

# ENVIRONMENTAL RESOURCE INVENTORY



FOR THE  
**BOROUGH OF NORTH PLAINFIELD**  
**SOMERSET COUNTY, NEW JERSEY**

**MARCH 2014**

**Prepared for:**

Borough of North Plainfield Environmental Commission

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CEA/WRA Permit Fact Sheet – Lockheed Electronics Corporation – July 24, 2013

North Plainfield High School Studies conducted on Stream Quality in the Stony Brook

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## **1.0 INTRODUCTION**

### **1.1 The Environmental Resource Inventory**

The North Plainfield Borough Environmental Resource Inventory (ERI) is a significant tool in addressing the environmental resources and impacts within the Borough of North Plainfield to help maintain a healthy environment and quality of life for its residents.

The Land Use Law suggests that the environmental commission prepare and submit to the Planning Board and Board of Adjustment an index of natural resources of the municipality as an element of the Master Plan. In this regard, the North Plainfield Borough ERI is designed to objectively identify and describe the natural resources, cultural conditions, environmental features and concerns within the municipality for planning purposes. The ERI provides visual (mapping) and text depictions that describe various cultural and natural resources, their sensitivities and limitations for development, and existing laws and suggested measures for protection of sensitive resources.

In addition to serving as an aid for municipal planning, the ERI functions as a guide for surveys and other scientific activities, and as an educational document. The ERI contents have been gathered from many existing resources such as reports, studies, documents and maps provided by county, state and federal agencies, North Plainfield's municipal government, businesses, and organizations.

Some limited field work was conducted as part of the preparation of this ERI; however, site - specific studies were not conducted specifically for development of the ERI. Wetland delineations, wildlife studies, surface water and groundwater testing require onsite field investigations for conclusively determining the presence and character of various resources and impacts. Multiple existing available studies within the Borough of North Plainfield were incorporated into the document. Additional data may be directly incorporated into the ERI in future revisions. Along with the Municipal Master Plan, the North Plainfield ERI should be periodically reviewed as municipal conditions and regulations change, and additional data becomes available.

The North Plainfield ERI was created by the North Plainfield Environmental Commission with a matching grant from the Association of New Jersey Environmental Commissions (ANJEC). More information regarding the function and preparation of an ERI is available at the ANJEC website at [www.anjec.org](http://www.anjec.org).

### **1.2 North Plainfield Background**

The Borough of North Plainfield is an approximate 2.82 square mile (1805 acre) municipality located at the base of the Watchung Mountains in eastern Somerset County, New Jersey. The Borough is just 23 miles from Manhattan and occurs with the region commonly referred to as the New York Metropolitan Area. It is bordered by Plainfield City (Union County) to the southeast, Green Brook Township to the southwest; and Watchung Borough to the northwest (Appendix A, Map 1). North Plainfield Borough's dominant land use is medium density single unit residences

with areas of higher density/ multiple family residences and commercial or service uses (see Existing Zoning Mapping). Several critical environmental resource areas have been mapped in the municipality, primarily along stream corridors. These resource areas include unique vegetation communities, wildlife habitats, floodplains, core forests (greater than 10 hectares) or forested wetlands. These areas are particularly susceptible environmental impacts from a number of sources discussed in the ERI. These critical resources are mapped both independently and collectively on the Critical Areas Map (Appendix A).

Census data from 2010 indicates that North Plainfield Borough population was 21,936. This number reflects modest population growth over the last 20 years. The current census data reflects a 3.9% increase from the 21,103 residents counted in the 2000 census, and a 12.1% increase from the 18,820 residents counted in the 1990 census. The 2010 census data indicated a high population density of 7779 people per square mile (people/sq. mi.). This density represents an increase of over 100 people/sq. mi when compared 1990 Census density of 6673 people/sq. mi.

### **1.2.2 North Plainfield Borough Environmental Commission and Other Committees**

North Plainfield has an established history of environmental awareness, planning and regulation through its commissions, committees, master plan and municipal code. In recent years, municipal environmental groups have worked with the North Plainfield Borough Council, Planning Board, Mayor's Office, Economic Development, and the Board of Adjustment on various environmental initiatives. These include a sustainability portion of the North Plainfield Master Plan, a tree management plan, invasive species control activities, sustainable land use planning, and green design initiatives. Measures taken by North Plainfield have resulted in a bronze certification for the municipality by Sustainable New Jersey. A discussion of this certification and measures taken by North Plainfield are included in section 3.2.2 of this report.

The key environmental groups within the town include the North Plainfield Environmental Commission (NPEC), the Shade Tree Advisory Board and the Green Team (see Section 3.2.2). The NPEC is a municipal advisory body created pursuant to P.L.1968, c.245 (C.40:56A-1 et seq.) in the late 1970's by the North Plainfield Borough Council. The NPEC is associated with the Municipal Planning Board and Board of Adjustment and a Planning Board member sits on the Commission. NPEC members are appointed by the Mayor.

NPEC and the North Plainfield ERI are closely connected to the Borough planning process through the Master Plan. The Land Development Chapter of the Borough Code <sup>18</sup> expresses this relationship in its statement of purpose as follows:

- a. To guide the appropriate use of development of all lands in the Borough, in a manner which will promote the public health, safety, morals, and general welfare;
- b. To secure safety from fire, flood, panic and other natural and man-made disasters;
- c. To provide adequate light, air and open space;
- d. To ensure that the development of the Borough does not conflict with the development and general welfare of neighboring municipalities, the County and the State as a whole;

- e. To promote the establishment of appropriate population densities and concentrations that will contribute to the well-being of persons, neighborhoods, communities and regions and preservation of the environment;
- f. To encourage the appropriate and efficient expenditure of public funds by the coordination of public development with land use policies;
- g. To provide sufficient space in appropriate locations for a variety of residential, recreational, commercial and industrial uses and open space, both public and private, according to their respective environmental requirements in order to meet the needs of all citizens;
- h. To encourage the location and design of transportation routes which will promote the free flow of traffic while discouraging location of such facilities and routes which result in congestion or blight;
- i. To promote a desirable visual environment through creative development techniques and good civic design and arrangements;
- j. To promote the conservation of open space and valuable natural resources and to prevent urban sprawl and degradation of the environment through improper use of land;
- k. To encourage coordination of the various public and private procedures and activities shaping land development with a view of lessening the cost of such development and to the more efficient use of land.
- l. To provide that the unique character of its neighborhoods be maintained.  
(Ord. #679, S 102)



## 2.0 HISTORY

Included here is a brief overview of the History of North Plainfield Borough. For additional information on the history of the Borough, see the booklet “Looking Back – A History of North Plainfield” reprinted in Appendix D of this report. The booklet was updated in 1985 from an earlier version.

### 2.1 Indigenous People

The earliest evidence of indigenous settlement, evidenced by certain tool making technologies dates back to at least 10,000 years within New Jersey<sup>15</sup>. The settlement of these individuals within New Jersey follows the retreat of the Wisconsin Glaciation. The earliest period of this settlement is referred to as the Archaic Period (8000-1000 BC)<sup>16</sup>. Archaic period settlers were seasonally opportunistic hunter-gatherers that often operated in smaller groups than their later ancestors<sup>16</sup>. As the post-glacial climate changed (towards 1000 BC), indigenous people developed new agricultural techniques, and technologies such as pipe and pottery making<sup>15</sup>. This later period, known as the Woodland Period, gave rise to the Lenni-Lenape culture.

The Delaware Indians or Lenni-Lenape, which roughly translates to “real men” or “genuine men,” were the indigenous people of the entire Delaware basin including all of New Jersey, Eastern Pennsylvania and Southern New York when Europeans first settled the region<sup>1,2</sup>. Lenni-Lenape spoke dialects of Eastern Algonquian languages and consisted of three major divisions within the New Jersey portion of their ancestral lands. These divisions were known as the Minsi or Munsee in Northern New Jersey, the Unami in central New Jersey and the Unalachtigo in Southern New Jersey<sup>3,4,5</sup>. The Munsee included multiple tribes claiming lands North of the Raritan established at the Treaty of Easton in 1758<sup>6</sup>. The Raritan Indians, who were associated with the Munsee, were located in the vicinity of present-day North Plainfield<sup>7</sup>. The Raritan ancestral lands included the areas between the Watchung Mountains and the Raritan Bay, and Portions of Staten Island. At the time of European colonization in the 17<sup>th</sup> century, the local Raritan subset occupying the Green Brook Valley was referred to as the “Sacunk” which translates roughly to “stream outlet”<sup>8</sup>.

Native peoples occupied portions of Northern New Jersey until the mid-18<sup>th</sup> century when they were steadily forced further west. It is thought that the Raritan Indians left the region in the late 1700’s. There is a reference to a Raritan Indian village in western Pennsylvania after 1756<sup>9</sup>. Most of the Lenape moved through Pennsylvania, Ohio, and Indiana before dividing into two groups in Illinois. Both groups eventually settled in Oklahoma.

North Plainfield and the Green Brook watershed contain evidence of a long pre-colonial history dating back approximately 10,000 years. Prehistoric sites in New Jersey are typically found near substantial streams in areas with well-drained soils, level topography, historic trails, and a substantial vantage point. Pottery fragments, fireplace stones, charcoal, and stone chips/unfinished tools or other evidence of tool making are the typical remains of local prehistoric sites<sup>3</sup>. The vicinity of the North Plainfield including the Green Brook (which was larger and could be navigated in previous centuries) was an ideal location for indigenous people’s campsites. Multiple sites were identified in the Green Brook Valley starting in the early 20<sup>th</sup> century,

particularly around the confluence of Green and Stony Brooks near the border of North Plainfield<sup>8</sup>. Material including fire stones, pottery, shell fragments, arrowheads, and stone tools were found associated with these sites<sup>8</sup>. One burial site was identified within North Plainfield near the confluence. The spread of development within northern New Jersey during the 20th century and associated land alteration has obscured much of the local evidence of the indigenous cultures. As early as 1929, Archaeologist Max Schrabisch noted problems of site development and the looting of sites as factors impacting the documentation of New Jersey's indigenous people<sup>9</sup>.

In addition to sites, evidence of indigenous people and their activity within the region can be seen in observed through the transportation routes they established. The Lenni-Lenape and other Mid-Atlantic Native Americans typically moved between the Atlantic shore in the summer and mountainous inland areas of the region in the winter. As a result, many ancient transportation routes or trails transect portions of New Jersey, some of which are still partially maintained<sup>8</sup>. Trails typically parallel streams to avoid impassable areas such as mountain ridges or multiple stream crossings. The Green Brook Watershed, which is sheltered by the Watchung Mountains, contains ample streams for water and food supply, contained multiple trails of this type<sup>8</sup>. Some of these trails such as "Old Raritan Road" (between Elizabethtown and Bound Brook) became roads after colonization.

## **2.2 Early European Settlement**

The first European settlements in the vicinity of North Plainfield occurred in the late 17<sup>th</sup> century<sup>8, 10</sup>. The initial European settlers of the North Plainfield area were by Dutch farmers who traveled west from Long Island<sup>8, 10</sup>. The Vermeule and Cadmus families were among these early Dutch settlers of the modern day North Plainfield area. The Vermeule family owned large tracts of land in the western portion of present day North Plainfield. The house that bears this name, the Vermeule Mansion, is the one individual structure within North Plainfield listed on the National Historic Register (see Section 2.4, below) and currently serves as a community center. Many members of the prominent settler families are buried in the cemeteries behind Vermeule Mansion and on Brook Avenue<sup>10</sup>.

Other early settling families of the region were Quakers of English or Scottish descent that settled from New England. One of these Quaker families, the Vail family, owned property in the eastern portion of present-day North Plainfield. In the time of early settlement, the Borough was referred to as, "Blue Hills" and was a part of Warren Township. A number of these early settler families received 1,200 acres each from King George of England. These properties extended from the ridge of the First Watchung Mountain downward towards Green Brook. Initially families of the region lived on widely dispersed, relatively isolated farms. The farmers of these homesteads would trade small amounts of surplus goods at local markets. Brookside gristmills or sawmills were the earliest local colonial industries in the region. Subsequently villages formed around these industries. The local gristmills would typically grind wheat, oats, barley, corn and other grains into flour or meal<sup>8</sup>.

During the American Revolution in 1776 and 1777, present-day North Plainfield and surrounding communities acted as a semi-militarized zone between the British Forces in

eastern/northeastern New Jersey and the Continental Army encamped in the Morristown area <sup>8</sup>. The area became strategically important as rival troops battled for control of villages, food and resources. The Blue Hills Fort and Camp site, located in Green Brook Park (Plainfield and North Plainfield Townships) served as an important outpost for Revolutionary soldiers who periodically repelled invading British forces in this area during this turbulent period <sup>11</sup>.

The largest military action of the Green Brook Valley Region, the Battle of Bound Brook, occurred in April of 1777 in Bound Brook to the southwest of North Plainfield. During this event, 4000 Hessian and British troops led by Major General Cornwallis traveled from New Brunswick to the Village of Bound Brook and ambushed 500 American troops, who largely managed to escape into the Watchung Mountains <sup>8</sup>. The British subsequently took control of the village and eventually returned to New Brunswick. Shortly after this battle on June 26, 1777, General Washington, operating from the Blue Hills Fort outpost, forced the British out of New Jersey in the Battle of the Short Hills (see Table 1) <sup>11</sup>. As a result of the historical significance of the Blue Hills Fort Site, the Green Brook Park was listed on the National Register of Historic Places (see Table 1).

### **2.3 Civil War Era and Industrial Settlement**

The 19<sup>th</sup> century brought the development of new industries in the vicinity of North Plainfield. Among these was a hat making industry that resulted in 15 hat factories along the Green Brook by the 1840's. During the early 1900's, a silk mill was built in the vicinity Brook Avenue and Pearl Street <sup>17</sup>. Within the factory, silk imported from Japan was cleaned, dried, spun and furnished into cloth <sup>17</sup>. With the expansion of industry, came expanded transportation systems including the development of railroads within North Plainfield.

In 1831, the New Jersey Legislature granted permission to the Elizabethtown and Somerville Railroad Company to construct a railroad from Elizabeth to Somerville. The railroad passed within the vicinity of North Plainfield, with stops in Bound Brook and Plainfield <sup>17</sup>. Railroads continued to develop within the North Plainfield area throughout the 19<sup>th</sup> century. With the expansion of transportation came the conversion of wealthy New Yorkers from vacationers to commuting residents. As this transformation occurred, the regional population of the North Plainfield Area steadily grew <sup>17</sup>. As a result of the increasing population of businessmen in North Plainfield, the Washington Park district was created (see Section 2.4). The development featured various styles of homes developed between 1860 and 1900 <sup>17</sup>. In 1872, North Plainfield Township was incorporated and included current-day North Plainfield, Watchung and Green Book <sup>10</sup>. North Plainfield later became a separate Borough in 1885 <sup>17</sup>. Infrastructure continued to grow within the Borough and the first firehouse was established on Somerset Street in 1888 and a second fire house was established on Harrison Avenue in 1897. The original Borough Hall was developed in 1896 <sup>17</sup>. As industries and resident populations continued grow into the 20<sup>th</sup> century. Transportation corridors continued to expand. Within North Plainfield, State Highway 29 (currently Route 22) was opened officially in 1930. At this point in time, some of the eastern and much of the western portions of the Borough remained agricultural (see Appendix A, Historic Aerial). Suburban expansion into these agricultural areas continued into the second half of the 20th century.

## 2.4 Historic Resources <sup>12, 13</sup>

North Plainfield has three structures or districts which are listed on the State and /or National Registers of Historic Places and two additional resources given consideration. Listed places include Green Brook Park (described in Section 2.2), the Van Derventer/Brunson House (see Appendix B, Photo A), and Washington Park Historic District. Additional places evaluated for registration include the Battle of the Short Hills (with relevance to North Plainfield - see Section 2.2) and the First German Reformed Church located on Craig Place <sup>12</sup>.

**Table 1 Listed Sites Considered for the NJ and National Registers of Historic Places  
North Plainfield Borough <sup>12, 13</sup>**

Historic Resource	State ID #	Location	State Status Date	National Register Date Reference#	SHPO opinion Date
Battle of the Short Hills	5025	n/a	n/a	n/a	3/23/01
First German Reformed Church	4312	43-45 Craig Place	n/a	n/a	9/7/04
Green Brook Park	3551	Between Parkview, Tappan, Myrtle Avenues (north), Myrtle Avenue and front street (south), Clinton Avenue (west) and Brookside	3/8/2004	5/14/04 #04000437	6/20/00
Van Derventer/Brunson House	4249	614 Greenbrook Road	3/8/2004	10/27/04 #04001191	COE 5/14/93
Washington Park Historic District	2574	Rockview Terrace, Park Place, Linden, Mercer, Myrtle, Orchard, Rockview, Sycamore, Washington and Willow Avenues	3/4/1987	4/9/87 #87000603	n/a

**n/a – not applicable**

### **The Van Derventer/Brunson House (Vermeule Mansion)**

This Greek Revival mansion dates to approximately 1840. The house was modified by local businessman Jeremiah Van Derventer in 1870. Van Derventer added a mansard roofed third story in the New Empire style. The home was again enlarged by Van Derventer's grandson, Augustus J. Brunson in the early 1900's <sup>14</sup>. During this time, Colonial Revival fireplaces and features were introduced. The site is now Borough property purchased with Green Acres grants. It was preserved and restored and is currently managed by *Friends of Vermeule Mansion*. The mansion is also home to the Fleetwood Camera Museum, whose founder's estate also supported the building renovation.

### **The Washington Park Historic District**

The Washington Park Historic District contains a well preserved collection of late 19<sup>th</sup> century private residences representing Victorian American architectural style. As the railroad developed and increasing numbers of New York businessmen continued to settle in the North Plainfield Area in the mid-1800's, Washington Park was planned as a suburb in the Romantic tradition. The significant architectural styles and winding tree-lined streets of the District contributed to its

historic significance and subsequent State and National listing. At the time of National Register listing, Washington Park was comprised of 213 homes occupying about 300 acres between Stony and Green Brooks near Grove Street <sup>13</sup>.

**First German Reformed Church**

This church was built in 1886 and designed by architect Oscar Teal. Services were conducted in German for many years. The church contains distinctive multi-textured surfaces and elaborate gables and steeples. This structure was evaluated but not listed on the State or National Registers.

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- 1 Lenape Talking Dictionary. 2002. Lenape Language Preservation Project. Website: <http://www.talk-lenape.org/introduction.php>
- 2 Lenape Lifeways 2002. About the Lenape. Information about the roles of women in Lenape society. Website: <http://www.lenapelifeways.org/lenape1.htm>
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- 5 Woodruff A. S. and F. Al Palmer. The Unalachtigo of New Jersey "The Original People of Cumberland County" Available on the Cumberland County Website: <http://www.co.cumberland.nj.us/content/163/233/239/804.aspx#1>
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- 15 Marshall S. B. (undated) Aboriginal Settlement in During the Paleo-Indian Cultural Period 10,000 BC – 6000 BC. Assessed (2013) from the NJDEP Historic Preservation Office. [http://www.nj.gov/dep/hpo/1identify/pg\\_10\\_AboriginalSettleNJMarshall.pdf](http://www.nj.gov/dep/hpo/1identify/pg_10_AboriginalSettleNJMarshall.pdf)
- 16 Kraft H. C. and A. Mounier. (undated) The Archaic Period in New Jersey (8000 - 1000 BC). Assessed (2013) from the NJDEP Historic Preservation Office. [http://www.nj.gov/dep/hpo/1identify/pg\\_52\\_ArchaicPeriodNJCraft\\_Mounier.pdf](http://www.nj.gov/dep/hpo/1identify/pg_52_ArchaicPeriodNJCraft_Mounier.pdf)
- 17 Blue Hills Historical Society. 1985. Looking Back – A History of North Plainfield.
- 18 Borough of North Plainfield. 1987 (Amended 2011). Revised General Ordinances. Code adopted December 19, 1988 Amended through July 31, 2011. [www.codedsystems.com](http://www.codedsystems.com)

## **3.0 CLIMATOLOGY**

Regional and global climatologic features, such as temperature fluctuations and precipitation levels, influence wildlife and plant communities, crop selection and yields, soil formation, wetlands and floodplains, and energy use. As global climate change becomes increasingly publicized in the media, the general public is becoming interested in climate influence on ecological systems, as well as its influence on quality of life and the economy. This section discusses climate change and climatologic characteristics of the North Plainfield Borough areas and of the northeastern United States. This section describes how climate characteristics influence regional ecology, energy use, and quality of life.

### **3.1 Regional and Local Climate**

New Jersey experiences a significant variation in temperature between the summer and winter months, and large daily and day-to-day fluctuations<sup>1</sup>. In the winter, New Jersey's climate is influenced by the semi-permanent high pressure that forms over Canada and the northern Great Plains. Strong surges of cold air borne on prevailing winds from the northwest drag cold polar air masses to the southeast over the eastern United States. Storm centers often accompany these cold polar masses of air. In spring, the high pressure over Canada weakens and a Bermuda high develops over the Atlantic Ocean. The clockwise flow around this high pressure system results in prevailing winds from the south and southwest, carrying moist tropical and maritime air from the Gulf of Mexico and the Caribbean. In autumn, the Bermuda high weakens and retreats to the south. During this transition period, New Jersey often experiences mild and tranquil weather as weak high pressure moves slowly southeast from Canada. The winter circulation pattern slowly becomes reestablished by December as winter weather conditions arrive<sup>1</sup>.

In spite of New Jersey's small size (7,836 square miles), the State has relatively diverse climatic conditions. The Office of the State Climatologist identifies five distinct climate zones in New Jersey: Northern, Central, Pine Barrens, Southwest, and Coastal. Each region's geology and elevation, distance from the Atlantic Ocean, and prevailing atmospheric flow patterns can produce distinct variations in the daily weather among the zones. North Plainfield is located entirely within the Central Climate Zone.

The Central Climate Zone has a northeast to southwest orientation, running from Bergen County in northeastern New Jersey to the Trenton area in Mercer County. This region is characterized by the multitude of urban locations with higher levels of pollutants. These pollutants are produced by the high volume of automobile traffic and industrial processes. The regional concentrations of buildings, structures, and impervious surfaces in the most urban areas, such as Newark and Elizabeth retain high levels heat, elevating local temperatures to levels greater than surrounding vegetated or less densely developed suburban areas. This phenomenon is often referred to as a "heat island".

North Plainfield occurs along the northern edge of the Central Zone, just south of the Northern Climate Zone, which runs just beyond the Watchung Mountains in western Somerset and most of Morris County. The edge between these climate zones is often the boundary between freezing and non-freezing precipitation in the wintertime. There are also distinctive differences in



summertime heat between this climate zone and areas to the south which tend to have nearly twice as many days (30 to 40) with temperatures above 90 degrees F.

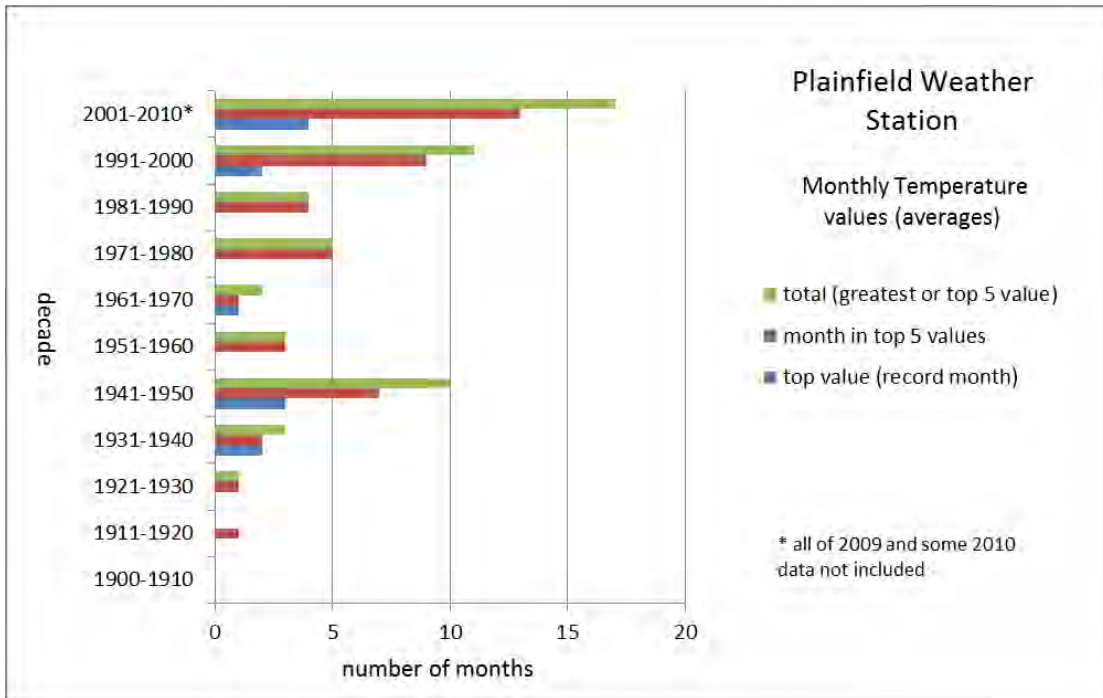
The data provided in Table 2 represent mean climate data from 1893 to 2012 for the Plainfield Weather Station, located less than one mile south of North Plainfield’s southern border <sup>2</sup>.

<b>Table 2 Climate Data - Plainfield Weather Station <sup>2</sup> 1893-2012</b>												
<b>Variable</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>
Mean ° F	38.7	40.7	50.5	62.1	72.9	81.2	85.8	83.8	77.2	66.1	53.8	42.0
Median ° F	38.7	40.8	50.4	61.5	72.6	81.7	85.7	83.6	77.0	65.9	53.6	41.9
Minimum ° F	29.1	29.0	40.3	55.0	64.1	72.3	80.2	77.4	71.7	57.9	45.4	30.2
Maximum ° F	49.0	51.4	63.5	70.0	80.3	85.9	93.1	89.9	84.2	73.5	62.5	51.9
Precip. Inches	3.62	3.30	4.04	3.84	4.10	3.99	5.20	4.75	4.36	3.82	3.63	3.82
Max. Snowfall Inches	8.4	9.7	5.4	0.8	-	-	-	-	-	-	8.4	9.7

Additional information from is available from the Office of the State Climatologist, Rutgers University website at [http://climate.rutgers.edu/stateclim\\_v1/monthlydata/index.html](http://climate.rutgers.edu/stateclim_v1/monthlydata/index.html).

Based on the data available from the Plainfield Weather Station, the number of months with average temperatures reaching record levels has generally increased since 1971 (with the exception of 1941-1950). This is consistent with trends throughout northern New Jersey and the northeastern United States <sup>10</sup>. Weather extremes, particularly record high temperatures, have become more frequent within the last decade in the region. Chart 1 on the following page illustrates this trend by showing the number of record breaking or top 5 average monthly (high) temperature values between 1900 and 2010. The ramifications of warming trends and other issues related to global climate change are discussed in Section 3.2.

**Chart 1: Range of Extreme High (top 5 recorded) Monthly Temperature Averages  
Plainfield Weather Station 1900 – 2010<sup>2</sup>**



### 3.2 Global Climate Change

The scientific community at large and major world governments have reached the consensus that anthropogenic or human induced global climate change is occurring on earth. This change has resulted from the increased release of heat trapping emissions, particularly from the combustion of fossil fuels<sup>3, 4, 22</sup>. Other emissions include methane release from livestock production, landfills and releases of gasses and refrigerants from industrial sources<sup>3</sup>. Human activities that result in the emission of certain gasses (water vapor, carbon dioxide, methane, particulate matter and trace gasses) contribute to the phenomenon known as the greenhouse effect<sup>4</sup>. This effect occurs when these gasses in the lower atmosphere trap solar radiation and heat, and raise atmospheric temperature. While the greenhouse effect is in part naturally occurring and vital for stabilizing the earth's temperature, human related increases of atmospheric carbon dioxide from a pre-industrial level of 280 parts per million (PPM) to currently over 370 PPM have enhanced the greenhouse effect<sup>4</sup>. Studies indicate that the result of this increase in atmospheric carbon has increased the global average temperature by positive 1.42 °F between 1906 and 2005<sup>5</sup>. This upward trend is expected to continue and the EPA estimates that mean temperatures in New Jersey could rise by as much as 4 °F by the year 2100. These findings generally correspond with the warming trend data presented from the Plainfield Weather Station in Section 3.1 and other regional climate datasets. This change may result in drastic weather pattern changes and observable warming trends in northern latitudes with major impacts on ecosystems, human health and on the quality of life<sup>5</sup>.

### **3.2.1 Regional Ecological Impacts of Global Climate Change**

As stated above, scientific evidence suggests that the earth's climate is changing and, without substantial intervention, will continue to change throughout the world in the coming decades with various consequences to ecosystems. While there is ample climatic and ecological evidence for anthropogenic climate change, the precise and localized predictions of impacts are difficult to determine due to the numerous variables involved. Long-term variations in emission volumes, climate and ecosystem response, and other compensation mechanisms or compounding factors all complicate the process of determining impacts<sup>22</sup>. This section discusses some impacts that may occur, particularly where there is already existing evidence. Certainly in the future, land stewards, municipal planners, and agency representatives responsible for managing land will need to carefully monitor conditions and take an adaptive approach to mitigating impacts of global climate change on their lands or within their communities. This may be of particular importance in communities such as North Plainfield that contain high population densities and are subject to impacts from flash flooding (see Section 7.5).

#### **Changes in Temperature**

In addition to increased precipitation, some studies have projected two to five fold increases of extremely hot summer days and increases in short-term (one to three months) warm season droughts in the Northeast<sup>7</sup>. As previously mentioned, the data collected at the Plainfield Weather Station appears to reflect this trend (see Section 3.1). These increased extreme heat days could lead to an increase in heat stress events and impacts for the public, particularly for vulnerable populations, such as the elderly and urban poor<sup>7</sup>. The increased frequency of extreme heat events may increase water demands within ecosystems (see below). This demand would be associated with increases in evaporation and evapotranspiration (from plant growth and productivity)<sup>8</sup>.

#### **Changes in hydrological cycles**

The earth's hydrological cycles are directly connected to climatic radiation and temperature levels<sup>23</sup>. As a result, unstable hydrological fluctuations induced by climate change are a major concern within the Northeast. The Northeast is expected to have an increase in intense rain events particularly in winter months<sup>7</sup>. Some estimates identify increases in winter flooding and precipitation by as much as 20 to 30% within the Northeast<sup>8</sup>. Evidence currently suggests that northern New Jersey's precipitation levels have increased by 12% between 1971 and 2000 when compared to levels between 1895 and 1970<sup>3</sup>. Due to the increased summer temperature, the increased evaporation of moisture, and the subsequent drying of soil; the frequency of short-term droughts (1 to 3 months) is expected to increase in the Northeast without intervention<sup>7</sup>.

Due the historic flooding conditions of the Green Brook Watershed (see Section 7.5), any increase in volume or frequency of flooding is of concern to North Plainfield and the surrounding communities for ecological, quality of life and economic reasons. In light of the potential for increases in flooding episodes, proper management and restoration of floodplains that provide flood storage and dissipate runoff will become increasingly vital.

### **Changes in ecology and ecological interactions**

Included in this section are several examples of generalized ecological impacts potentially accelerated by global climate change. It is important to consider that these examples are a small sample of the many ecological complications that could be caused by this phenomenon. Furthermore, many interacting variables, including invasive species changes, stress and disease, habitat loss, species competition, deer grazing, seed dispersal and other wildlife influences may alter the predicted outcomes of climate change<sup>8</sup>. For example, studies indicate that red maple (*Acer rubrum*), a common wetland forest component of North Plainfield, may benefit or be impacted by climate change based on the severity of climate change and other variables<sup>8, 10</sup>. Nevertheless, increasingly observable ecological impacts resulting from climate change are a certainty in the future.

Habitat specific and migratory species, including wetland and northern forest birds (such as warblers and thrushes) have been determined to be particularly vulnerable to global climate change<sup>6</sup>. This could have implications to impact some of the migratory bird species that may seasonally utilize the floodplain forests of North Plainfield (see Wildlife Section 10). More adaptable resident bird species that may be visible in the backyards and forest fragments of North Plainfield, such as blue jay (*Cyanocitta cristata*), American robin (*Turdus migratorius*), Northern cardinal (*Cardinalis cardinalis*), tufted titmouse (*Baeolophus bicolor*), and red-tailed hawks (*Buteo jamaicensis*) may be less affected or increase under various emissions scenarios<sup>6</sup>.

Various ecological interactions, such as mutualisms, competition and parasitism, could be heavily disrupted by global climate change. The impacts of global climate change on ecosystems become compounded as certain invasive animals, plants, fungi and diseases become more successful at populations within an ecosystem. Invasive insects that may benefit from warming scenarios may include the woolly adelgid (*Adelges tsugae*), emerald ash borer (*Agrilus planipennis*), and gypsy moth (*Lymantria dispar dispar*). Certain parasitic fungi and other diseases, including Dutch elm disease, white pine blister rust and beech bark disease, are also expected to benefit from climate change<sup>8</sup>. The acceleration of the emerald ash borer (beetle) and Dutch elm disease would be of particular concern to North Plainfield due to the presence of green ash and American elm in North Plainfield floodplain forests. In addition to potential changes in insect pests, insects beneficial to humans may be impacted as well. Vital plant–pollinator relationships between insects and flowering plants may be disrupted as timing between the flowering species and the seasonal activity (phenology) of their insect hosts is interrupted<sup>11</sup>.

Species shifts in northeastern forest ecosystems may occur as seasonal temperatures become milder as some southern species of trees expand northward and northern species disappear from the southern portion of their range<sup>23</sup>. Various invasive plants known within the vicinity of North Plainfield and the surrounding region, including Japanese honeysuckle (*Lonicera japonica*), appear to respond positively to rising carbon dioxide (CO<sub>2</sub>) and would be expected to expand their range in northeastern forests<sup>8</sup>. In addition, the increased CO<sub>2</sub> may result in an increase in the presence and toxicity of poison ivy (*Toxicodendron radicans*). Poison ivy, although native, is an aggressive and opportunistic plant that is common in a variety of habitats in North Plainfield, including disturbed successional areas and forests, particularly along forest edges. Studies have found that in the presence of increased atmospheric CO<sub>2</sub>, poison ivy may grow

more vigorously and produce a stronger form of urushiol, the oil toxin that results in rashes on humans<sup>12</sup>.

### **3.2.2 Mitigating impacts of Global Climate Change**

The complexity of global climate change can make determining ways to mitigate its impacts on a local or regional level a daunting task. Understanding its complexity, developing solutions, and mitigating impacts requires the involvement and cooperation of the scientific community (from many biotic and abiotic scientific disciplines), as well as cooperation and action from individuals representing a broad spectrum of cultural and political backgrounds.

#### **State Level Actions**

New Jersey enacted the Global Warming Response Act in 2007 (P.L.2007, c.112) based the best available science and consideration of economic growth. This law requires stabilization of statewide greenhouse gas emissions to 1990 levels by 2020, followed by a further reduction to 80 percent below 2006 levels by 2050<sup>3</sup>. In response to the Act, the State subsequently released the 2009 New Jersey Global Warming Response Act Recommendations Report<sup>13</sup>. This report outlines the major sources of global climate change in New Jersey, the various solutions that may be enacted, and the economic costs and benefits of global climate change and climate change mitigation<sup>31</sup>. The report was developed with input from a range of State agencies, including Environmental, Public Utilities, Treasury, Banking and Insurance, Transportation, Agriculture, Economic Development, and Community Affairs departments.

To facilitate New Jersey to a clean energy economy that meets the required reductions in greenhouse gas emissions, NJDEP developed the Sustainability and Green Energy (SAGE) Program<sup>3</sup>. The SAGE Program identifies five major objectives: Accelerate the Transition to a Clean Energy Economy; Enable Responsible and Sustainable Economic Growth; Provide Resources on Sustainability; Foster Environmental and Energy Innovation; and Address Climate Change and Global Warming. With regard to climate change, the program seeks to reduce greenhouse emissions, preserve sinks (or natural storage resources) for carbon such as forest soils and wetlands, and mitigate unavoidable impacts such as coastal flooding.

#### **Municipal Actions**

One of the key actions stated in the SAGE Program objectives is support for the Sustainable Jersey Program, which was developed in 2009. Sustainable Jersey is a certification program for New Jersey municipalities that seek to reduce their carbon footprint, become more energy efficient, and sustain the quality of life in their communities<sup>14</sup>. The program currently has 116 certified municipalities within New Jersey. Citizens of North Plainfield have worked to improve the sustainability of the municipality and mitigate impacts of global climate change. As a result, the municipality received a “Bronze” level certification from Sustainable Jersey in 2011<sup>14</sup>.

Actions that North Plainfield has participated in include:

- **Partnerships and Outreach:** Development or continuation of Municipal Committees, Commissions and Partnerships, including the Environmental Commission, Shade Tree Advisory Board, and the Green Team. The North Plainfield Green Team Committee was established and first met in 2010. The Green Team works to identify sustainability issues

to be resolved and what actions may be taken. The Shade Tree Advisory Board works to inventory and safeguard public trees and meet the no net loss canopy goal.

These groups have worked with the Borough Council, Planning Board, Mayor's Office, Economic Development, and the Board of Adjustment on sustainability initiatives and environmental protections including a sustainability portion of the North Plainfield Master Plan.

- **Tree and Woodlands Management:** In addition to acting as a carbon sink, shade trees assist in cooling of public spaces, facilities, and residences and, when utilized effectively, can reduce energy emissions and costs. The North Plainfield Borough Council has passed a Tree Protection ordinance regulating the maintenance and removal of public trees. The ordinance is enforced by the Shade Tree Advisory Board and Department of Public Works and seeks “a no net loss of public canopy trees within the Borough.”

As of 2011, the Shade Tree Advisory Board estimated the North Plainfield's canopy cover at 60 - 65% and developed a State-approved Tree Management Plan. As part of woodland management activities, the Environmental Commission has identified invasive species and developed actions to control these species (see Section 9, Land Use).

- **Land Use:** On September 26, 2011, the North Plainfield Borough Council passed a Sustainable Land Use Pledge resolution. The resolution has been distributed to the Planning Board, Board of Adjustment, Board of Education, Environmental Commission, Economic Development Committee and the Mayor's office.
- **Energy Audits for Municipal Buildings and Green Design:** An energy audit was conducted for four public buildings in 2009, with the intent of seeking ways to improve the energy efficiency of these buildings. In 2011, a Green Building Design Ordinance was created with a green development checklist for commercial and residential buildings.
- **Support of Local Food:** North Plainfield Farmer's Market was developed to promote the purchase of local produce and sustainable food consumption.
- **Wildlife and Wildlife Habitat:** On August 16, 2010, the Borough Council passed a Pledge Supporting NJ Wildlife Action Plan. The NJ Wildlife Action Plan was developed to provide a plan for protection of the State's most imperiled species. The Plan's land use goal includes the sustainability or expansion of healthy forest in the Piedmont Region. The goal of maintenance of these native forests is consistent with the goals of Sustainable New Jersey. The resolution was distributed to the Mayor's Office, Planning Board, Board of Adjustment, Environmental Commission, Economic Development Committee, and the Plainfield Area Humane Society, which acts as the Borough's animal control entity.

## 4.0 AIR QUALITY

The air quality in New Jersey has improved significantly since the passage of the Clean Air Act in 1970. New Jersey is now in compliance with all National Ambient Air Quality Standards (NAAQS, 40 CFR 50), except for ozone. While national levels have improved, local air quality issues pertaining to air toxics and particulate matter (PM) remain. In 1998, the US Environmental Protection Agency (EPA) created emission density maps that depict emission tons per square mile for counties throughout the Country. NJDEP indicates problems with air quality issues, such as diesel emissions, ozone and air toxics from industrial and transportation sources, potentially impact the health of large numbers of individuals, particularly sensitive groups such as children and asthmatics.

### 4.1 Regional Air Quality – Criteria Pollutants

The most recent ambient air quality data for Criteria Pollutants in the Somerset County Region (Region 3 –Suburban Region) were obtained from the 2011 Air Quality Report published by the NJDEP Bureau of Air Monitoring <sup>15</sup>. In New Jersey, there are continuous monitoring stations that monitor six specific criteria air pollutants, which are used as indicators of air quality and for which Ambient Air Quality Standards (AAQS) have been established by the EPA. These pollutants are listed as carbon monoxide (CO), nitrogen oxides (NO<sub>2</sub>), ozone (O<sub>3</sub>), sulfur dioxide (SO<sub>2</sub>), particulate matter (PM), and lead (Pb). Because ambient levels have dropped far below the standard throughout the State, lead is only monitored through the Bureau of Air Quality Monitoring Network at the New Brunswick Station. Ambient air quality data is used as the baseline for evaluating the effect of the construction of new emission sources or of modifications to existing sources. New stationary sources of air contamination require permits from the NJDEP, Bureau of Air Quality.

Air quality monitoring for criteria pollutants is performed by the NJDEP in five locations in Region 3 Suburban Region, which includes Morris, Somerset and Middlesex Counties. Table 3 indicates the pollutants monitored at the region’s stations. Stations within the vicinity of North Plainfield include the Chester and Morristown Stations, which are approximately 16 miles northwest and 12 miles north of North Plainfield, respectively.

<b>Table 3 Criteria Pollutants monitored within the Suburban Reporting Region (Includes North Plainfield Borough) <sup>15</sup></b>						
<b>Station</b>	<b>County</b>	<b>CO</b>	<b>SO<sub>2</sub></b>	<b>PM</b>	<b>O<sub>3</sub></b>	<b>NO<sub>2</sub></b>
Chester	Morris	-----	X	-----	X	X
Morristown	Morris	X	-----	-----	-----	X
New Brunswick	Middlesex	-----	-----	X	-----	-----
Perth Amboy	Middlesex	X	X	X	-----	-----
Rutgers University	Middlesex	-----	-----	-----	X	X

X = Tested at Station

---- = Not tested at Station

The air monitoring data is also used to characterize the general air quality within nine distinct Air Quality Index Reporting Regions covering New Jersey. Descriptor ratings, ranging from “Good” to “Very Unhealthy,” have been established to provide a general system of rating the regional air quality. The NAAQS is given a numerical Air Quality Index (AQI) rating. The primary health based standard AQI rating for each pollutant is generally a value of 100; any pollutant values above 100 are considered unhealthy. The values for each pollutant are as follows: 0-50 is considered “good” air quality; 51-100 is considered “moderate;” 101-150 “is unhealthy for sensitive groups;” 151-200 is “unhealthy;” and 201-300 is “very unhealthy.”

The summary of air quality throughout New Jersey in 2011 found that 166 days were considered “good;” 153 days were considered “moderate;” 44 days were considered “unhealthy for sensitive groups;” and two days were considered “unhealthy.” According to the 2011 Air Quality Report, the Suburban Metropolitan Region had the fifth greatest amount of days reported as “good” among all nine reporting regions at 305. There were 48 days within the region ranked “moderate” and 12 days ranked as “unhealthy for sensitive groups”<sup>15</sup>. Three of the eight other reporting regions had worse criteria pollutant air quality conditions than the Suburban Region in 2011. The Southern Metropolitan Region, which includes Union, Essex and Hudson Counties, had the poorest air quality of the State’s reporting region.

Unhealthy Air Quality days in New Jersey more often occur during the summer months in urban areas adjacent to Philadelphia and New York City. Ozone and particulate matter are the most common pollutants exceeding standards in these areas. Sulfur dioxide (SO<sub>2</sub>), particularly in the Northern Delaware Valley, is also a common pollutant exceeding standards in New Jersey. Increased levels of SO<sub>2</sub> in New Jersey have been linked to power plant emissions in eastern Pennsylvania<sup>15, 16</sup>.

There were several AQI Exceedances (above 100) for the Suburban Reporting Region in 2011, primarily at the Rutgers University Monitoring Station. Excessive ozone (see Section 4.2) occurred on May 31, June 1, and July 21 at the Rutgers Station and on July 20 at the Chester Station. The Rutgers Station also had a SO<sub>2</sub> exceedance on June 1, 2011 and a PM (see Section 4.2) exceedance on July 21, 2011. The Chester Station had a single particulate matter exceedance on July 21, 2011<sup>15</sup>.

## **4.2 Regional Air Quality - Air Toxics**

Air toxics are a large group of pollutants that are likely to be emitted into the atmosphere in large enough quantities to result in adverse health effects, including lung and respiratory conditions, birth defects, and cancer. Although there is no Federal air quality standard for these toxicants, Congress in 1990 directed the EPA to begin addressing 200 of these substances known as Hazardous Air Pollutants (HAPs) by developing technology control standards<sup>17</sup>.

The EPA has subsequently established chemical specific health benchmarks based on toxicity values<sup>17</sup>. NJDEP started monitoring these substances in 1989 to determine if they exceed safe levels within the State. Some of these toxicants are tested for in Air Quality Monitoring Stations through a manual monitoring network. This data obtained through collected samples are then analyzed in a laboratory. The data collected through manual sampling cannot be monitored in



real time as the criteria pollutants are. Seventy volatile organic compounds and 13 metals are monitored under the manual monitoring network as air toxics. Estimates in New Jersey derived in 2005 found that the State releases 67,370 tons of air toxics annually at that time<sup>18</sup>. The 2005 data found that approximately 33% of air toxics are derived from on-road mobile sources, such as cars, buses, and trucks; 29% are derived from non-road mobile sources, such as lawnmowers, airplanes, boats and trains; 31% are derived from non-point sources, such as residential, commercial, and small industrial sources; and 7% are derived from point sources, such as factories and power plants<sup>18</sup>.

The largest group of air toxics are volatile organic compounds (VOC; see Section 4.8 Contamination). In 2005, the EPA determined that the top five cancer risk VOCs in Somerset County, based on toxicity and background concentrations, are formaldehyde, benzene, acetaldehyde, carbon tetrachloride, and naphthalene<sup>19</sup>. Acrolein was found to create the greatest respiratory risk in the State<sup>19</sup>. Since 1994, overall statistical trends in major VOC emissions has decreased in New Jersey due to improvements in automotive emissions technologies and more stringent standards and most VOCs are approaching health benchmarks. In spite of these significant reductions, exceedances over benchmarks still occur for various VOCs (see Table 4).

In addition to being linked to adverse health problems, VOCs contribute to the development of ground level ozone (O<sub>3</sub>). Ozone is a gas that forms when nitrogen oxides and VOCs react in the presence of sunlight and heat. Ozone is formed during daylight hours in the summer. Ozone is the most common criteria pollutant exceeding standards in the State. Repeated exposure to ozone results in damage to the lungs and aggravates many respiratory ailments. Children and asthmatics are especially prone to be affected by exposure to ozone.

Metals are another group of potentially dangerous air toxics (see Contamination Section 4.8). These metals are sometimes naturally occurring, but may be released into the atmosphere through combustion and industrial processes. These substances may be associated with cancers, human development impacts, and other health issues. The most prominent toxic metals identified in as risk levels in the State include arsenic, cadmium, chromium, cobalt, and nickel<sup>18</sup>.

Air Toxics are measured on a regional scale at three monitoring stations within New Jersey: Chester (within Morris County), Elizabeth (Union County), and New Brunswick (Middlesex County). Due to their occurrence within the same (Suburban) reporting region (see Section 4.1), data from the Chester (approximately 16.5 miles northwest) and the New Brunswick (approximately 9 miles south) Air Monitoring Stations were evaluated and included in Table 4 and 5. Data from chemicals exceeding established health benchmarks is expressed in micrograms per cubic meter (ug/m<sup>3</sup>). Table 4 also includes a risk ratio, which evaluates the potential harm of a chemical by evaluating its concentration in the sample against the established benchmark. If the risk ratio is greater than 1, its level of concentration may be of health concern<sup>18</sup>. The results indicate that four substances, including the VOCs acrolein and formaldehyde, and the metals chromium and cadmium, are by many magnitudes, the highest risk ratio of the chemicals exceeding benchmarks at the Chester and New Brunswick Stations in 2011. These chemicals are discussed briefly below. In addition, concerns regarding the vaporization of trichloroethylene (TCE) with regard to the Lockheed Electronic Company are also discussed.

<b>Table 4 Air Toxic VOCs Exceeding Long-term Health Benchmarks New Brunswick and Chester Lab Monitoring Stations (2011)</b> <sup>18</sup>					
<b>Pollutant</b>	<b>Chester Mean (ug/m<sup>3</sup>)</b>	<b>New Brunswick Mean (ug/m<sup>3</sup>)</b>	<b>NJDEP Long term Health Benchmark (ug/m<sup>3</sup>)</b>	<b>Chester Risk Ratio</b>	<b>New Brunswick Risk Ratio</b>
Acetaldehyde	1.61	2.49	0.45	4	6
Acrolein	1.19	0.76	0.02	59	38
Acrylonitrile	0.10	0.089	.015	7	6
Benzene	0.52	0.71	0.13	4	5
1,3 Butadiene	NA	0.054	0.033	≤1	1.6
Carbon tetrachloride	0.62	0.59	0.17	4	3
Chloroform	0.10	0.12	0.043	2	3
Chloromethane	1.23	1.29	0.56	2	2
Ethylbenzene	NA	0.49	0.40	≤ 1	1.2
Formaldehyde	2.37	2.70	0.077	31	35

NA- Not applicable (does not exceed benchmark)

<b>Table 5 New Jersey Air Toxic Metals Exceeding Long-term Health Benchmarks New Brunswick and Chester Lab Monitoring Stations (2011)</b> <sup>3</sup>					
<b>Pollutant</b>	<b>Chester Mean (ug/m3)</b>	<b>New Brunswick Mean (ug/m3)</b>	<b>NJDEP Long term health Benchmark (ug/m3)</b>	<b>Chester Risk Ratio</b>	<b>New Brunswick Risk Ratio</b>
Arsenic	0.0003	0.0004	2.3E-04	1.3	1.5
Cadmium	0.002	0.003	2.4E-04	10	13
Chromium	0.004	0.005	8.3E-05	48	64
Cobalt	0.0004	0.0007	1.1E-04	4	6

### VOCs Exceeding Risk Ratios

**Acrolein** is an industrial VOC typically associated with the production of acrylic acid and vaporizes easily into the atmosphere. Acrolein is released during combustion of materials including fossil fuels, tobacco smoke, cooking oils and grease, and unintended fires. It may also be used as an agent to control aquatic weeds, bacteria, algae and mollusks<sup>20</sup>. Exposures to acrolein typically come from breathing in tobacco smoke, automobile exhaust, vapors from cooking grease, or exposure to facilities where acrolein is manufactured or used<sup>7</sup>. The chemical dissipates rapidly from soil and water, and breaks down rapidly in the air (50% within one day of release) due to interaction with chemicals and sunlight<sup>20</sup>. Little is known about the health effects of acrolein; however, breathing large quantities could cause lung damage or death. Exposure to lesser amounts can cause eye and throat irritation<sup>20</sup>. The EPA has not determined this chemical to be carcinogenic based on the lack of data.

**Formaldehyde** is a colorless VOC gas with a pungent smell commonly used for a variety of applications. It is used in the production of textiles, resins and other chemicals. It is also used as embalming fluid, disinfectant, fungicide, fertilizer and food preservative, and can also be found in some cosmetics and medicines. Formaldehyde naturally occurs in low levels in plants and animals, including humans <sup>20</sup>. Indoor air levels of formaldehyde are generally greater than outdoor air levels. In general, formaldehyde breaks down quickly in the air (typically within hours) and dissipates quickly in water. It evaporates rapidly from soils and does not accumulate in plant or animal tissue <sup>20</sup>. The most common exposure to formaldehyde is direct inhalation. Formaldehyde is classified as a carcinogen and a mutagen based on inhalation studies <sup>20</sup>. It is corrosive in nature and can cause eye, ear nose mouth, throat or skin irritation and neurological damage <sup>7</sup>.

One localized VOC concern that has been studied in North Plainfield is the potential presence of **Trichloroethylene** (TCE; see Section 4.8.3 for a description) in indoor air resulting from a subsurface contamination plume associated with the former LEC site. An ongoing vapor intrusion study conducted by Tetra Tech Engineers has occurred at selected buildings within Regency Village Apartments in North Plainfield and the Avalon Watchung Apartments in Watchung Borough. As of June 2013, two sub-slab soil gas samples exceeded Soil Gas Screening Level (SGSL) at two buildings in the Avalon Watchung Apartments; however, Tetra Tech did not find TCE exceeding the acceptable SGSL in the indoor air in those samples or at any other tested location in the study, indicating there may not be a pathway for TCE to enter the indoor air <sup>21</sup>. Additional tests are being considered for some buildings based on these findings <sup>4</sup>. The comprehensive study report may be viewed at the Lockheed Martin website: <http://www.lockheedmartin.com/us/who-we-are/eesh/remediation/north-plainfield.html>

### **Metals Exceeding Risk Ratios**

**Cadmium** is a known carcinogen metal that can impact multiple human organ systems, including cardiovascular, gastrointestinal, neurological, renal and reproductive systems. It can also interfere with human development. This mineral can be found within the earth and with other elements, such as oxygen. It is typically extracted during production of other metals, such as copper or zinc. Cadmium is corrosion resistant and has multiple industrial purposes, such as use in batteries, pigments, and metal and plastic coatings <sup>20</sup>.

**Chromium** is a known carcinogen known to impact the renal, respiratory and immunological systems in humans. Some forms of chromium are naturally occurring and essential nutrients, other industrial forms are dangerous. Various forms are used for making steel, dyes, chrome plating, tanning and wood preservation <sup>20</sup>. The hexavalent chromium form ( $\text{Cr}^{+6}$ ) is the variant used for the health benchmark. It is not known how much of the monitored chromium at the stations is  $\text{Cr}^{+6}$ .

### 4.3 Diesel

Diesel exhaust is a complex mixture of compounds in gas and particle form. The PM of diesel has a central core of carbon (soot) and organic compounds, and trace elements including sulfates, nitrates, metals and other trace elements. PM produced by diesel engines, or diesel PM, degrades air quality and threatens public health and has been identified as being carcinogenic. Localized high levels of diesel PM may occur in North Plainfield, particularly within the vicinity of major transportation areas, such as along the Route 22 corridor. Sources may include trucks, construction vehicles and buses that emit a mixture of primarily gas and solid pollutants, including black carbon soot.

Children, specifically those with asthma or other chronic respiratory illnesses, may be particularly sensitive to any exposure to diesel exhaust. The overall level of New Jersey citizens' exposure to diesel emissions remains uncertain. According to NJDEP, it is difficult to measure the level of diesel emissions in the atmosphere because it is a complex mixture of substances. With funding from the New Jersey Center for Environmental Indicators, NJDEP is seeking to develop a measurement process for determining levels of exposure to diesel within the State. Diesel PM levels have been found to exceed standards on occasion at monitoring stations within the North Plainfield region.

The NJDEP Diesel Risk Reduction Program has multiple initiatives to reduce diesel PM in the environment. This includes a series of amendments (N.J.A.C. 7:27 14.1, 14.3-14.7; 7:27A3.10, and 7:27B, 4.1, 4.3 and 4.4) and new rules (N.J.A.C. 7:27 14.8-14.10, and 7:27-32) that are designed to cut diesel emissions through retrofitting diesel reduction units to certain equipment, vehicle inspections, idling restrictions for school buses and other vehicles, and diesel reduction for ships, trains planes and equipment associated with New Jersey ports<sup>24</sup>.

#### 4.4 References for Climate and Air Quality

- 1 Office of the State climatologist 2012. General Background Information  
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## 5.0 GEOLOGY

Natural forces, including glaciations, erosion, sedimentation, fluvial processes, and freeze/thaw cycles interact with the outcropping geology and drastically influence environmental conditions. Understanding the underlying geology of a site is critical to understanding the nature of ecosystems. Regional hydrology, topography and slope development, development of soils<sup>29</sup>, vegetation and wildlife are all heavily influenced by the underlying geology.

The friability (ability to crack) and permeability of bedrock influence the volume and quality of groundwater recharge and release<sup>1</sup>. Geologic formations provide the parent material for soil development and thus influence soil physical and chemical characteristics, such as texture and pH<sup>2</sup>. The geological processes that occur including tectonic plate shifts, volcanic eruptions and weathering rates of bedrock material result in slopes, mountains, valleys, caves, outcrops and other topographic characteristics. The resultant hydrological, soil and topographic conditions all influence the nature of the associated vegetation communities<sup>2</sup>. Due to the close interrelationship between geology and aquifers, both subjects are considered in this chapter.

### 5.1 Physiography

Physiography is the relationship between a particular location and its underlying regional geology. The billion plus years of geological processes which have formed New Jersey have resulted in the development of four major landforms with distinct features referred to as physiographic provinces<sup>3</sup>. These four provinces include the Ridge and Valley and Highlands provinces in northwestern New Jersey, the Piedmont in northeastern and central New Jersey, and the Coastal Plain in southern New Jersey. The Piedmont Province area may be referred to as the Newark Basin. The “basin” refers to the Province’s half-graben geologic form. A half-graben is a depressed area of land bordered by a fault on one side. The half-graben forming the Newark Basin is filled with bedded layers of non-marine sedimentary and igneous (volcanic) rock and bordered by the Ramapo Fault to the west. The Borough of North Plainfield is located in the near center of the Piedmont Province within New Jersey (see Appendix A, Geology Map).

The Piedmont Province is a 1,600 square mile area situated in northern and central New Jersey between the Highlands and Coastal Plain. In New Jersey the province underlies the counties of Essex, Hudson, Union, Hunterdon, and Somerset, most of Bergen, and parts of Mercer, Middlesex, Morris, and Passaic. The Piedmont is characterized by gently rolling plains of elevations typically between 200 to 400 feet above mean sea level (AMSL). The plains are separated by a series of erodible ridges. Mildly folded and faulted sedimentary rocks of Triassic and Jurassic age (240 to 140 million years old), comprise the Piedmont valleys while Jurassic age igneous rocks comprise ridge areas within the formation.

The Wisconsinan Glaciation, which occurred 110,000 to 10,000 years ago, resulted in the development of a massive ice sheet which covered much of northern New Jersey and influenced all aspects of geology in the Piedmont Province and elsewhere. As this glacier shifted and melted, it deformed and moved surface materials and land topography. During the melting process, a massive lake (Lake Passaic) formed and subsequent rivers, streams and wetlands formed. Hydrologic action transported and deposited soil and rock trapped within the glacier.

Today, the wetland remnants of Lake Passaic include the Passaic Meadows and the Great Swamp within the Piedmont Province.

## 5.2 Stratigraphy and Geologic Formations

Stratigraphy refers to the rock layers and layering of geologic formations. Geologic formations within North Plainfield consist of surface formations with contribute to soil development and underlying bedrock formations. The underlying bedrock formations within the Borough of North Plainfield are limited to two sedimentary bands of the Passaic Formation oriented in a northeast southwest orientation (see Appendix A, Geology Map). There are no igneous bedrock formations within North Plainfield; however, the Orange County basalt formation that forms part of the Watchung Mountains is immediately to the north of the Borough in Green Brook (see Appendix A, Geology Map). These two sedimentary formations and the adjacent igneous basalt formations are discussed in this section. All descriptions of geologic formations are summarized from NJDEP New Jersey Geological Survey geologic mapping.

### 5.2.1 Surficial Geology <sup>4</sup>

Above the bedrock formations within North Plainfield are surface formations which may be several to over 100 feet thick. Within North Plainfield, these surface formations are primarily sedimentary materials influenced by glacial action during the Holocene (12,000 to 11,500 C years ago) and Late Pleistocene (126,000 to 11,900 C years ago) eras (see Section 5.1). There are four sedimentary surficial formations within North Plainfield (see Geology Map). An additional surface formation derived from igneous basalt is located along the base of the Watchung Ridge just north of North Plainfield. The surface formations within the municipality are as follows:

**Late Wisconsinan Glaciofluvial Plain Deposits** This material consists of yellowish brown to reddish brown sand, pebble-to-cobble gravel. The formation may be as 80 feet thick 80 feet thick. This formation is formed from plains deposited by glacial streams during the late Wisconsinan glaciation. It is found primarily in non-floodplain areas southwest of Westervelt in North Plainfield.

**Alluvium** This material consists of reddish brown, yellowish brown, brown, gray sand, gravel, silt, minor clay and peat reaching thicknesses as much as 20 feet thick. Alluvium occurs in modern floodplains and channels and was deposited during the Holocene and late Pleistocene Eras. Alluvium is the primary formation covering the majority of the floodplains of the Green and Stony Brooks within North Plainfield.

**Weathered Shale, Mudstone, and Sandstone** This material consists of reddish brown, yellow, light gray silty sand to silty clay with shale, mudstone, or sandstone fragments. The formation ranges from 10 feet thick on shale and mudstone, 30 feet thick on sandstone. This formation occurs in a single patch occupying most of North Plainfield northeast of Westervelt Avenue.

**Pensauken Formation** This formation consists of yellow, reddish yellow and white sand, clayey sand, pebble gravel, minor silt, clay, and cobble gravel. Sand within this formation may include weathered feldspar. This formation is as much as 140 feet thick. This formation is the erosional



remains of a river plain that occupied the broad valley within the Inner Coastal Plain area. A small patch of this formation occurs partially within the northern most tip of North Plainfield near Graybar Drive.

## 5.2.2 Bedrock Geology

### Igneous Formations

**Orange Mountain Basalt Ja**<sup>5</sup> Basalt is an igneous rock made of very fine grained material that includes small amounts of quartz (under 20%) and larger amounts of feldspar (over 65%). Basalt is formed from volcanic magma that is rapidly cooled at or near the earth's surface. Basalt does not erode as easily as the surrounding sedimentary rock and therefore forms ridges within the Piedmont.

The Orange Mountain Basalt is a 200 m thick formation comprised of primarily dark greenish gray to greenish black basalt. It occurs just north of North Plainfield Borough in Green Brook Township and forms the first Watchung Mountain.

### Sedimentary formations

**Passaic Formation Mudstone Facies JTrpms**<sup>5</sup> This unit is the dominant bedrock formation in North Plainfield and underlies all nearly all portions of the Borough below Route 22 (see Appendix A, Geology Map). The unit consists primarily of reddish-brown to brownish-red, massive silty to sandy mudstone and siltstone. This formation underlies most portions of North Plainfield below the vicinity of Route 22.

**Passaic Formation JTrp**<sup>5</sup> (Lower Jurassic Upper Triassic) Certain outcropping portions of the Passaic Formation are mapped as an entire undivided formation. The undivided formation consists of reddish brown to brownish purple and grayish red siltstone and shale. The whole formation is approximately 11,810 ft. thick. Within North Plainfield, the Passaic Formation forms a narrow approximate 1200 to 1400 foot band that runs in a northeast southwest orientation on either side of Route 22.

### Fault lines

Several fault lines occur within the vicinity of North Plainfield Borough (see Appendix A, Geology Map). One unnamed fault line runs in a north-south orientation between Parkview Avenue to the south and Maple Avenue to the north in the southern part of the Borough. Several other faults including one major fault, the New Brunswick Fault, run in a general north-south orientation just to the east of North Plainfield.

Faults represent a fracture in a section or volume of rock where some displacement between the sections of rock, due to earth movement, has occurred. Normally, the fault consists of multiple fractures or deformities within an area referred to as a fault zone as opposed to a single clean fracture. The faults around North Plainfield are considered "normal" faults. Normal faults are

formed when one mass of land drops down relative to land on the other side of the fault. The influence of fluid and contamination migration along fault lines is discussed below.

### **5.3 Aquifers and Hydrogeology of Recharge Areas**

Aquifers are saturated permeable geologic units (similar to those described above) that can transmit significant quantities of water under ordinary hydraulic gradients. Geologic formations that have hydraulic conductivity values tend to be the most productive in terms of well yields (see below). Examples of aquifers with high conductivity include unconsolidated sands and gravels, permeable sandstones and limestones, and heavily fractured sedimentary, volcanic and crystalline rocks. North Plainfield Borough's aquifers are associated with sedimentary mudstones, sandstones and shales of the Passaic Formation may have varying levels of hydrologic conductivity or the ability of water to be transmitted horizontally or vertically through rock formations. A discussion of this conductivity of water relative to the Passaic Formation is discussed further in the contamination section of the ERI.

Various aquifers have different well yields (amount of water a well can provide) depending on characteristics of the aquifers. These yields may range from 1 to 3,000 gallons of water per minute (GPM) within the state of NJ. While there are no active public-community wells functioning in North Plainfield due to contamination, basic aquifer information on well yield and location of well head protection areas are still discussed in the ERI. This information is significant within North Plainfield because it provides insight into the permeability and size of aquifers within the municipality's geologic formations, which has bearing on the migration of contamination.

The NJ Geological Survey has assigned a well yield ranking system for the aquifers of the state based on the findings of high capacity wells. The aquifers are ranked from A to E depending on GPM yield. The ranks are as follows: E, less than 25 gpm; D, 25 to 100 gpm; C, greater than 100 gpm to 250 gpm; B, greater than 250 gpm to 500 gpm; and A, greater than 500 gpm<sup>6</sup>. It is important to consider that the well yield data collected for this ranking system is from high capacity wells and does not represent all wells located within the aquifer. High capacity wells are often created after thorough hydrologic and geologic investigations and may be installed near surface waters that contribute to well-yields totals<sup>7</sup>.

Bedrock aquifer yields are often related to the amount and impact of weathering on bedrock. Weathering increases fracture sizes between rocks and amount of water storage and transmission through these rocks depends on the separation distance between fractures. Fracture separations may range from several inches in some types of rocks to several feet in others. Most weathering of rocks occurs near the surface of bedrock to 75 feet. Although weathering may occur to 500 feet, most fractures providing high yield wells will be encountered at depths of less than 150 feet. Faults within the Newark Basin tend to act as a barrier to hydrologic conductivity as they tend to break the continuity of Aquifer beds. They can; however, direct the flow parallel to the fault itself<sup>11</sup>.

Aquifers may be either confined or unconfined. Confined aquifers are situated such that less permeable formations (called aquitards) are located above and below the aquifer, confining the

groundwater in the aquifer. The aquifers nearest the ground surface (such as unconsolidated surface aquifers) are generally unconfined aquifers. An actively pumped well in an unconfined aquifer can draw down the surface water table in the vicinity of the well when pumped, affecting nearby surface water bodies<sup>8</sup>. There is one bedrock aquifer associated with the geologic formations of North Plainfield- the Brunswick Aquifer. This aquifer is briefly discussed in this Section.

### **5.3.1 Brunswick Aquifer**

The Brunswick Aquifer derives its name from its association with the Brunswick Formation, currently known as the Passaic Formation (see Section 5.2). Piedmont aquifers within exist within the weathered joint and fracture systems of shales within the upper 200 – 300 ft)<sup>9, 10</sup>. Fracture areas are smaller and water availability lessens below 500 feet within the formation. Intergranular spaces within the aquifer and coarser grained sandstones also hold water<sup>9</sup>. The shale and sandstone portions of the Brunswick Aquifer tend to be the most productive and contain wells known to yield up to 1500 gallons per minute (gpm)<sup>38</sup>. The Brunswick Aquifer high capacity well yields range from 20 to 460 gpm with a mean of 188 gpm, giving it a “C” ranking. A USGS study of 709 domestic wells within Stony Brook, Beden Brook and Jacob’s Creek drainage basins resulted in a median well yield of 15 gpm for Passaic Formation wells, exceptionally lower than the high capacity well yields<sup>8</sup>.

Much of the migration of water and within the Newark Basin may occur relatively horizontally along the spaces or fractures between the bedding planes (geologic layers). The largest bedding fractures of this nature may transmit as much as 1000 gallons per day per foot (gpd/ft)<sup>9</sup>. Vertical joints or cracks between beds may also result in vertical transmission of water. Massive red mudstones of the Passaic formation tend to have less fractures lowering hydrologic conductivity. Weathered shales and mudstone beds also have poorly integrated fractures and therefore low permeability (see Section 5.3.2, Recharge Areas)<sup>10</sup>.

### **5.3.2 Recharge Areas**

In order for pumped aquifers to be sustained, they require sufficient recharge. Recharge is the groundwater derived from a portion of precipitation that does not run off into streams or return to the atmosphere through evaporation and evapotranspiration (through plant uptake). Factors which determine the amount of water that infiltrates to the groundwater aquifer include the porosity and permeability of the surface material, the slope of the land, the amount and kind of natural and artificial cover; as well as the intensity and amount of precipitation.

The majority of North Plainfield has recharge rates of 9 to 11 inches per year. This includes most of the medium density residential areas overtop Dunellen and Birdsboro Soils (see Appendix A, Soils Map). Recharge rates can generally not be determined on hydric soil corridor areas of Green and Stony Brooks. These areas are generally level, forested and contain Parsippany and Rowland Silt Loams. Much of the commercial/business area covered by Amwell Gravelly Loam or Mount Lucas Watchung Silt Loams along the Route 22 and Somerset Street corridors have low recharge rates of 1-8 inches per year (see Appendix A, Groundwater Recharge Map).

## **5.4 Potable Water Supply**

Water systems are classified as community or noncommunity systems. Community water systems contain no less than 15 service connections used by year round residents, or regularly serve at least 25 year round residents. Examples include municipal systems and mobile home community systems.

Currently the sole public community water purveyor for North Plainfield Township is the NJ American Water – Elizabethtown Division. Source water for this system comes from 98 regional wells and seven surface water intakes (see Table 6). Water sources for the Elizabethtown system include the Millstone River, Upper Potomac-Raritan–Magothy Aquifer; the Raritan River; deposits within igneous and metamorphic rocks, glacial sand and gravel; Delaware & Raritan Canal, Brunswick Aquifer and the Stockton Formation.

A noncommunity water system is a public water system used by individuals other than year round residents for at least sixty days of the year. Noncommunity water systems may serve transient or nontransient populations. If the water system serves the same 25+ people over a six month period during the year, the system is considered nontransient. Examples include schools, offices and factories. A transient noncommunity water system is a system that is active at least sixty days of the year, but does not serve the same population during that time period. Rest stop areas, restaurants, and motels are examples of transient noncommunity systems. There is currently one identified public noncommunity well located just southwest of the intersection of Greenbrook Road and Somerset Street North Plainfield, however this well is inactive. There are no septic systems within North Plainfield. All residences and establishments of North Plainfield utilize the Borough's public sewer system. Chapter XIII of the Revised General Ordinances of North Plainfield (amended July 31, 2011) discusses municipal sewer and water use <sup>12</sup>.

## **5.5 Well Head Protection**

In order to protect New Jersey groundwater resources, the NJDEP has identified Well Head Protection Areas (WHPAs) for public community and public noncommunity water supply wells. The WHPA is the area from which a well head draws its water within a specified timeframe. (Once delineated, the WHPAs are typically considered priority areas in order to prevent and clean up groundwater contamination.)

WHPAs consist of three tiers, each based on the time of travel (TOT) to the well. The outer boundaries of these tiers will have the following times of travel:

- Tier 1 = two years (730 days)
- Tier 2 = five years (1,826 days)
- Tier 3 = twelve years (4,383 days)

The portion of the zone of contribution designated as the WHPA is based upon the TOT of the groundwater to a pumping well. The TOT is particularly significant in that it is related to the amount of time it would take a flowing contaminant to reach the well from a given location. The

TOT determination aids in prioritizing sources that pose an imminent threat to a well water source.

Most of North Plainfield southwest of Norwood Avenue and south of Route 22 is within existing well head protection areas; however, due to contamination purposes these wells are currently not contributing to water supplies (NPEC Personal Communication).

Land Use Chapter 22, Article XI of the Revised General Ordinances of North Plainfield (amended July 31, 2011) provides information on Well Head Protection Areas. Specifically section 22-137.6 specifies regulation of well head protection areas within the municipality. These regulations focus primarily in the regulation of activities that may introduce major or minor potential pollutant sources (PPS) within a well head protection area.

## **5.6 Sole Source Aquifers**

The Federal Safe Drinking Water Act contains provisions that allow for specific designation of areas that are dependent on groundwater as their sole or principal drinking water source. The technical requirements for designation as a sole source aquifer (SSA) are that (1) more than 50% of the drinking water for the aquifer service area is supplied by the aquifer system and (2) that there are no economically feasible alternative drinking water sources<sup>43</sup>.

When an area is designated as a sole source aquifer, the Federal environmental review process will ensure that Federal agencies will not commit funds toward projects which may contaminate these designated ground water supplies<sup>13</sup>. The Buried Valley Sole Source Aquifer System is located over one mile to the northwest of North Plainfield. North Plainfield however, does not lie within an area designated a sole source aquifer and is therefore projects within the community are not subject to Federal review associated with SSAs.

## **5.7 Groundwater Contamination**

The chemical quality of ground water is a primary concern where it is used for public and domestic supply. The chemical properties are determined by the chemical properties of the precipitation; the mineralogy of the substrate through which the water moves; and the length of time the water is in contact with the substrate. The chemical content can be altered by the introduction of contaminants into the environment. Pollutants may enter the environment from point or nonpoint sources. Point sources are discrete sources where concentrations may be elevated, such as leaking pipes, underground storage tanks and accidental spills. Nonpoint sources are usually lower concentrations spread out over larger areas, such as fertilizers and pesticides applied in agricultural areas, stormwater runoff from pavement, and vehicle emissions that settle on the ground and infiltrate with precipitation.

Contamination of groundwater may be the result of a surface spill of a liquid, or be the result of a buried solid which is dissolved into groundwater as the result of water percolation. Contamination may be less dense than water and float, as in the case of petroleum products, or may sink within the aquifer as many solvents do. Certain chemicals may mix with aquifer water and become solutions such as chlorides. Some chemicals that dissolve into the water may travel

distances of thousands of feet from the original source in the form of a “plume.” The introduction of certain biodegradable materials into an aquifer may result in changes to the chemical properties of the groundwater. These chemical changes may result in the freeing of previously bound naturally occurring metals into groundwater.

The New Jersey Department of Environmental Protection produces a Source Water Assessment Report under the Source Water Assessment Program (SWAP) <sup>12</sup> for all public water systems within the state. This report determines the susceptibility of a water system to various contaminants and does not reflect actual contaminants being consumed by customers of that water supply system. Under this program the following parameters are considered: Pathogens including bacteria and viruses; nutrients including nitrogen and phosphorus; volatile organic compounds (VOCs) such as solvents, degreasers and gasoline components; pesticides; inorganics including asbestos, arsenic, lead and other metals; radionuclides including uranium and radium; radon; and disinfection byproduct precursors (DBP) that include chlorinated solutions of organic matter.

Each contaminant is given a high (H), medium (M), or low (L) rating depending on the susceptibility of the particular well. Levels of susceptibility are determined by looking at various factors impacting the wells including the hydrologic conductivity of the soil, percentages of organic matter and clay in the soils, the proximity of agricultural land uses, the proximity and amount of urban landscape or impervious surfaces, and the proximity of streams and wetlands. Susceptibility ratings for the 98 wells and 7 intakes of NJ American Water - Elizabethtown Division, North Plainfield’s public water purveyor, are listed in Table 6. It is important to remember that these ratings reflect a well’s potential for contamination, and does not confirm actual contamination. Public water systems are required to monitor for regulated contaminants and must install treatment if any contaminants are detected at frequencies and concentrations above allowable levels <sup>12</sup>.

Additional details and information regarding source water protection data for North Plainfield Borough and throughout New Jersey may be obtained through the NJDEP at the SWAP website: [www.nj.gov/dep/swap](http://www.nj.gov/dep/swap)

**Table 6 Contamination Potential for Public Community  
Source Water for North Plainfield Borough<sup>14</sup>**

Name and/or ID #	Pathogens			Nutrients			Pesticides			VOCs			Inorganics			Radio-nuclides			Radon			DBP			
	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	H	M	L	
SOURCES																									
Wells (98)	4	65	29	42	56			24	74	88		10	16	66	16	39	59		92	6		25	73		
GUDI																									
Surface Intakes (7)	7			7			7				7		7					7			7	7			

Source: NJDEP SWAP for North Plainfield Borough (2004); Source: NJ American – Elizabethtown (2004);

### 5.7.1 Private Well Testing Act<sup>20</sup>

In March 2001, the Private Well Testing Act (N.J.S.A. 58:12 A-26 et seq.) was signed into law in New Jersey. This act requires individuals to test any private potable water well on the property for multiple parameters, including contaminants dangerous to human health. Private landowners are required to test wells when creating a well or when renting, buying, selling or leasing a home or multi-unit dwelling. The data is sent from test laboratories to the State where it is used to issue water quality notifications and assess overall water quality of the State<sup>15, 20</sup>.

Between September 2002 and January 2011, 3829 wells in Somerset County were tested under the Act. Although there are no records available for private wells tested within North Plainfield, many wells were testing in the surrounding communities of Warren, Bound Brook and Green Brook. The most common contaminant identified through the tests in this location was arsenic. Volatile Organic Compounds or VOCs, which includes a large and diverse group of chemicals, were the second most common contaminant. These specific contaminants and their presence in in North Plainfield and the region are discussed in Contaminants (Section 4.9.1)<sup>15</sup>.

### 5.7.2 Contaminants

**Volatile Organic Compounds (VOCs)** - VOCs are the most common organic groundwater contaminants in New Jersey and typical of areas with heavy concentrations of urban/industrial land use. The higher occurrence of VOCs is reflected in the susceptibility levels of wells within Northern New Jersey Water Systems. Wells within the Elizabethtown system were determined to generally have high susceptibility (88 of 98 wells) for volatile organic compounds or VOCs (see Table 6). VOC contaminants include a diverse array of compounds that typically include solvents, degreasers, and additives of gasoline. Gas stations, chemical plants, and other industries are typical sources of VOCs. In addition to often being linked to adverse health problems such as cancer, airborne VOCs (See Air Quality Section 7.0) contribute to the ground level development of the respiratory pollutant ozone (O<sub>3</sub>) when nitrogen oxides and VOCs react in the presence of sunlight and heat. Typical VOC contaminants include Toluene, Benzene,

Ethylbenzene, Xylenes trichloroethylene (TCE), perchloroethylene (PCE), MTBE (methyl tertiary-butyl ether) and tert-butyl alcohol (TBA).

Of these, 56 were found to have VOCs exceeding one or more acceptable or mean contaminant levels (MCL). Bound Brook Borough, which borders North Plainfield to the southwest, had 5 of 21 or 23.8% of its tested wells exceed the MCL for at least one VOC. Other Somerset County municipalities had between 0 and 5.6% of its wells exceed a MCL for VOCs <sup>15</sup>.

The VOCs benzene, TCE and MTBE have been identified as sources of ground water contamination in North Plainfield Borough by the NJDEP. The VOCs identified in North Plainfield are discussed below with information provided by the Centers for Disease Control's Agency for toxic Substances and Disease Registry (ASDR) <sup>16</sup>.

**Benzene** is a hydrocarbon VOC widely used chemical in the industrial production of many products including plastics, resins, nylon and industrial fibers, detergents, drugs and pesticides. It also occurs as a byproduct of oil, gasoline and cigarette smoke. It evaporates quickly and dissolves slightly in water. It is a known carcinogen that effects the hematological (blood forming) immune and nervous systems.

**TCE** is a VOC used primarily as a degreaser on metal parts. It is also used as a general solvent for spot and paint removal, and as an adhesive. It commonly occurs as a contaminant in underground water systems as a result of manufacture, use and disposal of the chemical. It is thought to be a carcinogen and can have impacts on organ development and the nervous system <sup>16</sup>.

**Methyl Tertiary Butyl Ether (MTBE)** is a common VOC groundwater contaminant with a pungent odor used as a fuel additive to increase oxygen content in gasoline. It sometimes breaks down into T tert-Butyl alcohol (TBA) in groundwater. Leaky underground fuel tanks can result in MTBE contamination. It is capable of effecting liver, kidney and nervous systems. It is; however, not thought to be carcinogenic <sup>16</sup>.

Additional VOCs, including formaldehyde and acrolein, which have found to impact regional Air Quality, are discussed in the Air Quality Section 4.2.

**Nutrients and Pathogens** – Forty two of the Elizabethtown Division's 98 Community Water Source wells have high potential for nutrient contamination; the remaining 56 wells have medium potential for contamination. All of Elizabethtown's 7 surface water intakes have high potential for nutrient contamination. Nutrient contamination is linked with high levels of nitrogen (nitrates) and phosphorus. High nutrient levels may be connected to fertilizers from agricultural areas or lawns; or may result from sewage treatment effluent, leaky septic systems, livestock or excessive waterfowl (e.g. Canada goose) populations. Nutrients can have environmental and human health impacts by enhancing the growth of harmful pathogens such as *E. coli* bacteria or creating eutrophic conditions in open waters. Eutrophism is caused by an exponential population increase of oxygen-consuming photosynthetic organisms such as algae which deprives a system of oxygen and may impact fish and other aquatic wildlife. Residential development, golf courses or other sources of maintained lawn may contribute to excessive



nitrogen or phosphorus through application of fertilizers for grass maintenance. Within Somerset County, NJDEP identified 15 of 3829 or tested private wells as have levels of nitrates above the MCL of 10 milligrams per liter (mg/L) <sup>15</sup>. Pathogens, particularly Fecal coliform bacteria, is a primary factor in primary contact use limitations of surface waters within North Plainfield.

**Pesticides** - Pesticides are a group of manmade chemicals used to kill or control pests. Subcategories of pesticides include herbicides (plants), fungicides (fungi), rodenticides (rodents), algicides (algae), insecticides (insects and other arthropods), nematocides (nematode worms), and bactericides (bacteria and similar pathogens). They are typically distributed from non-point sources such as agricultural fields, golf courses, residential lawns, transportation rights-of-way, commercial and industrial sources and atmospheric deposition. A wide range of chemicals are used as pesticides including organochlorine; organophosphorus; carbamate insecticides; chlorophenoxy, acetanilide, and triazine herbicide acids; and some VOC fumigants. Variables that may impact pesticide contamination potential include organic content of soil (wells), surrounding land use, and distance from the water source to agricultural operations, and minimum distances to golf courses.

Twenty four of the 98 wells utilized for North Plainfield Borough's public community water were found to have medium contamination potential for pesticides while the remaining 74 wells were found to have low contamination potential. All surface water intakes were found to have high potential for pesticide contamination.

**Radiation (Radionuclides and Radon)** are unstable, radioactive components of certain elements naturally occurring or introduced into the soil. Common forms of radionuclides include alpha emitters, proton/proton emitters, radium 226/228 and radon. All of these forms of radiation have been linked to various forms of cancer. Radon is a naturally occurring gas that results from the breakdown of uranium in soil. NJDEP indicates that the geologic formations in NJ typically associated with the highest levels of uranium occur in the Highlands Province of NJ and the surrounding region <sup>18</sup>. Although radon is most dangerous as air contamination, it may also enter water. Ninety two of 98 wells within the Elizabethtown Division have high potential for radon contamination. Surface waters utilized by North Plainfield's water purveyor were found to have low radioactive contamination potential. Municipal water systems are required to test for and treat water above the mean contaminant level (MCL). The current MCL for dissolved radium (226 and 228) is 5pCi/L (picocuries per liter) <sup>18, 19</sup>.

**Inorganics** - Inorganics include a variety of non-organic substances ranging from asbestos to heavy metals. Heavy metals are those metals ranging from copper (average atomic weight 63.546) and those above it in the periodic table. Industrial waste is a typical source of these metal contaminants. Certain metals including cobalt, manganese, molybdenum, vanadium, strontium, zinc, nickel, copper and iron are utilized by all living organisms in trace amounts. However, mercury, cadmium, chromium, arsenic and lead are metals considered particularly dangerous to humans and wildlife in surface waters <sup>16</sup>. Chromium may cause respiratory and dermatological problems; and arsenic may cause digestive tract and cardiac harm. Arsenic has also been linked to cancer <sup>16</sup>. Arsenic is known to sometimes naturally occur within wells drilled in Northern New Jersey <sup>20</sup>. Within Somerset County, most municipalities south of Bridgewater Township had 20 to 40% of their tested private wells exceeding the MCL for Arsenic (5 ug/l\l) between

September 2002 and January 2011. Levels of arsenic occurrence were lower in northern Somerset County was lower with municipalities mostly testing between 0 and 7% above 5 micrograms/liter (ug/L). The highest recording for a well was 78 ug/L of arsenic in both Bernards and Hillsborough Townships<sup>15</sup>.

**Disinfection Byproduct Precursors (DBP)** - DBPs are byproducts resulting from the reaction between disinfectants and organic and inorganic compounds in water. Chlorine is the most common disinfectant associated with DBPs. Chlorine is typically used in public water supplies as a means of controlling water-borne pathogens. Common chlorination byproduct chemicals include trihalomethanes (THMs), haloacetic acids, haloacetonitriles and chloral hydrate. Natural organic matter has been determined to be a primary organic component of DBPs<sup>21</sup>.

DBPs may be naturally occurring or the result of septic system effluent coming in contact with surface water bodies or groundwater supplies. Water with higher concentrations of organic compounds is naturally more susceptible to DBP formation. Water quality and water treatment factors that are identified as potentially contributing to the development of certain DBPs (THM) include increased contact time, higher presence of carbon precursors in the water, higher temperature, higher pH, greater presence of free chlorine residuals, and higher concentrations of bromide. Twenty-five wells contributing to Elizabethtown's water were found to high potential for DBP contamination while the remaining 75 wells were found to have medium potential. All surface water intakes utilized by the North Plainfield Borough have high potential for DBP contamination.

Additional information on these and other forms of water contamination may be found at the EPA website at [www.epa.gov/ogwdw/hfacts.html](http://www.epa.gov/ogwdw/hfacts.html) and the NJDEP SWAP website at [www.nj.gov/dep/swap/reports/sw\\_dbp.pdf](http://www.nj.gov/dep/swap/reports/sw_dbp.pdf).

## **5.8 Known Contamination Sites**

### **5.8.1 Known Contaminated Sites List**

The NJDEP Site Remediation Program currently maintains a list of more than 12,000 New Jersey sites that are confirmed to be contaminated and are undergoing a remedial investigation or a cleanup or are waiting assignment to a NJDEP case manager<sup>22</sup>. The most recent list of Known Contaminated sites identifies 25 known contaminated sites within North Plainfield (see Table 7). The majority of these contamination sites are associated with gas stations or the automobile industry in some capacity.

NJDEP defines Known Contaminated Sites as sites where contamination of soil and/or groundwater is confirmed at levels greater than the applicable cleanup criteria or standard. Remedial activities, which may be as simple as soil removal and replacement, or which are very complex may be underway. The sites may be handled under one or more State and/or Federal regulatory programs. A site may be active, or may be pending when the site has not yet been assigned to a specific remediation program, or may be closed with restrictions<sup>22</sup>. The NJDEP may be contacted for detailed information on the nature, extent and severity of contamination at a specific site. All of the active sites are in a stage of remediation and have a particular State

Bureau overseeing remediation. For information on the type of remediation, or other general information about Known Contaminated Sites, visit NJDEP at [www.nj.gov/dep/srp/kcsnj/](http://www.nj.gov/dep/srp/kcsnj/). In some cases, requests for specific contaminants or additional information may require a formal Open Public Records Act (OPRA) request.

<b>Table 7 NJDEP Active Known Contaminated Sites and Groundwater Contamination Areas (CEA) in North Plainfield <sup>22</sup></b>		
<b>Address</b>	<b>Site Name</b>	<b>PI Number</b>
122 RT 22	TORESCO ENTERPRISES	20476
1292 RT 22	GETTY 00665	1725
1299 RT 22	GETTY 00666	1724
17 19 DUPONT ST	NORTH PLAINFIELD BORO	12270
19 ROCKVIEW TER	ELIZABETHTOWN WC ROCKVIEW TERRACE WELL	G000011633
263 SOMERSET ST	N PLAINFIELD BORO MUN BLDG	12269
340 WATCHUNG AVE	SHELL STATION 138455	4755
400 SOMERSET ST	SUNOCO 0006-8882	14849
462 SOMERSET ST	BP SERVICE STATION 369	883
505 SOMERSET ST	SWEDISH IMPORTS INC	2745
535 SOMERSET ST	FLEET BANK	G000030271
536 542 SOMERSET ST	VIP HONDA	228106
545 RT 22	BRISTOL MOTORS INC	32595
548 RT 22	AVIS CAR RENTAL	4563
555 SOMERSET ST	VIP HONDA	450836
559 RT 22	RAY'S SPORT SHOP INC	22422
58 GREENBROOK RD	56882 GETTY	1498
611 613 RT 22	EXXON R/S 33088	7911
614 GREENBROOK RD	VERMEULE COMMUNITY CENTER	33698
904 908 RT 22	DELUCCIA HARDWARE	25840
922 RT 22	EXXON R/S 33249	7677
925 RT 22	GULF	12943
937 RT 22	BINSKY AND SNYDER INC	1436
RT 22 & WATCHUNG AVE	J&J TRANSMISSION INC	11813
RT 22 & W END AVE	MOBIL SERVICE STATION NORTH PLAINFIELD	G000022078

Source NJDEP known contaminated Sites List (Revised 4/2012)

### **5.8.2 Groundwater Contamination Areas – Classification Exception Area**

The Classification Exception Areas (CEA) are geographic areas established by NJDEP where contamination of groundwater exceeds New Jersey Ground Water Quality Standards (NJGWQS)

for a specific contaminant. Within CEAs, institutional controls have been established. When a CEA is designated for an area, the constituent standards and designated aquifer uses such as well use are suspended for the term of the CEA. A well restriction area (WRA) may be established around a CEA, prohibiting installation of water wells and monitoring wells without approval of the NJDEP. It is important to recognize that a CEA may not identify the full extent of the contamination or plume. If the CEA is connected to a NJPDES discharge the CEA is only associated with areas determined to be effected by the discharge and not the full extent of contamination.

Within North Plainfield, there are several sites are listed as CEAs (see Appendix A, Known Contaminated Sites Map) the largest of these areas is associated with the Lockheed Electronics Corporation (see Section 5.8.3). The Lockheed Electronics Groundwater Contamination Area was formerly established beneath the footprint of what is now Watchung Square Mall, a redevelopment of the Lockheed Electronics site. This site is located within Watchung Borough. The area was approximately 98 acres with a restriction depth to 400 feet. The identified contaminant is a VOC known as Trichloroethylene (TCE) (see Section 5.7.2).

On July 22, 2013, nearby residents were notified by Lockheed that the area of the CEA had been expanded to about 497 acres in a swath approximately 1.9 miles long and 2,000 feet wide. The area extends approximately from the from the Home Depot to Martin's way and south to the intersection of Rockview Terrace and Rockview Avenue<sup>27</sup> (see Appendix D, Correspondence and Reference Material).

Several relatively smaller CEAS are found in central and western North Plainfield. An additional 0.72 acre CEA is associated with the Somerset County and North Plainfield public works garages near Dupont Street and Steiner Place (see Table 7). Benzene is the identified contaminant at this location with restrictions to a depth of 67 feet. The VIP Honda in the vicinity of 536-542 Somerset Street is associated with a 0.35 acre CEA with a restriction depth to 50 feet. The polluting compound has been tentatively identified. The Getty Service Station at 58 Greenbrook as a CEA of 0.51 acres to a depth of 50 feet. The Getty Service Station contaminants are MTBE and Benzene (see Contamination Section). The Getty Service Station near Route 22 and Rock Avenue (see Getty Station 00666) on the western border of North Plainfield has an approximate 1.2 acre CEA associated with it. The polluting compound has the CEA been tentatively identified, and has a restriction depth to 50 feet.

For further information about CEAs for sites on the Site Remediation Program (SRP) visit NJDEP at [www.state.nj.us/dep/srp/regs/guidance.htm#cea](http://www.state.nj.us/dep/srp/regs/guidance.htm#cea)

### **5.8.3 Lockheed Electronics Facility**

From 1959 to 1989 the Lockheed Electronics Company (LEC) manufactured, tested and assembled electronics at their facility on the north side of Route 22 in North Plainfield and Watchung<sup>24 25</sup>. During this period, Lockheed disposed of the degreasing VOC solvent TCE (see Section 5.7.1) by dumping it onsite<sup>25</sup>. The current company, Lockheed Martin, was determined to be the responsible party for site cleanup and conducted an investigation of the site in 1989 under the supervision of the NJDEP. At this time, TCE was discovered in the soil. Much of the

contaminated soil was subsequently excavated and the NJDEP granted final approval of the site in 1998, which allowed for its use for other purposes. In 1999, the site was redeveloped into a shopping center <sup>24</sup>.

In 1993, groundwater onsite was found to be contaminated with TCE <sup>25</sup>. Forty monitoring wells were installed and a “pump and treat” system for the site was established in 2003 that pumped water to an above ground processing facility <sup>25</sup>. After subsequent decreases in concentrations, NJDEP allowed the system be decommissioned <sup>25</sup>. Groundwater samples received by the North Plainfield Environmental Commission in 2011 show a gradual decline in TCE concentration in some wells <sup>25</sup>. At the epicenter of the spill, the TCE concentration declined about 40% since 2003, when the pump and treat system was installed. Biodegradation of TCE is accompanied by an increase in cis-1,2-dichloroethene <sup>24</sup>. This substance has been observed at only a few wells at the edge of the plume <sup>24</sup>.

TCE contamination does remain onsite at levels that exceed the New Jersey Ground Water Quality Standards. As a result, a Classification Exception Area has been established by the NJDEP (see Section 5.8.2). The contamination at the monitoring well closest to the source (MW549), which is screened at between 190 and 201 feet (-11 to -21 msl) had a TCE concentration of 595 ppb on September 24, 2012. The NJDEP acceptable level for TCE is 1 part per billion <sup>24</sup>.

An indoor vapor intrusion study was also conducted by the firm TetraTech at nearby apartments to determine if there is a presence of TCE in indoor air of local apartments (see Air Quality, Section 7.0). The Regency Village Condominiums in North Plainfield and the Avalon Watchung Apartments in Watchung Borough were tested in 2013. As of June 2013, two sub-slab soil gas samples exceeded Soil Gas Screening Level (SGSL) at two buildings in the Avalon Watchung Apartments; however, Tetra Tech did not find TCE exceeding the acceptable SGSL in the indoor air in those samples or at any other tested location in the study, indicating there may not be a pathway for TCE to enter the indoor air <sup>26</sup>. Because Avalon at Crystal Ridge was fitted with a radon barrier when constructed, it is surmised that the vapors from the contaminated groundwater below are being retarded by this barrier. Lockheed and TetraTech are continuing to monitor this situation with oversight by the NPEC <sup>28</sup>.

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## **6.0 SOILS**

### **6.1 Introduction**

Soils provide the basis for the potential land uses within the community. They determine the types of vegetation or crops that can be grown and influence the development activities and design of structures that can be constructed. Soils represent a non-renewable resource and must be appropriately managed. In addition to the cultural and aesthetic losses typically associated with the loss of farms to residential development, subsequently, the loss of quality soil typically occurs. Residential and commercial development results in the conversion of soils from their historic agricultural or open space uses into permanent non-use.

Soils are formed by forces of the environment acting on soil material deposited or accumulated by geologic processes. The characteristics of a soil at any given location are determined by the climate in which the soils material has accumulated and has existed since accumulation; the physical and mineralogical composition of the parent material; the relief or slope of the land which influences drainage, moisture content, aeration, susceptibility to erosion, and exposure to the sun and elements; the biological forces (plants and animals) acting upon the soil material; and the length of time the climate and biological forces have had to act on the soil <sup>1</sup>. As discussed in the Geology Section, the soils of North Plainfield are primarily derived from sedimentary mudstones, shales and sandstones impacted from glacial processes (see Section 6.2 below).

The US Department of Agriculture's (USDA) Natural Resource Conservation Service (NRCS) has prepared soil mapping from the Soil Survey Geographic (SSURGO) database that is available from NJDEP GIS data. Soils under the USDA system are arranged in increasingly specific groups (see Section 6.2, Soil Series) based on various definitive characteristics of the soil profile or pedon. The pedon is typically viewed as a cross section of soil showing various layers or horizons. Generalized horizons may include O (organic – dark layer of poorly decomposed plant residues) A – topsoil that contains organic residues and soil life; E -soil leached of organic and mineral content; B – subsoil that accumulates irons, aluminum, clays and organic compounds; C - substratum that contains parent materials; and R - contains weathered bedrock. Subscripts may exist within a horizon and denote additional details such as Ap (A horizon disturbed by plowing) or B2 (slight color or texture changes with horizon depth). The pedon is defined by slope, position, size, profile features, color, chemical and mineralogical properties, and physical structure <sup>2</sup>. Details of the various horizons for North Plainfield's soil series are discussed in Section 6.3.

### **6.2 Soil Series**

As with living organisms, scientists may classify soils into increasingly detailed groups based on similarity of characteristics. The most commonly used detailed classification is the soil unit. The soil unit includes the general series name, texture, and range of slope it occurs on, and may include the hydrological regime (e.g. Birdsboro silt loam, 2-6% slopes, rarely flooded). Table 8 identifies 14 soil mapping units within North Plainfield Borough that are components of 10 more general soil series (see Appendix A, Soils Map). The soil series consists of a set of

characteristics common to a group of soils. Series characteristics of the soil pedon (profile) include number, depth and type of layers, color, texture, drainage, acidity, associated land use, and other features (see Section 6.3). There are several dominant soil series within the municipality that are mixed with other series or mixed with homogeneous urban land soils. Urban land and fluvaquents soils lack the identifiable profile characteristics to be grouped in a named series (see Non-Series Soils Section 5.3.1).

**Table 8 Soil Series and Units and Other Land Cover within North Plainfield**

Map Unit Symbol	Map Unit Name	Farmland	Hydric	Kf* Erosion Factor	Depth to Bedrock	Acres	% Of North Plainfield
AmdB	Amwell, gravelly loam, 2-6% slopes	Farmland of Statewide Importance	Hydric Inclusions	0.37	>60 in.	210.74	11.67%
BhnB	Birdsboro silt loam, 2-6% slopes	Prime Farmland	-	0.37	>70 in.	3.56	0.20%
BhnBr	Birdsboro silt loam, 2-6% slopes, rarely flooded	Prime Farmland	-	0.37	>70 in.	262.70	14.55%
BhpBr	Birdsboro- urban land complex, 0-8% slopes	-	-	0.37	>70 in.	1.41	0.08%
BoyAt	Bowmansville silt loam, 0-2% slopes, frequently flooded	Farmland of Statewide Importance	Hydric	0.32	>66 in.	263.77	14.61%
DunB	Dunellen sandy loam, 3-8% slopes	Prime Farmland	-	0.28	>70 in.	497.89	27.58%
DunC	Dunellen sandy loam, 8-15% slopes	Farmland of Statewide Importance	-	0.28	>70 in.	263.87	14.62%
DuxA	Dunellen moderately well drained sandy loam, 0-2% slopes	Prime Farmland	-	.05	>70 in.	45.58	2.53%
FmhAt	Fluvaquents, loamy, 0-3% slopes, frequently flooded	-	Hydric	0.32	n/a	1.12	0.06%
MopCb	Mount Lucas - Watchung silt loams, 6-12% slopes, very stony	-	Hydric (Watchung Only)	0.37	> 66-72 in.	83.98	4.65%
NehEb	Neshaminy silt loam, 18-35% slopes, very stony	-	-	0.37	54 in.	0.04	0.00%
NemDb	Neshaminy - Mount Lucas silt loams, 12-18% slopes, very stony	-	-	0.37	54 in.	3.37	0.19%
PbpAt	Parsippany silt loam, 0-3% slopes frequently flooded	-	Hydric	0.05	>70 in.	22.23	1.23%

RarAr	Raritan silt loam, 0-3% slopes, rarely flooded	Prime Farmland	Hydric Inclusions	0.37	>60 in.	89.88	4.98%
RorAt	Rowland silt loam, 0-2% slopes, frequently flooded	Farmland of Statewide Importance	Hydric Inclusions	0.43	>65 in.	48.41	2.68%
UR	Urban land	-	-	-	-	3.93	0.22%
WATER	Water	-	-	-	-	2.63	0.15%
TOTAL		-	-	-	-	1805.11	100.00%

- See Section 6.7.1 for an explanation of Kf erodibility

### 6.3 Major Soil Series Descriptions (OSD) <sup>3</sup>

#### Introduction

The information below describes a range of characteristics of the series that make up the Soils of North Plainfield. The series are listed as greatest to least amount mapped within the municipality. This information includes depth and thickness of soil layers, acidity, color, structure gravel content, drainage and typical land cover. Most of North Plainfield Borough soils are identified as silty or sandy loams. Loams are soils that are generally comprised of 40% silt, 40% sand and 20% clay ratio. “Silt” or “Sandy” loam refers to a greater proportion of that material than in the standard ratio. Many of the poorly drained or flat soils are hydric and a large proportion within North Plainfield are listed as either Prime Farmland or Soils of Statewide Importance. This soil quality is reflected in the municipality’s primary former use as farmland (see Appendix A, Historic Aerial Map).

The information collected here is derived from the USDA Natural Resource Conservation Service’s Official Soil Series Descriptions (OSD) and the USDA Soil Survey Geographic SSURGO Soils Database <sup>3</sup>.

#### Dunellen

Approximately 807.84 acres (44.5% of North Plainfield Borough’s land cover) are mapped as Dunellen series soils. Dunellen soils are very deep, well-drained soils occurring on slopes ranging from 0 to 35 %. These soils are commonly found on glacial outwash plains and stream terraces on linear slopes. These soils form in stratified coarse-loamy outwash material derived from sandstone. In the solum of the soil series, the permeability tends to be rapid. The rock fragments within the Dunellen Series are mostly rounded pebbles composed of red shale, sandstone or siltstone, and may include basalt, granite, gneiss, quartzite and conglomerates.

The Dunellen series pedon consists of the major horizons A, E, B and C, and are comprised of sandy loams. The A horizon of 0 to 8 inches is a brown sandy loam. The E horizon of 8 to 14 inches is a brown sandy loam with a subangular blocky structure. The BE and the Bt horizons of 14 to 32 inches are reddish brown sandy loams with weak subangular blocky structures. The C horizon is 2 layers, one layer being the C horizon (32 to 42 inches) and the other being the 2C horizon (42 to 70 inches). The 2C horizon is comprised of loamy sand. Both are reddish brown in color and consist of 10% rounded gravel.

Dunellen soil depth to bedrock is typically greater than 10 feet. The soil contains rock fragments ranging from 0 to 15 % in the upper part of the solum and from 0 to 30 % in the lower solum. Rock fragments in the C horizon range from 5 to 50 %. The soil reaction ranges from very strongly acid to moderately acid. Within their urban and suburban locations, Dunellen soils are mostly utilized for community development. Non-developed areas can be used for pasture, hay or general crops. Forested areas are dominated by red, white and black oak (*Quercus* spp.), hickory (*Carya* spp.), red maple, and ashes (*Fraxinus* spp.).

### **Birdsboro**

Approximately 267.67 acres or 14.8 % of North Plainfield's land cover are mapped as Birdsboro soils series. The Birdsboro Series consists of very deep, well drained to moderately well drained soils developed from old alluvial deposits of red sandstone, shale and siltstone. These soils are found on terraces and alluvial fans with slopes ranging from 0 to 15%. Birdsboro soils are of moderate permeability. Most Birdsboro soils are primarily cultivated or in pasture with about 25% in non-agricultural use. A small portion of the non-agricultural soil contains mixed hardwood forest.

The Birdsboro soil contains an A horizon, four B subhorizons, and a C horizon. The A horizon is 0 to 10 inches of dark or pale brown siltloam. The B horizon is 10 to 46 inches thick and comprised of reddish brown loam to 39 inches. The lower portion is brown sandy clay loam with yellowish or light brownish mottles. The C horizon extends from 46 to 70 inches and consists of reddish brown, very gravelly clay loam. The solum thickness ranges from 30 to 50 inches. Birdsboro depth to gravelly layers is more than 40 inches with bedrock at 6 to 20 feet or more. Gravel content ranges from 0 to 20 % in the solum, and from 0 to 70 % in the C horizon. Acidic reaction ranges from strongly to extremely acid. Most of the Birdsboro soils are cultivated or in pasture. A small portion of these soils are covered by mixed hardwoods. Approximately 25 % is in non-agricultural use.

### **Bowmansville**

Approximately 263.77 acres (14.6% of North Plainfield's land cover) are mapped as Bowmansville soils. The Bowmansville series consists of very deep, poorly and somewhat poorly drained fine-loamy soils. They are formed in recent alluvial deposits derived from upland soil materials weathered from dolerite or basalt. Bowmanville soils are found on floodplains with smooth slopes of 0 to 3 %. Saturated hydraulic conductivity ranges from moderately high (above stratified sand and gravel) to high (in stratified sand and gravel).

The solum contains an A, two B and two C horizons. The Ap horizon ranges from 0 to 7 inches and consists of reddish brown silt loam with weak medium granular structure. The BA horizon ranges from 7 to 16 inches of reddish brown silt loam. This layer contains weak medium subangular blocky structure. The Bg1 layer ranges from 16 to 26 inches of pinkish gray, silt loam with weak medium subangular blocky structure. The Bg2 layer ranges from 26 to 35 inches; pinkish gray, silt loam; weak coarse subangular blocky structure. The Cg1 layer is 35 to 52 inches of pinkish gray sandy loam. This layer contains weak thick platy parting to weak medium subangular blocky structure. The Cg2 layer is 52 to 66 inches in depth. This layer is variegated pinkish gray and strong brown stratified sand and gravel.

Solum thickness ranges from 18 to 59 inches and the depth to bedrock is more than 6 feet. Depth to strongly contrasting stratified sand and gravel is more than 40 inches. Reaction ranges from strongly acid through slightly acid in the solum and from strongly acid through neutral in the C horizon. Some pedons have thin layers of sand, silt, clay or gravel within 60 inches.

### **Amwell**

Approximately 210.4 acres (11.6 % of North Plainfield's land cover) are mapped as Amwell soils. The Amwell series is comprised of deep and very deep, somewhat poorly and moderately well drained soils on uplands. Artificial drainage is needed to remove excess water from Amwell soils. Amwell soil upper horizons are fine loamy upland soils formed mainly in colluvial material derived from basic igneous rocks. Lower horizons are formed from either glacial drift or residuum derived from either basic igneous rocks or shale. The slopes range from 0 to 15 %.

The Amwell pedon contains an A, E, three Bt, and two C horizons. The A horizon is 0 to 3 inches and dark grayish brown in color. The E horizon is 3 to 14 inches of brown gravelly silt loam with weak coarse subangular blocky structure. The Bt horizon is 14 to 21 inches of yellowish brown clay loam with weak medium and coarse subangular blocky structure. The Btx1 horizon is 21 to 26 inches of brown loam with weak thick platy and weak very coarse prismatic structure. The Btx2 horizon is 26 to 36 inches; dark yellowish brown fine sandy loam with weak thick platy structure. The C horizons contain 36 to 60 inches of yellowish brown fine sandy loam.

The Amwell solum thickness ranges from 30 to 50 inches with a depth to bedrock of more than 40 inches. Depth to the top of the fragipan ranges from 18 to 30 inches. Rock fragments range from 0 to 25 % in the A and Bt horizons and from 5 to 50 % in Btx and C horizons. Reaction ranges from strongly acid to neutral.

Amwell soils occur on lower slopes and extend between steeper slopes and flatter upland areas and may have development limitations due to slopes, stone content and seasonal high water. The dominant use is woodland containing pin oak (*Quercus palustris*), red maple, elm (*Ulmus* spp.), ash, and red oak (*Quercus rubra*). Some areas containing Amwell soil have been cleared and used for pasture or cultivated crops.

### **Raritan**

Approximately 89.88 acres or 5.0% of North Plainfield's land cover are mapped as Raritan series soils. The Raritan series soils are very deep, moderately well or somewhat poorly drained fine loamy soil formed in sediments from red noncalcareous shale, siltstone, and sandstone. Slopes range from 0 to 15 %. The soil consists of an A, four B horizons, and C horizon. Ap is 0 to 10 inches; brown silt loam; moderate medium and coarse granular structure. The BA layer is 10 to 12 inches; brown silt loam; moderate medium and coarse subangular blocky structure. The Bt1 layer is 12 to 18 inches of yellowish red silty clay loam with moderate medium subangular blocky structure. The Bt2 is 18 to 30 inches; reddish brown clay loam; moderate medium angular blocky structure. The Btx is 30 to 51 inches of reddish brown clay loam with moderate medium prismatic parting to moderate coarse platy structure. The horizon C is 51 to 62 inches of brown and reddish brown gravelly loam with weak very coarse prismatic structure. Solum thickness ranges from 42 to 56 inches. Depth to unconforming material is more than 40 inches. Depth to

the fragipan ranges from 20 to 30 inches. Depth to bedrock ranges from 5 to 20 feet. The amount of water rounded gravel in the solum ranges from 0 to 15 % and from 0 to 50 % in the C horizon. The solum and substratum range from very strongly acid through moderately acid, unless limed. Largely cleared and in general farm crops with considerable acreage in urban and industrial use. Woodlands associated with Raritan soils are oak dominant mixed hardwoods.

### **Mount Lucas-Watchung**

Approximately 83.98 acres (4.7% of North Plainfield's land cover) are mapped as Mount Lucas-Watchung complex soils. The Mount Lucas component consists of deep and very deep, moderately well and somewhat poorly drained soils formed in material weathered from diabase and other dark colored basic rocks. Slopes range from 0 to 25 %. Artificial drainage is needed to remove excess water from the Mount Lucas soils. Erosion is a potential hazard where the soils are strongly sloping or steep. Steep slopes, stoniness, and a seasonal high water table are limitations for community development. Mount Lucas soils contain an O (organic), A, four B and a C layer within the pedon. Mt. Lucas solum thickness ranges from 20 to 65 inches. Depth to bedrock is greater than 48 inches. Angular rock fragments of diabase and some quartzite and other rocks range from 0 to 50 % and from 5 to 60 % in the C horizon. The rock fragment content in the particle control section averages less than 35 %. The upper part of the solum ranges from strongly to slightly acid and the lower part from moderately acid to neutral. The dominant clay mineral is kaolinite with significant amounts of illite and montmorillonite. Mount Lucas soils are nearly level upland flats to steep concave lower slopes. Approximately 50 % of this soil is cleared and utilized as cropland. Woodland areas are oak-hickory type mixed hardwoods.

The Watchung soil component consists of very deep, poorly drained soils on upland flats and depressions. They are formed in residuum from basic rocks. Slope ranges from 0 to 8 %. The Watchung component consists of A, E, four B and two C horizons within the pedon. The solum thickness ranges from 24 to 55 inches and the lower boundary of the argillic horizon is within 40 inches of the surface. Depth to bedrock is more than 60 inches. Rock fragment content ranges from 0 to 15 % throughout the profile including up to 15 % of cobbles and stones. Some pedons have up to 40 % rock fragments. Soil layer acidity ranges from very strongly acid to neutral. Native forest vegetation is northern red oak, pin oak, willows (*Salix* spp.), and box elder (*Acer negundo*). Successional species growing on this soil may include sedges, ironweed (*Vernonia altissima*) and Joe-pye-weed (*Eutrochium purpureum*). Portions that remain in agriculture are primarily used for corn or pasture.

### **Rowland**

Approximately 48.41 acres (2.7 % of North Plainfield's land cover) are mapped as Rowland soils. The Rowland series consists of very deep, moderately well and somewhat poorly drained soils. These soils are flooded by streams in precipitation events. Permeability is considered moderate to moderately slow above approximately 40 inches and rapid in the underlying sands and gravels.

Rowland contains an A, two B and two C horizons. The A horizon is 0 to 10 inches of dark reddish brown silt loam and friable with many fine roots. The B horizon from 10 to 28 inches is reddish brown silt loam. The horizon is friable with many fine roots in the upper 16 inches and few medium roots in the lower portions. The C horizon from 28 to 65 inches is weak red in

color and silty clay loam to 44 inches and stratified sand and gravel from 44 to 65 inches. Gray and brown mottling occurs in the upper portions. Solum thickness ranges from 24 to 40 inches. Depth to stratified sand and gravel is more than 40 inches. Water worn gravel constitutes 0 to 10 % of the solum. Gravel levels increase from 0 to 25 % of the C horizon to between 30 and 90 % of the 2C horizon. Stratified sand, silt, clay or gravel is present in some pedons at depths less than 40 inches. Reaction ranges from very strongly to slightly acid.

Rowland soils are formed on relatively narrow nearly level flood plains in alluvial sediments washed from nearby gently sloping to sloping uplands underlain mainly with red and brown shale, sandstone, and conglomerate. Soil uses are primarily pasture or cropland. Wooded areas are dominated by mixed hardwoods.

**Parsippany** - Approximately 22.23 acres (1.2% of North Plainfield's land cover) are mapped as Mount Lucas-Watchung complex soils. Parsippany soils are deep poorly drained soils occurring in silty and clayey sediments on relatively level areas ranging in grade from 0 to 8 %. Parsippany soils contain an A, AB, three B, BC and a C horizon. The four inch A horizon consists of an A and ABg layer consisting of dark grayish brown and dark gray silt loam. The Upper Bg horizon (4 to 9 inches) consists of gray silty clay loam with brown and gray iron accumulations and depletions. The lower Btg (1 and 2) horizons (9 to 29 inches) are generally reddish brown silty clay. The lower portion may contain up to 3% fine gravel comprised of granitic gneiss and shale. The BC layer extends from 29 to 50 inches and is composed of brown and strong brown clay loam. It is followed by a reddish brown silt loam C layer from 50 to 70 inches. The A and upper B layers are generally strongly acid to very strongly acid. The soil pedon becomes increasingly less acid in the lower B and BC horizons and is neutral in the C horizon.

These soils generally occur in fine glacial lake bottom sediments. Parent materials consist of weathered basalt, shale and granite. These soils are typically found in low woodlands historically consisting of elm, swamp white oak, green ash, and red maple. Parsippany soil is occasionally utilized for moisture tolerant agriculture including various crops, hay and pasture.

**Neshaminy-Mount Lucas** Approximately 3.4 acres or 0.19% of North Plainfield's land cover are mapped as Mount Lucas-Watchung complex soils.

Neshaminy soils are well drained with moderately slow saturated hydro conductivity. Runoff ranges from slow to very rapid. These soils are characterized by a mesic fine-loamy soil. Neshaminy soils contain an Oi (thin organic layer), A, E, four B, C and an R (restrictive layer). Neshaminy soils are often very stony and contain rock fragments of angular quartzite and rounded diabase. Stone percentages range from 0 to 40% occur in the upper solum and 0 to 60% in the lower solum and C horizon. Color ranges from grayish brown and yellowish brown in the upper solum to yellowish red and red in the lower solum and C horizons. Neshaminy is naturally very strongly acid to moderately acid. Depth to bedrock in the Neshaminy soil is 48+ inches. Stony and steep areas are typically covered by upland oak and hickory forest. Less steep areas are sometimes used as cropland, hay and pastureland. Some portions are utilized for urban and suburban development.

### 6.3.1 Major Non-Series Land Cover Types

#### Major Non Series Land Cover:

**Fluvaquents** Approximately 1.2 acres (less than 0.1%) of soils within the river corridors of North Plainfield Borough are identified as fluvaquent soils. Fluvaquent soils are usually young hydric soils formed on riverbanks in which the hydric nature of the soil prevents the formation of diagnostic characteristics.

**Urban Land (soils)** Approximately 3.9 acres (0.22% of North Plainfield) is mapped as urban land soil, which does not directly correspond with urban land use land cover (see Land Use Land Cover Section). Urban land soil is not conducive to soil identification or vegetation growth. Urban land soils have been severely altered, excavated, or disturbed to a significant extent and no longer have distinguishable morphologic features such as distinguishable layers. Because of the often multiple disturbances these soils have undergone, they no longer function as they did in their original state and information on their characteristics is limited.

### 6.4 Prime Farmlands

The US Department of Agriculture Natural Resource Conservation Service (NRCS) has identified classified soils throughout the US based on their agricultural significance, or Land Capability Classification. Prime Farmlands (PF) lands have soil with the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops and are available for these uses. PF soils have the quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops when treated and managed according to acceptable farming methods. PF soils are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding. Often these soils are highly suitable for forests and other vegetation communities.

Soils of Statewide Importance (SI) include those soils in Land Capability Class II and III that do not meet the criteria as Prime Farmlands, but nonetheless support agricultural production, with some limitations. SI soils may be suited to certain crops or require special conservation practices to maintain their productivity. Other soils that may have certain important growing qualities but do not qualify as having statewide importance may be identified as soils of Unique Importance or Soils of Local Importance. Table 9 identifies the soil-mapping units that are considered Prime Farmland and other Soils of Importance within North Plainfield.

The importance of agriculture in North Plainfield's history is reflected in the amount of quality farming soils within the Borough. Approximately 1686 acres or 93% of the Borough of North Plainfield's soil is considered prime Farmland or soils of Statewide Importance.



<b>Table 9 Summary of Acres Agriculturally Important Soils in North Plainfield</b>		
<b>Farm Class</b>	<b>Sum Of Acres</b>	<b>Percent within North Plainfield Borough</b>
<b>Prime Farmland</b>	<b>899.61</b>	<b>49.8%</b>
<b>Soils of Statewide Importance</b>	<b>786.71</b>	<b>43.6%</b>
<b>Quality Soil Total</b>	<b>1686.32</b>	<b>93.4%</b>

## 6.5 Hydric Soils

Approximately 720 acres (approx. 40% of the land cover) of hydric soils or soils with hydric inclusions are mapped in North Plainfield Borough. Hydric soils typically correspond with wetland or floodplain mapping (see Appendix A, Forest and Forested Wetland Maps). Hydric soils are soils that have low permeability, are poorly to very poorly drained, and have a water table at or near the ground surface during the growing season. Hydric soils may be frequently ponded or flooded for a long or very long duration during the growing season and typically support wetland vegetation communities. Multiple soil series and types in North Plainfield are identified as being hydric or having hydric inclusions (see Table 8).

<b>Table 10 Summary of Hydric Soils within North Plainfield</b>		
<b>Hydric</b>	<b>Sum Of Acres</b>	<b>Percent within North Plainfield Borough</b>
Hydric or Hydric Inclusions	720.13	39.8%
Non-hydric	1084.98	60.2%
<b>TOTAL</b>	<b>1805.11</b>	<b>100.00%</b>

## 6.6 Topography and Slopes

Steep slope areas provide important ecological, functional and scenic importance. Steep slopes are sometimes home to rare plants and wildlife within the region, provide excellent opportunities for wildlife observation and recreation, and add to the rural or aesthetic character of the region. Some of these important slope habitats are found along the Watchung Mountains adjacent to North Plainfield's northern boundary (see Appendix B, Photo B).

In general, development of steep slopes (in excess of 10%) increases the risk of erosion, high stormwater runoff coefficients and flooding potential. The additional runoff results in sedimentation of down slope surface waters, which damages habitat and has the potential to damage property. The sloping land increases the rate of stormwater runoff, which reduces the rate of groundwater infiltration. This is exacerbated when vegetation is stripped from the slope.

Elevations in North Plainfield generally range from approximately 60 feet above mean sea level (AMSL) near the confluence of Green Brook and Stony Brook to 120 feet AMSL on the northern end of the Borough north east of Norwood Avenue. As North Plainfield is generally low lying area at the foot of the Watching Mountains, topography within the Borough tends to be fairly level or gently sloping with most portions of the municipality having slopes between 0 and 6%, with some areas having slopes between 8-15%. Areas in this 8-15% range are upland areas adjacent to stream corridors that are primarily developed. The Steep Slopes map in Appendix A, derived from USGS data, illustrates the foot elevation changes across the Borough, which tends to drop in elevation from the northern and eastern to the southern and western parts of the Borough. The narrow bands on the Steep Slopes Map illustrate the location of the steepest slopes which are generally located north of the Route 22 corridor.

Although steep slopes are generally not significant within North Plainfield itself, the steep slopes of the first Watchung Mountain parallel the northern boundary of North Plainfield in both Green Brook Township and Watchung Borough (Appendix A, Steep Slopes Map). Management of these slopes is critical for North Plainfield as runoff from these slopes has the potential to impact stormwater quality and quantity within the municipality, and contributes to the severe flooding associated with the Borough. The adjacent first Watchung Ridge has nearby elevations as high as approximately 560 feet AMSL. The slopes of these adjacent sections of the First Watchung Mountain are primarily vegetated with forest (see Appendix A, Orthographic Airphoto Map) and generally range from 12 to 35%.

Both the Borough of Watchung and Green Brook Township have developed ordinances to protect slope areas. Within Green Brook, these include limits on disturbance for any steep slopes of 20% or greater grade<sup>4</sup>. Watchung Borough sets limits on impervious surfaces for slopes in various gradient categories over 10%<sup>5</sup>.

## **6.7 Soil Erosion and Sediment Control**

Under the Soil Erosion and Sediment Control Act of 1976 (L. 1975 C. 251, § 1 eff. Jan. 1, 1976), a Soil Erosion and Sediment Control Plan must be prepared for any land clearing or disturbance of 5,000 square feet or more within the State of New Jersey. Soil disturbance of one acre or more during construction also requires a New Jersey Pollutant Discharge Elimination System (NJPDES) permit (NJPDES Rules - N.J.A.C.7:14a) and a Request for Authorization (RFA) from NJDEP's Bureau of Nonpoint Pollution. Additional information on the Act is available through the NJ Department of Agriculture<sup>6</sup>.

Information regarding this process in North Plainfield Borough can be obtained through Somerset County Soil Conservation District (SCD). The SCD monitors compliance with the SESC plan during construction. Information about Soil Erosion and Sediment Control can be found at the Somerset County SCD at <http://www.co.somerset.nj.us/publicworks/soil/index.html>.

Though generally level, there is potential for soil erosion issues throughout North Plainfield. Stream bank erosion within the stream corridors does occur within the Borough (see Appendix B, Photo C). This is a particular problem with regard to high-velocity conditions following storms which can undercut and collapse stream banks. Reduction of impervious surfaces and

plantings along stream banks of soil stabilizing woody and other species may help mitigate the problem. The NPEC have partnered with the boy scouts and contributed to reducing streambank erosion through vegetation planting and other methods. The NPEC has noted that, as with many locations throughout New Jersey, bank erosion is a major issue of concern in North Plainfield. There are a few stream buffer ordinances and owners of riparian area are, in general, not aware of their responsibilities for controlling erosion. Property owners are responsible for the care of the streambanks and have to pay for improvements, including the cost of State permits. The NPEC advocates the maintenance of vegetated stream buffers of at least 100 feet for small waterways. This maintenance should include control of Japanese knotweed.

NJDEP has one mapped debris landslide area identified along the northern border of North Plainfield. The location is approximately 1,100 feet southwest of the intersection of Gray Street and Route 22 along the North Plainfield-Watchung Borough border. The landslide occurred on a construction site after heavy rain in August 2000<sup>7</sup>.

### **6.7.1 Soil Erodibility (K-factor)**

K-Factor is a quantitative description of the inherent erodibility and rate of runoff of a particular soil when all other variables (such as water capacity, rain splash and abrasion) are the same. The K-factor is the susceptibility of soil particles to detachment and transport by rainfall and runoff. It is primarily driven by texture; however, other factors such as structure and organic matter can contribute to erodibility<sup>9</sup>. For a particular soil, the soil erodibility factor is the rate of erosion per unit erosion index from a standard plot<sup>9</sup>. The Kf factor specifically analyzes particles of soil under 2 mm and is typically the same as the K-factor in most soils<sup>10</sup>. The Kf levels for soils in North Plainfield are listed in Table 8. It is important to consider that the rate of erosion of soils in a particular location is not solely determined by inherent erodibility properties, but additional properties including land use and land cover, slope, and rate of precipitation.

Soils in the range of 0.5 to 0.2 are considered low erodibility. Typically clay soils that do not detach easily are in this category as are some coarse textured soils that have low runoff<sup>10</sup>. Medium textured silt and loam soils, which includes the dominant soils of North Plainfield, tend to have moderate erodibility levels between 0.25 and 0.4<sup>10</sup>. Amwell, Birdsboro, Dunellen (most), Raritan, Neshaminy and Mt. Lucas are all North Plainfield series that fall within this moderate category. The most erodible soils (those with Kf above 0.4) are limited in North Plainfield. Rowland Silt Loam 0-2% slopes, frequently flooded (RorAt - 0.43 Kf) is the only highly erodible soil that occurs (in minor amounts) in North Plainfield (see Appendix A, Soils Map).

### **6.8 Acid Producing Soils**

NJDEP Division of Land Use defines acid producing soils as “Soils that contain geologic deposits of iron sulfide minerals (pyrite or marcasite) which, when exposed to oxygen from the air or from surface waters, oxidize to produce sulfuric acid<sup>8</sup>. Acid producing soils, upon excavation, generally have a pH of 4.0 or lower. After exposure to oxygen, these soils generally have a pH of 3.0 or lower.” The underlying formations associated with acid producing soils in

New Jersey are primarily located within the inner and outer Coastal Plain Province of New Jersey, and not within the Piedmont or specifically, North Plainfield Borough .

## 6.9 References for Soils

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- 9 Pacific Northwest National Laboratory. US Department of Energy. Definition of K-Factor soils (Assessed 2013). [http://mepas.pnnl.gov/mepas/formulations/source\\_term/5\\_0/5\\_32/5\\_32.html](http://mepas.pnnl.gov/mepas/formulations/source_term/5_0/5_32/5_32.html)
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## **7.0 WATER RESOURCES**

### **7.1 Watershed Management Areas, Drainage Basins and Major Surface Water Features**

A watershed is an area of land that drains into a common body of water such as a stream, lake, river or bay. The watershed area itself includes surface water features and the surrounding land. Watershed boundaries are typically delineated by topographic features such as hills and slopes that define the patterns of drainage. Active management of the land use activities within a given watershed is a good method for managing water quality in the receiving water bodies.

NJDEP manages watersheds by dividing the State into 20 large watershed management areas (WMAs). The Borough of North Plainfield is located within the Lower Raritan, South River and Lawrence WMA (WMA 9)<sup>1</sup>. More specifically, the entire municipality drains to the Raritan River via Green Brook. Green Brook forms the southern municipal boundary and is the receiving water for several smaller tributaries. Crab Brook drains the northeastern portion of the Borough and flows in a westerly direction long the south side of Route 22 and drains to the Stony Brook in the approximate geographical center of North Plainfield. Stony Brook flows south through the approximate center of the Borough and then meanders west and drains into the Green Brook east of Clinton Avenue. In the northwestern portion of North Plainfield Borough, an unnamed tributary to the Green Brook flows to the west into Green Brook Township. The most notable natural areas in the Borough are found along the banks of the Stony Brook and the Green Brook, especially in the low lying floodplains of these water courses (see Appendix A, Surface Water and Subwatershed Map).

WMA 9 is characterized in part by extensive areas of residential development and relies heavily on groundwater sources for water supply<sup>1</sup>. This is also true of North Plainfield Borough, where residential development is by far the dominant land use and where the relatively limited commercial development is located primarily along the Route 22 corridor.

For more on information on these and other WMAs, visit the NJDEP Water Quality Management Program website at <http://www.nj.gov/dep/wqmp/>.

#### **7.1.1 Watersheds and Subwatersheds**

Within each WMA, there are multiple watersheds comprised of still smaller subwatersheds. The US Geological Survey has mapped and identified watersheds using a hierarchical numbering system. Each watershed or “hydrologic unit” is identified by a unique hydrologic unit code (HUC). There are 150 HUC-11 watersheds in New Jersey ranging in size from 0.1 to 143 square miles, with an average size of 51.9 square miles<sup>1</sup>. These HUC-11 watersheds are further divided into the smallest mapped (sub) watersheds designated as HUC-14’s (14 digits). There are 921 HUC-14 subwatersheds in New Jersey, ranging in size from 0.1 to 42 square miles, with an average size of 8.5 square miles<sup>1</sup>. There are three portions of HUC-14 subwatersheds within North Plainfield Borough identified in Table 11. These include Green Brook (North Plainfield Gage to Blue Brook), Stony Brook, and Green Brook (Bound Brook to North Plainfield Gage).

In addition to the stream surface waters, NJDEP maps two waterbodies within North Plainfield Borough. These include the Pond at Green Acres (1.235 ac. - NJDEP ID code 170425808) near Rockview Terrace and the Green Brook Park Lake (1.73 ac. - NJDEP ID code 64665948) north of West End Avenue.

**Table 11 North Plainfield Borough HUC 14 Subwatersheds and Major Streams**

<b>Subwatershed</b>	<b>HUC 14 Number</b>	<b>Associated Streams and Ponds within North Plainfield Borough</b>
Green Brook (N Plainfield gage to Blue Bk.)	02030105120020	Green Brook
Stony Brook (North Plainfield)	02030105120030	Crab Brook and Stony Brook, Pond at Green Acres
Green Brook (Bound Bk. to N Plainfield gage)	02030105120040	Green Brook and Stony Brook, Green Brook Impoundment

## **7.2 Surface Water Quality Classification**

As part of New Jersey’s responsibility to protect, restore, and enhance surface waters, surface water quality is evaluated with respect to Surface Water Quality Standards (SWQS). New Jersey’s Surface Water Quality standards (N.J.A.C. 7:9B, *et seq.*) establish the water quality goals and policies underlying the management of the State’s water quality. Water quality concerns occur when SWQS are not met or are threatened.

The highest quality surface waters in New Jersey are referred to as Outstanding Natural Resource Waters (ONRW). These waters are typically in State or National parks and are not subject to any wastewater discharges or increases in runoff [these waters may be identified as Freshwater 1 (FW1) or Pinelands (PL) waters]. Remaining waters are identified as Freshwater 2 (FW2) waters. North Plainfield’s waters are all listed as FW2, which is the typical freshwater designation of the urban and suburban portions of northern New Jersey.

### **7.2.1 Trout Waters**

The presence of trout has some regulatory implications under various rules including the riparian zone restrictions of the NJDEP Flood Hazard Control Act Rules (N.J.A.C. 7:13-4.1). Timing restrictions for in-water work, such as bridge repair, may also apply to both trout maintenance and production waters (see Fisheries Section 10.1). All waters within North Plainfield Borough and all waters minimally one mile downstream are listed as non-trout waters by NJDEP. This designation indicates that the Borough’s waters do not support stocked, maintained or reproductive populations of trout. Waters just upstream of North Plainfield are listed as trout maintenance; however this would not have regulatory bearing on North Plainfield as they are upstream.

## **7.2.2 Category 1 and 2 waters**

In addition to the standard water quality classifications previously mentioned, waters within New Jersey are also classified as either Category 1 or Category 2 waters. Category 1 (C1) waters are those waters designated for additional protection due to their “color, clarity, scenic setting, other aesthetic value, exceptional ecological significance, recreational significance, water supply significance or fisheries resources”<sup>2</sup>. All other waters are considered Category 2 (C2) waters. Under the NJ Stormwater Management Rules (N.J.A.C. 7:8), C1 waters are protected from “measurable or calculable changes in water quality and are afforded a designated special waters resource protection area (SWRPA). All surface waters within North Plainfield Borough and the adjacent subwatershed waters are all classified as C2 waters (see Appendix A, Surface Waters and Subwatersheds Map) and not subject to SWRPA standards. These C2 waters include Crab, Stony and Green Brooks and any unnamed tributaries within North Plainfield.

## **7.3 Surface Water Quality Assessments**

The surface water quality for streams is evaluated in New Jersey using various testing methods. One significant method employed by NJDEP is a protocol termed Ambient Biological Monitoring Network (AMNET) for rapidly assessing water quality (see Section 7.3.3). In addition, under the Federal Clean Water Act Section 303 (d), States are required to list the health status of their streams (see Section 7.3.3). The 303(d) list is generated using the AMNET and other stream monitoring data such as that generated by the NJDEP Clean Lakes Program, NJDEP Shellfish Monitoring Program, Fish Tissue Monitoring, and NJDEP/USGS chemical and physical water quality monitoring (see Section 7.3.4).

### **7.3.1 Point Source Pollution**

Point source pollution comes from a defined “point” in the landscape, such as an industrial or stormwater discharge pipe. Point source discharges to surface and ground water are regulated by the NJDEP under the New Jersey Pollution Elimination Discharge System (NJPDES) program (N.J.A.C. 7:14a). Much of this program was created in 1972 by the Federal Clean Water Act. To accomplish the goals of the program, permits are issued that limit the mass and/or concentration of pollutants, which may be discharged into the ground or surface water. These types of permits often require monitoring and include maintenance and Best Management Practices to ensure that they are functioning properly. The types of permitted facilities range from campgrounds, schools and shopping centers to large industrial and municipal wastewater facilities. The most recent NJPDES Active Permit List indicates that within North Plainfield, there is one public stormwater (surface) discharge (263 Somerset Street) on file with the NJDEP<sup>3</sup>.

### **7.3.2 Nonpoint Source Pollution**

Nonpoint sources of pollution are potentially difficult to identify since they do not discharge directly from a “point” source, such as a pipe of leaking septic system. These nonpoint sources are derived over broad areas and from multiple sources. Common examples include stormwater running off of multiple impervious surfaces, or from agricultural areas that are subject to erosion or may contain waste from livestock. The most common nonpoint pollutants include solid



waste/floatables, sediment, nutrients, pesticides, metals, road salts, petroleum hydrocarbons, and pathogens.

In addition to increased runoff, developed areas also accumulate pollutants on the land surface from atmospheric deposition (see Air Quality, Section 4). These pollutants are mobilized and transported to streams during storm events. Stormwater that runs off of pavement or is stored in detention basins is also often heated, which raises the temperature of the receiving waters. Non-point pollutants are discussed in Section 4.9 (Contamination) of the North Plainfield ERI. The most prominent contamination issue in the Borough is associated with the 80 acre Lockheed Electronics Company (LEC) Site (currently Watchung Square Mall – see Section 5.8)<sup>4</sup>.

### **7.3.3 AMNET Monitoring (Aquatic Invertebrate Populations)**

The NJDEP performs monitoring of benthic macroinvertebrate populations using the Environmental Protection Agency's (EPA) Rapid Bioassessment Protocols – Level II procedure. Using this method, aquatic communities are examined for pollution tolerant and intolerant life forms and the results are used to compute a New Jersey Impairment Score and Biological Condition. The program is termed the Ambient Biological Monitoring Network (AMNET). Biological condition of a stream sample is based on 100 organism samples taken at the AMNET site. The benthic macroinvertebrate samples examined include representatives of various taxonomic families of insects and insect larvae; mollusks, such as mussels; clams and snails; and crustaceans, such as crayfish. Ratings of the stream condition are based on the level of pollution tolerance of the families collected, the ratio of pollution tolerant to pollution intolerant families, and the biodiversity of the system (percentage of single species dominance). In New Jersey, over 800 locations are sampled on a five-year rotating schedule. Biological impairment of streams may be caused by several major factors, including nonpoint source pollution, point source pollution and/or a lack of stream corridor (riparian) buffers<sup>5</sup>.

Non-impaired streams are represented by maximum taxa richness, balanced groups (ratio of pollution tolerant to intolerant groups), and a good representation of pollution intolerant species. Moderately impaired communities are characterized by reduced richness of EPT taxa, or Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies); reduced community balance; and reduced number of pollution intolerant taxa. Severely impaired communities are benthic communities that are drastically different from those in less impaired situations including a few dominant pollution tolerant macroinvertebrate taxa<sup>12</sup>. The most pollution tolerant groups include worms (Oligochaeta), midges (Simuliidae), leeches (Hirudinia), and various snails (Gastropoda). The scoring system for impairment as listed in Table 12 is based on three basic categories: Non-Impaired, Moderately Impaired and Severely Impaired<sup>5</sup>.

The second round of sampling of New Jersey streams included a riparian habitat score system developed from revised EPA criteria<sup>6</sup>. Parameters considered in the evaluation include in-stream substrate, channel morphology, bank structural features, and riparian vegetation. The area evaluated included the sample site and the adjacent area within a 100 to 200 foot radius. The qualitative habitat assessment involves four condition categories, rating each parameter as optimal, suboptimal, marginal or poor. Scores within the State have ranged between 53 and 197.

Habitat scores include four categories: Optimal (160-200), Sub-Optimal (110-159), Marginal (60-109) and Poor (<60).

Two AMNET biological monitoring stations are located within North Plainfield Borough (see Table 11). The habitat conditions and invertebrate diversities of North Plainfield Borough appear to be somewhat impacted based on the available AMNET data. Currently, two of the three local sample stations have impairment ratings considered “fair” and riparian habitat conditions are considered sub-optimal, indicating somewhat impacted or fragmented vegetated buffers along surface waters. The AMNET station findings at North Plainfield reflect the general conditions within the Lower Raritan (HUC 11). The Lower Raritan Watershed contains primarily fair conditions based on AMNET data, particularly along Green Brook and its tributaries. Several stations in the southern part of the watershed have “poor” readings. One station along the Raritan River within the watershed currently has a “good” rating. Additional studies dating back to 1975 of macroinvertebrate composition within the Stony Brook have been conducted by North Plainfield High School students (see Appendix D, Correspondence and Additional Reference Material). In these studies, students have found a good to fair mix of EPT taxa.

#### 7.3.4 Federal Clean Water Act Section 303 (d)

**Table 12 AMNET Biological Condition of Streams within or Adjacent to North Plainfield <sup>5</sup>**

<b>Stream Name</b>	<b>Location</b>	<b>AMNET #</b>	<b>Previous (2004) Impairment Score/Rating</b>	<b>Current (2009) Impairment Score/Rating</b>	<b>Current Habitat Score/rating</b>
Green Brook	Raymond Avenue (Plainfield City)	AN0421	26.4/fair	20.68/Poor	122/Suboptimal
Stony Brook	Westend Avenue	AN0422	27.47/Fair	34.99/Fair	146/Suboptimal
Green Brook	Clinton Avenue	AN0423	30.39/Fair	30.78/Fair	129/Suboptimal

Under the Federal Clean Water Act Section 303(d), each state in the U.S. is required to list impaired waterbodies. New Jersey is required to list impaired waterbodies as part of the water quality planning process in the State pursuant to the Water Quality Planning Act (N.J.S.A. 58:11A-7). New Jersey uses chemical and biological stream monitoring (see above) to determine impaired waters. Waterbodies may be removed from the 303(d) list once the water quality standards are met for a particular pollutant <sup>7</sup>.

The Clean Water Act requires that each impaired (non-attaining for pollutants) waterbody is given a priority ranking of high (H), medium (M) or low (L) with the goal of lowering Total Maximum Daily Load (TMDL) of the particular pollutant. The prioritization process takes into account various environmental, social and political factors. Prioritization criteria include source and parameters of impairment; additional data needs; TMDL complexity and nature; waterbody use and cultural or historic importance; efficiency concerns; watershed management activities; sensitive species concerns; and public interest. Table 13 provides the most recent available (2012) data for impaired waterbodies within the vicinity of North Plainfield Borough.

All portions of streams within North Plainfield were found to have pollution impairment levels sufficient for listing on the current (2012) Draft 303d list. The primary sources of impairment include arsenic, pH and dissolved solids (see Section 4.8).

The 303(d) determination also provides designated uses for waterbodies within the subwatersheds <sup>7</sup> and lists whether or not waterbodies currently support that use based on pollution levels. Within North Plainfield, industrial water supply is the only designated use fully supported among all subwatershed waterbodies within the Municipality. Green Brook (Bound Bk. to North Plainfield Gage); is the only North Plainfield subwatershed currently supporting public water supply and agricultural water supply. Due to the consistent presence of fecal coliform bacteria, primary contact recreation such as swimming is not considered an acceptable use within these watersheds at this time. In addition, none of the subwatershed bodies are currently fully supporting aquatic life, as indicated by AMNET data (see Section 7.3.3). Acidity has determined to be the primary reason in portions of the Green Brook (N Plainfield Gage to Blue Bk.); however, the reasons are not known in the other subwatershed areas.

**Table 13 2012 (Draft) 303(d) Impaired Waterbodies  
List for the Vicinity of (Subwatersheds) North Plainfield Borough <sup>7</sup>**

Subwatershed	HUC 14 ID#	Pollutants	Cycle first listed	Priority
Green Brook (N Plainfield Gage to Blue Bk.)	02030105120020	Arsenic	2012	L
		Total Dissolved Solids	2010	M
		pH	2010	M
Stony Brook (North Plainfield)	02030105120030	Arsenic	2012	L
		Total Dissolved Solids	2008	M
		Unknown	2006	M
Green Brook (Bound Bk. to N Plainfield Gage)	02030105120040	Unknown	2006	M

**Table 14 2012 Status of Designated Uses By Subwatershed  
for Waters Within the Vicinity of North Plainfield Borough <sup>7</sup>**

NJDEP WMA Assessment Unit ID Name	Assessment Unit Name	CATEGORIES AND REASON FOR NOT SUPPORTING						
		Aquatic Life	Aquatic Life (Trout)	Primary Contact Recreation	Public Water Supply	Agricultural Water Supply	Industrial Water Supply	Fish Consumption
Green Brook (N Plainfield Gage to Blue Bk.)	02030105120020	NS pH	NS	NS FC	NS	NS TDS	FS	II
Stony Brook (North Plainfield)	02030105120030	NS CU	NS	NS FC	NS A, TDS	NS TDS	FS	II
Green Brook (Bound Bk. to N Plainfield Gage)	02030105120040	NS CU	NS	NS FC	FS	FS	FS	II

Categories: Fully Supporting -FS; Not Supporting -NS; Insufficient Information -II,

Causes: A - arsenic; FC- fecal coliform bacteria; pH - acidity; TDS-total dissolved solids; CU- cause unknown

## 7.4 Surface Water Quality Protection

### 7.4.1 Riparian Corridors

Riparian corridors refer to the areas bordering water bodies and are typically associated with rivers, streams, lakes and ponds. Healthy functional riparian corridors include vegetated areas such as forests or wetlands along river systems. The riparian corridors in which streams and rivers are located serve many functions in protecting the water quality of the water body. They are complex ecosystems that provide food and shade and are effective in removing excess nutrients and sediment from surface runoff and shallow groundwater. Streamside vegetation also buffers the impacts of some herbicides and pesticides and provides dissolved and particulate organic food needed to maintain high biological productivity and diversity. Streamside forests improve water quality and biological diversity by filtering out sediments and suspended solids; transforming excess nitrogen and phosphorus; storing nutrients for extended periods; and providing energy to the stream in the form of dissolved carbon compounds and particulate organic detritus (dead plant matter). This detritus forms the basis for the aquatic food chain. Riparian corridors are particularly critical to keep water from getting overheated; cool water is able to hold increased levels of dissolved oxygen and will support a wider diversity of benthic macro invertebrates that form the base of aquatic food chains.

The effectiveness of a preserved buffer along stream corridors can vary, depending on soil permeability and slopes. Areas with flatter slopes and with soils having a greater proportion of sand would not require a buffer as wide as areas with steeper slopes and soils containing less sand. The most effective riparian corridors should typically be 300 feet or wider<sup>8,9</sup>.

Approximately 7,800 linear feet of forested riparian habitat run along the Green Brook in North Plainfield. An additional 5,100 linear feet of forested riparian habitat run along Stony Brook in the municipality (see Appendix A, Forests and Forested Wetlands). The vegetated corridor ranges in width from approximately 1,220 feet (Stony Brook above County Road 649) to less than 150 feet (Stony Brook just below Rt. 649). The Green Brook forested corridor from its confluence with Stony Brook south to the municipal border in North Plainfield generally ranges in width from 500 to 900 feet. These forested and vegetated habitats have been identified as wood turtle habitat (see Appendix A, Landscape Project Map).

These major forested stream corridors comprise a combined total area of riparian corridor of approximately 197 square acres within North Plainfield.

Under the NJDEP Flood Hazard Area Control Act (FHACA) Rules (N.J.A.C. 7:13; last amended September 7, 2010), the NJDEP regulates development (vegetation removal) within the vicinity of stream corridors and within floodplains. Under the revised regulation, the protection of vegetation or Riparian Zone extends for a distance of 50, 150 or 300 feet from the top of bank along streams depending on several factors. A 300 foot width Riparian Zone has been adopted to protect all C1 waters. A 150-foot Riparian Zone is provided for all trout production waters and all upstream waters; all trout maintenance waters and all upstream waters within one linear mile as measured along the length of the regulated water; any segment of water flowing through an area that contains documented habitat for threatened or endangered species of plant or animal,

which is critically dependent on the regulated water for survival, and all upstream waters within one linear mile; and any segment of a water flowing through an area that contains acid producing soils. A 50 foot riparian zone is provided for all remaining regulated waters. A corridor of 50 foot width may provide some limited stream corridor functions, such as shade and bank stabilization, but will provide less in the way of filtering sediment or pollutants or the uptake of nutrients.

Due to the presence of State threatened wood turtle habitat throughout the corridors of southern North Plainfield, stream riparian zones in the southern half of the municipality, including non-habitat stream areas within a mile upstream, would be expected to be 150 feet (see Section 7.5.2). Certain stream portions in the northern part of the municipality would be more likely to have a 50 standard riparian zone. Riparian zone widths are subject to review and verification by the NJDEP on a case-by-case basis.

#### **7.4.2 Stormwater Management Review**

Increases in development and impervious surfaces result in increases of stormwater runoff quantity and velocity. The increase in quantity causes streams to peak faster and higher than under natural or predevelopment conditions, and may result in downstream flooding and erosion problems.

As a result of the water quality and quantity issues associated with stormwater, New Jersey adopted two sets of rules in 2005 that affect stormwater management. The first set of rules is the Phase II New Jersey Pollutant Discharge Elimination System Stormwater Regulation Program Rule (N.J.A.C. 7:14A-1 *et seq.*). These rules address pollutants associated with existing stormwater runoff, as required under the Federal Clean Water Act. These rules govern the issuance of permits to certain public entities, including municipalities, which own or operate small municipal storm sewer systems (MS4s). The permit program establishes the Statewide Basic Requirements that must be implemented to reduce nonpoint source pollutant loads from these sources. The Statewide requirements include measures such as the adoption of ordinances (litter control, pet waste, wildlife feeding, proper waste disposal, etc.); the development of a municipal stormwater management plan and implementing ordinances; requiring certain maintenance activities (such as street sweeping and catch basin cleaning); implementing solids and floatables controls; locating discharge points and stenciling catch basins; and a public education component<sup>10</sup>.

The second set of rules are the Stormwater Management Rules (N.J.A.C. 7:8-1 *et seq.*), which apply to stormwater systems associated with new (proposed) development. The design and performance standards established in these rules have replaced the stormwater management rules that apply to residential development under the Residential Site Improvement Standards (RSIS), and include residential subdivisions, site plan and building permit approvals. For non-residential development, the Stormwater Management Rules will not be applied at a local level until a municipal ordinance is passed adopting the standards. However, if the non-residential development requires one of the Land Use Regulation Program permits listed at N.J.A.C. 7:8-1.6(c), the new rules will be applied under that review.

The Stormwater Management Rules apply to new development that will ultimately result in the disturbance of one or more acres of land, or in an increase in impervious surface by one-quarter of an acre or more (*i.e.*, “major development” under NJDEP regulation). The Stormwater Management Rules for major development require standards for quantity and quality control including groundwater recharge, runoff quantity controls (such as detention basins), runoff quality controls (such as total suspended solids (TSS) removal devices), and buffers around Category One (C1) waters. Details of the performance standards can be found in Subchapter 5 of the Stormwater Management Rules <sup>10</sup>.

North Plainfield has adopted a Stormwater Management Plan. As part of its promotion, the NPEC has volunteered to assist in the implementation of its education and outreach element. The Commission has been working with the local scouting organizations and schools to promote stewardship in stormwater management, particularly in erosion control and passive stormwater treatment measures.

## **7.5 Floodplains and the Flood Hazard Area Control Act Rules**

### **7.5.1 NJDEP Flood Hazard Area Control Act Rules –Definitions**

Activities in floodplains (see Appendix A, Flood Hazard Areas Map) are regulated by the NJDEP under the NJ Flood Hazard Area Control Act (FHACA; N.J.S.A. 58:16A-50 *et seq.*).

A Flood Hazard Area (FHA) is defined in N.J.A.C. 7:13-1.2 as the land and space above that land, which lies below the FHA Design Flood. The area of the FHA Design Flood is determined by a discharge 25% larger than the discharge resulting from a 100-year storm in order to account for the effects of future development in the watershed (NJDEP Flood Control). The FHA includes both the floodway and flood fringe. The floodway is the channel and inner portions of the floodplain adjoining the channel which are reasonably required to carry and discharge the flood <sup>11</sup>. The floodway is subject to high velocity flows during flooding events and as such development within a floodway is highly restricted. It is defined in the North Plainfield Administrative Code as areas reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than 0.2 feet <sup>12</sup>. The flood fringe is the portion of the floodplain contiguous with the floodway. The flood fringe experiences flooding, but is inundated to a lesser degree than the floodway. Delineated FHAs have been established and officially adopted by the State of New Jersey for certain watercourses. Flood profiles, mapping and corresponding computer models for delineated watercourses may be obtained from the NJDEP <sup>11</sup>.

The Flood Insurance Program, administered by the US Flood Emergency Management Agency (FEMA), has also prepared mapping and classifies floodplain areas in a manner similar to the State of New Jersey. Within the FHACA rules (N.J.A.C. 7:13-3), NJDEP has established methodologies and circumstances for using FEMA floodplain mapping (see Appendix A, Flood Hazard And Topographic Contours Map) for determining the FHA for FHACA applications.

North Plainfield has additional flood hazard regulations under the administrative code Chapter XX, Flood Prevention <sup>12</sup>. These regulations include development permits and preventions for

flood hazard reduction. Included are regulations for appropriate development and variances, design and elevations, definitions and materials.

### **7.5.2 Flood Hazard Area Control Act Rules and Riparian Zones**

Certain activities within the FHA must be authorized by an FHA Permit issued by NJDEP in accordance with the NJDEP FHACA rules. The FHACA rules (N.J.A.C. 7:13) were updated and reissued in 2007, and most recently amended in September 2010. Similar to the NJDEP Wetlands Permit structure, FHA General Permits have been created for various activities within the FHA. If an activity does not fall under one of the designated General Permits, the activity may require the application of a FHA Individual Permit, depending on the nature and location of the proposed activity within the FHA. It is important to note that FHA Individual Permits are generally not as costly as Freshwater Wetlands Individual Permits. The application process may also require NJDEP verification of the lines of the FHA or Floodway (Jurisdictional Determination), which would need to be shown on a plan signed and sealed by a professional engineer<sup>11</sup>.

Additional activities are covered under various Permits-By-Rule identified within FHACA rules (N.J.A.C 7:13-7). Permits-By-Rule have been created for a variety of reconstruction or regular maintenance activities within a FHA. Permit-By-Rule activities do not require a FHA permit application; however, certain Permits-By-Rule do require a minimum 14 day notification to NJDEP prior to the start of activities.

In addition to the FHA, an additional regulated area referred to as the Riparian Zone has been established under the revised rules (N.J.A.C. 7:13 - 4.1). Activities involving vegetation clearing within the Riparian Zone are regulated and amounts of permitted clearing have been established within the rules. The Riparian Zone exists along every regulated water (as defined in the FHACA Rules N.J.A.C. 7:13-2.2) and includes the land and vegetation in the regulated water and a portion of land extending from the top of bank, or centerline of a linear feature such as a stream, or from the normal water surface limit for a pond or lake. The size of the regulated Riparian Zone depends on several factors listed here<sup>11</sup>.

For Category 1 (C1) streams and upstream waters within the same HUC-14 subwatershed, the regulated Riparian Zone would be 300 feet. None of North Plainfield's waters or subwatersheds have a C1 designation (see Appendix A, Wetlands and Surface Waters Map).

A 150 foot Riparian Zone is provided for all trout production waters and all upstream waters; all trout maintenance waters and all upstream waters within one linear mile as measured along the length of the regulated water; any segment of water flowing through an area that contains documented habitat for certain water-dependent threatened or endangered species and all upstream waters within one linear mile; and any segment of a water flowing through an area that contains acid producing soils. Although located immediately upstream of North Plainfield, there are no trout maintenance or trout production waters within or within one mile downstream of the Borough. The wood turtle is the only critically water-dependent species under the Flood Hazard Rules that would impact riparian buffers of streams in portions of the Borough. This would include habitats mapped as wood turtle habitat or one mile upstream.

By regulating and limiting development in the FHA and Riparian Zone, not only is the floodplain protected as a resource, but potential property loss is minimized as well. Filling and development of floodplains removes the capacity of the floodplain to provide flood storage benefits which increase the likelihood of increased upstream and downstream flooding (see Section 7.5.4, Flood Prone Areas of North Plainfield). Vegetated floodplains reduce the velocity of stormwater, thereby reducing erosion and increasing flood storage. Floodplains also provide vital habitat and travel corridors for wildlife.

The Borough of North Plainfield also has some additional restrictions within floodplains including prohibitions on the storage or dumping of certain materials within the floodplain areas

### **7.5.3 Flood History and Control Projects in North Plainfield Watersheds**

North Plainfield and its associated Green Brook subbasin have a history of severe and devastating floods over the past century. Without continued mitigation and control activities, impacts from increasingly frequent and severe storms would be expected to increase in the subbasin, particularly in the context of Global Climate Change (see Section 3.2). The subbasin is a 65 square mile area incorporating Green, Stony, Blue, and Ambrose Brooks. In recent history, the subbasin has had a number of major and minor storm events totaling over \$2.4 billion in damages.

Some of the most devastating local flood events have occurred over the last 40 years. Major Floods in North Plainfield occurred from storms on August 27-29, 1971; August 2, 1973; and September 16, 1999 (Tropical Storm Floyd). The 1971, 1973 and 1999 storms cost \$20 million in damages and claimed 4 lives in the Borough<sup>13</sup>. One other significant storm occurred in October of 1996, which resulted in close to 3,000 evacuations and damage to more than 1,950 residences and businesses totaling approximately \$22.8 million.

Between 2000 and 2013 there have been an additional number of storms. An additional storm of record was a large Nor'easter that occurred on April 15-17, 2007; Tropical Depression Ida in November 2009; a series of storms and flooding starting on March 12, 2010; and severe storms and flooding on August 13, 2011, and August 26, 2011 as a result of Hurricane Irene. The most recent large event was Hurricane Sandy in 2012<sup>14</sup>. The March, 2010 storm event resulted in municipal infrastructure damage, residential damage and evacuations<sup>14</sup>. As a result of the frequent and significant occurrence of flooding in North Plainfield, the Borough is considered of High Natural Hazard or Vulnerability Risk Ranking by the County of Somerset and others<sup>4</sup>.

In response to storms and impacts within the Green Brook subbasin during the 1971 and 1973, storms, the Green Brook Flood Control Commission was authorized by the State to oversee flood control projects within the subbasin. The commission is a partnership between the NJDEP, USACE, Union, Somerset, and Middlesex Counties; and 13 afflicted municipalities. Municipal partners include North Plainfield, Bound Brook, Bridgewater, Dunellen, Green Brook, Middlesex, Piscataway, Plainfield, Scotch Plains, South Plainfield, Warren and Watchung<sup>15</sup>. A full description of the establishment and activities of the Green Brook Flood Control Commission in North Plainfield is included in Chapter II of Administrative Code (2-25.3)<sup>12</sup>.



The commission is involved with a series of flood control and prevention measures known as the Green Brook Flood Control Project. The project consists of a number of structural and non-structural flood control measures throughout the Green Brook Subbasin to reduce the impacts of flooding. These measures include the development of earthen levees and concrete flood walls, closable flood barriers, removal of flood sensitive infrastructure from floodplains, elevation raisings of bridges, the creation of pumping stations, upgrading of stormwater systems, flood proofing of properties, and acquisition of lands for flood storage<sup>16</sup>. North Plainfield participates in the Green Brook Flood Control Commission. The flood control plan adopted in 1974 included 50 year flood protection for North Plainfield along the Green Brook and Stony Brook; however, the program was not funded. Union and Somerset Counties have taken the initiative for bridge reconstruction and stream improvements consistent with the design flows, especially for the Stony Brook, but there is no comprehensive program. The Upper Basin of the Green Brook (from Clinton Avenue up to Berkeley Heights) has been the subject of separate negotiations for years, but the political issues have yet to be resolved<sup>20</sup>.

As part of this flood control project in North Plainfield, the Crab Brook Flood Control Project was developed by NJDOT in 2004 to reduce flooding in the Route 22 Corridor. The major element of the project was to increase the flood capacity of the Crab Brook to negate flooding impacts from a 10-year storm intensity with some reduction in intensity for a storm between 10 and 100 year levels. The project was planned but not funded by NJDOT. Channel improvements have also been developed by the USACE for Green Brook, Stony Brook and Middle Brook<sup>17, 18</sup>.

North Plainfield also assists in resident outreach and education in relation to flooding and flood hazards. Information on the Borough website (<http://www.northplainfield.org>) provides information on local flooding and flood prevention under the Emergency Management webpage. The webpage provides information on flash flooding; flood hazards; damage prevention; cleanup, disease and mold control; safety procedures and evacuation information at this location<sup>13</sup>.

#### **7.5.4 Flood Prone Areas of North Plainfield**

As previously discussed, many of the low lying areas within the Green Brook Subbasin are subject to frequent and severe flooding. North Plainfield is particularly vulnerable to major flooding along portions of all major streams in the municipality (see Appendix A, Flood Hazard and Topographic Contour Map). North Plainfield is adjacent to, and downstream from steep slopes of the Watchung ridge, which typically range in elevation from 450-500 feet AMSL. In contrast North Plainfield is gently rolling or relatively level. Most floodplain areas are generally between 20 and 30 feet AMSL with some areas between 30 and 40 feet AMSL. This rapid change in elevation results in runoff with high velocity and rapid time of travel to stream segments within North Plainfield. This condition, combined with development and impervious surfaces, sedimentation, and limited flood storage, all contribute to the flooding issues specific to the municipality. The most vulnerable areas within North Plainfield are included in the Flood Hazard Area and Topographic Contour Map in Appendix A.

Art Bernard Associates prepared the floodplain mapping based on FEMA Flood Insurance Rate Maps (FIRM) for Somerset County, NJ (see Appendix A, Flood Hazard Areas and Topographic Contours Map). This mapping was developed by FEMA as a standard to determine the need and amount of flood insurance landowners need<sup>19</sup>. The prepare map shows three flood zones in North Plainfield, two of which are considered part of the “Special Flood Hazard Area.”<sup>19</sup>. The Special Flood Hazard Areas may also be referred to as the 100-year flood, which indicates that that have a 1% chance per year of being flooded (i.e. the flood elevation will be equaled or exceeded at that location). It is important to consider that the perception of flooding within the 100-year floodplain can be somewhat deceiving, as flooding periodically impacts these areas at a greater frequency than once per 100 years.

Within North Plainfield, the largest 100-year flood areas are concentrated along the corridor of Stony Brook, Crab Brook, and along portions of the Green Brook, particularly downstream of Grove Street. Most areas within the 100-year flood within North Plainfield are high to medium density residential areas or floodplain/bottomland forest.

A Special Flood hazard Area identified on the North Plainfield Floodplain map is referred to as 100-year shallow flooding is identified along a section of Crab Brook between Watchung Avenue and Grove Street. This implies that there is a 1% chance of shallow water (1 to 3 feet) flooding, typically as ponded water<sup>19</sup>. Land use in this area is primarily high-density residential and commercial (see Appendix A, Land Use/Land Cover Map).

The remaining area identified to on the map refers to several primarily forested or medium density residential areas primarily along the margins of the 100-year flood that are identified as having a 0.2% annual risk of flooding. These areas are sometimes referred to as referred to as the 500-year floodplain.

## 7.6 References for Water Resources

- 1 NJDEP Division of Watershed Management Information on Watershed Management Area 9 (WMA 9) [www.state.nj.us/dep/watershedmgt](http://www.state.nj.us/dep/watershedmgt)
- 2 NJDEP 2010 Bureau of Water Quality Standards and Assessment - Category One Waters <http://www.nj.gov/dep/wms/bwqsa/c1waters.htm>
- 3 NJDEP 2011. Permit Administration Section Active Permit List Updated 5/24/11. <http://www.nj.gov/dep/dwq/database.htm> (Accessed, 2013)
- 4 Tetra Tech 2013. Comprehensive Vapor Intrusion Investigation Report for the Lockheed Electronics Company (LEC) Site. Boroughs of Watchung and North Plainfield, Somerset County New Jersey. Produced by Tetra Tech for Lockheed Martin. One Salem Square, 295 Route 22 East, Suite 104E, Whitehouse Station, NJ 08889
- 5 NJDEP 2011. Bureau of Freshwater and Biological Monitoring. Ambient Biological Monitoring Network of NJ (AMNET) Macroinvertebrate Sampling <http://www.state.nj.us/dep/wms/bfbm/amnet.html>
- 6 USEPA 2012. Rapid Bioassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish Second Edition (Utilized for making water quality assessments under the NJDEP AMNET Program) <http://water.epa.gov/scitech/monitoring/rsl/bioassessment/index.cfm>
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- 8 Welsch, David J., 1991. Riparian Forest Buffers - Function and Design of Protection and Enhancement of Water Resources. US Department of Agriculture, Forest Service. Publication # NA-PR-07-91.
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## 8.0 WETLANDS

### 8.1 Definition and Identifying Factors

The NJDEP regulates activities in wetlands (see Section 8.4) and their adjacent transition areas under the New Jersey Freshwater Wetlands Protection Act (N.J.S.A. 13:9A-1 *et seq.*), which defines a wetland as:

“An area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation.”<sup>1</sup>

The North Plainfield Code<sup>2</sup> for Land Development utilizes the state definition in defining wetlands (Article VIII Zoning Board of Adjustment - 22-101.2 Regulation). Wetlands serve many important ecological and quality of life functions. They minimize flooding by absorbing water during storm events and releasing it slowly over time. This function is particularly important along the forested stream corridors of North Plainfield. They also improve water quality by filtering sediments and absorbing nutrients and pollutants and reducing them to their elemental forms. Wetlands provide habitat for many species of wildlife including Federal and State-listed endangered and/or threatened species and in turn enhance passive recreational experiences such as fishing and bird watching.

In order to accurately define and delineate wetlands, a methodology was developed by the Federal Interagency Committee for Wetland Delineation (FICWD) and is presented in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989). NJDEP has adopted this manual as the technical basis for identifying and delineating freshwater wetlands in New Jersey. The location and extent of wetlands is established using a three-parameter approach: 1) dominance of hydrophytic vegetation, 2) presence of hydric soils, and 3) evidence of long-term wetland hydrology<sup>1</sup>.

The general distribution of freshwater wetlands in North Plainfield is depicted on the Forest and Forested Wetlands Map (Appendix A, Master Plan Maps), as well as the Surface Water Map, Land Use /Land Cover Map in Appendix A. The extent of wetlands as depicted are intended to be used as a general planning tool. The specific location, extent and resource value classification of wetlands is subject to case-by-case detailed field delineations, surveys and analysis. The presence, absence, extent and resource value classification of wetlands are subject to verification by the NJDEP Division of Land Use Regulation (DLUR) through the Letter of Interpretation (LOI) application process.

## 8.2 Wetland Resource Value Classification <sup>1</sup>

The Freshwater Wetlands Protection Act (N.J.S.A. 13:9A) classifies wetlands according to resource value. Each wetland resource value classification has a corresponding transition area, or upland buffer, that must be maintained between the wetland and adjacent development to protect the integrity and viability of the wetland ecosystem (N.J.A.C.7:7A-2.5). There are three different resource value classifications: exceptional, ordinary and intermediate:

*Exceptional resource value wetlands* are the highest quality wetlands and require a 150-foot transition area. Exceptional resource value wetlands are those that drain to Freshwater 1 (FW-1) waters, Freshwater 2 (FW-2) trout production (TP) waters or their tributaries, or are present or documented habitat for threatened or endangered species.

*Ordinary resource value wetlands* are typically viewed as the lowest quality wetlands and do not require a transition area. Ordinary resource value wetlands do not exhibit the characteristics of exceptional resource value wetlands and include isolated wetlands that are surrounded by development of more than 50% and are less than 5,000 square feet in size. These wetlands include drainage ditches, swales, or detention basins.

*Intermediate resource value wetlands* include all freshwater wetlands not defined as exceptional or ordinary and require a 50-foot transition area.

NJDEP has the final authority to determine the resource value classification of wetlands. This is established when the NJDEP issues a Letter of Interpretation (LOI) for a site. An LOI is obtained by submitting an application to the NJDEP Land Use Regulation Program in accordance with the requirements found at N.J.A.C. 7:7A-3.

The highest quality waters in New Jersey are designated “Outstanding Natural Resource Waters” (FW1). The FW1 waters are designed to be kept in a natural state and not subject to any wastewater discharges or increases in runoff. All remaining waters are categorized as FW2. As discussed in the Open Water Section of the ERI, there are no Freshwater 1 (FW1) waters within North Plainfield Borough.

All wetlands within North Plainfield Borough drain to Freshwater 2 Non-Trout waters (FW2-NT). There are large blocks of State-threatened wood turtle habitat (*Glyptemys insculpta* - see Wildlife Section 10.5) mapped by NJDEP Landscape Mapping along the Stony and Green Brook corridors in southern portions of the Borough. As result, many of the Borough wetlands that are appropriate in size and structure for wood turtle may be marked as exceptional resource value and subject to a 150 buffer.

It is important to note that while there are appropriate forested wetland corridors in North Plainfield, many of the adjacent residential land use areas in southwestern North Plainfield have clearly been marked incorrectly as wood turtle habitat (see Appendix A, Landscape Project Map). This discrepancy has been informally acknowledged by NJDEP and may possibly be

corrected during the next round of improvements to Landscape Mapping <sup>3</sup>. It is important to consider; however, that any wetland permit application, transition area application, or LOI for sites in the potentially misidentified habitat areas would need to consider the potential mapping discrepancy relative to wood turtle. This includes the applicant thoroughly documenting onsite land use and explaining any observable habitat limitations so the appropriate transition area can be applied in the NJDEP LOI or permitting process.

Other non-isolated wetlands over 5000 square feet in North Plainfield Borough that do not contain wildlife habitat, such as certain modified wetlands, may be classified as intermediate resource value wetlands and would have an associated 50-foot width wetland transition area (buffer). The resource value, or width of the transition area, is established by the NJDEP on a case-by-case basis when an LOI application is submitted for NJDEP review and verification.

### 8.3 Wetland Communities

According to 2007 Land Use data, North Plainfield Borough’s NJDEP mapped wetlands include a total of approximately 124 acres of the total municipal land. It is likely that additional wetlands exist within the Borough and onsite evaluation of areas (through the LOI or permitting process) may, on occasion, reveal the presence of freshwater wetlands. The wetland communities are classified following a system identified by Cowardin et al. (1979) <sup>4</sup> which separate wetlands into one of five basic ecological systems: Marine, Estuarine, Riverine, Palustrine, and Lacustrine. North Plainfield’s wetlands would likely be exclusively palustrine. Palustrine wetlands are all non-tidal wetlands dominated by trees, shrubs, persistent emergent plants, emergent mosses, or lichens.

<b>Table 15 NJDEP Distribution of Wetland Communities in North Plainfield Borough</b>	
<b>Wetland Type (NJDEP defined)</b>	<b>Acres</b>
Deciduous Forested Wetlands (PFO 1)	106.12
Deciduous Scrub-Shrub Wetlands (PSS 1)	2.13
Herbaceous (Emergent Wetlands) (PEM)	0.37
Modified Wetlands (MOD) on Fields	13.66
Modified Wetland MOD – Agricultural)	0.52
Modified Wetland ( MOD -cemetery)	1.33
<b>Total</b>	<b>124.17</b>

**Palustrine Deciduous Forest (Wooded) Wetlands (PFO 1)** Palustrine wetlands typically include all wetlands termed marsh, bogs, swamps, and fens. They are usually bordered by uplands and often shoreward of lakes and river channels. Palustrine wetlands may include small, shallow intermittent or permanent ponds, such as vernal pools (see Wildlife Section 10.8). Palustrine wetlands may be further defined by vegetation type, hydrology source, and human influences. North Plainfield’s palustrine wetland types and approximate percentage contributions are included in Table 15.

As with most other municipalities in Northern New Jersey, deciduous forested wetlands are the most abundant wetland type in North Plainfield, making up approximately 85% of the NJDEP mapped wetland areas. Deciduous wooded wetlands occupy approximately 106 acres of mapped wetlands within the Borough and make up the majority of forested areas (see Appendix A, Forest and Forested Wetland Map). The deciduous wetlands of North Plainfield Borough are primarily associated with the corridors of lower Stony Green Brooks (south of Grove Street). Several additional fragments of forested wetland are located along Crab Brook, along Route 22 and scattered among the residential areas primarily in central North Plainfield.

These forested wetland stream buffers are extremely important in absorbing and filtering pollutants and sediments from adjacent residential or developed areas. They also tend to stabilize stream flows by temporarily storing floodwater and mitigating the effects of drought (see Section 7.5).

Deciduous wooded wetlands are hardwood forested wetlands with vegetation that is greater than 6 meters tall and may have a variety of water regimes ranging from permanently inundated to intermittently flooded. Within North Plainfield, the majority of these forest areas are typically flooded only after large storms and not persistently inundated. Some relatively small depressions within these forest areas may seasonally hold some standing water (see Appendix B, Photo D) and evidence of occasional flooding, including piled debris and scour, is readily observable in many areas. There are some small portions of forested areas within North Plainfield that may have some spring fed hydrology and contain small amounts of standing water year round. Such an example exists within the forest adjacent to the western end of the Green Brook Park ball fields (see Appendix B, Photo E). The dominant canopy species of the wetland forests of North Plainfield include a mix of typical northern New Jersey broadleaf wetland forest species. These include red maple (*Acer rubrum*), green ash (*Fraxinus americana*), and pin oak (*Quercus palustris*). Other forest areas, including portions of Green Acres Park are dominated by large silver maple (*Acer saccharinum*). Other common wetland or stream oriented tree species present include American sycamore (*Platanus occidentalis*), American elm (*Ulmus americana*), and shagbark hickory (*Carya ovata*)<sup>5</sup>.

Common native understory shrubs that occur in North Plainfield wetland forests include spicebush (*Lindera benzoin*), silky dogwood (*Cornus amomum*), highbush blueberry (*Vaccinium corymbosum*), southern arrowwood, (*Viburnum dentatum*), musclewood (*Carpinus caroliniana*), and witch hazel (*Hamamelis virginiana*). Vine species may include poison ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), common greenbrier (*Smilax rotundifolia*), and grape (*Vitis spp.*)<sup>5</sup>. Common native understory floor herbaceous species identified within North Plainfield wetland forests include skunk cabbage (*Symplocarpus foetidus*), jack-in-the-pulpit (*Arisaema triphyllum*), tussock sedge (*Carex stricta*), jewelweed (*Impatiens capensis*), and various native *Polygonum* spp. including smartweeds and jumpseed (*Polygonum virginianum*), false nettle (*Boehmeria cylindrica*) and white snakeroot (*Ageratina altissima*) in slightly drier locations. Other native species that may be expected may include spring beauty (*Claytonia virginica*), trout lily (*Erythronium americanum*), cinnamon fern (*Osmunda cinnamomea*), marsh fern (*Thelypteris palustris*), sensitive fern (*Onoclea sensibilis*), clearweed (*Pilea pumila*), wood nettle (*Laportea canadensis*), and blueflag (*Iris versicolor*)<sup>5</sup>.



Many more herbaceous species are likely present in these forests; however, the forest understory is overwhelmingly dominated by several aggressive non-native species which drops overall understory plant diversity. The most common of these invasive species in North Plainfield are Japanese knotweed and Japanese stiltgrass. Privet, wineberry, lesser celandine, multiflora rose, and Japanese barberry are also present in lesser amounts within North Plainfield's forested wetlands <sup>6</sup>. Section 9.2.3 Invasive Species discusses these species and their impacts within North Plainfield in further detail.

**Scrub-Shrub Wetlands (PSS1)** – Within North Plainfield, there are approximately 2.13 acres of scrub-shrub wetlands. These wetland are mapped in one location in western North Plainfield (see Mapped Wetlands Map). There are possibly other patches of scrub-shrub habitat interspersed among forested wetlands and along stream corridors. These wetlands include vegetation that is less than 6 meters tall and includes true shrubs or young trees, often representing a stage of succession following disturbances such as fire, flooding, logging or utility clearing or beaver activity.

Scrub-shrub wetlands may also be a component of marsh wetlands otherwise dominated by herbaceous species. Scrub-shrub wetlands include a variety of water regimes ranging from permanently inundated to intermittently flooded. Typical northern New Jersey wetland shrub species historically expected in North Plainfield would include buttonbush (*Cephalanthus occidentalis*), red osier dogwood (*Cornus sericea*), silky dogwood (*Cornus amomum*), smooth alder (*Alnus serrulata*), common elder (*Sambucus canadensis*), swamp rose (*Rosa palustris*), highbush blueberry (*Vaccinium corymbosum*) and meadowsweet (*Spirea tomentosa*).

**Palustrine Emergent (Herbaceous) Wetlands (PEM1)** - Palustrine emergent wetlands are freshwater marshes, fens, wet meadows, or successional open water edges/floodplains dominated by persistent and non-persistent grasses, rushes, sedges, forbs and other herbaceous or grass-like plants with little or no woody species component. Within North Plainfield, NJDEP mapping shows only approximately 0.37 acres of palustrine emergent wetlands dominated by herbaceous species (see Table 15). These wetlands are primarily located as linear patches adjacent to Green and Stony Brooks. As with scrub shrub wetlands, plant communities with herbaceous wetland characteristics may occur as small patches within the municipality and mapped as modified wetlands, urban areas, forested wetlands or under another category.

Examples of small areas with herbaceous wetland characteristics include vegetated areas on the periphery of Green Acres Park Lake, Green Brook Lake, and in a canopy breaks within the forested wetlands of Green Brook (see Appendix B, Photos E - G) as well as in the vicinity of the Blue Star Highway property along Route 22 <sup>19</sup>. North Plainfield's emergent wetland plant communities are a mix of grasses, rushes, sedges and forbs. These species include cattail (*Typha* spp.), tussock sedge, spotted jewelweed, common rush (*Juncus effusus*), nut sedge (*Cyperus* sp.), path rush (*Juncus tenuis*), porcupine sedge (*Carex hystericina*) and other *Carex* sedges, pickerelweed (*Pontederia cordata*), bulrushes (*Scirpus* spp.), native or non-native irises (*Iris* spp.), purple loosestrife (*Lythrum salicaria*), blue vervain (*Verbena hastata*), water pepper (*Polygonum hydropiper* and similar *Polygonum* sp.), and manna-grass (*Glyceria striata*), forget-me-not (*Myosotis* sp.) and water dock (*Rumex orbiculatus*). Open water areas in North Plainfield

areas also contain exotic aquatic plants including (water lilies (*Nymphaea* spp.) and water milfoil (*Myriophyllum spicatum*).

Other herbaceous wetland species expected to occur in these or other North Plainfield wetlands include tick-seed sunflower and similar species (*Bidens* spp.), rice cutgrass (*Leersia oryzoides*), bur-reeds (*Sparganium* spp.), arrow arum (*Peltandra virginica*), purple loosestrife (*Lythrum salicaria*), and arrow-leaved tearthumb (*Polygonum sagittatum*)<sup>5</sup>.

#### **8.4 Wetland Regulations**

Since July 1, 1988 the NJDEP Bureau of Freshwater Wetlands has regulated all disturbances in freshwater wetlands under the NJ Freshwater Wetlands Protection Act Rules (N.J.A.C. 7:7A-1.1 *et seq.*). Since July 1, 1989, the NJDEP has regulated “transition areas” (i.e. lands adjacent to wetlands). As per the freshwater wetlands law and regulations, municipalities cannot adopt local wetlands ordinances (N.J.S.A. 13:9B-30). Municipalities may adopt ordinances to require a Letter of Interpretation or encourage wetland protection through various actions.

In March 1994, the NJDEP assumed the State’s administration of the Federal wetlands program, Section 404, of the Federal Clean Water Act (33 U.S.C. §1251 *et seq.* (1972)) for the majority of freshwater wetlands in the state. The US Army Corps of Engineers (USACE) retained jurisdiction over all tidal wetlands, certain interstate waters and wetlands and most freshwater wetlands within 1000 feet of tidal waters. The USEPA the National Marine Fisheries Service (NMFS) and the US Fish and Wildlife Service retain some oversight over this program, reviewing permit applications for major discharges to wetlands and reviewing new Statewide General Permits and other changes to the Rules for consistency with the Federal 404 program.

Between July 1, 1988 and July 1, 1989, only activities in wetlands and open waters themselves were regulated by NJDEP. Since July 1, 1989, buffer or transition areas adjacent to wetlands have also been regulated. Regulated activities in wetlands include draining, flooding, cutting of vegetation, excavation, filling, and erection of structures. Similar activities are regulated in wetland transition areas.

There are two broad types of NJDEP permits than can be issued for disturbance in wetlands: 1) General Permits and 2) Individual Permits. General Permits may also be issued for activities in wetland transition areas. General Permits can be granted for certain minor activities in wetlands subject to certain conditions. There are General Permits for wetland encroachments related to multiple activities including: utility lines; outfalls; road crossings; disturbance of isolated wetlands; disturbance of ditches or swales; surveying; soils sampling; house additions; trails and boardwalks; docks and piers; dredging of ponds; fish and wildlife management activities; cleanup of hazardous waste; etc. For outfalls and road crossings, no more than 1/4 acre of wetlands can be disturbed. For isolated wetlands, ditches and swales, no more than 1 acre of wetlands may be disturbed. Additions to residential dwellings existing prior to July 1, 1988, are limited to less than 750 sq. ft. of fill with no impact to adjacent wetlands. If wetlands filling cannot be avoided, proposed activities should be limited to those activities authorized under the General Permit where at all possible.

Individual Permits are required for all other disturbances in wetlands not authorized under General Permits. These permits are generally costly, very difficult to obtain, and require mitigation (see Section 8.5). If the proposed activity is water dependent, and wetlands disturbance is minimized, a permit may be granted. For non-water dependent uses, it must be proven that there is no other alternative location or design for the proposed project that would involve less or no wetlands disturbance. An alternative site to be considered can be on property owned by the applicant or on any property that could be obtained within the region.

Activities in wetland transition areas (regulated uplands surrounding a wetland) must be authorized under a Transition Area Waiver. Granting of a wetland permit is accompanied by a waiver to disturb the associated transition area. If activities are limited to within a transition area, they may be approved under an NJDEP Transition Area Averaging Plan Waiver. Under such a plan, the shape of a transition area may be adjusted as long as the total area of the standard transition area is not reduced and other width requirements of the transition area are maintained. Selected activities within a transition area may be authorized under a Special Activities Waiver. These activities may include construction of road crossings or stormwater outfalls that would be authorized under a General Permit if they were conducted in wetlands. Where certain specific characteristics of slope and vegetative cover are present in the transition area and the development intensity is not high, a straight reduction of the transition area, without compensation, may be authorized under a waiver. Lastly, a Hardship Waiver may be granted under certain circumstances. Transition Area Waivers may require deed restrictions or other land use restrictions on remaining adjacent transition areas.

As previously mentioned, municipalities are limited by law in adopting ordinances that specifically regulate activities in wetlands and wetland transition areas. Specific freshwater wetland regulations in New Jersey are the responsibility of NJDEP and /or the USACE.

Municipalities may adopt an ordinance requiring that an applicant for subdivision, site plan or building permit approval obtain an LOI from NJDEP establishing the limit of wetlands and wetlands transition areas on a property or similar measures. The Municipal Code of North Plainfield does encourage the protection wetlands through several articles in the Code that involve identification and description of wetlands for approvals<sup>2</sup>. These can be found in the Environmental Impact Statement requirements under Article VI Subdivision and Site Plan Review and Approval; and with relation to stormwater in Article VIII Zoning Board of Adjustment. In addition the Master Plan (identified in the Borough Code as Article III Master Plan) currently being developed has a conservation plan element that addresses the conservation of wetlands and other natural resources

## **8.5 Wetland Mitigation**

Wetlands, such as modified agricultural wetlands, may be converted to their original state as part of a mitigation project. Wetland mitigation is required for certain private or public projects that impact open waters and wetlands in New Jersey. The need for mitigation depends on the size of the impact and/or type of permit being obtained. Mitigation is the creation, restoration, enhancement, mitigation bank credit purchase, monetary contribution, preservation, or a land donation as compensation for wetlands impacted or lost during permitted activities such as road development. Mitigation may provide opportunities for landowners to sell wetlands that are

otherwise not developable and have less economic value, or sell adjacent uplands they wish not to sell for development. The New Jersey Department of Transportation and other organizations are often required to purchase sites for mitigation as part of their permitting processes. Mitigation at a ratio of 2 acres of wetland compensation to 1 one acre of impact would typically be a condition of a Freshwater Wetlands Individual Permit. Recent NJDEP wetland regulation revisions adopted in 2008 (N.J.A.C. 7:7A) additionally require mitigation for several General Permits.

For those required to do wetland mitigation, it may be performed onsite or offsite or through land donations, monetary contributions, or through the purchase of Wetland Mitigation Bank credits. A Wetland Mitigation Bank is a pre-constructed wetland or an area of wetland/upland that has been preserved. Mitigation Banks are assigned to specific Watershed Management Areas (WMA) to compensate for wetland losses within that WMA. The portion of WMA 9 that includes North Plainfield Borough is currently serviced by the Cranbury and Wyckoff Mills Mitigation Banks, both of which are able to sell credit as of June, 2013. More information on mitigation may be acquired through the Division of Land Use Regulation Mitigation Council <sup>7</sup>.

In addition, the USDA Natural Resource Conservation Service (NRCS) can direct landowners to programs and organizations involved with wetland mitigation/restoration. A local example of the benefits of wetland mitigation includes the management of wetlands as part of the NJDEP/USACE Green Brook Flood Control Project on the Finderne Farm in the Bridgewater Area <sup>8</sup> (see discussion on floods in Section 6.5).

## **9.0 LAND USE**

North Plainfield Borough is a community consisting mostly of low to medium density residential single-family housing (see Appendix B, Photo S) interspersed with smaller natural areas including open waters, forested wetlands, and upland forest patches. North Plainfield's areas of higher density dwellings, including apartments and condominiums, are situated primarily north of Route 22. Commercial areas are primarily concentrated around Route 22 and along Somerset Street. A relatively small amount of deciduous forest cover exists within North Plainfield. Forested areas are primarily associated with forested stream corridors, particularly Stony Brook, and portions of the lower Green Brook.

As is typical with many communities within the New York Metropolitan Area, North Plainfield's conversion from agricultural land use to residential and commercial development progressed rapidly during the second half of the twentieth century and the most evident land use/land cover change over the past 100 years. Portions of the of the Borough west of West End Avenue and east of Watchung Avenue were dominated by agriculture into the 1930's as evident on historic aerials of the community (see Appendix A, Historic Aerial Map).

Prior to clearing for farmland, North Plainfield's natural land cover would have been a mix of upland and lowland deciduous forest described in Sections 8.3 and 9.2. With the exception of the remaining forested stream corridors, major forested areas within North Plainfield were cleared during the 18<sup>th</sup> and 19<sup>th</sup> century regional expansion of agriculture (see Appendix A, Orthographic Air Photo and Historic Aerial Maps).

Within the North Plainfield ERI, two maps are included to illustrate current land usage and cover types. An Existing Development Patterns Map developed by Art Bernard Associates for the master plan shows patterns of Land Use based on 2012 Tax maps and field observation. The second land map is a Land Use/Land Cover (LULC) Map derived from 2007 NJDEP GIS data. The LULC Map shows land uses and additional land covers, such as forests and wetlands, based on NJDEP airphoto interpretation and data. The acreages collected in Table 17 are derived from the NJDEP 2007 Land Use Land Cover data and correspond with the LULC map

### **9.1 Land Use/Cover Types**

The LULC cover types mapped and described in the ERI include forest, wetlands, agriculture, barren land, water, and a variety of developed land use types referred to as "urban." For North Plainfield Borough, these urban land uses primarily include residential, recreational, commercial and services, industrial, and transportation/communication/utility infrastructure, and cemeteries. These designations and their definitions have been derived from the Anderson Classification System and edited by the NJDEP<sup>9</sup>. The approximate acreages of these various cover types are summarized in Table 16 and descriptions of these land uses and land covers are listed below. Section 8.3 of the ERI provides descriptions of wetland cover types.

<b>Table 16 Distribution of NJDEP Defined Land Use/Land Cover Types in North Plainfield (2007)</b>			
<b>General Land Use Cover Type</b>	<b>Specific Land Use/Land Cover Type Label</b>	<b>Approximate Acres</b>	<b>Approximate Municipal %</b>
Urban	Residential - Single Unit Low/Medium Density	1073.25	60.1
Urban	Commercial and Services	235.06	13.2
Urban	Residential - High Density Multiple Dwelling	194.13	10.9
Urban	Transportation /Communication/ Utilities	40.17	2.2
Urban	Other Urban or Built-Up Land	29.75	1.7
Urban	Athletic Fields and other Recreational	20.69	1.2
Urban	Industrial	3.87	0.2
Urban	Cemetery	2.26	0.1
Barren Land	Transitional Area	1.02	0.06
Wetlands	Forested, Modified, Scrub-shrub, and Herbaceous Wetlands	124.17	6.7
Forest	Deciduous Forest (upland)	35.51	2.0
Water	Streams, Artificial Lakes, Bridge Areas over water, exposed flats	22.06	1.2
Agriculture	Orchards/Nurseries/Horticultural Area	2.84	0.2
	<b>TOTAL</b>	<b>1784.78</b>	

## **9.2 Land Use/Land Cover Descriptions**

### **9.2.1 Urban and Non-vegetated Land Cover**

Included here are North Plainfield’s Urban land use and land cover categories based on the Anderson (1976) definitions and adapted by NJDEP (2002) <sup>9</sup>. These urban areas generally lack substantial natural vegetation habitats and are typically identified by human made structures, impervious cover (asphalt and other surfaces not pervious to water), and manicured lawns or infields. The level of impervious cover of urban areas is specifically important due to its impacts on stormwater runoff quantity and quality (see stormwater under Section 6.4). The term “urban” is also used by the USDA and others to describe soil cover. Urban soil is often associated with urban land cover. Urban soils have been disturbed by human activity to the point where they lack the identifiable natural characteristics to be placed in a soil series (see Section 6).

**Residential** - At approximately 1267 acres or 71% of the municipal land cover, residential is the most common general land use within North Plainfield. The residential coverage within the Borough is primarily a mix of small to medium density single unit housing distributed throughout the municipality. The impervious surface cover typically ranges from 30 to 35% in

these low and medium density areas. About 18% of North Plainfield's residential cover is comprised of high density, multiple family dwellings. These high density dwellings are primarily concentrated near commercial areas north of Route 22 and along Somerset Street. High density residential areas around Somerset Street typically have impervious cover levels of around 40%. The high density residential areas (multi-family apartment areas) along the Route 22 corridor have levels of impervious cover typically around 65%.

**Commercial and Services** – Commercial and service land use/land cover consists of buildings, driveways, parking lots and landscaped areas associated with the sale or provision of products or services. Within North Plainfield, this designation includes commercial strip development, shopping centers, office buildings, hotels, all levels of public and private schools (excluding recreational fields), health service facilities and police stations. These commercial areas are concentrated along the Route 22 corridor and along Somerset Street, and tend to have high density residential housing adjacent to them. Impervious surface levels for this type of development typically range from 70 to 100 % in North Plainfield.

**Athletic Fields and other Recreational** – This land use/land cover type in North Plainfield Borough refers to public lands specifically designated for the purpose of active recreation. Within the Borough, about 20 acres (or approximately half) of this cover type is athletic fields. Examples of the remaining non-athletic recreational land in North Plainfield include maintained picnic or landscaped areas, such as those in Green Acres and Green Brook parks (see Appendix B, Photos H and I). Typically these areas are covered by maintained cool-season (lawn) grasses and sparse ornamental, planted or occasionally natural tree cover.

**Transportation, Communication and Utilities** – This land cover type refers to road surfaces, utility services such as communication towers, power lines stormwater basins and water utilities. Major transportation routes that minimally include two lanes in each direction (such as Route 22) are also mapped under this category. The smaller roads typical of North Plainfield suburban areas are not included under this category and are generally included under other more appropriate urban categories, such as residential.

**Industrial** - A relatively small portion (3.87 acres) of North Plainfield is mapped as industrial. Under the NJDEP definition, Industrial is land where manufacturing, assembly or processing of products takes place. Industrial land use within North Plainfield is primarily limited to a parcel of land near Brook Avenue near the Green Brook municipal border (see Appendix A, Land Use /Land Cover Map).

**Agricultural** – As mentioned in the Land Use/Land Cover introduction, agricultural land use was relatively common in North Plainfield in the early 20<sup>th</sup> century. At that time, it represented approximately 30% or more of the Borough's land cover. Easternmost and westernmost portions of the municipality remained as farmland into the 1930's (see Appendix A, Historic Aerial) before converting to mostly low or medium density residential. Currently, agricultural land mapped within North Plainfield is limited to several acres of horticultural/orchard area adjacent to Green Acres Park and Greenbrook Road. Agricultural land use comprises approximately 0.2% of the total land use of the municipality.

**Other Urban or Built Up land** - Other urban or built up land is defined as undeveloped, open lands within, adjacent to, or associated with urban areas. These may include abandoned residential or commercial sites that have not yet been redeveloped and may be brush-covered or grassy. It may also include large grassy areas associated with some residences or corporate parks, or maintained lawns in urban parks may also be included if a specific recreational use is not evident. In addition, areas that have been partially developed or redeveloped but remain unfinished are included.

**Transitional** – Transitional Land is barren or exposed land that is in the process of being developed (construction site) at the time of land use analysis. Due to the inherent temporary nature of this land use, it would be expected that its location within North Plainfield would change regularly and ultimately result in additional urban land cover. It would be expected; however, to remain a very minor portion of the total municipal land use /land cover.

### 9.2.2 Upland Vegetation Cover

**Upland Deciduous Forest** – Only small fragments of North Plainfield woodlands are mapped as upland deciduous forest. It is likely that the majority of this forest type in North Plainfield was cleared for agriculture during the 18<sup>th</sup> and 19<sup>th</sup> centuries. These forests currently comprise about 29% of the mapped forest habitat, with the remaining forest mapped as floodplain/wetland forest. Some of these larger areas of wetland forest have small upland vegetation components/species mixed within the canopy. Most of the approximate 35 acres of upland deciduous forest within North Plainfield has greater than 50% crown closure. Based on NJDEP mapping, approximately 9 acres of this forest contains less than 50% crown closure, indicating open breaks and greater likelihood of a shrub or herbaceous dominance in the understory.

The upland forests of North Plainfield would historically have included mixed oak (*Quercus spp.*) and hickories (*Carya sp.*) with other species such as American Chestnut (*Castanea dentata*), American beech (*Fagus grandiflora*) and tulip poplar (*Liriodendron tulipifera*) occurring<sup>5</sup>. Mature examples of these species, such as red oak, white ash (*Fraxinus americana*) and tulip poplar, can be seen in lesser amounts mixed within the drier portions or edges of North Plainfield floodplain forests of Green, Stony and Crab Brooks. Common understory shrubs and vines of these mesic forests include arrowwood (*Viburnum dentatum*), blackhaw (*Viburnum prunifolium*), common greenbrier (*Smilax rotundifolia*), poison ivy (*Toxicodendron radicans*), grape (*Vitis spp.*), spicebush (*Lindera benzoin*), ironwood, and witchhazel (*Hammamelis virginiana*).

Common herbaceous species in the native community include mayapple (*Podophyllum peltatum*), violets (*Viola spp.*), wild sarsaparilla (*Aralia nudicaulis*), wood anemone (*Anemone nemorosa*), false Solomon's seal (*Maianthemum racemosum*), white wood aster (*Eurybia divaricata*), sweet cicely (*Osmorhiza claytonii*), and jack-in-the-pulpit (*Arisaema triphyllum*), white snakeroot (*Ageratina altissima*) and many other species<sup>5</sup>. Hay-scented fern (*Dennstaedtia punctilobula*) is a common upland forest fern occurring in North Plainfield.

While fragments of mature forest may remain, many upland forest patches or fragments within North Plainfield are dominated by secondary successional and/opportunistic and exotic species.



Secondary successional forest species may include Norway maple (*Acer platanoides*), black cherry, box elder (*Acer negundo*) Eastern red cedar (*Juniperus virginiana*), mulberry (*Morus* spp.), cottonwood, and black walnut. Certain planted or naturalized conifers occur in small amounts within the Borough. The most common species may be Norway spruce and white pine (*Pinus strobus*). American holly (*Ilex opaca*), a native broadleaf evergreen, also occurs naturalized in small amounts in Green Brook Park <sup>6</sup> and may occur elsewhere.

Many of these upland forest understories, like wetland forests, are severely impacted by invasive species including Japanese knotweed (*Polygonum cuspidatum*) and Japanese stiltgrass (*Microstegium vimineum*). Other invasive species that have been identified in North Plainfield <sup>6</sup> and would be expected in upland areas include Japanese barberry (*Berberis thunbergii*), multiflora rose (*Rosa multiflora*), Asiatic bittersweet (*Celastrus orbiculatus*), exotic honeysuckles (*Lonicera* spp.), burning bush (*Euonymus alatus*), Norway maple, privet (*Privet* spp.) and garlic mustard (*Allaria petiolata*). Other species, such as tree-of-heaven (*Ailanthus altissima*), would also be expected. Section 9.2.3 includes more detailed descriptions of these and other highly invasive species common in the vegetation communities of North Plainfield and the surrounding region.

### 9.2.3 Invasive Plant Species

The increases in global commerce and transportation over the 20<sup>th</sup> century have created opportunities for exotic (non-native) species to become accidentally or intentionally introduced into ecosystems. As a result, infestations of non-native species have become much more common. While many introduced exotic species do not naturalize or appear to be ecologically benign, a percentage of these species become extremely harmful to ecosystems and are termed “invasive.” The New Jersey Invasive Species Council (NJISC) and the National Invasive Species Council define an invasive species as “a species that is 1) nonnative to the ecosystem under consideration and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health” <sup>10</sup>. Invasive species may be any introduced plant, fungus, animal, or microorganism that fits this definition.

New Jersey contains approximately 1,000 non-native plant species or approximately 30% of the State’s vascular plants. This relatively high percentage of invasive species is attributable to the region’s long history of colonization and its position as an international commercial and transportation hub <sup>11</sup>.

Invasive species often have a set of common characteristics, including the tendency to be hearty and adaptable, the ability to reproduce rapidly, and the ability to outcompete native species. Compounding environmental issues, such as forest fragmentation, hydrological changes, pollution, and browse impacts of native species from deer, livestock or other species will often compound the impact of invasive species. In addition, there are many examples of the spread of various invasive species being linked to global climate change (see Section 3.2).

The term *harmful invasive plant* is used to describe an exotic non-native plant that is capable of invading natural plant communities, displacing indigenous species, contributing to species extinctions, altering community structure and ultimately disrupting ecological processes <sup>10,11</sup>.

The presence of invasive plants often results in a drop of overall species diversity, a reduction of wildlife value of a plant community. Some invasive plant species are spread more effectively by utilizing chemical and structural (allelopathic) methodologies for outcompeting native plant species<sup>75</sup>. Examples of invasive species within North Plainfield that use growth suppressing allelopathic chemicals include Japanese Barberry and Garlic Mustard.

Various management strategies may be typically employed to reduce invasive species impacts to improve vegetation community health or wildlife habitat. Measures taken may include manual or mechanical removal, integrated pest control, herbicides, various land use restrictions on transport or planting, and educating consumers on the problems associated with purchasing and planting invasives. One of the most effective elements to control any invasive species is early detection and a rapid response<sup>10</sup>. Once a species is established, eradication may be difficult or essentially impossible and a more practical management strategy of containment and localized control (rather than full eradication) may be required. In order to control a species, multiple and regular treatments, even within a relatively small area, may be required.

All natural plant communities of North Plainfield are heavily impacted by invasive species. The two most dominant species observed by ASGECI and others are Japanese knotweed (*Polygonum cuspidatum*) and Japanese stiltgrass (*Microstegium vimineum*) (see Section 9.2.4). These species comprise well over 80% of the floodplain forest floors and understory cover in many of the forested locations in North Plainfield (see Appendix B, Photos J and K )<sup>6</sup>. Monocultures of these species are easily observable at both the Green Acres and Green Brook forests<sup>6</sup> and stream corridors of the Stony and Green Brooks themselves. The North Plainfield Environmental Commission and Shade Tree Advisory Board are currently identifying large monocultures of Japanese knotweed in riparian areas to target for eradication.

#### 9.2.4 Major Invasive Plant Species Descriptions

The following list (below) includes species identified or expected within North Plainfield that are recognized by NJDEP as highly invasive plants within the state<sup>11</sup>. It is important to consider that these species are listed as the most invasive and common in the region; however, many additional invasive species may be expected within the municipality or may develop within the future.

**Japanese Stiltgrass** (*Microstegium vimineum*- Asia) – Japanese stiltgrass is a highly aggressive grass that grows in wetland floodplains, forested uplands, forested and open wetlands, roadside ditches and other disturbed areas. This species grows rapidly and often in large dense patches. As with many other invasive plants, it forms a monoculture that can smother nearly everything in the understory, reduces overall diversity, and decreases plant production<sup>11</sup>. These species can be observed growing in large low monocultures that smother the wetland forest floors of North Plainfield (see Appendix B, Photo D).

**Japanese Knotweed** (*Polygonum cuspidatum* - Eastern Asia) – This species is a large herb (over 12 feet) with large leaves and stems superficially similar in appearance to bamboo. Although a non-woody species, Japanese knotweed grows in large shrub-like clusters that form

monocultures. The species is tolerant of extreme conditions, such as high heat or shade<sup>12</sup> and is common throughout New Jersey.

Japanese knotweed is found in disturbed areas, roadsides, floodplain forests, and often along streams and other waterbodies. It forms dense monoculture stands that impact riparian habitat by reducing plant and wildlife diversity<sup>11, 12</sup>. It may also alter water flow along streams and contribute to flooding. This plant is well documented in North Plainfield in all large forested areas and riparian habitats (see Appendix B, Photos J and K) and a control program has been developed by the Borough. Due to its regional pervasiveness, teams of technicians from both Union and Somerset Counties have attempted to control Japanese Knotweed in wetlands and riparian areas for several years<sup>18</sup>.

Starting in 2008, the Shade Tree Advisory Board (SAB) adopted the stretch of Parkview Avenue between Harrington St and Clinton Avenue as a pilot demonstration for knotweed eradication. Working with a local volunteer Larry Murrell and the Union County Park Commission, SAB was trained in the effective techniques of glyphosate stem injection, seed head removal and follow up spraying of new shoots. The SAB has been able to significantly reduce the infestation along the roadside<sup>20</sup>. The NPEC contends these efforts need to be ongoing and need to be expanded to the local stream corridors of the Borough<sup>20</sup>.

**Privet** (*Ligustrum* spp. - Asia, Europe) Privet is a shrub or small tree (typically 5 to 12 feet) found in a variety of fields, forests and floodplains. Privet may form dense thickets that outcompete native vegetation<sup>15</sup>. Privet can be difficult to destroy once established. Privets are a somewhat common understory component of Green Acres Park forests.

**Garlic Mustard** (*Alliaria petiolata* - Europe) – Garlic mustard occurs in moist woodlands, floodplains, along trails, and forest edges. The species reduces native herbaceous diversity and lowers habitat quality. As with barberry and a number of other invasive plants, it can suppress growth of native seedlings through (allopathic) chemicals<sup>11</sup>. The species displaces many native spring wildflower species of woodland habitats. It is also avoided by browsing white-tailed deer, which contributes to its competitive ability<sup>11</sup>. This species is a fairly common forest floor component of the forests of North Plainfield<sup>6</sup>.

**Japanese Barberry** (*Berberis thunbergii* - Asia) – This thorny shrub is found in upland woods and open forest understory. Barberry can grow densely in the understory, reducing habitat quality for birds and other wildlife<sup>12</sup>. It may also raise the pH of soils, reduce litter layers in forests<sup>78</sup>, and reduce competition from other understory plant species. This species has been observed in relatively small amounts within Green Acres Park<sup>6</sup>.

**Multiflora Rose** (*Rosa multiflora* - Asia) – Multiflora rose occurs within a variety of habitats, including forest edges and gaps, floodplains, utility rights-of-way, roadside edges and other disturbed areas, grasslands and open wetlands. This thorny shrub produces dense monocultures that are impenetrable to humans and wildlife. This species outcompetes native species and reduces overall native species diversity<sup>11</sup>. This species has been documented in North Plainfield Forests<sup>19</sup>.

**Common Reed or Phragmites** (*Phragmites australis* - Europe) – Although common reed is pan-global in origin, European strains have replaced much of the native variant in the United States<sup>12</sup>. Common reed commonly inhabits a variety of brackish and freshwater marsh habitats. It can also inhabit riverbanks, ditches, and dredge spoil areas, some of which may be upland. It may be a component of some of the NJDEP mapped areas referred to as Brushland/Shrubland. It would be primarily by limited to small amounts along surface water edges or waste areas in North Plainfield.

**Purple Loosestrife** (*Lythrum salicaria* - Eurasia) – Introduced as an ornamental plant, purple loosestrife is a woody perennial herb that is easily identifiable by its large, purplish showy spike, which can persist well after blooming. It occupies open, typically damp, habitats, including sedge meadows, cattail marshes, streamside areas, floodplains, bogs, and ditches. It is particularly aggressive in wetlands that have undergone hydrologic disturbance. Purple loosestrife grows in monotypic stands that can alter wetland hydrology, reduce native plant diversity, impact sensitive wildlife, and decline overall production of the wetland<sup>12</sup>. Within North Plainfield, it would be primarily limited to streamside and pond edges or wet ditches and is documented as occurring along the Blue Star Highway vicinity<sup>19</sup>.

**Wineberry** (*Rubus phoenicolasius* - Asia) – Wineberry is a shrubby vine that grows along forest habitats that include wooded ravines and floodplains, shale bluffs, and successional fields. The species can grow in impenetrable thickets that threaten certain rare plant communities<sup>11</sup>. This species can regularly be observed in the forest edges of North Plainfield's open spaces<sup>6, 13</sup>.

**Autumn Olive** (*Elaeagnus umbellata* - Europe and Asia) – Autumn olive is a dense shrub or small tree found in old fields, roadsides, pastures and open woodlands. The species may shade out native species and is a nitrogen fixer that may alter soil nitrogen cycling and consequently impact natural plant succession<sup>12</sup>. Due to the lack of large early successional habitats in North Plainfield, it would not be expected that Autumn olive would occur in large amounts within the natural plant communities of the municipality.

**Tree-of-Heaven** (*Ailanthus altissima* - Central China) – Ailanthus or Tree-of-heaven thrives in a variety of disturbed sites with rocky or poor soils such as vacant lots, forest edges and gaps, roadsides, and other disturbed areas. The species reproduces rapidly and can suppress the growth of native species through chemical means and interfere with natural forest succession<sup>11</sup>. It would likely occur within forest edges, overgrown lots, and other urbanized areas of North Plainfield.

**Honeysuckle spp.** (*Lonicera* spp. - Eurasia) – The invasive honeysuckle species may occur as a vine (Japanese honeysuckle) or shrub (tartarian and other honeysuckles). These species occupy forest understories, old fields, roadsides, thickets, fencerows and rocky bluffs. The vines and shrubs can form dense monocultures that smother and collapse native plants and result in a loss of plant regeneration<sup>11</sup>.

**Asiatic Bittersweet** (*Celastrus orbiculatus* - Eastern Asia) – Asiatic bittersweet is an aggressive vine that inhabits forest edges, open woodlands, fields, hedgerows and other disturbed lands. It grows over native vegetation and kills trees by shading, girdling and uprooting them<sup>12</sup>. This

species would be expected to be growing over the forest understory and edges in the open spaces at North Plainfield.

**Bamboo** (*Phyllostachys sp.* – Asia) - Bamboos are large grasses growing anywhere from 7 to 40 feet depending on the species. Bamboo species spreads through aggressive rhizomatous (root) growth. Bamboo may grow in very dense monocultures that crowd out and shade all other species and can make native seedling regeneration nonexistent. Once established, bamboo is very difficult to eradicate <sup>12</sup>. Running bamboos have been planted in several parts of the borough by private landowners for decorative purposes or for privacy fences. In many of these locations, the plant has developed a monoculture of larger land areas <sup>20</sup>. Injectable herbicide treatments similar to those used for Japanese knotweed have been used to control bamboo species.

**Porcelainberry** (*Ampelopsis brevipedunculata* -Asia) – This deciduous climbing vine frequently occurs in old fields, roadsides, right-of-ways, and other disturbed areas. The plant forms thick mats similar to oriental bittersweet that smother indigenous vegetation and exposes host trees to damaging weather elements. It is dominant in the Piedmont region of New Jersey.

**Chinese Bush-Clover** (*Sericia lespedeza* Eastern Asia) – Bush-clover is an erect perennial legume that grows in dense stands. Chinese bush-clover tolerates varying soil conditions, including very nutrient poor soils. Bush-clover occurs in various habitat types, including forest edges, fields, open woodlands, and wetland edges. It is reported in all physiographic provinces of New Jersey.

**Norway Maple** (*Acer platanoides* - Europe and West Asia) – Norway maple is a common invasive throughout New Jersey. It occurs under variety of conditions, including alluvial fields, disturbed sites, and floodplain forests. This species can form dense monocultures that shade out native species. This species has traditionally been a common planted tree and it is both planted and naturalized in Green Brook and Green Acres Parks.

**Lesser Celandine** (*Ranunculus ficaria* - Europe) – This plant often occurs in alluvial forested floodplains, as well as grassy meadows, lawns and other open areas. Lesser celandine is a sprawling herbaceous plant identified by its showy yellow flowers during blooming. Lesser celandine forms extensive monocultures that reduce diversity and heavily impact spring ephemerals. Monocultures of this plant have been documented within Green Brook Park <sup>13</sup> and would be expected within much of the floodplain forest of North Plainfield.

**Winged Euonymus** or **Burning Bush** (*Euonymus alatus* - Northeastern Asia) – Winged euonymus grows in rich woodlands over trap rock, shale or limestone. It may grow in alluvial soils and floodplains. The species grows in dense thickets and can displace native species. This species can be observed growing in a dense thicket along Green Brook near the adjacent Green Brook Lake in North Plainfield <sup>6</sup>.

**Mile-a-Minute Weed** (Asia) - Mile-a-minute weed is spreading northward throughout New Jersey from the south. This vine invades open and disturbed areas including roadsides, forest edges, wetlands, and stream edges. It is a sprawling plant that grows rapidly overtop of native plants, shading from light exposure <sup>11</sup>. It is known within the Piedmont Regions of New Jersey.

**Lady's Thumbs** (*Persicaria spp.* – Europe, Asia) – These non-native smartweeds are small herbaceous plants reaching 30 inches<sup>14</sup>. It grows in disturbed habitats, such as pastures, yards, meadows, rights-of-way, and roadsides. It is also found in forests and shaded areas. Its ability to tolerate extreme shaded areas and a range of pH make it potential problem in moist shaded habitats, such as damp forests. These species inhabit portions of the forested corridors of North Plainfield.

### 9.3 Open Space

The Open Space Section includes information on both public open space and private vacant land from a land use study prepared for the Master Plan<sup>21</sup>. It also includes municipal, county and State open space data from the NJDEP Green Acres Recreation and Open Space Inventory<sup>16</sup>. Green Acres is an NJDEP program that provides funds to aid in the purchase of open space in New Jersey. Properties that receive Green Acres funding are included on the Green Acres Recreation and Open Space Inventory. The mission of Green Acres is to use partnerships to create system of interconnected open spaces to preserve and enhance New Jersey's natural environment and its historic, scenic, and recreational resources for public use and enjoyment<sup>16</sup>.

Table 17 lists these Green Acres encumbered open space parcels within North Plainfield and their acreages. It is important to note that the information provided in Table 17 is an estimate of open spaces and acreages based on available Green Acres data and subject to change. Updated and detailed information for planning purposes regarding open space should be acquired directly through Green Acres and the Borough of North Plainfield municipal offices. Most large open space areas in North Plainfield are mixed use parcels that contain either recreational or manicured fields or are undeveloped land with floodplain forest<sup>6,17</sup> (see Appendix A, Historic Districts and Public Open Space Map). Properties listed in table 17 include Union County (Green Brook Park) property, municipal property, and some State-owned (NJDOT) property. There are no Federally-owned properties in North Plainfield.

A public land study conducted for the Borough of North Plainfield Master Plan found that “vacant public land” (primarily floodplain forest land) accounts for 80.2 acres or 4.3 percent of Borough land area<sup>21</sup>. The study identifies 24.7 acres of Borough-owned vacant land in addition to vacant land owned by the County and State (see Section 9.3.1). The vacant land forests within these open spaces serve important natural functions including as a corridor for wildlife, as a buffer to surface waters, and as flood storage (see flooding discussion in Section 6.5).

The study determined that an additional 8.5 acres of municipal public land in the Borough is non-recreational “public facility” land. The municipal building and firehouse, the municipal garage, two public parking lots, the municipal library, the Veterans Memorial, the Vermeule Mansion/Community Center site, and the Somerset County Road Department facility are all examples of public facility property<sup>21</sup>.

The remaining public land in North Plainfield is designated as active “recreational use” and accounts for 88.7 acres (4.8 percent) of the Borough. Recreational areas include 80.2 acres of Borough-owned properties and two North Plainfield Board of Education properties totaling 8.5 acres. Borough-owned recreational facilities include Green Acres Park, Vermeule Park, Stony Brook Park, and recreational portions of Green Brook Park (see Section 9.3.1). Recreational land owned by the North Plainfield Board of Education includes (Upper) Krausche Field and Fromm Field<sup>21</sup>.

The existing land use study<sup>21</sup> also identified a total of 75 privately-owned vacant or undeveloped parcels of land in North Plainfield. These parcels represent about 30.4 acres of land, or 1.6 percent of the total land area in the Borough. This tally includes 14.32 acres of undeveloped/unoccupied land comprising the former Villa Marie site. The remaining 62 parcels of vacant land are primarily small privately-owned individual lots of less than ¼ acre in size remain representing about 16.1 acres<sup>21</sup>. These parcels are generally within existing residential neighborhoods or are small privately-owned individual lots located along stream corridors.

The municipal land use study evaluated these sites based on available environmental data and an assessment of development potential. The study estimated that approximately 9.7 acres (36 parcels) are developable. The remaining 26 parcels have substantial development limitations based on size or location within floodplains<sup>21</sup>.

**Table 17  
Green Acres Identified  
Preserved Open Space (Broken into Block and Lot)  
within the Borough North Plainfield <sup>16</sup>**

<b>Block</b>	<b>Lot</b>	<b>Name</b>	<b>Approx. Acres</b>	
5	ALL	FLOODPLAIN LAND – Owned by the State of NJ	12.44	
6	20	MEMORIAL PARK	NA	
144	5	MEMORIAL PARK	0.58	
154	10.A	STONY BROOK ACQ	NA	
154	16	STONY BROOK ACQ		
154	19	STONY BROOK ACQ		
154	20	STONY BROOK ACQ		
154	21	STONY BROOK ACQ		
154	21.A	STONY BROOK ACQ		
154	22	STONY BROOK ACQ		
154	23	STONY BROOK ACQ		
154	24	STONY BROOK ACQ		
154	6.C	STONY BROOK ACQ		
154	7	STONY BROOK ACQ		
154	8	STONY BROOK ACQ		
154	8.A	STONY BROOK ACQ		
170A	30	GREEN BROOK PARK (Ballfield at Willow Av. Ext.)		16.8
171	1	GREEN BROOK PARK (Stony Brook Confluence) Owned by Union City		24.16
185	ALL	FLOODPLAIN LAND	0.43	
186	ALL	FLOODPLAIN LAND	6.00	
187	ALL	FLOODPLAIN LAND	0.74	
189	ALL	FLOODPLAIN LAND	6.54	
194	22	PUMP HOUSE	0.24	
199.C	1.S	VERMEULE TRACT	NA	
199.C	1.V (14)	VERMEULE TRACT (Cemetery)	2.50	
199	1	VERMEULE TRACT (Mansion and Grounds)	4.27	
154.01	1	State Acquisition.	59.97	
6	2.01	NA	4.84	
170.02	15	Gr. Br. Floodplain	16.80	

NA –not available



### 9.3.1 Key Public Open Space Area Descriptions

#### **Municipal**

Green Acres Park is a 9.6 acre park accessible from Rockview Terrace. It consists primarily of a recreation park and playground with a slide, swing, basketball courts and a small picnic area (see Photos F and L).

The park also contains a small grassy area and a 1.3 acre created pond, Green Acres Pond, with a walking trail surrounding it. The pond edge contains a narrow emergent wetland fringe consisting of a mix of sedges, grasses and wetland forbs including *Polygonum* spp. and pickerelweed. The pond itself is approximately 3.5 to 4 feet deep, with a sandy loam bottom. The pond has been reinforced along the edges with imported clayey soil. This combination allows for prolific growth of attached vegetation even without exogenous nutrients. Thus the pond appears to be eutrophic (nutrient laden) but is also well aerated by wind.

The pond contains a fountain that may provide aeration, but is primarily for aesthetic purposes. The pond contains dense vegetation including invasive Eurasian water milfoil (*Myriophyllum heterophyllum*) and pond lily (*Nelumbo nucifera*). The depth of the pond would need to be at least 12 feet to prevent plant infestation and clogging. A rain garden constructed as part of an Eagle Scout project captures water from impervious surface runoff and filters it before it enters the pond. Public works personnel are instructed not to mow the rain garden and maintain the vegetated buffer around the pond. The pond contains some panfish such as sunfish and it is stocked with trout and bass annually prior to the Borough's annual fishing derby at the pond.

The park includes access to the Stony Brook and contains some floodplain forested habitats (see the wetland forest description in Section 8) adjacent to the stream and to the southwest. The Stony Brook (within the park) typically runs from less than one to three feet deep (under typical weather conditions) with a gravel-cobble bottom. It contains some panfish and a variety of smaller fish such as minnow species.

Much of the natural areas of the Park can be traversed with relative ease; however, waterproof boots may be required to cross the stream and access the muddier portions of the floodplain forest, particularly during wet conditions. In spite of impacts from fragmentation and invasive species, the pond, surrounding wetlands, and adjacent forest do contain some opportunities for viewing interesting wildlife viewing including turtles, frogs, and forest birds such as wood thrush (see Appendix B, Photos M - N). The North Plainfield Borough Code, under Chapter XVII, sets rules and regulations for the Green Acres Park Area including permitted activities and access <sup>2</sup>.

Vermeule Park is located at 614 Greenbrook Rd behind the North Plainfield Community Center. This park is primarily for active recreation and consists of a playground, and open field areas. The wooded lawn areas in front of the community center and by the mansion is also used for passive recreation and is the site of several fund raising events to support the Friends of Vermeule Mansion.

Overlook Park is a small "pocket park" located on the southeast corner of Greenbrook Road and West End Avenue. It is comprised of a parking area and a quiet area for communing with the

Stony Brook. The Borough also uses a portion of the park for temporarily storing collected vegetation.

The Monument is an additional pocket park located in the Historic District at the convergence of Willow and Myrtle Avenues. It is the site of war memorial celebrations on Memorial and Veteran's Days and acts a greenspace for local residents.

### **County**

Green Brook Park is owned and operated by the Union County Park System; however, recreational portions in North Plainfield are owned by the Borough. The park consists of portions of the lower Green Brook and Stony Brook (North Plainfield) corridors in both Plainfield Township and North Plainfield Borough. Approximately 9,900 linear feet of the Green Brook run through the park within North Plainfield. This multi-use park contains two forested parcels of Union County owned land adjacent to the Green Brook in North Plainfield totaling 32.3 acres<sup>21</sup>. Eastern municipally-owned portions of the park around West End Avenue consist of manicured cool season grass lawn areas with sparse planted trees. This area contains soccer and baseball fields, a playground, and a picnic area. Planted trees include *Malus* sp. trees, conifers, and a number of deciduous trees (including recently planted native floodplain trees) on the southern end of the open areas (see Appendix B, Photo H). The park also falls within the Green Brook Park Historic District, which is listed on the National Register of Historic Places.

The dominant natural community within this park in North Plainfield is wetland forest dominated by red maple, pin oak and sycamore and is described in the wetland forest area (Section 8). Portions of this forest are easily traversed along deer or pedestrian trails while other locations (such as confluence of Stony Brook) contain dense understory patches that are difficult to traverse.

The pond within Green Brook Park is a small shallow pond with some access to the pond edges. The pond contains small fish and common herptiles. The pond has some opportunity for wildlife viewing including foraging (herons) and other birdlife.

### **State**

Blue Star Drive Greenbelt property consists of NJDOT owned (primarily wetland) forest dominated by red maple, pin oak, ashes, and elms. The forested area is approximately 2,200 feet long and between 100 and 230 foot wide and contains a section of the Crab Brook. The property parallels US Route 22 between Farragut Road and Norwood Ave to the South. The property is designed as part of a natural memorial to New Jersey veterans of World War II. The forested land owned by the State of New Jersey in this area accounts for 11 properties totaling 23.2 acres in area. Nearly half of the state-owned vacant land comprises environmentally sensitive land within the Crab Brook stream corridor.

## 9.4 References for Wetlands and Land Use/Land Cover

- 1 NJDEP Division of Land Use Regulation (DLUR) 2013. Guidance on Freshwater wetlands Rules and Regulations  
<http://www.nj.gov/dep/landuse/lawsregs.html#2>
- 2 North Plainfield 2011. Revised General Ordinances of the Borough of North Plainfield, County of Somerset, NJ.1 987. Code adopted December 19, 1988, Amended through July 31, 2011 Coded Systems, LLC www.codedsystems.com
- 3 NJDEP Natural Heritage Program. 2012. Patrick Worner. Personal communication with ASGECI regarding potentially inaccurate Landscape Mapping in North Plainfield.
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## 10.0 WILDLIFE

### 10.1 Fisheries

The NJDEP Bureau of Freshwater & Biological Monitoring (BFBM) conducts Fish Index of Biotic Integrity (FIBI) studies in New Jersey’s streams and water bodies. Data collected from the FIBI Monitoring Network sample point locations measure the health of the stream based upon multiple attributes of the resident fish assemblage. Attributes include (but are not limited to) species diversity, ratio (trout and white suckers), numbers of fish collected and fish with anomalies. A stream or water body’s FIBI score and rating is based on the deviation from reference conditions and may be classified as either “poor” (10-28), “fair (29-36), “good” (37-44) or “excellent” (45-50).

This section of the ERI includes data collected at four FIBI stations within the Lower Raritan Watershed near North Plainfield. The score data is compiled in Table 18. This data is derived from samples taken between the years 2003 through 2009 <sup>1</sup>. A list of fish identified during sampling is included in Table 22.

**Table 18 Fish Index of Biotic Integrity**

**Streams near North Plainfield Borough (Lower Raritan Watershed HUC 11 (2003-2009) <sup>1</sup>**

FIBI ID/Name	Location	Past IBI/Habitat Ratings/year	Current Habitat/IBI Ratings/year
FIBI 097a Green Brook	Clinton Ave. Plainfield - N. Plainfield	Poor/ (2005)	Poor/Sub-optimal (2009)
FIBI 091 Green Brook	Rt 28 Middlesex Boro (Middlesex)	Fair/Sub-optimal (2004)	Poor/Sub-optimal (2009)
FIBI 071 Ambrose Brook	Melrose and Seneca Avenues Middlesex Boro (Middlesex)	N/A	Fair/Marginal (2008)
FIBI 072 Middle Brook	Talmadge Avenue Bound Brook Boro	Good (IBI-2003) No habitat rating	Fair/Sub-optimal (2008)

The fish habitat of the Stony and Green Brooks within North Plainfield consists of fairly clear streams with moderate flow, and depths typically ranging from several inches to more than two feet. Substrates of the streams consist of gravel, cobble or sand substrates (see Appendix B, Photos K and O). The results from sampling indicate a somewhat impacted fishery with limited fish diversity. The Stony Brook has very good water quality, as supported by macroinvertebrate studies done at North Plainfield High School as far back as 1975 (see Appendix D). However, the Stony Brook has habitat restrictions common to flashy streams located in the Lower Raritan Watershed. According to the NPEC, here is a scarcity of riffle-pool areas due to the frequency of short duration high flow events. Hydrometeorology-based channel modifications could be used to improve the habitat and potentially increase the species diversity. One Eagle Scout project included construction of a Z-dam for this purpose, but washed away and rebuilt on several occasions over a number of years <sup>37</sup>.

Two families of fish are most common within North Plainfield’s stream systems. These families are Centrarchidae, which includes several predatory species including crappie, sunfish and bass; and numerous species from minnow family, Cyprinidae. Cyprinid species identified within the

watershed include several dace species, shiners, chubs including fallfish (*Semotilus corporalis*), and Eastern silvery minnow (*Hybognathus regius*).

Other species identified within the watershed streams include bullhead catfish (*Ameiurus* sp.), perch and darters, killifish and American eel (*Anguilla rostrata*). Other species likely to occur within these streams include additional minnow species, pickerel (Genus *Esox*), channel catfish (*Ictalurus punctatus*), and additional members of the perch family (Percidae) such as yellow perch and various darters. The NJDEP lists the portion of the Green Brook bordering North Plainfield, the Stony Brook, and all other tributaries in North Plainfield as “Non-trout.” As a result, stock and reproductive trout would not typically be expected in the surface waters of North Plainfield. Upper portions of the Green Brook (upstream from where it passes under Rt. 22) in Scotch Plains and Watchung Borough are listed as trout maintenance (TM). Fisherman report; however, that this reach of the Green Brook along Diamond Hill Road is littered and contaminated with runoff from Interstate 78 nearby. Trout maintenance waters contain stocked non-reproductive trout. The three species that are typically stocked in these waters are rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*) and brook trout (*Salvelinus fontinalis*). Based on the proximity of these species to North Plainfield (approximately 4,500 ft. upstream), it would be expected that trout species would occasionally occur within the Borough waters. However the timing restrictions and other restrictions associated with trout waters would not apply to North Plainfield since the municipality is immediately downstream from the identified trout portion of the Green Brook.

<b>Table 19 List of Freshwater Fish Identified Within or Near North Plainfield</b>		
<b>Common Name</b>	<b>Latin</b>	<b>Source</b>
Pumpkinseed sunfish	<i>Lepomis gibbosus</i>	GAML
Green sunfish	<i>Lepomis cyanellus</i>	GAM
Bluegill	<i>Lepomis gibbosus</i>	GA
Redbreast sunfish	<i>Lepomis auritus</i>	GAM
Black crappie	<i>Pomoxis nigromaculatus</i>	A
Largemouth bass	<i>Micropterus salmoides</i>	AM
Smallmouth bass	<i>Micropterus dolomieu</i>	M
White perch	<i>Morone americana</i>	M
White sucker	<i>Catostomous commersoni</i>	GAM
Fallfish	<i>Semotilus corporalis</i>	GM
Creek Chub	<i>Semotilus atromaculatus</i>	GAM
Blacknose dace	<i>Rhinichthys atratulus</i>	GM
Creek chubsucker	<i>Erimyzon oblongus</i>	A
Longnose dace	<i>Rhinichthys cataractae</i>	GM
Tessellated darter	<i>Etheostoma olmstedii</i>	GAM
Golden shiner	<i>Notemigonus crysoleucas</i>	G
Common shiner	<i>Luxilus cornutus</i>	G
Spottail shiner	<i>Notropis budsonius</i>	GA
Satinfin Shiner	<i>Notropis analostanus</i>	G

Brown bullhead	<i>Ameiurus nebulosus</i>	GAM
Yellow bullhead	<i>Ameiurus natalis</i>	GM
American eel	<i>Anguilla rostrata</i>	GAM
Banded killifish	<i>Fundulus diaphanus</i>	GAM
Eastern Silvery minnow	<i>Hybognathus regius</i>	G
Mosquitofish	<i>Gambusia affinis</i>	L*

Species occurrence confirmed in fish IBI studies: G- Green Brook A- Ambrose Brook

M- Middle Brook (see Table 19)

L- Observed in North Plainfield Lakes (ASGECI 2013) \* Possibly introduced as mosquito control

No anadromous (ocean migrant species that spawn inshore) species (*Alosa* spp. herring or striped bass (*Morone saxtilis*) are identified in the waters around North Plainfield Borough<sup>2</sup>. The American eel is catadromous (moving from freshwater to the ocean to breed), and has been identified within the surface waters of North Plainfield (see Table 19). The American eel is highly mobile and has the ability to move short distances over land and around significant impediments to migrate to the sea for reproduction.

## 10.2 Endangered and Threatened Wildlife Species

Endangered species are those whose prospects for survival in New Jersey (State-listed), or nationally (Federally-listed), are in immediate danger because of a loss or change in habitat, over-exploitation, predation, competition, disease, disturbance or contamination. Assistance is needed to prevent future extinction. Threatened species are those that may become endangered in New Jersey or federally if conditions surrounding them begin or continue to deteriorate.

The US Fish and Wildlife Service protects Federally-listed endangered and threatened wildlife and plant species and their habitat under the 1973 Endangered Species Act. Under Section 7 of this Act, Federal agencies are required to consult with the USFWS to ensure that the actions they authorize, fund, or carry out will not jeopardize listed species. In the event that proposed actions are determined to jeopardize a listed species, the USFWS must offer reasonable alternatives that will meet the goals of the proposed action without jeopardizing the listed species.

Under Section 9 of the Act, private landowners are prohibited from the "take" of endangered or threatened species. It is unlawful to endanger the welfare of a listed species and this provision is extended to the habitat required by the species for its survival. Section 10 of the Act provides for the preparation of Habitat Conservation Plans. This provision is made to protect the rights of private landowners to develop or use their land even though they have endangered species on their property. These landowners can receive an "incidental take permit" provided they develop a Habitat Conservation Plan that provides for the conservation of the species.

The State of New Jersey has its own Endangered Species Act, the Endangered and Nongame Species Conservation Act (N.J.S.A. 23:2A-13 *et seq.*), which resulted in the listing of State endangered animal species (N.J.A.C. 7:25-4:13) and a Nongame Species list, including threatened species (N.J.A.C. 7:25 4.179(a)). As part of this Act, all New Jersey animals appearing on the Federal list are also included on this State list. Endangered plants in New Jersey have been identified in accordance with the *Endangered Plant Species List Act* (N.J.S.A. 13:1B-15.151 *et seq.*).

State listed endangered and threatened wildlife species in North Plainfield Borough that are dependent upon wetlands have increased protection to their wetland habitat under the *Freshwater Wetlands Protection Act* rules. Federally listed plant species are also afforded protection under this Act. A freshwater wetland that is habitat for an endangered or threatened species is considered exceptional resource value (N.J.A.C. 7:7A-2.4(b) 2) and is given a standard transition area width of 150 feet (N.J.A.C. 7:7A-2.4(d)). More stringent review of wetland permit applications is also performed. The NJ Flood Hazard Area Control Act rules also provide for protection by providing a 150-foot regulated riparian zone for certain water-dependent State listed endangered and threatened animal and plant species habitats (see Section 8.1). Within North Plainfield Borough, wood turtle (*Glyptemys insculpta* –State Threatened) is the only confirmed threatened or endangered species (see Section 10.3).

### **10.3 Endangered and Threatened Species within North Plainfield Borough**

The New Jersey Natural Heritage Program (NHP) (Appendix D), NJ Landscape Project mapping Version 3.1 (Appendix A, Map 16) and the U.S. Fish and Wildlife Service (USFWS) resources were reviewed as part of the preparation of this ERI<sup>3 4 5</sup>. Data from Landscape Mapping (see Section 10.4) and the Natural Heritage Program indicate records of one State threatened species the wood turtle confirmed, and one Federally-listed endangered species, the Indiana bat (*Myotis sodalis*) potentially present. Two bird species, the wood thrush and great blue heron, are State special concern species confirmed within the Borough. State Special Concern species are defined by NJDEP as species that warrant special attention because of some evidence of decline, inherent vulnerability to environmental deterioration, or habitat modification that would result in their becoming a State-threatened species<sup>16</sup>. State Special Concern species may receive some limited habitat protection for certain projects in certain portions of New Jersey including the Highlands, Coastal, and the Pinelands Regions. State Special Concern species would not be expected to receive additional protection within North Plainfield Borough.

These listed species are all associated with the open waters and adjacent forested corridors of Green and Stony Brooks (see Appendix A, Landscape Map). The Federally-listed Endangered Indiana bat (*Myotis sodalis*) is listed as potentially occurring within North Plainfield (see Section 10.5).

### **10.4 The Landscape Project**

In 1994, the NJ Division of Fish, Game and Wildlife's Endangered and Nongame Species Program (ENSP) adopted a landscape level approach to rare species protection called the Landscape Project<sup>4</sup>. The Landscape Project has been designed to provide peer reviewed, scientifically sound information that is easily accessible and can be integrated with planning, protection and land management programs at every level of government – State, county and municipal, as well as nongovernmental organizations and private landowners. The ENSP has developed landscape maps that identify critical rare species habitats based on land use classifications, documented rare species locations and habitat models linked to each of the rare, threatened or endangered species. This data has been incorporated into the North Plainfield Borough Threatened and Endangered Species Habitat (Landscape) Map in Appendix A. The



habitat patches are assigned a Rank of 1 through 5, based on the status of the species present as follows:

- Rank 5:** Presence of one or more Federally - listed threatened or endangered species.
- Rank 4:** Presence of one or more State - listed endangered species.
- Rank 3:** Presence of one or more State - listed threatened species.
- Rank 2:** Presence of one or more occurrence of State Special Concern Species.
- Rank 1:** Habitat patches with minimum habitat specific suitability size and potential condition requirement for threatened or endangered or priority species that do not intersect with any confirmed occurrence.

Landscape Mapping Version 3.1 also includes vernal habitats which are marked as a circular area with a 1000 foot radius from the approximate vernal pool center (see Appendix A, Endangered and Threatened Species Map). There are no confirmed or potential vernal pools/habitats mapped within North Plainfield Borough (see Vernal Pools in Section 10.8).

The habitat patches are identified by the highest rank species occurring within that patch. For example, all patches in North Plainfield Borough with a Rank of 3 have the presence of State – threatened wood turtle even if the lower ranked great blue heron foraging (Rank 2) is identified in the same patch. The Federally-endangered Indiana bat is identified by USFWS as potentially occurring within the Borough due to municipality’s proximity to known hibernacula or roosting areas. Critical habitat for Indiana bat; however, is not identified within the Borough and therefore its Rank 5 habitat is not identified on Landscape Mapping.

NJDEP Landscape Mapping is created by combining species location occurrences with airphoto analysis of adjacent or connected appropriately sized and structured natural communities. While it is a quite useful tool, the Landscape Mapping is not a substitute for site-specific surveys and habitat identification mistakes occasionally occur. The forested wetland corridors in North Plainfield have documented occurrences three State-listed or rare species (see below) and appear to have the correct conditions for these species. However, an adjacent residential land use area in southwestern North Plainfield have clearly been marked incorrectly as Rank 3 wood turtle habitat (see Appendix A). This mistake was likely the result of a typographical or similar error during data entry or development. This discrepancy has been informally acknowledged by NJDEP and may possibly be corrected during the next round of improvements to Landscape Mapping<sup>36</sup>. The incorrectly marked non-habitat areas are identified on the ERI mapping to help assure that the error is acknowledged in NJDEP permit applications and other determinations where the potential presence of wood turtle habitat could have bearing.

**Table 20 Identified Threatened, Endangered and Special Concern Species documented in or within the vicinity of North Plainfield Borough  
NJDEP Landscape Project and Natural Heritage Program (NHP)**

Common Name	Latin Name	Class	Rank	Status	Source
Indiana Bat	<i>Myotis sodalis</i>	Mammalia	N/A	LE SE	USFWS
Wood Turtle	<i>Glyptemys insculpta</i>	Reptilia	3	ST	NJDEP NHP and Landscape
Great Blue Heron	<i>Ardea herodias</i>	Aves	2	SC	NJDEP NHP and Landscape
Wood Thrush	<i>Hylocichla mustelina</i>	Aves	2	SC	NJDEP NHP

SE = State endangered; ST = State threatened; LE = Federally-listed endangered  
SC; State species of special concern; NHP –NJDEP Natural Heritage Project

### 10.5 Rare, Threatened and Endangered Species Descriptions

#### Indiana Bat

Between April and August, Indiana bats inhabit upland forests, floodplains and riparian forests of northern New Jersey. The bats roost under loose bark of forest trees during the day. Dead trees or trees with flaky bark such as the shagbark hickory are of particular importance for summer roosting habitat. Other important tree species include bitternut and pignut hickories, sycamore, red oak, white oak, sugar maple, white ash, and cottonwood. One study <sup>6</sup> found that 75% of the roost trees were in uplands while the remaining 25% were in riparian habitats. Roost trees also typically have southern sun exposure and are found in forest clearings or edges.

At night in the summer, Indiana bats forage for insects around streams, lakes and reservoirs. Natural riparian clearings and trees in the riparian floodplains are a particularly important part of the foraging habitat. Other forage areas include above the forest canopy, over early successional clearings, over croplands, pasture and other agricultural areas.

Around August, the bats begin to congregate around the hibernacula and build up fat reserves for their winter dormancy <sup>7</sup>. Hibernacula are naturally occurring caves and abandoned mine shafts. There are only two known Indiana bat hibernacula in New Jersey, both of which are in Morris County <sup>8</sup>. Threats to Indiana bats include destruction of hibernating and maternity colonies; vandalism or sealing of hibernacula; forest fragmentation and other habitat loss; and use of pesticides and other environmental contaminants. Because Indiana bats utilize relatively few hibernacula and concentrate in large colonies that may number in the tens of thousands, a single catastrophic event such as a disease outbreak could have significant impacts on the entire population <sup>9</sup>. In 2006, such an event, white-nose syndrome, was a fungus identified in a cave in Albany, New York. The syndrome, named for the white deposits that may be observed on the noses of infected bats, has killed approximately 400,000 cave-dwelling bats since then. Impacted species include tri-colored (*Perimyotis subflavus*), northern long-eared, big brown, small-footed and Indiana bats <sup>10</sup>.

Although NJDEP Landscape mapping does not identify Indiana Bat foraging or maternal roosting habitat in North Plainfield, USFWS identifies it as potentially occurring within the Borough<sup>5</sup>. The forested floodplain corridors of the Green and Stony Brooks meet the basic foraging conditions and have the potential to be foraging areas for Indiana bat.

The USFWS would typically request a tree (6 inch or greater Diameter at Breast Height, DBH) clearing timing restriction from April 1 to September 30 to avoid impacts to Indiana Bat. Under certain circumstances such as public works projects requiring tree removal, the USFWS may request forest data including photos, project description, tree sizes, and other information to determine if the timing restriction is required or if a survey is required. It is recommended that the USFWS New Jersey Field Office be contacted for technical assistance prior to any projects involving tree removal within North Plainfield Borough to avoid potential impacts to this species.

### **Wood Turtle**

Wood turtles are highly terrestrial and utilize a variety of habitats including open or forested floodplains, wet meadows and forested wetlands with emergent or shrubby vegetation and streams and creeks. Wood turtle activity often occurs in wooded and marshy stream corridors; however, the turtles may travel well into a variety of atypical upland areas including woodlots, meadows and agricultural fields, particularly after warm spring and summer rains. In addition to berries, mushrooms and green plants, these omnivorous turtles feed on a variety of small animals including fish, frogs, tadpoles, soft bodied invertebrates and carrion<sup>9</sup>.

Wood turtle wetland habitats are often associated with streams over 10 feet in width and at least one foot deep, which they utilize for mating and hibernating. Hibernacula occur directly within streams, often in an undercut stream bank with a submerged root system. In the spring, wood turtles lay eggs in uplands adjacent to their wetland habitats in areas typically containing loose sand or dirt. Upland habitats required for breeding must be considered when determining the full habitat requirements for this species<sup>11</sup>.

The wood turtle is highly dependent on high quality riparian habitats for foraging and in-stream hibernation and breeding. Habitat loss and stream degradation from development has significantly reduced wood turtle populations in New Jersey and the species was listed as threatened by the NJ Division of Fish and Wildlife in 1979. Although considered globally stable, several northeastern states have reported wood turtle population declines and the effects of predation and disturbance on the turtle's reproductive success and juvenile mortality remain a concern in New Jersey<sup>9</sup>.

The corridor of Stony Brook and Lower Green Brook has records of wood turtle from as recent as 2008 based on NJDEP Landscape Data<sup>3,4</sup>. The structure of these streams within North Plainfield is consistent with wood turtle stream habitat. Portions of these streams contain sections that are at least 10 feet wide with a moderate flow; small cobble, gravel, or sandy bottoms; and undercutting banks with pockets of water two or more feet deep (see Photos O and P)<sup>20</sup>.

The streams' surrounding floodplain forest canopies of red maple, sycamore, green ash and American elm are consistent with habitat for wood turtle. Some small portions of the understory

and forest floor within the corridors consist of dominant mixtures of native *Carex* sp. sedges, smartweeds (*Polygonum* spp.), grasses such as manna grass (*Glyceria* sp.), skunk cabbage and other native rich forest or wetland herbaceous species<sup>20</sup>. These areas are consistent with suitable foraging habitat for wood turtle (see Appendix B, Photo E). It is important to consider, however, that the overwhelming dominance of Japanese stiltgrass (*Microstegium vimineum*) and Japanese knotweed (*Polygonum cuspidatum*) in the floodplain understory may limit the overall local population success of this species within the municipality and the watershed. Additional impediments to wood turtle habitat within North Plainfield may include the encroachment of urban/residential areas and division of habitat corridors by roads, degraded water quality and sedimentation.

Some of the suburban land use areas in southern North Plainfield have been apparently incorrectly mapped as wood turtle habitat<sup>36</sup>. Nevertheless, any NJDEP wetland or flood hazard area permit applications for sites mapped as wood turtle habitat need to address the species in the application. For more information on NJDEP permitting and wood turtle habitat in North Plainfield, see the Floodplains and Wetlands sections of the ERI, in Sections 6 and 8 respectively.

### **Wood Thrush**

The wood thrush is a forest bird somewhat similar in size and manner to its relative, the American robin. It has a warm brown back and a white breast covered with black spots. The wood thrush feeds on forest floor insects and other arthropods such as centipedes, wood lice, and spiders. It also eats worms, snails, salamanders and a variety of forest floor fruits from species such as blueberry (*Vaccinium* spp.), spicebush (*Lindera benzoin*), grape (*Vitis* spp.), Virginia creeper (*Parthenocissus quinquefolia*), elderberry (*Sambucus canadensis*), and jack-in-the-pulpit (*Arisaema triphyllum*)<sup>12</sup>. The wood thrush is a common Neotropical migrant (see Section 10.7) and its distinctive flute-like call is a common springtime sound of Northeastern woodlands.

Wood thrushes prefer to nest in often moist deciduous or mixed forests with a dense tree canopy at least some large trees and a generally well-developed understory. The most common tree species in wood thrush habitat within the eastern region are American beech (*Fagus grandifolia*), sweet gum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), Eastern hemlock (*Tsuga canadensis*), flowering dogwood (*Cornus florida*), American hornbeam, oaks (*Quercus* spp.), or pines (*Pinus* spp.)<sup>12</sup>. Wood thrush will utilize a wide variety of fragmented habitats with relatively small patch sizes. The reproductive success of wood thrush; however, decreases rapidly in patch sizes less than 100 acres. Robbins (1979) estimated that a minimum areas of 247 acres (100 ha) is required to support a viable breeding population of wood thrush<sup>13</sup>. In general studies have shown that nest predation and cowbird brood parasitism of wood thrush occur at higher rates in fragmented habitat areas<sup>12</sup> and contribute to this correlation.

Although still relatively common, wood thrushes are declining due to habitat fragmentation in the Northeast and numbers of this species are well-below historical levels<sup>12</sup>. Protection of this species' habitat benefits a suite of forest interior and Neotropical migrant birds (see Section 10.7) including many warblers, other thrushes such as the veery, flycatchers, and vireos. As a result of its decreasing numbers and close connection to forest health and patch size; the wood thrush is listed as both a Bird of Conservation Concern and a Species of Regional Concern by USFWS.

The deciduous floodplain forest communities of North Plainfield, though fragmented and heavily impacted by invasive species, provide wood thrush habitat and their presence was confirmed in Green Acres Park/Green Brook corridor during ASGECI's field evaluation on June 19, 2013<sup>20</sup>.

### **Great Blue Heron**

At sizes reaching nearly 54 inches, the impressive great blue heron is the largest of the North American herons. It is generally blue-grey to brownish in color and has a distinctive long s-shaped neck and a long thick bill. The primary feathers on the wings are very dark in appearance. The underside is whitish with brownish streaks. It is a common bird and can often be observed foraging by stalking prey on foot along stream banks, lakes, flooded agricultural fields and wetlands.

Hérons are generalist predatory feeders eating fish, amphibians, reptiles, small birds, mammals, insects and other arthropods, or just about any other animal it can swallow<sup>12</sup>. It captures prey with a quick strike as it slings its neck and head forward towards its prey.

Great blue herons nest in colonial groups (up to 100 nests) in isolated wooded swamps or upland islands surrounded by wetlands or waters<sup>12</sup>. Nest trees are typically 30 to 70 feet above ground (up to 90 feet above ground) on edges of marshes, open wetlands and other water bodies<sup>14</sup>. Tree species utilized for nesting include ash (*Fraxinus* spp.), birch (*Betula* spp.), maple (*Acer* spp.), elm (*Ulmus* spp.), hickory (*Carya* spp.), oaks (*Quercus* spp.), and aspen (*Populus* spp.)<sup>15</sup>.

Great blue herons are stable within New Jersey; however, their colonial nesting areas are sensitive to human disturbance and listed as State Special Concern<sup>16</sup>. Within North Plainfield, great blue herons can be observed foraging along the banks of the major streams as well as the lakes, including Green Brook Park Lake. There are no known blue heron nest colonies within the Borough of North Plainfield<sup>20</sup>. The black-crowned night heron (*Nycticorax nycticorax* State-threatened (breeding) is an additional heron species that has been observed foraging at the Green Brook Park Lake<sup>20</sup>. ASGECI did not observe any rare or sensitive plant species or vegetation communities in its partial evaluation of Green Brook and Green Acres Parks<sup>20</sup>.

## **10.6 Rare Plants**

ASGECI reviewed NJDEP Records through both the Natural Heritage Plant Grid and the Natural Heritage Project review (see Appendix D, Correspondence). According to the Natural Heritage Project letter dated December 27, 2012, there are no records of rare plants or ecological communities within North Plainfield Borough. The Natural Heritage Grid Map shows records of Rare plants occurring very close to the borders of North Plainfield. The precision of Grid Map itself is limited and the actual records very likely associated with vegetated gorge of Stony Brook to the north of North Plainfield Borough. The plants identified in this location include a mix of terrestrial (upland) and several palustrine (wetland or floodplain associated) plant species. Some rarest State-listed plant species are not identified for their protection and are listed as "data sensitive".

Natural Heritage Program utilizes data from the various research and observations of both organizations and individuals. As a result, some of the data may not be derived from comprehensive site-specific field surveys. Some natural areas in New Jersey have never been thoroughly surveyed while other areas have. Due to the ongoing, dynamic nature of plant data records, NHP does not provide definitive statements on the presence, absence, or condition of biological elements in any part of New Jersey<sup>3</sup>.

## **10.7 Migratory Birds, Forest Fragmentation and Forest Interiors**

All migratory birds are a Federal trust resource and protected under the Migratory Bird Treaty Act (40 Stat. 755; 16 U.S.C. 703-712). Many common species, such as the American woodcock (*Scolopax minor*), wood thrush (see Section 10.5) and black duck (*Anas rubripes*), while not State or Federally-listed endangered or threatened, are becoming increasingly uncommon within our region and may have USFWS or other regional priority with migratory bird organizations and partnerships such Partners in Flight and the NJDEP NJ Wildlife Action Plan. US Fish and Wildlife Service and other agencies and organizations typically utilize migratory bird data in determining management and preservation strategies on their managed properties. Focus and management of many key, often common, forest or shrub-nesting bird species (such as scarlet tanager (*Piranga olivacea*) or Eastern towhee (*Pipilo erythrophthalmus*), results in the protection of a suite of birds and other wildlife species.

### **10.7.1 Neotropical Migrant Birds and Forest Fragmentation**

Neotropical migrant bird species, such as the wood thrush (see Section 10.5), are those species that breed in temperate North America and migrate south to overwinter in the Caribbean Islands, Mexican lowlands, and Central and South America (Neotropics). These species are often of particular regional preservation interest due to habitat loss and subsequent population decreases. Species include warblers, thrushes, orioles, tanagers, grosbeaks, vireos, hummingbirds, flycatchers, and swallows and swifts.

Most Neotropical migrant species are insect eating passerines (songbird) species of the forest interior and often require healthy, relatively large wooded tracts for breeding<sup>17 18</sup>. The numbers and diversity of Neotropical migrant bird species are important factors in determining the health of a forest. Typically, most forest interior species will only nest within a forest “core” that is at least 90 meters (295 feet) from the nearest forest edge. In addition the forest core must be a minimum of about 10 hectares (25 acres) in size<sup>18</sup>.

Fragmentation of forested areas isolated from the main forest complex increases the amount of edge habitat and decreases the amount of forest interior bird habitat. Negative effects of forest fragmentation are well documented for breeding birds<sup>18, 19</sup>. Fragmented forests are characterized by high levels of edge-related nest predation, and/or cowbird brood parasitism for many area sensitive species. Fragmentation also compounds impacts from wind and other weather extremes as well as the spread of exotic and invasive species such as Japanese honeysuckle and Japanese barberry. Within the forests of North Plainfield this fragmentation has facilitated the spread of monocultures of both Japanese knotweed and Japanese stiltgrass (see Appendix B, Photos D and J).

Due to its proximity to the Watchung Mountains and associated forests, it would be expected that various Neotropical migrants would be common during migratory times of the year (particularly May, September and October) in the forests of North Plainfield. In addition to wood thrush, other Neotropical migrant birds that utilize shrub habitats and/or are somewhat less sensitive to patch size or disturbance likely nest within the wetland forest corridors of North Plainfield Borough. Examples of these species identified within North Plainfield include red-eyed vireo (*Vireo olivaceus*), yellow warbler (*Setophaga petechial*), common yellowthroat, (*Geothlypis trichas*) and yellow-billed cuckoo (*Coccyzus americanus*)<sup>20</sup>.

### 10.7.2 Linear Corridors

Linear forested corridors may compensate for some fragmentation for migratory birds and species with limited mobility (small mammals, herptiles and some invertebrates). Developing linear habitat connectivity may provide wildlife the ability to move between larger habitat patches<sup>21</sup>. Generally, the wider the linear habitat corridor, the more likely it is to function as effective wildlife habitat. Hodges and Kremetz recommend that the minimum corridor width be no less than 100 meters (330 feet) for wildlife function<sup>22</sup>. These wider corridors also improve habitat conditions within the stream itself and may mitigate flood conditions.

The forested habitats of North Plainfield are primarily wetland/riparian forest corridors associated with the Green and Stony Brooks in southern North Plainfield (see Appendix A, Landscape Map and Forested Wetlands Map). The largest block of this corridor habitat, which includes generally contiguous forest on the lower portions of the Stony and Green Brooks, is about 79 hectares (195 acres) in size. Some additional partially fragmented forest patches are adjacent to this larger block. The main forested corridor within North Plainfield is typically between 600-700 feet wide; however, there is substantial variation in width within the municipality. This corridor ranges in width from approximately 1150 linear feet in Green Acres Park to under 200 feet in several locations including Green Brook Park.

Many other stream corridor areas north of Grove Street (along Green and Crab Brooks) are non-forested or have much narrower forest corridors ranging from 150 to 300 feet in width (see Appendix A, Landscape Project Map). Based on the patch sizes within North Plainfield and adjacent core forested areas to the south; municipal forested habitats of southern North Plainfield may support reproductive populations of wood thrush or other forest interior species.

The forested corridor of Green Brook continues downstream in several adjacent municipalities before merging with the Raritan River in Bound Brook Borough. This adjacent corridor provides an additional approximate 220 ha (540 acres) of primarily forest habitat. Patch size and connectivity becomes critical for sustaining large healthy populations of wood thrush and other forest species. It would be expected that the forested corridors of Green and Stony Brooks would, during migratory periods in the spring or fall, contain a variety of these regionally prioritized or State-Special Concern Species.

Attempts to expand or improve corridors within North Plainfield may improve the overall migration of wildlife between the Watchung Mountains and downstream areas along the Green

Brook/Bound Brook/ Raritan River complex (see Appendix A, Mapping). Widening corridors may improve wood turtle foraging habitat and the likelihood of nesting Neotropical migrant or forest interior birds. Improvement of corridor width and quality should be a consideration in future habitat planning.

## **10.8 Additional Wildlife Species**

In addition to listed wildlife, a wide diversity of common terrestrial vertebrate wildlife species including common resident bird species, reptiles, amphibians and mammals can be found within North Plainfield Borough. A complete list of vertebrate wildlife species documented or expected within the North Plainfield is found in Appendix C of the ERI.

### **Resident Birds**

Many common wintering and year-round resident birds utilize a variety of forested, park and residential habitats in North Plainfield. Examples include various woodpeckers including downy (*Picoides pubescens*), hairy (*Picoides villosus*) and red-bellied woodpeckers (*Melanerpes carolinus*), and yellow-shafted flicker (*Colaptes auratus auratus*); various sparrows such as song sparrow (*Melospiza melodia*), dark-eyed juncos (*Junco hyemalis*), and white throated sparrows (*Zonotrichia albicollis*); finches including American goldfinch (*Carduelis tristis*); screech owl (*Megascops asio*) and great horned owl (*Bubo virginianus*); crows and the blue jay (*Corvidae*); and certain thrushes including American robin (*Turdus migratorius*). These common suburban/backyard residents play important ecological functions. These common species act as native seed dispersers, control insect populations, and in the case of turkey vultures (*Cathartes aura*), American crows (*Corvus brachyrhynchos*), and several other species act as scavengers of carrion. These species also provide readily accessible educational opportunities and aesthetic value to a community.

### **Reptiles and Amphibians**

Generally less mobile than other terrestrial vertebrates, reptiles and amphibians or “herptiles” are particularly sensitive to development and habitat loss. Salamander and other herptile populations are frequently impacted by road traffic as they move between fragmented habitats. Because of their unshelled eggs and porous skin, many amphibian populations may be impacted by sudden climate or hydrology changes and pollution. As a result of their sensitivity, herptile diversity is an excellent way to gauge water quality and habitat health on a local, regional or global scale.

Some herptile species are particularly ecologically important in transferring energy across trophic levels in a food web. For example the very common red-backed salamander (*Plethodon cinereus*), which potentially occurs within the borough of North Plainfield, consumes vast amounts of tiny invertebrates and detritus underutilized by larger vertebrates. As a result of their unique ecological niche, this inconspicuous salamander comprises the majority of vertebrate biomass in many Northeastern forests<sup>23</sup>. The salamanders, in turn, are an important food source for many other herptiles, birds and mammals. In addition, the tremendous consumption and control of forest decomposers by red-backed and other salamanders decreases decomposition rates and ultimately slows the rate of CO<sub>2</sub> emission into the atmosphere<sup>24 25</sup>.



Aquatic or semi-aquatic salamanders and frogs that may be present within North Plainfield include several species somewhat tolerant of disturbance. Species include two-lined salamanders (*Eurycea bislineata*) and possibly the dusky salamander (*Desmognathus fuscus*). Frogs that are found in the surface waters of North Plainfield include green frogs (*Lithobates clamitans*) and bullfrogs (*Lithobates catesbeianus*)<sup>20</sup>. Other frog species potentially present include American toads (*Anaxyrus americanus*), gray tree frogs (*Hyla versicolor*), spring peepers (*Pseudacris crucifer*), and pickerel frogs (*Lithobates palustris*). Amphibians requiring vernal pools have not been identified in North Plainfield (see Section 10.9).

In addition to the State-threatened wood turtle, the wetland forests and open waters of North Plainfield support other reptiles including the eastern painted turtle (*Chrysemys picta*) and the non-native red-eared slider (*Trachemys scripta elegans*), both of which were identified in Green Acres Park waterbodies<sup>20</sup>. Special Concern box turtle (*Terrapine carolina*) and common disturbance-tolerant turtles and snapping turtle (*Chelydra serpentina*) may also occur. Snakes that may occur within the municipality include garter snake (*Thamnophus sirtalis*), black racer (*Coluber constrictor*), ringneck snake (*Diadophis punctatus punctatus*), milk snake (*Lampropeltis triangulum*), and northern water snake (*Nerodia sipedon*).

### **Mammals**

Many opportunistic and disturbance tolerant mammals would be expected in North Plainfield Borough. The most common species include groundhog (*Marmota monax*), Norway rat (*Rattus norvegicus*), Eastern chipmunk (*Tamias striatus*), white-footed mouse (*Peromyscus leucopus*), red fox (*Vulpes vulpes*), Eastern gray squirrel (*Sciurus canadensis*), white-tailed deer (*Odocoileus virginianus*), Virginia opossum (*Didelphis virginiana*), and raccoon (*Procyon lotor*) and striped skunk (*Mephitis mephitis*). Other more secretive or rarer mammal species that are known to occur within the vicinity of North Plainfield include Southern flying squirrel (*Glaucomys volans*), and weasel family (mustelids) members mink (*Mustela vison*), and river otter (*Lutra canadensis*).

In addition to the potential occurrence of the endangered Indiana bat, several additional bat species including red bat (*Lasiurus borealis*), big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), long-eared bat (*Plecotus auritus*), and the Eastern pipistrelle (*Perimyotis subflavus*) may occur within North Plainfield. Larger predatory mammals including black bear (*Ursus americanus*) and Eastern coyote (*Canis latrans*) have been occasionally identified within North Plainfield Borough. Both coyotes and black bear live in close proximity to humans throughout much of New Jersey and utilize a diverse array of naturally and human derived food sources<sup>27, 28, 29</sup>. Larger predatory mammals are further discussed in the Deer and Nuisance Wildlife Section 10.10.

## **10.9 Vernal Pools**

Vernal pools are ephemeral wetlands that fill annually in the winter and early spring from precipitation runoff or rising groundwater tables. They may be located within a forested, scrub/shrub or emergent wetlands or even within uplands of varying types<sup>26</sup>. During most warm seasons, they dry out, losing water through evapotranspiration or as the groundwater table drops. This wet/dry cycle and the low water oxygen levels prevent the establishment and breeding of fish, yet provide a unique temporary habitat for many species. The time of year that

the pool fills and dries out will influence the community of animals that utilizes the pool. Numerous amphibians and invertebrates have evolved life cycles adapted to the exploitation of vernal pools.

Some species are completely dependent on these pools (obligate species) including local species such as wood frogs (*Lithobates sylvatica*) and/or spotted salamanders (*Ambystoma maculatum*) 26. Other species, known as facultative species, utilize other wetlands, or open waters in addition to vernal pools for reproduction. Very common facultative frog species that likely occur within North Plainfield Borough are spring peepers, gray treefrogs or green frogs.

NJDEP uses four basic criteria to determine if a wetland is a certified vernal pool. A wetland certified by the State as a vernal pool must be: a confined basin/depression lacking a permanent outlet; harboring documented obligate or facultative vernal habitat species (as identified in N.J.A.C. 7:7A, Appendix 1); maintaining water for at least two continuous months between March & September of a normal rainfall year; and free of fish populations or drying at some time during a normal rainfall year (N.J.A.C. 7:7A-1.4).

Currently, under the NJDEP Freshwater Wetlands Protection Act Rules (N.J.A.C. 7:7A), vernal pools and adjacent wetland transition areas (typically 50 foot) are protected from disturbance by prohibition of issuance of most general permits for activities in these vernal habitats. The NJDEP has discretionary authority, however, to require an Individual Permit for a proposed disturbance to an isolated wetland considered a vernal pool.

There are no NJDEP identified potential or confirmed vernal habitats in North Plainfield Borough. ASGECI did not identify any potential vernal pools during its visit to portions of Green Acres and Green Brook Parks in June 2013; however, a full evaluation of vernal habitat was not completed during this visit <sup>20</sup>.

According to NJDEP GIS data, the closest confirmed vernal habitat is in Warren Township (on the opposite side of the Watchung Ridge) approximately 2.75 miles north of North Plainfield Borough. This confirmed habitat is part of a large contiguous cluster of habitats associated with the Passaic River. The closest potential habitat is located approximately 700 feet to the north in Watchung Borough. Other nearby potential habitats occur in Green Brook Township and Piscataway Township (Middlesex County) and Berkeley Heights Township (Union County). Additional clusters of confirmed habitats occur in South Plainfield Borough (Union County).

Due to the small size of some vernal pools and the use of remote techniques such as airphoto analysis for determining potential vernal habitat through landscape mapping, it is possible that additional potential habitat areas may exist in and around North Plainfield Borough; however, the areas that could support these habitats are limited to the stream corridors, which may be subject to flooding and predation from fish. It is also possible that some vernal facultative or obligate (most likely wood frog) amphibians occur within or close to North Plainfield Borough. It is important to consider that amphibians may utilize adjacent forested habitat of up to 1,000 feet or more from the breeding pool <sup>11</sup>.

## 10.10 Deer and Nuisance Wildlife Impacts

As with invasive plants such as Japanese knotweed, overpopulations of certain species of opportunistic native and non-native wildlife species can have detrimental ecological impacts, as well as negative economic, quality of life or health impacts on people. Among the most common nonnative bird species resulting in ecological impacts are European starlings (*Sturnus vulgaris*) and house sparrows, (*Passer domesticus*); both of which are well established in North Plainfield<sup>20</sup> and occur throughout New Jersey. These species are aggressive nesters and feeders that displace native species such as bluebirds from cavity nesting sites. These exotic birds may also outcompete grosbeaks or winter finch species in feeding areas. Maintaining nest boxes with the correctly sized entry hole and sealing gaps and cracks in houses and structures will reduce local nesting by these species.

In the last two decades, some Canada goose (*Branta canadensis*) populations have become residential and remain in New Jersey throughout the breeding season. Goose feces in addition to being unsightly and presenting potential health and quality of life issues, may raise the nutrient levels in waterbodies and reduce habitat quality for aquatic wildlife. Measures such as egg addling may be employed for reducing goose numbers. North Plainfield has no control program for Canada geese and resident populations are not an issue in North Plainfield due to the limited amount of open habitat. Green Acres Park, for example, contains enough forbs and tall vegetation to limit populations of resident geese. At one time, the North Plainfield Public Works department conducted egg addling and utilized harassment dogs; however, the program was ended as the need for it was not apparent<sup>37</sup>.

Many ecologists consider white-tailed deer overpopulation to be the greatest ecological threat to forests of New Jersey and southern New York<sup>30</sup>. Ecological impact of deer can be observed by the presence of a browse line within a forest understory. The deer browse line is a striation of heavy defoliation that typically extends from the forest floor to a height of around three to four feet (the typical maximum height that deer are capable of effectively browsing). The browse line is marked by drastic losses in vegetation density and diversity, even at relatively low deer densities<sup>31</sup>.

Overgrazing of vegetation from excess deer populations may lead to increased vegetation exposure to wind, ice, insects and parasites. Deer overpopulation also results in a lack of forest tree seedling regeneration from seed and shoot overconsumption; a lack of understory habitat structure (such as that required for ground nesting birds, salamanders and small mammals); and an increase in invasive species as deer avoid problematic species (see Section 9.2) such as Japanese stiltgrass, garlic mustard, and Japanese barberry<sup>32</sup>.

In addition to the ecological impact; there are multiple economic/cultural or quality of life impacts associated with local deer population increases. The North Jersey Deer Crash Coalition, which is chaired by members of NJDEP and State transportation agencies, has found about 7,000 deer-car crashes are reported annually in New Jersey and estimates twice as many deer related crashes are unreported<sup>34</sup>. Lyme disease, a neurological disease with a wide variety of symptoms, is caused by a spirochete bacteria and typically transmitted to humans by deer ticks (*Ixodes scapularis*) and lone star ticks (*Amblyomma americanum*) in New Jersey. Although deer are not

a reservoir for Lyme disease, deer are the preferred winter host for adult deer ticks which rely on the deer for successful reproduction<sup>33</sup>.

The State of New Jersey is divided into 68 deer management zones. Each management zone has set harvest conditions and limits based on deer population numbers. North Plainfield is situated primarily in Zone 36 with portions north/west of Route. 22 in Zone 13. In 2013, deer harvested in Zone 13 was 1756 and 917 in Zone 36. Zone 13 is associated with the wooded areas of the Watchung Mountains and less urbanized, which allows for more hunting opportunities. Somerset County has averaged a harvest of 3840 deer per year since 2005 with 3369 harvested in 2012<sup>35</sup>. While hunting occurs regularly in portions of these local zones, North Plainfield's open space is limited by its close proximity to residences.

As with all other parts of New Jersey, there is evidence of deer overpopulation within North Plainfield<sup>20</sup>. Evidence and impacts from deer overpopulation can be observed within the forested tracts of North Plainfield (see Appendix B, Photos Q and R). This includes the observation of multiple deer within natural areas during daylight hours, frequent well-established deer trails and evidence of forage, including tracks and scat throughout the forests<sup>20</sup>. While the Union County Park System acknowledges the impacts of deer within Green Brook Park, it does not have a hunting program or an active deer management of any type at that location<sup>38</sup>. There are currently no municipal deer control programs within North Plainfield. Limited Bow hunting had been given some limited consideration within North Plainfield in the past (minutes council of the Borough Aug 16 2010 and Mar 28 2011)<sup>39</sup>.

Two large predatory mammal species, the Eastern coyote and the black bear have expanded throughout New Jersey over the last several decades and have been confirmed in North Plainfield; however, sightings in North Plainfield of both species are very rare. Eastern coyotes are members of the dog family (Canidae) and somewhat similar in appearance to a German shepherd. Eastern coyotes are larger than their western counterparts and average 20-50 pounds in New Jersey<sup>27</sup>. They may vary in color from black, tan or blonde. Eastern coyotes are secretive and wary of humans. They may, however, be attracted to areas associated with human activity such as trash and refuse areas, livestock or agricultural areas, bird feeders, wood piles, brush piles and other features that provide shelter or food for rodent prey<sup>27</sup>.

Eastern coyotes have been documented in the vicinity of North Plainfield as early as 1957 (Green Brook Township). Numbers of coyote documentations in Somerset County expanded significantly during the mid-1980's. Coyotes were first documented in North Plainfield in the early 1990's<sup>27</sup>. Populations expanded eastward through northern New Jersey between 1995 and 2005 and confirmations occurred periodically throughout Essex and Union Counties during this time. The frequency of reports to NJDEP from North Plainfield and the surrounding area remains limited to a few reports with many more reports occurring in the Watchung Mountains to the north and in western Somerset County.

The NJ Division of Fish and Wildlife recommends several precautions avoid coyote conflicts. These include securing garbage and covering compost piles, removing brush and other shelters from around the house, taking in pets, bird feeders and other prey attractants in at night, and remove and food or water sources when possible. It is particularly important to never

intentionally feed a coyote or unintentionally feed a coyote by feeding feral animals such as cats. Coyotes will typically be frightened by motion sensitive lights, or loud noises, or spraying from garden hoses; all may be used to discourage coyotes from lingering around a residence<sup>27</sup>.

Black bear utilize a variety of habitats including undeveloped open space such as forests, wetlands and riparian corridors<sup>28</sup>. The greatest populations of bear within the state are north of I-78, however the species is expanding southward throughout the state<sup>29</sup>. Black bears had been observed in North Plainfield by 2000<sup>29</sup>.

NJDEP encourages municipalities to educate their residents about ways to avoid attracting bears. Basic precautions include being careful with garbage (i.e. bear resistant containers), bird feeders and other potential food sources. The State also encourages homeowners to learn how to report bear damage or nuisance behavior. NJDEP also emphasizes that intentionally and unintentionally feeding bear is illegal in the State of New Jersey and fines may range to \$1000 dollars for each offense.

More information on New Jersey's bears, bear reporting and bear precautions is available at the following NJDEP website: [http://www.state.nj.us/dep/fgw/bearfacts\\_municipalities.htm](http://www.state.nj.us/dep/fgw/bearfacts_municipalities.htm)

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## 11.0 GLOSSARY OF TERMS

**Air Toxics** - defined by USEPA as hazardous air pollutants known or suspected to cause cancer or other serious health effects or birth defects.

**Alluvial** – refers to soils comprised of sand or silt (alluvium) that are deposited by a river or other running water.

**AMNET** – Ambient Biological Monitoring Network. NJDEP program to assess the quality of waterbodies through biological methods.

**Anadromous species** – a species of fish that breed in freshwater and migrate to the ocean.

**Aquifer** – a geologic formation that is saturated and can transmit water. These may be bedrock or surface aquifers. Aquifers may have confined or unconfined, which implies water may be transmitted through or confined within geologic layers.

**Basalt** – a common extrusive volcanic rock formed from the rapid cooling of lava. Basalt is usually dark and fine grained.

**Bedrock** – the geological rock formation underlying the soil.

**Benthic**- an organism that lives on or within the substrate a of a river, ocean or other waterbody.

**Buffer** –refers to an area surrounding a stream, wetland or waterbody in which certain activities such as vegetation clearing or development may be restricted.

**Classification Exception Area (CEA)** – An NJDEP designated area where groundwater exceeds NJ Water quality standards for one or more contaminants.

**Climate Zone** – a distinct region with specific climate characteristics.

**Climatology** – the study of climate, particularly the collection and analysis of weather conditions over a period of time.

**Community** – a group of populations of living things usually defined by key plant species (i.e. marsh community).

**Competition** - an ecological relationship in which two organisms or species are impacted negatively by the relationship.

**Conifer/Coniferous** – a group of evergreen trees that include pines, spruces and cedars.

**Contiguous** – refers to connected habitat. Some species require large, contiguous forest or wetland habitats.

**Corridor** – typically refers to a linear pathway of habitat that may be utilized by wildlife for movement and migration. Corridors may be associated with forested areas, particularly along rivers and streams.

**Criteria air pollutants** - the six most common air pollutants in the U.S. and the only pollutants with established national air quality standards. Criteria pollutants include carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide.

**Crown closure** – percentage of ground covered by a vertical projection of the outer crown perimeter of a stand of vegetation. Forest areas in North Plainfield are typically greater than 50% crown closure.

**Deciduous** – refers to plants that drop their leaves during our winter season.

**Ecology** – the study of the interaction of organism populations and their relationship to their physical environment.

**Ecosystem** – environments comprised of interacting populations and communities of organisms and the abiotic environment.

**Emergent**- refers to a prevalence of herbaceous vegetation and open canopy within a wetland plant community.

**Endangered species** - population of organisms which is immediately at risk of becoming extinct or extirpated (locally extinct) because it is either few in numbers, or threatened by changing environmental or predation parameters.

**Estuarine** - referring to tidal waterbodies. Typically used to describe certain types of tidal wetlands under the (Cowardin *et al* 1979) classification system. Estuarine wetlands are not found in North Plainfield.

**Eutrophic** – describes waterbodies containing large quantities of nutrients (nitrogen or phosphorus) resulting in vigorous growth of aquatic plants and often depleted oxygen

**Evapotranspiration** – the uptake of water through the roots of a plant and evaporation from its leaves.

**Facultative** – refers to species that may or may not use a particular habitat. Facultative vernal pool species sometimes use these habitats but may use lakes or pools. Amphibians in North Plainfield would likely be facultative vernal pool species.

**FEMA** –Federal Emergency Management Agency. Among its many functions FEMA establishes the Flood Insurance Rate Maps (FIRM) defining 100-year floodplains used for regulatory and planning purposes.

**Feral** – refers to animals descended from domesticated species that have been introduced into the wild and are naturalized. Typically it refers to domestic animals that are reproducing within the wildlife habitat.

**Floodplain** – an area adjacent to a watercourse inundated by regulatory flood

**Fluvaquents** –poorly defined hydric soils typically found in swamps or marshes.

**Fragipan** – a subsurface layer of soil that is more dense than above layers.

**Fragmentation** – refers to the process by which areas of habitat, such as forests or wetlands, are divided and isolated into smaller habitats by development. Generally fragmentation reduces the sensitive species habitat quality in those areas.

**Geology** – the science and study of the solid and liquid materials that constitute the earth.

**Glacial** – related to glacier activity. Particularly (within this document) the Wisconsin Glaciation (110,000 to 10,000 years ago) which had particular impacts on local geology, soils and ecology. Glacial activity has had a major influence on the soils and geology of North Plainfield.

**GPM** – gallons per minute -used in reference to well water yields. NJDEP rates aquifers on their GPM well yield.

**Groundwater** –water beneath the earth’s surface in soil or gravel pore spaces, or in fractures or solution channels in rock strata.

**Herbaceous** – a plant that lacks woody persistent parts and typically has stems and leaves that die down to the soil level at the end of the growing season.

**Herptile** – an informal term to describe amphibians and reptiles. Although they are in distinct taxonomic classes, reptiles and amphibians may share certain similar habitats, morphology and behaviors, and are therefore sometimes discussed in this generalized way.

**Hibernacula** – refers to a microhabitat used by groups of animals (such as bats or turtles) for hibernation.

**Horizon** – a layer within a soil profile that contributes to its distinctive classification. The most general soil horizons (from shallow to deep) are: O – Organic; A – Topsoil; B – Subsoil; C- Parent Material; and R- Bedrock. These categories may be further broken down by various characteristics.

**HUC** - Hydrologic Unit Code – a code of numbers used for identifying all drainage basins and watersheds and subwatersheds in a nested arrangement from largest to smallest. The HUC code becomes longer. Eleven digits are used for watersheds and 14 digits for subwatersheds.

**Hydric**- pertaining to a high moisture regime in soils. Hydric soils are poorly drained soils often associated with wetlands and floodplains.

**Hydrometeorology**- the study of the transfer of water and energy between the land surface and the lower atmosphere

**Hydrophytic** - preferring moist environments. Certain wetland vegetation is referred to as hydrophytic.

**Impervious Surfaces** – surfaces on which water is not absorbed such as asphalt or concrete. Higher levels of impervious surface coverage may be associated with increases in flash flooding and reductions in water quality.

**Invasive species** - a non-native organism that establishes itself and often becomes dominant in a new ecosystem, resulting in environmental harm to that system. Invasive species may result in ecological or economic harm, and impact the quality of life for a community.

**Invertebrates** – referring to a large informal grouping of species without backbones. Most animals (over 95% of species) are invertebrates. Major groups include insects, crustaceans, spiders, mollusks, and various worm taxa.

**Jurassic** - a unit of the geological timescale extending from 200 to 145 MYA. The era is typically identified with the dominance of certain dinosaur species.

**KCS - Known Contaminated Site** - a list of industrial, commercial or residential sites where soil and/or groundwater is determined by NJDEP to be contaminated beyond acceptable standards.

**Lacustrine** – pertaining to lakes and lake habitats. Typically used to describe certain wetlands associated with lake environments.

**Landscape Project** –Statewide mapping created by NJDEP that identifies parcels of habitat potentially containing rare, threatened or endangered species.

**Letter of Interpretation (LOI)** – Document issued by the NJDEP which confirms the presence of wetlands, their boundaries and their resource value on a property in the State of New Jersey.

**Loam/loamy** – a general term for soil that is approximately 40% sand, 40% silt and 20% clay and typically is good for growing crops. Loams are the most common soils in North Plainfield.

**Mesic forest-** forests that have moderate or well-balanced moisture (supply not overly dry or flooded).

**Mitigation** – a general term used for actions required as compensation for the loss of a resource. Mitigated wetlands are those that are created, enhanced or preserved to compensate for wetlands altered or lost under various permits.

**Mixed Forest** – refers to forests that contain components of both broadleaf deciduous and conifer trees.

**Mutualism** – an ecological relationship between two organisms (typically species) that benefits both species.

**MYA** – Million Years Ago i.e. 30 MYA = 30,000,000 years.

**Neotropical** – referring to Central and South America. The term typically refers to local migrant songbirds that overwinter in Central or South America.

**NJAC** – NJ Administrative Code. Included in State Law references referred to throughout the ERI text.

**NJDEP** – NJ Department of Environmental Protection. State agency regulating all aspects of the environment in New Jersey.

**NJPDES** – NJ Pollution Discharge Elimination System. NJDEP program that regulates pollution discharges in surface and groundwater through a permitting program.

**NOAA** – National Oceanographic and Atmospheric Administration. A federal agency focused on the conditions of the ocean and the atmosphere. Used as a reference in discussions of climate change.

**Nonpoint Source Pollution** - pollution that comes from many diffuse sources and carried by runoff and other means as opposed to **point source pollution** which comes from a single point such as a sewage treatment plant.

**NRCS** - Natural Resource Conservation Service. A program within the USDA. Developing soil data including the Soil Survey Geographic (SSURGO) database and maintaining some of Federal land grant programs are among their activities relevant to the ERI.

**Obligate species** - refers to species that requires a particular habitat for part or all of its life cycle. Obligate vernal pool breeding amphibians rely on these temporary waterbodies for successful reproduction. Obligate species are currently not known to breed in North Plainfield.

**Outcrop** – a reference to a geologic formation that is exposed at the earth's surface.

**Ozone** - a strong smelling inorganic compound comprised of three oxygen atoms (O<sub>3</sub>). It is naturally occurring and beneficial in low concentrations throughout the Earth's atmosphere. Elevated ground level ozone is toxic to humans and other animal species. These elevated levels have resulted from industrial processes and related activities.

**Palustrine** – a term used to define wetlands that are nontidal, freshwater in nature and not considered lacustrine or riverine. Most wetlands in North Plainfield are considered palustrine. The term is used in the Cowardin et al (1979) classification system.

**Parasitism**- a relationship between two organisms (typically species) where one species benefits and one is negatively impacted. Typically parasitic relationships do not result in the immediate death of the host (i.e. predation).

**Particulate matter (PM)** - a mixture of tiny solid and liquid particles in the atmosphere. Particulate matter pollution may include acids, organic chemicals, metals, soil or dust particles. Particles less than 10 micrometers pose the greatest threat to people because of their ability to enter nasal passages, lungs and mucous membranes.

**Pedon** – a cross section of soil profile showing the various horizons used in its classification.

**Physiography** – the relationship of an area to its underlying geology. North Plainfield is in the Piedmont physiographic province.

**Potable water** - water that is used for human consumption. In North Plainfield, this water is provided through a public community purveyor

**Recharge** - refers to groundwater that is derived from precipitation and not diverted into streams or other surface water bodies

**Riparian** – referring to the corridor of vegetation communities and habitat surrounding a river or stream.

**Riverine** - referring to rivers or stream habitats. Typically used in the context of wetlands adjacent to or within with rivers.

**SCD** – Soil Conservation District. A county operated institution that aids in the regulation of soil erosion and sediment control.

**Soil Series** – A specific grouping of soils that share common characteristics. The most widespread series within North Plainfield is the Dunellen Series.

**Solum** - Upper layers of a soil profile where topsoil formation occurs.

**Special Concern** - a term used by NJDEP for species that warrant special attention because of some evidence of decline, inherent vulnerability to environmental deterioration, or habitat modification that would result in the species becoming Threatened.

**SSURGO** – Soil Survey Geographic. Refers to the soil information database provided by the USDA Natural Resource Conservation Service

**Stratigraphy** – the branch of geology pertaining to the study of rock layers and layering (stratification).

**Subwatershed** – this term refers to smaller component of a watershed that is associated with a stream or stream section. Multiple subwatersheds comprise a watershed.

**Surface Runoff** – water flow over the ground surface resulting when precipitation does not completely infiltrate the soil.

**Surface Water** – water collecting on the ground or in a stream, lake, wetland or impoundment.

**SWAP** – Source Water Assessment Program. A program conducted by the NJDEP to assess the quality of public drinking water systems.

**Taxonomic Group (Taxa)** – a grouping of related organisms or soils that share common features.

**Threatened Species** – any species that are vulnerable to extinction or extirpation (localized extinction) in the near future.

**TMDL** – Total Maximum Daily Load. The daily maximum amount of a pollutant a waterbody can receive while still meeting the established required standard for that pollutant.

**Triassic** – a section of the geological timescale ranging from approximately 251 to 199 MYA. A number of geological formations of the Piedmont are from this period.

**USACE** – US Army Corps of Engineers. Agency involved with the Federal regulation of Wetlands and Open Waters and various county projects including Flood and Superfund Mitigation.

**USDA** – US Department of Agriculture. Responsible for Federal agricultural programs. Parent department of the Natural Resource Conservation Service (NRCS).

**USEPA or EPA** – US Environmental Protection Agency. Responsible for creating and enforcing regulations at the federal level to protect the environment.

**USFWS** – US Fish and Wildlife Service. Responsible for enforcing Federal wildlife regulation including the Endangered Species Act.

**Vernal Pool** – ephemeral wetlands or bodies of water that are utilized by a variety of animals for at least part of their life cycle. There are vernal pools documented near but not within North Plainfield.

**Volatile Organic Compounds (VOC)** - a large group of toxic compounds that includes various gasoline additives and solvents. Trichloroethylene and vinyl chloride are two examples of VOCs linked to human health issues.

**Watershed** – a region or area of land that drains into a specific body of water. Watersheds are defined in part for regulatory purposes. Within New Jersey, watersheds are grouped into larger Watershed Management Areas. Watersheds are also broken into smaller subwatersheds associated with smaller streams or stream sections.

**Well Head** - refers to a point from which water is drawn to the surface from an aquifer. Well heads may be assigned tiered areas that show where groundwater drawn from over a given amount of time.

**Wetland** - an area inundated or saturated by water, contains saturated soil conditions and supports vegetation adapted for life in saturated soil conditions. May be wet meadows, marshes, forests floodplains, and swamps.

**WMA** – Watershed Management Area. Regulatory areas defined by a specific group of watersheds.



## **APPENDIX A**

### **ERI MAPS OF NORTH PLAINFIELD**

Map 1 Location Map

Map 2 Orthographic Airphoto Map

Map 3 Historic Aerial (1930) Map

Map 4 Historic Sites and Open Space Map

Map 5 Surficial and Bedrock Geology Map

Map 6 Groundwater Recharge Map

Map 7 Known Contaminated Sites and Surface Water Discharge Points Map

Map 8 Steep Slopes Map

Map 9 Surface Waters and Subwatersheds Map

Map 10 NJDEP Land Use/Land Cover Map

Map 11 NJDEP Landscape Project Map

Map 12 Misidentified Wood Turtle (Urban Areas) Map

Map 13 Critical Areas Map

### **MASTER PLAN MAPS INCLUDED**

**(Prepared for the Master Plan by Art Bernard Associates)**

Flood Hazard and Topographic Contours Map (Plate 3)




Existing Soil Composition Map (Plate 4)

Mapped Wetlands Map (Plate 5)

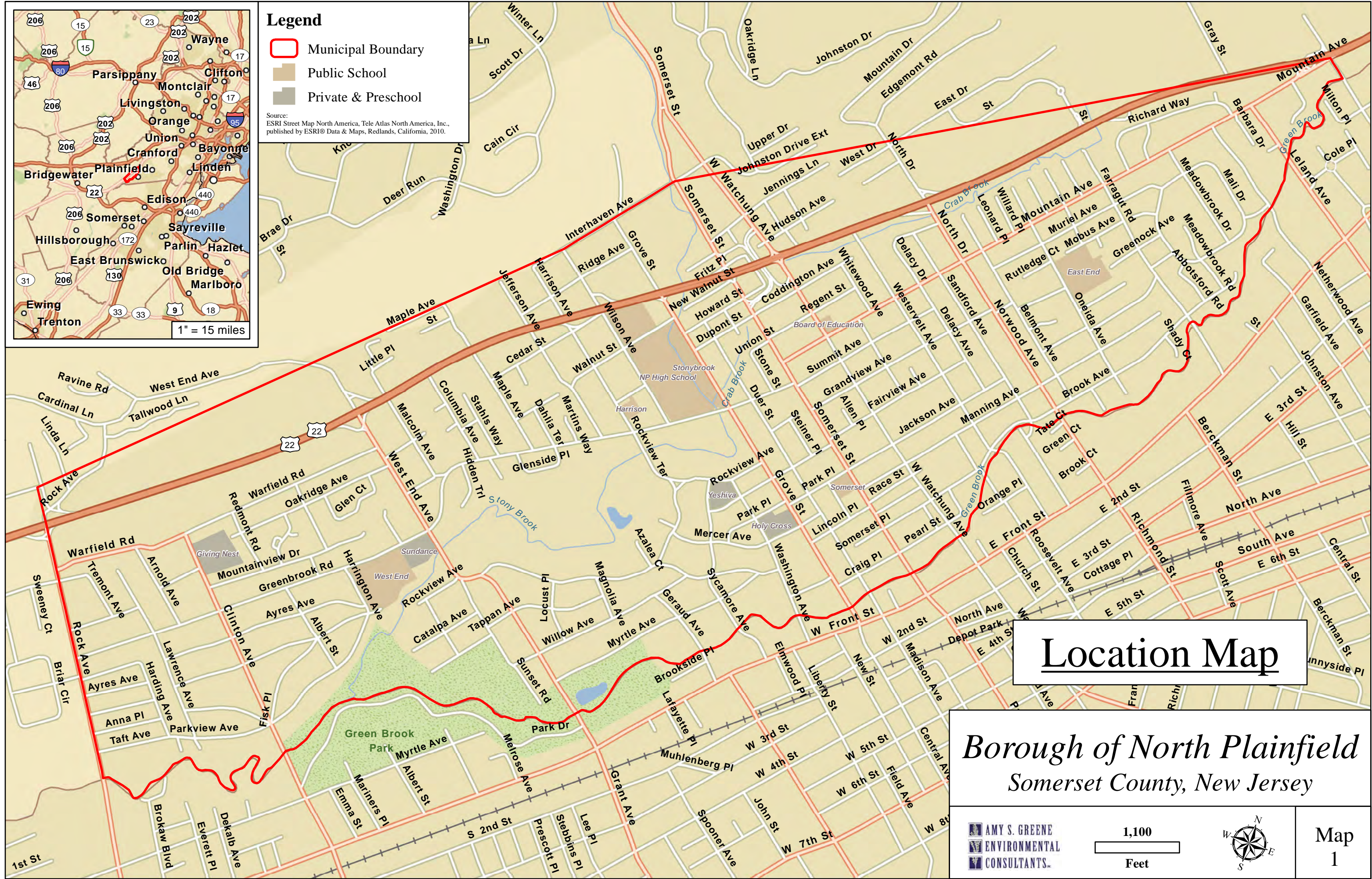
Forest and Forested Wetlands Map (Plate 6)

### **ZONING MAP OF NORTH PLAINFIELD (Map IV)**



- Legend**
-  Municipal Boundary
  -  Public School
  -  Private & Preschool

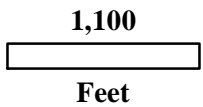
Source: ESRI Street Map North America, Tele Atlas North America, Inc., published by ESRI® Data & Maps, Redlands, California, 2010.



# Location Map

## Borough of North Plainfield Somerset County, New Jersey

AMY S. GREENE  
ENVIRONMENTAL  
CONSULTANTS.



Map  
1

**Legend**

 Municipal Boundary

Source:  
New Jersey 2012 - 2013 High Resolution Orthophotography, NAD83 NJ State Plane Feet, MrSID Tiles, State of New Jersey -  
Office of Information Technology (NJOT), Office of Geographic Information Systems (OGIS), Trenton, NJ, March 2013.  
This (map/publication/report) 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.



Borough of Watchung  
Somerset County

Township of Green Brook  
Somerset County

City of Plainfield  
Union County

City of Plainfield  
Union County

Orthographic Aerial  
of Municipality

*Borough of North Plainfield*  
*Somerset County, New Jersey*

AMY S. GREENE  
ENVIRONMENTAL  
CONSULTANTS

1,100  
Feet



Map  
2

**Legend**

 Municipal Boundary

Source:  
NJDEP 1930 Aerial Photography of New Jersey (Black and White), New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS), Trenton, New Jersey, February 2005.  
This (map/publication/report) 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.



Historic Aerial  
(circa 1930)

*Borough of North Plainfield*  
*Somerset County, New Jersey*








AMY S. GREENE  
ENVIRONMENTAL  
CONSULTANTS

1,100  
Feet

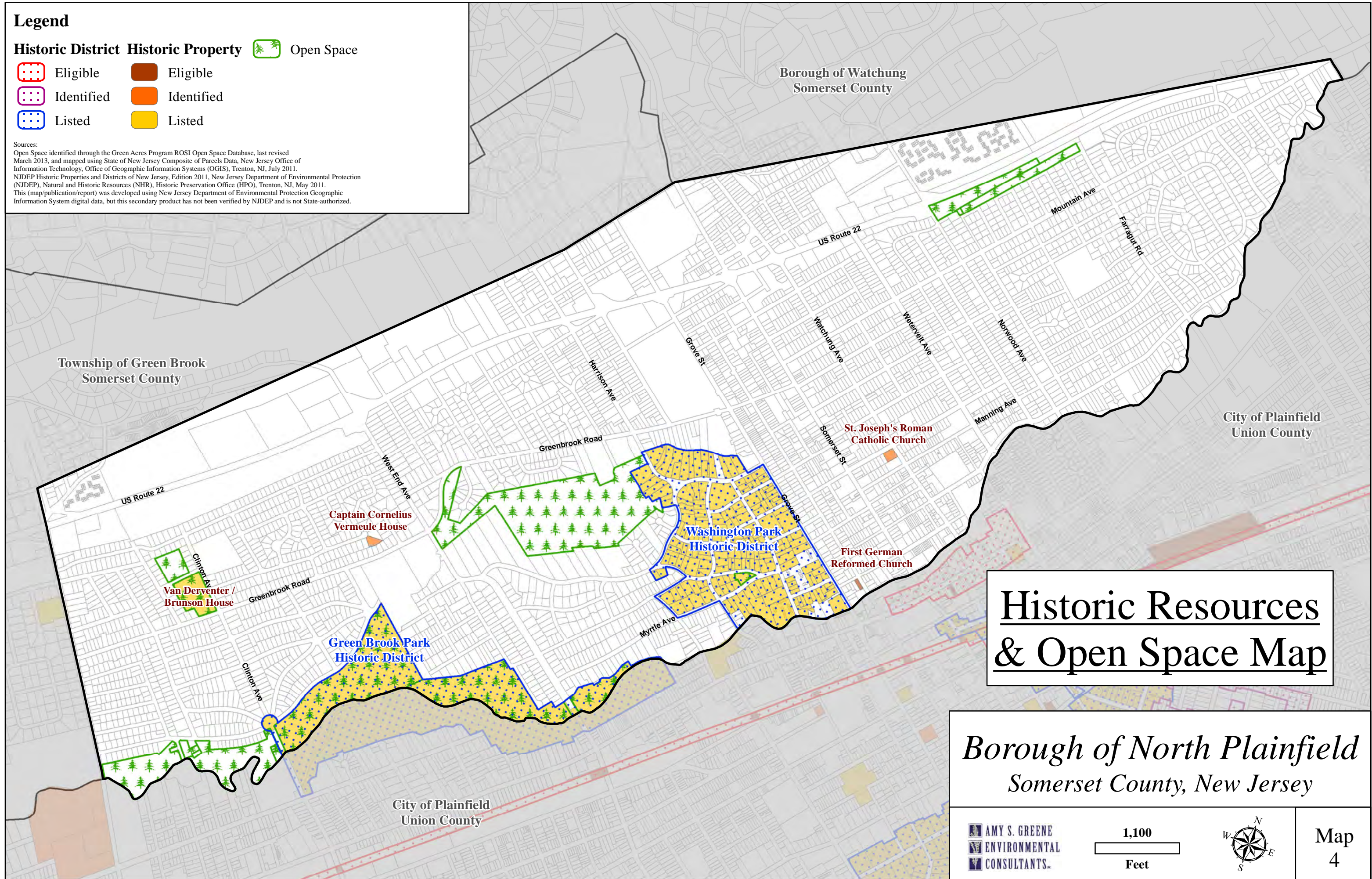


Map  
3

**Legend**

<b>Historic District</b>	<b>Historic Property</b>		Open Space
	Eligible		Eligible
	Identified		Identified
	Listed		Listed

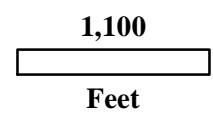
Sources:  
 Open Space identified through the Green Acres Program ROSI Open Space Database, last revised March 2013, and mapped using State of New Jersey Composite of Parcels Data, New Jersey Office of Information Technology, Office of Geographic Information Systems (OGIS), Trenton, NJ, July 2011.  
 NJDEP Historic Properties and Districts of New Jersey, Edition 2011, New Jersey Department of Environmental Protection (NJDEP), Natural and Historic Resources (NHR), Historic Preservation Office (HPO), Trenton, NJ, May 2011.  
 This map/publication/report 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.



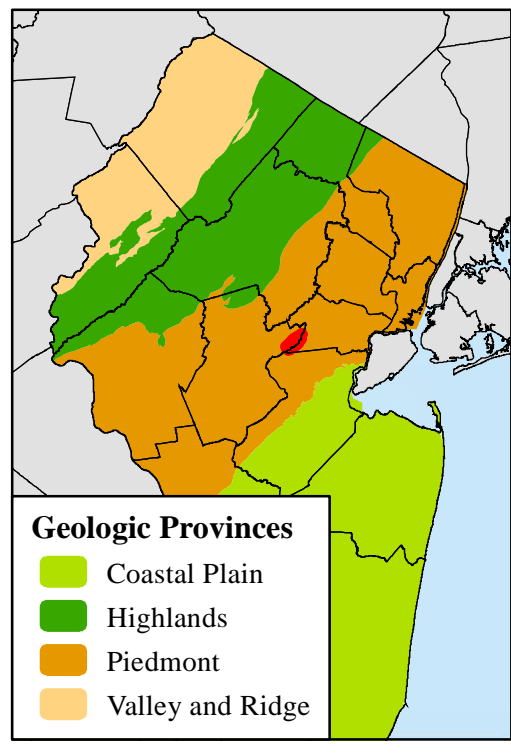
# Historic Resources & Open Space Map

*Borough of North Plainfield  
Somerset County, New Jersey*

AMY S. GREENE  
ENVIRONMENTAL  
CONSULTANTS.



Map  
4



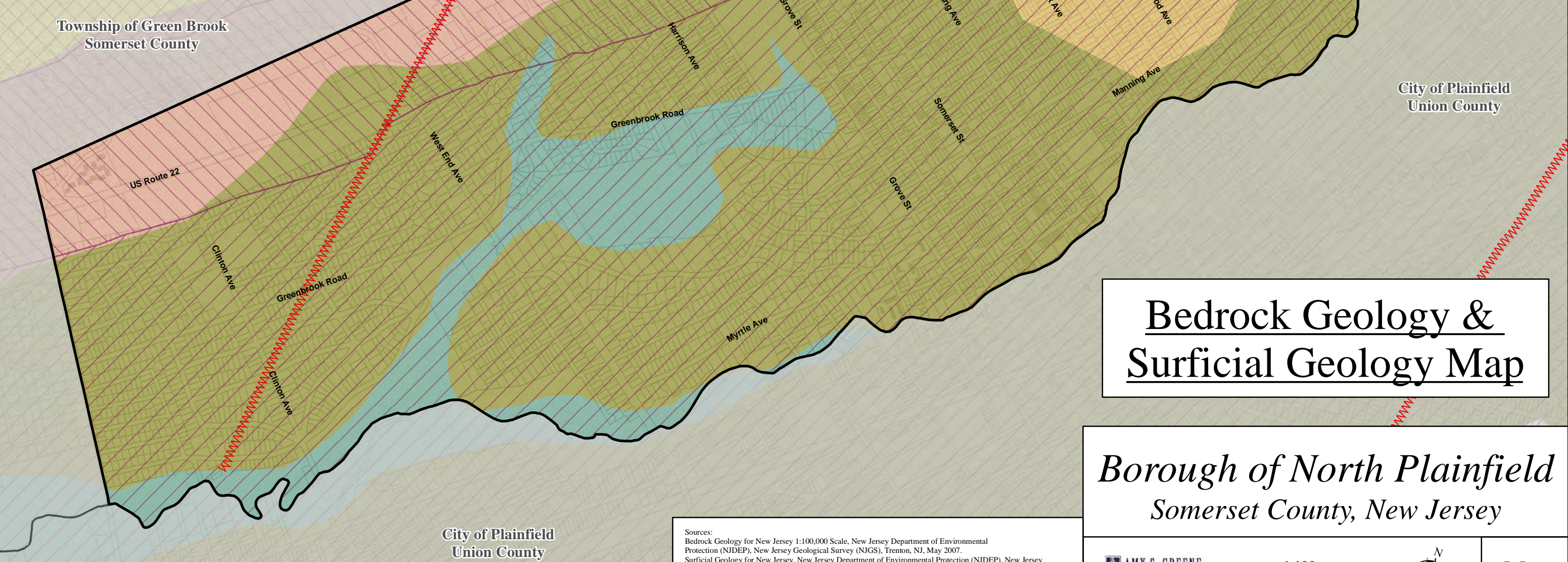
**Legend**

**Surficial Geology**

- Alluvium
- Basalt Colluvium
- Late Wisconsinan Glacio-fluvial Plain Deposits
- Pensauken Formation
- Weathered Basalt
- Weathered Shale, Mudstone, and Sandstone

**Bedrock Geology**

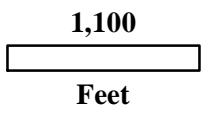
- Orange Mountain Basalt
- Passaic Formation
- Passaic Formation Mudstone facies
- Faults (from Bedrock Geology data)



# Bedrock Geology & Surficial Geology Map

*Borough of North Plainfield  
Somerset County, New Jersey*

Sources:  
Bedrock Geology for New Jersey 1:100,000 Scale, New Jersey Department of Environmental Protection (NJDEP), New Jersey Geological Survey (NJGS), Trenton, NJ, May 2007.  
Surficial Geology for New Jersey, New Jersey Department of Environmental Protection (NJDEP), New Jersey Geological Survey (NJGS), Geologic compilation by Scott D. Stanford and Ron W. Witte, Trenton, NJ, January 2006.  
Physiographic Provinces of New Jersey, New Jersey Department of Environmental Protection (NJDEP), New Jersey Geological Survey (NJGS), Ronald S. Pristas (ed.), Trenton, NJ, June 2002.  
This (map/publication/report) 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.

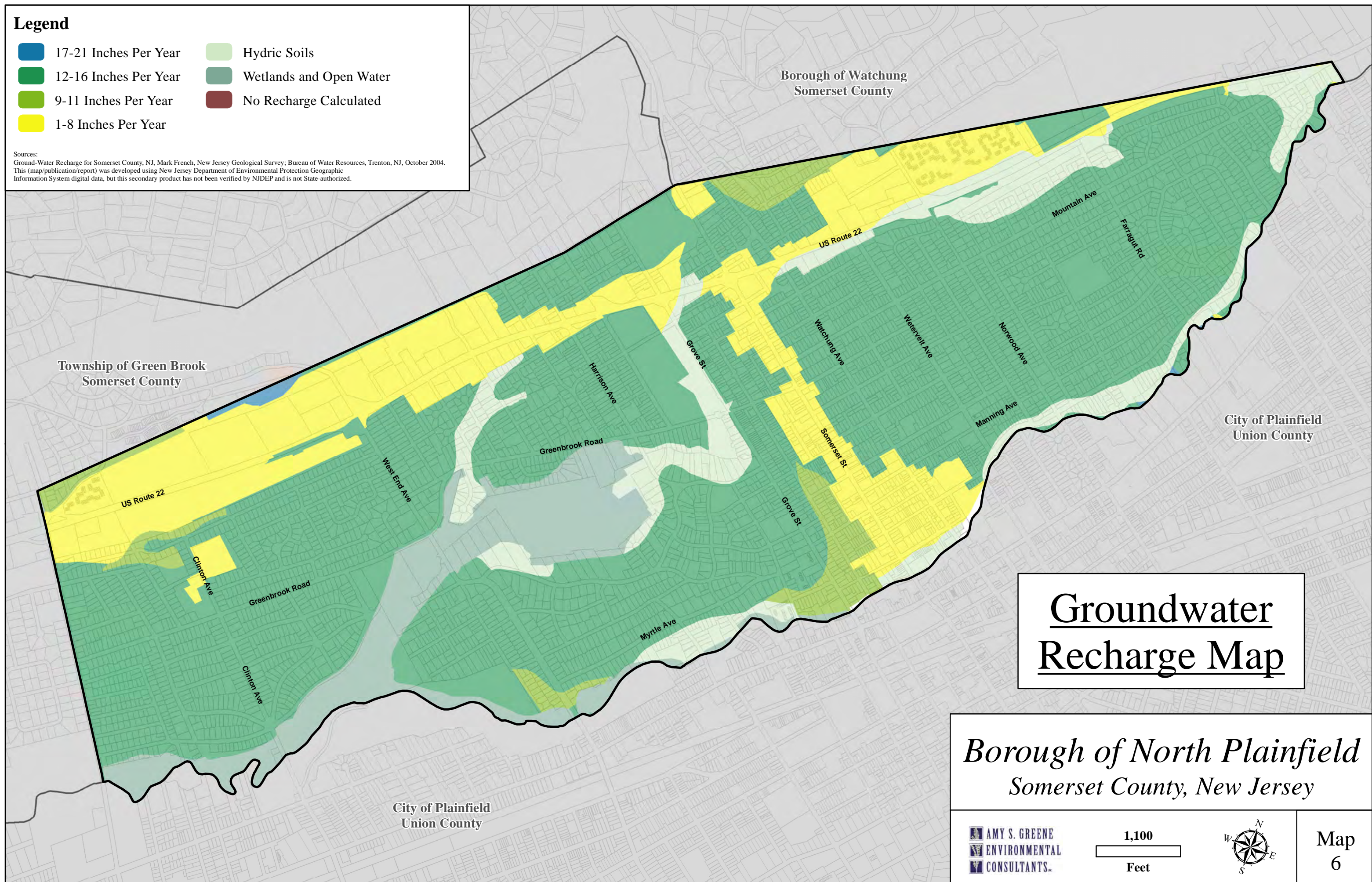


Map  
5

**Legend**

- 17-21 Inches Per Year
- 12-16 Inches Per Year
- 9-11 Inches Per Year
- 1-8 Inches Per Year
- Hydric Soils
- Wetlands and Open Water
- No Recharge Calculated

Sources:  
Ground-Water Recharge for Somerset County, NJ, Mark French, New Jersey Geological Survey; Bureau of Water Resources, Trenton, NJ, October 2004.  
This (map/publication/report) 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.



# Groundwater Recharge Map

*Borough of North Plainfield  
Somerset County, New Jersey*




**AMY S. GREENE  
ENVIRONMENTAL  
CONSULTANTS**

1,100  
Feet

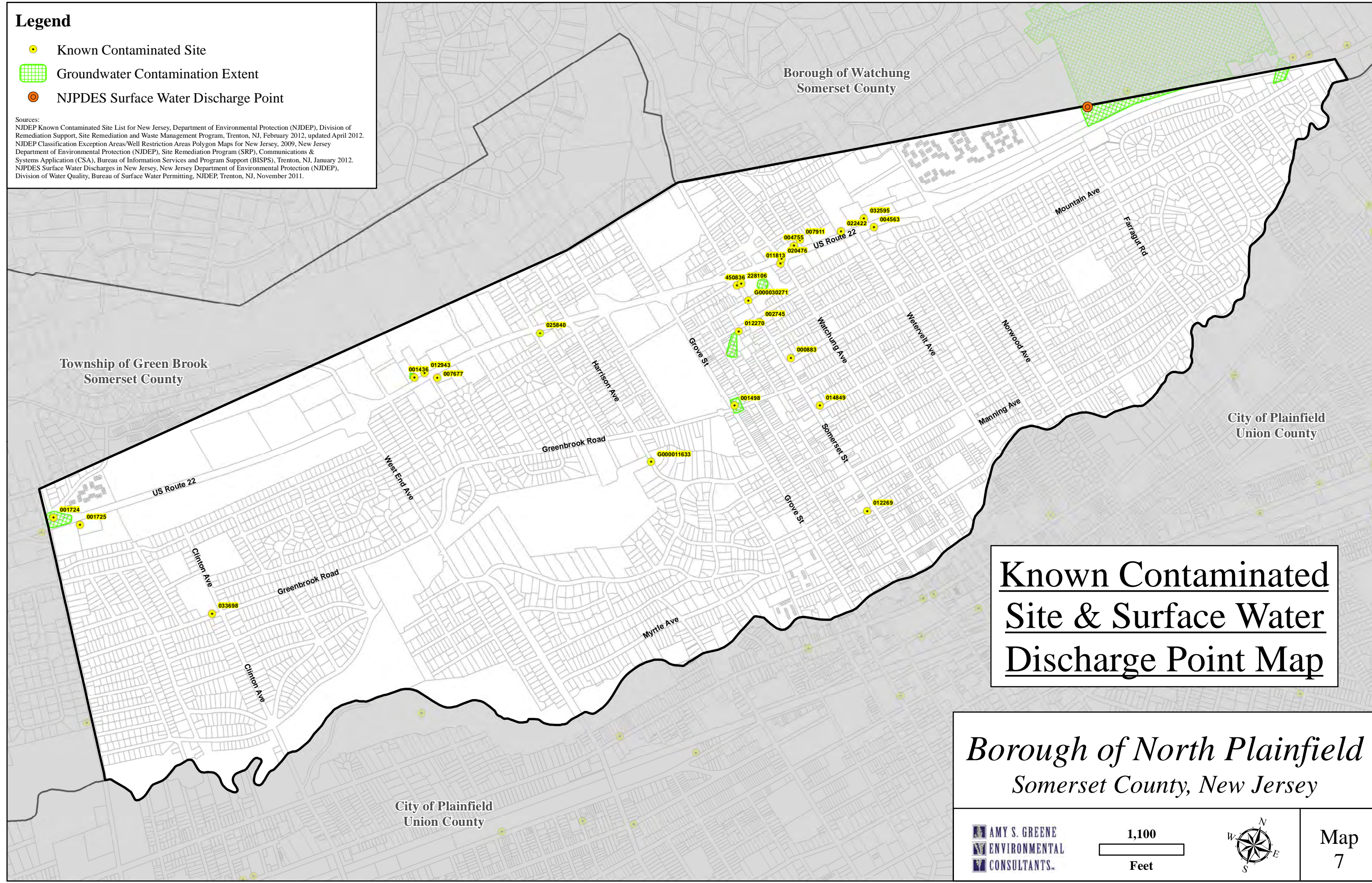


Map  
6

**Legend**

-  Known Contaminated Site
-  Groundwater Contamination Extent
-  NJPDES Surface Water Discharge Point

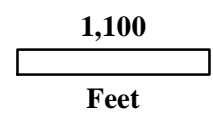
Sources:  
 NJDEP Known Contaminated Site List for New Jersey, Department of Environmental Protection (NJDEP), Division of Remediation Support, Site Remediation and Waste Management Program, Trenton, NJ, February 2012, updated April 2012.  
 NJDEP Classification Exception Areas/Well Restriction Areas Polygon Maps for New Jersey, 2009, New Jersey Department of Environmental Protection (NJDEP), Site Remediation Program (SRP), Communications & Systems Application (CSA), Bureau of Information Services and Program Support (BISPS), Trenton, NJ, January 2012.  
 NJPDES Surface Water Discharges in New Jersey, New Jersey Department of Environmental Protection (NJDEP), Division of Water Quality, Bureau of Surface Water Permitting, NJDEP, Trenton, NJ, November 2011.



**Known Contaminated Site & Surface Water Discharge Point Map**

*Borough of North Plainfield  
 Somerset County, New Jersey*



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 CONSULTANTS.



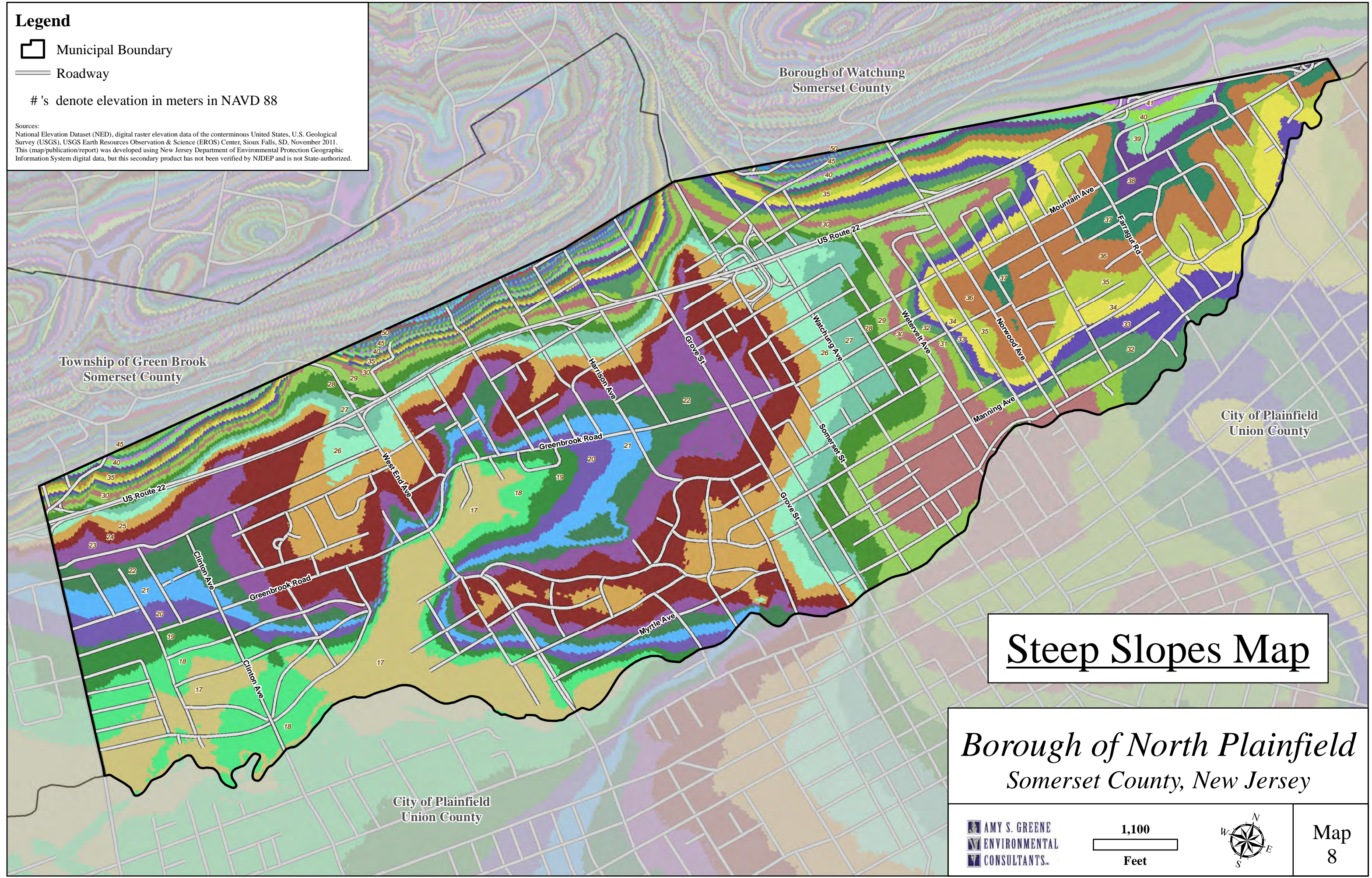
Map  
 7



**Legend**

-  Municipal Boundary
-  Roadway
- # 's denote elevation in meters in NAVD 88

Sources:  
National Elevation Dataset (NED), digital raster elevation data of the conterminous United States, U.S. Geological Survey (USGS), USGS Earth Resources Observation & Science (EROS) Center, Sioux Falls, SD, November 2011.  
This (map/publication/report) was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.



**Steep Slopes Map**

*Borough of North Plainfield  
Somerset County, New Jersey*

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ENVIRONMENTAL  
CONSULTANTS.

1,100  
Feet

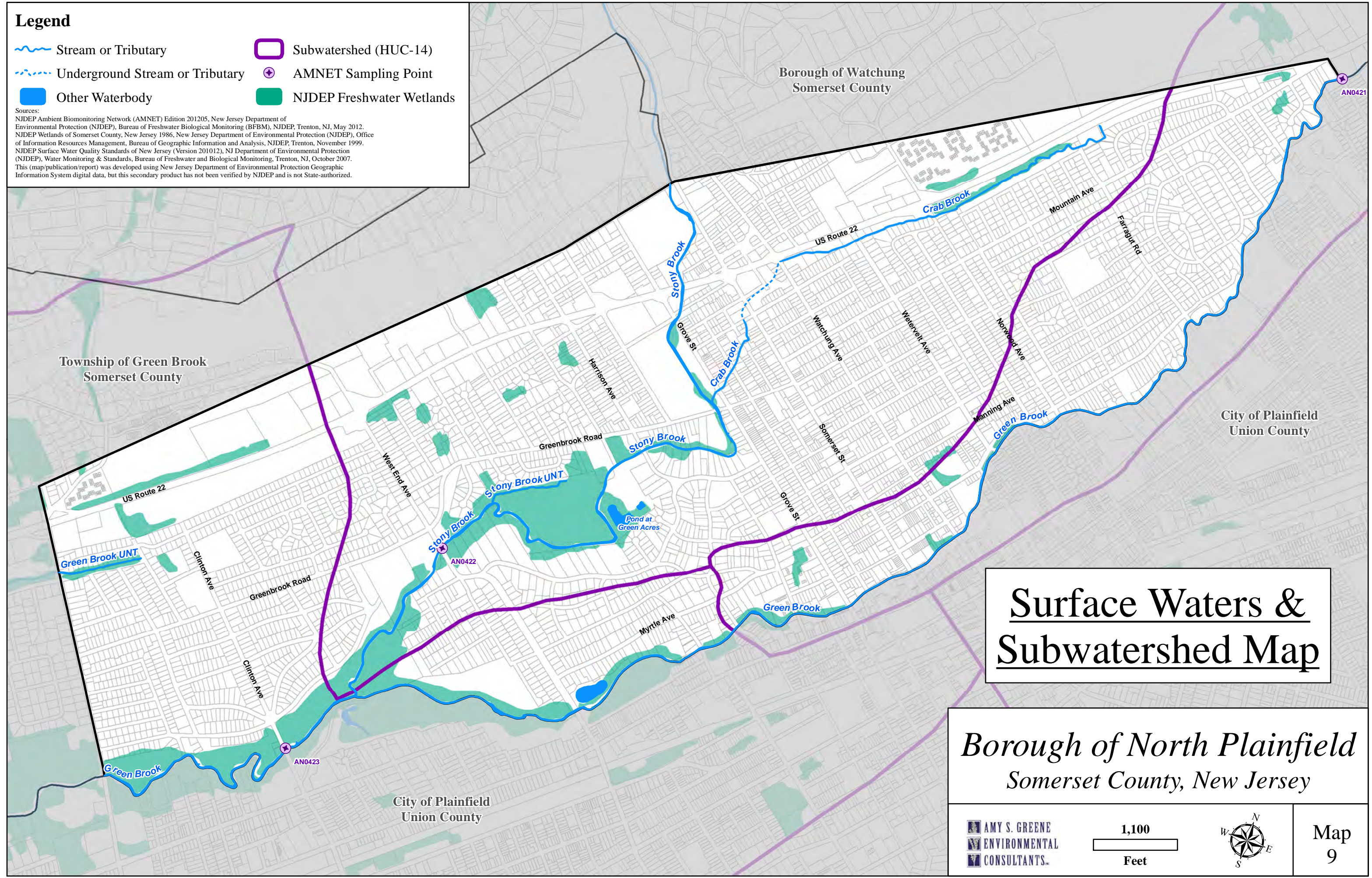


Map  
8

**Legend**

-  Stream or Tributary
-  Underground Stream or Tributary
-  Other Waterbody
-  Subwatershed (HUC-14)
-  AMNET Sampling Point
-  NJDEP Freshwater Wetlands

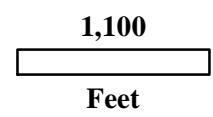
Sources:  
 NJDEP Ambient Biomonitoring Network (AMNET) Edition 201205, New Jersey Department of Environmental Protection (NJDEP), Bureau of Freshwater Biological Monitoring (BFBM), NJDEP, Trenton, NJ, May 2012.  
 NJDEP Wetlands of Somerset County, New Jersey 1986, New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management, Bureau of Geographic Information and Analysis, NJDEP, Trenton, November 1999.  
 NJDEP Surface Water Quality Standards of New Jersey (Version 201012), NJ Department of Environmental Protection (NJDEP), Water Monitoring & Standards, Bureau of Freshwater and Biological Monitoring, Trenton, NJ, October 2007.  
 This (map/publication/report) 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.



# Surface Waters & Subwatershed Map

*Borough of North Plainfield  
 Somerset County, New Jersey*

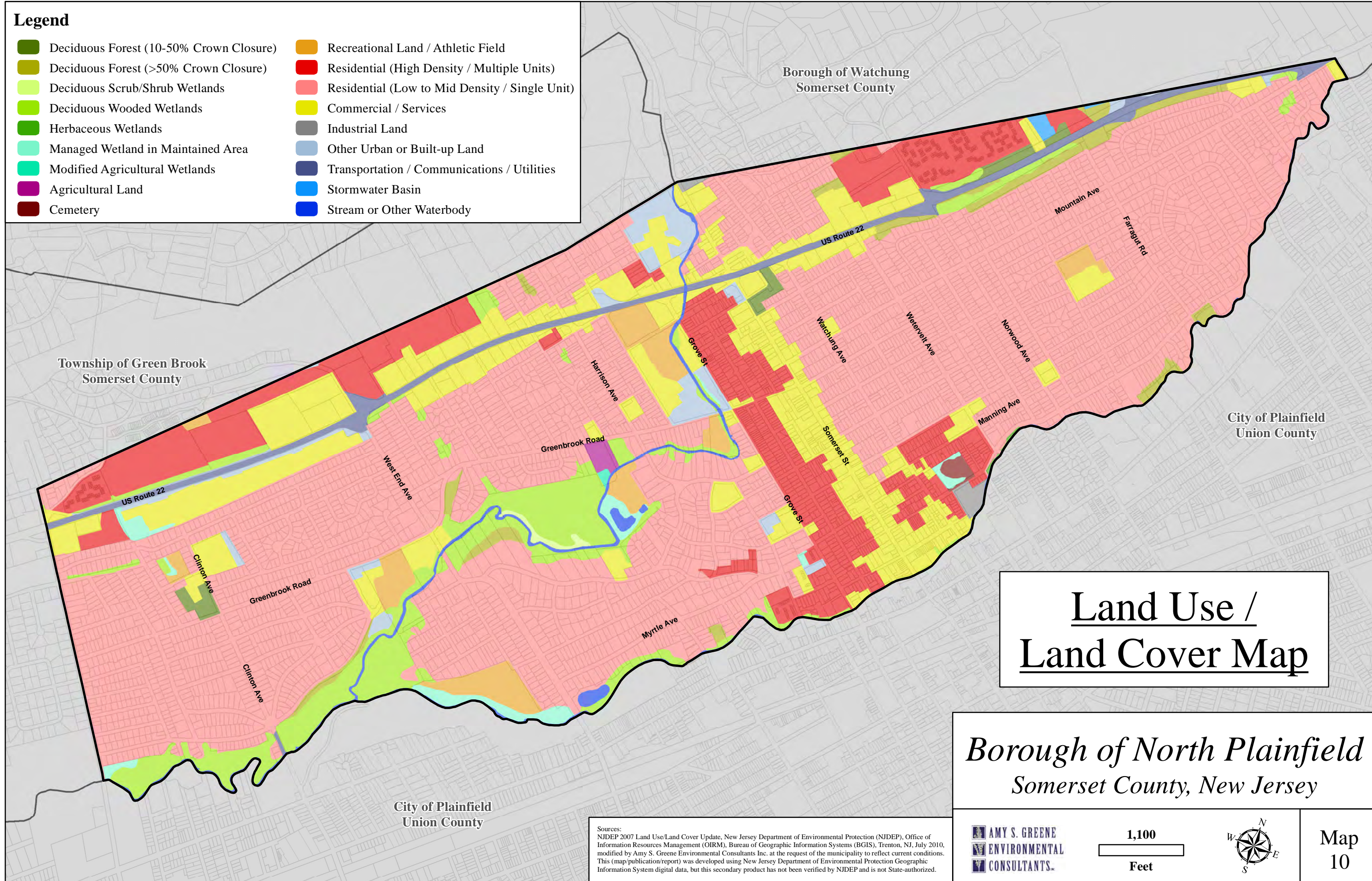
 AMY S. GREENE  
 ENVIRONMENTAL  
 CONSULTANTS.



Map  
 9

**Legend**

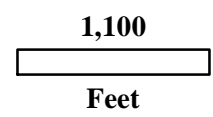
- |   |  |
|---|--|
|  Deciduous Forest (10-50% Crown Closure) |  Recreational Land / Athletic Field             |
|  Deciduous Forest (>50% Crown Closure)   |  Residential (High Density / Multiple Units)    |
|  Deciduous Scrub/Shrub Wetlands          |  Residential (Low to Mid Density / Single Unit) |
|  Deciduous Wooded Wetlands               |  Commercial / Services                          |
|  Herbaceous Wetlands                     |  Industrial Land                                |
|  Managed Wetland in Maintained Area      |  Other Urban or Built-up Land                   |
|  Modified Agricultural Wetlands          |  Transportation / Communications / Utilities    |
|  Agricultural Land                       |  Stormwater Basin                               |
|  Cemetery                                |  Stream or Other Waterbody                      |



**Land Use /  
Land Cover Map**

*Borough of North Plainfield  
Somerset County, New Jersey*

Sources:  
NJDEP 2007 Land Use/Land Cover Update, New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS), Trenton, NJ, July 2010, modified by Amy S. Greene Environmental Consultants Inc. at the request of the municipality to reflect current conditions. This (map/publication/report) 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.

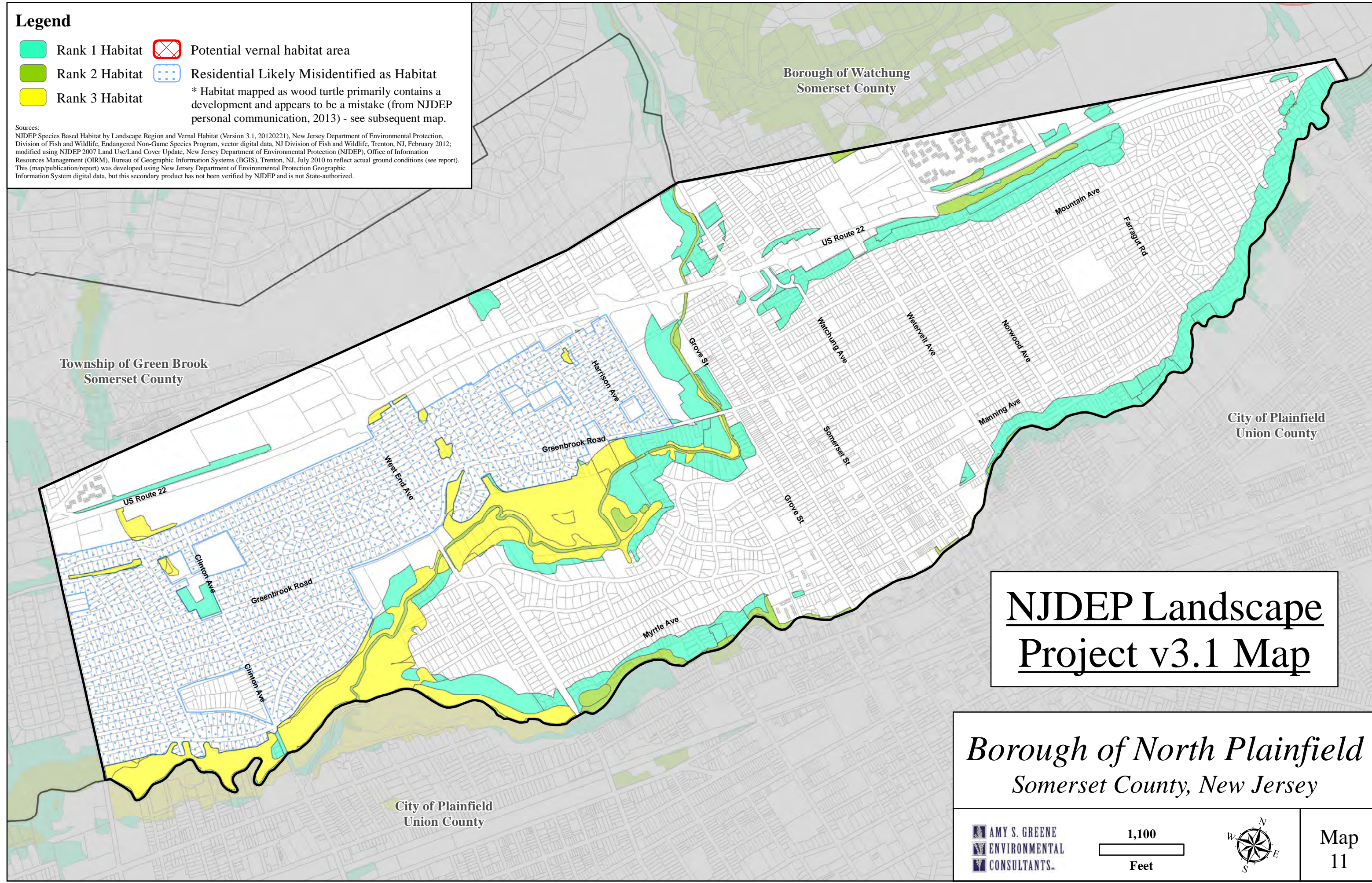


Map  
10

**Legend**

- Rank 1 Habitat
  - Rank 2 Habitat
  - Rank 3 Habitat
  - Potential vernal habitat area
  - Residential Likely Misidentified as Habitat
- \* Habitat mapped as wood turtle primarily contains a development and appears to be a mistake (from NJDEP personal communication, 2013) - see subsequent map.

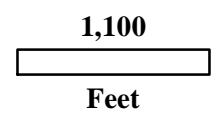
Sources:  
 NJDEP Species Based Habitat by Landscape Region and Vernal Habitat (Version 3.1, 20120221), New Jersey Department of Environmental Protection, Division of Fish and Wildlife, Endangered Non-Game Species Program, vector digital data, NJ Division of Fish and Wildlife, Trenton, NJ, February 2012;  
 modified using NJDEP 2007 Land Use/Land Cover Update, New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS), Trenton, NJ, July 2010 to reflect actual ground conditions (see report).  
 This (map/publication/report) was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.



**NJDEP Landscape  
 Project v3.1 Map**



*Borough of North Plainfield  
 Somerset County, New Jersey*

**AMY S. GREENE  
 ENVIRONMENTAL  
 CONSULTANTS.**



**Map  
 11**

**Legend**

-  Municipal Boundary
  -  Residential Likely Misidentified as Habitat
- \* Habitat mapped as wood turtle primarily contains a development and appears to be a mistake (from NJDEP personal communication, 2013) - see previous map.

Sources:  
Modified NJDEP 2007 Land Use/Land Cover Update, New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS), Trenton, NJ, July 2010 to reflect actual ground conditions (see report).  
New Jersey 2012 - 2013 High Resolution Orthophotography, NAD83 NJ State Plane Feet, MrSID Tiles, State of New Jersey - Office of Information Technology (NJOT), Office of Geographic Information Systems (OGIS), Trenton, NJ, March 2013.  
This (map/publication/report) 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.

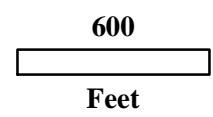
Township of Green Brook  
Somerset County

City of Plainfield  
Union County

Urban Residential  
Area Mapped as  
Wood Turtle Habitat







*Borough of North Plainfield*  
*Somerset County, New Jersey*

AMY S. GREENE  
ENVIRONMENTAL  
CONSULTANTS

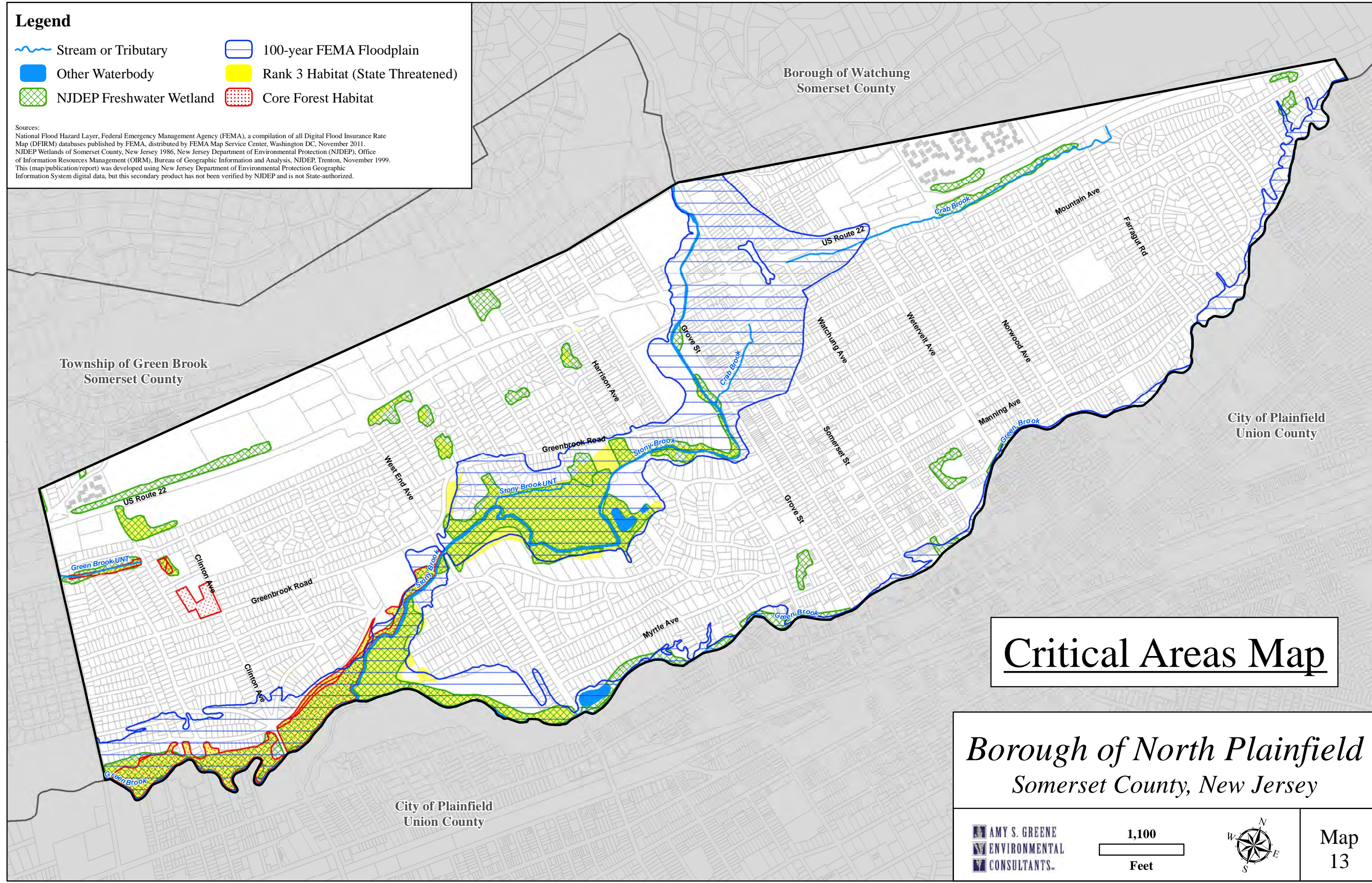


Map  
12

**Legend**



-  Stream or Tributary
-  Other Waterbody
-  NJDEP Freshwater Wetland
-  100-year FEMA Floodplain
-  Rank 3 Habitat (State Threatened)
-  Core Forest Habitat

Sources:  
 National Flood Hazard Layer, Federal Emergency Management Agency (FEMA), a compilation of all Digital Flood Insurance Rate Map (DFIRM) databases published by FEMA, distributed by FEMA Map Service Center, Washington DC, November 2011.  
 NJDEP Wetlands of Somerset County, New Jersey 1986, New Jersey Department of Environmental Protection (NJDEP), Office of Information Resources Management (OIRM), Bureau of Geographic Information and Analysis, NJDEP, Trenton, November 1999.  
 This (map/publication/report) 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.

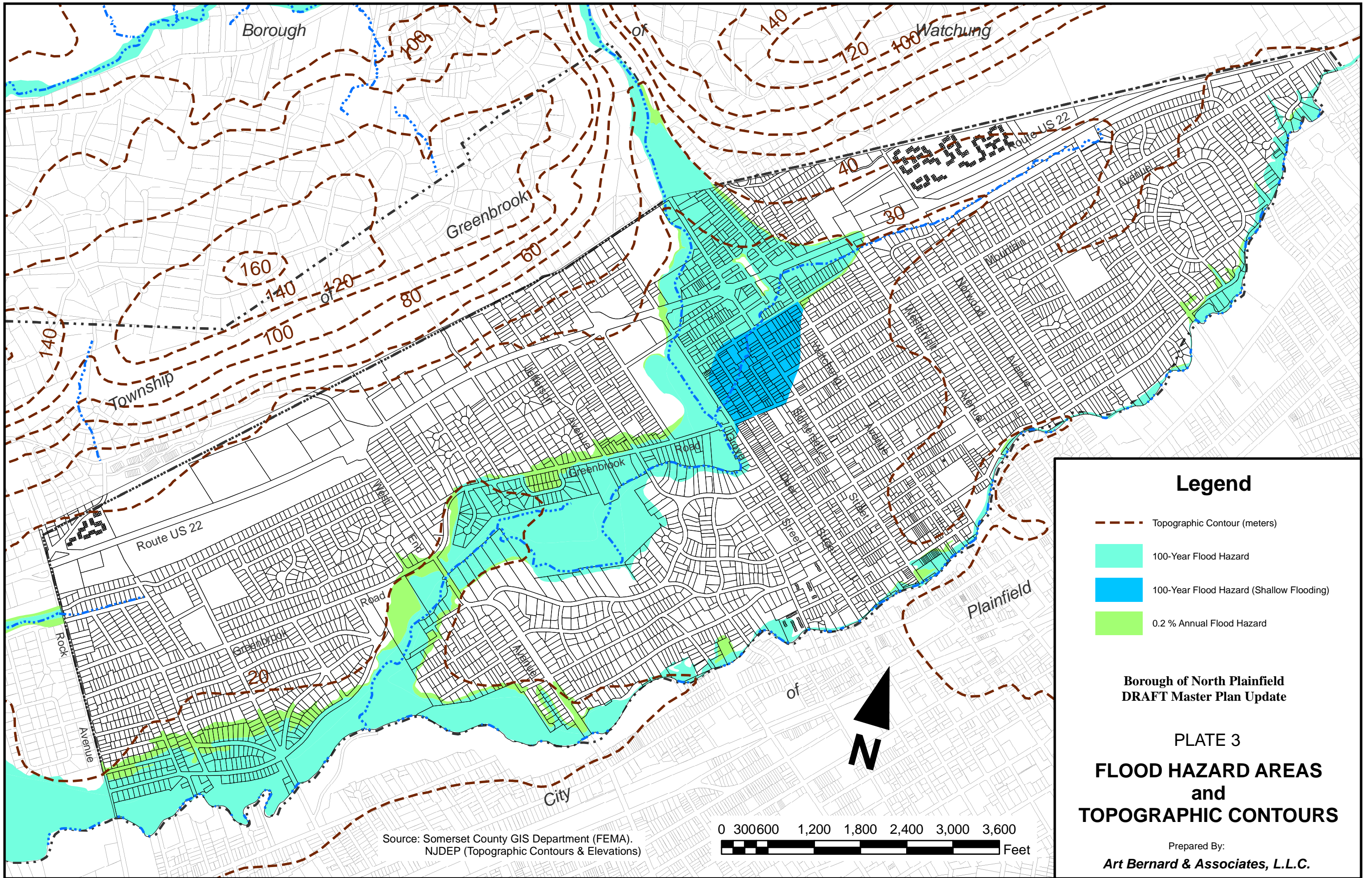


**Critical Areas Map**

*Borough of North Plainfield  
 Somerset County, New Jersey*

 <p>AMY S. GREENE          ENVIRONMENTAL          CONSULTANTS.</p>	<p>1,100          Feet</p>		<p>Map          13</p>
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MUNICIPAL MAPS PREPARED BY ART BERNARD ASSOCIATES



Source: Somerset County GIS Department (FEMA).  
 NJDEP (Topographic Contours & Elevations)



**Legend**

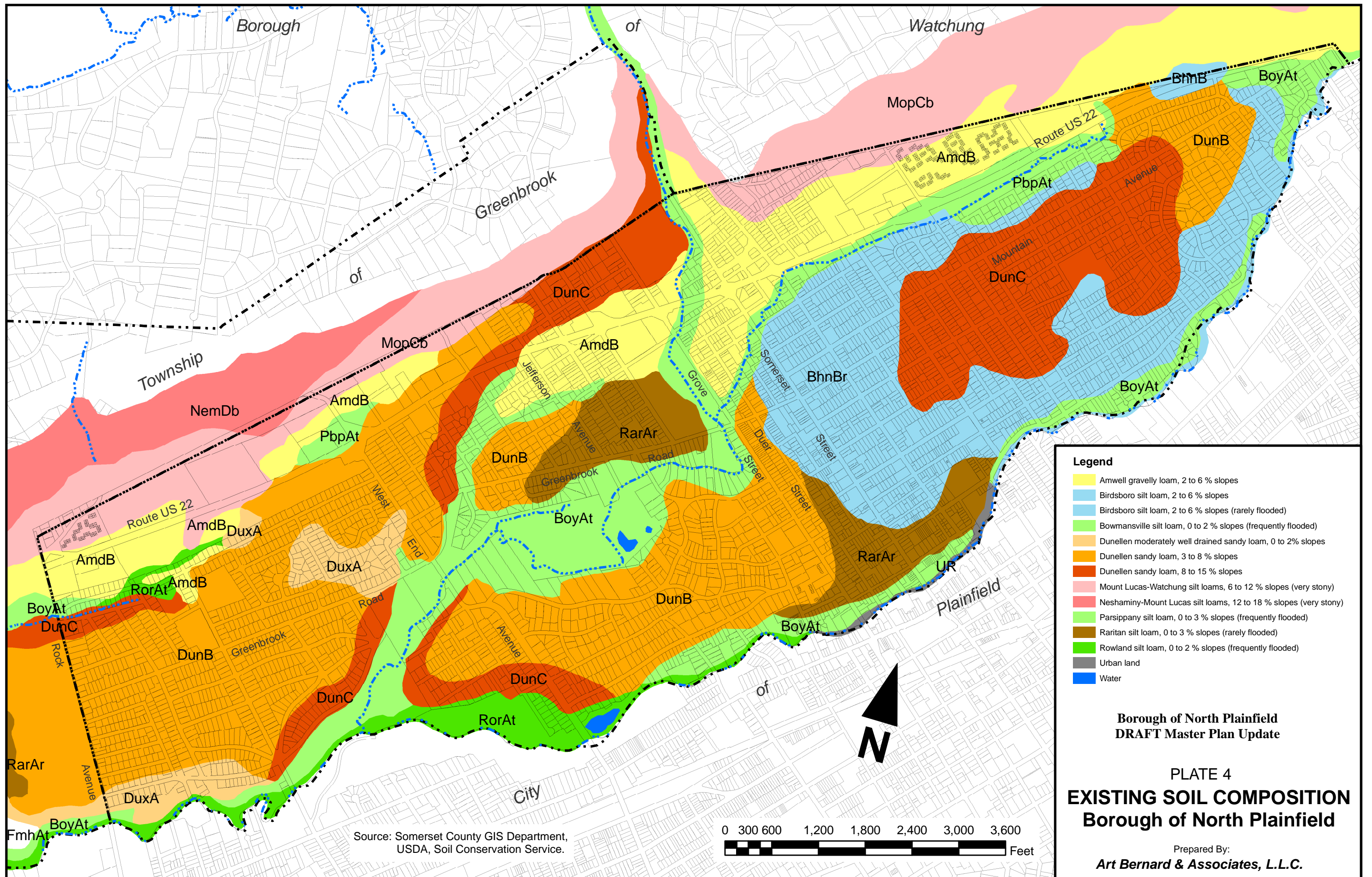
-  Topographic Contour (meters)
-  100-Year Flood Hazard
-  100-Year Flood Hazard (Shallow Flooding)
-  0.2 % Annual Flood Hazard

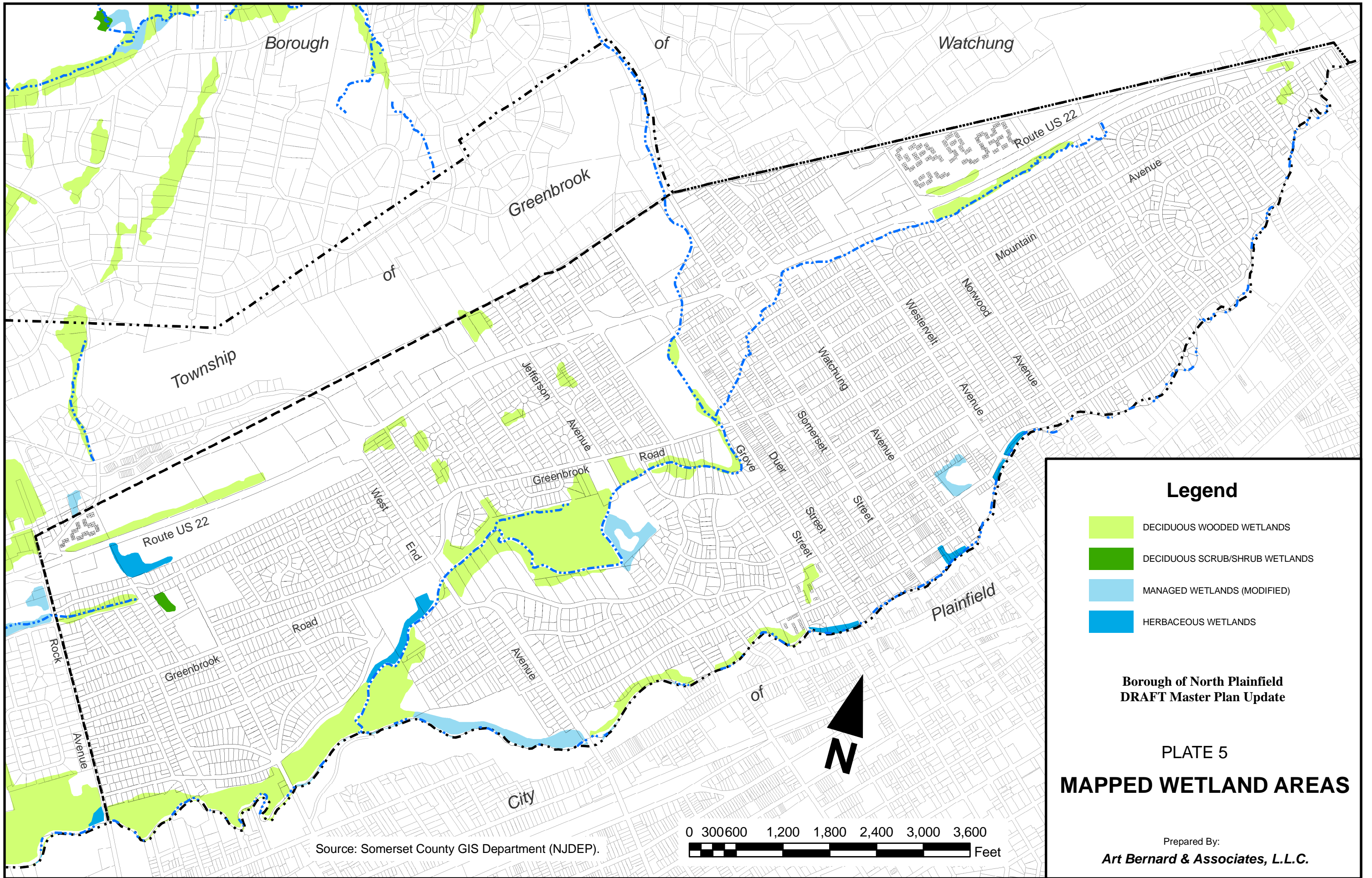
**Borough of North Plainfield  
 DRAFT Master Plan Update**

**PLATE 3  
 FLOOD HAZARD AREAS  
 and  
 TOPOGRAPHIC CONTOURS**

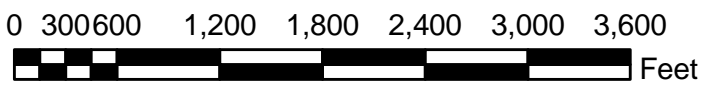
Prepared By:  
**Art Bernard & Associates, L.L.C.**







Source: Somerset County GIS Department (NJDEP).



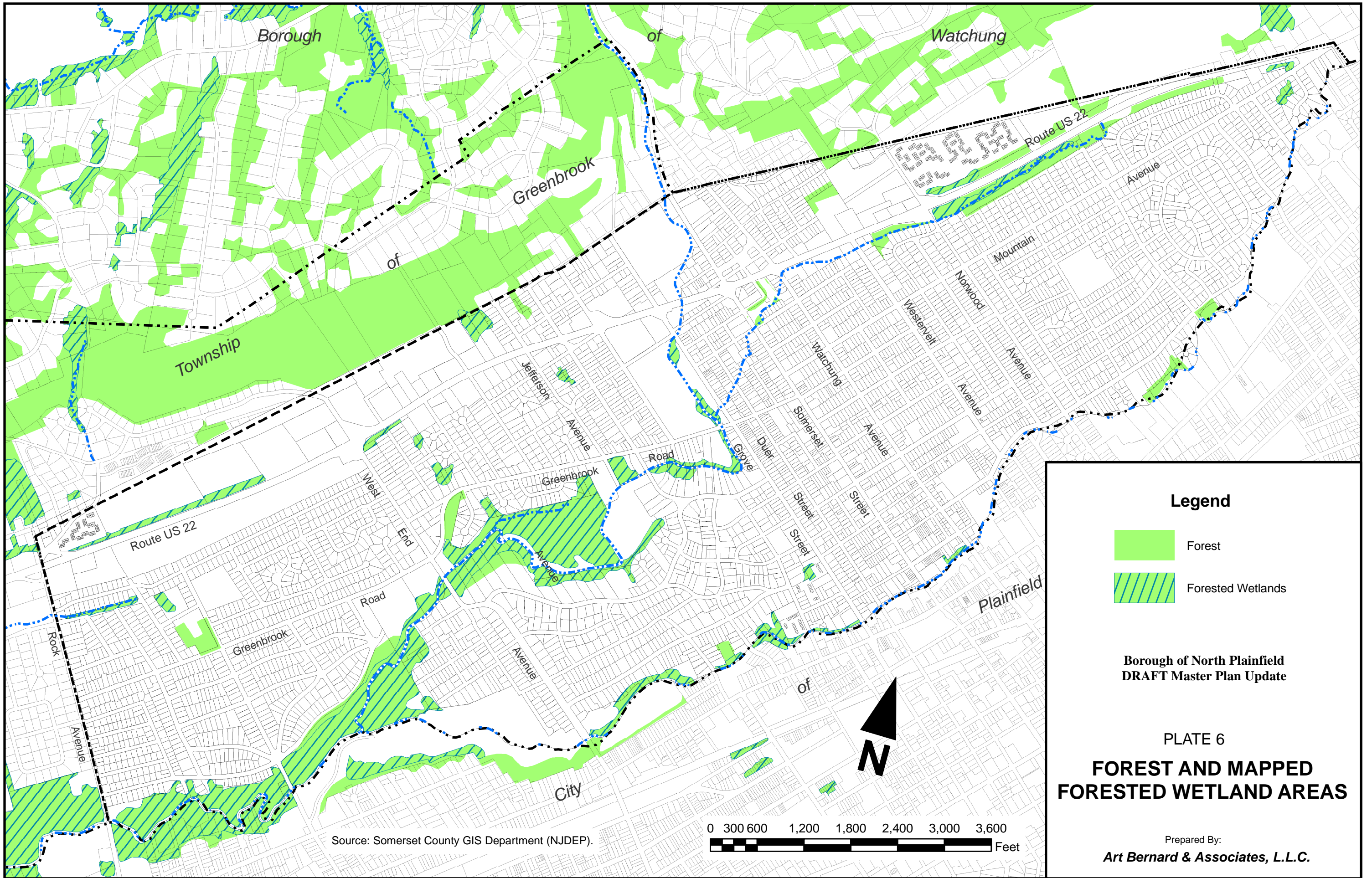
**Legend**

- DECIDUOUS WOODED WETLANDS
- DECIDUOUS SCRUB/SHRUB WETLANDS
- MANAGED WETLANDS (MODIFIED)
- HERBACEOUS WETLANDS

**Borough of North Plainfield  
DRAFT Master Plan Update**

**PLATE 5  
MAPPED WETLAND AREAS**

Prepared By:  
**Art Bernard & Associates, L.L.C.**



MUNICIPAL ZONING MAP

**DATA SOURCES**

**SOMERSET COUNTY ENTERPRISE DATA**  
 - Zoning Datasets  
 - Municipal Boundaries  
 - Highways, County and Local Roads  
 - Railroads

**MUNICIPAL DATA**  
 - Adopted Ordinances, Amendments & Associated Information  
 Provided by Municipality

**NOTES**

1. This is not an official zoning map. It represents the best available information on current Municipal Zoning in GIS format. This GIS zoning dataset was used in Wastewater Management Plan (WMP) Build-out and Capacity Analysis along with separate "look-up" table containing the land use and density factors.

2. Somerset County uses the following map projection & coordinate system when presenting GIS data:  
 - Horizontal: North American Datum 1983 (NAD83)  
 - Vertical: North American Vertical Datum 1987 (NAVD87)  
 - Coordinate System: New Jersey State Plane Feet

**Legend**

**BASE ZONE CODES**

- B
- B-1
- B-2
- B-2a
- B-3
- B-4
- B-5
- B-6
- R-1
- R-2
- R-3
- R-4
- R-5
- R-6
- R-7
- R-8
- R-9

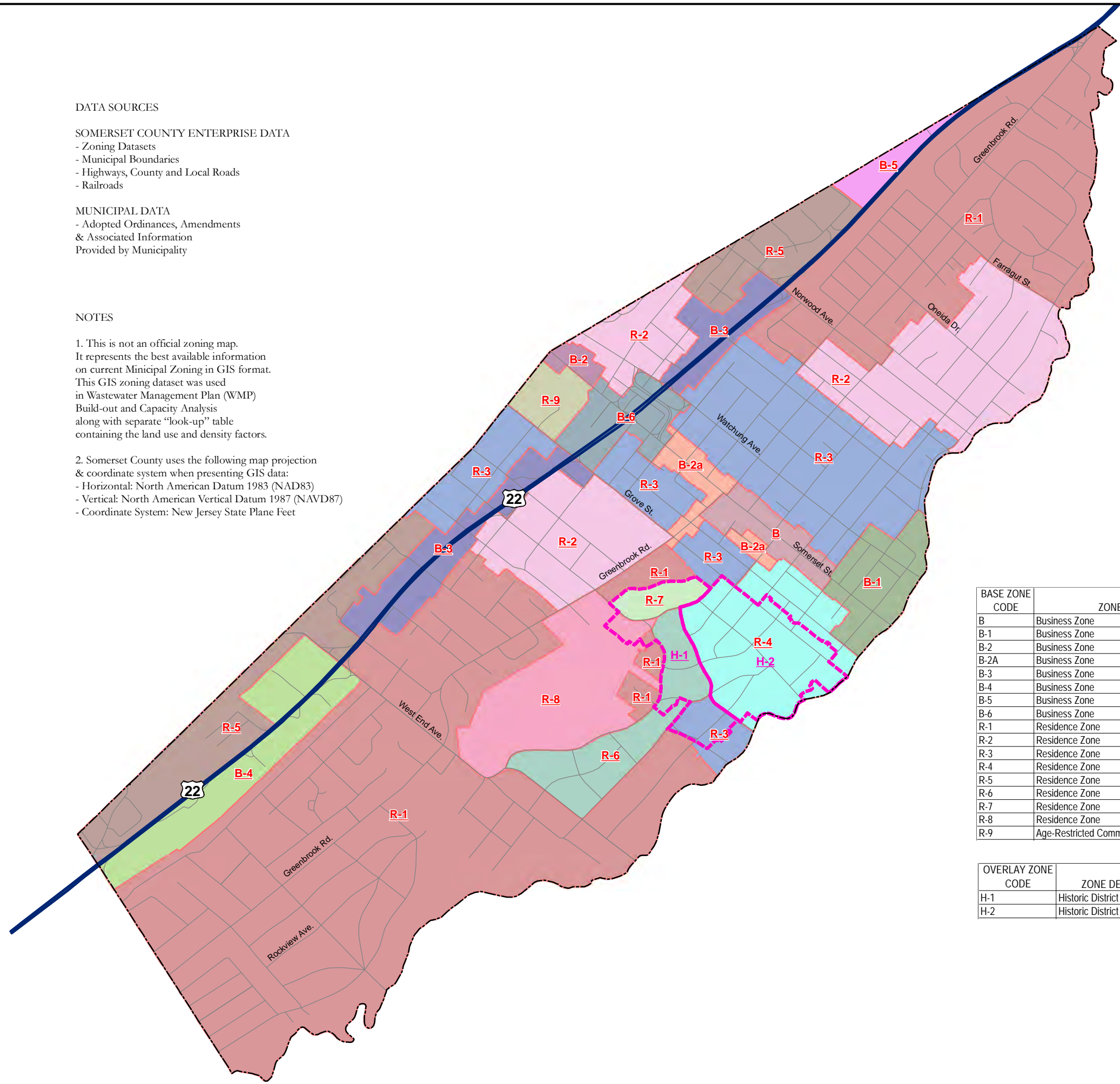
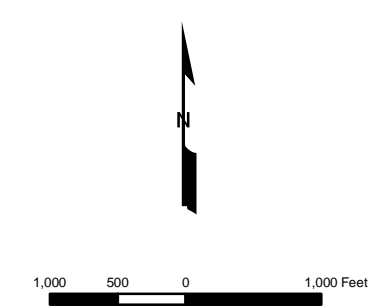
- BASE ZONE BOUNDARIES
- BASE ZONE LABELS
- OVERLAY ZONE BOUNDARIES
- OVERLAY ZONE LABELS
- MUNICIPAL BOUNDARIES

**MAJOR ROADS**

- County Roads
- LOCAL ROADS
- | RAILROADS

BASE ZONE CODE	ZONE DESCRIPTION
B	Business Zone
B-1	Business Zone
B-2	Business Zone
B-2A	Business Zone
B-3	Business Zone
B-4	Business Zone
B-5	Business Zone
B-6	Business Zone
R-1	Residence Zone
R-2	Residence Zone
R-3	Residence Zone
R-4	Residence Zone
R-5	Residence Zone
R-6	Residence Zone
R-7	Residence Zone
R-8	Residence Zone
R-9	Age-Restricted Community (ARC) Residence Zone

OVERLAY ZONE CODE	ZONE DESCRIPTION
H-1	Historic District Residence Zone
H-2	Historic District Residence Zone



**NORTH PLAINFIELD BORO**  
 Somerset County, NJ  
  
**Map IV**  
  
**MUNICIPAL ZONING**

**APPENDIX B**

**PHOTOGRAPHS OF NORTH PLAINFIELD**



Photo A: View of the Van Derventer/Brunson House (Vermeule Mansion). This is the only structure listed on the National Historic Register in North Plainfield.



Photo B: View looking north of Route 22 showing northward increase in elevation associated with the base of the Watchung Mountains.



Photo C: View looking at an eroded bank along Stony Brook in Green Acres Park.



Photo D: A forested depression with ponded water in Green Acres Park. Monocultures of Japanese stiltgrass can be seen around the edges of the depression.





Photo E: A spring fed wetland dominated by native herbaceous vegetation in the forested understory of Green Brook Park.



Photo F: View of the lake at Green Acres Park showing aquatic and wetland vegetation within shallower portions and along its edges.



Photo G: View of Green Brook Park Lake showing a great blue heron foraging on the Lake. This area is listed by NJDEP Landscape Mapping as great blue heron foraging habitat.



Photo H: Photo looking east at Green Brook Park Lawns with recently planted native trees.



Photo I: View of a maintained lawn with a forested canopy at Green Acres Park. A small group of resident Canada geese is present in the Photo.



Photo J: View looking at a dense Japanese knotweed understory in Green Acres Park. Monocultures of this invasive species are common throughout much of the forests and riparian areas of North Plainfield.



Photo K: View of a riparian area along the Crab Brook showing the cobble and gravel substrate typical of North Plainfield Streams. Japanese knotweed is visible on the far bank.



Photo L: View of the Green Acres Park parking area. This multi-use park contains recreational facilities and natural areas.



Photo M: View of a red-bellied woodpecker on a snag in Green Acres Park. This species is typical of the common wildlife that can be expected to be observed in the park.



Photo N: View of a juvenile painted turtle on vegetation at Green Acres Park Lake.



Photo O: View of the Green Brook in Green Brook Park in North Plainfield. The Brook represents the boundary of North Plainfield and the city of Plainfield in this location.



Photo P: View looking north at the Stony Brook near its confluence with Green Brook.



Photo Q: View of the forest canopy in Green Acres Park. Forest gaps may encourage tree seedling regeneration or increase the likelihood of invasive or opportunistic species colonization. Dense colonies of Japanese stiltgrass (not consumed by deer) dominate the forest floor.



Photo R: View of a whitetail deer buck in Green Brook Park. The easy and frequent observation of deer within these parks may be an indication of deer overpopulation.



Photo S: View looking northwest along Clinton Avenue. Land use in this area typifies the medium-density residential development common in North Plainfield.



**APPENDIX C**

**LISTS OF POTENTIAL VERTEBRATE WILDLIFE WITHIN NORTH PLAINFIELD**

### Sources For Terrestrial Wildlife List:

Harry Strano, ASGECI Biologist (list editor); NJDEP Reptiles and Amphibians of New Jersey (Schwartz and Golden, 2002); Bird Finding in New Jersey;

**Note:** The following represents a very broad list of potentially occurring species within North Plainfield. Included in these lists, particularly for birds, are both species that are common and expected and species that would only potentially occur as a very rare and temporary occurrence. Examples may include spring migratory birds such as forest interior warblers that may briefly rest in forest fragmented areas or species such as golden eagles that may likely only be spotted as a flyover during fall migration. Birds listed as “b” range from confirmed and likely breeders to birds that, based on their habitat requirements and known breeding locations, have a slight chance of breeding in North Plainfield.

### BIRD SPECIES POTENTIALLY OCCURRING WITHIN NORTH PLAINFIELD

<u>Scientific Name</u>	<u>Common Name</u>	<u>Note</u>
<i>Podilymbus podiceps</i>	pied-billed grebe	
<i>Phalacrocorax auritus</i>	double-crested cormorant	
<i>Botaurus lentiginosus</i>	American bittern	
<i>Ixobrychus exilis</i>	least bittern	
<i>Ardea herodias</i>	great blue heron	
<i>Casmerodius albus</i>	great egret	
<i>Egretta thula</i>	snowy egret	
<i>Butorides striatus</i>	green heron	
<i>Nycticorax nycticorax</i>	black-crowned night heron	
<i>Cygnus olor</i>	mute swan	<b>b</b>
<i>Chen caerulescens</i>	snow goose	
<i>Branta canadensis</i>	Canada goose	<b>b</b>
<i>Aix sponsa</i>	wood duck	<b>b</b>
<i>Anas crecca</i>	green-winged teal	
<i>Anas rubripes</i>	American black duck	
<i>Anas platyrhynchos</i>	mallard	<b>b</b>
<i>Anas acuta</i>	northern pintail	
<i>Anas discors</i>	blue-winged teal	
<i>Anas americana</i>	American wigeon	
<i>Aythya collaris</i>	ring-necked duck	
<i>Lophodytes cucullatus</i>	hooded merganser	
<i>Mergus merganser</i>	common merganser	
<i>Oxyura jamaicensis</i>	ruddy duck	
<i>Coragyps atratus</i>	black vulture	
<i>Cathartes aura</i>	turkey vulture	<b>b</b>
<i>Pandion haliaetus</i>	osprey	
<i>Haliaeetus leucocephalus</i>	bald eagle	
<i>Circus cyaneus</i>	Northern harrier	
<i>Accipiter striatus</i>	sharp-shinned hawk	
<i>Accipiter Cooperii</i>	Cooper's hawk	

<i>Accipiter gentilis</i>	Northern goshawk	
<i>Buteo lineatus</i>	red-shouldered hawk	
<i>Buteo platypterus</i>	broad-winged hawk	
<i>Buteo jamaicensis</i>	red-tailed hawk	<b>b</b>
<i>Buteo lagopus</i>	rough-legged hawk	
<i>Aquila chrysaetos</i>	golden eagle	
<i>Falco sparverius</i>	American kestrel	
<i>Falco columbarius</i>	merlin	
<i>Falco peregrinus</i>	peregrine falcon	
<i>Bonasa umbellus</i>	ruffed grouse	
<i>Phasianus colchicus</i>	ring-necked pheasant	
<i>Meleagris gallopavo</i>	Eastern wild turkey	<b>b</b>
<i>Fulica americana</i>	American coot	
<i>Charadrius vociferus</i>	killdeer	<b>b</b>
<i>Tringa melanoleuca</i>	greater yellowlegs	
<i>Tringa flavipes</i>	lesser yellowlegs	
<i>Tringa solitaria</i>	solitary sandpiper	
<i>Actitis macularia</i>	spotted sandpiper	<b>b</b>
<i>Calidris minutilla</i>	least sandpiper	
<i>Gallinago gallinago</i>	common snipe	
<i>Philohela minor</i>	American woodcock	
<i>Larus delawarensis</i>	ring-billed gull	
<i>Larus argentatus</i>	herring gull	
<i>Larus marinus</i>	great black-backed gull	
<i>Leucophaeus atricilla</i>	laughing gull	
<i>Columba livia</i>	rock dove	<b>b</b>
<i>Zenaida macroura</i>	mourning dove	<b>b</b>
<i>Coccyzus erythrophthalmus</i>	black-billed cuckoo	<b>b</b>
<i>Coccyzus americanus</i>	yellow-billed cuckoo	<b>b</b>
<i>Tyto alba</i>	common barn owl	<b>b</b>
<i>Otus asio</i>	Eastern screech owl	<b>b</b>
<i>Bubo virginianus</i>	great horned owl	<b>b</b>
<i>Strix varia</i>	barred owl	
<i>Asio otus</i>	long-eared owl	
<i>Asio flammeus</i>	short-eared owl	
<i>Aegolius acadicus</i>	northern saw-whet owl	
<i>Chordeiles minor</i>	common nighthawk	<b>b</b>
<i>Chaetura pelagica</i>	chimney swift	<b>b</b>
<i>Archilochus colubris</i>	ruby-throated hummingbird	<b>b</b>
<i>Ceryle alcyon</i>	belted kingfisher	<b>b</b>
<i>Melanerpes erythrocephalus</i>	red-headed woodpecker	
<i>Melanerpes carolinus</i>	red-bellied woodpecker	<b>b</b>
<i>Sphyrapicus varius</i>	yellow-bellied sapsucker	
<i>Picoides pubescens</i>	downy woodpecker	<b>b</b>
<i>Picoides villosus</i>	hairy woodpecker	<b>b</b>
<i>Colaptes auratus</i>	Northern flicker	<b>b</b>

<i>Dryocopus pileatus</i>	pileated woodpecker	<b>b</b>
<i>Contopus borealis</i>	olive-sided flycatcher	
<i>Contopus virens</i>	eastern wood pewee	<b>b</b>
<i>Empidonax flaviventris</i>	yellow-bellied flycatcher	
<i>Empidonax virescens</i>	Acadian flycatcher	
<i>Empidonax alnorum</i>	alder flycatcher	
<i>Empidonax traillii</i>	willow flycatcher	<b>b</b>
<i>Empidonax minimus</i>	least flycatcher	<b>b</b>
<i>Sayornis phoebe</i>	Eastern phoebe	<b>b</b>
<i>Myiarchus crinitus</i>	great-crested flycatcher	<b>b</b>
<i>Tyrannus Tyrannus</i>	eastern kingbird	<b>b</b>
<i>Eremophila alpestris</i>	horned lark	
<i>Progne subis</i>	purple martin	<b>b</b>
<i>Tachycineta bicolor</i>	tree swallow	<b>b</b>
<i>Stelgidopteryx serripennis</i>	northern rough-winged swallow	<b>b</b>
<i>Riparia riparia</i>	bank swallow	<b>b</b>
<i>Herndon pyrrhonota</i>	cliff swallow	
<i>Hirundo rustica</i>	barn swallow	<b>b</b>
<i>Cyanocitta cristata</i>	blue jay	<b>b</b>
<i>Corvus brachyrhynchos</i>	American crow	<b>b</b>
<i>Corvus ossifragus</i>	fish crow	
<i>Poecile carolinensis</i>	Northern chickadee	<b>b</b>
<i>Parus bicolor</i>	tufted titmouse	<b>b</b>
<i>Sitta canadensis</i>	red-breasted nuthatch	
<i>Sitta carolinensis</i>	white-breasted nuthatch	<b>b</b>
<i>Certhia americana</i>	brown creeper	
<i>Thryothorus ludovicianus</i>	Carolina wren	<b>b</b>
<i>Troglodytes aedon</i>	house wren	<b>b</b>
<i>Troglodytes troglodytes</i>	winter wren	
<i>Regulus satrapa</i>	golden-crowned kinglet	
<i>Regulus calendula</i>	ruby-crowned kinglet	
<i>Polioptila caerulea</i>	blue-gray gnatcatcher	<b>b</b>
<i>Sialia sialis</i>	eastern bluebird	<b>b</b>
<i>Catharus fuscescens</i>	veery	<b>b</b>
<i>Catharus bicknelli</i>	Bicknell's thrush	
<i>Catharus minimus</i>	gray-cheeked thrush	
<i>Catharus ustulatus</i>	Swainson's thrush	
<i>Catharus guttatus</i>	hermit thrush	
<i>Hylocichla mustelina</i>	wood thrush	<b>b</b>
<i>Turdus migratorius</i>	American robin	<b>b</b>
<i>Dumetella carolinensis</i>	gray catbird	<b>b</b>

<i>Mimus polyglottos</i>	Northern mockingbird	<b>b</b>
<i>Toxostoma rufum</i>	brown thrasher	<b>b</b>
<i>Anthus rubescens</i>	water pipit	
<i>Bombycilla cedrorum</i>	cedar waxwing	<b>b</b>
<i>Sturnus vulgaris</i>	European starling	<b>b</b>
<i>Vireo griseus</i>	white-eyed vireo	<b>b</b>
<i>Vireo solitarius</i>	solitary vireo	
<i>Vireo philadelphicus</i>	Philadelphia vireo	
<i>Vireo flavifrons</i>	yellow-throated vireo	
<i>Vireo gilvus</i>	warbling vireo	
<i>Vireo olivaceus</i>	red-eyed vireo	<b>b</b>
<i>Vermivora pinus</i>	blue-winged warbler	<b>b</b>
<i>Vermivora chrysoptera</i>	golden-winged warbler	
<i>Vermivora peregrina</i>	Tennessee warbler	
<i>Vermivora reficapilla</i>	Nashville warbler	
<i>Vermivora celata</i>	Orange-crowned warbler	
<i>Parula americana</i>	Northern parula	
<i>Dendroica petechia</i>	yellow warbler	<b>b</b>
<i>Dendroica pensylvanica</i>	chestnut-sided warbler	<b>b</b>
<i>Dendroica magnolia</i>	magnolia warbler	
<i>Dendroica tigrina</i>	Cape May warbler	
<i>Dendroica caerulescens</i>	black-throated blue warbler	
<i>Dendroica coronata</i>	yellow-rumped warbler	
<i>Dendroica virens</i>	black-throated green warbler	
<i>Dendroica fusca</i>	blackburnian warbler	
<i>Dendroica dominica</i>	yellow-throated warbler	
<i>Dendroica pinus</i>	pine warbler	
<i>Dendroica discolor</i>	prairie warbler	
<i>Dendroica palmarum</i>	palm warbler	
<i>Dendroica castanea</i>	bay-breasted warbler	
<i>Dendroica striata</i>	blackpoll warbler	
<i>Dendroica cerulea</i>	cerulean warbler	
<i>Miniotilta varia</i>	black and white warbler	<b>b</b>
<i>Setophaga ruticilla</i>	American redstart	<b>b</b>
<i>Protonotaria citrea</i>	prothonotary warbler	
<i>Helmitheros vermivorus</i>	worm-eating warbler	
<i>Seiurus aurocapillus</i>	ovenbird	<b>b</b>
<i>Seiurus noveboracensis</i>	Northern waterthrush	
<i>Seiurus motacilla</i>	Louisiana waterthrush	
<i>Oporornis formosus</i>	Kentucky warbler	
<i>Oporornis agilis</i>	Connecticut warbler	
<i>Oporornis philadelphia</i>	mourning warbler	
<i>Geothlypis trichas</i>	common yellowthroat	<b>b</b>
<i>Wilsonia citrina</i>	hooded warbler	
<i>Wilsonia pusilla</i>	Wilson's warbler	
<i>Wilsonia canadensis</i>	Canada warbler	

<i>Icteria virens</i>	yellow-breasted chat	
<i>Piranga olivacea</i>	scarlet tanager	<b>b</b>
<i>Piranga rubra</i>	Summer tanager	
<i>Cardinalis cardinalis</i>	northern cardinal	<b>b</b>
<i>Pheucticus ludovicianus</i>	rose-breasted grosbeak	<b>b</b>
<i>Passerina cyanea</i>	indigo bunting	<b>b</b>
<i>Spiza americana</i>	dickcissel	
<i>Pipilo erythrophthalmus</i>	Northern towhee	<b>b</b>
<i>Spizella arborea</i>	American tree sparrow	
<i>Spizella passerina</i>	chipping sparrow	<b>b</b>
<i>Spizella pusilla</i>	field sparrow	
<i>Passerella iliaca</i>	fox sparrow	
<i>Melospiza melodia</i>	song sparrow	<b>b</b>
<i>Melospiza lincolnii</i>	Lincoln's sparrow	
<i>Melospiza georgiana</i>	swamp sparrow	
<i>Zonotrichia albicollis</i>	white-throated sparrow	
<i>Zonotrichia leucophrys</i>	white-crowned sparrow	
<i>Junco hyemalis</i>	dark-eyed junco	
<i>Agelaius phoeniceus</i>	red-winged blackbird	<b>b</b>
<i>Sturnella magna</i>	Eastern meadowlark	
<i>Euphagus carolinus</i>	rusty blackbird	
<i>Quiscalus quiscula</i>	common grackle	<b>b</b>
<i>Molothrus ater</i>	brown-headed cowbird	<b>b</b>
<i>Icterus spurius</i>	orchard oriole	
<i>Icterus galbula</i>	Baltimore oriole	<b>b</b>
<i>Carpodacus purpureus</i>	purple finch	
<i>Carpodacus mexicanus</i>	house finch	<b>b</b>
<i>Carduelis flammea</i>	common redpoll	
<i>Carduelis pinus</i>	pine siskin	
<i>Loxia curvirostra</i>	Red crossbill	
<i>Loxia leucoptera</i>	white-winged crossbill	
<i>Carduelis tristis</i>	American goldfinch	<b>b</b>
<i>Hesperiphona vespertinus</i>	evening grosbeak	
<i>Passer domesticus</i>	house sparrow	<b>b</b>

**MAMMALS POTENTIALLY WITHIN NORTH PLAINFIELD**

<b><u>Scientific Name</u></b>	<b><u>Common Name</u></b>	<b><u>Most Common</u></b>
<i>Didelphis marsupialis</i>	opossum	X
<i>Sorex cinereus</i>	masked shrew	
<i>Sorex dispar</i>	long-tailed shrew	
<i>Blarina brevicauda</i>	short-tailed shrew	X
<i>Scalopus aquaticus</i>	eastern mole	X
<i>Myotis lucifugus</i>	little brown bat	
<i>Lasionycteris noctivagans</i>	silver-haired bat	
<i>Pipistrellus subflavus</i>	eastern pipistrel	
<i>Eptesicus fuscus</i>	big brown bat	X
<i>Lasiurus borealis</i>	red bat	
<i>Lasiurus cinereus</i>	hoary bat	
<i>Plecotus auritus</i>	N. Long eared bat	
<i>Myotis leibii</i>	small-footed myotis	
<i>Myotis sodalus</i>	Indiana bat	
<i>Sylvilagus floridanus</i>	Eastern cottontail	X
<i>Tamias striatus</i>	Eastern chipmunk	X
<i>Marmota monax</i>	woodchuck	X
<i>Sciurus carolinensis</i>	gray squirrel	X
<i>Tamiasciurus hudsonicus</i>	red squirrel	
<i>Glaucomys volans</i>	southern flying squirrel	X
<i>Castor canadensis</i>	beaver	
<i>Erethizon dorsatum</i>	porcupine	
<i>Peromyscus leucopus</i>	white-footed mouse	X
<i>Microtus pennsylvanicus</i>	meadow vole	X
<i>Ondatra zibethicus</i>	muskrat	X
<i>Rattus rattus</i>	black rat	
<i>Rattus norvegicus</i>	brown rat	X
<i>Mus musculus</i>	house mouse	X
<i>Napaeozapus insignis</i>	woodland jumping mouse	
<i>Canis latrans, var.</i>	Eastern coyote	
<i>Vulpes vulpes</i>	red fox	X
<i>Urocyon cinereoargenteus</i>	gray fox	
<i>Procyon lotor</i>	raccoon	X
<i>Ursus americanus</i>	black bear	
<i>Mephitis mephitis</i>	striped skunk	X
<i>Lutra canadensis</i>	river otter	
<i>Neovison vison</i>	mink	
<i>Mustela frenata</i>	long-tailed weasel	
<i>Mustela erminea</i>	short-tailed weasel	
<i>Odocoileus virginianus</i>	white-tailed deer	X

## AMPHIBIANS POTENTIALLY WITHIN NORTH PLAINFIELD

<u>Scientific Name</u>	<u>Common Name</u>	<u>Most common</u>
<i>Ambystoma maculatum</i>	spotted salamander	
<i>Notophthalmus v. viridescens</i>	red-spotted newt	
<i>Desmognathus f. fuscus</i>	Northern dusky salamander	
<i>Plethodon c. cinereus</i>	red-backed salamander	X
<i>Plethodon g. glutinosus</i>	Northern slimy salamander	
<i>Hemidactylium scutatum</i>	four-toed salamander	
<i>Pseudotriton r. ruber</i>	Northern red salamander	
<i>Eurycea b. bislineata</i>	Northern two-lined salamander	
<i>Bufo americanus</i>	American toad	X
<i>Hyla c. crucifer</i>	Northern spring peeper	X
<i>Hyla versicolor</i>	Northern gray treefrog	X
<i>Rana catesbeiana</i>	bullfrog	X
<i>Rana clamitans melanota</i>	green frog	X
<i>Rana sylvatica</i>	wood frog	
<i>Rana spenocephala</i>	Southern leopard frog	
<i>Rana palustris</i>	pickerel frog	X



## **REPTILES POTENTIALLY OCCURRING WITHIN NORTH PLAINFIELD\***

### **Scientific Name**

*Chelydra s. serpentina*  
*Sternotherus odoratus*  
*Clemmys guttata*  
*Clemmys insculpta*  
*Terrapene c. carolina*  
*Pseudemys scripta elegans*  
*Chrysemys p. picta*  
*Nerodia s. sipedon*  
*Storeria d. dekayi*  
*Thamnophis s. sirtalis*  
*Thamnophis s. sauritus*  
*Diadophis punctatus edwardsi*  
*Coluber c. constrictor*  
*Pantherophis o. obsoleta*  
*Lampropeltis t. triangulum*

### **Common Name**

snapping turtle  
stinkpot  
spotted turtle  
wood turtle  
eastern box turtle  
red-eared slider  
eastern painted turtle  
northern water snake  
northern brown snake  
eastern garter snake  
eastern ribbon snake  
northern ringneck snake  
northern black racer  
black ratsnake  
eastern milk snake

\*These species are most likely to be found based on their known range and habitat preferences. Some species on the list, such as eastern garter snake, are much more likely to be observed than others, such as spotted turtle or black rat snake. Other species such as Northern copperhead would have been expected to occur within North Plainfield at one time, but are currently very unlikely to occur.

## **APPENDIX D**

### **CORRESPONDENCE AND ADDITIONAL REFERENCE MATERIAL**

North Plainfield Natural Heritage Letter - December 27, 2012.

CEA/WRA Permit Fact Sheet – Lockheed Electronics Corporation – July 24, 2013

North Plainfield High School Studies conducted on Stream Quality in the Stony Brook 1975,  
2011 and Undated

Looking Back – A History of North Plainfield -1985



## State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION  
Division of Parks and Forestry  
Mail Code 501-04  
ONLM -Natural Heritage Program  
P.O. Box 420  
Trenton, NJ 08625-0420  
Tel. #609-984-1339  
Fax. #609-984-1427

CHRIS CHRISTIE  
*Governor*

KIM GUADAGNO  
*Lt. Governor*

BOB MARTIN  
*Commissioner*

December 27, 2012

John Pabish  
Amy S. Greene Environmental Consultants, Inc.  
4 Walter E. Foran Boulevard, Suite 209  
Flemington, NJ 08822-4666

Re: North Plainfield Borough Environmental Resource Inventory (ASGECI #3517)

Dear Mr. Pabish:

Thank you for your data request regarding rare species information for the above referenced project site in North Plainfield Borough, Somerset County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3.1) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Landscape Project habitat mapping and the Biotics Database for occurrences of any rare wildlife species or wildlife habitat on the referenced site. The Natural Heritage Database was searched for occurrences of rare plant species or ecological communities that may be on the project site. Please refer to Table 1 (attached) to determine if any rare plant species, ecological communities, or rare wildlife species or wildlife habitat are documented on site. A detailed report is provided for each category coded as 'Yes' in Table 1.

The Natural Heritage Program reviews its data periodically to identify priority sites for natural diversity in the State. Included as priority sites are some of the State's best habitats for rare and endangered species and ecological communities. Please refer to Table 1 (attached) to determine if any priority sites are located on the site.

A list of rare plant species and ecological communities that have been documented from Somerset County can be downloaded from <http://www.state.nj.us/dep/parksandforests/natural/heritage/countylist.html>. If suitable habitat is present at the project site, the species in that list have potential to be present.

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from [http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes\\_2010.pdf](http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2010.pdf).

If you have questions concerning the wildlife records or wildlife species mentioned in this response, we recommend that you visit the interactive NJ-GeoWeb website at the following URL, <http://www.state.nj.us/dep/gis/geoweb splash.htm> or contact the Division of Fish and Wildlife, Endangered and Nongame Species Program at (609) 292-9400.

PLEASE SEE 'CAUTIONS AND RESTRICTIONS ON NHP DATA', which can be downloaded from <http://www.state.nj.us/dep/parksandforests/natural/heritage/newcaution2008.pdf>.

Thank you for consulting the Natural Heritage Program. The attached invoice details the payment due for processing this data request. Feel free to contact us again regarding any future data requests.

Sincerely,

A handwritten signature in blue ink, appearing to read 'R. Cartica', with a horizontal line extending to the right.

Robert J. Cartica  
Administrator

c: NHP File No. 12-4007454-2423

***Table 1: On Site Data Request Search Results (6 Possible Reports)***

Rare Plants/Ecological Communities Possibly On Site:	No
Natural Heritage Priority Sites On Site:	No
Landscape 3.1 Species Based Patches On Site:	Yes
Landscape 3.1 Vernal Pool Habitat On Site:	No
Landscape 3.1 Stream/Mussel Habitat On Site:	No
Other Animals Tracked by ENSP On Site:	No

<p style="text-align: center;"><b>Rare Wildlife Species or Wildlife Habitat on the Project Site Based on Search of Landscape Project 3.1 Species Based Patches</b></p>
--

<b>Class</b>	<b>Common Name</b>	<b>Scientific Name</b>	<b>Feature Type</b>	<b>Rank</b>	<b>Federal Protection</b>	<b>State Protection</b>	<b>Grank</b>	<b>Srank</b>
<i>Aves</i>								
	Great Blue Heron	Ardea herodias	Foraging	2	NA	Special Concern	G5	S3B,S4N
	Wood Thrush	Hylocichla mustelina	Breeding Sighting	2	NA	Special Concern	G5	S3B
<i>Reptilia</i>								
	Wood Turtle	Glyptemys insculpta	Occupied Habitat	3	NA	State Threatened	G4	S2

07/30/13 <sup>e</sup> Mayor, Borough Council, Administrator, Engineer, Environmental Commission, DPW  
Lockheed Martin Corporation  
6801 Rockledge Drive Bethesda, MD 20817 Director and Borough Attorney from Borough Clerk.

**LOCKHEED MARTIN** 

July 24, 2013

**DELIVERED BY CERTIFIED MAIL**

NJDEP Office of Community Relations  
P. O. Box 402  
Trenton, NJ 08625-0402

Re: CEA/WRA Permit Fact Sheet  
Former Lockheed Electronics Corp. Site (Watchung Square Mall property)  
Route 22 West, Watchung, NJ  
NJDEP PI No. 004334

Dear Sir/Madam:

Lockheed Martin Corporation is hereby submitting a copy of the updated Classification Exception Area/Well Restriction Area (CEA/WRA) Permit Fact Sheet (Table I) for the former Lockheed Electronics Corp. Site, in accordance with the New Jersey Department of Environmental Protection's (NJDEP's) public notice requirements (N.J.A.C. 7:26E-1.4). A list of the Fact Sheet recipients (Table II) located within the CEA boundary (see attached figure) and a copy of one of the property owner/tenant letters are also attached. These documents have also been sent to the Watchung borough clerk, the Watchung Board of Health, the North Plainfield borough clerk, and the North Plainfield Department of Health.

If you have any questions or need additional information, please feel free to contact me at 301-548-2223 or [charles.trione@lmco.com](mailto:charles.trione@lmco.com).

Very truly yours,



Charles Trione  
Project Lead

Enclosures:  
CEA/WRA Permit Fact Sheet (Table I)  
Recipients List (Table II)  
CEA Map  
Sample Letter

CC: Watchung borough clerk  
Watchung Board of Health  
North Plainfield borough clerk  
North Plainfield Department of Health.

July 22, 2013

Delivered by Certified Mail

STATE OF NEW JERSEY  
1035 PARKWAY AVE.  
TRENTON N J 08625

Re: *Site Information Sheet*  
Former Lockheed Electronics Company (LEC) Property (Site)  
(Currently the Watchung Square Mall)  
1500 Route 22 West, Watchung, New Jersey  
NJDEP Preferred ID No. 004334

Dear Sir/Madam:

Please find enclosed a Fact Sheet on the environmental remediation activities associated with the former Lockheed Electronics Company (LEC) property referenced above. For a number of years, Lockheed Martin Corporation (Lockheed Martin) has been evaluating and cleaning up groundwater contamination associated with former operations at the Site. Lockheed Martin takes its environmental responsibilities very seriously. We want to assure you that no public drinking water sources are affected and there are no impacts to the soil.

Lockheed Martin is providing you with this information in accordance with the New Jersey Department of Environmental Protection's (NJDEP) public notice requirements (N.J.A.C. 7:26E-1.4). This letter is being sent via Certificate of Mailing to all property owners and tenants within the Classification Exception Area (see Figure 1), which shows the area of groundwater currently under investigation by Lockheed Martin related to the referenced Site. Copies are also being mailed to the NJDEP Office of Community Relations, the Watchung and North Plainfield municipal clerks, the Watchung Board of Health, and the North Plainfield Health Department.

It is our understanding that you are an owner or tenant of the following property located within the boundary of the Classification Exception Area:

Block: 4.019999999999996 Lot: 42  
Property Address: HIGHWAY 22, NORTH PLAINFIELD

LEC's former operations at the Site included the cleaning of electronic circuit boards with trichloroethene (TCE), a cleaning solvent. Contaminants associated with Site operations were detected in the soil at the former Site and groundwater in 1993. The impacted soil at the former Site was cleaned up to the satisfaction of the NJDEP and the Site was subsequently redeveloped as the Watchung Square Mall. Lockheed Martin has determined that contamination in the groundwater has migrated from the Site. A thorough environmental investigation has been conducted to determine the nature and extent of the contamination.



Based on the findings, Lockheed Martin determined that a groundwater extraction and treatment system would most effectively clean up the groundwater contamination. The system was installed and began operating in July 2003. The treatment system was designed to collect the groundwater and remove the contamination in an aboveground facility, and has prevented contamination from entering Crab Brook. Groundwater impacts have decreased significantly since the system started operating, and TCE concentrations in the vicinity of the treatment system have achieved NJDEP cleanup levels for several years. As a result, the treatment system was shut down in 2011 and the treatment equipment has been decommissioned and sent to a recycling facility.

Again, we want to assure you that no public drinking water sources are affected and there are no impacts to the soil. To read more information on the project, an informational sheet is attached and a website is available at <http://www.lockheedmartin.com/us/who-we-are/eesh/remediation/north-plainfield.html>. If you have any questions, please contact me at 301-548-2223 or [charles.trione@lmco.com](mailto:charles.trione@lmco.com).

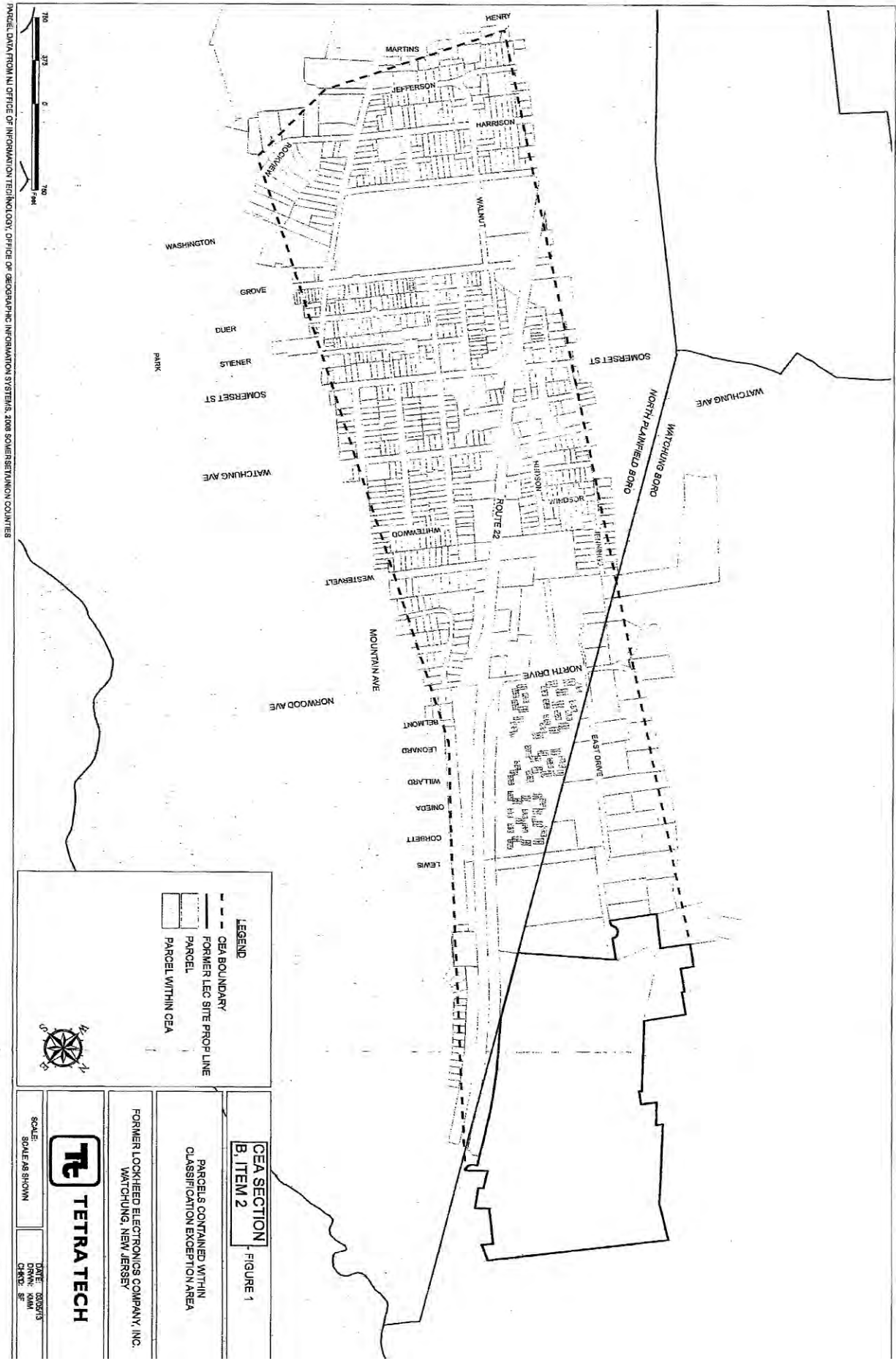
Very truly yours,  
Lockheed Martin Corp.



Charles Trione  
Project Lead

Enclosures:

**CEA/WRA Permit Fact Sheet**  
**Exhibit B Map**  
**Site Information Sheet**



**LEGEND**

- - - CEA BOUNDARY
- FORMER LEC SITE PROP LINE
- ▭ PARCEL
- ▭ PARCEL WITHIN CEA



**CEA SECTION B, ITEM 2**  
FIGURE 1

PARCELS CONTAINED WITHIN CLASSIFICATION EXCEPTION AREA  
FORMER LOCKHEAD ELECTRONICS COMPANY, INC.  
WATCHUNG, NEW JERSEY



SCALE: SCALE AS SHOWN

DATE: 08/2015  
DRAWN: JMM  
CHECKED: SF

# Fauna Drift Following Storm Surge in an Urban Stream

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By Michael Sani and Kevin Sani

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Kevin Sani and Michael Sani

Adult Sponsor: Dr. Sarah O'Donnell

Fauna Drift Following Storm Surge in an Urban Stream

## **Introduction**

The purpose of this investigation was to study the effect of a set of factors on the drift of fauna after a storm surge in Stony Brook, an urban stream local to North Plainfield, NJ. Responses by macroinvertebrates to watershed impacts are commonly used as an assessment of stream water quality. Lotic macroinvertebrate communities are not stationary. Drifting macroinvertebrates and nutrients affect downstream foodwebs and, thus, are important to stream communities. Factors that impact drift are critical to downstream recolonization particularly after major disturbances such as storm surge. Drift has been suggested to be affected by biotic and abiotic factors of streams including current discharge velocity, diel periodicity, dissolved oxygen (DO), and the export of coarse particulate organic matter (CPOM). The factors investigated in Stony Brook were the export of CPOM in the form of leaves, the export of CPIM in the form of candy wrappers, current discharge velocity, pH, and dissolved oxygen levels. These factors were studied in relation to diel periodicity specifically focusing on nocturnal drift. All of these factors were expected to influence drift. In all cases, these factors were studied following storm surge when current discharge was heavy.

## **Experimental Description**

Capture of drifting fauna was accomplished by the use of drift nets made of PVC piping and 600  $\mu\text{m}$  nylon mesh. The design used was similar to that in Figure 1 and that described by Merritt

(Merritt et al. 1996). Six drift nets were placed in the stream, with two nets at each site. The drift nets collected drifting fauna. The nets were periodically removed and emptied. Captured fauna were placed into sampling jars with 10% formalin solution. Identification of captured fauna was performed later in the lab.

Sampling was performed at three sites in August 17 and 18 of 2011 and September 1 and 2 of 2011. All dates followed a storm within 48 hours. The locations selected were: (1) the entrance of the stream at New Walnut Street (Figure 2), (2) under the bridge adjacent to the intersection of Grove Street and Walnut Street, and (3) behind the Emerald City Auto Spa. All samples were taken in areas where current discharge velocity was high.

The methods used to ascertain measured factors are as follows. Dissolved Oxygen was measured using the Winkler Method (Figure 3) (Smock 2006); a Bromothymol Blue kit was used to measure pH. Chemical tests were conducted in the field using LaMotte chemical testing kits. Current discharge velocity was measured using a Geopacks flowmeter. The export of CPOM was measured by releasing 25 wet leaves one-by-one and recording the time each took to travel an unobstructed distance (Figure 4). CPIM was measured similarly using 100 cm<sup>2</sup> candy wrappers composed of a thin, buoyant, and metallic material. These factors were measured on August 17 at 9:00 AM, 12:30 PM, 3:30 PM, and 5:30 PM. At these times, captured fauna were transferred from the drift nets to the sampling jars. To quantify nocturnal drift and ascertain diel periodicity, the drift nets were laid for 12 hours overnight. The first group of overnight fauna was collected the morning of August 18, 2011. Two additional overnight tests were performed on the nights of September 1 and September 2, 2011, shortly after Hurricane Irene.

## **Results**

### ***Taxa Identification***

The common families found in the total drift were adult Leptophlebiidae, Gérridae, and Caédinae. Macroinvertebrates comprised a subset of total drift. Their common families included Hyrdopsychidae, Talitridae, and Hippobóscidae. Full identification of nocturnal drift is shown in Table 1. Total drift and macroinvertebrate drift were statistically tested to determine if they were correlated (Figure 5). A correlation coefficient of 0.88 was found, showing that a strong, positive, and linear correlation between these two variables was evident.

### ***Data Analysis***

Total drift and macroinvertebrate drift were compared to pH levels, temperature, the export of both CPOM and CPIM, diel periodicity, current discharge velocity, and DO levels. A two-way Analysis of Variance (ANOVA) was performed for both total drift and macroinvertebrate drift in relation to current discharge velocity and DO saturation (Figures 6 and 7). Both ANOVAs had p-values of 0.6750 (df=8), indicating that current discharge velocity and DO saturation are not interacting factors on either total drift or macroinvertebrate drift.

In addition to ANOVAs, the effects of the factors of total drift and macroinvertebrate drift were analyzed for polynomial regression and correlation coefficients. Polynomial regression is a form of statistical analysis in which the relationship between the independent variable (x) and the dependent variable (y) is modeled as an n<sup>th</sup> order polynomial. This method is used when the relationship between the independent variable and dependent variable looks like it follows a curved line, not a straight line, as appeared to be the case for the effects of both current discharge velocity and dissolved oxygen levels on drift.

### ***Constant Factors***

Throughout the experiment, several variables remained constant. Since pH levels were constant at 7.3, and the amount of drifting organisms fluctuated drastically throughout the experiment, it can be concluded that pH is not a factor of drift in a lotic environment. Temperature stayed constant at a range of 20-23°C.

### ***Export of CPOM/CPIM***

Both CPOM and CPIM floated downstream with almost equal velocities, indicating that they behave similarly in a lotic environment. Linear regressions of the export of CPOM and drift under diurnal conditions were performed, and there was a weak correlation between the two. The coefficients of determinance for the linear regressions of the velocity of CPOM versus total drift and the velocity of CPOM versus macroinvertebrate drift were 0 and 0.16, respectively (Figures 15 and 16). Linear regressions of CPIM and drift were also performed under diurnal conditions (Figures 17 and 18). There was a weak correlation between the export of CPIM and drift. The coefficients of determinance for the linear regressions of the velocity of CPIM versus total drift and the velocity of CPIM versus macroinvertebrate drift were 0.01 and 0.25, respectively.

### ***Diel Periodicity***

Drifting fauna exhibited diel periodicity. An analysis of fauna collected shows that under diurnal conditions the driftnets collected an average of 5 organisms per hour. Under nocturnal conditions, though, the driftnets collected an average of 68 organisms per hour.

### ***Current Discharge Velocity***

Polynomial regressions for current discharge velocity and drift were performed under diurnal and nocturnal conditions. There was a weak correlation between current discharge velocity and drift



under diurnal conditions. Diurnally, the coefficients of determinance for the polynomial regressions of current discharge velocity versus total drift and current discharge velocity versus macroinvertebrate drift were both 0.34 (Figures 6 and 7). Their curves are similar in shape, but no conclusion can be drawn from the regressions in terms of the relationship between current discharge velocity and drift during the day. However, there was a strong correlation between current discharge velocity and drift under nocturnal conditions. The coefficients of determinance for the polynomial regressions of current discharge velocity versus total drift and current discharge velocity versus macroinvertebrate drift were 0.99 and 0.94, respectively (Figures 8 and 9). At speeds over 0.5 m/s, an increased current discharge velocity yielded a greater amount of drift.

### ***Dissolved Oxygen***

Polynomial regressions of DO levels and drift were also performed under diurnal and nocturnal conditions. There was a weak correlation between DO levels and drift under diurnal conditions. The coefficients of determinance for the polynomial regressions of DO levels versus total drift and DO levels versus macroinvertebrate drift were 0.22 and 0.07, respectively (Figures 10 and 11). Conversely, there was a strong correlation between DO levels and drift under nocturnal conditions. The coefficients of determinance for the polynomial regressions of DO levels versus total drift and DO levels versus macroinvertebrate drift were 0.93 and 0.95, respectively (Figures 12 and 13). The regressions of the data have analogous curves, suggesting that DO has similar effects upon total drift as well as macroinvertebrate drift. An interpolation of the polynomial regression for DO levels and drift suggests that both total drift and macroinvertebrate drift maximized when the DO level was 7.5 ppm, which is approximately 90% saturation at 22°C. This was determined using a nomogram for dissolved oxygen (Figure 14). It can be concluded

that there is a positive correlation between DO saturation and drift.

## **Discussion**

### ***Export of CPOM/CPIM***

In other studies, the export of CPOM has been found to be related to the community composition of drifting macroinvertebrates (Meehan 1996; Hershey & Lamberti 1998). Streams running through fields and pastures have significantly less drift than those running through forests. This is due largely to the fact that the former streams have significantly lower amounts of CPOM from falling leaves (Bilby & Bisson 1992). Since Stony Brook is an urban stream, there is an influx of litter, otherwise known as coarse particulate inorganic matter (CPIM). This excess matter could be possibly detrimental or possibly beneficial to drift. The CPIM might pollute the stream, thus lowering the amount of drifting fauna. It was also postulated that it could help the drifting fauna by providing a means of transportation in the form of an object to cling onto during a surge.

Although correlations were poor, there was a strong resemblance between the behavior of CPOM export and CPIM export. While the regressions of CPOM and CPIM export versus total drift have slightly negative slopes, the regressions of CPOM and CPIM export versus macroinvertebrate drift have slightly positive slopes. Therefore, there is no apparent difference between the effects of the export of CPOM on drift and the effects of the export of CPIM on drift. However, the linear regressions were poor, so there is no evidence supporting that either the export of CPOM or that of CPIM has an effect on either total drift or macroinvertebrate drift under storm surge conditions. That is, neither falling leaves nor litter appear to impact drift after

a storm.

### ***Diel Periodicity***

The abundance of nocturnal drift versus diurnal drift supports findings in other studies testing the diel periodicity of drift in a lotic environment. Although some organisms, such as caddisfly larvae, have diurnal drift patterns, fauna generally display nocturnal drift patterns. The prevalence of nocturnal drift patterns is probably related to decreased levels of predation after sunset (Svendsen et al. 2004). Specifically, the diel periodicity of drift may be due to the decreased level of visible light, which impairs predators' ability to spot drifting prey (Anderson 1966).

### ***Current Discharge Velocity***

In other studies, current discharge velocity has been shown to affect drift; there is a positive correlation between the two. In one experiment, a four-fold increase in current discharge velocity yielded a significant increase in drift (Lancaster 1992). It is believed that drastic increases in current discharge could cause more passive (accidental) drift among fauna. (Cellot 1996). During the experiment, strong currents may have forced organisms to drift passively downstream, or, conversely, drifting organisms may have taken the opportunity to move downstream faster under storm conditions.

### ***Dissolved Oxygen***

Nearly all stream organisms are sensitive to oxygen concentration. Dissolved oxygen saturation directly impacts lotic fauna through oxygen availability and metabolic processes (Smock 2006). Moreover, oxygen availability is a crucial factor of the composition of freshwater communities because it critically affects the distribution of many species (Connolly 2004). During this

investigation, more organisms drifted when dissolved oxygen levels were higher due to improved stream conditions.

### ***Future Investigation***

This experiment should be repeated at a time not following a storm surge to enable comparison of drift following storm surge with drift not following storm surge. Seasonal variations should also be studied after storm surge. Specifically, repeating this experiment during cooler seasons like spring or autumn when DO saturation capabilities are increased will allow further analysis of the effects of DO saturation on drift.

### **Conclusion**

The export of CPOM and CPIM both had weak relationships with drift. Additionally, the velocities of the leaves and the wrappers as they floated downstream were similar. Therefore, it can be concluded that neither falling leaves nor litter affect drift differently, and they probably have no effect upon drift at all. Under diurnal conditions, there was no apparent relationship between either DO saturation or current discharge velocity and drift. Under nocturnal conditions, though, a strong correlation was shown between DO saturation and drift as well as current discharge velocity and drift. As DO saturation approaches 100%, the amount of drifting fauna increases. Similarly, as current discharge velocity exceeds 0.5 m/s, drift increases as current discharge velocity increases. In accordance with previous studies, diel periodicity was evident, as the driftnets caught significantly more fauna under nocturnal conditions.

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Claudia Salazar and **Danielle Stewart**

Adult Sponsor: Dr. Sarah O'Donnell

Stony Brook: A Study in Stream Water Quality

## **Introduction**

A healthy stream is one that is cool, odorless, and clear. There should be high oxygen levels and riparian vegetation. The temperature of the stream should be less than 17.8°C. The phosphate level should be less than 0.1 mg/L. The nitrate level is less than 2 mg/L. The pH is between 6.5 and 8.5. The dissolved oxygen is greater than 5 mg/L. The chloride is less than 30 mg/L. When the physical assessment is between 160 and 121 the riparian vegetation is optimal. When it is between 120 and 81 it is suboptimal, between 80 and 41 it is marginal, or 40 it is poor. A healthy stream also has large amounts of pollutant sensitive organisms, such as mayflies, stoneflies, caddisflies, water pennies, hellgrammites, and gilled snails.

The health of Stony Brook in North Plainfield was assessed by comparing macroinvertebrate indices, physical and chemical characteristics of Stony Brook to those of Alplaus Kill, a stream in New York. In North Plainfield, NJ, Stony Brook is an urban stream in the New Jersey Raritan Watershed Two sites in North Plainfield, were investigated in August, 2010. The locations selected were: 1) across from the red door of Stony Brook School, and 2) diagonal from CVS pharmacy, and about fifty feet away behind the Stony Brook car wash. The method of assessment was to compare Stony Brook to a typical healthy stream in its abundance in macroinvertebrates as well as physical and chemical characteristics.

## **Methods and Procedures**

Two sites were tested, where macro-invertebrates were collected using the kicknet process to collect 100 macroinvertebrates per site (2). One hundred macroinvertebrates were captured and preserved using 70% ethanol. They were identified later in the lab (3). Physical and chemical characteristics measured were temperature, phosphates, pH, nitrate, dissolved oxygen, chloride, and the physical characteristics. Dissolved oxygen was tested using the Winkler Method; nitrate as tested using the Nitrate Test; phosphate was tested using the Ascorbic Acid Reduction Method; chloride was tested using the Direct Reading Titrator Method; for pH was tested using the Bromothymol pH Test. All chemical tests were conducted in the field using LaMotte chemical testing kits.

## **Results and Analysis**

A total of 100 macroinvertebrates were captured and identified from each of the two sites (Figures 1 and 2). A student t test was performed to compare the means of both sites (Figure 3) (3). The two means were not significantly different ( $p < .05$ ). The critical t value was 1.97. The calculated t was .59. Once the data were analyzed, they were assembled into indices to interpret the health of the stream in North Plainfield. Stony Brook is healthy was determined by the Benthic Macroinvertebrate Sampling and Analysis standard indices (1). One index, the EPT Index is named for three orders of aquatic insects that are common in the benthic macroinvertebrate community: Ephemeroptera (mayflies), Plecoptera (stoneflies), and

Trichoptera (caddisflies). EPT richness of 15 was found, indicating non-impacted water quality (Figure 4). The taxa richness was 7 indicating moderately impacted water quality (Figure 5). The Percent Model Affinity was 94.875% indicating non-impacted water quality (Figure 6). Two other biotic indices were also used to measure Stony Brook. The Major Group Biotic Index score was 5.87, indicating moderately impacted water quality (Figure 7). The Aquatext Biotic index score was 65.35, which is considered good (Figure 8).

The physical and chemical characteristics measured were temperature, phosphates, pH, nitrate, dissolved oxygen, chloride, and the physical characteristics (Figure 9). In a healthy stream, the temperature of the stream should be less than 17.8°C, the phosphate level should be less than 0.1 mg/L, the nitrate level should be less than 2 mg/L, the pH should be between 6.5 and 8.5, the dissolved oxygen should be greater than 5 mg/L, and the chloride should be less than 30 mg/L. When the physical assessment is between 160 and 121 the riparian vegetation is optimal, 120 - 81 is suboptimal, 80 - 41 is marginal, and below 40 is poor. Our findings showed chloride high (Site A: 69 mg/L; Site B: 72.5 mg/L). Phosphates were marginal (Sites A and B: 0.1 mg/L). All other measurements indicated a healthy stream. The temperature of Site A was 20.8°C; Site B was 19.5. Site A pH was 7.4; Site B was 7.3. Site A has an average nitrate of 1.6 mg/L; Site B was 1.6 mg/L. Site A had an average dissolved oxygen 8.5 mg/L; Site B was 8.1 mg/L. Using the Physical Habitat Assessment, the riparian structure and composition score of Site A was 135 and of Site B was 122 (Figure 10).

## Conclusion

The results allowed for a conclusion to be drawn. Comparing the two streams it appears that Stony Brook, located in North Plainfield is healthier than Alplaus Kill. Although Stony Brook is slightly impacted it is affected less than Alplaus Kill.

Below, Table 1 compares the macroinvertebrate indices; from standard ranges we can conclude that Stony Brook is the less impacted stream, thus healthier. Below Table 1 is Table 2 where the chemical balance of both streams is compared.

Table 1. Macroinvertebrate Comparison of Stony Brook and Alplaus Kill

Macroinvertebrate Indices	Stony Brook	Alplaus Kill
EPT	15	6
Taxa Richness	7	13.5
Percent Model Affinity	94.875%	53.25%
Biotic Index	5.87	3.4



Table 2. Chemical Comparison of Stony Brook and Alplaus Kill

<b>Chemical Balance</b>	<b>Stony Brook</b>	<b>Alplaus Kill</b>
<b>pH</b>	7.3-7.4	7.9
<b>Dissolved Oxygen (mg/L)</b>	8.1-8.5	7.2-7.4
<b>Nitrate (mg/L)</b>	1.6	0
<b>Phosphate (mg/L)</b>	0.1	0
<b>Chloride (mg/L)</b>	69-72.5	NA

The chemical analysis results suggest what the possible impact could be, i.e. phosphate and chloride were moderately high. The causes of the high phosphate and chloride could be caused by the car wash, students, runoff from the cars. The main sources of pollutant could be traffic and litter. The salt from cars and the antifreeze would run into the stream during the winter. During the summer, the fluid from air condition runs into the stream. The traffic and exhaust from the street/ overpass and local highway as well as parking lots also contribute. Both sites are very accessible so their litter often travels into stream.

The car wash was thought to have an effect, but it does not. In October of 2010 and five years earlier the owners preformed an environmental study, Phase 1, to see the effect of the car wash on the stream. In both cases, the study said there was no impact. The soap used is very high grade eco-friendly soap, called EcoLab. About 60-70% of the water is recycled and it is recycling in the town sanitary sewer. Therefore, the car wash does not appear to be the cause of the impact.

Another possible source of pollutants is the road that runs over the stream in several places. From the road, fertilizers and other pollutants could be running into the stream. Phosphate levels are usually high due to the fertilizer, but if that were the case, then the nitrogen levels would be high as well. Another possibility for the high levels of phosphate could be septic leachate. Although there are very few septic systems in North Plainfield, the septic leachate could be coming from Watchung, a neighboring town located above the road. Therefore, septic leachate could be a source of phosphates particularly during low stream flow as found in the summer. We plan to perform a mass loading to predict the phosphate source.

Again, chloride may be coming from the road. Chloride levels usually come from salt; however, it was a dry summer when the sites were tested. Therefore, we do not think salt was the source of chloride. More investigation will need to be performed.

Despite the high levels of chloride and phosphate, Stony Brook remains one of the few high quality urban streams in New Jersey. North Plainfield expends a great deal of effort to sustaining a clean environment. The North Plainfield Environmental Commission (NPEC) monitors pollution and encourages town residents to respect the environment (6). For example, North Plainfield participates in "Clean the Town Day" and "Green Day," and participates in SUSTAINABLE JERSEY™, a certification program for municipalities in New Jersey that want to go green.

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## **Appendix**

Figure 1. Macroinvertebrate Classifications, Site A

Figure 2. Macroinvertebrate Classifications, Site B

Figure 3. T-Test Expression and Solution

Figure 4. EPT Richness Score

Figure 5. Taxa Richness Score

Figure 6. Percent Model Affinity Score

Figure 7. Major Group Biotic Index Score

Figure 8. Aquatext Biotic Index Score

Figure 9. Chemical Assessment

Figure 10. Physical Habitat Assessment

**Figure 1. Macroinvertebrate Classifications, Site A**

Site A				
Order	Family	Genus	Species	#
Amphipoda (Scud) **	Haustoriidae	Pontoporeia	affinis	31
	Gammaridae	Gammarus		24
	Talitridae	Hyaella		9
Trichoptera (Caddisfly)  *	Hydropsychidae	Macrostemum		3
	Philopotamidae	Dolophilodes		2
	Philopotamidae	Wormaldia		3
	Psychomyiidae	Psychomyia		3
	Hydrophilidae	Leucotrichia		1
	Molannidae			5
		Psychoglypha		1
		Parapsyche		3
		Ithytrichia		2
Plecoptera (Stonefly) *	Peltoperlidae	Peltoperla	tallaperla	1
Diptera (Midge Fly) ***	Dixidae	Dixella		3
	Simuliidae	Twinnia		2
Ephemeroptera (Mayfly) *	Macdunnoa			1

Leech-1  
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Gilled Snail-5  
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(\*) Pollution Intolerant  
 (\*\*) Somewhat Pollution Tolerant  
 (\*\*\*) Pollution Tolerant

**Figure 2. Macroinvertebrate Classifications, Site B**

Site B				
Order	Family	Genus	Species	#
Amphipoda (Scud) **	Haustoriidae	Pontoporeia	affinis	15
	Gammaridae	Gammarus		43
	Talitridae	Hyaella		17
Trichoptera (Caddisfly) *	Hydropsychidae	Macrostemum		2
	Philopotamidae	Dolophilodes		5
	Hydroptilidae	Agraylea		1
	Hydroptilidae	Oxyethira		1
	Leptoceridae	Ceraclea		1
Plecoptera (Stonefly) *	Peltoperlidae	Peltoperla	tallaperla	2

Leech-4 \*\*\*

Gilled Snail-2 \*\*\*

Annelids-3 \*\*\*

Waterpenny- 4 \*

**(\*) Pollution Intolerant**

**(\*\*) Somewhat Pollution Tolerant**

**(\*\*\*) Pollution Tolerant**

Figure 3. T-Test Expression and Solution

$$S^2_{n_1+n_2} = \frac{\left( \sum_{i=1}^{n_1} x_i^2 - \bar{x}_1 \sum_{i=1}^{n_1} x_i \right)_1 + \left( \sum_{i=1}^{n_2} x_i^2 - \bar{x}_2 \sum_{i=1}^{n_2} x_i \right)_2}{n_1 + n_2 - 2}$$

$$= \frac{[1730 - 7.69(100)] + [2444 - 5.56(100)]}{13 + 18 - 2}$$

$$S^2_{n_1+n_2} = \frac{961 + 1888}{29} \Rightarrow 98.241$$

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{S^2_{n_1+n_2} \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

$$= \frac{7.69 - 5.56}{\sqrt{98.241 \left( \frac{1}{13} + \frac{1}{18} \right)}}$$

$$t = \frac{2.13}{\sqrt{13.015}} \Rightarrow 0.59$$

**Figure 4. EPT Richness Score**

	Site A	Site B
Average= 15	18	12
<b>EPT RICHNESS SCORE:</b>  >7 = non-impacted 3 - 7 = slightly impacted 1-2 = moderately impacted 0 = severely impacted		

**Figure 5. Taxa Richness Score**

	Site A	Site B
Average= 7	7	7
<b>TOTAL TAXA RICHNESS SCORE:</b>  >13 non-impacted 10-13 slightly impacted 7-9 moderately impacted < 7 severely impacted		

**Figure 6. Percent Model Affinity Score**

	Site A	Site B
Average= 94.875	94.625	95.125
<b>PERCENT MODEL AFFINITY SCORE:</b>  > 64 non-impacted 50-64 slightly impacted 35-49 moderately impacted <35 severely impacted		



**Figure 7. Major Group Biotic Index Score**

		Site A		Site B	
Average= 5.87		5.49		6.25	
<b>BIOTIC INDEX SCORE:</b>	0-4.50 non-impacted	4.51-5.50 slightly impacted	5.51-7.00 moderately impacted	7.01-10 severely impacted	

**Figure 8. Aquatext Biotic Index Score**

		Site A		Site B	
Average= 65.35		68.1		62.6	
<b>BIOTIC INDEX SCORE:</b>					
Excellent > 70 Good 60-79					

**Figure 9. Chemical Assessment**

	<b>Healthy Stream Model</b>	<b>Stony Brook Site A</b>	<b>Stony Brook Site B</b>
<b>Temperature</b>	<b>&lt;17.8°C</b>	<b>20.8°C</b>	<b>19.5°C</b>
<b>Phosphate</b>	<b>&lt;0.1mg/L</b>	<b>0.1 mg/L</b>	<b>0.1 mg/L</b>
<b>Nitrate</b>	<b>&lt;2 mg/L</b>	<b>1.6 mg/L</b>	<b>1.6 mg/L</b>
<b>pH</b>	<b>6.5-8.5</b>	<b>7.4</b>	<b>7.3</b>
<b>Dissolved Oxygen</b>	<b>&gt;5 mg/L</b>	<b>8.5 mg/L</b>	<b>8.1 mg/L</b>
<b>Chloride</b>	<b>&lt;30 mg/L</b>	<b>69 mg/L</b>	<b>72.5 mg/L</b>

**Figure 10. Physical Habitat Assessment**

Habitat Parameter	Optimal	Suboptimal	Marginal	Poor	Site A	Site B
Score	20	15	10	5		
Basin land cover	Near 100% natural	50-75% natural	25-50% natural	0-25% natural	5	5
Riparian width	>18 meters	12-18 meters	6-12 meters	<6 meters	18	15
Riparian structure and composition	Natural structure with predominantly native vegetation	Natural structure but a high percentage of non-native vegetation	Natural vegetation modified and non-native plants predominate	Riparian structure and composition highly disrupted	20	15
Shading	>75% of the water surface of sample reach is shaded	50-75% shaded in reach	20-50% shaded in reach	<20% shaded in reach	15	20
Channel alternation	Channelizing absent or minimal; stream with normal pattern	Slight localized channelizing or evidence of historic channelizing	40-80% of stream reach channelizing	>80% of stream reach channelizing	20	15
Embeddedness	Boulder, cobble, and gravel particles with obvious open interstices	Boulder, cobble, and gravel particles <25% predominately embedded by sand; negligible silt	Boulder, cobble, and gravel particles 25-50% embedded by a mixture of sand and silt	Boulder, cobble, and gravel particles >50% embedded by sand and silt	17	17
Benthic silt cover	No obvious surface deposited silt in reach	Silt deposits common along stream margins	Interstitial silt extensive in mid-channel	Top surface of substratum silt-covered	20	15
Water appearance	Clear and odorless with no oil sheen	Slightly turbid; bottom visible in pools	Turbid; bottom visible in shallow riffles	Very turbid, odiferous, or oily	20	20
<b>Total</b>					<b>135</b>	<b>122</b>

INDEPENDENT STUDY

An Investigation of the Streambed Inhabitants  
of the Stony Brook

Janis Hoagland &

Marlise Reinhold

Adv. Biology

June 11, 1975

A small stream can provide a varied habitat populated by numerous types of plants and animals. The two major areas of a stream in which organisms are found are open water and bottom substrate. Because “creatures of rivers and streams are controlled more by the type of bottom on which they live than by the general physical state of the river,”<sup>1</sup> the type of substrate is the key to the kinds of inhabitants to be found in a brook.

Our independent study was the investigation of the streambed organisms of two sites of the Stony Brook with differing substrate and the comparison between the animals collected from each site.

The Stony Brook is a moderately fast flowing hard-water stream which undergoes no major changes as it flows through North Plainfield. However, for our study we chose two sites where bottom type differed slightly. Both would be considered “eroding,”<sup>2</sup> with streambeds of stones and gravel. The upper site, number 1, is gravel studded with larger stones and rocks; the lower site, number 2, is gravel with an ashy mud beneath and fewer larger stones. In other respects the sites are similar. Following is a table of the other important characteristics of the sites:

	Site No. 1	Site No.2
Width	23 ft.	21 ft.
Depth (Variable w/ Rainfall)	3 in. to 10 in.	4 in. to 14 in.
Bank Slope	Moderate	Fairly Steep and Abrupt
Bank Cover	Weeds, Grass	Weeds, Trees, Mud
Shade	Very Little	Moderate

<sup>1</sup>H.B.N. Hynes, The Biology of Polluted Waters, (England: Liverpool University Press), p. 13.

<sup>2</sup>Hynes, p. 27.

The turbidity of the water was negligible except after heavy rain, the fishing derby which involved the construction and removal of a dam, and dredging operations upstream (near the high school), all of which disturbed the bottom. The water temperature gradually rose from 12oC to 25oC as warm weather arrived, with some fluctuation occurring as the weather conditions varied. Lastly, the pH of the water was consistently 8.5, which is slightly alkaline but within the range of normalcy for a hard-water stream.<sup>3</sup>

Samplings at each site were made weekly at the same time of day and identical collection methods were used at both sites. We limited our study to the bottom-dwelling organisms, excluding plants, algae, and microscopic animals. At each site we took two jars of bottom material with water covering it to be representative samples of substrate with accompanying water. In addition to these, we took as many individual organisms as we could obtain by overturning stones, troweling the bottom and dip-netting and sifting the gravel. We spent approximately forty-five to sixty minutes at each site looking for animals in this way.

The organisms that we found were those to be expected in a stream of the Stony Brook's type. "The inhabitants of the 'eroding' river beds are a rich assortment of worms, leeches, shrimps, insects, mites, and mollusks,"<sup>4</sup> almost all of which we collected. As spring progressed the number of larvae decreased and we started to find pupae and nymphs. There was also a general increase in the number of organisms which we attributed to the greater warmth and longer daylight span.

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<sup>3</sup>Dr. Charles E. Penn. Investigating Water Problems, (Maryland: LaMotte Chemical products Company), p.39.

<sup>4</sup>Hynes, p. 28.

Because “precise identification of organisms to species requires a specialist in limited taxonomic groups,”<sup>5</sup> we identified specimens by comparison of them to the illustrations and verbal descriptions in the texts. This method cannot be totally accurate, but we classified all our organisms as specifically as possible, some to tentative species, others not. A list of the organisms, classified from general to specific, follows:

## Phylum ANNELIDA

Class Oligochaeta – segmented worms

Lumbriculus (Sites No. 1 and No. 2)

Nais (1)

Eiseniella (1,2)

Chaetogaster diaphanous (1)

Class Hirudinea – leeches

Herpobdella punctata (1)

## Phylum PLATYHELMINTHES

Class Turbellaria – flatworms

Planaria maculata (1)

Stenostomum leucops (1)

Crenobia alpina (1)

Dendrocoelum lacteum - milky planarian (2)

## Phylum MOLLUSCA

Class Gastropoda – snails

Family Amnicolidae – limpet snails (1,2)

## Phylum CHORDATA

Class Osteichthyes

Family Cyprinidae – minnows (1,2)

## Phylum ARTHROPODA

Class Crustacea

Subclass Branchiopoda

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<sup>5</sup>Laboratory Manual for Aquatic Biology, U.S. Dept. of the Interior, Federal Water Pollution Control Administration, p. 27-7.

List of Organisms cont'd.

- Order Cladocera – water fleas
    - Genus *Daphnia* (1)
  - Suclass Ostracod (1)
  - Subclass Copepoda
    - Cyclops strenuous* (1)
  - Subclass Malacostraca
    - Order Amphipoda
      - Genus *Gammarus* – scuds (1,2)
  - Class Insecta
    - Order Plecoptera – stoneflies
      - Chloroperla torrentium* (2)
    - Order Tricoptera – caddisflies (larvae) (1)
    - Order Coleoptera – beetles
      - Genus *Psephenus* (larva) – waterpennies (1)
    - Order Diptera – midges
      - Anatopynia* (larvae) (1,2)
      - Diamesa* (larvae) (1,2)
      - Cricotopus sylvestria* (larvae) (1,2)
- Also several pupae of this order (1,2)

Unclassified: eggs in a gelatinous mass on a rock which hatches into probably immature fish that died immediately (2)

Of the two sites, the upper one yielded more variety of organisms, especially of the annelids, flatworms, and crustaceans. The larger stones in the first site on which algae grow provide a better environment for those animals not found at the second site.

The water pennies, which are beetle larvae and feed on the algae, were abundant at site no. 1 but lacking at site no. 2. The crustaceans are dependent on these algae and so were more numerous at the upper site.



Also, caddis fly larvae make their cases of fine gravel upon the larger stones and accordingly were found only at the upper site. Conversely, at the second site, the finer gravel and mud provide a better habitat for burrowing larvae and worms so were found greater numbers of these there than at the upper site.

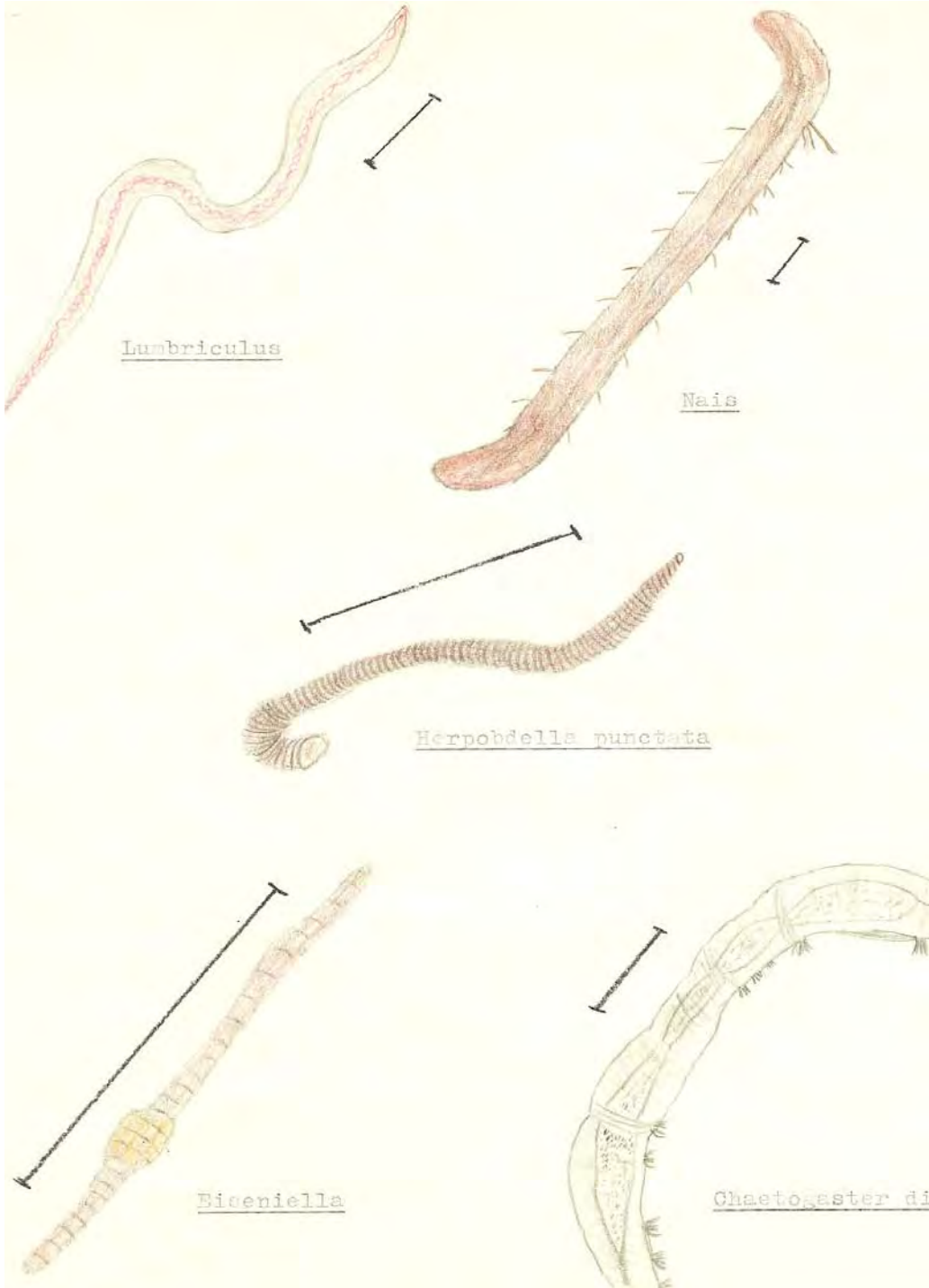
A secondary conclusion that can be drawn from the abundance and variety of life in the water is that the Stony Brook is not very polluted. Although we did not chemically analyze the water, the presence of some of these organisms indicates clean water. “Stonefly nymphs...and caddis fly larvae represent a grouping (sensitive or intolerant) that is quite sensitive to environmental changes. Black fly larvae, scuds, sow bug, snails,..., and most kinds of midge larvae are intermediate (facultative or intermediate) in tolerance.”<sup>6</sup>

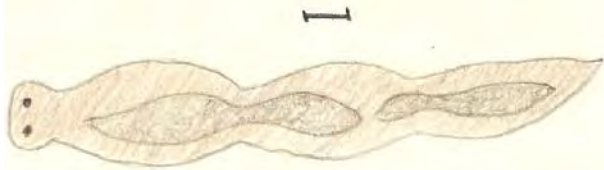
Our study of the brook was by no means complete. Bad weather and rain, the dredging, and the fishing derby were unforeseen occurrences which hampered our project. Our inexperience caused us to make some errors and oversights which led to inaccuracy. Also, seven weeks in not time enough to fully investigate a stream community because of the overlapping life cycles of the organisms. Most expert studies entail weeks of preparation and then several months to a year or more to accomplish and interpret.

Despite these limiting factors, we learned great deal about the animal community of a brook. Most of the organisms we found are not even noticed if one does not know where to look and what to expect. We have gained valuable experience for any future studies of this sort and general knowledge of fresh-water biology, as well.

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<sup>6</sup>Laboratory Manual for Aquatic Biology, p. 27-3.

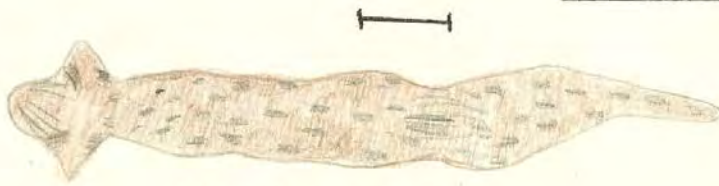




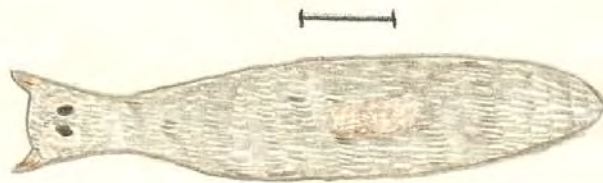
Stenostomum leucops



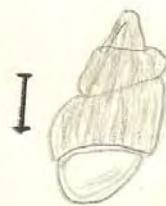
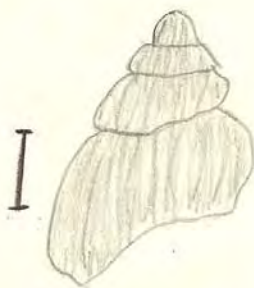
Dendrocoelum lacteum



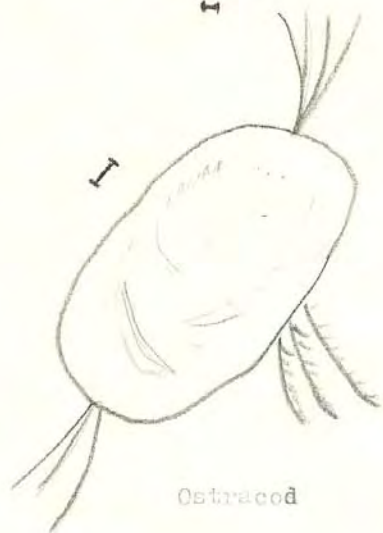
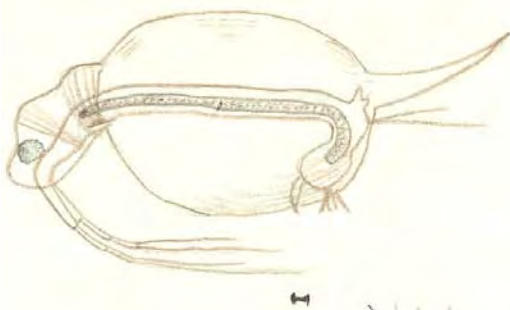
Planaria maculata



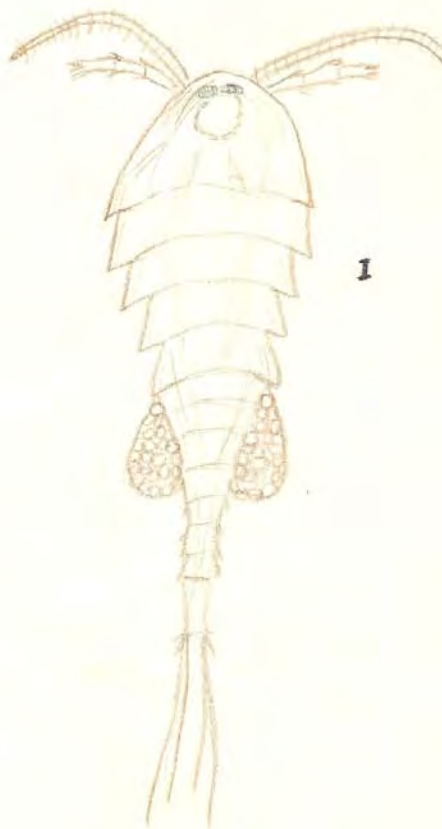
Crenobia alpina



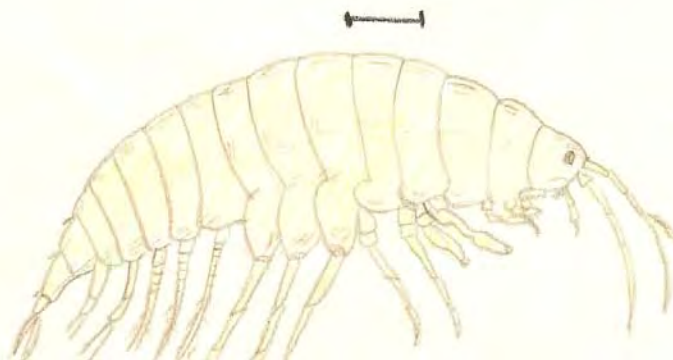
Daphnia

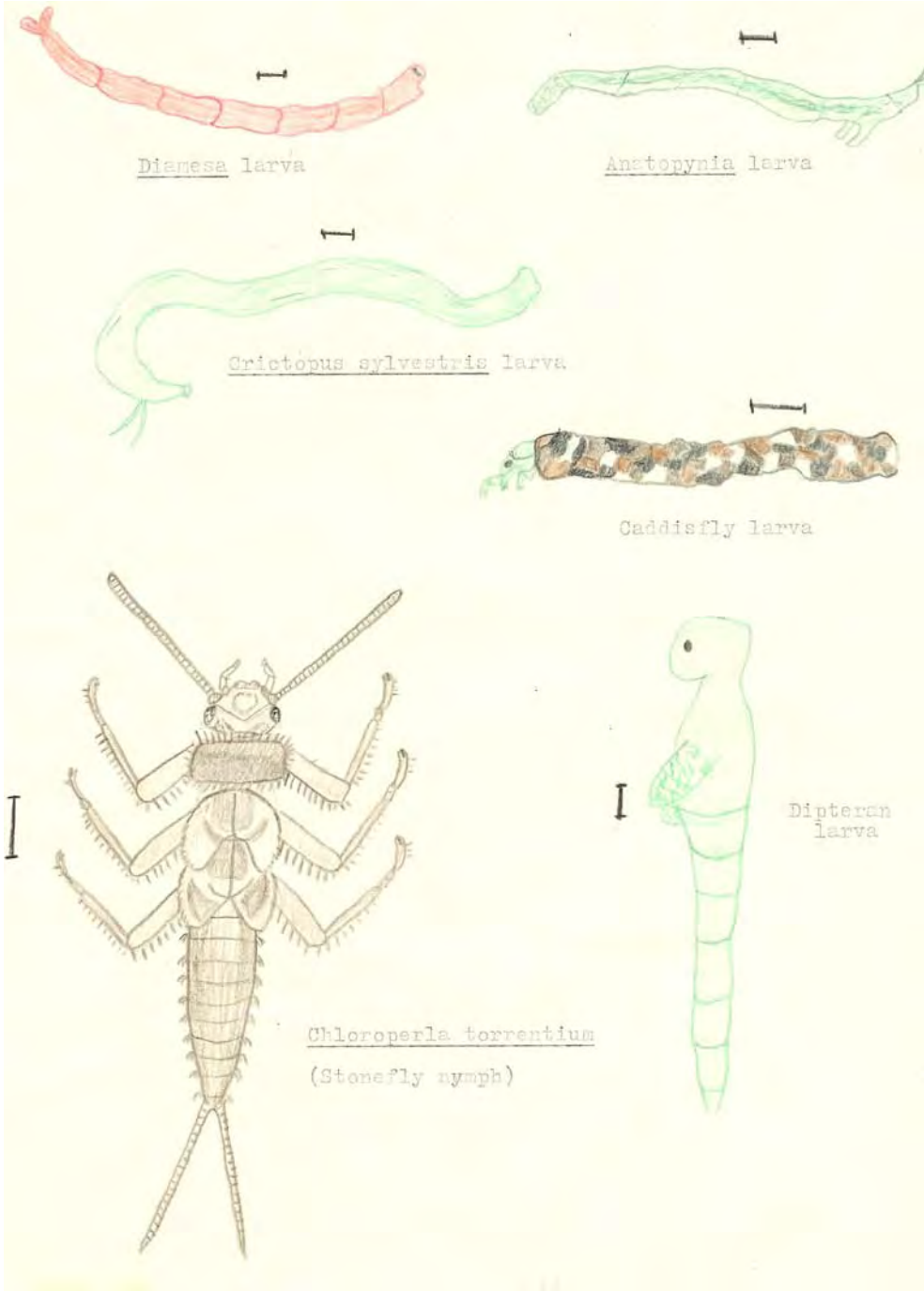


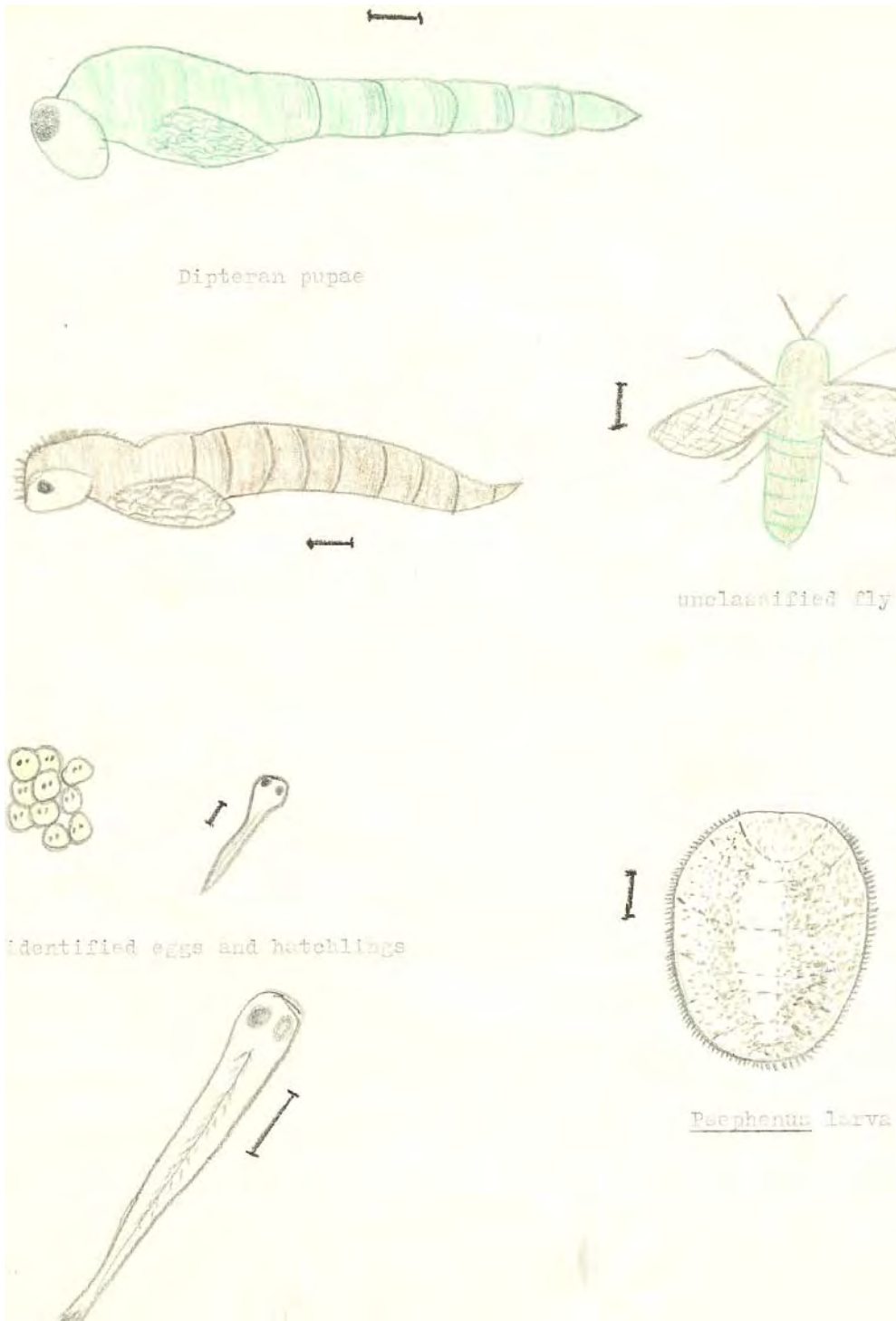
Ostracod



Cyclops strenuus







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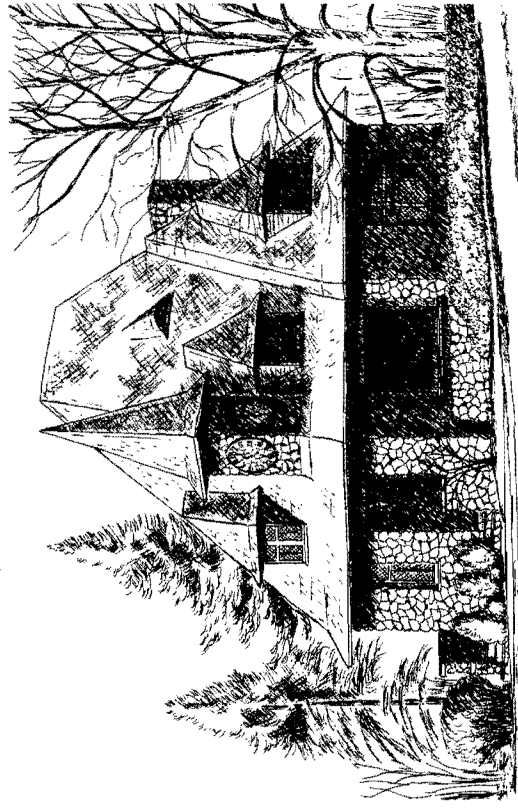
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MAP - The Stony Brook





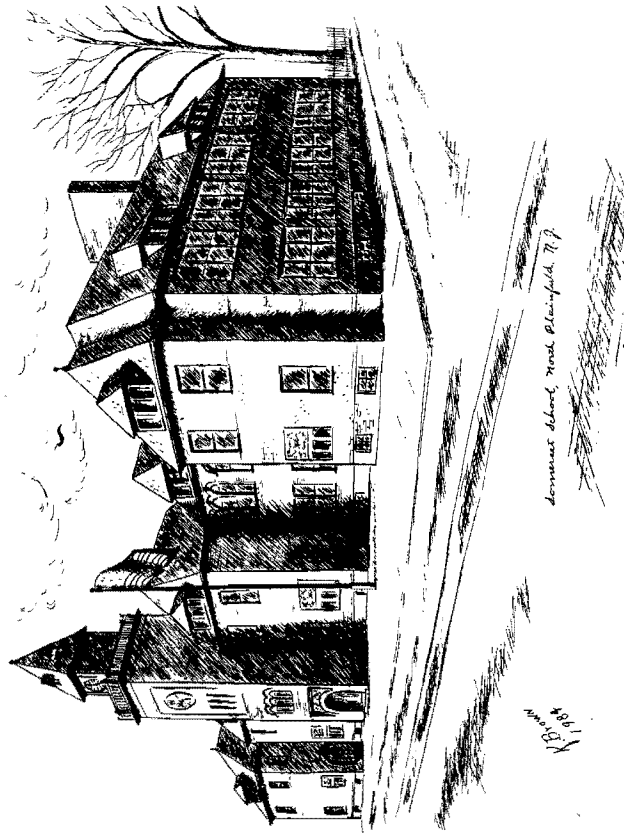
# Looking Back



A. Brown  
1884

Old Hyde gate house  
North Plainfield,  
N.J.

## A History of North Plainfield



A. Brown  
1904

Common school, North Plainfield, N.J.

## The Blue Hills Historical Society of North Plainfield



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## ***Introduction***

The Blue Hills Historical Society of North Plainfield has prepared the following booklet as part of its contribution to the Centennial Celebration of 1985. It has been written with a two fold purpose: many residents new or unfamiliar with our town will learn its history and, for those who have been born here or lived here most of their lives, we hope these pages will stir warm memories of days gone by.

The Society has endeavored to combine documented facts with stories told by local residents in order to present an account of important events from the earliest times down to today.

The pictures, maps, and stories have been carefully selected to help the reader develop a feeling for the past and understand the growth of our town from Indian trails to macadam roads, smoke signals to modern radios and from bark houses to large gracious mansions.

We sincerely hope all the readers will take pride in our rich heritage and see how the town of North Plainfield has progressed during the last 100 years. By learning from the past and working together in the future we can keep North Plainfield "A Proud Community".

Borough of North Plainfield, New Jersey  
Municipal Building: 263 Somerset Street  
07060

Telephone: 756-4600



STEVEN NOVAK, JR.  
MAYOR

Dear North Plainfielders:

North Plainfield in 1985 will be celebrating its 100th anniversary. Thanks to the efforts of many fine elected officials, public employees and volunteers who have served on committees and commissions, North Plainfield has progressed and yet still remained a proud, tree-lined, suburban community over the last 100 years. It is a town of tradition and history, made up of many ethnic groups, and having many active clubs, organizations, and church groups.

The government of North Plainfield has become a humanistic business that is concerned with the planning for our children's children and preserving the history and tradition of the past.

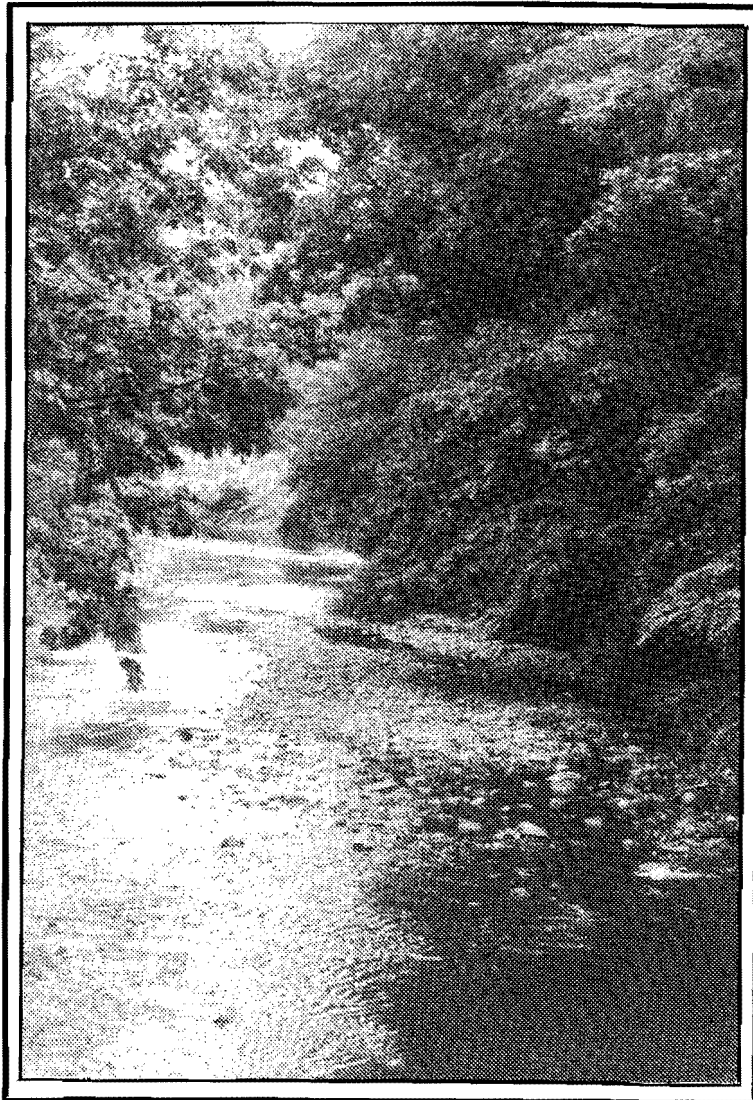
Residents in 1985 will be able to participate in our Centennial Celebration, that has been worked on by many residents and community groups. Featured attractions will be the North Plainfield weekend, of June 8th and 9th, an exciting fireworks display, a parade, dances and balls, a time capsule and many other gala events throughout the entire year that have been planned by the Centennial Committee. It should be a proud moment for all those living and visiting North Plainfield in our Centennial Year, 1985.

Happy Anniversary,

*Steve Novak, Jr.*  
Mayor Steve Novak, Jr.

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## Beginning

Nestled in the northeast corner of Somerset County lies the small boro of North Plainfield. It is bordered on the northwest by the first ridge of the Watchung Mountains and, on the south and east, the Green Brook provides a natural boundry between Union and Somerset Counties. Rock Avenue, on the west, divides the towns of North Plainfield and Green Brook.

Flowing through the town are two main waterways, the Green Brook, as mentioned, and the Stony Brook. These two streams now quietly flowing through the Boro were once an important source of power and because of the rich, fertile soil along their banks many early settlers made this area their home.

Originally, Somerset County operated as a single township. In 1769, by Royal Charter, Bernards Township was formed out of the northern precinct of the county.

On March 5, 1806, Warren was created as a separate township composed of the present day North Plainfield, Warren, Green Brook and Watchung.

On April 2, 1872, an Act of the New Jersey Legislature was passed, which divided North Plainfield Township from the Township of Warren. This new township included the towns of North Plainfield, Watchung and Green Brook.

The boundries of this new township are described below in the Act, known as Assembly No. 113.

### ASSEMBLY NO. 113

AN ACT TO CREATE A NEW TOWNSHIP IN THE COUNTY OF SOMERSET, TO BE CALLED THE TOWNSHIP OF NORTH PLAINFIELD.

BE IT ENACTED BY THE SENATE AND GENERAL ASSEMBLY OF THE STATE OF NEW JERSEY, THAT ALL THAT PORTION OF THE STATE OF NEW JERSEY, THAT ALL THAT PORTION OF THE TOWNSHIP OF WARREN, IN THE COUNTY OF SOMERSET, LYING WITHIN THE BOUNDARIES AND DESCRIPTIONS FOLLOWING, TO WIT: BEGINNING AT A POINT IN THE CENTER OF GREEN BROOK, NEAR SEBRING'S GRIST MILL, AND CORNER OF WARREN AND BRIDGEWATER TOWNSHIPS: FROM THENCE ALONG THE BRIDGEWATER LINE AND WARREN, TO THE CENTRE OF THE PUBLIC ROAD LEADING FROM BOUND BROOK TO WASHINGTON VALLEY: FROM THENCE, A STRAIGHT LINE IN A NORTHEAST-ERLY COURSE, TO A POINT IN THE LINE OF UNION COUNTY, ON THE FARM OF THOMAS ROGERS, AND IS THE CORNER OF NEW PROVIDENCE TOWNSHIP, FROM THENCE ALONG THE LINE OF NEW PROVIDENCE AND WARREN TOWNSHIPS, TO A POINT IN THE LINE OF WESTFIELD TOWNSHIP: THENCE ALONG THAT LINE AND THE LINE OF WESTFIELD TOWNSHIP: THENCE ALONG THAT LINE AND THE LINE OF PLAINFIELD TOWNSHIP, TO THE LINE OF PISCATAWAY TOWNSHIP, IN THE COUNTY OF MIDDLESEX, THENCE ALONG THE LINE OF SAID PISCATAWAY TOWNSHIP TO THE AFORESAID POINT IN THE CENTER OF GREEN BROOK, AND PLACE OF BEGINNING, BE AND THE SAME IS HEREBY SET OFF FROM THE SAID TOWNSHIP OF WARREN AND CREATED INTO A NEW TOWNSHIP TO BE CALLED AND KNOWN BY THE NAME OF THE "TOWNSHIP OF NORTH PLAINFIELD".

North Plainfield was set off from the Township in the year 1885, Watchung in the year 1926, and Green Brook in 1932.

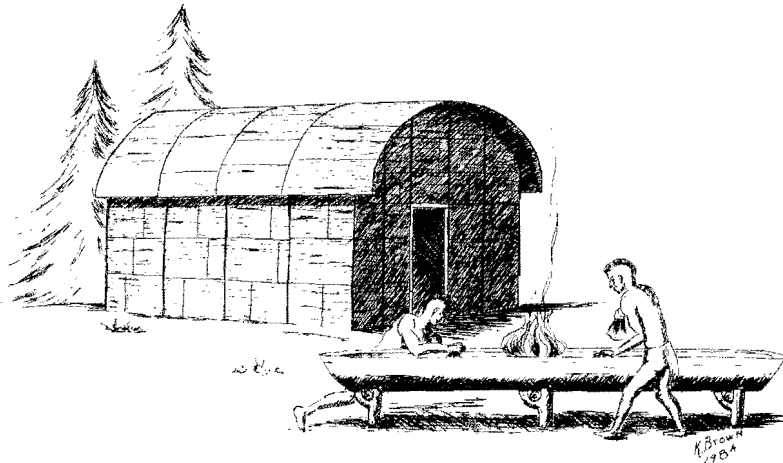
## First Inhabitants



Blondyn Plains was the name given to this area by Benjamin Hull when he purchased it from the Indian "Cowankeen," in 1683. In 1685 Peter Sommans, patented 3,500 acres, including all from the base of the Watchung Mountains to a little southeast of Eighth Street. This tract included North Plainfield and part of Plainfield. It is said that the Indians settled in the area because of its closeness to the water, the fish in its brooks, and the crystal clear springs which supplied them with drinking water they called "sweet water".

The Lenni Lenape, whose name means "Original People" in their own tongue, were members of the Algonquin nation. Just previous to the arrival of Europeans, the Indians had been subjugated by their enemies, the Iroquois, who forced them to pay a yearly tribute in Wampum, assume the name of "women" and give up the use of arms.

Village life centered on the long house where tribal ceremonies were held. Private homes were simple and consisted of green saplings bent over and fastened at the top and then covered over with bark, skins or grass mats. There was a hole in the roof to let smoke escape. Inside there were platforms around the outer wall which served as seats or beds.



For food, the Indians grew maize, beans and squash, but they were mainly dependent on hunting and fishing.

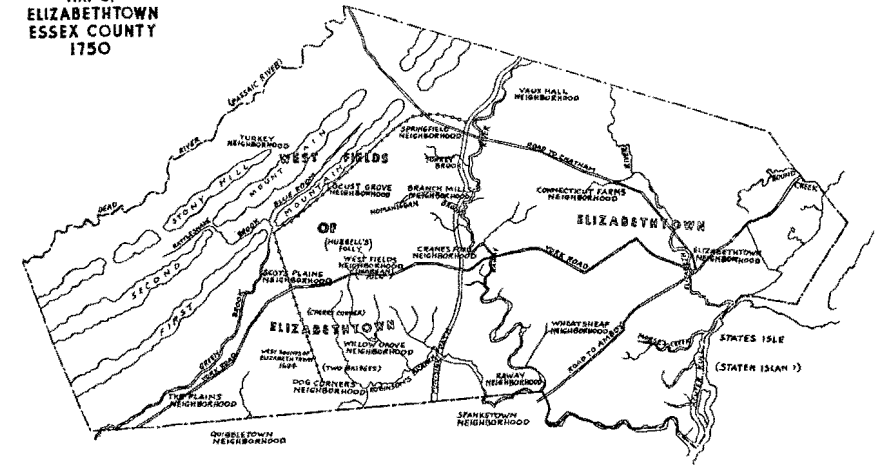
In a description of the Naraticongs who lived north of the Raritan River, we find that their clothing consisted of a blanket or skin thrown over the shoulders, deerskins fastened with thongs about the legs, feet covered with deerskin moccasins ornamented with quills and wampum beads.

Wampum was a form of money used by the Indians. This consisted of a series of beads made from ordinary clam shells and strung on thongs or sinews of animals. Wampum was the term applied to white beads and suckanock or black wampum, to violet or blue beads with the latter worth twice as much.

The Indians traveled on narrow foothpaths and on the local waterways, which were much deeper 300 years ago. The Indians also had a large network of cross-country trails. One of their main trails, the Minnisink Trail, came through the Watchung Notch and down present day Somerset Street. Another of the borough's main thoroughfares, Greenbrook Road, was also once an Indian trail. The name Watchung... "wachunk" (in the Minnisink dialect) means "high mountain."

When the Indians left this area for good is not known. We do know, however, that there were still some Indians in the area during the Revolutionary War. Tradition states that there were Indian wigwams located near Washington Rock in or about 1777. On May 14, 1779, a brigade from camp Middlebrook located in the mountainside in Bround Brook was paraded in review before General Washington and a number of Indian chiefs.

MAP OF  
ELIZABETHTOWN  
ESSEX COUNTY  
1750



## ***First Families***

The history of any community depends upon the people who settle in the area, work the soil and gradually develop the land from vast forests and vacant streams to small towns with thriving industries using waterpower from nearby waterways. The early settlers of North Plainfield developed their town much the same way. Many of the early pioneers in this area were Quakers who emigrated from England to escape religious persecution. They traveled inland on the local waterways and settled along their banks. There were no roads, only the narrow Indian trails.

Among this early group of settlers who were in this area before or around 1778 were: Vermeules, Vails, Cadmus, Marselis, Boices, Mannings, and the Drakes.

### **THE VAILS**

The Vails are one of the first families to come and settle along the Green Brook. John Vail is found in the annals of Salem, Massachusetts around the year 1650, is later discovered in Westchester county, New York and in about the year 1685 John is found in the providence of East Jersey. It is not known who John married, but two sons were born to the family. John born 1685 married Martha Fitz Randolph and owned a farm on both sides of the Green Brook extending from the area of Richmond Street in Plainfield, over the brook and into the Netherwood Avenue area of North Plainfield. Steven Vail a brother to John owned property in the area and his son John in 1730 owned land in the borough. On a map of 1778, the farms of Joseph, Abraham, David and John Vail are located on the east side of Somerset Street bordering the land of Andrew Drake. These properties ran from Front Street, Plainfield to the top of the mountains.

### **THE VERMEULES**

In the year 1693 a young man named Adrian Vermeule journeyed to America to visit with friends who had made the trip a few years before. Enjoying the rugged lifestyle in America, Adrian decided that he would stay and make America his home. In the year 1708 he is found in Bergen County, New Jersey. He was well known in the town and held the jobs of town clerk, school master, and court messenger. In 1708 Adrian married Christina Cadmus. It is here in Bergen County that their two sons Cornelius and Frederick were born.

Adrian died in the year 1753, however, before that he purchased 160 acres with his brother-in-law, Dirck Cadmus, of Bergen. This property ran from the top of the Watchung Mountains to what is now Eighth Street in Plainfield. The property also ran west from West End Avenue to Jefferson Avenue in Dunellen.

Upon this land in 1736, Cornelius and his brother Frederick built a large Dutch home and soon named their property "The Blue Hills Plantation." This name was chosen because of the blue haze that would settle over the Watchung Mountains.

In 1808 this large home was torn down or burned, and replaced with another home. In the kitchen of the new house beams from the original Dutch house can be seen.

Frederick Vermeule never married, and in 1740 his brother Cornelius married Mary Marselis. To this marriage four boys and two girls were born. The first born was Adrian and he married Elizabeth Field and built a home on Rock Avenue. Gerritge second born (1744) married Capt. Jacob Sebring. Eder born January 2, 1748 married Elizabeth Myer and built his home on Myrtle Avenue. Frederick born February 8, 1751, married Altea Sebring and it is said he remained at home to take care of the farm. Christina born November 4, 1754 was unmarried. Cornelius born June 30, 1757 married Elizabeth Middagh and built his home on Greenbrook Road. (the house now sits on Mountainview Drive) Dinah the last child was born September 25, 1759 and married Richard Field.

Cornelius and each of his four sons served in the Revolutionary War and it was at this time that the Vermeules donated the land to the government so that a fort could be built to protect the Old York Road and the "Notch", at Somerset Street, in the mountains.

In 1775 Cornelius was elected a member of the Somerset Committee of Correspondence, and elected a member of the Provincial Congress.

It is stated in the Early History of Plainfield, "that in 1734 William Webster purchased of Peter Sommans a tract extending north from present Watchung Avenue to John Vail's land. After Sommans' death, his executor, sold the remainder of the tract to Isaac Drake, Isaac Manning, Peter Wooden, Andrew Drake, Thomas Clawson, Richard Lenox and the Vermeules, all before 1745."

Issac Manning, who purchased the tract lying northeast of Dirck Cadmus, between the mountain and Green Brook, was the brother of James Manning who built his house on the west bank of the Cedar Brook in 1729. Between the farm of Isaac Manning and the present Somerset Street was Peter Wooden's farm, and, just northeast of Somerset Street, was Andrew Drake.

In 1745 Luke Covert purchased a Proprietary title from Durmond and Alexander, successors to Sir Evan Cameron, to the land southwest of the Vermeules, reaching from Clinton Avenue to a little beyond Rock Avenue. Southwest of his farm was the farm of Ide Marselis, who had settled there about 1735. Marselis was of another old Bergen family and in 1740 Cornelius Vermeule married his daughter Maritie. Luke Covert, the son of the first Luke, married another daughter of Ide Marselis, Annatie.



*Battle of Blue Hills — painting by Floyd Gellerman, DuCret School of Art.*

## Revolutionary War

During the years of the Revolutionary War the Vermeule family and the property that they owned played an important part in the events that were to later follow. Cornelius Vermeule had four sons from the ages of 18 to 33; each of these sons and the father, Cornelius Vermeule, did his share in the fight for independence. The British had entered New Jersey and many of its roads and passes needed protection. It was at this time that General George Washington realized that a fort was needed in the area. Cornelius Vermeule, who at this time owned 1200 acres of land, did not hesitate when asked if the fort could be built on his property.

“Early in 1777, the camp was established by Colonel Winds. He and his staff were quartered at the Vermeule homestead, where all was a-bustle for they were building a large fort at the camp. Every resource of the plantation and of the Blue Hills, from Scotch Plains to Quibbletown, including horses, cattle, slaves, and material, was drawn upon. Eder Vermeule’s new house and the new mill on Green Brook were given over to the Army. Over the brook, half a mile west of the fort was the Vermeule homestead, with its great Dutch barns, slave quarters, and abundant equipment. The two mills on Green Brook furnished flour, feed, sawed lumber, and firewood.”

Speech by C. Vermeule

The fort was built to defend the notch in the Watchung Mountains at Somerset Street and the Old York Road, now Front Street. This road was also known as the Quibbletown-Scotch Plains Road.

On January 5, 1777, General Winds led his men from this fort to the battle of Spantown to aid in an attack by the enemy.

“It was from this fort on January 7, 1779, that Adrian Vermeule, eldest son of Captain Cornelius, set out on a scouting trip towards the enemy’s base at New Brunswick. On his return when near Quibbletown, he was overtaken by a British platoon, wounded and carried off a prisoner; dying in the old Sugar House, the British prison, in New York on March 9 following.”

Adrian was a dispatch-rider and minute man and it is said that his father Cornelius Vermeule never got over the news of his son’s death.

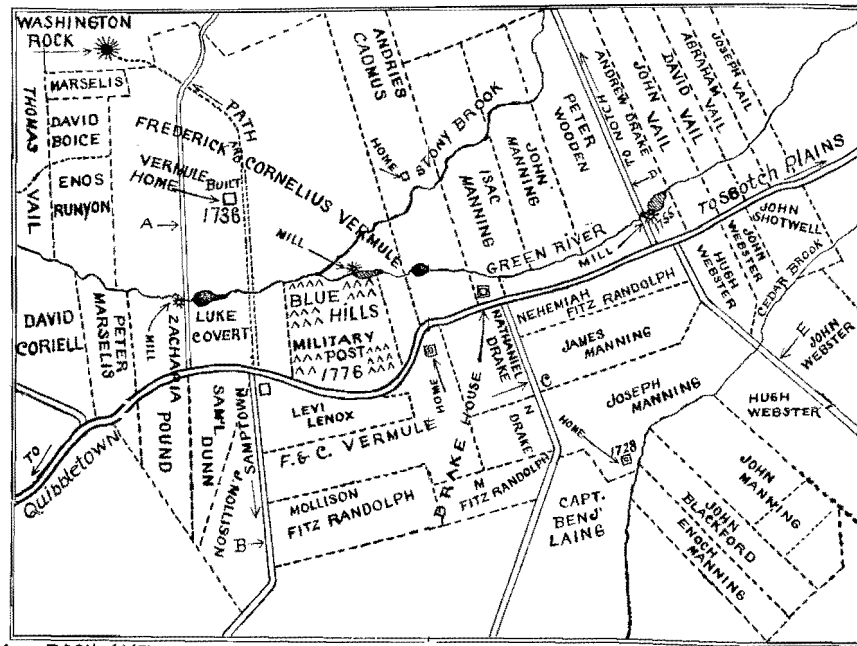
“Dr. Richard Middagh Vermeule wrote in 1852, that his grandfather Cornelius Vermeule fed and lodged all the officers of one of General Washington’s regiments for about one year, during the gloomiest periods of the national struggle, and never asked or received pay of the government.”

It was at this point that Washington Rock was utilized as a lookout post. Washington Rock, once located in North Plainfield Township, at an elevation of 511 feet offered Washington a superb view of British troop movements on the plains below. A story passed down through the Vail family states that Washington and an aide, while camped at Middlebrook, were riding through the area trying to locate a good lookout point. Coming across a group of men he inquired if any of them knew of a spot on the mountain where he could secure a good view of the plain below. Edward Fitz-Randolph, one of the group, replied that he knew of such a spot and that if he had his horse, he would take him to it. Washington then requested his aide to dismount, and Fitz-Randolph, mounted on the aide’s horse, guided Washington to the rock.

“General Washington came to the Vermeule plantation to watch the enemy’s movements. The rock on the brow of the mountain there, was a far better point of observation than Chimney Rock, so after the enemy left New Brunswick, he transferred his headquarters to the homestead.”

The militia stationed at the post referred to it as being “at the Vermeules”. General Wind’s Brigade, the nucleus of this garrison, numbered over 600 men, its full strength being twice that, but in the militia one-half served each successive month, alternately. The entire garrison of this post must have fluctuated from about 1,000 - 2,000 men. Troops stationed here consisted of most of the militia of Morris and Sussex County, the First Essex Regiment and the First Somerset under Col. Frederick Frelinghuysen. The First Essex was a company made up of men from what is now Plainfield, and the First Somerset, the company of Capt. Gavin McCoy included usually Frederick and Cornelius Vermeule and most of the young men from North Plainfield. There were also troops from Hunterdon and the First Middlesex Regiment.

# ORIGINAL MAP BY CAPT. CORNELIUS VERMULE 1778



A — ROCK AVE.  
 B — CLINTON ..  
 C — PLAINFIELD AVE.  
 D — SOMERSET ST.  
 E — WATCHUNG AVE.  
 SCALE, 4 3/4" TO MILE  
**OLD MAP 4 3/4" X 7" ENLARGED BY G.S. DUFFORD 1934**

A series of beacons set up in the Watchung Mountains provided the local militia men with an early warning system. The string of beacons eventually reached from West Point to Princeton with three additional sites in Monmouth County. Central to the entire system was the string of beacons in the Watchungs. Washington himself asked that the beacons be built of logs in the form of a pyramid, 16-18 feet square at the base, and about 20 feet in height. The interior was filled with brush. The lighting of any beacon was a signal to fire all the others. Within minutes, a warning of approaching British troops could be spread hundreds of miles, alerting militia forces as far away as the Delaware River. During the day, lookouts in the Watchungs would fire cannons to warn of enemy attack.

Men from the Blue Hills Militia Post fought in the battles of Quibbletown, Short Hills, Springfield and many others in the area. It was also from this fort that protection was given to the area to keep it from being pillaged and plundered.

In 1778 the Blue Hills fort also saw action when the men returned from the battle of Monmouth, one of the worst in the state.

In June of 1780 the battle of Springfield was the last important battle to be fought on Jersey soil, and the men from the Blue Hills Militia post once again did their duty to protect their country from 7,000 British troops. The fighting and alarms continued from the 3rd to the 17th, while up the road by the militia post streamed the Middlesex and Somerset men. Lieut. Eder Vermeule was among the Essex troops, and Capt. David Smalley's company with the First Somerset Brigade, including Issac Manning and Cornelius Vermeule Jr., also went forward with them.

In August, 1781, many American troops passed by the fort on their way to Yorktown. These troops came by way of the highway through Scotch Plains.

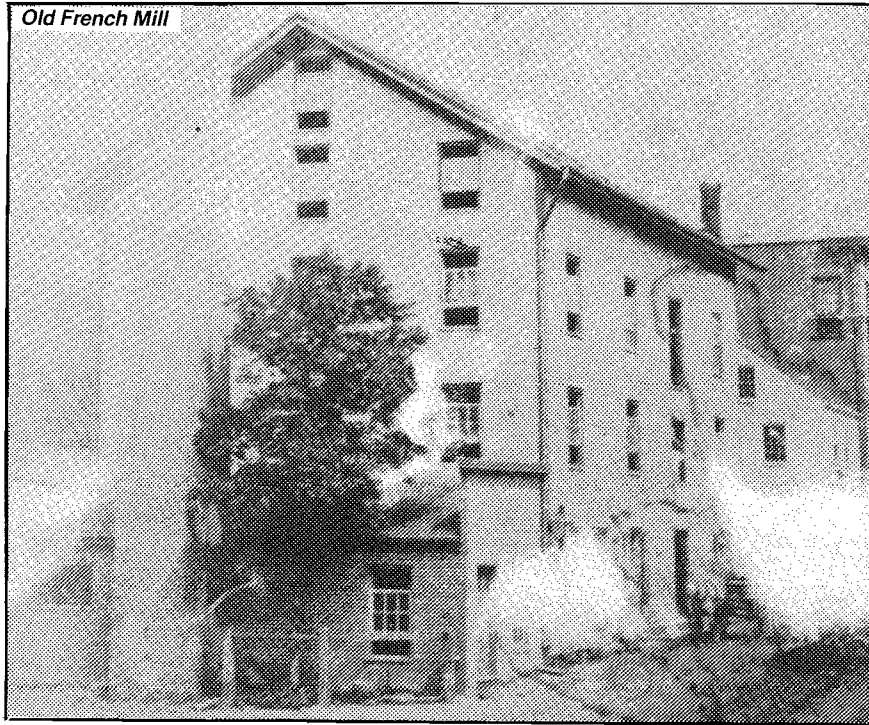
Cornelius Vermeule died on March 15, 1784, but the history of the fort continued. In 1799, when it looked like there would be war with France, Washington, remembering the fort, located a regiment there.

In March, 1803, Captain Cornelius Vermeule purchased his part of the old camp back from the government, just five months after he had resigned his captaincy. Celebration was held at the fort for the man who had served his country for 27 years. In 1816, Vermeule purchased the remainder of the camp at \$70.00 per acre, the government having paid him \$50.00 some years before.





Old French Mill



## Early Industries

As early pioneers settled into the different regions of the country there were certain basic needs that they all required. Each settlement or village had to be self-supporting and certain necessities had to be provided. In the Blue Hills section of New Jersey, towns were developing along the Green Brook and early mills were set up along its banks. In the 1700's every village had at least one saw mill, grist mill, fulling mill, or carding mill.

A saw mill is described in the book, *Village at the Crossroads*, as a wooden shed along a stream covering a steel saw which was driven by a wheel about 2 feet in diameter. The wheel had short spokes and when water struck the bottom blades it revolved making a noise like a bird fluttering hence the name flutter wheel.

A grist mill was where early settlers took their grain to be ground for other uses. It was composed of two large millstones between which the grain was poured. The different textures of grain were determined by the miller who would change the amount of space between the stones. The mill was run by waterpower, a large waterwheel being on the outside of the building turning very slowly.

The fulling mill compacted the fibers and removed any extra oil in the handwoven cloth. The cloth was put in a large tub with lye soap and then a waterwheel, slowly turning, made wooden mallets pound the material. When this was completed, the material was stretched and dried. Many

fulling mills often dyed the cloth as well. One could always tell dyeing day by the color of the water in the Green Brook.

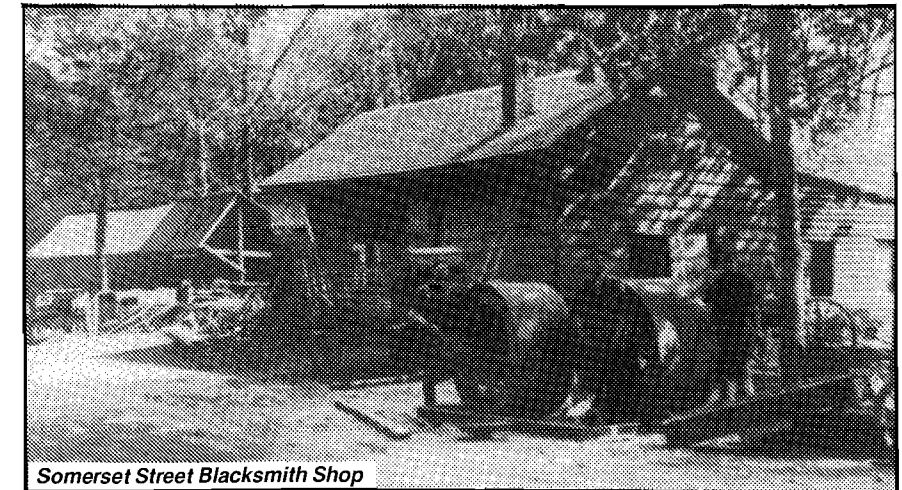
At the carding mill the process was one in which fibers, such as cotton, worsted, or wool, were manipulated into sliver form prior to spinning.

It is said that the Vails were the first family in the area and they settled along the Green Brook in the 1600's. Along the brook they built a fulling and carding mill.

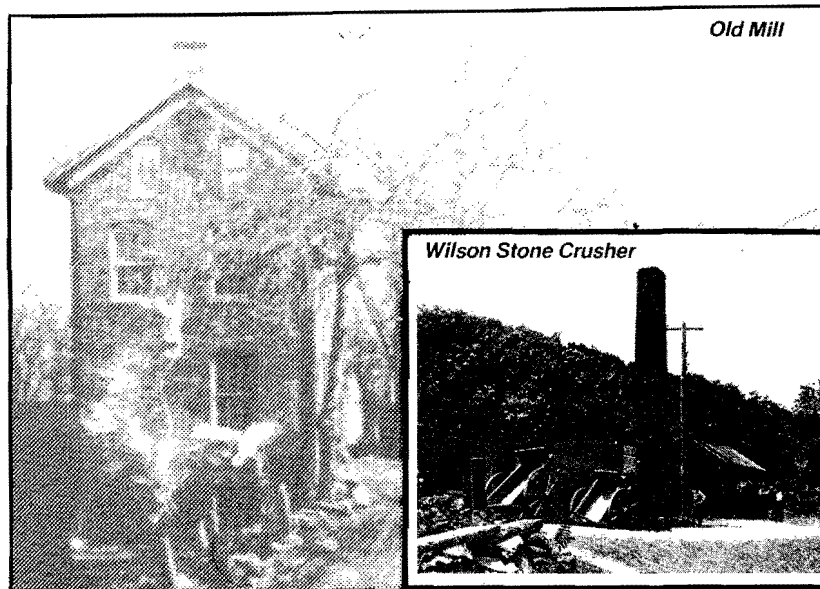
The next mills we find were the saw and grist mills of Frederick and Cornelius Vermeule. The sons of Captain Cornelius Vermeule built their mill in the area which is now Rock Avenue. According to early documents this was in 1750. In 1777 we find another saw mill on the property of Eder Vermeule. Eder Vermeule lived on the brook. His house is located at 113 Myrtle Avenue. The mill was located between the house and West End Avenue. This saw mill played an important part in the building of the Blue Hills Militia Post. Also on this property, but closer to West End Avenue, was a grist mill. Both of these mills played an important role in the building of the area.

One of the earliest of all the mills in the area was a grist mill built about 1755. The rights to operate this mill were given by the King of England. The mill was originally on the Cedar Creek but during the year 1782 it was moved to the Green Brook where it ground grain for many of the settlers in the area. The mill was purchased by P.M. French who operated it until 1900. Located on Mountain Avenue (Somerset Street) and Front Street the mill was on a direct route from Watchung and many farmers brought their grain down the mountain to be ground. It was P.M. French who had the Wetumpka Dam built on the Stony Brook in the Watchung Mountains to increase water power.

In the early 1800's another important business or industry, hat making, was developing along the Green Brook. Around the year 1812 G.W. Randolph established a hat shop on Front Street and twenty-five years later there were fifteen hat shops located along the Brook.



Somerset Street Blacksmith Shop



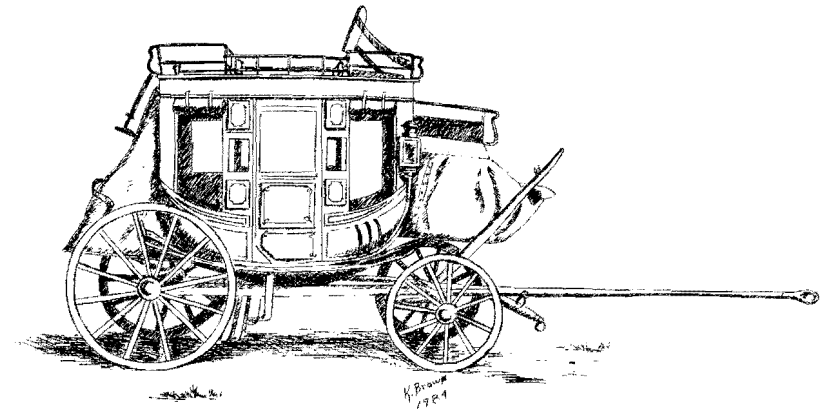
No village could be without a blacksmith and North Plainfield was no exception. Abraham Thorn, blacksmith, had his "smithy" shop on Somerset Street. The Thorns were an old family in the area and owned and farmed land along the Green Brook. A blacksmith shop consisted of a large fire or forge fanned by hugh bellows. The smithy would set a piece of iron into the fire to get hot and would then hammer it on an anvil into the shape he wanted. Many blacksmiths would make hinges, horseshoes, tools, and rims for early wagons. The shop was a very hot and busy place in early days.

In the area, but not in the boundries of the town of North Plainfield, were copper mines. It is said that the early Indians used the copper to make jewelry and other fancy trinkets. In the early 1800's copper was being mined in the area of Watchung with one mine being on Valley Road and another at the Stony Brook gorge below the Watchung circle.

In the year 1887 there were six rock quarries in Warren County, quarrying sandstone and traprock. On upper Somerset Street was located the Wilson Stone Quarry.

In the year 1900 a silk mill was being built in North Plainfield at the corner of Brook Avenue and Pearl Street. The T.J. Mitchell Company of New York erected a brick building two stories high and 50 by 75 feet in size. In 1916 a second addition was added and a third in 1920.

The original name was the Em-Ess Silk Company and as time went on the name was changed to the Jersey Silk Mills. According to The Courier News, raw silk from Japan was brought across the Pacific Ocean, through the Panama Canal and up the Atlantic seacoast to the City of New York. New York sent the great bales to the factory on Brook Avenue, where the silk was cleaned, dried, wound on spools, and spun through looms into finished cloth.



## ***Indian Trails To Macadam Roads***

When the first settlers arrived in the area, the only roads they had to use were the narrow trails the Indians made many generations before. The trails only allowed room for a horse or person on foot. However, as more and more settlers arrived wider roads were needed to allow for the passing of wagons and carriages of farmers as they traveled to the mills and villages where their grain was ground and supplies were purchased.

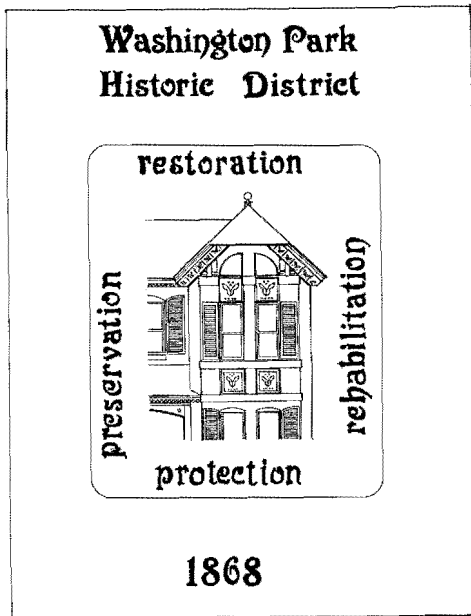
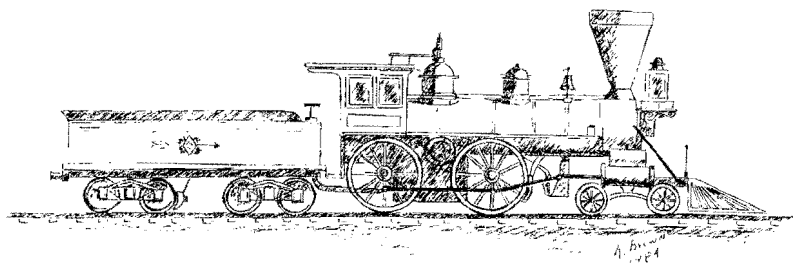
Settlements and farms became scattered across the mountains and valleys as highways were built. Many of these highways were built by the King of England, thus the name "The King's Highway". They were built on old Indian paths which usually traveled across the state. One such highway in our area was known as the Old York Road. The road was built over the Naraticong Trail which the Indians used each season as they journeyed across New Jersey on their way to the Delaware River. The Old York Road, was given its name by the citizens of Philadelphia because the road ended at New York. The ride was often long and bumpy and took many days of travel. The trip was usually made once a week and many stops were made along the way. As the years went on and the country became more populated, faster and safer ways of travel were needed. According to the book, "Old York Road", a law was passed in 1765 providing for the appointment of "Road Commissioners to run out straight public roads between New York and Philadelphia, five acres to every 100 to be set aside for roads. So it was that east of the Somerset County Old York Road Survey the Naraticong Trail, which, until this time had been but little more than a bridle path, was that same year widened and improved from Bound

Brook to Quibbletown, thence it went over what then was known as the Scotch-Plains-Quibbletown Road which ran then, as now, thru Plainfield (Front Street)." This road continued down Front St. and thru Scotch Plains, Westfield, Garwood and Elizabeth until it reached New York. Until 1839, the Old York Road was still considered one of the most picturesque highways in the state.

In February, 1831, the Elizabethtown and Somerville Railroad Company was granted permission by the New Jersey Legislature to build a railroad from Elizabeth to Somerville. The train was to make stops at the towns of Plainfield, Westfield, Scotch Plains and Bound Brook. "The original equipment consisted of one nine-ton locomotive called 'The Eagle', one eight-wheel passenger car and four four-wheel box cars." The first run was to be from Elizabeth to Plainfield, and residents of all the in-between towns lined the trackside for this memorable occasion.

As the years went on, more and more railroad companies were building tracks across the state and many trains were coming into the Plainfield area. These railroads greatly increased the population of the area and made it possible for wealthy New Yorkers, who had once vacationed in the area, to become commuters and locate here permanently. People were attracted to the area by the "fresh air and country environment."

With the increase in the number of people and automobiles, plans were laid out for a new state highway that would pass through North Plainfield. State Highway Route 29, predecessor of our current Route 22, was officially opened for traffic on August 13, 1930. The entire three lane highway was opened in November, 1933. It was in 1953 that State Highway 29 was widened and renumbered Route 22.



## Washington Park

Seventeen years before North Plainfield became a borough, Washington Park was being established as a planned development. Because of the easy access to the railroads located in nearby Plainfield, Washington Park was being sought after by wealthy businessmen from New York. Many of these wealthy men purchased property and in 1867 and 1868 these citizens decided to have their section laid out. "The Washington Park North Plainfield development in the Township of Warren was filed with the clerk of Somerset County on May 12, 1868, as a complete real estate development with 'villa' sites for the well-established personages of the New York business world."

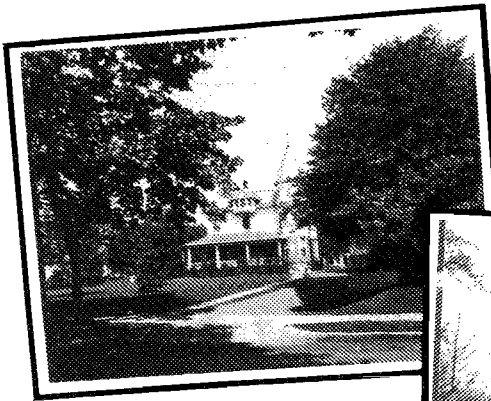
J.W. Soper & Co., Civil Engineers, made a map by streets showing the property involved, which described:

"Washington Park takes in the section from Grove Street to Green Brook all the way to West End Avenue along the brook. The tract agreement and covenant restrictions were drawn up by John van Winkle\*. The development was received in Somerville on May 8, 1868 and recorded on July 3, 1868 by Wm. Ross Jr., Clerk of Somerset County."

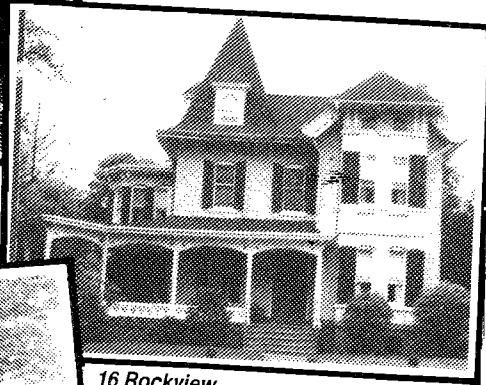
Signers:

John Tappin	Isaac Gaston	W.H. McMahon
Wm. White	W. de Klyn	H.P. Bronk
W.J. Roome	Edmund Embury	John van Winkle*
Geo. A. Marsh	Eleanor Bronk	

\*First Mayor of Borough of North Plainfield, 1885.



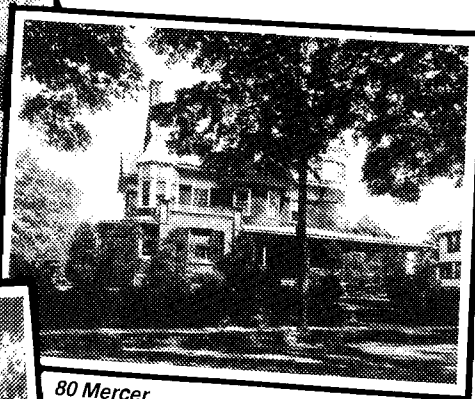
40 Willow



16 Rockview



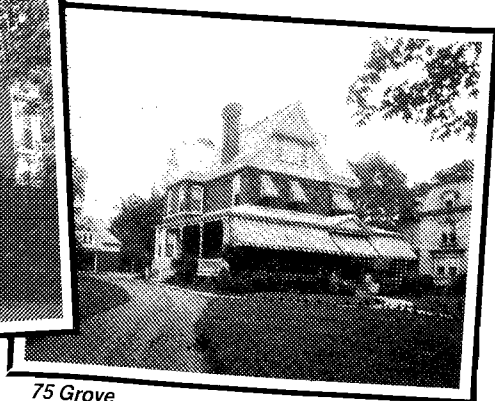
42 Washington



80 Mercer



171 Sycamore



75 Grove

In 1868, articles appeared in local newspapers advertising that the New York City dwellers should consider the serenity of the beautiful development of the Washington Park section for commuters' residences.

In the book, "Washington Park Historic District", architect Robert Hopp states that architecturally the district had begun with a few Federal style houses of the pre 1870's. Establishment of the District brought the Mansards of the 1860's and 1870's, followed by the Italianates of the 1880's. The District filled out in the period between 1890 and 1900 with the Centennial-inspired Victorian, in all its varied aspects of Gothic, Stick Style, Queen Ann, and a myriad of subinfluences.

It is also stated in the Washington Park Historic District book that there are 198 structures within the District, including the Holy Cross Church and the Margaret McCutchen Nursing Home. All remaining structures are residential, including a number converted into multiple dwellings in the World War II period.

This narrative would not be complete unless we described some of the opulent homes in the Washington Park Section of North Plainfield.

The Holy Cross Church was organized in 1868 and dedicated in June, 1869. It was built in the Carpenter Gothic style with verticle board and batten. The church was built by the Rev. E. Embury at a cost of \$1,900.00 and was presented to the Parish free of incumbrances with the condition that the seats would always be free.

On a trip down Myrtle Avenue we stop at number 27. This home was built around 1857 by C.A. Reed, an attorney. In 1895 he was elected to the New Jersey House of Assembly, and in 1896, he was elected State Senator and became President of the Senate in 1899. The many stained and leaded glass windows and the diamond-shaped shingles make this a very interesting and beautiful house.

Continuing down Myrtle we come to No. 44 built in 1896 for George T. Rogers, one the developers of Washington Park. Many of the interesting features of this house are the Queen Ann hip roof, high gables with half-round windows and its use of leaded glass.

Around the corner on Willow Avenue we come to the house built by William White. Mr. White was born in England and came to America as a young boy and in 1865, he moved to Plainfield and became a master builder. He superintended the construction of the First Baptist Church, which was dedicated in the fall of 1869.

The house is a 2 1/2 story Queen Anne, with a three story round tower. The first floor of the tower was called an "Arabian Smoking Room". The house has a slate roof and shell trim. From 1919 until 1940's the house was owned by a Mr. Needham, inventor of the pneumatic tube. He installed a large pipe organ with room in the basement for pipes and generator.

Turning onto Rockview we come to the home of C.W. McCutchen. Mr. McCutchen was in the export flour business, with Holt & Co., New York. One of the most beautiful of all the homes in the area, this house is a interesting combination of styles. "A combination of English country house, American materials and Japanese influences quite evident in what is certainly a nationally unique building." In 1948, the house was turned over to the Religious Society of Friends to be used as a home for elderly people.

We have only described a few of the wonderful homes of this fabulous section of North Plainfield, however, the Washington Park Historic District book may be seen at the Public Library.



*McCutchen Home*

## ***North Plainfield Becomes A Borough***

The year was 1885, and a special election was being held to decide whether or not the Township of North Plainfield should become the Borough of North Plainfield. This election was held February 17 and the plan was defeated by seven votes. The following is a copy of a document dated February 6, 1885.

### **NOTICE**

#### **Special Election**

I, William E. Jones, chosen Freeholder of the Township of North Plainfield, in the county of Somerset, State of New Jersey, under and by virtue of the state in such case made and provided, (a duly signed petition for that purpose having been presented to me), do call and hereby give notice of a special election of the electors within the boundaries hereinafter set forth who are qualified to vote at elections for state and township officers to be held at the

Warren Engine House in  
Somerset Street

in North Plainfield, in the Township of North Plainfield, in the county of Somerset and State of New Jersey, on

Tuesday, Feb. 17, 1885

Polls to be open from 7 a.m. to 7 p.m.

The object of the said election is to vote for or against the incorporation of a proposed borough under an act of the Legislature of the State of New Jersey, entitled "An Act for the formation of Borough Government approved April 5, 1878 and the supplements thereto,

That the accurate co-operate name of said proposed borough is "The mayor and Council of the Borough of North Plainfield."

The supporters of the borough were not discouraged and a second election was set up for June 9, 1885. At this time the event was celebrated with fireworks when it was announced by a vote of 248 to 219 in favor of changing the township to a borough.

It was reported in the Plainfield Evening News of June 10, 1885. "The Boroughites Victorious-North Plainfield Rises One Round in the Ladder of Fame."



*Spencer Hall*



## Fire Department

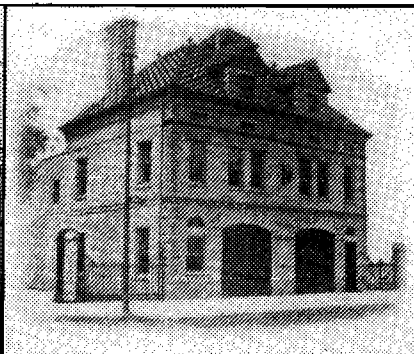
When North Plainfield became a borough its fire department was then known as Warren Engine Company No. 1 of the Plainfield Fire Department. In 1888 the borough purchased the building at 90 Somerset Street including the equipment for \$3600. The following year Plainfield withdrew its services and the mayor and council

formed the North Plainfield Volunteer Fire Company. It was decided that each volunteer firefighter would wear a red shirt and helmet as its uniform. The company was proud of their speed in getting to a fire, pulling the hand pumper by hand ropes, and in moving the steamer first by hand and later by horses. In a history of North Plainfield by C. Warren it states that "Warren Engine Company No. 1, was equipped with an Amoskeag Steamer, 3,000 feet of hose, one hose cart, two ladders, and a full complement of tools and two three-gallon fire extinguishers".

In 1896 the borough purchased land and contracted for a building to be built on Harrison Avenue. Known as the West End Hose Company No. 2, in 1897 it was equipped with one two-wheeled hose cart and 1000 feet of hose.

The two companies continued to serve the borough of North Plainfield until March 12, 1904, when the volunteer fire company was abolished.

The West End Hose Company, on Harrison Avenue was purchased by Mr. Herman Klinsman Sr. and converted into a dwelling. The Warren Engine Company on Somerset Street was purchased by Joseph Church, who operated a grocery store there.



The last fire chief of the volunteer fire company was Julius Stahl. In a news article Mr. Stahl states that "in 1894 the mayor and council put in a 'call box' system of 12 boxes, and the alarm was sounded by the steam whistle at the plant of the North Plainfield Electric Light Company. Before this, anyone who saw a fire would pull the long rope that hung in the tower of the firehouse. The old fire coard would give a dollar to the person turning in the alarm." Today this bell hangs in the Exempt Firemen's Hall.

In 1904, the fire company was relocated on Somerset Street, now the Police Department. The present firehouse built in 1937, is located at Somerset and Lincoln Place adjacent to Borough Hall. The first motorized fire equipment was purchased in 1916 and the department has continued to modernize its equipment.

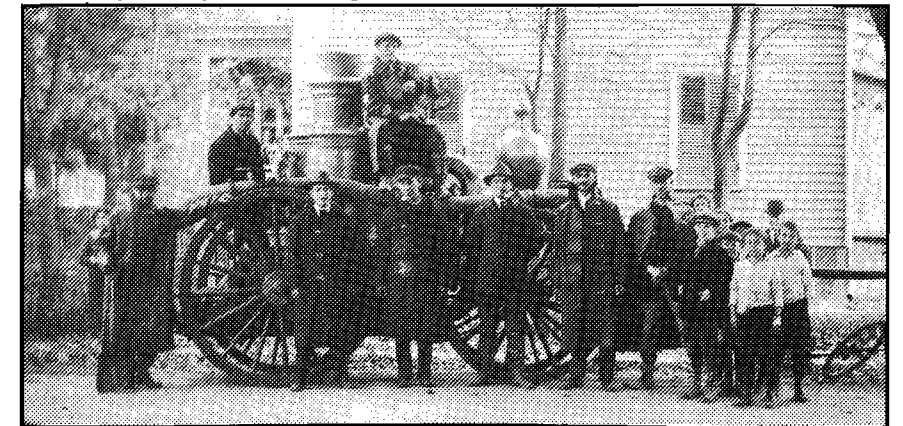
Today North Plainfield Fire Department is prepared to meet any local fire emergencies and to assist surrounding communities in a reciprocal agreement.

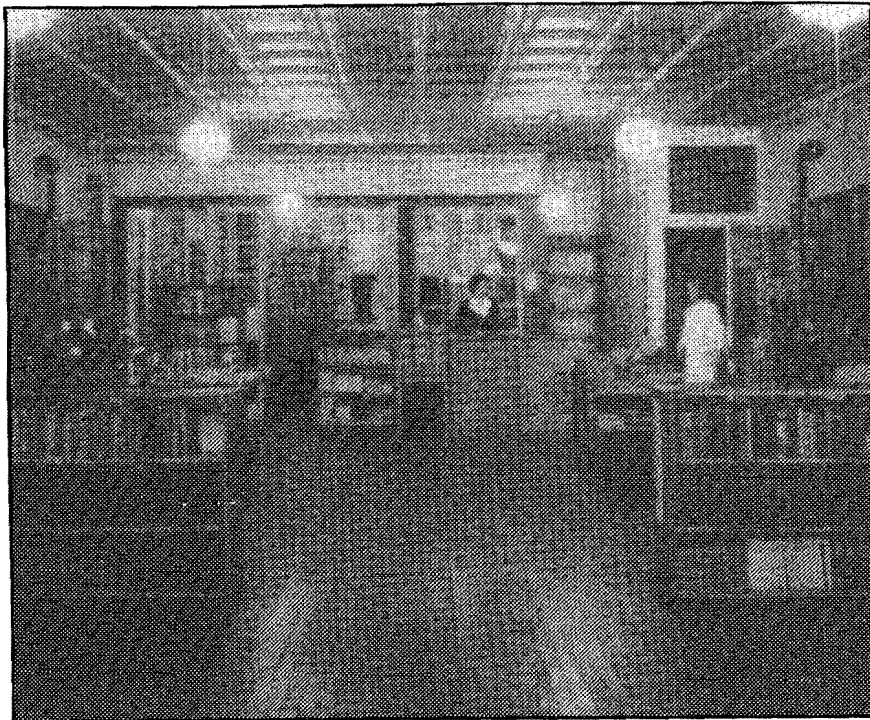
The idea of the exempt firemen's hall on Somerset Street was started at an annual social meeting of the exempt volunteers. This group had felt the need of a meeting place of their own for sometime.

Julius Stahl, then president of the North Plainfield Exempt Firemen's Association, talked in favor of a permanent home. Mayor "Bill" Smalley gave \$100. to start a campaign and William Debele deeded a lot 50x100 worth about \$1500, at that time, for the building. Once started the project caught on quickly and in time the number of donors reached 437. A complete list was kept, now recorded in gold lettering in the hall their donations built.

The building at 300 Somerset Street was opened July 24, 1924. Housed within its walls are reminders of early fire fighting days such as an old hand pumper, the old steam engine and on the walls many pictures of former fire chiefs, volunteers, old fire houses and medals and badges of former firefighters.

The corner stone was donated by L.L. Manning and inside was placed the courier-News of the day, a sample of all money then in circulation and a history of why the building was built.





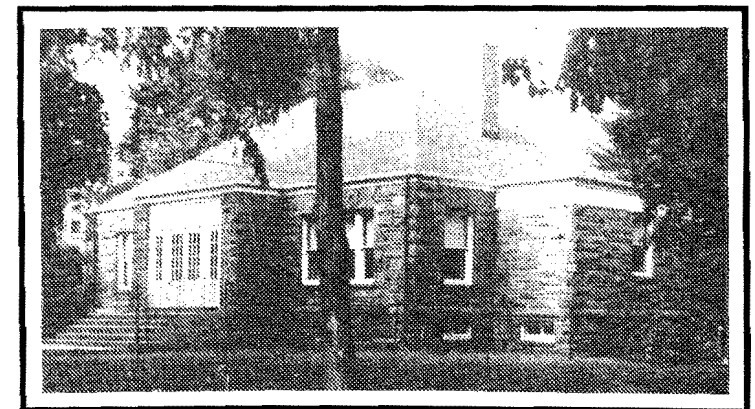
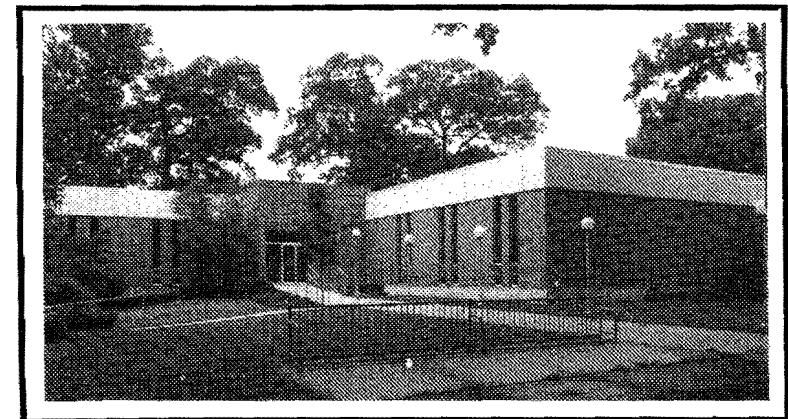
## ***North Plainfield Memorial Library***

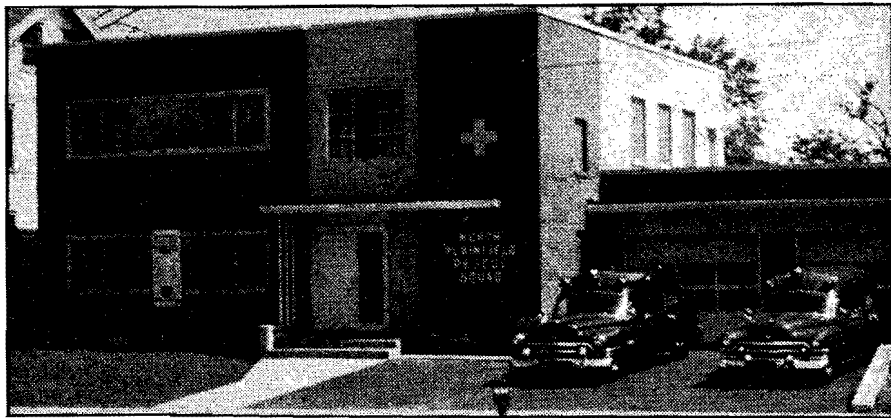
Sixty years ago three dedicated ladies of the borough's only PTA began a lending library with a modest appropriation of \$300.00. The library's first home was the Sunny Shoppe located on the corner of Somerset Street and Linden Avenue. Six years later in 1931, with the assistance of the borough's four PTAs, Mrs. Charles McVicker started the official North Plainfield Library with thirty volumes. The new home of the library was Walter's Barber Shop on Somerset Street. In 1935 the library was moved to the second floor of the Exempt Fireman's Hall. In five years the library grew from only a small portion of the second floor to the entire floor.

By 1946 the library had totally outgrown the Exempt Fireman's Hall. The North Plainfield Library Association, formed in 1939, organized fund drives to raise \$45,000 for a new library. The mayor appointed a Library Commission to acquire the land and to build a new building. The Borough of North Plainfield bought the house and grounds at 6 Rockview Avenue and gave \$5,000 toward the renovation. With the \$25,000 raised by two fund drives, the \$30,000 cost of renovation was met and the new North Plainfield Memorial Library opened in 1949.

As the borough population grew the library was again faced with overcrowded conditions. Several plans for expansion were considered. It was decided by the Library Commission to remodel the lower level for a children's library and magazine room. In May of 1959, the Borough Council passed an ordinance taking \$10,000 from capital funds for the remodeling of the lower level.

Our library has grown from several shelves in a candy store to the present impressive building. This is due to the dedication of a handful of boroughites. In reading the records and minutes of past Council meetings, the new library was always referred to as The North Plainfield War Memorial Library. When the new library opened the building was named North Plainfield Memorial Library with nothing to commemorate those who fought honorably for our country. This omission was corrected in March, 1984 with the presentation of a plaque which reads "This building is dedicated to those of North Plainfield who served their country."





## Rescue Squad

“Service to Humanity with Tender Hearts and Gentle Hands”.

As the borough grew, it became obvious that a Rescue Squad was needed. In April of 1949 plans were outlined to civic groups of the borough for the formation of a squad. During April the first organization meeting was held in the exempt firemen’s hall on Somerset Street. Use of the hall was granted for temporary quarters.

A certificate of incorporation was filed with the Somerset County Clerk listing the names of the twenty three charter members. The squad was qualified to service the town after completing the first aid training course given by Dunellen Rescue Squad in June of 1949.

Two vehicles were in service at this time, a 1929 Buick ambulance was presented to the squad by Plainfield’s governing body and a used 1940 LaSalle ambulance was purchased as a second vehicle on notes signed by several squad members.

During the 1950’s, the ladies auxiliary was organized, the squad delivered their first baby in the ambulance, they purchased their first new ambulance and traveled to Washington D.C. on its first relay trip.

On July 21, 1954 the Rescue Squad purchased property at 334 Somerset Street to be the site of their new building. Notables and representatives of the Borough Council and Borough organizations along with the public joined with the squad at the dedication ceremonies of their new home on April 28, 1958.

Today each new squad member undergoes over 120 hours of classroom instruction and over 150 hours of “on-the-job” training with a senior squad member during his/her first year; but their training never ends. They are always learning new techniques and must be fully certified every three years.

Each year over 1500 borough residents call on the squad in times of sudden illness or injury. They are a voluntary non-profit organization and the average volunteer is on duty 900 hours a year and answers over 130 calls.

## Somerset Street

Long before the white settlers migrated into this area, Somerset Street was only a narrow Indian Trail used by the Delaware or Lenni Lenape Indians on hunting expeditions or war parties.

Leading down from the Watchungs at this time it was the only path over the mountain. As settlers came into the region and developed the land, this narrow trail was becoming more and more popular as the only “way” to the mill to which the farmers would take their grain to have ground into flour. This mill later became the city mill at the corner of Somerset and Front Streets. It was also at this site in the year 1760 that the first store was established. Thomas Nesbit opened his store so that pioneers could bring hides, skins, and tallow and trade them for other necessities of the day. Nesbit then took the skins and hides to Perth Amboy where he traded them for other supplies.

As more and more farmers settled into the area, the path had to be widened because the wagons needed more room to travel. As the years went by Mountain Avenue, or as some called it, “Road to the Mountain,” became a tree lined “lane” down through the center of a slowly developing town.

The Wooden family was one of the earliest in the area, and in the *Courier News* in the year 1895 the following article was found: “it is safe to say that there is today hardly a man, woman or child in North Plainfield who has not set foot at some time or other on the property once owned by old Peter Wooden, one of the original residents of the borough, fondly known as “Uncle Peter Wooden” to those who knew him well.

For Uncle Peter owned all the land along Somerset Street, main thoroughfare of the borough, on the west side of the street back in the 1800’s.

From about where Stony Brook approaches Somerset Street, where the bridge leading into the old Brookside Sanitarium is, right down Somerset to Front Street, “Uncle Peter” owned it all.

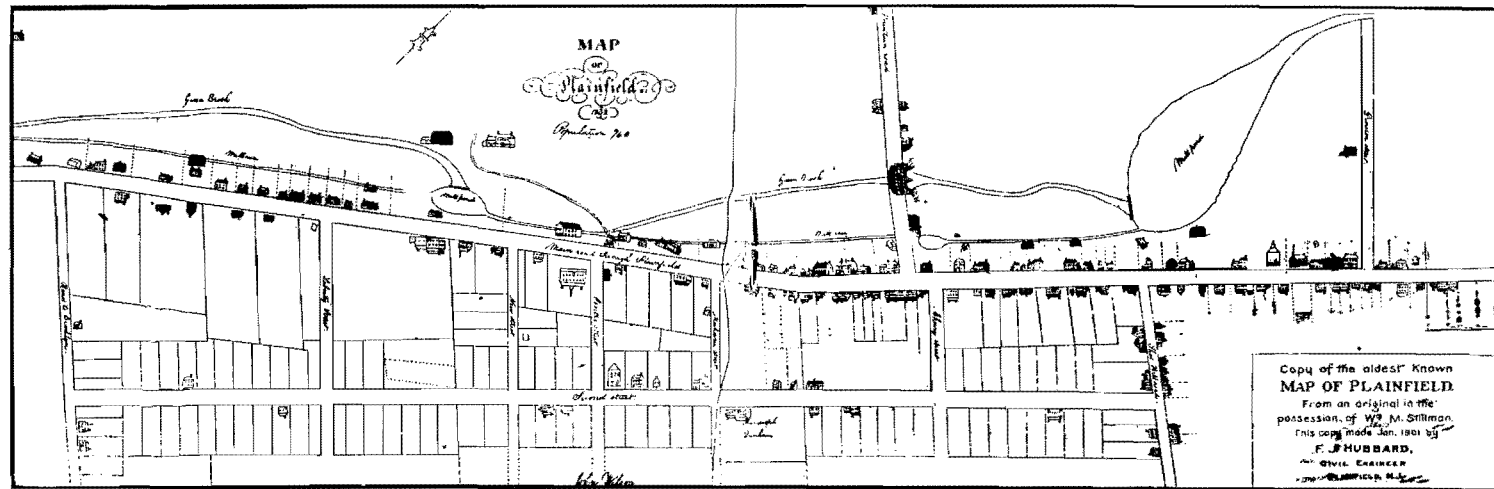
The large tract he once owned in time passed to other hands and is today a thriving business and residential district.”

In 1876, one could see hitching posts appearing down the “lane” and travel was becoming increasingly steady. Paving the road was the only way that carriages and wagons could make the trip without getting caught in the mud.

Large, heavy stones called Telford were blasted out of the Wadleigh Quarry on Upper Somerset Street and carried to the street below. Telford stone were laid with their points upwards and filled in with small crushed stones. The top layer of stones was called “waterbound macadam” because the little stones were sprayed with water and rolled with a steam roller. This was the first Telford Road in the state of New Jersey.

Fifteen years later another form of transportation was to come to the borough. The Fourth Street Trolley Line was laid in the macadem pavement. The year was 1890, and wagons, carriages and the trolley all ran side by side down the street carrying people in many different directions.





In an early newspaper article the street was described as follows: "on each side of Somerset Street were great, spreading trees, including elms, maples and other varieties, the street being a bower of shade in the summer time, the trees going all the way to Green Brook. The lovely trees, however, went the same way as the Indians, because Somerset Street was too narrow for heavy traffic and had to be widened. All the trees in the way were doomed and needed to be removed."

Upon leaving Plainfield in the 1880's and heading down Somerset Street one could see that "the horse still reigned." Just over the bridge was the L.M. French Carriage Shop. Louis French, the son of Phineas Mundy French, started the carriage business at the age of 17 in the year 1869. Starting with only three employees, he built the business so that in 1915, thirty men worked for him and his carriages and "buggies" were being sent all over the world. The year 1915 brought the gasoline buggy and Louis M. French sold the business and retired.

Next to and across the street from L.M. French were the horseshoeing establishment of Hand and Martin and the wheelwright shop of George Stewart. Also across the street was the blacksmith J.P. Homan and the harness shop of J.F. Ryerson.

At the corner of Somerset Street and Pearl Street was the gracious mansion of Phineas Munday French. Mr. French moved his family into this 22 room home in 1859 and lived there until his death in 1901. Phineas French settled in the borough of North Plainfield in the year 1838. In 1839 he purchased an interest in the "City Mill" and later bought the entire plant.

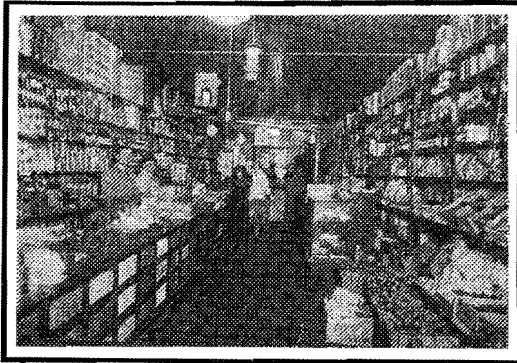
Mr. French, one of the directors of the Beach Bank, owned the Plainfield gas works, and owned large real estate holdings in the area. For twenty years he was a member of the Court of Appeals, and was also a freeholder of the county. The *Daily Press* reports his death, "He was not only the oldest but one of the most highly respected businessmen in the borough and city."

Today the site of the old French mansion with its four large columns and formal gardens is the home of the Firestone Tire Company.

On the opposite corner of Pearl Street was the large, stately home of Dr. Lewis Craig, set back from the road and surrounded with large beautiful elms. Dr. Craig was a highly respected physician in the borough and added much to the building of North Plainfield. In 1895 the heirs of Dr. Craig sold the house to Dr. Peter Zeglia who continued to practice medicine in the area for the next 50 years. Today the property is occupied by Jersey Auto Accessories. On the other side of the street between Craig Place and the intersection of Harmony Street could be found the flour and feed store of L. Heyniger, the home of Peter Wooden, the Springman's barber shop and the Warren Engine Company. Also on this block was the home of Doctor A. H. Dundon. It was at the corner of Lincoln Place where in the late 1890's, P.T. Barnum raised his circus tent on Wooden's property, which extended back to Duer Street. At the corner of Lincoln and Somerset was the grocery store of J.P. Humble, and across the street one could find the crackerbarrel store of Henry Newton Spencer, the drug store of W. E. Mattison and the Voehl Bake Shop. At the corner of Race Street was the Smalley Butcher Shop and down the street was the Wheeler Shoe Shop. Becker's Hoop Shop was at the corner of Harmony Street and Benjamin S. Braider and Peter Lee had a grocery store at the corner of Manning Avenue.

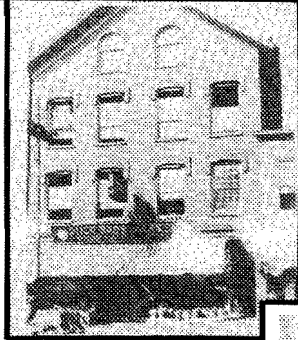
Up the block could be seen the Somerset School at the corner of Park Place, and now the Grace Methodist Church sits across the street. Past Park Place and Jackson Avenue were large residential homes and the farm of John Allen. These extended up Somerset Street where a few hotels and saloons could be seen.

Today the fancy residences are gone and the shade trees have been removed; however, the street is still the main throughfare from the mountain to Plainfield, and along its macadam street you can find stores of every shape and kind. Every day old stores close and new stores take their place. Progress is still in the making on Somerset Street.



*Church's Market*

*55 Somerset Street*



*Glick Bros. Market*



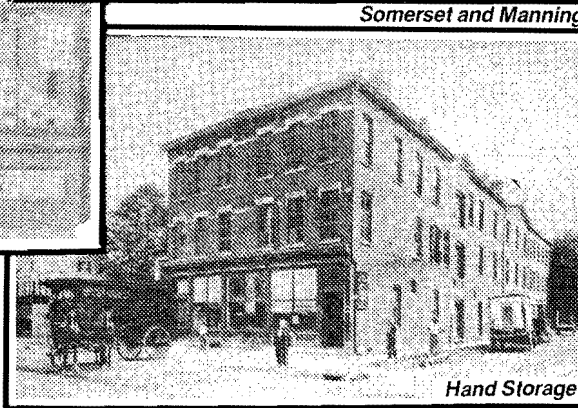
*Hotel Site of  
Borough Hall*



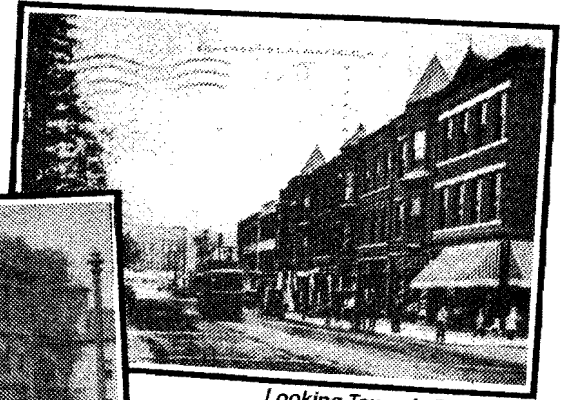
*Somerset and Manning*



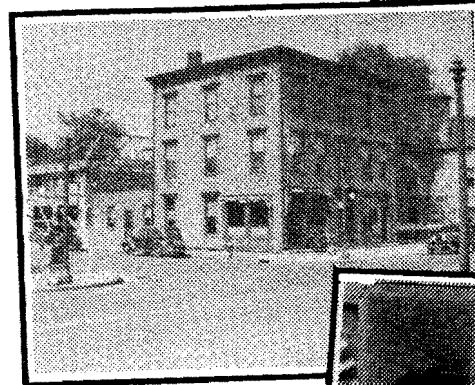
*Barber Shop  
C1914*



*Hand Storage*



*Looking Towards Plainfield*



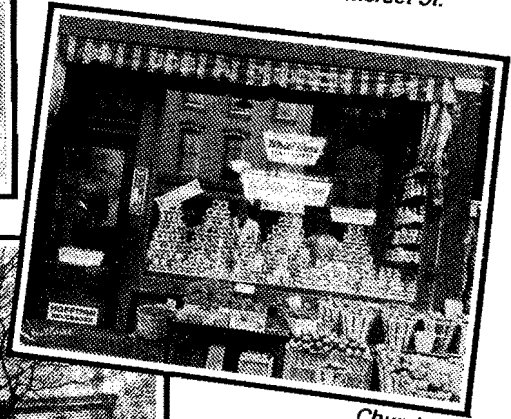
*Hotel Site of  
Borough Hall*



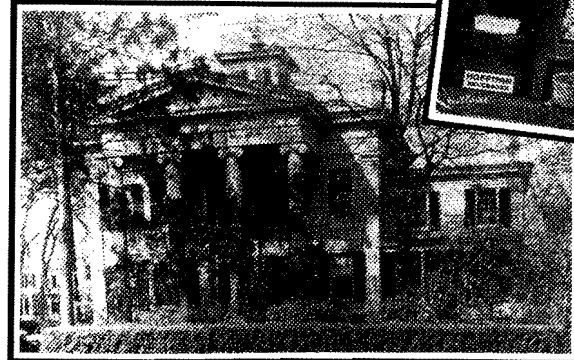
*Summit and Somerset St.*



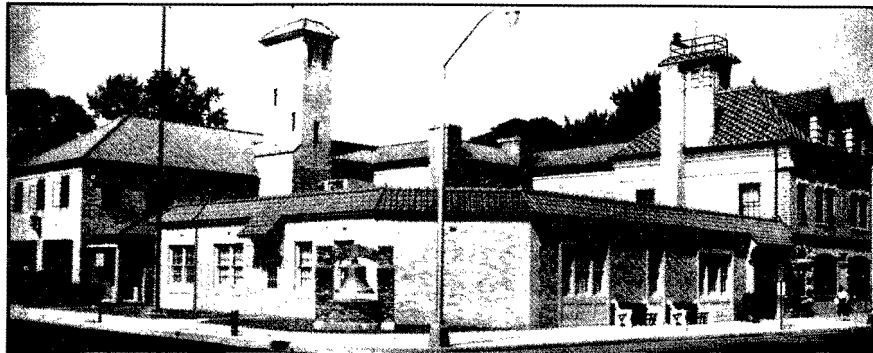
*Blacksmith Shop*



*Church's  
Market*



*French Mansion*



## Borough Hall

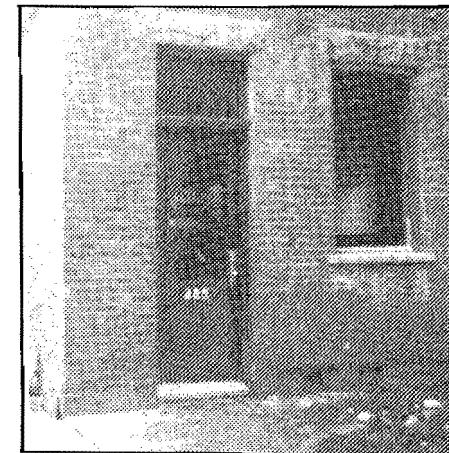
Located at the corner of Somerset Street and Lincoln Place is the North Plainfield Borough Hall. The oldest section erected in 1896 now is the home of the North Plainfield Police Department. In 1937, the main section of the building was constructed with the aid of the Public Works Administration of the Federal Government. In 1958 another addition was added which is now the front section.

Housed in the Municipal Building is the Mayors office, Borough Clerks Office, City Engineer, Welfare Office, Tax Collector, Health Officer, the Municipal Court and the Fire and Police Department.

### MAYORS OF NORTH PLAINFIELD

John Van Winkle	1885-1887	Julius Stahl	1926-
Dr. Justus H. Cooley	1887-1889	Alex Milne	1926-1937
Charles Place	1890-1891	Edgar F. Sheppard	1938-1941
William L. Saundres	1892-1893	Herbert W. Schaefer	1942-1943
Henry E. Needham	1894-1895	Thomas E. Beatty	1944-1949
Benjamin A. Hagerman, Jr.	1895-1896	Robert J. Underhill	1950-1951
John F. Wilson	1897-1898	Charles E. Goudreau	1952-1954
Newton B. Smalley	1899-1907	Harold R. McCusker	1954-1963
Samuel Townsend	1908-1909	Olrandio L. Abbruzzese	1964-1967
Newton B. Smalley	1910-1911	Thomas A. Sperry, Jr.	1968-1971
Robert Clark	1912-1915	Frank R. Nero	1972-1974
William L. Smalley	1916-1925	Edward J. Brady	1974-1974
		Steven Novak, Jr.	1975-

## North Plainfield Police Department



With the birth of the Borough came the birth of a Police Department. In the beginning the department boasted a force of one. At that time the peace officer was known as Marshall. The first Marshall was Peter B. Weaver. In addition to enforcing the law, the Marshall lit the gas street lamps every night. Prisoners were kept in a wooden jail located on Lincoln Place.

At one time police headquarters, with a court room and jail, were located in the Warren Engine Co. Fire Department at 223 Somerset Street. By 1916 the department moved to a building on the site of the Municipal Rotunda. In 1937 the department moved to its present quarters.

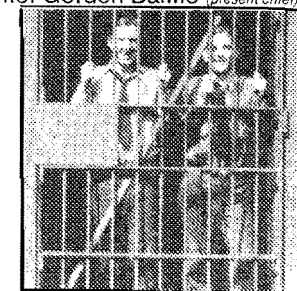
As the Borough grew the department expanded and modernized. By 1929 the force had no patrol cars or police radio. They used four motorcycles for the patrolmen who could drive. Those who could not drive used two bicycles. Early records reveal bicycle patrolmen were able to catch and ticket speeders driving automobiles.

A teletype machine was installed in 1954 allowing the department to receive police alarms. To send alarms, the department had to contact Morristown State Police. The same year the department purchased a radar speed timer. The purpose of radar is to eliminate the risks of chasing a speeder in a police car.

During the second term of Mayor Newton B. Smalley, Marshall George Weiss was appointed Police Chief. The residents of the Borough can be proud of the progress made by the Police Department in the past one hundred years. From a one man force to today's modern efficient law enforcement agency. With the addition of three new men in 1984 the force has grown to 40 men with the assistance of 3 civilian dispatchers and 2 civilian employees. For the positive results in the war against Drunk Drivers North Plainfield was again awarded a DWI Grant to continue their good work. They are proud, as the Borough is, of the award bestowed by the New Jersey State Safety Council "Police Department Of The Year" award of merit.

### POLICE CHIEFS OF THE BOROUGH OF NORTH PLAINFIELD

Chief George Weiss	Chief Irving Bennett
Chief Martin Kane	Chief Jack Ralli
Chief Ralph Farmer	Chief Thomas Dunne
Chief Paul Zanowic	Chief Gorden Baillie (present chief)



## Schools

On April 7, 1856 the majority of voters attending the annual meeting of School District Number Three, in the Green Brook Valley School House, decided upon a division of the district, thus the North Plainfield School District number ten was established. At the same meeting David Coon, Richard Elliot and Phineas M. French were elected trustees for the newly formed district.

The legal voters of the new district met again on July 12, 1856, to discuss the purchase of a lot and the building of a suitable school house. At the meeting of April 1857, the trustees reported the purchase of a lot on the corner of Harmony, Warren and Race Streets for \$300 to be the site of the first school building. J. Busky was given a contract to build a school for \$1,500. It was impossible for the district to raise enough money for the building so a loan was granted by the state for \$1,000. This debt was not paid until the property was sold twenty-five years later.

The first school district provided educational services to 116 children between the ages of five and eighteen. The annual cost of each child's education was \$1.70. The first teacher, Charles E. Gouse, was hired at an annual salary of \$360.



Kindergarten 1916 Somerset School

By 1873, the school census was 510 and five teachers were employed. In 1877, the Mission School on Chatham Street was rented for the overflow of pupils and the Spencer Building, at 188 Somerset Street, known as "Chicken Coop College", also furnished additional space.

A stronger public interest in Public Schools, beginning about 1880, led to the appointment of a committee to find a suitable site for a new school. On May 2, 1882, the committee, composed of James McGee, Phineas M. French and Henry K. Carroll recommended the purchase of a lot on Somerset Street and to build a twelve-room, brick building equipped with the most modern ideas at the cost of \$25,000. The new school was occupied the next year and Charles E. Boss was chosen as its first principal.



First School Harmony Street



Somerset Street

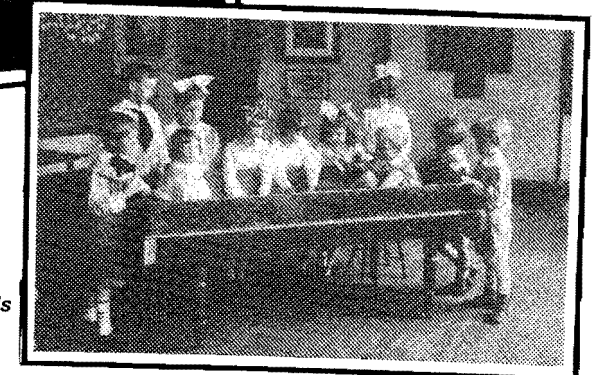


"The Village Belles"



1st Grade  
Circa:  
1921

Somerset School  
P.T.A.



Kdg. Somerset Schools  
Circa:  
1917

The borough of North Plainfield's first Board of Education was elected on July 20, 1894. The nine men were J. McCutcheon, president, Samuel Townsend, S.B. Joseph, John H. Van Winkle, Ezra Loomis, William A. Schutt, George F. Brown, H.B. Wells and A.E. Overton. The four committees that were formed under this board were: Finance, Teachers, Building and Repair, Supplies and Attendance.

About 1896 North Plainfield established its first full four year high school which began on the second floor of Somerset School. Four courses were available: classical, commercial, Latin-scientific, and general. By 1897 the school was placed on the State-approved high school list and had 90 students. North Plainfield's first high school graduates were three women... Bessie Thompson-Day, Edna Louise French and Harriet Helen Philips.

The Somerset School grounds were also the site of a manual training school, the gift of Charles W. McCutcheon. The school taught wood-working and manual arts to boys and offered household science classes for girls.

Somerset School was damaged by fire which destroyed the southern half of the building in 1950. The clock tower was originally in the center of the building.

On May 31, 1898, \$21,000 was appropriated to build Watchung School, located on Mountain Avenue. The building was occupied in September, 1899, with Ema U. Tamlum as principal, earning an annual salary of \$600. Watchung School was a two-story elementary school until fire destroyed the entire second floor. The one story building is now used as the offices of the Board of Education.

Harrison School located on Harrison Avenue was built in 1914, at a cost of \$30,380, in a district where it had been greatly needed. Harrison had the largest playground in the school system and was the most modern building until East and West End Schools were built in 1936. The building now houses the Department of Pupil Services and the Office of Adult Education.

By 1920, Somerset School was over-crowded and, after considerable study, the Board of Education submitted for approval to the voters a proposal, including an expenditure of \$300,000.00. for the purchase of land and a new high school building. The Wilson property located on Greenbrook Road was eventually selected. The property consisted of twenty seven acres near the center of the borough and cost \$35,000. The new school was erected and opened to pupils in September, 1925. Within two years the building was over-crowded and an addition at the cost of \$179,700 was authorized. North Plainfield High School which now houses grades 7-12 was built in a six-phase process with additions being completed as recent as 1982. The High School newspaper takes its name from Colonel Wilson's Estate, "Tunlaw", the site on which the school was built.

The Board of Education was authorized to purchase, in 1927, two tracks of land, one at each end of the borough, at the cost of \$20,300, to be used when needed for building of elementary schools. Both East End and West

End Schools were built in 1936. Dedication exercises for both schools were held in Somerset School gymnasium on Jan. 7, 1937.

Additions in 1966 provided both schools with gymnasiums. Outdoor tennis courts are a special feature of East and West End Schools.

The newest of the elementary buildings is Stony Brook School built in 1951. Located along the brook and adjacent to the high school complex, Stony Brook has 12 classrooms and a single size gym.

The school buildings and grounds are now being used in various ways for community activities. After school hours buildings are utilized as regular meeting places for local organizations and for evening adult school, and the athletic facilities serve for year-round recreational activities.

North Plainfield's enrollment had decreased from a high of 4,088 students in 1968-69 to the September, 1983, figure of 2,365.

Graduation Class  
of 1888



"Tunlaw" was the name of the home of Mayor Col. John F. Wilson. Col. Wilson purchased the property from Judge Cary and at that time it was the only home on Greenbrook Road from Somerset Street to West End Avenue where the old Cadmus house stood. Upon purchasing the home Col. Wilson remodeled it into one of the most beautiful houses in the area. When Col. Wilson died the property was left to his daughter who sold it to the North Plainfield Board of Education. The North Plainfield High School now stands on the property. Tunlaw comes from the word "Walnut" spelled backwards and is now the name of the High School newspaper.



## Churches

In 1885, the year the Borough of North Plainfield was incorporated, there was only one church. The Church of the Holy Cross was located at the corner of Washington and Mercer Avenue and was dedicated June 13, 1869. Not long after, St. Joseph's Church was established in 1881. In 1892 came the building of the Grace Methodist Church on Park Place and Somerset Street. Also located in the boro was the Warren Mission Chapel started around 1870 by Miss Jennie Wheeler.

Presently there are 12 churches in the borough described as follows:

### **The Church Of The Holy Cross (Episcopal), North Plainfield, N.J.**

The ground was broken for the Church of the Holy Cross on August 4th, 1868, making it the oldest church in the borough. In 1870, the Rev. Edmund Embury became the first rector, and the following year the church was admitted into union with the Diocese of New Jersey. On Holy Cross Day, September 14th, 1876, the year of our nation's centennial, the church building was officially consecrated by the Rt. Rev. John Scarborough, Bishop of New Jersey. Ground was also broken at that time for Spooner Hall which in recent years has been divided into classrooms. During the late 1930's the Chapel Wing was built and in 1944 the present rectory (103 Grove St.) was purchased. The erection of Embury Hall in 1957 completed the complex which now fills nearly the entire block. In 1984, a \$60,000 organ rebuilding project was completed.

One of the early residents of what is now the rectory was extremely interested in horticulture and many trees which are unusual botanical specimens may still be seen in the five-acre churchyard to which they attract many birds not often seen in our area.

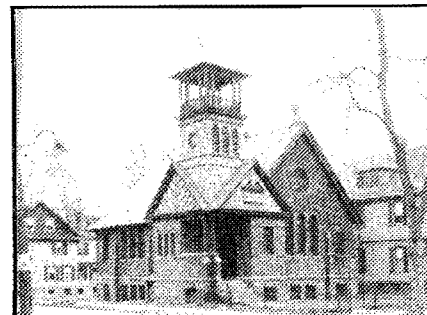
The parish currently provides a wide range of Christian activity which begins at the altar. The Rev. Canon Ronald G. Albury is presently the 15th rector, and the Rev. Carl E. Christiansen, Jr., is assistant.

### **St. Joseph**

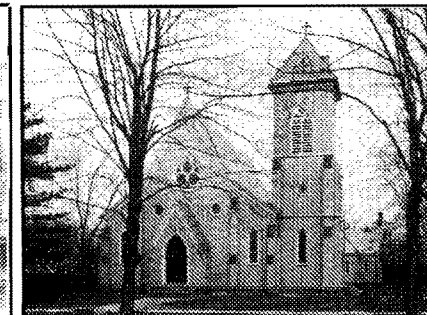
Mass was first celebrated in North Plainfield in 1851 at the James Verdon residence on the corner of Somerset Street and Summit Avenue. It was not until April 1882 that St. Joseph's Parish was established by Bishop O'Farrell with Rev. John Brady as first pastor. Before 1847, Catholics in this area had the choice of a long horse cart ride to New Brunswick or a hand car ride on the railroad to Elizabeth to attend Sunday Mass. After 1847, with the founding of St. Mary's, Stony Hill, the trip became a bit less rigorous but was still demanding since they had to travel up and over the Watchung hills. Mr. Verdon traveled to New York and was able to convince Archbishop Hughes of the dire spiritual plight of our community. The Archbishop duly sent Father James Mc Conough to survey the situation. Mass became so large that the Verdon home was no longer able to contain the congregation. In 1880 Catholics of North Plainfield found themselves separated from the Plainfield community as members of the newly formed diocese of Trenton. The borough of North Plainfield became the first parish erected by the new diocese in 1882.

Rev. Thomas O'Hanlon assumed the pastorate in 1882, offering Mass in the fire-house, then in a store-front on Somerset Street and later in an old public school. He purchased the lot on Manning Avenue and laid the cornerstone of a new House of God.

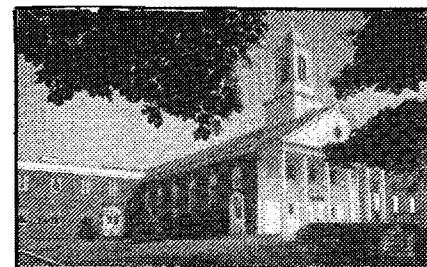
The present church was dedicated on April 28, 1912.



*German Reformed*



*Holy Cross*



*Hywood Park Baptist*



*St. Peters Lutheran*

### **Hydewood Park Baptist Church**

The Hydewood Park Baptist Church was founded in the year 1891 by the Christian Endeavor Society of the First Baptist Church of Plainfield.

This work was carried on as a Mission, first in a tent and then in a rented home, until June 1897, at which time it was moved to a new place of worship, which was then known as the East Third Street Chapel of the First Baptist Church of Plainfield.

In June 1904, the Rev. John W. Musson was called as the first Pastor of the Chapel.

In 1924, the property on East Third Street was sold to the Crescent Avenue Presbyterian Church, and the present property at Norwood, Manning, and Belmont Avenues, North Plainfield, was purchased from the Hyde family.

On July 22, 1926, the Church was incorporated and renamed the Hydewood Park Baptist Church.

On July 7, 1929, the new church building, fronting on Norwood Avenue, North Plainfield, was dedicated to the Lord with 200 seating capacity under Pastor Robert F. Pierce (4th pastor).

### **German Reformed Church**

One hundred and twenty-five years of devotion to German culture, tradition, and the German language describes the philosophy and activities of the First German Reformed Church in North Plainfield, New Jersey which was celebrated in 1983.

The Church began as a congregation in August, 1857 when some German people, living in Plainfield, asked John Henry Oerter, Pastor of Warren Reformed Church, to conduct prayer meetings for them on Sunday evenings. By July 10, 1858 Reverend Oerter organized the First German Reformed Church with 54 German settlers. Then a schoolhouse was purchased in 1859 at the corner of Roosevelt Avenue and Fifth Street, Plainfield, New Jersey and was used as their sanctuary. The congregation was called the First Reformed Protestant Dutch Church of Plainfield.

The families of the congregation tended to be large, but there was a high degree of turnover because of the westward move of many families and the population depletion from epidemics. The Reverend Jacop F. Neef served as first pastor of the congregation until 1964.

On November 25, 1886 a dream of the congregation began to take shape and became a reality when the cornerstone for the First German Reformed Church was laid. The beautiful "Ebenezer" church building, in which the members worship today, was completed and dedicated on February 12, 1888.

### **Grace United Methodist Church**

In 1885 the board of the First Methodist Church of Plainfield, began to discuss a chapel for the Borough of North Plainfield. At the following meeting of the official board it was reported that a property on the corner of Somerset Street and Park Place, 85 feet by 170 was purchased at a cost of \$3,835. On November 6, 1889 the pastor appointed a committee of five men to supervise the building plans. Work proceeded as planned and on February 14, 1892 the Park Place Chapel was dedicated. At the 1893 conference the Rev. Herbert F. Randolph was appointed as the first minister of the Grace Methodist Church. In December of the same year, Miss Alice Carroll was appointed as organist of the church a position she held until June of 1944. The first directory of the church was published in March of 1894, listing the names and address of all members. June of the same year a lot was purchased, being 40x124 next to the church on Park Place. The cost was \$900. and the present parsonage is now located on the site.

The later years have been times of rapid change, but the church grew as the North Plainfield Community developed and its ministry expanded.

### **Trinity Reformed Church**

In the early 1960's Trinity Reformed Church was condemned. The stately church building at 144 West Second Street in Plainfield which had housed the congregation since its founding in 1880 was scheduled to be taken over for Plainfield's Madison Avenue Project. So the congregation made its exodus to a new building and site on the corner of West End Avenue and Greenbrook Road in North Plainfield in January of 1966, where the congregation has continued to worship and praise God without fail since that time.

Trinity has become intimately involved in the life of North Plainfield since 1966. It has shared in the joint community worship services on Thanksgiving Eve and Good Friday. It has endured the two floods which afflicted the area in 1969 and 1973 and remembers with warmth the assistance offered by many within the community at those times. It also clothes and feeds the needy of our community through its involvement in North Plainfield FISH.

### **North Plainfield Baptist Church**

The Borough of North Plainfield was already forty-four years old when Robert and Laura Lines started holding Sunday School in their home at 515 Greenbrook Road. The year was 1920, and there were no churches in this section of town. The Lines family was burdened that boys and girls would have a place to attend Sunday School.

The West End Sunday School, as it was called, continued to meet in the Lines' home for several years. Mr. Lines dug out his cellar and made a family room. While Sunday School classes met everywhere in the house (including kitchen and bed rooms), the family room became the place for worship services held right after Sunday School.

In the files there is a letter dated September 19, 1941 from Borough Clerk, Frederick A. Martin, advising the Chapel that their bid of \$350 for a piece of property had been accepted by the Mayor and Council. The current location of the church, at the corner of Albert and Rockview was established.

What do you do with a vacant piece of property? If you're old-fashioned, you clear it, and have a tent-meeting. This was done at the new church location. After this was done, a few years passed before a cornerstone was laid. The big event took place September 1, 1946, with John Reid acting as chairman of the ceremonies.

The name of the Chapel was changed to North Plainfield Baptist Church in early 1970's.

### **Spiritual Assembly of the Baha'i's of North Plainfield**

At the time of the founding of North Plainfield in 1885, there were no Bahai's in the United States. The first American Baha'i was Thorton Chase of Chicago in 1894. By 1912 there were Baha'is in Montclair, Teaneck, Fanwood (the Mayor of Fanwood and some members of his family were Baha'is) and other New Jersey cities. Walter and Paula Reinecker who moved from Germany in 1925, were the first Baha'is in North Plainfield. In some towns and cities in New Jersey there are Centers where the Baha'is meet. In North Plainfield the Baha'is meet in their homes.

Throughout the years, the Baha'is have championed the elimination of prejudice of all kinds as a significant step toward world peace. World Peace Day, on the third Sunday in September, Race Unity Day on the second Sunday in June, and World Religion Day are sponsored each year by the Baha'is throughout the world.

### History of Community Baptist Church

On March 9th, 1969, Community Baptist Church was organized by Rev. William J. Alston and a few dedicated followers. Starting out, they had no church of their own, so they shared the edifice of St. Andrews Episcopal Church at Clinton Avenue and Fifth Street. There Father Backus and his Congregation were both gracious and helpful. They played a huge part in Community Baptist's struggle to come into it's own. The up-hill climb was and continues to be a long and tedious journey. We know this is typical of any growing organization. By the Grace of God, Rev. William J. Alston and his small but faithful congregation were able to purchase the building they now occupy. This building located at 20 Grove Street, North Plainfield, New Jersey has now become known as Community Baptist Church.

### The Warren Union Mission Chapel

The Warren Union Mission Chapel was started by Miss Jeanie Wheeler in June of 1870 on Chatham Street and remained there for many years. The Constitution of the Chapel stated that the religious services were to be non-sectarian. In 1893 the membership voted to become identified with the Crescent Avenue Presbyterian Church in Plainfield. As the Borough grew and the congregation increased, a site at the corner of Watchung and Fairview Avenue was purchased. In 1907 the corner stone was laid for a new brick church. Soon after the dedication request was made by the members to become an independent church. The request was granted and it became known as the Watchung Avenue Presbyterian Church.

### St. Peter's Lutheran Church

The first Lutheran services in Plainfield were held in 1888. The church was started by the Rev. Edward F. Moldenke, pastor of St. Peter's Church in New York City. The Rev. Moldenke was assisted by John H. Koch of Watchung Avenue in gathering Lutherans to form the first congregational organization in 1892. The first service was held by Rev. Moldenke in the Y.M.C.A. building. After holding several services their congregation moved to Warren Chapel with Rev. E. Kionka as pastor. In the spring of 1893 Mr. Koch purchased a piece of property 75x175 at the corner of Grove Street and Mercer Avenue. By August 27 the corner stone was laid and by November 1893 the building was completed.

### Church of St. Luke

In 1965 Bishop Ahr appointed Fr. Joseph L. Remias as pastor to establish the parish of St. Luke. The parishioners were former members of St. Joseph's, North Plainfield and St. John's, Dunellen.

The church was built, and dedicated in June of 1970 at Clinton Avenue, North Plainfield.

Fr. John C. Giordano was installed as pastor in 1980 and under his guidance, the membership has grown from 300 to 600 families.

A Parish Center with classrooms, offices and meeting rooms was dedicated in September of 1983.

## Historic Sites

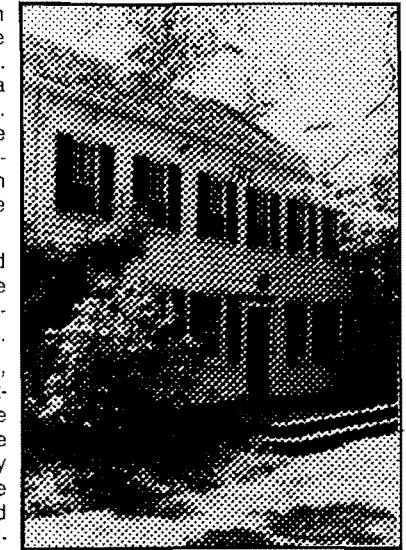
### The Eder Vermuele House c. 1777

113 Myrtle Avenue  
Owned by The Fredrick Crystals

Built for the second son of Cornelius Vermuele Sr., this sturdy two story frame building has been well preserved. The house sit well back from the street with the front facing the Greenbrook Pond. Entrance to the house is a long center hall with a double living room and two fireplaces on one side. Opposite is a dining room with a huge fireplace containing a gigantic iron pot on a swinging handle. Close your eyes and imagine the officers from the Blue Hills Military Post enjoying dinner while quartered there.

The kitchen area has been remodeled and updated. Antique hand-hewn beams were installed to retain the original colonial atmosphere. Upstairs are four bedrooms and two baths.

The first son of Cornelius Vermuele, Adrian, died at age thirty-three, while a prisoner of the British. Family records indicate Adrian built his home one half mile west of the original homestead. Due to the similarity in design, some think the Mundy House may have belonged to Adrian. The house stands today almost as it stood over two hundred years ago. A heating system and bathroom fixtures are the only changes made over the years.



### The Cornelius Vermeule Jr. House c. 1784

457 Mountainview Drive  
Owned by The Arthur Hogstroms

Captain Cornelius Vermuele built this typical Georgian style farm house in 1784. It has a center hall with a wide gradual stairway. The first floor consists of four rooms, two on each side of the center hall. Upstairs are six bedrooms, two on the right and four on the left. Few changes have been made to the house except for several remodelings to the kitchen, where at one time stood a large fire place, now covered. An old chimney stack comes down into the kitchen and separates it from the dining room.

The house originally sat twenty-five feet from Greenbrook Road. Sometime between 1910 and 1915 the house was moved one hundred twenty-five feet back from the road to its present location.

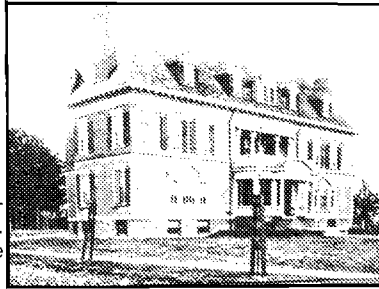
It has been said that this house is an excellent example of the middle class farm house built during the latter part of the 18th century.





## Children's Home

The children's home has been located on Westervelt Avenue since the borough was organized. The institution cared for orphan children under the direction of the Children's Home Association.



## Brookside Sanitarium

The site of St. Joseph's School was at one time the site of a sanitarium. Justice H. Cooley was the director. In 1876 it was moved to Somerset Street and Interhaven Avenue. It then became Brookside Sanitarium. For several years it was operated as the Arthur Pitney Home for aged and invalid. In 1939 a group of seven nuns from Wurzburg, Germany came to the area and purchased the sanitarium which now operates under the name of Villa Maria.



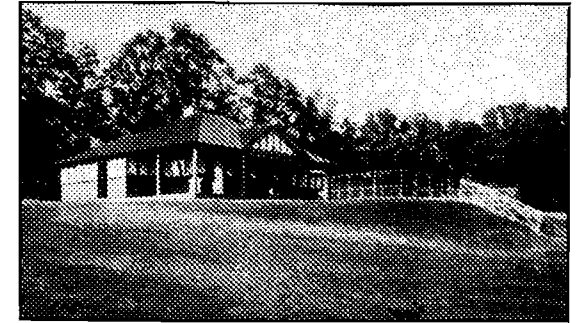
## Memorial Park

The property at the corner of Myrtle and Willow Avenue was donated by Mr. and Mrs. Charles C. McCutcheon as a memorial to those who died in World War I. In the center of the Park stands a boulder erected as a monument by the citizens of the borough in memory of those who served in the years 1917 and 1918.

1917	1918
Charles R. Ball	Joseph E. Kirch
Marsom L. Butterfield	Edmund J. Laporte
William P. Carson	Frank Lionette
Edson L. Day	Ernest J. Neal
Douglas Diplock	John W. Schomp
James E. Forgeron	Richard Schroeder
	John V. Todd



## Park Club and Hydewood Golf Club



For many years the center of social activity centered around the Park Club located at 20 Washington Avenue. Built in 1889 or 1890 the club promoted tennis, bowling and other sports. Also known as Pythian Hall today the building is known as the North Plainfield VFW.

In 1892 a group of men from the Park Club decided that they needed a golf course and approached Charles Hyde asking for use of some of his property at the base of the mountains. The golf course was laid out and built with nine holes running through leafy glades and around a small brook.



The course has been changed many times in its history and so has its name. Starting as the Park Golf Club and later changed to Hydewood Golf Club and finally the Community Golf Club. As route 29 widened and the course was altered many of the old players looked for new location which started the Watchung Valley Country Club now known as Twin Brooks.

## Spencer Hall (Page 23)

First owned by Lewis Craig Spencer this "Crackerbarrel" store was the meeting place for many important events in the borough. When Lewis Craig Spencer went west he sold the store to his father James Lyman Spencer who left it in his will to his son Henry Newton Spencer. Henry N. Spencer extended the upstairs so that the building could be used for meetings. The first mayor and council met in the "Hall" in 1885 and a few local trials were held within its walls. When the local schools became over-crowded Spencer Hall (Chicken Coop College) was used to hold classes. It was also the headquarters for Presidential Candidate Benjamin Harrison and Vice President Levi Morton in the year 1887-8.

## The Old Bell

The old bell which now hangs in the exempt firemen's hall was first brought to Plainfield in 1867 by John Taylor Johnston, then President of the Central Railroad. The bell was placed at the Plainfield Railroad Station and announced the arrival of trains.

The bell was later given to Warren Engine Co., No. 3, on Somerset Street.

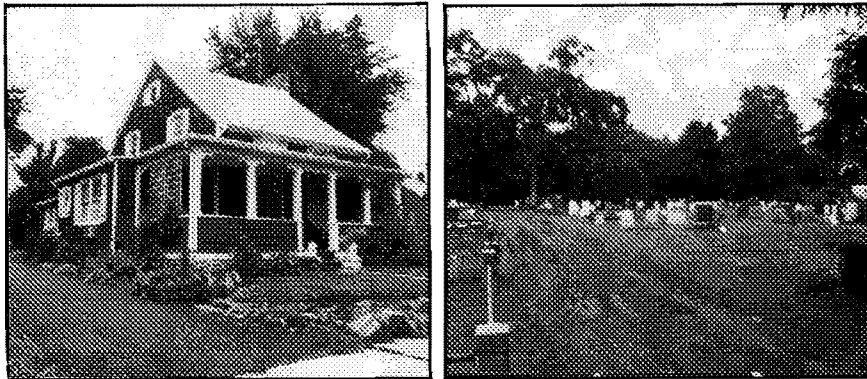
It was used as an alarm bell until 1894. when it was replaced with a larger bell. At this time the smaller bell disappeared and was not found until 10 years later. It had been buried in the cellar of the engine house, but removed by pranksters and buried in a cabbage patch on Somerset Place. Since the Old Warren Company had no place for the bell, it was given to the Warren Chapel, now Watchung Avenue Presbyterian Church. In 1924 when the exempt firemen's hall was constructed the bell was given back to them.

## Presbyterian Cemetery

The Presbyterian Cemetery on Brook Avenue belongs to the first Presbyterian Church of Plainfield and was part of the original tract of land purchased in 1825. John and Lewis Craig, for whom Craig Place was named, are largely responsible for permanent location of the Presbyterian Church.

It is believed that one of the earliest burials was that of William Sayre, who died at the age of 85 in 1828. This inscription is on his headstone. "In the Revolutionary War he took an active part for his country. Into the church of Christ he was a member, a deacon more than thirty years and always adorned his profession with the Godlyness which becomes the Christian."

Many old residents of North Plainfield are buried in this cemetery.



## The Stage House c. 1740

704 Greenbrook Road  
Owned by Dorette Weston

Sometimes known as the Stage House, this quaint Pre-Revolutionary farm house has been beautifully restored. In 1939 Mr. & Mrs. Robert Knight purchased the house without heat or indoor plumbing for \$1,200. The first floor consists of two rooms and a summer kitchen. Each room has a fireplace except the kitchen. The second "half-story" has four tiny rooms without fireplaces.

The foundation under the two main rooms is made of large boulders held together with powdering cement. Under the kitchen is a crawl space. Looking in one can see a fifteen foot beam. The beam is a tree split in half with bark still evident. By the front door, inside the wall is a thirteen foot sapling. The bark is still on this tree also. The three downstairs doors, front middle and back, are all in line. They were positioned so that a horse could go far enough into the house to bring in the huge logs in winter.

In 1970 Mr. Thomas Weston began complete restoration. One of his accomplishments was to build a triple hinged screen for the larger fireplace. The restoration was completed in 1975.

## Hydewood Hall

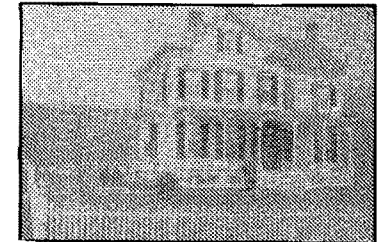
Early in 1900, Francis De Lacey Hyde built a mansion at the foot of the mountain and named it "Hydewood Hall". The road to his home was approached by way of Westervelt Avenue where their carriage house stood on the left side just before Crab Brook. The "lane" or drive ran directly to the mansion. Francis Hyde was the son of Charles Hyde who had a large estate on East Front Street in Plainfield. It is said that Mrs. Hyde entertained Teddy Roosevelt at this home.

## The Hyde Gatehouse (front cover)

In 1911 Louis Kepler Hyde son of Francis Hyde built a mansion on the top of the mountain. Mr. Hyde decided to have an approach to his mansion by Norwood Avenue and had a "Gate House" built of stone complete with a clock tower. The long drive up the mountain was called Hyde's Drive and led to the Hyde mansion "Oakmont". William C. Smith local builder and mason of North Plainfield built the Hyde Gate House now occupying the corner of Mountain Avenue and North Drive.

## The Rutgers Cadmus House

C1878  
340 Crosson Place  
Owned by Mr. & Mrs. Jerry B. Loizeaux



The home of Rutgers V. Cadmus was built in 1877, being completed in 1878 on a tract of land originally owned by the pioneer Cadmus family. Mr. Cadmus was the son of Cornelius Cadmus, who had purchased his 1200 acres from King George of England in 1734. It took two years to complete. The maple trees planted then, still remain.

There is the old parlor-type living room, large entrance hall, formal dining room and a family room. (An opening in the wall joins this room to the large kitchen, done in 1963 by the present owners.) A lovely old coal stove graces the kitchen and there is a pantry, also. The open back porch was made into a laundry room, also in 1963 and a screened-in porch was added in 1965, serving as a sitting and dining area with a Franklin stove. Beautiful plaster moldings adorn the center of the ceilings in the three main rooms and front hallway. There are four large bedrooms, with two smaller rooms, used for a den and dressing room. There are front and back stairs. The house remains much the same, as when it was built, with only a few changes, in keeping with its historical heritage.

## Vermeule Cemetery

Located 200 feet north of Carter Place, lies the Revolutionary Cemetery of the Vermeule family. Behind a newly restored brick wall lies the remains of this early pioneer family whose sons fought in the Revolutionary War. Every Memorial Day services are held at the cemetery to honor these great men.

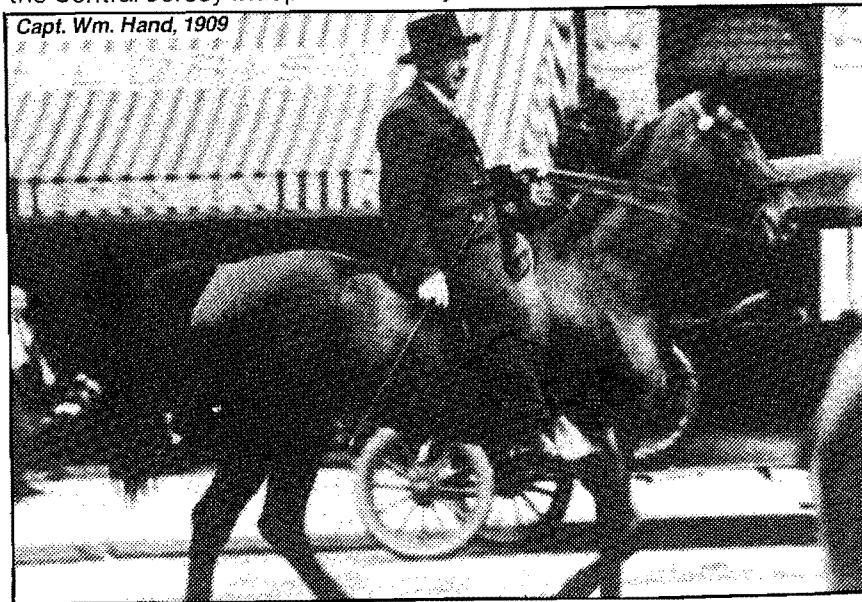
## Did You Know?

In 1876 during the United States Centennial, Plainfield began its parade with the ringing of church and fire bells at sunrise and an artillery salute by the Plainfield Artillery Company.

In 1909 a special Celebration for Plainfield's 50th and North Plainfield's 25 anniversary were held as a four day event. At that time a crowd of 20,000 watched 6,000 marchers and activities including fireworks and a band concert in West End Park.

Old Amity, the antique silver hose carriage was billed as the hit of the parade in 1959. Belonging to North Plainfield Exempt Firemen, they called it "the most beautiful piece of fire equipment ever built."

The parade held on the 4th of July was just a Plainfield - North Plainfield affair for many years but eventually the surrounding areas began to participate under the Neighborhood 4th of July celebration until 1955 when the Central Jersey Independence Day Celebration name appeared.



That Charles Sebring supplied money for the first Edison Electric Light Heat and Power Company of North Plainfield on Race Street in 1891. The company gave North Plainfield its first incandescent light, before that the people used arc lamps. In 1896, this power company was taken over by the Plainfield Light Company, which sold out to the Public Service.

That between Stigers Alley (Watchung Avenue) and Elm Place was Tier's Pond. This pond was an amusement park located on the Green Brook between North Plainfield and Plainfield. On the Plainfield side of the pond eating ice cream and boating were just two of the ways people enjoyed themselves on a hot summer's day. During the winter skaters from both communities could be seen gliding across the ice. Water from the pond also supplied power to French's Mill on Somerset Street.

That at the same time Washington Park was being laid out another development was being planned in the borough. Col. Pride of New York City had purchased the property north of Greenbrook Road to the mountain and from Jefferson Avenue to Grove Street. The property was acquired from Mary Cory and Richard Elliott and wife in the 1868. Not as grand as Washington Park the area did not develop as quickly.

That along Mountain Avenue between North Drive and Route 22 there is a group of streets called "Boxers Row." Boxers Row got its name from Mr. Ernest Jeffrey who named the streets after famous boxers from the turn of the century. These streets include: Leonard Place, Willard Place, Corbett Place and Jefferies Place.

That in the late 1880's P.T. Barnum brought his magnificent circus to North Plainfield. The circus was set up on the farm of Peter Wooden, which is now the area of Lincoln Place and Somerset Street.

That the area known today as Mali Drive, was once the property of John Taylor Johnston, President of the Central Railroad. Upon his death his daughter Mrs. Pierre Mali developed the property on the north side of the Green Brook. The Mali house stood on Front Street in Plainfield and the property extended to the top of the Watchung Mountains.

That in 1883 the L.L. Company, a candy business was started in the borough by Julius J. Stahl. In 1890 Stahl opened a candy and cigar shop at 108 Somerset Street. Mr. Stahl was last in partnership with William Debele and they operated a candy store next to Somerset School. In 1916 Stahl sold his interest to Debele who continued the business for many years.

That in 1870 a roller skating rink was built on Grove Street for means of recreation. It was as successful as a commercial enterprise as it was a social center.

That the first grist mill was built by John Webster on the banks of what was the "the upper large millpond", between 1750 and 1760, in the area of what was to become the Plainfields. The pond later came to be known as "Tiers" and was a famous outdoor resort for the area.

That the North Plainfield Police officers were called "marshals" until an ordinance of June 22, 1923 changed their title to patrolmen.

That Thomas Morrison who lived on Mountain Avenue, North Plainfield started the Plainfields' first daily newspaper, "The Evening News." He had spent some years in journalism before June 2, 1884, when he started his Plainfield paper.

That an old map, indicates in the 1830's there were only 15 houses in North Plainfield. Twelve of them were on Somerset Street (shown on the map as Mountain Road), two residences on Washington Avenue and one where Geraud Avenue is now.

That it was during the early part of this century when New Jersey was the movie capital of the country that four silent motion pictures were filmed in North Plainfield. The movie industry was particularly drawn to this area because of an unusual parcel of land that straddled the Green Brook owned by Phiroz Saklatvala in 1907. Saklatvala wanted to create an oriental environment, so he commissioned Japanese architect Taked

Shiota to design a garden and transform the farmland of his Leland Avenue property.

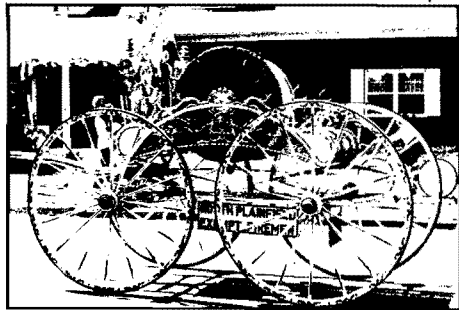
The brook was diverted into several waterways containing two small islands reached by seven bridges, each copying a different Japanese arch. The gardens contained hundreds of trees, flowers and flowering shrubs that supplied blooms from spring to late fall. The garden also contained a two story pagoda, tea house and a lily pond. While Saklatvala's estate was in Plainfield, the oriental gardens were located across the brook in North Plainfield.

"Madame Butterfly" starring Mary Pickford was one of the films shot on location in the gardens. Three other silent motion pictures filmed here include "Greater Love Hath No Man", "Broken Fetters" and "A Lesson From The Far East."

That in 1910 a publication describing North Plainfield noted that the only streets there during the Civil War Era were Somerset, Pearl, Chatham, Warren (Watchung Avenue), Harmony, Race and Greenbrook Road. It was predicted in the future there would be homes and beautiful lawns dotting the sides of the mountain.

That when the borough was first formed the political activity centered around Somerset Street, which then was a dirt road with wooden sidewalks. The borough was divided into the east and west, with all sections voting on Somerset Street.

That the blizzard of 1888 began with a warm rain falling during Sunday evening of March 11. By the time it was over about 12:30 A.M. Tuesday, reports of up to 40 inches of snow had fallen. The gale force winds continued through Tuesday and drifts continued to mount. Telegraph, mail and train services were completely stopped. Incredibly a Plainfield man A.P. Pittis and a North Plainfield resident W.H. Larabee walked home from Jersey City that day. Frank McConoughy of Somerville and Harry Brokaw of North Plainfield walked from Elizabeth to Plainfield. (on their way home.)



That the famous old silver hose "carriage" with its silver filigree body and delicate wagon spring wheels was made for the Amity Street Fire Company in New York about 1840. It belonged to the Warren Engine Company of the Plainfield Fire Department about 1879. In 1918 it was sold to Elizabeth and the North Plainfield Exempt firemen tried to locate it for about 40 years.

Quite by accident George Giddes a member of the exempts, found the carriage in a storage building of the Elizabethtown Water Company.

Letters went back and forth and finally the silver prize was sold back to North Plainfield for an undisclosed price.

That in 1881 John Shay of North Plainfield Township received a tax bill for \$15.44 based on a rate of \$1.59 per \$100, assessed evaluation. The breakdown was as follows: County tax \$2.88, township tax \$2.44, state school tax \$2.00, poor tax \$.96, road tax \$1.28, sinking fund, interest and principle \$3.36, poll tax \$1.00, special school tax \$1.36 and \$.36 costs.

It had been raining all afternoon of July 30, 1889. Up in the mountains the streams had risen to rivers and dams crumbled. It was the breaking of the Scotch Plains dam that caused a torrent of water to rush down Somerset Street destroying many of the shops. According to Mr. Horace Martin, the blacksmith, the water flooded Somerset on each side going up to Front Street. Other buildings destroyed besides the blacksmith shop were Stewarts Wheelwright Shop, Pradmer's Tailor Shop, and the stables of Blumm's livery stable were undermined and Seguire's livery stable was flooded. The flood also damaged many of the bridges along the Green Brook including those of Duer Street, Grove Street and Washington Avenue. There was a long wooden bridge at Washington Avenue and just below it the brook was dammed up to furnish water for the Cadmus grist mill. Tiers pond was also dammed up for French's grist mill on Somerset Street. Later the same evening the water subsided but the wreckage blocked the Somerset Street bridge for some time.



On August 2, 1973 torrential rains struck the area. A series of heavy thunderstorms started at 5 A.M. and the heaviest down pour came at 7:30. As the rains continued by 9 A.M. there were wide spread reports of people needing evacuation. People were shocked to see water rushing through their homes and streets. By Friday morning, 24 hours later the water was disappearing nearly as fast as it fell. Greenbrook Road was a sea of mud and the area was filled with residents using hoses, shovels, rakes, and rags trying to salvage what they could of their possessions and their property. The owner of a gas station just below the circle in Watchung watched as a 7-foot wall of water washed down the mountain and tore out the gas pumps, uncovered buried tanks and released 10,000 gallons of gasoline. A car dealer on Somerset Street totaled the cost of 200 new and used cars

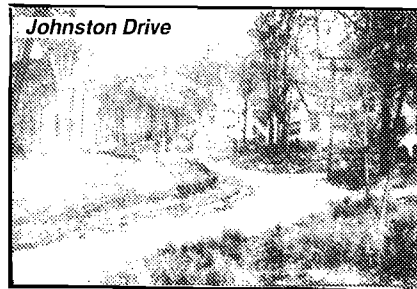
and estimated his loss at a half-million dollars. Somerset Street was lined with boarded up stores and debris as crews with State Highway equipment worked to clear the roads. Mayor Frank Nero said, "North Plainfield could be in for losses of 4-5 million dollars." Governor Cahill toured North Plainfield the day after the flood and declared a state of emergency and requested President Nixon to make a major disaster declaration for the affected areas, qualifying them for the federal assistance that was needed.

That it was in the year 1944, that Mayor Thomas Beatty wrote to Postmaster Armstrong of Plainfield and requested that a substation be built in North Plainfield. This request was granted and on December 1, 1944 the North Plainfield Post Office opened at 320 Somerset Street. Later the Post Office was moved to its location on Jackson Avenue.

That in 1957 the VFW held a contest for all students of North Plainfield High School. The purpose of the contest was to design a seal for the borough. At that time students from Warren were attending North Plainfield and Carol White's design was chosen by a group of judges from different organizations in the town.

The seal was put on a flag and presented to Mayor Harold McCusker July 4, 1957. The seal denotes the history of the borough, beginning with the Raritan Indians, Light industry, and family. The incorporation date of 1885 and the Latin words Focus Et Domus (Hearth and Home) complete the design.

That over a century ago it was the idea of John Taylor Johnston, President of the Central Railroad of New Jersey to build Johnston's Drive. John T. Johnston had a summer home on East Front Street and his property extended over the brook and up to the mountains.



This was one of the first macadamized roads in the State of New Jersey. The full length of the road was 3 1/2 miles and cost \$25,000 to build.

Soon the road became popular with local horsemen who would race their trotters the full length. The first big development came with the building of the Mountain Park Inn which could accommodate 100 guests. The hotel advertised "Built on the crest of the Watchung Mountains, 600 feet above sea level, commands one of the most magnificent views in the State." The hotel later became the Groszman School for retarded children and in 1939 burned to the ground.

Today the road is lined with beautiful modern homes with a view of New York.

That to North Plainfield belongs the distinction of having had the first municipal radio station in the United States. It was established in 1919 by William J. Butterfield. WEAM, as the station was called, was located on the corner of Rockview and West End Avenues.

## Vermeule Community Center and Green Acres Park

Green Acres Park is 37 acres of land lying in the plain of the Stony Brook between Rockview Terrace and West End Avenue.

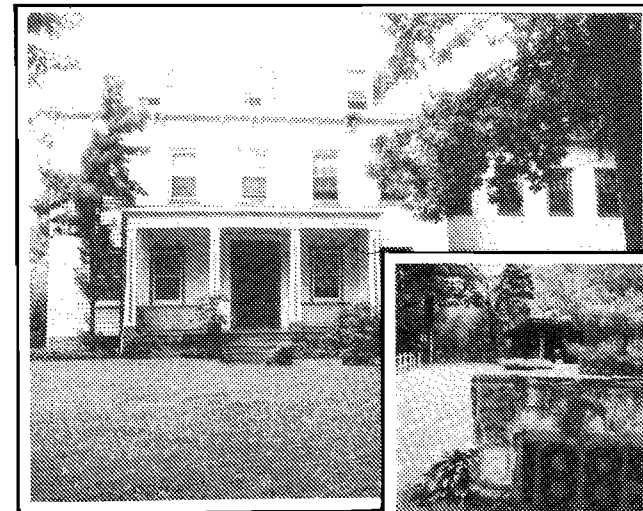
The land was purchased by the Borough in 1969 with matching funds from the State of New Jersey. In January of 1973, North Plainfield received a grant from the Ford Foundation to create a master plan for this land. Its actual development was made possible by a State matching Green Acres grant received in 1977. The park was basically completed in the Spring of 1979, but improvements will always be made.

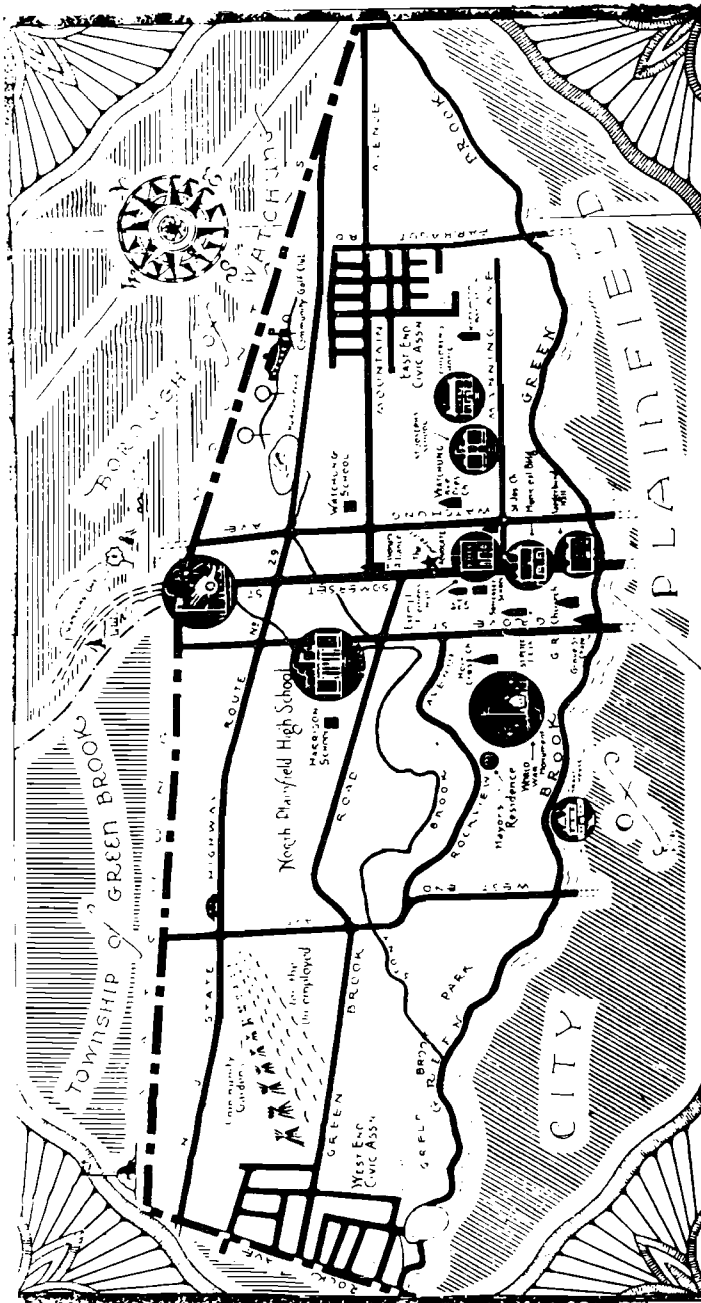
The Vermeule Community Center which is 7.9 acres in area, is located at the intersection of Greenbrook Road and Clinton Avenue.

The land was purchased by the Borough in 1974 with matching funds from the State Green Acres program of New Jersey. In 1980 North Plainfield received another Green Acres grant for the partial development of the property.

Located on the land is the historical Vermeule cemetery, which dates back to 1736, where Memorial Day services are held annually. One of the buildings on the property dates back to 1777, a time when colonial soldiers are said to have camped at the site. An antique smokehouse is also located on the site. The grounds are landscaped with a variety of trees, flora and gardens.

The land includes the mansion, which is used as a health clinic, historical museum, and a meeting room with a kitchen. The blue room, houses a meeting room with kitchen facilities. The barn building, is used for 4-H, girl scouts and arts and crafts. The beige room, is used for meetings and music. Three small cottages are also located on the property.





## Interviews

### Mrs. Margaret Arnold

Mrs. Margaret Arnold moved to North Plainfield in 1929. She recalls the many meetings of the West End Civic Association, she and her husband attended. Mr. Arnold served as president of the Association with Mrs. Arnold as secretary. Some of the accomplishments of the Association were to bring city water out to the residents of the West End. They were responsible for bringing bus service to the west end of North Plainfield, as well as being instrumental in the building of West End School. Along with her memories she treasures the gavel used by her husband to call the meetings to order. The gavel was made by the manual arts teacher Mr. Hans Skawold.

Mr. Louis Arnold was born in North Plainfield in 1897. Mrs. Arnold remembers her husband tell of the time around 1911, he and his father planted Maple trees on both sides of Greenbrook Road from Rock Ave. as far as the Brunson Estate. Many of us remember the trees arching over Greenbrook Road.

Mrs. Arnold loves North Plainfield and is proud to have participated in building our borough.

### Mrs. Annie K. Luthman

Mrs. Annie Keller Luthman still lives in the house on Wilson Avenue, which her father built and where she was born 93 years ago. At that time there were several members of the Keller family living in houses on Harrison Avenue, Cedar Street and Wilson Avenue. One of Mrs. Luthman's uncles, on Cedar Street, had a baker shop in the back of his house. He would travel around the town with his horse and wagon selling baked goods. There was also another use for the horse. When the firehouse, then on the corner of Harrison Avenue and Walnut Street, sounded the alarm the first man to arrive with his horse got paid for pulling the pumper to the fire.

Some other early memories were of the Wilson Estate on Greenbrook Road, the site of the High School and of the apple orchards on what is now the lower and upper athletic fields. The block from Rt. 22 to Walnut Street, the West side is almost as it was when Mrs. Luthman was a child. There were a few houses on Cedar Street and three houses on Harrison Avenue built by Mr. Wilson for his coachman and servants.

In the Maple Avenue area there were two ponds, Folangs Pond and Debeles Pond. They were used by the neighborhood for skating, but mainly used by the owners to supply ice to area residents. On Cedar Street near Rt. 22 and Maple Avenue was a brick yard and clay pit, where Mrs. Luthman remembers picking dandelions and catching bull frogs. The soil in the area was mostly clay and all roads being dirt, when it rained large puddles appeared and this brought out the frogs.

Mrs. Luthman was employed for many years in the Plainfield area. At one time for Rosenbaum Department Store on Front Street as a sales person and later for Muhlenberg Hospital as a seamstress. They made and repaired sheets, draperies, aprons, caps and various other articles used in the hospital.

Still active in senior citizen groups, Mrs. Luthman does all her own house work and finds time to can vegetables from her garden.

### Marion Milne

I have many memories of the years I have lived in North Plainfield.

One of my favorite memories is of a place where my friends and I used to play when we were children. Located off of Rockview Avenue, down below the "Pasture", a small area along Stony Brook, was called "Seven Springs" after the seven springs that were found there.

I don't know who discovered it. Maybe the Indian children played there. It was our special place. We all had yards of our own to play in, but our yards didn't have a brook, garter snakes, blood-suckers and duck-eggs. We climbed trees, invented games to play, paddled in the brook and an occasional fall in the water. In the spring the area was full of all kinds of wild-flowers. Purple and white violets, dog-tooth violets, spring beauties, jack-in-the-pulpit, dutchmens' britches, arbutus, anemones and others.

We picked bunches of these flowers for our Mothers, hoping they would over-look our muddy clothes, rips and tears, and wet shoes.

It was a beautiful place. No building around the area, you could see way past Greenbrook Road. The brook always ran clear, no debris thrown in a long its course.

We didn't realize we were playing on someone's property. Who owned it? We really never thought about it, and we were never chased away. You can say I thought it was beautiful because I saw it through the eye of a child. But I know different.

Imagine yourself in an area with all trees, green grass, a brook, open spaces, and beautiful flower art undisturbed by noise and violence. I'm sure you would agree it was beautiful.

It is your father and mother that pick the place where you are born. I'm glad my parents picked North Plainfield.

Today, in 1985, this area has been developed, called Azalea Court. Eleven houses have been built where cows were pastured.

### **Theodore Koller**

Mr. Koller was born in the house at 40 Race Street and has lived in the borough all his life. He is the third generation Koller in North Plainfield, his grandfather Michael Koller having come to North Plainfield about 1875 and establishing a shoemaker shop at 27 Lincoln Place. In 1933 Mr. Koller's mother purchased the house on Grove Street where the Kollers still make their home.

Mr. Koller remembers the trolley in the early 20's and the Hudson Pond on Route 22. He states that Somerset Street was a shopping area used by Warren, Mt. Bethel and Watchung. Along Somerset Street could be found 6 meat markets, 12 grocery stores, 2 bakeries and 1 live poultry store.

Today Mr. Koller is involved in a newly established organization called "Friends of Carpenters". This group was organized about 4 years ago in the Watchung Presbyterian Church with a purpose of finding an old house to fix up and paint. The Somerset Plumbing and Heating Company on Somerset Street donated half the value of a lot they owned on Chatham Street and with the help of Small Cities Grants Money the lot was purchased and townhouses are being built. One very interesting point is that the lot on Chatham Street was once the site of the Warren Chapel which is now the Watchung Presbyterian Church.

### **Miss Margaret V. Smith**

Miss Margaret V. Smith was born and grew up in the family home at 113 Duer Street. Miss Smith's grandmother purchased the house in 1882 from the Smalley family for \$2,000. Miss Smith remembers that her mother attended the school on "Mud Lane" from grades 1-9 and attended Plainfield High School, then the Old Stillman School for grades 10-12. Miss Smith, a former Plainfield teacher, attended Somerset School and remembers the High School being on the second floor of the building. Visiting relatives and traveling was a favorite pastime for the Smiths and she recalls that to get to Basking Ridge and Far Hills you had to walk to the Plainfield Train Station and catch the train to Newark where there was a changeover in Elizabeth. In Newark you had to take the trolley to the DL&W Station where you took another train to Basking Ridge. The trolley to Newark from Plainfield took about 2 hours.

In 1927 Miss Smith purchased a new Chevrolet and traveling was much quicker and more comfortable.

### **Elizabeth Oliwa**

At Fischer Casting Company Forty Years Ago

In September 1942 we moved into one of the new small houses built by Sears Roebuck on Glendale Road. Behind this street on either side were huge fields. The grass was tall, but before long there were paths made by people walking their dogs. At night in the distance in the field behind our house we could see the lights of an oblong building and we could hear the rumbling noise which sounded like that of a silk mill I had seen in Pennsylvania.

For about a year and a half I was at Eastern Aircraft in Linden, New Jersey working on the one-man war plane "The Wild Cat". I never went near the lights in the field behind our house.

When I was laid off in the fall of 1944, the radio messages still urged women to get into war work. One cold morning in January 1945, my neighbor, Ruth Kidd, and I decided to investigate the factory across the field. We walked in the snowy ruts in Glendale Road and went west on Greenbrook Road which still had no sidewalks, to the Fischer Casting Company off Green Brook Road far back in the clearing.

Mr. Louis Fischer and his son Mr. Arthur Fischer said they could use both of us. I was to work with Mr. Monk who had lost an arm while working on one of the machines. My job was to inspect three to five pound cast iron valves for certain flaws and to put the perfect ones in large wooden barrels, my arms always ached.

The main factory room was large, cold and rather dark with poor lighting. There were grinders, buffers, band saws, a sand blaster and a long work bench where women and men worked on the valves. The foundry was a horrible place far back. The best place was the core room where mostly women worked with sand and molds needed to make hollow castings. The people sat on high stools in a very warm area. Ruth Kidd worked here.

The lunch room had a long table with two benches. Only the women ate here. Each brought a brown bag of sandwiches and a thermos of coffee.

On a warm day near the end of March, we "waded" across the tall grass behind the factory and found a stone or brick wall on which we sat to eat our lunch. Someone said this wall was around a small cemetery. The grass was as high as the wall but we tried to find some grave-stones. They were there.

The office in this factory was up a circular stairway in what looked like a silo or tower. The main "boss" was a powerful woman, Marguerite (or Margaret) Coletta, who worked at the bench like a man.

Many of the barrels of cast iron valves were taken in trucks to the Walter Kidde Company. I was told they would be used in various war plants.

Everyday I came home very dirty with black smudges on my face, arms and clothing. I needed two baths. On April 12, 1945 as I came in the door, my neighbor, Kate Mueller, telephoned giving me the news of the death of President Roosevelt.

Shortly after this I was offered a teaching position at Whittier School in Dunellen at a salary of \$1700. a year. I was so happy! My war work stint at Fischer Casting Company at 75¢ an hour was over. I had been an elementary school teacher for fifteen years in Pennsylvania and New Jersey. Soon I would be back at my real job, working with children. Fischer Casting Company would go on without me.

### **Edward W. Appgar**

It was late spring of 1952 when our family moved to a little cape cod bungalow located at 11 Carter Place - a dirt road on the Brunson property. A number of things on the several hundred acre estate, which fronted on Greenbrook Road for about a quarter mile from Arnold Ave. east in North Plainfield and stretched northerly to the top of the first Watchung mountain ridge in Greenbrook, interested a boy my age.

There was the old apple orchard on the easterly side of Arnold Avenue and north of Carter Place where abandoned fruit trees were good for climbing and rotting fruit made good ammunition for throwing.

Directly east of the lower part of the orchard was a swampy area where cat tails could be cut and dried to be burned as a bug repellent for use while watching the fireworks launched from Greenbrook Park down Clinton Avenue on the fourth of July. The booms ricocheting between the Watchung and distant Netherwood Hills quickened the heartbeat of a boy whose parents took seriously the legal ban of private fireworks in New Jersey.

The swamp was fed by a concrete walled spring located in the woods near the present Warfield Road behind the Vermeule family cemetery. Those woods were a cool retreat for a boy in the summertime as he got his feet wet in the bubbling brook and noticed the mosses and skunk cabbage growing nearby. In the winter "getting lost" and retracing ones steps while exploring the woods and various wild animal tracks fired a boys imagination a proved a satisfying pastime.

Another landmark of interest to us children was the old Fischer Casting factory at the corner of Oyster Shell (covered Clinton Ave. extension and Carter Place). We spent many an hour searching the discarded sand for waste bronze which we collected and sold for eight cents a pound. Most of the profit from the venture was spent at the factory's soda machine — another favorite spot since the nearest corner store was about a mile away on Front Street in Plainfield.

Each memorial day a neighborhood event, interesting all the children, was the ceremony held in the aforementioned cemetery honoring the Revolutionary War veterans interred there. Mr. Harold Jeffrey has worked hard to restore this boro landmark. Even we children helped for many months to collect, clean and stack brick from the dilapidated original wall. At one service soon after the wall was rebuilt, I remember Cornelia Vermeule, an elderly family member came with her deformed black maid and servant-butler Barard F. Thomas who chauffeured her in a large black aged limousine. Since 1980 his body has rested here. Direction signs for the cemetery were posted on the side of our house.

Overseeing, almost parenting if you will, this whole complex which also included eight small houses, the barn building housing five apartments, the garage building with its apartment and office addition, and the twenty-six room main house with five apartments were Mr. and Mrs. Augustus J. Brunson, who made their home on the first floor of this main house.

The first recollection I have of Mr. Brunson was seeing him reclining on an antique mahogany couch in his office. He was a tall, slim gentleman, who appeared much younger than the octogenarian he was at that time. Blanket-covered, not far from a crackling fire, he was listening to his "talking machine" as he had been blind for some forty years. At other times his secretary would be reading to him some current book or perhaps the Wall Street Journal. By profession, a lawyer, he remained mentally alert and interested in daily affairs right up until his death at 93 in 1963. I had come with my mother to pay our monthly rent and as became customary there was candy for me from him.

Mrs. Emily K. Brunson was a lady short in stature but large in presence. She seemed to me a very caring, kindly person of great ability. Trained nurse, housewife, co-manager she shared Mr. Brunson's love for and interest in their "farm" and tenants.

As a child I felt this especially at Christmas, when all the tenants would receive baskets of her homemade goodies and each of the families with children would get individual and family games in addition. She sure had won my heart.

To those who knew them, the Brunson's more than a century hand of care can be seen around the Vermeule Community Center even today. The fieldstone foundation and it's many additions bear testimony to the stories of Mr. Brunson about his grandparents and uncles start of the main farmhouse in the early nineteenth century and it's subsequent additions and changes through this century.

The beautiful grounds and native plantings of mighty oak, chestnut and black walnut trees give evidence of his desire for the preservation of the "Brunson Farm". More recent plantings of English Walnut, Holly, Ginkgo trees, as well as various evergreens including white pine, blue spruce, sequoia, and others, bear the touch of Mrs. Brunson.

To many who live in this area, this remaining parcel of that farm, known now as Vermeule Community Center will remain the Brunson house and property for quite some time.

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## The Blue Hills Historical Society of North Plainfield

The purpose of the Blue Hills Historical Society of North Plainfield is to research and catalog the history of North Plainfield. This organization will also be dedicated to the preservation of the oldest remaining structures in North Plainfield. The Historical Society will also work towards acquiring a home in which to permanently display authenticated articles and written materials pertaining to the history of North Plainfield. The written history and collected materials will be housed as a permanent record and will become the property of the Blue Hills Historical Society and its members.

## Acknowledgements

We wish to express our sincere appreciation to all those in the community who have generously shared their memories, photos, maps and knowledge of North Plainfield which made possible the writing of this book. Any errors or omissions are entirely unintentional.

Jean Adamus	Theodore Koller	North Plainfield Library
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Kenneth Brown	Mrs. Luthman	North Plainfield Churches
"Sonny" Church	Robert Miller	Elizabeth A. Oliwa
Mrs. Frederick Crystal	Harold Dietzman	Elizabeth Orloff
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Harold Jeffrey	Edward McBride	Watchung Historical Society

The authors would especially like to thank Theodore Koller for the material, photos, and memorabilia that he has contributed to the society.

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