

V. THE PREFERRED ALTERNATIVE

Based on preliminary environmental impacts, compatibility with project needs and input received from the public, public officials and various agencies, the No-Build Alternative and the Master Plan, Modified Alternative have been carried into detailed analysis. The Master Plan Modified Alternative included two (2) options for the alignment of the Eastpark Drive, Option A and Option B. Option B has been selected the Preferred Alternative because it eliminates the impacts to the J.R. Weldin Archaeological Site ruins. Following is a description of the issues, impacts and mitigation measures proposed with the No-Build and Preferred Alternatives. *Table V-1* provides an impact summary for the No-Build and Preferred Alternatives.

A. Community Effects

1. Land Use

The study area generally extends from the U.S. 202/I-95 interchange, north to the existing AstraZeneca entrance near Delaware Route 141; and from the new Rockland Road Bridge on Delaware Route 141 east to the Murphy Road/Foulk Road intersection. Existing land use in the study area is generally mixed, comprised primarily of commercial, residential and institutional uses, as well as recreational and open space.

Commercial uses are most common along U.S. 202 including Brandywine Plaza, Independence Mall and the AstraZeneca complex, as well as several independent commercial establishments. Residential uses include the developments of Alapocas, Alapocas II, Weldin Ridge, Deerhurst and Fairfax Farms which are situated to the east and west of U.S. 202 and are generally set back, although a portion of the Deerhurst development does front existing U.S. 202. Institutional uses including A.I. DuPont Hospital for Children and the Ronald McDonald House are located along Rockland Road, to the west of U.S. 202. The Rock Manor Golf Course is situated to the north of the I-95/U.S. 202 interchange and to the east of U.S. 202. Open space in the form of woodlands and parks is primarily associated with the Brandywine Creek Valley in the southeast portion of the study area.

No-Build Alternative

Traffic congestion that would result from the No-Build Alternative is beyond the capacity of the existing roadways and would not meet project needs. Land Use would be adversely impacted because the capacity of the existing transportation network would not be compatible with planned land development in the project area.

Preferred Alternative

Land use in the project area will be altered as a result of the planned development in the Blue Ball Properties Area. The proposed transportation improvements will also affect land use in the study area by changing vacant lands and fallow agricultural fields to transportation use. Most

TABLE V-1			
Summary of Impacts and Mitigation			
Resource	Preferred Alternative	No-Build Alternative	Mitigation for Preferred Alternative
Displacements: A. Occupied Residences	0	0	Comprehensive Relocation Assistance Remaining DeIDOT lands would be transferred to the State Parks system.
B. Unoccupied Residences	1 (Weldin-Husbands House)	0	
C. Business	1 (JOK Distributors/Kehtron)	0	
D. Non-Profit	0	0	
Community Effects	Widening of Murphy Road would require an extra lane for pedestrians to cross from the Deerhurst Community to the Fairfax Shopping Center area. Existing land use would be somewhat altered by the project. Bicycle greenway will provide alternative means of transportation.	Existing land use would be unaffected. Inconsistent with future economic development goals and improvements for the Blue Ball Properties area. Goals for the completion of the bicycle and Greenway Trail connection would not be met.	Accessibility to community services would be enhanced as well as commuting time. Improved pedestrian access from Deerhurst Community to shopping area south of Rt. 141/Murphy Road.
Wetland Encroachments	Approximately 1.12 acres of wetlands will be affected.	Existing wetlands would not be affected.	Comprehensive mitigation package includes wetland replacement, stream restoration and buffer enhancement.
Stream/Waterway Encroachment	A total of 595 linear feet of waterway will be affected.	Stream/waterways would not be altered, resulting in continued flooding and scouring problems associated with Alapocas Run.	Stream Restoration Plan for Alapocas Run will help reduce scouring/flooding problems. Buffer enhancement will help increase water quality and aesthetics.

TABLE V-1 con't.

Summary of Impacts and Mitigation			
Resource	Preferred Alternative	No-Build Alternative	Mitigation for Preferred Alternative
Forestland	7 acres total from the Alapocas Tract, AstraZeneca Triangle and the Weldin Tract.	There would be no affect to the forestland in the project area. In the No-Build Alternative, invasive exotics such as Tree of Heaven and Multiflora Rose will continue to degrade the forestland in the area.	Landscape Planning utilizing native plant material, reducing invasive exotics in the project area and improving the quality of the forestland.
Agricultural Land	24 acres total from the Alapocas Tract, AstraZeneca Triangle and the Weldin Tract.	Agricultural land in the project area will not be affected under the No-Build Alternative. This alternative is inconsis tent with the Blue Ball Master Plan and proposed future land development.	Much of the agricultural land will be converted to open space parkland and recreational ballfields and multi-use paths.
Hazardous Waste Management	3 Sites in Project Area: <ul style="list-style-type: none"> • Concord Pike Gulf Station • Cingular Wireless (Former Hank Black's Foreign Car Center) • Dexsta Federal Credit Union 	Hazardous waste sites will not be affected under the No-Build Alternative.	Only impacts to the Concord Pike Gulf Station are expected based upon current design. Waste management plan recommended.

TABLE V-1 con't.

Summary of Impacts and Mitigation

Resource	Master Plan Modified Alternative	No-Build Alternative	Mitigation for Master Plan Modified Alternative
Noise Sensitive Areas	<p>4 areas that warranted abatement consideration:</p> <ul style="list-style-type: none"> • Deerhurst Community (Abatement not feasible or practical) • Ronald McDonald House (reasonableness being evaluated) • 1 Rock Manor (Potential abatement not feasible or practical) • Blue Ball Barn (Abatement not feasible or practical) 	<p>No-Build noise levels in the area already exceed the noise level criteria in close proximity to U.S. 202. It would be expected that they would increase in the No-Build condition.</p>	<p>Noise walls and earthen berms were modeled for abatement considerations.</p> <p>Installation of privacy fencing, walls or landscaping can provide more of a psychological barrier than noise mitigation options.</p> <p>Some level of noise reduction may be achieved.</p>
Air Quality	Decreased Idle Emissions	<p>Under the No-Build Alternative air quality is expected to worsen, due to increased idle emissions.</p>	<p>Transit/Bike/ Pedestrian facilities provided by Master Plan Alternative to reduce vehicular congestion and decrease idle emissions.</p>

of the roads that will impact this land will be park roads. These park roads will also serve to help separate local and regional traffic.

The Preferred Alternative places the Eastpark Drive in an east-west alignment between the proposed golf practice area and the proposed multi-purpose soccer fields. It then connects to Carruthers Lane and travels north to a relocated segment of Weldin Road. This portion of Weldin Road connects to Foulk Road at an intersection north of the existing Foulk Road/Weldin Road intersection. For additional information related to land uses, see *Section V.K: Land Use*.

2. Right of Way Requirements and Displacements

Compensation to, and relocation of affected property owners will be conducted in compliance Federal and Delaware laws and regulations including the Eminent Domain Code Act of June 22, 1964 (Public Law 84) as amended, and the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Comprehensive relocation assistance will be provided to the displaced home and business owners who are impacted by this project. Property to be acquired, under advanced acquisition, is compensated for at current fair market value, supplemental housing payments are provided, and some cost associated with property closing, moving, professional services and other items are also covered.

No-Build Alternative

No new right-of-way, property acquisitions or displacements will be required as a result of the No-Build Alternative.

Preferred Alternative

The majority of the new right-of-way required for the Preferred Alternative will come from two large properties located along the east and west sides of U.S. Route 202 between Augustine Cut-Off and Foulk Road. These will be acquired by the State of Delaware's Department of Natural Resource and Environmental Control (DNREC) for recreational use and open space preservation. The property on the west side of U.S. 202, south of Murphy Road is currently owned by DNREC, and the property on the east side of U.S. 202, south of Rockland Road, is currently owned by Al-Zar Associates.

The Preferred Alternative for the Blue Ball Properties Area Transportation Project will require partial right-of-way from approximately five (5) additional properties, they are: the Gulf Station located at U.S. 202 and Murphy Road; Brandywine Plaza, consisting of three (3) separate offices in one complex; the Montchanin Assisted Living Community at Childrens Drive and Route 141; the Porter Reservoir and One Rock Manor Avenue.

Additionally, the Preferred Alternative will also require the full acquisition of one (1) commercial property requiring the demolition of the building. This property, owned by JOK Distributors is located adjacent to the Brandywine Plaza, north of Foulk Road. It is located within Tax Parcel Number 0611000032, and, according to the New Castle County Department of Land Use, has an assessed value of \$206,800.00 as of 1983, when it was last assessed. From the Brandywine Plaza Complex there are approximately 105 parking spaces that will be removed as part of the Blue Ball Properties Area Transportation Project.

As part of this project, DelDOT is committed to transferring DelDOT state right of way lands to the State Park system.

3. Environmental Justice

In December 1998, the Federal Highway Administration issued FHWA Order 6640.23, *FHWA Actions to Address Environmental Justice in Minority Populations and Low Income Populations*. The purpose of the order is to establish policies and procedures for FHWA to use in complying

with Executive Order 12898 dated February 11, 1994 to ensure that environmental justice is achieved. This is accomplished by promoting nondiscrimination in federal programs affecting health and environment, and avoiding any disproportionately high, adverse human health or environmental effects on minority and low-income populations.

In a memorandum from the President of the United States accompanying the issuance of the Executive Order, it is noted that the use of the National Environmental Policy Act of 1969 (NEPA) by federal agencies is an appropriate method for evaluating impacts to such affected communities.

According to the 1990 U.S. Census Bureau (the most up-to-date information available) the total population of the state of Delaware is 666,168 persons. Of this total statewide population, 19.6 percent are minorities (minorities are defined by the U.S. Census Bureau as individuals classified as members of one of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic). The total population of New Castle County is 441,946 persons, 19.5 percent are minorities. The total population of the City of Wilmington is 71,516 persons, 57.7 percent are minorities. The project area is comprised of parts of Census Tracts 108, 116 and 117. The total population of these Census Tracts is 10,716, of which 5.8 percent are minorities.

The median family income of families statewide is \$40,252 annually. Families in New Castle County and Wilmington are \$45,216 and \$31,152 respectively. The median family income of the families living in the Census that comprise the project area is \$71,822.

Field reconnaissance of the project study area and research on the Census Bureau's World Wide Web site <http://www.census.gov/> confirmed that there are no large concentrations of low-income and/or minority populations living within the study area.

The percentage of the population of New Castle County over 65 years old is 11.4percent. This percentage is less than the statewide average of 12.1percent. However, the average percentage of the population of the Census Tracts that comprise the project area over 65 years old is 20.3 percent.

No-Build Alternative

No issues related to environmental justice will occur as a result of the No-Build Alternative since no displacements will take place, nor will any communities be divided as a result of this alternative.

Preferred Alternative

No special considerations as specified under Executive Order 12898 (*Environmental Justice in Minority Populations and Low-Income Populations*) will be required as a result of the Preferred Alternative since no residential relocations will occur. Additionally, the Preferred Alternative will not divide any minority and/or low income communities. Authority for this program is contained in the *Eminent Domain Code Act of June 22, 1964* (Public Law 84); its amending *Act No. 169* (December 29, 1971); and *the Uniform Relocation Assistance and Real Property*

Acquisition Policies Act of 1970, Public Law 91-646 (49 CFR 24), as amended by Public Law 100-17, Uniform Relocation Act Amendments of 1987.

4. Community Cohesion and Services

U.S. 202 divides the study area to the east and west and effectively separates the neighborhoods in these areas, while I95 provides a physical barrier that defines the southern terminus of the study area. Although a certain level of cohesiveness between these neighborhoods does exist, such as some shared community facilities and services, interaction between them is limited due to the presence of these two major highways.

Emergency service providers, as well as local industries, will benefit from the proposed road improvements in the form of reduced response times and more efficient travel through the study area. Additionally, the proposed road improvements will allow local traffic to operate separately from regional traffic creating a safer and more desirable driving environment.

Although the Preferred Alternative does not require the acquisition of the Ronald McDonald House, it will necessitate relocating Delaware Route 141 closer to this facility. As a result, impacts associated with noise, air quality, safety and visual setting have been considered. Given the special circumstances of the children housed at this facility, any potential impacts that can not be avoided must be mitigated. As part of the design phase of this project, noise mitigation and speed controls, as well as landscaping and other aesthetic enhancements have been considered, and if determined effective and feasible, then will be implemented. Coordination with officials from the Ronald McDonald House and DelDOT will continue throughout the design phase of this project to ensure that the appropriate mitigation measures are implemented.

The A. I. DuPont Hospital for Children is a full-service regional pediatric medical center located in the Blue Ball Properties area. It is located south of the Rockland Road/Childrens Drive Intersection. The A. I. DuPont facility is a major employer in the Blue Ball Project area. The proposed roadway improvements will provide improved accessibility to the site. There will be no right-of-way required from the hospital as a result of the proposed improvements. Additionally, the proposed improvements will not require the roadway to be moved closer to the hospital.

Another community improvement to the Blue Ball Area resulting from the proposed action (but not under NEPA or federal compliance) is the proposed park improvements that resulted as part of the Master Plan. As a State of Delaware initiative, “The park will provide users with a balance of passive and active recreational opportunities...” “The park segment west of U.S. 202 is reserved primarily for passive recreation, natural and historic interpretive opportunities, and facilities to detain and improve stormwater runoff from site improvements. The east park segment will be devoted principally to active recreation executed within the context of environmental enhancement and stormwater management of the watershed east of Route 202.” (*Blue Ball Master Plan, January 2001*) The Blue Ball Properties Area Transportation Project was designed in conjunction with the Master Plan for transportation improvements, and therefore provides access to the proposed amenities, providing improvements to the surrounding area.

No-Build Alternative

Existing congested traffic conditions within the study area will continue with the No-Build Alternative. Therefore, access to facilities and services will continue to be hindered with this alternative.

Preferred Alternative

As part of the Preferred Alternative, a series of local roads and pedestrian/bicycle paths (the Greenway) is proposed. This local road network, which will be developed as a series of park roads, will separate local and regional traffic by providing a grade-separated crossing of U.S. 202 for local east/west traffic. Additionally, the existing Greenway to the west of U.S. 202 will be extended to cross under U.S. 202 and connect near the Rock Manor Golf Course. This local road network will also provide improved access to the neighborhoods to the east and west of U.S. 202, and will promote neighborhood interaction by providing a safe and efficient means to cross U.S. 202.

The one business displacement described previously will not affect overall community cohesion. Other local businesses will not be affected adversely by the Blue Ball Area Transportation project, but should instead offer better access and safety to these businesses.

Additionally, as part of the Preferred Alternative, the Weldin-Husbands House will be impacted. This impact should not affect overall community cohesion. The locally considered historic resource may be relocated and renovated. However, further feasibility and structural capabilities will be deciding factors if this decision is undertaken. Overall community cohesion should not be affected because the access that is provided through the local road network does not change.

B. Historic and Archaeological Sites

Historic Properties

The identification and evaluation of historic properties, as defined under Section 106 of the National Historic Preservation Act and implementing regulations, 36CFR§800, has been completed within the area of potential effect (APE) for the Blue Ball Properties Area Transportation Improvement Project. The Area of Potential Effect (APE) was established in consultation with DelDOT, FHWA, the Delaware State Historic Preservation Officer (SHPO), and additional Consulting Parties under Section 106. Properties eligible for listing in the National Register of Historic Places have been identified. The Identification and Evaluation Survey under 36 CFR part 800.4, has two components, one for architectural resources and one for archaeological resources.

Previous and Current Identification and Evaluation Surveys

Previous identification and evaluation surveys have been conducted within portions of the APE for earlier transportation and private development projects. A bibliography of existing Cultural Resource Documentation was prepared by John Milner Associates, Inc.

An historic resources survey was conducted for the proposed Blue Ball Properties Area Improvement Project. The purpose of this survey was to identify all buildings and structures, fifty years in age or older, situated within the Area of Potential Effect (APE) for the project. Previous studies conducted within the APE resulted in the identification of seven (7) properties listed or eligible for inclusion in the National Register of Historic Places (NRHP), one of which is **Lombardy Hall**, a National Historic Landmark (NHL). The **Concord Pike Milestone** has been relocated a number of times and can easily be temporarily placed in storage during construction and can be relocated in the same vicinity. The remaining five (5) listed or eligible NRHP resources include; **One Rock Manor Avenue, 13 Rock Manor Avenue, Blue Ball Barn, Bird-Husbands House**, and the **William Murphy House** (of which, the last three are contributing elements to the Nemours Historic District). Recent fieldwork resulted in the identification of six (6) additional resources within the project's APE, meeting the fifty-year criteria. The National Register Criteria for Evaluation were then applied to these six (6) resources, resulting in the identification of three (3) additional resources recommended eligible for listing in the NRHP; **“Wartime” Deerhurst, Porter Reservoir** and the **Jewish Community Cemetery**. Verbal concurrence was received from the State Historic Preservation Office at the January 24, 2001 meeting (*Table V-2*) (*Figure 27*).

Identification of Architectural Resources

The survey of architectural resources includes the identification and evaluation of all buildings, structures, objects, and districts eligible for the National Register of Historic Places within the APE. Eight (8) architectural resources have been identified as being eligible for or listed in the National Register of Historic Places. These include:

1. *(N-14008) Nemours Historic District* - contributing elements to the Nemours Historic District include:
 - A. *(N-4048) Blue Ball Barn* - Included as part of the Nemours Historic District, the Blue Ball Barn is part of the property that was owned by one of the most prominent families in Delaware, the duPonts. Alfred duPont and his wife, Jessie Ball duPont owned the Nemours Mansion, constructed c. 1910, located on Rockland Road.
 - B. *(N-594) Bird-Husbands House* - The Bird/Husbands House was built c.1809 soon after William Bird purchased the property. The house was subsequently sold to Andrew Husbands c.1868 and around that time a large addition was built, which is now the main part of the house. Alfred I. duPont purchased the house c.1908 and it was used to house workers for his estate. The house is also significant as an example of 19th century vernacular architecture.
 - C. *(N- 544) William Murphy House* - Constructed c.1840, the William Murphy House is significant as an example of Greek Revival architecture and is related to the agricultural development of the Blue Ball Properties Area. The building was also acquired by Alfred I. duPont and used as housing for workers on his estate, Nemours.

2. ***(N-14003) Porter Reservoir*** –The Porter Reservoir is a complex of buildings and structures built from c.1907 to c.1990. The facility represents a trend in public works of creating aesthetic spaces in conjunction with functional engineering facilities. Located in a suburban environment, the reservoir is along Concord Pike just north of the City of Wilmington near the Augustine Cut-Off. The complex is accessed by a driveway on the Concord Pike that is marked by a pair of pillars.

Inside the driveway divides and forms an oval shape which leads to the front of the filter plant building. There is also a road leading to the facility from Carruthers Lane that crosses the Rock Manor Golf Course. In 1921, the golf course was built on the grounds of the reservoir.

Some plans for the reservoir drawn prior to 1921 refer to the land that is now occupied by the course as parkland. When the golf course was opened it was known as the Porter Reservoir Golf Course. After its establishment, the golf course took over some of the buildings formerly used at the reservoir. The second story of the gatehouse/laboratory, for example, served as the original clubhouse for the golf course. Also a maintenance building now used by the course was originally designed for use as a reservoir storage building.

The main building on the grounds of the complex is the filter plant. Related outbuildings include the original gate house/laboratory, a storage building/garage, a chemical storage building, a pumping station, a sampling/metering building, a cable television shed, and a cellular telephone transmission shed. Structures include the reservoir, a clarifloculator facility, a modern water tower and an electrical substation. There is also an underground reservoir that stores approximately 7.5 mg (million gallons) of filtered water. The condition and integrity of the Porter Reservoir property are excellent. This property has been recommended for eligibility with the National Register of Historic Places.

3. ***(N-13802) “Wartime” Deerhurst*** - This portion of the Deerhurst suburban residential community is located north of the City of Wilmington on the southeast corner of Murphy Road and U.S. 202 (Concord Pike). The majority of the houses are Colonial Revival in style and were built c. 1943. There are approximately 109 homes in this section of the community. Deerhurst was built in three (3) stages. The plans for the “Wartime” section, located in the western part of the neighborhood, were completed by September, 1942. Located along Peirce Road, York Road, Murphy Road, U.S. 202 and Hurst Road, these houses were part of the second stage of development.

Legend

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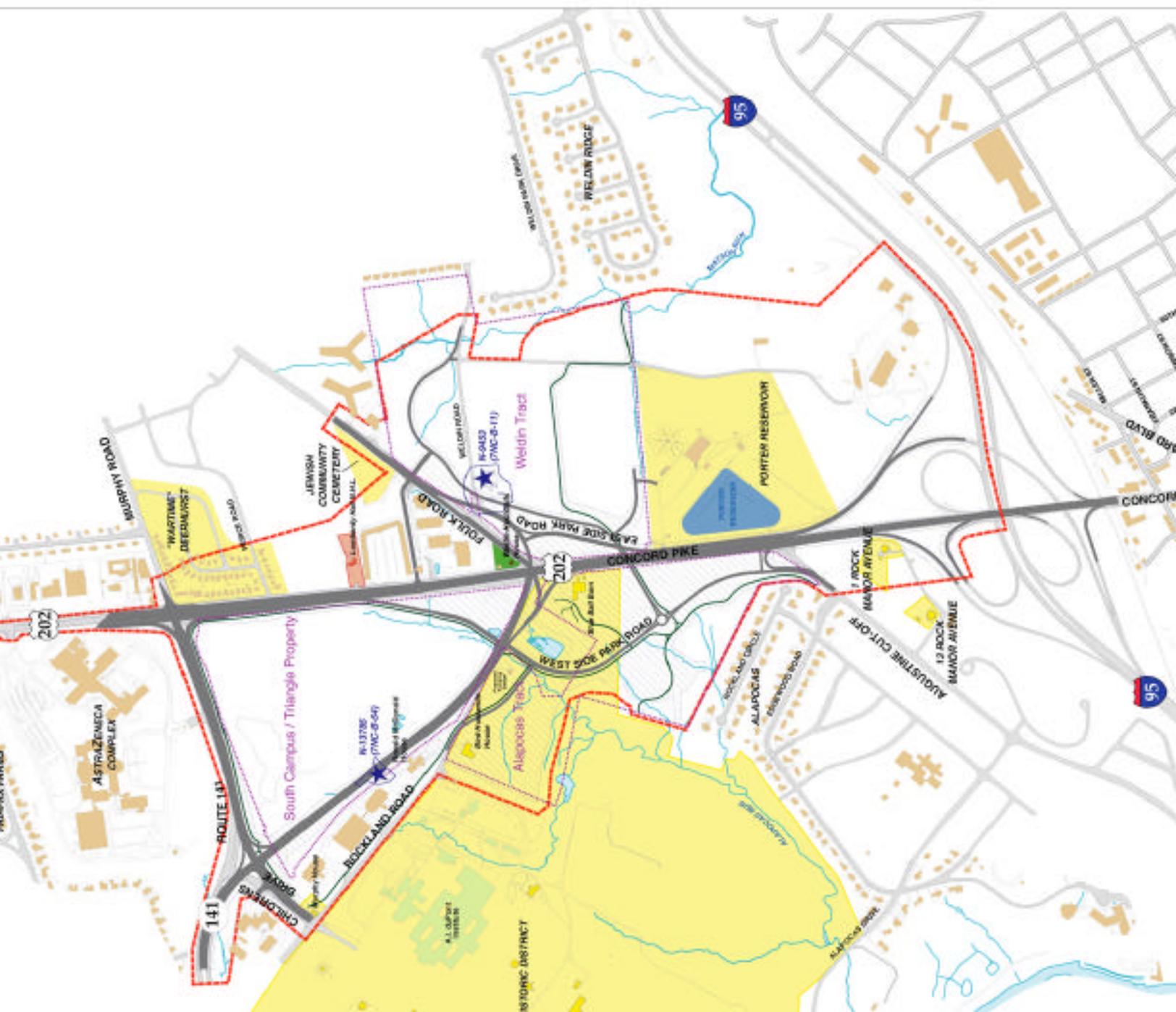


FIGURE 27: CULTURAL RESOURCES

Three lots of “Wartime” Deerhurst were set aside for commercial use. The commercial lots are located along the eastern side of Concord Pike just south of the intersection with Murphy Road. These commercial buildings were built in a row and share common walls. They still exist and retain historic integrity. A gas station built in the mid 1930s was located at the southeast corner of Concord Pike and Murphy Road. It was constructed prior to the development of Deerhurst and is currently a Cingular Wireless retail store. It has lost nearly all of its historic integrity and no longer appears to be a 1930s building. Between the row of the three commercial buildings and the Cingular Wireless building is a small rectangular building that was built, according to a date stone, in 1962. It also does not contribute to the historic significance of the neighborhood since it was not present during the period of significance.

Deed restrictions controlling additions and alterations to houses in “Wartime” Deerhurst have been in effect and enforced since the early part of the neighborhood’s history. As a result of the deed restrictions, the historic integrity has been retained and the condition of the neighborhood is excellent.

4. **(N-491) Lombardy Hall** - Lombardy Hall was built c. 1750. It was originally called “Pizgah” and was owned by Charles Robinson. Gunning Bedford, Jr. acquired the 250-acre farm c.1785. By 1793, he had renamed the structure Lombardy Hall. Gunning Bedford, Jr. was prominent in Delaware politics during the late 1700s. In addition, he was a signer of the Constitution. After his term as the Attorney General of Delaware from 1784-1789, President Washington appointed him federal district judge for the State. He occupied this position until his death in 1812. This resource is a National Historic Landmark, which must also be considered under Section 110 of the National Historic Preservation Act.
- 5/6. **(N-12673) One Rock Manor Avenue** – The subdivision that One Rock Manor Avenue is situated in was begun c.1910 and was never completed. Six (6) original properties were built, of which five (5) are still extant. Included in this subdivision, and previously determined eligible for listing in the National Register of Historic Places also is the **(N-12676) 13 Rock Manor Avenue**.
7. **(N-12684) Concord Pike Milestone** - A granite milestone, situated on the northwest corner of Rockland Road and Concord pike (U.S. 202) has the inscription “2 To W”, informing past travelers that they were two (2) miles from Wilmington. The Wilmington and Great Valley Turnpike, known today as Concord Pike (U.S. 202), received its charter in 1811, and the Delaware portion was completed prior to the Pennsylvania portion. The entire roadway, which connected West Chester, Pennsylvania and the Great Valley with the Port of Wilmington, was completed in 1818. The exact date of erection of the milestone is unknown. Best records indicate that it was placed next to the new roadway between 1811 and 1818, when the turnpike was established.
8. **(N-14004) Jewish Community Cemetery** - The Jewish Community Cemetery began with individual synagogues “renting” space in the Lombardy Cemetery. Eventually an association was formed and the Jewish cemetery split off c.1952. The first synagogue to acquire space in the Lombardy Cemetery was the Orthodox Adas Kodesch Congregation

in 1890. Prior to this acquisition, the Moses Montefiore Mutual Benefit Society had established the first Jewish Cemetery in Wilmington. By 1910, the graves were transferred to the Lombardy Cemetery. After that several other sections were created including the Chesed Shel Emeth Congregation c.1902, the Workman's Circle Branch 69 Organization c.1909, the Beth Shalom Congregation c.1924, and the Farband Labor Zionist Order. Along with a few additions and some of the sections merging, there are currently three sections in the Jewish Community Cemetery.

No-Build Alternative

Implementation of the No-Build Alternative will have no effect on historic resources in the project area.

Preferred Alternative

The Preferred Alternative required a review of existing architectural resources in the project area to determine eligibility of the properties (*Table V-2*).

A Historic Resources Survey/Determination of Eligibility Report was submitted to the Delaware State Historic Preservation Office (SHPO) on October 30, 2000. Verbal concurrence was received from the SHPO at a January 24, 2001 meeting.

A draft Determination of Effect/ Case Report has been prepared and submitted to the SHPO and other Section 106 consulting parties for review and concurrence. Concurrently, a Memorandum of Agreement in draft form has been prepared and submitted for review and for mitigation options and regulatory compliance.

Archaeological Resources

Previous Archaeological Field Work Within the Area of Potential Effect (APE)

Much of the APE has been tested for other transportation projects or private developers. Sixteen archaeological resources have been identified previously within the APE. Information concerning each site is summarized below.

Of the 16 sites, three (3) sites within the project APE were determined to need further testing to determine eligibility status. The three sites were 7NC-B-54, 7NC-B-49, and 7NC-B-11. The previously identified archaeological resources within the APE for this project are listed below.

N-544 (7NC-841), William Murphy House Site: The William Murphy House is a contributing element to the Nemours Historic District. Archaeological testing of the property associated with the house has shown that the archaeological component of this property does not have the potential to provide significant information (Thunderbird 1997). Therefore, the archaeological component does not contribute to the National Register property.

**Table V-2
Listed/Eligible/Recommended Properties**

Historic Resource	Listed/Eligible/ Recommended	Eligibility Criteria
Nemours Historic District (N-14008) •William Murphy House (N-544) •Bird-Husbands House (N-494) •Blue Ball Barn (N-4048)	Eligible	Criteria A, B and C Contributing resource Contributing resource Contributing resource
Porter Reservoir (N-14003)	Eligible*	Criterion C
“Wartime” Deerhurst** (N-13802)	Eligible*	Criteria A and C
Lombardy Hall (N-491)	Listed	National Historic Landmark
1 Rock Manor Avenue (N-12673)	Eligible	Criterion C
13 Rock Manor Avenue (N-12676)	Eligible	Criterion C
Concord Pike Milestone (N-12684)	Listed	Criterion A
Jewish Community Cemetery (N-14004)	Eligible	Criterion A
Blue Rock Farmhouse (N-1177)	Not Eligible*	N/A
Lombardy Cemetery (N-14005)	Not Eligible*	N/A
Rock Manor Golf Course (N-9405/N-14006)	Not Eligible*	N/A

* = Per verbal concurrence at the January 24, 2001 meeting, pending written concurrence from the SHPO.

N-494 (7NC-B-16), Bird-Husbands House Site: The Bird-Husbands House is a contributing element to the Nemours Historic District. Archaeological testing of the property associated with the house has shown that the archaeological component of this property does not have the potential to provide significant information (Thunderbird 1989). (Thunderbird conducted additional work in this area in 1998 and found no significant archaeological deposits [Dan Griffith, personal communication, 2000].) Therefore, the archaeological component does not contribute to the National Register property. The SHPO concurred with this on March 23, 1988.

N-542 (7NC-B-22), Blue Ball Tavern Site: This site was determined to be eligible for the listing in the National Register. Data Recovery excavations have occurred and the site no longer exists (Thunderbird n.d.). Therefore, it will not be considered during the development of this project.

N-545/N-4017 (7NC-B-17), Sweeny Site: This was identified by Thunderbird (1989). On March 23, 1988, the SHPO concurred that this site is not eligible for the National Register.

N-546, T. Husbands Site, 1301 Rockland Road: This was identified by Thunderbird (1989). On March 23, 1988, the SHPO concurred that this site is not eligible for the National Register.

N-10939 (7NC-B-10), Smithy Site: This was identified by Thunderbird (1989). On March 23, 1988, the SHPO concurred that this site is not eligible for the National Register.

N-10940 (7NC-B-12), Concord Pike Site: This was identified by Thunderbird (1989). On March 23, 1988, the SHPO concurred that this site is not eligible for the National Register.

N-10941 (7NC-B-13), Alapocas Run Site: This was identified by Thunderbird (1989). On March 23, 1988, the SHPO concurred that this site is not eligible for the National Register.

N-10942 (7NC-B-14), Matsons Run Site: This was identified by Thunderbird (1989). On March 23, 1988, the SHPO concurred that this site is not eligible for the National Register.

N-10943 (7NC-B-15), Rock Manor Site: This was identified by Thunderbird (1989). On March 23, 1988, the SHPO concurred that this site is not eligible for the National Register.

N-13783 (7NC-B-52), DuPont Tenant Houses: This site was identified by JMA (2000). Archaeological testing has shown that the site does not have the potential to provide significant information and is therefore not eligible for the National Register.

N-13784 (7NC-B-53), Triangle Woods Site: This site was identified by JMA (1999). The SHPO concurred with the ACOE's determination that this site is not eligible for listing in the National Register in a letter dated April 26th, 2000. Although the site is located within the APE for this project, no ground disturbing activities will occur in or near the site. Since the project does not have the potential to affect this site, due to the nature of the resource and the project activities, no further evaluation of this site is necessary for this project.

N-13786 (7NC-B-55), Milner Site 2: This site was identified by JMA (1999), and additional Phase II studies were undertaken, although the work was concluded without JMA having made a recommendation as to the site's eligibility. (It was determined that the site fell outside of the APE of the AstraZeneca project, for which the work was being undertaken.) Although the site is located within the APE for this project, no ground disturbing activities will occur in or near the site. Since the project does not have the potential to affect this site, due to the nature of the resource and the project activities, no further evaluation of this site is necessary for this project.

N-13785 (7NC-B-54), Ronald McDonald House Site: This site was found by JMA (1999). A Phase II Archaeological Evaluation was completed at this site to determine whether it was eligible for listing in the National Register of Historic Places. The results are summarized below.

N-13717 (7NC-B-49), Augustine Cutoff Site: This site was identified by Thunderbird (2000). The site was considered to be potentially eligible for the National Register of Historic Places. A Phase II Archaeological Evaluation was completed at this site. The results are summarized below.

N-9453 (7NC-B-11), Weldin Plantation: This site was identified by Thunderbird (1989). The site was considered to be potentially eligible for the National Register of Historic Places. A

Phase II Archaeological Evaluation was completed at this site. The results are summarized below.

Results of the Phase I Archaeological Identification Testing

An Archaeological Identification Survey (Phase I) was completed for portions of the proposed APE to identify archaeological resources, per 800.4(b). The surveys were conducted in accordance with the Delaware SHPO's guidance *Guidelines for Architectural and Archaeological Surveys in Delaware, A Management Plan for Delaware's Prehistoric Cultural Resources*, and *Management Plan for Delaware's Historical Archaeological Resources*.

No additional archaeological sites were identified during the Phase I Archaeological Identification Survey.

Results of the Phase II Archaeological Evaluation Testing

As a result of the Phase II Archaeological Evaluation Testing, 7NC-B-11 and 7NC-B-54 were determined to be eligible for listing in the National Register of Historic Places. 7NC-B-49 was determined to be not eligible.

7NC-B-11 (the Weldin Plantation): This site is a historic farmstead that may date to the early eighteenth century and was occupied until the mid-20th century. The site was identified previously and is discussed in greater detail in *Archeological Investigations of the Proposed Dualization of Route 141 (Centre Road), From Route 100 (Montchanin Road) to U.S. Route 202 (Concord Pike), New Castle County, Delaware*, Thunderbird Archeological Associates, Inc., 1989.

The site may date to the 1720s, and so would have been occupied throughout each of the periods described in the *Management Plan for Delaware's Historic Archaeological Resources*. During the Exploration and Frontier Settlement Period, the *Management Plan* indicates that dispersed English farmsteads are located along the major creeks. Information relating to domestic economy, manufacturing and trade, landscape interaction, and social group identity, behavior, and interactions might be obtainable from excavations at this site.

The Intensified and Durable Occupation Period continues to provide a context for domestic economy for farmsteads that may have slaves or indentured servants. The evolution of the site throughout the Transformation from Colony to State, Industrialization and Capitalization, and Urbanization and Suburbanization Periods may allow a unique opportunity to compare the occupation of one site during the eighteenth, nineteenth, and twentieth centuries. The property was owner occupied at various times throughout its history and tenant occupied during other times. Comparison of different occupations, with presumed differences in economic status, may provide important data concerning socioeconomic patterns throughout the history of this site. The SHPO concurred with the determination that the site is eligible during a meeting held January 26, 2001.

7NC-B-54 (Ronald McDonald House Site): This site is considered to be eligible for the National Register of Historic Places due to the Ronald McDonald House Site's apparent depositional integrity and Piedmont setting. The site dates to the Woodland I Period and appears to have been utilized repeatedly during that period for wetland related resource procurement. It was probably plowed only lightly during the early historic period. The site retains excellent integrity and may provide significant information on micro-behavior. The SHPO and DelDOT agreed that the site is eligible during a meeting held January 26, 2001.

(7NC-B-49) the Augustine Cut-Off Site: This site is an early 20th century residential property. The site is discussed in *Phase I Archeological Investigations for the Proposed Augustine Cut Off, New Castle County, Delaware*, Thunderbird Archeological Associates, Inc., 2000. Phase II Archeological Evaluation Testing demonstrated that the location of the majority of the structures on the site is underneath existing SR 0202. SR 0202 has been widened to the west since the houses were demolished. Therefore, the site is not considered to be eligible for the National Register of Historic Places. The SHPO concurred with this determination during a meeting held January 26, 2001.

No-Build Alternative

The eligible archaeological sites in the Blue Ball Properties Area Transportation Project will not be impacted in the No-Build Alternative. Some of the sites, however, may be vandalized and further degradation to the ruins at the Weldin Plantation site may occur due to neglect.

Preferred Alternative

The Preferred Alternative option places the Eastpark Drive in an east-west alignment between the proposed golf practice area and the proposed multi-purpose soccer fields, north of the hedgerow. It then connects to Carruthers Lane and travels north to a relocated segment of Weldin Road. This portion of Weldin Road connects to Foulk Road at an intersection north of the existing Foulk Road/Weldin Road intersection. This alternative is consistent with the impacts of the Master Alternative to the Nemours Historic District; described on page 42, **Section D**. This option is consistent with the impacts of the J.R. Weldin Archaeological Site Avoidance Alternative B described on **page 44, Section 5**.

Results of Park Study

The proposed State Park's Master plan has been reconfigured to minimize impacts to the J.R. Weldin Archaeological Site. A concrete retaining wall has also been added between Route 141 and the archaeological ruins, so that none of the ruins will be displaced. (**Figure 28**)

Two options that looked at the location of the Eastpark Drive alignment were reviewed, Option A and Option B.

Eastpark Drive Option A – (Figure 28) This option places the Eastpark Drive in an alignment parallel with the U.S. 202 off ramp. It passes through a portion of the J.R. Weldin Archaeological Site, displacing a portion of the ruins. The Eastpark Drive then connects to relocated Weldin Road with an intersection east of Foulk Road. This option is consistent with the J.R. Weldin Archaeological Site Minimization Alternative.

While Option A is currently consistent with the Blue Ball Properties Master Plan, this option would result in the following impacts;

- Displacement of a portion of the ruins at the J.R. Weldin Archaeological Site. Specifically, the Eastpark Drive would destroy 18th century farmhouse ruins which occupies the western portion of the site. Some associated rock walls and features such as the equipment shed would also be destroyed. Other features of the site would remain, including the barn ruins and a perimeter rock wall (Phase III archaeological data recovery would mitigate portions of the site to be destroyed).

Eastpark Drive Option B – This option places the Eastpark Drive in an east-west alignment between the proposed golf practice area and the proposed multi-purpose soccer fields, north of the hedgerow. It then connects to Carruthers Lane and travels north to a relocated segment of Weldin Road. This portion of Weldin Road connects to Foulk Road at an intersection north of the existing Foulk Road/Weldin Road intersection. This option is consistent with the J.R. Weldin Archaeological Site Avoidance Alternative B described on page 61.

Results of Park Study

Currently, there is an evaluation of the proposed State Park's Master plan which evaluated the spatial arrangement of the parks facilities. The analysis will determine if all plan facilities can be reconfigured with in the same land cover such that the Eastpark Drive (Option B) could be incorporated. If the proposed park plan features are compromised or minimized in safety, spatial arrangement and function, this option will be dismissed. If functions can be rearranged such that all of the features conform to the parks plan, this option may be retained.

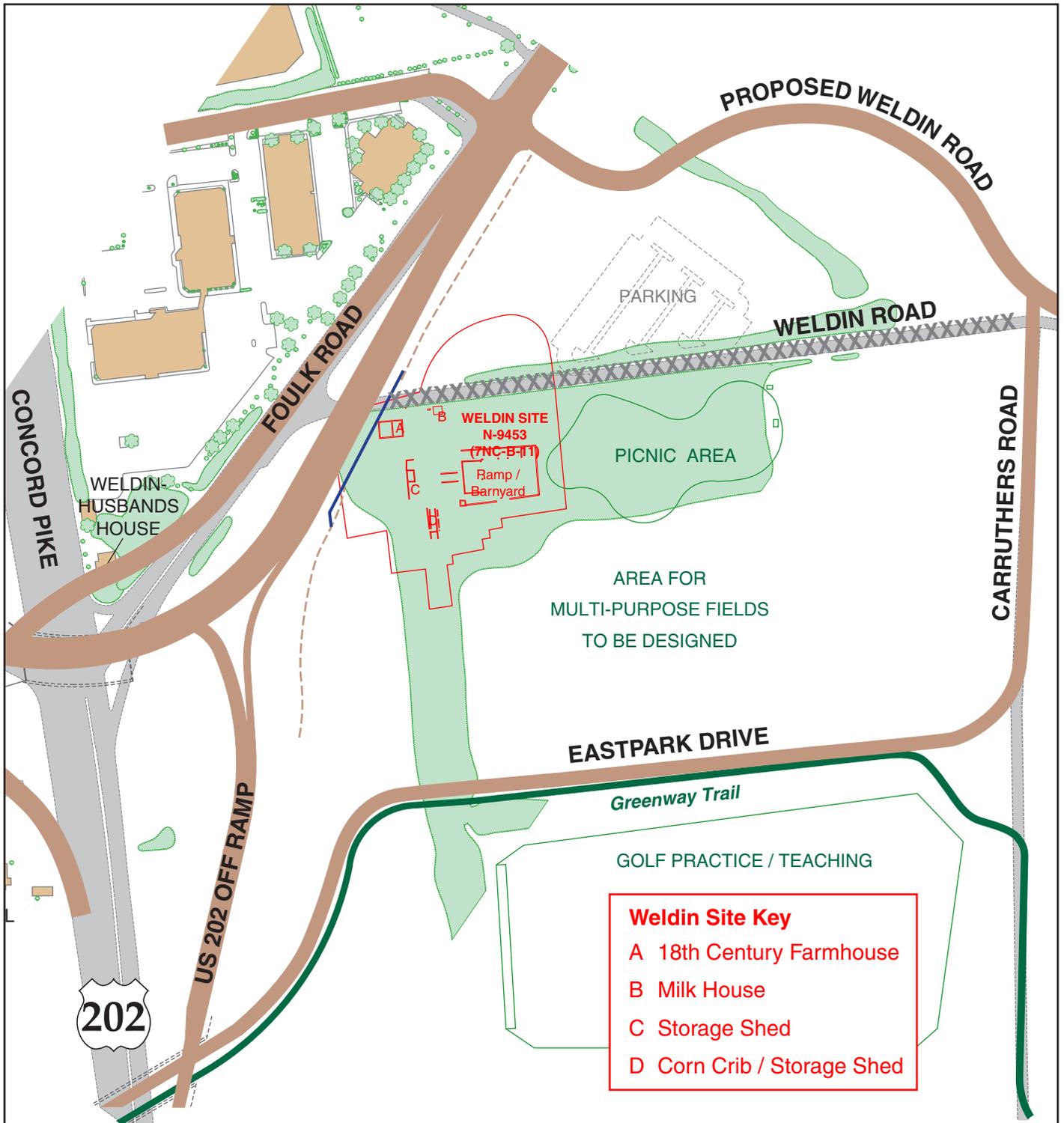
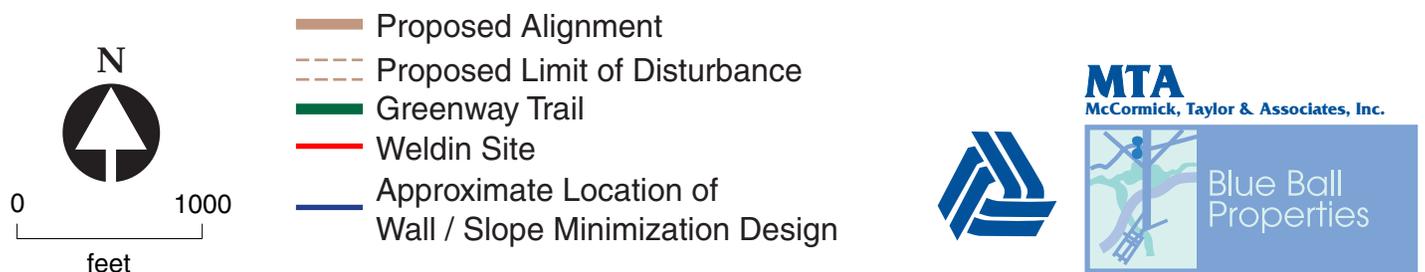


FIGURE 28: MINIMIZATION OF IMPACTS TO J.R. WELDIN ARCHAEOLOGICAL SITE



C. Air Quality

Air quality became a national concern in the mid-1960s, leading to the passage of the Air Quality Act in 1967. Following the passage of the Federal Clean Air Act Amendments of 1990 (CAAA90), states were mandated to implement additional steps to reduce airborne pollutants and improve local and regional conditions. Automobile emissions have been identified as a critical element in attaining federal air quality standards for carbon monoxide (CO) and ozone (O₃).

Highway agencies are required to consider the impacts of highway projects on both a local and regional level. Regional air quality is assessed by evaluating potential ozone (O₃) concentrations and reductions in relation to emission budgets identified by the State Implementation Plan (SIP). This assessment is performed by regional planning commissions and documented in the Transportation Improvement Program (TIP). The regional air quality assessment is documented below in the Conformity Evaluation.

Generally, local air quality is assessed on a micro-scale, by evaluating CO concentrations at the project level. CO is a colorless, odorless, poisonous gas considered to be a serious threat to those who suffer from cardiovascular disease. High concentrations of CO tend to occur in areas of high traffic volumes or areas adjacent to a stationary source of the pollutant. CO emissions are associated with the incomplete combustion of fossil fuels in motor vehicles and are considered to be a good indicator of vehicle-induced air pollution.

The purpose of this study is to identify and evaluate “worst-case” CO concentrations within the project corridor. Since the atmosphere is a complex system, it would be difficult to use short-term air quality monitoring to establish existing maximum levels. Therefore, the study process relies on computer modeling to assess both existing and future conditions. For the purposes of this assessment, air quality projections were made for existing (2000) and design (2010) years of the project.

The air quality modeling approach includes the use of two computer programs. Based on traffic data and historic climatic data, CO emissions were calculated using the US EPA MOBILE5b computer model. The MOBILE5b computer model is documented in the *User's Guide to MOBILE5* (EPA-AA-TEB-94-01), May 1994. The projected worst-case CO emission rates were then applied to the CAL3QHC computer model. This program is used to determine dispersion of CO from highway sources to air quality sensitive receptors by representing the geometric relationship between roadways and receptor sites. Factors taken into account in this model include pollutant source strength, wind speed, wind angle, atmospheric stability, roadway length and width, surface roughness, vehicle volume, emission factor, and background CO concentrations. This program is fully documented in the *User's Guide to CAL3QHC, Version 2.0* (EPA-454/R-92-006), September 1995.

After applying the modeling process to predict existing (2000) and design year (2010) CO concentrations, these levels were compared to the *National Ambient Air Quality Standards* (NAAQS) for CO. These standards are 35 parts per million (ppm) and 9 ppm for the second

highest one-hour and eight-hour periods, respectively. These standards have been designed and adapted in an effort to protect public health and welfare.

The air quality modeling analysis was performed in accordance with methodology identified in US EPA's *Guideline for Modeling Carbon Monoxide From Roadway Intersections* (EPA - 454/R-92-005), November 1992. Initially, each of the existing and future signalized intersections were evaluated and ranked in terms of existing and future levels of service and total traffic volumes. Based on this ranking, the existing and future intersection of U.S. 202/Murphy and Powder Mill Roads (in the northern section of the project area) was identified as a representation of worst-case CO conditions within the project corridor. Therefore, the modeling analysis focused on this intersection as an indicator of worst-case CO concentrations for the project.

Existing roadway (2000) and future, design year (2010) build conditions were modeled using Mobile 5b and CAL3QHC programs to determine worst-case CO concentrations within the project area. Predictions were made at year 2000 conditions as well as for the design year build option. Consistent with EPA guidance, 32 receivers were placed adjacent to this intersection to represent worst-case areas of human exposure. Receivers were placed approximately three meters (10 feet) from the edge of travel lanes to represent sidewalk locations adjacent to the existing and future intersection. **Figure 29** identifies the locations of the receiver sites evaluated in the modeling analysis.

The air quality models were designed to replicate traffic operations associated with the existing and future build conditions. Both free flow links and intersection areas were modeled under existing and projected traffic conditions. As stipulated by US EPA's *Guideline for Modeling Carbon Monoxide From Roadway Intersections*, each receptor represents an area where the public would have continuous access to the immediate vicinity. The greatest concentrations of CO tend to occur in the winter months, when automobiles experience incomplete combustion of fuel, due to low temperatures. For this reason all modeling was performed to represent winter conditions. As stipulated in EPA guidance, a background CO concentration of 2.0 ppm was assumed and added to those CO levels predicted by computer modeling to predict total CO levels in the area.

Existing Conditions

The existing (2000) CO concentrations were projected using the modeling techniques described above. Worst-case traffic operations and atmospheric conditions were incorporated to predict existing, worst-case CO concentrations. The worst-case, one-hour CO concentrations modeled for the existing year (2000) are projected to range from 2.6 ppm to 5.2 ppm, with the highest CO concentrations (of 5.2 ppm) predicted in the southeast quadrant of the intersection, adjacent to the Deer Hurst Residential community. Using a persistence factor of 0.7, eight-hour CO levels are projected to range from 2.4 to 4.2 ppm. The worst-case one-hour and eight-hour concentrations predicted at this intersection are well below the one-hour (35 ppm) and eight-hour (9 ppm) NAAQS for CO.

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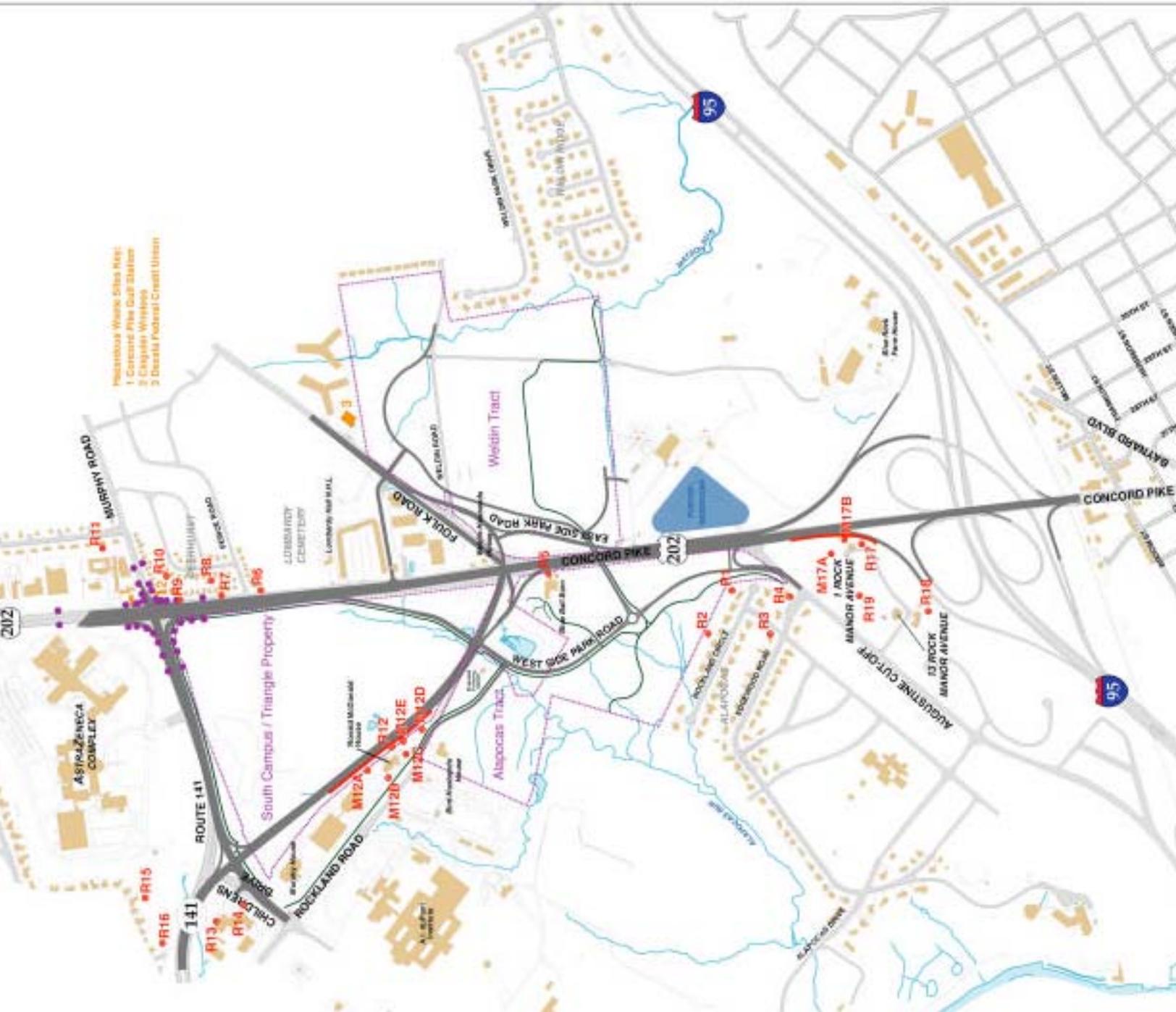
HAZARDOUS WASTE

Legend

- Air ●
- R8 ⊕
- Nc ■
- Po ■
- Pc —
- Gr —
- Pr —
- Bl —

Description

Site Number	Description
R-1	Resid
R-2	Resid
R-3	Resid
R-4	Resid
R-5	Histor
R-6	Resid
R-7	Resid
R-8	Resid
R-9	Resid
R-10	Resid
R-11	Resid
R-12	Resid
R-13	Resid
R-14	Resid
R-15	Resid
R-16	Resid
R-17	Resid
R-18	Resid
R-19	Resid



Hazardous Waste Sites Key:
 1 Concord Pike Gulf Station
 2 Chrysler Wreckage
 3 Deasala Federal Credit Union

FIGURE 29: AIR/ NOISE/HAZ WASTE

No-Build Alternative

Future conditions under the No-Build Alternative will continue to worsen as traffic congestion increases.

Preferred Alternative

Future air quality conditions were evaluated using the methodology and procedures described above. The proposed roadway and intersection improvements were incorporated into the air quality models to predict future, design year (2010) CO levels with the proposed in place and in use. Design year, peak-hour traffic volumes and operations were incorporated into the model to reflect worst-case CO predictions. The results of the future conditions model indicate that the worst-case, one-hour CO concentrations modeled for the design year (2010) are projected to range from 2.5 ppm to 4.7 ppm, with the highest CO concentrations (of 4.7 ppm) predicted in the southeast quadrant of the intersection, adjacent to the Deer Hurst Residential community. Using a persistence factor of 0.7, eight-hour CO levels are projected to range from 2.4 to 3.9 ppm. The worst-case one-hour and eight-hour concentrations predicted at this intersection are well below the one-hour (35 ppm) and eight-hour (9 ppm) NAAQS for CO.

By comparing these design year CO concentrations to existing levels, slight reductions in CO are anticipated. While increases in traffic volumes are anticipated in the future, the increase in traffic volume is offset by the reduction in CO emissions (associated with cleaner running vehicles and refined fuel source requirements in the future), as well as the increased capacity associated with the proposed intersection improvements. Therefore, the proposed project is anticipated to lead to improvements to local air quality conditions. Since no air quality impacts are anticipated, no mitigation measures are necessary.

Conformity Analysis

The project has also been evaluated related to regional air quality concerns. The *Clean Air Act Amendments* (CAAA) of 1990 mandate improvements to the nation's air quality. The final conformity regulations promulgated by the US EPA in 1993, as part of 40 CFR Part 51, require transportation plans and programs conform with the State Implementation Plan (SIP). The final conformity rule requires that transportation plans in ozone non-attainment areas are consistent with the most recent estimates of mobile source emissions; provide for the expeditious implementation of transportation control measures in the applicable implementation plan; and contribute to annual emission reductions in ozone and carbon monoxide non-attainment areas.

Based on the CAAA and most recent EPA classifications, New Castle County has been designated as severe non-attainment for ozone; therefore, the conformity requirements apply to this project. The conformity analysis performed as part of the Wilmington Area Planning Council (WILMAPCO) 2025 Plan for the Metropolitan Transportation Plan (Long Range Plan) included the Delaware 141 Improvement Project. The Metropolitan Transportation Plan was approved by WILMAPCO council on February 23, 2000. The 2001/2003 Transportation Improvement Program (TIP) was adopted by WILMAPCO in March 2000. This conforming TIP was approved by US DOT (FHWA and FTA) on April 13, 2000. Therefore, the Delaware 141 Project is considered part of a conforming TIP/SIP, and has met all conformity requirements, as outlined by the CAAA of 1990.

D. Noise

Impacts associated with noise are a prime concern when considering roadway improvement projects. Roadway construction at a new location or even improvements to the existing transportation network may cause negative impacts to the noise sensitive receptors located adjacent to the project area. For this reason, the FHWA and DelDOT have established a noise analysis methodology and noise level criteria to assess the potential noise impacts associated with the construction and the use of transportation projects.

The following methodology was used to assess the noise impacts associated with the relocation of Delaware Route 141 and the widening of US Route 202. First, the project area was studied to determine the locations of noise sensitive receptors. Category B noise sensitive receptors are of greatest concern when assessing transportation related noise levels. Category B receptors include, but are not limited to, residences, hospitals, motels, hotels, schools, recreational areas, parks, and places of worship.

The selected representative sensitive noise receptors were then monitored to determine the existing ambient noise conditions and propagation characteristics throughout the project area before the introduction of the proposed roadway improvements. Following the completion of noise monitoring, the project area was modeled using the FHWA Traffic Noise Model (FHWA TNM7) to simulate existing and future noise conditions throughout the corridor. The FHWA TNM7 computer model is the current FHWA approved noise model for predicting and assessing highway-related noise levels. The existing (2000) model calibration results (using traffic data recorded during the monitoring process) were compared to the monitored levels to determine if the model provided an accurate representation of the actual existing conditions throughout the project area. After the existing conditions model was verified, additional modeling was performed for existing conditions using worst-case traffic data supplied by the project traffic engineers. Following a thorough evaluation of existing conditions, the proposed improvements were incorporated to predict the future noise levels at each receptor with the proposed roadway widening in place and in use. Future noise projections were made for the year 2010, the design year of the project. The design year noise levels were then compared to the appropriate Federal and State Noise Abatement Criteria (NAC) to determine the extent and degree of future noise level impacts. Where noise impacts were identified, abatement measures were considered.

Highway noise impact assessment procedures, noise abatement procedures, and noise abatement criteria used throughout this study are in accordance with the DelDOT Transportation Noise Policy. DelDOT guidelines are based on the U.S. Department of Transportation, FHWA, Federal Aid Policy Guide 23 Code of Federal Regulations (CFR) Part 772.

No-Build Alternative

Under the No-Build Alternative, peak hour traffic volumes will increase above existing levels and travel speeds would be expected to decrease due to the effects of traffic congestion. Therefore, noise levels for the No-Build Alternative may decrease during the peak traffic hours.

Preferred Alternative

The selection of sensitive receptors was guided by the locations of the proposed roadway improvements, including the widening of U.S. Route 202, the relocation of Delaware Route 141, and the addition of local roads and connector ramps. In order to determine the existing noise conditions within the project area, noise monitoring was conducted at 19 representative noise-sensitive receptor sites. **Figure 29** shows the project area and the locations of the 19 noise monitoring sites. **Table V-3** provides a description of the noise monitoring receptor sites.

TABLE V-3
Existing Monitored Noise Levels

Site Number	Description	Existing Noise Level
R1	Residence – 2 Rockland Lane, side yard behind driveway	54.6
R2	Residence – Behind 106 Rockland Circle	55.9
R3	Residence – 101 Edgewood Road	54.5
R4	Residence – Entrance to Alapocas along Edgewood Road	61.1
R5	Historic Barn site along 202	68.8
R6	Residence – 1681 Peirce Road, Deerhurst Development	68.7
R7	Residence – 1689 on route 202	71.5
R8	Residence – 5 York Road, back left corner of property	56.5
R9	Residence – Between 1697 and 1699 on 202	66.7
R10	Residence – Between 19 York Road	56.2
R11	Residence – 1802-1804 Inglewood Drive	56.5
R12	Residence – Ronald McDonald House	53.2
R13	Residence – Carillion Crossing – Assisted Living, back yard	60.4
R14	Residence – Carillion Crossing – Assisted Living, front yard	54.7
R15	Residence – 208 Weluyn Road	51.3
R16	Residence – 202 Weluyn Road	55.2
R17	Residence – 1 Rock Manor Drive	64.1
R18	Residence – 13 Rock Manor Drive	64
R19	Residence – Second row home in Rock Manor Community	54.9

Noise monitoring was performed at each of the selected sensitive receptors using Metrosonics dB-3080 sound analyzers. Readings were taken on the A-weighted scale and reported in decibels (dBA). Prior to noise monitoring, noise meters were calibrated using a Metrosonics cl-304 acoustical calibrator. The noise monitoring equipment shed meets all requirements of the American National Standard Specifications for Sound Level Meters, ANSI S1.4-1983 (R1991), Type 2 and meet all requirements, as defined by FHWA. Noise monitoring was conducted in accordance with the methodologies contained in FHWA-PD-96-046, *Measurement of Highway-Related Noise*, (FHWA, May 1996).

Noise monitoring was conducted for 10-minute durations at 19 representative sensitive receptors. This 10-minute monitoring was conducted during the AM peak traffic period and was representative of existing peak hour noise levels throughout the project area. The resulting hourly equivalent noise levels (Leq(h)) at each receptor are found in **Table V-3**. Leq is defined as the equivalent, constant sound level that, over a given period of time, would produce as much acoustic energy as a variable level over that same period of time. Basically, recognizing that the decibel is derived logarithmically, Leq is an average noise level over a given period of time.

While the monitored levels are derived from 10-minute monitoring samples, they are representative of peak-hour noise levels throughout the corridor. Again, **Table V-3** provides a description of each monitored receptor site, and **Figure 29** presents the locations of the monitored (and modeled) receptor sites. The results of the monitoring analysis indicated existing noise levels ranged from 51.3 to 71.5 dBA (Leq(h)) during the peak noise hour(s). As expected, sites in proximity to existing roadways had higher noise levels than more remote sites.

Noise Model Calibration and Projection of Existing and Future Conditions

The next step in the noise analysis is to project existing (2000) and future, design year (2010) noise levels and determine if they will approach or exceed State and/or Federal noise abatement criteria. If the criteria are approached or exceeded at any receptor, noise mitigation would be considered and evaluated in an attempt to reduce future noise to acceptable levels.

Federal regulations (23 CFR Part 772) state that if a noise level at any given receptor approaches or exceeds the appropriate abatement criterion, or if predicted traffic noise levels substantially exceed the existing noise levels, abatement considerations are required. **Table V-4** summarizes the State and Federal criteria for a variety of activity categories. All the sites monitored and/or modeled in this noise analysis fall within Activity Category B; therefore, any future noise level that approaches or exceeds 67 dBA is considered a noise impact.

The Federal procedures require the State to define the level which "approaches" the criteria. DelDOT considers the noise abatement criteria to be approached if the traffic noise levels are within one decibel of the values shown in **Table V-4**. Also, DelDOT defines a substantial increase" a noise level increase of 10 decibels from existing to design year conditions.

TABLE V-4
Noise Abatement Criteria
Hourly A-Weighted Sound Level Decibels (dBA)

ACTIVITY CATEGORY	Leq. (h)	DESCRIPTION OF ACTIVITY CATEGORY
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and severe important public need and where the preservation of those qualities is essential if the area is to continue to serve it's intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.
Source: 23 CFR Part 772		

The noise assessment was conducted using the FHWA Traffic Noise Model (FHWA TNM7). Computer modeling was performed for both the existing (2000) and design year (2010) of the project. Base mapping and field views were used to identify all Category B noise-sensitive land uses within the corridor. Initially, noise modeling was performed at the 19 noise monitoring locations.

The first step in the modeling process is the model verification. This is done by comparing the actual monitored results at each receptor to those which were modeled by the computer (using traffic data collected during the noise monitoring process). *Table V-5* provides a summary of the model verification for the existing (2000) conditions. Column 2 shows the year 2000 monitored Leq at each receptor. Column 3 shows the year 2000 modeled Leq at each receptor, using traffic data collected during the monitoring process. Column 4 shows the difference between the monitored and modeled values. A difference of 3 dBA is considered acceptable and represents an accurate model. Because all analyzed receptors show less than a 3 dBA difference between the monitored and modeled noise levels, the model is considered to be an accurate representation of the actual existing conditions throughout the project area.

Following the calibration of the existing conditions noise model, additional noise modeling was performed for existing (2000) conditions using traffic data supplied by the traffic engineers. This modeling step was performed to evaluate existing, worst-case conditions associated with existing worst-case traffic volumes and composition. Where necessary, additional (modeling only) receptor sites were added to predict existing (and future) noise levels throughout the corridor. Modeling only sites are designated with an "M", followed by the number of the nearest monitoring site, and a letter for clarification (e.g., M12A, representing a portion of the Ronald McDonald House property). Column 5 of *Table V-5* provides a summary of worst-case, existing noise levels, based on worst-case existing traffic volumes, supplied by project traffic engineers.

**Table V-5
Delaware 141 Noise Level Summary**

1	2	3	4	5	6	7	8
	2000	2000 Model		2000 Worst-Case		2010	
Site	Monitored	Calibration	Difference	Modeled	Impact	Modeled	Abatement
Number	Noise Level *	Noise Level	Mon./Mod. **	Noise Level ***	Criteria	Noise Level	Consideration
R1	54.6	57.3	2.7	59.7	66.0	65.2	No
R2	55.9	53.4	-2.5	56.4	66.0	58.6	No
R3	54.5	52.0	-2.5	55.8	66.0	59.3	No
R4	61.1	62.7	1.6	63.5	66.0	64.1	No
R5	68.8	69.1	0.3	74.6	66.0	74.6	Yes
R6	68.7	70.5	1.8	72.8	66.0	74.1	Yes
R7	71.5	71.0	-0.5	73.3	66.0	73.9	Yes
R8	56.5	59.1	2.6	62.5	66.0	64.5	No
R9	66.7	67.8	1.1	72.2	66.0	73.4	Yes
R10	56.2	58.1	1.9	61.8	66.0	63.8	No
R11	56.5	54.0	-2.5	56.5	66.0	59.3	No
R12	53.2	51.0	-2.2	53.8	63.8	74.2	Yes
M12A	--	--	--	52.7	62.7	71.5	Yes
M12B	--	--	--	63.7	66.0	64.1	No
M12C	--	--	--	64.5	66.0	66.6	Yes
M12D	--	--	--	62.9	66.0	70.5	Yes
M12E	--	--	--	57.6	66.0	70.5	Yes
R13	60.4	58.5	-1.9	60.0	66.0	64.2	No
R14	54.7	57.2	2.5	60.5	66.0	64.6	No
R15	51.3	51.9	0.6	57.1	66.0	61.1	No
R16	55.2	56.0	0.8	60.8	66.0	64.1	No
R17	64.1	66.1	2.0	66.1	66.0	68.4	Yes
M17A	--	--	--	60.0	66.0	63.2	No
M17B	--	--	--	68.2	66.0	69.0	Yes
R18	64.0	64.7	0.7	63.7	66.0	64.9	No
R19	54.9	56.1	1.2	56.1	66.0	59.4	No

* 2000 modeled existing noise level using traffic data recorded during the monitoring process

** Difference between monitored and modeled noise levels

*** 2000 modeled existing noise levels using traffic data supplied by traffic engineers

Note: Grey shading indicates noise levels approach or exceed FHWA/DeIDOT Noise Abatement Criteria

Following the modeling of existing conditions, the analysis continued with the prediction of future noise levels with the proposed roadway improvements in place. This is done by incorporating the proposed improvements into the calibrated noise model and applying projected traffic volumes and composition for the design year (2010) of the project. Terrain features, including proposed cut and fill data, were revised to represent the topographic changes associated with the proposed roadway design.

Future noise levels associated with the proposed roadway improvements were predicted at each receptor site. Column 6 of *Table V-5* shows the impact criteria used to assess impacts at each

receptor site. Column 7 of *Table V-5* shows the projected noise levels at each of the modeled receptor sites. As identified in column 8 of *Table V-5*, future (Design Year) noise levels are projected to exceed the FHWA/DeIDOT Noise Abatement Criteria at 11 receptor sites, including R5 representing the historic Blue Ball barn on existing U.S. 202; R6, R7, and R9 representing approximately 13 single family residential units and a multi-unit apartment building in the front-row of the Deerhurst Community (fronting U.S. 202); R12 and M12A, M12C, M12D, and M12E, representing the limits of the property of the Ronald McDonald House, located adjacent to the proposed Delaware Route 141 “spur”; and R17 and M17B, representing one residence in the Rock Manor residential Development. These identified areas represent the limits of anticipated noise impacts, and no other noise-sensitive land uses throughout the corridor are projected to exceed the FHWA/DeIDOT Noise Abatement Criteria. Because future noise levels are projected to exceed the Noise Abatement Criteria at the historic barn (R5), the Deerhurst Community (R6, R7, and R9), the Ronald McDonald House (R12, M12A, M12C, M12D, and M12E), and One Rock Manor Avenue (R17 and M17B), noise mitigation measures were evaluated.

Noise Mitigation

While a wide range of potential noise mitigation measures exist, due to limited right-of-way and existing land uses throughout the corridor, noise walls or earthen berms were considered the only feasible form of potential noise mitigation. The project area was evaluated to identify the likelihood of providing noise walls or berms to reduce future noise levels.

Preliminary noise mitigation was examined for all receptor sites which exceed the FHWA/DeIDOT Noise Abatement Criteria. The evaluation focused on placing noise barriers (or berms) between existing/future roadways and the impacted noise-sensitive land uses. Potential noise barriers were evaluated within the limits of DeIDOT Right-of-Way (ROW) and considered on either the edge-of-shoulder (in roadway fill or at grade conditions) or at the top-of-cut (in roadway cut conditions). For a barrier to be considered effective (feasible and practical) it must be capable of reducing noise levels by at least 5 dBA.

Noise barriers were considered to reduce noise levels at three of the noise-impacted areas. Based on the existing land use (non-residential) and the lack of outdoor use areas at the historic Blue Ball barn (R5), the Department has determined that noise mitigation is not reasonable for this property. To that end, noise mitigation is not being proposed. In addition, worst-case existing noise levels are also high, due to existing traffic using U.S. 202.

A noise barrier evaluation was performed for the impacted residential units in the Deerhurst Community, represented by R6, R7, and R9. Within this community, noise impacts are limited to the front-row homes, adjacent to existing and future U.S. 202. Due to driveway access in this area, noise barriers were determined to be not feasible (i.e., not capable of reducing noise levels by at least 5 dBA) at the majority of the impacted sites. Driveway access would require breaks in the potential noise barrier system, rendering the barrier ineffective at reducing future noise levels by at least 5 dBA. Therefore, noise barriers are not being proposed for the Deerhurst Community. In addition, worst-case existing noise levels are also high, due to existing traffic using U.S. 202.

Noise barriers were also evaluated for the Ronald McDonald House, represented by R12, M12A, M12C, M12D, and M12E. In this area, noise levels are projected to increase by approximately 22 dBA, due to the introduction of the Route 141 Spur (*Figure 29*). The noise mitigation analysis performed for the Ronald McDonald House focused on placing a noise barrier between the Route 141 Spur and the backyard of the facility. A noise barrier was “optimized” at approximately 14 feet in height and approximately 1,140 feet in length, yielding a total square footage of approximately 15,960 ft². At an estimated cost of \$25 per square foot, the noise barrier is estimated at approximately \$399,000. The proposed barrier design is shown on *Figure 29*. This design would adequately mitigate for the entire property and would reduce future noise levels by 4 to 16 dBA, depending on the location of the modeling site. Final mitigated noise levels would range from approximately 58 to 61 dBA, depending on receiver location. This “optimized” noise barrier is considered feasible, as per DelDOT policy; however, reasonableness has not yet been determined, due to the unique nature of this land use.

Noise barriers were also evaluated for the Rock Manor Community, represented by R17 and M17B. In this area, noise levels are projected to increase by approximately 1 to 2 dBA, due to the slight shift in the alignment of U.S. 202. The noise mitigation analysis focused on placing a barrier along the cut line of U.S. 202 and the on-ramp to I-95 southbound. A noise barrier was “optimized” at approximately 12 feet in height and approximately 700 feet in length, yielding a total square footage of approximately 8400 ft². At an estimated cost of \$25 per square foot, the noise barrier is estimated at approximately \$210,000.

Construction Impacts

Construction impacts are also a concern with regard to noise. The use of heavy machinery and construction vehicles may cause temporary noise impacts to the sensitive receptors throughout the corridor. In order to minimize these impacts, construction activities will be limited to normal working hours (under county code) and equipment shed is expected to be outfitted with appropriate noise muffling devices. These measures should minimize the temporary construction noise impacts anticipated throughout the project area.

During the construction phase of the project, U.S. 202 will be re-routed on a six-lane temporary road following the same alignment of the future Westpark Drive. This temporary road will carry all northbound and southbound traffic of U.S. 202. U.S. 202 will remain closed from the Augustine Cut-off to approximately just south of the Deerhurst Community during the construction phase of the project.

Due to the temporary roads’ proximity to the Alapocas Community (R1, R2, R3, R4) a construction noise model was developed to predict potential noise impacts associated with the proposed detour route. Noise sensitive receptor sites, R1, R2, R3, and R4 all represent homes located within the Alapocas Community. During the construction phase, noise levels are predicted to range from 55 to 61 dBA, and therefore, are below DelDOT’s Noise Abatement Criteria. Once the construction phase of the project is completed, the temporary road will be reduced from six-lanes to two-lanes, and traffic will be rerouted back to U.S. 202.

E. Municipal, Residual and Hazardous Waste

The study methodology used to define the existing waste-related conditions for the project was structured as a preliminary Phase I Environmental Site Assessment (ESA). The scope of this “desktop” search was determined through discussions with DelDOT’s planning office. The study included review of Phase I ESA standard environmental record sources maintained by Delaware Department of Natural Resources and Environmental Control (DNREC) and Environmental Protection Agency (EPA).

A field reconnaissance of the project area was conducted on April 20, 2000, to verify the locations of sites that were listed on these databases and to identify any additional sites of concern that were not included on the database lists. Historical aerial photography was consulted to aid in verifying historical land use of the project area.

To determine potential impacts, the property conditions, site history, and present operations were evaluated with respect to proposed roadway design. The presence of a waste indicator within or near the proposed right-of-way does not necessarily mean that an impact will be realized during construction. It is important to consider the roadway design and evaluate impacts based on construction activities necessary to build the roadway improvements. Only those sites within the project area with the potential for impacts are described in this EA. The project’s waste management file should be consulted for more detail on all properties included in the waste site evaluation.

No-Build Alternative

Implementation of the No-Build Alternative will not affect the municipal, residential or hazardous waste sites in the project area.

Preferred Alternative

In this evaluation, two main types of impacts were considered: worker protection and waste handling requirements. All potential impacts can normally be mitigated through appropriate planning and incorporating special provisions into the construction contract.

Potential Waste Site Inventory

The preliminary Phase I ESA identified one gasoline retail station and two sites at which leaking underground storage tanks (LUSTs) have been taken out of service as potential impact areas based on current design. These three sites are listed in **Table V-6** and are shown on **Figure 29**. Additional general conditions that may impact the roadway construction were also

TABLE V-6
Municipal, Residual and Hazardous Waste

Site Number	Site Name	Location	Impacts	
			No-Build	Build
1	Concord Pike Gulf Station	Northeast corner of Route 202 and Route 141		X
2	Cingular Wireless (formerly Hank Black's Foreign Car Center)	Southeast corner of Route 202 and Route 141		*
3	Dexsta Federal Credit Union	300 Foulk Road		*
* No impacts are expected based on current design. However, due to past contamination at these sites, a re-evaluation may be necessary as design progresses.				

The following properties and conditions have been identified as having potential impacts to the construction of proposed roadway improvements.

▪ **Site 1 – Concord Pike Gulf Station**

This site is located on the northeast corner of the U.S. 202 and Delaware Route 141 intersection. The Gulf property is an active fuel retail station with three 10,000-gallon gasoline underground storage tanks (USTs), one 10,000-gallon diesel fuel UST, and one 8,000-gallon kerosene UST. The 10,000 gallon USTs are located south of the station building adjacent to Route 141; the kerosene tank is located east of the building.

According to DNREC's storage tank database, the USTs located at this site are in compliance with applicable regulatory requirements. The storage tanks are steel which have been upgraded to include cathodic protection. In 1994, a leak was detected between the southernmost two storage tanks, which was repaired. In 1998 a waste oil tank was removed; soil testing indicated total petroleum hydrocarbon (TPH) and benzene, toluene, ethylbenzene and xylene (BTEX) levels below the state action levels.

The UST field containing the four 10,000 gallon tanks is situated very near the edge of sidewalk along Murphy Road. Based on the current design requiring approximately 15 feet of additional right of way from the Gulf property along Murphy Road, at least two of these four storage tanks would have to be closed and relocated. Depending upon the availability of a suitable location to relocate the UST field on the Gulf property, this UST closure could affect the viability of the gasoline retail station at this location.

During the relocation of these storage tanks, there is also the potential for encountering residual contamination from the 1994 leak. Soil testing may be required during construction to identify contaminant presence and levels, and determine appropriate containment and/or disposal procedures enacted.

- **Site 2 – Cingular Wireless (Former Hank Black’s Foreign Car Center)**

This site, currently operated as Cingular Wireless, is located on the southeast corner of the U.S. 202 and Delaware Route 141 intersection. While this site was operated as a car center, an UST containing used oil was determined to be leaking and was taken out of service.

A review of DNREC’s files revealed that the storage tank was removed in July 1995. Soil samples taken at that time revealed levels of TPH and BTEX below state action levels. It was determined that no threat to human health or the environment resulted from the contamination present, and a finding of No Further Action (NFA) was issued.

It should be noted that although the two samples tested were found to be below action levels, if any obvious contamination is detected (by staining, odor, etc.), the affected soil must be segregated, possibly analyzed, and disposed of in accordance with the appropriate regulations.

- **Site 3 – Dexsta Federal Credit Union**

Two heating oil USTs were once registered at this site, at 300 Foulk Road. One was recorded as leaking; both were removed in 1997. Soil testing results from these tank removals revealed concentrations of diesel range organics up to three times the state action level of 1000 ppm. However, because the contaminated area is located beneath a blacktop parking area with little chance for exposure, and no groundwater involvement indicated, a NFA letter was issued.

This NFA contains the caveat that any future digging, boring, or excavation may encounter contaminated soils and/or groundwater, which would then require a DNREC Contaminated Media Management Plan. The proposed project would not involve the affected area, which is located east of the existing building (the side furthest from Foulk Road.) However, there is the potential that contamination may have migrated. If any contaminated soil or groundwater is encountered, an appropriate management plan must be implemented.

In addition to these specific property concerns, three general conditions were noted that may impact the roadway construction:

- **Asbestos Containing Material (ACM)**

Buildings constructed prior to 1975 may contain asbestos building materials, that when demolished, could require special handling and waste disposal. In Final Design, appropriate studies should be undertaken to determine the presence or absence of ACM in buildings slated for demolition. If ACM is present, construction documents should contain provisions for ACM management and worker safety during construction.

- **Utilities**

Relocation of utilities during construction, if performed incorrectly, can adversely impact the environment and worker health and safety. Coordination with utility companies during Final Design to identify concerns and appropriate relocation procedures effectively mitigates these impacts. This coordination should include discussion of appropriate handling of electrical transformers to ensure that PCBs, if present, are not released to the environment.

- **Groundwater**

In addition to the sites detailed above, other properties in the vicinity of the project area may have experienced hazardous waste releases. While these properties may not be directly impacted by the project construction, contamination may have migrated off site and could be encountered elsewhere. Preliminary geotechnical investigations for the project have indicated groundwater levels between 5 and 17 feet in depth. As the project involves cuts of up to 20 feet or more, there is a high probability of encountering groundwater.

During Final Design, the potential for encountering contaminated groundwater in excavations should be evaluated more thoroughly. Specific cut areas should be evaluated with respect to potential contaminant sources and available groundwater data. Construction documents should contain provisions to address the contamination in affected areas.

Mitigation

The waste management impacts presented in this section can be mitigated through appropriate planning and incorporating special provisions into the construction contract. A Waste Management Plan (WMP) should be prepared and implemented for all construction activities in the vicinity of the three potential waste sites identified in this section. This WMP should address anticipated impacts, and may include provisions such as the following:

- UST system closure;
- Handling and disposal of petroleum contaminated soil;
- Handling and disposal of ACM in affected buildings slated for demolition; and
- Health and Safety Plan.

The results of the waste site investigations performed to date indicate that all other areas of the project corridor do not require a WMP. However, if unanticipated contamination is encountered during construction, the WMP could be applied.

F. Surface and Groundwater Quality

The project area lies within two watersheds of Delaware's Piedmont Drainage Basin, the Brandywine Creek and Shellpot Creek watersheds (**Figure 30**). The Delaware Department of Natural Resources and Environmental Control (DNREC) has identified pathogens, nutrients, physical habitat condition and water supply as the main water quality concerns for both watersheds. The general water quality conditions within the two watersheds are such that neither system meets the recommended parameters to support primary contact recreation use (activities such as swimming) and at least 60 percent of both watersheds fail to meet aquatic life use parameters.

Within the Brandywine Creek watershed nitrogen and phosphorus concentrations were considered to be high and bacteria levels frequently exceeded state water quality standards. While falling within state water quality standards, dissolved oxygen levels have shown a long-term decreasing trend. There is also a limited finfish consumption advisory posted for the non-tidal portion of the Brandywine Creek due to concerns of PCB pollution. The watershed lacks

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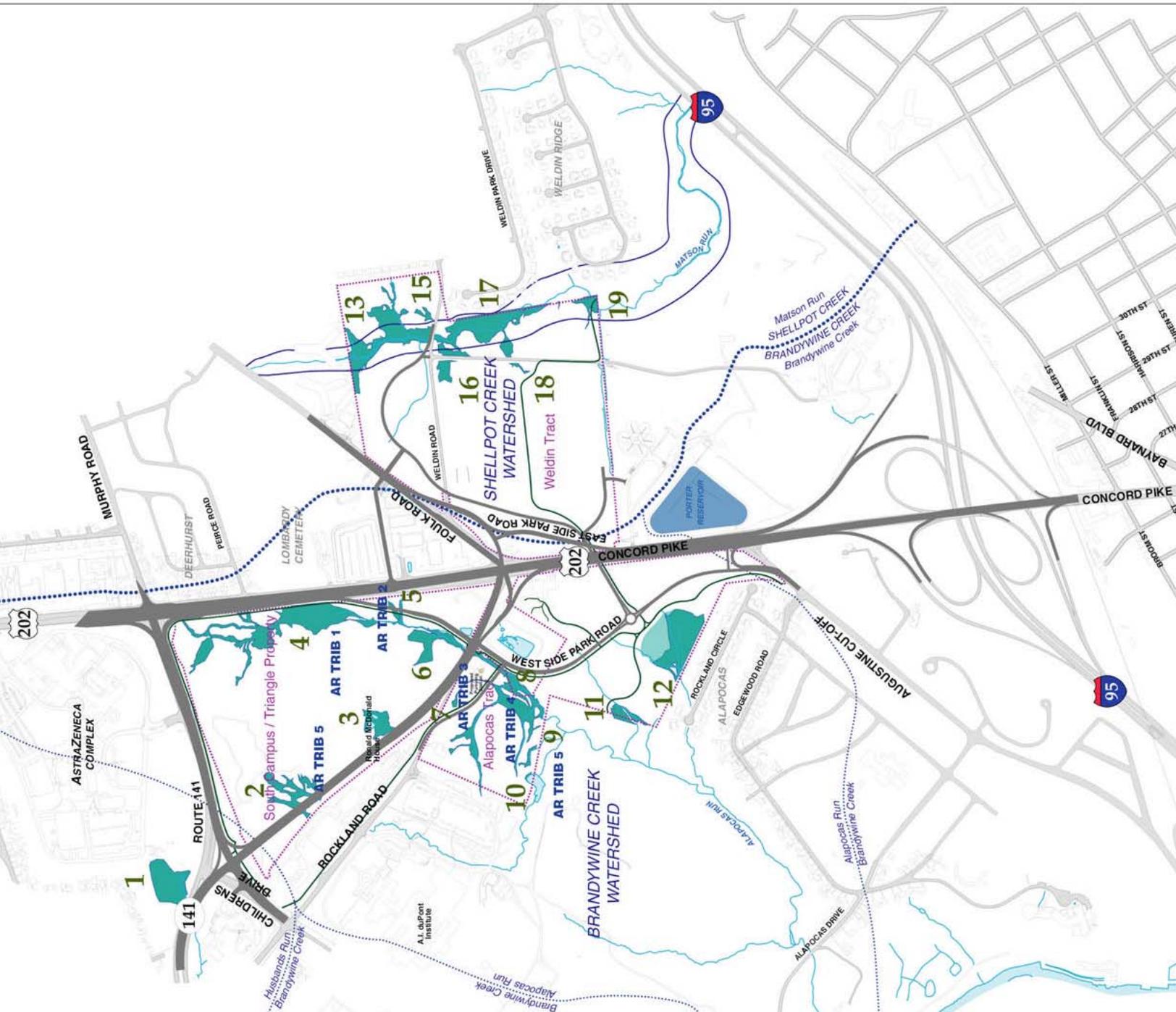


FIGURE 30: WATER RESOURCES

the physical, chemical and/or biological conditions needed to fully support aquatic life requirements and only 40 percent of the watershed was found to have the conditions that partially support aquatic life requirements.

The Shellpot Creek watershed also possesses high phosphorus concentrations and bacteria levels that frequently exceed state water quality standards. Like the Brandywine Creek watershed, the Shellpot Creek watershed has dissolved oxygen levels that fall within state standards but have shown a decreasing long-term trend. The watershed also lacks the physical, chemical and/or biological conditions needed to fully support aquatic life requirements and only 33 percent of the watershed was considered to partially support aquatic life condition requirements.

The project area contains two (2) sub-watersheds of Brandywine Creek and a single sub-watershed of Shellpot Creek. The majority of the project area to the east of U.S. 202 drains into Matson Run, a tributary of Shellpot Creek. The extreme northwest corner of the project area drains into Husband's Run, which is a tributary of Brandywine Creek. The bulk of the remaining portion of the project area drains to Alapocas Run, another Brandywine Creek tributary. A small portion of the project area drains directly to Brandywine Creek at the project's southern extreme.

The water quality conditions within these sub-watersheds were found to vary significantly as identified during field investigations conducted in the project study area. These investigations included evaluating physical, chemical and biological parameters on Alapocas Run, north and south of Rockland Road. In general, Alapocas Run exhibited moderate to poor water quality indicators, its tributary to the west (located within the AstraZeneca Triangle tract) exhibited moderate to good water quality indicators and Matson Run exhibited moderate water quality indicators. Potential pollution sources to the streams are present throughout the project area from increased development, but considerably more threatening to Alapocas Run and Matson Run, than to the western Alapocas tributary. All of the project area streams flow through a narrow, mostly wooded riparian zone that helps improve their water quality.

At the Rockland Road crossing of Alapocas Run the stream was found to exhibit signs of flashiness, bank erosion, accumulation of sediment deposits and low dissolved oxygen levels. A narrow riparian zone was present at this location. The stream exhibits varying water quality conditions further upstream in the AstraZeneca Triangle tract, but accumulated sediment, stream bank erosion and flashiness remain problematic, especially in the stream stretch from the U.S. 202/existing Delaware Route 141 intersection to approximately 1,000 feet downstream. The AstraZeneca tract stream stretch does possess a much broader riparian zone above the Rockland Road crossing.

Downstream of the Rockland Road crossing Alapocas Run stream habitat and water quality appears better, but far from ideal water quality conditions. For approximately 750 feet below the crossing, the stream has a wide forested riparian buffer on its western side and gently sloped stable banks. There was little evidence of flashiness, bank erosion, accumulation of sediment deposits or poor dissolved oxygen levels. Below this stretch bank erosion again becomes problematic as significant undercutting of 4-foot to 6-foot banks is occurring. Sediment deposits were also evident in portions of this stream stretch, however, there was little evidence of other

pollutants and dissolved oxygen levels were within good water quality range. A wide forested riparian buffer supports the stream in this location.

The tributaries joining Alapocas Run within the AstraZeneca Triangle tract (AR Trib 1 and AR Trib 2), exhibited poorer water quality conditions. These streams had highly eroded and/or rock-lined channels, oils within the streams' sediments and on the water surface, exhibited evidence of low dissolved oxygen levels, contained heavy algae growth and lacked a wooded riparian zone for some of their reach.

The western Alapocas tributary (AR Trib 5), exhibited the best water quality conditions of the project area streams. This stream has its spring fed headwaters within the AstraZeneca Triangle tract and exhibits no evidence of low dissolved oxygen levels, erosion or above normal sedimentation accumulation. Prior to its entrance into a pipe culvert that carries the stream under Rockland Road, the stream flows entirely within the wooded portion of the AstraZeneca Triangle tract.

Matson Run was found to exhibit a slight presence of surface and sediment oils, indications of low dissolved oxygen levels, some stream bank erosion, possessed minor levels of sediment deposition and had a broad riparian zone.

According to DNREC and US Geological Survey records the project area does not contain any public supply wells. This is in part due to the geologic formations within the project area, hypersthene-quartz-andesine gneiss of the Wilmington Complex and the unconsolidated sediments of the Bryn Mawr Formation, which provide low groundwater yields that average well under 10 gallons per minute. Limited site investigations revealed that the groundwater table within the project area was encountered five feet below the ground surface at its closest point to the surface and generally was found to be at least 10 feet below the surface. Some of the potential contamination sources to the local groundwater found within the project area include pesticide and herbicide use on the agricultural fields, large facility grounds and golf courses, as well as hazardous waste storage tanks at service stations and other facilities.

No-Build Alternative

Implementation of the No-Build Alternative will have no effect on water quality and aquatic biota in the study area. Conditions of Alapocas Run and Matson run will not be improved and may continue to degrade due to lack of existing stormwater controls.

Preferred Alternative

The groundwater and surface water quality in the vicinity of the proposed project could experience an increase in degradation due to the additional impermeable surfaces created by the new roads and greenway. The new roads will expand the area that could potentially contribute roadway pollutants (i.e. automotive oils, roadway deicing agents) to project area surface waters and groundwater aquifers by creating approximately 63.2 acres of additional impermeable surface area. The existing permeable surface area and its associated vegetation is currently providing the removal of these pollutants prior to their reaching the surface waters and groundwater aquifers. Approximately 1.0 acres of the removed vegetation will be from within

the stream's riparian zones. Removal of riparian zone vegetation could result in increased stream temperatures and channel instability.

Mitigation

A stormwater management system will be constructed as part of the project to reduce the potential water quality impacts that will be associated with the project's construction. The proposed stormwater management system will consist of a series of retention basins and runoff control swales that will collect runoff from the new roadways, as well as the other facilities being constructed in association with the roadway project. By collecting the roadway and other facilities' surface runoff before it reaches the project area streams or infiltrates into the groundwater table, the stormwater system will provide a measure of pollution control. Sediments, nutrients and chemical pollutants will settle out of the collected waters and/or become available for uptake by the basins' and swales' vegetation. Additionally, the retention basins will improve the base flow of the project area streams and reduce the flashiness that promotes stream bank erosion. With the planned implementation of the stormwater runoff control measures, no substantial adverse water quality impacts are anticipated to occur as a result of the project. Rather, the proposed project could in fact improve the overall long-term water quality of the project area streams by reducing sediment loads, reducing stream bank erosion due to storm event flashiness and improving the stream's base flow. These water quality improvements could ultimately be reflected in the water quality of Brandywine Creek and Shellpot Creek and play a factor in attaining the state's water quality improvement goals for these drainage basins.

Construction activities could temporarily elevate the sediment loads of project area streams due to erosion of exposed surfaces. The increased sediment levels would cease with the completion of the project and the stabilization of the exposed surfaces. The proper implementation of and strict adherence to the project's erosion and sediment control plan will minimize the opportunity for adverse impact upon the groundwater and surface water resources.

G. Hydrological Impacts

The project area contains several perennial and intermittent watercourses located within the Brandywine Creek and Shellpot Creek Watersheds (**Figure 30**). Section 10 of Delaware's *Stream Basins & Designated Uses* identifies public water supply, industrial water supply, primary contact recreation, secondary contact recreation, fish, aquatic life and wildlife, and agricultural water supply as the designated uses for the Brandywine Creek Watershed within the vicinity of the project. The Shellpot Creek Watershed designated uses within the project vicinity were identified as industrial water supply, primary contact recreation, secondary contact recreation, fish, aquatic life and wildlife and agricultural water supply.

The two main streams located in the project area are Alapocas Run and Matson Run. Alapocas Run has its headwaters in the project area, primarily within the AstraZeneca Triangle tract. The headwaters of Matson Run lie upstream of Weldin Road, primarily beyond the project area. Both streams are perennial and exhibit stream bank erosion from flashy stormwater events.

Alapocas Run originates in the northeastern corner of the AstraZeneca Triangle tract and flows southward parallel to U.S. 202 until reaching Rockland Road. At this point the stream turns in a westerly direction and eventually confluences with Brandywine Creek to the south. The stream has a sand/silt substrate mixed to varying degrees with cobble/gravel to boulder-sized rocks. A small base flow was observed within Alapocas Run during field investigations conducted in early May 2000. Within the upper reaches of the stream water depths ranged from three (3) to six (6) inches in a five (5) foot wide channel. Near Rockland Road the stream width was approximately 10 feet and the water depths ranged from one (1) inch to six (6) inches. Below the Rockland Road area, the stream channel widens to widths of 13-feet to 24-feet. Stream depths in this area range from 2 inches to 1 foot. Normal flow velocity was slow throughout the stream reach. The only man-made encroachment of the stream in the project area is the bridge carrying Rockland Road over the stream.

Several intermittent and perennial tributaries flow into the reach of Alapocas Run located in the project area. Their headwaters are located within or immediately adjacent to the project area. All of the tributaries exhibited minor to no base flow volumes during field investigations and most exhibited signs of erosion due to runoff related flashiness.

Alapocas Run

AR Trib 1, a perennial stream, enters Alapocas Run as the AstraZeneca Triangle tract changes from woodland cover to agricultural land cover. This stream has gravel dominated silt/sand substrate within a 5-foot wide, heavily eroded channel. The stream exhibited a 4-inch water depth with little flow velocity near its confluence with Alapocas Run. The tributary's surface water was heavily laden with algae.

A short distance below the first tributary's confluence, AR Trib 2 enters Alapocas Run from the east. The stream appears to be perennial, having a marginal base flow during field observations. The stream enters the AstraZeneca Triangle tract after exiting a pipe cross-drain that carries roadway and commercial development runoff, as well as a small stream that appears to originate to the east of the commercial development. The tributary consists of a 10-foot wide rock-lined channel that lacks vegetative cover until just before it reaches its confluence with Alapocas Run. A third Alapocas Run tributary, AR Trib 5, lies within the northwestern portion of the AstraZeneca Triangle tract. The tributary's headwaters originate from spring seeps located on the tract. Flow from the seeps moves through a number of shallow and undefined channels before measurably concentrating within a single channel roughly 200 feet from the tract's western border. From the point of concentration, the tributary heads to the southwest and enters a small drainage pipe located near the tract's boundary. The pipe carries the tributary under a commercial facility and Rockland Road and exits into an open channel on the A.I. DuPont property. Eventually the tributary flows into Alapocas Run at a point approximately 1,000 feet southwest of Rockland Road.

AR Trib 5 was observed to have a small base flow during field investigations. At the entrance to the drainage pipe located on the AstraZeneca Triangle tract, this perennial stream has a silt/sand substrate mixed with gravel. Stream flow was observed to be slow within the tributary's 3-foot wide channel. Water depth ranged from one 1 inch to six 6 inches. The stream is entirely located within a forested wetland and is relatively undisturbed.

There are several other Alapocas Run tributaries located within the project area below Rockland Road. These watercourses originate within the A.I DuPont property and the Alapocas tract. The tributaries carry runoff from the surrounding land and have some base flow that originates from spring seeps. Within the proposed project's area of disturbance, these tributaries do not have regular flow and are therefore intermittent. The physical characteristics of the streams are similar in that they possess poorly-defined channels at their upper extremes and well-defined channels near their confluence with Alapocas Run. Vegetative cover ranges from agricultural crops and grasses along the eastern tributaries to tall grasses, shrubs and trees along the western tributaries. All of the tributaries carry stormwater runoff into low-lying wetlands prior to releasing into Alapocas Run.

Matson Run

Matson Run flows from north to south near the eastern edge of the project area. The stream collects surface runoff from a small portion of the project area and has only one associated tributary in the project area. A sufficient amount of groundwater and/or stored surface water is released to the stream to maintain a modest base flow as the stream flows under Weldin Road. Field observations found the stream to have an approximately 20-foot wide channel in the vicinity of the road. The channel is considerably narrower a short distance above and below the Weldin Road crossing. It appears the channel was widened in the vicinity of the road crossing in order to facilitate full use of the four large pipes that have been installed to carry the stream under Weldin Road. Regular stream flow above the road crossing appears to be restricted to only a fourth of the actual channel, but fans out as the stream reaches the four crossing pipes. Once at the crossing, the stream flows into all four pipes and flows within the entire width of the channel after exiting the pipes. Water depth within the channel below the road crossing was observed to range from two inches to four inches. Water depth above the crossing was observed to be as much as one (1) foot in depth. The stream's substrate consists of silt/sand heavily mixed with primarily cobble-sized rock. The only FEMA identified 100-year floodplain in the project area lies along this stream.

No-Build Alternative

Implementation of the No-Build Alternative will have no effect on the project area streams. Alapocas Run and Matson run will not be improved and may continue to degrade.

Preferred Alternative

The proposed project will encroach on several of the project area streams (**Figure 30**). Alapocas Run will be affected by the widening of an existing crossing and the construction of a new roadway crossing downstream of the existing Rockland Road crossing. In addition to the Alapocas Run impacts, two of its project area tributaries will also be crossed by new roadways. Matson Run will not be directly encroached upon by the proposed project. **Table V-7** presents a summary of the project related stream impacts.

**Table V-7
STREAM ENCROACHMENTS**

Stream	Stream Type	Encroachment Type	Area of Encroachment Linear Feet
AR Trib 2	Perennial	New roadway structure for Ramp C	70
AR Trib 2	Perennial	Temporary roadway structure	60
Ar Trib 3	Perennial	Roadway crossing for Route 141 Spur	145
AR Trib 3	Perennial	Roadway structure for Rockland Road	190
AR Trib 5	Intermittent	New roadway structure for Route 141	130
		Total Encroachments	595

Relocated Weldin Road will rejoin the existing road's alignment in the vicinity of Matson Run. This change in alignment will occur prior to reaching Matson Run and will not require modification of the existing Matson Run structure. As such, no encroachment of the stream will occur. However, a small portion of the realignment will occur within the stream's FEMA defined 100-year floodplain. In accordance with 23 CFR 650, it is anticipated that no significant encroachment of the floodplain will occur as a result of the realignment. Coordination with FEMA and the county will occur during Final Design, as necessary, to ensure any floodplain encroachments are addressed in a manner consistent with FEMA's *Procedures for Coordinating Highway Encroachments on Floodplains with Federal Emergency Management Agency* and the County Unified Development Code (UDC).

The new alignment of Delaware Route 141 will cross Alapocas Run in the same location that existing Rockland Road now crosses the perennial stream. However, the Delaware Route 141 crossing will require a longer structure to carry the road over the stream. The longer structure will cause the enclosure of an additional 145 linear feet of Alapocas Run in this location. This encroachment will not change the overall drainage pattern of the stream, other than creating a larger area of enclosed stream reach.

Immediately below the relocated Delaware Route 141 crossing of Alapocas Run, the stream will be crossed by relocated Rockland Road. This crossing will enclose approximately 190 linear feet of the stream, creating a new area of encroachment along the stream's reach. The new crossing will not alter the stream's general drainage pattern, other than creating the new stream enclosure.

Proposed Ramp C will connect U.S. 202 with relocated Delaware Route 141 and the local connector road at an intersection located immediately to the east of the relocated Delaware Route 141 crossing of Alapocas Run. Ramp C will also have an encroachment of an intermittent stream associated with its construction. AR Trib 2 flows to Alapocas Run through a primarily rock-lined channel that originates at the outlet of a cross drainage pipe that runs under U.S. 202. Approximately 70 linear feet of the intermittent stream channel will be permanently encroached by Ramp C. An additional 60 linear foot encroachment of the stream will occur as a result of a temporary road that will be in place during construction activities. Neither encroachment will

alter the stream's general drainage pattern as appropriate measures will be incorporated to maintain stream flow through the encroachment areas.

The last stream encroachment will occur within the northwestern portion of the AstraZeneca Triangle tract affecting AR Trib 5. The Route141 Spur will cross the perennial stream at its entrance point to the drainage pipe that carries the tributary to the A.I. DuPont property. The crossing will create a 130 linear foot encroachment of the stream. In addition to the direct loss of stream channel, the new roadway may also alter the base flow of the stream as it has the potential to fill some of the spring seep area that contributes to the stream's base flow. Overall, the potential impact to the stream will be minor, as the stream will continue to receive base flow from the majority of its contributing seeps, leaving the stream's general drainage pattern intact. With the incorporation of appropriate surface drainage connections, the stream will also continue to receive surface flow from areas bisected by the proposed roadway.

Mitigation

The creation of additional impermeable surfaces by the proposed project will be countered with the construction of stormwater detention basins throughout the project corridor. This mitigation measure will prevent an overall increase in storm-generated flows within the project area streams despite the project's increase in impermeable surface area. Additionally, the stormwater detention basins will collect stormwater runoff from some currently existing impermeable surface areas that drain directly into the project area streams. By collecting and detaining this stormwater runoff, the proposed project will reduce the flashiness of the project area streams and the associated stream bank erosion created by the heavy storm flow the stream's currently carry. By releasing the detained stormwater runoff to the streams over a longer time period, the stream base flows will also be improved. As such, the project is expected to generate a positive impact on the project area streams, as well as to the larger downstream systems.

In addition, a Stream Restoration Plan for Alapocas Run will be implemented to help control the existing flash stormwater conditions that have resulted in severe scouring and undercutting in the stream. The plan will be prepared in cooperation with the regulatory agencies and local officials. The Stream Restoration plans include enhancement of the riparian buffer along Alapocas Run, south of Rockland Road.

A conceptual mitigation design will be implemented for mitigation of the wetlands that will be impacted from the Master Plan Alternative. This replacement will occur on the southern portion of the Alapocas Tract, adjacent to an existing wetland. The plan will be prepared in cooperation with the regulatory agencies and local officials.

H. Geology

The project study lies in the transition zone between the Piedmont physiographic province and Atlantic coastal plain regions, and is underlain by meta-igneous rock that make up the geology of the greater Wilmington area. The bedrock underlying the project site is made up of the banded gneiss of the Wilmington Complex, locally referred to as Brandywine Blue Granite. The terrain is characterized by gently rolling topography and exposed crystalline bedrock. These coarse grained rocks have minimal secondary permeability usually resulting in low groundwater yields.

The average yield for a domestic well within the Wilmington Complex is about one (1) gallon per minute. According to DNREC records, the Wilmington Complex does not support any public water-supply wells or Water Resource Protection Areas within the project limits.

Within the northeastern corner of the project area lies the Bryn Mawr Formation. This formation consists of shallow deposits of predominantly sandy or gravelly sediments underlain by rocks of the Wilmington Complex. Due to the sediments' thinness and limited aerial extent, groundwater yields within the Bryn Mawr Formation are insignificant. According to DNREC records, the Bryn Mawr Formation does not support any public water-supply wells or Water Resource Protection Areas within the project limits.

The Soil Survey of New Castle County, Delaware, 1970, indicates that the project area contains five (5) Soil Series types. The dominant project area soil is Talleyville silt loam (TaB2), having coverage of 65 percent to 70 percent. The remaining soils identified as being present include Aldino silt loam (AdA), Neshaminy-Montalto silt loam (NmB2), Neshaminy-Talleyville-Urban land complex (NtB) and Watchung-Calvert silt loam (WcA). The Talleyville, Neshaminy-Montalto and Neshaminy-Talleyville-Urban soil series are upland soils that generally support agricultural land, woodland and developed land in the project area. The Aldino and Watchung-Calvert soil series' support most of the project area wetlands as they are found in low lying areas and depressions. **Table V-8** lists some of the more significant characteristics of the project area soils.

**TABLE V-8
SOIL CHARACTERISTICS¹**

Soil	Slope (percent)	Drainage	Depth to Bedrock (ft)	Seasonal High Water Table (ft)	Erosion Hazard	Road Suitability
AdA	0 to 3	Moderately Well Drained	4 to 6	1 to 2	High	Fair stability, severe frost action
NmB2	3 to 8	Well Drained	5 to 12	> 4	Moderate	Fair to good stability, moderate frost action
NtB	0 to 8	Well Drained	6 to 10	> 4	Moderate	Fair to good stability, moderate frost action
TaB2	2 to 5	Well Drained	6 to 10	> 6	Moderate	Good stability, moderate frost action
WcA	0 to 3	Poorly Drained	5 to 10	0	High	Very poor stability, severe frost action

AdA:Aldino silt loam, NmB2:Neshaminy-Montalto silt loam, NtB:Neshaminy-Talleyville-Urban land complex, TaB2:Talleyville silt loam, WcA:Watchung-Calvert silt loam

¹ Characteristics obtained from the *Soil Survey of New Castle County, Delaware, 1970*

Preliminary geotechnical field investigations consisting of 38 backhoe excavated test pits were conducted within the Alapocas tract of the project area to evaluate subsurface conditions. Subsequently, another nine (9) test pits were excavated to determine rapid infiltration testing of the tract's soils. Analysis of the investigation results revealed the subsurface soils encountered throughout the agricultural field portion of the tract to be of a soft to very stiff consistency, predominately silt and clay soil irregularly interlayer with thin layers of predominately granular soil. Based on the USDA Soil Texture Classification System, the tract soils were classified as sandy loam, sandy clay loam, loam, silty clay loam, clay loam and clay.

Apparent massive rock was observed in 11 of the test pits performed at depths ranging from 8 feet to 13 feet below the ground surface. Based on the limited locations where rock was encountered, the rock surface was generally observed to follow the ground surface topography. Groundwater was observed in nine (9) of the test pits at depths ranging from 5 feet to 17 feet. Within the Alapocas tract the groundwater elevation appears to follow the ground surface topography, sloping downwards toward the west and south in the general direction of Alapocas Run.

No-Build Alternative

Implementation of the No-Build Alternative will not affect the geology in the project area.

Preferred Alternative

The depth of excavation required for the proposed project varies from site to site. It is anticipated that there would be no impacts to the geology and groundwater in the areas that would have limited depth of excavation. In these locations there would be limited disturbance of bedrock and the bedrock throughout the project area has poor permeability, which greatly limits the potential for pollutants to enter the groundwater system. In areas where significant excavation is required, the potential to affect groundwater conditions will increase. The impact in these areas should be limited to the disturbance of groundwater flows, which due to their low volumes do not provide a significant contribution to the other resources of the project vicinity. No detrimental impacts to domestic or public water-supply wells or Water Resource Protection Areas are anticipated, as the project vicinity is not known to have these features.

To ensure that impacts to the geology is minimized, detailed geological field investigations and vibration studies will be conducted during Final Design. The potential impacts to and need for remediation of sinkholes and similar geological features will be conducted at that time. Control measures will be designed for the project as necessary to ensure that water is not diverted to existing closed depressions or sinkholes, as this could contribute to the formation or expansion of sinkholes. Additional measures to be taken that will reduce the risk of contaminating the local groundwater include the development and strict adherence of an erosion and sediment control plan and the incorporation of the proposed stormwater management basins.

I. Fish and Wildlife

The Department of Natural Resource and Environmental Control (DNREC) and the United States Fish and Wildlife Service (USFWS) have been contacted regarding the presence of threatened and endangered species located within the project area. According to DNREC and USFWS, except for occasional transient species, there are no known threatened and endangered species that will be affected by the proposed project (*Appendix E*).

The project area is comprised primarily by three (3) property parcels: the AstraZeneca Triangle, which consists of approximately 72.15 acres; the Weldin tract, consisting of approximately 92.51 acres; and the Alapocas tract, consisting of approximately 59.82 acres. The project area also includes smaller residential and commercially-developed parcels that surround the three major land tracts. However, the developed parcels offer only a marginal amount of valuable habitat to project area wildlife.

Within the three major land parcels there are several different habitat cover types: woodland, scrub/shrub, old field, agricultural field, woodland stream, and wetlands. Agricultural fields comprise the largest amount of the parcels covering about 48 percent or approximately 108 acres. Woodland habitat comprises approximately 25 percent of the three parcels covering approximately 56 acres. Wetland and stream habitat comprise approximately 11 percent of the parcels covering approximately 25 acres. Scrub/shrub and old field cover types comprise the bulk of the remaining 225 acres of the parcels.

The presence of the field, woodland stream and wetland habitats creates the potential for a wide variety of wildlife species to use the project area for food, shelter or nesting. Species that would be expected to utilize the project area include songbirds, mourning doves, crows, red-tailed and sharp-skinned hawks, shrews, mice, frogs, groundhogs, rabbits, raccoons, fox, deer, squirrels, snakes, turtles and salamanders.

The agricultural field cover type is predominate in all three of the major parcels of the project area. It provides food source habitat to species utilizing adjacent habitats, but offers little in the way of primary or resting, breeding and cover habitat. Species such as the white-tailed deer, raccoon, cottontail rabbit, Canadian goose and morning dove will forage in the agricultural fields. Predatory species such as the red fox and red-tailed hawk are drawn to the agricultural fields by the foraging species and use them as a primary hunting ground.

The woodland habitat of the three parcels is mainly concentrated in the northern half of the AstraZeneca Triangle tract and the southwestern edge of the Alapocas tract, as well as along the riparian zones of all three tracts. While development activity on the AstraZeneca Triangle tract has removed a sizeable amount of woodland habitat in that location of the project area, this cover type is still a viable and important resource within the tract. The woodland cover type provides cover, food and breeding habitat for the majority of the wildlife species that inhabit the project area and is one of the more valuable wildlife cover types available. In fact, its significance has increased with the removal of woodland from the AstraZeneca Triangle Tract.

While most of the wetlands and streams found in the project area are far from pristine, they are a valuable habitat source. They are a reliable source of water for the terrestrial species utilizing the project area and provide breeding, food and cover value to aquatic and water dependant species. Amphibians, reptiles and small fish species will utilize portions of these habitats, drawing larger predators such as green herons, kingfishers and raccoons. The cover types also provide a major breeding ground for insects, which support insectivores such as the little brown bat and numerous songbird species.

The scrub/shrub and old field cover types also offer valuable habitat to the project area wildlife species. They are a prime breeding area for species such as the northern cardinal, meadow vole and cottontail rabbit. These two cover types also provide food and cover sources for many of the project area species.

No-Build Alternative

Implementation of the No-Build Alternative will not affect the fish and wildlife of the project study area.

Preferred Alternative

The Preferred Alternative would require new roadway construction within the AstraZeneca Triangle tract, the Weldin tract and the Alapocas tracts, as well as within maintained commercial property. Where possible, the new roadway will traverse along the borders of the three (3) major tracts, minimizing the loss of habitat. However, both the Alapocas and Weldin tracts will contain new secondary roads that dissect portions of their agricultural fields.

The most significant effect the project will have on area wildlife will be the creation of a wider transportation corridor in the vicinity of the existing U.S. 202 and Rockland Road intersection. The proposed local road system and Route 141 Spur would further dissect the habitat units contained on the Alapocas tract and the AstraZeneca Triangle tract. Instead of a secondary 2-lane road separating the tracts, a new 4-lane state highway (Delaware Route 141) and realigned Rockland Road will split the two tracts. This will create a more significant mortality hazard for individual species that are likely to cross the roadway system when utilizing the bisected habitats. The magnitude of this concern may have been lessened by the recent removal of a sizeable portion of wildlife habitat cover on the AstraZeneca Triangle Tract as there will be less reason for animals to cross the roadway. The mortality hazard will also be increased where other new roads will be constructed, but to a lesser degree.

With the conversion of 7 acres of forested land, 24 acres of agricultural land, 1.12 acres of wetlands and streams, and 2.14 acres of old field and scrub/shrub habitat to transportation use, the project will remove this amount of available habitat from wildlife utilization. This will reduce the ability of the project area to support the number of wildlife individuals currently present. Despite the individual losses, the project should not significantly reduce the capability of the remaining land and adjacent parcels to support the wildlife species diversity that is currently found within the project area.

The proposed Greenway that will be constructed as part of the project will also have a minor affect on project area wildlife. The Greenway will directly remove a minor amount of habitat currently available to wildlife. It will also open up areas within the Alapocas and Weldin tracts to human use. This will create some wildlife flight from the immediate vicinity of the path at times of human activity. However, the Greenway may benefit wildlife by increasing the path users' appreciation and understanding of wildlife, in the long run stimulating the path users to undertake activities that are favorable to wildlife preservation.

The fish and aquatic life impacts associated with the proposed project will be minor in nature. As indicated under ***Section V.G - Hydrologic Impacts***, the proposed project will have three perennial stream crossings, most notably crossing Alapocas Run. The crossings will require the placement of either a bridge, culvert or drainage pipe in the areas of encroachment. The culvert and drainage pipe installations would be the most intrusive of the crossing options as they would permanently enclose the affected stream and remove natural streambed. However, none of the perennial streams appear to support a significant fish population, no fish were observed in the streams during field investigations, and only 595 linear feet of stream will potentially be enclosed by the project. This would remove a very small percentage of aquatic habitat available to project area aquatic species, essentially creating a negligible loss of habitat and effect of the aquatic species.

J. Wetlands

An inventory of existing conditions in the project area was conducted to preliminarily identify potential wetland areas. This inventory included review of the U.S. Fish and Wildlife Service's National Wetland Inventory (NWI) Mapping, the Soil Survey of New Castle County, Delaware (USDA 1970) and field reconnaissance surveys.

On-site wetland investigations were conducted throughout the project corridor that resulted in the identification and delineation of 20 wetland areas. The majority of the wetlands are located along Alapocas and Matson Runs and are classified as palustrine forested systems.

A brief description of the project area wetlands is provided below and summarized in **Table V-9**. The location and extent of these areas are shown on **Figure 30** (Wetland 14 was removed as it was determined non-regulatory by the ACOE). The wetland boundaries of the wetland systems have been determined from an official survey conducted in November 1998. A detailed discussion of the wetlands is provided under separate cover in three individual reports prepared by Environmental Consultants Inc. titled *Wetland Identification Alapocas Parcel*, *Wetland Identification Rock Manor Parcel* and *Wetland Investigation For: Triangle Parcel*. The U.S. Army Corps of Engineers issued a wetland jurisdictional determination in May 1, 2000 that confirmed the wetland boundaries of the AstraZeneca Triangle parcel. Jurisdictional determination of the wetland boundaries for the other two (2) tracts was received March 20, 2001.

Wetland Area 1 - Classified as palustrine forested (PFO), this wetland is approximately 1.98 acres in size. Located in the southwest corner of the AstraZeneca property, north of existing Delaware Route 141, this is the only wetland within the project area that drains to Husband's Run. The wetland lies in a topographic depression and collects surface runoff from the developed area to its north and east. Several spring seeps located within the wetland also contribute to the systems' hydrologic support.

Wetland Area 2 - This wetland is classified as a palustrine forested and emergent system (PFO/PEM) totaling approximately 1.47 acres in size. The wetland is located on the northwest side of the AstraZeneca Triangle tract within the site's large woodland area. The majority of the

**TABLE V-9
Summary of Wetland Characteristics**

Wetland #	USFWS Classification	Wetland Area (acres/ hectares)	Representative Species	Primary Functions
1	PFO	1.98/0.80	red maple, pin oak, sweetgum	GWD, FA, WD/A
2	PFO/PEM	1.47/0.59	sweetgum, red maple, whitegrass, tearthumb, skunk cabbage	GWD, SS, W D/A
3	PFO/PEM	0.90/0.36	red maple, sweetgum, persimmon, soft rush, beggar-ticks, lady's thumb	GWD, FA, SS, W D/A
4	PFO/PEM	4.48/1.81	red maple, arrowwood, whitegrass, common reed, false nettle, greenbrier	GWD, FA, SS, W D/A
5	PFO/PEM	0.13/0.05	red maple, whitegrass	GWD, SS, W D/A
6	PFO/PEM	1.08/0.43	red maple, black willow, silky dogwood, soft rush, tearthumb, panic grass, jewelweed	FA, SS, S/T R, N R/T
7	PSS/PEM	0.06/0.02	silky dogwood, arrowwood, soft rush, smartweed	GWD, W D/A
8	PFO/PEM	2.14/0.87	red maple, pin oak, silky dogwood, multiflora rose, soft rush, golden rod, purple loosestrife	GWD, FA, SS, W D/A
9	PFO/PEM	0.13/0.05	red maple, pin oak, silky dogwood, multiflora rose, soft rush, golden rod, purple loosestrife	GWD, FA, SS, W D/A
10	PFO/PEM	0.06/0.02	red maple, pin oak, silky dogwood, multiflora rose, soft rush, golden rod, purple loosestrife	GWD, FA, SS, W D/A
11	PFO/PEM	0.48/0.19	red maple, pin oak, silky dogwood, multiflora rose, soft rush, golden rod, purple loosestrife	GWD, FA, SS, W D/A
12	PSS/PEM	2.72/1.10	silky dogwood, multiflora rose, soft rush, woolgrass, purple loosestrife, common reed	GWD, FA, S/T R, N R/T, W D/A
13	PFO	3.65/1.45	red maple, green ash, tulip popular, silky dogwood, arrowwood, celandine,	GWD, FA, SS, W D/A
14	PEM	0.01/0.004	soft rush, jewelweed	FA
15	PFO	0.14/0.06	red maple, green ash, tulip popular, silky dogwood, arrowwood, celandine	FA, W D/A

**TABLE V-9, cont.
Summary of Wetland Characteristics**

Wetland #	USFWS Classification	Wetland Area (acres/hectares)	Representative Species	Primary Functions
16	PEM	0.39/0.16	blackberry, purple loosestrife, soft rush, sensitive fern, common reed	FA, S/T R, N R/T, W D/A
17	PFO/PEM	3.22/1.30	red maple, sweetgum, silky dogwood, multiflora rose, soft rush, sensitive fern, poison ivy, jewelweed, purple loosestrife, fireweed	GWD, FA, SS, W D/A
18	PEM	0.06/0.02	multiflora rose, soft rush, sensitive fern, poison ivy, jewelweed, purple loosestrife, fireweed	FA, S/T R, N R/T, W D/A
19	PFO/PEM	0.50/0.20	red maple, sweetgum, silky dogwood, multiflora rose, soft rush, sensitive fern, poison ivy, jewelweed, purple loosestrife, fireweed	GWD, FA, SS, W D/A
20	PEM	0.04/ 0.02	multiflora rose, soft rush, sensitive fern, poison ivy, jewelweed, purple loosestrife, fireweed	FA, S/T R, N R/T, W D/A
PEM = Palustrine Emergent; PSS = Palustrine Scrub/shrub; PFO = Palustrine Forested GWD = Groundwater Discharge; FA = Floodflow Alteration; SS = Sediment Stabilization; S/T R = Sediment & Toxicant Retention; N R/T = Nutrient Removal & Transformation; W D/A = Wildlife Diversity & Abundance				

wetland lies within drainage depressions and channels created by long-term surface flow generated by numerous springs seeps located throughout the wetland's boundaries. Near the wetland's southwestern border the surface flow from the seeps concentrates enough to form a shallow, slow moving perennial stream (Alapocas Trib 5). The vegetation within the seep depressions is primarily emergent with mature trees and shrubs lining the higher elevations of the wetland. The wetland also receives surface runoff from the northwestern section of the AstraZeneca Triangle tract.

Wetland Area 3 - Located on the AstraZeneca Triangle tract's western border at the site's transition from woodland to agricultural land, this wetland is approximately 0.90 acres in size. The vegetative cover of the wetland is primarily comprised of emergent species, but a small portion of the wetland extends into the woodlands. The collection of surface runoff provides some of the systems hydrologic support, however, at least a portion of the wetland's main hydrologic source is groundwater. The northeast corner of the wetland contains an apparent 0.25 acre vernal pool. Excess surface water leaves the wetland via an intermittent channel that cuts through the adjacent agricultural field and down to *Wetland 6*.

Wetland 4 - This wetland is classified as a palustrine emergent and forested (PEM/PFO) system that is approximately 4.48 acres in size. The wetland is located along the eastern side of the AstraZeneca Triangle tract within the tract's woodlands. There are scattered pockets of the

wetland that are dominated by emergent vegetation. The hydrologic source of this system comes from surface runoff generated from an upslope of the AstraZeneca Triangle tract, as well as, from spring seeps scattered throughout the wetland. Floodwaters of Alapocas Run also provide a frequent hydrology source to portions of the wetland. The wetland is hydrologically connected to **Wetland 6** by Alapocas Run.

Wetland 5 - Classified as a 0.13-acre palustrine forested and emergent wetland (PFO/PEM), this wetland lies in a small depression within agricultural land located adjacent to U.S. 202. The wetland's vegetation primarily consists of a pocket of mature trees that have grown around several spring seeps. Emergent vegetation extends around the outer extremes of the wooded pocket and along the poorly defined channel that carries excess surface water from the wetland to nearby Alapocas Run. The spring seeps provide the primary hydrological source of the wetland, but surface runoff also contributes to the system's hydrologic support.

Wetland 6 - Located in the southeastern corner of the AstraZeneca Triangle tract, this wetland lies within a depression at the base of the tract's large agricultural field and along the Alapocas Run riparian zone. The wetland is classified as a palustrine emergent and forested (PEM/PFO) system with the emergent component occurring primarily within the field depression and the forested component within the riparian zone. Collection of surface runoff from floodflow, the agricultural field and **Wetland 3** is the primary hydrologic source of the wetland. The wetland totals approximately 1.08 acres in size.

Wetland 7 - This wetland is a small, approximately 0.06 acre, system that lies within a topographic depression located in the northwestern portion of the Alapocas tract. The wetland's vegetation is comprised of several species of shrubs and herbs giving the system its palustrine emergent and scrub/shrub (PEM/PSS) classification. Surface runoff and possibly spring seep flow provide the wetland's hydrology. Excess surface water drains from the wetland to the east and Wetland 8.

Wetlands 8, 9 & 10 - These three wetland areas are all part of a contiguous palustrine system that contains emergent, scrub/shrub and forested cover types (PEM/PSS/PFO). They are located in the western portion of the Alapocas tract within the riparian zone of Alapocas Run or along the stream's western tributaries. All three wetlands rely on spring seeps, surface runoff and stream flooding as their hydrology sources. A sizeable portion of the approximately 2.14 acre **Wetland 8** consists of a farm pond that has been filled, either naturally or through human intervention. The wetland has forested cover along the Alapocas Run riparian zone and within its boundaries located at the southern edge of the Alapocas tract. Scrub/shrub and emergent vegetation comprise the rest of the wetland's cover as it extends from the riparian zone westward along AR Trib 3 and AR Trib 4. **Wetlands 9** and **10** are primarily forested systems that contain emergent pockets associated with AR Trib 4. Within the project area their extents are minor, approximately 0.13 acre and 0.06 acre respectively. The limits of all three wetlands extend beyond the project area and join together down gradient of the Alapocas tract.

Wetlands 11 & 12 - Located immediately adjacent to the agricultural field of the Alapocas tract, these two wetlands possess similar hydrology regimes. They are positioned in topographic depressions that gather surface runoff from the agricultural field via small, defined intermittent

channels and through overland flow. Additional hydrologic support may also be derived from small spring seeps. Both wetlands release excess surface water into the intermittent channels that drain to Alapocas Run.

The two wetlands contain emergent vegetation components (PEM) within their boundaries. **Wetland 11** also contains a forested cover component (PFO) that is an extension of the woodlands located below the Alapocas tract. **Wetland 12** has a second cover component that consists of scrub/shrub vegetation (PSS). Both wetlands' boundaries extend beyond the Alapocas tract, with the former extending into the woodlands located to its west and the latter extending south into the adjacent residential development. Within the project area, the wetlands total approximately 0.48 acre (0.19 hectares) and 2.72 acres (1.10 hectares), respectively.

Wetland 13 - This wetland area is located along the eastern edge of the project area and is part of a larger system that has been split by Weldin Road. Positioned to the north of the road, the wetland is primarily forested, giving it a palustrine forest (PFO) classification. A total of approximately 3.65 acres of the wetland is contained in the Weldin tract, with only a small sliver of the wetland extending north of the tract into adjacent commercial property. The wetland's hydrologic support comes from the flooding of Matson Run, collection of surface runoff and spring discharge.

Wetlands 14 & 15 - These two wetland areas lie adjacent to **Wetland 13** within the Weldin tract. Both areas lie within topographic depressions that appear to have been separated from Wetland 13 by human disturbance. The 0.01-acre emergent (PEM) area that comprises **Wetland 14** is located at the edge of an agricultural field and extends into the woodlands that line Matson Run. The wetland appears to utilize surface runoff for its primary hydrologic source. The 0.14-acre forested (PFO) area that comprises **Wetland 15** lies within the Matson Run woodlands immediately north of Matson Run and east of **Wetland 13**. Spring discharge and the collection of surface runoff appear to be the primary hydrologic sources for the wetland.

Wetland 16 - Classified as a palustrine emergent (PEM) system, this wetland lies within the Weldin tract in the southwest corner of the Weldin Road and Carruthers Lane intersection. The approximately 0.39-acre wetland appears to have originally been part of Wetland 17, but was fragmented from the wetland by construction of Carruthers Lane. The collection of surface runoff from the adjacent agricultural field acts as the wetlands primary hydrologic source.

Wetland 17 - This wetland area is part of the large wetland system paralleling Matson Run. It runs from Weldin Road along the Weldin tract border toward the southeastern corner of the tract. At this point the approximately 3.22-acre wetland continues off the Weldin tract and out of the project area. The wetland is similar to **Wetland 13** in size, function and vegetative cover. The vegetative cover is primarily forested (PFO) with emergent (PEM) pockets scattered throughout. Spring discharge, stream flooding and surface runoff all provide the hydrology of the wetland.

Wetland 18 - Located within one of the Weldin tract agricultural fields across Carruthers Lane from Wetland 17, this wetland area is an emergent (PEM) system of approximately 0.06 acres in size. Like Wetland 16, the wetland appears to be an original part of **Wetland 17** that has been

fragmented by Carruthers Lane. Also like *Wetland 16*, the collection of surface runoff from the adjacent agricultural field is the wetland's primary hydrologic source.

Wetland 19 - This wetland area is another fragment of the larger Matson Run wetland system that is located within the Weldin tract. The 0.50-acre wetland lies in the southeast corner of the tract. It is contiguous with *Wetland 17*, artificially separated from the wetland by the eastern border of the Weldin tract. The wetland's hydrology, function and vegetative cover are essentially the same as those described for *Wetland 17*.

Wetland 20 - The last wetland area identified within the project area and on the Weldin tract, this 0.04-acre wetland is positioned along the southern border of the tract immediately adjacent to Carruthers Lane. Like *Wetlands 16* and *18*, the wetland appears to have been historically connected to the large Matson Run wetland system, but has been fragmented from that system by Carruthers Lane. The wetland is comprised of emergent vegetation (PEM) and is hydrologically supported by surface runoff generated by the adjacent agricultural field and roadway.

Functional Value

The project area wetlands share many of the same functions. The most predominate functions provided by the wetlands include groundwater discharge, floodflow alteration, sediment stabilization and wildlife diversity/abundance. Additional functions provided by some of the wetlands include sediment/toxicant retention and nutrient removal/transformation. The degree and value of the functions provided by the wetlands are dependent on many factors. However, in general the wetland's size, surface water detention capacity, vegetative cover type and density play the most significant roles in their functional value. The greater the size, detention capacity and cover density, the more able a wetland will be in providing the functions.

The function of groundwater discharge is provided by the majority of the project wetlands. The function occurs in the wetland areas that are supported by spring seeps. These wetlands release some of the seep flow to the project area streams, making a significant contribution to the streams' base flow and making groundwater discharge one of their primary functions. *Wetlands 2, 3, 4, 5, 8, 11, 12, 13* and *17* all provide this important function at a significant level.

The function of floodflow alteration is provided by project area wetlands that have at least some capacity and opportunity to detain surface runoff. These wetlands are generally located in topographic depressions that receive storm generated runoff via street flow or stream flooding. They detain the collected runoff for varying periods of time reducing the potential of flooding in down gradient areas. *Wetlands 1, 8, 12, 16* and *18* are particularly effective in providing this function.

The function of Wildlife Diversity/Abundance is provided by most of the wetlands in the project area. These wetlands offer habitat to project area wildlife that would otherwise not be found within their immediate vicinity. This allows more wildlife species to inhabit the project area, stimulating great wildlife diversity and abundance within the project area. *Wetlands 1, 2, 3, 4, 6, 8, 12, 13* and *17* are noteworthy in providing this function.

The functions of sediment/toxicant retention and nutrient removal transformation are provided by several of the project area wetlands. These wetlands have the ability to detain/retain storm generated runoff for a significant period of time and have a dense vegetative cover. The runoff they collect will come from areas that contribute sediments, pollutants or nutrients to their downstream watersheds. These areas include agricultural fields and developed areas. Upon retaining the storm water runoff, sediments and toxicants will settle out of the collected runoff and the vegetation will uptake nutrients carried by the runoff. **Wetlands 6, 12, 16, 18 and 20** have the greatest capacity to perform these functions within the project area.

No-Build Alternative

Implementation of the No-Build Alternative will have no affect on the wetlands in the project study area.

Preferred Alternative

The implementation of the Preferred Alternative will result in the direct loss of approximately 1.12 acres of wetlands. As seen on **Table V-10**, the majority of the impacts will occur to the wetlands within the Alapocas Run watershed. The new roadway construction required for the project would create the loss of 1.08 acres of wetlands, while the construction of the Greenway path will add an additional 0.03 acres of impact to the wetland. Only one wetland, **Wetland 5**, will be completely eliminated by the proposed project. The other wetlands directly affected wetlands will continue to be viable and provide their current functions, but to a lesser degree after the completion of the project.

Wetland 2 will lose approximately 30 percent or 0.364 acres of its total size. A part of this loss will be the result of creating nonviable area, but the majority of the loss will be due to direct encroachment into the wetland. The area of the wetland being lost mainly acts as a collection area for spring flow that is generated by the rest of the wetland. For the most part, the spring seep areas within the wetland will not be affected by the proposed project, allowing the wetland to continue to act as a headwater area for AR Trib 5.

**TABLE V-10
Wetland Impacts**

Wetland Number	Impact	Acreage Affected
2	Direct encroachment by new roadway and creation of two small nonviable remnant pockets.	0.364
3	Direct encroachment of western edge by new roadway.	0.086
4	Direct encroachment of eastern edge by widening of U.S. 202.	0.432
5	Direct encroachment of spring seep area by new roadway.	0.129
8	Direct encroachment of riparian zone by new roadway.	0.082
19	Direct encroachment by Greenway.	0.025
	Total Acres Lost	1.12

Wetland 3 will experience only a small loss from its 0.90 acres and no loss of the wetland’s vernal pool area will occur. The impact to the wetland will be the result of a direct encroachment by the proposed roadway. The area affected is on the outer fringe of the wetland

and its loss should not affect the wetland's ability to continue to provide its current functions at near current capacities.

Wetland 4 will experience the loss of approximately 9 percent of its total size or a loss of approximately 0.43 acres. The loss will occur along its eastern border where the proposed widening of U.S. 202 will encroach on two drainage fingers of the wetland, as well as a 0.35-acre strip of the wetland located adjacent to the existing roadway. These losses should not dramatically affect the wetland's ability to provide its current functions at their current capacities.

Wetland 5 will have one of the more significant wetland impacts that will be associated with the proposed project. The wetland's forested spring seep area will be completely eliminated by the project. This will effectively alter the wetland's ability to provide its functions and reduce the wetland's value. Provided the proposed project is constructed in a manner that will direct the altered springs into the remaining portion of the wetland, the undisturbed portions of the wetland will be able to provide at least some of the functions the wetland currently provides. However, for the purposes of this evaluation indirect losses have been assumed resulting in the complete loss of the 0.13-acre wetland.

Wetland 8 is the last wetland within the Alapocas Run watershed that will be directly affected by the proposed project. This wetland will lose approximately 0.082 acres of its forested riparian zone area as a result of two culverted crossings connecting the new Section of Rockland Road to West Side Park Road. This loss will reduce the wetland's ability to provide some of its functions at their current capacity, but will not eliminate any of the functions the wetland currently provides.

Wetland 19 is the only affected area wetland in the Matson Run watershed that will experience a direct loss of area as a result of the proposed project. The Greenway will cut through the wetland bisecting it and directly affecting approximately 0.025 acres. A culverted hydrologic connection between the split sections of the wetland will be maintained by the project and the wetland should not experience a significant impact to its viability.

The proposed project also has the potential to cause indirect impacts that could affect project area wetlands. Because the project would alter existing topography and most of the wetlands rely on surface runoff to provide at least some of the hydrologic support, there is the potential for altering the hydrologic support to the wetlands. There is also the potential of wetland impacts occurring as a result of sedimentation deposition during construction and the release of roadway pollutants (i.e. automotive oils, road deicing agents) once the new roads are opened to travel.

The secondary roads proposed for the Alapocas tract could potentially alter the drainage pattern within the agricultural field that contributes surface runoff to **Wetlands 11** and **12**. The proposed changes will direct runoff from a majority of the contributing watershed into a stormwater management system that is being designed to accommodate runoff from new impervious surfaces. The design of the stormwater management facilities and flow of surface runoff will be specially designed to address these concerns at **Wetlands 11** and **12**.

The proposed project also has the potential to cause sediment deposition and roadway pollutant impacts to occur within the project area wetlands. The extensive exposure of earth during construction activities could induce sedimentation deposits to accumulate in adjacent wetlands. The completion of the project could cause the release of roadway pollutants (i.e. automotive oils, road deicing agents) into the wetlands once the new road is opened to travel. However, sedimentation impacts should be minimal and will not have a noticeable affect on the wetlands provided that proper implementation of and strict adherence to the project's erosion and sediment control plan is carried out. Roadway pollutant impacts will also be minimized through the stormwater management system and bioswales that will be implemented as part of the project. The minimal amount of pollutants that would reach the wetlands from the roadway should easily be absorbed by the wetland systems without altering the wetlands current conditions.

Mitigation

Throughout the project development process measures to avoid and minimize wetland impacts were pursued, however, based on the current preliminary design it will be necessary to encroach on approximately 1.12 acres of wetlands as a result of project implementation. Additional measures to minimize impacts will continue through final design, including use of retaining walls and/or increased slopes.

As part of the Army Corps of Engineers (ACOE) permitting process, the acreage and function of the wetlands lost as a result of the Preferred Alternative are required to be replaced. The design goals for the amount of wetland replacement were obtained through coordination with the ACOE, EPA and DNREC during the August 17, 2000 Agency Field View. Forested wetland losses should be replaced at a 2:1 ratio, scrub/shrub wetlands at a 1.5:1 ratio and emergent wetlands at a 1:1 ratio. The design goals for the replacement of lost wetland functions would be to effectively replace the functions lost. If this ratio cannot be achieved with mitigation alone, all wetlands will be replaced at a ratio of 1:1 in combination with a mitigation package including stream restoration, wetland encroachment and riparian buffer enhancement.

Site selection of potential replacement wetlands was based upon review of preliminary design plans, area hydrology and soils of the project area. Site analysis has followed the process of selecting areas that would best replace the primary functions and values of the impacted wetlands and follow an established hierarchical approach. Other potential constraints such as archaeology issues, Section 4(f) properties, ownership and social aspects were also considered. On-site wetland mitigation within the watershed to be affected will be the highest priority for wetland replacement sites. If this is not possible, then site evaluation will move off-site, but within the affected wetland's watershed where practical.

Three (3) conceptual mitigation areas were preliminarily identified within the study area in the Alapocas tract area adjacent to the existing wetland areas associated with Alapocas Run. Additional evaluations are being performed to determine whether the site conditions are conducive to wetland replacement. Groundwater monitoring wells were installed in each of the three (3) sites in November 2000. Based on information collected and results of the monitoring well data, the mitigation site area adjacent to ***Wetland 12*** was determined to have the most potential for replacing the lost wetland functional values. This proposed mitigation site will be

combined with other mitigation strategies for the project including stream restoration floodplain enhancement; landscape and buffer enhancement and use of bioswales. Coordination with the regulatory agencies in selecting the most appropriate mitigation strategies for the projects will continue through Final Design.

Section 404 (b)(1) Analysis

A detailed Section 404 (b)(1) Analysis is included in ***Appendix B***. The analysis presents an evaluation of wetland impacts, avoidance and minimization measures that follow the Clean Water Act, Section 404 (b)(1) guidelines (40CFR, Part 230, Subparts B-F).

K. Land Use

Existing land use in the project area is diverse and varied, and is comprised of a number of different land use categories. These categories include forestland, wetlands, residential, agricultural, and non-residential (***Figure 31***). There will be direct land use pattern changes to the project area from implementation of the Preferred Alternative, as well as secondary impacts from the project as a result of proposed future land use plans generated by the state and local governments.

Previous proposals for land use changes in the project area included the future development of the open land comprising the AstraZeneca Triangle tract, the Weldin Tract and the Alapocas Tract. However, due to economic development pressures to local and state agencies, and in conjunction with the Blue Ball Properties Area Transportation Improvement Project, the open land of the Weldin Tract and the Alapocas Tract has been planned for preservation as parkland. The AstraZeneca Triangle parcel will be utilized for the expansion of the AstraZeneca Pharmaceutical Company.

No-Build Alternative

Implementation of the No-Build Alternative would have no affect on land use in the project study area.

Preferred Alternative

Approximately 47.8 acres of right-of-way will need to be converted to transportation land use as a result of the Preferred Alternative. Impacts directly associated with the proposed project are shown in ***Table V-11*** and described throughout this report in sections ***G. Hydrologic Impacts, I. Fish and Wildlife, J. Wetlands*** and ***L. Other Natural Resources and M. Access***.

Legend

- Forest
- Resid
- Non-F
- Agricul
- Recre
- Grass
- Ceme
- Blue E
- Reser
- Propo
- Propo
- Propo
- Water



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FIGURE 31: LAND USE

FIGURE 31: LAND USE

**TABLE V-11
Land Use Impacts**

Cover Type	Impact by Acre
Forestland	7.0
Wetlands	1.12
Agricultural land	24.0
Old Field – Scrub/Shrub	2.14
Residential	0.0
Non-Residential	13.49
Total Right-of-Way Impacts	47.75

As part of a Land Use mitigation package, remaining lands that are under DelDOT ownership will be transferred to the State Park system.

L. Other Natural Resources

The current land use of the project area has limited the extent and habitat value of the natural resources that are present. The area is primarily comprised of forestland and agricultural land, surrounded by residential, institutional and commercial uses. The habitats that are present offer some valuable breeding and cover conditions to most wildlife species, but they are bisected by major roadways, such as U.S. 202, Rockland Road and Foulk Road. The cover types with moderate to good habitat value are limited by their relative size and the proposed changes in land use due to the expansion of the AstraZeneca Pharmaceutical Company. These cover types include the project area streams and wetlands, which are described in sections *G. Hydrologic Impacts*, *I. Fish and Wildlife* and *J. Wetlands*. A discussion of the project area farmlands follows.

At present, there are approximately 37.04 acres of noncontiguous agricultural land potentially impacted by the proposed roadway widening. The farmland is on land that has been acquired by the State of Delaware and is no longer being actively utilized. The impacts to farmlands and farmland operations have been minimized by the use of existing right-of-way to the best extent practicable. The LESA evaluation form (Form AD-1006) has determined that no coordination is required with the Natural Resource Conservation Service and is included in *Appendix F*.

No-Build Alternative

Implementation of the No-Build Alternative would not affect other natural resources in the project study area.

Preferred Alternative

The Preferred Alternative has been designed to minimize impacts to agricultural lands, which reduces the potential for roadway-related secondary impacts to occur. The agricultural lands have been proposed for parkland and stormwater management. The proposed project should not put additional development pressure on the remaining agricultural lands.

M. Access

No-Build Alternative

Implementation of the No-Build Alternative would not affect access in the project study area.

Preferred Alternative

The Blue Ball Properties Area Transportation Project consists of the construction of new roadways, as well as improvements to existing roadway facilities. The proposed access based on the Preferred Alternative for each roadway within the study area is detailed below.

New Roadways:

- Delaware Route 141 Spur. This facility is proposed to be controlled-access with access at signalized intersections with Childrens Drive/Existing Delaware Route 141, AstraZeneca, Augustine Cut-Off Extension, and U.S. Route 202. An unsignalized right-in/right-out access to the AstraZeneca campus will be provided, in addition to the main access. It is not anticipated that any other roadway or driveway access points will be allowed on the Delaware Route 141 Spur.
- Westpark Drive/Augustine Cut-Off Extension. This facility is proposed to be fee-access with signalized intersections at the Delaware Route 141 Spur, the Connector Road to U.S. Route 202 near the existing Augustine Cut-Off intersection, and either a signalized or roundabout intersection at the Eastpark Drive. Unsignalized intersections are proposed at the intersection with Rockland Road, and with the driveway access to the Blue Ball Barn. It is not anticipated that any other roadway or driveway access points will be provided on this roadway, although additional access to park and Bike/Pedestrian facilities may be required.
- Eastpark Drive. This facility is proposed to be free-access with either a signalized or Roundabout intersection at the Westpark Drive and an unsignalized intersection with relocated Carruthers Lane.
- Relocated Weldin Road. This facility is proposed to be free-access with unsignalized intersection with the Eastpark Drive, the Connector Road to Foulk Road, and Carruthers Lane. Additional unsignalized driveway access points will be required to access the park facilities and water treatment plant.
- I-95 Ramp to Delaware Route 141 Spur/Foulk Road. This roadway connection, which serves traffic originating on I-95 and traveling towards the Delaware Route 141 Spur, U.S. Route 202 northbound or Foulk Road, is required to be a limited-access facility. Other than the proposed intersection with the Delaware Route 141 Spur/Foulk Road, no other access points will be allowed on this roadway link.
- Connector Road (south of Independence Mall). This facility is proposed to be a free-access facility, with a signalized intersection at Foulk Road, and a right-in/right-out unsignalized intersection with U.S. Route 202. Mid-block unsignalized driveway access points will be necessary to serve the surrounding business establishments.

Existing Roadways:

- U.S. Route 202. This facility is proposed to be a divided, controlled-access facility. Driveways and median openings provided for in the U.S. Route 202 Safety Improvement Project will be maintained; however, some additional access may be limited. Signalized intersections on U.S. Route 202 will occur at the Connector Road to Augustine Cut-Off, Foulk Road/Ramp from Route 141 Spur, Independence Mall, and existing Delaware Route 141/Murphy Road.
- Existing Delaware Route 141. This facility is proposed to be free-access, with signalized intersections at U.S. Route 202, and Childrens Drive/Route 141 Spur. An unsignalized westbound right-in access, and an eastbound unsignalized right-out access, will be provided to and from the AstraZeneca campus. Reconfiguration of access to the AstraZeneca campus may be possible in the future (with additional or revised access points).
- Foulk Road/Relocated Foulk Road. This facility is proposed to be controlled-access, with signalized intersection at U.S. Route 202, the I-95 Ramp to Foulk Road, and the Connector Roads to U.S. Route 202 and Weldin Road. Existing driveway access points will be maintained. No other access points will be allowed at this roadway link.
- Murphy Road. This facility is currently and is proposed to be free-access, with a signalized intersection at U.S. Route 202. The driveway access to the gas station on the northeast corner of Murphy Road and U.S. Route 202 may need to be modified, due to the addition of a turn lane on Murphy Road.
- Childrens Drive. This facility is currently and is proposed to be free-access, with signalized intersections at existing Delaware Route 141/Route 141 Spur, and Rockland Road. Existing access points will be maintained, but likely modified, due to the reconfigured design of Childrens Drive.
- Rockland Road. This facility is currently and is proposed to be free-access, with a signalized intersection at Childrens Drive, and a proposed unsignalized intersection with the Westpark Drive. Existing driveway access points will be maintained, and additional driveway access point may be feasible if necessary.
- Carruthers Lane. This is currently a free-access facility that provides access to Weldin Road to Rock Manor Golf Course, Wilmington Skating Club and several residents. It will be relocated from Weldin Road to the west, connecting to the Eastpark Drive just east of the U.S. Route 202 underpass.
- Eastpark Drive. Eastpark Drive in an east-west alignment between the proposed golf practice area and the proposed multi-purpose soccer fields. It then connects to Carruthers Lane and travels north to a relocated segment of Weldin Road. This portion of Weldin Road connects to Foulk Road at an intersection north of the existing Foulk Road/Weldin Road intersection.

N. Permits

No-Build Alternative

No permits would be required with the No-Build Alternative.

Preferred Alternative

Stream crossings over Alapocas Run and Matson Run and their tributaries will be required as a result of the project. Additionally, approximately 1.12 acres of wetlands will be affected. The stream crossings and wetland impacts will require permits from New Castle County, Coastal Zone Management (CZM) consistency determination, a 404 Permit from the Army Corps of Engineers (ACOE), a Subaqueous Lands Permit from the Delaware Department of Natural Resources and Environmental Control (DNREC) and a Section 401 Water Quality Certification.

Wetland mitigation will also be required to compensate for the wetland impacts. On-site mitigation within the watershed to be affected will be the highest priority for wetland replacement sites. Next priority will be off-site within the same watershed. Conceptual mitigation areas have preliminarily been identified within the project study area and will be further evaluated for feasibility during Final Design.

The Brandywine Creek is dammed downstream of the project area and the relevant portions of Alapocas Run and Matson Run are both above the fall line. As such, it is expected that a Coast Guard Permit will not be required for the project.