

DRAFT

Natural Resource Inventory

**LAKEWOOD TOWNSHIP ENVIRONMENTAL COMMISSION
AND
LAKEWOOD TOWNSHIP PLANNING BOARD**

February 28, 2006

Prepared By



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PURPOSE

The Township of Lakewood Environmental Commission in consultation with the Township of Lakewood Planning Board and Township Committee has prepared this Natural Resource Inventory as a reference for land use and planning decisions in the Township.

The purpose of a Natural Resource Inventory is to identify the natural resources within a municipality and to describe their importance to the public health, safety and welfare of the community. A Natural Resource Inventory provides an essential part of the background data necessary for a Planning Board to review key environmental characteristics of the Township and then apply this information while considering future master plan amendments and reviewing applications for development.

Information generated for this inventory was obtained from federal and state environmental agencies, published materials, and consultation with local officials. All figures were generated using data downloaded from the New Jersey Department of Environmental Protection, Geographic Information System metadata and represent the most up-to-date information available. Data presented herein is intended for general municipal-wide planning purposes and is not intended as definitive site-specific information. Site inspections, field verifications or delineations will be required for development review and site planning purposes for specific sites.

INTRODUCTION

The Township of Lakewood is located in northern Ocean County, south of Monmouth County, east of Jackson Township and north of Dover Township (Figure 1). According to GIS data provided by NJDEP, the Township encompasses an area of approximately 16,030 acres (25.05 square miles). Lakewood is located within the Barnegat Bay Watershed, which encompasses the Metedeconk River and Kettle Creek.

The Township includes approximately 7,126 acres or 44 percent of urban land uses (Figure 2). Nearly a third of the urban uses are residential. Lakewood also includes 5,995

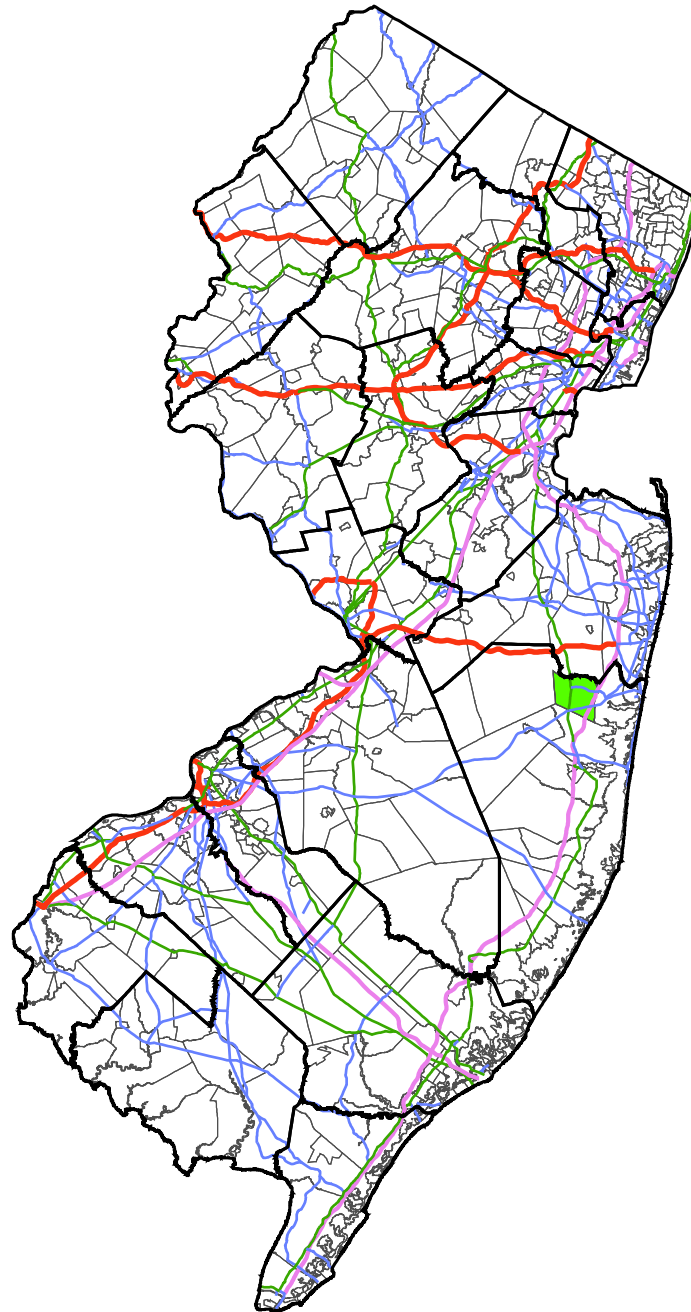
DRAFT Natural Resource Inventory
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acres or 37 percent of forest cover and 1,882 acres or 12 percent of wetlands. The remaining area is encompassed in agricultural and “barren” land uses. Surface water bodies encompass approximately 238 acres.

Lakewood is situated at the confluence of several major roadways, including Route 9, Route 70 and Route 88, and has four exits of the Garden State Parkway. Lakewood also contains freight rail lines and is being considered as part of the proposed reinstatement of a passenger rail line and station for the Monmouth-Ocean-Middlesex (MOM) or Monmouth-Ocean (MO) rail system.

The Township of Lakewood is located largely within the Suburban Planning Area (PA2), with portions delineated in the Fringe Planning Area (PA3) and in the Environmentally Sensitive Planning Area (PA5). A Critical Coastal Environmental Site designation is associated with Lake Carasaljo, Lake Shenandoah and wetlands on the 2001 State Plan Policy Map (Figure 3). The State Development and Redevelopment Plan envisions that localities within a PA2 will exemplify compact form of development, protect the character of existing stable communities, protect natural resources, redesign areas to prevent sprawl, and revitalize cities and towns. A portion of the Township is also within the jurisdiction of the Coastal Area Facilities Review Act (CAFRA), which is east of the Southern Branch Main Line.

Preserved land in Lakewood has been classified on the Statewide GIS in three categories: County parks and open space, municipal parks and open space, preserved farmland and private open space (Figure 4). The open space areas are predominately along the South Branch of the Metedeconk River. They include the 565 acre Ocean County Park (former John D. Rockefeller estate), the 100 acre Lake Shenandoah County Park, the 176 acre Lake Carasaljo and 149 acre Pine Park. Preserved under the Ocean County Farmland Preservation Program, the 59.47 acre Dwulet farm on Joe Parker Road farm has been preserved as a field and ornamental crop area. The Township Unified Development Ordinance provides for an open space zone in the areas that surround Lake Shenandoah and the Ocean County Park.



- Lakewood Township
- Municipal Boundary
- County Boundary
- Interstate Highway
- US Highway
- State Highway
- Toll Road



11 Tindall Road
 Middletown, NJ 07748-2792
 Phone: 732-671-6400
 Fax: 732-671-7365

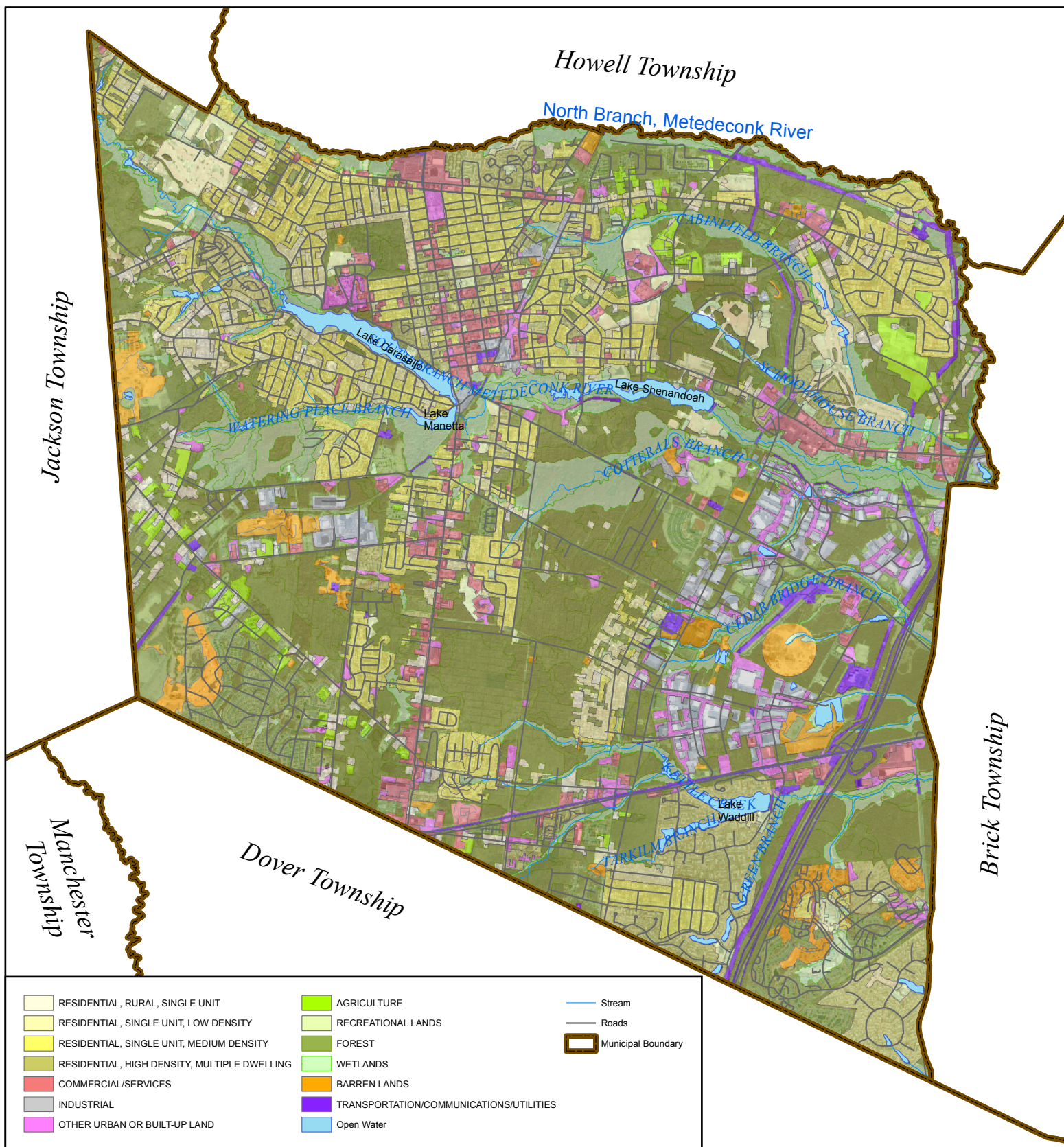
**-Draft- Figure 1: Site Location
 Lakewood Township
 Ocean County, New Jersey**

0 62,500 125,000 250,000
 Feet

Prepared by: STK, February 22, 2006
 Source: NJDEP
 File Path: H:\LAKE\00030\Permits\lakeNRI_location.mxd



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



TM 11 Tindall Road
 Middletown, NJ 07748-2792
 Phone: 732-671-6400
 Fax: 732-671-7365

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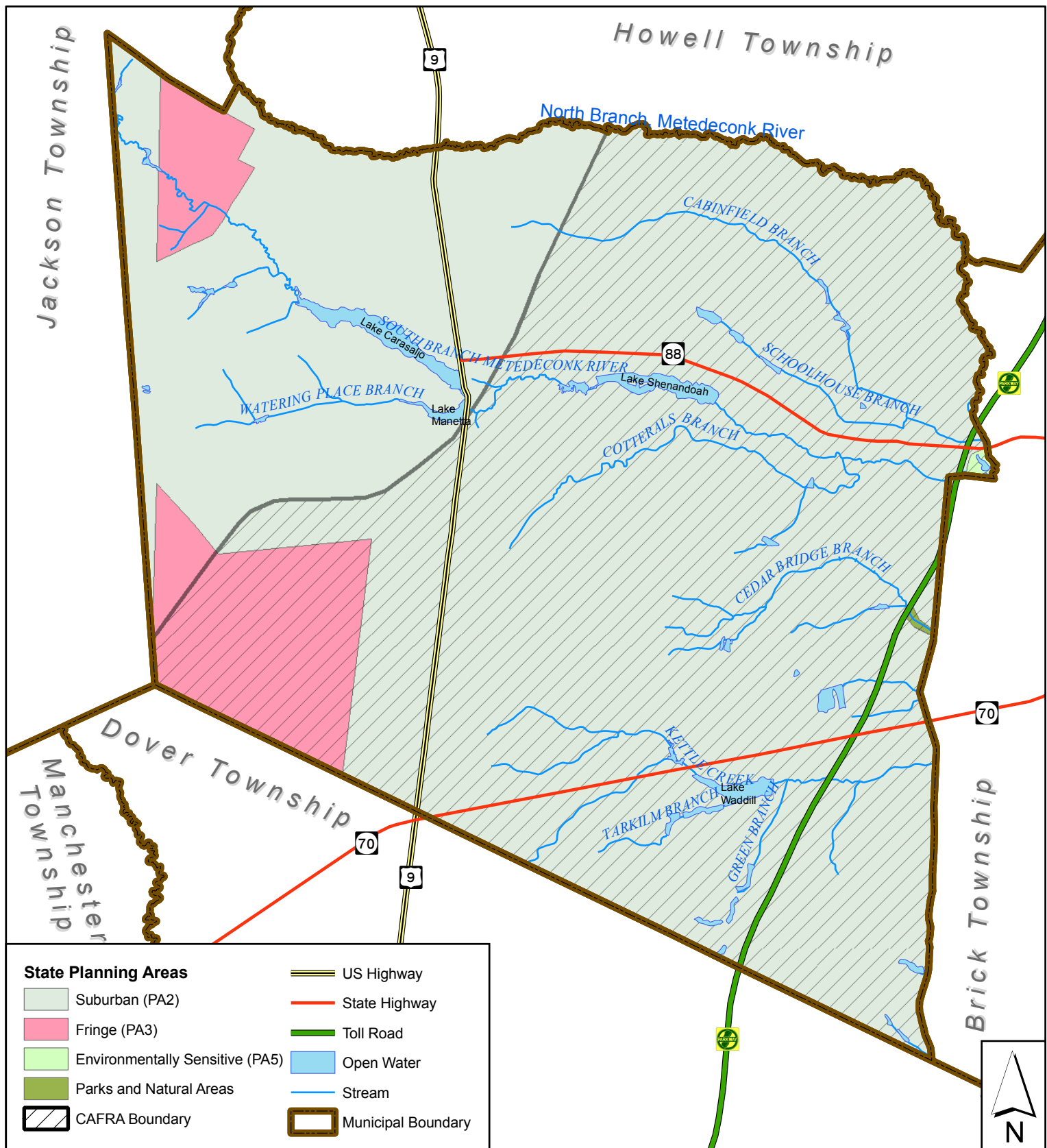
Prepared by: STK, October 26, 2005
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Figure 2: Existing Land Use Lakewood Township Ocean County, New Jersey

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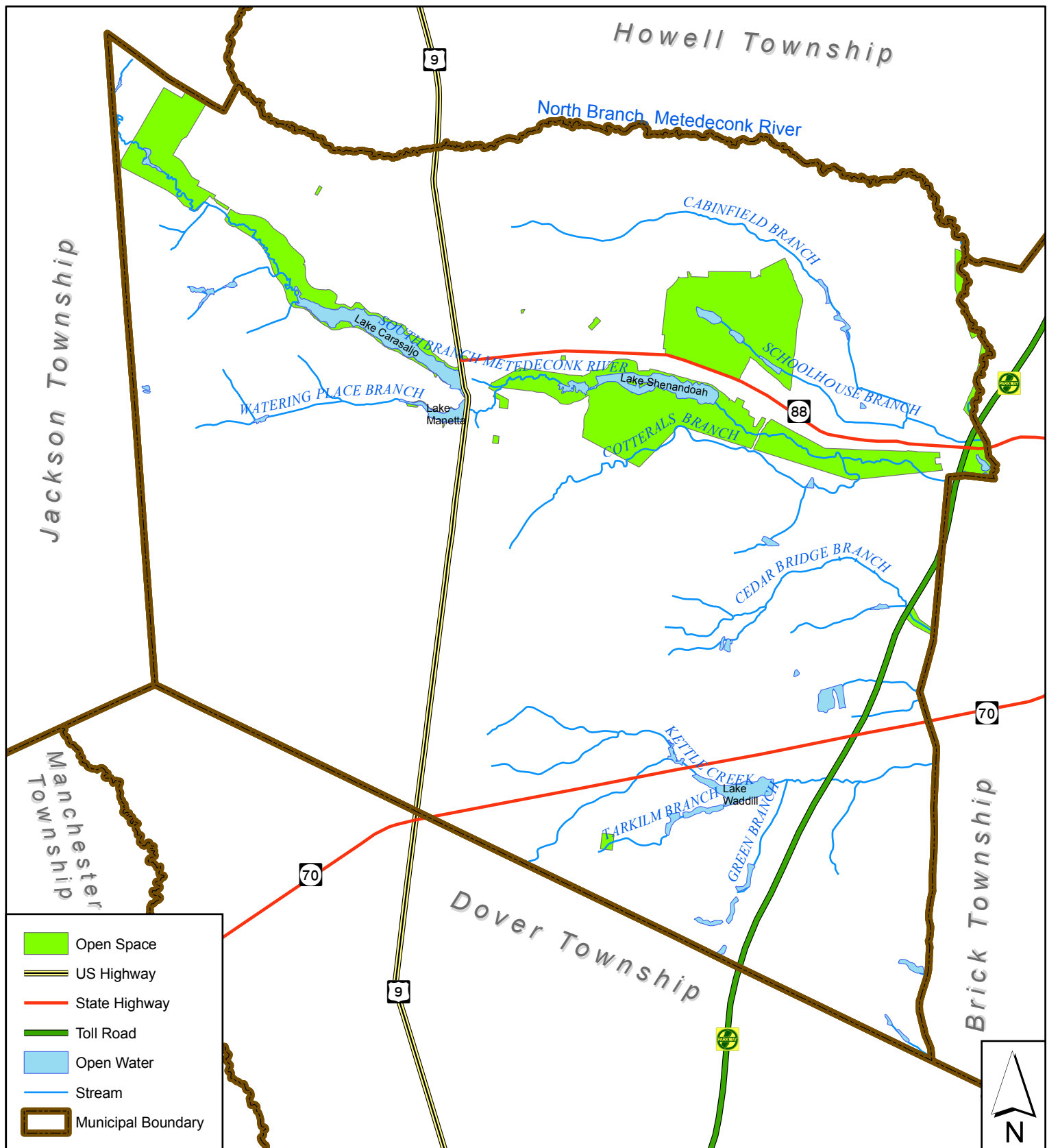
ASSOCIATES

0 2,250 4,500 9,000 Feet

**Figure 3: State Planning Areas
 Lakewood Township
 Ocean County, New Jersey**
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Prepared by: STK, February 22, 2006
 Source: NJDEP, 2001 State Plan Policy Map
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T&M 11 Tindall Road
 Middletown, NJ 07748-2792
 Phone: 732-671-6400
 Fax: 732-671-7365

0 2,250 4,500 9,000
 Feet

**-Draft- Figure 4: Open Space
 Lakewood Township
 Ocean County, New Jersey**

Prepared by: STK, February 22, 2006
 Source: NJDEP
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NOTE: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

ENVIRONMENTAL COMPONENTS

The Township of Lakewood rivers and stream corridors provide recreation activities, are essential for proper drainage of the community and are suitable habitat for wildlife species. Residents, businesses, and industry in Lakewood are dependent on groundwater supply. Lakewood is contained in the Outer Coastal Plain. The Outer Coastal Plain contains sandy soils that provide ideal conditions for aquifers. In the Township this aquifer is the Kirkwood-Cohansey that provides groundwater to Lakewood residents. Groundwater supplies can be vulnerable to pollution and over-pumping of aquifers and need to be conserved and protected. Soils contained in Lakewood are from the Cohansey formation that are mostly medium to coarse grained sands, although some thin clay soil layers are present. In Lakewood there are fourteen soil series each with a corresponding component totaling twenty-five.

Lakewood's waterbodies are located in the federal Barnegat Bay priority wetland that includes all of the tributary waters of the system. With both freshwater and tidal, the Metedeconk River System supports suitable habitat for the major wintering population of the federally threatened and state endangered Bald Eagle and for other state listed species such as Red-Shouldered Hawks, Pine Barrens Tree frogs, and Barred Owls. The Township wetland areas also serve as a vital resource for the variety of wildlife and vegetative species and economic development. The Natural Heritage Database delineates a federal endangered and state threatened Swamp Pink (*Helonias bullata*) critical hydrophyte vegetative species.

The New Jersey Department of Environmental Protection has designated the North and South Branches of the Metedeconk River, as well as Watering Place, Cotterals Branch, Schoolhouse Branch and Cabinfield Branch, with the vast, unspoiled Kirkwood-Cohansey aquifer underlying most of the region as Category One. This special level of protection serves not only to protect wildlife and vegetative species it also ensures that the protection of potable water supplies.

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These rivers and stream corridors are also subject to flooding and impairments. All waterbodies within Lakewood contain lowland areas. There are also several impaired waterways within the Township that require protection along the waterways of Lakewood.

The Township of Lakewood's Natural Resource Inventory was prepared as a reference guide and planning guide and considers the following environmental components:

- **Geology:** The Township is located within the Atlantic Coastal Plain physiographic region and in the Outer Coastal sub-region. The bedrock type determines the quality and depth of soil layers, the amount of groundwater available and the recharge capability. Soil vary with respect to erosion potential, septic suitability, hydric conditions, floodplains and distribution of prime farmlands.
- **Climate:** The Township is located within the Pinelands Climatic Zone and Atlantic Coastal Zone. Air quality and the noise regulations are reviewed.
- **Hydrology:** The Township is located within the Long Island-New Jersey Coastal Drainage system, with which the Barnegat Bay-Little Egg Harbor Watershed is contained. The Metedeconk River System is an important water resource for the Township. The hydrology component also describes the various aquifers and groundwater potential, as well as the wetlands in the Township.
- **Wildlife and Vegetative Species:** There are significant stands of remaining forest cover and forested wetlands that support wildlife habitat and serve many important functions, including erosion control and reduction of stormwater runoff.

GEOLOGY

Physiography

The Township of Lakewood is located within the Atlantic Coastal Plain physiographic region and in the Outer Coastal sub-region. The Coastal Plain is categorized as a plain that rises gradually from sea level on the east, west, and south to elevations as high as nearly 120 meters (394 feet) where the Inner and Outer Coastal Plains join at the northeast-southwest trending *cuestas*, a belt of low hills. The Outer Coastal Plains minerals are mostly marine-deposited sedimentary sands, gravels, and clays overlain with later deposits made in interglacial Pleistocene time. The Outer Plain contains sandy soils which is an ideal condition for the 17 trillion gallon aquifer located in the Pinelands. Although the Pinelands are typically viewed as being very dry, in many places the water table is quite close to the surface, giving rise to extensive wetlands. The major rivers originating mostly in the Pinelands in this relatively flat, low-lying region are slow-flowing, rich in humates that impart a brown tea color to the water, low in nutrients, and acidic. In addition many rivers are tidal for significant portions of their length.

Stratigraphy

Most of the sediments of the New Jersey Coastal Plain range in age from Cretaceous to Miocene (135 to 5.3 million years old) and were deposited in deltaic and marine environments; the period of marine deposition ended in the Miocene with the Cohansey Sand. These soils are mostly medium to coarse grained sands, although some thin clay soil layers are present. The soils developed from the Cohansey formation are very porous and infertile because for the most part, the parent material has a greater proportion of coarse sand particles than finer clay particles. The greater the proportion of coarse particles in a soil, the less it is able to retain water and nutrients such as calcium, magnesium, phosphorus, and potassium.

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There are fourteen soil series each with a corresponding component totaling twenty-five in the Township of Lakewood (Figure 5). Of these soil series, 12,835.97 acres or 80 percent of Lakewood are hyrdic soils (Figure 6). There are fourteen soils that have been identified as prime, unique, Statewide and locally important and total 8,597.13 acres or 54 percent (Figure 7). Figure 8, Septic Suitability illustrates that most soils in Lakewood are septic suitable. A detailed description of the soil series and component is summarized in Appendix A. Not listed as a series or component are pits, sand and gravel (PHG) that encompass 293.09 acres or 1.8 percent of Lakewood, Urban Land that encompass 374.72 acres or 2.3 percent of Lakewood, and Water that encompass 210.83 acres or 1.3 percent of Lakewood.

Soil Series	Summary of Soil Series		
	Hyrdic	Farmland	Septic Suitability
AtsA	X	Unique	Very Limited
BerAr	X	Unique	Very Limited
BerAt	X		Very Limited
DocB	X	Statewide	Not Limited
DoeA	X	Prime	Not Limited
DoeB		Prime	Not Limited
Dofg		Statewide	Not Limited
EveB			Not Limited
EveC			Not Limited
EveD			Not Limited
GamB	X	Statewide	Very Limited
HbmB		Statewide	Very Limited
HboA	Hydric Rating Wetland	Prime	Very Limited
KemA	X	Prime	Very Limited
LakB	Hydric Rating Wetland		Very Limited
LakbB	X	Local	Very Limited
LasB			Not Limited
LasC			Not Limited
MakAt	X	Unique	Very Limited
MumA	X	Statewide	Very Limited
PhbC			Not Limited
PssA	X		Somewhat Limited
PstAt	X		Very Limited
PsuB			Not Limited
SacB	X	Prime	Not Limited

Exhibit 1 highlights the hyrdic rating, the seasonal water table depth, runoff potential, and the land class and suitability for different land uses and septic suitability for each soil.

Downer loamy sand (DocB) and Evesboro sand (EveB) are the dominant soil series throughout the Township. DocB can be found in the northwest and northeast section of the municipality and below Route 528 and U.S. Highway 70. EveB is more prevalent in the northern section of the Township and in residential areas. The Metedeconk River, which forms a natural northern boundary with Howell Township, has the hyrdic soil Berryland (BerAt) adjacent to its banks. The Metedeconk River (Southern Branch) connecting Lake Shenandoah and Lake Carasaljo contains a mixture of hyrdic soils (BerAt, Downer sandy loam (DoeA), Lakehurst sand (LakB), Manahawkin muck

(MakAt), and Psammets (PssA)) and non-hydric soils (Evesboro sand (EveD)). The Kettle Creek watershed in the southeast part of the municipality is dominated by the hydric soils of DocB, EveB, MakAt, and Berryland sand (BerAr). In terms of developed areas, the historic downtown area is labeled as urban land and the Lakewood Industrial Complex is dominated by Lakewood sand (LasB).

Hydric soils are not located within the southeast portion of the municipality, where farmland with Statewide importance is located. Farmland with Statewide importance is located throughout the municipality in the northeast and northwest, as well as in the centrally area of the Township. The Township also contains Lakehurst sand (LakkB) a soil of local farmland importance along the Cotterals Branch. The areas with the least suitable septic uses are along the waterways of the Township.

The following describes each soil series and component:

- I. Atsion Series— This series is hydric soil
 - a. Atsion sand (AtsA)—AtsA is listed as a farmland hydric soil with unique importance. This soil is comprised of two soil series: Atsion with a flat landform and Berryland with a drainageway flat landform. AtsAs encompasses 982.75 acres or 6.13 percent of Lakewood. Woodland species include Blackgum, Pitch Pine and Red Maple.
- II. Berryland Series—This series is a hydric soil.
 - a. Berryland sand, rarely flooded (BerAr)—BerAr is listed as a farmland soil with unique importance. This soil is comprised of four soil series: both Berryland and Atsion contain a drainageway flat landform, Manahawkin is a swamp floodplain landform and Mullica is a depression landform. This soil encompasses 143.44 acres or 1.0 percent of Lakewood. Woodland species include Black Oak, Chestnut Oak, Pitch Pine, Scarlet Oak and White Oak.

- b. Berryland sand, frequently flooded (BerAt)—BerAt is contained in a depression landform and encompasses 515.90 acres or 3.2 percent of Lakewood. Woodland species include Pitch Pine.

III. Downer Series—According to the United States Department of Agricultural Natural Resource Conservation Services (USDA—NRC), New Jersey nominated the Downer series as the official State soil. Woodland species include Black Oak, Pitch Pine, Scarlet Oak and White Oak.

- a. Downer loamy sand (DocB)—DocB is listed as a soil of statewide importance and encompasses 3,500.93 acres or 21.8 percent of Lakewood. This component is a hydric soil
- b. Downer sandy loam (DoeA)—DoeA is listed as a prime soil and encompasses 770.11 acres or 4.8 percent of Lakewood. This component is a hydric soil
- c. Downer sandy loam (DoeB)—DoeB is listed as a prime soil and encompasses 679.37 acres or 4.2 percent of Lakewood. This component is not a hydric soil
- d. Downer gravelly sandy loam (DofgB)—DofgB is listed as a soil of statewide importance and encompasses 684.86 acres or 4.3 percent of Lakewood. Woodland species include Black Oak, Scarlet Oak, Virginia Pine and White Oak. This component is not a hydric soil

IV. Evesboro Series—This soil is not a hydric soil and includes the following woodland species: Chestnut Oak, Pitch Pine, Scarlet Oak and White Oak.

- a. Evesboro sand (EveB)—EveB encompasses 2,879.09 acres or 18.0 percent of Lakewood.
- b. Evesboro sand (EveC)—EveC encompasses 478.17 acres or 3.0 percent of Lakewood.
- c. Evesboro sand (EveD)—EveD encompasses 155.58 acres or 1.0 percent of Lakewood. Woodland species include Black Oak, Virginia Pine, Chestnut Oak, Pitch Pine, Shortleaf Pine, Virginia Pine and White Oak.

- V. Galloway Series—This series is a hydric soil and includes the following woodland species Pine Oak, Sweetgum, Virginia Pine and White Oak.
 - a. Galloway loamy sand (GamB)—GamB encompasses 286.10 acres or 1.8 percent of Lakewood.

- VI. Hammonton Series—This series is not a hydric soil.
 - a. Hammonton loamy sand (HbmB)—HbmB is listed as a soil of statewide importance and encompasses 32.62 acres or less than 0.5 percent of Lakewood. The woodland species include Black Oak, Pitch Pine, Red Maple and White Oak.
 - b. Hammonton sandy loam (HboA)—HboA is considered as a prime soil, is a flat drainageway landform and encompasses 166.25 acres or 1.0 percent of Lakewood. The woodland species include Black Oak, Pitch Pine, Shortleaf Pine, Virginia Pine and White Oak.

- VII. Keyport sandy loam (KemA)—This component, a hydric soil, is listed as a prime farmland soil and exhibits a depression landform. This soil encompasses 49.71 acres or less than 0.5 percent of Lakewood. Woodland species include American Beech, Loblolly Pine, Northern Red Oak and Yellow-poplar.

- VIII. Lakehurst series— This series is contained in a depression landform.
 - a. Lakehurst sand (LakB)—LakB encompasses 612.77 acres or 3.8 percent of Lakewood and contains a wetland hydric soil rating. Woodland species include Chestnut Oak, Pitch Pine, Post Oak and Scarlet Oak.
 - b. Lakehurst sand, clayey substratum (LakkB)— LakkB encompasses 16.88 acres or less than 0.5 percent of Lakewood and is a hydric soil. This component has been designated as a "farmland of local importance." Woodland species include Black Oak, Virginia Pine, Blackgum, Pitch Pine and White Oak.

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- IX. Lakewood sand— This series is not a hydric soil.
- a. Lakewood sand (LasB)— LasB encompasses 1,905.84 acres or 11.9 percent of Lakewood. Woodland species include Chestnut Oak, Pitch Pine, Post Oak and Scarlet Oak.
 - b. Lakewood sand (LasC)—LasC encompasses 243.05 acres or 1.5 percent of Lakewood. Woodland species include Pitch Pine, Shortleaf Pine and Virginia Pine.
- X. Manahawkin muck, frequently flooded (MakAt)—This component is a hydric soil and is listed as unique farmland soil. This soil is comprised of four soil series: both Berryland and Atsion contain a drainageway flat landform, Manahawkin is a swamp floodplain landform and Mullica is a depression landform. This soil encompasses 648.89 acres or 4.1 percent of Lakewood. The woodland species include the Atlantic White Cedar and Red Maple.
- XI. Mullica sandy loam (MumA)— This component is a hydric soil and is listed as farmland with Statewide importance. This soil is comprised of three soil series: Mullica, Berryland, and Manahawkin all of which are a depression landform. This soil encompasses 6.17 acres or less than 0.5 percent of Lakewood. Woodland species include Blackgum, Pitch Pine, Red Maple and Sweetgum.
- XII. Phalanx Series—This series is not a hydric soil and includes the following woodland species Black Oak, Chestnut Oak, Pitch Pine, Virginia Pine and White Oak.
- a. Phalanx loamy sand (PhbC)—PhbC encompasses 31.75 acres or less than 0.5 percent of Lakewood.
- XIII. Psammments series—
- a. Psammments (PssA)—PssA is a hydric soil and is comprised of comprised of three soil series two of which Mullica and Berryland are a depression

landform. The other series Atsion is a flat landform. This soil encompasses 213.69 acres or 1.3 percent of Lakewood.

- b. Psamments, sulfidic substratum, frequently flooded (PstAt)— PstAt is a hydric soil and is comprised of three soil series, Appoquinimink, Transquaking, Mispillion all of which exhibit a tidal flat landform. This soil encompasses 55.93 acres or less than 0.5 percent of Lakewood.
- c. Psamments, waste substratum (PsuB)—PsuB is not hydric and encompasses 42.04 acres or less than 0.5 percent of Lakewood.

- XIV. Sassafras sandy loam (SacB)—This component is not a hydric soil and is considered as prime soil and encompasses 48.90 or less than 1 percent of Lakewood. SacB woodland species include Black Oak, Northern Red Oak, Scarlet Oak, White Oak and Yellow-popular.

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Exhibit 1: Soil Types and Conditions

Soil	Hydric Rating*	Seasonal Water Table Depth	Septic Suitability [⊖]	Surface Runoff	Kf Erodibility Factor [⊗]	NonIrrigated Capability Class (Irrigated) [•]	Farmland Soils Designation [♦]	Structures Permitted	Road Suitable (Hazard of Erosion)	Open Space Trails
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*Hydric criteria codes:

1. All Histels except for Folistels, and Histosols except for Folists.
2. Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, Pachic subgroups, or Cumulic subgroups that:
 - A. are somewhat poorly drained and have a water table at the surface (0.0 feet) during the growing season, or
 - B. are poorly drained or very poorly drained and have either:
 - 1.) a water table at the surface (0.0 feet) during the growing season if textures are coarse sand, sand, or fine sand in all layers within a depth of 20 inches, or
 - 2.) a water table at a depth of 0.5 foot or less during the growing season if permeability is equal to or greater than 6.0 in/hr in all layers within a depth of 20 inches, or
 - 3.) a water table at a depth of 1.0 foot or less during the growing season if permeability is less than 6.0 in/hr in any layer within a depth of 20 inches.

3. Soils that are frequently ponded for long or very long duration during the growing season.
4. Soils that are frequently flooded for long or very long duration during the growing season.

[⊖]Septic Suitability is divided into three classes: 1.) Not limited: Soil feature is compatible with septic use; 2.) Somewhat Limited: Soil feature is moderately compatible with septic use and 3) Very Limited: Soil feature is not compatible with septic use.

[⊗]Kf Soil erodibility factors quantify the susceptibility of soil detachment by water. These erodibility factors predict the long-term average soil loss, which results from sheet and rill erosion under various alternative combinations of crop systems and conservation techniques. Factor Kf considers the whole soil, and factor Kf factors obtained experimentally vary from 0.02 to 0.69. For the purpose of soil interpretations, the factors have been grouped into 14 classes. The classes are identified by a representative class value as follows: .02, .05, .10, .15, .17, .20, .24, .28, .32, .37, .43, .49, .55, and .64.

[♦]Land Capability Classes include:

Class 1 soils have slight limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or require very careful management, or both.

Class 5 soils have little or no hazard of erosion but have other limitations, impractical to remove, that limit their use mainly to pasture, range, forestland, or wildlife food and cover.

Class 6 soils have severe limitations that make them generally unsuited to cultivation and that limit their use mainly to pasture, range, forestland, or wildlife food and cover.

Class 7 soils have very severe limitations that make them unsuited to cultivation and that restrict their use mainly to grazing, forestland, or wildlife.

Class 8 soils and miscellaneous areas have limitations that preclude their use for commercial plant production and limit their use to recreation, wildlife, or water supply or for esthetic purposes.

Each land capability has a corresponding subclass that represents the dominant limitation of each Land Capability Class. They are defined as follows:

Subclass e is made up of soils for which the susceptibility to erosion is the dominant problem or hazard affecting their use. Erosion susceptibility and past erosion damage are the major soil factors that affect soils in this subclass.

Subclass w is made up of soils for which excess water is the dominant hazard or limitation affecting their use. Poor soil drainage, wetness, a high water table, and overflow are the factors that affect soils in this subclass.

Subclass s is made up of soils that have soil limitations within the rooting zone, such as shallowness of the rooting zone, stones, low moisture-holding capacity, low fertility that is difficult to correct, and salinity or sodium content.

Subclass c is made up of soils for which the climate (the temperature or lack of moisture) is the major hazard or limitation affecting their use.

[•]There are three categories for farmland designations: 1) Prime is the land that has the best combination of physical and chemical characteristics for producing food, feed, forage; 2) Unique is land other than prime farmland that is used for production of specific high-value food and fiber crops, i.e. cranberries and 3) State is land classified by a State agency that do not meet the criteria for that of prime or unique.

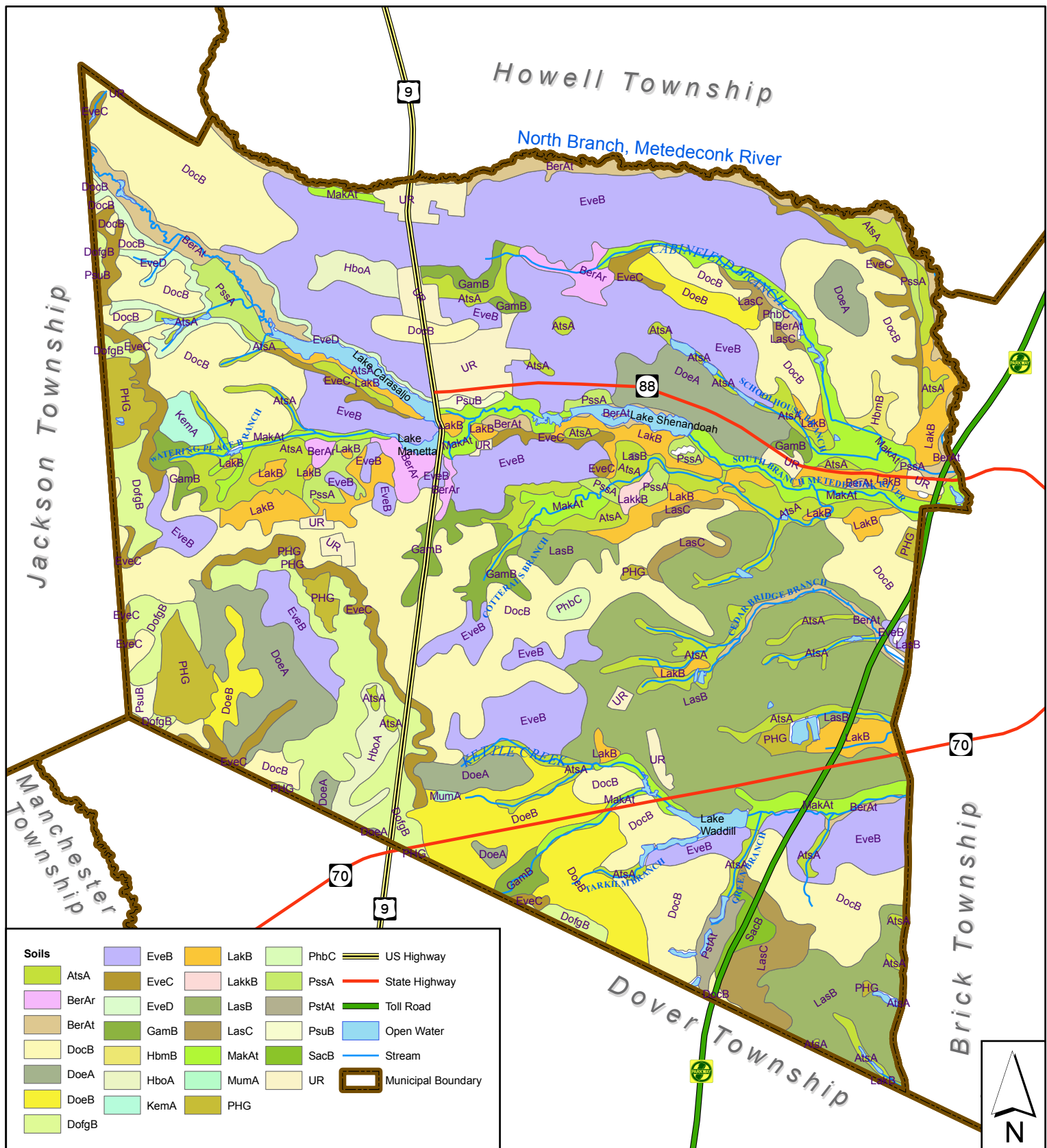
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Soil	Hydric Rating	Seasonal Water Table Depth	Septic Suitability	Surface Runoff	Kf Erodibility Factor	NonIrrigated Capability Class (Irrigated)	Farmland Soils Designation	Structures Permitted	Road Suitable (Hazard of Erosion)	Open Space Trails
AtsA (Atison/Berryland)	2B3/2B3, 3	2 Inches	Very Limited	Negligible	.05	5w	Unique	Very Limited	Moderate (Slight)	Very Limited (too sandy)
BerAr (Berryland/Atsion/Manahawkin/Mullica)	2B3, 3/2B3/1,3/2 B3		Very Limited	Negligible	.10	5w	Unique	Very Limited	Well (Slight)	Very Limited (too sandy)
BerAt	2B3, 3		Very Limited	Very Low	.10	5w		Very Limited	Poor (Slight)	Very Limited (too sandy)
DocB (Atsion/Mullica)	2B3/2B3	Greater than 6 feet.	Not Limited	Very Low	.20	2s	State	Not Limited	Well (Slight)	Somewhat Limited (too sandy)
DoeA (Mullica)	2B3	Greater than 6 feet	Not Limited	Very Low	.28	1	Prime	Not Limited	Well (Slight)	Not Limited
DoeB		Greater than 6 feet	Not Limited	Low	.28	2e	Prime	Not Limited	Well (Moderate)	Not Limited
DofgB			Not Limited	Very Low	.28		Statewide	Not Limited	Moderate (Slight)	Not Limited
EveB		Greater than 6 feet	Not Limited	Negligible	.10	7s		Not Limited	Moderate (Slight)	Very Limited (too sandy)
EveC		Greater than 6 feet	Not Limited	Negligible	.10	7s		Not Limited	Moderate (Slight)	Very Limited (too sandy)
EveD		Greater than 72 inches	Not Limited	Negligible	.17			Very Limited	Poor (Slight)	Very Limited (too sandy)
GamB (Atison/Mullica)	2B3/2B3	24 to 48 inches	Very Limited	Very Low	.17		Statewide	Somewhat Limited	Well (Slight)	Somewhat Limited (too sandy)
HdmB		18 inches	Very Limited	Very Low	.20	2w	Statewide	Somewhat Limited	Well (Slight)	Somewhat Limited (too sandy)
HboA (Atison/Mullica)	2B3/2B3	18 inches	Very Limited	Very Low	.32	2w	Prime	Somewhat Limited	Well (Slight)	Somewhat Limited

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Township of Lakewood, Ocean County

Soil	Hydric Rating	Seasonal Water Table Depth	Septic Suitability	Potential Runoff Class	Kf Erodibility Factor	NonIrrigated Capability Class (Irrigated)	Farmland Soils Designation	Structures Permitted	Road Suitable (Hazard of Erosion)	Open Space Trails
KemA	2B3		Very Limited	Not Rated	.32	2w	Prime	Somewhat Limited	Well (Slight)	Not Limited
LakB	2B3	18 inches	Very Limited	Negligible	.05	4w		Somewhat Limited	Moderate (Slight)	Very Limited (too sandy)
LakkB (Atison/Berryland)	2B3/2B3, 3		Very Limited	Not Rated	.05		Local	Somewhat Limited	Moderate (Slight)	Not rated
LasB		Greater than 6 feet	Not Limited	Negligible	.10	7s		Not Limited	Moderate (Slight)	Very Limited (too sandy)
LasC			Not Limited	Not Rated	.10	7s		Somewhat Limited	Moderate (Slight)	Very Limited (too sandy)
MakAt (Manahawkin/Atison/Berryland/Mullica)	1, 3/2B3/2B3,3/2B3	0 inches	Very Limited	Negligible	.05	7w	Unique	Very Limited	Poor (Very Serve)	Very Limited (too sandy)
MumA (Mullica/Berryland/Fallingston)	2B3/2B3, 3/2B3		Very Limited	Negligible	.05	4w	State	Very Limited	Poor (Slight)	Very Limited
PhbC			Not Limited	Not Rated	.20			Very Limited	Moderate (Slight)	Somewhat Limited (too sandy)
PssA (Atison/Berryland/Mullica)	2B3/2B3, 3/2B3		Somewhat limited	Not Rated	.17	7s		Not Limited	Moderate (Slight)	Very Limited (too sandy)
PstAt (Appoquinimink/Pawcatuck/Transquaking)	2B3, 3		Very Limited	Very Low	.20	7s		Very Limited	Poor (Slight)	Not Rated
PsuB			Not Limited	Not Rated	Not Rated	8s		Not Limited	Well (Slight)	Not Rated
SacB (Fallsington)	2B3	Greater than 6 feet	Not Limited	Medium	.28	2e	Prime	Not Limited	Well (Moderate)	Not Limited

Source: United States Department of Agriculture Natural Resources Conservation Services. Soil Data Mart, NJ029 Lakewood County, New Jersey. Web search February 17, 2006



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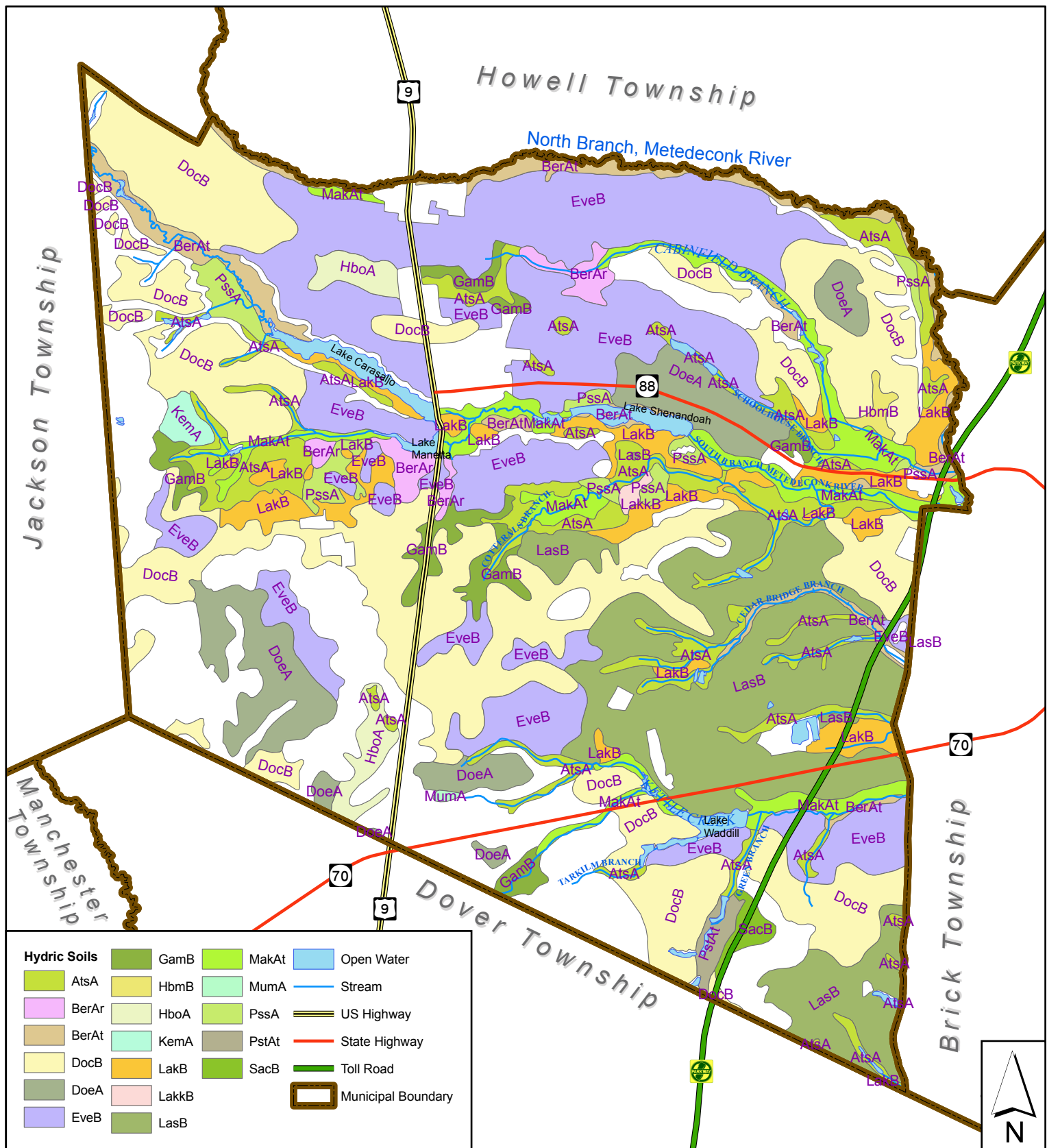
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Figure 5: Soil Types Lakewood Township Ocean County, New Jersey

Prepared by: STK, February 22, 2006
 Source: NJDEP; USDA NRCS
 File Path: H:\LAKE\00030\Permits\lakeNRI_soil.mxd

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



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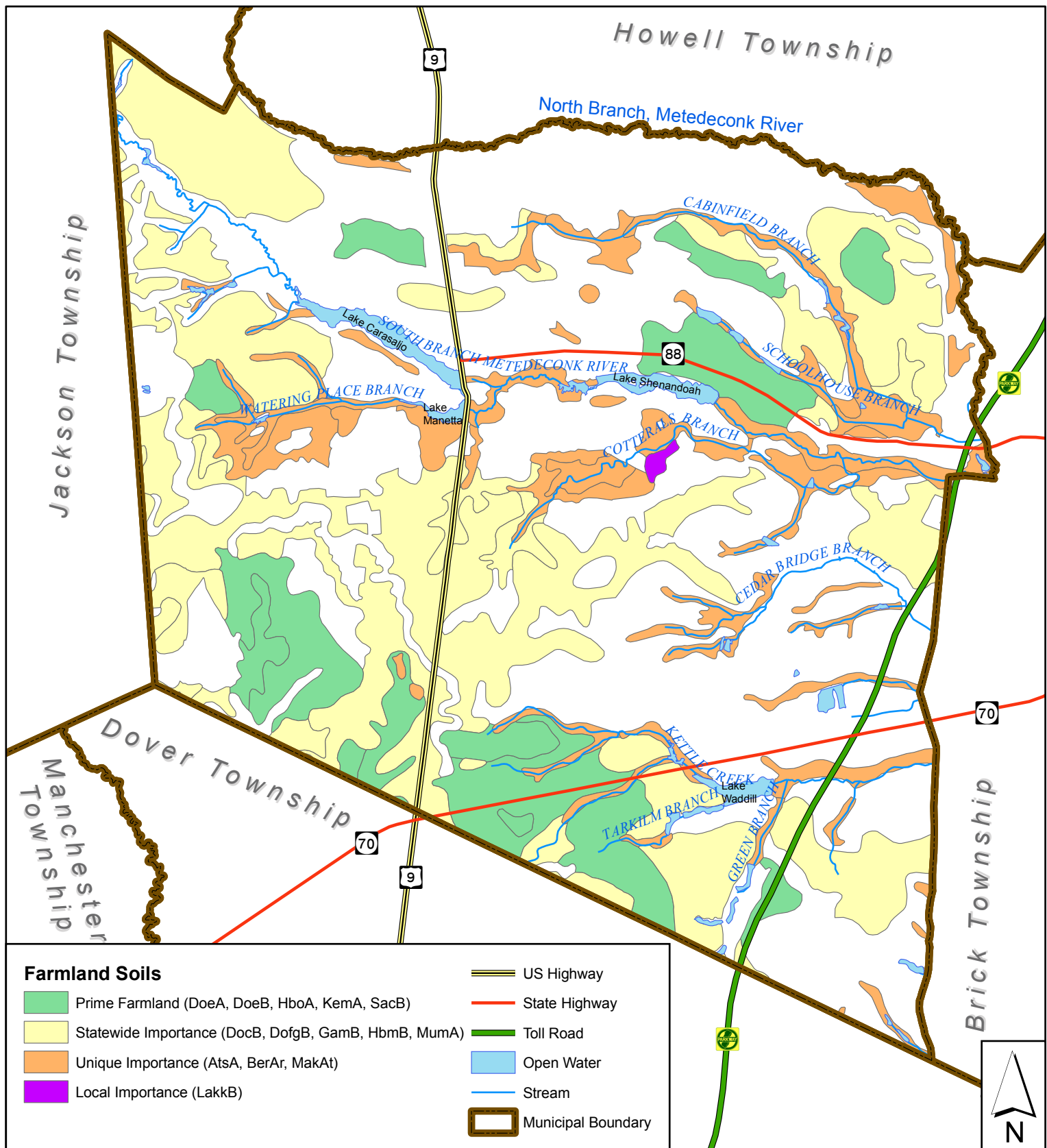
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Figure 6: Hydric Soils Lakewood Township Ocean County, New Jersey

Prepared by: STK, February 22, 2006
 Source: NJDEP; USDA NRCS
 File Path: H:\LAKE\00030\Permits\lakeNRI_hydric.mxd

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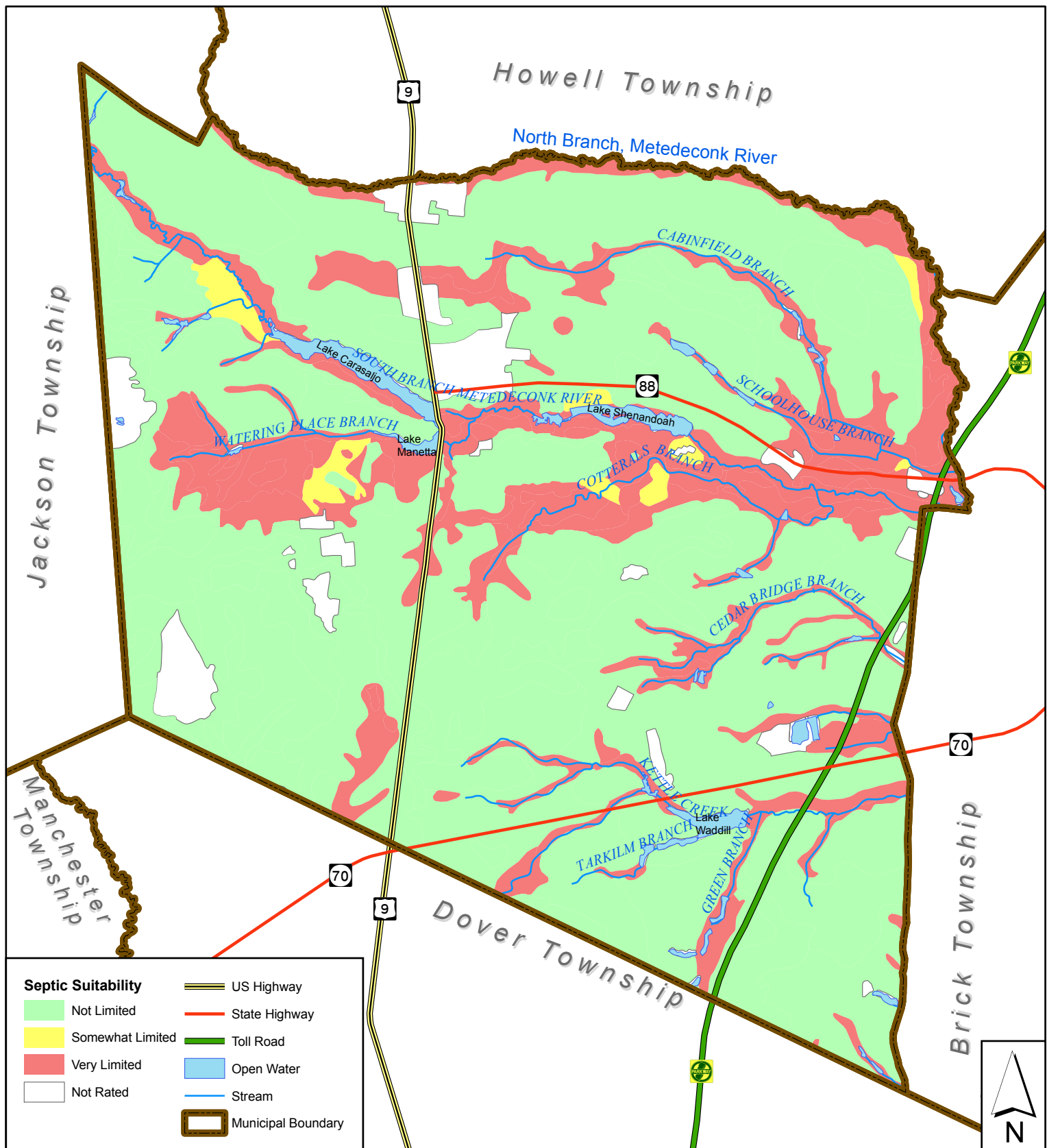


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**-Draft- Figure 7: Farmland Soils
 Lakewood Township
 Ocean County, New Jersey**

Prepared by: STK, February 22, 2006
 Source: NJDEP; USDA NRCS
 File Path: H:\LAKE\00030\Permits\lakeNRI_farmland.mxd

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



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Prepared by: STK, February 22, 2006
 Source: NJDEP; USDA NRCS
 File Path: H:\LAKE\00030\Permits\lakeNRI_septic.mxd

-Draft- Figure 8: Septic Suitability Lakewood Township Ocean County, New Jersey

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

Climate

The Office of the New Jersey State Climatologist indicates that Lakewood is in the transition area between a Coastal Climatic Zone and a Pinelands Climatic Zone. Lakewood is approximately 10 miles from the Atlantic Ocean. A Coastal Climatic Zone is influenced by land and Ocean temperatures. When the Ocean is warmer in autumn and early winter, the Coastal Zone will experience warmer temperatures than interior regions of the state. In contrast during the spring months, the Ocean breezes keep temperatures along the coast cooler. Ocean breezes often penetrate 5-10 miles inland, but under more favorable conditions, can affect locations 25-40 miles inland. Being adjacent to the Atlantic Ocean, with its high heat capacity (compared to land), seasonal temperature fluctuations tend to be more gradual and less prone to extremes. The most extreme weather events are nor'easters between October and April and tropical storms and hurricanes in late Summer and early Fall. The Pinelands Climatic Zone is influenced by its porous sandy soils and scrub pine and oak forest ecology. There is a wider range of daily maximum and minimum temperatures because the porous soil is rapidly infiltrated and leaves surfaces quite dry.

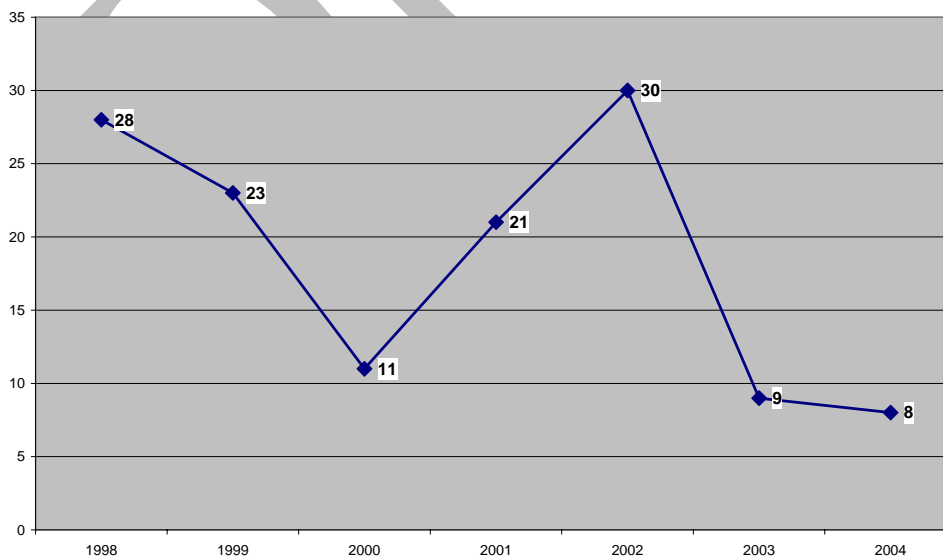
The Office of the New Jersey State Climatologist provides average annual temperatures and precipitation normals from 1971 to 2000 and records data on average heating and cooling degree days. The Township is located within 11 miles of Toms River monitoring station in the Coastal Climatic Zone and about 12 miles from Freehold in the Pinelands Climatic Zone. At the Toms River station, the annual mean temperature reported is 53.1°F; the lowest mean temperature is 31.2°F in January and the highest mean temperature is 75.0°F in July. At the Freehold station, the annual mean temperature reported is 52.6°F; the lowest mean temperature is 30.1°F in January and the highest mean temperature is 74.7°F in July. Annual precipitation totals 48.81 inches in Toms River; precipitation on average ranges from 3 inches to 5 inches per month, the wettest month is in August at 4.35 inches. In Freehold the annual precipitation totals 46.77 inches; precipitation on average ranges from 3 inches to 4 inches per month, the wettest month is in August at 4.48 inches. The Office of the New Jersey State Climatologist records average heating and cooling degree days, where the temperatures are below 65°F

and above 65°F respectively. For the Toms River, the average heating degree days total 5,173; where the highest heating degree month is January. The average cooling degree days total 858; the highest cooling degree month is July. In Freehold, the average heating degree days total 5,287; where the highest heating degree month is January. The average cooling degree days total 801; the highest cooling degree month is July. These figures can be used to target conservation measures for energy consumption high usage time periods.

Air

The entire State, including the Township of Lakewood, is listed in a non-attainment area pursuant to the National Ambient Air Quality Standards for the six criteria pollutants: Carbon Monoxide, Lead, Nitrogen Dioxide, Ozone, Particulate Matter and Sulfur Dioxide. The NJDEP maintains a continuous air monitoring network throughout the State. Approximately 16 miles from Lakewood is Colliers Mills at the Colliers Mills Wildlife Management Area in Jackson and Plumstead Townships, Ocean County the local air monitoring station site for this area. The Colliers Mills measures ozone (O₃) only.

Chart 1: 1998-2004 Total Ozone Exceedances Days
at Colliers Mills Monitoring Station



Source: New Jersey Department of Environmental Protection, Bureau of Air Monitoring. Web search May 19, 2005.

The 8-hour-average exceedances for ground-level ozone has been recorded at Colliers Mills since 1998. The 8-hour ozone standard is 0.08 parts per million (ppm). For concentrations to be considered exceedances, they must be 0.085ppm or above. There has been four record days recorded at Colliers Mills in 2002 at 0.138 ppm on July 9th, in 2001 at 0.121 ppm at Colliers Mills on August 7th, in 2000 at 0.132 ppm on June 10th and in 1998 at 0.113 ppm on June 25th. Chart 1 shows the number of days the 8-hour health standard was exceeded for the 1998-2004 time period.

Noise

The Noise Control Act of 1972 (42 USC 4901) addresses concerns that noise beyond a certain level generally negatively impacts health and welfare. This Act directed that the United States Environmental Protection Agency, Office of Noise Abatement produce noise abatements standards for major sources of noise from transportation, vehicles and equipment, machinery, appliances and other products in commerce. Noise abatement standards are deemed by Congress and the State as a local concern, therefore a Noise Pollution Clearinghouse maintains records and standards from the former Office of Noise Abatement for federal standards. The NJDEP Office of Compliance and Enforcement is authorized only to promulgate modal ordinances that can be adopted by municipalities. The Township of Lakewood adopted their noise regulations in September 1970, as BH:16-1 et. al., and does not incorporate the NJDEP model ordinance language.

Noise is measured for industrial, commercial, public service or community service facilities during specific times of the day, decibels (dBA) and frequencies audible to humans. The A-weighted scale is the most common measure of sound that combines the effect of multi-frequency noises in a manner that stimulates the sensitivity and response of the human ear. The Octave band sound pressure level measures the sound pressure level measured in decibels in standard octave bands with a sound level meter. The Township adopted noise regulations are contained in Exhibit 2.

Exhibit 2: Adopted Noise Regulations

Time	7:00 – 22:00	22:00 – 7:00
Maximum A-weighted sound level standard (dBA)	60	55
Octave Band Center Frequency (Hz)	Octave Band Level Pressure Level (dBA)	
20-75	74	79
75-150	69	74
150-300	59	64
300-600	52	57
600-1200	46	51
1200-2400	40	45
2400-2800	34	39
4800-9600	32	37

Source: Township of Lakewood, Ordinances Board of Health, BH:16-1 et. al.

HYDROLOGY

According to the United States Geological Survey National Water-Quality Assessment (NAWQA) Program, the Township of Lakewood is located within the Long Island-New Jersey Coastal Drainages. The Long Island-New Jersey Coastal Drainages encompasses 6,000 square miles in New York and New Jersey, and includes all of Long Island, Staten Island and the coastal drainages of New Jersey. The principal river systems within the study unit are the Hackensack, Passaic, Raritan, Toms, Mullica, and Great Egg Harbor Rivers in New Jersey; Toms (192 square miles), Mullica (569 square miles), and Great Harbor (347 square miles) all drain in the Atlantic Coastal physiographic region. Of the Atlantic Coastal rivers, the combined drainage area includes most of the Pinelands that consists of water with pristine quality, whereas water in other parts of the New Jersey Coastal Plain have been negatively affected by agricultural and lawn chemicals, septic-tank effluent, and synthetic organic compounds from domestic and commercial use.

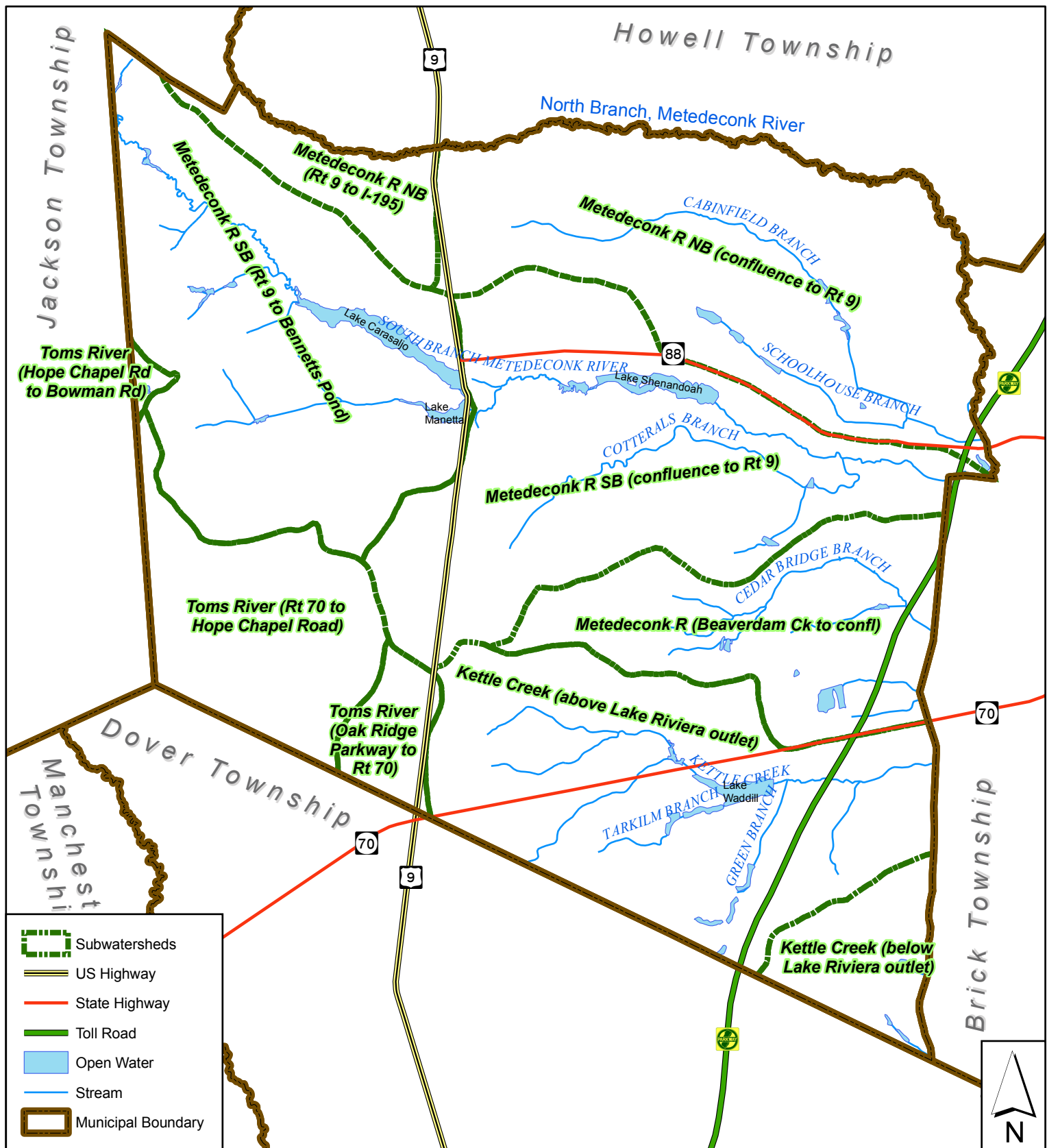
Lakewood is in the State Watershed Management Area 13, Barnegat Bay. The Barnegat Bay-Little Egg Harbor Watershed has been included in the United States Environmental Protection Agency's National Estuary Program, created by the Clean Water Act Amendments of 1987. The USEPA defines watersheds as the area of land that drains into a body of water such as a river, lake, stream or bay. The watershed is separated from other systems by high points in the area such as hills or slopes and includes not only the

waterway itself but also the entire land area that drains into it. The USEPA defines estuaries as partially enclosed bodies of water that are formed where fresh water mixes with salty seawater and are often known as bays, lagoons, harbors, inlets or sounds. Wetlands adjacent to estuaries serve as natural filtration systems, stabilize shorelines and prevent erosion.

The Barnegat Bay-Little Egg Harbor Watershed encompasses 660 square miles and most of Ocean County and its 33 municipalities and four municipalities in Monmouth. The Barnegat Bay Watershed is comprised of three microtidal bays: Barnegat Bay, Manahawkin Bay and Little Egg Harbor and is a nearly continuous 43-mile barrier island. Lakewood is contained in the Metedeconk River subwatershed and Kettle Creek subwatershed (includes Reedy Creek).

On the local community scale there are 10 subwatersheds delineated by the NJDEP with a minimum basin area of 3,0000 acres in Lakewood (Figure 9):

- I. Metedeconk River Northern Branch (Rte 9 to I-195)
- II. Metedeconk River Northern Branch (confluence to Rte 9)
- III. Metedeconk River Southern Branch (Rte 9 to Bennetts Pond)
- IV. Metedeconk River Southern Branch (confluence to Rte 9)
- V. Metedeconk River (Beaverdam Creek to confluence)
- VI. Toms River (Hope Chapel Road to Bowman Road)
- VII. Toms River (Rte 70 to Hope Chapel Road)
- VIII. Toms River (Oak Ridge Parkway to Rte 70)
- IX. Kettle Creek (above Lake Riveria outlet)
- X. Kettle Creek (below Lake Riveria outlet)



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Figure 9: Subwatersheds (HUC 14) Lakewood Township Ocean County, New Jersey

Prepared by: STK, February 22, 2006
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NOTE: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

Groundwater

Groundwater exists below the surface in pores between sedimentary particles and in the fissures of more solid rocks. Most groundwater lies at shallower depths in aquifers and accounts for about 20 times more than the total of surface waters on continents and islands. In the United States, 40 percent of groundwater supplies the public water supply. Specifically in New Jersey, more than one-half of New Jersey's drinking water is supplied by over 300,000 wells that serve more than 4 million people (Walter Jones (2004)).

An important component of groundwater protection is the quality of the aquifer. An aquifer is a body of geologic material that can supply useful quantities of ground water to natural springs and water wells. An aquifer relies on precipitation seepage, hydric soils and wetlands to continually supply an underlying aquifer. It is through the hydrologic cycle that aquifers recharge and discharge into the environment. In terms of human health, safe water drinking legislation and regulations have been enacted to ensure a supply of clean drinking water.

The Township's aquifers are located in the Kirkwood-Cohansey geological formation of the Miocene age. Since the 1920s, the United States Geological Survey has recorded groundwater levels in 196 wells in New Jersey. The *Water Resources Data New Jersey Water Year 2004 Report* lists two observations in close proximity to Lakewood in the Kirkwood-Cohansey, which include the Fort Dix Military Reservation in Plumstead Township and the Lakehurst Naval Air Station in Jackson Township. Both wells have been monitored daily since 1992. The Fort Dix Military Reservation drilled water table observation well at Latitude 40°01'20" and Longitude 74°26'53" is 75 feet deep. The land surface is 180 feet above NGVD (1929): the highest recording is 45.63 feet below land surface on June 15, 1998 and the lowest recording is 53.86 feet below land surface on Nov. 18, 2002. The Lakehurst Naval Air Station drilled water table observation well at Latitude 40°02'37" and Longitude 74°21'27" is 38 feet deep and screened at 23 feet to 38 feet deep. The land surface is 110 feet above NGVD (1929): the highest recording is

22.86 ft below land surface on May 23, 1998 and the lowest recording is 28.81 ft below land surface on Oct. 13-21, 1995.

The *Water Resources Data New Jersey* also reports that in 2004, all of the record low water levels were in wells located in the Coastal Plain. These record low levels are the result of increasing withdrawals from wells that tap two confined aquifers: the Atlantic City 800-foot sand of the Kirkwood Formation and the Piney Point aquifer in the southern part of the State.

The NJDEP Water Supply Administration identifies the Kirkwood-Cohansey water source in Lakewood as a deficit/critical water supply planning area (Planning Area 15 & 16). The Lakewood Municipal Utilities Authority (PWSID: 1514002) and the New Jersey American Water Company (PWSID: 1514001) both have water allocation permits to provide water service in Lakewood. The Lakewood Municipal Utilities Authority is permitted to withdraw 3183.000 million gallons per year (MGY) of 335.760 million gallons per month (MGM) from the Kirkwood-Cohansey aquifer. The firm's capacity is 5.490 million gallons per day (MGD). NJDEP reports a total daily peak figure of 5.356 MGD, a monthly total demand of 170.935 MGM and a yearly total demand of 1231.029 MGY. The firm is operating at a surplus and operates eight wells. The New Jersey American Water Company is permitted to withdraw 2128.000 million gallons per year (MGY) of 238.440 million gallons per month (MGM) from the Kirkwood-Cohansey aquifer. The firm's capacity is 13.320 million gallons per day (MGD). NJDEP reports a total daily peak figure of 11.136 MGD, a monthly total demand of 317.294 MGM and a yearly total demand of 2762.088 MGY. The firm is operating at a surplus and operates nine wells.

Figure 10 depicts the groundwater recharge areas in Lakewood based on a NJDEP ranking system of each county and watershed management conditions land use cover, soil suitability and wetland areas. In addition to the ranks, the cover includes hydric soils (L), wetlands (W), and no recharge areas (X). The ranking system depicts the annual

infiltration rate which expresses the rate of entry into a soil as a depth of water per case year. The following are the individual ranks delineated in Figure 8 and Exhibit 3:

Exhibit 3: Groundwater Recharge Areas in Lakewood

Rank	Range inches/year	Acres	Percent of Lakewood
A	16 to 23	6,753.88	42.1%
B	11 to 15	4,093.63	25.5%
C	8 to 10	5.28	0.0%
D	1 to 7	1893.84	11.8%
E	0	648.27	4.0%
L	NA	515.98	3.2%
W	NA	2,118.72	13.2%
X	NA	0	0.0%
Total		16,029.60	100%

Source: New Jersey Department of Environmental Protection, Geographic Information System Information.

Areas that are ranked “A” or “B” are most likely to have high recharge ranks because there is less impervious coverage and is most likely to contain land uses that are either open space or agricultural areas. Areas that are ranked “C” or “D” are most likely to have low recharge ranks because the dominate land use is urban and there is more likely to be greater impervious cover. The greatest recharge areas are in the undeveloped sections of the Township, in Ocean County Park, Lake Shenandoah County Park, Pine Park and the Lakewood Country Club.

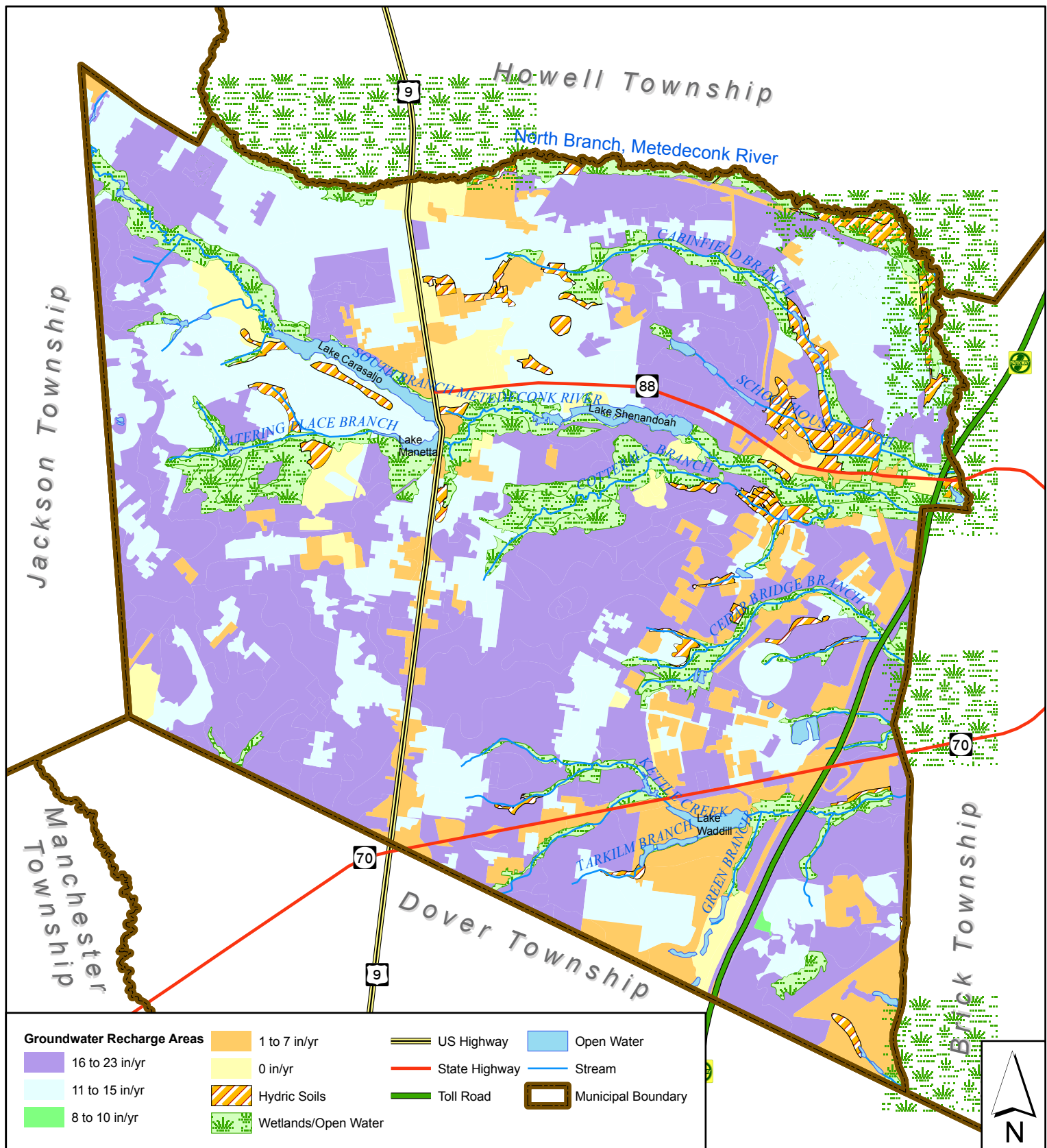
In the Kirkwood-Cohansey formation there are 433 public wells with an average depth of 120 feet. Acknowledging that these wells are essential in providing public water and that these wells can be over-pumped and contaminated, the Federal Safe Drinking Water Act of 1986 Amendments (42, USC 300 et. seq.) directed States to develop a wellhead protection program plan for both public community and non-community water-supply wells. The New Jersey wellhead protection plan delineates areas based on the time of travel, rate of pumping and aquifer characteristics (thickness, transmissivity, porosity, and hydraulic gradient). Time of travel is directly related to the distance the water has to travel to arrive at a well once its starts pumping. The time is divided into three tiers based on travel time to wells:

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Township of Lakewood, Ocean County

- Tier 1: 2 years (730 days)—This boundary is devised to account for the time travel to the outer boundary and presence of bacteria and viruses. The tier extends from the well to the boundary established to represent the 2 year time travel.
- Tier 2: 5 years (1,826 days)—This boundary is devised to account for the discharge of known pollution contamination and the ability of the NJDEP to locate responsible parties. Although not an exact science, this boundary accounts for the “smearing effect” observed in pollution plumes and the acceleration of groundwater near a pumping well. The NJDEP is in the process of revising the procedures for pollution case management. The tier extends from the perimeter of Tier 1 to the boundary representing the 5 year time travel.
- Tier 3: 12 years (4,383 days)—This boundary is devised to demonstrate the complete zone of contribution and to ensure on-going monitoring of wellhead areas. The tier extends from the perimeter of Tier 2 to the outer boundary representing the 12 year time travel.

Each corresponding year delineation is comprised of pumping rates and related aquifer characteristics that determine the extent of the time of travel which are dependent on the individual aquifer bedrock geology and drainage direction.

All wellhead protection areas with a buffer of 50 feet and delineated tiers are located in Figure 11. The wells located within the northern section of the Township do not meet these conditions. Figure 11 shows nine wellhead protection areas in the Township and three in Dover Township. The Township of Lakewood’s wellhead protection areas are contained in PA2, Suburban Planning Area.



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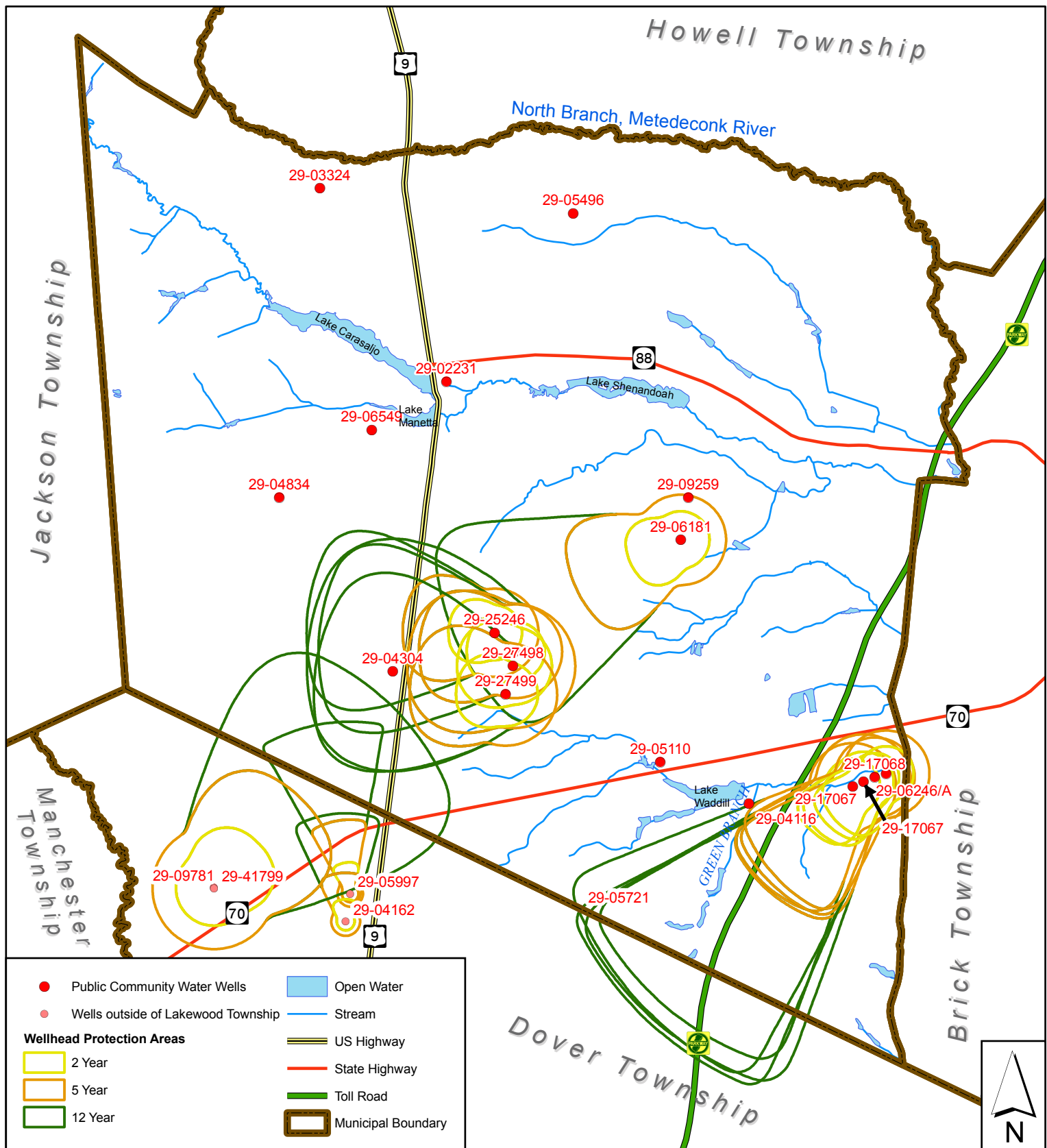
**Figure 10: Groundwater Recharge Areas
 Lakewood Township
 Ocean County, New Jersey**

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 Feet

Prepared by: STK, February 22, 2006
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**Figure 11: Well Head Protection Areas
 Lakewood Township
 Ocean County, New Jersey**

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Surface water

The waterways contained in Lakewood are part of the Long Island-New Jersey Coastal Drainages (Figure 12). The two major waterway systems within the Township include the Metedeconk River and Kettle Creek. The Metedeconk River North Branch serves as a natural boundary with the Township of Howell in Monmouth County. The South Branch of the Metedeconk River includes the following lakes: Lake Shenandoah, Lake Carasaljo, and Lake Manetta. The Kettle Creek is in the southern portion of the Township and includes Lake Waddill. NJDEP identifies the waterways and the surface water quality standards as follows:

- Cabinfield Branch—Category One
- Cedar Bridge Branch—Category Two
- Cotterals Branch—Category One
- Green Branch—Category Two
- Kettle Creek—Category Two
- North Branch (Metedeconk River)—Category One
- Schoolhouse Branch—Category One
- South Branch (Metedeconk River)—Category One
- Tarkilm Branch—Category Two
- Watering Place Branch—Category One

In New Jersey all waterbodies, unless otherwise designated as an Outstanding Natural Resource or Category One, are subject to the antidegradation policies set forth in N.J.A.C. 7:9B-1.5(d). Through the rulemaking process, NJDEP has designated Category One (C1) waterways because there have been measurable changes in water quality and greater protection of these water resources is necessary. C1 waterways have been designated based on their exceptional ecological significance, exceptional recreational or aesthetic significance, exceptional water supply significance, exceptional fisheries resources, exceptional shellfisheries, or their location within publicly preserved open space. As part of the new Stormwater Management Rules (N.J.A.C. 7:8), additional

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Township of Lakewood, Ocean County

protection has been afforded to C1 waterbodies and a 300 foot buffer as a new best management practice to meet the antidegradation standards.

The Federal Water Pollution Control Act of 1972 (33 U.S.C. 1251 et. seq.), commonly referred to as the Clean Water Act, requires the State to report to the United States Environmental Protection Agency a list of impaired waters and protection measures. The *New Jersey 2004 Integrated Water Quality Monitoring and Assessment Report* indicates that the tributaries that drain into the Atlantic Ocean from Long Branch to Cape May to have dissolved oxygen and fecal coliform along its waterways. Barnegat Bay area also is subject to dissolved oxygen, fecal coliform and total coliform. The following waterbodies in Lakewood are impaired:

Site ID	Location	Parameters
Lake Carasaljo North Beach and South Beach	Carasaljo Lake-13	Fecal Coliform
Lake Carasaljo	Carasaljo Lake-13	Phosphorus
AN0515	Kettle Creek at New Hampshire Ave in Lakewood	Benthic Macroinvertebrates
01408100	Metedeconk River N Br at Lakewood	Phosphorus, Dissolved Oxygen, Nitrate, Dissolved Solids, Total Suspended Solids, Unionized Ammonia, Fecal Coliform, Temperature, pH
AN0507	School House Branch (Cabinfield Br) at Lanes Mill Rd in Lakewood	Benthic Macroinvertebrates
AN0511	Metedeconk River S Br at Cedar Bridge Rd in Lakewood	Benthic Macroinvertebrates

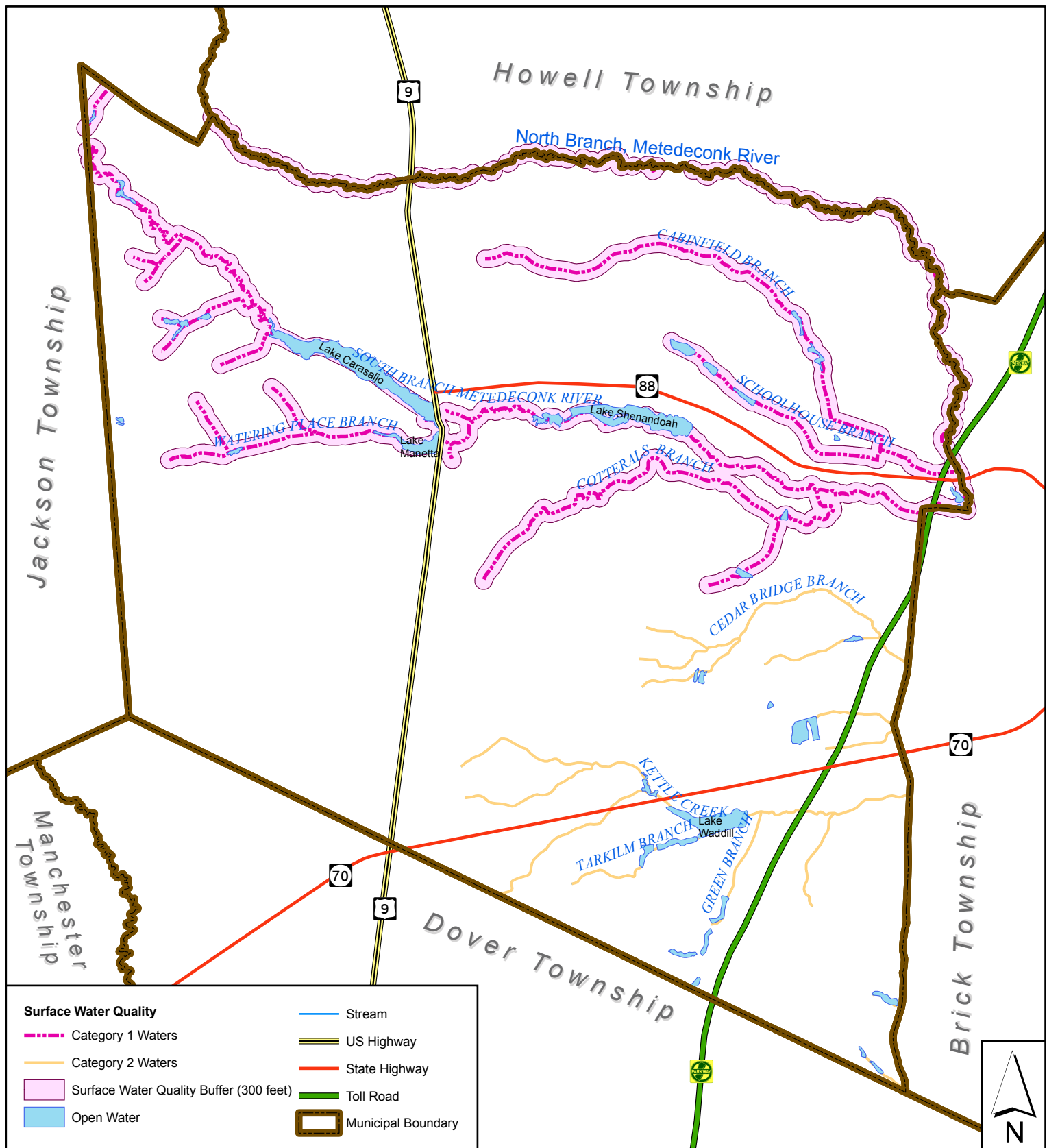
Source: New Jersey Department of Environmental Protection Water Monitoring and Standards. New Jersey 2004 Integrated Water Quality Monitoring and Assessment Report. Web search February 21, 2006.

Flood prone areas, including lowland areas adjacent to a river or a lake, are depicted on Figure 13. Floodplains are designated by the frequency of the flood that is large enough to cover them. The Federal Emergency Management Agency determines the 100-year floodplain and the 500-year floodplain based on analysis of records of river flow, storm tides, and rainfall and information obtained through consultation with the communities.

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Township of Lakewood, Ocean County

The information at the local level include floodplain topographic surveys, and hydrologic and hydraulic analysis. Typically, only drainage areas that are greater than one square mile are studied. The waterways in Lakewood are within the 100-year floodplain.

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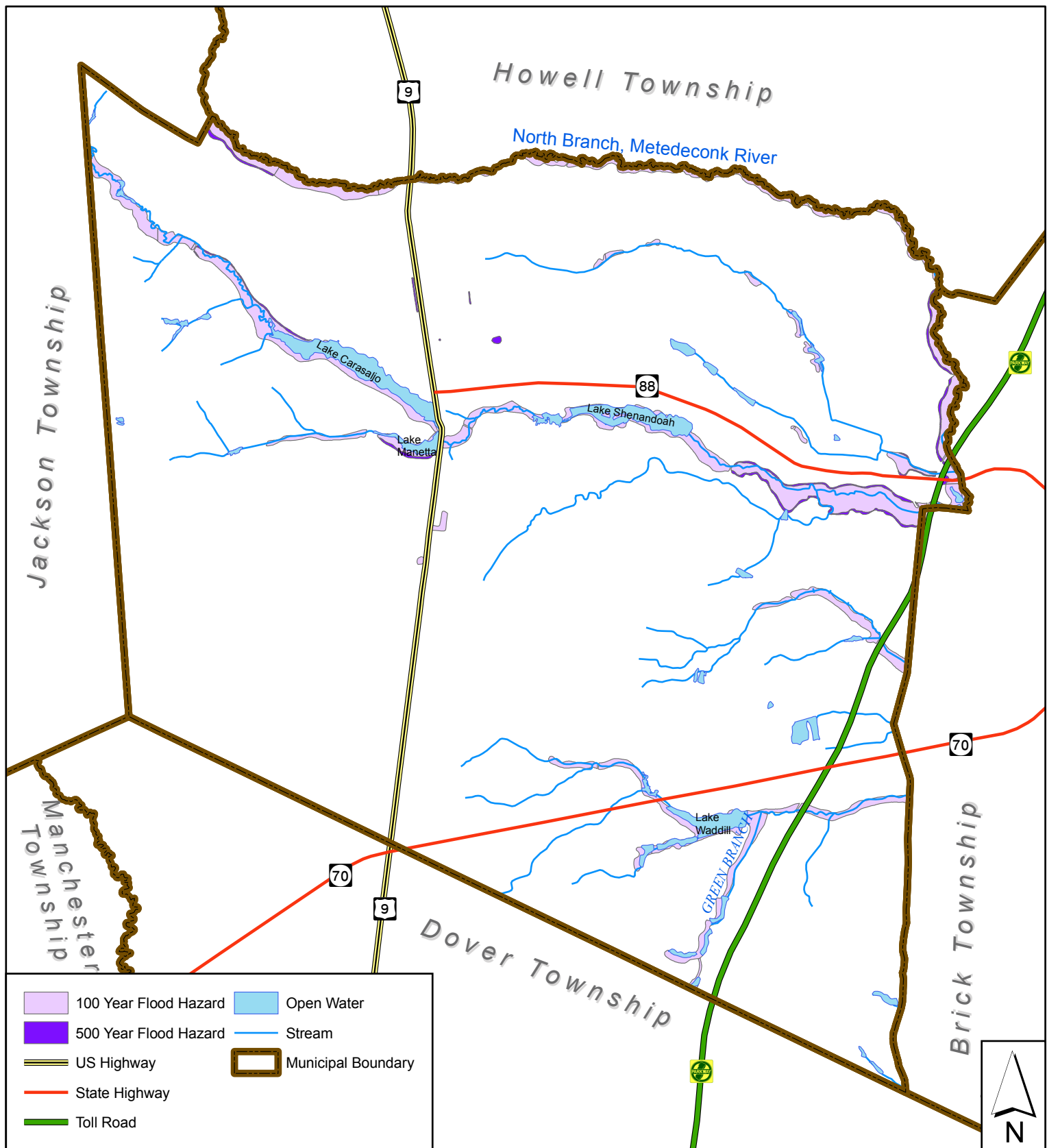
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**Figure 12: Surface Water Quality
Lakewood Township
Ocean County, New Jersey**

Prepared by: STK, February 22, 2006
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 Phone: 732-671-6400
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Figure 13: FEMA Flood Hazard Areas
Lakewood Township
Ocean County, New Jersey
-Draft-

Prepared by: STK, February 22, 2006
 Source: NJDEP; FEMA
 File Path: H:\LAKE\00030\Permits\lakeNRI_flood.mxd

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

Wetlands

The United States Department of Environmental Protection defines wetlands as areas where water covers the soil or is present either at or near the surface of the soil all year or for varying periods of time during the year, including during the growing season. These conditions lead to the development of unique aquatic and terrestrial species and soils that support types of plant and animal communities living in and on the soil.

According to the United States Fish and Wildlife Services *Wetlands and Deepwater Habitats Classification National Wetlands Inventory Mapping Code*, a total of 1,887.96 acres or 11.8 percent of the total land area is located in Lakewood are wetlands. The United States Department of Agriculture Natural Conservation Services notes

Summary of Wetlands	
Palustrine Wetland	Disturbed/Modified
Atlantic White Cedar	Agriculture
Coniferous scrub/shrub	Disturbed
Coniferous wooded	Managed
Deciduous scrub/shrub	Right-of-way
Deciduous wooded	
Herbaceous	
Mixed Forested (Coniferous dominated)	
Mixed Forested Wetland (Deciduous dominated)	
Mixed scrub/shrub (Coniferous dominated)	
Mixed scrub/shrub (Deciduous dominated)	

fifteen hydric soils that support ecological conditions for wetlands (Figure 6). Appendix B lists wetland plant communities identified in Ocean County that may occur in Lakewood.

In Lakewood the following are characteristics of freshwater wetlands (Figure 14):

- I. Palustrine System—This system includes areas that are grouped as vegetated wetlands (marsh, swamp, bog, fen, and prairie) and are small, shallow, permanent or intermittent water bodies often called ponds. All water regimes except subtidal are included. Wetlands are delineated based on the dominate type of vegetation, a total land area less than 20 acres, low water depth and relative salinity. The following species are dominant emergent plants: Cattails, Common Reed, Water Willow, Purple Loosestrife, Rice Cutgrass, Burreeds, Arrow Arum, Goldenrods, Woolgrass, Soft Ruch, Pickerelweed,

Smartweeds, Three-way Sedge, Sedges, Twig Rush,* Bayonet Rush,* Canada Rush,* Pipeworts,* Bull Sedge,* Cottongrass,* Golden Club,* Lowland Broomsedge,* Manna Grasses,* and Beakrushes.* The astrick (*) denotes species characteristics of the Pinelands.

- a. Atlantic White Cedar Wetland—This wetland accounts for 148.66 acres or 7.9 percent of wetland areas in Lakewood and is most prevalent along the Cotterals Branch. Woody vegetation in this wetland is 6 m (20 feet) tall or taller. In areas where the woody vegetation is dominated by shrubs, the vegetation is less than 6 m (20 feet) tall. The dominate vegetation is the Atlantic White Cedar (*Chamaecyparis thyoides*) and Pitch Pine is often present. Common species found in the shrub layer include Dangleberry, High-bush Blueberry, Swamp Azalea, Fetterbush, Sweet Pepperbush, and Bayberry. Plants associated with canopy openings include the Pitcher plant, Sundew and chain fern.
- b. Coniferous scrub/shrub wetland—This wetland encompasses 27.58 acres or 1.5 percent of wetland areas in Lakewood. Woody vegetation in this wetland is less than 6 m (20 feet) tall. These species include both broad-leafed and needle-leafed evergreens, true shrubs, young trees (saplings), and trees or shrubs that are small or stunted because of environmental conditions. The substrate is saturated to surface for extended periods during the growing season.
- c. Coniferous wooded wetland—This wetland encompasses 379.56 acres or 20.1 percent of wetland areas in Lakewood. This wetland occurs on the South Branch Metedeconck River, Cedar Bridge Branch, Watering Place Branch and Kettle Creek. Woody vegetation in this wetland is 6 m (20 feet) tall or taller. The

dominate woody vegetation includes needle-leaved evergreen. There are two saturation scenarios present in this wetland; either the substrate is saturated to surface for extended periods during the growing season or surface water is present for extended periods especially early in the growing season.

- d. Deciduous scrub/shrub wetland—This wetland encompasses 45.16 acres or 2.4 percent of wetland areas in Lakewood. This wetland can also be characterized as emergent, defined as an area that is flooded either seasonally or permanently. Woody vegetation in this wetland is less than 6 m (20 feet) tall. These species include broad-leaved deciduous trees, true shrubs, young trees (saplings), and trees or shrubs that are small or stunted because of environmental conditions. The substrate is saturated to surface for extended periods during the growing season.
- e. Deciduous wooded wetland—This wetland encompasses 679.5 acres or 36 percent of wetland areas in Lakewood. This wetland occurs on the North and South Branches of the Metedeconck River, Cabinfield Branch, Watering Place Branch and Kettle Creek. This wetland can also be characterized as emergent, defined as an area that is flooded either seasonally or permanently. Woody vegetation in this wetland is 6 m (20 feet) tall or taller. These species include broad-leaved deciduous trees, true shrubs, young trees (saplings), and trees or shrubs that are small or stunted because of environmental conditions. There are two saturation scenarios present in this wetland; either the substrate is saturated to surface for extended periods during the growing season or surface water is present for extended periods especially early in the growing season.

- f. Herbaceous Wetlands—This wetland encompasses 15.96 acres or 0.8 percent of wetland areas in Lakewood. This wetland can also be characterized as emergent, defined as an area that is flooded either seasonally or permanently. Emergent vegetative species are perennial plants and are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. In some instances herbaceous wetlands may have broad-leaved deciduous trees. There are two saturation scenarios present in this wetland; either the substrate is saturated to surface for extended periods during the growing season or surface water is present for extended periods especially early in the growing season.
- g. Mixed Forested Wetlands (Coniferous Dominated)—This wetland encompasses 183.48 or 9.7 percent of wetland areas in Lakewood. These wetlands occur along Water Place Branch, Kettle Creek and in Lake Shenandoah. Woody vegetation in this wetland is 6 m (20 feet) tall or taller and includes both needle-leaved evergreen and broad-leaved deciduous. As the name implies, there are relatively more needle-leaved evergreens (>50 percent and <75 percent) than broad-leaved deciduous vegetative species. These areas exhibit three relative saturation scenarios: the substrate is saturated to surface for extended periods during the growing season; or surface water is present for extended periods especially early in the growing season, or there is seasonal flooding.
- h. Mixed Forested Wetlands (Deciduous dominated)— This wetland encompasses 183.48 or 9.7 percent of wetland areas in Lakewood. These wetlands occur along Water Place Branch, Kettle Creek and in Lake Shenandoah. Woody vegetation in this wetland is 6 m (20 feet) tall or taller and includes both needle-leaved evergreen and broad-leaved deciduous. There are relatively more broad-leaved

deciduous (>50 percent and <75 percent) than needle-leaved evergreens vegetative species. These areas exhibit three relative saturation scenarios: the substrate is saturated to surface for extended periods during the growing season; or surface water is present for extended periods especially early in the growing season, or there is seasonal flooding.

- i. Mixed Scrub/Shrub Wetlands (Coniferous Dominated)—This wetland encompasses 2.32 acres or 0.1 percent of wetland areas in Lakewood. Woody vegetation in this wetland is less than 6 m (20 feet) and includes true shrubs, young trees (saplings), and trees or shrubs that are small or stunted because of environmental conditions, needle-leaved evergreen that are young or stunted trees and broad-leaved deciduous. These areas exhibit three relative saturation scenarios: the substrate is saturated to surface for extended periods during the growing season; or surface water is present for extended periods especially early in the growing season, or there is seasonal flooding.
- j. Mixed Scrub/Shrub Wetlands (Deciduous dominated)—This wetland encompasses 32.35 acres or 1.7 percent of wetland areas in Lakewood. Woody vegetation in this wetland is less than 6 m (20 feet), includes true shrubs, young trees (saplings), and trees or shrubs that are small or stunted because of environmental conditions, broad-leaved deciduous, needle-leaved evergreen that are young or stunted trees. These areas exhibit three relative saturation scenarios: the substrate is saturated to surface for extended periods during the growing season; surface water is present for extended periods especially early in the growing season, or there is seasonal flooding. The substrate is saturated to

surface for extended periods during the growing season, but surface water is seldom present.

II. Disturbed/Modified Wetland—These areas are former wetlands that have been converted to agricultural, landfills and other land uses. All the soils in these areas retain their hydric properties.

- a. Agricultural Wetlands—These areas encompass 3.43 acres or 0.2 percent of wetland areas in Lakewood.
- b. Disturbed Wetlands—These areas encompass 22.47 acres or 1.2 percent of wetland areas in Lakewood. These wetlands occur along the Cedar Bridge Branch. Areas described as disturbed refer to wetlands that have been cleared, filled or excavated.
- c. Managed Wetlands—These areas encompass 30.71 acres or 1.6 percent of wetland areas in Lakewood. There are few managed wetlands along the North and South Branches of the Metedeconk River. Managed wetlands refer to wetlands that are managed for miscellaneous types of agriculture, such as orchards, nurseries, sod and seed farms, cranberry and blueberry farms, live stock feed lots, poultry farms horse farms and other specialty farms.
- d. Wetland Rights-of-Way—These areas encompass 26.32 acres or 1.4 percent of wetland areas in Lakewood. There is a small portion delineated adjacent to the North Branch of the Metedeconk River.

The United States Environmental Protection Agency—Region 2 Marine and Wetlands Protection Branch (1994) includes Lakewood as part of the priority Barnegat Bay and its tributaries wetland. The purpose of the priority wetland designation is to protect

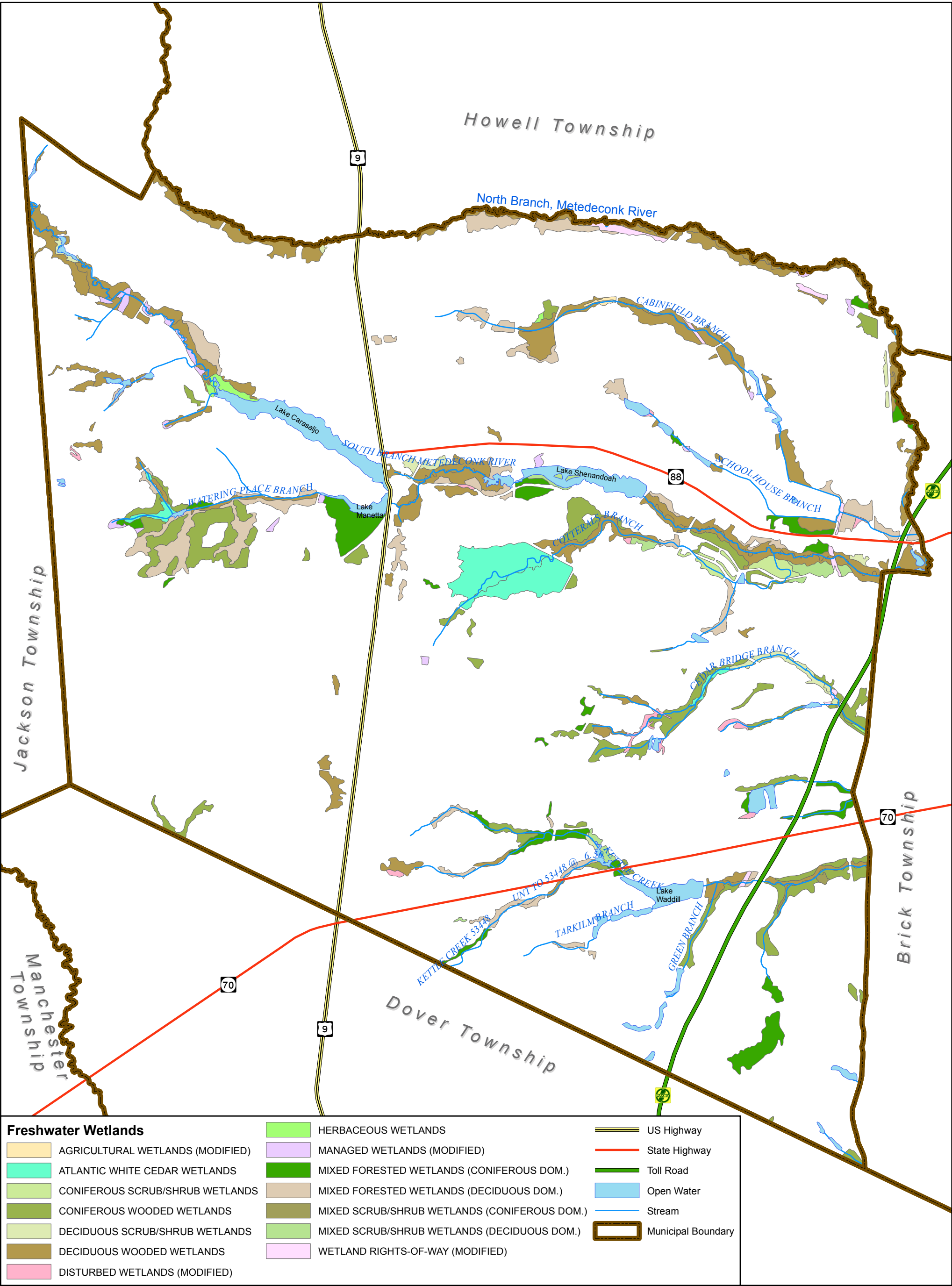
DRAFT Natural Resource Inventory
Township of Lakewood, Ocean County

identified resources values from the potential adverse impacts from dredged or fill material discharges into waters and to recognize regional planning efforts.

The Barnegat Bay resource values identified for protection are:

- Fishery and nursery habitat
- Shellfish nursery and habitat
- Estuarine and palustrine wetlands.
- Wildlife habitat for game and nongame species, including indigenous state listed herptiles (Pine Barrens treefrog, tiger salamander).

The USEPA recognizes that the adverse impacts to this wetland include residential and commercial development pressures, as the Barnegat Bay is a popular shore area.



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**Figure 14: Freshwater Wetlands
Lakewood Township
Ocean County, New Jersey**

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Feet

Prepared by: STK, February 22, 2006
Source: NJDEP
File Path: H:\LAKE\00030\Permits\lakeNRI_wetTABLOID.mxd



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

WILDLIFE AND VEGETATION

The NJDEP Division of Fish and Wildlife, Endangered and Nongame Species Program—*New Jersey's Landscape Project, Version 2.0*, indicates the Township of Lakewood is in the Pinelands Landscapes. The Pinelands Landscape encompasses all or parts of Atlantic, Ocean, Burlington, Camden, Cape May, Cumberland and Gloucester counties. This area is an internationally recognized ecosystem as its waterways support aquatic communities unique among the Mid-Atlantic states. The Pinelands contains numerous wetland systems that support reptile, amphibian and invertebrate populations, numerous insect species, as well as Neotropical bird populations.

The NJDEP Division of Fish and Wildlife, Endangered and Nongame Species Program Landscape Project lists federal and state endangered, threatened and priority species by habitat type which is based on the Natural Heritage Program's Biological Conservation Database. The information contained in the Landscape Project is peer-reviewed and scientifically based. Using the Landscape data, the Township is able to locate critical habitat based on the conservation status of the species that are present. Habitat types are categorized as emergent, forested wetland, forest, grassland and beach in the Landscape Project and are ranked on a scale of 1 to 5, as follows:

<u>Rank</u>	<u>Indication</u>
1	Suitable habitat, no special concern, threatened or endangered species sighted
2	Habitat patch with species of special concern present
3	Habitat patch with State threatened species present
4	Habitat patch with State endangered species present
5	Habitat patch with State endangered species present

The Pinelands Landscapes within which Lakewood is located exhibit a variety of suitable habitats for wildlife species, which includes suitable Bald Eagle foraging area habitat (Figure 15). In Lakewood, 75.9 percent (6,826.43 acres) is forest cover, 19.3 percent (1,733.79 acres) is forested wetland, 1.2 percent (221.11 acres) is grassland, 0.6 percent (56.88 acres) is beach and 0.5 percent (46.92 acres) is emergent. Suitable Bald Eagle foraging area is 2.5% (221.11 acres).

DRAFT Natural Resource Inventory
Township of Lakewood, Ocean County

Exhibit 4 lists endangered and threatened wildlife species contained in Lakewood based on the species habitat preferences. The Township contain has suitable foraging area for the federally threatened and state endangered Bald Eagle. There are two state bird endangered species, five (5) state threatened species of which the Barred Owl and the Northern Pine Snake and thirteen (13) priority species of which the Baltimore Oriole and the Eastern Box Turtle.

Exhibit 4: Pinelands Landscapes Endangered, Threatened and Priority Species by Habitat Type

	Emergent Wetlands	Forested Wetland	Forest	Grassland	Beach
Birds					
Federal Threatened					
Bald Eagle Foraging Area (NB: Non-breeding population only) <i>Haliaeetus leucocephalus</i>					
State Endangered					
Least Tern <i>Sterna antillarum</i>					X (Suitable)
Red-Shouldered Hawk <i>Buteo lineatus</i>			X		
State Threatened					
Barred Owl <i>Strix varia</i>		X	X		
Cooper's Hawk <i>Accipiter cooperii</i>		X	X		
Red-Headed Woodpecker <i>Melanerpes erythrocephalus</i>			X		
Priority Species					
Baltimore Oriole <i>Icterus galbula</i>			X		
Black and White Warbler <i>Mniotilta varia</i>			X		
Blue-Winged Warbler <i>Vermivora pinus</i>			X		
Brown Thrasher <i>Toxostoma rufum</i>			X		
Carolina Chickadee <i>Parus carolinensis</i>			X		
Colonial Waterbird Foraging Habitat	X				

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Township of Lakewood, Ocean County

	Emergent Wetlands	Forested Wetland	Forest	Grassland	Beach
Priority Species continued					
Eastern Towhee <i>Pipilo erythrophthalmus</i>		X	X		
Eastern Wood-Pewee <i>Contopus virens</i>			X		
Gray Catbird <i>Dumetella carolinensis</i>		X	X		
Pine Warbler <i>Dendroica pinus</i>		X	X		
Purple Finch <i>Carpodacus purpureus</i>			X		
Red-Eyed Vireo <i>Vireo olivaceus</i>			X		
Scarlet Tanager <i>Piranga olivacea</i>			X		
White Eyed Vireo <i>Vireo griseus</i>		X	X		
Wood Thrush <i>Hylocichla mustelina</i>		X	X		
Herptiles					
State Threatened					
Northern Pine Snake <i>Pituophis melanoleucus melanoleucus</i>			X	X	
Pine Barrens Treefrog <i>Hyla andersonii</i>		X	X		
Priority Species					
Carpenter Frog <i>Rana virgatipes</i>		X			
Eastern Box Turtle <i>Terrapene carolina carolina</i>			X	X	
Fowler's Toad <i>Bufo fowleri</i>		X			
Northern Spring Salamander <i>Gyrinophilus porphyriticus</i>			X		
Spotted Turtle <i>Clemmys guttata</i>		X			

Source: New Jersey Department of Environmental Protection, Division of Fish and Wildlife, Endangered and Nongame Species Program—*New Jersey's Landscape Project, Version 2.0*. Web Search February 22, 2006.

Bald Eagle Foraging Area

The Township contains two Bald Eagle (*Haliaeetus leucocephalus*) Foraging habitat areas on Lake Shenandoah and Lake Carasaljo. Suitable Bald Eagle habitat contains areas with forests that are associated with bodies of water. They prefer areas that are free of human disturbance and build large nests in “supercanopy” trees. Supercanopy trees are trees that are much taller than the immediate surrounding trees. Typical foraging habitats include large perch trees, which are critical for hunting fish and other waterfowl.

Forest

Forested area makes up a large part of Lakewood’s ecology. In the undeveloped portions of the Township there are contiguous forested areas. There are twenty-two known threatened and endangered species and priority species that are located within forested areas. The state endangered bird species includes the Red-Shouldered Hawk and the state threatened Barred Owl, Cooper’s Hawk and Red-Headed Woodpecker. Priority bird species include the Baltimore Oriole, Black-and-White Warbler, Blue-Winged Warbler, Brown Thrasher, Carolina Chickadee, Eastern Towhee, Eastern Wood-Pewee, Gray Catbird, Pine Warbler, Purple Finch, Red-Eyed Vireo, Scarlet Tanager, White Eyed Vireo, and Wood Thrush. The Township contains suitable habitat for the state threatened herptiles, the Northern Pine Snake and Pine Barrens Treefrog and the priority species, the Eastern Box Turtle and Northern Spring Salamander.

The Pinelands ecology is suitable for the state threatened Barred Owl which is known to breed in the Pinelands. According to Bruce Beans and Larry Niles (2003), the Barred Owl a “resident” species, also known as the “swamp owl,” prefers remote, contiguous, old-growth wetland forests and is often found with species such as the state threatened Cooper’s Hawk. In addition, the state threatened Northern Pine Snake found in the Township prefers dry pine-oak forests growing on very infertile sandy soil such as Lakehurst and Lakewood.

Forested Wetlands

Forested wetland habitat forms a natural band along the North and South Branches of the Metedeconk River, the Watering Place Branch, the Cotterales Branch, Kettle Creek and Cedar Bridge Branch. There are eleven known threatened and endangered species and priority species that are located within forested wetland areas. The state threatened bird species include the Barred Owl and Cooper's Hawk and state priority Eastern Towhee, Gray Catbird, Pine Warbler, White Eyed Vireo, and Wood Thrush. The Township contains suitable habitat for the state threatened herptile Pine Barren's Treefrog and priority species, Carpenter Frog, Fowler's Toad, and Spotted Turtle.

Grassland

Grasslands encompass an area in the northeastern section of Lakewood near the Cabinfield Branch. The Township contains habitat suitable for the state herptile priority species, the Eastern Box Turtle and the Northern Salamander.

Beach

There is beach suitable habitat for the federally threatened and state endangered Piping Plover near the Cedar Bridge Branch. The Piping Plover prefers flat areas with sparse vegetation, such as the American Beach grass or Sea Rocket.

Emergent

Emergent wetland areas are located along the North Branch of the Metedeconk River, Kettle Creek and Lake Carasaljo and provide suitable habitat for the foraging area of the Colonial Waterbird.

Exhibit 5 lists the endangered and threatened vegetative species from the Natural Heritage Database. NJDEP documents rare vegetative species and ecological community habitat as part of the Natural Heritage Database administered through the Office of Natural Lands Management contained in Lakewood. The database is based on the presences of a rare plant species/ecological community in a GIS grid. There are 100 grid cells totaling 358 and 372 acres in size. Recording of a plant species is based on an occurrence in a grid cell, meaning that the whole grid will be coded as containing said species. However, the species may not be located in every grid cell. Therefore, site specific studies may be a better and more accurate determinant of the existence or absence of a specific species at a site.

DRAFT Natural Resource Inventory
Township of Lakewood, Ocean County

Exhibit 5: Federal, State and Rare Vegetative Species

Global ¹	Federal ²	State ³	Rare
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¹**GLOBAL RANK**

G1 Critically imperiled globally because of extreme rarity (5 or fewer occurrences), or because of some factor(s) making it especially vulnerable to extinction.

G2 Imperiled globally because of rarity (6-20 occurrences), or because of some other factor(s) making it very vulnerable to extinction throughout its range.

G3 Either very rare and local throughout its range (21 to 100 occurrences), or found locally (even abundantly at some of its locations) in a restricted range (e.g. a physiographic region), or because of some other factor(s) making it vulnerable to extinction throughout its range.

G4 Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5 Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

GH Historically known, with the expectation that it may be rediscovered.

GX Species believed to be extinct throughout its range with no likelihood that it will be rediscovered.

GU Possibly in peril range-wide but status uncertain; more information is needed.

G? Species has not yet been ranked.

GNE Exotic in the United States (e.g. Japanese Honeysuckle).

Q If a taxon is treated as a full species, a qualifying "Q" is added after the global rank to denote its questionable taxonomic assignment.

T Global ranks containing a "T" qualifier denote that the infraspecific taxon is being ranked differently than the full species. For example, *Polygala cruciata* var. *aquilonia* is ranked G5T4 the full species is ranked G5 and the expression *aquilonia* is ranked G4.

²**FEDERAL RANK**

E Formally listed as Endangered under the Endangered Species Act of 1973 & **T** Formally listed as Threatened under the Endangered Species Act of 1973.

PE Proposed Endangered. & **PT** Proposed Threatened.

C1 Taxa for which the Service currently has on file substantial information on biological vulnerability and threat(s) to support the appropriateness of proposing to list them as endangered or threatened species.

C1* Taxa which may be possibly extinct (although persuasive documentation of extinction has not been made).

Species of Concern (Federal species of concern includes those species formerly considered C2 candidates as described below).

C2 Taxa for which the information now in the possession of the Service indicates that proposing to list them as endangered or threatened species is possibly appropriate, but for which substantial data on biological vulnerability and threat(s) are not currently known or on file to support the immediate preparation of rules.

C3 Taxa that are no longer being considered for listing as threatened or endangered species. Such taxa are further coded to indicate three subcategories, depending on the reason(s) for removal from consideration.

3A Taxa for which the Service has persuasive evidence of extinction.

3B Names that, on the basis of current taxonomic understanding, do not represent taxa meeting the Act's definition of "species."

3C Taxa that have proven to be more abundant or widespread than was previously believed.

SA Similarity of appearance of species.

³**STATE RANK**

D Declining species: a species that has exhibited a continued decline in population numbers over the years.

E Endangered species: a species whose prospects for survival within the state are in immediate danger due to one or many factors - loss of habitat, over-exploitation, predation, competition, disease. An endangered species requires immediate assistance or extinction will probably follow.

T Threatened species: a species that may become endangered if conditions surrounding the species begin or continue to deteriorate.

EX Extirpated species: a species that formerly occurred in New Jersey, but is not now known to exist within the state.

I Introduced species: a species not native to New Jersey that could not have established itself here without the assistance of man.

INC Increasing species: a species whose population has exhibited a significant increase, beyond the normal range of its life cycle, over a long time period.

P Peripheral: a species whose occurrence in New Jersey is at the extreme edge of its present natural range.

S Stable species: a species whose population is not undergoing any long-term increase or decrease within its natural cycle.

U Undetermined species: a species about which there is not enough information available to determine the status.

LP Pinelands: a species listed by the Pinelands Commission as endangered or threatened within their legal jurisdiction.

DRAFT Natural Resource Inventory
Township of Lakewood, Ocean County

	Global	Federal			State			Rare
		Endangered	Threatened	Rank	Endangered	Threatened	Rank	
Curly Grass Fern <i>Schizaea pusilla</i>	G3			3C			LP	X
Low Rough Aster <i>Aster radula</i>	G5						LP	
Parker's Pipewort <i>Eriocaulon parkeri</i>	G3			3C				
Pine Barren Bellwort <i>Uvularia puberula</i> var. <i>nitida</i>	G5T3				X			X
Pine Barren Boneset <i>Eupatorium resinosum</i>	G3			C2	X		LP	X
Swamp Pink <i>Helonias bullata</i>	G3		X		X		LP	X
Pine Barren Reedgrass <i>Calamovilfa brevipilis</i>	G4			3C			LP	X

Sources: New Jersey Department of Environmental Protection Office of Natural Lands Management. Natural Heritage Database. Web Search July 28, 2005.
United States Department of Interior Fish and Wildlife Services. National Conservation Training Center Conservation Library.

DRAFT Natural Resource Inventory
Township of Lakewood, Ocean County

As part of the directives of the Freshwater Wetlands Protection Act (N.J.S.A. 13:9B-1 et. seq.), NJDEP has provided protocols for determining wetland ecologies with exceptional resource value and provides specific habitat discussion for the Swamp Pink (*Helonias bullata*), a federally threatened and state endangered vegetative species. The identification of suitable wetland habitat includes defining the presence, absence, and distribution of each species and identifying associated vegetative species. The most important factor affecting the occurrence of Swamp Pink is the hydrologic regime of the habitat and the dominate woodland species that include both evergreen and deciduous forests, such as Pitch Pine (*Pinus rigida*), Atlantic White Cedar (*Chamaecyparis thyoides*), Sour gum (*Nyssa sylvatica*) and Red Maple (*Acer rubrum*). *Helonias* is more abundant in the southern Coastal Plain counties, and reaches as far north as Middlesex and Monmouth counties and, historically, was in Mercer county. The Swamp Pink represents in excess of 70 percent of the world's population of this species (NJDEP Land Use Regulation Program).

Swamp Pink is a member of the Lily family (*Liliaceae*) and is a smooth perennial herb, measuring between 9-25 cm (4-10 in) in length and 2-4 cm (0.8-1.6 in) in width, with evergreen, parallel-veined, and oblong leaves which form a basal rosette. A single flower stalk appears in the spring (mid-late April) and features 30-50 pink flowers. During the winter months, the leaves of *Helonias* lie flat or slightly raised from the ground and are often obscured by leaf litter. Swamp Pink prefers a variety of wetland habitats: swampy forested wetlands bordering meandering streams, headwater wetlands, sphagnous, hummocky, dense, Atlantic White cedar (*Chamaecyparis thyoides*) swamps, bogs, and spring seepage areas. Headwater wetlands habitats tend to be extremely sensitive, therefore NJDEP generally discourages direct discharge of stormwater into *Helonias* habitats. In addition, the United States Fish and Wildlife Services require that upland buffers of greater than 150 feet be in place for new construction and development.

Plant species found in vegetative association with *H. bullata* are as follows (NJDEP Land Use Regulation Program):

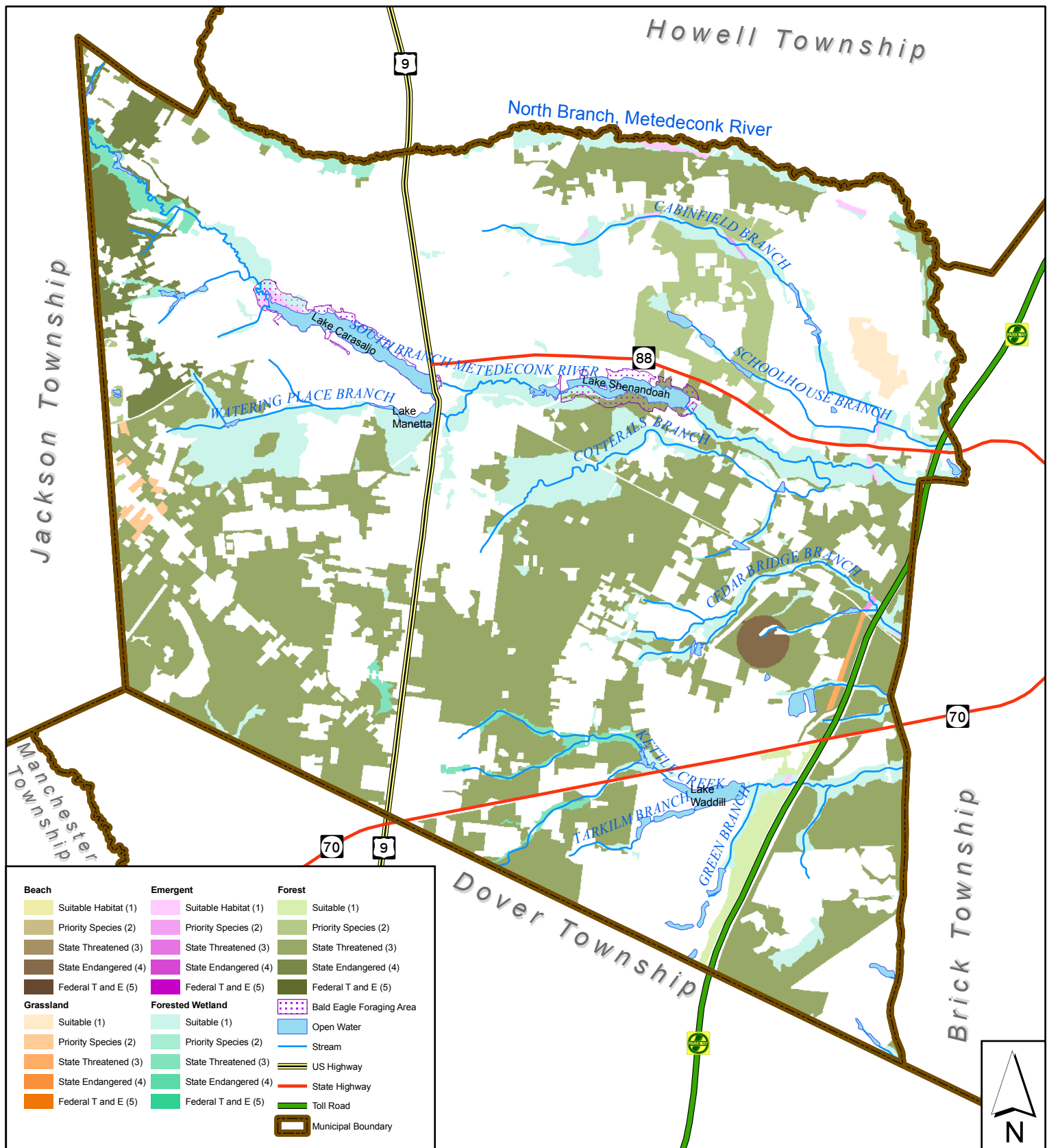
American Larch
Larix laricina

Atlantic White cedar
Chamaecyparis thyoides

Black Gum
Nyssa sylvatica

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Township of Lakewood, Ocean County

Back Spruce <i>Picea mariana</i>	Carolina Holly <i>Ilex ambigua</i>	Cinnamon Fern <i>Osmunda cinnamomea</i>
Collin's Sedge <i>Carex collinsii</i>	Common Elderberry <i>Sambucus canadensis</i>	Common Winterberry <i>Ilex verticillata</i>
Eastern Hemlock <i>Tsuga canadensis</i>	Golden Club <i>Orontium aquaticum</i>	Highbush Blueberry <i>Vaccinium corymbosum</i>
Lesser Prickly Sedge <i>Carex muricata</i>	Mountain Blueberry <i>Vaccinium constablei</i>	Mountain Laurel <i>Kalmia latifolia</i>
Northern Long Sedge <i>Carex folliculata</i>	Northern Spicebush <i>Lindera benzoin</i>	Red Alder <i>Alnus serrulata</i>
Red Maple <i>Acer rubrum</i>	Red Spruce <i>Picea rubens</i>	Rough-Leaved Aster <i>Aster radula</i>
Smooth Azelea <i>Rhododendron arborescens</i>	Sphagnum Moss <i>Sphagnum spp.</i>	Swamp Rose <i>Rosa palustris</i>
Sweetbay Magnolia <i>Magnolia virginiana</i>	Pitch Pine <i>Pinus rigida</i>	Purple-Stemmed Aster <i>Aster puniceus</i>
Three Leaf Gold Thread <i>Coptis trifolia</i>	Yellow Clintonia <i>Clintonia borealis</i>	Virginia Bugleweed <i>Lycopus virginicus</i>
Witherod <i>Viburnum cassinoides</i>	White pine <i>Pinus strobus</i>	Woodland Horsetail <i>Equisetum sylvaticum</i>



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Figure 15: Threatened and Endangered Species Habitat
Lakewood Township
Ocean County, New Jersey

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 Source: NJDEP
 File Path: H:\LAKE\00030\Permits\lakeNRI_TnE.mxd

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

APPENDIX A

Soil Classification

The United States Department of Agricultural, Natural Resources Conservation Services Soil Data Mart (USDA—NRC, Soils Data Mart) provides technical data on each soil series described below. The following is a description of each soil formation.

I. Atsion series

The Atsion series formed in the coastal plain sediments and the Atsion sand (AtsA) is contained in Lakewood. AtsA series consists of deep, poorly drained soils on uplands with a slope range of 0 to 2 percent. Typically these soils have a dark gray sand surface layer over 10 inches of light gray sand. The subsoil from 18 to 24 inches is very dark brown sand and from 24 to 36 inches is very dark gray sand. The substratum from 36 to 60 inches is brown loose sand. The depth to a restrictive feature is 16 to 40 inches to a ortstein. The slowest soil permeability within a depth of 60 inches is rapid.

Available water capacity to a depth of 60 inches is low, and shrink swell potential is low. Annual flooding is rare, and annual ponding is none.

II. Berryland Series

The Berryland series formed in the coastal plain sediments and consists of deep, very poorly drained soils on uplands with a slope range from 0 to 2 percent. Typically these soils have a black sand surface layer 10 inches thick over 2 inches of gray sand. The subsoil from 12 to 20 inches is firm and weakly cemented dark reddish brown loamy sand. From 20 to 30 inches the subsoil is dark gray loose sand. The substratum from 30 to 72 inches is grayish brown stratified loose sand. The depth to a restrictive feature is 10 to 16 inches to a ortstein. The slowest soil permeability within a depth of 60 inches is

Horizons

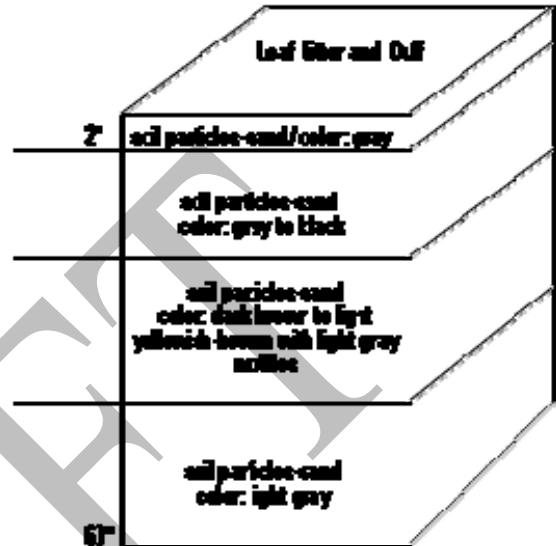
Depth

A1

A2

B

C



Descriptions of Horizons

A1—Surface layer; color varies from very dark gray to black because organic matter is incorporated into the soil

A2—Subsurface; zone of removal of nutrients, iron, and/or clay by downward moving water to lower depths of profile. Usually lighter colored than surface layer

B—Subsoil; acts as a filter accumulating or catching downward moving components removed from subsurface layer. Usually dark iron colored and may contain clay particles

C—Substratum; transition area between soil and parent material; clay layers and mineral particles may be found in this horizon; color is usually lighter than subsoil

Source: New Jersey Pinelands Commission. On-line Curriculum Project, Pinelands Soils Unit Lesson Plans, Grades 7-8. Web Search May 13, 2005.

moderately rapid. Available water capacity to a depth of 60 inches is low, and shrink swell potential is low. Annual flooding is occasional, and annual ponding is occasional.

The series contains two components in Lakewood:

Berryland sand, rarely flooded (BerAr)

Berryland sand, frequently flooded (BerAt)

III. Downer Series

The Downer series formed in acid moderately coarse textured coastal plain sediments. This series consists of very deep well drained soils on uplands

In Lakewood, the Downer series is comprised of two different soil formations. The first is comprised of the following:

Downer loamy sand (DocB)—The DocB slope ranges from 0 to 5 percent.

Downer sandy loam (DoeA)—The DoeA slope ranges from 0 to 2 percent.

Downer sandy loam (DoeB)—The DoeB slope ranges from 2 to 5 percent.

Typically these soils have a dark grayish brown loamy sand surface layer 18 inches thick. The subsoil from 18 to 30 inches is yellowish brown sandy loam. The substratum from 30 to 40 inches is loose loamy sand. Below 40 inches, the range includes stratified layers of gravel to sandy clay loam. The minimum depth to the top of a restrictive feature is greater than 60 inches. The slowest soil permeability within a depth of 60 inches is moderate. Available water capacity to a depth of 60 inches is moderate, and shrink swell potential is low. Annual flooding is none, and annual ponding is none. The slope ranges from 0 to 30 percent.

The second soil formation is the Downer sandy loam, gravelly substratum (DofgB), which has a slope of 2 to 5 percent. Typically, these soils have a grayish brown sandy loam surface layer 4 inches thick. The subsoil from 4 to 23 inches is yellowish brown or strong brown sandy loam and from 23 to 35 inches is yellowish red gravelly loamy sand. the substratum from 35 to 74 inches is yellowish red, yellow, and very pale brown stratified fine sand to very gravelly sand with strong brown sandy loam or loamy sand thin lamellae. Annual flooding is none, and annual ponding is none. Slopes range from 0 to 5 percent.

IV. Evesboro Series

The Evesboro series formed in acid sandy coastal plain sediments. The series consists of very deep excessively drained soils on uplands with a slope of 0 to 40 percent. Typically, these soils have a grayish brown sand surface layer 3 inches thick and a yellowish brown

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sand layer from 3 to 16 inches. The subsoil between 16 to 30 inches is yellowish brown sand. The substratum from 30 to 72 inches is loose yellowish brown sand. The depth to a restrictive feature is greater than 60 inches. The slowest soil permeability within a depth of 60 inches is moderately rapid. Available water capacity to a depth of 60 inches is low, and shrink swell potential is low. Annual flooding is none, and annual ponding is none.

Each component of the Evesboro series contains a different slope range:

Evesboro sand (EveB)— The EveB slope ranges from 0 to 5 percent.

Evesboro sand (EveC)— The EveC slope ranges from 5 to 10 percent.

Evesboro sand (EveD)— The EveD slope ranges from 10 to 15 percent.

V. Galloway Series—Galloway loamy sand (GamB)

The Galloway series consists of deep, moderately well drained soil on uplands. The series formed in coarse-textured coastal plain sediments and is hydric. Typically, these soils have a loamy sand surface layer, 9 inches thick, that is grayish brown in the upper part and light brownish-gray in the lower part. The substratum from 9 to 39 inches is olive yellow loamy sand, and from 39 to 47 inches it is light brownish-gray sand. The IIC horizon from 47 to 0 inches is yellowish brown coarse sand. Annual flooding is none, and annual ponding is none. GamB slopes range from 0 to 5 percent.

VI. Hammonton Series

The Hammonton series is formed in acid moderately coarse textured coastal plain sediments. The series consists of very deep moderately well drained soils on uplands and is not a hydric soil. Typically, these soils have a very dark grayish brown loamy sand surface layer 8 inches thick and a yellowish brown loamy sand subsurface layer from 8 to 18 inches. The subsoil between 18 to 36 inches is mottled yellowish brown sandy loam. The substratum from 36 to 60 inches is loose brownish yellow sand. The depth to a restrictive feature is greater than 60 inches. The slowest soil permeability within a depth of 60 inches is moderate. Available water capacity to a depth of 60 inches is moderate, and shrink swell potential is low. Annual flooding is none, and annual ponding is none.

Hammonton loamy sand (HbmB)—HbmB slope ranges from 0 to 5 percent.

Hammonton loamy sand sandy loam (HboA)—HboA slope ranges from 0 to 2 percent.

VII. Keyport sandy loam (KemA)

The Keyport series formed in northern coastal plain sediments. The series consists of very deep, moderately well drained soils on uplands. Typically these soils have a dark brown silt loam surface layer 10 inches thick. The subsoil layers from 10 to 44 inches are

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yellowish brown and dark yellowish brown silty clay loam. The upper substratum from 44 to 60 inches is dark gray silty clay loam and the lower substratum from 60 to 72 inches is dark gray stratified clay to loamy sand. KemA slope ranges from 0 to 2 percent.

VIII. Lakehurst Series.

The Lakehurst sand formed in acid sandy coastal plain sediments and consists of deep, moderately well or somewhat poorly drained soils on uplands. Typically in woodland areas these soils have a dark gray sand surface 3 inches thick and a light gray sand layer from 3 to 15 inches. The subsoil between 15 to 18 inches is dark brown loamy sand.

There are two components in the Lakehurst Series and the difference in the component is in the lower part of the subsoil.

Lakehurst sand (LakB) with a slope of 0 to 5 percent

The lower part of the subsoil from 18 to 36 inches is yellowish brown sand. The substratum from 36 to 60 inches is pale brown loose sand. The depth to a restrictive feature is greater than 60 inches.

Lakehurst sand, clayey substratum (LakkB) with a slope of 0 to 5 percent

The lower part of the subsoil from 18 to 40 inches is yellowish brown sand. The substratum from 40 to 60 inches is pale brown loose sand.

The depth to a restrictive feature is greater than 60 inches. The slowest soil permeability within a depth of 60 inches is moderately rapid. Available water capacity to a depth of 60 inches is low, and shrink swell potential is low. Annual flooding is none, and annual ponding is none.

IX. Lakewood Series

The Lakewood series formed in acid sandy coastal plain sediments. This series consists of deep, excessively drained soils on uplands with a slope of 0 to 5 percent. Typically in woodland areas these soils have a black loose sand surface layer 1 inch thick and a light brownish gray loose sand layer from 1 to 10 inches. The subsoil between 10 and 14 inches is yellowish brown loose sand. The lower part of the subsoil is yellowish brown loose sand. The substratum from 36 to 60 inches is brownish yellow loose sand. The depth to a restrictive feature is greater than 60 inches. The slowest soil permeability within a depth of 60 inches is rapid. Available water capacity to a depth of 60 inches is low, and shrink swell potential is low. Annual flooding is none, and annual ponding is none.

Lakewood sand (LasB)— LasB slope ranges from 0 to 5 percent.

Lakewood sand (LasC)—LasC slope ranges from 0 to 5 percent.

X. Manahawkin muck, frequently flooded (MakAt)

The Manahawkin series consists of very deep, very poorly drained soils formed in organic deposits, over sand and gravel with a slope of 0 to 2 percent. Typically, they have a black surface and subsurface layer of highly decomposed organic material, 39 inches thick. The substratum to a depth of 60 inches is gray sand. Manahawkin soils are in low positions in back swamps, lake basins, and along fresh water channels as they open to tide water. The depth to a restrictive feature is greater than 60 inches. The slowest soil permeability within a depth of 60 inches is moderately rapid. Available water capacity to a depth of 60 inches is very high, and shrink swell potential is low. Annual flooding is frequent, and annual ponding is frequent.

XI. Mullica sandy loam (MumA)

The Mullica series formed in acid sandy coastal plain sediments. The series consists of very deep, very poorly drained soils on flats and in depressions. Typically, these soils have a black sandy loam surface layer 10 inches thick. The subsurface layer from 10 to 18 inches is gray sandy loam. The subsoil from 18 to 28 inches is mottles gray sandy loam. The substratum from 28 to 60 inches is gray or grayish brown gravelly sand or sand. MumA slope ranges from 0 to 2 percent.

XII. Psamments series

Psamments are excessively drained to well drained sandy fill land that has been smoothed. The thickness of the fill ranges from 24 to 48 inches but is dominantly 36 inches. Gravel content ranges from 0 to 50 percent.

Psamments (PssA)—PssA slope ranges from 0 to 3 percent.

Psamments sulfidic substratum, frequently flooded (PstAt)—PstAt slope ranges 0 to 3 percent.

Psamments, waste substratum (PsuB)—This component is formed from inactive sanitary landfills. These areas contain smoothed or uneven accumulations and general refuse.

XIII. Phalanx loamy sand (PhbC)

This component is formed in the acid sandy coastal plains sediments and consists of deep well drained soils on uplands. Typically these soils have a dark brown loamy sand surface layer 2 inches thick and a reddish brown loamy sand subsurface layer 4 inches thick. The subsoil from 6 to 46 inches is red sandy loam. The substratum from 46 to 72 inches is yellowish red sand. There are in the lower part of the b and c horizon successive layers of fractured indurated iron cemented sandstone. Annual flooding is none, and annual ponding is none. PhbC slopes range from 0 to 25 percent.

XIV. Sassafras sandy loam (SacB)

This component is formed in marine or alluvial coastal plain sediments and consists of very deep, well-drained soils on uplands. Typically, these soils have a brown sandy loam surface layer, 9 inches thick. The subsoil, from 9 to 21 inches, is yellowish-brown loam, from 21 to 32 inches, is brown sandy clay loam, and, from 32 to 40 inches, is strong brown sandy loam. The substratum, from 40 to 52 inches, is strong brown gravelly sandy loam and, from 52 to 70 inches, is brownish-yellow loamy sand.

The depth to a restrictive feature is greater than 60 inches. The slowest soil permeability within a depth of 60 inches is moderately slow. Available water capacity to a depth of 60 inches is moderate, and shrink swell potential is low. Annual flooding is none, and annual ponding is none.

SacB slope ranges from 2 to 5 percent.

APPENDIX B

Wetland Plant Communities

The United States Department of Interior Fish and Wildlife *Wetland of New Jersey* (1985) report was reviewed to identify wetland plant communities in Ocean County.

Species specific to freshwater wetlands in the Pine Barrens include:

Bayonet Rush	Wild Rice	Bull Sedge <i>Carex bullata</i>
Pipeworts <i>Eriocaulon spp.</i>	Canada Rush	Cottongrass <i>Eriophorum virginicum</i>
Golden Club <i>Orontium aquaticum</i>	Manna Grass <i>Glyceria obtuse</i>	Twig Rush <i>Cladium mariscoides</i>
Coast Sedge <i>Carex exilis</i>	Virginia Meadow Beauty	Three-way Sedge
Beakrushes <i>Rhynchospora alga and others</i>	Redroot <i>Lachnanthes caroliniana</i>	Lowland Broomsedge <i>Andropogon virginicus var. abbreviatus</i>
Twisted Yellow-eyed Grass <i>Xyris torta</i>	Sundews <i>Drosera spp.</i>	Panic Grass <i>Panicum spp.</i>
Shortleaf Milkwort <i>Polygala brevifolia</i>	Peat Mosses <i>Sphagnum spp.</i>	Wild Oat Grass <i>Danthonia sericea var. epilis</i>
Bog Aster <i>Aster nemoralis</i>	Toothleaf flatsedge <i>Cyperus dentatus</i>	Bog Rush <i>Juncus pelocarpus</i>
Forked rush <i>J. dichotomus</i>	Rice Cutgrass	Eastern Bur-reed <i>Sparganium americanum</i>
Woolgrass	Pickerelweed	Spikerushes
St. John's-Worts <i>Triadenum virginicum and Hypericum spp.</i>	Bladderworts <i>Utricularia spp.</i>	Orchids <i>e.g., Platanthera blephariglottis</i>
Purple Pitcher Plants <i>Sarracenia purpurea</i>	Bog Asphodel <i>Narthecium americanum</i>	Slender Blue Flag <i>Iris prismatica</i>
Gold-crest <i>Lophiola Americana</i>	False Asphodel <i>Tofieldia racemosa</i>	Royal Fern <i>Osmunda regalis</i>
Bartonia <i>Bartonia virginica</i>	Twisted Yellow-eyed Grass	Ten-angled Pipewort <i>Eriocaulon decangulare</i>
Dense St. John's-Wort <i>Hypericum densiflorum</i>	Big Cranberry <i>Vaccinium macrocarpon</i>	Scattered Pitch Pine <i>Pinus rigida</i>
Inkberry <i>Ilex glabra</i>	Bayberry	Sheep Laurel <i>Kalmia angustifolia</i>

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Fetterbush
Leucothoe racemosa

Witherod
Viburnum cassinoides

Atlantic White Cedar swamps include:

Atlantic white cedar
Chamaecyparis thyoides
Highbush Blueberry

Alder

Big Cranberry
Vaccinium macrocarpon

Virginia Cottongrass

Peat Moss and other mosses

Swamp Pink
Helonias bullata

Swamp Pink
Calopogon pulchellus

Rose Pogonia
Pogonia ophioglossoides

Twining Bartonia
Bartonia paniculata

Liverworts

Pitch Pine lowlands wetlands include

Pitch pine

Turkeybeard
Xerophyllum asphodeloides

Sand myrtle
Leiophyllum buxifolium

Palustrine scrub-shrub wetlands include:

Red maple

Bayberry

Red Chokeberry
Aronia arbutifolia

Leatherleaf
Chamaedaphne calyculata

Black Gum

Swamp Azalea

Sweet Pepperbush

Smartweed

Sedge
Carex collinsii

Bladderworts
Utricularia spp.

Dragon's Mouth
Arethusa bulbosa

Green Rein Orchid
Platanthera clavellata

Round-Leaved Sundew
Drosera rotundifolia

Curly Grass Fern
Schizaea pusilla

Reindeer Moss
Cladonia incrassata

Scrub oak
Quercus ilicifolia

Lowland Broomsedge

Leatherleaf

Black Chokeberry
A. melanocarpa
B.

Fetterbush

Red Maple

Dangleberry

Arrow Arum

Spatulate-Leaved Sundew

Purple Pitcher Plant

Partridgeberry

White Fringed Orchid
P. blephariglottis

Starflower
Trientalis borealis

Wintergreen
Gaultheria procumbens

Greenbriar
Smilax glauca and *S. rotundifolia*

Cowwheat
Melampyrum lineare

High Bush Blueberry

Staggerbush
Lyonia mariana

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Sweet Pepperbush	Swamp Azalea	Shrubby St. John's-Wort
Sheep Laurel	Dangleberry <i>Gaylussacia frondosa</i>	Dwarf Huckleberry <i>Gaylussacia dumosa</i>
Fetterbush	Big Cranberry <i>Vaccinium macrocarpon</i>	Pitch Pine
Atlantic White cedar <i>Chamaecyparis thyoides</i>	Gray Birch <i>Betula populifolia</i>	Inkberry
Chokeberry	With-rod	Possum Haw <i>Viburnum nudum</i>
Smooth Alder	Buttonbush	Dense St. John's-Wort
Hardwood swamps contain the following wetland species:		
Black Gum	Sweet Gum	Sweet Bay <i>Magnolia virginiana</i>
Atlantic White Cedar	Ash	Tulip Tree
American Holly <i>Ilex opaca</i>	Sassafras <i>Sassafras albidum</i>	Gray Birch
Willow Oak <i>Quercus phellos</i>	Pitch Pine	Loblolly Pine <i>Pinus taeda</i>
Black Huckleberry <i>Gaylussacia baccata</i>	Southern Arrowwood	Leatherleaf
Inkberry	Spicebush	Smooth Alder
Other blueberries <i>Vaccinium pallidum</i>	Winterberry	Staggerbush
Serviceberries <i>Amelanchier spp.</i>	Chokeberries	Sheep Laurel
Mountain Laurel <i>Kalmia latifolia</i>	Tussock Sedge	Rice Cutgrass
Skunk Cabbage	Beggar-Ticks	Cinnamon Fern
Royal Fern	Arrow-Leaved Tearthumb	Joe-Pye Weeds
White Grass <i>Leersia virginica</i>	Meadow Rue <i>Thalictrum sp.</i>	Bracken Fern <i>Pteridium aquilinum</i>
Sensitive Fern	Chain Fern	Bedstraws
False Nettle	Common Greenbriar	Bamboo Vine <i>Smilax laurifolia</i>
Poison Ivy	Virginia Creeper	Japanese Honeysuckle
Wild Grape	Trumpet Creeper <i>Campsis radicans</i>	Maleberry

APPENDIX C

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