



ENVIRONMENTAL RESOURCE INVENTORY

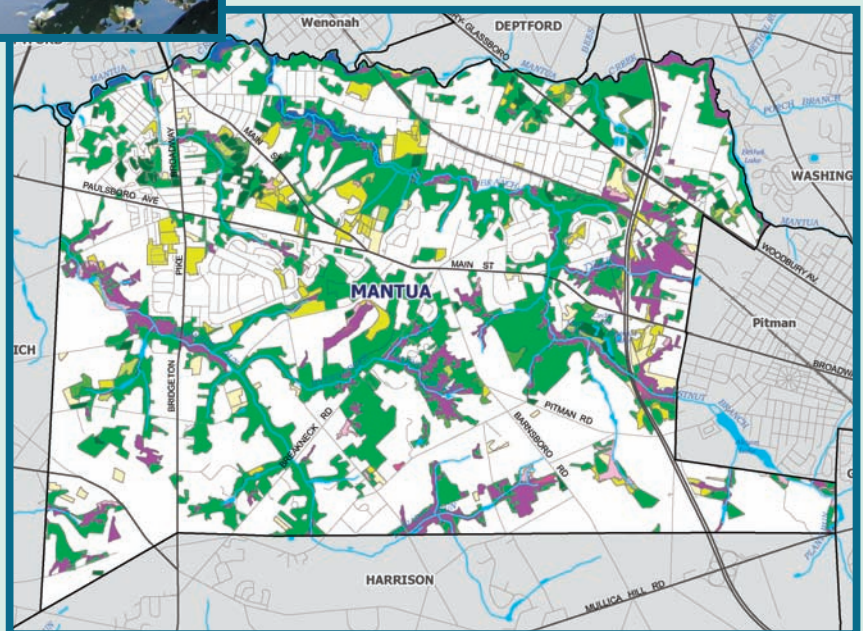


for the **TOWNSHIP** of



MANTUA

GLOUCESTER COUNTY, NEW JERSEY



prepared by:



Delaware Valley
Regional Planning
Commission

with:

The Environmental
Commission of
Mantua Township

MARCH 2005



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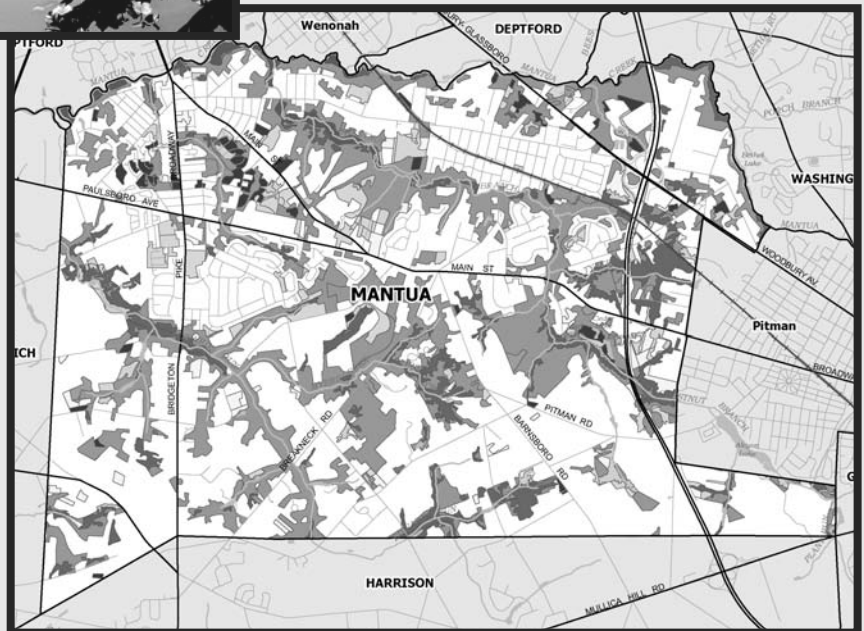


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Created in 1965, the Delaware Valley Regional Planning Commission (DVRPC) is an interstate, intercounty and intercity agency that provides continuing, comprehensive and coordinated planning to shape a vision for the future growth of the Delaware Valley region. The region includes Bucks, Chester, Delaware, and Montgomery counties, as well as the City of Philadelphia, in Pennsylvania; and Burlington, Camden, Gloucester and Mercer counties in New Jersey. DVRPC provides technical assistance and services; conducts high priority studies that respond to the requests and demands of member state and local governments; fosters cooperation among various constituents to forge a consensus on diverse regional issues; determines and meets the needs of the private sector; and practices public outreach efforts to promote two-way communication and public awareness of regional issues and the Commission.



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

This report was funded by the Association of New Jersey Environmental Commissions (ANJEC) Smart Growth Assistance Grant Program, funded by the Geraldine R. Dodge Foundation, and by the Township of Mantua. Funding was also provided by the Delaware Valley Regional Planning Commission's Open Space and Greenways Program. The authors are solely responsible for the report's findings and conclusions, which may not represent the official views or policies of the non-municipal funding agencies.

MANTUA TOWNSHIP ENVIRONMENTAL RESOURCE INVENTORY

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MANTUA TOWNSHIP ENVIRONMENTAL RESOURCE INVENTORY

ACKNOWLEDGEMENTS

Many thanks are due to the organizations that provided funding for *this Environmental Resources Inventory for the Township of Mantua*. They are:

- The Association of New Jersey Environmental Commissions (ANJEC) Smart Growth Assistance Grant Program, funded by the Geraldine R. Dodge Foundation
- The Township of Mantua
- The Delaware Valley Regional Planning Commission's Open Space and Greenways Program

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Pete Scirrotto, Committeeman
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The impetus for the creation of this document, and its guidance and review, came from the Mantua Township Environmental Commission.

The Mantua Township Environmental Commission

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Special appreciation and thanks is extended to Richard Cromley, Chair of the Mantua Township Environmental Commission, for guiding the ERI process from beginning to end, supplying data and resources, and organizing ERI meetings. Appreciation is also extended to staff at various New Jersey state offices who provided information for this inventory.

The following DVRPC staff members made significant contributions to this report:

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MANTUA ENVIRONMENTAL RESOURCES INVENTORY

SECTION 1: INTRODUCTION

The purpose of an Environmental Resource Inventory is to identify and describe the natural resources of a community. A community's natural resources – its soil, water, air, forests, fields, and waterways – are fundamental to its character. They are the foundation for its economic success and its quality of life. The protection and wise use of those resources is essential to the public health, safety, and welfare of current and future residents. The Environmental Resource Inventory provides the basis for the development of methods and steps to preserve, conserve, and utilize those resources.

Mantua Township's natural resources have long shaped the lives of its inhabitants. The Native Americans, who inhabited Mantua for more than 10,000 years before the arrival of Europeans, relied upon fish and game from the area's streams and extensive upland forests. Native American villages also made good use of the region's rich agricultural soils, farming indigenous corn, tomatoes and fruit. The high-quality soils of Mantua also played a major role in the development of European settlements. Almost immediately after their arrival, the first Swedish and English settlers began to clear the forest and work the land, raising grain, fruits and vegetables.

While the natural resources of the township were the primary factor shaping the lives of Mantua's residents for thousands of years, in the past half century the patterns and challenges of suburban development have become the predominant and most visible themes in the township. As population and residential development in Mantua increase, documentation of its natural resources has become a necessity, especially if it is to support the residents of the future. Resources such as surface and ground water will become increasingly important to Mantua's population and to that of neighboring communities. Mantua's wetlands, forests, and grasslands, which provide significant habitat for a wide variety of plants and animals, will be vital to the continued health of the town and the enjoyment of its citizenry. Detailed knowledge of these resources will empower Mantua's citizens to make informed decisions as they confront the challenges of growth while maintaining and conserving the natural resources that make Mantua special. In so doing, Mantua's residents can cultivate and nurture their community's identity and the sense of place it provides.

Preparing an Environmental Resource Inventory requires gathering all the existing information that can be found about a township's resources, and presenting it in a form that is useful to a broad audience. The Inventory reflects a particular moment in time, and it is assumed that it will be updated as new data becomes available.

Several documents and reports were utilized in preparing the *Environmental Resource Inventory for Mantua Township*, including the *Mantua Township Master Plan* from 1990, along with a number of reference works. These are listed at the end of this document. The maps and data relating to Mantua Township's natural resources are derived from the New Jersey Department of Environmental Protection's (NJDEP's) Geographic Information System mapping, from *The Landscape Project* produced by the Endangered and Nongame Species Program of the New

INTRODUCTION

Jersey Fish and Wildlife Division, and from mapping data compiled and prepared by the Delaware Valley Regional Planning Commission (DVRPC).



A Bucolic Scene Typical of Mantua's Rural Spaces

Photo by Allison Hastings

SECTION 2: BRIEF TOWNSHIP HISTORY

Mantua Township was incorporated on February 23, 1853 and named after the Mantua Creek, which forms the township's northern border with the Borough of Wenonah and Deptford Township. The township was originally part of the Civil Organization of West Jersey, established in 1676, and was within Greenwich Township, one of the four incorporated jurisdictions in what is now Gloucester County. In February of 1881, the western portion of the township detached to form East Greenwich Township.

Recent archaeological finds show that humans have been present on the land within township boundaries for approximately 10,000 years. Early Native American communities relied on the township's natural resources until the arrival of Europeans. Throughout Gloucester County, pre-European settlements were associated with stream corridors. The Native Americans who lived along what is now known as Mantua Creek were known as the Mantas (the Lenape word for frog). Both the creek, and subsequently the township, were named for this tribe.

In 1638, Swedish settlers ventured to the Delaware Valley and established a colony at the confluence of the Delaware River and Raccoon Creek in what is now Logan Township. Individual Swedish families, accustomed to water travel, purchased land from the Indians and founded their own homesteads along the interior waterways.

Dutch colonists, who had settled in present-day Manhattan in 1624 and who had laid claim to all of the land in present-day New Jersey, ceded control of their territories to the English in 1664. Shortly thereafter, most of New Jersey's Swedish settlers abandoned their Raccoon Creek village for Fort Christiana in Delaware. The remaining Swedish, those who tended thriving farms and established successful trade with the Indians, gave shelter to the first English travelers, including those passengers of the first English ship, *Kent*, which arrived in 1677 and docked at Raccoon Creek.

Early Swedish and English settlers raised grain, fruit and vegetables, and tended stock. In the 1800s, Mantua's rich marl deposits were discovered and a new industry flourished. Marl is a soil rich in calcium and carbonated lime that was used as commercial fertilizer. It was excavated and exported throughout the Delaware Valley.

Mantua Township contained several significant residential communities in the late 19th century, some of which are now separate municipalities. The Village of Mantua, the oldest settlement in the township, was located on the northeast border on an elevated bluff overlooking Mantua Creek. Barnsboro, a stagecoach stop, was at the center of Mantua Township, situated at the intersection of four major roads. Sewell was another important stagecoach stop, lying between Barnsboro and Turnersville in present-day Washington Township, and named after a local Civil War hero and official of the West Jersey Railroad Company, General William T. Sewell. Pitman Grove, a Methodist camp-meeting town founded in 1871, was located along the eastern edge of the township. By 1904, Pitman's seasonal parishioners had become permanent residents and the town seceded from Mantua Township to form the Borough of Pitman. In the 1870s, a land improvement company began to promote a new bedroom community centered on a West Jersey

BRIEF TOWNSHIP HISTORY

railroad station known as Wenonah. Wenonah, named after a character from a Henry Wadsworth Longfellow's poem "The Song of Hiawatha," also seceded from the township to become its own borough at the turn of the 20th century.

Waterways were important to Mantua from its earliest days. Because Mantua Creek is tidal up to a point within the township, the Village of Mantua became a regional shipping point. Farm products, as well as timber from the rich forests, were conveyed to downstream markets.

Travel on roads was extremely difficult during the 18th and early 19th centuries. Private individuals usually maintained roads and bridges and they often erected tollhouses to fund construction and upkeep. Route 553A (Main Street) was an important toll road, often traveled by stagecoaches and farmers between the villages of Mantua and Glassboro, with a toll in Barnsboro.



Photo by Chris Linn

Historic House in Downtown Mantua

Railroads and trolley lines were key factors in Mantua's growth from the mid 19th until well into the 20th century. Unlike other large agricultural townships in Gloucester County, Mantua experienced early residential development due to the placement of railroad stations. For example, in the late 19th century, Wenonah, Pitman Camp Meeting, and Greenlawn in Sewell were successful middle-class towns built around railroad stations. The railways gave these towns access to the regional centers of Woodbury, Camden and Philadelphia. Additionally, Mantua, Pitman, Barnsboro, and Sewell were connected to the Camden-Gloucester & Woodbury trolley system. Shortly after the First World War, buses replaced the trolley lines and in 1942, the Gloucester County Board of Chosen Freeholders ordered the removal of abandoned trolley tracks so that the steel could be used for the World War II effort.

Highways and trucks began to replace railroad transport of both goods and people after World War II. In the 1950s, the New Jersey Turnpike was built, with one of its exits on Route 322 in nearby Woolwich Township. In the 1960s, the construction of Interstates 295 and 55 made large areas of southern New Jersey more accessible by automobile and encouraged the suburbanization of the region.

Today, Mantua is a rapidly developing community, home to over 14,000 people. From 1990 to 2000, Mantua's population increased by over 41 percent (from 10,074 to 14,217 residents). DVRPC projects a population of 15,180 in 2005, and 16,200 in 2010. Reflecting Mantua's population growth, the number of housing units increased from 3,619 units to 5,411 units between 1990 and 2000. Since 2001, Mantua's planning board has approved an additional seven major subdivisions and eight minor subdivisions. This rapid residential growth is indicative of Mantua's shift from a rural farming community to a suburban bedroom community. Indeed, the majority of the township's workers commute to locations outside of the township, and nearly half (49.9 percent) work beyond the borders of Gloucester County.



Former Rail Station, Downtown Sewell

Photo by Chris Linn

BRIEF TOWNSHIP HISTORY

SECTION 3: MANTUA TOWNSHIP LOCATION, SIZE, AND LAND USE

Mantua is an incorporated township located in central Gloucester County, New Jersey. The township is bounded by eight Gloucester County municipalities: Washington, Deptford and West Deptford townships to the north and east; East Greenwich Township to the northwest; Harrison Township to the southwest; Glassboro and Pitman boroughs to the southeast and Wenonah Borough to the northeast. The Mantua Creek forms the township's entire northeastern boundary. See **Map 1: Mantua Township**

Mantua Township occupies 10,264 acres or 16 square miles on the coastal plain of New Jersey. Mantua's land use reflects its natural setting, its long agricultural past, and the successive waves of suburban residential development that have occurred since the end of World War II. The southwestern half of the township is still quite rural, while the northeastern portion is largely developed. Residential development is concentrated primarily in the northeastern portion of the township, most of which occurred during the 1940s, '50s, '60s and from 1990 to the present. During the 1990s, Mantua population grew by 4,000 residents, a 41 percent increase.



Photo by Chris Linn

A 1950s-era House in Sewell

MANTUA TOWNSHIP LOCATION, SIZE, AND LAND USE

Notably, before European settlement, as much as 90 percent of the township was covered with a mostly mixed deciduous hardwood forest composed of oak, birch, ash, beech, hickory, walnut and maple trees. Although large portions of that expansive forest are now gone, almost 29 percent of the township remains forested. Given the good soils in Mantua, it is not surprising that as of 2002, an additional 29 percent of the township's land area was dedicated to agricultural uses. Developed land uses, which include residential, commercial, industrial, and civic land uses, occupy slightly more space than either forested or agricultural areas, covering almost 33 percent of Mantua. The township's remaining land is either barren (e.g., quarries, construction sites, athletic fields, etc.) or occupied by open water or wetlands.



Photo by Chris Linn

Forests and Fields in Mantua

Table 1 shows Mantua's land cover grouped into general categories based on the New Jersey Department of Environmental Protection's (NJDEP's) 1995/97 color infrared digital imagery updated with NJDEP's 2002 color aerial photography.¹

Table 2 breaks down the 1995/97 general land cover categories into detailed land cover categories.²

¹ The 1995/97 land cover dataset is NJDEP's most up-to-date comprehensive land use information. Updates to the general categories, based on NJDEP's 2002 color aerial photography, were performed by DVRPC in 2004.

² The land cover information in Table 2 is from 1995/1997 and is not updated to 2002.

MANTUA TOWNSHIP LOCATION, SIZE, AND LAND USE

Table 3 shows Mantua’s land uses according to DVRPC’s *Year 2000 Land Use Survey*, also updated to 2002.³

These categories are also depicted on **Map 2: NJDEP Land Cover** and **Map 3: DVRPC Land Use**.

Table 1: Mantua Township General Table Land Cover Classes (1995/97)

General Land Classes	Acres	Percent
Agriculture	2,875	28.01%
Barren Land	241	2.35%
Developed	3,598	35.05%
Forest	2,731	26.60%
Water	46	0.45%
Wetlands	773	7.54%
Total	10,264	100.00%

Source: NJDEP, Bureau of Geographic Information System

Table 2: DVRPC Year 2000 Land Use for Mantua Township

Land Uses	Acres	Percent
Agriculture	2,981	29.05%
Commercial	257	2.50%
Community Service	70	0.68%
Forest	3,239	31.56%
Industrial	83	0.81%
Mining	44	0.43%
Parking	69	0.68%
Recreation	292	2.84%
Residential	2,529	24.64%
Transportation	166	1.62%
Utility	146	1.43%
Vacant	332	3.24%
Water	56	0.55%
Total	10,264	100.00%

Source: DVRPC, Year 2000 Land Use Survey

³The DVRPC Year 2000 Land Use Survey is based on visual interpretation of aerial photography produced in March 2000 at a scale of 1:2,400. This data was updated based on NJDEP’s 2002 color aerial photography.

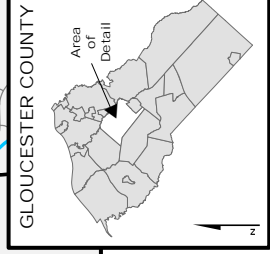
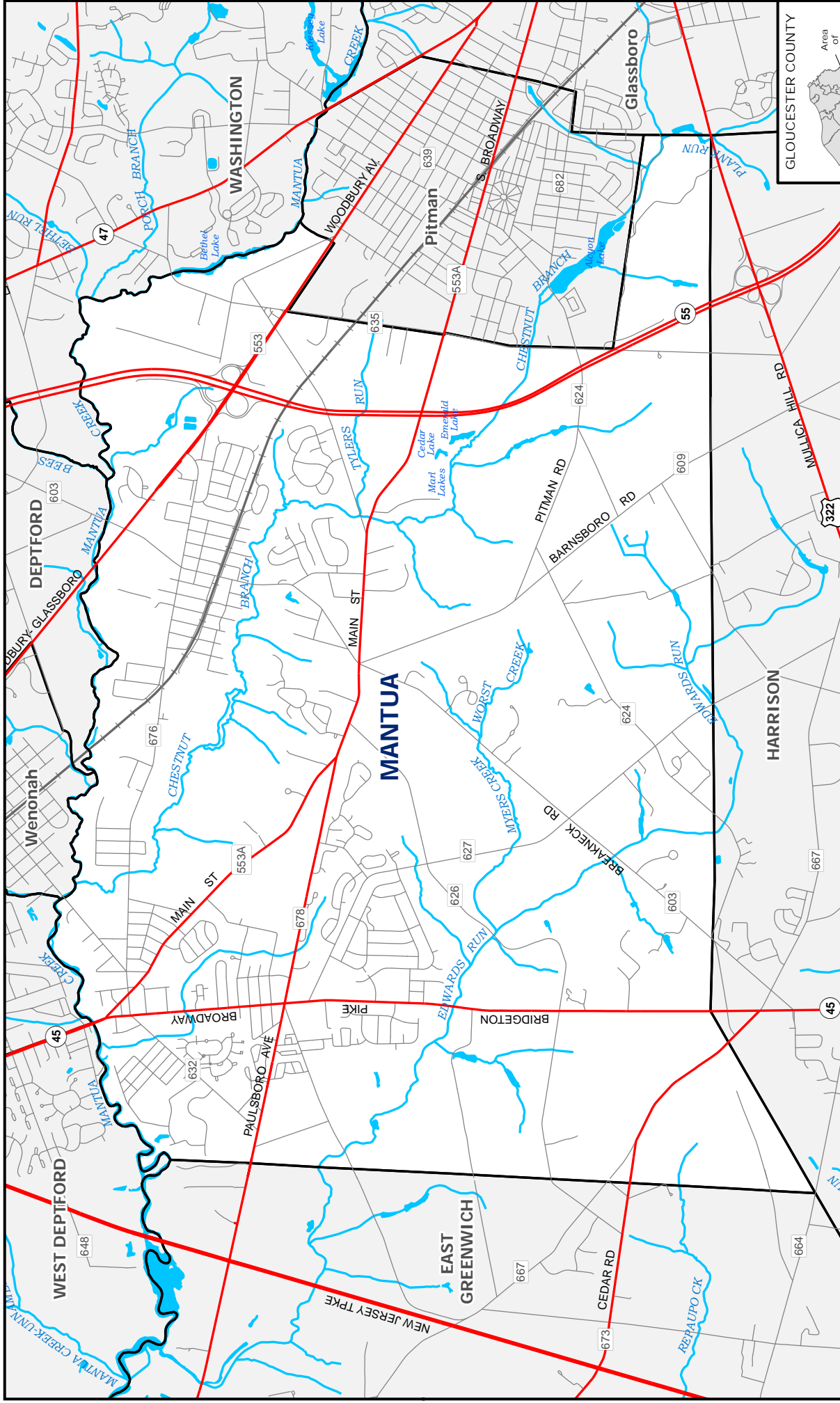
MANTUA TOWNSHIP LOCATION, SIZE, AND LAND USE

Table 3: Mantua Township Detailed Land Cover (1995/97)

Land Use Categories	Acres	Percent
Cropland and Pastureland	2,256.77	21.99
Deciduous Forest	2,267.94	22.09
Residential, Rural, Single Unit	915.57	8.92
Residential, Single Unit, Medium Density	850.52	8.29
Wetlands (deciduous wooded)	563.98	5.49
Orchards/Vineyards/Nurseries/Horticultural Areas	430.07	4.19
Residential, Single Unit, Low Density	428.77	4.18
Other Urban or Built-up Land	328.40	3.20
Recreational Land	247.48	2.41
Other Agriculture	230.47	2.25
Commercial/Services	207.94	2.03
Old Field (<25% brush covered)	173.68	1.69
Altered Lands	173.41	1.69
Coniferous Forest	129.89	1.26
Brush/Shrubland (mixed deciduous/coniferous)	124.01	1.21
Brush/Shrubland (deciduous)	123.59	1.20
Transportation/Communication/Utilities	101.43	0.99
Residential, High Density, Multiple Dwelling	100.78	0.98
Industrial	80.79	0.79
Wetlands (freshwater tidal marshes)	70.50	0.69
Extractive Mining	63.39	0.62
Wetlands (deciduous scrub/shrub)	52.77	0.51
Mixed Forest (deciduous dominant)	50.17	0.49
Disturbed Wetlands	40.08	0.39
Mixed Forest (coniferous dominant)	42.13	0.41
Transitional Area	39.40	0.38
Artificial Lakes	31.16	0.30
Agricultural Wetlands	27.29	0.27
Brush/Shrubland (coniferous)	21.77	0.21
Athletic Fields (schools)	21.22	0.21
Wetlands (herbaceous)	18.76	0.18
Tidal Rivers, Inland Bays, and Other Tidal Waters	14.99	0.15
Undifferentiated Barren Lands	8.63	0.08
No Longer Military, Use to be Determined	8.45	0.08
Former Agricultural Wetland (becoming shrubby)	6.08	0.06
Confined Feeding Operations	5.71	0.06
Managed Wetland in Maintained Lawn Greenspace	3.40	0.03
Wetlands (mixed scrub/shrub, deciduous dominant)	2.57	0.03
Wetlands (coniferous scrub/shrub)	0.91	0.01
Total	10,264.00	100.00

Source: NJDEP, Bureau of Geographic Information System

map 1: Mantua Township

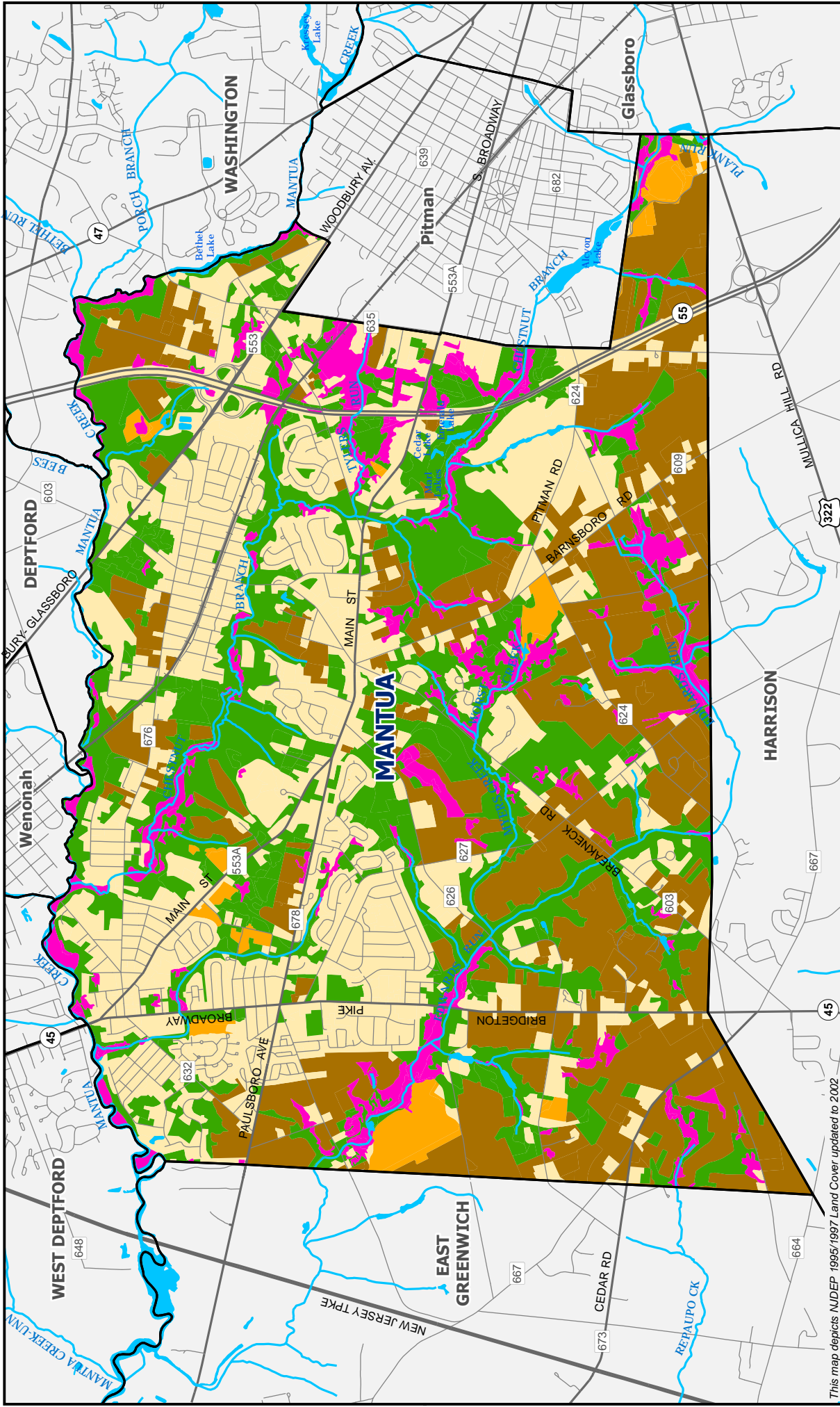
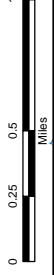


DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
FEBRUARY 2004



Sources : NJDEP, 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.

map 2: NJDEP Land Cover ('95/'97 updated to 2002)



Legend

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

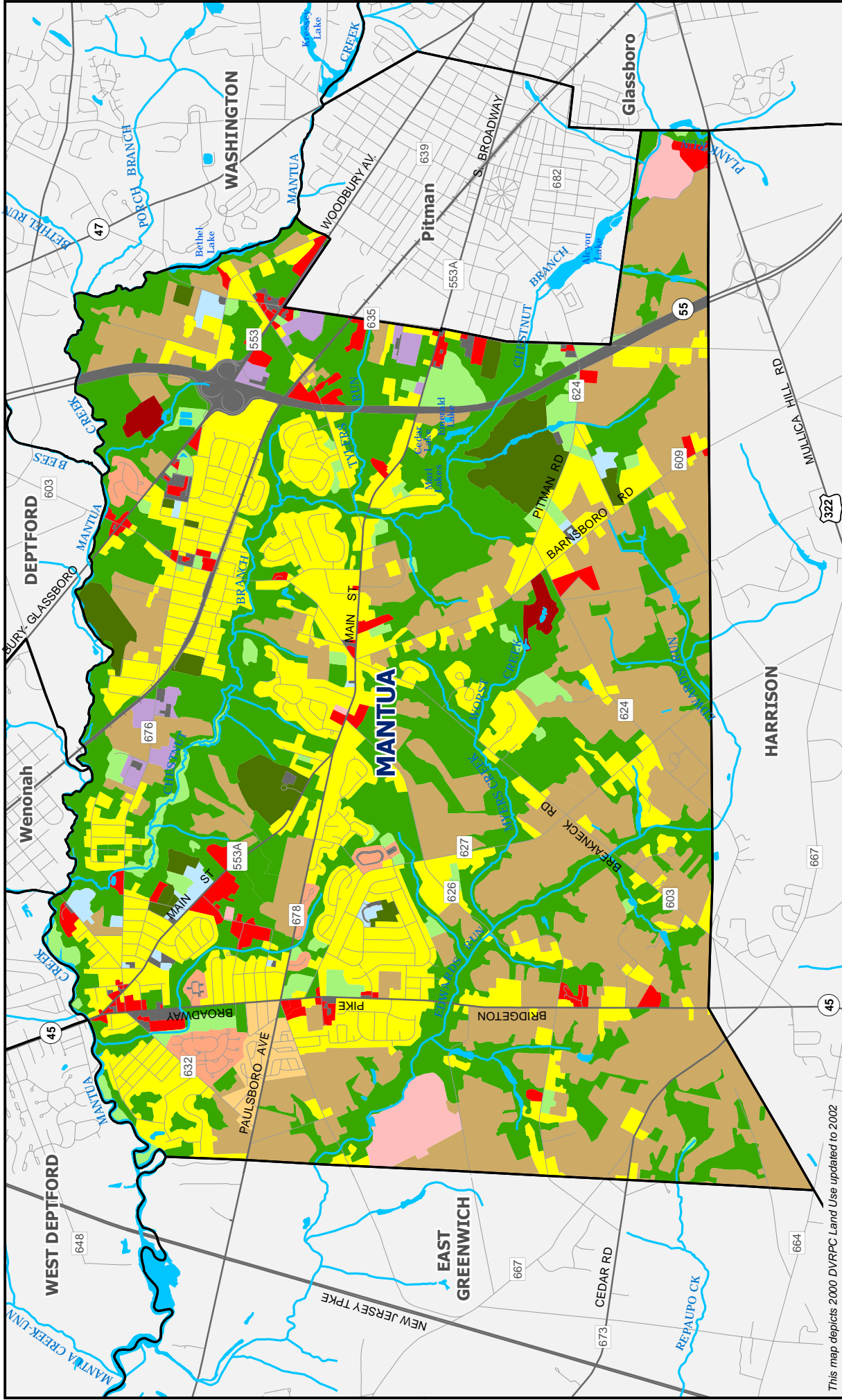
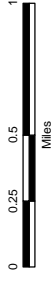
This map depicts NJDEP 1995/1997 Land Cover, updated to 2002

DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
FEBRUARY 2004



Sources: NJDEP, 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.

map 3: DVRPC Land Use (2000 updated to 2002)



This map depicts 2000 DVRPC Land Use updated to 2002

Legend

- Agriculture
- Commercial
- Community Services
- Mnfg.:Light Industrial
- Residential:Mobile Home
- Residential:Multi-Family
- Residential:Single-Family
- Transportation / Parking
- Utility
- Vacant
- Water
- Wooded

DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
FEBRUARY 2004



Sources : NJDEP, 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.

MANTUA TOWNSHIP LOCATION, SIZE, AND LAND USE

SECTION 4: NATURAL RESOURCES**4.1 PHYSIOGRAPHY**

Physiography is the study of a location in relation to its underlying geology. New Jersey is characterized by four physiographic provinces. The rocky terrain of the Appalachian Province is at one extreme and the sands of the coast are at the other. Mantua Township is located in the Atlantic Coastal Plain, the southernmost of these four provinces in New Jersey.

The Atlantic Coastal Plain landscape extends from Massachusetts to Texas and is divided into Inner and Outer sections. 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 Period, 65 million years ago to the present. Outer Coastal Plain soils are sandier and less fertile than those of the Inner Plain and do not hold water as well.

In the general vicinity of the dividing line between the two segments of the Coastal Plain is a belt of low hills, which runs northeast and southwest through the southern half of New Jersey. These hills are the youngest of the Cretaceous formations and are largely made up of sand and marl formations. The hills taper to fairly low elevations in Gloucester County but are visible in the Mullica Hill area. The Inner Coastal Plain lies to the west of the band of hills and the Outer Coastal Plain lies to the east.

Mantua Township is nearly bisected by the boundary between the Inner and Outer coastal plains, with rocks dating from both the Cretaceous and Cenozoic periods outcropping in the township. Although portions of Mantua are in the Outer Coastal Plain, most of the township's soils are generally regarded as agriculturally productive. This is because the drop in soil fertility between the Inner and Outer coastal plains is not instantaneous, but gradually moves west to east across the Outer Coastal Plain. While most of Mantua has good agricultural soils, the soils several miles to the east become considerably sandier as the landscape transitions into the Pine Barrens.

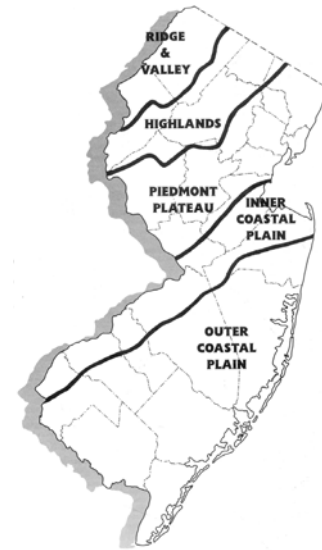


Fig. 1. The Physiographic Regions of New Jersey

4.2 TOPOGRAPHY AND SURFACE LANDSCAPES

Mantua Township's position in central Gloucester County has given it a largely upland character with abundant high-quality agricultural soils. Compared with municipalities closer to the Delaware River, the township contains relatively limited wetlands. Most of these occur adjacent to the major streams that flow across the township on their way to the Delaware River. The valleys of the Mantua Creek, Chestnut Branch, Edwards Run and their tributaries bisect Mantua's gently rolling upland. The highest elevations in the township approach 150 feet above sea level, while the lowest elevations in the township are only a few feet above sea level.⁴

The upland area is characterized by rich soils that once supported extensive beech-oak forests. Today, Mantua's upland forests are dominated by oak trees and, to a lesser degree, beech, maple and birch trees. Along the river valleys are freshwater tidal marshes and wet forests of sweet gum and red maple. The streams are relatively flat, as in all of southern New Jersey, with bottoms composed of mud, sand or small rocks and pebbles. The agricultural southern half of the township is mostly dominated by row crops, such as corn and soy beans, as well as fruit orchards, which are concentrated in the southeastern corner of the township.



Photo by Chris Linn

A Field of Winter Wheat, Heritage Road

⁴ Sea level is measured relative to the 1929 National Geodetic Vertical Datum (NGVD). Mean tide in the Delaware Estuary is approximately 1.4 feet above the 1929 NGVD

4.3 SOILS

Soil is the foundation for all land uses. A region’s soil defines what vegetation is possible, influencing agricultural uses. It also determines how land can be developed for other purposes. Soil is also a natural resource that cannot be replenished on the human time scale.

Mantua Township soils consist of 26 series types and 61 variations within those series as identified by the US Department of Agriculture’s Natural Resources Conservation Service. These are listed in **Table 5: Mantua Township Soils** and shown on **Map 3: Soils**.

Mantua’s soils are rich in agricultural value. About 38 percent of the soils in Mantua Township are considered Prime Farmlands (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.

The most abundant of all soils in Mantua Township are those classified as Farmlands of Statewide Importance (S-1), which occupy 41 percent of the land surface. These soils are close in quality to Prime Farmland and can sustain high yields of crops when correctly managed under favorable conditions. Of the remaining two categories of farmland soils, 5 percent of Mantua’s farmland is classified as Farmland of Local Importance (L-1), which are soils that can support the production of high value, regional crops such as horticultural crops or indigenous foods. The great majority of Mantua’s soils are rich and valuable soils. See **Table 4: Agricultural Values for Mantua Soils** for the acreage of each of these categories of farmland.

Table 4: Agricultural Values for Mantua Soils

Designation	Type	Area (Acres)	Percent
P-1	Prime Farmland	3,464	33.8%
S-1	Statewide Importance	4,250	41.4%
L-1	Local Importance	537	5.2%
Other Soil	Wet soils, pits, steep slopes, made land, etc.	1,971	19.2%
Water	Water	42	0.4%
Totals		10,264	100.0%

Source: NJ Farmlands Inventory, NJ Natural Resources Conservation Service

4.3.1 Soil Series

Several soil series appear more frequently in Mantua Township than others, and are briefly described as follows.

Freehold Series

Fifty percent of all Mantua soils are a variation of the Freehold series. These soils, formed from sandy marine deposits, are mostly gently sloping and well drained. Around streambeds, these soils may be steeply sloping. Freehold soils occur in close association with Collington, Colts Neck, Marlton, Westphalia, Woodstown, and Dragston soils. Throughout most of Mantua, but especially between Chestnut Branch and Edward's Run, deposits of Freehold are found with deposits of Marlton. Freehold soils are easily worked for agricultural production and have low to moderate natural fertility. Different variations of these soils will support upland forests of oaks and poplar and provide high quality wildlife habitat. These soils are well suited to various seasonal crops because variations of Freehold soils warm at different times of the year. In Mantua, a large deposit of Freehold soil underlies most of the homes in Sewell. Freehold sandy loam on level and gently sloping terrain is classed as prime soil. (Capability Units I, II, and IV depending on slope)



Photo by Chris Linn

Mantua's Fertile Soils, Jefferson Road

NATURAL RESOURCES

Westphalia Series

The second most abundant, accounting for 16.8 percent of all Mantua soils are Westphalia soils. Westphalia soils were formed from a marine deposit of fine sand and thus are well drained and gently sloping. These soils once supported a native forest of mixed oaks, beech, yellow poplar, and holly. Westphalia soils are found throughout the township and closely associated with Marlton and Freehold soils, but have less clay content. Westphalia soils are friable (easy to crumble) and have low natural fertility but respond to fertilization. If cultivated, Westphalia soils may suffer from wind and water erosion. However, Westphalia soils on level terrain are classed as prime soils. (Capability Units II, III, IV, VII depending on slope)

Marlton Series

Marlton soils make up over 7 percent of Mantua soils. They are well drained and found on gentle slopes or adjacent to streams. These soils are moderately fertile and high in potassium, though that nutrient is not readily available for plants. Marlton soils are closely associated with Freehold, Collington, Colemantown, and Kresson soils and they are commonly referred to as marl and greensand. A large belt of marl extends from Monmouth County southward to Salem County and the richest and most abundant deposits lie in New Jersey's coastal plain. This area of land is recognized as having prized agricultural value since colonial times. From the early 19th century into the 20th century, Marlton soils, and other marl soils rich in potassium and magnesium, were used as a natural fertilizer on lime-deficient soils. Today, marl is used as a water softener. Since Marlton soils have a high content of clay, they occasionally hold large amounts of water during wet seasons, which makes them unsuitable for early and late planting seasons. (Capability Units II, III, IV, and VI depending on slope)

Sassafras Series

About 6 percent of Mantua is made up of Sassafras soils, which are usually found on sandy flats along waterways. Slopes can range from nearly level to very steep. Sassafras soils are found in the southeast corner of Mantua, along the tributaries to the Chestnut Branch. These soils can support vegetation consisting of mixed oaks and scattered pines. They are considered farmland of statewide importance. Sassafras soils are easy to work, have a low natural fertility, and respond to fertilization. (Capability Units I, II, and III, depending on variation)

Alluvial Series

In Gloucester County, Alluvial soils consist of material deposited by streams. Alluvial soils form when materials from other soil layers are removed and deposited on flood plains by streams flowing through different kinds of soils and geologic materials. Most areas of alluvial land have large amounts of organic matter, and groundwater is close to the surface. (Capability Unit VII)

Freehold, Colts Neck and Collington Series

Freehold, Colts Neck, and Collington soils are deposits associated with the separate Freehold series, Colts Neck series, and Collington series, but appear so completely intermixed that the

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deposits cannot be undifferentiated. The Freehold, Colts Neck, and Collington series are made up of mostly Freehold loamy sand and are found in steep slopes. In Mantua, these soils are found generally along the banks of Edward’s Run and Mantua Creek. This soil suffers from rapid runoff and erosion and is best suited for pasture, woodland, and wildlife habitat. As the soil surface becomes steeper, sandy subsoil is revealed, which is less clayey than the Freehold series. (Capability Units VI and VII depending on slope)

Nixonton and Barclay Series

Nixonton and Barclay soils occur in undifferentiated associations and make up 4.7 percent of Mantua soils. Nixonton and Barclay soils consist of fine sand with small amounts of mica and glauconite. These soils are somewhat poorly drained, nearly level in all deposits, and are found in lower terrains. They often receive high amounts of runoff water from higher elevations. These soils are not well suited for farming as they have low natural fertility and plowing is hindered by excessive groundwater. (Capability Unit II)

Pasquotank Series

Pasquotank soils make up 4.4 percent of all Mantua soils. They occur in close association with Nixonton and Barclay soils, similarly formed in nearly level, low-lying depressions and consisting of fine sand. Pasquotank soils are not suited for farming and require extensive draining and maintenance, as ditches tend to cave in. (Capability Unit III)

Woodstown Series

Variations of the Woodstown Series make up 2.5 percent of all soils in Mantua Township. Historically, these soils have supported oak, beech, poplar, and pitch pine forests. This series is closely associated with Aura, Downer, Freehold and other soils. Woodstown soils are not well drained. These soils usually occur on terraces along large streams and in beds of gravel. Cultivation is hampered by wetness. (Capability Unit II)

Table 5: Mantua Township Soils

Soil Code	Soil Name	Acres	Percentage of all Acres	Designation*
Ad	Alluvial land	586.15	5.7%	NA
AmB	Aura loamy sand, 0-5 percent slopes	3.33	0.0%	P-1
ArB	Aura sandy loam, 0-5 percent slopes	95.70	0.9%	P-1
AsB	Aura-Sassafras loamy sands, 0-5 percent slopes	90.09	0.9%	P-1
AsC	Aura-Sassafras loamy sands, 5-10 percent slopes	215.32	2.1%	S-1
AuB	Aura-Sassafras sandy loams, 0-5 percent slopes	45.91	0.4%	P-1
AuC	Aura-Sassafras sandy loams, 5-10 percent slopes	11.18	0.1%	S-1
AuC3	Aura-sassafras sandy loams, 5-10 percent slopes, severely eroded	21.16	0.2%	L-1
Ck	Colemantown-Matlock loams	69.28	0.7%	NA
CmB	Collington loamy sand, 0-5 percent slopes	1.38	0.0%	P-1
CnA	Collington sandy loam, 0-2 percent slopes	22.91	0.2%	P-1

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Soil Code	Soil Name	Acres	Percentage of all Acres	Designation*
CnB	Collington sandy loam, 2-5 percent slopes	34.01	0.3%	P-1
CnC	Collington sandy loam, 5-10 percent slopes	26.73	0.3%	S-1
CoB	Colts Neck soils, 0-5 percent slopes	1.28	0.0%	P-1
CoC	Colts Neck soils, 5-10 percent slopes	2.65	0.0%	S-1
DoB	Downer loamy sand, 0-5 percent slopes	142.53	1.4%	S-1
DsB	Downer sandy loam, 2-5 percent slopes	20.82	0.2%	S-1
Fa	Fallsington loam	66.36	0.6%	S-1
Fd	Fallsington sandy loam	78.14	0.8%	S-1
FhB	Freehold loamy sand, 0-5 percent slopes	1,709.84	16.7%	S-1
FhC	Freehold loamy sand, 5-10 percent slopes	277.93	2.7%	S-1
FnB	Freehold sand, thick surface variant, 0-10 percent slopes	213.87	2.1%	S-1
FoA	Freehold sandy loam, 0-2 percent slopes	410.52	4.0%	P-1
FoB	Freehold sandy loam, 2-5 percent slopes	508.17	5.0%	P-1
FoC	Freehold sandy loam, 5-10 percent slopes	86.43	0.8%	S-1
FoD3	Freehold sandy loam, 10-15 percent slopes, severely eroded	31.15	0.3%	L-1
FsD	Freehold soils, 10-15 percent slopes	199.05	1.9%	L-1
FtE	Freehold, Colts Neck, and Collington soils, 15-25 percent slopes	390.62	3.8%	NA
FtF	Freehold, Colts Neck, Collington soils, 25-40 per. slopes	137.70	1.3%	NA
Fw	Fresh water marsh	43.64	0.4%	NA
KpB	Keyport sandy loam, 0-5 percent slopes	2.47	0.0%	P-1
KrB	Kresson sandy loam, 0-5 percent slopes	27.56	0.3%	S-1
LdB	Lakeland sand, 0-10 percent slopes	6.83	0.1%	L-1
Mc	Made land, coarse materials	3.24	0.0%	L-1
MrB	Marlton sandy loam, 0-5 percent slopes	287.07	2.8%	P-1
MrC	Marlton sandy loam, 5-10 percent slopes	43.42	0.4%	S-1
MrC3	Marlton sandy loam, 5-10 percent slopes, severely eroded	125.46	1.2%	L-1
MrD	Marlton sandy loam, 10-15 percent slopes	22.68	0.2%	NA
MrD3	Marlton sandy loam, 10-15 percent slopes, severely eroded	68.63	0.7%	NA
MrE	Marlton sandy loam, 15-25 percent slopes	41.47	0.4%	NA
MrF	Marlton sandy loam, 25-40 percent slopes	181.63	1.8%	NA
Mu	Muck	54.92	0.5%	L-1
NbB	Nixonton and Barclay soils, 0-5 percent slopes	482.23	4.7%	P-1
Pa	Pasquotank fine sandy loam	452.10	4.4%	S-1
Pg	Pits	73.34	0.7%	NA
Po	Pocomoke loam	34.00	0.3%	S-1
SfB	Sassafras loamy sand, 0-5 percent slopes	163.90	1.6%	S-1
SfC	Sassafras loamy sand, 5-10 percent slopes	197.47	1.9%	S-1
SrA	Sassafras sandy loam, 0-2 percent slopes	43.25	0.4%	P-1
SrB	Sassafras sandy loam, 2-5 percent slopes	125.38	1.2%	P-1
SrC	Sassafras sandy loam, 5-10 percent slopes	71.33	0.7%	S-1
SrD3	Sassafras sandy loam, 10-15 percent slopes, severely eroded	2.00	0.0%	NA
SsD	Sassafras soils, 10-15 percent slopes	69.31	0.7%	S-1
SsE	Sassafras soils, 15-40 percent slopes	14.40	0.1%	NA
Tm	Tidal marsh	99.92	1.0%	NA
W	Water	42.44	0.4%	NA

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Soil Code	Soil Name	Acres	Percentage of all Acres	Designation*
WaD3	Westphalia fine sandy loam, 10-15 percent slopes, severely eroded	40.28	0.4%	NA
WhB	Westphalia soils, 0-5 percent slopes	1,053.33	10.3%	P-1
WhC	Westphalia soils, 5-10 percent slopes	339.01	3.3%	S-1
WhD	Westphalia soils, 10-15 percent slopes	95.04	0.9%	L-1
WhE	Westphalia soils, 15-40 percent slopes	199.04	1.9%	NA
WsB	Woodstown and Dragston sandy loams, 0-5 percent slopes	257.30	2.5%	P-1
Total Acreage		10,264.29	100.0%	
Total Farmland Acreage		8,251.09		
Total Non-Farmland Acreage		2,013.2		
Steep Slopes (15%+ Slopes)		964.87		

Source: NJDEP (based on Soil Survey of Gloucester County)

*Explanation of Designations

P-1	Prime Farmland
S-1	Statewide Importance
L-1	Local Importance
U-1	Unique Farmland
NA	Land not appropriate for farming, e.g. eroded, very steep slopes, pits permanently wet soils, water, etc.

Soil characteristics can severely restrict the use of sites for construction and development. **Table 6: Soil Limitations for Development** records the soils and their possible limitations for building foundations and septic systems. As indicated in the table, the township has some soils that are severely limited for on-site septic systems. Septic systems require soils that have a low water table (five feet or more from the surface) and high permeability to allow for proper drainage of wastewater. Soils with high water tables (five feet or less from the surface) create a potential for erosion, wet basements, and low permeability, often allowing wastewater to collect near the surface.

Table 6: Soil Limitations for Development

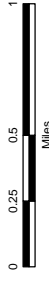
Soil Series	Soil Codes	Acreage	Building with Basement	Building without Basement	Septic Systems	Limitations
Alluvial	Ad	586.15	C	C	C	1, 2
Aura	Am, Ar	99.03	A	A	A	
Aura-Sassafras	AsB, AsC, AuB, AuC, AuC3	383.68	A	A	A	3
Colemantown-Matlock loams	Ck	69.28	B	A	C	1
Collington	Cm, CnA, CnB, CnC	85.04	A	A	A	

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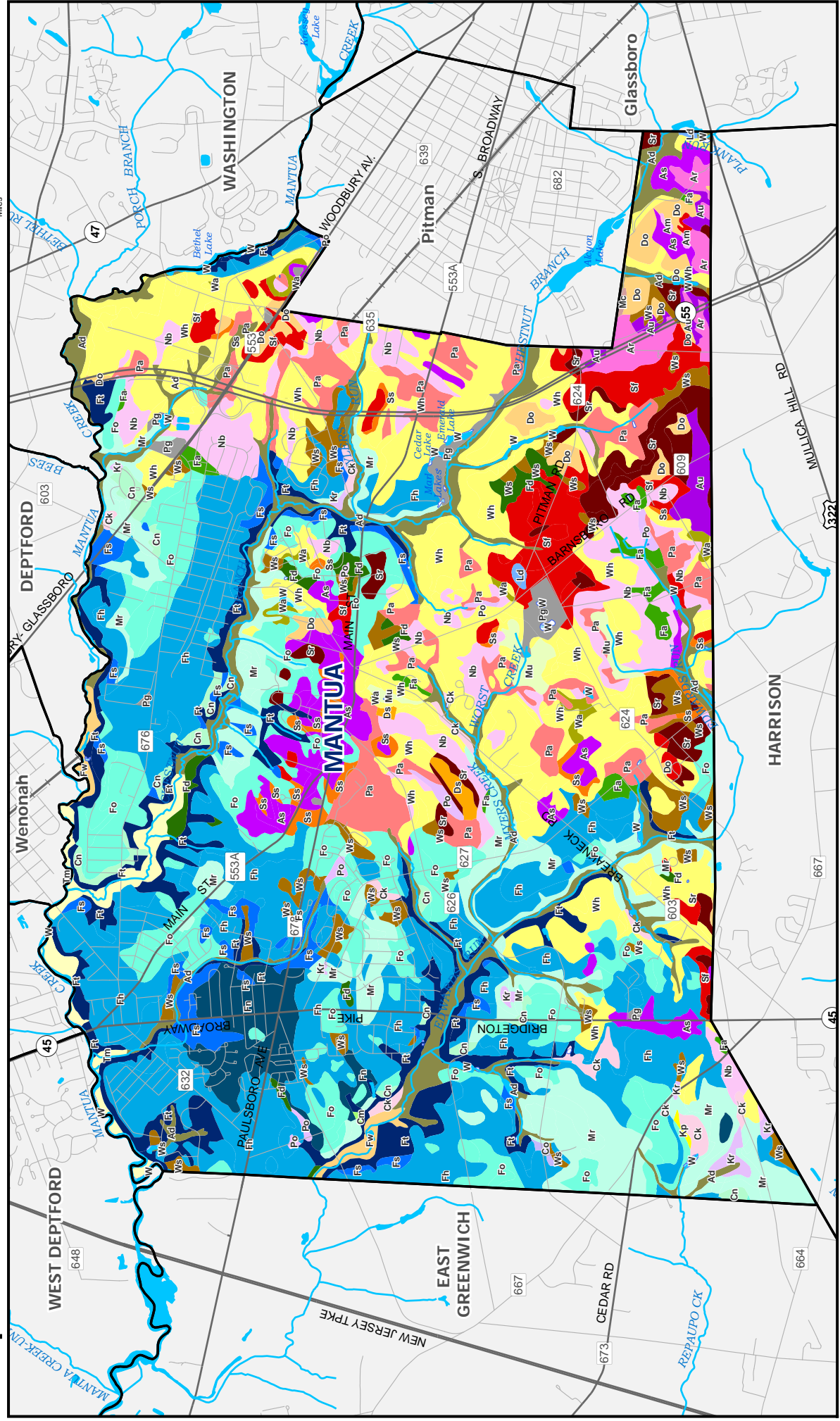
Soil Series	Soil Codes	Acreage	Building with Basement	Building without Basement	Septic Systems	Limitations
Colts Neck	CoB, CoC	3.93	A	A	A	
Downer	DoB, DsB	163.35	A	A	A	
Fallsington	Fa, Fd	144.50	A	A	B	
Freehold	FhB, FhC, FnB, FoA, FoD3, FoB, FoC, FsD	3,436.95	A	A	A	
Freehold, Colts Neck, and Collington soils	FtE, FtF	528.31	C	C	C	3
Freshwater marsh	Fw	43.64	C	C	C	1
Keyport	KpB	2.47	B	B	C	1
Kresson	KrB	27.56	B	A	C	1
Lakeland	LdB	6.83	A	A	A	
Made Land	Mc	3.24	B	B	B	1, 3
Marlton	MrB, MrD, MrD3, MrE, MrF, MrC, MrC3	770.36	B	A	B	1
Muck	Mu	54.92	C	C	C	1, 2, 3
Nixonton and Barclay soils	NbB	482.23	C	A	C	2, 3
Pasquotank	Pa	452.10	B	A	C	2, 3
Pits	Pg	73.34	A	A	A	3
Pocomoke	Po	34.00	B	B	B	
Sassafras	SfB, SfC, SrA, SrB, SrC, SrD3, SsD, SsE	687.04	A	A	A	
Tidal marsh	Tm	99.92	C	C	C	1, 2
Tidal marsh	Tm	99.92	C	C	C	1, 2
Water	W	42.44	NA	NA	NA	NA
Westphalia	WaD3, WhB, WhD, WhE, WhC	1,726.70	A	A	A	
Woodstown	WsB	257.30	B	A	A	
Total		10,264.29				

Key to Land Use Implications		Key to Limitations
A = Slight.	Little or no limitation(s) or easily corrected by use of normal equipment and design techniques.	1: High water table (0 to 3 feet) 2: Shallow depth to bedrock (less than 5 feet) 3: Strongly sloping (15% or over)
B = Moderate.	Presence of some limitation, which normally can be overcome by careful design and management at somewhat greater cost.	
C = Severe.	Limitations that, normally, cannot be overcome without exceptional, complex, or costly measures.	

Sources: Soil Survey of Gloucester County, NJ NRCS, and Cook College at Rutgers University.



map 4: Soils



DELAWARE VALLEY REGIONAL PLANNING COMMISSION
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Sources: NJDEP, 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.

Ad, Alluvial land	Fs, Freehold soils	Mu, Muck	Tm, Tidal marsh
Am, Aura loamy sand	Ft, Freehold, Colts Neck, Clington s/s	Nb, Nixonton and Barclay soils	W, Water
Ar, Aura sandy loam	Fw, Fresh water marsh	Pa, Pasquotank fine sandy loam	Wa, Westphalia fine sandy loam
As, Aura-Sassafras loamy sands	Kp, Keyport sandy loam	Pg, Pits	Wh, Westphalia soils
Au, Aura-Sassafras sandy loams	Kr, Kresson sandy loam	Po, Pocomoke loam	Ws, Woodstown and Dragston sandy loams
Co, Collemantown-Matlock loams	Ld, Lakeland sand	Sf, Sassafras loamy sand	
Cm, Collington loamy sand	Mc, Made land, coarse materials	Sr, Sassafras sandy loam	
Cn, Collington sandy loam	Mr, Marlton sandy loam	Ss, Sassafras soils	
	Co, Colts Neck soils		
	Do, Downer loamy sand		
	Ds, Downer sandy loam		
	Fa, Fallington loam		
	Fd, Fallington sandy loam		
	Fh, Freehold loamy sand		
	Fn, Freehold sand		
	Fo, Freehold sandy loam		

4.4 SURFACE WATER RESOURCES

All of Mantua’s land drains to the Delaware River. Most of the land surface drains by way of the Mantua Creek, which forms the township’s northeastern border. The headwaters of the Mantua Creek are located in Glassboro, Washington Township and in the Glassboro Wildlife Management Area in Monroe Township. The southeastern corner of Mantua Township drains to – and forms the headwaters of – Still Run, which is part of the Repaupo Creek system.

4.4.1 Watersheds

A watershed is all the land that drains to a particular waterway such as a river, stream, lake, or wetland. The boundaries of a watershed are defined by the high points in the terrain, such as hills and ridges. Large watersheds are made up of smaller ones, down to the catchment level of a local site. So, for example, the Delaware River watershed is made up of many smaller watersheds, such as the Mantua Creek watershed. The Mantua Creek watershed, in turn, is formed of several subwatersheds, consisting of the land that drains to a major tributary or branch of the creek, such as the Chestnut Branch subwatershed. These subwatersheds can be further subdivided into smaller ones, each surrounding the smaller tributaries that flow to the larger channel, and so on down to the catchment level. Watersheds are natural ecological units, where soil, water, air, plants, and animals interact in a complex relationship. Mantua Township contains two HUC 11 watersheds – the Mantua Creek and the Repaupo Creek watersheds.⁵ The percentage of Mantua Township land that is within each of these two watersheds is listed in the following table. See also **Map 5: Watersheds** and **Map 6: Surface Water, Wetlands, and Vernal Ponds**.

Table 7: Watersheds in Mantua Township

Watershed	USGS Watershed Code (HUC 11 Number)	Stream Classification	Acreage within Mantua	% of Mantua land	Subwatersheds (HUC 14 Numbers) within Mantua
Repaupo Creek	02040202140	FW2-NT/SE2	473	4.6	02040202140020 02040202140030
Mantua Creek	02040202130	FW2-NT/SE	9791	95.4	02040202130020 02040202130030 02040202130040 02040202130050

Source: NJDEP, Bureau of Geographic Information Systems

⁵ “HUC” stands for Hydrological Unit Code, which is a numerical identification number given to every drainage system in the United States by the US Geological Survey. HUC-11 codes are the 11-digit numbers applied to a part of a drainage area that is approximately 40 square miles in size. HUC-11 areas are further subdivided into HUC-14 subwatersheds, with the identification number for each one having 14 digits.

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Repaupo Creek Watershed

The Repaupo Creek watershed is a complex of streams that drain a total of 41 square miles of land. In Mantua, this watershed occupies only 473 acres or 4.6 percent of the township, and comprises the upper reaches, or headwaters, of the Still Run drainage. Still Run flows into a network of drainage canals and ditches, which are connected to both the Repaupo Creek and directly to the Delaware River. Near the Delaware River the Repaupo Creek Watershed is characterized by extensive areas of tidal marsh in both Greenwich and Logan townships. These marshes provide high quality habitat for a wide variety of plants, birds, animals and aquatic life.

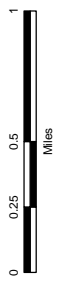
Mantua Creek Watershed

Mantua Creek drains 50.9 square miles and is 18.6 miles long. The Mantua Creek watershed covers approximately 15.3 square miles or 95.4 percent of Mantua Township. Mantua Creek's main branch rises in Glassboro and flows into the Delaware River just north of Paulsboro Borough. The creek forms the boundary between Mantua and its neighboring municipalities to the north: Deptford, West Deptford, Washington and Wenonah. The mouth of the creek, at Paulsboro, is channelized where it flows through a British Petroleum refinery site. Just upstream of Paulsboro, the creek is bordered by extensive tidal marshes and mudflat areas. The creek is tidal from the Delaware River up to a point approximately one-half mile east of where Route 632 (Wenonah Avenue) crosses over the creek near Wenonah Borough.

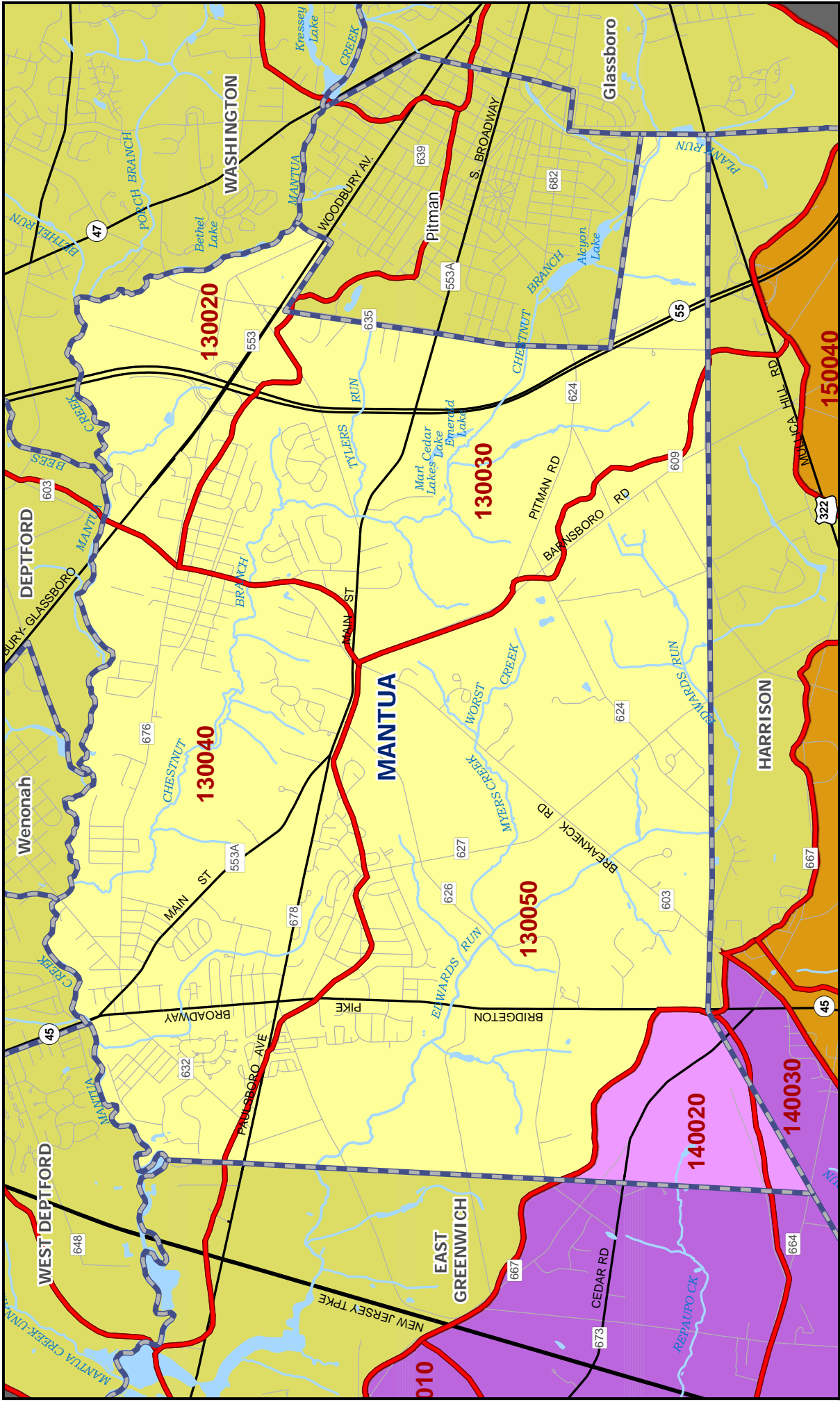
Mantua Creek has one main channel and several major tributaries, two of which flow primarily through Mantua Township. The Chestnut Branch begins in Glassboro, flows through Pitman, and then flows across Mantua from the southeast to the northwest, joining Mantua Creek just south of where Route 632 crosses over the creek. Edwards Run, located south of the Chestnut Branch, also flows northwesterly across Mantua, joining the main channel near the confluence of Routes 678 and 551 in East Greenwich. Other major tributaries include the Monongahela Brook in Deptford Township and Bees Branch, Bethel Run, and Porch Branch in Washington Township.

There are a number of smaller tributaries to the Mantua Creek system in Mantua. Myers Creek and Worst Creek flow into Edwards Run just south of Route 626. Tylers Run joins the Chestnut Branch just before it flows under Tyler's Mill Road. A small unnamed tributary to Mantua Creek flows through the Village of Mantua. This tributary starts near Brookview Drive and flows under Beverly Road before joining the main channel just to the east of Route 45.

Major impoundments in the watershed are Kandle Lake, Kressey Lake, Lake Oberst, Bethel Lake and Alcyon Lake. Bethel Lake lies on the border between Mantua and Washington townships. The four other impoundments lie outside of Mantua. Kressey Lake and Lake Oberst are on the main stem of the Mantua upstream of Bethel Lake. Kandle Lake is on Duffield Run, a tributary of the Mantua Creek in Washington Township, and Alcyon Lake is on the Chestnut Branch in Pitman.



map 5: Watersheds



- Watersheds**
- Mantua Creek
 - Reapaupo Creek
 - Raccoon Creek
- Subwatersheds**
- Boundary

DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
OCTOBER 2004

Sources: NJDEP, 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.



Photo by Chris Linn

Chestnut Branch near Sewell

4.4.2 Streams

There are a total of 36 stream miles flowing across Mantua Township, 26 of which are first or second order, or headwater, streams. That is, they are the initial sections of stream channels with no contributing tributaries (first order streams), or they are stream channels formed from only one branching section of tributaries above them (second order streams). The headwaters are where a stream is “born,” and actually begins to flow.

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

sites for the aquatic life that is at the base of the food chain, and often serve as spawning or nursery areas for fish.

Table 8: Mantua Township Streams

Stream Order	Miles
First Order streams (smallest)	14.43
Second Order streams	11.16
Third Order streams	3.77
Fourth Order streams (Mantua Creek main channel)	6.22
Total	35.58

Source: NJDEP, Bureau of Geographic Information Systems

Approximately two miles of the Mantua Creek and the extreme lower reaches of the Chestnut Branch are tidal within Mantua. Tidal flows bring Delaware River water into the streams twice a day. Tidal flows both help and hinder maintenance of good water quality in affected streams. The flood (incoming) tide carries leaves and nutrients that are beneficial to aquatic organisms, but it also limits the regular flushing out of silt and pollutant-laden waters coming from upstream. Silt deposition within a stream tends to increase during flood tides, although deposition is also a function of stream shape, the presence of specific flow barriers, and the quantity of silt (the load) being carried by the stream. See **Map 6: Surface Water, Wetlands, and Vernal Pools**.

Mantua Creek and Chestnut Branch are monitored by NJDEP for only one water quality parameter – aquatic life. The previous two rounds of sampling, in 1995 and 2000, showed that both Mantua Creek and Chestnut Branch were moderately impaired in their ability to support healthy populations of aquatic life. Edwards Run is tested for both aquatic life support and a wide range of other water quality parameters. The most recent sampling for aquatic life in 2000 showed Edwards Run to be impaired. In a separate series of samplings between November 2000 and August 2002, Edwards Run was shown to be impaired for phosphorous and fecal coliform (see the *Surface Water Quality* section that follows for more information).

4.4.3 Lakes and Ponds

There are eight named waterbodies and numerous other small ponds and water impoundments in Mantua Township. Mantua’s named waterbodies include Bethel Lake, Hurff Lake, Tylers Mill Pond, Jessup Mill Lake, Cain Mill Lake, Emerald Lake, Cedar Lake and Marl Lakes. These open bodies are all permanent waters. Bethel Lake, which lies on the border between Mantua and Washington townships was created by impounding the main stem of Mantua Creek. Tylers Mill Pond, Cain Mill Lake and Jessup Mill Lake, as their names imply, are millponds, created in the 18th and 19th centuries to power gristmills or sawmills. Emerald Lake, Cedar Lake and Marl Lakes are abandoned marl pits that have since filled with water. All of these lakes are classified as artificial waterbodies by NJDEP. Naturally occurring lakes do not exist in southern New Jersey.



Photo by Chris Linn

Chestnut Branch, Ceres Park

There are a total of approximately 31.5 acres of waterbodies within Mantua. Bethel Lake, at 9.6 acres (only part of which falls within Mantua's boundary) is the largest. The smallest mapped waterbody, which has no commonly known name, is approximately one-half acre. Mantua's only publicly owned lakes are Bethel, Emerald and Cedar lakes. They are used for passive recreational activities such as fishing and bird watching. Emerald and Cedar lakes are located in Ceres Wildlife Sanctuary. The remaining lakes in the township are privately owned, including Hurff Lake, which is used for swimming.

See **Map 6: Surface Water, Wetlands, and Vernal Ponds.**

4.4.4 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

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normal circumstances, wetlands are those areas that support a prevalence of defined wetland plants on a wetland soil. The US Fish & 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 or nontidal. Tidal wetlands can be either saline or freshwater. There are also special wetland categories to denote saturated areas that have been altered by human activities.

New Jersey protects freshwater (interior) 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,” can determine for sure if there are freshwater wetlands on a property. An LOI verifies the presence, absence, or boundaries of freshwater wetlands and transition areas on a site. Activities permitted to occur within wetlands are very limited and permits are required for most of them. Additional information on wetlands rules and permits is available through NJDEP and on their Web site under “land use.” See *Sources of Information*, page 87.



Photo by Chris Linn

Wetlands, Confluence of Mantua Creek and Chestnut Branch

All of Mantua's wetlands are freshwater. Natural wetlands of all types total 710 acres within the township, of which 564 acres are forested wetlands, 75 acres are low-growing emergent, scrub/shrub or herbaceous wetlands, and 71 acres are tidal wetlands. All of Mantua's tidal wetlands are located along the edges of Mantua Creek between the head of tide and the East Greenwich border, and along the extreme lower reaches of the Chestnut Branch, which is also tidal. These change to patchy forested nontidal wetlands further upstream. The largest forested wetland areas in Mantua are located along the Chestnut Branch, near the border with Pitman, and in the headwaters of Edwards Run. Scattered forested and scrub/shrub wetlands can also be found in Mantua along all of the tributaries to Mantua Creek and in the headwaters of Still Run. See **Map 5: Surface Water, Wetlands, and Vernal Pools**.

Mantua also includes 76 acres of wetland areas that have been altered by human activities and no longer support typical wetland vegetation, or are not vegetated at all. Collectively, these will be referred to as *modified* wetlands in this document.⁶ Modified wetland areas do, however, show obvious signs of soil saturation and exist in areas shown to have hydric soils on US Soil Conservation Service soil surveys. Mantua's modified wetlands fall into the following categories as defined by the *Anderson Land Use Classification* system: 40 acres of disturbed wetlands, 27 acres of agricultural wetlands, 6 acres of former agricultural wetlands and 3 acres of wetlands found in maintained greenspace or lawn. A more detailed description of all of Mantua's wetland areas is found in the *Biological Resources* section, under "Wetlands," page 58.

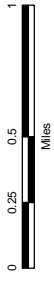
4.4.5 Agricultural Wetlands

Agricultural wetlands occupy 27 acres of Mantua Township. These "quasi-wetlands" are found scattered as small sites primarily in the south central portions of the township. Agricultural wetlands are lands under cultivation that are modified former wetland areas. These areas still exhibit evidence of soil saturation in aerial infrared photo surveys, but they do not support natural wetland vegetation. See **Map 5: Surface Water, Wetlands, and Vernal Pools**.

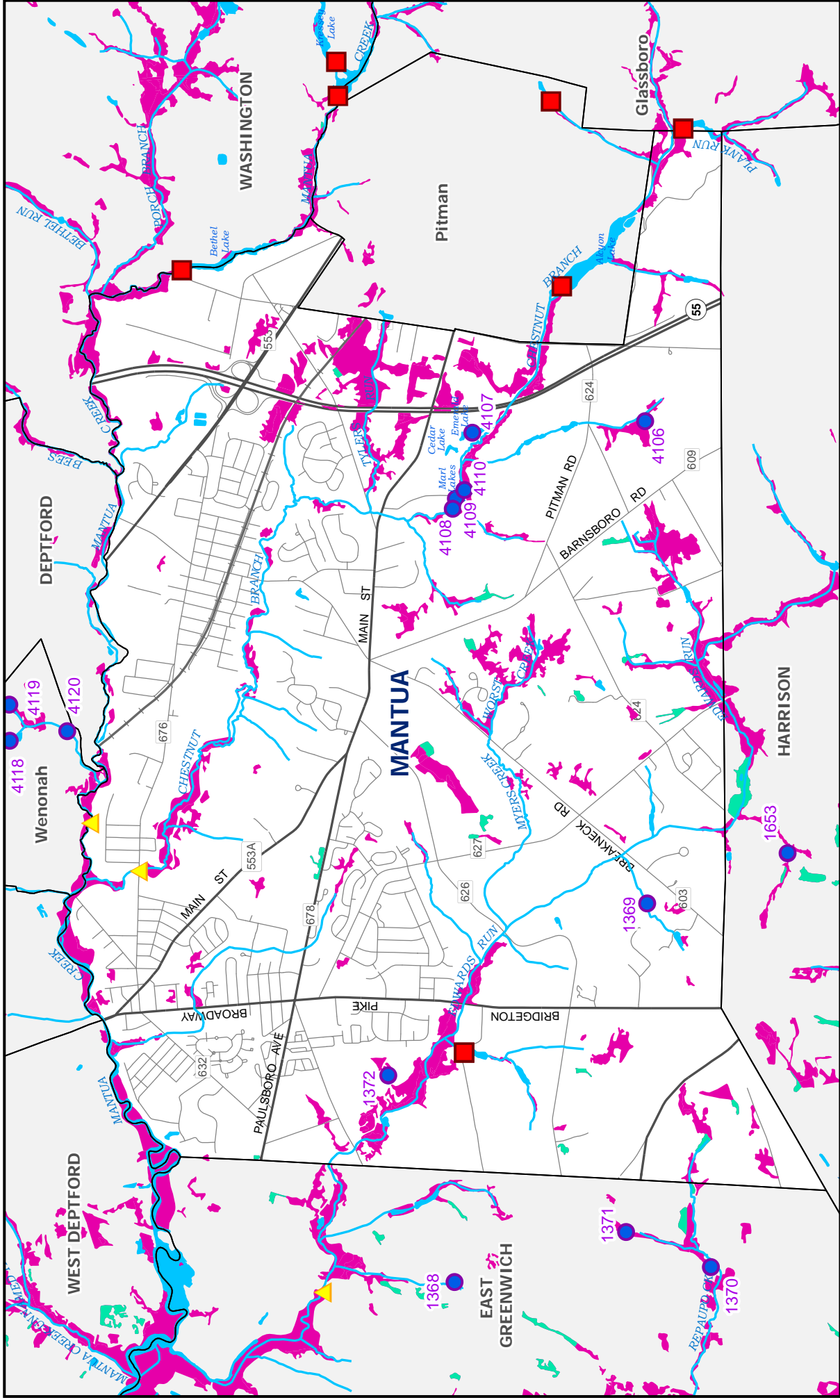
As long as agricultural wetland areas remain in agricultural use, they are exempt from New Jersey's Freshwater Wetlands Rules *N.J.A.C. 7:7A*. However, if an agricultural area is removed from agricultural production for more than five years, any wetlands located within that area lose their exempt status. Also, according to *N.J.A.C. 7:7A-2.8(b)2*, "the exemptions apply only as long as the area is used for the exempted activity." Therefore, if the area is used for anything other than farming, the exemption no longer applies.

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

⁶ Like interior wetlands, Mantua's modified wetlands are also nontidal.



map 6: Surface Water, Wetlands, and Vernal Pools



- Legend**
- Agricultural Wetlands
 - Wetlands
 - Vernal Pool
 - ▲ Head of Tide
 - Dam



Sources : NJDEP, 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.

4.4.6 Vernal Pools

Vernal pools are bodies of water that appear following snow melt and during spring rains but which disappear or are dry during the rest of the year. They are highly important sites for certain rare species of frogs and salamanders, called obligate breeders. Obligate breeders will only breed in vernal pools, because the pool's impermanence prevents residence by predators who would consume the eggs and young.

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

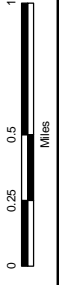
The New Jersey Division of Fish and Wildlife has been conducting a Vernal Pool Survey project since 2001, to identify, map, and certify vernal ponds through the state. Regulations promulgated at that time prohibited the issuance of a Statewide General Permit (SGP) 6 in certified vernal habitats and required that a 75-foot buffer be maintained around the pools. However, a ruling by the New Jersey Supreme Court in July 2004 struck down the vernal habitat rule. Currently, even though NJDEP cannot deny a SGP-6 permit due to the presence of vernal pools, it still has the authority to require and deny any of the other 25 general permits in vernal habitats. In addition, a SGP-6 permit can be denied in exceptional resource value wetlands, as established through a Letter of Interpretation (LOI), issued by DEP. Local municipalities and citizens can assist in designating vernal pools as exceptional resource value wetlands by identifying occurrences of threatened and endangered species in vernal habitats and submitting supporting information to DEP. Municipalities can also provide additional protection by instituting restrictive zoning or negotiating conservation easements on the land surrounding vernal pools.

The state has identified seven vernal pools in Mantua Township. Surveys of each pool are planned to determine what species are present and, indeed, if the pool is still in existence as a natural habitat. None of these sites had been surveyed as of May of 2004. See **Map 5: Surface Water, Wetlands, and Vernal Pools**.

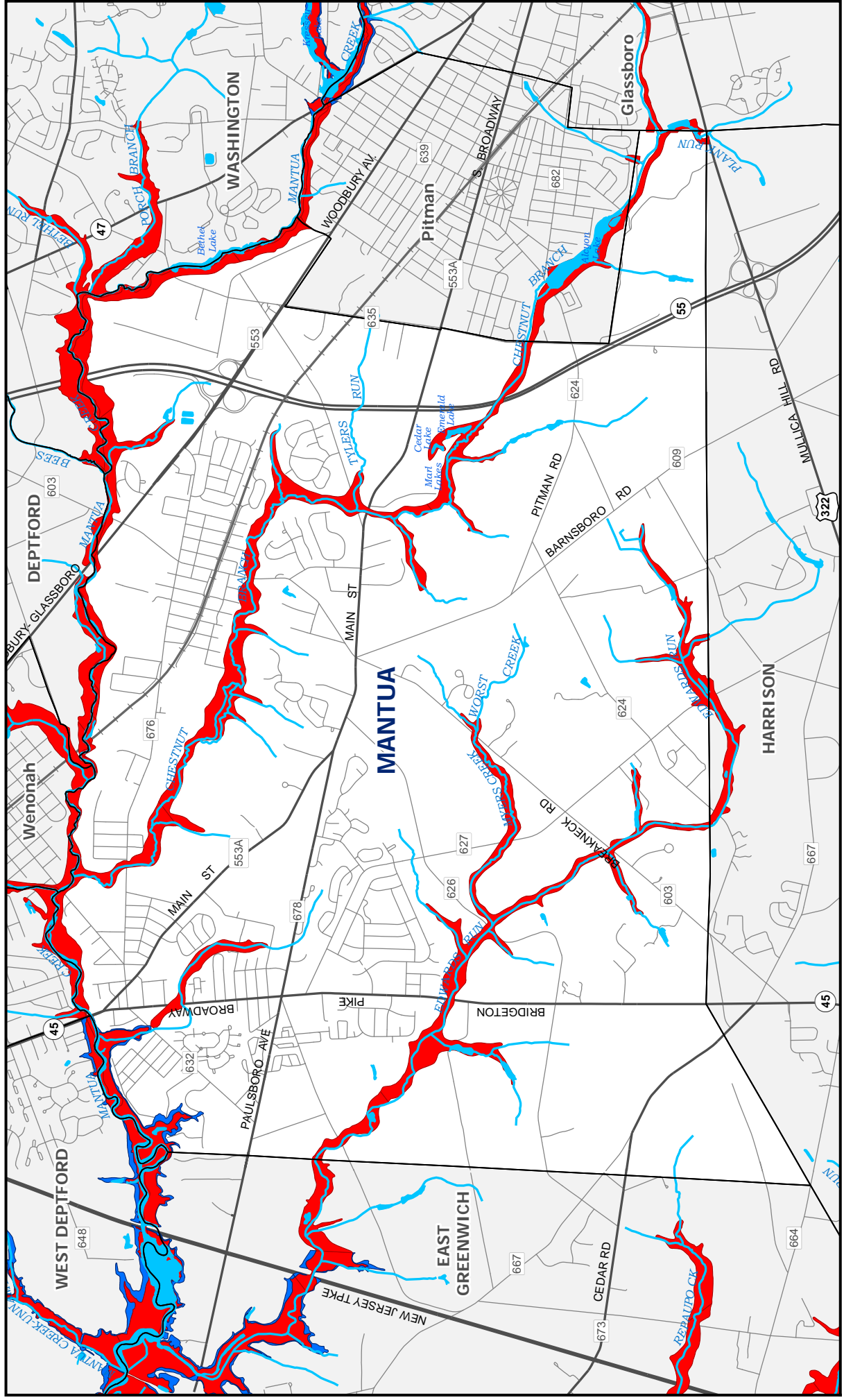
4.4.7 Floodplains

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 1 percent chance of occurring in any given year).

Although the terms "flood hazard area" and "100-year floodplain" denote 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



map 7: Floodplains



Legend

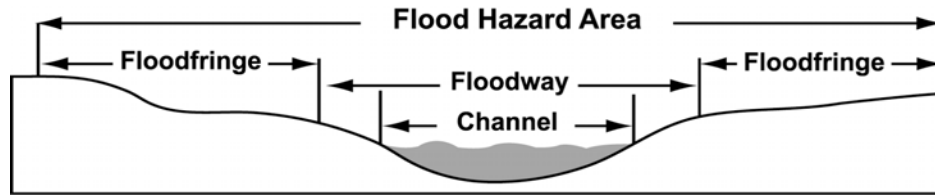
- 100-Year Floodplain
- 500-Year Floodplain

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Sources : NJDEP, DVRPC
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percent. This type of flood is called the “flood hazard area design flood” and it is the flood regulated by NJDEP.



Source: *The Streams of Washington Township*

Fig. 2. Parts of a Flood Hazard Area

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 stream encroachment 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.” See *Sources of Information*, page 87.

New Jersey’s flood hazard area maps are not available in digital form. Consequently, it is only possible to approximate the spatial extent of the flood hazard area in Mantua by using the Federal Emergency Management Agency’s (FEMA’s) 100-year floodplain maps. FEMA’s maps show that 664 acres or 6.5 percent of the township’s land area falls within the 100-year floodplain. Presumably, the flood hazard area would be slightly larger.⁷ Nearly all of Mantua’s floodplain areas are located along the main branches of Mantua Creek, Chestnut Branch and Edwards Run. Because these creeks lie in relatively steep-banked stream valleys, the extent of the floodplain in Mantua is somewhat limited, compared to other parts of Gloucester County. See **Map 7: Floodplains**.

⁷ Site plan and subdivision applications require detailed engineering studies that depict the boundaries of the flood hazard area at a large scale.

Table 9: Flood Hazard Area Acreage

Category	Acres
100-year floodplain	664
500-year floodplain	672

Source: Federal Emergency Management Agency (FEMA)

4.4.8 Surface Water Quality

Water quality standards are established by federal and state governments to ensure that water is suitable for its intended use. The federal Clean Water Act (P.L. 95-217) requires that, wherever possible, water-quality standards provide water suitable for fish, shellfish, and wildlife to thrive and reproduce and for people to swim and boat.

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.

Mantua Creek is classified as FW2–NT/SE, which means that it is both a freshwater and estuarine stream that is not a trout producing or trout maintaining water. Mantua Creek is freshwater from its headwaters to a location downstream past the head of tide. From this point seaward, the creek is estuarine water. The remainder of Mantua’s streams are FW2-NT waters. See **Table 10: Water Quality Classifications of Streams in Mantua Township**. 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 waterbody’s designated use(s) is based on numerous surface water quality parameters. Some examples of surface water quality parameters include fecal coliform, dissolved oxygen, pH, phosphorous, and toxic substances (see *N.J.A.C. 7:9B-1.14*). NJDEP also evaluates water quality by examining the health of aquatic life in a stream. NJDEP operates two water quality monitoring networks: the Ambient Surface Water Monitoring Network (ASWM) and the Ambient Biomonitoring Network (AMNET). NJDEP runs the ASWM network in cooperation with US Geological Survey (USGS). This network contains 115 stations that monitor for nutrients (i.e., phosphorous and nitrogen), bacteria, dissolved oxygen, metals, sediments, chemicals, and other parameters. AMNET, which is administered solely by NJDEP, evaluates the health of aquatic life as a

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biological indicator of water quality.⁸ This network includes 820 monitoring stations located throughout the state. Each station is sampled once every five years. The first round of sampling for all stations took place between 1992 and 1996 and a second round occurred between 1997 and 2001.

Table 10: Water Quality Classifications of Streams in Mantua Township

Streams	Classification
Mantua Creek	FW 2 – NT/SE
Chestnut Branch	FW 2 – NT
Edwards Run	FW 2 – NT

Source: NJDEP, *Surface Water Quality Standards, N.J.A.C. 7:9B*

Mantua Township Stream Water Quality

There are six AMNET sites and one ASWM site within Mantua Township or along its borders. NJDEP sampled each of the six AMNET sites in July 1995 and again in July 2000. Each AMNET site is tested for only one water quality parameter – aquatic life. In the first sampling, five of the six sites were rated as “moderately impaired” for aquatic life support, and one site on Edwards Run was rated as “severely impaired.” That is, the streams are not able to maintain diverse populations of aquatic organisms. All six sites were rated as moderately impaired in the second sampling. Mantua’s AMNET stations are listed in **Table 11: New Jersey AMNET Sampling Locations for Mantua Township** and are depicted on **Map 7: Water Quality – Nontidal Waters**.

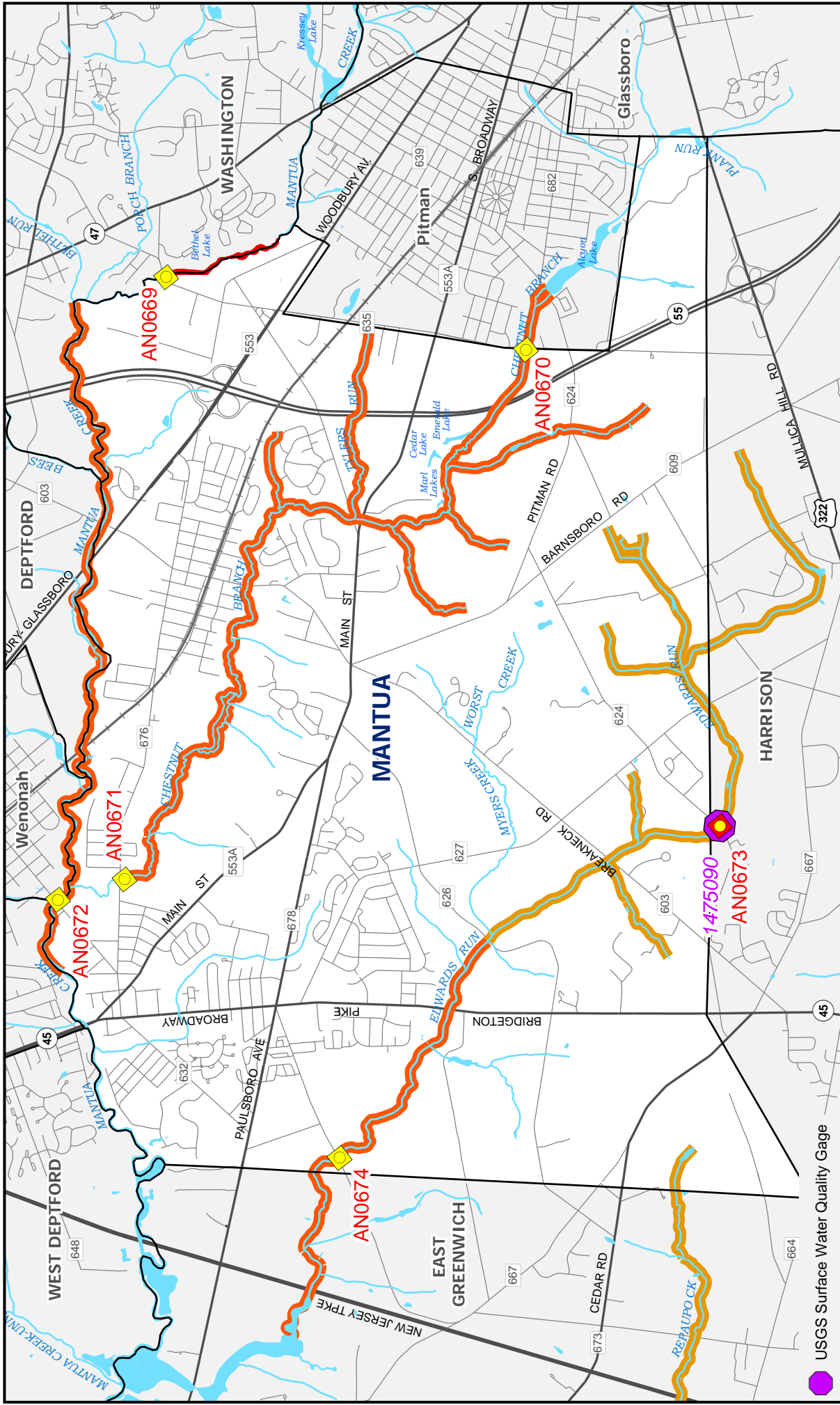
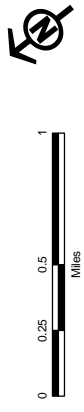
One site, just beyond Mantua’s border in South Harrison, is part of the USGS/NJDEP Ambient Surface Water Monitoring (ASWM) network. This site is tested for dissolved oxygen, pH, ammonia, nitrogen, phosphorous, metals, and a wide range of organic and inorganic chemicals. The site was sampled 12 times between November 2000 and August 2002. The results of these samples are summarized in **Table 12: New Jersey ASWM Sampling Locations for Mantua Township** and the station location is depicted on **Map 8: Water Quality**.

New Jersey’s Integrated Water Quality Monitoring and Assessment Report

The federal Clean Water Act under Section 303(d) requires states to identify “Impaired Waters” where specific designated uses are not fully supported. Accordingly, NJDEP prepares a biennial list of impaired waters – the 303(d) List. The federal Clean Water Act also requires states to periodically assess and report on the quality of all their waters, not just impaired waters. This biennial water quality report is entitled New Jersey’s Water Quality Inventory Report (also known as the 305(b) Report). However, in 2002, the US Environmental Protection Agency (EPA) recommended that states integrate their Water Quality Inventory Report [305(b)] and their Impaired Waterbodies List [303(d)]. Following EPA’s guidance, NJDEP combined the

⁸ More specifically, AMNET monitors the health of benthic (bottom-dwelling) macroinvertebrate communities.

map 8: Water Quality



USGS Surface Water Quality Gage

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Sources: NJDEP, 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.

Impaired Waters
 Eutrophic Lake
 Aquatic Life Designated Use Does Not Attain Standards
 Elevated Concentrations of Fecal Coliform Bacteria

NJDEP Ambient Biomonitoring Network (AMNET) 2000
1st Round of Sampling
 Non-Impaired
 Moderately Impaired
 Severely Impaired
2nd Round of Sampling
 Non-Impaired
 Moderately Impaired
 Severely Impaired

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303(d) List and the 305(b) Report into a single document called the *2002 Integrated List of Waterbodies*. NJDEP is now preparing to finalize and release the *2004 Integrated List of Waterbodies*. The Integrated List of Waterbodies (for both 2002 and 2004) includes five sublists. Sublists 1 through 4 comprise what was formerly the 305(b) Report. Sublist 5 is the 303(d) List.

Although all of the six AMNET stations in Mantua were moderately impaired for aquatic life (benthic macroinvertebrates) only three of these stations were placed on Sublist 5 in the *2004 Integrated List of Waterbodies*. The remaining stations were placed on Sublist 3 because NJDEP determined that there was “insufficient data” to either list them as impaired or nonimpaired with any certainty. The ASWM station on Edwards Run is listed on Sublist 5 for two parameters: phosphorous and fecal coliform. It is on Sublist 1 (fully attaining or nonimpaired) for temperature, dissolved oxygen, pH, nitrate, dissolved solids, total suspended solids and ammonia.

NJDEP has issued guidance for associating stream segments with monitoring stations. Based on this guidance the following waters in Mantua are impaired for aquatic life: the entire Chestnut Branch and all its tributaries, the main stem of Edwards Run from the New Jersey Turnpike to its confluence with Myers Creek, and the main stem of the Mantua Creek from the beginning of its FW2 segment to its confluence with Bethel Run. Edwards Run and all of its tributaries are also impaired for fecal coliform and phosphorous from their headwaters to the confluence of Edwards Run and Myers Creek.

For impaired waters (waters on *Sublist 5*), the state is required to establish total maximum daily loads (TMDLs). A TMDL quantifies the amount of a pollutant a waterbody can assimilate without violating a state’s water quality standards. A TMDL is intended to reduce pollutant loads so that a waterbody can meet its surface water quality standards.

Knowing the actual condition of streams and stream banks, and planning for their improvement, requires fuller surveys and more frequent monitoring than the state can provide. The state only monitors main channels and large tributaries and only does biological assessments on a five-year cycle. Stream surveys by local organizations are much needed, along with regular monitoring of water quality on all of a community’s waterways.

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Table 11: New Jersey AMNET Sampling Locations for Mantua Township

Site ID	Station Name/ Waterbody	Municipality	Parameters Tested	2004 Sublist	1995 NJ Impairment Score	2000 NJ Impairment Score
AN0669	Mantua Creek at Lambs Rd in Mantua	Mantua/Washington	Benthic Macroinvertebrates	3	9	18
AN0670	Chestnut Branch at Lambs Rd in Mantua	Mantua/Pitman	Benthic Macroinvertebrates	3	18	21
AN0671	Chestnut Branch at Mantua Blvd in Mantua	Mantua	Benthic Macroinvertebrates	5	12	18
AN0672	Mantua Creek at Mantua Ave in Wenonah	Mantua/Wenonah	Benthic Macroinvertebrates	5	12	18
AN0673	Edwards Run at Pitman - Jefferson Rd in Harrison	Mantua	Benthic Macroinvertebrates	3	3	12
AN0674	Edwards Run at Jessups Mill Rd in Mantua	Mantua	Benthic Macroinvertebrates	5	15	12

Source: NJDEP, Bureau of Freshwater and Biological Monitoring

NJ Impairment Score	Biological Assessment
0-6	Severely Impaired
9-21	Moderately Impaired
24-30	Non-impaired

2004 Sublist	Status
1	Fully attaining
3	Insufficient data
5	Impaired Waters

Table 12: New Jersey ASWM Sampling Locations for Mantua

Site ID	Station Name/ Waterbody	Municipality	Parameters Tested	2004 Sublist	Sampling Dates	Data Source
01475090	Edwards Run at Jefferson	Mantua/Harrison	Phosphorus , Fecal Coliform	5	11/00 - 8/02	NJDEP/USGS Data
01475090	Edwards Run at Jefferson	Mantua/Harrison	Temperature, Dissolved Oxygen, pH, Nitrate, Dissolved Solids, Total Suspended Solids, Unionized Ammonia	1	11/00 - 8/02	NJDEP/USGS Data

Source: NJDEP, Bureau of Freshwater and Biological Monitoring

4.4.9 Causes of Water Quality Impairments

Stormwater Runoff

Stormwater runoff and other nonpoint source pollution (pollution coming from a wide variety of sources rather than from a single point such as a discharge pipe) have the largest effect on the water quality and channel health of streams in Mantua. These sources are also the most difficult to identify and remediate because they are diffuse, widespread, and cumulative in their effect. Most nonpoint source pollution in the Mantua Creek watershed is known to derive from stormwater drainage off paved surfaces such as streets, commercial/industrial areas, and residential sites (with and without detention basins), and from agricultural fields that lack adequate vegetative buffers. Some of this runoff comes to the waterways from similar sources in upstream townships and some of it derives from Mantua land uses.

In March 2003 the NJDEP issued a new Stormwater Management Rule, as required by the US Environmental Protection Agency's Phase II Stormwater Management Program for Municipal Separate Stormwater Sewer Systems (MS4). The rule lays out guidance and requirements for management of and education about stormwater at the local level. It applies to all towns in New Jersey, all county road departments, and all public institutional facilities on large sites (such as hospitals and colleges). Beginning in 2004, municipalities were required to obtain a New Jersey Pollution Discharge Elimination System (NJPDES) general permit for the stormwater system, and its discharges, within their borders, which is considered to be owned and "operated" by the township.

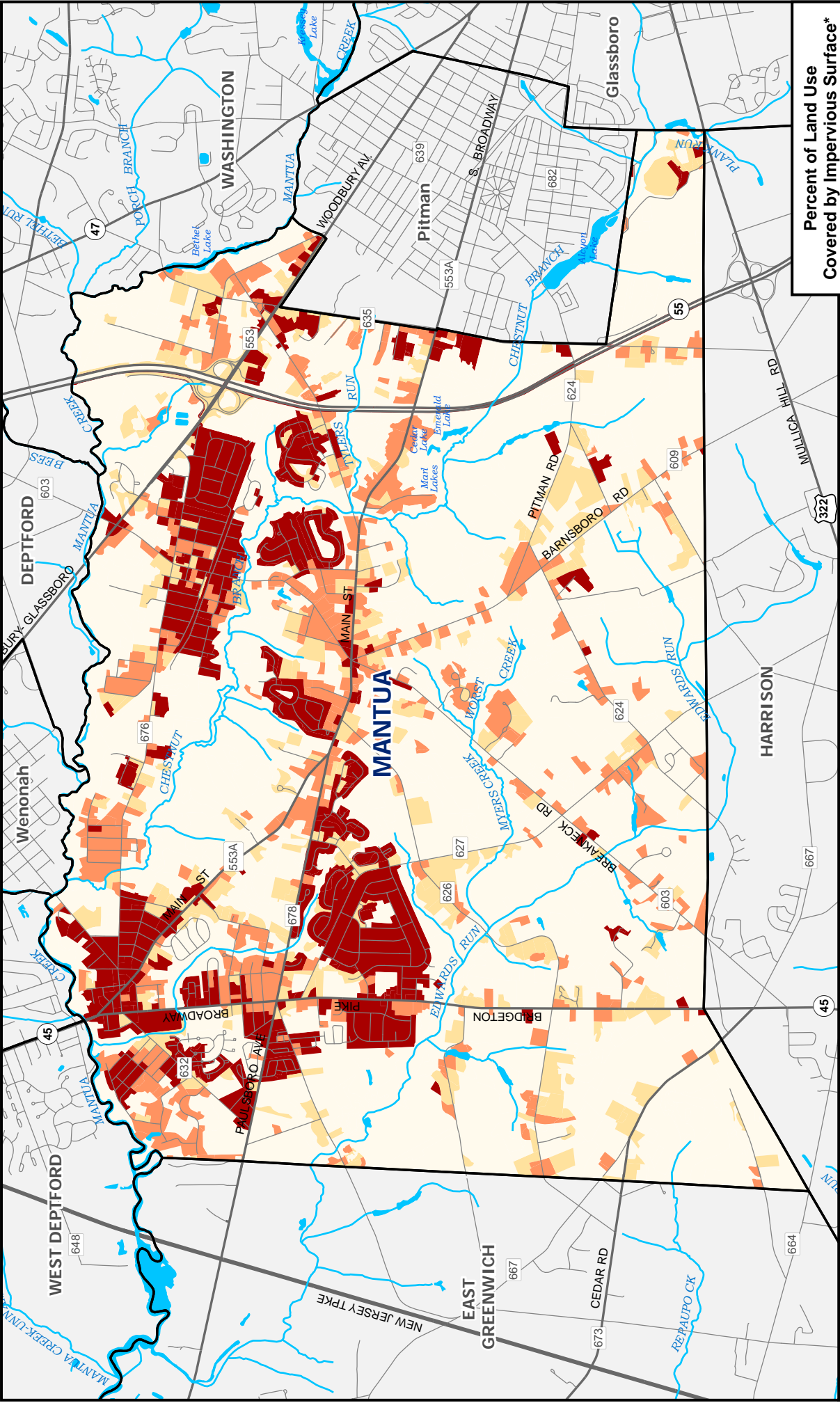
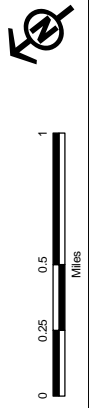
Under the 2004 NJPDES permit, a town must meet certain specific requirements in planning, ordinance adoption, education, management of township facilities, and investigation of parts of the stormwater system. Fulfillment of these statewide basic requirements is scheduled to occur over the course of five years.

See **Figure 3** for details of the statewide basic requirements of this program.

Impervious Coverage

The volume of runoff that is carried to a stream also impacts stream channel condition. Increased volume usually results from increased impervious surface within a subwatershed. As an area becomes developed, more stormwater is directed to the streams from neighborhood storm drains, residential and commercial stormwater facilities, and road drainage. In general, scientists have found that levels of impervious cover of 10 percent or more within a subwatershed are directly linked to increased stormwater runoff, enlargement of stream channels, increased stream bank erosion, lower dry weather flows, high stream temperatures, lower water quality, and declines in aquatic wildlife diversity. When impervious cover reaches 25 to 30 percent, streams are found to be severely degraded. The general land use data for Mantua Township identifies over 32 percent of the township as developed, although not all of that area will be impervious. **Map 9: Impervious Coverage** shows the extent of impervious coverage for all of Mantua.

map 9: Impervious Coverage



Percent of Land Use Covered by Impervious Surface*

- Less than 5
- 5 - 10
- 10 - 25
- Greater than 25

*NJDEP 1995/1997 Land Use

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Sources: NJDEP, 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.

**Stormwater Management Statewide Basic Requirements
Towns, Highway Agencies, and Institutions**

1. Control post-construction stormwater management in new development and redevelopment through:
 - Adoption of a stormwater management plan in accordance with N.J.A.C. 7:8.
 - Adoption and implementation of a stormwater control ordinance in accordance with N.J.A.C. 7:8. This ordinance requires retention on site of 100% of preconstruction recharge, and use of low-impact design in stormwater facilities, among other features.
 - Ensuring compliance with Residential Site Improvement Standards for stormwater management. The RSIS is currently being revised to incorporate the low-impact design and other requirements of the stormwater control ordinance.
 - Ensuring long-term operation and maintenance of Best Management Practices on municipal property.
 - Requiring that new storm drain inlets meet new design standards.
2. Conduct local public education:
 - Distribute educational information (about stormwater requirements, nonpoint source pollution, and stewardship) annually to residents and businesses and conduct a yearly “event” (such as a booth with these messages at a community day).
 - Have all municipal storm drain inlets labeled with some type of “don’t dump” message.
 - Distribute information annually regarding fertilizer/pesticide application, storage, disposal, and landscaping alternatives.
 - Distribute information annually regarding proper identification, handling, and disposal of wastes including pet waste and litter.
3. Controlling improper disposal of waste through improving yard waste collection and through adoption of ordinances (pet waste, litter, improper dumping, and wildlife feeding).
4. Controlling solids and floatables through increased street sweeping, retrofitting storm drain inlets during road repairs, and instituting programs for stormwater facility management, for roadside erosion control, and for outfall pipe scouring/erosion.
5. Improving maintenance yard operations, specifically for de-icing material storage, fueling operations, vehicle maintenance, and housekeeping operations.
6. Increasing employee training about all of the above.

Fig. 3. Stormwater Management Statewide Basic Requirements

Inadequate 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 for wildlife to move

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between larger forested habitat areas. This greenway can be utilized for recreation by residents as well, through trails, bikeways, and access points to the water for fishing and canoe/kayak launching.

The importance of a healthy, intact buffer zone (also referred to as a “riparian corridor”) has been well documented scientifically over the past 20 years, especially for headwater streams. There is less agreement and much continuing research on the appropriate minimum width of a buffer. In 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.

Restoration of stream buffers on agricultural lands is supported by various programs of the US Department of Agriculture (USDA) and the New Jersey Department of Agriculture, such as the Conservation Reserve Program (CRP), administered by the USDA’s Farm Service Agency (FSA). This program compensates farming landowners for the loss of land being converted to a buffer or other habitat. It also funds or directly creates new buffers where they are absent. Programs such as the Environmental Quality Incentive Program (EQIP), administered by the Natural Resources Conservation Service (NRCS) of USDA, encourage the “due care” management of agricultural lands, involving the proper levels of fertilizer and pesticide applications to farmland. It funds up to 75 percent of the costs of eligible conservation practices. These are all programs in which individual landowners volunteer to take part.

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 and “nonpoint source” pollution, but only required states to regulate point sources.

NJDEP, through the Division of Water Quality and the Bureau of Point Source Permitting, administers the NJPDES program (*N.J.A.C. 7:14A*). Under NJPDES, any facility discharging domestic or industrial wastewater directly into surface or ground water 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. Permits are available and required for

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surface water, ground water, storm water, combined sewer overflow, and residual discharges. NJDEP enforces the terms of NJPDES permits by visiting discharging facilities and conducting water quality, biological, and toxicological analyses and thermal impact and cooling water assessments.

Under the Open Public Records Act (OPRA) of 2002, a list of active NJPDES permits is available. As of September 30, 2004, eight NJPDES permits were issued to individual facilities in Mantua Township. These are shown in **Table 13: Mantua Township NJPDES Permits**, below.

Since the adoption of the Federal Clean Water Act in 1972 and the implementation of NJPDES in subsequent years, water pollution from point sources has decreased drastically. However, as development has continued to spread throughout New Jersey, nonpoint source pollution has increased substantially in recent decades. NJDEP's new Stormwater Management Rules, described above, focus on reducing and controlling nonpoint sources of water pollution.

Table 13: Mantua Township NJPDES Permits

NJPDES Permit Number	Facility Name	Effective Start Date	Expiration Date	Discharge Category Description	Street Address	Street City	State	Zip Code
NJ0089354	INVERSAND CO	5/1/2002	4/30/2007	GW - Discharge to Groundwater	625 WOODBURY GLASSBORO RD	Mantua	NJ	08080
NJG0115754	PONTES USED AUTO PARTS	4/1/2001	11/30/2004	SM - Scrap Metal Processing / Auto Recycling (GP)	55 NEW YORK AVE	Mantua	NJ	08051
NJG0147605	AUTO AND TRUCK RECYCLER OF NEW JERSEY	4/1/2004	11/30/2004	SM - Scrap Metal Processing/Auto Recycling (GP)	440 MAIN ST	Sewell	NJ	08080
NJG0152846	MANTUA TWP	4/1/2004	2/28/2009	R9 - Tier A Municipal Stormwater General Permit	401 MAIN ST	Mantua	NJ	08051

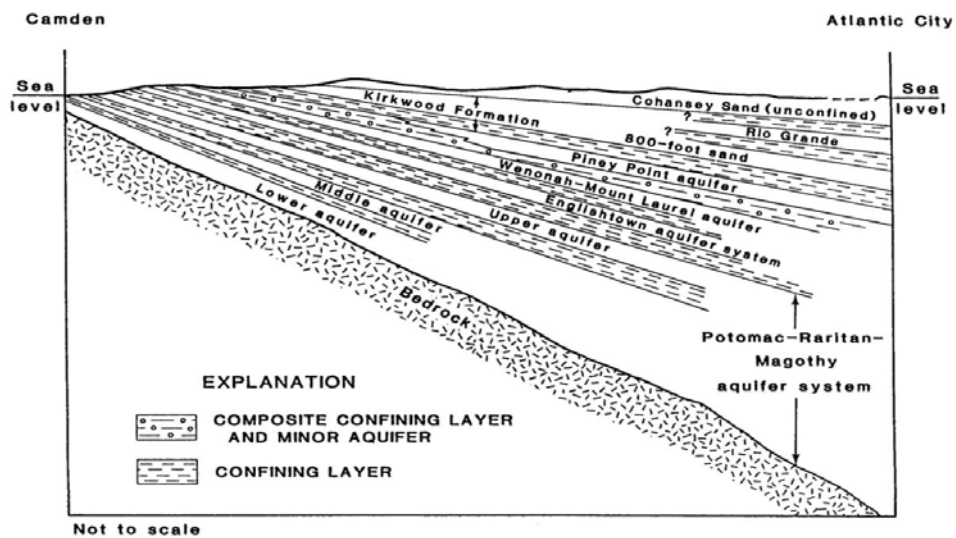
Source: NJDEP

4.5 GROUNDWATER

The geology of the New Jersey Coastal Plain can be visualized as a tilted layer cake, with its “layers” or strata formed of gravels, sands, silts, and clays. The saturated gravel and sand layers, with their large pore spaces, are the aquifers from which water is drawn. The silt and clay layers, which impede the movement of water, are called confining beds. A cross section across southern New Jersey from west to east would show that the layers are not horizontal but tilt downward to the southeast, getting deeper as they cross the state toward the Atlantic Ocean. Because of this tilting, each layer or formation emerges on the land surface in a sequential manner. The deepest formations emerge on the surface near the Delaware River. Where a formation emerges is its “outcrop” area.

4.5.1 Geologic Outcrops

Of the 13 geological formations that outcrop in Gloucester County, 8 outcrop in Mantua Township. Five of these formations are water-bearing strata (aquifers) and three are confining beds. The oldest and deepest of the water-bearing formations that outcrop in Mantua is the Englishtown aquifer, which is composed primarily of sands and gravels. The remaining aquifers that overlay the Englishtown and outcrop in Mantua include the Wenonah-Mount Laurel, the Piney Point, the 800-foot sand, the Rio Grande, the Kohansey Sand (unconfined), and the Kirkwood Formation. The remaining aquifers that overlay the Englishtown and outcrop in Mantua include the Wenonah-Mount Laurel, the Vincentown, and the Kirkwood and Kohansey aquifers, which, because they are not always separated by a confining bed, are generally referred to by a combined, hyphenated name. See **Map 10: Aquifer and Confining Bed Outcrops** for a visual depiction of the outcrop areas. All of the aquifers and confining beds found in Mantua are described in the succeeding paragraphs. Their pertinent hydrologic characteristics are summarized in **Table 13**.



Source: US Geological Survey

Fig. 4. Aquifers of Southern New Jersey along a Line from Camden to Atlantic City

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Englishtown Formation

The Englishtown formation outcrops in the extreme northwestern corner of Mantua Township. It consists of sand and clay. While it has been known to produce well yields of up to 100 gallons per minute, it is considered only a minor aquifer. Recharge is both direct, by precipitation on the outcrop area, and indirect, by leakage from overlying formations.

Marshalltown Formation

The Marshalltown Formation consists of clay and sandy clay. It is not a significant aquifer and, instead, acts as a confining layer between the Englishtown Formation and the Wenonah-Mount Laurel Formation, both of which are more permeable.

Wenonah-Mount Laurel Formation

The Wenonah-Mount Laurel Formation consists of fine to course grained sand. Well yields are high, up to 200 gallons per minute. Recharge to this aquifer is principally through inter-formational leakage.

Navesink and Hornerstown Formations

These formations consist of sand and clay that permit some seepage but effectively confine the aquifers that lay under them.

Vincentown Formation

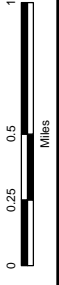
Outcroppings of this formation are irregular as contrasted to the bands that are characteristic of the other formations described. Generally, the Vincentown is found approximately 100 feet below the surface. However, it outcrops in Mantua in the southeastern most corner of the township and also in an area lying west of Barnsboro. Although it is not a well-developed aquifer, it is considered more productive than either the Englishtown or Kirkwood formations. Recharge is inter-formational from the Kirkwood.

Kirkwood Formation

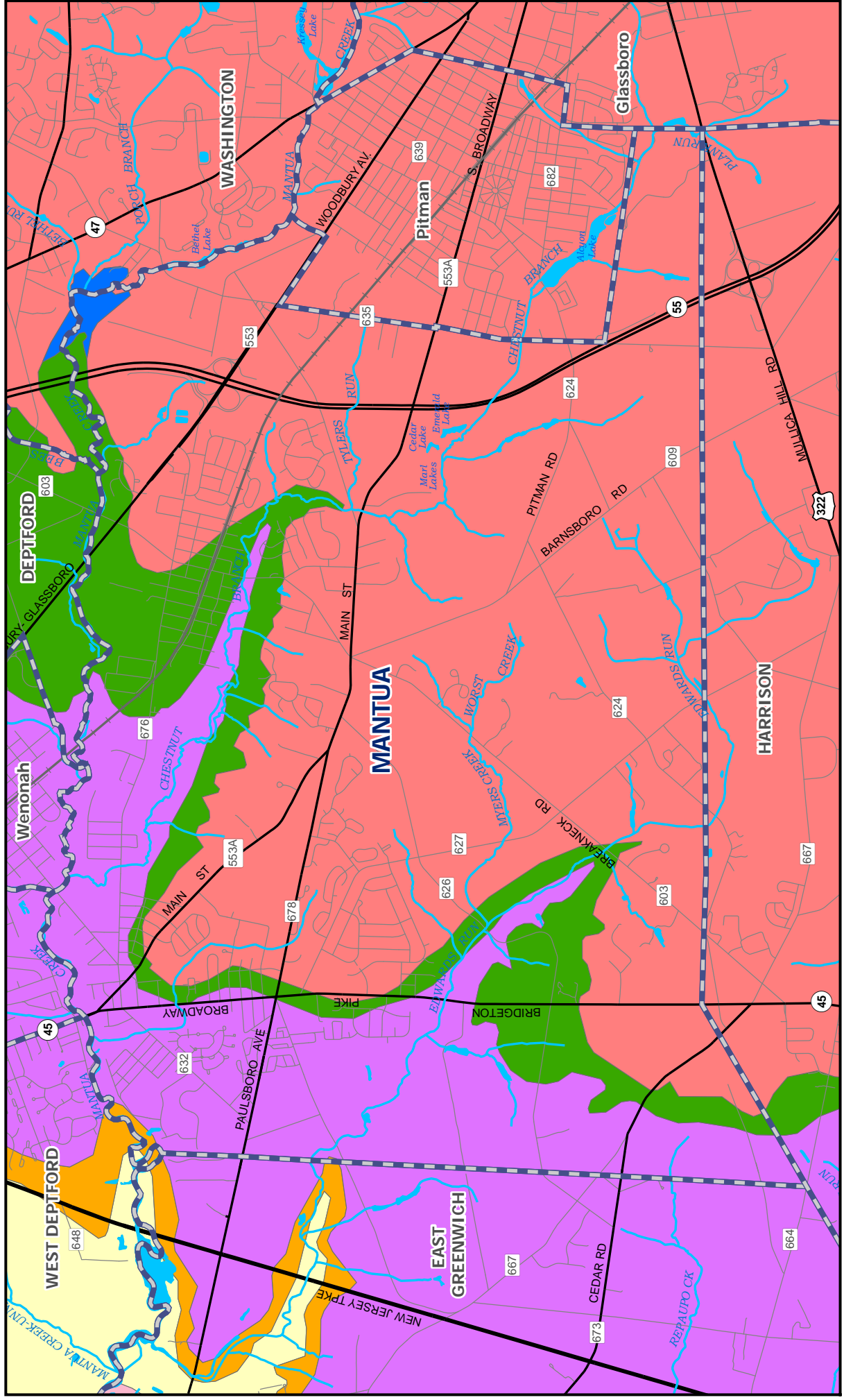
The Kirkwood Formation consists of sand and clay and has the largest outcrop area in the township. Although in itself it is a minor aquifer in Mantua, its hydrological significance lies in its ability to absorb precipitation and transmit it to aquifers below. Since the local water table transmits to the Kirkwood, which, in turn, recharges other aquifers, contamination of groundwater supplies is possible. Therefore, care should be taken in locating and designing septic systems or disposing of industrial wastes in outcrop areas.

Cohansey Sand

The Cohansey Sand consists of highly permeable sand and is an extremely productive aquifer with excellent developmental potential. It outcrops in Mantua in the extreme southern tip of the



map 10: Aquifer and confining Bed Outcrops



- Legend**
- Kirkwood-Cohansey Aquifer System
 - Composite Confining Unit
 - Mt. Laurel-Wenonah Aquifer
 - Marshalltown-Wenonah Confining Unit
 - Englishtown Aquifer System

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township, west of Pitman. Recharge of the Cohansey Sand is from precipitation on the outcrop area. It is highly susceptible to contamination due to its shallow water table. Concern for the future water supply of the region dictates an extremely cautious approach to land development in the outcrop area.

Table 14: Geologic Formations Outcropping in Mantua Township

Pre-quaternary Geologic Formation	Thickness (feet)	Well Yields (gpm)	Range in Well Depth (feet)
Englishtown	0-50	20-100	50-160
Marshalltown	10-40	40-100	100
Wenonah-Mt. Laurel	65-95	Up to 200	35-200
Navesink	0-40	10-50	—
Hornerstown	8-30	10-50	—
Vincentown	0-55	10-150	85-100
Kirkwood	50-160	10-50	25-100
Cohansey	0-130	Up to 800	25-130

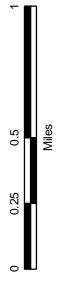
Source: Hardt and Hilton, Water Resources and Geology of Gloucester County

4.5.2 Drinking Water Supply

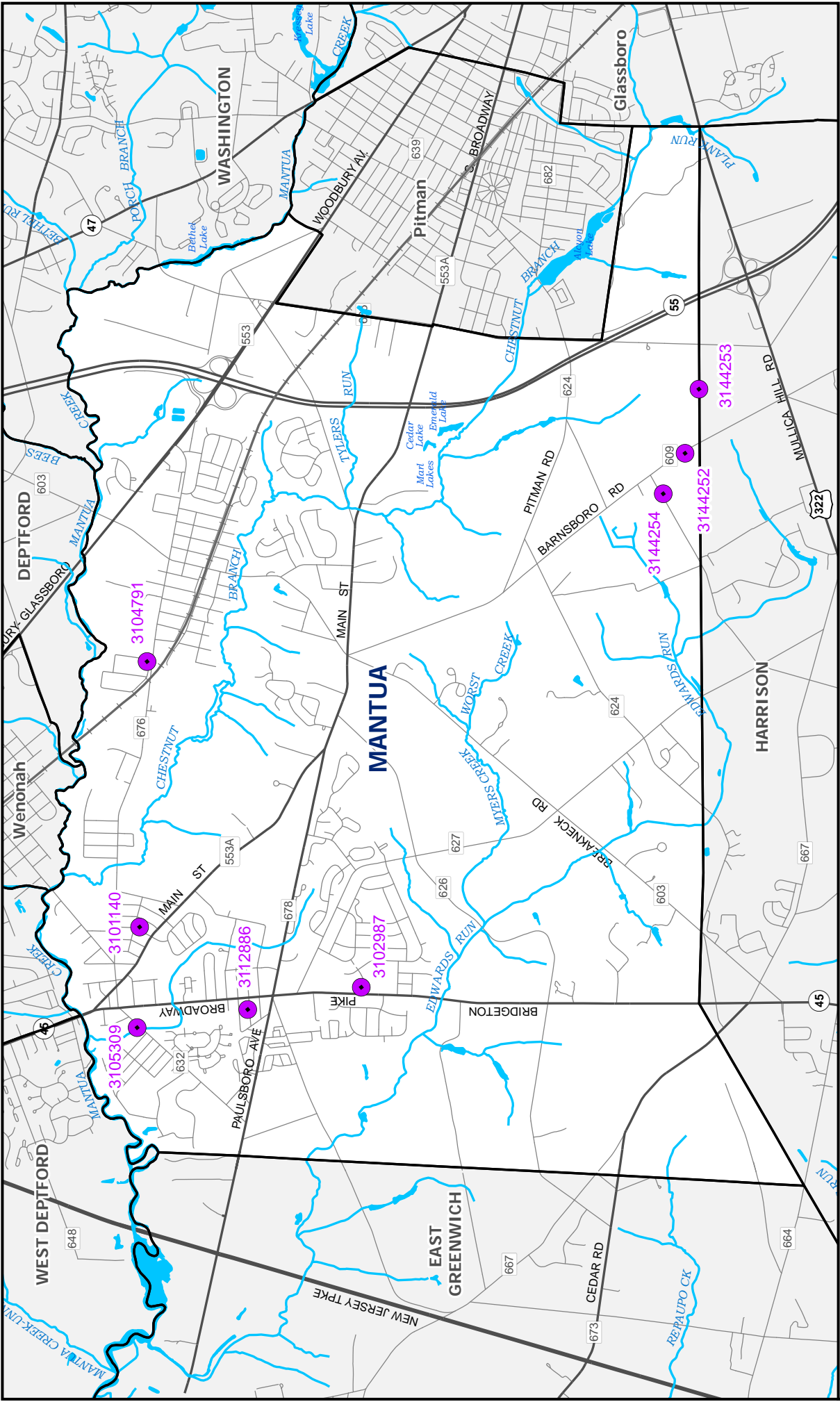
Of the aquifers that outcrop in Mantua, only the Mount Laurel-Wenonah is a significant source of public drinking water for the township. The remaining aquifers that outcrop in Mantua are too shallow to be used for drinking water. They are, however, a significant drinking water source for county residents living to the east of Mantua.

There are eight active public community water supply wells in Mantua Township, as listed in **Table 15: Public Water Supply Wells** and shown on **Map 11: Public Water Supply Wells**. Three of these wells tap into the Mount Laurel-Wenonah aquifer, and are located in the southern portion of the township along Barnsboro Road. The remaining public community water supply wells tap into the Potomac-Raritan-Magothy (PRM) aquifer.


Most private wells in Mantua also probably draw on either the PRM formation or the Mount Laurel-Wenonah aquifer, but since there is no comprehensive inventory of private wells available to municipalities, it is difficult to know for sure. Permits for private wells are held by the county health department, but there are many gaps in the records due to various factors, including well age. The recently enacted (2002) Private Well Testing Act requires state-certified laboratory water testing in order to sell a residential property. This will not identify what aquifers are being drawn upon by private wells, but it will eventually provide better documentation of the quality of drinking water from private wells in an area.



map 11: Public Water Supply Wells



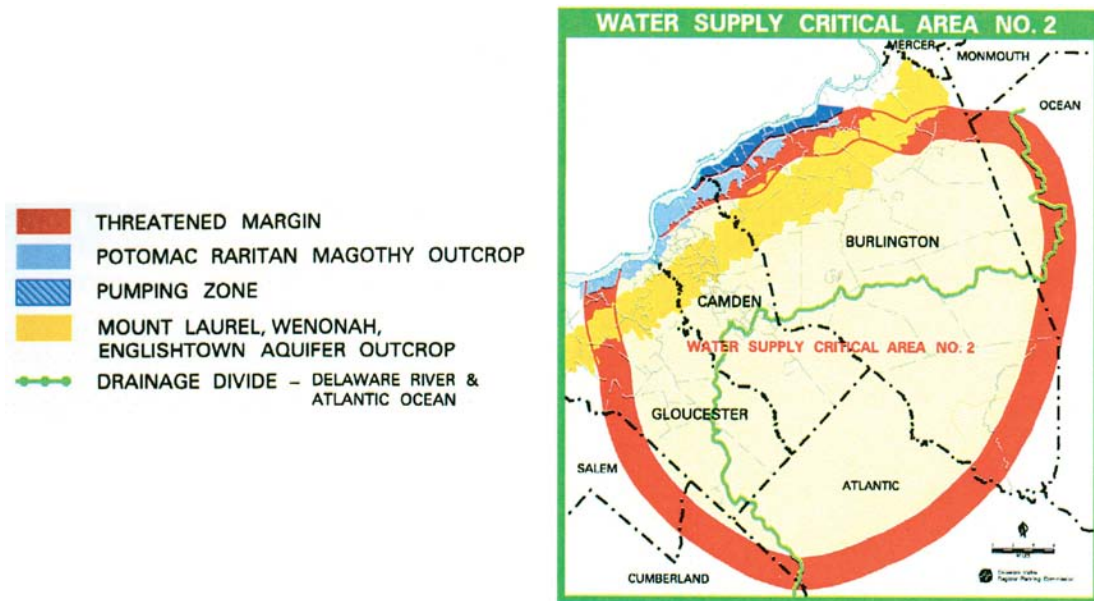
Legend

-  Public Community Water Supply Wells

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Sources : NJDEP, DVRPC
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Source: DVRPC

Fig. 5. Water Supply Critical Area No. 2

Because of the limits on the withdrawal of groundwater from the PRM, Mantua has increasingly been forced to rely upon water piped from the Delaware River for its drinking water supply. Mantua purchases this water from the New Jersey American Water Company. In 2004, Mantua purchased 7 percent of its drinking water supply from New Jersey American Water.

4.5.3 Wellhead Protection Areas and Water Supply Wells

Because an outcrop is the area where an aquifer emerges on the land surface, preventing contamination of the land in aquifer outcrop areas is extremely important in order to maintain a safe drinking water supply. To protect aquifer outcrop areas, NJDEP established the Well Head Protection Program Plan in 1991. The program delineates Well Head Protection Areas (WHPAs) around public community water supply wells. A WHPA is the area from which a well draws its water within a specified time frame. Once delineated, these areas become a priority for efforts to prevent and clean up groundwater contamination. Other components of the Well Head Protection Plan include implementing best management practices to protect groundwater, land use planning, and education to promote public awareness of groundwater resources.

Delineating a Wellhead Protection Area (WHPA)

A WHPA consists of three tiers, each based on time of travel to the well:

- Tier 1 = two years
- Tier 2 = five years
- Tier 3 = twelve years

Calculation of the tier boundaries is based on findings of how long specific contaminants can survive in groundwater, how much time would be required for specific remedies to be undertaken, and on the likelihood of natural dilution over distance. The tiers are shown as rings around a well, with the groundwater direction of travel factored in to create plume-like shapes.

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The delineation of a WHPA differs depending upon whether a well draws on a confined or unconfined aquifer, because it takes a much longer time for contaminants to reach a confined aquifer. In Mantua, all public community water supply wells draw on confined aquifers. According to NJDEP studies, it would take longer than 12 years for contamination entering from the surface to reach Mantua’s wells. Therefore, the WHPAs for Mantua’s wells are limited to a 25-foot radius around the well location. By contrast, WHPAs in other portions of the state can be as large as several square miles.

Table 15: Public Water Supply Wells

Well ID #	Original Owner	Aquifer	Depth to Top of Well Screen (feet)	Depth to Bottom of Well Screen (feet)
31-01140	Mantua Twp. Municipal Utilities Authority	Upper PRM	316	348
31-02987	Mantua Twp. Municipal Utilities Authority	Upper PRM	337	480
31-04791	Mantua Twp. Municipal Utilities Authority	Upper PRM	368	Unknown
31-05309	Mantua Twp. Municipal Utilities Authority	Upper PRM	268	Unknown
31-44252	Mantua Twp. Municipal Utilities Authority	Mount Laurel-Wenonah	199	220
31-44253	Mantua Twp. Municipal Utilities Authority	Mount Laurel-Wenonah	191	210
31-44254	Mantua Twp. Municipal Utilities Authority	Mount Laurel-Wenonah	183	226
31-12886	Manor Water Associations Inc	PRM	Unknown	330

Source: NJDEP

4.5.4 Groundwater Recharge

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

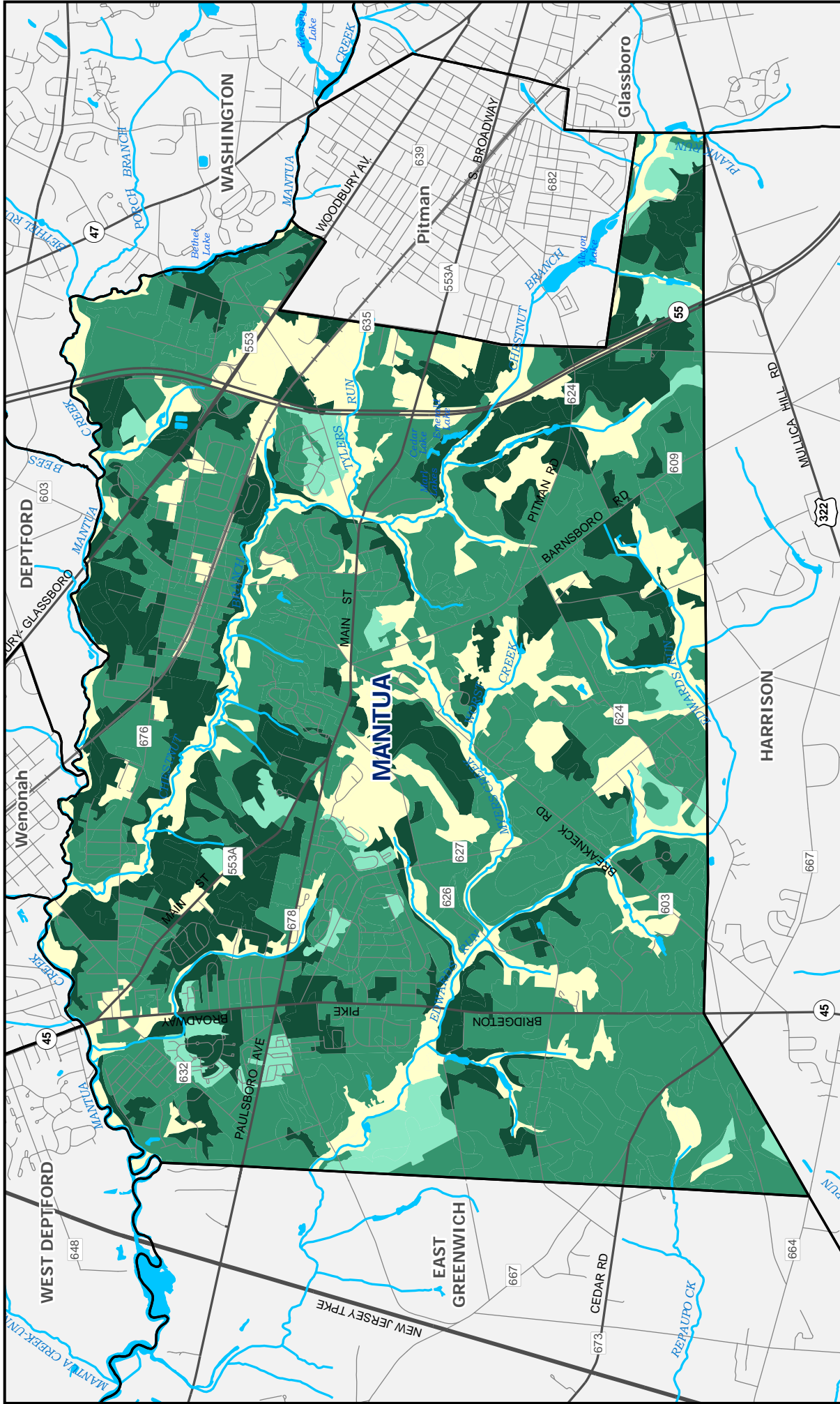
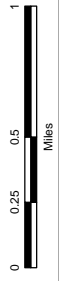
The New Jersey Geological Survey has developed a methodology for evaluating land areas for their ability to transmit water to the subsurface, using precipitation records, soil surveys, and land use/land cover data. NJDEP has used this methodology to map and rank land areas throughout the state as to groundwater recharge potential. Recharge is measured as the amount of precipitation that will reach the water table in one year.

In Mantua, lands with recharge of greater than 12 inches per year, the highest in the township, are found in scattered patches, with the largest areas along either side of Main Street in the northern part of the township, and along Chestnut Branch in the southeastern corner of the township. Other high recharge land can be found to the south of Edwards Run and to the south of Mantua Creek. In the case of Mantua, recharge is to the Wenonah-Mount Laurel and Kirkwood-Cohansey aquifers. See **Map 12: Groundwater Recharge**.

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On these high recharge lands, the amount of paving and other impervious cover has the most detrimental impact, although they are also usually the places that are most suitable for building because they are on well-drained soils. Conversely, these are also regions where the dilution of substances from septic systems, such as nitrates, may require a larger land area because the soils are usually more “porous.” For example, minimum average lot sizes of two to four acres are often needed for proper nitrate dilution from septic systems in areas having 10 or more inches per year of groundwater recharge.

map 12: Groundwater Recharge



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Sources : NJDEP, DVRPC
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SECTION 5: BIOLOGICAL RESOURCES

When a community decides to protect wildlife and habitat, they have chosen to protect biodiversity, which enables many species, including humans, to thrive and live healthy lives. Biodiversity refers to the variety of genetic material within a species population, the variety of species (plants, animals, microorganisms) within a habitat, and the variety of habitats 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 hard for an ecosystem to recover or replace species.

Scientists have discovered and named somewhere between 1.5 and 1.8 million plant and animal species in the world. Far more species, possibly 10 to 20 times the number of known species, are unknown to science. Alarming, this great diversity of species is now diminishing at an unprecedented rate. Researchers generally agree that the extinction rate is now catastrophically high, somewhere between one thousand and ten thousand times the rate before human beings began to exert significant pressure on the environment. Given these trends, and barring significant increases in conservation efforts, approximately one-half of the world's species will be gone by the end of this century.⁹

While the decline of biodiversity may appear to be a global problem, conservation needs to occur on both global and local levels if it is to succeed. Mantua contains numerous types of habitats, all of which are important for maintaining biodiversity. Upland forests, which are the most abundant type of ecosystem in Mantua, occur where land is dry and undeveloped. Grassland and grassland-suitable habitat, like pastureland, is the second most common ecosystem type in Mantua. Along Mantua's stream corridors and lakeshores are wetlands, which support plants that require constantly saturated soils; and within and around waterbodies are submerged communities, which require persistent standing water. The following sections will identify and describe in more detail the plant and animal communities that inhabit these unique ecosystems within Mantua Township.

5.1 NATURAL VEGETATION

A region's vegetation is dependent on many factors, the most important of which are climate and soils. Mantua's climate is cool and temperate with rainfall ranging from 42 to 44 inches per year. For a detailed description of Mantua's soils see section 4.3 *Soils* on page 17.

Mantua's natural vegetation types, along with human-influenced types of land cover, have been tabulated and mapped by NJDEP's 1995/97 land cover analysis. This data, based on infrared aerial photography, is the most recent available. The designation of a particular land cover as a

⁹ Wilson, Edward O. *The Future of Life*. New York: Vintage Books, 2002. pp. 14, 99-102.

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vegetation type is based on definitions provided by the Anderson Land Use Classification System, created by the US Geologic Survey. See **Map 13: Natural Vegetation (1995/1997)**.

Table 16: Mantua Township Natural Vegetation

Type of Vegetation	Acres	% of Total Land Area
Deciduous Forest	2,267.94	22.10%
Coniferous Forest	129.89	1.27%
Mixed Forest (>50% deciduous)	50.17	0.49%
Mixed Forest (>50% coniferous)	42.13	0.41%
Brushland/Shrubland	443.04	4.32%
Artificial Lakes	31.16	0.30%
Tidal Waters	14.99	0.15%
Tidal Wetlands	70.50	0.69%
Interior Wetlands (deciduous wooded wetlands)	563.98	5.49%
Interior Wetlands (deciduous scrub/shrub wetlands)	52.77	0.51%
Interior Wetlands (coniferous scrub/shrub wetlands)	0.91	0.01%
Interior Wetlands (mixed scrub/shrub wetlands)	2.57	0.03%
Interior Wetlands (herbaceous wetlands)	18.76	0.18%
Modified Wetlands (agricultural wetlands)	27.29	0.27%
Modified Wetlands (disturbed wetlands)	40.08	0.39%
Modified Wetlands (former agricultural wetlands)	6.08	0.06%
Modified Wetlands (wetlands in maintained lawn)	3.40	0.03%
Total Vegetation Land Cover	3,765.66	36.70%

Source: NJDEP (1995/97 Land Cover)

5.1.1 Wetlands

Nearly all wetlands in Mantua Township are found in association with major streams and their tributaries. NJDEP, which employs USGS guidelines, classifies wetlands with naturally occurring vegetation into two major categories: (1) *tidal wetlands*; and (2) *interior wetlands*, which are wetlands found in nontidal lowlands associated with waterways, and isolated wetlands surrounded by uplands. NJDEP also identifies *modified wetlands*, which are wetlands that have been altered by human activities and do not support typical natural wetland vegetation, but which do show signs of soil saturation on aerial infrared surveys. Because Mantua is inland, the township has far more interior wetlands than tidal wetlands. Tidal wetlands occupy only 71 acres of Mantua. Interior wetlands, by contrast, occupy 639 acres of Mantua's land. Modified wetlands, which are also nontidal, occupy 76 acres of the township.

Mantua's interior wetlands are scattered throughout the township along Mantua Creek, Edwards Run, Chestnut Branch and their tributaries. While interior wetlands are not the most abundant land type in Mantua, they provide high-quality animal and plant habitat, purify the township's surface and ground water, and create picturesque landscapes that add immeasurably to the quality of life for township residents. Mantua Township has three major types of interior

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wetlands: (1) wooded wetlands dominated by deciduous trees; (2) scrub/shrub wetlands dominated by deciduous woody plants; and (3) herbaceous wetlands. See **Map 13: Natural Vegetation (1995/1997)**.

Common throughout Mantua Township are deciduous wooded wetlands (also referred to as forested wetlands). Deciduous wooded wetlands occupy about 564 acres of Mantua and support mixed hardwoods that flourish in lowlands. Closely associated with deciduous wooded wetlands are scrub/shrub wetlands, occupying about 56 acres of Mantua. These wetlands are generally composed of young, medium-height, primarily deciduous woody plants. With its banks largely undeveloped and surrounded by agricultural lands, Edwards Run supports large swaths of deciduous wooded and scrub/shrub wetlands. The tributaries to Edwards Run and Chestnut Branch and its tributaries support wooded wetlands enclosed by upland forests. Wooded wetlands are also found to a lesser extent along Mantua Creek and adjoining tributaries. Marl, Cedar, and Emerald lakes in the Chestnut Branch watershed support some wooded and scrub/shrub wetlands.

Some common trees in Mantua's deciduous wooded wetlands are red maple, black tupelo, green ash, black willow, swamp white oak, willow oak, Southern red oak, sweetgum, and American sycamore. Mantua's scrub/shrub wetlands are composed of young saplings of red maple, box elder, and sweetgum, and dominated by shrub species like silky dogwood, red-ossier dogwood, gray dogwood, meadowsweet, steplebush, Southern arrowhead, and hazel alder.

In Mantua, herbaceous wetlands are very rare, occupying only 19 acres of Mantua's land area. Herbaceous wetlands generally occur along lake edges, open floodplains, and former agricultural wetland fields. Herbaceous wetlands are found in close proximity to wooded wetlands along two of Mantua's streams: the very end of the main channel of Edwards Run near Barnsboro Road, and along a stretch of Chestnut Branch that is adjacent to Marl, Cedar, and Emerald lakes. Herbaceous wetland plants include rice cutgrass, reed canary grass, pond lily, tearthumb, arrow-leaved tearthumb, broadleaf cattail, and the common reed (*Phragmites*).

Mantua's 71 acres of tidal marshes are entirely freshwater and are located along the tidal portion of Mantua Creek and Chestnut Branch. Wild rice (*Zizania aquatica*) is perhaps the most distinctive of the plants that grow in freshwater tidal marshes. This annual grass can grow to be nine feet tall and is an important food source for migratory waterfowl. It is often found in association with broad-leaved cattail. Other plants that grow with it are pickerelweed, arrow arum, nodding beggar ticks, and spatterdock. Other plants found in freshwater tidal marshes are the pond lily, Japanese knotweed (an invasive plant), and Joaquin sunflower. Another plant surrounding tidal marshes is the invasive *Phragmites*.



Wild Rice

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In Mantua, modified wetlands encompass agricultural wetlands, former agricultural wetlands, disturbed wetlands and wetlands that occur in maintained greenspaces such as open lawns, golf courses, and storm water swales. Modified wetlands differ from non-modified wetlands in that they do not support the typical natural wetland vegetation found in analogous unaltered natural areas, although they do exhibit evidence of soil saturation. In total, modified wetlands occupy just 76 acres, less than 1 percent of Mantua's total land area.

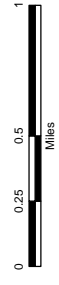
5.1.2 Upland Forests

Upland areas are those locations without water at or near the soil surface. Over 90 percent of Mantua is comprised of upland soils. Upland forests can be found scattered throughout Mantua's uplands. Most of Mantua's original upland forests have been cleared and converted to farms or residential or commercial development. Nearly all old-growth forests, because of their natural fertility, were cleared for farmland during colonial times. Current upland forests are second- or third-growth woodlands and tend to be located near stream corridors or are patchy woodlands occupying less desirable soils. See **Map 13: Natural Vegetation (1995/1997)**.

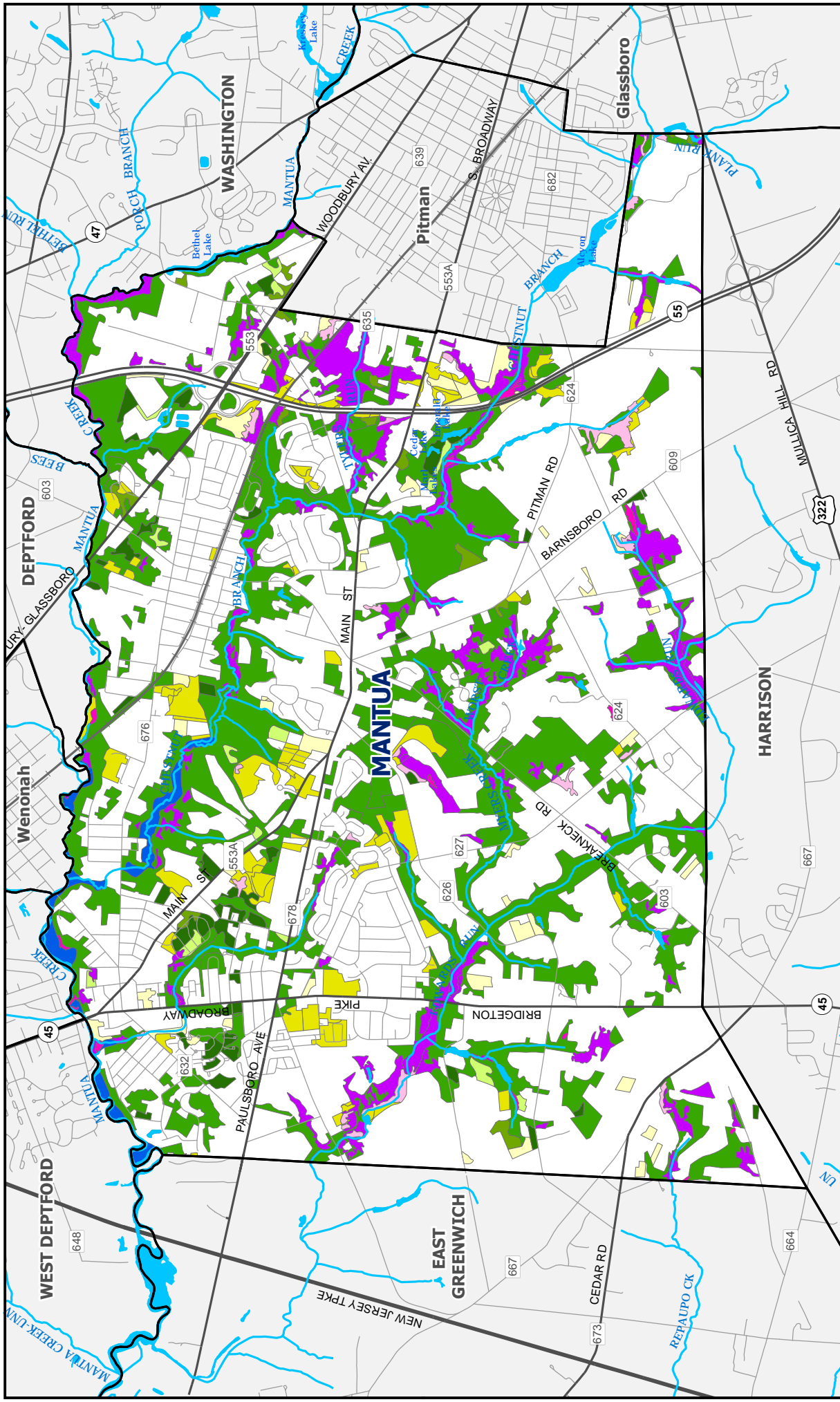
Mantua has more diverse forests than some other townships in Gloucester County because it lies in both the inner *and* outer coastal plains. Additionally, New Jersey's climate can support an extraordinary variety of plant species; some of the southernmost occurrences of northern range plant species and the northernmost occurrences of southern range plant species are found in the state. Mantua's forests are a combination of mesic forests and Pineland deciduous upland forests. Typical mesic forests require a moderate amount of moisture in soils and climate, and underlying soils tend to be the most fertile in South Jersey. Pineland forests, by contrast, tend to have poorer, sandier soils and are inhabited by a mixture of pines and oaks.

Upland forests are the second most abundant type of land cover in Mantua, after developed land. Approximately 2,490 acres of Mantua is upland forest, of which the great majority (2,268 acres) is deciduous forest. Some of this upland forest has been preserved by the creation of Ceres Park Wildlife Sanctuary and Chestnut Branch Park. However, due to the large expanses dedicated to active recreation fields in Chestnut Branch Park, only the northern half of the park is forested. The composition of Mantua's upland deciduous forests is largely one of mixed oaks – black, red, chestnut, and Shumard oaks – joined by other hardwoods such as birch, beech, hickory, and locust trees, and ailanthus and sweetgum. The understory is dominated by flowering dogwood, black cherry, ironwood, and sassafras. Vines, such as wild grapes, Virginia creeper, Japanese honeysuckle, and poison ivy, are common. Spicebush, arrowwood, and black haw are common shrubs in moister locations. Some of the most *recognizable* trees in Mantua's deciduous forests are the black oak, mockernut hickory, sweetgum, American beech, Northern catalpa, and flowering dogwood.

Coniferous trees occur on about 130 acres of Mantua. These forests are mostly made up of successional, or pioneer, plants, like Virginia pine, scrub pine, and pitch pine, which will eventually be overgrown by dominant deciduous trees, such as ash, birch, oak, and hickory.



map 13: Natural Vegetation (1995 / 1997)



Vegetation

- Brush/Shrubland
- Tidal Waters
- Upland Forest - Deciduous
- Wetlands - Scrub/Shrub
- Brush/Shrubland - Oldfield
- Tidal Marshes - Freshwater
- Upland Forest - Mixed (Conif. dom.)
- Wetlands - Wooded - Deciduous
- Upland Forest - Mixed (Decid. dom.)
- Lakes
- Upland Forest - Coniferous
- Wetlands - Herbaceous

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Sources : NJDEP, 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.



Photo by Chris Linn

Upland Forest Foliage near Edwards Run

5.1.3 Grasslands and Agricultural Lands

NJDEP defines grassland habitat as brushland, shrubland or old fields that were cleared or disturbed at one time and then abandoned. Following abandonment, old fields are overgrown by perennial herbs and grasses. These pioneer plants remain the dominant species for 3 to 20 years time. Later, woody plants take over. This habitat is visible especially along wood edges, roadsides, and in landscapes where mowing is infrequent and where woody plants are not yet the dominant vegetation.

Slightly more than 4 percent of Mantua's land cover consists of brushland, shrubland or old fields. In Mantua, brushland is generally found adjacent to residential, commercial and industrial development, while old fields occur more often near agricultural or wetland areas. In addition to brushland and old fields, active agricultural cropland and pastureland is considered suitable "grassland" habitat for wildlife. Agricultural cropland and pastureland is the single most abundant type of vegetative land cover in Mantua Township, accounting for about 22 percent of the township's land area. See **Map 13: Natural Vegetation (1995/1997)**.

5.2 LANDSCAPE PROJECT PRIORITY HABITATS

The Landscape Project, developed by the Endangered and Nongame Species Program of the NJDEP Division of Fish & Wildlife, identifies and 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). Categories three through five include habitats throughout the state that possess two exceptional conditions: (1) a documented occurrence of one or more species on either the federal or the state threatened and endangered species lists, and (2) a sufficient amount of habitat type to sustain these species. These habitats are collectively known as "critical habitat." Categories one and two include habitats that either have a documented occurrence of a *species of special concern* in New Jersey, or are habitat deemed suitable for species that are included on the state or federal threatened and endangered species lists but for which there are no documented occurrences or sightings. These habitats are labeled "suitable habitats."

The Landscape Project identifies both critical and suitable habitat in Mantua Township. It is important to preserve both levels of habitat in order to maintain the diversity of species that still exists in the township. The rankings in Mantua are primarily the result of habitat being either critical or suitable for bald eagle nesting or foraging, for other rare bird species such as the peregrine falcon, Cooper's hawk, pied-billed grebe, and redheaded woodpecker, or for the endangered bog turtle. See **Map 14: Landscape Project Habitat Priorities**.

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Table 17: Landscape Project Habitat Rankings – Acreage in Mantua Township

Category	Rank	Acres	% of Total Habitat	% of All Mantua Land
Emergent Wetlands	Critical Habitat (5)	16.32	0.36%	0.16%
	Suitable Habitat (1)	111.61	2.45%	1.09%
Forested Wetlands	Critical Habitat (4)	40.66	0.89%	0.40%
	Critical Habitat (5)	74.67	1.64%	0.73%
	Suitable Habitat (1)	815.53	17.92%	7.95%
Upland Forest	Suitable Habitat (1)	1,624.00	35.68%	15.82%
Grassland	Critical Habitat (5)	634.89	13.95%	6.19%
	Suitable Habitat (1)	1,234.06	27.11%	12.02%
Total Habitat		4,551.73	100.0%	44.35%
Total Mantua Land		10,264.00		100.00%

Source: NJDEP

5.2.1 Landscape Project Data on Wetland Habitat

The Landscape Project divides wetland habitats into two types – forested and emergent wetlands. Emergent wetlands are marshy areas characterized by low-growing shrubs and herbaceous plants in standing water. They can be either tidal or nontidal. About 128 acres in Mantua are identified as priority emergent wetlands habitat. Of these, 16 acres are ranked as critical and the remaining 112 are ranked as suitable. Animal species that can be found in these wetland habitats include endangered turtles, rare fish, mollusks, crustaceans, and insects. Emergent wetlands are also important habitat for migratory waterfowl and passerines (land birds) like bald eagles and peregrine falcons. The tidal portion of Mantua Creek is included in a nearby bald eagle’s foraging area and is classed as critical emergent wetlands habitat.

Mantua’s forested wetlands are the third most common habitat type in the township, occupying 931 acres, of which 116 are ranked as critical. Critical forested wetland habitat in Mantua is located along the northern stretch of Edwards Run and adjoining lands, and along sections of Mantua Creek between Route 45 and the CSX railroad. Forested wetlands support species such as warblers and foraging bald eagles that nest along Mantua’s creeks. They can also be home to various rare amphibians (frogs and salamanders). The red-shouldered hawk, a state endangered species, also makes its home in Mantua’s forested wetlands. The red-shouldered hawk prefers to nest in pine forests, forest ravines and wooded swamps, near open water.

Mantua’s forested wetlands are also home to swamp pink, a federal and state listed endangered species, which relies on palustrine (swampy) wetlands. Swamp pink was once found in numerous, though isolated populations throughout the Mid-Atlantic States (from New York to Georgia). Today, the plant may have fewer than 100 populations, with the most documented in New Jersey. The pink wildflower is very sensitive to habitat destruction because it can only grow in wetlands with perennially saturated, but not flooded, soils. Additionally, swamp pink is

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known to be intolerant of pollution and cannot be grown in captivity. Because swamp pink populations are so rare and vulnerable, they can only be saved through habitat preservation.

5.2.2 Landscape Project Data on Upland Forest Habitat

The Landscape Project ranked 15 percent of Mantua's total land cover as suitable upland forest habitat. None of Mantua's upland forests were ranked as critical habitat.

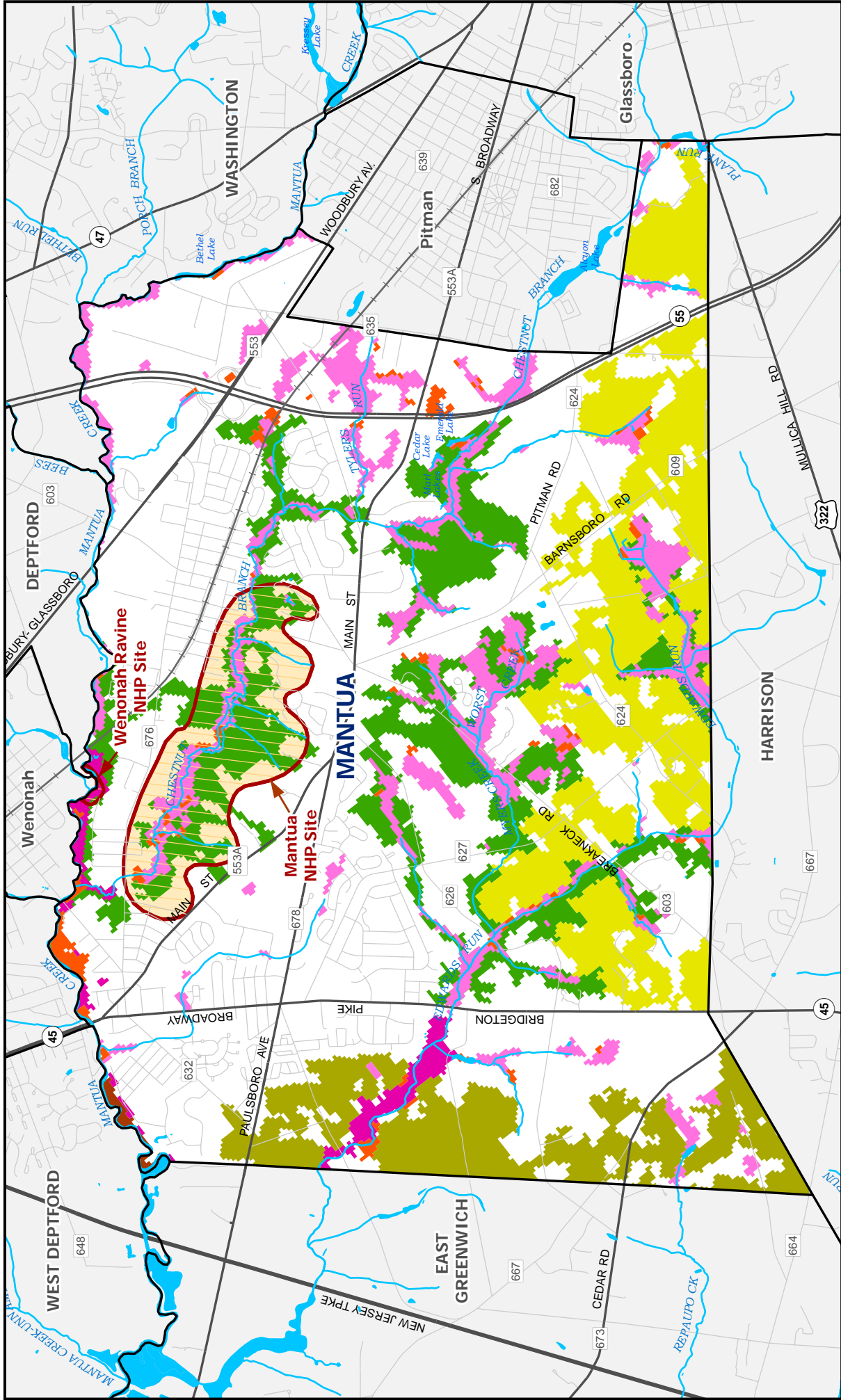
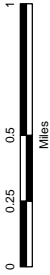
5.2.3 Landscape Project Data on Grassland Habitat

The Landscape Project designates 1,234 acres of the township as suitable grassland habitat. Most of this habitat is found close to Edwards Run and its tributaries in the southeastern part of the township. In addition, approximately 635 acres of farmland, found mostly to the west of Bridgeton Pike (Route 45), is ranked as critical grassland-species habitat. Grassland-dependent species are the most threatened group of species in New Jersey, primarily because the most common form of grassland habitat—agricultural fields—is the most threatened habitat in the state due to development pressure and rising land values. Unfortunately, much of the critical grassland habitat in Mantua has been displaced by recent town house and commercial development along Bridgeton Pike.

A large portion of Mantua's agricultural land is designated as critical or suitable grassland habitat for the following reasons: (1) migrating birds cannot visually distinguish cropland from grassland, (2) cropland turns into grassland when it is fallow for one year or more, (3) some crops like alfalfa and soybeans provide suitable nesting habitat for several bird species such as sparrows, (4) all or most endangered and threatened birds are area-sensitive, requiring large ranges that include grasslands and agricultural lands, and (5) agricultural land provides important disturbance buffers, separating humans and domestic predatory animals like dogs and cats from rare and endangered bird species.

Examples of grassland-dependent species that use grassland habitat for nesting or feeding include the grasshopper sparrow, vesper sparrow, and some species of butterflies and moths. Mantua's designated grassland habitat also provides suitable habitat for migrating birds. Critical grassland habitat in Mantua is designated as such because it provides foraging habitat for bald eagles

map 14: Landscape Project Habitat Priorities (2004)



Emergent Wetlands
 Critical Habitat
 Suitable Habitat

Forested Wetlands
 Critical Habitat
 Suitable Habitat

Grasslands
 Critical Habitat
 Suitable Habitat

Upland Forest
 Suitable Habitat

Natural Heritage Priority Site

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Sources : NJDEP, 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.

5.3 ANIMAL COMMUNITIES

Although no comprehensive inventory of the different animal species within New Jersey, Gloucester County, or Mantua Township exists, there are records of sightings, biological studies of range, and assessments of endangered and threatened status that can be used to identify and describe known and possible animal communities in Mantua Township.

5.3.1 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. Though they are the most abundant animal life forms, they are not generally well recognized and their fundamental role in sustaining natural systems is often not fully appreciated.

Invertebrates consist of insects (beetles, butterflies, moths, ants, dragonflies, termites, bees, flies wasps, and others), arachnids (spiders, ticks and mites), crustaceans (crayfish, 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. Monitoring the presence of macroinvertebrates reveals the effect of pollutants over a long period of time. The Ambient Biomonitoring Network (AMNET) surveys streams for macroinvertebrate communities, which are an indicator of water quality, as discussed in the *Surface Water Quality* section of this document (page 37).

There are nine endangered invertebrate species (two beetle species, four butterfly species, and three mussel species) and eight threatened invertebrate species (three butterfly species and five mussel species) in the State of New Jersey. Of particular interest are mussels; at one time freshwater mussels were abundant in the Delaware River and its tributaries and a major food source for native peoples. Deep parts of Mantua Creek provided suitable mussel habitat. Unfortunately, due to destruction of suitable aquatic habitats by dams and pollution, the native mussel population has sharply declined and shows no signs of rebounding. Of those species on the New Jersey Endangered and Threatened list, one, the dwarf wedgemussel, is listed as endangered under the federal Endangered Species Act.

5.3.2 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. Birds that nest in the township are known, but migrants that depend on Mantua's wet forests as stopover sites in which to rest and feed are not as thoroughly inventoried.

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Mammals

Mammals appear to be abundant because they tend to be larger and live in habitats also ideal for human development. There are over 500 mammal species in New Jersey, nine of which are listed as endangered by the state. Six of these species are whales and of the three land-based species, none are commonly found in Mantua. Mammals commonly found in Mantua Township include cottontail rabbits, eastern gray squirrels, skunks, little brown bats, white-tailed deer, and raccoons.

Deer Management in New Jersey

While many residents prize the presence of mammalian life, mammals often come into conflict with humans in suburban areas. The white-tailed deer presents a classic case of this conundrum. Indeed, the argument over whether New Jersey has too many, just enough, or not enough deer often causes controversy. On one hand, there is inherent value in New Jersey's deer population: deer are a beloved symbol of wildlife, a visible subject for wildlife education and research, a part of human recreation activities like wildlife watching and hunting, and a food source for carnivores and humans. On the other hand, conflicts often arise when humans and deer compete for the same space. According to the US Department of Agriculture, deer cause more damage to agricultural crops than any other vertebrate wildlife species, and farmers in densely human-populated areas appear to be the most affected. Additionally, deer can devastate the understory of forests through overgrazing, harming other wildlife and preventing growth of seedlings and young trees. Finally, as most motorists are well aware, collisions between deer and automobiles frequently result in serious damage.

Controlling deer numbers has become increasingly difficult in New Jersey for numerous reasons, including: (1) hunters have less access to land inhabited by deer, (2) some communities pass ordinances prohibiting hunting, (3) public and private groups establish deer refuges, (4) suburban housing patterns prevent hunting and provide year round food for deer, (5) public and private groups oppose deer hunting, and (6) hunters are leaving the state to hunt in nearby states.

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

While current deer problems should be addressed, it is important to note that New Jersey's white-tailed deer population has actually remained relatively stable throughout the state over the past decade and that increasing conflicts between deer and human populations arise as suburban communities spread into once rural areas. The most effective way then to avoid a continuing

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expansion of conflicts between deer and humans is to preserve the wild habitats to which deer naturally belong.

Fish

When European settlers arrived in present-day Gloucester County, they encountered Native Americans who regularly fished along the inland streams and gathered mussels in the Delaware River. Due to the unintended consequences of 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. Based on survey data supplied by the bureau, Mantua's freshwater streams may contain the following fish: sunfish, blue gill, pickerel, pumpkinseed, eastern mudminnow, common shiner, largemouth bass, perch, darter, and the American eel.

Birds

There are over 500 species of birds in New Jersey, which is an exceptional number given the state's small size. New Jersey is an important location for migratory birds heading south for winter. Not only is the state an important "rest stop" for birds migrating to warmer climates in Central and South America, but the New Jersey Atlantic coast and the Delaware Bay are major routes along the North American flyway (established migratory air route).

Additionally, the State of New Jersey now has a "resident" Canada goose population of approximately 100,000 birds that no longer migrate to more southern locales, and may double in size in the next 5 to 10 years. While geese are a valuable component of the urban/suburban environment, providing enjoyable wildlife opportunities for the public, they can also cause property and environmental damage. Goose droppings that wash into lakes during storm events can elevate coliform bacteria to unhealthy levels, closing lakes to swimming. Goose droppings

N.J. Department of Environmental Protection Freshwater Fish Advisories

Fishing provides enjoyable and relaxing recreation and many people like to eat the fish they catch. Fish are an excellent source of protein, minerals and vitamins, are low in fat and cholesterol, and play an important role in maintaining a healthy, well-balanced diet.

However, certain fish may contain toxic chemicals, such as polychlorinated biphenyls (PCBs), dioxins, and mercury, which accumulate in water and aquatic life. Chemical contaminants such as dioxin and PCBs are classified by the US Environmental Protection Agency as probably 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 catches fish at numerous sampling stations throughout the state and tests for contaminant levels, adopting advisories to guide residents on safe consumption practices.

NJDEP issued a fish advisory for the following species of fish in Gloucester County: American eel, Striped bass, Hybrid striped bass, Channel catfish, White catfish, Bluegill sunfish, Brown bullhead, Largemouth bass, Common carp, Black crappie, Chain pickerel, Pumpkinseed sunfish, and Yellow perch. Recreational fishermen and women should regularly check for local fish advisories on NJDEP's Division of Science, Research and Technology website: <http://www.state.nj.us/dep/dsr/njmainfish.htm/>.

US EPA General Consumption Guidelines

- If possible, eat smaller amounts of several different types of fish rather than a large amount of one type that may be high in contaminants. Consume species of fish that have lower levels of contaminants, such as fluke or flounder.
- Smaller fish of a species will usually have lower chemical levels than larger fish in the same location because contaminants tend to buildup in the fish over time. It is advisable to eat smaller fish (of legal size) more often than larger fish.

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limit human use of grassy areas in parks; and because geese can be quite aggressive during the nesting season, they can potentially injure humans.

However, 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 US Department of Agriculture's approval. Management techniques include planting shrubby vegetation around streams, lakes, and ponds to block waterfowl access, discouraging humans from feeding geese, and removing geese eggs and replacing with them decoys.

Common Reptiles and Amphibians

Reptiles can be quite elusive when surveys attempt to document them. Some species, such as the endangered bog turtle, have been well documented in Mantua and nearby Woolwich Township. Amphibians of some types are abundant, such as bullfrogs. Other species are rare because they depend on vernal pools, as was discussed in the *Surface Water Resources – Vernal Pools* section of this document (page 35). In Mantua, the coastal plain milk snake, bog turtle, carpenter frog, eastern box turtle, and Fowler's toad – all endangered, threatened or species of special concern – have been sighted in the last several years.

Rare and Endangered Vertebrates

According to the Natural Heritage Database and the Landscape Project, seven rare wildlife species have been sighted in Mantua Township over the course of the past several years. This number is large in comparison to Mantua's neighboring municipalities. Brief descriptions of two of these species and their preferred habitat, provided by the New Jersey Fish and Wildlife Service, follow.

The red-shouldered hawk (*Buteo lineatus*) is a soaring hawk about as big as a crow. The hawk requires mature wet woods such as riparian forests for breeding and nesting. Red-shouldered hawks prefer a closed canopy of tall trees with an open sub-canopy and variable amounts of understory shrubs and seedlings. In southern New Jersey, these hawks are found in vast and contiguous freshwater wetlands, especially hardwood or mixed wood/cedar swamps containing maple, black gum, sassafras, magnolia, and Atlantic white cedar. In Mantua, agricultural fields

Federal Endangered Species Act*

An "Endangered" species is in danger of extinction throughout all or a significant portion of its range

A "Threatened" species is one that is likely to become endangered in the near future

New Jersey Endangered Species Act**

An "Endangered" species is in danger of immediate extinction within the state due to one of several factors: loss or degradation of habitat; over-exploitation; predation; competition; disease; or environmental pollution.

A "Threatened" species is one that may become endangered if environment conditions continue to deteriorate. It is vulnerable due to one of several factors: small population size; restricted range; narrow habitat affinities; or significant population decline.

A species of "Special Concern" is that warrants special attention because of the evidence of population decline, environmental deterioration, or habitat modification that would result in becoming Threatened. Special Concern status also extends to species whose population size is unknown or unstudied.

* Definitions adapted from US Fish and Wildlife Service, "Listing a Species and Threatened or Endangered: Section 4 of the Endangered Species Act." Washington, DC: February 2001.

** Definitions adapted from N.J. Division of Fish, Game, and Wildlife, Endangered and Non-game Species Program, "Status Definition." Trenton, NJ: April 2002.

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or low-density residential tracts usually surround these areas. The red-shouldered hawk avoids nesting near residences, roads, and development. Habitat loss and declines in population in the Northeast have resulted in the listing of this species as endangered in New Jersey, threatened in New York, and of special concern in Connecticut.

The bog turtle (*Clemmys muhlenbergii*) is an endangered species in many eastern states, including New Jersey, and is listed as threatened on the federal list. It is the smallest native turtle in the United States. Bog turtles lay their eggs in stream banks and cover them with vegetation for protection. These turtles are one of the most difficult animals to find, as they are rare, elusive, and often dwelling on swamp bottoms where they bury themselves in several inches of mud to escape predators. Suitable habitats are dwindling as wetlands are destroyed for human settlement or by pollution. The greatest numbers of bog turtles in the nation are found in the wetland areas of agricultural lands in northwestern and southwestern New Jersey.

See **Appendix A** for a list of *Vertebrate Animals Known or Probable in Mantua Township*. See **Appendix B** for a list of *State Endangered and Threatened Species*. See **Appendix C** for a list of *Rare Plant and Animal Species and Natural Communities Presently Recorded in the NJ Natural Heritage Database for Mantua Township*.

5.4 NATURAL HERITAGE DATABASE AND PRIORITY SITES

Natural Heritage Priority (NHP) Sites are areas designated by the New Jersey Division of Parks and Forestry's Office of Natural Lands Management as exemplary natural communities within the state that are critically important habitat for rare species. Preserving these areas is a top priority for efforts to conserve biological diversity in New Jersey.

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

NHP designations are based on the records of the Natural Heritage Database, which lists documented sightings of endangered and threatened species. Information on particular sites may also be provided by the Nature Conservancy or by the NJDEP Endangered and Nongame Species Program, and especially through the latter agency's Landscape Project.

Mantua Township has within its borders two of 410 NHP sites in New Jersey: (1) the **Mantua NHP Site** and (2) the **Wenonah Ravine NHP Site**. The **Mantua NHP Site** is located along the Chestnut Branch stream corridor on the northeastern side of the township. It is a rich wooded ravine bounded by Maple Avenue to the north and Blackwood-Barnsboro Road to the south. One federally listed threatened plant species, two state-listed endangered plant species, and several plant species of special concern have been sighted in this area. The **Mantua NHP Site** has a biodiversity rating of B5, meaning the area is of general biodiversity interest.

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The **Wenonah Ravine NHP Site** is a wooded ravine located along a small stretch of Mantua Creek in three communities – Mantua, Wenonah, and Deptford. The site contains the only confirmed occurrence of a state critically imperiled tree species, the pawpaw (*Asimina triloba*). This site's boundaries are limited to the documented population of the plant species and an adjacent buffer. It has a biodiversity rating of B4, meaning the area is of moderate significance because it is a site that contains a state imperiled species. See **Map 14: Landscape Project Habitat Priorities** for the location of the NHP sites.

SECTION 6: THE BUILT ENVIRONMENT

6.1 POPULATION

The 2000 US Census listed a population of 14,217 residents for Mantua Township. The 2000 population was a growth of 41 percent over the 1990 figure. DVRPC projects that Mantua's population will increase to 15,180 residents by 2005 and to 16,200 by 2010.

The majority of Mantua's population lives in single-family homes in Sewell; in Centre City – a 1950s planned community; in numerous subdivision developments such as the villages of Berkely, Mill Run, and Crescent Hollow built between 1990 and the present, or scattered on individual lots throughout the active farming areas.

According to the 2000 Census, 3,956 residents, over 27 percent of Mantua's population, are under the age of 18. Of those residents under 18 years of age, 2,825 are children between the ages of 5 and 18. This age group represents those residents who are most physically active in the community and most likely to use public recreational facilities.

6.2 TRANSPORTATION

Mantua Township is relatively accessible compared to much of rural southern New Jersey. County roads, which were once rural farming roads or dirt paths created by Native Americans, now serve as major traffic thoroughfares in the township. Mantua rose to prominence in Gloucester County because of its accessible transportation routes, especially in regard to commercial transport, which utilized every significant mode, from the days of water travel on Mantua Creek, to the construction of rail lines, to the 20th century's modern highways.

The modern transportation corridors that serve Mantua have also fostered much of its past and current growth. In 1951 the state completed the New Jersey Turnpike. Although the turnpike crosses through East Greenwich just to the west of Mantua, it serves as a significant transportation artery for the entire region. State Route 55, which crosses Mantua from the northeast to the southwest and was constructed between 1965 and 1989 as a sister road to State Route 42, has dramatically increased the speed with which Mantua's residents can access the more built-up sections of the Philadelphia metropolitan region. U.S. Route 55 has one exit in Mantua Township on County Route 553 leading to Glassboro (and Rowan University) and Pitman to the east, and Wenonah and Woodbury to the west. State Route 45 (Bridgeton Pike) is also a significant northeast-southwest road, bisecting Mantua's most densely developed areas and connecting those cities historically central to agriculture, commerce and distribution in Gloucester and Salem counties, including Woodbury, Mantua, Mullica Hill, Woodstown, and the City of Salem.

County roads within the township include Routes 553, 603, 609, 624, 626, 627, 632, 676, and 678. These provide access and connections within the township and county and are remnants of past land uses that connected farming centers of activity. The majority of them run through or toward Barnsboro, Mantua Village, or Sewell, all of which are older settlements within the region. In some cases, these formerly rural routes struggle to handle the increasing volumes of traffic associated with the township's suburban growth. County Route 553A (Main Street), once a toll road, links Mantua Village to Barnsboro and Pitman, but also serves new developments such as Bellemeade and Crescent Hollow. Smaller roads in the township are a mixture of old rural lanes and newer subdivision thoroughfares.

6.3 HISTORIC RESOURCES

Protection and preservation of historic structures, lands, and views is of high importance to Mantua Township's residents. The township has two sites – the Barnsboro Hotel and the Jesse Chew House – on the National and State registers of Historic Places. Three additional sites were issued a State Historic Preservation Office (SHPO) Opinion, which determines if sites are eligible for inclusion on the State Register of Historic Places.¹⁰ Nearly 140 other sites may have the potential to be listed as local, state or national landmarks, but have not yet been nominated by local citizens or identified by government employees for such a designation. The township boasts numerous 18th and 19th century structures, including large farmsteads and charming storefronts. Most of these historic structures are in the village of Mantua, but others are scattered throughout the township in Mantua Heights, Jefferson, Tylers Mill, Sewell, and Barnsboro.

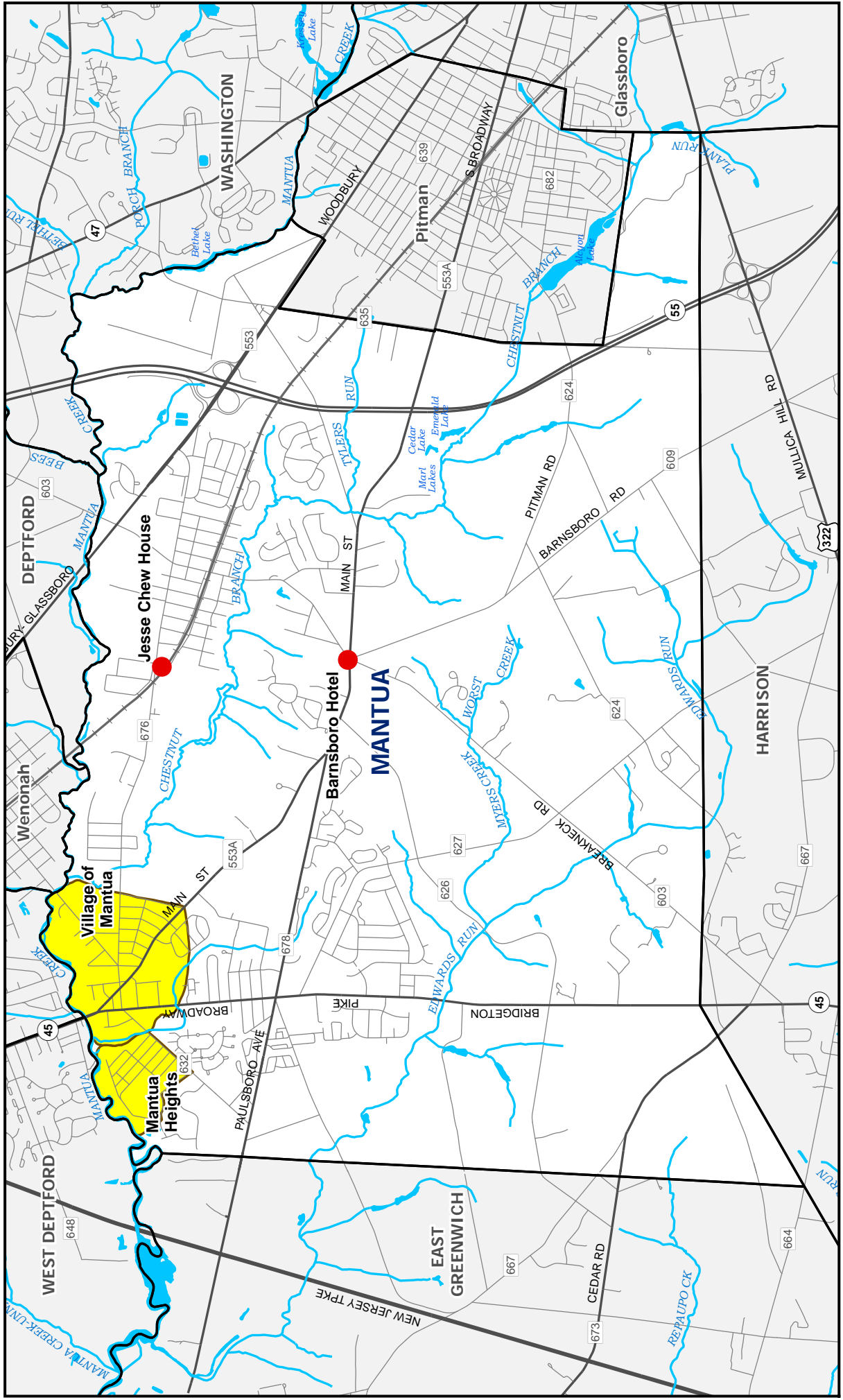
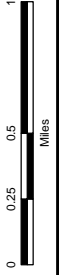
See **Map 15: Historic and Cultural Resources** and **Table 18: Sites listed on the National & State Registers of Historic Places** for sites currently listed on the National and State Registers. See **Appendix D** for a list of *Mantua Township's Historic and Cultural Resources* detailing the locations of other sites possibly eligible for nomination to the National and State registers.

The Mantua Township Historical Commission collects information on historic resources, which it has published in two volumes (1976 and 2000) for the township. The Commission also recently rehabilitated the Union Street School for use as a senior center, and organizes other activities to celebrate and commemorate the township's history.

New Jersey municipalities are permitted to identify, designate and regulate their own historic resources through the adoption of historic preservation ordinances (which are recognized as zoning laws under the New Jersey Municipal Land Use Law). Many municipalities throughout the state, such as neighboring Harrison Township, have adopted historic district ordinances that regulate façade and structural changes to buildings within the designated area. These regulations acknowledge the existence of particular historic assets in a municipality and highlight the

¹⁰ Filing an Environmental Impact Statement (EIS) usually prompts the issuance of a SHPO Opinion. Private individuals, companies, organizations, or governments that use federal funding are often required to file an EIS, which may result in the NJDEP recognizing possible threats to certain historic sites and identifying those sites as eligible for listing on the State Register of historic places.

map 15: Historic and Cultural Resources



Legend

- SHPO Opinion (Historic District)
- National Register

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Sources : NJDEP, 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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historic importance and contemporary charm of original settlements – such as Mullica Hill in Harrison and the Village of Mantua.

Table 18: Sites Listed on the National & State Registers of Historic Places

Name	Location	Register	State ID#
Barnsboro Hotel	Pitman and Sewell Roads	National & State	1399
Jesse Chew House	611 Mantua Boulevard	National & State	1400
Mantua Heights Historic District	Mantua Creek & Berkley Road, Springfield Av & West Landing Rd	State Historic Preservation Office Opinion	Opinion Number 2731
Prehistoric Site	No data available	State Historic Preservation Office Opinion	Opinion Number 3884
Village of Mantua Historic District	Roughly bounded by Mantua Creek, Maple Av and an unnamed tributary	State Historic Preservation Office Opinion	Opinion Number 2744

Source: New Jersey State Historic Preservation Office, August 2004

The National Park Service and the New Jersey SHPO jointly administer the Certified Local Governments (CLG) program, which provides technical assistance and funding for community-based preservation efforts. As of October 2003, Harrison Township is the only municipality in Gloucester County that is a CLG. To participate, municipalities must maintain a historic preservation commission, survey local historic properties, provide opportunities for public participation in preservation activities, and develop and enforce local preservation laws. If Mantua were to become a CLG, it would be eligible to draw on an exclusive pool of matching federal and state funds for program implementation or rehabilitation work.

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

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

6.4 TOWNSHIP UTILITIES AND SERVICES

6.4.1 Drinking Water

Residences in the more developed sections of Mantua, including Mantua Village and Centre City, are supplied with public drinking water by the Mantua Municipal Utilities Authority (MUA). Newer residential developments along Country Routes 553 and 553A, including Crescent Hollow, Rosewood, Buckingham Village, and the Village of Berkely are also served with public water through the Mantua MUA. Township residents that live in less developed areas, including most of southern Mantua, rely on private wells. As new development projects spread out into Mantua Township, older properties on private wells and septic systems are required to connect to Mantua Township's public sewer and water. More properties in Mantua Township have public water service than sewer service because building sewer lines in older or rural parts of the township is cost prohibitive. The MUA is completing a comprehensive plan to identify areas in which new water and sewer lines can be constructed.

The drinking water wells that serve the public in Mantua Township are listed in **Table 15** on *page 53*. **Map 11: Public Water Supply Wells** shows the location of Mantua's public water supply wells. These wells account for over 93 percent of Mantua's public drinking water supply. The remainder is purchased from New Jersey American Water.

6.4.2 Sewer

As with public water, sewer service is provided to the more developed sections of Mantua, including most of Mantua Village, Centre City, Sewell, and the Bellemeade, Crescent Hollow, Rosewood and Ravenswood developments. However, not all of Mantua's built-up areas have sewer service. In particular, the neighborhood to the east of Route 45 between Mt. Royal Road and Main Street is not sewered and neither is the neighborhood to the north of Berkley Road and west of Mantua Village. Mantua may want to encourage denser areas such as these to become sewered to avoid potential threats to water quality in the future. Sewering those properties that are adjacent to stream corridors and other critical areas should also be a top priority. Mantua's rural areas also do not have sewer service. Properties in these areas rely on private septic systems for the disposal of their sewage.

Although not all of Mantua is sewered, the entire township is approved for sewer service according to the Tri-County Water Quality Management Plan. Currently, Mantua's sewer service system is maintained by the Mantua Municipal Utilities Authority (MMUA). Mantua Township's sewage is pumped to the Gloucester County Utilities Authority's sewage treatment plant in West Deptford near the mouth of Mantua Creek, with discharge to the Delaware River. The GCUA is the approved Wastewater Management Planning Agency for all of Mantua Township.

6.4.3 Trash/Recycling

In Mantua Township, trash and recycling, including vegetation (brush and leaves), are picked up on a weekly basis. The township accepts commingled glass, metal cans and plastics (numbers 1 and 2 only) as well as mixed paper (newsprint, magazines, envelopes, letters, cereal boxes, telephone books and corrugated cardboard). Large metal appliances are collected on regular trash days. Motor oil, batteries, and tires may be brought to the public works building on weekdays from 5:30 a.m. until 2:00 p.m. and on the fourth Saturday of each month from 10:00 a.m. until 2:00 p.m. The public works facility is located within the municipal complex on Main Street.

6.4.4 Education

Mantua Township has three public elementary schools, Centre City Elementary School, Sewell Elementary School, and J. Mason Tomlin Elementary School. The Centre City and Sewell schools educate children in grades K-4. The J. Mason Tomlin School educates children in grades K-4 and all of the township's 5th and 6th grade students. After finishing elementary school, Mantua's students attend the Clearview Regional Middle and High School in Harrison Township. Mantua Township is also home to the Gloucester County Christian School, a private school which is located on the site of the former Nike Missile Base on Golf Club Road.



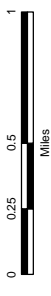
Photo by Chris Linn

Sewell Elementary School

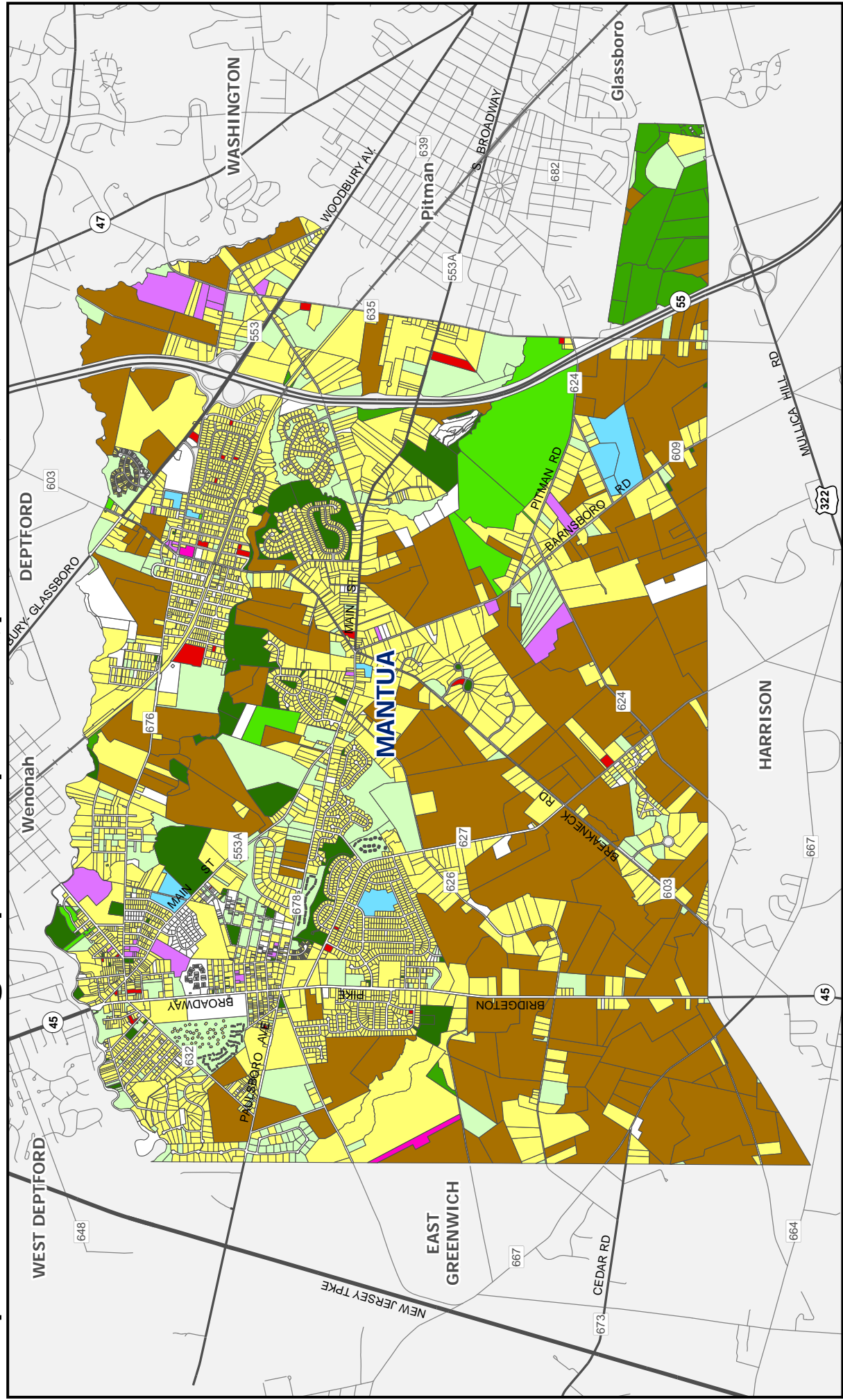
6.4.5 Parks and Recreation

The Mantua Township Parks Department provides a wide variety of recreational opportunities at two township parks, Chestnut Branch Park and Ceres Park. The facilities at Chestnut Branch Park include walking/jogging/biking trails, a playground, tennis courts, beach volleyball courts, soccer/football fields, a roller hockey rink, a “bank-shot” basketball court, and a picnic pavilion. Ceres Park is an undeveloped park that offers opportunities for walking, jogging and nature observation.

See **Map 16: Existing Open Space 2003**, which is included in this document for easy reference. For additional details on Mantua's open space and recreation needs and plans, see the *Open Space & Recreation Plan for the Township of Mantua*.



map 16: Existing Open Space (parcels)



DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
FEBRUARY 2004

Legend

- Municipal Property - Classes 15C & 15F
- County Property - Classes 15C & 15F
- State Property - Classes 15B, 15C, & 15F
- Federal Property - Classes 15C & 15F
- School Property - Classes 15A & 15B
- Vacant Land - Class 1
- Developed Parcel
- NJ Tpke Authority - Classes 15B, 15C, 15D & 15F
- Church or Cemetery Property - Classes 15D & 15E
- Farm Assessed - Class 3A & 3B
- Other Exemption - Class 15F

Sources : NJDEP, DVRFC
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.



Photo by Chris Linn

Bank Shot Basketball, Chestnut Branch Park

SECTION 7: ENVIRONMENTAL ISSUES

7.1 KNOWN CONTAMINATED SITES

A 2001 NJDEP inventory of Known Contaminated Sites reported 296 contaminated sites in Gloucester County. Fifteen of these sites are located in Mantua Township. There are also 11 sites in Pitman Borough, 4 in Washington Township, 2 in Harrison Township, 1 in Deptford Township, one in Wenonah Borough, and one in Glassboro Borough that are close to Mantua's borders. See **Table 19: Known Contaminated Sites in Mantua Township & Region** on page 83, and also **Map 17: Known Contaminated Sites** on page 82.

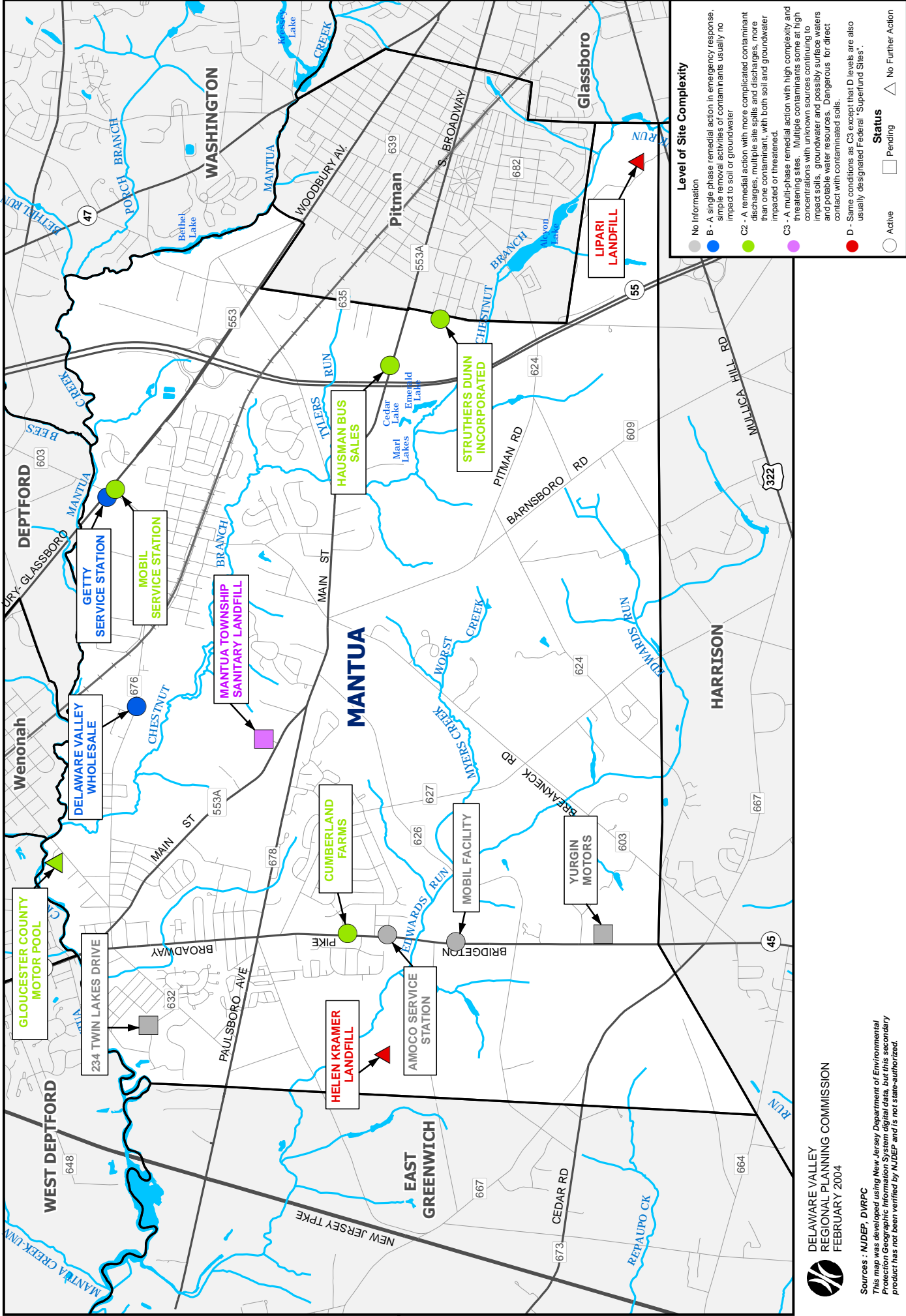
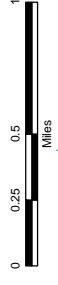
The New Jersey *Known Contaminated Sites List* includes former factory sites, landfills, locations of current or former leaking underground storage tanks, sites where chemicals or wastes were once routinely discharged, and places where accidents have resulted in spills and pollution. Contamination may have affected soil, groundwater, surface water, or a combination of site conditions. The most dangerous sites, from a human health standpoint, can be listed as Superfund sites, which make them eligible for federal cleanup funds. Other sites are handled by state or individual programs, or through private funds.

There are 27 Superfund sites in Gloucester County, 2 of which are in Mantua. The Helen Kramer Landfill, located on the western side of the township below Edwards Run, and the Lipari Landfill, located in the most eastern part of the township south of Pitman, are on the National Priority List (Superfund list) and thus have been receiving federal funding for cleanup. See **Appendix E**.

7.1.1 Underground Storage Tanks

There are a number of private residences in Mantua Township that still have underground storage tanks, used primarily to hold home heating oil. As these tanks age and rust they often begin to leak, which becomes a serious threat to the groundwater below them. These sites sometimes overlap with Known Contaminated Sites, but are often less contaminated and require a lower level of remediation. See **Table 20: Underground Storage Tanks in Mantua Township** on page 84.

map 17: Known Contaminated Sites



Level of Site Complexity

- No Information
- B - A single phase remedial action in emergency response, simple removal activities of contaminants usually no impact to soil or groundwater
- C2 - A remedial action with more complicated contaminant discharges, multiple site spills and discharges, more than one contaminant, with both soil and groundwater impacted or threatened.
- C3 - A multi-phase remedial action with high complexity and threatening sites. Multiple contaminants some at high concentrations with unknown sources continuing to impact soils, groundwater and possibly surface waters and potable water resources. Dangerous for direct contact with contaminated soils.
- D - Same conditions as C3 except that D levels are also usually designated Federal "Superfund Sites".

Status

- Active
- Pending
- △ No Further Action

ENVIRONMENTAL ISSUES

Table 19: Known Contaminated Sites in Mantua Township & Region

Site ID	Name	Address	Town	Status*	Lead Agency*	Remedial Level*
NJD014725410	Marvin Jonas Incorporated	Bark Bridge Road	Deptford	Active	BCM	D
NJD027394410	Joel Maganizer Ford Incorporated	North Delsea Drive	Glassboro	Active	BUST	B
NJL800589772	Residence	Richwood Road	Harrison	Active	BUST	B
NJL800522369	Mullica Hill Gas Stop	Route 45 and Cedar Road	Harrison	Active	BUST	
NJL000040915	Residence	Twin Lakes Drive	Mantua	Pending	BFO-S	NA
NJL800463887	Amoco Service Station Mantua Township	Valley View Drive and Route 45	Mantua	Active	BUST	
NJD982725152	Cumberland Farms	Capital Drive and Bridgeton Pike	Mantua	Active	BUST	C2
NJL800037624	Delaware Valley Wholesale	Mantua Blvd.	Mantua	Active	BFO-IN	B
NJL800056665	Getty Service Station Mantua Township	Woodbury-Glassboro Road	Mantua	Active	BFO-IN	B
NJD982727752	Gloucester County Motor Pool	Woodland Avenue	Mantua	NFA-A	BUST	C2
NJD980505366	Helen Kramer Landfill	Jessup Mill Road	Mantua	NFA-A	BCM	D
NJL800619389	Lansbrook	Saline Drive	Mantua	Active	BFO-S	
NJD980505416	Lipari Landfill	Route 322	Mantua	NFA-A	BCM	D
NJL900001843	Mantua Township Sanitary Landfill	Main Street	Mantua	Pending	BFO-CA	C3
NJL800593790	Mobil Facility #DJD	Bridgeton Pike	Mantua	Active	BUST	
NJD986605665	Mobil Service Station Mantua Township	Glassboro-Woodbury Road	Mantua	Active	BUST	C2
NJD982790966	Yurgin Motors	Route 45	Mantua	Pending	BFO-CA	NA
NJL800568776	Residence	Taurus Court	Mantua	Active	BFO-S	
NJD000697474	Sunoco Service Station Deptford Township	Route 45 and Ogden Woodbury Road	Mantua	Active	BUST	
NJD981085954	Amoco Service Station Pitman Borough	N Woodbury and Holly Avenues	Pitman	Active	BUST	C2
NJD051406346	CBS Records Incorporated	Lambs and Woodbury Roads	Pitman	Active	BEECRA	D
NJL600181218	Coast Service Station Pitman Borough	Woodbury and Holly Avenues	Pitman	Active	BUST	C2
NJL600133474	Franklin Electric Company	Broadway	Pitman	NFA-A	BUST	C2
NJD980790984	NJ Department of Military and Veterans Affairs	Route 47 (Delsea Drive) and Columbia Avenue	Pitman	Active	BUST	C2
NJL600195127	Pitman Cleaners	Walnut Avenue	Pitman	Active	BFMCR	B
NJD002349751	Struthers Dunn Incorporated	Lambs Road	Pitman	Active	BFO-S	C2
NJL600036396	William F. Jacobs Incorporated	North Woodbury Avenue	Pitman	Active	BUST	C2
NJL800069940	Hausman Bus Sales	North Broadway	Pitman	Active	BFO-S	C2
NJD986623270	Shell Service Station Pitman Borough	Woodbury and Holly Avenues	Pitman	Active	BUST	C2
NJL800290181	Residence	North Woodbury Road	Pitman	Active	BFO-S	C2
NJ0001118892	Residence	Blackwood-Barnsboro Road	Washington	Pending	EMSA	C1
NJL800202780	Citgo Service Station Washington Township	Route 47 and Blackwood-Barnsboro Road	Washington	Active	BUST	C2
NJL500052154	Precision Specialties Incorporated	Delsea Drive	Washington	Active	BEECRA	C2
NJL600017883	Stratton Motors Incorporated	Route 47 (Delsea Drive)	Washington	Active	BUST	C2
NJD986584597	Cumberland Farms	Mantua and West Avenues	Wenonah	Active	BUST	C2

Source: NJDEP

* See page 85 explanations of Status, Lead Agencies, and Remedial Level

ENVIRONMENTAL ISSUES

Table 20: Underground Storage Tanks in Mantua Township

Case ID	Tank Number	TMS Number	Name	Address	Town	Lead Agency*	Status*	Remedial Level*
90-01-31-1019			Residence	Bridgeton Pike	Mantua	BUST	NFA-A	
92-06-24-0848	109794	C92-1289	Center City School	Lansing Drive	Mantua	BUST	NFA-A	C1
	338600	N99-1744; N99-1781	Former Charles Sawyer Engineering property	429 Woodbury-Glassboro Road	Mantua	BFO-IN	NFA-A	B
89-03-30-1037	45443	C93-6265; C93-6266	Gloucester County Motor Pool**	Woodland Ave.	Mantua	BUST	NFA-A	C2
88-11-17-1258	58566		Gulf Service Station	2922 Capital and Bridgeton Pike	Mantua	BUST	ATP	C2
	303068	C94-1661	Hangsterfer	Ogden Road	Mantua	BFO-IN	NFA-A	B
91-10-02-0921	109802	C91-2388; C91-2694	James Mason Tomlin School	Main Street and Maple Avenue	Mantua	BUST	NFA-A	C1
91-08-27-1428	64424		L.J. Wursts & Sons LLC	400 S. Main Street	Mantua	BFO-IN	AA	
00-04-26-1057-25	5258		Mobil Service Station**	120 Bridgeton Pike	Mantua	BUST	ATP	C2
98-12-21-1412-05	257303	N98-2410	Old Gas Station	22 Main Street	Mantua	BFO-IN	AA	
92-06-25-1640	109811	C92-1290	Sewell School	Spruce Street	Mantua	BUST	NFA-A	C1
99-01-20-1542-44	104195	N98-0684	SICO #811** (Amoco Service Station)	Valley View Drive and Route 45	Mantua	BUST	ATP	B
94-02-07-1825	11206	C93-1222	Township of Mantua Police Station	50 Main Street	Mantua	BFO-IN	NFA-A	B
	329303	N98-2756	Kinnarney Rubber Co.	450 Main Street	Mantua	BFO-IN	NFA-A	B
	88923	C91-3746	Campbell's Auto Express	Lambs Road and Laurel Road	Mantua	BFO-IN	NFA-A	B
89-10-26-1233			Nicholson Property (closed service station)	Bridgeton Pike	Mantua	BFO-IN	AA	
91-02-21-0741	75035		Wenonah Central Office (NJB)	Broadway and Chestnut	Mantua	BUST	NFA-A	C1

Source: NJDEP

* See page 85 for explanations of Status, Lead Agencies, and Remedial Level

** Site also appears on Known Contaminated Site List (2001)

ENVIRONMENTAL ISSUES

Lead Agencies

Status	
Code	Meaning
NFA-A	No further action for a partial area of a site
ATP	The site is assigned to a case management program, listed under Lead Agency
AA	The site is awaiting case management assignment

Initials	Full Name
BFO-IN	Bureau of Field Operations – Initial Notice Section
BFO-CA	Bureau of Field Operations – Case Assignment Section
BFO-S	Bureau of Field Operations – Southern Field Office
BEECRA	Bureau of Environmental Evaluation, Cleanup and Responsibility Assessment
BUST	Bureau of Underground Storage Tanks
EMSA	Environmental Measurements and Site Assessment Section
BCM or BSCM	Bureau of State Case Management
BFCM or BFMCR	Bureau of Federal Case Management

Explanation of Remedial Levels

Remedial Level	Explanation of Site Complexity
B	A single-phase remedial action in emergency response; simple removal activities of contaminants; usually no impact to soil or groundwater.
C1	A remedial action with simple sites; one or two contaminants localized to soil and the immediate spill or discharge area.
C2	A remedial action with more complicated contaminant discharges; multiple site spills and discharges; more than one contaminant, with both soil and groundwater impacted or threatened.
C3	A multi-phase remedial action with high complexity and threatening sites. Multiple contaminants some at high concentrations with unknown sources continuing to impact soils, groundwater, and possibly surface waters and potable water resources. Dangerous for direct contact with contaminated soils.
D	Same conditions as C3 except that D levels are also usually designated federal "Superfund Sites."
ND	Not designated
NA	Not assessed

A case manager is assigned to every *Known Contaminated Site* and *Underground Storage Tank* case and can provide further information on each site. The Case Manager can be reached by contacting NJDEP's Site Remediation Program's lead agency, which is listed in the table for each site. Go to <http://www.state.nj.us/dep/srp/kcs-nj/gloucester/> for contact information.

7.2 RADON

Radon is a radioactive gas that comes from the natural decay of uranium found in nearly all soils. It moves up through the ground to the air above, and into all types of homes through cracks and other holes in foundations. A build-up of radon-contamination within a home can pose a long-term health hazard to residents, specifically for lung cancer. It is invisible, odorless, and tasteless; the only method of detection is to conduct a test of the air within a home. Fortunately, radon testing is inexpensive. If radon levels are high in a home, NJDEP suggests the homeowner take the following actions: (1) prevent radon from entering the house by repairing cracks and insulation, and (2) dilute radon concentrations currently in the house.

NJDEP classifies townships into three categories as to the risk of having high radon levels. Mantua Township is listed as a Tier 2 municipality with moderate risk of having high radon levels in homes. Tier 3 is the lowest level. NJDEP estimates that the average radon level found in a home is 3.08 picocuries per liter (radon is measured in picocuries per liter) in air. The “action” level or dangerous level is 4.0 picocuries per liter in air.

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- P.L. 96-510. *Federal Comprehensive, Environmental Response, Compensations and Liability Act of 1980 (CERCLA)*.
- P.L. 105-312. *Federal Migratory Bird Treaty Act of 1918*.
- N.J.S.A. 13:1B-15.151 et seq. *New Jersey Endangered Plant Species Act*.
- N.J.S.A. 23:2A et seq. *New Jersey Endangered and Nongame Species Conservation Act of 1973*.
- N.J.S.A. 58:10A-1 et seq. *New Jersey Water Pollution Control Act*.
- N.J.S.A. 58:16A-50 et seq. *New Jersey Flood Hazard Area Control Act*.
- N.J.A.C. 7:7A et seq. *New Jersey Freshwater Wetlands Protection Act Rules*.
- N.J.A.C. 7:8 et seq. *Stormwater Management Rules*
- N.J.A.C. 7:9B-1.12. *New Jersey Surface Water Quality Standards*.
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- N.J.A.C. 7:13 et seq. *New Jersey Flood Hazard Area Control*.
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- N.J.A.C. 7:15 et seq. *Water Quality Management Planning Rule*
- N.J.A.C. 10:1B. *Open Public Records Act of 2002*

MANTUA TOWNSHIP ENVIRONMENTAL RESOURCES INVENTORY

APPENDIX A: Vertebrate Animals Known or Probable in the Township of Mantua

Species	General Habitat	Township Locations
Mammals		
Virginia opossum	All Habitats	Throughout
Short-tailed shrew	Woodlands	Throughout
Eastern mole	Uplands	Throughout
Star-nosed mole	Uplands	Throughout, Occasional
Little brown bat	Uplands	Throughout
Eastern pipistrel (bat)	Uplands	Throughout
Eastern cottontail rabbit	All Habitats	Throughout, Common
Eastern chipmunk	Woodlands	Throughout
Woodchuck	Woodlands and Fields	Throughout
Gray squirrel	Woodlands	Throughout, Common
White-footed mouse	Woodlands	Throughout
Jumping mouse	Fields	Throughout
Meadow vole	Open Fields	Throughout
Red-backed vole	Woodlands	Throughout
Muskrat	Wetlands	Throughout
Brown rat	Wetlands, Homes, Farms	Throughout
House mouse	Homes and residential areas	Throughout, Common
Red fox	All Habitats	Throughout
Raccoon	All Habitats	Throughout, Common
Long-tailed weasel	Wetlands	Throughout
Striped skunk	Uplands	Throughout, Common
White-tailed deer	All Habitats	Throughout, Common
Mink	Wetlands	Throughout
Coyote	Woodlands and Fields	Throughout
Birds		
Great blue heron*	Open Marsh, Lake Edges	Throughout
Great egret*	Open Marsh, Lake Edges	Throughout
Snowy egret	Open Marsh, Lake Edges	Throughout
Green-backed heron	Open Marsh, Lake Edges	Throughout
Mute swan	Open Water	Large Lakes
Snow goose	Winter Migrant in Fields	Open Farms
Canada goose	Open Water, Fields	Throughout
Wood duck	Forested Wetlands	Throughout
Green-winged teal	Wetlands	Winter Migrant
Blue-winged teal	Wetlands	Winter Migrant
Black duck	Marsh, Lakes	Throughout
Mallard*	Wetlands	Throughout

APPENDIX A: Vertebrate Animals Known or Probable in the Township of Mantua

Species	General Habitat	Township Locations
Northern shoveler duck	Open Water	Winter Migrant
Ring-necked duck	Open Water	Winter Migrant
Greater & lesser scaup	Open Water	Winter Migrant
Bufflehead	Open Water	Winter Migrant
Hooded merganser	Open Water	Winter Migrant
Ruddy duck	Open Water	Winter Migrant
Black vulture	Open Fields	Throughout
Turkey vulture*	All Habitats	Throughout
Osprey	Open Water	Lakes and ponds
Bald eagle	Open Water	Chestnut Branch; Stream Corridors; Endangered
Northern harrier	Open Fields	Throughout
Sharp-shinned hawk	Woodlands	Throughout
Cooper's hawk	Woodlands	Throughout
Red-shouldered hawk	Woodlands; Wetland Forests	Throughout; Endangered
Broad-winged hawk	Woodlands	Throughout
Red-tailed hawk	All Habitats	Throughout
American kestrel	Open Fields	Throughout
Ringed-neck pheasant	Old Fields, Farms	Released throughout
Wild turkey	Woodlands	Throughout
Bobwhite	Old Field, Woodlands	Throughout
Killdeer	Bare Ground, Lake Edges	Throughout
Lesser yellowlegs	Lake Edges	Throughout
Solitary sandpiper	Lake Edges	Throughout
Spotted sandpiper	Lake Edges	Throughout
American woodcock	Wetland Forests	Throughout
Laughing gull	Open Water, Parking Lots	Summer Visitor
Ring-billed gull	Open Water, Parking Lots	Throughout
Herring gull	Open Water, Dumps	Winter Visitor
Rock dove	Houses and Bridges	Throughout
Mourning dove	Woodlands and Fields	Throughout; Common
Black-billed cuckoo	Woodlands	Occasional
Yellow-billed cuckoo	Woodlands	Throughout
Barn owl	Farmland	Throughout
Eastern screech owl	Woodlands	Throughout
Great horned owl	Woodlands	Throughout
Barred owl	Wetland Forests	Wooded Wetlands
Saw-whet owl	Wetland Forests	Wooded Wetlands
Common nighthawk	Upland Woodlands; Flat-roofed Buildings	Summer Night Sky
Chimney swift	Bridges, House Chimneys	Residential Areas
Ruby-throated hummingbird	Woodlands and Fields	Throughout
Belted kingfisher*	Wetlands	Throughout

APPENDIX A: Vertebrate Animals Known or Probable in the Township of Mantua

Species	General Habitat	Township Locations
Red-bellied woodpecker*	Woodlands	Throughout
Yellow-bellied sapsucker	Woodlands	Fall Migrant
Downy woodpecker	Woodlands	Throughout
Hairy woodpecker	Woodlands	Throughout
Northern flicker	Woodlands	Throughout
Wood peewee	Woodlands	Upland Woods
Eastern phoebe	Woodlands	Throughout
Great crested flycatcher	Woodlands	Throughout
Eastern kingbird	Fields, Farmland	Throughout
Purple martin	Open Fields, Wetlands	Agricultural Areas
Tree swallow	Open Fields, Wetlands	Throughout
Barn swallow	Buildings, Bridges; Open Fields	Throughout
Blue jay	Woodland, Parks, Residential Areas	Throughout, Common
American crow	All Habitats	Throughout, Common
Carolina chickadee	Woodlands, Parks	Throughout, Common
Tufted titmouse	Woodlands, Parks	Throughout, Common
White breasted nuthatch	Woodlands	Throughout
Brown creeper	Woodlands	Throughout
Carolina wren	Woodland Edges, Yards	Throughout, Common
House wren	Suburbs, Woodland Edges	Throughout
Golden and ruby-crowned kinglets	Woodlands	Fall Migrant
Blue-gray gnatcatcher	Woodlands, Wetland Forests	Throughout
Eastern bluebird	Woodland Edges	Throughout
Wood thrush	Woodlands	Throughout
American robin	All Habitats	Throughout, Common
Gray Catbird	Woodlands, Edges, Yards	Throughout, Common
Northern mockingbird	Hedgerows, Yards	Throughout, Common
Brown thrasher	Woodlands	Throughout
Cedar waxwing	Old fields, Young woodlands	Throughout
European Starling	All Habitats	Throughout, Pest
White-eyed vireo	Woodlands	Throughout
Philadelphia vireo	Woodlands	Migrant
Red-eyed vireo	Woodlands	Wetland Forests
Marsh wren	Tidal Marsh	Mantua Creek
Yellow warbler	Upland Forest	Throughout
Chestnut-sided warbler	Woodlands	Migrant
Black-throated blue warbler	Woodlands	Migrant
Yellow-rumped / myrtle warbler	Woodlands	Throughout, Winter Migrant
Pine warbler	Woodlands	Throughout

APPENDIX A: Vertebrate Animals Known or Probable in the Township of Mantua

Species	General Habitat	Township Locations
Prairie warbler	Shrubby areas	Throughout
Palm warbler	Pine Woodlands	Migrant
Black and white warbler	Pine Woodlands	Migrant
Northern parula warbler	Woodlands	Throughout
American redstart	Rich woodlands	Throughout
Ovenbird	Woodlands	Throughout
Common yellowthroat	Shrubby areas	Throughout
Louisiana waterthrush	Wetland Forests	Throughout
Scarlet tanager	Woodlands	Throughout
Northern cardinal	Woodland Edges, Residential Areas	Throughout, Common
Indigo bunting	Woodland Edges, Old Fields	Throughout
Rufus sided towhee	Woodland Edges, Wetland Forests	Throughout
Chipping sparrow*	Woodlands, Suburbs	Throughout
Field sparrow*	Old Fields	Throughout
Song sparrow*	Old Fields, Marsh Edges	Throughout
American tree sparrow*	Open Areas	Throughout
White-throated sparrow*	Woodlands, Suburban Feeders	Winter Migrant
Dark-eyed junco*	Woodlands, Suburban Feeders	Winter Migrant
Red-winged blackbird	Open Wetlands, Marsh	Throughout
Common grackle	All Habitats	Throughout, Common
Brown-headed cowbird	Open Areas	Throughout, Pest
Orioles: Northern, orchard, & Baltimore	Woodlands, Edges	Throughout
House finch	Open Areas, Suburban Feeders	Throughout
American goldfinch	Open areas, Old Fields	Throughout
House sparrow	Residential Areas, Old Fields	Throughout, Common
Reptiles		
Bog turtle	Muddy Agricultural Fields/Wetlands	Endangered
Common snapping turtle	Ponds and Lakes	Throughout
Stinkpot turtle	Wetlands	Throughout
Spotted turtle	Freshwater Wetlands and Ponds	Throughout
Eastern box turtle	Uplands	Throughout
Red-bellied turtle	Lakes and Ponds	Throughout
Eastern painted turtle	Lakes and Ponds	Throughout
Northern fence lizard	Uplands	Throughout
Northern water snake	Wetlands	Throughout
Garter snake	All Habitats	Throughout

APPENDIX A: Vertebrate Animals Known or Probable in the Township of Mantua

Species	General Habitat	Township Locations
Eastern ribbon snake	Wetlands	Throughout
Southern ring neck snake	Woodlands	Throughout
Northern black racer*	Edges	Throughout
Rough green snake	Woodlands	Throughout
Black rat snake	All Habitats	Throughout
Amphibians		
Red-backed salamander	Woodlands	Throughout
Fowlers toad	Uplands	Throughout
Spring peeper	Wetlands	Throughout
Bull frog	Lakes and Ponds	Throughout
Green frog	Wetlands	Throughout
Wood frog	Woodlands	Throughout
Southern leopard frog	Wetlands	Throughout
Fish		
American brook lamprey	Streams	Throughout
Sea lamprey	Rivers and Streams	Possible
Blueback herring (tidal only)	Streams	Possible
Chain pickerel	Lakes and Streams	Throughout
Common carp	Rivers, Streams, and Lakes	Throughout
Eastern mud minnow*	Streams	Throughout
Eastern silvery minnow	Rivers and Streams	Throughout
Common shiner	Streams	Throughout
Golden shiner	Streams	Throughout
Spottail shiner	Rivers and Streams	Throughout
Swallowtail shiner		
Fathead minnow		
Fallfish		
White sucker*	Streams	Throughout
Creek chub-sucker	Streams	Throughout
Brown bullhead	Lakes and Streams	Throughout
Tadpole madtom	Lakes and Streams	Throughout
Redfin Pickerel	Streams, Lakes, Ponds	Throughout
American eel	All waters	Throughout
Pirate perch	Streams	Throughout
Banded killfish	Streams and Ponds	Probable
Mummichog		
Mud sunfish*	Streams and swamps	Throughout
Black-banded sunfish*	Cedar swamps	Throughout
Banded sunfish*	Swamps	Throughout
Blue-spotted sunfish*	Swamps and Streams	Throughout
Redbreast sunfish	Lakes and Streams	Probable

APPENDIX A: Vertebrate Animals Known or Probable in the Township of Mantua

Species	General Habitat	Township Locations
Bluegill*	All waters	Throughout
Pumpkinseed*	All waters	Throughout
Yellow perch	Lakes	Throughout
Tessellated Johnny darter	Lakes	Throughout
Satinfin Shiner	Rivers and Streams	Rare
Swamp darter	Swamps	Throughout
Large mouth bass*	Lakes	Throughout
Black Crappie	Lakes and Ponds	Throughout

*Denotes animal species documented photographically by Michael A Hogan for the Mantua Township Environmental Commission in 1997.

Source: Modified version of Table 11 of the Environmental Resource Inventory for Franklin Township, Gloucester County New Jersey.

MANTUA TOWNSHIP ENVIRONMENTAL RESOURCES INVENTORY

APPENDIX B: State Endangered and Threatened Species

Birds			
Endangered		Threatened	
American Bittern	<i>Botaurus lentiginosus</i>	Bobolink	<i>Dolichonyx oryzivorus</i> BR
Eagle, bald	<i>Haliaeetus leucocephalus</i> BR **	Eagle, bald	<i>Haliaeetus leucocephalus</i> NB **
Falcon, peregrine	<i>Falco peregrinus</i>	Hawk, Cooper's	<i>Accipiter cooperii</i>
Goshawk, northern	<i>Accipiter gentilis</i> BR	Hawk, red-shouldered	<i>Buteo lineatus</i> NB
Grebe, pied-billed	<i>Podilymbus podiceps</i> *	Night-heron, black-crowned	<i>Nycticorax nycticorax</i> BR
Harrier, northern	<i>Circus cyaneus</i> BR	Night-heron, yellow-crowned	<i>Nyctanassa violaceus</i>
Hawk, red-shouldered	<i>Buteo lineatus</i> BR	Knot, red	<i>Calidris canutus</i> BR
Owl, short-eared	<i>Asio flammeus</i> BR	Osprey	<i>Pandion haliaetus</i> BR
Plover, piping	<i>Charadrius melodus</i> **	Owl, barred	<i>Strix varia</i>
Sandpiper, upland	<i>Batramia longicauda</i>	Owl, long-eared	<i>Asio otus</i>
Shrike, loggerhead	<i>Lanius ludovicianus</i>	Rail, black	<i>Laterallus jamaicensis</i>
Skimmer, black	<i>Rynchops niger</i> BR	Skimmer, black	<i>Rynchops niger</i> NB
Sparrow, Henslow's	<i>Ammodramus henslowii</i>	Sparrow, grasshopper	<i>Ammodramus savannarum</i> BR
Sparrow, vesper	<i>Pooecetes gramineus</i> BR	Sparrow, Savannah	<i>Passerculus sandwichensis</i> BR
Tern, least	<i>Sterna antillarum</i>	Sparrow, vesper	<i>Pooecetes gramineus</i> NB
Tern, roseate	<i>Sterna dougallii</i> **	Woodpecker, red-headed	<i>Melanerpes erythrocephalus</i>
Wren, sedge	<i>Cistothorus platensis</i>		
Reptiles			
Endangered		Threatened	
Rattlesnake, timber	<i>Crotalus h. horridus</i>	Snake, northern pine	<i>Pituophis m. melanoleucus</i>
Snake, corn	<i>Elaphe g. guttata</i>	Turtle, Atlantic green	<i>Chelonia mydas</i> **
Snake, queen	<i>Regina septemvittata</i>	Turtle, wood	<i>Clemmys insculpta</i>
Turtle, bog	<i>Clemmys muhlenbergii</i> **		
Atlantic hawksbill	<i>Eretmochelys imbricata</i> **		
Atlantic leatherback	<i>Dermochelys coriacea</i> **		
Atlantic loggerhead	<i>Caretta caretta</i> **		
Atlantic Ridley	<i>Lepidochelys kempfi</i> **		
Amphibians			
Endangered		Threatened	
Salamander, blue-spotted	<i>Ambystoma laterale</i>	Salamander, eastern mud	<i>Pseudotriton montanus</i>
Salamander, eastern tiger	<i>Ambystoma tigrinum</i>	Salamander, long-tailed	<i>Eurycea longicauda</i>
Treefrog, southern gray	<i>Hyla chrysocelis</i>	Treefrog, pine barrens	<i>Hyla andersonii</i>

APPENDIX B: State Endangered and Threatened Species

Invertebrates			
Endangered		Threatened	
Beetle, American burying	<i>Nicrophorus mericanus</i> **	Elfin, frosted (butterfly)	<i>Callophrys irus</i>
Beetle, northeastern beach tiger	<i>Cincindela d. dorsalis</i> **	Floater, triangle (mussel)	<i>Alasmidonta undulata</i>
Copper, bronze	<i>Lycaena hyllus</i>	Fritillary, silver-bordered (butterfly)	<i>Bolaria selene myrina</i>
Floater, brook (mussel)	<i>Alasmidonta varicosa</i>	Lampmussel, eastern (mussel)	<i>Lampsilis radiata</i>
Floater, green (mussel)	<i>Lasmigona subviridis</i>	Lampmussel, yellow (mussel)	<i>Lampsilis cariosa</i>
Satyr, Mitchell's (butterfly)	<i>Neonympha m. mitchellii</i> **	Mucket, tidewater (mussel)	<i>Leptodea ochracea</i>
Skipper, arogos (butterfly)	<i>Atrytone arogos arogos</i>	Pondmussel, eastern (mussel)	<i>Ligumia nasuta</i>
Skipper, Appalachian grizzled (butterfly)	<i>Pyrgus wyandot</i>	White, checkered (butterfly)	<i>Pontia protodice</i>
Wedgemussel, dwarf	<i>Alasmidonta heterodon</i> **		
Mammals		Fish	
Endangered		Endangered	
Bat, Indiana	<i>Myotis sodalis</i> **	Sturgeon, shortnose	<i>Acipenser brevirostrum</i> **
Bobcat	<i>Lynx rufus</i>		
Whale, black right	<i>Balaena glacialis</i> **		
Whale, blue	<i>Balaenoptera musculus</i> **		
Whale, fin	<i>Balaenoptera physalus</i> **		
Whale, humpback	<i>Megaptera novaeangliae</i> **		
Whale, sei	<i>Balaenoptera borealis</i> **		
Whale, sperm	<i>Physeter macrocephalus</i> **		
Woodrat, Allegheny	<i>Neotoma floridana magister</i>		

** Also on the federal Endangered and Threatened list

Source: NJDEP, Division of Fish & Wildlife

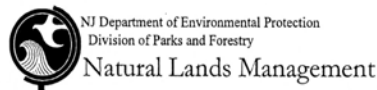
CAUTIONS AND RESTRICTIONS ON NATURAL HERITAGE DATA

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

This office cannot provide a letter of interpretation or a statement addressing the classification of wetlands as defined by the Freshwater Wetlands Act. Requests for such determination should be sent to the DEP Land Use Regulation Program, P.O. Box 401, Trenton, NJ 08625-0401.

The Landscape Project was developed by the Division of Fish & Wildlife, Endangered and Nongame Species Program to map critical habitat for rare animal species. Some of the rare species data in the Landscape Project is in the Natural Heritage Database, while other records were obtained from other sources. Natural Heritage Database response letters will list all species (if any) found during a search of the Landscape Project. However, any reports that are included with the response letter will only reference specific records if they are in the Natural Heritage Database. This office cannot answer any inquiries about the Landscape Project. All questions should be directed to the DEP Division of Fish and Wildlife, Endangered and Nongame Species Program, P.O. Box 400, Trenton, NJ 08625-0400.

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



MANTUA TOWNSHIP ENVIRONMENTAL RESOURCES INVENTORY

APPENDIX C: Rare Plant and Animal Species and Natural Communities Presently Recorded in the NJ Natural Heritage Database for Mantua Township

Scientific name	Common Name	Federal Status*	NJ Status*	State Rank*
Ecosystems				
Bald eagle foraging area		LT	E	S1, S2
Vascular Plants				
<i>Aplectrum Hyemale</i>	Puttyroot		E	S1
<i>Aristida dichotoma var curtissII</i>	Curtiss' three-awn grass			S2
<i>Cacalia atriplicifolia</i>	Pale Indian plantain		E	S1
<i>Asclepias variegata</i>	White milkweed			S2
<i>Asclepias verticillata</i>	Whorled milkweed			S2
<i>Asimina triloba</i>	Pawpaw		E	S1
<i>Desmodium Laevigatum</i>	Smooth tick-trefoil			S3
<i>Epilobium strictum</i>	Downy willowherb			S2
<i>Helonias Bullata</i>	Swamp-pink	LT	E	S3
<i>Luzula Acuminata</i>	Hairy wood-rush		E	S2
<i>Malaxis unifolia</i>	Green adder's-mouth			S2
<i>Phaseolus polystachios var polystachios</i>	Wild-kidney bean			S2
<i>Phlox maculata var maculata</i>	Spotted phlox			S3
<i>Sphenonpholis pensylvanica</i>	Swamp oats			S2
<i>Spiranthes odorata</i>	Fragrant ladies' tresses			S2
<i>Vernonica glauca</i>	Broad-leaf ironweed		E	S1
<i>Vulpia elliotea</i>	Squirrel-tail six-weeks grass		E	S1
Vertebrates				
<i>Clemmys mühlenbergii</i>	Bog turtle	LT	E	S2
<i>Rana virgatipes</i>	Carpenter frog			S4
<i>Lampropeltis triangulum triangulum x L. t. elapsoides</i>	Coastal plain milk snake			
<i>Terrapene carolina</i>	Eastern box turtle			S5
<i>Bufo woodhousii fowleri</i>	Fowler's toad			S5
<i>Buteo lineatus</i>	Red-shouldered hawk		E	S1, S2

*** Key to Federal and State Status Codes**

LT	Taxa formally listed as threatened
E	Endangered species – one whose prospects for survival within the state are in immediate danger due to one or many factors.
S1	Critically imperiled in NJ because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres).
S2	Imperiled in NJ because of rarity (6 to 20 occurrences).
S3	Rare in state with 21 to 50 occurrences. Includes elements which are widely distributed but with small populations/acreage, or with restricted distribution but locally abundant.
S4	Apparently secure in state, with many occurrences.
S5	Demonstrably secure in state and essentially ineradicable under present conditions.

Source: NJDEP, New Jersey Natural Heritage Program

MANTUA TOWNSHIP ENVIRONMENTAL RESOURCES INVENTORY

APPENDIX D: Mantua Township's Historic and Cultural Resources

Name	Address	Name	Address
<i>Main Street</i>		<i>Other Streets (cont.)</i>	
Building	100 Main ST	Building	Chawkin RD & Cedar RD
Building	104-106 Main ST	Building	Broadway & Georges Alley
Building	108 Main ST	Building	Glassboro-Woodbury RD
Building	112-114 Main ST	Building	Glof Club RD
Building	118 Main ST	Building	Lambs RD
Building	126 Main ST	Building	Mt. Royal RD
Building	137-139 Main ST	Building	Pitman RD
Building	138 Main ST	Building	Pitman RD
Building	145 Main ST	Building	Richmond RD
Building	150 Main ST	Building	Richmond RD
Building	158 Main ST	Building	Richmond RD
Building	27 Main ST	Building	Richwood RD & Jefferson RD
Carpenter House	23 Main ST	Building	Richwood RD & Harley RD
Building (1900)	Main ST	Building (1850 asbestos)	Berkeley RD
Building (1860)	Main ST	Building (bungalow)	Braodway
Building (1890)	Main ST	Building (bungalow)	Broadway & Union ST
Building (1810)	Main ST	Building (Craftsman)	Berkeley RD
Building (Victorian Slate)	Main ST	Building (North 1850 Wood)	Berkeley RD
Building (1858)	Main ST	C. Jessup House (1876)	Heritage RD
Building (stuccoed)	Main ST	Clinton foursquare	Clinton ST
Building (three bay)	Main ST and Union ST	Fairwinds Press	Mt. Royal RD
Former Bank	Main ST	First Federal Savings	Broadway
Fire House	Main ST	Golf Club	Golf Club RD
New House	Main ST	Grant House	Jackson RD
Building	Main ST	Group of Buildings (bungalows)	Clinton ST & Norris ST
Building	Main ST	Ice cream shop	Broadway
Barnsboro Hotel	Main ST	Jaggard House	Borsboro Richmond RD
<i>Union Street</i>		Jessup House	Heritage RD
Building	105 Union ST	Mt. Zion Church	Richwood RD
Building	108 Union ST	Pitman Country Club	Pitman RD
Building	109 Union ST	Rhneron-Grier House	Bethel Mill RD
Building	11 Union ST	Tonkin Street garage	Tonkin ST
Building	112-114 Union ST	<i>Bridges</i>	
Building	115 Union ST	Bridge: Barnsboro-Blackwood Road over Mantua Creek	Barnsboro-Blackwood RD
Building	118-120 Union ST		
Building	119-121 Union ST	Bridge: Barnsboro-Fairview Road/Chestnut Branch	Barnsboro-Fairview RD
Building	127 Union ST		
American Legion	128 Union ST	Bridge: Breackneck Road over Edwards Run	Breackneck RD
Building	13 Union ST		
Building	212 Union ST	Bridge: Grenloch-Richwood Road over Mantua Creek	Grenloch-Richwood RD
Building	220 Union ST		
Building	25 Union ST	Bridge: Jessups Mill Road over Edwards Run	Jessups Mill RD
Building	26-28 Union ST		

APPENDIX D: Mantua Township's Historic and Cultural Resources

Name	Address	Name	Address
Building	27 Union ST	Bridge: Mantua Boulevard over Millville Branch of Conrail	Mantua BLVD
Building	29 Union ST		
Building	32 Union ST	Bridge: Mantua-Glassboro Road over Chestnut Branch	Mantua-Glassboro RD
Building	38 Union ST		
Barber Shop	55 Union ST	Bridge: State HWY 45 over Edwards Run	State HWY 45
Mantua Academy	Union ST		
1790 house	Union ST	Bridge: Tyler Mills Road over Chestnut Branch	Tyler Mills RD
1850 SJF house	Union ST		
Grist Mill	Union ST	Streetscapes	
1879 Hotel	Union ST	Streetscape: High Street	High ST
Union Street Bank	Union ST	Streetscape: Hill Street	Hill ST
Post Office	Union ST	Streetscape: McCarthy Avenue (between Union & Main)	McCarthy AVE
Masonic Lounge	Union ST		
Mantua Methodist Church	Union ST	Streetscape: McCarthy Avenue (Between Wenonah & Union)	McCarthy AVE
Other Streets			
Jesse Chew House	611 Mantua BLVD	Streetscape: Norris Avenue (between Main & Union)	Norris AVE
Astor Heritage	Mantua BLVD		
Building	Mantua BLVD	Streetscape: Norris Avenue (Between Union & Clinton)	Norris AVE
Beckett Farmstead	Pitman RD		
Bethel Mill	Bethel Mill RD	Streetscape: Summit Street (between Union & Main)	Summit ST
Building	Breakneck RD		
Building	Breakneck RD & Jackson RD	Streetscape: Tonkin Street (between Hill & Broadway)	Tonkin ST
Building	Breckneck RD		
Building	Bridgeton Pike	Streetscape: Turner Street (From Union to dead end)	Turner ST
Building	Bridgeton Pike and Heritage RD		
Building	Bridgeton Pike	Streetscape: Woodland Avenue streetscape	Woodland AVE
Building	Bridgeton Pike		
Building	Broadway & Tonkin ST	Streetscape: Mortel Street	Mortel ST
Building	Broadway & Chestnut ST	Streetscape: Wenonah Avenue	Wenonah AVE
Building	Broadway & Center ST	Streetscape: Richmond Road	Richmond RD
Building	Broadway & Union ST		

Source: NJDEP, NJ Historic Preservation Office

APPENDIX E: A Description of Superfund Sites in Mantua Township*Lipari Landfill*

The Lipari Landfill, located in Mantua Township and bordering the municipalities of Pitman, Glassboro and Harrison Township, is a former sand and gravel quarry used as a 15-acre landfill and toxic chemical repository from 1958 to 1971. It accepted household waste, chemical wastes, and industrial materials—an estimated 3,000,000 gallons of liquid wastes and 12,000 cubic yards of solid wastes. The landfill was closed by the State of New Jersey in 1971 after neighbors complained about respiratory problems, nausea, dying vegetation, and odors emanating from the dumpsite. Aided by years of community protest, outrage, and grassroots action, then-Congressman Jim Florio succeeded in coauthoring the federal Superfund Legislation and adding Lipari Landfill to the new national list of chemical waste sites.

Nearby residents complained that frequent rainfalls flushed contaminants into yards, streams, marshlands, and lakes. Lake Alcyon, the area's swimming area, was closed to recreational use. In 1982, the Lipari Landfill was recommended for National Priority Listing, and due to its impact on over 11,000 Gloucester County residents, given top ranking.

In 1984, The US EPA began its first phase of remediation, which aimed to contain the contaminants on-site by inserting a 30-foot clay wall around the area and capping the landfill with a synthetic membrane cover. In 1985, the EPA devised an on-site remediation program targeting leachate and groundwater contamination. They designed a system of wells to flush water-soluble contaminants out of the residential area by injecting water, which pumped solid leachate and groundwater to an on-site treatment center. Operation of the treatment center commenced between 1992 and 1993.

In 1988, the EPA designed an off-site remediation program, intended to alleviate some of the devastating effects to private property, and surface and groundwater sources within the four affected communities. Groundwater and leachate were collected from the aquifers and stored for treatment. Chestnut Branch Marsh, Alcyon Lake, Chestnut Branch, and Rabbit Run were dredged and pollutants removed through a low temperature volatilization system (referred to as "baking"). Excavated, treated soils were in-filled on the former Alcyon Lake Racetrack. Finally, a monitoring system was installed to ensure that on-site cleanup continues to be effective. Off-site cleanup efforts were completed in the late summer of 1995.

During the EPA's preliminary studies throughout the 1980s, concerned citizens founded the Lipari Information Network (LINK) to monitor the federal government's actions. Additionally, LINK pushed for human health studies to measure the impact of the Lipari Landfill on the 11,000 affected residents. LINK received funding from the Agency for Toxic Substances and Disease Registry to contract independent researchers and analysts. The LINK-sponsored studies, in addition to the state's studies, proved there was an increase in cancer-related illness (excluding lung cancer) and leukemia as well as a drop in infant birth weights among area residents.

The Philadelphia-based chemical company Rohm & Haas was legally found to be the primary polluter and thus responsible for cleanup costs. At the time of disposal, Rohm & Haas probably

APPENDIX E: A Description of Superfund Sites in Mantua Township

paid 75 cents for each barrel of chemical waste. Removal of a single barrel is now estimated at \$2,000. Rohm & Haas paid over \$52 million of the \$100 million remediation project. Other companies have also been found to be liable polluters and have paid for the cleanup.

In 1995, the Alcyon Lake was reopened for public swimming. The Lipari Landfill is now the site of a public sports field complex, hosting soccer, baseball, and other athletic fields. The recreational project is considered a success in brownfield redevelopment.

Helen Kramer Landfill

The Helen Kramer Landfill Superfund site encompasses a 66-acre refuse area and an 11-acre previously stressed vegetation area. The site is adjacent to a stretch of Edwards Run, a tributary to Mantua Creek. Centre City is the nearest residential community approximately 1,200 feet east of the site. The Helen Kramer Landfill was originally operated as a sand and gravel pit; and became a landfill in the mid-1960s. Many different waste types were deposited on the site, such as municipal waste, septage, industrial wastes (such as sludge, waste oils, solvents, chemical intermediates, pesticides, plastics, acids and bases, heavy metals, paints, and pigments), and hospital wastes. Most industrial wastes were disposed of directly into the landfill, not in containers. It is estimated that several million gallons of chemical wastes and over two million cubic yards of solid waste were disposed of at the Helen Kramer Landfill. The waste is more than 50 feet deep in most areas.

The United States Environmental Protection Agency reports that very little is known about the Helen Kramer Landfill operations and practices between 1965 and 1970, prior to the New Jersey Solid Waste Management Act. In 1974, NJDEP acquired new regulatory authority to monitor and restrict hazardous waste disposal in landfills. Subsequently, DEP personnel observed leachate discharged into Edwards Run and ordered the landfill to desist in disposing of hazardous wastes, but municipal and household wastes, including septage, were permissible. NJDEP reports that sporadic chemical dumping continued between 1974 and 1981, though Helen Kramer was not an approved hazardous waste facility. In 1977, Helen Kramer's landfill registration was revoked. Agency hearings on the revocation continued until 1981, after which the landfill ceased operation under judicial action.

Over the course of a few years, EPA, NJDEP, the Gloucester County Health Department, and private engineering consultants conducted many environmental studies on the site contamination and found that a portion of the Mt. Laurel/Wenonah aquifer, immediately under the site's soil surface, was contaminated with organic and inorganic pollutants. Additionally, Edwards Run was contaminated with organic and inorganic pollutants. Such contaminants are toxic and mutagenic to living organisms. Volatile organic compounds were found in the ambient air on and near the site. Fortunately, the Marshalltown aquifer that supplied drinking water to private residences was not contaminated at the time.

In September 1983, the Helen Kramer Landfill was added to the National Priorities List and became a Superfund site. EPA began a remedial investigation and feasibility study in 1984 to determine contamination and select a remediation strategy. EPA performed a risk assessment to determine the impact of the landfill on public health and the environment. Airborne

APPENDIX E: A Description of Superfund Sites in Mantua Township

contaminants, proven to be carcinogenic, were found in amounts above the recommended levels in and around the site. Several contaminants in Edwards Run were found to exceed water quality standards developed prior to the Clean Water Act. Even today, leachate entering Edwards Run continues to render the stream unusable for its designated use as an FW-2 Non-Trout Surface Water.

In 1985, EPA selected a remediation plan for the site that included the construction of a clay cap over the site, excavation of the lagoons and leachate ponds, construction of a slurry wall, construction of a groundwater/leachate collection trench, disposal of groundwater/leachate for treatment at the Gloucester County Utility Authority, construction of a gas collection and treatment system, construction of a security fence, and the implementation of a long-term monitoring program extending beyond EPA's remediation activities.

After the lagoons were drained and excavated, a six-layer cap, which enabled dangerous gases and liquids to be collected and treated, was built over an area of approximately 81.5 acres. As part of the operation and monitoring phase, 13 groundwater monitoring wells were installed around the perimeter of the site. An extensive system of groundwater and leachate pumps, collection basins, air filters, and underground slurry walls were built that reduced groundwater flow in the Mt. Laurel/Wenonah aquifer. NJDEP was responsible for the operation and maintenance phase from 1995 to 1998 after which EPA determined that the remedial level was met. NJDEP continues to be responsible for long-term monitoring.

Under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), EPA sued 30 potentially responsible parties for reimbursement of costs incurred while cleaning up the Helen Kramer Landfill. The case was settled in 1998; the responsible parties agreed to reimburse the United States \$95 million and New Jersey \$8.6 million for past and future cleanup costs. The responsible parties also filed suit to identify over 200 third parties who also engaged in waste disposal on the site. The Helen Kramer Landfill, as well as the Lipari Landfill, remains on the National Priorities List as sites that did or could threaten human health.

Neighboring Superfund Sites

There are two other Superfund sites close to Mantua's borders. Marvin Jonas, Incorporated, also known as Marvin Jonas Waste Disposal, in Deptford Township was nominated for the National Priorities List in 1979, but after an assessment period from 1979 to 1984, was deemed not to be a major human health hazard. In 1984, New Jersey's Bureau of Case Management took over site assessment and monitoring from USEPA. The other site, CBS Records, also known as Sony Music Entertainment, located in Pitman Borough, was nominated for the National Priorities List in 1980. Both NJDEP and USEPA assessed the site from 1980 to 1986 and determined that the site was not a major human health hazard. The Bureau of Environmental Evaluation, Cleanup, and Response Assessment (BEECRA) monitors the site for changes in contamination at this time.

APPENDIX E: A Description of Superfund Sites in Mantua Township

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DELAWARE VALLEY REGIONAL PLANNING COMMISSION

Publication Abstract

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ABSTRACT

This publication documents the natural and community resources of Mantua Township, Gloucester 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; deer management; Heritage Priority Sites; and known contaminated sites. Community resources that are briefly described include population, transportation, township utilities and services, and protected open space. A short history of the community is also included.

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for the **TOWNSHIP** of



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