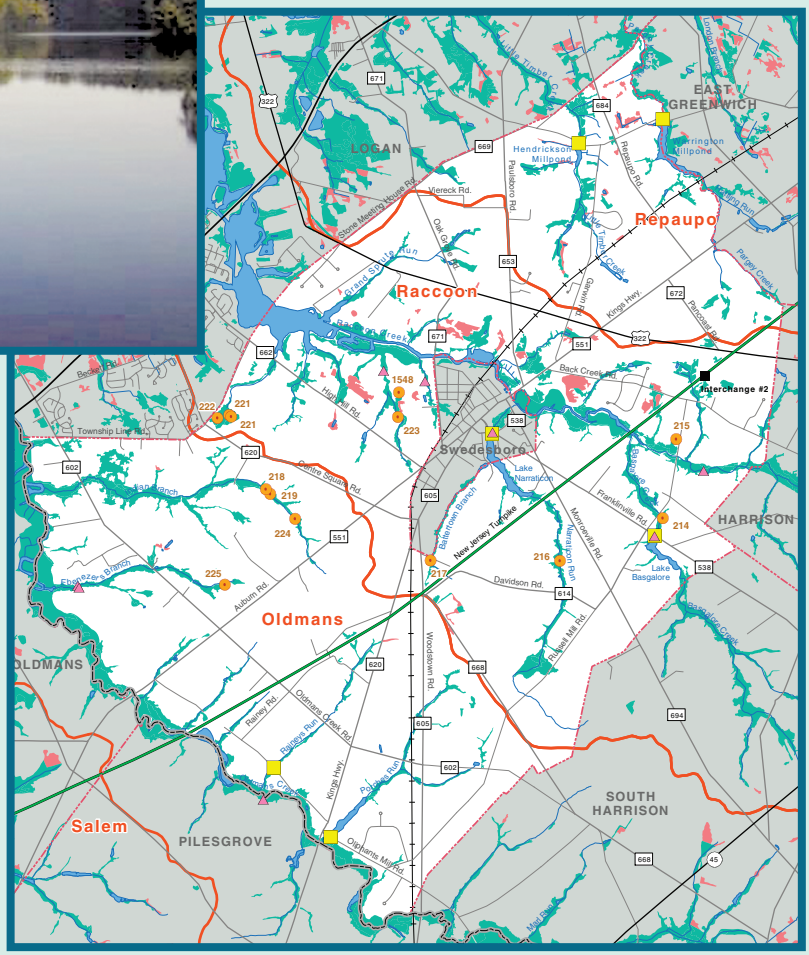
ENVIRONMENTAL RESOURCE INVENTORY

for the TOWNSHIP of

WOOLWICH

GLOUCESTER COUNTY, NEW JERSEY



prepared by:

Delaware Valley Regional Planning Commission

with:

The Environmental Commission of Woolwich Township

APRIL 2004

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.

DVRPC is funded by a variety of funding sources including federal grants from the U.S. Department of Transportation's Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), the Pennsylvania and New Jersey departments of transportation, as well as by DVRPC's state and local member governments. The authors, however, are solely responsible for its findings and conclusions, which may not represent the official views or policies of the funding agencies.

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Gratitude is also extended to Mayor Guiseppe Chila and the other members of the Woolwich Township Committee for providing support, information, and funding to this project.

Township Committee, Township of Woolwich

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The impetus for the creation of the document, and its guidance and review, came from the Woolwich Township Environmental Commission.

The Woolwich Township Environmental Commission, December 2003

Alex Elefante, Chairperson
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Carolyn Grasso
Ted Otten, Township Committee Liaison

In fashioning the Woolwich Inventory, the *Environmental Resource Inventory of the Township of Franklin* (Gloucester County) served as a model. Joseph Arsenault, Chairman of the Franklin Township Environmental Commission and principle author of that *Inventory*, was especially helpful in reviewing plant and fish data on Woolwich, and in granting permission for use and adaptation of some of the Franklin *Inventory* text. Another valued source was Woolwich resident, William Cozens, whose historical articles for the *Newtown Press* provided facts for the *Brief History* section. DVRPC interns Alison Hastings and Stephanie Potts gave invaluable help by gathering and compiling data. Members of the Woolwich Township Environmental Commission, the Open Space and Recreation Committee, Township Clerk Jane DiBella, and other township officials, volunteers, and staff all provided information for this inventory.

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 intelligent 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.

Woolwich Township's natural resources have made it a significant agricultural community in the past. This character is changing as the township undergoes major residential development that was planned several years ago. Today (February 2004), Woolwich is the fastest growing community in the state of New Jersey. Documentation of its resources has become a necessity, especially if it is to support residents of the future. Woolwich's surface waters and groundwater resources will become increasingly important to its growing population. Its upland deciduous forests, grasslands, tidal marshes, and forested wetlands, which provide significant habitat for endangered and threatened plants and animals, will be vital to the continued health of the community and the enjoyment of its expanding citizenry.

Preparing an Environmental Resource Inventory requires gathering all the existing information that can be found about those resources, and presenting it in a form that is usable by 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 Woolwich Township*, including the Woolwich *Master Plan* adopted in November 2003, along with a number of reference works. These are listed at the end of this document. The maps and data relating to Woolwich Township's natural resources are derived from the New Jersey Department of Environmental Protection Geographic Information System mapping system, from *The Landscape Project* produced by the Endangered and Nongame Species Program of the New Jersey Fish and Wildlife Division, and from the Waitzman Planning Group, the consultant for preparation of the 2003 Township *Master Plan*.

BRIEF TOWNSHIP HISTORY

Woolwich Township was first incorporated on March 17, 1767 and takes its name from an English town on the Thames River famous for its naval school. The township was part of the Civil Organization of West Jersey, established in 1676, and was originally within Greenwich Township, one of the four incorporated jurisdictions in what is now Gloucester County. When Woolwich Township was first formed from Greenwich Township in 1750, before incorporation, it encompassed an area of 40,000 acres and was known as South Greenwich. Subsequent secessions reduced the land area, with Franklin Township being formed from Greenwich and Woolwich in 1820, and Harrison Township in 1844. In 1877, West Woolwich, which is now known as Logan Township, was set off from Woolwich, although in 1901 part of Logan was returned to Woolwich. In 1902, Swedesboro, the principal town of Woolwich, was incorporated as a separate municipality.

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. Most pre-European settlements were associated with stream corridors. Indian villages are known to have existed beside both the Raccoon and Oldmans Creeks. The Narraticons lived in the vicinity of the Raccoon. Their name, which is a version of the Indian word for "raccoon," survives in the names of the creek and the main lake in Woolwich – Narraticon Lake. The Kagkakaini Sakins lived along the Mosackas Creek, now called Oldmans Creek.

In 1638 Swedish settlement came to the Delaware Valley and a colony was established on the east side of the Delaware River that was referred to as "New Stockholm" (also "New Sweden"). This began to grow when the land was purchased by the Swedes from the Indians in 1641. The first settlement was located on the banks of Raccoon Creek and was called "Raccoon" until 1765 when the name was changed to "Swedesborough." Swedish and Finnish inhabitants moved into the area and created homesteads. It is they who gave shelter to the passengers of the first English ship to arrive in 1677, which docked at the Raccoon Creek.

With English settlement in the region, Swedish place names began to be replaced with English names, including that of "Woolwich." Early settlers raised grain, fruit and vegetables, and tended stock. Peter Kalm, a Finnish botanist and one of the most famous recorders of botany in the colonies, traveled in the region between 1748 and 1751. He began his stay in Swedesboro and in his important account, *Travels in North America*, reported on all kinds of fruit growing on local farms and "peaches so thick on the ground that one could hardly miss stepping on them." Some of New Jersey's richest farmland is located within Woolwich Township and farming has always been a principal industry of the area.

Waterways were important to Woolwich and Swedesboro from the earliest days. Farm products, as well as timber from the rich forests, were conveyed to markets along the wide tidal Raccoon and Oldmans Creeks. Along with other vessels, an early steamboat plied the

Raccoon Creek from the wharves at Swedesboro to Philadelphia, carrying produce to the Dock Creek Farmers Market. Early mills in the area that ground flour and sawed lumber relied on the tributaries to these streams to provide their power. Mills were established at Lake Narraticon next to Swedesboro, on Basgalore Creek, on Purgey's (or Pargey's) Creek forming Warrington Millpond, and on Porches Mill Creek.

Travel on roads was nearly impossible during the 18th and early 19th centuries. Road quality was exceedingly poor and bridges were frequently in disrepair or nonexistent. However, the first highway to cross both Camden and Gloucester Counties, Kings Highway (also called Salem Road or the Great Road), was completed in 1702 and provided an alternative to water travel. The Kings Highway travels through the center of Woolwich Township and Swedesboro and has several historic houses and structures along its length.

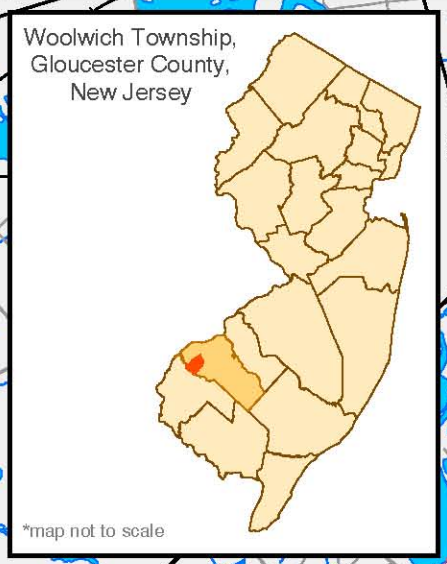
Railroads became an important means of travel and transport of goods, especially farm produce, in the latter half of the 19th century. One of the earliest lines in the southern part of Gloucester County was the Swedesboro Railroad, established in 1854, and subsequently operated by the West Jersey Railroad Company and then the Pennsylvania–Reading Seashore Line. This line opened new markets for products from the Woolwich area. It also carried passengers until 1933. It continues to operate today as a freight line.

The railroad served new processing plants that were established in Gloucester County in the late 19th century. One of these, founded by Edgar Hurff, was the largest privately owned processing plant in the world. Hurff also developed the largest seed business in the world and was the first to process canned asparagus in the eastern United States. The Hurff plant became the California Packing Corporation plant that packaged Del Monte vegetables for many years. The facility serves today as a Del Monte distribution center and is located in Woolwich next to the western boundary of Swedesboro.

Highways and trucking 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 the northeast corner of Woolwich Township. The turnpike bisects the township on a northeast–southwest line. In the 1960s the construction of Interstate 295 began to bring major changes to Woolwich. Although the road is west of Woolwich, in Logan Township, it provides easy access in and out of Woolwich. A major residential development called Beckett was planned for Logan and Woolwich Townships in the 1970s. In Woolwich, this development is now called Weatherby and will bring a total of 4500 housing units along Center Square Road in the southwest quadrant of the township.

Today, Woolwich Township is home to people from a wide array of ethnic and social backgrounds, with a diverse set of occupations reflecting today's 21st century service and light manufacturing economies. Automobile transportation corridors provide the framework for land uses today. Many residents commute throughout the tri-state region for employment and for other basic services. This has made the township something of a bedroom community for the more urbanized portions of southern New Jersey. However, Woolwich Township still supports an active farming community and is still served by and connected to the historic town center of Swedesboro.

Woolwich Township



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

Map 1: Woolwich Township

Miles
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Delaware Valley Regional Planning Commission
January 2004

WOOLWICH TOWNSHIP LOCATION, SIZE, AND LAND USE

Woolwich is an incorporated Township located toward the northwest end of Gloucester County, New Jersey. The township is bounded by four Gloucester County communities: Logan Township on the north, East Greenwich to the northeast, and Harrison and South Harrison Townships to the east and southeast. The western boundary is the Oldmans Creek, which forms the dividing line between Gloucester and Salem Counties. On the Salem side are two neighboring municipalities – Oldmans Township to the north and Pilesgrove Township to the south. At the center of Woolwich is the 498-acre incorporated borough of Swedesboro. See **Map 1: Woolwich Township**.

Woolwich Township occupies 13, 713 acres or 21.27 square miles situated on the coastal plain of New Jersey, within 4 miles of the Delaware River. It is in an area that is still primarily rural, although the township is undergoing extensive development due in part to its proximity to the Philadelphia–Camden and Wilmington metropolitan areas and the ever enlarging suburbanized perimeter of those urban centers.

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

General Land Classes	Acres	%
Agriculture	7830	57.10
Barren Land	149	1.09
Forest	2362	17.22
Developed	1760	12.84
Water	282	2.05
Wetlands	1330	9.70
Total	**13713**	**100.00**

Source: NJDEP

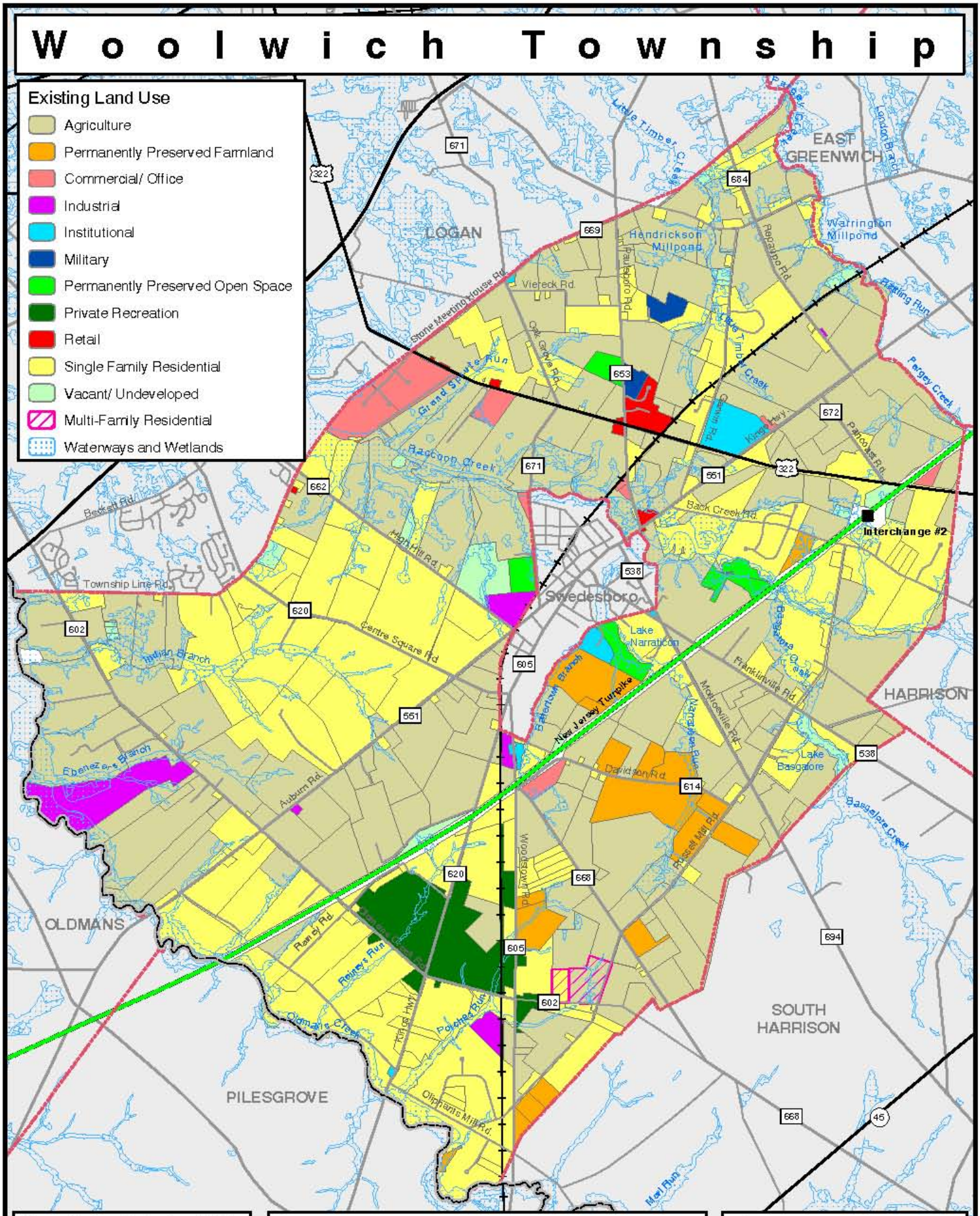
Table 2: Existing Land Use (2002)

Existing Land Use	Acres	% of Total Land Area
Agriculture	7074	51.5
Permanently Preserved Farms	489	3.6
Commercial/Office	138	1.0
Industrial	228	1.7
Institutional	120	0.9
Military (former Nike bases)	36	0.3
Permanently Preserved Open Space	24	0.2
Private Recreation	341	2.5
Retail	60	0.4
Single-Family Residential	4680	34.1
Multi-Family Residential	85	0.6
Transportation	214	1.6
Vacant	224	1.6
Total	**13713**	**100.0**

Source: The Waetzman Planning Group, Inc.

See also **Map 2: Existing Land Use (2002)** for a visual depiction of 2002 land use.

Woolwich Township



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

Map 2: Existing Land Use (2002)

Miles
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Delaware Valley Regional Planning Commission
January 2004

NATURAL RESOURCES

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. Woolwich Township is located in the Atlantic Coastal Plain, the most southerly 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 inter–bedded sand and clay. Deposits originating in the breakdown of Appalachian and Catskill sedimentary, metamorphic, and igneous rocks are interbedded with layers formed by oceanic (marine) deposition, which occurred as the ocean shoreline advanced and receded over geologic time. The Inner Plain layers date from the Cretaceous Period, 135 to 65 million years ago. Soils of the Inner Coastal Plain are quite fertile.

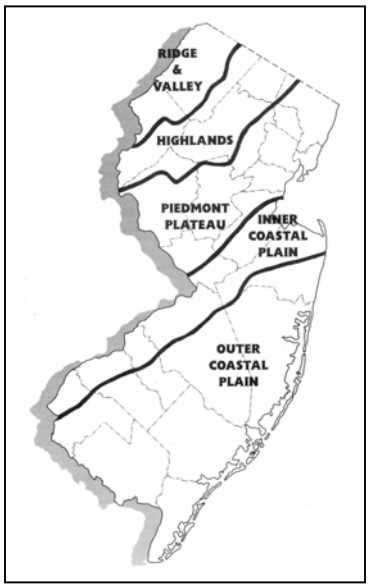


Fig. 1: The Physiographic Regions of New Jersey

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 less fertile than those of the Inner Plain and don't hold water as well.

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 can be identified in the Mullica Hill area. The Inner Coastal Plain lies to the west of the band of hills, with most of its surface waters draining toward the Delaware River. The Outer Coastal Plain slopes more gradually to the east, with drainage generally toward the Atlantic Ocean. Woolwich Township sits immediately to the west of this boundary and is entirely on the Inner Coastal Plain.

TOPOGRAPHY AND SURFACE LANDSCAPES

Woolwich Township occupies a moderately rolling upland straddling the watershed divide between the main channels of the Raccoon and Oldmans Creeks in the central and southern part of the township and the divide between the Raccoon Creek and Repaupo Creek (Pargey

or Purgy Creek in Woolwich) watersheds in its northern part. The area is characterized by rich soils in the uplands that once supported extensive beech–oak forests and, in the southeastern section of the township, a Pine forest. Along the river valleys are wet forests of sweet gum and red maple and freshwater tidal marshes. The streams are relatively flat, as in all of southern New Jersey, with muddy and/or sandy bottoms. Smaller streams flow in narrow, incised corridors while the tidal channels are wide and broad. Several stream corridors in Woolwich are characterized by very steep slopes, for some of their length. These are located in the upstream reaches of the three main streams and along some of their tributaries.

The highest elevation within the township is approximately 150 feet Mean Sea Level at a point just east of the intersection of Monroeville and Russell Mill Roads. The lowest elevations are 10 feet Mean Sea Level and under, located along the tidal marshes of both the Raccoon and Oldmans Creek corridors.

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 a natural resource that cannot be replenished on the human time scale.

Woolwich's soils are very rich in agricultural value and are among the finest, most productive soils in all of New Jersey. In Woolwich Township the soils consist of 28 series types and 42 variations within those series as identified by the Soil Conservation Service. Seventy (70%), the majority of these township soils, 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.

Nineteen percent (19%) of Woolwich's soils are classified as Farmlands of Statewide Importance (S-1). These soils are close in quality to Prime Farmland and can sustain high yields of crops when correctly managed with favorable conditions. Of the remaining two classifications, 1.6% is categorized as Farmland of Local Importance (L-1), which are soils that can support the production of high value, regional crops like horticultural crops or indigenous foods. Seven percent (7.1%) are Unique Farmlands (U-1), which are similar to L-1 soils in that they can support specialized crops only.

See *Table 3: Agricultural Values for Woolwich Soils* (following page) for the acreage of these categories of farmland[1], and *Table 4: Woolwich Township Soils* (page 15) for all soils by type. See also **Map 3: Soils** (page 17).

[1] New Jersey Farmlands Inventory, New Jersey Natural Resources Conservation Service, September 24, 1990, available online at www.nj.nrcs.usda.gov/technical/soils/njfarmindex.html

Table 3: Agricultural Values for Woolwich Soils

Designation	Type	Area (In Acres)	Percent
P-1	Prime Farmland	9602	70
S-1	Statewide Importance	2606	19.0
L-1	Local Importance	220	1.6
U-1	Unique Farmland	976	7.1
Other Soil	Wet soils, pits, developed land, etc.	75	0.6
Water	Water	234	1.7
Totals		**13714**	**100.00**

Source: New Jersey Farmlands Inventory, New Jersey Natural Resources Conservation Service

Soil Series

Several soil series appear more frequently in Woolwich Township than others, and are briefly described below.[1]

Freehold Series
Fifty percent of Woolwich soils are a variation of the Freehold series. These soils formed from sandy marine deposits, are mostly gently sloping, and are 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. Freehold soils are easily worked for agricultural production with low to moderate natural fertility. Different variations of soil are well suited to support upland forests of oaks and poplar and provide high quality wildlife habitat. These soils are also well suited to many different vegetable crops and can support various seasonal crops as the variations of soils warm at different times of the year. (Capability Units I, II, and IV depending on slope).

Marlton Series
Marlton soils are well drained and are found on both gentle and steep slopes or adjacent to streams. These soils are moderately fertile and high in potassium, although that nutrient is not readily available for plants. 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).

Colts Neck Series
Six percent of Woolwich soils are a part of the Colts Neck series. These well-drained soils occur around and in the Borough of Swedesboro. They occur in association with Freehold soils. Occasionally, ironstone can be found in the soil sub-surface layers, which deters cultivation. Colts Neck soils are well drained and moderately fertile. The soils retain moisture and are moderately permeable and, therefore, well suited to fruits and vegetables. (Capability Unit II and III depending on slope).

[1] Derived from Soil Conservation Service, *Soil Survey of Burlington County New Jersey*, USDA and New Jersey Agricultural Experiment Station, October 1971.

Alluvial Series
Alluvial land in Woolwich is formed from material deposited by streams that flow to the Delaware River. The streams begin in the gravelly divides and flow through several belts of different kinds of soils and geologic materials. As these materials from other soil layers are removed and then deposited on flood plains, they form alluvial land. Most areas of alluvial land have large amounts of organic matter, and groundwater is close to the surface. (Capability Unit VII).

Woodstown Series
Variations of the Woodstown Series make up over 5% of all acres in Woolwich 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, except that Woodstown is not well drained. These soils occur on terraces along large streams and in beds of gravel where cultivation is hampered by wetness. (Capability Unit II).

Westphalia Series
The Westphalia soils are well drained, with gentle slopes. These soils occur in a belt that extends across the county and support mixed oaks, beech, poplar and holly trees. While associated with Freehold soils, Westphalia soils developed from finer sands and have less clay in the subsoil. Westphalia soils are easily cultivated throughout the year, are low in natural fertility, but respond to fertilizers, and are subject to water erosion. Sandy variations in this series are subject to wind erosion. Despite threats of erosion, these soils are well suited to all seasonal vegetables and produce high crop yields. (Capability Unit II, III depending on variation).

Tidal Marsh
This land lies near sea level and tides cover it daily. Tidal marsh is found near the Delaware River, but extends inland along the Raccoon and Oldmans Creeks. These tidal marshes remain mostly freshwater, due to Gloucester County's location upstream on the Delaware. Tidal marsh is composed of rich organic matter and minerals and in some spots, peat can be found. Generally, the marsh is 3 feet to 10 feet deep but in some areas it is only 24 inches thick. By the 1930s, much of this land had been diked or ditched for cultivation, but this practice has been abandoned. While tidal marsh is rich in fertility, it

Capability Units

I – Soils have few limitations that restrict their use.

II – Soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

III – Soils have severe limitations that reduce the choice of plants, require very careful management, or both.

IV – Soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

V – Soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, woodland, or wildlife habitat.

VI – Soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, woodland, or wildlife habitat.

VII – Soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, woodland, or wildlife habitat.

VIII – Soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, water supply, or to aesthetic purposes.

is often not a good agricultural soil because of its extreme acidity and the constant subsidence of the land. (Capability Unit VIII).

Keyport Series
Keyport soils developed from deposits of clay. Due to the high clay content, permeability is very slow and therefore these soils are not often used for cultivation. Where the soil slopes, more drainage occurs. During rainy seasons, standing water forms in slight depressions. (Capability Unit IV).

Table 4: Woolwich Township Soils

Soil Code	Soil Name	Woolwich Acres	Percentage of all Soils	Designation*
Ad	Alluvial land	704	5	NA
AmB	Aura loamy sand, 0-5 percent slopes	5	0.0	P-1
ArB	Aura sandy loam, 0-5 percent slopes	50	0.4	P-1
AsB	Aura-Sassafras loamy sands, 0-5 percent slopes	60	0.4	P-1
AuB	Aura-Sassafras sandy loam, 5-10 percent slopes, Severely eroded	172	1	P-1
Ba	Bayboro loam	13	0.1	S-1
Ck	Colemantown-Matlock loams	57	0.4	S-1
CmB	Collington loamy sand, 0-5 percent slopes	27	0.2	P-1
CnA	Collington sandy loam, 0-2 percent slopes	86	1	P-1
CoB	Colts Neck soils, 0-5 percent slopes	832	6	P-1
DoB	Downer loamy sand, 0-5 percent slopes	72	1	S-1
DsB	Downer sandy loam, 2-5 percent slopes	4	0.0	P-1
Ek	Elkton loam	46	0.3	S-1
Fa	Fallsington loam	140	1	S-1
Fd	Fallsington sandy loam	151	1	S-1
FhB	Freehold loamy sand, 0-5 percent slopes	4,084	30	P-1
FnB	Freehold sand, thick surface variant, 0-10 percent slopes	104	1	S-1
FoA	Freehold sandy loam, 0-2 percent slopes	1,792	13	P-1
FoD3	Freehold sandy loam, 10-15 percent slopes, Severely eroded	158	1	L-1
FsD	Freehold soils, 10-15 percent slopes	182	1	NA
FtE	Freehold, Colts Neck, and Collington soils, 15-25 percent slopes	766	6	NA
Fw	Fresh water marsh	28	0.2	NA
KpB	Keyport sandy loam, 0-5 percent slopes	260	2	P-1
KrB	Kresson sandy loam, 0-5 percent slopes	113	1	NA
LdB	Lakeland sand, 0-10 percent slopes	26	0.2	L-1
LkA	Lenoir and Keyport loams, 0-5 percent slopes	44	0.3	S-1
Mf	Made land, fine materials	17	0.1	L-1
MrB	Marlton sandy loam, 0-5 percent slopes	1,018	7	P-1
MrD	Marlton sandy loam, 10-15 percent slopes	150	1	NA
MrE	Marlton sandy loam, 15-25 percent slopes	98	1	NA
Mu	Muck	12	0.1	U-1
NbB	Nixonton and Barclay soils, 0-5 percent slopes	9	0.1	P-1

Table 4: Woolwich Township Soils (continued)

Soil Code	Soil Name	Woolwich Acres	Percentage of all Soils	Designation*
Pg	Pits	47	0.3	NA
Po	Pocomoke loam	77	1	S-1
Ps	Pocomoke sandy loam	26	0	S-1
SfB	Sassafras loamy sand, 0-5 percent slopes	210	2	S-1
SrA	Sassafras sandy loam, 0-2 percent slopes	184	1	P-1
SrD3	Sassafras sandy loam, 10-15 percent slopes, Severely eroded	44	0.3	NA
SsD	Sassafras soils, 10-15 percent slopes	58	0.4	S-1
SsE	Sassafras soils, 15-40 percent slopes	53	0.4	NA
Tm	Tidal marsh	260	2	NA
W	Water	234	2	NA
WaD3	Westphalia fine sandy loam, 10-15 percent slopes, Severely eroded	43	0.3	NA
WhB	Westphalia soils, 0-5 percent slopes	444	3	P-1
WhD	Westphalia soils, 10-15 percent slopes	20	0.1	U-1
WhE	Westphalia soils, 15-40 percent slopes	13	0.1	NA
WnA	Woodstown and Dragston loams, 0-2 percent slopes	19	0.1	P-1
WoB	Woodstown and Dragston loamy sands, 0-5 percent slopes	95	1	P-1
WsB	Woodstown and Dragston sandy loams, 0-5 percent slopes	591	4	P-1
WtB	Woodstown and Klej loamy sands, 0-5 percent slopes	16	0.1	S-1
Total Acreage		**13,712**	**100**	
Total Farmland Acreage		**10,977**		
Total Non-Farmland Acreage		**2,735**		
Steep Slopes (15%+ Slopes)		**930**		

*Designations: P–1: Prime Farmland
S–1: Statewide Importance
L–1: Local Importance
U–1 Unique Farmland
NA – Land that is not appropriate for farming (e.g. eroded, developed, very steep slopes, pits, permanently wet soils, water)

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

Certain soils are more suitable for development and construction than others. Soil characteristics affect drainage features of a site, including the depth to seasonal high water. These features determine feasibility of constructing buildings with basements and installing standard septic systems, as the table below shows.

Table 5: Soil Limitations for Development

Soil Series	Soil Codes	Acreage	Building with Basement	Building without Basement	Septic Systems	Limitations
Alluvial land	Ad	704	C	C	C	1, 2
Aura	Adnb, Ar	56	A	A	A	
Aura-Sassafras	As, Au	232	A	A	A	3
Bayboro	Ba	13	C	B	C	
Colemantown-Matlock	Ck	57	B	A	C	1
Collington	Cm, Cn	112	A	A	A	
Colts Neck	Co	832	A	A	A	
Downer	Do, Ds	76	A	A	A	
Elkton	Ek	46	C	C	C	
Fallsington	Fa, Fd	291	A	A	B	
Freehold	Fh, Fn, Fo, Fs	6,320	A	A	A	
Freehold, Colts Neck, and Collington	Ft	766	C	C	C	3
Freshwater marsh	Fw	28	C	C	C	1
Keyport	Kp	260	B	B	C	1
Kresson	Kr	113	B	A	C	1
Lakeland	Ld	26	A	A	A	
Lenoir and Keyport	Lk	44	A	A	B	
Made land	Mf	17	B	B	B	1, 3
Marlton	Mr	1,267	B	A	B	1
Muck	Mu	12	C	C	C	1, 2, 3
Nixonton and Barclay	Nb	9	A	A	A	
Pits	Pg	47	A	A	A	3
Pocomoke	Po, Ps	103	B	B	B	
Sassafras	Sf, Sr, Ss	548	A	A	A	
Tidal marsh	Tm	260	C	C	C	1, 2
Water	WATER	234	NA	NA	NA	NA
Westphalia	Wa, Wh	520	A	A	A	
Woodstown	Wn, Wo, Ws, Wt	721	B	A	A	

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

Source: *Soil Survey of Gloucester County*

STEEP SLOPES

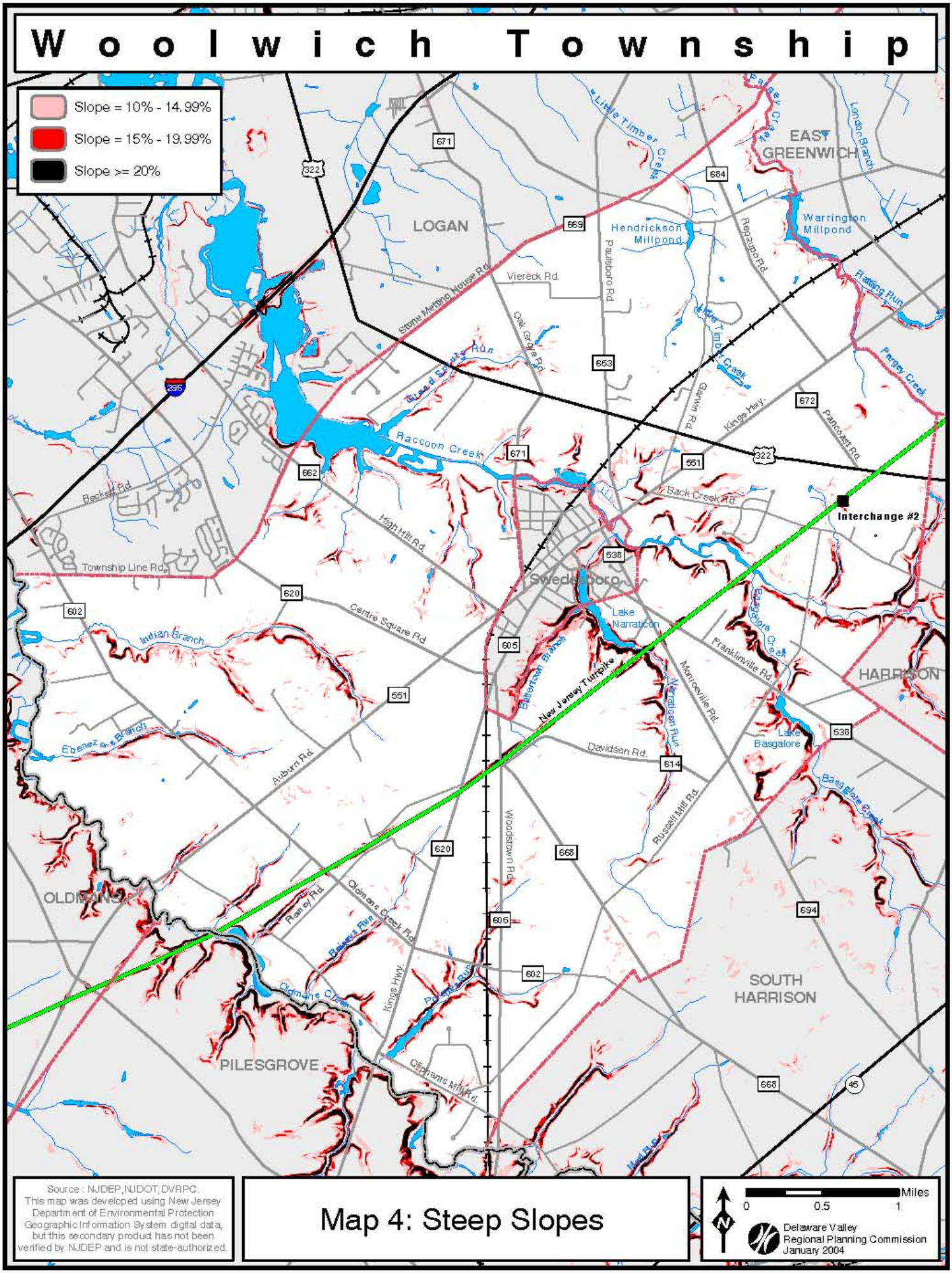
Only a small percentage of Woolwich Township has slopes of over 10% (the percent of vertical rise to horizonal distance). However, the steepest slopes are very steep indeed – up to 40% in some cases. Steep slopes are found almost entirely along the waterways of the township, including along a variety of the smaller streams throughout the township, and especially along the south sides of Basgalore Creek and Narraticon Run. Most of these slopes are well vegetated, although farm fields may extend to the edge of the plateau at their upper end. In some locations development has occurred on more moderate slopes, especially in the Back Creek Road area along the north side of Raccoon Creek and the small tributaries to it.

In general, development of steep slope areas is inadvisable because it can result in soil instability, erosion, sedimentation of the stream below, increased stormwater runoff, and flooding. This causes habitat destruction, and potential damage to property. Erosion on steep slopes is especially prevalent where excessive tree removal has taken place.

Where steep slopes remain forested, some very old trees can be found in Woolwich Township, possibly even remnants of virgin (never cut) forest. In addition, certain rare herbaceous plants can be found on forested steep slopes having Marlton soils, because of their adaptation to the glauconitic nature of such soils. No detailed inventory of these sites exists at present, although some of the Woolwich endangered plant records from the state's Natural Heritage Database (see Appendix B) are from these habitats. An in-depth assessment of Woolwich's steep slope forests is needed and merits a special study. Some regions have been negatively affected by fertilizers from adjoining farm fields or by runoff from development, but there may still be sites that are intact.

See **Map 4: Steep Slopes** for locations.

Raccoon Creek at low tide


Woolwich Township
Slope = 10% - 14.99%
Slope = 15% - 19.99%
Slope >= 20%
LOGAN
EAST GREENWICH
Swedesboro
HARRISON
SOUTH HARRISON
OLDMANS
PILESGROVE
Hendrickson Millpond
Warrington Millpond
Lake Narraticon
Lake Basgalore
Interchange #2
New Jersey Turnpike
Raccoon Creek
Little Timber Creek
Oldmans Creek
Indian Branch
Ebenezer Branch
Back Creek Rd.
Centre Square Rd.
Auburn Rd.
Davidson Rd.
Russell Mill Rd.
Woodstown Rd.
Kings Hwy.
Paulsboro Rd.
Repaupo Rd.
Pancoast Rd.
Franklinville Rd.
Monroeville Rd.
Source : NJDEP, NJDOT, DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.
Map 4: Steep Slopes
Miles
0
0.5
1
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January 2004

WATER RESOURCES

SURFACE WATERS

All of Woolwich's land drains to the Delaware River by way of three main stream systems – the Repaupo Creek system on the north end of the township, the Raccoon Creek across the center, and the Oldmans Creek on the southern end. The start of the main channel of each of these streams lies outside of Woolwich, in the townships to the north, east, and south, although there are many tributaries that are wholly within Woolwich's boundaries.

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. A watershed includes not only the water body or waterway itself, but also the entire land area that drains to it. 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 Raccoon Creek. The Raccoon watershed, in turn, is formed of several large subwatersheds, consisting of the land that drains to a major section or branch of the creek or to a large, branching tributary. 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. The percentage of Woolwich Township land that is within each of the three watersheds is listed in the following table.

Table 6: Watersheds in Woolwich Township

Watershed	*USGS Watershed Code (HUC 11 no.)*	*Stream classification*	*Acreage within Woolwich*	*% of Woolwich land*	*Subwatersheds (HUC 14 nos.)*
Repaupo Creek	02040202**140**	FW2 - NT & SE2 (tidal)	2,099	15	02040202140**030** 02040202140**040**
Raccoon Creek	02040202**150**	FW2 – NT & SE2 (tidal)	6,188	45	02040202150**040** 02040202150**050** 02040202150**060**
Oldmans Creek	02040202**160**	FW2 – NT & SE1 (tidal)	5,426	40	02040202160**030** 02040202160**050**

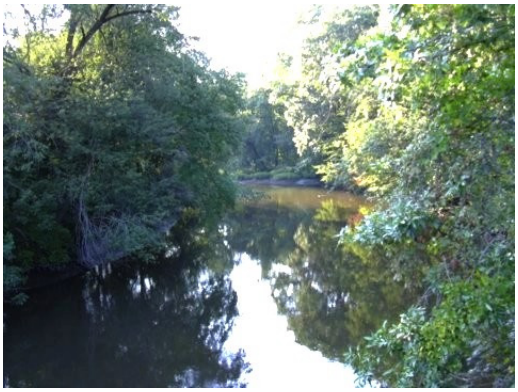
Source: NJDEP

See also **Map 5: Watersheds** and **Map 6: Surface Water, Wetlands, and Vernal Ponds**.

Repaupo Creek Watershed

The Repaupo watershed is a complex of streams that drain a total of 41 square miles of land. In Woolwich, this watershed occupies 2,099 acres, most of which drain to Pargey (or Purgy)

Creek which is the northern border between Woolwich and East Greenwich Townships. Pargey Creek starts just inside the boundary of Woolwich, immediately east of Kings Highway. Within half a mile it is joined by Rattling Run coming from Harrison and East Greenwich Townships. After running under the railroad line it passes through Warrington Mill Pond before traveling on to become the border between Greenwich and Logan Townships. West of Route 130 it is met by Still Run and, from there, the creek is called the Repaupo. The main creek channel empties into the Delaware River just below Flood Gate Rd. (the westward extension of Repaupo Rd.). There is extensive ditching at the mouth end of the Repaupo and the creek's discharge point at the Delaware has a tide gate on it. This and other tide gates were established in order to prevent incoming tides from flooding the lands adjoining the Repaupo. Dikes and other mechanisms to drain the rich soils of marshy areas were built by Dutch and Swedish settlers as early as the 1800s and continued to be used into the 20th century. Tidegates are a legacy of those land drainage practices.



The Little Timber Creek, which rises (starts) in Woolwich northwest of the junction of Route 322 and Kings Highway, is considered part of the Repaupo watershed but is actually an independent stream. The Little Timber forms Hendrickson Mill pond as it flows northwestward across Woolwich. It then travels west across Logan, meanders through the large Cedar Swamp in Logan where it is joined by other tributaries that start on the western edge of Woolwich. It then empties directly into the Delaware River.

Both Pargey Creek and Little Timber Creek are freshwater streams. The portions of these Repaupo Watershed streams within Woolwich Township are not affected by the Delaware River tides.

Raccoon Creek Watershed

The Raccoon Creek watershed contains approximately 40 square miles. The creek itself is 19 miles long and flows from Elk and South Harrison Townships in the southeast, across Harrison, Woolwich, and Logan Townships, to the Delaware River. While there are several tributaries to the creek, the main one is the South Branch Raccoon Creek, which starts close to the western edge of the border between Elk and South Harrison Townships. It continues its northwestward flow into Harrison Township. The northern or main branch also begins in Elk Township and flows northward into Harrison Township where it bends to the west before being joined by the South Branch. From there the creek enters Woolwich and travels 4.4 miles across the center of the township.

One of two major tributaries to the Raccoon within Woolwich is Basgalore Creek, which rises in South Harrison Township. In Woolwich it is dammed to form Basgalore Lake near

the junction of Route 538 and Russell Mill Road. The mill that was once at this lake has had several names including Dilke's Mill and Russell's Mill. Route 538 was originally constructed in order to connect the mill to Swedesboro. The other major Raccoon tributary in Woolwich is Narraticon Run, also called Church Run. A dam on this tributary in Swedesboro forms Narraticon Lake, part of which is within Swedesboro and part in Woolwich Township. The name "Narraticon" was also the original name of the Raccoon Creek, in its extended form of "Narraticonsippus." Another smaller lake, called Little Lake but also known as Battentown Lake, was formed by blocking the Battentown Branch of Narraticon Creek. It is filled with debris but its center marks the line between Swedesboro and Woolwich Township.[1]

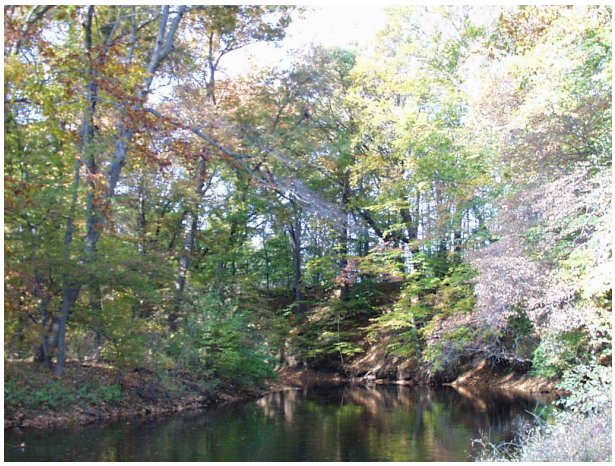
There are a number of smaller, unnamed tributaries to the Raccoon in Woolwich, which enter the creek on both its north and south sides. A slightly larger named tributary, Grand Sprute, is located on the north side of the Raccoon near the western boundary of the township. It starts at Grove Road and flows under Route 322 before traveling southward to join the main creek.

Raccoon Creek is navigable from Kings Highway westward. It is also tidal up to a point ¾ miles east of the New Jersey Turnpike in Woolwich. The creek was a major transportation corridor to and from Swedesboro throughout the 18th and 19th centuries, and its Swedesboro length was once lined with wharves for loading barges and small ships. Along the creek today there are still some industrial facilities, although most of these are situated closer to the Delaware. The sewage treatment plant that serves Swedesboro is located here.

Tidal wetlands are found along the main channel of the Raccoon, especially to the east and west of Swedesboro. These change to forested wetlands east of the NJ Turnpike. The tidal wetland area immediately east of Swedesboro up to the NJ Turnpike is visited by large numbers of migratory waterfowl in the spring and fall. Forested wetlands are also found along all of the Raccoon's tributary streams.

[1] William Cozens, Unpublished article on Woolwich streams and lakes, 2001.

Oldmans Creek Watershed



Oldmans Creek drains an area of 44 square miles and is 20 miles long. The creek marks the boundary between Gloucester and Salem Counties. Tidal marshes exist at the mouth of the creek and for a distance up its length. The creek is tidal for most of its extent in Woolwich, up to a point just past Rainey's Run.

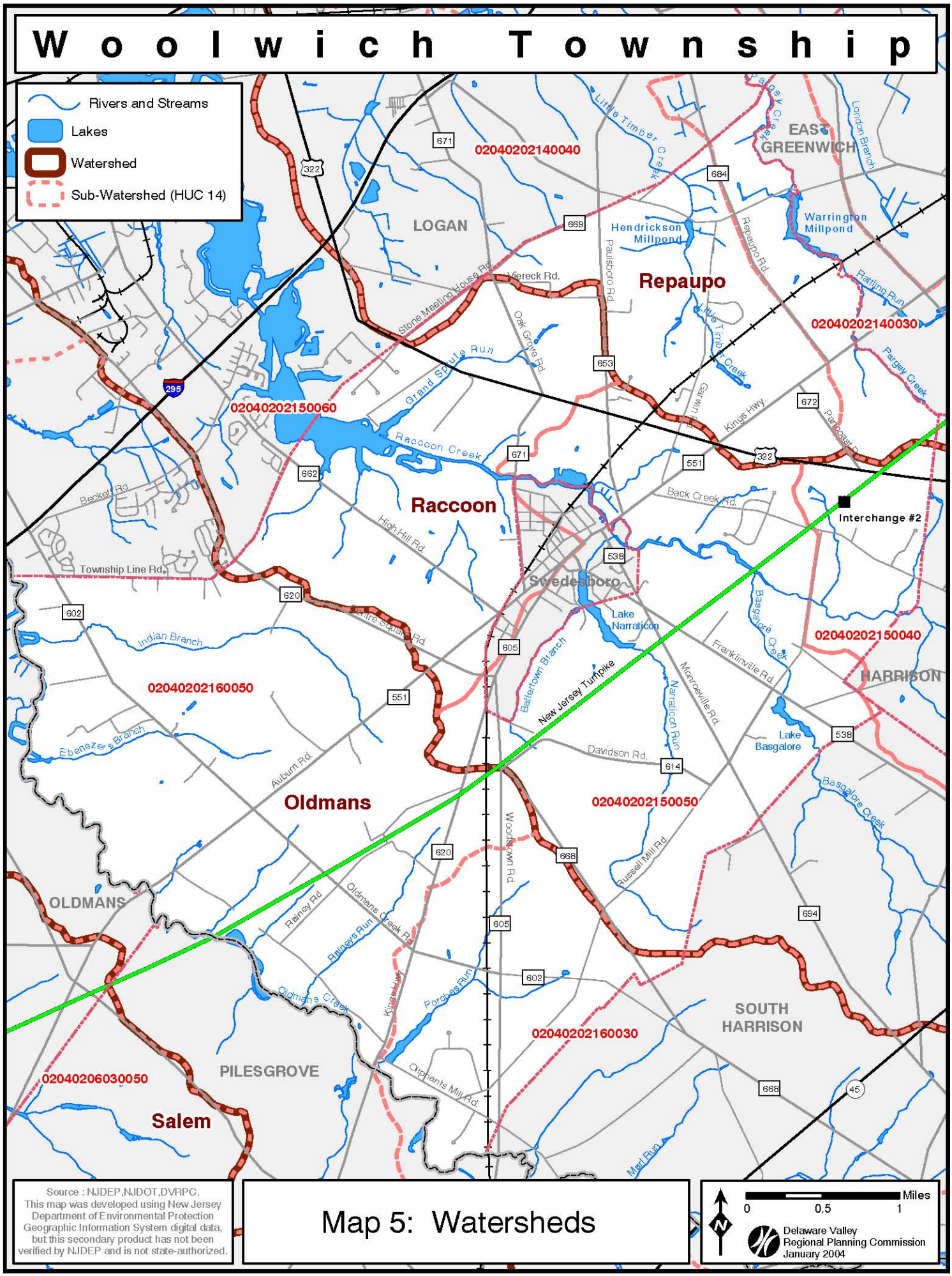
Oldmans Creek has one main channel without significant branching, but it has many tributaries. All those in Woolwich begin north of Oldmans Creek Road and flow almost directly south to join the main channel. The largest Oldmans tributary in the township is Indian Branch, which flows through the heart of the land bounded by Center Square and Oldmans Creek Roads on the north and south and Auburn and Township Line Roads on the east and west. This land is currently being developed as part of the Weatherby project. Several design elements to protect this creek have been included in the planning for Weatherby but construction is always a potential hazard to the water quality of a stream. It requires careful monitoring by construction managers and by independent monitors within the community.

Other Oldmans Creek tributaries in Woolwich are Ebenezers Branch, Rainey's Run, and Porches Run (or Oliphant Creek). Porches Run was dammed in the 19th century to power a gristmill, called Porches Mill and then Oliphants Mill, and Oliphant Millpond was one of Woolwich's larger waterbodies until the late 1990s. Due to lack of funds to repair the privately owned dam, which was classed as a high hazard dam by the state, the 25-acre pond was drained. The original mill building is also gone but can be seen in the town of Smithville, New Jersey where it was removed for restoration in 1959.[1]

The Oldmans corridor has wetlands along both sides for most of its length, including along most of the Woolwich extent, which is 4.4 miles long. At its lower end, closer to the Delaware River, there is an extremely large wetland area, the Pedricktown Marsh, which is one of the premier bird areas in the state of New Jersey and which thus attracts many bird watchers from throughout the region as visitors. The water quality of Oldmans Creek was very high until about ten years ago when it began to deteriorate as development in the area increased. This is a major concern because of the potential effects on the tidal marsh and its upstream wetlands, and on the very important habitat they provide for a great variety of wildlife.

[1] William Cozens, "The Case of the Disappearing Lake: Nature Not The Cause." *Newtown Press*, December 2002.

Woolwich Township



Streams

In Woolwich Township, there are a total of 46 stream miles flowing across the land. Some of the streams, in all three of the watersheds within its boundaries, are considered to be 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. In Woolwich Township, 32 miles of the total 46 miles of streams are first or second order streams, or headwaters.

These headwaters are of particular importance because they tend to contain a diversity of aquatic species and their condition affects the water quality found downstream. They are also the most vulnerable to human intrusion. They drain only a small area of land, usually no larger than one square mile (640 acres). 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 oversilted by sediment-laden runoff and their water quality can be rapidly degraded. In addition, first order streams are greatly affected by changes in the local water table because they are fed by groundwater sources. Headwaters are important sites for the aquatic life that is at the base of the food chain, and often serve as spawning or nursery areas for fish.

Table 7: Woolwich Township Streams

Stream Order	Miles	Percent
First Order streams (smallest)	25.74	55.92
Second Order streams	5.61	12.19
Third Order streams	9.78	21.26
Fourth Order Streams (Raccoon main channel only)	4.90	10.64
Total Stream Miles	**46.03**	**100.00**

Source: NJDEP

Woolwich Township is also characterized by tidal waters, on both the Raccoon Creek and Oldmans Creek. Tidal flows bring Delaware River water into the streams twice a day, as far as points on the eastern side of the township. Tidal flows both help and hinder maintenance of good water quality in affected streams. The flood (incoming) tide carries and leaves 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 Ponds**.

Lakes

A portion of the township's water resources includes ponds and lakes. These open bodies are essentially permanent waters found along stream corridors, as well as isolated ponds excavated for irrigation. Damming the streams in colonial and early industrial times created most of Woolwich's open waters. Although they are classified as true lake systems by federal and state maps, all Woolwich lakes are man-made impoundments. Most were originally created for gristmill or sawmill power. True lakes do not exist in southern New Jersey. There are a total of 233 acres of lakes within Woolwich. Most are used for public or private recreation such as fishing and bird watching. Warrenton Millpond, Hendrickson Millpond, and Lake Basgalore are all private lakes. Lake Narraticon is part public and part private. Boating is permitted on the Narraticon, which is stocked by the state with trout. None of Woolwich's lakes are available for swimming. See **Map 6: Surface Water, Wetlands, and Vernal Ponds**.

Wetlands

Wetlands support unique communities that serve as natural water filters and incubators for many beneficial species. The term "wetland" is applied to areas where water meets the soil surface and supports a particular biological community. Under 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. The source of water for a wetland can be a stream or lake edge, as well as groundwater that rises close to the land surface.

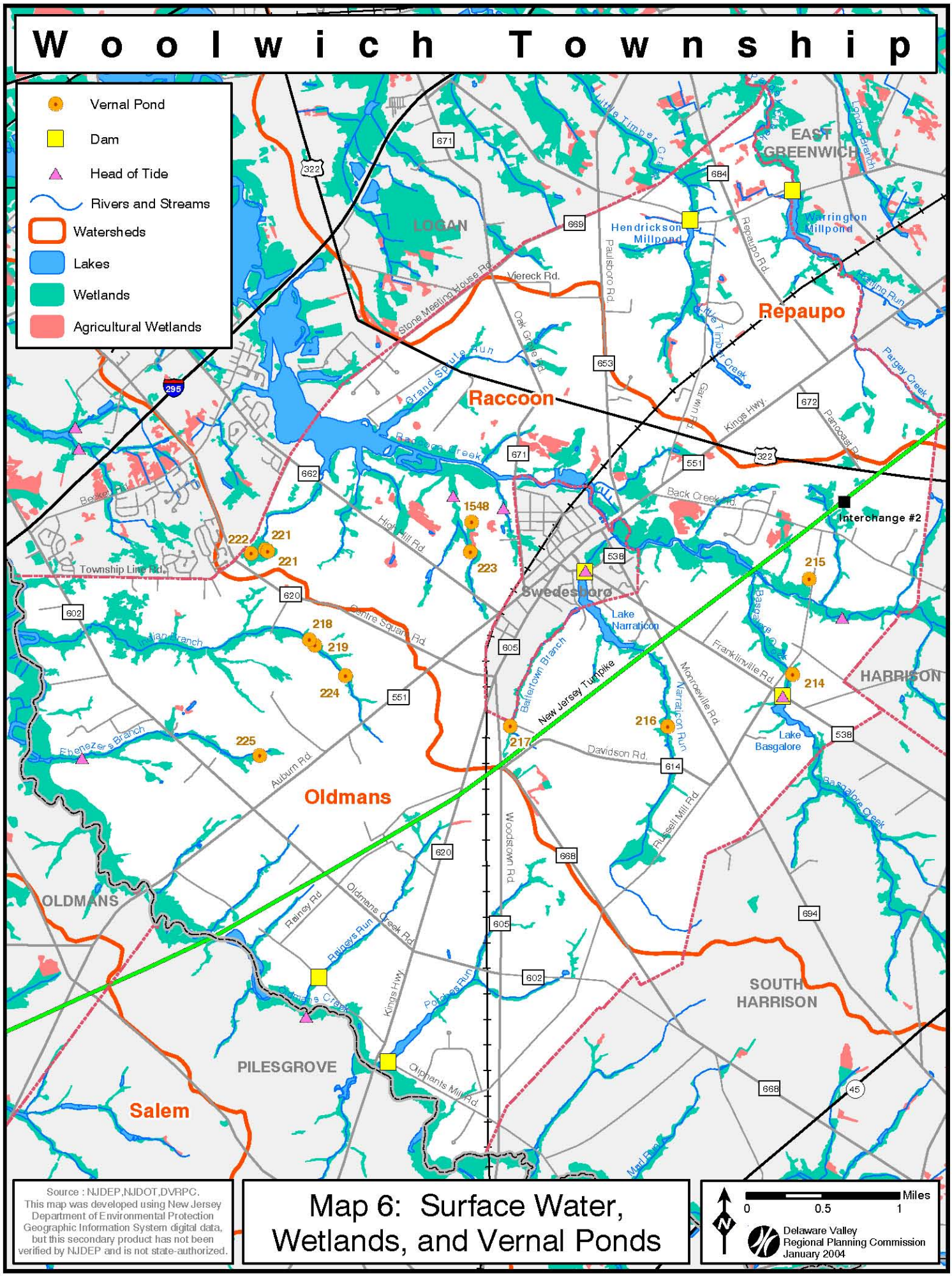
Woolwich Township has both tidal freshwater marshes and freshwater wetlands along its stream corridors and on lake edges. Wetlands total 1165 acres within the township, of which 653 acres are forested wetlands, 316 acres are low-growing riparian (streamside or lake edge) wetlands, and 196 acres are tidal marsh.

See **Map 6: Surface Water, Wetlands, and Vernal Ponds**. A more detailed description of wetland areas is found in the Biological Resources section, under "Wetlands," page 54.

Agricultural Wetlands

Another category of wetlands in Woolwich is that of agricultural wetlands, although they occupy only a small amount of acreage. These are found in a discontinuous band on the north side of Raccoon creek, west of the turnpike, and as tiny areas in the northwest corner of the community. Agricultural wetlands are low-lying areas that once were wet but which have been converted to agricultural use through drainage.

Draining fields for agriculture used to be done using perforated tile pipes that were buried



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

Map 6: Surface Water, Wetlands, and Vernal Ponds

Miles
0 0.5 1

Delaware Valley Regional Planning Commission
January 2004

Agricultural Wetlands

Another category of wetlands in Woolwich is that of agricultural wetlands, although they occupy only a small amount of acreage. These are found in a discontinuous band on the north side of Raccoon creek, west of the turnpike, and as tiny areas in the northwest corner of the community. See **Map 6: Surface Water, Wetlands, and Vernal Ponds**. Agricultural wetlands are low-lying areas that once were wet but which have been converted to agricultural use through drainage.

Draining fields for agriculture used to be done using perforated tile pipes that were buried below plow depth and linked together into a network. Called "tile drainage," these systems lowered the water table and introduced more oxygen into the root zone, which resulted in better crop yields. Drainage systems can be quite long-lived and require only the periodic maintenance of drainage ditches and outlets. They do tend, however, to convey nitrogen from the fields into local streams more efficiently than is desired, which can have negative effects on stream health.

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

Vernal Ponds

Vernal ponds 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 amphibians (obligate breeders). Particular types of frogs and salamanders will only breed in vernal ponds, which provide their offspring with a measure of protection because the pond's impermanence prevents residence by predators who would consume the eggs and young. Vernal ponds 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. Once a vernal pond is certified, regulations require that a 75-foot buffer be maintained around the pond. NJDEP's Division of Land Use Regulation oversees this designation and restricts development around vernal ponds by denying construction permits. Local municipalities can provide additional protection by instituting restrictive zoning or negotiating conservation easements on the land surrounding the pond.

The state has identified 12 vernal ponds in Woolwich. Surveys of each pond are planned to determine what species are present and, indeed, if the pond is still in existence as a natural habitat. None of these sites had been surveyed by the end of 2003. See **Map 6: Surface Water, Wetlands, and Vernal Ponds.**

Flood Hazard Areas

Flood hazard areas are defined as the combination of the 100-year floodplains and the adjacent floodfringe areas that help to hold and carry excess water during overflow of the normal stream channel. The 100-year floodplains are defined as the land area that will be inundated by the overflow of water resulting from a 100-year flood (a flood which has a 1% chance of occurring in any given year).

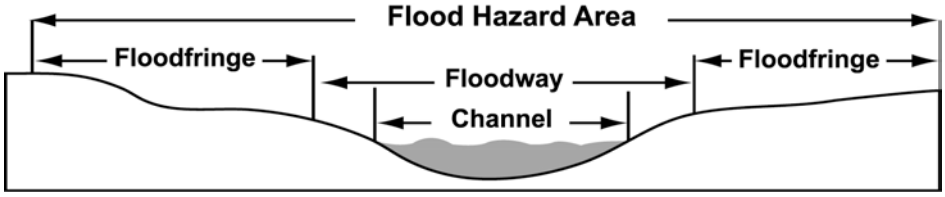


Fig. 2: Parts of a Flood Hazard Area

Flood hazard areas require protection in order to prevent serious loss to residents. Equally important is the preservation of the environmentally sensitive aquatic communities that exist in these flood hazard areas, as well as in the stream corridors themselves. These communities are often the first link in the food chain of the aquatic and other ecosystems. In addition, floodplain areas serve the function of removing and mitigating various pollutants, through the uptake of excess chemical loads in the water by their vegetation and by the filtering of sediments generally. All efforts to maintain these flood hazard areas will help to preserve the flood-carrying capacity of the streams and their water quality. See **Map 7: Flood Hazard Areas**.

Table 8: Flood Hazard Area Acreage

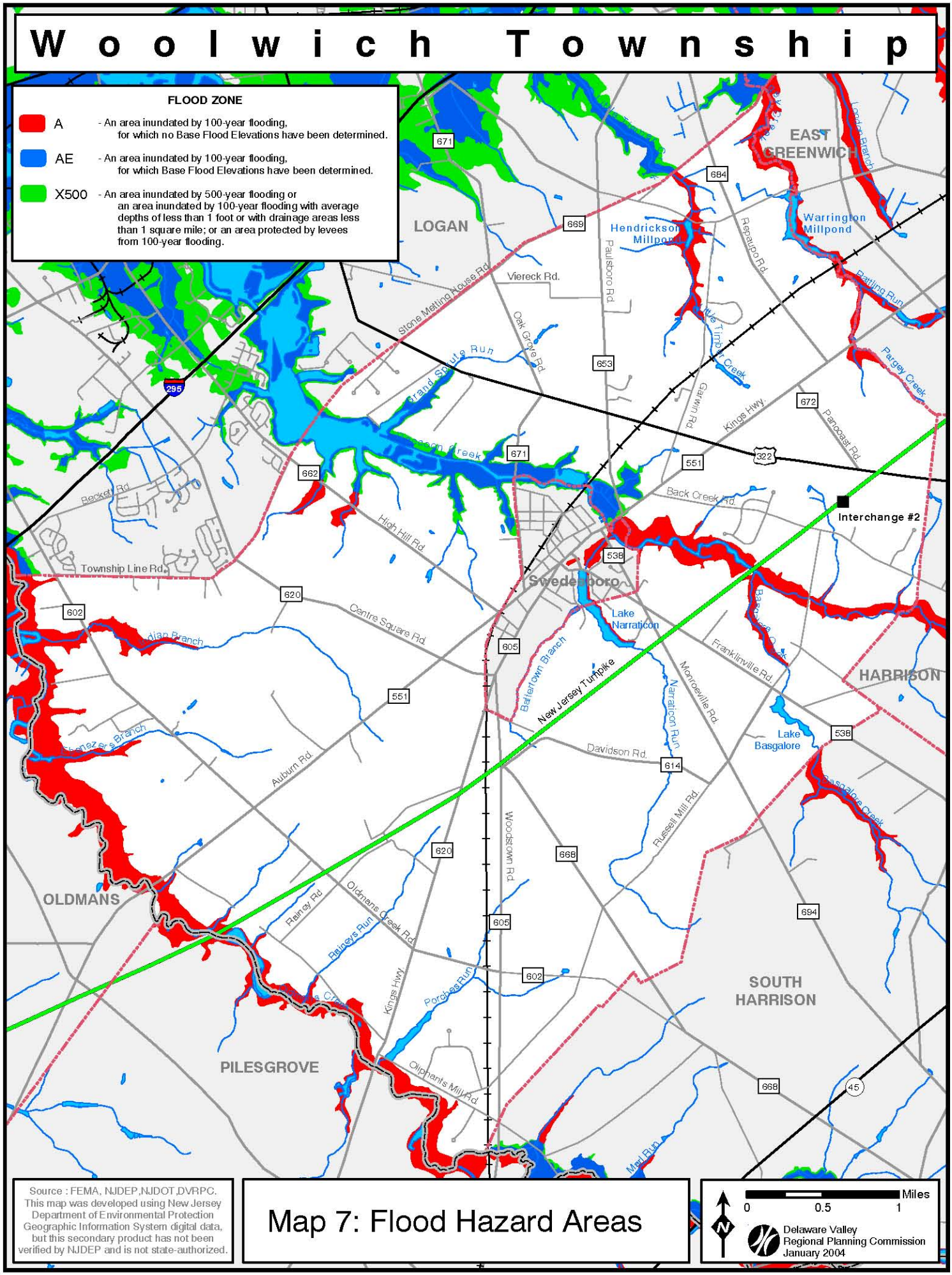
Category	Acres
A – An area inundated by 100-year flooding for which no base flood elevations have been determined	758.3
AE – An area inundated by 100-year flooding, for which base flood elevations have been determined	277.8
X500 – An area inundated by 500-year flooding, or an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile, or an area protected by levees from 100-year flooding	63.3

Source: Federal Emergency Management Agency (FEMA)

Surface Water Quality

Water quality standards are established by Federal and State governments to ensure that water is suitable for its intended use. Standards are specific to water use and differ for surface water, groundwater, and marine waters. In New Jersey, all water is classified according to its designated use: swimming, boating, shellfish harvesting, water supply, maintaining a fish population, and supporting fish reproduction. The Federal Clean Water

Woolwich Township



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

Map 7: Flood Hazard Areas

Miles
0 0.5 1

Delaware Valley Regional Planning Commission
January 2004

Act (P.L. 95-217) requires that wherever possible the water-quality standards provide water suitable for fish, shellfish, and wildlife to thrive and reproduce and for people to swim and boat. Some classes of waters, such as freshwater streams (FW), are further subdivided into trout-producing, trout-maintenance, and non-trout waters (NT waters). Each classification has a corresponding set of water-quality criteria, or numerical concentration values, that must be met.

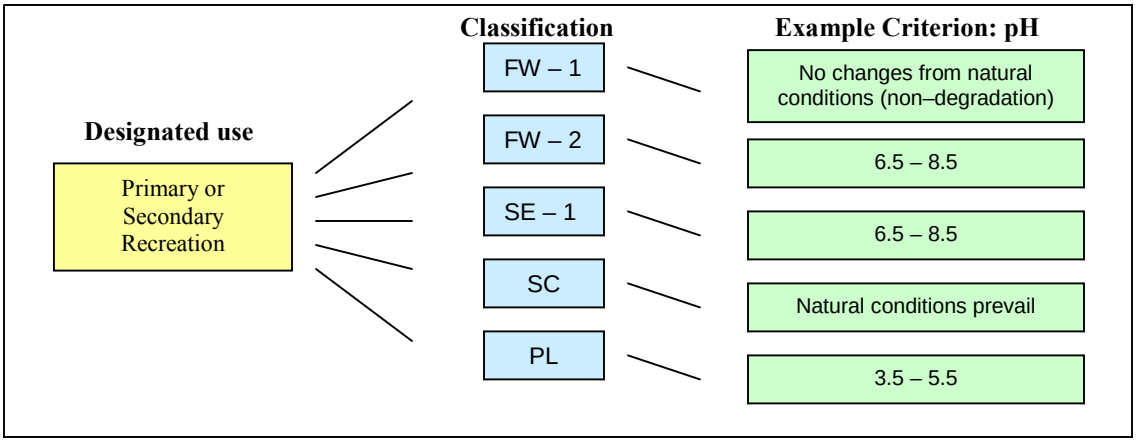


Fig. 3: ***Example of NJDEP Water–quality Standards, Classifications, and Criteria.[1]:***
Designated water uses include primary (swimming), secondary (boating), maintaining fish, supporting fish reproduction, and potable public water supply. Classifications are FW – 1 & 2 = Freshwater; SE-1 = Saline estuaries; SC = Saline coastal; PL = Pinelands. Each classification except FW-1 has a specific set of criteria, or numerical guidelines, that must be met. pH is one of these and is shown in this example. The pH criteria for FW-2 and SE-1 are the same but the pH criteria for SC and PL are different.

All freshwaters of New Jersey are assigned designated uses that reflect the national clean water goals. However, some tidal and estuarine saline waters of the state are classified for lower goals because the national goals are not currently believed to be attainable. Tidal waters within the estuarine (and potentially saline) portion of the Delaware basin between Woodbury Creek and Raccoon Creek are classified as SE-2 waters and only have to meet water quality criteria for secondary contact recreation (boating and fishing). Thus, the tidal portion of Raccoon Creek in Woolwich is classified as SE-2. The tidal portion of Oldmans Creek is SE-1, a classification with more stringent criteria.

The portions of Raccoon and Oldmans Creeks within Woolwich Township that are above head of tide and all of Pargey and Little Timber Creeks are classified as FW2–NT, which means that they are general freshwater streams that are not trout producing or trout maintenance waters ("non trout"). Waters with FW–2 classification, and SE-1 waters such as the lower Oldmans, must provide aquatic life support – healthy habitat for aquatic wildlife – and must meet the designated human uses of primary recreation (swimming) and secondary recreation (boating and similar activities.) See *Table 9*: *Water Quality Classifications of Streams in Woolwich Township* on the following page.

[1] From: Martha k. Watt, *A Hydrogeologic Primer for New Jersey Watershed Management*. U.S. Geological Survey in cooperation with the NJ Dept. of Environmental Protection. West Trenton, NJ, 2000.

Table 9: Water Quality Classifications of Streams in Woolwich Township

Streams	Classification
Repaupo (Pargey & Little Timber Creeks)	FW 2 – NT
Raccoon Creek	SE 2 (tidal portion); FW 2 – NT (nontidal)
Oldmans Creek	SE–1 (tidal portion); FW 2 – NT (nontidal)

Source: NJDEP

Each classification is associated with a specific set of criteria that impose limits on what is allowable in discharges to the waters. If there are documented exceedances of the human use criteria limits for a particular stream segment or lake, or if the segment/lake fails to meet the (lesser) criteria for support of aquatic life use, it must be included on a list of impaired waters – the 303d list. This, in turn, generates a requirement that the state develop a plan of action to improve the water quality.

Woolwich Township Stream Water Quality

The nontidal portions of all three of Woolwich's stream systems, including the main channels and all tributaries to them, are listed on the 2002 Impaired Waters List – the 303d list. (Tidal portions are not included in this listing.) In other words, all of Woolwich's FW-2 streams are impaired. Most of the impairments are for insufficient aquatic life support. That is, the streams are listed as not meeting stream health criteria to maintain diverse populations of aquatic organisms. Many of the segments are awaiting retesting or further investigation to determine if they can be "delisted," because their water quality may have actually improved since the listing was first made. These are labeled on maps and tables as "Insufficient Data for Delisting," as compared to "Non Attainment of Water Quality Standards." Only limited assessment of water quality or channel and bank condition has been conducted on the tidal portions of the streams within Woolwich.

The US Geological Service maintains a stream flow gauging station near Swedesboro, at which chemical data has been collected over the years, along with flow and tide data. The New Jersey Department of Environmental Protection conducted biological monitoring at the same site between 1992 and 1996 and again between 1997 and 2000. There are also four other biological monitoring sites within the township, two of which are in tidal areas on the Raccoon and Oldmans Creeks.

Thus there are a total of five state monitoring locations in Woolwich. Results of this monitoring indicate that water quality at three of the stations is currently severely impaired and that it has declined from a moderate impairment rating in 1993, seven years ago. Two of these sampling sites are on the Raccoon and one is on Oldmans Creek. Two other sites, one on Oldmans at the base of Porches Run (or Oliphant Creek) and one on Pargey Creek at the township line corner, are moderately impaired and have stayed substantially the same since the previous monitoring.

Lake Water Quality in Woolwich

Lakes are also listed on the impaired waters list if they have been assessed. Only publicly owned lakes have been analyzed by the state. In Woolwich only Lake Narraticon has been studied. In 1998 the lake was found to be eutrophic, meaning that it had excessive levels of vegetative growth, most probably due to high nitrate and/or phosphorus inputs coming from the land. Eutrophic lakes are often covered with a vegetative mat at the height of summer. As this vegetation dies and decays it consumes and reduces the amount of oxygen in the water and can have a deleterious effect on fish and other aquatic animals.

In summary, water quality within the three watersheds in Woolwich Township, based on this biological and chemical monitoring, is moderately to severely impaired. It has been declining in quality rather than improving.

See *Table 10: Water Quality of Nontidal Waters* below and **Map 8: Water Quality – Nontidal Waters** for detailed information and locations, page 41.

Table 10: Water Quality of Nontidal Waters in the Region (2002 Impaired Waters listed on the 303D List)

Watershed	Station/ Site ID	Station Name	Township	Parameters tested	Data Source	Nonattaining or Insufficient data to delist
Raccoon Creek	01477120	Near Swedesboro	Woolwich	Total Phosphorus (TP), Fecal Coliform (FC)	USGS/ NJDEP	**Nonattaining**
Raccoon Creek	AN0679	At Ellis Mill Rd	Elk	Aquatic Life	AMNET	**Nonattaining**
Raccoon Creek	AN0680	At N Main St	Harrison	Aquatic Life	AMNET	Insufficient data
Raccoon Ck South Branch	AN0681	South Br at Swedesboro Rd	South Harrison	Aquatic Life	AMNET	Insufficient data
Raccoon Ck South Branch	AN0682	South Br at High St	Harrison	Aquatic Life	AMNET	**Nonattaining**
Raccoon Creek	AN0683	At Tomlin Station Rd	Harrison	Aquatic Life	AMNET	**Nonattaining**
Raccoon Creek	AN0684	Basgalore Creek at Russell Mill Rd	Woolwich	Aquatic Life	AMNET	Not assessed, tidal
Raccoon Creek	AN0685	At Kings Hwy	Woolwich	Aquatic Life	AMNET	Not assessed, tidal
Raccoon	Lake 72	Narraticon Lake	Woolwich	Chemical & biological	NJDEP Clean Lakes Prog	1998 - Eutrophic; 2002 – Insuff. data
Repaupo Creek	AN0676	Rattling Run at Tomlin Station Rd	East Greenwich	Aquatic Life	AMNET	Insufficient data
Repaupo Creek	AN0677	Pargey Creek at Swedesboro–Paulsboro Rd	Woolwich	Aquatic Life	AMNET	Insufficient data
Oldmans Creek	01477440	At Swedesboro-Monroeville Rd (Jessups Mill)	South Harrison	Fecal Coliform	USGS/ NJDEP	**Nonattaining**
Oldmans Creek	AN0686	At Swedesboro-Monroeville Rd (Jessups Mill)	South Harrison	Aquatic Life	AMNET	Insufficient data
Oldmans Creek	01477510	At Kings Hwy (Porches Mill)	Woolwich	Total Phosphorus (TP), Fecal Coliform (FC), pH	USGS/ NJDEP	Attaining – pH **Nonattaining – TP, FC**
Oldmans Creek	AN0688	At Kings Hwy (Porches Mill)	Woolwich	Aquatic Life	AMNET	Insufficient data
Oldmans Creek	AN0687	At Lake Rd	So. Harrison	Aquatic Life	AMNET	Insufficient data
Oldmans Creek	AN0689	At Pointers - Auburn Rd (Rt 551)	Woolwich	Aquatic Life	AMNET	Not assessed, tidal
Oldmans Creek	?	Harrisonville Lake	So. Harrison	Chemical & biological	NJDEP Clean Lakes Prog	**Eutrophic**

Source: NJDEP

Causes of Water Quality Impairments

Stormwater Runoff

Stormwater runoff and other non-point 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 Woolwich. These are also the most difficult to identify and remediate because they are diffuse, widespread, and cumulative in their effect. Most non-point source pollution in the three watersheds is known to derive from stormwater drainage off agricultural fields that lack adequate vegetative buffers and from paved surfaces such as streets, commercial/industrial areas, and residential sites (with and without detention basins.) Some of this runoff comes to the waterways from similar sources in upstream townships and some of it derives from Woolwich land uses.

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% or more within a subwatershed are directly linked to increased stormwater runoff, enlargement of stream channels, increased streambank erosion, lower dry weather flows, high stream temperatures, lower water quality, and declines in aquatic wildlife diversity. When impervious cover reaches 25% to 30%, streams are found to be severely degraded.

Knowing the actual condition of streams and steam 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 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.

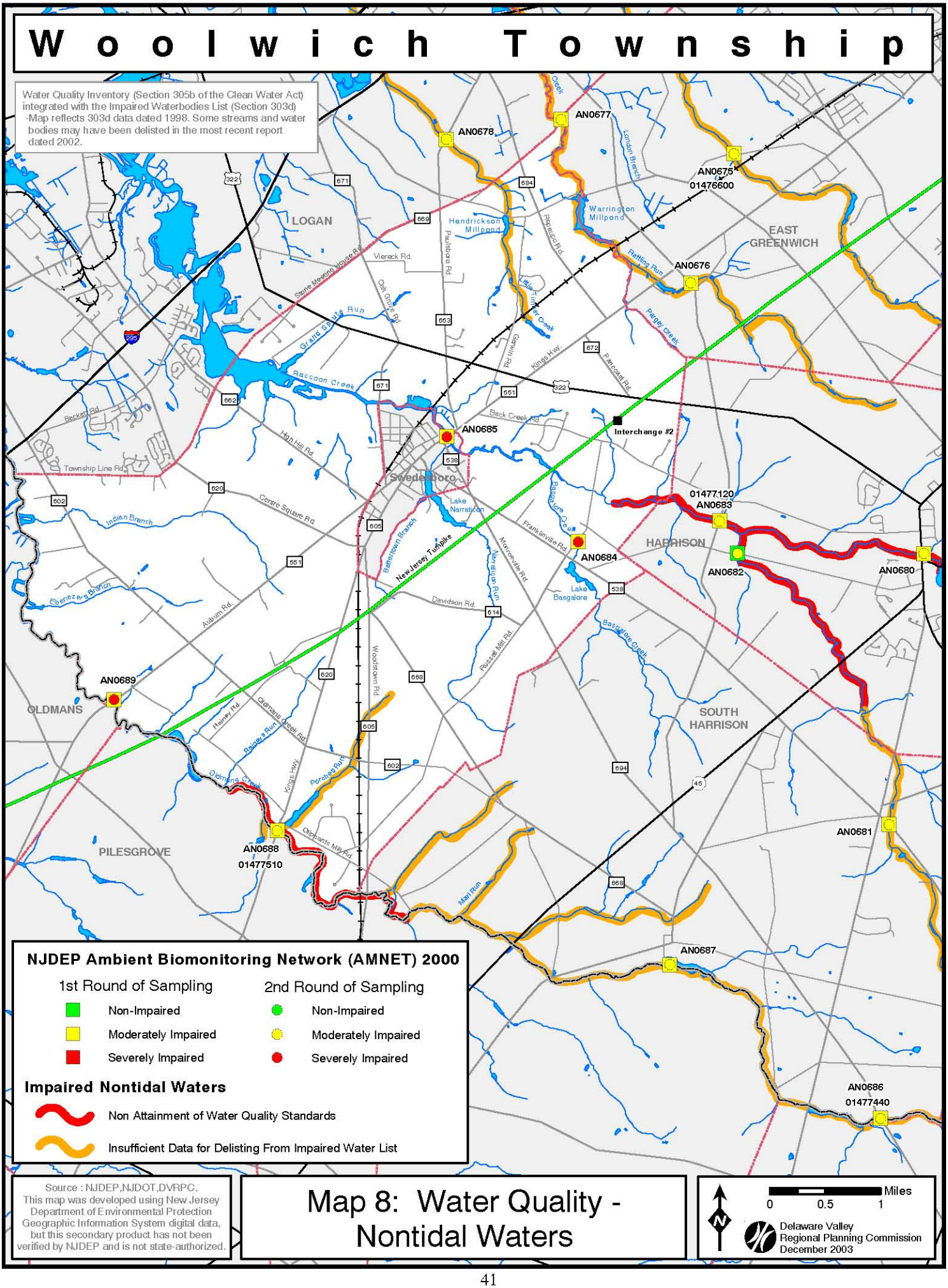
Inadequate Stream Buffers

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 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 (often 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.

Woolwich Township

Water Quality Inventory (Section 305b of the Clean Water Act) integrated with the Impaired Waterbodies List (Section 303d) -Map reflects 303d data dated 1998. Some streams and water bodies may have been delisted in the most recent report dated 2002.



NJDEP Ambient Biomonitoring Network (AMNET) 2000

1st Round of Sampling	2nd Round of Sampling
Non-Impaired	Non-Impaired
Moderately Impaired	Moderately Impaired
Severely Impaired	Severely Impaired

Impaired Nontidal Waters

- Non Attainment of Water Quality Standards
- Insufficient Data for Delisting From Impaired Water List

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

Map 8: Water Quality - Nontidal Waters

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Delaware Valley Regional Planning Commission
December 2003

The New Jersey 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 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% of the costs of eligible conservation practices. These are all programs in which individual landowners volunteer to take part.

Example of an inadequate buffer and of streambank erosion

Point Sources of Pollution

Point source pollution of waterways, which comes from single sources or a "point" such as an industrial pipe discharge, are controlled by the New Jersey Department of Environmental Protection through the New Jersey Pollution Discharge Elimination System (NJPDES), where permits regulate the discharges. In Woolwich there is one permit for a discharge to groundwater, through an infiltration pond. Six permits for discharges to surface water exist at facilities in Swedesboro or close to Woolwich's borders in adjoining townships, as indicated in the table below.

See **Map 13: Approved Sewer Service Areas & NJPDES Permit Sites** on page 69 for the locations of these permitted facilities.

TABLE 11: New Jersey Pollution Discharge Elimination Permit System (NJPDES) Permits

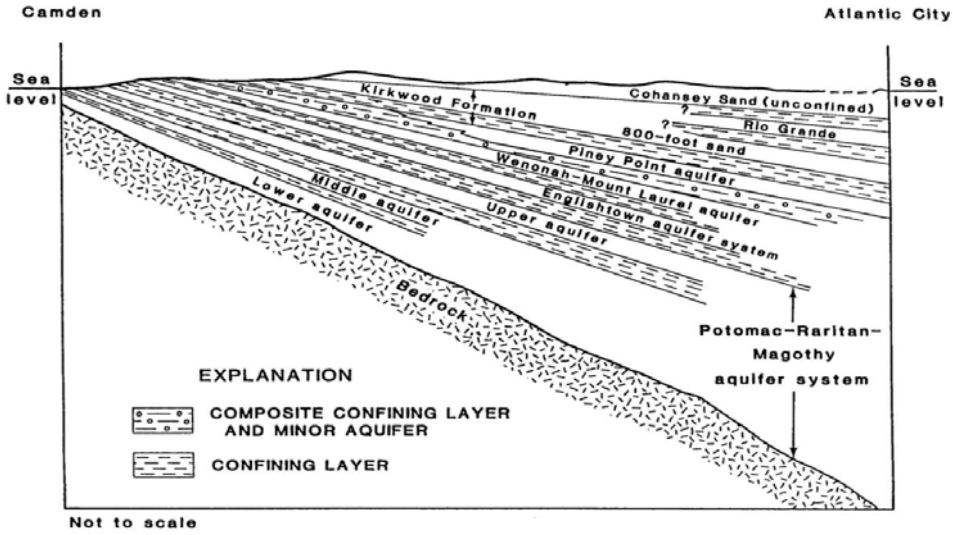
NJPDES ID #(s)	Facility Name	Municipality	Status	Type of Discharge	Receiving Waters
NJ0099732.I01I GPS	Grasso Foods	Woolwich	Existing	Discharge to Groundwater	Infiltration Pond
NJ0022021.001A	Swedesboro Sewage Treatment Plant	Swedesboro	Existing	Minor Municipal - Sanitary discharge	Racoon Creek
NJ0023299.001A GPS	Pureland Treatment Plant	Logan	Existing	Major Industrial	Raccoon Creek via unnamed trib.
NJ0005240.001A, .002A, .003A, .004A, & .001B	Safety-Kleen Inc - Bridgeport	Logan	Existing	Major Industrial	Racoon Creek via diffuser
NJ0106861.001A & .002A	Container Recycling Alliance	Logan	Nonpoint Pollution Control Board	Minor Industrial – Stormwater	Raccoon Creek via storm sewer
NJ0071340.001A & .002A	Pandrol Inc	Logan	Permit Terminated 2/1/93	Non–contact Cooling Water	Raccoon Creek via storm sewer
NJ0057495.001A & .002A	Gloucester County Improvement Auth.	So. Harrison	Nonpoint Pollution Control Board	Minor Industrial – Stormwater	Racoon Creek via storm sewer

Source: NJDEP

GROUNDWATER

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

A cross section across southern New Jersey from west to east would show that the aquifers are not horizontal but tilt toward the southeast, getting deeper as they cross the state toward the Atlantic Ocean. Because of this tilting, each aquifer emerges on the land surface in a sequential manner. The deepest strata emerge on the surface near the Delaware River. These are their "outcrop" areas. The Potomac–Raritan–Magothy (PRM) formation, the deepest and most abundant, is a major water source for Inner Coastal Plain communities and provides all of Woolwich Township's water. Other smaller aquifers on top of the PRM are the Englishtown and the Mt. Laurel – Wenonah. The two thick layers that overlie these older formations, beginning east of the inner/outer coastal plain divide, are the Kirkwood (lower) and the Cohansey (on top), which are so similar to each other that they are usually referred to by a combined, hyphenated name.



Source: U.S. Geological Survey

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

Potomac-Raritan-Magothy Aquifers (PRM)

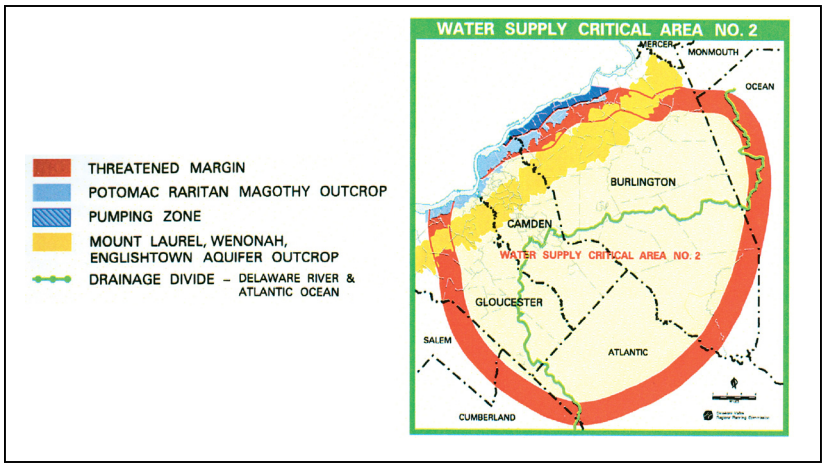
The Potomac-Raritan-Magothy (PRM) is the principal formation underlying Woolwich Township. This multiple aquifer is actually a large series of formations that have been

combined and described as a single unit because the individual formations – the Potomac group and the Raritan and Magothy Formations – are lithologically indistinguishable from one another over large areas of the Coastal Plain. That is, they are composed of materials of like kind and size laid down by both an advancing and retreating sea across southern New Jersey and by deposits of material that came from the breakdown and erosion of the Appalachian and Catskill Mountains beginning in the Cretaceous Period (150 to 60 million years ago).

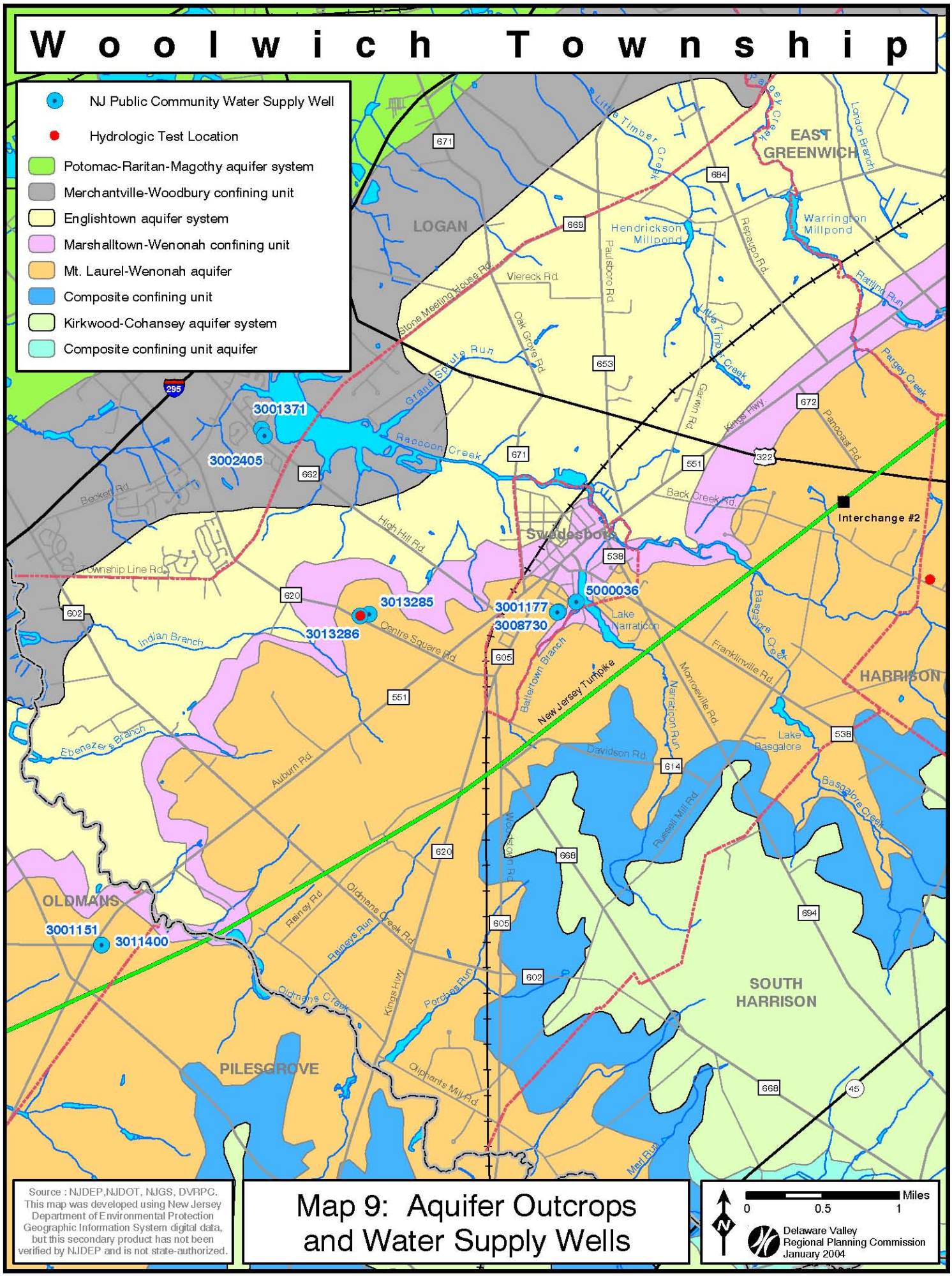
In the Delaware Valley, three aquifers have been distinguished within the PRM system, designated as lower, middle, and upper, and there are two confining units or layers between the three water-bearing strata. The aquifers themselves are made up largely of sands and gravels, locally interbedded with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

The PRM is the primary source of drinking water to New Jersey residents from Burlington to Salem Counties, as well as to communities across the river in Delaware. Because of such large usage, there has been a decline in PRM aquifer water levels. This became so serious that the New Jersey Department of Environmental Protection established Water Supply critical Area #2 in 1986. All water supply companies within Critical Area #2 were given annual limits on water withdrawals in the PRM. Usage from the PRM was cut back by over 20% and no increases in pumping were allowed. Piping of treated Delaware River water filled the gap in much of the county.

Woolwich Township is outside the boundary of the Critical Area, but close to it. There is increased concern that additional pumpage from the aquifer in the borderline areas will necessitate the expansion of the Critical Area boundaries. Thus, water supply companies in southwestern Gloucester and northwestern Salem County have and will continue to have difficulty getting approvals from the New Jersey Department of Environmental Protection for any additional water allocations from the PRM.



Source: DVRPC *Fig. 5: Water Supply Critical Area No. 2*


Woolwich Township
NJ Public Community Water Supply Well
Hydrologic Test Location
Potomac-Raritan-Magothy aquifer system
Merchantville-Woodbury confining unit
Englishtown aquifer system
Marshalltown-Wenonah confining unit
Mt. Laurel-Wenonah aquifer
Composite confining unit
Kirkwood-Cohansey aquifer system
Composite confining unit aquifer
3001371
3002405
3013285
3013286
3001177
3008730
5000036
3001151
3011400
LOGAN
EAST GREENWICH
Swedesboro
OLDMANS
PILESGROVE
HARRISON
SOUTH HARRISON
Interchange #2
Lake Narraticon
Lake Basgalore
Hendrickson Millpond
Warrington Millpond
Raccoon Creek
Little Timber Creek
Oldmans Creek
Indian Branch
Ebenezer Branch
Barlertown Branch
Narraticon Run
Basgalore Creek
Parvin Creek
London Branch
Pargey Creek
Rattling Run
Grand Sprue Run
Porcheg Run
Marl Run
New Jersey Turnpike
Kings Hwy
Centre Square Rd.
Auburn Rd.
Rainey Rd.
Raineys Run
Oldmans Creek Rd.
Oliphants Mill Rd.
Russell Mill Rd.
Davidson Rd.
Monroeville Rd.
Franklinville Rd.
Paulsboro Rd.
Repaupo Rd.
Viereck Rd.
Stone Meeting House Rd.
Oak Grove Rd.
Garwin Rd.
Pancoast Rd.
Back Creek Rd.
High Hill Rd.
Township Line Rd.
Becker Rd.
671
669
684
653
672
551
322
538
620
602
605
614
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662
Source : NJDEP,NJDOT, NJGS, 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 9: Aquifer Outcrops and Water Supply Wells
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Delaware Valley Regional Planning Commission
January 2004

In Gloucester County, use of the lower PRM aquifer for drinking water is limited due to high chloride concentrations (salt water intrusion). This is thought to be either very ancient seawater within the lower aquifer, or the result of movement into it from its eastern side, which is in contact with ocean water. Whatever the cause, the lower aquifer is not usable for drinking supply in much of its extent.

Other Aquifers

There are other smaller aquifers on top of the PRM in Woolwich. These include the Englishtown and the Mt. Laurel – Wenonah aquifers. Both aquifers are shallow in the Woolwich vicinity and neither is a major source for drinking water by residents although individual private wells may utilize these aquifers, particularly if they are older, shallow wells.

Outcrops

The outcrop area of the PRM, where it tilts upward to the surface, is under and immediately beside the Delaware River. River water actually enters and recharges the upper and middle PRM aquifers. The Englishtown formation crops out to the east of the PRM outcrop, on the west side of Woolwich. The Mt. Laurel – Wenonah outcrops through the eastern two-thirds of the township. In addition, a small portion of the Kirkwood–Cohansey aquifer also outcrops in Woolwich, east of the NJ Turnpike.

These three aquifers above the PRM are sources of irrigation water for agriculture in the township and they are a very significant drinking water supply to county residents living to the east of Woolwich. Because an outcrop is the area where the aquifer emerges on the land surface, preventing contamination of the land in outcrop areas is extremely important in order to maintain a safe drinking water supply.

See **Map 9: Aquifer Outcrops and Water Supply Wells** for a visual depiction of these areas.

Groundwater Recharge

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

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. The New Jersey Department of Environmental Protection has used this methodology to map and rank land areas throughout the state as to groundwater

recharge potential. Recharge is equivalent to the amount of precipitation that will reach the water table in an area with a particular combination of soils and land use. It is expressed as inches per year.

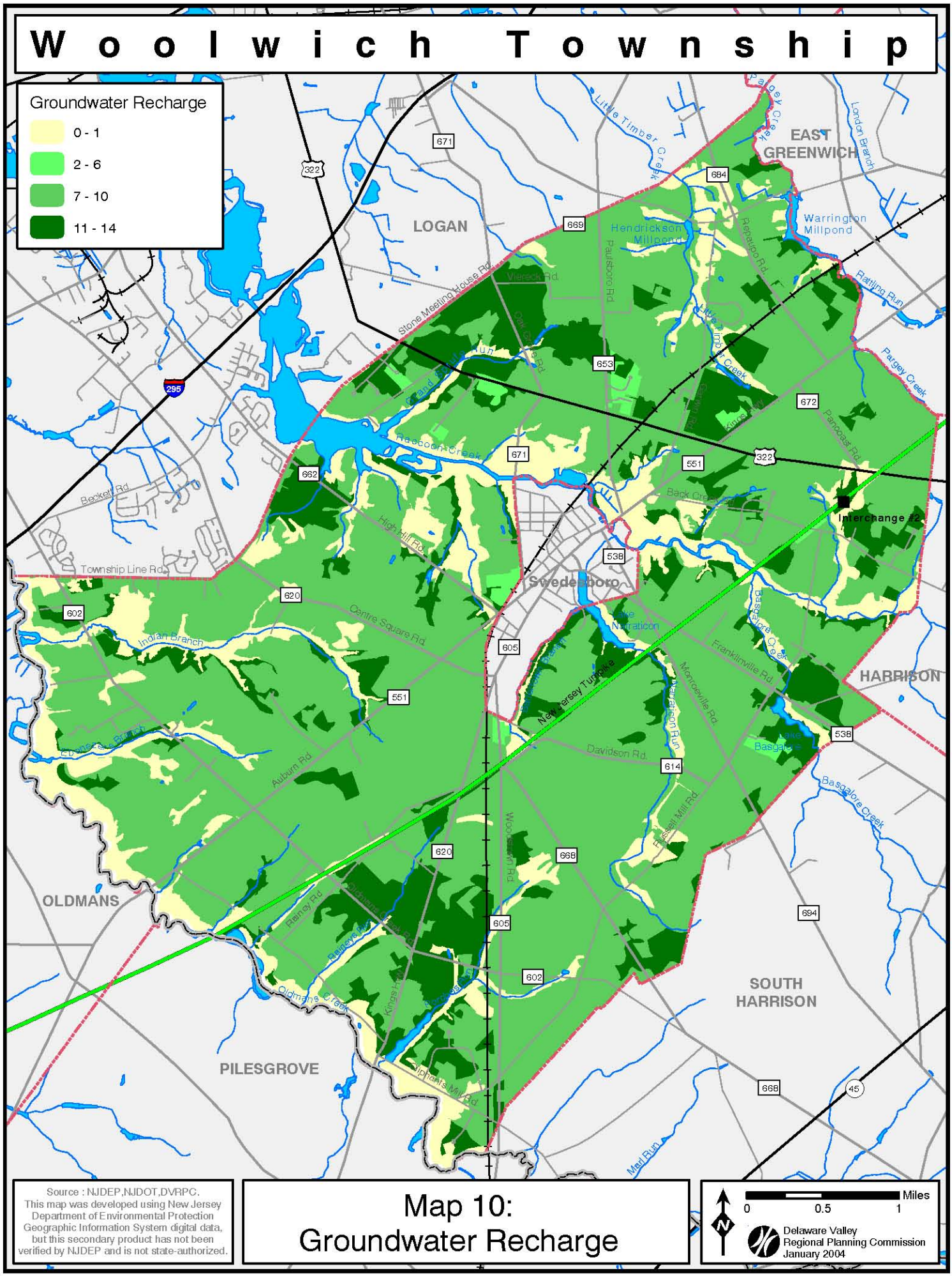
In Woolwich, lands with recharge of 11 to 14 inches per year, the highest in the township, are found in scattered pockets. These are sites where the amount of paving and other impervious cover has the most detrimental impact on aquifer recharge. Conversely, these are also regions where the dilution of substances from septic systems, such as nitrates, requires a larger land area because the soils are more "porous." For example, minimum average lot sizes of 2 to 4 acres are needed for proper nitrate dilution from septic systems in areas having 10 to 12 inches per year of groundwater recharge.[1]

See **Map 10: Groundwater Recharge**.

A soy bean field in Woolwich. Agricultural lands as well as forests are prime sites for groundwater recharge.

[1] *Woolwich Township Master Plan. Phase I.* October 3, 2003, p. 28.

Woolwich Township



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

Map 10: Groundwater Recharge

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Delaware Valley Regional Planning Commission
January 2004

BIOLOGICAL RESOURCES

VEGETATION

Vegetation is controlled by many factors, the most important of which are climate and soils. Woolwich's climate is a cool temperate type associated with a coastal, permanently humid-warm summer condition. Rainfall in the region averages 44 inches per year.

Table 12: Woolwich Township Vegetation

Type of Vegetation	Acres	% of Total Land Area
Brush/shrubland - Coniferous	54	0.39
Brush/shrubland - Deciduous	150	1.10
Brush/shrubland - Mixed Deciduous/coniferous	115	0.84
Freshwater Wetlands - Deciduous Scrub/shrub	232	1.69
Freshwater Wetlands - Deciduous Wooded	653	4.76
Freshwater Wetlands - Herbaceous	82	0.59
Freshwater Wetlands - Mixed Scrub/shrub (Deciduous-dominated)	2	0.01
Old field (< 25% Brush-covered)	345	2.52
Tidal Marshes (Freshwater)	196	1.43
Upland Forest - Coniferous	43	0.31
Upland Forest - Deciduous	1503	10.96
Upland Forest - Mixed (>50% Coniferous)	25	0.18
Upland Forest - Mixed (>50% Deciduous)	121	0.88
Water - Lakes - Impoundments	92	0.67
Water - Lakes - Natural	1	0.01
Water - Tidal rivers, inland bays, and other tidal waters	188	1.37
Total	**3802**	**27.72**

Source: NJDEP (1995/97 Land Cover)

See **Map 11: Vegetation.**

Lower Plants and Microscopic Life

Algae, mosses, liverworts and other lower organisms (bacteria, fungi) form the base of a food web that affects the entire local ecosystem. These small plants are common in all environments in Woolwich. The many species at this level are not well known and there are almost no specific records of them for the area. Also unknown are the microscopic animals that feed upon them. Together they form the backbone of the living community.

Submerged Communities

The stream corridors and lakes within the township support plants with distinct habitat requirements – the persistent presence of standing water. Light is also a limiting factor to this plant community and it is found only within the shallower parts of open, perennial lakes

and streams that are not shaded by a forest canopy. Plants such as pondweeds, bladderworts and other submerged plants are found in permanent standing water, such as lakes and ponds.[1] Forms of algae can also be abundant both in lakes and in tidal waters, although large algal mats are usually a sign of excessive nutrient inputs coming from the land.

Wetlands

The location and type of vegetation are key features for classifying wetlands. Virtually all wetlands in Woolwich Township are found in association with the major streams and their tributaries. See **Map 6: Surface Water, Wetlands, and Vernal Ponds,** on page 31. The greatest extent of emergent wetlands are found as freshwater tidal marshes along the main channels of the Raccoon and Oldmans Creeks, although there are small pockets of emergent wetlands that are not tidal.

Wild rice

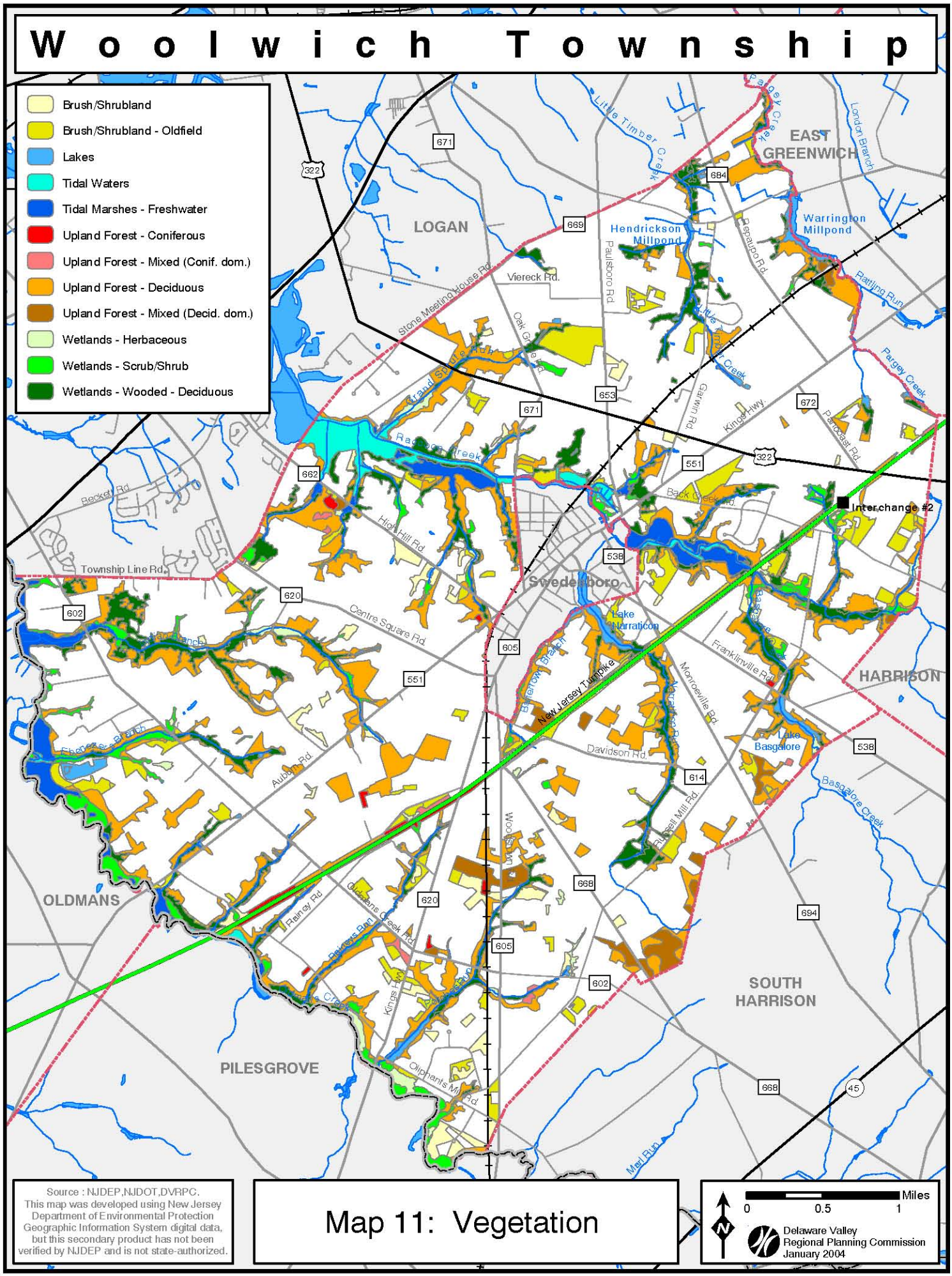
In the tidal marshes, *Phragmites*, an invasive plant, becomes extensive in some stretches. Wild rice is perhaps the most distinctive plant of the marshes in these regions. This annual grass can grow to be 9 feet tall and is an important food source for migratory waterfowl. It is often found in association with broad-leaved cattail. Other plants that grow with it are water hemp, jewelweed, pickerelweed, arrow arum, nodding beggar-ticks, sneezeweed, and spatterdock.[2]

Most of the other wetlands in Woolwich are forested or shrubby wetlands located in upstream areas and along tributaries and their floodplains. These nontidal upstream wetlands are "palustrine" wetlands (stream-associated, versus "lacustrine" or lake-associated) and are usually covered with deciduous trees or shrubs, although some evergreen trees or shrubs may be present.

Woolwich's wet forests are of three main types. Those on tidal floodplains are dominated by green ash, red maple, silver maple, and sycamore. River Birch may also be present. Along smaller stream corridors and main channels above head of tide are found forested wetlands dominated by red maple, green ash, and black gum. On hydric soils on upland terraces are wooded areas dominated by sweet gum, with red maple also associated.[3] Pin oak, swamp white oak, white oak, willow oak, tulip tree, and sweet bay magnolia may also be found in these forests, primarily in the nontidal regions. American Holly is frequently present as an understory tree. In some areas, pitch pine or American pine is also prevalent among the larger trees. At one time, according to historical records, Atlantic White Cedar was present in Woolwich. As in much of South Jersey it was depleted for use as roofing and other building material because of its superior water-resistant characteristics.

[1] Franklin Township Environmental Commission, *Environmental Resource Inventory of Franklin Township*, February 4, 2002, [Franklin Township, New Jersey].
[2] Collins, Beryl Robichaud & Karl H. Anderson, *Plant Communities of New Jersey. A Study in Landscape Diversity*, Rutgers University Press, New Brunswick NJ, 1994.
[3] Joseph Arsenault, personal communication.

Woolwich Township



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

Map 11: Vegetation

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Delaware Valley Regional Planning Commission
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Shrubs in the more mature wet forests include arrowwood, spicebush, highbush blueberry, and sweet pepperbush. Poison ivy and Japanese honeysuckle are often abundant and form dense thickets. Shrubs are also the dominant plants where wetlands are recovering from past impacts.

Upland Forests

Upland areas are those locations without water at or near the soil surface. Upland forests are located on drainage divides, terraces and slopes where water is not the controlling factor. Most upland forests have been cleared and converted to farms or homes. The remaining uplands are relegated to remnants along stream corridors, or are patchy woodlands associated with large farms and areas with less desirable soils.[1]

Approximately 17% or 2,345 acres of Woolwich is forested and of this, 1,692 acres or 72% is upland forest, according to the 1995/97 land cover analysis prepared by the New Jersey Department of Environmental Protection. This data is the most recent available based on infrared aerial photography. See **Map 11: Vegetation**.

The composition of upland forests in the township is largely one of mixed oaks – white, black, red, chestnut, and scarlet oaks – joined by beech, pignut and mockernut hickories, black walnut, tulip tree, and red maple. Virginia pine is also present and, in some situations, can be fairly extensive. The understory is dominated by flowering dogwood, black cherry, ironwood, and sassafras. Vines are common, including Virginia creeper, wild grapes, Japanese honeysuckle, and poison ivy. Spicebush, arrowwood, and black haw are common shrubs in moister locations.

Grasslands (Open Habitat and Agricultural Lands)

Woolwich is rich in habitat for species that utilize grasslands and other open habitats, including agricultural fields, pastures, and old fields. Old fields are lands that were cleared or disturbed at one time and then abandoned. Following abandonment, perennial herbs and grasses succeed to become the dominant species for a length of time from 3 to 20 years. Later, woody plants begin to take over. This habitat is visible especially along wood edges, roadsides, and in other landscapes where mowing is infrequent and where woody plants are not yet the dominant vegetation.[2]

In Woolwich, 319 acres or 8.3% of the vegetation is classed as brush or shrubland, as of the 1995/97 land cover analysis by NJDEP. An additional 345 acres or 9% of uncultivated and undeveloped areas of the township are old fields. These habitats, along with the large amount of agricultural land in row crops, horticultural use, and pasturage gives Woolwich a high proportion of habitat for grassland-dependent wildlife. See **Map 11: Vegetation**.

[1,2] Franklin Township Environmental Commission, *Environmental Resource Inventory of Franklin Township*, February 4, 2002, [Franklin Township, New Jersey].

LANDSCAPE PROJECT PRIORITY HABITATS

The Landscape Project, developed by the Endangered and Nongame Species Program of the NJDEP Division of Fish & Wildlife, documents the value of various types of habitats within New Jersey. It then ranks these habitats as to their importance. The highest ranking goes to habitat areas where there has been a documented occurrence of one or more species that are on either the federal or the state Threatened and Endangered Species lists and where there is a sufficient amount of habitat type to sustain these species ("critical habitat"). A second category includes habitats that have documented occurrences of species of special concern in New Jersey. Another rank consists of lands with habitat deemed suitable for species that are included in the higher categories but for which there are no documented occurrences or sightings ("suitable habitat").

Landscape Project data for Woolwich Township identifies locations with the most important habitats for wildlife and categorizes them as either "critical habitat" (the highest) or as "suitable habitat." 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 Woolwich are primarily a result of the habitat being either critical or suitable for Bog Turtles or for Bald Eagle nesting or foraging.

Table 13: Landscape Project Habitat Rankings – Acreage in Woolwich Township

Category	Rank	Acres	Subtotals	% of Total
Emergent Wetlands	Critical Habitat (5)	336.57	431.87	3.33
	Suitable Habitat (1)	95.3		0.94
Forested Wetlands	Critical Habitat (5)	240.84	788.35	2.39
	Suitable Habitat (1)	547.51		5.42
Upland Forest	Critical Habitat (5)	914.52	1053	9.06
	Suitable Habitat (1)	138.48		1.38
Grasslands	Critical Habitat (5)	1,920.25	7,819.63	19.03
	Suitable Habitat (1)	5,899.38		58.45
Total			**10,092.85**	**100.00**

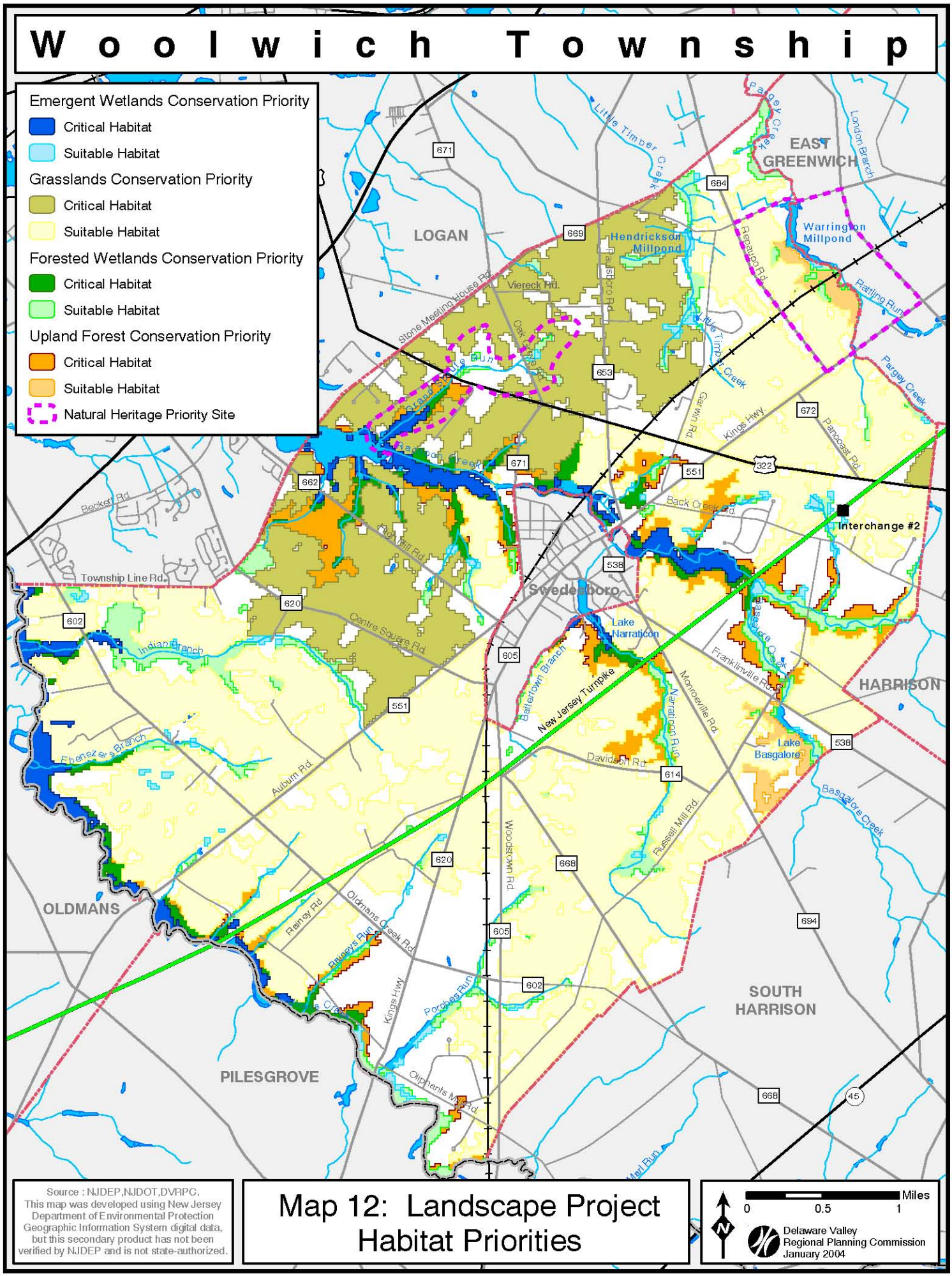
Source: NJDEP

See **Map 12: Landscape Project Habitat Priorities**.

Landscape Project Data on Wetland Habitat

The Landscape Project divides wetland habitats into two types – forested and emergent wetlands. Forested wetlands support species such as warblers and foraging Bald Eagles that nest along Raccoon Creek. They can also be home to various rare amphibians (frogs and salamanders). Emergent wetlands are marshy areas characterized by low-growing shrubs and herbaceous plants in standing water, usually. They can be tidal or nontidal. Animal species that can be found there include endangered turtles, rare fish, mollusks, crustaceans, and insects.

Woolwich Township



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

Map 12: Landscape Project Habitat Priorities

Miles
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Delaware Valley Regional Planning Commission
January 2004

The wetland acreage in Woolwich that is ranked as critical (the highest value) is split about 60%/40% between emergent wetlands and forested wetlands. High value emergent wetlands are located in stretches along Raccoon Creek east and west of Swedesboro and along some of its tributaries, especially Grand Sprute Run. They are also found in discontinuous stretches along almost the entire length of Oldmans Creek and on the lower reaches of Indian Branch.

Forested wetlands of highest value are present along nearly the entire length of Raccoon Creek, and on all its tributaries west of the NJ Turnpike. They are also present along the eastern half of Oldmans Creek and along Rainey's Run. Emergent wetlands ranked at the suitable habitat level are found along Little Timber Creek, in small pockets along some Raccoon tributaries, and on Porches Run and Indian Branch in the Oldmans watershed. Forested wetlands ranked at the suitable habitat level are prevalent along the entire length of Pargey Creek, and much of Little Timber Creek. They are also found adjoing critical habitat along the length of most of the Raccoon and its tributary streams east of the turnpike, along Porches Run, and on three-fourths of Indian Branch.

Landscape Project Data on Upland Forest Habitat

The Landscape Project has ranked upland forests in the same manner as wetlands. Woolwich's highest ranked ("critical habitat") upland forests are found associated with the main channel and tributaries of Raccoon Creek. A large area of the lower ranked "suitable habitat" upland forest is found along Pargey Creek in the vicinity of Warrington Millpond. Another such forest is located on the eastern edge of the township, south of Lake Basgalore.

Landscape Project Data on Grassland Species Habitat

Nearly all of Woolwich's farmland, active and inactive, is ranked as being habitat for grassland species. Critical habitat, the highest ranking, comprises 1,902 acres, located in the western half of the township between Little Timber Creek and Indian Branch, along with a small piece of land at the northeast corner of Woolwich. Land rated at the lower level, as "suitable habitat," is even more abundant – 5,899 acres or 43% of all township land. Indeed, all except the stream corridors and two modest sections of the township are classed as priority conservation land for grassland-dependent species.

Examples of grassland-dependent species that use this habitat for nesting or feeding include Grasshopper Sparrow, Vesper Sparrow, and some species of butterflies and moths. In Woolwich foraging Bald Eagles are documented as relying on this habitat, along with other raptors such as Red–tailed and Marsh Hawks.

ANIMAL COMMUNITIES

The fauna of Woolwich Township includes both invertebrates and vertebrates. Invertebrates are more numerous and consist of insects (beetles, butterflies, moths, ants, termites, bees, wasps, and others), arachnids (spiders, ticks and mites), crustaceans (crayfish, microscopic copepods), mollusks (mussels, clams, snails and slugs), and worms.

Although there is no inventory of these groups, even at the state level, some types have been investigated to a greater degree in the Raccoon Creek and in Oldmans Creek. Most notable are the freshwater mussels found at points in those streams. Several of these organisms are endangered species. Once abundant and a source of food for native Americans and early settlers as well as for wildlife, these animals have declined with the 20th century drop in water quality of many freshwater streams. Freshwater mussels have also been affected, in part, by declines in fish species. Mussels are sedentary creatures and at one stage of their life cycle they depend on fish for transport to areas with higher mating potential.

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 Woolwich's wet forests as stopover sites in which to rest and feed are not as thoroughly inventoried.

Reptiles can be quite elusive when surveys attempt to document them. Some species, such as the endangered bog turtle, are found in Woolwich Township. Their very specific habitat requirements (boggy, muddy farm fields) limit their adaptability to the changing land uses that are occurring throughout New Jersey. The NJ Division of Fish & Wildlife has several efforts underway to identify and protect bog turtle habitat. Amphibians of some types are abundant, such as bullfrogs. Other species are rare because they depend on vernal ponds, as was discussed in the Surface Waters – Vernal Ponds section of this document (page 33).

The Bald Eagles that nest along the Raccoon Creek also forage along its length in Woolwich, as well as in the Oldmans Creek drainage. Eagles prefer fairly open waterways with adjoining forested habitat in which they can sit and watch for prey. They use such habitat throughout the year, provided it stays ice-free for most of the winter. The tributaries to the Delaware River meet these requirements. Bald Eagles are sighted in many parts of Woolwich throughout the year.

See **Appendix A** for a complete list of **Vertebrate Animals Known or Probable in the Township of Woolwich**.

Bog Turtle

Photo courtesy of the State of Maryland Department of Natural Resources

NEW JERSEY NATURAL HERITAGE DATABASE AND HERITAGE 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 critically important remaining habitat for rare species and as exemplary natural communities within the state. These areas are to be considered as top priorities for the preservation of biological diversity in New Jersey.

The 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, especially through the latter agency's Landscape Project.

Woolwich Township has within its borders two of only 410 NHP Sites in the state of New Jersey. These are the **Grand Sprute Run NHP Site** located along that stream corridor on the western side of the township, and the **Tomlin Station NHP Site** along the southern side (in Woolwich) of Warrington Millpond. The Grand Sprute Run site is a steep-sided, wooded ravine with open (emergent) and forested wetlands along much of its length, and mixed oak upland forest on its slopes. The stream runs north to south into Raccoon Creek, crossing under Route 322. The site contains two plant species of New Jersey state special concern and habitat for other rare plant species. It has a biodiversity rating of B5, meaning that the area is of general biodiversity interest, which is a ranking of state significance.

The Tomlin Station NHP Site is a dry pine/oak woodland on the crest of the Pargey Creek stream valley. State critically imperiled plant species have been documented on the site, along with other state rare species. It also has a biodiversity rating of B5.

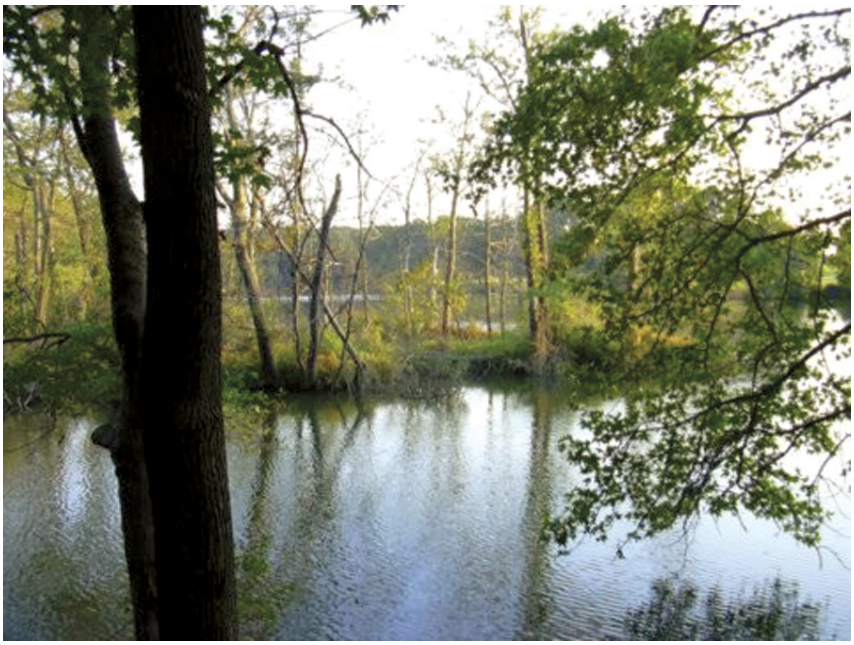
See **Map 12: Landscape Project Habitat Priorities** for the location of the two NHP sites.

The Natural Heritage Database also lists for Woolwich several species of threatened and endangered plants and animals, or rare natural communities, that have been found in other parts of the township. The sighting records for the plants (only) are shown on topographic maps. These indicate where the sightings occurred, although the map information is deliberately nonspecific. The principal areas with the most rare plant or community records are along the Raccoon corridor, especially to the west of Swedesboro, and next to Lake Narraticon, and along Oldmans Creek, especially in the vicinity of Raineys Run. Natural Heritage individual records of animals have been incorporated into the Landscape Project, but plant listings are not a basis for that modeling.

It is important to note that the Natural Heritage Database lists primarily those sightings that have been submitted to it, along with some ecological community data. It incorporates both historically and recently documented sightings. Areas without sightings may never have been surveyed. Conversely, land use in areas with sightings may have changed considerably

over recent years, and the species once found there may be gone. Local surveys to update the database, and regular consultation of records before any development is approved, are two measures that would help to increase threatened and endangered species' protections.

See **Appendix B** for a list of **Rare Plant Species and Natural Communities Presently Recorded in the New Jersey Natural Heritage Database**.



Warrington Millpond, part of the Tomlin Station Natural Heritage Priority Site

THE BUILT ENVIRONMENT

LAND USE

An agricultural landscape dominates in most of Woolwich Township, with broad farm fields and gently rolling hills. As the fastest growing municipality in New Jersey, Woolwich will be undergoing considerable alteration in the coming years and its landscape will be changing. A total of 1659 subdivision lots were granted final or preliminary approval between 1994 and 2002. In 2003, 430 single-family homes and 229 apartments within the Weatherby Planned Unit Development, along with 208 other units elsewhere in the township, had received approvals by the end of the year.

See *Table 14: Specific Land Uses & Land Cover (1995/97)* on the following page for details, as well as **Map 2: Existing Land Use (2002)** on page 9.

POPULATION

The 1990 US Census labeled Woolwich Township as a rural area and listed the resident population as 1,468. The population more than doubled by the 2000 Census to 3,032 people. This is an increase of 107%. The population density is currently about 214 people per square mile. According to the Delaware Valley Regional Planning Commission population forecasts, Woolwich's population was projected to be 4,490 by 2005 and 6,390 by 2010, the latter figure being an increase of 111% from the 2000 Census figure. However, by 2002 the population had already reached 4,549 individuals, which is a 50% increase within only two years.

Most of the township's residents live in single-family dwellings, scattered on large individual lots, or in the new, more compact developments such as those of the Weatherby project. Large farm holdings occupy extensive acreage, although many farms have been sold or optioned for development. Population is distributed widely across the rural residential landscape with concentrations of population in the southeast corner of the township and in the newer residential developments.

Table 14: Specific Land Uses & Land Cover (1995/97)

Land Use/Land Cover Category	Acres	% of Total Land Area
Cropland and Pastureland	7286	53.13
Deciduous forest (>50% crown closure)	1362	9.93
Residential, rural, single unit	876	6.38
Deciduous wooded wetlands	653	4.76
Old field (< 25% brush covered)	345	2.52
Other urban or built-up land	289	2.11
Orchards/vineyards/nurseries/horticultural areas	277	2.02
Other agriculture	263	1.92
Deciduous scrub/shrub wetlands	232	1.69
Freshwater tidal marshes	196	1.43
Tidal rivers, inland bays, and other tidal waters	188	1.37
Recreational land	169	1.23
Deciduous brush/shrubland	150	1.10
Deciduous forest (10% - 50% crown closure)	141	1.03
Mixed forest (>50% deciduous with >50% crown closure)	118	0.86
Mixed deciduous/coniferous brush/shrubland	115	0.84
Residential, single unit, low density	110	0.80
Transportation/communications/utilities	110	0.80
Agricultural wetlands (modified)	107	0.78
Transitional areas	101	0.73
Artificial lakes	92	0.67
Industrial	84	0.62
Herbaceous wetlands	82	0.59
Commercial/services	56	0.41
Coniferous brush/shrubland	54	0.39
Extractive mining	48	0.35
Athletic fields (schools)	48	0.35
Former agricultural wetland (becoming shrubby, not built-up)	38	0.28
Coniferous forest (>50% crown closure)	38	0.27
Disturbed wetlands (modified)	17	0.13
Mixed forest (>50% coniferous with >50% crown closure)	13	0.09
Military reservations	13	0.09
Mixed forest (>50% coniferous with 10%-50% crown closure)	12	0.09
Plantation	6	0.04
Residential, single unit, medium density	6	0.04
Coniferous forest (10% - 50% crown closure)	5	0.04
Confined feeding operations	5	0.03
Managed wetland in maintained lawn greenspace	3	0.02
Mixed forest (>50% deciduous with 10% - 50% crown closure)	3	0.02
Mixed scrub/shrub wetlands (deciduous dom.)	2	0.01
Natural lakes	1	0.01
Wetland rights-of-way (modified)	1	0.01
Total	**13,713**	**100.00**

Source: NJDEP

TRANSPORTATION

Woolwich has always been at the center of good transportation, in comparison to many communities in southern New Jersey. Its transportation, especially commercial transport, has utilized every significant mode, from the days of water travel as the only practical conveyance, to the construction of the earliest major road in the region, to a main rail line (still in operation), to the 20th century's modern highways.

The modern transportation corridors that serve Woolwich have also fostered much of its current and planned growth. These are the state's New Jersey Turnpike, and the federal Interstate 295. The turnpike has one of its few interchanges within Woolwich, which is interchange #2, on Route 322. I–295 runs through Logan Township rather than Woolwich but is within ½ mile to 4 miles of the Woolwich border. The two interchanges on this highway at Route 322 and Center Square Road provide easy access for Woolwich residents from both the northern and southern halves of the township.

Route 322, another state highway, is a major east-west corridor across the county and across South Jersey. It links to the Commodore Barry Bridge over the Delaware River and continues all the way to the Atlantic shore. It also connects with Route 55, a north–south, limited access highway to the east of Woolwich. Traffic congestion on this road is a serious problem east of Woolwich, in Harrison Township, where this two-lane road must pass through Mullica Hill and the restricted intersections beyond.

County roads within the township include Routes 551, 538, 602, 605, 614, 620, 653, 668, 669, 672, and 694. 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 to Swedesboro, which was always the primary center for Woolwich. Smaller roads in the township are a mixture of old rural lanes and newer subdivision thoroughfares.

TOWNSHIP UTILITIES AND SERVICES

Drinking Water

Until recently, all water for residences and commercial properties in Woolwich was provided by private wells, most of which served a single user. Public water was available for Swedesboro residents and for a few Woolwich residents, such as those in the Lakeside development on Route 538 adjoining Swedesboro, which could be reached by the Swedesboro Water Department. However, public water is now being supplied to all residential units in the Weatherby developments by the Consumers New Jersey Water Company (recently renamed Aqua of New Jersey), which serves Logan Township. Consumers New Jersey has received an increased allocation to pump groundwater from the Potomac-Raritan-Magothy (PRM) aquifer in order for construction of the planned housing

units in Woolwich to go forward. This DEP allocation is temporary until a pipeline can be extended to the project area from Mantua Township. That line will bring treated Delaware River water from the New Jersey American Water Company Water Treatment Plant in Delran, Burlington County.

All public wells in Woolwich/Swedesboro draw on the PRM aquifer. Most private wells probably do so, too. Other water-bearing formations that have their western edge in Woolwich are too shallow for municipal drinking water supply but may be used by individual, private well owners, particularly if a well is older. There is no comprehensive inventory of private wells – their depth or condition – available to municipalities. Well permits 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.

A list of drinking water wells that serve the public in Woolwich Township and Swedesboro is in *Table 15*, below. **Map 9: Aquifer Outcrops and Water Supply Wells** on page 47 shows the location of these public wells. Well permits for these wells are issued by the Bureau of Water Allocation, New Jersey Department of Environmental Protection.

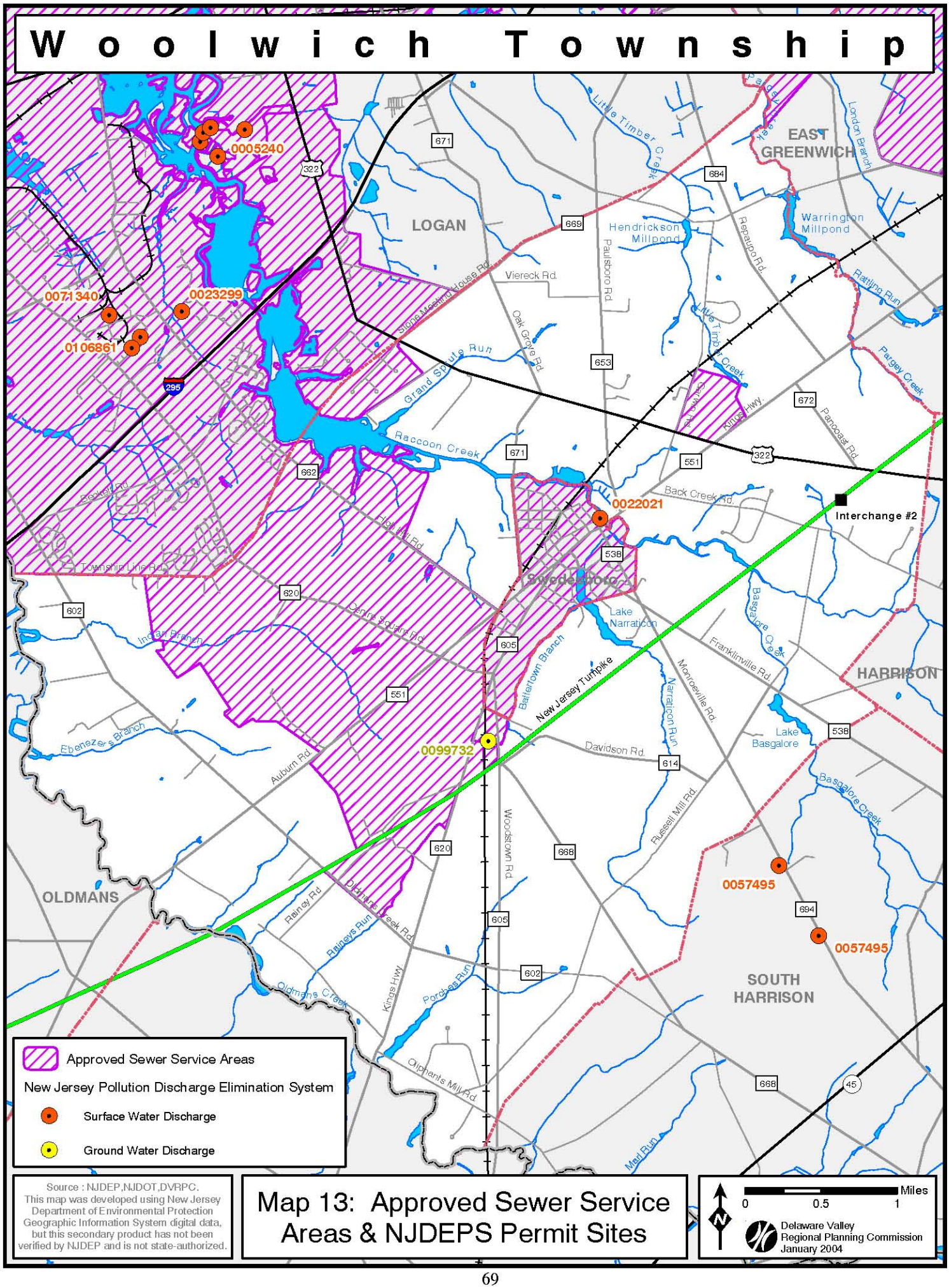
Table 15: Public Water Supply Wells in Woolwich and Swedesboro

Well Permit	Well Drilling Permit	Well Owner	Well Number	Aquifer *	Type of Aquifer	Depth to Top of Well Screen (feet)	Depth to Bottom of Well Screen (feet)
0817001	30-01177	Swedesboro Water Dept	Well 3	Middle PRM	Confined	241	312
0817001	30-08730	Swedesboro Water Dept	Well 4	Upper PRM	Confined	207	283
0824001	30-13285	Consumers NJ Water Co	Well 2	Upper PRM	Confined	184	224
0824001	30-13286	Consumers NJ Water Co	Well 1	Upper PRM	Confined	190	220
0817001	50-00036	Swedesboro Water Dept	Well 2	Upper PRM	Confined	217	240
		*PRM = Potomac – Raritan – Magothy aquifer					

Source: NJDEP

Sewer

Most residents and commercial establishments in Woolwich rely on private septic systems for the disposal of sewage but, as with drinking water, Weatherby is an exception. Already constructed units, and those that will be built, will connect to the Logan Township Municipal


Woolwich Township
0005240
0071340
0023299
0106861
0022021
Interchange #2
0099732
0057495
0057495
LOGAN
EAST GREENWICH
HARRISON
SOUTH HARRISON
OLDMANS
Swedesboro
Lake Narraticon
Lake Basgalore
Hendrickson Millpond
Warrington Millpond
Raccoon Creek
Grand Sprute Run
Little Timber Creek
Pargey Creek
Rattling Run
London Branch
Basgalore Creek
Narraticon Run
Oldmans Creek
Porches Run
Marl Run
Ebenezer Branch
Indian Branch
Barkertown Branch
Diahants Creek Rd.
Oliphants Mill Rd.
Auburn Rd.
Rainey Rd.
Raineys Run
Woodstown Rd.
Davidson Rd.
Russell Mill Rd.
Monroeville Rd.
Franklinville Rd.
Repaupo Rd.
Paulsboro Rd.
Viereck Rd.
Oak Grove Rd.
Stone Meeting House Rd.
Back Creek Rd.
Pancoast Rd.
Kings Hwy.
Centre Square Rd.
Hollow Rd.
Township Line Rd.
Becker Rd.
New Jersey Turnpike
295
322
671
669
684
653
672
551
662
538
620
602
605
614
668
694
45
Approved Sewer Service Areas
New Jersey Pollution Discharge Elimination System
Surface Water Discharge
Ground Water Discharge
Source : NJDEP,NJDOT,DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.
Map 13: Approved Sewer Service Areas & NJDEPS Permit Sites
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1
Delaware Valley Regional Planning Commission
January 2004

Utility Authority treatment plant located on the Delaware River in Logan Township. That arrangement operates under an inter-local agreement between the Logan MUA and Consumers New Jersey, which is serving as the purveying agent. Another site that is connected to Logan's sewage treatment system is the Commodore Business Park on Route 322, part of which is in Woolwich and part in Logan Township.

Residents of Swedesboro are served by a treatment plant operated by the Swedesboro MUA, located along the Raccoon Creek at the north end of Swedesboro. This plant also serves the Kingsway Regional High School, north of Swedesboro. Plans for expansion of the Swedesboro plant and its sewer service area, to accommodate business growth and other development in part of Woolwich, are outlined in the Woolwich Master Plan adopted in 2003. See **Map 13: Approved Sewer Service Areas & NJPDES Permit Sites** for the location of the currently approved sewer service area.

Electric Power

Electric service is supplied by the regional public power utility, Conectiv Power Services, Inc. This is a relatively new company created through a merger between Atlantic City Electric, Delmarva Power and Light, and Baltimore Power and Light. This company provides amplified electric power via road front, overhead power lines. These aboveground lines tap the regional electric resources generated and provided by Public Service Utility's Artificial Island power plant located in Lower Alloways Creek Township, Salem County, and connect to the power grid that links power providers throughout the northeast United States.

Natural Gas

South Jersey Gas Company provides natural gas services to Woolwich Township. Most of the community has gas pipelines in roadways, for current or future service, although areas that are still farmland-dominated may not have piping and some new housing is on propane gas. Most new development in Woolwich will have natural gas service available to it. The South Jersey Gas Company obtains its product via transmission lines coming from the west, under the Delaware River, with the supply originating at points as distant as Texas, Oklahoma, and even Canada. The company maintains a gate station just south of Swedesboro where gas is transferred from the supplier's lines to company lines. Transmission lines transect the landscape and can run across private property. The gas company holds easements on such properties in order to maintain a 50'-wide right-of-way along the lines.

Communications

Land-based voice and data transmission is provided by aboveground, road–frontage lines owned by Bell Atlantic Telephone Company, now called Verizon. This system reaches all

parts of the township, providing a minimum link to the surrounding electronic world. Cellular or non-land-based systems that rely on satellite/microwave radio transmissions rather than wire, utilize two satellite/microwave towers in the township. One is located on Davidson Rd. next to the Turnpike and the other is on Route 322.

Township Services

Woolwich cooperates with the borough of Swedesboro in providing many essential emergency and standard-of-living municipal services.

Fire and Emergency

The Woolwich Fire Company serves both Woolwich and Swedesboro. It is composed of a group of over 50 dedicated volunteers under the leadership of Fire Chief James Shew. The company recently celebrated its 100th year. The company also operates an ambulance/rescue squad made up of 10 members. The main firehouse is located on Kings Highway in Swedesboro. A secondary firehouse is on Woodstown Road in Woolwich.

Police

Woolwich Township has a separate thirteen-member police force under the leadership and direction of Chief Russell Marino. The force is composed of two Lieutenants, four Sergeants, six Patrolmen, and one Class 1 special officer.

Trash/Recycling

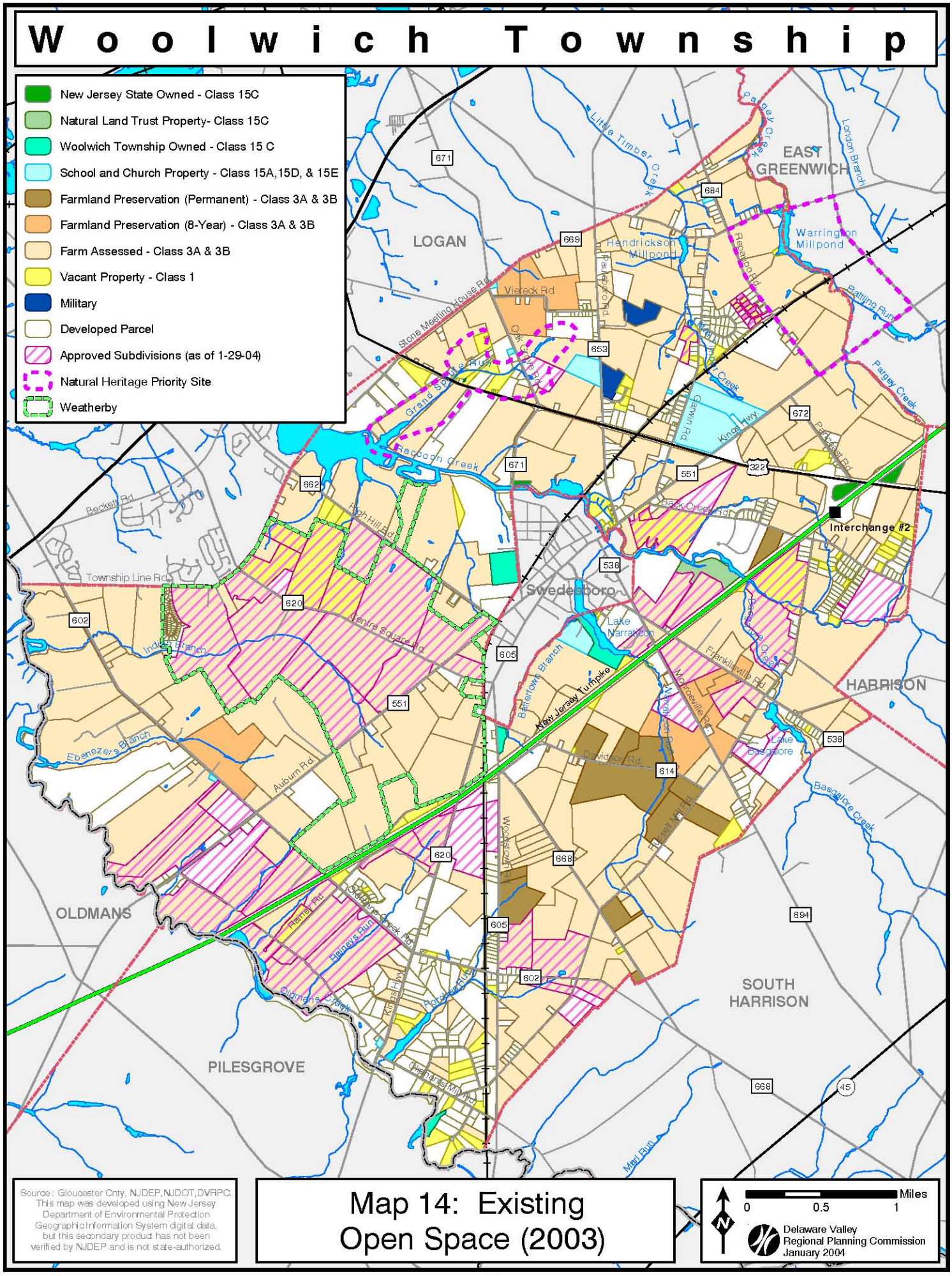
Woolwich Township provides curbside service and recycling pickup on a weekly basis. The township accepts commingled plastic bottles, glass bottles and jars, and aluminum and steel food/beverage containers. It also takes all forms of paper. Large bulk items are removed by appointment. Household Special Waste such as, paints, stains, motor oil, lead, acid, pesticides, gasoline, etc have locations/dates that are set by Gloucester County and a schedule is provided to the residents for drop-off and disposal of these non-recyclable items. The Township also does vegetative (grass clippings and wood) pickup.

Education

The Swedesboro/Woolwich District teaches Woolwich Township and Swedesboro children. Students attend the Margaret Clifford School on Auburn Avenue in Swedesboro for pre–Kindergarten and Kindergarten. Grades 1-4 are in the new (2003) Charles Stratton School on Center Square Road, and those in 5th and 6th grades attend the Walter Hill School on Kings Highway.

Margaret Clifford Elementary School

Woolwich Township



Kingsway Regional High School serves the children of Woolwich Township for grades 7 through 12. Woolwich is a constituent member of the Kingsway District, along with the Borough of Swedesboro and the Townships of South Harrison and East Greenwich. Logan Township students attend Kingsway Regional on a tuition basis. Construction of a new Middle School has recently been approved by voters. This facility is planned to serve 7th and 8th grades.

Parks and Recreation

The Township of Woolwich and the Borough of Swedesboro have a joint partnership in the area of recreation. The Parks and Recreation Committee annually sponsors events for youngsters and assists in funding the youth sports programs. Little League, soccer, wrestling, basketball, and football programs are available for children ages 5 to high school.

In 1996 the two municipalities jointly purchased 23 acres of land on Locke Avenue to serve as a park facility, which opened in 2000. This site provides ball fields, a walking trail, and a playground. A concession stand, bathrooms, and picnic pavilion are under construction. An additional, adjoining 56 acres has just been negotiated for acquisition from the Del Monte Corporation. This will dramatically expand the park and its facilities.

Locke Avenue Park

Kingsway High School also has playing fields that can be utilized by the township when high school use allows.

Another 29-acre park available to Woolwich residents is located next to Lake Narraticon, on its south side. This property is owned by the Borough of Swedesboro but is outside the borough's boundaries and within Woolwich's territory. It has a ½ mile walking trail that is accessible from the Swedesboro side of the property. Lake Narraticon is the only lake within Woolwich that is open to the public. The use of non-gasoline-powered boats is permitted on the water. The lake is stocked with trout by the NJ Division of Fish & Wildlife.

See **Map 14: Existing Open Space 2003**, which is included in this document for easy reference. For additional details on Woolwich's open space and recreation needs and plans, see the *Open Space & Recreation Plan for the Township of Woolwich*.

ENVIRONMENTAL ISSUES

KNOWN CONTAMINATED SITES

While there are 296 contaminated sites in Gloucester County, only two of these sites are located in Woolwich Township. There are an additional five sites within the boundaries of Swedesboro. There are also five sites in Logan Township and one in Oldmans Township (Salem County) that are close to Woolwich's borders. See ***Map 15: Known Contaminated Sites***.

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

Only one of these sites, the Rollins Environmental Services Inc. facility in Logan Township, is listed as a Superfund site. The site owned by Matlack, Inc. in Woolwich was nominated for the National Priority List designation and thus is also eligible for federal funding. State or individual programs handle other sites.

Table 16: Known Contaminated Sites in the Woolwich Township Region

Site ID	Name	Location	Municipality	Status	Status Date	Remedial Level*
NJD043584101	Matlack Incorporated	Rte 322	Woolwich Twp	Active	08/08/90	D
NJL900000431	Gahrs Solid Waste Disposal Area	Auburn Rd.	Woolwich Twp	Pending	03/02/94	C3
NJL600156459	Schrufer Property	43 Main St.	Oldmans Twp	Pending	08/14/97	C2
NJD981082977	Swedesboro Coal Gas South Jersey Gas	Auburn & Bridgeport Aves.	Swedesboro	Active	09/19/94	C3
NJP000900803	Teledyne Packaging	20 Ashton Ave.	Swedesboro	Active	04/27/98	C2
NJL800024457	Getty Service Station, Swedesboro	Kings Hwy & Glen Echo Ave.	Swedesboro	Active	07/07/95	C2
NJD982180820	Gloucester Co. Highway Dept.	Glen Echo Ave.	Swedesboro	Active	06/20/94	B
NJL800575045	Pats Service Station	501 Kings Hwy	Swedesboro	Active	06/21/00	B
NJL800610248	607 Kings Highway	607 Kings Hwy	Swedesboro	Active	12/28/00	C1
NJD980529697	Red Kole Farm	High Hill Rd.	Logan Twp	No Further Action	10/14/99	C1
NJD087098455	Logan Circuits Inc.	208 Center Square Rd.	Logan Twp	Active	03/11/97	C2
NJL860000942	35B Hendrickson Mill Road	35B Hendrickson Mill Rd.	Logan Twp	Active	07/22/97	C2
NJL000060186	139 Applewood Drive	139 Applewood Dr.	Logan Twp	Pending	06/25/93	C1
NJD053288239	Rollins Environmental Services, Inc.	Rte 322	Logan Twp	Active	01/04/93	D

Source: NJDEP

***See next page for explanation of Remedial Level**

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."

AIR QUALITY

Most air quality issues in Woolwich Township are regional in nature and have little to do with the resources or population of the township. Air quality is affected primarily by industrial activity west of the township. Air masses are blown east by the prevailing westerly winds. Industrial electrical power generation from coal fired plants in states such as Ohio, Michigan, and western Pennsylvania, along with automobile inputs from the Philadelphia metropolitan region, control the quality of air that Woolwich receives. This burning of fossil fuels increases the concentrations in the east of sulfur, nitrogen, and airborne particulate pollutants.

Ozone, sulfur, nitrogen, and particulates produced by incomplete combustion of petroleum fuels are produced more locally by high traffic loads in the Delaware Valley. These products impact township air quality on a daily basis. Ozone pollution is a ground level pulmonary irritant. High levels can be dangerous to people with asthma, emphysema, or the elderly with chronic lung ailments. Ground level ozone also affects plant growth.

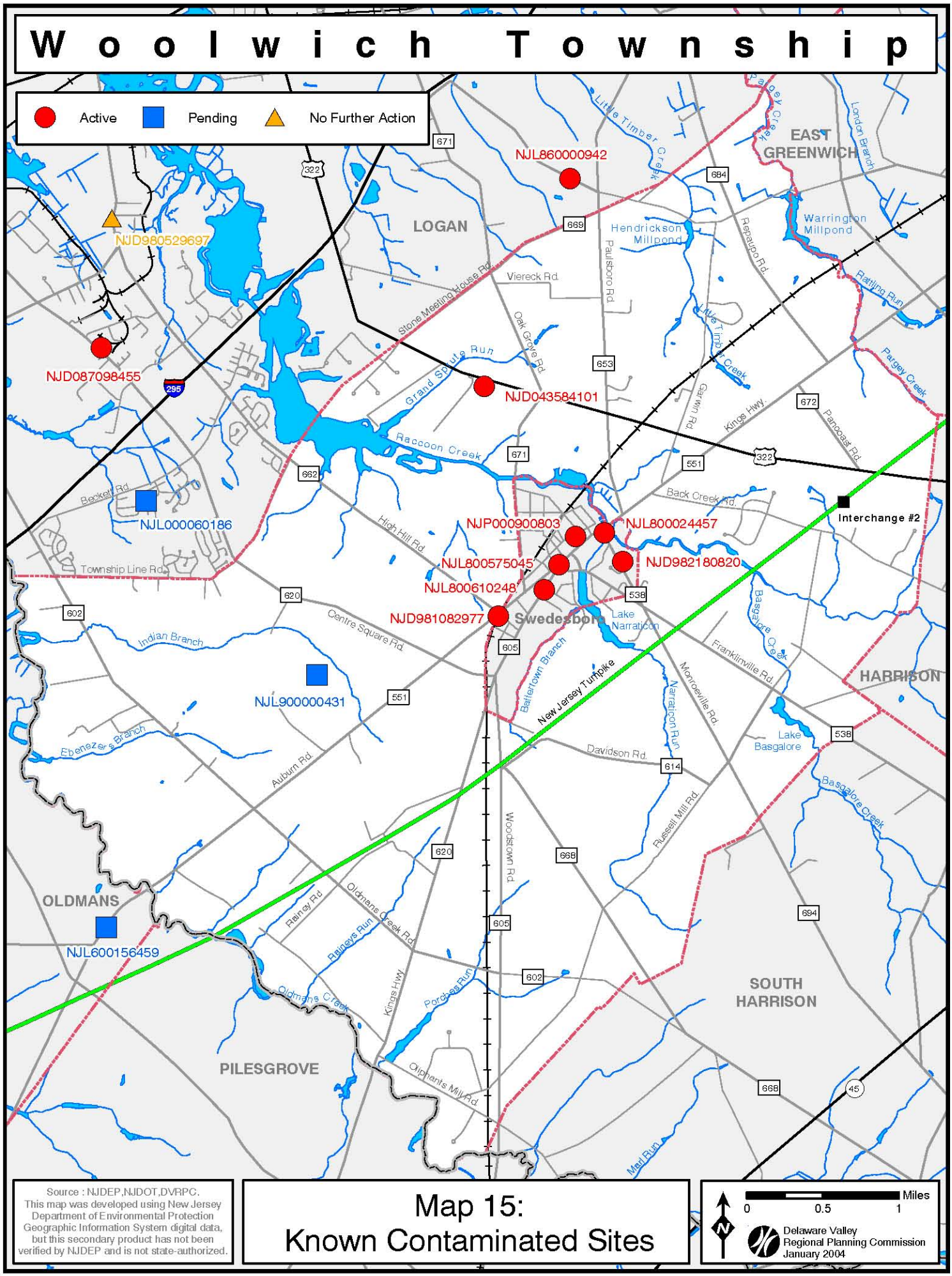
Mercury is a pollutant that is found in the tissues of lake fish in Gloucester County. Its presence is thought to result from deposition into lakes and lake bottom sediments from air, with the mercury component having originated from the fossil fuel-burning plants and other sources to the west. Once in the sediments, mercury is absorbed by bottom-dwelling and bottom-feeding fish species and becomes concentrated in their fatty tissues. Fish Advisories issued by the state advise against eating certain lake-caught fish species more than occasionally, and provide guidance on cooking these species in certain ways. The hazard is primarily to fishermen and their families who eat the catch from area lakes and are unaware of the contamination. Pregnant women and children are especially vulnerable to these hazards.

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-contaminated air within a home can pose a long-term health hazard to residents, specifically for lung cancer. The only method of detection is to conduct a test of the air within the home.

The NJDEP classifies townships into two categories as to the risk of having high radon levels. Tier 2 is the lower risk level and Woolwich has been so classified. However, there are documented high levels of radon in some areas of the township and residents are advised to utilize radon-testing kits to measure their home air. The Township Environmental Commission has made the kits available and has additional information on the problem and its remedies.


Woolwich Township
Active
Pending
No Further Action
NJL860000942
NJD980529697
NJD087098455
NJD043584101
NJP000900803
NJL800024457
NJD982180820
NJL800575045
NJL800610248
NJD981082977
NJL000060186
NJL900000431
NJL600156459
Interchange #2
LOGAN
EAST GREENWICH
Swedesboro
HARRISON
OLDMANS
PILESGROVE
SOUTH HARRISON
Lake Narraticon
Lake Basgalore
Raccoon Creek
Grand Sprute Run
Little Timber Creek
Pargey Creek
Hendrickson Millpond
Warrington Millpond
Repaupo Rd.
Paulsboro Rd.
Viereck Rd.
Stone Meeting House Rd.
Oak Grove Rd.
Kings Hwy.
Pancoast Rd.
Rattling Run
London Branch
Back Creek Rd.
High Hill Rd.
Beckett Rd.
Township Line Rd.
Centre Square Rd.
Indian Branch
Ebenezer Branch
Auburn Rd.
Barkleytown Branch
New Jersey Turnpike
Narraticon Run
Monroeville Rd.
Franklinville Rd.
Basgalore Creek
Davidson Rd.
Russell Mill Rd.
Woodstown Rd.
Rainey Rd.
Rainey's Run
Oldmans Creek Rd.
Oldmans Creek
Porches Run
Kings Hwy.
Oliphants Mill Rd.
Marl Run
Gawn Rd.
671
322
669
684
653
672
551
662
620
602
538
605
614
668
694
45
295
Source : NJDEP,NJDOT,DVRPC.
This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.
Map 15:
Known Contaminated Sites
N
Miles
0
0.5
1
Delaware Valley Regional Planning Commission
January 2004

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NJ Department of Environmental Protection

- www.state.nj.us/dep/gis – For Geographic Information System maps and table data.
- www.state.nj.us/dep/landuse – For information on wetlands and flood hazard area regulations and permits
- www.state.nj.us/dep/srp/kcs–nj/gloucester/– To check the Known Contaminated Site List pertaining to the Township for periodic updates
- www.state.nj.us/dep/srp/contacts – To reach the case manager for a Known Contaminated Site

- www.dbcrssa.rutgers.edu/ims/vernal– For mapping and data on Vernal Pools.
- Division of Water Quality: www.state.nj.us/dep/dwq
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APPENDIX A: VERTEBRATE ANIMALS KNOWN OR PROBABLE IN THE TOWNSHIP OF WOOLWICH

Species	General Habitat	Township Locations
Mammals		
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	Uplands	Throughout
Eastern Cottontail	All Habitats	Throughout, Common
Eastern Chipmunk	Woodlands	Throughout
Woodchuck	Woodlands and Fields	Throughout
Gray Squirrel	Woodlands	Throughout
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 Villages	Throughout
Red Fox	All habitats	Throughout
Raccoon	All Habitats	Throughout
Long-tailed Weasel	Wetlands	Throughout
Striped Skunk	Uplands	Throughout
River Otter	Large Streams	Oldmans and Raccoon
White-tailed Deer	All Habitats	Throughout
Mink	Wetlands	Throughout
Coyote	Woodlands and Fields	Throughout
Birds		
Pied-billed Grebe	Open Water	Lakes and Ponds, Tidal waters
Double-crested Cormorant	Open Water	Lakes and ponds, Tidal waters
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
Black Duck	Marsh, Lakes	Throughout
Mallard	Wetlands	Throughout
Blue-winged Teal	Wetlands	Winter Migrant
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

Species	General Habitat	Township Locations
Black Vulture	Open fields	Throughout
Turkey Vulture	All Habitats	Throughout
Osprey	Open Water	Lakes and ponds, Tidal waters
Bald Eagle	Open Water	Stream Corridors
Northern harrier	Open Fields	Throughout
Sharp-shinned Hawk	Woodlands	Throughout
Cooper's Hawk	Woodlands	Throughout
Red-Shouldered Hawk	Woodlands	Throughout
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
Common Tern	Open Water	Summer on Larger Lakes
Rock Dove	Houses and Bridges	Villages
Mourning Dove	Woodlands	Throughout
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	Summer Night Sky
Chimney Swift	Bridges, House Chimneys	Villages
Ruby-throated Hummingbird	Woodlands and Fields	Throughout; Common
Belted Kingfisher	Wetlands	Throughout
Red-bellied Woodpecker	Woodlands	Throughout
Yellow-bellied Sapsucker	Woodlands	Fall Migrant
Downy Woodpecker	Woodlands	Throughout; Common
Hairy Woodpecker	Woodlands	Throughout
Northern Flicker	Woodlands	Throughout; Common
Wood Pee-wee	Woodlands	Upland Woods
Eastern Phoebe	Woodlands	Throughout
Great Crested Flycatcher	Woodlands	Throughout
Eastern Kingbird	Fields, Farmland	Throughout
Purple Martin	Open Fields, Wetlands	Villages
Tree Swallow	Wetlands	Throughout
Barn Swallow	Buildings, Bridges	Throughout
Blue Jay	Woodland	Throughout; Common

Species	General Habitat	Township Locations
American Crow	All Habitats	Throughout, Common
Carolina Chickadee	Woodlands	Throughout, Common
Eastern Tufted Titmouse	Woodlands	Throughout, Common
White Breasted Nuthatch	Woodlands	Throughout
Brown Creeper	Woodlands	Throughout
Carolina Wren	Edges, Yards	Throughout
House Wren	Villages, Edges	Throughout
Golden and Ruby crowned Kinglets	Woodlands	Winter Migrant
Eastern Bluebird	Edges	Throughout
Wood Thrush	Woodlands	Throughout
American Robin	All Habitats	Throughout, Common
Catbird	Woodlands, Edges	Throughout
Mockingbird	Hedgerows, Yards	Throughout
Brown Thrasher	Woodlands	Throughout
Cedar Waxwing	Old Fields, Young Woodlands	Throughout
Starling	Villages	Throughout; Pest
White Eyed Vireo	Woodlands	Throughout
Philadelphia Vireo	Woodlands	Migrant
Red eyed Vireo	Woodlands	Wetland Forests
Marsh Wren	Tidal Marsh	Raccoon and Oldmans
Yellow Warbler	Upland Forest	Throughout
Chestnut-side Warbler	Woodlands	Migrant
Black-throated Blue Warbler	Woodlands	Migrant
Yellow-rumped Warbler	Woodlands	Throughout
Pine Warbler	Woodlands	Throughout
Prairie Warbler	Shrubby Areas	Throughout
Palm Warbler	Pine Woodlands	Throughout
Black and White Warbler	Pine Woodlands	Migrant
American Redstart	Rich Woodlands	Throughout
Ovenbird	Woodlands	Throughout; Common
Yellowthroat	Shrubby Areas	Throughout
Scarlet Tanager	Woodlands	Throughout
Cardinal	Edges	Throughout; Common
Indigo Bunting	Edges, Old Fields	Throughout
Rufus sided Towhee	Pine Woodlands	Throughout
Chipping Sparrow	Woodlands	Throughout
Field Sparrow	Old Fields	Throughout
Song Sparrow	Old Fields	Throughout
White-throated Sparrow	Woodlands	Winter Migrant
Dark-eyed Junco	Woodlands	Winter Migrant
Red-winged Black Bird	Open Wetlands, Marsh	Throughout
Common Grackle	All Habitats	Throughout
Brown-headed Cowbird	Open Areas	Throughout; Pest
Orioles: No., Orchard, Baltimore	Woodlands	Throughout
House Finch	Open Areas	Throughout
Red Crossbill	Pine Woodlands	Winter Migrant
Pine Siskin	Woodlands	Winter Migrant

Species	General Habitat	Township Locations
American Goldfinch	Open Areas, Old Fields	Throughout
House Sparrow	Villages, Old Fields	Throughout
Reptiles		
Bog Turtle	Muddy Agricultural Fields/Wetlands	Endangered; Documented
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
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 Frogs	Wetlands	Throughout
Wood Frog	Woodlands	Throughout
Southern Leopard Frog	Wetlands	Throughout

Fish		
Chain Pickerel	Lakes and Streams	Throughout
Eastern Mudminnow	Streams	Throughout
Golden Shiner	Streams	Throughout
Iron Colored Shiner	Lakes and Streams	Possible
White Sucker	Streams	Throughout
Creek Chub-sucker	Streams	Throughout
Brown Bullhead	River, Lakes and Streams	Throughout
Channel Catfish	River and Tidal Streams	Throughout
Tadpole Madtom	Lakes and Streams	Throughout
American Eel	All waters	Throughout
Pirate Perch	Streams	Throughout
Mud sunfish	Streams and Swamps	Throughout
Blue-spotted Sunfish	Swamps and Streams	Throughout
Bluegill	All Waters	Throughout
Pumpkinseed	All Waters	Throughout
Yellow Perch	Lakes	Possible
Tessellated Johnny Darter	Lakes	Throughout
Swamp Darter	Swamps	Throughout
Large mouth bass	Lakes	Throughout

Species	General Habitat	Township Locations
Alewife	Tidal Streams	Possible
Blueback herring	Tidal Streams	Possible
Striped Bass	Tidal Streams	Possible
Hogchoker (Sole)	Tidal Streams	Possible

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

APPENDIX B: RARE PLANT SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN THE NJ NATURAL HERITAGE DATABASE FOR WOOLWICH TOWNSHIP

Scientific name	Common Name	Federal Status	NJ Status	State Rank*
Ecosystems				
Freshwater tidal marsh complex				S3
Freshwater tidal marsh complex				S3
Vascular Plants				
Alopecurus carolinianus	Tufted meadow–Foxtail			S3S4
Amianthium muscitoxicum	Fly poison			S2
Asclepias variegata	White milkweed			S2
Asclepias verticillata	Whorled milkweed			S2
Aster radula	Low rough aster		E	S1
Carex prairea	Prairie sedge			S2
Castanea pumila	Chinquapin		E	S1
Cyperus lancastriensis	Lancaster flat sedge		E	S1
Cyperus retrofractus	Rough flatsedge		E	SH
Dalibarda repens	Robin run–away		E	SH.1
Desmodium laevigatum	Smooth tick-trefoil			S3
Desmodium viridiflorum	Velvety tick–trefoil			S2
Draba reptans	Carolina whitlow–grass		E	SH
Eleocharis tortilis	Twisted spike–rush		E	S1
Elephantopus carolinianus	Carolina elephant–foot		E	SH
Epilobium angustifolium ssp	Narrow–leaf fireweed			S1
Glyceria laxa	Northern manna grass			S1
Helonias bullata	Swamp pink	Lt	E	S3
Lygodium palmatum	Climbing fern			S2
Malaxis unifolia	Green adder's mouth			S2
Obolaria virginica	Virginia pennywort			S2
Phaseolus polystachios var	Wild kidney bean			S2
Phlox maculata var maculata	Spotted phlox			S3
Platanthera ciliaris	Yellow–fringed Orchid			S2
Polygala incarnata	Pink milkwort		E	S2
Puccinellia fasciculata	Saltmarsh alkali grass			S2
Pycnanthemum torrei	Torrey's mountain–mint		E	S1
Ranunculus ambigens	Water–plaintain spearwort			S2
Sisyrinchium fuscatum	Sand–plain blue–eyed grass			S2
Spiranthes odorata	Fragrant ladies' tresses			S2
Verbena simplex	Narrow–leaf vervain		E	S1

*** 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.
SH & SH.1	Historical occurrence in NJ but no extant occurrences are known, although not all historical occurrences have been field surveyed. SH.1 = Documented from a single location.

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.

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

DELAWARE VALLEY REGIONAL PLANNING COMMISSION

Publication Abstract

Title: ***Environmental Resource Inventory for Woolwich Township, Gloucester County, New Jersey***

Date Published: **April 2004**
Publication No. **04012**

Geographic Area Covered: Woolwich Township, Gloucester County, New Jersey

Key Words: Environment, environmental resource inventory, environmental commission, conservation, master planning, natural resources, Gloucester County, Swedesboro, Woolwich Township.

ABSTRACT

This publication documents the natural and community resources of Woolwich Township, Gloucester County, New Jersey. The natural resource information includes descriptions, tables and maps of land use; soils; steep slopes; drinking water aquifers and wells; surface waters including watersheds, streams, lakes, wetlands, and floodplains; impacts on water resources; vegetation including forests and grasslands; animal communities; threatened and endangered species; contaminated sites; and air quality. 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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W o o l w i c h T o w n s h i p

Soil Type

- Ad
- Am 0-5%
- Ar 0-5%
- As 0-10%
- Au 0-10%
- Ba
- Ck
- Cm 0-10%
- Cn 0-10%
- Co 0-10%
- Do 0-5%
- Ds 2-5%
- Ek
- Fa
- Fd
- Fh 0-10%
- Fn 0-10%
- Fo 0-10%
- FoD 10-15%
- Fs 10-15%
- Ft 15-40%
- Fw
- Kp 0-10%
- Kr 0-5%
- Ld 0-10%
- Lk 0-5%
- Mf
- Mr 0-10%
- MrD 10-15%
- MrE 15-40%
- Mu
- Nb 0-5%
- Pg
- Po
- Ps
- Sf 0-10%
- Sr 0-10%
- Sr 10-15%
- Ss 10-15%
- Ss 15-40%
- Tm
- Wa 10-15%
- Wh 0-10%
- Wh 10-15%
- WhE 15-40%
- Wn 0-2%
- Wo 0-5%
- Ws 0-5%
- Wt 0-5%
- Water

LOGAN
EAST GREENWICH
Swedesboro
HARRISON
OLDMANS
PILESGROVE
SOUTH HARRISON

Little Timber Creek
Parvey Creek
Hendrickson Millpond
Warrington Millpond
Stone Meeting House Rd.
Viereck Rd.
Oak Grove Rd.
Grand Sprute Run
Raccoon Creek
Kings Hwy
Pancoast Rd.
Reppaupo Rd.
Becket Rd.
Township Line Rd.
High Hill Rd.
Back Creek Rd.
Centre Square Rd.
Lake Narraticon
Franklinville Rd.
Monroeville Rd.
New Jersey Turnpike
Narraticon Run
Lake Basgalore
Basgalore Creek
Auburn Rd.
Woodstown Rd.
Russell Mill Rd.
Oldmans Creek
Porches Run
Oliphants Mill Rd.

295 322 671 684 669 662 672 551 538 620 602 605 614 668 694 45 653

Source : NJDEP,NJDOT,U.S. Department of Agriculture, Natural Resources Conservation Service,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: Soils

0 0.5 1 Miles

Delaware Valley Regional Planning Commission
January 2004

for the TOWNSHIP of

WOOLWICH

GLOUCESTER COUNTY, NEW JERSEY

Delaware Valley
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Commission

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