ENVIRONMENTAL RESOURCE INVENTORY

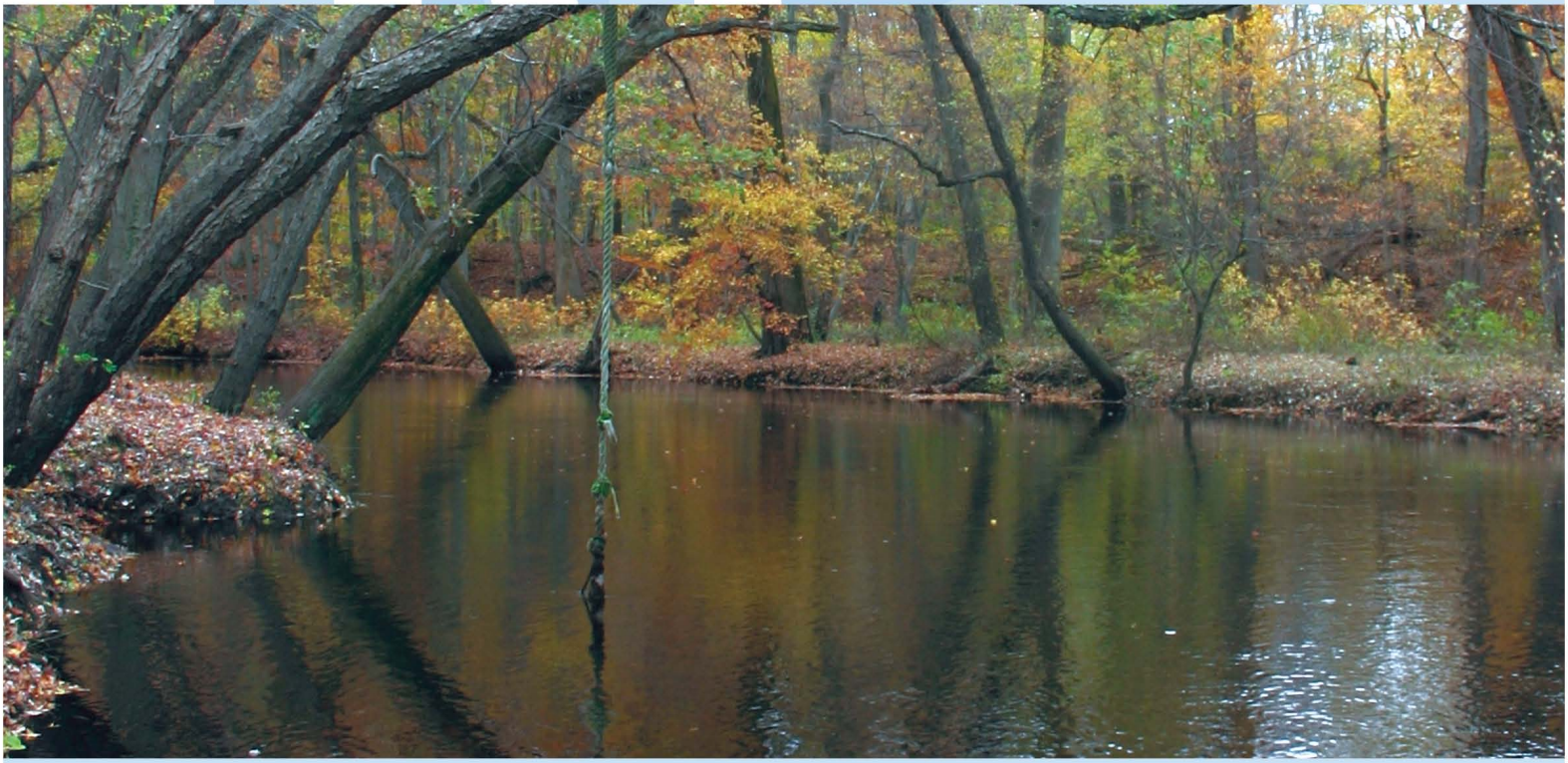
ERI

FEBRUARY 2011

For the Township of:

PEMBERTON

Burlington County, New Jersey



by:

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

with:

The Environmental Commission of Pemberton Township

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

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Executive Summary

Pemberton Township is a municipality of about 28,000 people and covers nearly 63 square miles (40,148 acres). About 90 percent of the township is located in the Pinelands, one of the most unique ecosystems in the world. The Brendan T. Byrne State Forest covers about 12 square miles (7,600 acres) of the township and contains the historic Whitesbog Village, the birthplace of the cultivated blueberry.

Pemberton Township lies primarily in the Outer Coastal Plain, although the non-Pinelands portion of Pemberton lies in the Inner Coastal Plain. Pemberton Township mostly contains sandy soils with limited agricultural fertility, except for specialized crops like blueberries and cranberries.

There are about 244 miles of streams running through Pemberton Township, most of which (150 miles) are headwater streams. There are also over 700 acres of lakes and ponds, including Lake Pemberton, Mirror Lake, Hanover Lake, Little Pine Lake, Country Lakes, Presidential Lakes, and other smaller lakes and ponds.

Pemberton Township is located entirely within the Rancocas Creek watershed, which is divided into four smaller watersheds and 16 even smaller subwatersheds within the township. In 2008, 12 of these subwatersheds were impaired for one or more designated uses. Some subwatersheds in Pemberton Township were impaired due to copper, lead, mercury, E. coli, phosphorus, arsenic, PCBs, and other contaminants.

Pemberton Township contains a rich diversity of plant and animal life, and natural vegetation cover nearly three-fourths of the township. Over one-third of the township is composed of wetlands, the majority of which is wooded. Upland forest covers another third of the township, and brushland and water bodies also occupy large areas. About 12 percent of the township is agricultural land, and developed land covers about 14 percent.

Many threatened, endangered, and other rare species are located in Pemberton Township, including the Bald Eagle, Bobcat, Timber Rattlesnake, Corn Snake, Vesper Sparrow, Pied-billed Grebe, and American Bittern. Preserving the natural habitats of these species within Pemberton Township can help protect them from complete extinction. A number of very rare plants have been identified in Pemberton Township as well, including Swamp-pink, Chaffseed, and Pickering’s Morning Glory.

Some developed areas in Pemberton Township rely on individual drinking water wells and on-site septic systems for water and sewage. These areas lie atop the unconfined and vulnerable Kirkwood-Cohansey Aquifer, one of the largest sources of pure water in the world. Protecting this invaluable aquifer from contamination should be a high priority for the township.

Pemberton Township has a number of places listed on the State and National Registers of Historic Places. The preservation of these sites maintains the agricultural, industrial, and civic heritage of Pemberton and the Pinelands as a whole. In addition, Pemberton Township contains important conservation areas, such as a New Jersey Audubon Society Important Bird Area, a Wildlife Management Area, Natural Heritage Priority Sites, and critical habitat and foraging areas for endangered animals. Protecting these and other natural areas in the township can help preserve imperiled plant and animal species, laying the foundation for a more biodiverse and sustainable future.

CHAPTER 1

Introduction

The purpose of an Environmental Resource Inventory is to identify and describe the natural resources of a community. A community's natural resources–its soil, water, air, forests, fields, and waterways–are fundamental to its character. The protection and wise use of those resources is essential to the public health, safety, and welfare of current and future residents.

The Environmental Resource Inventory provides the basis for the development of methods and steps to preserve, conserve, and utilize those resources, although it does not include specific recommendations to those ends. It is, instead, a compendium of all the existing information that can be found about a township's natural resources, presented in a form that is useful to a broad audience. The inventory reflects a particular moment in time, and it should be updated as new data becomes available.

The settlement and growth of Pemberton Township is inherently tied to its natural resources. Early settlers saw the forests, the waters, and the soils as opportunities for industry, development, and prosperity. Pemberton's environmental resources enabled the rise of its industries, agriculture, resorts, and community. From its origins as endless forest with meandering tea-colored streams, to the home of industrial mills and furnaces, to an idyllic summer destination for urbane visitors, to the birthplace of the cultivated blueberry, to a strategic military training ground since World War I, Pemberton has taken many shapes over time, but has retained its natural beauty to the present day.

The rural landscape of Pemberton Township

As development pressures increase in and around Pemberton Township, documentation of its natural resources becomes a necessity. Special measures to protect and enhance the historic characteristics, agricultural economy, unique forest ecosystems, and water

bodies of Pemberton Township are essential to maintain these resources in the face of increasing population and development. Pemberton Township's water, wetlands, forests, and grasslands provide significant habitat for a wide variety of plants and animals, many of which are threatened and endangered. These areas are critically important in protecting the health and vitality of the township. Detailed documentation of these resources will aid Pemberton Township's citizens to balance the pressures of growth with conservation, maintaining and shaping the community's unique identity while preserving its rich historic fabric and exceptional natural environment.

Sources

Several documents and reports were utilized in preparing the *Environmental Resource Inventory (ERI) for Pemberton Township*. These reports and references are listed at the end of this document.

The maps and data relating to natural resources are mainly derived from the New Jersey Department of Environmental Protection (NJDEP), the United States Geological Survey (USGS), and the Delaware Valley Regional Planning Commission (DVRPC). Information from these sources specific to Pemberton Township has been included whenever it was available. Information from other reports about specific sites has also been incorporated, along with data provided by the township and county. The ERI has been reviewed and revised by members of the Environmental Commission and other municipal officials.

Descriptive introductions to some topics have been included in the ERI to give readers some background on various complex topics. The hope is that this information will also assist the Pemberton Township Environmental Commission and other township officials in obtaining additional data from state sources in the future and in determining the types of investigations that still need to be conducted.

CHAPTER 2

Brief History

Long before European settlement, the first people to live in Pemberton Township were the Native Americans. Recent archaeological findings show that Native Americans lived in the Burlington County region for 8,000 to 10,000 years before colonial settlement. These original residents were members of the Lenni Lenape tribe, who inhabited much of southern New Jersey. Most Lenni Lenape settlements were located along river banks and they maintained a culture combining hunting, fishing, trapping, and early agriculture. A significant Native American site was uncovered near the confluence of the Rancocas Creek North Branch and Indian Run, now the Birmingham area of Pemberton. Major excavations in 1940 and 1955 uncovered artifacts that indicated that Native Americans frequented the area over a long period of time; however, no evidence has been shown to support a long-term settlement at this location. Although the Lenni Lenape lived in southern New Jersey for thousands of years, they succumbed to the diseases and encroachment of the newly arrived European settlers. By 1758, all remaining Native Americans south of the Raritan River were encouraged to live in the 3,258-acre reservation called Brotherton in what is now Shamong Township, New Jersey; this has been recognized as the first Indian Reservation in the country.

The first European settlers in the Delaware Valley were the Dutch, who, in 1624, settled and built a fort near what is today Gloucester City, Camden County. As early as 1638, Swedish settlers ventured into the Delaware Valley. In 1644, King Charles II of England took control of much of America's eastern seaboard and deeded most of present-day New Jersey to his brother, the Duke of York, who split it into East and West. The British quickly sought to occupy the land and secure its control. West Jersey was settled mostly by English Quakers. Throughout the 17th century, sections of New Jersey were acquired from the Lenni Lenape tribe, including present-day Pemberton Township, located primarily in the Pinelands.

The Pinelands was an attractive area for new settlers after arriving in the colonies, as it had mature trees, fertile ground, and numerous streams. In fact, the first industries in the region were based on the exploitation of these natural resources. One of the very first industries was lumbering, and sawmills were constructed to turn the virgin woodlands into lumber for the construction of homes, ships, and other purposes. Another early industry was grist mills, used to turn grain into flour. As the lumbering industry depleted old growth woodlands and turned to second and third growth trees, the charcoal industry grew, since it could use these smaller trees. However, the operation of charcoal pits required the clear-cutting of woodland, which eradicated vast areas of the Pinelands. Another early industry was the manufacturing of bog iron, derived from decayed vegetative matter and the iron salts found in streams. The sands of southern New Jersey gave rise to the glass

industry, the furnaces of which were fueled by the area's abundant wood and charcoal. The soils were also used in the manufacturing of brick, tile, and pottery, as well as for sand and gravel "mining." The abundance of wildlife led to the leather industry, and tanneries treated animal hides with tannin derived from tree bark.

Burlington County, home to Pemberton Township, was officially founded on May 17, 1694. By that time it was a well-established region, with industries in the county that included a tannery, sawmills, pottery, and brickyards. Thomas Olive's grist mill, named "Wellingborough," (located in present-day Willingboro) was also in operation.

Pemberton became an incorporated township on March 10, 1846, by an Act of the New Jersey Legislature. It was created using sections of the already established Southampton Township, Northampton Township (now Mount Holly), and New Hanover Township. Pemberton's boundaries expanded in 1850 with an additional area of Northampton Township. The township decreased in size when portions of the township went to Westampton Township in 1854 and Woodland Township in 1866. Pemberton Borough was established circa 1894. In 1967, a portion of Pemberton Borough was ceded back to the township.

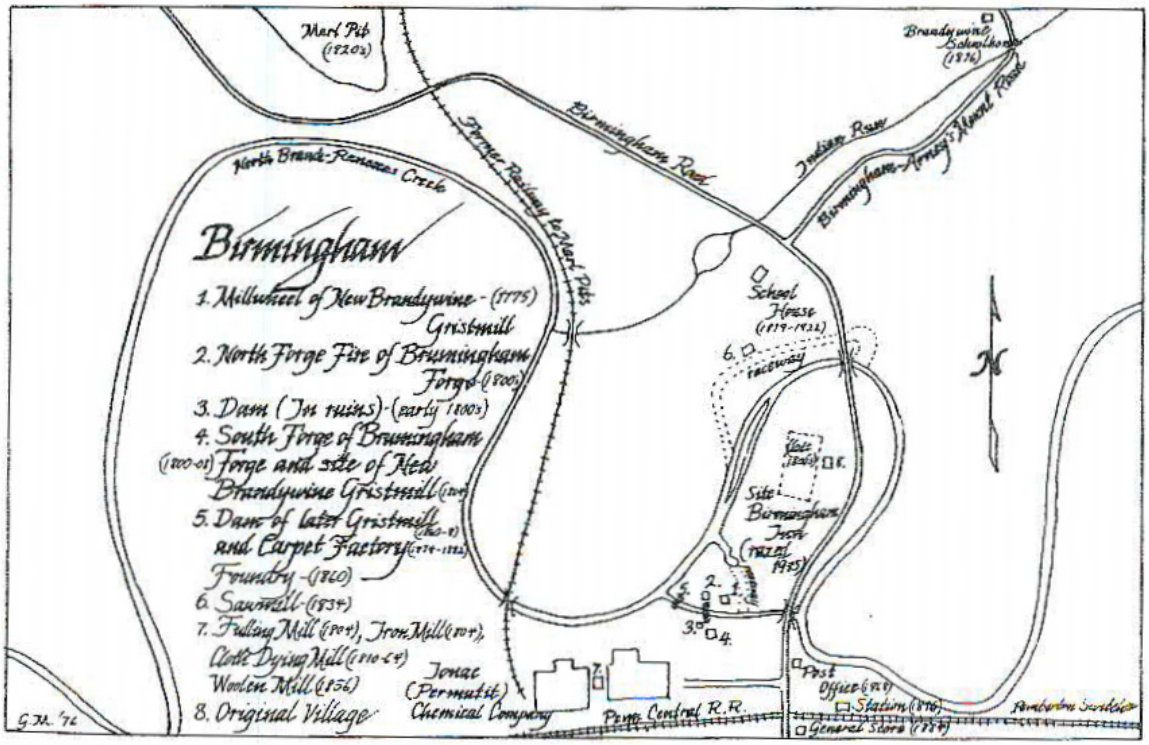
The railroad enabled early development of Pemberton Township.

Early settlers of Pemberton established mills and furnaces that were powered by damming smaller tributaries to form millponds and lakes. The 11 dams in Pemberton Township are artifacts of this age. Hanover Furnace, the oldest iron furnace in the region, was built between 1791 and 1792 on the Rancocas Creek North Branch. This quick-running stream, along with abundant timber and bog iron, made the location ideal for an iron-smelting furnace. Hanover Furnace produced pig iron, fireplace backs, stoves, agricultural tools, water and gas pipes, and even cannons. By the 1830s, the Birmingham area of Pemberton was a thriving industrial village with a cotton manufactory, gristmill, sawmill, fulling mill (involved in the manufacturing of woolen clothing), and iron furnace, as well as about 15 to 20 houses, as seen in **Figure 1: Historic Birmingham**. Another major industrial center in Pemberton was Lebanon Glass Works, erected in 1851 for the manufacture of glass bottles. This was the only glassworks in the northern part of the Pinelands, and it attracted many skilled immigrant artisans to Pemberton. Lebanon Glass Works also employed many workers from Hanover Furnace, which slowed production in the 1850s and closed in 1855. Lebanon Glass Works itself shut down in 1866, primarily due to the near total depletion of the surrounding forest that was cut down to provide fuel

for the glass furnace. Other industrial operations in Pemberton producing iron products, carpets, wheels, and other items were established throughout the 19th century.

In addition to Pemberton's abundant waterways that powered industrial production, another natural resource attracted people and economic growth to the region. The mineral glauconite–also known as greensand or, more commonly, marl–is found four to ten feet below the surface, and one of the richest deposits is found in a two- to eight-foot wide band stretching across central New Jersey. High in potash and phosphorus, marl was commonly used as a fertilizer in the 1800s before higher-grade fertilizers were developed in the late-1800s. Marl was strip-mined at a pit near the Birmingham area of Pemberton. There was a resurgence in marl mining in the 1920s, when the material was used in commercial water softeners.

Figure 1: Historic Birmingham



Source: Olsen, 1976

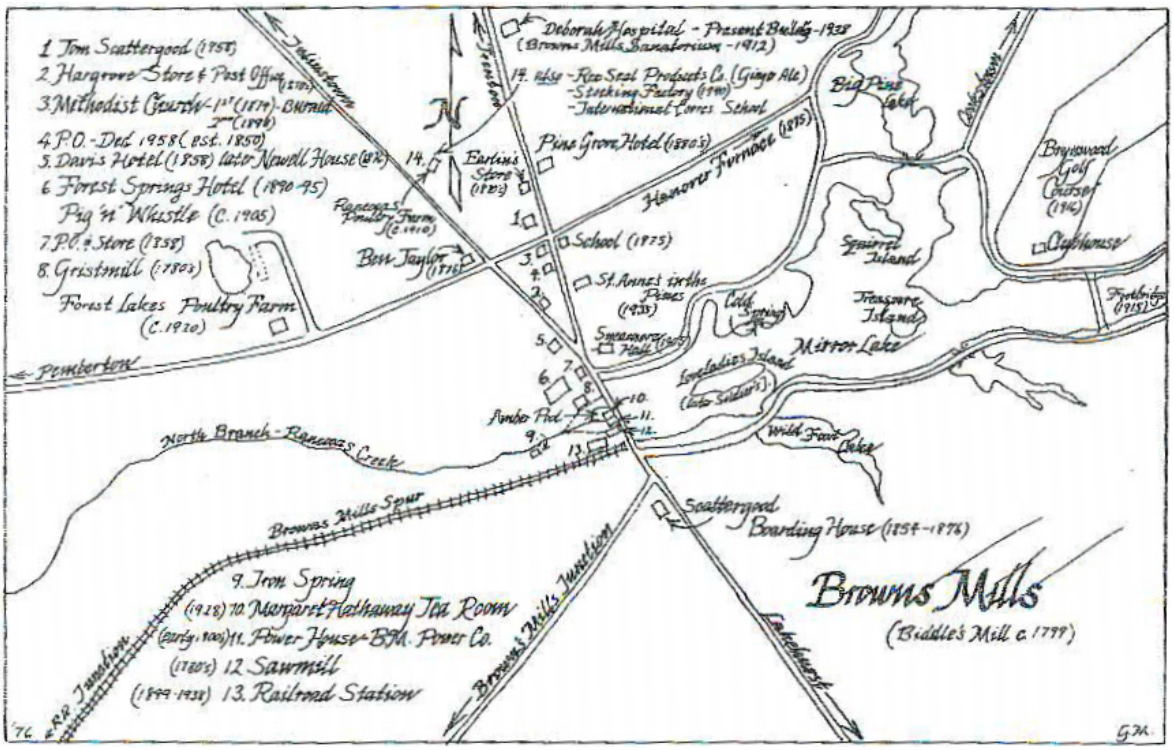
Although Hanover Furnace shut down in 1855, its closure propelled Pemberton toward another growth period, as the disturbed land where iron was strip mined proved conducive to cranberry and blueberry cultivation. Colonel James A. Fenwick purchased a 490-acre tract of land adjacent to the closed Hanover Furnace that included the former canal and canal pond once used by the furnace. Fenwick cultivated this land for cranberries and his success generated a cranberry boom in Pemberton in the late 1860s.

Fenwick's granddaughter, Elizabeth White, became interested in developing the land between the cranberry bogs, where wild blueberries were growing. Many in New Jersey had tried and failed to cultivate blueberries, and it was generally accepted that blueberries could not be cultivated. White, however, became aware in 1911 of Dr. Frederick V.

Coville's work in blueberry cultivation, and she convinced her father to support Dr. Coville's research by providing the land, financing, and infrastructure to carry out blueberry cultivation experiments at Whitesbog. With White's help, Dr. Coville was able to cultivate blueberries ready for sale by 1916 at Whitesbog. At its peak, Whitesbog had 90 acres under cultivation. Since blueberries are harvested in late July and cranberries in early September, the two crops could both be grown at Whitesbog, which became the largest bog in the state. The Whitesbog was in operation until Elizabeth White's death in 1954, at which time the land was sold to the State of New Jersey and became part of the Brendan T. Byrne State Forest. Today, cranberries are still grown on the bog using a parcel of land leased to the White family.

One of the earliest residents of Pemberton Township was a man named Abraham Brown, born in 1760. The Browns Mills area of Pemberton is named for the large mill tract operated by the Brown family that at one time contained a gristmill, sawmill, mansion house, four tenant houses, and a general store with accompanying house. Brown began renting a spare room in his home to travelers who were on their way from Trenton to the shore. Brown's spare room, along with the Old Hotel, built in 1820, set the tone for 19th century Pemberton Township. As early as 1861, the healing powers of natural springs in the area were touted in advertisements for the Browns Mills Boarding House. Rail service, which reached the area in 1834, operated by the Delaware and Atlantic Rail Road Company, enabled the development of Browns Mills as a health resort. Browns Mills quickly became a popular stop for travelers, and over the years it developed an elite society of its own.

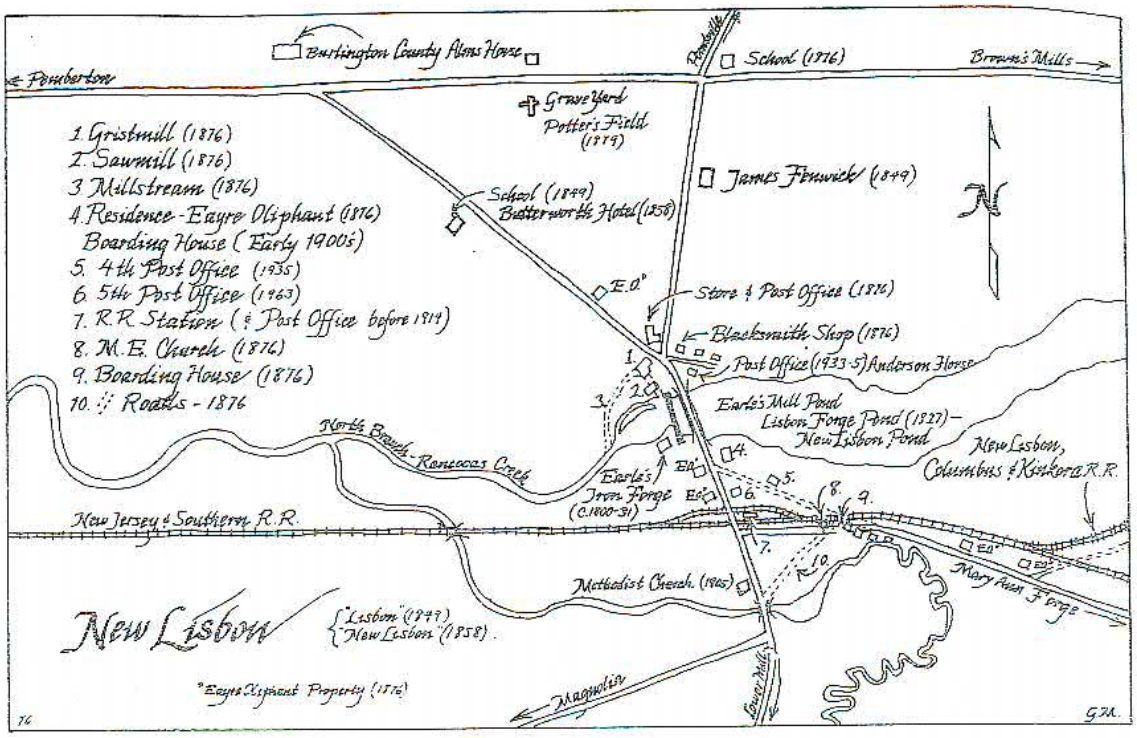
Figure 2: Historic Browns Mills



Source: Olsen, 1976

The Old Hotel was followed by the construction of other resorts, including the Forest Springs Hotel in 1889, the Birmingham Inn in 1895, and the Pig 'n Whistle Inn in 1905. The five-story Forest Springs Hotel was one of the largest hotels in the country when it was built. Vacationing visitors in Browns Mills enjoyed canoeing and swimming in Mirror Lake, and springhouses at Iron, Cold, and Sulfur Springs, which, along with the local cedar trees, were believed to have curative properties. The Browns Mills Railroad Station, located on Junction Road, was operated by the Pemberton and New York Railroad from 1890 to 1938. Bellhops in horse-drawn jitneys and motor cars carried passengers from the station to local hotels and boarding homes. The North Pemberton Railroad Station was built in 1892, replacing an earlier station that burned down in 1891. The station operated until 1969, when direct rail service between Pemberton and Camden ended. The former station now houses a museum of regional history and an information center for the Pinelands and the Pemberton area.

Figure 3: Historic Lisbon



Source: Olsen, 1976

In 1799, the New Lisbon area, originally called Lisbon, was chosen as the site of the Burlington County Poor House, or almshouse. Before that time, each township in the county was responsible for its indigent. The building was erected in 1801, with additions built in 1805 and 1925. A fire in 1937 destroyed the County Almshouse, which was rebuilt as Buttonwood Hall. The County Asylum was built in Pemberton in 1900, followed by the Fairview Sanatorium in 1913. Fairview Sanatorium, the first state-licensed sanatorium for the treatment of tuberculosis, was founded in Browns Mills by Dr. Marcus W. Newcomb. It was believed that the fresh air, combined with rest and good nutrition, would help in the treatment of tuberculosis. Tuberculosis sanatoria were common in mountainous and forested areas of the United States in the early 20th century, until antibiotics were

developed in the 1940s. The Fairview Sanatorium evolved into the Deborah Heart and Lung Center, a national leader in the treatment of pulmonary, vascular, and cardiac diseases.

The town saw a population increase in 1916, when *The Philadelphia Press* published an advertisement in which subscribers to the newspaper could purchase lots in Pemberton for a reduced price. With a six-month subscription to the newspaper, one could buy a lot for $2.80 a month for a total of $32.50. After the first month's payment, permission was given to use and build on the lot. When one had paid for both the six-month subscription and the land, the deed was given to the subscriber. As the newspaper advertisement read, "it is a simple and definite proposition." Today, many descendants of the original 1916 owners still live on these properties.

Entrance to Fort Dix

In 1917, the U.S. Army selected an area in Pemberton Township to be the site of one of its new camps where servicemen would be trained for World War I. Named after Major General John Adams Dix and originally established as Camp Dix, the fort quickly grew as demand for trained soldiers escalated during World War I and the U.S. Army implemented a "crash program" to expand its forces from 200,000 to 1,000,000 servicemen. When the armistice was signed in November, 1918, Camp Dix became the major separation center for the U.S. Army. However, the camp fell into disuse and disrepair after the war. During the Great Depression, the formerly deserted barracks were used by members of the Civilian Conservation Corps. The camp was rebuilt and expanded in anticipation of World War II and was renamed Fort Dix on March 8, 1939. After World War II, the fort was used for basic training. The fort is also the site of the Atlantic Strike Team of the U.S. Coast Guard and a federal correctional institution. Once just a dirt strip used by Camp Dix for training flights, McGuire Air Force Base was reopened and expanded in 1949. The base was named for Major Thomas B. McGuire, Jr., of Ridgewood, New Jersey, who was killed in action during World War II in the South Pacific. McGuire posthumously received the Medal of Honor in 1945 for his heroic efforts to rescue a fellow pilot.

Throughout the 20th century, Pemberton residents began working outside the township and commuting to their jobs by train and, later, by car. Pemberton Township is conveniently located between several important municipalities: Mount Holly, Trenton, Philadelphia, and Fort Dix, which is located in both Pemberton and New Hanover townships. Due to this geographic position, soon after the Second World War, the township saw a spike in new residents and a shift from a rural society to one that was

rural-suburban. The influence of Fort Dix and McGuire Air Force Base on Pemberton Township was also profound and spurred the increased development of housing and schools in the 1940s through 1960s. Thousands of new residents came to Pemberton and moved into new suburban-style residential developments named Blueberry Manor, Country Lakes, Lake Valley Acres, Oak Crest, Oak Pines, Oak Ridge Estates, Pemberton Gardens, Pemberton Heights, Pemberton Manor, Presidential Lakes, and Sunbury Village. These newcomers catalyzed residential development. Because of this, 19th century communities were either demolished or incorporated.

Burlington County College built a campus in Pemberton in 1971 that currently attracts more than 7,500 students annually. The campus is also home to the Burlington County Police Academy.

Pemberton has four census-designated places (CDPs)–Browns Mills, Country Lake Estates, Pemberton Heights, and Presidential Lakes Estates–and a portion of the Fort Dix CDP, as well as a number of historic settlements, including New Lisbon, Birmingham, and Magnolia. See **Map 1: Places in Pemberton Township**.

Pemberton Township contains farmland, forest, and waterbodies.

Pemberton Township is currently in an era of rapid change and will decide its future through the planning it undertakes now to protect its quality of life. Pemberton Township's rural setting, heavy forest coverage, and picturesque bodies of water have long attracted residents. Recent decisions to preserve forested land, protect historic landmarks, and guide future growth are examples of Pemberton's intention to plan for its future.

CHAPTER 3

Location, Size, and Land Use

Pemberton is an incorporated township located in western Burlington County, New Jersey. The township is bounded by eight municipalities: New Hanover Township to the north, Springfield and Wrightstown townships to the northwest, Eastampton and Southampton townships to the west, Woodland Township to the south, Manchester Township to the east, and Plumsted Township to the northeast. See **Map 1: Places in Pemberton Township** and **Map 2: Aerial Photo (2007)**.

There are a number of individual communities within Pemberton, each with its own identity. These include Browns Mills, Country Lake Estates, Pemberton Heights, Presidential Lake Estates, Fort Dix (partially), Birmingham, the Preserve at Rancocas, Sunbury Village, Magnolia, New Lisbon, and Whitesbog. Residential development is concentrated mainly around the numerous lakes in the township.

Browns Mills, which runs along the northeastern edge of the township, is 5.7 square miles in size and, as of 2000, is home to 11,257 residents. This unincorporated area was developed in the mid-19th century as a summer retreat for visitors seeking to get away from the industrial metropolises of Philadelphia, Camden, and New York City. Once hailed for its fresh Pine Barren air and pristine springs that were thought to have curative properties, today the area is home to an ethnically diverse population.

Athletic fields on Pemberton Browns Mills Road

Located in eastern Pemberton Township along Route 530, Country Lake Estates is 1.4 square miles in size. Situated on Country Lake, this area is home to 4,012 people as of the 2000 Census. Because of the large lake, nearly 19 percent of Country Lake Estates is water by area.

Pemberton Heights, located just south of Pemberton Borough, is accessible by Route 530. It is just 0.9

square miles in size and was home to 2,512 people in 2000.

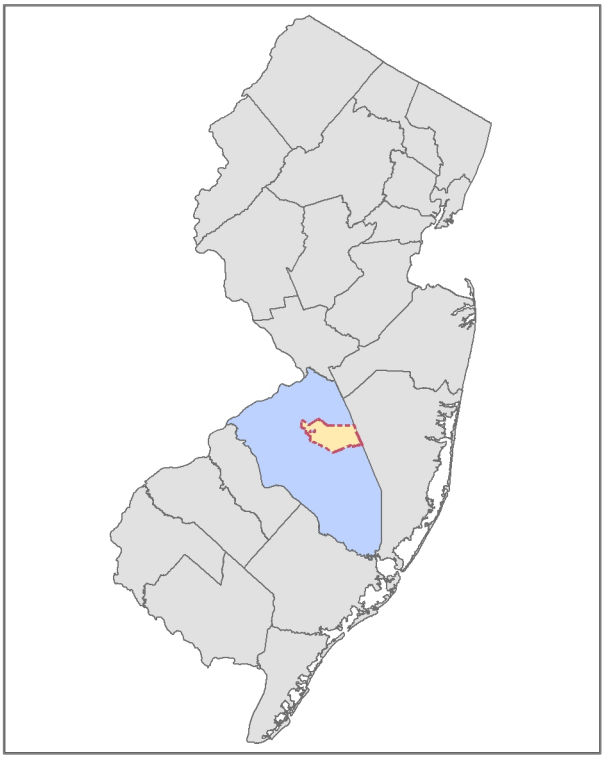
Presidential Lakes Estates is located along Route 70 on the southern border of Pemberton Township. In 2000, it was home to just 2,332 residents and is 1.1 square miles in size.

Fort Dix straddles the northern section of Pemberton Township, the eastern edge of Springfield Township, and the western edge of New Hanover Township. As of 2000, this census-designated place was home to roughly 7,500 residents and is 11.3 square miles in size.

According to the U.S. Census Bureau, Pemberton Township occupies a total area of 62.5 square miles and is located on the Inner Coastal Plain of New Jersey. The U.S. Census Bureau estimates that Pemberton Township had a population of 27,975 in 2008, a modest decrease from its 2000 population of 28,691.

Access to both Interstate 295 and Interstate 95 is located within 10 miles of Pemberton Township. Commercial and industrial development is located mainly along Odd Fellows Road (County Route 616), Magnolia Road (County Route 664), and Juliustown Road (County Route 669). Pemberton is located approximately 27 miles from Philadelphia and 22 miles from Trenton. Bus service provided by New Jersey Transit connects Pemberton to these major metropolitan areas. See the **Transportation** section for more detailed information.

Figure 4: Location of Pemberton Township



Source: DVRPC, 2010

Despite the numerous roads crossing the township, Pemberton also contains large contiguous areas of woodlands and wetlands. The 34,725-acre Brendan T. Byrne State Forest is located in southeastern Pemberton Township, as well as in Manchester and Woodland townships. The park is operated and maintained by the New Jersey Division of Parks and Forestry. The Cedar Swamp Natural Area is a 735-acre portion of the park that contains several endangered wetlands plant species, including the endangered swamp pink (*Helonias bullata*). Also within the Brendan T. Byrne State Forest is the over 3,000-acre Historic Village of Whitesbog, which was the state's largest producer of blueberries and cranberries from 1870 through the 1950's.

The majority of land in Pemberton Township is classified as wetlands (36 percent, or 14,366 acres). This is followed closely by forested land (35 percent, or 14,023 acres). As of 2007, urbanized land is the third most common type of land cover in Pemberton, comprising 15 percent (or 5,853 acres) of the township, followed by agriculture, which makes up 12 percent (or 4,711 acres) of the township.

Table 1: General Land Cover (2007) shows Pemberton's land cover grouped into general categories. The categories are based on data collected from the New Jersey Department of Environmental Protection's (NJDEP's) 2007 color infrared digital imagery. **Table 2: Detailed Land Cover (2007)** breaks down the 2007 general land cover categories into detailed land cover categories. See also **Map 3: NJDEP Land Cover (2007)**.

Table 1: General Land Cover (2007)

General Land Classes	Area (Acres)	Percent
Wetlands	14,366.45	35.78%
Forest	14,022.77	34.93%
Urban	5,853.49	14.58%
Agriculture	4,711.69	11.74%
Water	926.09	2.31%
Barren Land	267.41	0.67%
Total	**40,147.90**	**100%**

Source: NJDEP, 2007

Table 2: Detailed Land Cover (2007)

Type	Area (Acres)	Percentage
Agricultural Wetlands (Modified)	2,829.26	7.05%
Airport Facilities	13.43	0.03%
Altered Lands	120.00	0.30%
Artificial Lakes	813.50	2.03%
Athletic Fields (Schools)	148.21	0.37%
Atlantic White Cedar Wetlands	461.14	1.15%
Beaches	1.99	0.00%
Bridge over Water	0.55	0.00%
Cemetery	2.90	0.01%
Commercial/Services	415.04	1.03%
Confined Feeding Operations	8.89	0.02%
Coniferous Brush/Shrubland	216.13	0.54%
Coniferous Forest (10-50% Crown Closure)	875.92	2.18%
Coniferous Forest (>50% Crown Closure)	4,427.29	11.03%
Coniferous Scrub/Shrub Wetlands	61.48	0.15%
Coniferous Wooded Wetlands	2,884.47	7.18%

Type	Area (Acres)	Percentage
Cropland and Pastureland	3,455.62	8.61%
Deciduous Brush/Shrubland	111.11	0.28%
Deciduous Forest (10-50% Crown Closure)	521.18	1.30%
Deciduous Forest (>50% Crown Closure)	1,818.86	4.53%
Deciduous Scrub/Shrub Wetlands	469.99	1.17%
Deciduous Wooded Wetlands	4,518.49	11.25%
Disturbed Wetlands (Modified)	44.98	0.11%
Extractive Mining	89.21	0.22%
Former Agricultural Wetland (Becoming Shrubby, Not Built-Up)	67.19	0.17%
Herbaceous Wetlands	108.98	0.27%
Industrial	32.65	0.08%
Managed Wetland in Built-Up Maintained Rec Area	3.36	0.01%
Managed Wetland in Maintained Lawn Greenspace	10.56	0.03%
Military Installations	438.71	1.09%
Mixed Deciduous/Coniferous Brush/Shrubland	316.50	0.79%
Mixed Forest (>50% Coniferous with 10-50% Crown Closure)	212.05	0.53%
Mixed Forest (>50% Coniferous with >50% Crown Closure)	2,147.85	5.35%
Mixed Forest (>50% Deciduous with 10-50% Crown Closure)	173.81	0.43%
Mixed Forest (>50% Deciduous with >50% Crown Closure)	2,746.55	6.84%
Mixed Scrub/Shrub Wetlands (Coniferous Dom.)	154.84	0.39%
Mixed Scrub/Shrub Wetlands (Deciduous Dom.)	144.82	0.36%
Mixed Wooded Wetlands (Coniferous Dom.)	1,620.82	4.04%
Mixed Wooded Wetlands (Deciduous Dom.)	961.69	2.40%
Natural Lakes	4.06	0.01%
Old Field (< 25% Brush Covered)	217.54	0.54%
Orchards/Vineyards/Nurseries/Horticultural Areas	1,021.27	2.54%
Other Agriculture	225.91	0.56%
Other Urban or Built-Up Land	448.20	1.12%
Phragmites Dominate Interior Wetlands	4.51	0.01%
Plantation	237.98	0.59%
Recreational Land	84.84	0.21%
Residential, High Density, or Multiple Dwelling	184.08	0.46%

Type	Area (Acres)	Percentage
Residential, Rural, Single Unit	845.45	2.11%
Residential, Single Unit, Low Density	762.23	1.90%
Residential, Single Unit, Medium Density	2,201.13	5.48%
Stormwater Basin	11.97	0.03%
Streams and Canals	107.97	0.27%
Transitional Areas	42.28	0.11%
Transportation/Communication/Utilities	202.33	0.50%
Undifferentiated Barren Lands	13.93	0.03%
Upland Rights-of-Way Undeveloped	62.33	0.16%
Wetland Rights-of-Way	19.89	0.05%
Total	**40,147.90**	**100%**

Source: NJDEP, 2007

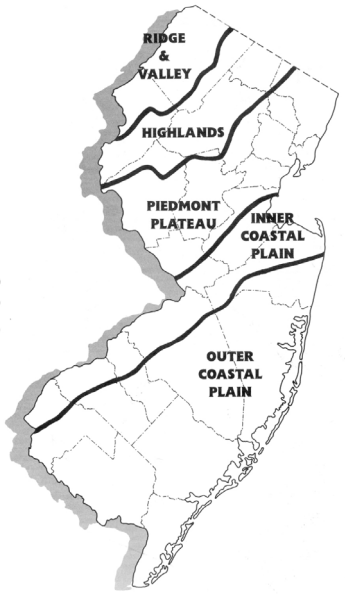
CHAPTER 4

Natural Resources

Physiography

Physiography is the study of a location in relation to its underlying geology. New Jersey is characterized by four physiographic provinces (see **Figure 5: The Physiographic Regions of New Jersey**). The rocky terrain of the Appalachian Province is at one extreme and the sands of the coast are at the other. Pemberton Township is located in the Coastal Plain, the southernmost of these four provinces in New Jersey.

Figure 5: The Physiographic Regions of New Jersey



Source: NJGS

The Atlantic Coastal Plain landscape extends from Massachusetts to Texas and is divided into Inner and Outer sections. The Coastal Plain generally consists of unconsolidated sands, silts, and clays. As these sediments are prone to erosion, the Coastal Plain is generally characterized by regions of low topographic relief. In New Jersey, the Inner Coastal Plain is made up of interbedded sand and clay. Deposits originating in the breakdown of Appalachian and Catskill sedimentary, metamorphic, and igneous rocks are interbedded with layers formed by oceanic (marine) deposition, which occurred as the ocean shoreline advanced and receded over geologic time.

The Inner Plain layers date from the Cretaceous Period, 135 to 65 million years ago. Generally, soils of the Inner Coastal Plain are quite fertile. The Outer Coastal Plain was formed more recently than the Inner Coastal Plain. It was laid down by the ocean and developed during the mid-to-late part of the Cenozoic Era, 65 million years ago to the present. Outer Coastal Plain soils are sandier and less fertile than those of the Inner Plain and do not hold water as well.

In the general vicinity of the dividing line between the two parts of the Coastal Plain is a belt of low hills, which runs northeast and southwest through the southern half of New Jersey. These hills are the youngest of the Cretaceous formations and are largely made up of sand and marl formations. In Burlington County, the hills can be identified between Arney's Mount in Springfield Township and Big Hill in Southampton Township.

The dividing line of the Coastal Plain runs through Pemberton Township and generally follows the boundary of the Pinelands within the municipality. The western, non-Pinelands

area of Pemberton Township has abundant areas of prime farmland typical of the fertile Inner Coastal Plan soils. The Outer Coastal Plain soils that characterize much of the Pinelands are generally considered to be less fertile, although they are important for specialized agricultural crops such as blueberries and cranberries.

Topography and Surface Landscapes

Topography relates to the surface terrain and features of an area. The vast majority of Pemberton is generally flat, typical of areas in the Atlantic Coastal Plain. Ridges and high points delineate the boundaries of watersheds, as seen in **Map 7: Watersheds**. The lowest elevation in Pemberton, 15 feet above sea level, is located in the northwest portion of the township along the North Branch Rancocas Creek. At 174 feet above sea level, the highest point is located on Pointville Road on the township's northern border with New Hanover.

Because of its low elevation and relatively flat topography, large areas across Pemberton are located in FEMA's 100-year floodplain, as shown on **Map 9: Floodplains (2010)**. These areas occur predominantly along the rivers and tributaries in the township. In general, development and agriculture occur on upland areas, with wetlands and forests occurring in the lower elevations. The agricultural bogs in the southern and eastern portions of the township are also located in floodplain areas.

The landscape is heavily dominated by natural and agricultural wetlands along streams and in bog areas. The upland area is characterized by rich soils that support extensive coniferous, deciduous, and mixed forests. As in all of southern New Jersey, Pemberton's streams are relatively flat, with mostly muddy and/or sandy bottoms, although the bottoms of some stream segments are lined with small rounded rocks and pebbles.

Forested steep slopes

Steep Slopes

Slope is measured as the percent of vertical rise to horizontal distance. The majority of Pemberton Township has slopes of less than 10 percent. The steepest slopes in the township are located along major streams, such as the North Branch Rancocas Creek and Misery Brook. Most of the steep slopes in the township are well vegetated with a dense forest cover. Pemberton's steep slopes are depicted on **Map 4: Steep Slopes**.

In general, development of areas with steep slopes is inadvisable, as it is likely to result in soil instability, erosion, sedimentation of streams, increased stormwater runoff, and increased flooding. These effects are responsible for habitat destruction, water pollution, and potential damage to property. Erosion on steep slopes is especially prevalent where excessive tree removal has taken place.

On steep slopes bordering creeks and streams, it is not unusual to see trees that have fallen into the gullies or into the streams themselves. In some places, the rate of tree loss is accelerated beyond natural rates by erosion from flash flooding, which in turn is often caused by increases in impervious surface upstream. However, trees on steep slopes fall for other reasons as well, including age, severe storms (especially if their roots have been exposed from erosion), and heat and water loss, which dries the soil. Where steep slopes remain forested, some very old trees can be found. No detailed inventory of these sites exists at present, although some of the Pemberton endangered plant records from the state's Natural Heritage Database are from these habitats (see **Appendix C: Plant Species in Pemberton Township**). Some regions have been negatively affected by fertilizers from adjoining farm fields, by runoff from development, or by recent flooding, but there may still be intact sites.

Soils

Soil is the foundation for all land uses. A region's soil defines what vegetation is possible, and so influences agricultural uses. Soil properties also affect the location of wells and septic facilities, often determining development potential in certain areas. Soil is a natural resource that cannot be replenished on the human time scale. Pemberton Township soils consist of 31 series types and 82 variations within those series (excluding water), as identified by the U.S. Department of Agriculture's Natural Resources Conservation Service. All soil types in the township are listed in **Table 4: Soils** and shown on **Map 5: Soils**.

Soil Quality Classification

Just over half of the soil in Pemberton is rated for agricultural use, and much of this is only suitable for unique agricultural production like blueberry and cranberry cultivation. The majority of Pemberton's soils are either considered "soils of unique importance" (29 percent) or classified as not rated for agricultural use (47 percent). The relatively small percentage of prime farmland soils in Pemberton Township corresponds to regional physiography, as the Pine Barrens climate zone (in which the majority of Pemberton Township is located) is known for its sandy, less fertile soils. See **Table 3: Agricultural Quality of Soils** for the acreage of each of these classes of farmland. See also **Map 6: Agricultural Quality of Soils** for a visual depiction.

Prime Farmland Soils

Just 13 percent (5,370 acres) of all soils in Pemberton Township are classified as Prime Farmland (P-1). Prime Farmlands are lands that have the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. They can sustain high yields of crops when managed with correct farming methods. Prime Farmlands are not excessively erodible or saturated with water for long periods of time and do not flood frequently. Prime Farmland is located in the western half of Pemberton Township, largely outside the boundary of the Pinelands.

The NRCS outlines specific criteria for Prime Farmland classification. For example, according to Prime and Unique Farmlands federal regulation, soil horizons (layers) within a depth of 40 inches must have a pH between 4.5 and 8.4 (mildly acidic to mildly basic). In addition, the soils must have an average temperature above 32 degrees Fahrenheit at a depth of 20 inches. The USDA outlines additional Prime Farmland requirements for mean summer soil temperature, erodibility factor, water table depth, permeability rate, and more. Land classified as Prime Farmland does not have to be farmed but does have to be potentially available for such use. Thus, water and urban land does not qualify as Prime Farmland.

Soils of Statewide Importance

About 10 percent (4,169 acres) of soils in Pemberton are classified as soils of Statewide Importance (S-1). These soils are close in quality to Prime Farmland and can sustain high yields of crops when correctly managed under favorable conditions. Criteria for establishing soils of Statewide Importance are determined by state agencies. These soils are located throughout Pemberton Township, particularly in the central portion of the township.

Agricultural land in western Pemberton Township

Soils of Unique Importance

Pemberton has an abundance of soils considered to be of Unique Importance (U-1), totaling almost 29 percent of the township, or 11,815 acres. According to the USDA, soils of Unique Importance are those that support particular food or fiber crops, including temperature, humidity, air drainage, elevation, aspect, or proximity to market. For soils to be classified as of Unique Importance, the land must also be used for a specific high-value food or fiber and have an adequate moisture supply for that crop. Soils of Unique Importance are located in the

central and eastern portions of Pemberton Township and are mostly associated with wetland areas and riparian corridors.

Soils Not Rated

Nearly half (approximately 47 percent) of Pemberton's soils have not been rated for agricultural use by the NRCS and are therefore labeled "N/A." These soils are not rated for agricultural use and may be best suited for other uses, or they may not yet have been assessed for quality by the NRCS. The NRCS created all of the Soil Quality Classifications in 1990, although several new subtypes of soils were created in 2005 that are not yet rated for agricultural use. Soils that are not rated are not necessarily limited for agricultural use.

Table 3: Agricultural Quality of Soils

Designation	Type/Farm Classification	Area (Acres)	% of municipality
P-1	All areas are Prime Farmland	5,370.48	13.39%
S-1	Farmland of Statewide Importance	4,169.41	10.40%
U-1	Farmland of Unique Importance	11,814.99	29.46%
N/A	Not Rated for Agriculture	18,746.10	46.75%
	Total	**40,100.98**	**100.00%**

Source: USDA NRCS, 2004

Hydric Soils

The vast majority (83 percent) of Pemberton's land area consists of hydric soils. Hydric soils, as defined by the NRCS, are soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic (oxygen-free) conditions in their subsurface. These soils have unique soil properties and are an important element of wetland areas. If a soil is classified as "hydric," land use may be restricted due to the relationship of hydric soils to the definition of wetlands and to laws regarding wetland preservation. Soils that have limitations, such as a high water table or flooding, can qualify as Prime Farmland and of Statewide Importance when the limitations are overcome by measures such as drainage or flood control.

Soil Series

Several soil series appear more frequently in Pemberton Township than others and are briefly described as follows according to the Burlington County Soil Survey and NRCS soil database.

Atsion Series

The most abundant soil series in Pemberton Township is the Atsion series, composing almost 18 percent of the township (7,212 acres). These soils derive from sandy marine sediments. This series tends to be found at lower lying elevations with slopes of between zero and two percent. Atsion soils are poorly drained, and the depth to seasonal high water table is six and 12 inches January to December. These soils are strongly to extremely acidic. The associated land cover is often wooded areas, with some use for blueberry and cranberry production. Vegetation consists mostly of pitch pine mixed with black gum and red maple, with an undergrowth of highbush blueberries, sweet pepperbush, sheep laurel, and greenbriar.

Lakehurst Series

The Lakehurst series accounts for approximately 16 percent (6,406 acres) of Pemberton Township. These soils come from sandy coastal plain sediments. Lakehurst soils are typically found on broad flats bordering streams and depressions throughout the Coastal Plain. This sandy series is generally found at elevations between two and 20 feet above sea level. The soils are moderately well drained, with rapid permeability to the subsoil and slow permeability to the substratum. The depth to seasonal high water table is 18 to 42 inches, January to April. These soils are strongly to extremely acidic. The vegetation is generally dominated by pitch pines, shortleaf pines, black oaks, and white oaks, with an understory of lowbush blueberries and scrub oak. In locations where there is a high occurrence of wildfires, pitch pine and blackjack oak tend to be more dominant.

Lakewood Series

The Lakewood series covers approximately 13 percent (5,135 acres) of Pemberton Township. These soils are formed from sandy marine sediments. The Lakewood soil series is mostly found on upland coastal plain marine terraces at elevations between 25 and 450 feet above sea level. These soils are excessively drained, and the depth to seasonal high water table is greater than 60 inches. These soils are very strongly to extremely acidic. The Lakewood series is mostly associated with woodland areas where the vegetation is dominantly pitch pine, black oak, and white oak. Where wildfires have been severe, the trees are dwarfed, growing less than five feet tall and consisting primarily of pitch pine, scrub oak, and blackjack oak.

Evesboro Series

Another soil type found in Pemberton Township is the Evesboro series, which accounts for approximately 10 percent (3,952 acres) of the township. These soils derive from sandy marine and eolian (wind) deposits. The Evesboro series soils are generally found on Coastal Plain uplands. These soils are excessively drained and the depth to seasonal high water table is greater than six feet. Evesboro soils are strongly to extremely acidic. Most areas of these soils can be wooded, used for fruit and vegetable crops, or utilized for urban land. Vegetation tends to consist of black oak, white oak, red oak, yellow poplar,

and chestnut oak, with scattered hickories, pitch pine, Virginia Pine, loblolly pine, and scrub and blackjack oaks.

Berryland Series

The Berryland Series soil type accounts for approximately five percent (2,169 acres) of the township's soils. These soils are made of sandy eolian deposits and/or fluviomarine (river and sea) sediments. The Berryland series is most often classified as a loamy sand or sand and is found at elevations with slopes between zero and two percent. It is typically found near broad, level areas adjacent to swamps and in the bottoms of closed depressions at levels just above the tidal mark. The soils are considered to be very poorly drained, and the depth to the seasonal high water table is between six and 10 inches from October to June, and 12 to 24 inches in summer months. These soils are strongly to extremely acidic. The associated land cover of Berryland soils is often best suited for woodlands, although some land is cleared for high-bush blueberry and cranberry cultivation. When drained, Berryland soils can support the growing of vegetables, corn, soybeans, and small grain. Woodland vegetation characteristic of Berryland soils includes pitch pine, Atlantic white cedar, red maple, and black gum. Dense understory can feature high-bush blueberry, sweet pepperbush, bay magnolia, leather leaf, gallberry, and greenbriar.

Adelphia Series

A final common soil type in Pemberton Township is the Adelphia series, which makes up five percent (1,923 acres) of the township. These soils are made of glauconite-bearing eolian and/or fluviomarine deposits. This series consists of soils with a loamy composition containing moderate amounts of glauconite, a mineral in the mica group. Adelphia series soils have a moderate concentration of organic matter and are moderately high in their natural fertility. These soils are moderately well drained and the depth to seasonal high water table is greater than six feet. These soils are strongly to extremely acidic. Crops grown on Adelphia series soils include small grains, corn, soybeans, hay, pasture, tomatoes, potatoes, fruit, nursery stock, and sod. Adelphia series soils have been designated as Prime Farmland, although much of the Adelphia soils in the state have been urbanized.

Table 4: Soils

Soil Type	Description	Area (Acres)	% of Pemberton	Ag. Quality*	Hydric?
AdmA	Adelphia fine sandy loam, 0 to 2 percent slopes	1,127.68	2.81%	P-1	Yes
AdmB	Adelphia fine sandy loam, 2 to 5 percent slopes	143.67	0.36%	P-1	No
AdmkA	Adelphia fine sandy loam, clayey substratum, 0 to 2 percent slopes	53.22	0.13%	P-1	Yes
AdmmA	Adelphia high glauconite variant fine sandy loam, 0 to 2 percent slopes	161.19	0.40%	P-1	Yes
AdnA	Adelphia loam, 0 to 2 percent slopes	28.05	0.07%	P-1	Yes
AdotB	Adelphia sandy clay loam, truncated, 0 to 5 percent slopes	409.46	1.02%	N/A	No
AtsA	Atsion sand, 0 to 2 percent slopes	6,210.51	15.49%	U-1	Yes
AtshA	Atsion sand, loamy substratum, 0 to 2 percent slopes	811.84	2.02%	U-1	Yes
AttA	Atsion fine sand, 0 to 2 percent slopes	145.54	0.36%	U-1	Yes
AtthA	Atsion fine sand, loamy substratum, 0 to 2 percent slopes	44.02	0.11%	U-1	Yes
BerAs	Berryland sand, 0 to 2 percent slopes, occasionally flooded	357.70	0.89%	U-1	Yes
BesAs	Berryland mucky sand, 0 to 2 percent slopes, occasionally flooded	1,765.03	4.40%	U-1	Yes
BetAs	Berryland fine sand, 0 to 2 percent slopes, occasionally flooded	46.72	0.12%	U-1	Yes
BugA	Buddtown loamy fine sand, 0 to 2 percent slopes	209.12	0.52%	P-1	Yes
BugB	Buddtown loamy fine sand, 2 to 5 percent slopes	188.08	0.47%	P-1	Yes
BuhA	Buddtown fine sandy loam, 0 to 2 percent slopes	588.63	1.47%	P-1	Yes
BuhB	Buddtown fine sandy loam, 2 to 5 percent slopes	20.39	0.05%	P-1	Yes
CoeAs	Colemantown loam, 0 to 2 percent slopes, occasionally flooded	93.20	0.23%	N/A	Yes
ComA	Collington fine sandy loam, 0 to 2 percent slopes	103.80	0.26%	P-1	No
ComB	Collington fine sandy loam, 2 to 5 percent slopes	243.74	0.61%	P-1	No
ComC	Collington fine sandy loam, 5 to 10 percent slopes	24.59	0.06%	S-1	No
DocB	Downer loamy sand, 0 to 5 percent slopes	927.97	2.31%	S-1	Yes
DocC	Downer loamy sand, 5 to 10 percent slopes	152.49	0.38%	S-1	No
DoetB	Downer sandy loam, truncated, 0 to 5 percent slopes	177.02	0.44%	S-1	No

Soil Type	Description	Area (Acres)	% of Pemberton	Ag. Quality*	Hydric?
EveB	Evesboro sand, 0 to 5 percent slopes	3,263.81	8.14%	N/A	Yes
EveC	Evesboro sand, 5 to 10 percent slopes	231.66	0.58%	N/A	No
EvehB	Evesboro sand, loamy substratum, 0 to 5 percent slopes	431.24	1.08%	N/A	No
EvfB	Evesboro fine sand, 0 to 5 percent slopes	25.37	0.06%	N/A	No
FmgAt	Fluvaquents, sandy, 0 to 3 percent slopes, frequently flooded	1,573.54	3.92%	U-1	Yes
FmhAt	Fluvaquents, loamy, 0 to 3 percent slopes, frequently flooded	809.45	2.02%	N/A	Yes
FrfB	Freehold loamy sand, 0 to 5 percent slopes	356.11	0.89%	P-1	Yes
FrfC	Freehold loamy sand, 5 to 10 percent slopes	26.58	0.07%	S-1	No
FrkC3	Freehold sandy loam, 5 to 10 percent slopes, severely eroded	1.70	0.00%	N/A	No
FrmA	Freehold fine sandy loam, 0 to 2 percent slopes	334.44	0.83%	P-1	No
FrmB	Freehold fine sandy loam, 2 to 5 percent slopes	165.86	0.41%	P-1	No
FrmC	Freehold fine sandy loam, 5 to 10 percent slopes	40.01	0.10%	S-1	No
FrmD	Freehold fine sandy loam, 10 to 15 percent slopes	73.06	0.18%	N/A	No
GahB	Galloway sand, 0 to 5 percent slopes	203.83	0.51%	S-1	Yes
GakB	Galloway fine sand, 0 to 5 percent slopes	14.33	0.04%	S-1	Yes
HoaB	Holmdel loamy sand, 0 to 5 percent slopes	367.80	0.92%	P-1	Yes
HodA	Holmdel fine sandy loam, 0 to 2 percent slopes	858.26	2.14%	P-1	Yes
HodB	Holmdel fine sandy loam, 2 to 5 percent slopes	59.54	0.15%	P-1	No
JdrA	Jade Run fine sandy loam, 0 to 2 percent slopes	468.94	1.17%	S-1	Yes
KeaA	Keansburg fine sandy loam, 0 to 2 percent slopes	234.97	0.59%	N/A	Yes
KrbA	Kresson loamy sand, 0 to 5 percent slopes	1.41	0.00%	S-1	Yes
KreA	Kresson fine sandy loam, 0 to 2 percent slopes	22.48	0.06%	S-1	Yes
KrhA	Kresson loam, 0 to 2 percent slopes	31.30	0.08%	S-1	Yes
LakB	Lakehurst sand, 0 to 5 percent slopes	3,466.79	8.65%	N/A	Yes
LakfB	Lakehurst sand, thick surface, 0 to 5 percent slopes	2,533.60	6.32%	N/A	Yes

Soil Type	Description	Area (Acres)	% of Pemberton	Ag. Quality*	Hydric?
LakhB	Lakehurst sand, loamy substratum, 0 to 5 percent slopes	316.74	0.79%	N/A	Yes
LamB	Lakehurst fine sand, 0 to 5 percent slopes	89.21	0.22%	N/A	Yes
LanB	Lakehurst-Lakewood sands, 0 to 5 percent slopes	28.35	0.07%	N/A	No
LasB	Lakewood sand, 0 to 5 percent slopes	2,978.96	7.43%	N/A	Yes
LasC	Lakewood sand, 5 to 10 percent slopes	591.56	1.48%	N/A	No
LasD	Lakewood sand, 10 to 15 percent slopes	63.53	0.16%	N/A	No
LasfB	Lakewood sand, thick surface, 0 to 5 percent slopes	847.03	2.11%	N/A	No
LashB	Lakewood sand, loamy substratum, 0 to 5 percent slopes	644.93	1.61%	N/A	No
LathB	Lakewood fine sand, loamy substratum, 0 to 5 percent slopes	8.80	0.02%	N/A	No
MakAt	Manahawkin muck, 0 to 2 percent slopes, frequently flooded	860.09	2.14%	U-1	Yes
MapC	Marlton fine sandy loam, 5 to 10 percent slopes	2.93	0.01%	S-1	No
MunA	Mullica fine sandy loam, 0 to 2 percent slopes	1,256.95	3.13%	S-1	Yes
PefB	Pemberton sand, 0 to 5 percent slopes	9.70	0.02%	S-1	No
PHG	Pits, sand and gravel	287.97	0.72%	N/A	No
PHM	Pits, clay	22.65	0.06%	N/A	No
SacA	Sassafras sandy loam, 0 to 2 percent slopes	23.67	0.06%	P-1	Yes
SacB	Sassafras sandy loam, 2 to 5 percent slopes	0.00	0.00%	P-1	Yes
ShsA	Shrewsbury fine sandy loam, 0 to 2 percent slopes	498.15	1.24%	S-1	Yes
ShuA	Shrewsbury sandy clay loam, truncated, 0 to 2 percent slopes	146.50	0.37%	N/A	Yes
ShwA	Shrewsbury ironstone substratum variant fine sandy loam, 0 to 2 percent slopes	21.08	0.05%	N/A	Yes
ThfB	Tinton sand, 0 to 5 percent slopes	99.37	0.25%	S-1	No
ThfC	Tinton sand, 5 to 10 percent slopes	22.33	0.06%	S-1	No
ThftB	Tinton sand, thick surface, 0 to 5 percent slopes	189.04	0.47%	S-1	No
UdrB	Udorthents, refuse substratum, 0 to 8 percent slopes	104.17	0.26%	N/A	No
UdwB	Udorthents, wet substratum, 0 to 8 percent slopes	45.92	0.11%	N/A	Yes

Soil Type	Description	Area (Acres)	% of Pemberton	Ag. Quality*	Hydric?
URSAAB	Urban land, sandy, 0 to 8 percent slopes	100.39	0.25%	N/A	No
WATER	Water	759.34	1.89%	N/A	No
WedA	Westphalia loamy fine sand, 0 to 2 percent slopes	99.82	0.25%	P-1	No
WedB	Westphalia loamy fine sand, 2 to 5 percent slopes	79.97	0.20%	P-1	No
WeeA	Westphalia fine sandy loam, 0 to 2 percent slopes	61.76	0.15%	P-1	No
WeeB	Westphalia fine sandy loam, 2 to 5 percent slopes	94.19	0.23%	P-1	Yes
WobB	Woodmansie sand, 0 to 5 percent slopes	49.29	0.12%	N/A	No
WobhB	Woodmansie sand, loamy substratum, 0 to 5 percent slopes	65.35	0.16%	N/A	No
WofB	Woodstown fine sandy loam, 2 to 5 percent slopes	1.50	0.00%	P-1	No
Total		**40,100.98**	**100.00%**		**33,316.96**

Source: USDA NRCS, 2004

* Explanation of Ag Quality Designations	
P–1	Prime Farmland
S–1	Statewide Importance
L–1	Local Importance
N/A	Soil not rated for agricultural use by NRCS, but may be suitable or currently used for such use.

Certain soil characteristics can severely restrict the use of sites for construction and development. **Table 5: Soil Limitations for Development** records the soils and their possible limitations for building foundations and septic systems. As indicated in the table, the township has some soils that are severely limited for on-site septic systems. Septic systems require soils that have a low water table (five feet or more from the surface) and high permeability to allow for proper drainage of wastewater. Soils with high water tables (five feet or less from the surface) create a potential for erosion, wet basements, and low permeability, often allowing wastewater to collect near the surface. Because the suitability of a soil for a septic disposal field is very site specific and relies on many factors, including but not limited to the soil type, there is not an accurate source of soil information regarding this subject. The best way to determine soil suitability for a septic system is to request a site survey by a professional.

Table 5: Soil Limitations for Development

Soil Series	Soil Types	Acreage	Land Use Implications*		
			Building without Basement	Building with Basement	Septic Systems
Adelphia	AdmA, AdmB, AdmkA, AdmmA, AdnA, AdotB	1,923.27	B	C	C
Atsion	AtsA, AtshA, AttA, AtthA	7,211.92	C	C	C
Berryland	BerAs, BesAs, BetAs	2,169.45	C	C	C
Buddtown	BugA, BugB, BuhA, BuhB	1,006.22	B	C	C
Colemantown	CoeAs	93.20	C	C	C
Collington	ComA, ComB	347.54	B	A	C
	ComC	24.59	B	B	C
Downer	DocB, DocC, DoetB	1,257.48	A	A	C
Evesboro sand	EveB, EveC, EvehB, EvfB	3,952.08	A	A	C
Fluvaquents	FmgAt, FmhAt	2,382.99	C	C	C
Freehold	FrfB, FrfC, FrmA, FrmB	882.98	A	A	C
	FrkC3, FrmC, FrmD	114.76	B	B	C
Galloway	GahB, GakB	218.16	B	C	C
Holmdel	HoaB, HodA, HodB	1,285.59	B	C	C
Jade Run	JdrA	468.94	C	C	C
Keansburg	KeaA	234.97	C	C	C
Kresson	KrbA, KreA, KrhA	55.19	C	C	C
Lakehurst	LakB	3,466.79	A	B	C
	LakfB, LakhB, LamB	2,939.56	B	C	C

Soil Series	Soil Types	Acreage	Land Use Implications*		
			Building without Basement	Building with Basement	Septic Systems
Lakehurst-Lakewood	LanB	28.35	B-A	C-A	C
Lakewood	LasB, LasC, LasD, LasfB, LashB, LathB	5,071.29	A	A	C
	LasD	63.53	B	B	C
Manahawkin	MakAt	860.09	C	C	C
Marlton	MapC	2.93	B	B	C
Mullica	MunA	1,256.95	C	C	C
Pemberton	PefB	9.70	A	B	C
Pits, sand and gravel	PHG	287.97	NA	NA	NA
Pits, clay	PHM	22.65	C	C	C
Sassafras	SacA, SacB	23.67	A	A	C
Shrewsbury	ShsA, ShuA, ShwA	665.73	C	C	C
Tinton	ThfB	288.41	A	A	C
	ThfC	22.33	B	B	
Udorthents	UdrB	104.17	A	A	B
	UdwB	45.92	NA	NA	NA
Urban land	URSAAB	100.39	A	A	C
Water	WATER	759.34	NA	NA	NA
Westphalia	WedA, WedB, WeeA, WeeB	335.73	A	A	C
Woodmansie	WobB	49.29	A	A	C
	WobhB	65.35	A	B	B
Woodstown	WofB	1.50	A	B	C
Total		**40,100.98**			

Source: USDA NRCS, 2004

*Key to Land Use Implications	
A = Not Limited	Little or no limitation(s) or easily corrected by use of normal equipment and design techniques.
B = Somewhat Limited	Presence of some limitations that normally can be overcome by careful design and management at somewhat greater cost.
C = Very Limited	Limitations that normally cannot be overcome without exceptional, complex, or costly measures.
NA = Not Rated	Soil series/type not rated for designated use.

Climate

Geographically situated approximately halfway between the Equator and the North Pole, New Jersey's climate is extremely variable. The state's temperate, continental climate is influenced by hot, cold, dry, and humid airstreams that create highly variable local weather conditions. From May through September, New Jersey is dominated by moist, tropical air originating in the Gulf of Mexico and carried by prevailing winds from the southwest. In winter, winds generally prevail from the northwest, bringing cold, polar air masses from subarctic Canada.

Although New Jersey is one of the smallest states in the country, it has five distinct climate regions. The state's climate varies across these five regions: North, Central, Southwest, Pine Barrens, and Coastal. Distinct variations between these climate regions is due to a combination of factors, including geology, distance from the Atlantic Ocean, and prevailing atmospheric flow patterns

Pemberton is primarily located within the Pine Barrens climate zone. Unlike the Southwest zone to the west, which is characterized by moist, agriculturally productive soils and the maritime effects of the Delaware Bay, the Pine Barrens zone is characterized by sandy soils that retain less moisture. The sandy soils of the Pine Barrens are very porous, allowing precipitation to rapidly infiltrate the ground and leave the surface dry. In addition to reducing soil fertility, this phenomenon allows for a wider range between the daily maximum and minimum temperatures than in the Southwest climate zone. Finally, these drier conditions also make the Pine Barrens region more prone to forest fires.

Based on data collected by the National Climate Data Center, the mean annual temperature in Pemberton Township is 53.9 degrees Fahrenheit. January is the coldest month, with a mean temperature of 32.3 degrees, and July is the hottest month, with a mean temperature of 74.9 degrees. The mean annual precipitation is 47.12 inches. August is the rainiest month, with a mean precipitation of 5.16 inches, and February is the driest month, with an average of just 2.85 inches.

Growing Seasons

Pemberton Township is located within U.S. Department of Agriculture (USDA) Plant Hardiness Zone 6B, where annual minimum temperatures are typically between -5 and 0 degrees Fahrenheit. Hardiness zones are based on average annual minimum temperatures and are helpful in indicating which plant species are able to survive the winter in each area. Most of southern and eastern New Jersey is actually designated as Zone 7, which is the warmest Plant Hardiness Zone in New Jersey, and is characterized by annual minimum temperatures between 0 and 5 degrees Fahrenheit.

Pemberton's agricultural growing season is approximately six months, or 180 days, from mid-April through mid-October. The growing season is generally defined as the period between the last spring frost and the first autumn frost. However, the harvest of grain

crops typically continues throughout November, and winter crops such as broccoli, cauliflower, and cabbage are grown until the first hard freeze, usually in early January.

Surface Water Resources

The land and water in Pemberton Township drain to Rancocas Creek and ultimately to the Delaware River. Most of the township drains to the Rancocas Creek North Branch, although a southern portion drains to the Rancocas Creek South Branch.

Watersheds

A watershed is all the land that drains to a particular waterway, such as a river, stream, lake, or wetland. The high points in the terrain, such as hills and ridges, define the boundaries of a watershed. Large watersheds are made up of a succession of smaller ones, and smaller ones are made up of the smallest area–the catchment area of a local site. So, for example, the Delaware River watershed is made up of many smaller watersheds, such as the Rancocas Creek watershed, which themselves consist of smaller subwatersheds. These subwatersheds can be further subdivided into smaller ones, each surrounding smaller tributaries that flow to the larger channel, and so on down to the catchment level. Watersheds are natural ecological units, where soil, water, air, plants, and animals interact in a complex relationship.

Each watershed corresponds to a hydrological unit code, or HUC, as delineated by the United States Geological Survey (USGS). A HUC 11 watershed (identified by an 11-digit code) contains a number of HUC 14 subwatersheds (identified by a 14-digit code). The State of New Jersey has 152 HUC 11 watersheds and over 900 HUC 14 subwatersheds. Pemberton Township lies entirely within the larger Rancocas Creek Watershed, which is divided into four HUC 11 watershed divisions: Rancocas Creek NB (below New Lisbon dam), Rancocas Creek NB (above New Lisbon dam), Rancocas Creek SB (above Bobby's Run), and Greenwood Branch (NB Rancocas Creek). These HUC 11 watersheds are then further divided into 16 smaller HUC 14 subwatersheds, listed in **Table 6: Watersheds and Subwatersheds** and depicted on **Map 7: Watersheds**.

Rancocas Watershed

The NJ Department of Environmental Protection manages natural resources on a watershed basis. The state has been divided into 20 Watershed Management Areas (WMAs). Pemberton Township is located within WMA 19: "Rancocas." WMA 19 is the largest watershed in south-central New Jersey and is comprised of the North Branch, South Branch, and Main Stem of the Rancocas Creek, including Mill Creek. Portions of Burlington, Camden, and Ocean counties, and approximately 33 municipalities, are included in this management area, which covers 360 square miles and reaches deep into the Pinelands.

Most watersheds in the Pinelands drain either east to the Atlantic Ocean or south to the Delaware Bay, although the Rancocas Creek watershed is an exception to this in that it drains west to the Delaware River. Approximately 68 percent of the Rancocas Creek watershed is within the Pinelands Management Area, which is regulated by the Pinelands Commission. Pemberton Township is located in the northeastern part of the Rancocas Creek watershed.

Pemberton Township is entirely within the Rancocas Creek Watershed.

The Rancocas Creek is composed of three branches: the North Branch, the South Branch, and the main stem. The tributaries that flow through Pemberton Township primarily flow into the North Branch, with a small portion of the township's southwestern waterways flowing to the South Branch. The North Branch, which starts just south of Fort Dix, is 31 miles long and drains 167 square miles, making the North Branch the largest subwatershed within the Rancocas Creek basin. The North Branch's main tributaries are Greenwood Branch, McDonalds Branch, and Mount Misery Brook. The South Branch begins near Chatsworth and drains 144 square miles. Its tributaries include the Southwest Branch Rancocas Creek, Stop the Jade Run, Haynes Creek, and Friendship Creek.

The main stem, which flows for approximately eight miles, drains 49 square miles between the confluence of the North and South branches at Hainesport and the Delaware River. The mouth of the Rancocas Creek is located between Riverside and Delanco on the Delaware River. The tidal influence of the stream is evident as far as 15 miles upstream from the mouth, near the dam at Mount Holly on the North Branch, Vincentown on the South Branch, and Kirby Mills on the Southwest Branch. Within Pemberton, the Rancocas Creek is nontidal and freshwater. The eastern part of the watershed is predominantly forested or agricultural, while the western side of the watershed is more heavily developed. Approximately 40 percent of the total watershed is forested, 30 percent is developed, and 17 percent is used for agriculture, including cranberry bogs.

The Rancocas Creek Watershed Management Area was the first in New Jersey to have a management plan, which was created in 2003. The plan identifies water quality objectives and strategies to achieve those objectives. Some of the recommended strategies included developing model ordinances to improve water quality, encouraging stormwater management retrofits, educating municipal officials about water resource planning, protecting lands along the Rancocas Creek, promoting agricultural viability, and creating and sustaining partnerships with the public and interested organizations. DVRPC developed a Greenway Plan for the Rancocas Creek in 2002, which identifies parcels along the main branches for proposed open space acquisition. The Plan also recommends implementing a 300-foot buffer along the creek's banks.

Table 6: Watersheds and Subwatersheds

Watershed Name (HUC 11)	Subwatershed Name (HUC 14)	Subwatershed ID (HUC 14#)	Total Area (Acres) - Subwatershed	Acres within Pemberton Township	% of Pemberton Township
Greenwood Branch (NB Rancocas Creek) (02040202030)	Pole Bridge Branch (above County line)	02040202030010	0.01	14,805.40	36.88%
	Bucks Cove Run/Cranberry Branch	02040202030050	2,194.17		
	Greenwood Br (below Country Lake & MM confluence)	02040202030090	6,436.63		
	Pole Bridge Br (Country Lake dam - County line)	02040202030060	3,522.13		
	Bisphams Mill Creek (below McDonalds Br)	02040202030080	2,119.43		
	Mount Misery Brook MB/NB (below 74d27m30s)	02040202030030	533.04		
Rancocas Creek NB (above New Lisbon dam) (02040202020)	Ong Run/Jacks Run	02040202020020	1,307.46	8,564.40	21.33%
	Gaunts Brook/Hartshorne Mill Stream	02040202020010	251.68		
	Rancocas Ck NB (incl. Mirror Lake-Gaunts Brook)	02040202020030	3,956.90		
	Rancocas Ck NB (NL dam to Mirror Lake)	02040202020040	3,048.35		
Rancocas Creek NB (below New Lisbon dam) (02040202040)	Rancocas Ck NB (Rt 206 to Pemberton bridge)	02040202040030	3,221.18	12,349.45	30.76%
	Rancocas Creek NB (Smithville to Rt 206)	02040202040040	1,015.04		
	Pemberton / Ft Dix trib. (NB Rancocas Ck)	02040202040020	3,552.80		
	Rancocas Ck NB (Pemberton bridge to NL dam)	02040202040010	4,560.41		
Rancocas Creek SB (above Bobbys Run) (02040202050)	Jade Run	02040202050070	4,309.88	4,428.65	11.03%
	Rancocas Creek SB(above Friendship Ck)	02040202050060	118.78		
Total				**40,147.90**	100%

Source: NJDEP, 2000

Streams

There are approximately 244 stream miles flowing across Pemberton Township. Over 150 miles of these are first order (or headwater) streams, meaning they are the initial sections of stream channels with no contributing tributaries. The headwaters are where a stream is "born" and actually begins to flow. See **Table 7: Stream Order**.

Most waterways in Pemberton Township are headwater streams.

Headwaters are of particular importance because they tend to contain a diversity of aquatic species and their condition affects downstream water quality. Because of their small size, they are highly susceptible to impairment by human activities on the land. First- and second-order streams are narrow and often shallow, and are characterized by relatively small base flows. This makes them subject to greater temperature fluctuations, especially when forested buffers on their banks are removed. They are also easily over silted by sediment-laden runoff and their water quality can be rapidly degraded. In addition, first-order streams are greatly affected by changes in the local water table because they are fed by groundwater sources. Headwaters are important sites for the aquatic life that is at the base of the food chain and often serve as spawning or nursery areas for fish.

Table 7: Stream Order

Stream Order	Length (miles)
1	151.03
2	36.29
3	18.60
4	17.52
5	12.98
6	7.17
Total	**243.59**

Source: NJDEP, 2002

Many streams in the Pinelands, including those in Pemberton, have a distinctive brown, or "tea," color, which is the result of an abundance of an organic iron complex formed from decomposing plant matter combined with iron oxide ions dissolved in groundwater. This water is commonly called "cedar water" due to the incorrect assumption that the brown

color results from the roots of cedar trees. Most streams in the Pinelands are low in hardness, alkalinity, and acidity and are high in humic complex, or organic matter. All streams in Pemberton Township, listed below in **Table 8: Named Streams**, are tributaries of the Rancocas Creek.

Table 8: Named Streams

Baffin Brook	Gum Spring
Bisphams Mill Creek	Hartshorne Mill Stream
Bucks Cove Run	Indian Run
Budds Run	Jacks Run
Cannon Run	Jade Run
Cranberry Branch	Mount Misery Brook
Gaunts Brook	North Branch Rancocas Creek
Goldys Run	Ong Run
Goodwater Run	Pole Bridge Branch
Greenwood Branch	Powells Run

Source: NJDEP, 1998

Lakes and Ponds

There are approximately 701 acres of artificial lakes in Pemberton Township. In addition, there are nine acres of natural lakes in the township and 71 acres of streams and canals.

The five largest lakes within Pemberton Township are Lake Pemberton, Mirror Lake, Hanover Lake, Country Lake, and Presidential Lake. In addition, there are many other lakes that are 10 acres or less in size, and these lakes are scattered throughout the township. Smaller lakes and ponds in Pemberton Township include Big Pine Lake, Little Pine Lake, Long Lake, Mount Misery Lake, and Whitesbog Pond.

Domestic geese frequent the lakes of Pemberton Township.

The majority of lakes in Pemberton Township are classified as artificial water bodies by NJDEP. Artificial lakes and ponds are man-made impoundments of water that are formed by damming. They are often used for irrigation, flood control, recreation, or cranberry bogs.

Wetlands

Wetlands support unique communities that serve as natural water filters and as incubators for many beneficial species. The term “wetland” is applied to areas where water meets the soil surface and supports a particular biological community. The source of water for a wetland can be an estuary, river, stream, lake edge, or groundwater that rises close to the land surface. Under normal circumstances, wetlands are those areas that support a prevalence of defined wetland plants on a wetland soil. The U.S. Fish and Wildlife Service designates all large vascular plants as wetland (hydric), non-wetland (non-hydric) or in-between (facultative). Wetland soils, also known as hydric soils, are areas where the land is saturated for at least seven consecutive days during the growing season. Wetlands are classified as either tidal (coastal) or nontidal (interior). Tidal wetlands can be either saline or freshwater. There are also special wetlands categories to denote saturated areas that have been altered by human activities.

New Jersey protects freshwater wetlands under the New Jersey Freshwater Wetlands Protection Act Rules: N.J.A.C. A 7:7A. The law also protects transition areas, or “buffers,” around freshwater wetlands. The New Jersey freshwater wetlands maps provide guidance on where wetlands are found in New Jersey, but they are not the final word. Only an official determination from NJDEP, called a “letter of interpretation" (LOI), can legally determine for sure if there are freshwater wetlands on a property. An LOI verifies the presence, absence, and boundaries of freshwater wetlands and transition areas on a site. Activities permitted to occur within wetlands are very limited and usually require a permit.

Within the Pinelands, wetlands are also regulated by the Pinelands Commission, which is the lead regulatory body for identifying and delineating wetlands and assessing wetland buffer areas in the Pinelands. There are more stringent regulations for wetlands located in the Pinelands, and most types of development are prohibited on these wetlands. Development is also prohibited within 300 feet of any wetland, unless the applicant can demonstrate that the development will not have a significant adverse impact on the wetland.

White Fringed Orchid

Photo by Richard Beck

All of Pemberton’s wetlands are freshwater. Natural wetlands cover 11,793 acres within the township (29 percent of total land

area), of which 10,365 acres are wooded wetlands and 1,428 acres are low-growing emergent, scrub/shrub or herbaceous wetlands. See **Map 8: Surface Water, Wetlands, and Vernal Pools**.

In addition to natural wetlands, Pemberton Township also includes 2,605 acres (six percent of total land area) of modified or disturbed wetlands. Modified wetlands are former wetland areas that have been altered by human activities and no longer support typical wetland vegetation, or are not vegetated at all. Modified wetland areas do, however, show obvious signs of soil saturation and exist in areas shown to have hydric soils on U.S. Soil Conservation Service soil surveys.

Pemberton's modified wetlands fall into the following categories: 2,543 acres of agricultural wetlands, 49 acres of disturbed wetlands, 226 acres of former agricultural wetlands, two acres of wetlands used as right-of-ways, and 12 acres of wetlands found in maintained greenspace, lawns, or recreation area. A more detailed description of Pemberton's natural wetland areas is found in the **Biological Resources** section, under "Wetlands."

Agricultural Wetlands

Agricultural wetlands occupy 2,543 acres (six percent) of Pemberton Township. Agricultural wetlands are modified former wetlands that are under cultivation yet still exhibit evidence of soil saturation in aerial infrared photo surveys. See **Map 8: Surface Water, Wetlands, and Vernal Pools**.

Agricultural wetlands were usually drained by a technique called "tile drainage." Tile drainage was a common method of removing excess water from farm fields that exhibited one or more of the following characteristics: (1) small areas of isolated wetlands, (2) very flat land that ponded in wet weather, (3) soils that were slow to warm in the spring because of a relatively high water table, or (4) soils that had a very high clay content and, therefore, drained slowly. Tile drainage was very labor intensive, as it involved installing subsurface drainage pipes throughout a field at a depth of three to six feet. Tile drains were used sparingly–only where there were extremely wet spots. Therefore, the existence of tile drainage strongly indicates a natural wetland hydrology.

The Natural Resources Conservation Service sponsors the Wetlands Reserve Program, a voluntary program that offers landowners a chance to receive payments for restoring and protecting wetlands, including agricultural wetlands, on their property. Restoring agricultural wetlands would require removing them from agricultural use and restoring them to their natural state. This program provides technical and financial assistance to eligible landowners who can enroll eligible lands through permanent easements, 30-year easements, or restoration cost-share agreements.

Vernal Pools

Vernal pools are bodies of water that appear following snowmelt and during spring rains, but disappear or are dry during the rest of the year. They are highly important sites for certain rare species of amphibians. Particular types of frogs and salamanders will only breed in vernal ponds (obligate breeders), which provide their offspring with a measure of protection because the pond's impermanence prevents the residence of predators of the eggs and young.

Vernal pools are so intermittent that their existence as wetlands has frequently not been recognized. Consequently, many of them have disappeared from the landscape, or have been substantially damaged. This, in turn, is a principal cause of the decline of their obligate amphibian species.

The New Jersey Division of Fish and Wildlife has been conducting a Vernal Pool Survey project since 2001 to identify, map, and certify vernal ponds throughout the state. A certified vernal pool is one that occurs in a confined basin without a permanently flowing outlet, has habitat documented for one obligate or two facultative herptile (reptile and amphibian) species, maintains ponded water for at least two continuous months between March and September, and is free of fish populations throughout the year.

Once a vernal pond is certified, regulations require that a 75-foot buffer be maintained around the pond. NJDEP's Division of Land Use Regulation oversees this designation and restricts development around vernal ponds by denying construction permits. Local municipalities can provide additional protection by negotiating conservation easements on the land surrounding the pond or by instituting restrictive zoning, such as passing a stream corridor protection overlay ordinance that specifically includes the vernal pools. A township can also include the pools in its official map. The South Jersey Land and Water Trust provides training sessions every March to teach volunteers how to identify, survey, and certify vernal pools. Information is available at its website: http://www.sjlandwater.org/ongoing/vernalpools.htm.

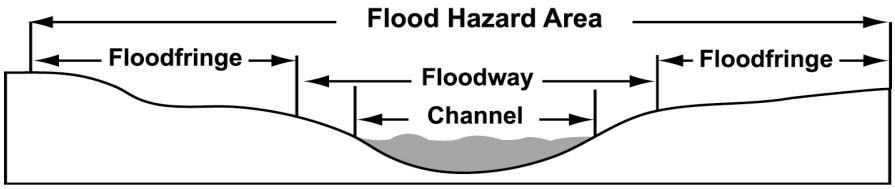
The state has identified 101 potential vernal pools in Pemberton Township, which are listed in **Appendix B: Vernal Pools in Pemberton Township**. These vernal pools are fairly evenly distributed throughout the township. However, vernal pools are not commonly found in the south-central section of the township, where upland forest ecosystems dominate. Surveys of each pond are needed to determine if the pond is still in existence as a natural habitat, and if it is, what species are present. Once surveyed, the New Jersey Division of Fish and Wildlife will review the data and those pools that meet the criteria will be certified.

Floodplains

Areas naturally subject to flooding are called floodplains. Floodplains encompass a floodway, which is the portion of a floodplain subject to high velocities of moving water, and the adjacent flood fringe, which helps to hold and carry excess water during overflow of the normal stream channel. The 100-year floodplain is defined as the land area that will

be inundated by the overflow of water resulting from a 100-year flood (a flood that has a one percent chance of occurring in any given year).

Figure 6: Parts of a Flood Hazard Area



Source: NJDEP

Floodplains require protection in order to prevent loss to residents, especially within the boundaries of the floodway. Equally important is the preservation of the environmentally sensitive aquatic communities that exist in floodplains. These communities are often the first link in the food chain of the aquatic ecosystem. In addition, floodplains serve the function of removing and mitigating various pollutants through the uptake by their vegetation of excess chemical loads in the water and by the filtering of sediments generally. All efforts to keep development out of floodplains will help to preserve the flood-carrying capacity of streams and their water quality.

In New Jersey and throughout the country, building in areas subject to flooding is regulated to protect lives, property, and the environment. New Jersey regulates construction in the flood hazard area under the Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 et seq., and its implementing rules at N.J.A.C. 7:13. Activities that are proposed to occur in a flood hazard area will require issuance of a flood hazard area permit or a letter of non-applicability from the NJDEP. Although the terms “flood hazard area” and “100-year floodplain” refer to similar concepts, NJDEP defines them in slightly different ways. There are a number of different methods that NJDEP uses to determine the extent of the flood hazard area, including defining the flood hazard area as the area inundated by a flood resulting from the 100-year discharge increased by 25 percent.

Some residential areas in Pemberton Township are located in floodplains.

New Jersey’s flood hazard area maps are not available in digital form. Consequently, it is only possible to approximate the spatial extent of the flood hazard area in Pemberton by using the Federal Emergency Management Agency’s (FEMA’s) 100-year floodplain maps. FEMA’s maps show that 10,336 acres, or 26 percent, of Pemberton

Township's land is within the 100-year floodplain area, and an additional 273 acres are within the 500-year floodplain area. Nearly all of Pemberton's floodplain areas are located along the branches of the Rancocas Creek and its many tributaries. See **Table 9: Floodplains** and **Map 9: Floodplains (2010)**.

Table 9: Floodplains

Floodplain	Area (Acres)	% of Pemberton in Floodplain
100-Year Floodplain	10,335.46	25.74%
500-Year Floodplain	273.16	0.68%
Total Floodplain	**10,608.62**	**26.42%**
Total Pemberton Area	**40,147.90**	

Source: FEMA, 2010

Surface Water Quality

Water quality standards are established by federal and state governments to ensure that water is suitable for its intended use. The ultimate objective of the federal Clean Water Act (P.L. 95-217) is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. Standards are intended to restore the quality of the nation's waters to provide for the protection and propagation of fish, shellfish, and wildlife, and to provide for recreation in and out of the water, wherever attainable.

All waterbodies in New Jersey are classified by NJDEP as either freshwater (FW), Pinelands water (PL), saline estuarine water (SE), or saline coastal water (SC). Freshwater is further broken down into freshwater that originates and is wholly within federal or state parks, forests, or fish and wildlife lands (FW1), and all other freshwater (FW2). The water quality for each of these groups must be able to support designated uses that are assigned to each waterbody classification (see Surface Water Quality Standards N.J.A.C. 7:9B-1.12). In addition to being classified as FW1 and FW2, fresh waterbodies are classified as trout producing (TP), trout maintaining (TM), or nontrout waters (NT). Each of these classifications may also be subject to different water quality standards. All waterbodies in Pemberton are classified as Pinelands waters, with the exception of one stream (Powells Run). Four streams are classified as Pinelands waters in some segments and FW2-NT in others. Jade Run is classified as Pinelands waters in most segments and FW1 in one segment. The classifications of all surface waters in Pemberton Township are listed in the table below.

Mirror Lake

Table 10: Surface Water Classifications

Category	Waterbody Name
PL	Baffin Brook
PL	Big Pine Lake
PL	Bisphams Mill Creek
PL	Bucks Cove Run
PL / FW2-NT	Budd Run
PL	Cannon Run
PL	Country Lake
PL	Cranberry Branch
PL	Gaunts Brook
PL / FW2-NT	Goldys Run
PL	Goodwater Run
PL	Greenwood Branch
PL	Gum Spring
PL	Hanover Lake
PL	Hartshorne Mill Stream
PL / FW2-NT	Indian Run
PL	Jacks Run
PL / FW1	Jade Run
PL	Little Pine Lake
PL	Long Lake
PL	Mirror Lake
PL	Mount Misery Brook
PL	Mount Misery Lake
PL	North Branch Mount Misery Brook
PL / FW2-NT	North Branch Rancocas Creek
PL	Ong Run
PL	Pole Bridge Branch
FW2-NT	Powells Run
PL	Presidential Lakes
PL	South Branch Mount Misery Brook
PL	South Branch Rancocas Creek UNT
PL	Whitesbog Pond

Source: NJDEP, 2008

All lakes and nearly all streams in Pemberton Township have an additional degree of protection afforded to them due to their classification as either PL or FW1. These waterbodies are considered Outstanding Natural Resource Waters and have strict antidegradation standards. FW1 waters, or nondegradation waters, have exceptional significance and cannot be subject to any man-made wastewater discharges. Activities that might alter existing water quality in FW1 waters are prohibited. PL waters are maintained in their natural state and changes are allowed only toward natural water quality.

New Jersey's Integrated Water Quality Monitoring and Assessment Report

The Federal Clean Water Act mandates that states submit biennial reports to the U.S. Environmental Protection Agency (EPA) that describe the quality of their waters. States must submit two reports: the first is the *Water Quality Inventory Report*, or 305(b) Report, which documents the status of principal waters in terms of overall water quality and support of designated uses; the second is the 303(d) List, which lists the water bodies that are not attaining water quality standards. States must also prioritize the impaired water bodies on the 303(d) List for Total Maximum Daily Load (TMDL) analyses and identify those high-priority water bodies for which they anticipate establishing TMDLs in the next two years. See the **Total Maximum Daily Loads (TMDLs)** section for additional information.

Beginning in 2002, the NJDEP combined the 305(b) Report and the 303(d) List into a single report, according to the EPA's guidance. The biennial *Integrated Water Quality Monitoring and Assessment Report* places each of the state's waters on one of five "sublists." Sublists 1 and 2 contain waters that are attaining standards. Sublist 3 contains waters that have insufficient data to determine their status. Sublist 4 contains waters that do not attain water quality standards, but which meet one of the following three conditions: (1) a TMDL has been completed for the pollutant causing nonattainment; (2) other enforceable pollution control requirements are reasonably expected to result in conformance with the applicable water-quality standards; or (3) nonattainment is caused by something other than a pollutant. Sublist 5, equivalent to the 303(d) List, contains waters that do not attain their designated use and for which a TMDL is required.

In 2006, NJDEP began reporting water quality data on a HUC 14 subwatershed basis, and so the assessments of portions of rivers and streams are reported by the subwatershed that they fall within. Subwatersheds (assessment units) are assessed on their attainment of eight different designated uses, although not all uses are applicable to all subwatersheds. The designated uses are as follows:

- Aquatic life (general)
- Aquatic life (trout)
- Recreation
- Drinking water supply
- Industrial water supply

- Agricultural water supply
- Shellfish harvesting
- Fish consumption

As none of the waters in Pemberton Township support trout or shellfish, these designated uses are not applicable. The determination of whether or not water quality is sufficient to meet a body of water's designated use(s) is based on whether or not the body of water is within established limits for certain surface water quality parameters. Some examples of surface water quality parameters include fecal coliform, dissolved oxygen, pH, phosphorous, and toxic substances. NJDEP also evaluates water quality by examining the health of aquatic life in a stream.

As shown in the table below, 12 of the 16 subwatersheds that are partially within Pemberton are impaired (Sublist 5) for at least one designated use, and four subwatersheds either attain all designated uses (Sublists 1 or 2) or have insufficient data for assessment (Sublist 3). For aquatic life, the most general and encompassing parameter of water quality, 10 subwatersheds are impaired, five are non-impaired, and one has insufficient data. Between 2006 and 2008, a number of subwatersheds in Pemberton Township went from having insufficient data to showing impairment for one or more designated uses. See **Map 10: Water Quality (2008)**.

Table 11: Integrated Water Quality Monitoring and Assessment Report, 2008

Subwatershed Name (HUC 14)	Subwatershed ID (HUC 14 #)	Aquatic Life (General)	Recreation	Drinking Water Supply	Agricultural Water Supply	Industrial Water Supply	Fish Consumption
Gaunts Brook/Hartshorne Mill Stream	02040202020010	5	3	5	3	N/A	3
Ong Run/Jacks Run	02040202020020	5	5	2	2	N/A	3
Rancocas Ck NB (incl. Mirror Lake-Gaunts Brook)	02040202020030	5	5	5	3	N/A	5
Rancocas Ck NB (New Lisbon dam to Mirror Lake)	02040202020040	5	5	3	3	N/A	5
Pole Bridge Branch (above County line)	02040202030010	3	3	3	3	N/A	3
Mount Misery Brook MB/NB (below latitude 74d27m30s)	02040202030030	1	1	1	1	N/A	3
Bucks Cove Run/Cranberry Br	02040202030050	2	3	2	3	N/A	5
Pole Bridge Br (Country Lake dam - County line)	02040202030060	2	3	2	2	N/A	3
Bisphams Mill Creek (below McDonalds Br)	02040202030080	2	3	3	3	N/A	3
Greenwood Br (below Country Lake & Mount Misery confluence)	02040202030090	1	1	1	1	N/A	5
Rancocas Ck NB (Pemberton bridge to New Lisbon dam)	02040202040010	5	2	5	2	N/A	3
Pemberton/Ft Dix trib. (NB Rancocas Ck)	02040202040020	5	3	3	3	3	3
Rancocas Ck NB (Rt 206 to Pemberton bridge)	02040202040030	5	4A	5	2	2	3
Rancocas Creek NB (Smithville to Rt 206)	02040202040040	5	4A	5	2	2	3
Rancocas Creek SB (above Friendship Ck)	02040202050060	5	5	5	3	N/A	5
Jade Run	02040202050070	5	3	2	2	N/A	3

Source: NJDEP, 2008

Key to Integrated Report Sublists	
Sublist	**Placement Conditions**
Sublist 1	The designated use is assessed and attained AND all other designated uses in the assessment unit area are assessed and attained. (Fish consumption use is not factored into this determination based on EPA guidance.)
Sublist 2	The designated use is assessed and attained BUT one or more designated uses in the assessment unit are not attained and/or there is insufficient data to make a determination.
Sublist 3	Insufficient data is available to determine if the designated use is attained.
Sublist 4	The designated use is not attained or is threatened; however, development of a TMDL is not required for one of the following reasons: 1) A TMDL has been completed for the pollutant causing nonattainment; 2) Other enforceable pollution control requirements are reasonably expected to result in the conformance with the applicable water quality standard(s) in the near future and the designated use will be attained through these means; or 3) Nonattainment is caused by something other than a pollutant.
Sublist 5	The designated use is not attained or is threatened by a pollutant or pollutants and a TMDL is required.

The 12 subwatersheds in Pemberton that do not attain at least one designated use are each impaired due to one or more parameters, as shown in **Table 12: List of Impaired Waters with Priority Ranking, 2008**. Of the impaired subwatersheds, pH was a cause of impairment in six subwatersheds, phosphorus impaired six subwatersheds, copper, lead, arsenic, and E. coli impaired four subwatersheds each, and mercury impaired three subwatersheds. Other contaminants included polychlorinated biphenyls (PCBs), DDT (and its metabolites), dissolved oxygen, and unknown causes.

The pH, or acidity, of waters is very important, as it affects most chemical and biological reactions. Acidity is determined by a number of complex interactions and is affected by an area's geology. Acidity in the Pinelands is generally lower than natural conditions due to stormwater runoff from developed areas.

Phosphorus exists naturally at low levels within the environment, although excess phosphorus can lead to harmful algae blooms, which can produce "dead zones" where no aquatic life can survive. Typical causes of phosphorus pollution include overfertilization of lawns and agricultural areas; runoff from impervious surfaces like parking lots, lawns, rooftops, and roadways; discharge from waste-water treatment plants; and overflow from septic systems. Soil erosion is a major contributor of phosphorus to streams, and streambank erosion occurring during floods can transport high quantities of phosphorous into the water system.

Copper, lead, mercury, and arsenic are all considered heavy, or toxic, metals. Trace amounts of some of these elements are essential to maintain the metabolism of the human body, although consuming them in larger doses can be toxic or poisonous. Heavy metals bioaccumulate, meaning they accumulate in the body and are not easily broken down. The consumption of heavy metals can cause kidney and liver failure, bone defects, stomach and intestinal irritation, fetal deformities, acute or chronic damage to the nervous system, and various cancers. Heavy metals generally enter the water system through industrial processes, such as the manufacture of electronics, paint, batteries, metal, or lamps.

E. coli (Escherichia coli) bacteria inhabit the intestinal tract of humans and other warm-blooded animals and enter waterways through human and animal waste. Levels of E. coli in water may increase after periods of flooding, when stormwater runoff may carry manure or animal waste from agricultural production or from excessive geese populations into streams.

Polychlorinated biphenyls (PCBs) are considered a highly toxic persistent organic pollutant (POP) and have been outlawed worldwide. POPs have long half-lives, bioaccumulate in the fatty tissue of animals, and are transmitted up the food chain. PCBs are byproducts of industrial processes used to make electrical, heat transfer, and hydraulic equipment; paints, plastics, and rubber products; pigments, dyes, and bleached paper; herbicides and pesticides; and many other industrial applications. Exposure to PCBs causes cancer and damages the immune, reproductive, nervous, and endocrine systems.

Dissolved oxygen (DO) is necessary for almost all aquatic life, so its concentration provides a good indicator of the health of an aquatic ecosystem. Under low DO conditions, fish are more susceptible to the effects of other pollutants, such as metals and toxics, and at very low DO levels, trace metals from sediments are released into the water column. Summer algal bloom die-off has been implicated as a cause of low DO concentrations.

For each cause of impairment, the 12 impaired subwatersheds in Pemberton Township are ranked low, medium, or high based on their priority for Total Maximum Daily Load (TMDL) development, discussed in the following section. The priority ranking takes environmental, social, and political factors into account in order to focus limited available resources in the most efficient and effective manner.

Table 12: List of Impaired Waters with Priority Ranking, 2008

Subwatershed Name	Subwatershed ID (HUC 14#)	Parameter	Ranking
Gaunts Brook/Hartshorne Mill Stream	2040202020010	Copper	M
		Lead	M
Ong Run/Jacks Run	2040202020020	pH	M
		E. Coli	M
Rancocas Ck NB (incl. Mirror Lake-Gaunts Brook)	2040202020030	pH	M
		Phosphorus	M
		E. Coli	M
		Copper	M
		Lead	M
		Mercury	M
Rancocas Ck NB (New Lisbon dam to Mirror Lake)	2040202020040	pH	M
		Phosphorus	M
		E. Coli	M
		Mercury	M
Bucks Cove Run/Cranberry Br	2040202030050	Mercury	M
Greenwood Br (below Country Lake & Mount Misery confluence)	2040202030090	PCB	M
		DDD	M
		DDE	M
		DDT	M
Rancocas Ck NB (Pemberton bridge to New Lisbon dam)	2040202040010	pH	M
		Arsenic	M
		Copper	M
		Lead	M

Subwatershed Name	Subwatershed ID (HUC 14#)	Parameter	Ranking
Pemberton/Ft Dix trib. (NB Rancocas Ck)	2040202040020	Cause Unknown	L
Rancocas Ck NB (Rt 206 to Pemberton bridge)	2040202040030	Phosphorus	H
		Arsenic	M
		Copper	M
		Lead	M
Rancocas Creek NB (Smithville to Rt 206)	2040202040040	Phosphorus	H
		Arsenic	M
Rancocas Creek SB (above Friendship Ck)	2040202050060	pH	M
		Phosphorus	M
		E. Coli	M
		Arsenic	M
		PCB	M
Jade Run	2040202050070	Dissolved Oxygen	M
		pH	M
		Phosphorus	H

Source: NJDEP, 2008

Total Maximum Daily Loads (TMDLs)

For impaired waterways with a high priority ranking for remediation, the state is required by the EPA to establish a Total Maximum Daily Load (TMDL). A TMDL quantifies the amount of a pollutant that a waterbody can assimilate (its loading capacity) without violating water quality standards. The purpose of a TMDL is to initiate a management approach or restoration plan based on identifying the sources of a pollutant and determining the percentage reductions of the pollutant that must be achieved by each source. These sources can be point sources, such as sewage treatment plants, or nonpoint sources, such as stormwater runoff. A TMDL goes through four stages. First, it is proposed in a report by NJDEP. It is then established when NJDEP finalizes its report. Next, it is approved by EPA. Finally, it is adopted when NJDEP adopts it as an amendment to a water quality management plan.

In general, implementation of a TMDL relies on actions mandated by the Municipal Stormwater Management program, which includes the ordinances that municipalities are required to adopt under that permit. It also depends on voluntary improvements in stormwater management in agricultural and other areas.

A TMDL determines the percentage reduction needed in order for a stream segment to meet the water quality standard. Nonpoint and stormwater point sources are the largest

contributors, as runoff from various land uses transports pollutants into waterbodies during rain events. Nonpoint sources also include inputs from sources such as failing sewage conveyance systems, sanitary sewer overflows, and failing or inappropriately located septic systems.

Eight subwatersheds located partially within Pemberton were listed on the 2006 to 2008 TMDL schedule. As seen **Table 13: TMDLs for Impaired Waters, 2008**, two of these listings are for the reduction of pathogens, four are for phosphorus, and two are for both pathogens and phosphorus. As seen in the table below, all TMDLs for pathogens were deferred, and all TMDLs for phosphorus were not completed due to an anticipated 2008 delisting. However, phosphorus was still a source of water quality contamination in the 2008 report for six subwatersheds, as shown in **Table 12: List of Impaired Waters with Priority Ranking, 2008**.

Table 13: TMDLs for Impaired Waters, 2008

Subwatershed Name	Subwatershed ID (HUC 14#)	Parameter	Status
Rancocas Ck NB (incl. Mirror Lake-Gaunts Brook)	02040202020030	Pathogens	Deferred
		Phosphorus	Anticipated 2008 Delisting
Rancocas Ck NB (New Lisbon dam to Mirror Lake)	02040202020040	Pathogens	Deferred
		Phosphorus	Anticipated 2008 Delisting
Mount Misery Brook MB/NB (below latitude 74d27m30s)	02040202030030	Pathogens	Deferred
Greenwood Br (below Country Lake & MM confl.)	02040202030090	Pathogens	Deferred
Rancocas Ck NB (Pemberton bridge to New Lisbon dam)	02040202040010	Phosphorus	Anticipated 2008 Delisting
Rancocas Ck NB (Rt 206 to Pemberton bridge)	02040202040030	Phosphorus	Anticipated 2008 Delisting
Rancocas Creek NB (Smithville to Rt 206)	02040202040040	Phosphorus	Anticipated 2008 Delisting
Jade Run	02040202050070	Phosphorus	Anticipated 2008 Delisting

Source: NJDEP, 2008

Water Quality Monitoring Networks

New Jersey's Integrated Report is based on the water quality assessments of a number of different monitoring networks. The Ambient Surface Water Quality Monitoring Network (ASWMN) and the Ambient Biological Monitoring Network (AMNET) are the two primary sources of surface water monitoring data. The ASWMN is a cooperative network between USGS and NJDEP that samples surface water quality at 215 stations, six of which are located within Pemberton. These stations monitor stream flow, as well as temperature,

dissolved oxygen (DO), pH, carbon dioxide, nitrogen, ammonia, phosphorus, arsenic, and many other parameters.

AMNET, administered solely by NJDEP, consists of over 800 stream sites in the state and provides long-term biological data. The program routinely samples and evaluates benthic macroinvertebrate populations at each site as a biological indicator of water quality. Benthic macroinvertebrates are bottom-dwelling aquatic insects, worms, mollusks, and crustaceans that are large enough to be seen by the naked eye. There are 10 AMNET monitoring sites in Pemberton Township and Borough, six of which also serve as ASWMN stations. Although one station is located in the borough, its water quality data is relevant for the township as well. Beyond the information included in the Integrated Report, additional water quality data gathered from these monitoring stations is available through the USGS and the NJDEP.

Table 14: Stream Monitoring Network Stations

Station Name	AMNET	ASWMN
Greenwood Branch at New Lisbon Rd	AN0148	01466900
Ong Run at Browns Mills	AN0149A	01465965
North Branch Rancocas Creek at Hanover Furnace	AN0143	01465950
Pole Bridge Branch near Browns Mills	AN0144	01466200
Mount Misery Brook at Upton	AN0145	01466100
North Branch Rancocas Creek at Pemberton (Borough)	AN0149	01467000
Budds Run at Main Street	AN0150	
Indian Run at Birmingham Rd	AN0151A	
Jade Run at Stockton Bridge Rd	AN0157A	
Bisphams Mill Ck at New Lisbon Rd	AN0147	

Source: NJDEP, USGS, 2009

Knowing the actual condition of streams and steam banks, and planning for their improvement, requires more frequent surveying and monitoring than the state can provide. The state primarily monitors main channels in non-tidal areas, and only does biological assessments through AMNET on a five-year cycle. A community may benefit from additional stream surveys by local organizations, along with regular monitoring of water quality on all local waterways.

Other Monitoring

Certain fish may contain toxic chemicals, such as PCBs, dioxins, or mercury, which accumulate in water and aquatic life. Chemical contaminants, such as dioxin and PCBs, are classified by the U.S. Environmental Protection Agency as probable cancer-causing substances in humans. Elevated levels of mercury can pose health risks to the human nervous system. Infants, children, pregnant women, nursing mothers, and women of childbearing age are considered to be at higher risk from contaminants in fish than other

members of the general public. Since 1982, NJDEP has been catching fish at numerous sampling stations throughout the state and testing for contaminant levels and adopting advisories to guide residents on safe consumption practices.

The consumption advisories for fish caught in general freshwater and in the Pinelands region are listed in the table below. Within Pemberton Township, there are additional fish consumption advisories for three species of fish in Mirror Lake and Whitesbog Pond. These advisories supersede the general advisories.

Table 15: Fish Consumption Advisories

Species	General Population	High-Risk Individuals
	Eat No More Than:	Eat No More Than:
General Freshwater Advisories		
Trout (Brown, Brook, Rainbow)	One Meal Per Week	One Meal Per Week
Largemouth Bass		One Meal Per Month
Smallmouth Bass		
Chain Pickerel		
Yellow Bullhead	No Restrictions	
Brown Bullhead		
Sunfish(4)		One Meal Per Week
Pinelands Region*		
Largemouth Bass	One Meal Per Month	Do Not Eat
Chain Pickerel		
Brown Bullhead	One Meal Per Week	
Yellow Bullhead		
Sunfish(4)		One Meal Per Month
Mirror Lake (Burlington Co.) (P)		
Largemouth Bass	One Meal Per Week	One Meal Per Month
Brown Bullhead	No Restrictions	One Meal Per Week
Whitesbog Pond (Ocean Co.) (P)		
Chain Pickerel	One Meal Per Week	Do Not Eat
** All water bodies of the Pinelands region unless there is a waterbody specific advisory listed below with a P notation.*		

Source: NJDEP, 2009

Causes of Water Quality Impairments

Point Sources of Pollution

Point sources of pollution, which come from a single source, or "point," such as an industrial pipe discharge, are regulated by NJDEP through the New Jersey Pollution Discharge Elimination System (NJPDES). New Jersey created NJPDES in response to the Federal Clean Water Act of 1972, which mandated that each state develop water quality standards and regulate the amount of pollution entering water bodies. The act classified all water pollution into one of two categories: "point source" pollution coming from a single source, such as an industrial pipe; and "nonpoint source" pollution, which comes from many diffuse sources. Although the Federal Clean Water Act only required states to regulate point sources, New Jersey also regulates nonpoint sources through authority of the NJPDES rules. See **Nonpoint Sources of Pollution** (page 54).

NJDEP, through the Division of Water Quality and the Bureau of Point Source Permitting, administers the NJPDES program. Under NJPDES, any facility discharging over 2,000 gallons per day (gpd) of wastewater directly into surface water or ground water (generally through a septic system) must apply for and obtain a permit for discharging. Rather than creating individually tailored permits for each and every facility, the Division of Water Quality uses scientific standards to create and issue general permits for different categories of dischargers. NJDEP enforces the terms of the NJPDES permit by visiting discharging facilities and requiring facilities to periodically conduct water quality, biological and toxicological analyses, and thermal impact and cooling water assessments.

As of November 2009, nine NJPDES permits for point source pollution were issued to individual facilities in Pemberton Township and one was issued to a facility in Pemberton Borough. These are shown in **Table 16: NJPDES Permits for Point Source Pollution**. Of the 10 permits, four discharge to surface water, three discharge to groundwater, two discharge to stormwater, and one is a land application of residuals.

Table 16: NJPDES Permits for Point Source Pollution

NJPDES Permit Number	PI Number	Facility Name	Municipality	Effective Start Date	Expiration Date*	Discharge Category Code	Discharge Category Description
NJ0005509	46968	Lanxess Sybron Chemicals Inc	Pemberton Twp	1/1/2008	12/31/2012	B - Discharge to surface water	Industrial Wastewater
NJ0022438	46764	Helen A Fort Middle School	Pemberton Twp	9/1/2008	9/30/2008	A - Discharge to surface water	Sanitary Wastewater
NJ0024821	46763	Pemberton Township MUA STP	Pemberton Twp	1/1/2009	12/31/2013	A - Discharge to surface water	Sanitary Wastewater
NJ0138827	46763	Pemberton Township MUA STP	Pemberton Twp	9/1/2006	7/31/2009	D - Land application of residuals	Land Appl. Biosolids-Class B
NJG0128554	49295	Country House Restaurant	Pemberton Twp	6/1/2008	5/31/2013	T1 - Discharge to groundwater	Sanitary Subsurface Disposal (GP)
NJG0133132	49657	Whitesbog Village - Brendan Byrne State Forest	Pemberton Twp	6/1/2008	5/31/2013	T1 - Discharge to groundwater	Sanitary Subsurface Disposal (GP)
NJG0133141	49658	Brendan Byrne State Forest	Pemberton Twp	6/1/2008	5/31/2013	T1 - Discharge to groundwater	Sanitary Subsurface Disposal (GP)
NJG0143804	195313	Chianti Cheese Co	Pemberton Boro	6/1/2007	5/31/2012	5G2 - Discharge to stormwater	Basic Industrial Stormwater GP - NJ0088315 (5G2)
NJG0157236	46763	Pemberton Township MUA STP	Pemberton Twp	6/1/2007	5/31/2012	5G2 - Discharge to stormwater	Basic Industrial Stormwater GP - NJ0088315 (5G2)
NJG0166146	46763	Pemberton Township MUA STP	Pemberton Twp	10/1/2006	5/31/2011	ABR - Discharge to surface water	Wastewater Beneficial Reuse (GP)

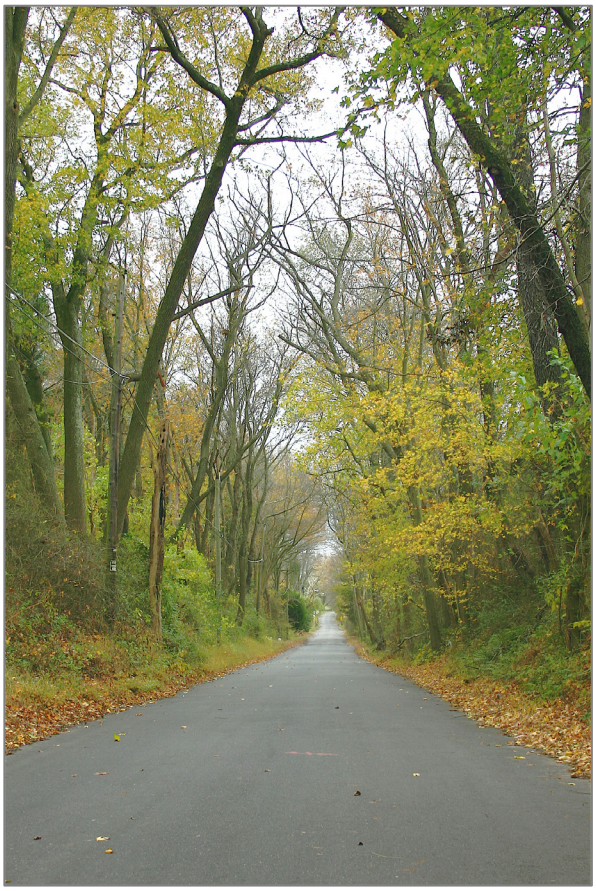
** Expired permits may still be active, even without an updated permit.*

Source: NJDEP, 2009

Nonpoint Sources of Pollution

Nonpoint source pollution, or stormwater runoff, has the largest effect on the water quality and channel health of streams in Pemberton. The sources of polluted stormwater runoff are also the most difficult to identify and remediate because they are diffuse, widespread, and cumulative. Most nonpoint source pollution in Burlington County derives from stormwater runoff from paved surfaces, such as streets, commercial and industrial areas, residential sites (with and without detention basins), and agricultural fields lacking adequate vegetative buffers. The waterways in Pemberton are affected by stormwater runoff from within the township and upstream municipalities.

Since the adoption of the federal Clean Water Act and the implementation of NJPDES in subsequent years, water pollution from point sources has decreased dramatically. However, as development has continued to spread throughout New Jersey, nonpoint source pollution has increased substantially in recent decades. NJDEP's new Stormwater Management Rules focus on reducing and controlling nonpoint sources of water pollution.



Excessive paved surfaces increases stormwater runoff.

The Municipal Stormwater Regulation Program was developed in response to the U. S. Environmental Protection Agency's (USEPA) Phase II rules, published in December 1999. The NJDEP issued final stormwater rules on February 2, 2004, and established four NJPDES general permits: the Tier A Municipal Stormwater General Permit (Tier A Permit); the Tier B Municipal Stormwater General Permit (Tier B Permit); the Public Complex Stormwater General Permit (Public Complex Permit); and the Highway Agency Stormwater General Permit (Highway Permit). Both Pemberton Township and Borough are Tier A municipalities. Public complexes include certain large public colleges, prisons, hospital complexes, and military bases. There are two public complexes in Pemberton Township: Burlington County College and Fort Dix. Highway agencies include county, state, interstate, or federal government agencies that operate highways and other thoroughfares. There are no NJDPES permits for highway agencies in Pemberton Township. The two Tier A Municipal Stormwater General Permits and the two Public Complex Stormwater General Permits in Pemberton Township and Borough are listed in the table below.

Table 17: NJPDES Permits for Nonpoint Source Pollution

NJPDES Permit Number	PI Number	Facility Name	Municipality	Effective Start Date	Expiration Date	Discharge Category
NJG0147940	207737	Pemberton Boro	Pemberton Boro	3/1/2009	2/28/2014	R9 - Tier A Municipal Stormwater General Permit
NJG0148652	207721	Pemberton Twp	Pemberton Twp	3/1/2009	2/28/2014	R9 - Tier A Municipal Stormwater General Permit
NJG0153184	222867	Burlington County College Pemberton Campus	Pemberton Twp	3/1/2009	2/28/2014	R11 - Public Complex Stormwater General Permit
NJG0153206	222870	US Army Fort Dix	Pemberton Twp	3/1/2009	2/28/2014	R11 - Public Complex Stormwater General Permit

Source: NJDEP, 2009

The NJPDES Phase II program lays out guidance and requirements for management of and education about stormwater at the local level. It applies to all towns in New Jersey, all county road departments, and all public institutional facilities on large sites (e.g., hospitals and colleges). Beginning in 2004, municipalities were required to obtain a New Jersey Pollution Discharge Elimination System (NJPDES) general permit for the stormwater system and its discharges within their borders, which are considered to be owned and "operated" by the municipality. The general permits address stormwater quality issues related to new development, redevelopment, and existing development by requiring regulated entities to implement Statewide Basic Requirements (SBRs).

Under the 2004 NJPDES permit, a town must meet certain specific requirements in planning, ordinance adoption, education, management of township facilities, and investigation of parts of the stormwater system. Fulfillment of these Statewide Basic Requirements is scheduled to occur over the course of five years. All of the requirements are intended to reduce the water pollution from stormwater runoff. NJDEP readopted the Stormwater Management Rules, with certain amendments, in 2009.

The Pinelands Commission has additional standards regarding stormwater management for development in the Pinelands, and municipal stormwater management plans must be certified by the Pinelands Commission. For any major development that wishes to use alternate methods of stormwater management, or that cannot mitigate the calculated runoff on the parcel proposed for development, an exception may be granted by the Pinelands Commission. The exception must provide for sufficient mitigation and must

occur within the Pinelands and within the same drainage area as the proposed development.

Pemberton Township adopted a Municipal Stormwater Management Plan in 2006. A revised version of this plan, prepared by Adams, Rehmann & Heggan Associates, was approved in 2008 by the township.

Impervious Coverage

The volume of stormwater runoff that is carried to a stream impacts the stream channel condition. Increased volume usually results from increased impervious surface within a subwatershed. As an area becomes developed, more stormwater is directed to the streams from neighborhood storm drains, residential and commercial stormwater facilities, and road drainage. In general, scientists have found that levels of impervious cover of 10 percent or more within a subwatershed are directly linked to increased stormwater runoff, enlargement of stream channels, increased stream bank erosion, lower dry weather flows, higher stream temperatures, lower water quality, and declines in aquatic wildlife diversity. When impervious cover reaches 25 to 30 percent, streams can become severely degraded.

As shown in the table below, impervious coverage is relatively low in Pemberton Township. The HUC 14 with the highest percentage of impervious coverage is the Ong Run/Jacks Run subwatershed, with about 10 percent impervious coverage. This subwatershed includes the northern area of Browns Mills, as well as much of Fort Dix and McGuire Air Force Base. Other subwatersheds located partially in Pemberton Township have between zero and six percent impervious coverage. With such low rates of impervious surfaces, precipitation is able to infiltrate into the ground and recharge aquifers, and streams are not inundated with polluted stormwater flows from those surfaces.

Pemberton Township has relatively low impervious coverage.

Table 18: Impervious Coverage by HUC 14 Subwatersheds

Watershed ID (HUC 11 #)	Subwatershed Name (HUC 14)	Subwatershed ID (HUC 14 #)	% Impervious
Rancocas Creek NB (above New Lisbon dam) (02040202020)	Gaunts Brook/Hartshorne Mill Stream	02040202020010	0.28%
	Ong Run/Jacks Run	02040202020020	9.95%
	Rancocas Ck NB (incl. Mirror Lake-Gaunts Brook)	02040202020030	5.95%
	Rancocas Ck NB (New Lisbon dam to Mirror Lake)	02040202020040	4.57%
Greenwood Branch (NB Rancocas Creek) (02040202030)	Pole Bridge Branch (above County line)	02040202030010	2.55%
	Mount Misery Brook MB/NB (below latitude 74d27m30s)	02040202030030	0.02%
	Bucks Cove Run/Cranberry Branch	02040202030050	1.79%
	Pole Bridge Br (Country Lake dam - County line)	02040202030060	4.01%
	Bisphams Mill Creek (below McDonalds Br)	02040202030080	1.80%
	Greenwood Br (below Country Lake & Mount Misery confluence)	02040202030090	2.60%
Rancocas Creek NB (below New Lisbon dam) (02040202040)	Rancocas Ck NB (Pemberton bridge to New Lisbon dam)	02040202040010	5.39%
	Pemberton/Ft Dix trib. (NB Rancocas Ck)	02040202040020	5.17%
	Rancocas Ck NB (Rt 206 to Pemberton bridge)	02040202040030	3.87%
	Rancocas Creek NB (Smithville to Rt 206)	02040202040040	4.42%
Rancocas Creek SB (above Bobbys Run) (02040202050)	Rancocas Creek SB (above Friendship Ck)	02040202050060	1.13%
	Jade Run	02040202050070	1.21%

Source: NJDEP, 2002

Stream Buffers

The stream buffer is the region immediately beyond the banks of a stream that serves to limit the entrance of sediment, pollutants, and nutrients into the stream itself. Stream buffers are quite effective at filtering substances washing off the land. The vegetation of the buffer traps sediment and can actually utilize (uptake) a percentage of the nutrients flowing from lawns and farm fields. When forested, a stream buffer promotes bank stability and serves as a major control of water temperature. The buffer region also serves as a green corridor—a greenway—for wildlife to move between larger forested habitat areas.

Residents can utilize these greenways for recreation with the addition of trails, bikeways, and access points to water for fishing and canoe/kayak launching.

The importance of a healthy, intact buffer zone (also referred to as a "riparian corridor")–especially for headwater streams–has been well documented scientifically over the past 20 years. However, there is less agreement and much continuing research on the appropriate minimum width of a buffer. In the literature on this issue, a recommended minimum buffer width of 100 feet is most common, with differing activities permitted in each of three zones within the buffer. Buffers of up to 300 feet are recommended for wildlife corridors and potential passive recreational use, such as walking trails.

Most of the streams in Pemberton Township are bordered by healthy, wooded riparian buffers. Streams lacking a vegetated buffer include those in the agricultural southwest portion of the township, as well as in some developed areas in Browns Mills and Country Lakes. However, Pemberton Township does not have a riparian buffer ordinance regulating the protection of its intact vegetated buffers.

The New Jersey Freshwater Wetlands Protection Act incorporates buffer requirements into its wetland protection regulations. The width of the "transition zone" extending beyond a wetland is determined by the value of the wetland, based on its current use and on the documented presence/absence of threatened or endangered species. Municipalities may not establish buffers on wetlands that exceed those required by the state statute. However, the municipality can make certain that those limits are accurate through its review of the wetlands delineation process, and it can also monitor use of the land within the transition area and take action against encroachments.

Within the boundaries of the Pinelands, the Pinelands Commission requires a 300-foot buffer around all wetlands for any new development.

Restoration of stream buffers on agricultural lands is supported by various programs, such as the Conservation Reserve Program (CRP), administered by the U.S. Department of Agriculture's Farm Service Agency (FSA) and the New Jersey Department of Agriculture. This program compensates farming landowners for the loss of land being converted to a buffer or other habitat. It also funds or directly creates new buffers where they are absent. Programs such as the Environmental Quality Incentive Program (EQIP), administered by the Natural Resources Conservation Service (NRCS) of USDA, encourage the "due care" management of

A well-vegetated stream buffer in Pemberton Township

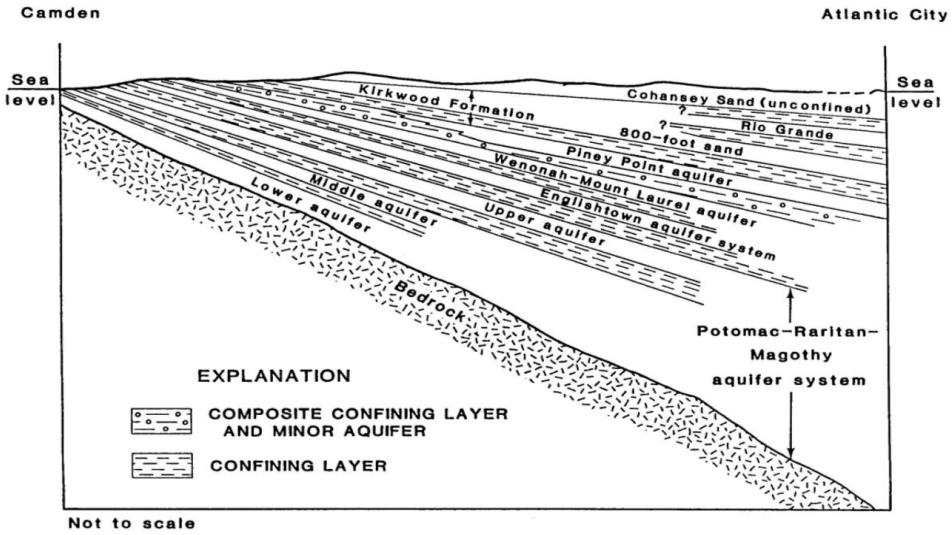
agricultural lands, involving the proper levels of fertilizer and pesticide applications to farmland. It funds up to 75 percent of the costs of eligible conservation practices. These are all programs in which individual landowners volunteer to take part.

Groundwater

The geology of the New Jersey Coastal Plain can be visualized as a tilted layer cake, with its “layers,” or strata, formed of gravels, sands, silts, and clays. The saturated gravel and sand layers, with their large pore spaces, are the aquifers from which water is drawn. The silt and clay layers, which impede the movement of water, are called confining beds.

A cross section across southern New Jersey from west to east would show that the aquifers are not horizontal, but tilted toward the southeast, getting deeper as they cross the state toward the Atlantic Ocean. See **Figure 7: Aquifers of Southern New Jersey**. Because of this tilting, each aquifer emerges on the land surface in a sequential manner. The deepest strata emerge on the surface near the Delaware River. Where each individual layer emerges is called its “outcrop” area. The Potomac–Raritan–Magothy (PRM) formation, the deepest and most abundant aquifer, is a major water source for Inner Coastal Plain communities.

Figure 7: Aquifers of Southern New Jersey



Source: USGS

Other smaller aquifers on top of the PRM are the Englishtown, the Wenonah-Mount Laurel, and the Kirkwood-Cohansey. The Kirkwood-Cohansey is a formation composed of two thick layers, the Kirkwood (lower) and the Cohansey (upper), which overlie the older formations. It begins east of the Inner/Outer Coastal Plain divide.

The dividing line of the Coastal Plain runs diagonally through Pemberton Township and generally follows the boundary of the Pinelands within the municipality. The Pinelands area of Pemberton Township is located within the Outer Coastal Plain and the surficial geology consists primarily of the Kirkwood-Cohansey aquifer system. This system is made

up of the Cohansey Sand and Kirkwood Formation (Lower Member). In the western portion of the township, located within the Inner Coastal Plain, the geologic outcroppings include the Manasquan Marl, Vincentown Sand, Hornerstown Marl, and Navesink Marl formations. See **Map 11: Geologic Outcrops**.

Aquifers

The Kirkwood Cohansey aquifer system outcrops in the majority of Pemberton Township in most of the Pinelands portion of the township. A composite confining unit aquifer also outcrops and is bordered on either side by confining units. Also known as an aquitard, a confining unit is an impenetrable layer of fine, compact clay that divides one aquifer from another. A small portion of the Wenonah-Mount Laurel aquifer also outcrops in the northwest corner of Pemberton Township.

Although the Kirkwood-Cohansey outcrops across much of the township, drinking water in Pemberton Township is withdrawn from the deeper Wenonah-Mount Laurel, Englishtown, and the PRM aquifer systems.

Kirkwood-Cohansey Aquifer System

The Kirkwood-Cohansey aquifer is a major aquifer system underlying about 3,000 square miles of southern New Jersey on the Coastal Plain. It is an unconfined aquifer, which means that it is located on the surface and is not confined by impenetrable layers or clay or rock. This aquifer is composed of the Kirkwood Formation and Cohansey Sand, both dating from the Miocene age.

The Kirkwood Formation is made of thick clay beds with interbedded zones of variable types of sand, clay, and gravel. The surface layer of the Kirkwood Formation contains silt or clay, under which is an aquifer zone of water-bearing sands. In general, the Kirkwood Formation is in hydraulic connection with the Cohansey Sand, and they act as a single aquifer. The Cohansey Sand is made from coarser grained materials, predominantly light-colored quartz sand with lenses of silt and clay. It contains minor amounts of pebbly sand and interbedded clay. Some local clay beds within the Cohansey Sand are relatively thick. Within Pemberton Township, the Cohansey Sand outcrops in most upland areas, while the Kirkwood Formation outcrops in most wetlands areas.

The very shallow and unconfined Cohansey Sand aquifer is extremely vulnerable to contamination. Shallow wells tapping the Kirkwood-Cohansey in the Presidential Lake Estates and Country Lake Estates have historically been contaminated with nitrate levels from leaking septic systems. In addition, leachate from the former municipal landfill, closed in 1980, in the southeastern area of the township contaminated a number of drinking water wells.

Wenonah-Mount Laurel Aquifer System

Many wells in Pemberton draw from the Wenonah-Mount Laurel aquifer system. The Wenonah-Mount Laurel aquifer is composed of the Wenonah Formation and the Mount Laurel Sand, both of the late Cretaceous age. It is thickest in Burlington, Camden, Gloucester, and Salem counties, reaching 100 to 120 feet, with its top and base being approximately 175 feet and 205 feet below sea level, respectively. In Burlington County, this aquifer is not a major water source due to low yield.

Englishtown Aquifer System

Some wells in Pemberton draw from the Englishtown aquifer system. The Englishtown Formation, of the late Cretaceous age (65 to 100 million years ago), outcrops in the Inner Coastal Plain in an irregular band that extends from Raritan Bay to the Delaware River. Where the Englishtown Formation is exposed, the primary components are fine-to-medium-grained sands. In parts of Burlington, Camden, Gloucester, and Salem counties, the aquifer is commonly less than 40 feet thick. Like the Wenonah-Mount Laurel aquifer, it is not a major source of water in Burlington County due to its small size and greater proportion of fine-grained sediments, which results in lower yields. In Monmouth and Ocean counties, this aquifer system is a significant water source.

Potomac-Raritan-Magothy Aquifer System (PRM)

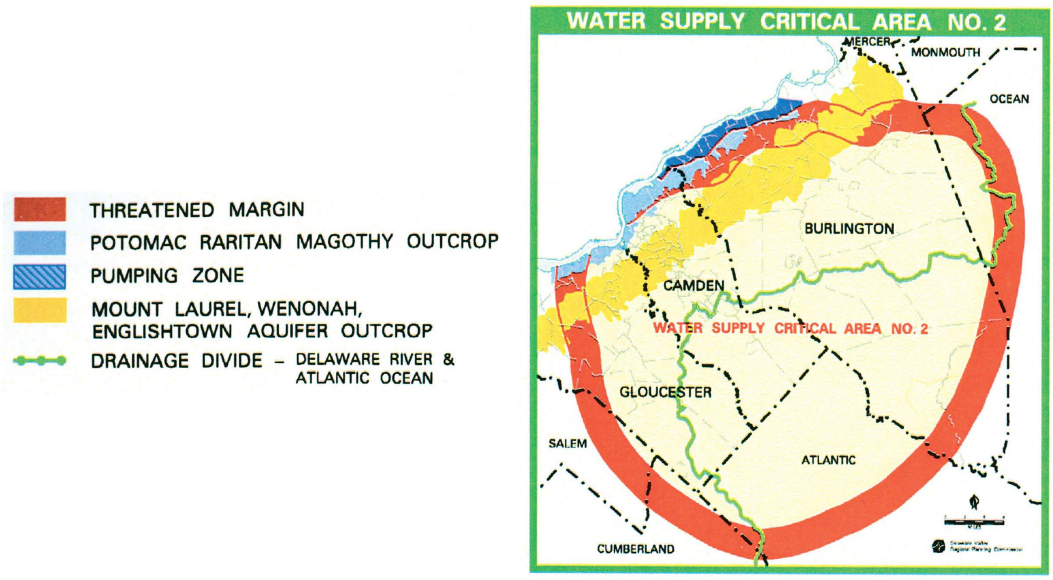
The Potomac-Raritan-Magothy (PRM) is a deep geological formation underlying Pemberton Township. This multiple aquifer is actually a large series of formations that have been combined and described as a single unit because the individual formations–the Potomac group and the Raritan and Magothy formations–are lithologically indistinguishable from one another over large areas of the Coastal Plain. That is, they are composed of materials of like kind and size laid down by both an advancing and retreating sea across southern New Jersey, and by deposits of material that came from the breakdown and erosion of the Appalachian and Catskill mountains beginning in the Cretaceous period.

In the Delaware Valley, three aquifers have been distinguished within the PRM system, designated as lower, middle, and upper, and divided by two confining units or layers between the three water-bearing strata. The aquifers themselves are largely made up of sands and gravels, locally interbedded with silt and clay. The lower aquifer sits on the bedrock surface. Confining beds between the aquifers are composed primarily of very fine-grained silt and clay sediments, which are less permeable and thus reduce the movement of water between the aquifers. They also help to slow the entry of any contaminants on the surface down into the groundwater.

The PRM is the primary source of drinking water for New Jersey residents from Burlington to Salem counties, as well as communities in Delaware. Because of such high usage, PRM aquifer water levels have declined. This became so serious that the New Jersey Department of Environmental Protection established the Water Supply Critical Area No. 2 in 1986. All water supply companies within Critical Area No. 2 were given annual limits on

water withdrawals in the PRM. Usage from the PRM was cut back by over 20 percent and no increases in pumping were allowed. Piping of treated Delaware River water filled the gap in much of the region. As shown in **Figure 8: Water Supply Critical Area No. 2**, Pemberton Township falls within Water Supply Critical Area No. 2.

Figure 8: Water Supply Critical Area No. 2



Source: DVRPC

There is increased concern that additional pumping from the aquifer in the borderline areas will necessitate the expansion of the Critical Area No. 2 boundaries. Water supply companies in Burlington, Ocean, Gloucester, and Salem counties have and will continue to have difficulty getting approvals from the New Jersey Department of Environmental Protection for any additional water allocations from the PRM.

Over the last few decades, groundwater levels in the majority of the observation wells within and surrounding Pemberton Township have diminished. These readings coincide with continued development in and around Pemberton. As seen in **Table 19: USGS Groundwater Observation Sites**, the water level (depth below surface) in 11 wells has increased, while it has decreased in just five wells. As the water level reading increases, the groundwater level decreases, meaning the depth at which one would find water is increasing below the land surface. With increased water level depth, wells must be drilled deeper to reach sizable and usable quantities of water.

Table 19: USGS Groundwater Observation Sites

USGS Observation Site	Site Name	Primary Aquifer	Date of First Observation	Water Level (feet below land surface)	Date of Last Observation	Water Level (feet below land surface)
395839074424903 050385	Ind 5	Middle PRM	11/16/1973	97	11/20/2003	81.2
395839074424901 050383	Discontinued 2	Upper PRM	11/3/1983	49.6	10/29/1993	71.5
395959074391901 050389	Institutional 1	Mount Laurel Sand-Wenonah Formation	11/4/1983	15.7	10/29/1993	14.8
395813074395001 050354	SVWC 1	Mount Laurel Sand-Wenonah Formation	6/18/1953	17	11/20/2008	26.2
395807074383701 050375	Bur Co Inst 3/9	Englishtown Formation	3/4/1957	35	11/5/2008	45.6
395753074370601 051086	Domestic	Mount Laurel Sand-Wenonah Formation	4/22/1985	55	11/14/2003	43
395855074351301 051165	PW 1	Mount Laurel Sand-Wenonah Formation	8/20/1965	65	11/1/2008	103
395834074351301 051475	Trenton Rd OW3	Mount Laurel Sand-Wenonah Formation	6/23/1992	120	11/5/2008	105.9
395752074345201 050365	Pemberton PW 4	Mount Laurel Sand-Wenonah Formation	9/15/1960	60	11/5/2008	91.1
395915074330802 051186	Pemberton PW 8A	Mount Laurel Sand-Wenonah Formation	5/8/1990	108	11/6/2008	90.7
395755074323901 050366	Pemberton 4 Inch Ob	Mount Laurel Sand-Wenonah Formation	2/1/1972	58	11/10/2003	121.9
395710074331101 051191	PW 1	Englishtown Formation	10/26/1998	72.3	11/4/2008	102.9
395825074490901 050718	Pemberton	Mount Laurel Sand-Wenonah Formation	10/1/1959	28	11/5/2008	97.8
395639074295301 050744	Domest 66	Mount Laurel Sand-Wenonah Formation	11/9/1978	91	11/6/2008	105.7
395801074434401 051004	PW 2	Mount Laurel Sand-Wenonah Formation	12/2/1982	47	11/6/2008	57.86
395651074412301 050359	Pemberton PW 1	Mount Laurel Sand-Wenonah Formation	7/19/1967	25	11/6/2008	34.3

Source: USGS, 2009

Groundwater Recharge

Recharge of groundwater is an important issue in southern New Jersey because of the dependence on aquifers for drinking supply and for agricultural use. The amount of rainwater that actually enters an aquifer is a function of many factors, including the nature and structure of the aquifer itself. The amount of precipitation that infiltrates the soil and reaches the saturated zone to become groundwater–the recharge of the aquifer–is also dependent on climatic conditions, the nature of the soil, and the vegetation of an area.

Using precipitation records, soil surveys, and land use/land cover data, the New Jersey Geological Survey has developed a methodology for evaluating land areas for their ability to transmit water to the subsurface. NJDEP has used this methodology to map and rank land areas throughout the state as to groundwater recharge potential. Recharge is equivalent to the amount of precipitation that will reach the water table in an area with a particular combination of soils and land use. It is expressed as inches per year.

In Pemberton Township, about 48 percent of the land (19,209 acres) experiences groundwater recharge of greater than 11 inches per year. These are mostly areas of upland forest and residential development in the Pinelands, and agricultural land in the non-Pinelands portion of the township. Just three percent of the township (1,150 acres) has a groundwater recharge rate of seven to 10 inches per year, and about one percent of the land recharges between two and six inches per year.

The areas of Pemberton Township with the lowest groundwater recharge rates (less than one inch per year) are mostly wetlands areas. Wetlands have a low recharge rate because they are a land area where the groundwater meets the land surface and are therefore saturated for most of the year.

In general, lands immediately adjacent to the creeks' floodplains, marshes, and wetlands of the township exhibit less groundwater recharge. In addition, large amounts of paving and impervious cover on high recharge lands will have the most detrimental impact, although these areas are also usually the places most suitable for building because they are well drained. Conversely, these are regions where the dilution of substances from septic systems, such as nitrates, may require a larger land area because the soils are usually more "porous." For example, minimum average lot sizes of two to four acres are often needed for proper nitrate dilution from septic systems in areas having 10 or more inches per year of groundwater

Groundwater recharge affects the base flow of streams.

recharge, depending on the soils.

See **Table 20: Groundwater Recharge** below and **Map 12: Groundwater Recharge (1997)**.

Table 20: Groundwater Recharge

Recharge Rate (inches per year)	Acres	Percent of Total Acreage in Township
0 to 1	19,259.65	47.9%
2 to 6	529.76	1.3%
7 to 10	1,149.56	2.9%
11 to 18	19,208.93	47.9%
Total	40,147.90	

Source: NJDEP, 1997

Water Supply Wells

Wells that provide drinking water may be either private or public water supply wells. Private water supply wells are those that serve less than 25 people and are not regulated by the EPA or DEP. Public water supply wells–which may be publically or privately owned–are those that serve at least 25 people or 15 service connections for at least 60 days per year. According to the EPA, public water supply wells serve 90 percent of the people of the United States with drinking water. Public water supply wells are further defined as being either community or non-community. A public community water supply well serves 15 or more service connections used by year-round residents or at least 25 year-round residents. Public community water supply wells may serve municipalities, subdivisions, nursing homes, or other areas or institutions.

There are 20 active public community water supply wells serving Pemberton Township. They are listed in **Table 21: Public Community Water Supply Wells** below and shown on **Map 13: Public Water Supply Wells (2004)**. Those wells owned by Burlington County Institution (AKA New Lisbon Water System), Pemberton Township Water Department (AKA Main Supply), and Lake Valley Water Company together make up the drinking water supply for the Pemberton Township Water Department.

Table 21: Public Community Water Supply Wells

Well ID	Original Owner	Address of Well	Depth of Bottom of Well	Primary Aquifer
3200276	Burlington County Institution	Rte 530 & Rte 646	378.00	Englishtown
3200383	Pemberton Twp Water Dept	Catawba Terr & Sepulga Dr	345.00	Mount Laurel-Wenonah
3200386	Pemberton Twp Water Dept	Lester St & Junction Rd	330.00	Mount Laurel-Wenonah
3200490	Hilltop Mobile Village	Stanley Way & Brian Dr	307.00	Mount Laurel-Wenonah
3200526	Deborah Heart & Lung Center	Earlin Ave & Trenton Rd	298.00	Mount Laurel-Wenonah
3200539	Lake Valley Water Co	Lafayette Ave	239.25	Mount Laurel-Wenonah
3200658	Burlington County Institution	Rte 530	387.00	Englishtown
3200795	Burlington County Institution	Rte 530	371.33	Englishtown
3200818	Pemberton Twp Water Dept	Ridge Rd	338.00	Mount Laurel-Wenonah
3200819	Pemberton Twp Water Dept	Ridge Rd & Bishop St	332.50	Mount Laurel-Wenonah
3206929	Deborah Heart & Lung Center	Earlin Ave & Trenton Rd	315.00	Mount Laurel-Wenonah
3208631	Lake Valley Water Co	Oak Pines Blvd	252.83	Mount Laurel-Wenonah
3212359	Pinefield Apartments	Junction Rd	312.00	Mount Laurel-Wenonah
3215968	Pemberton Twp Water Dept	Beech St	364.00	Mount Laurel-Wenonah
*3219062	Pemberton Twp Water Dept	Trenton Rd	512.00	Englishtown
3222040	Pinefield Apartments	Junction Rd	312.00	Mount Laurel-Wenonah
3222041	Pinefield Apartments	Junction Rd	314.00	Mount Laurel-Wenonah
3224742	Pemberton Twp Water Dept	Ridge Rd & Daffodil Lane	484.00	Englishtown
5200001	Pineview Terrace Inc	Lakehurst Rd	440.00	Mount Laurel-Wenonah
5200009	US Army	Juliustown Rd	1140.00	Potomac-Raritan-Magothy
** Well ID # 3219062 (AKA Well #11) was closed in 2010.*				

Source: NJDEP, 2009

Public non-community wells are another part of a public water system. There are two types of public non-community water systems: transient and non-transient. The name refers to the type of populations that utilize them and their frequency of use. A transient non-community water system serves at least 25 people each day, but this population changes each day. These systems are at places such as rest stops, gas stations, and restaurants. A non-transient non-community water system serves at least 25 of the same people daily at a minimum of six months per year at places like schools, factories, and office parks.

There are 17 public non-community wells in Pemberton Township, eight of which are transient and nine of which are non-transient. They are listed in **Table 22: Public Non-Community Water Supply Wells** below and shown on **Map 13: Public Water Supply Wells (2004)**.

Table 22: Public Non-Community Water Supply Wells

Public Water Supply ID	System Name	Well Name	Well Depth	Well Type
0329300	First Baptist Church	Well	180.00	Non-transient
0329301	Newcomb School	Well 2	154.00	Non-transient
0329302	Fort Middle School	Well 1	146.00	Non-transient
0329303	Pemberton Twp High School	Well (Old Side)	233.00	Non-transient
0329308	Terrace Inn Bar	Kitchen Well	180.00	Transient
0329309	Country House Rest & Lounge	Well	180.00	Transient
0329311	Riccardo's Pizza Restaurant	Well	180.00	Transient
0329316	The Lakes Store	Well	180.00	Transient
0329317	Magnolia Road Tavern	Well	180.00	Transient
0329320	Aspen Physical Therapy	Well 1	200.00	Non-transient
0329323	Veterans Of Foreign Wars	Well	180.00	Non-transient
0329324	Burlington County Community Action	Well 1	133.00	Non-transient
0329325	Mario & Franks Pizza	Well	180.00	Transient
0329327	Pemberton Twp High School	Well (New Side)	231.00	Non-transient
0329328	Pemberton Texaco & Food Mart	Well	180.00	Transient
0329303	Pemberton Twp High School	Well (Soccer Field)	180.00	Non-transient
0339316	Lebanon State Forest	Whites Bog Visitor Center Well	413.00	Transient

Source: NJDEP, 2004

As required by federal and state regulations, public water supply wells (both community and non-community) in the state are monitored by NJDEP on a regular basis. The monitoring schedules for the public water supply wells in Pemberton Township are shown in **Appendix H: Monitoring Schedules for Public Water Supply Wells**.

Sampling requirements for a water system may change at any time for several reasons, including analytical results, changes in population, and/or inventory. It is generally the responsibility of the public water system and its licensed operator to make sure that proper monitoring is performed for the entire distribution system and each point of entry for all parameters. Sampling requirements may be confirmed by referring to the Code of Federal Regulations (40 CFR 141) and the New Jersey Safe Drinking Water Act Regulations (N.J.A.C. 7:10). See the **Drinking Water** section in the **Built Environment** chapter for more information about the drinking water supply in Pemberton Township.

Private Drinking Wells

Private wells supplying potable water are not routinely monitored like public community water systems (public water) and public non-community wells. Beginning in 2002, however, the State of New Jersey, under the Private Well Testing Act, required that well water be tested for contaminants when properties are sold or leased. Prior to 2002, each county health department mandated what parameters were to be tested for real estate transactions.

Wellhead Protection Areas

As part of its 1991 Well Head Protection Program Plan, the New Jersey Department of Environmental Protection has delineated Wellhead Protection Areas (WHPAs) around all community wells. A WHPA is the area from which a well draws its water within a specified time frame (tiers). Pollutants spilled directly on or near the wellhead will enter the water source within that time frame. Once delineated, these areas become a priority for efforts to prevent and clean up groundwater contamination. Other components of the Wellhead Protection Plan include implementing best management practices to protect groundwater, land use planning, and education to promote public awareness of groundwater resources.

Once WHPAs are delineated, potential pollution sources may be managed by landowners or municipalities, in relation to the tier locations. Protection of land and restrictions on activities within wellhead zones (relating to uses that generate contaminants, and to the storage, disposal, or handling of hazardous materials) are important for maintaining the quality of water within those zones.

The radius of the WHPA depends on a number of factors related to the well and the underlying hydrogeology. The thicker and more porous the aquifer and the slower the pumping rate of the well, the smaller the radius is of the WHPA. The WHPAs in Pemberton Township, shown on **Map 12: Public Water Supply Wells (2004)**, are somewhat small due to the confined nature of the aquifers they draw from, which are protected more from contamination than unconfined aquifers.

Air Quality

Air quality is one of the most difficult environmental resources to measure because its sources are diffuse and regional in nature. Common sources of air pollution include industry, cars, trucks, buses, fires, and dust. For example, the burning of coal in Ohio, Michigan, and Western Pennsylvania to generate electricity sends pollutants such as sulfur, nitrogen, and particulate matter all the way to the East Coast. Locally produced sources of air pollution include daily roadway traffic and industrial facilities.

Air Quality Criteria Pollutants

Ground level ozone (O_3) is formed when volatile organic compounds (VOC) and nitrogen oxides react with sunlight and heat. It is produced more in the summer months and is the primary constituent of smog. Ground level ozone is a pulmonary irritant, which, even in low levels, can be dangerous to sensitive populations such as people with asthma or emphysema, and the elderly. It can also affect plant growth and is responsible for hundreds of millions of dollars in lost crop production.

Particulate matter (PM), or particle pollution, is made up of dust, ash, smoke, and other small particles formed from the burning or crushing of materials such as wood, rocks, and oil. When ingested, particulate matter can lodge deep in the lungs and can contribute to serious respiratory illnesses, such as asthma or lung disease. Particulate matter also creates haze, reduces visibility, and covers buildings in dirty soot.

Carbon monoxide (CO) is a colorless, odorless gas that is formed when carbon fuel is not burned completely. It is a component of motor vehicle exhaust; therefore, higher levels of CO generally occur in areas with heavy traffic congestion. The highest levels of CO typically occur during the colder months, when air pollution becomes trapped near the ground beneath a layer of rising warm air.

Nitrogen oxides (NOx) are a group of highly reactive gases that contain nitrogen and oxygen in varying amounts. Motor vehicles, electric utilities, and homes and businesses that burn fuels emit nitrogen oxides; they can also be found naturally. Nitrogen oxides are primary components in ground-level ozone (smog), acid precipitation, and other toxic chemicals. Acid precipitation can cause lung ailments in humans, property damage, harm to aquatic life, and other environmental and human health problems.

Sulfur dioxide (SO_2) is released into the atmosphere when fuel containing sulfur, such as coal and oil, is burned, and when gasoline is refined from oil. Sulfur dioxide dissolves in water vapor to form acid precipitation.

Lead (Pb) is a pollutant that was historically released by cars and trucks burning leaded fuel, but metal-processing plants and trash incinerators are the major source of emissions today. Lead tends to be a localized air pollutant, found in urban or high traffic areas, and is deposited in soil and water, harming fish and wildlife.

Increasing public awareness regarding air pollution led to the passage of a number of state and federal laws, including the original Clean Air Act of 1963 and a much stronger Clean Air Act of 1970 (CAA). In 1990, the CAA was amended and expanded by Congress to include a market approach to reducing air pollution by allowing certain companies to buy and sell emission “allowances,” or “credits.” The 1990 CAA also required transportation projects receiving federal funding to be in conformity with state air quality goals. The 1990 CAA also revised the way that air toxins are regulated, increasing the number of regulated toxic air pollutants from seven to 187.

In 1970, the U.S. Environmental Protection Agency (EPA) was formed to enforce the Clean Air Act (CAA). In New Jersey, the EPA allowed NJDEP to enforce the CAA because the state agency developed more stringent air standards and created a State Implementation Plan (see NJAC 7:27). The CAA identified six criteria pollutants–ozone, particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, and lead–that are destructive to human health and the built and natural environment (see explanation of Criteria Pollutants at left). The EPA sets National Ambient Air Quality Standards (NAAQS) for these pollutants based on human health effects, as well as environmental and property damage.

Between 1970 and 2007, total emissions of the six criteria air pollutants decreased by more than 50 percent. The industrial sector reduced its toxic air emissions by 70 percent during this time period. Stricter emissions standards in the auto industry have made cars 90 percent “cleaner” since 1970. Cars also pollute less because refineries are required to produce cleaner fuels; leaded gasoline was completely banned in 1996.

Point Sources of Air Quality Pollution

Under the CAA, the EPA limits the amount of other air pollutants and toxins that are emitted by point sources, such as chemical plants, industrial factories, power plants, and steel mills. The NJDEP Air Quality Permitting Program issues permits for stationary sources of air pollution, such as power plants, oil refineries, dry cleaners, food processing centers, and manufacturing plants, and regulates and monitors their emissions. There are 44 active air quality permits in Pemberton Township, listed below in **Table 23: Facilities with Active Air Quality Permits**.

Table 23: Facilities with Active Air Quality Permits

Facility Name	Address	PI Number
Belasco Petroleum Co - Pemberton Citgo	2 Ft. Dix - Arney's Mt Pemberton Rd	A4644
Browns Mills Service Station	2 Lakehurst Rd	A4513
Burlington County Corrections Work Release Ctr	630 Pemberton Browns Mills Rd	46034
Burlington County Highway Dept - Pemberton	624 Pemberton Browns Mills Rd	46053
Burlington County Juvenile Detention Center	620 Pemberton Browns Mills Rd	46033
Burlington County College	Pemberton - Browns Mills Rd	45269
Buttonwood Hospital of Burlington County	600 Pemberton Rd	46024
Comcast of Garden State	1 Dickens St	46343
Deborah Heart and Lung Center	200 Trenton Rd	45373
Fort Dix Bldg 3650 Addition	Saylors Pond Rd - Bldg 3650	45607
Fort Dix Bldg 3650 Addition	Saylors Pond Rd - Bldg 3650	45608
Fort Dix Maintenance Field Shop Facility	Fort Dix NJ Armed National Guard	45609
Fort Dix Training and Development Center	Club Rd	45253
Getty Service Station #56313	206 Hanover St	A4567
Haines Elementary School	Juliustown Rd	45469
Harker Wylie Elementary School	125C Trenton Rd	45470
Helen A. Fort Middle School	Fort Dix - Pemberton Rd	45471
Lang Site Groundwater Remediation Facility	City Line Road	45507
Lanxess Sybron Chemicals Inc.	200 Birmingham Rd	45977
Midtown Cleaners	521 Lakehurst Rd	L4526
M&T Inc	538 Lakehurst Rd	A4738
NJ DEP Brendan T. Byrne State Forest	Brendan T. Byrne State Forest	H4566

Facility Name	Address	PI Number
Patriot Fuels	227 Pemberton - Browns Mills Rd	A4803
Pemberton Twp Board of Education - Brotherhood School	Egbert St	45479
Pemberton Twp Board of Education - Busansky School	16 Scrapetown Rd	45495
Pemberton Twp Board of Education - Crichton School	Junction Rd	45467
Pemberton Twp Board of Education - Denbo School	Junction Rd	45468
Pemberton Twp Board of Education - Emmons School	14 Scrapetown Rd	45496
Pemberton Twp Board of Education - Newcomb School	300 Fort Dix Rd	45472
Pemberton Twp Board of Education - Stackhouse School	125 Traton Rd	45499
Pemberton Twp High School #2	Arneys Mt - Pemberton Rd	45060
Pemberton Twp MUA F.A. Doyle Pump Station #5	Noteboom Ave	45554
Pemberton Twp MUA Pump Station #2	Meadowview Ln	45552
Pemberton Twp MUA Pump Station #4	Pemberton - Browns Mills Rd	45553
Powerhouse Equipment & Engineering Co Inc.	2401 Vandenberg Ave	46192
Puritan Oil Co	40 West Hampton St	A4534
Richard E. Pierson Construction	Texas Ave & Nassau St	46349
Sybron Chemicals	200 Birmingham Rd	45030
Sunoco Service Station	Hanover St & Hampton St	A4576
US Army Garrison - Fort Dix	Range Rd	45924
US Army Training Center - Fort Dix	Range Rd	45255
Verizon Browns Mills Co #54404	369 Lakehurst Rd	45404
Village Chrysler Jeep	106 Fort Dix Rd	46193
Wawa Inc. Store #982	Fort Dix & Arneys Mt Rds	A3834

Source: NJDEP, 2009

NJDEP enacted the Emission Statement Rule in 1992, requiring certain sites that have an air quality permit to report specific air contaminants, including carbon monoxide (CO), sulfur dioxide (SO_2), ammonia (NH_3), respirable particulate matter (PM_{10} and $PM_{2.5}$), lead (Pb), total suspended particulate matter (TSP), volatile organic compounds (VOC), nitrogen oxides (NOx), and 38 other toxic air pollutants. Emission Statement reporting applies if a facility has a potential to emit: five tons or greater of Pb, 10 tons or greater of

VOC, 25 tons or greater of NOx, or 100 tons or greater of CO, SO_2, PM_{10}, $PM_{2.5}$, TSP, or ammonia.

There are three facilities in Pemberton Township that are required to submit emission statements: the New Lisbon Development Center, the U.S. Army Garrison Fort Dix, and Lanxess Sybron Chemicals. In 2008, all three facilities released data on their air emissions of the following 12 contaminants: ammonia, benzene, carbon monoxide, carbon dioxide, methane, nitrogen oxides, lead, respirable particulate matter, polycyclic organic matter, sulfur dioxide, total suspended particulate matter, and volatile organic compounds. The emissions of the following seven other contaminants are reported by one or two facilities: arsenic compounds, cadmium compounds, ethylene dichloride, hydrogen chloride, methylene chloride (dichloromethane), nickel compounds, and propylene dichloride. The 2008 statements of the three regulated facilities in Pemberton Township are included in **Appendix G: Emissions Statements**.

Air Quality Monitoring

As of 2009, NJDEP's Bureau of Air Monitoring maintains a network of 42 continuous monitoring stations across the state and is proposing the establishment of two new sites by the end of 2010. Most of the monitoring stations are clustered in the New York metropolitan area. Each station monitors at least one of 23 different parameters, including many air pollutants, as well as wind speed, wind direction, solar radiation, or other parameters. Several of these parameters–carbon monoxide, nitrogen oxides, ozone, sulfur dioxide, smoke shade, particulate matter, and various meteorological data–are measured continuously and data is available instantaneously. As enabled by the CAA, the EPA has set National Ambient Air Quality Standards (NAAQS) for the six criteria pollutants: particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide, ozone, and lead. There are two kinds of NAAQS: the primary standard is based on human health effects, while the secondary standard is based on environmental and property damage.

There is a continuous monitoring station located approximately 10 miles (16 kilometers) to the northwest of Pemberton Township in Burlington Township, Burlington County. In 2006 (the most recent year of available data), the Burlington monitoring station monitored three parameters at different scales. Carbon monoxide was monitored at the "micro" scale, representative of 10 to 100 meters, while both sulfur dioxide and smoke shade were monitored at the "neighborhood"

Pemberton Township's air quality is monitored at nearby stations.

scale, representative of one to 10 kilometers. As both of these scales are not representative of Pemberton Township, data from this station is not included here.

The other continuous monitoring station closest to Pemberton Township is located in Collier's Mills, Ocean County, approximately 10 miles (16 kilometers) to the northeast. In 2006, the Collier's Mills station monitored ozone. This station monitors at the "urban" scale, meaning it is representative of 10 to 100 kilometers from the station, which would include all of Pemberton Township.

The amount of ozone has decreased greatly in New Jersey since the 1980s, and one-hour concentrations have not exceeded 0.200 parts per million (ppm) since 1988. For ground-level ozone (O_3), there are two NAAQ standards: (1) a one-hour concentration of 0.12 ppm, and (2) an eight-hour average concentration of 0.08 ppm. For the national standards, these are the same for both primary and secondary effects. New Jersey, however, has tightened the one-hour concentration standard for secondary effects to 0.08 ppm. Ozone was monitored at 14 stations throughout the state in 2006, although at the Colliers Mills and two other stations, it was only monitored during the ozone season. The Colliers Mills station did not exceed the one-hour standard, although it did exceed the eight-hour standard on nine days in 2006, as shown in the two tables below.

Table 24: Ozone One-Hour Averages, 2006

Monitoring Site	1-hr Max ppm	2nd Highest 1-hr Max ppm	4th Highest 1-hour Average 2004-2006 ppm	# of days with 1-hour Averages above 0.12ppm
Colliers Mills	0.108	0.108	0.117	0
Statewide	*0.135*	*0.131*		*3*

Source: NJDEP, 2009

Table 25: Ozone Eight-Hour Averages, 2006

Monitoring Site	1st Highest	2nd Highest	3rd Highest	4th Highest
Colliers Mills	0.099	0.098	0.094	0.091
Statewide	*0.115*	*0.112*	*0.106*	*0.103*

Source: NJDEP, 2009

In addition to the continuous monitoring network, the NJDEP Bureau of Air Monitoring operates a manual air quality monitoring network that measures a greater number of parameters. At these stations, samples are taken that are then analyzed in a laboratory for respirable particulate matter, lead, total suspended particulate matter, atmospheric deposition, ozone precursors, and a number of other contaminants. These stations are located across the state, but are generally concentrated in the New York metropolitan area.

The manual air quality monitoring network closest to Pemberton Township is located in Pennsauken, Camden County, approximately 20 miles (31 kilometers) away. This station

monitors at the “neighborhood” scale, which is not representative of Pemberton Township, so this data is not included here.

Air Quality Index

The Air Quality Index (AQI) is an index for reporting daily air quality. The EPA created the AQI to indicate a region’s air quality by measuring levels of five of the six criteria pollutants (excluding lead). The AQI is focused on the potential human health hazards experienced by breathing unhealthy air. Scores for the AQI range from 0 to 500 and are divided into six color-coded categories, as shown in **Figure 9: Air Quality Index (AQI)** below. The higher the AQI value, the greater the level of air pollution and associated health concerns.

Figure 9: Air Quality Index (AQI)

Numerical Air Quality Index (AQI) Rating	Descriptive Rating: Levels of Health Concern	AQI Color Code
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

Source: NJDEP, 2005

The daily score is based on whatever the highest individual pollutant score is reported. For example, if ozone scored 150 and particulate matter scored 100, the daily AQI would be 150, which is considered “Unhealthy for Sensitive Groups.” The index is used to measure overall air quality by counting the number of days per year when the AQI of each metropolitan region exceeds 100. An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level the EPA has set to protect public health.

New Jersey is divided into nine regions, which report their respective AQI. Burlington County is in Region 5: Central Delaware Valley. The monitoring stations for Region 5 are located in Burlington Township and at Rider University in Ewing Township, Mercer County. In 2005, the most recent year of annual data, Region 5 reported 321 good (green) and 37 moderate (yellow) days, seven days which were unhealthy for sensitive groups (orange), and no unhealthy (red) days.

CHAPTER 5

Biological Resources

When a community protects wildlife and habitat, it is also protecting biodiversity, which is important for the health and productivity of the ecosystem and its inhabitants, including humans. Biodiversity refers to the variety of genetic material within a species population, the variety of species (plants, animals, and microorganisms) within a community, and the variety of natural communities within a given region. Biodiversity facilitates adaptation and evolution, improving a species' chance of survival as the environment changes. A diversity of plant and animal species is also necessary to maintain healthy human environments, working landscapes, and productive ecosystems. Lower organisms, many not well known, contribute to nutrient cycling, decomposition of organic matter, soil rehabilitation, pest and disease regulation, pollination, and water filtering. Once biodiversity declines, it is extremely difficult for an ecosystem to recover or replace species.

Pemberton contains numerous types of habitats, all of which are important for maintaining biodiversity. Wooded wetlands and upland forests are the two most abundant natural ecosystems found in Pemberton. Herbaceous wetlands and scrub wetlands are also present in large areas adjacent to Pemberton's stream corridors and creeks. The following sections will identify and describe in more detail the plant and animal communities that inhabit these unique ecosystems within Pemberton Township.

Natural Vegetation

A region's vegetation is dependent upon many factors, the most important of which are climate and soils. Pemberton's climate is cool and temperate, and it is characterized by moderate temperatures, precipitation, and wind, with an average annual temperature of 54 degrees Fahrenheit. The average annual precipitation is 47 inches and is fairly well distributed throughout the year. The majority of Pemberton's soils are poorly drained soils that exhibit ponding and sustain wetland plants. However, Pemberton also has a great deal of moderately well-drained soils that support a diversity of trees and crops. See the **Soils** section for a detailed description of Pemberton's soils.

Pemberton's natural vegetation types, along with human-influenced types of land cover, have been tabulated and mapped by NJDEP's 2007 land cover analysis. This data, based on infrared aerial photography, is the most recent available. The designation of a particular land cover as a vegetation type is based on definitions provided by the Anderson Land Use Classification System, created by the U.S. Geologic Survey. See **Map 14: Natural Vegetation (2007)** and **Table 26: Natural Vegetation**.

Table 26: Natural Vegetation

Vegetation Type	Area (Acres)	Percentage of Township
Wetlands - Herbaceous	108.98	0.27%
Wetlands - Modified	2,975.23	7.41%
Wetlands - Phragmites Dominated	4.51	0.01%
Wetlands - Scrub/Shrub	831.12	2.07%
Wetlands - Wooded - Atlantic White Cedar	461.14	1.15%
Wetlands - Wooded - Coniferous	2,884.47	7.18%
Wetlands - Wooded - Deciduous	4,518.49	11.25%
Wetlands - Wooded - Mixed (Coniferous Dominated)	1,620.82	4.04%
Wetlands - Wooded - Mixed (Deciduous Dominated)	961.69	2.40%
Wetlands Total	14,366.45	35.78%
Upland Forest - Coniferous	5,303.21	13.21%
Upland Forest - Deciduous	2,340.04	5.83%
Upland Forest - Mixed (Coniferous Dominated)	2,359.90	5.88%
Upland Forest - Mixed (Deciduous Dominated)	2,920.35	7.27%
Upland Forest Total	12,923.51	32.19%
Brush/Shrubland	643.74	1.60%
Brush/Shrubland - Oldfield	217.54	0.54%
Brush/Shrubland Total	861.28	2.15%
Water	926.09	2.31%
Beach	1.99	0.00%
Total Natural Vegetation	29,079.32	72.43%
Total Area of Pemberton Township	40,147.90	100%

Source: NJDEP, 2007

Wetlands

Wetlands are a critical ecological resource, supporting both terrestrial and aquatic animals and boasting biological productivity far greater than that found on dry land. Wetlands play a vital role in maintaining water quality by naturally filtering surface and ground waters. The ecological importance of wetlands, however, has not always been appreciated. For over three centuries, people drained, dredged, filled, and leveled wetlands to make room for development and agriculture. Although the pace of wetland destruction has slowed markedly in the past three decades, human activities have destroyed approximately 115 million of the original 221 million acres of wetlands in the United States since the beginning of European settlement.

Turks Cap Lily

Photo by Richard Beck

Most wetlands in Pemberton are found in association with the township's many streams and tributaries. Wetlands provide valuable animal and plant habitat, naturally filter the township's surface and groundwater, and create picturesque landscapes that add to the quality of life for area residents. Pemberton's most abundant wetlands are deciduous wooded wetlands, coniferous wooded wetlands, and modified (typically agricultural) wetlands.

Common mostly in the central portion of Pemberton Township are deciduous wooded wetlands (sometimes referred to as wetland forests or, more typically, hardwood swamps). Deciduous wooded wetlands occupy about 4,518 acres (11 percent) of Pemberton's total land area and support mixed hardwoods that flourish in lowlands. There are also over 961 acres (two percent) of mixed wetlands that are dominated by deciduous trees. The typical canopy of deciduous wooded wetlands in the Pinelands is mostly composed of trident red maple, black gum, sour gum, smooth alder, and gray birch. The understory includes shrubs like highbush blueberry, dangleberry, dwarf huckleberry, sweet pepperbush, swamp magnolia (sweet bay), and leatherleaf, as well as a variety of herbaceous plants, grasses, sedges and rushes. Deciduous wooded wetlands provide important habitat for a wide variety of mammals, birds, reptiles, and amphibians.

Coniferous wooded wetlands are common in the central and eastern portions of Pemberton Township within the Pinelands. Pemberton also contains about 1,700 acres (four percent) of mixed wetlands that are dominated by coniferous trees. These wetlands cover about 2,884 acres (seven percent) of the total land in the township. Pitch pine is the typical species in the coniferous wetlands of the Pinelands, and common greenbriar is abundant in wet pitch pine lowlands.

Although just one percent of Pemberton Township is covered in Atlantic White Cedar wooded wetlands, these 461 acres provide a unique and threatened habitat for some of the rarest flora and fauna in the Pinelands. Atlantic White Cedar swamps were once the characteristic swamp of the Pinelands, although excessive deforestation in the past has reduced their number and size dramatically. The tall stands of cedars in a well-established cedar swamp cool and shade the floor, which is typically covered with sphagnum mosses and various other plants. Other plants in cedar swamps include highbush blueberry, swamp magnolia, gray birch, swamp azalea, pitcher plants, sundews, several species of orchids, and various wildflowers, as well as a diversity of grasses, sedges, and rushes.

Closely associated with deciduous and coniferous wooded wetlands are scrub/shrub wetlands, occupying about 831 acres (two percent) of Pemberton. These wetlands are generally composed of young, medium-height, primarily deciduous woody plants. Scrub/shrub wetlands are usually in early successional stages and will later become shrub-dominated wetlands or those dominated by canopy species. Scrub/shrub wetlands are typically dominated by shrub species like fetterbush, sweet pepperbush, highbush blueberry, inkberry, leatherleaf, northern bayberry, red chokeberry, and swamp azalea.

Pemberton has large tracts of modified wetlands covering 2,975 acres (seven percent) of the township's land area. The large bogs at Whitesbog are all modified wetlands, and other smaller areas of modified wetlands are located throughout the township. Modified wetlands are areas that have been altered by human activities and do not support natural wetland vegetation, but which do show signs of soil saturation on aerial infrared surveys. Modified wetlands encompass agricultural wetlands, former agricultural wetlands, disturbed wetlands, and wetlands that occur in maintained green spaces, such as open lawns, golf courses, and stormwater swales.

Slender Rattlesnake Root

Photo by Richard Beck

Other types of wetlands found in Pemberton include herbaceous wetlands, which cover 108 acres (less than one percent) of the township. Herbaceous wetlands generally occur along lake edges, open floodplains, and former agricultural wetland fields. Herbaceous wetland plants include rice cutgrass, reed canary grass, pond lily, tearthumb, arrow-leafed tearthumb, and broadleaf cattail. Just five acres of wetlands in Pemberton are classified as being dominated by *Phragmites*, a reed that colonizes easily and pushes into wetland areas from adjacent dry land areas, spreading through an underground root system that is difficult to eradicate. In addition to its tendency to aggressively spread, *Phragmites* often becomes a dominant monoculture and is therefore considered an invasive species.

A 2003 study conducted by the Pinelands Commission analyzed the status of the diverse aquatic and wetland resources within the Rancocas Watershed, which entirely encompasses Pemberton Township. An element of this study was the inventorying of plant species found at 51 stream-monitoring sites within the watershed, including 15 sites within Pemberton Township. At one or more of these sites, 146 plant species were identified. The most commonly found herbaceous plant species included groundnut, tussock sedge, blunt manna-grass, common rush, rice cut-grass, stiltgrass, bullhead lily, arrow arum, slender burr-reed, and marsh Saint John's-wort. Frequently occurring woody plants found at these sites included red maple, smooth alder, sweet pepperbush, fetterbush, black gum, Virginia creeper, swamp azalea, common greenbriar, and highbush blueberry. A complete list of wetlands plants found within the township through this study is included in **Appendix C: Plant Species in Pemberton Township**.

Upland Forests

Upland forests occur where drainage is sufficient so that soils do not become saturated for extended periods of time. Upland forests are the second most abundant natural vegetative land cover in Pemberton after wetlands. About 12,923 acres (32 percent) of Pemberton is composed of upland forests.

Large oak trees are found throughout Pemberton.

Over 5,000 acres (13 percent) in Pemberton are composed of coniferous forest, large areas of which are southeast of Country Lake. Coniferous forests in the Pinelands are dominated by pitch pines, with Pine Barrens heather typically found in the understory. Ground cover includes lichens, mosses, and the sub-shrubs bearberry and teaberry. For centuries, forests in the Pinelands have been exposed to frequent wildfires, and these extremely harsh conditions have created forests with pitch pine trees with stunted growth and certain genetic peculiarities. Coniferous trees in the Pinelands produce “serotinous” cones, or pine cones that open only when subjected to the heat of wildfires. These trees also have an extraordinary ability to send up new growth from their roots, even when much of the tree is completely burned.

Additionally, pine/oak upland forest, or a mixed forest where coniferous trees dominate, covers over 2,000 acres (six percent) of Pemberton Township. The pine/oak upland forest is the most typical natural community in the Pinelands. The pine/oak forests of the Pinelands are characterized by pitch pines, short-leaf pines, and several species of oaks. Common oak species found in the Pinelands include blackjack oak, black oak, and white oak. There are also some Virginia pines is some places. The understory is composed of various shrubs, such as scrub oak, black huckleberry, lowbush blueberry, Pine Barrens heather, sweet-fern, teaberry, shad-bush, sheep laurel, and mountain laurel. The ground is also covered by lichens, mosses, bracken ferns, perennial wildflowers, and sub-shrubs like bearberry, teaberry, and golden heather.

Oak/pine forests, or a mixed forest where deciduous trees dominate, cover nearly 3,000 acres (seven percent) in Pemberton. Ecologists believe that oaks tend to predominate in areas where wildfire has been suppressed. In some areas, oaks are able to out-compete the pines and become the exclusive tree type. Additionally, deciduous forest covers over 2,000 acres (six percent) of Pemberton. Deciduous trees found in the Pinelands include mixed oaks–black, red, chestnut, shumard, and scarlet–joined by other hardwoods like paper birch, American beech, honey locust, hickory, and sweetgum. The understory is dominated by flowering dogwood, black cherry, ironwood, and sassafras. Vines, such as Virginia creeper, wild grapes, Japanese honeysuckle, and poison ivy, are common. Spicebush, arrowwood, and black haw are common shrubs in moister locations.

Grasslands and Agricultural Lands

NJDEP defines grassland habitat as brushland, shrubland, or old fields that were cleared or disturbed at one time and then abandoned. Following abandonment, old fields are overgrown by perennial herbs and grasses. These pioneer plants remain the dominant species for three to 20 years. Later, woody plants take over. This habitat is visible, especially along wood edges, roadsides, and in landscapes where mowing is infrequent and where woody plants are not yet the dominant vegetation.

Grasslands may often be found adjacent to agricultural lands.

About 861 acres (two percent) of Pemberton's land cover consists of brushland, shrubland, or old fields. Old fields are sections of farmland that have become idle and have transitioned to land suitable for grassland and brushland species habitat. Small patches of these lands are scattered throughout Pemberton and are often found adjacent to agricultural lands and upland forests.

Pinelands National Reserve

Nearly 90 percent of Pemberton Township is within the 1.1 million-acre Pinelands National Reserve. This area encompasses nearly 22 percent of the State of New Jersey and is rich in cultural, ecological, and agricultural history. The boundary of the Pinelands includes all or part of 56 municipalities in seven counties. The Pinelands is the largest body of open space on the mid-Atlantic seaboard between Richmond and Boston. Most land in the Pinelands overlays the vast Kirkwood-Cohansey aquifer, which holds an estimated 17-trillion gallons of freshwater. The Pinelands is home to 700,000 people, 43 endangered or threatened animal species, and an unknown number of rare plant species.

There are three state forests in the Pinelands, with a combined area of 173,288-acres, or three percent of the State of New Jersey. Covering 115,000 acres, Wharton State Forest is the single-largest tract of land in the state park system. Bass River State Forest, the first New Jersey state forest, contains the world's largest pygmy forest of pine and oak trees, which reach just four feet at maturity. The Brendan T. Byrne State Forest is located partially within Pemberton Township and encompasses Whitesbog. Each park offers ample hiking trails, many of which are wheelchair-accessible.

The Pinelands was approved as a National Reserve on January 16, 1981. In 1983, the United Nations Educational, Scientific, and Cultural Organization (UNESCO) named it a

Biosphere Reserve, an area meant to demonstrate a balanced relationship between humans and the biosphere. The Pinelands was named an International Biosphere Reserve in 1988 and is considered to have one of the first and best widespread ecosystem management plans in the country. The goals of a UNESCO Reserve are to conserve the life within the reserve, to provide a site for scientific research and monitoring, and to promote sustainable development in communities of surrounding regions.

In addition to the valuable and unique environmental features of the Pinelands, the over one million acres also includes historic and prehistoric sites, hamlets, subdivisions, towns, and active farmland. New Jersey is the second largest producer of blueberries and the fourth largest producer of cranberries in the country, and all this production occurs within the Pinelands.

The New Jersey Pinelands Commission's Comprehensive Management Plan (CMP), adopted in 1980 and approved by Congress in 1981, is a plan to balance protection with development. To ensure the effectiveness of the plan, county and municipal master plans and land use ordinances must be brought into conformance with the CMP. The CMP divides the Pinelands region into nine different management areas based on land use capability. Each area has different goals, objectives, development intensities, and permitted uses. Pemberton contains every type of Pinelands management area, with the exception of Pinelands Town. See **Map 21: State Plan (2001)**. In order to develop in the Pinelands, an application must be submitted to the Pinelands Commission. Development applications are reviewed to ensure conformance with the Pinelands CMP. After this review, the Pinelands Commission issues a Certificate of Filing, and this enables the applicant to apply for state and local permits and approvals. If the development does not meet the land use and environmental standards of the CMP, then the applicant may attempt to obtain a Waiver of Strict Compliance, which involves additional review. The development review process by the Pinelands Commission is aimed at fostering environmentally sensitive development in order to protect one of the most unique ecosystems in the world.

Landscape Project Priority Habitats

The Landscape Project, developed by the Endangered and Nongame Species Program of the NJDEP Division of Fish and Wildlife, documents areas in New Jersey that provide suitable or critical habitat for rare and imperiled species. It categorizes these habitats into one of five groups according to their importance (five being the highest). Categories three through five include habitats throughout the state that possess two exceptional conditions: (1) a documented occurrence of one or more species on either the federal or the state threatened and endangered species lists, and (2) a sufficient amount of habitat type to sustain these species. These habitats are collectively known as "critical habitat." Categories one and two include habitats that either have a documented occurrence of a

Species of Special Concern[1] in New Jersey, or are deemed suitable for species on the state or federal threatened and endangered species lists, but for which there are no documented occurrences or sightings. These habitats are labeled “suitable habitats.”

As seen in **Map 15: Landscape Project Priority Habitats (2007)**, nearly all undeveloped land in Pemberton Township has been identified as either critical or suitable habitat for threatened and endangered species. Maintaining both types of habitat is crucial to preserving the diversity of species that still exist in the township and in the Pinelands as a whole. Landscape Project areas in Pemberton provide habitat for rare bird species and Species of Special Concern, such as the Great Blue Heron, Barred Owl, Bobolink, and Brown Thrasher, and for rare reptiles and amphibians, such as the Carpenter Frog, Eastern Box Turtle, Milk Snake, Northern Pine Snake, and Eastern King Snake.

Table 27: Landscape Project Habitats

Category	Rank	Area (Acres)	% of Total Habitat	% of Township Land
Emergent Wetlands	Critical Habitat (4)	251.52	0.80%	0.63%
	Critical Habitat (3)	562.55	1.80%	1.40%
	Suitable Habitat (2)	1,573.96	5.04%	3.92%
	Suitable Habitat (1)	517.86	1.66%	1.29%
	Total	**2,905.90**	**9.30%**	**7.24%**
Forested Wetlands	Critical Habitat (4)	1,735.79	5.55%	4.32%
	Critical Habitat (3)	3,359.71	10.75%	8.37%
	Suitable Habitat (2)	5,036.32	16.11%	12.54%
	Suitable Habitat (1)	1,306.94	4.18%	3.26%
	Total	**11,438.76**	**36.59%**	**28.49%**
Forest	Critical Habitat (4)	9,570.55	30.62%	23.84%
	Critical Habitat (3)	2,375.23	7.60%	5.92%
	Suitable Habitat (2)	835.63	2.67%	2.08%
	Suitable Habitat (1)	163.55	0.52%	0.41%
	Total	**12,944.96**	**41.41%**	**32.24%**
Grassland	Critical Habitat (4)	806.23	2.58%	2.01%
	Critical Habitat (3)	1,218.46	3.90%	3.03%
	Suitable Habitat (2)	101.82	0.33%	0.25%
	Suitable Habitat (1)	1,841.32	5.89%	4.59%

[1] A Species of Special Concern is a formal definition; it indicates a species that may be under consideration for listing as threatened due to documented population decline or habitat loss.

Category	Rank	Area (Acres)	% of Total Habitat	% of Township Land
	Total	**3,967.82**	**12.69%**	**9.88%**
Beach	Suitable Habitat (1)	1.99	0.01%	0.00%
	Total	**1.99**	**0.01%**	**0.00%**
	Total Habitat	**31,259.43**	**100.00%**	**77.86%**

Source: NJDEP, 2007

Landscape Project Data on Grassland-Dependent Species Habitat

The Landscape Project designates nearly 4,000 acres (10 percent of the township) as critical or suitable habitat for grassland-dependent species. This land is divided evenly between critical and suitable habitat. These areas are found nearly exclusively in the agricultural non-Pinelands western portion of Pemberton Township. Many agricultural lands serve as habitat for grassland-dependent species, since migrating birds cannot visually distinguish cropland from grassland, and because cropland evolves into grassland when it is fallow for one year or more. Additionally, some crops, like alfalfa and soybeans, provide suitable nesting habitat for small birds like sparrows. All or most threatened and endangered birds require large ranges that include agricultural “grasslands.” The Landscape Project includes this land in its assessment because agricultural lands provide important disturbance buffers between the rare and endangered wildlife species and humans, and between the rare species and predatory animals like dogs and cats.

Grassland-dependent species (mostly birds) are the most threatened group of species in New Jersey, primarily because the most common form of habitat used by these species, agricultural fields, is also the most threatened habitat in the state. This is due to development pressure associated with rising land values, as well as changes in agricultural practices on remaining agricultural lands. Many areas of critical and suitable grassland habitat in Pemberton have been preserved as farmland, although large areas of critical grassland habitat north of Pemberton Borough are not preserved and face development pressure.

Many species of birds depend on grasslands.

Threatened and endangered grassland-dependent birds in Pemberton include the American Kestrel and Bobolink. Grasslands also provide habitat for rare or declining amphibians and reptiles, including the Milk Snake, Eastern Box Turtle, and Northern Pine Snake (a Threatened

species in the state). Also found are rare species of butterflies and moths, including the Dotted Skipper.

Landscape Project Data on Wetland Habitat

The Landscape Project divides wetland habitats into two types–emergent and forested wetlands. Emergent wetlands are marshy areas characterized by low-growing shrubs and herbaceous plants in standing water. Nearly 3,000 acres (seven percent of the township) are identified as priority emergent wetlands habitat, with the majority ranked at the suitable level. The large bogs at Whitesbog and other bog areas south of New Lisbon Road are identified as critical habitat for emergent wetlands-dependent species. Smaller areas of suitable habitat are located throughout the township.

Emergent wetlands in Pemberton Township provide habitat for the American Bittern and other rare birds. These areas are also important habitat for migratory waterfowl and passerines (smaller perching birds), such as migrating flycatchers and warblers. The Carpenter Frog and other rare amphibians and reptiles are also found in many emergent wetlands areas in Pemberton Township.

There are over 11,000 acres (28 percent of the township) of forested wetlands in Pemberton Township that provide important habitat for threatened and endangered species, the majority of which is identified as suitable habitat by the Landscape Project. Critical habitat of forested wetlands is located mainly in the center area of the township, with large areas also surrounding Whitesbog. Suitable habitat is located across the township in many low-lying areas.

Forested wetlands in Pemberton support rare bird species like the Barred Owl and Brown Thrasher, in addition to many other migratory and nesting birds. These areas also provide habitat for various rare amphibians and reptiles, including the Carpenter Frog and Eastern King Snake.

Landscape Project Data on Upland Forest Habitat

Nearly 13,000 acres (32 percent) in Pemberton Township are important upland forest habitat, the vast majority of which (nearly 10,000 acres) is critical habitat for threatened and endangered species. This important upland forest habitat is found across Pemberton, with large contiguous areas located between the waterways in the southeastern portion of the township.

Forested areas in Pemberton Township provide crucial habitat for a variety of rare bird species, including the Barred Owl, Black-throated Green Warbler, Brown Thrasher, Wood Thrush, and Great Blue Heron, as well as reptiles and amphibians, such as the Milk Snake, Eastern Box Turtle, Northern Pine Snake, and Pine Barrens Treefrog. These areas also provide important habitat for rare butterflies and moths, including the Silver-bordered Fritillary and Dotted Skipper.

Pinelands Ecological Integrity Assessment

The Pinelands Ecological Integrity Assessment was developed in order to provide a comprehensive, regional approach to preserving this unique ecosystem of nearly one million acres. This assessment is a component of the Pinelands Comprehensive Management Plan (CMP), which uses an ecosystem approach to protect the natural resources of the Pinelands and to direct development away from ecologically critical areas. The goal of the Ecological Integrity Assessment is to conserve the characteristic Pinelands plant and animal species and communities.

The overall ecological integrity of areas of the Pinelands was assessed based on a composite of three integrity measures: landscape, aquatic, and wetland-drainage. *Landscape* integrity relates to large tracts of natural habitat necessary for the conservation of characteristic Pinelands plants and animals, particularly wide-ranging species. The landscape integrity analysis indicated that habitat-patch size, the total amount of habitat, and the type, extent, and proximity of land-use activities–including development, agriculture, and roads–are important determinants of ecological integrity, affecting species richness, abundance, composition, and breeding success. *Aquatic* integrity relates to the health of aquatic communities and is based on the percentage of a watershed that is neither developed nor upland agriculture. In the Pinelands, water-quality degradation, characterized by increases in pH, specific conductance, and dissolved solids, is related to basin-wide, upland-land uses. Similarly, *wetland-drainage* integrity addresses the percentage of land in a wetland-drainage unit (a discrete area of wetland and adjacent uplands) that is neither developed nor upland agriculture. The wetland-drainage analysis indicated that land uses in adjacent uplands influence both the quantity and quality of groundwater flowing to wetlands, which in turn can affect the composition of plant and animal communities associated with wetlands.

In Pemberton Township, most undeveloped areas were ranked with the highest ecological integrity class (90 to 100). See **Map 16: Pinelands Ecological Integrity Assessment (2002)**. These areas represent some of the most ecologically critical areas within the Pinelands. Overall, 51 percent of the Pinelands area fell within the highest ecological integrity class (90 to 100).

Animal Communities

Although no comprehensive inventory of the different animal species within Burlington County or Pemberton Township exists, there are records of sightings, biological studies of range, and assessments of endangered and threatened species status. Using federal, state, and other scientific sources, it is possible to identify and describe known and possible animal communities of Pemberton Township. These are included in **Appendix D: Vertebrate Animals Known or Probable in Pemberton Township**.

Invertebrates

Invertebrates are the basis of a healthy environment and are part of every food chain–either as food for amphibians and fish, or as a part of nutrient cycling systems that create and maintain fertile soils. Invertebrates consist of insects (beetles, butterflies, moths, dragonflies, ants, termites, bees, wasps, flies, and others), arachnids (spiders, ticks, and mites), crustaceans (crayfish and microscopic copepods), mollusks (mussels, clams, snails, and slugs), and worms.

Macroinvertebrates are invertebrates that are visible to the naked eye but smaller than 50 millimeters. Benthic (bottom dwelling) macroinvertebrate communities provide a basis for ecological monitoring and are relatively simple to collect from shallow stream bottoms. These communities consist largely of the juvenile stages of many insects, such as dragonflies and mayflies, as well as mollusks, crustaceans, and worms. Monitoring for diverse assemblages of macroinvertebrates reveals the effect of pollutants over a longer period of time than chemical monitoring can show. The Ambient Biomonitoring Network (AMNET) surveys streams for macroinvertebrate communities, which indicate certain levels of water quality, discussed in the section on **Surface Water Quality**.

There are nine endangered invertebrate species (two beetle species, four butterfly species, and three mussel species) and eight threatened invertebrate species (three butterfly species and five mussel species) in New Jersey. Of those species on the New Jersey Endangered and Threatened List, one–the dwarf wedge mussel–is listed as endangered under the federal Endangered Species Act. The threatened Silver-bordered Fritillary (*Bolaria selene myrina)* butterfly is found in Pemberton Township, as well as the Dotted Skipper (*Hesperia attalus*) butterfly, a species of special concern.

Vertebrates

Vertebrates are less numerous than invertebrates, but their larger size makes them much more visible, and thus better studied and recorded. Fish species are fairly well documented, as are mammals. Although elusive, reptile and amphibian species found in Pemberton Township have been inventoried by a local biologist. Birds that nest in the township are also known, but migrants that depend on Pemberton's wetlands and wet forests as stopover sites in which to rest and feed are not as thoroughly inventoried.

Mammals

Mammals appear to be abundant because they tend to be larger and live in habitats also ideal for human development. There are 90 mammal species in New Jersey, of which nine are listed as endangered and none are listed as threatened by the state. Some common mammals found in Pemberton Township include the Opossum, Masked Shrew, Eastern Mole, Big Brown Bat, Little Brown Bat, Eastern Cottontail, Eastern Chipmunk, Gray Squirrel, Red Squirrel, White-footed Mouse, Meadow Vole, Muskrat, Pine Vole, Red Fox, Gray Fox, Raccoon, Long-tailed Weasel, Mink, Striped Skunk, River Otter, and White-

tailed Deer. The Bobcat, an endangered species, has been sighted in Pemberton Township.

Management of white-tailed deer is an issue in New Jersey. While many residents prize the presence of mammalian life, deer often come into conflict with humans in suburban and agricultural areas. According to the U.S. Department of Agriculture, deer cause more damage to agricultural crops than any other vertebrate wildlife species. Farmers in densely human-populated areas appear to be the most affected. Additionally, deer can devastate the understory of forests through overgrazing, destroying the growth of seedlings and young trees. Finally, as most motorists are aware, collisions between deer and automobiles frequently result in serious damage.

Controlling deer numbers has become increasingly difficult in New Jersey, primarily because suburban landscaping provides year-round food, which supports population growth; and because the principal method of culling the population–hunting–is not feasible in suburban environments.

To minimize human-deer conflicts, the New Jersey Agricultural Experiment Station recommends both lethal and nonlethal deer management options for community-based deer management programs. For example, municipalities can extend the hunting season, issue depredation permits to private landowners, engage in sharp shooting, and employ traps and euthanasia to reduce deer numbers. Alternatively, communities and private landowners can choose to apply nonlethal, although more costly, deer management strategies, such as installing reflectors and reducing speed limits on rural roads to decrease deer-vehicle collisions, modifying habitat by planting bad tasting plants on commercial and residential properties, using taste-based and odor-based repellents, and employing traps and translocation techniques.

Birds

New Jersey has between 350 and 500 species of birds, which is an exceptional number given the state's small size. New Jersey is an important location for migratory birds heading south for the winter. Not only is the state an important "rest stop" for birds migrating to warmer climates in Central and South America, but also the New Jersey Atlantic Coast and the Delaware Bay are major parts of the Eastern Flyway (established migratory air route) in North America.

Pemberton Township is home to a great abundance and variety of birds. Within the township's boundaries, there have been documented sightings of over 250 species of birds, listed in **Appendix D: Vertebrate Animals Known or Probable in Pemberton Township**. Some birds that are very numerous or are common and frequently seen include the Great Blue Heron, Mute Swan, Wood Duck, American Black Duck, Mallard, Green-winged Teal, Turkey Vulture, Red-tailed Hawk, Mourning Dove, Great Horned Owl, Whip-poor-will, Red-bellied Woodpecker, Downy Woodpecker, Northern Flicker, Eastern Wood-Pewee, Eastern Phoebe, Great Crested Flycatcher, Eastern Kingbird, Blue Jay, American Crow, Tree Swallow, Barn Swallow, Carolina Chickadee, Tufted Titmouse, White-breasted Nuthatch, House Wren, Carolina Wren, American Robin, Gray Catbird,

Brown Thrasher, European Starling, Pine Warbler, Prairie Warbler, Common Yellowthroat, Eastern Towhee, Chipping Sparrow, Field Sparrow, Song Sparrow, White-throated Sparrow, Dark-eyed Junco, Northern Cardinal, Red-winged Blackbird, Common Grackle, and House Sparrow.

Another common bird is the Canada Goose. The State of New Jersey has a "resident" Canada Goose population of approximately 100,000 birds that no longer migrate to more southern locales, and that number may double in the next five to 10 years. While geese are a pleasant component of the urban/suburban environment, providing enjoyable wildlife opportunities for the public, they can also cause property and environmental damage. Goose droppings that wash into lakes during storm events can elevate coliform bacteria to unhealthy levels, closing lakes to swimming. Goose droppings limit human use of grassy areas in parks, and because geese can be quite aggressive during the nesting season, they can also injure humans.

A flock of Canada Geese

Removing geese or preventing them from residing in park areas is a difficult task. Because geese move freely, the most effective management solutions are best conducted at the community level. Canada geese are protected by the Migratory Bird Treaty Act. Therefore, a management program may require the U.S. Department of Agriculture's approval and permits. A new federal rule signed into law in December 2005 eases hunting restrictions and allows county and municipal officials to coordinate with state fish and wildlife departments to destroy birds and/or eggs that pose a threat to public health and safety. Management techniques include planting shrubby vegetation around streams, lakes, and ponds to block waterfowl access, discouraging humans from feeding geese, and removing geese eggs and replacing with decoys.

Rare birds in Pemberton Township include the American Bittern, American Kestrel, Barred Owl, Black-throated Green Warbler, Red-shouldered Hawk, Cooper's Hawk, Bobolink, and Wood Thrush.

Important Bird and Birding Areas

The Important Bird Area (IBA) program is a global effort by the Audubon Society to identify and conserve areas that are vital to birds and other species. The New Jersey Audubon Society has an expanded initiative called the Important Bird and Birding Area (IBBA) Program, which identifies areas that provide essential habitat for sustaining bird populations (Bird Areas), as well as areas that provide exceptional opportunities for bird

watching (Birding Areas). The New Jersey IBBA Program has identified 122 sites within the state. Two sites, Brendan T. Byrne State Forest and Whitesbog (a component of Byrne), are located partially within Pemberton Township. For mapping purposes, these two sites have been combined with Greenwood Forest/Pasadena Wildlife Management Area into a single IBA due to the nature of the landscape and the decisions that were made when developing the GIS model. The combined IBA is very expansive and reflects contiguous forested areas in the Pinelands. See **Map 22: Conservation Areas (2007)**.

The Brendan T. Byrne State Forest IBA is made up of over 60,000 acres of primarily coniferous and mixed upland forest, with areas of shrub-scrub habitat. This site includes Byrne, the second-largest state forest after Wharton State Forest, as well as a number of private holdings and land trust properties. The forest includes the 735-acre Cedar Swamp Natural Area, upland pine-oak and oak-pine forests, pitch pine (*Pinus rigida*), lowland forest, and scrub-shrub habitat. During the breeding season, there have been observations of as many as 20 Red-headed Woodpeckers, a state-threatened species. This site contains as many as 10,000 Pine Warblers, 1,000 Prairie Warblers, 5,000 Eastern Towhees, 1,000 Whip-poor-wills, and 500 Eastern Wood-Pewees, all of which are rare, regional responsibility species. This forest area contains a number of other smaller IBA sites, including Whitesbog. The majority of this site is protected from development; however, threats to wildlife in this IBA include on-road fatalities from heavily traveled highways (such as Routes 70 and 72), illegal off-road vehicle use, and habitat fragmentation. Invasive species like Southern Pine Beetles and Gypsy Moths require appropriate measures of control. Forests should be managed as large, contiguous areas while maintaining a diversity of Pinelands community types, including early successional habitats.

The Whitesbog IBA contains nearly 10,000 acres of land, which includes early successional fields, oak and pine forests, American White Cedar swamps, ponds, reservoirs, streams, and over 3,000 acres of abandoned and cultivated cranberry bogs and blueberry fields. The Whitesbog IBA is significant for providing habitat for over 200 species of birds, including the state-endangered Bald Eagle, American Bittern, and Pied-billed Grebe. This site provides habitat for the regional responsibility species Eastern Towhee, Pine Warbler, and Whip-poor-will. This area also supports the Ruffed Grouse, Northern Bobwhite, Barred Owl, Mallard, American Black Duck, Wood Duck, Green-winged Teal, Virginia Rail, Least Bittern, Red-winged Blackbird, Yellow-billed Cuckoo, Baltimore Oriole, Orchard Oriole, and Common Night Hawk. Shorebirds, including the Greater Yellowlegs, Lesser Yellowlegs, Pectoral Sandpiper, Least Sandpiper, Semipalmated Sandpiper, and Upland Sandpiper, may be observed feeding along the edges of the reservoirs during fall migration. As a component of the Brendan T. Byrne State Forest, Whitesbog is protected from encroachment of development within the immediate area. However, recreational overuse and illegal off-road vehicle use are threats to the wildlife in Whitesbog. Maintenance of the scrub-shrub habitat in portions of the Whitesbog IBA should be actively managed. In order to maintain the structural complexity that characterizes a healthy forest, ecological forestry practices may be appropriate in areas of dense, closed-canopy forest. The bird and wildlife response to the regeneration of abandoned cranberry bogs and blueberry fields is also important.

Reptiles and Amphibians

Reptiles and amphibians can be quite elusive when surveys attempt to document them. Some reptiles and amphibians, called herpetological species, are rare because they depend on vernal ponds, as discussed in the **Surface Waters Resources** section. Amphibians in particular tend to be very sensitive to environmental changes, offering a visible warning to humans that significant changes are occurring.

New Jersey is home to approximately 80 reptile and amphibian species. There are just three types of lizards found in the state, all of which have been documented in Pemberton Township. Some common herpetological species that have been documented in Pemberton include the Red-backed Salamander, Bullfrog, New Jersey Chorus Frog, Green Frog, Pickerel Frog, Northern Spring Peeper, Southern Leopard Frog, Eastern Painted Turtle, Snapping Turtle, Stinkpot, Northern Fence Lizard, Eastern Garter Snake, Eastern Milk Snake, Northern Brown Snake, Northern Water Snake, Red-bellied Snake, Rough Green Snake, Ringneck Snake, and Eastern Ribbon Snake.

There are also many rare herpetological species that have been sighted in Pemberton Township, including the Carpenter Frog, Fowler's Toad, Eastern Box Turtle, Wood Turtle, Corn Snake, Eastern King Snake, Milk Snake, Northern Pine Snake, Timber Rattlesnake, Southern Gray Treefrog, and Pine Barrens Treefrog. See **Appendix D: Vertebrate Animals Known or Probable in Pemberton Township** for a complete list of reptiles and amphibians that may be found in the township.

Fish

When European settlers arrived in present-day Burlington County, they encountered Lenape Indians, who regularly fished along the inland streams and gathered shellfish in the Delaware River. Shad fishing was an important industry along the Delaware River until the early 20th century. Due to urban development, industrial advancement, overfishing, and mechanized agriculture, the amount and diversity of aquatic life has decreased dramatically throughout most of New Jersey.

The New Jersey Division of Fish and Wildlife, under the Bureau of Freshwater Fisheries, monitors and actively aids the propagation, protection, and management of the state's freshwater fisheries. The bureau raises several million fish for stocking in suitable waterbodies and conducts research and management surveys.

There are over 30 species of fish that have been documented in Pemberton's many streams and lakes. See **Appendix D: Vertebrate Animals Known or Probable in Pemberton Township**.

Threatened and Endangered Species

Many species of rare wildlife have been documented in Pemberton Township over the course of the past 100 years. Unfortunately, a few species have not been recently spotted in the township. Brief descriptions of those species listed on the Natural Heritage

Database for Pemberton Township, provided by the New Jersey Fish and Wildlife Service, follow. Additionally, there are other rare species sighted by township residents but not yet verified by the Endangered and Nongame Species Program.

The Comprehensive Management Plan (CMP) of the Pinelands Commission provides that no development can be carried out that would have irreversible adverse impacts on habitats critical to the survival of threatened or endangered animal species (N.J.A.C. 7:50-6.27). In order to determine whether or not a population of a threatened or endangered species is present at the site of a proposed development, additional research is needed. The most accurate way to do so is through researching known sighting records and documentation, habitat assessments and, as appropriate, field surveys of the area. To determine the appropriate extent of surveying needed, the likelihood of the presence of a threatened or endangered species can be evaluated based on known sightings and the suitability of the habitat.

The Natural Heritage Database of the NJDEP lists 37 species of rare wildlife found in Pemberton Township. Twenty-two of these are birds, eight are reptiles, three are amphibians, three are invertebrates, and one is a mammal. Although within the state these wildlife species are listed as either endangered, threatened, or as species of special concern, none are included on the federal threatened and endangered species list. These animals are listed in **Appendix D: Vertebrate Animals Known or Probable in Pemberton Township**. The following are descriptions of some of the rare wildlife species found in Pemberton Township.

The **Bald Eagle** (*Haliaeetus leucocephalus*) is an endangered species in New Jersey, although it has been delisted on the federal level. Bald Eagles mostly consume fish, and thus often choose to build nests in forested areas near water bodies. Population decline caused by shooting, poisoning, and egg collecting accelerated after the introduction of DDT into the environment. DDT was shown to cause thinning of the eggshells, which would crack under the weight of the incubating adult bird. The Bald Eagle was listed as an endangered species in New Jersey in 1974, and as endangered in the lower 48 states in 1978. It was removed from the federal endangered list in 2008, but remains on the New Jersey endangered list. Bald Eagle populations in New Jersey have since increased from a single nesting pair in 1970 to 69 nesting pairs in 2008. Within Pemberton, there are large areas identified as bald eagle foraging areas along the Rancocas Creek North Branch, Lake Pemberton, Mirror Lake, Greenwood Branch, Hanover Lake, Country Lake, and Whitesbog.

The **Bobcat** (*Felis rufus*) is an endangered species in New Jersey. Bobcats are found across the United States in a variety of habitats ranging from deserts to mountains to swamps. In the Northeast, their preferred habitat is forest, areas of mixed forest and agriculture, and rural areas near cities and small towns. They generally live in areas of rough, broken habitat with a mix of early and late successional stages with a dense cover of vines, shrubs, briars, and conifers. This dense understory provides areas for resting and protection from predators and harsh weather. In New Jersey, the bobcat population declined steeply in the early 19th century, as forests were cleared for lumber, charcoal, fuel, and agriculture. The number of bobcats in the state continued to decline due to habitat fragmentation and shootings, and by 1970, it was believed that the species had

been extirpated from the state. To restore the bobcat population, the New Jersey Division of Fish, Game, and Wildlife implemented a program from 1978 to 1982 that released 24 bobcats in the northern part of the state. This program has been successful, and bobcats have been confirmed and reported in 13 counties of the state.

The **Timber Rattlesnake** (*Crotalus horridus horridus*) is the only rattlesnake in New Jersey and is arguably the most endangered species in the state. These reptiles were once found throughout the state, but habitat loss, illegal collecting, road-side mortality, and unjustified killings have caused the rattlesnake population to decline in New Jersey. The Timber Rattlesnake also has a low reproductive potential because the females reach maturity at a late age, they usually reproduce once every three or four years, and they have small litters. In the Pinelands, this venomous snake is found in swamps and pine/oak forests, where it makes its dens along riverbeds. Beginning in 2001, the Pinelands Commission and the New Jersey Division of Fish and Wildlife have worked on a project to locate undocumented hibernacula (dens) in the Pinelands region to facilitate greater protection of the species. This program involves capturing adult rattlesnakes in the Pinelands, implanting them with radio transmitters, and tracking them using radio-telemetry. The hibernacula will then be mapped using GIS.

The **Corn Snake** (*Elaphe guttata guttata*), also known as the “red rat snake,” is an endangered species in New Jersey found in sandy, forested areas. The preferred habitat is in pine/oak forests with an understory of low brush. They can be found in hollow logs, railroad ties, and building foundations, as well as under boards and logs. The Pinelands is the northern limit of this species. These snakes are mostly nocturnal, especially during the summer months. Habitat loss and illegal gathering for the pet trade led to the decline of the Corn Snake population.

The **Vesper Sparrow** (*Pooecetes gramineus*), formerly known as the “bay-winged bunting,” is a songbird whose preferred habitat is open areas like cultivated fields, grasslands, fallow fields, and pastures. Fallow, uncultivated fields provide protection for nesting habitat, cover, foraging sites, and singing perches. Although once an abundant species in the state, its numbers declined as the agricultural land it depends upon was replaced with suburban development. The Vesper Sparrow was listed as threatened in the state in 1979 and as endangered in 1984.

The **Pied-billed Grebe** (*Podilymbus podiceps*) is a duck-like diving bird that is endangered in New Jersey. Grebes are well-adapted for swimming underwater and waterproof their feathers by pruning them with secretions from an oil gland at the base of their tail. They nest in freshwater marshes associated with ponds, bogs, lakes, reservoirs, or slow-moving rivers. Breeding sites typically contain open water with submerged or floating vegetation. They can be found in a variety of habitats outside the breeding season. Although common during the 19th century, the Pied-billed Grebe population suffered from hunting for food and feathers, which were used in earmuffs and hats. Increased habitat loss and degradation led to further population decline, and the species was listed as threatened in 1979 and endangered in 1984. Human disturbance, flooding, contaminated runoff, and the continued loss of wetlands through draining, dredging, filling, pollution, and siltation still threaten the viability of the Pied-billed Grebe.

The breeding population of the **American Bittern** (*Botaurus lentiginosus*), a vocal wading bird, is endangered in New Jersey. During the breeding season, these birds inhabit emergent wetlands such as cattail ponds, sedge marshes, and marshes created by impoundments or beaver dams. They prefer to nest in shallow water with dense vegetation. Occasionally, American Bitterns may nest in wet fields or grasslands containing tall grasses. During the non-breeding season, American Bitterns may occupy a variety of wetlands or grassland habitats. The American Bittern was a common species before hunting and wetland destruction caused initial declines by the 1920s. Accelerated habitat loss since the 1950s, however, caused the population to decline at an alarming rate. The American Bittern has been documented in emergent wetlands in the Whitesbog area.

Natural Heritage Program

The New Jersey Natural Heritage Program identifies the state's most significant natural areas through a comprehensive and continuously updated inventory of rare plant and animal species and representative ecological communities. The Natural Heritage Database compiles information on the distribution, biology, status, and preservation needs of these species and communities. Those threatened and endangered plants and animals identified in Pemberton Township by the Natural Heritage Database are listed in **Appendix C, Rare Plant Species** and in **Appendix D, Rare Wildlife Documented in Pemberton Township**. Threatened and endangered plants found in Pemberton include Swamp-pink, Chaffseed, and Pickering's Morning Glory. Natural Heritage Grid Maps show the general locations of rare plant species and ecological communities, without providing the sensitive detailed information that could place these resources at risk for vandalism or illegal collection.

The Natural Heritage Database provides the foundation for the designation of Natural Heritage Priority (NHP) sites. NHP sites are exemplary natural communities within the state that provide critically important habitat for rare plant and animal species. Preserving these areas should be a top priority in efforts to conserve biological diversity in New Jersey.

Pickering's Morning Glory

Photo by Richard Beck

Designation as an NHP site does not carry any specific requirements or restrictions on the land. Rather, the designation is made because of a site's high biological diversity value. Owners of NHP sites are encouraged to become informed stewards of the property and to consider working with the local community, nonprofit groups, or the state to preserve the land permanently.

Information on particular sites may also be provided by the Nature Conservancy or by the NJDEP Endangered and Nongame Species

Program, and especially through the latter agency's Landscape Project. Biodiversity rankings of NHP sites range from B1 (outstanding significance for biodiversity) to B5 (general biodiversity interest).

There are four different NHP sites in Whitesbog, two of which are located in Pemberton Township: Whitesbog Roadside and Whitesbog Village Sandhill. See **Map 22: Conservation Areas (2007)**. The Whitesbog Roadside site, located near the intersection of Routes 530 and 70, contains a mowed roadside through pitch pine lowland over Atsion sand and provides habitat for rare plants. The site has a biodiversity ranking of B3 and contains a globally imperiled plant species. The Whitesbog Village Sandhill site is located on a long, narrow, sandy ridge that is possibly a paleodune, or Pleistocene/early Holocene sand dune, which is now stable. The dune is intact in the southern half of the site and contains heath, sedge, and bracken ferns. This site has a biodiversity ranking of B3 and contains a population of a globally rare plant species.

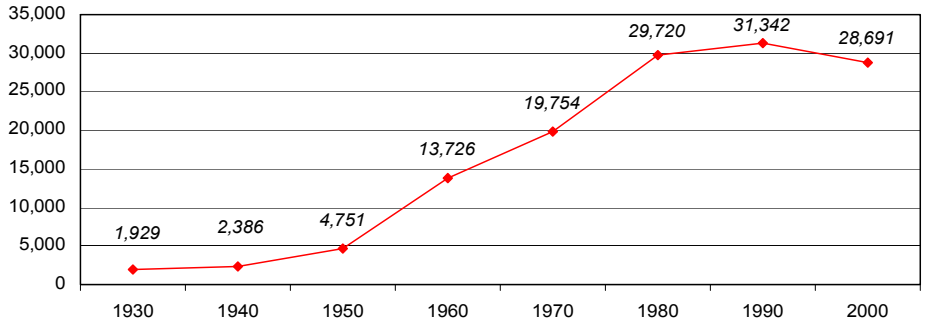
CHAPTER 6

The Built Environment

Population and Housing

Between 1930 and 2000, the population of Pemberton Township increased dramatically, from 1,929 to 28,691. Pemberton Township experienced moderate growth between 1930 and 1940, growing from 1,929 to 2,386 people. Its population doubled in the 1940s and reached 4,751 in 1950. Residential developments including Country Lakes, Presidential Lakes, and Pemberton Heights spurred explosive population growth during the middle of the century, and Pemberton Township grew from under 5,000 in 1950 to nearly 30,000 in 1980. The population of Pemberton peaked in 1990, with a population of 31,342 people. In 2008, the U.S. Census estimated that Pemberton Township had a population of 27,975 people, a slight decrease from its 2000 population of 28,691.

Figure 10: Pemberton Township Population, 1930 - 2000



Source: U.S. Census Bureau, 1930-2000

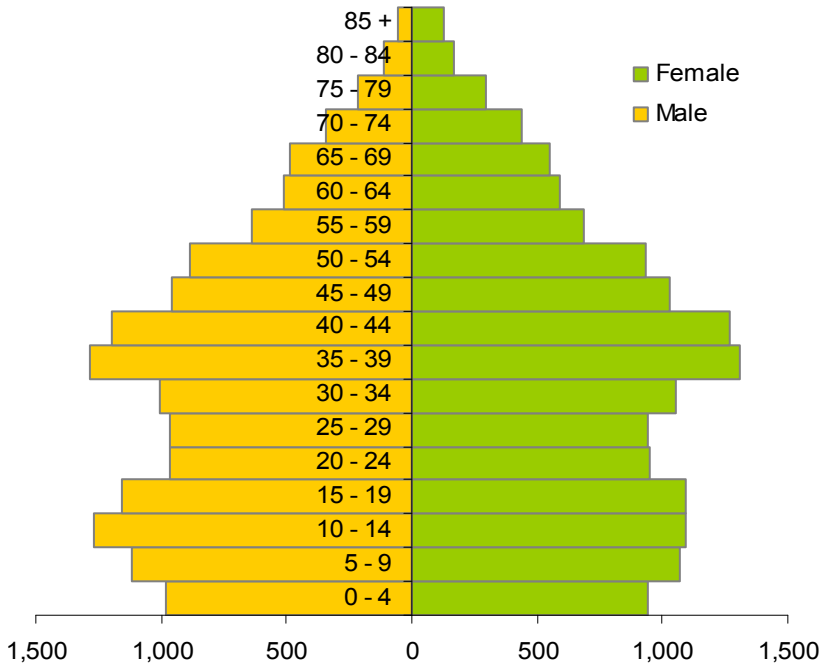
According to the 2000 U.S. Census, 14,842 residents of Pemberton Township (68 percent of the population aged 16 and over) were in the labor force. Of those in the labor force, 13,931 were in the civilian labor force and 911 were in the armed forces. Approximately 29 percent of jobs were in sales and office occupations; 23 percent were in service occupations; 21 percent were in management, professional, and related occupations; 16 percent were in production, transportation, and material moving occupations; 10 percent were in construction, extraction, and maintenance occupations; and less than one percent were in farming, fishing, and forestry occupations.

The township's median age is 34, similar to the national average of 35. The percentage of residents of Pemberton Township aged 65 and over was about 10 percent in 2000, slightly

less than the national average of 12 percent. Approximately 21 percent of Pemberton's residents are children between the ages of five and 18. This represents the age group that is most likely to generate demand for public schools, community facilities, and recreational opportunities.

Based on the 2000 U.S. Census, Pemberton's population is ethnically diverse, with 66 percent of the population identifying themselves as white, 23 percent identifying themselves as black or African American, nine percent identifying themselves as Hispanic or Latino, and three percent identifying themselves as Asian. The percentage of individuals below the poverty line in Pemberton Township is about nine percent, less than the national average of about 12 percent. The average household income in Pemberton ($47,394) was higher than the national average ($41,994).

Figure 11: Pemberton Township Population by Age and Gender, 2000



Source: U.S. Census Bureau, 2000

According to U.S. Census data from 2000, Pemberton had 10,778 housing units. Of the 10,050 occupied housing units, about 73 percent (7,380 units) were owner occupied, higher than the national average of 66 percent. The amount of rental properties is about 27 percent (2,670 units), lower than the national average of 34 percent. The average home in Pemberton Township was constructed in 1971. The median value of a single-family home in Pemberton Township in 2000 was $98,300, lower than the national average of $119,600. The population of Pemberton Township is concentrated in a number of different neighborhoods, including Browns Mills, Country Lake Estates, Pemberton Heights, Presidential Lake Estates, Fort Dix, Birmingham, the Preserve at Rancocas, Sunbury Village, Magnolia, New Lisbon, and Whitesbog. Some of these communities were described in the **Location, Size, and Land Use** chapter.

Transportation

Pemberton Township is located in a relatively accessible part of Burlington County. It is approximately 27 miles from Philadelphia and 22 miles from Trenton. The township is located between U.S. Route 206 along the township's western border with Eastampton, and NJ Route 70 along the southeastern border, which connects Pennsauken (Camden County) with Point Pleasant (Ocean County). A number of county routes cross through the township and connect Pemberton to neighboring townships. In addition to providing access to nearby commercial centers, these roads connect smaller residential streets within the township.

Accessibility to highways and other major roads is integral to the quality of life of Pemberton residents, as approximately 95 percent of the township's employed population commutes to work by automobile, according to the 2000 U.S. Census. The mean travel time to work for Pemberton residents is between 30 and 34 minutes, slightly higher than the New Jersey average of 28 minutes and the national average of 24 minutes. Just one percent of Pemberton residents rely on public transportation for their commute.

New Jersey Transit Bus 317 serves Pemberton Township, linking Philadelphia to Asbury Park, with two stops in Pemberton Township. The bus makes one stop at the Burlington Community College and another at the corner of Hanover and Elizabeth streets, before continuing along Route 530

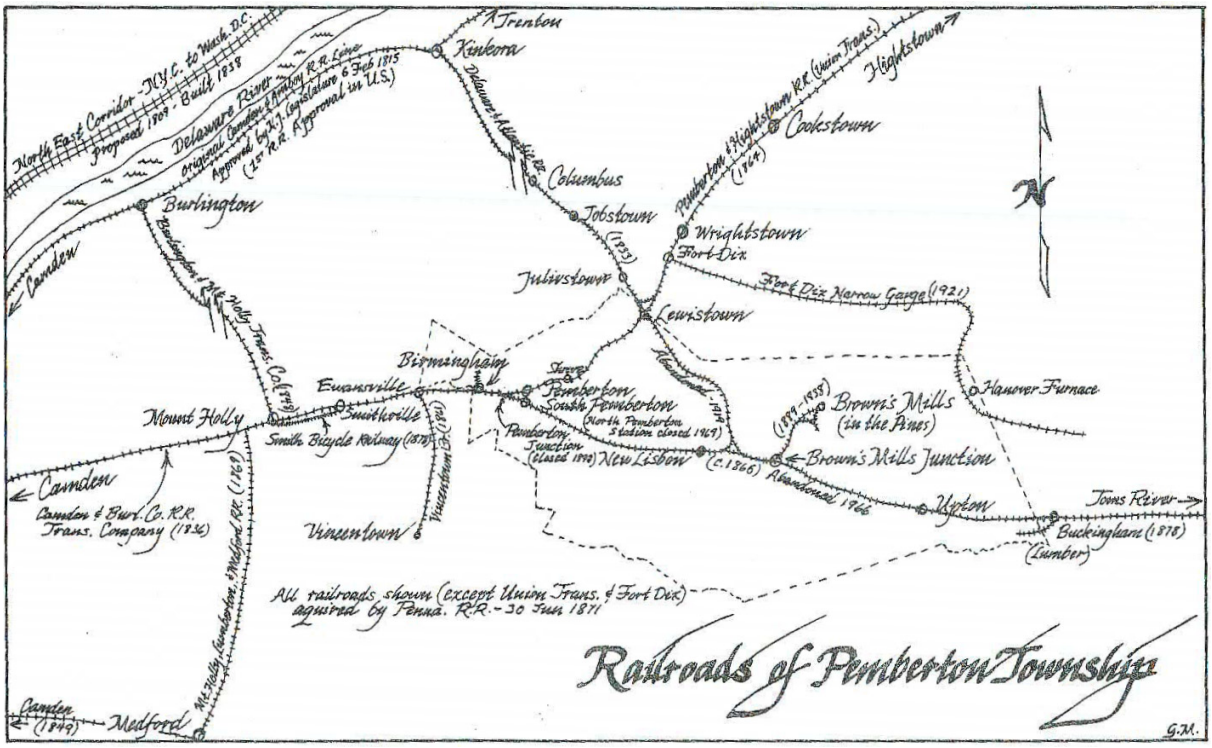
Burlington County offers the BurLink bus service, which connects with NJ Transit bus routes and River LINE stations. BurLink Route 1, connecting Beverly to Pemberton, has four stops in Pemberton Township. In addition, Academy Bus offers daily bus service from nearby Westampton, 15 miles east, to New York City.

Railroad history is preserved in Pemberton Township.

There is no direct access to NJ Transit's commuter rail in Pemberton Township. Moreover, there are no active passenger or freight rail lines in the township. Historically, there were a number of rail lines running through the township, including the Pemberton and Hightstown Railroad, which was in operation from 1868 through the late 1960s. The historic railroads of the township are shown in **Figure 12: Historic Railroads of Pemberton Township**. Although no longer active, the original Pemberton Station serves as a museum, and a 2.5-mile long stretch of the

railroad has been turned into a trail.

Figure 12: Historic Railroads of Pemberton Township



Source: Olsen, 1976

There are no public airports located in Pemberton Township. Pemberton Airport, a private airport owned by Metro Airways, is located within the township, south of North Pemberton Road. The closest major airports are in Newark and Philadelphia. The South Jersey Regional Airport, located in Lumberton eight miles west of Pemberton Township on Route 530, is one of the largest private airport facilities (also available for public use) in the country.

Although not within Pemberton, Interstate 295 provides high-speed access from Delaware to central New Jersey. The closest exit for I-295 is approximately 10 miles from Pemberton Township. Constructed in the late 1940s and early 1950s as a means to bypass Philadelphia along Interstate 95, the highway spurred southern New Jersey's accelerated population growth throughout the 1950s and 1960s.

Historic Resources

Pemberton Township has seven sites that are listed on the National and State Registers of Historic Places. These sites are the Birmingham School (destroyed by fire in July of 1993), Evergreen Park Mental Hospital (demolished), Fenwick Manor, Hanover Furnace, Benjamin Jones House, North Pemberton Railroad Station, and Whitesbog Historic District. These sites are shown on **Map 17: Historic Resources**.

Birmingham School, located on Birmingham Road, was listed on both the State and National Registers of Historic Places in 1992. Tragically, the school was destroyed by fire less than one year later in July of 1993.

Fenwick Manor was constructed in 1827 by Benjamin Jones, who operated the Hanover Furnace and established the Columbus, Kinkora, and Springfield Railroad. This country retreat was designed based on a pattern book of the day and was built in the Federal style. Today, the former home serves as the headquarters for the Pinelands Commission and was listed on both the State and National Registers of Historic Places in 1990.

Hanover Furnace (or Hanover Iron Furnace) dates from the 18th century and was used to forge iron for a great variety of uses, as discussed in the **History** section. Today, the site stands as a testament to the industrial past of the region and provides visitors with a deeper understanding of local history. This site was listed on the State Register in 1973 and the National Register in 1974.

The **Benjamin Jones House** (also known as Horner Farm, or Halstead) was built in 1830 by Benjamin Jones. The house has both Federal and Greek Revival features, including four cast iron columns made at Jones's Hanover Furnace. Although they are no longer standing, the property also once housed a grist mill and functioning farm. The building was listed on both the State and National Registers in 1982.

The North Pemberton Railroad Station is a registered historic site.

The **North Pemberton Railroad Station** was built in 1892 by John S. Rogers of Moorestown, New Jersey. The station features ornate Queen Anne architectural features, including a sweeping hip roof, trussed brackets, and broad gables on all four sides. The station was in continuous use until 1969, when the Pemberton and Hightstown Railroad eliminated its service between Pemberton and Camden. In 1976, ownership was transferred to Conrail. The station lay unused until it was renovated in 1999. Today, it houses the Pemberton Township Historical Trust (PTHT) and serves as the North Pemberton Railroad Station Museum. It features artifacts from the railroad, the local Native American population, and the regional blueberry and cranberry industries. There is also a 2.5-mile rail trail open to pedestrians and bicyclists. The building was added to the State Register in 1977 and the National Register in 1978.

The **Whitesbog Historic District**, located in both Burlington and Ocean counties, contains the relatively intact Whitesbog Village, including workers' cottages, the general store, a boarding house, a water tower, a school, the superintendent's house, and

"Suningive," Elizabeth White's home and gardens. As detailed in **Brief Township History**, James Fenwick developed Whitesbog and successfully cultivated cranberries on strip mine conditions left from the closed Hanover Furnace. At its height in the early 20th century, Whitesbog was the largest and most successful cranberry farm in the state. Whitesbog is historic for being the birthplace of the cultivated blueberry, which was developed with the help of Elizabeth White. The Whitesbog Historic District, including the property buildings, was added to both the state and national registers in 1988. The land, sites, and buildings at Whitesbog are restored and protected by the Whitesbog Preservation Trust, which offers historic and natural tours and other events throughout the year.

Evergreen Park Mental Hospital, located on Pemberton-Browns Mills Road (Route 530), was constructed by Burlington County in 1900 to serve as an asylum. Originally called the Burlington County Hospital for the Insane, it was added to a county complex that also included an almshouse for the poor. It ceased operations with the expansion of Buttonwood Hall, now known as Buttonwood Hospital. Evergreen Park Mental Hospital was issued a Determination of Eligibility (DOE) for inclusion in the State Register in 1988; however, the structure was later demolished.

Two other sites–Mirror Lake (and structures) and the John D. Rockefeller Memorial Highway–have been issued State Historic Preservation Office (SHPO) opinions, which review a site's eligibility for inclusion on the State Register of Historic Places. A SHPO Opinion is an opinion of eligibility issued by the State Historic Preservation Officer. It is usually issued in response to the filing of an Environmental Impact Statement (EIS) associated with a federally funded activity that will have an effect on historic properties not listed on the National Register.

Mirror Lake and Dam, along with the remains of its pump and power house, received a SHPO opinion in 1992. These structures were constructed in 1880 to create a reservoir. Mirror Lake Dam is a gravity dam made of earthen construction that is 18 feet tall and 750 feet long. The lake has a normal surface area of 215 acres and today serves as a recreational area for canoeing, swimming, and fishing. The remains of both the pump house and power house are still visible.

The **John Davison Rockefeller Memorial Highway Historic District** is also known as NJ Route 70. It runs from Pennsauken to Wall Township and is a two-lane highway through the Pine Barrens. The route connects to NJ Route 530 in Pemberton Township and runs in a general east-west direction, connecting Camden to the Atlantic Ocean. The road was planned in 1927 and constructed between 1930 and 1933. Named after the famous oil baron and philanthropist, it received a SHPO opinion in 2003.

These properties and historic districts all meet the New Jersey and National Register criteria for significance in American history, archaeology, architecture, engineering, or culture, and possess integrity of location, design, setting, materials, workmanship, feeling, and association. Other sites may have the potential to be listed as local, state, or national landmarks, but have not been nominated by local citizens or identified by SHPO for such a designation. See **Table 28: Historic Sites** for current listings.

Table 28: Historic Sites

Name	Location	State ID#	Register
State and National Registers of Historic Places			
Birmingham School	Birmingham Road	859	NR: 12/31/1992 SR: 11/2/1992 COE: 4/27/1992 (destroyed by fire, July 1993)
Fenwick Manor	15 Springfield Road	861	NR: 10/25/1990 SR: 9/7/1990
Hanover Furnace (Site)	Fort Dix, Hanover Lake Area	852	NR: 3/1/1974 SR: 6/15/1973
Benjamin Jones House	Pemberton-Browns Mills Road	862	NR: 11/30/1982 SR: 9/29/1982
North Pemberton Railroad Station	Hanover Street and Penn Central Railroad	863	NR: 5/23/1978 SR: 12/19/1977
Whitesbog Historic District	County Route 530, northwest of NJ Route 70	864	NR: 10/27/1988 SR: 6/17/1988
Eligible Sites for State and National Registers of Historic Places			
Evergreen Park Mental Hospital	Pemberton-Browns Mills Road (County Route 530)	3002	DOE: 7/18/1988 SHPO Opinion: 5/8/1987 (Demolished)
Mirror Lake and Dam, and remains of pump house and power house	Mirror Lake	3004	SHPO Opinion: 9/8/1992
John Davison Rockefeller Memorial Highway Historic District	NJ Route 70 (also in Southampton Township and Woodland Township)	4123	SHPO Opinion: 1/27/2003

NR: National Register of Historic Places
SR: State Register of Historic Places
SHPO: State Historic Preservation Office
COE: Certificate of Eligibility
DOE: Determination of Eligibility

Source: NJ State Historic Preservation Office, 2009

New Jersey municipalities are permitted to identify, designate, and regulate their own historic resources through the adoption of historic preservation ordinances (which are recognized as zoning laws under the New Jersey Municipal Land Use law). Responsibility to maintain the character of the historic properties within the township is carried out by the planning board and zoning board of adjustment, as outlined by the township codes. As official bodies of the township, the boards are responsible for conducting research on and nominating significant buildings and sites to the State and National Registers of Historic Places.

The National Park Service and the New Jersey SHPO jointly administer the Certified Local Governments (CLG) program, which provides technical assistance and funding for community-based preservation efforts. As of January 2009, only three municipalities in Burlington County–Burlington City, Evesham Township, and Mount Holly Township–are CLGs. To participate, municipalities must maintain a historic preservation commission, survey local historic properties, provide opportunities for public participation in preservation activities, and develop and enforce local preservation laws. If Pemberton Township were to become a CLG, it would be eligible to draw from an exclusive pool of matching federal and state funds for program implementation or rehabilitation work.

There are also federal incentives for individuals, organizations, or firms that own historic properties and are interested in historic preservation. Interested parties can take advantage of the Rehabilitation Investment Tax Credit, a federal tax incentive to encourage the preservation and reuse of older income-producing properties, including offices, apartment buildings and retail stores.

Investing in historic preservation efforts can provide a municipality with important and impressive returns. Private and public efforts to preserve and rehabilitate historic districts create attractive places to live, work, and play, and stimulate new investment in older residential and commercial centers. A historic district, like that in nearby Mount Holly, can become a regional draw for tourists and boutique customers. Furthermore, historic preservation maintains a municipality's character, distinctly separating it from other rural and suburban communities, for both new and established residents.

Cultural Resources and Open Space

Cultural and Civic Resources

There is a branch of the Burlington County Library system located in the Browns Mills section of Pemberton Township.

There are two non-profit historic organizations in Pemberton Township that preserve and interpret the rich history of the township. The Pemberton Township Historic Trust, a volunteer-run organization, collects and holds information on the community's historic resources. Members volunteer in the North Pemberton Railroad Station and the organization sponsors annual township events, including the Holiday Hayride, Day at the Station, Lantern Show, MS walk, volunteer picnic, and the Train, Toy and Collectible show. The historic North Pemberton Railroad Station, listed on both the New Jersey and National Registers of Historic Places, is open to the public and currently houses a museum of regional history.

The Whitesbog Preservation Trust is responsible for the restoration and protection of the buildings and land, and educates about the history, culture, and natural environment of Whitesbog. Visitors are welcome to take a five-mile driving tour of the village. An interpretive guide for the driving tour provides insights into the natural environment and

the impact of the past timber, iron, and agricultural industries on the land. Visitors can also explore the Old Bog Nature Trail and see the formal garden and natural vegetation of the site. There are special events held year-round at Whitesbog, including village tours, moonlight walks, tundra swan tours, nature walks, educational lectures, a blueberry festival, and a winter celebration.

Open Space and Recreation

As depicted in **Map 19: Open Space (2007)**, Pemberton Township has many large contiguous areas of preserved land, including state forest land, Fort Dix, preserved farmland, and other land owned by the municipality, county, non-profits, and other entities. There are also large areas of unpreserved farm-assessed land, both within and outside of the Pinelands. Depicted on this map are a great number of small parcels, many of which were sold with a subscription to *The Philadelphia Press* newspaper in1916, as described in the **Brief History** section on page 8. Currently, Pemberton Township is the owner of the vast majority of the unbuilt "newspaper parcels" shown on this map, which are interspersed with privately held developed lots. Also shown is a large unbuilt subdivision north of Presidential Lakes, which is forested land and is also mostly owned by Pemberton Township.

The parks and recreational amenities in the municipality are shown on **Map 20: Parks and Recreation (2010)**. These include sports facilities, canoe launches, trails, natural areas, and other resources. Pemberton Township has a Recreation Services Department that coordinates a range of programs. These programs include organized sports, before- and after-school programs, a winter parade, a summertime water carnival, public outdoor movie screenings, a nine-hole golf tournament, and other activities for residents of all ages.

There are over 200 acres of recreational land in Pemberton Township.

The Burlington County Parks and Recreation Department, headquartered in Eastampton, operates a park system with over 2,100 acres of parkland, including trails, recreational water access, picnic facilities, and play areas. This department maintains the Rancocas Creek Canoe Trail, which runs through Pemberton Township. There are two canoe launches in the township and one in Pemberton Borough that may be used to access the trail. One canoe launch is located at Burlington County College; the other, at Birmingham Road, is planned for future access. Clark's Canoe Rental, located within Pemberton Borough, also serves as a canoe launch.

Mirror Lake, Little Pine Lake, Country Lakes, Presidential Lakes, Lake Pemberton, and any accompanying beaches are zoned as recreational areas by the township. In these designated areas, visitors are allowed to swim, fish, and operate non-motor-propelled boats. Lake Pemberton Park, Sunbury Community Park, the Ball Park, and Newcomb Park are also open to the public for recreational activities.

Recreation fields on school properties are also a part of the community's recreation amenities and are often well used after school hours by people of different age groups. The municipal Recreation Services Department works in cooperation with the Pemberton Township Board of Education to coordinate the use of indoor and outdoor facilities for the township's sports programs.

There are 205.5 acres of land in the township that are dedicated to recreational use. This equates to approximately 136 people per acre and includes 68.3 acres of recreational land, 1.9 acres of beaches, and 135.3 acres of school playing fields.

Pemberton Township is home to numerous large lakes and navigable streams. Prominent bodies of water include Hanover Lake, Mirror Lake, Country Lake, the Presidential Lakes, Lake Pemberton, Jacks Run, and the Rancocas Creek North Branch. Boating, swimming, and fishing are all common sights on the lakes and creeks.

The Pemberton Rail-Trail is a three-mile biking and pedestrian trail located on a former rail line. This trail extends from the historic North Pemberton Rail Station to Juliustown, Springfield Township. The Pemberton Rotary Club was instrumental in planning, developing, and maintaining this rails-to-trails project. The planned Kinkora-Pemberton Rail-Trail would extend this trail to Florence Township.

In addition, the Municipal Complex, West End Recreational Building, Senior Citizens Complex, and Community Center at Sunbury Village provide space for residents.

In July 2009, The Pemberton Township Planning Board approved measures to develop the northern, non-Pinelands region of the township. The approval of this new master plan encourages future development, including authorization of residential and commercial development of the Greenberg Dairy Farm on North Pemberton Road, where a complex for residents aged 55 and older is planned. The planning board is making provisions for future additional recreational space in these areas.

The Pemberton Rail-Trail

Township Utilities and Services

Drinking Water

The Pemberton Township Water Department supplies public drinking water to residences in most of Browns Mills, the majority of Country Lakes, and Lake Valley. The Pemberton Township Water Department purchased the stand-alone Lake Valley Water Company in 2005 to serve that area. The New Lisbon water system is a stand-alone system owned by Burlington County, although managed by the Pemberton Township Water Department. The Pemberton Township Water Department also serves communities within Pemberton Borough, including Johnson Court (formerly known as Pemberton Heights), Sheldon Road, and Arneys Mount Road. Both the Hilltop Mobile Home Park and Skipper's Mobile Home Park have emergency interconnections with the public water system. Sunbury Village and the adjacent Baker Residential community receive drinking water from the private company New Jersey American Water. Homes in Presidential Lakes and the far southwest side of Country Lakes depend upon private wells for drinking water supply.

The three public water supply systems (New Lisbon, Lake Valley, and the Main Supply), operated by the Pemberton Township Water Department, operate a total of nine wells within the township that tap either the Englishtown or the Mount Laurel-Wenonah aquifers. The Water Department used to operate a 10th well in the township, although this well (Well #11) was closed following a violation reported in the 2009 Annual Drinking Water Quality Report. This well, which tapped the Englishtown aquifer, exceeded the Maximum Contaminant Level (MCL) for Combined Radium, most likely due to erosion of natural deposits. All other wells of the Pemberton Township Water Department had no violations for contaminants.

The New Lisbon Water System (identified as "Burlington County Institutions" in data on water supply wells) utilizes three wells in Pemberton Township, all of which draw groundwater from the Englishtown aquifer. These wells were completed in 1956, 1970, and 1972. There are two wells used by the Lake Valley Water Company for their drinking water sources. Both wells tap the Mount Laurel-Wenonah aquifer and were completed in 1967 and 1982. Lastly, the Pemberton Township Water Department (also referred to as "Main Supply") operates six wells, five of which draw from the Mount Laurel-Wenonah aquifer and one that draws from the Englishtown aquifer.

See the section on **Groundwater** (page 59) for more information about the groundwater and water supply wells in Pemberton Township.

Sewer Service

The Pemberton Municipal Utility Authority (MUA) provides sewer collection service to some developed areas in Pemberton Township. The municipal sewer service area is shown in **Map 18: Approved Sewer Service Area and NJPDES Permits (2008)**. There are 17 pumping stations in Pemberton, and the MUA maintains over 200 miles for piping. The MUA does not currently have any plans for major infrastructural improvements to the

sewer system. The treatment facility of the MUA, located on Birmingham Road, was one of the first sludge treatment facilities in Burlington County. The Pemberton MUA treatment facility is rated to treat up to 1.76 million gallons per day (mgd), and has a design capacity of 2.50 mgd. All sludge is treated on site and the cleaned fluid is discharged on the 260 acres of on-site farmland.

The Pemberton Township School District maintains and operates its own sewage treatment plant, which is not connected with the Pemberton MUA. Sybron Chemical Plant recently abandoned its sewage treatment facility on Birmingham Road and decommissioned its sewage plan. Sybron is in the process of removing the plant, which has possible contamination issues.

Pemberton Township's Natural Resources Inventory, which was prepared in the 1970s, discusses the groundwater contamination in Presidential Lake Estates caused by septic systems and states that extending sewer service to this area should be a high municipal priority. To date, this area still does not have sewer service, and so the Kirkwood-Cohansey aquifer remains vulnerable to contamination from septic systems, thus threatening public health from contaminated drinking water wells. The NJDEP and Pinelands Commission have precluded the extension of sewer and water infrastructure in the Presidential Lakes area in the interest of discouraging additional growth in the area.

Trash and Recycling

Pemberton Township does not have a municipal solid waste management department, but instead contracts with a sanitary company every five years to manage trash collection. Curbside municipal trash service is available in Pemberton on a twice-weekly basis for single-family detached homes. Large-scale commercial and residential developments are not served by this company, and instead must contract with a private company to remove their solid waste. Residents must schedule pickup for appliances. Recycling–including glass bottles and jars, aluminum and steel food and beverage cans, empty aerosol cans, plastic bottles, newspaper, and cardboard–is picked up by Burlington County twice a month. The Burlington County Hazardous Waste Facility accepts all hazardous materials (including asbestos, silvex, and pentachlorophenol), with the exception of radioactives, cylinders, and explosives.

In addition, Pemberton has a fall leaf pickup. During these times, residents are able to rake and pack leaves in bags not to exceed 30 pounds in weight. Depending on their area, the bags will be collected curbside from early November to late December. NJDEP stormwater regulations forbid the placement of leaves within 10 feet of a storm drain. At other times of the year, residents can dispose of leaves and yard waste by securing them in bags and taking them to the Public Works Yard.

Hazardous materials–such as paints, oil, asbestos, gasoline, pesticides, and fertilizer–can also be disposed of at the Resource Recovery Center (EcoComplex), a specially equipped landfill in Westampton/Florence Township, Burlington County.

The Pemberton Township Public Works Department is responsible for road maintenance, street sweeping, snow removal, leaf and brush collection, maintenance of all township buildings and recreation areas, and mowing and maintenance of all township open space.

Education

Pemberton Township has nine public elementary schools: Samuel T. Busansky School, Aletta Crichton School, Alexander Denbo School, Howard L. Emmons School, Fort Dix Elementary School, Isaiah Haines School, Harker-Wylie Elementary School, Marcus Newcomb Elementary School, and Joseph A. Stackhouse School. There is also one public middle school and one public high school in the township: Helen A. Fort Middle School and Pemberton Township High School. In 2008, the Pemberton Township School District educated over 5,000 students. There are no private schools in Pemberton Township.

A New Early Childhood Center is currently under construction and is expected to open in January 2011. This center will serve approximately 640 students in pre-kindergarten and kindergarten.

Additionally, both the Evening High School and the Burlington County Alternative High School, which educate approximately 75 students, are located within Pemberton Township.

In addition, Pemberton Township is home to a campus of the Burlington County College (BCC), an accredited two-year public community college. The school awards associate's degrees as well as vocational certificates. The other main campus of BCC is located in Mount Laurel, and these two campuses combined serve approximately 8,500 full- and part-time students. BCC is also home to the Burlington County Police Academy. The Academy offers a 22-week basic course certificate for police officers twice a year. The Pinelands Institute for Natural and Environmental Studies (PINES) is a program of BCC that operates in conjunction with the Brendan T. Byrne State Forest to provide educational programs on the natural and cultural history of the Pinelands. These programs include specialized tours, educational workshops and courses, school field trips, and other special events.

New Jersey State Plan

The New Jersey State Development and Redevelopment Plan (the State Plan) is a policy guide to be used by state, regional, and local agencies to increase the consistency of planning efforts. The State Plan provides a vision for the comprehensive development of the state. Municipal, county, and regional plans will be reviewed by the State Planning Commission to evaluate consistency with the State Plan. Within the state, areas outside the Pinelands are divided into six planning areas by the State Plan. Each planning area reflects varying levels of development, infrastructure capacity, and presence of natural

resources. Within Pemberton Township, the area outside the Pinelands is within the Rural Planning Area (PA4), which designates an area for limited growth.

In addition to planning areas, the State Plan has designated Centers where growth should be concentrated. There is a designated Center of “Pemberton” that encompasses Pemberton Borough and a non-Pinelands area of Pemberton Township. In addition, the Center of “Juliustown,” located in Springfield, is located just to the north of the township. See **Map 21: State Plan (2001)** for a depiction of the State Plan planning areas and centers in Pemberton Township.

Within the Pinelands, land is divided into Pinelands Management Areas designated by the Pinelands Comprehensive Management Plan. There are eight different Pinelands Management Areas within Pemberton Township, described in the adjoining text box.

Pinelands Management Areas

Preservation Area: This is the heart of the Pinelands environment and the most critical ecological region. No residential development, except for one-acre lots in designated infill areas and special "cultural housing" exceptions. Limited commercial uses in designated infill areas.

Special Agricultural Production Area: These are areas primarily used for berry agriculture and horticulture of native Pinelands plants. Only residential farm-related housing on 40 acres and expansion of existing nonresidential uses are permitted.

Forest Area: This is a largely undeveloped area that is an essential element of the Pinelands environment. It contains high quality water resources and wetlands and provides suitable habitat for many threatened and endangered species. Permitted residential densities average one home for every 28 acres.

Agricultural Production Area: These are areas of active agricultural use. Farm-related housing on 10 acres and nonfarm housing on 40 acres are allowed. Permitted nonresidential uses are agricultural commercial and roadside retail within 300 feet of preexisting commercial uses.

Rural Development Area: This is a transitional area that balances environmental and development values between conservation and growth areas. Limited, low-density residential development and roadside retail are permitted. Residential densities average one home for every five acres.

Military and Federal Installation Area: Federal enclaves within the Pinelands. Permitted uses are those associated with the function of the installation or other public purpose uses.

Pinelands Villages: Small, existing, spatially discrete settlements that are appropriate for infill residential, commercial, and industrial development compatible with their existing character. Residential development is permitted on minimum one-acre lots if not sewered.

CHAPTER 7

Environmental Issues

Conservation Areas

Throughout Pemberton Township, in addition to those areas critical for agricultural production, historic preservation, recreation, and quality of life, there are also areas that have been designated as having particular significance for sensitive wildlife and ecological communities.

The **Brendan T. Byrne State Forest and Whitesbog Important Bird Area** (IBA), discussed in the **Birds** section of the **Biological Resources** chapter, is a large, contiguous forested area that provides habitat for rare birds, including Red-headed Woodpeckers, a threatened species in New Jersey. Most, but not all, of this IBA is protected land owned by the State of New Jersey.

The **Whitesbog Roadside** and **Whitesbog Village Sandhill Natural Heritage Priority** (NHP) sites, discussed in the **Natural Heritage Program** section of the **Biological Resources** chapter, contain globally rare or imperiled plant species. The specific species are not identified to protect the sites from vandalism or theft. These NHP sites are located on both public and private land.

The **Pemberton Lake Wildlife Management Area** (WMA) is located on nearly 82 acres of publically owned land around and including Pemberton Lake. This area, like most WMAs, provides opportunities for the public to engage in wildlife-oriented recreational activities like bird-watching, wildlife observation and photography, and fishing, although firearm hunting is not permitted.

Wood Turtle Critical Habitat and **Bald Eagle Foraging Areas** have also been identified in Pemberton Township. As seen in **Appendix D: Rare Wildlife Documented in Pemberton Township**, these are certainly not the only threatened, endangered, or otherwise rare animals that are found in Pemberton Township, although they are the only two with mapped areas essential to their viability.

Known Contaminated Sites

The New Jersey Known Contaminated Sites List includes former factory sites, landfills, locations of current or former leaking underground storage tanks; sites where chemicals or wastes were once routinely discharged; and places where accidents have resulted in spills

and pollution. Contamination may have affected soil, groundwater, surface water, or a combination of site conditions. The most dangerous sites, from a human health standpoint, are listed on the National Priorities List (NPL) under the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLA is commonly referred to as “Superfund” because sites on the NPL are eligible for federal and state cleanup funds. Other sites may be remediated by state cleanup funds (via the New Jersey Spill Compensation and Control Act), while the majority of sites are remediated by the responsible parties as required pursuant to state and federal regulations.

As of June 2010, there are 23 Known Contaminated Sites in Pemberton Township, which are listed in **Table 29: Known Contaminated Sites**. See **Map 23: Known Contaminated Sites (2009)** for the locations of non-home-owner contaminated sites as of 2009. Known Contaminated Sites are active sites with confirmed contamination of the soil, groundwater, and/or surface water. Active sites are those sites having one or more active cases, with any number of pending and closed cases. These sites include private residences, two landfills, garages, gas stations, a hospital, a shopping center, and other locations. Exact addresses of private residences have been removed for confidentiality.

Table 29: Known Contaminated Sites

Site ID	PI Number	PI Name	Address	Home Owner
371095	459204	Trenton Road	Trenton Rd	Yes
75354	G000043558	Spruce Boulevard	Spruce Blvd	No
174756	229172	3rd Avenue	3rd Ave	Yes
368173	455437	Scrapetown Road	Scrapetown Rd	Yes
405633	507726	Bayberry Street	Bayberry St	Yes
396992	496718	Goodwater Avenue	Goodwater Ave	Yes
10610	006599	Browns Mill Shell	2 Lakehurst Rd	No
56957	032109	Browns Mills Shopping Center	101 Pemberton Browns Mills Rd	No
48318	018280	Bus Garage	150 Juliustown Browns Mills Rd	No
39876	000443	Buttonwood Hospital	600 Pemberton Browns Mills Rd	No
56160	030584	Earlines Garage	107 Trenton Rd	No
27981	293072	Fort Dix Groundwater Contamination	Fort Dix	No
93729	293072	Fort Dix Groundwater Contamination	Browns Mills Rd	No
93729	G000000024	Fort Dix Landfill	Browns Mills Rd	No
58226	232974	Hilltop Mobile Village	304 Trenton Rd	No

Site ID	PI Number	PI Name	Address	Home Owner
375618	465531	Imagination Kingdom Playground	559 Pemberton Browns Mills Rd	No
10601	G000004422	Lang Property	City Line Rd	No
10606	002815	MB Oil Corp	227 Pemberton Browns Mills Rd	No
173420	227536	Pemberton Active Adult Community	Spilt Rock Rd	No
48026	031007	Pemberton Borough	71 Elizabeth St	No
63777	G000004436	Pemberton Township Landfill	Whites Bogs Pasadena Rd	No
45791	023811	Pemberton Twp Municipal Complex	500 Pemberton Browns Mills Rd	No
14685	006168	Sybron Chemicals Inc	200 Birmingham Rd	No

Source: NJDEP, June 2010

In addition to the 23 active locations, there are five pending sites with confirmed contamination, listed in the table below.

Table 30: Pending Known Contaminated Sites

Site ID	PI Number	PI Name	Address	Home Owner
10641	007560	Emmons School	14 Scrapetown Rd	No
63952	G000005895	Busters Junkyard	1572 Pepper Rd	No
64192	G000009546	Belasco Petroleum Company	Rt 668 & 616	No
64283	G000010416	701 Lakeshore Drive North	701 N Lake Shore Dr	No
308669	G000011606	33 Drexel Avenue	33 Drexel Ave	No

Source: NJDEP, June 2010

Thirty-six hazardous waste sites in Burlington County have been nominated for the National Priority List (NPL), more commonly referred to as Superfund sites. Fourteen of these sites in the county are currently on the NPL, meaning they pose a major human health hazard and are in need of federal funds for cleanup. Of those 14 sites, two are located in Pemberton Township: the Fort Dix Landfill site and the Lang Property (listed in **Table 29: Known Contaminated Sites**).

The Fort Dix Landfill site (EPA ID: NJ2210020275) is located on Juliustown-Brown Mills Road in Pemberton Township and has been on the NPL list since 1987. Municipal refuse was dumped in a 126-acre site on the Army Base, as well as in an adjoining grease pit, from 1950 until 1984. In addition to the Landfill Site, the Fort Dix complex is also home to several non-Superfund contaminated areas, including two groundwater contamination

sites listed in **Table 29: Known Contaminated Sites**. The Army is the responsible party for the Fort Dix cleanup and has been conducting the remediation. As of June 17, 2010, the EPA states that both current human exposures and contaminated groundwater migration are under control, and that there is no reported contamination threat to surrounding areas.

The Lang Property (EPA ID: NJD980505382) is a 10-acre dump site in Pemberton Township and has been on the NPL list since 1983. The dumping ground is just outside of the Brendan T. Byrne State Forest and is in close proximity to residential properties. Roughly 1,500 drums of chemical waste were emptied onto the grounds of this site, causing contamination of the soils and groundwater. The primary concern is over ground water contamination, which was determined to be present by the EPA in 1979. More than 20 private wells are within a one-mile radius of the property, as well as the Cohansey aquifer, which supplies over 13,000 area residents with drinking water. The backup well system for Pemberton is also less than three miles from the site. Site remediation began in 1988, including the removal of 13,200 tons of contaminated soil. A groundwater remediation system was put in place by 1995, including three extraction wells and a treatment plant building. The EPA conducted a Five-Year Review Report in 2005, with data sampling indicating that, with the exception of very shallow groundwater, the aquifer was near complete remediation. Remediation actions continue to address the contaminated shallow groundwater and subsurface soils. The next EPA report on the Lang Property will be conducted in September 2010.

Underground Storage Tanks

As of November 2009, there are seven active and compliant sites in Pemberton Township with regulated underground storage tanks that contain hazardous substances, pursuant to N.J.A.C. 7:14B et seq. They are listed in **Table 31: Active and Compliant Underground Storage Tanks**. If there is a known release to soil and/or groundwater, a site will also be listed on **Table 29: Known Contaminated Sites**. There may also be private residences in Pemberton Township that still have underground storage tanks, used primarily to hold home-heating oil. As these tanks age and rust, they often begin to leak, which becomes a serious threat to the groundwater below them. Those private residences are not publicly listed by NJDEP unless they pose a human health hazard. See **Appendix F: Known Contaminated Sites** for a list of all tanks in the township, including terminated sites where tanks have been removed.

Table 31: Active and Compliant Underground Storage Tanks

Facility ID	Facility Name	Street Address	Expiration Date
18280	Bus Garage	150 Juliustown Rd	3/31/2010
443	Buttonwood Hospital	600 Pemberton & Browns Mill Rds	3/31/2010
2815	MB Oil Corp	227 Pemberton Browns Mills Rd	3/31/2010
728	Mike Citgo	40 W Hampton St	3/31/2010
30441	M&T Inc	538 Lakehurst Rd	3/31/2010
6163	Pemberton Gasco	2 Arneys Mount Rd	3/31/2010
23811	Pemberton Twp Municipal Complex	500 Pemberton-Browns Mills Rd	3/31/2010

Source: NJDEP, November 2009

There are six sites in Pemberton Township where there is active remediation of underground storage tanks, shown in **Table 32: Underground Storage Tanks with Active Remediation**. Three of these sites undergoing remediation of former tanks also have active and compliant underground storage tanks.

Table 32: Underground Storage Tanks with Active Remediation

PI Number	PI Name	Street Address	Bureau
32109	Browns Mills Shopping Center	101 Pemberton Browns Mill Rd	BUST
18280	Bus Garage	150 Juliustown Rd	BUST
443	Buttonwood Hospital	600 Pemberton & Browns Mill Rds	BUST
30584	Earlines Garage	107 Trenton Rd	BUST
232974	Hilltop Mobile Village	304 Trenton Rd	INS
23811	Pemberton Twp Municipal Complex	500 Pemberton-Browns Mills Rd	BUST

BUST: Bureau of Underground Storage Tanks - (609) 292-8761

INS: Initial Notice Section (now BCAIN) - (609) 292-2943

Source: NJDEP, November 2009

Mirror Lake Lead Threat

In March 1999, the NJDEP conducted a Sediment Toxicity Test at AMNET site “North Branch Rancocas Creek at the outlet of Hanover Lake” (AMNET site AN0143), located in Pemberton Township. The results of the test demonstrated that the water exhibited “acute toxicity,” as shown by the survival rates of test organisms. The report theorized that the toxicity may have been caused by the presence of heavy metals, notably lead, citing a

sediment sampling report conducted in November 1998. The lead levels reported for the Pemberton site were 6,970 mg/Kg (PPM). It was noted that this contamination of Hanover Lake may have been due to bullet fragments from the Fort Dix firing range. Because heavy metals were found in Gaunt's Brook, which extends from the base into Mirror Lake, further investigation was warranted.

Shortly thereafter, the NJDEP funded an emergency sampling at Mirror Lake in order to ensure that there was no immediate health hazard to swimmers and/or fishermen. The NJDEP's Division of Publicly Funded Site Remediation sent a sampling team to collect water, sediment, and fish samples from the lake. The NJDEP concluded from the samples that the levels of lead in Mirror Lake did not present any immediate health hazards, either to bathers or to anyone consuming fish caught in the lake. Fort Dix subsequently agreed to further investigate the pollution of Hanover Lake and any associated waterbodies, and to remediate any contamination of the dam and stream sediments (all under the supervision of the EPA). As of February 2010, the EPA reported that these actions were funded and in progress.

In 2008, as described in the section **New Jersey's Integrated Water Quality Monitoring and Assessment Report** (page 42), several subwatersheds in Pemberton were listed as impaired by numerous parameters, including lead. Mirror Lake and Hanover Lake are located within the Rancocas Creek North Branch subwatershed, which is impaired by six different sources: pH, phosphorous, E. Coli, copper, mercury, and lead. This subwatershed does not attain four designated uses: Aquatic Life (General), Drinking Water Supply, Fish Consumption, and Recreation. The designated use of Recreation refers to the suitability of a waterbody for recreation either on or in the water. As the subwatershed is impaired for the designated use of Fish Consumption, the NJDEP Division of Fish and Wildlife recommends limiting the consumption of certain types of fish caught in Mirror Lake; see **Table 15: Fish Consumption Advisories**.

Radon

Radon is a radioactive gas that comes from the natural decay of uranium found in nearly all soils. It is invisible, odorless, and tasteless. It moves up through the ground to the air above and into all types of homes through cracks and other holes in foundations. A build-up of radon-contaminated air within a home can pose a long-term health hazard to residents, specifically for lung cancer. The only method of detection is to conduct a test of the air within a home. Fortunately, radon testing is inexpensive. All radon test results conducted in the state are reported to NJDEP by certified companies, which perform the tests or manufacture the test kits. This data is used to classify municipalities into a three-tier system, which identifies the potential for homes with indoor radiation problems.

NJDEP classifies municipalities into three categories according to the potential for indoor radon problems: high (Tier 1), moderate (Tier 2), and low (Tier 3). Pemberton Township is classified as a Tier 2 municipality, indicating a moderate risk of high radon levels in homes. The average indoor radon level in the United States is about 1.3 picoCuries per liter (pCi/L). At the level of 4 pCi/L, NJDEP recommends a homeowner consider steps to

reduce long-term exposure to radon gas. If radon levels are high in a home, NJDEP suggests that the homeowner take the following actions: (1) prevent radon from entering the house by repairing cracks and insulation; and (2) dilute radon concentrations currently in the house by installing a radon extraction system and/or frequently ventilating indoor air.

NJDEP provides information on testing, mitigation, radon's health effects, and additional information on their website at www.njradon.org. Free information packets are available upon request. The NJDEP can also be reached for radon-related questions by phone at 800-648-0394. All companies conducting radon testing and mitigation are certified by NJDEP and are listed on their website.

Other Environmental Concerns

Dam Maintenance

There are 15 dams located in Pemberton Township, which are listed in **Table 33: Dams** and shown on **Map 8: Surface Water, Wetlands, and Vernal Pools**. The Bisphams Mill Dam, which was located in Presidential Lakes just outside Pemberton's borders in Woodland Township, was removed in 2006.

Table 33: Dams

Dam Name	Federal ID	Class	Stream	Height (Ft)	Length (Ft)	Ownership
Bayberry Street Dam	-	III - Low	Jacks Run	-	-	Public
Birmingham Dam	-	Unclassified	North Branch Rancocas Creek	3.0	150	Private
Birmingham Dam	-	Unclassified	North Branch Rancocas Creek	4.0	60	Private
Country Lake #1 Dam	NJ00050	II - Significant	Pole Bridge Branch	13	580	Public/Private
Country Lakes #3 Dam	NJ00052	II -Significant	Cranberry Branch	13	300	Public/Private
Country Lakes Lower #2 Dam	NJ00051	III - Low	Pole Bridge Branch	16	307	Private
Hanover Lake Dam	NJ00459	I - High	Hartshorne Mill Stream	8	300	Public
Jade Run Dam	-	Unclassified	Jade Run	-	-	Private
Lebanon Forest #1 Dam	NJ00592	II - Significant	Bisphams Mill Creek	10	900	Private
Lebanon Lake Dam	NJ00812	II - Significant	Bisphams Mill Creek	10	925	Public/Private
Mirror Lake Dam	NJ00458	I - High	Rancocas Creek	18	750	Public

Dam Name	Federal ID	Class	Stream	Height (Ft)	Length (Ft)	Ownership
Mt. Misery Dam	NJ00759	II - Significant	Mt Misery Brook	10	325	Private
New Lisbon Dam	-	Unclassified	Greenwood Branch	-	-	Public
New Lisbon Mill Dam	NJ00601	Unclassified	North Branch Rancocas Creek	15	300	Private
Pine Mill Lake Dam	NJ00049	III - Low	Jacks Run	18	300	Public

Source: NJDEP, 2000

Although the lakes created by these dams provide recreational opportunities, wildlife habitat, and scenic views, they require consistent monitoring and maintenance. Dam failures can cause catastrophic property damage and loss of life. Within New Jersey, dams that raise the waters of a stream more than five feet are under state jurisdiction and are regulated under the Safe Dam Act. New Jersey's Dam Safety Program administers the rules and regulations of this act to ensure the safety and integrity of dams in New Jersey.

There are four hazard classifications of dams relating to their potential for property damage and loss of life in case of failure. These four categorizations are: Class I (High-Hazard Potential), Class II (Significant-Hazard Potential), Class III (Low-Hazard Potential), and Class IV (Small-Dam Low-Hazard Potential). As seen in the table above, of the 15 dams in Pemberton Township, two–Hanover Lake Dam and Mirror Lake Dam–are categorized as being high hazard dams. All high and significant hazard dams require an Emergency Action Plan (EAP), which must be reviewed by the NJDEP and updated annually. Class I dams must be regularly inspected annually, Class II and III dams are inspected every two years, and Class IV dams are inspected every four years.

There are 15 dams in Pemberton Township.

CHAPTER 8

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2009 Monitoring Schedule of Public Community Water Supply Systems H-1

2009 Monitoring Schedule of Public Non-Community Water Supply Wells H-5

APPENDIX A

Federal and State Conservation Programs for Farmers

Federal Programs

The **Conservation Reserve Program (CRP)** is offered by NRCS and administered by the Farm Service Agency. It provides technical and financial aid and gives farmers assistance in complying with federal, state, and tribal environmental laws. The program encourages farmers to convert highly erodible or environmentally sensitive cropland to vegetative cover, such as native grasses, filter strips, or riparian buffers. In exchange, farmers receive rental payments for enrolled land, as well as financial assistance for implementing and maintaining conservation practices.

The State of New Jersey partnered with the USDA to help farmers protect water quality by establishing a $100 million **Conservation Reserve Enhancement Program (CREP)**, which is the New Jersey version of the federal program**.** Under a joint agreement between the USDA and State of New Jersey, $100 million in funding has been provided for New Jersey farmers to install stream buffers in order to reduce the flow of nonpoint source pollution into the state's waterways. Types of buffers to be installed include trees, shrubs, vegetative filter strips, contour grass strips, and grass waterways. Under the program, a landowner installs and maintains approved practices through a 10- or 15-year rental contract agreement. A landowner entering the state Farmland Preservation Program or Green Acres Program also may opt for a permanent easement under the Conservation Reserve Enhancement Program. This would provide additional payment for permanent maintenance of approved conservation practices. The program will pay landowners annual rental and incentive payments for participating in the program, as well as 100 percent of the cost to establish approved practices. Additional information can be found at www.fsa.usda.gov, or contact the local Farm Services Agency (FSA) Office or Soil and Water Conservation District Office.

Another program targeted for wetlands preservation is called the **Wetlands Reserve Program (WRP)**. WRP is a voluntary resource conservation program that provides landowners with the opportunity to receive financial incentive to restore, protect, and enhance wetlands in exchange for returning marginal land from agriculture. WRP is made possible by a reauthorization in the Food, Conservation and Energy Act of 2008, known as the Farm Bill. The program has three enrollment options: permanent easement, 30-year easement, or restoration cost-share agreement, which has a minimum 10-year

commitment. Applications are accepted on a continuous basis and may be obtained and filed at any time.

The **Grassland Reserve Program (GRP)** is another conservation program authorized by the 2008 Farm Bill. GRP is a voluntary program that protects grasslands, pasturelands, and rangelands without prohibiting grazing. Participants voluntarily put limitations on the future use of their land while retaining the ability and right to conduct grazing practices, produce hay, mow or harvest for seed production, conduct fire rehabilitation, and construct firebreaks and fences. There are four enrollment options: permanent easement; 30-year easement; rental agreement, which is available in 10-, 15-, 20-, or 30-year contracts; and restoration agreement. Participants are compensated in different ways according to the enrollment option.

The **Wildlife Habitat Incentives Program (WHIP)** is another USDA voluntary program that targets landowners who want to preserve and protect fish and wildlife habitat on nonfederal lands. WHIP applicants develop a plan of operations, outline conservation practices, and implementation schedules. The NJ State Conservationist, in conjunction with the State Technical Committee, identifies and prioritizes plans that complement the goals and objectives of relevant fish and wildlife conservation initiative at the state, regional, and national levels. If selected, a plan forms the basis of a cost-share agreement, lasting between one to 10 years. NRCS will pay for up to 75 percent of costs of implementing conservation practices that protect fish and wildlife habitat. For beginning farmers, socially disadvantaged or limited resource producers, NRCS will pay for up to 90 percent of costs. In New Jersey, a state plan has been developed that targets a number of priority habitat areas: pollinator habitat, grasslands habitat, disturbance-dependent habitat, bog turtle priority species habitat, wetland habitat, and Delaware Bay priority habitat.

The **Environmental Quality Incentives Program (EQIP)** is also a part of the reauthorized Farm Bill of 2008. EQIP is a voluntary program that focuses on conservation that promotes both agricultural production and environmental quality. The program itself offers technical and financial assistance with installation and implementation of structural and management practices on agricultural land. EQIP features a minimum contract term compared to other programs, lasting a maximum of 10 years. Landowners are eligible for incentive and cost-share payments of up to 75 percent and sometimes up to 90 percent, while still engaging in livestock or agricultural production activities.

The **Conservation Stewardship Program (CSP)** is a voluntary program administered by the NRCS that replaces the Conservation Security Program. This program is intended to promote conservation and improvement of soil, water, air, energy, plant and animal life, etc. on tribal and private working lands. Working lands refer to a variety of land types, including cropland, grassland, prairie land, improved pasture, and range land. In some cases, forested lands would also be included in this category. CSP is available in 50 states, as well as the Caribbean and Pacific Basin areas, and provides equal access to funding.

The **Farm and Ranch Lands Protection Program (FRPP)** is a voluntary land conservation program that assists farmers in keeping their lands for agricultural purposes. FRPP provides matching funds to those provided by state, tribal, local government, or

nongovernment organizations, offering farm and ranch protection programs designed to purchase conservation easements. The FRPP is managed by the NRCS. Conservation easements are purchased by the state, tribal, or local entity. A participating landowner agrees not to convert his or her land to nonagricultural uses, and to develop a conservation plan for any highly erodible lands. Landowners do, however, maintain all of their rights to utilize their land for agricultural purposes.

The federal Environmental Protection Agency (EPA) offers the **Strategic Agricultural Initiative**, an outreach program designed to demonstrate and facilitate the adoption of agricultural management practices that will enable growers to transition away from the use of high-risk pesticides. Funds are provided to projects that develop agricultural management practices that offer risk reductions to human health and the environment.

The EPA also offers the S**ource Reduction Assistance Program**, which prioritizes water conservation and the minimization of chemicals of concern, such as pesticides, endocrine disruptors, and fertilizers.

The U.S. Fish and Wildlife Service offers technical and financial assistance to private landowners through the **Partners for Fish and Wildlife** program. The owners restore wetlands, streams, and river conditions, as well as other important fish and wildlife habitat, for federal trust species.

State Programs

The **Landowner Incentive Program (LIP)** is a preservation program for private landowners who wish to protect and conserve rare wildlife habitat and species. LIP is funded by the U.S. Fish and Wildlife Service and is administered by NJDEP's Division of Fish and Wildlife and Endangered Nongame Species Program. Participating landowners receive both technical and financial assistance through this competitive grant program. Generally, a five-year minimum commitment is required, and longer terms are preferred. A 25 percent cost-share is required of the landowner. While the LIP is seeking funding for additional habitat protection projects, it may be another year before grants are available.

The **State Agricultural Development Committee (SADC) in New Jersey** has made soil and water conservation grants available as part of the Farmland Preservation Program. The grants give landowners up to 50 percent of the funds required for approved soil and water conservation projects. Farms are only eligible if they are already enrolled in a permanent or eight-year easement program. Soil projects can include measures to prevent or control erosion, control pollution on agricultural land, and improve water management for agricultural purposes. Projects must be completed within three years of SADC funding approval. However, under special circumstances, the grant may be renewed for an additional year.

NJDEP's 319(h) Nonpoint Source Pollution Control Pass-through Grant Program provides financial assistance to reduce nonpoint source pollution through riparian buffers, manufactured treatment devices, and other methods. Applicants must be a government entity or a nonprofit organization, but can partner with farmers.

APPENDIX B

Vernal Pools in Pemberton Township

Id #	USGS Quad Name	X Coordinate	Y Coordinate	Old Id
7695	Whiting NJ	543113	4424046	1160
7870	Pemberton NJ	530529	4419316	1200
7874	Pemberton NJ	529969	4420122	1201
7878	Pemberton NJ	529837	4420198	1202
7860	Browns Mills NJ	532151	4420178	1199
7882	Browns Mills NJ	533764	4420488	1203
7886	Browns Mills NJ	533761	4420500	1204
7890	Browns Mills NJ	533754	4420511	1205
7894	Browns Mills NJ	533493	4421040	1206
7937	Pemberton NJ	531548	4424548	1216
8204	Pemberton NJ	528347	4423323	1252
8216	Pemberton NJ	529205	4423801	1253
8228	Pemberton NJ	529180	4423421	1254
8241	Pemberton NJ	529232	4423471	1255
7917	Browns Mills NJ	534708	4423777	1211
7921	Browns Mills NJ	532816	4424048	1212
7925	Browns Mills NJ	533173	4423951	1213
7929	Browns Mills NJ	533236	4423697	1214
7948	Browns Mills NJ	533444	4423880	1219
7955	Browns Mills NJ	533671	4423848	1220
7959	Browns Mills NJ	533823	4423905	1221
7963	Browns Mills NJ	533678	4424938	1222
8105	Browns Mills NJ	532604	4423773	1245
8119	Browns Mills NJ	535632	4424944	1246
7971	Browns Mills NJ	540391	4426270	1224
7975	Browns Mills NJ	540350	4426240	1225
7991	Browns Mills NJ	541443	4424255	1229

Id #	USGS Quad Name	X Coordinate	Y Coordinate	Old Id
7997	Browns Mills NJ	539754	4424168	1230
8040	Browns Mills NJ	540771	4426361	1240
8049	Browns Mills NJ	539859	4424011	1241
8160	Pemberton NJ	531730	4420432	1249
8177	Pemberton NJ	529518	4423048	1250
8190	Pemberton NJ	529471	4422979	1251
8342	Pemberton NJ	530826	4419037	1262
8412	Pemberton NJ	529085	4420402	1267
8583	Pemberton NJ	527152	4421342	1297
8587	Pemberton NJ	526935	4421438	1298
8591	Pemberton NJ	527016	4421331	1299
8601	Pemberton NJ	526970	4421432	1300
8605	Pemberton NJ	527192	4421383	1301
8609	Pemberton NJ	527112	4421330	1302
8613	Pemberton NJ	527014	4421319	1303
8617	Pemberton NJ	527132	4421416	1304
8621	Pemberton NJ	527074	4421232	1305
8625	Pemberton NJ	526751	4422162	1306
8629	Pemberton NJ	527106	4421953	1307
8633	Pemberton NJ	527197	4422019	1308
8637	Pemberton NJ	527267	4422012	1309
8656	Pemberton NJ	527928	4420357	1313
8660	Pemberton NJ	528005	4420187	1314
8664	Pemberton NJ	527950	4420254	1315
8668	Pemberton NJ	527823	4420265	1316
8672	Pemberton NJ	528433	4422210	1317
8687	Pemberton NJ	528370	4422360	1320
8691	Pemberton NJ	528275	4422403	1321
7933	Browns Mills NJ	532123	4421025	1215
7940	Browns Mills NJ	534670	4422030	1217
7944	Browns Mills NJ	535243	4421733	1218
8029	Browns Mills NJ	535442	4421689	1238
8033	Browns Mills NJ	535327	4421834	1239
8146	Browns Mills NJ	533607	4420051	1248

Id #	USGS Quad Name	X Coordinate	Y Coordinate	Old Id
7906	Browns Mills NJ	541895	4420321	1209
7913	Browns Mills NJ	540782	4421186	1210
9747	Pemberton NJ	528942	4426899	157
9788	Pemberton NJ	528786	4426854	158
9830	Pemberton NJ	528538	4426624	159
9874	Pemberton NJ	528624	4426533	160
10000	Pemberton NJ	526475	4425712	163
10210	Pemberton NJ	524499	4426031	168
10252	Pemberton NJ	524427	4425884	169
10298	Pemberton NJ	524279	4425954	170
10341	Pemberton NJ	523895	4425356	171
10381	Pemberton NJ	524092	4425389	172
10424	Pemberton NJ	524075	4425340	173
10467	Pemberton NJ	523858	4425543	174
10767	Pemberton NJ	522867	4425729	181
10809	Pemberton NJ	522793	4425753	182
10976	Pemberton NJ	525912	4424985	186
11015	Pemberton NJ	524618	4426777	187
11058	Pemberton NJ	524669	4426533	188
11100	Pemberton NJ	524585	4425625	189
11140	Pemberton NJ	525077	4425782	190
11236	Pemberton NJ	525216	4423573	193
9915	Pemberton NJ	528512	4426862	161
9958	Pemberton NJ	528278	4427046	162
10043	Pemberton NJ	526898	4425948	164
10084	Pemberton NJ	528597	4425944	165
10126	Pemberton NJ	527656	4427109	166
10168	Pemberton NJ	528863	4423696	167
16452	Browns Mills NJ	534736	4424577	4843
16439	Browns Mills NJ	541226	4423573	4834
16443	Browns Mills NJ	542149	4426289	4838
16453	Browns Mills NJ	540229	4423842	4844
16450	Browns Mills NJ	536517	4422704	4841
16451	Browns Mills NJ	535604	4422526	4842

Id #	USGS Quad Name	X Coordinate	Y Coordinate	Old Id
16455	Browns Mills NJ	533930	4420388	4846
16456	Browns Mills NJ	534021	4420332	4847
16436	Whiting NJ	543216	4423214	4831
16437	Whiting NJ	543323	4423185	4832
16438	Whiting NJ	543302	4423126	4833
16449	Browns Mills NJ	542139	4421921	4840

Source: Rutgers University Grant F. Walton Center for Remote Sensing and Spatial Analysis (CRSSA), 2008

APPENDIX C

Plant Species in Pemberton Township

Wetlands Plant Species Found at Stream Monitoring Sites

Scientific Name	Common Name
Herbaceous plants	
Ambrosia artemisiifolia	common ragweed
Andropogon virginicus var. abbreviatus	bushy beard-grass
Andropogon virginicus var. virginicus	broomsedge
Apios americana	groundnut
Asclepias incarnata	swamp milkweed
Aster divaricatus	white wood aster
Aster novi-belgii	New York aster
Aster racemosus	small white aster
Azolla sp.	water fern
Bidens connata	purple-stemmed beggar ticks
Bidens frondosa	beggar ticks
Bidens polylepis	tickseed sunflower
Bidens sp.	beggar ticks
Boehmeria cylindrica	false nettle
Callitriche heterophylla	larger water starwort
Carex crinita	fringed sedge
Carex lurida	shallow sedge
Carex sp.	sedge
Carex stricta	tussock sedge
Chelone glabra	turtlehead
Cinna arundinacea	sweet woodreed
Cuscuta sp.	dodder
Cyperus dentatus	toothed flatsedge

Scientific Name	Common Name
Cyperus strigosus	straw-colored flatsedge
Decodon verticillatus	swamp loosestrife
Dioscorea villosa	common wild yam
Dulichium arundinaceum	three-way sedge
Echinochloa muricata	American barnyard grass
Eleocharis acicularis	needle spike-rush
Epilobium coloratum	purple-leaved willow-herb
Erechtites hieracifolia	pilewort
Eupatorium dubium	eastern joy-pye weed
Eupatorium perfoliatum	common boneset
Eupatorium sp.	joe-pye weed
Euthamia tenuifolia	slender-leaved goldenrod
Galium tinctorium	stiff marsh bedstraw
Glyceria obtusa	blunt manna-grass
Glyceria striata	fowl manna-grass
Hypericum canadense	Canadian St. John's-wort
Hypericum mutilum	dwarf St. John's-wort
Impatiens capensis	spotted touch-me-not
Juncus caesariensis	New Jersey rush
Juncus effusus	common rush
Juncus pelocarpus	brown-fruited rush
Leersia oryzoides	rice cut-grass
Lemna sp.	duckweed
Lespedeza sp.	bush-clover
Lindernia dubia	short-stalked false pimpernel
Lobelia cardinalis	cardinal flower
Ludwigia alternifolia	seedbox
Ludwigia palustris	water purslane
Lycopus uniflorus	northern bugleweed
Lycopus virginicus	Virginia bugleweed
Lysimachia terrestris	swamp loosestrife
Microstegium vimineum	stiltgrass
Mikania scandens	climbing hempweed
Myosotis laxa	small forget-me-not

Scientific Name	Common Name
Myriophyllum humile	low water milfoil
Nuphar variegata	bullhead lily
Nymphaea odorata	white water lily
Onoclea sensibilis	sensitive fern
Orontium aquaticum	golden club
Osmunda cinnamomea	cinnamon fern
Osmunda regalis	royal fern
Panicum clandestinum	deertongue grass
Panicum longifolium	long-leaved panic-grass
Panicum sp.	switchgrass
Panicum verrucosum	warty panic-grass
Peltandra virginica	arrow arum
Phragmites australis	common reed
Pilea pumila	clearweed
Polygonum arifolium	halberd-leaved tearthumb
Polygonum cespitosum	cespiitose knotweed
Polygonum punctatum	dotted smartweed
Polygonum sagittatum	arrow-leaved tearthumb
Potamogeton diversifolius	waterthread pondweed
Potamogeton pusillus	small pondweed
Pteridium aquilinum	bracken
Rhexia virginica	Virginia meadow beauty
Rhynchospora capitellata	small-headed beaked-rush
Rumix obtusifolius	broad-leaved dock
Sagittaria sp.	arrowhead
Sanicula canadensis	short-styled snakeroot
Scirpus cyperinus	wool-grass
Scirpus subterminalis	water club-rush
Scutellaria lateriflora	mad-dog skullcap
Solidago sp.	goldenrod
Sparganium americanum	slender bur-reed
Symplocarpus foetidus	skunk cabbage
Thalictrum pubescens	tall meadow rue
Triadenum virginicum	marsh Saint John's-wort

Scientific Name	Common Name
Typha latifolia	broad-leaved cat-tail
Utricularia sp.	bladderwort
Viola lanceolata	lance-leaved violet
Viola sp.	violet
Woodwardia areolata	netted chain fern
Xyris difformis	yellow-eyed grass
Woody Plants	
Acer negundo	box elder
Acer platanoides	Norway maple
Acer rubrum	red maple
Acer saccharinum	silver maple
Alnus serrulata	smooth alder
Aronia arbutifolia	red chokeberry
Berberis thunbergii	Japanese barberry
Betula populifolia	gray birch
Celastrus orbiculatus	Asiatic bittersweet
Cephalanthus occidentalis	buttonbush
Chamaecyparis thyoides	Atlantic white cedar
Chamaedaphne calyculata	leatherleaf
Clematis terniflora	yam-leaved clematis
Clethra alnifolia	sweet pepperbush
Cornus amomum	silky dogwood
Eubotrys racemosa	fetterbush
Gaylussacia frondosa	dangleberry
Itea virginica	Virginia willow
Juglans nigra	black walnut
Kalmia angustifolia	sheep laurel
Kalmia latifolia	mountain laurel
Lindera benzoin	spicebush
Liquidambar styraciflua	sweet gum
Lonicera japonica	Japanese honeysuckle
Lyonia ligustrina	maleberry
Magnolia virginiana	sweet bay
Myrica pensylvanica	bayberry

Scientific Name	Common Name
Nyssa sylvatica	black gum
Parthenocissus quinquefolia	Virginia creeper
Pinus rigida	pitch pine
Platanus occidentalis	sycamore
Quercus phellos	willow oak
Quercus prinus	chestnut oak
Quercus velutina	black oak
Rhododendron viscosum	swamp azalea
Rosa sp.	rose
Rubus hispidus	swamp dewberry
Salix sp.	willow
Sambucus canadensis	common elder
Smilax glauca	glaucous greenbriar
Smilax rotundifolia	common greenbriar
Spiraea tomentosa	steeplebush
Toxicodendron radicans	poison ivy
Vaccinium corymbosum	highbush blueberry
Vaccinium macrocarpon	large cranberry
Viburnum dentatum	southern arrowwood
Viburnum nadum var. nudum	naked withe-rod
Vitis labrusca	fox grape
Wisteria sp.	wisteria

Source: Pinelands Commission, 2003

Rare Plant Species

Common Name	Scientific Name	Federal Status	State Status	Regional Status	G Rank	S Rank	Last Observed	Identified?
Vascular Plants								
Pine Barrens Reedgrass	*Calamovilfa brevipilis*			LP	G4	S4	1985-10-05	Y
Barratt's Sedge	*Carex barrattii*			LP	G4	S4	1985-05-01	Y
Swamp-pink	*Helonias bullata*	LT	E	LP, HL	G3	S3	1999-10-17	Y
Narrow-panicle Rush	*Juncus brevicaudatus*			HL	G5	S2	1924-09-02	Y
Canby's Lobelia	*Lobelia canbyi*			LP, HL	G4	S3	2006-07-31	Y
Climbing Fern	*Lygodium palmatum*			LP, HL	G4	S2	2008-08-05	Y
Loblolly Pine	*Pinus taeda*			HL	G5	S2	1952-02-28	Y
Chaffseed	*Schwalbea americana*	LE	E	LP, HL	G2G3	S1	2007-09-10	Y
Pickering's Morning-glory	*Stylisma pickeringii var. pickeringii*		E	LP, HL	G4T3	S1	2006-07-31	Y
Terrestrial Community - Other Classification								
Pitch Pine Lowlands (Undifferentiated)	*Pinus rigida saturated woodland alliance*				G3	S3	2002-??-??	Y

Source: NJDEP Natural Heritage Database, 2009

Federal Status Codes
LE – Taxa formally listed as endangered.
LT – Taxa formally listed as threatened.
State Code
E – An endangered species is one whose prospects for survival within the state are in immediate danger due to one or many factors - a loss of habitat, over-exploitation, predation, competition, or disease. An endangered species requires immediate assistance or extinction will probably follow.
Regional Codes
LP – Indicates taxa listed by the Pinelands Commission as endangered or threatened within their legal jurisdiction. Not all species currently tracked by the Pinelands Commission are tracked by the Natural Heritage Program. A complete list of endangered and threatened Pineland species is included in the New Jersey Pinelands Comprehensive Management Plan.
HL – Indicates taxa or ecological communities protected by the Highlands Water Protection and Planning Act within the jurisdiction of the Highlands Preservation Area.

See tables at end of Appendix D for a description of G and S Rank status codes.

APPENDIX D

Vertebrate Animals Known or Probable in Pemberton Township

Fish

Common Name	Scientific Name	Historical Presence
American brook lamprey	*Lampetra appendix*	Native
American eel	*Anguilla rostrata*	Native
Alewife	*Alosa pseudoharengus*	Native
Goldfish	*Carassius auratus*	Exotic
Common carp	*Cyprinus carpio*	Exotic
Golden shiner	*Notemigonus crysoleucas*	Native
Ironcolor shiner	*Notropis chalybaeus*	Native
Fallfish	*Semotilus corporalis*	Native
Creek chubsucker	*Erimyzon oblongus*	Native
Yellow bullhead	*Ameiurus natalis*	Native
Brown bullhead	*Ameiurus nebulosus*	Native
Channel catfish	*Ictalurus punctatus*	Introduced
Tadpole madtom	*Noturus gyrinus*	Native
Redfin pickerel	*Esox americanus*	Native
Chain pickerel	*Esox niger*	Native
Eastern mudminnow	*Umbra pygmaea*	Native
Pirate perch	*Aphredoderus sayanus*	Native
White perch	*Morone americana*	Native
Mud sunfish	*Acantharchus pomotis*	Native
Blackbanded sunfish	*Enneacanthus chaetodon*	Native
Bluespotted sunfish	*Enneacanthus gloriosus*	Native
Banded sunfish	*Enneacanthus obesus*	Native
Redbreast sunfish	*Lepomis auritus*	Native

Common Name	Scientific Name	Historical Presence
Pumpkinseed	*Lepomis gibbosus*	Native
Bluegill	*Lepomis macrochirus*	Introduced
Largemouth bass	*Micropterus salmoides*	Introduced
White crappie	*Pomoxis annularis*	Introduced
Black crappie	*Pomoxis nigromaculatus*	Introduced
Swamp darter	*Etheostoma fusiforme*	Native
Tessellated darter	*Etheostoma olmstedi*	Native
Yellow perch	*Perca flavescens*	Native

Source: Arndt, Rudolf G. "Annotated Checklist and Distribution of New Jersey Freshwater Fishes, with Comments on Abundance." The Bulletin [of the] New Jersey Academy of Science, V. 49, No. 1, Spring, 2004.

Birds

Common Name	Scientific Name	Status		Relative Abundance			
				Spring	Summer	Fall	Winter
Loons - Grebes							
Common Loon	*Gavia immer*	S	mw	R	-	R	-
Pied-billed Grebe	*Podilymbus podiceps*	E	bmw	U	R	U	O
Horned Grebe	*Podiceps auritus*	RP	mw	R	-	R	-
Gannets - Pelicans - Cormorants							
Double-crested Cormorant	*Phalacrocorax auritus*	S	bmw	O	O	O	R
Bitterns - Herons - Ibises							
American Bittern	*Botaurus lentiginosos*	E	bm	O	O	O	-
Least Bittern	*Ixobrychus exilis*	SC	bm	O	O	O	-
Great Blue Heron	*Ardea herodias*	SC	bmw	C	C	C	O
Great Egret	*Casmerodius albus*	RP	bm	O	O	O	-
Snowy Egret	*Egretta thula*	RP	bm	R	O	R	-
Little Blue Heron	*Egretta caerulea*	RP	bm	R	O	R	-
Cattle Egret	*Bubulcus ibis*	RP	bm	R	R	R	-
Green Heron	*Butorides striatus*	RP	bm	U	U	U	-

Common Name	Scientific Name	Status		Relative Abundance			
				Spring	Summer	Fall	Winter
Black-crowned Night Heron	*Nycticorax nycticorax*	T	bm	R	-	R	-
Yellow-crowned Night Heron	*Nyctanassa violaceus*	T	bm	R	-	R	-
White Ibis	*Eudocimus albus*	U	a	-	R	-	-
Glossy Ibis	*Plegadis falcinellus*	RP	bm	O	O	O	-
Geese - Swans - Ducks							
Snow Goose	*Chen caerulescens*	INC	mw	O	-	O	O
Canada Goose	*Branta canadensis*	INC	bmw	C	C	C	C
Brant	*Branta bernicla*	RP	mw	R	-	-	R
Mute Swan	*Cygnus olor*	I	bmw	R	-	-	R
Tundra Swan	*Cygnus columbianus*	INC	mw	C	-	C	C
Wood Duck	*Aix sponsa*	RP	bmw	C	C	C	R
Gadwall	*Anas Strepera*	S	bmw	R	-	R	-
American Wigeon	*Anas americana*	S	mw	O	-	R	R
American Black Duck	*Anas rubripes*	RP	bmw	C	C	C	C
Mallard	*Anas platyrhynchos*	INC	bmw	C	C	C	C
Blue-winged Teal	*Anas discors*	S	bmw	O	O	O	-
Northern Shoveler	*Anas clypeata*	S	mw	R	-	R	-
Northern Pintail	*Anas acuta*	RP	mw	O	-	O	O
Green-winged Teal	*Anas crecca*	S	bmw	C	R	C	O
Canvasback	*Aythya valisineria*	RP	mw	R	-	R	R
Redhead	*Aythya americana*	S	mw	R	-	R	R
Ring-necked Duck	*Aythya collaris*	S	mw	C	-	O	U
Greater Scaup	*Aythya marila*	RP	mw	R	-	R	-
Lesser Scaup	*Aythya affinis*	RP	mw	O	-	R	-
Bufflehead	*Bucephala albeola*	RP	mw	U	-	O	O

Common Name	Scientific Name	Status		Relative Abundance			
				Spring	Summer	Fall	Winter
Common Goldeneye	*Bucephala clangula*	S	mw	O	-	O	O
Hooded Merganser	*Lophodytes cucullatus*	S	bmw	U	-	U	U
Common Merganser	*Mergus merganser*	S	bmw	R	-	R	R
Red-breasted Merganser	*Mergus serrator*	S	bmw	R	-	R	R
Ruddy Duck	*Oxyura jamaicensis*	D	bmw	R	-	R	-
Vultures - Hawks - Falcons							
Black Vulture	*Coragyps atratus*	INC	bmw	R	-	R	R
Turkey Vulture	*Cathartes aura*	INC	bmw	C	C	C	C
Osprey	*Pandion haliaetus*	T	bm	O	O	O	-
Bald Eagle	*Haliaeetus leucocephalus*	E	bmw	U	O	U	U
Northern Harrier	*Circus cyaneus*	E	bmw	U	R	U	U
Sharp-shinned Hawk	*Accipiter striatus*	SC	bmw	O	R	O	O
Cooper's Hawk	*Accipiter Cooperii*	T	bmw	O	O	O	O
Northern Goshawk	*Accipiter gentilis*	E	bmw	R	R	R	R
Red-shouldered Hawk	*Buteo lineatus*	E	bmw	O	R	O	O
Broad-winged Hawk	*Buteo platypterus*	SC	bm	U	U	U	-
Red-tailed Hawk	*Buteo jamaicensis*	INC	bmw	C	C	C	C
Rough-legged Hawk	*Buteo lagopus*	D	mw	R	-	R	R
Golden Eagle	*Aquila chrysaetos*	S	mw	R	-	R	R
American Kestrel	*Falco sparverius*	SC	bmw	U	O	U	R
Merlin	*Falco columbarius*	INC	m	O	R	O	R
Peregrine Falcon	*Falco peregrinus*	E	bmw	O	R	O	R
Grouse - Turkey - Quail							

Common Name	Scientific Name	Status		Relative Abundance			
				Spring	Summer	Fall	Winter
Ring-necked Pheasant	*Phasianus colchicus*	D	bw	R	R	R	R
Ruffed Grouse	*Bonasa umbellus*	D	bw	R	R	R	R
Wild Turkey	*Meleagris gallopavo*	INC	bw	U	U	U	U
Northern Bobwhite	*Colinus virginianus*	RP	bw	R	R	R	R
Rails - Cranes							
King Rail	*Rallus elegans*	SC	bm	R	R	R	-
Virginia Rail	*Rallus limocola*	RP	bmw	U	U	U	R
Sora	*Porzana carolina*	S	bm	R	R	R	-
Common Moorhen	*Gallinula chloropus*	U	bm	R	-	-	-
American Coot	*Fulica americana*	U	bmw	R	-	R	-
Plovers - Sandpipers							
Black-bellied Plover	*Pluvialis squatarola*	S	m	O	O	R	-
American Golden Plover	*Pluvialis dominica*	RP	m	R	R	R	-
Wilson's Plover	*Charadrius wilsonia*	U	a	R	R	R	-
Semipalmated Plover	*Charadrius semipalmatus*	S	m	O	O	O	-
Killdeer	*Charadrius vociferus*	S	bmw	U	U	U	-
Black-necked Stilt	*Himantopus mexicanus*	U	m	R	-	-	-
American Avocet	*Recurvirostra americana*	U	m	-	R	-	-
Greater Yellowlegs	*Tringa melanoleuca*	RP	m	U	U	U	R
Lesser Yellowlegs	*Tringa flavipes*	S	m	R	U	U	-
Solitary Sandpiper	*Tringa solitaria*	U	m	U	U	U	-
Willet	*Catoptrophorus semipalmatus*	RP	bm	R	R	-	-
Spotted Sandpiper	*Actitis macularia*	SC	bm	U	U	U	-
Upland Sandpiper	*Bartramia longicauda*	E	bm	R	R	R	-

Common Name	Scientific Name	Status		Relative Abundance			
				Spring	Summer	Fall	Winter
Semipalmated Sandpiper	*Calidris pusilla*	RP	m	U	C	U	-
Western Sandpiper	*Calidris mauri*	S	m	-	O	O	-
Least Sandpiper	*Calidris minutilla*	U	m	U	C	U	-
White-rumped Sandpiper	*Calidris fuscicollis*	U	m	-	O	O	-
Baird's Sandpiper	*Calidris bairdii*	U	m	-	R	R	-
Pectoral Sandpiper	*Calidris melanotos*	U	m	-	O	O	-
Stilt Sandpiper	*Calidris himantopus*	U	m	-	O	O	-
Buff-breasted Sandpiper	*Tryngites subruficollis*	RP	m	-	R	-	-
Short-billed Dowitcher	*Limnodromus griseus*	U	m	-	R	R	-
Long-billed Dowitcher	*Limnodromus scolopaceus*	U	m	-	R	R	-
Common Snipe	*Gallinago gallinago*	S	bmw	O	O	O	O
American Woodcock	*Philohela minor*	RP	bmw	C	U	U	U
Wilson's Phalarope	*Phalaropus tricolor*	U	m	-	R	R	-
Red-necked Phalarope	*Phalaropus lobatus*	U	m	-	-	R	-
Jaegers - Gulls - Terns - Skimmers							
Laughing Gull	*Larus atricilla*	S	bmw	O	O	O	-
Ring-billed Gull	*Larus delawarensis*	INC	bmw	O	O	O	O
Herring Gull	*Larus argentatus*	S	bmw	O	O	O	O
Great Black-backed Gull	*Larus marinus*	D	bmw	O	O	O	O
Gull-billed Tern	*Sterna nilotica*	RP	bm	-	U	O	-
Common Tern	*Sterna hirundo*	SC	bm	R	R	-	-
Forster's Tern	*Sterna forsteri*	RP	bm	R	R	-	-
Least Tern	*Sterna antillarum*	E	bm	-	R	-	-
Doves - Cuckoos - Owls							
Rock Dove	*Columba livia*	I	bmw	O	O	O	O

Common Name	Scientific Name	Status		Relative Abundance			
				Spring	Summer	Fall	Winter
Mourning Dove	*Zenaida macroura*	S	bmw	A	A	A	A
Black-billed Cuckoo	*Coccyzus erythropthalmus*	RP	bm	U	U	U	-
Yellow-billed Cuckoo	*Coccyzus americanus*	RP	bm	U	U	U	-
Barn Owl	*Tyto alba*	SC	bmw	R	R	R	R
Eastern Screech Owl	*Otus asio*	RP	bw	U	U	U	U
Great Horned Owl	*Bubo virginianus*	S	bw	C	C	C	C
Snowy Owl	*Nyctea scandiaca*	U	w	-	-	R	R
Barred Owl	*Strix varia*	T	bw	O	O	O	O
Long-eared Owl	*Asio otus*	T	bmw	R	R	R	R
Short-eared Owl	*Asio flammeus*	E	bmw	R	-	R	R
Northern Saw-whet Owl	*Aegolius acadicus*	S	bmw	R	R	R	R
Nightjars - Swifts - Hummingbirds							
Common Nighthawk	*Chordeiles minor*	SC	bm	U	U	U	-
Whip-poor-will	*Caprimulgus vociferus*	RP	bm	C	C	O	-
Chimney Swift	*Chaetura pelagica*	RP	bm	U	U	U	-
Ruby-throated Hummingbird	*Archilochus colubris*	D	bm	U	U	U	-
Kingfishers - Woodpeckers - Flycatchers							
Belted Kingfisher	*Ceryle alcyon*	S	bmw	U	U	U	O
Red-headed Woodpecker	*Melanerpes erythrocephalus*	T	bmw	R	R	R	-
Red-bellied Woodpecker	*Melanerpes carolinus*	INC	bw	U	U	U	U
Yellow-bellied Sapsucker	*Sphyrapicus varius*	U	mw	O	-	O	O
Downy Woodpecker	*Picoides pubescens*	S	bw	C	C	C	C
Hairy Woodpecker	*Picoides villosus*	D	bw	U	U	U	U
Northern Flicker	*Colaptes auratus*	RP	bmw	C	C	C	O

Common Name	Scientific Name	Status		Relative Abundance			
				Spring	Summer	Fall	Winter
Eastern Wood Pewee	*Contopus virens*	RP	bm	C	C	C	-
Yellow-bellied Flycatcher	*Empidonax flaviventris*	U	m	R	-	R	-
Acadian Flycatcher	*Empidonax virescens*	RP	bm	R	R	R	-
Alder Flycatcher	*Empidonax alnorum*	INC	bm	R	-	-	-
Willow Flycatcher	*Empidonax traillii*	RP	bm	R	-	-	-
Least Flycatcher	*Empidonax minimus*	SC	bm	R	-	R	-
Eastern Phoebe	*Sayornis phoebe*	S	bm	C	C	C	R
Great Crested Flycatcher	*Myiarchus crinitus*	RP	bm	C	C	C	-
Eastern Kingbird	*Tyrannus Tyrannus*	RP	bm	C	C	C	-
Shrikes - Vireos							
Loggerhead Shrike	*Lanius ludovicianus*	E	mw	R	-	R	R
Northern Shrike	*Lanius exubitor*	S	w	R	-	R	R
White-eyed Vireo	*Vireo griseus*	D	bm	O	O	O	-
Yellow-throated Vireo	*Vireo flavifrons*	RP	bm	R	-	R	-
Blue-headed Vireo	*Vireo solitarius*	SC	bm	R	-	R	-
Warbling Vireo	*Vireo gilvus*	S	bm	R	R	-	-
Philadelphia Vireo	*Vireo philadelphicus*	S	m	-	-	R	-
Red-eyed Vireo	*Vireo olivaceus*	S	bm	O	O	O	-
Jays - Crows - Larks - Swallows							
Blue Jay	*Cyanocitta cristata*	D	bmw	C	C	C	C
American Crow	*Corvus brachyrhynchos*	S	bmw	C	C	C	C
Fish Crow	*Corvus ossifragus*	S	bmw	U	U	U	U
Horned Lark	*Eremophila alpestris*	SC	bmw	R	-	R	R
Purple Martin	*Progne subis*	S	bm	O	O	O	-

Common Name	Scientific Name	Status		Relative Abundance			
				Spring	Summer	Fall	Winter
Tree Swallow	*Tachycineta bicolor*	INC	bm	C	C	C	-
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	S	bm	O	O	O	-
Bank Swallow	*Riparia riparia*	S	bm	O	O	O	-
Cliff Swallow	*Hirundo pyrrhonota*	SC	bm	R	R	R	-
Barn Swallow	*Hirundo rustica*	S	bm	C	C	C	-
Chickadees - Nuthatches - Wrens							
Carolina Chickadee	*Parus carolinensis*	S	bw	A	A	A	C
Black-capped Chickadee	*Parus atricapillus*	S	bmw	-	-	-	R
Tufted Titmouse	*Parus bicolor*	INC	bw	C	C	C	C
Red-breasted Nuthatch	*Sitta canadensis*	S	bmw	O	O	O	O
White-breasted Nuthatch	*Sitta carolinensis*	INC	bw	C	C	C	C
Brown Creeper	*Certhia americana*	INC	bmw	O	R	O	O
Carolina Wren	*Thryothorus ludovicianus*	INC	bw	O	O	O	O
House Wren	*Troglogytes aedon*	S	bm	C	C	O	-
Winter Wren	*Troglodytes troglodytes*	SC	bmw	O	-	O	O
Kinglets - Thrushes - Thrashers							
Golden-crowned Kinglet	*Regulus satrapa*	INC	bmw	C	-	U	C
Ruby-crowned Kinglet	*Regulus calendula*	D	mw	O	-	O	O
Blue-gray Gnatcatcher	*Polioptila caerulea*	S	bm	U	U	U	-
Eastern Bluebird	*Sialia sialis*	INC	bmw	U	U	U	O
Veery	*Catharus fuscescens*	SC	bm	O	O	R	-
Gray-cheeked Thrush	*Catharus minimus*	SC	m	R	-	R	-
Swainson's Thrush	*Catharus ustulatus*	S	m	R	-	R	-

Common Name	Scientific Name	Status		Relative Abundance			
				Spring	Summer	Fall	Winter
Hermit Thrush	*Catharus guttatus*	D	bmw	U	O	U	C
Wood Thrush	*Hylocichla mustelina*	RP	bm	U	U	U	-
American Robin	*Turdus migratorius*	S	bmw	C	C	C	U
Gray Catbird	*Dumetella carolinensis*	RP	bmw	C	C	C	-
Northern Mockingbird	*Mimus polyglottos*	D	bmw	U	U	U	O
Brown Thrasher	*Toxostoma rufum*	RP	bmw	C	C	C	-
Starlings - Pipits - Waxwings							
European Starling	*Sturnus vulgaris*	I	bmw	C	C	C	C
American (Water) Pipit	*Anthus rubescens*	U	mw	U	-	U	O
Cedar Waxwing	*Bombycilla cedrorum*	S	bmw	U	C	U	O
Warblings							
Blue-winged Warbler	*Vermivora pinus*	RP	bm	U	U	O	-
Golden-winged Warbler	*Vermivora chrysoptera*	SC	bm	R	-	R	-
Tennessee Warbler	*Vermivora peregrina*	D	m	R	-	R	-
Orange-crowned Warbler	*Vermivora celata*	S	m	R	-	R	-
Northern Parula	*Parula americana*	SC	bm	O	R	O	-
Yellow Warbler	*Dendroica petechia*	S	bm	U	U	R	-
Chestnut-sided Warbler	*Dendroica pensylvanica*	S	bm	R	-	R	-
Magnolia Warbler	*Dendroica magnolia*	INC	bm	O	-	R	-
Cape May Warbler	*Dendroica tigrina*	S	m	R	-	R	-
Black-throated Blue Warbler	*Dendroica caerulescens*	RP	bm	O	-	O	-
Yellow-rumped Warbler	*Dendroica coronata*	INC	bmw	U	-	U	R

Common Name	Scientific Name	Status		Relative Abundance			
				Spring	Summer	Fall	Winter
Black-throated Green Warbler	*Dendroica virens*	SC	bm	O	O	R	-
Blackburnian Warbler	*Dendroica fusca*	RP	bm	R	-	R	-
Yellow-Throated Warbler	*Dendroica dominica*	RP	bm	R	-	R	-
Pine Warbler	*Dendroica pinus*	RP	bm	C	C	C	-
Prairie Warbler	*Dendroica discolor*	RP	bm	C	C	C	-
Palm Warbler	*Dendroica palmarum*	INC	m	U	-	R	-
Bay-breasted Warbler	*Dendroica castanea*	S	m	R	-	R	-
Blackpoll Warbler	*Dendroica striata*	D	m	U	-	R	-
Cerulean Warbler	*Dendroica cerulea*	SC	bm	R	-	R	-
Black-and-white Warbler	*Miniotilta varia*	RP	bm	C	C	U	-
American Redstart	*Setophaga ruticilla*	INC	bm	U	U	U	-
Prothonotary Warbler	*Protonotaria citrea*	RP	bm	O	O	O	-
Worm-eating Warbler	*Helmitheros vermivorus*	RP	bm	R	R	R	-
Ovenbird	*Seiurus aurocapillus*	D	bm	C	C	U	-
Northern Waterthrush	*Seiurus noveboracensis*	S	bm	O	-	O	-
Louisiana Waterthrush	*Seiurus motacilla*	RP	bm	O	-	O	-
Kentucky Warbler	*Oporornis formosus*	SC	bm	O	O	R	-
Common Yellowthroat	*Geothlypis trichas*	D	bm	C	C	C	-
Hooded Warbler	*Wilsonia citrina*	RP	bm	O	O	R	-
Wilson's Warbler	*Wilsonia pusilla*	S	m	R	-	R	-
Canada Warbler	*Wilsonia canadensis*	SC	bm	R	R	R	-
Yellow-breasted Chat	*Icteria virens*	SC	bm	R	R	R	-
Tanagers - Sparrows - Cardinals							

Common Name	Scientific Name	Status		Relative Abundance			
				Spring	Summer	Fall	Winter
Summer Tanager	*Piranga rubra*	RP	bm	R	R	-	-
Scarlet Tanager	*Piranga olivacea*	RP	bm	C	C	U	-
Western Tanager	*Piranga ludoviciana*	U	a	R	-	-	-
Eastern Towhee	*Pipilo erythrophthalmus*	RP	bmw	A	A	A	R
American Tree Sparrow	*Spizella arborea*	U	mw	O	-	O	U
Chipping Sparrow	*Spizella passerina*	S	bmw	C	C	C	-
Field Sparrow	*Spizella pusilla*	RP	bmw	C	C	C	U
Vesper Sparrow	*Pooecetes gramineus*	E	bmw	R	-	R	-
Savannah Sparrow	*Passerculus sandwichensis*	T	bmw	O	-	O	U
Henslow's Sparrow	*Ammodramus henslowii*	E	bm	R	-	R	-
Fox Sparrow	*Passerella iliaca*	INC	mw	O	-	O	O
Song Sparrow	*Melospiza melodia*	D	bmw	C	C	C	C
Swamp Sparrow	*Melospiza georgiana*	D	bmw	C	C	U	-
White-throated Sparrow	*Zonotrichia albicollis*	D	bmw	C	-	C	C
White-crowned Sparrow	*Zonotrichia leucophrys*	D	mw	-	-	R	R
Dark-eyed Junco	*Junco hyemalis*	S	bmw	C	-	C	C
Snow Bunting	*Plectophenax nivalis*	U	mw	R	-	R	O
Northern Cardinal	*Cardinalis cardinalis*	INC	bw	C	C	C	U
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	RP	bm	O	-	O	-
Blue Grosbeak	*Guiraca caerulea*	INC	bm	R	R	-	-
Indigo Bunting	*Passerina cyanea*	RP	bm	O	O	R	-
Dickcissel	*Spiza americana*	RP	bm	-	-	R	R
Blackbirds - Finches							
Red-winged Blackbird	*Agelaius phoeniceus*	S	bmw	A	A	U	C

Common Name	Scientific Name	Status		Relative Abundance			
				Spring	Summer	Fall	Winter
Eastern Meadowlark	*Sturnella magna*	SC	bmw	R	-	R	O
Rusty Blackbird	*Euphagus carolinus*	INC	mw	O	-	O	O
Common Grackle	*Quiscalus quiscula*	D	bmw	C	C	C	U
Brown-headed Cowbird	*Molothrus ater*	S	bmw	U	U	U	U
Orchard Oriole	*Icterus spurius*	S	bm	U	U	O	-
Baltimore Oriole	*Icterus galbula*	RP	bm	U	U	O	-
Pine Grosbeak	*Pinicola enucleator*	U	w	-	-	-	R
Purple Finch	*Carpodacus purpureus*	RP	bmw	-	-	-	R
House Finch	*Carpodacus mexicanus*	S	bmw	U	U	U	U
Red Crossbill	*Loxia curvirostra*	INC	a	R	-	-	R
White-winged Crossbill	*Loxia leucoptera*	INC	a	R	-	-	R
Common Redpoll	*Carduelis flammea*	U	a	-	-	-	R
Pine Siskin	*Carduelis pinus*	S	mw	O	-	O	O
American Goldfinch	*Carduelis tristis*	INC	bmw	U	U	U	U
Evening Grosbeak	*Hesperiphona vespertinus*	D	w	R	-	R	R
House Sparrow	*Passer domesticus*	I	bmw	C	C	C	C

Source: NJDEP, Division of Parks and Forestry. “Birds: Brendan T. Byrne State Forest.” [All species located within boundaries of Pemberton Township. Compiled with assistance of Leonard Little].

Status	
E - Endangered	b - breeding
T - Threatened	pb - possibly breeding
SC - Special Concern	m - migrant
D - Decreasing	
INC - Increasing	
RP - Regional Priority	w - winters
S - Stable	a - accidental
U - Undetermined	* - present during breeding season-no confirmed nesting
I - Introduced	
P - Peripheral	

Relative Abundance	
A - Abundance - Very numerous, should not miss	O - Occasional - Seen only a few times per season
C - Common - Frequently heard or seen in suitable habitat	R - Rare - Not annually found
U - Uncommon - Seen in limited numbers	***Bold indicates threatened or endangered species***

Reptiles and Amphibians

Common Name	Scientific Name	Status
Salamanders		
Four-toed Salamander	*Hemidactylium scutatu*	D
Northern Red Salamander	*Pseudotriton*	D
Red-backed Salamander	*Plethodon Cinereus*	S
Frogs and Toads		
Bullfrog	*Rana catesbeiana*	S
Carpenter Frog	*R. virgatipes*	SC
New Jersey Chorus Frog	*Pseudacris triserita*	S
Eastern Spadefoot Toad	*Scaphiopus holbrookii*	D
Fowler's Toad	*Bufo woodhousei*	SC
Green Frog	*R. clamitans*	S

Common Name	Scientific Name	Status
Northern Cricket Frog	*Acris crepitans*	U
Pickerel Frog	*Rana palustris*	S
Pine Barrens Treefrog	***H. andersoni***	**E**
Northern Spring Peeper	*Hyla crucifer*	S
Southern Leopard Frog	*R. utricularia*	S
Southern Gray Treefrog	***Hyla versicolor***	**E**
	Turtles	
Wood Turtle	***Clemmys insculpta***	**T**
Eastern Box Turtle	*Terrapene carolina*	S
Eastern Mud Turtle	*Kinosternon subrubrum*	U
Eastern Painted Turtle	*Clirysemys picta*	S
Red-bellied Turtle	*C. rubriventris*	U
Snapping Turtle	*Chelydra serpentine*	S
Stinkpot	*Sternotherus odoratus*	S
Spotted Turtle	*Clemmys guttata*	U
	Lizard	
Northern Fence Lizard	*Sceloporus undulatus*	S
Ground Skink	*Scincella lateralis*	U
Five-lined Skink	*Eumeces fasciatus*	U
	Snakes	
Black Rat Snake	*Elaphe obsoleta*	U
Corn Snake	***Elaphe guttata***	**E**
Eastern Garter Snake	*Thamnophis sirtalis*	S
Eastern Hognose Snake	*Heterodon platyrhinos*	D
Eastern Kingsnake	*Lampropeltis getulus*	U
Eastern Milk Snake	*L. triangulum*	S
Eastern Worm Snake	*Carphorhis Amoenus*	U
Northern Black Racer	*Coluber constrictor*	U
Northern Brown Snake	*Storeria dekayi*	S
Northern Pine Snake	***Pituophis melanoleuscus***	**T**
Northern Water Snake	*Natrix sipedon*	S
Red-bellied Snake	*Storeria occipitomaculata*	S
Rough Green Snake	*Opheodys aestivus*	S
Timber Rattlesnake	***Crotalus horridus***	**E**

Common Name	Scientific Name	Status
Ringneck Snake	*Diadophis punctatus*	S
Eastern Ribbon Snake	*Thamnophis sauritus*	S
Scarlet Snake	*Cemophora coccinea*	U

Source: Leonard Little, 2009

Status	
E - Endangered	S - Stable
T - Threatened	U - Undetermined
D - Decreasing	I - Introduced
SC - Special Concern	
Bold indicates threatened or endangered species	

Mammals

Common Name	Scientific Name	Status
Order Marsupialia (Pouched Mammals)		
Opossum	*Didelphis marsupialis*	S
Order Insectivora (Insect Eaters)		
Masked Shrew	*Sorex cinereus*	S
Least Shrew	*Crytotis parva*	U
Short-tailed Shrew	*Blarina brevicauda*	S
Eastern Mole	*Scalopus aquaticus*	S
Star-nosed Mole	*Condylura cristata*	U
Order Chiroptera (Bats)		
Big Brown Bat	*Eptesicus fuscus*	S
Eastern Pipistrel	*Pipistrellus subflavus*	U
Little Brown Bat	*Myotis lucifugus*	S
*Keen's Myotis	*Myotis septentrionalis*	U
*Red Bat	*Lasiurus borealis*	S
*Hoary Bat	*Lasiurus cinereus*	U
*Silver-haired Bat	*Lasionycteris noctivagans*	U
Order Lagomorpha (Rabbits)		
Eastern Cottontail	*Sylvilagus floridanus*	S
Order Rodentia (Rodents)		
Eastern Chipmunk	*Tamias striatus*	S

Common Name	Scientific Name	Status
Woodchuck	*Marmota monax*	S
Gray Squirrel	*Sciurus carolinensis*	S
Red Squirrel	*Tamiasciurus hudsonicus*	S
Southern Flying Squirrel	*Glaucomys volans*	U
Beaver	*Castor candensis*	INC
White-footed Mouse	*Peromyscus leucopus*	S
Boreal Red-backed Vole	*Clethrionomys gapperi*	S
Meadow Vole	*Microtus pennsylvanicus*	S
Muskrat	*Ondatra zibethicus*	S
Southern Bog Lemming	*Synaptomys cooperi*	U
Norway (Brown) Rat	*Rattus norvegicus*	I
House Mouse	*Mus musculus*	I
Meadow Jumping Vole	*Zapus hudsonius*	U
Pine Vole	*Microtus pinetorum*	S
Order Carnivora (Flesh Eaters)		
Red Fox	*Vulpes vulpes*	S
Gray Fox	*Urocyon cinereoargenteus*	S
Raccoon	*Procyon lotor*	S
Long-tailed Weasel	*Mustela frenata*	S
Mink	*Mustela vison*	S
Striped Skunk	*Mephitis mephitis*	S
Bobcat	***Felix rufus***	**E**
River Otter	*Lutra canadensis*	S
Eastern Coyote	*Canis latrans, var.*	INC
Order Ardodactyla (Even-toed Hoofed Mammals)		
White-tailed Deer	*Odocoileus virginianus*	D

Source: Leonard Little, 2009

Status	
E - Endangered	S - Stable
T - Threatened	U - Undetermined
D - Decreasing	I - Introduced
INC - Increasing	P - Peripheral
Bold indicates threatened or endangered species	
**** indicates found during migration***	

Rare Wildlife Documented in Pemberton Township

Common Name	Scientific Name	State Status	G Rank	S Rank
Silver-bordered Fritillary	*Bolaria selena myrina*	T	G5T5	S2
American Bittern	*Botaurus lentiginosus*	E/SC	G4	S1B,S3N
American Kestrel	*Falco sparverius*	SC	G5	S3B,S3N
Arogos Skipper	*Atrytone arogos arogos*	E	G3G4T1T2	S1
Bald Eagle	*Haliaeetus leucoceephalus*	E	G4	S1B,S1N
Barred Owl	*Strix varia*	T/T	G5	S2B,S2N
Black-billed Cuckoo	*Coccyzus erythropthalmus*	SC/S	G5	S3B
Black-throated Green Warbler	*Dendroica virens*	S/S	G5	S3B
Bobcat	*Lynx rufus*	E	G5	S1
Bobolink	*Dolichonyx oryzivorus*	T/SC	G5	S2B,S3N
Broad-winged Hawk	*Buteo platypterus*	SC/RP	G5	S3B
Brown Thrasher	*Toxostoma rufum*	SC/S	G5	S3B,S4N
Carpenter Frog	*Rana virgatipes*	SC	G5	S3
Coastal Plain Milk Snake Integrade	*Lampropeltis traingulum triangulum x L. t. elapsoides*	SC	G5T5	S3
Cooper's Hawk	*Accipiter cooperii*	T/S	G5	S2B,S4N
Corn Snake	*Elaphe guttata guttata*	E	G5T5	S1
Dotted Skipper	*Hesperia attalus slossonae*		G3G4T3	S3
Eastern Box Turtle	*Terrapene carolina carolina*	SC	G5T5	S3
Eastern King Snake	*Lampropeltis g. getula*	U	G5T5	S3
Eastern Meadowlark	*Sturnella magna*	SC/SC	G5	S3B, S3N
Fowler's Toad	*Bufo woodhousii fowleri*	SC	G5	S3
Great Blue Heron	*Ardea herodias*	SC/S	G5	S3B,S4N
Hooded Warbler	*Wilsonia citrina*	D/S	G5	S3B
Least Bittern	*Ixobrychus exilis*	SC/SC	G5	S3B,S3N
Northern Parula	*Parula americana*	P/S	G5	S3B
Northern Pine Snake	*Pituophis melanoleucus melanoleucus*	T	G4T4	S2
Pied-billed Grebe	*Podilymbus podiceps*	E/S	G5	S1B,S3N
Pine Barrens Treefrog	*Hyla andersonii*	T	G4	S2
Red-headed Woodpecker	*Melanerpes erythrocephalus*	T/T	G5	S2B,S2N

Common Name	Scientific Name	State Status	G Rank	S Rank
Spotted Turtle	*Clemmys guttata*	SC	G5	S3
Timber Rattlesnake	*Crotalus horridus horridus*	E	G4T4	S1
Veery	*Catharus fuscescens*	S/S	G5	S3B
Vesper Sparrow	*Pooecetes gramineus*	E	G5	S1B,S2N
Wood Thrush	*Hylocichla mustelina*	SC/S	G5	S3B
Wood Turtle	*Glyptemys insculpta*	T	G4	S2
Worm-eating Warbler	*Helmitheros vermivorus*	S/S	G5	S3B
Yellow-breasted Chat	*Icteria virens*	SC/S	G5	S3B,S4N

NJDEP Natural Heritage Database, 2009

State Status	
T	Threatened species – may become endangered if conditions surrounding the species begin to or continue to deteriorate.
E	Endangered species – one whose prospects for survival within the state are in immediate danger due to one or many factors (e.g., a loss of habitat, overexploitation, predation, competition, or disease). An endangered species requires immediate assistance or extinction will probably follow.
INC	Increasing species – a species whose population has exhibited a significant increase, beyond the normal range of its life cycle, over a long-term period.
SC	Special Concern species – applies to animal species that warrant special attention because of some evidence of decline, inherent vulnerability to environmental deterioration, or habitat modification that would result in their becoming a threatened species. This category would also be applied to species that meet the foregoing criteria and for which there is little understanding of their current population status in the state.
RP	Regional Priority species – Applies to species in regional conservation plans
U	Undetermined species – a species about which there is not enough information available to determine the status.
D	Declining species – species that exhibited a continued decline in population numbers over the years.
P	Peripheral species – a species whose occurrence in New Jersey is at the extreme edge of its present natural range.
S	Stable species – a species whose population is not undergoing any long-term increase/decrease within its natural cycle.
Status for animals separated by a slash (/) indicates a dual status. The first status refers to the state breeding population, and the second status refers to the migratory or winter population.	

Global (G Rank) and State (S Rank) Element Rank	
G1	Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
G2	Imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
G3	Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout its range; with the number of occurrences in the range of 21 to 100.
G4	Apparently secure globally, although it may be quite rare in parts of its range, especially at the periphery.
G5	Demonstrably secure globally, although it may be quite rare in parts of its range, especially at the periphery.
T	Element ranks containing a "T" indicate that the infraspecific taxon is being ranked differently than the full species.
S1	Critically imperiled in New Jersey because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres). Elements so ranked are often restricted to very specialized conditions or habitats and/or are restricted to an extremely small geographical area of the state. Also included are elements that were formerly more abundant, but because of habitat destruction or some other critical factor of its biology, they have been demonstrably reduced in abundance. In essence, these are elements for which, even with intensive searching, sizable additional occurrences are unlikely to be discovered.
S2	Imperiled in New Jersey because of rarity (6 to 20 occurrences). Historically, many of these elements may have been more frequent, but are now known from very few extant occurrences, primarily because of habitat destruction. Diligent searching may yield additional occurrences.
S3	Rare in state with 21 to 100 occurrences (plant species and ecological communities in this category have only 21 to 50 occurrences). Includes elements that are widely distributed in the state, but with small populations/acreage or elements with restricted distribution, but are locally abundant. Not yet imperiled in state but may soon be if current trends continue. Searching often yields additional occurrences.
S4	Apparently secure in state, with many occurrences.
S5	Demonstrably secure in state and essentially ineradicable under present conditions.
B	Refers to the breeding population of the element in the state.
N	Refers to the non-breeding population of the element in the state.
Note: To express uncertainty, the most likely rank is assigned and a question mark added (e.g., G2?). A range is indicated by combining two ranks (e.g., G1G2, S1S3).	

APPENDIX E

Natural Heritage Program Caution

CAUTIONS AND RESTRICTIONS ON NATURAL HERITAGE DATA

The quantity and quality of data collected by the Natural Heritage Program is dependent on the research and observations of many individuals and organizations. Not all of this information is the result of comprehensive or site-specific field surveys. Some natural areas in New Jersey have never been thoroughly surveyed. As a result, new locations for plant and animal species are continuously added to the database. Since data acquisition is a dynamic, ongoing process, the Natural Heritage Program cannot provide a definitive statement on the presence, absence, or condition of biological elements in any part of New Jersey. Information supplied by the Natural Heritage Program summarizes existing data known to the program at the time of the request regarding the biological elements or locations in question. They should never be regarded as final statements on the elements or areas being considered, nor should they be substituted for on-site surveys required for environmental assessments. The attached data is provided as one source of information to assist others in the preservation of natural diversity.

This office cannot provide a letter of interpretation or a statement addressing the classification of wetlands as defined by the Freshwater Wetlands Act. Requests for such determination should be sent to the DEP Division of Land Use Regulation, P.O. Box 439, Trenton, NJ 08625-0439.

The Landscape Project was developed by the Division of Fish & Wildlife, Endangered and Nongame Species Program in order to map critical habitat for rare animal species. Natural Heritage Database response letters will also list all species (if any) found during a search of the Landscape Project. However, this office cannot answer any inquiries about the Landscape Project. All questions should be directed to the DEP Division of Fish and Wildlife, Endangered and Nongame Species Program, P.O. Box 400, Trenton, NJ 08625-0400.

This cautions and restrictions notice must be included whenever information provided by the Natural Heritage Database is published.

NJ Department of Environmental Protection
Division of Parks and Forestry
Natural Lands Management

APPENDIX F

Known Contaminated Sites in Pemberton Township

Regulated Underground Storage Tank Facilities

PI Number	Pi Name	Street Address	Doc Status	Expiration Date
7562	Brotherhood School	Egbert St	Terminated	11/16/2000
6599	Browns Mill Shell	2 Lakehurst Rd	Pending	
7557	Browns Mills No 1 School	Trenton Rd	Terminated	11/16/2000
24274	Browns Mills Roofing	91 Pemberton Browns Mills Rd	Terminated	11/16/2000
32109	Browns Mills Shopping Center	101 Pemberton Browns Mill Rd	Terminated	3/31/2001
20820	Browns Mills Supply Co	214 Lakehurst Rd	Terminated	11/16/2000
17556	Browns Woods Apartments	Lawrence Dr	Terminated	11/16/2000
16704	Burlington County College	Pemberton Browns Mills Rd	Terminated	11/16/2000
11284	Burlington County JINS Shelter	Pemberton Browns Mills Rd	Terminated	11/16/2000
11603	Burlington County Minimum Security	Pemberton Browns Mills Rd	Terminated	3/31/1998
7558	Busansky School	Scrapetown Rd	Terminated	11/16/2000
18280	Bus Garage	150 Juliustown Rd	Effective	3/31/2010
443	Buttonwood Hospital	600 Pemberton & Browns Mill Rds	Effective	3/31/2010
7559	Crichton School	1412 B Junction Rd	Terminated	11/16/2000
9376	Deborah Heart and Lung Center	200 Trenton Rd	Terminated	3/31/1998
7394	Denbo School	1412 A Junction Rd	Terminated	11/16/2000
12100	Dix Tire and Service Center	Ft Dix Rd	Terminated	11/16/2000
30584	Earlines Garage	107 Trenton Rd	Terminated	9/30/1995
21588	El Sombrero Inc	604 Trenton Rd	Terminated	3/31/1998
7560	Emmons School	Scrapetown Rd	Terminated	11/16/2000
7130	Emmons Willowbrook Farm Inc	201 Pointville Rd	Terminated	3/31/2001

PI Number	Pi Name	Street Address	Doc Status	Expiration Date
32207	Estate of Norman D Harker	372 Lakehurst Rd	Terminated	3/31/2001
13339	E W Bowker Co Inc	581 Magnolia Rd	Terminated	11/16/2000
30875	George Estelles Garage	222 Trenton Rd	Terminated	3/31/1998
7393	Haines School	Trenton Rd	Terminated	11/16/2000
7556	Harker-Wylie School	125 Trenton Rd	Terminated	11/16/2000
7554	Helen A Fort Middle School	Pemberton Wrightstown Rd	Terminated	11/16/2000
232974	Hilltop Mobile Village	304 Trenton Rd	Terminated	
15021	J&J Cleaners	Browns Mills Shopping Center	Terminated	11/16/2000
5109	Joseph J White Inc	1674 Rt 70	Terminated	11/16/2000
24581	Lake Pemberton Property	Rte 530	Terminated	11/16/2000
18604	Magda Industries	29 Jarvis St	Terminated	11/16/2000
1904	M and T Citgo	538 Lakehurst Rd	Terminated	3/31/1998
2815	MB Oil Corp	227 Pemberton Browns Mills Rd	Effective	3/31/2010
10598	McElven Fuel Inc	4 Magnolia Rd	Terminated	11/16/2000
728	Mike's Citgo	40 W Hampton St	Effective	3/31/2010
30441	M&T Inc	538 Lakehurst Rd	Effective	3/31/2010
7392	Newcomb School	Pemberton Wrightstown Rd	Terminated	11/16/2000
6817	NJ Bell Telephone	390 Main St	Terminated	11/16/2000
11868	Pemberton Borough	208 Hanover St	Terminated	11/16/2000
31007	Pemberton Borough	71 Elizabeth St	Terminated	6/30/1996
6163	Pemberton Gasco	2 Arneys Mount Rd	Effective	3/31/2010
7553	Pemberton Twp High School	Arneys Mount Pemberton Rd	Terminated	11/16/2000
31028	Pemberton Twp MUA Sewage Treat Plant	Birmingham Rd	Terminated	3/31/1998
23811	Pemberton Twp Municipal Complex	500 Pemberton-Browns Mills Rd	Effective	3/31/2010
33687	Pemberton Twp Water Dept	97 Lester St	Terminated	11/16/2000
258	Pointville Getty Inc	256 Pointville Rd	Terminated	11/16/2000
16927	Shady Oaks Apartments	Rt 38 & W Hampton	Terminated	11/16/2000
21266	Shady Oaks Assoc	Rt 530 S Pemberton	Terminated	11/16/2000
7563	Stackhouse School	Trenton Rd	Terminated	11/16/2000
11385	Stan Danley Auto Repair	Ft Dix & Arneys Mt Rd	Terminated	11/16/2000

PI Number	Pi Name	Street Address	Doc Status	Expiration Date
6168	Sybron Chemicals Inc	200 Birmingham Rd	Terminated	11/16/2000
7070	TOC Browns Mills	Lakehurst and Pemberton Rds	Terminated	11/16/2000
12914	Towbin Chrysler-Plymouth Inc	101 Pemberton Juliustown Rd	Terminated	11/16/2000
13141	Towbin Chrysler-Plymouth Inc	106 Pemberton Juliustown Rd	Terminated	11/16/2000
4823	Twin Oaks Fuel Corp	510 Trenton Rd	Expired	3/31/2001
33818	United Methodist Camps & Conference Center	801 Mt Misery Rd	Terminated	11/16/2000
1903	Walt's Getty Inc	324 Trenton Rd	Terminated	11/16/2000
18056	William L Yerkes	105 Pemberton Juliustown Rd	Terminated	11/16/2000

Source: NJDEP, 2009

Emission Statements

2009 Air Emission Statements

Pollutant Name	Ozone – Pounds Per Day	Tons Per Year	CO – Pounds Per Day
PI Number	**Facility Name**	**Facility Address**	**Facility City**
45835	**New Lisbon Developmental Center**	**Rt 72**	**New Lisbon**
Ammonia		0.72	
Arsenic compounds		0.001	
Benzene		0.011	
CO	64.36	4.82	43.08
CO2		22820	
Methane		0.88	
Nickel compounds		0.076	
NOx (Total)	635.34	50.62	
Pb		0.02	
PM-10 (Total)		4.64	
PM-2.5 (Total)		0.002	
Polycyclic organic matter		0.004	
SO2		42.54	
TSP		5.46	
VOC (Total)	9.22	1.02	
PI Number	**Facility Name**	**Facility Address**	**Facility City**
45924	**US Army Fort Dix**	**US Army Fort Dix**	**Fort Dix**
Ammonia		0.48	
Benzene		7.20E-05	

Pollutant Name	Ozone – Pounds Per Day	Tons Per Year	CO – Pounds Per Day
Cadmium compounds		0.025	
CO	335.17	27.8	604.24
CO2		38068	
Methane		93.971	
NOx (Total)	747.05	32.87	
Pb		0.086	
PM-10 (Total)		18.58	
PM-2.5 (Total)		0.001	
Polycyclic organic matter		0.078	
SO2		7.6	
TSP		19.27	
VOC (Total)	133.29	20.32	
PI Number	**Facility Name**	**Facility Address**	**Facility City**
45977	**Lanxess Sybron Chemicals Inc.**	**200 Birmingham Rd**	**Birmingham**
Ammonia		0.28	
Arsenic compounds		4.40E-04	
Benzene		0.011	
CO	0	1.68	32.02
CO2		8420	
Ethylene dichloride		0	
Hydrogen chloride		0.689	
Methane		0.34	
Methylene chloride (Dichloromethane)		0	
Nickel compounds		0.028	
NOx (Total)	0	18.54	
Pb		0	
PM-10 (Total)		4.94	
PM-2.5 (Total)		0.002	
Polycyclic organic matter		4.00E-04	
Propylene dichloride	0	4.65	0
SO2		26.46	

Pollutant Name	Ozone – Pounds Per Day	Tons Per Year	CO – Pounds Per Day
TSP		5.3	
VOC (Total)	5.92	9.46	

Source: NJDEP, 2009

Monitoring Schedules for Public Water Supply Wells

2009 Monitoring Schedule of Public Community Water Supply Systems

Water Facility	Contaminant	SDWIS Code	Monitoring Frequency	Population
US Army Fort Dix (NJ0325001)				
Distribution System (DS)	Total coliform bacteria	3100	month	Residential: 15,829 From 1/1 To 12/31
	Iron-manganese		annual	
	Lead/Copper		triennial	
	Total THM-HAA5 (Stage 1)			
Rancocas Creek (IN001005)	DBP precursor		month	
Main Plant/New Jersey Ave. (TP001004)	Carbon, total organic (TOC)	2920	month	
	Inorganics		annual	
	Nitrate		annual	
	Radiological compounds		triennial	
	Secondary's		annual	
	Turbidity		month	
	Volatile organic compounds		annual	
Treatment House Well #5 (TP005016)	Inorganics		triennial	
	Nitrate	1040	annual	
	Radiological compounds		triennial	
	Secondary's		triennial	
	Volatile organic compounds		triennial	
Treatment House Well #6	Inorganics		triennial	

Water Facility	Contaminant	SDWIS Code	Monitoring Frequency	Population
(TP006018)	Nitrate	1040	annual	
	Radiological compounds		triennial	
	Secondary's		triennial	
	Volatile organic compounds		triennial	
Burlington County Institution (NJ0329001)				
Distribution System (DS)	Total coliform bacteria	3100	month	
	Lead/Copper		triennial	
	Total THM-HAA5 (Stage 1)			
Well 8/Rt. 530 (TP001003)	Inorganics		triennial	
	Nitrate	1040	annual	
	Radiological compounds		6 years	
	Secondary's		triennial	Residential: 500
	Volatile organic compounds		triennial	From 1/1 To 12/31
Well 10/Work Release Facility	Inorganics		triennial	
	Nitrate	1040	annual	
	Radiological compounds		triennial	
	Secondary's		triennial	
	Volatile organic compounds		triennial	
Hilltop Mobile Village (NJ0329002)				
Distribution System (DS)	Total coliform bacteria	3100	month	
	Lead/Copper		triennial	
	Total THM-HAA5 (Stage 1)			
Well 1 (TP001002)	Inorganics		triennial	Residential: 200
	Nitrate	1040	annual	From 1/1 To 12/31
	Radiological compounds		6 years	
	Secondary's		triennial	
	Volatile organic compounds		triennial	

Water Facility	Contaminant	SDWIS Code	Monitoring Frequency	Population
Pemberton Township Water - Lake Valley (NJ0329003)				
Distribution System (DS)	Total coliform bacteria	3100	month	Residential: 3,500 From 1/1 To 12/31
	Lead/Copper		triennial	
	Total THM-HAA5 (Stage 1)			
Well 1/Lafayette Ave (TP001001)	Inorganics		triennial	
	Nitrate	1040	annual	
	Radiological compounds		triennial	
	Secondary's		triennial	
	Volatile organic compounds		triennial	
Well 2/Oak Pines Blvd (TP002004)	Inorganics		triennial	
	Nitrate	1040	annual	
	Radiological compounds		6 years	
	Secondary's		triennial	
	Volatile organic compounds		triennial	
Pemberton Twp Dept Main (NJ0329004)				
Distribution System (DS)	Total coliform bacteria	3100	month	Residential: 12,378 From 1/1 To 12/31
	Iron-manganese		annual	
	Lead/Copper		triennial	
	Total THM-HAA5 (Stage 1)			
Treatment House Well #4 (TP001001)	Inorganics		triennial	
	Nitrate	1040	annual	
	Radiological compounds		6 years	
	Secondary's		triennial	
	Volatile organic compounds		triennial	
Treatment House Well #6 (TP003006)	Inorganics		triennial	
	Nitrate	1040	annual	
	Radiological compounds		6 years	
	Secondary's		triennial	

Water Facility	Contaminant	SDWIS Code	Monitoring Frequency	Population
	Volatile organic compounds		triennial	
Treatment House Well #7 (TP004008)	Inorganics		triennial	
	Nitrate	1040	annual	
	Radiological compounds		6 years	
	Secondary's		triennial	
	Volatile organic compounds		triennial	
Well No. 11/Trenton Road (TP005019)	Inorganics		triennial	
	Nitrate	1040	annual	
	Radiological compounds		quarter	
	Secondary's		triennial	
	Volatile organic compounds		triennial	
Pemberton Well #8 Treatment Plant (TP010012)	Inorganics		triennial	
	Nitrate	1040	annual	
	Radiological compounds		6 years	
	Secondary's		triennial	
	Volatile organic compounds		triennial	
Pineview Terrace Incorporated (NJ0329005)				
Distribution System (DS)	Total coliform bacteria	3100	month	Residential: 300 From 1/1 To 12/31
	Lead/Copper		triennial	
	Total THM-HAA5 (Stage 1)			
Well 1/Behind Unit 12 (TP001003)	Inorganics		triennial	
	Nitrate	1040	annual	
	Radiological Compounds		6 years	
	Secondary's		triennial	
	Volatile organic compounds		triennial	
NJ American W Co Sunbury (NJ0329006)				
Distribution System (DS)	Total coliform bacteria	3100	month	

Water Facility	Contaminant	SDWIS Code	Monitoring Frequency	Population
	Lead/Copper		triennial	Residential: 711 From 1/1 To 12/31
	Total THM-HAA5 (Stage 1)			
Well 1/Anderson Rd (TP001002)	Inorganics		triennial	
	Nitrate	1040	annual	
	Radiological compounds		9 years	
	Secondary's		triennial	
	Volatile organic compounds		triennial	
Pinefield Apartments (NJ0329008)				
Distribution System (DS)	Total coliform bacteria	3100	month	Residential: 120 From 1/1 To 12/31
	Lead/Copper		triennial	
	Total THM-HAA5 (Stage 1)			
Treatment Plant/Junction Ave (TP001001)	Inorganics		triennial	
	Nitrate	1040	annual	
	Radiological compounds		6 years	
	Secondary's		triennial	
	Volatile organic compounds		triennial	

Source: NJDEP, 2009

2009 Monitoring Schedule of Public Non-Community Water Supply Wells

Water Facility	Contaminant	SDWIS Code	Monitoring Frequency	Population
Aspen Physical Therapy (NJ0329320)				
Distribution System (DS)	Total Coliform Bacteria	3100	Quarter	Nontransient: 8 Transient: 26 From 1/1 To 12/31
Treatment Plant (TP001001)	Nitrate	1040	Annual	
Pemberton Headstart Center (NJ0329324)				
Distribution System (DS)	Total Coliform Bacteria	3100	Quarter	Nontransient: 32 Transient: 8 From 1/1 To
	Lead/Copper		Annual	

Water Facility	Contaminant	SDWIS Code	Monitoring Frequency	Population
Treatment Plant (TP001001)	Inorganics		Triennial	12/31
	Nitrate	1040	Annual	
	Volatile Organic Compounds		Triennial	
Anapas Country House (NJ0329309)				
Distribution System (DS)	Total Coliform Bacteria	3100	Quarter	Nontransient: 24 Transient: 150 From 1/1 To 12/31
Treatment Plant (TP001001)	Nitrate	1040	Annual	
First Baptist Church (NJ0329300)				
Distribution System (DS)	Total Coliform Bacteria	3100	Quarter	Nontransient: 2 Transient: 50 From 1/1 To 12/31
Treatment Plant (TP001001)	Nitrate	1040	Annual	
Pemberton Twp Fort Middle School (NJ0329302)				
Distribution System (DS)	Total Coliform Bacteria	3100	Month	Nontransient: 900 Transient: 101 From 1/1 To 12/31
	Lead/Copper		Triennial	
	Total THM-HAA5 (Stage 1)			
Treatment Plant (TP001001)	Inorganics		Triennial	
	Nitrate	1040	Annual	
	Volatile Organic Compounds		Triennial	
Whitesbog - Visitor Center				
Distribution System (DS)	Total Coliform Bacteria	3100	Quarter	Transient: 25 From 1/1 To 12/31
Well 1 (WI001001)	Nitrate	1040	Annual	
Pete & Johns Pizza (NJ0329325)				
Distribution System (DS)	Total Coliform Bacteria	3100	Quarter	Nontransient: 2 Transient: 40 From 1/1 To 12/31
Well 1 (WI001001)	Nitrate	1040	Annual	
Newcomb School (NJ0329301)				
Distribution System (DS)	Total Coliform Bacteria	3100	Quarter	Nontransient: 675 Transient: 50 From 1/1 To 12/31
	Lead/Copper		Triennial	
Well Newcomb (WI001001)	Inorganics		Triennial	
	Nitrate	1040	Annual	
	Volatile Organic Compounds		Triennial	

Water Facility	Contaminant	SDWIS Code	Monitoring Frequency	Population
Pemberton Twp High School - Old Side (NJ0329303)				
Distribution System (DS)	Total Coliform Bacteria	3100	Month	Nontransient: 1400 Transient: 238 From 1/1 To 12/31
	Lead/Copper		Triennial	
	Total THM-HAA5 (Stage 1)			
Treatment Plant (TP001001)	Inorganics		Triennial	
	Nitrate	1040	Annual	
	Volatile Organic Compounds		Triennial	
Pemberton Twp High School - New Side (NJ0329327)				
Distribution System (DS)	Total Coliform Bacteria	3100	Month	Nontransient: 1,400 Transient: 238 From 1/1 To 12/31
	Lead/Copper		Triennial	
	Total THM-HAA5 (Stage 1)			
Treatment Plant (TP001001)	Inorganics		Triennial	
	Nitrate	1040	Annual	
	Volatile Organic Compounds		Triennial	
Terrace Inn Bar (Kitchen) (NJ0329308)				
Distribution System (DS)	Total Coliform Bacteria	3100	Quarter	Nontransient: 2 Transient: 35 From 1/1 To 12/31
Well 1 (WI001001)	Nitrate	1040	Annual	
The Lakes Store (Grocery) (NJ0329316)				
Distribution System (DS)	Total Coliform Bacteria	3100	Quarter	Nontransient: 1 Transient: 100 From 1/1 To 12/31
Well 1 (WI001001)	Nitrate	1040	Annual	
Veterans of Foreign Wars (NJ0329323)				
Distribution System (DS)	Total Coliform Bacteria	3100	Quarter	Nontransient: 2 Transient: 26 From 1/1 To 12/31
Well 1 (WI001001)	Nitrate	1040	Annual	

Source: NJDEP, 2009

Maps

Map 1: Places in Pemberton Township
Map 2: Aerial Photo (2007)
Map 3: NJDEP Land Cover (2007)
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Map 5: Soils
Map 6: Agricultural Quality of Soils
Map 7: Watersheds
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Map 15: Landscape Project Priority Habitats (2007)
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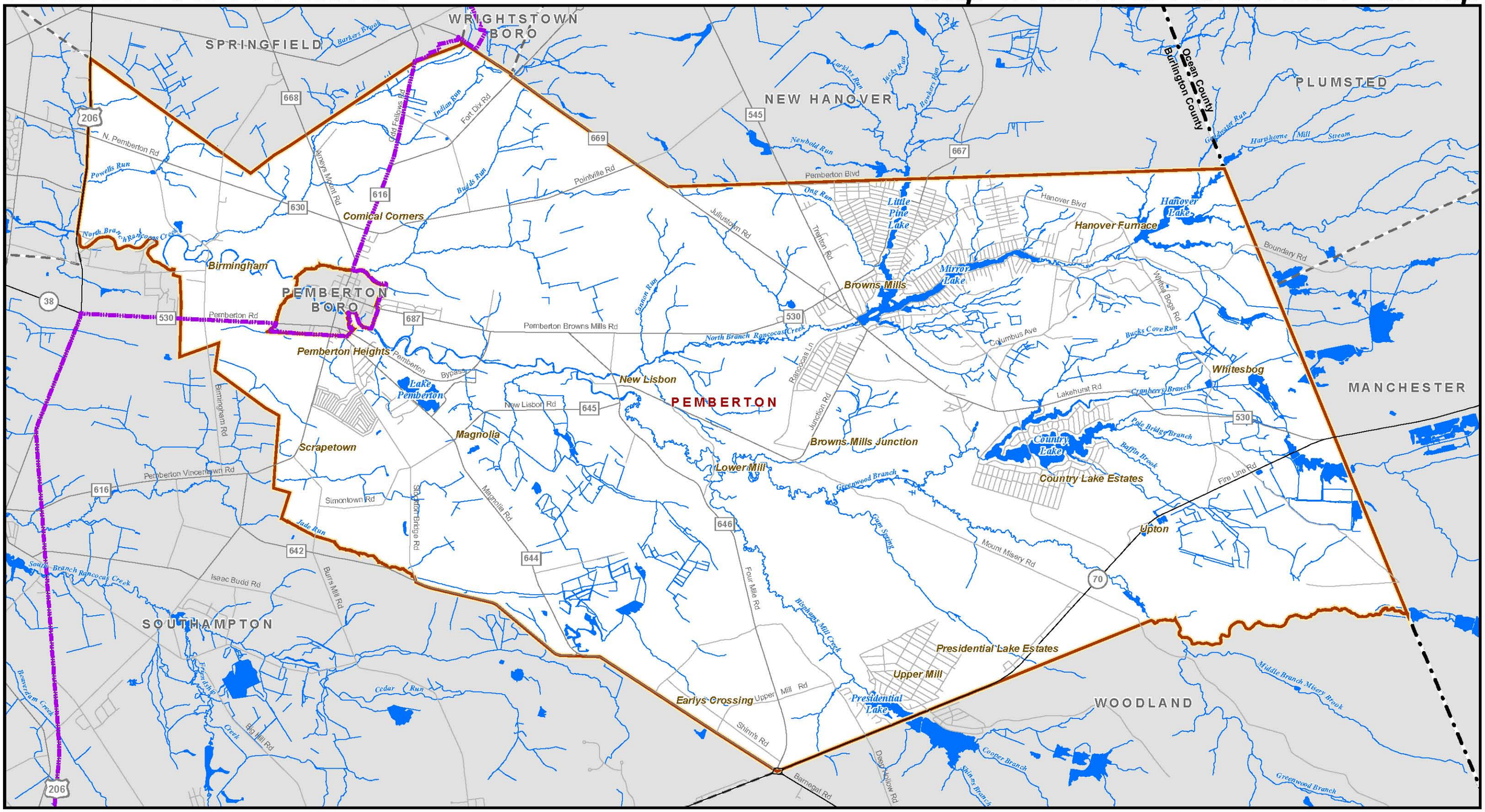
Map 18: Approved Sewer Service Area and NJPDES Permits (2008)
Map 19: Open Space (2007)
Map 20: Parks and Recreation (2010)
Map 21: State Plan (2001)
Map 22: Conservation Areas (2007)
Map 23: Known Contaminated Sites (2009)

PEMBERTON TOWNSHIP

Map 1: Places in Pemberton Township



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

- Pemberton Township
- Pinelands Boundary
- County Boundary
- Municipal Boundary
- Lake
- Stream

N

1 0.5 0 1
Miles

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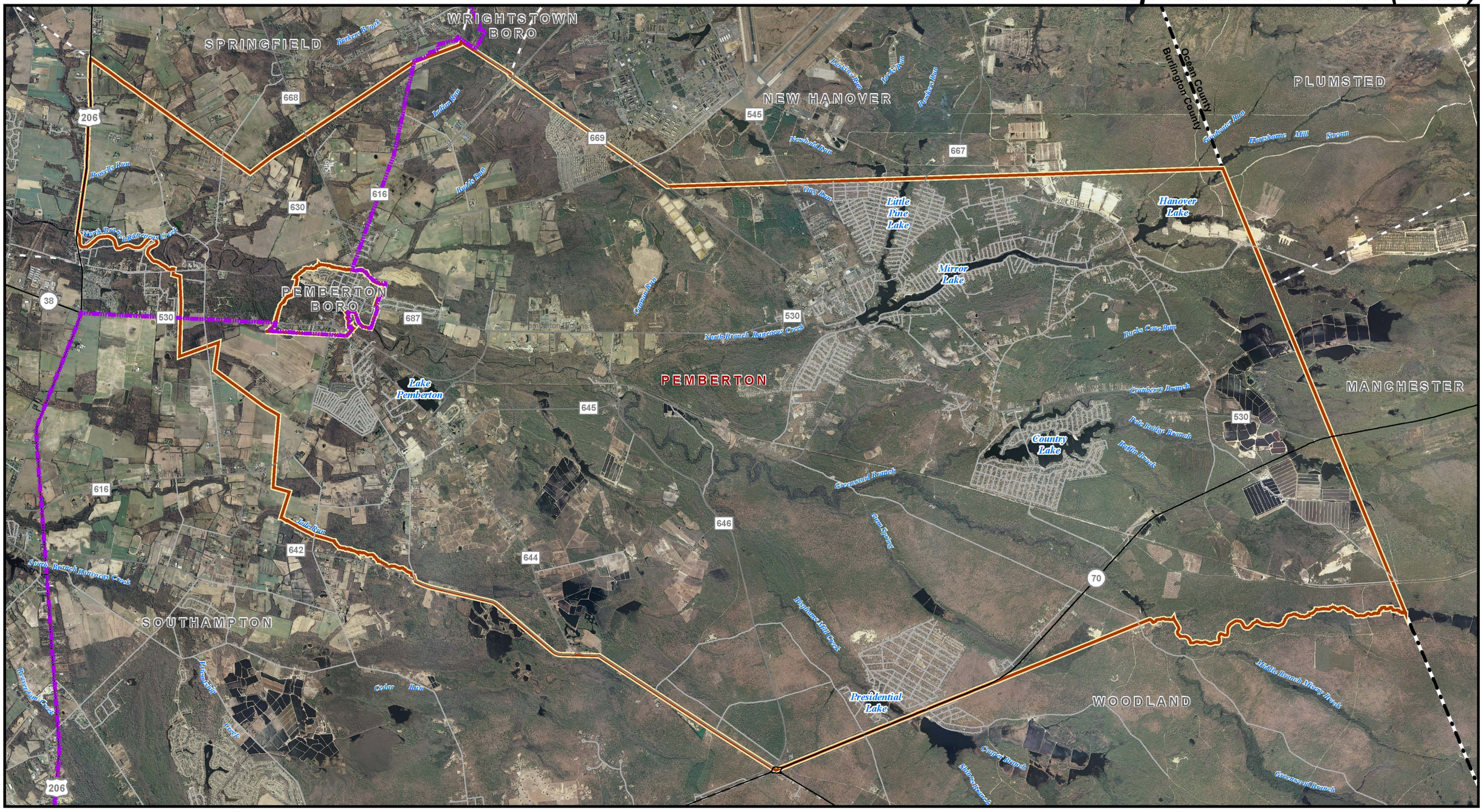
PEMBERTON TOWNSHIP

Map 2: Aerial Photo (2007)



Sources : NJDEP, NJDOT, NJOIT, DVRPC. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Pinelands Boundary
Pemberton Township
County Boundary
Municipal Boundary

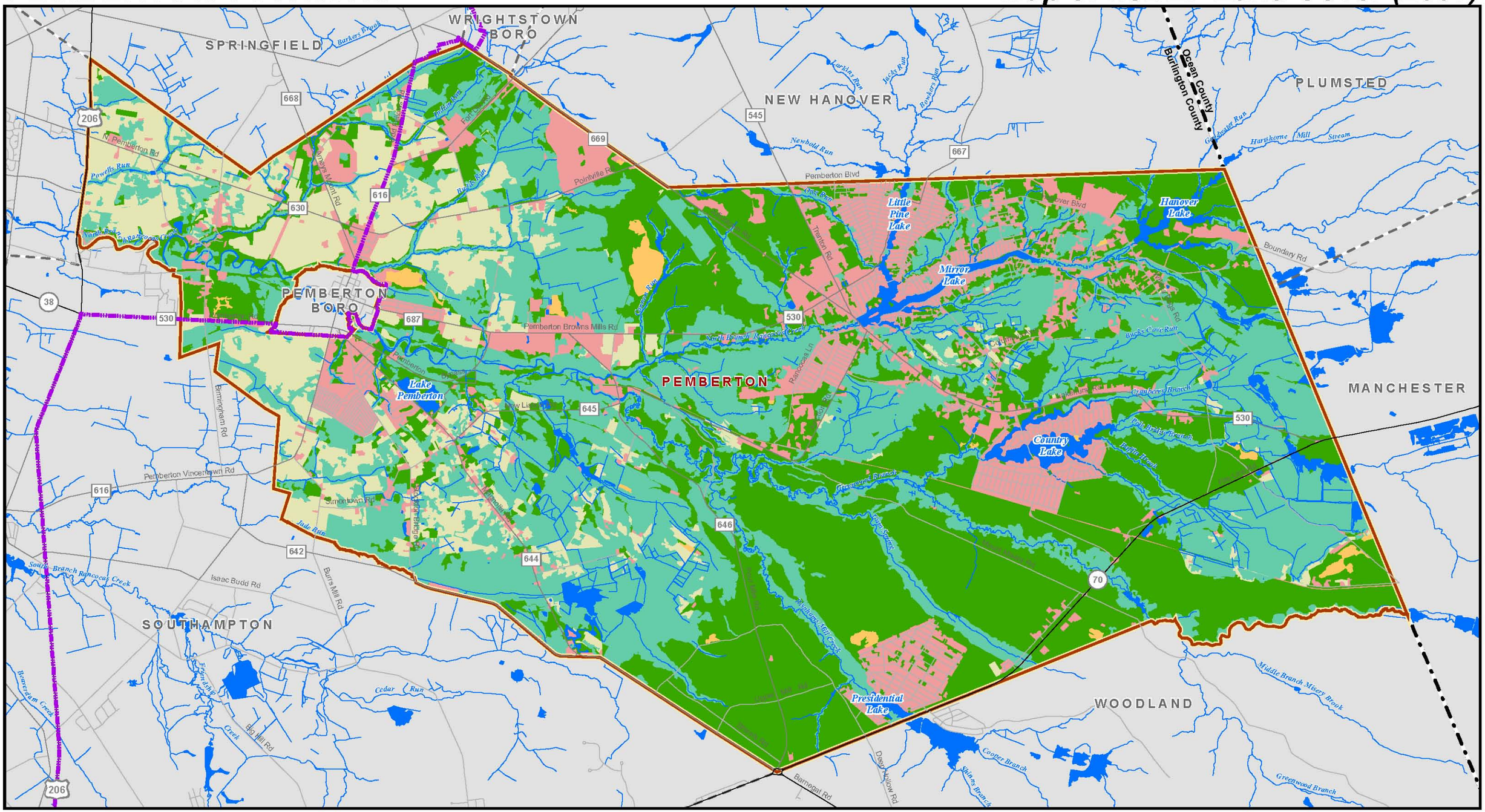
N

1 0.5 0 1
Miles

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

PEMBERTON TOWNSHIP

Map 3: NJDEP Land Cover (2007)



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Land Cover Categories

Agriculture	Forest	Water
Barren Land	Developed	Wetlands

N

1 0.5 0 1
Miles

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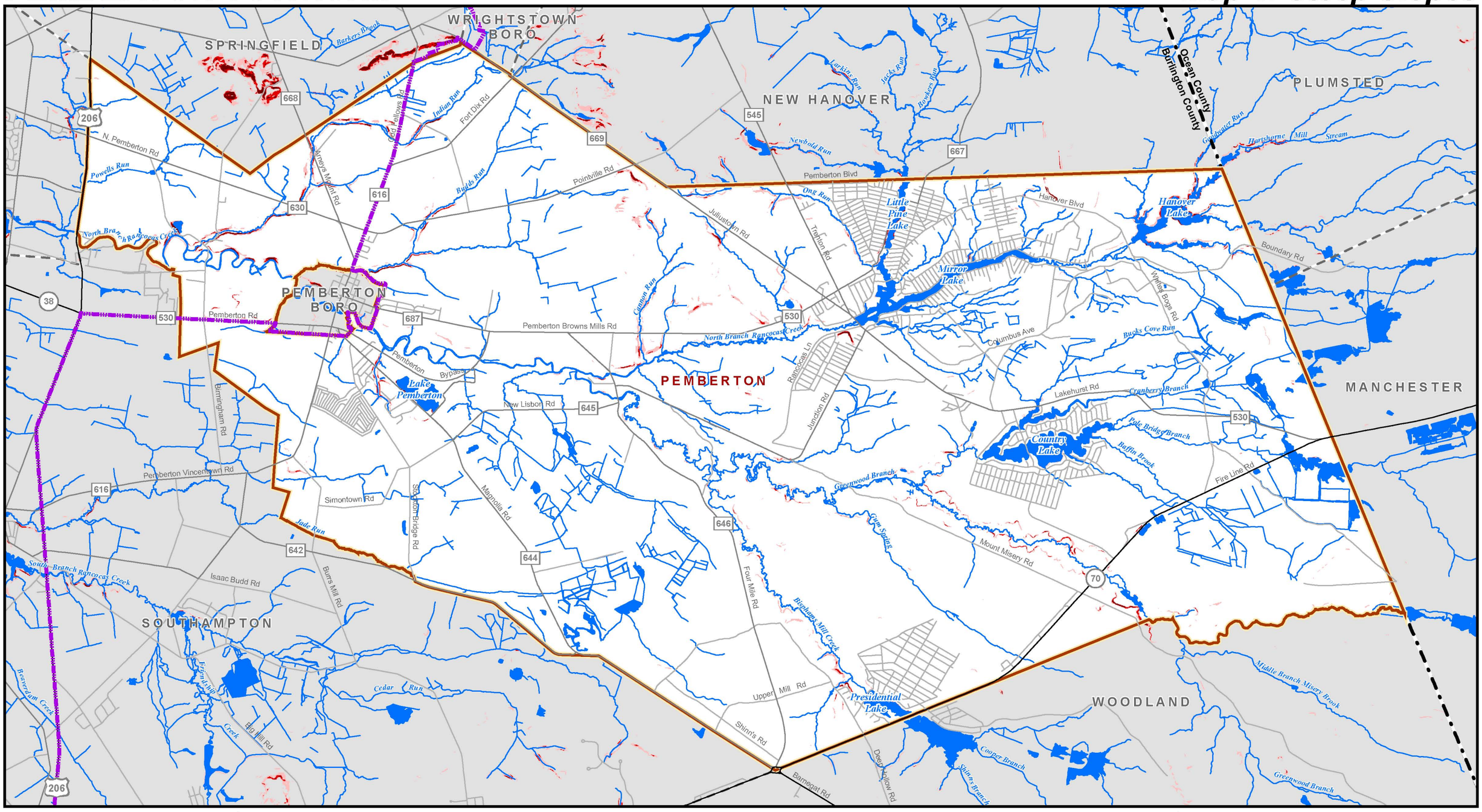
Map 4: Steep Slopes



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Steep Slopes

- Slope ≤ 10%
- Slope = 10% - 14.99%
- Slope = 15% - 19.99%
- Slope ≥ 20%

N

1 0.5 0 1
Miles

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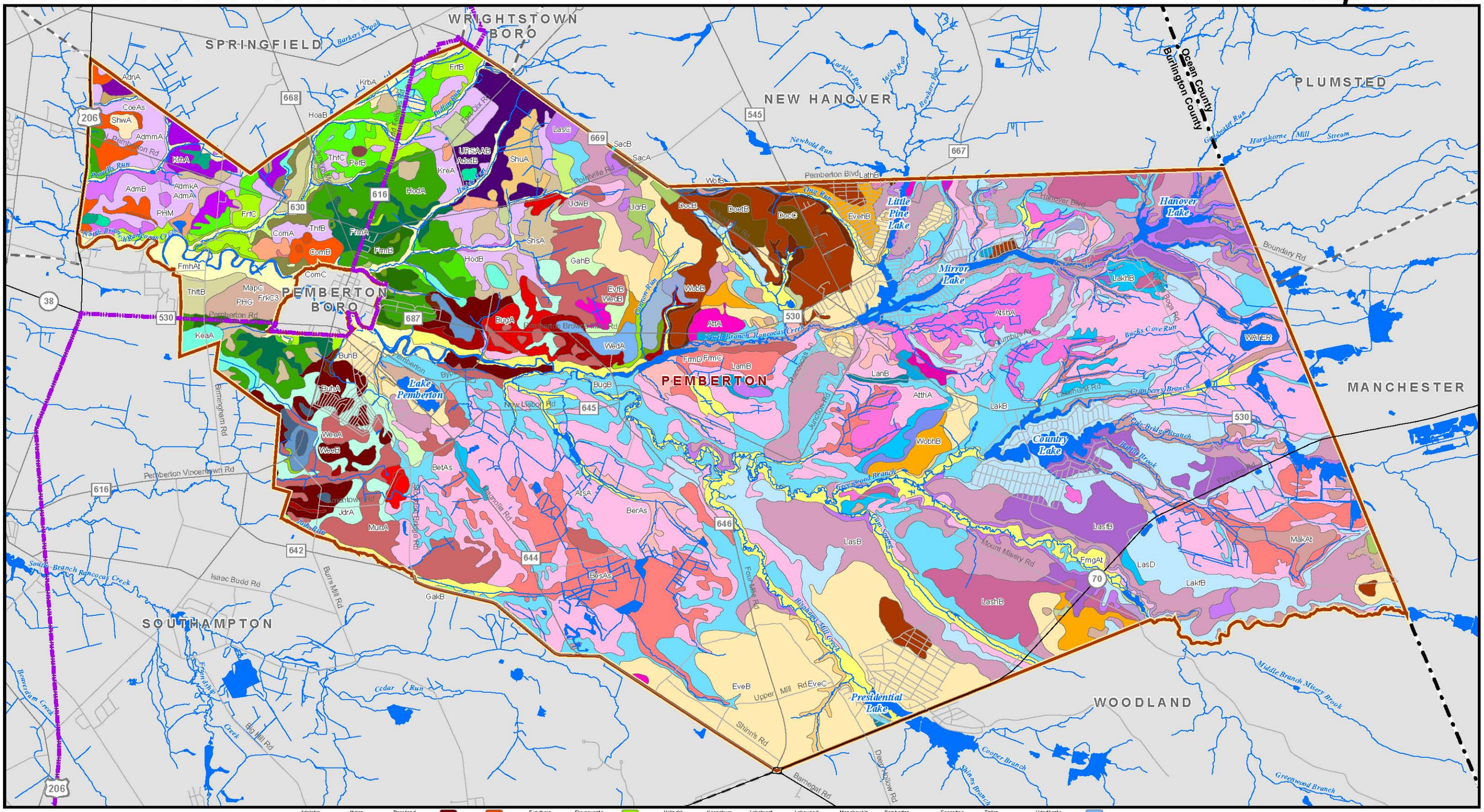
Map 5: Soils



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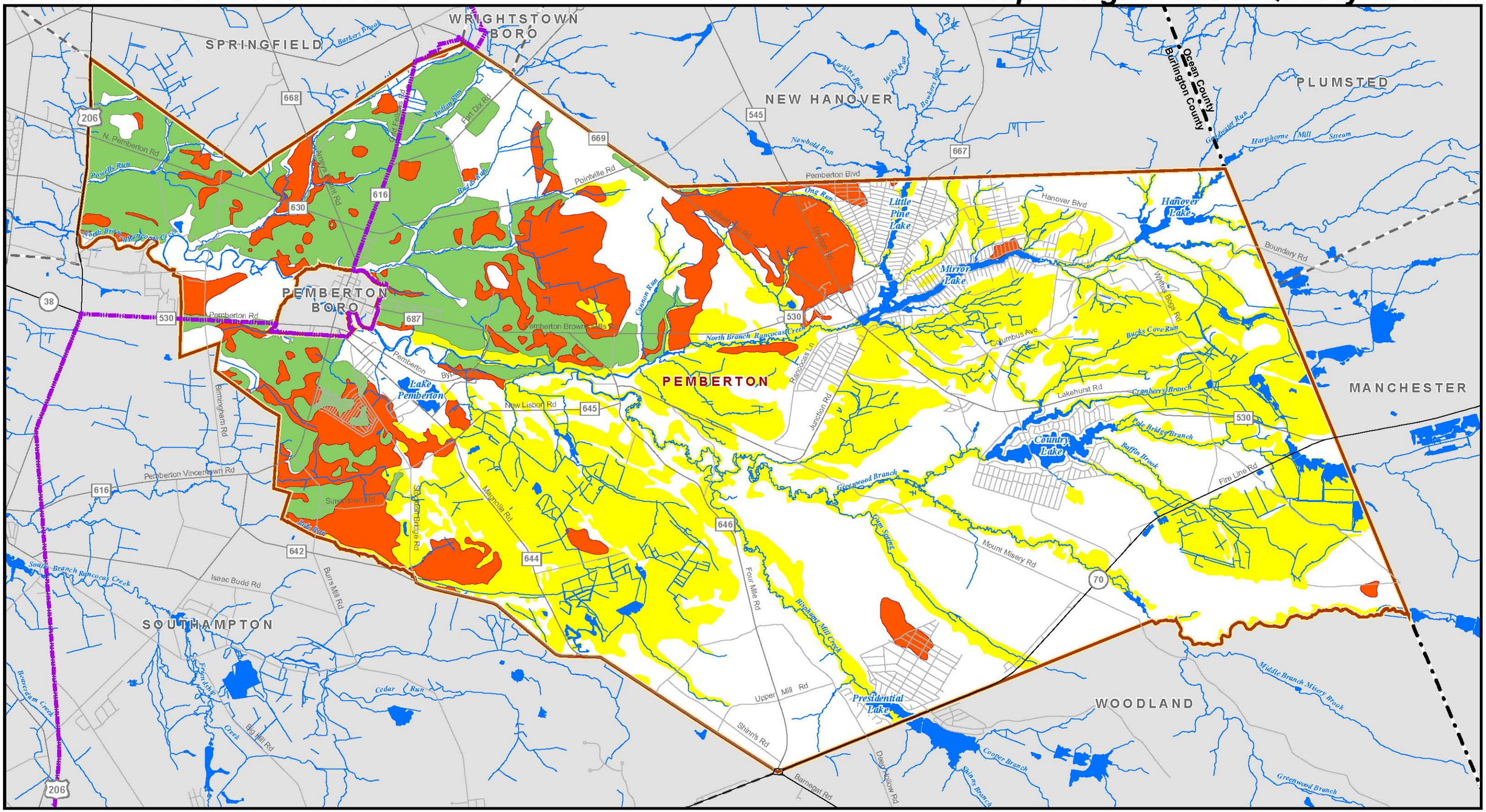
Map 6: Agricultural Quality of Soils



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Soil Designation

- Prime Farmland
- Farmland of Statewide Importance
- Unique Farmland
- Not Rated for Agricultural Use

N

1 0.5 0 1
Miles

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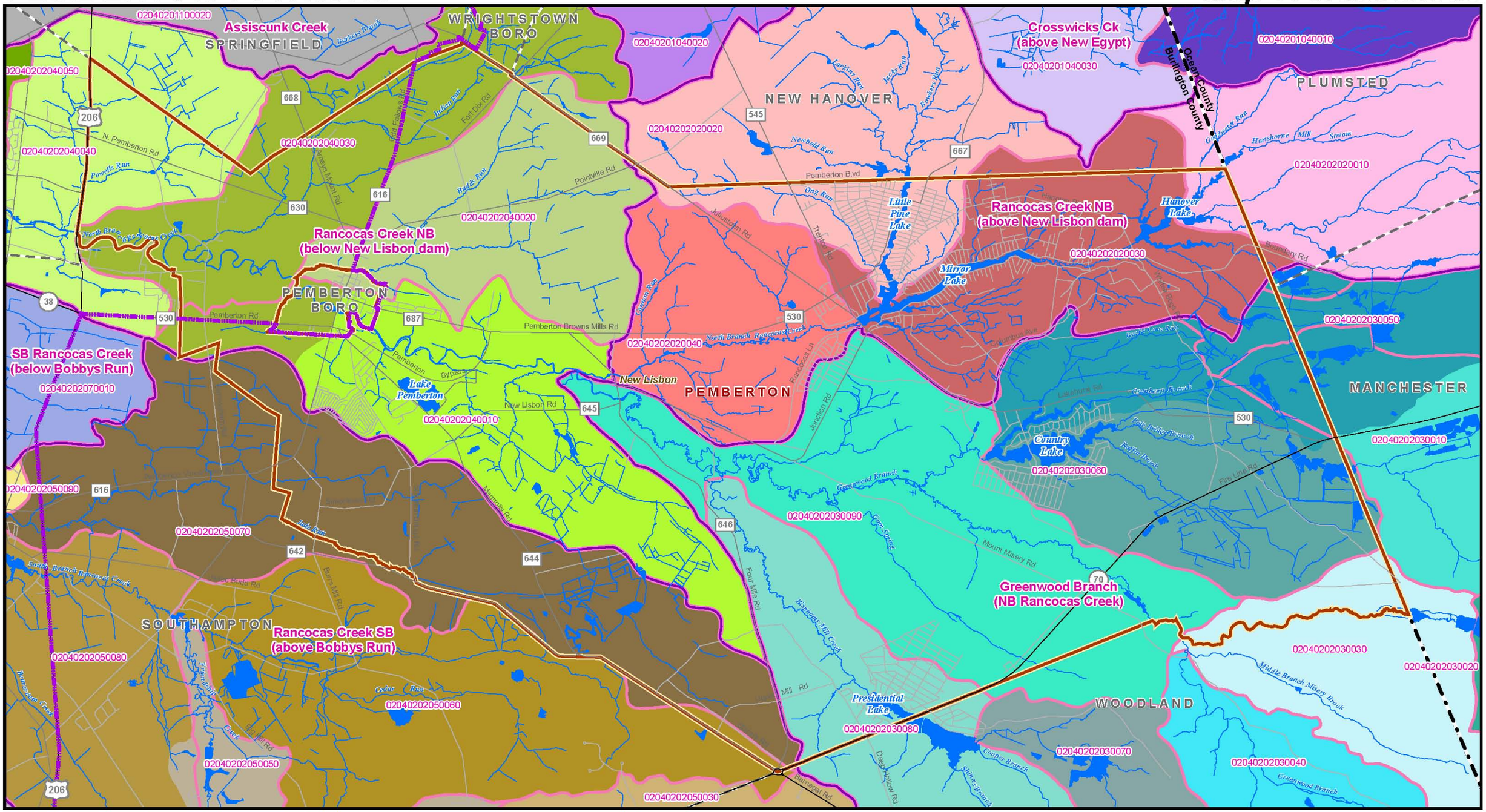
Map 7: Watersheds



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Pemberton Township
Pinelands Boundary
HUC 11 Watershed
HUC 14 Subwatershed
Stream
Lake

N

1 0.5 0 1
Miles

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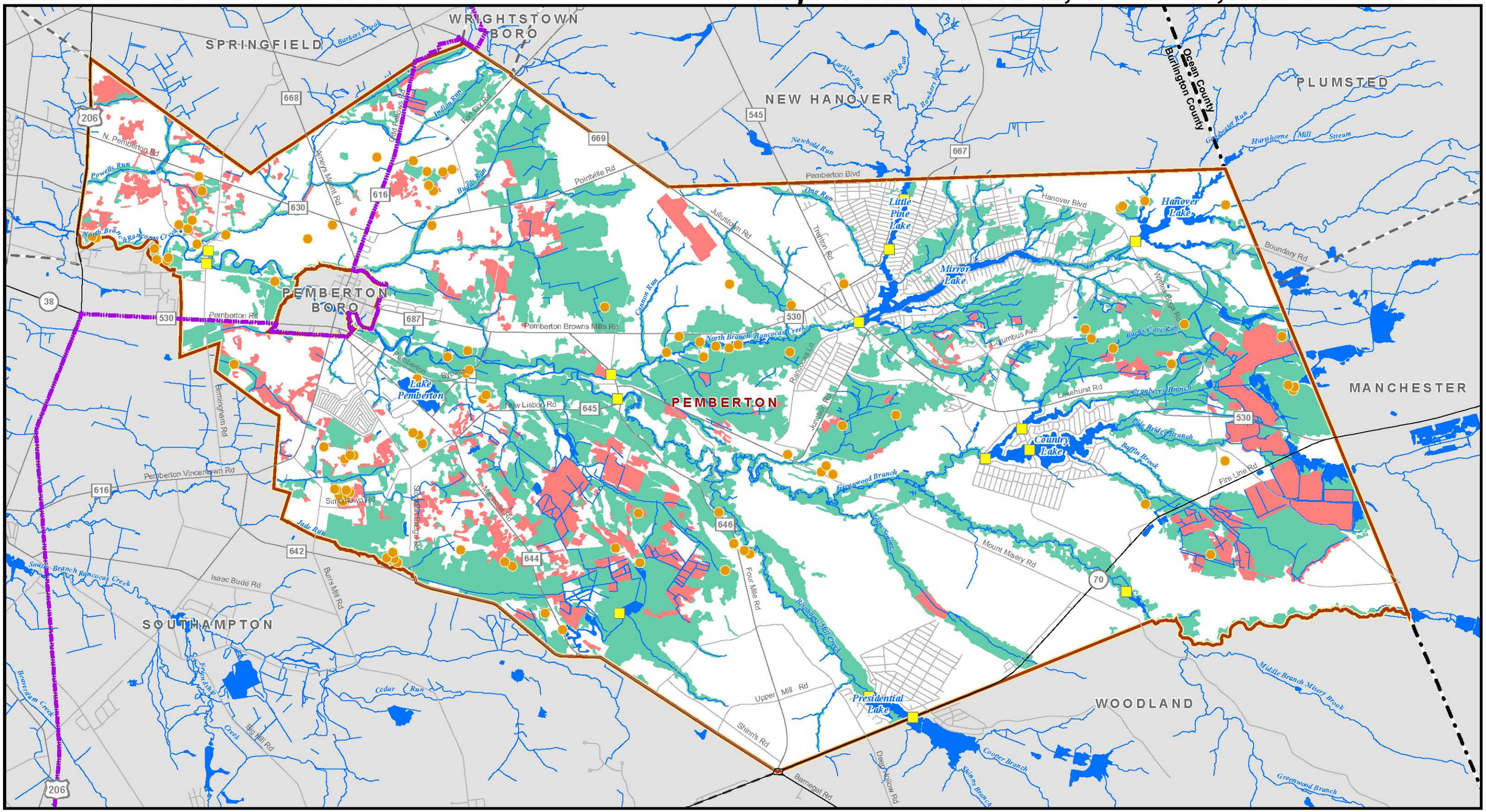
Map 8: Surface Water, Wetlands, and Vernal Pools



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Vernal Pool
Dam
Agricultural Wetlands
Wetlands
Stream
Lake

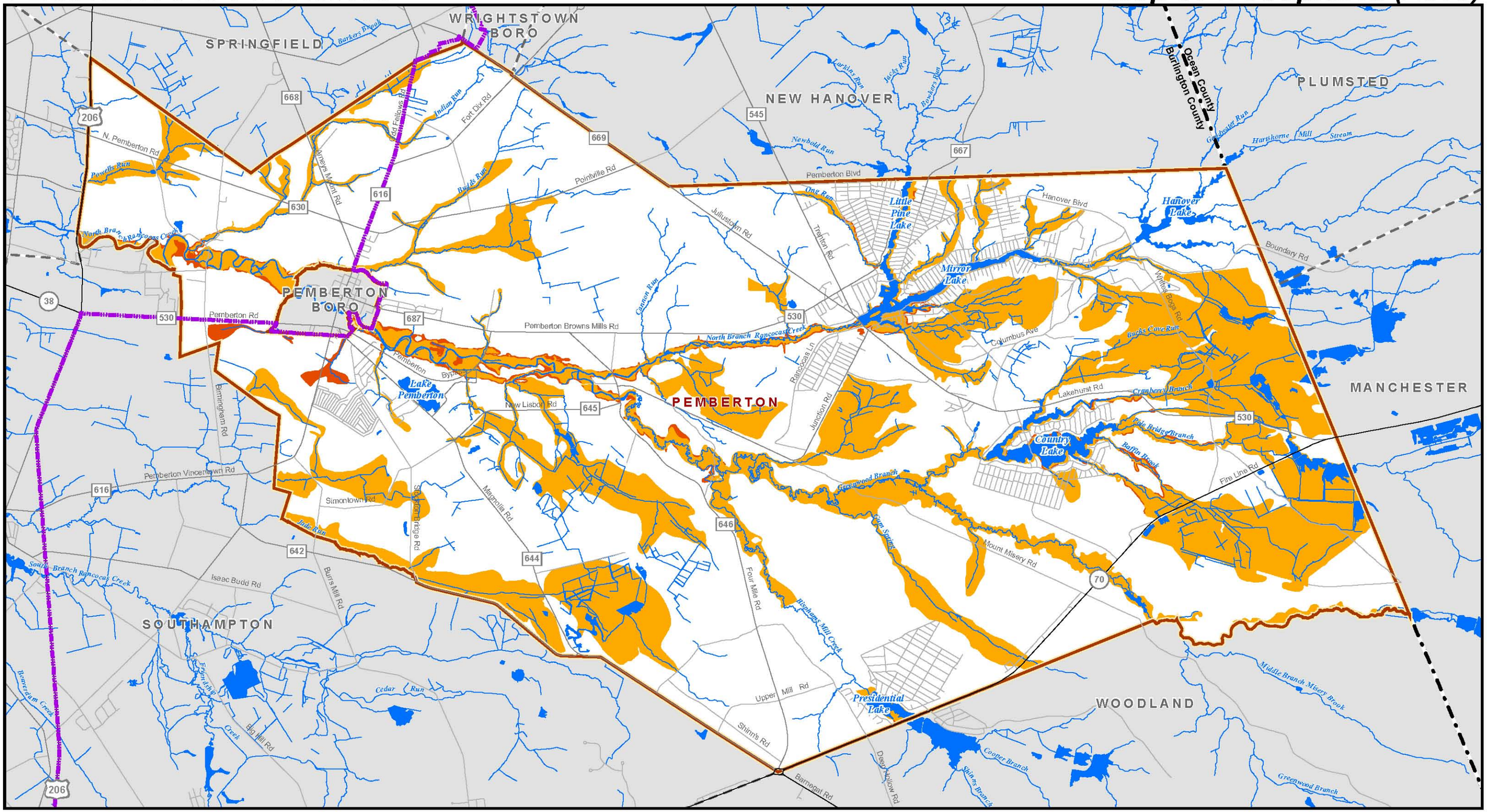
N

1 0.5 0 1
Miles

DELAWARE VALLEY
dvrpc
REGIONAL PLANNING COMMISSION

PEMBERTON TOWNSHIP

Map 9: Floodplains (2010)



Sources : FEMA, NJDEP, NJDOT, DVRPC. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

100-Year Floodplain
500-Year Floodplain
Stream
Lake

1 0.5 0 1
Miles

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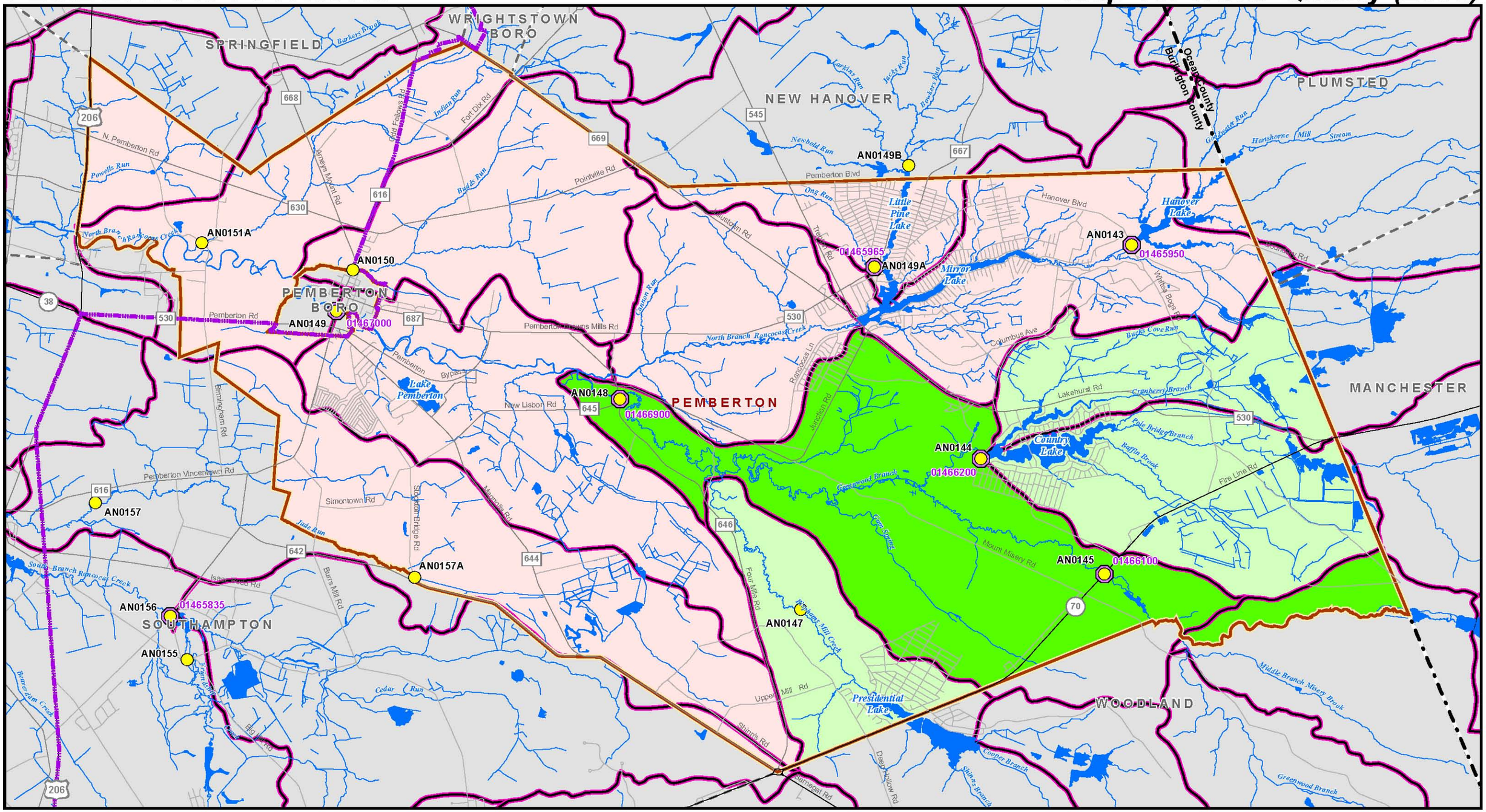
Map 10: Water Quality (2008)



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

- NJDEP Ambient Biomonitoring Network (AMNET) Sampling Site
- USGS Surface Water Quality Guage (2008)
- HUC 14 Subwatershed

2008 Integrated Water Quality Report

General Aquatic

- Sublist 1 - All designated uses are met (with the exception of fish consumption)
- Sublist 2 - Attains designated use
- Sublist 5 - Does not attain designated use and a TMDL is necessary

N

1 0.5 0 1
Miles

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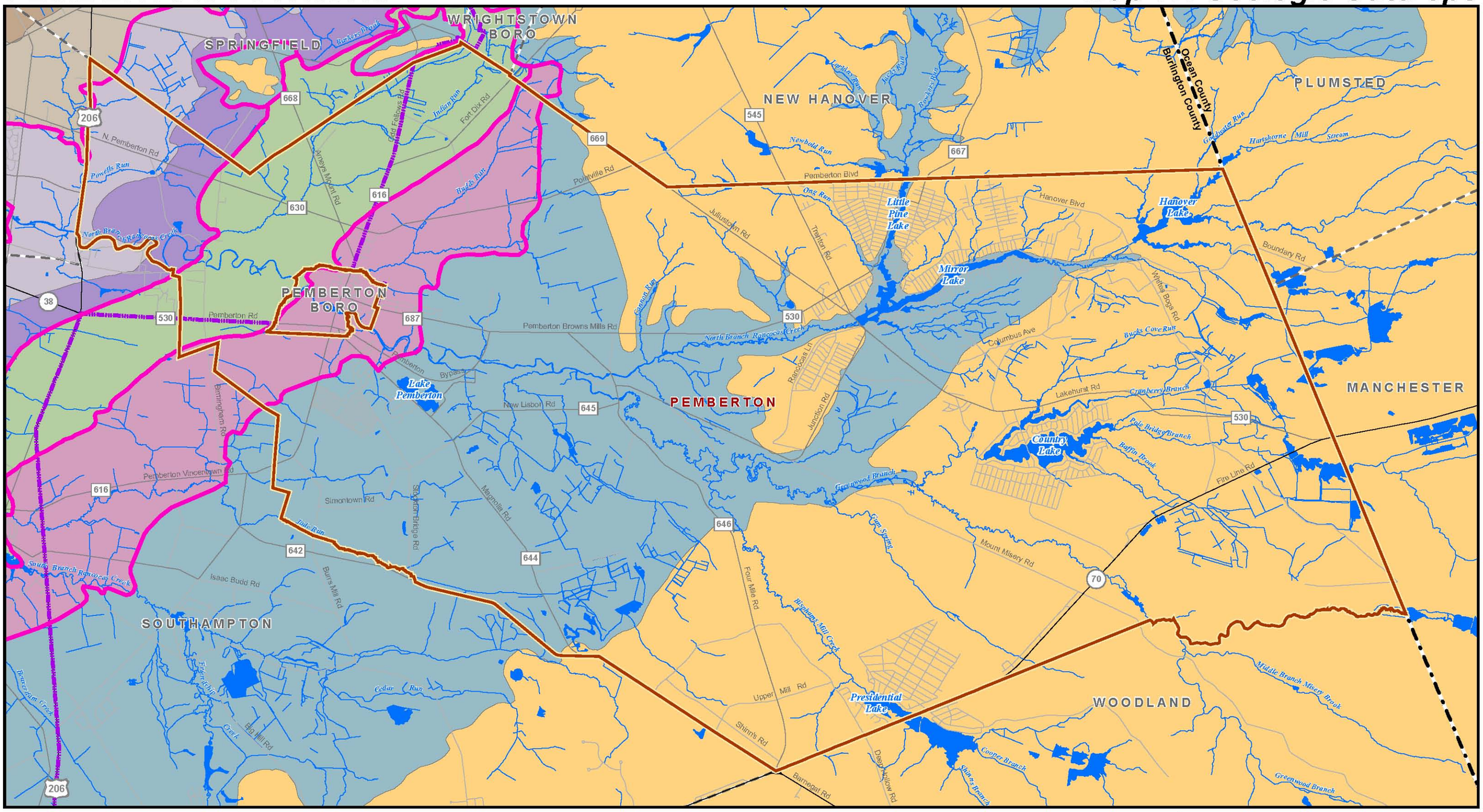
Map 11: Geologic Outcrops



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Bed Outcrop Formations

Aquifer	Navesink	Manasquan
Wenonah	Hornerstown	Kirkwood
Mt. Laurel	Vincentown	Cohansey

N

1 0.5 0 1
Miles

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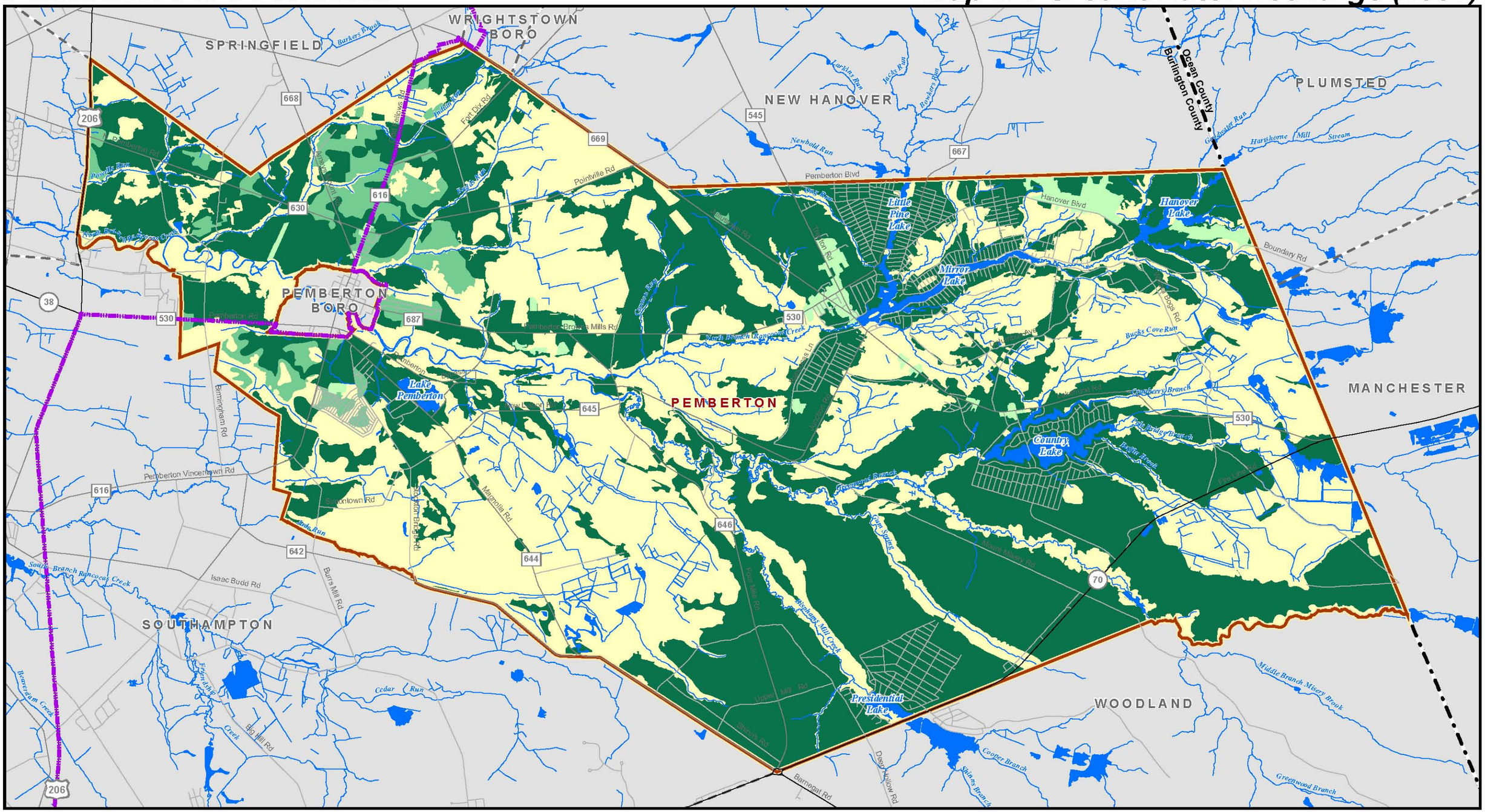
Map 12: Groundwater Recharge (1997)



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Inches Per Year

0 - 1 | 2 - 6 | 7 - 10 | 11 - 18

1 0.5 0 1
Miles

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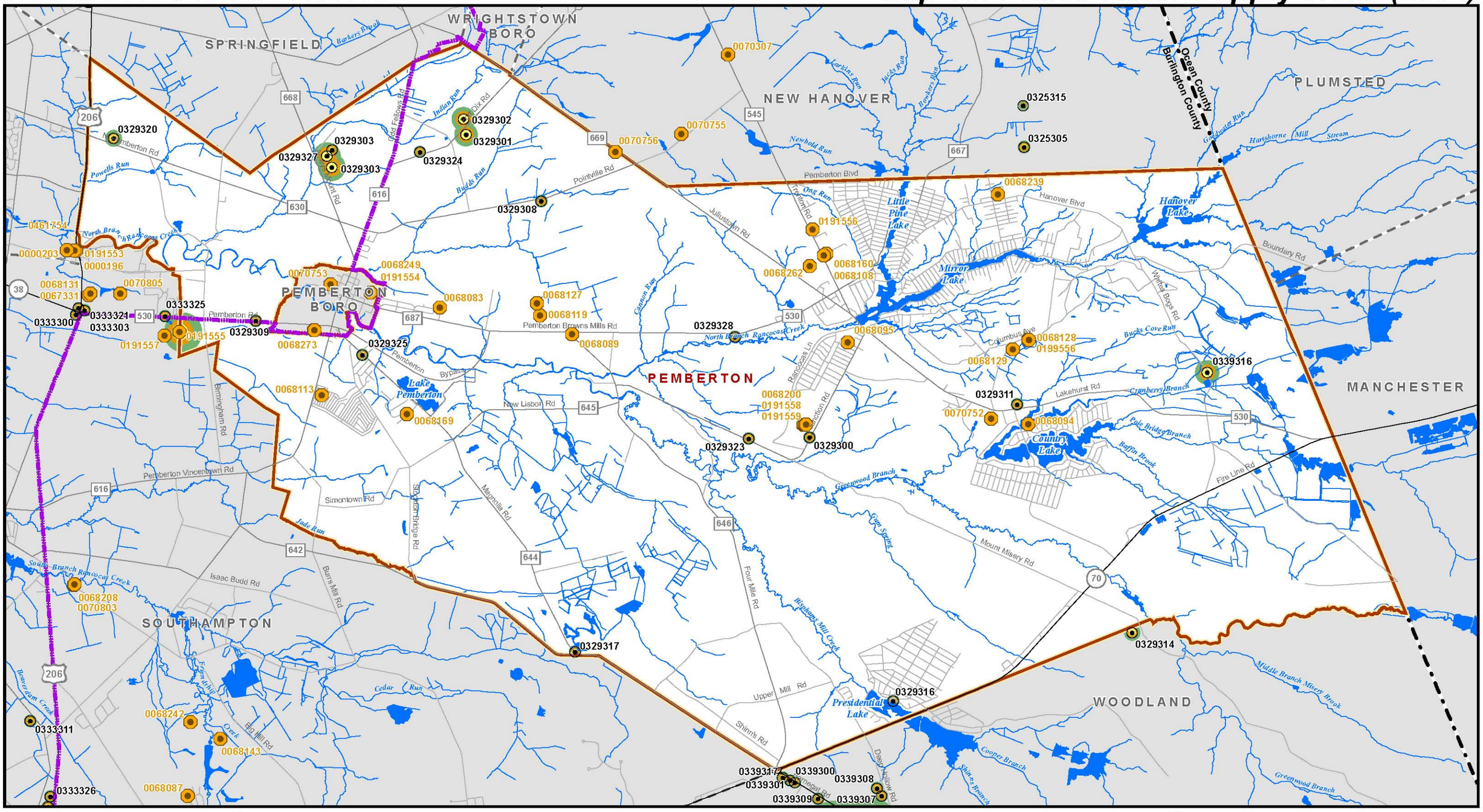
Map 13: Public Water Supply Wells (2004)



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Public Non-Community Well

Public Community Well

Wellhead Protection Area

Public Non-community; Public Community

- 2-year time of travel
- 5-year time of travel
- 12-year time of travel

N

1 0.5 0 1
Miles

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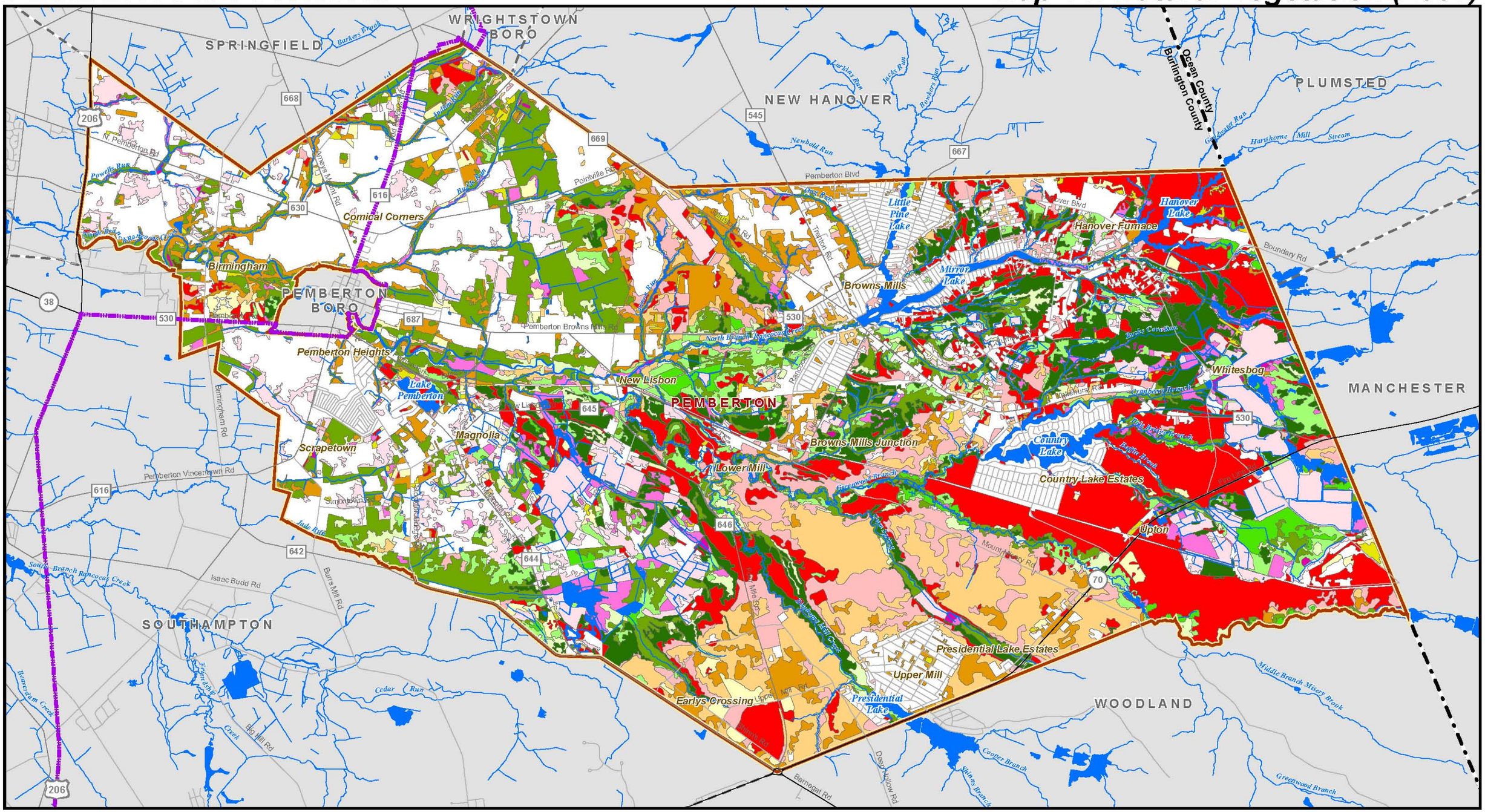
Map 14: Natural Vegetation (2007)



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Vegetation

- Brush/Shrubland
- Brush/Shrubland - Oldfield
- Upland Forest - Coniferous
- Upland Forest - Mixed (Con. Dom.)
- Upland Forest - Deciduous
- Upland Forest - Mixed (Decid. Dom.)
- Water
- Wetlands - Modified
- Wetlands - Scrub/Shrub
- Wetlands - Herbaceous
- Wetlands - Phragmites Dominated
- Wetlands - Wooded - Deciduous
- Wetlands - Wooded Mixed (Decid. Dom.)
- Wetlands - Wooded - Coniferous
- Wetlands - Wooded - Atlantic White Cedar
- Wetlands - Wooded Mixed (Con. Dom.)
- All other land cover

N

1 0.5 0 1
Miles

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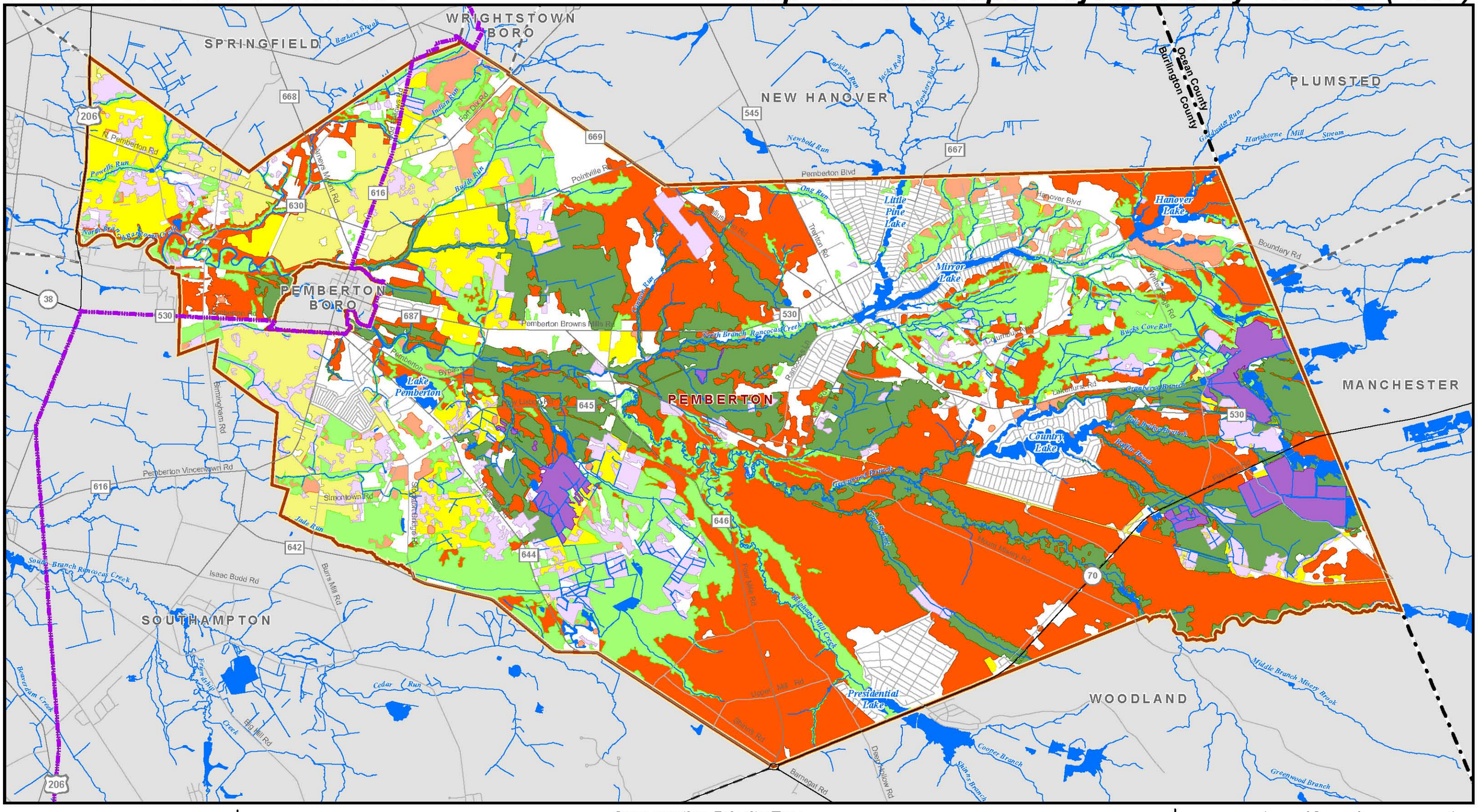
Map 15: Landscape Project Priority Habitats (2007)



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Conservation Priority Type

Emergent Wetlands	Upland Forest	Forested Wetlands	Grasslands	Beach
Critical Habitat	Critical Habitat	Critical Habitat	Critical Habitat	Suitable Habitat
Suitable Habitat	Suitable Habitat	Suitable Habitat	Suitable Habitat	

N

1 0.5 0 1
Miles

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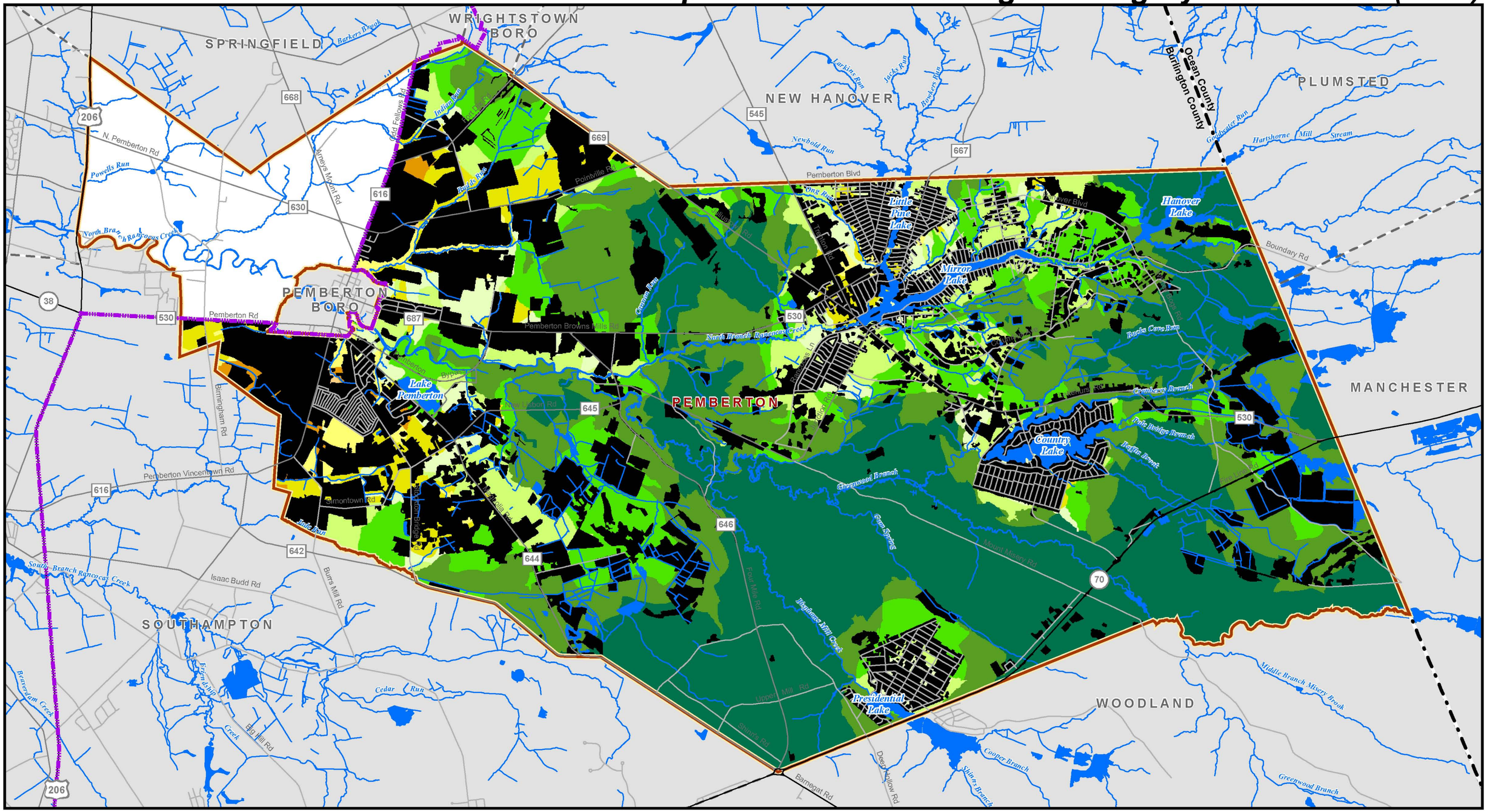
Map 16: Pinelands Ecological Integrity Assessment (2002)



Sources : Pinelands Commission, NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Ecological Integrity Score

0	20	40	60	80	100	Pinelands Boundary	
10	30	50	70	90			

N

1 0.5 0 1
Miles

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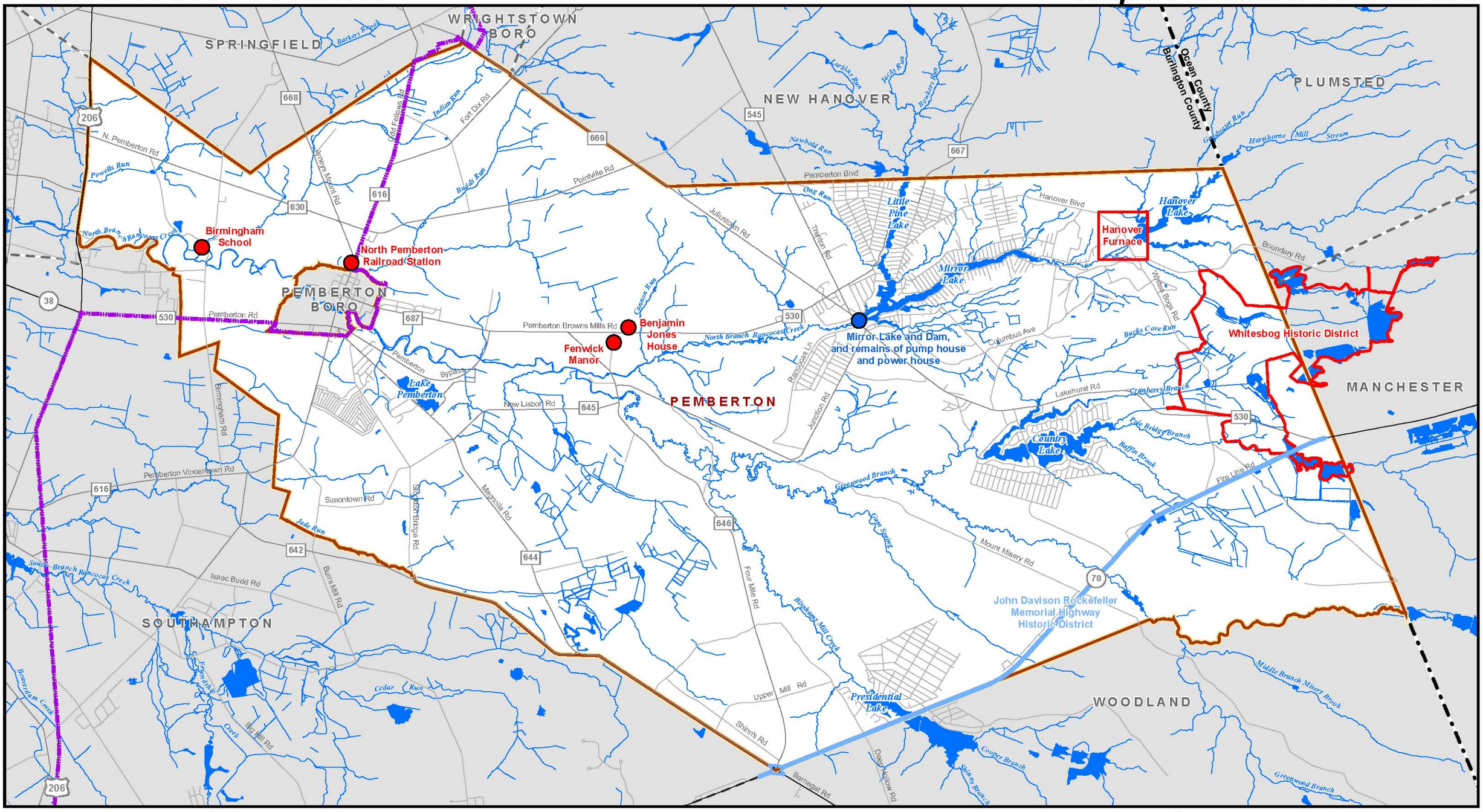
Map 17: Historic Resources



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

- Place listed on NJ and National Registers of Historic Places
- Place eligible for NJ and National Registers of Historic Places
- District eligible for NJ and National Registers of Historic Places
- Site or District listed on NJ and National Registers of Historic Places

N

1 0.5 0 1
Miles

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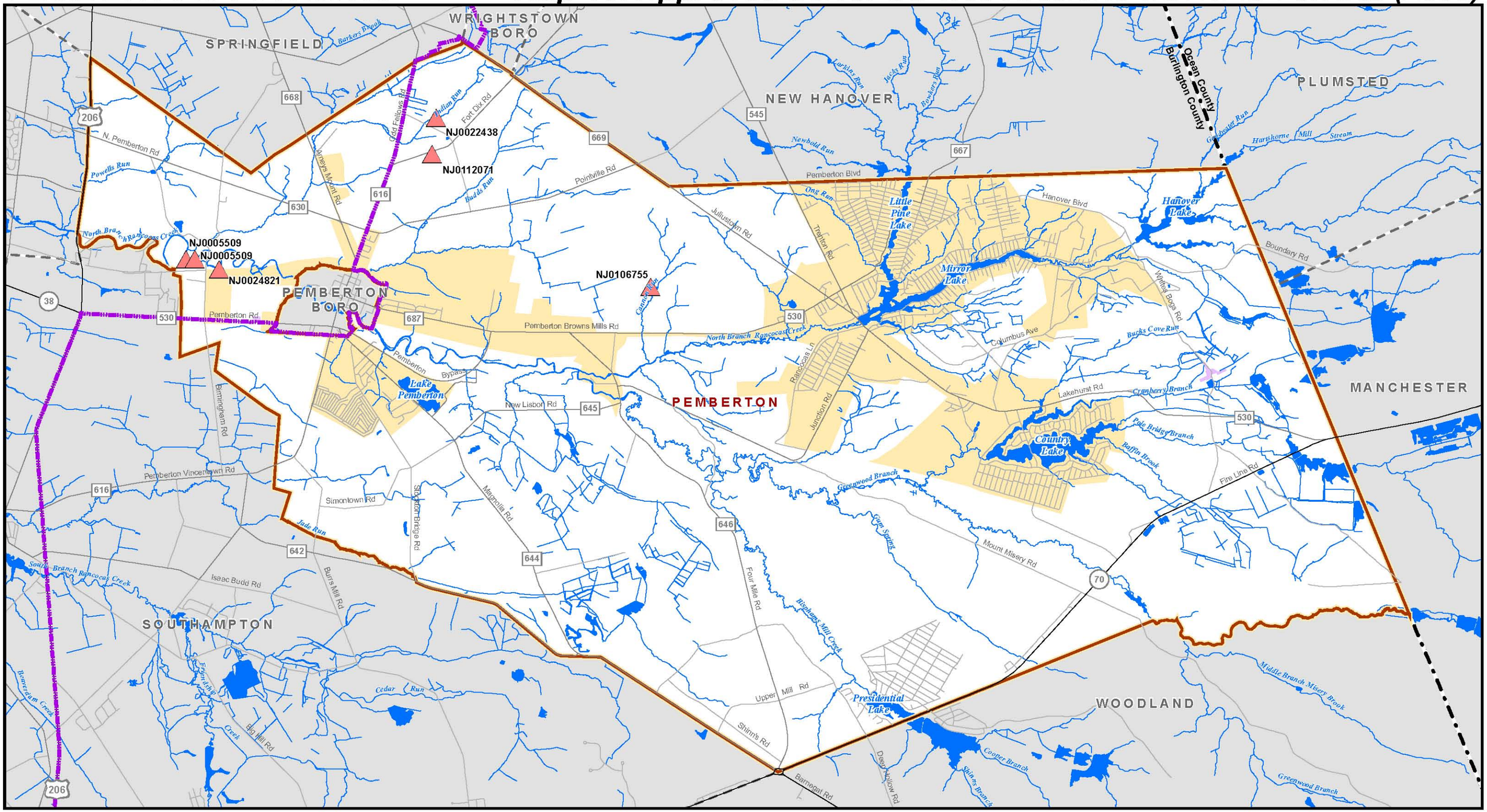
Map 18: Approved Sewer Service Area and NJPDES Permits (2008)



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Approved Sewer Service Area (2008)

Type of Wastewater Disposal

- Ground Water Discharge (through Individual NJPDES Permitted Facility)
- Surface Water Discharge

▲ NJPDES Permit for Discharge to Surface Water (2009)

N

1 0.5 0 1
Miles

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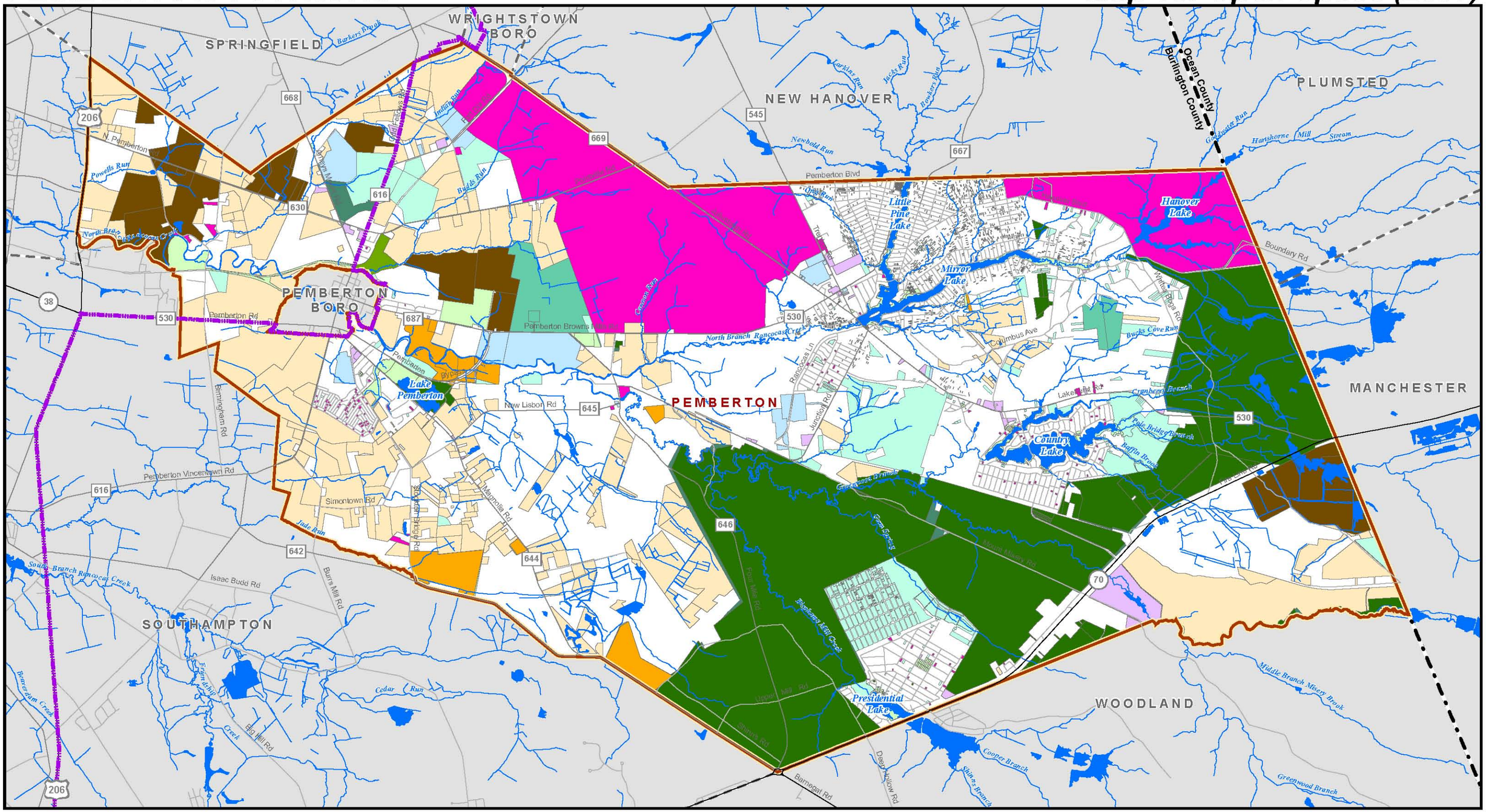
Map 19: Open Space (2007)



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Preserved Open Space

- Preserved Farmland
- Municipal
- County
- State
- Non-Profit

Public and Non-Profit Owned Properties

- Municipal
- County
- State
- Federal
- School Property
- Church, Charitable or Cemetery
- Other Exemption

- Farm Assessed (Not Preserved)

N

1 0.5 0 1
Miles

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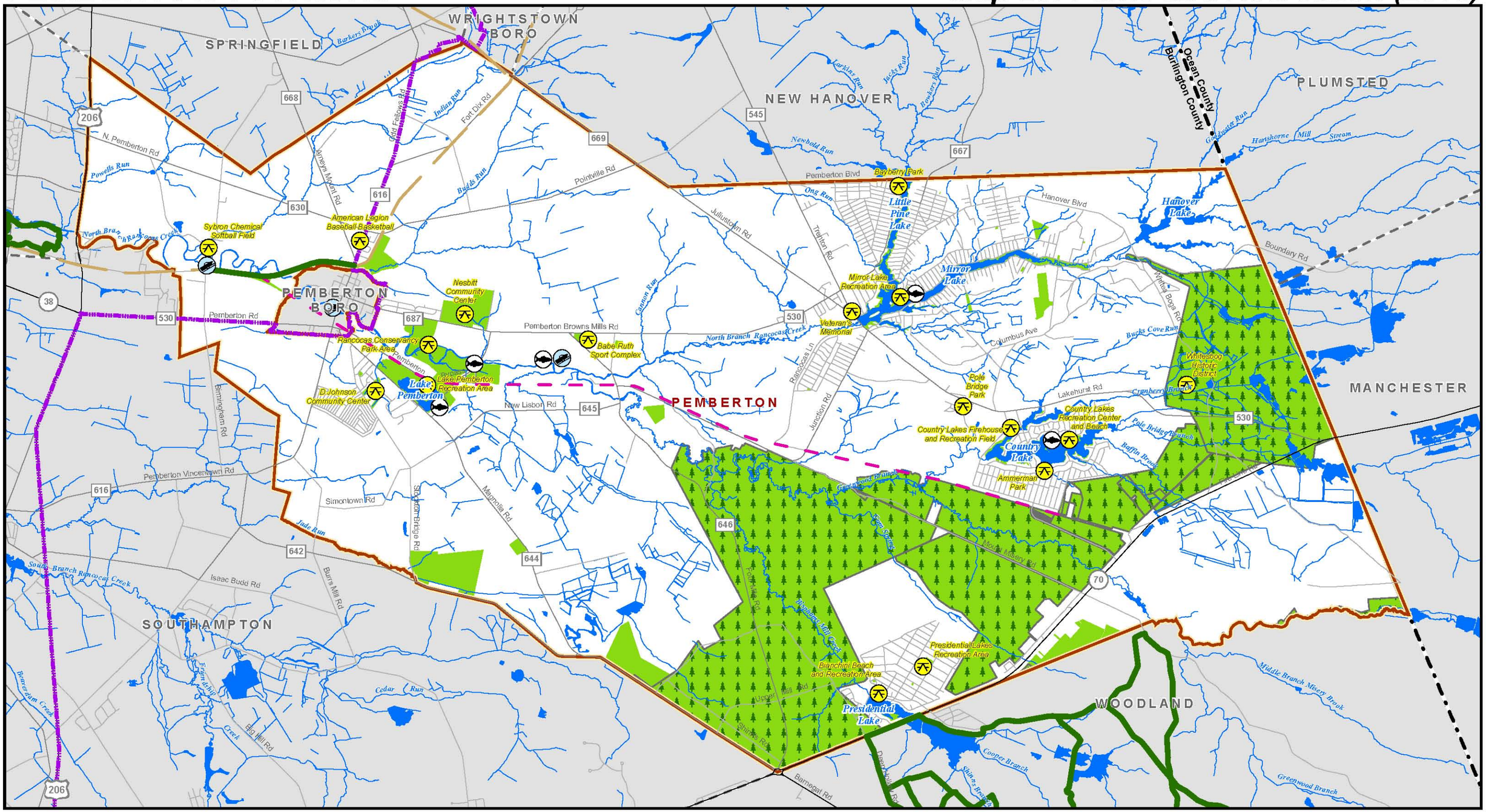
Map 20: Parks and Recreation (2010)



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

- Recreation Facility
- Canoe Launch
- Fishing Pier

Multi-Use Trails - Status

- Existing
- Planned
- Proposed

Preserved Open Space

- Park or Recreation
- Brendan T Byrne State Forest

N

1 0.5 0 1
Miles

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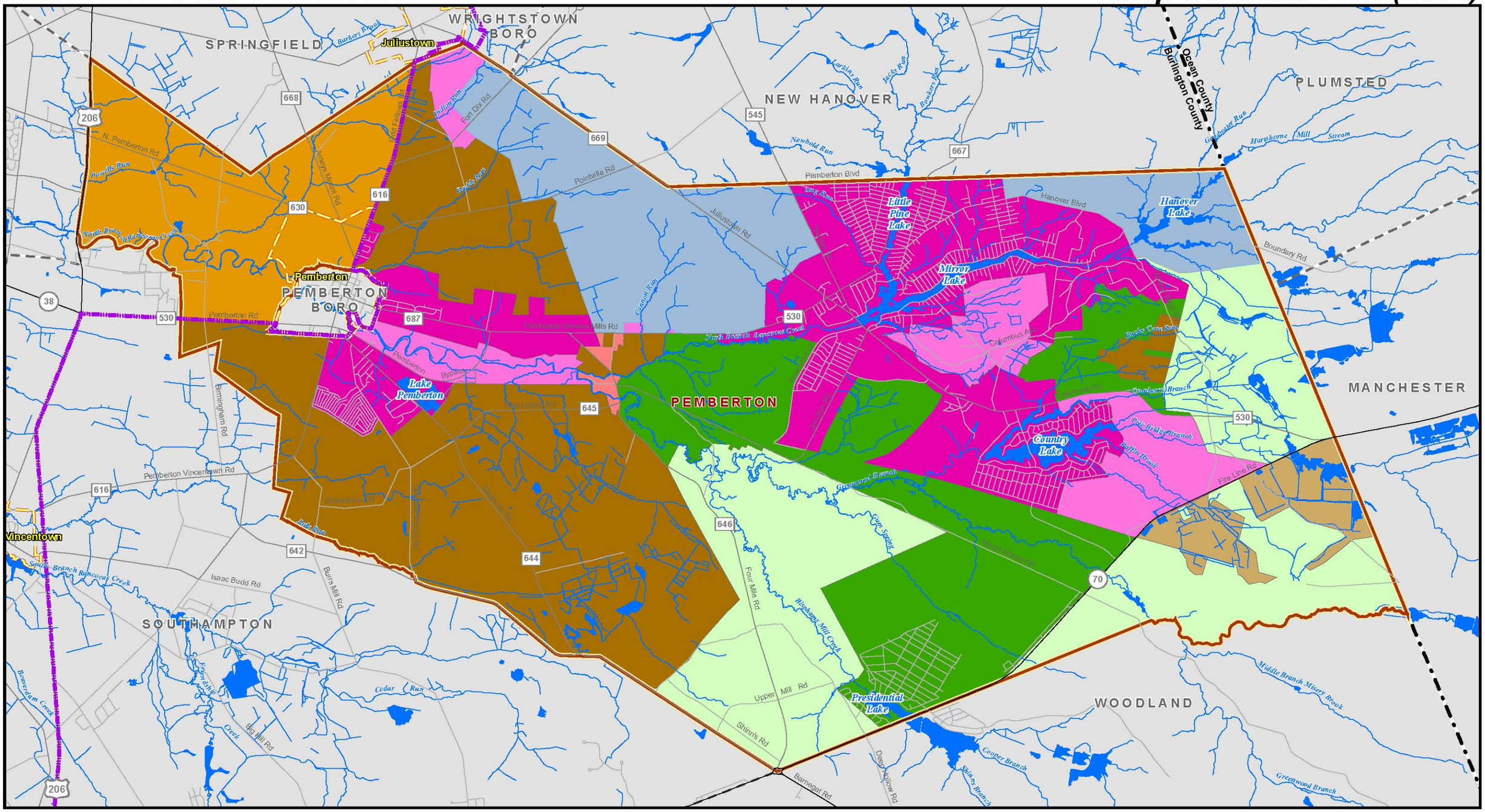
Map 21: State Plan (2001)



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

- Pinelands Boundary
- Center Boundary

Planning Areas

- Rural (PA 4)

Pinelands Management Areas

- Agricultural Production Area
- Federal or Military Facility
- Forest Area
- Pinelands Village
- Preservation Area
- Regional Growth Area
- Rural Development Area
- Special Ag Production Area

N

1 0.5 0 1
Miles

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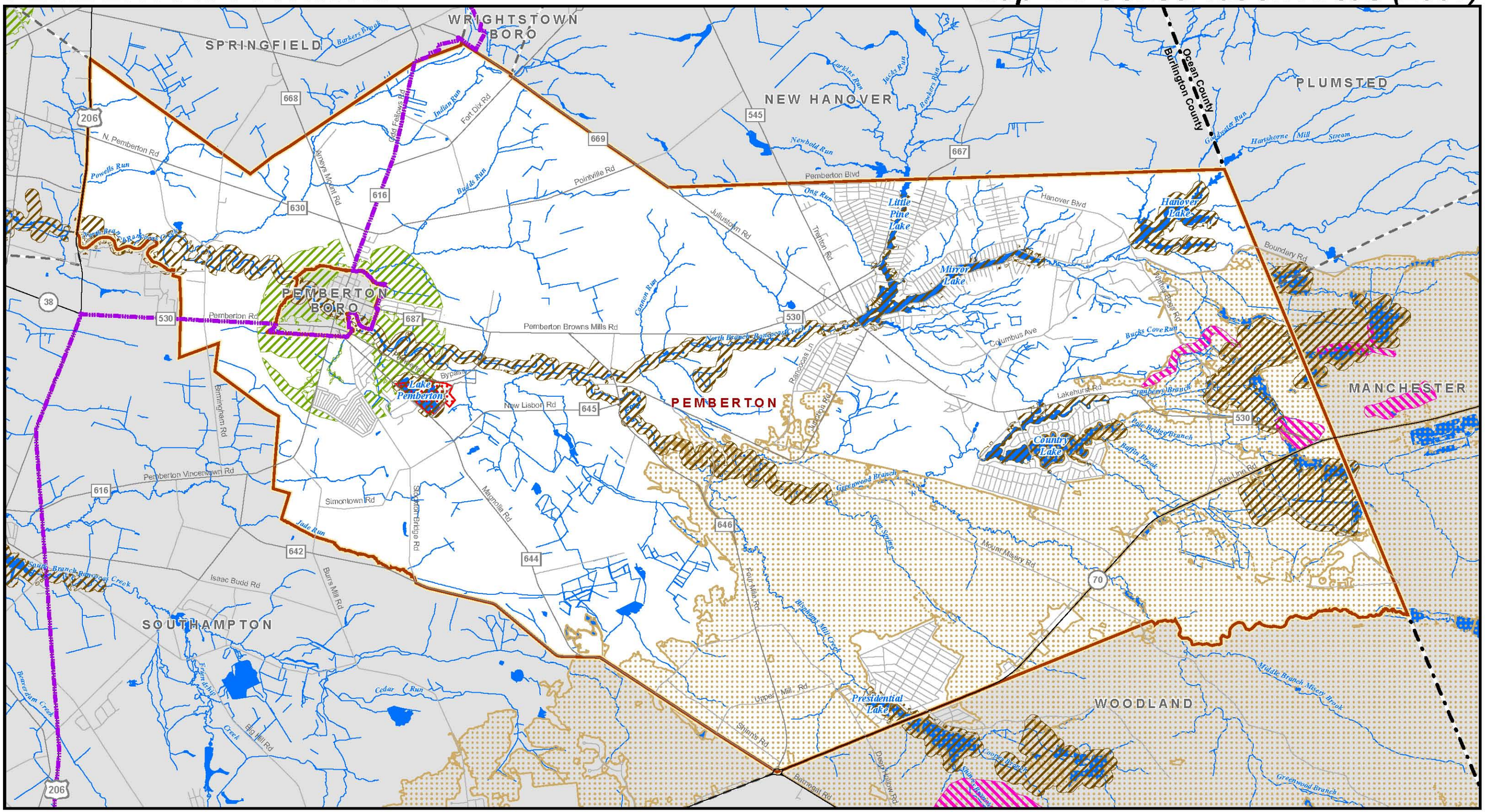
Map 22: Conservation Areas (2007)



Sources : NJ Audubon, NJDEP, NJDOT, DVRPC. This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

- Pinelands Boundary
- Bald Eagle Foraging Area
- Natural Heritage Priority Site
- Wood Turtle Critical Habitat
- Brendan T. Byrne State Forest and Whitesbog Important Birding Area (IBA)
- Pemberton Lake Wildlife Management Area

N

1 0.5 0 1
Miles

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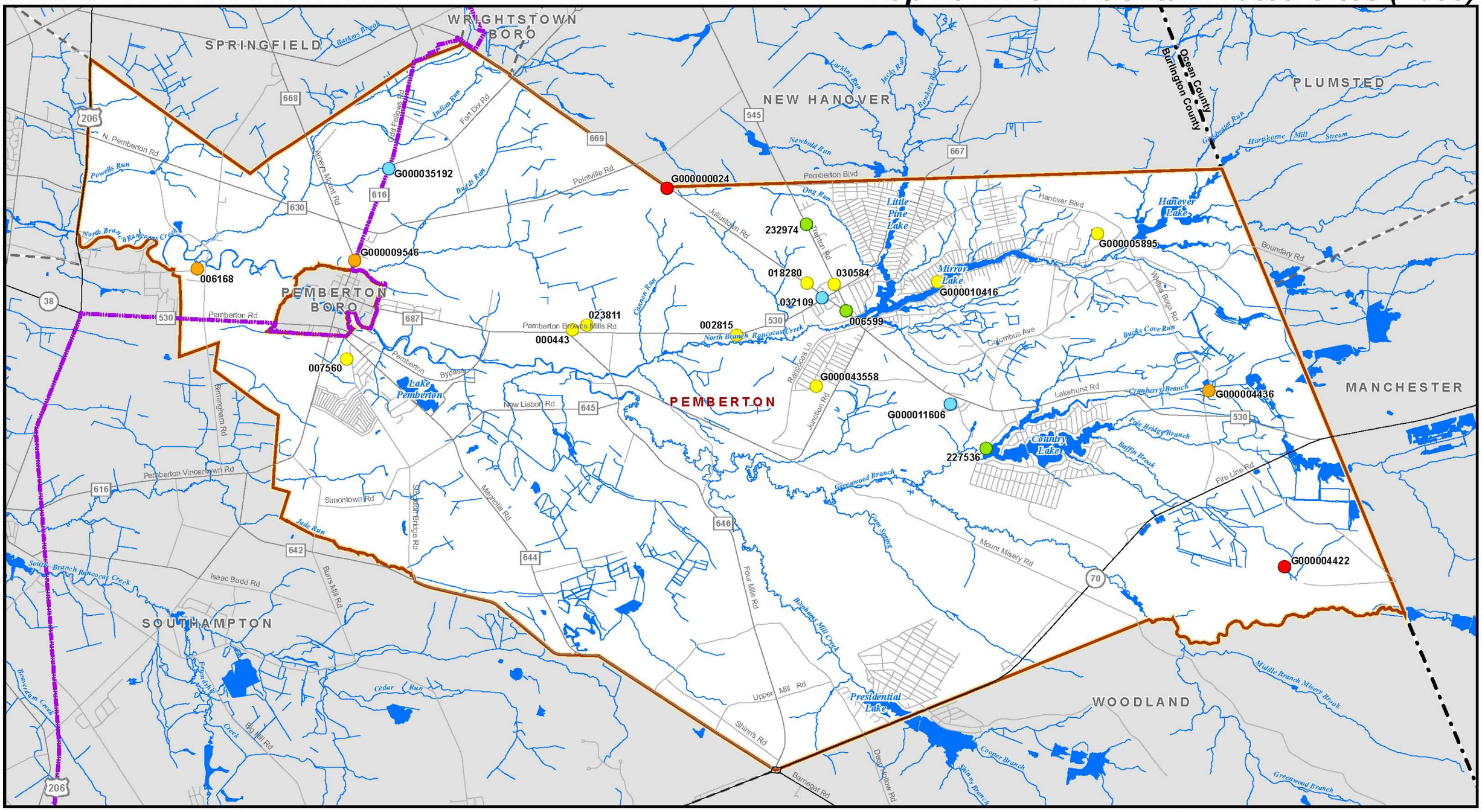
Map 23: Known Contaminated Sites (2009)



Sources : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

- **B:** Single Phase Remedial Action, Single Contamination Affecting Only Soils
- **C1:** No Formal Design, Source Known Potential Groundwater Contamination
- **C2:** Formal Design, Known Source with Groundwater Contamination
- **C3:** Multi-Phased Remedial Action, Unknown or Uncontrolled Discharge to Soil or Groundwater
- **D:** Multi-Phased Remedial Action, Multiple Source/Release to Multi-media Including Groundwater

N

1 0.5 0 1
Miles

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Publication Title:	Pemberton Township Environmental Resource Inventory
Publication Number:	10049
Date Published:	February, 2011
Geographic Area Covered:	Pemberton Township, Burlington County, New Jersey

Key Words

Agriculture, air quality, aquifers, biodiversity, biological resources, built environment, Burlington County, climate, conservation, development, endangered species, environmental issues, environmental resource inventory, floodplains, forests, grasslands, groundwater, habitat, land preservation, Landscape Project, master planning, natural resources, New Jersey, open space, Pemberton Township, Pinelands, population, Rancocas Creek, soils, steep slopes, topography, U.S. Census, vernal pools, water quality, watersheds, wetlands.

Abstract

This publication documents the natural and community resources of Pemberton Township, Burlington County, New Jersey. The natural resource information includes descriptions, tables, and maps of: land use; soils; drinking water, aquifers, and wells; surface waters, including watersheds, streams, lakes, wetlands, and floodplains; impacts on water resources and surface water quality; impervious coverage; vegetation, including wetlands, forests, and grasslands; animal communities; threatened and endangered species; Natural Heritage Priority Sites; Landscape Project Priority Habitats; and known contaminated sites. Community resources that are briefly described include population, transportation, township utilities and services, historic sites and buildings, and protected open space. A short history of the community is also included.

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