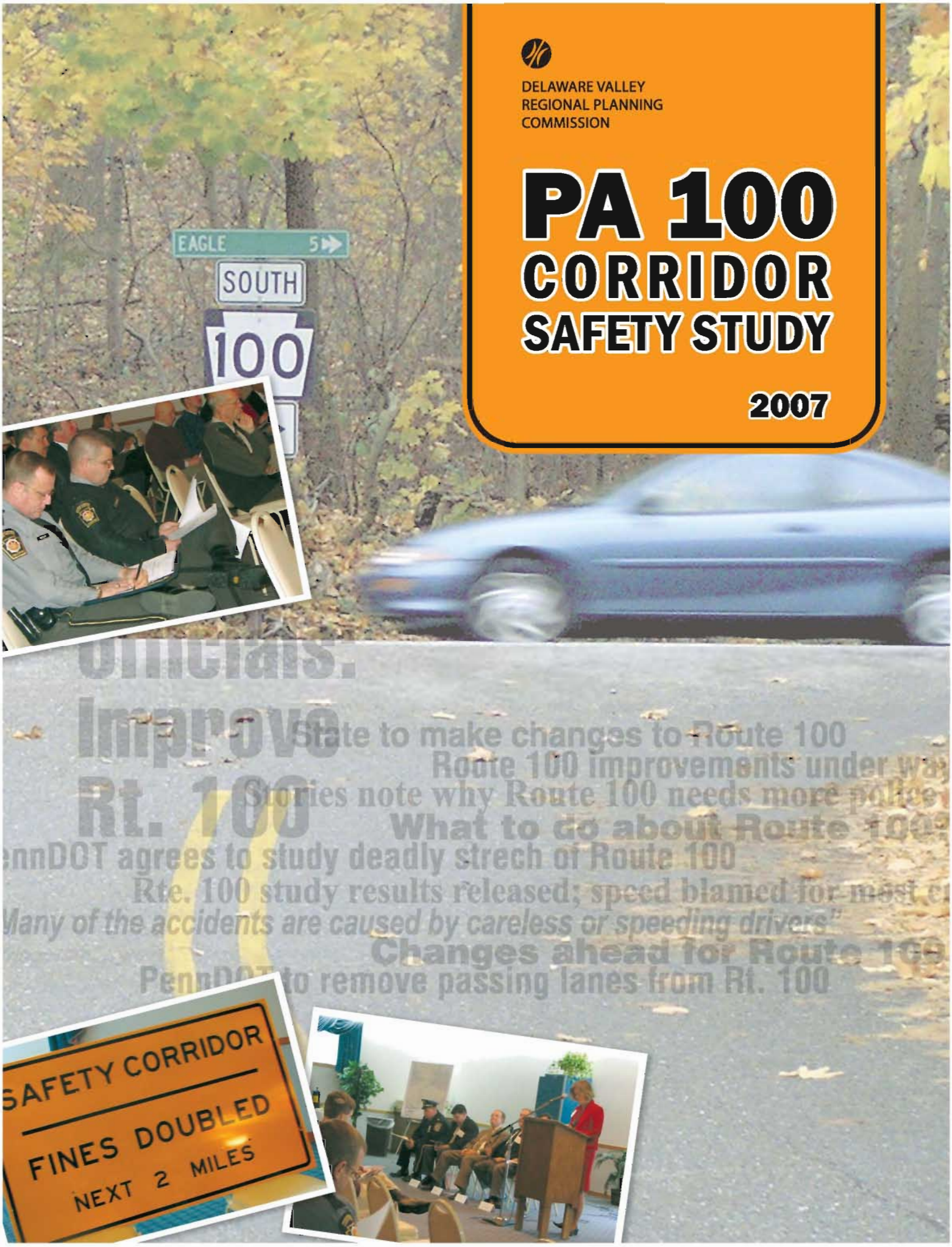
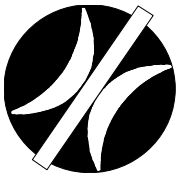


DELAWARE VALLEY
REGIONAL PLANNING
COMMISSION

PA 100 CORRIDOR SAFETY STUDY

2007

Created in 1965, the Delaware Valley Regional Planning Commission (DVRPC) is an interstate, intercounty and intercity agency that provides continuing, comprehensive and coordinated planning to shape a vision for the future growth of the Delaware Valley region. The region includes Bucks, Chester, Delaware, and Montgomery counties, as well as the City of Philadelphia, in Pennsylvania; and Burlington, Camden, Gloucester and Mercer counties in New Jersey. DVRPC provides technical assistance and services; conducts high priority studies that respond to the requests and demands of member state and local governments; fosters cooperation among various constituents to forge a consensus on diverse regional issues; determines and meets the needs of the private sector; and practices public outreach efforts to promote two-way communication and public awareness of regional issues and the Commission.



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.

DVRPC is funded by a variety of funding sources including federal grants from the U.S. Department of Transportation's Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), the Pennsylvania and New Jersey departments of transportation, as well as by DVRPC's state and local member governments. (A sentence regarding special sources of funding may be inserted here.) The authors, however, are solely responsible for its findings and conclusions, which may not represent the official views or policies of the funding agencies.

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EXECUTIVE SUMMARY

Between 2003 and 2005, there have been eight fatal crashes on an 8.4 mile segment of PA 100 in northern Chester County; in 2006, two additional fatal crashes occurred; and a third took place in January 2007. Underlying the safety issue is that over the last two decades, this section of Chester County has experienced a significant growth in population and employment, with a consequent increase in traffic.

In response to these safety concerns, state legislators and municipal officials met with Pennsylvania Department of Transportation (PennDOT) traffic engineers to try to address the safety problem. In response, PennDOT has conducted safety studies and subsequently undertook a number of corrective actions. However, due to continuing concerns, at the request of Chester County, PennDOT provided funding for the Delaware Valley Regional Planning Commission (DVRPC) to conduct an independent analysis of the crashes in the corridor with the objective of developing a more comprehensive list of crash remediation strategies.

The section of PA 100 under study extends from South Hanover Street in North Coventry Township to Font Road in Upper Uwchlan Township. It passes through five municipalities: North Coventry, South Coventry, East Nantmeal, West Vincent and Upper Uwchlan townships.

A review of PennDOT's Crash Database revealed 382 reportable crashes between 2000 and 2005. At the time of the analysis, data for 2002 was unavailable. Eighty four percent of the crashes involved hit-fixed object, angle and rear-end crashes. Hit-fixed objects, where a vehicle runs off the road and hits a tree, utility pole or a fence, represented 43 percent of all the crashes. These crashes were distinctly located in wooded or tree covered areas on PA 100 where there are hills and curves. Angle crashes accounted for 24 percent of the total crashes and were primarily located at major cross streets. Over one-third of the angle crashes occurred at PA 23 in South Coventry Township. Rear-end crashes represented 17 percent of the reportable crashes, with the majority taking place along the commercial strip in North Coventry Township.

Analysis of the Crash Database revealed that many crashes were clustered in the late fall: one-third of the crashes occurred between October and December. Wet weather and wet surface conditions appear to be major contributing factors. Wet weather was associated with 101 crashes (36 percent of the crashes), while wet surface conditions were associated with 137 of the crashes (56 percent of the crashes). The percentage of wet weather and wet surface crashes are disproportionate when compared to the statewide average, indicating a significant problem. Discussions with municipal officials revealed a direct correlation between crashes and the overhead tree canopy. A combination of

slippery leaves and other debris on the road and the inability of the roads to dry contribute to the wet surface problem. A tree management program is needed to reduce debris and expedite roadway surface drying.

Speeding, either exceeding the speed limit or driving too fast for conditions, is another contributory factor for the crashes. Driving too fast for conditions – due to traffic, curves/hills, or inclement weather – was a factor in 135 (35 percent) of the crashes. Speeding was a contributory factor in 24 crashes (6 percent of the crashes). Speed studies conducted by DVRPC confirmed excessive speeds on PA 100. For example, between Horseshoe Trail and Nantmeal Road, 91 percent of the motorists traveling northbound travel faster than the 45 mph posted speed limit, with 17.4 percent going more than 10 mph over the speed limit. In the southbound direction, 70 percent of the traffic speeds. At the curves, traffic slows, but a significant number of motorists still exceed the speed limit.

Other factors contributing to crashes include the horizontal curves, aggressive drivers and poor access control. Over or under compensation at curves by motorists was noted in 53 of the crashes reported. While PennDOT posted curve warning signs at many locations, field views revealed supplemental signing is needed at many of these locations, and other curves lack any warning signs. Aggressive driving, whether it is tailgating (36 crashes), driving on the wrong side of the roadway (28 crashes) or running a red light (18 crashes), is a major factor. More active police enforcement is needed to control speeding and aggressive driving. Access management is a problem at several locations including North Coventry commercial strip, PA 23 intersection, PA 401 intersection and Font Road. Better land use planning such as access control, interconnecting driveways and creating a village-like atmosphere where people can walk between businesses are steps that can resolve this type of problem.

Because crashes in the corridor are caused by a combination of factors, the recommendations must be multi-faceted in order to address the various underlying causes. No single mitigation measure by itself can satisfactorily reduce the incidence and severity of crashes. Recommendations were generated by DVRPC field views, municipal outreach meetings and discussions with Chester County and PennDOT.

The recommendations are divided into two general categories: corridor-wide recommendations and municipality-specific recommendations. Corridor-wide recommendations are general strategies, such as speed enforcement or upgrading warning signs, which have wide application throughout the corridor. They fall under three subcategories: speed enforcement, physical improvements and land use strategies. Municipality-specific recommendations are a more specific set of recommendations targeted to address unique issues associated with crash clusters located within each of the five municipalities.

Since the number of recommendations exceeds the ability of PennDOT and the municipalities to implement projects, DVRPC was asked to prioritize projects for advancement. A recommendation matrix was created to identify high priority short-term actions that will have an immediate impact in reducing crashes. High priority projects with a longer time frame, and higher costs, were also identified. A draft Action Plan was presented to municipal and elected officials on December 1, 2006. The plan was adjusted to reflect comments received. The resulting Action Plan will serve as the basis of a Transportation Improvement Program (TIP) project being prepared by Chester County Planning Commission and PennDOT District 6-0 Traffic Unit for federal funding.

A concerted effort is necessary to ensure that the Action Plan is carried out, involving elected officials, PennDOT, Chester County, municipalities, Pennsylvania State Police and developers. Consequently, there should be on-going meetings among the parties, either one or two times a year, to track progress, deal with issues that arise or even periodically adjust the plan. As an organization that works closely with PennDOT, the municipalities and developers, the Chester County Planning Commission should assume lead responsibility.

PA 100 Corridor Safety Action Plan

ACTION	DESCRIPTION	RESPONSIBILITY	COST	FUNDING SOURCE
Short-Term Actions				
Speed enforcement program	A corridor-wide blitz enforcement program targeted to high accident months. Designate PA 100 as a Highway Safety Corridor	Local police, PA State Police, municipalities	$20,900/year	Smooth Operator Program, Buckle Up PA, Highway Safety Corridor program
Pull-outs for police enforcement • Horseshoe Tr – Somerset Nursery • Blackhorse Rd – Cedar La • Third location TBD	Constructing pull-outs that will provide a safe haven for police to conduct speed enforcement at the curve sections and other locations where there are no shoulders	PennDOT, state and local police	$350,000	DVRPC TIP
Apply Nova Chip treatment • Horseshoe Tr – Fairview Rd • Blackhorse Rd – Cedar La • Pughtown Rd – Prizer Rd • Prizer Rd – Flowing Springs Rd	Increasing roadway surface friction to prevent slippery surface/run off the road crashes. As part of the treatment, narrow painted median and widen shoulders to create a buffer at the curves: Fairview Rd to Horseshoe Tr, Blackhorse Rd to Cedar La.	PennDOT	$580,000	DVRPC TIP
Tree management • Fairview Rd – Horseshoe Tr • Blackhorse Rd – Cedar La • Prizer Rd – Titus Inn	Cutting back tree branches and/or trees to dry road surface, improve lighting conditions and sight distance around curves	PennDOT Maintenance	$80,000–$100,000	Low-cost safety funding
Upgrade signs/additional signs • Curves throughout corridor • West Vincent speed limit signs	Providing guidance and adequate warnings to motorists	PennDOT	$15,000–$20,000	PennDOT maintenance budget and low-cost safety funding

Source: DVRPC 2007

PA 100 Corridor Safety Action Plan

ACTION	DESCRIPTION	RESPONSIBILITY	COST	FUNDING SOURCE
Conduct North Coventry PA 100 Concept Study	Study focused along commercial strip, determine cross section, access management, streetscape	North Coventry Township	$16,000	TBD
Bucktown improvements • Construct interim northbound left-turn lane • Access management	• Construct left turn-lane as temporary measure until PA 23/PA 100 connector is constructed. Retime traffic signal • Incorporate access management treatment including closing, consolidating and relocating driveways to minimize vehicle conflict	South Coventry Township	• Left-turn lane – $130,000 • Access management – N/A	• Left-turn lane – DVRPC TIP • Access management – property owners, developers
Maintenance program • Blackhorse Rd hill salting	Develop a cooperative agreement for winter plowing and salting of Blackhorse Rd hill	PennDOT Maintenance	N/A	N/A
Dynamic message sign/beacon • Horseshoe Tr • Blackhorse Rd	Signs that will warn motorists of hazardous conditions ahead at the approach of curves (e.g., wintry conditions, road closures/detours, etc.). Includes both temporary portable DMS signs and permanent sign structures	PennDOT, municipalities	$335,000	DVRPC TIP
Medium-Term Actions				
Implement North Coventry PA 100 Concept Study recommendations	Move forward in implementing improvements identified in the North Coventry PA 100 Concept Study	North Coventry Township, PennDOT	Dependent upon results from study	Developers and Act 209 fees

Source: DVRPC 2007

PA 100 Corridor Safety Action Plan

ACTION	DESCRIPTION	RESPONSIBILITY	COST	FUNDING SOURCE
South Coventry PA 23/PA 100 connector	Proposed connector will extend west of PA 23 intersection southward to connect to Hartman Rd, will help to alleviate congestion at PA 23 intersection	Developer	N/A	Developer
Blackhorse Hill • Blackhorse Rd climbing lane transition • Flatten curve	• Extension of the northbound merge lane, ending at the Loop Road • Flattening the curve between Blackhorse Rd and Cedar La	West Vincent Township, PennDOT	$760,000	DVRPC TIP
Long-Term Actions				
Realign the French Creek curve	Realign the curve and bridge over French Creek between Pughtown Rd and Prizer Inc.	PennDOT	$4,400,000–$5,700,000*	DVRPC TIP
Daisy Point Rd connector	Proposed connector road will extend west of PA 100 and Pughtown Rd intersection, northward to connect with the PA 23/PA 100 connector road, also includes the closure of Daisy Point Rd access to PA 100	South Coventry Township	N/A	South Coventry and developers

* Excludes right-of-way costs
Source: DVRPC 2007

I. INTRODUCTION

Between 2003 and 2005, there were eight fatal crashes on an 8.4 mile segment of PA 100 in northern Chester County; in 2006, two additional fatal crashes occurred. Underlying the safety issue is that over the last two decades, this section of Chester County has experienced a significant growth in population and employment, with a consequent increase in traffic and greater potential for crashes to occur.

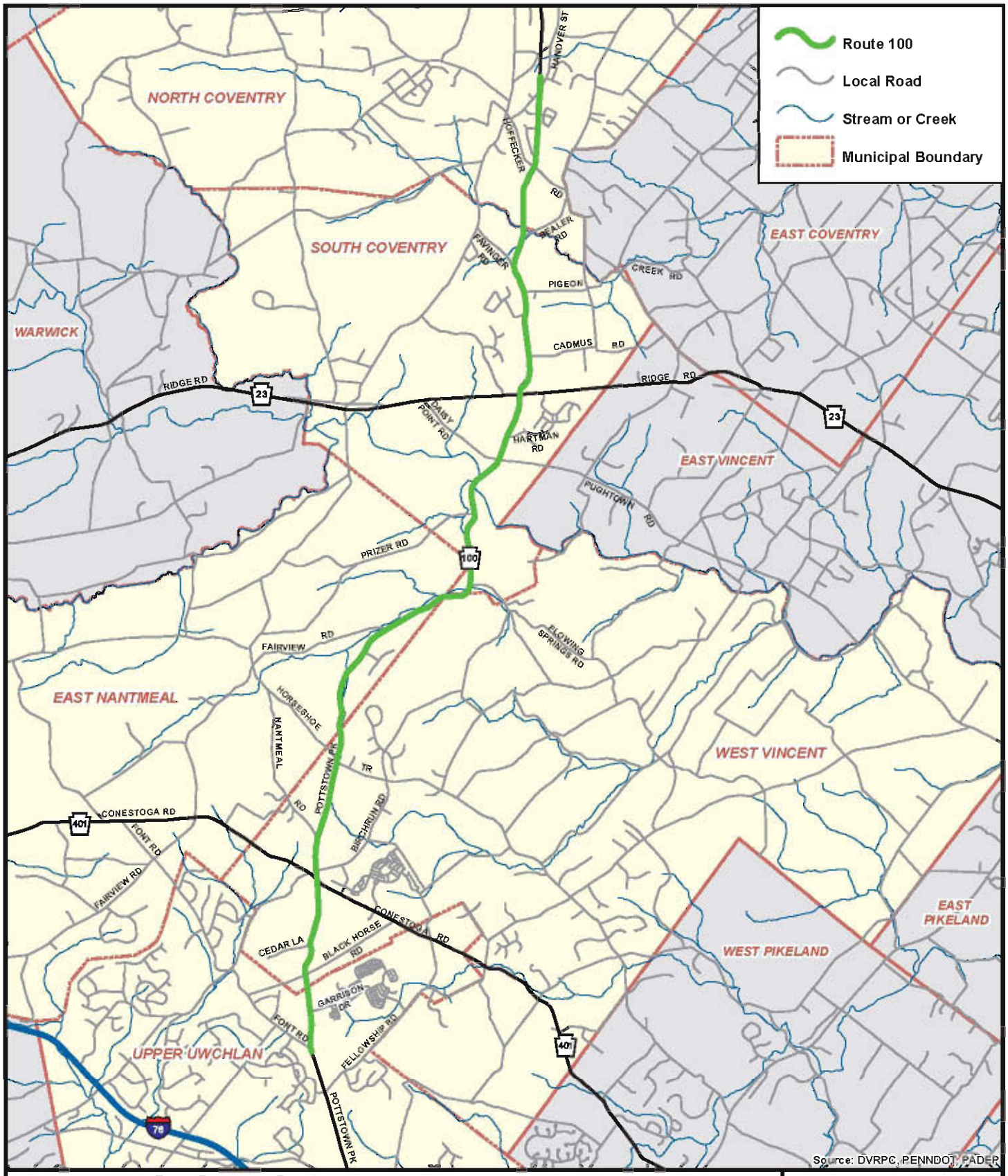
In response to these safety concerns, state legislators and municipal officials met with Pennsylvania Department of Transportation (PennDOT) traffic engineers to try to solve the safety problem. In response, PennDOT has conducted safety studies and subsequently undertook a number of corrective actions including removal of truck climbing lanes and the installation of rumble strips and raised pavement markers. Due to continuing concerns, at the request of Chester County, PennDOT provided funding for the Delaware Valley Regional Planning Commission (DVRPC) to conduct an independent analysis of the crashes in the corridor with the objective of developing a more comprehensive list of crash remediation strategies.

The section of PA 100 under study extends from South Hanover Street in North Coventry Township to Font Road in Upper Uwchlan Township; see Map 1 for study area location. It passes through five municipalities: North Coventry, South Coventry, East Nantmeal, West Vincent and Upper Uwchlan townships.

A review of PennDOT's Crash Database revealed 382 reportable crashes between 2000 and 2005. At the time of the analysis, data for 2002 was unavailable. An analysis of the crashes was conducted to determine the general characteristics of the crashes and their trends. The objective was to determine on a corridor-wide basis the mode of crashes: hit-fixed objects versus rear-end crashes, and what factors contributed to them. Equally important, it determined what factors were not associated with the crashes. A series of maps were produced plotting some of the more significant crash factors by crash location to determine if there is any correlation.

The corridor was then divided into six crash clusters based on the distribution of the crashes and the physical characteristics of the roadway. A more detailed analysis of the clusters was conducted to identify local factors causing accidents.

Based upon the cluster analysis, a comprehensive program to reduce accidents was developed. There are three components to the program: corridor-wide improvements applicable to more than one cluster; municipality specific recommendations to resolve unique problems within each municipality; and an action program that identifies costs, funding and implementation responsibilities



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 1: Study Area

0 0.5 1 1.5 2
Miles

Delaware Valley Regional Planning Commission
July 2007

Location map

*Map not to scale

for the most critical recommendations. A recommendations matrix was used to screen the recommendations and advance those most critical to the Action Plan.

To support the crash analysis and better understand the traffic characteristics of PA 100, traffic data was collected at five locations along the corridor. Hourly traffic counts, vehicular classification counts and vehicle speeds were collected in August and September 2005. An analysis of the data is presented in the report; the raw data from the field counters is presented in the Appendix A.

Because development in the corridor has indirectly contributed to the growth in accidents, Chester County requested a land use analysis as part of the study to ascertain if land use oriented strategies could possibly help mitigate the rise in crashes. The analysis examined demographic trends, existing land uses, zoning, proposed development and environmental constraints. Based on this analysis, a series of land use recommendations were developed and incorporated into the recommendations.

PennDOT has undertaken a number of actions to reduce crashes on PA 100. These actions are documented in the report. There was concern among several local officials that PennDOT may have used an inappropriate pavement mixture when they resurfaced PA 100, and that this may have contributed to the crash problem. Pertinent sections of PennDOT's paving manual were reviewed to ascertain the appropriate pavement mixture for PA 100.

To guide this effort, an initial meeting was held with state legislators, municipal officials, the Pennsylvania State Police, Chester County and PennDOT on July 28, 2006, to review current traffic conditions, a summary of the analysis of the Crash Database and crash clusters and the land use analysis. PennDOT summarized the actions they have taken in response to previous meetings with local officials. During August and September 2006, meetings were held with each municipality in the corridor to review the crash data and begin formulating specific recommendations for their municipality. A summary of the findings was then presented to Chester County and PennDOT for preliminary review. In cooperation with them, a recommendation matrix was developed to screen which strategies will go into the Action Plan. A second corridor-wide meeting was held on December 1, 2006. Prior to the meeting, recommendations, recommendation matrix and Action Plan were mailed to invitees so they would be prepared to discuss them. The Action Plan was finalized in 2007 based upon the group's comments.

II. BACKGROUND

DESCRIPTION OF THE CORRIDOR

PA 100 (Pottstown Pike) is the only major north-south road that runs through central Chester County. It serves as the main artery for both local and through traffic, providing direct access to West Chester and Exton to the south, and the Pottstown area to the north. Within the study area, it passes through the villages of Bucktown, Pughtown, Ludwigs Corner and Eagle (located south of the study area).

PA 100 is essentially a two-lane road with one lane in each direction. At three locations, there is a second northbound lane which serves either as a truck climbing lane or as a passing lane. There used to be several additional passing lanes, but over the years PennDOT removed them, either by converting them to a continuous center turn lane or marking them out with striping, to reduce accidents on PA 100. Truck climbing lanes/passing lanes are located at the following locations:

- From Temple Road/Suburbia Shopping Center to South Hanover Street, North Conventry Township. The second northbound lane functions as an exit lane for South Hanover Street rather than as a passing lane;
- From PA 23 to just south of Cadmus Road, South Conventry Township; and
- From the Upper Uwchlan/West Vincent township line to Cedar Road, West Vincent Township.

Physically, PA 100 can be characterized as both a hilly and curvy road, which is why it has had a number of truck climbing/passing lanes. The shoulder width varies considerably. Many sections of the corridor have ample shoulders (for example in North Conventry Township); but in the curvy sections the shoulders are narrow and there are locations where guiderail or rock faces are within one foot of the roadway. The posted speed limit in the study area is 45 mph; however, several curves have curve warning signs with 35 mph speed plaques warning drivers to slow down. There are several reverse curves; the more pronounced ones are located between Horseshoe Trail and Somerset Nursery in East Nantmeal Township and between Prizer Road and Pughtown Road in South Coventry Township.

Four signalized intersections are in the corridor. Traffic signals are located at:

- Temple Road/Suburbia Shopping Center, North Conventry Township;
- Cadmus Road, South Conventry Township;
- PA 23 (Ridge Pike), South Conventry Township; and
- PA 401 (Conestoga Road), West Vincent Township.

Due to the hilly terrain, steep slopes and the French Creek watershed, traffic volumes on the non-signalized cross streets are fairly low. The more significant non-signalized intersections include:

- South Hanover Street (PA 663), North Coventry Township;
- Hoffecker Road, North Coventry Township;
- Favinger Road, South Coventry Township;
- Daisy Point/Pughtown Road, South Coventry Township;
- Prizer Road, South Coventry Township;
- Flowing Springs Road, South Coventry Township;
- Horseshoe Trail, West Vincent Township;
- Nantmeal Road, West Vincent Township;
- Blackhorse Road, West Vincent Township; and
- Font Road, Upper Uwchlan Township.

West Vincent Township's Ludwigs Corner Master Plan calls for a bypass around the PA 100/PA 401 intersection, to the east of PA 100. Partially built, the bypass will ultimately extend from PA 100/Nantmeal Road (which will be realigned to slightly north of its current location) to a point approximately 1,300 feet south of the PA 100/PA 401 intersection.

EXISTING TRAFFIC CONDITIONS

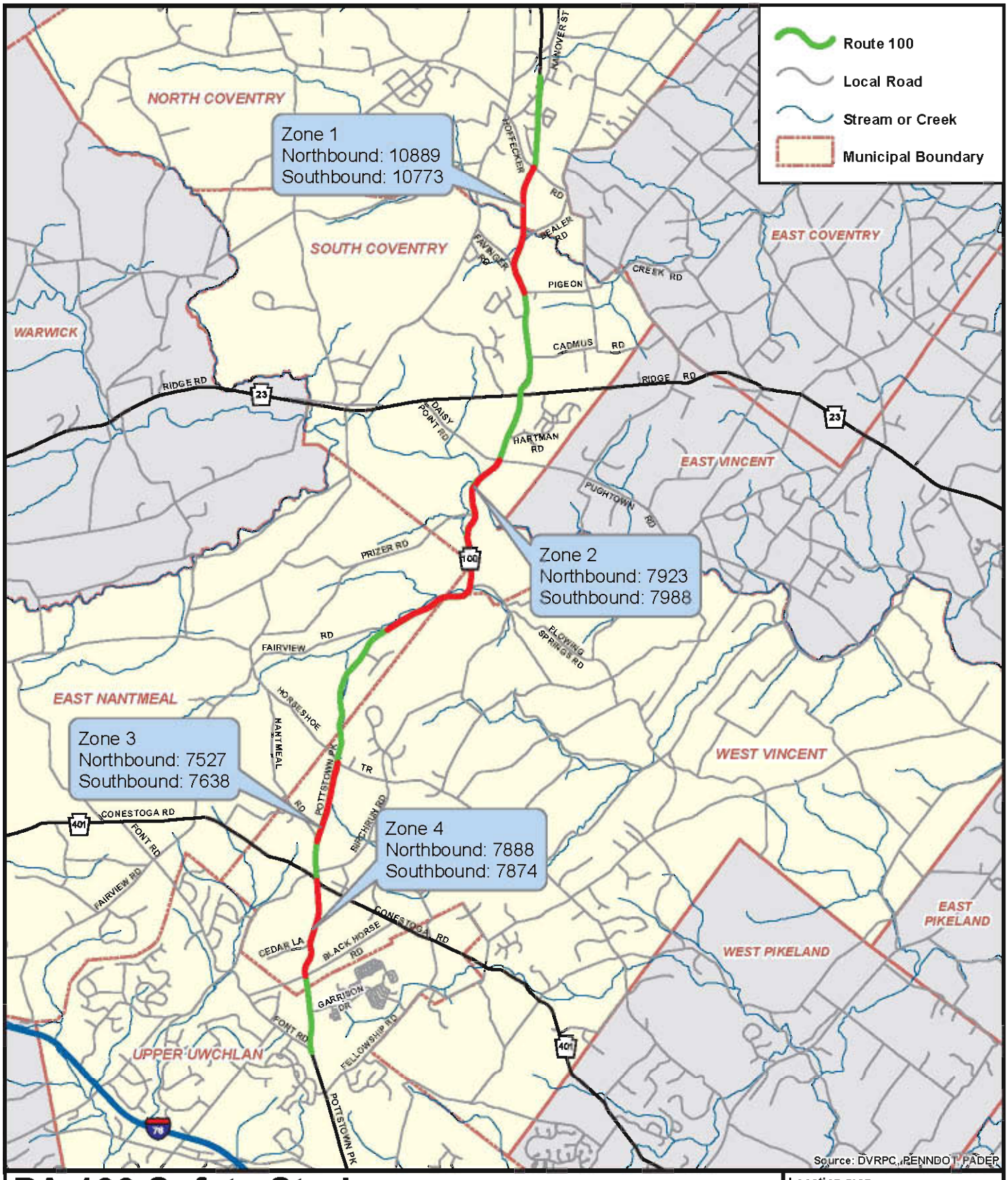
At the beginning of this study, basic traffic information was collected via automatic traffic counters: traffic volumes, vehicle classification counts and travel speeds. This information was used to evaluate traffic patterns on PA 100.

Methodology

Traffic data was collected by DVRPC from August 29 to September 2, 2005. Counts were taken at four zones along PA 100, see Map 2. These zones were selected based on corridor characteristics, best location for the collection devices, and safety considerations, see Table 1.

Traffic volumes, vehicle classification counts and travel speeds were collected in the same manner. Two air tubes were spread eight feet apart from each other, connected to an automatic traffic counting machine. Traffic volumes and vehicle classifications were both collected on August 30, 2005 and September 1, 2005. Data was collected by direction and by vehicle type over a 24-hour period. Raw classification counts generated 13 categories of vehicle types; there were nine categories of trucks (two axle, three axle, etc.). For the purpose of this analysis, the data was consolidated into the following five categories:

- Motorcycle;
- Cars;



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 2: Traffic Count Zones

0 0.5 1 1.5 2
Miles

N

Delaware Valley
Regional Planning Commission
July 2007

Location map

*Map not to scale

- Light trucks (2 axles);
- Buses; and
- Heavy tractor trucks (3+ axles).

Table 1: Traffic Count Zones

Zone	From	To	Characteristics
1	Hoffecker Rd	Pigeon Creek Rd	Rural, rolling terrain, open (northern section), wooded (southern section)
2	Pughtown Rd	Fairview Rd	Rural, wooded, curves and changes in grade of roadway
3	Horseshoe Trail	Nantmeal Rd	Rural, 2 lane, rolling and level terrain, open, straight road alignment
4	PA 401	Blackhorse Rd	Ludwig Corner (PA 401) congestion, curves, passing lane, change in grade

Source: DVRPC, 2007

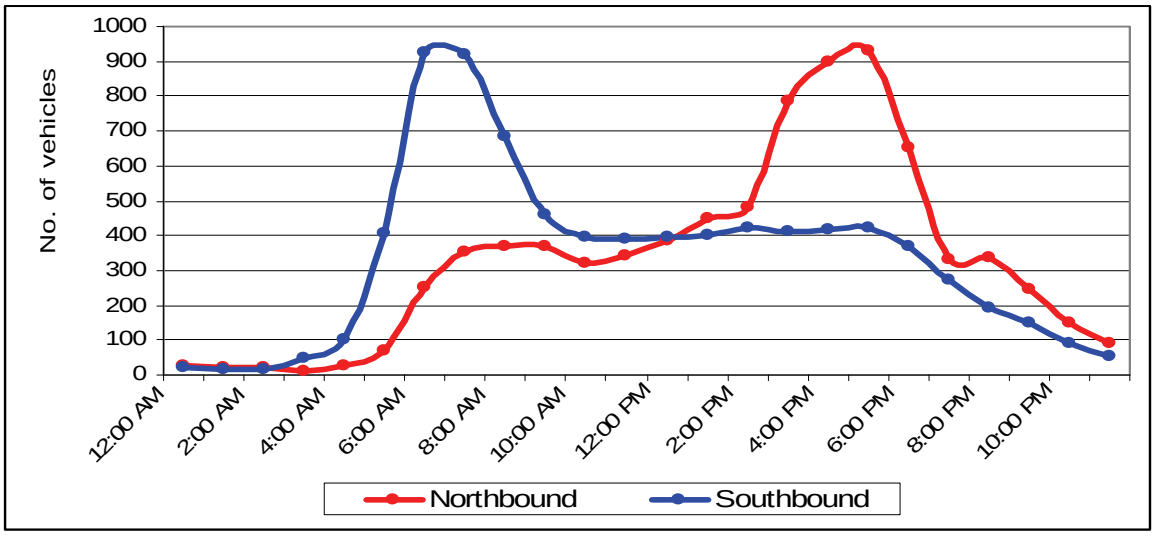
Travel speeds were collected in each direction beginning on August 29, through September 2, 2005. All speeds were taken over a 48-hour spread over a three day period, beginning at 8:00 AM for the first day and ending at 7:00 AM on the third day. For Zones 1 and 2, the data collected on August 30 was used. For Zones 3 and 4, the data collected on September 1 was used.

Traffic Volumes

A review of the traffic counts revealed traffic in the corridor is fairly consistent (except for Traffic Zone 1) – approximately 15,600 vehicles per day. Over the course of the day traffic is evenly split directionally, approximately 7,800 vehicles per day in each direction. With the exception of Ludwigs Corner, there are no substantial traffic generators south of PA 23 to significantly impact traffic flow. However, there is a substantial movement between PA 23 west and PA 100 north, resulting in higher traffic volumes north of PA 23. Traffic Zone 1 (Hoffecker Road to Pigeon Creek Road) had a daily volume of 21,700 vehicles per day.

Hourly traffic volume data was analyzed via a series of line graphs created to summarize the directional traffic flow of each zone over the 24-hour time period. A sample graphic for Zone 2 (Pughtown Road to Fairview Avenue) is shown in Figure 1. The red line on the graph indicates vehicles traveling in the northbound direction and the blue line represents the vehicles traveling in the southbound direction. A complete set of the traffic count/vehicle classification data and the traffic volume graphics, by traffic zone, is included in Appendix A.

Figure 1: Hourly Traffic Variation: Zone 2 (Pughtown Rd to Fairview Rd)



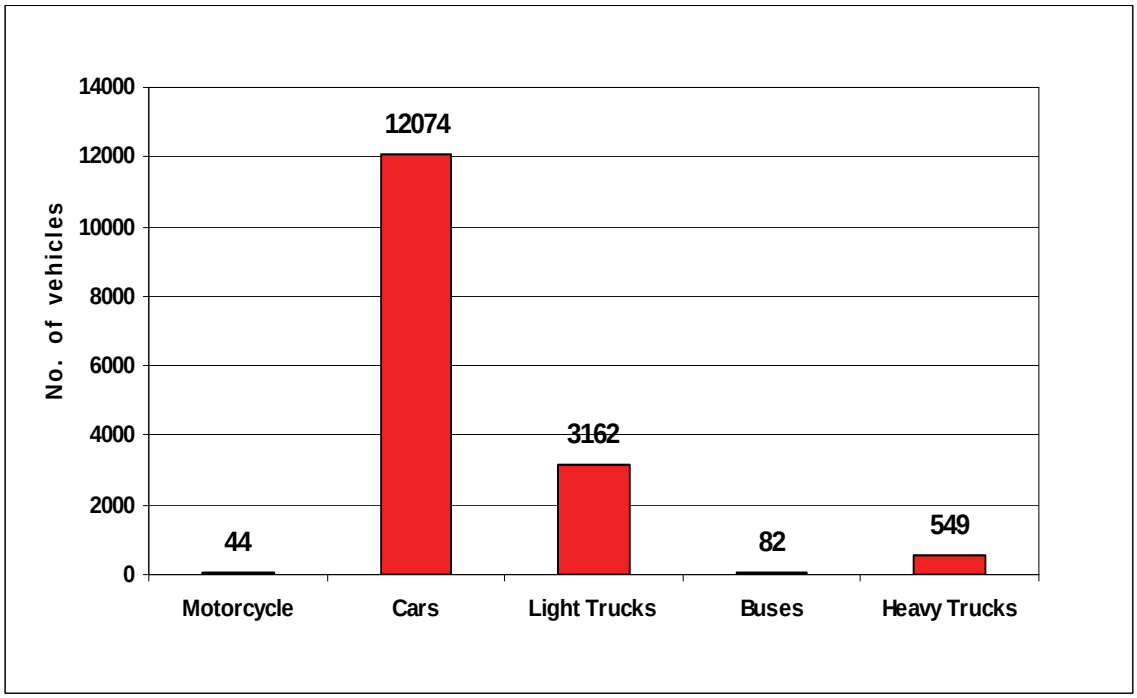
Source: DVRPC, 2005

As might be expected, there is a significant directional variation in hourly traffic. The morning peak is heavily southbound oriented; traffic destined to Exton, Lionville and the US 202 corridor, peaking around 6-8 AM. The afternoon peak is northbound oriented, peaking between 4-6 PM. Generally, there are between 800-900 vehicles per hour in the peak direction; for Traffic Zone 1, the volumes were slightly higher, in the range of 1,100-1,200 vehicles per hour. Mid-day traffic volumes are relatively flat, approximately 350-450 vehicles per hour in either direction; again, Traffic Zone 1 has slightly higher mid-day traffic volumes.

Vehicle Classification

Passenger cars represent 75 percent of the traffic on PA 100. Light trucks (pick-up trucks, vans, panel trucks) represent 20 percent and heavy trucks account for 3.5 percent. To place this in perspective, there are about 3,000 light trucks and 500-600 heavy trucks on PA 100 daily. For a principal arterial, PA 100's heavy truck percentage is lower that what would typically be expected, around 5-6 percent. It appears trucks try to avoid the roadway due to congestion. The number of buses traveling on PA 100 varied from 101 buses in Traffic Zone 1 to 65 buses in Traffic Zone 4. Traffic counts were collected prior to the start of school and they appear to have missed school bus traffic. The distribution of vehicle types can be observed in Figure 2 for Traffic Zone 2, which is typical of the corridor. More detailed information for each of the traffic zones is contained in Appendix A.

Figure 2: Traffic Classification: Zone 2 (Pughtown Road to Fairview Road)



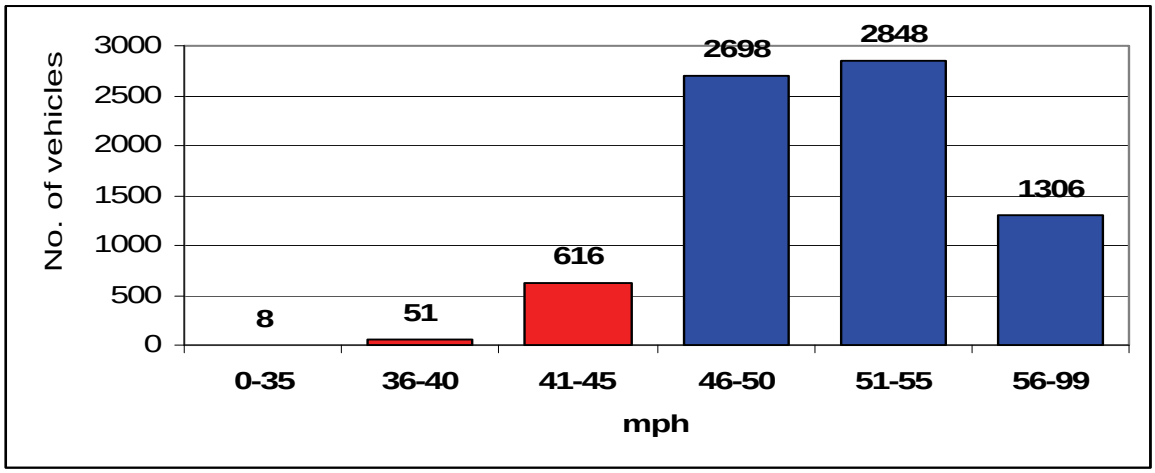
Source: DVRPC, 2005

Travel Speeds

When the Crash Database was examined, it was observed that one of the primary causes of accidents in the corridor was speeding: motorists were either exceeding the speed limit or they were traveling at speeds unsafe for road conditions. Travel speeds collected by DVRPC document the aggressive speeding behavior of motorists.

Traffic Zone 3 (Horseshoe Trail to Nantmeal Road) is typical of travel speeds in the straight sections of PA 100 where curves and hills do not impede travel speeds. As shown graphically in Figure 3, 91 percent of the motorists traveling northbound are traveling faster than the speed limit (on the figure, red indicates vehicles traveling below the 45 mph speed limit and blue indicates vehicles traveling faster than the speed limit). In fact, 1,306 of the motorists (17.4 percent) are going more than 10 mph over the speed limit. In the southbound direction (not shown), 70 percent of the traffic is speeding. Traffic Zone 1, which is also a straight section, displays similar characteristics.

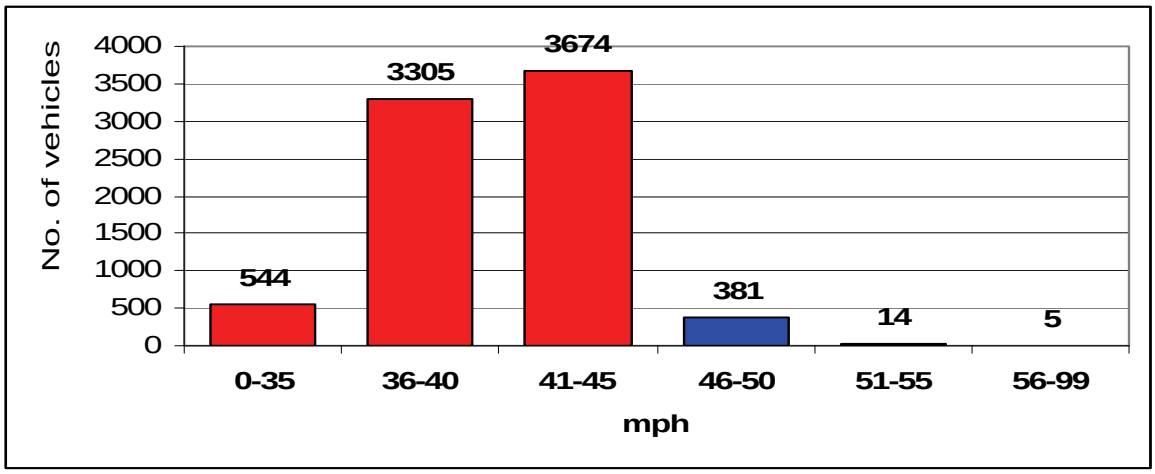
Figure 3: Travel Speeds: Zone 3 (Horseshoe Trail to Nantmeal Road)



Source: DVRPC, 2005

Traffic Zone 2 (Pughtown Road to Fairview Avenue) is typical of a section of PA 100 with hills and horizontal curves. As shown in Figure 4, the travel speed profile shows a remarkable decrease in travel speed as compared to Figure 3. PA 100 curves significantly slow travel speeds. However, 18 percent of the motorists still exceed the speed limit and 89 of them (1.1 percent) are traveling at speeds over 10 mph greater than the posted speed limit. In the northbound direction, 95 percent travel within the speed limit, with 5 percent exceeding it.

Figure 4: Travel Speeds Zone 2 (Pughtown Road to Fairview Road)



Source: DVRPC, 2005

III. CRASH DATA ANALYSIS

Crash data for this study was obtained from PennDOT's Crash Database. Crash data is available for the following five-year period: 2000, 2001, 2003, 2004 and 2005. Year 2002 data was not available at the time of the analysis. Over the course of this five-year period, there were a total of 382 reportable crashes, of which 322 were located mid-block on PA 100 and 60 were located at intersections. Reportable crashes are accidents where there is at least one injury and/or a vehicle towed from the scene. Map 3 depicts the location of the crashes on PA 100.

The crash data used for analysis in this report was provided by PennDOT. DVRPC uses this data as an analysis tool for traffic safety related transportation planning and programming purposes only. The raw data is the property of PennDOT and its release is expressly prohibited without the written consent of the Department.

For the purpose of this analysis, the crash data is divided into two separate categories: general corridor-wide crash trends (this chapter) and crash cluster analysis (next chapter).

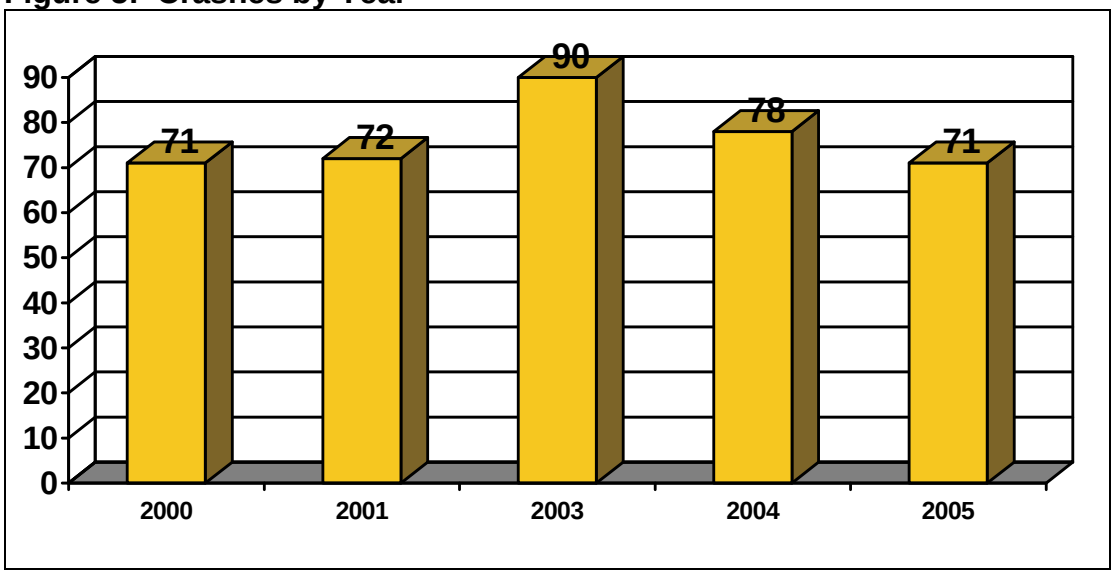
GENERAL CORRIDOR-WIDE CRASH TRENDS

PennDOT's Crash Database contains hundreds of factors that describe specific details of any crash; a partial listing of more pertinent factors found within the database is located in Appendix B. An initial screening was conducted to ascertain which of these factors implicate the underlying causes of crashes in the corridor. They can range from physical deficiencies such as horizontal curves; to driver related issues, such as speeding. The analysis indicated drunk driving, substance abuse, teenage drivers, senior drivers and trucks did not have a major impact on the crashes. Some examples of this analysis are presented in Appendix C. The tables and charts listed below describe some of the more significant corridor-wide findings from the analysis.

CRASHES BY YEAR

Figure 5 shows the distribution of crashes over the five-year period. Of the reportable crashes, 71 crashes occurred in 2000 and 72 occurred in 2001. The highest number of crashes (90 crashes) happened in 2003. The last two-year period analyzed showed a decrease in the number of crashes to 78 in 2004 and 71 in 2005. Other than 2003, the numbers of crashes were fairly consistent, in the range of 71 to 78 crashes per year.

Figure 5: Crashes by Year



Source: PennDOT Crash Database, 2005

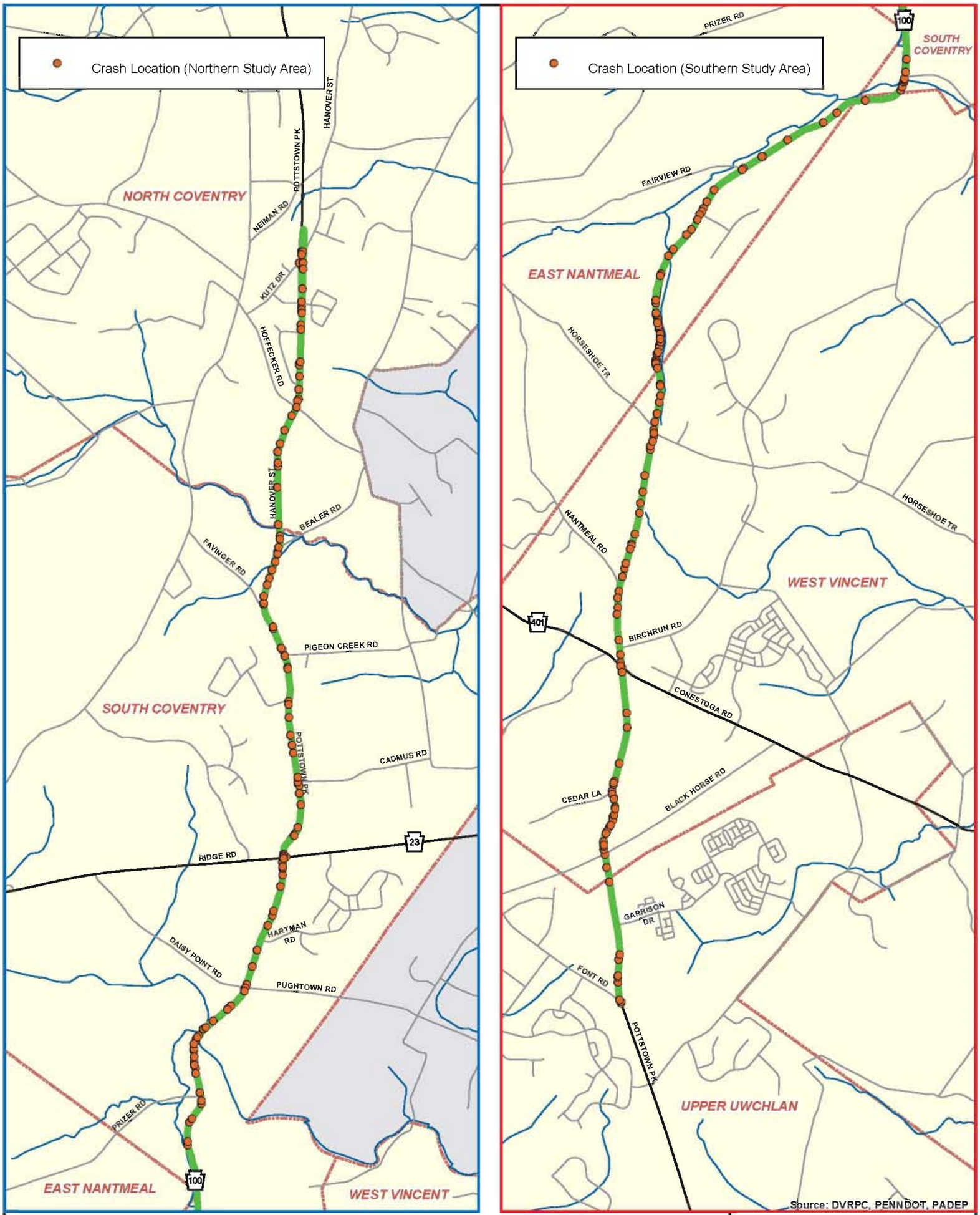
CRASHES BY MONTH

Table 2 depicts the monthly breakdown of the number of crashes over the five-year period. Highlighted in red text are the months with the highest number of crashes, months where more than 10 percent of the crashes occurred. There is a significant seasonal component to the crashes. As shown, the months of October, November and December, 25 percent of the year, account for nearly one-third of all crashes. According to a separate analysis, not shown, the majority of these crashes occurred along curvy and wooded sections of the corridor and involved vehicles hitting objects. With the exception of June, the spring and summer months have the least number of crashes.

Table 2: Crashes by Month

Month	2000	2001	2003	2004	2005	Total	Percent
January	7	4	12	5	6	34	9
February	3	5	4	6	7	25	7
March	4	8	7	6	4	29	7
April	4	3	6	3	4	20	5
May	11	7	8	5	3	34	9
June	13	6	12	9	3	43	11
July	4	5	3	7	7	26	7
August	6	1	5	4	6	22	6
September	2	5	8	4	5	24	6
October	2	3	10	10	14	39	10
November	5	15	6	11	8	45	12
December	10	10	9	8	4	41	11
TOTAL	**71**	**72**	**90**	**78**	**71**	**382**	**100%**

Source: PennDOT Crash Database, 2005



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 3: Corridor-wide Crash Locations

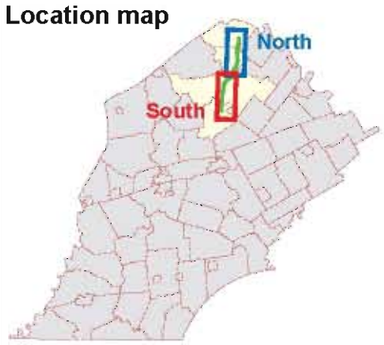
Route 100
Local Road
Stream or Creek
Municipal Boundary

0 0.25 0.5 0.75 1
Miles

N

Delaware Valley
Regional Planning Commission
July 2007

Location map



*Map not to scale

LOCATION BY MUNICIPALITY

Table 3 shows the location of crashes by municipality. South Coventry Township had the highest number of crashes, 156 (41 percent); while Upper Uwchlan Township had the least number of crashes, 15 (4 percent). Comparing the absolute number of crashes among municipalities does not present a true picture of the crash situation. As shown in Table 3, South Coventry has more centerline miles of PA 100 than the other municipalities. When crashes were examined on a per mile basis, the crash rate among the municipalities was consistent.

Table 3: Crashes by Municipality

Municipality	Number of Crashes	PA 100 Lane Miles
North Coventry	60	1.2
South Coventry	156	3.2
East Nantmeal	54	1.3
West Vincent	97	2.2
Upper Uwchlan	15	0.5

Source: PennDOT Crash Database, 2005

CRASH TYPE

PennDOT's Crash Database characterizes crashes by eight categories of crash types. Of the 382 crashes on PA 100, hit-fixed object, angle, and rear-end crashes represent nearly 84 percent of the total crashes. A more comprehensive breakdown of the crash types is given in Table 4. Map 4 documents the distribution of crash types on PA 100.

Hit-fixed object, where a vehicle runs off the road and hits a utility pole, guiderail, fence or some other fixed object, represents the largest specific mode of crash, 43 percent of all the crashes. Over 93 percent of hit-fixed object crashes occurred in South Coventry, East Nantmeal and West Vincent townships. Of the 54 crashes in East Nantmeal Township, 43 of the crashes (80 percent) were hit-fixed object related. These crashes were distinctly located in areas along the corridor where there are hills and curves. Speeding, driving too fast for conditions, and slippery road surface conditions were the main contributory factors in the occurrence of these crashes.

Angle crashes accounted for 24 percent of the crashes in the corridor. They were primarily located at major cross streets; however, driveways also contribute to angle crashes. Thirty-two of the 39 angle crashes in South Coventry Township were located at the PA 23 intersection. Twenty-seven of the crashes in North Coventry Township (45 percent) were angle crashes. The majority of these crashes were located at the Temple Road traffic signal and along the commercial strip just south of the intersection.

Rear-end crashes represented 17 percent of all crashes. The majority of these crashes were located along the commercial strip section in North Coventry Township, and to a lesser extent throughout South Coventry Township.

Table 4: Crash Type

Crash Type	Number	Percent
Hit-Fixed Object	166	43
Angle	90	24
Rear-end	66	17
Head-on	24	6
Non-collision	14	4
Sideswipe (same direction)	7	2
Sideswipe (opposite direction)	8	2
Hit Pedestrian	1	<1
Unknown	6	2

Source: PennDOT Crash Database, 2005

CRASH SEVERITY

Data from the PennDOT database characterizes crash severity by the following categories: fatal, injury crashes, property damage only and unknown. The PennDOT database defines a fatal crash as an incident involving at least one fatality and not the total number of people who died at the scene of a crash. Injury crashes are incidents where at least one person is injured at the scene of the crash. The Crash Database classified the injury related crashes into three sub groupings: major, moderate and minor. The majority of crashes were property damage only and personal injury at 51 percent and 44 percent respectively. The severity level was unknown for 10 crashes.

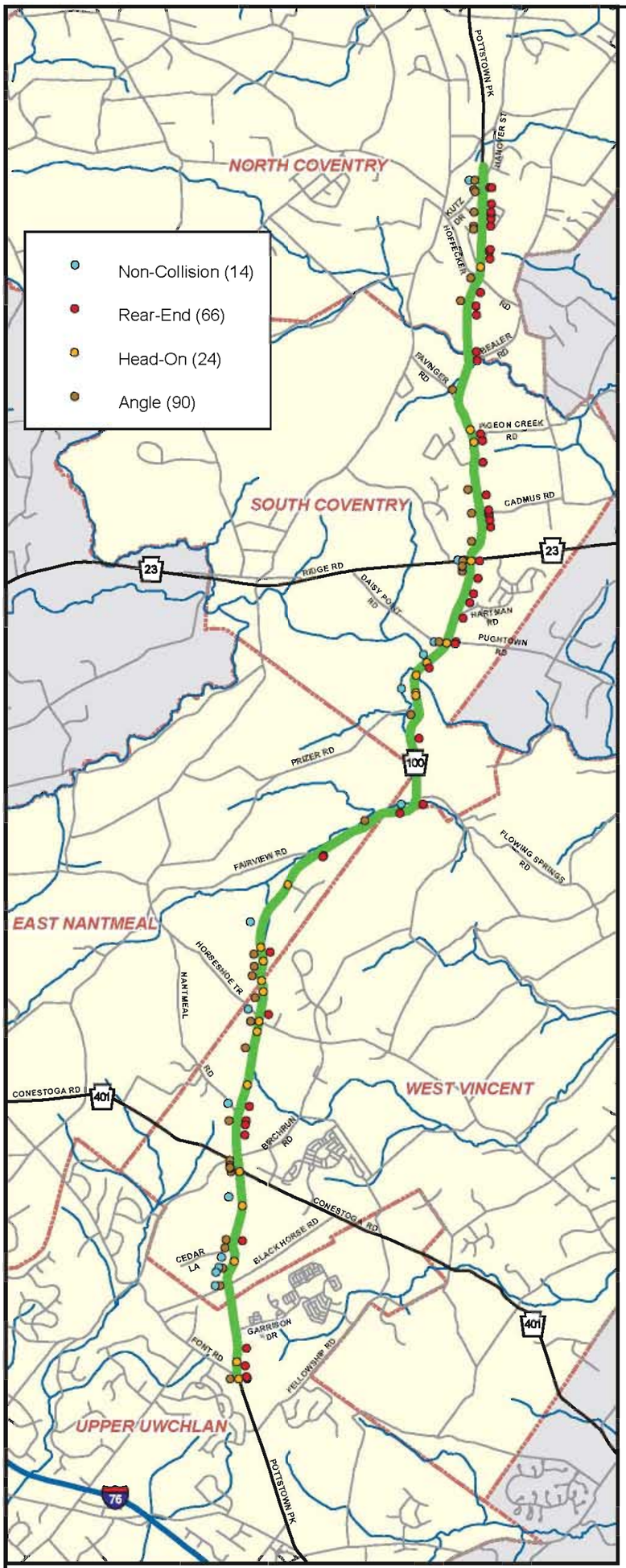
Table 5: Crash Severity

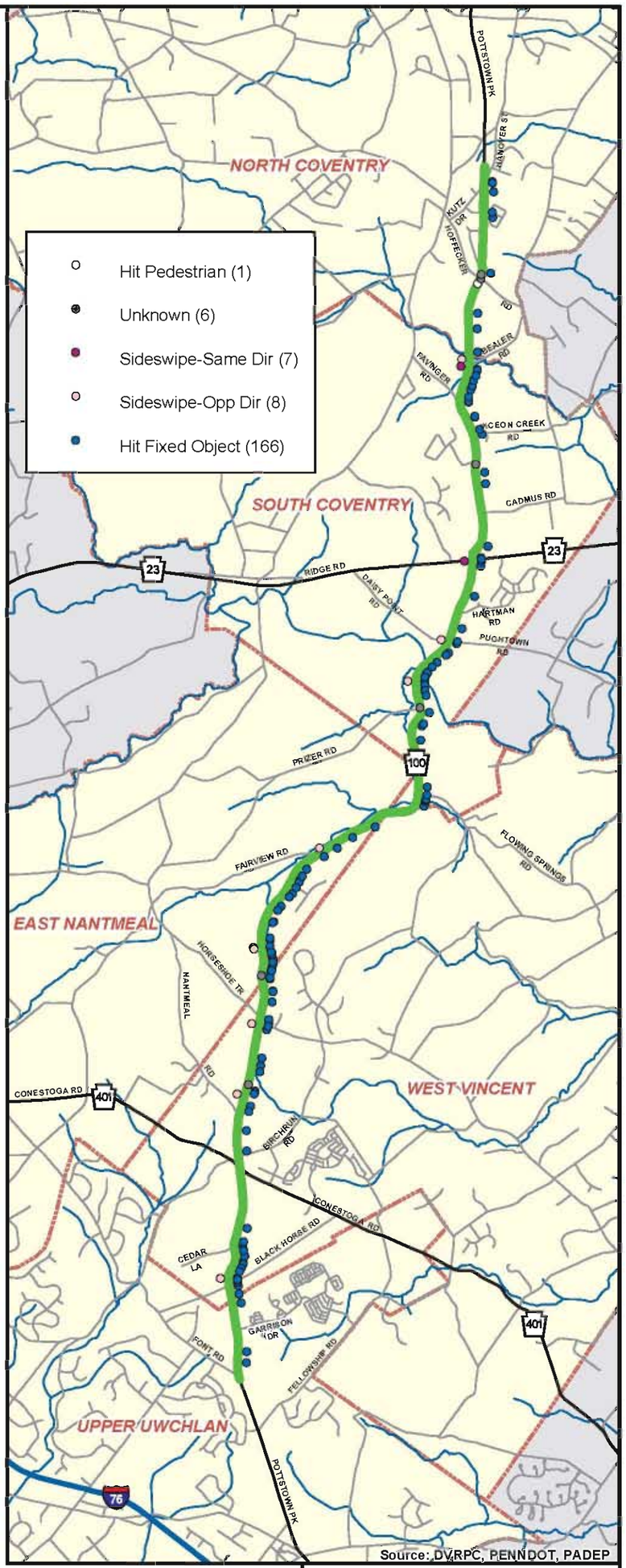
Crash Severity	Number	Percent
Fatal	8	2
Injury	169	44
Property Damage Only (PDO)	195	51
Unknown	10	3

Source: PennDOT Crash Database, 2005

FATAL CRASHES

The high rate of fatal crashes is a recent trend. Although this study analyzed crash data since 2000, fatal crashes did not start occurring until 2003; since then, there have been eight fatal crashes on PA 100. In 2006, there were two additional fatal crashes (information about them is not yet available in PennDOT's Crash Database). The fatal crashes fell within three crash types: hit fixed-object, angle and head-on collisions. The fatalities were located in South





Source: DVRPC, PENNDOT, PADEP

PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 4: Crash Type

Route 100
Local Road
Stream or Creek
Municipal Boundary

0 0.5 1 1.5 2
Miles

N

Delaware Valley
Regional Planning Commission
July 2007

Location map

*Map not to scale

Coventry, East Nantmeal and West Vincent townships. There were four crashes in 2003, three crashes in 2004, and one crash at the beginning of 2005. Seven of the eight crashes occurred during the fall and winter months. Table 6 summarizes the fatal crashes. Map 5 depicts the location of the fatal crashes compared to the non-fatal crashes on PA 100.

Table 6: Fatal Crash Description

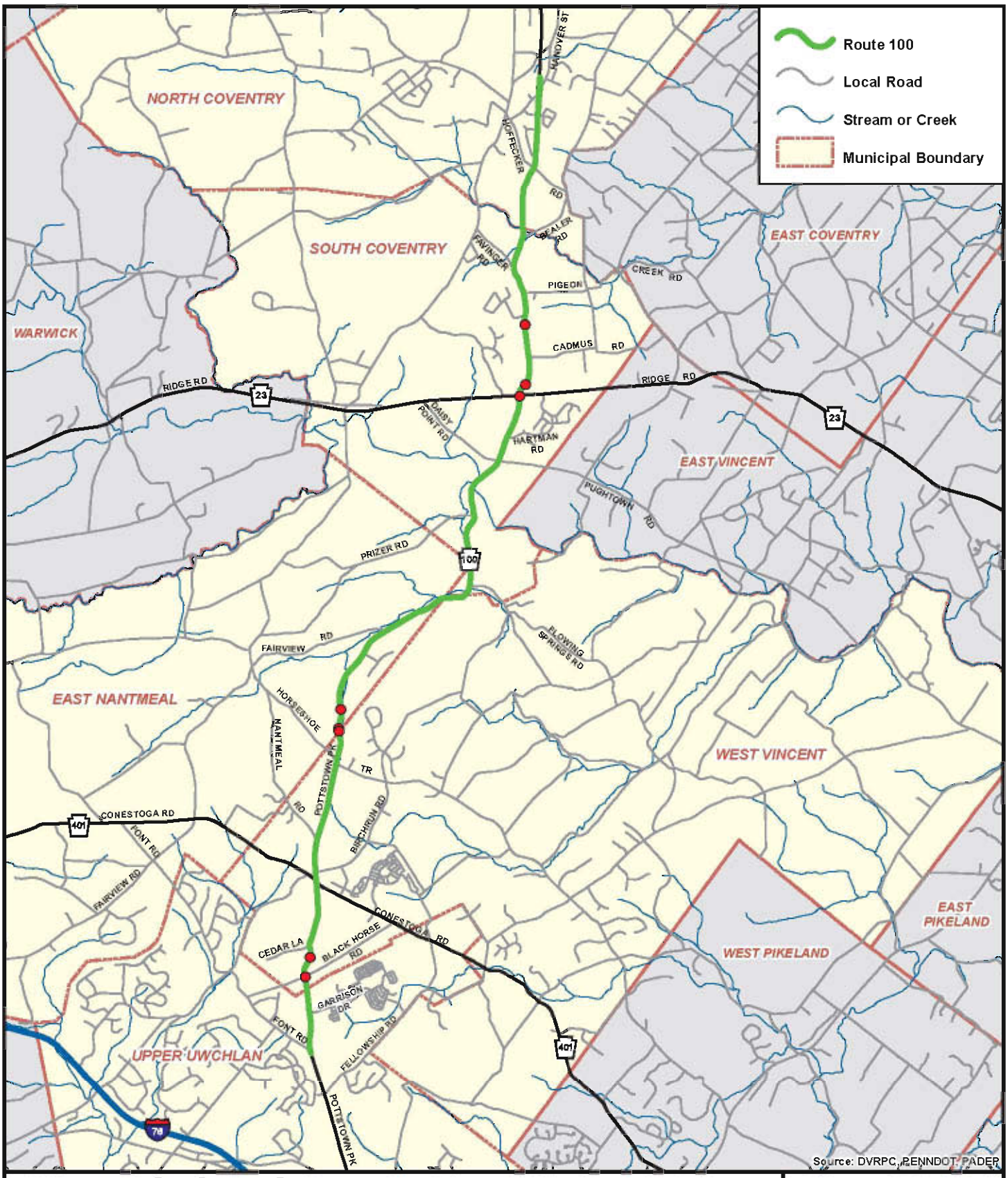
Location	Crash Date	Crash Type
#1	January 19, 2003	Hit-fixed Object
#2	February 2, 2003	Angle
#3	October 29, 2003	Head-on
#4	November 12, 2003	Angle
#5	April 24, 2004	Hit-fixed Object
#6	October 23, 2004	Head-on
#7	December 22, 2004	Hit-fixed Object
#8	January 1, 2005	Angle

Source: PennDOT Crash Database, 2005

OTHER CRASH TRENDS

The crash analysis analyzed several other corridor-wide crash factors. Map 6, shows the lighting conditions at the time of the crash. Nearly 70 percent of the crashes occurred during the daylight conditions. These crashes were consistently spread throughout the study area. Twenty percent of the crashes happened at nighttime in areas where there were no street lights. Many of these crashes were clustered along the curvy and hilly section of the corridor in South Coventry, East Nantmeal and West Vincent townships.

Rainy weather and wet road surface condition are contributory causes of crashes on PA 100. As documented in Table 7, rainy weather was present for 101 crashes, about 26 percent of the total crashes. This percentage is higher than the statewide average, approximately 14 percent. Even more significant is wet road surface crashes. There were 137 wet surface crashes; a higher number than rainy weather crashes. They represent 36 percent of the total crashes, well above the statewide average of 20-21 percent. Causes for the high incidence of wet surface crashes include the overhead tree cover not providing an adequate opportunity for the road surface to dry, debris on the road forming slippery conditions, and the profile of the roadway creating hydroplaning conditions. As shown in Map 7, these crashes are generally clustered along the curvy and hilly sections of PA 100 in South Coventry, East Nantmeal and West Vincent townships. The majority of the slippery crashes result in vehicles hitting fixed objects.



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 5: Fatal Crash Locations

● Fatal Crash (8)

0 0.5 1 1.5 2
Miles

N

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July 2007

Location map

*Map not to scale

Table 7: Weather and Road Surface Conditions

Condition	Dry	Rainy/ Wet
Weather	247	101
Road surface	203	137

Source: PennDOT Crash Database, 2005

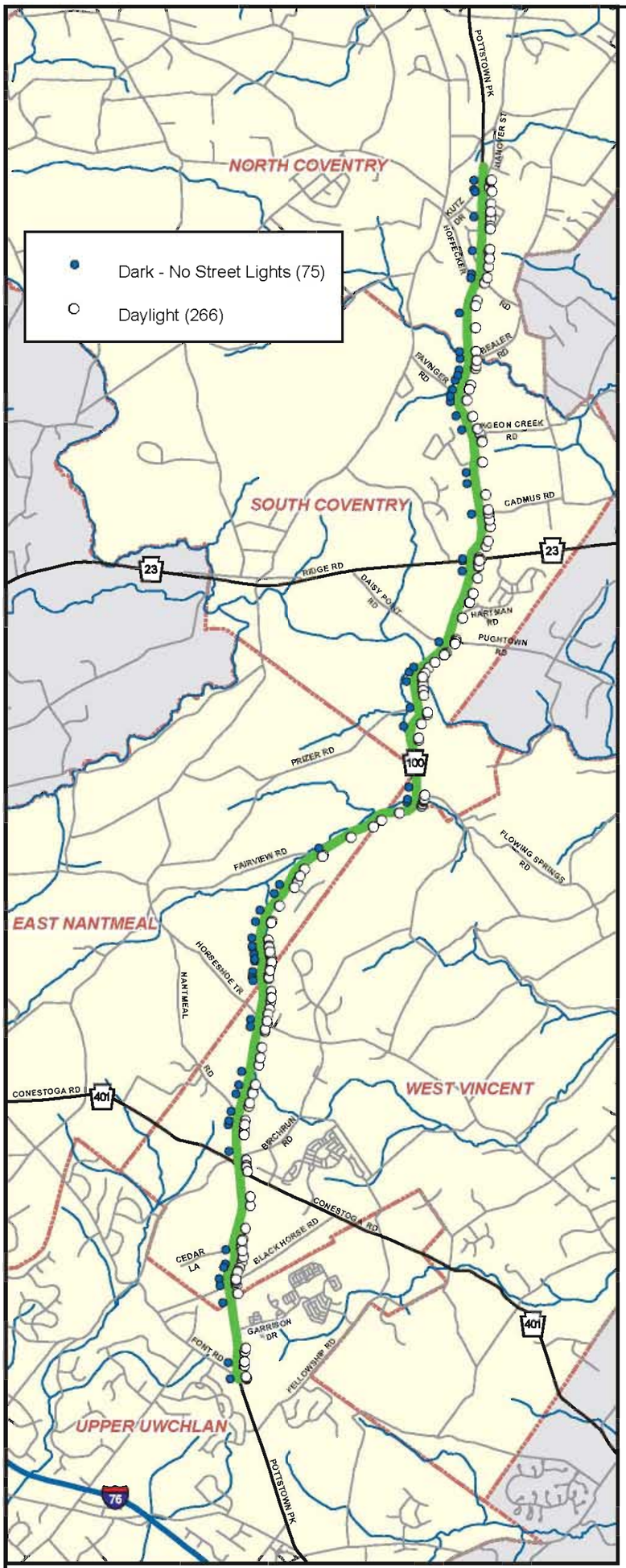
Time of day was another crash factor examined. Data revealed that the majority of crashes typically took place during the morning and afternoon peak hours. As previously discussed, this trend corresponds with the commuter travel patterns along the corridor. The direction of travel was also studied. There were a disproportionate number of crashes involving vehicles traveling northbound (188 crashes) versus southbound vehicles (115 crashes). As shown in Map 8, these crashes were evenly distributed throughout the corridor; however, there were a few cluster locations where northbound crashes were predominate, including the commercial strip in North Coventry Township and Blackhorse Hill in West Vincent Township. Eastbound and westbound vehicles on the map generally represent crossroad traffic at intersections, or vehicles exiting driveways.

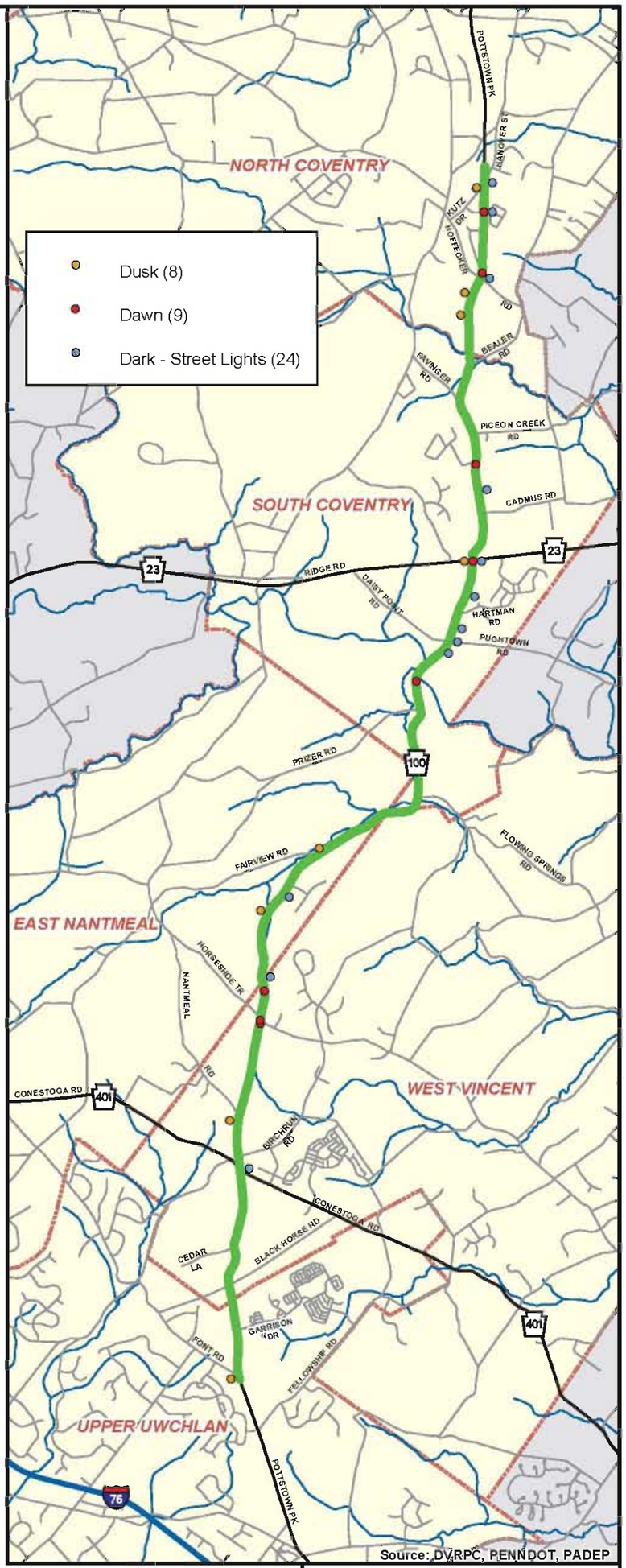
Driver action was another factor studied in the analysis. In many instances, the primary cause of a crash was not necessarily due to physical attributes of the roadway or environmental elements, but was directly the result of the action of the driver. The database revealed an assortment of driver actions and the crash analysis tried to correlate the various contributory driver actions responsible for different types of crashes. Driving too fast for conditions, either due to traffic, roadway design or inclement weather, was the leading contributory driver behavior for causing hit-fixed object crashes. Angle crashes at intersections were the result of drivers being distracted, making careless turns, failing to proceed without clearance and running red lights. A major cause of rear-end crashes were the result of aggressive driving and tailgating. The Table 8 summarizes the contributory driver actions identified in PennDOT Crash Database. The distribution of crashes associated with different types of driver actions is shown on Map 9.

Table 8: Driver Action

Driver Action	Number
Driving too fast for conditions	135
Over or under compensation at curves	53
Tailgating	36
Making improper or careless turns	34
Driving on wrong side of roadway	28
Driving distracted	27
Speeding	24
Affected by physical condition	24
Proceeding without clearance after stop	18
Running red light	18

Source: PennDOT Crash Database, 2005





Source: DVRPC, PENNDOT, PADEP

PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 6: Lighting Conditions

Route 100
Local Road
Stream or Creek
Municipal Boundary

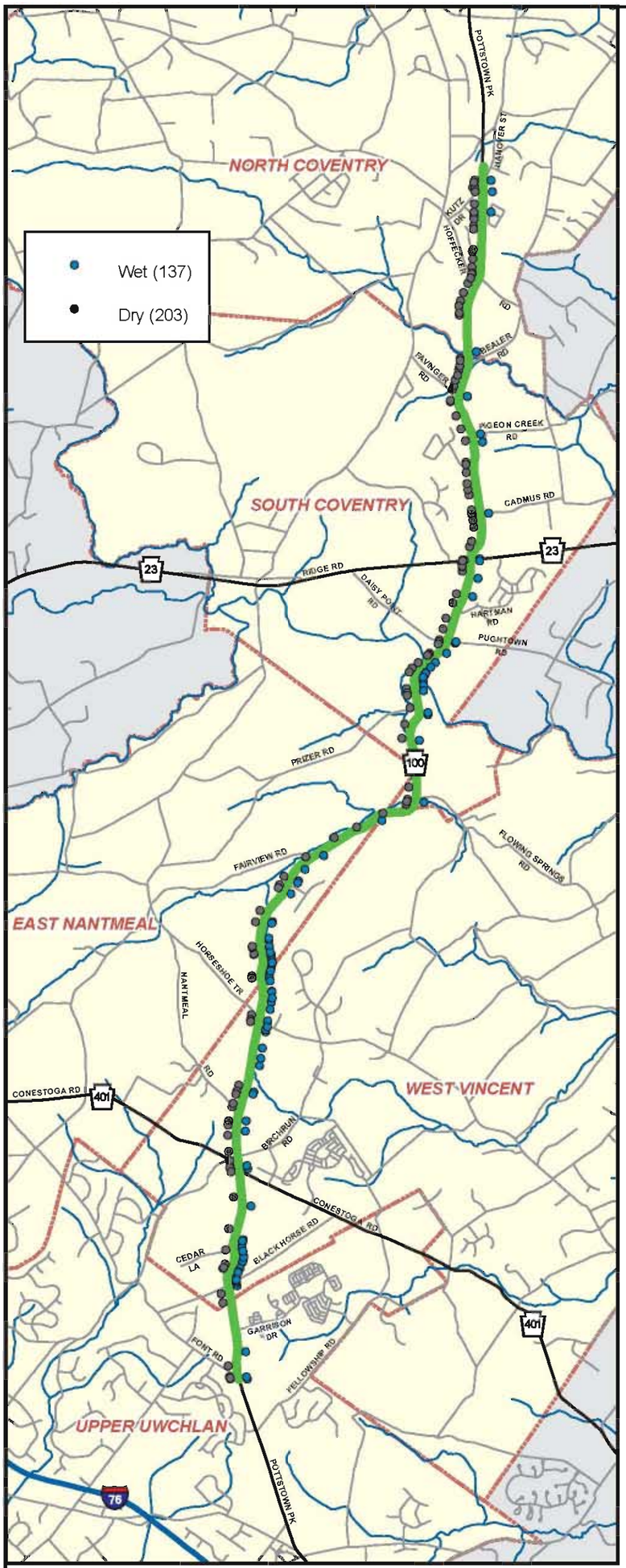
0 0.5 1 1.5 2
Miles

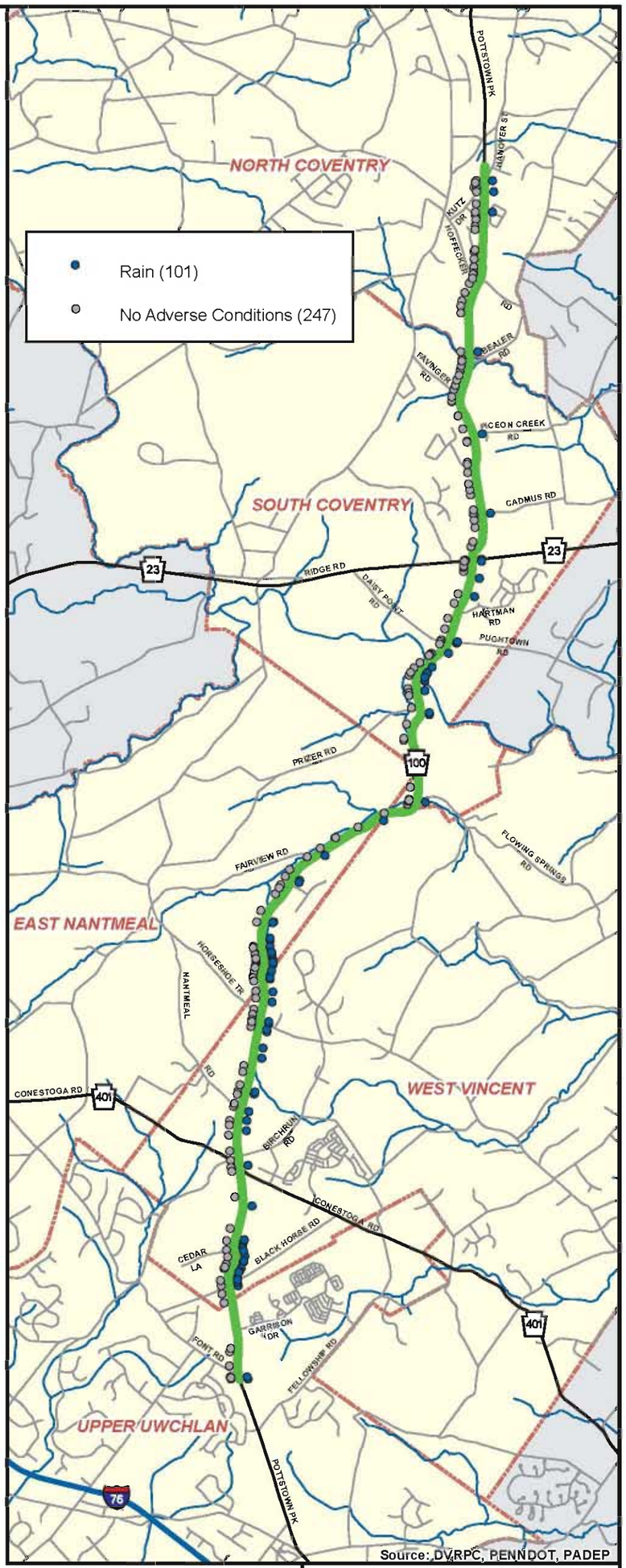
N

Delaware Valley
Regional Planning Commission
July 2007

Location map

*Map not to scale





Source: DVRPC, PENNDOT, PADEP

PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 7: Road Surface and Weather Condition

Route 100
Local Road
Stream or Creek
Municipal Boundary

0 0.5 1 1.5 2
Miles

N

Delaware Valley
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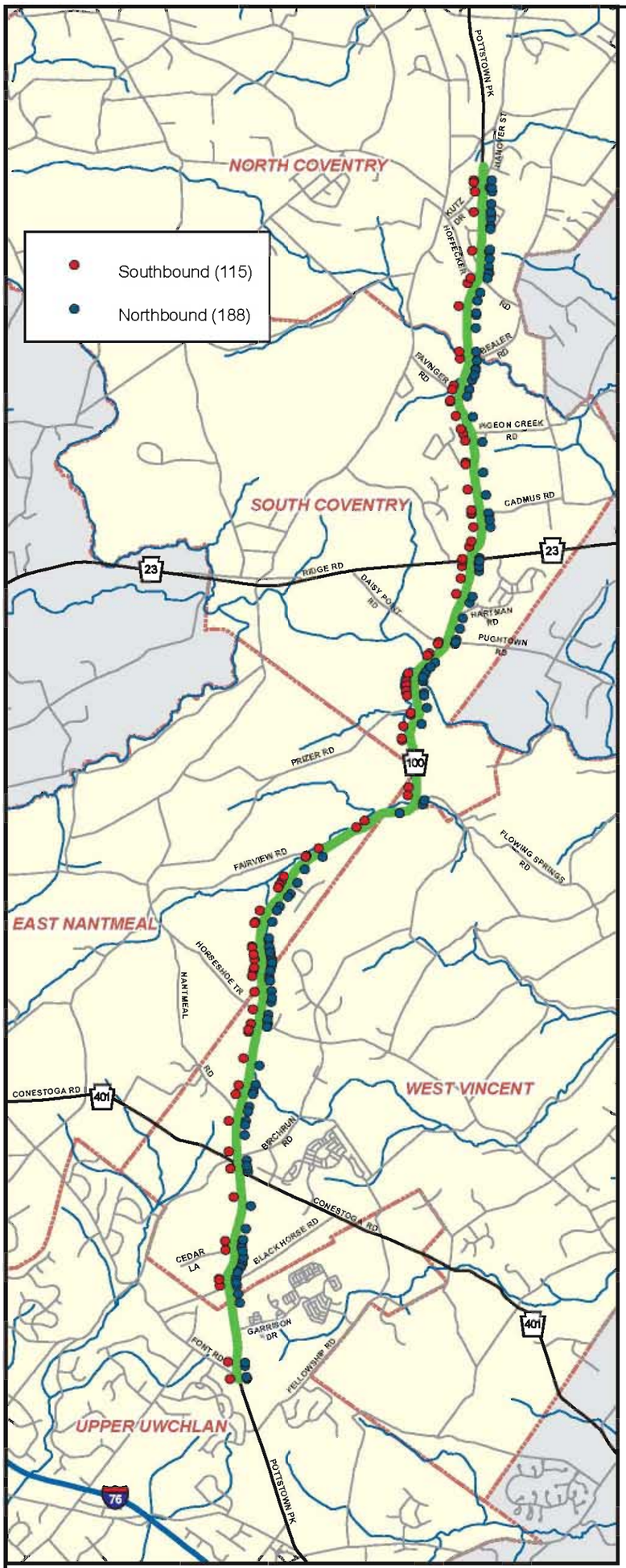
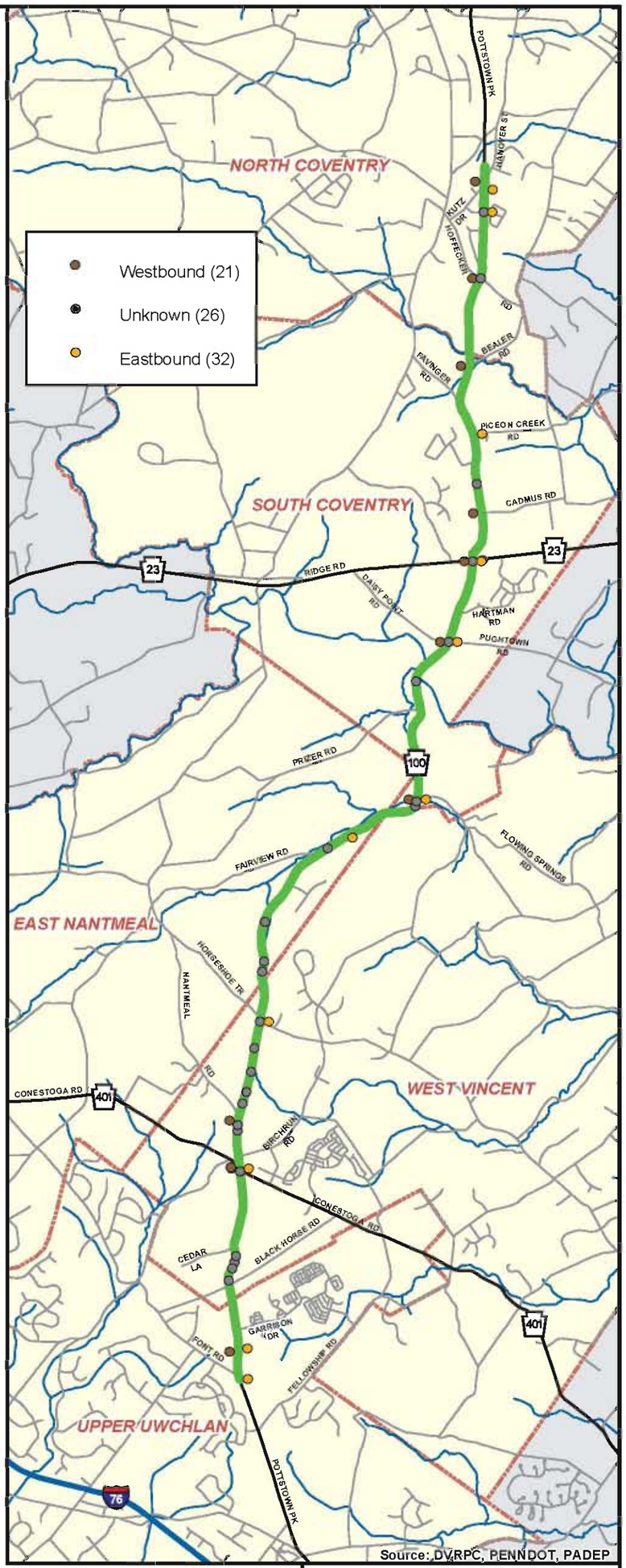
Location map

*Map not to scale





Source: DVRPC, PENNDOT, PADEP

PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 8: Direction of Travel

Route 100
Local Road
Stream or Creek
Municipal Boundary

0 0.5 1 1.5 2
Miles

N

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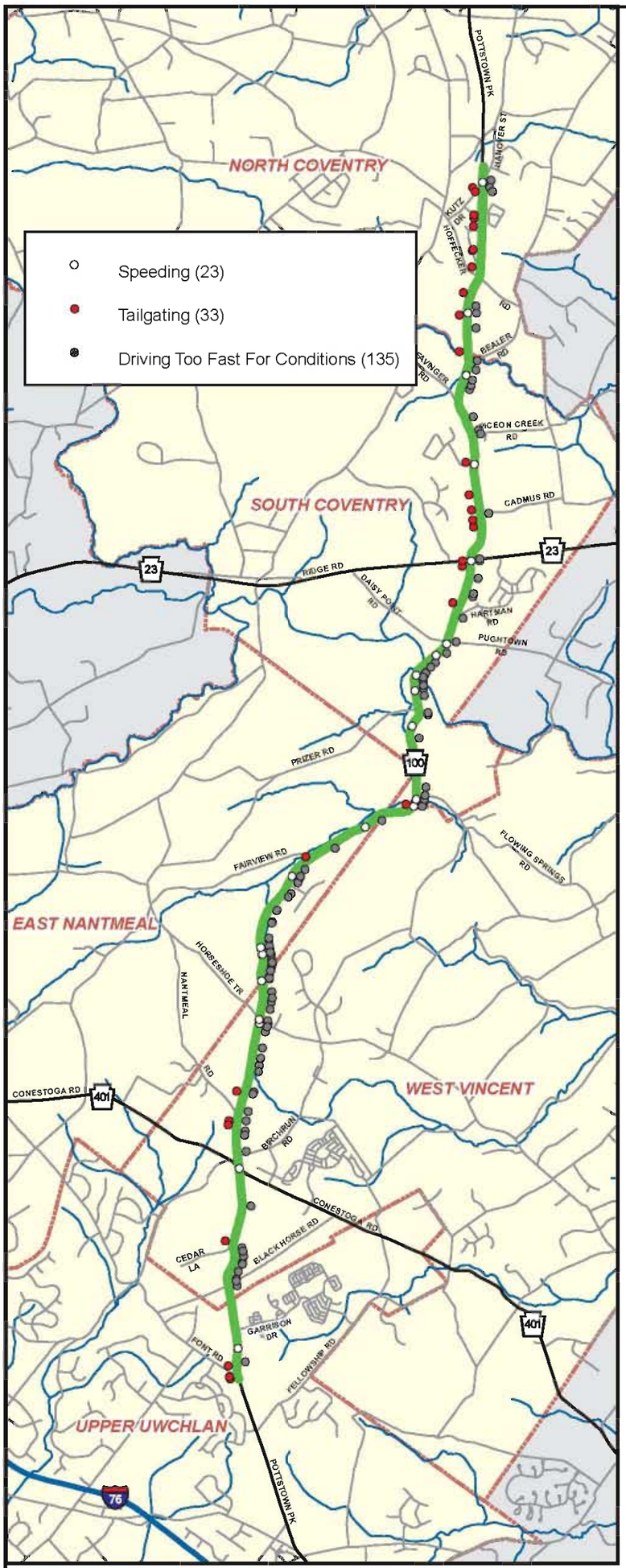
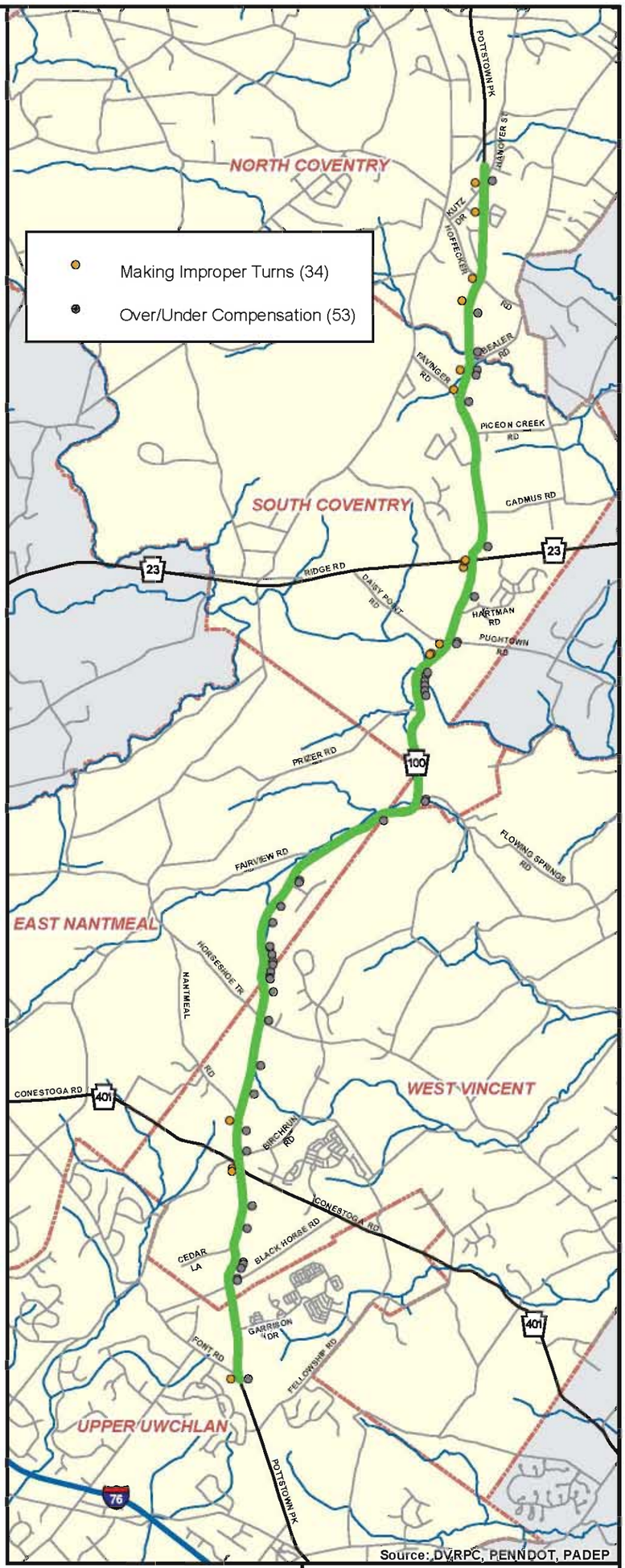
Location map

*Map not to scale





Source: DVRPC, PENNDOT, PADEP

PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 9: Driver Behavior

Route 100
Local Road
Stream or Creek
Municipal Boundary

0 0.5 1 1.5 2
Miles

N

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Regional Planning Commission
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Location map

*Map not to scale

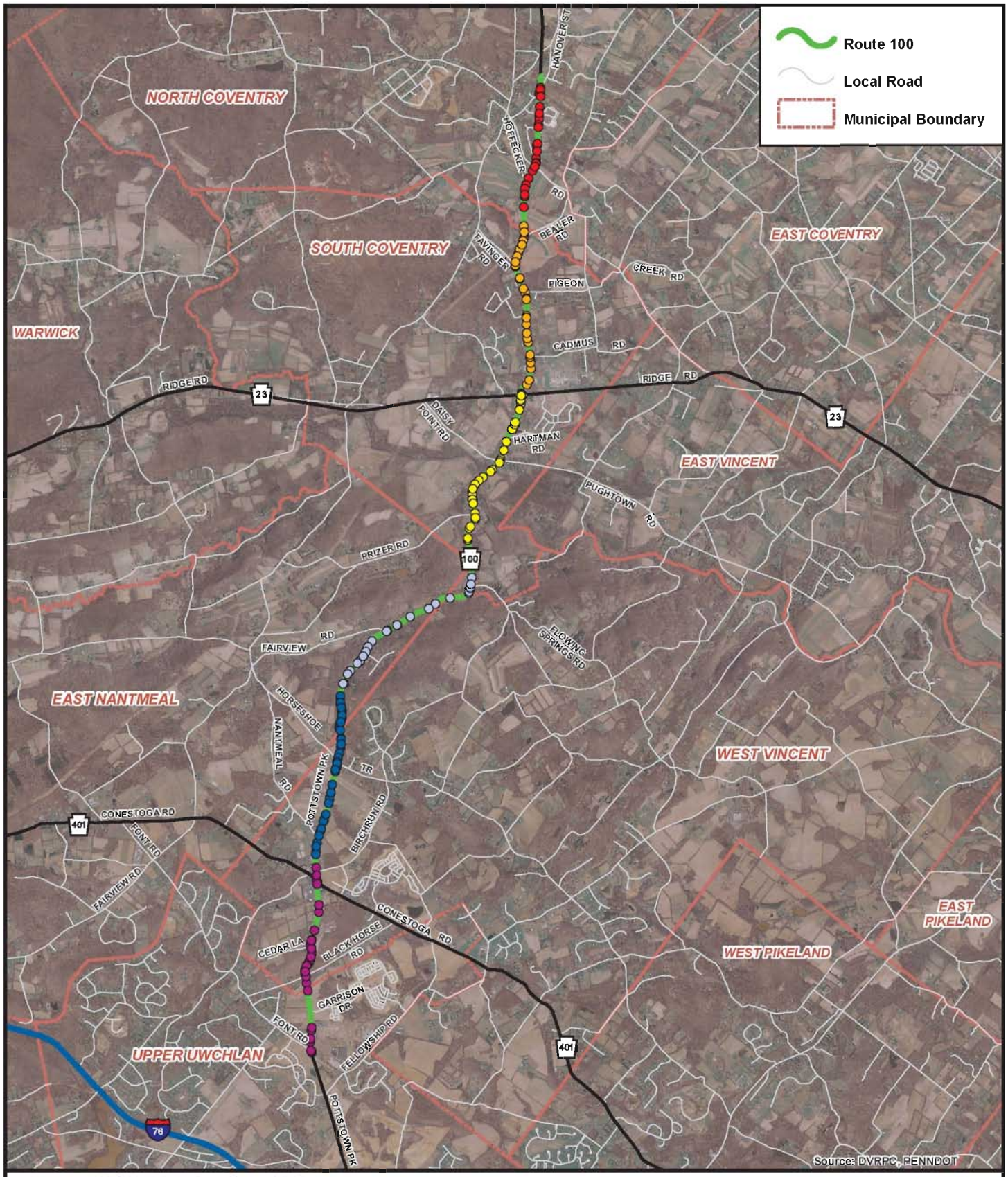
IV. CRASH CLUSTER ANALYSIS

Six crash clusters were created to identify in more detail the causes of PA 100 crashes. These clusters are intended to focus on smaller segments to systematically analyze local crash issues and link the crashes to specific physical, operating and environmental conditions that can be rectified through intervention by PennDOT and other government organizations.

The clusters, displayed on Map 10, were created based on segments of an appropriate length to generate insightful information. Table 9 summarizes the main findings of each cluster.

The following pages present detailed information for each cluster including:

- Cluster crash statistics that summarize crashes by year, collision type, direction, illumination, weather and road conditions.
- Cluster findings that highlight pertinent crash facts for that cluster.
- Since rear-end, angle and hit-fixed object crashes, represent a disproportionate number of crashes in the corridor they are explicitly examined in each cluster.
- Cluster maps, overlaid on 2005 aerial photos, show the approximate location of each crash within the cluster. It should be noted that the crash location is only as accurate as the location information entered on the accident report. When several crashes have occurred at the same location, or in very close proximity, only one colored dot is shown due to mapping limitations. Consequently, not every single crash is displayed on the cluster maps.



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 10: Corridor-wide Cluster Locations

0 0.5 1 1.5 2
Miles

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- Cluster 1 Crash Location
- Cluster 2 Crash Location
- Cluster 3 Crash Location
- Cluster 4 Crash Location
- Cluster 5 Crash Location
- Cluster 6 Crash Location

Table 9: Crash Cluster Analysis Summary

Cluster	Problems/Issues	Potential Causes
#1 North Coventry (60 crashes)	A number of rear-end and angle crashes at Suburbia Shopping Center signal; angle crashes at Hoffecker Rd intersection; series of rear-end crashes along commercial strip; majority northbound crashes	Signal at Suburbia Shopping Center; too many driveway openings along commercial strip; unexpected traffic backups; driver actions (tailgating, distracted).
#2 Bealer Rd – Cadmus Rd (43 crashes)	A number of northbound HFO crashes at night (no street lights) between Bealer Rd and Pigeon Creek Rd; a number of crashes at Cadmus Rd intersection area	Change in grade of road and driver behavior (speeding and alcohol) causes of HFO crashes; running red light, tailgating and driver distracted are causes at Cadmus Rd
#3 PA 23 – Pughtown Rd (97 crashes)	A number of HFO crashes south of Pughtown Rd; series of multi-directional rear-end and angle crashes at PA 23	Driving too fast for conditions, wet road causes of HFO crashes; intersection geometry, traffic congestion and driveways at gas station are causes of crashes at PA 23
#4 Fairview Rd and vicinity (35 crashes)	A high number of HFO crashes throughout cluster	Change in grade of road, curves, and driver action (driving too fast for conditions) are causes of HFO crashes
#5 Horseshoe Tr – Nantmeal Rd (88 crashes)	High number of wet road, HFO crashes predominantly in East Nantmeal, north of Horseshoe Tr; northbound rear-end crashes near Nantmeal Rd	Wet road, wooded area, driver behavior (driving too fast for conditions) are causes of HFO crashes; driver behavior (tailgating), intersection geometry, are cause of crashes at Nantmeal Rd
#6 PA 401 – Font Rd (59 crashes)	Number of angle and rear-end crashes at PA 401 and Font Rd respectively; series of wet road, northbound HFO crashes between Cedar La and Blackhorse Rd	Intersection geometry and driver behavior (making improper turns, tailgating) are causes for PA 401 and Font Rd crashes; wet road, northbound passing lane, curve, grade, driver behavior (driving too fast for conditions) are causes of HFO crashes

Note: HFO is hit-fixed object
Source: DVRPC, 2007

CRASH CLUSTER #1: NORTH COVENTRY

Cluster #1 contains 60 crashes. All crashes within this cluster occurred in North Coventry Township; the majority of which were scattered along the commercial strip section of PA 100 between South Hanover Street and Hoffecker Road.

Cluster Crash Statistics

CRASHES BY YEAR
- 2000 – 16
- 2001 – 6
- 2003 – 15
- 2004 – 6
- 2005 – 17

CRASHES BY COLLISION TYPE
- Angle – 27
- Rear-end – 19
- Hit-fixed Object – 9
- Non collision – 1
- Head-on – 1
- Hit Pedestrian – 1
- Unknown – 2

DIRECTION
- Northbound – 34
- Southbound – 13
- Eastbound – 6
- Westbound – 4
- Unknown – 3

ILLUMINATION
- Daylight – 40
- Dark no street lights – 8
- Dark with street lights – 7
- Dusk – 3
- Dawn – 2

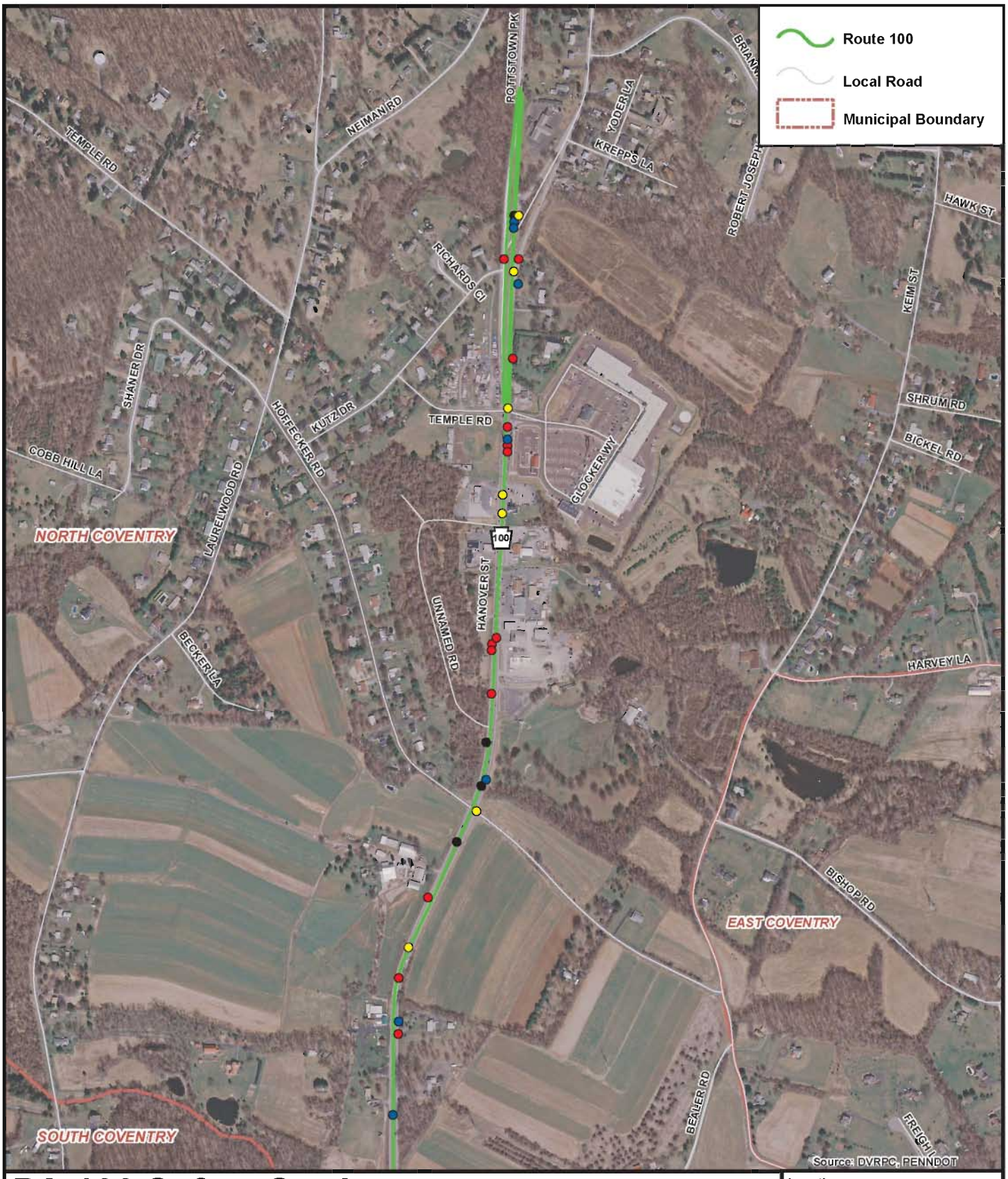
WEATHER
- No adverse conditions – 53
- Rain – 3
- Snow – 3
- Unknown – 1

ROAD CONDITIONS
- Dry – 51
- Wet – 4
- Snow – 3
- Unknown – 2

Source: PennDOT Crash Database, 2005

Cluster Findings

- There was a concentration of northbound rear-end and angle crashes at the Temple Road/Suburbia Shopping Center intersection. All the angle crashes at this intersection occurred within the last three years of the analysis period, since the shopping center was fully occupied. Most of them were associated with left-turn movements into and out of the shopping center. Rear-end crashes were the result of traffic backups at the intersection. The Crash Database revealed tailgating, distracted, making careless turns and running a red light as contributory driver actions.



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 11: Cluster 1- North Coventry Location of Crashes

0 0.05 0.1 0.15 0.2
Miles

Delaware Valley
Regional Planning Commission
July 2007

- Other Crashes (5)
- Hit Fixed Object (9)
- Rear End (19)
- Angle (27)

Location map

*Map not to scale

Somewhat related to the Temple Road traffic signal, the Crash Database identified a series of rear-end crashes located along the commercial strip, just south of Temple Road. These crashes are attributable to a combination of numerous driveway entrances and driver actions (tailgating, distracted). Unanticipated backups from the Temple Road signal frequently extend past the commercial strip to the foot of a slight grade. Afternoon traffic congestion, turning movements at driveways and sight obstruction from the hill account for the high number of rear-end crashes.

- There was also a concentration of angle crashes at Hoffecker Road intersection. Their potential causes primarily relate to driver actions, namely proceeding without clearance and making careless turns.
- There was a large increase in the total number of crashes between 2004 and 2005.
- Crashes typically happened during daylight, fair weather, and dry road conditions.
- Nearly half of the crashes involve at least one injury, and the other half involved property damage only.
- The only crash involving a pedestrian within the study area occurred within this cluster.

Rear-end Crashes

Rear-end crashes represented nearly 31 percent of all crashes within the cluster. Ten of the 19 rear-end crashes were located at the Temple Road/Suburbia Shopping Center intersection. Seven of these were northbound, and were a result of tailgating and distracted drivers. Other locations where these types of crashes occurred were at Hoffecker Road (2 rear-end crashes), the commercial strip location south of the Suburbia Shopping Center (4 rear-end crashes) and south of Hoffecker Road (3 rear-end crashes). The following is a yearly breakdown of the rear-end crashes within this cluster: 2000 (6 crashes); 2001 (3 crashes); 2003 (4 crashes); 2004 (0 crashes); and 2005 (6 crashes).

Angle Crashes

Angle crashes represent 45 percent of all crashes within the cluster. Ten of the 27 crashes were located at the Temple Road/Suburbia Shopping Center intersection. Seven of these crashes were the result of left turns. Four of the crashes involved vehicles traveling northbound making left turns onto Temple Road. There were no westbound crashes reported at this particular intersection. The primary causes of these crashes were drivers making improper or careless turns and running the red light. For years 2000 and 2001, there were no reported angle crashes; therefore, all 10 angle crashes at Temple Road occurred in past three years of the analysis: 2003 (3 crashes); 2004 (2 crashes); and 2005 (5 crashes).

Another 10 angle crashes occurred at Hoffecker Road. These crashes were a result of drivers proceeding without clearance after stopping and making improper or careless turns. Other locations where angle crashes occurred were at Kutz Drive and South Hanover Street (3 total crashes for both intersections) and the commercial strip location south of the Suburbia shopping center (3 crashes). Aggressive driving was noted as a factor in all the angle crashes, with the exception of one crash. The following is a yearly breakdown of the angle crashes within this cluster: 2000 (5 crashes); 2001 (1 crash); 2003 (8 crashes); 2004 (5 crashes); and 2005 (8 crashes).

Hit-fixed Object Crashes

Hit-fixed object crashes represented 15 percent of all the crashes in the cluster. They were scattered throughout the cluster. Some of the objects hit included trees, poles, embankments and guide rails. Four of the nine hit-fixed object crashes involved speeding resulted in vehicles overturning. Three of the nine crashes were alcohol related. Nearly half of the hit-fixed object crashes occurred during dark lighting conditions. The following is a yearly breakdown of the hit-fixed object crashes within this cluster: 2000 (3 crashes); 2001 (0 crashes); 2003 (3 crashes); 2004 (1 crash); and 2005 (2 crashes).

CRASH CLUSTER #2: BEALER ROAD TO CADMUS ROAD

Cluster #2 is the first of two clusters located in South Coventry Township. This cluster contains 43 crashes located north of PA 23.

Cluster Crash Statistics

CRASHES BY YEAR
- 2000 – 6
- 2001 – 10
- 2003 – 13
- 2004 – 9
- 2005 – 5

CRASHES BY COLLISION TYPE
- Angle – 7
- Rear-end – 13
- Hit-fixed Object – 18
- Head-on – 2
- Sideswipe – 2
- Unknown – 1

DIRECTION
- Northbound – 18
- Southbound – 20
- Eastbound – 1
- Westbound – 3
- Unknown – 1

ILLUMINATION
- Daylight – 28
- Dark no street lights – 13
- Dark with street lights – 1
- Dawn – 1

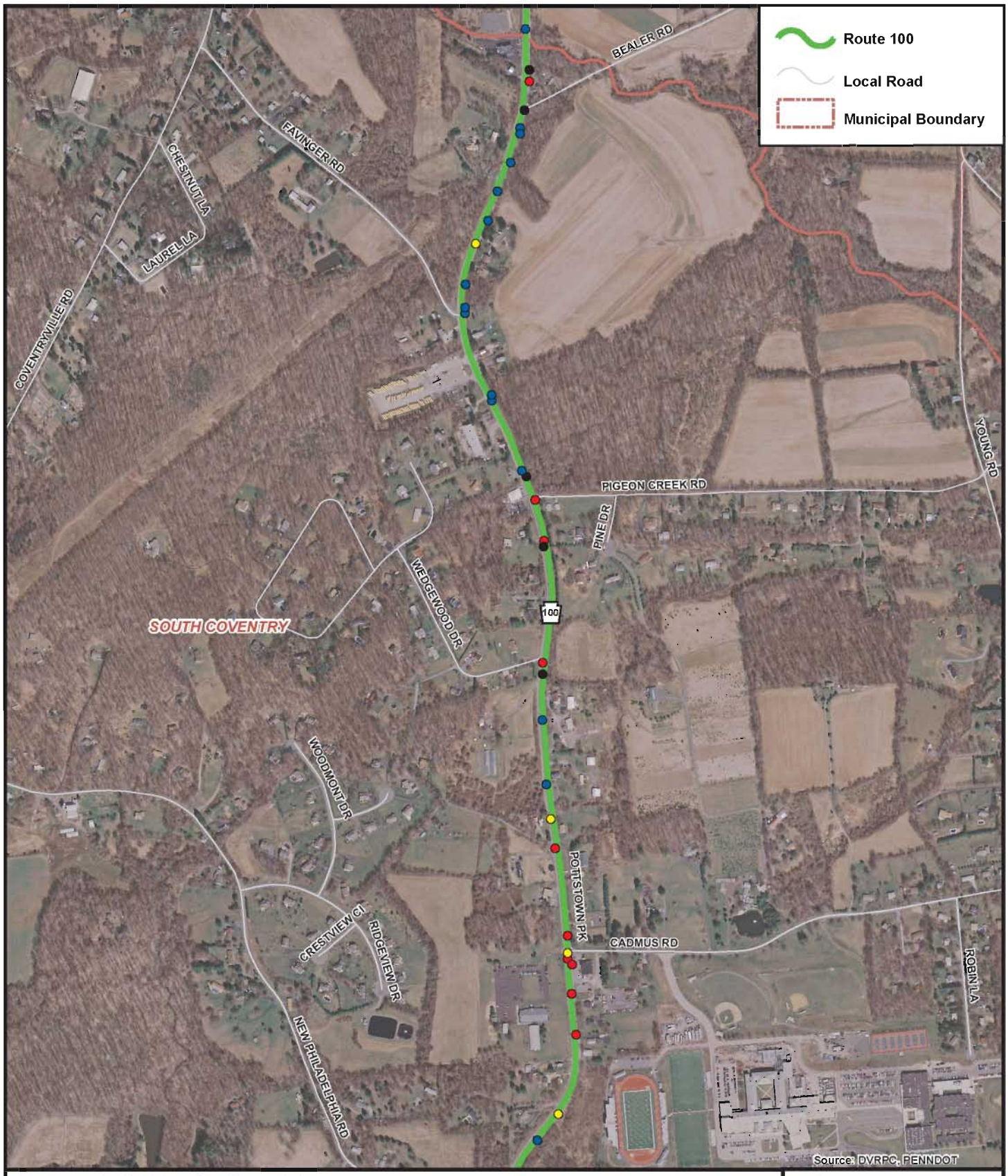
WEATHER
- No adverse conditions – 34
- Rain – 5
- Sleet/hail – 1
- Snow – 3

ROAD CONDITIONS
- Dry – 31
- Wet – 8
- Snow – 3
- Ice – 1

Source: PennDOT Crash Database, 2005

Cluster Findings

- There were two fatal crashes in this cluster. Both crashes were the result of hitting a fixed object.
- Since 2003, there has been a steady decrease in number of crashes, with hit-fixed object crashes seeing the largest decrease. Removal of the passing lane is partially responsible for the overall decrease in crashes.
- Both of the head-on crashes were located near the Pigeon Creek Road intersection.
- There were a number of northbound rear-end and angle crashes at Cadmus Road intersection. The primary causes relate to driver action, including running a red light, careless turning and the presence of the traffic signal.



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 12: Cluster 2- Bealer Road to Cadmus Road Location of Crashes

0 0.05 0.1 0.15 0.2
Miles

Delaware Valley
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- Other Crashes (5)
- Angle (7)
- Rear End (13)
- Hit Fixed Object (18)

Location map

*Map not to scale

- Also there were a number of northbound, nighttime hit-fixed object crashes between Bealer Road and Pigeon Creek Road. Contributory causes relate to driver action include traveling too fast for conditions (some alcohol related), curves, change in grade (downhill) and land use (wooded area).

Rear-end Crashes

Rear-end crashes represent nearly 30 percent of all crashes within the cluster. Seven of the rear-end crashes were located at or near the Cadmus Road intersection: three of which were northbound during the afternoon peak hours. Other locations where rear-end crashes occurred were Bealer Road and south of Pigeon Creek Road. There were eight southbound crashes and five northbound crashes. Five of the southbound crashes were the result of drivers slowing down or tailgating.

Rear-end crashes appear to be a recent phenomenon. Eight of the rear-end crashes occurred during the last three years of the study period. Of the four rear-end crashes in 2005, three occurred at Cadmus Road. The following is a yearly breakdown of the rear-end crashes within the cluster: 2000 (2 crashes); 2001 (3 crashes); 2003 (2 crashes); 2004 (2 crashes); and 2005 (4 crashes).

Angle Crashes

Angle crashes represent 16 percent of all crashes within the cluster. All of these crashes were scattered throughout the cluster. The primary causes of angle crashes were the result of driver behavior including running a red light (i.e., Cadmus Road) and careless turning. There were no reported angle crashes for years 2000, 2001, and 2005. In 2004, all of the angle crashes were at Cadmus Road. The following is a yearly breakdown of the angle crashes within the cluster: 2000 (0 crashes); 2001 (0 crashes); 2003 (3 crashes); 2004 (4 crashes); and 2005 (0 crashes).

Hit-fixed Object Crashes

Hit-fixed object crashes represent 42 percent of all crashes within the cluster. Fourteen of the 18 crashes are located in the northern section of the cluster, between Bealer Road and Pigeon Creek Road. Many crashes located in this area were northbound, occurring at night (i.e.; no street lights) and were the result of drivers speeding too fast for conditions. Six of the 18 hit-fixed object crashes were alcohol related. Half of the crashes involved drivers attempting to negotiate curves. Seven of the crashes took place on the downhill incline between Bealer Road and Favinger Road. As might be expected, some of the objects hit include trees, poles, embankments and guiderail. The following is a yearly breakdown of the hit-fixed object crashes within the cluster: 2000 (2 crashes); 2001 (7 crashes); 2003 (6 crashes); 2004 (2 crashes); and 2005 (1 crash).

CRASH CLUSTER #3: PA 23 TO PUGHTOWN ROAD

Cluster #3 is the second of two clusters located in South Coventry Township. This cluster contains 97crashes located south of PA 23, representing the most crashes of any cluster.

Cluster Crash Statistics

CRASHES BY YEAR
- 2000 – 17
- 2001 – 24
- 2003 – 21
- 2004 – 19
- 2005 – 16

CRASHES BY COLLISION TYPE
- Angle – 31
- Rear-end – 14
- Hit-fixed Object – 34
- Non collision – 4
- Head-on – 8
- Sideswipe – 5
- Unknown – 1

DIRECTION
- Northbound – 38
- Southbound – 31
- Eastbound – 17
- Westbound – 8
- Unknown – 3

ILLUMINATION
- Daylight – 70
- Dark no street lights – 11
- Dark with street lights – 12
- Dusk – 1
- Dawn – 3

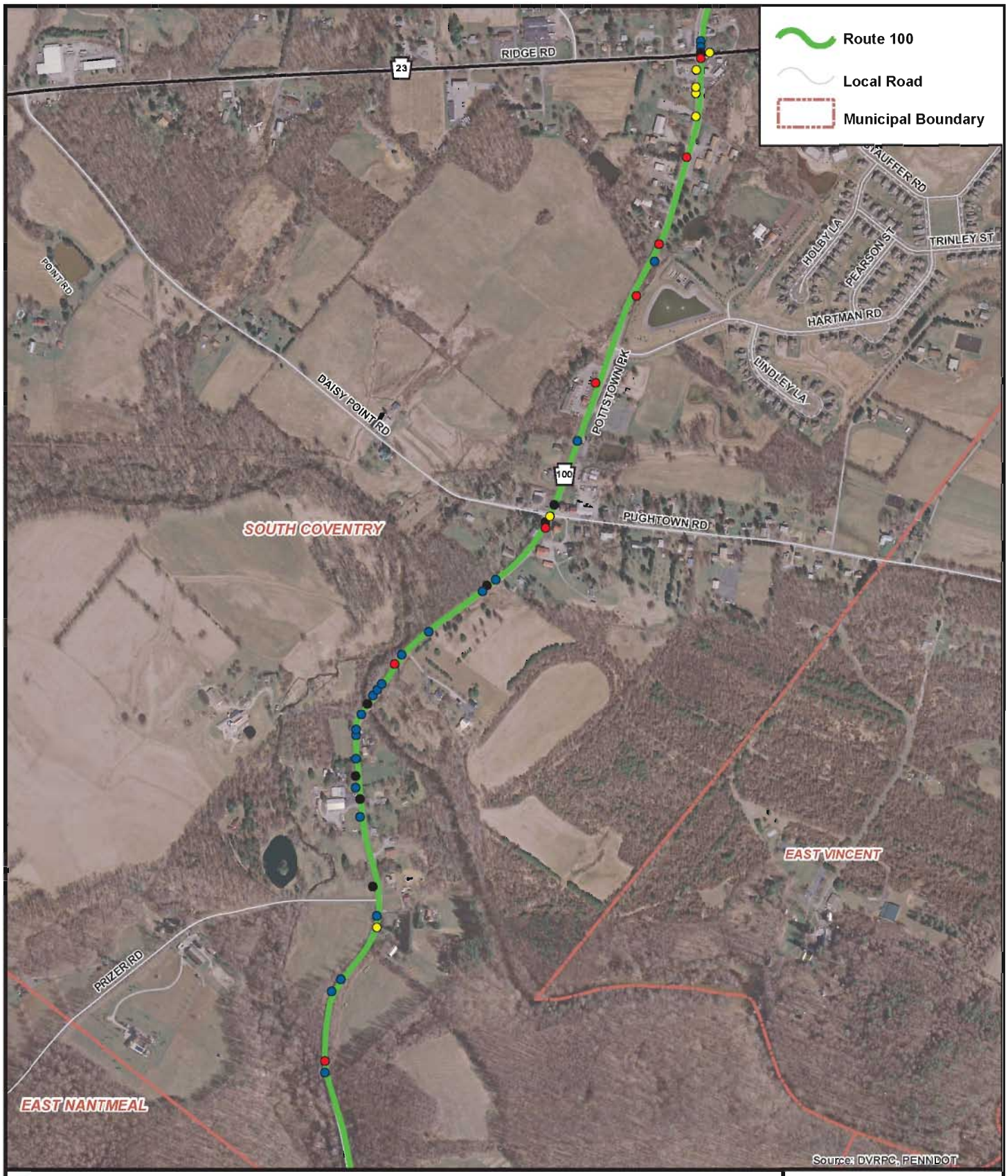
WEATHER
- No adverse condition – 62
- Rain – 28
- Rain/fog – 2
- Sleet/hail – 1
- Snow – 4

ROAD CONDITIONS
- Dry – 57
- Wet – 33
- Snow – 4
- Ice – 1
- Sand/dirt/gravel – 2

Source: PennDOT Crash Database, 2005

Cluster Findings

- There was one fatal crash in the cluster. It involved an angle crash at PA 23.
- Of the six clusters, this cluster had the highest number of angle crashes, 31 crashes. The majority of angle crashes were located at or near the PA 23 intersection. A large number of them occurred during the afternoon peak hour. Factors contributing to these crashes include the PA 23 traffic signal, traffic congestion and backups at the intersection, intersection geometry, gas station driveway openings in close proximity to intersection and driver action (improper turning).



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 13: Cluster 3- PA 23 to Pughtown Road Location of Crashes

0 0.05 0.1 0.15 0.2
Miles

N

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- Rear End (14)
- Other Crashes (18)
- Angle (31)
- Hit Fixed Object (34)

Location map

*Map not to scale

- Although the PA 23 intersection is located near a school zone, there was no reported school bus or pedestrian related crashes at PA 23 or its immediate vicinity.
- Overall, this cluster had the second highest number of hit-fixed object crashes, 34 crashes. There was a high concentration of hit-fixed object crashes between Pughtown Road and Prizer Road. The primary cause of these crashes were driver actions including driving too fast for conditions and negotiating curves, wet pavement conditions and the change in grade at French Creek.
- There was a series of head-on crashes south of the PA 23 intersection, primarily caused by driver actions (driving on wrong side of roadway and speeding) and negotiating curves.
- There was a series of southbound rear-end crashes between PA 23 and Pughtown Road. These crashes were mainly due to driver action (tailgating and speeding) and the change in grade (downhill).
- With the exception of hit-fixed object crashes, the other crashes in the cluster primarily occurred in the daytime, during fair weather and dry road conditions.

Rear-end Crashes

Rear-end crashes represent nearly 14 percent of all crashes within the cluster. These crashes were primarily located in the northern section of the cluster between PA 23 and Pughtown Road. Nearly half of the rear-end crashes were located at intersections or driveways. Many of the crashes were in the southbound direction and occurred on a downhill slope. The primary causes were the result of drivers speeding and tailgating. No rear-end crashes were reported in 2005. The following is a yearly breakdown of the rear-end crashes within this cluster: 2000 (2 crashes); 2001 (5 crashes); 2003 (4 crashes); 2004 (3 crashes); and 2005 (0 crashes).

Angle Crashes

Angle crashes represent 32 percent of all crashes within the cluster. Twenty five of the 31 angle crashes were located at or near the PA 23 intersection. There were very few morning crashes; however, 11 of the 25 crashes occurred between 3 PM and 6 PM. One fatal angle crash occurred at PA 23. Some causes for angle crashes include drivers tailgating and making improper turns. Ten of the 25 crashes involved vehicles on PA 23 making left turns onto PA 100. The following is a yearly breakdown of the angle crashes within the cluster: 2000 (7 crashes); 2001 (9 crashes); 2003 (6 crashes); 2004 (4 crashes); and 2005 (5 crashes).

Hit-fixed Object Crashes

Hit-fixed object crashes represent 35 percent of all crashes within the cluster. The majority of the hit-fixed object crashes were located in the southern section

of the cluster, south of Pughtown Rd. The main causes for these crashes were the result of drivers traveling too fast for conditions (18) and wet pavement (17). According to the accident reports, the roadway grades at French Creek are also a factor. Nineteen of the crashes involved drivers attempting to negotiate curves. Some of the objects hit include trees, poles, embankments, and guiderails. The following is a yearly breakdown of the hit-fixed object crashes within the cluster: 2000 (5 crashes); 2001 (7 crashes); 2003 (7 crashes); 2004 (6 crashes); and 2005 (9 crashes).

CRASH CLUSTER #4: FAIRVIEW ROAD AND VICINITY

Cluster #4 is located in South Coventry, West Vincent and East Nantmeal townships. Thirty five crashes occurred in the cluster, the fewest number of crashes among the corridors. A majority of the crashes were located in East Nantmeal Township.

Crash Cluster Statistics

CRASHES BY YEAR
- 2000 – 9
- 2001 – 5
- 2003 – 8
- 2004 – 10
- 2005 – 3

CRASHES BY COLLISION TYPE
- Angle – 1
- Rear-end – 4
- Hit-fixed Object – 26
- Non collision – 2
- Head-on – 1
- Sideswipe – 1

DIRECTION
- Northbound – 14
- Southbound – 14
- Eastbound – 2
- Westbound – 1
- Unknown – 4

ILLUMINATION
- Daylight – 23
- Dark no street lights – 9
- Dark with street lights – 1
- Dusk – 1
- Unknown –1

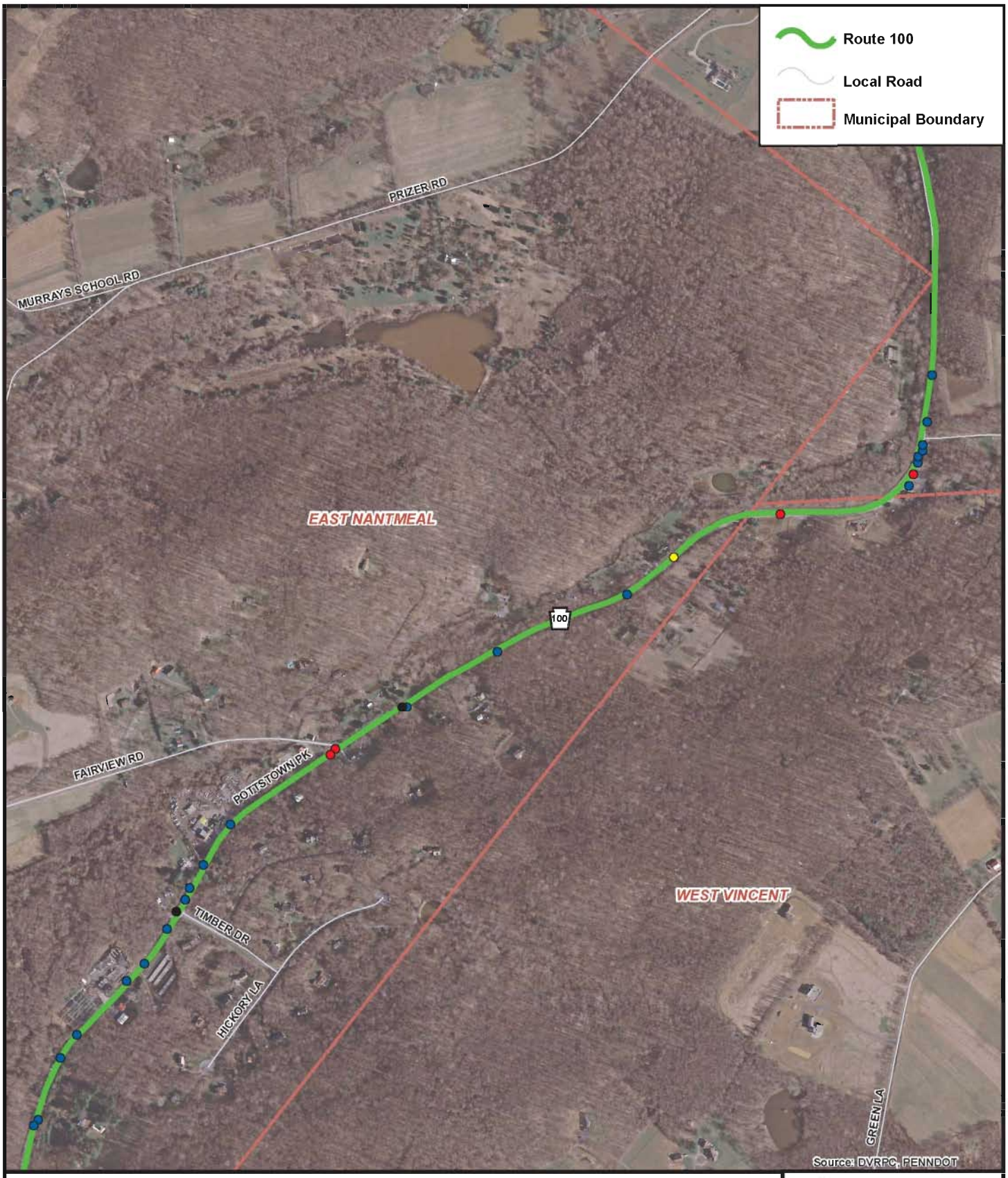
WEATHER
- No adverse conditions – 22
- Rain – 7
- Sleet/Rain – 2
- Snow – 4

ROAD CONDITIONS
- Dry – 17
- Wet – 11
- Snow – 1
- Slush – 1
- Ice – 4
- Unknown – 1

Source: PennDOT Crash Database, 2005

Cluster Findings

- In this cluster there was a tremendous drop in number of overall crashes between 2004 and 2005.
- There were 26 hit-fixed object crashes throughout entire cluster, with a few resulting in overturned vehicles. These crashes were primarily the result of driver action (traveling too fast for conditions, negotiate curves), wet road conditions, wintry weather conditions, curves, change in topography and land use (wood area). There was also a strong seasonal occurrence with these crashes occurring during the fall and winter season.



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 14: Cluster 4- Fairview Road and Vicinity Location of Crashes

0 0.05 0.1 0.15 0.2
Miles

N

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July 2007

- Angle (1)
- Rear End (4)
- Other Crashes (4)
- Hit Fixed Object (26)

Location map

*Map not to scale

- Three of the four rear-end crashes occurred in September and October 2004. All four rear-end crashes occurred during the same time of the day, 3 PM – 4 PM.

Rear-end Crashes

Rearend crashes represent nearly 11 percent of all crashes within the cluster. The four rear-end crashes sporadically occurred throughout the cluster. Two of the four rear-end crashes were at Fairview Road. These crashes involved vehicles traveling northbound. Three of the four rear-end crashes occurred in September and October 2004. All rear-end crashes took place between the hours of 3 PM and 4 PM. The following is a yearly breakdown of the rear-end crashes within the cluster: 2000 (1 crash); 2001 (0 crashes); 2003 (0 crashes); 2004 (3 crashes); and 2005 (0 crashes).

Angle Crashes

There was one reported angle crash in the cluster. This crash occurred between Flowing Springs Road and Fairview Road. The driver of the vehicle that caused the crash was a youth, traveling southbound on PA 100. The primary cause of the crash was driver action (driving too fast for conditions) combined with wet road and rainy weather. The following is a yearly breakdown of the angle crashes within the cluster: 2000 (1 crash); 2001 (0 crashes); 2003 (0 crashes); 2004 (0 crashes); and 2005 (0 crashes).

Hit-fixed Object Crashes

Hit-fixed object crashes, representing 74 percent of all crashes, is the primary safety issue in the cluster. All of the crashes involved only one vehicle and were scattered throughout the cluster. Some of the objects hit include trees, poles, embankments, and guide rails. There is a strong seasonal factor, 20 of the 26 crashes occurred between the months of October through March. Many of the crashes took place south of Fairview Road; they involved drivers traveling both directions. Causes of these crashes included drivers driving too fast for conditions, speeding, over or under compensation at curves, driving on the wrong side of the road and careless passing or lane changing. Wet road conditions may have contributed to some of these crashes, which included slick pavement from rainy weather (8 crashes) and wintry precipitation (5 crashes). The wet road crashes were primarily located south of Fairview Road. The wintry road conditions crashes were primarily located near Flowing Springs Road. Nearly half of the crashes involved no injury to the driver. Six of the 26 hit-fixed object crashes resulted in the vehicle being overturned. The following is a yearly breakdown of the hit-fixed object crashes within the cluster: 2000 (7 crashes); 2001 (4 crashes); 2003 (7 crashes); 2004 (5 crashes); and 2005 (3 crashes).

CRASH CLUSTER #5: HORSESHOE TRAIL TO NANTMEAL ROAD

Cluster #5 contains 88 crashes located in East Nantmeal and West Vincent townships. It had the second highest number of crashes among the clusters. Nearly half of the crashes are located in the reverse curves in East Nantmeal Township. The other crashes within this cluster were widely distributed along PA 100 just south of Nantmeal Road in West Vincent Township.

Cluster Crash Statistics

CRASHES BY YEAR
- 2000 – 12
- 2001 – 22
- 2003 – 20
- 2004 – 21
- 2005 – 13

CRASHES BY COLLISION TYPE
- Angle – 7
- Rear-end – 9
- Hit-fixed Object – 55
- Non collision – 2
- Head-on – 7
- Sideswipe – 6
- Unknown – 2

DIRECTION
- Northbound – 51
- Southbound – 25
- Eastbound – 1
- Westbound – 2
- Unknown – 9

ILLUMINATION
- Daylight – 61
- Dark no street lights – 22
- Dark with street lights – 1
- Dusk – 1
- Dawn – 3

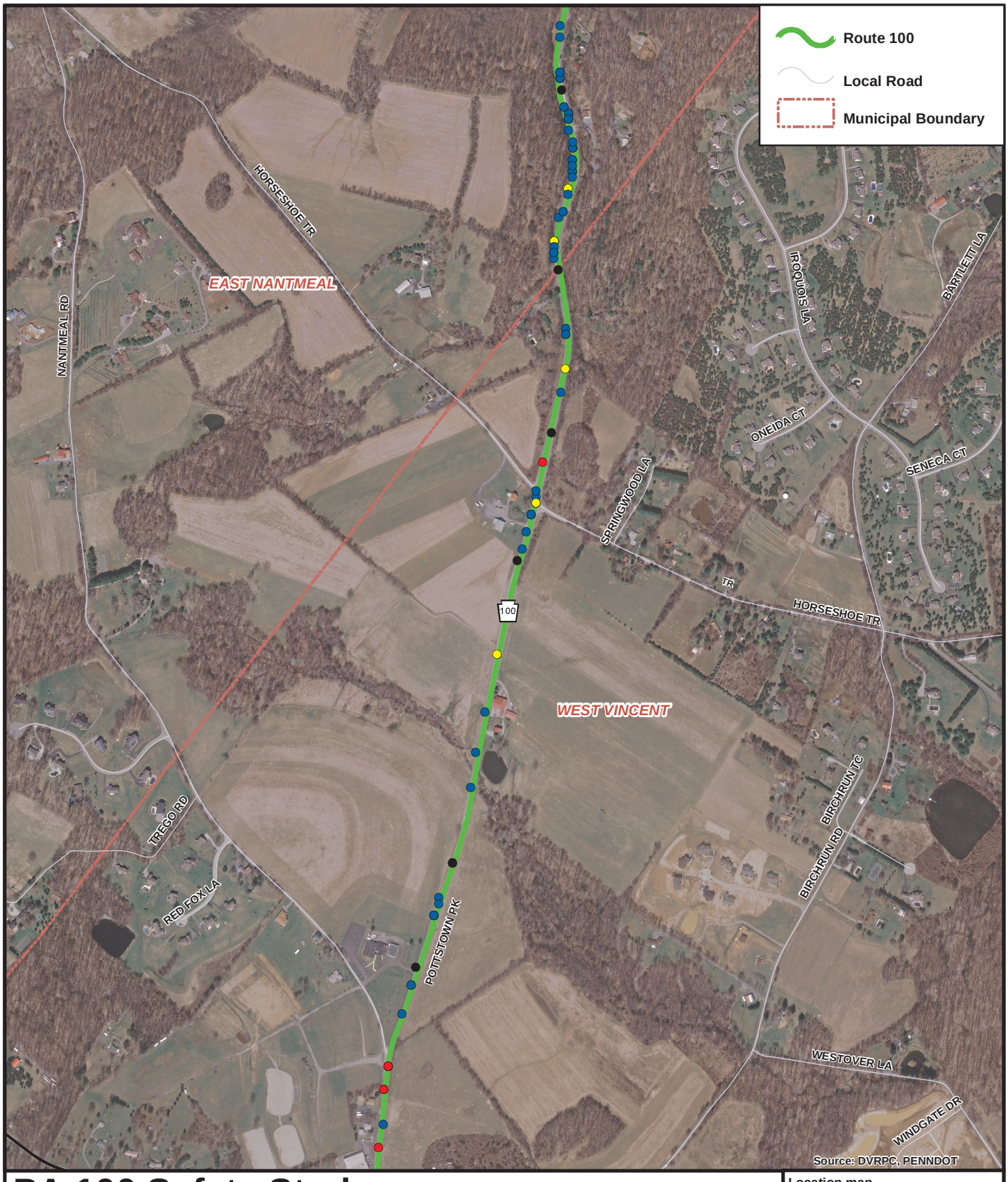
WEATHER
- No adverse conditions – 37
- Rain – 36
- Sleet/Rain – 1
- Snow – 3
- Fog – 1
- Rain/Fog – 3
- Unknown – 7

ROAD CONDITIONS
- Dry – 23
- Wet – 53
- Snow – 3
- Ice – 7
- Unknown – 2

Source: PennDOT Crash Database, 2005

Cluster Findings

- There were three fatal crashes in this cluster, involving angle, head-on, and hit-fixed object crashes.
- Between 2004 and 2005 there was a significant decrease in the overall number of crashes. Most of it is associated with a reduction in the number of hit-fixed object crashes,10 fewer crashes than 2004. Tree trimming by PECO north of Horseshoe Trail may have contributed to the reduction in crashes.



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 15: Cluster 5- Horseshoe Trail to Nantmeal Road Location of Crashes

0 0.05 0.1 0.15 0.2
Miles

N

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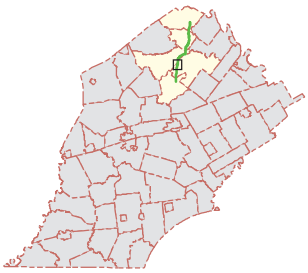
July 2007

- Angle (7)
- Rear End (9)
- Other Crashes (17)
- Hit Fixed Object (55)

Location map



*Map not to scale

- There has been a series of head-on crashes between Timber Drive and Horseshoe Trail, primarily the result of driver action; either failure to negotiate curves or passing vehicles.
- There has also been a high number of northbound, wet road, nighttime hit-fixed object crashes resulting from driver action (traveling too fast for conditions), wet roads, curves, change in topography, land use (wood area) and time of year (fall season) between Timber Drive and Horseshoe Trail.
- The crash analysis revealed a concentration of nighttime, northbound rear-end crashes at or near Nantmeal Road, primarily caused by driver action (tailgating and speeding).
- With 53 crashes, wet road related crashes appear to be a major problem in this cluster.

Rear-end Crashes

Rear-end crashes represent nearly ten percent of all crashes within the cluster. The majority of these crashes are located at or near the Nantmeal Road intersection. They probably involved vehicles turning onto Nantmeal Road. Six of the crashes at this location occurred in the northbound direction under dark (no street lights) lighting conditions. The primary causes for rear-end crashes in this cluster were from drivers tailgating, stopping suddenly and speeding. The following is a yearly breakdown of the rear-end crashes within the cluster: 2000 (1 crash); 2001 (0 crashes); 2003 (2 crashes); 2004 (1 crash); and 2005 (5 crashes).

Angle Crashes

Angle crashes represent nearly seven percent of all crashes within the cluster. The majority of these crashes were located just north and south of the Horseshoe Trail intersection. Nearly half of the crashes were northbound. All crashes were a result of drivers traveling too fast for conditions. One fatal angle crash occurred in the cluster. The following is a yearly breakdown of the angle crashes within the cluster: 2000 (0 crashes); 2001 (3 crashes); 2003 (2 crashes); 2004 (1 crash); and 2005 (0 crashes).

Hit-fixed Object Crashes

Hit-fixed object crashes represent nearly 63 percent of all crashes within the cluster. These crashes were located throughout the cluster. In the northern section of the cluster, north of Horseshoe Trail, there were a series of hit-fixed object crashes; 24 involved northbound vehicles, 26 wet road surface, and 14 nighttime conditions. Sixteen of the crashes located in that area happened between the months of September and November. According to the accident reports, the dominant cause of these crashes was the result of drivers speeding and traveling too fast for conditions. Overall there were 36 northbound, 46 wet road, 18 negotiation of curves and 18 nighttime (dark no street lights) hit-fixed

object crashes in the cluster. One fatal hit-fixed object crash occurred in the cluster. The following is a yearly breakdown of the hit-fixed object crashes within the cluster: 2000 (7 crashes); 2001 (11 crashes); 2003 (14 crashes); 2004 (17 crashes); and 2005 (7 crashes).

CRASH CLUSTER #6: PA 401 TO FONT ROAD

Cluster #6 contains 59 crashes that took place in the southern half of West Vincent Township or the northern portion of Upper Uwchlan Township. The majority of crashes are located in West Vincent in two distinctive sections, at the PA 401 intersection and along Blackhorse Hill curve.

Cluster Crash Statistics

CRASHES BY YEAR
- 2000 – 11
- 2001 – 5
- 2003 – 13
- 2004 – 13
- 2005 – 17

CRASHES BY COLLISION TYPE
- Angle – 17
- Rear-end – 7
- Hit-fixed Object – 24
- Non collision – 5
- Head-on – 5
- Sideswipe – 1

DIRECTION
- Northbound – 33
- Southbound – 12
- Eastbound – 5
- Westbound – 3
- Unknown – 6

ILLUMINATION
- Daylight – 44
- Dark no street lights – 12
- Dark with street lights – 2
- Dusk – 1

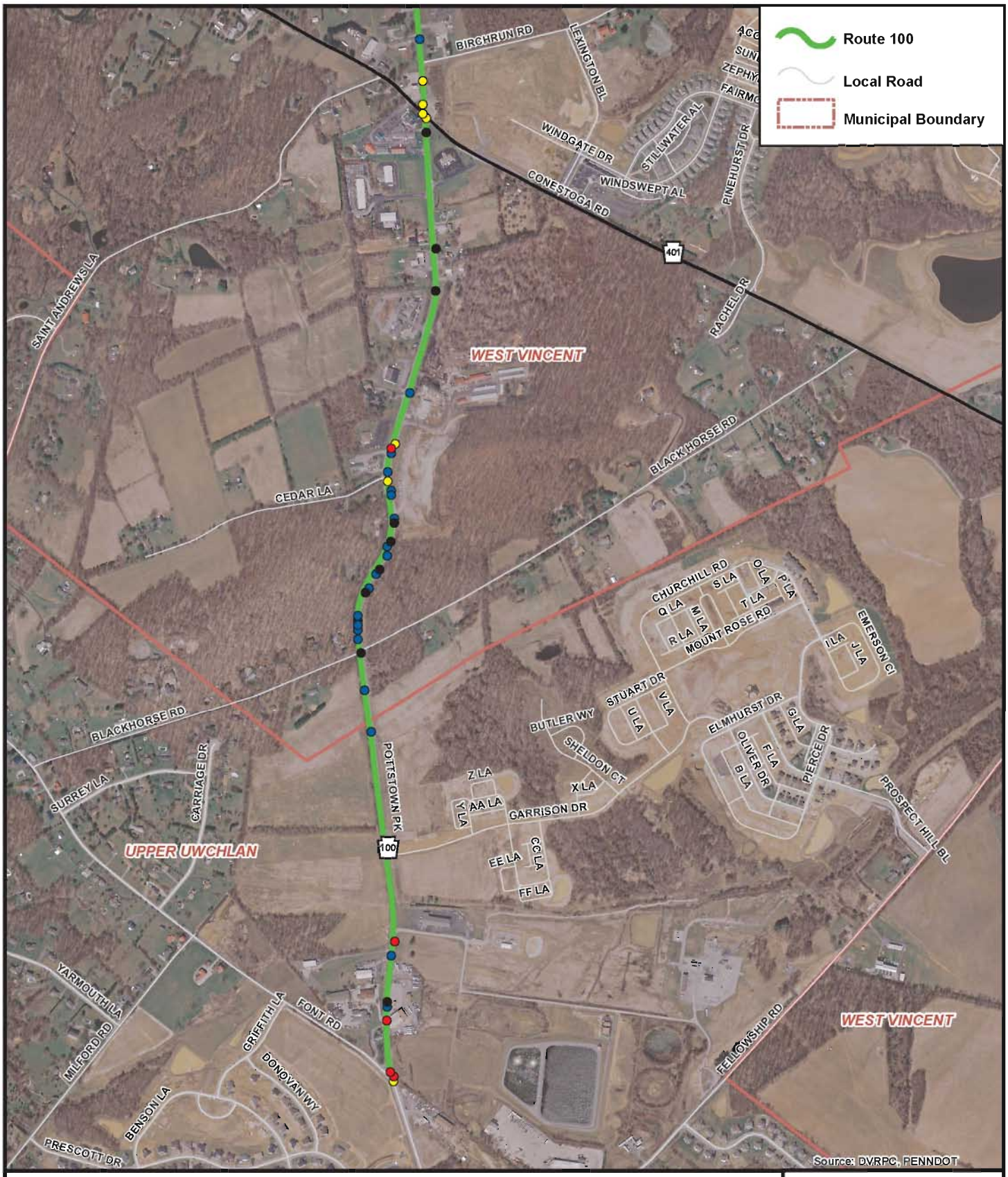
WEATHER
- No adverse conditions – 32
- Rain – 22
- Rain/Fog – 1
- Snow – 3

ROAD CONDITIONS
- Dry – 24
- Wet – 30
- Snow – 2
- Ice – 2
- Unknown – 1

Source: PennDOT Crash database, 2005

Cluster Findings

- There were two fatal crashes in this cluster, one was a head-on and the other was an angle crash.
- Between 2004 and 2005 there was an increase in the overall number of crashes, from 13 to 17 crashes per year.
- There was a cluster of northbound, wet road, hit-fixed object crashes caused by driver action (driving too fast for conditions), the steep grade and curve between Cedar Lane and Blackhorse Road, land use (wooded area), and time of year (fall season).



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 16: Cluster 6- PA 401 to Font Road Location of Crashes

0 0.05 0.1 0.15 0.2
Miles

N

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July 2007

- Rear End (7)
- Other Crashes (11)
- Angle (17)
- Hit Fixed Object (24)

Location map

*Map not to scale

- There also have been a series of non-collision crashes between Cedar Lane and Blackhorse Road, a result of poor driver behavior (distracted).
- The analysis revealed numerous inclement weather and wet road crashes.
- There have been a number of northbound head-on crashes throughout the cluster primarily caused by tailgating.
- At PA 401 there were a number of northbound angle crashes. It appears left turns at the traffic signal, intersection geometry, traffic congestion, gas station driveway openings in close proximity to the intersection and driver action (improper turning) all contributed to the angle crashes.
- The majority of rear-end crashes were located at Font Road; they were primarily due to driver action (tailgating) and the intersection geometry.

Rear-end Crashes

Rear-end crashes represent nearly twelve percent of all crashes within the cluster. The majority of these crashes were located in the southern section of the cluster near the Font Road intersection. These predominately northbound crashes were primarily the result of tailgating. The following is a yearly breakdown of the rear end crashes within the cluster: 2000 (3 crashes); 2001 (0 crashes); 2003 (2 crashes); 2004 (1 crash); and 2005 (1 crash).

Angle Crashes

Angle crashes represent nearly 29 percent of all crashes within the cluster. Ten of the 17 crashes were located at or near the PA 401 intersection. Five of these crashes involved vehicles traveling northbound, making left turns onto PA 401. Other locations where angle crashes occurred were near Cedar Lane (4 crashes) and Font Road (3 crashes). The main causes for these crashes were drivers making improper and careless turns. One fatal angle crash occurred in the cluster. The following is a yearly breakdown of the angle crashes within the cluster: 2000 (3 crashes); 2001 (3 crashes); 2003 (3 crashes); 2004 (4 crashes); and 2005 (4 crashes).

Hit-fixed Object Crashes

Hit-fixed object crashes represent nearly 41 percent of all crashes within the cluster. These crashes were predominantly located in the central portion of the cluster, between Cedar Lane and Blackhorse Road. Thirteen of the 24 crashes happened between the months of September and November. The primary causes of these crashes were drivers speeding and traveling too fast for conditions. Overall there were 14 northbound hit-fixed object crashes, 17 associated with wet road surface conditions, and 5 occurred at night (dark no street lights). The following is a yearly breakdown of the hit-fixed object crashes in the cluster: 2000 (0 crashes); 2001 (1 crash); 2003 (6 crashes); 2004 (7 crashes); and 2005 (10 crashes).

V. Land Use Analysis

This analysis focuses on demographic and land use trends. An understanding of these trends is important in framing study recommendations and ensuring future development does not foster unsafe conditions. Unlike the crash analysis that only studies PA 100; the land use analysis covers a broader area that specifically looks at county, municipal, or parcel level data. As requested by the Chester County Planning Commission, the land use analysis identifies the following demographic and development trends occurring around the corridor:

- Population
- Housing
- Employment
- Land Use
- Zoning
- Development
- Development Constraints

DEMOGRAPHICS

Studying the demographic makeup of a community is necessary in terms of understanding land use changes. Population forecasts are an important tool in planning for upcoming infrastructure improvements, housing and community facility needs and minimizing environmental impacts. Population and other demographic information were analyzed at the municipal level utilizing Year 2000 U.S. Census data.

Population

In the Year 2000, the five townships in the study area had a combined population of 21,083 residents, as shown in Table 10, representing 5 percent of Chester County's population. Between 1990 and 2000, the study area municipalities gained 3,789 residents, a 22 percent increase over the 1990 population. Upper Uwchlan Township gained the largest number of residents (2,454) and experienced the largest percentage increase (57 percent) among the five townships. South Coventry and East Nantmeal townships gained only 200-300 residents, while North Coventry Township lost population.

As the expansion of suburban growth in the region continues, population is also forecasted to increase in rural communities. Population forecasts by DVRPC indicate that by the Year 2030, the five municipalities should have a population of 32,290 residents, an increase of 53 percent while Chester County's population is expected to increase by 32 percent. The municipalities forecasted to have the largest increase in population between 2000 and 2030 are West Vincent

Township with 1,800 residents (a 57 percent increase) and Upper Uwchlan Township with 8,110 residents (a 118 percent increase).

Table 10: Population Trends

Municipality	1980 Census	1990 Census	2000 Census	2030 DVRPC	Absolute Change 2000–2030	Percent Change 2000–2030
North Coventry	7,164	7,506	7,381	7,670	289	3.9
South Coventry	1,556	1,682	1,895	2,450	555	29.3
East Nantmeal	1,222	1,448	1,787	2,210	423	23.7
West Vincent	1,992	2,262	3,170	5,000	1,830	57.7
Upper Uwchlan	1,805	4,396	6,850	14,960	8,110	118.4
Study Area Total	13,739	17,294	21,083	32,290	11,207	53.2%
Chester County	316,660	376,396	433,501	571,800	138,299	31.9%

Source: DVRPC Data Bulletin # 73, 2005

The U.S. Census releases yearly population estimates. A comparison of U.S. Census estimates with DVRPC's forecasts indicate by 2005, all of the municipality's population estimates, except for Upper Uwchlan, are either equal to or greater than the DVRPC 2010 forecasts, suggesting that the residential population is increasing at a much faster rate than previously forecasted.

Housing

As the population increases, new housing units are constructed to match the needs of homeowners. With average household size across most of the country steadily declining, while population is increasing, total housing units naturally increase faster then the population rate. Between 1990 and 2000, the number of housing units in the five municipalities increased by 1,394 units to 7,710 which resulted in a 22 percent unit increase, see Table 11. This rate was also slightly greater than Chester County's housing growth of 17 percent. Mirroring population growth, more units were built in the southern municipalities in the corridor than at the northern end; housing in Upper Uwchlan increased by 56 percent compared to approximately 7.5 percent in North Coventry and South Coventry townships. Upper Uwchlan also had the highest increase in housing units with 777 dwelling units, over twice the total number of units built in any other municipality in the corridor.

Post 2000 housing trends can be evaluated utilizing residential building permits issued by the municipalities been 2000 and 2005. Again, Upper Uwchlan leads in the number permits granted with 879, while both South Coventry and West Vincent each have granted approximately 250. During the six-year period, the corridor had 200 more housing starts than the ten-year period between 1990 and 2000.

Table 11: Housing Units: 1990 – 2000

Municipality	1990 Census	2000 Census	Absolute Change 1990–2000	Percent Change 1990–2000
North Coventry	2,896	3,114	218	7.5
South Coventry	670	721	51	7.6
East Nantmeal	514	587	73	14.2
West Vincent	846	1,121	275	32.5
Upper Uwchlan	1,390	2,167	777	55.9
Study Area Total	6,316	7,710	1,394	22.1%
Chester County	139,597	163,773	24,176	17.3%

Source: U.S. Census, 2000

Regionally, DVRPC compared new residential building permits through 2005 to existing housing stock in 2000 for all the municipalities in the nine county region. That analysis places Upper Uwchlan 13th out of over 300 municipalities with a 41 percent increase while South Coventry is ranked 16th with 36 percent, underlying the rapid growth starting to occur in the corridor. This rapid rate of construction will impact the existing infrastructure, specifically schools, libraries, fire and police protection and recreational facilities. The new local population will also result in changes to the traffic volumes and traffic patterns within the corridor.

Table 12: Housing Starts: 2000 – 2005

Municipality	2000	2001	2002	2003	2004	2005	Total 2000-2005	New Starts 2000–2005 Over 2000 Units
North Coventry	44	30	16	19	18	26	153	4.9%
South Coventry	11	40	44	62	44	57	258	35.8%
East Nantmeal	10	7	4	7	6	11	45	7.7%
West Vincent	24	31	38	90	86	3	272	24.3%
Upper Uwchlan	33	15	113	90	142	486	879	40.6%
Study Area Tot.	122	123	215	268	296	583	1,607	20.8%
Chester County	3,051	2,900	3,304	2,961	3,661	3,081	18,958	11.6%
% Co. Starts	4.0%	4.2%	6.5%	9.1%	8.1%	18.9%	8.5%	

Source: DVRPC Data Bulletin # 83, 2006

Employment

Chester County experienced a steady increase in population and employment between 1990 and 2000, and the PA 100 corridor is no exception. Employment within the five municipalities increased by almost 2,200 jobs (63 percent) to over 5,600 jobs, see Table 13. This rate is three times higher than the Chester County average of 21 percent. North Coventry gained close to 1,000 new jobs and South Coventry gained over 500 jobs. While South Coventry's employment increased over 1,000 percent, it started with a negligible base of only 54 jobs.

Between 2000 and 2030, employment within the five municipalities is forecasted to increase at a faster pace than Chester County, which is anticipated to gain an additional 5,500 jobs, a 97 percent increase. Upper Uwchlan is forecasted to double employment, gaining over 2,400 jobs, the largest increase in the study area. West Vincent will increase at a higher rate of 205 percent and gain over 1,000 jobs.

Businesses within the townships provide much needed tax revenue, but also generate more traffic and congestion for workers, customers or clients. In several townships, the increase will significantly affect the municipal character. While employment will increase, the townships will still have a lower percentage of jobs than their share of the County population. Consequently, this area is expected to remain primarily residential and agricultural, serving as a bedroom community to nearby employment centers.

Table 13: **Employment Trends**

Municipality	1990 Census	2000 Census	Percent Change 1990-2000	2030 DVRPC	Absolute Change 2000–2030	Percent Change 2000–2030
North Coventry	1,187	2,152	81.3%	3,477	1,325	61.6
South Coventry	54	683	1165.8%	1,171	488	71.4
East Nantmeal	214	334	56.1%	527	193	57.8
West Vincent	145	506	249.0%	1,542	1,036	204.7
Upper Uwchlan	1,876	1,993	6.2%	4,426	2,433	122.1
Study Area Total	3,476	5,668	63.1%	11,143	5,475	96.6%
Chester County	197,752	238,641	20.7%	345,026	106,421	44.6%

Source: DVRPC Data Bulletin # 73, 2005

A DVRPC report, *Employment Centers in the Delaware Valley*, identifies 136 employment centers within the region. While no centers exist along the PA 100 corridor, several centers are located at either end. The PA 100/Eagle/Lionville center, just south of the corridor, employs over 11,000 workers, primarily in the service and manufacturing industries. Further to the south, the Downingtown/ Exton center employs almost a 1,000 workers. To the north, the Pottstown center employs over 21,000 workers in similar industries. Not all local residents will work in these three centers, but it is clear that much more employment resides outside of the study area than within it.

Combining these economic conditions together with some of the housing characteristics leads to very simple conclusions. More local residents will work outside of the study area than inside, with a high probability that they will be working in one of the nearby employment centers. Since transit service within the corridor does not exist, the majority of workers will be driving to their destinations. With the increasing population, however, it might eventually be feasible to establish a bus route through the corridor, connecting Pottstown to Downingtown, with stops at several of the larger developments along the way.

Population Characteristics and Environmental Justice

As part of Title VI of the Civil Rights Act of 1964 and the 1994 President's Executive Order on Environmental Justice, DVRPC has adopted guidelines to help identify potential direct and disparate impacts of transportation projects and programs on defined minority, handicapped, lower income and other disadvantaged groups. The DVRPC report, "… *and Justice for All: DVRPC's Strategy for Fair Treatment and Meaningful Involvement of All People,*" outlines the agency's environmental justice methodology and establishes regional benchmarks for identifying disadvantaged communities at the census tract level for eight demographic categories. While none of the census tracts within the PA 100 corridor are identified as disadvantaged, several adjacent census tracts to the north and east of the study area are moderately disadvantaged. This suggests that while the residents living in the five municipalities are not disadvantaged, users of the roadway coming from neighboring communities may have other needs and concerns for improvements on the roadway.

The overwhelming race in the five municipalities is white (96 percent), which is higher than the county average of 89 percent. African American and Asian residents combine for 2 percent of the study area population. The area's Hispanic population is under 1 percent, which is also lower then the County's 4 percent average.

Educational attainment, measured by the highest level achieved for citizens 25 years or older, within the five municipalities is very similar to Chester County, where approximately 26 percent have high school diplomas as the highest educational level attained and about 27 percent have college diplomas.

While Chester County has a median household income of $65,295, the five municipalities are higher at $75,200 per household. Chester County also had a higher median household income than adjacent counties. Within the municipalities themselves, household income is lower towards the northern end of PA 100 and increases steadily towards the south. The difference between the highest and lowest median household incomes in the study area is significant: Upper Uwchlan at $96,711 has a median household income more than double of the North Coventry median income of $44,000.

LAND USE AND DEVELOPMENT

Land use data for 2005 was compiled at the parcel level, selecting parcels within at least a quarter mile from the roadway. Base maps were slightly adjusted to reflect current land use patterns, namely additional parcels were included to complete subdivisions and access points at key roads while parcels from municipalities not included in the study were removed. In total, this analysis encompasses 5,035 acres in portions of the five municipalities. Aerial

photography from 2005 was used to update the 2000 land use analysis. Furthermore, this data has been verified by using the Chester County assessor's database.

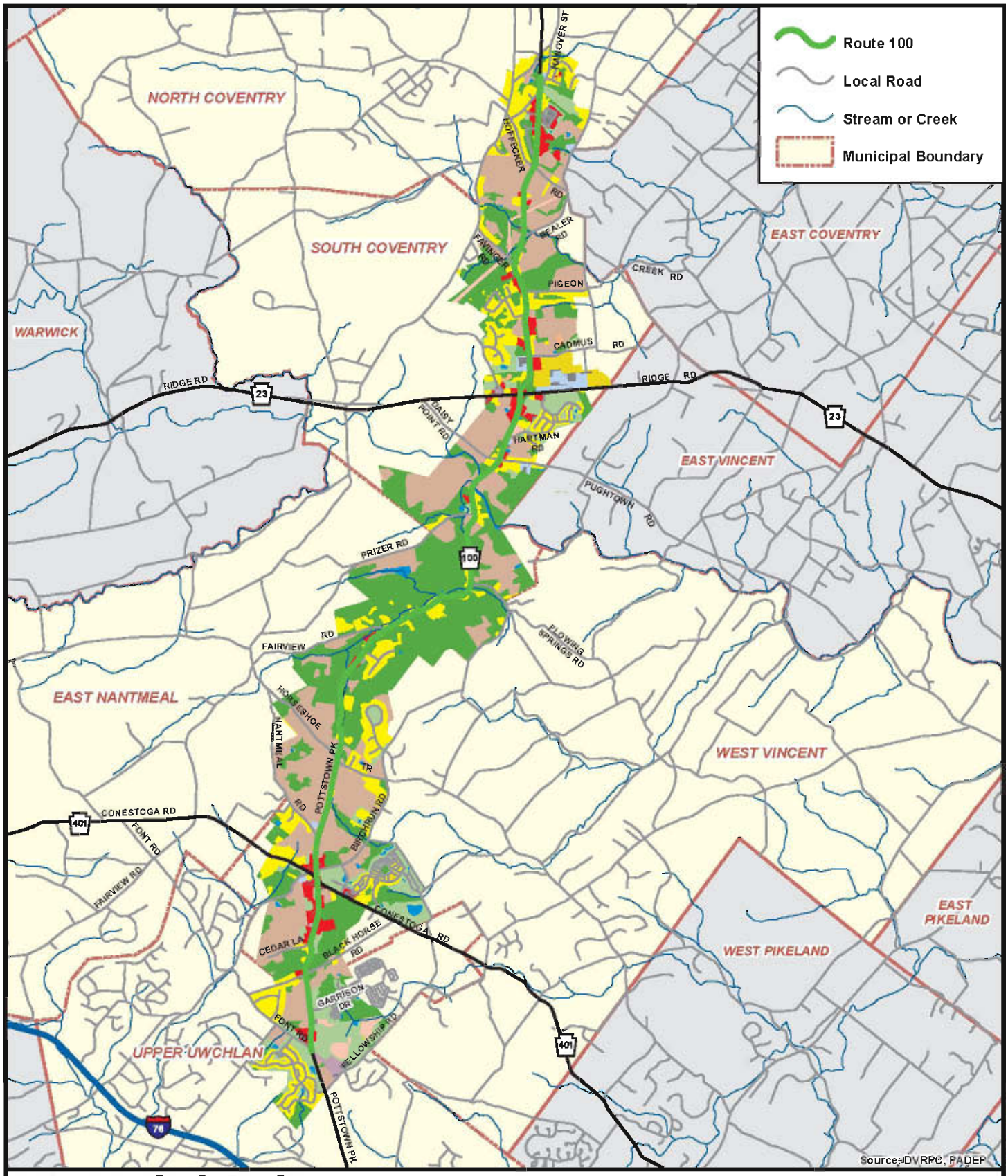
The area surrounding PA 100 is quite rural, with large tracts of open space and occasionally scattered development. Wooded uses (35 percent of the study area at 1,738 acres) and agricultural uses (29 percent of the study area at 1,457 acres) prevail, combining for over 60 percent of the total area, see Table 14 and Map 17. Agricultural uses vary from crops to husbandry, with many farms still active today. The agricultural and wooded percentages are comparable to those for Chester County as a whole.

Residential land uses cover 894 acres or 18 percent of the total area and is predominantly single-family detached homes. The housing units are overwhelmingly single-family homes on lots greater then one acre; however, this is slowly changing. Multi-family housing was not present in 2005. Access to subdivisions is predominately off of PA 100, but several subdivisions have access via other roads.

Commercial uses are located sporadically along the corridor, constituting 4 percent of the study area, with clusters at Temple Road, PA 23, and PA 401. While each municipality contains some commercial development, East Nantmeal contains the lowest amount in both actual acres and percentages. The type of commercial development is mixed. Stand-alone highway development, strip development and even a large shopping center, Suburbia in North Coventry Township, can be found in the corridor. Only a few commercial properties do not have access directly to PA 100.

While only a fraction of the total acreage, several other uses can be found along PA 100. Community services, manufacturing, and recreational uses are minimal, representing fewer than 3 percent of the total area. Community services include fire stations, libraries, churches and schools. Recreational uses include school facilities, ball fields, indoor facilities and neighborhood swimming pools. It should be noted that Upper Uwchlan Township has plans for a recreational ball field between Fellowship Road and PA 100.

While not currently a factor, pedestrian and bicycle traffic should also be considered. With the forecasted population increase, the incidence of pedestrian or bicycle accidents will only increase. Unless sidewalks are constructed, pedestrians living close to the community service and commercial centers will be forced to use highway shoulders. The accepted distance most people will walk is a quarter mile.



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 17: Draft Land Use (2005)

0 0.5 1 1.5 2
Miles

N

Delaware Valley Regional Planning Commission
July 2007

Draft Land Use (2005)

- Parking
- Utility
- Vacant
- Wooded
- Recreation
- Residential Mobile Home
- Commercial
- Community Services
- Agriculture
- Residential Single-Family Detached
- Industrial
- Residential Multi-Family
- Water

Table 14: 2005 Land Use

2005 Land Use (Acres)	Wooded	Agriculture	Residential	Vacant	Commercial	Recreation	Community Services	Manufacturing	Other	Total
North Coventry	115	215	165	22	38	0	4	0	21	581
South Coventry	533	515	270	93	65	53	39	2	51	1,622
East Nantmeal	489	209	96	0	9	0	0	2	9	814
West Vincent	518	450	244	173	58	3	6	2	33	1,486
Upper Uwchlan	83	68	118	191	12	2	0	17	40	531
Study Area Total	1,738	1,457	894	480	182	58	49	22	154	5,035
Chester County	133,474	190,121	112,053	12,002	8,105	7,546	4,503	2,790	15,137	485,732

2005 Land Use (Percentage)	Wooded	Agriculture	Residential	Vacant	Commercial	Recreation	Community Services	Manufacturing	Other	Total
North Coventry	19.8	37.0	28.4	3.9	6.6	0.0	0.7	0.0	3.7	100.0
South Coventry	32.8	31.8	16.7	5.7	4.0	3.3	2.4	0.1	3.1	100.0
East Nantmeal	60.1	25.7	11.8	0.0	1.1	0.0	0.0	0.2	1.1	100.0
West Vincent	34.9	30.3	16.4	11.7	3.9	0.2	0.4	0.1	2.2	100.0
Upper Uwchlan	15.6	12.7	22.3	36.0	2.3	0.4	0.0	3.1	7.5	100.0
Study Area Total	34.5%	28.9%	17.8%	9.5%	3.6%	1.2%	1.0%	0.4%	3.1%	100.0%
Chester County	27.5%	39.1%	23.1%	2.5%	1.7%	1.6%	0.9%	0.6%	3.1%	100.0%

Source: DVRPC, 2007

COMPOSITE ZONING

Land use in and around the corridor is controlled by municipal zoning ordinances. These zoning regulations control the specific use of the land, such as a residential dwelling or a retail establishment, and also regulate lot sizes, setbacks, density and height among other restrictions. Zoning ordinances may be general in their regulations or more specifically mention categories of commercial use.

Twenty-three separate zones within the five townships have been combined into seven broader categories to provide a comparative zoning analysis and are illustrated in Map 18 and Table 15. A more detailed breakdown of zones found in the study area has been included in Appendix D. Even though specific regulations vary greatly between municipalities, the seven zones are very general in nature and serve to provide comparisons between the municipalities. In general, zones for residential, commercial, industrial and municipal uses can be found along the PA 100 corridor.

While each zone can be characterized into a general category, the following zoning districts should be specifically discussed:

- West Vincent has a five-tier by-right residential development system that a developer may choose from. In the lowest density tier, single-family homes are permitted on a 10-acre parcel; however, a permanent easement is created to protect the land. Densities are increased with each tier, making lot sizes smaller and permitting multi-family housing in Tier 5. Greenway space is also increased with each tier.
- West Vincent has begun the process of constructing a Town Center at Ludwigs Corner. The Planned Commercial/Light Industrial (PC/LI) zone is unique by permitting a wider variety of uses as special exceptions and conditional uses, including light manufacturing.
- South Coventry has several residential and commercial zones that limit lot size, setbacks, and other regulations through access to central sewer and water. The Township also employs an open space development option granting density bonuses for developers to provide a greater amount of open space within their tract.
- East Nantmeal utilizes a density residential option permitting up to four units per acre as a conditional use on tracts of at least 40 acres in several residential zones. Fifty percent of the tract must be dedicated to community open space.

While this study differentiates three residential classifications ranging from very low to medium density, these descriptions should only be used when comparing zones within the study area. If comparing the residential zones found along PA 100 to other residential zones within the greater Delaware Valley region, all of the zones found here fall under the “very low” to “low” classification.

Table 15: Generalized Zoning District Descriptions

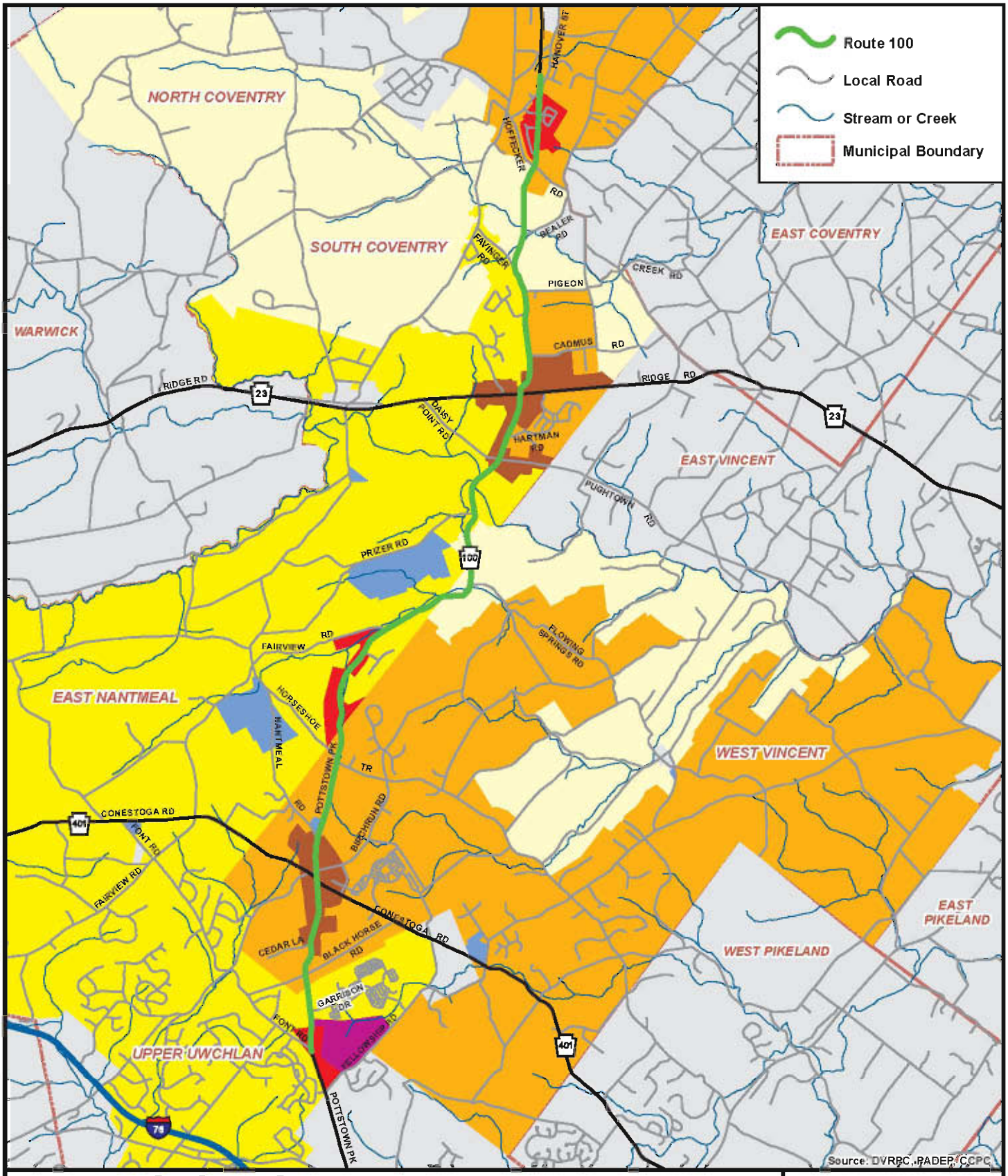
Zone	Name	Description
R-1	Very Low Density Residential	Intended ideally for agricultural use and very low density, single family rural development on lots greater than 2 acres.
R-2	Low Density Residential	Intended for slightly higher single family residential development. Lot sizes vary between one to two acres.
R-3	Medium Density Residential	Intended for single family, two-family, and multi-family residential development. Lot sizes smaller than an acre.
C	Commercial	Intended for retail and office development either in single buildings or as part of a shopping center. Minimum lot sizes vary between 10,000 and 30,000 square feet.
VC	Village Center	Intended to provide retail, office, and residential development. Residential units tend to be permitted above other uses, but may be permitted by right. Lot sizes vary between 10,000 and 30,000 square feet.
LI	Light Industrial	Intended for limited industrial, manufacturing, and research uses on three-acre lots.
M/I	Municipal/Institutional	Intended for municipal, institutional, and educational uses.

Source: DVRPC, 2006

By looking at the zoning along PA 100, a pattern emerges that characterizes this roadway. Each municipality has a commercial zone along the road surrounded by one to three of the residential zones. These commercial zones tend to be located at intersections with other major roadways, such as PA 401, PA 23, and Font Road. Since each commercial zone is separated by residential districts, a regular contiguous commercial strip will not emerge along this corridor, but rather a series of small scale commercial nodes.

The zoning in place establishes the potential for five, but ideally four, town centers or villages to emerge. One new development, Ludwigs Corner at the intersection of PA 100 and PA 401, will emerge as a village along the corridor. This mixed-use development will contain different types of residential housing, retail, office and civic uses in a single master plan. In time, a new elementary school and age-restricted housing may be constructed adjacent to this development, thus creating a new town along the corridor. New roads will be built within the development, making PA 100 the “by-pass” around this new town. The development is compact and allows residents to walk from their home to various commercial, cultural and recreational destinations.

Other locations, such as Pughstown and Bucktown, can build upon existing residential and commercial buildings and build complementary uses around them, making new walkable communities. Additionally, by adding more residential components around commercial centers, potential for mass transit options may emerge.



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 18: Composite Zoning

0 0.5 1 1.5 2
Miles

Delaware Valley Regional Planning Commission
July 2007

- N/A
- Very Low Density Residential
- Low Density Residential
- Medium Density Residential
- Village Center
- Municipal / Institutional
- Light Industrial
- Commercial

Location map

*Map not to scale

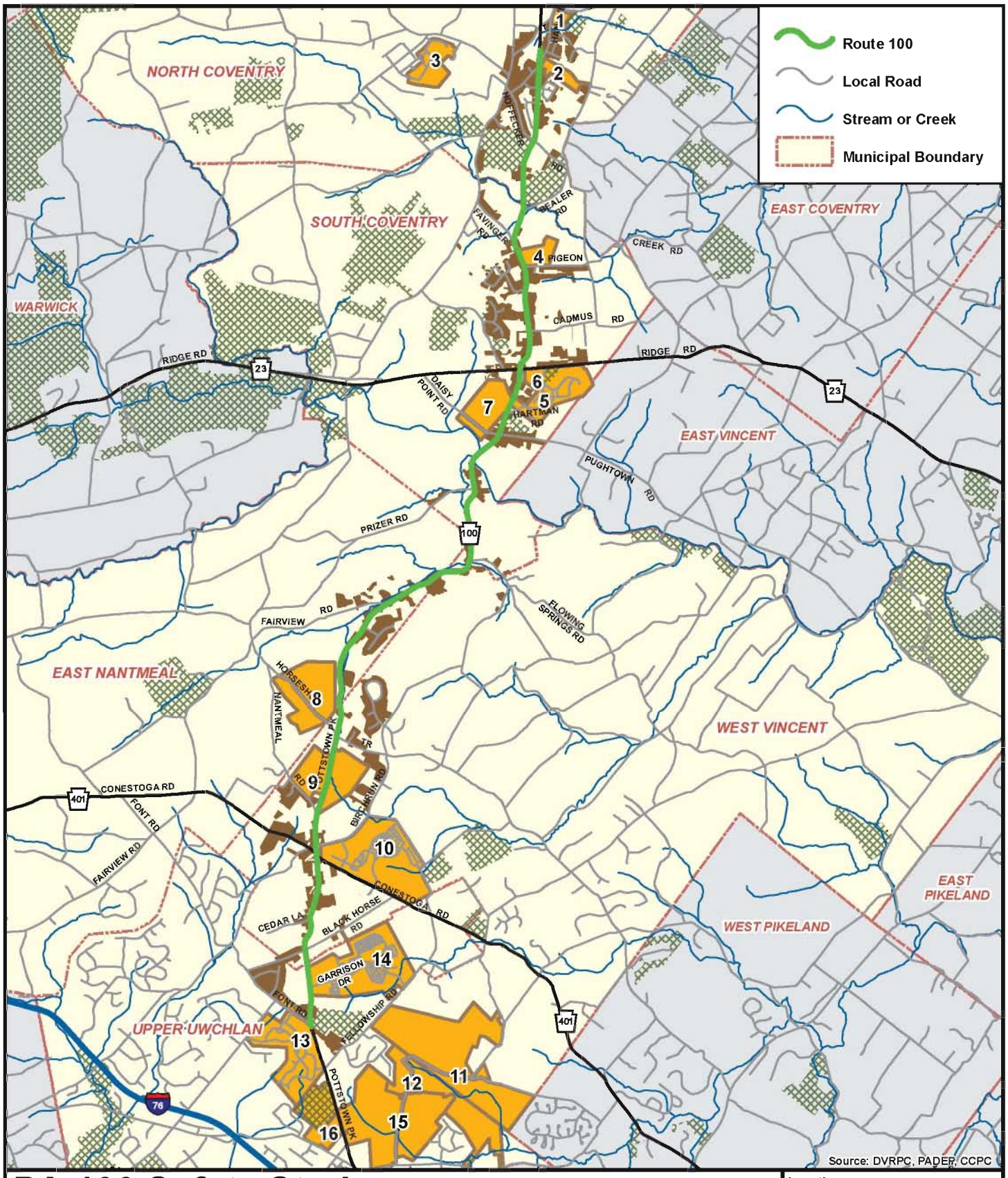
Pending and Proposed Development

Future land use is always speculative, but recently several housing subdivisions have been built. At least 63 subdivisions have been proposed in and around the parcels in the corridor between February 1999 and September 2005. Several proposals include re-submissions for the same tract of land. These subdivision reviews vary in size from less than an acre to over 275 acres. Half of the proposals are for single units and another 20 percent are for two units. Five proposals are for between 180 and 570 units. The majority of proposals are for residential single-family detached units; however, several proposals include provisions for multi-family condominiums or townhouses. Most of the larger subdivisions utilize cluster development practices, where residential units are placed on smaller lots and closer together, thereby concentrating the development and allowing for larger tracts of connected open space. Developers incorporating a cluster development are rewarded with density bonuses in many municipalities.

Major developments that have undergone recent subdivision review are listed in Table 16 and displayed on Map 19. The subdivision numbers on the map correspond with the subdivisions listed in the table. Notable recent residential developments include Ridglea, a 186 unit subdivision location across from the Owen J. Robert's High School and the Reserve at Eagle, a 208 single family subdivision located at the very southern end of the study area.

The southern end of the corridor contains the largest concentration of new residential subdivisions. Windsor Ridge in Upper Uwchlan, one of two very large subdivisions currently under construction, will have 442 single-family homes upon completion. Weatherstone, at the eastern side of the PA 401 intersection, will have 273 housing units along with 240,000 square feet for retail and office space along a new "main street" to be constructed at Ludwigs Corner. A new municipal library has been completed at this site along with other commercial and mixed-use buildings. Several access roads are included in the design to create the new Ludwigs Corner Town Center. While not included in the study area, three major subdivisions in Upper Uwchlan will add an additional 1,100 houses.

Municipal comprehensive plans combined with local zoning ordinances are guiding growth within the corridor. Chester County provides broader guidance, connecting adjacent communities together to form a single vision through their *Landscapes* document. This plan outlines various concentrations of development, from rural and natural areas to suburban and urban centers. In comparing this plan to municipal zoning and pending developments, most of the development along the corridor corresponds to the Chester County vision.



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 19: Pending and Proposed Development

0 0.5 1 1.5 2
Miles

Delaware Valley
Regional Planning Commission
July 2007

5 Significant Development

Developed Land

Protected Land

Location map

*Map not to scale

Table 16: Pending and Proposed Development

#	Municipality	Development	Developer/Owner	Size	Status
1	Upper Uwchlan	Coventry Heights	Gambone Brothers	9 SFD	Final approval pending
2	North Coventry	Coventry Fields	Heritage Building Group	15 SFD	Pending
3	North Coventry	Coventry Lakes	Heritage Building Group	57 SFD	Under const
4	South Coventry	Bello Terreno	Villa Building Company	18 SFD	Pending
5	South Coventry	Ridglea	Orleans Homes	88 SFD, 93 SFA	Under const
6	South Coventry	Bucktown Crossing	Earth Enterprise	55+ community, 74 apts in 4 units	Approved
7	South Coventry	Symons Farm	Heritage Building Group	44 SF	Pending
8	East Nantmeal	Mary Hill	Mary Hill	—	—
9	West Vincent	Cornerstone Rise at Griffiths Field	—	216 apts	Pending
10	West Vincent	Weatherstone	The Hankin Group	273 SFA & SFD 240,000 sf retail & office	Under const
11	West Vincent	Ewing Tract	Toll Brothers	226 SFD, 92 SFA	Pending
12	Upper Uwchlan	Ewing Tract	Toll Brothers	77 SFD, 160 SFA	Approved
13	Upper Uwchlan	Reserve at Eagle	Toll Brothers	208 SF	Under const
14	Upper Uwchlan	Windsor Ridge	Pulte Homes	228 SFD, 214 SFA	Under const
15	Upper Uwchlan	Byers Station	Orleans Homes/ K Hovanian Homes	446-662 SFA & SFD	Under const
16	Upper Uwchlan	Waynebrook	David Cutler Group	70 SF	Under const

SF – Single Family, SFA – Single Family Attached, SFD – Single Family Detached
Source: Municipal and developer websites, conversations with municipal officials, and Chester County Planning Commission. Status is current as of March 2006.

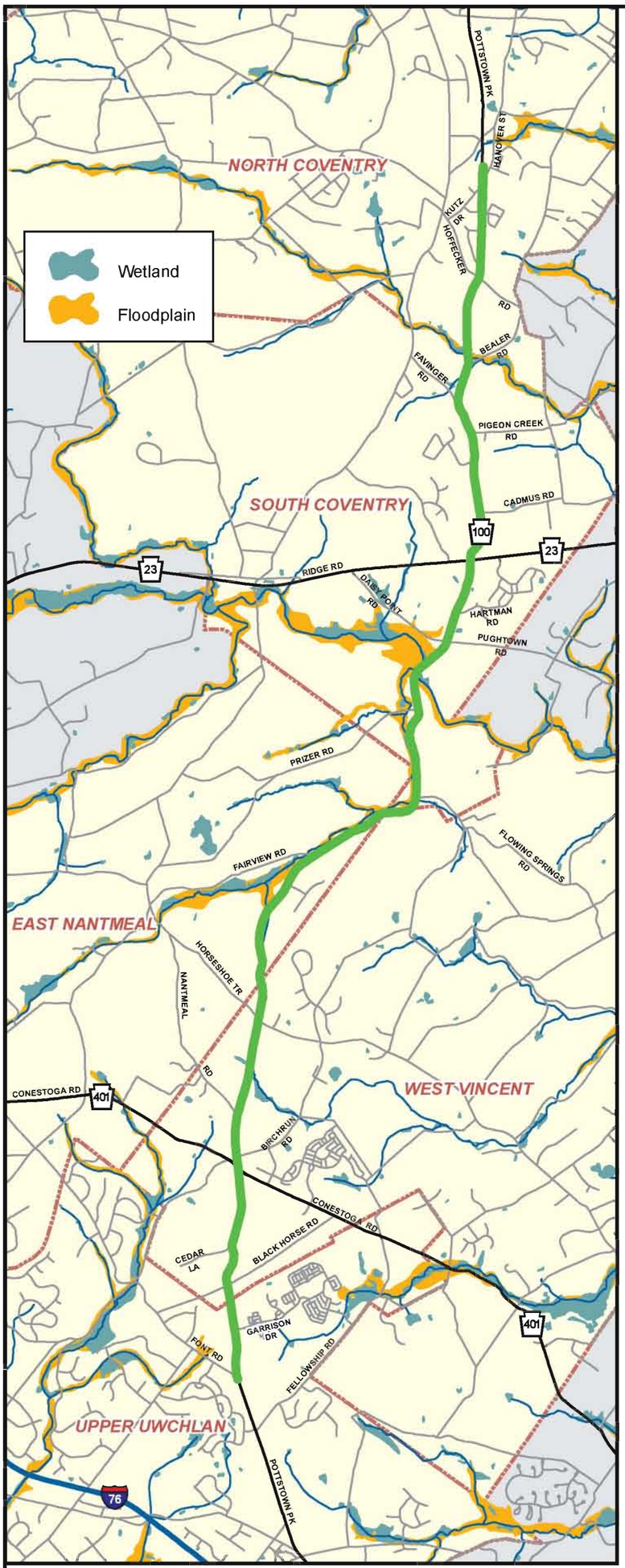
Development Constraints

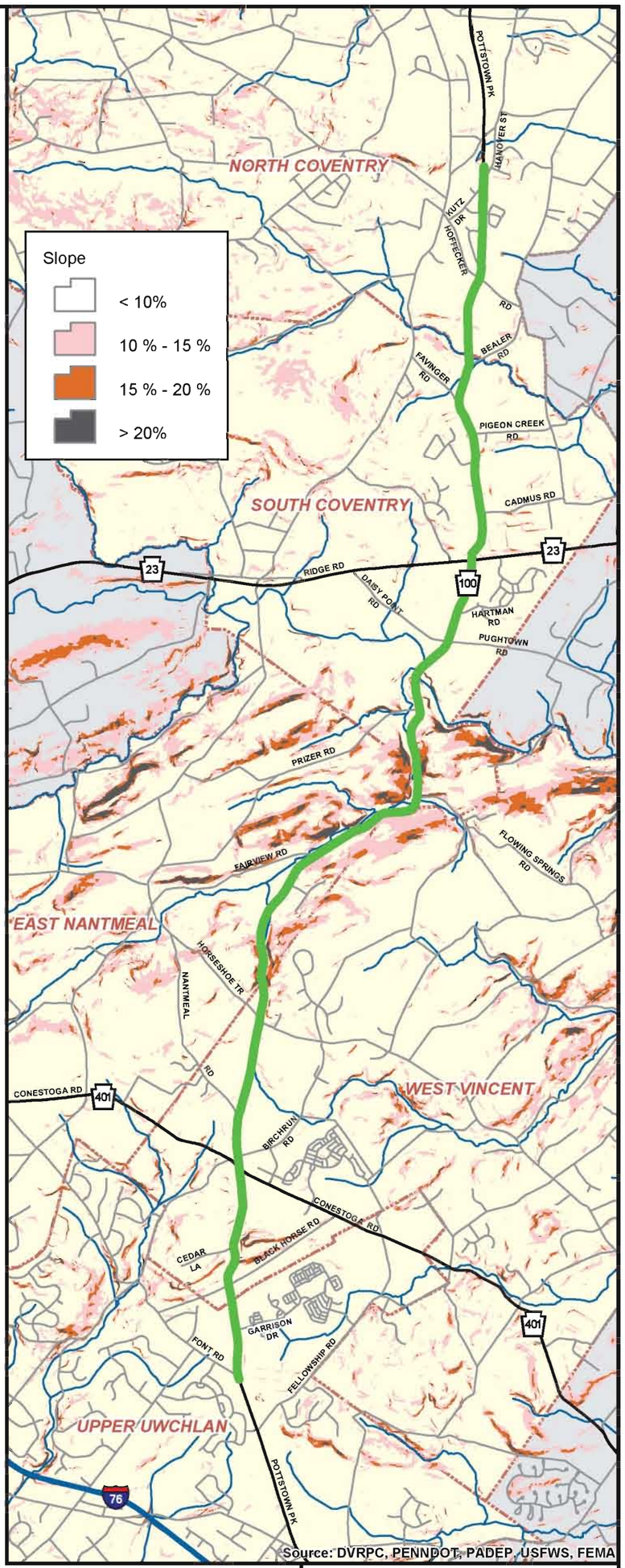
Another factor in determining what can be built in any given area is natural features. The following elements also guide and determine development along the corridor and are also illustrated in Map 20:

- Open space preservation – Chester County offers several preservation programs including Farmland Preservation, Municipal Park Grants and Preservation Partners. Conservation groups, such as the Green Valley Association and the French and Pickering Conservation Trust, help contribute to conservation efforts in the area. As part of the DVRPC 2030 Plan, greenways have been proposed to connect the larger open spaces together along rivers and tributaries in Chester County.
- Hydrology – The streams and tributaries within the study area are key ecological features and impact the area in several ways. Chester County has created watershed management plans for every watershed in the county. These plans provide valuable analysis of existing conditions within each watershed to establish goals and objectives for environmental improvement. Floodplains occur along many of these streams. Wetlands within the study area are ecologically diverse and productive for plants and animals, and can include swamps, marshes, vernal pools and bogs. They improve water quality by filtering surface water runoff. The ability to

absorb large quantities of water in downpours or when snow melts helps erosion control and flood protection.

- Topography – Terrain within the corridor varies greatly from one end to the other with elevations ranging from 275 to 725 feet Hilly areas are located at the southern end of the corridor and south of the border between East Nantmeal and West Vincent townships. Slopes greater than 15 percent present problems with storm water runoff and erosion.





Source: DVRPC, PENNDOT, PADEP, USFWS, FEMA

PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map 20: Hydrology and Steep Slopes

Route 100
Local Road
Stream or Creek
Municipal Boundary

0 0.5 1 1.5 2
Miles

N

Delaware Valley
Regional Planning Commission
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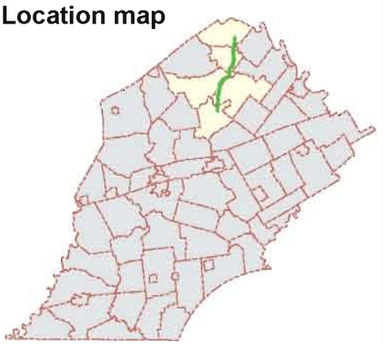
Location map



*Map not to scale

VI. PENNDOT PA 100 SAFETY INITIATIVES

This chapter describes past and current PennDOT actions to improve safety in the corridor prior to the DVRPC safety study. Actions include resurfacing and reconstruction projects, conducting safety studies and removal of passing/truck climbing lanes. Future actions include Highway Occupancy Permit (HOP) projects in three of the municipalities. Actions undertaken in response to this study are not documented herein.

PREVIOUS PENNDOT ACTIONS

Over the last eight years, PennDOT completed a number of improvement projects on PA 100. The improvements, and the year they were completed, are summarized below:

- Resurfacing PA 100 Montgomery County Line to PA 23 (1998);
- Widening and reconstructing shoulders on PA 100 between Temple Road and Hoffecker Road (1998);
- Reconstruction of PA 100 between PA 23 and Prizer Road, including new bridge over French Creek (2000-2001);
- Improved and redesigned PA 100/Pughtown Road intersection (2000-2001); and
- Resurfacing PA 100 between Prizer Road and Fellowship Road (2002).

Between 2003 and 2005 local officials started taking a more regional approach to safety issues on PA 100. In December 2003, State Representative Curt Schroder (155th District) held a meeting with the local municipal officials to develop recommendations for safety improvements. In January 2004, State Representatives Timothy Hennessey (26th District) and Curt Schroder, and Senator John Rafferty (44th District) met with PennDOT District 6-0 to discuss safety concerns. In response to these meetings, PennDOT initiated a safety analysis of PA 100 between Prizer Road and Blackhorse Road.

The study found over 40 percent of the crashes occurred in the segment between Nantmeal Road and the bridge over Beaver Run. Consistent with the findings of this study, PennDOT determined that the majority of accidents were hit-fixed object caused by driving too fast for conditions. An analysis of the need for passing/climbing lanes was conducted by surveying the speed of trucks and all vehicles. Since the average speed of trucks and all vehicles were almost identical, 45 mph and 48 mph respectively, there was no need for the passing/climbing lanes. Therefore, the study recommended eliminating both passing/climbing lanes in this section and striping the median.

In the segment between Blackhorse Road and Cedar Lane, in West Vincent Township, the average speed for all vehicles was 41 mph with an average truck speed of 29 mph. Due to the large difference in speeds, PennDOT felt the truck climbing lane was needed. The study recommended lengthening the transition from two lanes to one lane and increasing the size of the signs posted in the transition area.

The third section studied was from Flowing Springs Road to Fairview Road, in South Coventry and East Nantmeal townships. Again, the study found the majority of crashes were hit-fixed object. Improving curve warning signs was recommended.

Since the study indicated speeds on PA 100 generally exceed the posted speed limit, it did not recommend lowering the speeds limit. However, it did recommend reevaluation after the other improvements were implemented.

PennDOT also conducted skid testing to determine if the pavement has a sufficient Skid Resistance Level (SRL). The results of this analysis will be discussed later in this chapter.

As a consequence of its safety study, PennDOT implemented the following improvements to PA 100:

- Blackhorse Road to Cedar Lane – Retained truck climbing lane, upgraded merge and lane drop warning signs, and installed a left-turn lane at Cedar Lane. Completed spring 2004. Since extending the transition area would necessitate reducing the width of the center turn lane, it could not be constructed without compromising safety.
- Horseshoe Trail to Flowing Springs Road – Removed two truck climbing lanes, painted 12 foot center median with cross-hatching and upgraded curve warning signs and advisory speed plaques. Completed summer 2004.
- Pughtown Road and Horseshoe Trail – Installed edge line rumble strips, centerline rumble strips, and raised pavement markers. Completed fall 2005.

In March 2005, Representative Hennessey requested a more comprehensive study of roadway and traffic conditions, accident history, and a wider range of alternative improvements. PennDOT, in cooperation with Chester County Planning Commission, arranged for DVRPC to conduct this effort. At Chester County's request, a land use element was added because the potential solutions could impact land use in the corridor.

PLANNED PA 100 IMPROVEMENTS

A number of improvements were planned for the corridor. With the exception of the PA 23 safety improvement and Ludwigs Corner Bypass (a congressional earmark), the other projects are highway occupancy permit related.

- Wawa (North Coventry Township) – Highway occupancy permit project to realign and widen Temple Road approach at the Suburbia Shopping Center intersection. Provide right-turn lane on southbound PA 100.
- Cadmus Road (South Coventry Township) – Highway occupancy permit project to widen Cadmus Road for a two-lane approach (construct right-turn lane), construct curbing and install protected left-turn phasing for PA 100 southbound left turns. Improvements will be funded by Owen J. Roberts School District.
- PA 23 (South Coventry Township) – Safety project to construct a northbound left-turn lane is under discussion between the Township and PennDOT. One of the outstanding issues is local match for the project.
- Hartman Road (South Coventry Township) – Highway occupancy permit project to widen PA 100 for a left-turn lane and a right-turn deceleration lane. The proposed improvements are for a mixed-use development (Heritage Building Group) to be located opposite Hartman Road.
- Holly Place Associates (South Coventry Township) – Highway occupancy permit project to widen PA 100 for a left-turn lane for a proposed office building.
- Nantmeal Road (West Vincent Township) – Highway occupancy permit project to relocate and realign intersection and construct a left-turn lane. Improvement to be constructed by developers as part of the Ludwigs Corner Bypass.
- PA 401 (West Vincent Township) – Highway occupancy permit project to construct left-turn lanes. Improvement is part of Ludwigs Corner master plan.
- Ludwigs Corner Bypass – Segment between PA 100 and PA 401 has received a federal earmark.

PAVEMENT CRITERIA AND ANALYSIS

A number of local officials have suggested that PennDOT used the wrong pavement mix when it resurfaced PA 100; consequently, there is insufficient skid resistance, resulting in the wet surface crashes. PennDOT used SRL E; others have suggested SRL H would have been more appropriate.

PennDOT's Pavement Policy Manual (Publication 242) establishes the Department's policies and guidelines for the maintenance, construction, restoration, resurfacing and reconstruction of pavement. The primary purpose of the manual is to ensure that pavement structures are evaluated in the same

manner for all projects and corrective measures follow uniform criteria. The manual permits deviations when unusual situations or problems are encountered. However, these exceptions must be documented and require approval by PennDOT Central Office.

According to the manual (see Appendix E for an excerpt from the manual), determination of the appropriate SRL designation for the bituminous wearing course is based on the anticipated Average Daily Traffic (ADT). For traffic volumes above 20,000 vehicles per day, SRL E is used. For roads with traffic volumes between 5,001 to 20,000 vehicles per day, SRL H is used. According to PennDOT District 6-0, 95 percent of the paving contracts within the district use SRL H. SRL E is based on a harder aggregate. While skid resistance values are initially similar between SRL E and SRL H, SRL E would be expected to hold that value longer.

SRL E was used on PA 100 between PA 23 and the Montgomery County Line because its traffic volume exceeded 20,000 vehicles per day. SRL H was used on PA 100 south of PA 23 because its volume was under 20,000 vehicles per day. The segment of PA 100 north of PA 23 also has higher truck volumes than the segment south of PA 23.

VII. CORRIDOR-WIDE RECOMMENDATIONS

Because PA 100 crashes are caused by a combination of excessive speeds, environmental conditions, roadway geometrics and roadside development, the recommendations must be multi-faceted in order to address the wide range of underlying causes. No single mitigation measure by itself can satisfactorily reduce the number of incidences and severity of crashes.

Recommendations are divided into two general categories: corridor-wide recommendations and municipality-specific recommendations. Corridor-wide recommendations are general strategies, such as speed enforcement or warning sign upgrades, which have wide applications throughout the corridor. Municipality-specific recommendations are more focused recommendations targeted to address unique issues associated with crash clusters. Recommendations were generated by a combination of DVRPC field views, municipal outreach meetings, and discussions with Chester County and PennDOT.

This chapter presents 13 corridor-wide recommendations. The recommendations are divided into three categories – speed enforcement and education, physical improvements and land use strategies. For each recommendation, there is a general description describing its objective, benefits, actions associated with it and locations where it is applicable. Each recommendation is associated with an implementation timeframe:

- Short-term – Less than three years;
- Medium-term – Between three and eight years; and
- Long-term – Greater than eight years.

SPEED ENFORCEMENT AND EDUCATION

Speed Enforcement Program

The objective is to establish a corridor-wide speed enforcement program to minimize speeding on PA 100. Because dedicating police personnel to PA 100 can be a labor intensive effort, distracting from other law enforcement duties, it is recommended police enforcement be targeted to high accident months. Speeding and driving at excessive speed for conditions are two of the primary contributory causes of hit-fixed object crashes in the corridor.

In the municipal outreach meetings, local police departments unanimously praised a PA 100 speed enforcement program conducted several years ago. Using funding from a safety grant, municipalities from Upper Pottsgrove to

Uwchlan Township cooperatively instituted a speed enforcement blitz. While there was broad consensus that a similar type program should be reinstituted, there was concern over of lack of sufficient police personnel and equipment to sustain it. Targeting the enforcement blitz to October through December, when accidents peak, would be the most effective use of resources, not unduly overburdening police departments in the corridor

Police enforcement in the corridor is divided among local police and Pennsylvania State Police. North Coventry, West Vincent and Upper Uwchlan townships are patrolled by municipal police departments; the Pennsylvania State Police patrol South Coventry and East Nantmeal townships.

At the December 1, 2006, public officials meeting, representatives from PennDOT Central Office indicated funding was available to help fund an enforcement program through PennDOT's Smooth Operator Program and Buckle Up PA enforcement initiatives. As a consequence of the meeting, North Coventry, West Vincent and Upper Uwchlan townships have applied for and received, grants for police enforcement.

- Smooth Operator Program – While largely targeted to aggressive driving during the summertime, PennDOT has indicated PA 100 municipalities are eligible to apply for it. Smooth Operator Program is a partnership among the Pennsylvania State Police, local police and PennDOT. Under the program, the State Police will share resources including radar and reconnaissance aircraft. To help fund the Smooth Operator Program, in 2006 PennDOT distributed $400,000 to twelve counties with a history of aggressive driving. A secondary benefit of the Smooth Operator Program is that it could potentially solve the issue of funding State Police participation in a local speed enforcement blitz program. According to the State Police, they can not divert part of a highway safety grant to local police to increase their enforcement on PA 100.
- Buckle Up PA – Buckle Up PA is a project funded through the PennDOT dedicated to raising the seat belt usage level in Pennsylvania through increased enforcement, public awareness and education. Its focus areas include aggressive driving, impaired driving, youth drivers and occupant protection. Safety coordinators can assist police departments with school programs, public awareness, equipment and other resources.

Designating PA 100 as a Highway Safety Corridor will also result in increased police enforcement and the doubling of fines. The Highway Safety Corridor program was enacted by the state legislature in 2004. PennDOT is currently promulgating guidelines for the program. While not yet final, preliminary eligibility requirements call for: 1) a crash analysis for the proceeding five years to determine if driver behavior exceeds thresholds set by PennDOT; 2) adequate safe areas for police to pull over violators; 3) sufficient area to post safe highway corridor signs; and 4) a written commitment by local and state enforcement

personnel to provide visible and sustained enforcement. Even though the program is not yet fully operational, at the December 1, 2006, public officials meeting, PennDOT said they would consider designating PA 100 as a Highway Safety Corridor.

A speed enforcement issue repeatedly raised by the municipalities was the inability of local police to employ radar devices. This has placed an undue burden on the municipal police departments, limiting their ability to lower speeds on PA 100. The state legislature should reconsider this prohibition.

The speed enforcement program is a short-term action.

Construct Pull-outs for Police Enforcement

Constructing pull-outs for police patrols complements the speed enforcement program. The objective of this action is to provide a safe haven for police officers to conduct speed enforcement at the curves and other locations where there are no shoulders. Police officials at the municipal outreach meetings stated they were unable to effectively enforce the speed limit due to the inability to safely pull over speeders. When they conduct speed enforcement, they are forced to do so away from the curves, thereby not effectively reducing speeds where it is most needed.

Ideally, pull-out locations should be identified by a joint effort among police and PennDOT personnel. What may appear to be an optimal pull-out location from a police perspective may not work from PennDOT's perspective due to insufficient right-of-way or construction concerns. It is assumed two pull-outs are needed in tandem, one for a police officer to measure vehicle speeds and a larger area for a second officer to safely pull over speeders. Construction of pull-outs will entail clearing and constructing a safe zone.

Potential areas for pull-outs include:

- Curves between Fairview Road and Horseshoe Trail;
- Curves between Cedar Lane and Black Horse Road; and
- Other locations to be determined by field views.

This is a short-term action.

Education Program

The objective of a public education program is to supplement the speed enforcement program by warning motorist to slow down. Like the speed enforcement program, it should be targeted to the fall-winter season when there is an increase in the incidence of crashes. Ideally, slower vehicle speeds and less aggressive driving will result from this effort.

This on-going effort is a low-cost program. Public officials, such as PennDOT or the State Police, can initiate newspaper articles warning motorists of the tree season and the need to drive more carefully, especially during inclement weather. Depending upon timing of municipally mailings, municipalities can incorporate brochures into their mailings warning motorists to drive more slowly. Posters can be placed in supermarkets and other business establishments along PA 100 providing safety warnings. Both PennDOT's Smooth Operator Program and Buckle Up PA fund public education programs and can be of assistance in designing them.

Dynamic message signs are recommended for two locations on PA 100, just south of Blackhorse Hill and by Horseshoe Trail. Messages posted on the signs should be an integral component of the public education program. However, overloading motorists with dynamic message sign information can be counterproductive; motorists will begin ignoring posted messages, not discerning warning information from educational messages.

PHYSICAL IMPROVEMENTS

The next group of corridor-wide recommendations relate to physical improvements to PA 100. They vary in terms of priority, cost, implementation timeframe and location.

Apply Nova Chip

The objective of applying a Nova Chip treatment at curves is to reduce wet surface crashes that typically result in hit-fixed object crashes. Nova Chip is a thin, coarse aggregate hot mix applied over a liquid membrane. The membrane seals the existing road surface. Nova Chip increases roadway skid resistance, reducing wet surface crashes. While it is very effective in reducing wet pavement crashes, Nova Chip is considerably more expensive than traditional roadway overlay treatments.

Nova Chip treatment should be limited to locations with the highest incidence of wet surface crashes:

- Curve between Pughtown Road and Prizer Road;
- Curves between Prizer Road and Flowing Springs Road;
- Curves between Horseshoe Trail and Fairview Road; and
- Curves between Blackhorse Road and Cedar Lane.

Applying Nova Chip will require temporary removal of raised pavement markers and some striping. This presents an opportunity to reconfigure sections of PA 100, increasing shoulder widths by narrowing the stripped out median. The net

result will be an increased buffer between the travel lanes and roadside obstructions such as guiderails, trees and rock faces.

Applying Nova Chip treatment is considered a short-term action.

Tree Management

Analysis of the cluster crash data repeatedly showed wet surface conditions are a major contributory factor in hit-fixed object crashes at the curves. In fact, many clusters had more wet surface accidents than wet weather accidents suggesting the road surface is not sufficiently drying after inclement weather. The overhanging tree canopy is partially responsible for this situation. In addition, anecdotal stories from West Vincent Township officials and others suggest debris from trees falling onto the roadway forms slippery conditions, analogous to the slippery leaves problem faced by SEPTA. This is somewhat substantiated with crash records showing accidents peaking in October, November and December, when leaves fall on the roadway. Also, at the municipal outreach meeting with West Vincent Township, they reported a drop of hit-fixed object cashes after PECO trimmed trees on the curvy section north of Horseshoe Trail. This was verified by crash statistics showing a reduction in crashes in 2005 as compared to 2004.

This study recognizes PA 100's tree canopy is very scenic and there would be substantial opposition from local residents for the complete removal of trees because it would change the character of the highway. Therefore, a more selective trimming of the canopy is recommended. PennDOT Chester County Maintenance would be responsible for implementing this recommendation, either through their own resources or via an outside contractor. Areas where tree management is needed include the following locations:

- Prizer Road to Titus Inn;
- Fairview Road to Horseshoe Trail; and
- Cedar Lane to Blackhorse Road.

Tree management is considered a short-term action.

Upgrade Signs and Add Additional Signs

Warning signage is needed to warn drivers about potentially hazardous conditions, and to provide adequate guidance to help negotiate curves. Warning signs include chevrons (W1-8 sign), curve signs (W1-2 sign for a curve, W1-4 for a reverse curve) and a combination horizontal alignment/advisory speed sign (W1-2a sign) warning drivers to lower their speed around a curve.

Over the years, PennDOT has substantially increased the number of warning signs in the corridor in response to safety concerns expressed by municipal and

public officials. However, there are still additional needs. Many curves still lack curve warning signs. At some curves the existing chevrons do not fully delineate the curve; they start or end in the middle of the curve. At other curves, driveways interrupt chevron spacing, creating significant gaps in the delineation. While the vast majority of signs are well maintained, a few signs are either obstructed or damaged. Intersection warning signs, giving drivers advance notice as they approach an unsignalized intersection, are nearly nonexistent. The combination of aggressive drivers and partially hidden intersections increases the potential for rear-end crashes. More specific signs recommendations are detailed under the municipal recommendations in the next chapter.

Reflectors on guiderail is another area for improvement. As damaged guiderail is replaced, PennDOT is installing guiderail that has built-in reflectors spaced along it. As motorists drive at night, they are experiencing a combination of the older unreflectorized guiderail and the newer reflectorized guiderail creating confusion and/or misinformation, rather than providing adequate guidance for motorists. PennDOT maintenance should accelerate the guiderail replacement process to ensure all guiderail present consistent delineation, especially around the curves.

Upgrade and add additional signs, is generally considered a short-term action. When sign upgrades are dependent upon other actions, such as relocating driveways, it becomes a medium-term action.

Access Management

The objective of access management is to close, consolidate and/or relocate driveways to minimize vehicle conflicts. Many driveways on PA 100 do not meet current occupancy permit standards: there are too many driveways, driveways are improperly spaced next to each other and in many instances driveway widths are excessively wide. When driveways are located too close to an intersection it creates a hazardous situation, since drivers do not normally expect vehicles to turn into or out of driveways as they pass through an intersection. Also, traffic queues at signalized intersections often obstruct the view of vehicles turning into or out of driveways.

In addition to more traditional access management issues, at some driveways the location and width of the driveway have prevented PennDOT from installing warning signs at curves. Two prime examples of this problem are at Titus Inn in South Coventry Township and Collinson Inc. in East Nantmeal Township.

Locations where access management is applicable include:

- Titus Inn;
- Temple Road commercial strip area;
- PA 23 intersection;
- Pughtown Road intersection;

- Ludwigs Corner;
- Collision Inc.;
- Cadmus Road; and
- Font Road.

Access management is considered a short-term to medium-term action.

Maintenance Program

It is critical that PennDOT Chester County Maintenance maintain warning signs, drainage structures and pavement on PA 100 in order to maximize the benefits of the recommendations contained in this report.

Maintenance activities include:

- Periodically trim trees or cut back shrubbery to maintain adequate sign visibility and sight distance at intersections and curves. Tree trimming will also minimize debris on the roadway and expedite road drying.
- Replace damaged signs; upgrade signs to a larger size if needed.
- Maintain all pavement markings, raised pavement markers and guiderail.
- Periodically clean drainage structures, with more frequent cleaning during fall and winter months.
- Maintain clear zones by removing shrubbery, trees, utility poles and other fixed objects. If a vehicle runs off PA 100, a clear zone would give the motorist an opportunity to recover before hitting a fixed object.

According to the municipalities, giving the hilly sections of PA 100 a higher plowing or salting priority is a major concern. Blackhorse Hill is frequently closed due to snow and icy conditions. PA 100 is already a PennDOT high priority road. One solution to this issue is a mutual aid agreement between PennDOT and the municipalities enabling the municipalities to assume responsibility for plowing and salting, or permitting them to supplement PennDOT's efforts.

The maintenance program is considered an on-going action.

Crossroad Treatments at Unsignalized Intersections

The objective of this recommendation is twofold: to improve the safety of vehicles turning off PA 100 at unsignalized intersections and to improve the safety of vehicles exiting the crossroads onto PA 100. Improving intersection visibility, through warning signs and cutting back shrubbery and berms, will go a long way to achieving this goal. The net result will be less rear-end and angle crashes on PA 100.

This recommendation includes:

- Replace and install cross road warning signs and street name signs;
- Construct shoulders or right-turn lanes for turning vehicles;
- Cutback shrubbery and berms; and
- Realign and/or widen cross road approaches.

Primary locations for cross road treatment include:

- Favinger Road;
- Flowing Springs Road;
- Timber Drive;
- Horseshoe Trail;
- Blackhorse Road; and
- Font Road.

Cross road treatment at unsignalized intersections is considered a short-to medium-term action, depending upon its complexity.

LAND USE STRATEGIES

Although this is a safety study, the land use analysis identified several land use related strategies that would be beneficial in reducing crashes.

Foster Sustainable Development

The objective of this recommendation is to foster a sustainable community capable of successfully absorbing more businesses and residents, which the long-term demographics show will likely occur along PA 100. Anticipated increases in traffic and congestion can be partially offset by encouraging mixed-use development, cluster development and improving interconnectivity among land uses. Less congestion will result in fewer angle and rear-end crashes at driveways and intersections. If sufficient densities are achieved, it may be feasible to initiate limited transit service on PA 100, which would help by removing additional traffic and further reducing congestion.

There are many possible actions associated with fostering sustainable development. What they all have in common is applying good planning techniques on an on-going basis. A partial list of actions which foster sustainable development include:

- Co-locating complementary land uses reduces the need to travel on PA 100. Walking, bicycling and other alternative modes start becoming a viable alternative to driving. Encourage mixed-use development, village concept and cluster development. Permit more uses within some

subdivisions, including residential, retail, small office, cultural and religious uses, in close proximity to each other. Permit or require residential uses, especially apartments, above some commercial uses.

- Encourage or require higher residential density around specific commercial centers, tall buildings and smaller lot sizes. Increase height limit to up to four or five stories in some locations. Higher densities can reduce distances between local land uses and make connector roads more viable than using PA 100.
- Continue to follow Chester County's *Landscapes* Plan. *Landscapes* calls for clustering retail and commercial land uses along PA 100.
- Explore shuttle services on PA 100 between Pottstown and Exton. Residential densities in the near term do not warrant full bus service on this portion of PA 100. Shuttle services, with limited operations, in conjunction with community-sized park and ride lots, is a potential short-term alternative to begin developing transit service.

Pedestrian amenities, which are detailed elsewhere in the recommendations, complement fostering sustainable development by providing the pedestrian interconnection among different land uses.

Since the goal is to encourage mixed-use development and interconnected land uses, sustainable development is largely applicable to the "village" areas along PA 100:

- Temple Road commercial strip area;
- PA 23/Bucktown area;
- Pughtown Area; and
- Ludwigs Corner area.

South Coventry Township expressed interest in establishing a more village type atmosphere in Bucktown and Pughtown. Due to their close proximity to each other, the Township should examine options to enhance ties between the two communities, creating a larger mass for village development. Examples include constructing a sidewalk or bicycle path linking the two communities, converting the Hartman Drive intersection to a roundabout to help slow down traffic and placing higher density development along PA 100 between PA 23 and Pughtown Road.

Fostering sustainable development is considered an on-going action.

Incorporate Pedestrian Amenities

Municipalities should foster pedestrian connectivity between residential areas and retail areas, schools and other public uses. Pedestrian activity and pedestrian accidents in the corridor are non-existent. However, as residential

development continues to occur around villages, such as Bucktown or Ludwigs Corner, the potential for pedestrian crashes will likely increase.

Municipalities should undertake measures, as development occurs, to provide for pedestrian amenities. This includes constructing sidewalks in village areas and constructing sidewalks from subdivisions to nearby schools, parks, libraries and shopping areas. This can be accomplished by mandating sidewalks, buffer areas between the sidewalk and roadway, crosswalks, lighting and pedestrian phasing at traffic signals as part of land development projects in the PA 100 corridor. Besides removing pedestrian activity from roadways, other ancillary benefits include traffic calming in villages that have pedestrian treatments, and reducing vehicular trips. Constructing pedestrian amenities is largely the responsibility of developers in conjunction with future development projects.

Primary locations for pedestrian amenities are:

- Temple Road Commercial Strip area;
- PA 23 intersection, Bucktown, Owen J. Roberts High School area;
- Pughtown Road area; and
- Lugwigs Corner area.

Pedestrian amenities are considered a medium-term action.

Protect Natural Features

While protecting natural features will not directly address crash problems on PA 100, it will produce several substantial benefits, such as focusing development and managing storm water runoff, which indirectly will contribute to reducing crashes on PA 100.

Actions that protect natural features include the following:

- Preserve wetlands through site plan review and open space programs;
- Limit development near floodplains;
- Limit development around steep slopes; and
- Encourage preservation of farms, fields, and wooded areas by focusing on adjacent properties.

By concentrating development in areas compatible for development, the municipalities and counties will be bettered prepared to manage traffic than having to deal with areas where they cannot construct the proper infrastructure to support it.

Protect natural features is considered an on-going action.

VIII. MUNICIPALITY-SPECIFIC RECOMMENDATIONS

This chapter recommends specific actions to mitigate PA 100 crash problems. They include a combination of longer-term, more complex projects, such as realigning sections of PA 100, in addition to detailed application of corridor-wide safety measures to specific problems. For simplicity, the recommendations, are grouped by municipality, and are listed from north to south.

NORTH COVENTRY TOWNSHIP

Hanover Street/Temple Road/Commercial Strip (see Map 21)

This segment of PA 100 has a number of distinct problems that, because of their close proximity and overlap, must be treated in an integrated manner. Commercial development, access control and traffic backups are the predominate issues. It is also a transitional area from controlled access highway to the north to uncontrolled access south of Temple Road.

On the west side of PA 100, there are a number of vacant properties waiting for redevelopment. Wawa is coming to the former motel site at Temple Road, and the Coventry Diner is for sale. The Lincoln Drive area, originally proposed as a residential development, is likely to be developed as a commercial development. On the east side, there are a series of driveways from the Ye Old Coventry Pub to the Building Supply property. PennDOT's Crash Database shows a correlation between the driveways and northbound angle and rear-end crashes. Ideally, driveways should be consolidated and properties interconnected but tight parking lot layouts, rear lot establishments and a potential traffic signal for the Lincoln Drive development do not yield any easy solutions. The area is zoned Commercial Village Development and North Coventry would like to establish a more village-like atmosphere. They also have an easement ordinance that gives them authority to close driveways. However, given the complexity of land use and access issues, there is no consensus among township official on how to achieve their goals.

Overlaid on top of land use issues is traffic congestion due to the Temple Road traffic signal. In the afternoon, traffic backups extend past the commercial strip area, resulting in numerous rear-end crashes. A combination of lengthy traffic queues, high speeds, a hill obstructing the view of northbound motorists, and vehicles turning into and out of commercial establishments create a hazardous situation. Eighty percent of the northbound crashes in the commercial strip area occur from 3-6 PM when the backup peaks.

The second northbound lane from Temple Road to Hanover Street should have reduced, if not eliminated, the backups. However, motorists are discouraged

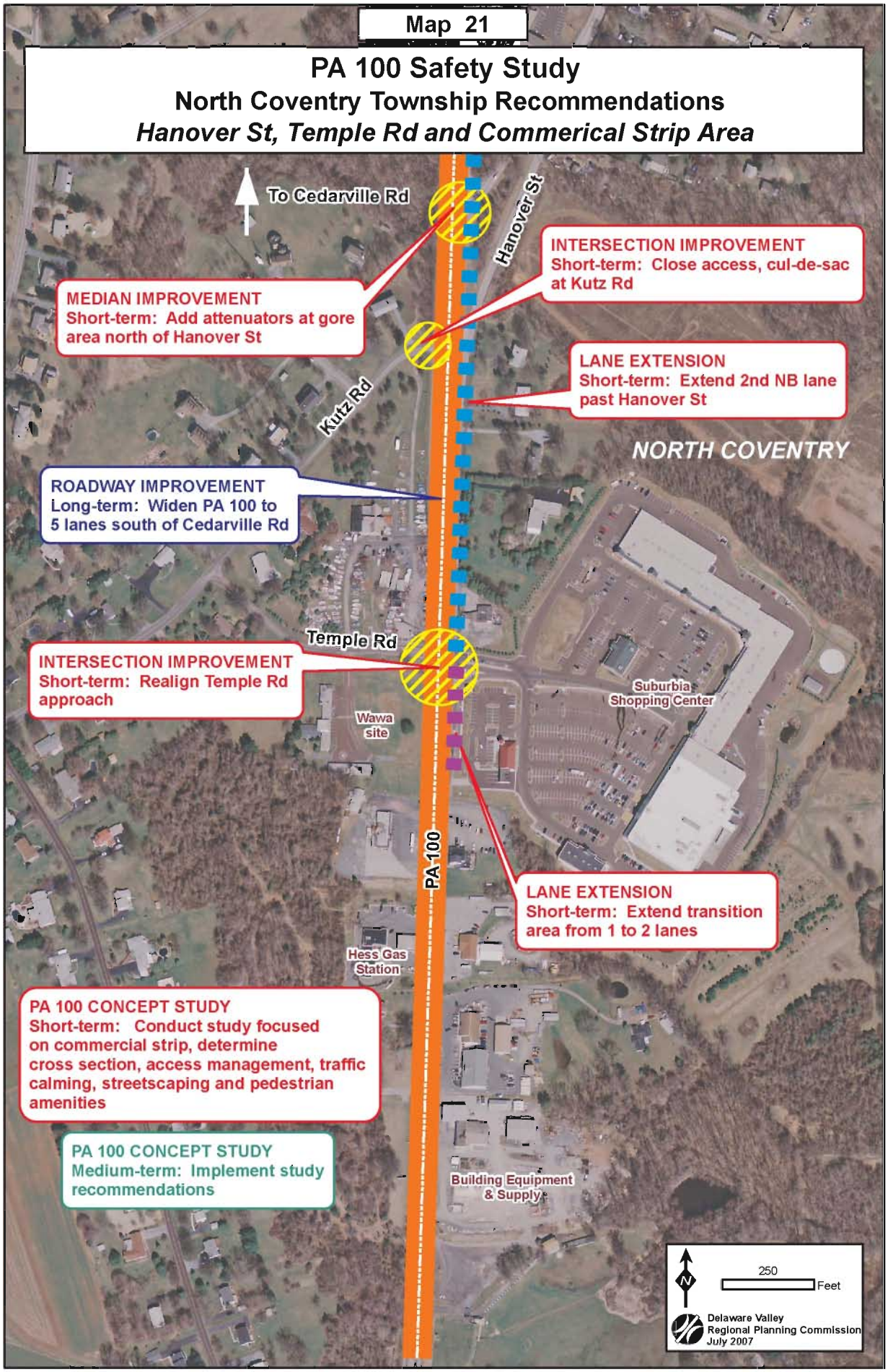
from using it because of the short merge distance before the lane exits at Hanover Street. Mid-day visual observations indicated a disproportionate number of motorists remained in the left lane; the right lane was underutilized. A longer merge area will increase its usage and reduce backups. In addition, insufficient storage capacity at the signal, only 200-250 ft. in length, makes it difficult for motorists stuck in the northbound backup to reach the second lane. An auxiliary issue is the overhead sign, just north of Temple Road, which indicates the right lane must exit at South Hanover Street. The sign is substandard and should be replaced with a properly sized sign.

On most mornings, southbound backups occur at Temple Road. While the Crash Database did not reveal any problems, North Coventry police did report aggressive driving behavior with motorists using the South Hanover Street merge lane as a queue bypass. North Coventry ultimately wants the controlled access highway section to have four lanes from Cedarville Road to the Temple Road/Commercial Strip area. The issue of how to transition PA 100 from a four-lane highway to a two-lane arterial was raised at the North Coventry municipal outreach meeting.

Other problems in the area include Temple Road misaligned with the entrance to the Suburbia Shopping Center; sight distance restrictions at Kutz Road; and the South Hanover Street intersection. Kurtz Road's alignment, coupled with guiderail and shrubbery, effectively obstructs the road from approaching southbound motorists, creating a potentially hazardous situation. South Hanover Street forms an unsignalized Y intersection with PA 100. There is a unique left lane merge from South Hanover Street to southbound PA 100. Despite its awkward geometry, only six reportable crashes occurred, three of which were angle accidents. According to North Coventry police, a more serious problem exists just north of the intersection where an island divides PA 100. There have been a series of minor, non-reportable crashes, where motorists have mounted the island.

Short-term actions:

- Conduct PA 100 Concept Study – Because of the complexity of the land use and access management issues, North Coventry Township would like to conduct a more in-depth study to develop a conceptual plan for the area. This study would develop a detailed parcel-by-parcel access management plan, identify streetscape concepts to help calm traffic and propose pedestrian amenities to create a village atmosphere. Gaining buy-in from property owners and developers is critical. The Township's long-term vision calls for widening PA 100 to accommodate additional traffic related to commercial development and to ease the transition from a controlled access highway to an arterial. The proposed concept study will help the Township determine the appropriate cross section of PA 100 and how to transition the change in lane configuration.


Map 21
PA 100 Safety Study
North Coventry Township Recommendations
Hanover St, Temple Rd and Commerical Strip Area
To Cedarville Rd
Hanover St
INTERSECTION IMPROVEMENT
Short-term: Close access, cul-de-sac at Kutz Rd
MEDIAN IMPROVEMENT
Short-term: Add attenuators at gore area north of Hanover St
LANE EXTENSION
Short-term: Extend 2nd NB lane past Hanover St
Kutz Rd
NORTH COVENTRY
ROADWAY IMPROVEMENT
Long-term: Widen PA 100 to 5 lanes south of Cedarville Rd
Temple Rd
INTERSECTION IMPROVEMENT
Short-term: Realign Temple Rd approach
Suburbia Shopping Center
Wawa site
PA 100
LANE EXTENSION
Short-term: Extend transition area from 1 to 2 lanes
Hess Gas Station
PA 100 CONCEPT STUDY
Short-term: Conduct study focused on commercial strip, determine cross section, access management, traffic calming, streetscaping and pedestrian amenities
PA 100 CONCEPT STUDY
Medium-term: Implement study recommendations
Building Equipment & Supply
N
250
Feet
Delaware Valley Regional Planning Commission
July 2007

- Extend second northbound through lane – To reduce traffic back-ups at Temple Road, extend the second northbound through lane by increasing the storage capacity south of Temple Road and extending the merge lane past South Hanover Street. Ye Old Coventry Pub and other building structures will force the widening for the transition from one to two lanes to take place on the west side of PA 100. How much additional capacity can be added requires a more detailed engineering analysis. At South Hanover Street, grade differences and the Neiman Road underpass prevents a continuous widening of PA 100 to Cedarville Road. As an interim measure, construction of the second lane to the rear of the church property will provide an additional 1,000 ft. for merging.
- Add attenuators at gore area north of Hanover Street – The divisional island just north of Hanover Street has experienced repeated non-reportable crashes. The delineators are constantly being knocked down. Attenuators, which have a greater visible profile, will be more effective in channeling traffic around the island.
- Realign Temple Road approach – The Wawa project will realign Temple Road as a Highway Occupancy Permit project. This intersection is misaligned with the entrance to Suburbia Shopping Center.
- Cul-de-sac Kutz Road – Kurtz Road is a low-volume residential street, with only 10 homes along it between PA 100 and Temple Road. Traffic exiting is limited to only right turns onto PA 100. Due to shrubbery and guiderail, the Kurtz Road intersection is partially obstructed to oncoming southbound traffic. North Coventry Township is concerned about Wawa-bound traffic using Kurtz Road to avoid the Temple Road traffic signal. Cul-de-sac Kurtz Road at PA 100 to alleviate concerns about its visibility and Wawa.

Medium-term improvements to the Temple Road/commercial strip area will focus on implementing the Concept Study recommendations. This will necessitate extensive coordination between the Township, developers, PennDOT and Chester County to fund the road widening, new traffic signals, streetscape improvements and to ensure future driveways comply with the concept plan. Long-term improvements entail the widening of PA 100 to four lanes from Cedarville Road to Hanover Street, including the widening of the Neiman Road underpass.

Hoffecker Road Intersection

Hoffecker Road is an unsignalized low-volume road that is located south of the commercial strip area. Safety concerns relate more to its geometry than to the crash history of the intersection. Given its location at the crest of a hill, vehicles have difficulty exiting Hoffecker Road due to limited sight distance, heavy traffic volume and high speeds on PA 100. Over the five-year period, there were 10 reportable crashes; all were angle crashes, attributable to improper turning, proceeding without clearance after a stop or making improper entrance to the

highway. It is surrounded by prime developable land, which when developed, could potentially generate substantially more traffic on Hoffecker Road, necessitating a higher level of traffic control at the intersection.

The PA 100 Concept Study should evaluate long-term Hoffecker Road intersection improvement options: a traffic signal, roundabout, or grade separation. Since it can take years to build up sufficient traffic demand on Hoffecker Road to justify the long-term solution, it may be necessary to construct a traffic signal or roundabout as an interim measure. North Coventry Township should consider prohibiting access to PA 100, requiring all future development to have driveways exclusively on Hoffecker Road. PA 100's vertical alignment sharply limits the ability of vehicles to safely exit; even a right turn-in and right turn-out driveway can be dangerous due to the difference in speed with through traffic. Mandating all traffic to Hoffecker Road will have the secondary benefit of achieving the volume to justify a traffic signal or other improvements.

Township police on numerous occasions have observed through traffic using the center turn lane south of Hoffecker Road to bypass slower moving vehicles. They requested cross hatching and rumble strips to discourage through traffic from using it. This recommendation is consistent with actions undertaken in other sections of PA 100.

SOUTH COVENTRY TOWNSHIP

Favinger Road Intersection

Favinger Road is a skewed intersection, located on a curve, on the west side of PA 100. Crash records indicate removal of the center passing lane by PennDOT has eliminated crashes at the intersection and its immediate vicinity. Therefore, the recommendations focus on increasing intersection visibility and realigning Favinger Road to form a perpendicular intersection.

In the short-term, combination horizontal alignment/intersection signs (W1-10 sign) should be installed to indicate the presence of an intersection on a curve. An advance street name plaque (W16-8 sign) for Favinger Road can be incorporated into the sign assembly. In the medium-term, realign Favinger Road to form a more perpendicular intersection with PA 100. This action will improve turning movements between Favinger Road and PA 100 north.

Cadmus Road Intersection

A Highway Occupancy Permit project, funded by the Owen J. Roberts School District, is planned for the Cadmus Road intersection. As part of the project, an exclusive southbound left-turn phase will be added to the traffic signal, and Cadmus Road will be widened with provisions for left and right-turn lanes.

Pop's Garage, located at the southeast corner of the intersection, has numerous access points on both Cadmus Road and PA 100, including two driveways immediately adjacent to the intersection. When the property is redeveloped, the Township should require the developer to consolidate driveways in conformance with current PennDOT standards.

PA 23 Intersection (see Map 22)

Crashes at PA 23 are the indirect consequence of traffic congestion at the intersection. Angle crashes constitute over half the accidents, with red light running and improper turns the primary contributory factors. Approximately half the crashes occurred during the afternoon peak period, between 3-6 PM. Traffic backups make drivers overly aggressive, resulting in poor decision-making. Therefore, the primary focus is on measures to reduce congestion and eliminate unnecessary turn movements. A secondary focus is helping South Coventry Township establish a more village-like ambiance at Bucktown and Pughtown. This entails diverting traffic around the two villages, reducing driveways and providing pedestrian amenities.

As a short-term interim measure, constructing a northbound left-turn lane will help reduce northbound traffic backups in the afternoon. South Coventry Township and PennDOT have been in discussion about constructing the northbound left-turn lane as a Highway Occupancy Permit project. South Coventry lacks money for the project and is looking for alternative funding sources.

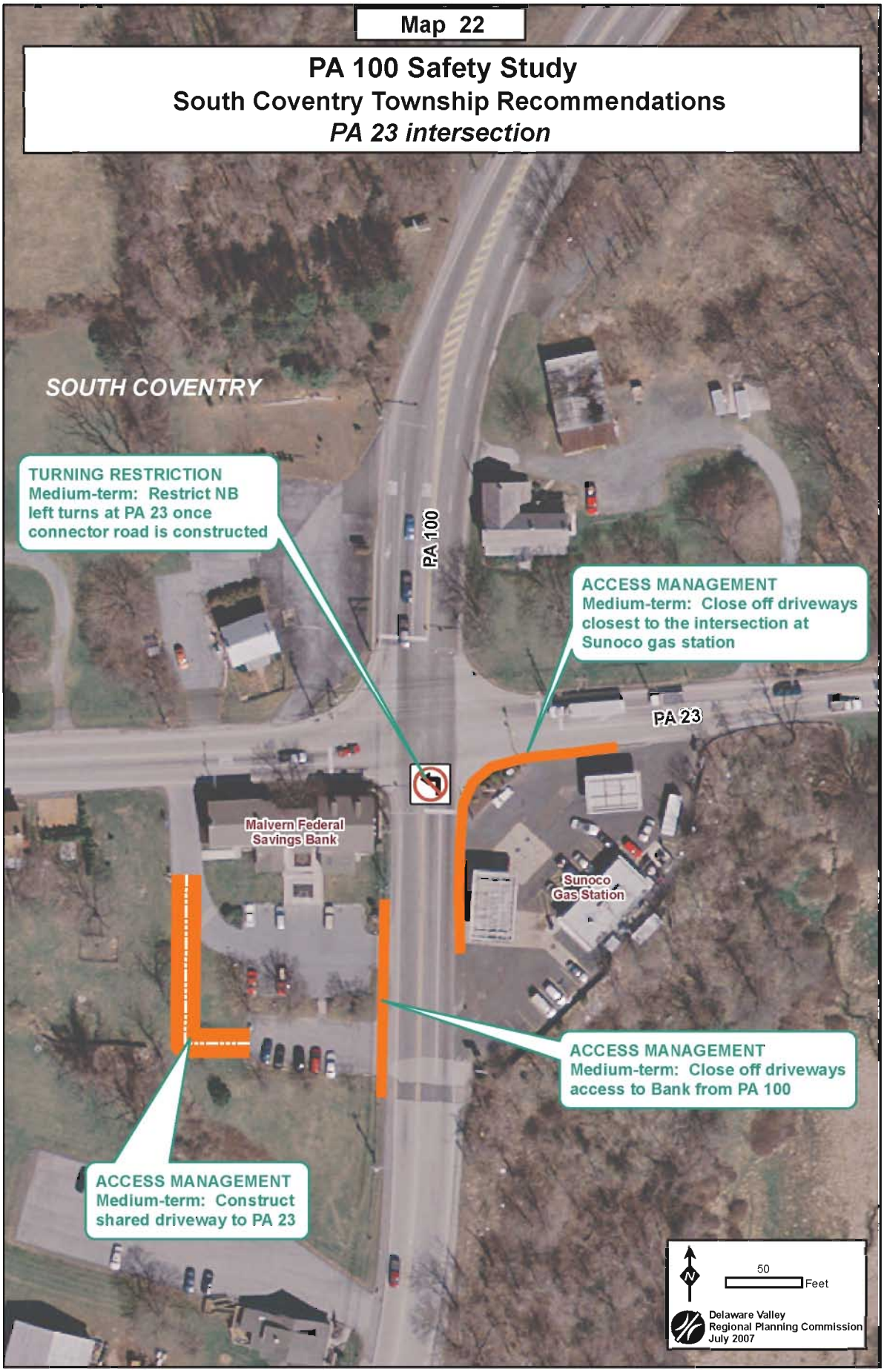
A proposed development along the west side of PA 100, from PA 23 to south of Hartman Road, provides the Township the opportunity to construct a connector road that will divert traffic from PA 100 south to PA 23 east, around Bucktown. When completed, northbound left turns at PA 23 can be prohibited. This in turn would allow PennDOT to retime the PA 100/PA 23 traffic signal, giving more green time to the other approaches, reducing overall congestion. The developer, Heritage Building Group, has received Final Plan approval from the Township. Heritage has been tied-up in litigation for several years, and it is unclear when construction may begin or if they would even consider modifying their plan. South Coventry Township supports preserving right-of-way through the site but does not have much leverage to require the connector.

Access management can reduce angle and improper turning crashes. At a minimum, the following measures should be taken:

- Sunoco Gas Station (southeast quadrant) – Close driveways on PA 100 and PA 23 closest to the intersection. The remaining driveways should comply with current PennDOT highway occupancy standards.

Map 22

PA 100 Safety Study
South Coventry Township Recommendations
PA 23 intersection



- Malvern Federal Savings Bank (southwest quadrant) – Close driveways to the bank and its parking lot; construct a new consolidated driveway with access only to PA 23. The new driveway should be located further away from the intersection than the existing PA 23 driveway (the bank owns the adjoining parcel on PA 23). Consider closing the driveway to the beauty shop (just south of the bank on PA 100) and provide access to it via the consolidated driveway.

South Coventry has expressed interest in transforming Bucktown into a village. Consolidating or eliminating driveways, as discussed, is a first step towards this goal. Incorporation of pedestrian amenities (sidewalks and streetscape) and constructing bicycle paths to link with adjoining residential areas or even the municipal park on PA 100, will help foster a village-type setting. Ultimately, fostering mixed land uses, higher densities around Bucktown, and interconnected driveways (all sustainable development techniques) will achieve the intended goal.

Between PA 23 and Pughtown Road (see Map 23)

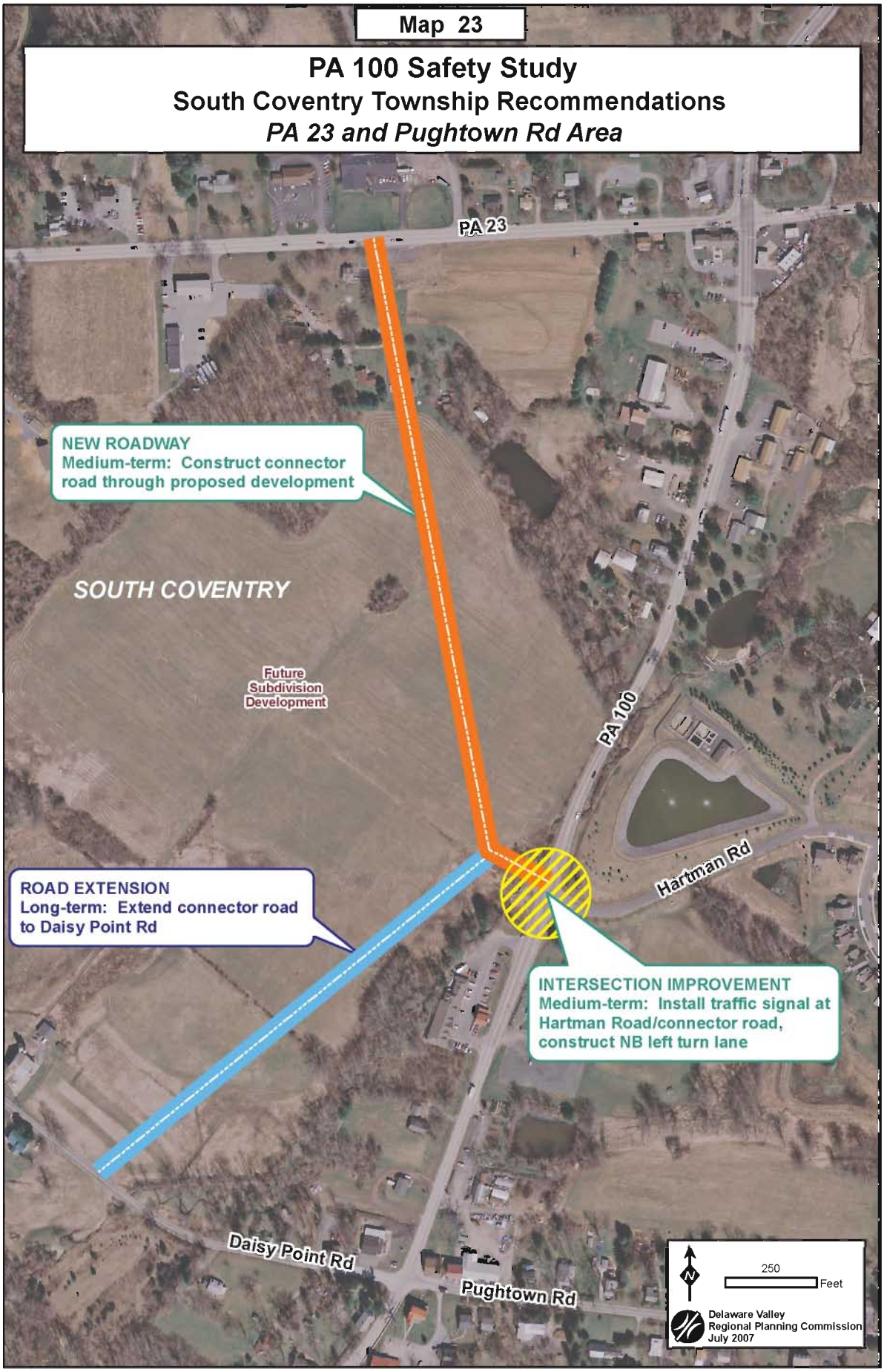
Improvements to this section of PA 100 will help support critical improvements recommended for Bucktown and Pughtown. The objective is to eliminate select turning movements at PA 23 and Pughtown Road by constructing connector roads to the west of PA 100.

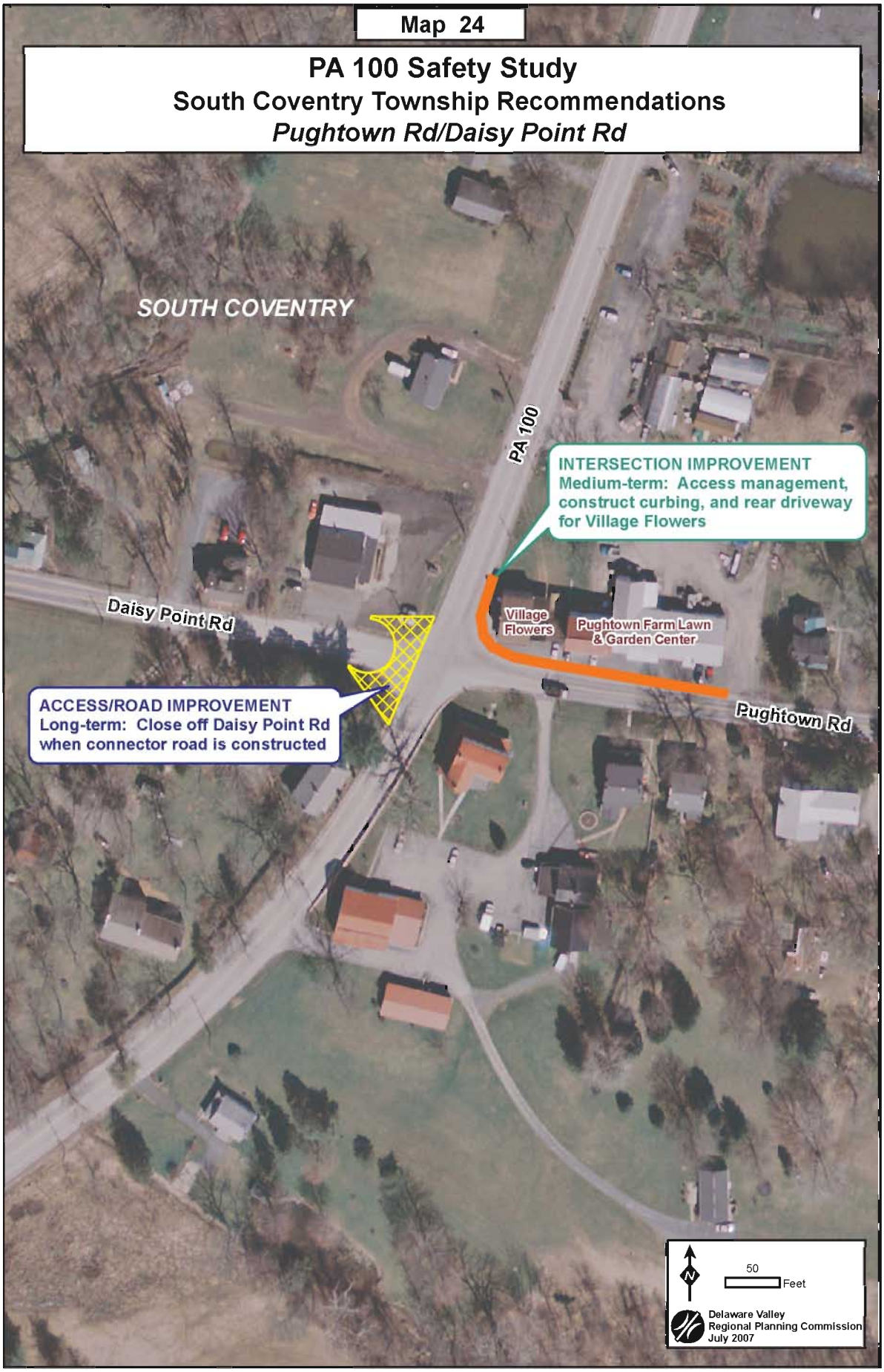
The first connector will run from PA 23 through the Heritage Building Group development and connect to PA 100 at Hartman Road. While the Township is supportive, it is unclear whether the developer will incorporate the connector into its design. Construction of the development will require improvements at Hartman Road, regardless whether the connector is constructed. In lieu of constructing a traffic signal and northbound left-turn lane, the Township should consider a roundabout. Besides providing access to the development/connector and Hartman Road, it would have the added benefit of slowing traffic as it approaches Pughtown to the south and Bucktown to the north. If properly designed, it can help reinforce the village-type atmosphere of the area.

The second connector, a long-term improvement, would link Daisy Point Road to the PA 23 to PA 100 connector. Its objective is to divert traffic away from the Daisy Point Road intersection. Left turns from Daisy Point Road are prohibited. The connector would provide for this movement. Depending upon its alignment, it could potentially function as a rear access roadway for businesses fronting PA 100.

Pughtown Road/Daisy Point Road Intersection (see Map 24)

This intersection is characterized by physical deficiencies rather than an actual crash problem. Over a five-year period, there were only 11 reportable crashes, a


Map 23
PA 100 Safety Study
South Coventry Township Recommendations
PA 23 and Pughtown Rd Area
PA 23
NEW ROADWAY
Medium-term: Construct connector road through proposed development
SOUTH COVENTRY
Future Subdivision Development
PA 100
Hartman Rd
ROAD EXTENSION
Long-term: Extend connector road to Daisy Point Rd
INTERSECTION IMPROVEMENT
Medium-term: Install traffic signal at Hartman Road/connector road, construct NB left turn lane
Daisy Point Rd
Pughtown Rd
N
250
Feet
Delaware Valley Regional Planning Commission
July 2007


Map 24
PA 100 Safety Study
South Coventry Township Recommendations
Pughtown Rd/Daisy Point Rd
SOUTH COVENTRY
PA 100
INTERSECTION IMPROVEMENT
Medium-term: Access management, construct curbing, and rear driveway for Village Flowers
Daisy Point Rd
Village Flowers
Pughtown Farm Lawn & Garden Center
Pughtown Rd
ACCESS/ROAD IMPROVEMENT
Long-term: Close off Daisy Point Rd when connector road is constructed
N
50
Feet
Delaware Valley Regional Planning Commission
July 2007

combination of angle, rear-end, and hit-fixed object crashes. Access management, lack of sufficient sight distance and the tightness of the intersection are the predominant issues.

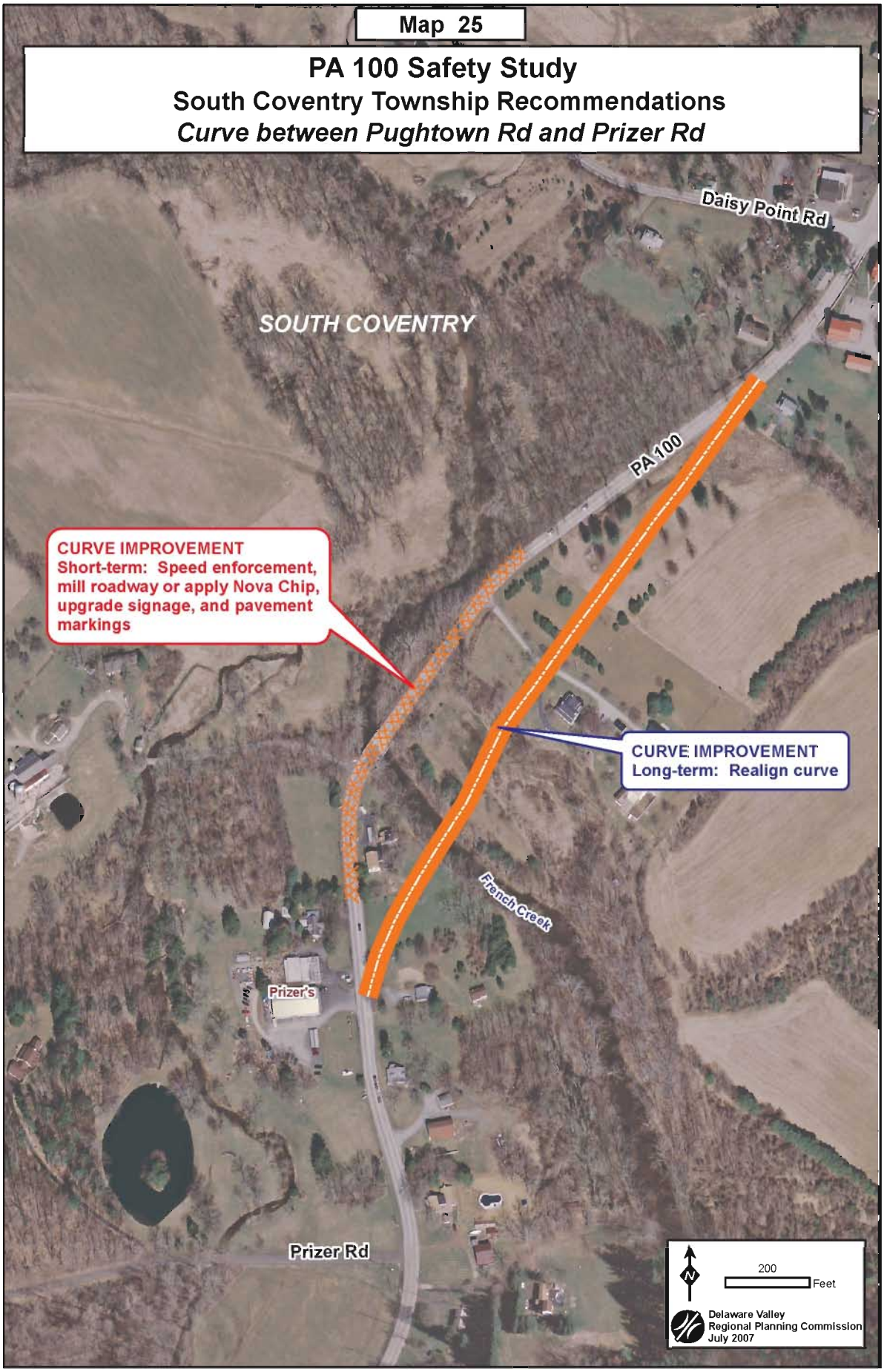
There is uncontrolled access on the westbound approach of Pughtown Road. Village Flowers and Pughtown Farm Lawn Garden Center are set a few feet back from Pughtown Road, allowing cars to perpendicular park in front of them. Vehicles pulling out of these spaces conflict with PA 100 traffic turning onto Pughtown Road. Due to the setback, the stop sign on Pughtown Road is isolated in the middle of the parking area. To address this situation, curbing should be placed along Pughtown Road for the first 150 ft. from the PA 100 curb line (approximately 75 ft. into Pughtown Farm Lawn Garden Center). There is adequate parking in its rear for customers. A driveway from the garden center's rear lot to Village Flowers would compensate for closure of the flower shop's driveway. According to South Coventry Township, Village Flowers proposed a similar concept several years ago. With curbing, the stop sign can be properly located.

Embankment walls located at the southeast and southwest corners of the intersection restrict sight distance on Pughtown and Daisy Point roads. Due to sight distance limitations, left turns from Daisy Point Road are prohibited; however, there is a directional sign for northbound PA 100. Constructing a connector to the proposed PA 23 to PA 100 connector and cul-de-sac Daisy Point Road will eliminate half the turns at the intersection, including the Daisy Road left turn and cross traffic from Pughtown Road. This is a long-term recommendation because it is contingent upon construction of the PA 23 to PA 100 connector.

South Coventry officials would like to enhance the village character of Pughtown. Placing curbing on Pughtown Road and constructing a roundabout at Hartman Road are initial steps towards this objective. Encouraging mix-use development, with commercial development on PA 100 and higher-density residential development behind it will create a critical mass to form a village. Sidewalks, especially a path to the municipal park on PA 100, will contribute to a village-like ambiance.

Curve between Pughtown Road and Prizer Road (see Map 25)

This section of PA 100 is characterized by a compound horizontal and vertical curve over French Creek. Even though PennDOT recently reconstructed the French Creek Bridge, there still is a considerable dip in grade on PA 100 at the creek. Chevron signs are deployed to delineate the horizontal curve. According to PennDOT's Crash Database, there were 18 hit-fixed object crashes, with speed and wet road surface as the primary contributing factors. Eleven were hill related (evenly split going between going up hill and down hill) and 13 were due to failure to negotiate a curve (again, evenly split between a left and right curve).


Map 25
PA 100 Safety Study
South Coventry Township Recommendations
Curve between Pughtown Rd and Prizer Rd
Daisy Point Rd
SOUTH COVENTRY
PA 100
CURVE IMPROVEMENT
Short-term: Speed enforcement, mill roadway or apply Nova Chip, upgrade signage, and pavement markings
CURVE IMPROVEMENT
Long-term: Realign curve
French Creek
Prizer's
Prizer Rd
N
200
Feet
Delaware Valley
Regional Planning Commission
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Short-term actions to reduce crashes include:

- Nova Chip treatment – The number of wet surface crashes support the need for Nova Chip treatment;
- Speed enforcement – From Prizer Road to Pughtown, PA 100 is a fairly open road giving motorists a false security as they approach the curve. Speed enforcement to lower speeds is critical;
- Pull-outs – While not explicitly recommended, pull-outs may be required to support speed enforcement activities. If pull-outs are needed, it would be up to the Pennsylvania State Police and PennDOT to identify potential locations where right-of-way is available and where vehicles can safely pull in and out; and
- Upgrade warning signs – Additional chevron signs (W1-8) are needed to better define the curve; larger signs should also be considered. Existing signs do not fully delineate the curve limits.

Unlike other sections of PA 100, overhead foliage is not an issue at French Creek.

Short-term actions do not address the underlying problem, the combination horizontal/vertical curve over French Creek. Realignment is ultimately needed to straighten the road and bridge the creek without a severe dip. Undeveloped land is available east of PA 100 to eliminate the horizontal curve. However, the topography of French Creek will necessitate a substantial bridge, embankment walls or some combination in order to bridge the valley with only a minimal dip of the roadway. South Coventry officials considered a similar realignment several years ago; however, the idea was dropped due to objections from one of the nearby land owners. Based on the number and severity of crashes and the potential to use the old alignment as recreational access to French Creek, they are supportive of the realignment concept.

Curves between Prizer Road and Titus Inn

Beaver Run to the west and a rock face to the east abuts this section of PA 100. Due to the tight lateral restrictions, there is minimal horizontal clearance between the roadway, guiderail lining Beaver Run, and the rock face. Even with its tight cross section, there were only nine hit-fixed object crashes. Seven of the crashes had speeding or traveling too fast for conditions as a contributory factor; wet surface conditions contributed to five of the crashes. A disproportionate number of crashes occurred overnight or early morning. The tree canopy covering the roadway makes it especially dark during the day and at night.

Short-term recommendations include speed enforcement, tree management, and upgrading warning signs. Fully reflectorizing all guiderail will improve roadway delineation, especially during nighttime conditions. While other sections of PA 100 have more substantial wet surface crash problems, applying Nova Chip to

this section, as part of a larger Nova Chip program, will prove beneficial. Widening the roadway to increase shoulder width is a long-term recommendation. However, given the number of crashes as compared to other locations, and the cost involved, it is not a high-priority recommendation.

At the southern end of this section is Flowing Springs Road and Titus Inn. Flowing Spring Road intersection is located on a curve, immediately to its south is a culvert for Flowing Springs to pass under PA 100. Guiderail extends from the culvert to the intersection; consequently, there is no shoulder for right turning vehicles. The center passing lane has been removed, replaced with cross-hatching; as a consequence, there are no provisions for left turning vehicles. The actual intersection is largely invisible to motorists due to the curve and adjacent guiderail. To increase the intersection's visibility, a combination horizontal alignment/intersection sign (W1-10 sign) with a supplemental advance street name plaque (W16-8 sign) should be installed. Erection of a street name sign at the intersection would reinforce the definition of the intersection. In the medium-term, a right-turn lane and a left-turn lane are needed to separate turning vehicles from speeding through traffic going around the curve.

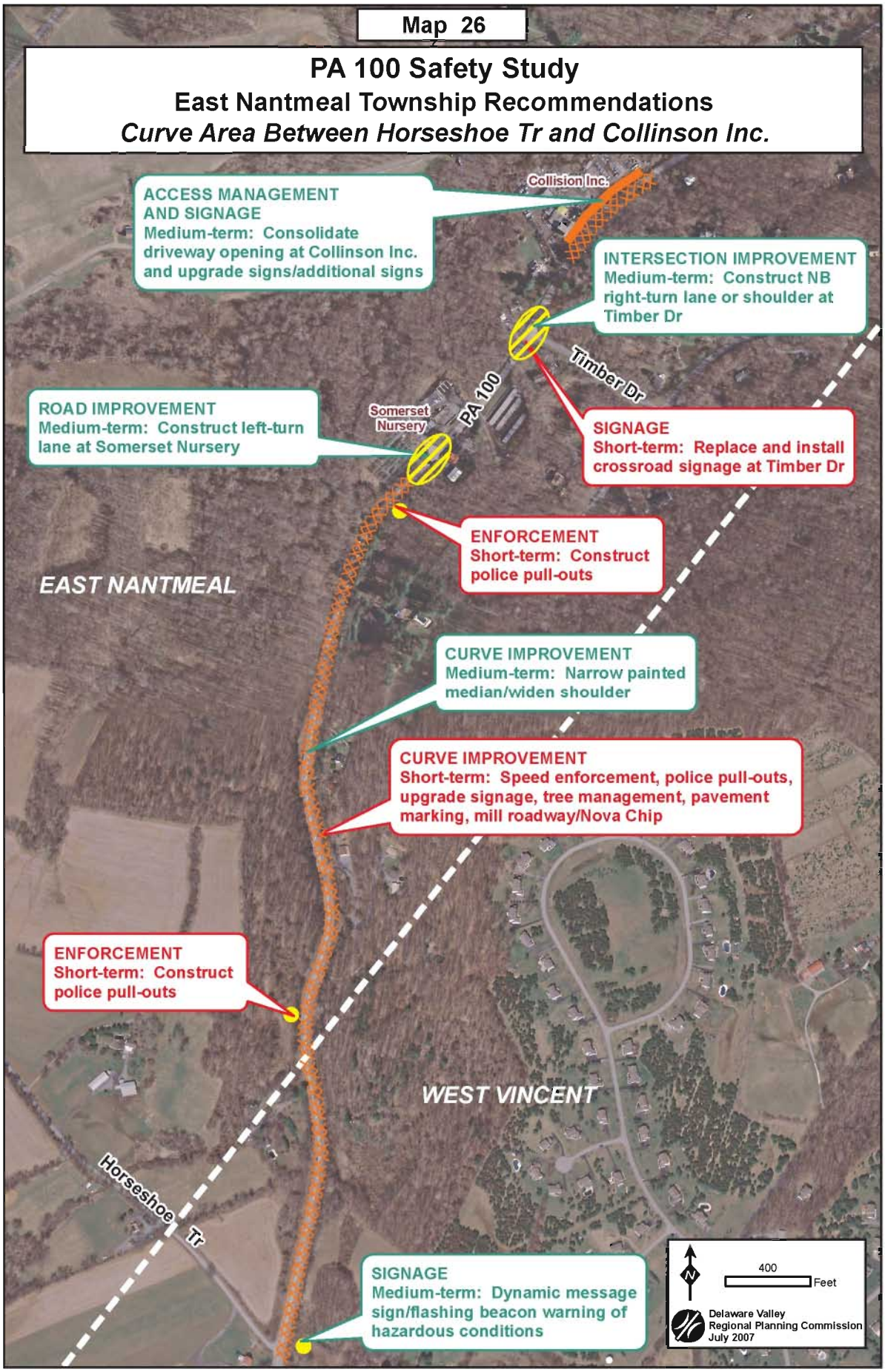
Titus Inn, just south of Flowing Springs Road, is also situated on a curve. The location of its driveways disrupts the layout of chevrons along the curve. The problem is exacerbated by excessively wide driveways, leaving large gaps where chevrons should be posted. Access management, relocating driveways and bringing them in compliance with current highway occupancy standards, would give PennDOT an opportunity to fill in the missing chevron gaps.

EAST NANTMEAL TOWNSHIP

Curves between Horseshoe Trail and Fairview Road (see Map 26)

There have been 47 reportable hit-fixed object crashes in this section of PA 100 since the year 2000. The vast majority of the crashes, 34 accidents, took place on a series of reversible curves between the southern limits of the township and Somerset Nursery. Three fatal crashes occurred in this area, including one that happened in October 2006 (not accounted for in PennDOT's Crash Database.) Twenty crashes took place in wet weather, 29 on wet surface conditions, and 27 in the northbound direction. Negotiating left curves was a factor in 15 crashes; negotiating right curves was a factor in four crashes. Twenty of the crashes occurred during nighttime conditions. According to the crash reports, speeding or driving at excessive speeds for conditions was a primary factor in many of the crashes.

Other problems either raised by Township officials or identified by DVRPC include the need for a left-turn lane at Somerset Nursery and left and right-turn lanes at Timber Drive. The combination of high speeds and the curves leave


Map 26
PA 100 Safety Study
East Nantmeal Township Recommendations
Curve Area Between Horseshoe Tr and Collinson Inc.
ACCESS MANAGEMENT AND SIGNAGE
Medium-term: Consolidate driveway opening at Collinson Inc. and upgrade signs/additional signs
Collision Inc.
INTERSECTION IMPROVEMENT
Medium-term: Construct NB right-turn lane or shoulder at Timber Dr
Timber Dr
PA 100
ROAD IMPROVEMENT
Medium-term: Construct left-turn lane at Somerset Nursery
Somerset Nursery
SIGNAGE
Short-term: Replace and install crossroad signage at Timber Dr
ENFORCEMENT
Short-term: Construct police pull-outs
EAST NANTMEAL
CURVE IMPROVEMENT
Medium-term: Narrow painted median/widen shoulder
CURVE IMPROVEMENT
Short-term: Speed enforcement, police pull-outs, upgrade signage, tree management, pavement marking, mill roadway/Nova Chip
ENFORCEMENT
Short-term: Construct police pull-outs
WEST VINCENT
Horseshoe Tr
SIGNAGE
Medium-term: Dynamic message sign/flashing beacon warning of hazardous conditions
N
400
Feet
Delaware Valley Regional Planning Commission
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drivers unprepared when they unexpectedly encounter turning vehicles at these locations. Even though PennDOT has installed chevrons at the Collinson Inc. curve, it is still poorly delineated because of gaps in the chevrons due to driveways. In addition, trucks have been observed parking on the shoulder, obstructing the chevrons from on-coming traffic. Between Timber Drive and Collinson Inc., there have been 13 hit-fixed object crashes.

In the short-term, the following actions are required:

- Speed enforcement – It is critical to lower vehicular speeds through a speed enforcement blitz program. Pennsylvania State Police are responsible for patrolling PA 100 in East Nantmeal Township. The police would like PA 100 to be designated as a Highway Safety Corridor so that they can dedicate additional resources to it.
- Construct pull-outs for police enforcement – Pennsylvania State Police stated they need pull-outs to safely enforce the speed limit. There is a widened area in the southbound direction, close to West Vincent Township, which can potentially function as a pull-out. In the northbound direction, pull-outs will have to be constructed. A stream running parallel to PA 100 may make constructing pull-outs difficult due to lack of sufficient right-of-way.
- Apply Nova Chip treatment – Even though PennDOT skid resistance tests results are consistently negative, anecdotal stories and the high number of wet weather and wet surface crashes indicate a wet surface problem. In some areas, according to local officials, water sheets across PA 100 because of poor drainage and its super elevation. Nova Chip treatment will address wet road surface problems, including hydroplaning due to sheeting water. PennDOT, in response to local safety concerns, has striped out the center passing lane and installed raised pavement markers. As part of the Nova Chip treatment, the shoulders can be widened by narrowing the stripped center lane. Increasing the shoulder width will create a larger buffer between travel lanes and roadside obstructions.
- Tree management – Trees, whether it is wet leaves on the roadway, debris from the overhead canopy clogging drainage or obstructing sight distance at curves, are a contributory cause of the crashes. West Vincent Township reported a drop in the number of crashes in this area after PECO trimmed trees several years ago. A more comprehensive and sustained tree management program is required.
- Dynamic message sign – Due to the high number of crashes and their severity, supplemental warning signage, in addition to traditional curve signs, is needed. A dynamic message sign can warn motorists about unsafe conditions (wet road, accident ahead), urge motorists to slow down, or be used in conjunction with radar devices to display vehicle speeds as a technique to slow traffic. Operationally, the sign can either be controlled by one of the municipalities or it can be operated by PennDOT's

Traffic Control Center based on real-time information from East Nantmeal Township or a local emergency responder.

- Upgrade signs/additional signs – Curve warning signs are located prior to the reverse curves. Within the curve area, other than raised pavement markers, there is a lack of warning devices to delineate the curves. Due to the high incidence of nighttime crashes, additional chevrons (W1-8 signs) and reflectors on guiderail should be employed.
- Cross road signs at Timber Drive – Advance crossroad signs (W2-2 signs) are needed to increase the visibility of this intersection to PA 100 motorists. A supplemental street name plaque (W16-8 sign) should be added to the cross road sign assembly.

The following medium-term improvements are also required:

- Construct left-turn lane at Somerset Nursery – This will safely remove turning vehicles from the traffic stream;
- Timber Drive – Construct shoulder or right-turn lane; and
- Access management at Collinson Inc. – Relocating and narrowing driveways is needed in order to properly place chevrons at the Collinson curve.

Fairview Road is a skewed intersection that should be realigned; however, East Nantmeal Township wants to minimize traffic on it. Therefore, no improvements to Fairview Road are recommended.

WEST VINCENT TOWNSHIP

Horseshoe Trail Intersection

While there have been a number of reportable crashes associated with the intersection, the primary issues relate to its physical layout. It is a disjointed intersection. An embankment in the northwest corner obstructs the sight distance of eastbound motorists; the westbound approach is very narrow and has a tight turning radius making it difficult for northbound PA 100 traffic to make a right turn, and shrubbery in the southwest and northeast corners interferes with sight distance. Because the intersections are off-set by only 100 ft., there are no left-turn lanes on PA 100. It is difficult for motorists to locate the intersection, guiderail and shrubbery create a tunnel effect, and the street name sign is virtually invisible.

Short-term recommendations focus on addressing visibility at the intersection. It includes clearing shrubbery, leveling the berm in the northwest corner, and installing advance crossroad signs (W2-1 sign). Realigning the intersection by relocating the westbound approach to the north, widening Horseshoe Trail's approaches and constructing a center turn lane are medium-term improvements.

West Vincent Township owns the land immediately contiguous to the intersection on the east side of PA 100. It plans to establish an open space and a spray field.

During periodic field views, clogged drains were observed at the intersection. This can be a contributory factor for some of the wet surface crashes reported. On-going drain cleaning and removal of shrubbery, can address this problem.

Ludwigs Corner (see Map 27)

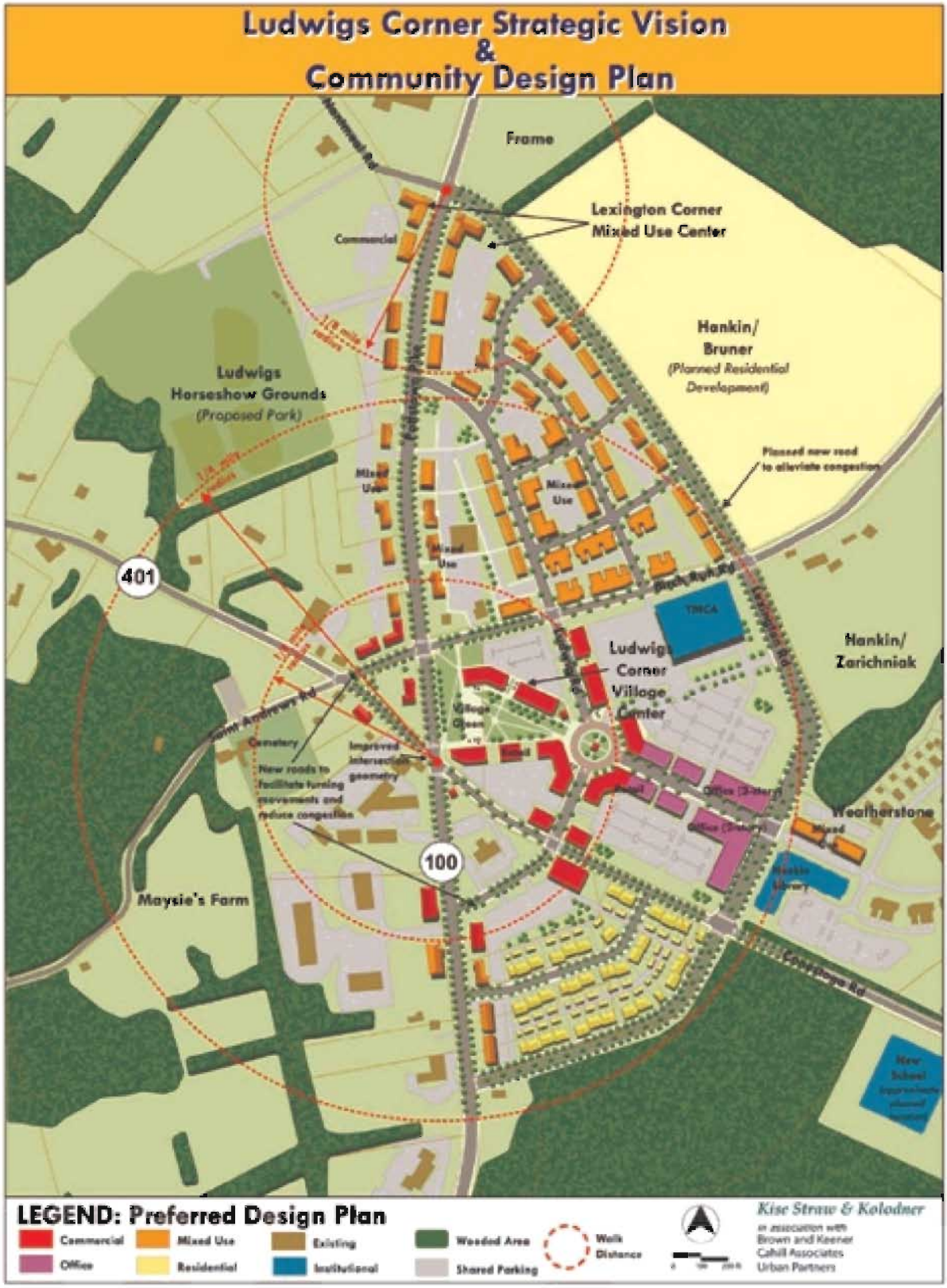
Ludwigs Corner Strategic Vision and Community Design Plan, funded through a $60,000 Chester County grant, has two primary purposes. First, from a land use perspective, it is intended to create a compact, walkable, mixed-used village center as a way to accommodate new medium-to-high density housing, retail, office and civic uses, such as a library and a village green. From a traffic perspective, the Plan calls for a new roadway parallel to PA 100 to reduce congestion on PA 100, and to improve connectivity to the new development. Land use and transportation elements of the Plan are shown on Map 28. This section will list critical elements of the Plan that need to advance to reduce crashes on PA 100. It will also recommend additional actions that can help support the Plan.

Short-term actions:

- Complete Loop Road from Birch Run Road to PA 100 – The Loop Road segment from PA 401 to Birch Run Road is constructed; the Township intends to have developers pay for the extension from Birch Run Road to PA 100. Based upon the developer's timetable, this is a short-term action.
- PA 401 intersection – There were 10 reportable crashes at the intersection, all of which were angle crashes relating to turning vehicles. Traffic congestion and long queues of traffic, lead to aggressive driving at the intersection. West Vincent Township's long-term objective is to construct a loop road to remove traffic from the intersection by improving interconnectivity to PA 401 East and to the proposed development east of PA 100. The Township is currently constructing additional lanes at the intersection to help traffic flow.
- Birch Run Road Extension – Extending Birch Run Road from PA 401 to PA 100, as called for in the Plan, should reduce turning movements at the PA 100/PA 401 intersection, leading to fewer crashes.
- Access management – The Sunoco Gas Station driveway adjacent to the intersection on PA 100 and PA 401 should be closed. No access should be permitted to the property abutting the east side of PA 100 between PA 401 and Birch Run Road. The parcel has a 350 ft. frontage on PA 100. It is currently vacant, less than 200 ft. wide, and according to the Plan it should be incorporated into the village green. DBN First Bank's driveway is being used as a cut though for PA 100 northbound traffic turning right onto PA 401. Relocating and realigning the intersection as shown on Map

Map 27

PA 100 Safety Study
West Vincent Township Recommendations
Ludwig's Corner



Map 28

Source: Kise Straw & Kolodner, 2005; map obtained from:
http://www.westvincenttwp.org/Ludwigs%20in%20Color.jpg

27 will no longer make the driveway a straight connector road. These access management recommendations are not included in the Plan.

- Nantmeal Road intersection – This is a skewed intersection that essentially forms a combined intersection with Ludwigs Corner Horse Show Grounds driveway. Other issues include lack of a left-turn lane on PA 100 and poor sight distance. West Vincent Township has a Highway Occupancy Permit to realign Nantmeal Road to form a perpendicular intersection with PA 100. This will require relocating Nantmeal Road to Ludwigs Corner Fire Company property. A northbound left-turn lane will be constructed as part of the realignment. When the Loop Road from Birch Run Road to PA 100 is completed, it will form the fourth leg of the intersection. At that time the intersection will be signalized, and a southbound left-turn lane will be constructed.

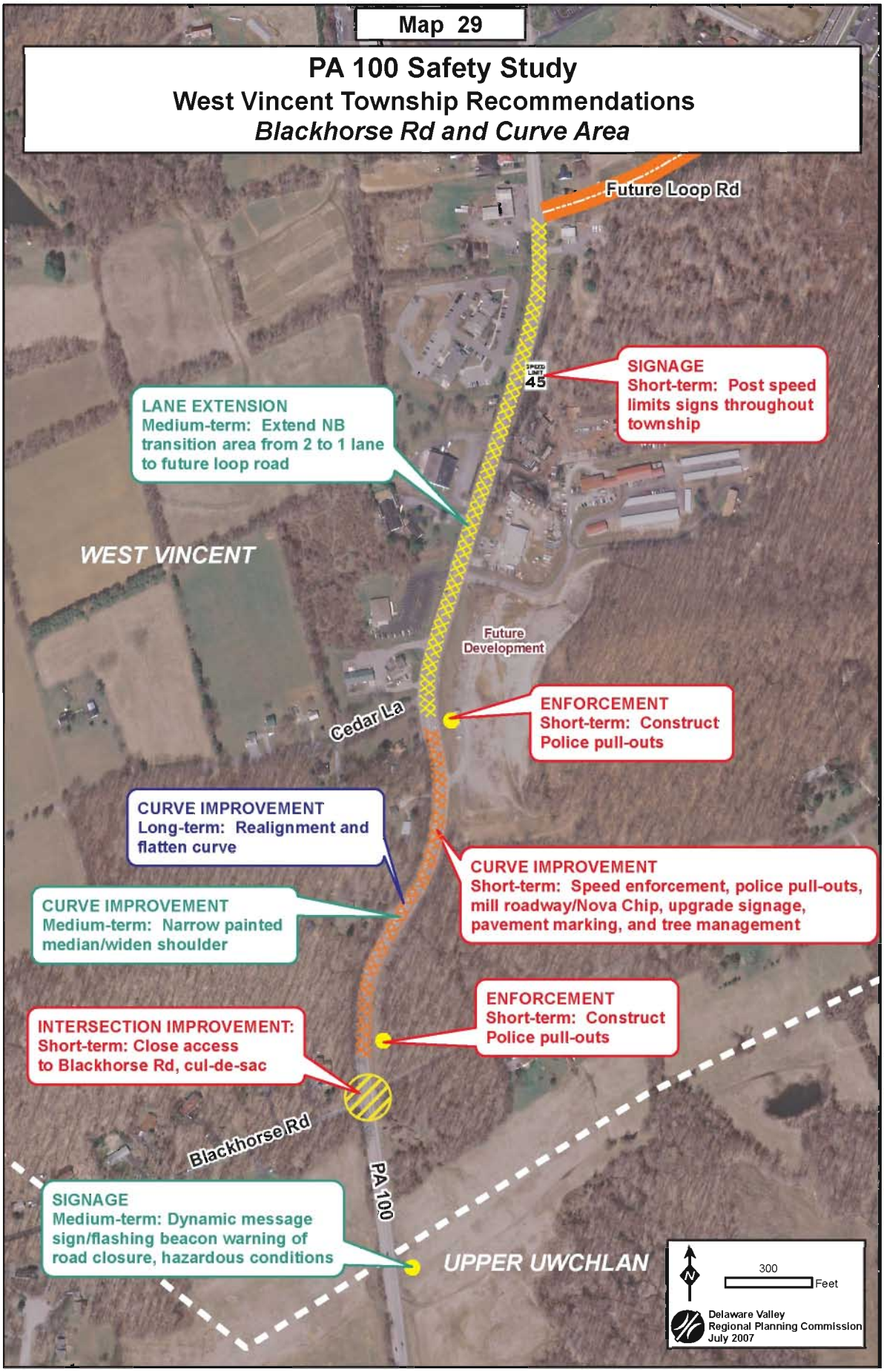
Completion of the Loop Road from PA 401 to PA 100 has been partially funded by a federal earmark. West Vincent Township, Chester County, and PennDOT have to find the local match and complete the funding package prior to the project entering into design. Incorporation of pedestrian amenities is another medium-term improvement. Sidewalks and trails are not only needed in Ludwigs Corner, they should extend out to connect to nearby developments and land uses. An extensive pedestrian network may help to reduce vehicular trips within Ludwigs Corner.

Curve between Blackhorse Road and Cedar Lane (see Map 29)

At this intersection, there were 24 reportable crashes, 19 of which were hit-fixed object. They occurred predominately in the northbound direction. According to the accident reports, driving too fast for conditions and wet surface conditions (15 crashes) were the primary contributory causes. The majority of these crashes were clustered in the fall; for example, five crashes took place in October 2005. Also, two fatal accidents occurred in this section of PA 100.

There is general consensus that the Blackhorse Hill northbound passing lane is the underlying cause of the crashes. Vehicles driving at excessive speeds in the passing lane, to bypass trucks and other slow-moving vehicles, either lose control negotiating the curve or at the merge at the top of the hill. The Township felt wet leaves make the road very slippery, accounting for crashes peaking in the fall. PennDOT District 6-0 Traffic Unit conducted a detailed speed analysis of the Blackhorse Hill. Results indicate a significant speed differential between cars and heavy trucks on the hill, 41 mph and 29 mph respectively. Because of this, PennDOT was unable to remove the passing lane, as requested by West Vincent Township.

Other physical deficiencies include the Blackhorse Road intersection situated on the hill. Its westbound approach has sight distance limitations, a tight turning radius and a narrow road width that makes it difficult for a vehicle to turn into


Map 29
PA 100 Safety Study
West Vincent Township Recommendations
Blackhorse Rd and Curve Area
Future Loop Rd
SIGNAGE
Short-term: Post speed limits signs throughout township
LANE EXTENSION
Medium-term: Extend NB transition area from 2 to 1 lane to future loop road
WEST VINCENT
Future Development
Cedar La
ENFORCEMENT
Short-term: Construct Police pull-outs
CURVE IMPROVEMENT
Long-term: Realignment and flatten curve
CURVE IMPROVEMENT
Short-term: Speed enforcement, police pull-outs, mill roadway/Nova Chip, upgrade signage, pavement marking, and tree management
CURVE IMPROVEMENT
Medium-term: Narrow painted median/widen shoulder
ENFORCEMENT
Short-term: Construct Police pull-outs
INTERSECTION IMPROVEMENT:
Short-term: Close access to Blackhorse Rd, cul-de-sac
Blackhorse Rd
PA 100
SIGNAGE
Medium-term: Dynamic message sign/flashing beacon warning of road closure, hazardous conditions
UPPER UWCHLAN
N
300
Feet
Delaware Valley Regional Planning Commission
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Blackhorse Road if a vehicle is waiting to exit. Police frequently close PA 100 in the winter because cars have difficulty climbing the hill when snow or ice is present.

Short-term recommendations include:

- Speed enforcement – It is critical to lower vehicular speeds though a speed enforcement blitz program. West Vincent Township only has seven full time police officers and can not afford to assign one of them to enforce traffic regulations on PA 100. By using safety funds, they can dedicate part time police personnel to speed enforcement. Because posted speed limit signs are not adequately spaced in accordance with the Pennsylvania Vehicle Code, township police can not legally enforce the speed limit. PennDOT needs to erect additional speed limit signs to maintain statutory half-mile spacing.
- Construct pull-outs for police enforcement – West Vincent Police Department currently enforce speeds on Blackhorse Hill by stationing an officer at the top of the hill. More visible pull-outs are needed on the hill itself to effectively lower speeds.
- Apply Nova Chip Treatment – Applying Nova Chip will help to rectify the wet surface condition on the hill. In conjunction with Nova Chip treatment, the shoulder should be widened by narrowing the striped out center median.
- Tree management – Leaves and other debris from the tree canopy create slippery conditions. Trimming back the canopy will reduce this problem and accelerate the drying of PA 100.
- Upgrade signs/additional signs – Northbound PA 100 curve signs are posted prior to the approach of the hill. These signs should be supplemented with an advisory speed plaque (W13-1 sign). An advance cross road sign (W2-1 sign) for Blackhorse Road is also required. In addition, post signs warning slower moving traffic to keep right.
- Dynamic message sign – Due to the number and severity of crashes, supplemental warning signage in addition to traditional curve signs is needed. A dynamic message sign can warn motorists about unsafe conditions (slippery road ahead, accident ahead, PA 100 is closed), urge motorists to slow down or be used in conjunction with radar devices to display vehicle speeds. Operationally, the sign can either be controlled by one of the municipalities or it can be operated by PennDOT's Traffic Control Center based on real-time information from West Vincent Township Police Department.

As a medium-term recommendation, lengthening the passing lane from Black Horse Hill to the Ludwigs Corner Loop Road would reduce the need to speed, because motorists will have a longer opportunity to bypass slower moving traffic. The estimated 1,400 ft. extension will more than double the length of the passing lane. Adjoining roadside development will also help to lower speeds in this

transition area. The two-lane section can be safely terminated by having the right lane form a free flow right turn into the Loop Road. Signing and a traffic signal at the Loop Road will give motorists ample warning that only one lane will continue north on PA 100. Ending the second lane on a flat, straight section, instead of just over a crest of a hill, is inherently safer.

Concurrent to extending the passing lane, the curve should be flattened by widening the roadway on the inside of the curve. This will enable passing to occur on a straighter section instead of the existing curve. If drivers still speed, they will not have to overcompensate for the curve.

On an on-going basis, higher priority should be given to plowing and salting the roadway so that it does not have to be closed in adverse weather conditions. This can take the form of a mutual aid agreement between West Vincent Township and PennDOT maintenance.

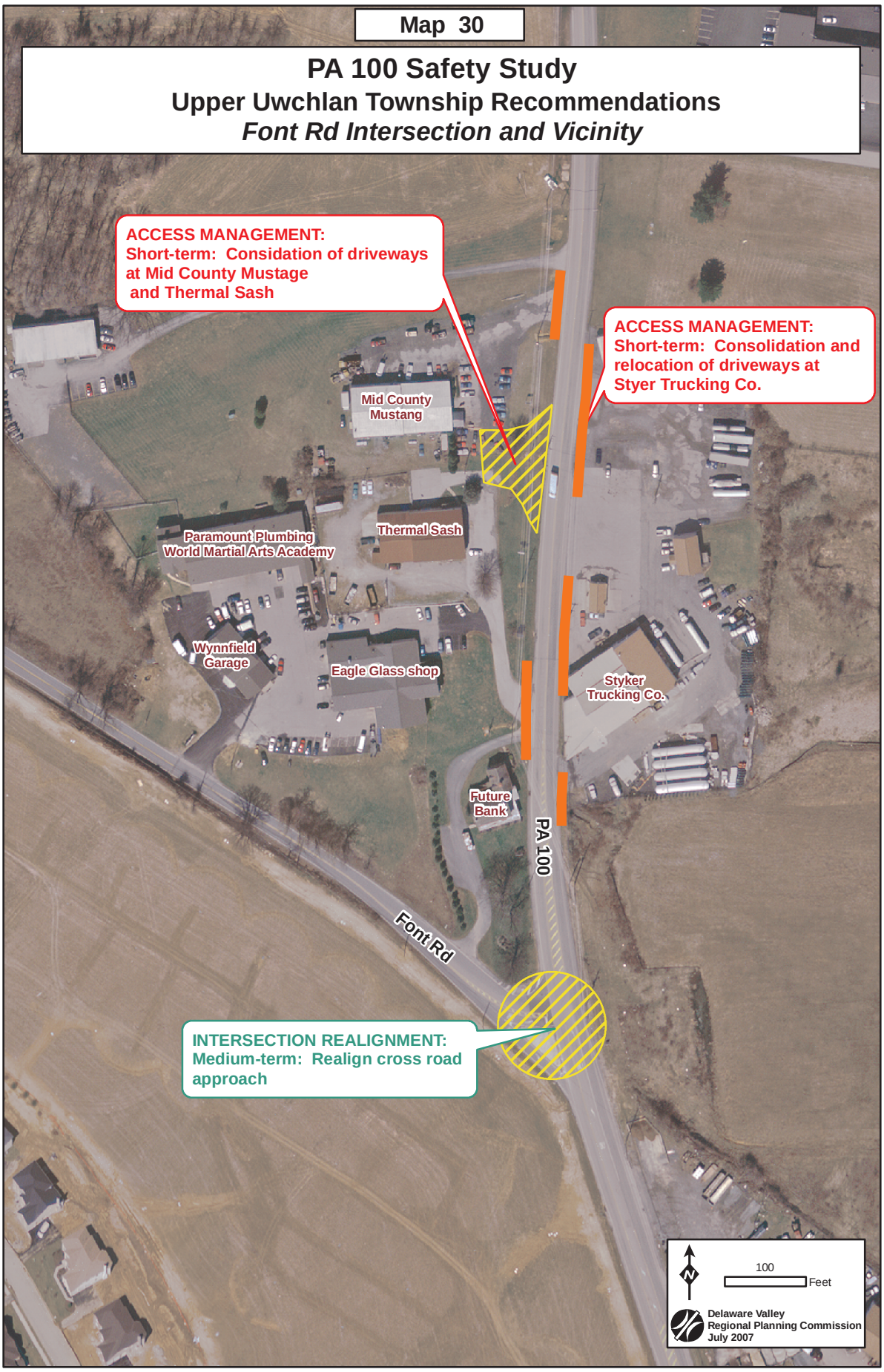
UPPER UWCHLAN TOWNSHIP

Font Road Vicinity (see Map 30)

The problem with Font Road relates more to its physical layout and access control than to actual crashes. Only eight reportable crashes occurred at Font Road, none in 2005.

Of the crashes, three were angle and four were rear-end crashes. Font Road is a skewed intersection located at the beginning of a horizontal curve. Due to its location at the beginning of a curve, northbound left turns are more inclined to turn into Font Road's free-flow right-turn lane than into Font Road, which is located further into the curve. As a result, the free-flow right-turn lane is signed with four "Do Not Enter" signs. Right-turning traffic from Font Road has difficult observing southbound PA 100 traffic because the free-flow right-turn lane is situated after the curve. Realigning Font Road approximately 100 ft. to the north would create a more perpendicular intersection, improving sight distance for motorists.

Just north of Font Road there are a number of commercial establishments that require improved access management. Styker Trucking Company's frontage, on the east side of PA 100, is almost continuously open. Its driveways should be in compliance with current PennDOT highway occupancy standards. On the west side of PA 100, there are four driveways serving a new bank, Eagle Glass, Thermal Sash, Mid County Mustang and other commercial establishments. The driveways should be consolidated and the commercial establishments internally interconnected.


Map 30
PA 100 Safety Study
Upper Uwchlan Township Recommendations
Font Rd Intersection and Vicinity
ACCESS MANAGEMENT:
Short-term: Considation of driveways at Mid County Mustage and Thermal Sash
ACCESS MANAGEMENT:
Short-term: Consolidation and relocation of driveways at Styer Trucking Co.
Mid County Mustang
Thermal Sash
Paramount Plumbing
World Martial Arts Academy
Wynnfield Garage
Eagle Glass shop
Styker Trucking Co.
Future Bank
PA 100
Font Rd
INTERSECTION REALIGNMENT:
Medium-term: Realign cross road approach
N
100
Feet
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IX. ACTION PLAN

This chapter presents the Action Plan for PA 100, see Table 17. It is largely composed of high-priority short-term actions that will have an immediate impact on reducing crashes. High-priority medium and long-term projects that are more costly and require a longer implementation timeframe are also included. This plan will also serve as the basis of a Transportation Improvement Program (TIP) project prepared by Chester County Planning Commission and PennDOT District 6-0 Traffic Unit for federal funding.

RECOMMENDATION MATRIX

Since the number of recommendations in this report exceeds the ability of PennDOT and the municipalities to implement projects, DVRPC was asked to prioritize projects for advancement. A recommendation matrix was developed to screen which actions and projects should be placed in the Action Plan. Each recommendation in the report was ranked as to its priority and implementation timeframe. The resulting matrix, which lists both corridor-wide and municipality specific projects, is shown in Appendix F.

The effectiveness of the recommendations to reduce crashes was subjectively evaluated. Actions and projects that directly address the causes of crashes, such as speed enforcement to reduce speeds or tree management to minimize wet leave crashes, are considered high-priority projects. Actions or projects that affect general safety concerns, such as realigning intersections, or that impact low volume/low crash locations were given a lower priority. To a limited extent, priorities reflect input gathered from the municipal outreach meetings and discussions with Chester County and PennDOT. Projects were categorized by the following timeframes:

- Short-term – Less than three years;
- Medium-term – between three and eight years;
- Long-term – Greater than eight years; and
- Ongoing.

ACTION PLAN

The Action Plan is an amalgamation of most of the high priority measures with an emphasis on short-term actions to obtain an immediate reduction in crashes. The longer-term projects are generally targeted to PA 100 physical improvements, correcting underlying roadway deficiencies. For each measure in the Action Plan, there is a brief description, cost, funding source and the lead organization(s) responsible for implementing it. The costs listed in the Plan are

ballpark estimates based on generalized cost factors. The Action Plan is a $2,400,000 package with nearly $1,600,000 to be funded through the DVRPC TIP and the remainder by PennDOT. A preliminary Action Plan was presented at the December 1, 2006, Public Officials Meeting. Based upon comments received, the Plan was slightly modified consolidating some projects and changing priorities as recommended by the group.

MONITORING PROGRAM

To ensure the Action Plan is carried out requires a concerted effort among elected officials, PennDOT, Chester County, the municipalities, Pennsylvania State Police and developers. Consequently, periodic meetings among the parties, either once or twice a year, are needed to track progress, deal with implementation issues that arise, and adjust the Plan as necessary. As the one stakeholder who works most closely with PennDOT, the municipalities, and developers, Chester County Planning Commission should assume lead responsibility for this on-going coordination effort. The municipalities and elected officials were adamant a mechanism should be employed to carry out the Plan, not just one or two minor recommendations.

Table 17: PA 100 Corridor Safety Action Plan

ACTION	DESCRIPTION	RESPONSIBILITY	COST	FUNDING SOURCE
Short-Term Actions				
Speed enforcement program	A corridor-wide blitz enforcement program targeted to high accident months. Designate PA 100 as a Highway Safety Corridor	Local police, PA State Police, municipalities	$20,900/year	Smooth Operator Program, Buckle Up PA, Highway Safety Corridor program
Pull-outs for police enforcement • Horseshoe Tr — Somerset Nursery • Blackhorse Rd — Cedar La • Third location TBD	Constructing pull-outs that will provide a safe haven for police to conduct speed enforcement at the curve sections and other locations where there are no shoulders	PennDOT, state and local police	$350,000	DVRPC TIP
Apply Nova Chip treatment • Horseshoe Tr – Fairview Rd • Blackhorse Rd – Cedar La • Pughtown Rd – Prizer Rd • Prizer Rd – Flowing Springs Rd	Increasing roadway surface friction to prevent slippery surface/run off the road crashes. As part of the treatment, narrow painted median and widen shoulders to create a buffer at the curves: Fairview Rd to Horseshoe Tr, Blackhorse Rd to Cedar La	PennDOT	$580,000	DVRPC TIP
Tree management • Fairview Rd – Horseshoe Tr • Blackhorse Rd – Cedar La • Prizer Rd – Titus Inn	Cutting back tree branches and/or trees to dry road surface, improve lighting conditions and sight distance around curves	PennDOT Maintenance	$80,000–$100,000	Low-cost safety funding
Upgrade signs/additional signs • Curves throughout corridor • West Vincent speed limit signs	Providing guidance and adequate warnings to motorists	PennDOT	$15,000-$20,000	PennDOT maintenance budget and low-cost safety funding
Conduct North Coventry PA 100 Concept Study	Study focused along commercial strip, determine cross section, access management, streetscape	North Coventry Township	$16,000	TBD

Source: DVRPC 2007

Table 17: PA 100 Corridor Safety Action Plan

ACTION	DESCRIPTION	RESPONSIBILITY	COST	FUNDING SOURCE
Bucktown improvements • Construct interim northbound left-turn lane • Access management	• Construct left-turn lane as temporary measure until PA 23/PA 100 connector is constructed. Retime traffic signal • Incorporate access management treatment including close, consolidate and relocate driveways to minimize vehicle conflict	South Coventry Township	• Left-turn lane – $130,000 • Access management – N/A	• Left-turn lane – DVRPC TIP • Access management – property owners, developers
Maintenance program • Blackhorse Rd hill salting	Develop a cooperative agreement for winter plowing and salting of Blackhorse Rd hill	PennDOT Maintenance	N/A	N/A
Dynamic message sign/beacon • Horseshoe Tr • Blackhorse Rd	Signs that will warn motorists of hazardous conditions ahead at the approach of curves (wintry conditions, road closures/detours, etc.). Includes both temporary portable DMS signs and permanent sign structures	PennDOT, municipalities	$335,000	DVRPC TIP
Medium-Term Action				
Implement North Coventry PA 100 Concept Study recommendations	Move forward in implementing improvements identified in the North Coventry PA 100 Concept Study	North Coventry Township, PennDOT	Dependent upon results from study	Developers and Act 209 fees
South Coventry PA 23/PA 100 connector	Proposed connector will extend west of PA 23 intersection southward to connect to Hartman Rd, will help to alleviate congestion at PA 23 intersection	Developer	N/A	Developer

Source: DVRPC 2007

Table 17: PA 100 Corridor Safety Action Plan

ACTION	DESCRIPTION	RESPONSIBILITY	COST	FUNDING SOURCE
Blackhorse Hill • Blackhorse Rd climbing lane transition • Flatten curve	• Extension of the northbound merge lane, ending at the Loop Road • Flattening the curve between Blackhorse Rd and Cedar La	West Vincent Township, PennDOT	$760,000	DVRPC TIP
Long-Term Actions				
Realign the French Creek curve	Realign the curve and bridge over French Creek between Pughtown Rd and Prizer Inc.	PennDOT	$4,400,000–$5,700,000*	DVRPC TIP
Daisy Point Rd connector	Proposed connector road will extend west of PA 100 and Pughtown Rd intersection, northward to connect with the PA 23/PA 100 connector road, also includes the closure of Daisy Point Rd access to PA 100	South Coventry Township	N/A	South Coventry and developers

* Excludes right-of-way costs
Source: DVRPC 2007

APPENDIX A

EXISTING TRAFFIC CONDITIONS

ZONE #1: Hoffecker Road to Pigeon Creek Road

Table A-1: Zone #1 Northbound Vehicle Volumes and Vehicle Classifications

Time	Motorcycle	Cars	Light Trucks (2 Axles)	Buses	Heavy/Tractor Trucks (3+ Axles)	Total
12:00 AM	1	39	7	0	0	47
1:00 AM	0	19	5	0	3	27
2:00 AM	0	14	8	0	5	27
3:00 AM	0	17	5	1	3	26
4:00 AM	1	20	13	1	10	45
5:00 AM	0	74	49	2	8	133
6:00 AM	2	240	117	4	28	391
7:00 AM	3	365	117	4	28	517
8:00 AM	3	380	122	5	24	534
9:00 AM	1	398	108	3	33	543
10:00 AM	3	322	121	5	33	484
11:00 AM	1	369	133	5	26	534
12:00 PM	1	413	113	2	26	555
1:00 PM	1	474	123	2	25	625
2:00 PM	2	545	163	3	24	737
3:00 PM	3	692	234	3	23	955
4:00 PM	5	903	231	2	15	1156
5:00 PM	6	1004	175	3	15	1203
6:00 PM	4	656	121	1	10	792
7:00 PM	4	370	80	0	13	467
8:00 PM	2	432	67	2	5	508
9:00 PM	2	261	40	1	7	311
10:00 PM	0	136	25	1	3	165
11:00 PM	0	89	16	5	7	117
Total	45	8,232	2,193	55	374	10,899

Source: DVRPC, 2005

ZONE #1: Hoffecker Road to Pigeon Creek Road

Table A-2: Zone #1 Southbound Vehicle Volumes and Vehicle Classifications

Time	Motorcycle	Cars	Light Trucks (2 Axles)	Buses	Heavy/Tractor Trucks (3+ Axles)	Total
12:00 AM	0	21	3	0	5	29
1:00 AM	1	20	2	0	5	28
2:00 AM	0	14	5	0	3	22
3:00 AM	1	36	8	2	3	50
4:00 AM	0	68	38	1	13	120
5:00 AM	0	331	160	3	15	509
6:00 AM	0	801	265	5	19	1090
7:00 AM	4	853	202	3	20	1082
8:00 AM	3	660	149	3	28	843
9:00 AM	2	421	120	4	33	580
10:00 AM	2	401	133	2	34	572
11:00 AM	1	378	129	3	23	534
12:00 PM	1	374	132	1	22	530
1:00 PM	2	439	130	3	29	603
2:00 PM	1	424	148	1	25	599
3:00 PM	3	420	147	3	25	598
4:00 PM	5	429	146	3	21	604
5:00 PM	6	566	125	2	19	718
6:00 PM	5	445	96	2	9	557
7:00 PM	3	314	62	1	10	390
8:00 PM	5	195	66	2	7	275
9:00 PM	2	196	30	1	8	237
10:00 PM	2	98	18	0	11	129
11:00 PM	0	54	17	1	2	74
Total	49	7,958	2331	46	389	10,773

Source: DVRPC, 2005

ZONE #1: Hoffecker Road to Pigeon Creek Road

Figure A-1: Zone #1 Northbound Travel Speeds

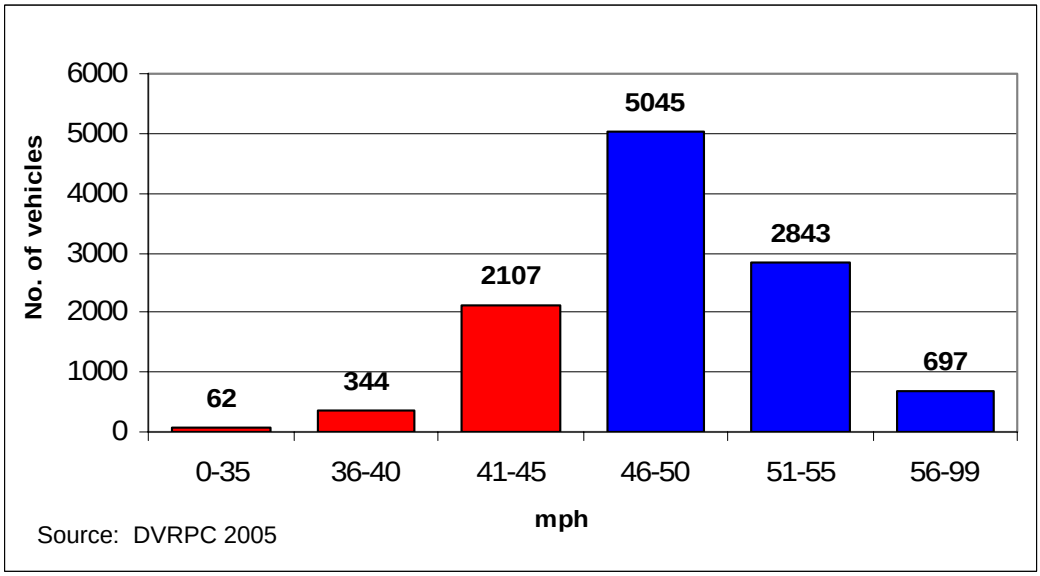


Figure A-2: Zone #1 Southbound Travel Speeds

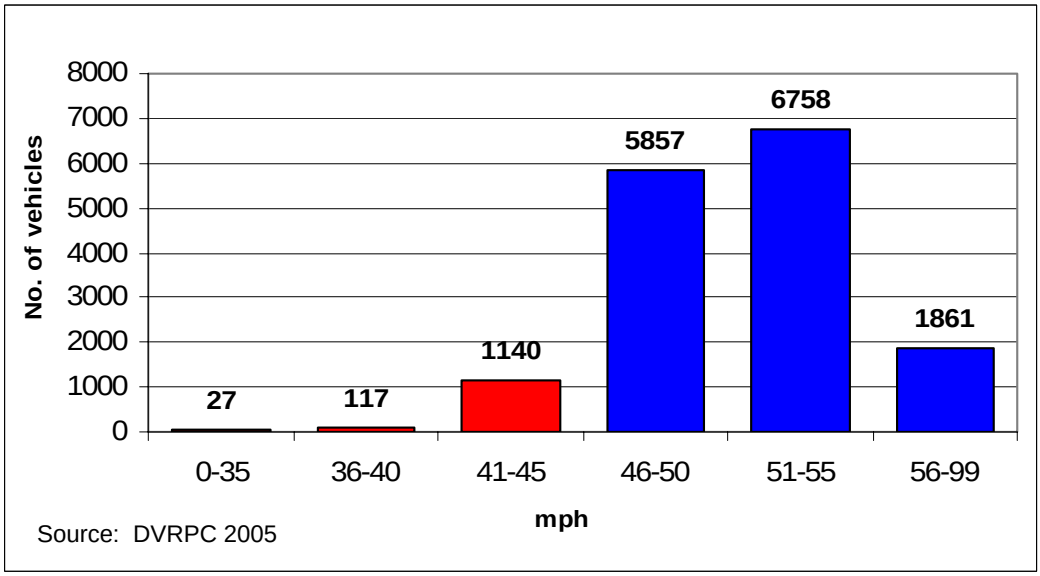
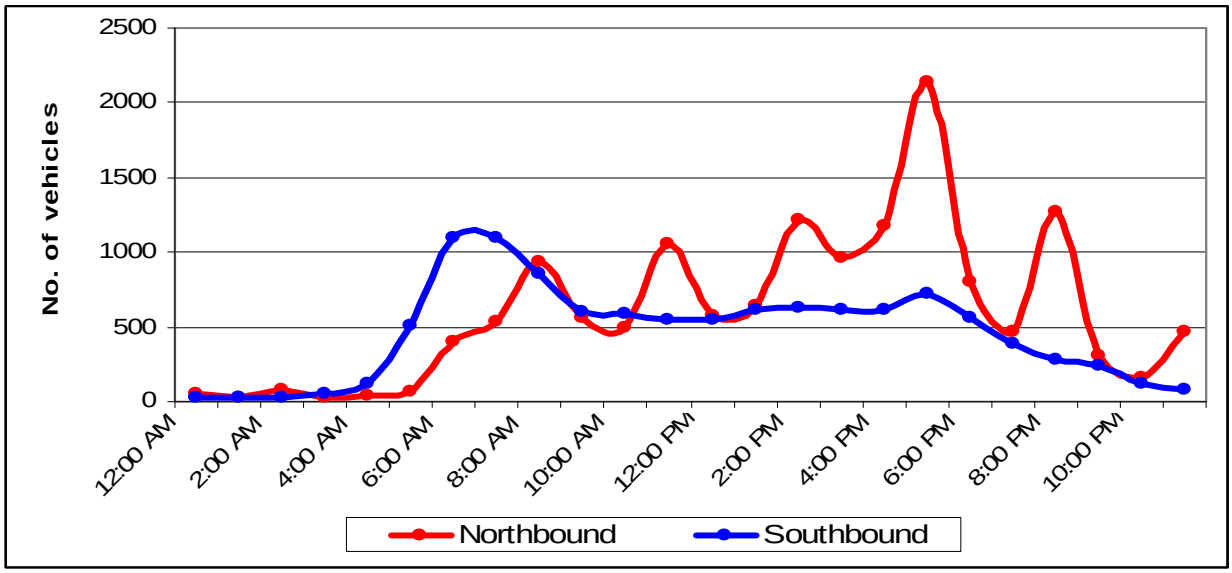


Figure A-3: Zone #1 Northbound and Southbound Traffic Patterns



Source: DVRPC, 2005

ZONE #2: Pughtown Road to Fairview Road

Table A-3: Zone #2 Northbound Vehicle Volumes and Vehicle Classifications

Time	Motorcycle	Cars	Light Trucks (2 Axles)	Buses	Heavy/Tractor Trucks (3+ Axles)	Total
12:00 AM	1	26	2	0	0	29
1:00 AM	0	16	5	0	2	23
2:00 AM	0	12	9	0	1	22
3:00 AM	0	6	3	2	2	13
4:00 AM	0	15	4	1	5	25
5:00 AM	0	38	27	1	4	70
6:00 AM	0	161	72	2	15	250
7:00 AM	0	263	71	2	16	352
8:00 AM	0	272	73	3	19	367
9:00 AM	0	274	77	2	14	367
10:00 AM	1	206	93	1	22	323
11:00 AM	0	233	90	2	19	344
12:00 PM	1	279	70	4	30	384
1:00 PM	0	329	92	4	26	451
2:00 PM	1	342	112	2	23	480
3:00 PM	4	570	188	3	21	786
4:00 PM	3	703	174	0	17	897
5:00 PM	1	784	129	2	13	929
6:00 PM	4	536	102	1	9	652
7:00 PM	0	265	57	0	8	330
8:00 PM	1	286	45	1	5	338
9:00 PM	0	209	33	1	4	247
10:00 PM	0	124	23	1	3	151
11:00 PM	0	76	9	5	3	93
Total	17	6,025	1560	40	281	7,923

Source: DVRPC, 2005

ZONE #2: Pughtown Road to Fairview Road

Table A-4: Zone #2 Southbound Vehicle Volumes and Vehicle Classifications

Time	Motorcycle	Cars	Light Trucks (2 Axles)	Buses	Heavy/Tractor Trucks (3+ Axles)	Total
12:00 AM	1	16	1	0	2	20
1:00 AM	0	13	0	0	3	16
2:00 AM	1	8	5	0	3	17
3:00 AM	0	35	8	2	3	48
4:00 AM	0	58	31	2	8	99
5:00 AM	2	269	123	3	11	408
6:00 AM	1	680	220	3	19	923
7:00 AM	1	761	144	4	10	920
8:00 AM	0	521	134	3	27	685
9:00 AM	0	335	102	2	21	460
10:00 AM	0	291	81	2	22	396
11:00 AM	4	282	88	3	16	393
12:00 PM	1	290	84	4	18	397
1:00 PM	0	295	85	2	17	399
2:00 PM	3	312	88	2	18	423
3:00 PM	3	305	88	2	15	413
4:00 PM	0	316	86	3	12	417
5:00 PM	3	342	66	0	12	423
6:00 PM	3	311	48	1	8	371
7:00 PM	0	216	49	1	6	272
8:00 PM	1	154	34	1	3	193
9:00 PM	2	128	16	1	5	152
10:00 PM	1	70	12	0	9	92
11:00 PM	0	41	9	1	0	51
Total	27	6,049	1602	42	268	7,988

Source: DVRPC, 2005

ZONE #2: Pughtown Road to Fairview Road

Figure A-4: Zone #2 Northbound Travel Speeds

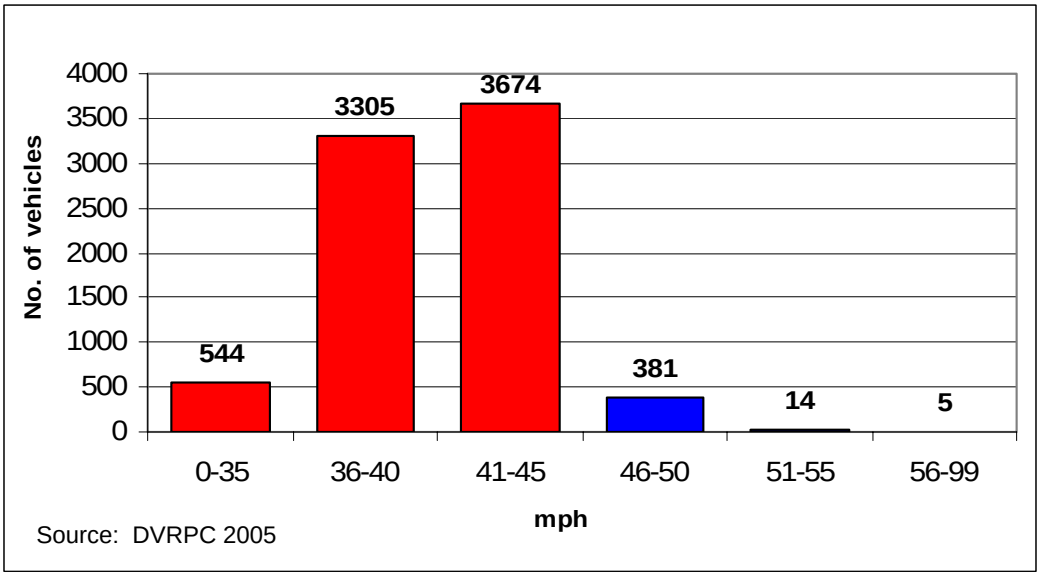


Figure A-5: Zone #2 Southbound Travel Speeds

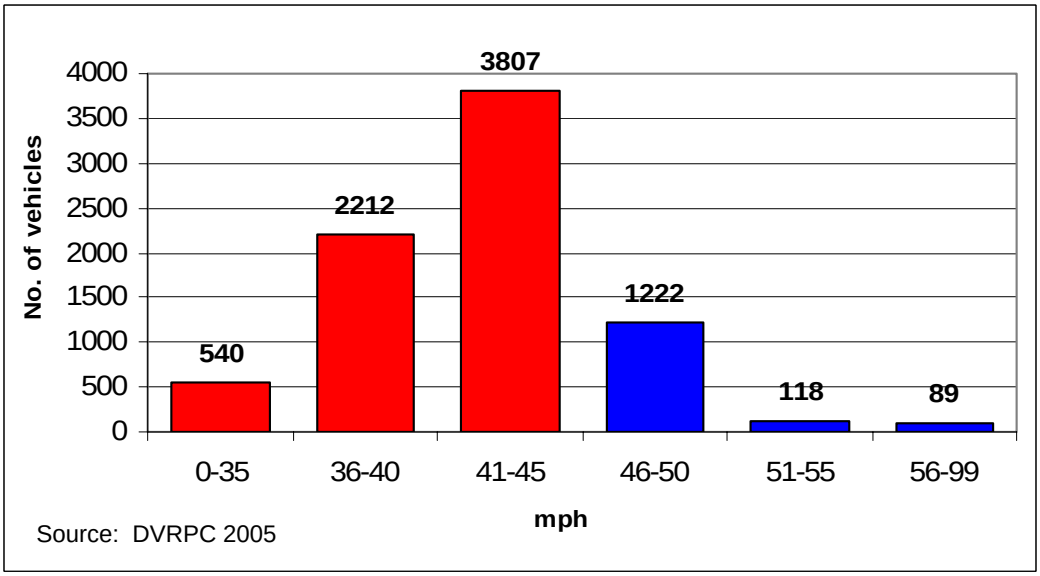
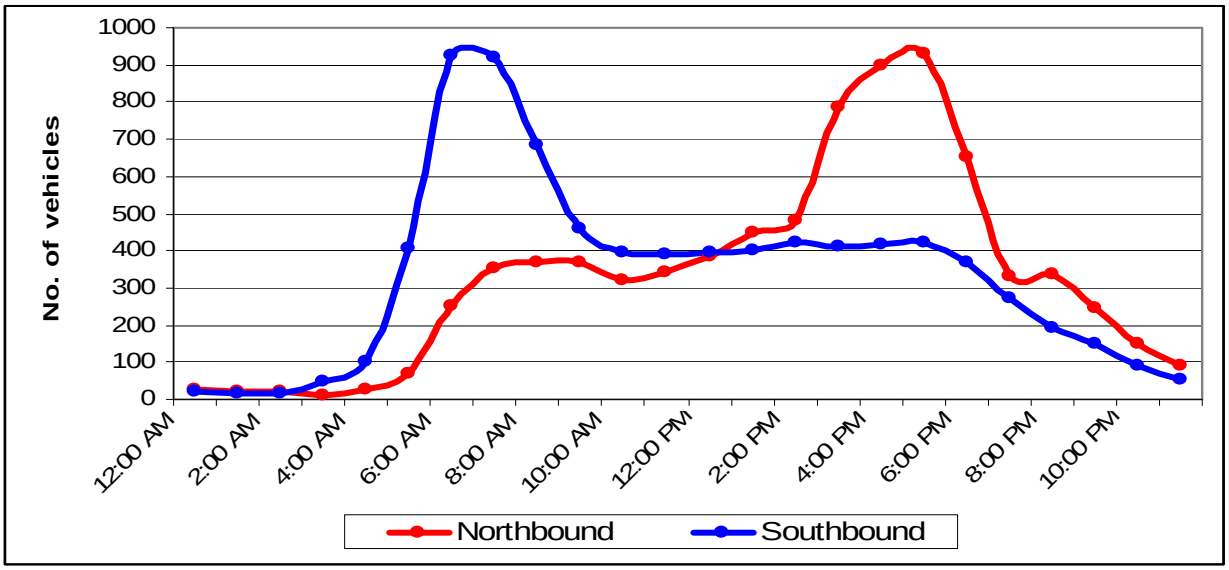


Figure A-6: Zone #2 Northbound and Southbound Traffic Patterns



Source: DVRPC, 2005

ZONE #3: Horseshoe Trail to Nantmeal Road

Table A-5: Zone #3 Northbound Vehicle Volumes and Vehicle Classifications

Time	Motorcycle	Cars	Light Trucks (2 Axles)	Buses	Heavy/Tractor Trucks (3+ Axles)	Total
12:00 AM	0	26	8	0	4	38
1:00 AM	0	27	5	1	2	35
2:00 AM	1	10	4	0	2	17
3:00 AM	0	10	1	1	1	13
4:00 AM	1	13	6	2	4	26
5:00 AM	0	46	24	1	4	75
6:00 AM	1	153	65	3	13	235
7:00 AM	3	296	61	3	13	376
8:00 AM	2	237	73	2	18	332
9:00 AM	1	203	81	2	22	309
10:00 AM	2	193	85	1	15	296
11:00 AM	3	235	83	2	22	345
12:00 PM	4	234	85	3	19	345
1:00 PM	1	301	92	1	18	413
2:00 PM	9	350	112	2	22	495
3:00 PM	5	478	151	3	22	659
4:00 PM	10	694	152	3	14	873
5:00 PM	11	703	119	3	12	848
6:00 PM	5	484	84	1	8	582
7:00 PM	1	302	48	0	3	354
8:00 PM	3	307	55	1	7	373
9:00 PM	2	212	24	0	1	239
10:00 PM	0	126	14	1	2	143
11:00 PM	2	89	10	1	4	106
Total	67	5,729	1442	37	252	7,527

Source: DVRPC, 2005

ZONE #3: Horseshoe Trail to Nantmeal Road

Table A-6: Zone #3 Southbound Vehicle Volumes and Vehicle Classifications

Time	Motorcycle	Cars	Light Trucks (2 Axles)	Buses	Heavy/Tractor Trucks (3+ Axles)	Total
12:00 AM	0	15	4	0	1	20
1:00 AM	0	11	0	0	3	14
2:00 AM	0	14	4	0	2	20
3:00 AM	0	23	10	0	3	36
4:00 AM	0	57	31	3	7	98
5:00 AM	6	222	132	2	18	380
6:00 AM	9	670	187	2	14	882
7:00 AM	3	690	138	2	19	852
8:00 AM	3	550	125	3	21	702
9:00 AM	1	327	103	2	18	451
10:00 AM	2	228	81	1	16	328
11:00 AM	3	262	67	2	19	353
12:00 PM	2	270	81	3	17	373
1:00 PM	3	323	98	1	22	447
2:00 PM	2	262	70	1	23	358
3:00 PM	4	314	88	3	20	429
4:00 PM	5	289	70	2	12	378
5:00 PM	7	335	76	1	14	433
6:00 PM	11	264	52	0	9	336
7:00 PM	3	206	36	1	5	251
8:00 PM	2	163	27	1	6	199
9:00 PM	2	123	27	0	3	155
10:00 PM	2	66	12	0	1	81
11:00 PM	1	44	7	1	9	62
Total	**71**	**5,728**	**1526**	**31**	**282**	**7,638**

Source: DVRPC, 2005

ZONE #3: Horseshoe Trail to Nantmeal Road

Figure A-7: Zone #3 Northbound Travel Speeds

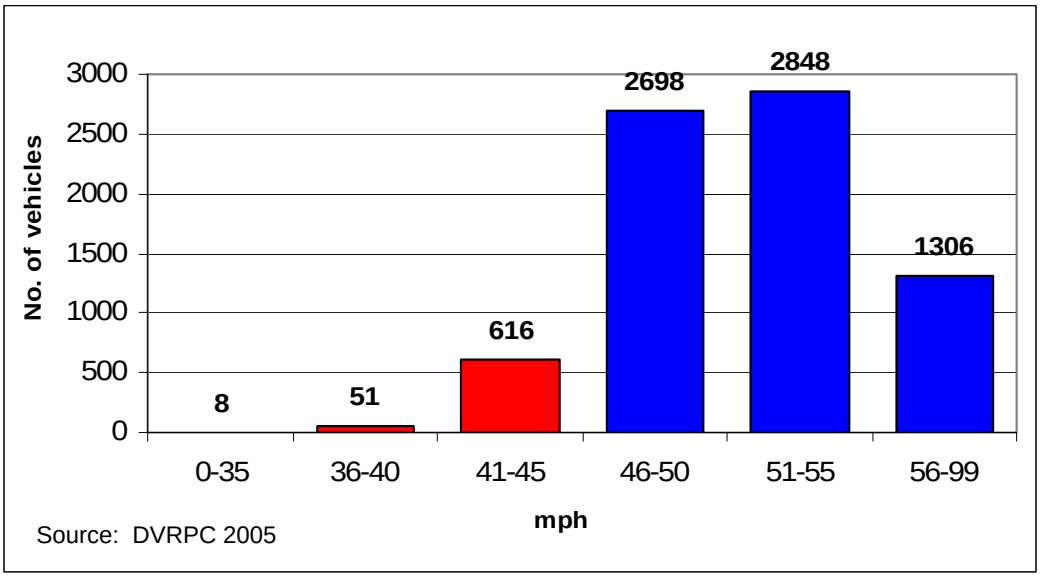


Figure A-8: Zone #3 Southbound Travel Speeds

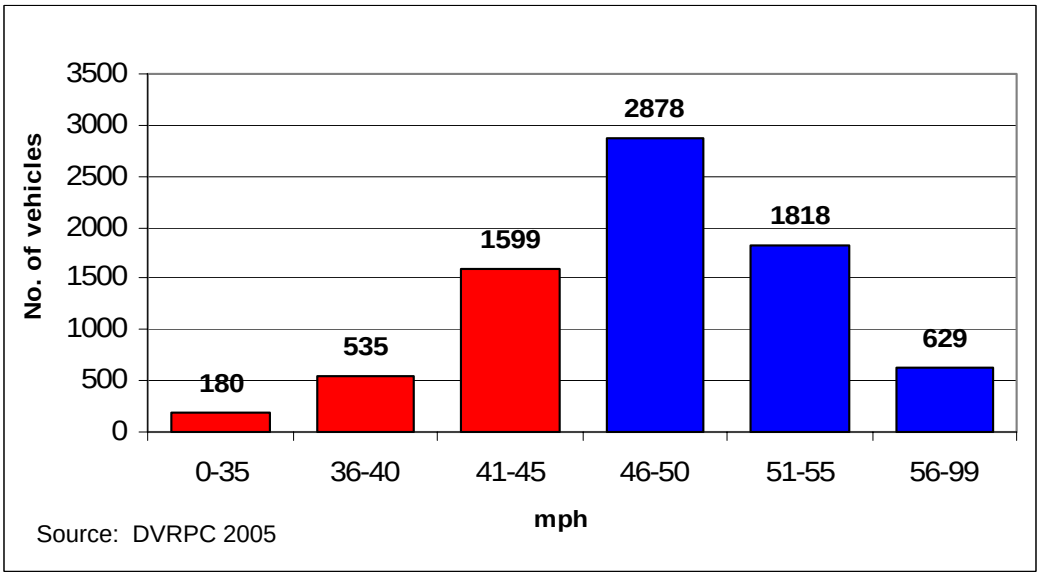
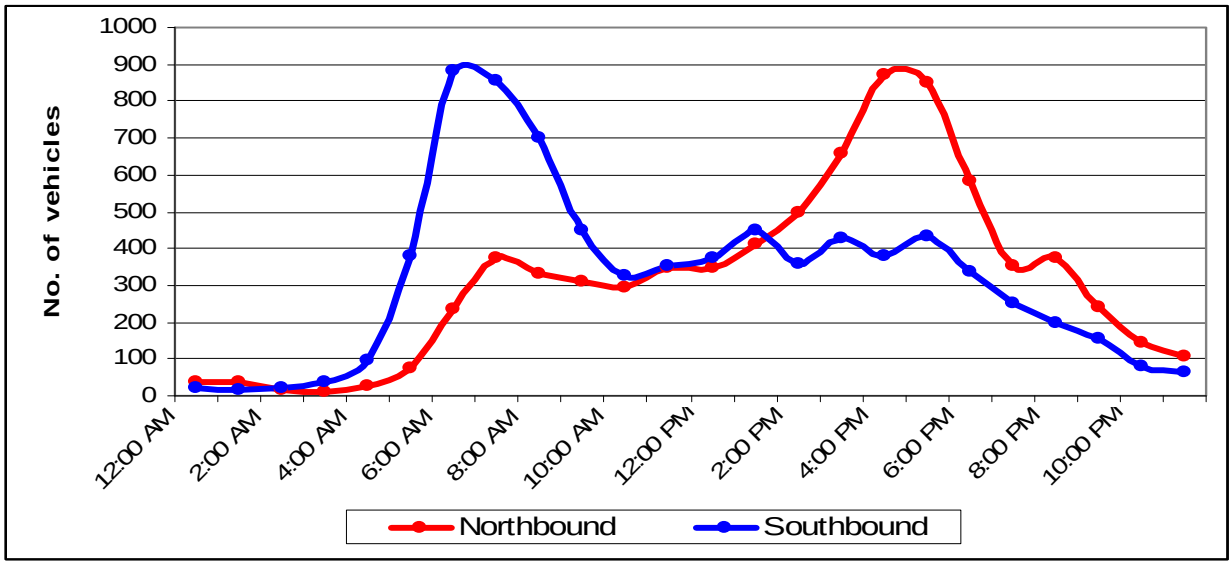


Figure A-9: Zone #3 Northbound and Southbound Traffic Patterns



Source: DVRPC, 2005

ZONE #4: PA 401 to Blackhorse Road

Table A-7: Zone #4 Northbound Vehicle Volumes and Vehicle Classifications

Time	Motorcycle	Cars	Light Trucks (2 Axles)	Buses	Heavy/Tractor Trucks (3+ Axles)	Total
12:00 AM	0	33	13	0	3	49
1:00 AM	0	26	4	2	4	36
2:00 AM	1	12	6	0	2	21
3:00 AM	0	9	2	1	1	13
4:00 AM	0	15	6	0	4	25
5:00 AM	0	41	26	1	4	72
6:00 AM	2	151	75	1	16	245
7:00 AM	2	295	93	3	12	405
8:00 AM	2	268	83	2	29	384
9:00 AM	2	242	98	2	21	365
10:00 AM	1	237	93	3	20	354
11:00 AM	2	274	94	2	22	394
12:00 PM	3	295	118	1	23	440
1:00 PM	3	335	107	2	21	468
2:00 PM	4	386	138	3	20	551
3:00 PM	5	429	160	2	19	615
4:00 PM	7	620	165	2	20	814
5:00 PM	8	631	112	3	14	768
6:00 PM	4	455	84	1	8	552
7:00 PM	2	328	56	2	4	392
8:00 PM	5	334	58	1	6	404
9:00 PM	3	205	27	0	3	238
10:00 PM	0	141	23	1	2	167
11:00 PM	3	90	19	1	3	116
Total	59	5,852	1660	36	281	7,888

Source: DVRPC, 2005

ZONE #4: Hoffecker Road to Pigeon Creek Road

Table A-8: Zone #5 Southbound Vehicle Volumes and Vehicle Classifications

Time	Motorcycle	Cars	Light Trucks (2 Axles)	Buses	Heavy/Tractor Trucks (3+ Axles)	Total
12:00 AM	0	16	2	0	2	20
1:00 AM	0	8	1	0	3	12
2:00 AM	0	17	3	0	3	23
3:00 AM	0	22	7	0	2	31
4:00 AM	0	58	25	3	8	94
5:00 AM	4	231	110	1	19	365
6:00 AM	8	597	170	2	30	807
7:00 AM	3	510	121	1	20	655
8:00 AM	1	455	96	2	21	575
9:00 AM	1	338	101	1	25	466
10:00 AM	3	272	80	2	22	379
11:00 AM	3	314	88	1	22	428
12:00 PM	1	336	90	2	23	452
1:00 PM	3	381	96	2	22	504
2:00 PM	3	340	93	2	25	463
3:00 PM	4	356	91	1	15	467
4:00 PM	5	347	73	4	8	437
5:00 PM	5	370	75	1	17	468
6:00 PM	12	313	58	0	10	393
7:00 PM	2	259	36	2	8	307
8:00 PM	3	186	24	1	5	219
9:00 PM	1	137	27	0	1	166
10:00 PM	1	67	9	0	1	78
11:00 PM	3	45	6	1	10	65
Total	66	5,975	1482	29	322	7,874

Source: DVRPC, 2005

ZONE #4: Conestoga Road to Blackhorse Road

Figure A-10: Zone #4 Northbound Travel Speeds

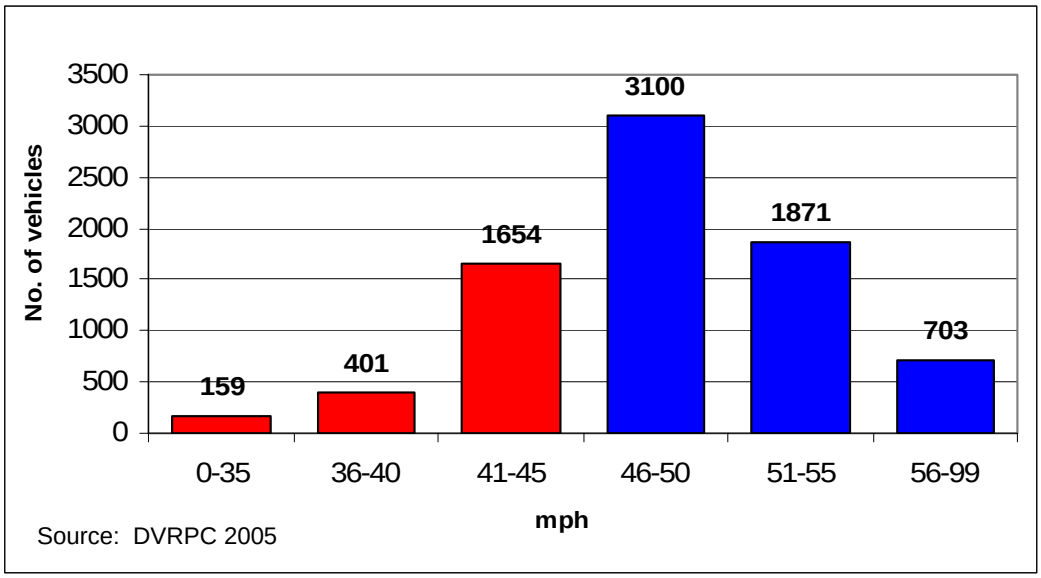


Figure A-11: Zone #4 Southbound Travel Speeds

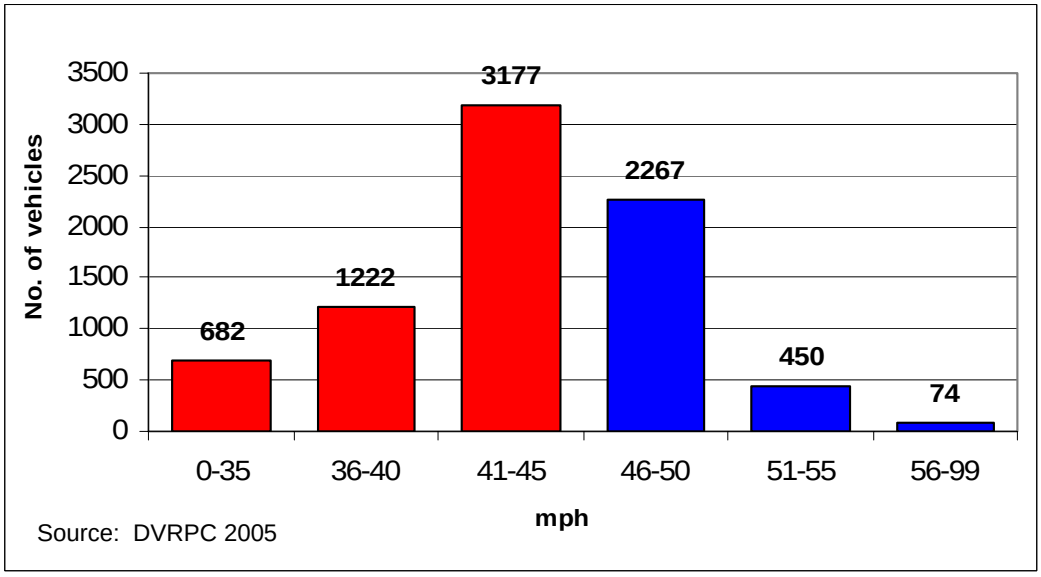
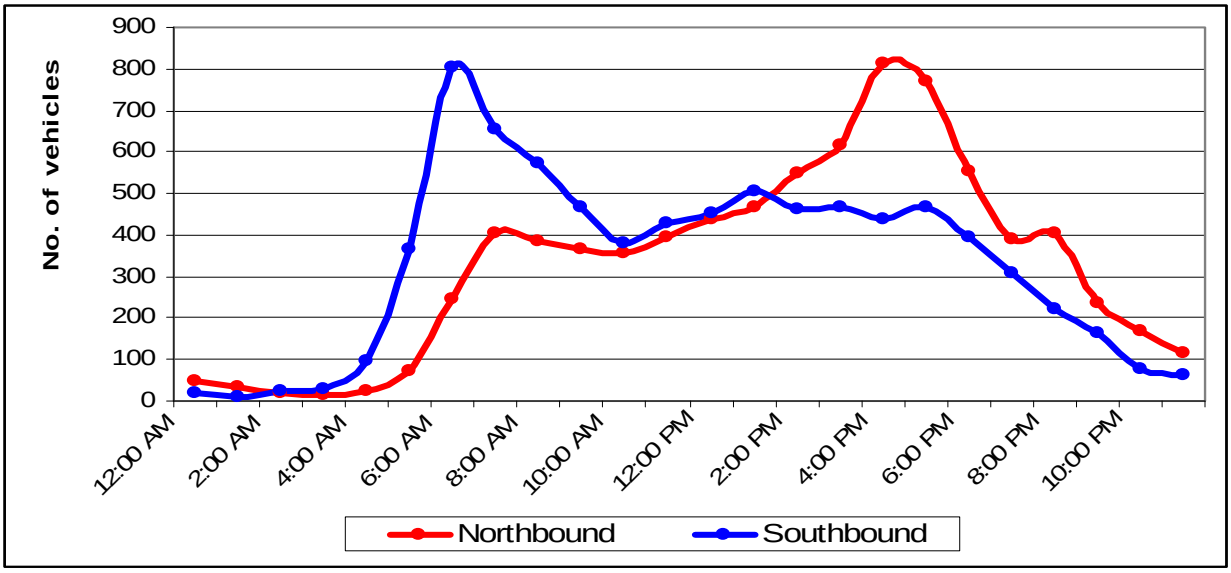


Figure A-12: Zone #4 Northbound and Southbound Traffic Patterns



Source: DVPC, 2005

APPENDIX B

PARTIAL LIST PENNDOT CRASH DATABASE FACTORS

Collision Type

Non-collision
Rear-end
Head-on
Rear-end (backing)
Angle
Sideswipe (same direction)
Sideswipe (opposite direction)
Hit-fixed object
Hit pedestrian
Other or unknown

Environmental Roadway Factor

None
Windy conditions
Sudden weather conditions
Deer in roadway
Obstacle on roadway
Other animal in roadway
Glare
Work zone related
Slippery road conditions (ice/snow)
Substances on roadway
Potholes
Broken or cracked pavement
TCD obstructed
Soft shoulder or shoulder drop off
Other roadway factor
Other environmental conditions
Unknown

Illumination

Daylight
Dark – no street lights
Dark – street lights
Dusk
Dawn
Dark – unknown roadway lighting
Other
Unknown

Relationship to Road

On roadway
Shoulder
Median
Roadside
Outside trafficway
In parking lane
Gore (ramp/highway)
Unknown

Road Condition

Dry
Wet
Sand/mud/dirt/oil/gravel
Snow covered
Slush
Ice
Ice patches
Water – standing/moving
Other
Unknown

Weather

No adverse conditions
Rain
Sleet (hail)
Snow
Fog
Rain and fog
Sleet and fog
Other
Unknown

Roadway Alignment

Straight
Curved
Unknown

Driver Action

No contributing action
Driver was distracted
Driving using hand-hold phone
Driver using hands-free phone
Making illegal U-turn
Making improper or careless turn
Moving from wrong lane
Turning from wrong lane
Proceeding w/o clearance after stop
Running stop sign
Running red light
Tailgating
Sudden slowing or stopping
Illegally stopped on road
Careless passing or lane change
Driving on wrong side of road
Making improper ent. to highway
Making improper exit from highway
Careless parking or unparking
Over/under compensation at curve
Speeding
Driving too fast for conditions
Failure to maintain proper speed
Driver fleeing police
Driver inexperienced
Failure to use specialized equipment
Affected by physical conditions
Other improper actions
Unknown

Grade

Level roadway
Uphill
Downhill
Sag or bottom of hill
Crest or top of hill
Unknown

Harm Event

Hit unit 01
Hit unit 02
Hit unit 03
Hit other traffic unit
Hit deer
Hit other animal
Collision non-fixed object
Struck by unit 01
Struck by unit 02
Struck by unit 03
Struck by other traffic unit
Hit tree or shrubbery
Hit embankment
Hit utility pole
Hit curb
Hit guardrail
Hit guardrail end
Hit curb
Hit concrete barrier
Hit ditch
Hit fence or wall
Hit building
Hit culvert
Hit bridge pier or abutment
Hit bridge rail
Hit boulder/obstacle in roadway
Hit impact attenuator
Hit fire hydrant
Hit roadway equipment
Hit mail box
Hit traffic island or channelization
Hit snow bank
Hit other fixed object
Overturn or roll over
Jacknife
Fire in vehicle
Other non-collision

Vehicle Movement

Going straight
Slowing or stopping in lane
Stopped in traffic lane
Passing or overtaking vehicle
Leaving a parked position
Parked
Entering a parked position
Trying to avoid animal, ped, object
Turning right on red
Turning left on red
Turning left
Making a U-turn
Backing up
Changing lanes or merging
Negotiating curve – right
Negotiating curve – left
Other
Unknown

Injury Severity

Not injured
Killed
Major injury
Moderate injury
Minor injury
Injury/unknown severity
Unknown

Vehicle Type

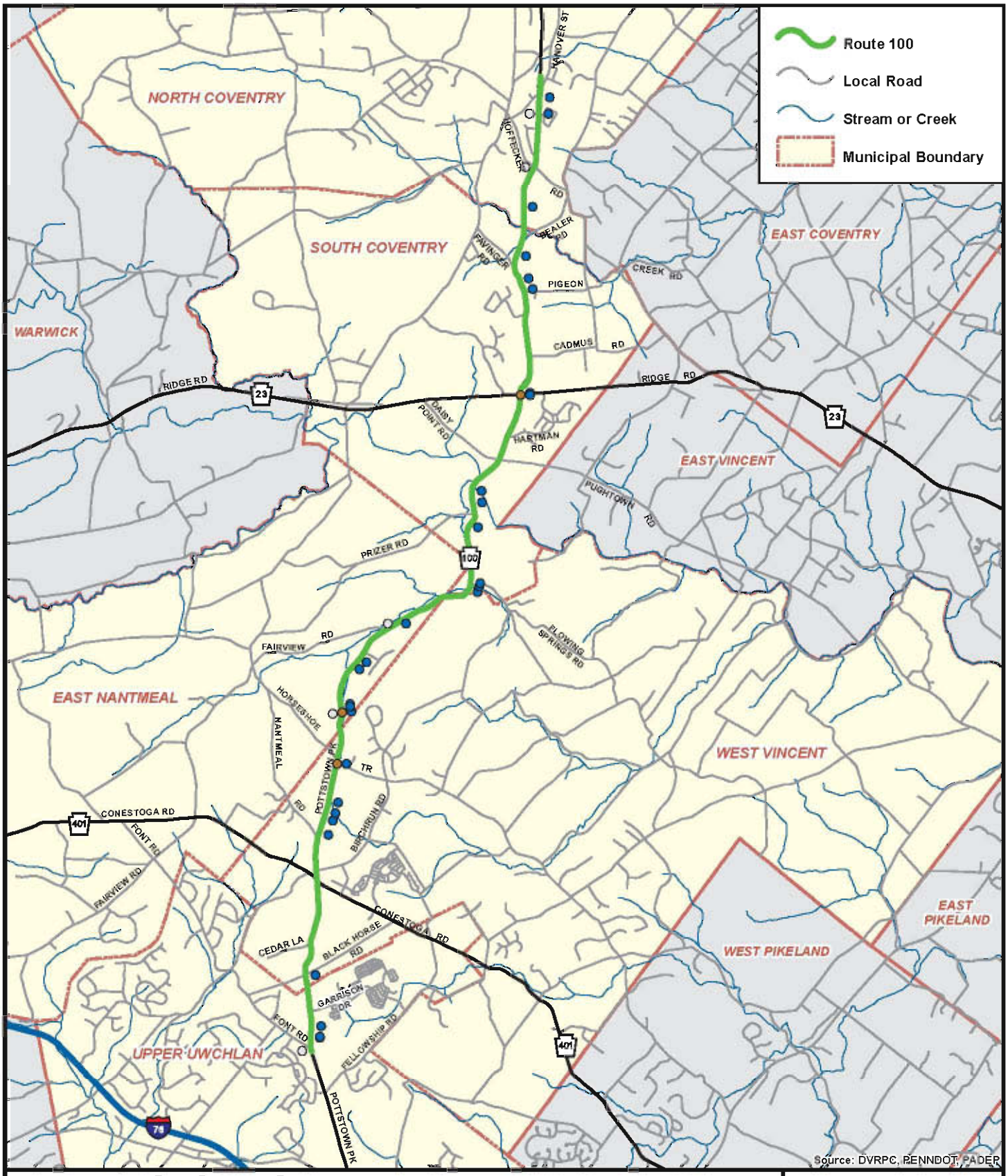
Automobile
Motorcycle
Bus
Small truck
Large truck
SUV
Van
Farm equipment
Construction equipment
ATV
Bicycle, tricycle
Horse and buggy
Horse and rider
Train
Trolley
Other Vehicle
Unknown vehicle

Driver Condition

Apparently normal
Had been drinking
Illegal drug use
Sick
Fatigue
Asleep
Medication
Unknown

APPENDIX C

CRASH ANALYSIS MAPS



Source: DVRPC, PENNDOT, PADER

PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map C1: Other Road Surface Conditions

0 0.5 1 1.5 2
Miles

N

Delaware Valley Regional Planning Commission
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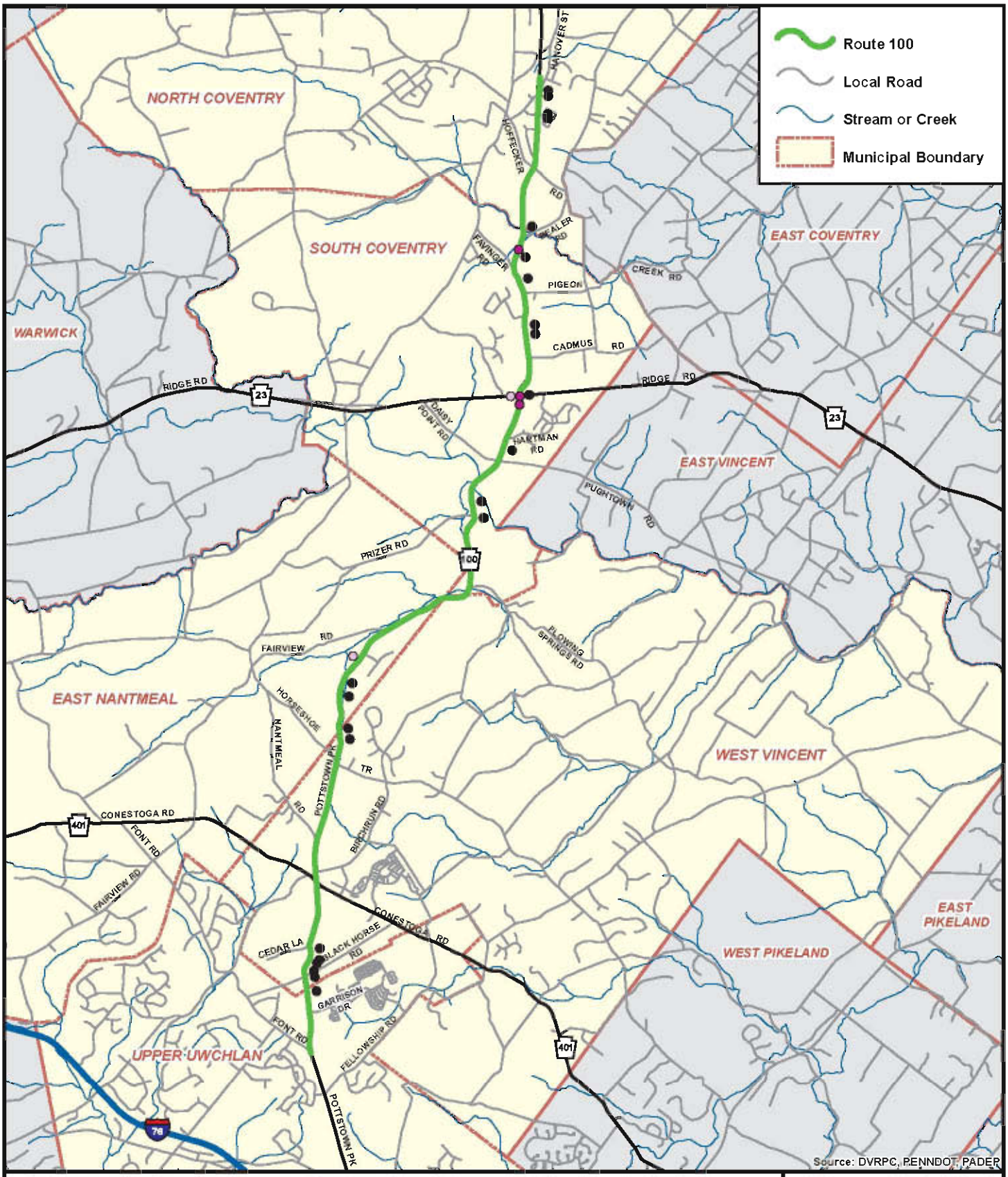
- Unknown (5)
- Sand/Mud/Dirt/Oil/Gravel (5)
- Wintery Mix (30)

Location map

*Map not to scale



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map C2: Controlled Substances

- Medication (2)
- Alcohol and Drugs (3)
- Alcohol (23)

0 0.5 1 1.5 2
Miles

N

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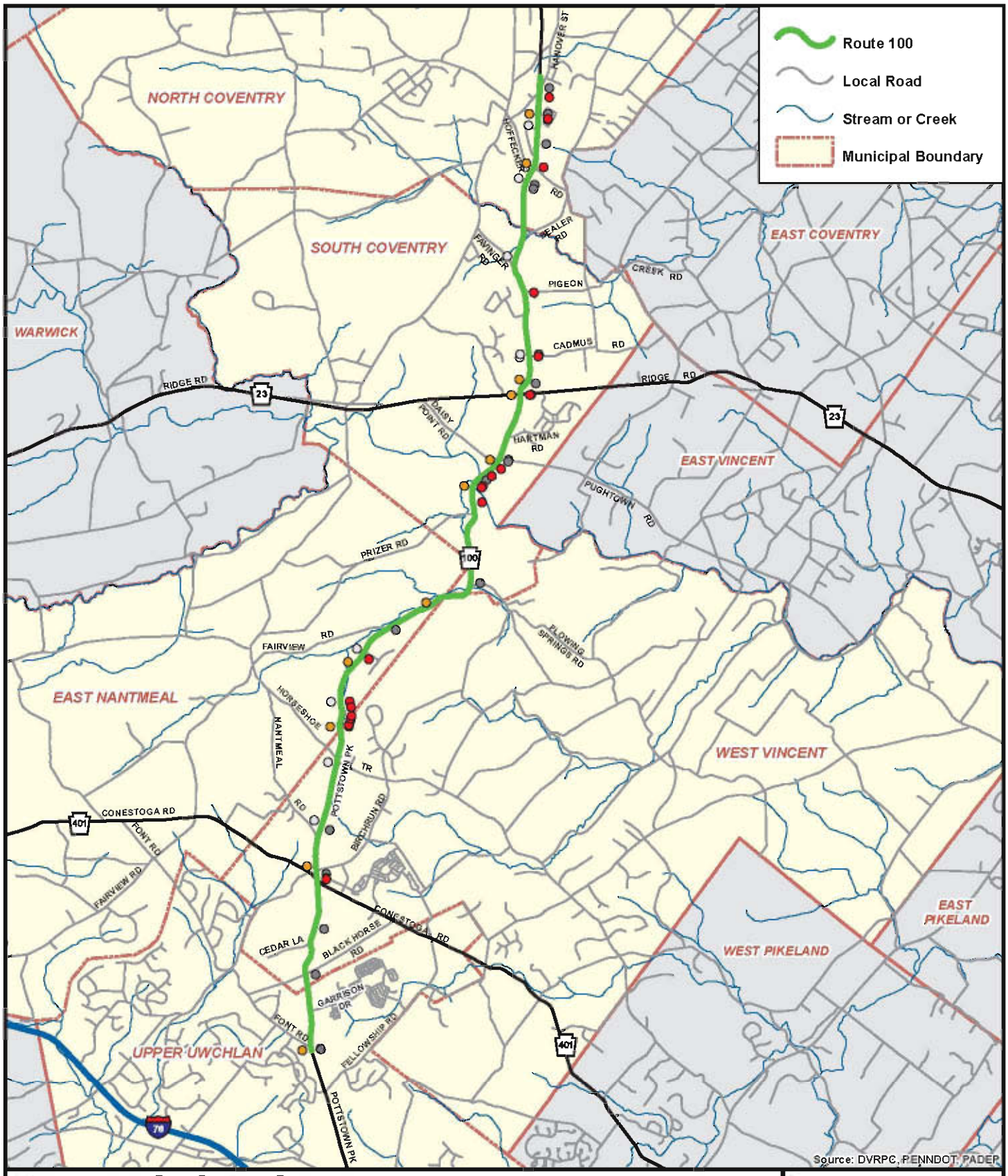
Location map

*Map not to scale



PA 100 Safety Study

North Coventry Township (South Hanover Street)
Upper Uwchlan Township (Font Road)

Map C3: Age

0 0.5 1 1.5 2
Miles

Delaware Valley Regional Planning Commission
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- 16 Year Old Driver (13)
- Age 75 or Greater (19)
- 17 Year Old Driver (26)
- Age 65 to 74 Driver (32)

Location map

*Map not to scale

APPENDIX D

LAND USE ANALYSIS

Table D-1: Municipal Zoning Designations

DVRPC Zoning Category	Municipality	Corresponding Municipal Zoning Category
	North Coventry	RC Resource Conservation
	South Coventry	RC Rural Conservation
R-1 Very Low Density	East Nantmeal	NA
Residential	West Vincent	RC Rural Conservation
	Upper Uwchlan	NA
	North Coventry	NA
	South Coventry	AP Agricultural Preservation & LR Low Density Residential
R-2 Low Density Residential	East Nantmeal	AP Agricultural Preservation & AR Agricultural/ Residential
	West Vincent	NA
	Upper Uwchlan	R-2 Residential 2
	North Coventry	R-1 Residential
	South Coventry	MR Medium Density residential
R-3 Medium Density Residential	East Nantmeal	NA
	West Vincent	R-2 Residential 2 & R-3 Residential 3
	Upper Uwchlan	NA
	North Coventry	C-1 Commercial & C-4 Neighborhood Commercial
	South Coventry	NA
C Commercial	East Nantmeal	C Commercial
	West Vincent	NA
	Upper Uwchlan	C-3 Highway Commercial
	North Coventry	NA
	South Coventry	VM Village Mixed-use & MU Mixed-use
VC Village Commercial	East Nantmeal	NA
	West Vincent	PC/LI Planned Commercial/Light Industrial & VCC Village Center Commercial
	Upper Uwchlan	NA
	North Coventry	NA
	South Coventry	NA
LI Light Industry	East Nantmeal	NA
	West Vincent	NA
	Upper Uwchlan	LI Limited Industrial
	North Coventry	NA
	South Coventry	NA
M/I Municipal/Institutional	East Nantmeal	EI Educational/Institutional
	West Vincent	M Municipal
	Upper Uwchlan	NA

Source: DVRPC (based upon the zoning of study area municipalities), 2006

Notes:

- West Vincent has a five-tier by-right residential development system that a developer may choose from. In the lowest density tier, single-family homes are permitted on a 10-acre parcel; however, a permanent easement is created to protect the land. Densities are increased with each tier, making lot sizes smaller and permitting multi-family housing in Tier 5. Greenway space is also increased with each tier.

- West Vincent has begun the process of constructing a new Town Center at Ludwigs Corner. The PC/LI zone is unique by permitting a wider variety of uses as special exceptions and conditional uses, including light manufacturing.
- South Coventry has several residential and commercial zones that limit lot size, setbacks, and other regulations through access to central sewer and water. This municipality also employs an open space development option granting density bonuses for developers to provide a greater amount of open space within their tract.
- East Nantmeal utilizes a density residential option permitting up to four units per acre as a conditional use on tracts of at least 40 acres in several residential zones. Fifty percent of the tract must be dedicated to community open space.

APPENDIX E

EXCERPT FROM PENNDOT PAVEMENT MANUAL

Providing Friction in Bituminous Wearing Courses (PennDOT Publication 242 - 2003 Edition, Section 5.6)

The pavement surface of a highway should have an adequate level of friction throughout its life to insure safe driving conditions. From a safety standpoint, a desirable surface:

- Develops an adequate amount of friction between the tire and pavement;
- Has sufficient surface texture (i.e., low-speed gradient) to prevent build-up of water pressure at the tire/pavement interface at the posted speed limit; and
- Is capable of retaining these properties under traffic and environmental conditions throughout the life of the surface.

Studies of bituminous pavement surfaces during their normal life indicate that material properties, mix design and construction techniques are all criteria in the development of a surface with good friction values. The most significant material property affecting the surface friction is the polishing resistance of the coarse aggregate. In 1975, PennDOT adopted a system of rating aggregates for friction.

The rating system was developed from a comprehensive test strip research program. It was determined that friction values go through an annual cycle in Pennsylvania roughly approximate a sine curve. Low values usually occur in late summer and fall with the amplitude depending on coarse aggregate characteristics and traffic volume. Initial friction measurements were nearly all adequate and not indicative of future performance. Coarse aggregate properties have the major effect and the petrographic properties of a particular source can be related to its friction value.

Each of the approved sources of coarse aggregate listed in Bulletin 14, Aggregate Procedures, are assigned a Skid Resistance Level (SRL) designated based on the particular aggregate properties. The SRL designation for an aggregate is based on performance in properly designed and produced dense-graded bituminous surfaces. Friction test results determined by PennDOT, using AASHTO-T242 Test Method, are used in assigning SRL designations.

When planning all new construction, overlays and resurfacing work, use the guidelines in Table E-1 to determine the appropriate SRL designation for the course aggregate used in bituminous wearing course or the fine aggregate in FJ-1 wearing course. Determine the SRL designation by the anticipated initial ADT [note: average daily traffic] on the new facility or the current ADT for resurfacing. Exceptions to this may be made on a project-by-project basis.

Whenever a bituminous wearing course will be used, the SRL designation shall be indicated on pavement design forms, on typical sections and in the contract proposal. A contractor is given the option of providing an aggregate with that

SRL or better or an equivalent blend of aggregates. **The use of inappropriate high type SRL designations on non-wearing courses, leveling courses, shoulders and short duration temporary roadways will be prohibited.**

Table E-1: Skid Resistance Level Criteria

Initial or Current Two-Way ADT*	SRL Designation
Above 20,000	E
5,001 – 20,000	H; Blend of E and M; Blend of E and G
3,001 – 5,000	G; Blend of H and M; Blend of E and L
1,001 – 3,000	M; Blend of H and L; Blend of G and L; Blend of E and L
0 – 1,000	L

*When all traffic for an SR travels in one direction, divide the ADT values shown above by 2 to determine the required SRL.

Source: PennDOT Publication 242 – 2003 Edition

APPENDIX F

RECOMMENDATION MATRIX

Table F-1: Recommendation Matrix - Corridor-wide Recommeded Improvements

CATEGORY	SHORT-TERM			MEDIUM-TERM			LONG-TERM			ON-GOING		
	High	Medium	Low	High	Medium	Low	High	Medium	Low	High	Medium	Low
SPEED ENFORCEMENT PROGRAM												
Corridor-wide	X											
CONSTRUCT PULL-OUTS FOR POLICE ENFORCEMENT												
Horseshoe Tr to Somerset Nursery	X											
Blackhorse Rd to Cedar La	X											
Other locations to be determined	X			X								
APPLY NOVA CHIP												
Curves between Horseshoe Tr and Fairview Rd	X											
Curves between Blackhorse Rd and Cedar La	X											
Curves between Prizer Rd to Pughtown Rd	X											
Curves between Prizer Rd to Flowing Springs Rd	X											
TREE MANAGEMENT												
Horseshoe Tr to Fairview Rd	X											
Blackhorse Rd to Cedar La	X											
Titus Inn to Prizer Rd	X											
UPGRADE SIGNS/ADDITIONAL SIGNS/PAVEMENT MARKINGS												
Signs at curve between Horseshoe Tr and Fairview Rd	X											
Signs at curve between Blackhorse Rd and Cedar La	X											
Speed limit signs in West Vincent	X											
Signs at curve between Prizer and Pughtown Rd		X										
Signs at Titus Inn curve		X										
Curve between Prizer Rd and Flowing Springs Rd		X										
Install RPM's at above locations		X										
Install transverse pavement marking, "Slow" pavement marking			X									
ACCESS MANAGEMENT												
Titus Inn	X											
Temple Rd Commercial Strip area	X			X								
PA 23 intersection	X			X								
Pughtown Rd intersection		X			X							
Ludwigs Corner		X			X							
Collinson Inc.					X							
Cadmus Rd			X									
Font Rd			X									
MAINTENANCE PROGRAM												
Corridor-wide										X		
CROSS ROAD TREATMENTS AT UNSIGNALIZED INTERSECTIONS												
Flowing Springs Rd												
Replace and install crossroad signage		X										
Construct shoulder or right turn/left turn lane at Flowing Springs Rd						X						
Horseshoe Tr												
Replace and install crossroad signage		X										
Cutback shrubbery and berms		X			X							
Realign/widen cross road approaches					X							
Blackhorse Rd												
Close off access on both sides by cul-de-sac		X										
Font Rd												
Realign/widen cross road approaches (DEVELOPER)				X								
Favinger Rd												
Replace and install crossroad signage			X									
Realign cross road approach						X						
Timber Dr												
Replace and install crossroad signage			X									
Construct shoulder or right turn lane for vehicles					X							

Table F-1: Recommendation Matrix - Corridor-wide Recommeded Improvements (continued)

CATEGORY	SHORT-TERM			MEDIUM-TERM			LONG-TERM			ON-GOING		
	High	Medium	Low	High	Medium	Low	High	Medium	Low	High	Medium	Low
FOSTER SUSTAINABLE DEVELOPMENT												
Temple Rd Commercial Strip Area											X	
Bucktown/Pughtown Rd Area											X	
Ludwig's Corner											X	
Font Rd Area											X	
INCORPORATE PEDESTRIAN AMENITIES												
Temple Rd Commercial Strip area					X							
PA 23 intersection/Owen J. Roberts H.S./Bucktown					X							
Pughtown Rd area					X							
Ludwig's Corner area					X							
EDUCATION												
Corridor-wide											X	
PROTECT NATURAL FEATURES												
Corridor-wide											X	

Table F-2: Recommendation Matrix - Municipality Specific Recommemded Improvements

CATEGORY	SHORT-TERM			MEDIUM-TERM			LONG-TERM			ONGOING		
	High	Medium	Low	High	Medium	Low	High	Medium	Low	High	Medium	Low
NORTH COVENTRY TWP												
Hanover St/Temple Rd/Commercial Strip												
Conduct PA 100 Concept Study	X											
Extend second NB lane past Hanover St	X											
Extend transition area from 1 to 2 lanes	X											
Add attenuators at the gore area North of Hanover St		X										
Access management	X			X								
Realign Temple Rd approach (Developer/HOP Project)		X										
Close access to Kutz Rd, cul-de-sac			X									
Implement Concept Study Recommendations				X								
Incorporate pedestrian amenities					X							
Widen PA 100 to 5 lanes south of Cedarville Rd							X					
Hoffecker Rd												
Study Hoffecker Rd as part of PA 100 Concept Study	X											
Install striping, rumble strips, and RPMs in the median		X										
Traffic signal/roundabout					X			X				
Grade separate, no ramps									X			
SOUTH COVENTRY TWP												
Favinger Rd												
Replace and install crossroad signage			X									
Realign cross road approach						X						
Cadmus Rd												
Construct SB protected left hand phasing and widen Cadmus Rd (HOP Project)		X										
Access management - Pop's Garage					X							
PA 23 Intersection												
Construct NB left turn lane at PA 23	X											
Restrict NB left turn at PA 23 (when connector road is constructed)				X								
Access management - bank, gas station	X			X								
Implement streetscaping, pedestrian amenities					X							
Foster sustainable development - Implement village concept											X	
Between PA 23 and Pughtown Rd												
Construct connector road through proposed development (Developer)				X								
Install roundabout or traffic signal at Hartman Rd/connector road				X								
Extend PA 23 connector road to Daisy Point Rd (Township/Developer)							X					
Pughtown Rd/Daisy Point Rd												
Access management					X							
Construct curbing on Pughtown Rd approach					X							
Incorporate pedestrian amenities					X							
Close off Daisy Point Rd (when connector road is completed)							X					
Foster sustainable development - Implement village concept											X	
Curve between Pughtown Rd and Prizer Rd												
Speed Enforcement Program	X											
Apply Nova Chip	X											
Upgrade signs/additional signs		X										
Pavement markings			X									
Realign curve							X					
Curves between Prizer Rd and Titus Inn												
Speed Enforcement Program	X											
Tree management	X											
Access management at Titus Inn	X											
Apply Nova Chip	X											
Upgrade signs/additional signs		X										
Replace and install crossroad signage at Flowing Springs Rd		X										
Pavement markings			X									
Construct shoulder or right turn/left turn lane at Flowing Springs Rd						X						
Widen for shoulders									X			

Table F-2: Recommendation Matrix - Municipality Specific Recommemded Improvements (continued)

CATEGORY	SHORT-TERM			MEDIUM-TERM			LONG-TERM			ONGOING		
	High	Medium	Low	High	Medium	Low	High	Medium	Low	High	Medium	Low
EAST NANTMEAL TWP												
Curves between Horseshoe Tr and Fairview Rd												
Speed Enforcement Program	X											
Construct pull-outs for police enforcement	X											
Apply Nova Chip and narrow painted median/widen shoulder	X											
Tree management	X											
Upgrade signs/additional signs	X											
Pavement markings			X									
Replace and install crossroad signage at Timber Dr			X									
Dynamic message sign/beacons (Northbound)	X											
Access management at Collinson Inc.					X							
Construct shoulder or right turn lane for vehicles at Timber Dr					X							
Construct left turn lane at Somerset Nursery					X							
WEST VINCENT TWP												
Ludwigs Corner												
PA 401 intersection - left turn lanes **	X											
Nantmeal Rd intersection - relocate, realign, left turn lane ** (Developer)	X											
Complete Loop Rd - Birch Run Rd to PA 100/Nantmeal Rd **	X											
Access management - Sunoco gas station		X										
Birch Run Rd Extension - PA 100 to PA 401 **		X										
DBN First Bank - relocate and realign driveway **		X										
Complete Loop Rd - PA 401 to PA 100 (federal earmark)				X								
Incorporate pedestrian amenities					X							
Curve between Blackhorse Rd and Cedar La												
Speed Enforcement Program	X											
Construct pull-outs for police enforcement	X											
Apply Nova Chip and narrow painted median/widen shoulder	X											
Tree management	X											
Upgrade signs/additional signs	X											
Pavement markings			X									
Intersection improvements at Blackhorse Rd		X										
Dynamic message sign/beacons				X								
Extend transition area from 2 to 1 lane	X											
Realign PA 100 to flatten curve				X								
Maintenance Program - higher PennDOT plowing/salting priority										X		
Horseshoe Tr												
Replace and install crossroad signage		X										
Cutback shrubbery and berms		X										
Realign/widen cross road approaches, construct center turn lane					X							
Correct drainage/maintenance										X		
Township-wide												
Post additional speed limit signs (1/2 mile spacing)	X											
UPPER UWCHLAN TWP												
Access management Font Rd area (Styker, Thermal Sash/Mid County Mustang)			X									
Realign/widen cross road approaches				X								
Foster sustainable development - Interconnectivity, mixed use development											X	

** refers to Ludwigs Corner Master Plan and Developer

PA 100 Corridor Safety Study

Publication No.: 07002

Date Published: July 2007

Geographic Area Covered: This study consists of the area in northwestern Chester County surrounding PA 100. The study area includes North Coventry, South Coventry, East Nantmeal, West Vincent and Upper Uwchlan townships.

Key Words: safety study, crash analysis, crash trends, crash types, crash cluster analysis, traffic speeds, land use, speed enforcement, access management, tree management, cross road treatments, warning signs, sustainable development, action plan

ABSTRACT

The purpose of this study is to conduct a crash analysis of PA 100 in Chester County between South Hanover Street and Font Road. Since 2003, 10 fatal crashes occurred on this 8.4 mile section of PA 100. Crash trends since 2000 were analyzed to determine the underlying causes of the crashes. Nearly 84 percent of the crashes involved running off the road and hitting fixed objects, angle, and rear-end crashes. Contributory causes involved speeding, wet surface conditions, access control and horizontal and vertical curves.

Detailed corridor-wide and municipality specific recommendations were developed to mitigate the safety problem. Corridor-wide recommendations focused on speed enforcement, physical improvements and land use strategies. Municipality recommendations focused on specific local crash issues. An Action Plan, consisting largely of short-term high priority recommendations, was developed to immediately address PA 100 crashes.

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