

Scenic Conservation Plan,  
Brandywine Valley National Scenic Byway

# Existing Conditions Report



Delaware Greenways  
February 2011

# EXISTING CONDITIONS REPORT

## TABLE OF CONTENTS

1. Introduction.....	1
1.1 Background.....	1
1.2 The Scenic Conservation Plan.....	1
1.3 Previous Efforts.....	2
1.4 The Planning Process.....	3
1.5 Study Areas.....	5
2. Land Use.....	7
2.1 Geography and the Natural Environment.....	7
Landform.....	8
Water Resources.....	9
2.2 Historic and Current Population.....	11
2.3 Historic and Current Land Use.....	13
Residential Development.....	15
Commercial, Office, and Industrial Development.....	16
Parks, Recreation, and Open Space.....	17
Future Land Use—County Comprehensive Plan 2007.....	20
2.4 Protected Lands.....	21
2.5 Current Zoning.....	24
2.6 Infrastructure and Services.....	26
Water Supply.....	26
Wastewater.....	29
2.7 Land Use Contexts.....	30
3. Transportation.....	34
3.1 Introduction.....	34
3.2 Physical Characteristics of the Study Area Roadways.....	35
3.3 Crash Analysis.....	39
Crash Rates.....	41
Day of Week.....	44
Lighting Conditions.....	44
Pavement and Weather Conditions.....	45

## EXISTING CONDITIONS REPORT

Manner of Impact.....	45
First Harmful Event.....	46
Findings.....	46
3.4 Functional Classification .....	47
3.5 Traffic Volumes .....	49
3.6 Roadway Typology .....	50
3.7 Currently Planned Roadway System Improvements .....	54
3.8 Non-motorized Transportation.....	54
Pedestrian and Trail Network.....	54
Bicycle Network.....	55
Active and Operating Railroads .....	56
Rail to Trail/Rail with Trail Opportunities.....	56
3.9 Public Transportation Facilities.....	57
4. Synthesis of Existing Key Issues.....	59
4.1 Linking Land Use and Transportation.....	59
4.2 Transportation Design Implications .....	61
4.3 Emerging Issues.....	62
Waste Water and Water Resources.....	62
Large Land Owners .....	62
Public Water and Sewer .....	63
Pedestrian and Bicycle Access.....	63
Access to Trails and Scenic Areas.....	63
Traffic Signing and Signing by Property Owners.....	63
Development Access and Development Layout.....	64
Context Sensitive Design Manual .....	65
Land Development Guidelines.....	65
Emerging Issues: Next Steps .....	66

# 1. INTRODUCTION

## 1.1 BACKGROUND

In September of 2005 the Brandywine Valley Scenic Byway became the first designated National Byway in the State of Delaware. The 12.25 mile Brandywine Valley National Scenic Byway (BVNSB) corridor contains some of the most beautiful and historically significant roads and scenery in Delaware.

The Byway is comprised of the Kennett Pike (Route 52) and Montchanin Road (Route 100) corridors, extending from Rodney Square in downtown Wilmington, Delaware, north to the Delaware-Pennsylvania border. The Byway is composed of three major sections, which are: (1) The City of Wilmington (lower Route 52 from Rodney Square to Rising Sun Lane) (2) Kennett Pike (upper Route 52 from Rising Sun Lane to the Pennsylvania border) (3) Montchanin Road (Route 100 from Kennett Pike to the Pennsylvania border) Together, these three sections form a loop that begins and ends in downtown Wilmington. For the purposes of the Scenic Conservation Plan, only the Kennett Pike and Montchanin Road sections will be addressed, as the section within the City of Wilmington faces significantly different issues and challenges to scenic conservation.

This document provides an assessment of the existing land use and transportation situation in the study area. A separate Viewshed Analysis Report presents the existing conditions of the study area's most significant visual features and supplements the information provided in this report.

A third working paper will cover the Trend Scenario which concerns the future situation in the study area if the current policies and programs of state and county government remain unchanged for the foreseeable future. Subsequent working papers will address a community vision, goals and objectives for the study area, an assessment of plans for alternative futures, and finally, the draft Conservation Plan. The final report package will include plan maps, a narrative, design guidelines for land use and transportation, and implementation tools that will set the policies and management structure for the implementation and management of the Conservation Plan.

## 1.2 THE SCENIC CONSERVATION PLAN

The BVNSB Corridor Management Plan produced a set of goals and identified associated objectives and action steps to facilitate sustainable management of the Byway. The Scenic Conservation study and planning process was initiated out of concern for maintaining the intrinsic qualities of Delaware's Brandywine Valley Byway corridor in light of its new residential and commercial development. The final product of this work will be the Scenic Conservation Plan (Plan), which will identify a path forward to protect and preserve the beauty and accessibility of the BVNSB corridor and its landscapes, while providing for sustainable growth and development. The planning process will be conducted between approximately September 2010 and September 2011.

The BVNSB Scenic Conservation Plan has three main aims:

1. to maintain the character and experience of the Byway corridor;
2. to protect property values; and,
3. to provide safe, convenient access to the Byway corridor amenities and resources for residents, businesses and visitors.

### 1.3 PREVIOUS EFFORTS

The Plan builds upon previous efforts.

- *The Brandywine Scenic River and Highway Study* (New Castle County, 1987). This study, sponsored by New Castle County, formally documented the natural beauty and historical significance of the Brandywine Valley. It became one of the guiding documents for all subsequent planning in the Valley undertaken by New Castle County.
- *BVNSB Corridor Management Plan* (2005). Once the Brandywine Valley National Scenic Byway was awarded national designation, Delaware Greenways, in conjunction with WILMAPCO and DelDOT developed a comprehensive plan to preserve the beauty and intrinsic resources of the Byway Corridor. The goals and recommendations of the Corridor Management Plan provide the guidance for the Conservation Plan. Specifically, the Corridor Management Plan documented the resources of the Byway Corridor and developed goals, objectives and recommendations for the management and preservation of the Byway. It also suggested actions to be taken by government and by Delaware Greenways to manage the roadways and surroundings of the Byway. The Conservation Plan is being developed in direct response to Goal 3 of the CMP:

*“to establish a **collaborative, interdisciplinary approach** to developing and implementing all future transportation projects along the byway, involving all stakeholders to ensure that transportation projects are in harmony with the byway communities; **to preserve and enhance environmental, scenic, aesthetic, and historic resources while enhancing safety and mobility...**”*

- *Scenic Stewardship: A Plan to Preserve and Enhance the Landscape of the Brandywine Valley Scenic Byway* (2005). This Plan developed landscape design standards for the Byway Corridor.

While the New Castle County Comprehensive Plan and associated implementing ordinances are comprehensive, chaotic development, alien to the character of the villages and landscapes is still possible in spite of those planning initiatives and guidance from the other existing documents. Left alone, development will lead to an increase in unmanaged traffic that will inhibit the mobility of residents and visitors and limit the ability to access and enjoy the Byway and the surrounding valley. Threats to the Byway Corridor and to the entire Valley thus remain, and must be addressed by additional measures.

Because land use patterns and the resultant movement of people, goods and services impact the Byway, the BVNSB Scenic Conservation Plan is being developed with an emphasis on the importance of integrating land use and transportation. The Plan development process focuses on the land use, scenic resources, and roadways that make up the BVNSB Corridor.

A Conservation Plan is needed to provide a management structure, policies, and implementation tools which will protect and preserve the essential beauty and function of the Brandywine Valley and the Brandywine Valley National Scenic Byway.

Ultimately, the Plan will guide:

1. Maintenance of the character and experience of the Byway
2. Preservation of land values
3. Provision of safe, convenient access for residents, businesses, and visitors

#### 1.4 THE PLANNING PROCESS

The Conservation Sub-committee of the Brandywine Valley Byway Management Committee has been assigned the task of guiding the development of the Scenic Conservation Plan. Staff of Delaware Greenways is the responsible party for the development of all technical work. Travel demand modeling work is based upon the Peninsula Mode used by DeDOT.

Figure 1.4-A illustrates the four phase planning process for the development of the Scenic Conservation Plan. Details of each phase are explained in the following paragraphs.

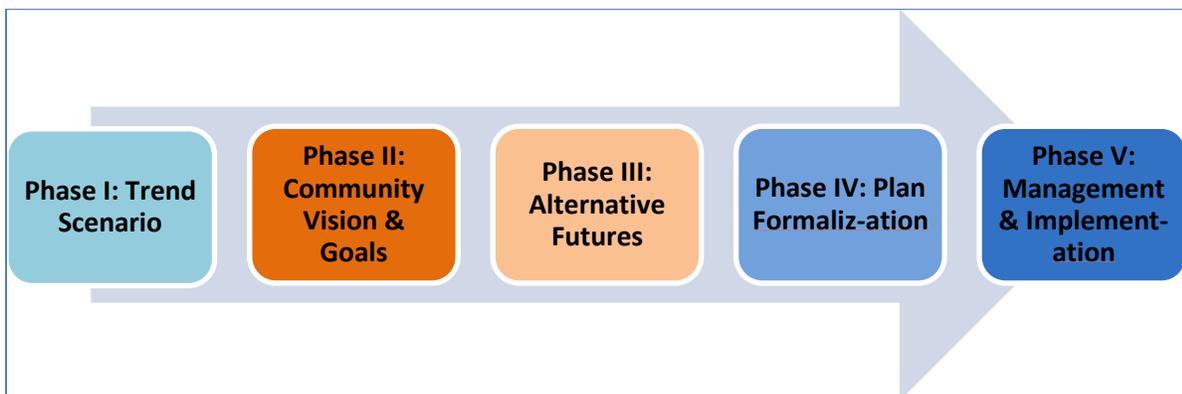


Figure 1.4-A

#### Phase 1 – Develop the Trend Scenario

This phase addresses the question, what will the future look like if current practices continue? The key steps in developing the Trend Scenario are:

- Inventory of existing environmental, demographic and transportation conditions
- Inventory of visual environment
- Identification of prime viewsheds and their threats
- Analysis of how the study area is impacted under current regulatory and market trends

### **Phase 2 – Establish a Community Vision and Goals**

This step addresses the question, what would *we* like the area to be like in the future and how do we get there? The ‘we’ in the question represents community stakeholders, including residents, businesses, and visitors. To achieve that consensus, a participatory planning approach has been devised. The approach includes a public visioning session in which attendees are challenged to envision the future based upon the technical data from the Trend Scenario and establish a vision for what they hope the future of the area to be. In addition, measures and metrics are identified to enable the alternative futures to be developed and analyzed in the subsequent phase of the study.

### **Phase 3 – Evaluate Alternative Futures**

Based upon the consensus vision and goals from the previous phase, a series of alternative futures are developed showing different ways to meet the vision. These alternative futures are then compared against the measures and metrics so that each goal and element of the vision can be compared across each alternative future. Based upon a comparison of the alternatives one alternative future is selected. This alternative future could also be a combination of several alternative futures or a combination of specific elements of different alternative futures.

### **Phase 4 – Formalize the Plan**

This phase formalizes and elaborates upon the selected alternative future by adding details including:

- Maps that detail the location and type of development, areas to be preserved, and mobility and circulation improvements
- Policies needed to implement the Plan
- Recommendations for implementation of the Plan, including the responsible agency to implement the Plan.

During this phase, a report will be prepared that presents the Plan and the technical effort supporting the Plan as well as documenting the input of the public in shaping the Plan.

### **Phase 5 – Plan Management and Implementation**

This phase adds Design Guidelines for natural and man-made areas and for transportation and mobility improvements. It also adds an implementation toolkit to show the recommended strategies and initial tactical steps to implement the key recommendations.

## 1.5 STUDY AREAS

Three study areas have been established to facilitate development of the Plan. Figure 1.5-A shows the three study areas.

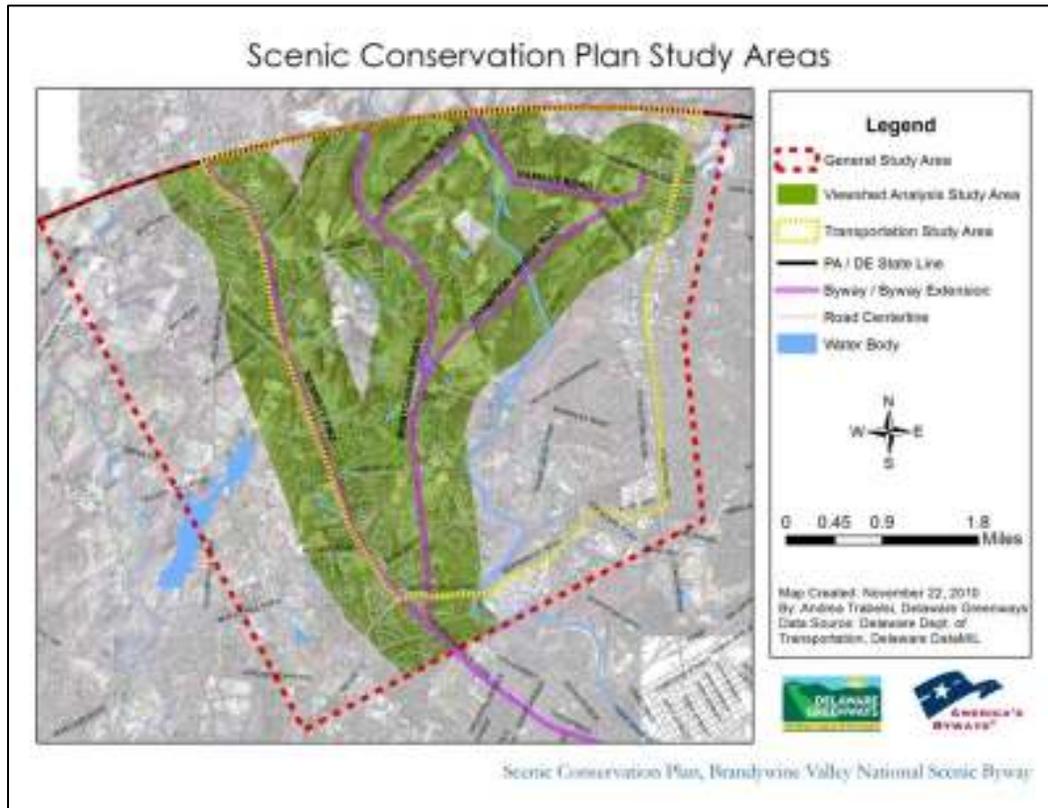


Figure 1.5-A

Study areas have been devised for land use (delineated by dashed red line), the viewshed analysis (shown as the green shaded area), and for transportation (delineated by yellow dashed line). The purpose of defining three study areas is not to keep the issues separate, but rather to aide in organization and maintain a reasonable and focused scope of study. The primary components of the study, which include the viewshed analysis, land use planning, and transportation planning require consideration of different factors of influence, including geographic distribution. The complexity of those factors varies. Consequently, the areas of study for each of the three components are slightly different. The study area for land use is the widest because land use attributes have the most wide reaching impacts. That is, land use decisions even beyond a mile from the Byway roads have great potential to impact traffic patterns and viewshed. The viewshed study area is smaller than the land use study area and focuses on the landscape, sights, and views within approximately 0.5 miles of the BVNSB and byway extension roads; 0.5 miles is the approximate distance within which the eye

## EXISTING CONDITIONS REPORT

can detect patterns and detail<sup>1</sup>. The transportation study area is the most compact and includes the area/roads bounded by and including: Kennett Pike; Route 202; Route 141; and the Pennsylvania-Delaware state boundary. All study areas are bound to the south by the City of Wilmington boundary.

---

<sup>1</sup> USDA Forest Service. "Landscape Aesthetics, A Handbook for Scenery Management." *Agriculture Handbook*, Number 701. December 1995.

## 2. LAND USE

This section describes the existing/current conditions that influence land use and development in the approximately 16,000 acres (25 square miles) that make up the land use study area (see Figure 2.0-A). The existing conditions addressed include geography, natural features, land uses, zoning, and infrastructure.

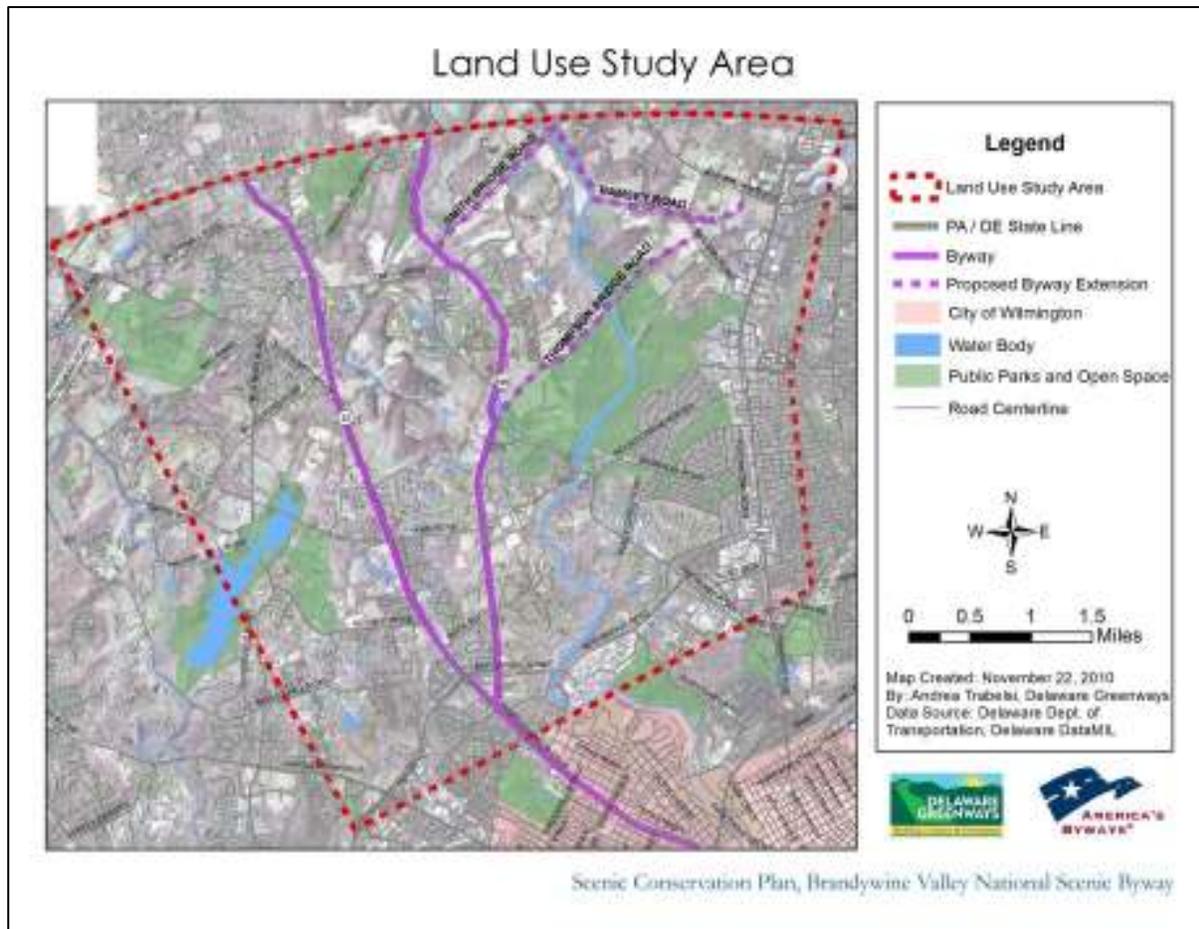


Figure 2.0-A

### 2.1 GEOGRAPHY AND THE NATURAL ENVIRONMENT

Land use patterns in the Brandywine Valley originally stemmed from geography of the region. Waterways and the natural environment dictated access, travel, food supply, and the ability to settle and build. The regional economy also developed under the opportunities and constraints provided by the local landscapes. Although engineering and technology has enabled society to travel and build nearly anywhere, landform and water are still factors that influence development.

### LANDFORM

The landform of the Brandywine Valley is comprised of undulating hills, which are increasingly steep and variable as one moves northward. Figure 2.1-A shows the grade of the land (in percent slope) in the study area. Steep slopes (slopes greater than 25%) are the areas highlighted in red and yellow on the map. Concentrations of steep slopes occur in the northern section of the study area, particularly along Montchanin Road, along the Brandywine Creek, and to a lesser degree along tributaries of the Brandywine Creek and other water bodies. In addition, the map also shows erosion prone slopes, which are locations where development is riskier because of potential for slope failure. Erosion prone slopes are also sources of water degrading silt and suspended solids.

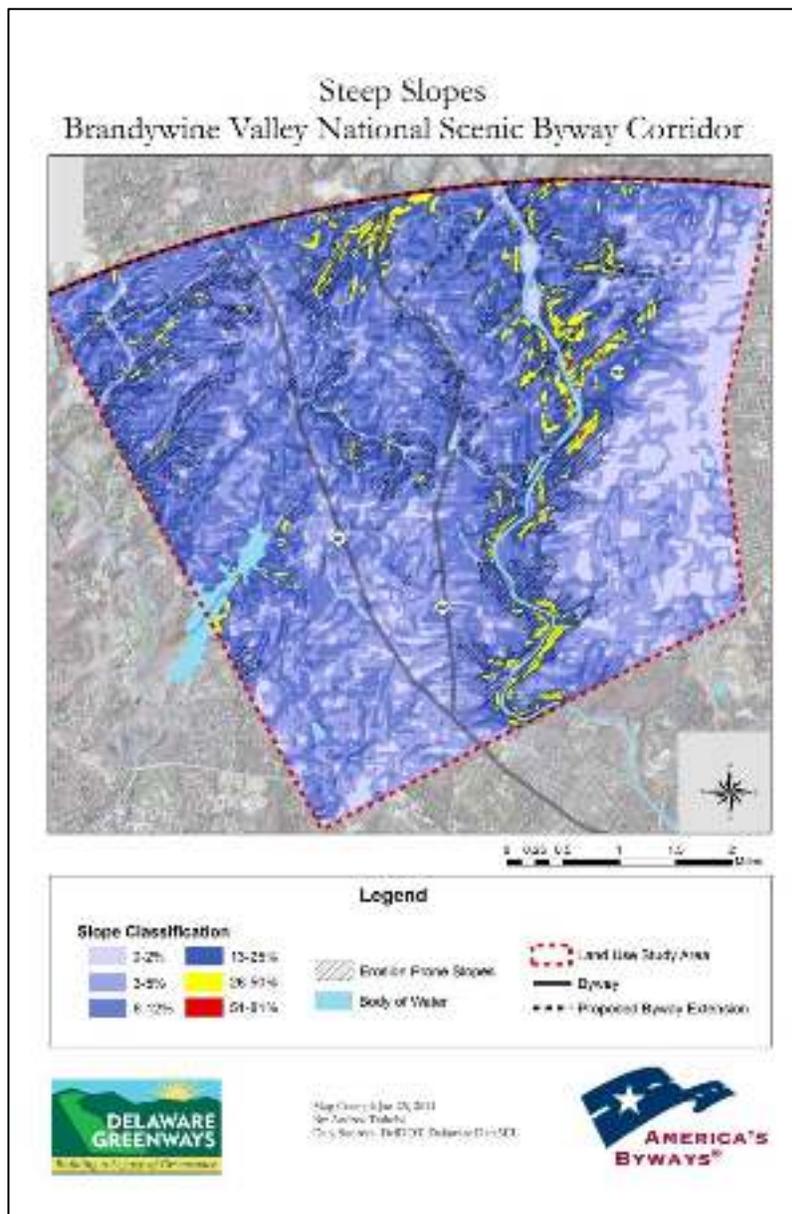


Figure 2.1-A

The locations of steep slopes and erosion prone slopes define areas that may be less favorable for development because of the potential for slope failure, difficulty and expense of construction, and negative environmental impacts that are associated with development of steep slopes. Slopes of greater than 25% cannot be built upon and the amount of building is significantly reduced in areas of slopes of between 15% and 25%. Review of the figure shows that approximately 430 acres (3%) of the study area has slopes of greater than 25%. The majority of these slopes are along the Brandywine Creek. Other areas with steep slopes are clustered around Route 100 and located near the Pennsylvania border. They are typically located along tributaries to the Brandywine Creek. Steep slopes also exist around the Hoopes Reservoir, located to the west of Route 52. Slopes between 6% and 25% can be considered 'rolling landscape'. These slopes are scattered across 3,000 acres (19%) of the

## EXISTING CONDITIONS REPORT

countryside and also add landscape variation, contributing to the beauty of the study area. Of the slopes shown on the map, approximately 1,900 acres (12%) is considered prone to erosion. (See the Viewshed Report for more on this topic.)

*WATER RESOURCES*

The Brandywine Creek, flowing north to south, and roughly bisecting the study area, is a significant visual, cultural, and environmental resource. Figure 2.1-B shows the Creek and other water resources in the study area.

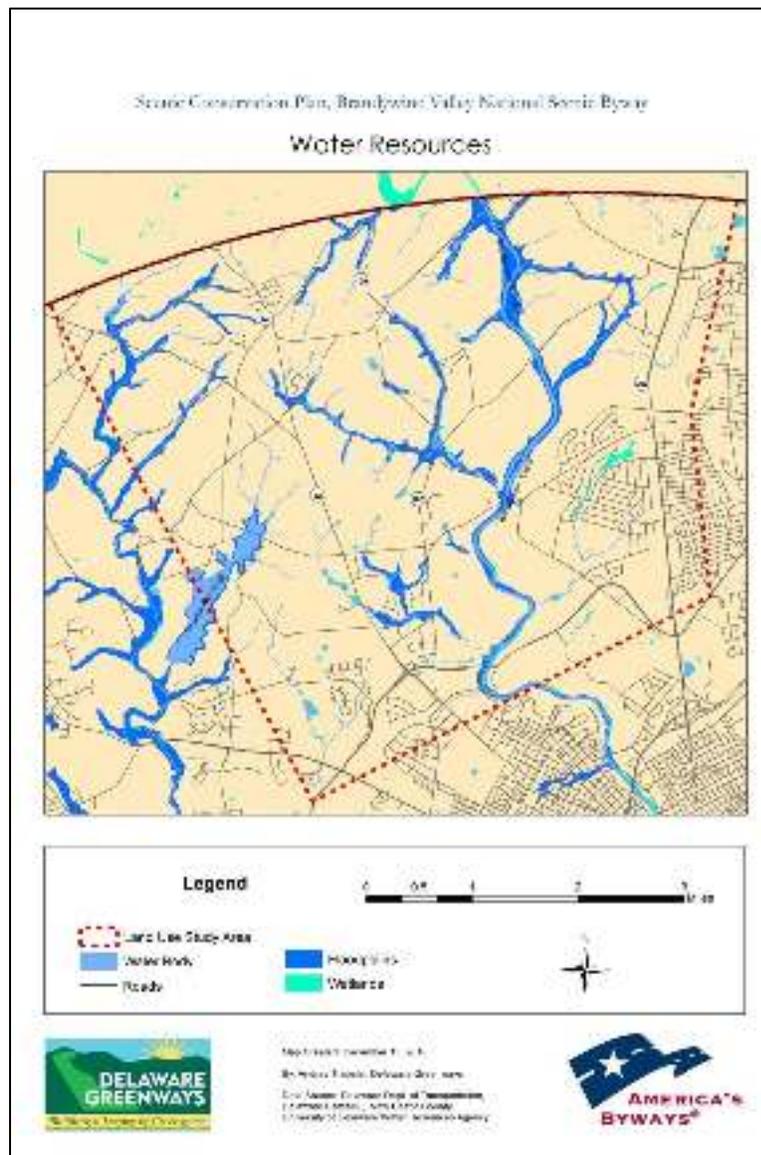


Figure 2.1-B

The presence of the Creek both attracts development and also puts limitations on it. Development is drawn to the Creek for the amenities (scenic, recreational, etc.) it offers; however, development along the Creek and its floodplains is limited by government restrictions aimed at preventing flood damage and protecting the environment. The New Castle County Unified Development Code generally does not allow development on a wetland, and allows only very low impact uses in any floodplain, such as cropland, natural areas, and trails. However, non-conforming uses/structures that existed prior to the regulations are acceptable and improvements/replacements may be made. Further, the UDC requires a 50 foot minimum riparian buffer area adjacent to all floodplains and wetlands of certain size, and a 100 foot buffer from all streams<sup>2</sup>.

Figure 2.1-C shows the location of floodplains and erosion prone slopes in the study area, which are areas where development is

<sup>2</sup> Floodplains and floodways are addressed in sections 40.10.310-40.10.317

undesirable from an environmental, risk, and financial standpoint.

Hoopes Reservoir, which serves as the water supply for much of the study area, is partially located in the study area's western boundary. The Reservoir and additional water supply issues are explained further in section 2.6.

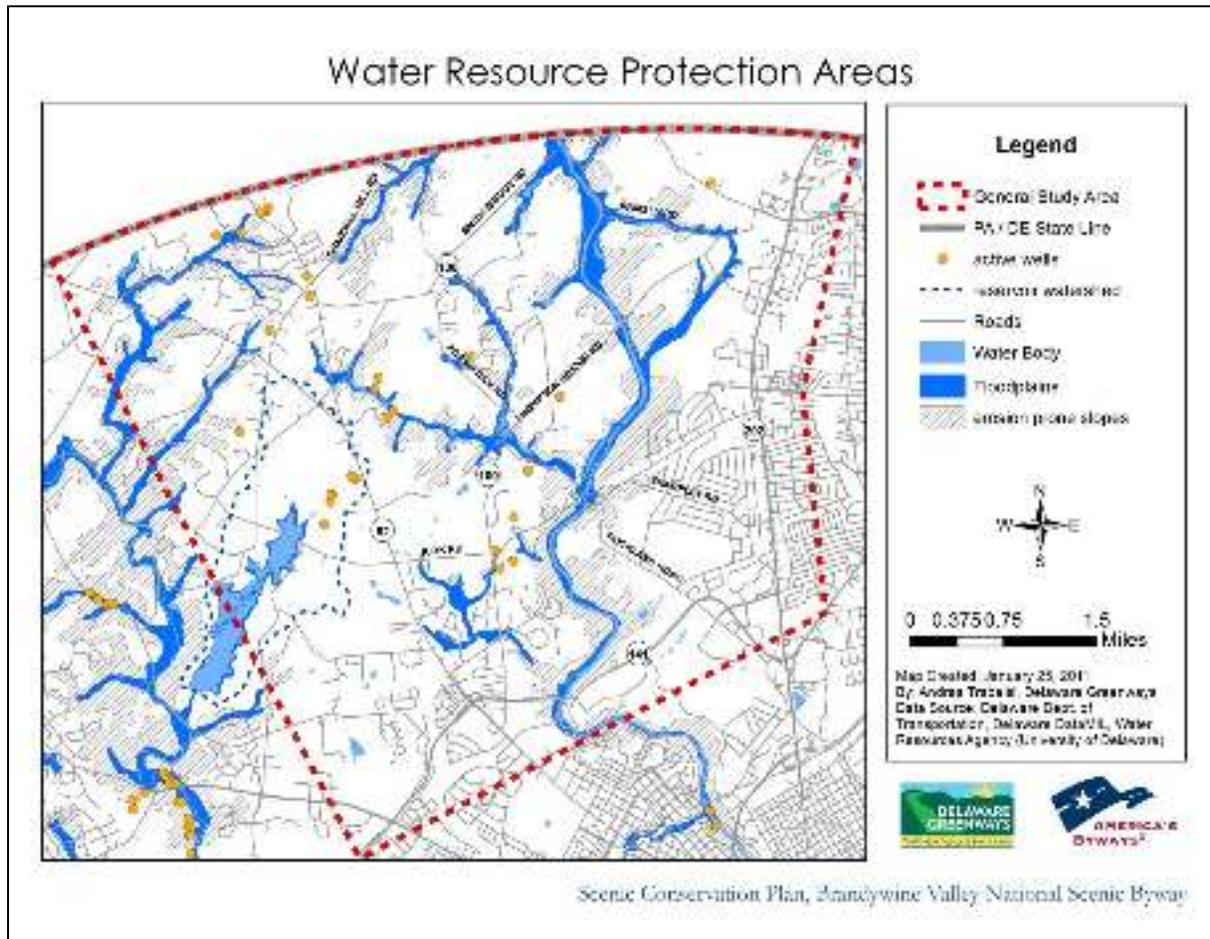


Figure 2.1-C

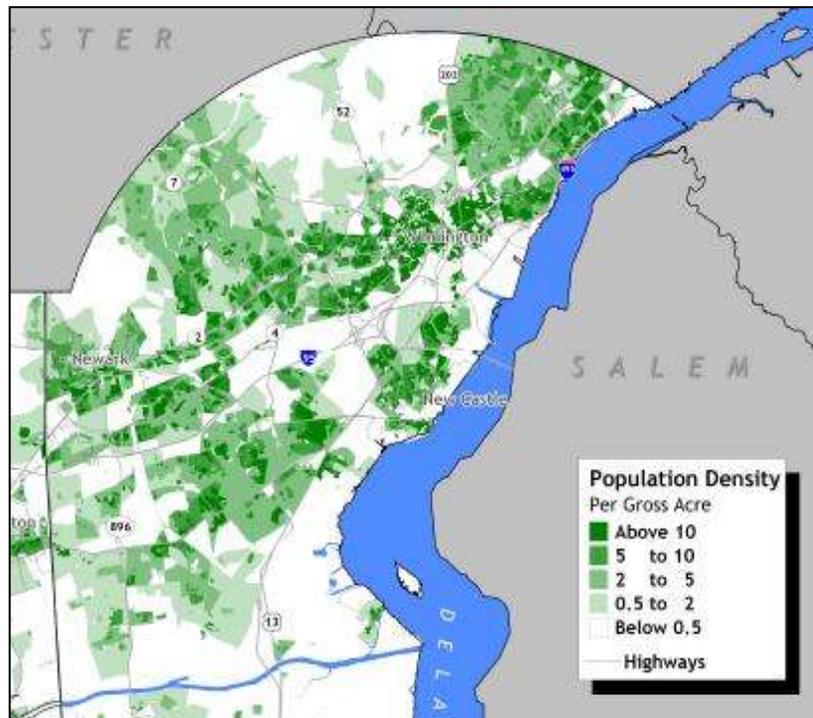
Within the study area, a number of smaller water bodies and wetlands also exist (shown in Figure 2.1-C). Most of the smaller water bodies east of Kennett Pike (roughly the boundary between the Brandywine and Red Clay watersheds) are tributaries to the Brandywine Creek; streams west of Kennett Pike drain to the Red Clay Creek and Hoopes Reservoir. Aside from the 100 foot stream buffer requirement, there are generally no regulations restricting development along the smaller water bodies in the study area; however, their protection is important and increasingly so as the development density and population increases.

Apparent gaps in regulations affecting development along all the waterways and wetlands in the study area could ultimately lead to degraded water resources, which will not only impact the ability to enjoy them as amenities in the community, but also will threaten their ability to provide more

imperative resources to the community, such as drinking water. Water resource issues are not yet strong limiters of development in the Valley, but are certain to be increasingly important as development occurs.

## 2.2 HISTORIC AND CURRENT POPULATION

The Brandywine Valley area has some of the lowest population densities in northern New Castle County. Figure 2.2-A shows the population density by census block according to the 2000 U.S. Census. The average population density over the entire study area is roughly .75 persons per acre (1 person per every 1.3 acres). The population of the study area is approximately 8,850<sup>3</sup>. Figure 2.2-B shows population in the study area by Traffic Analysis Zone (TAZ--a geographical unit used by a number of planning bodies in Delaware to define areas for measurement, projection, and modeling of population, employment, and traffic patterns). The figure indicates that the population is concentrated along Route 202 on the eastern edge of the study area, from Greenville in toward Wilmington, and in Centreville in the northwest section of the study area. Table 2.2-A further explains the current population and population density in the TAZs that fall within the study area. Population density is lowest in TAZs 127, 128, 129, and 69.



**Figure 2.2-A: Population Density by Census Block (2000)**  
Source: WILMAPCO

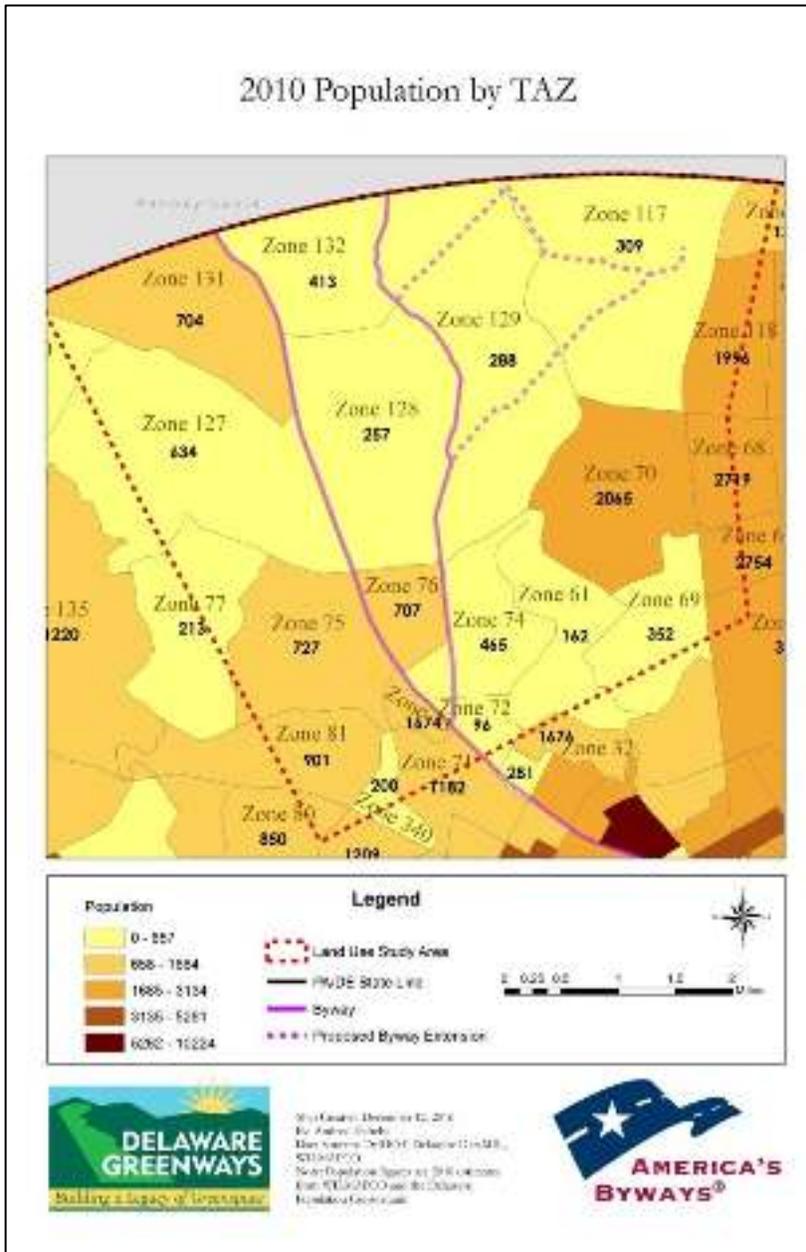
Population densities are low in these areas for a number of reasons, which are:

- TAZ 69: an area with non-residential land uses, including the Astra Zeneca campus and Nemours Hospital and grounds.

<sup>3</sup> Delaware Population Consortium estimate

EXISTING CONDITIONS REPORT

- TAZ 127: residential area zoned mostly as “Suburban Estate” (low densities of roughly 1 dwelling unit per 2 acres) with some large parks and recreational areas.



- TAZ 128: (lowest density in the study area .12 persons per acre) Winterthur Estate and two golf courses are located in this zone. While approximately 650 (75%) acres of the Winterthur property are in conservation easement, the golf courses are not protected from development.

- TAZ 129: (density of .27 persons per acre) Brandywine Creek State Park and a number of large family estates, including Granogue, are located in this TAZ, which is zoned almost entirely as “Suburban Estate” which has a maximum density of two dwelling units per acre although in many areas of this zoning, that density is not currently present.

Figure 2.2-B

**Table 2.2-A: Population by TAZ\***

TAZ	Land Area (acres)	1985**		2000		2010		2040	
		Population	Density (Persons/Acre)	Population	Density (Persons/Acre)	Population	Density (Persons/Acre)	Population	Density (Persons/Acre)
61	382	92	0.12	156	0.41	162	0.42	162	0.42
69	1131	831	1.11	628	0.56	352	0.31	335	0.30
70	475	2627	2.57	2203	4.64	2065	4.35	2257	4.75
72	128	119	0.65	110	0.86	96	0.75	144	1.13
73	673	Not available	Not Available	1170	1.74	1674	2.49	1793	2.66
74	1001	274	0.4	485	0.48	465	0.46	442	0.44
75	347	Not Available	Not Available	772	2.22	727	2.10	701	2.02
76	951	254	0.72	692	0.73	707	0.74	700	0.74
117	603	233	0.12	117	0.19	309	0.51	518	0.86
127	1620	Not Available	Not Available	1068	0.66	634	0.39	994	0.61
128	2071	289	0.18	276	0.13	257	0.12	288	0.14
129	1060	347	0.17	301	0.28	288	0.27	312	0.29
131	824	Not Available	Not Available	621	0.75	704	0.85	660	0.80
132	455	421	0.51	452	0.99	413	0.91	396	0.87
<b>TOTAL</b>	<b>11,721</b>	<b>5,487</b>		<b>9,051</b>		<b>8,853</b>		<b>9,802</b>	

\*Traffic Analysis Zone is a geographical unit used by a number of planning bodies in Delaware to define areas for measurement, projection, and modeling of population, employment, and traffic patterns

\*\*Source: Brandywine Valley Scenic and Historic Highway Study (1987), by New Castle County; data not available for certain zones because of renumbering/reconfiguration in subsequent years

The demographic makeup of the population in the study area differs from statewide and countywide averages. Residents of the study area tend to be older, wealthier, and have fewer individuals per household as compared to the county and the state.

The median age for the study area (using census 2000 data from tracts 117, 118, and 119) was 49.3, with approximately 80% of the population over 18 years old and 25% of the population over 65 years. According to WILMAPCO's 2010 population estimates (by TAZ), there are currently 4,774 households in the study area. According to the 2000 Census, there are approximately 1,600 housing units and 96 % are occupied; 7 % of the occupied housing units are rentals. These last few statistics indicate a highly stable population and housing inventory.

### 2.3 HISTORIC AND CURRENT LAND USE

Land use patterns in the Brandywine Valley have remained relatively the same as what they were 30 years ago, as reported in the 1987 New Castle County *Brandywine Valley Scenic River and Highway Study*. Development over the last half-century in the Brandywine Valley has been largely influenced by historic travel patterns, the area's proximity to Wilmington, and the nature of land ownership. Development originally concentrated along the prime travel routes, Routes 52 and 202,

## EXISTING CONDITIONS REPORT

and near Wilmington, and growth and development pressure remains strongest in those areas. Areas closer to the Brandywine Creek and to the northern portion of the study area have remained relatively undeveloped, much the result of the large land holdings of a number of families, institutions, and businesses, which have held onto their property without significant subdivision. Figure 2.3-A, below, shows current land uses (according to 2007 land use / land cover data). Table 2.3-A shows the amount of different land uses in the study area.

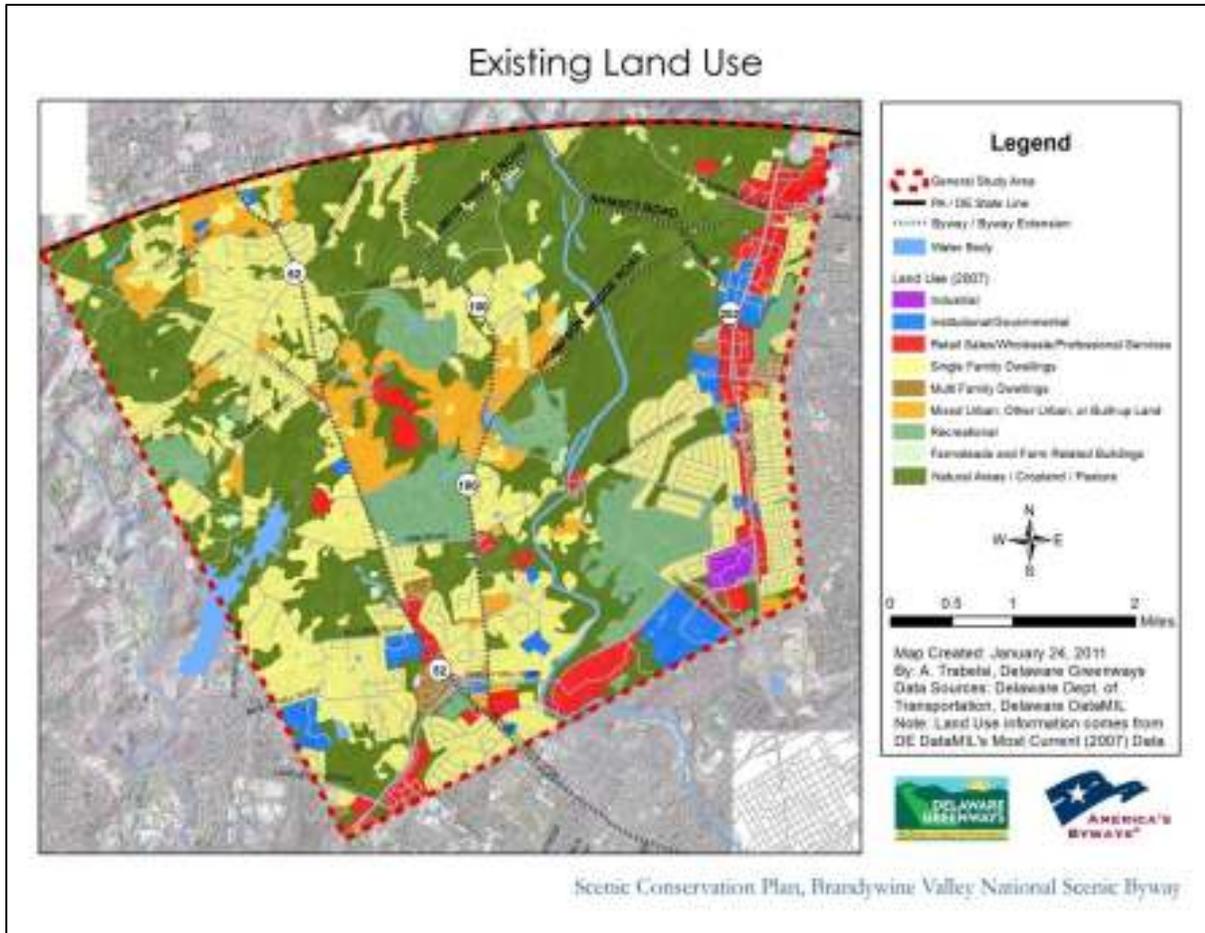


Figure 2.3-A

**Table 2.3-A: Land Uses in Study Area**

Use	Area (acres)	Percent of Study Area
Industrial	70	0.5 %
Institutional/Governmental	100	0.6 %
Retail Sales/Wholesale/Professional Services	900	5.8 %
Single Family Dwellings	4,900	33.6 %
Multi Family Dwellings	160	1.0 %
Mixed-Urban/Other Urban/Built -Up Land	1,000	6.5 %
Recreational	1,350	8.7 %
Farmsteads/Farm-Related Buildings	500	3.2 %
Natural Areas/Farmland/Pasture	6,500	42.0 %
TOTAL	15,480	100 %

*RESIDENTIAL DEVELOPMENT*

Aside from natural areas, farmland, and pastures, the majority of land use in the study area is single family residential (33%). Most are homes located on one acre lots or larger in suburban, cul-de-sac style subdivisions, like that shown in the photo at right. The location of the residential developments/neighborhoods in the study area are highlighted in yellow in Figure 2.3-B.



**Low-density residential development along Snuff Mill Road, adjacent to the Oberod Estate. This is a typical development type in the study area.**

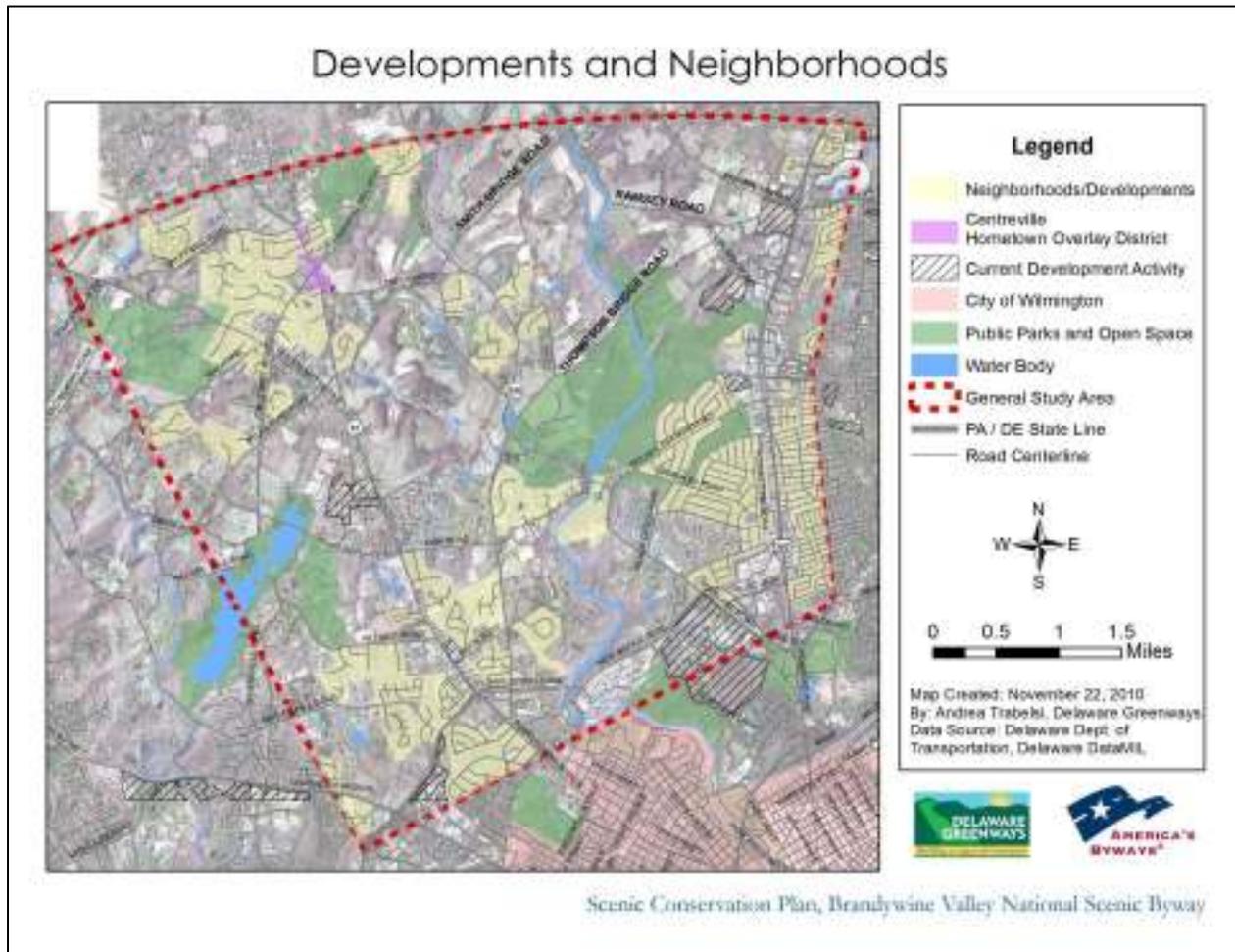


Figure 2.3-B

### *COMMERCIAL, OFFICE, AND INDUSTRIAL DEVELOPMENT*

Commercial, office, and industrial land uses make up roughly 6% of the study area and are concentrated near Wilmington and the US 202 corridor, Route 52 in Greenville, and at the intersection of Delaware Routes 141 and 48. Centreville is also the location of a number of small retail stores and offices. The shopping center developments along US 202 serve a regional shopping market extending into Pennsylvania as well as northern New Castle County. Astra Zeneca has a major research and development facility on US 202. Along DE Route 141, DuPont has research and development facilities. The Nemours Children's Hospital is also along the DE Route 141 corridor.

Figure 2.3-B (above) shows current development activity in areas highlighted with diagonal lines. These areas are where the county has received permit requests; though some of the areas of current development activity have not been developed prior to expiration, a number of the areas are classified as "pending." Though the areas delineated as "current development activity" do not

necessarily imply that development is or will be occurring in the specific location, one can deduce that in general more development is highly likely.

*PARKS, RECREATION, AND OPEN SPACE*

Roughly nine percent of the study area is used for recreational purposes, which includes private golf courses and other public parks oriented toward structured athletic activities, such as tennis or field sports. There are three country clubs with Golf Courses in the study area. The DuPont Country Club is located on Rockland Road, the Wilmington Country Club is located on DE Route 52 and the

Biderman Country Club is located along Adams Dam Road.

Approximately 40 percent of the study area is made up of other natural areas and open space, much of which is publicly owned or open to the public. The Brandywine Creek State Park consists of 933 acres within the study area. The major part of the park is located along Thompsons Bridge Road and Adams Dam Road. The park features over nine miles of trails as shown in Figure 2.3-C. It also features a nature center and recreational infrastructure, such as a disc golf course.

In addition to the golf courses, a number of other natural and recreational areas in the study area are

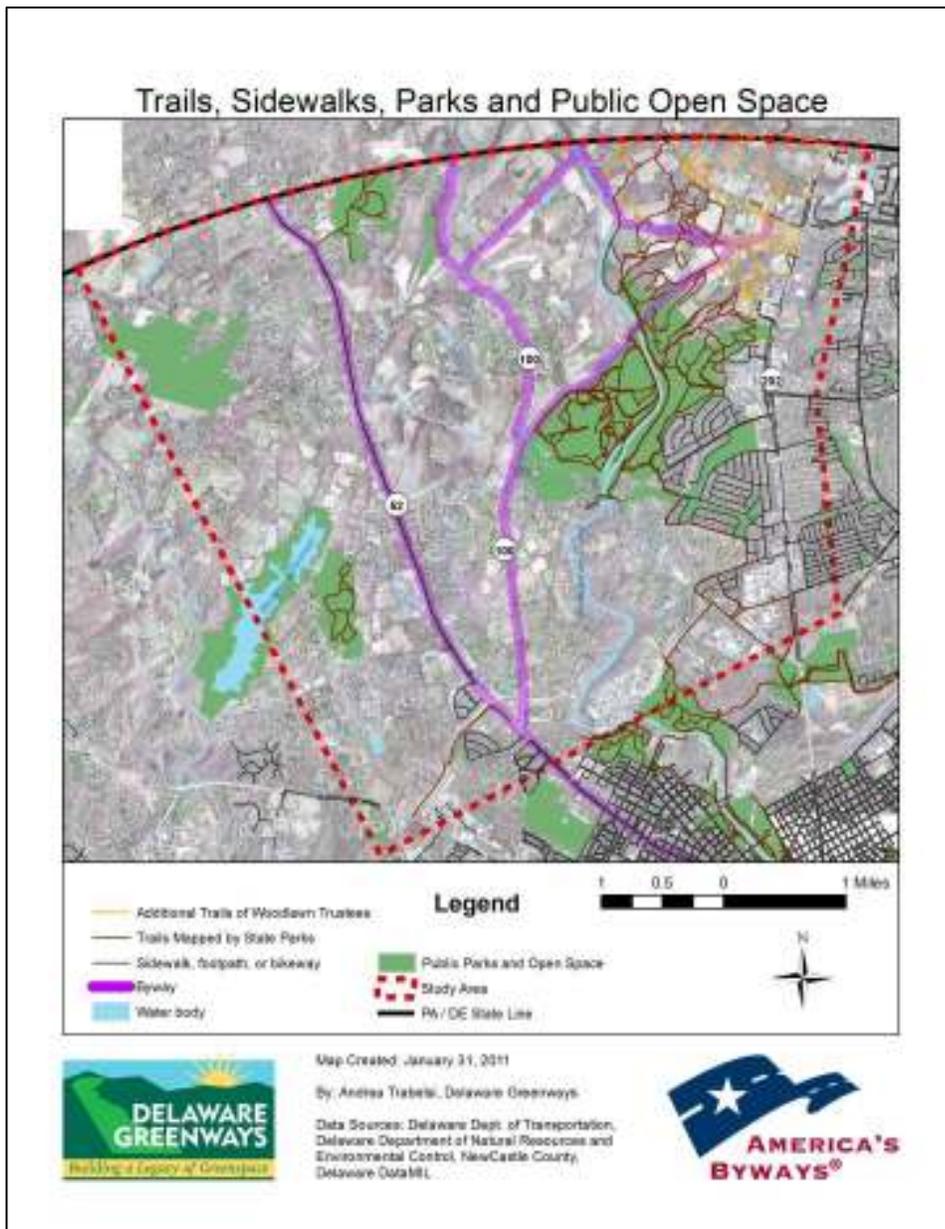
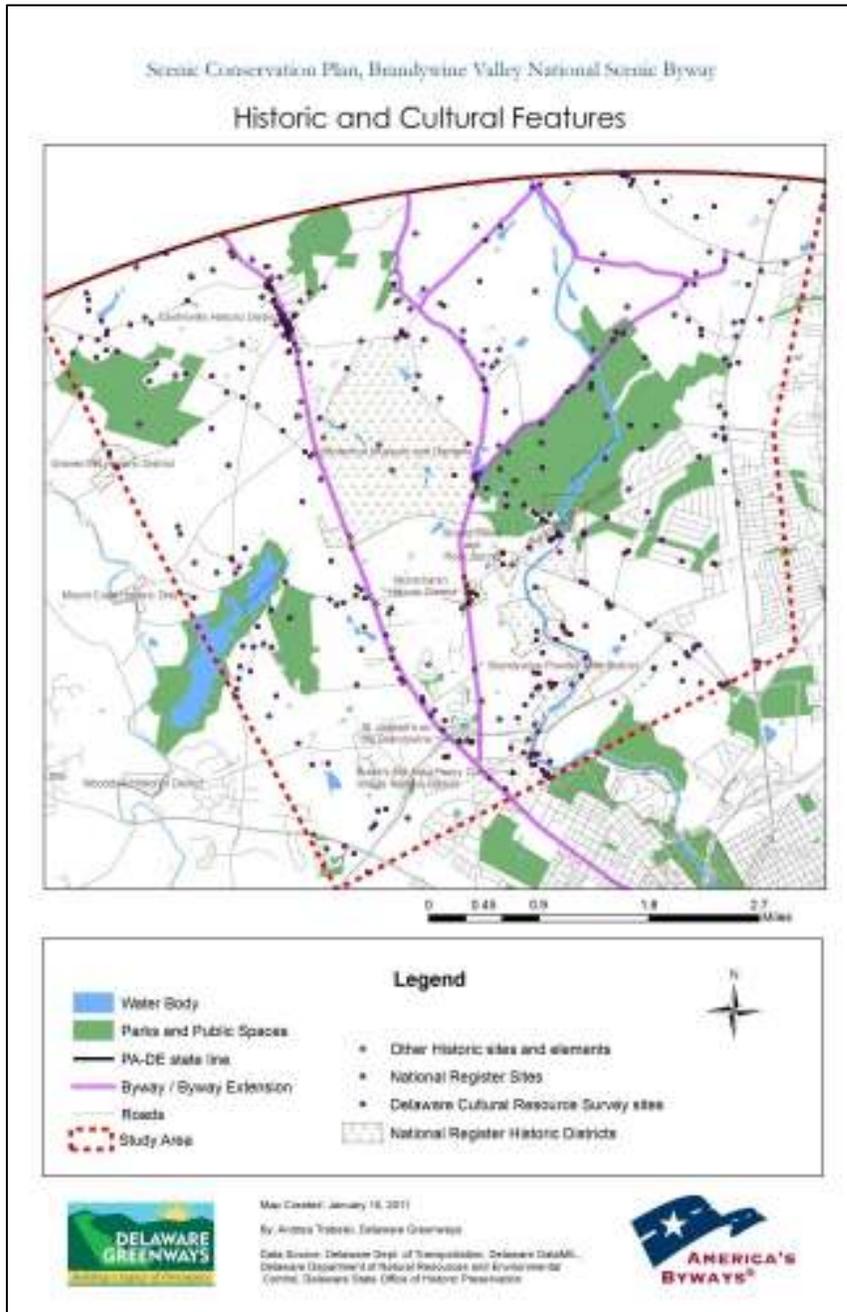


Figure 2.3-C

privately owned, but open to the public, including the following:

- Winterthur Museum and Gardens, a 1,000 acre preserve, founded by Henry Francis du Pont, is the premier museum of American decorative arts, reflecting both early America and the du Pont family's life here. Its 60-acre naturalistic garden is among the country's best, and its research library serves scholars from around the world.
- Hagley Museum and Library is located on 235 acres along the banks of the Brandywine River in Wilmington, Delaware. Hagley is the site of the gunpowder works founded by E. I. du Pont in 1802. The museum's mission is to preserve and interpret the unfolding history of American enterprise.
- Delaware Museum of Natural History is located across Route 52 from Winterthur. While much of its interest lies within the building, the grounds contain open grassy areas, some large, mature trees and a number of statues.
- Woodlawn Trustees natural areas are open to the public for hiking and other recreation. The property is primarily located in the northeastern quadrant of the study area. A small portion of their holdings are protected under a conservation easement, however, the majority is zoned for residential development. In the northeastern portion of the study area, north of the residential neighborhoods along Mt. Lebanon Road and extending into Pennsylvania, Woodlawn Trustees owns 1500 acres within Delaware and another 500 acres of land in Pennsylvania. The Trustees allow the public access to certain tracts of their lands along the Brandywine Creek as well as the Ramsey Farm for recreational and educational purposes. They also lease land to farmers. The Trustees develop their holdings to further their mission in part of providing low and middle income housing in the Wilmington area. In progressing their mission, they support and practice sustainable development as directed by the founder of the trust, William Bancroft.
- The DuPont estate of Granogue, named after a town in France, is an estate of 505 acres and located between Smith Bridge Road on the west side of the Brandywine Creek. Located on the top of a high knoll, the mansion house commands a view of the most scenic parts of the Brandywine Valley and is also considered in and of itself as one of the most picturesque views. Large tracts are leased to farmers for agricultural purposes but the house and the grounds most proximate to it remain home to members of the DuPont family. The estate is occasionally open to the public during events, such as the annual Granogue Cyclocross bicycle race held every autumn.
- Flint Woods Nature Preserve is 37 acres of habitat owned and managed by the Delaware Nature Society (DNS) and provides a showcase of unique and native species of plants and animals. The site is located just east of Centreville and is open occasionally to members of DNS.
- Valley Green Park is a park along Campbell Road given to the City of Wilmington by the Hobbs family.

EXISTING CONDITIONS REPORT



Many of the major institutions noted above are of historic significance. Including some of those mentioned above, there are 24 sites in the study area on the National Register of Historic Places. An additional 32 locations have been deemed historically significant by the Delaware Historical Society, and still exist today. The historic areas and sites are shown in Figure 2.3-D. (Additional details about historic resources in the study area are found in the Viewshed Analysis Report.)

Figure 2.3-D

*FUTURE LAND USE—COUNTY COMPREHENSIVE PLAN 2007*

The New Castle County Department of Land Use is currently in the process of updating the County Comprehensive Plan. As of the date of this report, the 2012 Future Land Use Plan has not yet been prepared. Figure 2.3-E shows the 2007 Future Land Use Plan. As shown in the figure, the majority of the land in the study area is designated as Resource and Rural Preservation.

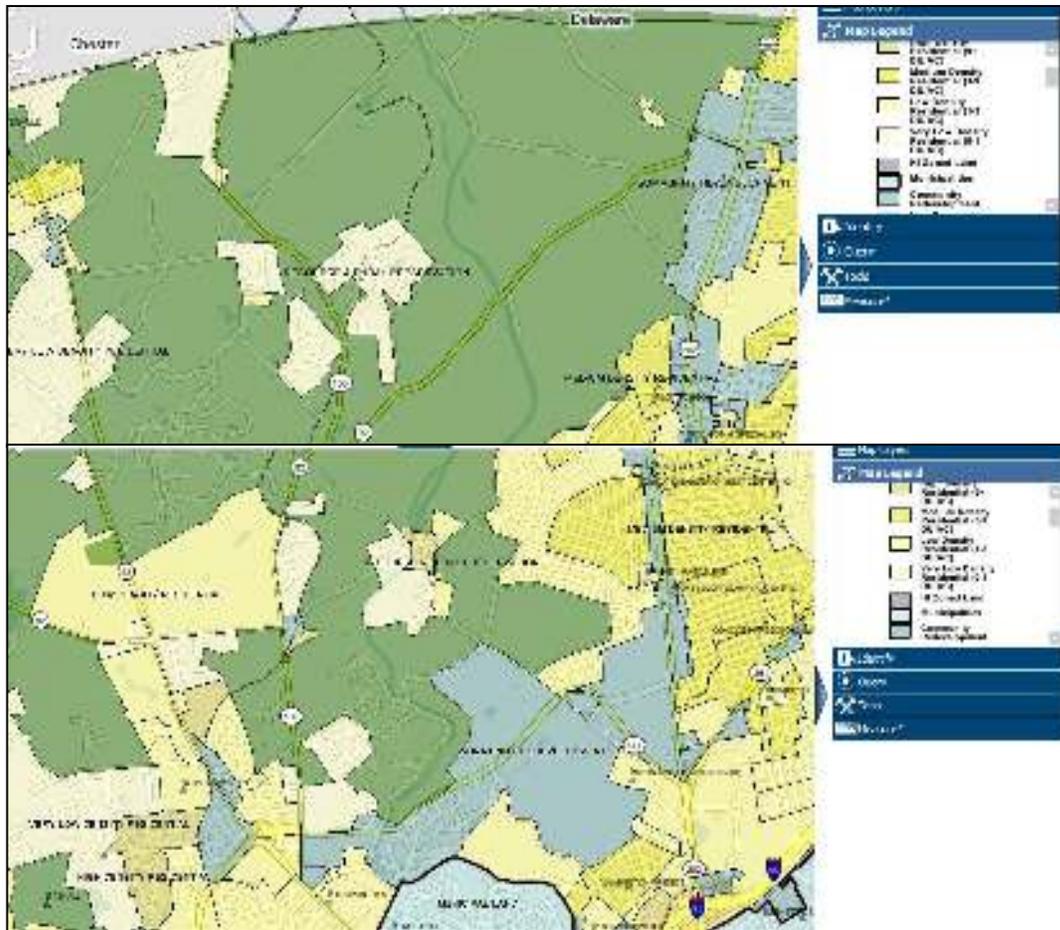


Figure 2.3-E: Future Land Use

Source: 2007 Future Land Use Plan, New Castle County

## 2.4 PROTECTED LANDS

Figure 2.4-A illustrates the lands that are protected from development within the study area. In all, there are approximately 4,300 acres protected from development.

The following is a list of the types of land preservation methods currently in use in the study area:

Each of the preservation tools affords different levels of protection. The level of protection afforded and the major characteristics and requirements of the various types of preservation tools in use in the BVNSB study area and on the properties noted in the table is summarized below.

### Permanent Protection:

#### ***Publicly-owned Parks and Open Space***

Thousands of acres of land in the study area have been acquired through fee simple purchase or donation for park and open space protection.

Funding for these

lands have been secured through various state and federal sources, and these lands are owned and managed by the State, County, or local governing bodies. Development on these properties must comport with the terms under which funding was secured and further the mission of the managing agency, and is subject to all federal, state and local permitting and approval processes.

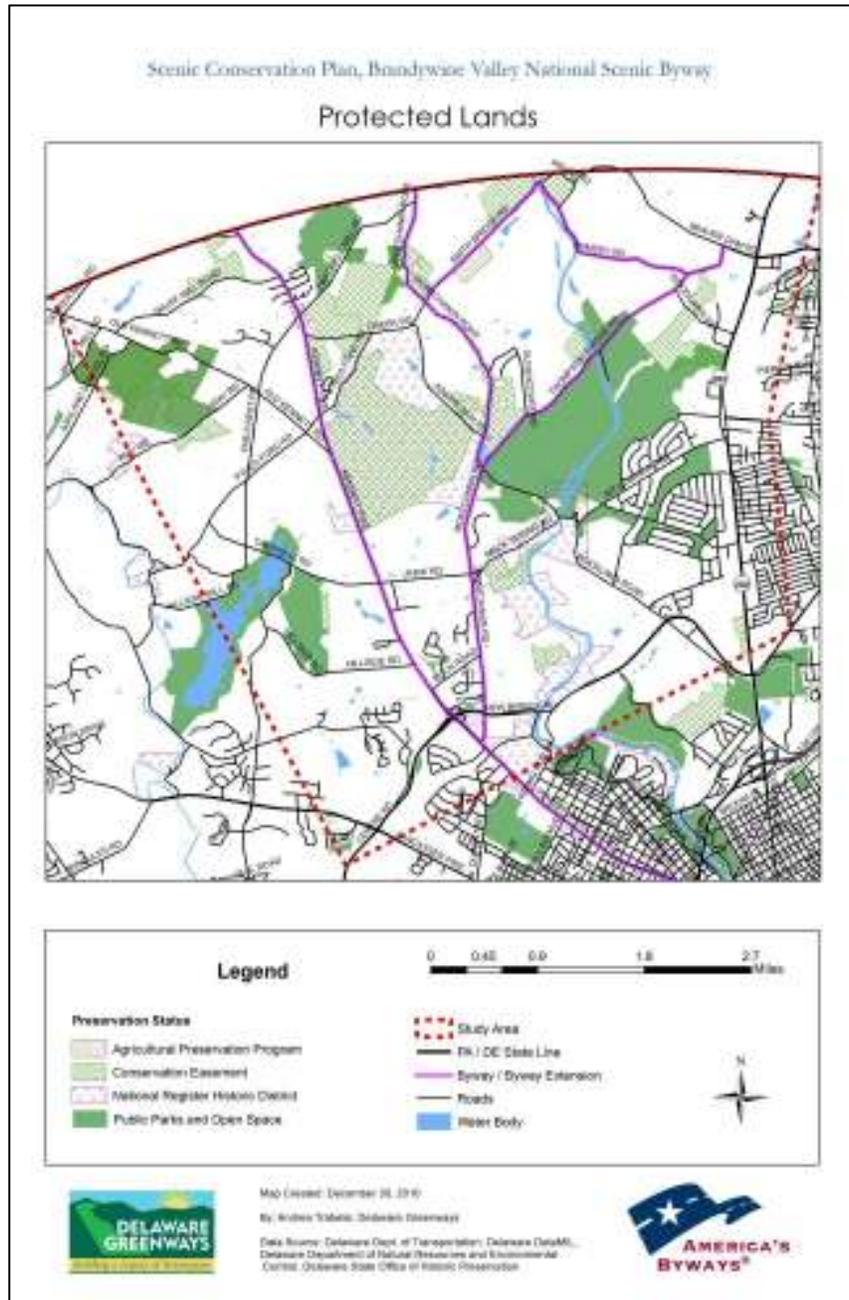


Figure 2.4-A

***Conservation Easement***

A conservation easement is a restriction placed on a piece of property to protect its associated resources. The easement is either voluntarily donated or sold by the landowner and constitutes a legally binding agreement that limits certain types of uses or prevents development from taking place on the land in perpetuity while the land remains in private hands. Conservation easements protect land for future generations while allowing owners to retain many private property rights and to live on and use their land, at the same time potentially providing them with tax benefits.

In a conservation easement, a landowner voluntarily agrees to sell or donate certain rights associated with his or her property – often the right to subdivide or develop – and a private organization or public agency agrees to hold the right to enforce the landowner's promise not to exercise those rights. In essence, the rights are forfeited and no longer exist.

An easement selectively targets only those rights necessary to protect specific conservation values, such as water quality or migration routes, and is individually tailored to meet a landowner's needs. Because the land remains in private ownership, with the remainder of the rights intact, an easement property continues to provide economic benefits for the area in the form of jobs, economic activity and property taxes.

A conservation easement is legally binding, whether the property is sold or passed on to heirs. Because use is permanently restricted, land subject to a conservation easement may be worth less on the open market than comparable unrestricted and developable parcels. Sometimes conservation easements will enable the landowner to qualify for tax benefits in compliance with Internal Revenue Service rules. In this study area, easements are held by organizations that include the Delaware Nature Society, the Brandywine Conservancy, Delaware Department of Natural Resources and Environmental Control, and the North American Land Trust.

***Agricultural Preservation Easement***

Agricultural Preservation programs exist at both the State level and in New Castle County. At the state level, the Delaware Agricultural Lands Preservation Foundation preserves farms - the cornerstone of rural Delaware. The Foundation, which is staffed and supported by the Delaware Department of Agriculture, preserves historic structures, wildlife habitats, important environmental features, wetlands, and forests, as well as setting aside, permanently, the critical farmland for future generations of Delawareans.

The Foundation's Agricultural Easement program is a permanent conservation program in which the Farmland Preservation Foundation purchases development rights from landowners and imposes a permanent agricultural conservation easement on the land. Land must first be in an Agricultural Preservation District before the owner can apply to sell the development rights.

New Castle County has, in past years, also acquired easements for the purpose of agricultural land preservation. This activity has not occurred in recent years due to budgetary cuts.

Limited Protection:

***Agricultural Conservation District***

The Delaware Agriculture Lands Preservation Foundation also features an Agricultural Preservation District program, which was established under the Delaware Agricultural Lands Preservation Act. The District program works (as described by the Delaware Department of Agriculture) as follows:

*A district is a voluntary agreement to use land only for agricultural purposes for at least a ten year period. Land must yield a minimum farm income, satisfy a scoring system standard, and undergo a review and approval process. Almost any size farm anywhere in the state can qualify. There is no payment to the landowner for creating the district. However, there are several benefits to landowners in an agricultural district. The unimproved land in the district is exempt from real estate transfer, county, and school taxes. There are significant protections against nuisance suits for land in the district. Landowners are permitted limited residential uses. Permitted agricultural uses include but are not limited to: crop production, herd animal and poultry operations, horse operations, forest production, non-commercial hunting, trapping and fishing, and agricultural eco-tourism operations, as well as farm markets and roadside stands.*

***Hometown Overlay***

The Hometown Overlay designation is a protection mechanism overseen by New Castle County which allows local communities to develop guidelines for development and design for the designated local area. The Hometown Overlay District is intended to perpetuate and enhance the character of early settlement areas, hamlets, villages, and pre-World War II subdivisions. Many of these communities have unique characteristics that do not conform to modern zoning standards, but still possess qualities making them viable and attractive places to live and work. The purpose of the overlay district is to ensure that infill, redevelopment, and changes to the zoning pattern are compatible with the existing community. Each district will require its own community redevelopment plan that may address such issues as land use, dimensional characteristics, protected resources, and amenities, and other features, as appropriate. Future development will conform to the established character of the community as defined in the plan instead of adhering strictly to modern zoning standards. Communities in the unincorporated areas of the county identified in Chapter 10 of the 1997 New Castle County Comprehensive Development Plan Update as well as Claymont; and, incorporated areas regulated by the UDC are currently eligible for the overlay district.

### ***Density Bonuses***

Many jurisdictions preserve open space by allowing developers a greater number of development entitlements for a given tract of land. These 'density bonuses' encourage developers to design plans that preserve open space by clustering a more dense development away from the most important areas of open space. In New Castle County, the Unified Development Code (UDC) provides density bonuses for development plans that preserve significant amounts of open space.

### Minimal Protection:

#### ***National Register of Historic Preservation***

The National Register of Historic Preservation is administered by the National Park Service with the purpose of protecting historically significant sites nominated by the State Historic Preservation Office. Under the federal regulations, there are no restrictions on what a property owner may do with the property. In Delaware, there are no laws protecting historic property from development, per se, however, under the state's Preliminary Land Use Service (PLUS) program the State Historic Preservation Office reviews development proposals that may impact historic properties and makes recommendations regarding ways to avoid or minimize negative effects that development will have on the historic property. The study area contains numerous National Register Historic Sites and Districts (see Figure 3.1.G). Historic districts delineate larger areas, within which properties are subject to the same rules and procedures as properties given the individual historic site designations.

## 2.5 CURRENT ZONING

In New Castle County, there are 16 zoning classifications regulating development in the Unified Development Code (UCD). Each classification allows a major land use type, within which other acceptable auxiliary uses and building types are identified. Each classification has different bulk standards which control building placement, allowable building envelopes and identifies areas protected from development. Taken together, these regulations dictate the number of dwelling units for each residential district and how much building area--defined as floor area ratio--or the amount of building (expressed in square feet of floor area) that can be built on each parcel of land. For the scope and purposes of this study, only the major attributes of each zoning district that relate to how many dwelling units or how many square feet of non-residential that can be built on a given parcel of land are relevant. Table 2.5-A illustrates the zoning classifications that exist in the study area and their major attributes<sup>4</sup>.

---

<sup>4</sup> The allowable densities presented in Table 2.5-A represent the approximate values used in calculating the development potential of the parcels. Zoning densities for any given parcel are ultimately determined based on complex calculations factoring in a number of variables. The table present an estimate of density sufficient for grasping the development setting (e.g. dense urban versus sprawling residential); however, specific information regarding zoning densities is available in the New Castle County UDC, Section 40.04.110.

EXISTING CONDITIONS REPORT

**Table 2.5-A : Allowable Building Density By Zoning District Classification**

Type of Development	Zone District Classification	Zoning Sub-classification**	Max Gross Density	Max Gross FAR***	Total Acres in Study Area	
Single-Family Residential	Suburban Reserve	Single-family Residential	0.17	N/A	161	
	Suburban Estate	Single-family Residential	0.41	N/A	11671	
	Suburban	Single-family Residential	0.67	N/A	2085	
	Neighborhood Conservation	NC2a		0.41	N/A	6102
		NC40		0.9	N/A	
		NC21		1.48	N/A	
		NC15		1.89	N/A	
		NCap		20.8	N/A	
		NC10		2.65	N/A	
NC5			4.62	N/A		
NC6.5		3.73	N/A			
Garden Apartments	Neighborhood Conservation	NCga	15.00	N/A	8	
Townhouse	Neighborhood Conservation	NCth	10.45	N/A	6	
Office	Office Regional	N/A	N/A	0.445	1424	
	Office Neighborhood	N/A	N/A	0.36	50	
Commercial	Commercial Neighborhood*				155	
Commercial	Commercial Regional	N/A	N/A	0.47	383	
Mixed Residential, Office, and Commercial	Suburban Transition	Other permitted uses****	N/A	0.3	163	
	Diversified Planned Unit Development**	NCpud	N/A	N/A	230	

\* Zoning classification exists in the study area but all lands of this type are built out to capacity.

\*\*regulations are complex for Planned Unit Developments. Please refer to the New Castle County UDC for details.

\*\*\*includes zoning districts NC15, NC2a, NC40, NC6.5, NC10, NC5, and NCap

\*\*\*\*Max Gross FAR was calculated by taking the average for all zoning sub-classifications within the zoning district classification

Figure 2.5-A shows the location of the zoning districts. (Colors used in the table correspond with those in the map.)

EXISTING CONDITIONS REPORT

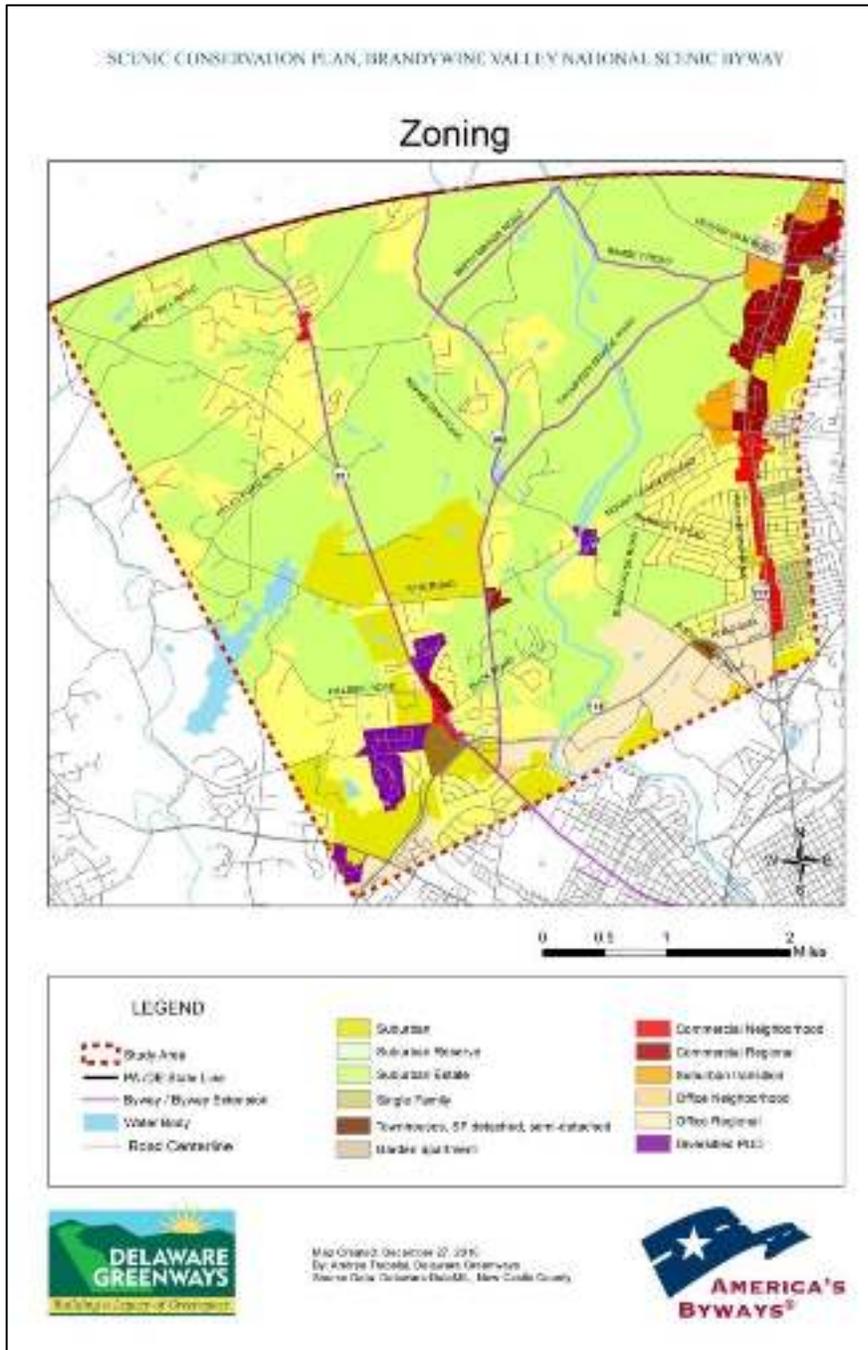


Figure 2.5-A

2.6 INFRASTRUCTURE AND SERVICES

The availability of infrastructure is one factor that can promote or inhibit development. Water supply and wastewater systems, roads, and the presence of other services and infrastructure and/or the ability to provide those services or infrastructure will influence future development. The following paragraphs explain the water supply and wastewater systems; transportation infrastructure is addressed in detail in Section 3.

*WATER SUPPLY*

Water supply varies greatly across the study area. The northern parts of the study area rely on well systems, while three different suppliers—United Water of Delaware, the City of Wilmington, and Artesian Water Company—serve the rest of the areas, as shown in Figure 2.6-A.

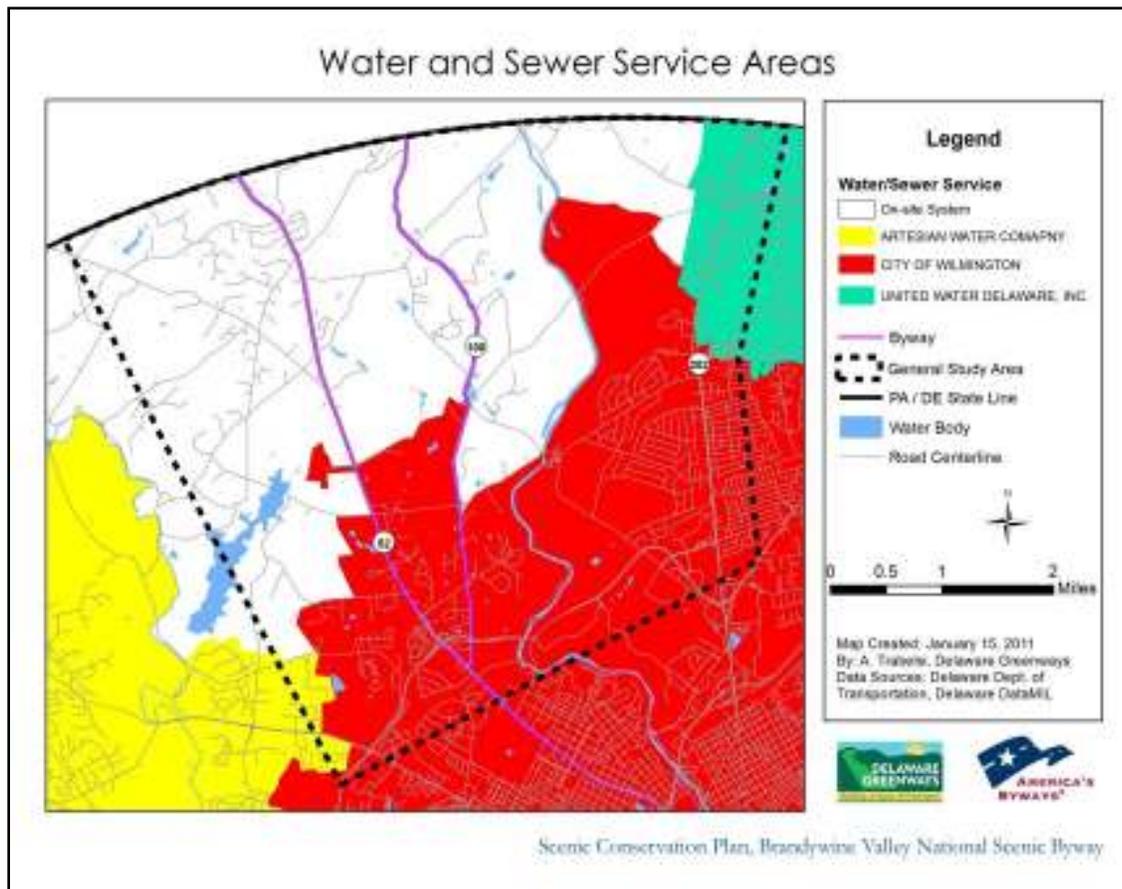


Figure 2.6-A

Figure 2.6-B shows the location of the Hoopes Reservoir and active wells, which are some of the surface and groundwater sources for drinking water in the study area. The areas not serviced by a supplier must rely on a private or community well.

Although water supply data specific to the study area is not available, the existing supply capacity of each purveyor and associated demand projections are presented in Table 2.6-A. According to the projections, none of the purveyors are at risk of not being able to meet water demands in their service areas in the coming decade. Those properties that currently source their water from wells, however, seem to be at greater risk of interruptions in accessing sufficient quantity and/or quality water as any additional development in the study area has the potential to negatively impact availability.

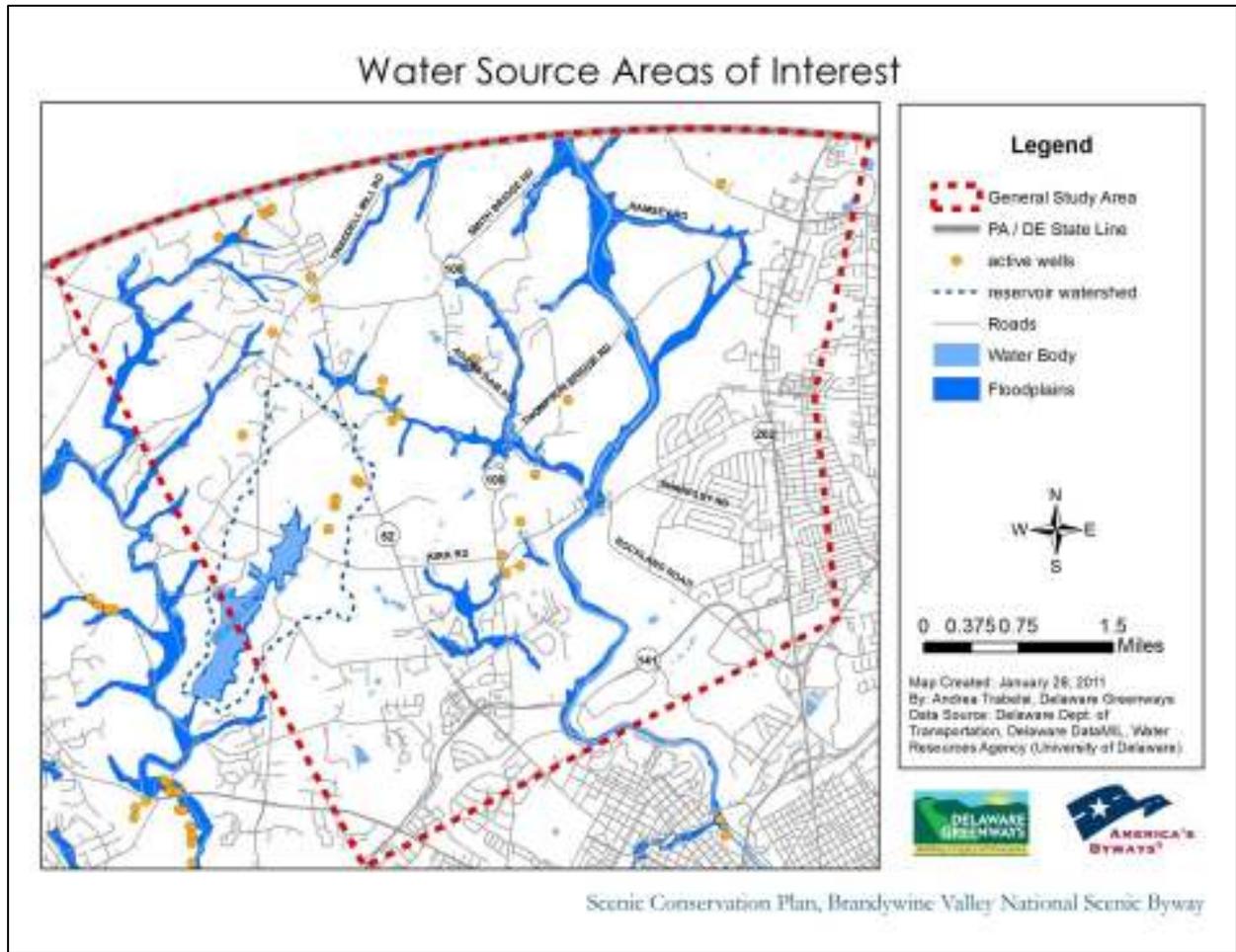


Figure 2.6-B

Table 2.6-A: Water Supply and Demand Projections

Purveyor	2009 Supply Capacity (mgd)	2009 Projected Demand (mgd)*	2012 Projected Demand (mgd)	2020 Projected Demand (mgd)
Artesian	29.0	22.8	22.9	23.8
United Water	26.8	24.4	24.5	24.1
City of Wilmington	38.3	26.4	26.5	29.6

Source: Memorandum to Water Supply Coordinating Council, Feb. 20, 2009, from Gerald Kaufman, Water Resources Agency, University of Delaware, <http://www.wra.udel.edu>

\* Water demands for 2009 represent the peak maximum monthly demand recorded by each purveyor for the 5 year period 2004 – 2008. Water demands for 2012 and 2020 projected based on 0.17% per year increase in population forecast for northern New Castle County by the Delaware Population Consortium.

In consideration of the issue of a potential water shortage for those relying on wells (in the context of long-term development of the area), a likely possible solution could be the extension of the



## 2.7 LAND USE CONTEXTS

The information about land use presented in the previous sections identified a number of different land use related issues or “conditions”, each of which are each important on their own merits. For the purposes of building the Scenic Conservation Plan, however, the separate conditions need to be drawn together to formulate an understanding of how the area exists as a collection of all of the variables and conditions. In recognition that the foundation of the Scenic Conservation Plan is to be the interrelationship between land use and transportation, the separate conditions explored in the previous paragraphs have been considered in aggregate and developed into a set of existing land use context district classifications shown in Figure 2.7-A. These context districts are essentially areas of roughly the same land use patterns, uses, and conditions. (Note: the context districts are not hard edges clearly differentiating one area from another, rather, the districts identify approximate boundaries of areas which function and feel a certain way, different from those surrounding it.

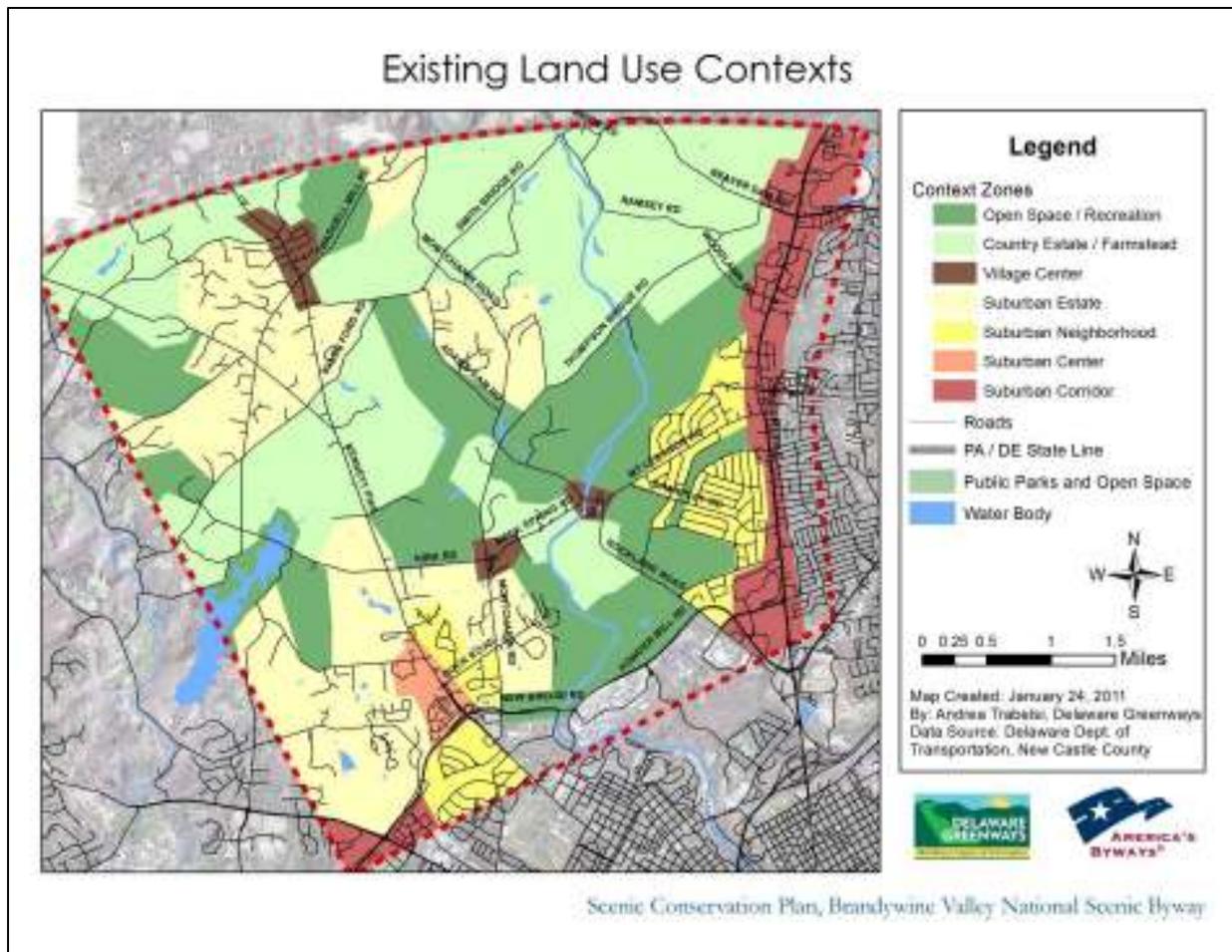


Figure 2.7-A

## EXISTING CONDITIONS REPORT

Based upon field views of the study area, seven different and definable land use contexts have been identified.

- *Open Space / Recreation*—much of the land in the study area serves as either public or private open space. The Open Space / Recreation context district includes golf courses, publicly or privately owned parks, and other designated open space. This designation is applied only to large areas of contiguous open space. Smaller parks or open space that exists within a significantly larger expanse of another context designation has been assigned the surrounding land's designation, as deemed appropriate.
- *Country Estate / Farmstead* – Scattered across the countryside are large houses in the design of European chateaus or large home. Typical lot sizes in this context area are at least 5 acres, with some over one hundred acres. Throughout this landscape, farming has mostly been abandoned as the main source of income although many have large gardens or maintain a small livestock operation. A few properties continue to operate as farm-based industry, including the Ramsey Farm, and Hy-Point Dairy.
- *Village Center* – There are three village centers within the study area: Centreville, Montchanin and Rockland. Each village center has retained its historic character and contains residential, commercial, and office establishments.
- *Suburban Estate*—this classification is similar to the Suburban Neighborhood classification in function. It serves almost entirely as residential use. The form and layout is less dense and individual properties tend to be more private. The roadways serving suburban estate neighborhoods are mostly cul-de-sacs.
- *Suburban Neighborhood* – Predominantly low density residential communities, many built since World War II. House lots are typically



Land Use Context: Open Space/Recreation



Land Use Context: Country Estate/Farmstead



Land Use Context: Village Center



Land Use Context: Suburban Estate

## EXISTING CONDITIONS REPORT

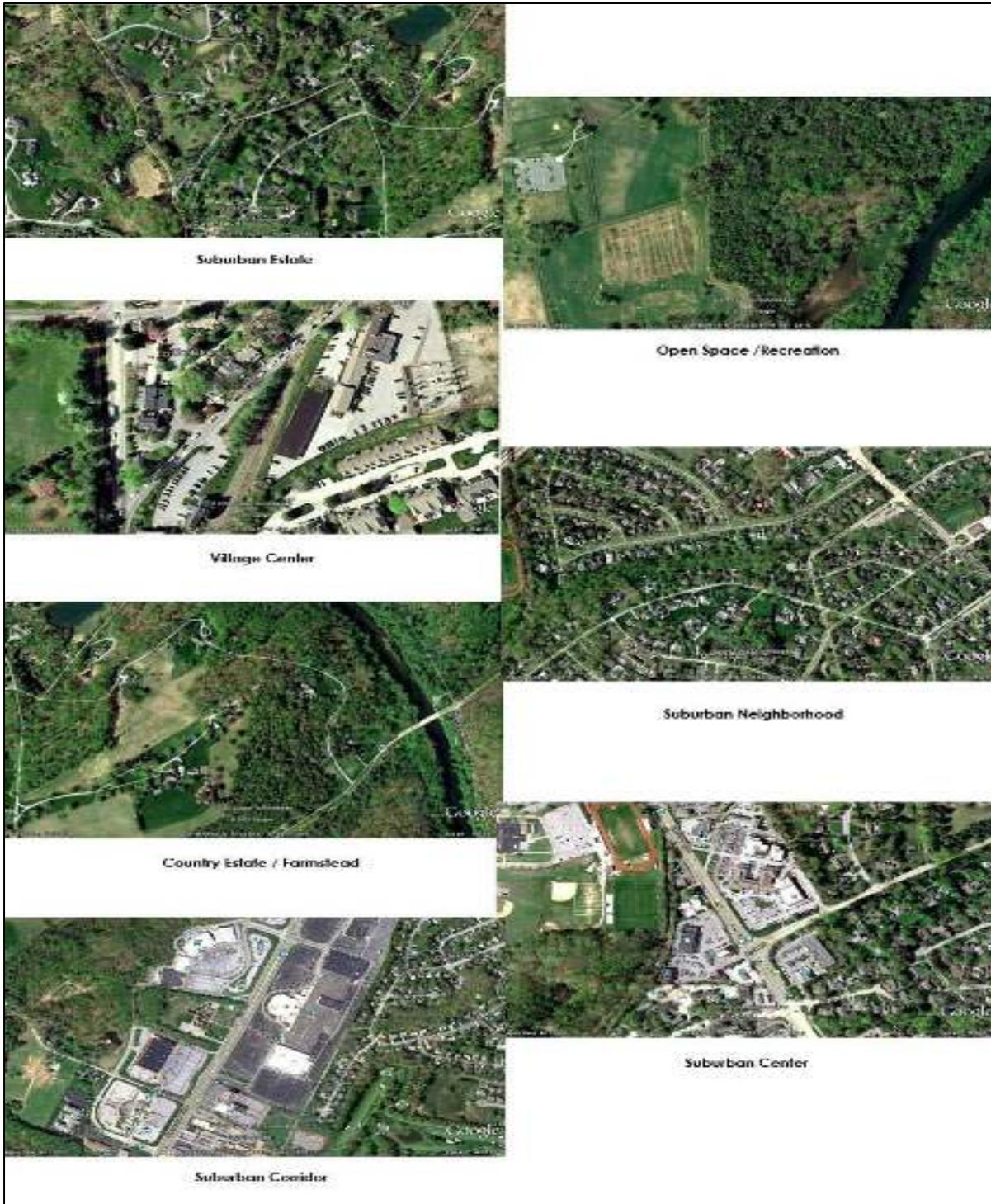
arranged along a curvilinear internal system of streets with limited connections to regional road network or surrounding streets. Lot sizes are usually two acres to one-quarter acre, but in older suburbs, it is common to find one-eighth acre lots. Garden apartments and low rise condominiums are also included in this type. This land use context can include community facilities such as schools, churches and recreational facilities.

- *Suburban Corridor* – This area is characterized by big box stores, commercial strip centers, restaurants, auto dealerships, office parks, and gas stations. These uses are sometimes interspersed with natural areas and occasional clusters of homes. Buildings are usually set back from the roadway behind surface parking. Office buildings are usually set back a bit more than adjacent retail frontage to establish garden separation from ground windows. US 202 is a suburban corridor.
- *Suburban Center* – Often a mixed-use, cohesive collection of land uses that may include residential, office, retail, and restaurant uses where commercial uses serve surrounding neighborhoods. These areas are typically designed to be accessible by car, and may include large parking areas and garages. They are less accommodating to pedestrians than town centers, and opportunities to cross the primary roadway can be limited. On-street parking may or may not be provided. Greenville is an example of a suburban center.



Land Use Context: Suburban Center

The land use contexts described in the previous section are shown in aerial view in the figures below. These contexts are further addressed in the concluding section (Section 4).



Land Use Contexts in the Brandywine Valley

### 3. TRANSPORTATION

#### 3.1 INTRODUCTION

The transportation study area is roughly defined as the area bound by Delaware Route 52 on the west, US Route 202 to the east, the Pennsylvania-Delaware state line to the north, and Delaware Route 141 to the south (see Figure 3.1-A). In addition to the Brandywine Valley National Scenic Byway (Route 52 and Route 100), roads of interest include the proposed Byway Extension (Smith Bridge Road, Ramsey Road, and Thomson Bridge Road), and other roads in the study area, which are highlighted in Figure 3.1-A.

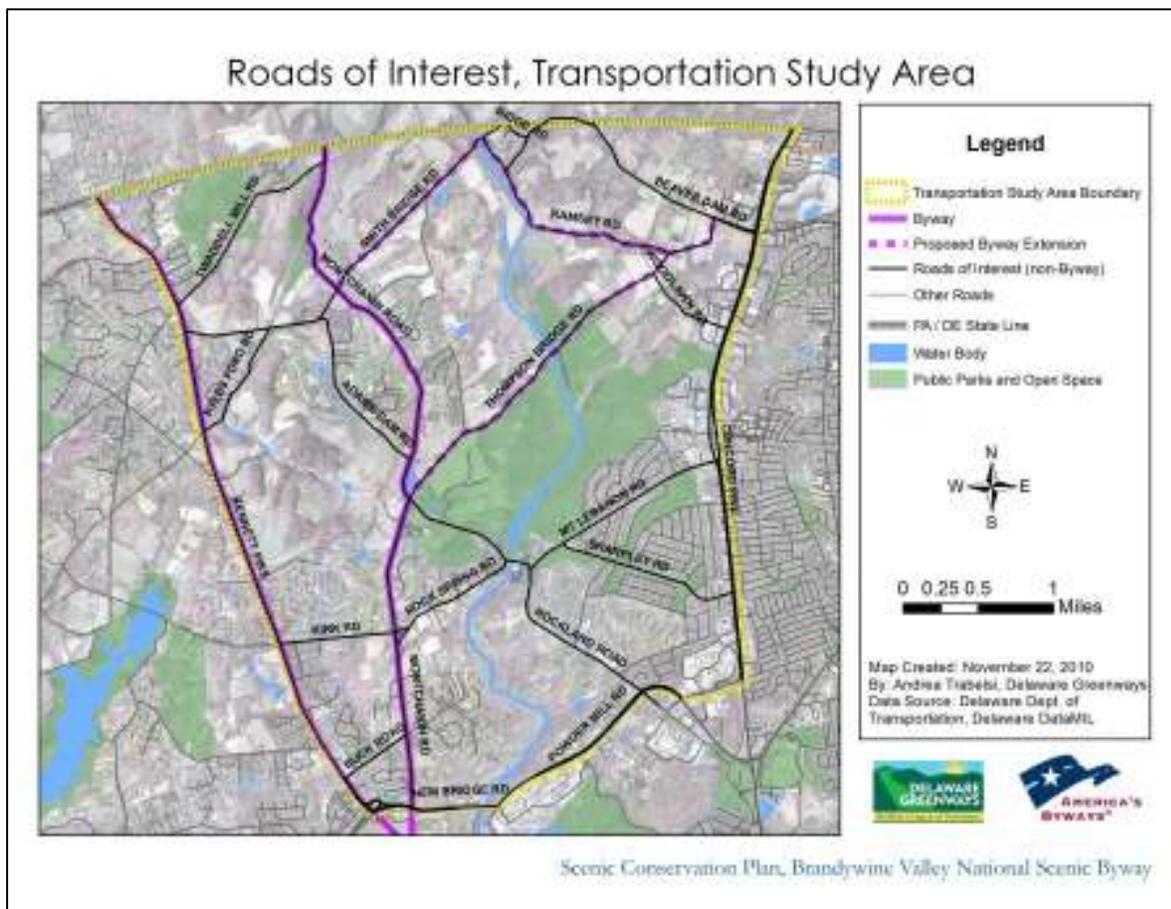


Figure 3.1-A

In this section of the report, the analysis of the existing transportation situation will include an assessment of the functional classification, physical dimensions, traffic controls and the crash status of the key roadways. In addition, public transportation services and facilities for pedestrians, bicycles and public transportation will be examined. Current and future transportation plans and initiatives will also be surveyed.

### 3.2 PHYSICAL CHARACTERISTICS OF THE STUDY AREA ROADWAYS

This section describes the physical characteristics of the study area roadways. These characteristics are an important factor in analyzing the Trend Scenario and in developing and analyzing alternative futures. If future travel demands placed upon the study area roadways change significantly, traffic conditions could change and adversely affect the existing configuration of the roadway.

- **US 202 (Concord Pike)** is a six to eight lane divided roadway. Traffic lanes are 12 feet wide, turning lanes are provided for major intersections and driveways. Major



US 202 North of Children's Drive

intersections are controlled by traffic signals. Land uses along the roadway are largely commercial with some office developments interspersed. The roadway is designed to high standards with access to major developments provided in general accordance with DelDOT Access Management Standards. However, smaller developments, approved prior to the reconstruction of US 202 in the 1980's generally do not meet current standards but meet the intent of the Standards. There are two posted speed limits. Between the Route 141 interchange and Mt. Lebanon Road, the posted speed limit is 40 miles per hour. North of Mt. Lebanon Road the posted speed limit is 50 miles per hour.

- **Delaware Route 52 (Kennett Pike)** is a two lane roadway, except in Greenville, where it is a divided roadway with two 12 foot travel lanes in each direction. West of Greenville and except for the area in Centreville, the roadway is a two lane undivided roadway with 12 foot lanes and a 10 foot paved shoulder. In Centreville, a recently completed improvement



Route 52, Kennett Pike, north of Route 82



Route 52, Kennett Pike, in Greenville

includes traffic calming islands in the center of the roadway at each end of the village. Between the two islands, the travel lanes are reduced to 11 feet and a five foot bicycle lane is striped. On-road, parallel parking is also allowed in Centreville. Kennett Pike is a part of

## EXISTING CONDITIONS REPORT

the Brandywine Valley National Scenic Byway. Kennett Pike is posted with a 35 miles per hour limit in both Greenville and in Centreville. It carries a 50 mile per hour limit between Greenville and Centreville and consistent with Pennsylvania, it is posted with a 45 mile per hour limit north of Centreville.

- Delaware Route 141** is a four lane roadway. Between Children’s Drive and Alapocas Road it is a four lane divided roadway with 12 foot lanes and 10 foot paved shoulders. Between Alapocas Road and Barley Mill Road, it is a four lane undivided roadway with no shoulders and 12 foot travel lanes. Across the Tyler McConnell Bridge, it is a two lane undivided roadway with 12 foot travel lanes. Between the bridge and Kennett Pike, it widens to a four lane divided roadway with 12 foot lanes and 10 foot shoulders. On the east side of the Brandywine Creek, Route 141 is posted at 45 miles per hour but across the Tyler McConnell Bridge and to Route 52, it is posted at 35 miles per hour.
- Delaware Route 100 (Montchanin Road)** is a two lane roadway with 10 foot travel lanes and one foot paved shoulders. Montchanin Road is a part of the Brandywine Valley National Scenic Byway. South of its intersection with Thompson Bridge Road, land uses abutting it are generally suburban residential. There is also the small village of Montchanin which includes an inn, some offices and residences and is located at its intersections with Kirk Road and Rockland Road. As is typical, few of the residences have access directly onto Route 100; rather, residences are clustered in subdivisions that connect to Route 100 via the development street network. North of Thompson Bridge Road, the land uses are large lot residential or agricultural. Montchanin Road is posted at 35 miles per hour between Route 141 and a point north of Buck Road where the posting increases to 40 miles per hour through Montchanin to Thompson Bridge Road. Between Thompson Bridge Road and Adams Dam Road, it is posted at 30 miles per hour. Between Adams Dam Road and Smith ridge Road, it is posted at 35 miles per hour. North of Smith Bridge Road, it is posted at 40 miles per hour.
- Delaware Route 92 (Thompson Bridge Road)** is a two lane roadway with 10 foot travel lanes and one foot paved shoulders. Land uses are generally rural in nature. Thompson Bridge Road is part of the proposed Byway Extension. Thompson Bridge Road is posted at 35 miles per hour its entire length.



Route 100, Montchanin Road

## EXISTING CONDITIONS REPORT



Route 92, Thompson Bridge Road

- **Buck Road** is a two lane roadway with 10 foot travel lanes and one foot paved shoulders except in Greenville as it approaches Route 52 where it widens to three lanes and is curbed. Land uses along its length are commercial in Greenville and suburban residential elsewhere. Buck Road carries a 25 mile per hour posting.
- **Mt. Lebanon Road** between US 202 and Hartford Road is a 40 foot wide, curbed roadway passing thorough a residential neighborhood of single family homes. In this section, it is striped as a two lane roadway with two 12 foot travel lanes and 10 foot wide paved parking lanes/shoulders. Between Hartford Road and Rockland Road, Mt. Lebanon Road is a two lane, 20 foot wide road with no shoulders. In this section, the adjacent lands are generally undeveloped except near its intersection with Rockland Road where there is a condominium development. Mt. Lebanon Road has two speed postings. In the suburban section between Route 202 and Hartford Road, it is posted at 35 miles per hour. Between Hartford Road and Rockland Road, the speed limit is 25 miles per hour.
- **Kirk Road** is a two lane roadway with a 20 foot paved section striped as two 9 foot travel lanes and a one foot wide shoulder. Kirk Road traverses a suburban area with a golf course on its north side. Kirk Road is signed as Delaware Route 82. Kirk Road carries a 40 miles per hour posted limit.
- **Rockland Road** is a two lane roadway with three distinct sections within the study area. The first section extends from Children's Drive to Mt. Lebanon Road. In this section, Rockland Road is a 20 foot wide roadway with two 10 foot travel lanes and no shoulders. Golf courses abut much of its length. Between Mt. Lebanon Road and Adams Dam Road, it is a 22 to 40 foot road striped to operate with one eleven foot wide travel lane in each direction. The extra width is allocated to turning lanes and shoulders. In this section, land uses are commercial and industrial related to the crossing of the Brandywine Creek.

Although not incorporated, this area is known as Rockland. Between Adams Dam Road and Montchanin Road, Rockland Road is a 20 foot wide paved road striped as two 10 foot lanes without shoulders. The land uses in this section are large lot residential. As Rockland Road nears Route 100, it enters the village of Montchanin where the land uses are a mix of commercial and residential. Between Children's Drive and Black Gate Road, the posted speed limit is 35 miles per hour. Between Black Gate Road and Mt. Lebanon Road, Rockland Road is posted with a 30 mile per hour speed. Between Mt. Lebanon Road and Adams Dam Road it is posted with a 30 mile per hour speed limit and between Adams Dam Road and Montchanin Road, it carries a 35 mile per hour posting.

- **Smith Bridge Road** is a 20 foot wide two lane roadway with 10 foot travel lanes and no shoulders. It passes through the rural countryside by a mix of estates and small houses. It crosses a covered bridge near the Pennsylvania Line. It carries a 35 mile per hour posted speed limit.



Smith Bridge

- **Twaddell Mill Road** has a pavement width of 18 feet and is striped with two nine foot travel lanes. It has no shoulders. Land uses adjacent to it are rural in nature and the roadway is not posted with a speed limit.
- **Adams Dam Road** has two sections. The first section is between Mt. Lebanon Road and Thompson Bridge Road. This section is a 20 foot wide, two lane roadway with no shoulders. The travel lanes are 10 feet wide and the posted speed limit is 40 miles per hour. Along this section, land uses are residential homes on large lots. The second section is between Montchanin Road and Center Meeting Road. It is also a 20 foot wide road with two 10 foot lanes and no shoulders carrying a 35 mile per hour posting. Land uses along this section are generally suburban residential as well as a golf course.
- **Beaver Valley Road** is a two lane road with a variable paved width of between 18 and 22 feet. There are no shoulders. There is a short section of the road in Pennsylvania but still maintained by the Delaware Department of Transportation. Land uses along its length are generally rural with office developments at its intersection with US 202. Beaver valley Road

carries a 40 mile per hour posting between Route 202 and the Pennsylvania Line. In Pennsylvania and after its return to Delaware, it carries a 35 mile per hour posting.

- **Center Meeting Road** is a two lane road with a pavement width of 20 feet. It has no shoulders. Land uses along its length are generally rural in nature except as it approaches Centerville where it takes on a village atmosphere with smaller buildings. Center Meeting Road has a 35 mile per hour posted speed limit.
- **Creek and Ramsey Roads** are both 18 foot wide two lane roads with no shoulders. Land uses along its length are rural in nature. As the roadway approaches and parallels the Brandywine Creek, recreational uses are evident. Neither roadway is posted with a speed limit.



Ramsey Road

### 3.3 CRASH ANALYSIS

Crash data was provided by the Delaware Department of Transportation for the period beginning January 1, 2007 and ending December 31, 2009 for the study area roadways. The data for these years were analyzed and mapped for the purposes of identifying clusters and patterns of crashes. It should be noted at the outset that this is not a rigorous analysis such as is performed by DelDOT as a regular part of their responsibilities; rather, the purpose of the analysis is to guide the recommendations of the Scenic Preservation Plan such that the identified patterns and clusters are addressed. Detailed design recommendations resulting from the Accident Analysis will be referred to DelDOT for further action.

Table 3.3-A shows the study area crashes by roadway. There were 1,243 crashes, 63 injury crashes. Five fatal crashes and five crashes involving a pedestrian in the three year study period. As would be expected Route 202 accounted for 726 (58%) of the study area crashes. Route 52, Kennett Pike accounted for 178 crashes, about one fourth of the total crashes that occurred on

Route 202. However, taken together, Routes 202 and 52 accounted for 72% of the total study area crashes.

**Table 3.3-A: Crashes by Roadway**

Roadway	Total Crashes	Injury Crashes	Fatalities Crashes	Pedestrian Crashes
Route 202	726	32	1	4
Route 52	178	10	1	1
Montchanin Road	114	4	0	0
Thompson Bridge Road	72	4	0	0
Beaver Valley Road	15	3	0	0
Route 141	51	4	2	0
Center Meeting Road	7	0	0	0
Mt Lebanon Road	22	0	0	0
Ramsey and Creek Roads	17	3	0	0
Adams Dam Road	7	1	0	0
Rockland Road	13	0	1	0
Kirk Road	5	1	0	0
Smith Bridge Road	13	1	0	0
Buck Road	0	0	0	0
Twaddle Mill Road	3	0	0	0
<b>Totals</b>	<b>1243</b>	<b>63</b>	<b>5</b>	<b>5</b>

Route 100, Montchanin Road, had the third highest number of crashes, accounting for 114 crashes. Thompson Bridge Road accounted for 72 crashes. The Brandywine National Scenic Byway consisting of Routes 52 and 100 accounted for 292 crashes and the nominated Byway extension of Thompson Bridge Road, Ramsey Road and Smith Bridge Road accounted for 102 crashes. Fortunately, of the 1243 crashes, only 63 caused an injury and five caused a fatality. There were 14 injury crashes on the Byway and eight on the nominated Byway. There was one fatal accident on Route 52. There were also five crashes involving a pedestrian in the study area with one occurring on the Byway.

Figure 3.3-A illustrates the location of the crashes in the study area. In the figure, each colored dot represents one crash. Leaving aside Route 202 which represents a continuous cluster of crashes, Route 52 has clusters of crashes within Centreville, where DelDOT just completed an improvement to Route 52 and at Route 82 where a safety improvement is planned for the intersection. On Route 100, Montchanin Road, there are clusters at the Kirk Road/Rock Springs Road intersection in the village of Montchanin. On Thompson Bridge Road, Route 92, there is a cluster of crashes beginning south of Ramsey Road and continuing to Beaver Dam Road. Beyond the noted clusters, the remaining crashes were fairly scattered throughout the study area roadways.

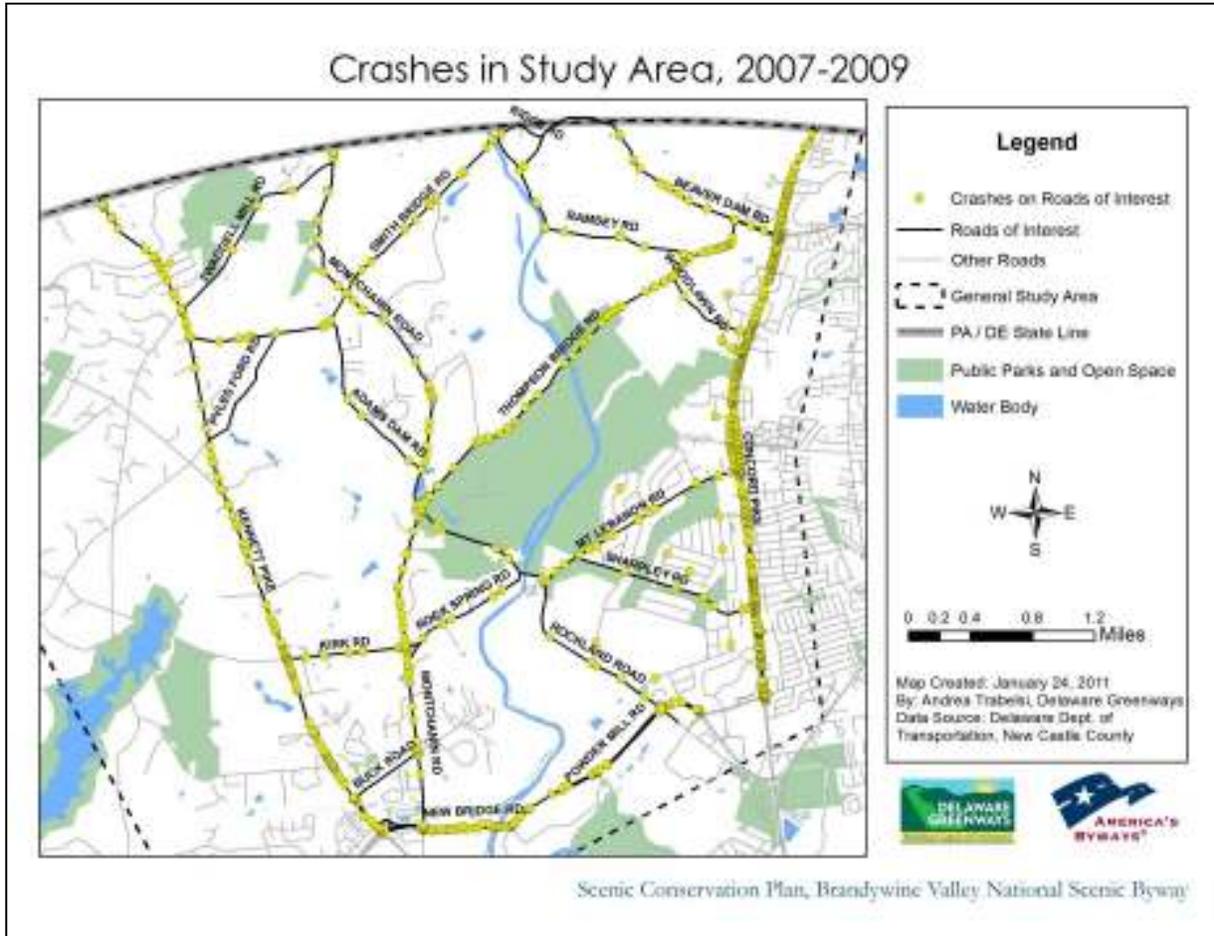


Figure 3.3-A

### CRASH RATES

When attempting to compare the crash situation using crash rates on one roadway to compare with the crash rates on another, several factors must be considered when developing the method of comparison. They are:

- Type of roadway or functional classification
- Traffic volume or the amount of traffic
- Length of the roadway section

## EXISTING CONDITIONS REPORT

First is the type of roadway typically illustrated by comparing roadways of the same functional classification. The purpose of considering roadway classification is that roadways are classified by the type of traffic carried. The “arterials” typically carry regional traffic while “collectors” carry traffic between nearby communities. Research demonstrates that accident rates are lower on arterials because they are typically built to higher standards. Also important is to know the amount of traffic carried. Traffic crash rates do not always increase as traffic increases. In fact, in some cases, the rates decrease even as traffic increases. Lastly, the length of the roadway must be known since short sections might have a cluster of crashes where a longer section might include sections relatively free of crashes, affecting the crash rate.

A method to determine the crash rate of a given roadway that accounts for the functional classification, the amount of traffic and the section length has been established and is used by the Delaware Department of Transportation and other transportation agencies across the United States. This method calculates the crash rate per million vehicle miles traveled and restricts the calculation to a single functional classification. This method was used to calculate the crash rate for each roadway in the study area.

The following tables show the crash rates for each functional classification. Table 3.3-B shows the accident rate for the Local Roadways in the study area. These roadways are the lowest functional class but all are scenic. In fact, Ramsey Road and Creek Road are part of the nominated Brandywine Valley Scenic Byway Extension.

**Table 3.3-B: Crash Rates for Study Area Local Roads**

Road Name	Limits	Length in Miles	Average Daily Traffic	Number of Crashes	Accident Rate
Ramsey Road	Route 92 to Creek Road	0.98	600	11	17.08
Creek Road	Ramsey Road to Smith Bridge Road	0.51	2,600	6	4.13
Beaver Valley Road	Concord Pike to Thompson Bridge Road	0.29	9,400	4	1.34
Beaver Valley Road	Thompson Bridge Road to PA Line	1.05	600	11	15.95
Beaver Valley Road	PA Line to Creek Road	0.36	600	0	0.00
Center Meeting Road	Montchanin Road to Kennett Pike	1.13	1,740	7	3.25
Adams Dam Road	Montchanin Road to Center Meeting Road	1.23	1,200	3	1.01

The weighted average of the crash rate per million vehicle miles traveled on study area local roads is 4.76. Ramsey Road and a section of Beaver Valley Road far surpass the accident rate. Ramsey Road had 11 crashes in its almost one mile segment largely due to its windy alignment. Similarly, Creek Road had six crashes occur on its half mile length but the crash rate is lower than the average for local roadways in the study area.

The weighted average of the accident rate per million vehicle miles traveled on study area local roads is 1.94. Route 100, Montchanin Road, between Adams Dam Road and the PA Line has a substantially higher rate (5.03) than the average crash rate for Major Collectors in the study area

## EXISTING CONDITIONS REPORT

(see Table 3.3-C). Montchanin Road is part of the Brandywine Valley national Scenic Byway. Smithbridge Road, a part of the Nominated Extension is higher than the study area rate but not substantially so.

**Table 3.3-C: Crash Rates for Study Area Major Collectors**

Road Name	Limits	Length in Miles	Average Daily Traffic	Number of Crashes	Accident Rate
Route 100	Route 141 to Adams Dam Road	2.94	14,500	43	0.92
Route 100	Adams Dam Road to PA Line	2.58	5,000	71	5.03
Route 92	Adams Road to Beaver Valley Road	2.87	8,000	72	2.86
Smith Bridge Road	Montchanin Road to PA Line	1.53	2,200	13	3.53
Twaddell Mill Road	Kennett Pike to Montchanin Road	1.37	500	3	4.00
Kirk Road	Kennett Pike to Montchanin Road	0.77	2,900	5	2.04
Buck Road	Kennett Pike to Montchanin Road	0.49	3,100	0	0.00
Mt Lebanon Road	Concord Pike to Hartford Road	0.96	5,200	10	1.83
Mt Lebanon Road	Hartford Road to Rockland Road	0.5	6,900	12	3.18
Rockland Road	Children's Road to Mt Lebanon Road	1.47	2,200	5	1.41
Rockland Road	Mt Lebanon Road to Adams Dam Road	0.18	7,100	3	2.14
Rockland Road	Adams Dam Road to Montchanin Road	0.94	5,700	5	0.85

The only Minor Collector road in the study area, Adams Dam Road, has a low accident rate, as shown in Table 3.3-D.

**Table 3.3-D: Crash Rates for Study Area Minor Collectors**

Road Name	Limits	Length in Miles	Average Daily Traffic	Number of Crashes	Accident Rate
Adams Dam Road	Mt Lebanon Road to Thompson Bridge Road	0.82	3,200	4	1.39

**Table 3.3-E: Crash Rates for Study Area Principal Rural Arterials Collectors**

Road Name	Limits	Length in Miles	Average Daily Traffic	Number of Crashes	Accident Rate
Kennett Pike	PA Line to Stonegates Driveway	3.8	13,500	122	2.17
Concord Pike	PA Line to Murphy Road	4.2	51,000	726	3.10
Route 141	Children's Drive to Barley Mill Road	1.46	23,000	27	0.73
Route 141	Barley Mill Road to Kennett Pike	0.78	31,000	24	0.91

The weighted accident rate for Principal Rural Arterials in the study area is 2.71 (See Table 3.3-E). None of these major study area roadways have a crash rate of concern. On Route 52, Kennett Pike, it should be noted that there a cluster of crashes at the Route 82 intersection which is the subject of a DelDOT sponsored safety improvement project.

**Table 3.3-F: Crash Rates for Principal Urban Arterials**

Road Name	Limits	Length in Miles	Average Daily Traffic	Number of Crashes	Accident Rate
Kennett Pike	Stonegates Driveway to Route 141 Interchange	0.78	18,100	56	3.62

There is a short section of Kennett Pike in Greenville which can be considered urban in nature. While the accident rate is higher than the rural section, it is still not of concern (see Table 3.3-F).

*DAY OF WEEK*

Figure 3.3-B shows crashes on the Brandywine Valley National Scenic Byway by day of week. As shown in the chart, most of the crashes occur on a Friday with Saturday, Sunday and Monday having the lowest number of crashes. The same pattern can be seen for all of the other roadways in the study area.

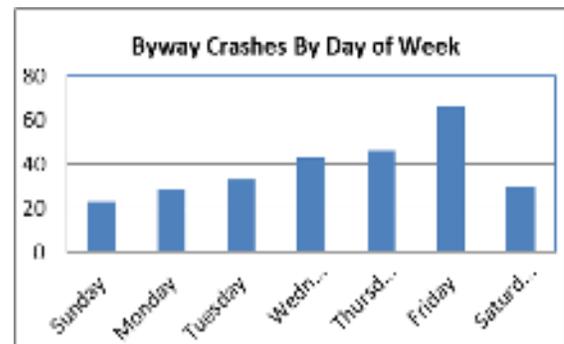


Figure 3.3-B--Note that Friday is, by far, the day with the most Crashes.

*LIGHTING CONDITIONS*

Figure 3.3-C illustrates the effect of light conditions on when crashes occur. The blue bar shows that for all the study area roadways, 65% occur during the day and 35% occur at night. The same pattern occurs on the Byway. However, for the remainder of the study area, including the nominated Byway extension, 60% of the crashes

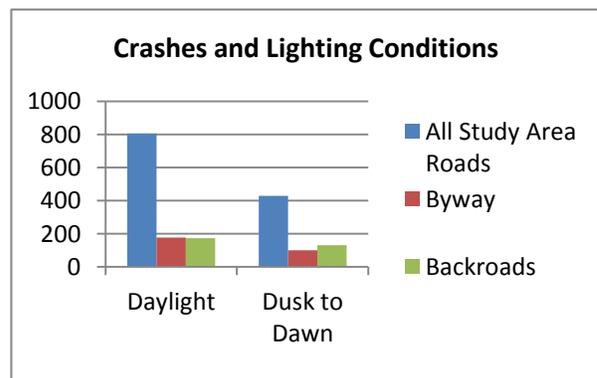


Figure 3.3-C-- Note that the majority of crashes occur during the daylight hour except on the back roads.

occur during the day and 40% at night, a slight increase in the proportion of nighttime crashes.

**PAVEMENT AND WEATHER CONDITIONS**

Figure 3.3-D shows the effect on pavement conditions on crashes. The figure compares the number of crashes that occurred on dry pavement against wet, snowy or icy pavements. As shown in the figure, 895 (72%) of the study area crashes occurred on dry pavement. Separating out the Byway and the local roads, similar breakdowns occurred.

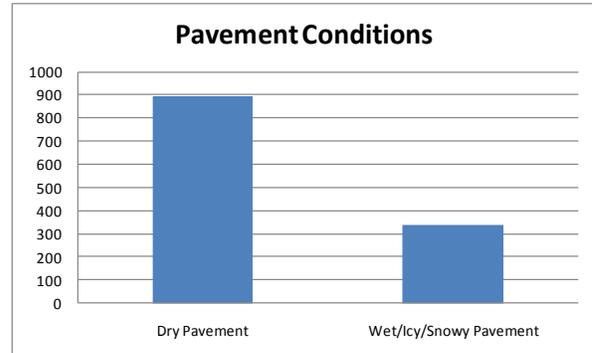


Figure 3.3-D-- By far, the majority of the crashes occurred on dry pavement.

Figure 3.3-E shows crashes in relation to weather conditions. Sixty-one percent of the crashes occurred in clear weather, a statistic consistent throughout the study area regardless of the type of highway.

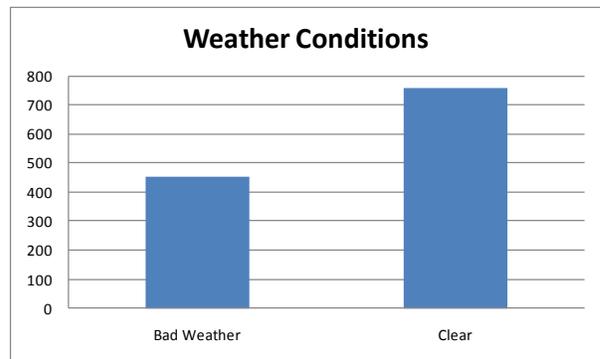


Figure 3.3-E-- About 60% of all crashes occurred in clear weather.

In summary, considering roadway, weather conditions, and ambient lighting, the majority of study area crashes occurred during the day, on dry pavement and in good weather.

**MANNER OF IMPACT**

**Table 3.3-G: Manner of Impact**

	All Study area Roadways	Byway	Local Roads
Non Collision (Single Vehicle)	20%	33%	56%
Rear-end	50%	40%	18%
Head-on	2%	1%	2%
Rear to rear	1%	1%	1%
Angle	16%	18%	15%
Sideswipe same direction	8%	3%	2%
Sideswipe opposite direction	2%	2%	3%
Unknown	1%	1%	2%

Manner of impact is an indication of how the vehicle(s) involved in the accident collided. Table 3.3-G shows the types of impact recorded by DelDOT. The categories begin with 'Non Collision' which is a single vehicle event such as running off the road or striking an animal. The other types of impact are the typical types of collisions between vehicles. The numbers indicate that most of the crashes in the study area were rear end, representing about half of the crashes. However, when considering only the Brandywine Valley National Scenic Byway, rear end crashes,

while still the most prevalent, represent only 40% of the 275 crashes. Considering the local roads, the most prevalent type of accident is the non-collision category, representing 56% of the 298 crashes.

### *FIRST HARMFUL EVENT*

The First harmful Event is the first injury or damage-producing event that characterizes the crash type. Traffic Safety Engineers use the identification of the First Harmful Event to provide a uniform

**Table 3.3-H: First Harmful Event**

	<b>All Study Area Roadways</b>	<b>The Byway</b>	<b>Local Roads</b>
Non-Collision (Single Vehicle)	2.0%	2.2%	6.4%
Pedestrian	0.6%	0.7%	0.3%
Bike/Motorcycle Collision	0.4%	1.1%	0.3%
Animal	2.6%	4.8%	5.0%
Another Moving Vehicle	79.0%	68.1%	39.6%
Parked Vehicle	0.8%	0.4%	2.0%
Other Moving object	0.9%	1.1%	3.0%
Fixed object	13.1%	21.2%	40.9%
Train Collision	0.6%	0.4%	2.3%

basis to analyze crashes and develop crash statistics for the purpose of understanding the causes of crashes and crash patterns, and then identifying possible remedial countermeasures. Table 3.3-H highlights the statistics relating to First Harmful Event.

When considering all study area roadways, the vast majority, 79% of the 1243 study area crashes were a collision with another moving vehicle. Second highest but substantially lower at 13.1% were

collisions with a fixed object such as a tree, pole or guardrail. All other first harmful events were a small part of the crash picture. However, when considering the local roads, the picture changes dramatically. Collisions with another moving vehicle and non-collisions were virtually equal in number.

### *FINDINGS*

The analysis of study area accident data for the years 2007 through 2009 showed that there were 1243 crashes, 63 injury crashes, five fatal crashes and five pedestrian crashes. However, Route 202 accounted for 726 of the study area crashes. Route 52 was second with 178 and Route 100, Montchanin Road was third with 114 crashes.

The Brandywine Valley National Scenic Byway consisting of Routes 52 and 100 accounted for 292 or 23% of the study area crashes. The nominated Byway extension of Ramsey Road, Creek Road, Smith Bridge Road and Thompson Bridge Road accounted for 102 crashes.

Considering accident rates, Ramsey Road on the Nominated Byway Extension and Beaver Valley Road between Thomson Bridge Road and the Pennsylvania Line were substantially higher than any other roadway segments analyzed in the study area. On Route 100, Montchanin Road, there are clusters at the Kirk Road/Rock Springs Road intersection in the village of Montchanin. Clusters of crashes were noted on Thompson Bridge Road, Route 92, where there is a cluster of crashes beginning south of Ramsey Road and continuing westward to Beaver Dam Road.

While the majority of crashes on all roadways occurred on dry pavement in decent weather conditions, and during the daylight hours, on the local roads, including the Nominated Byway Extension, night time crashes almost equaled the number of daytime crashes. Except on the local roads, crashes involving another vehicle, particularly rear end crashes were the predominate type of crashes. However, on the local roads and the Nominated Byway Extension, single vehicle crashes involving a fixed object were the predominate type.

### 3.4 FUNCTIONAL CLASSIFICATION

As defined by the Federal Highway Administration, functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide. Because roadways, taken together, make up a system in which each individual roadway depends upon the others, identifying how each roadway fits into that system or network of roadways is fundamental to understanding the concept of functional classification. There are three basic classifications of roadways:

- Arterial roadways
- Collector roadways
- Local roadways

Figure 3.4-A illustrates the different service provided by the three basic functional classifications. Arterial roadways are designed to provide mobility within a larger area. Collector roadways aim to strike a balance between mobility and access to adjacent land uses. Local roadways are primarily designed to serve adjacent land uses. The Delaware Department of Transportation (DelDOT) has expanded the classification of roadways to include sub-categories as follows:

- Arterial Roadways
  - Principal arterials
  - Minor arterials
- Collector Roadways
  - Major collectors
  - Minor collectors
- Local Roadways

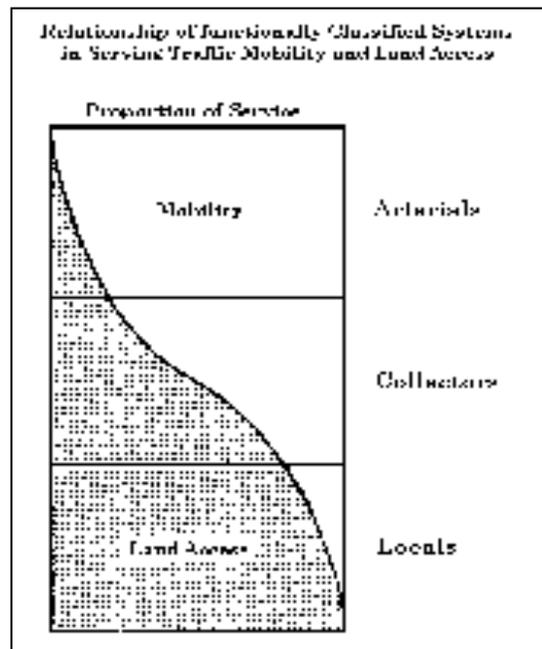


Figure 3.4-A-- Functional Classification as Related to Roadway Purpose

Figure 3.4-B illustrates the functional Classification that DelDOT in cooperation with the Wilmington Area Planning Organization (WILMAPCO) has assigned to the roadways in the study area.

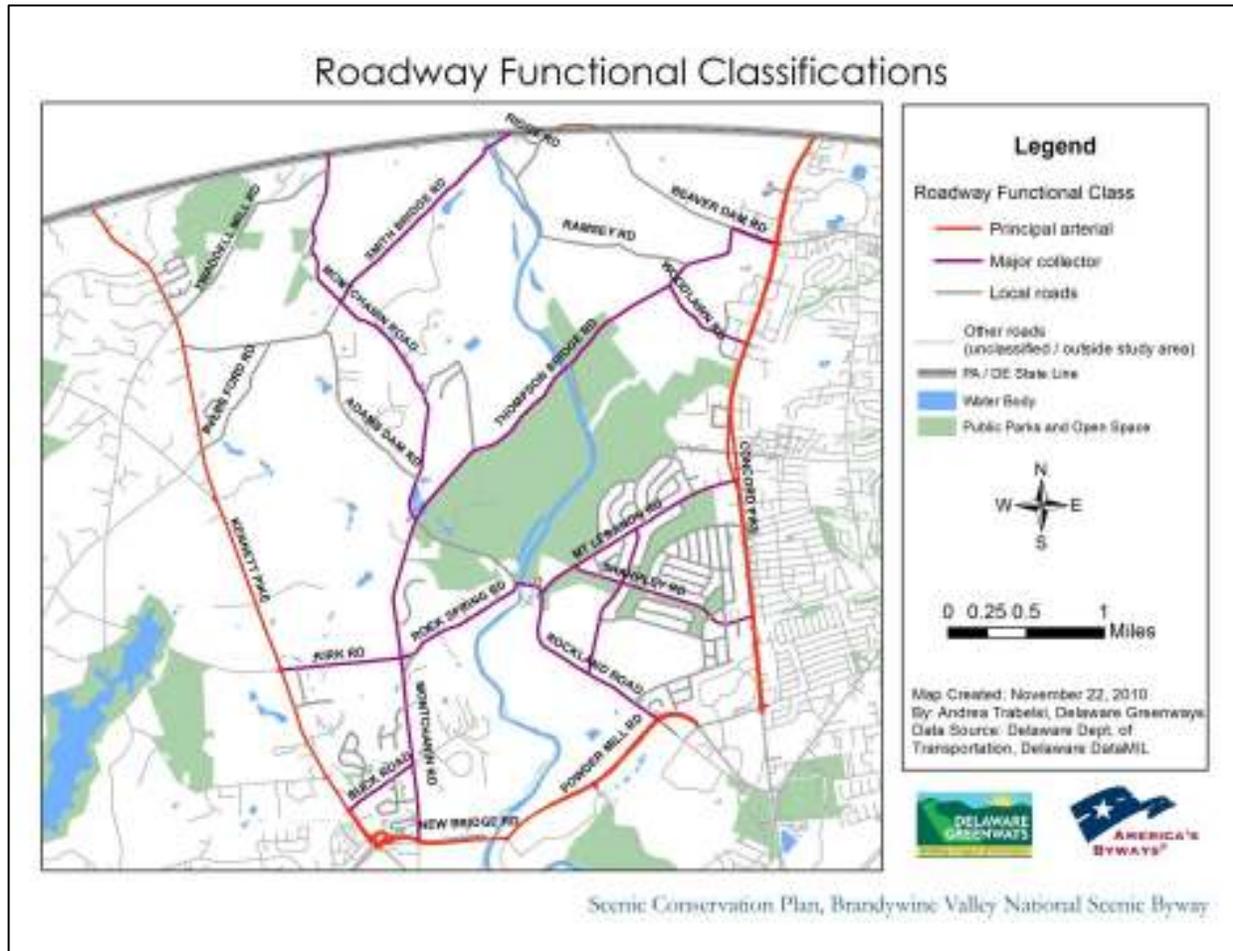


Figure 3.4-B

As shown in the figure US Route 202 and Delaware Routes 52 and 141 are classified as Principal Arterials. Delaware Routes 100 and 92 are Major Collectors. Table 3.4-A illustrates the functional classification of the study area roadways. Most of the study area roadways are classed as major collectors.

**Table 3.4-A: Functional Classification of Study Area Roadways**

Road Name	From-To	Functional Class	Daily Traffic Volume Range (Rounded)
US Route 202	PA Line to Murphy Road	Principal Arterial	41,500 to 51,500
DE Route 52	PA Line to Route 141 Interchange	Principal Arterial	11,000 to 17,500
DE Route 141	Children's Drive to Route 52	Principal Arterial	19,400 to 22,400
Buck Road	Route 52 to Route 100	Major Collector	3,000
Kirk Road	Route 52 to Route 100	Major Collector	2,900
Mt Lebanon Road	US 202 to Rockland Road	Major Collector	4,900 to 6,600
Rockland Road	Children's Road to Route 100	Major Collector	2,200
Route 100	Route 141 to PA Line	Major Collector	1,600 to 15,000
Thompson Bridge Road	Adams Road to Beaver Valley Road	Major Collector	6,700 to 7,900
Smith Bridge Road	Route 100 to PA Line	Major Collector	1,700
Twaddell Mill Road	Route 52 to Route 100	Local	500
Adams Dam Road	Route 100 to Center Meeting Road and Mt. Lebanon Road to Thompson Bridge Road	Local	2,200 to 3,100
Beaver Valley Road	US 202 to Creek Road	Local	2,000 to 3,000
Center Meeting Road	Route 100 to Route 52	Local	1,700
Creek Road	Ramsey Road to Smith Bridge Road	Local	2,600
Ramsey Road	Route 92 to Creek Road	Local	600

### 3.5 TRAFFIC VOLUMES

Average daily traffic is a measure of how much traffic uses the roadways of the study area. Average daily traffic represents a seasonally adjusted volume that uses the roadway on a typical weekday. Figure 3.5-A and Table 3.4-A (above) illustrate the average daily traffic volumes. As shown in the figure, the most heavily traveled roadway is US 202, Concord Pike, which carries an average of 50,000 vehicles per day. Route 141 carries about 21,000 vehicles per day while Route 52 carries 17,000 and 11,000 vehicles per day in Greenville and Centerville, respectively. Route 100 carries 14,000 vehicles per day near Route 141 and Route 92 but steadily decreases as it makes its way north to Pennsylvania. At the Pennsylvania line, it carries just 1600 vehicles per day, separating it from the other major routes as a Neighborhood Collector route. Similarly, Route 92 carries about 8,000 vehicles per day.

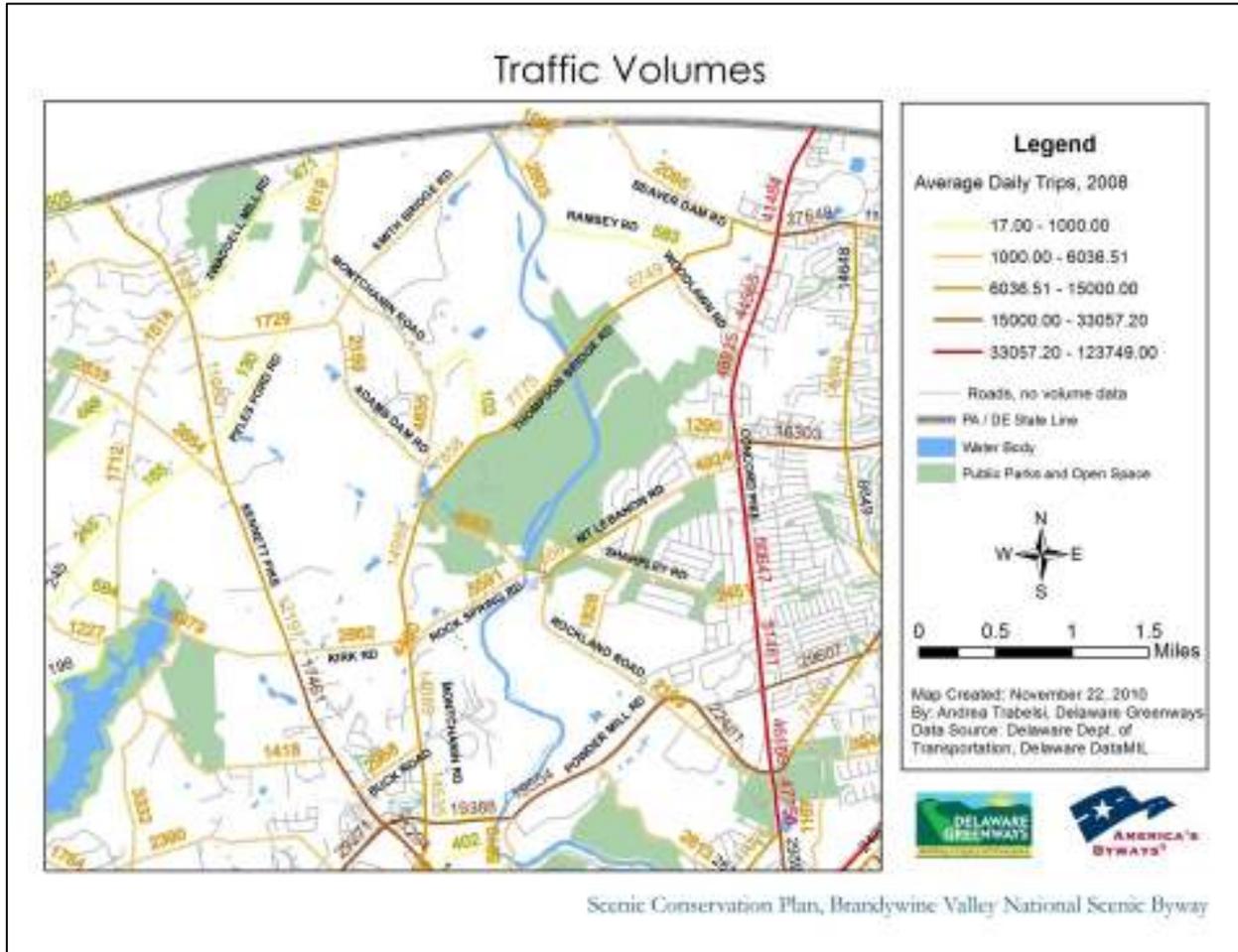


Figure 3.4-A

### 3.6 ROADWAY TYPOLOGY

A problem with the existing functional classification system is that an entire highway is sometimes placed into a certain class based on select characteristics – such as the overall highway length, or traffic volumes – although its level of access and mobility are not consistent with other roadways in that class. For example, many state highways are classified as principal arterials even if they are far more vital to community access than to regional mobility.

This inconsistency creates a dilemma for highway designers: the application of design standards for that class may encourage higher operating speeds than are appropriate for segments serving community access. To address this issue, a roadway typology is proposed, which better captures the role of the roadway within the community. It focuses more narrowly on the characteristics of

## EXISTING CONDITIONS REPORT

access, mobility and speed. If a segment of an arterial roadway has a relatively low speed, is important to community access, and has a lower average trip length, it should not be designed like a high order arterial. Further, under this approach, roadways are segmented to a greater degree than in methods used for defining traditional functional classification. If one segment of a roadway has low average trip lengths and has consistently lower speeds, its design should be different than another section which carries long trips.



Figure 3.6-A: Route 202



Figure 3.6-B: Kennett Pike (Route 52)

US Route 202 and Delaware Route 52 are both classified as Principal Arterials although it is evident that they serve different types of traffic (see Figures 3.6-A and 3.6-B). When improvements are called for on a given functional classification of roadway, the starting design controls such as design speed, lane width, shoulder width, sharpness of horizontal curves and grades are the same. Consequently, the designer would traditionally begin a project on both US 202 and State Route 52 with the same design controls. With growing acknowledgement of the value of designing a roadway to be sensitive to the context of an area, a new way of designing roadways is taking hold across the country and in Delaware. This movement, dedicated to developing designs that are sensitive to the man-made and natural environments, requires the designer to think about more than just the best design for moving traffic as rapidly as possible. In fact, the designer is challenged to integrate all users of the public right of way, motorized and non-motorized travel modes, in a manner that best compliments the users of the right of way and the adjacent land uses. A key step in this analysis is to understand how the public right of way is used by the different modes. Regarding motorized traffic, the key question is what types of trips use the facility; e.g., regional, through or local. Through its Context Sensitive Design Policy, DelDOT has recognized that US 202 and State Route 52 should be treated differently for the reasons stated above.

However, a methodology of relating roadways and roadway designs of the same functional classifications to the type of trips using that roadway is necessary to relate the roadway to its context, in this case, the scenic Brandywine Valley and the Brandywine Valley National Scenic Byway. To provide this consistency, a concept called 'Roadway Type' has been designed. It should be emphasized that Roadway Type should be used only as a planning and design "overlay" to be

factored into individual projects, and does not replace the traditional functional classification system used in Delaware. Further, while developed for use in Pennsylvania as part of their Smart Transportation Program, other states have developed similar methods of linking roadway design to the context of the adjacent land uses.

The roadway classes shown in Table 3.6-A correspond to the classifications of arterial, collector and local as described in the AASHTO Green Book<sup>5</sup>. Their design values should likewise correspond to the design guidelines provided in the Green Book. The roadway types are taken from the Smart Transportation Guidebook published by the Pennsylvania Department of Transportation<sup>6</sup>.

**Table 3.6-A: Roadway Categories**

Roadway Class	Roadway Type	Desired Operating Speed (mph)	Average Trip Length (mi)	Volume	Intersection Spacing (ft)	Comments
Arterial	Regional	30-55	15-35	10,000-40,000	660-1,320	Roadways in this category would be considered "Principal Arterial" in traditional functional classification.
Arterial	Community	25-55	7-25	5,000-25,000	300-1,320	Often classified as "Minor Arterial" in traditional classification but may include road segments classified as "Principal Arterial."
Collector	Community	25-55	5-10	5,000-15,000	300-660	Often similar in appearance to a community arterial. Typically classified as "Major Collector."
Collector	Neighborhood	25-35	<7	<8,000	300-660	Similar in appearance to local roadways. Typically classified as "Minor Collector."
Local	Local	20-30	<5	<3,000	200-660	

Source: Pennsylvania Department of Transportation, *Smart Transportation Guidebook*, 2008

By considering roadway type along with roadway classification and traffic volumes, design controls can be tailored to the specific roadway under consideration.

Applying the concepts illustrated in the table, in the US 202/State Route 52 example, US 202 would have a typology of a Regional Arterial. State Route 52 would be assigned a typology of a Community Arterial. Routes 100 and 92 would be considered as Community Collectors. Table 3.6-B illustrates the Functional Classification and Roadway Type of the study area roadways.

<sup>5</sup> American Association of State Highway and Transportation Officials, *A Policy on Geometric Design of Highways and Streets, 5th Edition*, 2004. Commonly called "The Green Book", all state transportation agencies base their highway design criteria on the guidance provided in this publication.

<sup>6</sup> Pennsylvania Department of Transportation, *Smart Transportation Guidebook*, 2008. This Guidebook develops a methodology for assessing land use context from rural to urban and links each land use context to a roadway type, developing roadway design guidance for each combination of roadway type and land use context.

**Table 3.6-B: Functional Classification and Roadway Type of Study Area Roadways**

Road Name	Functional Class	Roadway Type
US Route 202	Principal Arterial	Regional Arterial
DE Route 52	Principal Arterial	Community Arterial
DE Route 141	Principal Arterial	Regional Arterial
DE Route 100	Major Collector	Community Collector
DE Route 92	Major Collector	Community Collector
Kirk Road	Major Collector	Neighborhood Collector
Mt Lebanon Road	Major Collector	Neighborhood Collector
Rockland Road	Major Collector	Neighborhood Collector
Smithbridge Road	Major Collector	Neighborhood Collector
Rock Spring Road	Major Collector	Neighborhood Collector
Woodlawn Road	Major Collector	Neighborhood Collector
Buck Road	Major Collector	Neighborhood Collector
Sharpley Road	Major Collector	Neighborhood Collector
Twaddell Mill Road	Local	Neighborhood Collector
Adams Dam Road	Local	Neighborhood Collector
Beaver Valley Road	Local	Neighborhood Collector
Center Meeting Road	Local	Neighborhood Collector
Creek Road	Local	Neighborhood Collector
Ramsey Road	Local	Neighborhood Collector

Note: All other roads in the study area are categorized as the "Local" road type.

Figure 3.6-C illustrates the Roadway Types for the Study Area. Routes 202 and 141 are considered Regional Arterials as they serve mostly regional traffic. Route 52, an arterial serves mostly traffic from the community. Routes 100 and 92 are classified as Community Collectors serving to connect the communities within the Brandywine Valley. The remaining Major Collectors are classes as Neighborhood Collectors as they serve only the neighborhoods that they pass through.

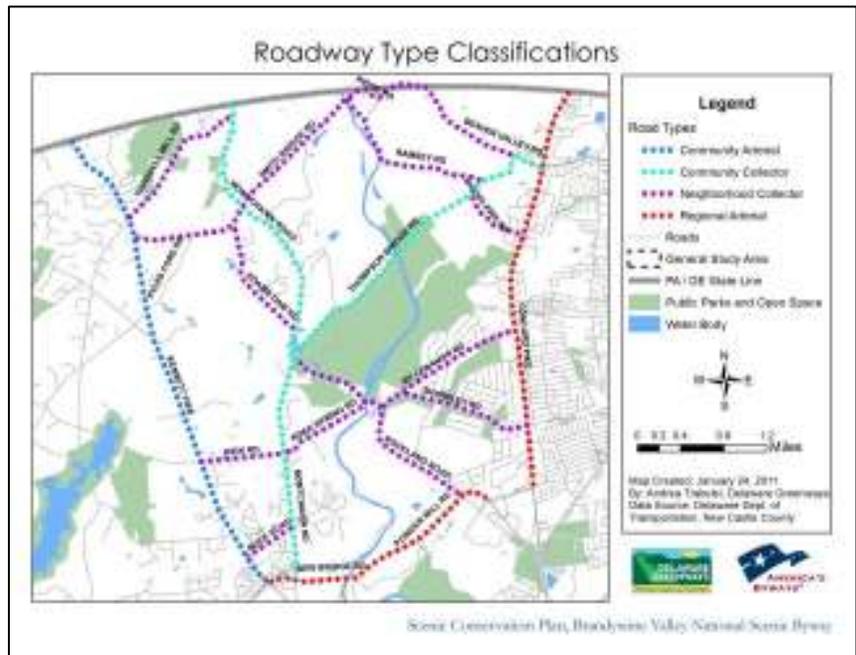


Figure 3.6-C

### 3.7 CURRENTLY PLANNED ROADWAY SYSTEM IMPROVEMENTS

The current Transportation Improvement Plan managed by DelDOT identifies two capital projects and two bridge projects. The projects are:

- Tyler McConnell Bridge Replacement Project. This project on DE Route 141 includes constructing a 2-lane parallel bridge along the existing two lane structure, which has been declared historic, and widening Route 141 on the east side of the bridge to match the four lane divided cross section of the Route 141 in the Blue Ball Improvement area. On the west side of the bridge, DE Route 141 will be widened in a similar manner to match the cross section at the Route 100 intersection. Context sensitive design principles will be followed in this historic area. This project is not currently funded although planning funding is provided in the existing Transportation Improvement Program.
- Highway Safety Improvements at the DE Route 52/82 intersection. While the actual scope of the improvements is in flux, it is clear that the improved intersection will include turning lanes for the DE Route 52 legs of the intersection and new traffic signals.
- Bridge 100 Replacement. Bridge 100 on Old Kennett Road west of Centerville will be replaced with a wider bridge that includes shoulders.
- Bridge 536 Replacement. Bridge 536 on Guyencourt Road is the replacement of an existing culvert. This project is currently underway.

### 3.8 NON-MOTORIZED TRANSPORTATION

While the majority of trips made in the study area are by automobile, many trips are made by bicycle, walking and by public transit.

#### *PEDESTRIAN AND TRAIL NETWORK*

Within the study area, sidewalks are commonplace within Centerville, Greenville, along Mt. Lebanon Road and at various points along US 202. Elsewhere in the study area, sidewalks are a random occurrence. Route 52 is also considered a pedestrian pathway due to its shoulders. The East Coast Greenway touches the southern part of the study area along Rockland Road where the Northern Delaware Greenway (NDG) begins. Figure 3.8-A shows the Northern Delaware Greenway, the only north-south trail connection in the study area, and the type of trails that it comprises.

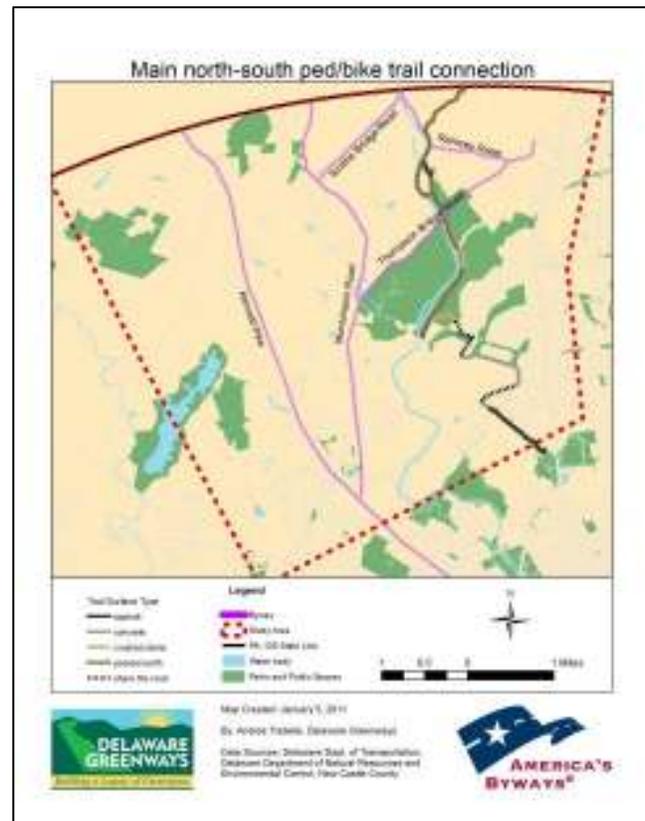


Figure 3.8-A

## EXISTING CONDITIONS REPORT

As shown, as it parallels Rockland Road, it is a paved asphalt path but then as it enters the residential district surrounding the DuPont Country Club, shares the width of streets until it comes to Mt. Lebanon Road where it becomes a crushed stone path to the Brandywine Creek. Along the creek as it passes through the Brandywine Creek State Park, it is either crushed stone or packed earth. As it enters the lands of Woodlawn Trust and continues along the creek, it remains packed earth. Finally, it veers eastward from the creek and into Pennsylvania as a packed earth trail. In addition, there is a network of trails in the Brandywine Creek State Park and through the land holdings of Woodlawn Trust that provide access to recreational areas. The NDG trail is marked with signage, but is irregular at points especially within the section passing through the neighborhoods near the DuPont Country Club.

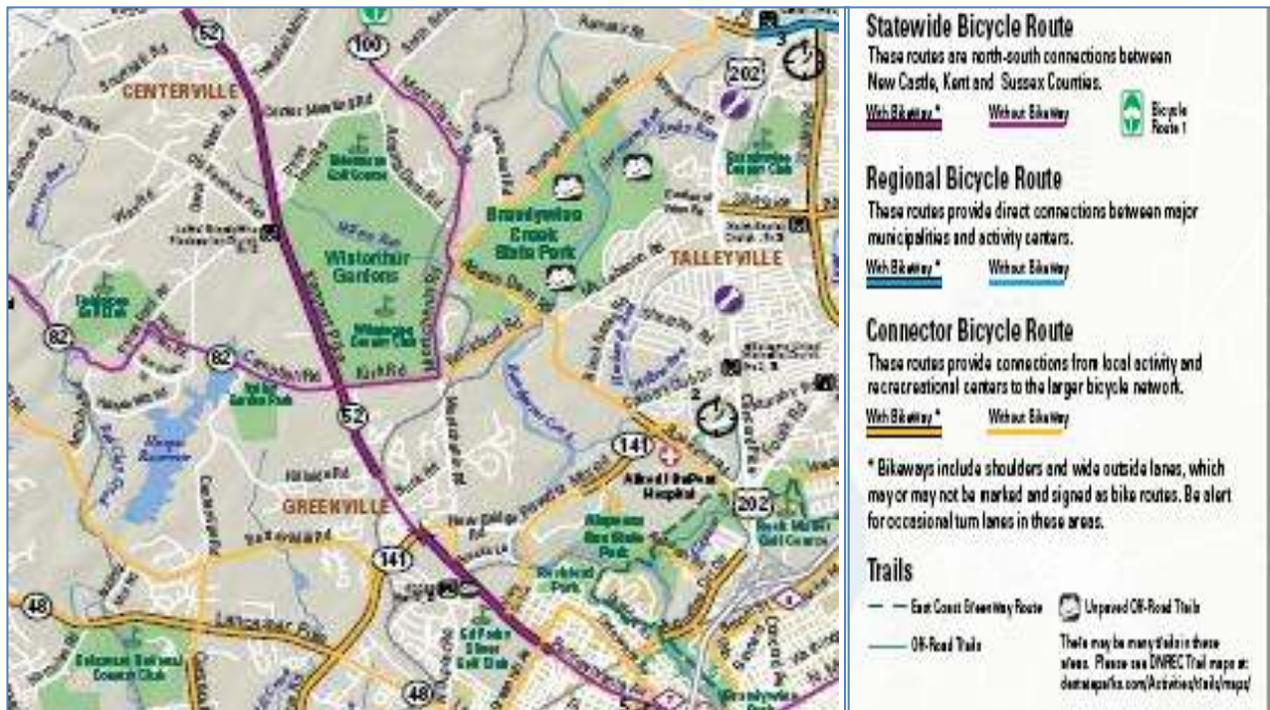
*BICYCLE NETWORK*

Figure 3.8-B: Bicycle network and bike-way classifications  
Source: DelDOT

Figure 3.8-B illustrates the bicycle network within the study area. Similar to its roadways, DelDOT classifies the bicycle routes as statewide, regional and connector routes. Statewide routes are defined as routes that connect the three counties of Delaware together. They typically run in a north-south direction. Regional bicycle routes connect municipalities and activity centers together. Connector routes connect recreational and local activity centers together. Each classification can either be on road or off road, or, if on a public roadway, with a bikeway or without a bikeway. As shown on the figure, within the study area, except for the trails in the Brandywine Creek State Park and on the property of Woodlawn trust, all bicycle facilities are on-road.

Route 52, because of its shoulders is considered a statewide on-road facility with a bikeway, except in Greenville where there are no shoulders or bike lanes. There, it is considered a statewide bicycle facility without bike lanes. Kirk Road (Route 82) and Montchanin Road (Route 100) north of Kirk Road is also considered a statewide bike route but since there are no shoulders, bicycle traffic uses the travel lanes. Thompson Bridge Road between Route 100 and US 202 is a connector bicycle route as is Rockland Road and Adams Dam Road.

#### *ACTIVE AND OPERATING RAILROADS*

In the study area, there is an active short line railroad which is part of the CSX System. Known as the East Penn Railroad, it runs between Elsmere Junction and Coatesville in Chester County, PA. It serves a number of industries along the way and service is on an on demand basis. The right of way varies between 65 and 70 feet in width.

#### *RAIL TO TRAIL/RAIL WITH TRAIL OPPORTUNITIES*

The Delaware Rail to Trail & Rail with Trail Facility Master Plan analyzed operating and non-operating rail rights of way for the purpose of determining which might be appropriate for conversion to either rail to or rail with trail facilities. One former rail right of way in the Brandywine Valley, called the Rockland Track was considered in the report but was not selected as a candidate corridor. Figure 3.8-C shows the location of the track. It extends from Carpenters Row at Route 100 in Montchanin and extends to an abandoned bridge across the Brandywine Creek at Rockland Mills. It was studied because of the potential to connect Route 100, a statewide bicycle route to the Brandywine Creek State Park and the network of trails in the park.

The 'track' is 1.1 miles in length. The right of way has largely been abandoned and the bridge over the creek needs substantial repair work to be serviceable. In all, the Master Plan estimated it would cost between \$137,500 and \$302,500 depending upon the type of service to construct a trail on the former right of way. The cost of the bridge and the cost of re-establishing the right-of-way are not included in the cost



**Figure 3.8-C: Rockland Track**  
Source: DelDOT

estimates.

### 3.9 PUBLIC TRANSPORTATION FACILITIES

Within the Brandywine Valley study area, Delaware Authority for Regional Transit (DART) operates four fixed route bus lines. Routes 2 and 35 run along Concord Pike with service every 30 minutes throughout the day light hours. They operate at a volume to capacity ratio greater than 35%. Route 10 which travels along Route 52 is essentially peak hour service with 20 minute service during the morning peak hours and 30 minute service in the evening peak hours with sporadic service throughout the day. Route 28 operates limited service to Astra-Zeneca and the DuPont Experimental Station during peak hours yet it operates at a 35% volume to capacity ratio. Figure

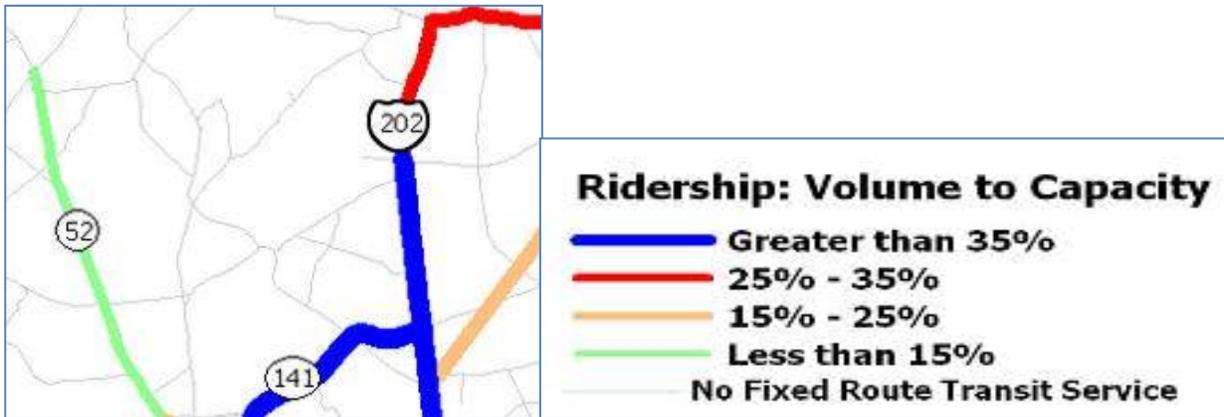


Figure 3.9-A: Transit Utilization

Source: New Castle County

3.9-A shows transit utilization for the three DART Routes in the study area.

Designated bus stops on the key study area roadways include the following:

#### Route 10 along Kennett Pike

Inbound to Wilmington	Outbound to Centreville
Twaddle Mill Road	Briars Lane
Presbyterian Church	Busk Road
Natural History Museum	Railroad Tracks
Country House	Brook Valley Road
Campbell Road	Sunnyside Road
Opposite Sunnyside Road	Kirk Road
Brook Valley Road	Opposite Wilmington Country Club
Railroad Tracks	Opposite Natural History Museum
Buck Road	Opposite Winterthur Exit
Presidential Drive	Opposite Presbyterian Church
Presidential Drive	Pyles Ford Road
	Somero Lane
	Opposite Swallow Hollow
	Center Meeting Road
	Twaddle Mill Road

**Routes 2 and 35 along Concord Pike**

<b>Inbound to Wilmington</b>	<b>Outbound to Centreville</b>
Brandywine Town Center Park and Ride Eastbound	Independence Mall
Brandywine Town Center Opposite Community Center	Murphy Road
Brandywine Town Center Opposite Target	Fairfax Shopping Center
Naaman's Road Opposite Stratford Apartments	Wachovia
Concord Pike and Naaman's Road	Opposite Zeneca Building
Brandywine Commons and Shop Rite	Opposite Rollins Building
Concord Mall Sears	Opposite Sharpley Road
Concord Mall Boscov's	Prospect Drive
Rocky Run Boulevard	Nichols Avenue
Righter Parkway	Cleveland Avenue
Garden of Eden Road	Florence Avenue
Silverside Road	Prospect Avenue
Mt. Lebanon Road	Wing Wah
Opposite Prospect Avenue	Brandywine Boulevard
Whitby Road	Silverside Road
Opposite Cleveland Avenue	Concord Square
Opposite Nichols Avenue	Opposite Rocky Run Boulevard
Opposite Woodrow Avenue	Concord Mall Sears
Sharpley Road	Concord Mall Boscov's
Rollins Building	Brandywine Commons Opposite Shop Rite
Zeneca Building	Wilmington Trust/Naaman's Road
Murphy Road	Naaman's Road/Perry Lane
Opposite Independence Mall	Brandywine Town Center Opposite Target
	Brandywine Town Center Opposite Community Center
	Brandywine Town Center Park and Ride Eastbound

In the future, as part of the Tyler McConnell Bridge project, a jitney service has been proposed along Route 141 connecting Route 202 AND THE Kirkwood Highway. The goal of this service would be to relieve traffic on local roadways in the corridor. It should be noted that the Tyler McConnell Bridge project is not currently funded.

## 4. SYNTHESIS OF EXISTING KEY ISSUES

This section synthesizes key issues that have emerged from examining the existing land use, environmental, infrastructure and transportation conditions in the Brandywine Valley. Some of the issues are mutually exclusive; that is, not dependent upon other issues. However, most are interrelated and must be examined together. The key issues are summarized from the viewshed analysis and the analysis of existing conditions. Taken together, they establish the foundation on which the Scenic Conservation Plan will be built. These final paragraphs bring together the information regarding existing conditions specifically to:

1. examine the link between land use and transportation in the study area; and,
2. identify the conditions that are most likely to impact the desired outcomes of the Plan

The emerging issues identified herein will also serve as key points of discussion in the next phase of the planning process: community visioning and goal setting.

### 4.1 LINKING LAND USE AND TRANSPORTATION

The basis of the Scenic Conservation Plan is the link between land use and transportation and the understanding of how one affects the other. To more clearly understand that interrelationship, the roadways and the land uses within the study area have each been classified in light of the aims of the plan: 1) to maintain the character and experience of the Brandywine Valley and the Byway corridor; 2) to protect property values of the landowners within the Valley; and 3) to provide safe, convenient access to the amenities and resources for residents, businesses and visitors within the Valley and along the Byway corridor. The resulting classifications for existing land uses and roadways are referenced as land use context districts and roadway types. Each has been mapped separately and discussed in previous land use and transportation sections of the report. Land use context and roadway type comprises the organizing framework for the selection of appropriate roadway design guidelines and design guidelines for natural and built areas throughout the Brandywine Valley. Figure 4.1-A shows the land use context districts and road types mapped together.

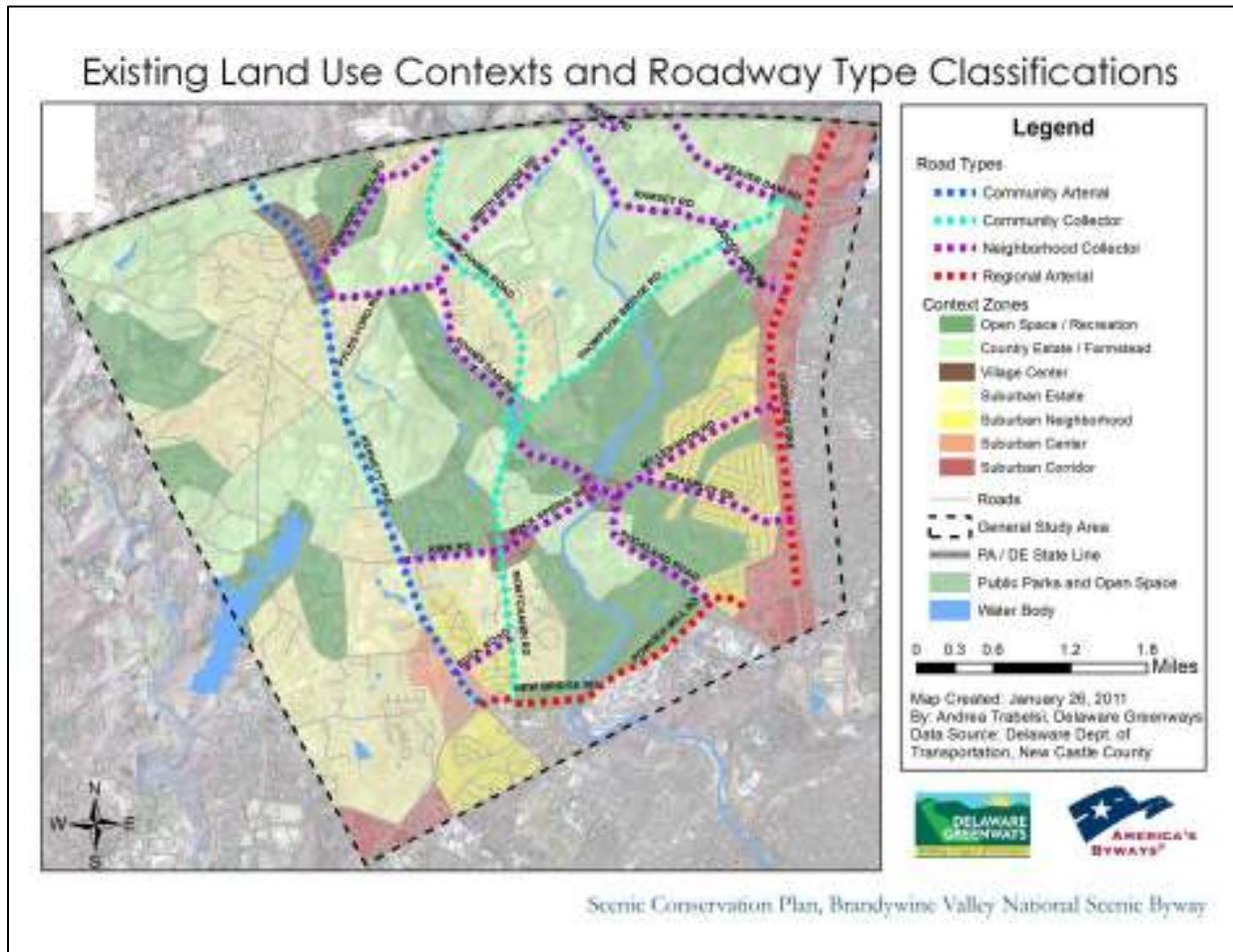


Figure 4.1-A

A context area is a land area comprising a unique combination of different land uses, building form and function, building density, roadways, and other landscape features. The different context districts are presented in figure 4.1-B and are explained in more detail in section 2.7 of this document.

By superimposing roadway types and land use context districts, it is possible to establish a matrix showing each combination of road type and land use context that exists (see Table 4.1-A, below). The matrix provides an understanding of how roadway types should look and operate as each passes through the several land use context districts. This allows the development of different roadway and roadside design guidelines to be developed resulting in a better matching of transportation design and adjacent land use. In subsequent sections of the Scenic Conservation Plan covering how the area will change if current practices remain unchanged (the Trend Scenario) and how the area should change (the evaluation of alternative future plans) enables the Plan to be more specific and targeted. In this way, the roadway design should be compatible with the existing

land use context, or a planned future land use context that reflects the community vision. In the table, an 'X' denotes that the roadway type noted in the columns is present in the land use context districts noted in the rows.

**Table 4.1-A: Matrix of Land Use Context Districts and Roadway Types in the Study Area**

Land Use Context District	Roadway Type				
	Regional Arterial	Community Arterial	Community Collector	Neighborhood Collector	Local Roadway*
Open Space/Recreation	X	X	X	X	X
Country Estate/Farmstead		X	X	X	X
Village Center		X	X	X	X
Suburban Estate		X	X	X	X
Suburban Neighborhood	X		X	X	X
Suburban Center		X			X
Suburban Corridor	X			X	X

\*All other roads shown in Figure 4.1-A, which are within the transportation study area are considered "Local" roads.

## 4.2 TRANSPORTATION DESIGN IMPLICATIONS

As shown in Table 4.1-A, there are 26 combinations of land use context and roadway types in the Brandywine Valley. Even though not all of the 26 combinations require a separate set of design guidelines, examining each for its unique contextual characteristics enriches the designer's understanding of context and enables a truly context sensitive transportation design to evolve. This understanding influences the geometric design of the roadway and the types of amenities required in the right-of-way. Transportation design elements are organized into three general categories:

- *Desired Operating Speed:* This is the speed at which vehicles should travel that section of road as intended by the highway designer and the community planner working together with the community. In context sensitive design, the roadway type and land use context should play a large role in determining the desired operating speed. For example, pedestrian travel and the presence of civic uses and retail close to the street all suggest the need to consider lower desired operating speeds.
- *Roadway:* Roadway elements and geometry should be selected with a clear understanding of surrounding land uses. For example, roadways in the Village Center Context District should be designed to operate differently than the same roadway in the Country Estate/Farmstead Context District. In the former district, the roadway might have narrower lanes to allow a bicycle lane along the edge of the paved section whereas in the latter district, the roadway might be narrower with bicycles accommodated on separated trails.
- *Roadside:* The roadside primarily serves the pedestrian and the transit rider and provides a transition between public and private space. In the Village Center Context District,

pedestrians might be accommodated with sidewalks but in the Country Estate/Farmstead District, pedestrians might be accommodated on a nearby trail.

As the type and location of development is projected into the future either as the culmination of current trends and practices or as the result of selecting the most desired future, the map of land use contexts and roadway type will be updated.

As indicated above, the relationship of land use context district and roadway type will be revisited as the study team and the Conservation Committee consider the future of the study area.

### 4.3 EMERGING ISSUES

The following paragraphs highlight key issues that have emerged from research into the existing conditions of the Brandywine Valley.

#### *WASTE WATER AND WATER RESOURCES*

Studies reviewed by USEPA cite onsite septic system failure rates nationwide at 10 to 20 percent<sup>7</sup>. With at least half of the study area serviced by onsite septic systems, failure and subsequent public health threats are of concern. As density increases in the study area, methods for managing waste water effectively may need to be modified. Soil infiltration and hydraulic conductivity are two limiting factors that will impact the feasibility of continued practice of using conventional septic systems. Although the County has established guidelines for keeping most of the study area on on-site septic systems, an alternative method for management could occur at an undetermined point in the future. This issue is beginning to manifest itself in the Centreville area with warnings of E coli bacteria found in the water supply. Whether this finding is a harbinger of things to come or an isolated occurrence, this plan should consider the possibility of this issue and how it affects the environment, and the residents and businesses of the Brandywine Valley.

#### *LARGE LAND OWNERS*

Land values are unquestionably high in the Brandywine Valley and as time goes on, it is likely that some of the owners of large parcels will consider selling or developing some or all of their holdings. Some of the large parcels are country clubs and some are owned by families who have lived in the area for generations. It is not known which land owners might find themselves in that position in the horizon of this study but since many of such parcels are zoned and not protected from development, this plan should consider this eventuality.

Conversely, large land owners might find it prudent to develop their holdings in a sustainable manner and the plan should consider and encourage this eventuality. The plan may also develop alternative strategies enabling the owners to retain their holdings.

---

<sup>7</sup> U.S. Environmental Protection Agency (USEPA). 2000. Draft EPA Guidelines for Management of Onsite/Decentralized Wastewater Systems. U.S. Environmental Protection Agency, Office of Wastewater Management, Washington, DC. Federal Register, October 6, 2000, 65(195): 59840-59841.

### *PUBLIC WATER AND SEWER*

County policy has been to use the lack of public water and sewers as a means to manage growth. In the northern part of the study area as noted earlier in the Existing Conditions Report, public water and sewer services are not available and the permitted zoning densities are reflective of on-lot wells and sewage disposal. Yet just across the border in Pennsylvania, 'package systems' for wastewater treatment and public water and sewer is generally available. This means that large scale developments can and do occur there. In many cases, commuting traffic from these developments finds its way into Delaware, the place of employment for many residents of southeastern Chester and southern Delaware counties. This phenomenon is evidenced by the highly directional peak hour traffic on Delaware Routes 52, 92 and 100.

As time goes on, if the Wilmington area continues to be a job center and residential development increases in the Brandywine Valley and northward, this traffic pattern will continue with increased traffic volumes through the study area. In considering this issue, it should be noted that in recent years, the State of Delaware and the City of Wilmington have encouraged job growth along the US 202 Corridor and in the City of Wilmington. The vast Astra-Zeneca complex and the emergence of national credit card companies locating in Wilmington are a result of that policy.

### *PEDESTRIAN AND BICYCLE ACCESS*

The viewsheds from the roadway system in the Brandywine Valley study area are exceptionally scenic and this beautiful scenery is visually accessible by motorized vehicle. There are multiple access points for both pedestrian and bicycle access although a lack of parking areas is evident. However, except for Route 52, all of the roads have no shoulders and have locations where curves, hills and valleys do not provide enough sight distance for motorists, bicyclists and pedestrians to occupy the travel lanes safely. To be sure, there are locations where all three can see and be seen but prudence indicates that an alternative system of connections for the slower modes of bicycles and pedestrians be developed. Ideally, this network would connect to locations where the historic, scenic and cultural resources of the study area can be enjoyed.

### *ACCESS TO TRAILS AND SCENIC AREAS*

The emergence of the Northern Delaware Greenway as a spine along the Brandywine Creek is a positive development but, except for the network of trails in Brandywine Creek State Park, connections to the areas attractions and destinations are lacking. Access within the park to the trail network is easy and convenient. Parking is strategically provided in many areas within the park. Outside the park, trail access is intermittent as is signage. There are some formal and informal areas to park but they are not systematically provided. Scenic viewsheds in general, must be viewed from a moving vehicle. This creates a conflict between 'sightseeing' traffic and 'commuting' traffic.

### *TRAFFIC SIGNING AND SIGNING BY PROPERTY OWNERS*

There are several issues identified regarding signing. On-road traffic signing is solely the province of DelDOT and takes the following forms:

## EXISTING CONDITIONS REPORT



**Intersection of Montchanin Road, Adams Dam Road and Thompson Bridge Road. Note the many traffic signs and the private signs. While many consider this as an example of sign clutter, some are required traffic signs. Nevertheless, there may be some opportunities to reduce or regulate the type, number and size of private signs and the number of traffic signs.**

- Regulatory signs (such as stop signs, speed limit signs, no passing, and signs related to traffic signals)
- Warning signs (such as signs that warn of curves, intersections, signals ahead and animals)
- Directional signs (typically green signs that point to directions and place names)

There are other DelDOT managed signs. These include way finding signs informing motorists of area attractions, motorist service signs informing motorists of services and businesses and lastly, signing for Byways. When considering these last three types of signing DelDOT typically solicits input from communities and community organizations. The issue of signing manifests itself as a balance between sign clutter and too little information. Within the study area, signing is not very consistent and all categories should be reviewed for consistency in

accordance with the Corridor Management Plan.

### *DEVELOPMENT ACCESS AND DEVELOPMENT LAYOUT*

Development within the study area has two characteristics: single points of access to the roadway network and connections to the roadway network not in character with the scenic nature of the roadway system.



Figure 4.3-A shows two examples of roadway networks. The upper network is typical of the residential development in the study area. Most have single access points which require trips to a neighboring development to be made via the main roadway system. Successive developments taking access from a single roadway would add additional local traffic to the roadway network and as a consequence could over load it unnecessarily. On the other hand, the network in the lower part of the figure provides alternative pathways throughout the development. As a result, the stress of traffic on the main road is minimized.

The second issue is the layout of the development entrance. Typically, the design of development

**Figure 4.3-A: Types of Roadway Networks**

entrances follows DelDOT Design Standards and include left turn lanes and right turn deceleration lanes. The design also includes 12 foot wide traffic lanes. Fortunately, DelDOT has been rethinking this practice and is permitting narrower lane widths but still required are wide development streets at the intersection with the main road and deceleration lanes. This additional roadway widening detracts from the scenic character of the roadway, particularly since the developer designs landscape screening of the development from the roadway, preserving the character of the roadway to the extent possible.

### *CONTEXT SENSITIVE DESIGN MANUAL*

DelDOT has published a manual on Context Sensitive Design for Delaware's Byways. This Manual provides guidance for roadway planning and design for all of Delaware's Byways, leaving the specific design to be developed on a case by case basis within the Manual's guidance. To this end, there are two issues related to the study area that the Manual leaves for this study to address:

1. Design Guidelines for the Brandywine Valley National Scenic Byway. The Route 52/82 safety Improvement Project has forced this issue for Route 52 and as part of the project, transportation design guidelines are being developed for Route 52. Such guidelines need to be developed for Route 100.
2. Delaware Greenways is about to nominate an extension to the Brandywine Valley National Scenic Byway. Beyond the nominated extension of Ramsey, Creek, Smithbridge and Thompson Bridge Roads, there are other scenic roadways in the study area deserving of design guidelines similar to the design guidelines for the Byway itself.

Specific design guidelines for similar roadways give the local communities and DelDOT a starting point with design elements of general agreements. Design guidelines for access to developments and for new streets will also be a part of the design guidelines.

### *LAND DEVELOPMENT GUIDELINES*

Similar to roadway design guidelines, many landowners or new and old homes take extreme pride in how their properties are presented to the public. Landscaping, design treatments and an overall quality of maintenance add to the scenic qualities of the study area. However, one type of development, the large tract house, commonly called a "McMansion" presents architectural features that many consider to be out of place in the Valley. Many communities have developed guidelines beyond those in a typical zoning or land use and subdivision ordinance to guide architects as they design buildings and landscapes for the study area. This study will also address this issue with design guidelines.

*EMERGING ISSUES: NEXT STEPS*

The above issues are related to the conditions that exist in the study area today. As the study proceeds to generating future land use and transportation scenarios, the above list will be monitored to see how each performs under different future scenarios. The first future scenario to be created is the “Trend Scenario,” which represents the likely future of land use and transportation in the study area if current trends and practices continue. The Trend Scenario will serve as a basis for community visioning and goal setting, as well as for generating desired alternative future scenarios.