# ENVIRONMENTAL RESOURCE INVENTORY

# ERI

JUNE 2013

For the Township of:

# MOORESTOWN

Burlington County, New Jersey


by:

DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

with:

The Environmental Advisory Committee of Moorestown Township


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DELAWARE VALLEY dvrpc REGIONAL PLANNING COMMISSION

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The impetus for the creation of this document, and its guidance and review, came from the Moorestown Township Environmental Advisory Committee.

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Save the Environment of Moorestown (STEM) funded this ERI on behalf of Moorestown Township. A volunteer effort by STEM members in the 70s and 80s led to the development of the previous ERI, and later the formation of both the Township Environmental Advisory and Open Space committees. STEM also developed a rating system that became the basis for land preservation in Moorestown Township.

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# Executive Summary

Moorestown Township is a municipality of 20,726 people and covers 15 square miles (9,578.66 acres).

Moorestown lies in the Inner Coastal Plain and contains mostly fertile, well-drained soils of fine sandy loam.

There are about 22 miles of streams running through Moorestown and 106 acres of lakes and ponds, including Strawbridge Lake.

There are portions of three watersheds: the Rancocas Creek, the Pennsauken Creek, and Pompeston Creek/Swede Run. These are subdivided into eight subwatersheds located within Moorestown. In 2010, all eight of these subwatersheds were impaired for one or more designated uses. The most common cause of impairment was phosphorus.

Two-thirds of Moorestown is developed land, which is mostly single-family residential. Agriculture and wetlands each cover about 11 percent of the township, while forest land covers about eight percent. Water and barren land cover the remaining three percent of Moorestown.

Moorestown contains foraging and wintering habitat for the state-endangered bald eagle, as well as habitat for the state-threatened black-crowned night-heron, savannah sparrow, and bog turtle.

Drinking water for township residents is drawn from wells in the township that tap the Potomac-Raritan-Magothy Aquifer. Additional water supply is purchased from the Delaware River through New Jersey American Water.

There are seven historic sites that have been listed on the National and State Registers of Historic Places, in addition to the Moorestown Historic District.

There are 20 municipal recreational facilities in the township, in addition to hundreds of acres of school lands, private recreational facilities, county lands, and conservation easements.

Moorestown Township contains 27 active known contaminated sites, none of which are on the Superfund list.

CHAPTER 1

# Introduction

The purpose of an Environmental Resource Inventory (ERI) 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 are essential to the public health, safety, and welfare of current and future residents.

The ERI 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 should be updated as new data becomes available. This current ERI is an update of the *Moorestown Natural Resource Inventory,* last updated in 1989.

While present-day Moorestown Township is predominantly developed land, approximately one-third of the town remains covered in natural vegetation and farmland. These natural areas consist of wetlands, prime soils, stream corridors, floodplains, steep slopes, aquifers, and forested lands. Moorestown is bordered by the Rancocas Creek and the North Branch of the Pennsauken Creek, and numerous smaller streams run through the township. Moorestown's water, wetlands, forests, and grasslands provide significant habitat for a wide variety of plants and animals. These areas are critically important in protecting the health and vitality of the township.

Special measures to protect and enhance the historic characteristics, agricultural economy, unique forest ecosystems, and water bodies of Moorestown are essential to maintain these resources in the face of development pressures. Detailed documentation of these resources will aid Moorestown 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 natural environment.

## Sources

Several documents and reports were utilized in preparing the *Environmental Resource Inventory (ERI) for Moorestown Township*, including the 1989 *Moorestown Natural Resources Inventory*. 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's (NJDEP's) Geographic Information System

mapping, the Landscape Project produced by the Endangered and Nongame Species Program of the NJDEP Division of Fish and Wildlife, reports by the United States Geologic Service (USGS) and New Jersey Geologic Service, and data and maps compiled by the Delaware Valley Regional Planning Commission (DVRPC). The ERI has been reviewed and revised by members of the Environmental Advisory Committee and other municipal officials.

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

Camden Avenue

*Source: Joan Ponessa*

CHAPTER 2

# Brief History

Prior to its European settlement in the late 1600s, what would become Moorestown Township and its region were occupied by various peoples. By the time of European arrivals, these Native Americans called themselves the Lenni Lenape. Later, they were called the “Delaware” by Europeans. The Lenni Lenape inhabited much of southern New Jersey and their settlements were usually located along stream banks. They fished and hunted, and there is some evidence that certain wild plant communities were managed. The Lenni Lenape valued the area for its abundance of fish and game and utilized the regional creeks extensively for transportation. Evidence of early Native American sites and activities has been documented near riparian and other natural resource areas of Moorestown Township. Although some archeological sites have been developed, there are others that still exist, such as along Hooten Run and Swede Run. Archeological evidence has been uncovered along Second Street in the town center and Pleasant Valley Avenue, among other places. The “Indian Spring” on the east side of Main Street in the town center is believed to have been used by prehistoric settlers. This evidence mostly suggests small ephemeral encampments of individual, family, or group proportions and ranges in history from 10,000 BC to 1500 AD. Larger, multi-seasonal base camps were once associated with the North Branch Pennsauken Creek and Rancocas Creek Main Stem on either side of the township.


Indian Spring Historic Marker
*Source: DVRPC*

The first European settlers in Burlington County were the Dutch, who populated Burlington Island in 1624. A fort and civil center were established on the island, along with a number of dwellings and a tavern. As early as 1638, Swedish settlers also ventured into the Delaware Valley and purchased land from the Indians to build small settlements along the Delaware River. 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. Moorestown Township, located in West Jersey, was initially settled in 1682, the same year that William Penn chartered Pennsylvania.

The origins of Moorestown begin in 1682 as two communities separated by approximately two miles: Rodmantown to the west and Chestertown to the east. Rodmantown was named after Dr. John Rodman, who purchased 500 acres of land in 1686 in what is now

the western section of Moorestown. What is now the eastern part of Moorestown was called Chestertown, and later called Chester.

James and Esther Adams conveyed a plot for the Friends Meeting House, which was built just after 1700. This was the first community building in what would become Moorestown. The daughter of James and Esther Adams, Elizabeth, married Thomas Moore. Moore purchased 33 acres of land on the north side of the Kings Highway, which occupied the area from the Friends Cemetery to Locust Street. Moore subdivided this land and sold the parcels for residential and commercial development. Moore himself opened an inn in 1743 near the intersection of Union and West Main streets. Because of Moore's Inn, the area became known as Moorestown around 1760. The area was officially known as Moorestown in 1802, with the establishment of the Post Office.

Moorestown Friends Meeting Complex
*Source: DVRPC*

The King's Highway was a main reason for the success of Moorestown's growth. Also known as Old Salem Road, the construction of King's Highway was authorized in 1681 by the West Jersey Assembly and completed in 1686. This road connected the English settlements at Burlington and Salem and was the first road constructed in Burlington County. King's Highway crossed the Rancocas Creek near the present-day border of Moorestown and Delran at a place known as Hollinshead's Ferry (also spelled Hollingshead) and later as Hackney's Dock. The Hollinshead family operated a ferry for many years, which traveled between their property on the south side of the Rancocas Creek and Adam's Wharf, located on the north shore.

In the years prior to the Civil War, Moorestown was a civic hub for the surrounding agricultural area. The early town contained grist mills, tanneries, blacksmith shops, and distilleries. The resource needs created by the Civil War and pressure to industrialize provided a boost to Moorestown's development. During and after the Civil War, the construction of railroads and canals in the region provided an enormous boost for shipping agricultural and other products, as well as provided the infrastructure for increased job opportunities and economic expansion. The first railroad came to Moorestown in 1867, after the war ended.

Local Quaker communities founded the first schools, both one-room stone schoolhouses, in 1785. Quaker communities established several types of community institutions in Moorestown, including schools, elderly boarding homes, and athletic facilities. In 1827, disagreements within the Quaker community caused the Hicksite and Orthodox Friends to build different schools. In 1827, the Hicksite Friends built Moorestown Friends High School on Chester Avenue near Second Street. In 1878, the Orthodox Friends consolidated the two schoolhouses, built in 1785, as Moorestown Friends Academy, on the current Moorestown Friends School site.

Browning-Hess Farm Market
*Source: DVRPC*

Many of the early Quaker community facilities have been renovated and are now part of other institutions.

Thomas Cowperthwaite House
*Source: DVRPC*

The first school in Moorestown was built sometime before 1830 at the southeast corner of Second and Church streets. This school, open to all local children, was known as the Friendship School, and parents paid a small fee for each child enrolled.

The first free public school in Moorestown was opened in 1873. This new brick school building was located on the north side of Second Street near Church Street, and offered free education to all local children. An adjacent high school was built in 1898, which closed in 1970. Stanwick School was built in 1895, closed in 1964, and destroyed by fire in 1976. A segregated school for African Americans, School #7, was built on North Church Street in 1900. This school was enlarged in 1928, integrated in 1949, and closed in 1969. Another brick school building, School #9, was built in 1906 on Second Street, and closed in 1961. A new high school was built in 1914 on Church Street at the northeast corner of Second Street, and the 1873 school was demolished. Lenola Elementary School was built in 1917, and an addition was built in 1952. Lenola Elementary School was closed in 1980.

Passenger travel by rail in the 1800s allowed Moorestown to become a suburb of the cities of Camden and Philadelphia, as residents could commute to work with relative ease. Residential areas expanded along the rail line. The central neighborhoods of Moorestown were established between 1875 and 1910. The diverse architectural composition of the township illustrates that era's popular domestic American architectural styles of Federal, Greek Revival, Gothic Revival, Italianate, Second Empire, Queen Anne, Shingle, Colonial Revival, Arts and Crafts, Bungalow, and Tudor Revival. The far eastern and western areas of the town were still primarily agricultural at this time period.

The Moorestown Improvement Association was formed in 1904 to preserve and enhance the quality of life in the municipality. The association initiated a study that led to the establishment of the township water works in 1912. In its initial years, the association worked to install concrete sidewalks, plant shade trees, install street signs, purchase property for parkland, initiate a trash removal system, and conduct other civic initiatives.

There are several unique community facilities in Moorestown. The Perkins Center for the Arts, for example, was established as a plant nursery that specialized in ornamental trees. The adjoining residence, initially called Perkins Homestead, was built in 1832. In 1910, Philadelphia architect Herbert C. Wise designed a home on the former nursery site. This Tudor Revival style home, Evergreen Lawn, was a wedding gift to the Perkins' son and his wife. Mable Sullivan, Alice Perkins' sister, bequeathed the property as a park or other community facility to Moorestown Township. The Perkins Center for the Arts honors the Perkins' gift by providing an arboretum and art programs for Moorestown Township and Collingswood Borough. Another important community facility is the Moorestown Community House. Eldridge Reeves Johnson, the founder of the Victor Talking Machine Company, donated the funds to build the Moorestown Community House in 1923. Opened

in 1926, the Moorestown Community House offers a ballroom, meeting rooms, offices for nonprofit organizations, and a heated indoor swimming pool for residents of Moorestown and surrounding communities.

Moorestown Community House
*Source: DVRPC*

Moorestown Township was officially incorporated on March 11, 1922, by an act of the New Jersey State Legislature, from portions of Chester Township (now Maple Shade Township). The 1920s led to rapid suburban expansion, as more families were able to afford automobiles. This led to more residential development away from the concentrated areas around rail lines, as many workers could now commute by car to the urban centers of Philadelphia and Camden. Residential development was stagnant during the Great Depression of the 1930s and the war effort of the early 1940s. The economic boom and mass ownership of automobiles of the post-World War II era greatly impacted Moorestown, as the population shifted from the cities to the suburbs. Development spread outwards from the older center of Moorestown to the surrounding agricultural lands. Moorestown experienced a surge of population in the 1950s and 1960s, growing from just over 9,000 people in 1950 to over 15,000 in 1970. Population remained relatively flat between 1970 and 1990, and then grew again between 1990 and 2010, from 16,000 to nearly 21,000.

The George C. Baker Elementary School was constructed in 1952, and the Mary E. Roberts School was built in 1957. An annex to the Church Street High School was opened in 1940. A new high school was built in 1962 on Bridgeboro Road, with an addition constructed in 1969. South Valley Elementary School was opened in 1964. A new middle school was built in 1971 on North Stanwick Road, renamed the William W. Allen, III Middle School in 1979. The Upper Elementary School opened in 2001 to house grades four through six.

The Moorestown Mall was opened in 1964, with John Wanamaker's and Gimbels as anchor tenants. The mall was reconstructed after a devastating fire in 1992. Currently, there are four anchor tenants: Boscov's, Sears, Macy's and Lord and Taylor. A large, multiscreen theater is currently under construction.

Today, Moorestown Township honors its rich history, while planning for the future. The Moorestown Improvement Association offers a series of walking tours of the township, with accompanying brochures that highlight buildings in the historic district. The Moorestown Historic District, listed on the State and National Registers of Historic Places, protects the distinct cultural and architectural heritage of Moorestown.

CHAPTER 3

# Location, Size, and Land Use

Moorestown is an incorporated township located on the southwest edge of Burlington County, New Jersey. The township is adjacent to Cinnaminson, Delran, Maple Shade, Mount Laurel, and Willingboro. Moorestown is bordered by the north branch of Pennsauken Creek to the west and Rancocas Creek to the east. See **Map 1: Places in Moorestown Township** and **Map 2: Aerial Photo (2010)**.

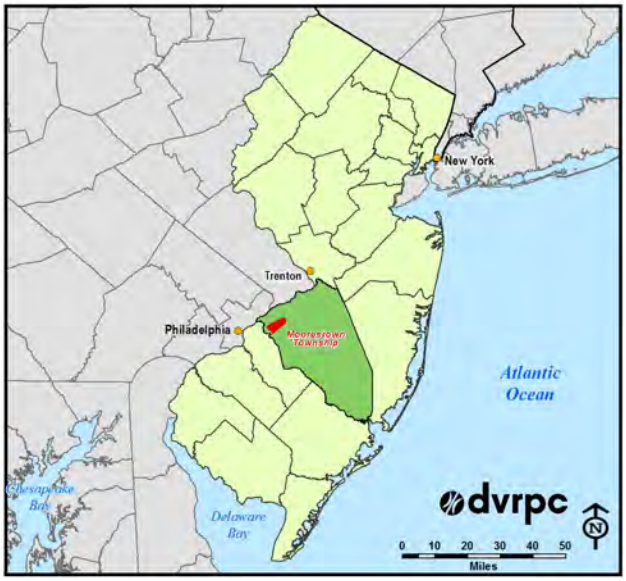



Figure 1: Moorestown Township

Source: DVRPC

According to the U.S. Census Bureau, Moorestown occupies a total area of 15.1 square miles (9,578.66 acres), and is located on the inner coastal plain of New Jersey. The U.S. Census Bureau estimates that Moorestown had a population of 20,726 people in 2010, a modest increase from its 2000 population of 19,017.

Moorestown is served well by highways. The township is located close to I-295, the New Jersey Turnpike (I-95), and Routes 38, 73, and 130. Moorestown is not immediately served by passenger rail. However, there is access from adjacent townships to the River LINE and PATCO rail. There is also bus service in Moorestown Township that connects to surrounding townships and boroughs.

**Table 1: Moorestown General Land Cover (2007)** shows Moorestown's land cover grouped into general categories. The categories are based on data from the New Jersey Department of Environmental Protection's (NJDEP's) 2007 color infrared digital imagery. The majority of land in Moorestown is classified as urban land (67 percent, or 6,396.47 acres). This is followed by agriculture (11 percent, or 1,065.74 acres). Wetlands comprise almost an equal amount of space as agriculture in Moorestown at 11 percent, or 1,046.91 acres, of the township, followed by forest, which makes up eight percent (or 770.63 acres) of the township. NJDEP's categorization separates wooded wetlands from upland forest areas and includes the former in the wetlands category. See **Map 3: NJDEP Land Cover (2007)**.

**Table 2: Moorestown Detailed Land Cover (2007)** derives from the same dataset as **Table 1**, but provides a more detailed breakdown of the land cover categories.

Table 1: Moorestown General Land Cover (2007)

| General Land Classes | Area (Acres) | Percent |
|---|---|---|
| Agriculture | 1,065.74 | 11.13% |
| Barren Land | 82.78 | 0.86% |
| Forest | 770.63 | 8.05% |
| Urban | 6,396.47 | 66.78% |
| Water | 216.13 | 2.26% |
| Wetlands | 1,046.92 | 10.93% |
| **Total** | **9,578.66** | **100.00%** |

Source: NJDEP, 2007

Table 2: Moorestown Detailed Land Cover (2007)

| Type | Area (Acres) | Percent |
|---|---|---|
| Agricultural Wetlands (Modified) | 85.85 | 0.90% |
| Altered Lands | 30.20 | 0.32% |
| Artificial Lakes | 105.43 | 1.10% |
| Athletic Fields (Schools) | 77.77 | 0.81% |
| Bridge Over Water | 0.32 | 0.00% |
| Cemetery | 15.06 | 0.16% |
| Commercial/Services | 541.30 | 5.65% |
| Coniferous Brush/Shrubland | 3.77 | 0.04% |
| Coniferous Forest (>50% Crown Closure) | 18.18 | 0.19% |
| Coniferous Wooded Wetlands | 0.98 | 0.01% |
| Cropland and Pastureland | 920.97 | 9.61% |
| Deciduous Brush/Shrubland | 32.19 | 0.34% |
| Deciduous Forest (10-50% Crown Closure) | 80.40 | 0.84% |
| Deciduous Forest (>50% Crown Closure) | 445.27 | 4.65% |
| Deciduous Scrub/Shrub Wetlands | 43.22 | 0.45% |
| Deciduous Wooded Wetlands | 702.74 | 7.34% |
| Disturbed Wetlands (Modified) | 29.13 | 0.30% |
| Former Agricultural Wetland (Becoming Shrubby, Not Built-Up) | 5.77 | 0.06% |
| Freshwater Tidal Marshes | 94.53 | 0.99% |
| Herbaceous Wetlands | 22.34 | 0.23% |
| Industrial | 450.00 | 4.70% |
| Industrial and Commercial Complexes | 3.32 | 0.03% |

| Type | Area (Acres) | Percent |
|---|---|---|
| Major Roadway | 34.35 | 0.36% |
| Managed Wetland in Built-Up Maintained Rec Area | 9.99 | 0.10% |
| Managed Wetland in Maintained Lawn Greenspace | 25.86 | 0.27% |
| Military Installations | 8.50 | 0.09% |
| Mixed Deciduous/Coniferous Brush/Shrubland | 16.86 | 0.18% |
| Mixed Forest (>50% Coniferous with 10-50% Crown Closure) | 1.02 | 0.01% |
| Mixed Forest (>50% Coniferous with >50% Crown Closure) | 19.85 | 0.21% |
| Mixed Forest (>50% Deciduous with >50% Crown Closure) | 8.68 | 0.09% |
| Mixed Scrub/Shrub Wetlands (Deciduous Dom.) | 6.26 | 0.07% |
| Mixed Urban or Built-Up Land | 1.92 | 0.02% |
| Natural Lakes | 0.42 | 0.00% |
| Old Field (< 25% Brush Covered) | 132.03 | 1.38% |
| Orchards/Vineyards/Nurseries/Horticultural Areas | 73.99 | 0.77% |
| Other Agriculture | 70.78 | 0.74% |
| Other Urban or Built-Up Land | 486.60 | 5.08% |
| Phragmites Dominate Coastal Wetlands | 2.64 | 0.03% |
| Phragmites Dominate Interior Wetlands | 17.61 | 0.18% |
| Phragmites Dominate Old Field | 7.14 | 0.07% |
| Phragmites Dominate Urban Area | 1.89 | 0.02% |
| Plantation | 5.25 | 0.05% |
| Railroads | 19.84 | 0.21% |
| Recreational Land | 399.85 | 4.17% |
| Residential, High Density or Multiple Dwelling | 109.42 | 1.14% |
| Residential, Rural, Single Unit | 1,441.69 | 15.05% |
| Residential, Single Unit, Low Density | 1,460.31 | 15.25% |
| Residential, Single Unit, Medium Density | 1,226.05 | 12.80% |
| Stormwater Basin | 64.53 | 0.67% |
| Streams and Canals | 4.71 | 0.05% |
| Tidal Rivers, Inland Bays, and Other Tidal Waters | 105.25 | 1.10% |
| Transitional Areas | 52.58 | 0.55% |
| Transportation/Communication/Utilities | 54.08 | 0.56% |
| **Total** | **9,578.66** | **100%** |

Source: NJDEP, 2007

**Table 3: Moorestown Land Use** shows the existing land uses in the township based on parcel data from Moorestown Township. Unlike the land cover data shown above, the land use data assigns a single use to each parcel. See **Map 4: Land Use** for a depiction of this parcel data. **Table 3** has a lower total acreage than **Table 2** because **Table 3** does not include road acreage in its land use calculations. In **Table 2**, the area covered by roads is included in Transportation/Communication/Utilities and Major Roadways.

About half of Moorestown's area consists of residential communities. The majority of residences are single-family homes, but there are nearly 100 acres of multi-family housing as well. The second-most common land use is farmland, which covers 11 percent of Moorestown's area, and is an important part of Moorestown's economy and culture. See the **Soils** section for a more detailed discussion of Moorestown agriculture and soils. Open space and industrial uses comprise nine percent and eight percent of the township's area, respectively. Private and public recreational facilities total nine percent of Moorestown's area. Slightly more than half of recreational facilities are open to the public. Less than three percent of the township land is considered vacant land.

Table 3: Moorestown Land Use

| Land Use Type | Acres | Percent |
|---|---|---|
| Cemetery | 14.70 | 0.15% |
| Charitable | 62.85 | 0.66% |
| Commercial | 503.46 | 5.26% |
| Farmland | 914.65 | 9.55% |
| Industrial | 724.40 | 7.56% |
| Institutional | 131.38 | 1.37% |
| Open Space | 722.89 | 7.55% |
| Public School | 160.07 | 1.67% |
| Recreational-Private | 276.72 | 2.89% |
| Recreational-Public | 393.21 | 4.11% |
| Residential | 4,291.28 | 44.80% |
| Residential-Multi-Family | 176.64 | 1.84% |
| Transportation | 718.83 | 7.50% |
| Vacant | 271.46 | 2.83% |
| Water | 216.13 | 2.26% |
| **Total** | **9,578.66** | **100.00%** |

Source: Moorestown Township, 2012

CHAPTER 4

# Natural Resources

## Physiography

Physiography is the study of a location in relation to its underlying geology. New Jersey is characterized by five physiographic provinces (see **Figure 2: 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.

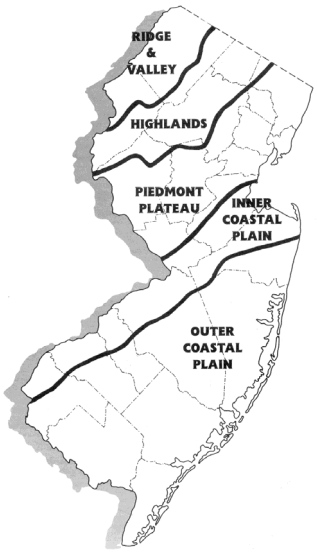



Figure 2: The Physiographic Regions of New Jersey

Source: NJDEP

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.

Moorestown Township is completely located in the Inner Coastal Plain of New Jersey. In New Jersey, the Inner Coastal Plain is made up of inter-bedded sand and clay. Deposits originating in the breakdown of Appalachian and Catskill sedimentary, metamorphic, and igneous rocks are inter-bedded 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 Coastal 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 called the cuesta belt, 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. In Moorestown Township, Main Street courses along the cuesta upland. The Inner Coastal Plain lies to the west of the band of hills and the Outer Coastal Plain lies to the east. A diversity of habitats and natural resources are found along the cuesta, which has long attracted human settlements.

## Topography and Surface Landscapes

Topography relates to the surface terrain and features of an area. The vast majority of Moorestown is generally flat, typical of areas in the Inner Coastal Plain. See **Map 5: Elevation** and **Map 6: Steep Slopes**. The highest elevations in the township are found on Main Street, which is located along the cuesta upland on a ridge of high ground composed of upland gravel, as shown in **Map 15: Surface Geology**. Elevations along Main Street exceed 100 feet above sea level. The lowest elevations are located in tidal creek floodplains of the North Branch Pennsauken Creek and Rancocas Creek Main Stem.

Ridges and high points delineate the boundaries of watersheds, seen in **Map 9: Watersheds**. The ridge of Main Street forms the dividing line between land flowing to the Pompeston Creek/Swede Run watershed to the north and the Pennsauken Creek watershed to the south.

Because of its low elevation and relatively flat topography, about 10 percent of Moorestown is located in a floodplain, as shown on **Map 11: Floodplains (1996)**. Floodplains occur exclusively along the creeks and tributaries in the township.

## Steep Slopes

Slope is measured as the percent of vertical rise to horizontal distance. The majority of Moorestown has slopes of less than 10 percent. 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.

Stokes Hill
*Source: Chet Dawson*

Moorestown's steep slopes are depicted on **Map 6: Steep Slopes**. The eastern area of the township to the east of the Laurel Creek Country Club has some of the steepest slopes in the township. On the other side of Moorestown, upland areas to the west of Strawbridge Lake also have steep slopes. There is another band of steep slopes south of the ridge of Main Street,

particularly at Stokes Hill, the location of the first test run of the Flexible Flyer sled in the 1880s.

# Soils

Soil is the foundation for all land uses. A region's soil defines what vegetation is possible, therefore influencing 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.

Moorestown's soils consist of 18 series types and 42 variations within those series, 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: Moorestown Soils** and shown on **Map 7: Soils**.

## Soil Series


Wigmore Acres
*Source: DVRPC*

Several soil series appear more frequently in Moorestown than others and are briefly described, as follows, according to the Burlington County Soil Survey and NRCS soil database. The two most commonly found soil series in the township are the Woodstown and Sassafras series, both of which are fine sandy loam. Fine sandy loam refers to soils that have particle sizes slightly larger than clay soils and therefore drain better and are less compactable. However, because it does have a significant percentage of finer particles as well, the soil is capable of retaining nutrients for a longer period of time, making it ideal for agricultural crops.

### Woodstown

Woodstown is the most commonly found soil type in Moorestown, covering about 43 percent of the township. Generally associated with Sassafras and Fallsington soils, it is moderately well-drained fine sandy loam. The Woodstown series was formed in alluvial material and usually occurs below Sassafras and above Fallsington soils. The series has a fluctuating water table that can rise to a depth of two feet in winter. Although variations are hydric, the soil is not a wetland indicator and can be developed. The Woodstown series is identified as prime farmland soil.

## Sassafras

The Sassafras series, the second most common soil type in Moorestown, covers about 28 percent of the township. This soil series is associated with Woodstown, Freehold, Holmdel, and Downer soils. Sassafras and Woodstown soils developed in material deposited by glacial water on the glauconitic marine deposits in which Freehold and Holmdel soils formed. Sassafras soils are typically found occupying higher positions than Woodstown and Holmdel near the Delaware River. The native vegetation consists of red oak, white oak, black oak, scarlet oak, hickory, beech, yellow poplar, and Virginia pine. Sassafras soils are identified as prime farmland soil.

## Holmdel

Holmdel soils are often found in association with Freehold soils and are very similar to them. This series drains slightly less well than Freehold and has a high water table in late winter. Holmdel soils are typically found on slightly steeper slopes. Their native vegetation consists of red, scarlet, and white oaks, yellow poplar, beech, and hickory. Flatter areas with Holmdel soil are dominated by pin and willow oak, and sweet gum. Holmdel soils are identified as prime farmland soil.

## Galestown

Galestown soils are high in sand and low in clay, which makes them very highly drained. In Moorestown, this soil series is found near the Rancocas Creek and the Pennsauken Creek. These soils are low in organic matter and fertility, yet they are still identified as a prime farmland soil when located on slopes less than six percent. Natural vegetation for this soil series consists of oak hickory forest, with a strong presence of Virginia pine.

## Fallsington

Consisting of nearly level fine sandy loams, gray in color and distinctly mottled, Fallsington soils are alluvial soils deposited in lower elevations. They typically remain saturated for six to eight months of the year, and in summer the water table may drop below three feet, but this depends greatly on seasonal rain fall. These soils are indicators of freshwater wetlands and severely limit development.

## Keyport

Keyport soils are found in limitation in the Northwest corner of Moorestown. They have a high available water capacity and are slowly permeable. Erosion is high on slopes exceeding two percent and can be a hazard. These soils are very acidic and contain moderate organic matter. Keyport is a prime farmland soil. Native vegetation is hardwood forest, characterized by yellow poplar, red oak, willow oak, ash, beech, and hickory.

### Donlonton

Donlonton soils are poorly draining and located in nearly level areas. The soil series contains small amounts of glauconite. Typically found below Keyport soils and above Colemantown and Shrewsbury soils, Donlonton soils are slowly draining and have high water-holding capacity, causing severe shrink and swell, making the soil highly unsuitable for development. Donlonton soils are characterized as prime farmland. Native vegetation includes hardwood forest, pin oak, willow oak, and swamp white oak.

### Freehold

Freehold soils are sandy and well drained. The series is typically dark grayish-brown in color and low in glauconite. Freehold soils contain iron among the finer particles, which gives the soils a reddish color at lower horizons. The soils are very acidic and occupy higher horizons. The natural vegetation on this series is typically a red oak, beech, and yellow poplar hardwood forest. They are identified as prime farmland soils.

## Soil Characteristics

### Hydric Soils

Less than half (45 percent) of Moorestown'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 Soils of Statewide Importance when the limitations are overcome by measures such as drainage or flood control.

### Depth to Water Table

The water table refers to a saturated zone in the soil that occurs during certain months. The depth to the water table is the distance between this zone and the ground surface. Estimates of the upper limit are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table. Development can be severely constrained on soils with a depth to water table of less than one foot. A depth to water table between one and three feet can also impede development.

## Flood Frequency Class

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. "None" means that flooding is not probable, or the chance of flooding is less than once in 500 years. "Very rare" means that flooding is very unlikely but possible under extremely unusual weather conditions, or the chance of flooding is less than one percent in any year. "Rare" means that the chance of flooding is one to five percent in any year. "Occasional" means that the chance of flooding is five to 50 percent in any year. "Frequent" means that flooding is likely to occur often under normal weather conditions. In this case, the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year. "Very frequent" means that the chance of flooding is more than 50 percent in all months of any year under normal weather conditions.

## Potential Frost Action

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity (Ksat), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

## Drainage Class

"Drainage class" refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized: excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained.

Table 4: Moorestown Soils

| Soil Type | Description | Area (Acres) | % of Moorestown Township | Ag. Quality* | Hydric? | Depth to Water Table (centimeters) | Flood Frequency Class | Potential Frost Action | Drainage Class |
|---|---|---|---|---|---|---|---|---|---|
| CoeAs | Colemantown loam, 0 to 2 percent slopes, occasionally flooded | 19.45 | 0.20% | N/A | Y | 15 | Occasional | High | Poorly drained |
| ComB | Collington fine sandy loam, 2 to 5 percent slopes | 12.61 | 0.13% | P-1 | Y | >200 | None | Moderate | Well drained |
| DoaA | Donlonton fine sandy loam, 0 to 2 percent slopes | 9.81 | 0.10% | P-1 | Y | 54 | None | High | Somewhat poorly drained |
| DobA | Donlonton loam, 0 to 2 percent slopes | 174.83 | 1.83% | P-1 | Y | 54 | None | High | Somewhat poorly drained |
| FanA | Fallsington fine sandy loam, 0 to 2 percent slopes | 388.73 | 4.06% | S-1 | Y | 30 | None | Moderate | Poorly drained |
| FmhAt | Fluvaquents, loamy, 0 to 3 percent slopes, frequently flooded | 138.56 | 1.45% | N/A | Y | 38 | Frequent | High | Somewhat poorly drained |
| FrmD | Freehold fine sandy loam, 10 to 15 percent slopes | 13.82 | 0.14% | U-1 | N | >200 | None | Moderate | Well drained |
| FrmB | Freehold fine sandy loam, 2 to 5 percent slopes | 16.70 | 0.17% | P-1 | N | >200 | None | Moderate | Well drained |
| FrmkB | Freehold fine sandy loam, clayey substratum, 2 to 5 percent slopes | 16.77 | 0.18% | P-1 | N | >200 | None | Moderate | Well drained |
| FrfB | Freehold loamy sand, 0 to 5 percent slopes | 52.28 | 0.55% | P-1 | Y | >200 | None | Moderate | Well drained |
| FrfC | Freehold loamy sand, 5 to 10 percent slopes | 25.54 | 0.27% | S-1 | N | >200 | None | Moderate | Well drained |
| FrkC3 | Freehold sandy loam, 5 to 10 percent slopes, severely eroded | 25.39 | 0.27% | S-1 | N | >200 | None | Moderate | Well drained |

| Soil Type | Description | Area (Acres) | % of Moorestown Township | Ag. Quality* | Hydric? | Depth to Water Table (centimeters) | Flood Frequency Class | Potential Frost Action | Drainage Class |
|---|---|---|---|---|---|---|---|---|---|
| GabB | Galestown sand, 0 to 5 percent slopes | 424.04 | 4.43% | U-1 | N | >200 | None | Low | Somewhat excessively drained |
| GakB | Galloway fine sand, 0 to 5 percent slopes | 6.60 | 0.07% | N/A | Y | 54 | None | Moderate | Moderately well drained |
| GahhB | Galloway sand, loamy substratum, 0 to 5 percent slopes | 14.20 | 0.15% | N/A | Y | 54 | None | Moderate | Moderately well drained |
| HodA | Holmdel fine sandy loam, 0 to 2 percent slopes | 24.10 | 0.25% | P-1 | Y | 69 | None | High | Moderately well drained |
| HodB | Holmdel fine sandy loam, 2 to 5 percent slopes | 151.10 | 1.58% | P-1 | N | 69 | None | High | Moderately well drained |
| HodkA | Holmdel fine sandy loam, clayey substratum, 0 to 2 percent slopes | 260.29 | 2.72% | P-1 | Y | 69 | None | High | Moderately well drained |
| HodkB | Holmdel fine sandy loam, clayey substratum, 2 to 5 percent slopes | 136.25 | 1.42% | P-1 | N | 69 | None | High | Moderately well drained |
| HoaB | Holmdel loamy sand, 0 to 5 percent slopes | 46.60 | 0.49% | P-1 | Y | 69 | None | High | Moderately well drained |
| HofB | Holmdel-Urban land complex, 0 to 5 percent slopes | 109.70 | 1.15% | N/A | N | 69 | None | High | Moderately well drained |
| KeoA | Keyport loam, 0 to 2 percent slopes | 26.39 | 0.28% | P-1 | Y | 76 | None | Moderate | Moderately well drained |

| Soil Type | Description | Area (Acres) | % of Moorestown Township | Ag. Quality* | Hydric? | Depth to Water Table (centimeters) | Flood Frequency Class | Potential Frost Action | Drainage Class |
|---|---|---|---|---|---|---|---|---|---|
| KeoB | Keyport loam, 2 to 5 percent slopes | 220.20 | 2.30% | P-1 | N | 61 | None | High | Moderately well drained |
| KeoC | Keyport loam, 5 to 10 percent slopes | 31.90 | 0.33% | S-1 | N | 76 | None | Moderate | Moderately well drained |
| MamnAv | Mannington-Nanticoke complex, 0 to 1 percent slopes, very frequently flooded | 171.24 | 1.79% | N/A | Y | 0 | Very frequent | High | Very poorly drained |
| PHG | Pits, sand, and gravel | 64.84 | 0.68% | N/A | N | >200 | None | NA | Well drained |
| SaeA | Sassafras fine sandy loam, 0 to 2 percent slopes | 1,145.49 | 11.96% | P-1 | N | 183 | None | Moderate | Well drained |
| SaeB | Sassafras fine sandy loam, 2 to 5 percent slopes | 638.28 | 6.66% | P-1 | N | 183 | None | Moderate | Well drained |
| SaeC | Sassafras fine sandy loam, 5 to 10 percent slopes | 169.06 | 1.76% | S-1 | N | 183 | None | Moderate | Well drained |
| SaekA | Sassafras fine sandy loam, clayey substratum, 0 to 2 percent slopes | 336.79 | 3.52% | P-1 | N | 127 | None | High | Moderately well drained |
| SaekB | Sassafras fine sandy loam, clayey substratum, 2 to 5 percent slopes | 311.03 | 3.25% | P-1 | N | 127 | None | High | Moderately well drained |
| SabB | Sassafras loamy sand, 0 to 5 percent slopes | 14.43 | 0.15% | P-1 | N | >200 | None | Moderate | Well drained |
| SapkB | Sassafras-Urban land complex, clayey substrata, 0 to 5 percent slopes | 52.23 | 0.55% | N/A | N | 127 | None | High | Moderately well drained |
| UdrB | Udorthents, refuse substratum, 0 to 8 percent slopes | 31.50 | 0.33% | N/A | N | >200 | None | NA | Well drained |

| Soil Type | Description | Area (Acres) | % of Moorestown Township | Ag. Quality* | Hydric? | Depth to Water Table (centimeters) | Flood Frequency Class | Potential Frost Action | Drainage Class |
|---|---|---|---|---|---|---|---|---|---|
| URSACB | Urban land, sandy over clayey, 0 to 8 percent slopes | 27.95 | 0.29% | N/A | N | >200 | None | High | Somewhat poorly drained |
| URSAAB | Urban land, sandy, 0 to 8 percent slopes | 115.07 | 1.20% | N/A | N | >200 | None | Low | Excessively drained |
| WATER | Water | 79.17 | 0.83% | N/A | Y | >200 | None | NA | NA |
| WofA | Woodstown fine sandy loam, 0 to 2 percent slopes | 1,513.04 | 15.80% | P-1 | Y | 77 | None | Moderate | Moderately well drained |
| WofB | Woodstown fine sandy loam, 2 to 5 percent slopes | 416.89 | 4.35% | P-1 | N | 77 | None | Moderate | Moderately well drained |
| WofkA | Woodstown fine sandy loam, clayey substratum, 0 to 2 percent slopes | 1,382.36 | 14.43% | P-1 | Y | 46 | None | High | Moderately well drained |
| WofkB | Woodstown fine sandy loam, clayey substratum, 2 to 5 percent slopes | 763.42 | 7.97% | P-1 | N | 46 | None | High | Moderately well drained |
| **Total** | | **9,578.66** | **100.00%** | | **45.10%** | | | | |

Source: USDA NRCS, 2012

| *Agricultural Quality Designations | |
|---|---|
| P–1 | Prime Farmland |
| S–1 | Statewide Importance |
| U-1 | Unique Importance |
| N/A | Soil not rated for agricultural use by NRCS, but may be suitable or currently used for such use. |

## Agricultural Quality Classification

Flying Feather Farm Market
*Source: DVRPC*

The upland areas of Moorestown are characterized by high quality soils suitable for farming. There are still a number of active agricultural operations in the township, although many farms are leased to farmers and are susceptible to development. The agricultural heritage of the township is still evident in the farm markets that provide fresh, local produce in a rustic setting. See **Table 5: Agricultural Values for Moorestown Soils** for the acreage of each of these classes of farmland. See also **Map 8: Agricultural Quality of Soils** for a visual depiction.

### Prime Farmland Soils

Approximately 80 percent (7,655 acres) of all soils in Moorestown 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 throughout the township.

Swede Run Fields
*Source: DVRPC*

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. However, many of the lands containing Prime Farmland soils have been developed and are no longer in agricultural use.

### Soils of Statewide Importance

About seven percent (650 acres) of soils in Moorestown 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 Moorestown, generally on slopes greater than five percent.

### Soils of Unique Importance

About six percent (595.28 acres) of soils in Moorestown are soils considered to be of Unique Importance (U-1). The USDA outlines specific Unique Farmland criteria that support particular food or fiber crops, including temperature, humidity, air drainage, elevation, aspect, or proximity to market. In order for lands to be classified as Unique Farmland, 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 on the northeastern edge of the township along the Rancocas Creek, and along the northwestern corner along the north branch of the Pennsauken Creek. These soils are mostly associated with wetland areas and riparian corridors.

### Soils Not Rated

Approximately seven percent of Moorestown soils have not been rated for agricultural use by the NRCS and are therefore labeled “N/A.” These soils are not appropriate for agricultural use and may be best suited for other uses, or they may not yet have been assessed for quality by NRCS. NRCS created all of the Soil Quality Classifications in 1990, although several new subtypes of soils were created in 2005 are are not yet rated for agricultural use. Soils that are not rated are not necessarily limited for agricultural use.

Table 5: Agricultural Values for Moorestown Soils

| Designation | Type/Farm Classification | Area (Acres) | % of municipality |
|---|---|---|---|
| P-1 | All areas are Prime Farmland | 7,655.25 | 79.92% |
| S-1 | Farmland of Statewide Importance | 650.46 | 6.79% |
| U-1 | Farmland of Unique Importance | 595.28 | 6.21% |
| N/A | Not Prime Farmland | 677.67 | 7.07% |
| | **Total** | **9,578.66** | **100.00%** |

Source: USDA NRCS, 2004

## Soil Limitations for Development

Certain soil characteristics can severely restrict the use of sites for construction and development. **Table 6: Soil Limitations for Development** lists the soils in Moorestown 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 the 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 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 6: Soil Limitations for Development

| Name | Symbol | Dwellings with Basements | Dwellings Without Basements | Septic Systems |
|---|---|---|---|---|
| Colemantown loam, 0 to 2 percent slopes, occasionally flooded | CoeAs | Very limited | Very limited | Very limited |
| Collington fine sandy loam, 2 to 5 percent slopes | ComB | Not limited | Somewhat limited | Very limited |
| Donlonton fine sandy loam, 0 to 2 percent slopes | DoaA | Very limited | Somewhat limited | Very limited |
| Donlonton loam, 0 to 2 percent slopes | DobA | Very limited | Somewhat limited | Very limited |
| Fallsington fine sandy loam, 0 to 2 percent slopes | FanA | Very limited | Very limited | Very limited |
| Fluvaquents, loamy, 0 to 3 percent slopes, frequently flooded | FmhAt | Very limited | Very limited | Very limited |
| Freehold fine sandy loam, 10 to 15 percent slopes | FrmD | Somewhat limited | Somewhat limited | Very limited |
| Freehold fine sandy loam, 2 to 5 percent slopes | FrmB | Not limited | Not limited | Very limited |
| Freehold fine sandy loam, clayey substratum, 2 to 5 percent slopes | FrmkB | Not limited | Not limited | Very limited |
| Freehold loamy sand, 0 to 5 percent slopes | FrfB | Not limited | Not limited | Very limited |
| Freehold loamy sand, 5 to 10 percent slopes | FrfC | Not limited | Not limited | Very limited |
| Freehold sandy loam, 5 to 10 percent slopes, severely eroded | FrkC3 | Somewhat limited | Somewhat limited | Very limited |
| Galestown sand, 0 to 5 percent slopes | GabB | Not limited | Not limited | Very limited |
| Galloway fine sand, 0 to 5 percent slopes | GakB | Very limited | Somewhat limited | Very limited |
| Galloway sand, loamy substratum, 0 to 5 percent slopes | GahhB | Very limited | Somewhat limited | Very limited |
| Holmdel fine sandy loam, 0 to 2 percent slopes | HodA | Very limited | Somewhat limited | Very limited |
| Holmdel fine sandy loam, 2 to 5 percent slopes | HodB | Very limited | Somewhat limited | Very limited |

| Name | Symbol | Dwellings with Basements | Dwellings Without Basements | Septic Systems |
|---|---|---|---|---|
| Holmdel fine sandy loam, clayey substratum, 0 to 2 percent slopes | HodkA | Very limited | Somewhat limited | Very limited |
| Holmdel fine sandy loam, clayey substratum, 2 to 5 percent slopes | HodkB | Very limited | Somewhat limited | Very limited |
| Holmdel loamy sand, 0 to 5 percent slopes | HoaB | Very limited | Somewhat limited | Very limited |
| Holmdel-Urban land complex, 0 to 5 percent slopes | HofB | Very limited | Somewhat limited | Very limited |
| Keyport loam, 0 to 2 percent slopes | KeoA | Somewhat limited | Somewhat limited | Very limited |
| Keyport loam, 2 to 5 percent slopes | KeoB | Very limited | Somewhat limited | Very limited |
| Keyport loam, 5 to 10 percent slopes | KeoC | Somewhat limited | Somewhat limited | Very limited |
| Mannington-Nanticoke complex, 0 to 1 percent slopes, very frequently flooded | MamnAv | Very limited | Very limited | Very limited |
| Pits, sand, and gravel | PHG | Not rated | Not rated | Not rated |
| Sassafras fine sandy loam, 0 to 2 percent slopes | SaeA | Not limited | Not limited | Very limited |
| Sassafras fine sandy loam, 2 to 5 percent slopes | SaeB | Not limited | Not limited | Very limited |
| Sassafras fine sandy loam, 5 to 10 percent slopes | SaeC | Somewhat limited | Somewhat limited | Very limited |
| Sassafras fine sandy loam, clayey substratum, 0 to 2 percent slopes | SaekA | Somewhat limited | Not limited | Very limited |
| Sassafras fine sandy loam, clayey substratum, 2 to 5 percent slopes | SaekB | Somewhat limited | Not limited | Very limited |
| Sassafras loamy sand, 0 to 5 percent slopes | SabB | Not limited | Not limited | Very limited |
| Sassafras-Urban land complex, clayey substrata, 0 to 5 percent slopes | SapkB | Somewhat limited | Not limited | Very limited |
| Udorthents, refuse substratum, 0 to 8 percent slopes | UdrB | Not limited | Not limited | Somewhat limited |
| Urban land, sandy over clayey, 0 to 8 percent slopes | URSACB | Somewhat limited | Somewhat limited | Very limited |
| Urban land, sandy, 0 to 8 percent slopes | URSAAB | Not limited | Not limited | Very limited |

| Name | Symbol | Dwellings with Basements | Dwellings Without Basements | Septic Systems |
|---|---|---|---|---|
| Water | WATER | Not rated | Not rated | Not rated |
| Woodstown fine sandy loam, 0 to 2 percent slopes | WofA | Somewhat limited | Not limited | Very limited |
| Woodstown fine sandy loam, 2 to 5 percent slopes | WofB | Somewhat limited | Not limited | Very limited |
| Woodstown fine sandy loam, clayey substratum, 0 to 2 percent slopes | WofkA | Very limited | Somewhat limited | Very limited |
| Woodstown fine sandy loam, clayey substratum, 2 to 5 percent slopes | WofkB | Very limited | Somewhat limited | Very limited |

Source: USDA NRCS, 2004

## 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.

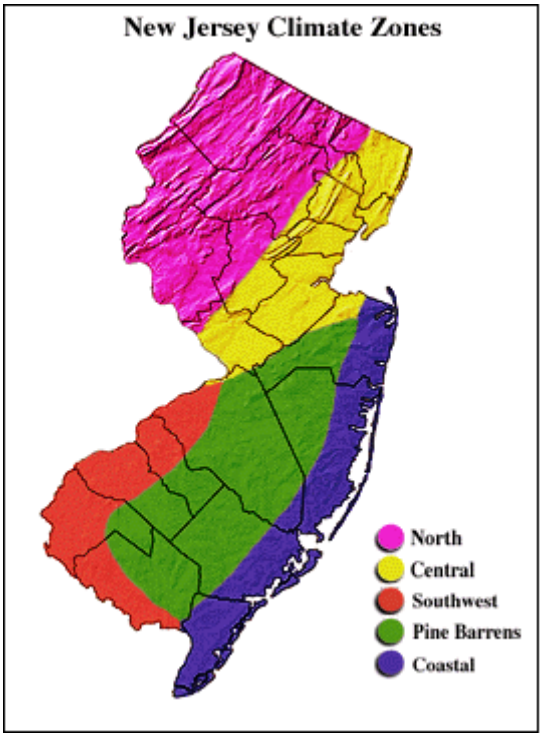



Figure 3: The New Jersey Climate Zones

Source: Office of the New Jersey State Climatologist

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.

Moorestown is completely located within the Southwest Climate zone.

The Southwest has the highest average daily temperatures in the state and, without sandy soils, tends to have higher nighttime minimum temperatures than in the neighboring Pine Barrens. This region receives less precipitation than the Northern and Central regions of the state since it is farther away from the Great Lakes-St. Lawrence storm track. It is also far enough inland to avoid the heavier rains from some coastal

storms, and so the Southwest Region receives less precipitation than the Coastal Region.

The National Climate Data Center (NCDC) operates over 4,000 stations in the United States, including a station in Moorestown. Based on NCDC data collected between 1981 and 2010, the mean annual temperature in Moorestown is 54.9 degrees Fahrenheit. January is the coldest month, with a mean temperature of 32.9 degrees, and July is the hottest month, with a mean temperature of 76.5 degrees.

## Precipitation and Storm Events

The Southwest climate zone, where Moorestown is located, receives less precipitation than the North, Central, and Coastal regions, but more than the Pine Barrens region. The region's lack of orographic features (elevated terrain) and its greater distance from the Great Lakes-St. Lawrence storm track may explain the lower precipitation. However, Moorestown Township's location on the Inner Coastal Plain does make it more susceptible to the heavy rains associated with coastal storms than parts of the North and Central Regions. The normal average annual precipitation for Moorestown between 1981 and 2010 was 48.22 inches. Moorestown receives the most precipitation in July, with a mean of 5.00 inches, and the least in February, with an average of 2.76 inches.

Snowfall typically occurs in New Jersey when moist air from the south converges with cold air from the north. In Moorestown, snowfall may occur from November to mid-April, but is most likely to occur from December to March. From data gathered between 1981 and 2010, the average monthly snowfall is greatest in February.

## Growing Seasons

Moorestown is located within U.S. Department of Agriculture (USDA) Plant Hardiness Zone 7A, where annual minimum temperatures are typically between 0°F and 5°F. 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.

Swede Run Fields
*Source: DVRPC*

Moorestown'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. The frost-free growing season in Moorestown is about 60 days longer than in northern New Jersey, where frosts generally end in May and begin in October. The main crop grown in Moorestown is soy beans.

# Surface Water Resources

The land in Moorestown drains to the Rancocas Creek, Pompeston Creek/Swede Run, or the Pennsauken Creek. These waterways then flow to the Delaware River. Moorestown contains the headwaters of both the Pompeston Creek and Swede Run. There is a total of nearly 22 miles of streams located within or on the borders of Moorestown.

Susan Stevens Halbe Preserve

*Source: DVRPC*

## 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, down to 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 itself consists of smaller subwatersheds.

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 (each identified by a 14-digit code). The State of New Jersey has 152 HUC 11 watersheds and over 900 HUC 14 subwatersheds. Moorestown lies within three HUC 11 watersheds: Rancocas Creek, Pennsauken Creek, and Pompeston Creek/Swede Run. All watersheds eventually empty into the Delaware River, which itself flows into the Atlantic Ocean. These HUC 11 watersheds are then further divided into eight smaller HUC 14 subwatersheds, shown in **Table 7: Watersheds and Subwatersheds in Moorestown**. See also **Map 9: Watersheds** and **Map 10: Surface Water, Wetlands, and Vernal Pools**.

Table 7: Watersheds and Subwatersheds in Moorestown

| WMA | Watershed (HUC 11) | Subwatershed (HUC 14) ID | Subwatershed (HUC 14) Name | Acres | % of Moorestown |
|---|---|---|---|---|---|
| Rancocas (19) | Rancocas Creek (02040202080) | 02040202080010 | Parkers Creek (above Marne Highway) | 74.69 | 0.78% |
| | | 02040202080020 | Rancocas Creek (Martins Beach to NB/SB) | 908.40 | 9.48% |
| | | 02040202080040 | Rancocas Creek (Rt 130 to Martins Beach) | 1,085.74 | 11.33% |
| Lower Delaware (18) | Pompeston Creek / Swede Run (02040202090) | 02040202090010 | Swede Run | 2,442.33 | 25.50% |
| | | 02040202090020 | Pompeston Creek (above Rt 130) | 2,086.34 | 21.78% |
| | Pennsauken Creek (02040202100) | 02040202100010 | Pennsauken Ck NB (above NJTPK) | 184.37 | 1.92% |
| | | 02040202100020 | Pennsauken Ck NB (incl StrwbrdgLk-NJTPK) | 1,286.11 | 13.43% |
| | | 02040202100030 | Pennsauken Ck NB (below Strawbridge Lk) | 1,510.74 | 15.77% |
| **Total acres** | | | | **9,578.70** | **100.00%** |

Source: NJDEP, 2010

## Watershed Management Areas

The New Jersey Department of Environmental Protection manages natural resources on a watershed basis. As shown in **Figure 4**, the state has been divided into 20 Watershed Management Areas (WMAs), which are larger in size than HUC 11s. Moorestown Township is located partially within WMA 18: Lower Delaware Tributaries and WMA 19: Rancocas.

### Watershed Management Area 18: Lower Delaware Tributaries

WMA 18 includes the Cooper River, Big Timber, Manuta, Newton, Oldmans, Pennsauken, Pompeston, Raccoon, Repaupo, and Woodbury creeks, as well as Baldwin Run, Swede Run, and Maple Swamp. This management area includes all or part of 68 municipalities in Burlington, Camden, and Gloucester counties, encompassing 391 square miles. In general, industrial and urban development is concentrated downstream closer to the Delaware River and the upstream headwaters have more forested and agricultural land uses. The upstream areas are more influenced by suburban and agricultural runoff problems, whereas the downstream portions are influenced by both past and present industrial and urban uses.

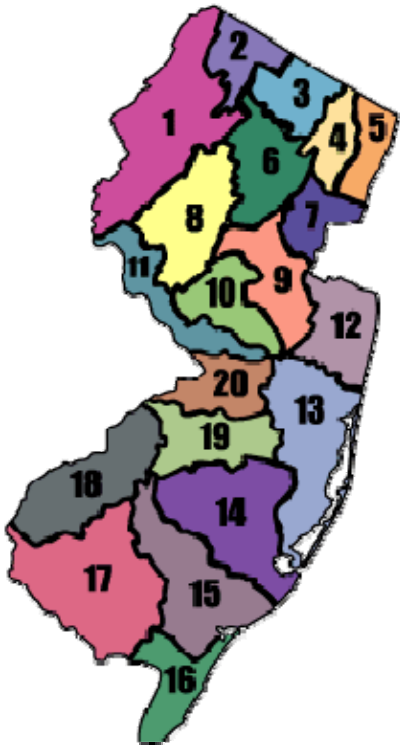



Figure 4: Watershed Management Areas in New Jersey

Source: NJDEP

Moorestown is located within the Pompeston and Swede Run watersheds within this larger WMA and contains the headwaters for both streams.

The Pompeston Creek forms a confluence with the Delaware River at Riverton. Two other confluences occur in its six-mile run from its headwaters in Moorestown to its mouth. Swede Run flows north and forms a confluence with the Delaware River at Dredge Harbor in Delran. The Pennsauken Creek joins the Delaware River near Palmyra. The North Branch of the Pennsauken Creek forms the southern border of Moorestown, while the South Branch forms the border between Burlington and Camden counties.

The Pompeston Creek Watershed Association, formed in 1963, has conducted stream monitoring since 1998. The watershed association has also performed many stream cleanups, provided educational programming, established streambank and habitat restorations, and other activities. Save the Environment of Moorestown (STEM) conducts a Natural Care Program, and four of its annual 12 work projects are scheduled within the Moorestown portion of the Pompeston Creek watershed.

### Rancocas Watershed Management Area 19

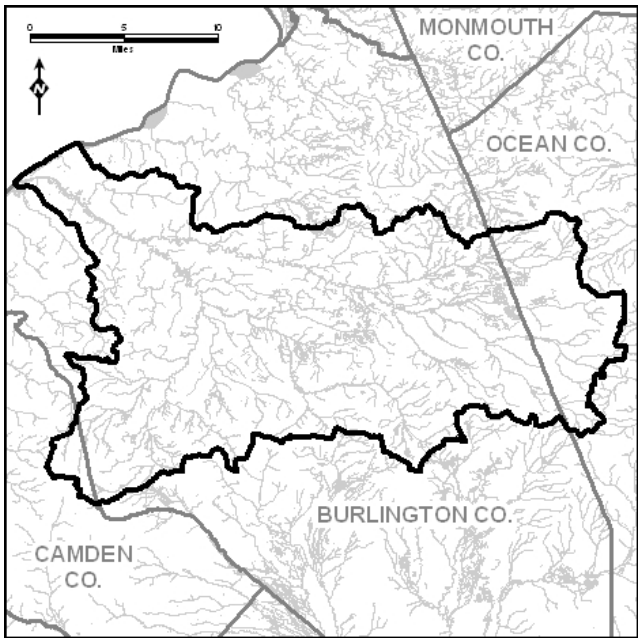



Figure 5: The Rancocas Creek Watershed

Source: NJDEP

Moorestown Township is also located partly in WMA 19, the Rancocas Creek watershed. 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.

The Rancocas, which means “many kinsmen” in the Lenni Lenape language, is the largest watershed in south central New Jersey, and was also the first watershed in New Jersey to have a management plan. The entire watershed drains 360 square miles, covering 30 municipalities in Burlington, Camden, and Ocean counties. 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.

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 Main Stem of the Rancocas Creek forms Moorestown’s northeast boundary. The Parkers Creek tributary forms part of Moorestown’s boundary with Mount Laurel to the east, and Boundary Creek forms

part of Moorestown's boundary with Delran to the west. The subwatersheds of Kendle's Run and Little Run are entirely within Moorestown and flow to the Rancocas Creek.

The Rancocas Conservancy, a nonprofit land trust that has preserved approximately 2,000 acres in the Rancocas watershed, had its origins as a watershed association established in 1989. It is dedicated to protecting the natural and historical resources of the watershed.


Boundary Creek Natural Area
*Source: DVRPC*

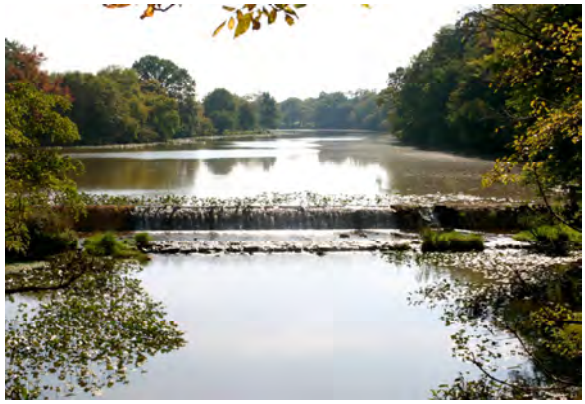
## Lakes

There are 106 acres of lakes in Moorestown, which are nearly all artificial lakes formed by impoundments of waterways. The largest lake is Strawbridge Lake, detailed below, which is formed by three impoundments of the North Branch of the Pennsauken Creek and covers 33 acres. The second largest lake covers eight acres and is located behind the estates at Tom Brown Road and New Albany Road. There are a number of small lakes ranging between less than half an acre and five acres located around the Laurel Creek Golf Course east of Hartford Road. There are also many small lakes of less than three acres in size located adjacent to new developments and estates. These lakes were likely to have been built as stormwater management devices.

### Strawbridge Lake

Strawbridge Lake is a 32.9-acre lake formed by three impoundments. Dams on Hooten Run form the upper and middle basins. The lower basin is formed at the confluence of Hooten Run and the North Branch of the Pennsauken Creek. Construction on the impoundments that formed the tri-basin lake began in the 1920s and was completed between 1931 and 1937.

Strawbridge Lake is surrounded by Strawbridge Lake Park, an active park owned by Moorestown and maintained by the Moorestown Township Department of Public Works. The lake is accessible via Haines Drive and Route 38. Although no longer stocked, Strawbridge Lake is still a popular recreational non-food fishing spot used by local residents.



Dam at Strawbridge Lake Park
*Source: DVRPC*

Strawbridge Lake has been severely impacted by nonpoint source pollution and shoreline erosion. Sediment deposition from upstream soil disturbances, including new construction and small landscape projects, as well as stream bank erosion within its watershed, gives the lake a muddy appearance and has reduced the average water depth to less than three feet. Nutrient runoff into the lake causes an overabundance of algae and aquatic weeds. The lake's ecologically degraded condition causes habitat loss for aquatic species and limits recreational opportunities.

The lake has exceeded the state criterion for phosphorus and fecal coliform since at least the early 1990s. A diagnostic-feasibility study was conducted in 1993, and the lake was listed as a water-quality limited water by the state in 1998. The sources of fecal bacteria are both animal and human and are likely due to failing septic systems, waterfowl, and farm animals. Sediment core sampling of the lake found total nitrogen and total phosphorus to be relatively high and several heavy metals, including arsenic, lead, mercury, and selenium, were detected in the lake sediment.

A major lake restoration project was constructed in the late 1990s that involved over 4,000 feet of shoreline stabilization using soil bioengineering techniques and the planting of a vegetative buffer. Much of the planting was done by volunteers under the leadership of the Delaware Riverkeeper Network. Shoreline access areas were created using red gravel bordered by large flat stone. Biofilter wetlands were also constructed around the lake at the locations of seven stormwater discharges. Three of the discharges were also retrofitted with sedimentation chambers to remove coarse sediment from Route 38 runoff. Between 1997 and 2000, all three basins of Strawbridge Lake were dredged of tens of thousands of cubic yards of sediment.

The Canada goose population at Strawbridge Lake continues to be in overabundance, contributing to fecal bacteria contamination. The “no mow” vegetated buffer established as part of the lake restoration project has only been partially effective and is often violated in response to requests from residents and visitors for neatness and water visibility. Prior to events at the lake, the township contracts with a firm that utilizes teams of border collies to chase away the geese, a temporary control measure.

## 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.

Railroad Crossing the North Branch Pennsauken Creek
*Source: DVRPC*

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 DEP, 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. Additional information on wetlands rules and permits is available through NJDEP.

More information on the wetlands in Moorestown is located in the **Natural Vegetation** section.

## 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 pools (obligate breeders), which provide their offspring with a measure of protection because the pool’s impermanence prevents the residence of predators of the eggs and young, especially fish. Other species may use vernal pools, but are not limited to them for breeding. They are called facultative breeders.

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 pools 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 pool is certified, regulations require that a 75-foot buffer be maintained around the pool. NJDEP’s division of Land Use Regulation oversees this designation and restricts development around vernal pools by denying construction permits. Local municipalities can provide additional protection by negotiating conservation easements on the land surrounding the pool 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.

The state has identified eight potential vernal pools in Moorestown, which are listed in **Appendix A: Vernal Pools in Moorestown Township** and shown on **Map 10: Surface Water, Wetlands, and Vernal Pools**. Surveys of each pool are needed to determine if the pool is still in existence as a natural habitat, and if it is, what species are present. At least one other vernal pool remains to be listed. 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, or flood hazard areas. Floodplains encompass a floodway, which is the portion of a floodplain subject to high velocities of moving water, and the adjacent flood fringe, which helps to hold and carry excess water during overflow of the normal stream channel. The 100-year floodplain is defined as the land area that will be inundated by the overflow of water resulting from a 100-year flood (a flood that has a one percent chance of occurring in any given year).

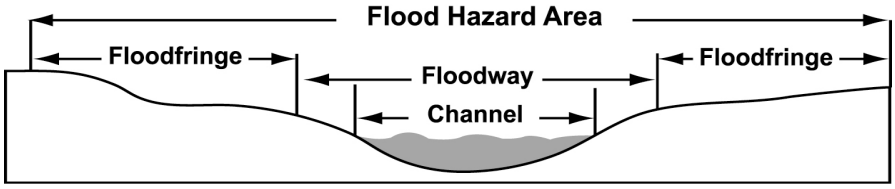



Figure 6: Parts of a Flood Hazard Area

Source: NJDEP

Although the terms “flood hazard area” and “100-year floodplain” refer to similar concepts, NJDEP defines them in slightly different ways. New Jersey’s regulations define the flood hazard area as the area inundated by a flood resulting from the 100-year discharge increased by 25 percent. This type of flood is called the “flood hazard area design flood” and it is the flood regulated by 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. Additional information on floodplain activities is available from NJDEP and from its web site under “Land use.”

Moorestown also has a municipal ordinance that regulates development in the floodplain. Chapter 83: Flood Damage Prevention was adopted in 1995, and replaced a previous floodplain regulation from 1971. The Flood Damage Prevention ordinance aims to reduce flood losses in five ways:

1. Restricting or prohibiting uses that may increase erosion or flooding.
2. Requiring flood damage protection at the time of construction.
3. Controlling the alteration of natural floodplains, stream channels, and natural protective barriers.

4. Controlling filling, grading, dredging and other development that may increase flood damage.
5. Preventing or regulating flood barriers that may divert floodwaters and increase flood hazards.

According to Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) data, 823 acres of Moorestown Township's land is within the 100-year floodplain, and an additional 173 acres are within the 500-year floodplain. The floodplains in Moorestown are located adjacent to nearly all creeks and tributaries in the township. See **Map 11: Floodplains (1996)** and **Table 8** below. These floodplain areas were identified by FEMA to administer the National Flood Insurance Program and do not necessarily represent all areas in the township subject to flooding. These maps were revised in 1996 and digitized in 2008. When available, updated flood maps may be obtained through the FEMA Map Service Center.

Table 8: Floodplains in Moorestown

| Flood Plain | Area (Acres) | % of Moorestown Township in Flood Plain |
|---|---|---|
| 100-Year Flood Plain | 822.99 | 8.59% |
| 500-Year Flood Plain | 172.58 | 1.80% |
| **Total** | **995.56** | **10.39%** |

Source: FEMA, 1996

## 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 streams in Moorestown are FW2-NT.

According to NJDEP rules, FW2-NT waters must provide for (1) the maintenance, migration, and propagation of the natural and established biota; (2) primary and secondary contact recreation (i.e., swimming and fishing); (3) industrial and agricultural water supply; (4) public potable water supply after conventional filtration and disinfection; and (5) any other reasonable uses.

The determination of whether or not water quality is sufficient to meet a body of water's designated use(s) is based on an analysis of certain surface water quality parameters, including fecal coliform, dissolved oxygen, pH, phosphorous, and toxic substances. NJDEP also evaluates water quality by examining the health of aquatic macroinvertebrate life in a stream.

## 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.

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 Moorestown support trout or shellfish, these designated uses are not applicable.

For aquatic life, the most general and encompassing parameter of water quality, five subwatersheds in Moorestown are impaired, one has insufficient data, and one is attaining. For agricultural water supply quality, a rating slightly below drinking water supply quality, three subwatersheds have insufficient information and four are attaining. For fish consumption, four

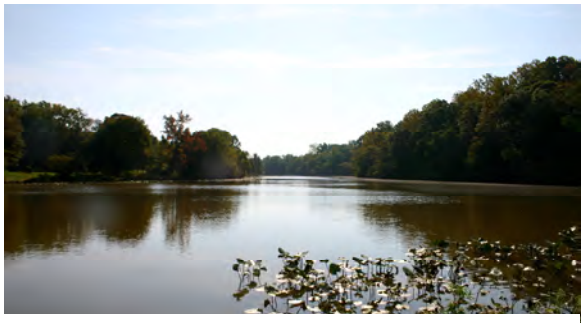
subwatersheds have insufficient information and three are not supporting because of chemical pollution. For industrial water supply, five are attaining and three subwatersheds have insufficient information. For primary contact recreation, such as swimming, four subwatersheds are impaired and four have insufficient information. For public water supply, three subwatersheds are attaining, two are impaired, and two have insufficient information. See **Map 12: Surface Water Quality (2010)** and **Table 9: Integrated Water Quality Monitoring and Assessment Report, 2010** and **Table 10: TMDLs for Impaired Waters in Moorestown, 2010,** which follow.

The eight subwatersheds in Moorestown that do not attain one or more designated uses are each impaired due to one or more parameters for that use, as shown in **Table 9: Integrated Water Quality Monitoring and Assessment Report, 2010**.

Of the impaired subwatersheds, pH was a cause of impairment in one subwatershed, phosphorus in six subwatersheds, and copper, lead, or pathogens in four subwatersheds. Other contaminants included mercury, arsenic, total suspended solids (TSS), polychlorinated biphenyls (PCBs), and dissolved oxygen.

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. With increased acidity, water is more able to carry and dissolve substances. Acidity impairments may be due to pH levels that are too high or too low, depending on the natural level for the particular habitat.

Phosphorus exists naturally at low levels within the environment, although excess phosphorus can lead to harmful algae blooms that can lead to "dead zones," where no aquatic life can survive. Typical causes of phosphorus pollution include over-fertilization 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.



Strawbridge Lake
*Source: DVRPC*

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, and become concentrated in predators after they consume large amounts of contaminated prey. 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 usually enter the water system through industrial processes, such as the manufacture of electronics, paint, batteries, bullets, metal, or lamps.

Pathogens are disease-causing bacteria, viruses, and protozoans that derive from the intestinal tracts of humans and animals. The consumption of pathogens can cause serious damage to the

digestive system and can cause serious illness, or even death. Sources of pathogens include leaking septic tanks, wastewater-treatment discharge, and animal wastes.

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 into streams. Elevated levels of E. coli may be attributed to waste from Canada geese, among other sources. E. coli itself is not necessarily a health hazard, but it serves is an indicator of the presence of sewage or animal waste, which may contain other more harmful microbes that are not as easily monitored.

Polychlorinated biphenyls (PCBs) are considered a highly toxic persistent organic pollutant (POPs) 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.

Chlordane is a man-made chemical that was used as a pesticide from 1948 to 1988, when it was banned due to concern over its damage to the environment and human health. Like PCBs, chlordane does not break down easily and builds up in animal life and the environment. In humans, exposure to chlordane can affect the nervous system, digestive system, and liver. Small amounts can cause pain, sickness, and vision problems; large amounts can cause convulsions and death.

DDE is the ethylene metabolite equivalent of DDT, the pesticide used extensively in the 1940s and 1950s. DDD is similar to DDT, but it has only two chloroethylene molecules, compared to the three found in DDT. DDD has some medical use. DDT was effective in nearly eliminating typhus during World War II and has successfully combated malaria in many parts of the world, although it has been shown to have harmful effects on plant and animal life. Exposure to DDT impairs the nervous and immune systems in animals and is highly toxic, particularly for fish. It also causes eggshell thinning in birds, the primary reason why bald eagles and other large raptors became endangered in the United States. The prohibition of DDT enabled the eagle population to become reestablished.

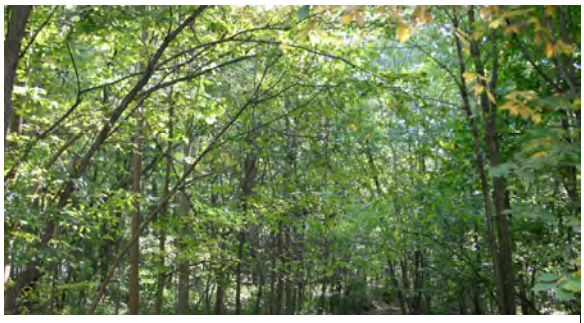
Table 9: Integrated Water Quality Monitoring and Assessment Report, 2010

| Subwatershed Name | Subwatershed ID | Water Type | Agricultural Water Supply | Aquatic Life (General) | Fish Consumption | Industrial Water Supply | Primary Contact Rec. | Public Water Supply | Sources of Contamination |
|---|---|---|---|---|---|---|---|---|---|
| Parkers Creek (above Marne Highway) | 02040202080010 | RIVER | Fully Supporting | Not Supporting: Phosphorus (Total) | Insufficient Information | Fully Supporting | Insufficient Information | Fully Supporting | • Transfer of Water from an Outside Watershed<br>• Agriculture<br>• Urban Runoff/Storm Sewers |
| Rancocas Creek (Martins Beach to NB/SB) | 02040202080020 | RIVER | Fully Supporting | Not Supporting: Phosphorus (Total) | Not Supporting: Phosphorus (Total) | Fully Supporting | Insufficient Information | Fully Supporting | • Municipal Point Source Discharges<br>• Agriculture<br>• Urban Runoff/Storm Sewers<br>• Atmospheric Deposition - Toxics |
| Rancocas Creek (Rt 130 to Martins Beach) | 02040202080040 | FRESHWATER LAKE & RIVER | Insufficient Information | Insufficient Information | Not Supporting: Polychlorinated biphenyls | Insufficient Information | Insufficient Information | Insufficient Information | • Municipal Point Source Discharges<br>• Agriculture<br>• Urban Runoff/Storm Sewers<br>• Atmospheric Deposition - Toxics |
| Swede Run | 02040202090010 | FRESHWATER LAKE & RIVER | Fully Supporting | Not Supporting: Oxygen, Dissolved | Not Supporting: Polychlorinated biphenyls | Fully Supporting | Insufficient Information | Not Supporting: Arsenic | • Agriculture<br>• Urban Runoff/Storm Sewers<br>• Atmospheric Deposition - Toxics |

| Subwatershed Name | Subwatershed ID | Water Type | Agricultural Water Supply | Aquatic Life (General) | Fish Consumption | Industrial Water Supply | Primary Contact Rec. | Public Water Supply | Sources of Contamination |
|---|---|---|---|---|---|---|---|---|---|
| Pompeston Creek (above Rt 130) | 02040202090020 | FRESHWATER LAKE & RIVER | Insufficient Information | Not Supporting: pH, Oxygen, Dissolved & Phosphorus (Total) | Insufficient Information | Insufficient Information | Not Supporting: Escherichia coli | Fully Supporting | • Agriculture<br>• Urban Runoff/Storm Sewers |
| Pennsauken Ck NB (above NJTPK) | 02040202100010 | RIVER | Insufficient Information | Fully Supporting | Insufficient Information | Insufficient Information | Not Supporting: Fecal coliform | Insufficient Information | • Agriculture<br>• Urban Runoff/Storm Sewers |
| Pennsauken Ck NB (incl StrwbrdgLk-NJTPK) | 02040202100020 | FRESHWATER LAKE & RIVER | Fully Supporting | Not Supporting: Phosphorus (Total) | Not Supporting: Chlordane, DDD, DDE, DDT, Mercury, PCB in fish tissue | Fully Supporting | Not Supporting: Fecal coliform | Not Supporting: Arsenic | • Industrial Point Source Discharge<br>• Agriculture<br>• Urban Runoff/Storm Sewers<br>• Source Unknown<br>• Atmospheric Deposition - Toxics |
| Pennsauken Ck NB (below Strawbridge Lk) | 02040202100030 | RIVER | Fully Supporting | Not Supporting: Cause Unknown | Insufficient Information | Fully Supporting | Not Supporting: Fecal coliform | Not Supporting: Arsenic | • Urban Runoff/Storm Sewers<br>• Industrial Point Source Discharge<br>•Municipal Point Source Discharges<br>•Agriculture |

Source: NJDEP, 2010

## Total Maximum Daily Loads (TMDLs)



Pompeston Creek
*Source: DVRPC*

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, then it is established when NJDEP finalizes its report, next it is approved by EPA, and 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 program. 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 stormwater 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.

None of the subwatersheds that Moorestown falls within are located on the state's TMDL schedule with a high priority for remediation.

There are eight subwatersheds with a medium priority for remediation. As seen in the table below, four of these TMDLs are for the reduction of pathogens, three are for phosphorus, and one is for both pathogens and phosphorus. There are four subwatersheds where polychlorinated biphenyls (PCBS) are present in the water or in fish tissue. Fecal coliform was present in two subwatersheds, and pH TMDLs were present in one subwatershed. The North Branch of Pennsauken Creek (including Strawbridge Lake) had elevated levels of DDD, DDE, DDT, mercury, PCBs, and arsenic.

Table 10: TMDLs for Impaired Waters in Moorestown, 2010

| HUC 14 ID | HUC 14 Subwatershed Name | Priority Rank | Use | Cause | Cycle First Listed |
|---|---|---|---|---|---|
| 02040202080010 | Parkers Creek (above Marne Highway) | Medium | Aquatic Life | Phosphorus (Total) | 2006 |
| 2040202080020 | Rancocas Creek (Martins Beach to NB/SB) | Medium | Aquatic Life | Phosphorus (Total) | 2006 |
| | | | Fish Consumption | Polychlorinated biphenyls | 2006 |
| 2040202080040 | Rancocas Creek (Rt 130 to Martins Beach) | Medium | Fish Consumption | Polychlorinated biphenyls | 2010 |
| 2040202090010 | Swede Run | Medium | Aquatic Life | Oxygen, Dissolved | 2008 |
| | | | Fish Consumption | Polychlorinated biphenyls | 2006 |
| | | | Public Water Supply | Arsenic | 2008 |
| 2040202090020 | Pompeston Creek (above Rt 130) | Medium | Aquatic Life | Oxygen, Dissolved | 2010 |
| | | | | pH | 2010 |
| | | | | Phosphorus (Total) | 2008 |
| | | | Primary Contact Recreation | Escherichia coli | 2008 |
| 2040202100010 | Pennsauken Ck NB (above NJTPK) | Medium | Primary Contact Recreation | Escherichia coli | 2008 |
| 02040202100020 | Pennsauken Ck NB (incl StrwbrdgLk-NJTPK) | Medium | Fish Consumption | Chlordane | 2008 |
| | | | | DDD, DDE, DDT | 2008 |
| | | | | Mercury | 2008 |
| | | Medium | Aquatic Life | Polychlorinated biphenyls | 2008 |
| | | Medium | Primary Contact Recreation | Fecal coliform | 2006 |
| | | Medium | Public Water Supply | Arsenic | 2006 |

| HUC 14 ID | HUC 14 Subwatershed Name | Priority Rank | Use | Cause | Cycle First Listed |
|---|---|---|---|---|---|
| 2040202100030 | Pennsauken Ck NB (below Strawbridge Lk) | Medium | Aquatic Life | Cause Unknown | 2008 |
| | | Medium | Primary Contact Recreation | Fecal coliform | 2006 |
| | | Medium | Public Water Supply | Arsenic | 2006 |

Source: NJDEP, 2010

## 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 Stream Monitoring Network (ASMN) and the Ambient Biological Monitoring Network (AMNET) are the two primary sources of surface water monitoring data. 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.

Bridge over Swede Run
*Source: DVRPC*

The ASMN is a cooperative network between USGS and NJDEP that samples surface water quality at 112 stations in the state. ASMN stations monitor stream flow, as well as temperature, dissolved oxygen (DO), pH, carbon dioxide, nitrogen, ammonia, phosphorus, arsenic, and many other parameters. AMNET is another water quality monitoring system that the Integrated Report is based upon. 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 the benthic macroinvertebrate population 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 nine stations that monitor the water quality of the watersheds of Moorestown, listed in the table below. Three of these stations are shared by both the ASMN and AMNET networks. There are another three that are in either the ASMN or AMNET networks. 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 11: Stream Monitoring Network Stations for Moorestown Watersheds

| HUC 14 ID | HUC 14 Name | ASMN ID | AMNET ID | Station Name |
|---|---|---|---|---|
| 02040202080020 | Rancocas Creek (Martins Beach to NB/SB) | 01467011 | AN0174 | Parkers Creek at Creek Rd and Centerton Rd |
| 02040202090010 | Swede Run | 01467027 | AN0176 | Swede Run Rt 130 Bridge D316-151/3944 |
| 02040202100010 | Pennsauken Ck NB (above NJTPK) | 01467066 | - | North Branch Pennsauken Creek at Gaither Drive and Fellowship Rd |
| | | 01467063 | - | North Branch Pennsauken Creek at Mt Laurel |
| | | - | AN0178 | North Branch Pennsauken Creek at Church Rd |
| | | - | AN0179 | North Branch Pennsauken Creek at Fellowship Rd |
| 02040202100020 | Pennsauken Ck NB (incl StrwbrdgLk-NJTPK) | 01467069 | - | North Branch Pennsauken Creek near Moorestown |
| 02040202100030 | Pennsauken Ck NB (below Strawbridge Lk) | 01467072 | AN0181 | North Branch Pennsauken Creek at Fork Landing Rd |
| | | - | AN0180 | North Branch Pennsauken Creek at Rt 537 Bridge B461 |

Source: NJDEP, 2009

Parkers Creek

*Source: DVRPC*

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 bottom sediments and aquatic life, including fish tissue. 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. It then adopts advisories to guide residents on safe consumption practices.

The consumption advisories for fish caught in general freshwater are listed in the table below. Within Moorestown, there are additional fish consumption advisories (which supersede the general advisories) for two species of fish in Rancocas Creek, Pompeston Creek/Swede's Run, Strawbridge Lake and/or Pennsauken Creek. More details on preparation and consumption of fish are found at the advisory website: www.state.nj.us/dep/dsr/njmainfish.htm

Table 12: Fish Consumption Advisories, 2012

| 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 | | One Meal Per Week |
| **Rancocas Creek, Pompeston Creek/Swede's Run, Strawbridge Lake and/or Pennsauken Creek** | | |
| Common Carp | Four meals per year | Do not eat |
| Bluegill Sunfish | One meal per month | One meal per year |

Source: NJDEP, 2012

## 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**.

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 and submit water quality, biological and toxicological analyses, and thermal impact and cooling water assessments.

As of August 2012, 32 NJPDES permits for point source pollution were issued to individual facilities in Moorestown. These are shown in **Table 13: NJPDES Permits for Point Source Pollution**. Of the 32 permits, one discharges to surface water (codes A, B, ABR), one discharges to groundwater (code T1, GW), 10 discharge to stormwater (code 5G2), and none are a land application of residuals (code D).

Although the NJPDES program has made much progress in regulating point source discharges, a great number of minor discharges have been allowed without regard to their cumulative impact on surface water quality. Environmental commissioners and town clerks receive notice from NJDEP when anyone applies for a permit to discharge to surface water under the New Jersey Pollution Discharge Elimination System (NJPDES). The commissions should examine the application and evaluate the proposal–the need for the permit, the location of the discharge, and the potential negative impacts. They should communicate their findings to NJDEP, the applicant, and the town.

Rancocas Creek

*Source: Kerry Miller*

Table 13: NJPDES Permits for Point Source Pollution

| NJPDES Permit Number | PI Number | Facility Name | Effective Start Date | Expiration Date* | Discharge Category Code | Discharge Category Description |
|---|---|---|---|---|---|---|
| NJG0194361 | 561067 | 308 Rt 38 Parking Modification | 3/1/2012 | 2/28/2017 | 5G3 | Construction Activity Stormwater (GP) |
| NJG0172316 | 479420 | Bamberger Beth DMD | 10/1/2008 | 9/30/2012 | K2 | Dental Facilities Onsite Wastewater Treatment Systems (GP) |
| NJG0143839 | 195325 | Chemique Inc | 6/1/2007 | 5/31/2012 | 5G2 | Basic Industrial Stormwater GP - NJ0088315 (5G2) |
| NJ0137812 | 87757 | Coca-Cola Refreshments - Moorestown | 12/1/2011 | 6/30/2012 | L | Significant Indirect User |
| NJG0163317 | 87757 | Coca-Cola Refreshments - Moorestown | 6/1/2007 | 5/31/2012 | 5G2 | Basic Industrial Stormwater GP - NJ0088315 (5G2) |
| NJ0103535 | 47500 | Combat Systems Engineering Dev Site (CSEDS) | 6/1/2009 | 5/31/2014 | GW | Discharge to Groundwater |
| NJG0161390 | 47500 | Combat Systems Engineering Dev Site (CSEDS) | 6/1/2007 | 5/31/2012 | 5G2 | Basic Industrial Stormwater GP - NJ0088315 (5G2) |
| NJG0029548 | 46638 | Hartford Road WTP | 4/1/2012 | 3/31/2017 | BPW | Potable Water Treatment Plant (GP) |
| NJG0101320 | 46638 | Hartford Road WTP | 12/1/2008 | 11/30/2013 | I2 | Potable WTP Basins & Drying Beds (GP) |
| NJ0079324 | 47161 | IMCO Inc | 6/1/2010 | 5/31/2015 | L | Significant Indirect User |
| NJG0143227 | 47161 | IMCO Inc | 6/1/2007 | 5/31/2012 | 5G2 | Basic Industrial Stormwater GP - NJ0088315 (5G2) |
| NJG0195880 | 563353 | Lockheed Martin Building 140 | 3/1/2012 | 2/28/2017 | 5G3 | Construction Activity Stormwater (GP) |
| NJG0161209 | 46829 | Lockheed Martin MS2 | 6/1/2007 | 5/31/2012 | 5G2 | Basic Industrial Stormwater GP - NJ0088315 (5G2) |
| NJG0199672 | 568706 | Madeira - Residential Subdivision | 3/1/2012 | 2/28/2017 | 5G3 | Construction Activity Stormwater (GP) |

| NJPDES Permit Number | PI Number | Facility Name | Effective Start Date | Expiration Date* | Discharge Category Code | Discharge Category Description |
|---|---|---|---|---|---|---|
| NJG0199605 | 568632 | Madeira - Site Plan | 3/1/2012 | 2/28/2017 | 5G3 | Construction Activity Stormwater (GP) |
| NJG0170895 | 464794 | Masco Bath Corp | 5/15/2008 | 5/31/2012 | 5G2 | Basic Industrial Stormwater GP - NJ0088315 (5G2) |
| NJG0162248 | 280413 | Mayberry Riggers Inc | 6/1/2007 | 5/31/2012 | 5G2 | Basic Industrial Stormwater GP - NJ0088315 (5G2) |
| NJG0192457 | 558722 | Moorestown Ambulatory Care Ctr | 3/1/2012 | 2/28/2017 | 5G3 | Construction Activity Stormwater (GP) |
| NJG0206245 | 581136 | Moorestown Library/Town Hall Complex | 3/1/2012 | 2/28/2017 | 5G3 | Construction Activity Stormwater (GP) |
| NJG0176419 | 207630 | Moorestown Twp | 3/1/2012 | 2/28/2017 | 5G3 | Construction Activity Stormwater (GP) |
| NJ0024996 | 46637 | Moorestown Twp WWTP | 12/1/2008 | 11/30/2013 | A | Sanitary Wastewater |
| NJG0157422 | 46637 | Moorestown Twp WWTP | 6/1/2007 | 5/31/2012 | 5G2 | Basic Industrial Stormwater GP - NJ0088315 (5G2) |
| NJG0196452 | 564448 | Opex Corp Solar Project | 3/1/2012 | 2/28/2017 | 5G3 | Construction Activity Stormwater (GP) |
| NJG0207675 | 585383 | P-237 CSEDS Building Addition | 3/1/2012 | 2/28/2017 | 5G3 | Construction Activity Stormwater (GP) |
| NJG0197025 | 565129 | Preliminary & Final Major Site Plan- Needlema | 3/1/2012 | 2/28/2017 | 5G3 | Construction Activity Stormwater (GP) |
| NJG0202436 | 573029 | Pryor Park | 3/1/2012 | 2/28/2017 | 5G3 | Construction Activity Stormwater (GP) |
| NJG0187089 | 546686 | QTG-CDSD Moorestown | 12/14/2010 | 5/31/2012 | 5G2 | Basic Industrial Stormwater GP - NJ0088315 (5G2) |
| NJG0181048 | 531211 | Single Family Home | 3/1/2012 | 2/28/2017 | 5G3 | Construction Activity Stormwater (GP) |
| NJG0143171 | 194735 | The Jet Pulverizer Co | 6/1/2007 | 5/31/2012 | 5G2 | Basic Industrial Stormwater GP - NJ0088315 (5G2) |

| NJPDES Permit Number | PI Number | Facility Name | Effective Start Date | Expiration Date* | Discharge Category Code | Discharge Category Description |
|---|---|---|---|---|---|---|
| NJG0186791 | 546218 | The Preserve At Willowbrook | 3/1/2012 | 2/28/2017 | 5G3 | Construction Activity Stormwater (GP) |
| NJG0203131 | 574510 | Wesley Bishop Park (North & South) | 3/1/2012 | 2/28/2017 | 5G3 | Construction Activity Stormwater (GP) |

Source: NJDEP, 2012

## Nonpoint Sources of Pollution

Since the adoption of the Federal Clean Water Act and the implementation of the NJPDES program 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. Nonpoint source pollution, or stormwater runoff, has the largest effect on the water quality and channel health of streams in Moorestown Township. According to US EPA, about half the pollution in New Jersey's surface water comes from nonpoint sources. Development dramatically increases nonpoint source pollution by increasing the volume of water and the level of pollutants in the runoff. Increased runoff causes erosion and sediment buildup in streams, carries nutrients from fertilizers, and washes toxics, bacterial contamination, road salt, motor oils, and litter into the stream.

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 Moorestown Township 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 Moorestown are affected by stormwater runoff both from within the township and upstream municipalities, and runoff generated in Moorestown contributes to downstream impacts.

NJDEP's Stormwater Management Rules focus on reducing and controlling nonpoint sources of water pollution. The Municipal Stormwater Regulation Program was developed and established four NJPDES general permits: the Tier A Municipal Stormwater General Permit (Tier A Permit) for more populous municipalities; the Tier B Municipal Stormwater General Permit (Tier B Permit) for rural communities; the Public Complex Stormwater General Permit (Public Complex Permit); and the Highway Agency Stormwater General Permit (Highway Permit). Moorestown Township is a Tier A municipality with a valid Tier A Permit (NJG0150215).

The NJPDES Stormwater program lays out guidance and requirements for management of and education about stormwater at the local level. Municipalities were required to obtain the 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).

## 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, or 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 launching canoes and kayaks.

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.

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.

As shown in **Map 16: Natural Vegetation (2007)**, most of the streams in Moorestown are bordered by wooded riparian buffers of varying widths.

Protecting riparian areas from development and enhancing or maintaining healthy vegetation in the stream corridor can help improve water quality, reduce flooding, and encourage biodiversity. Environmental commissions can encourage the preservation of existing vegetation and replanting of native vegetation along bare stream banks. Use of native vegetation in landscaping minimizes the need for pesticide and fertilizer use, and requires less frequent watering and mowing.

## 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 (see **Figure 7**) would show that the aquifers are not horizontal, but tilted toward the southeast, getting deeper as they cross the state toward the Atlantic Ocean. 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.

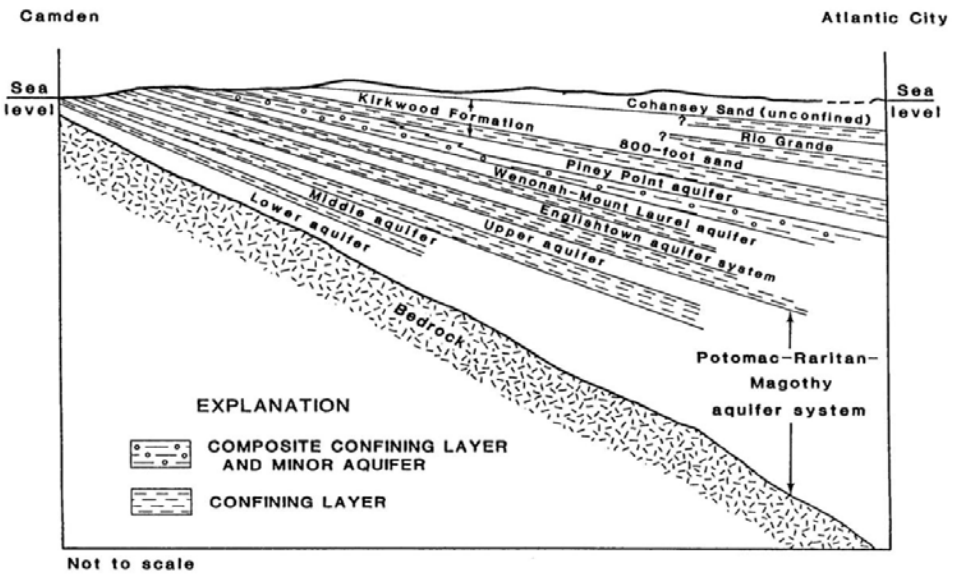



Figure 7: Aquifers of Southern New Jersey along a line from Camden to Atlantic City

Source: United States Geological Survey

The Potomac–Raritan–Magothy (PRM) formation is the deepest and most abundant aquifer. Other smaller aquifers on top of the PRM are the Englishtown and the Wenonah-Mount Laurel. The Kirkwood-Cohansey is a large formation that begins at the divide between the Inner and Outer Coastal Plain.

An outcrop is the area where the aquifer emerges on the land surface. Preventing contamination of the land in outcrop areas is extremely important in order to maintain a safe drinking supply. Confining units may also outcrop. Also known as an aquitard, a confining unit is an impenetrable layer of fine, compact clay that divides one aquifer from another.

As shown in **Map 13: Geologic Outcrops**, the Englishtown aquifer system outcrops in a band along the southern portion of the township, and the Merchantville and Woodbury formations outcrop along the center and northern portions. The Merchantville and Woodbury formations form a confining unit separating the Englishtown aquifer from the PRM aquifer system.

The public water supply wells located in and bordering Moorestown all tap into the PRM aquifer system. Some private wells may draw from the Englishtown aquifer system as well, although public data is not available on private wells. The public wells in Moorestown are shown on **Map 14: Public Water Supply Wells**. In addition to the water drawn from the wells, the Moorestown Water Department also purchases water from the Delaware River through New Jersey American Water.

The Potomac-Raritan-Magothy (PRM) is a deep geological formation underlying Moorestown. 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 inter bedded 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.

## 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. On the other hand, 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 seven active public community water supply wells serving Moorestown Township and four wells serving the Maple Shade Water Department, listed in **Table 14: Public Community Water Supply Wells** below. The Moorestown Township wells are shown on **Map 14: Public Water Supply Wells**.


Moorestown Township Water Tower
*Source: Joan Ponessa*

Table 14: Public Community Water Supply Wells In or Bordering Moorestown

| Well ID | Well Permit | Owner | Well Name | Well Address | Date of Well Completion | Finished Depth of Well | Primary Geologic Unit | Hydrologic Unit | Pumping Capacity (gal/min) |
|---|---|---|---|---|---|---|---|---|---|
| WSWL0000067225 | 3100000060 | Maple Shade Water Dept | Well 2 | Rte 73 & Rte 537 | 11/09/1949 | 121 | Magothy Formation | Upper Potomac-Raritan-Magothy Aquifer | 140 |
| WSWL0000077232 | 3100074649 | Maple Shade Water Dept | Well 8A | Rte 73 & Rte 537 | 10/15/2003 | 289 | Raritan Formation - Farrington Sand member | Middle Potomac-Raritan-Magothy Aquifer | 1,250 |
| WSWL0000067557 | 3100012925 | Maple Shade Water Dept | Well 11 | Rte 73 & Rte 537 | 02/17/1978 | 450 | Potomac Formation | Lower Potomac-Raritan-Magothy Aquifer | 1,250 |
| WSWL0000077233 | 3100074648 | Maple Shade Water Dept | Well 12 | Main Street Water Treatment Facility | 01/27/2004 | 458 | Potomac Formation | Lower Potomac-Raritan-Magothy Aquifer | 1,250 |
| WSWL0000070476 | 5100000041 | Moorestown Township | Well 3 | Kings Hwy | 04/02/1942 | 299 | Raritan Formation - Farrington Sand member | Middle Potomac-Raritan-Magothy Aquifer | 700 |
| WSWL0000067301 | 3100003806 | Moorestown Township | Well 4 | 510 Hartford Rd | 05/07/1959 | 340 | Raritan Formation - Farrington Sand member | Middle Potomac-Raritan-Magothy Aquifer | 700 |
| WSWL0000067346 | 3100004663 | Moorestown Township | Well 5 | Kings Hwy | 11/19/1963 | 288 | Raritan Formation - Farrington Sand member | Middle Potomac-Raritan-Magothy Aquifer | 805 |
| WSWL0000067353 | 3100004727 | Moorestown Township | Well 6 | Kings Hwy | 10/29/1963 | 288 | Raritan Formation - Farrington Sand member | Middle Potomac-Raritan-Magothy Aquifer | 700 |

| Well ID | Well Permit | Owner | Well Name | Well Address | Date of Well Completion | Finished Depth of Well | Primary Geologic Unit | Hydrologic Unit | Pumping Capacity (gal/min) |
|---|---|---|---|---|---|---|---|---|---|
| WSWL0000191576 | 3100050729 | Moorestown Township | Well 7 | North Church St | 05/02/1997 | 405 | Magothy, Raritan, and Potomac Formations | Potomac-Raritan-Magothy Aquifer System | 0 |
| WSWL0000067451 | 3100005387 | Moorestown Township | Well 8 | Hartford Rd | 07/02/1969 | 332 | Raritan Formation - Farrington Sand member | Middle Potomac-Raritan-Magothy Aquifer | 700 |
| WSWL965394 | E201110960 | Moorestown Township | Well 9 | North Church St | 11/11/2011 | 405 | Magothy, Raritan, and Potomac Formations | Potomac-Raritan-Magothy Aquifer System | 2,000 |

Source: NJDEP, 2009, Moorestown Township, 2013

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 no public non-community wells directly within Moorestown, although there are four located near the municipal border in the townships of Maple Shade and Mount Laurel. They are listed in **Table 15: Public Non-Community Water Supply Wells Serving Moorestown** and shown on **Map 14: Public Water Supply Wells**.

Table 15: Public Non-Community Water Supply Wells Serving Moorestown

| Well ID | Well Permit # | System Name | Well Permit | Well Name | Depth of Well |
|---|---|---|---|---|---|
| 3311 | 0324314 | Laurel Creek Country Club | - | Well | 180 |
| 3306 | 0324300 | NJ Turnpike / 4N Service Area | 31-00212 | Well 4N-1 | 222 |
| 3307 | 0324300 | NJ Turnpike / 4N Service Area | 31-00213 | Well 4N-2 | 180 |
| 3246 | 0319303 | Produce Junction | - | Well | 180 |

Source: NJDEP, 2009

***Private Drinking Wells***

Private wells supplying potable water are not routinely monitored like public community water systems (public water) and public non-community wells. However, beginning in 2002, 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.

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 serving Moorestown are shown in **Appendix D: Moorestown Drinking Water**.

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).

# 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.

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.

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.

**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 metals 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.

## Air Quality Index

The Air Quality Index (AQI) is an index for reporting air quality on a daily basis. 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 8: Air Quality Index (AQI)** below. The higher the AQI value, the greater the level of air pollution and associated health concerns.

Figure 8: 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

The daily score is based on the highest individual pollutant score 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 also 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 Ewing Township and Rider University. In 2011, the most recent year of annual data, Region 5 reported 320 good (green) and 38 moderate (yellow) days, seven days that were unhealthy for sensitive groups (orange), and zero unhealthy, very unhealthy, or hazardous (red, purple, and maroon) days.

## Local 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 49 active air quality permits in Moorestown, listed below in **Table 16: Facilities with Active Air Quality Permits**.

Table 16: Facilities with Active Air Quality Permits

| Facility Name | Address | PI Number |
|---|---|---|
| 308 Harper Drive Office Building | 308 Harper Drive | 46115 |
| ADT Security Services Inc | 50 Twosome Drive | 46148 |
| American Biltrite Inc | 105 Whittendale Drive | 46046 |
| Arfa Enterprises Inc | 105 Camden Ave | A9498 |
| Cardinal Press | 1253 Glen Ave | 45533 |
| CareOne Harmony Village At Moorestown | 301 N Stanwick Road | 46431 |
| CareOne at Moorestown | 895 Westfield Ave | 46430 |
| Chapel 2000 and Beyond Inc | 1537 Glen Ave | 46071 |
| Clondalkin Pharma and Healthcare Inc | 1224 Church Road | 46143 |
| Comcast Commercial Services Group Holdings | 650 Centerton Road | 46105 |
| Denglas Technologies LLC | 1259 N Church Street | 46025 |
| Denton Vacuum LLC | 1259 N Church Street | 46066 |
| Electro Magnetic Products | 355 Crider Ave | 45140 |
| Evergreen's Con Care Community | 309 Bridgeboro Road | 45514 |
| Former Citgo Service Station-Ward's Garage | 2 E Main | 45327 |
| George C Baker School | 139 Maple Ave | 45878 |
| Getty Service Station #56111 | Camden Ave and Cottage Rd | A4554 |
| IMCO Inc | 858 North Lenola Road | 45046 |
| J Cleaners and Tailors | 121-123 W Main Street | L4536 |
| Laurel Creek Pump Station | Laurel Creek Blvd | 45936 |
| Lutheran Home at Moorestown | 255 E Main St | 46018 |
| Mack Cali Realty Corp | 228 Strawbridge Dr | 46313 |
| Masco Bath | 540 Glen Ave | 46482 |

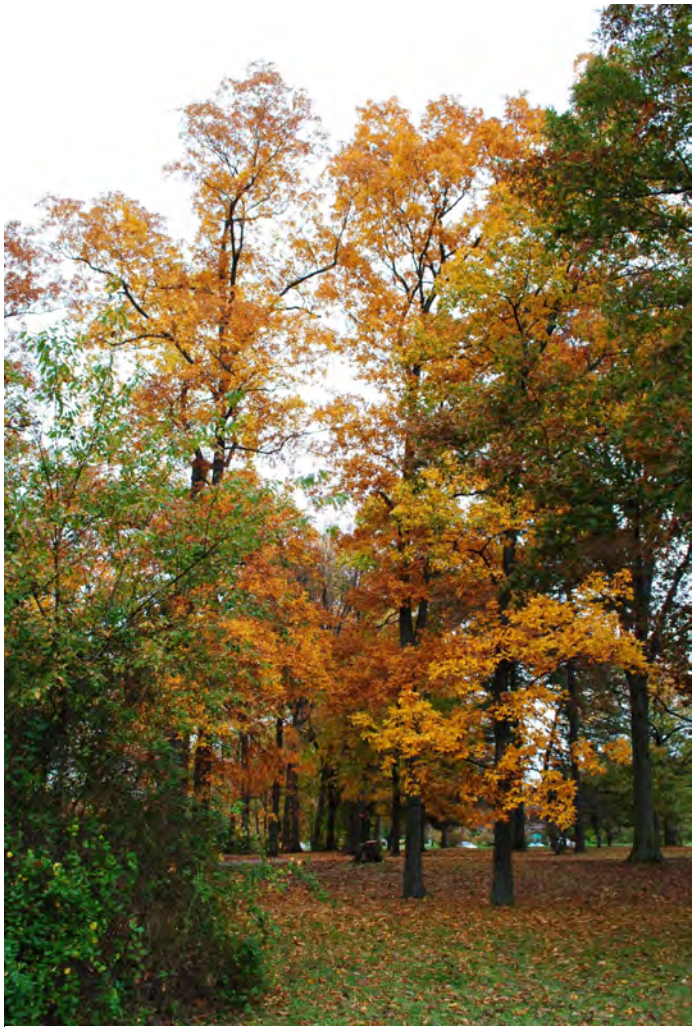
| Facility Name | Address | PI Number |
|---|---|---|
| McLean Packaging Corp | 1504 Glen Ave | 46283 |
| Mill Street Tire | 300 N Church Street | 46424 |
| Mobil Service Station #15EWD | 225 Chester Ave | 45503 |
| Moorestown Autobody | 26 E Camden Street | G4527 |
| Moorestown Board of Education Maintenance Facility | 801 N Stanwick Road | H8716 |
| Moorestown Cleaners | 186 W Camden Ave | L4512 |
| Moorestown Gas LLC | 201 Rt 38 | A45833 |
| Moorestown High School | 350 Bridgeboro Road | 45885 |
| Moorestown Lukoil | Rt 38 and Mt Laurel | A4527 |
| Moorestown Subheadquarters | 300 New Albany Road | 45454 |
| Moorestown Twp Library | 111 W 2nd Street | 46010 |
| Moorestown Twp Water Pollution Control Plant | Cottage St and Pine St | 45436 |
| Philadelphia Coca-Cola Bottling Company | 1250 Glen Ave | 45355 |
| Pleasant Valley Apartments | 531 Kings Highway | 46004 |
| PNC Bank Eastgate | 312 Rt 38 | 46001 |
| REM-006 | 1274 N Church Street | 45984 |
| Romano's Service Mobile Oil 15EWD | Chester and Plum Street 15-EWD | A4768 |
| Sears Unit #1494 | Rt 38 and Lenola Road | 46119 |
| Shell Service Station #138332 | 253 W Main Street | A4509 |
| Shell Service Station #138433 | 201 Rt 38 | A4507 |
| South Valley School | 210 Stanwick Road | 45887 |
| The Jet Pulverizer Co | 1255 N Church Street | 45339 |
| Thermacon Industries | 345 New Albany Road | 45336 |
| Tube Dec LLC | 390 New Albany Road | 46352 |
| United States Navy-CSEDS-AEGIS Technical REA | 300 Centerton Road | 45494 |
| Verizon Moorestown Co #55121 | 105 E Main Street | 45338 |

Source: NJDEP, 2012

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

There are seven facilities in Moorestown that are required to submit emission statements: IMCO Inc., Lockheed Martin MS2, Flexprint Inc, Beckett Corporation, Citation Graphics, American Biltrite Inc, and Clondalkin Moorestown. In 2011, three of these facilities released annual emission statements, which are included **in Appendix F: Emission Statements**.

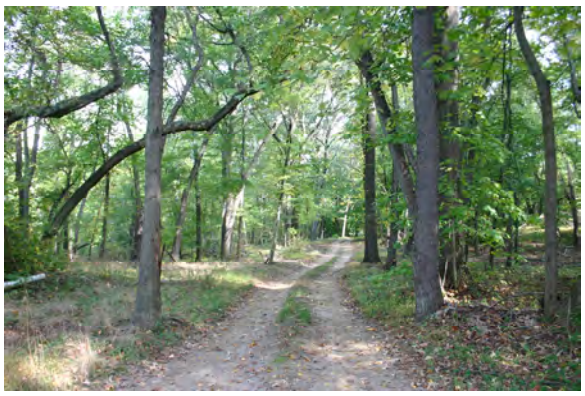


Strawbridge Lake Park
*Source: Joan Ponessa*

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.



Susan Stevens Halbe Preserve
*Source: DVRPC*

Moorestown 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 Moorestown. Herbaceous wetlands and scrub wetlands are also present in large areas adjacent to Moorestown'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 Moorestown.

## Natural Vegetation

A region's vegetation is dependent upon many factors, the most important of which are climate and soils. Moorestown's climate is characterized by moderate temperatures, precipitation, and wind, with an average annual temperature of 54.9 degrees Fahrenheit. The average annual precipitation is 48.22 inches and is fairly well distributed throughout the year. The majority of Moorestown's soils are poorly drained soils that exhibit ponding and sustain wetland plants. However, Moorestown 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 Moorestown. A list of plant species identified at South Valley Woods may be found in **Appendix B**.

Moorestown's natural vegetation types, along with human-influenced types of land cover, have been tabulated and mapped by NJDEP's 2007 land cover analysis based on infrared aerial photography. 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 16: Natural Vegetation (2007)**.

Table 17: Moorestown Natural Vegetation

| Vegetation Type | Area (Acres) | Percentage of Township |
|---|---|---|
| Brush/Shrubland | 52.81 | 0.55% |
| Brush/Shrubland - Oldfield | 139.17 | 1.45% |
| Tidal Marshes - Freshwater | 94.53 | 0.99% |
| Tidal Waters | 105.25 | 1.10% |
| Upland Forest - Coniferous | 18.18 | 0.19% |
| Upland Forest - Deciduous | 525.66 | 5.49% |
| Upland Forest - Mixed (Coniferous Dominated) | 20.87 | 0.22% |
| Upland Forest - Mixed (Deciduous Dominated) | 8.68 | 0.09% |
| Water | 110.88 | 1.16% |
| Wetlands - Coastal (Phragmites Dominated) | 2.64 | 0.03% |
| Wetlands - Herbaceous | 22.34 | 0.23% |
| Wetlands - Modified | 150.83 | 1.57% |
| Wetlands - Phragmites Dominated | 17.61 | 0.18% |
| Wetlands - Scrub/Shrub | 55.25 | 0.58% |
| Wetlands - Wooded - Coniferous | 0.98 | 0.01% |
| Wetlands - Wooded - Deciduous | 702.74 | 7.34% |
| **Total Natural Vegetation Acres** | **2,028.42** | **21.18%** |
| **Total Moorestown Township Acres** | **9,578.66** | **100.00%** |

Source: NJDEP, 2012

## 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.

Within Moorestown, wetlands are located in floodplain areas, as well as in other areas of depressions. All of Moorestown's wetlands are freshwater. Natural wetlands cover 1,047

acres within Moorestown (11 percent of the township), of which 704 acres are wooded wetlands, and 343 acres are low-growing emergent, scrub/shrub or herbaceous wetlands, or tidal marshes. See **Map 10: Surface Water, Wetlands, and Vernal Pools**.

Most wetlands in Moorestown are found in association with the township's many streams and tributaries. Moorestown's most abundant wetlands are deciduous wooded wetlands, scrub/shrub wetlands, and modified wetlands. These wetlands are found surrounding the township's stream corridors, such as Pompeston Creek and Swede Run, as well as Kendles Run. Wooded wetlands are also found adjacent to the majority of the township's deciduous upland forests. Trees like sweet gum, red maple, magnolia, black gun, and ash are surrounded by an understory consisting of shrubs like buttonbush, alder, and pepperbush, and herbaceous species, such as cardinal flower, skunk cabbage, and hellebore. Many of the wooded wetlands, once covered in willow, oak, white cedar, wild rice, and river cane, are now invaded by bulrush, cattails, *Phragmites*, and maple.

Great egret
*Source: Chet Dawson*

Wetlands are protected through enforcement of the buffer requirements of the New Jersey Freshwater Wetlands Protection Act.

## Upland Forests

Upland areas are those locations without water at or near the soil surface. Upland forests are located on drainage divides, terraces, and slopes, where water is not the controlling factor and where drainage is sufficient so that soils do not become saturated for extended periods of time. Nearly all old growth upland forests in New Jersey were harvested for lumber during colonial times.

Today, upland forests are the second most abundant natural vegetative land cover in Moorestown after wetlands. Upland forests occupy 573 acres (six percent) of the township. The tree composition in the these upland forests is mostly one of broad leaf hardwoods, including oak, hickory, beech, poplar, cherry, sassafras, and maple. Patches of coniferous pine may also occur sporadically.

## Grasslands

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 along wood edges, roadsides, and in landscapes where mowing is infrequent and where woody plants are not yet the dominant vegetation.

Brushland, shrubland, or old fields cover 192 acres (two percent) of Moorestown. In the township, brushland and old fields are generally found adjacent to residential, industrial or wetland areas. Trees, such as sassafras, black cherry, red cedar, and white oak, are often the first species to recolonize old field lands. Meadow onion, broom-sedge, rushes, grasses, common dogbane, and vines of Japanese honeysuckle can also be found in grassland habitat.

## Trees

The Moorestown Tree Planting and Preservation Committee was formed to encourage and assist the community of Moorestown to successfully implement a tree management program by providing information and assistance to the Township Council and management to sustain and enhance the community forest. In 2009, this committee began an initiative to inventory the trees located in road rights-of-way and in municipal parks, which are the responsibility of Moorestown Township to maintain. This in-depth survey was completed by local volunteers in 2012. The diameter, species, health, and GPS coordinates of nearly 7,700 trees in the township were inventoried. In addition, the survey identified sites for potential new plantings. **Map 22: Tree Survey** illustrates the results from this inventory.

Beech tree on Main Street
*Source: Joan Ponessa*

Overall, the most common tree surveyed was the red oak, of which there were 1,051 trees. The second most common tree was the pin oak (560 trees), followed by London planetree (358 trees), sugar maple (353 trees), common maple (302 trees), littleleaf linden (298), Norway maple (292 trees), Japanese zelkova (292 trees), and northern red oak (212). The complete list of tree species identified as part of the survey can be found in **Appendix B: Plant Species in Moorestown Township**.

Based on the township-wide tree survey, the economic and ecological benefits of trees were calculated. The total annual economic value of trees to the township is an estimated $850,000, an average of $137 per tree. The Moorestown Township Shade Tree Department budget for 2011 was $250,000, so the net annual benefit of trees to the township is a total of $600,000, or an average net benefit of $96.50 per tree. The township's trees lead to an annual energy reduction for cooling and heating costs of $105,000 in electricity and $16,000 in natural gas. These trees intercept a total of 23 million gallons of stormwater annually, saving $230,000 total. The annual stormwater interception per tree averages 3,725 gallons, or $37 per tree. The township's trees reduce atmospheric carbon dioxide by 1,500 tons annually, equivalent to a benefit of $22,000, and cause the removal or avoidance of 17,000 pounds of air pollutants, equivalent to a benefit of $17,000. The increase in property values caused by trees is estimated at $500,000, or an average of $80 per tree.

Moorestown Township has been a designated Tree City USA municipality since 1990. The Tree City USA program, sponsored by the Arbor Day Foundation in cooperation with the USDA Forest Service and the National Association of State Foresters, provides direction,

technical assistance, public attention, and national recognition for urban and community forestry programs in thousands of municipalities across the country.

## Landscape Project Priority Habitats

The Landscape Project, developed by the Endangered and Nongame Species Program of the NJDEP Division of Fish & Wildlife, documents the value of various types of habitats within New Jersey. It categorizes these habitats into one of five groups according to their importance (five being the highest). The NJDEP Division of Fish and Wildlife divides New Jersey into six habitat regions based on ecological characteristics. Moorestown Township is located entirely within the Piedmont Plains region. Moorestown Township contains all five rankings of habitat importance.

Approximately 33.24 percent, or 3,184.21 acres, of Moorestown Township has been identified as landscape project priority land. See **Map 17: Landscape Project Priority Habitat (2012)**.

Table 18: Landscape Project Habitats

| Rank | Area (Acres) | Percent of Township Land |
|---|---|---|
| 1 | 1,507.99 | 15.7% |
| 2 | 463.95 | 4.84% |
| 3 | 967.14 | 10.1% |
| 4 | 169.69 | 1.8% |
| **5** | 75.44 | 0.8% |
| **Total Landscape Project** | **3,184.21** | **33.24%** |
| **Total Moorestown Township** | **9,578.66** | **100%** |

Source: NJDEP, 2012

These areas have been identified as priority habitat due to the presence of the following rare species: savannah sparrow, great blue heron, bog turtle, bald eagle, black-crowned night heron, and wood thrush.

## Animal Communities

Although there is no comprehensive inventory of the different animal species that may be found within Moorestown, there are records of sightings, biological studies of range, and assessments of endangered and threatened species status. Using federal, state, local and other sources, it is possible to identify and describe known and possible animal communities of Moorestown. These are included in **Appendix C: Vertebrate Animals Known or Probable in Moorestown Township**. A list of animal species identified in South Valley Woods in 2011 is also included in **Appendix C**.

## 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, as compared to chemical monitoring, which measures water quality at one moment in time. 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**.

During warm weather, Moorestown is home to a variety of dragonflies, damselflies, butterflies, moths, beetles, wasps, and cicadas. A list of invertebrates identified at South Valley Woods can be found in **Appendix C**.

## 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.

White-tailed deer
*Source: Chet Dawson*

### 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 Moorestown Township include the opossum, Eastern mole, big brown bat, little brown bat, Eastern cottontail, Eastern chipmunk, gray squirrel, white-footed mouse, meadow vole, muskrat, pine vole, red fox, gray fox, raccoon, striped skunk, river otter, beaver, and white-tailed deer.

## 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.

Red-tailed hawk
*Source: Chet Dawson*

Moorestown is home to an abundance of birds, listed in **Appendix C: Animals Known or Probable in Moorestown Township**.

One of the most common birds 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. Goose droppings that wash into surface waters during storm events can elevate coliform bacteria to unhealthy levels, closing lakes to swimming.

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 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 goose eggs and replacing with decoys.

Canada geese
*Source: Chet Dawson*

By the early 1980s, the number of geese in Moorestown was becoming a rapidly increasing problem. Sidewalks and play areas around Strawbridge Lake were becoming unusable and parents were complaining about the slippery slime on the recreation fields. With the assistance of the USDA Fish and Wildlife Service, the Moorestown Environmental Advisory Committee (MEAC) in 2003 conducted goose counts in January and June and found that several thousand migratory geese were stopping over in Moorestown to join the close to 1,000 resident geese. Many of those migratory geese (mostly Canadian geese with a few snow geese) would spend the winter in Moorestown and still do. Later that year, MEAC presented to the Town Council a number of options for goose control and a program for egg addling and

goose harassment was adopted, with implementation beginning in 2004.

While geese remain a problem, the addling program has held the number of resident geese in check and the harassment program has reduced significantly the number of geese around Strawbridge Lake and the recreation fields. From 2004 to 2012, over 3,500 eggs were addled. About 100 nests are addled each year with the highest concentration along the tributaries to Strawbridge Lake and along Swede Run on the eastern part of the township. Border collies are used heavily for harassment with some use of radio controlled boats on Strawbridge Lake. Some residents have also contracted harassment services and there is an increasing use of dog cut outs in farm fields.

### Important Bird and Birding Area

The Important Bird Area (IBA) 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 and one site in Moorestown, Rancocas Creek.

The Rancocas Creek IBA is 8,969 acres of open waters and forested riparian habitat in the Pineland Plains region of New Jersey. The Rancocas Creek IBA is located between the Pinelands and the developed areas of Burlington County. Notable species in the Rancocas Creek IBA include bald eagles and pied-billed grebes, and the site hosts many wintering mallards and American black ducks. The Rancocas Creek is an important staging area for northern pintails during the major spring migrations. Staging areas are locations where migratory animals temporarily congregate for feeding and rest. Habitat protection for established staging areas can reduce mortality during migrations from exhaustion and collisions with buildings or traffic.

## 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. Some common herpetological species that may be found in Moorestown include the common snapping turtle, red-bellied turtle, eastern painted turtle, musk turtle, box turtle, Northern water snake, Eastern garter snake, Northern brown snake, black racer, bullfrog, green frog, Northern two-lined salamander, spring peeper, and New Jersey chorus frog. See **Appendix D: Animals Known or Probable in Moorestown 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 the unintended consequences of overfishing, urban development, industrial advancement, 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 are likely to be found in Moorestown's many streams and lakes. See **Appendix C: Animals Known or Probable in Moorestown Township**.

## Rare Wildlife

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. 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. These maps are available to Environmental Commissions and for research projects, but are otherwise not public.

According to the Natural Heritage Database and the Landscape Project, rare wildlife species have been documented in Moorestown Township over the course of the past 100 years.

The Natural Heritage Database of the NJDEP lists six species of rare wildlife found in Moorestown, which includes five birds and one reptile. Moorestown provides foraging and wintering habitat for the bald eagle (endangered), as well as foraging habitat for the black-crowned night heron (threatened) and great blue heron (species of special concern). There have also been breeding sightings of the savannah sparrow (threatened) and the wood thrush (species of special concern). The bog turtle also occupies habitat in Moorestown Township. The bog turtle is classified as endangered in the state and threatened in the United Sates. The bog turtle is the only rare species found in Moorestown Township that is federally listed.

Additionally, there are other rare species sighted by township residents but not yet verified by the Endangered and Nongame Species Program. They are, therefore, not included in this list. These animals are listed in **Appendix C: Animals Known or Probable in Moorestown Township** under **Rare Wildlife**.

CHAPTER 6

# The Built Environment

## Population and Housing

In 2010, the U.S. Census estimated that Moorestown had a population of 20,726 people, a nine percent increase from its 2000 population of 19,017.

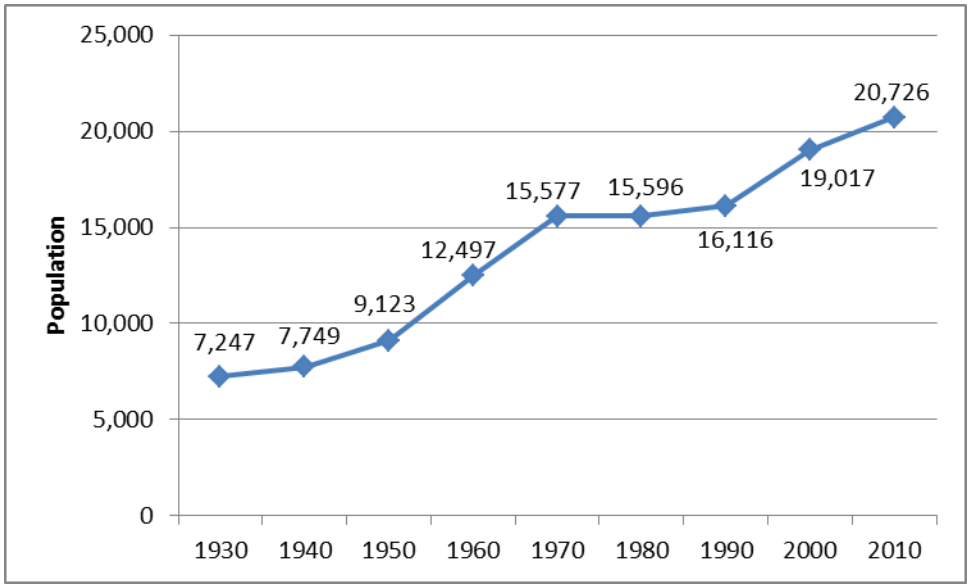



Figure 9: The Population of Moorestown, 1930-2010

Source: U.S. Census Bureau

According to the 2010 U.S. Census, 10,349 residents of Moorestown (66 percent of the population aged 16 and over) were in the labor force. Of those in the labor force, 10,322 were in the civilian labor force and 27 were in the armed forces. Approximately 57 percent were in management, professional, and related occupations; 24 percent of jobs were in sales and office occupations; 10 percent were in service occupations; four percent were in production, transportation, and material moving occupations; four 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 43.4, significantly above the national median of 34. The percentage of residents of Moorestown aged 65 and over was about 16 percent in 2010, compared to the national average of 12 percent. About one-fourth of all Moorestown

residents are children between the ages of 5 and 18. This represents the age group that is most likely to generate demand for public schools, community facilities, and recreational opportunities. As seen in the population pyramid figure below, the largest age groups of Moorestown residents are those under 20 years of age and those in their 40s and 50s.

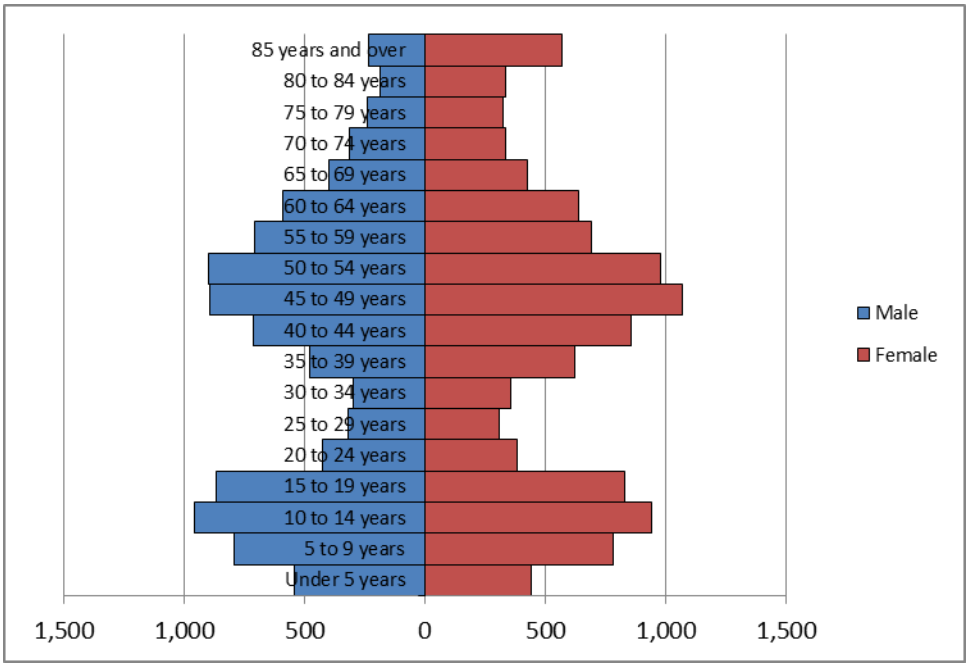



Figure 10: Moorestown Population by Age and Gender, 2010

Source: U.S. Census Bureau

Based on the 2010 U.S. Census, 86 percent of the population of Moorestown identifies as white, seven percent identify as black or African American, seven percent identify as Asian, and four percent identify as Hispanic or Latino. The percentage of individuals below the poverty line in Moorestown is about four percent, less than the national average of 12 percent. The average household income in Moorestown ($160,444) was nearly four times higher than the national average ($41,994).

According to U.S. Census data from 2010, Moorestown had 7,862 housing units. Of the 7,450 occupied housing units, about 79 percent (5,894 units) were owner occupied, higher than the national average of 66 percent. The amount of rental properties is about 21 percent (1,556 units), lower than the national average of 34 percent. The median value of a single-family home in Moorestown in 2010 was $484,000, significantly higher than the national average of $119,600.

## Transportation

Moorestown is located in a fairly accessible portion of Burlington County. It is approximately 15 miles from Philadelphia and 26 miles from Trenton. The township is located between the New Jersey Turnpike, I-295, and Routes 130, 38, and 73. These

major roads provide the quickest access to Philadelphia, Camden, Trenton, and the rest of New Jersey.

Accessibility to highways and other major roads is integral to the quality of life of Moorestown residents, as approximately 88 percent of the township's employed population commutes to work by automobile, according to the 2010 U.S. Census. The mean travel time to work for Moorestown residents is 29 minutes, longer than the New Jersey average of 28 minutes and the national average of 24 minutes. Less than five percent of Moorestown residents rely on public transportation for their daily commute.

NJ Transit buses serve Moorestown, connecting residents to Philadelphia, the Moorestown Mall, and Camden. Moorestown is not directly accessible by passenger rail, but residents can access the River LINE light rail in the nearby townships of Pennsauken, Palmyra, and Riverton. The River LINE connects townships and boroughs along the Delaware River between Trenton and Camden. Moorestown's residents can access SEPTA and NJ Transit trains from Camden and Trenton, which provide access to Philadelphia, as well as most of New Jersey. Atlantic City can be reached via NJ Transit from nearby Cherry Hill. The PATCO high speed line allows residents of South Jersey to travel to Camden and Philadelphia.

The township has developed approximately nine miles of dual-use paths for bicycles and pedestrians. The township's system consists of Class 1 and Class 3 routes. Class 1 paths are separate asphalt or concrete lanes that are usually built in the right-of-way adjacent to the cartway. Class 3 routes are located on existing streets in the cartway and are signed as bicycle routes. Class 3 routes are for bicycles only since the streets are coupled with sidewalks for pedestrians. See **Map 20: Parks, Recreation, and Open Space** for a depiction of the bike routes in the township.

## Historic Resources

The Moorestown Historic District was placed on the New Jersey and National Registers of Historic Places in 1990 through the effort of the Moorestown Improvement Association. The district contains about 350 contributing buildings.

Breidenhart

*Source: DVRPC*

In addition to the Moorestown Historic District, Moorestown has seven individual sites that are listed on the National and State Registers of Historic Places. These sites are listed in **Table 19** below.

There are another four sites that have been deemed eligible for the New Jersey and National Registers of Historic Places and have been issued Opinions of Eligibility from the State Historic Preservation Office (SHPO). These are also listed below in **Table 19**. There are numerous other properties that may be deemed eligible for the Registers, but which have not been issued a formal Opinion by SHPO.

Table 19: Historic Sites of Moorestown

| Map ID | Name | Location | State ID# | Register |
|---|---|---|---|---|
| **State and National Registers of Historic Places** | | | | |
| | Moorestown Historic District | Parts of Chester, French's, East Central, East Oak, Lippincott, and West Prospect Ave; East Main, West Main, East 2nd, East 3rd, and High streets | 836 | NR: 8/30/1990<br>SR: 11/28/1989 |
| 6 | Breidenhart | 225 E Main St | 832 | NR: 12/22/1977<br>SR: 6/13/1977 |
| 7 | Ivins-Conover House and Barn | Cox Road, east of Hartford Road | 834 | NR: 4/29/1977<br>SR: 3/22/1976 |
| 5 | Moorestown Friends School and Meetinghouse | Chester Ave and Main St | 837 | NR: 7/22/1988<br>SR: 6/16/1986 |
| 4 | Old Town Hall | 40 East Main St | 838 | NR: 8/10/1977<br>SR: 12/1/1976 |
| 2 | Perkins House | Camden Ave and Kings Highway | 839 | NR: 9/15/1977<br>SR: 3/22/1976 |
| 3 | Smith-Cadbury Mansion | 12 High Street | 840 | NR: 10/22/1976<br>SR: 8/10/1973 |
| 1 | Thomas French House | 512 Camden Ave | 833 | NR: 1/9/1978<br>SR: 1/17/1976 |
| **Eligible Sites for State and National Registers of Historic Places** | | | | |
| | Camden and Burlington County Railroad | Right of Way between Camden City and Mt. Holly Township | 4588 | SHPO opinion: 2/22/2006 |
| 18 | S. Little House | Creek Road | 835 | SHPO opinion: 12/29/1980 |
| 17 | Tallman Farmstead | Centerton Road | 2752 | SHPO opinion: 12/8/1999 |
| 19 | Vice Admiral James H Doyle Combat System Engineering Development Site | 300 Centerton Road | 5137 | SHPO opinion: 1/11/2012 |

Source: NJ State Historic Preservation Office, 2012

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.

In addition to the sites currently listed on the national and state registers for Moorestown, there are many other buildings and locations noted for local historical significance. These sites are listed in **Table 20** below:

Table 20: Moorestown Sites of Local Historic Significance

| Map ID | House Name | Date and Notes | Address | Block/Lot |
|---|---|---|---|---|
| 37 | Josiah Venable/Browning House/Thomas L. Slim House | 18th Century. Excellent example of vernacular building at its time | 834 North Lenola Road | 400/11 |
| 34 | 816 North Lenola Road | Circa 1890. Small house, 2 stories, 3 bays | 816 North Lenola Road | 400/21 |
| 41 | Elijah L. Hunt House | Circa 1834 and earlier | 505 Camden Ave | 1611/12 |
| 33 | Robert Williams Farmhouse | Circa 1825, simple 4-bay house in 7-course American bond | 118 S Colonial Ave | 2600/3 |
| 26 | Lippincott House | Mid-19th century/ Substantial, unpretentious house retaining details from at least 2 periods. | 1237 N Church St | 3504/3 |
| 28 | Clayton Lippincott/Collins House | Circa 1800s. 19th century vernacular framed farmhouse | 310 Peasant Valley Ave | 3102/24 |
| 23 | Lippincott House | Circa 1859. 4-bay house, probably originally clapboard, now shingled. | Riverton Road at the Cinnaminson border | 3603/26 |
| 38 | Lippincott House | Circa 1800 or earlier, example of typical federal house | 2801 Riverton Road | 3603/27 |
| 24 | Benjamin Leeds House | Circa 1835. Example of late federal house | 555 New Albany Road | 3900/12 |
| 45 | Joseph Lauer House | Circa early 1800s. Good example of a 19th century farmhouse. Porch demolished. | 1117 N Church St | 3902/9 |
| 44 | Pancoast House | Circa 1800 or earlier. Large house with several additions, possibly 1840s and 1880s. | 580 New Albany Road | 4000/7 |
| 31 | 764 Riverton Road | Circa 1850. Former tenant house for Lippincott Farm. Frame, 2 stories, 2 bays | 764 Riverton Road | 4012/16 |

| Map ID | House Name | Date and Notes | Address | Block/Lot |
|---|---|---|---|---|
| 30 | 762 Riverton Road | Circa 1850. Frame, 4 bays, 2 stories, door with transom, 2 dormers, modillion cornice | 762 Riverton Road | 4012/17 |
| 46 | Lippincott/Stow House | Circa 1829, 5 bay, 2.5 story frame, on NJ sandstone foundation | Relocated to Windsock Way | 1/2/5703 |
| 36 | Roberts House | Circa 1899. Frame, 3 stories, Victorian | Stanwick Road | 5800/80 |
| 21 | Heuling's Tenant House | Circa mid 1800s | 1001 Westfield Road | 6900/1 |
| 43 | Fruit Dale Farm | Circa 1800 or earlier | Bridgeboro Road | 6900/18 |
| 32 | Bishop House | Mid-1800 | Garwood Road | 7000/3 |
| 29 | Albert Lippincott House | Circa 1830s. 5 bay, 2.5 story salt box. | 310 Borton's Landing Road | 7401/10 |
| 39 | L.L. Walton House | Circa 1850 or earlier | Hartford Road across from Garwood Road | 7500/1 |
| 40 | William Cox House | Circa early 1800s | 800 Cox Road | 7700/9 |
| 35 | Samuel Huston House | Circa 1830s | Hartford Road | 7800/11 |
| 20 | Heaton House | Circa 1835 | 522 Creek Road | 7900/13 |
| 22 | Borton Landing House and Barn | Circa 1852 and earlier | Borton Landing Road at Rancocas Creek | 8600/1 |
| 25 | 101 Hartford Road | Unknown date. Has carriage house with earlier beams | 101 Hartford Road | 8801/1 |
| 42 | Pleasant Acres Dairy Farm | Circa 1850. 19th century vernacular frame farmhouse. Currently the Burlington County Agricultural Center | 500, 501, and 509 Centerton Road | 8801/3 |
| 8 | Thomas Cowperthwaite House | Circa 1742 | 85 Kings Highway | 1801/17 |
| 9 | Bispham/Walton House | Circa 1770 | 730 Marne Highway | 6800/2 |
| 10 | Roberts House | Circa 1800s | 770 Marne Highway | 6800/5 |
| 11 | Barclay Leeds House | Circa mid-1800s | 900 Riverton Road | 3801/1 |
| 12 | Unnamed House | | Tom Brown Road at New Albany Road. | 400/1 |
| 13 | Zelley House | Circa 1725 | 401 Stanwick Road | 5800/64 |

| Map ID | House Name | Date and Notes | Address | Block/Lot |
|---|---|---|---|---|
| 14 | Thomas Stratton House | Circa 1791 | 310 Bridgeboro Road | 5604/15 |
| 15 | Abraham Heulings House | Circa 1720 | 401 Bridgeboro Road | 6900/1 |
| 16 | Crispin House (or Tenant House to Bispham Farm) | Circa 1760 | 760 Marne Highway | 6800/4 |
| 27 | William Roberts House | Circa 1765-1785 | 601 N Church St | 3905/17 |

Source: Moorestown Township Master Plan, 2002, Moorestown Environmental Advisory Committee, 2013

Moorestown also has several roads or portions of roads that have historical significance, including: Old Salem Road (1692), Kings Highway (1765), Featherbed Lane (formerly Pettit's Lane, 1761), Riverton Road (Meeting House Lane, 1720), Lenola Road (1768), and Church Street (early 1800s).

## Parks, Recreation, and Open Space

Moorestown owns and manages over 20 recreational facilities and other sites in the township, covering over 400 acres. This includes facilities for passive recreation, sports fields and courts, an arts center, playgrounds, and other uses. The municipal parks and open spaces are listed in **Table 21** below.

Burlington County Community Agricultural Center
*Source: Chet Dawson*

In addition to lands dedicated to parks and recreation, there are another 265 acres preserved by the municipality for conservation purposes. This includes greenways along the Pennsauken, Rancocas, and Pompeston creeks, Swede Run, and other areas. Burlington County owns an additional 143 acres of open space in Moorestown, which includes conservation lands and the Community Agricultural Center. There are another 132 acres of recreational land located at five different schools, which are owned and maintained by the Moorestown Township Board of Education.

There are seven development-restricted properties totaling 165 acres in Moorestown. These privately owned properties have easements for conservation or agricultural purposes that restrict new development. There are over 340 acres of privately owned community facilities like swim clubs and golf courses that may be used for recreational purposes.

Moorestown Township has a Parks and Recreation Department and a Recreation Advisory Committee that coordinate a range of programs, with an emphasis on youth

sports and recreation programming. The Moorestown Open Space Advisory Committee is a citizen committee that advises on the use of open space funds for the acquisition and maintenance of open space in the township.

The preserved open space in the township is shown on **Map 20: Parks, Recreation, and Open Space**. This map also shows unpreserved farmland in the township.

Table 21: Moorestown Parks and Open Spaces

| Name | Acres | Use |
|---|---|---|
| Beech Street Park | 0.75 | Passive Recreation, Playground |
| Boundary Creek Natural Resource Area | 34.00 | Passive Recreation, Trails |
| Church St. Recreation Center | 0.50 | Indoor Recreation |
| Esther Yanai Preserve | 34.50 | Passive Recreation |
| Farrago Farm | 27.33 | Passive Recreation, Agriculture |
| Fullerton Memorial Park | 3.50 | Courts, Field Sports, Playground |
| John Pryor Memorial Park | 14.27 | Field Sports, Tot Lot |
| LeDuc Pocket Park | 0.90 | Passive Recreation |
| Lenola Road Athletic Fields | 3.14 | Field Sports |
| Little Woods | 11.00 | Rancocas Greenway |
| Locust Street Park | 4.50 | Passive Recreation |
| Maple Dawson Park/West End Field | 4.33 | Courts, Playground, Field Sports |
| Memorial Field | 26.00 | Field Sports, Track |
| New Albany Com. Ctr./Jeff Young Memorial Park | 9.10 | Indoor Meeting Space, Field Sports, Courts |
| Perkins Memorial | 4.61 | Arts Center, Passive Recreation, Community Gardens |
| Pompeston Park | 77.25 | Pompeston Greenway |
| Stokes Hill | 10.46 | Sledding, Passive Recreation |
| Stokes Woods | 2.50 | Swede Run Greenway |
| Strawbridge Lake Park | 103.07 | Passive Recreation, Playground |
| Susan Stevens Halbe Preserve | 17.30 | Passive Recreation |
| Swede Run Fields | 129.61 | Passive Recreation, Agriculture |
| Wesley Bishop Park | 58.00 | Field Sports, Conservation |
| Wigmore Acres | 12.10 | Passive Recreation |
| Yancy-Adams Park | 0.52 | Passive Recreation |

Source: Clarke Caton Hintz, 2009

# Township Utilities and Services

## Drinking Water


Kings Highway Water Treatment Plant
*Source: DVRPC*

The Moorestown Township Water Department (PWS ID#: NJ0322001) serves nearly all township residents with drinking water supply. The water is drawn from a combination of groundwater and surface water resources. Groundwater from the Potomac-Raritan-Magothy (PRM) aquifer system is drawn from six wells owned and operated by the Moorestown Township Water Department. Three wells are located to the south of Strawbridge Lake, two are located near the intersection of Hartford and McElwee Roads, and one is located adjacent to a tributary to the North Branch Pennsauken Creek south of Church Street. The Water Department also purchases surface water from the Delaware River from New Jersey American Water.

See **Appendix D: Moorestown Drinking Water** for the Annual Drinking Water Quality Report from reporting year 2011. Additional information on water supply wells is available in the **Water Supply Wells** section. See also **Map 14: Public Water Supply Wells**.

## Sewer Service

Most of the developed areas in the township are served by sewer service utilities, as shown in **Map 19: Approved Sewer Service Area**. The Moorestown Township Department of Public Works provides sewer service to most of the township. A small section of the township north of Tom Brown Road is served by the Delran Township Sewer Department and the Laurel Creek Country Club is served by Mount Holly Municipal Utilities Authority.

As shown in **Map 19**, there are large areas of Moorestown that are not within the approved sewer service area. This non-sewered area includes a number of preserved parcels, as well as large parcels of undeveloped, unpreserved land.

## Trash and Recycling

Moorestown Township collects trash once per week for residential districts. Trash is collected twice per week for commercial districts. Yard waste and appliances/junk is collected once per month, with the day depending on the district.

Recycling is collected once every other week, generally providing residents with two to three collection days per month, depending on the month. The Moorestown Township Public Works webpage offers the full schedule of collection dates. Burlington County is contracted for the curbside collection of bottles, cans, paper, and cardboard.

Moorestown Township also collects leaves at scheduled weeks throughout the year. Each district has two scheduled collection weeks in the fall, and one in the spring. Residents may bring leaves to the compost center on Creek Road every other Saturday between 12:00pm and 4:00pm. Appropriate dates for accessing the compost center are listed on the Moorestown Township Public Works webpage. Residents are not able to bring other yard waste that is only to be collected once per month on the district's designated day. NJDEP stormwater regulations forbid the placement of leaves within 10 feet of a storm drain.

New Jersey landfills no longer accept computers, TV's, DVD players, keyboards, modems, and other related electronic equipment as of January 2011. These items must be recycled. Moorestown residents can bring these items to the Burlington County Resource Recovery Complex on Rt 543 in Mansfield Monday through Saturday.

The Moorestown 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, water lines, sanitary sewer, storm drainage, and the mowing and maintenance of all township open space.

## Education

Moorestown has four public elementary schools: George C. Baker Elementary (K to 3), Mary E. Roberts Elementary (K to 3), South Valley Elementary (Pre-K to 3), and Upper Elementary (4 to 6) schools. There is also one public middle school (7 to 8), and one public high school in the township: William W. Allen Middle School and Moorestown High School. In the 2013 to 2014 school year, the Moorestown Township School District had 4,068 students on roll. This includes 477 students enrolled in special education. A total of 391 students are listed as eligible for the free or reduced lunch program. The Moorestown Public School District employs a total of 389 certified staff, 24 administrators, and 235 support staff.

In addition, there are five private schools in Moorestown. Kingsway Learning Center is a school geared toward educating children with learning disabilities with programming for ages 3 to 21. Our Lady of Good Counsel is a Catholic School in the township, educating grades Pre-K to 8. Moorestown Friends School, located in the center of town, is a Quaker school that offers preschool through high school for over 700 students. Chesterbrook Academy is a private daycare, preschool, and kindergarten in Moorestown. Chesterbrook Academy is part of a national network of schools that provide private education for toddlers through high school. Moorestown Children's School is a private preschool and kindergarten in Moorestown.

CHAPTER 7

# Environmental Issues

## 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, can be 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). The majority of the sites are remediated by the responsible parties as required pursuant to state and federal regulations. Responsible parties may be current or former owners or users of the site.

There are 23 active Known Contaminated Sites within Moorestown, listed below in **Table 22: Known Contaminated Sites in Moorestown**. These are active sites with confirmed contamination of the soil, groundwater, and/or surface water. These sites include garages, gas stations, a hospital, a shopping center, and various other locations. Homeowner sites have been removed from this list. Additionally, there are four Pending Sites, listed in **Table 23: Pending Known Contaminated Sites in Moorestown**. There are also 146 Closed Sites in the township, of which 67 are homeowner sites and 79 are non-homeowner sites. The non-homeowner closed sites are listed in **Appendix E: Known Contaminated Sites in Moorestown Township**. An active site has one or more active cases with confirmed contamination, and may have one or more pending or closed cases. A Pending Site has one or more cases with confirmed contamination, no active cases, and may include closed cases. Closed Sites are those with remediated contamination and have no active or pending cases. Non-homeowner sites are shown on **Map 21: Known Contaminated Sites (2012)**.

Table 22: Known Contaminated Sites in Moorestown

| Site ID | PI Number | PI Name | Address | Remedial Level* |
|---|---|---|---|---|
| 75471 | G000044126 | 300 Mill St | 300 Mill St | B |
| 14117 | 010395 | 56111 Getty | 201 Camden Ave | C1 |
| 74559 | G000039853 | Blue Chip Graphics Incorporated | 400 N Church St | C2 |
| 63660 | G000001786 | Cardinal Press Inc | 1253 Glen Ave | C1 |
| 21338 | 018390 | Chevron Chemical Moorestown Research Station | 1130 N Church St | C2 |
| 73434 | G000034055 | East Gate II | Nixon Dr & Harper Dr | C1 |
| 10733 | 006101 | Erico Fastening Systems | 301 New Albany Rd | D |
| 125291 | 165413 | First Union National Bank | 91 Main St | B |
| 10725 | 005695 | Flanagan & Sons | 401 Mt Laurel Rd | C2 |
| 14683 | G000004734 | Flexprint Inc | 390 New Albany Rd | C2 |
| 54914 | 024708 | GM Training Center | Rt 38 & Pleasant Valley Ave | C2 |
| 87864 | G000061702 | Laurel Creek Executive Center | Centerton Ave | C1 |
| 14415 | 014885 | Lockheed Martin | 199 Borton Landing Rd | D |
| 39333 | 234752 | Lutheran Home @ Moorestown | 255 E Main St | B |
| 80489 | G000043939 | Mill Street Woodworking Company | 310 Mill St | C2 |
| 10735 | 006585 | Moorestown Gas LLC | 201 Rt 38 | C2 |
| 37268 | 004357 | Moorestown Townhall | 111 W 2nd St | C2 |
| 10741 | 000734 | Moorestown Xtra Service Station Former | 2 E Main St | C2 |
| 10740 | G000003979 | NW Sign Industries Inc (A NJ Corporation) | 360 Crider Ave | C2 |
| 10736 | 002538 | Philadelphia Coca-Cola Bottling Co | 1250 Glen Ave | C2 |
| 41495 | 000333 | Pulverizing Services Inc | 331 New Albany Rd | C1 |
| 10723 | 007206 | Romano's Service Station | 225 Chester Ave | C2 |
| 127565 | 542684 | Willowbrook County Club | 4310 Moorestown Bridgeboro Rd | C1 |

Source: NJDEP, 2012

| *Remedial Status Codes |
|---|
| 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 |

D: Multi-Phased Remedial Action, Multiple Source/Release to Multi-media Including Groundwater

Table 23: Pending Known Contaminated Sites in Moorestown

| Site ID | PI Number | Pi Name | Address |
|---|---|---|---|
| 65019 | G000025997 | 2nd St | 2nd St |
| 64225 | G000009863 | 336 New Albany Road | 336 New Albany Rd |
| 55733 | 027021 | Mill St Properties | 301 Mill St |
| 47178 | 012457 | Stern's Moorestown Mall | Rt 38 & Lenola Rd |

Source: NJDEP, 2012

There are 22 hazardous waste sites in Burlington County that have been nominated for the National Priority List (NPL), more commonly referred to as Superfund sites. Nine 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. There are no Superfund sites located within Moorestown. The two closest Superfund sites are located in Cinnaminson and Willingboro.

Although not listed on the NPL, the known contaminated site of Pulverizing Services, Inc., underwent remedial action in 2000. International Pulverizing Services began operations in 1935. The plant was then owned and operated by Micronizer Company, a subsidiary of Freeport Sulfur Company, between 1946 and 1948. PPG Industries, Inc. was in charge of the plant between 1948 and 1963. Pulverizing Services, Inc. then took over the plant until it was shut down and abandoned in 1979. The plant produced pesticide products through the grinding, micronizing, and blending of pesticides. At first, inorganic pesticides such as lead arsenate, calciumarsenate, sulfur, and tetrasodium pyrophosphate were used. The plant then moved to formulating synthetic organic pesticides such as dichlorodiphenyltrichloroethylene (DDT), aldrin, malathion, dieldrin, lindane, rotenone, and n-methyl carbamate. NJDEP responded to a report of improper waste disposal at the site and performed a site inspection in 1985, which found evidence of contamination. Further investigation found pesticide contamination throughout the property. A five-year review conducted in 2005 by the Environmental Protection Agency (EPA) found that the remediation activities on site provided adequate protection of human health and the environment.

## Underground Storage Tanks

There are eight active and compliant sites in Moorestown with regulated underground storage tanks that contain hazardous substances, pursuant to N.J.A.C. 7:14B et seq. They are listed in **Table 24: Active and Compliant Underground Storage Tanks**. A hazardous material may be motor fuel, petroleum products, toxic pollutants, or other hazardous wastes or substances. If there is a known release to soil and/or groundwater, a

site will also be listed on **Table 22: Known Contaminated Sites in Moorestown**. There may also be private residences in Moorestown 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. Underground storage tanks are not required to be removed, although removal may reduce any resulting environmental liabilities. Information regarding underground storage tanks can be obtained at the NJDEP website. See **Appendix E: Known Contaminated Sites in Moorestown Township, Regulated Underground Storage Tank Facilities** for a list of all tanks in the township, including terminated sites where tanks have been removed.

Table 24: Active and Compliant Underground Storage Tanks

| Facility ID | Facility Name | Street Address | Expiration Date |
|---|---|---|---|
| 005695 | Flanagan and Sons | 401 Mount Laurel Rd | 3/31/2013 |
| 014885 | Lockheed Martin | 199 Borton Lndg Rd | 3/31/2013 |
| 007875 | Moorestown Citgo | 107 Camden Ave | 3/31/2013 |
| 006585 | Moorestown Gas LLC | 201 Rt 38 W | 3/31/2013 |
| 023620 | Moorestown Twp WWTP | 250 Pine St | 3/31/2013 |
| 004181 | PSE&G Southern Division-Moorestown | 300 New Albany Rd | 3/31/2013 |
| 007206 | Romano's Service Station | Chester Ave & Plum St | 3/31/2013 |
| 014829 | Sunoco 0012-1350 | 3240 Rt 38 & Hartford Rd | 3/31/2013 |

Source: NJDEP, 2012

There are no sites in Moorestown where there is active remediation of underground storage tanks.

CHAPTER 8

# Sources of Information

## Brief History


Cammarota, Ann Marie T. Pavements in the Garden: the Suburbanization of Southern New Jersey, Adjacent to the City of Philadelphia, 1769 - to the present. Madison: FDU Press, 2001.

Cresson, Jack.

- "A View of the Past: Sketches of Lost Histories and Ancient Campsites in Moorestown." N.d.
- "Pompeston Creek Prehistory." N.d.
- "The 'Indian Spring' in Moorestown." 2007.

Kraft, Herbert C. *The Lenape: Archaeology, History, and Ethnography.* Newark, New Jersey Historical Society, 1986.

Teague, Reginald W. *History of Moorestown Township Schools*. 1982.

U.S. Census Bureau. http://www.census.gov.

Weslager, C.A. *The Delaware Indians: A History*. New Brunswick, NJ: Rutgers University Press, 1990.

Widmer, Kemble. The New Jersey Historical Series, Vol. 19: The Geology and Geography of New Jersey. Princeton, NJ: D. Van Nostrand Company, 1964.


## Location, Size, and Land Use


Association of New Jersey Environmental Commissions (ANJEC):

Acting Locally: Municipal Tools for Environmental Protection. Mendham, NJ: ANJEC, 2002.

The Environmental Manual for Municipal Officials. Mendham, NJ: ANJEC, 1998.

Delaware Valley Regional Planning Commission:

Connections: The Regional Plan for a Sustainable Future. http://www.dvrpc.org/Connections.

Honachefsky, William B. *Ecologically Based Municipal Land Use Planning*. Boca Raton, FL: Lewis Publishers (CRC Press), 2000.

## Natural Resources

Center for Watershed Protection. *Rapid Watershed Planning Handbook: A Comprehensive Guide for Managing Urbanizing Watersheds*. Produced for the U.S. EPA, Office of Wetlands, Oceans, and Watersheds. Ellicott City, MD: Center for Watershed Protection, Inc., 1998.

Cresson, Jack. “Along the Rancocas in Western Burlington County.” Prepared for the Moorestown Open Space Advisory Committee. June 30, 2000.

F. X. Brown, 1993. *Diagnostic-Feasibility Study of Strawbridge Lake*. Prepared by F. X. Brown, Inc., 220 South Broad St, Lansdale, PA 19446. FXB Project No. NJ1246-01. Prepared for the Township of Moorestown, Burlington Co., NJ.

Grant F. Walton Center for Remote Sensing and Spatial Analysis at Rutgers University. “Mapping New Jersey’s Vernal Ponds.” http://www.dbcrssa.rutgers.edu/ims/vernal.

Koss, Walter J., et al. *Freeze/Frost Data*. Asheville, NC: National Climatic Data Center, 1988.

Ludlum, David. *The New Jersey Weather Book*. New Brunswick: Rutgers University Press, 1983.

National Oceanic and Atmospheric Administration. http://www.ncdc.noaa.gov/oa/ncdc.html.

New Jersey Department of Environmental Protection (NJDEP):

Division of Land Use Regulation. http://www.state.nj.us/dep/landuse.

Division of Water Monitoring and Standards. http://www.state.nj.us/dep/wms/bwqsa.

Division of Water Quality. http://www.state.nj.us/dep/dwq.

Division of Water Supply. http://www.nj.gov/dep/watersupply.

Division of Watershed Management. http://www.state.nj.us/dep/watershedmgt.

Endangered Plant Species Program. http://www.state.nj.us/dep/parksandforests/natural/endplants.html.

Fish Advisory Brochure, 2009. http://www.state.nj.us/dep/dsr/2009FishAdvisoryBrochure.pdf."

Geographic Information System. http://www.state.nj.us/dep/gis.

*Geology of Burlington County in Brief*. 1977.

*Homeowner's Manual for Septic Systems, A*. Trenton, NJ: NJDEP, Division of Water Quality, Bureau of Nonpoint Pollution Control, 1999.

New Jersey Integrated Water Quality Monitoring and Assessment Report. http://www.state.nj.us/dep/wms/bwqsa/generalinfo.htm.

*Report on the Establishment of Total Maximum Daily Load (TMDL) for Phosphorus in Strawbridge Lake, Moorestown Township, Burlington County, NJ Amendment to the Tri-County Water Quality Management Plan*. Adopted June 22, 2003.

New Jersey Natural Resources Conservation Service (NRCS). "Important New Jersey Soils." www.nj.nrcs.usda.gov/technical/soils/njfarmindex.html.

New Jersey State Climatologist. http://climate.rutgers.edu/stateclim.

OMNI Environmental Corporation. *Final Status Report for the Strawbridge Lake 319(h) Restoration Project*. January 21, 2000.

Pray, Rusty. "Moorestown seeks new way to control its Canada geese." *Philadelphia Inquirer.* September 15, 2003.

United States Department of Agriculture (USDA):

2007 Census of Agriculture. http://www.agcensus.usda.gov.

Environmental Quality Incentives Program. Natural Resources Conservation Service. http://www.nrcs.usda.gov/programs/eqip.

NRCS Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

Soil Data Mart http://soildatamart.nrcs.usda.gov.

United States National Arboretum. "USDA Plant Hardiness Zone Map". http://www.usna.usda.gov/Hardzone/ushzmap.html.

United States Environmental Protection Agency (EPA). http://www.epa.gov.

United States Geological Society (USGS):

National Water Information System: Mapper. http://wdr.water.usgs.gov/nwisgmap.

USGS New Jersey Water Science Center <http://nj.usgs.gov/> -

Water Resources. Site Information for the Nation. http://waterdata.usgs.gov/nwis/si.

Watt, Martha K. *A Hydrologic Primer for New Jersey Watershed Management*. West Trenton, NJ: US Geological Survey, Water-Resources Investigation Report 00-4140.

Winter, Thomas, et al. *Ground Water and Surface Water: A Single Resource*. Denver, CO: US Geological Survey, 1998.

Zapecza, Otto S. *Hydrogeologic Framework of the New Jersey Coastal Plain*. US Geological Survey Professional Paper 1404-B. Washington D.C: United States Government Printing Office, 1989.

### Biological Resources

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.

Britton, Nathaniel, and Addison Brown. *An Illustrated Flora of the Northern United States and Canada*. New York: Dover, 1970.

Brown, Lauren. *Grasses: An Identification Guide*. New York: Houghton Mifflin, 1979.

Burton, Dr. Maurice, and Robert Burton, eds. *The International Wildlife Encyclopedia: Vol. 5*. New York: Marshall Cavendish, 1969.

Caduto, Michael. *Pond and Brook: A Guide to Nature in Freshwater Environments*. Hanover: University Press of New England, 1990.

Collins, Beryl Robichaud, and Karl H. Anderson. *Plant Communities of New Jersey: A Study in Landscape Diversity*. New Brunswick, NJ: Rutgers University Press, 1994.

Dahl, T.E. *Status and Trends of Wetlands in the Conterminous United States 1986 to 1997*. Washington D.C.: US Department of the Interior, US Fish and Wildlife Service, 1991.

Environmental Commission for the Borough of Riverton. *Pompeston Creek Environmental Inventory*. July 2004.

Herpetological Associates, Inc. “Grassland Bird Survey at Block 7401, Lot 3 in Moorestown Township, Burlington County, New Jersey.” Prepared for Moorestown Township. July 28, 2010.

Martine, Christopher T. *Trees of New Jersey and the Mid-Atlantic States*. Jackson, NJ: NJ Department of Environmental Protection, Division of Parks and Forestry, New Jersey Forest Service, 2003.

New Jersey Department of Environmental Protection (NJDEP), Division of Fish, Game, and Wildlife.

Checklists of NJ Wildlife. http://www.state.nj.us/dep/fgw/chklists.htm.

New Jersey Department of Environmental Protection (NJDEP), Division of Watershed Management. “Management of Canada Geese in Suburban Areas: A Guide to the Basics”. March 2001.

Niles, L. J., M. Valent, J. Tash, and J. Myers. New Jersey’s The Landscape Project: Wildlife Habitat Mapping for Community Land Use Planning and Endangered Species Conservation. Project report. Endangered and Nongame Species Program, New Jersey Division of Fish & Wildlife, NJ Department of Environmental Protection, 2001.

Rothauser, Blaine. “South Valley Woods Nature Preserve.” 2011.

### The Built Environment

Clarke Caton Hintz. Open Space and Recreation Plan Element, Township of Moorestown, County of Burlington, 2009.

New Jersey State Historic Preservation Office. http://www.state.nj.us/dep/hpo.

Township of Moorestown. *Annual Water Quality Report*, 2011.

### Environmental Issues

New Jersey Department of Environmental Protection (NJDEP):

Known Contaminated Sites. http://www.nj.gov/dep/srp/kcsnj.

Site Remediation Program: Underground Storage Tanks. http://www.state.nj.us/dep/srp/bust/bust.htm.

United States Environmental Protection Agency. National Priorities List. http://www.epa.gov/superfund/sites/npl/nj.htm.

# Appendices

APPENDIX A

# Vernal Pools in Moorestown Township

| Id# | USGS Quad Name | X Coordinate | Y Coordinate | Old ID |
|---|---|---|---|---|
| 15382 | MOORESTOWN NJ | 502420.17910 | 4425181.94758 | 407 |
| 15368 | MOORESTOWN NJ | 504598.79461 | 4426593.75832 | 406 |
| 15427 | MOORESTOWN NJ | 503826.51686 | 4426967.94580 | 410 |
| 15396 | MOORESTOWN NJ | 503855.62108 | 4426990.43543 | 408 |
| 15410 | MOORESTOWN NJ | 503949.54836 | 4427002.34171 | 409 |
| 15354 | MOORESTOWN NJ | 504209.72884 | 4427014.59237 | 405 |
| 15658 | MOORESTOWN NJ | 506004.98749 | 4427058.12205 | 427 |
| 15644 | MOORESTOWN NJ | 506223.26918 | 4427100.45547 | 426 |

Source: Center for Remote Sensing and Spatial Analysis (CRSS), 2008

# Plant Species in Moorestown Township

## Tree Inventory

| Species | Total |
|---|---|
| **Broadleaf deciduous large** | |
| Pin oak | 560 |
| London planetree | 358 |
| Sugar maple | 353 |
| Maple | 302 |
| Norway maple | 292 |
| Japanese zelkova | 292 |
| Northern red oak | 212 |
| Silver maple | 178 |
| Sweetgum | 176 |
| Ash | 155 |
| American sycamore | 155 |
| Oak species | 130 |
| Black maple | 129 |
| Honeylocust | 124 |
| Willow oak | 101 |
| Green ash | 80 |
| White ash | 77 |
| Black cherry | 70 |
| American basswood | 66 |
| American beech | 60 |
| Elm | 59 |
| Tulip tree | 51 |
| Ohio buckeye | 43 |
| White oak | 41 |

| Species | Total |
|---|---|
| Hickory | 30 |
| Northern hackberry | 22 |
| Horsechestnut | 21 |
| Black walnut | 20 |
| Black oak | 20 |
| Katsura tree | 19 |
| American elm | 15 |
| Copper beech | 12 |
| Baldcypress | 11 |
| Kentucky coffeetree | 8 |
| Southern red oak | 8 |
| European ash | 7 |
| Northern pin oak | 7 |
| Chestnut oak | 6 |
| Florida maple | 5 |
| Laurel oak | 5 |
| Florida maple | 4 |
| Hackberry | 4 |
| Bear oak | 4 |
| Bur oak | 4 |
| English oak | 4 |
| Tatar ample | 3 |
| Narrowleaf ash | 3 |
| European larch | 3 |
| Scarlet oak | 2 |
| Water oak | 2 |
| Yellow birch | 1 |
| Bitternut hickory | 1 |
| American chestnut | 1 |
| Shagbark hickory | 1 |
| Turkish filbert | 1 |
| Cucumber tree | 1 |
| Dawn redwood | 1 |
| Red mulberry | 1 |

| Species | Total |
|---|---|
| Sourwood | 1 |
| Swamp white oak | 1 |
| Shingle oak | 1 |
| Swamp chestnut oak | 1 |
| Chinese toon | 1 |
| **Total** | **4,326** |
| | |
| **Broadleaf deciduous medium** | |
| Red maple | 1,051 |
| Littleleaf linden | 298 |
| Sawtooth oak | 83 |
| American hornbeam | 75 |
| Hedge maple | 59 |
| Black locust | 52 |
| Ginkgo | 50 |
| Amur maackia | 48 |
| Black tupelo | 38 |
| Unknown tree | 37 |
| Amur corktree | 27 |
| Yellowwood | 23 |
| Boxelder | 21 |
| Eastern hophornbeam | 20 |
| Mulberry | 17 |
| River birch | 14 |
| Hardy rubber | 13 |
| Japanese pagoda tree | 11 |
| Magnolia | 9 |
| Sassafras | 9 |
| Silverbell | 6 |
| Black ash | 5 |
| Black birch | 4 |
| European white birch | 3 |
| Royal paulownia | 3 |
| Willow | 3 |

| Species | Total |
|---|---|
| Paper birch | 2 |
| Common pear | 2 |
| Chinese elm | 2 |
| Slippery elm | 2 |
| Grey birch | 1 |
| English walnut | 1 |
| Overcup oak | 1 |
| Black willow | 1 |
| **Total** | **1,991** |
| | |
| **Broadleaf deciduous small** | |
| Plum | 160 |
| Pear | 152 |
| Dogwood | 98 |
| Callery pear | 73 |
| Japanese tree lilac | 64 |
| Amur maple | 45 |
| Eastern redbud | 44 |
| Crabapple | 36 |
| Kwanzan cherry | 26 |
| Goldenrain tree | 22 |
| Japanese maple | 10 |
| Apple | 8 |
| Hawthorn | 4 |
| Rose-of-Sharon | 4 |
| Cherry plum | 4 |
| Kousa dogwood | 3 |
| Common crapemyrtle | 3 |
| Higan cherry | 3 |
| Japanese snowbell | 3 |
| Trident maple | 2 |
| Paperbark maple | 2 |
| Flowering dogwood | 2 |
| Peach | 2 |

| Species | Total |
|---|---|
| European mountain ash | 2 |
| Broadleaf deciduous small | 1 |
| Russian olive | 1 |
| Star magnolia | 1 |
| Dwarf sumac | 1 |
| Variegated willow | 1 |
| **Total** | **777** |
| | |
| **Broadleaf evergreen small** | |
| Holly | 9 |
| American holly | 6 |
| Boxwood | 2 |
| Chinese holly | 2 |
| English holly | 1 |
| **Total** | **20** |
| | |
| **Conifer evergreen large** | |
| Eastern white pine | 204 |
| Norway spruce | 64 |
| Pine | 63 |
| Pitch pine | 25 |
| Leyland cypress | 12 |
| Red pine | 12 |
| Western red cedar | 12 |
| Pond cypress | 11 |
| Douglas fir | 10 |
| Cedar of Lebanon | 3 |
| Japanese black pine | 3 |
| Deodar cedar | 2 |
| Crytomeria | 2 |
| English yew | 2 |
| White fir | 1 |
| Japanese red cedar | 1 |
| Shortleaf pine | 1 |

| Species | Total |
|---|---|
| **Total** | **428** |
| | |
| **Conifer evergreen medium** | |
| Arborvitae | 35 |
| Eastern red cedar | 31 |
| Spruce | 25 |
| Eastern hemlock | 24 |
| Atlas cedar | 13 |
| Virginia pine | 7 |
| Blue spruce | 6 |
| White spruce | 5 |
| Juniper | 2 |
| Scotch pine | 2 |
| Japanese umbrella pine | 2 |
| **Total** | **152** |
| | |
| **Conifer evergreen small** | |
| Mugo pine | 1 |
| **Total** | **1** |
| | |
| **Township total** | **7,695** |

Source: Moorestown Township Tree Planting and Preservation Committee, 2012

## Rare Plant Species

| Common Name | Scientific Name | Federal Status | State Status | Regional Status | G Rank | S Rank | Last Observed | Identified? |
|---|---|---|---|---|---|---|---|---|
| **Vascular Plant** | | | | | | | | |
| Glomerate Sedge | *Carex aggregate* | | | HL | G5 | S1S2 | 1919-05-23 | Y |
| Parker's Pipewort | *Ericaulon parkeri* | | | HL | G3 | S2 | 1973-10-07 | Y |
| Swamp-pink | *Helonias bullata* | LT | E | LP, HL | G3 | S3 | 2009-12-08 | Y |
| Long-beak Water Buttercup | *Ranunculus longirostris* | | | HL | G5 | S2 | 1914-10-10 | Y |

| Common Name | Scientific Name | Federal Status | State Status | Regional Status | G Rank | S Rank | Last Observed | Identified? |
|---|---|---|---|---|---|---|---|---|
| Awl-leaf arrowhead | *Sagittaria subulata* | | | HL | G4 | S2 | 1974-07-11 | Y |

Source: NJDEP Natural Heritage Database, 2009

| Federal Status Codes |
|---|
| LE - Taxa formally listed as endangered |
| LT - Taxa formally listed as threatened |
| **State Code** |
| T - Threatened species. May become endangered if conditions surrounding the species begin to or continue to deteriorate. |
| E - Endangered species. 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. |
| INC - Increasing species. Population has exhibited a significant increase, beyond the normal range of its lifestyle, over a long-term period. |
| SC - Special concern species. Warrants special attention because of some evidence of decline, inherent vulnerability to environmental degradation, 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 the current population status in the state. |
| RP - Regional priority species. A species in a regional conservation plan. |
| U - Undetermined species. There is not enough information available to determine the status. |
| D - Declining species. Population has exhibited a continued decline in population numbers over the years. |
| P - Peripheral species. Occurrence in New Jersey is at the extreme edge of its natural range. |
| S - Stable species. Population is not undergoing any long-term increase/decrease within its natural cycle. |
| Status for animals separated by a slash (/) indicates a dual status. First status refers to the state breeding population, and the second status refers to the migratory or winter population. |
| **Regional Codes** |
| LP - Indicates taxa or ecological communities 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 Pinelands 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. |

# Flora Identified at South Valley Woods

The following plant species were identified by Blaine Rothauser of BR Environmental, LLC, on July 7 and 14, 2011 at South Valley Woods in Moorestown.

# Flora

Spotted Joe-Pye Weed
*(Eupatorium maculatum)*

1. Seedbox (*Ludwigia alternifolia*)
2. Giant Goldenrod (*Solidago gigantea)*
3. Rough-leaved goldenrod (*Solidago rogosa*)
4. Canada Goldenrod (*Solidago canadensis*)
5. Wild Madder (*Galium obtusum*)
6. Skunk Cabbage (*Symplocarpus foetidus*)
7. Suaqroot (*Conopholis americanal*)
8. Beechdrops (*Epifagus virginiana*)
9. Arrow Arum (*Peltandra virginica*)
10. Violet (*Viola sp.*)
11. Jack in Pulpit (*Arisaema sp*)
12. Pickerel weed (*Pontedaria cordata*)
13. Spotted Touch me Not (*Impatiens capensis*)
14. Yellow Sweet Clover (*Melilotus officinalis*)
15. Red Clover (*Trifolium pretense*)
16. Tick Trefoils (*Desmodium sp.*)

17. Crown Vetch (*Cornilla varia*)
18. Wood Betony (*Pedicularis Canadensis*)
19. Narrow Leaved Mtn. Mint (*Pycanthemum tenuifolium*)
20. Selfheal (*Prunella vulgarisi*)
21. Northern Bugleweed (*Lycopus uniflorus*)
22. Indian Pipe (*Monotropa uniflora*)
23. Bergamot (*Monarda fistulosa*0
24. Turtlehead (*Chelone glabra*)
25. Common speedwell (*Veronica officianlis*)
26. Mad-dog Skullcap (*Scutellaria lateriflora*)
27. Gray Beardtongue (*Penstemon hirsutus*0
28. Arrowhead (*Sagittaria sp.*)
29. Blue flag Iris (*Iris versicolor*)
30. Jump seed (*Tovara virginiana*)
31. Garlic mustard (*Alliaria officinalis*)
32. Willow Herb (*Epilobium sp.*)
33. *Carex stricta*
34. *Carex vulpinoida*
35. Tall Meadow Rue (*Thalictrum polygamum*)
36. Marsh Bedstraw (*Galium palustre*)
37. Partridge berry (*Mitchella repens*)
38. Teasel (*Dipsacus silvestris*)
39. Flowering Dogwood (*Cornus floridus*)]
40. Service berry (*Amelanchier sp.)*
    Ash-leaved maple (*Acer negundo*)]
41. Red maple (*Acer rubrum*)
42. Silver Maple (*Acer saccharinum*)
43. Sycamore (*Plantus occidentalis*)
44. Tulip Tree (*Liriodendron tulipefera*)
45. Black Cherry (Prunus serotina)
46. Red Oak (*Quercus rubra*)
47. Black Oak (*Quercus velutina*)
48. Willow Oak (*Quercus phellos*)]
49. Pin Oak (*Quercus paulstirs*)
50. White Oak (*Quercus alba*)
51. American Beech (*Fagus grandifolia*)
52. White Ash (*Fraxinus americana*)

53. Black Birch (*Betula lenta*)
54. Silky Dogwood (*Cornus amomum*)
55. Black Haw viburnum (*Viburnum prunifolium*)
56. Arrow Wood (*Viburnum dentatum*)
57. Highbush Blueberry (*Vaccinium corymbosum*)
58. Staggerbush (*Lyonia mariana*)
59. Spicebush (*Lindera benzoin*)
60. Buckthorn (*Rhamnus sp.*)
61. Shinleaf (*Pyrola elliptica*)
62. Sweet Pepperbush (*Clethra alnifolia*)
63. Wild Sarsaparilla (*Aralia nudicaulis*)
64. Wood Sorrel (*Oxalis montana*)
65. Strawberry (*Fragaria sp.*)
66. Purslane (*Portulaca oleracea*)
67. Mullein ( *Verbascum Thapsus*)
68. Japanese Knotweed ( *Polygonum cuspitatum)*
69. Water Pepper ( *Polygonum hydropiperoidesd*)
70. Pokeweed (*Phytolacca Americana*)
71. Wild Carrot (*Daucus carota*)
72. Yarrow (Achillea millifolium)
73. Water Hemlock (*Cicuta maculate*)
74. Common Blackberry (*Rubus allegheniensis*)
75. Avens (*Geum sp.*)
76. Woodland Agrimony (*Agrimonia striata)*
77. Moneywort (*Lysimachia nummalaria*)
78. Tall Buttercup (*Ranunculus acris*)
79. Dogbane (*Apocynum sp.*)
80. Bouncing Bet (*Saponaria officinalis*)
81. Swamp Milkweed (*Asclepias incarnate*)
82. Common Milkweed (*Asclepias syriaca*)
83. Whorled Loosestrife (*Lysimachia quadrifolia*)
84. Blue Vervain (*Verbena hastate*)
85. Azalea (*Rhodendron sp.*)
86. Steeplebush (*Spirea tomentosa*)
87. Swamp Rose (*Rosa palustris*)
88. Multiflora Rose (*Rosa multiflora*)
89. Elderberry (*Sambucus canadensis*)

90. Solomon Seal *(Polygonatum sp.)*
91. False Hellebore (*Veratrum viride*)
92. Turk's-cap Lily (*Lilium superbum*)
93. Hawkweed (*Heracium sp.*)
94. Common Fleabane (*Erigeron philadelphicus*)
95. Tickseed Sunflower (*Bidens coronata*)
96. Bitter Dock (*Rumex obtusifolius*)
97. Common Cattail (*Typha latifolia*)
98. False Stinging Nettle (*Bohmeria cylindrical*)
99. Canada Thistle (*Cirsium arvense*)
100. Boneset (Eupatorium perfoliatum)
101. Fox Grape (*Vitis labrusca*)
102. White Wood Aster (*Aster divaricatus*)
103. Asters (*Aster sp.*)
104. Sensitive Fern (*Onoclea sensibilus*)
105. Cinnamon Fern (*Osmunda cinnamomium*)
106. Interrupted Fern (*Osmunda claytoniana*)
107. NY Fern (*Thelypteris noveboracensis*)
108. Pennsylvania Sedge (*Carex Pennsylvanica*)
109. Orchard Grass (*Dactylus glomerata*)
110. Joe-pye Weed (*Eupatoriadelphus dubius*)
111. Posion Ivy (*Toxicodendron radicans*)
112. Virgina Creeper (*Parthenocissus quenquefoli*

APPENDIX C

# Vertebrate Animals Known or Probable in Moorestown Township

## Mammals

| Common Name | Scientific Name | Status |
|---|---|---|
| Opossum | *Didelphis marsupialis* | Stable |
| Eastern Mole | *Scalopus aquaticus* | Stable |
| Big Brown Bat | *Eptesicus fuscus* | Stable |
| Little Brown Bat | *Myotis lucifugus* | Stable |
| Eastern Cottontail | *Sylvilagus floridanus* | Stable |
| Eastern Chipmunk | *Tamias striatus* | Stable |
| Gray Squirrel | *Sciurus carolinensis* | Stable |
| White-footed Mouse | *Peromyscus leucopus* | Stable |
| Meadow Vole | *Microtus pennsylvanicus* | Stable |
| Muskrat | *Ondatra zibethicus* | Stable |
| Pine Vole | *Microtus pinetorum* | Stable |
| Red Fox | *Vulpes vulpes* | Stable |
| Gray Fox | *Urocyon cinereoargenteus* | Stable |
| Raccoon | *Procyon lotor* | Stable |
| Striped Skunk | *Mephitis mephitis* | Stable |
| River Otter | *Lutra canadensis* | Stable |
| Beaver | *Castor candensis* | Increasing |
| White-tailed Deer | *Odocoileus virginianus* | Decreasing |

Source: NJDEP, 2012

# Birds

| Common Name | Scientific Name | NJ State Status |
|---|---|---|
| **Loons - Grebes** | | |
| Pied-Billed Grebe | *Podilymbus podiceps* | E |
| **Gannets - Pelicans - Cormorants** | | |
| Double Crested Cormorant | *Phalacrocorax auritus* | S |
| **Bitterns - Herons - Ibises** | | |
| American Bittern | *Botaurus lentiginosus* | E |
| Least Bittern | *Ixobrychus exilis* | SC |
| Black Crowned Night Heron | *Nycticorax nycticorax* | T |
| Green Heron | *Butorides virescens* | RP |
| Great Blue Heron | *Ardea herodias* | SC |
| Great Egret | *Ardea alba* | RP |
| **Geese - Swans - Ducks** | | |
| Canada Goose | *Branta canadensis* | INC |
| Snow Goose | *Chen caerulescens* | INC |
| American Wigeon | *Anas americana* | S |
| Common Merganser | *Mergus merganser* | S |
| Hooded Merganser | *Lophodytes cucullatus* | S |
| Green-winged Teal | *Anas carolinensis* | RP |
| Mallard | *Anas platyrhynchos* | INC |
| Northern Pintail | *Anas acuta* | RP |
| Wood Duck | *Aix sponsa* | RP |
| American Black Duck | *Anas rubripes* | RP |
| **Ground Fowl (Galliformes)** | | |
| Wild Turkey | *Meleagris gallopavo* | INC |
| **Coots** | | |
| American Coot | *Fulica americana* | U |
| **Hawks-Falcons-Eagles** | | |
| Turkey Vulture | *Cathartes aura* | INC |
| Cooper's Hawk | *Accipeter cooperii* | T |
| Red-tailed Hawk | *Buteo jamicensis* | INC |
| Red-shouldered Hawk | *Buteo lineatus* | E |

| Common Name | Scientific Name | NJ State Status |
|---|---|---|
| Merlin | *Falco columbarius* | INC |
| Northern Harrier | *Circus cyaneus* | E |
| Osprey | *Pandion haliaetus* | T |
| Sharp-shinned Hawk | *Accipiter striatus* | SC |
| Bald Eagle | *Haliaeetus leucocephalus* | E |
| American Kestrel | *Falco sparverius* | SC |
| Peregrine Falcon | *Falco peregrinus* | E |
| **Rails - Cranes** | | |
| Common Moorhen | *Gallinula chloropus* | U |
| **Plovers – Sandpipers-Gulls** | | |
| Semi-palmated Plover | *Charadrius semipalmatus* | S |
| Spotted Sandpiper | *Actitis macularia* | SC |
| Killdeer | *Charadrius vociferus* | S |
| American Woodcock | *Scolopax minor* | RP |
| Wilson's Snipe | *Gallinago delicata* | U |
| Herring Gull | *Larus argentatus* | S |
| Ring-billed Gull | *Larus delawarensis* | INC |
| Laughing Gull | *Leucophaeus atricilla* | S |
| Great Black-backed Gull | *Larus marinus* | D |
| Greater Yellowlegs | *Tringa melanoleuca* | RP |
| Lesser Yellowlegs | *Tringa flavipes* | S |
| **Doves - Cuckoos - Owls** | | |
| Rock Pigeon | *Columba livea* | INC |
| Mourning Dove | *Zenaida macroura* | S |
| Great Horned Owl | *Bubo virginianus* | S |
| Eastern Screech Owl | *Megascops asio* | RP |
| Common Nighthawk | *Chordeiles minor* | SC |
| Yellow-billed Cuckoo | *Coccyzus americanus* | RP |
| **Kingfishers - Woodpeckers – Flycatchers** | | |
| Belted Kingfisher | *Ceryle alycon* | S |
| Red-bellied Woodpecker | *Melanerpes carolinus* | INC |
| Hairy Woodpecker | *Picoides villosus* | D |
| Downy Woodpecker | *Picoides pubescens* | S |
| Red-headed Woodpecker | *Melanerpes erythrocephalus* | T |

| Common Name | Scientific Name | NJ State Status |
|---|---|---|
| Northern Flicker | *Colaptes auratus* | RP |
| Willow Flycatcher | *Empidonix traillii* | RP |
| Eastern Wood Pewee | *Contopus virens* | RP |
| Acadian Flycatcher | *Empidonax virescens* | RP |
| Great Crested Flycatcher | *Myiarchus crinitus* | RP |
| Eastern Phoebe | *Sayornis phoebe* | S |
| Eastern Kingbird | *Tyrannus tyrannus* | RP |
| Eastern Wood Pewee | *Contopus virens* | RP |
| Ruby-throated Hummingbird | *Archilochus colubris* | D |
| Blue-gray Gnatcatcher | *Polioptila caerulea* | S |
| **Shrikes - Vireos** | | |
| Red-eyed Vireo | *Vireo olivaceus* | S |
| Blue-headed Vireo | *Vireo solitarius* | SC |
| White-eyed Vireo | *Vireo griseus* | D |
| Warbling Vireo | *Vireo gilvus* | S |
| **Jays - Crows - Larks - Swallows** | | |
| Blue Jay | *Cyanocitta cristata* | D |
| American Crow | *Corvus brachyrynchus* | S |
| Fish Crow | *Corvus ossifragus* | S |
| Horned Lark | *Eremophila alpestris* | SC |
| Eastern Meadowlark | *Sturnella magna* | SC |
| Barn Swallow | *Hirundo rustica* | S |
| Bank Swallow | *Riparia riparia* | S |
| Tree Swallow | *Tachycineta bicolor* | INC |
| Purple Martin | *Progne subis* | S |
| **Chickadees - Nuthatches – Wrens-Creepers** | | |
| Carolina Chickadee | *Poecile carolinesis* | S |
| White-breasted Nuthatch | *Sitta carolinensis* | INC |
| Red-breasted Nuthatch | *Sitta canadensis* | S |
| Tufted Titmouse | *Baeolophus bicolor* | INC |
| House Wren | *Troglodytes aedon* | S |
| Carolina Wren | *Thryothorus ludovicianus* | INC |
| Marsh Wren | *Cistothorus palustris* | RP |
| Winter Wren | *Troglodytes hiemalis* | SC |

| Common Name | Scientific Name | NJ State Status |
|---|---|---|
| Brown Creeper | *Certhia americana* | INC |
| **Kinglets - Thrushes – Thrashers** | | |
| Brown Thrasher | *Toxostoma rufum* | SC |
| Wood Thrush | *Hylocichla mustelina* | SC |
| Hermit Thrush | *Catharus guttatus* | D |
| Veery | *Catharus fuscescens* | SC |
| American Robin | *Turdus migratorius* | S |
| Northern Mockingbird | *Mimis polyglottos* | D |
| Gray Catbird | *Dumetella carolinensis* | RP |
| Ruby-crowned Kinglet | *Regulus calendula* | D |
| Golden-crowned Kinglet | *Regulus satrapa* | INC |
| **Starlings - Pipits - Waxwings** | | |
| European Starling | *Sturnus vulgaris* | I |
| Cedar Waxwing | *Bombycilla cedrorum* | S |
| **Warblings** | | |
| Black and White Warbler | *Mniotilta varia* | RP |
| Yellow Warbler | *Setophaga petechia* | S |
| Yellow-rumped Warbler | *Dendroica coronata* | INC |
| Prairie Warbler | *Dendroica discolor* | RP |
| Hooded Warbler | *Wilsonia citrina* | SC |
| Palm Warbler | *Dendroica palmarum* | INC |
| Blackpoll Warbler | *Dendroica striata* | D |
| Northern Parula | *Parula americana* | SC |
| Common Yellowthroat | *Geothlypus trichas* | D |
| American Redstart | *Setophaga ruticilla* | INC |
| Blue-winged warbler | *Vermivora cyanoptera* | RP |
| Tennessee Warbler | *Oreothlypis peregrina* | D |
| Nashville Warbler | *Vermivora ruficapilla* | S |
| Chestnut-sided Warbler | *Dendroica pensylvanica* | S |
| Magnolia Warbler | *Dendroica magnolia* | INC |
| Cape May Warbler | *Dendroica tigrina* | S |
| Black-throated Blue Warbler | *Dendroica caerulescens* | RP |
| Black-throated Green Warbler | *Dendroica virens* | SC |
| Blackburnian Warbler | *Dendroica fusca* | SC |

| Common Name | Scientific Name | NJ State Status |
|---|---|---|
| Pine Warbler | *Dendroica pinus* | RP |
| Wilson's Warbler | *Wilsonia pusilla* | S |
| Palm Warbler | *Dendroica palmarum* | INC |
| Ovenbird | *Seiurus aurocapillus* | D |
| **Tanagers - Sparrows - Cardinals** | | |
| Scarlet Tanager | *Piranga olivacea* | RP |
| House Sparrow | *Passer domesticus* | I |
| Chipping Sparrow | *Spizella passerina* | S |
| Song Sparrow | *Melospiza melodia* | D |
| Savannah Sparrow | *Passerculus sandwichensis* | T |
| Barn Swallow | *Hirundo rustica* | S |
| Tree Swallow | *Tachycineta bicolor* | INC |
| Northern Cardinal | *Cardinalis cardinalis* | INC |
| Rose-breasted Grosbeak | *Pheucticus ludovicianus* | RP |
| Indigo Bunting | *Passerina cyanea* | RP |
| Blue Grosbeak | *Passerina caerulea* | RP |
| Eastern Towhee | *Pipilo erythrophthalmus* | RP |
| American Tree Sparrow | *Spizella arborea* | U |
| Field Sparrow | *Spizella pusilla* | RP |
| Swamp Sparrow | *Melospiza georgiana* | D |
| White-throated Sparrow | *Zonotrichia albicollis* | D |
| White-crowned Sparrow | *Zonotrichia leucophrys* | D |
| Fox Sparrow | *Passerella iliaca* | INC |
| Dark-eyed Junco | *Junco hyemalis* | S |
| **Blackbirds – Finches-Swifts** | | |
| Bobolink | *Dolichonyx orzyivorus* | T |
| Red-winged Blackbird | *Agelaius phoeniceus* | S |
| Rusty Blackbird | Euphagus carolinus | S |
| House Finch | *Carpodacus mexicanus* | S |
| Common Grackle | *Quiscalus quiscula* | D |
| Brown-headed Cowbird | *Molothrus ater* | S |
| Orchard Oriole | *Icterus spurius* | S |
| Baltimore Oriole | *Icterus galbula* | RP |
| American Goldfinch | *Spinus tristis* | INC |

| Common Name | Scientific Name | NJ State Status |
|---|---|---|
| Chimney Swift | *Chaetura pelagica* | RP |
| Purple Finch | *Carpodacus purpureus* | RP |
| **Bluebirds** | | |
| Eastern Bluebird | *Sialia sialis* | INC |

Sources: Herpetological Associates, 2010, NJDEP, 2012

Key to Bird List

| Status | |
|---|---|
| E - Endangered | RP - Regional Priority |
| T - Threatened | S - Stable |
| SC - Special Concern | U - Undetermined |
| D - Decreasing | I - Introduced |
| INC - Increasing | P - Peripheral |

## Reptiles and Amphibians

| Common Name | Scientific Name | Status |
|---|---|---|
| **Salamanders** | | |
| Northern Red Salamander | *Pseudotriton r. ruber* | Decreasing |
| Northern Two-lined Salamander | *Eurycea b. bislineata* | Stable |
| **Frogs and Toads** | | |
| Bullfrog | *Rana catesbeiana* | Stable |
| Green Frog | *Rana clamitans melanota* | Stable |
| Spring Peeper | *Hyla c. crucifer* | Stable |
| New Jersey Chorus Frog | *Pseudacris triseriata kalmi* | Stable |
| **Turtles** | | |
| Common Snapping Turtle | *Chelydra s. serpentina* | Stable |
| Red-bellied Turtle | *Pseudemys rubriventris* | Undetermined |
| Eastern Painted Turtle | *Chrysemys p. picta* | Stable |
| Musk Turtle (Stinkpot) | *Sternotherus odoratus* | Stable |
| Box Turtle | *Terrapene c. carolina* | Stable |
| **Snakes** | | |
| Five-lined Skink | *Eumeces fasciatus* | Undetermined |
| Northern Water Snake | *Nerodia s. sipedon* | Stable |
| Eastern Garter Snake | *Thamnophis s. sirtalis* | Stable |
| Northern Brown Snake | *Storeria d. dekayi* | Stable |
| Black Racer | *Coluber c. constrictor* | Undetermined |
| Milk Snake | *Lampropeltis t. triangulum* | Stable |

Source: NJDEP, 2012

## Fish

| Common Name | Scientific Name |
|---|---|
| Mud Sunfish | *Acantharchus pomotis* |
| Blueback Herring | *Alosa aestivalis* |
| American Shad | *Alosa sapidissimia* |
| White Catfish | *Ameirus catus* |
| Brown Bullhead | *Ameirus nebulosus* |
| American Eel | *Anguilla rostrata* |

| Common Name | Scientific Name |
|---|---|
| Goldfish | *Carassius auratus* |
| White Sucker | *Catostomus commersonnii* |
| Satinfin Shiner | *Cyprinella analostana* |
| Common Carp | *Cyprinus carpio* |
| Gizzard Shad | *Dorosoma cepedianum* |
| Bluespotted sunfish | *Enneeacanthus gloriosus* |
| Creek Chubsucker | *Erimyzon oblongus* |
| Redfin Pickerel | *Esox americanus* |
| Chain Pickerel | *Esox niger* |
| Tessellated Darter | *Etheostoma olmstedi* |
| Bandel Killifish | *Fundulus diaphanous* |
| Mummichog | *Fundulus heteroclitus* |
| Eastern Silvery Minnow | *Hybognathus regius* |
| Channel Catfish | *Ictalurus punctatus* |
| Redbreast Sunfish | *Lepomis auritus* |
| Green Sunfish | *Lepomis cyanellus* |
| Pumpkinseed | *Lepomis gibbosus* |
| Bluegill | *Lepomis macrochirus* |
| Smallmouth Bass | *Micropterus dolomieu* |
| Largemouth Bass | *Micropterus salmoides* |
| White Perch | *Morone americana* |
| Striped Bass | *Morone saxatilis* |
| Golden Shiner | *Notemigonus crysoleucas* |
| Ironcolor Shiner | *Notropis chalybaeus* |
| Spottail Shiner | *Notropis hudsonius* |
| Yellow Perch | *Perca flavescens* |
| Black Crappie | *Pomoxis nigromaculatus* |
| Walleye | *Sander vitreum* |
| Eastern Mudminnow | *Umbra pygmaea* |

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.

## Rare Wildlife

| Common Name | Scientific Name | Feature Type | Federal Protection | State Protection | G Rank | S Rank |
|---|---|---|---|---|---|---|
| **Class: Aves** | | | | | | |
| Bald Eagle | *Halieaeetus leucocephalus* | Foraging, Wintering | NA | E | G5 | S1B, S2N |
| Black-crowned Night-heron | *Nycticorax nycticorax* | Foraging | NA | T | G5 | S1B, S2N |
| Great Blue Heron | *Ardea Herodias* | Foraging | NA | SC | G5 | S3B, S4N |
| Savannah Sparrow | *Passerculus sandwichensis* | Breeding Sighting | NA | T | G5 | S2B, S4N |
| Wood Thrush | *Hylocichla mustelina* | Breeding Sighting | NA | SC | G5 | S3B |
| **Class: Reptilia** | | | | | | |
| Bog Turtle | *Glyptemys muhlenbergii* | Occupied Habitat | T | E | G3 | S1 |

Source: NJDEP Natural Heritage Database, 2012

| State Protection | |
|---|---|
| T | Threatened: A species that may become endangered if conditions surrounding the species begin to or continue to deteriorate. |
| E | Endangered: A species whose prospects for survival within the state are in immediate danger due to one or many factors, such as a loss of habitat, over exploitation, predation, competition, disease. An endangered species requires immediate assistance or extinction will probably follow. |
| INC | Increasing: 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: A species that warrants 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: A species in regional conservation plans. |
| U | Undetermined: A species about which there is not enough information available to determine the status. |
| D | Declining: A species that exhibited a continued decline in population numbers over the years. |
| P | Peripheral: A species whose occurrence in New Jersey is at the extreme edge of its present natural range. |
| S | Stable: A species whose population is not undergoing any long-term increase/decrease within its natural cycle. |

| 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; the number of occurrences are 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 | The status of infraspecific taxa (subspecies or varieties) are indicated by a “T-rank” following the species global rank. |
| 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 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 which are widely distributed in the state, but with small populations/acreage or elements with restricted distribution, but 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. |
| NR | Species has not yet been ranked. |

# Fauna Identified at South Valley Woods

The following species were identified by Blaine Rothauser of BR Environmental, LLC, on July 7 and 14, 2011 at South Valley Woods in Moorestown.

# INSECTS & SPIDERS

"Potter Wasp"

**Common Names**

1. Candy-stripped Leafhopper
2. Achilid Planthopper
3. Ebony Jewelwing
4. 12-spotted Skimmer
5. Spreadwing Damselfly
6. Common White Tail
7. Familiar Bluet
8. Green Pondhawk
9. Great Blue Skimmer
10. Scorpion Fly
11. Net Winged Beetle
12. Six Spotted Lady Bug
13. 6-spotted Tiger Beetle
14. Carolina Locust
15. Katydid (Instar)
16. Aphid sp.
17. Water Strider
18. Water Boatmen
19. Leaf-footed Bug
20. Green Stink Bug
21. Darkling beetle
22. Lighting Bug sp.

23. Ellychnia Bug
24. Milkweed Beetle
25. Milkweed Bug
26. Box Elder Beetle
27. Long Horned beetle sp.
28. Two Spotted Click Beetle
29. Eastern Swallow Tail
30. Least Skipper
31. Wood Nymph
32. Northern Cloudywing
33. Morning Cloak
34. Monarch Butterfly
35. Cecropia Moth
36. Underwing Moth sp.
37. Phantom Cranefly
38. Cranefly sp.
39. Deerfly sp.
40. Golden Backed Snipe Fly
41. Robber Fly sp.
42. Bee Fly sp. (Multiple)
43. Mydas Fly
44. Long Legged Dance Fly sp.
45. Flower Fly sp. (multiple)
46. Carpenter bee
47. Bumble Bee sp.
48. Clearwing moth
49. Ichnemon Wasp Sp.
50. Cuckoo Wasp Sp.
51. Sphecidid Wasp Sp.
52. European Hornet
53. Bald Faced Hornet
54. Sweat Bee Sp.
55. Mason Bee Sp.
56. Honeybee
57. Digger Wasp
58. Carpenter Ant
59. Mound Ant
60. Polsites Wasp
61. Eastern Yellow Jacket
62. Marbled Spider
63. Wolf Spider Sp.
64. Spined Micrathena Spider
65. Jumping Spider Sp.

66. Potter Wasp

# BIRDS

"Scarlet Tanager"

## Common Names

1. Red-eyed Vireo
2. White-breasted Nuthatch
3. Blue Jay
4. Northern Flicker
5. Red-bellied woodpecker
6. Hairy Woodpecker
7. Downy Woodpecker

8. Eastern Phoebe
9. Kingbird
10. Baltimore Oriole
11. Eastern Wood Pewee
12. Arcadian Flycatcher
13. Rose-breasted Grosbeak
14. House wren
15. Carolina Wren
16. Common Grackle
17. American Robin
18. American Goldfinch
19. House Sparrow
20. Red Tailed Hawk
21. Turkey Vulture
22. Black Vulture
23. Spotted Sandpiper
24. Catbird
25. Yellow Warbler
26. Common Yellow Throat
27. Redstart
28. Mallard Duck
29. Great Horned Owl
30. Tufted Titmouse
31. Black and White Warbler
32. Indigo Bunting
33. Chipping Sparrow
34. Great Crested Flycatcher
35. Mourning Dove
36. European Starling
37. Great Blue Heron
38. Red-winged Blackbird
39. Cowbird
40. Mockingbird
41. Northern Cardinal
42. Scarlet Tanager
43. Brown Thrasher (NJ Special Concern)

44. Wood Thrush (NJ Special Concern)
45. Savannah Sparrow (NJ Special Concern)*
46. Veery (NJ Special Concern)
47. Hooded Warbler (NJ Special Concern)

**NJ Landscape Version 2.0:**

Red-shouldered Hawk (*Buteo lineanatus*) State Threatened

Red-Headed Woodpecker *(Melenerpes erythrocephalus*) State Endangered

* In Soybean Field as Viewed from South Valley Woods

# Mammals

"Eastern Chipmunk"

## Common Names

1. Woodchuck
2. White-footed Mouse (Nest)
3. Grey Squirrel
4. White-tailed Deer
5. Stripped Skunk (Tracks)
6. Raccoon
7. Red Fox
8. Virginia Opossum
9. Short-tail Shrew
10. Eastern Chipmunk
11. Cottontail Rabbit
12. Eastern Chipmunk

# Reptiles and Amphibians

"E*astern Box Turtle"*

## Common Names

1. Garter Snake
2. Black Rat Snake
3. Green Frog
4. Bull Frog
5. Red-back Salamander
6. Northern Slimy Salamander

7. Spotted Turtle (NJ Species of Special Concern)
8. Eastern Box Turtle (NJ Species of Special Concern)

***NOTE FROM OBSERVER**

It is important to keep in mind that the above list is a "snapshot" of record from two days in July 2011 that took place one week apart - a total of 14 hours of field observation. Four hours of this period consisted of an evening owl calling survey. So in essence only 10 hours of diurnal study was executed in the completion of this list. This list would grow exponentially if scientists that specialize in individual taxa were to perform field studies during all four seasons. This is what would be necessary in order to build a biodiversity index that better represents a complete assay of the South Valley Woods Ecological Complex. The list visibly shows that the degree of native flora and fauna on the site is very high in addition to being conducive for the fulfillment of life history requirements for 7 New Jersey Special Concern Species. The point is that in a mere 10 hours of field time it is clear that South Valley Woods is an undisputed ecological hotspot in Moorestown meeting all the criteria listed on page 20 of the Township Master Plan. This section describes how land is ranked based on positive natural factors for environmentally sensitive land.

APPENDIX D

# Moorestown Drinking Water

## Sampling Results

During the past year, we have taken hundreds of water samples in order to determine the presence of any radioactive, biological, inorganic, volatile organic, or synthetic organic contaminants. The table below shows only those contaminants that were detected in the water. The state requires us to monitor for certain substances less than once per year because the concentrations of these substances do not change frequently. In these cases, the most recent sample data are included, along with the year in which the sample was taken.

**Some people may be more vulnerable to contaminants in drinking water than the general population. Immunocompromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants may be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. The U.S. EPA/CDC (Centers for Disease Control and Prevention) guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline at (800) 426-4791.**

**REGULATED SUBSTANCES [1]**

| | | | | Moorestown Township | | Delaware River Regional WTP | | | |
|---|---|---|---|---|---|---|---|---|---|
| SUBSTANCE (UNIT OF MEASURE) | YEAR SAMPLED | MCL [MRDL] | MCLG [MRDLG] | AMOUNT DETECTED | RANGE LOW-HIGH | AMOUNT DETECTED | RANGE LOW-HIGH | VIOLATION | TYPICAL SOURCE |
| **Alpha Emitters** (pCi/L) | 2011 | 15 | 0 | 13.34 | ND–13.34 | NA | NA | No | Erosion of natural deposits |
| **Barium** (ppm) | 2011 | 2 | 2 | 0.0781 | 0.0424–0.0781 | 0.012 | 0.012–0.012 | No | Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits |
| **Bromate** (ppb) | 2011 | 10 | 0 | NA | NA | 6 | ND–6 | No | By-product of drinking water disinfection |
| **Chlorine** (ppm) | 2011 | [4] | [4] | 0.46 | 0.20–0.46 | 0.59 | 0.22–0.59 | No | Water additive used to control microbes |
| **Combined Radium** (pCi/L) | 2011 | 5 | 0 | 3.29 | ND–3.29 | NA | NA | No | Erosion of natural deposits |
| **Nickel** (ppb) | 2011 | 100 | NA | 10.9 | 0.74–10.9 | 1.3 | 1.3–1.3 | No | Pollution from mining and refining operations; Natural occurrence in soil |
| **Nitrate** (ppm) | 2011 | 10 | 10 | 4.05 | ND–4.05 | 0.94 | 0.94–0.94 | No | Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits |
| **Tetrachloroethylene** (ppb) | 2011 | 1 | 0 | 0.260 | ND–0.260 | NA | NA | No | Discharge from factories and dry cleaners |
| **Total Coliform Bacteria** (# positive samples) | 2011 | 1 positive monthly sample | 0 | 1 | NA | NA | NA | No | Naturally present in the environment |
| **Total Organic Carbon** (% removal) | 2011 | TT | NA | NA | NA | 44[2] | 44–77 | No | Naturally present in the environment |
| **Trichloroethylene** (ppb) | 2011 | 1 | 0 | 0.300 | ND–0.300 | NA | NA | No | Discharge from metal degreasing sites and other factories |
| **Turbidity**[3] (NTU) | 2011 | TT | NA | NA | NA | 0.10 | 0.04–0.10 | No | Soil runoff |
| **Turbidity** (Lowest monthly percent of samples meeting limit) | 2011 | TT | NA | NA | NA | 100 | NA | No | Soil runoff |
| **Uranium** (ppb) | 2011 | 30 | 0 | 1 | 1–1 | 1[4] | ND–2 | No | Erosion of natural deposits |

**Tap water samples were collected for lead and copper analyses from sample sites throughout the community**

| SUBSTANCE (UNIT OF MEASURE) | YEAR SAMPLED | AL | MCLG | AMOUNT DETECTED (90TH%TILE) | SITES ABOVE AL/ TOTAL SITES | VIOLATION | TYPICAL SOURCE |
|---|---|---|---|---|---|---|---|
| **Copper** (ppm) | 2011 | 1.3 | 1.3 | 0.0588 | 0/30 | No | Corrosion of household plumbing systems; Erosion of natural deposits |
| **Lead** (ppb) | 2011 | 15 | 0 | 4.7 | 2/30[5] | No | Corrosion of household plumbing systems; Erosion of natural deposits |

**SECONDARY SUBSTANCES (MOORESTOWN TOWNSHIP)**

| SUBSTANCE (UNIT OF MEASURE) | YEAR SAMPLED | RUL | MCLG | AMOUNT DETECTED | RANGE LOW-HIGH | EXCEEDANCE | TYPICAL SOURCE |
|---|---|---|---|---|---|---|---|
| **Manganese** (ppb) | 2011 | 50 | NA | 116 | 50.5–166 | Yes[6] | Leaching from natural deposits |

**INITIAL DISTRIBUTION SYSTEM EVALUATION (IDSE)[7]**

| SUBSTANCE (UNIT OF MEASURE) | YEAR SAMPLED | AMOUNT DETECTED | RANGE LOW-HIGH | TYPICAL SOURCE |
|---|---|---|---|---|
| **Haloacetic Acids [HAA]–IDSE Results** (ppb) | 2011 | 5.74 | ND–5.74 | By-product of drinking water disinfection |
| **TTHMs [Total Trihalomethanes]–IDSE Results** (ppb) | 2011 | 17.7 | 0.220–17.7 | By-product of drinking water disinfection |

## Definitions

**AL (Action Level):** The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

**MCL (Maximum Contaminant Level):** The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

**MCLG (Maximum Contaminant Level Goal):** The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

**MRDL (Maximum Residual Disinfectant Level):** The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

**MRDLG (Maximum Residual Disinfectant Level Goal):** The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

**NA:** Not applicable.

**ND (Not detected):** Indicates that the substance was not found by laboratory analysis.

**NTU (Nephelometric Turbidity Units):** Measurement of the clarity, or turbidity, of water. Turbidity in excess of 5 NTU is just noticeable to the average person.

**pCi/L (picocuries per liter):** A measure of radioactivity.

**ppb (parts per billion):** One part substance per billion parts water (or micrograms per liter).

**ppm (parts per million):** One part substance per million parts water (or milligrams per liter).

**RUL (Recommended Upper Limit):** The highest level of a contaminant recommended in drinking water. RULs are set to protect the odor, taste, and appearance of drinking water.

**TT (Treatment Technique):** A required process intended to reduce the level of a contaminant in drinking water.

**Footnotes**

[1] Under a waiver granted on December 30, 1998, by the State of New Jersey Department of Environmental Protection, our system does not have to monitor for synthetic organic chemicals/pesticides because several years of testing have indicated that these substances do not occur in our source water. The SDWA regulations allow monitoring waivers to reduce or eliminate the monitoring requirements for asbestos, volatile organic chemicals, and synthetic organic chemicals. Our system received monitoring waivers for synthetic organic chemicals and asbestos.

[2] Amount detected represents the lowest removal of Total Organic Carbon (TOC).

[3] Turbidity is a measure of the cloudiness of the water. It is monitored because it is a good indicator of the effectiveness of the filtration system. The turbidity rule requires that 95 percent or more of the monthly samples must be less than or equal to 0.3 NTU (no sample may exceed 1 NTU).

[4] Amount detected represents an average.

[5] The two sites above the action level were re-sampled, and results were below the action level.

[6] Secondary samples taken on April 13, 2011, and June 29, 2011 exceeded the RUL. The sequestering agent feed system at the North Church Street water treatment plant has since been automated to better control the manganese within our water distribution.The recommended upper limit for manganese is based on staining of laundry. Manganese is an essential nutrient, and toxicity is not expected from high levels which would be encountered in drinking water.

[7] We were required by the U.S. EPA to conduct an evaluation of our distribution system. This is known as an Initial Distribution System Evaluation (IDSE) and is intended to identify locations in our distribution system that have elevated disinfection by-product concentrations. Disinfection by-products (e.g., HAAs and TTHMs) result from continuous disinfection of drinking water and form when disinfectants combine with organic matter that naturally occurs in the source water.

APPENDIX E

# Known Contaminated Sites in Moorestown Township

## Closed Non-Homeowner Known Contaminated Sites

| Address | PI Name | PI Number |
|---|---|---|
| 1250 N Church St | 1250 Church St North | G000010400 |
| 14 Spruce St | 14 E Spruce St | G000040001 |
| 147 Haines Dr | 147 Haines Dr | G000043740 |
| 18 Cardinal Dr | 18 Cardinal Drive | G000032906 |
| 218 Frenches Ave | 218 Frenches Avenue | G000061006 |
| 221 Colonial Ave | 221 Colonial Avenue | 479361 |
| 26 E 3rd St | 26 E 3rd Street | G000061005 |
| 28 E Main St | 28 East Main Street | 530618 |
| 309 Westover Rd | 309 Westover Rd | G000037384 |
| 310 High St | 310 High St | G000060361 |
| 333 High St | 333 High Street | G000030510 |
| 340 W 3rd St | 340 West 3rd Street | G000029514 |
| 425 Chestnut Ave | 425 Chestnut St | G000044697 |
| 504 Stanwick Rd | 504 Stanwick Road North | G000038698 |
| 630 Garwood Rd | 630 Garwood Rd | G000039931 |
| 7 Harris St | 7 W Harris Ave | G000039071 |
| 700 Lippincott Ave | 700 Lippincott Avenue | G000031535 |
| 711 Lippincott Ave | 711 Lippincott Avenue | G000033554 |
| 720 Cox Rd | 720 Cox Rd | G000041496 |
| 74 2nd St | 74 East 2nd St | G000041993 |
| 740 Garwood Rd | 740 Garwood Road | G000031763 |
| 75 2nd St | 75 Second Street East | G000043796 |

| Address | PI Name | PI Number |
|---|---|---|
| 750 Garwood Rd | 750 Garwood Rd | G000036027 |
| 773 Hartford Rd | 773 Hartford Road | 243864 |
| 851 McElwee Rd | 851 McElwee Road | G000023587 |
| 9 Cardinal Dr | 9 Cardinal Dr | G000037588 |
| 908 N Lenola Rd | 908 N Lenola Rd | 533211 |
| Marter Ave & Centerton Rd | Acme Moorestown | G000061949 |
| 13 Camden Ave | Arco Gasoline Service Station | G000029450 |
| 229 Camden Ave | B&D Auto | 18669 |
| 700 E Main St | Cavalieri's Service Center | 19039 |
| 308 Rt 38 | Central Telephone Bureau | 26320 |
| 235 S Church St | Church St Properties | 95043 |
| Rt 38 & Nixon Dr | D'Andrea Tire Inc | 9182 |
| 1259 N Church St | Denton Vacuum LLC | 2229 |
| 1521 Glen Ave | Eastern Custom Graphics | 299163 |
| 219 W Main St | Eckenhoff Buick | 4794 |
| 101 Bridgeboro Rd | First Presbyterian Church Nursery School | 489554 |
| 123 Chester Ave | Former Acme Market | 420632 |
| 575 Westfield Rd | Georgakis Tract | 158085 |
| 923 N Lenola Rd | Graebel Van Lines | 516972 |
| 111 Whittendale Dr | Granite Packaging Supply Corporation | G000033873 |
| 309 Chestnut St | Hollingshead Co Inc | 44 |
| 1253 N Church St | J Wittman & Sons Inc | 21185 |
| 1255 N Church St | Jet Pulverizer Company | 3032 |
| Rt 38 & Lenola Rd | John Wanamaker | 18252 |
| 121 125 Camden Ave | Lenola Auto Service | 30231 |
| Lenola Rd & Merion Ave | Lenola Fire House | 23838 |
| 285 Church St | Lindell Enterprises | 19421 |
| 333 Bortons Landing Rd | Moorestown Farms LP | G000037028 |
| 510 Hartford Rd | Moorestown Hartford Road Plant | 26251 |
| 601 E 3rd St | Moorestown Public Works | 4358 |

| Address | PI Name | PI Number |
|---|---|---|
| 200 Camden Ave | Moorestown Shopping Center | G000024232 |
| Creek Rd | Moorestown Township Sanitary Landfill | G000010929 |
| Stanwick Rd | Moorestown Township BOE | 22907 |
| 120 Kings Hwy | Moorestown Water Treatment Plant | 26243 |
| 351 Crider Ave | National Filter Media Corporation | G000031845 |
| 800 Glen Ave | Omnimed Incorporated | G000002858 |
| 3rd St & Stanwick Rd | Perla Block Corp | 4147 |
| 323 New Albany Rd | Prism Color Corporation | G000037521 |
| 300 New Albany Rd | PSE&G Southern Division - Moorestown | 4181 |
| Twosome Dr | Ralph Wilson Plastics Company | G000025216 |
| 118 Rt 38 | Route 38 Farm Field | 332833 |
| Rt 38 & Lenola Rd | Sears Roebuck And Co | 20242 |
| 216 Rt 38 W | Semcor Property Former | 262452 |
| 300 N Church St | Service TBA & Auto Parts Inc | 26105 |
| 253 W Main St | Shell Service Station 138432 | 6591 |
| 318 Chester Ave | St Mathew Lutheran Church | 20288 |
| Hayfield Ct | Stanwick Glen | G000061851 |
| 309 Bridgeboro Rd | The Evergreen Episcopal Home | 22718 |
| 345 New Albany Rd | Thermacon Industries Incorporated | G000003527 |
| 426 Dawson St | Thomas Grimes | 202367 |
| 308 Harper Dr | Union Carbide Corp | 16675 |
| 1267 N Church St | WCAU Radio Transmitter | 25747 |
| Bortons Landing Rd | Wexford At Moorestown | G000036105 |
| 540 550 Glen Ave | Whitesell Enterprises | 12860 |
| 540 550 Glen Ave | Whitesell Enterprises | 13292 |
| Bortons Landing Rd | Wilson Boyer Samost Tract | 133806 |
| 355 Crider Ave | Yates Electromagnetics | G000007327 |

Source: NJDEP, 2012

# Regulated Underground Storage Tank Facilities

| PI Number | Pi Name | Street Address | Doc Status | Expiration Date |
|---|---|---|---|---|
| 10395 | 56111 Getty | 201 W Camden Ave | Terminated | 3/31/2001 |
| 2317 | Albert Ellis Inc | 124 Mill St | Terminated | 11/16/2000 |
| 26943 | Applied Digital Corp | 214 Flynn Ave | Terminated | 11/16/2000 |
| 22079 | Ben Craft Builders | 5 Main St E | Terminated | 11/16/2000 |
| 19039 | Cavalieri's Service Center | Main St & Marter Ave | Terminated | 11/16/2000 |
| 26320 | Central Telephone Bureau | 308 W Rt 38 | Terminated | 3/31/2001 |
| 18390 | Chevron Chemical Moorestown Research Station | 1130 N Church St | Terminated | 11/16/2000 |
| 95043 | Church St Properties | 235 S Church St | Terminated | 3/31/2004 |
| 23177 | Combat System Engineering Dept | Centerton Rd | Terminated | 11/16/2000 |
| 9182 | D'Andrea Tire Inc | Rte 38 & Nixon Dr | Terminated | 11/16/2000 |
| 2229 | Denton Vacuum LLC | 1259 N Church St | Terminated | 3/31/2007 |
| 4794 | Eckenhoff Buick | 219 W Main St | Terminated | 11/16/2000 |
| 8569 | Emergency Services Building | 261 W Main St | Terminated | 11/16/2000 |
| 6101 | Erico Fastening Systems | 301 New Albany Rd | Terminated | 11/16/2000 |
| 5695 | Flanagan & Sons | 401 Mount Laurel Rd | Effective | 3/31/2013 |
| 18669 | Former B&D Auto | 229 E Camden Ave | Terminated | 11/16/2000 |
| 24708 | GM Training Center | Rte 38 & Pleasant Valley Ave | Terminated | 11/16/2000 |
| 44 | Hollingshead Co Inc | 309 Chestnut St | Terminated | 3/31/2001 |
| 3032 | Jet Pulverizer Company | 1255 Church St N | Terminated | 11/16/2000 |
| 18252 | John Wanamaker | Rte 38 & Lenola Rd | Terminated | 11/16/2000 |
| 21185 | J Wittman & Sons Inc | 1253 North Church St | Terminated | 3/31/2001 |
| 5347 | Kmart 3350 | Rt 38 & S Lenola | Terminated | 11/16/2000 |
| 19961 | Latter Day Saints Church | 319 Bridgeboro Rd | Terminated | 3/31/2001 |
| 26873 | Lenola Auto Service | 104 W Camden Ave | Terminated | 11/16/2000 |
| 30231 | Lenola Auto Service | 121 to 125 Camden Ave | Terminated | 11/16/2000 |

| PI Number | Pi Name | Street Address | Doc Status | Expiration Date |
|---|---|---|---|---|
| 23838 | Lenola Fire House | Lenola Rd | Terminated | 11/16/2000 |
| 19421 | Lindell Enterprises | 285 Church St S | Terminated | 11/16/2000 |
| 14885 | Lockheed Martin | 199 Borton Lndg Rd | Effective | 3/31/2013 |
| 25165 | Merit Cordage Co Inc | 353 Crider Ave | Terminated | 11/16/2000 |
| 27021 | Mill St Properties | 301 Mill St | Terminated | 3/31/1998 |
| 7875 | Moorestown Citgo | 107 Camden Ave | Effective | 3/31/2013 |
| 19891 | Moorestown Community House | 16 East Main St | Terminated | 11/16/2000 |
| 21880 | Moorestown Friends Meeting | Main & Chester Ave | Terminated | 11/16/2000 |
| 31513 | Moorestown Friends School | 10 E Main St | Terminated | 3/31/1998 |
| 13360 | Moorestown Gardens Corp | 410 Flynn Ave | Terminated | 11/16/2000 |
| 6585 | Moorestown Gas LLC | 201 Rt 38 W | Effective | 3/31/2013 |
| 26251 | Moorestown Hartford Road Plant | 510 Hartford Rd | Terminated | 11/16/2000 |
| 14628 | Moorestown Oaks Apts | Camden Ave | Terminated | 11/16/2000 |
| 4358 | Moorestown Public Works | 601 3rd St E | Terminated | 11/16/2000 |
| 4357 | Moorestown Townhall | 111 2nd St W | Terminated | 11/16/2000 |
| 22907 | Moorestown Twp BOE | Stanwick Rd N | Terminated | 3/31/2001 |
| 23585 | Moorestown Twp STP | End of Pine St | Terminated | 11/16/2000 |
| 23620 | Moorestown Twp WWTP | 250 Pine St | Effective | 3/31/2013 |
| 26243 | Moorestown Water Treatment Plant | 120 Kings Hwy | Terminated | 11/16/2000 |
| 734 | Moorestown Xtra Service Station Former | 1 High St | Terminated | 11/16/2000 |
| 25888 | Moorestown Friends School | Page Ln | Terminated | 11/16/2000 |
| 6823 | NJ Bell Telephone | 105 E Main St | Terminated | 11/16/2000 |
| 26250 | North Church St | 1248 Church St N | Terminated | 11/16/2000 |
| 21800 | Our Lady Of Good Counsel Church | 42 West Main St | Terminated | 3/31/2001 |
| 8513 | Penn Jersey Subaru Inc | Glen Ave & Foster Rd | Terminated | 11/16/2000 |
| 4147 | Perla Block Corp | 320 Stanwick St N | Terminated | 3/31/2001 |

| PI Number | Pi Name | Street Address | Doc Status | Expiration Date |
|---|---|---|---|---|
| 2538 | Philadelphia Coca-Cola Bottling Co | 1250 Glen Ave | Terminated | 11/16/2000 |
| 26870 | Philadelphia Insulated Wire Co | 333 New Albany Rd | Terminated | 11/16/2000 |
| 14627 | Pleasant Valley Apts | 531 Kings Highway | Terminated | 11/16/2000 |
| 4181 | PSE&G Southern Division - Moorestown | 300 New Albany Rd | Effective | 3/31/2013 |
| 333 | Pulverizing Services Inc | 300 To 332 New Albany Rd | Terminated | 3/31/1998 |
| 8570 | Relief Engine Co | 222 Chester Ave | Terminated | 11/16/2000 |
| 7206 | Romano's Service Station | Chester Ave & Plum St | Effective | 3/31/2013 |
| 20242 | Sears Roebuck And Co | Rte 38 & Lenola Rd | Terminated | 3/31/2001 |
| 262452 | Semcor Property Former | 216 Rt 38 W | Terminated | |
| 26105 | Service TBA & Auto Parts Inc | 300 Church St N | Terminated | 3/31/1995 |
| 6591 | Shell Service Station 138432 | 253 W Main & Union Sts | Terminated | 3/31/2001 |
| 12457 | Stern's Moorestown Mall | Rte 38 & Lenola Rd | Terminated | 11/16/2000 |
| 20288 | St Matthew Lutheran Church | 318 Chester Ave | Terminated | 11/16/2000 |
| 14829 | Sunoco 0012-1350 | 3240 Rt 38 & Hartford Rd | Effective | 3/31/2013 |
| 22718 | The Evergreen Episcopal Home | 309 Bridgeboro Rd | Terminated | 11/16/2000 |
| 13206 | The Jet Pulverizer Company | 1255 Church St N | Terminated | 11/16/2000 |
| 202367 | Thomas Grimes | 426 Dawson St | Terminated | |
| 12928 | Trinity Church | 207 Main St W | Terminated | 11/16/2000 |
| 16675 | Union Carbide Corp | 308 Harper Dr | Terminated | 11/16/2000 |
| 7576 | Us Postal Service | 200 Chester Ave | Terminated | 11/16/2000 |
| 25747 | WCAU Radio Transmitter | 1267 Church St N | Terminated | 11/16/2000 |
| 12860 | Whitesell Enterprises | 540 To 550 Glen Ave | Terminated | 3/31/1998 |
| 12863 | Whitesell Enterprises | 400 Colonial Ridge | Terminated | 3/31/1998 |
| 13292 | Whitesell Enterprises | 540 To 550 Glen Ave | Terminated | 3/31/1998 |

Source: NJDEP, 2012

# Emission Statements

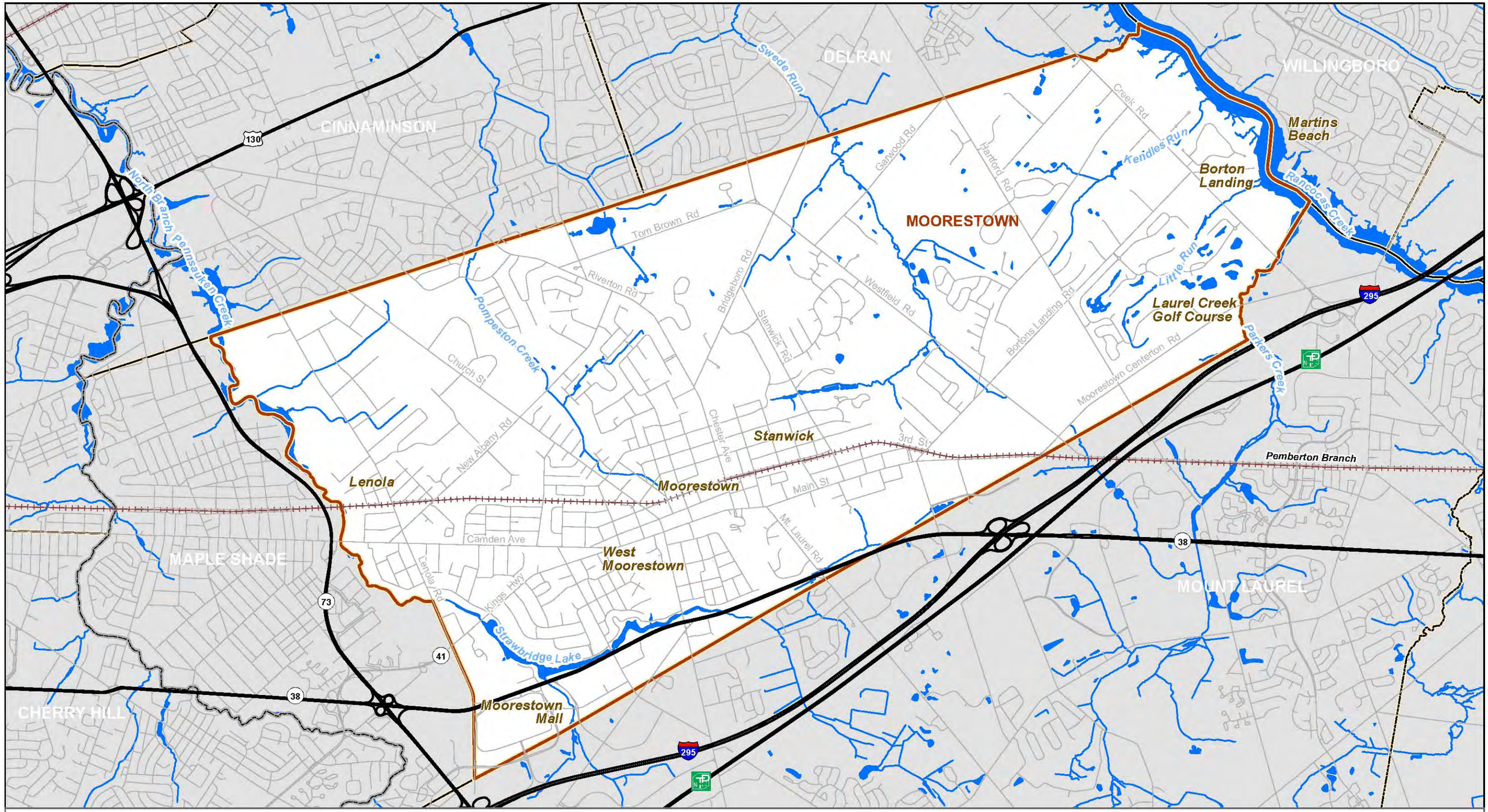
## 2011 Air Emission Statements

| PI Number | Facility Name | Facility Address | Facility City |
|---|---|---|---|
| 45077 | Lockheed Martin Company | 199 Borton Lndg Rd | Moorestown |
| **Pollutant Name** | **Ozone - PPD** | **TPY** | **CO - PPD** |
| CO | 17.76 | 4.39 | 36.32 |
| NOx (Total) | 26.63 | 6.59 | |
| VOC (Total) | 58.03 | 1.89 | |
| | | | |
| **PI Number** | **Facility Name** | **Facility Address** | **Facility City** |
| 46046 | American Biltrite Incorporated | 105 Whittendale Dr | Moorestown |
| **Pollutant Name** | **Ozone - PPD** | **TPY** | **CO - PPD** |
| Ammonia | | 5.83 | |
| CO | 12.27 | 4.06 | 34.27 |
| CO2 | | 5120.00 | |
| Methane | | 0.08 | |
| NOx (Total) | 14.61 | 4.76 | |
| Pb | | 0.01 | |
| PM-10 (Total) | | 0.34 | |
| PM-2.5 (Total) | | 0.34 | |
| SO2 | | 0.03 | |
| TSP | | 0.34 | |
| VOC (Total) | 168.86 | 36.51 | |

| PI Number | Facility Name | Facility Address | Facility City |
|---|---|---|---|
| 46143 | Clondalkin Moorestown | 1224 N Church St | Moorestown |
| **Pollutant Name** | **Ozone - PPD** | **TPY** | **CO - PPD** |
| Ammonia | | 1.01 | |
| CO | 0.03 | 0.11 | 0.28 |
| NOx (Total) | 0.03 | 0.13 | |
| PM-10 (Total) | | 0.00 | |
| TSP | | 0.00 | |
| VOC (Total) | 1.97 | 7.89 | |

Source: NJDEP, 2012

# Maps



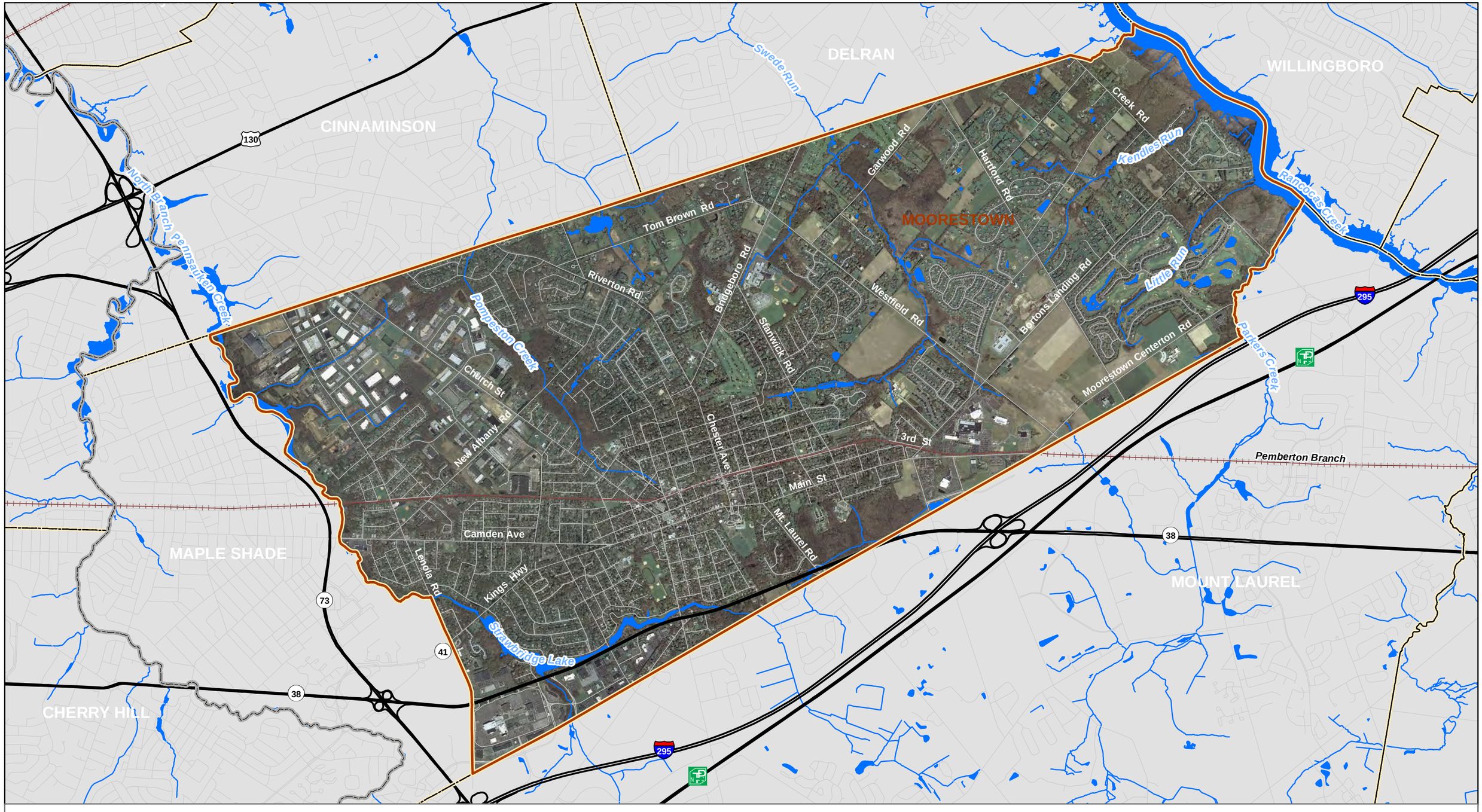

Source : NJDEP,NJDOT,DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

0 0.5 1
Miles

N

# Map 1: Places in Moorestown Township

dvrpc



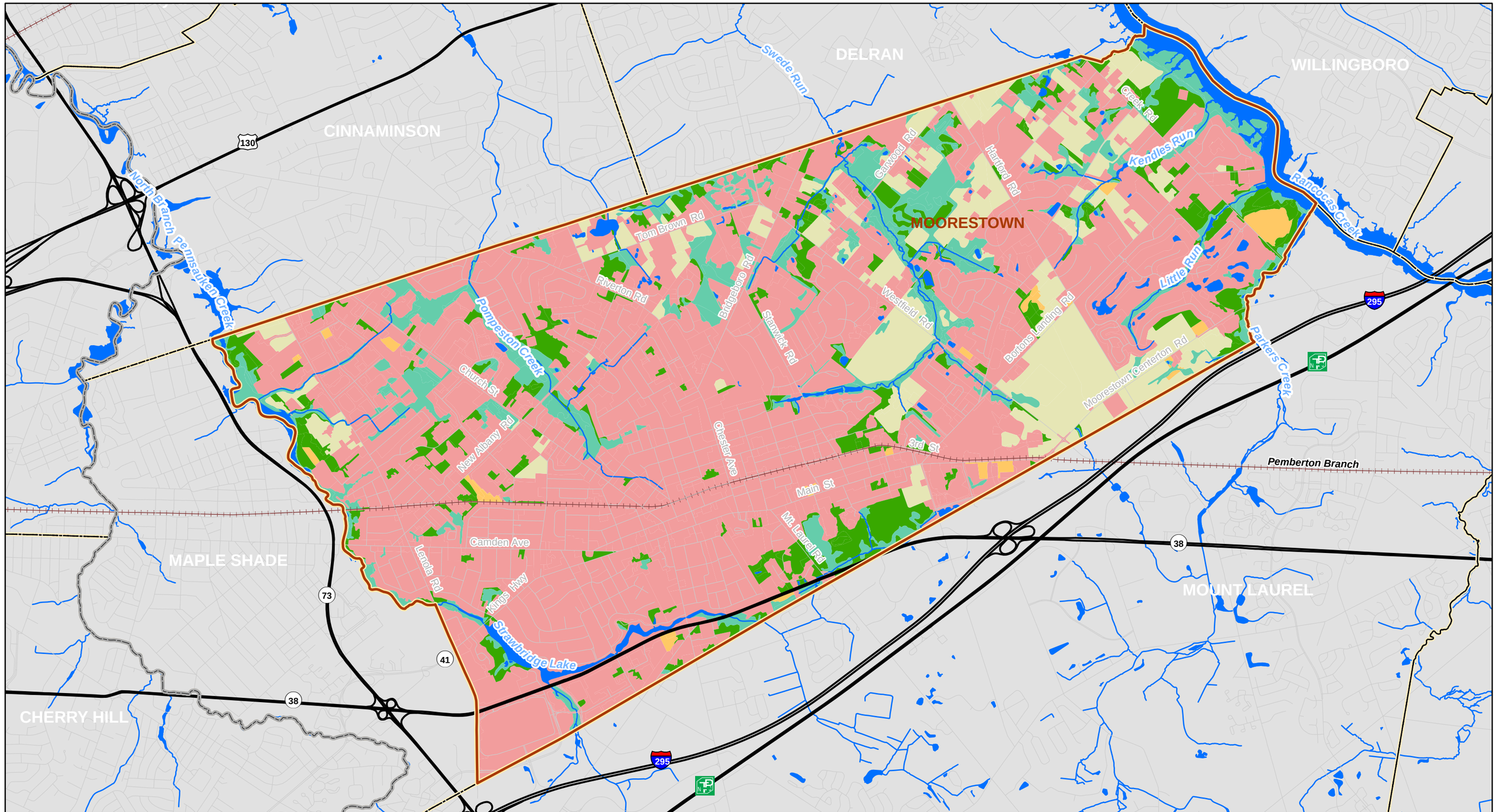

Source : NJDEP,NJDOT,DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

0 0.5 1
Miles

N

# Map 2: Aerial Photo (2010)

dvrpc




Source : 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.

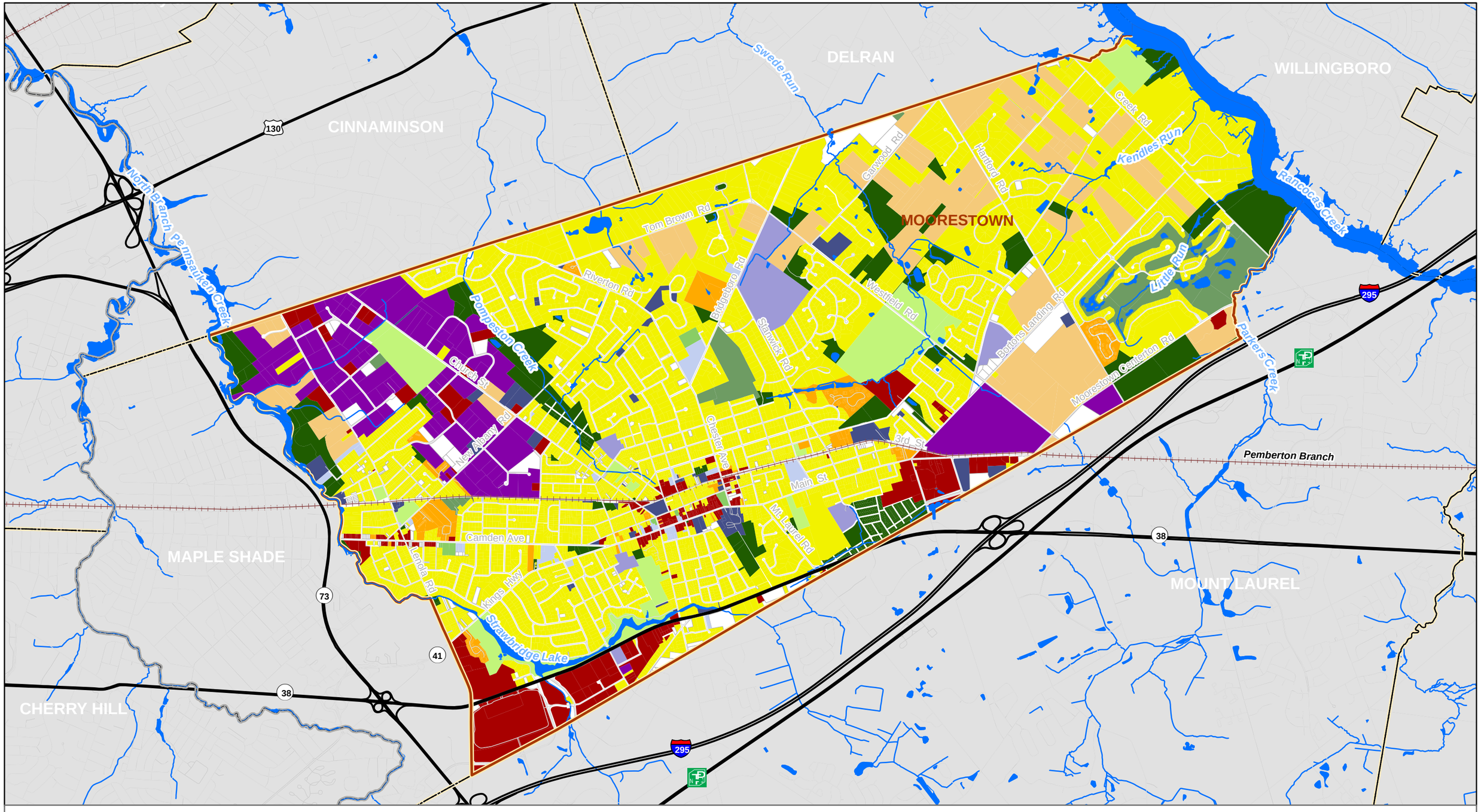
0 0.5 1
Miles

- Agriculture
- Barren Land
- Forest
- Developed
- Water
- Wetlands

# Map 3: NJDEP Land Cover (2007)

Acres are listed in Table 1.

dvrpc




Source : NJDEP,NJDOT,Moorestown ,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.

0 0.5 1
Miles

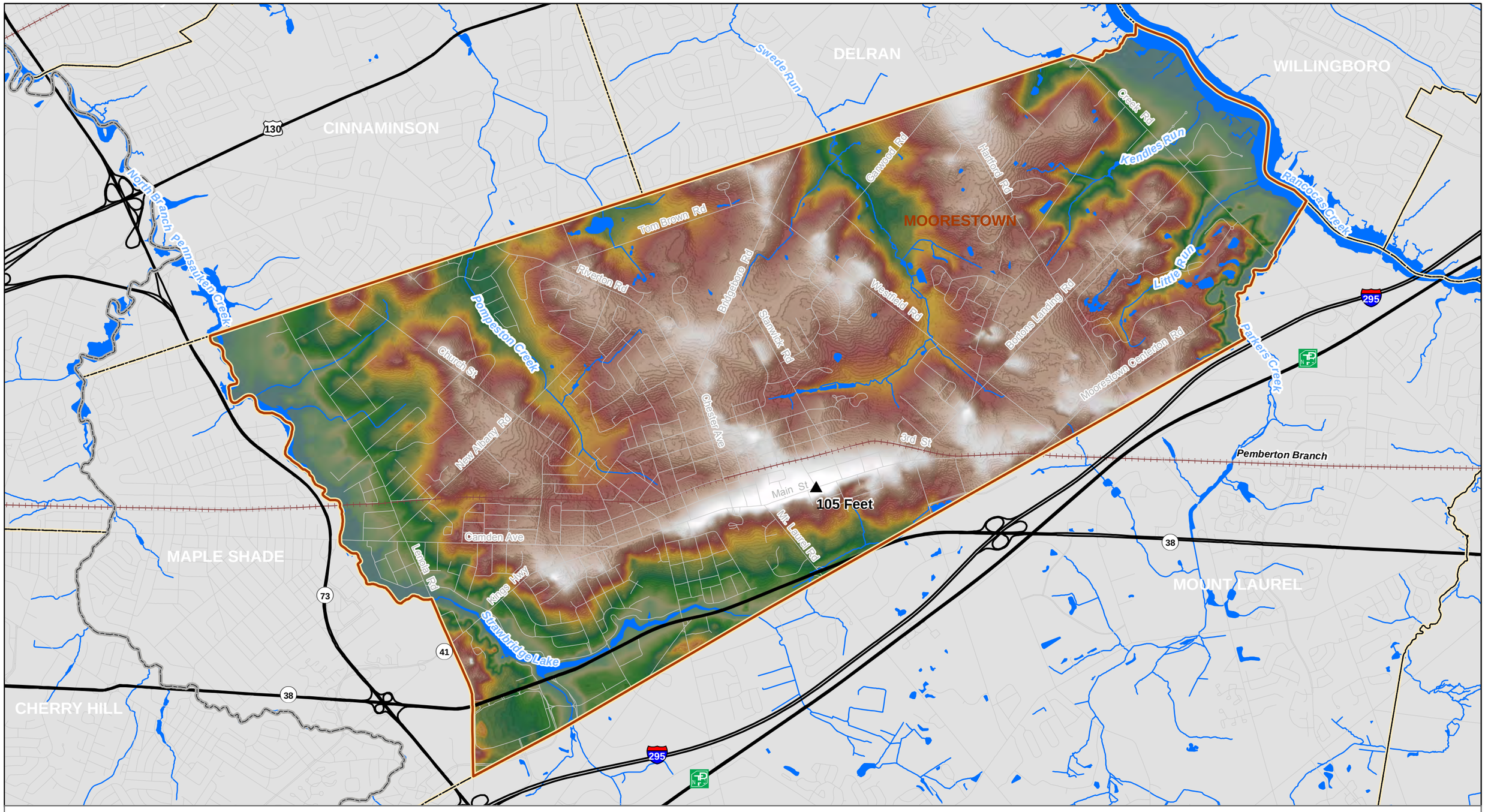
N

- Cemetery
- Charitable
- Commercial
- Farmland
- Industrial
- Institutional
- Open Space
- Public School
- Recreational-Private
- Recreational-Public
- Residential
- Residential-Multi-Family
- Vacant

# Map 4: Land Use

Acres are listed in Table 3.

dvrpc




Source : 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.

0 0.5 1
Miles

**Value (Feet above sea level)**

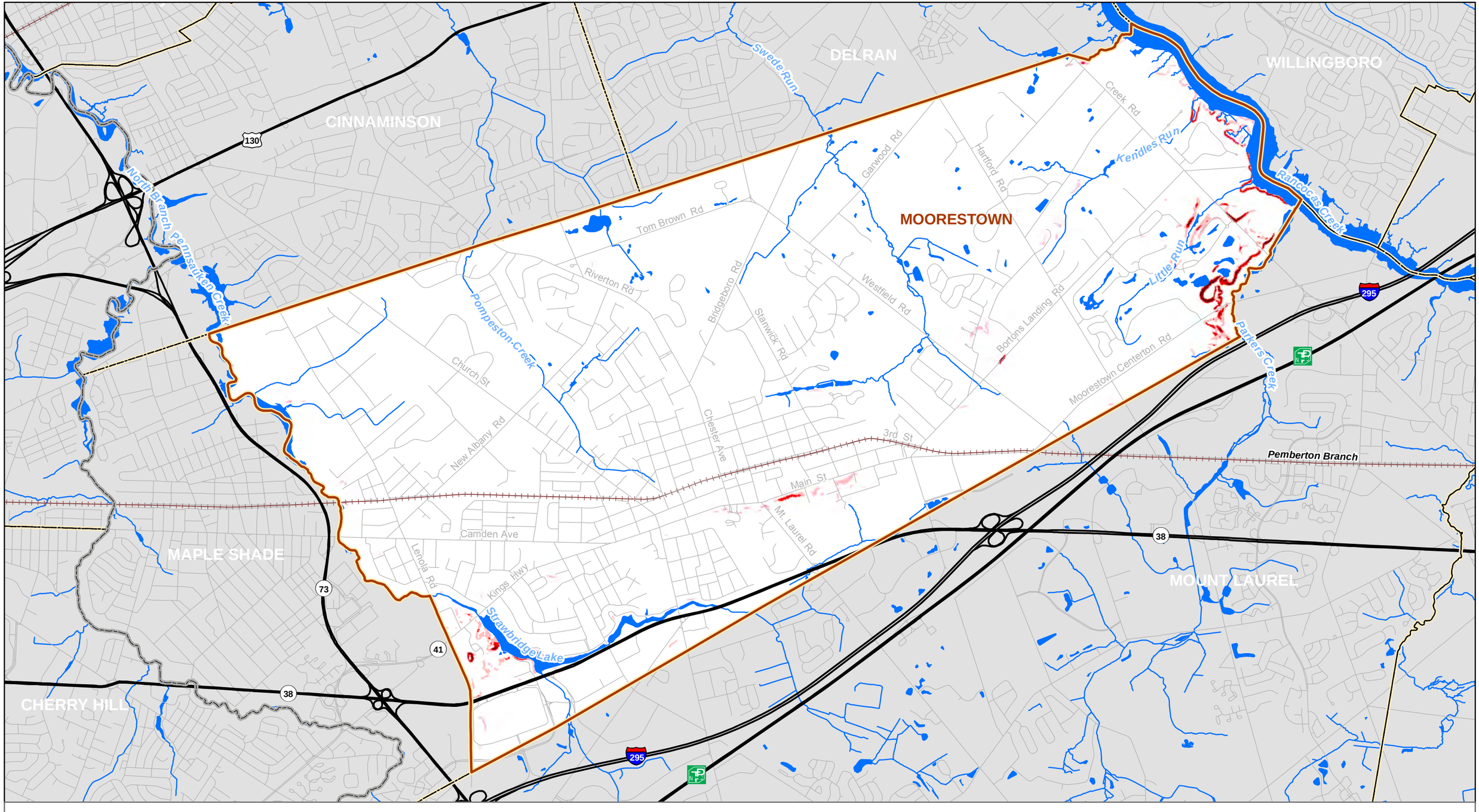
High: 105

Low: 0

▲ High Elevation

# Map 5: Elevation

dvrpc




Source : 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.

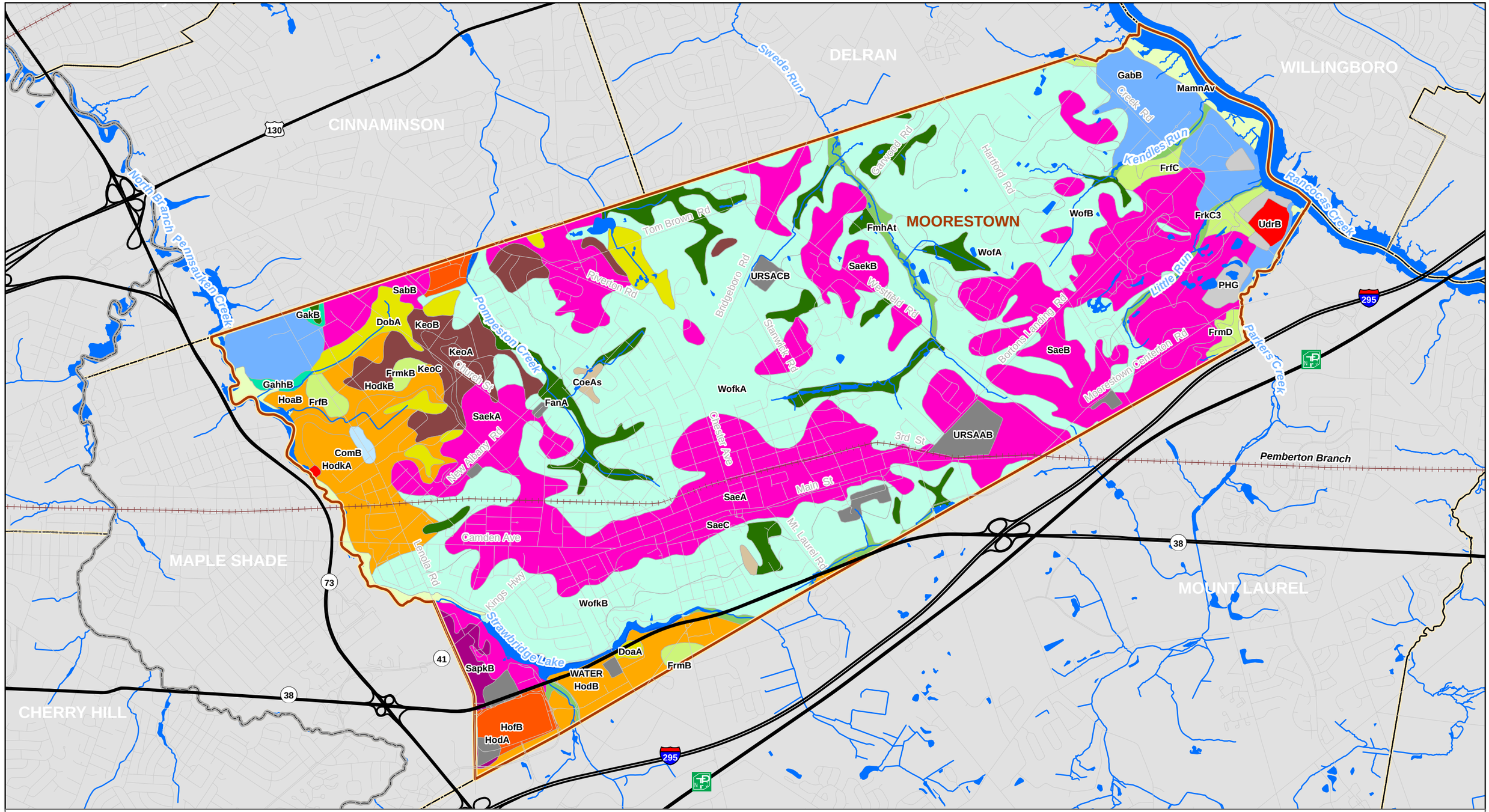
0 0.5 1
Miles

**Slopes**

- <10%
- 10% - 14.99%
- 15% - 19.99%
- ≥ 20%

# Map 6: Steep Slopes

dvrpc




Source : 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.

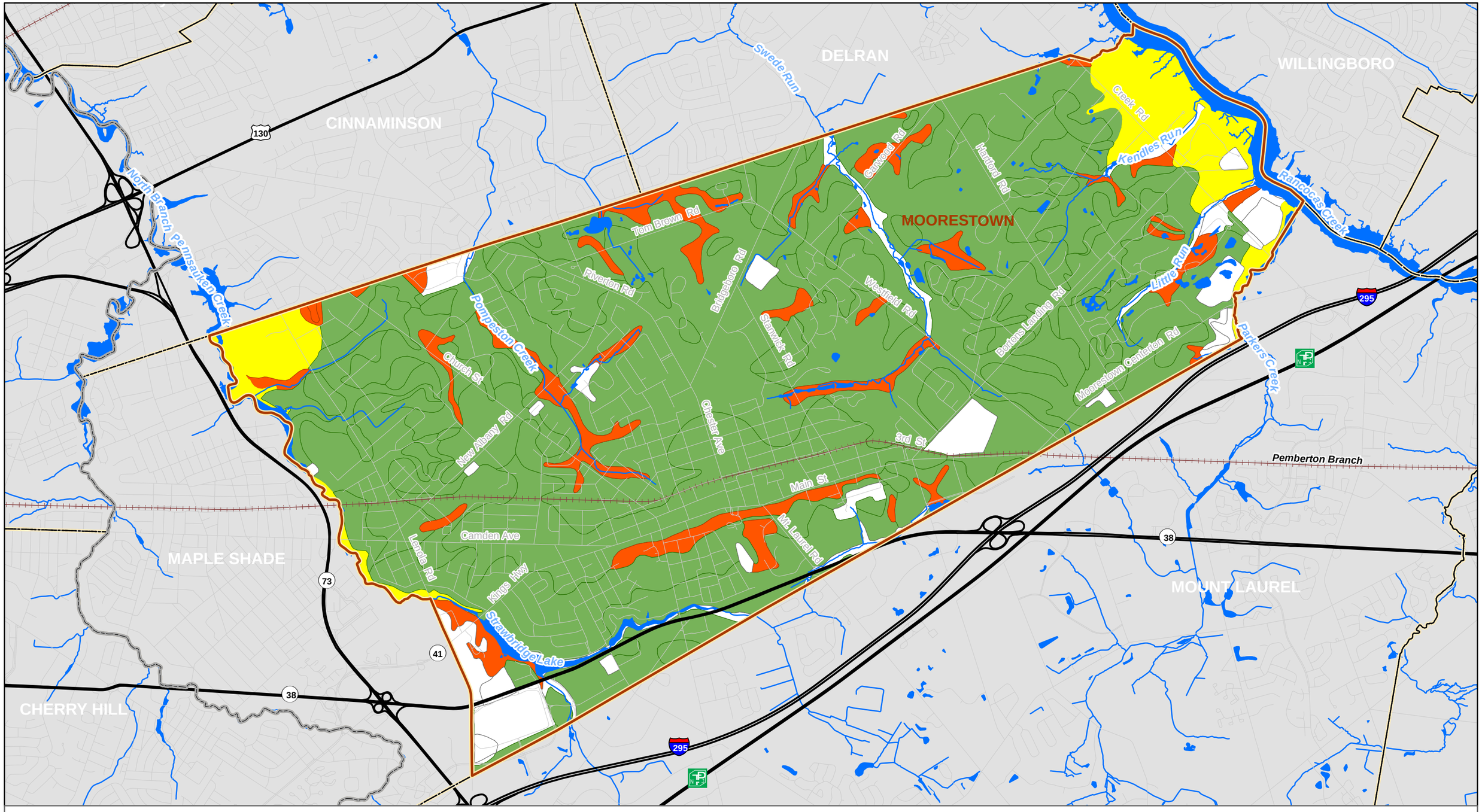
0 0.5 1
Miles

- Colemantown
- Collington
- Donlonton
- Fallsington
- Fluvaquents
- Freehold
- Galestown
- Galloway
- Holmdel
- Holmdel-Urban
- Keyport
- Mannington-Nanticoke
- Pits, sand and gravel
- Sassafras
- Sassafras-Urban
- Udorthents
- Urban
- Water
- Woodstown

# Map 7: Soils

Acres and descriptions are listed in Table 4.

dvrpc




Source : 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.

0 0.5 1
Miles

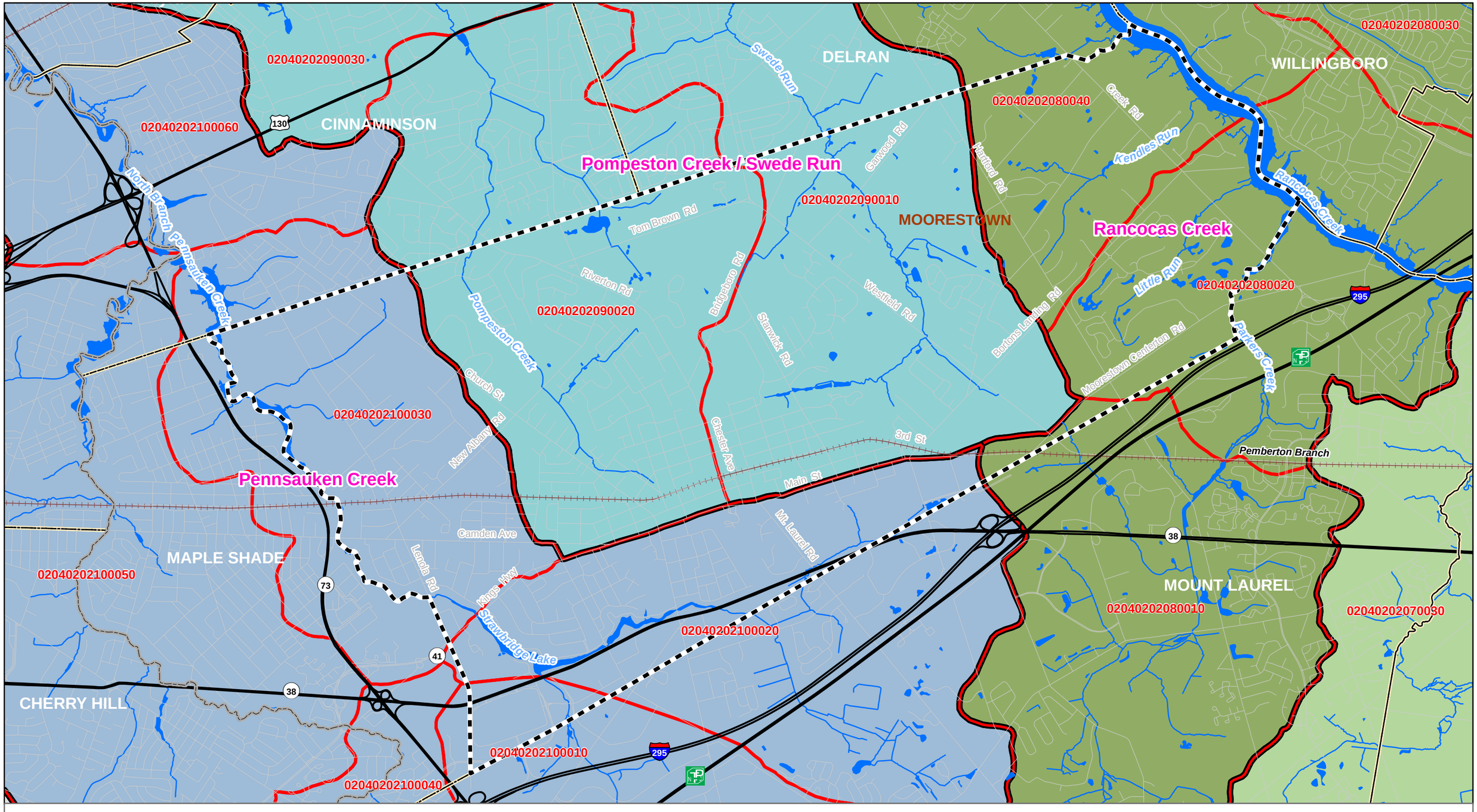
N

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

# Map 8: Agricultural Quality of Soils

Acres are listed in Table 5.

dvrpc




Source : 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.

0 0.5 1
Miles

N

**Lower Delaware**

- 02040202090, Pompeston Creek / Swede Run
- 02040202100, Pennsauken Creek

**Rancocas**

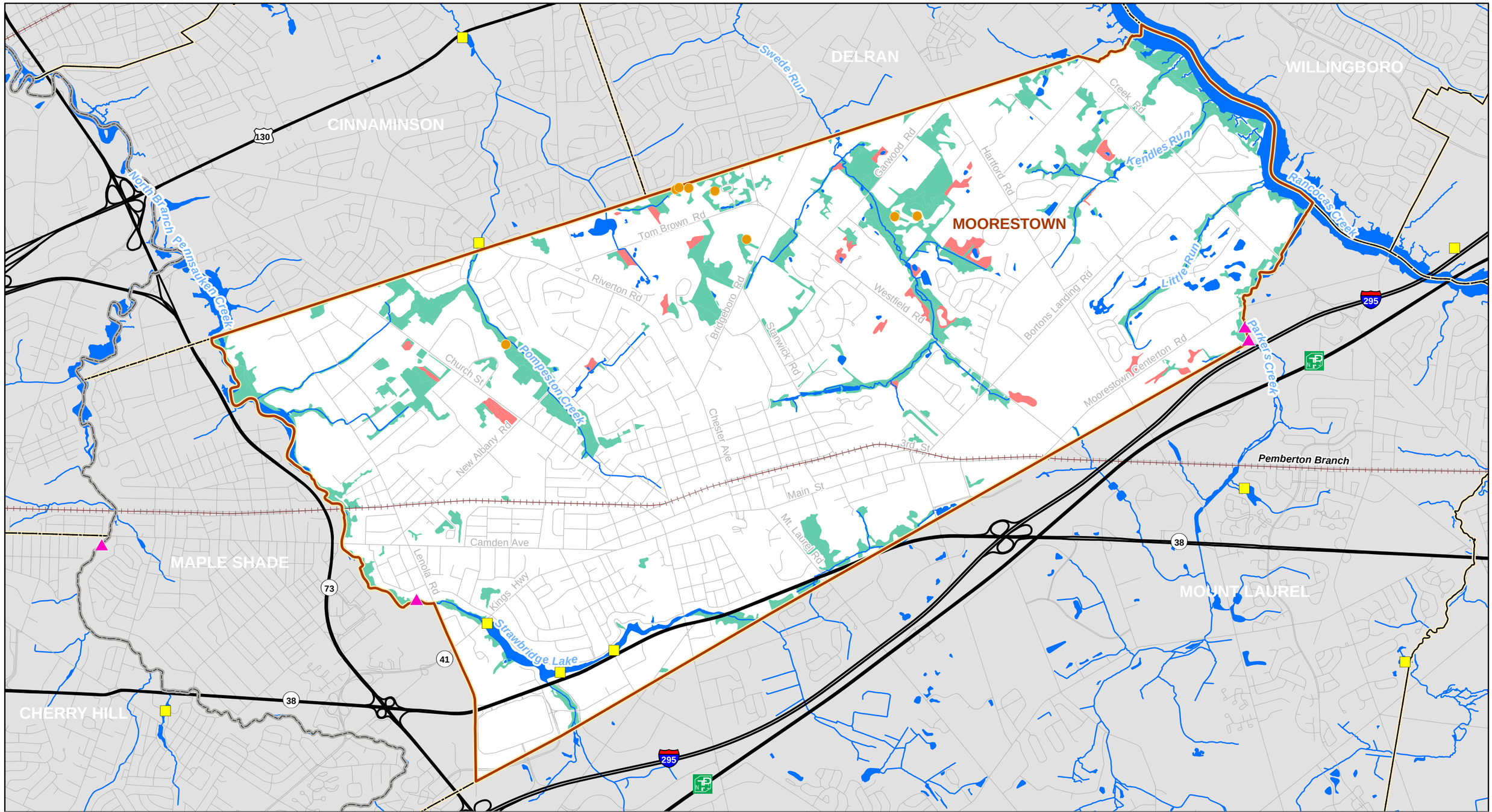
- 02040202080, Rancocas Creek
- 02040202070, Rancocas Creek SB

- Moorestown Township
- HUC 11 Watershed
- HUC 14 Subwatershed

# Map 9: Watersheds

Acres are listed in Table 7.

dvrpc



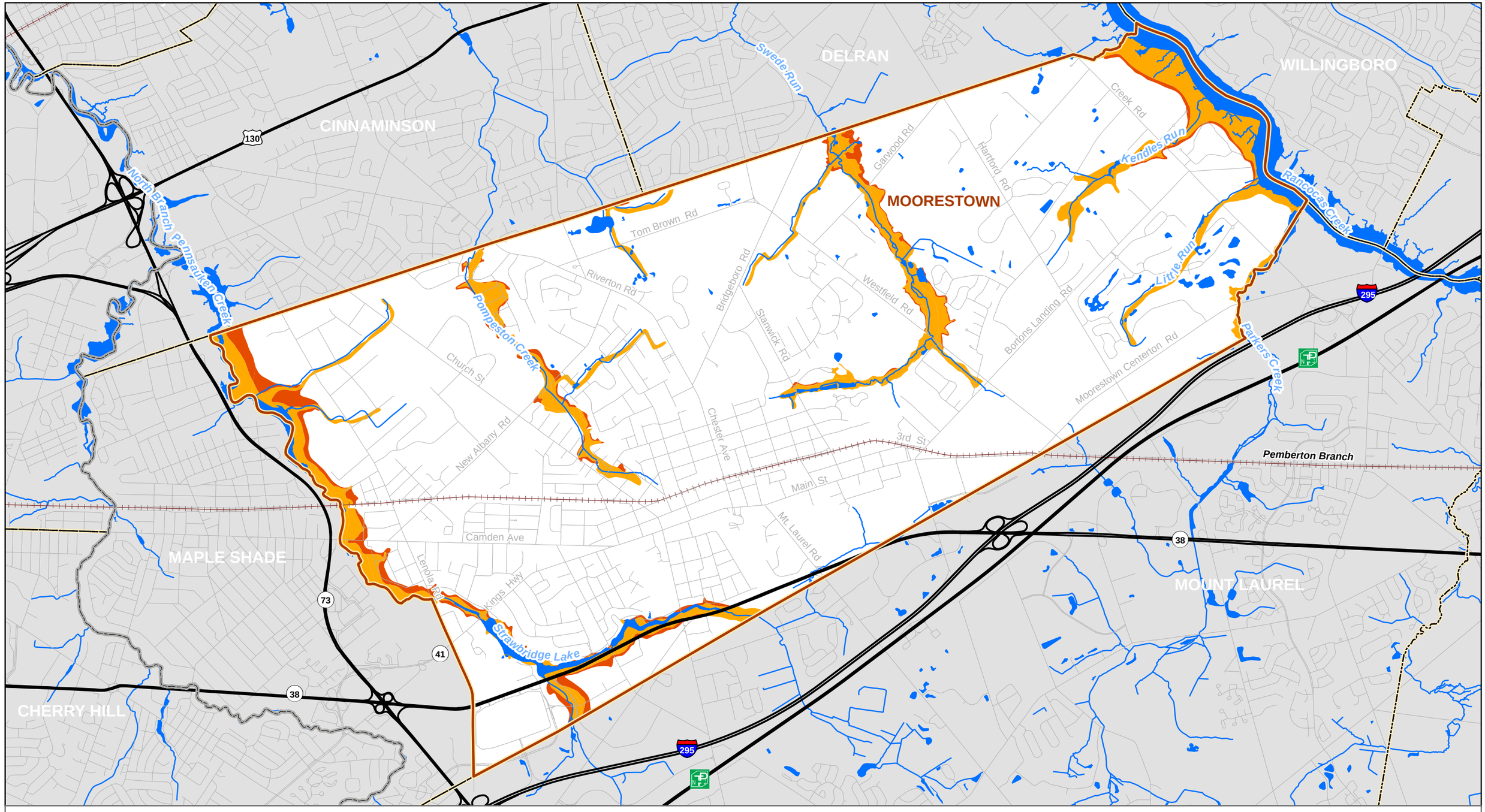

Source : NJDEP,NJDOT,DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

0 0.5 1
Miles

- Dam
- Head of Tide
- Potential Vernal Pool
- Agricultural Wetlands
- Wetlands

# Map 10: Surface Water and Wetland Resources

dvrpc




Source : 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.

0 0.5 1
Miles

N

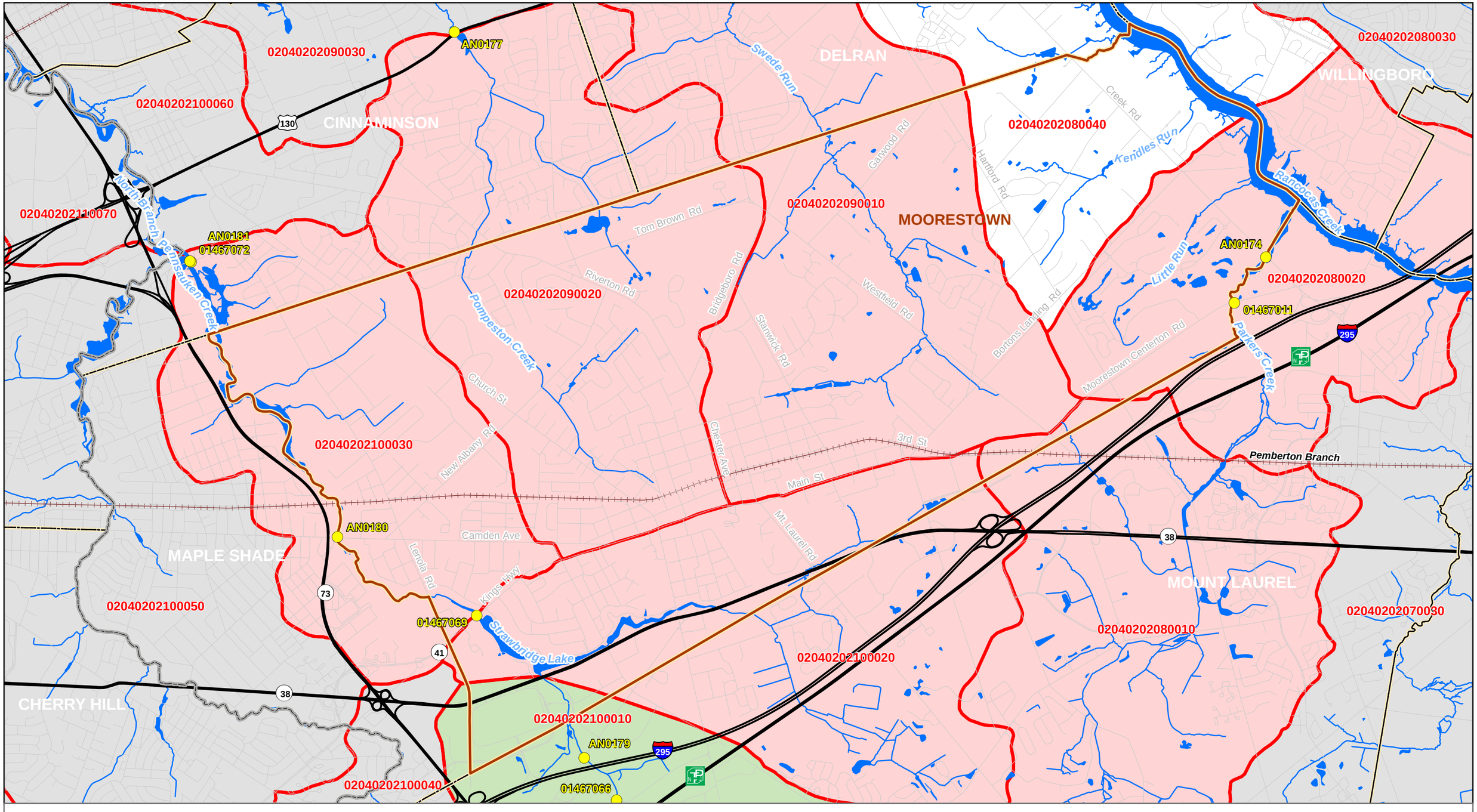
**Floodplain**

- 100-Year Floodplain
- 500-Year Floodplain

# Map 11: Floodplains (1996)

Acres are listed in Table 8.

dvrpc




Source : 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.

0 0.5 1
Miles

**2010 Integrated Water Quality Report**

**General Aquatic**

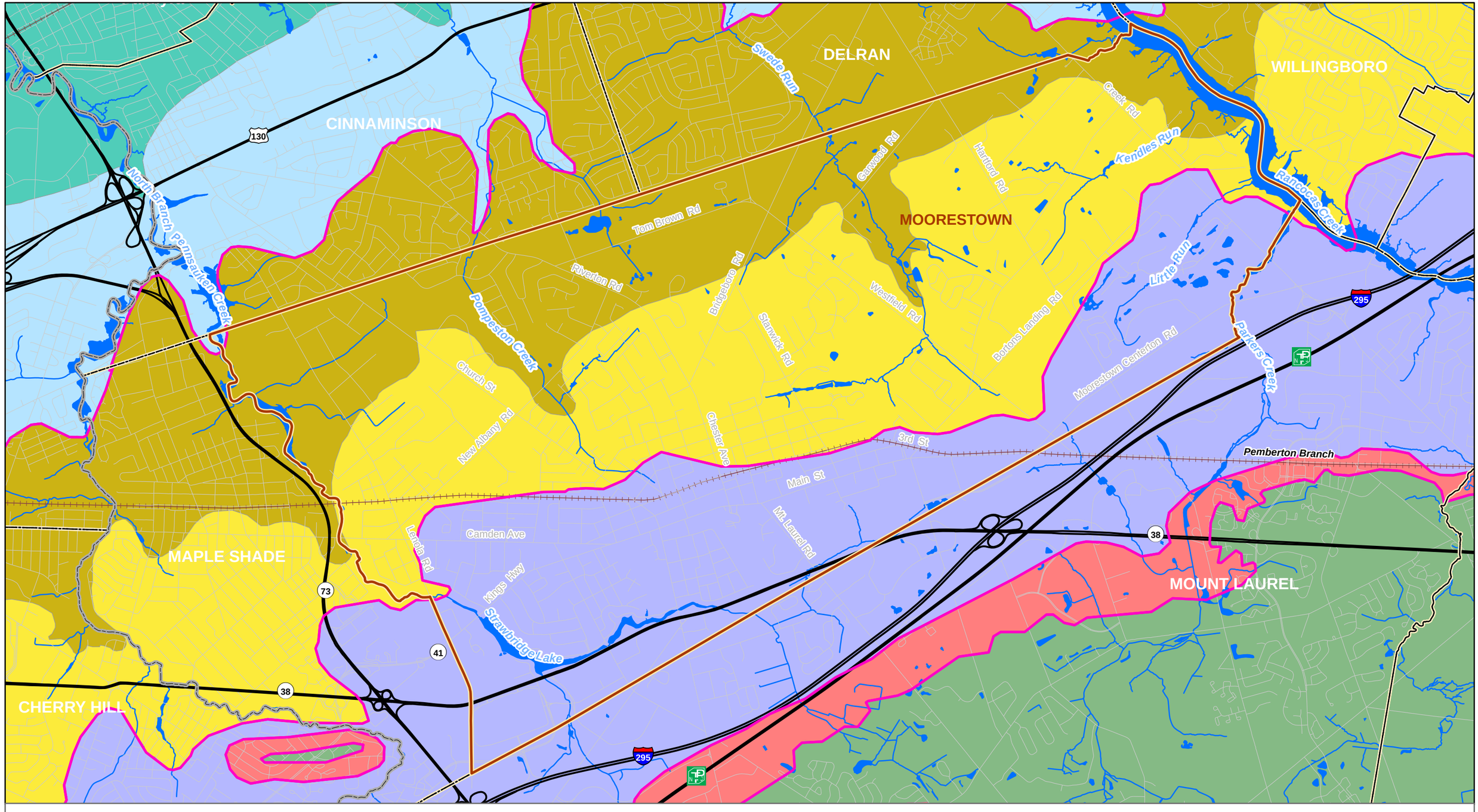
- Fully Supporting
- Insufficient Information
- Not Supporting

- Water Quality Monitoring Station
- Subwatershed Boundary (HUC 14)

# Map 12: Surface Water Quality (2010)

Subwatershed assessments are listed in Table 9.
Station information is listed in Table 11.

dvrpc




Source : NJDEP,NJDOT,DVRPC.
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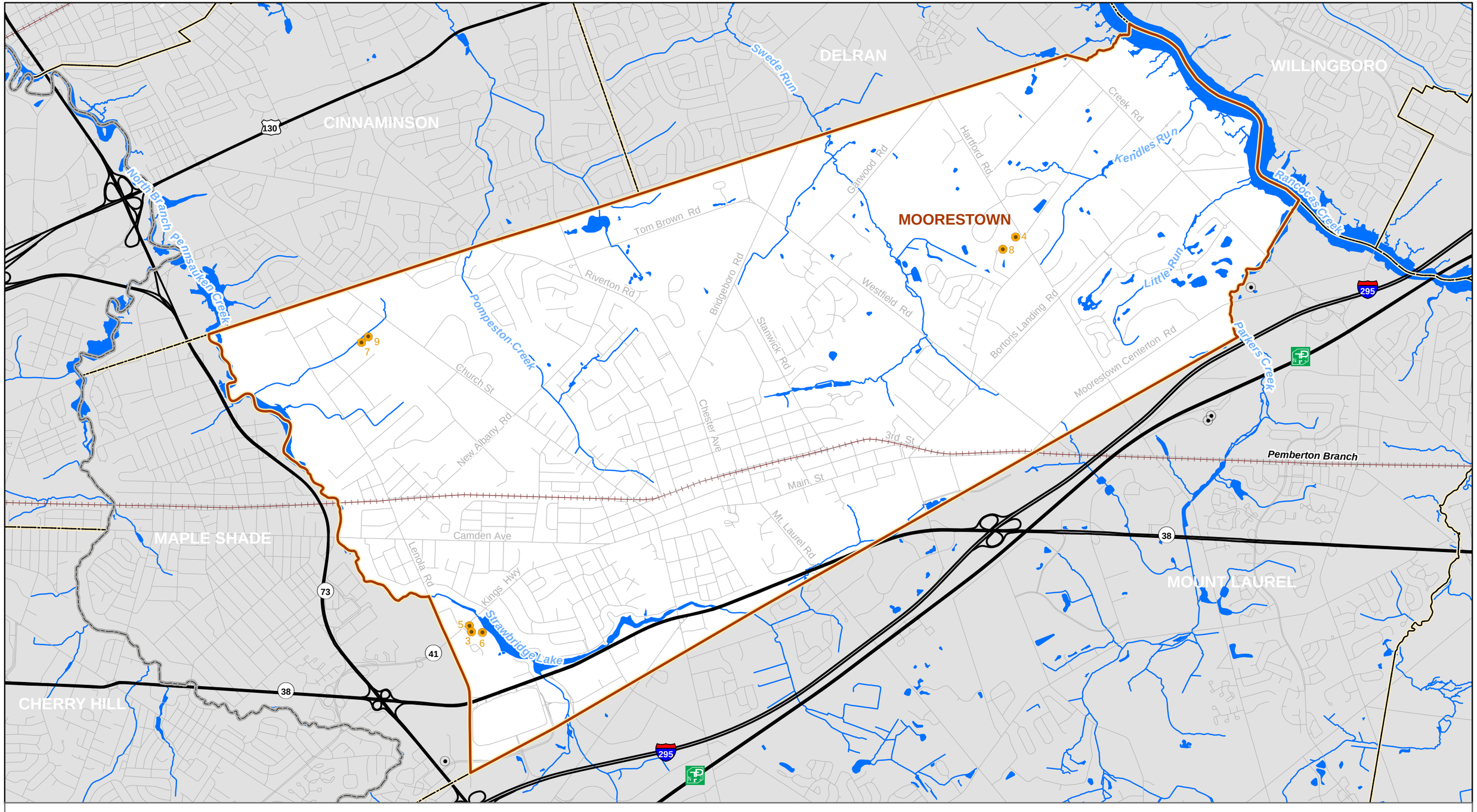
0 0.5 1
Miles

- Bedrock Aquifers
- Potomac Formation
- Magothy Formation
- Merchantville Formation
- Woodbury Formation
- Englishtown Formation
- Marshalltown Formation
- Wenonah Formation

# Map 13: Geologic Outcrops

dvrpc




Source : NJDEP,NJOT,DVRPC.
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Miles

N

Community Well

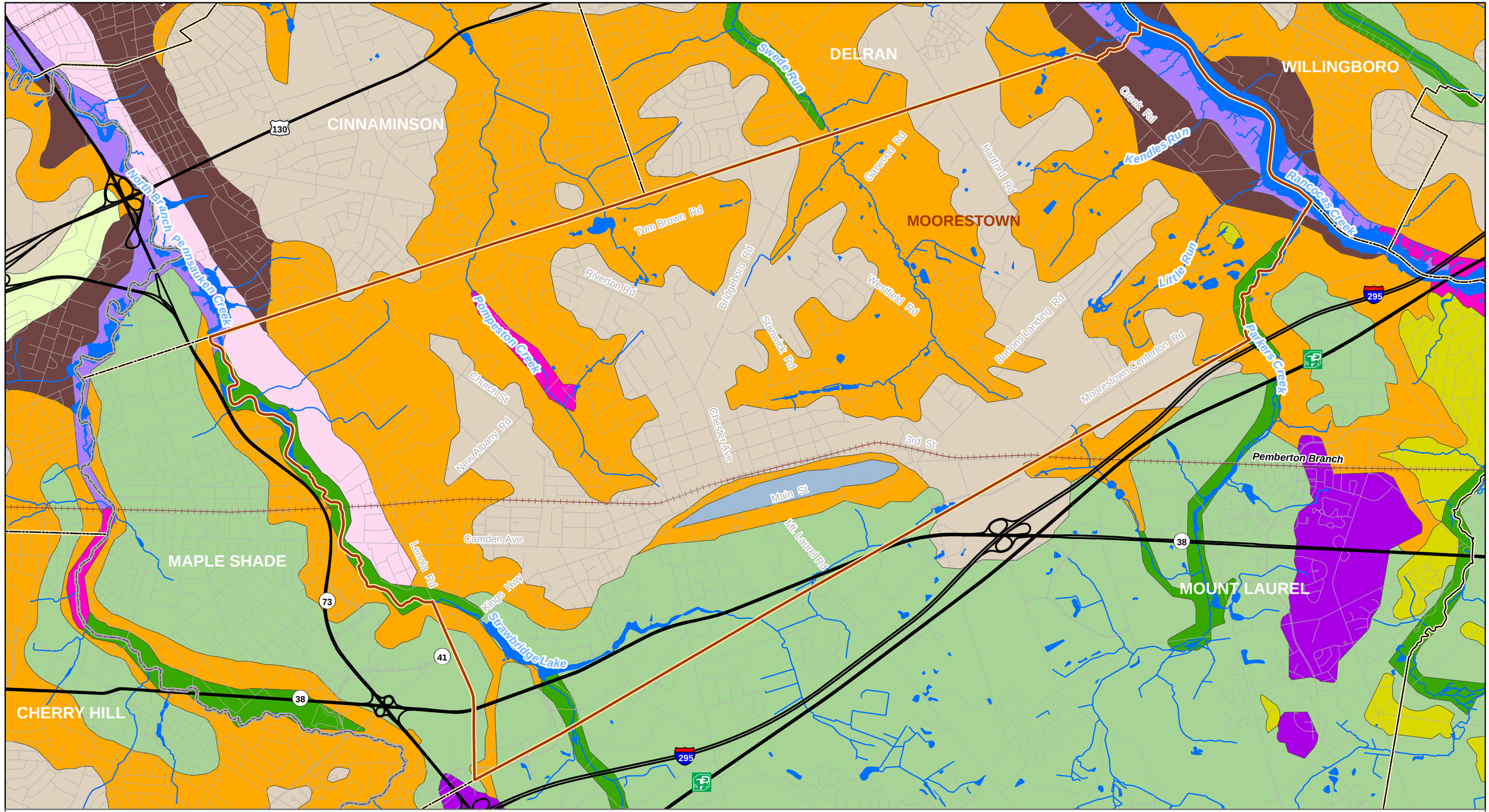
Non-Community Well

Community Wells labeled by Well Name.

# Map 14: Public Water Supply Wells

Well information is listed in Table 14.

dvrpc




Source : NJDEP,NJDOT,DVRPC.
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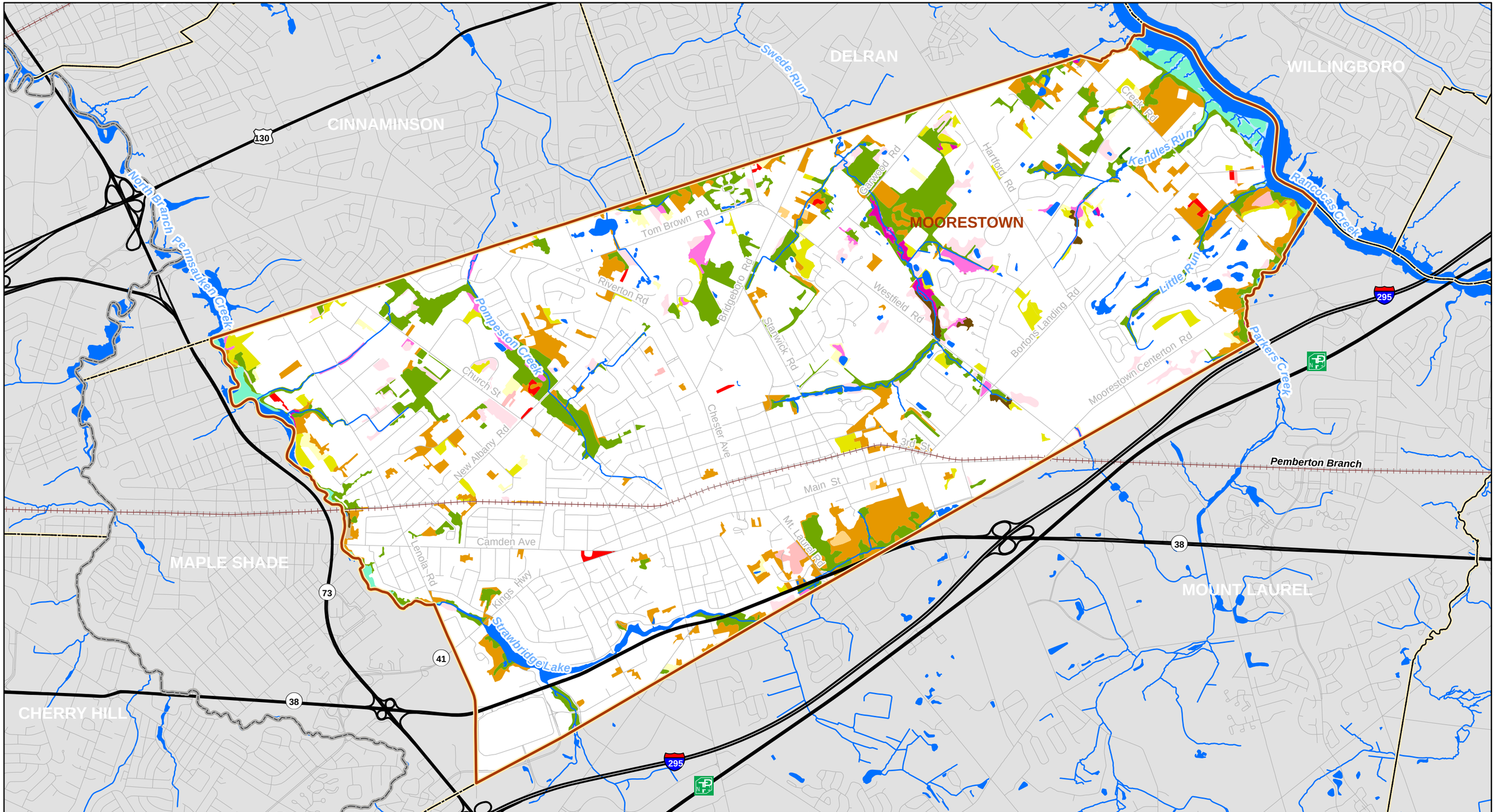
Miles

- Alluvium
- Cape May Formation, Unit 1
- Cape May Formation, Unit 2
- Elolian Deposits
- Lower Stream Terrace Deposits
- Pensauken Formation
- Salt-Marsh and Estuarine Deposits
- Swamp and Marsh Deposits
- Upland Gravel
- Upland Gravel, Lower Phase
- Upper Stream Terrace Deposits
- Weathered Coastal Plain Formations

# Map 15: Surface Geology

dvrpc




Source : NJDEP,NJDOT,DVRPC.
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Miles

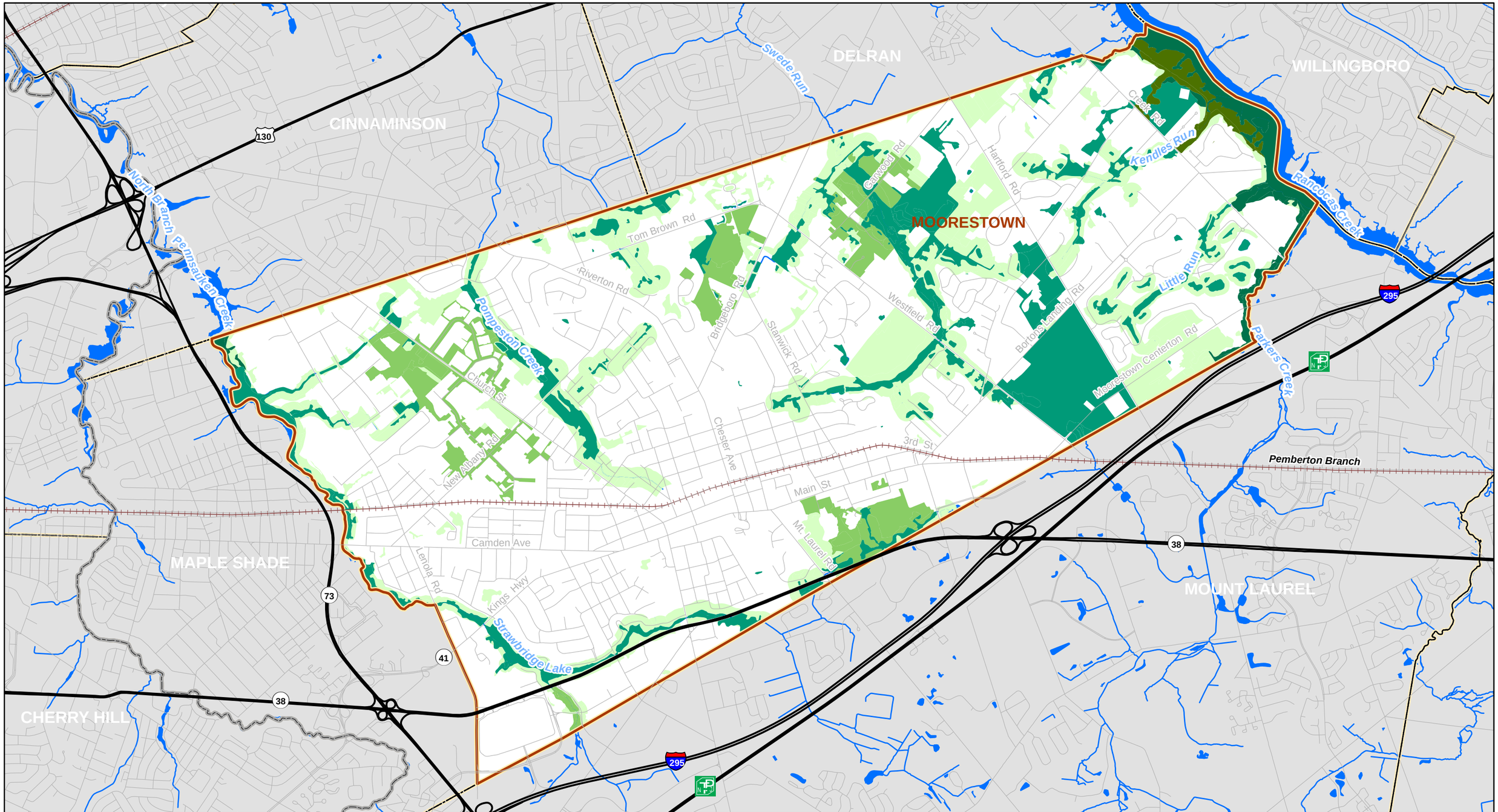
**Vegetation**

- Brush/Shrubland
- Brush/Shrubland - Oldfield
- Upland Forest - Coniferous
- Upland Forest - Mixed (Con. Dom.)
- Upland Forest - Deciduous
- Upland Forest - Mixed (Decid. Dom.)
- Water
- Tidal Waters
- Tidal Marshes - Freshwater
- Wetlands - Modified
- Wetlands - Scrub/Shrub
- Wetlands - Herbaceous
- Wetlands - Coastal (Phragmites Dominated)
- Wetlands - Phragmites Dominated
- Wetlands - Wooded - Deciduous
- Wetlands - Wooded - Coniferous

# Map 16: Natural Vegetation (2007)

Acres are listed in Table 17.

dvrpc




Source : 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.

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Miles

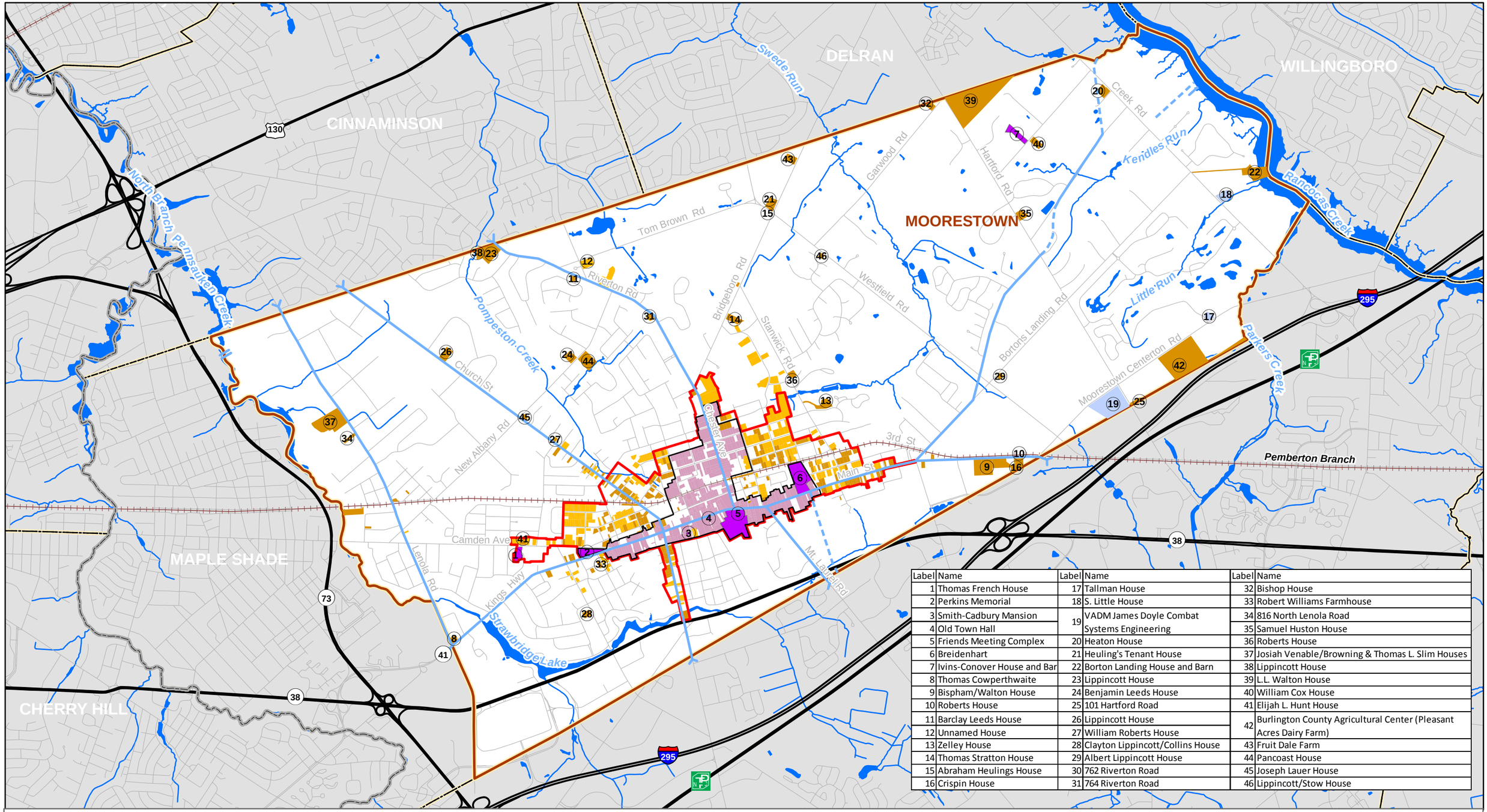
**Habitat Patches**

- Rank 1: Patches that contain species meeting requirements such as minimum core size or are criteria for endangered, threatened or special wildlife
- Rank 2: Patches with one or more occurances of species considered to be of special concern
- Rank 3: Patches containing one or more occurences of State threatened species
- Rank 4: Patches with one or more occurrences of State endangered species
- Rank 5: Patches with one or more occurrences of wildlife listed as endangered and threatened pursuant to the Federal Endangered Species Act of 1973

# Map 17: Landscape Project Priority Habitats (2012)

Acres are listed in Table 18.

dvrpc




| Label | Name | Label | Name | Label | Name |
|---|---|---|---|---|---|
| 1 | Thomas French House | 17 | Tallman House | 32 | Bishop House |
| 2 | Perkins Memorial | 18 | S. Little House | 33 | Robert Williams Farmhouse |
| 3 | Smith-Cadbury Mansion | 19 | VADM James Doyle Combat Systems Engineering | 34 | 816 North Lenola Road |
| 4 | Old Town Hall | | | 35 | Samuel Huston House |
| 5 | Friends Meeting Complex | 20 | Heaton House | 36 | Roberts House |
| 6 | Breidenhart | 21 | Heuling's Tenant House | 37 | Josiah Venable/Browning & Thomas L. Slim Houses |
| 7 | Ivins-Conover House and Bar | 22 | Borton Landing House and Barn | 38 | Lippincott House |
| 8 | Thomas Cowperthwaite | 23 | Lippincott House | 39 | L.L. Walton House |
| 9 | Bispham/Walton House | 24 | Benjamin Leeds House | 40 | William Cox House |
| 10 | Roberts House | 25 | 101 Hartford Road | 41 | Elijah L. Hunt House |
| 11 | Barclay Leeds House | 26 | Lippincott House | 42 | Burlington County Agricultural Center (Pleasant Acres Dairy Farm) |
| 12 | Unnamed House | 27 | William Roberts House | | |
| 13 | Zelley House | 28 | Clayton Lippincott/Collins House | 43 | Fruit Dale Farm |
| 14 | Thomas Stratton House | 29 | Albert Lippincott House | 44 | Pancoast House |
| 15 | Abraham Heulings House | 30 | 762 Riverton Road | 45 | Joseph Lauer House |
| 16 | Crispin House | 31 | 764 Riverton Road | 46 | Lippincott/Stow House |

Source : 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.

0 0.5 1
Miles

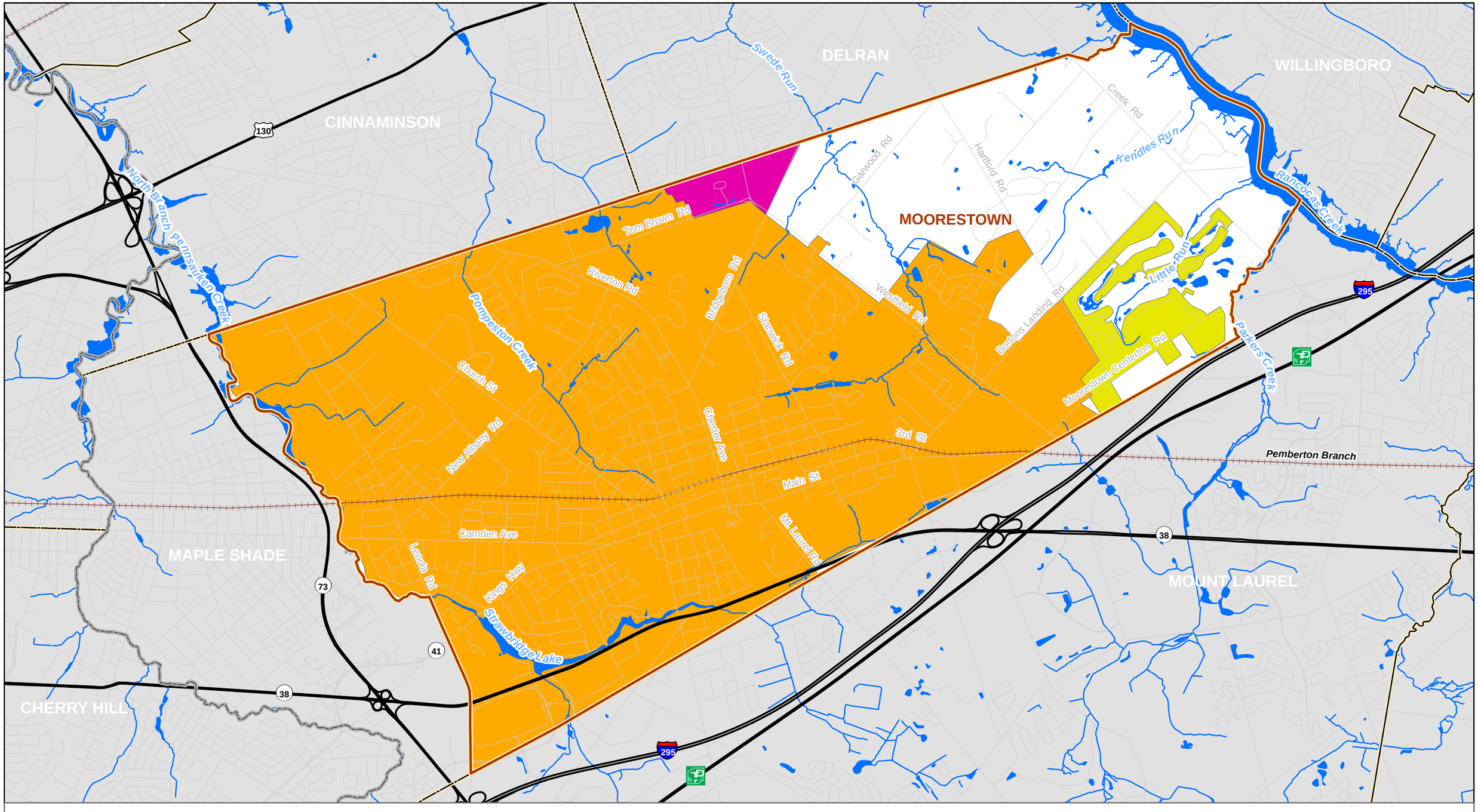
N

- Historic Roads-Defunct
- Historic Roads
- State & National Register Historic District
- Local Historic District
- State & National Register Individually Listed
- State & National Register Historic District
- State & National Register Eligible (SHPO Opinion)
- Pre 1900
- 1900-1930

# Map 18: Historic Resources

Site information is found in Tables 19 and 20.

dvrpc




Source : NJDEP,NJDOT,DVRPC.
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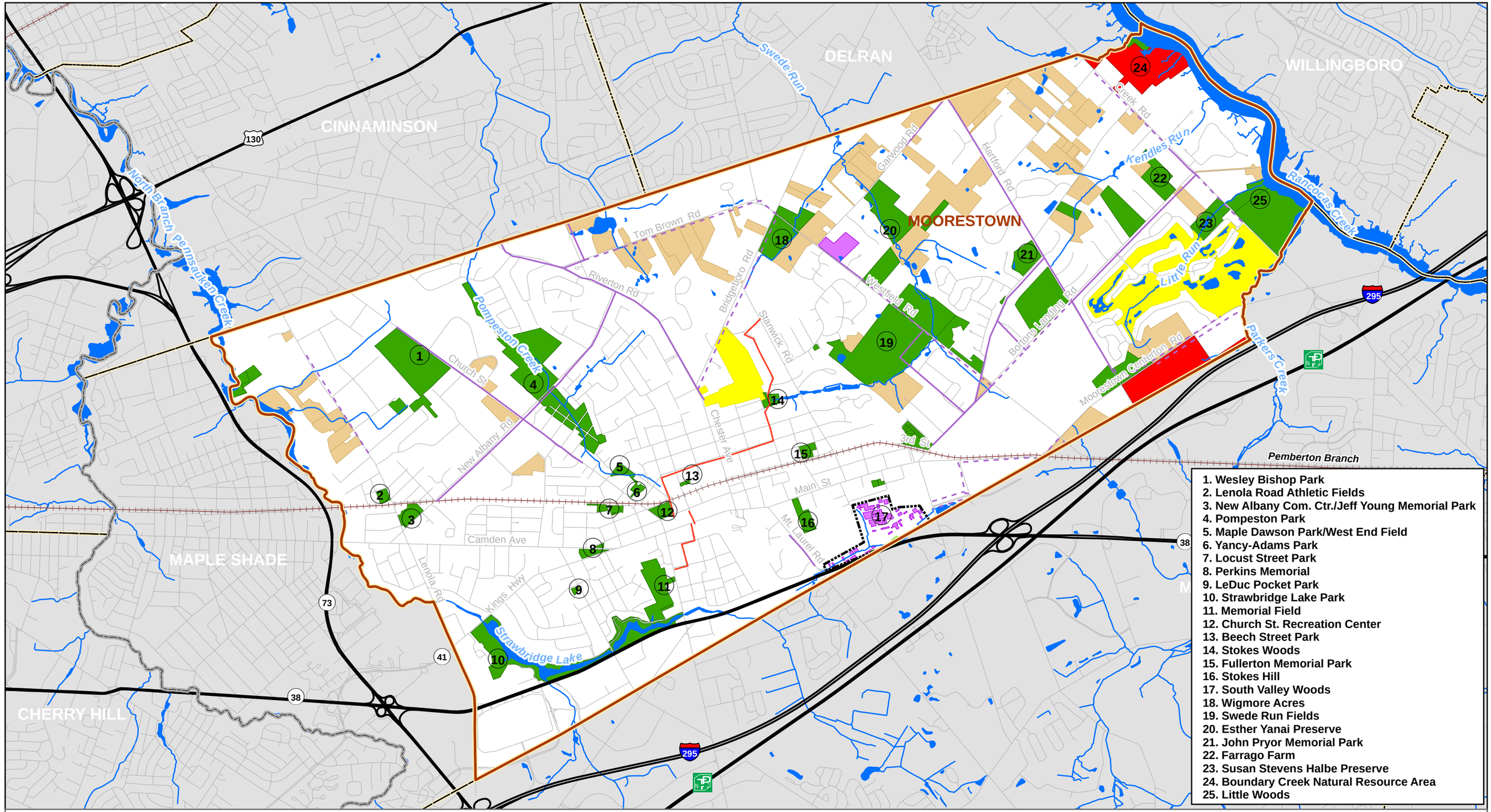
Miles

- Delran
- Moorestown
- Mount Holly

# Map 19: Approved Sewer Service Area

dvrpc




Source : NJDEP,NJDOT,DVRPC.
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0 0.5 1
Miles

N

Farm Assessed (Unpreserved)

**Open Space**

County
Nonprofit
Golf Course
Municipal

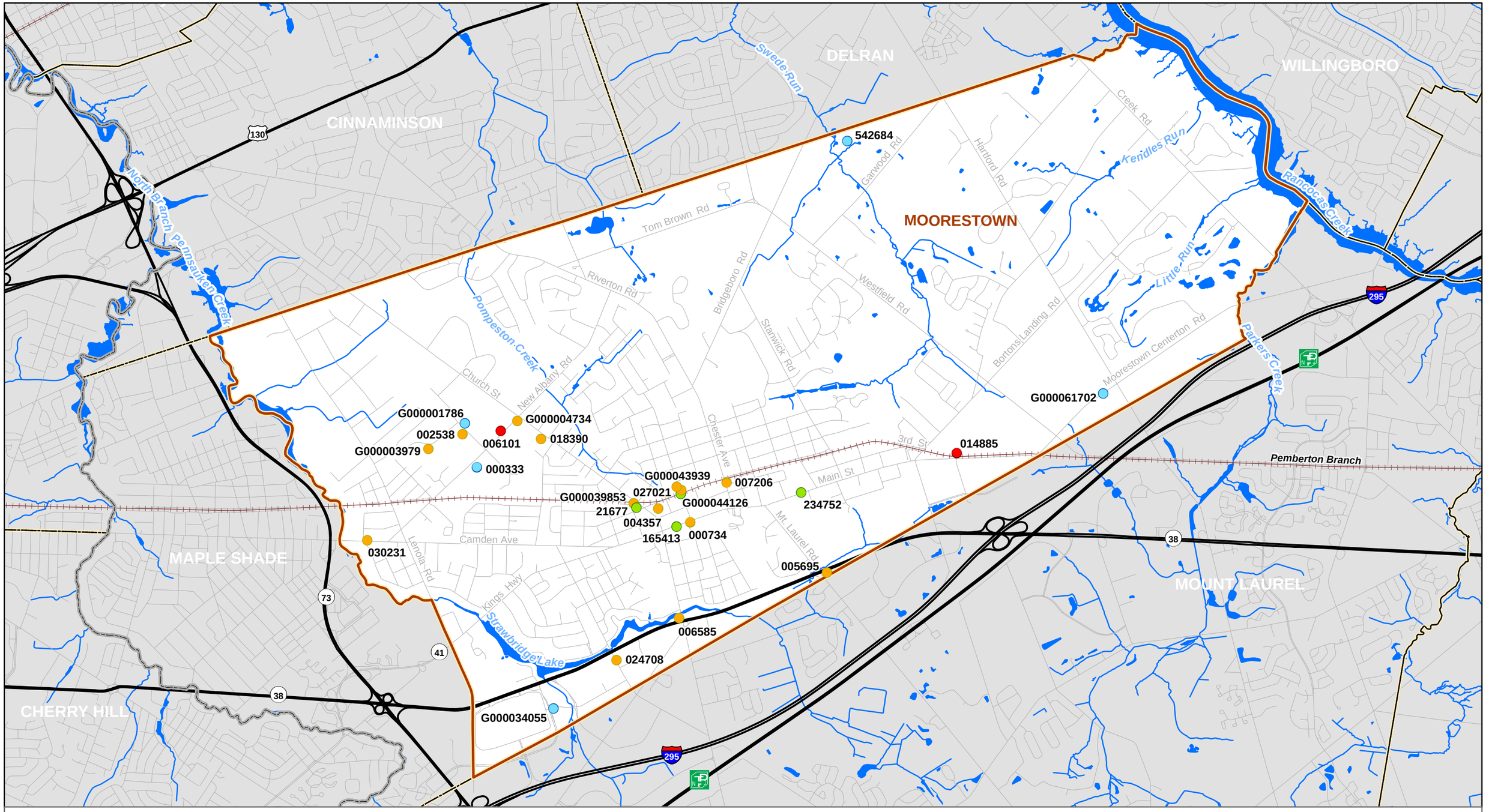
**Bike Lanes**

Existing, Off-Road
Proposed, Off-Road
Existing, On-Road
Proposed, On-Road

# Map 20: Parks, Recreation, and Open Space

Acres and uses are found in Table 21.

dvrpc




Source : NJDEP,NJDOT,DVRPC.
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0 0.5 1
Miles

N

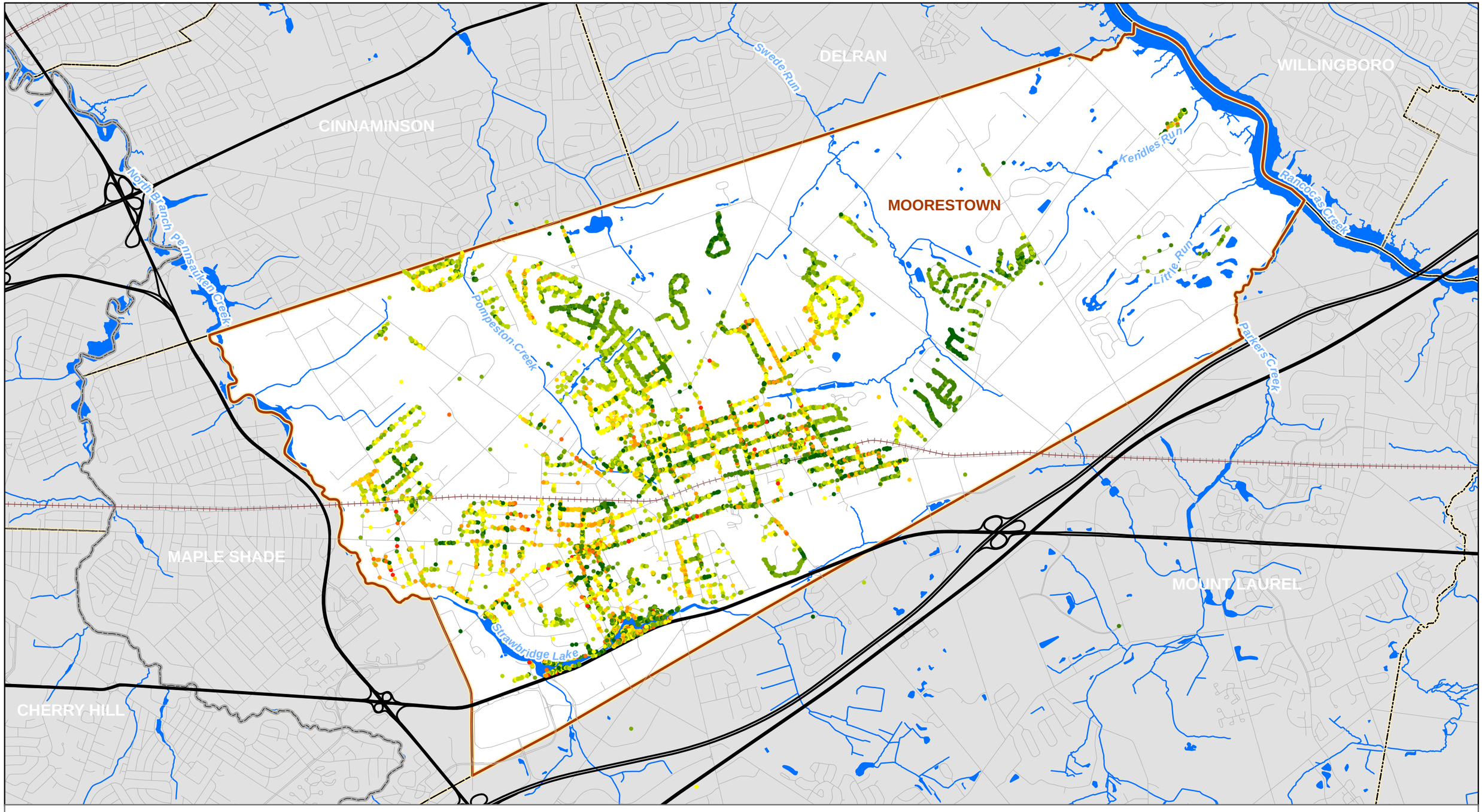
**Remedial Level**

- 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
- D: Multi-Phased Remedial Action, Multiple Source/Release to Multi-media Including Groundwater

# Map 21: Known Contaminated Sites (2012)

Sites are listed in Table 22.

dvrpc

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0 0.5 1
Miles

N

**Tree Diameter at Breast Height (DBH) in Inches**

- 0 to 3
- 3 to 6
- 6 to 12
- 12 to 18
- 18 to 24
- 24 to 30
- 30 to 36
- 36 to 42
- 42 and greater

# Map 22: Tree Survey

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| | |
|---|---|
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Abstract

This publication documents the natural and community resources of Moorestown 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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