
DELAWARE VALLEY
dvrpc
REGIONAL
PLANNING COMMISSION

February 2010

# Guiding Transportation Investments and Land Use Decisions along US 322

## Chester County

The Delaware Valley Regional Planning Commission is dedicated to uniting the region's elected officials, planning professionals and the public with the common vision of making a great region even greater. Shaping the way we live, work and play, DVRPC builds consensus on improving transportation, promoting smart growth, protecting the environment, and enhancing the economy. We serve a diverse region of nine counties: Bucks, Chester, Delaware, Montgomery, and Philadelphia in Pennsylvania; and Burlington, Camden, Gloucester and Mercer in New Jersey. DVRPC is the federally designated Metropolitan Planning Organization for the Greater Philadelphia Region — leading the way to a better future.

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

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# Acknowledgments

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# Executive Summary

Working with the Chester County Planning Commission, the Delaware Valley Regional Planning Commission (DVRPC) conducted a thorough analysis of the US 322 Corridor to assess land use, environmental policies and impacts, and transportation issues. The US 322 corridor is located in western Chester County, Pennsylvania. The study area encompasses approximately 15 miles of US 322 from the Lancaster County border in Honey Brook Township to US 30 Business in Downingtown Borough. The primary study area municipalities include the boroughs of Downingtown and Honey Brook, and the townships of Caln, West Brandywine, East Brandywine, Honey Brook, and West Nantmeal.

There are significant growth pressures in this part of the region due to its proximity to major employment centers and availability of developable land. In an effort to avert sprawl, there is a need for better land use controls coupled with infrastructure investments to preserve the quality of life for corridor residents. This study aims to preserve the operating performance of the current transportation facilities and promote multi-modal solutions in an effort to accommodate travel growth by coordinating land use and transportation reflective of smart growth principles.

With the support of the Chester County Planning Commission, DVRPC worked cooperatively with study area municipalities and pertinent state agencies to assess current transportation facilities and land use practices. The Pennsylvania Department of Transportation (PennDOT) is encouraging municipalities to work cooperatively along key transportation corridors to evaluate and plan for future growth and infrastructure improvements.

According to DVRPC estimates, the current population of the study area municipalities is over 44,000 persons and is forecasted to increase by 38 percent by the year 2035. While Chester County is forecasted to only grow by 31 percent, West Brandywine Township is forecast to grow by 59 percent and East Brandywine is forecast to grow by 46 percent.

Similar to population, employment in the seven municipalities is forecasted to increase. In 2005, approximately 20,000 residents were employed in the municipalities that make up the study area. DVRPC forecasts the total employment for the study area to increase by 24 percent by the year 2035.

An Environmental Justice assessment of the corridor was conducted to identify potential direct and indirect impacts of transportation projects on historically disadvantaged populations. Within this study area, the overall occurrence of disadvantaged population along US 322 is relatively low.

The development patterns of the US 322 corridor were analyzed and key smart growth planning techniques that have been adopted within the study area reviewed. Areas of specific interest—historic areas and redevelopment areas—are discussed, as they will have an impact on future transportation and infrastructure improvements for the corridor. There are 100 separate zoning categories within the eight municipalities along US 322, not including overlay districts. The zoning categories along the corridor are consistent with the corridor vision of conserving prime farmland and open space by clustering development within growth centers along the corridor. A vision for the US 322 corridor through Chester County includes:

- The US 322 corridor will be a gateway to rural Pennsylvania and a crossroad within the county.
- New growth and development will be provided in designated growth centers near water and sewer infrastructure necessary to accommodate such growth.
- New growth will complement and extend from the existing developments and not negatively affect agricultural and natural landscapes.
- Communities will strive to create defined Town Centers and Neighborhoods that maximize the rural and historic character of the area.
- Corridor communities will continue to preserve the natural areas and environmental quality through state, county, and local preservation programs.
- Corridor communities will work with the developers to attain a higher level of sustainability and design.
- Opportunities for increased transit will become part of the transportation network and provide linkages between residential developments and growth centers.

The natural resources of the US 322 corridor are critical to the area's sustainability, overall health, and quality of life. The integrity of these resources is inherently connected to the area's potential for future growth and transportation improvements. The corridor contains the headwaters of a significant water system that provides drinking water, recreation, and natural habitat. The water resources are increasingly threatened by polluted runoff from agricultural land and impervious surfaces.

The green infrastructure system in the corridor was reviewed and evaluated. It is important as it provides stormwater management, flood risk minimization, air and water quality improvement, temperature regulation, and habitat conservation. Three proposed greenways pass through the US 322 study area: Brandywine Creek, West Branch Brandywine Creek, and Great Valley Ridgelines.

The Lanchester Sanitary Landfill is owned and operated by the Chester County Solid Waste Authority (CCSWA). It is located in Honey Brook Township, and its impact on the corridor was assessed.

Corridor-wide environmental recommendations were developed. These include adopting agricultural best management practices, adopting or enhancing stream protection regulations, and implementing better stormwater design.

The transportation system was analyzed and recommendations developed. Corridor-wide improvements include developing Park-and-Ride facilities, implementing new commuter routes to employment parks, and rail and bus transit improvements.

The corridor has seen a growth in congestion issues during the weekday peak periods, which is exacerbated by the safety issues that exist at several intersections along the corridor.

Specific municipal recommendations were developed based on these congested and safety-related locations. These include:

- Honey Brook Borough/Honey Brook Township: gateway treatments along PA 10 and US 322, intersection improvements–lighting, signing, pavement markings, roadway realignment, and left-turn lanes;
- West Brandywine Township: PA 82 intersection improvements–lighting and tree trimming;
- West Brandywine Township: Swinehart Road intersection improvements–signing, roadway realignment;
- East Brandywine/West Brandywine Township: Culbertson Run Road intersection improvements–increasing capacity, striping, lighting, signing, pavement markings, and timing modifications;
- East Brandywine: a two-way left-turn lane (TWLTL) along North Guthriesville Road, Hopewell Road intersection improvements–signal timing modifications and Corner Ketch Road intersection improvements;
- Caln Township: US 30 Bypass improvements–pavement markings and new traffic signal, a ”Florida-T” roadway configuration, and improved Truck Route signage; and
- Downingtown Borough: retiming of Pennsylvania Avenue signal, coordination of US 322 signals, as well as improved Truck Route signage.

This report’s recommendations aim to alleviate potential congestion, improve highway efficiency, and enhance the quality of life within the communities along US 322. The implementation of these recommendations relies upon the corridor municipalities. A summary of each recommendation by subsection estimates possible project costs and identifies the responsible agency. Funding sources have also been identified for each recommendation. These are outlined by municipal, county, regional, and state funding sources.

CHAPTER 1

# Introduction

New homes are scattered throughout the corridor.

The US 322 corridor in Chester County, Pennsylvania, was identified through the Congestion Management Process (CMP) as an emerging corridor with potential future congestion problems as growth pressures continue in this part of the region. With the support of the Chester County Planning Commission, DVRPC worked cooperatively with study area municipalities and pertinent state agencies to assess current transportation facilities and land use practices. The goals of the study are to promote solutions to alleviate current and forecasted travel growth, further the goals of coordinated land use, and provide policy rationale for future transportation improvements. PennDOT is encouraging municipalities to work cooperatively along key transportation corridors to evaluate and plan for future growth and infrastructure improvements. The US 322 corridor study is intended to accomplish the following:

- preserve the operating performance of current transportation facilities;
- promote conditions to achieve multi-modal transportation solutions;
- further the goals of coordinated land use and transportation planning;
- determine future improvement priority areas;
- support and maintain the overall quality of life; and
- encourage municipal actions because of the study's findings.

## Corridor Description

The study area encompasses approximately 15 miles of US 322 from the Lancaster County border in Honey Brook Township to US 30 Business in Downingtown Borough. The primary study area municipalities include the boroughs of Downingtown and Honey Brook, and the townships of Caln, West Brandywine, East Brandywine, Honey Brook, and West Nantmeal. The location of the study area is shown in Figure 1, with the study area limits

stretching one-half mile from the center line of US 322 in order to provide a thorough land use and environmental assessment of the development trends for the corridor.

## Previous Studies

Studies preceded this US 322 corridor study. In 1994, DVRPC conducted a zoning build-out analysis for potential high growth corridors, including US 322. The report contained the major findings and methodology used to analyze the implications of municipal zoning ordinances and measure the amount of cumulative growth possible under the existing zoning. The report found that the zoning within the study area in 1994 could potentially accommodate an additional 54,000 residents and 46,000 employees. This would result in a 117 percent increase in the population for year 2020 and a 322 percent increase in employment for year 2020. The US 322 corridor has continued to grow over the past decade and in 2005 was classified as an emerging corridor for congestion in DVRPC's CMP.

In 2008, DVRPC also completed a study of the US 30 Coatesville-Downingtown Bypass. This study examined traffic along the US 30 Bypass on and off ramps and congestion issues during peak periods. The US 322 corridor study is compatible with the local comprehensive plans, Chester County's *Landscapes2*, and DVRPC's long-range plan, *Connections–the Regional Plan for a Sustainable Future*. The recommendations within this study also promote compliance with the Pennsylvania Municipalities Planning Code (MPC), in particular Article III of the MPC which requires municipalities to plan for land use, historic preservation, community facilities, circulation, and to adopt ordinances that are consistent with the municipal comprehensive plan. The MPC states that zoning must encourage the preservation of agricultural areas and other important resources.

## Planning Process

The US 322 corridor study was conducted by DVRPC through fiscal year 2009 with support from the Chester County Planning Commission. A steering committee was formed to help guide the direction and findings of the study. Representatives were invited to participate from the study area municipalities, Chester County, Lancaster County, Chester County Waste Authority, environmental advocacy groups, and from the Pennsylvania Department of Transportation (PennDOT). A thorough review of all municipal and county comprehensive plans and zoning was conducted. Steering committee meetings were held to introduce participants to the study tasks. A kick-off meeting was held in Honey Brook Borough in November 2008, and a subsequent meeting was held to review preliminary recommendations in April 2009.

Figure 1

# US 322: Study Area

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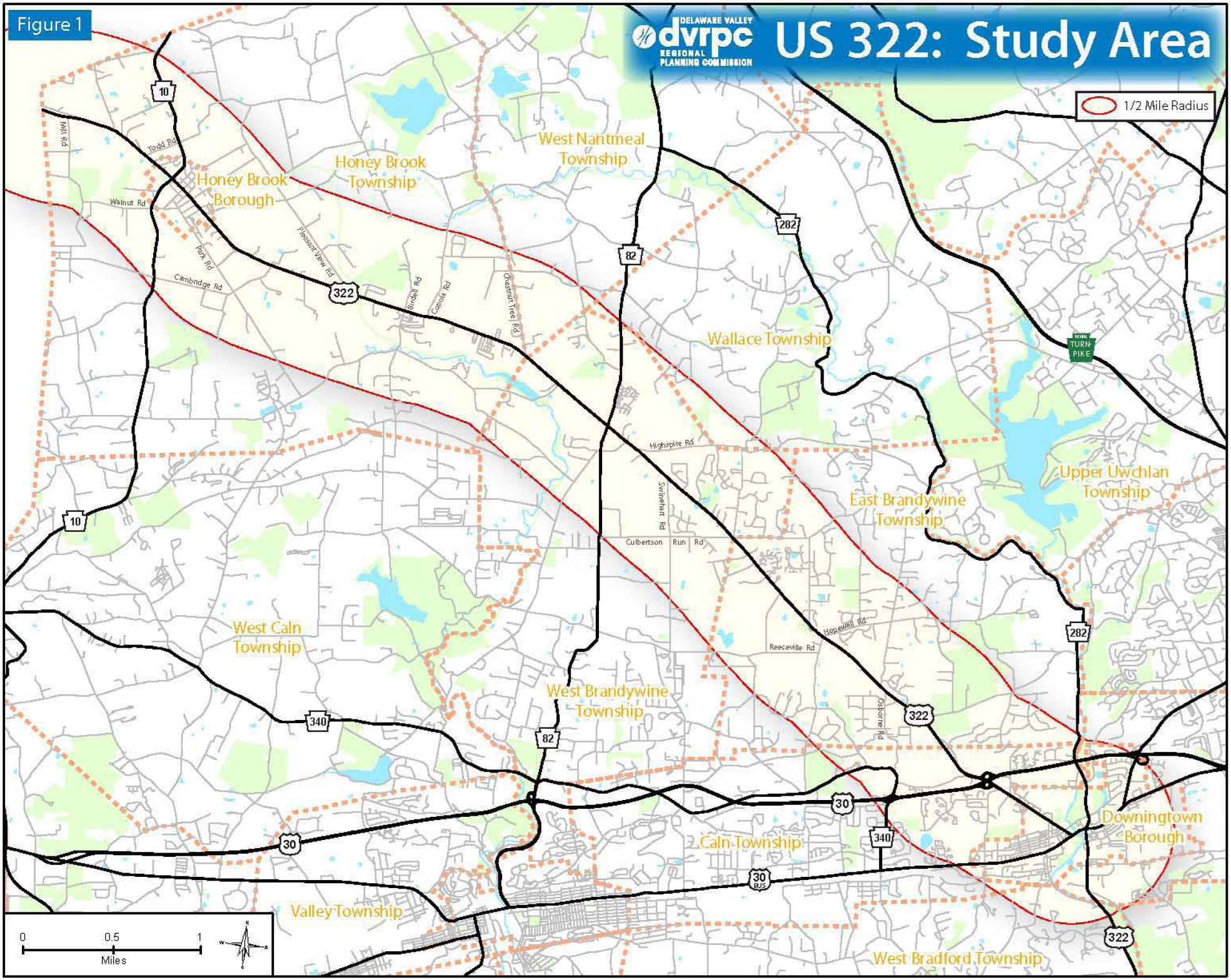

## Linking Land Use and Transportation

Corridor planning recognizes the linkages between land use and transportation and allows for the creation of integrated, comprehensive plans that cross municipal and county boundaries. Transportation corridors are appropriate planning areas because they are large and provide important connections between local jurisdictions and regions. Corridor plans focus on multi-modal transportation as well as other important components of the transportation network such as bicycles and pedestrians. There are several benefits to corridor plans:

- They provide a long-range framework for needed transportation and land use changes.
- Projects are evaluated through this framework.
- Alternatives to increased roadway capacity are examined, such as access management, transit, transportation demand management (TDM), and development patterns.
- They provide an opportunity for local jurisdictions to coordinate and collaborate on future improvements.

# CMP

The 2005 CMP advances the goals of the DVRPC long-range plan and strengthens strategies to mitigate congestion. Where additions to capacity are appropriate, the CMP includes supplemental strategies to reduce travel demand and improve operations. An updated CMP was adopted by the DVRPC Board in 2009 and provides guidance for all corridor studies within the region.

## US 322 Emerging Corridor

As shown in Figure 2, the DVRPC CMP identified the following corridors as congested or emerging: US 202, US 322, US 30, and PA 100. The US 322 subcorridor is shown as an emerging corridor and a continuation of the US 30 congested corridor. Emerging corridors are defined as corridors *that seem likely to become congested or are otherwise important for proactive planning*. These are based on travel corridors where three or more of the CMP criteria are in effect. The criteria include: (1) current daily congestion, (2) current peak hour congestion, (3) heavily used facilities, (4) 2025 daily congestion, (5) 2025 peak hour congestion, (6) frequent crash-related congestion, (7) inter-modal importance, and (8) land use focus. At a regional planning level, the strategies appropriate in all subcorridor types are a starting point to further study in emerging corridors.

## Subcorridor Principles

CMP corridors are divided into subcorridors. Subcorridors help with selecting strategies to reduce or manage congestion in congested corridors and are divided where similar strategies may be applicable. The challenges facing the US 322 corridor–dependence on automobile travel, single-use land development, limited transit options–can be addressed through congestion management strategies identified in the CMP. The remaining chapters in this study will evaluate the following techniques that may be implemented along the US 322 corridor to minimize the impact of future development. They include the following:

- safety improvements;
- pedestrian improvements;
- wayfinding;
- signal upgrades;
- intersection improvements (of a limited scale);
- access management;
- marketing (including outreach, education, and planning) of TDM; and
- growth management and smart growth policies.

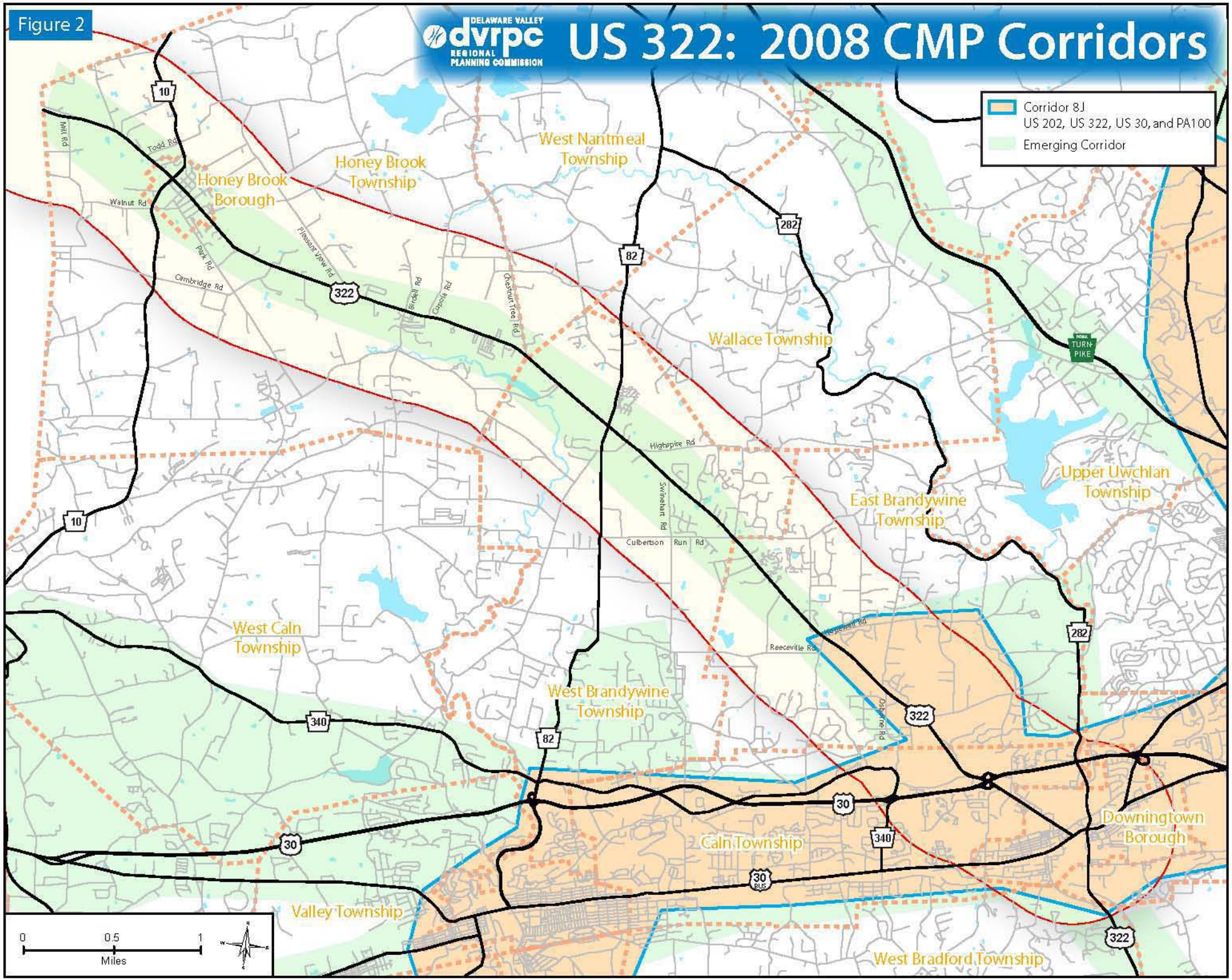
Figure 2
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US 322: 2008 CMP Corridors
Corridor 8J
US 202, US 322, US 30, and PA100
Emerging Corridor
West Nantmeal Township
Honey Brook Township
Honey Brook Borough
Wallace Township
East Brandywine Township
Upper Uwchlan Township
West Caln Township
West Brandywine Township
Caln Township
Downingtown Borough
Valley Township
West Bradford Township
Mill Rd
Todd Rd
Walnut Rd
Park Rd
Cambridge Rd
Pleasant View Rd
Birdell Rd
Capola Rd
Chestnut Tree Rd
Highspire Rd
Swinehart Rd
Culbertson Run Rd
Reeceville Rd
Creek Rd
10
82
282
322
340
30
30 BUS
TURN-PIKE
0
0.5
1
Miles

CHAPTER 2

# Demographics

Land use change is often spurred by population and housing growth. Population growth places strains on existing infrastructure, water and sewer systems, and schools. New housing construction can consume undeveloped land faster than the rate of population growth. Growth in the number of households in an area tends to be a more accurate indicator of development trends than growth in population.

## Population and Employment Growth

According to DVRPC estimates and forecasts, the current population of the study area municipalities is over 44,000 persons and is forecast to increase by 38 percent by the year 2035. Table 1 shows the forecasted population for the corridor. While Chester County is forecasted to only grow by 31 percent, several municipalities along the US 322 corridor are forecasted to grow at an even faster rate. West Brandywine Township is forecast to grown by 59 percent and East Brandywine by 46 percent.

Similar to population, employment in the seven municipalities is forecast to increase. In 2005, approximately 20,000 residents were employed in the municipalities that make up the study area, with Downingtown Borough containing 7,200 jobs, or 35 percent of the total employment. Caln Township contained 7,254, an additional 36 percent of the total employment. DVRPC forecasts the total employment for the study area to increase 24 percent by the year 2035. The majority of absolute employment growth is forecast to occur in Caln Township. Table 2 illustrates employment change for the study area from 2000 to 2035.

Table 1: 2035 Population Forecasts

| | Population | | | Population Change 2005–2035 | |
|---|---|---|---|---|---|
| | 2005 | 2015 | 2035 | Absolute | Percent |
| Caln Township | 12,270 | 14,013 | 16,939 | 4,669 | 38 |
| Downingtown Borough | 7,856 | 8,531 | 9,830 | 1,974 | 25 |
| East Brandywine Township | 6,449 | 7,963 | 9,421 | 2,972 | 46 |
| Honey Brook Borough | 1,388 | 1,554 | 1,907 | 519 | 37 |
| Honey Brook Township | 6,824 | 7,593 | 8,883 | 2,059 | 30 |
| West Brandywine Township | 7,636 | 9,357 | 12,174 | 4,538 | 59 |
| West Nantmeal Township | 2,193 | 2,373 | 2,747 | 554 | 25 |
| Study Area Total | 44,616 | 55,417 | 61,901 | 17,285 | 39 |
| Chester County | 473,880 | 531,971 | 622,498 | 148,618 | 31 |

*Source:* DVRPC. Analytical Data Report 14, *Employment Forecasts.* August 2007.

Table 2: Employment Change

| | Employment | | | Employment Change 2005–2035 | |
|---|---|---|---|---|---|
| | 2005 | 2015 | 2035 | Absolute | Percent |
| Caln Township | 7,254 | 7,862 | 8,942 | 1,688 | 23 |
| Downingtown Borough | 7,200 | 7,603 | 8,280 | 1,080 | 15 |
| East Brandywine Township | 970 | 1,148 | 1,446 | 476 | 49 |
| Honey Brook Borough | 495 | 599 | 773 | 278 | 56 |
| Honey Brook Township | 1,924 | 2,237 | 2,764 | 840 | 44 |
| West Brandywine Township | 2,465 | 2,655 | 2,973 | 508 | 21 |
| West Nantmeal Township | 434 | 478 | 552 | 118 | 27 |
| Study Area Total | 20,742 | 22,582 | 25,730 | 4,988 | 24 |
| Chester County | 253,628 | 285,352 | 337,093 | 83,465 | 33 |

*Source:* DVRPC. Analytical Data Report 14, *Employment Forecasts.* August 2007.

## Employment Centers

Employment centers are integrated, concentrated areas of non-residential developed land that have at least 500 employees and an employment density of at least 0.5 employees per acre. These centers, classified by DVRPC, are the backbone of the region's economy, affecting goods movement and communication systems. Highlighted in each employment center are major employers, those containing more than 300 employees. Based on 2000 employment and land use data, there are 88 employment centers in DVRPC's five Pennsylvania counties. Employment centers within proximity to the defined study area are shown in Figure 3 and include US 322/Honey Brook, US 322/Brandywine, Downingtown/Exton, and Coatesville/Thorndale. It should be noted that employment along the US 322 corridor is limited to parcels along the road within the boroughs of Downingtown and Honey Brook. Major employment centers within Chester County are along the US 30 and US 202 corridors, therefore requiring residents to travel to these major employment destinations.

## Commuting Patterns to Employment

The US 322 corridor is a major arterial that moves people and goods. Commuting patterns may indicate at what times the road network may be more congested and how workers get to their place of employment. Table 3 outlines the commuting patterns for the study area municipalities. Based on 2000 census data, less than 5 percent of workers are using transit to get to work. Transit service is available by train to Philadelphia, but the mean travel time indicates that many workers are traveling to employment centers within Chester County. As shown in the employment centers map (Figure 3), these places of employment are not served by transit. For each municipality in the study area, over 75 percent of workers are driving alone to work. To encourage less dependence on private automobile travel to work, Park-and-Ride locations have been identified for future employee shuttle services.

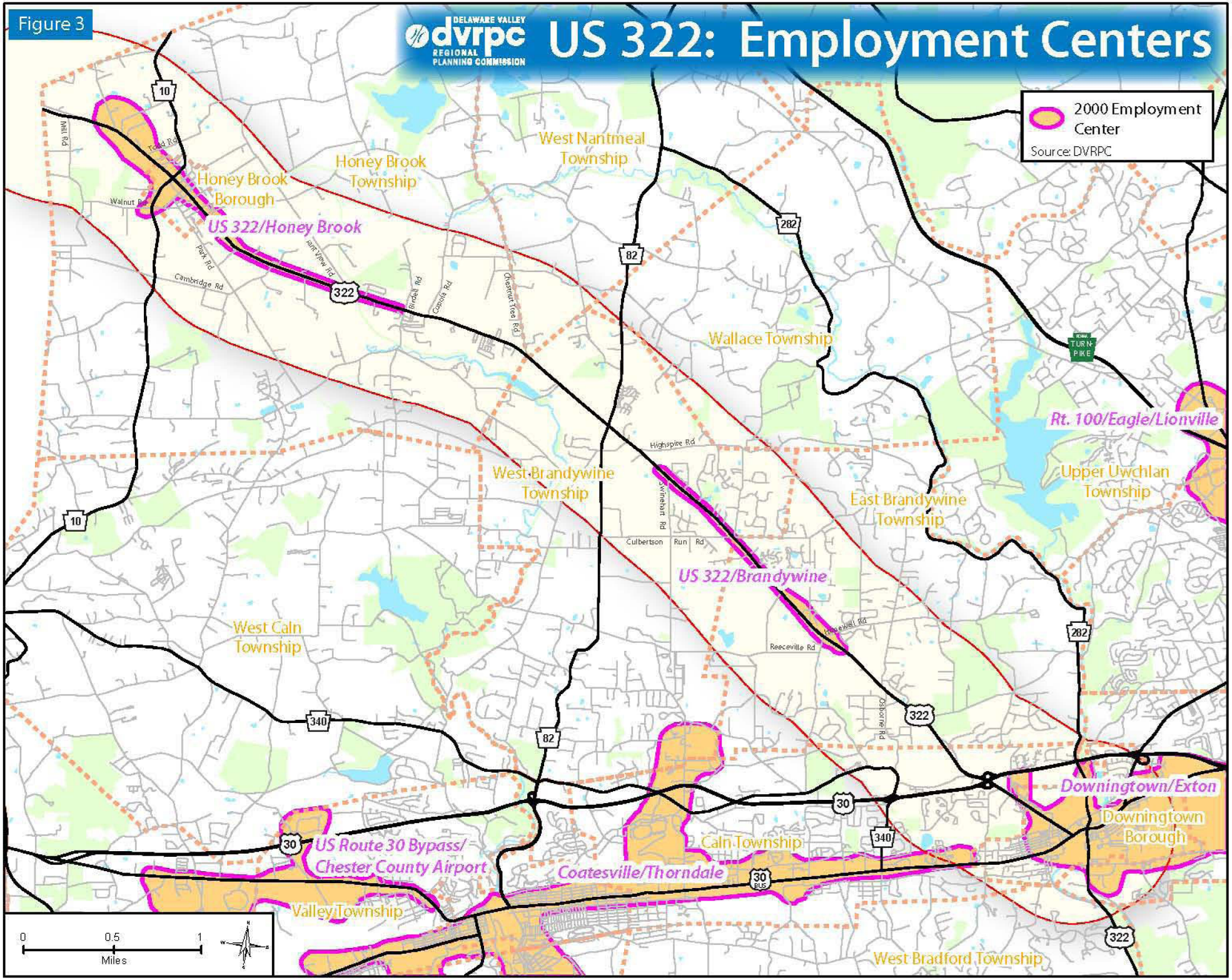
Table 3: Commuting Patterns

| | Drove Alone (%) | Carpooled (%) | Transit (%) | Mean Travel Time (Minutes) |
|---|---|---|---|---|
| Caln Township | 81.6 | 10.8 | 3.0 | 28.4 |
| Downingtown Borough | 78.8 | 13.1 | 3.2 | 22.0 |
| Honey Brook Borough | 79.7 | 11.3 | 0 | 29.7 |
| Honey Brook Township | 74.5 | 11.7 | 0.8 | 27.4 |
| East Brandywine Township | 86.4 | 6.5 | 1.5 | 28 |
| West Brandywine Township | 85.2 | 8.7 | 0 | 30 |
| West Nantmeal Township | 82.7 | 7.1 | 0.6 | 29.3 |

*Source:* DVRPC. U.S. Census Data. 2000.

Figure 3

# US 322: Employment Centers



## Environmental Justice

As part of Title VI of the Civil Rights Act of 1964 and the 1994 President's Executive Order on Environmental Justice (EJ), DVRPC adopted guidelines to mitigate potential direct and indirect impacts of transportation projects on historically disadvantaged populations. DVRPC employs an environmental justice methodology that quantifies levels of disadvantage within the nine-county region. Using 2000 census tract data, categories of eight potential disadvantaged groups were analyzed. They include non-Hispanic minority, carless households, female head of household with child, limited English proficiency, poverty level, elderly over 75 years of age, physically disabled, and Hispanic (Table 4). Each category is analyzed for the total concentration in the region, generating a baseline number. If a specific census tract contains a concentration higher than the baseline threshold, it is considered disadvantaged. Census tracts can therefore contain zero to eight degrees of disadvantage (DOD).

Table 4: Degrees of Disadvantage (DOD)

| DOD Population Group | Number of Tracts |
|---|---|
| Non-Hispanic Minority | 0 |
| Carless Households | 0 |
| Female Head of Household with Child | 1 |
| Limited English Proficiency | 0 |
| Poverty Level | 0 |
| Elderly over 75 Years of Age | 4 |
| Physically Disabled | 2 |
| Hispanic | 0 |

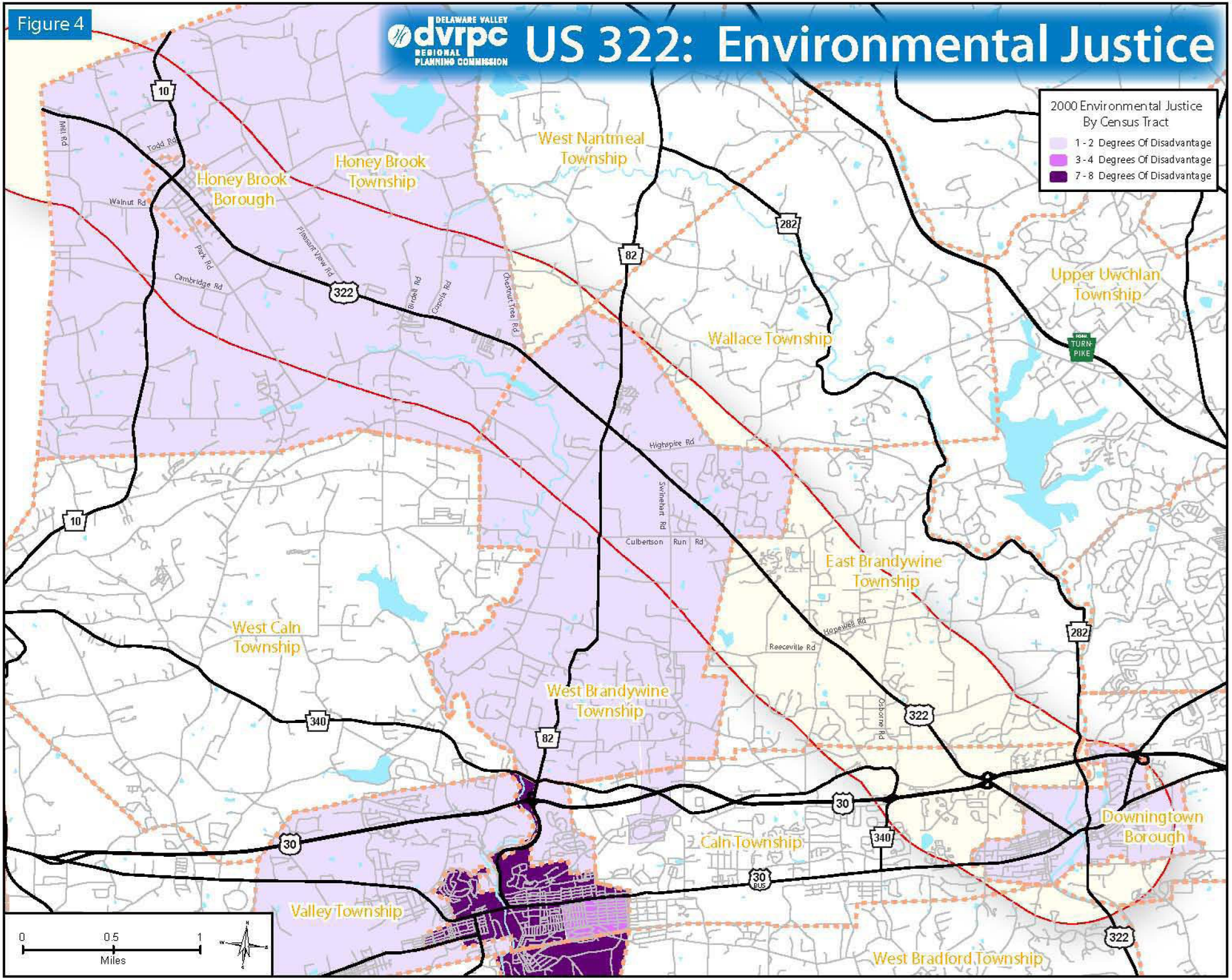
*Source:* DVRPC. 2009.

Figure 4 illustrates the ten census tracts that are wholly or partially located within the US 322 Study Area. The overall occurrence of disadvantage along US 322 is relatively low: four census tracts contain one or two DODs, and seven census tracts contain zero DODs. Two census tracts have a higher population of physically disabled populations. Four census tracts have a higher population of elderly populations over 75 years of age. One census tract has a higher population of female head of households with a child.

This analysis points out two trends with the US 322 corridor. They are the high number of elderly and the overall dependence on the automobile for transportation. Municipalities should ensure that new developments that cater to 55 and older populations address transportation, emergency care, and universal design elements. As shown in the demographic analysis, a majority of corridor residents are driving alone to their place of employment. New employment in the corridor should be centered near existing transit, or shared shuttle opportunities should be further explored.

Figure 4

# US 322: Environmental Justice



CHAPTER 3

# Land Use Vision

The municipal comprehensive plan guides the decision-making process for physical and social development of a municipality or county. It provides the vision and rationale for the municipal zoning ordinance and guides future growth. Understanding each comprehensive plan and zoning ordinance for the study area communities is critical to ensuring that future transportation and infrastructure improvements are linked to an overall vision that supports each community and the county. In addition to local plans, regional, county, and state plans that pertain to the corridor are important for consistency. This chapter outlines the development patterns of the US 322 corridor and highlights key smart growth planning techniques that have been adopted within the study area. Areas of specific interest—historic areas and redevelopment areas—are discussed, as they will have an impact on future transportation and infrastructure improvements for the corridor.

## Regional Policy

### *Connections–The Regional Plan for a Sustainable Future*

The region's long-range transportation and land use plan, *Connections*, was adopted by DVRPC to provide an integrated transportation and land use vision and policies for the region's growth and development. The transportation element of the plan presents a vision for the regional transportation system, including a specific set of transportation policies and strategies to achieve the vision. The plan also includes future study projects where a problem can be anticipated or final project or service improvements have been determined. Two of the key tenets of the future vision are to "support land use goals by transportation decisions" and to "advance economic development through transportation." The plan seeks to achieve this vision by supporting projects and improvements within the growth areas and centers identified in the plan. The land use element of the plan focuses on building a future that responds to the region's identified challenges and leads to the creation of sound communities, a healthy environment, and a stable foundation for economic development and essential infrastructure. Key policies of the plan include revitalization of the region's core cities, stabilization of the developed municipalities, growth management for growing communities, preservation of rural communities, and conservation of sensitive natural areas. The plan provides a regional-scale view of future development patterns and presents a comprehensive long-range blueprint for moving people and goods safely and efficiently.

*Connections* categorizes the 353 municipalities of the region into Planning Areas: Core Cities, Mature/Developed Communities, Growing Suburbs, and Rural Areas. Also included are specific growth areas and a hierarchy of "centers" of concentrated residential, commercial, and industrial development where future infrastructure will be supported and targeted. The US 322 corridor study municipalities fall into three categories within DVRPC's Planning Areas. The boroughs of Downingtown and Honey Brook are Mature/Developed Communities. Developed communities represent the region's first-generation suburbs, whether close to Philadelphia or in outlying locations. Developed communities experienced the first wave of post-war growth and are still stable and thriving, with housing opportunities for young families, transportation options, and a strong community identity. The townships of Caln, East Brandywine, and West Brandywine are Growing Suburbs. This category includes municipalities that are experiencing or forecast to experience significant growth in population, jobs, and land consumption. The remaining three townships in the study area, Honey Brook Township, Wallace Township, and West Nantmeal, are Rural Areas. These communities are valued as the most productive agricultural lands in the region. These areas maintain active farming communities and provide for limited infrastructure systems, preservation of rural lifestyles, and support for continued farming and natural resource protection.

## Chester County's *Landscapes2*

*Landscapes2* is Chester County's Draft comprehensive policy plan. The plan provides a framework for growth management and preservation and has guided municipal officials, developers, and citizens in setting priorities for future land use and transportation decisions. Originally adopted in 1996, *Landscapes* is currently being updated to account for the population boom and increased impacts on Chester County's infrastructure and transportation systems.

## *Landscapes2* Land Use Policies

The goals of the *Landscapes2* land use policy are to preserve and enhance the diverse mix of land uses within the urban, suburban, rural, agricultural, and natural landscapes to maintain a balance between growth and preservation. The US 322 study involves eight different communities with different character and guiding policies. The borough's of Downingtown and Honey Brook have been identified as urban areas along the corridor and should strive to provide a diversity of commercial and residential types at urban densities. The townships of East and West Brandywine are identified as suburban. The guiding principles includes supporting infill development, encouraging mixed use, improving public transportation options, and applying smart growth principles to create walkable neighborhoods. The center of the study area includes portions of West Brandywine and Honey Brook Township which are identified as rural. This area has prime farmland that should be preserved. A small area of Honey Brook Township, Rocklyn Station, has been identified as a rural center. This area currently has higher densities than its surrounding residential developments and is identified for future development that

includes higher densities and a mix of uses. The remainder of Honey Brook Township is identified as agricultural. Guiding principles are centered on the farming industry and preserving a viable agricultural economy.

## Municipal Comprehensive Plans

The comprehensive plans for each of the study area municipalities are important elements to the future of the US 322 corridor. Each community has increased residential development patterns that contribute to sprawling land use patterns and increased demand on the highway network. Select communities along the corridor—Honey Brook Township and West Brandywine—have adopted proactive planning techniques, such as conservation design and cluster development, to minimize the impact of low-density development. Honey Brook Township and Borough have a combined comprehensive plan that promotes development in the Borough and concentrating development in designated areas such as the Rocklyn Station area. The Borough of Downingtown has made redevelopment a priority near the southeastern Pennsylvania Transportation Authority (SEPTA) station and other vacant parcels in the downtown. Outlined below are specific plans for the study area communities.

# Priority Development Areas

To help encourage compact development within the corridor, two of the study area municipalities have designated areas for redevelopment: Downingtown Borough and Honey Brook Township. East Brandywine Township has identified the Village of Guthriesville as a center with a concentrated mix of uses. Below is an explanation of key development areas from each of the study area municipalities.

## East Brandywine Township

### Guthriesville Village

The Historic Village of Guthriesville remains the center of East Brandywine's history and future development. Located at the intersection of Horseshoe Road (US 322) and Bondsville Road/Hopewell Road, the Guthriesville Village includes the properties extending along Horseshoe Pike just west of North Guthriesville Road to Bondsville Road/Hopewell Road.

*The Village of Guthriesville Vision Plan and Development Strategy* provides a guide for the preservation and controlled development of the Guthriesville Village located within East Brandywine Township. The Plan contains a series of infrastructure, zoning, and development objectives with eleven specific

strategies for accomplishing these objectives. These strategies are critical to the preservation of this small, pedestrian-oriented village which abuts areas for larger-scale commercial businesses.

*The Village of Guthriesville Vision Plan and Development Strategy* encourages businesses that will make this the commercial hub of East Brandywine Township. Large-scale uses that require larger areas and auto-oriented businesses will be encouraged to locate outside of Guthriesville. According to the Village Vision Plan, the Village of Guthriesville can support over 400,000 square feet of retail and over 150,000 square feet of community-serving goods and services. The Village Vision Plan and East Brandywine Comprehensive Plan are proactively accommodating this growth in appropriate areas.

### Downingtown Borough

#### Central Business District Revitalization Plan

*The Central Business District Plan: A Strategic Plan for Downtown* was adopted in 1999. The report's recommendations and strategies work to "promote economic development without adversely affecting existing businesses and residents." The report's strategies outline a vision for the future of Downingtown Borough and provide a framework for further redevelopment and revitalization efforts in the downtown.

#### Sonoco Development

The Sonoco property is a 76-acre industrial site located in the southwest corner of Downingtown Borough adjacent to the Keystone Opportunity Zone (KOZ), providing the opportunity for two large-scale developments. These two developments would provide the catalyst for redevelopment in the Johnsontown neighborhood and provide the opportunity to ease congestion in the downtown by extending Boot Road through the redevelopment site. In addition, the Amtrak station may be relocated to provide for housing near transit and better passenger access and facilities.

#### KOZ

Downingtown's KOZ encompasses 70 acres located in the southwest of the borough near Johnsontown Park and the SEPTA/Amtrak regional rail station, and within walking distance of the downtown. The KOZ offers an opportunity to improve the pedestrian and vehicular pattern in the downtown. Plans are in place to provide for a new pedestrian tunnel at the train station, which will create an alternative route for pedestrians traveling from Johnsontown Park. In addition, improvements to Boot Road and Business Route 30, as well as enhanced parking structures are part of the KOZ development plan.

### Kardon Park

Kardon Park is a 45-acre site located in Downingtown Borough and East Caln Township. The site has immediate access to the Route 30 Bypass and Business Route 30, providing for easy commuting to the major employment centers in Chester County. The site was previously an industrial site and requires remediation but offers tremendous opportunity for redevelopment in the downtown.

One of the largest residential projects in Downingtown Borough is proposed for the Kardon Park site. Preliminary plans propose a mixed-use development with 364 multi-family residential units and over 20,000 square feet of commercial space with live-work units above. The development will have pedestrian trails and connect to the Chester County trail system.

### Brandywine Paper Mill

The Brandywine Paper Mill was historically one of Downingtown's economic anchors, located in the center of the Borough. Operations were closed several years ago. This site has been rezoned for mixed-use development and a possible parking garage.

### Honey Brook Township

### Rocklyn Station Strategic Development Plan

Rocklyn Station covers 1,120 acres in the southeastern area of Honey Brook Township, outside of the core agricultural area. The planning area includes parcels on the north and south sides of US 322 running east–west from Chestnut Tree Road to Birdell Road. The area is bound to the south by the West Branch of the Brandywine Creek and to the north by the North Branch of the Brandywine Creek. The area has several mobile home parks: Rockville, Brandywine Terrace, Keystone, Valley View, Green Acres, Lazy Acres, and Cupola Court. While this may not be the optimal housing design, the layout and street cross-section provide a foundation for future development that is more pedestrian-friendly. Commercial businesses are also smaller in scale, which allows for design guidelines that promote neighborhood character. The overall goal of the Rocklyn Station Plan is to create a place where there are opportunities to live, work, shop, and play in proximity to one another.

## Historic Areas

Within Pennsylvania, Chester County is second only to Philadelphia in having the most resources listed in the National Register of Historic Places. Within the study area, historic preservation organizations include the Chester County Historic Preservation Network and the Chester County Historical Society. In a recent survey as part of Chester County's *Landscapes2* Draft Policy Plan, nearly half of respondents identified historic and cultural resources as one

of the top three assets in the county. US 322, locally known as the Horseshoe Pike, was originally laid out in 1737 as Paxtang Pike. Meaning “still waters,” Paxtang was an early name for the area near present-day Harrisburg. In 1803, the road was renamed the Downingtown-Ephrata-Harrisburg Turnpike, known today as the Harrisburg-Downingtown Turnpike. US 322 became significant for trade between Harrisburg and Downingtown, an early indication of settlement patterns.

## Downingtown Borough

Downingtown Borough has six historic districts. Only one district, the East Lancaster Avenue Historic District, is listed in the National Register of Historic Places. Within this district are three historic properties. The most important property, the Log House, is located on the corner of East Lancaster Avenue and Manor Road. Listed below are four historic districts in proximity to the US 322 study area.

### East Lancaster Avenue Historic District

The East Lancaster Avenue Historic District is located on East Lancaster Avenue between Brandywine Avenue and Woodbine Road in Downingtown Borough. Many buildings in the historic district are in the Georgian, Federal, Italianate, or Queen Anne style. The district contains 121 buildings including domestic dwellings, stores, and churches. The western portion of this district is located within the US 322 study area.

### Brandywine Avenue Historic District

The Brandywine Avenue Historic District is south of the East Lancaster Avenue Historic District, located between Boot Road and Washington Avenue. The properties in this historic district include residential units as well as the historic Sonoco manufacturing area. This area will have an impact on the expansion of Boot Road or any other redevelopment projects.

### West Lancaster Avenue Historic District

The West Lancaster Avenue Historic District is located on West Lancaster Avenue between the Brandywine Creek and Aston Avenue. A small portion of this historic district is located in the US 322 study area.

### Kamestown Historic District

The Kamestown Historic District is located in a residential neighborhood of Downingtown Borough. The southern border abuts the West Lancaster Avenue Historic District, and its eastern border is US 322/Manor Avenue.

## East Brandywine Township

### Village of Guthriesville

The Village of Guthriesville developed at the crossroads of US 322/Hopewell Road/Bondsville Road during the first three quarters of the nineteenth century. The village contains a number of intact eighteenth-and nineteenth-century buildings, concentrated primarily on the south side of US 322. Guthriesville grew as an important stop on the Horseshoe Turnpike and continues to be the social, governmental, and commercial center of East Brandywine Township. The Guthriesville Historic District is located along US 322 in East Brandywine Township and was determined to be historic and eligible for listing in the National Register in 1999.

## Honey Brook Township/Borough

### Honey Brook Historic District

The Honey Brook Historic District was determined to be eligible for listing in the National Register in 2002. This district contains structures built mostly between 1830 and 1940, many of which are in the Italianate, Second Empire, and Queen Anne styles of architecture.

### Cupola Historic District

The Cupola Historic District is located in the Village of Cupola in Honey Brook and West Nantmeal Townships. This district historically contained domestic dwellings, agricultural processing buildings, and businesses. Most buildings were constructed between 1746 and 1918 and many are in the Gothic Revival style. The district was determined to be eligible for inclusion in the National Register in 1999.

## West Brandywine Township

### Hatfield-Hibernia Historic District

The Hatfield-Hibernia Historic District is located on 828 acres in West Brandywine and West Caln Townships. The district dates from 1749 and contains 19 contributing Greek revival and Stick/Eastlack style buildings, including domestic dwellings, a manufacturing facility, and a manufacturing facility furnace. This historic district was listed in the National Register in 1984.

## Existing Land Use

DVRPC uses aerial photographs to assist with a regional land use inventory. In order to evaluate how the corridor has developed, land use from 1995 was also reviewed. Table 5 indicates the increase in different land uses along US 322 since 1995. The comparison includes land within one mile of the centerline of US 322. By 2005, additional residential uses have been developed along the corridor: predominately single-family detached units. There has been a loss of over 1,000 acres of agriculture and 500 acres of wooded areas within the study area since 1995.

Table 5: Land Use Comparison by Acres

| | 2005 Acres | 1995 Acres | 1995–2005 |
|---|---|---|---|
| Agriculture | 7336.68 | 8486.64 | -1149.96 |
| Commercial | 491.14 | 289.43 | 201.71 |
| Community Services | 167.36 | 147.44 | 19.92 |
| Manufacturing: Light Industrial | 230.11 | 229.06 | 1.05 |
| Mining | 2.16 | 13.63 | -11.47 |
| Parking | 244.86 | 138.72 | 106.14 |
| Recreation | 527.28 | 138.10 | 389.19 |
| Residential: Mobile Home | 175.04 | 139.01 | 36.03 |
| Residential: Multi-Family | 370.01 | 145.54 | 224.47 |
| Residential: Row Home | 6.07 | 21.04 | -14.97 |
| Residential: Single-Family Detached | 4161.96 | 3754.11 | 407.85 |
| Transportation | 74.92 | 70.91 | 4.01 |
| Utility | 189.95 | 225.15 | -35.2 |
| Vacant | 697.30 | 340.99 | 356.31 |
| Water | 152.08 | 160.94 | -8.86 |
| Wooded | 4781.64 | 5306.74 | -525.1 |

*Source:* DVRPC. 2009.

## Corridor Zoning

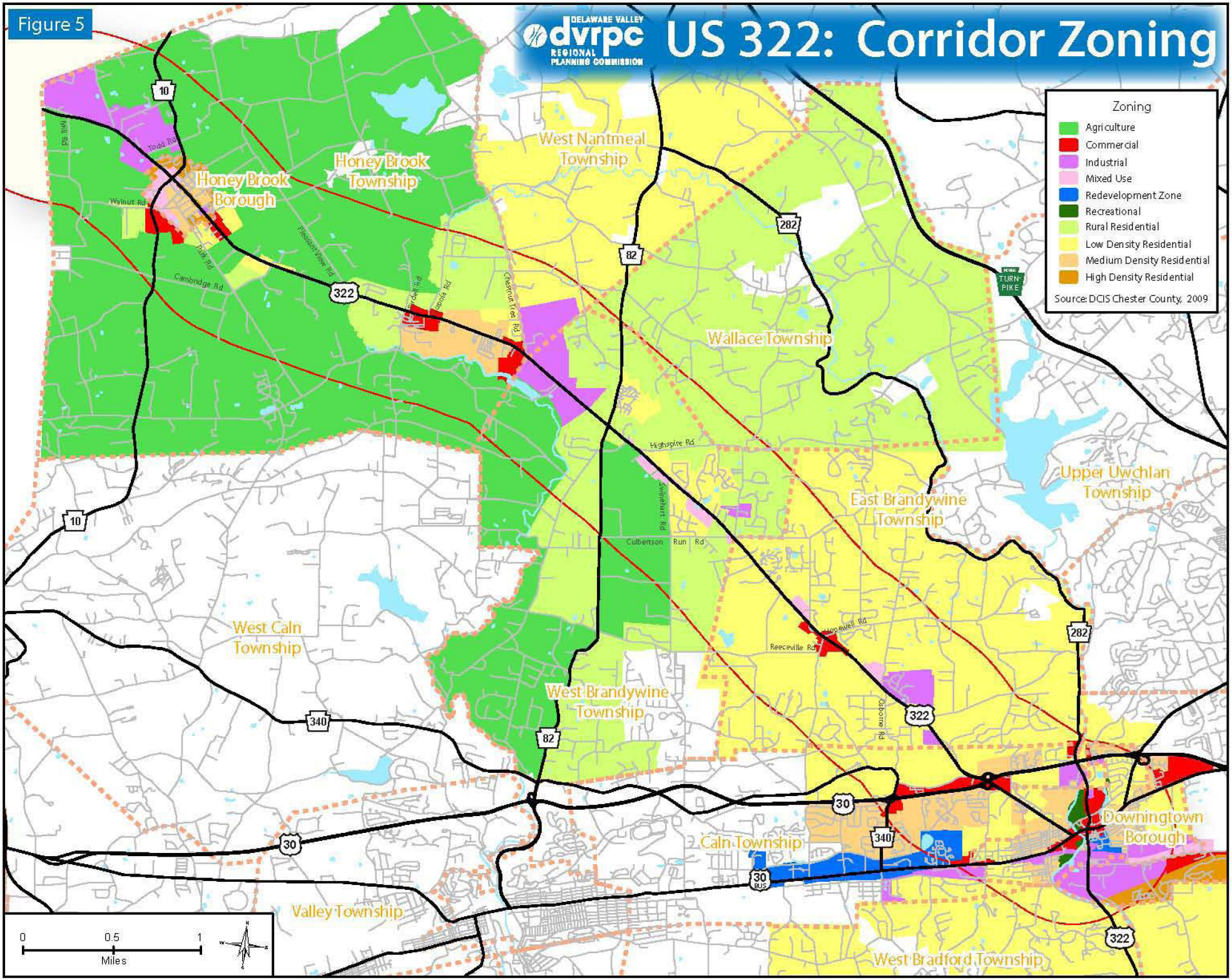
The municipal zoning code dictates what can be built in terms of development form and uses. In Pennsylvania, each municipality has local zoning control, permitting the locality to create their own zoning ordinance and districts. There are 100 separate zones within the eight municipalities along US 322, not including overlay districts. Similar to land use, the zoning along US 322 has been generalized and consolidated into general categories based on use and form. Generalized zoning for the corridor is shown in Figure 5.

The zoning categories along the corridor are consistent with the corridor vision of conserving prime farmland and open space and clustering development within growth centers along the corridor. Figure 6 illustrates how higher density residential uses are zoned for Downingtown and Honey Brook boroughs and the Rocklyn Station Development within Honey Brook Township. Mixed-use zones are shown in centers such as the Village of Guthriesville and Honey Brook.

Municipal zoning categories are also generally consistent in terms of residential densities and setbacks. The Honey Brook Township and West Brandywine municipal border does present an inconsistency with industrial uses zoned next to conservation areas and mixed-use residential and commercial in Honey Brook Township. While the existing uses in this area are not presently an issue, municipalities should ensure proper buffering between additional industrial uses and future residential development within this area.

Figure 5

# US 322: Corridor Zoning



## Corridor Land Use Vision

Creating a unified vision for the corridor begins with each community's comprehensive plan. Each of the study area townships have laid out the future of US 322 with low-density residential development, limited commercial development, and key mixed-use areas. At the same time, the preservation of open space and rural landscape remains vital to maintaining the quality of life that so many residents of Chester County desire. The Corridor communities have outlined sustainability and increased densities to some extent within their regulatory documents; however, the development patterns that have taken place have been independent of each other and continue to support sprawl. As development has occurred with few transportation improvements, land use decisions along and near US 322 have placed pressure on the road network. For example, residential developments have been built that provide access on side streets. No improvements have been made to the intersections, therefore making left-hand turns difficult at times. In addition, continued sprawl and increased automobile use will begin to negatively influence the Amish communities still thriving along the western portion of the study area.

Over the next few years, it is expected that the US 322 corridor will face continued growth pressure. The corridor vision reflects various scales (regional, county, and local) and recognizes the need for different perspectives among the study area communities. A vision for the US 322 corridor through Chester County includes:

- The US 322 corridor will be a gateway to rural Pennsylvania and a crossroad within the county.
- New growth and development will be provided in designated growth centers near water and sewer infrastructure necessary to accommodate such growth.
- New growth will complement and extend from the existing developments and not negatively affect agricultural and natural landscapes.
- Communities will strive to create defined town centers and neighborhoods that maximize the rural and historic character of the area.
- Corridor communities will continue to preserve the natural areas and environmental quality through state, county, and local preservation programs.
- Corridor communities will work with the developers to attain a higher level of sustainability and design.
- Opportunities for increased transit will become part of the transportation network and provide linkages between residential developments and growth centers.

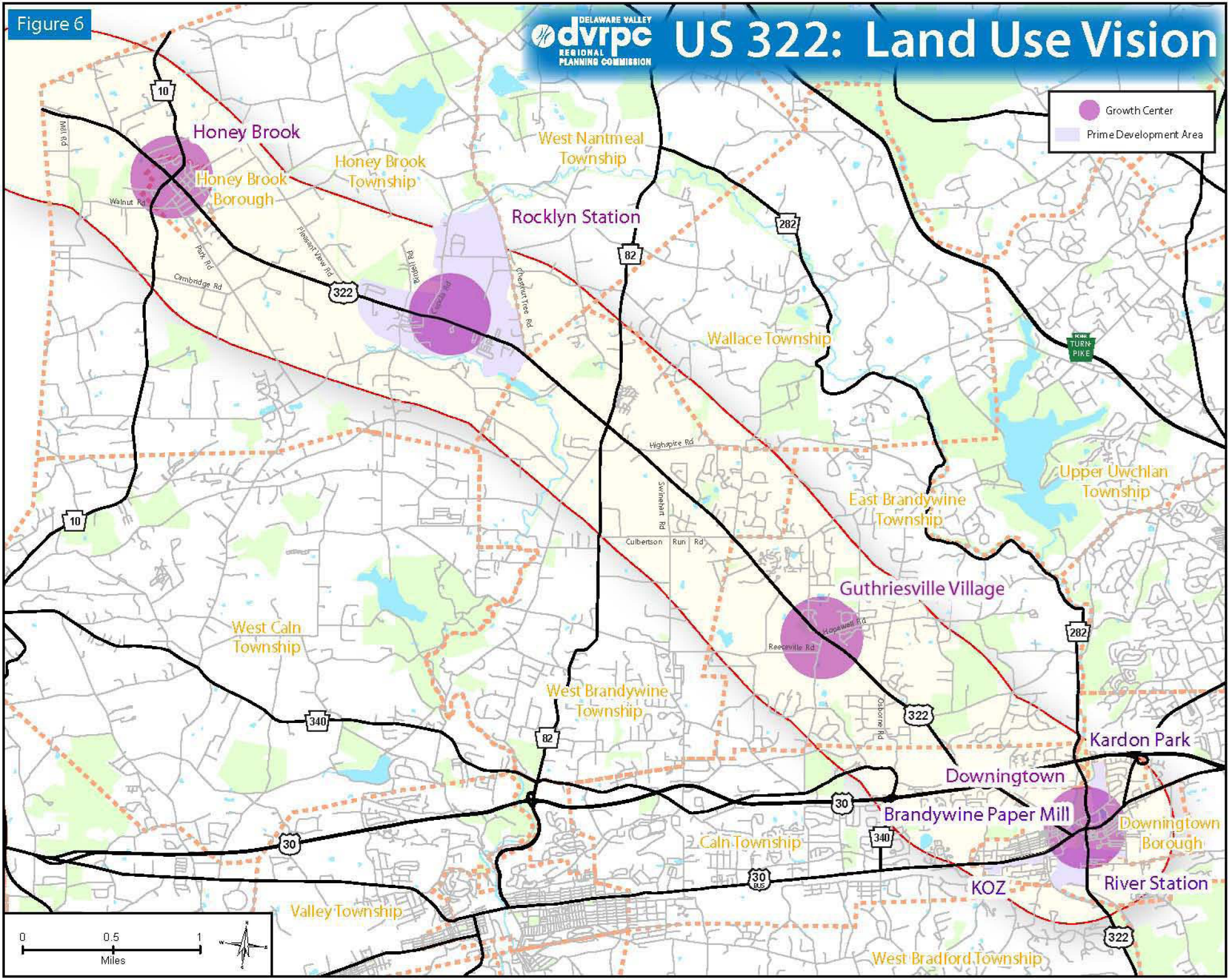


Figure 6
DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION
US 322: Land Use Vision
Growth Center
Prime Development Area
Honey Brook
Honey Brook Township
Honey Brook Borough
West Nantmeal Township
Rocklyn Station
Wallace Township
East Brandywine Township
Upper Uwchlan Township
Guthriesville Village
West Caln Township
West Brandywine Township
Kardon Park
Downingtown
Brandywine Paper Mill
Downingtown Borough
River Station
KOZ
Caln Township
Valley Township
West Bradford Township
Mill Rd
Walnut Rd
Park Rd
Cambridge Rd
Pleasant View Rd
Pughtown Rd
Coates Rd
Chestnut Tree Rd
Highspire Rd
Swinehart Rd
Culbertson Run Rd
Hopewell Rd
Reeceville Rd
Osborne Rd
10
322
82
282
340
30
30 BUS
0
0.5
1
Miles

## 1. Encourage Corridor Growth in Centers

As noted in the context analysis, the US 322 corridor contains two obvious centers: Honey Brook Borough and Downingtown Borough. These places have more dense development patterns, with older historic buildings with traditional configurations to the street: small setbacks, pedestrian access, and windows and doors facing the sidewalk. These types of places within the Delaware Valley region have been able to attract new residents and economic development around their unique character and amenities.

Between the two boroughs within the US 322 study area, the development pattern over the past decade has occurred more sporadically. Growth has been permitted in a sprawling pattern, with new single-family homes with front-loading driveways and large lots that emphasize automobile travel, rather than the pedestrian-friendly pattern in Downingtown Borough and Honey Brook Borough. This development pattern in part has occurred because of the vast farmland and open space still available along US 322, the zoning permitted by the municipalities, and the availability of large tracts of land. Commercial and retail uses along the corridor are also sprawling as many of the retail uses were converted from single-family homes.

The US 322 municipalities will continue to face development pressures and each must decide how they want to grow. There should be a strong emphasis on the revitalization of older areas and the preservation of the rural quality of life. In order to achieve these goals, municipalities should focus new development into growth centers to create walkable neighborhoods. Suggested areas for growth centers are:

- Honey Brook Borough (existing);
- East Brandywine Township (Village of Guthriesville);
- Honey Brook Township (Rocklyn Station Area); and
- Borough of Downingtown (existing).

## 2. Design for Future Residential Density

The density, design, and form of a community are important for the transportation network. Higher density and intensity of residential and nonresidential development can support other modes of transportation such as transit and bus. Residential density can be measured in a variety of ways: most commonly by population density, persons, or households per square mile or acre; or by housing unit density, the number of dwelling/housing units per acre. The US 322 study area is comprised of established and growing communities. In general, the residential densities that fall within the corridor study

area are considered very low to medium density, 0–6 housing units per acre. Downingtown Borough has the highest net housing density and is considered medium to high. Below are four design elements that should be explored in municipal subdivision and land development ordinances (SALDO) to promote increased residential densities.

### Interconnectedness

The most appealing places to live are interconnected and accessible. Many newer suburban subdivisions have one entry roadway from a major arterial roadway causing traffic congestion at one or two intersections. Communities should focus on the importance of a connected street network to help traffic flow as well as help to design more sustainable neighborhoods. Suburban development with its emphasis on single-use zoning creates the need for driving to access schools, shopping, and work. New streets can be designed by using context-sensitive design elements to also help encourage the use of sidewalks, bicycle paths, and multi-use trails. Interconnectedness language can be included within the language of the municipal SALDO. An example is, “In new residential, commercial, and mixed-use development, local street connections shall be spaced at intervals of no more than 530 feet as measured from the near side right-of-way (ROW) line, except where impractical due to physical or topographic constraints.”

### Green Infrastructure

Green infrastructure has environmental, psychological, and economic benefits. It can enhance economic development in communities by having homes adjacent to parks, green spaces, and natural features. Existing and planned residential developments along the US 322 corridor should adopt green infrastructure practices in order to maintain the natural balance between the built and natural environment. Green infrastructure elements are often adopted by ordinance within the SALDO. Examples include natural drainage areas and required landscaping as buffering between the road and sidewalk.

### Diversity of Housing Types

Newer subdivisions often have only one architectural style and housing type with slight variations. By offering different housing types, such as single-family attached, single-family detached, twins, row homes, apartments, and senior housing, consumers have more choices. It also creates an intergenerational neighborhood, allowing older people to move into smaller units while remaining in the same neighborhood. Several municipalities have zoned for mixed-use residential and commercial districts with higher densities. This should provide for single-family housing, townhomes, and apartments for different income levels.

## 3. Promote Transit-Oriented Development (TOD)

TOD techniques recognize the importance of a rail or bus station to a community and try to shape surrounding growth or infill to better serve residents, commuters, and visitors. TOD development offers municipalities several benefits. They include: (1) a decrease in vehicle trips; (2) a reduction in auto dependence; (3) preservation of land and the need to expand infrastructure systems; (4) an increase in home values; and (5) an enhanced sense of community.

Downingtown Train Station.

A successful TOD is structured through municipal zoning and design guidelines to ensure that new development achieves several goals. They include: (1) proximity to transit (1/4 mile radius around the transit stop for walkability); (2) medium to high-densities (6–8 dwelling units per acre) that will support the transit system and additional retail or commercial development; (3) built around and for the pedestrian with easy access to buildings; and (4) the creation of continuous activity near the station. In addition, municipalities can offer density bonuses to developers and a reduction of parking; streamline the permit review process; permit phased development; and, most importantly, offer tax incentives.

The SEPTA/Amtrak station located in Downingtown Borough is an excellent opportunity to employ TOD. The property is located in a KOZ where plans are underway to create a high-density mixed-use development, which will increase pedestrian traffic downtown and provide new housing options. There are no other train stations along the US 322 corridor; however, TOD can be applied around new growth centers, whose higher densities may support SEPTA bus service for this part of Chester County.

Building town centers requires maintenance of the look and feel of an area that is attractive and reflects the local, rural character. Currently, only the boroughs of Downingtown and Honey Brook and the Village of Guthriesville (East Brandywine Township) maintain an historic sense of place with their buildings. The remaining areas of US 322 are very rural and have been sprinkled with suburban-style residential subdivision developments that have no relationship to each other. Below are recommended elements for creating a sense of place for municipalities along US 322.

## 4. Adopt Smart Growth Zoning

Many zoning codes are based on Euclidian principles, which promote the separation of land uses. These codes are often difficult to use and focus primarily on use, leaving out other important elements of development such as form and density. Euclidian zoning codes often cannot respond to emerging growth trends. By introducing smart growth zoning, communities will be better able to respond to new land use patterns. For example, the US

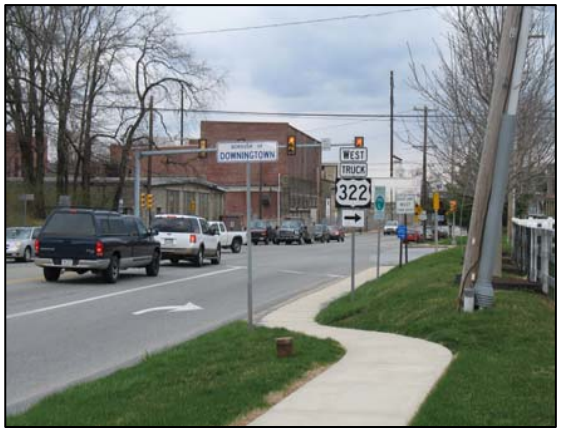
322 study area municipalities should adopt “growth center” zoning to promote new development that is compact, has shared access points, and allows building types that fit with the fabric of the surrounding neighborhood.

As land use patterns have changed, communities have amended their zoning codes by either adding overlay districts, or new zones, and classifications. Other types of smart growth zoning include overlay districts, TOD zoning, incentive zoning, and traditional neighborhood design (TND) zoning. Several municipalities along the corridor—Downingtown Borough, East Brandywine Township, and Honey Brook Township—have adopted smart growth zoning to control and support additional growth, such as:

- Establish a Transportation Development District (TDD) in order to assess fees on property and business owners for transportation improvements. East Brandywine Township has adopted an Act 209 Traffic Impact Ordinance. Additional municipalities along the US 322 corridor should also adopt an Act 209 to target redevelopment areas. A TDD district is adopted by ordinance and added to the municipal comprehensive plan.
- Include cluster zoning and conservation design or lot averaging to provide for open space, higher density, and developer flexibility in rural residential districts. Honey Brook Township has already enacted a cluster design ordinance to preserve agricultural lands.
- Rezone portions of land along US 322 so future large commercial districts are near US 30 Bypass or other major interchanges to keep regional traffic from moving through local streets.

## 5. Improve the Pedestrian Environment

The attractiveness and character of the street is important for bringing residents and visitors to a specific destination. Municipalities should invest in the streetscape in order to transform sprawling development into town-center growth centers. These places should be aesthetically pleasing and be distinct and recognizable from the rest of the corridor or neighborhood. Important elements of a streetscape include sidewalks (at least five feet wide), landscape buffers to separate pedestrians and vehicles, placemaking and wayfinding signage, and consistent design elements such as building size, height, and color.



Sidewalks are provided on main roads within Downingtown.

Investing in the pedestrian environment is vital to revive older centers and create a more lively retail destination. Investments may include realignment of intersections with wider sidewalks, traffic-calming measures such as mid-block crossings or raised pedestrian islands, or striping of intersections. Special measures can be taken in areas where there is a population of

individuals with mobility limitations such as longer timing at pedestrian signal crossings and the addition of street furniture, such as benches. Crosswalks should be well-marked and intersections should be installed with pedestrian signal crossings.

Throughout the US 322 corridor, there are sections that do not have sidewalks or other pedestrian facilities. There are sidewalks provided in the Borough of Honey Brook, but they are narrow and are not continuous throughout. Downingtown Borough also provides sidewalks in certain areas of the downtown. In the larger townships within the study area, there are sidewalks provided within residential subdivisions with no connection to other areas. To make the corridor more pedestrian-friendly, several improvements should be considered:

- Continuous sidewalks should be placed between retail and commercial establishments.
- Landscaped islands should be created where practical, to serve as refuge for pedestrians when crossing streets.
- Safety can be improved at pedestrian crossings with traffic-calming devices such as different paving textures, speed humps, tighter corners, curb extensions, and raised crosswalks. Integrating raised medians and gateways will lend to the downtown community feel.
- Landscape buffers should be placed between the sidewalk and the road to create a sense of safety.

### Borough of Downingtown

- The central business district should enhance connectivity to residential neighborhoods.
- The county bike trails along the Brandywine River should connect to the main sidewalks.

### Honey Brook Borough/Township

- A gateway treatment at this location would delineate the transition into Honey Brook Borough. A highly visible pedestrian crosswalk would also signal this transition.
- The Rocklyn Station area has been identified as a new growth center and should incorporate a pedestrian network that connects to nearby subdivisions and commercial areas.

### East Brandywine Township

- The Historic Village of Guthriesville should incorporate sidewalks within a one-half mile radius of the Village center. Raised crosswalks and pavers should be included in all streetscaping elements to establish an identity for the Village.

- Sidewalks and pedestrian signals should be incorporated at the US 30 Bypass Interchange area to connect to a future Park-and-Ride facility and commercial development.

## 6. Provide for Wayfinding along US 322

Different types of places use different types of signs to bring people to their destination. Additionally, municipalities have different sign requirements—heights and letter sizes—which also may confuse drivers and pedestrians.

Along US 322, there are many different types of signs for traffic intersections, parking areas, schools, streets, and even temporary signs. By adopting a wayfinding program, communities can improve access and connectivity from US 322 to neighborhoods, enhance the public image of the corridor, improve vehicular and pedestrian access, and help drivers identify parking convenient to their destination. It can be designed for first-time visitors, residents, pedestrians, and even transit users. It can be used to bring people to specific destinations, shopping centers, historic areas, and parking lots, either within a municipality or along corridors that cross municipal boundaries.

The *Manual of Uniform Traffic Devices (MUTCD)* provides guidance on lettering size and distance from the roadway for many types of wayfinding signs. Municipalities should be encouraged to use it as a guide for all signs in their communities. To help with placemaking, municipalities can create a sign district overlay for new growth centers. The following areas should be included as part of a wayfinding signage program for US 322:

- Borough of Downingtown (Central Business District, SEPTA station);
- US 322/US 30 Coatesville-Downingtown Bypass Interchange;
- Village of Guthriesville (US 322/Bondsville Road/Hopewell Road);
- Rocklyn Station between Chestnut Tree Road and Pleasant View Road;
- Honey Brook Borough (PA 10 and US 322);
- Historic Areas/Places of Interest; and
- “Amish farm stands.”

### 7. Remain Sensitive to Historic Resources and Properties

The US 322 study area is abundant with historic areas and properties that will have an impact on any future transportation improvements. Historic areas are important to the rural character of the corridor and will be fundamental to implementing the corridor vision. Future transportation improvements and growth must be sensitive to the location of historic buildings and areas along the US 322 corridor.

## Access Management

Access management improves safety and efficiency on roadways by limiting and controlling access points. It entails the careful planning of how, where, and when vehicles can turn onto or off a road, by providing access to land development while simultaneously preserving the flow of traffic on the surrounding road system. According to the Transportation Research Board's *Access Management Manual*, "access management seeks to limit and consolidate access along major roadways, while promoting a supporting street system and unified access and circulation system for development. The result is a roadway that will function safely and efficiently for its useful life, while providing for a more attractive corridor."

By managing access, municipalities can increase public safety with fewer accidents, extend the life of the roadway, reduce traffic congestion, support different transportation modes, and even improve the appearance and quality of the built environment with reduced vehicle emissions. With the increasing cost and lack of funding availability to build new roads or reconstruct existing arterials, the need for effective access management strategies is stronger than ever. Access management planning requires cooperation among government entities responsible for land development and transportation decisions. There is an opportunity to shape and enhance the corridor before larger access problems are created with the increased development. Without appropriate access management and with the failure to appropriately manage surrounding development, the function and characteristics of US 322 will deteriorate, causing an increase in vehicle crashes, increased commute times, unsightly commercial strip development, and a degradation of scenic landscapes. Specific access management recommendations have been included within the transportation chapter (Chapter 5).

### Access Management Principles

There are various methods used to accomplish access management. Municipal ordinances only establish the legal basis for employing the methods. Below are access management techniques.

### Limit the Number of Conflict Points

Collisions are more likely to happen when motorists are presented with complex driving situations created by numerous conflict points. A less complex driving situation is accomplished by limiting the number and type of conflict points. This can be achieved by installing a median barrier with no left turns at the median openings; installing raised median dividers with a left-turn deceleration lane; installing one-way operations; or installing traffic signals at high-volume driveways.

### Separate Conflict Areas

Motorists need sufficient time to address one set of potential conflicts before facing another. The necessary spacing between conflict areas should be increased to allow for larger perception and reaction time. This can be achieved by: regulating the minimum spacing of driveways, the distance between a crossroad intersection and the nearest driveway, and the minimum setback; or by consolidating existing access.

### Design for Functionality

Different roadways service different functions. It is important to design and manage US 322 according to its primary function: a major arterial (regional arterial). Major arterials provide mobility by allowing for higher speeds and fewer access points than smaller collector roadways.

### Limit Direct Access

The higher volumes of regional and through traffic will increase the need for more access control. Direct property access is appropriate for local and collector roads, but not regional roads, such as US 322.

### Promote Intersection Hierarchy

An efficient transportation network provides appropriate transitions from one classification of roadway to another. For example, freeways connect to arterials through an interchange that is designed for the transition. This concept can be used on US 322 through a series of intersection types that range from the junction of two major arterial roadways to transition interchanges for local and collector roadways.

### Locate Signals to Favor through Movements

Uniform spacing of intersections and signals on roadways enhances the ability to coordinate signals and ensure continuous movement of traffic at the desired speed. Failure to carefully locate access connections or median openings can cause substantial increases in travel time.

### Preserve the Functional Area of Intersections and Interchanges

The functional area of an intersection or interchange is the area that is critical to its safe and efficient operation. This is the area where motorists are responding to the intersection or interchange by deceleration and maneuvering to stop or complete a turn. Access connections too close to intersections or interchange ramps can cause serious traffic conflicts that result in crashes and congestion.

### Remove Turning Vehicles from Through Traffic Lanes

Turning lanes allow for gradual deceleration out of the through lane and into a protected area for an opportunity to complete a turn. This reduces the severity and duration of conflicts between turning vehicles and through traffic and improves the safety and efficiency of roadway intersections.

### Use Non-Traversable Medians to Manage Left-Turn Movements

Roadways should channel turning movements to controlled locations, such as behind a non-traversable median. Other techniques that minimize left turns or reduce the driver workload can be especially effective in improving roadway safety.

### Encourage a Supporting Circulation System

Well-planned communities provide a supporting network of local and collector streets to accommodate development, as well as unified property access and circulation systems. Interconnected street and circulation systems support alternative modes of transportation and provide alternative routes for bicyclists, pedestrians, and drivers. Alternatively, commercial strip development with separate driveways for each business forces even short trips onto arterial roadways.

## US 322 Access Management Recommendations

Consistent with its functional classification as a regional arterial, US 322 lacks a significant number of destination points and serves primarily as a regional through road. The vast majority of US 322 traffic can be considered to be traveling to or from somewhere outside of the corridor area. Equal to, if not more important than, mobility are safety issues. Much of US 322 in the corridor consists of rolling hills, heavy truck traffic, and fast highway speeds. This combination creates a potentially dangerous situation when left-turning vehicles are queuing in travel lanes. Access management techniques can be applied to prevent future development that requires left-turn queuing in travel lanes. Below are generalized examples of access management problems that should be improved for US 322.

Access to private residences is too close to several intersections.

- Residential driveways are located in the functional areas of US 322, US 30 Bypass, and other arterials.
- Several businesses have excessively wide driveways, i.e., no defined access.
- There are intersections within the study area that have corner properties with access from the higher functionally classified road, both roads, or without sufficient corner clearance.
- There is more than one access point for businesses and residences.
- Residential driveways have direct access from US 322.
- Several driveways and intersecting roads intersect US 322 at oblique angles.

Access management techniques include areas outside the highway ROW. An emphasis on connectivity of the entire transportation network can play a major role in ensuring traffic flow and mobility. Access management can be simple site design considerations such as limiting the number of driveways, sharing access points, and locating access on perpendicular roadways. To ensure change, municipalities should work together to create a uniform corridor plan with consistent implementation and enforcement.

## Municipal Access Management Regulations

An inventory of existing access management-related ordinances was conducted for each corridor municipality. The results are shown in Table 6. While the table may indicate that an aspect is covered, the degree of coverage varies. The first step is to have a municipal comprehensive plan that supports access management, in the event of legal challenges to the ordinances. In order to maintain consistency among corridor municipalities, it is recommended that the recognized functional classification be in accordance with the Chester County Planning Commission.

Table 6: Access Management Ordinance Inventory

| Ordinance Topic | Caln | Downingtown | Honey Brook Borough | Honey Brook Township | East Brandywine | West Brandywine | West Nantmeal |
|---|---|---|---|---|---|---|---|
| Limit Number of Driveways | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| Corner Clearance | | ✓ | | | ✓ | ✓ | ✓ |
| Safe Sight Distance | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Driveway Channelization | ✓ | ✓ | | | ✓ | | ✓ |
| Joint and Cross Access | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Driveway Throat Length | | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Driveway Throat Width | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Driveway Radius | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| Driveway Profile | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Auxiliary Lanes | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Driveway Spacing | | | | | | | ✓ |
| Intersection Spacing | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ |
| Frontage/Service Roads | ✓ | | | | | ✓ | |
| Access from Lesser Classified Street | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Driveway/Street Alignment | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Reverse Frontage | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

*Source:* http://www.ordinance.com

## Corridor Recommendations

### Encourage shared access along US 322

A primary disruption of traffic flow is the accommodation of turning vehicles. Turning vehicles decrease lane capacity and create conflict points with through traffic, opposing traffic, and pedestrians. Fewer access points will decrease the disruption of through traffic along US 322. Access onto US 322 could be consolidated at various locations, such as the entrances to the manufactured home communities at Keystone Court, Erica Circle, Gregory Circle, and Mark Road in Honey Brook Township.

### Install deceleration and/or acceleration lanes at high turning volume locations

Deceleration lanes allow vehicles to safely make right turns without disrupting traffic flow and through traffic. Acceleration lanes increase safety and efficiency by providing a lane for drivers to merge with traffic at or near the same speed of through traffic. Potential locations include Hawthorne Drive and Brantwyn Drive in East Brandywine Township.

### Encourage improved internal circulation among businesses and connections to the local street network

Well-planned communities and neighborhoods provide a supporting network of local and collector streets to accommodate development, as well as unified property access and circulation systems. Municipalities should ensure that future developments identify connections to the local road network and possible areas for shared access. Interconnected streets systems support alternative modes of transportation for bicyclists, pedestrians, and motorists. The KOZ in Downingtown provides an opportunity for well-planned multi-modal circulation.

### Adopt an access management overlay district

Overlay districts can be adopted by an individual municipality but work best as a multi-municipal effort. An access management overlay district adds special restrictions to the existing zoning district making them subject to further regulations. The overlay district may also contain language about signage and landscaping features to preserve the character of US 322. To ensure the overlay district meets the needs of the corridor,[1] a planning study should be conducted that addresses the purpose of the overlay, analyzes existing and future traffic conditions, recommends practices and improvements, and defines the boundaries of the overlay district.

### Provide for frontage roads within new commercial development

Frontage roads can provide direct access for local traffic that does not interfere with US 322 thru traffic. Proposed commercial developments near the US 30 Bypass interchange should consider frontage roads to provide better internal traffic circulation within the commercial development.

[1] Pennsylvania Department of Transportation. *Access Management Model Ordinances for Pennsylvania Municipalities Handbook*. 2006.

CHAPTER 4

# Environmental Resources

The natural resources of the US 322 corridor are critical to the area's sustainability, overall health, and quality of life. The integrity of these resources is inherently connected to the area's potential for future growth and transportation improvements. This chapter highlights the water resources, green infrastructure network, and solid waste and recycling issues of the US 322 communities.

## Water Resources

The water resources in the corridor merit particular attention, as the corridor contains the headwaters of a significant water system that provides drinking water, recreation, and natural habitat. The water resources are increasingly threatened by polluted runoff from agricultural land and impervious surfaces. Communities in the study area can be more vigilant about protecting water resources to ensure the long-term viability of their drinking water supply and water-based recreational areas.

### Watersheds and River Systems

A watershed is a geographic land area that drains to a specific body of water. Watersheds define regions because they are natural ecological units that link water, soil, plant, and animal life systems within a defined area. The US 322 corridor study area lies within the Brandywine-Christina watershed, which is divided into two sub-watersheds: the East and West Branches of the Brandywine Creek Watershed. The Brandywine-Christina Watershed drains to the Brandywine Creek, which drains to the Delaware Bay (via the Delaware River) and ultimately to the Atlantic Ocean. Watersheds within the study area are shown in Figure 7.

#### Brandywine Creek

The Lower Brandywine Creek was designated in 1989 as a Scenic River by Pennsylvania and is the source of drinking water for much of Chester County as well as Wilmington, Delaware. It is also used for recreational activities such as kayaking, swimming, and fishing, and is an important natural corridor that provides habitat for many species.

Although the Scenic River portion of the Brandywine Creek is south of the study area, its natural and aesthetic qualities depend on the protection of the river within the study area, particularly because the study area contains the headwaters of the Brandywine Creek. Headwaters are of particular importance in watersheds because headwater conditions affect water quality downstream. Headwater areas are the lands that drain directly to first-order streams, which are the smallest type of stream and are fed only by springs or ephemeral streams. First-order streams have a low volume of water and are susceptible to degradation of water quality because they tend to be small and shallow. Headwaters are important parts of water-based ecosystems because they typically contain a variety of aquatic life.

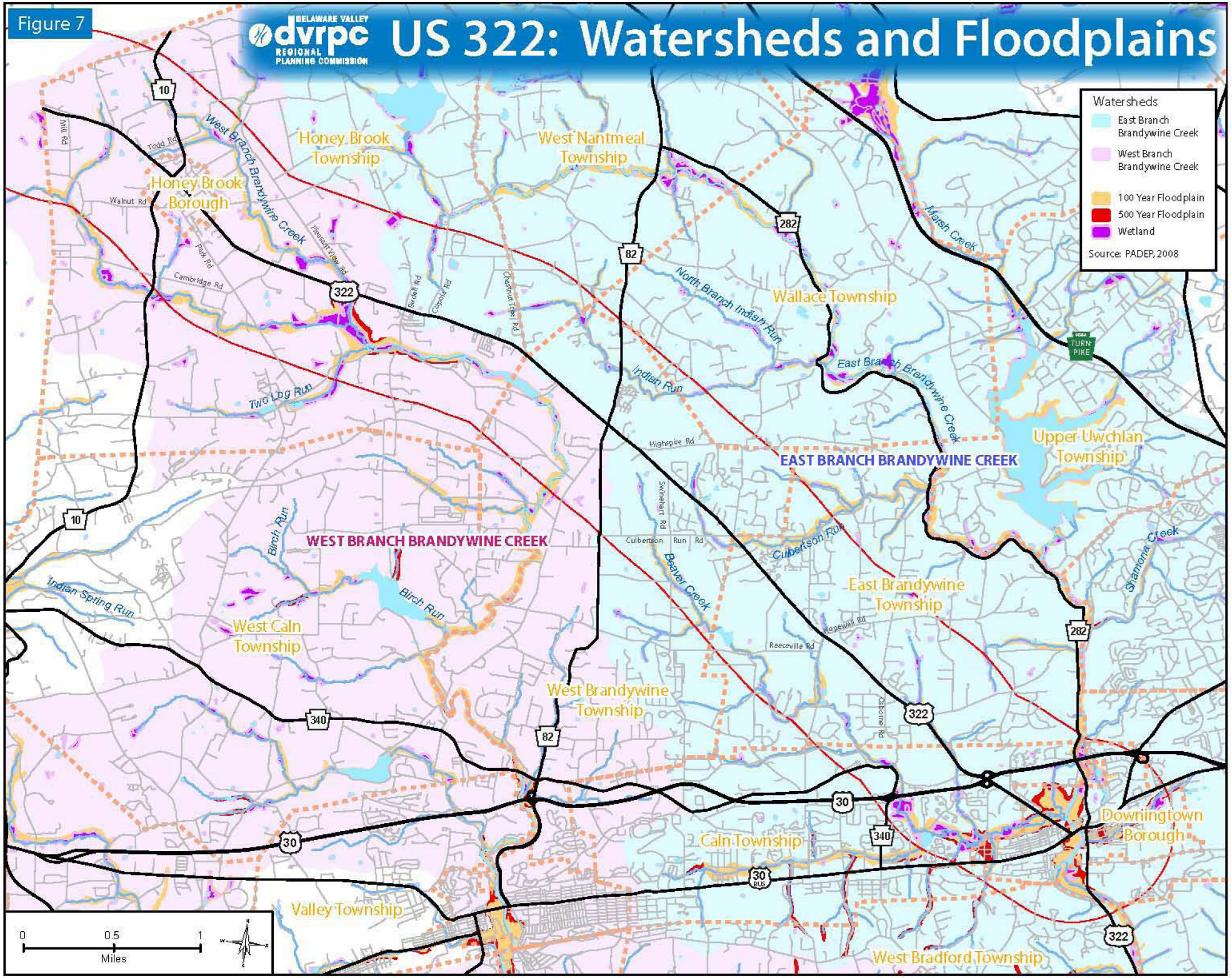
## Floodplains

Areas naturally subject to flooding are called floodplains, or flood hazard areas. Floodplains encompass a floodway, which is the portion of a floodplain subject to high velocities of moving water, and the adjacent flood fringe, which helps to hold and carry excess water during overflow of the normal stream channel. The 100-year floodplain is defined as the land area that will be inundated by the overflow of water resulting from a 100-year flood (a flood that has a one percent chance of occurring in any given year). Floodplains require protection in order to prevent loss to residents, especially within the boundaries of the floodway. Vegetative cover within the floodplain area provides soil stability and hinders erosion. Equally important is the preservation of the environmentally sensitive aquatic communities that exist in the floodplains. These communities are often the first link in the food chain of the aquatic ecosystem. In addition, floodplains remove and mitigate various chemical pollutants through uptake by their vegetation and natural filtration of sediments. All efforts to keep development out of floodplains will help to preserve the flood-carrying capacity and water quality of streams.

In Pennsylvania and throughout the country, building in areas subject to flooding is strictly regulated in order to protect lives, property, and the environment. Pennsylvania regulates construction in the flood hazard area under the Pennsylvania Flood Plain Management Act. This act states that no person may construct, modify, remove, destroy, or abandon a highway obstruction or an obstruction in a floodplain without first applying for and obtaining a written permit from the Pennsylvania Department of environmental Protection (PA DEP). Floodplains within the study area are shown in Figure 7. Floodplains are located along all waterways in the study area, and particularly near the confluence of waterways.

Figure 7

# US 322: Watersheds and Floodplains



## Wetlands

Within the study area, most wetlands are found in association with major streams and their tributaries. Because US 322 is inland, the wetlands are classified as interior wetlands. Interior wetlands provide high-quality plant and animal habitat, help purify surface and groundwater, and create scenic landscapes that enhance the area's quality of life. There are also agricultural wetlands scattered throughout the study area, which are lands under cultivation that are modified former wetland areas. These areas still exhibit evidence of soil saturation, but do not support natural wetland vegetation. Activities permitted to occur within wetlands and their transition areas are very limited, and most require permits. Although development on wetlands is regulated by the PA DEP, municipalities can be more vigilant about encroachments into wetlands by requiring that wetlands be shown as a feature on major subdivision and site plan submissions. This allows the municipality to determine where wetlands may be threatened by inappropriate development and request site plan changes as appropriate.

## Groundwater

With the exception of the boroughs of Downingtown and Honey Brook, the drinking water supply for most communities in the study area comes from wells that draw from groundwater. Groundwater is stored in aquifers, which are layers of porous, water-bearing rock, gravel, sand, silt, or clay. The study area is located in what is known as the Piedmont physiographic region, which contains mostly crystalline and sedimentary geologic deposits. The study area contains mostly crystalline deposits such as types of schist and gneiss, as well as bands of carbonate rock and sandstone and shale in portions of the study area. Groundwater and surface water are interconnected, and so impairment of one will affect the other. Since 1961, a U.S. Geological Survey (USGS) groundwater monitoring station near Honey Brook Township has annually measured groundwater recharge based on groundwater flow, or discharge. The most recent data for this station indicated that the water level is above the median, meaning there is no risk of a drought. In August 2009, the water level was 7.91 feet below the land surface, and the median level is 10.09 feet below the surface.

## Water Quality Assessment

The PA DEP monitors surface water quality through an assessment of the ability of the water body to support its designated use. Designated uses of water bodies include aquatic life, drinking water supply, recreation, and fish consumption. Water bodies that support their designated uses are identified as attaining, and those that do not are identified as non-attaining, or impaired. Within the study area, there are 55 miles of stream segments that are

attaining their designated uses and 21 miles of non-attaining stream segments.[2] Table 7 outlines the source of impairment within the study area. The attaining streams include segments of Beaver Creek, Culbertson Run, East Branch Brandywine Creek, West Branch Brandywine Creek, Indian Run, Two Log Run, and unnamed tributaries. The non-attaining streams consist of segments of West Branch Brandywine Creek and unnamed tributaries. The designated use of most of the attaining stream segments and all of the non-attaining stream segments was aquatic life. The designated use of a few attaining stream segments was drinking water supply. Agricultural runoff was the cause of impairment for 75 percent of the non-attaining streams.

Table 7: Impaired Streams

| Segments | Miles | Source of Impairment |
|---|---|---|
| 21 | 16.130 | Agriculture–Nutrients ; Agriculture–Siltation |
| 3 | 1.985 | Natural Sources–Water/Flow Variability |
| 8 | 1.761 | Urban Runoff/Storm Sewers–Cause Unknown ; Habitat Modification–Other Habitat Alterations |
| 7 | 1.563 | Urban Runoff/Storm Sewers–Flow Alterations |

*Source:* Pennsylvania Department of Environmental Protection. 2006.

All of the non-attaining stream segments in the western portion of the study area are impaired due to agricultural runoff of nutrients and siltation. Conversely, all of the non-attaining stream segments in the eastern portion of the study area are impaired due to either natural sources or urban runoff. The eastern portion of the study area is much more developed and has a greater concentration of residential, commercial, and manufacturing uses.

The USGS has conducted water quality monitoring studies in Chester County since 1925. A 2001 study on fecal coliform bacteria in the Brandywine Creek watershed in Chester County found elevated levels in many areas. Beaver Creek, Two Log Run, and Culbertson Run, located within the study area, were among the streams found to contribute elevated bacteria concentrations. The most common source of fecal coliform is animal waste, and agricultural production near waterways is one of the primary non-point sources of this type of pollution. The amount of fecal coliform in the watershed decreased from 1973 to 1999 because of improved wastewater treatment facilities, decreases in point-source discharges, and a decrease in agricultural land. This study tested 40 sites in Chester County; and two sites in Honey Brook Township had the highest levels of median fecal coliform concentration. These two sampling sites on the West Branch Brandywine Creek had median fecal coliform bacteria concentrations during base flow of 4,100 and 4,800 colonies per 100 milliliters. The PADEP criterion is no more than 200 colonies per 100 milliliters. Unfenced streams in the Honey Brook Township area were cited as a main cause of fecal coliform contamination of the West Branch Brandywine Creek.

[2] Pennsylvania Department of Environmental Protection. *Pennsylvania Integrated Water Quality Monitoring and Assessment Report*. 2006.

## Agricultural Runoff Management

The impairment of water resources should be addressed both at the source of the pollution and along the waterways themselves. As seen in Table 8, the majority of water quality impairment is due to agricultural nutrients and siltation. Agricultural runoff of nutrients is due to the spreading of chemical fertilizer, manure, or sludge, which all contain nutrients such as phosphorus, nitrogen, and potassium. Siltation pollution is caused by soil that washes off fields and into nearby water bodies, clouding the water and harming aquatic plants and animals. Nutrient runoff can be limited by implementing nutrient management plans that reduce the amount of fertilizer used. Farmers can employ a number of measures to reduce agricultural runoff from siltation, such as controlling the flow of runoff water, keeping the soil in place, and reducing soil transport. Using a more efficient irrigation system, such as drip irrigation, both conserves water use and reduces water runoff. Overgrazing should also be avoided as it exposes the soil, increases erosion, and may destroy the riparian vegetation necessary for natural filtration of pollution.

Around the streams themselves, riparian buffers can help prevent agricultural and other runoff from entering the water system. Riparian, or stream, buffers are strips of land along each side of a stream, and include trees, shrubs, and other types of vegetation. Common practices that degrade or destroy healthy riparian buffers include cultivating near streams, livestock grazing, timber harvest, construction activities, or lawn maintenance. When riparian buffers are maintained in their natural condition instead of being paved, mowed, or planted with agricultural crops, they serve as important filters that absorb pesticides, pathogens, and nutrients that would otherwise enter the stream and impair water quality. Protecting water quality through riparian buffers increases the available water supply and reduces the cost of water treatment. Riparian buffers also absorb and slow down the speed of runoff from flood waters and control erosion by stabilizing the streambank. Riparian buffers are often most effective along small or low-order streams, such as those in the study area, since most water enters channels from these areas. The cost of maintaining riparian buffers is minimal compared to the loss of property due to flooding and erosion in the absence of riparian buffers. Vegetated riparian buffers have habitat benefits as well and protect the macroinvertebrate and fish populations in the stream. Also known as greenways, forested linear corridors such as riparian buffers serve as wildlife habitat and a protective corridor for migration and travel. Honey Brook, East Brandywine, West Brandywine, Caln, and West Caln townships have riparian buffer ordinances. However, Honey Brook Township's ordinance allows agricultural and other incompatible uses in the riparian buffer. Honey Brook and Downingtown boroughs and East Caln and West Nantmeal townships do not have riparian buffer ordinances.

The PA DEP developed the Stream ReLeaf Program in 1998 to assist communities in restoring and maintaining forested riparian buffers. This program provides government agencies, citizen groups, and individuals with information and funding for the planning, design, establishment, and maintenance of streamside forested buffers. The Stream ReLeaf Program has assisted in twelve stream corridor restoration efforts—nine in Honey Brook Township, two in East Caln, and one in Downingtown—which have planted trees and shrubs. There are many other local, nonprofit, and federal programs designed to help with stream enhancement projects. The U.S. Department of Agriculture, Chester County Conservation District, Ducks Unlimited, the Brandywine Valley Association, and other organizations all have programs to assist with the cost of stream fencing or the planting of vegetation in riparian areas.

## Stormwater Management

Stormwater management entails designing, constructing, and maintaining land surfaces that direct and control runoff during storm events, or from the melting of ice and snow. Special attention should be paid to stream crossings, which are locations where a roadway crosses a stream. Municipalities should ensure that new development and redevelopment employ best management practices that seek to infiltrate stormwater first, and detain stormwater if and only if infiltration is not possible. Part of a municipal stormwater management plan should include the restoration of vegetated riparian buffers, described above. The *Pennsylvania Stormwater Best Management Practices Manual* is an excellent resource for guidance and information on protecting water resources through stormwater management, as is *Watersheds*, an element of Chester County's comprehensive plan *Landscapes*. Developed and published by the Chester County Water Resources Authority (CCWRA), *Watersheds* is the county's water policy plan.

Within the last two decades, the US Environmental Protection Agency (USEPA) has mandated a reduction in water pollution consistent with the requirements of the Clean Water Act of 1970. Federal and state water pollution reduction programs are combining to put significant new obligations onto local government. Pennsylvania's Stormwater Management Act of 1978 (Act 167) requires counties to evaluate stormwater management on a watershed basis and create stormwater management plans that must be implemented at the municipal level with the adoption of a Municipal Stormwater Ordinance. Additional obligations are required by municipal separate storm sewer system (MS4) operators. An MS4 is a publicly owned and operated system of stormwater conveyances that is not combined with sanitary sewer conveyances. In order to reduce pollutants and protect water quality, operators of MS4s are required to receive authorization to discharge pollutants under a National Pollution Discharge Elimination System (NPDES) permit. Updating or enacting a stormwater ordinance is required within the first year of the NPDES permit. The CCWRA has developed a model stormwater ordinance that should be considered for use as a base model for any municipality that needs to update their stormwater management standards. Every municipality in the study area with the exclusion of Honey Brook Borough and West Nantmeal Township has MS4 systems.

Stormwater management improvements are recommended in the Downingtown area to address not only water quality impairment due to stormwater runoff, but also the frequent flooding issues in the borough. Large areas of Downingtown are located in a floodplain, and it is frequently subjected to flooding due to its position in a valley at the confluence of a number of streams, including the East Branch Brandywine Creek, Beaver Creek, and Parke Run. During storm events, basements and cars in many areas of the borough are often inundated. A new stormwater management project, the Alcoa detention basin, is designed to take area runoff from Little Parke Run. This basin is located by the Bishop Shanahan High School near Woodbine Avenue in Downingtown. The construction of this basin was suggested in a 2003 study by the U.S. Army Corps of Engineers. Downingtown is also working in collaboration with East Caln Township to address other stormwater problems in the area.

### Stormwater Management Design

The best stormwater management practices are those that increase the amount of infiltration of rainwater into the ground. This can be achieved through interruptions in the paved surface that break up the stormwater runoff and infiltrate it at various points. Stormwater from smaller rainstorms can often be handled entirely by various low-impact or nonstructural designs. Smaller storms consist of one- through five-year storms. A one-year storm is equivalent to 2.5 inches of rainfall within 24 hours. A two-year storm has a 50 percent chance of occurring in a given year (or once in two years) and is equal to 3.2 inches of rain within 24 hours. The runoff from smaller storms such as these tends to have the greatest effect on water resources in terms of flooding and water quality impacts because they are more frequent and are not detained in detention basins, most of which are designed to control only the 10- to 100-year storms. Rainfall volume from smaller storms is often allowed to pass through the detention basin. However, over 95 percent of the annual volume of rainfall occurs during storm events less than the two-year storm, and so detention basins fail to manage or control most stormwater runoff. Alternative opportunities for stormwater management are discussed in the recommendations section of this chapter.

## Green Infrastructure

Green infrastructure refers to a community's interconnected network of open spaces and natural areas. These may include native vegetation, wetlands, parks, forests, and greenways. A greenway is a contiguous open space corridor that links natural, cultural, and recreational resources. Greenways are often implemented along creeks and streams because they help preserve environmental features and provide natural protection from flooding, improve water quality, and provide wildlife migration corridors, while enhancing quality of life. A green infrastructure system provides important services, including stormwater management, flood risk minimization, air and water quality improvement, temperature regulation, and habitat conservation.

*Connections*, the regional long-range plan of DVRPC, provides a regional vision for preserving green infrastructure throughout the Delaware Valley. The Greenspace Network identified in *Connections* illustrates a system linking park and open spaces, natural resource areas, and population centers to enhance the recreational, ecological, scenic, and economic vitality of the region (Figure 8). This network consists of 100 individually named greenspace corridors. Three proposed greenways pass through the US 322 study area: Brandywine Creek, West Branch Brandywine Creek, and Great Valley Ridgelines.

## Protected Land and Open Space

Well-managed, protected land enhances and supports natural resources and is crucial for protecting watersheds and ensuring a sustainable drinking water supply. Preserved land has air quality benefits and provides vital habitat for plants and animals. It also has social benefits such as recreation, education, and aesthetic enjoyment. Open space improves a community's quality of life and has been shown to increase property values. Over 100,000 acres of open space have been preserved throughout Chester County. Areas that are not protected in the western part of the county are undergoing development pressures; however, several municipalities have adopted planning techniques such as Transfer of Development Rights and Conservation Design to minimize the impact.

Table 8: Preserved Lands

| Preservation Type | Acres |
|---|---|
| County | 66.68 |
| Municipal | 406.41 |
| Nonprofit | 313.35 |
| Farmland | 484.75 |
| State | 44.31 |
| Total | 1,315.50 |

*Source:* DVRPC. 2009.

Within the study area, there are over 1,300 acres of preserved open space (Figure 8). As shown in Table 8, approximately 406 acres have been preserved by municipalities, 485 acres are preserved farmland, 313 acres have been preserved by nonprofits, 67 acres have been preserved by Chester County, and 44 acres have been preserved by the state. Much of the preserved open space in the study area consists of farmland followed by areas of woodland and recreation. Municipalities along the US 322 have been proactive in preserving prime farmland and woodlands. An explanation of municipal efforts is provided below.

### Caln Township

Outlined in the *2003 Comprehensive Plan*, open space areas within Caln Township are classified as agricultural, public, institutional, municipal, vacant, undeveloped, and reserved. Land within township has been preserved as part of the county land preservation program.

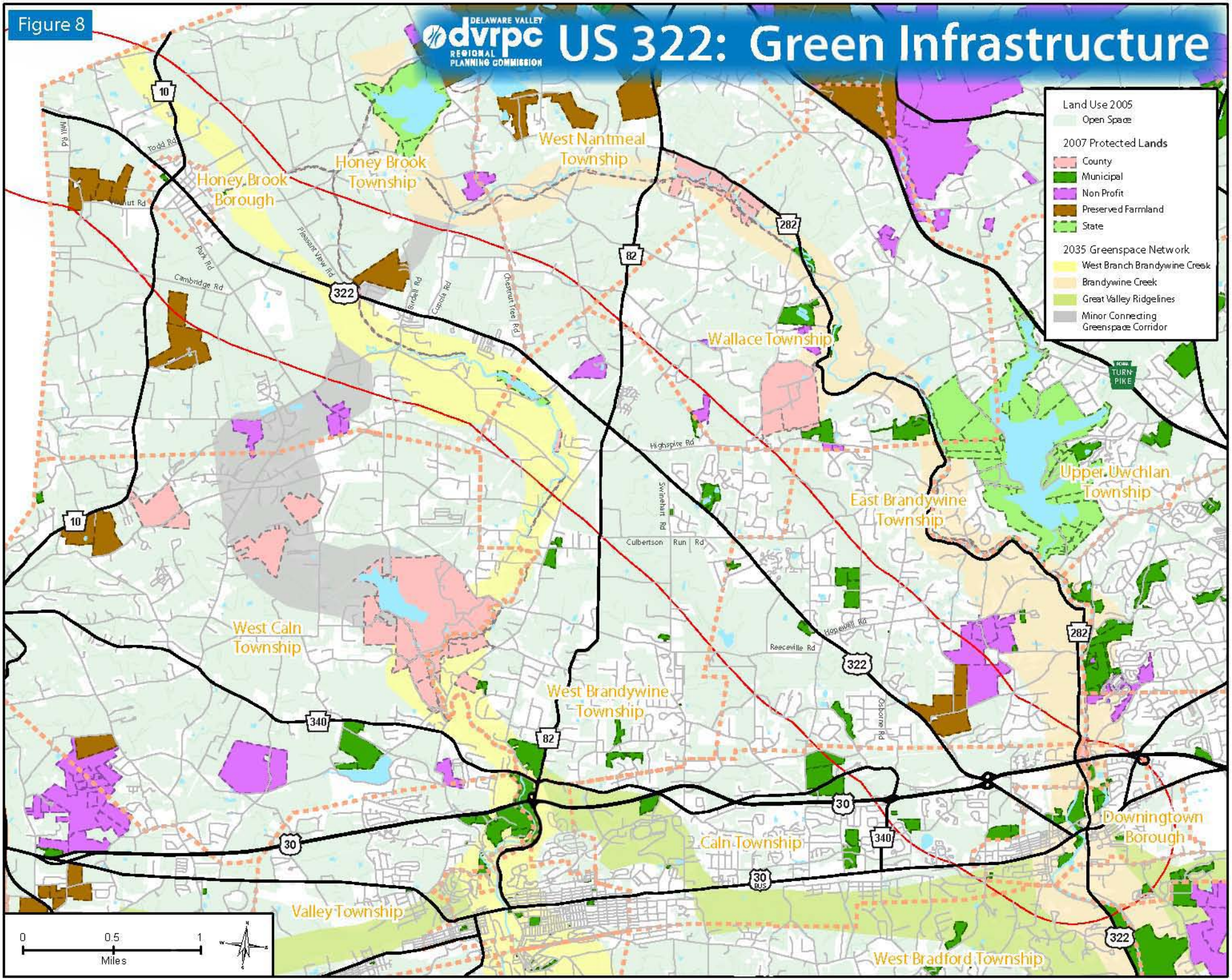
### Honey Brook Borough/Township

Honey Brook Township completed a *Land Preservation Plan* in 2007 that identified four priority areas for land preservation. The areas were chosen based on agricultural as well as natural resource qualities and are intended to accomplish a number of goals, including protecting large areas of contiguous farmland, protecting headwaters and riparian corridors, and providing a distinct edge to more developed areas. Honey Brook Borough has a thorough analysis of open space and prime lands within its comprehensive plan. Land is divided into three major areas for conservation efforts: steep slopes, prime agricultural soils, and water resources.

Figure 8

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

# US 322: Green Infrastructure



#### Downingtown Borough

Outlined in the borough's comprehensive plan are areas identified for more dense development as well as open space, recreation, and conservation. Approximately 13 percent of the borough is preserved, of which 9 percent will be used for open space and passive recreation.

#### East Brandywine Township

The overall goal for open space and recreational land use as outlined in the township's comprehensive plan is to retain as much of the traditional open, natural character of the township as possible, while increasing the emphasis on securing suitably-located open space to serve the recreational needs of the residents.

#### West Brandywine Township

The *2005 Comprehensive Plan* outlines specific preservation and conservation methods for water, woodlands, agricultural resources, historic resources, and cultural resources. Planning techniques such as transfer of development rights and overlay districts will assist the township in providing areas of contiguous open space and scenic landscapes.

## Solid Waste and Recycling

Pennsylvania is the largest trash importer in the country, and southeastern Pennsylvania has one of the largest concentrations of landfills in the state. In addition to potentially hazardous leachate (water that has been in contact with trash) emanating from these sites, landfills generate enormous amounts of truck traffic, placing higher demand on local and state roads. The US 322 corridor is heavily used by trash trucks using the Lanchester Landfill located in Honey Brook Township.

### Lanchester Landfill

The Lanchester Sanitary Landfill is owned and operated by the CCSWA. Covering 660 acres, the landfill is located on the county border in Honey Brook Township in Chester County and in Lancaster County in Salisbury and Caernarvon townships. The CCSWA serves over 300,000 residents and businesses within Chester County. On average, the Lanchester Landfill accepts 1,100 tons per day of non-hazardous municipal refuse and residuals. A majority of municipal refuge is from Chester County communities. To accommodate the need for additional capacity, an expansion is planned that will benefit residents within three-quarters of a mile. As an incentive to locate in their present space, portions of the landfill's tipping fee also benefit the host

townships, Chester County, and environmental stewardship programs. Contributions are made to the Environmental Stewardship Fund, Chester County, and the Pennsylvania Recycling Fund.

The Lanchester Landfill accepts only non-hazardous waste. This includes municipal solid waste, construction and demolition debris, sludge, and other non-hazardous residuals approved by the PA DEP. The Recycling Center at Lanchester accepts most recyclable materials, including cans, bottles (plastic and glass), mixed paper, and cell phones. Household hazardous waste materials are not accepted at Lanchester. In an effort to become more environmentally friendly, the CCSWA began leachate recirculation, which promotes the more rapid decomposition and stabilization of the waste mass, as well as the use of sheep and goats as natural weed and grass control. Methane gas produced from the landfill is used by Granger Energy to replace natural gas at three local businesses: Dart Container Corporation, Advanced Food Products, and L & S Sweeteners.

The Lanchester Landfill provides passive recreation for nearby residents and visitors. There is a scenic overlook located on top of the Lanchester Landfill. The scenic overlook rises 80 feet above the highest point of the Welsh Mountains, providing a panoramic view of the Conestoga and Brandywine Valleys. There are two picnic pavilions, binocular stations, a playground, and parking for cars, bikes, and horse-drawn buggies for visitors.

## Corridor-Wide Environmental Recommendations

### Adopt agricultural best management practices

Agricultural runoff is the source of impairment for approximately 75 percent of non-attaining (polluted) streams in the study area. Stream fencing, comprehensive nutrient management plans, efficient irrigation systems, and riparian buffers (discussed in the following recommendation) can all help to reduce water quality impairment caused by agriculture. One potential source of funding for these and other agricultural best management practices is the Pennsylvania Environmental Quality Incentives Program, which is a voluntary conservation program that provides technical and financial assistance to farmers and agricultural landowners to install and implement conservation practices. Although all municipalities in the study area with agricultural land can benefit from these practices, they are specifically recommended for Honey Brook Township, where all the streams impaired by agriculture are located.

#### Stream fencing

The lack of stream fencing in the Honey Brook Township area was cited by the USGS as a primary cause of contamination of the West Branch Brandywine Creek. Stream fencing prevents livestock from entering waterways and has numerous benefits for communities, farmers, and ecosystems.

These benefits include improvements to water quality, watershed functioning, wetlands restoration, aquatic and other wildlife habitat, herd health and insecurity, and other environmental and civic aspects.

### Comprehensive nutrient management plans (CNMP)

A comprehensive nutrient management plan is a grouping of conservation practices and management activities for an animal feeding operation that can help ensure the achievement of both production and natural resource protection goals. A CNMP may contain elements of the following: manure and wastewater handling and storage, land treatment practices, nutrient management, record keeping, feed management, and other utilization options.

### Efficient irrigation systems

The improvement of irrigation systems to use water more efficiently promotes ground and surface water conservation while also improving water quality by reducing the volume of water used on a farm. Drip irrigation, considered the most efficient irrigation system, involves emitting water gradually into the soil using a network of pipes. Although expensive to install, drip irrigation can improve crop health and maintain farm profitability in the long term, considering the increasing cost and scarcity of water.

## Adopt or enhance stream protection regulations

Municipalities in the study area can protect their streams by implementing a riparian management plan, instituting a greenways plan, or enforcing ordinances associated with riparian areas by adopting a stream-corridor protection ordinance. Such an ordinance ensures the maintenance of vegetated riparian buffers by requiring that development be set back from stream banks, floodplains, and wetland areas, and by limiting the use and intensity of activities within the corridor. A stream-corridor protection ordinance should be adopted in combination with an outreach program that educates the community—and especially owners of riparian properties—about the importance of vegetated stream buffers. By integrating an education component into stream protections, property owners are more likely to comply with the ordinance and the need for enforcement may be lessened.

The townships of Honey Brook, East Brandywine, West Brandywine, Caln, and West Caln all currently have riparian buffer ordinances. However, Honey Brook Township's ordinance allows pre-existing agricultural and other incompatible uses (such as driveways) in the riparian buffer. Honey Brook and Downingtown boroughs and East Caln and West Nantmeal townships currently do not have riparian buffer ordinances and it is recommended that they adopt such regulations.

### Implement better stormwater management design

The *Pennsylvania Stormwater Best Management Practices Manual* is a comprehensive overview of the concepts and technologies regarding stormwater management. The *Manual* outlines a detailed approach that first aims to prevent or minimize stormwater impacts, and then to handle stormwater problems through environmentally responsible mitigation techniques. The CCWRA offers additional assistance to municipalities in Chester County that are seeking to reduce stormwater runoff and its impacts. The CCWRA has prepared a Stormwater Management Model Ordinance that focuses on both reducing the volume of runoff through conservation design and utilizing innovative practices that emphasize infiltration and water quality.

Specific measures to manage stormwater from smaller storms rely on utilizing the natural contours and features of the land to maximize infiltration and groundwater recharge on-site, whenever possible. The best designs often use a combination of best management practices. Outlined below are some techniques that municipalities should consider implementing. Although all municipalities could benefit from these practices, they are especially recommended for Downingtown and Caln Township, which both contain streams that are impaired due to urban runoff and storm sewers, sources related to inadequate stormwater management.

#### Rain Gardens

Rain gardens are small bioretention areas that serve as small islands to filter stormwater runoff from their immediate surroundings. They are a part of natural landscaping and are positioned to capture the first level of runoff. They can be used in parking lots and along smaller paved areas such as sidewalks.

#### Vegetated Filter Strips

Vegetated filter strips are close-growing grasses or forest along the perimeter of an impervious surface allows water runoff to be slowed. Filter strips are often used in a series of stormwater controls and work best where slopes are less than 15 percent.

#### Bioretention Facilities

Bioretention facilities capture runoff from a diversion structure in a traditional drainage system or a large grassed area. They can be installed in median strips, parking lot islands, lawn areas, and other conveyance systems. Native plants are a necessary component, and trees and shrubs should be included.

### Drainage Swales

Swales are long, grassed, shallow depressions designed to intercept sheet flow. Grass swales can be designed to convey large and small storm events. Swales work best where slopes are less than two percent. Vegetation should be provided around the swale and should be native and tough. Soil permeability is a factor in swale design, so additional features may be needed along the length of a swale.

### Infiltration Trenches

An infiltration trench is a stone-filled subsurface where stormwater is collected and percolated slowly into the soil. Infiltration trenches can capture and treat water from an area no larger than 10 acres. They work best when combined with other pre-treatment techniques such as a grass swale or vegetated filter strip.

### Detention Basin Redesign

There are several alternatives to the conventional dry detention basin, depending on the site conditions. These include constructed wetlands, which can be built as part of the stormwater treatment plan, wet ponds that hold and slow peak flow and remove pollutants, and infiltration basins. Stormwater management design can include several small infiltration basins to accomplish the same goals as one large basin.

CHAPTER 5

# Transportation Network and Mobility

The transportation network in the study area includes a combination of state, county, and municipal roads that provide mobility and access to both freight and vehicular traffic traveling through the area. US 322 has a high percentage of truck traffic given its proximately to the Pennsylvania Turnpike, US 30, the Lanchester Landfill, and other truck-traffic-businesses generators. This characteristic does not match well with the fact that the western portion of the corridor has a large concentration of horse and buggy traffic. The corridor has also seen a growth in congestion issues during the weekday peak periods, which is exacerbated by the safety issues that exist at several intersections along the corridor. There are currently no programmed improvements for this corridor listed on the DVRPC Transportation Improvement Program (TIP) for Pennsylvania.

## Highway Network

The principal routes within the study area are as follows:

### US 322 (Horseshoe Pike)

The US 322 corridor is a regionally significant road that serves both regional and local traffic in western Chester County. US 322 is classified as a principal arterial highway and is oriented in an east–west direction. It provides a direct link to many regional transportation facilities such as US 30 Downingtown/Exton Bypass, Pennsylvania Turnpike, and US 30 Business. Traffic flows well on US 322 during peak and off-peak times, but congestion is quite noticeable during peak periods in Downingtown Borough. US 322 provides direct access to the Landfill property located on the border of Honey Brook Township and Caernarvon Township. As a result, the facility experiences greater truck traffic with increased speeds. Current vehicle classification counts show 12.2 percent trucks eastbound and 11.4 percent westbound for an average of 11.8 percent trucks along the corridor.

### US 30 (Coatesville-Downingtown Bypass)

The Coatesville-Downingtown Bypass is a limited access freeway. It extends from the intersection with US 202 in East Whiteland Township to Sadsbury Township in western Chester County. It provides a high speed alternative to US 30 Business with limited access. The Bypass intersects US 322 in Caln Township, near the southeastern end of the study area. The eastbound on-ramp (Ramp K) and the westbound off-ramp (Ramp M) are two of the four highest volume interchange ramps identified in the *US 30 Coatesville–Downingtown Bypass Traffic Study*.

### US 30 Business (Lancaster Avenue)

US 30 Business is a principal arterial east–west facility which bisects the study area, extending from Philadelphia through western Chester County and beyond. Within the study area, this roadway provides local east–west access between Coatesville and the Exton area. US 30 Business varies from between two to five travel lanes and the posted speed limit ranges from 25 mph in urban areas to 45 mph in rural areas. US 30 Business is a key connector for transit users to access SEPTA stations and county-wide transit service.

### PA 10 (Pequea Avenue/Conestoga Avenue)

Pennsylvania Route 10 is a minor arterial that provides north–south connectivity from the Pennsylvania Turnpike in Berks County to Cecil County Maryland. This roadway consists of two travel lanes. It is heavily traveled by trucks traveling to the Pennsylvania Turnpike at the Morgantown Interchange. Classification counts show 15.4 percent trucks northbound and 16.2 percent southbound for an average of 15.8 percent trucks along the roadway in the area north of Honey Brook Borough. South of the borough, counts show 9.6 percent trucks northbound and 7.4 percent trucks southbound for an average of 8.5 percent trucks.

### PA 82 (Manor Road)

Pennsylvania Route 82 is classified as a minor arterial that serves local traffic and truck traffic. It is oriented in a north–south direction. PA 82 has one travel lane in each direction. It provides direct access to Coatesville and the northern part of the study area.

### PA 282 (Creek Road)

Pennsylvania Route 282 is a rural major collector extending from Downingtown northward through East Brandywine and Wallace townships to PA 82. It has two travel lanes in each direction and is designated as State Bike Route L.

### PA 340

Pennsylvania State 340 is an urban collector at its easternmost limits where it intersects with US 30. In its western limits, it is classified as a rural major collector. Overall, it extends from Lancaster County in the west, to US 30 (Lincoln Highway) in the east. It is the closest alternate route to US 322.

# Traffic Volume Analysis

## Average Annual Daily Traffic (AADT) Volumes

Past and present AADT volumes for the roadways within the study area are illustrated in Figure 9. These volumes have been adjusted by weekly and seasonal factors to represent the daily traffic at each location during an average day of the year.

US 322 experiences AADT volumes of 8,000 to 12,000 vehicles per day between the Lancaster County border and PA 82. AADTs range from 12,000 to 19,000 vehicles per day at PA 82 and the US 30 Bypass. Between the US 30 Bypass and the Borough of Downingtown, traffic volumes are between 13,000 and 14,000. As expected, the traffic volumes are higher in the area between the US 30 Bypass and the areas of residential development in East and West Brandywine townships. Figure 9 also shows volumes for some of the cross roads, the majority of which have AADTs of less than 3,000 vehicles per day.

## Traffic Counts

In early 2009, DVRPC conducted traffic counts at numerous locations along the US 322 corridor. Turning movement count data was collected during peak hour periods at intersections that are currently signalized or were under study for signalization. Volume and classification data was collected over a 48-hour period at locations where vehicle speed and classification information was needed. Traffic volume counts were conducted at US 322 and the US 30 Bypass Interchange while speed and classification counts were collected on US 322 at the eastern limits of Honey Brook Borough and PA 10 at the northern limits of Honey Brook Borough.

Classification count results indicated that truck percentages along US 322 are 11.8 percent while PA 10 experiences 15.8 percent trucks north of Honey Brook Borough and 8.5 percent south of the Borough. Generators and destinations for truck traffic include the Lanchester Landfill, Zimmerman's Concrete of Ephrata, Pennsylvania, as well as several small trucking companies located along the corridor. Turning movement counts were taken on US 322 at the intersections of PA 10, Birdell Road, PA 82, Culbertson Run Road, Hopewell Road, and Corner Ketch Lyndell Road. Peak periods were determined to be approximately 7:00–8:00 in the morning and 4:00–5:00 in the evening for the entire corridor. The intersections of US 322 with PA 10 and the US 30 Bypass, however, see peak traffic volumes between 5:00 and 6:00 PM. Turning movement data and peak hour tabulations can be found in Appendix A.

Figure 9

# US 322: Traffic Volumes

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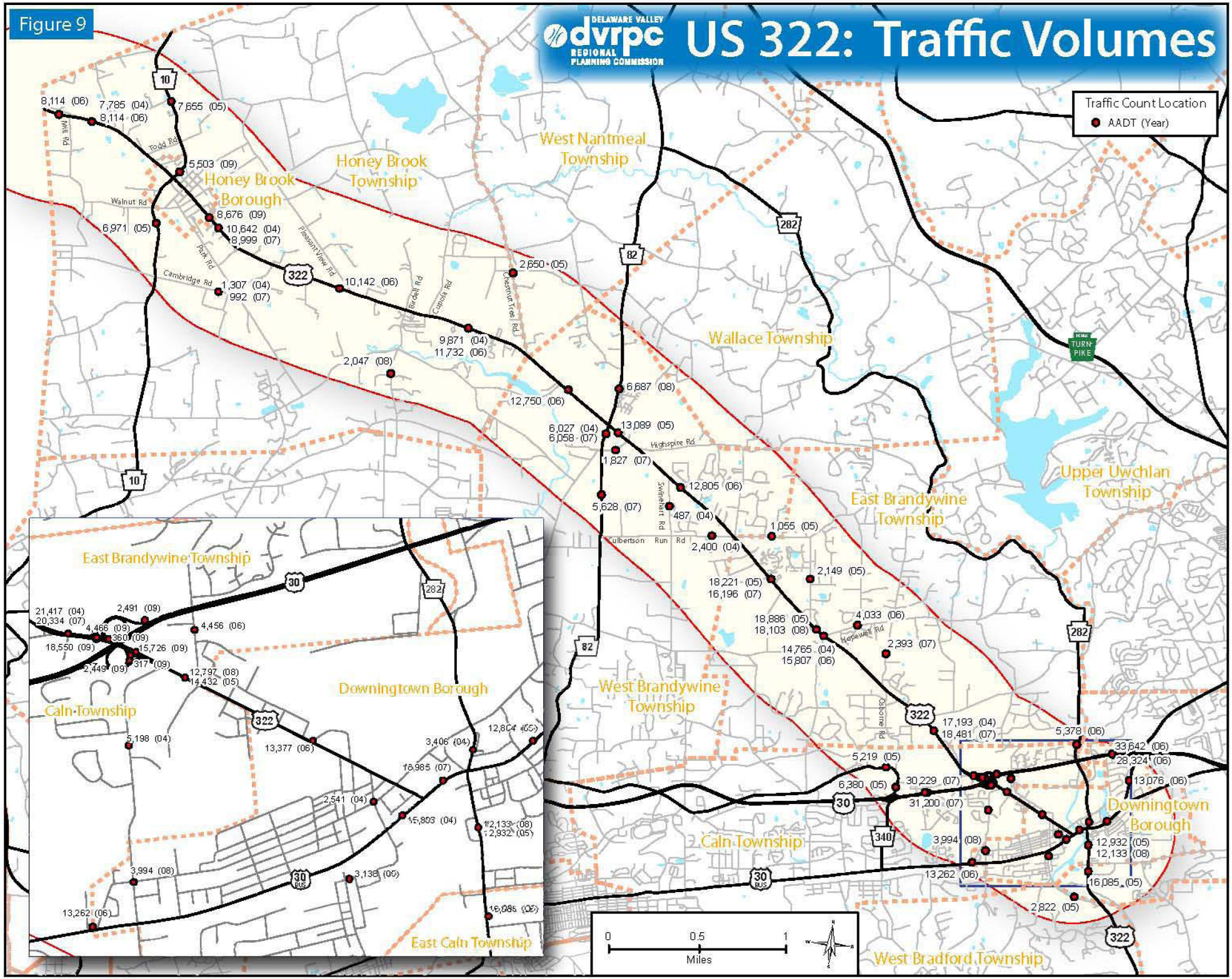


# Crash Analysis

This crash analysis utilized data collected from PennDOT. Highway crashes within the study area are concentrated primarily at major intersections. An analysis of data over a five-year period (2003–2007) reveals 325 crashes in the corridor with a concentration of crashes at the following locations. Table 9 details the crashes.

## US 322/US 30 Bypass Eastbound

Crashes were counted at the US 30 Bypass eastbound off-ramp. This location has the highest concentration of crashes within the US 322 corridor. Approximately 50 percent were angle crashes and 28 percent of the crashes involved rear-end collisions. Approximately 52 percent of the crashes resulted in some form of injury.

## US 322/US 30 Bypass Westbound

Crashes were counted at the US 30 Bypass westbound off -ramp. Traffic from the ramp must travel either eastbound or westbound on US 322. There is a steep gradient on US 322 westbound that provides for sight distance problems and trucks traveling at higher speeds. Twelve (12) crashes have been reported; 75 percent were classified as angle crashes. While there were no fatalities, 42 percent of the crashes resulted in some injury. Thirty-three percent of the crashes occurred during non-daylight hours.

## Route 322 /PA 82

This intersection is located in West Brandywine Township. The US 322 corridor has one travel lane in this section and no designated turn lanes. Twenty crashes have been reported at this intersection. Approximately 55 percent of the crashes were angle crashes and 25 percent were rear-end crashes. Sixty-five percent of the recorded crashes involved some form of personal injury and 40 percent occurred during non-daylight hours.

Table 9: Crash Clusters

| | US 322 /US 30 Bypass Eastbound | US 322 /US 30 Bypass Westbound | US 322/ PA 82 | US 322 /Culbertson Run Road/Little Washington Road | Total |
|---|---|---|---|---|---|
| Crash Type | | | | | |
| Non-Collision | 1 | 0 | 1 | 0 | 2 |
| Rear-End | 8 | 2 | 5 | 5 | 15 |
| Head-On | 1 | 0 | 1 | 3 | 2 |
| Angle | 17 | 9 | 11 | 2 | 37 |
| Sideswipe (Same Direction) | 1 | 1 | 2 | 0 | 4 |
| Hit Fixed Object | 1 | 0 | 0 | 1 | 1 |
| Severity | | | | | |
| No Injury | 12 | 7 | 4 | 4 | 23 |
| Injury | 11 | 5 | 12 | 6 | 28 |
| Injury/Unknown Severity | 4 | 0 | 1 | 1 | 5 |
| Unknown | 2 | 0 | 3 | 0 | 5 |
| Lighting Condition | | | | | |
| Daylight | 22 | 8 | 12 | 7 | 49 |
| Dark (without Street Lights) | 3 | 2 | 7 | 1 | 13 |
| Dark (with Street Lights) | 2 | 2 | 1 | 2 | 7 |
| Dawn | 2 | 0 | 0 | 1 | 3 |
| Road Condition | | | | | |
| Dry | 22 | 9 | 14 | 10 | 45 |
| Wet | 5 | 2 | 5 | 1 | 12 |
| Other | 2 | 1 | 1 | 0 | 4 |
| Total | 29 | 12 | 20 | 11 | |

*Source:* Pennsylvania Department of Transportation. 2008.

### US 322 /Culbertson Run Road/Little Washington Road/Springton Road

This intersection is located on the border of East and West Brandywine townships. It is a five-leg intersection where Culbertson Run Road, Little Washington Road, Springton Road, and US 322 intersect. Commercial buildings with separate access points are built on the eastbound side in West Brandywine Township. There is one travel lane at all approaches and departure legs. Of the 11 crashes recorded, 45 percent were rear-end and 27 percent were head-on. Approximately 63 percent of crashes resulted in some form of personal injury. Thirty-six percent of the crashes occurred during non-daylight hours.

## Intersection Level of Service (LOS)

The existing conditions of the corridor were analyzed by DVRPC in order to evaluate the current traffic operations. This evaluation was conducted using the LOS procedure. LOS analysis is a qualitative measure of operational conditions within a traffic stream. There are six defined levels of service, A–F, which describe operations from best to worst for the facility under analysis. These levels are defined in terms of parameters perceived by drivers and a range of operating conditions.

### Intersection Analysis

LOS of intersections is based on the control delay per vehicle imposed by the intersection. Table 10 shows the criteria for the LOS at signalized and unsignalized intersections. Although the criteria measured for both types of intersections is the control delay per vehicle, the value of the criteria varies due to the fact that drivers perceive delay differently at signalized intersections than unsignalized or stop-controlled intersections. A driver expects a different level of performance for a signalized intersection as it carries a higher volume of vehicles, and therefore a higher value of delay is considered acceptable.

Table 10: Level of Service (LOS) Criteria for Intersections

| Signalized Intersection: LOS | Control Delay: Seconds/vehicle | Unsignalized Intersection: LOS | Control Delay: Seconds/vehicle |
|---|---|---|---|
| A | ≤ 10 | A | 0-10 |
| B | >10–20 | B | >10–15 |
| C | >20–35 | C | >15–25 |
| D | >35–55 | D | >25–35 |
| E | >55–80 | E | >35–50 |
| F | >80 | F | >50 |

*Source:* Transportation Research Board. *Highway Capacity Manual.* 2000.

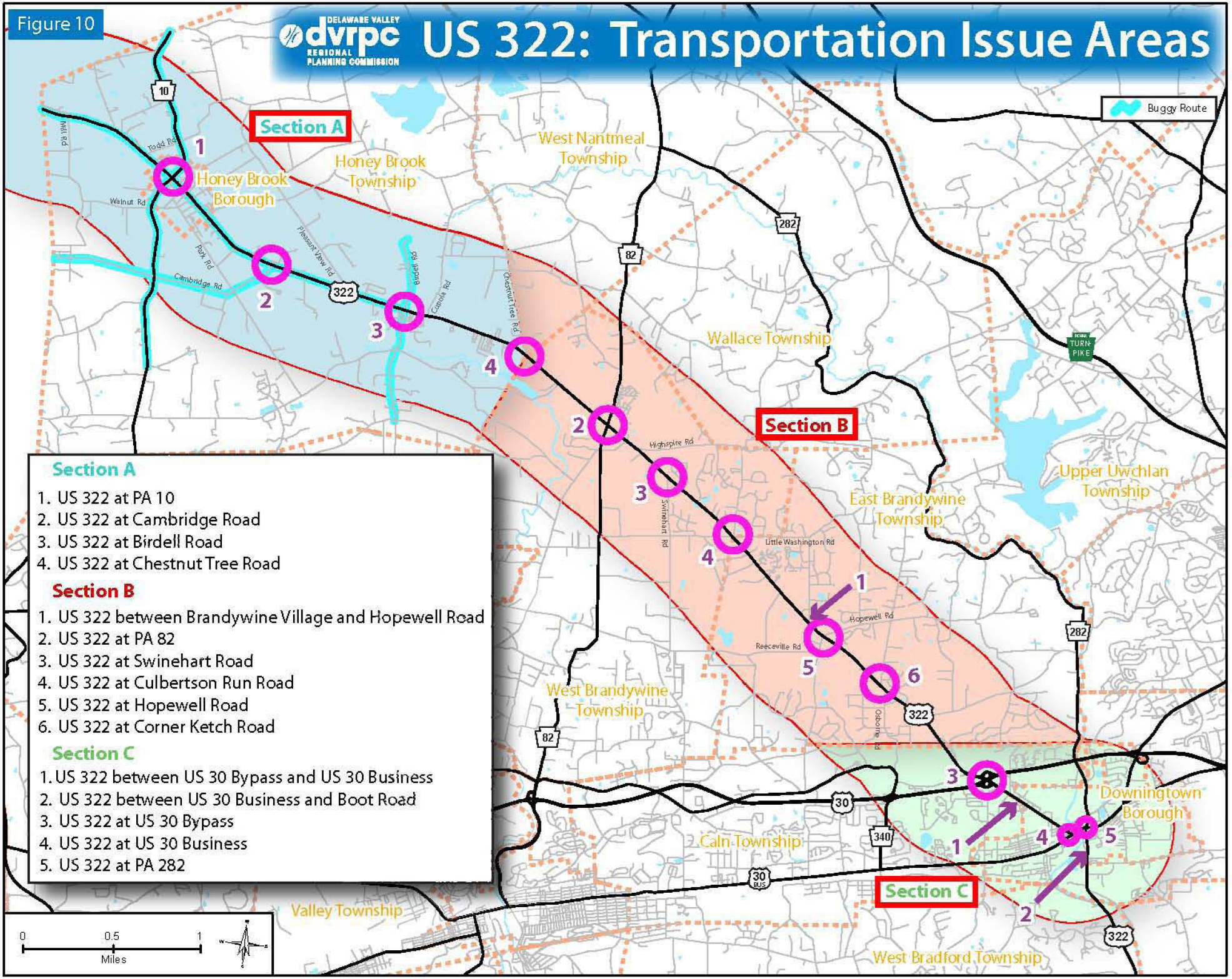
In order to fully understand the operational conditions within the corridor, the AM and PM peak period LOS was evaluated at numerous intersections within the corridor. Peak hour turning movement counts were conducted by DVRPC in early 2009 at the intersections under study. This volume data as well as traffic signal information obtained from PennDOT was analyzed using Synchro Software to determine the LOS. Tables showing the LOS results can be found in Appendix B. The intersections of US 322 with the US 30 Bypass and the five-leg intersection at Culbertson Run Road are currently performing the worst in the corridor and the intersections of US 322 with Corner Ketch Lyndell Road is performing the best.

## Corridor Analysis

In order to identify the transportation issues along the corridor, DVRPC solicited guidance from the study advisory committee, comprised of representatives of local municipalities, counties, and PennDOT among others. Some of the issues can be addressed corridor-wide while others need to be more specifically addressed. The locations of issue areas along the corridor are shown in Figure 10.

Figure 10

# US 322: Transportation Issue Areas




## Section A

1. US 322 at PA 10
2. US 322 at Cambridge Road
3. US 322 at Birdell Road
4. US 322 at Chestnut Tree Road

## Section B

1. US 322 between Brandywine Village and Hopewell Road
2. US 322 at PA 82
3. US 322 at Swinehart Road
4. US 322 at Culbertson Run Road
5. US 322 at Hopewell Road
6. US 322 at Corner Ketch Road

## Section C

1. US 322 between US 30 Bypass and US 30 Business
2. US 322 between US 30 Business and Boot Road
3. US 322 at US 30 Bypass
4. US 322 at US 30 Business
5. US 322 at PA 282

## Auxiliary Lanes

One of the issues throughout the corridor is the lack of auxiliary lanes, especially at unsignalized intersections. Exclusive turn lanes allow for turning vehicles to move out of the through traffic lanes while waiting to make the turn, which reduces disruption and delay for through traffic. Auxiliary lanes are typically provided at locations with high turn volumes or when a combination of through volumes and turn volumes cause long delays. At signalized intersections, the installation of an exclusive left-turn lane should be investigated when the volume of left-turn movements is near100 per hour and should be installed when capacity analysis indicates that the addition of the lane will improve intersection capacity.

PennDOT has compiled warrants based on these conditions.[3] Additionally, the Institute of Transportation Engineers recommends that left-turn lanes should be provided for safety reasons at high-speed rural unsignalized intersections, whether or not warrants are satisfied. Auxiliary lanes have been considered for each of the intersections analyzed throughout the corridor and are more specifically addressed in the intersection analysis section of each sub-area.

## Signing

The study team recommends that cross-road or side-road signs with advance street name plaques be installed along US 322 at major intersections. Additionally, stop-ahead signs should be installed along stop-controlled roadways that intersect US 322 throughout the corridor. This signing should meet current standards and should be consistent within all of the municipalities along the corridor.

# Sub-Area Analysis

Several areas of the corridor have unique characteristics and were chosen as separate analysis areas. The following analysis includes the sub-area as well as specific intersections within each area. Potential improvements were analyzed for each of the key intersections within the three sub-areas. This LOS analysis was completed using Synchro software. Summary charts showing the alternatives as well as their corresponding LOS result can be found in Appendix B.

[3] Pennsylvania Department of Transportation. *Access Management Model Ordinances for Pennsylvania Municipalities Handbook.* 2006.

## A. Honey Brook Segment

The Honey Brook sub-area segment of US 322 reaches from the Lancaster County border to the eastern edge of Honey Brook Township at the intersection with Chestnut Tree Road.

This segment sees horse and buggy travel as well as a growing proportion of older motorists which must be safely accommodated along the corridor. The Borough of Honey Brook also expressed an interest in detailed traffic calming recommendations.

### Horse and Buggy Accommodations

Horse and buggy travel ways identified by the study advisory committee include the majority of the Honey Brook segment. Specific routes, shown in Figure 10, include US 322, PA 10, Cambridge Road, and Birdell Road. The Honey Brook Township Comprehensive Plan of 2005–2006 recommends that 8- to 10-foot carriage lanes be included along arterial and collector roadways as part of the development of new ROW width requirements. Currently the US 322 roadway width consists of two 12-foot travel lanes with 10-foot shoulders in the area between Honey Brook Borough and Birdell Road. From that point eastward, shoulder widths are not consistent. Cambridge Road is classified as a local roadway but the township comprehensive plan recommends upgrading the functional classification to minor collector based on future growth. Birdell Road is classified as a minor collector, and therefore both of these roadways would require the provision for additional width.

The study team supports the township in recommending carriage lanes along these roadways which will serve buggy travelers as well as cyclists. Therefore, it is suggested that the shoulders along Cambridge Road and Birdell Road South at US 322 should be widened as feasible to accommodate eight-foot carriage lanes.

### Senior Driver Accommodations

Honey Brook Township has seen an increase in the number of older residents, especially in the areas surrounding the borough. *Planning Complete Streets for an Aging America* states, “Elderly drivers need to be able to notice, read, understand, and respond to visual cues and information.”[4] This AARP research report says that this can be achieved through improved landscaping, signing, and lighting that make the roadway more intuitive.

[4] AARP Public Policy Institute. *Planning Complete Streets for an Aging America*. May 2009.

According to the American Association of State Highway and Transportation Officials *Green Book*, older drivers need twice the brightness at night to process visual information for each decade over 25 years of age.[5] With this in mind, it is recommended that intersection lighting be installed on the northwest and southeast quadrants of the intersections to illuminate the stop bar area. This will improve visibility of the stop sign for those traveling along the side roads as well as the visibility of vehicles approaching the intersection for drivers along US 322. This can be accomplished by installing low-mast luminaire supports at the intersections or by installing luminaire arms on existing utility poles (with permission from their owners). An example of intersection lighting in rural areas is illustrated on the right. Additionally, increased visibility and delineation can be achieved along collector and local roadways through pavement markings and signing. Additional striping, including edge line, center line, and stop bars will make roadway conditions more discernible for older drivers while signing gives advance warning of roadway conditions.

Rural intersection lighting.

## Speed Analysis

A speed analysis was conducted on US 322 to investigate speeding near Honey Brook Borough. The posted speed limit within the borough limits is 35 mph which then rises to 40 mph in the area just east of the Borough, between the intersections of Wagon Way and Cambridge Road. East of Cambridge Road the posted speed limit is 55 mph.

Speed data was gathered by DVRPC along US 322 in the location of the eastern limits of the borough over a 48-hour period in February 2009. Approximately 76 percent of drivers travel at or below the posted speed limit in the westbound direction, while that figure is only 48 percent in the eastbound direction.

The charts found in Appendix C show the variation of speed by time of day in the eastbound and westbound directions respectively. The tables show more drivers are traveling at the posted speed limit in the westbound direction than the eastbound direction, and that more drivers travel above the speed limit in the AM peak hours in the eastbound direction and in the PM peak hours in the westbound direction. As the speed variation tables show, more than half of the drivers traveling eastbound along US 322 between the hours of 4:00 AM and 3:00 PM are driving above the speed limit.

[5] American Association of State Highway and Transportation Officials. *A Policy on Geometric Design of Highways and Streets*. 2004.

The *PA 10 Road Safety Audit Report* published by DVRPC in December 2008 recommended the extension of the 35 mph speed limit to a location north of Todd Road as well as the consideration of a gateway treatment as a traffic calming measure at the borough entrance. A gateway treatment would also be advantageous along the US 322 corridor in order to reduce travel speeds as vehicles enter the borough. There were no specific gateway treatments discussed or recommended by the PA 10 Safety Audit, but coordination is recommended between the proposed treatments along US 322 and PA 10. Various design elements that support the desired speed can be effective in reducing the operating speed. Some examples appropriate for this area include street trees and other landscaping elements that can be tied into a gateway treatment. Additionally, a reduction in shoulder width coupled with curb extensions and sidewalk improvements could limit the operating speed of motorists entering the borough. An example of a potential gateway treatment is illustrated in Figure 11. The figure depicts what a gateway treatment at the eastern limits of the borough would look like from the perspective of travelers headed westbound along US 322.

Within the borough, the northern edge of the roadway is striped, forming a narrow shoulder between the travel lane and the sidewalk. There is street parking on the south side of US 322, but the addition of an edge line to delineate the parking area would visually narrow the street, therefore reducing the speed of the motorist even when parked cars are not present.

The NJDOT/PennDOT *Smart Transportation Guidebook* recommends that regional arterial roadways have 11–12-foot lanes with 8–10-foot shoulders for an operating speed of 45–55 mph. The lower threshold of the lane widths are reduced to 10 feet with 4–6-foot shoulders within a town center, where the desired operating speed is 30–35 mph, such as along US 322 within the borough. However, the existing 12-foot lanes are preferred for areas with truck volumes greater than five percent.

The *Guidebook* also recommends avoiding occurrences where speed is reduced by more than 10 mph along adjacent segments. Westbound vehicles entering Honey Brook from the east see speed reduced from 55 mph to 40 mph at the intersection with Cambridge Road. It is recommended that consideration be given to reducing the speed to 45 mph and then to 35 mph. Additionally, further speed studies should be conducted along the edges of the borough to determine whether the speed along the section currently posted at 55 mph could be reduced to 45 mph. This speed may be much more appropriate for an area having a high percentage of trucks combined with horse and buggy travel and various access points. Additionally, the speed in the central business district of the borough should be studied to determine whether an operating speed of less than 35 mph is more appropriate. The following recommendations are to reduce the operating speed of motorists both entering and traveling within the Borough of Honey Brook:

- gateway treatment at the entrances to the borough along westbound US 322 and southbound PA 10;
- study of potential amendments of posted speed limits into and out of the borough to increments of 10 mph along US 322; and
- edge line delineation.

Figure 11: Before and After Gateway into Honey Brook Borough



*Source:* DVRPC. 2009.

## Intersection Analysis–Honey Brook Segment

### 1. PA 10–Conestoga Avenue/Pequea Avenue (Honey Brook Borough)

A large number of trucks utilize this intersection to access US 322 from the Pennsylvania Turnpike. The study advisory committee and field visits by the project team have noted that the truck-turning radius is a great concern at the intersection. The intersection has very small radii, and trucks need to pull into the opposing traffic lane in order to make a wide turn causing them to block the opposing movement. The intersection is also offset: The southern leg (Pequea Avenue) is offset to the west from the northern leg (Conestoga Avenue). The stop bars on the PA 10 approaches are located very far back from the intersection to allow for truck-turning movements. This combination makes it difficult for drivers to demarcate the path of the through movement. The intersection is currently signalized from side-mounted posts which are protected by bollards. These bollards are serving their purpose by protecting the traffic signals but are severely marred, indicating that numerous trucks have bumped against them as they attempt to make turning movements. Additionally, several historic buildings are located very close to the roadway, which precludes widening or realignment of the intersection.

The entire section of PA 10 within the study area boundaries for the US 322 Corridor Study was included in the *PA 10 Road Safety Audit Report*. Priority recommendations identified in the audit included traffic control elements such as signing, roadway delineation, and pavement markings as well as shoulder and drainage improvements. The report also recommended that shoulders be consistently four feet wide and inlets, pipes, and drains along the roadway should be cleared of debris. This report also recommended several intersection safety improvements that needed to be considered separately because of fiscal constraints. These improvements are also being recommended by this study and include replacing the curb at the northern approach of the intersection to increase the turning radius, and restriping the intersection area by adding dotted lines delineating the through movement for the offset intersection. It was also recommended that split-phase signal timing be considered to provide for safer turning movements. PennDOT is currently moving forward with a signal upgrade at this intersection. The project, which is currently in the design phase, will be constructed without ROW or utility involvement within the next year. The DVRPC TIP for FY 2009–2012 (MPS #72603) states that improvements include new traffic signal components and timing plan, updated curb ramps, and possible bulb-outs.

PA 10 and US 322 Intersection.

### Immediate Improvements

- Install dotted line extensions to delineate the offset intersection.
- Implement recommendations from the December 2008 DVRPC Road Safety Audit.

### Long-Term Improvements

- Increase the turning radius at the northern approach by removing and replacing the curb.

### 2. Cambridge Road (Honey Brook Township)

Cambridge Road is a local road that connects PA 10 with US 322 approximately one mile east of Honey Brook Borough. The concerns raised by the study advisory committee are the amount of senior drivers in the area as well as the horse and buggy traffic. The roadway has been improved in the area of the Knob Hill Farm development just south of the intersection with US 322. It is recommended that these improvements be carried through to the intersection with US 322. Cambridge Road improvements are illustrated in Figure 12.

#### Immediate Improvements

- Install advance warning signs for the stop condition as well as intersection warning signs with cross-road names;
- Install intersection lighting to illuminate the intersection in non-daylight hours; and
- Install edge-line and stop-bar pavement markings along Cambridge Road.

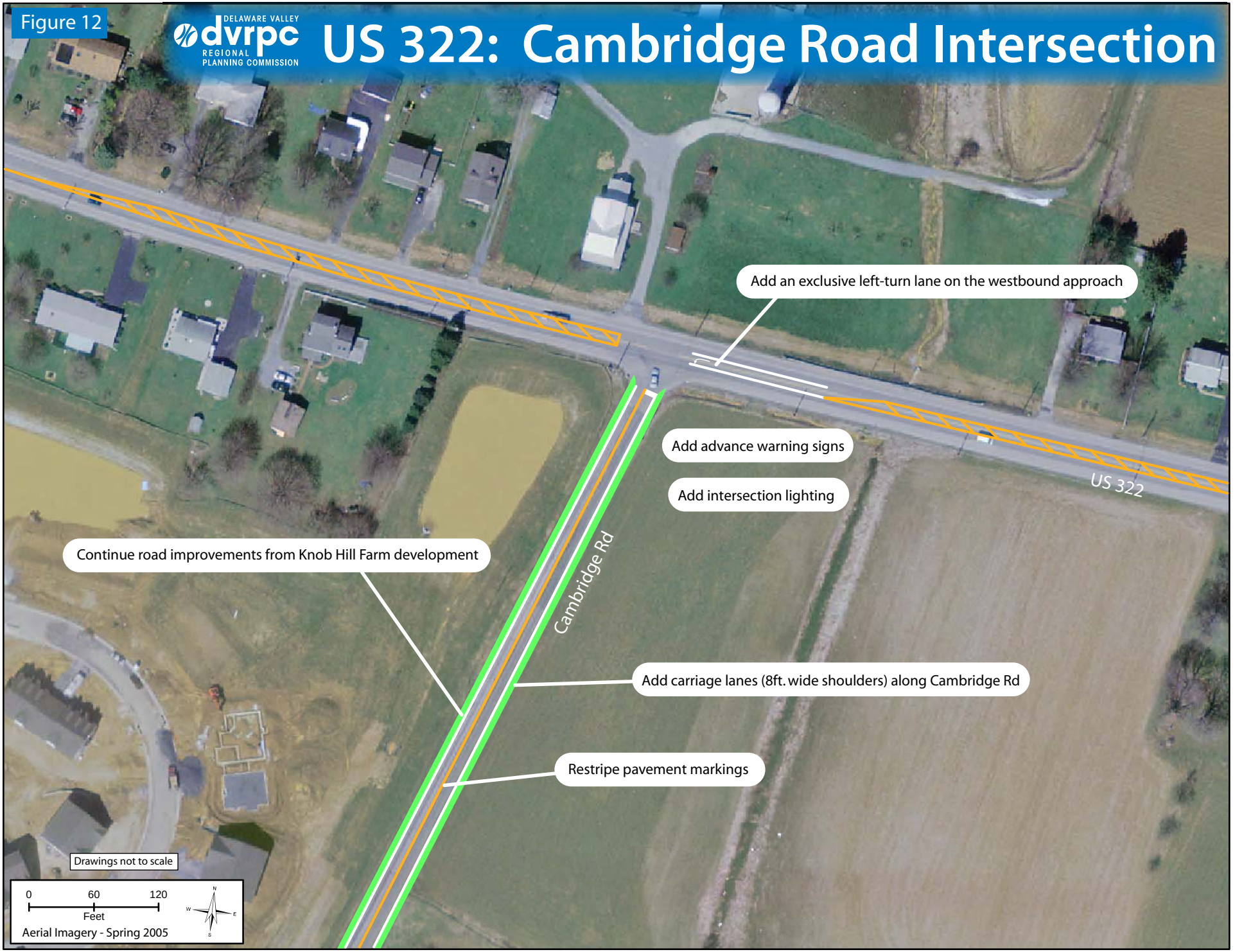
#### Long-Term Improvements

- Widen US 322 to accommodate an exclusive westbound left-turn lane;
- Continue roadway improvements from the Knob Hill Farm development entrance at Augusta Drive to the intersection with US 322; and
- Widen shoulders to provide eight-foot carriage lanes where feasible along both sides of Cambridge Road.

Figure 12

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

# US 322: Cambridge Road Intersection



### 3. Birdell Road (Honey Brook Township)

Birdell Road is a north–south minor collector within Honey Brook Township. The US 322 study advisory committee has asked DVRPC to determine if a traffic signal is warranted at this location. The committee also noted the number of senior drivers and buggy traffic along the intersecting roadway.

Intersection of Birdell Road and US 322

#### Traffic Signal Warrant Analysis

The study team conducted peak hour turning movement counts in February 2009 at the intersection in order to investigate the need for a traffic signal. Based on this traffic volume data, a signal is not currently warranted under the eight-hour or the four-hour vehicular warrants using the 70 percent criteria due to the speed limit being greater than 45 mph. The warrant should be reexamined as the traffic volumes along the northbound approach of Birdell Road increase due to potential development in the area south of US 322.

This potential signalization should be addressed in the future documents of the *Rocklyn Station Revised Strategic Development Plan* as the plans proceed. The installation of this signal should be balanced with the potential for traffic signals within the planned development as well as the outlying edges, Cupola Road and Chestnut Tree Road. The study team agrees with the requirement set forth in the township plan stating that signals should be one-quarter mile to one-half mile apart. This spacing requirement would allow for potential signalization at Birdell Road, Cupola Road, the intersection of the development's major north–south roadway, and Chestnut Tree Road at a time in the future where traffic volumes are such that warrants are met.

In the short term, issues such as clear sight triangles and the speed of the through traffic along US 322 should be evaluated in terms of available gaps for crossing traffic. The delay per vehicle, even in the peak hours, is reasonable for a rural two-way stop-controlled intersection. The maximum delay, even during the PM peak hour, is less than 30 seconds per vehicle. The addition of a northbound right turn lane and/or a southbound left-turn lane has little impact on the LOS of the intersection. The delay per vehicle is improved by only hundredths of a second in each case. Similarly, the through movements are currently operating at LOS A, and the intersection would realize only minimal improvement in delay with the addition of left-turn lanes on US 322.

The roadway currently is not striped with the exception of the northbound left-turn lane at the intersection. Because this roadway is narrow, striping of a centerline as well as shoulder improvements, intersection lighting, and advance warning signs may be helpful for older drivers. These recommended improvements are illustrated on Figure 13.

### Immediate Improvements

- Install advance warning signs on Birdell for stop condition as well as intersection warning signs with cross-road names;
- Install intersection lighting to illuminate the intersection in non-daylight hours; and
- Install pavement markings along the north leg of the intersection and continuation of the markings along the south leg.

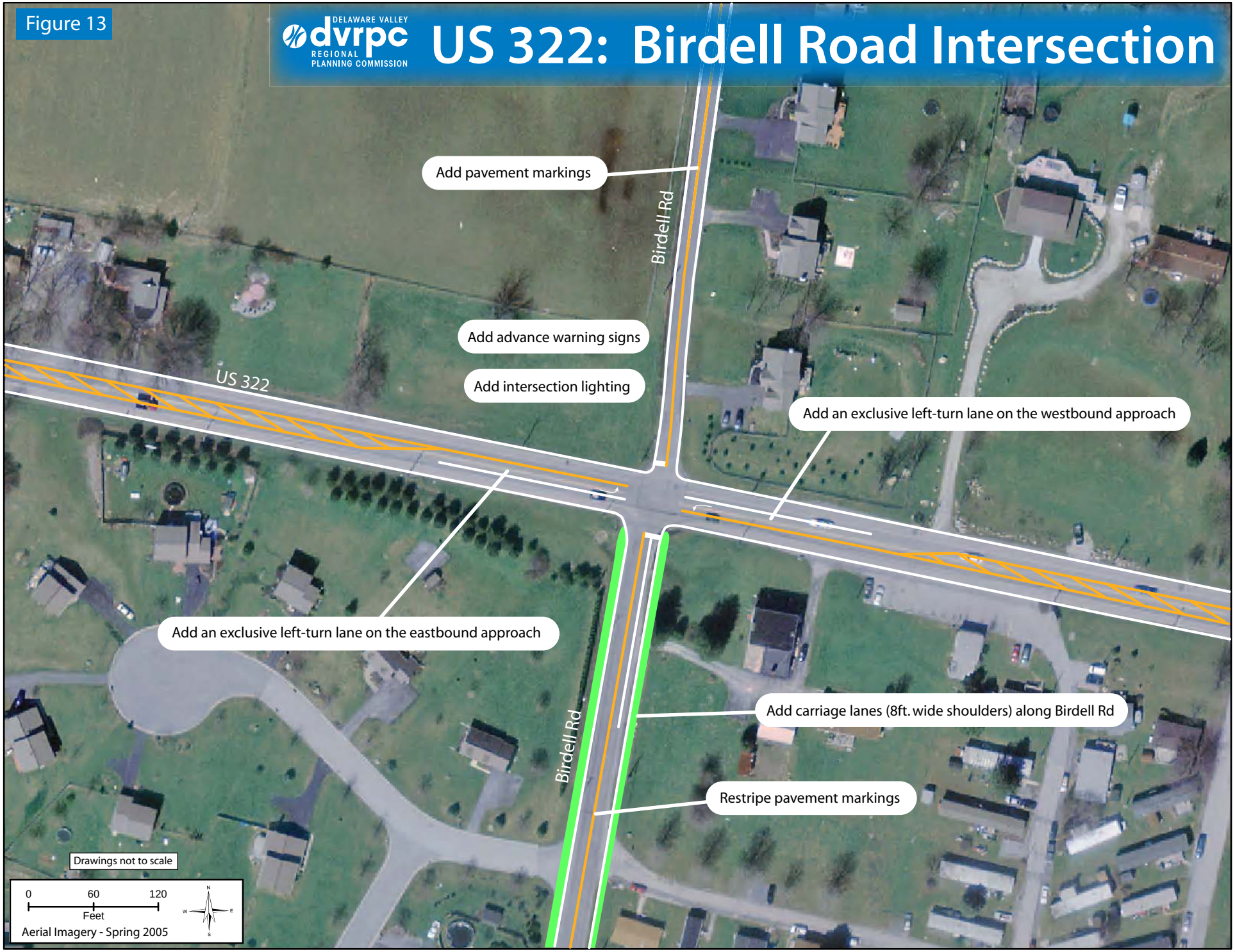
### Long-Term Improvements

- Widen US 322 to accommodate exclusive left-turn lanes along US 322;
- Widen shoulders to provide eight-foot carriage lanes where feasible along the southern leg of Birdell Road ; and
- Revisit traffic signal warrant analysis as development occurs in the area.

Figure 13

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

# US 322: Birdell Road Intersection



### 4. Chestnut Tree Road (Honey Brook Township)

Chestnut Tree Road is a minor collector roadway that connects US 322 with West Nantmeal Township to the north. The existing intersection angle was a major concern among the study advisory committee members, along with the recommendation of left-turn storage along US 322 (Horseshoe Pike). The Chester County *Circulation Handbook* recommends that roadways intersecting at angles less than 60 degrees be realigned to 90 degrees for a minimum of 50 feet along the intersecting roadway. The current intersection angle is approximately 42 degrees. The *Handbook* also recommends intersection radii of no less than 50 feet for rural intersections of non-local roadways. It is recommended that Chestnut Tree Road be realigned to the west in order to eliminate the substandard intersection angle. The Honey Brook Township *Comprehensive Plan Update* of 2006 as well as the *Rocklyn Station Revised Strategic Development Plan* comply with these recommendations. Recommended improvements for Chestnut Tree Road are illustrated in Figure 14.

Chestnut Tree Road and US 322.

#### Immediate Improvements

- Install advance warning signs on Chestnut Tree for the stop condition as well as intersection warning signs with side-road name.

#### Long-Term Improvements

- Realign Chestnut Tree Road to the west to meet US 322 at a right angle which is in agreement with the preliminary documents for the *Rocklyn Station Revised Strategic Development Plan*; and
- Widen US 322 to accommodate an exclusive eastbound left-turn lane along US 322.

Figure 14

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

# US 322: Chestnut Tree Rd Intersection

## B. Brandywine Segment

The Brandywine sub-area segment of US 322 includes the entire length of the corridor within the boundaries of West Brandywine and East Brandywine townships. This segment consists of the "middle" of the corridor and contains the intersection of US 322 and the major north–south roadway PA 82 (Manor Road). Issues that were identified by the study advisory committee for this segment include the lack of a consistent speed limit as well as intersection-specific concerns.

### Consistent Speed Limit/Traffic Calming

There is no consistent speed limit along the corridor. The posted speed ranges from 55 mph at the edge of Honey Brook Township to 25 mph in Downingtown Borough. The posted speeds also differ in the eastbound and westbound directions. Heading eastbound, the speed is reduced from 55 mph to 45 mph at the approach to the PA 82 intersection but remains reduced through the Culbertson Run Road intersection. Westbound speeds are not reduced to 45 mph until just before PA 82, thus the posted speeds are different from the eastbound speeds at the Swinehart Road and Culbertson Run Road intersections. It is recommended that the speed limit within this sub-area be investigated and new speed limit signing that reflects the outcome of the study be installed along US 322.

#### 1. Guthriesville TWLTL

East Brandywine Township expressed a desire to add a TWLTL in the village of Guthriesville between the Brandywine Village traffic signal and Hopewell/Bondsville Road. The study team determined that a TWLTL could be installed beginning at Brandywine Village, where the existing cross-section is four lanes. The additional fourth lane will be striped as a TWLTL to serve the residential drives along the southern side of US 322 in the area across from the Brandywine Village shopping center. The TWLTL will transition to a designated left-turn lane just west of the North Guthriesville Road intersection. An opposing left-turn lane will be striped in the area east of the intersection to serve the township municipal complex. The TWLTL is not recommended for the area between North Guthriesville Road and Hopewell/Bondsville Road due to the fact that there are only two drives, both of which are located within the influence area of the Hopewell/Bondsville Road intersection. The TWLTL recommendations are illustrated in Figures 15 and 16. A US 322 loop road is proposed in conceptual form as part of the East Brandywine Township *Act 209 Transportation Capital Improvements Plan.* This concept is proposed as a potential improvement based on traffic projections and the *Land Use Assumptions Report* for the year 2013. The loop road would be a two-lane roadway that would carry the eastbound US 322 traffic from a point west of North Guthriesville Road to a point west of Corner Ketch Road. Westbound traffic would be carried along the existing alignment of US 322.


Figure 15
DELAWARE VALLEY
dvrpc
REGIONAL
PLANNING COMMISSION
US 322: Guthriesville - West
Brandywine Village
US 322
N Guthriesville Rd
Match Line
Municipal Complex
Add a TWLTL between Brandywine Village and N Guthriesville Rd
Add an exclusive left-turn lane on the eastbound approach
Drawings not to scale
0
80
160
Feet
Aerial Imagery - Spring 2005

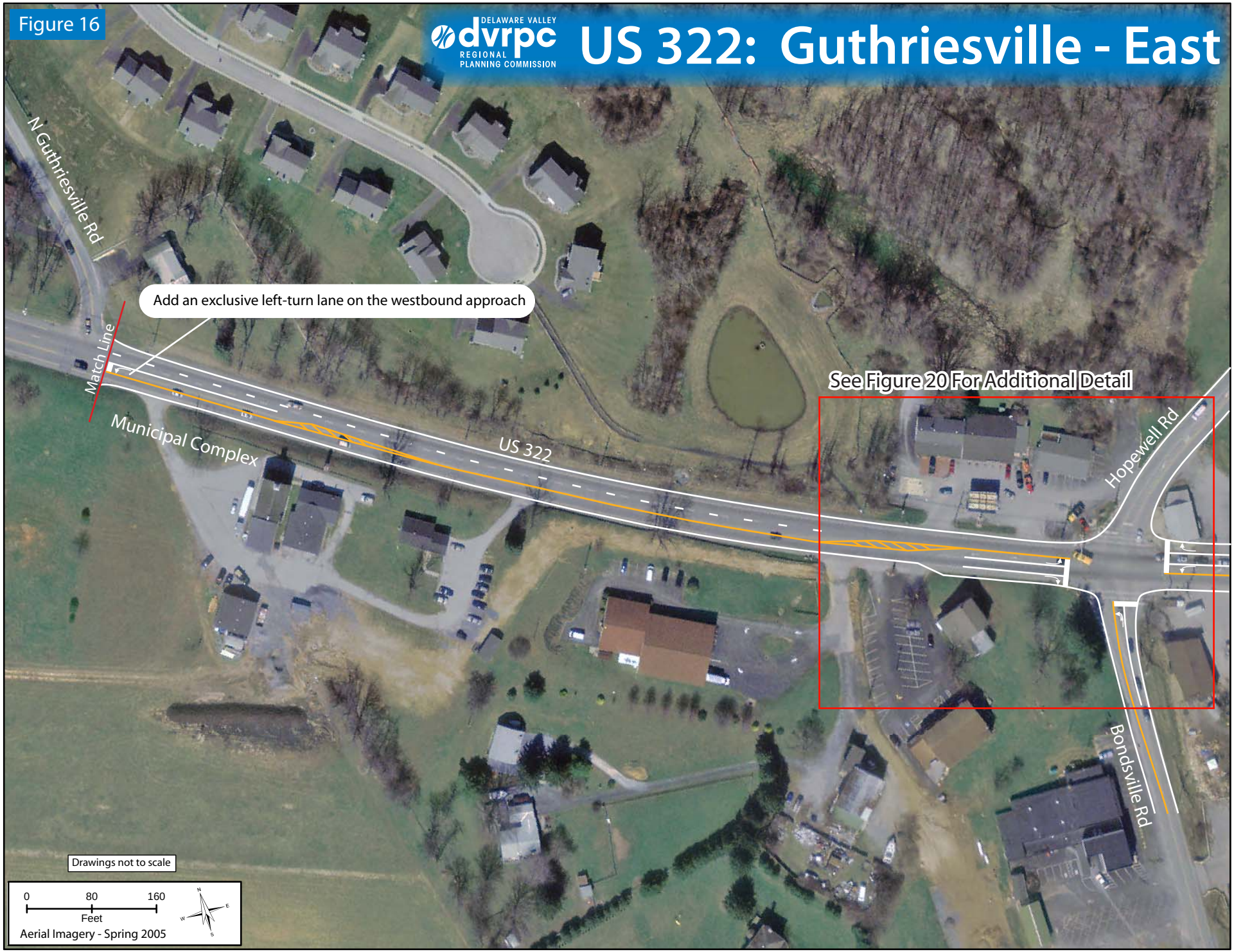


Figure 16
DELAWARE VALLEY
dvrpc
REGIONAL
PLANNING COMMISSION
US 322: Guthriesville - East
N Guthriesville Rd
Add an exclusive left-turn lane on the westbound approach
Match Line
Municipal Complex
US 322
See Figure 20 For Additional Detail
Hopewell Rd
Bondsville Rd
Drawings not to scale
0
80
160
Feet
Aerial Imagery - Spring 2005

## Intersection Analysis–Brandywine Segment

### 2. PA 82–Manor Road (West Brandywine Township)

Between 2003 and 2007, 13 of 20 crashes (65 percent) resulted in an injury. The majority of the crashes at this location are angle-type crashes, which tend to be of a higher severity. Traffic signals typically reduce this type of crash, so the traffic signal phasing was analyzed. Another concern is the number of mature trees and large shrubbery surrounding the intersection, which limits visibility and the driveways without sufficient corner clearance. The major issue at the PA 82 intersection is the number of turning movements being made. Greater than 30 percent of the traffic along each approach of Manor Road turns left at the intersection while less than 10 percent of the traffic turn left from the US 322 approaches. This results in an LOS D in the AM peak and LOS E in the PM Peak of PA 82.

Several alternatives were considered in determining what recommendations would best improve the safety and level of service of the intersection. Introducing split-phasing at the intersection decreased the LOS, while keeping the existing signal timing and adding left-turn lanes along PA 82 slightly increased the LOS. The most improvement in LOS can be achieved by adding left-turn lanes along PA 82 and adding an exclusive left-turn phase for these approaches. The recommendation is to implement these changes as well as the addition of left-turn lanes along US 322 as a safety measure. This recommendation can achieve LOS B overall at the intersection during both AM and PM peak hours while greatly reducing the delay currently experienced by drivers along the northbound and southbound approaches. The addition of left-turn lanes along PA 82 and US 322 is recommended. Ten-foot left-turn lanes and 11-foot through lanes can just be accommodated within the existing 33-foot ROW along PA 82. Twelve-foot left-turn lanes and through lanes with 6-foot shoulders can be accommodated within the 65+-foot ROW along US 322. Traffic signal poles will need to be relocated as part of the intersection improvement. Two-hundred-foot storage lengths should be provided in order to improve PA 82 to LOS C in both AM and PM peak hours. Figure 17 illustrates these recommended improvements.

#### Immediate Improvements

- Install intersection lighting to illuminate all approaches to increase visibility during non-daylight hours; and
- Trim tree limbs to prevent branches from overhanging traffic control devices.

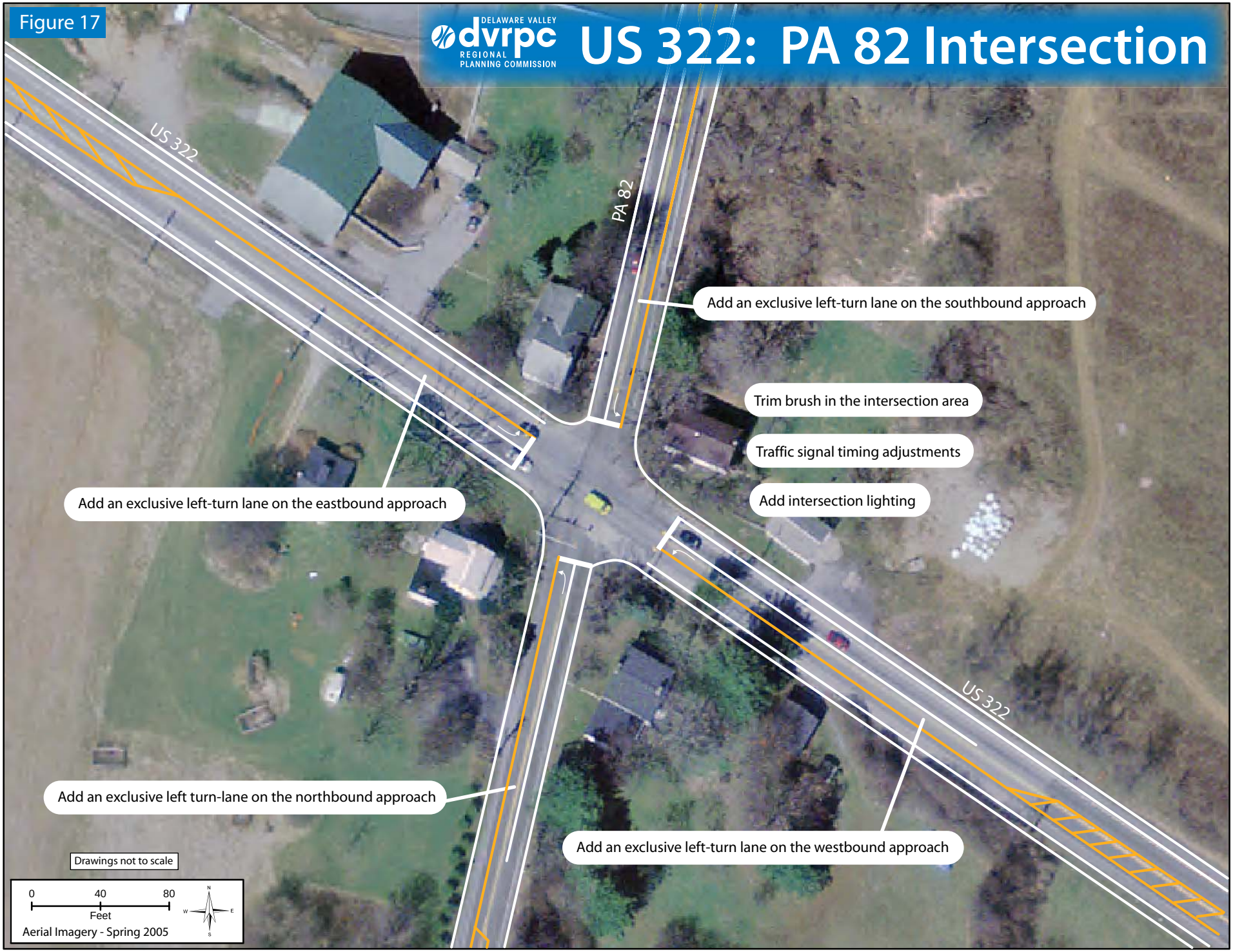
#### Long-Term Improvements

- Add exclusive left-turn lanes on all legs of the intersection; and
- Adjust traffic signal timing to provide exclusive left-turn phasing for the PA 82 approaches.

Figure 17

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

# US 322: PA 82 Intersection



### 3. Swinehart Road (West Brandywine Township)

Swinehart Road currently intersects US 322 at an angle of approximately 50 degrees. The Chester County *Circulation Handbook* recommends that intersection angles be no less than 60 degrees in order to safely accommodate traffic. The study advisory committee also asked that the study team look at realigning Swinehart Road to meet another road and then to signalize the new intersection which would include left-turn lanes along US 322.

Swinehart Road Intersection at US 322.

DVRPC is recommending that Swinehart Road be realigned to intersect US 322 at a right angle just west of the current intersection. This alignment is in agreement with a proposed development just north of the intersection. It is also recommended that the intersection remain unsignalized due to the low traffic volumes along Swinehart Road (the AADT was less than 500 vehicles per day in 2004). However, the warrant analysis should be reevaluated as development occurs in the area and traffic along Swinehart Road increases.

The West Brandywine Township *Comprehensive Plan* of October 2005 recommends that the intersection be signalized and a left-turn lane be provided along US 322 to accommodate any new development in the area. There is talk of development activity along US 322 north of the intersection, which is planning to have access through construction of a fourth leg of the relocated portion of Swinehart Road. As this development occurs, the township should evaluate the impact of the increased traffic and assess the need for signal installation. Recommended improvements are illustrated on Figure 18.

#### Immediate Improvements

- Install advance warning signs on Swinehart Road for the stop condition as well as intersection warning signs with cross-road names.

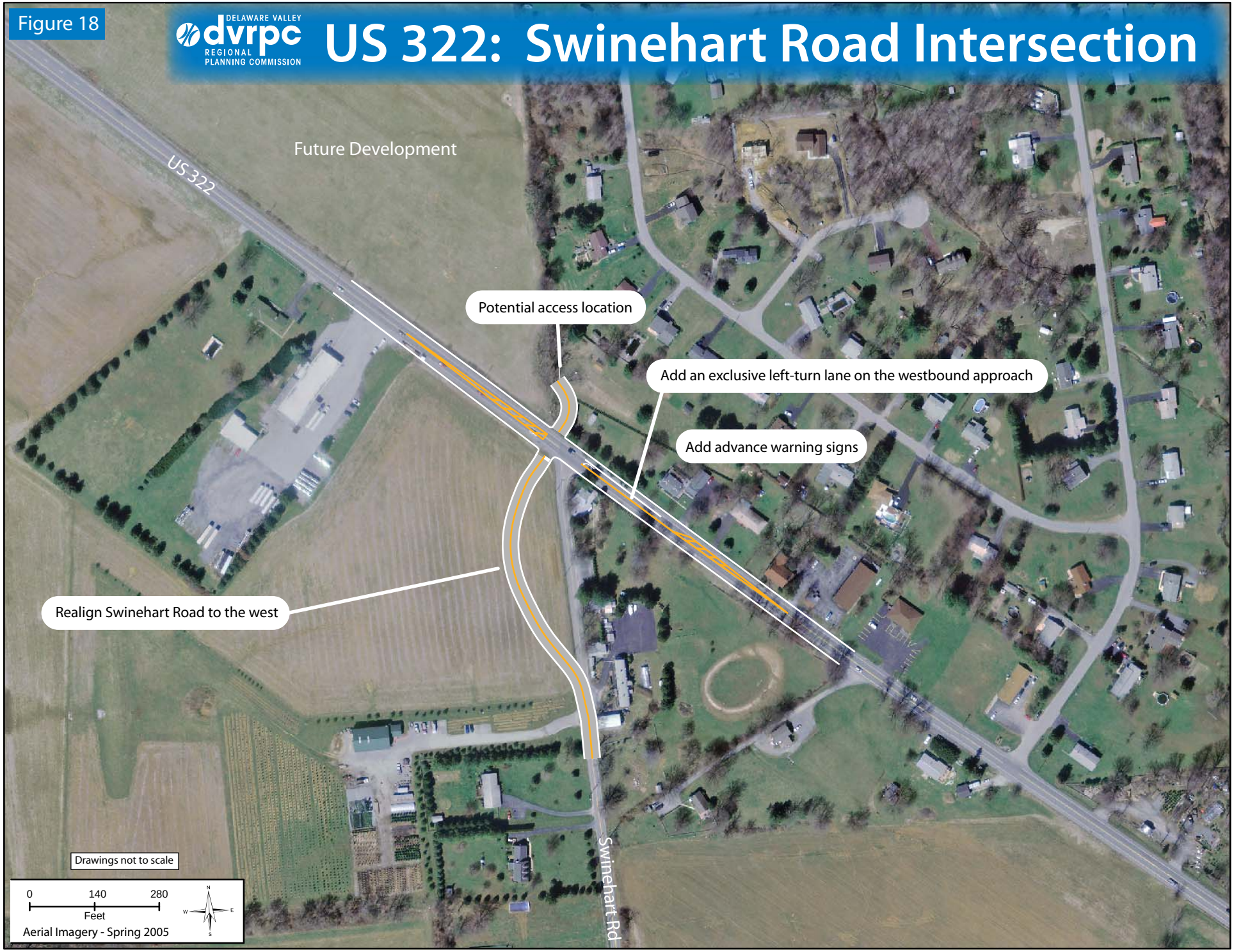
#### Long-Term Improvements

- Realign Swinehart Road to the west to meet US 322 at a right angle; and
- Widen US 322 to add an exclusive left-turn lane along westbound US 322.

Figure 18

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

# US 322: Swinehart Road Intersection



### 4. Culbertson Run Road/Springton Road/Little Washington Road (West/East Brandywine Township)

Some issues at the complex five-leg intersection include a high occurrence of injury crashes (approximately 64 percent) as well as a relatively high percentage of crashes occurring during non-daylight hours (approximately 36 percent). The majority of the crashes are rear-end and head-on type taking place in dry conditions.

The intersection is also very wide and has driveways without sufficient corner clearances. The current traffic signal timing does not allow for adequate clearance times. The intersection is currently operating at LOS C overall in both the AM and PM peak hours. However, the secondary roads are operating at LOS D and E. Several alternative signal timing and phasing plans were analyzed along with the addition of auxiliary lanes in order to determine suggestions for the intersection.

It is recommended that the intersection have lighting in order to illuminate the unusual five-leg intersection during non-daylight hours. This will make drivers more visible to each other and assist in their ability to delineate turning movements. Additionally, auxiliary lanes should be added along all approaches of the intersection as feasible within the existing ROW. The side-streets have ROW widths of 33 feet, which will accommodate the addition of a 10-foot turn lane but will leave only 1-foot of shoulder space. With the addition of the auxiliary lanes, the intersection will continue to operate at a LOS C overall, but the side-road approaches will improve to LOS D or better using the existing timing and phasing. Figure 19 illustrates the recommended improvements.

#### Immediate Improvements

- Add dotted edge-line extensions to guide motorists through the large intersection;
- Introduce intersection lighting to illuminate all approaches, making drivers more visible to each other during non-daylight hours;
- Move stop-bar locations closer to the intersection curve radii;
- Move the eastbound Culbertson Road stop bar 6-feet closer to the intersection and the westbound Little Washington Road stop bar 12-feet closer to the intersection; and
- Modify side street clearance intervals to 4.0 seconds and all other phases to 3.5 seconds in order to allow vehicles adequate time to clear the wide intersection.

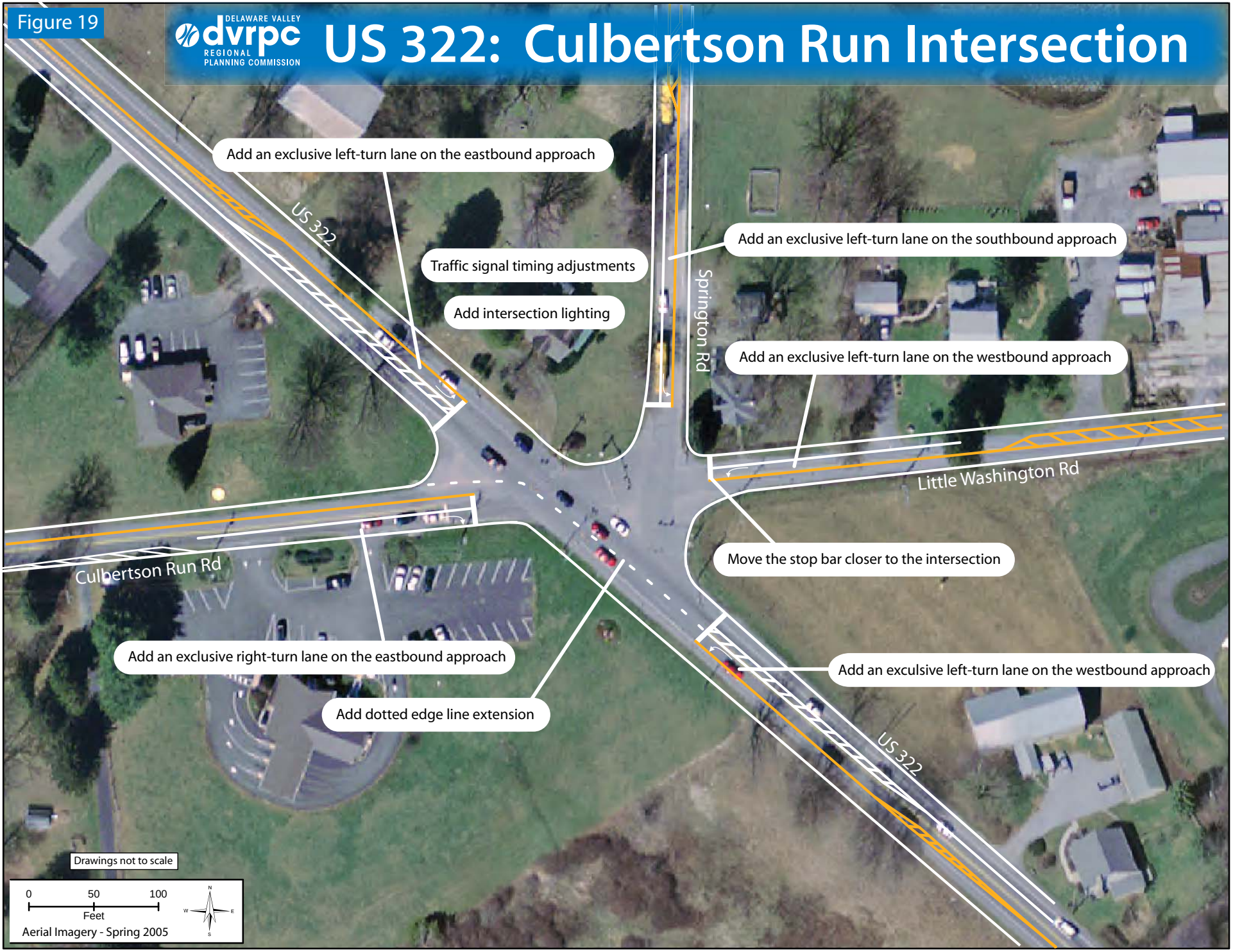
Long-Term Improvements

- Add offset left-turn lanes along US 322 eastbound and westbound to allow for a minimum of 400 feet of storage length;
- The ROW along US 322 is 60-feet or more (60-feet at one approach leg, 65-feet at the other), which allows for the addition of a 12-foot left-turn lane and six-foot shoulders;
- Add auxiliary lanes with 200-feet of storage length along the intersection side-roads;
- Provide left-turn lanes along southbound Springton Road and westbound Little Washington Road; and
- Provide a right-turn lane along eastbound Culbertson Road.

Figure 19

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

# US 322: Culbertson Run Intersection



### 5. Hopewell Road/Bondsville Road (East Brandywine Township)

This intersection lies within the Village of Guthriesville in East Brandywine Township. The intersection sees a large shift in traffic volumes between AM and PM peak hours. The AM sees traffic headed eastbound along US 322 and PM sees traffic returning in the westbound direction. The current traffic signal phasing plan includes a leading eastbound movement, but not a leading westbound movement in the PM. The intersection currently has an overall LOS C in the AM and LOS E in the PM peak hours. Analysis conducted by the study team shows that shifting the leading green time to the westbound movement in the PM peak hour brings the intersection to an overall LOS C. Recommended improvements for the intersection are illustrated in Figure 20.

Intersection at the Village of Guthriesville.

#### Immediate Improvements

- Verify the traffic signal is operating on the timing plan shown on version #8 of the PennDOT signal plans (8/27/07 revision). Concern has been raised that the signal plans show a northbound left-turn lane that does not yet exist; and
- Optimize signal phasing to include green time for westbound traffic along US 322 during the PM peak period which is currently dedicated to eastbound US 322. This will also require the addition of a detection zone for the westbound left-turn lane.

#### Long-Term Improvements

- Provide an exclusive left-turn lane along the northbound approach of Bondsville Road.; and
- Provide exclusive right-turn lanes along the eastbound and westbound approaches of US 322.

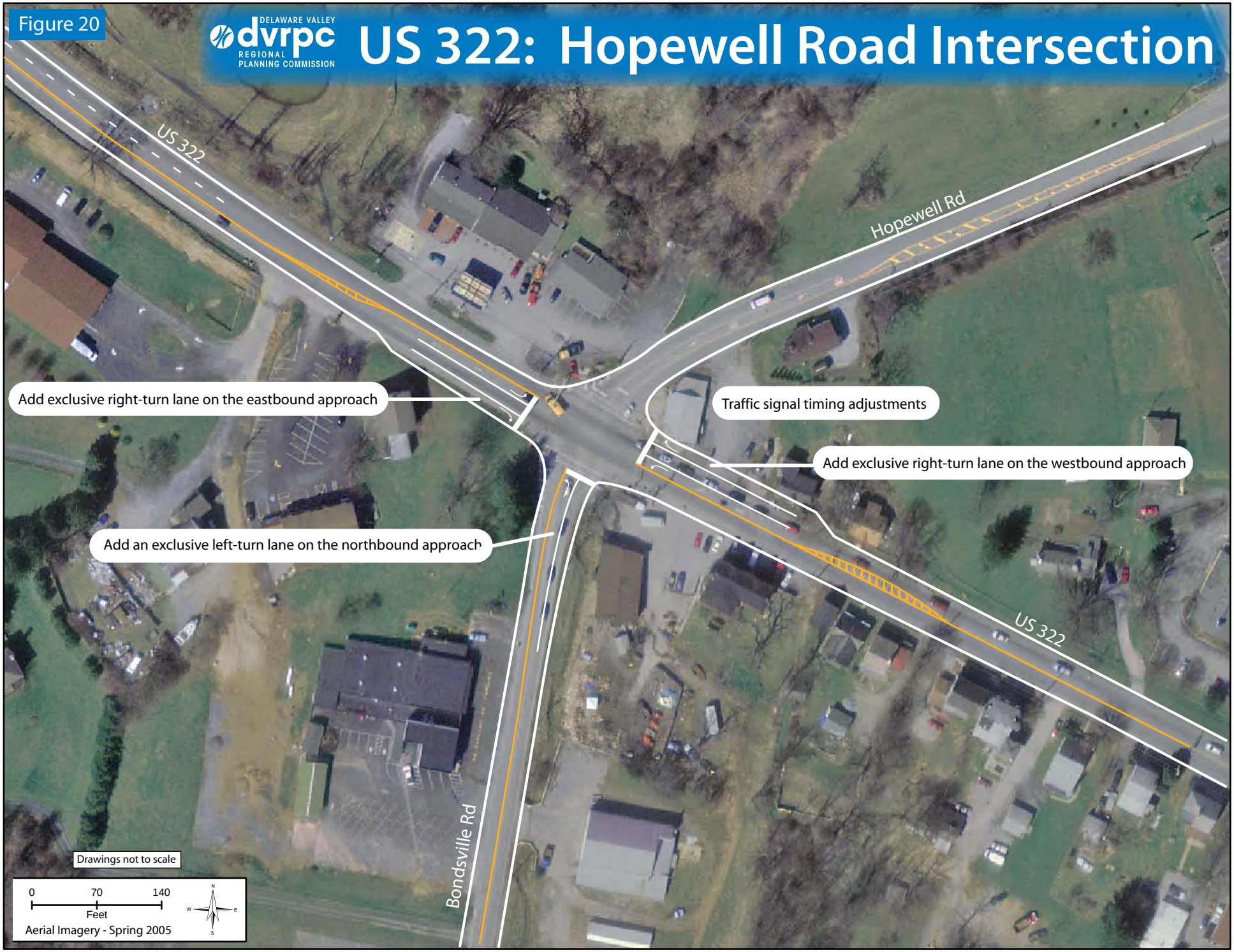


Figure 20
DELAWARE VALLEY
dvrpc
REGIONAL
PLANNING COMMISSION
US 322: Hopewell Road Intersection
US 322
Hopewell Rd
Add exclusive right-turn lane on the eastbound approach
Traffic signal timing adjustments
Add exclusive right-turn lane on the westbound approach
Add an exclusive left-turn lane on the northbound approach
US 322
Bondsville Rd
Drawings not to scale
0
70
140
Feet
Aerial Imagery - Spring 2005

### 6. Corner Ketch Lyndell Road (East Brandywine Township)

Area residents and municipal officials noted that PM congestion is an issue at this "T" intersection. The southbound movement takes away green time from the high-volume through movements along US 322. Analysis of this intersection by the study team indicates that the intersection is operating at an overall LOS B, with the southbound approach experiencing a slightly higher delay with LOS C. These are both well within the preferred range, and signal modifications would increase delay on US 322.

#### Immediate Improvements

- Install advance warning signs for the traffic signal as well as intersection warning signs with side-road name.

## C. Coatesville-Downingtown Bypass Segment

The US 30 Bypass sub-area segment contains the portion of US 322 lying within Caln Township and Downingtown Borough. This area can be roughly described as the section of US 322 between Old Horseshoe Pike and the Boot Road intersection in Downingtown.

### Truck Routing

Concern was raised by Downingtown officials that trucks are traveling through the borough rather than following posted truck routes around the borough. It was also noted that US 322 backs up when there are accidents on the US 30 Bypass. In those instances, motorists use Business 30 or Boot Road, therefore traveling through part or all of Downingtown in their re-route. DVRPC and PennDOT are currently working on the Route 30 Closed Loop Signal System Incident Management and Signal Operations Project, which will study the overall performance of the existing closed loop system as well as look at incident management improvements for the area. There is the potential for additional signage to reinforce the message of the existing truck information signage. Currently, there is one large guide sign along southbound US 322 between Old Horseshoe Pike and Edges Mill Road that states, "Truck Info– Trucks Over 12'-0" To West Chester Use US 30 to PA 100."

## Roadway Segment Analysis–Coatesville-Downingtown Bypass Segment

### 1. US 322–Manor Avenue (US 30 Bypass to Lancaster Avenue)

The study team recommends that the improvements identified in the River Station traffic impact study[6] be implemented as outlined in the study. These improvements include the retiming of the Pennsylvania Avenue traffic signal at US 322. Additionally, recommendations from the PA 100 study conducted by DVRPC in June of 2002 should also be made. These include the coordination of the traffic signals at Rock Raymond Road and North Lloyd Avenue to help the progression of through traffic as well as vehicles entering/exiting the bypass.

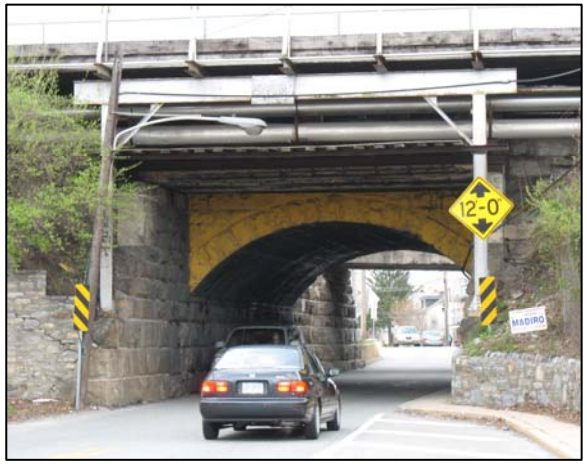
#### Immediate Improvements

- Retime traffic signals along Pennsylvania Avenue; and
- Coordinate signals at Rock Raymond Road and North Lloyd Avenue.

### 2. US 322–Brandywine Avenue (Lancaster Avenue to Boot Road)

This section of US 322 falls in the heart of Downingtown Borough. There is a height restriction of 12'-0" at the railroad bridge in the southern portion of the segment. Downingtown has posted numerous signs along the US 322 route, including a posted truck route. The intersection of Boot Road and US 322 will require major modifications as part of the River Station development. Traffic continuing on US 322 eastbound will turn right at the intersection rather than continue straight through the intersection once the development is complete.

The study team recommends that the improvements identified in the River Station traffic impact study be implemented as outlined in the study. The study adds a southbound right-turn lane, and eastbound right, through, and left-turn turn lane, a northbound left-turn lane, and a westbound through lane.




Tractor trailers often are stuck under the height-restricted bridges within Downingtown.

[6] Traffic Planning and Design. *River Station Mixed-Use Development Traffic Impact Study*. September 2008.

Immediate Improvements

- Examine the possibility of consolidating signage at intersections where truck routing signs are posted as well as removal of non-essential signage to reduce sign clutter.

Long-Term Improvements

- Add auxiliary lanes as outlined in the traffic impact study; and
- Implement split phasing for the eastbound and westbound traffic as well as southbound left-turn protected/permitted phasing as the River Station is developed.

## Intersection Analysis–Coatesville-Downingtown Bypass Segment

### 3. US 30 Bypass Interchange–Coatesville-Downingtown Bypass (Caln Township)

The interchange with the US 30 Bypass is a high-crash location for the corridor. There were 29 crashes at the eastbound ramps intersection and 12 crashes at the westbound intersection between 2003 and 2007. Approximately 75 percent of these crashes occurred under dry roadway conditions, and greater than 60 percent were angle type crashes. Angle crashes can typically be reduced with the installation of a traffic signal.

The study team determined that a traffic signal is warranted at the intersection of the westbound entrance and exit ramps. The left turns from the westbound exit "Ramp M," as well as the through traffic along US 322, warrant the installation of a traffic signal based on the Minimum Vehicular Volume and the Interruption of Continuous Traffic conditions. This intersection is located just less than one-quarter mile northwest of the existing signalized intersection at Lloyd Avenue. The installation of a traffic signal will increase safety at the interchange, but will have some negative effect on LOS, increasing it to a LOS B. The westbound through movement will remain LOS A, but the AM eastbound through movement will see some additional delay (LOS B) in order to allow southbound lefts to be protected.

US 30 Bypass Interchange at US 322.

Of the alternatives analyzed by the study team, two are recommended for implementation. The first includes the installation of a traffic signal at the westbound ramps intersection as well as signal phasing that includes an eastbound leading left-turn phase. The long-term alternative involves reconfiguring the westbound ramps intersection as a "Florida T" intersection, allowing the eastbound through movement to remain a free movement while traffic from the ramps and westbound US 322 are signalized. This configuration would reduce the overall delay for the AM peak hour but would require the addition of an eastbound lane under the US 30 Bypass in order to accommodate an eastbound left-turn lane. Additionally, pavement markings would need to be restriped in the westbound direction and a traffic divider installed.

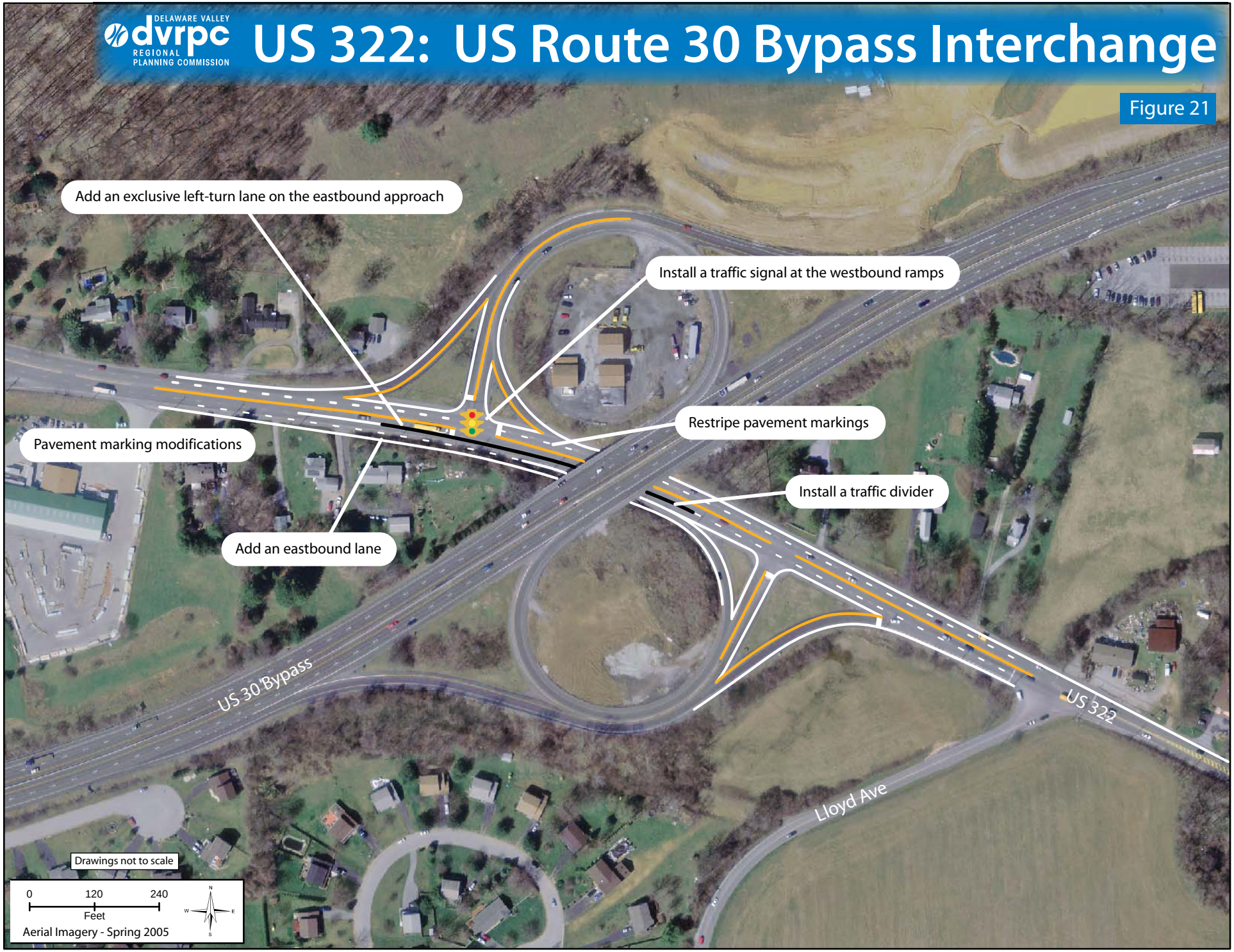
Along with the recommended improvements, the study team recommends that access to future development in the area of the interchange be via frontage roads that meet US 322 within the existing ramp intersections. Figure 21 illustrates the recommended improvements.

### Immediate Improvements

- Install a traffic signal at the intersection of the westbound entrance and exit ramps. The signal should include an eastbound leading left-turn phase; and
- Construct pavement marking modifications in the area of Edges Mill Road, which is currently being discussed by Chester County and Caln Township.

### Long-Term Improvements

- Explore the feasibility of configuring the westbound ramps intersection as a "Florida T" intersection, allowing the eastbound through movement to remain a free flow movement; and
- Construct frontage roads as access points for any future development in the interchange area.


DELAWARE VALLEY
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REGIONAL
PLANNING COMMISSION
US 322: US Route 30 Bypass Interchange
Figure 21
Add an exclusive left-turn lane on the eastbound approach
Install a traffic signal at the westbound ramps
Restripe pavement markings
Pavement marking modifications
Install a traffic divider
Add an eastbound lane
US 30 Bypass
US 322
Lloyd Ave
Drawings not to scale
0
120
240
Feet
Aerial Imagery - Spring 2005

### 4. US 30 Business–Lancaster Avenue (Downingtown Borough)

The extension of US 322 as part of the River Station development will modify the traffic flow significantly at this intersection. Traffic continuing on US 322 eastbound will pass through the intersection onto the new connector roadway and will no longer turn left at this intersection. The intersection will require modifications to the existing traffic signal timing and phasing, once the River Station connector is complete. The recommendations from the River Station traffic impact study should be implemented as outlined in the study.

#### Immediate Improvements

- Modify the US 30 Closed Loop Signal System, outlined within the Incident Management and Signal Operations Study, by DVRPC and PennDOT.

#### Long-Term Improvements

- Implement River Station improvements including the addition of a southbound through lane, and eastbound right-turn lane, and separate lanes for all three northbound movements. This will also include northbound and southbound protected/permitted left-turn phasing at this location.

### 5. PA 282–Wallace Avenue/Lancaster Avenue (Downingtown Borough)

This large five-leg intersection of three major arterials is located in the heart of Downingtown. Because of this central location, there is a large volume of pedestrian and vehicular traffic. A connector roadway from the intersection of US 322 with Lancaster Avenue is proposed as part of the River Station development. This roadway will remove one major route from the intersection and alleviate some of the congestion by greatly reducing the northbound left-turn vehicles. The recommendations from the River Station traffic impact study should be implemented as outlined in the study.

#### Immediate Improvements

- Modify the US 30 Closed Loop Signal System, outlined within the DVRPC and PennDOT's Incident Management and Signal Operations Study.

#### Long-Term Improvements

- Implement River Station improvements including the proposed connector roadway from the intersection of US 322 with Lancaster Avenue, which should be constructed as proposed; and
- Retime the traffic signal for AM and PM peak hour conditions as the River Station is developed.

## Park-and-Ride Opportunities

Park-and-Ride lots provide commuters with the ability to park vehicles while using public transit or participating in carpools/vanpools. Park-and-Ride lots are used as a common meeting spot that is convenient for drivers to leave their cars while sharing the ride to work. Park-and-Ride lots are often maintained by state or local governments and can provide parking where there are on-street parking problems or parking management issues in downtowns. These lots include clearly marked areas specifically designated by state or local transportation officials, areas with alternate uses at non-peak commute times, upon official agreement with owner (e.g., church lot or extra, fringe parking at shopping areas), and lots associated with transit stops, often maintained by the transit company for use by transit riders only.

Table 11: Possible Park-and-Ride Locations

| Municipality | Map Location | Property Name | Estimated Spaces |
|---|---|---|---|
| Honey Brook Borough | 1 | Honey Brook Presbyterian Church | 20 |
| Honey Brook Township | 2 | Living God Lutheran Church | 100 |
| | 3 | Peddler Inn | 50 |
| West Brandywine Township | 4 | Romano 4-H Center | 100+ |
| | 5 | The Golf Zone | 140 |
| | 6 | Life's A Party Shop | 40 |
| East Brandywine Township | 7 | Brandywine Village–Cropper's | 360 |
| | 8 | East Brandywine Municipal Complex | 105 |
| | 9 | East Brandywine Baptist Church | 120 |
| Caln Township | 10 | PennDOT proposed lot–US 30 Bypass | 30 |

*Source:* DVRPC. 2009.

Park-and-Ride lots along US 322 will help encourage the use of transit and lessen the impact on the transportation network within Chester County. There are currently no official Park-and-Ride lots within the study area. To further encourage center-type development, Table 11 identifies locations to be explored as Park-and-Ride lots. While most of the properties are privately owned, municipalities should work with the Transportation Management Association of Chester County (TMACC) and Chester County Planning Commission to pursue appropriate next steps. Outlined below are two share programs that can be implemented along US 322.

### Share-A-Lot Exchange Program

Share-A-Lot is a resourceful program initiated and organized through the cooperation of businesses in three counties and through Transportation Management Associations. Share-A-Lot allows employees of Company A who live near Company B to use Company B's lot to park their cars and then form carpools or vanpools to commute to Company A. In return, Company A allots a certain number of their parking spaces to employees from Company

B to do the same thing. Both companies can maximize the use of their lots while encouraging shared commutes. The convenience and the chance that more employees will be able to take advantage of this option increase when more companies participate.

### Share-A-Ride Program

The Share-A-Ride program is a free computerized service that provides commuters with convenient transit services, carpools, vanpool groups, and walking and bicycling opportunities within southeastern Pennsylvania. This service is free to commuters who participate. The Share-A-Ride program is available through the TMACC for portions of the US 322 corridor.

## Transit Analysis

Public transit within the study area is provided by SEPTA, Amtrak, and Krapf's Transit. The US 322 municipalities can access regional connections to New York, New Jersey, Philadelphia, and Pittsburgh from public or private transit providers in the area. Transit opportunities are shown on Figure 22.

### SEPTA Regional Rail

SEPTA's Regional Rail R5 service provides daily service to Downingtown and Thorndale stations. There are 7 weekday AM peak trains and 10 inbound weekday AM trains which serve both stations. There are 20 Philadelphia-bound trains departing from Downingtown Station between 5:00 AM and 11:17 PM (11:47 on Fridays), while there are 22 outbound weekday trains arriving between 6:38 AM to 1:16 PM.

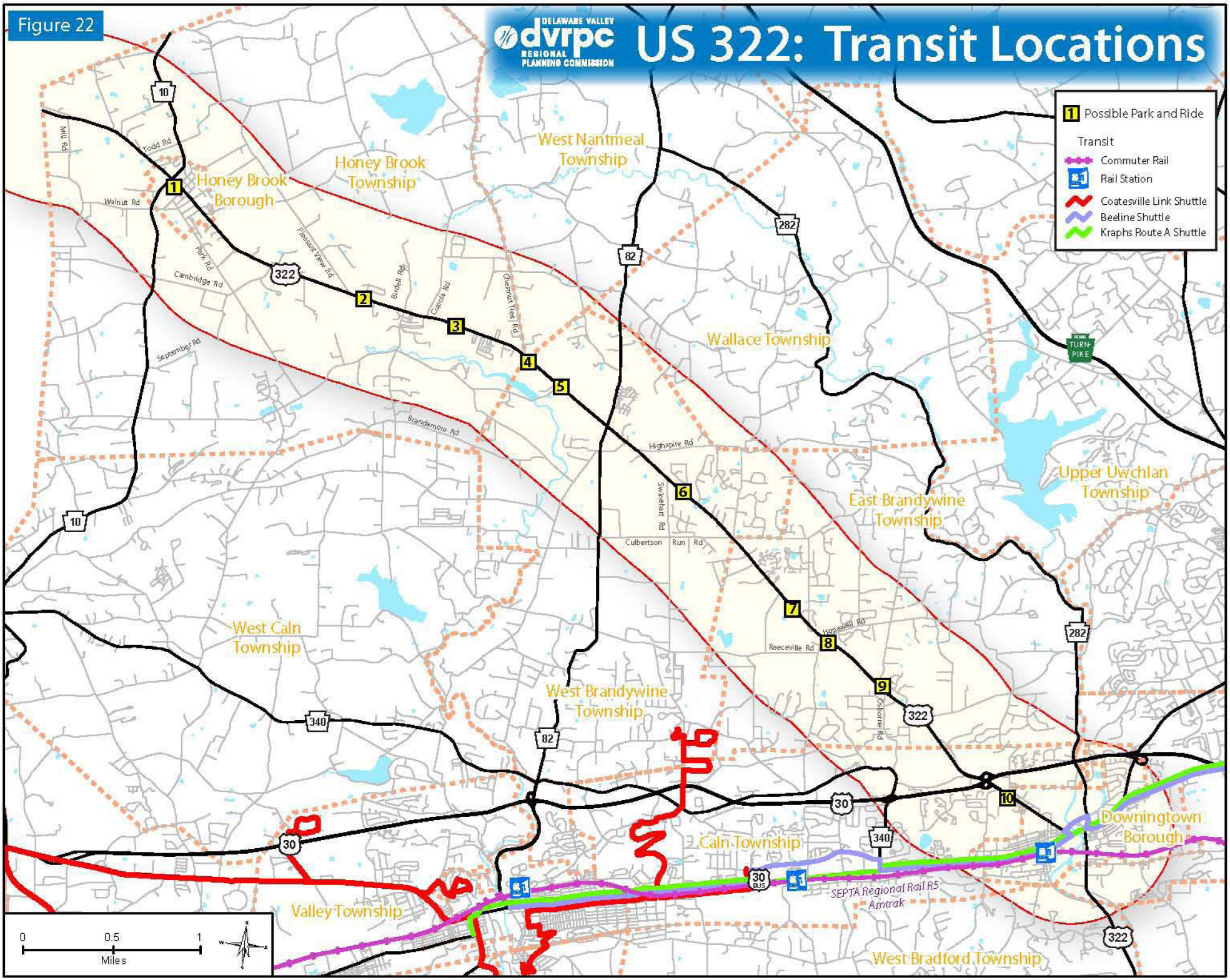
#### Downingtown Station

Downingtown Station is located at US 30 Business and Stuart Avenue in Downingtown Borough. The station can be accessed from US 30 Business. US 322 (Manor Avenue) extends northwest–southeast, just north of the station, and Downing and Viaduct Avenues connect the station to several smaller streets. Sidewalks are located along US 30 Business on several of the residential streets and in the immediate station area. There is also a semi-enclosed shelter for commuters as well as bicycle racks. There are 347 parking spaces provided for commuters. Parking is $1 per day and all spaces are owned, leased, and operated by SEPTA. Approximately 82 percent of the parking lots are utilized during the weekday. The Downingtown station provides service for SEPTA's Regional Rail R5 Thorndale and Amtrak's Keystone and Pennsylvania routes. There are also connections to Krapf's Transit Route A. The Downingtown Train station is located in the Borough's Keystone Opportunity Zone (KOZ).

The station and surrounding maintenance yard and residential properties were part of a planning process to improve this area. Based on previous studies done by the Borough, the station is proposed to be moved to a location closer to the Borough's downtown. The new station could serve as a regional transit center that would incorporate bus and carpool/vanpool facilities as well as provide direct connections to pedestrian paths linking the station to the central business district and new high-density residential development.

Figure 22

# US 322: Transit Locations



## Thorndale Station

Thorndale Station is located at US 30 Business (Lincoln Highway) and South Bailey Road in Caln Township. The station is accessed by US 30 Business for commuters arriving by automobile. Bailey Road and James Buchanan Drive provide connections for nearby residential neighborhoods. There are no sidewalks or bike paths connecting to the train station. Shelters are provided on the station's two platforms and bicycle racks are available. There are 250 daily fee spaces and 206 daily permit-only spaces for a total of 506 spaces. Parking is $1 per day and spaces are owned, leased, and operated by SEPTA. Approximately 67 percent of the spaces are utilized during the weekdays. The Thorndale Station provides service on SEPTA's Regional Rail R5 Thorndale line.

The Thorndale Station is located in the Train Station Overlay District that encourages mixed-use commercial development. The station area was improved to include new road spacing and sidewalks. Recently constructed multi-family dwelling units at the Mews at Bailey Station are located south of the station.

## Krapf's Coaches

Krapf's Coaches is located in Chester County and provides county bus service on Route A. Serving the municipalities of Coatesville, Downingtown, Exton, and West Chester, it carries more than 1,200 passengers and runs seven days a week, between 5:30 AM and 11:00 PM. The Route A shuttle service connects to the City of Coatesville's Link, Beeline, Suburban Link the Rambler serving Upper Merion Township, and southern Chester County's *SCCOOT* service. Route A shuttle service can be accessed at the Thorndale and Downingtown train stations. Krapf's Transit Route A shuttle has six eastbound and four westbound buses that serve this area daily. The first bus departs Strode Avenue in Coatesville at 5:25 AM while the last bus departs the same location at 6:00 PM. The Coatesville evening link service (Coatesville to Exton) provides later service with the last bus departing Regency Park to Exton Mall at 9:30 PM.

## TMACC

The TMACC provides scheduled shuttle bus service from Coatesville to Great Valley via Exton with the Beeline. The Beeline provides transit service during peak commuting hours from the Coatesville, Downingtown, and Exton areas to Great Valley Corporate Center. The Beeline provides weekday bus service from Coatesville and Downingtown to Great Valley primarily along US 30 (Lincoln Highway). There are four eastbound AM buses with the first bus departing US 30 and 2nd Avenue in Coatesville at 5:30 AM. The first bus stops in Downingtown at 5:48 AM. There are four westbound PM buses with the last bus arriving at US 30 and 2nd Avenue in Coatesville at 7:06 PM.

The Beeline serves the county's largest employment centers. Additional stops on the Beeline include Thorndale, SEPTA's R5 train station in Downingtown, Exton Square Mall, the Commons at Great Valley, Siemens Medical Systems, Wyeth Pharmaceuticals, and The Vanguard Group. The bus also serves several shopping centers, apartment complexes, housing subdivisions, and daycare centers along its route. The Beeline Route is broken into three zones. Trips within a single zone are $2. Each additional zone is an extra 60 cents. Senior citizens are provided a cost savings with a Medicare card, Pennsylvania Senior Citizen Transit Card, or railroad retirement card.

## Immediate Improvements

### Wayfinding

Provide wayfinding signs at strategic locations along the corridor to indicate the direction to the nearest or most convenient point of access for SEPTA's rail stations. These signs would increase the visibility of transit as a travel mode. It is recommended that the wayfinding assembly be designed to include the appropriate SEPTA train/bus symbol and a single-headed, directional arrow pointed along the route leading to the facility.

### Waiting Areas

Improve waiting areas at transit stations by providing adequate shelter such as canopies, benches, and glass windscreens designed for customer comfort. Since the value of transit as a congestion reduction measure is to serve commuters who could otherwise drive, such measures must compete with comfort and convenience of a private vehicle.

### Location of Bus Stops

Where feasible, parking bays that remove buses from the traffic stream while loading and unloading should be constructed. This will encourage bus use by making the service more attractive and safe and reduce delay for other vehicles on the roadway.

### Bus Stop Shelters

Although several bus stop shelters exist along the US 30 Business corridor, additional shelters should be erected where appropriate. All of the shelters should be made accessible by having paved walkways on their approach and having appropriate seating and glass windscreens to enhance customer comfort. A current bus schedule should be posted at each bus stop for each route as well as transfer points for intersecting buses and trains. This will increase the attractiveness of transit and could result in a corresponding decrease in auto travel.

## Long-Term Improvements

### Parking

Monitor passenger rail parking supply at the Downingtown transit station to ensure that projected future growth in transit ridership can be accommodated. The lack of parking at some stations makes commuting by train unavailable, or at best an unreliable choice for an unknown number of commuters who comprise a latent demand. Furthermore, the lack of parking negates much of the potential to attract new riders.

### Increased Frequency

An alternative would be to examine the feasibility of increasing the number of express trains that serve the heavy loading stations during the peak period. The feasibility of operating an express train should be considered based on peak demand. An additional express train is recommended to increase frequency.[7] Based on SEPTA's 2007 ridership data, train #9538, which now departs Thorndale at 7:30 AM, had 582 boardings of which; 375 were between Thorndale and Paoli. A second candidate is train #9542, which now departs Thorndale at 8:14 AM. It had 604 boardings; 207 were between Thorndale and Paoli. It can be expected that these trains, if made to run express from Paoli, would attract more riders due to the shorter travel time.

### Circulator Bus Service

Study the feasibility of a circulator bus service to serve all types of development in the study area. The viability of this service would initially be centered on areas of greatest demand.

# Bicycle Network

The bicycle network is made up of lanes, trails, signs, pavement markings, and amenities. It has a direct link to the number of people who use bicycles as a transportation mode. The design of the bicycle network facility is also linked to the perception of the bicycling experience and what may be expected. An extensive and integrated bicycling and walking network is essential in providing connections between residential neighborhoods, schools, parks, businesses, downtown, and transit stations. The US 322 corridor is described as an average bicycle route, which is moderately suitable for on-road cycling. Cyclists of lesser skill and experience riding in traffic may find conditions less favorable. The section of US 322 between Little Washington Road and Chestnut Tree Road in West Brandywine Township is designated as bicycle-friendly, which is the most suitable road conditions for on-road cycling. US 322 may have heavy traffic, but the shoulders are mostly wide enough for cyclists to be separated from motorized traffic. The bicycle-friendly route continues along Icedale Road / Beaver Dam Road to Honey Brook Road. US 322 (Manor Avenue) in Downingtown Borough is designated as a

[7] Delaware Valley Regional Planning Commission. *Needs and Opportunities Study for the R5 Extension West of Thorndale*. June 2007.

below-average route for on-road cycling. Cycling through this area is least suitable because of traffic congestion through the center of Downingtown. On-road cycling should be encouraged as an alternate mode of transportation for commuters using the SEPTA stations. Bicycle racks are provided at the Downingtown and Thorndale stations.

The US 322 study also has two marked off-road bicycle trails: Struble and Uwchlan Trail. The Trails are located on the eastern end of the study area in Downingtown Borough and continues along Route 282 (Creek Road) northward along Dowlin Forge Road and Eagleview Boulevard. The Struble Trail is connected to the Eagleview Corporate Employment Park via the Uwchlan Trail.

## Chester County Recommended Functional Classification

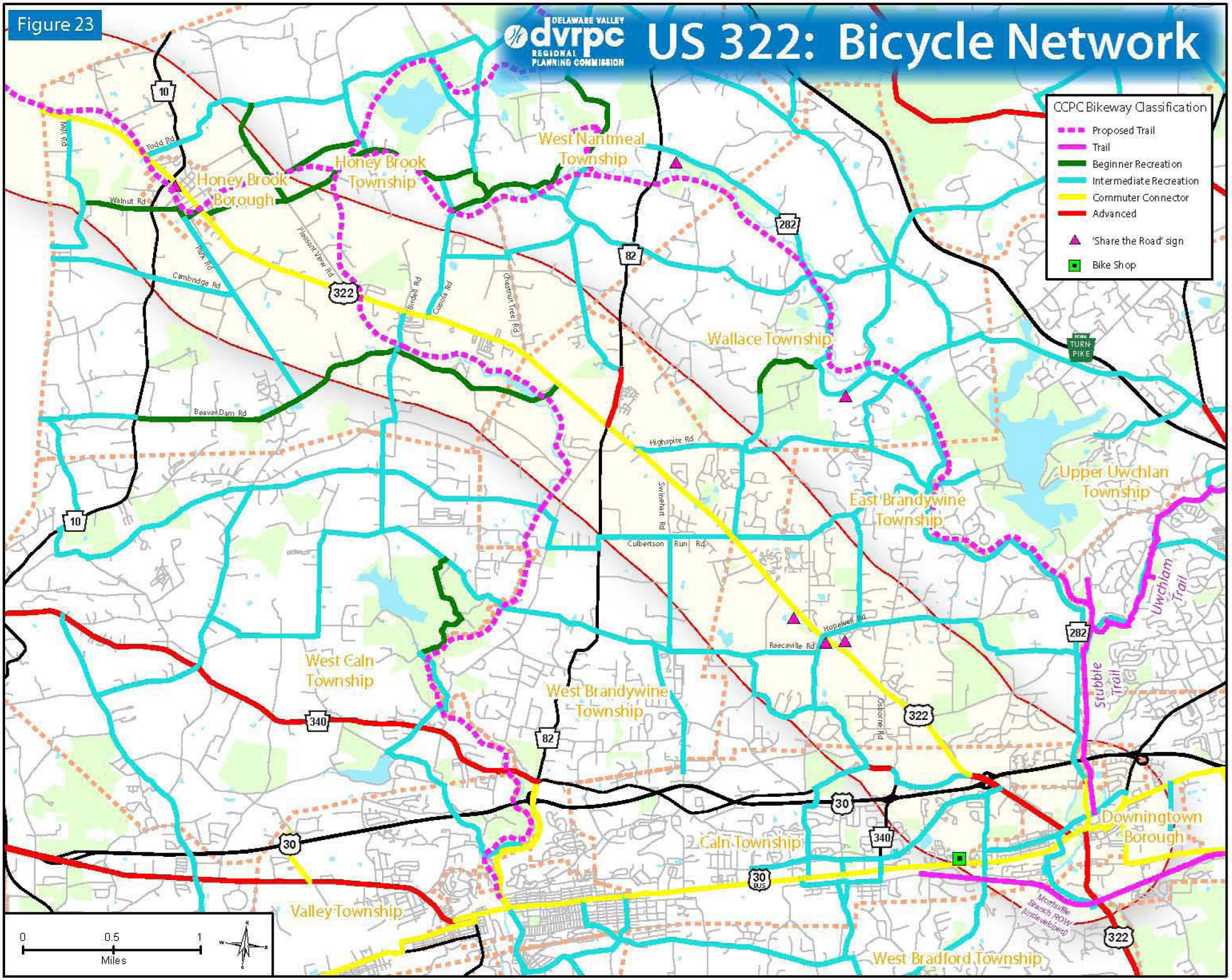
The Chester County Planning Commission's bicycle network is shown in Figure 23 and connects state, county, and municipal parks to population centers. The entire county network includes portions of all municipalities and provides cycling on over 1,000 miles of roads and 52 miles of trails. Chester County's Bicycle Network identifies several routes in the study area where biking is recommended based on varying competence level of riders, referred to as the functional classification. There are four classes of functional classification: (1) beginner recreation, often found on low-volume, low-speed roads with scenic values; (2) intermediate recreation, found in moderate traffic volumes and speeds and may or may not have scenic value; (3) commuter/connector, which are primary routes for through-travelers that have expertise and are traveling to a specific destination; and (4) advanced, which is intended for the seasoned rider who is comfortable in narrow shoulders and roads with high traffic volumes. A majority (56 percent) of the county network is designated as intermediate. Commuter/connector accounts for 21 percent, beginner accounts for 14 percent and advanced is the remaining 9 percent of the network.

A majority of US 322 and US 30 Business roadways are designated as commuter/connectors. There are also beginner recreation segments within the study area, but they are confined to parks or in very rural areas with low traffic volumes and a gentle terrain. The bicycle network is an environmentally sensitive way to promote alternative modes of transportation, as well as to promote this region of Chester County for recreation.

Bicyclist along US 322.

Figure 23

# US 322: Bicycle Network



## Chester County Planning Trails

In addition to the existing bicycle trails, Chester County has numerous trails proposed along the US 322 corridor. The proposed trails will link the area open spaces and existing trails with growing residential areas, some via inactive rail ROW. There are several planned trails that are currently undergoing feasibility studies and others that have reached the design and construction phase.

Of note, is the extension of the Struble Trail westward toward Struble Lake and Honey Brook Borough along the abandoned ROW of the New Holland Branch of the Penn Center Railroad. The southern most section of the Brandywine Creek Hibernia Trail is also undergoing feasibility study. This trail will link the Hibernia County Park trails with the proposed Rocklyn Station development area via abandoned railroad ROW between Coatesville and northern Honey Brook Township.

## Pennsylvania State Bicycle Network

The Pennsylvania State Bicycle Network consists of seven different routes that extend in every direction. Bicycle Route L is the only state route that is in proximity to the study area. Route L is 225 miles and extends from Susquehanna County to Chester County. It passes through several population areas before reaching Greater Philadelphia. Route L follows Route 282 (Creek Road) and connects to the Struble and Uwchlan trails in East Brandywine Township at Dowlin Forge Road.

## Bicycle Recommendations

Several strategies can improve roadway compatibility conditions for bicycle travel and increase overall bicycle safety. Below are recommendations for US 322 to become more bicycle-friendly. The Struble and Uwchlan Bicycle Trails and State Route L should be clearly marked and part of any wayfinding for the region. This should be promoted as an alternative mode of transportation for commuters who work at the Eagleview Corporate Employment Park. Only a small portion of US 322 is delineated as bicycle-friendly. Where feasible, municipalities should increase the shoulder lanes to provide a continuous bicycle network. If reducing travel lanes is not feasible, municipalities should consider off-road bicycle lanes to provide connections to the regional and county network. As new development continues along US 322, municipalities should ensure that any pedestrian paths are multi-modal and clearly marked for walkers and bicyclists. Connections should be made to existing county and regional bicycle and trail networks. Local, county, and state officials should provide educational materials to motorists, bicyclists, and pedestrians on how to share the road in a safe manner. Proper signage along US 322 should be installed to alert motorists of potential cyclists and slow-moving traffic.

# Pedestrian Network

As discussed in Chapter 3, a walkable environment can increase pedestrian activity and stimulate commercial activity in the area. It is a goal of this study to identify ways to make pedestrian thoroughfares safe, secure, and comfortable for all pedestrians. The areas of heavy pedestrian activity in the study area are the boroughs of Honey Brook and Downingtown. In improving the pedestrian environment within these high traffic areas of the corridor, emphasis should be placed on improving the connectivity of sidewalks and walkways, visibility of crosswalks, and pedestrian scale lighting.

## Pedestrian Recommendations

The following enhancements to the pedestrian environment within the boroughs of Downingtown and Honey Brook are proposed. Sidewalks and walkways are pedestrian thoroughfares that provide pedestrians with space to travel within the public ROW that is separated from roadway vehicles. Such facilities also improve mobility for pedestrians and provide access for all types of pedestrian travel, such as to and from home, work, parks, schools, shopping, and transit. Sidewalks in the boroughs, where deficient, should be upgraded to better meet these goals and, where needed, should be constructed to provide this function. Marked crosswalks indicate preferred locations for pedestrian crossings and help designate ROW for motorists to yield to pedestrians. Highly visible continental-style crosswalk markings should be placed at high pedestrian locations such as the areas where pedestrians cross US 322 near schools, shopping, and transit. Adequate lighting can enhance an environment and increase comfort and safety. Without sufficient lighting overhead, motorists may not be able to see pedestrians in time to stop. In commercial areas with nighttime pedestrian activity, streetlights and building lights should be utilized and additional lighting installed as necessary to enhance the ambiance of the area and the visibility of pedestrians. Additionally, pedestrian signals with countdown timers should be installed at all signalized intersections that lie within the borough's high pedestrian areas.

CHAPTER 6

# Recommendations and Implementation

This report's recommendations aim to alleviate potential congestion, improve highway efficiency, and enhance the quality of life within the communities along US 322. The implementation of these recommendations relies upon the corridor municipalities. This section summarizes each recommendation by subsection, estimates possible project costs, and identifies the responsible agency. Funding sources have also been identified for each recommendation. They are outlined by municipal, county, regional, and state funding sources.

Table 12: Environmental Recommendations

| Recommendation | Responsible Agency | Possible Funding Options | Project Cost Estimate |
|---|---|---|---|
| Install planted areas, bioswales, infiltration basins, rain gardens, riparian buffers throughout corridor | Municipal Officials<br>Developer<br>Chester County<br>PennDOT<br>SEPTA<br>Municipal Officials<br>Brandywine Conservancy | Conservation/Land Use Planning Grants<br>Growing Greener 2<br>Capital Improvement Program (CIP)<br>Municipal Challenge Grants<br>Business Improvement Districts (BIDs)<br>DVRPC's TCDI Program<br>Fees-in-Lieu | Varies |
| Encourage agricultural best management practices including stream fencing, nutrient management plans, and more efficient irrigation systems. | | | Minimal cost to the municipalities |
| Adopt riparian buffer ordinance in Honey Brook Borough, Downingtown, East Caln, and West Nantmeal. Enhance this ordinance in Honey Brook Township. | | | Minimal cost to the municipalities |

*Source:* DVRPC. 2009.

Table 13: Land Use Recommendations

| Recommendation | Responsible Agency | Possible Funding Options | Project Cost Estimate |
|---|---|---|---|
| Encourage Corridor Growth in Centers–Identify key parcels for infill development and mixed-use residential and commercial | Municipal Officials<br>PennDOT<br>Developer<br>Chamber of Commerce<br>SEPTA<br>TMACC | Capital Improvement Programs (CIP)<br>Impact Fee Ordinances<br>Business Improvement Districts (BIDs)<br>Transportation Enhancements Program<br>Home Town Streets/Safe Routes to School<br>Elm Street Program<br>LUPTAP Program<br>CMAQ Program<br>DVRPC's TCDI Program<br>Tax Increment Financing (TIF)<br>Community Revitalization Program<br>Transit Revitalization Investment District (TRID) | Minimal cost to municipalities. May require planning consultant and additional feasibility studies. |
| Design for Future Residential Density | | | |
| Promote Transit-Oriented Development (TOD) | | | |
| Adopt Smart Growth Zoning | | | |
| Ensure the Preservation of Historic Buildings and Neighborhoods along US 322 | | | |
| Improve the Pedestrian Environment - Install new sidewalks, install proper crosswalks, and pedestrian signalization | | | $300,000–$500,000 corridor wide |
| Provide for Wayfinding Along US 322–Design and install wayfinding signs | | | $20,000–$40,000 corridor wide |

*Source:* DVRPC. 2009.

Table 14: Transportation Recommendations

| Recommendation | Responsible Agency | Possible Funding Options | Project Cost Estimate |
|---|---|---|---|
| Install Advance Warning Signs as Appropriate (W2-1, W2-2, W3-1, W16-8) | Municipal Officials<br>PennDOT<br>TMACC<br>SEPTA | PA Infrastructure Bank<br>Transportation Enhancements (TE) Program<br>Community Transportation Development Fund<br>Liquid Fuels Tax Program<br>Transit Research and Demonstration Program<br>Business Improvement Districts (BIDs)<br>Transportation Improvement Program (TIP)<br>Impact Fees | $40,000–$55,000 corridor wide |
| Install Additional Speed Limit Signing | | | $20,000–$25,000 corridor wide |
| Implement Park-and-Ride Facilities. Implement new commuter routes to employment parks. | | | N/A |
| Access Management Overlay District | | | Minimal cost to the municipalities |
| Acceleration/Deceleration Lanes | | | $20,000–$50,000 (construction only each acceleration/deceleration lane) |
| Frontage Roads | | | Frontage Road–little cost to municipality (paid by developer through impact fees) |
| “Share the Road” Signage (W18-1) | | | $6,000–$10,000 corridor wide |
| Improve Transit Awareness | | | Minimal cost to the municipalities |
| Improve Waiting Areas | | | $4,000–$10,000 per location |
| Erect Bus Stop Shelters | | | $6,000–$7,500 each if paid by municipalities |
| Explore Feasibility of Increased Express Train Service | | | N/A |
| Explore Feasibility of Circulator Bus Service | | | N/A |

*Source:* DVRPC. 2009.

## Municipal Recommendations

The following estimates for Immediate Improvements are for construction costs only. Estimates for long-term improvements include preliminary engineering, final design, and construction costs, and are based on similar projects currently listed in the DVRPC Transportation Improvement Program (TIP).

Table 15: Honey Brook Borough/Honey Brook Township Recommendations

| Recommendation | Responsible Agency | Possible Funding Options | Project Cost Estimate |
|---|---|---|---|
| Gateway Treatments along PA 10 and US 322 | Municipal Officials<br>PennDOT<br>Developer | Business Improvement District (BID)<br>Capital Improvement Programs (CIP)<br>Home Town Streets/Safe Routes to School (HTS/SRS)<br>Transportation Enhancements (TE) Program<br>Liquid Fuels Tax Program<br>Transportation Improvement Program (TIP)<br>Highway Occupancy Permits | $100,000–$250,000 per location |
| PA 10 Intersection Improvements–Dotted line striping | | | Minimal cost to the municipality |
| Radii and Curb Modification | | | $60,000–$100,000 |
| Cambridge Road Intersection Improvements–Lighting, signing, pavement markings | | | $105,000–$135,000 |
| Add Carriage Lanes and Left-Turn Lane | | | $350,000–$500,000 |
| Birdell Road Intersection Improvements–Lighting, signing, pavement markings | | | $100,000–$130,000 |
| Add Carriage Lanes and Left-Turn Lane | | | $350,000–$500,000 |
| Chestnut Tree Road Intersection Improvements–Signing | | | Minimal cost to the municipality |
| Roadway Realignment and Left-Turn Lane | | | $1,200,000–$1,800,000 |

*Source:* DVRPC. 2009.

Table 16: West Brandywine Township Recommendations

| Recommendation | Responsible Agency | Possible Funding Options | Project Cost Estimate |
|---|---|---|---|
| PA 82 Intersection Improvements–lighting and tree trimming | Municipal Officials<br>PennDOT<br>Developer | Impact Fees<br>Capital Improvement Programs (CIP)<br>PA Infrastructure Bank<br>Home Town Streets/Safe Routes to School (HTS/SRS)<br>Transportation Enhancements (TE) Program<br>Liquid Fuels Tax Program<br>Transportation Improvement Program (TIP)<br>Highway Occupancy Permits | $50,000–$65,000 |
| Add Left-Turn Lanes and Upgrade Traffic Signal | | | $3,000,000–$4,000,000 |
| Swinehart Road Intersection Improvements–Signing | | | Minimal cost to the municipality |
| Roadway Realignment and Left-Turn Lane | | | $1,200,000–$1,800,000 |

*Source:* DVRPC. 2009.

Table 17: East Brandywine/West Brandywine Township Recommendations

| Recommendation | Responsible Agency | Possible Funding Options | Project Cost Estimate |
|---|---|---|---|
| Culbertson Run Road Intersection Improvements–Dotted line striping, lighting, signing, pavement markings, and timing modifications | Municipal Officials<br>PennDOT | Impact Fees<br>Capital Improvement Programs (CIP)<br>PA Infrastructure Bank<br>Home Town Streets/Safe Routes to School (HTS/SRS)<br>Transportation Enhancements (TE) Program<br>Liquid Fuels Tax Program<br>Transportation Improvement Program (TIP)<br>Highway Occupancy Permits | $80,000–$100,000 |
| Add Left-Turn Lanes | | | $500,000–$730,000 |

*Source:* DVRPC. 2009.

Table 18: East Brandywine Township Recommendations

| Recommendation | Responsible Agency | Possible Funding Options | Project Cost Estimate |
|---|---|---|---|
| N. Guthriesville Road TWLTL–add TWLTL | Municipal Officials<br>PennDOT<br>Developer | Impact Fees<br>Capital Improvement Programs (CIP)<br>CC Community Revitalization Program<br>PA Infrastructure Bank<br>Home Town Streets/Safe Routes to School (HTS/SRS)<br>Transportation Enhancements (TE) Program<br>Liquid Fuels Tax Program<br>Transportation Improvement Program (TIP)<br>Highway Occupancy Permits | $120,000–$200,000 |
| Hopewell Road Intersection Improvements–Timing modifications | | | $50,000–$80,000 |
| Add Turn Lanes | | | $1,000,000–$3,000,000 |
| Corner Ketch Road Intersection Improvements - Signing | | | Minimal cost to the municipality |

*Source:* DVRPC. 2009.

Table 19: Caln Township Recommendations

| Recommendation | Responsible Agency | Possible Funding Options | Project Cost Estimate |
|---|---|---|---|
| US 30 Bypass Improvements–pavement markings and traffic signal | Municipal Officials<br>PennDOT<br>Developer | Capital Improvement Programs (CIP)<br>Impact Fee Ordinances<br>PA Infrastructure Bank<br>Home Town Streets/Safe Routes to School (HTS/SRS)<br>Transportation Enhancements (TE) Program<br>Liquid Fuels Tax Program<br>Transportation Improvement Program (TIP)<br>Highway Occupancy Permits | $75,000–$120,000 |
| Florida-T Configuration | | | $7,500,000–$10,000,000 |
| Truck Route Signage | | | Minimal cost to the municipality |

*Source:* DVRPC. 2009.

Table 20: Downingtown Borough Recommendations

| Recommendation | Responsible Agency | Possible Funding Options | Project Cost Estimate |
|---|---|---|---|
| Retiming of Pennsylvania Avenue Signal and Coordination of US 322 Signals | Municipal Officials<br>PennDOT<br>SEPTA | Capital Improvement Program (CIP)<br>CMAQ Program<br>PA Infrastructure Bank<br>Home Town Streets/Safe Routes to School (HTS/SRS)<br>Transportation Enhancements (TE) Program<br>Liquid Fuels Tax Program<br>Transportation Improvement Program (TIP)<br>Highway Occupancy Permits | $80,000–$100,000 |
| Truck Route Signage | | | Minimal cost to the municipality |

*Source:* DVRPC. 2009.

## Funding Programs

This section details possible funding sources, ranging from traditional economic development mechanisms available to municipalities. This information was extracted from DVRPC's *Municipal Resource Guide.* If interested in any of the programs listed, please contact the agency listed.

### Municipal Programs

Business Improvement Districts (BIDs) are public/private partnerships in which businesses in a defined area elect to pay an additional tax in order to fund future improvements within that specific geographic area. Funds are collected by the taxing authority and used to provide services such as street and sidewalk maintenance, marketing, and capital improvements. BIDs are formed through the adoption of a municipal ordinance. State financial assistance is available for municipalities.

Community Impact Assessments are a process by which municipalities can evaluate the effects of a transportation (infrastructure) action on a community and the quality of life for its residents. This type of assessment should be done when large scale development will be taking place within a community or as part of a large transportation improvement. This assessment can help the municipality integrate land use, economics, and transportation to achieve common goals as well as bringing all federal and state agencies to agreement on the sustainable choice of improvement.

Capital Improvement Program (CIP) sets out a municipality's plans for future capital improvements, such as roads and other public facilities. The range and scope of these vary, but most cover an immediate 5–6 year period and can be scoped for up to 20 years. A successful CIP should include a schedule of implementation with a projected budget. If a municipality's CIP is consistent with the master plan and zoning ordinance, it can be a useful tool, allowing the municipality to plan for future growth and improvements and lowering costs by anticipating the future demands of the municipal infrastructure system. The CIP can also provide developers and the public with more certainty concerning future public improvements, thereby improving opportunities for participation and increasing accountability. The adoption and updating of the CIP is no small task, but should be considered an immediate priority for municipalities.

Impact Fees are paid by developers to help finance a variety of needed services and facilities that result from growth. This type of revenue provides a better quality of life for residents by financing the infrastructure needed to support additional population, employment, and development. It ultimately reduces the need to impose higher taxes on existing residents to finance additional facilities. An impact fee ordinance requires modification to the master plan and subdivision and zoning codes.

Parkland Dedications/Fees-in-Lieu requires developers to provide open space within their development or to contribute fees-in-lieu to improve or preserve open space elsewhere. Fees-in-lieu should be outlined in the zoning and municipal subdivision code for the municipality. They are often based on the number of automobile trips that a particular development will incur.

## County Programs

### Chester County (CC) Community Revitalization Program

Eligibility: Targeted areas in Chester County

Purpose: To invest in and stabilize older boroughs and townships in Chester County

Terms: Urban centers eligible for 75% of project costs

Deadline: Varies

C: Chester County Department of Community Development

P: 610-344-6900

I: www.chesco.org/ccdcd

### Chester County Greenways Grant

Eligibility:  Local governments in Chester County

Purpose:  For the acquisition of greenway corridors and natural resources management

Terms:  Grants for a maximum of 50% of the costs up to $250,000

Deadline:  Annual

C: Chester County Department of Parks and Recreation

P: 610-344-6415

I: www.chesco.org/ccparks

## Regional Programs

### Competitive Congestion Mitigation and Air Quality Program (CMAQ)

Eligibility: Public agencies, incorporated private firms, nonprofits, local and county governments

Purpose:  For projects that contribute to the attainment of the Clean Air Act standards by reducing emissions

Terms: 80% of costs

Deadline: Temporarily suspended

C: Delaware Valley Regional Planning Commission (DVRPC)

P: 215-592-1800

I: www.dvrpc.org

### Home Town Streets/Safe Routes to School (HTS/SRS)

Eligibility:  Federal or state agencies, Pennsylvania county or local governments, school districts, nonprofits

Purpose: To encourage the reinvestment in and redevelopment of downtowns

Terms: 80% of total costs.  Projects must be included in the 12-year state Transportation Improvement Program (TIP)

Deadline:  Varies

C: Delaware Valley Regional Planning Commission (DVRPC)

P: 215-592-1800

I: www.dvrpc.org

### Transportation and Community Development Initiative (TCDI)

Eligibility: Eligible municipalities

Purpose: Support local planning projects to improve transportation and encourage redevelopment

Terms: Grants up to $100,000 for single projects and $125,000 for multi-municipal projects; 20% local match required

Deadline: Every two years

C: Delaware Valley Regional Planning Commission (DVRPC)

P: 215-592-1800

I: www.dvrpc.org

### Transportation Enhancements Program (TE)–Pennsylvania

Eligibility: Pennsylvania local governments, counties, state or federal agencies, nonprofits

Purpose: Funds non-traditional projects designed to enhance the transportation experience, to mitigate the impacts of transportation facilities on communities and the environment, and to enhance community character.

Terms: 80% to 90% of costs can be funded

Deadline: Varies

C: Delaware Valley Regional Planning Commission (DVRPC)

P: 215.592-1800

I: www.dvrpc.org

## State Programs

### Community Revitalization Program

Eligibility: Pennsylvania local governments

Purpose: Provides funds for construction and renovation

Terms: Grants average $20,000

Deadline: Varies

C: Pennsylvania Department of Community and Economic Development

P: 800-379-7448

I: www.newpa.com

### Conservation/Sound Land Use Grants

Eligibility: Pennsylvania local governments

Purpose: To encourage conservation planning and sound land use planning

Terms: Grant funding for 50% of project cost

Deadline: Varies

C: Pennsylvania Department of Community and Economic Development

P: 866-466-3972

I: www.newpa.com

### Economic Adjustment Program (Title IX)

Eligibility: Pennsylvania local governments, states, counties, municipal authorities, or Indian tribes

Purpose: To assist local interests in design and implementation strategies to bring change to the local economy

Terms: Vary

Deadline: Open

C: Pennsylvania Department of Commerce

P: 215-597-4603

I: www.doc.gov

### Elm Street Program

Eligibility: Pennsylvania local governments, redevelopment authorities, nonprofit economic development organizations, other nonprofits, BIDs, neighborhood improvement districts (Elm Street)

Purpose: Grants for planning and improvements to mixed-use areas in proximity to central business districts

Terms: Maximum $50,000 for administrative grants; Maximum $250,000 for development projects and loans.

Deadline: Open

C: Pennsylvania Department of Community and Economic Development

P: 866-466-3972

I: www.newpa.com

### Growing Greener II

Eligibility:  Pennsylvania local governments and nonprofits

Purpose: Provides redevelopment grants to municipalities and nonprofits to help a community's downtown redevelopment effort, focusing on the improvement of downtown sites and buildings.

Terms: No minimum or maximum; typical grants average between $250,000 and $500,000

Deadline: Varies

C: Pennsylvania Department of Community and Economic Development

P: 866-466-3972

I: www.newpa.com

### Historic Preservation Grants

Eligibility:  Pennsylvania local governments, historical societies, historic preservation organizations, conservancies, educational institutions, museum, and multi-purpose organizations

Purpose: To identify, preserve, promote, and protect the historic and archaeological resources of Pennsylvania for the public

Terms: Maximum $5,000, with no match; over $5,001 requires a 50/50 match.

Deadline: Varies

C: Pennsylvania Historical and Museum Commission

P: 717-201-3231

I: www.artsnet.org

### Keystone Historic Preservation Grant Program

Eligibility:  Pennsylvania local governments and nonprofits

Purpose:  Provides funding for preservation, restoration, and rehabilitation projects of historic resources listed or eligible for the National Register of Historic Places.

Terms: Grants will be funded at 50%.

Deadline: Varies

C:  Keystone Historic Preservation

P: 800-201-3231

I: www.artsnet.org

### Land Use Planning and Technical Assistance Program (LUPTAP)

Eligibility:  Pennsylvania cities, boroughs, townships, counties, or multi-municipal entities

Purpose: For the purpose of developing and strengthening community planning and management capabilities

Terms: 50% of total costs; $100,000 maximum per fiscal year

Deadline: Open

C: Pennsylvania Department of Community and Economic Development

P: 215-560-2256

I: www.landuseinpa.com

### Liquid Fuels Tax Program

Eligibility:  Pennsylvania local governments

Purpose: Provides funds for any road-related activity

Terms: Vary

Deadline: Annual

C: Pennsylvania Department of Transportation

P: 610-205-6539

I: www.dot.state.pa.us

### Main Street Program

Eligibility: Pennsylvania municipalities and downtowns

Purpose: Provides funds for administrative costs associated with Main Street Manager positions and offices, physical improvements, and acquisition costs

Terms: $115,000 over a 5-year period; Downtown Reinvestment and Anchor Building components: up to $250,000 or not to exceed 30% of project costs

Deadline: Varies

C: Pennsylvania Department of Community and Economic Development

P:  866-466-3972

I: www.newpa.com

### Municipal Challenge Grant

Eligibility: Pennsylvania local governments

Purpose: Supports municipal tree inventories, tree planting, and tree care

Terms: Grant range from $1,000–$5,000; in-kind match required

Deadline: Annual

C: Pennsylvania Department of Conservation and Natural Resources

P: 717-727-2757

I: www.dcnr.state.pa.us

### Pennsylvania Infrastructure Investment Authority

Eligibility: Pennsylvania owner or operator (public or private) of an existing or proposed drinking water or wastewater system; PA municipal owner of a storm water conveyance system

Purpose: To provide funding for design, engineering and construction associated with drinking water distribution and treatment facilities, storm water conveyance, wastewater collection, treatment facilities, and brownfield remediation.

Terms: Funding up to $11 million per project for one municipality; up to $20 million for more than one municipality

Deadline: Varies

C: Pennsylvania Infrastructure Investment Authority

P: 717-783-6798

I: www.pennvest.state.pa.us

### Pennsylvania Infrastructure Bank

Eligibility: Pennsylvania local governments and contractors

Purpose: To provide low-cost financing to municipalities and contractors for eligible transportation improvements

Terms: Low-interest loans from $50,000 to $3.9 million through a revolving loan fund for implementation

Deadline: Open

C: Pennsylvania Department of Transportation (PennDOT)

P: 717-772-1772

I: www.dot.state.pa.us

### Transit Research and Demonstration Program

Eligibility: Pennsylvania local governments, transit operators, university, and transit organizations

Purpose: To fund innovative projects that improves the attractiveness of public transit

Terms: Grants for 80% of funding with a 20% local match

Deadline: Open

C: Pennsylvania Department of Transportation

P: 717-705-1493

I: www.dot.state.pa.us

### Transit Revitalization Investment District (TRID)

Eligibility: Pennsylvania local governments, counties, transportation authorities, and public transit agencies.

Purpose: To encourage private-sector investment and revitalization of areas immediately adjacent to transit.

Terms: 25% match for TRID planning study

Deadline: Open

C: Pennsylvania Department of Community and Economic Development

P: 717-783-1132

I: www.newpa.com

### Urban Development Program (UDP)

Eligibility: Pennsylvania local governments, counties, redevelopment authorities, and nonprofits

Purpose: Provides grants to promote and encourage the prosperous development of Pennsylvania business

Terms: No maximum or minimum; grants range between $5,000 and $25,000

Deadline: Varies; only one application per applicant per fiscal year

C: Pennsylvania Department of Community and Economic Development

P: 800-379-7448

I: www.newpa.com

# Conclusion and Next Steps

The purpose of this report is to address the emerging land use and transportation issues within the US 322 corridor. By addressing the corridor as a whole, this study has created a framework that allows local projects to fit in as part of a larger land use and transportation strategy. As sections of the study area are experiencing significant development, it is important to implement strategies that will help to preserve and maintain the quality of life that has been attracting so many to the area.

Upon completing this report, DVRPC staff concluded the study area was in need of intersection improvements, public transportation-related improvements, and smart growth regulations. DVRPC staff focused on areas where community revitalization is most likely to occur in the short–term, such as the Borough of Downingtown and the Village of Guthriesville, as there is more potential for public transportation in these areas.

Each of the study area municipalities should consider the recommendations throughout the report and work with their county and state representatives. DVRPC and its local, regional, and state partners will continue promoting multi-modal transportation options to help alleviate congestion and forecasted growth; furthering the goals of coordinated land use and transportation between municipalities and along multi-municipal corridors; determining a policy rationale for future priority transportation improvements; encouraging smart growth principles for future development; and implementing the goals of the adopted DVRPC long-range plan, *Connections,* and Chester County's *Landscapes2 Plan*.

# Sources


AARP Public Policy Institute. *Planning Complete Streets for an Aging America*. Washington, DC: AARP Public Policy Institute, May 2009.

American Association of State Highway and Transportation Officials. *A Policy on Geometric Design of Highways and Streets*. Washington, DC: AASHTO, 2004.

Black, John E. (Chairman, East Brandywine Township Historical Commission). Correspondence to Dick Wood, Sr., Fred Wood, and There DuPont, November 14, 2005.

Borough of Downingtown, Chester County Pennsylvania. *The Central Business District Plan: A Strategic Plan for Downtown.* 1999.

Borough of Downingtown, Chester County Pennsylvania. *Comprehensive Plan*. July 1994.

Borough of Downingtown, Chester County Pennsylvania. *Urban Center Revitalization Plan*. November 2004.

Brandywine Valley Association. http://www.brandywinewatershed.org

Caln Township, Chester County Pennsylvania. *2003 Comprehensive Plan.* 2003.

Chester County Planning Commission. *Circulation Handbook*. April 1994.

Chester County Planning Commission. *Landscapes2.* 2008.

Chester County Planning Commission. *Road Functional Classification Technical Memorandum, Publication 1-04.*

Chester County Solid Waste Authority. http://www.chestercountyswa.org

Chester County Solid Waste Authority. "*Fact Sheet*." Spring 2007.

DVRPC. Analytical Data Report No. 14, *Employment Forecasts*. August 2007.

DVRPC. *Congestion Management Process (CMP)*. August 2009.

DVRPC. *Connections–the Regional Plan for a Sustainable Future*. December 2009.

DVRPC. *Innovations in Zoning for Smart Growth*. July 2007.

DVRPC. *Linking Transit, Communities, and Development: A Regional Inventory of Transit-Oriented Development Sites*. December 2003.

DVRPC. *Municipal Resource Guide*. June 2009.

DVRPC. *Needs and Opportunities Study for the R5 Extension West of Thorndale*. June 2007.

DVRPC. *PA 10 Road Safety Audit Report.* December 2008.

DVRPC. *Pennsylvania Congestion Management System: PA 100 Corridor*. June 2002.

DVRPC. *Realizing Density: Strategies for Compact Suburban Development*. December 2004.

DVRPC. T*he Automobile at Rest: Toward Better Parking Policies in the Delaware Valley*. September 2008.

DVRPC. *US 30 Coatesville-Downingtown Bypass Traffic Study*. July 2008.

East Brandywine Township, Chester County Pennsylvania. *East Brandywine Township Comprehensive Plan*. July 14, 1987.

East Brandywine Township, Chester county Pennsylvania. East Brandywine Township Open Space Plan Task Force. *East Brandywine Township Open Space, Recreation, and Environmental Resources Plan.* 1992.

Federal Highway Administration. *Manual of Uniform Traffic Control Devices for Streets and Highways.* Washington, DC: FHWA, December 2007.

Heinrich & Klein Associates. *Pennsylvania Act 209 Transportation Impact Fee Study: Roadway Sufficiency Analysis and Transportation Capital Improvements Plan for East Brandywine Township.* October 2003.

*Honey Brook Joint Comprehensive Plan*. February 1993.

Honey Brook Township, Chester County Pennsylvania. *Comprehensive Plan Update*. December 2006.

Honey Brook Township, Chester County Pennsylvania. *Comprehensive Plan Update Amendment.* 2008.

Honey Brook Township, Chester County Pennsylvania. *Land Preservation Plan.* 2007.

Honey Brook Township, Chester County Pennsylvania. *Rocklyn Station Revised Strategic Development Plan.* December 2008.

New Jersey Department of Transportation/Pennsylvania Department of Transportation. *Smart Transportation Guidebook*. March 2008.

Ordinance.com. http://www.Ordinance.com

*Pennsylvania Code*, Title 67, Chapter 441.

Pennsylvania Department of Conservation and Natural Resources. http://www.dcnr.state.pa.us

Pennsylvania Department of Environmental Protection. http://www.dep.state.pa.us

Pennsylvania Department of Environmental Protection. *Pennsylvania Integrated Water Quality Monitoring and Assessment Report.* 2006.

Pennsylvania Department of Environmental Protection, Bureau of Radiation Protection and Bureau of Waste Management. *Radiological Investigation Results for Pennsylvania Landfill Leachate Fall 2005 Tritium Update.* April 7, 2006.

Pennsylvania Department of Environmental Protection, Bureau of Watershed Management. *Pennsylvania Stormwater Best Management Practices Manual.* December 30, 2006.

Pennsylvania Department of Transportation. *Access Management Model Ordinances for Pennsylvania Municipalities Handbook*. 2006.

Pennsylvania Historical and Museum Commission. *Cultural Resources Geographic Information System (CRGIS).* http://crgis.state.pa.us

Pennsylvania Water Resources Education Network. *Groundwater: A Primer for Pennsylvanians*.

Stahl, Sharon. "History of Landfills is a Story of Growth." *The Mercury* [Pottstown, Pennsylvania], October 23, 2003.

Traffic Planning and Design. *River Station Mixed-Use Development: Traffic Impact Study.* September 2008.

Transportation Research Board. *Access Management Manual.* Washington, DC: TRB, 2003.

Transportation Research Board. *Highway Capacity Manual.* Washington, DC: TRB, 2000.

U.S. Environmental Protection Agency. *Lanchester Landfill Gas Energy Project*. http://www.epa.gov/landfill/proj/prof/profile/lanchesterlandfillgasener.htm

U.S. Environmental Protection Agency. *Protecting Water Quality from Agricultural Runoff*. EPA 841-F-05-001. March 2005.

U.S. Geological Survey. "*Historical Trends and Concentrations of Fecal Coliform Bacteria in the Brandywine Creek Basin, Chester County, Pennsylvania.*" Water -Resources Investigations Report 01-4026. 2001.

U.S. Geological Survey. *Hydrologic Monitoring Networks in Chester County.* http://pa.water.usgs.gov/chester.html

Village of Guthriesville, East Brandywine Township, Chester County Pennsylvania. *Village of Guthriesville Vision Plan and Development Strategy*. April 2008.

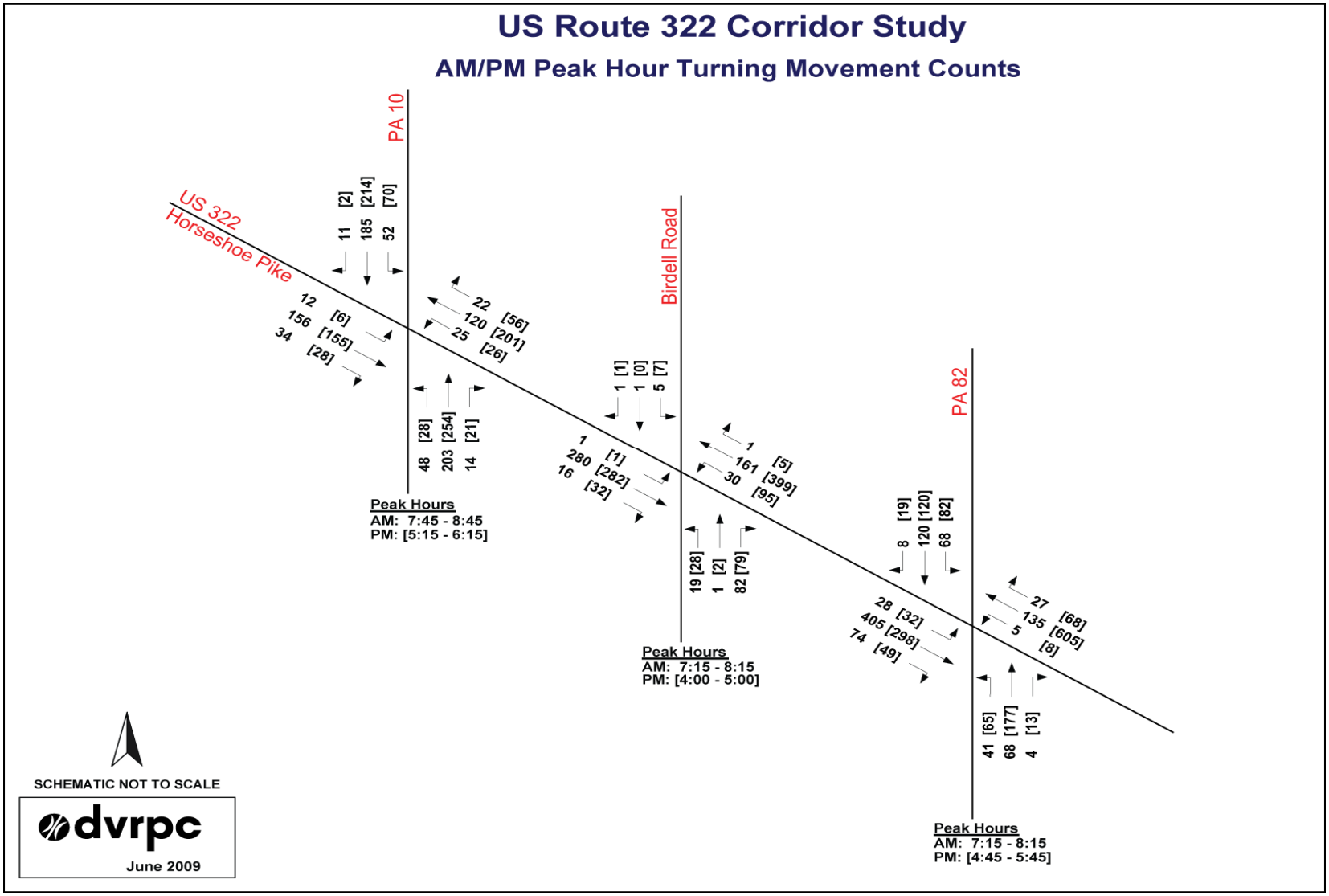
West Brandywine Township, Chester County Pennsylvania. *West Brandywine Township Comprehensive Plan.* October 1987.

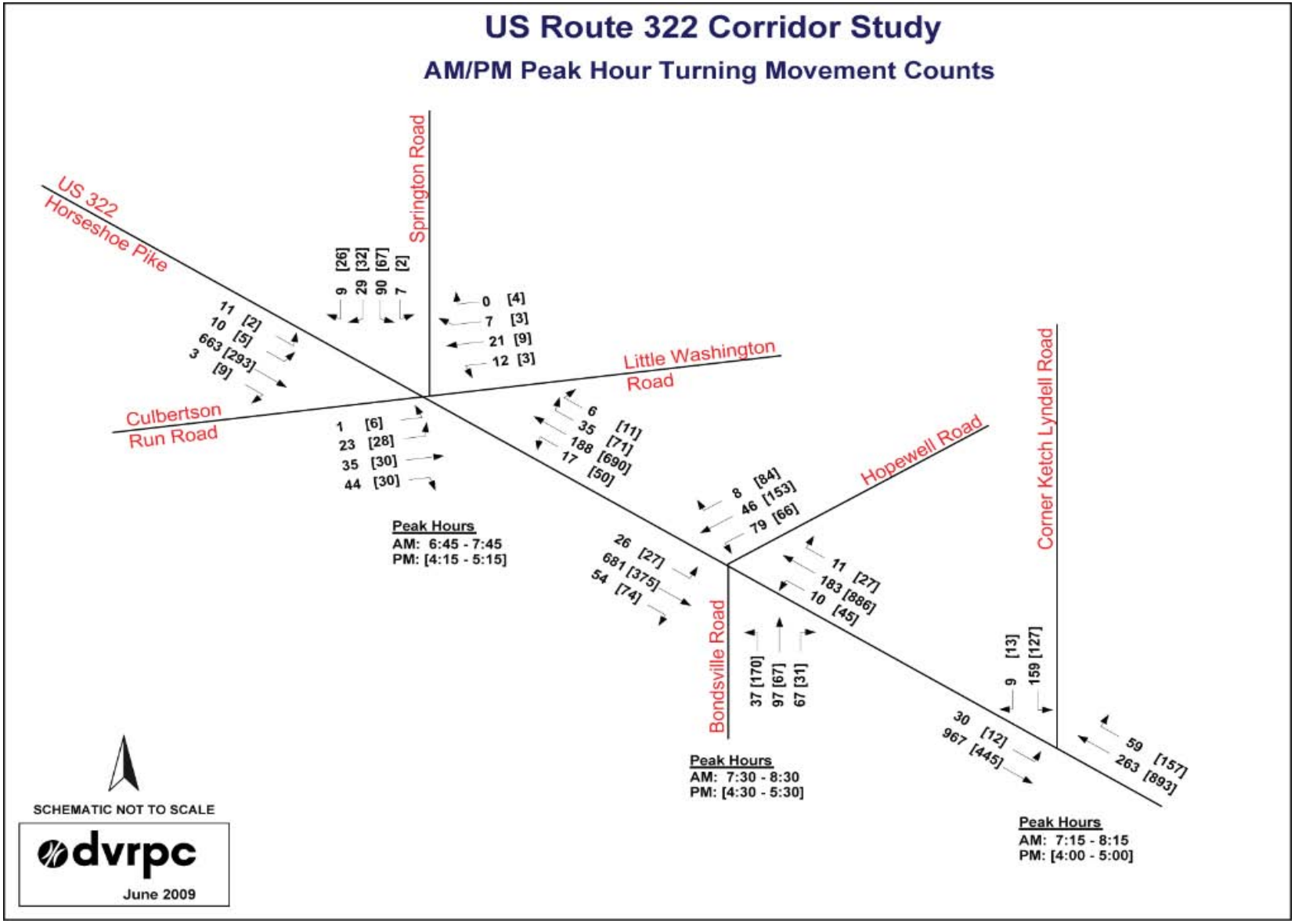
West Brandywine Township, Chester County Pennsylvania. *Comprehensive Plan.* October 2005.

Yerkes and Associates. *East Brandywine Township Act 209 Impact Fee Advisory Committee: Land Use Assumptions Report.* August 2003.

APPENDIX A

# Traffic Count Data




US Route 322 Corridor Study
AM/PM Peak Hour Turning Movement Counts
US 322
Horseshoe Pike
Springton Road
Little Washington
Road
Culbertson
Run Road
Hopewell Road
Corner Ketch Lyndell Road
Bondsville Road
11 [2]
10 [5]
663 [293]
3 [9]
9 [26]
29 [32]
90 [67]
7 [2]
0 [4]
7 [3]
21 [9]
12 [3]
1 [6]
23 [28]
35 [30]
44 [30]
6
35 [11]
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17 [690]
[50]
8 [84]
46 [153]
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26 [27]
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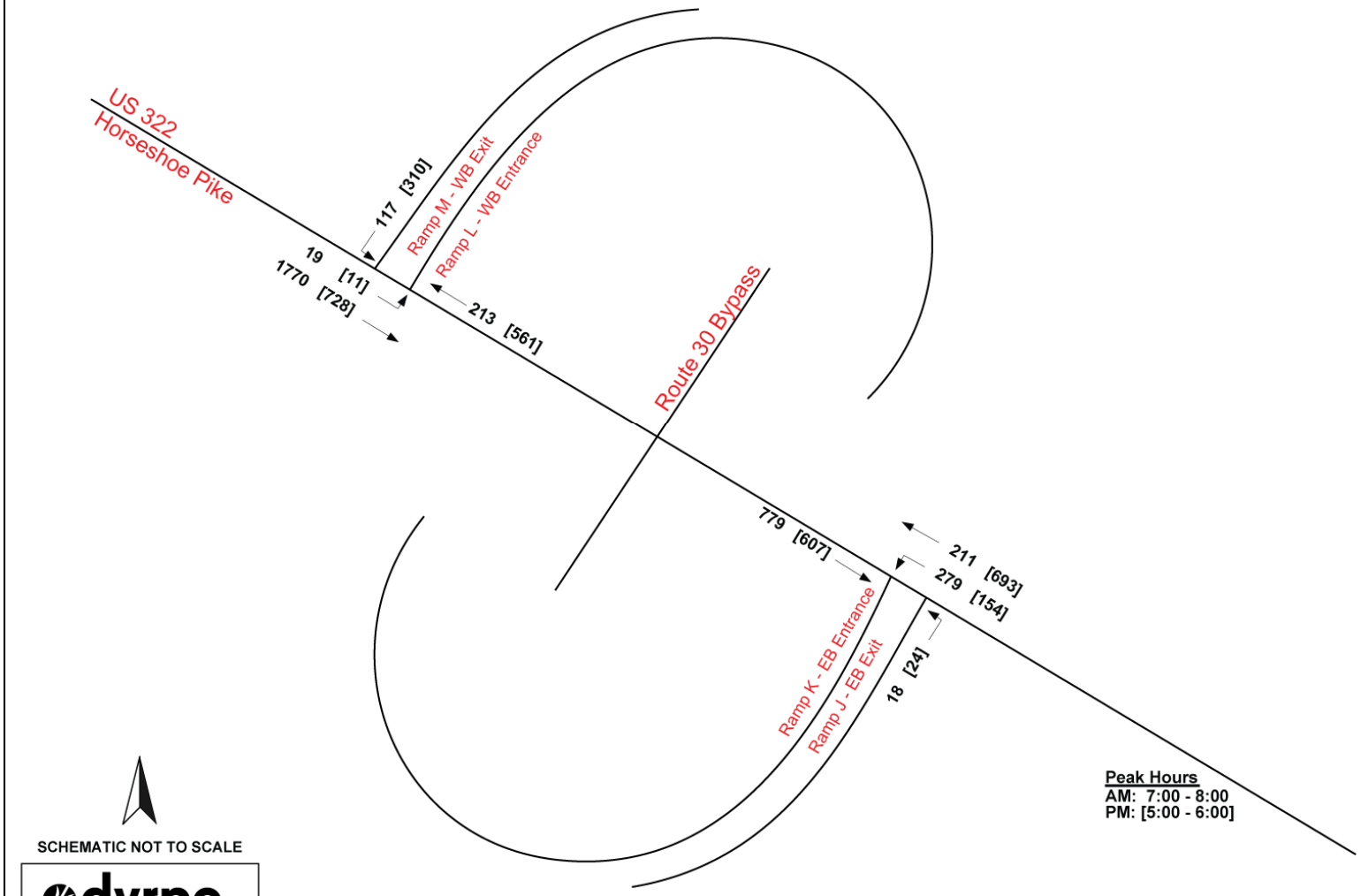
10 [45]
37 [170]
97 [67]
67 [31]
9 [13]
159 [127]
30 [12]
967 [445]
59 [157]
263 [893]
Peak Hours
AM: 6:45 - 7:45
PM: [4:15 - 5:15]
Peak Hours
AM: 7:30 - 8:30
PM: [4:30 - 5:30]
Peak Hours
AM: 7:15 - 8:15
PM: [4:00 - 5:00]
SCHEMATIC NOT TO SCALE
dvrpc
June 2009

# US Route 322 Corridor Study

## AM/PM Peak Hour Turning Movement Counts

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APPENDIX B

# Levels of Service

| AM Peak Hour | PA 10 | | | | | Birdell Road | | | | | PA 82 | | | | | Culbertson Road | | | | | | Hopewell Road | | | | | Corner Ketch | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PA 10 (NB) | PA 10 (SB) | US 322 (EB) | US 322 (WB) | Overall Intersection | Birdell (NB) | Birdell (SB) | US 322 (EB) | US 322 (WB) | Overall Intersection | PA 82 (NB) | PA 82 (SB) | US 322 (EB) | US 322 (WB) | Overall Intersection | Springton (SB) | Culbertson (EB) | Washington (WB) | US 322 (SEB) | US 322 (NWB) | Overall Intersection | Bondsville (NB) | Hopewell (SB) | US 322 (EB) | US 322 (WB) | Overall Intersection | Corner Ketch (SB) | US 322 (EB) | US 322 (WB) | Overall Intersection |
| **Existing** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Delay (sec) | 24.1 | 23.6 | 10.2 | 9.8 | 18.0 | 11.3 | 14.8 | 0.0 | 1.4 | N/A | 36.8 | 46.1 | 8.8 | 6.1 | 19.0 | 60.5 | 57.2 | 47.4 | 19.8 | 12.0 | 26.9 | 35.9 | 39.4 | 19.5 | 14.4 | 23.3 | 29.2 | 16.3 | 4.9 | 15.3 |
| LOS | C | C | B | A | B | B | B | A | A | N/A | D | D | A | A | B | E | E | D | B | B | C | D | D | B | B | C | C | B | A | B |
| **Improvement** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Delay (sec) | | | | | | | | | | | 28.3 | 28.8 | 9.0 | 6.7 | 14.8 | 48.8 | 50.4 | 48.9 | 14.7 | 9.2 | 21.6 | 34.9 | 39.9 | 17.8 | 12.6 | 21.9 | | | | |
| LOS | | | | | | | | | | | C | C | A | A | B | D | D | D | B | A | C | C | D | B | B | C | | | | |

| PM Peak Hour | PA 10 | | | | | Birdell Road | | | | | PA 82 | | | | | Culbertson Road | | | | | | Hopewell Road | | | | | Corner Ketch | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PA 10 (NB) | PA 10 (SB) | US 322 (EB) | US 322 (WB) | Overall Intersection | Birdell (NB) | Birdell (SB) | US 322 (EB) | US 322 (WB) | Overall Intersection | PA 82 (NB) | PA 82 (SB) | US 322 (EB) | US 322 (WB) | Overall Intersection | Springton (SB) | Culbertson (EB) | Washington (WB) | US 322 (SEB) | US 322 (NWB) | Overall Intersection | Bondsville (NB) | Hopewell (SB) | US 322 (EB) | US 322 (WB) | Overall Intersection | Corner Ketch (SB) | US 322 (EB) | US 322 (WB) | Overall Intersection |
| **Existing** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Delay (sec) | 23.3 | 28.4 | 11.0 | 12.8 | 19.7 | 14.5 | 25.8 | 0.0 | 2.3 | N/A | 57.0 | 66.0 | 9.7 | 13.4 | 27.3 | 59.4 | 55.4 | 46.0 | 12.3 | 28.2 | 29.6 | 67.8 | 47.2 | 14.3 | 79.2 | 57.4 | 25.4 | 5.8 | 11.8 | 11.3 |
| LOS | C | C | B | B | B | B | D | A | A | N/A | E | E | A | B | C | E | E | D | B | C | C | E | D | B | E | E | C | A | B | B |
| **Improvement** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Delay (sec) | | | | | | | | | | | 33.8 | 30.3 | 9.3 | 14.7 | 18.8 | 50.8 | 50.7 | 48.2 | 8.3 | 14.8 | 19.6 | 52.7 | 52.1 | 17.4 | 32.8 | 34.7 | | | | |
| LOS | | | | | | | | | | | C | C | A | B | B | D | D | D | A | B | B | D | D | B | C | C | | | | |

Source: DVRPC 2009

These tables show the LOS results for each intersection analyzed broken down by approach. The LOS of existing conditions is compared to the expected LOS after implementation of the improvements outlined in the study for each approach in the AM and PM peak hour.

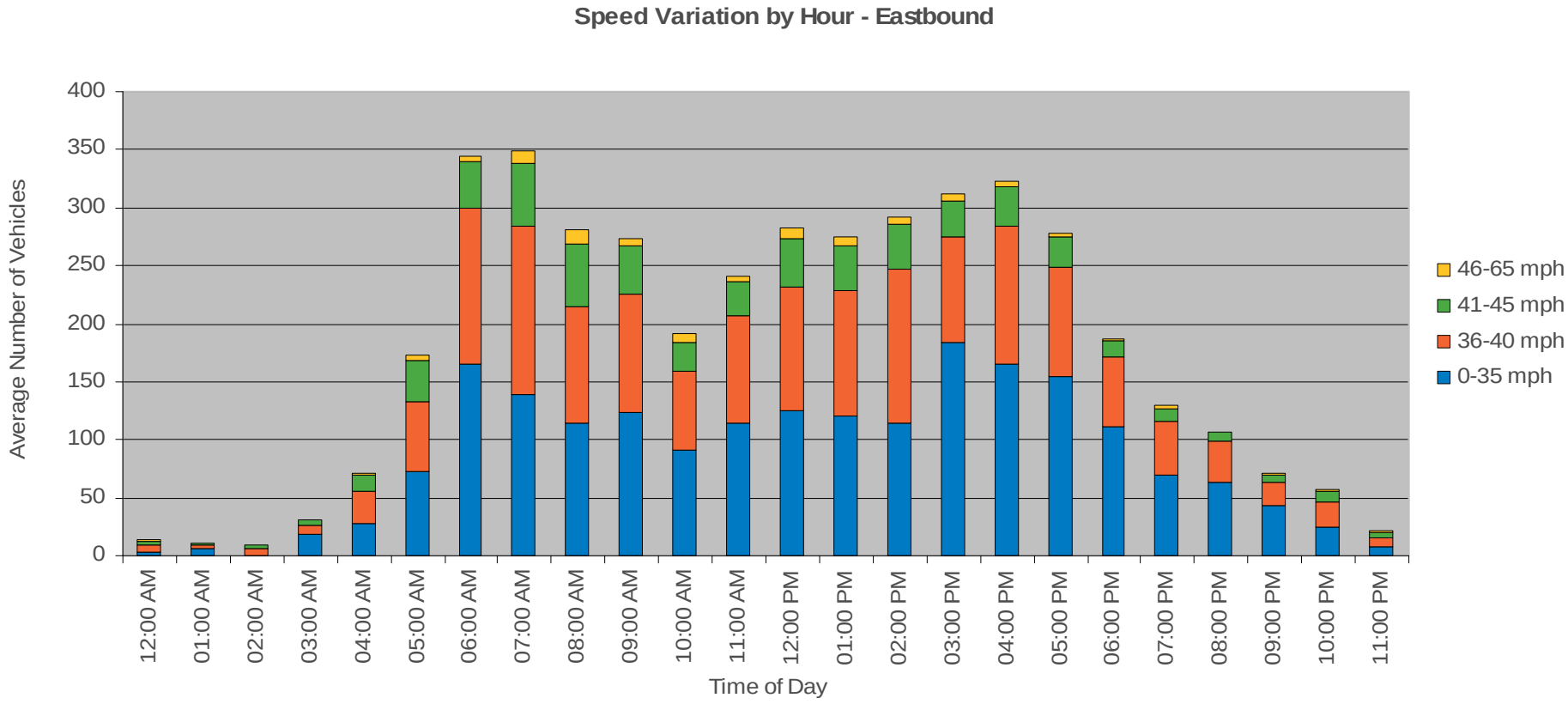
| AM Peak Hour<br>PM Peak Hour | US 30 Bypass | | | | | | | | | US 30 Bypass | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ramp M (SB Left to EB) | EB Left to Ramp L | US 322 (SEB) | US 322 NWB) | Ramp J (NB Left to WB) | WB Left to Ramp K | US 322 (SEB) | US 322 (NWB) | Overall Intersection | Ramp M (SB Left to EB) | EB Left to Ramp L | US 322 (SEB) | US 322 NWB) | Ramp J (NB Left to WB) | WB Left to Ramp K | US 322 (SEB) | US 322 (NWB) | Overall Intersection |
| **Existing** | | | | | | | | | | | | | | | | | | |
| Delay (sec) | 75.2 | 0.4 | 0.0 | 0.0 | 87.0 | 10.9 | 0.0 | 0.0 | N/A | 280.8 | 0.5 | 0.0 | 0.0 | 46.5 | 5.1 | 0.0 | 0.0 | N/A |
| LOS | F | A | A | A | F | B | A | A | N/A | F | A | A | A | E | A | A | A | N/A |
| **Improvement** | | | | | | | | | | | | | | | | | | |
| Delay (sec) | 33.3 | 40.1 | 1.0 | 8.2 | 87.0 | 10.9 | 0.0 | 0.0 | 3.5 | 39.3 | 203.6 | 3.2 | 12.9 | 46.5 | 5.1 | 0.0 | 0.0 | 13.5 |
| LOS | C | D | A | A | F | B | A | A | A | D | F | A | B | E | A | A | A | B |

Source: DVRPC 2009

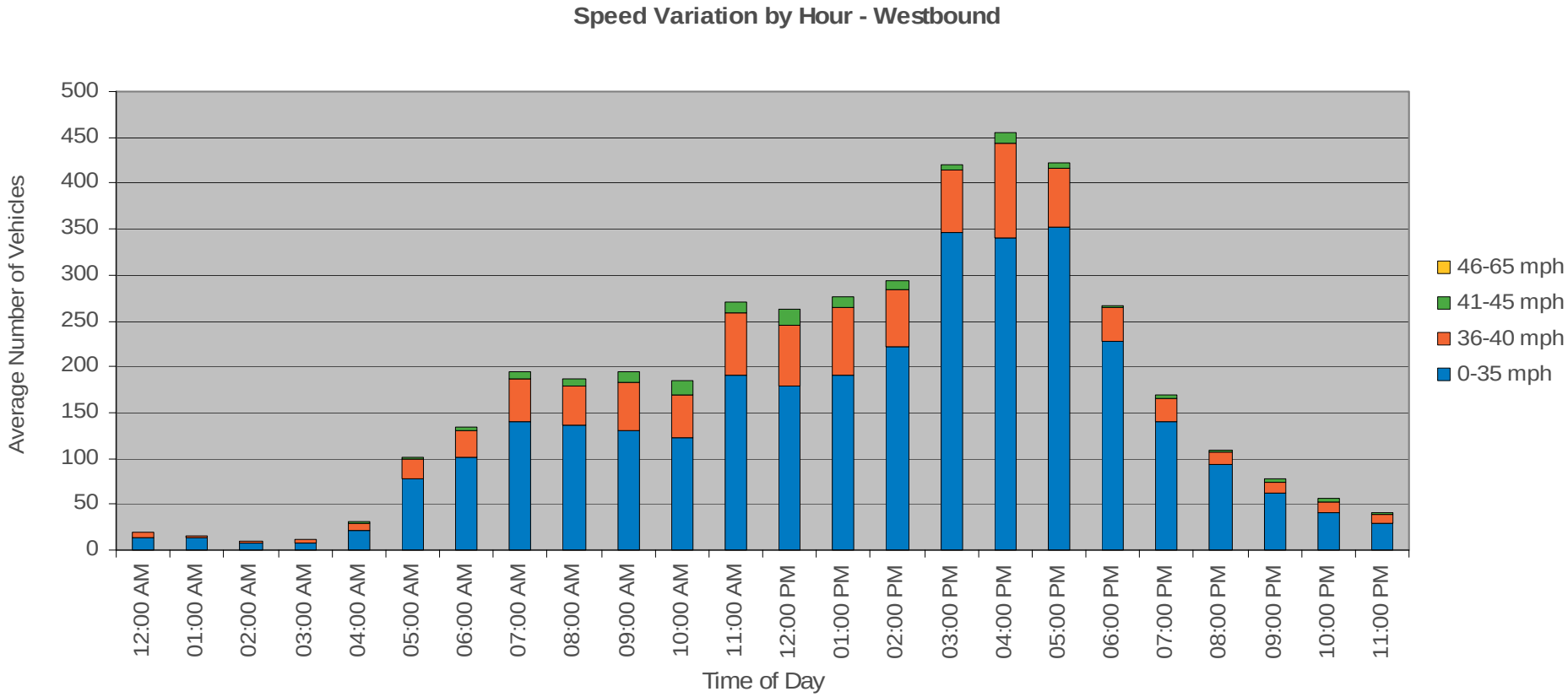
APPENDIX C

# Speed Analysis

These charts illustrate the variation of speed by time of day. These speeds were obtained along US 322 at the eastern limits of Honey Brook Borough.




*Source:* DVRPC 2009




*Source:* DVRPC 2009

| | |
|---|---|
| Publication Title: | Guiding Transportation Investments and Land Use Decisions along US 322–Chester County |
| Publication Number: | 09063 |
| Date Published: | February 2010 |
| Geographic Area Covered: | Caln Township, Downingtown Borough, Honey Brook Borough/Township, East Brandywine Township, West Brandywine Township, West Nantmeal, Chester County |

Key Words: Transportation, land use, transit, corridor, smart growth, intersection improvements, solutions, multi-municipal, coordinated, environment

Abstract: Improving the linkage between land use and transportation is essential for the future of the US 322 corridor through Chester County. Inappropriate land uses coupled with inadequate infrastructure and transportation access will have negative impacts on the entire road network and quality of life for the western portion of Chester County. Working with the Chester County Planning Commission, the Delaware Valley Regional Planning Commission (DVRPC) conducted a thorough analysis of the US 322 Corridor to assess land use, environmental policies and impacts, and transportation issues. The goals of the study include preserving the operating performance of the current transportation facilities, promoting multi-modal transportation solutions to help alleviate current and forecasted travel growth, furthering the goals of coordinated land use and transportation planning among municipalities, providing a policy rationale for future transportation improvements, and encouraging municipal actions to achieve a land use pattern that is reflective of smart growth principles.

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