

DRAFT NATURAL RESOURCE INVENTORY

OCEAN TOWNSHIP OCEAN COUNTY, NEW JERSEY

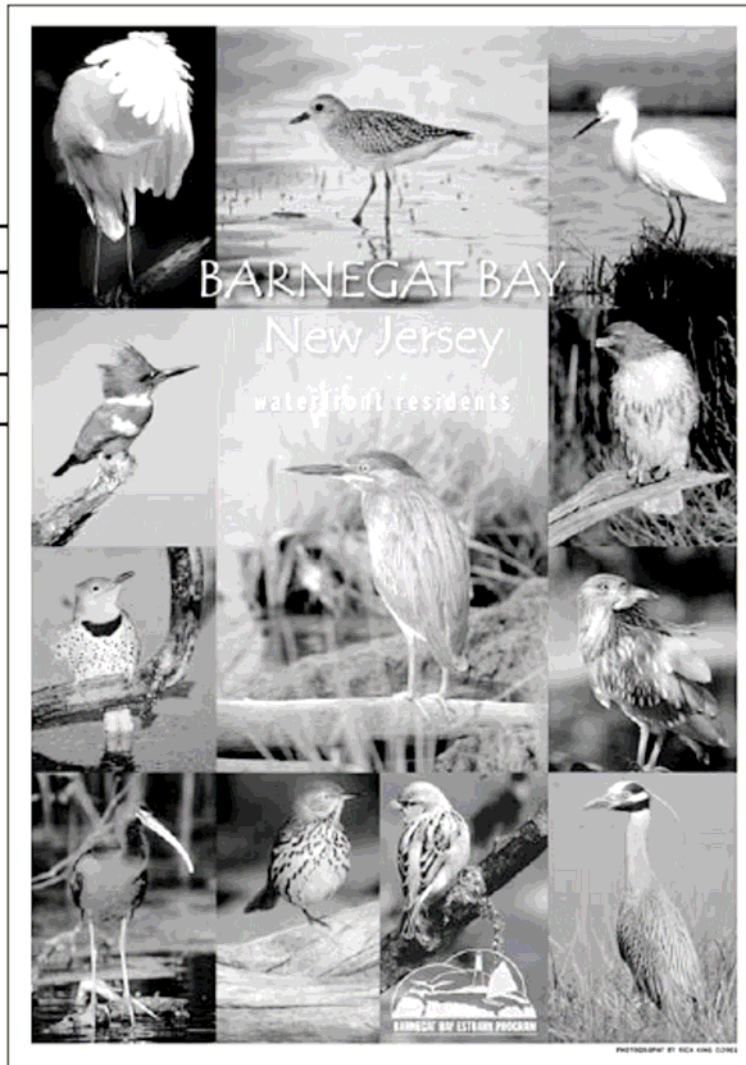


Photo: Barnegat Bay National Estuary Program Comprehensive Conservation and Management Plan. (2002).

June 7, 2005

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TABLE OF CONTENTS

	PAGE
EXECUTIVE SUMMARY	3
INTRODUCTION	4
<i>LAND USE</i>	7
CRITICAL ENVIRONMENTAL AREAS	18
ENVIRONMENTAL COMPONENTS	21
<i>GEOLOGY</i>	22
<i>Physiography</i>	22
<i>Stratigraphy</i>	22
<i>CLIMATE</i>	35
<i>Air</i>	36
<i>Noise</i>	37
<i>HYDROLOGY</i>	39
<i>Groundwater</i>	42
<i>Surface water</i>	47
<i>Wetlands</i>	50
<i>WILDLIFE AND VEGETATION</i>	58

FIGURES

Figure 1a: Location Map	5
Figure 1b: State Planning Areas, CAFRA and Pinelands Boundary	6
Figure 2a: Existing Land Use	16
Figure 2b: Preserved Land	17
Figure 3: Critical Environmental Areas	20
Figure 4: Soil Types	32
Figure 5: Farmland Soils	33
Figure 6: Septic Suitability	34
Figure 7: Subwatersheds (HUC14)	41
Figure 8: Groundwater Recharge Areas	45
Figure 9: Wellhead Protection Areas with Known Contaminated Sites	46
Figure 10: Surface Water Quality and Flood Hazard Areas	49
Figure 11: Freshwater Wetlands	57

Draft Natural Resource Inventory
Township of Ocean, Ocean County

Figure 12: Threatened and Endangered Species	64
Figure 13: Natural Heritage Grid	65

EXHIBITS AND CHARTS

Exhibit 1: Ocean Township Existing Land Uses	7
Exhibit 2: 2002 Public Open Space and Recreation Summary	13
Exhibit 3: Soil Types and Conditions	28
Exhibit 4: Ocean Township Adopted Noise Regulations	38
Exhibit 5: Groundwater Recharge Areas in Ocean	43
Exhibit 6: Atlantic Coastal and Pinelands Landscapes Endangered, Threatened and Priority Species by Habitat Type, Ocean Township	59
Exhibit 7: Ocean Township Federal, State and Rare Vegetative Species	60
Chart 1: 1998-2004 Total Ozone Exceedances Days at Colliers Mills Monitoring Station	36

APPENDICES

Appendix A Soil Classification	66
Appendix B Contaminated Sites	72
Appendix C References	73

EXECUTIVE SUMMARY

The Township of Ocean, Ocean County prepared this Natural Resource Inventory for consideration of Initial Plan Endorsement by the State Planning Commission. Ocean Township has many planning documents that consider natural resources, such as the Municipal Master Plan (1999/2001) and an optional element the 2002 Community Forestry Plan 2002-2007. Mayor David Van Pelt also participated in the Barnegat Bay Estuary Program, Comprehensive Conservation and Management Plan in 2002 which encompasses the entire length of the Barnegat Bay barrier islands.

Ocean Township is also one of three municipalities that are consistent with the goals and objectives of the New Jersey Pinelands Commission Comprehensive Management Plan. Consideration of potential environmental concerns of the proposed Waretown Center was also made in the Initial Plan Endorsement application in December 2004. To meet the requirements of Plan Endorsement, Ocean Township contends that the following consideration of natural resources and critical environmental areas achieves the stated purpose of a Natural Resource Inventory.

The purpose of a Natural Resource Inventory is to identify the natural resources within a municipality, their importance to the public health, safety and welfare, and the potential adverse impacts associated with utilization of such resources. A Natural Resource Inventory provides an essential part of the background data necessary for a Planning Board, as it both considers master planning for future of the municipality and reviews individual applications for development.

Information generated for this inventory was obtained from federal and state environmental agencies published materials. All figures were generated using data downloaded from the New Jersey Department of Environmental Protection, Geographic Information System metadata.

INTRODUCTION

The Township of Ocean commonly referred to as Waretown is located along the Barnegat Bay inlet which borders the Atlantic Ocean in Ocean County (Figure 1a). Adjacent municipalities include Lacey Township to the North and Barnegat Township to the South and West. Ocean is served by two main State highways the Garden State Parkway and Route 9 and County Route 532. The Garden State Parkway serves as a geographic boundary between “East” and “West” Ocean Township for many of planning decisions (Figure 1b). West of the Parkway is under the political jurisdiction of the Coastal Area Facility Review (CAFRA). Areas to the east are contained under the political jurisdiction of the New Jersey Pinelands Commission and encompass the sub-watershed of Oyster Creek. The New Jersey State Development and Redevelopment Plan State Plan Policy Map has no jurisdiction west of the Parkway and lists the majority of the area east of the Parkway in the Suburban Planning Area (Planning Area 2), in the Environmentally Sensitive Planning Area (Planning Area 5), the Environmentally Sensitive Planning Area/Barrier Islands Planning Area (Planning Area 5B) and in federal, state, county and municipal parks. Development has centered around Route 9 and Old Main Street in the Waretown section. The Township is in the process of obtaining Initial Plan Endorsement and center designation for this area from the New Jersey State Planning Commission.

Legend

- Ocean Township, Ocean County
- Municipal Boundary
- County Boundary
- Interstate Highway
- US Highway
- State Highway
- Toll Road

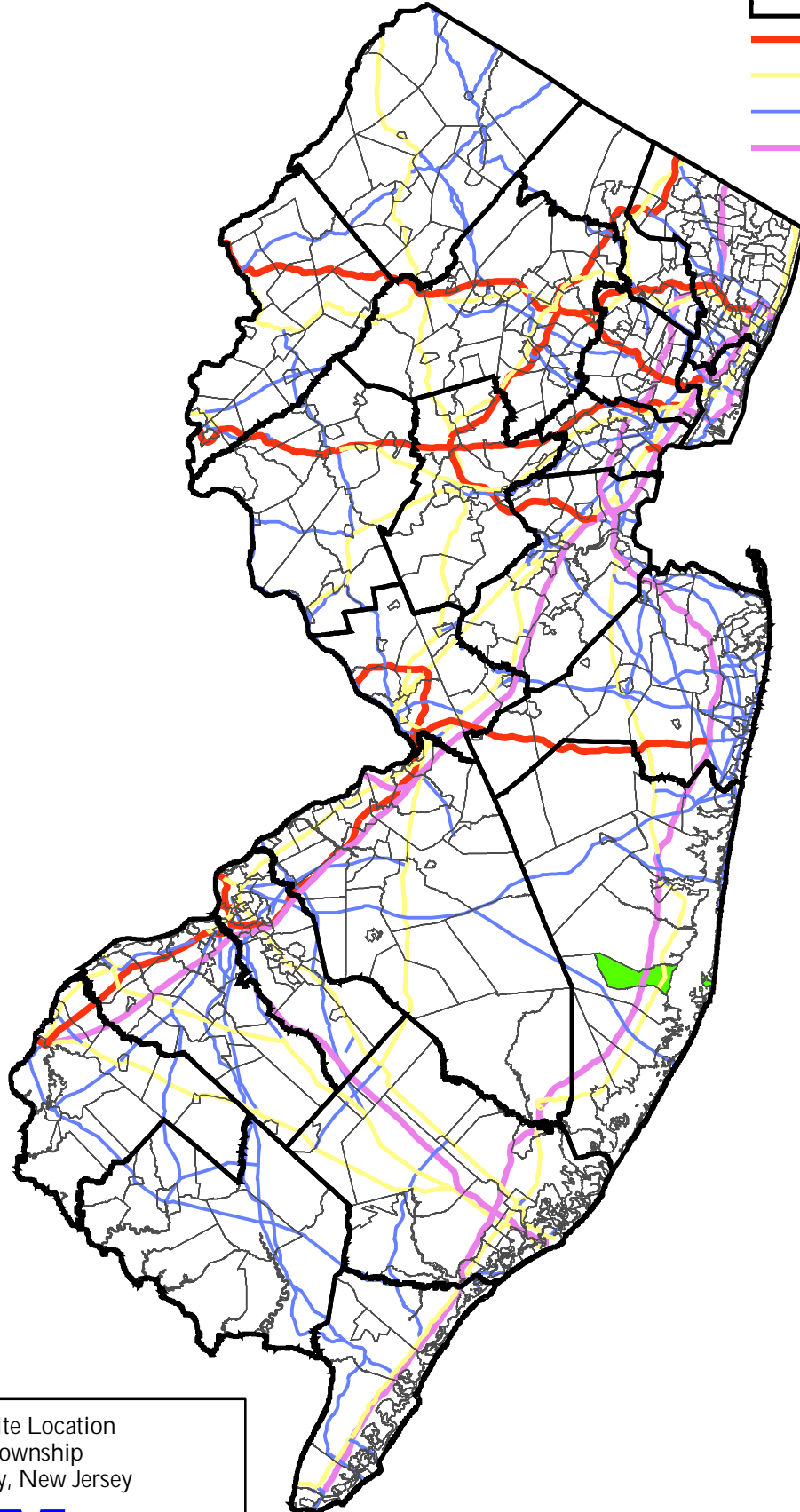


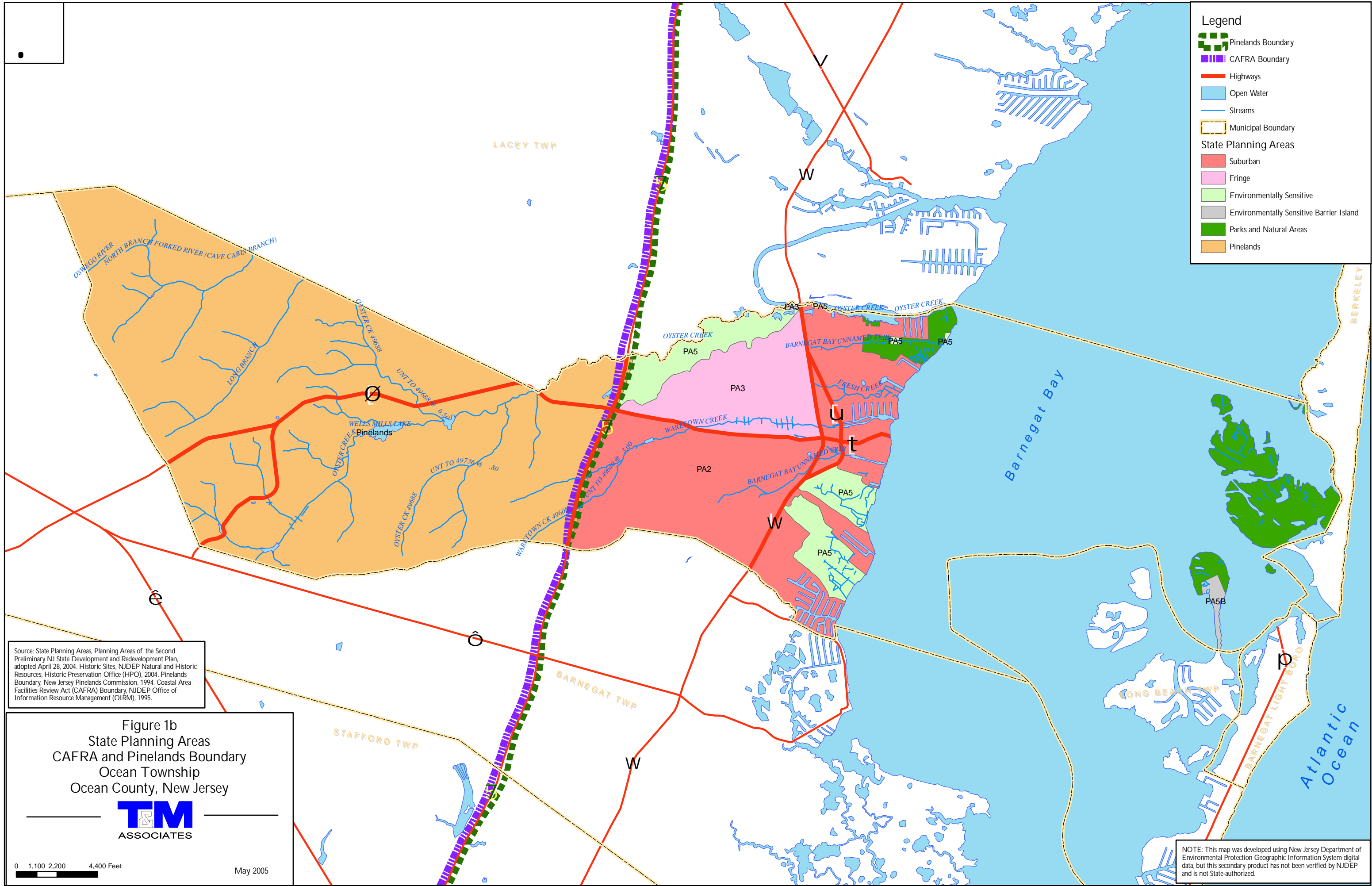
Figure 1a: Site Location
Ocean Township
Ocean County, New Jersey



0 24,500 49,000 98,000 Feet

May 2005

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



LAND USE

Figure 2a depicts the Township total land area and water area: land area encompasses 20.79 square miles or 13,301.61 acres and water area comprises 7,187 acres (Exhibit 1). Ocean can be characterized as a rural-suburban area; residential uses make up 15.94% of the total land area; of which 94.5% are single-family dwelling units; while farmland encompasses approximately 20%. The Pinelands planned unit development comprises 6.74% of the residential area. Industrial and commercial uses make up less than 5% of the total land area. Public property comprises 28.06% of Ocean and includes the existing and proposed Town Hall, the police and fire stations, a Community Center, Ocean County Library and Fire Academy, Wes & Priff Schools and the Municipal Utilities Authority Office & Pump Stations. Based on the tax database over a third is either Unclassified or Vacant; meaning that these properties have the potential of being places on the tax roll. The water area is comprised of the Barnegat Bay estuary which fronts 3.62 miles along the Barnegat Bay and Fresh Creek, Long Branch, Mill Creek, Oswego River, Oyster Creek and Waretown Creek, Warrens Creek rivers.

Exhibit 1: Ocean Township Existing Land Uses

<i>Land Use</i>	<i>Acres</i>	<i>Percent</i>
RESIDENTIAL	2,119.62	15.94
Residential	1,223.51	9.20
Pinelands Planned Unit Development	896.11	6.74
COMMERCIAL/INDUSTRIAL	401.79	3.02
FARMLAND (QUALIFIED)	2,526.87	19.00
PUBLIC PROPERTY	3,781.42	28.43
Secular	3,733.07	28.06
Religious	48.35	0.36
VACANT LAND	3,702.22	27.83
UNCLASSIFIED	769.69	5.79
Total Land Area	13,301.61	100%
Total Water Area*	7,187	

Source: 2002 Ocean Township Mod IV Tax Database & U.S. Census *Percent of total land area.

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Township of Ocean, Ocean County

The 2000 U.S. Census indicates that 6,450 residents live in Ocean Township with a population density of 310 persons per square mile. The North Jersey Transportation Planning Authority projects that in 2010, 7,997 residents will reside in Ocean, a quarter percent increase of population.

Bearing in mind the existing land uses and population growth, critical to a Natural Resource Inventory is the identification of the existing “preserved land uses” such as the Pinelands, the Coastal Area Facility Review (CAFRA) zone, beaches & dunes, scenic vistas, open space, preserved farmland and historic sites (Figure 2b).

The Township west of the Parkway is contained in the Pinelands National Preserve and the Pinelands Preservation Area and to the east in the Coastal Zone Management Act and Coastal Area Facility Review (CAFRA). The Pinelands National Preserve, totaling 445,000 hectares, is distinguished as being the first reserve to be designated by the National Parks and Recreation Act of 1978. In 1983, the United Nations Educational, Scientific and Cultural Organization (UNESCO) under the Man and Biosphere program created the Atlantic Coastal Plain Biosphere Reserve, of which the Pinelands National Reserve was included. The Pinelands Preservation Area, totaling 379,204 hectares (excludes areas to the east of the Garden State Parkway and to the south bordering Delaware Bay) was created as the area to implement the federal legislation in the Pinelands Protection Act of 1979 (P.L. 1979, c. 111). The Act also provided for a New Jersey Pinelands Commission to create a comprehensive management plan (CMP) to balance protection and development interests; the plan was adopted in 1980 and approved in 1981. There is one core preservation district, totaling 136,380 hectares to be maintained in its natural state through strict regulation of development, and a protection area where there are various categories of land use (forest, agriculture, regional growth, rural development, pinelands, towns and villages, military and federal institutions) based on existing natural features and projected need. In Ocean, the Pinelands account for 8,247.429 acres or 41.6% of the total land area; of which the majority of the area is designated as a Forest Area and a portion is a Rural Development Area and Preservation

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Township of Ocean, Ocean County

Area. The Brookville area in Ocean has been designated as a Pinelands Village under the Pinelands Comprehensive Management Plan and contains regulations governing its use.

The Coastal Zone Management Act of 1972 (16 USC §1451 et. seq.) authorizes States to protect the use of land and water resources that are of greater than local significance in the coastal zone. The coastal zone extends from the Great Lakes waters, to the international boundary between the United States and Canada and, in other areas, seaward to the outer limit of State title and ownership and extends inland from the shorelines only to the extent necessary to control shorelands, the uses of which have a direct and significant impact on the coastal waters, and to control those geographical areas which are likely to be affected by or vulnerable to sea level rise. The CAFRA Rules implement the federal legislation and regulates different types of development in each zone. The CAFRA area includes coastal waters beginning at Cheesequake Creek, Raritan Bay in Old Bridge, Middlesex County extending South along the coast around Cape May, and then north along the Delaware Bay ending at the Kilcohook National Wildlife Refuge in Salem County. The inland limit of the CAFRA area follows an irregular line drawn along public roads, railroad tracks, and other features and varies in width from a few thousand feet to 24 miles, measured straight inland from the shoreline.

From a historical perspective, the area that would become an important water resource Barnegat Inlet was first explored by Henry Hudson an Englishman in 1609 with his ship “Half Moon.” Settled in the 1730s, Waretown is named for Abraham Waier, a Rogerenes or Quaker Baptists who constructed a mill along the numerous watercourses. The Rogerenes were expelled from Connecticut because of their hostilities to the Puritan Sabbath laws of New England. The earliest known settlement is a one-room house built by Caleb Falkinburg, grandson of the first European settler in Ocean County along Waretown Creek and currently listed on both the federal and state National Historic Registers of Historic Sites.

For much of Waretown’s early history, the area served as a shipbuilding center at Shipyard Point between Waretown Creek and Skippers Cove. The biggest ship built at

this center was the “Magellon” and famous Schooners include “Lydia Middleton,” “Eva Homes” and “Marie Pearson.” With the advent of Steamboat technology, the shipyards also produced charcoal. Until the 1920s, shell fishing contributed to the economy and included harvesting of oysters, clams and scallops.

Water Features: Beaches, Coves & Harbors

Ocean Township web site lists several beaches, coves & harbors where residents can take pleasure in. These include Pebble Beach, Barnegat Beach and Holiday Beach. Coves include Skipper and Dogtown and harbors Sands Point, North & South Harbor and Bay Haven. These water features begin in the North at Oyster Creek, followed by Sands Point Harbor, the lagoon inlet at Holiday Beach, to Skippers Cove, ending at Shipyard Point, North Harbor a former shipyard at Waretown Creek. The water feature south of Waretown Creek is South Harbor. From South Harbor at the eastern terminus of the Old Pancoast Road is Barnegat Beach which is followed by Pebble Beach at Locheil Creek.

These water features are described below:

Barnegat Beach—Barnegat Beach is located north of Barnegat Beach Drive as far as Main Street and the vicinity of Westcott Avenue that extends down to the bay. Cox’s Point is the entrance for the two lagoons in the beach and a Marina at the inner end of each. The beach also included two farms: Headley Farm and Birdsall-Westcott Farm (end of Pancoast Road) and the former Newlin's Salt Works factory. The Salt Works factory was critical for the supply of salt during the American Revolution. The beach contains a beach built in the 1950s by the Barnegat Beach Civic Association Inc.

Bay Haven—Bay Haven is centrally located and on the bay, from Bay Avenue to Pennsylvania Avenue. There are some homes here but there are two large Marinas and other small lagoons. A thriving slip rental and boat business is in operation there. It was once a busy place at the site of the old Bayview Hotel and the

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Township of Ocean, Ocean County

Waretown Fishing Station where, in the old days one could rent a row boat and go crabbing or fishing.

Dogtown— Dogtown is located at the far end of Railroad Avenue, west of Route 9 and near Route 532. The area was named Dogtown because a Ray Peterson is said to have trained dogs here.

Holiday Beach—This area was once farmland. Holiday Beach Marina includes 225 slips.

Pebble Beach—Originally called Indianola for the small Indian camps or Picketts Field, Pebble Beach lies immediately west of Route 9, near Locheil Creek. Indianola served as the first settlement area for the Europeans. Residents also enjoyed fishing parties on this beach, as “weak fish” favored this beach.

Sands Point Harbor—Originally called Owltown, Sands Point Harbor has been documented as an ancient Indian campsite.

Skippers Cove—This area served as a town meadow and a focal point for watching ships at Birdsall-Conover house. In 1960 subdivisions plans were in place for a 237 housing development with access to both water and sewerage. The Skipper’s Cove Marina includes 15 slips.

South Harbor—South Harbor originally moored large ships and schooners and includes Liberty Harbor, an existing marina which includes 12 slips.

***Land Features: Scenic Vistas, Open Space, Preserved Farmland
& Historic Sites***

Stated explicitly in Title 18, Zoning regulations is the following purpose statement regarding preservation and conservation of natural resources contained in the Pinelands:

It shall also be the purpose of this title to implement the objectives of the Pinelands Protection Act and the Pinelands comprehensive management plan and to conform with the minimum standards contained in said plan. These objectives with respect to the Pinelands are to protect, preserve and enhance the significant values of the resources thereof, including natural, ecological, agricultural, archaeological, historic, scenic, cultural and recreational resources of Ocean Township and the Pinelands (Prior code §19-1.2). §18.02.020B.

As noted earlier Ocean Township is one of three municipalities that are consistent with the goals and objectives of the New Jersey Pinelands Commission Comprehensive Management Plan. Specific to scenic vistas, Title 18 defines scenic corridors and setback requirements for different land uses (Title 18.60.070). All roads except those that provide internal circulation for residential developments in the Preservation Area (PA), the Forest Area (FA), Rural Development (RU) and Industrial (I-2) districts are defined as scenic corridors (Title 18.60.070A.) In each zoning district the setback requirements are two hundred (200) feet from the center line of the scenic corridor and are issued for residential and industrial uses; agricultural product sales as well as existing development patterns are exempt. The zoning code also provides design guidelines for landscaping in the Pinelands areas.

Ocean Township has also prepared an Open Space and Recreation Plan pursuant to the guidelines of the New Jersey Department of Environmental Protection (NJDEP), Green Acres Program for the purposes of obtaining State grant match funding. In 2000, Ocean residents approved a dedicated source of funding for open space purchases at 1.2 cents per Municipal tax levy of one hundred (\$100) property valuation.

According to the Open Space Plan, 2,748 acres of publicly owned land are dedicated to the purposes of conserving and preserving open space or 21% of the total land area of 13,196 acres in Ocean Township (Ocean Township, Open Space and Recreation Plan (2002)). Over 94% of the dedicated open space is in Federal, State and County jurisdictions (Exhibit 2).

Exhibit 2: 2002 Public Open Space and Recreation Summary

Jurisdiction	Acreage	% of Open Space	% of Township Land Area
Federal	90.00	3.27	0.70
State	1,502.00	54.66	11.98
County	985.00	35.85	7.46
Municipal	170.84	6.22	1.30
Total	2,747.84	100.00	20.80

Source: Ocean Township, Open Space and Recreation Plan (2002).

Federal

The United States Department Interior, Fish and Wildlife Service owns a 90 acre parcel in the southern portion of the Township west of Route 9.

Ocean Township also contains a property listed on both the National and State Historic Registers. Listed on the National Register on August 12, 1993 and the State Register on July 7, 1993, the Falkinburg Farmstead (#93000829) is located at 28 Westcott Avenue. The building is of Federal, Greek Revival, Colonial architectural style from the 1700s, and used for the purpose of subsistence agricultural. Currently the property is a funeral home and a private residence.

State

The State owns portions of land on the eastern and western edges of the municipality. On the bayside State-owned property includes the Sedge Islands, Sands Point Harbor and Lighthouse Camp, on the western section portions of Greenwood Forest and Pasadena Wildlife Management Area are contained in Ocean.

The portion of the Garden State Parkway contained in Ocean Township contains a State Historic Officer Opinion (ID#3874) on October 12, 2001. The Garden State Parkway in its entirety has been designated as such. In southern New Jersey no changes have been made to the original alignment since construction began in 1946-1957.

County

The County owns three parcels: Wells Mills County Park, 938 acres west of the Parkway on Route 532, a 13-acre property on Bryant Road, east of Route 9 and a 34-acre property at Seventh Avenue.

Ocean Township has also participated in the County Farmland Preservation Program. Hammerstrom Farm 6.56 acre nursery is located on Roberts Road.

Municipal

Municipal owned properties include Waretown Lake (107.20 acres) at Route 532, Faust Park (0.22 acres) at Kennedy Drive, Toumey Park (5.18 acres) at 11th Street, Small Bay Beach (0.24 acres) at Tuscarora and Main/Navigator (58 acres) at Main Street & Navigator Street all of which are west of the Parkway. The Main/Navigator property is owned-jointly with the County. The township contains three major campgrounds: Joseph A. Citta Scout Reservation (600 acres); Ocean County Girl Scouts (8.5 acres) and Brookville Campground (40 acres). The Open Space Plan also proposes to preserve an additional 137 acres for community facilities, such as playgrounds, softball fields and jogging trails.

The 2001 Ocean County Master Plan listed seven properties¹ and the Trust for Public Land study² for consideration by Ocean Township for purposes of acquisition with the Ocean County Natural Lands Trust Program. The Natural Lands Trust is dedicated County levy of 1.2 cent per one hundred (\$100) of property valuation approved in 1997 by county residents. Three properties have been acquired and two are in the pipeline. The properties acquired include the 11.9-acre Knots Landing, Inc. property at Bryant Road, Pennsylvania Ave., Vessel Road, the 52.0 acre Barnegat Branch Rail Trail in Barnegat, Berkeley & Ocean Townships in a former Rail ROW, the 719 acre Johnson-

¹The 2001 Ocean County Master Plan lists the following properties: Bowker Tract, Crystal Bay Peninsula, Lochiel Creek, Forked River Mountain South (81.8 acres on Route 532); easement on the 154 acre Boy Scout Camp (Brookville Road); Knots Landing & Barnegat Branch pf the Central Railroad of New Jersey.

²The Trust for Public Land (1995) *The Century Plan* identifies the following properties: Sedge Island (21.9 acres); Barnegat Bay Beach Inland Area (950 acres—Route 9 South of Pancoast Road); Liberty Harbor (145 acres); Lighthouse Camp (95 acres); Bowker property (96 acres); Oyster Creek/Sands Point Harbor (140 acres); Waretown Creek (187 acres); Wells Mills Scout Camps (600 acres) & Wells Mills Park Area E (620 acres).

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Township of Ocean, Ocean County

Forked River Mountain Area on Route 532 and jointly owned by the Nature Conservancy, Forked River Mountain Coalition Inc. & Forked River Mountain South Property. The two properties in the pipeline include the 58 acre Lighthouse Drive property on Lighthouse Drive and the 5.86 Dock Avenue property at Dock Avenue and Bay Parkway. One of the objectives of the Open Space Plan is to encourage development of greenways within the municipality; the Barnegat Branch Rail Trail will achieve this goal by connecting the Township to the border of Toms River and is supported by not only the County but also the North Jersey Transportation Planning Authority Regional Transportation Plan.

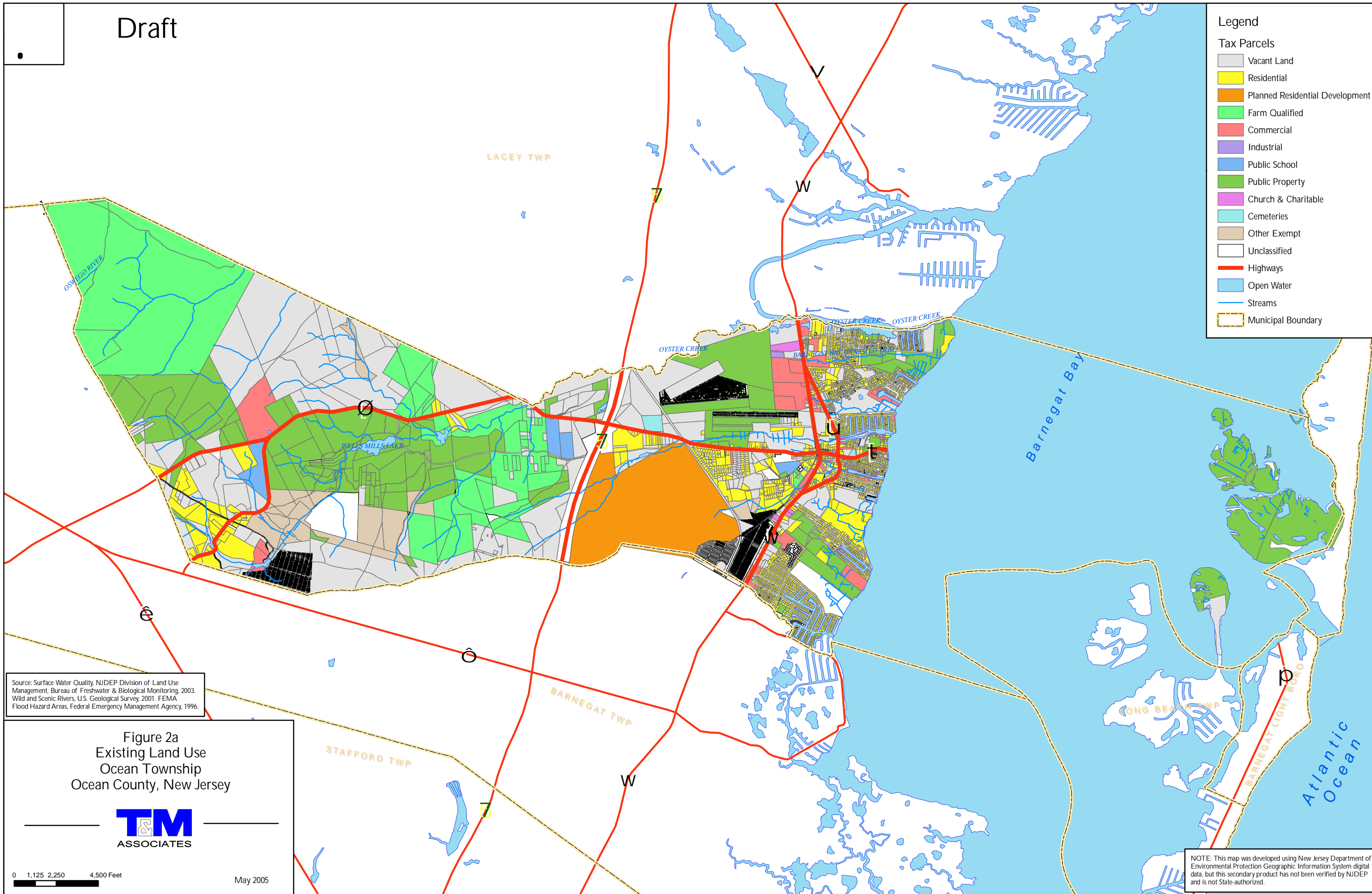
The Township also has prepared a five-year Community Forestry Management Plan 2002-2007 in accordance with the New Jersey Shade Tree and Community Forestry Act (P.L. 1996, C.35). Forest management has been an important driver for Ocean Township's economic stability from 1830 to 1930 for charcoal production. Currently interest in forestry is directed towards the indiscriminate and excessive cutting of trees and shrubs and proposals for new construction and development; listing species and appropriate types of soils for each. The Forestry Plan is focused on developing a Shade Tree Commission within the municipality as well as receiving reorganization from Tree City, USA.

Draft

Legend

Tax Parcels

- Vacant Land
- Residential
- Planned Residential Development
- Farm Qualified
- Commercial
- Industrial
- Public School
- Public Property
- Church & Charitable
- Cemeteries
- Other Exempt
- Unclassified
- Highways
- Open Water
- Streams
- Municipal Boundary



Source: Surface Water Quality, NJDEP Division of Land Use Management, Bureau of Freshwater & Biological Monitoring, 2003. Wild and Scenic Rivers, U.S. Geological Survey, 2001. FEMA Flood Hazard Areas, Federal Emergency Management Agency, 1996.

Figure 2a
Existing Land Use
Ocean Township
Ocean County, New Jersey



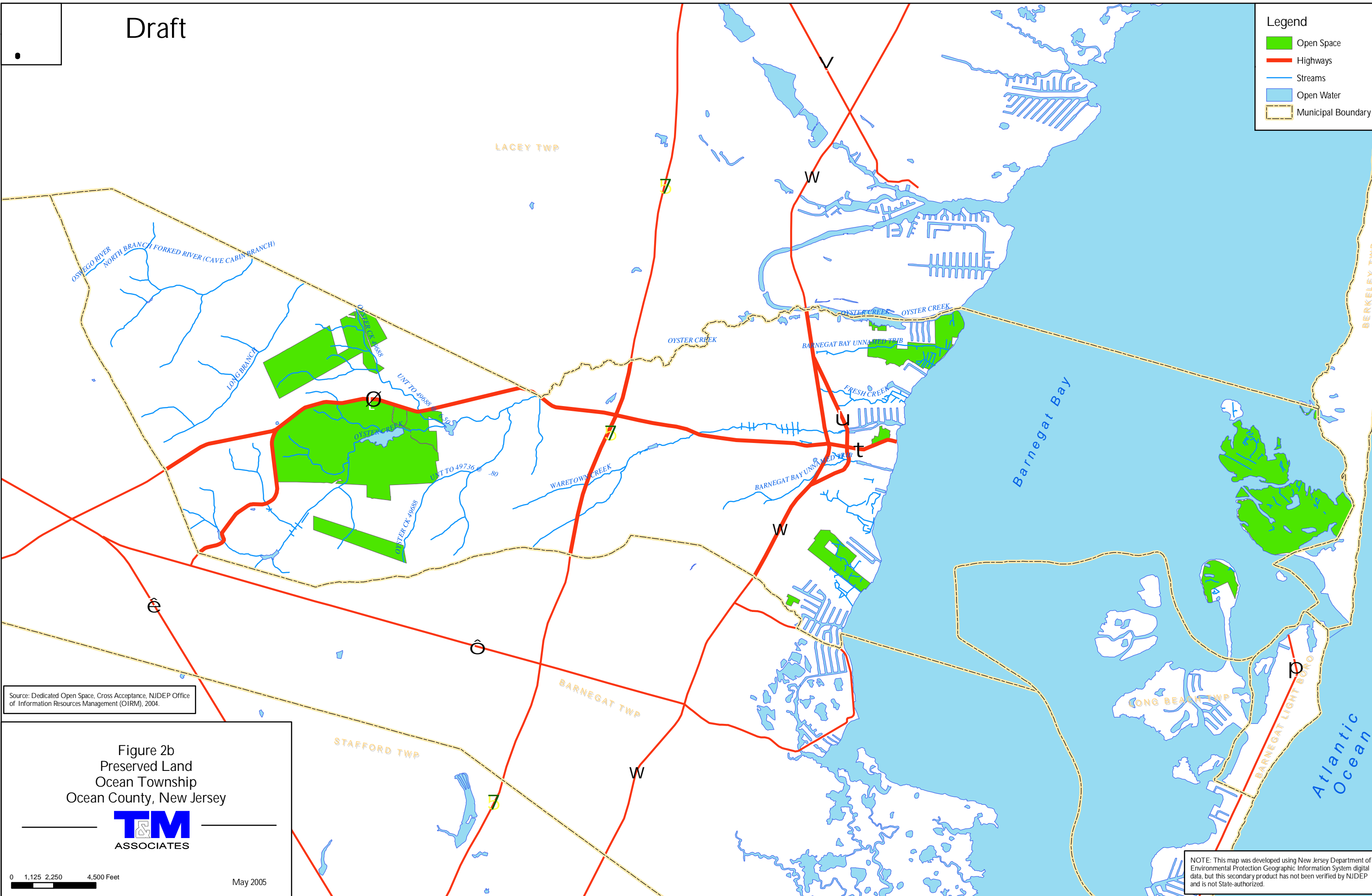
0 1,125 2,250 4,500 Feet

May 2005

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.

Draft

- Legend
- Open Space
 - Highways
 - Streams
 - Open Water
 - Municipal Boundary



Source: Dedicated Open Space, Cross Acceptance, NJDEP Office of Information Resources Management (OIRM), 2004.

Figure 2b
Preserved Land
Ocean Township
Ocean County, New Jersey



0 1,125 2,250 4,500 Feet

May 2005

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.

CRITICAL ENVIRONMENTAL AREAS

Critical areas include environmentally sensitive areas such as wetlands, streams, floodplains, and steep slope areas. They also include areas that are important for protecting groundwater, habitat areas needed to support biodiversity, and irreplaceable resources such as prime farmland. In addition, critical areas include existing preserved areas, such as open space, preserved farmland and historic sites. Figure 3 delineates the extent of critical environmental areas in Ocean Township.

Ocean Township is located in the Barnegat Bay priority wetland; including all of the tributary waters of the system. Barnegat Bay supports fishery habitat, shellfish habitat, estuarine and palustrine wetlands and critical habitat for game and nongame species. There is substantial threat to these natural resources from residential and commercial development. Based on the Landscapes Project, the State priority species, the Eastern Box Turtle has suitable habitat in Ocean. The Natural Heritage Database also delineates two critical hydrophyte species the Knieskern's Beaked Rush (*Rhynchospora knieskernii*) and Swamp Pink (*Helonias bullata*), both federal endangered and state threatened vegetative species.

Although none of the waterways in Ocean are listed as a Category One (C1), the New Jersey Pinelands Commission and the New Jersey Department of Environmental Protection maintain recognize the importance of maintaining overall surface water quality for residents and wildlife & vegetative species. The United States Environmental Protection Agency indicates that the entire seaboard from Long Branch to Cape May is impaired with dissolved oxygen and fecal coliform.

Ocean Townships rivers and streams provide recreation activities and can be considered as hazardous areas. The Barnegat Bay tributaries, Fresh Creek and Oyster Creek all contain lowland areas that have the ability to flood. The State-owned Sedge Islands on the eastern portion of the municipality can be affected by serve storms and be submerged.

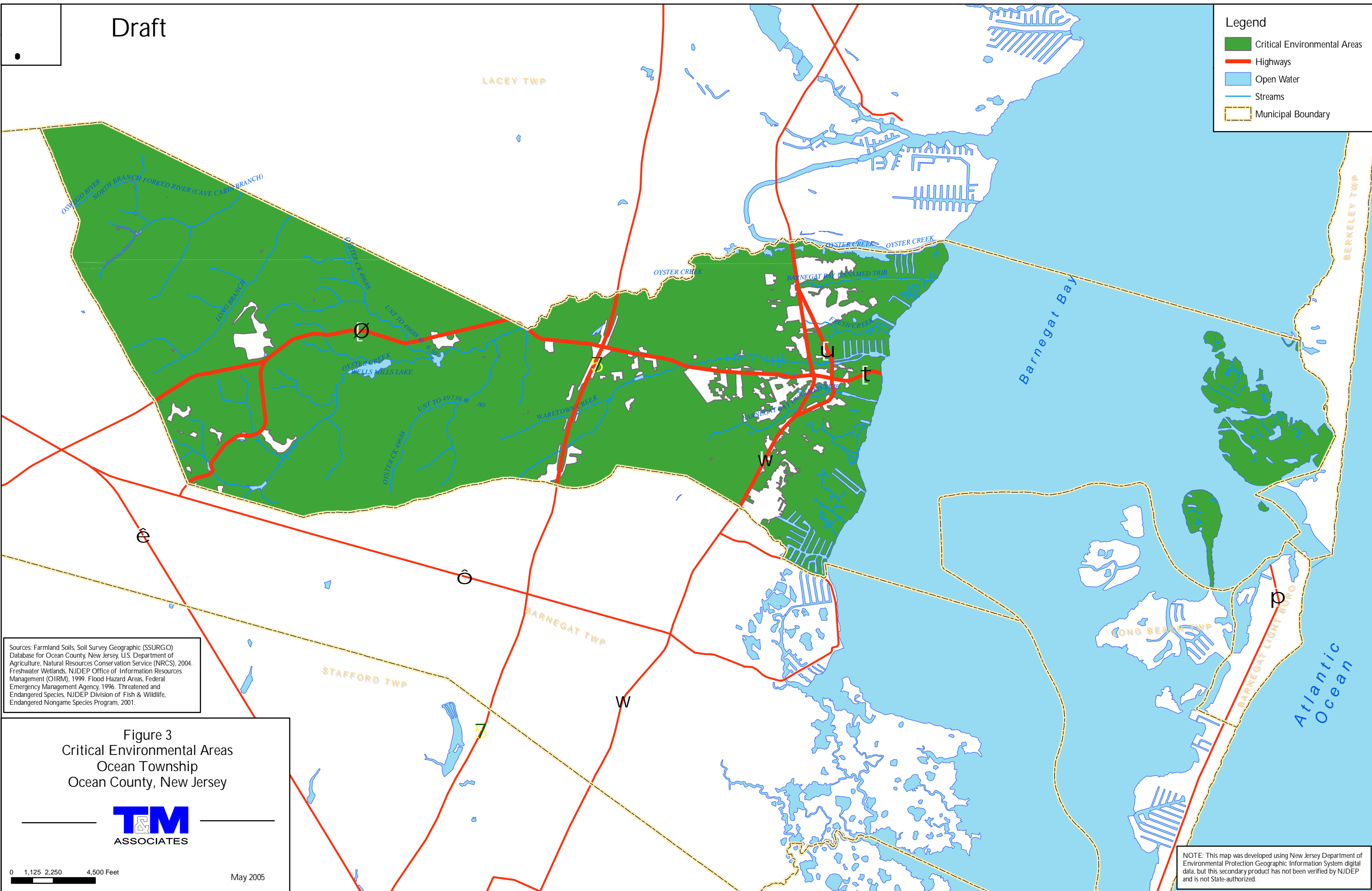
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Township of Ocean, Ocean County

Ocean Township residents are dependent on groundwater supply from the Kirkwood-Cohansey geological aquifer. Groundwater supplies can be vulnerable to pollution and over-pumping of aquifers and need to be conserved and protected.

These natural conditions are also augmented with existing preserved land, such as coves, harbors, open space, historic sites and preserved farmland.

Draft

- Legend
- Critical Environmental Areas
 - Highways
 - Open Water
 - Streams
 - Municipal Boundary



ENVIRONMENTAL COMPONENTS

Ocean Township is located within the Atlantic Outer Coastal Plain physiographic, the Coastal climatic zone climatic zone, the Long Island-New Jersey Coastal Drainage Area, the Watershed Management Area 13, referred to as the Barnegat Bay—Little Egg Harbor Watershed, the Kirkwood-Cohansey aquifer and the Atlantic and Pinelands Landscapes.

The Outer Plain contains sandy soils which is an ideal condition for aquifers and the groundwater for Ocean residents. Soils contained in Ocean are from the Cohansey formation which are mostly medium to coarse grained sands, although some thin clay soil layers are present. Sandy soil conditions create ideal conditions for cultivated crops and unique habitat for wildlife and vegetative species. In Ocean there are sixteen soil series each with a corresponding component totaling twenty-six.

According to the Office of the NJ State Climatologist, Ocean Township is located within the Coastal climatic zone which is greatly influenced by weather patterns by both the continent and ocean.

As discussed above, water resources in Ocean are significant. Ocean Township is located in the Long Island-New Jersey Coastal Drainages system and in the Barnegat Bay National Estuary Program. Ocean Township groundwater is comprised of the Kirkwood-Cohansey aquifer.

Ocean Township is located in both the Atlantic Coastal and Pinelands Landscapes. The Atlantic Coastal Landscape encompasses parts of Monmouth, Ocean and Atlantic counties. The Atlantic Coastal Landscape is dominated by beaches and marshes and supports colonial nesting birds, ospreys and peregrine falcons. The Pinelands Landscape encompasses all or parts of Atlantic, Ocean, Burlington, Camden and Gloucester counties and is an internationally recognized ecosystem and a unique aquatic community among the Mid-Atlantic States. The Pinelands contains numerous cedar swamps and wetland systems that supports reptile, amphibian and invertebrate populations, numerous insect

species, as well as Neotropical bird populations. Two federal threatened and state endangered vegetative species have suitable wetland habitat in Ocean Township; the Knieskern's Beaked Rush (*Rhynchospora knieskernii*) and Swamp Pink (*Helonias bullata*).

What follows is an identification of natural resources found in the City which include Geology, Climate, Hydrology and Wildlife & Vegetative Species.

GEOLOGY

Physiography

The Township of Ocean 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 (400 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; many are tidal for significant portions of their length.

The average elevation ranges from 0 feet at sea level to approximately 180 feet at its northwestern boundary.

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

Draft Natural Resource Inventory
Township of Ocean, Ocean County

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 like calcium, magnesium, phosphorus, and potassium.

There are sixteen soil series each with a corresponding component totaling twenty-six in the Township of Ocean (Figure 4). Included in separate Figures are soils considered as prime, unique, and statewide important (Figure 5) and septic suitable soils (Figure 6). 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) which encompasses 101.89 acres or 0.5X% of Ocean and Water which encompasses 6,683.71 acres or 32.98% of Ocean. Exhibit 3 highlights the hydric rating, the seasonal water table depth, runoff potential, and the land class and suitability for different land uses and septic suitability for each soil.

The following describes each soil series and component:

- I. Appoquinimink/Transquaking/Mispillion, very frequently flooded (AptAv)—AptAv is a hydric soil and is listed as a unique farmland soil. This soil is comprised of three soil series, Appoquinimink, Transquaking, Mispillion all of which exhibit a tidal flat landform. This soil encompasses 728.52 acres or 3.59% of Ocean.
- II. Atsion Series— This series is hydric soil
 - a. Atsion sand (AtsA)—AtsA is listed as a farmland 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 797.75 acres or 3.94% of Ocean. Woodland species include Blackgum, Pitch Pine and Red Maple.

Draft Natural Resource Inventory
Township of Ocean, Ocean County

- b. Atsion sand, tide flooded (AtsAt)—AtsAt encompasses 1.18 acres or less than 0.01% of Ocean.

- III. Aura sandy loam (AugB)—AugB is not a hydric soil and is considered as prime farmland. This soil encompasses 194.88 acres or less than 1% of Ocean. This component woodland species include Black Oak, Chestnut Oak, Pitch Pine, Scarlet Oak and White Oak.

- IV. 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 426.21 acres or 2.10% of Ocean. 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 82.50 acres or less than 0.5% of Ocean. Woodland species include Pitch Pine.

- V. Downer Series—This series is not a hydric soil. 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 1,570.85 acres or 7.75% of Ocean.
 - b. Downer sandy loam (DoeA)—DoeA is listed as a prime soil and encompasses 79.62 acres or less than 0.5% of Ocean.
 - c. Downer sandy loam (DoeB)—DoeB is listed as a prime soil and encompasses 1345.01 acres or 6.64% of Ocean.

Draft Natural Resource Inventory
Township of Ocean, Ocean County

- VI. 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 205.38 acres or 1.01% of Ocean.
 - b. Evesboro sand (EveC)—EveC encompasses 403.24 acres or 1.99% of Ocean.

- VII. 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 42.47 acres or less than 0.5% of Ocean. 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 324.38 acres or 1.60% of Ocean. The woodland species include Black Oak, Pitch Pine, Shortleaf Pine, Virginia Pine and White Oak.

- VIII. Hooksan fine sand (HorsC)—This component is not a hydric soil and encompasses 64.42 acres or less than 0.5% of Ocean. HorsC supports Pitch Pine.

- IX. Keyport sandy loam (KemA)—This component is a hydric soil, is listed a prime farmland soil and exhibits a depression landform. This soil encompasses 48.37 acres or less than 0.5% of Ocean. Woodland species include American Beech, Loblolly Pine, Northern Red Oak and Yellow-poplar.

- X. Lakehurst sand (LakB)—This component is not a hydric soil and is contained in a depression landform. LakB encompasses 2,586.46 acres or 12.76% of Ocean. Woodland species include Chestnut Oak, Pitch Pine, Post Oak and Scarlet Oak.

- XI. Lakewood sand— This series is not a hydric soil.
- a. Lakewood sand (LasB)— LasB encompasses 1,068.84 acres or 5.27% of Ocean. Woodland species include Chestnut Oak, Pitch Pine, Post Oak and Scarlet Oak.
 - b. Lakewood sand (LasC)—LasC encompasses 77.09 acres or less than 0.5% of Ocean. Woodland species include Pitch Pine, Shortleaf Pine and Virginia Pine.
- XII. 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 1,194.39 acres or 5.89% of Ocean. The woodland species is Atlantic White Cedar and Red Maple.
- XIII. 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 45.16 acres or less than 0.5% of Ocean. Woodland species include Blackgum, Pitch Pine, Red Maple and Sweetgum.
- XIV. Psamments series—
- a. Psamments (PssA)—PssA is a hydric soil and is comprised of comprised of three soil series two of which Mullica & Berryland are a depression landform. The other series Atsion is a flat landform. This soil encompasses 259.57 acres or 1.46% of Ocean.
 - b. Psamments, sulfidic substratum, frequently flooded (PstAt)— PstAt is a hydric souls and is comprised of three soil series, Appoquinimink, Transquaking, Mispillion all of which exhibit a tidal flat landform. This soil encompasses 240.27 acres or 1.19% of Ocean.

Draft Natural Resource Inventory
Township of Ocean, Ocean County

- c. Psammets, waste substratum (PsuB)—PsuB is not hydric and encompasses 54.73 acres or less than 0.5% of Ocean.

- XV. Sassafras sandy loam (SacB)—This component is not a hydric soil and is considered as prime soil and encompasses 134.66 or less than 1% of Ocean. SacB woodland species include Black Oak, Northern Red Oak, Scarlet Oak, White Oak and Yellow-popular.

- XVI. Woodmansie series— This component is not a hydric soil and supports the Pitch pine woodland species.
 - a. Woodmansie sand (WobB)—WoeB encompasses 500.57 acres or 2.47% of Ocean.
 - b. Woodmansie sand (WobC)—WoeB encompasses 968.29 acres or 4.78% of Ocean.

Draft Natural Resource Inventory
Township of Ocean, Ocean County

Exhibit 3: Soil Types and Conditions, Ocean Township, Ocean County

Soil	Hydric Rating*	Seasonal Water Table Depth	Septic Suitability [⊖]	Surface Runoff	Kw 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.

[⊗]Kw 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 Kw considers the whole soil, and factor Kw 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.

Draft Natural Resource Inventory
Township of Ocean, Ocean County

Soil	Hydric Rating	Seasonal Water Table Depth	Septic Suitability	Surface Runoff	Kw Erodibility Factor	NonIrrigated Capability Class (Irrigated)	Farmland Soils Designation	Structures Permitted	Road Suitable (Hazard of Erosion)	Open Space Trails
AptAv (Appoquinimink/ Transquaking/ Mispillion)	2B3, 3/ 1/1		Very Limited	Very High	.37/.05/.02	8w	Unique	Very Limited	Poor (Slight)/ Poor (Very Severe)/ Poor(Very Severe)	Very Limited
AtsA (Atison/Berryland)	2B3/ 2B3, 3	2 Inches	Very Limited	Negligible	.05	5w	Unique	Very Limited	Moderate (Slight)	Very Limited (too sandy)
AtsAt	2B3		Very Limited	Not Rated	.10	7w		Very Limited	Moderate (Slight)	Very Limited (too sandy)
AugB		20 inches	Very Limited	Medium	.28	2s	Prime	Not Limited	Well (Slight)	Not Limited
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		Greater than 6 feet.	Not Limited	Very Low	.20	2s	State	Not Limited	Well (Slight)	Somewhat Limited (too sandy)
DoeA		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
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)
HdmB		18 inches	Very Limited	Very Low	.20	2w	State	Somewhat Limited	Well (Slight)	Somewhat Limited (too sandy)

Draft Natural Resource Inventory
Township of Ocean, Ocean County

Soil	Hydric Rating	Seasonal Water Table Depth	Septic Suitability	Potential Runoff Class	Kw Erodibility Factor	NonIrrigated Capability Class (Irrigated)	Farmland Soils Designation	Structures Permitted	Road Suitable (Hazard of Erosion)	Open Space Trails
HboA (Atison/Mullica)	2B3/2B3	18 inches	Very Limited	Very Low	.32	2w	Prime	Somewhat Limited	Well (Slight)	Somewhat Limited
HorsC			Not Limited	Negligible	.17	7s		Somewhat Limited	Moderate (Slight)	Very Limited (too sandy)
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)
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
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		Greater than 6 feet	Not Limited	Medium	.28	2e	Prime	Not Limited	Well (Moderate)	Not Limited

Draft Natural Resource Inventory
Township of Ocean, Ocean County

Soil	Hydric Rating	Seasonal Water Table Depth	Septic Suitability	Potential Runoff Class	Kw Erodibility Factor	NonIrrigated Capability Class (Irrigated)	Farmland Soils Designation	Structures Permitted	Road Suitable (Hazard of Erosion)	Open Space Trails
WobB			Not Limited	Not Rated	.15	4s		Not Limited	Moderate (Slight)	Very Limited (too sandy)
WobC			Not Limited	Not Rated	.15	4s		Not Limited	Moderate (Slight)	Very Limited (too sandy)

Source: United States Department of Agriculture, Natural Resources Conservation Services. Soil Data Mart, NJ029 Ocean County, New Jersey. Web search May 23, 2005.

Draft

Legend

Soils	HboA	SacB
AptAv	HorsC	WATER
AtsA	KemA	WobB
AtsAt	LakB	WobC
AugB	LasB	Highways
BerAr	LasC	Open Water
BerAt	MakAt	Streams
DocB	MumA	Municipal Boundary
DoeA	PHG	
DoeB	PssA	
EveB	PstAt	
EveC	PsuB	
HbmB		

Source: Soil Survey Geographic (SSURGO) Database for Ocean County, New Jersey, U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS), 2004.

Figure 4
Soil Types
Ocean Township
Ocean County, New Jersey



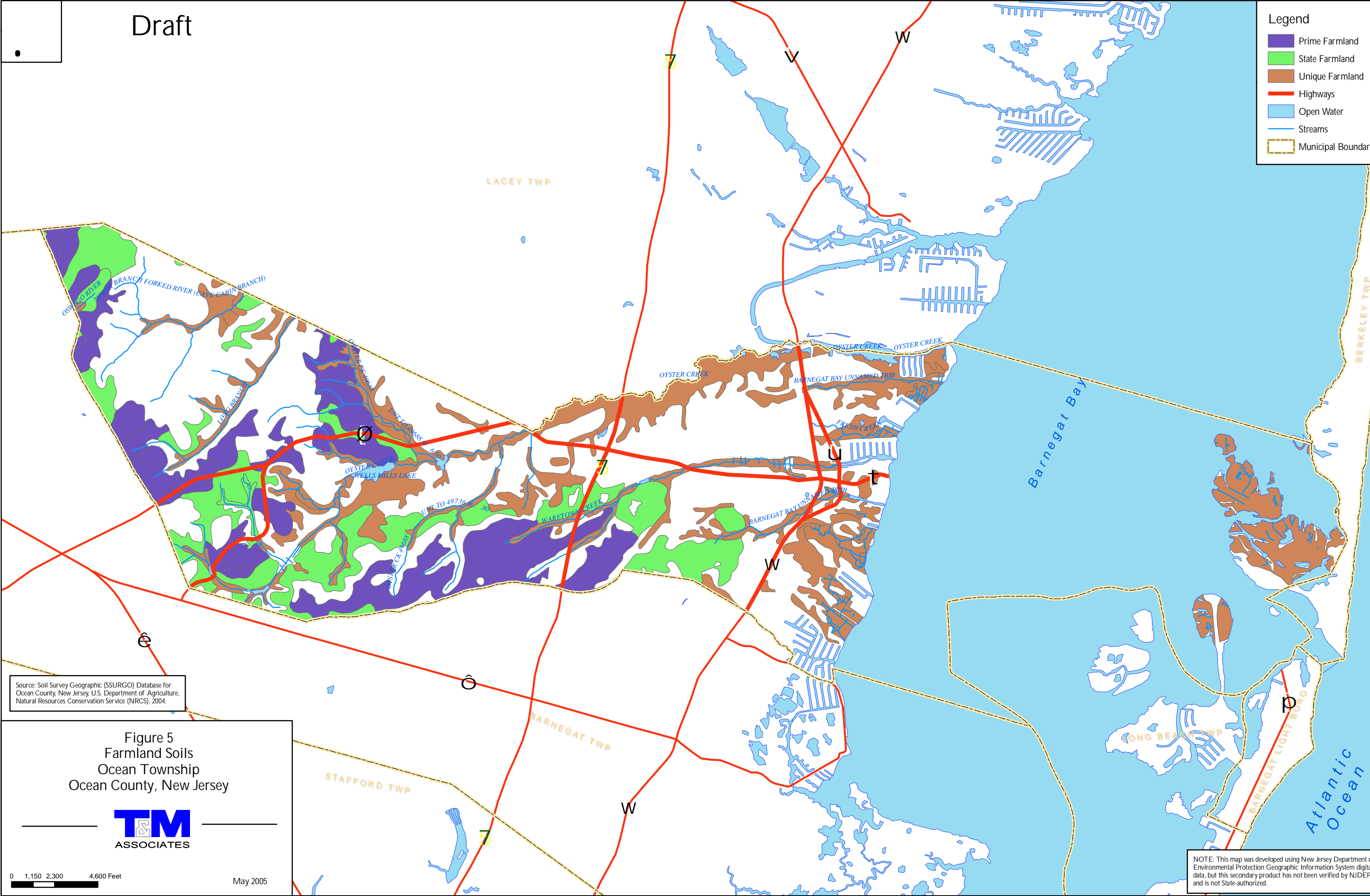
0 1,150 2,300 4,600 Feet

May 2005

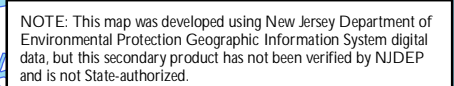
NOTE: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

Draft

- Legend
- Prime Farmland
 - State Farmland
 - Unique Farmland
 - Highways
 - Open Water
 - Streams
 - Municipal Boundary



•

 Municipal Boundary

Climate

According to the Office of the NJ State Climatologist, Ocean Township is located in the Coastal climatic zone. The Coastal Zone overall temperature is influenced by both the continent and ocean. 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.

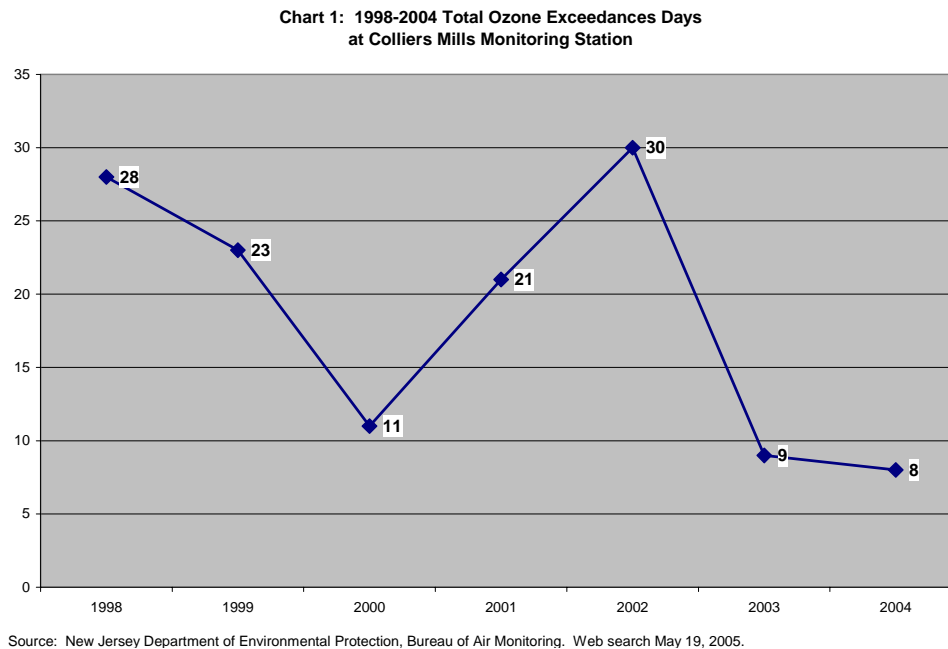
The closest monitoring station with internet available data is in Toms River about 12 miles north from Ocean. The Office of the NJ State Climatologist provides average annual temperatures and precipitation normals from 1971-2000 at this station. The annual mean temperature reported is 53.1°F; the lowest mean temperature is 31.2°F in January and the highest mean temperature is 75.0°F in July. The National Weather Service Forecast records significant events for the Atlantic City area: the highest temperature is set at 104°F on July 3, 1966 and the lowest temperature is set at -11°F on February 2, 1979.

Annual precipitation totals 48.81 inches; precipitation on average ranges from 3 inches to 5 inches per month, the wettest month is in August at 4.35 inches. The National Weather Service Forecast records average snowfall amounts for the Atlantic City area from 1979-2004. The Atlantic City area average snowfall totals about 20 inches. The highest recorded year for snowfall yielded 42.3 inches in 2002-2003 and no snowfall in 1997-1998. This area of New Jersey has been affected severally by the El Niño effects with several dry periods recorded for the years 1991-1992 and 1997-1998.

The Office of the NJ State Climatologist also records data on average heating and cooling degree days, where the temperatures are below 65°F and above 65°F respectively. For the monitoring station, 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. These figures can be used to target conservation measures for energy consumption high usage time periods.

Air

The entire state 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 New Jersey Department of Environmental Protection maintains a continuous air monitoring network throughout the State. The local air monitoring station site is located in Colliers Mills at the Colliers Mills Wildlife Management Area in Jackson and Plumstead Townships, Ocean County and measures ozone (O₃) only.



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) addressed concerns that noise beyond a certain level generally negatively impact 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 New Jersey Department of Environmental Protection, Office of Compliance and Enforcement is authorized only to promulgate modal ordinances that can be adopted by municipalities. Ocean Township adopted the State modal ordinance in its entirety in 1997, Chapter 8.16 (Ordinance 1997-18 (part)).

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 4:

Draft Natural Resource Inventory
Township of Ocean, Ocean County

Exhibit 4: Ocean Township Adopted Noise Regulations

Property Category	Residential property or portion of multi-use property				Non-residential (commercial, industrial, public service)	
	Outdoors		Indoors		Outdoors	Indoors*
Time	7:00 – 22:00	22:00 – 7:00	7:00 – 22:00	22:00 – 7:00	24 hours	24 hours
Maximum A-weighted sound level standard (dBA)	65	50	55	40	65	55
Octave Band Center Frequency (Hz)	Octave Band Level Pressure Level (dBA)					
31.5	96	86	86	76	96	86
63	82	71	72	61	82	72
125	74	61	64	51	74	64
250	67	53	57	43	67	57
500	63	48	53	38	63	53
1,000	60	45	50	35	60	50
2,000	57	42	47	32	57	47
4,000	55	40	45	30	55	45
8,000	53	38	43	28	53	43

*In those instances when commercial facility shares common wall/ceiling/floor with another commercial facility that is producing sound.

Source: Ocean Township, Ordinances Title 8: Public Health & Safety, Table 8:16A & 8:16B

A typical major source of noise would be major roadways, such as the Parkway or Route. However, much of the population is not located near the Parkway and complaints are generally from garbage trucks and high music levels which are causing public nuisances.

HYDROLOGY

According to the United States Geological Survey, National Water-Quality Assessment (NAWQA) Program, Ocean Township is located within the Long Island-New Jersey Coastal Drainages. The Long Island-New Jersey Coastal Drainages encompasses 6,000 squared 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, their combined drainage area includes most of the Pinelands, which consists of water with pristine quality, whereas water in other parts of the New Jersey Coastal Plain have been affected by agricultural and lawn chemicals, septic-tank effluent, and synthetic organic compounds from domestic and commercial use.

On a finer scale, Ocean Township is in 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. A watershed is defined 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 to it. Estuaries are a partially enclosed body 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. Ocean Township fronts 3.62 miles of the Barnegat Bay.

Draft Natural Resource Inventory
Township of Ocean, Ocean County

On the local community scale there are 9 subwatersheds delineated by the NJDEP with a minimum basin area of 3,0000 acres in Ocean (Figure 7):

- I. Barnegat Bay Central (Route 37 Barnegat Inlet)
- II. Barnegat Bay South (Barnegat Inlet-Surf City)
- III. Factory Bridge/Newbolds Bridge/Daniels Bridge
- IV. Forked River NB (Above old RR grad)
- V. Four Mile Branch (Mill Creek)
- VI. Oswego River (Above Route 532)
- VII. Oswego River (Sim Place Reservation to Route 539)
- VIII. Oyster Creek (Above Route 532)
- IX. Oyster Creek (Below Route 532)

In April 2004, the New Jersey Pinelands Commission studied the Oyster Creek subwatersheds detailing the Pinelands management areas, drainage basins, water quality, wetlands and unique resources in *The Essential Character of the Oyster Creek Watershed*. The Pinelands Commission concluded that both subwatershed have been minimally altered and are contiguous to other Pineland Preservation and Forest areas. The report identified numerous threatened and endangered species and vegetative species contained in the subwatersheds. Most of the species identified in the Oyster Creek watershed make up the discussion of the section on *WILDLIFE AND VEGETATIVE SPECIES* discussed below. Documented threatened Herptiles, Northern Pine Snake (*Pituophis melanoleucus*), Pine Barrens Treefrog (*Hyla andersonii*); endangered vegetative Pine Barren Bellwort (*Uvularia puberula* var. *nitida*) & rare vegetative species, Barratts' Sedge (*Carex barrattii*), Pine Barren Reedgrass (*Calamovilfa brevipilis*), Slender nut-rush (*Schizaea pusilla*) are not identified by NJDEP Landscape's Project for Ocean Township. The report raises concerns of the potential water quality issues that may arise with the Southern Ocean Landfill in the Oyster Creek watershed. At the present time the water-quality parameters were below the New Jersey Surface Water Quality Standards.

Draft

Legend

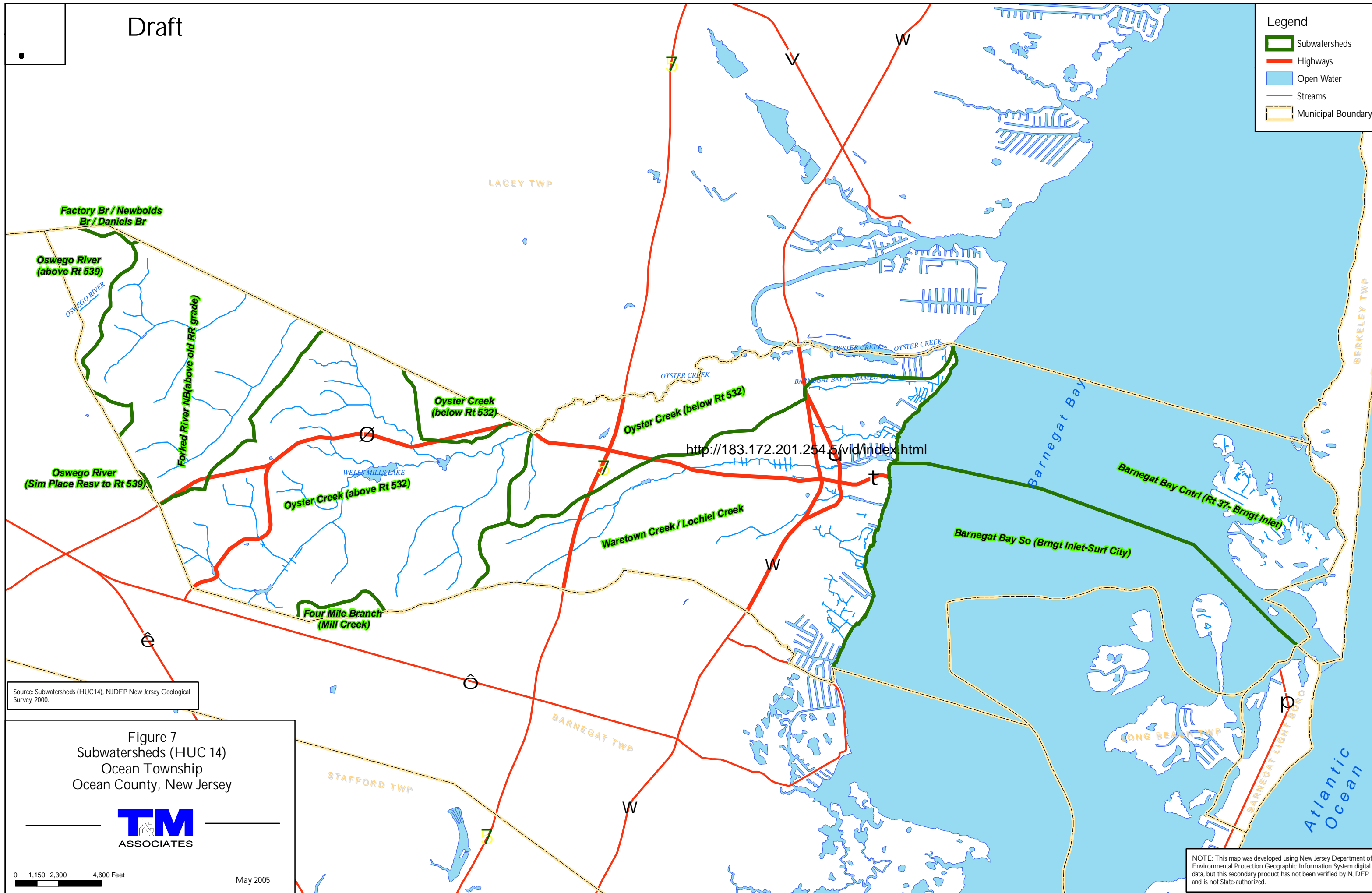
Subwatersheds

Highways

Open Water

Streams

Municipal Boundary



Source: Subwatersheds (HUC14), NJDEP New Jersey Geological Survey, 2000.

Figure 7
Subwatersheds (HUC 14)
Ocean Township
Ocean County, New Jersey



0 1,150 2,300 4,600 Feet

May 2005

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. 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).

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 are 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.

Ocean Township's aquifers are contained in the Kirkwood-Cohansey geological formation of Miocene age. Since the 1920s, the United States Geological Survey records groundwater levels in 196 wells in New Jersey. The Water Resources Data New Jersey Water Year 2004 report, lists two observations made at the Ocean Township well at intersection of the Garden State Parkway and Route 532 (Waretown-Brookville Rd). Since 1962, the Garden State Parkway well at Latitude 39°47'44" and Longitude 74°14'17" has been monitored manually and daily. The manual observation at the Garden State Parkway well is at 21 feet deep and screened at 18 to 21 feet. The land surface is 44.25 feet above NGVD (1929); the highest recording is 2.99 feet below land surface on April 3, 1984 and the lowest recording is 9.06 feet below land surface on October 8, 1985. The daily observation is taken at depth of 316 feet and screened at 306 to 316 feet. The land surface is 43.82 feet above NGVD (1929); the highest recording is 5.23 feet below land surface on April 10-11, 1973 and the lowest recording is 10.54 feet below land surface on August 20, 2002.

The Water Resources Data New Jersey also reports that in the year 2004, that 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.

Figure 8 depicts the groundwater recharge areas in Ocean Township based on a NJDEP ranking system of each county and watershed management conditions landuse 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 5:

Exhibit 5: Groundwater Recharge Areas in Ocean

Rank	Range inches/year	Acres	Percent of Ocean
A	16 to 23	7,945.70	39.21%
B	11 to 15	1,382.06	6.82%
C	8 to 10	45.36	0.22%
D	1 to 7	55.73	0.27%
E	0	551.21	2.72%
L	NA	333.03	1.64%
W	NA	9,953.30	49.11%
X	NA	0	0%
Total		20,266.39	100.00%

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 are 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.

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:

- 2 years (730 days)—This boundary is devised to account for the time travel to the outer boundary and presence of bacteria and viruses.
- 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.
- 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.

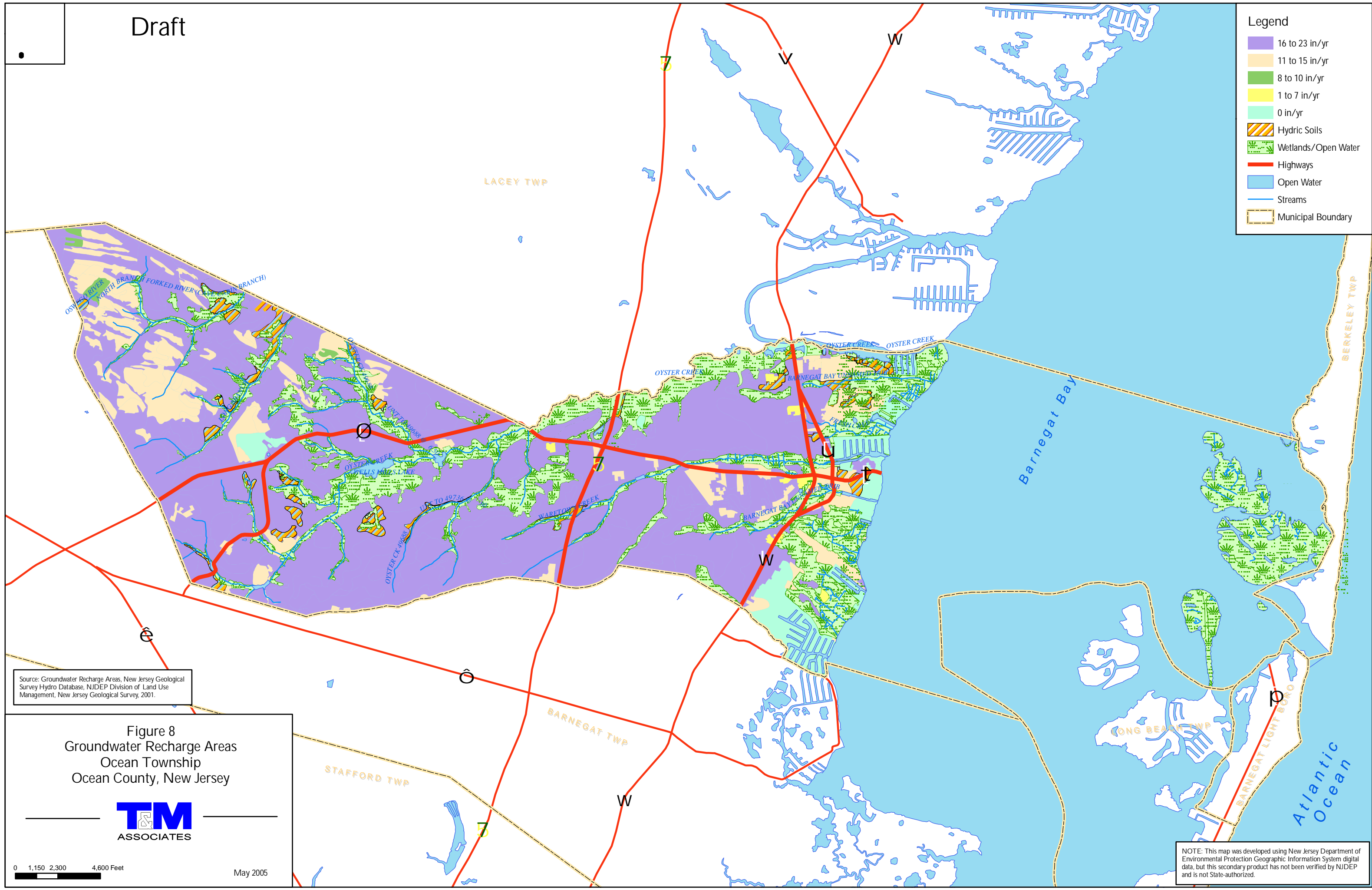
Each corresponding year delineation is comprised of pumping rates and related aquifer characteristics that determine the extent of the time of travel which are dependent on the individual aquifer bedrock geology and drainage direction.

All wellhead protection areas with a buffer of 50 feet are located in Figure 9. Figure 9 shows three wellhead protection areas in Ocean Township, one in Lacy Township, seven in Barnegat Township, two in Stafford Township and three in Barnegat Light Borough. The Ocean Township wellhead protection areas are contained in Planning Area 5, Environmentally Sensitive Areas. An element that is critical to ensuring the wellhead protection areas do not become degraded is to locate all known contaminated sites. These sites include those that are on the Superfund list, the NJDEP known contaminated list and the Industrial Site Recovery sites. Appendix B contains a detailed description of the programs and the sites that make up contaminated sites in Ocean. There are no contaminated sites in wellhead protection area plans in Ocean.

Draft

Legend

- 16 to 23 in/yr
- 11 to 15 in/yr
- 8 to 10 in/yr
- 1 to 7 in/yr
- 0 in/yr
- Hydric Soils
- Wetlands/Open Water
- Highways
- Open Water
- Streams
- Municipal Boundary



Source: Groundwater Recharge Areas, New Jersey Geological Survey Hydro Database, NJDEP Division of Land Use Management, New Jersey Geological Survey, 2001.

Figure 8
Groundwater Recharge Areas
Ocean Township
Ocean County, New Jersey



0 1,150 2,300 4,600 Feet

May 2005

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.

Draft

Legend

Public Community Water Wells

Wells outside of Ocean Township

Wellhead Protection Areas

2 Year

5 Year

12 Year

Known Contaminated Sites

Underground Storage Tanks

Currently Known Extent of Groundwater Pollution

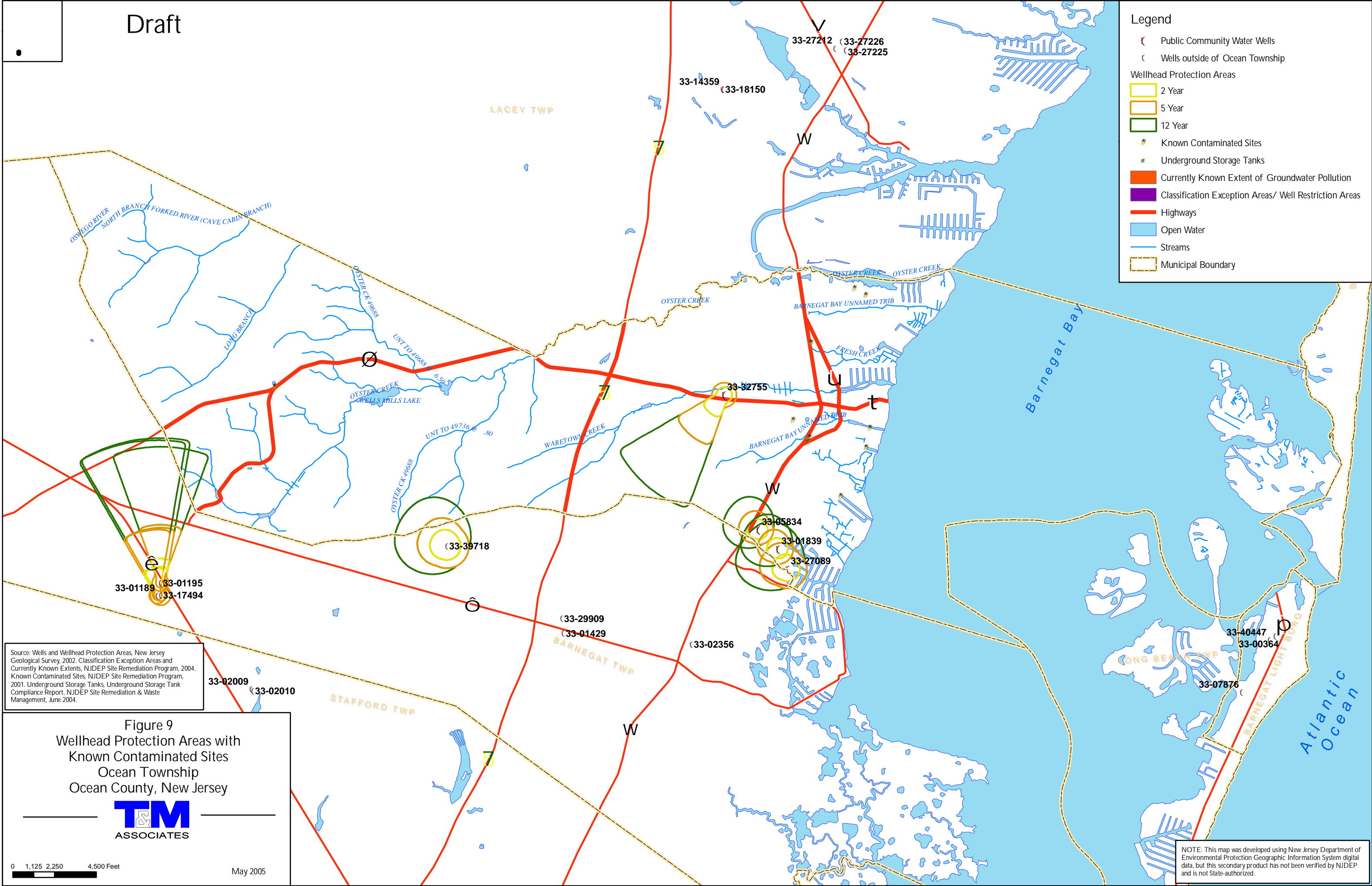
Classification Exception Areas/ Well Restriction Areas

Highways

Open Water

Streams

Municipal Boundary



Source: Wells and Wellhead Protection Areas, New Jersey Geological Survey, 2002. Classification Exception Areas and Currently Known Extents, NJDEP Site Remediation Program, 2004. Known Contaminated Sites, NJDEP Site Remediation Program, 2001. Underground Storage Tanks, Underground Storage Tank Compliance Report, NJDEP Site Remediation & Waste Management, June 2004.

Figure 9
Wellhead Protection Areas with
Known Contaminated Sites
Ocean Township
Ocean County, New Jersey



0 1,125 2,250 4,500 Feet

May 2005

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.

Surface water

Figure 10 shows the rivers and lakes, special designations and the floodplain areas contained in Ocean which all flow in the Long Island-New Jersey Coastal Drainages. Oyster Creek at the northeast side serves as a natural boundary with Lacey Township. Ocean includes Wells Mills Lake and also several tributaries: Barnegat Bay tributary, Fresh Creek, Long Branch, North Branch Forked River (Cave Cabin Branch), Oswego River and Waretown Creek.

Flood prone areas; lowland areas adjacent to a river, lake or ocean are also depicted on Figure 10. 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; information obtained through consultation with the communities; floodplain topographic surveys; and hydrologic and hydraulic analysis. Typically, only drainage areas that are greater than one square mile are studied.

Oyster Creek is contained in the 100-year floodplain and the areas of Barnegat Bay tributary & Fresh Creek adjacent to Barnegat Bay are located within the 500-year floodplain. The Sedge Islands are designated as having the properties of a velocity hazard (wave action) indicating that this is a coastal area contained in a 100-year flood plain and subject to storms or seismic sources.

Pursuant to the Surface Water Quality Standards (N. J. A. C. 7:9B), all waterways west of the Parkway are designated as Pinelands Waters (PL) in accordance with the New Jersey Planning Commission Comprehensive Management Plan; waters to the east of the Parkway⁷ are listed as FW2-NT/SE1. PL waters permit cranberry bog agricultural uses, public potable water supply and other ecological biota functions. FW2 designations are a general surface water classification applied to waterways that are not of exceptional quality, significance or resource. NT is the designation for non-trout waters. SE1 refers

Draft Natural Resource Inventory
Township of Ocean, Ocean County

to the general surface water classification applied to saline waters of estuaries and permit shellfish harvesting and other uses.

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

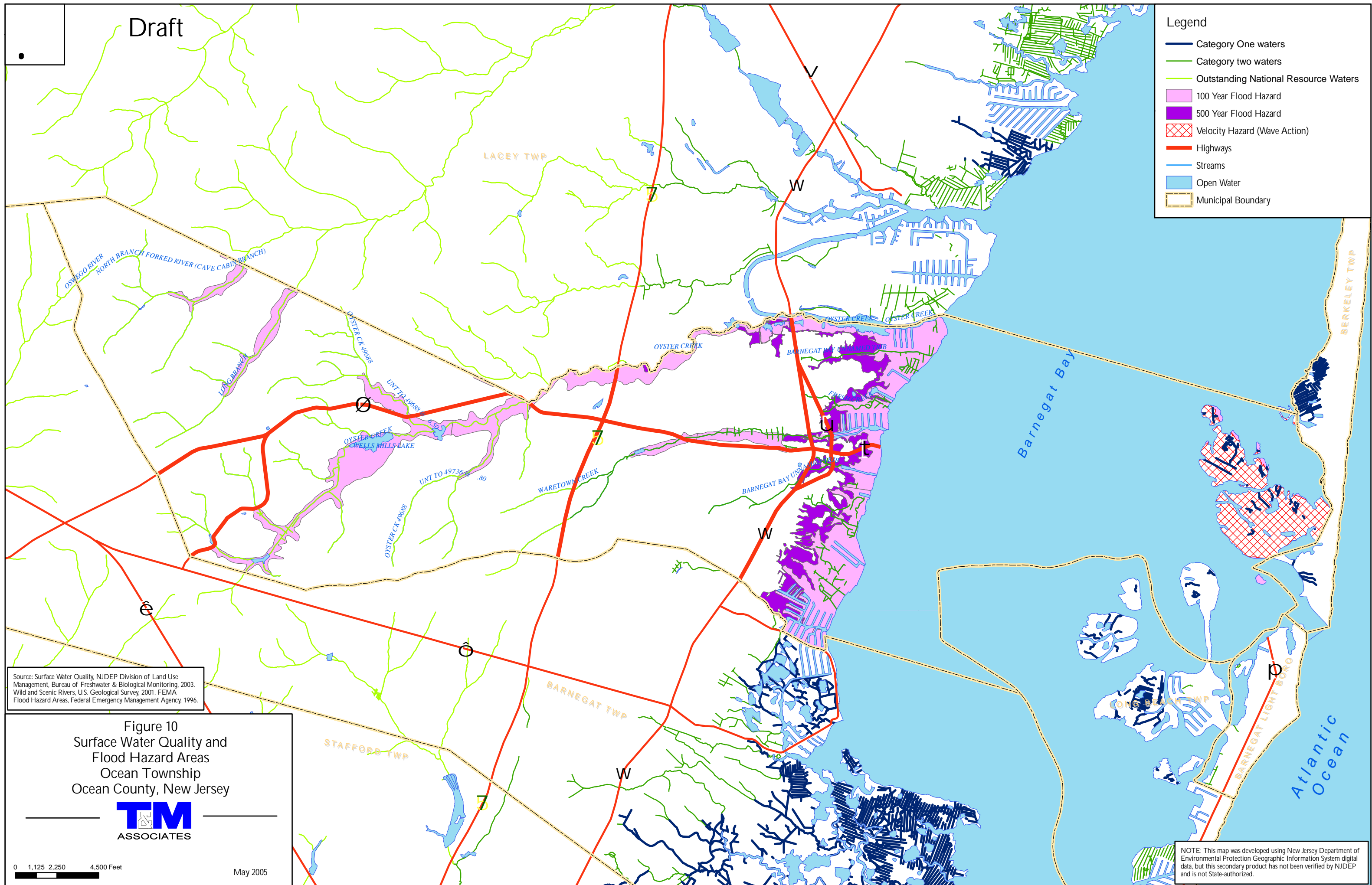
Site ID	Location	Parameters
AN0550	Long Branch at Lacey - Ocean boundary in Lacey	Benthic Macroinvertebrates
AN0552	Oyster Creek at Rt 532 in Ocean	Benthic Macroinvertebrates
1663	Oyster Creek Estuary	Total Coliform/ Fecal Coliform
R16	Waretown Creek-Tidal	Dissolved Oxygen, Total Coliform

Source: New Jersey Department of Environmental Protection, Water Monitoring and Standards. New Jersey 2004 Integrated Water Quality Monitoring and Assessment Report. Web search May 23, 2005.

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Legend

- Category One waters
- Category two waters
- Outstanding National Resource Waters
- 100 Year Flood Hazard
- 500 Year Flood Hazard
- Velocity Hazard (Wave Action)
- Highways
- Streams
- Open Water
- Municipal Boundary



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.

In Ocean, there are several hydric soils that support ecological conditions for wetlands. The United States Department of Agriculture, Natural Resources Conservation Services, Soils Data Mart listed the following soils as hydric soils and those that have hydric components:

Hydric Soil	Hydric Rating Components
Appoquinimink/Transquaking/Misphillion (AptAv)	Hammonton sandy loam (HboA)
Atsion sand (AtsA)	Lakehurst sand (LakB)
Atsion sand, tide flooded (AtsAt)	
Berryland sand, rarely flooded (BerAr)	
Berryland sand, frequently flooded (BerAt)	
Keyport sandy loam (KemA)	
Manahawkin much (MakAt)	
Mullica sandy loam (MumA)	
Psammets (PssA)	
Psammets, sulfidic substratum, frequently flooded (PstAt)	

Further on-site investigation is needed to delineate wetlands vegetation and the presence of water sufficient to support wetlands vegetation in the Ocean Township. As discussed above in *The Essential Character of the Oyster Creek Watershed* report and the approaching discussion of the protocols of the Freshwater Wetlands Protection Act (N.J.S.A. 13:9b-1 et seq.) for establishing exceptional resource value wetlands, Ocean Township has a deeper understanding of its unique natural resource values. Additional resources include the United States Department of Agriculture, Natural Resources Conservation Services, The PLANTS Database, Version 3.5 (2004).

Draft Natural Resource Inventory
Township of Ocean, Ocean County

In terms of types, there are several different categories of freshwater wetlands, no salt or vernal wetlands in Ocean Township have been recorded by NJDEP, Land Use Regulation Program. According to the United States Fish and Wildlife Services, Wetlands and Deepwater Habitats Classification National Wetlands Inventory Mapping Code there is a total of 3,320.05 acres or 16.38% of the total land area contained in freshwater wetlands in Ocean; 13.02 acres or 0.06% are not classified in Ocean. In Ocean the following are characteristics of freshwater wetlands (Figure 11):

- 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.

Atlantic White Cedar Wetland—This wetland accounts for 453.26 or 2.24% of Ocean. 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*).

Coniferous scrub/shrub wetland—This wetland encompasses 32.27 acres or 0.16% of Ocean. 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.

Coniferous wooded wetland—This wetland encompasses 359.85 acres or 1.78% of Ocean. 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.

Deciduous scrub/shrub wetland—This wetland encompasses 182.74 acres or 0.90% of Ocean. 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.

Deciduous wooded wetland—This wetland encompasses 349.10 acres or 1.72% of Ocean. 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.

Herbaceous Wetlands—This wetland encompasses 92.71 acres or 0.46% of Ocean. 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.

Mixed Forested Wetlands (Coniferous Dominated)—This wetland encompasses 390.50 acres or 1.93% of Ocean. 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% and <75%) than broad-leaved deciduous vegetative species. These areas exhibit three relative saturation scenarios either 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.

Mixed Forested Wetlands (Deciduous dominated)—This wetland encompasses 418.56 acres or 2.07% of Ocean. 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 broad-leaved deciduous (>50% and <75%) than needle-leaved evergreens vegetative species. These areas exhibit three relative saturation scenarios either 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.

Mixed Scrub/Shrub Wetlands (Coniferous Dominated)—This wetland encompasses 83.86 acres or 0.41% of Ocean. 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, needle-leaved evergreen that are young or stunted trees and broad-leaved deciduous. These areas exhibit three relative saturation scenarios either 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.

Mixed Scrub/Shrub Wetlands (Deciduous dominated)—This wetland encompasses 86.61 acres or 0.43% of Ocean. 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 either 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.

Saline Marshes—This wetland encompasses 739.17 acres or 3.65% of Ocean. Saline marshes are dominated by two grasses: Salt Marsh Cordgrass (*Spartina alterniflora*) and Salt-meadow grass (*Spartina patens*). Salt Marsh Cordgrass is a coarse, broad-leaved grass that grows 3 feet to 8 feet in height which lines the marshland closest to water and receives at least two flooding periods per day. The Salt-meadow grass is a fine-textured grass that forms into cowlicks on higher water table areas, flooded once a day and grows two feet high. Pannes, small shallow depressions occur in saline marshes which are flooded infrequently and remain dry for extended periods of time and are ideal for glassworts.

Vegetated Dune Communities—This wetland encompasses 70.37 acres or 0.35% of Ocean. The most abundant plant is Dunegrass (*Ammophila breviligulata*) with an extensive network of roots that binds to the sand and serves as a natural barrier to trap windblown sand. The most intense portion of

the dune is the ocean-facing dunes which catch wind-borne salt spray and sand movement.

- 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.

Agricultural Wetlands—These areas encompass 20.64 acres or 0.10% of Ocean. The dominant land use in these areas is crop production.

Disturbed Wetlands—These areas encompass 5.70 acres or 0.03% of Ocean. Areas described as disturbed refer to wetlands that have been cleared, filled or excavated.

Managed Wetlands—These areas encompass 17.67 acres or 0.09% of Ocean. Areas described as managed 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.

Wetland Rights-of-Way—These areas encompass 4.02 acres or 0.02% of Ocean.

Approximately 45 miles from Ocean Township is the 19.46 acre Vivian Chimento Wetland Mitigation Bank operated by Shaw Environmental Infrastructure Inc. in Little Silver Borough, Monmouth County. The bank received a total of 5.1 mitigation credits for coastal wetland enhancement activities and sold out all their credits. The service area of the bank included Watershed Management Areas 7, 9, 12, 13 & 14. For more information contact Matthew B. Noblet, Shaw Environmental & Infrastructure, Inc. at (609) 588-6491.

Draft Natural Resource Inventory
Township of Ocean, Ocean County

The United States Environmental Protection Agency—Region 2, Marine and Wetlands Protection Branch (1994) lists one priority wetland in Ocean, Barnegat Bay and its tributaries. The list recognizes those areas identified by various federal, state and private contributors to determine appropriate policy for any proposed dredged or fill material discharges into waters. The overall system includes municipalities in Burlington County (Bass River Township), in Monmouth County (Millstone Township & Howell Township) and in Ocean County (various municipalities) and the Metedeconk River watershed South to Great Bay, including the barrier islands to the east (U.S.G.S. Quadrangle(s):. Adelphia, Barnegat Light, Beach Haven, Brookville, Cassville, Farmingdale, Forked River, Keswick Grove, Lakehurst, Lakewood, Long Beach NE, New Gretna, Oswego Lake, Point Pleasant, Roosevelt, Seaside Park, Ship Bottom, Toms River, Tuckerton, West Creek, Whiting & Woodmansie). The Manahawkin Lake³ and the Manahawkin Swamp⁴ and Reedy Creek/Herring Point⁵ priority wetlands are located within the boundaries of the Barnegat Bay listing.

The Barnegat Bay resource values are as follows:

- 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).

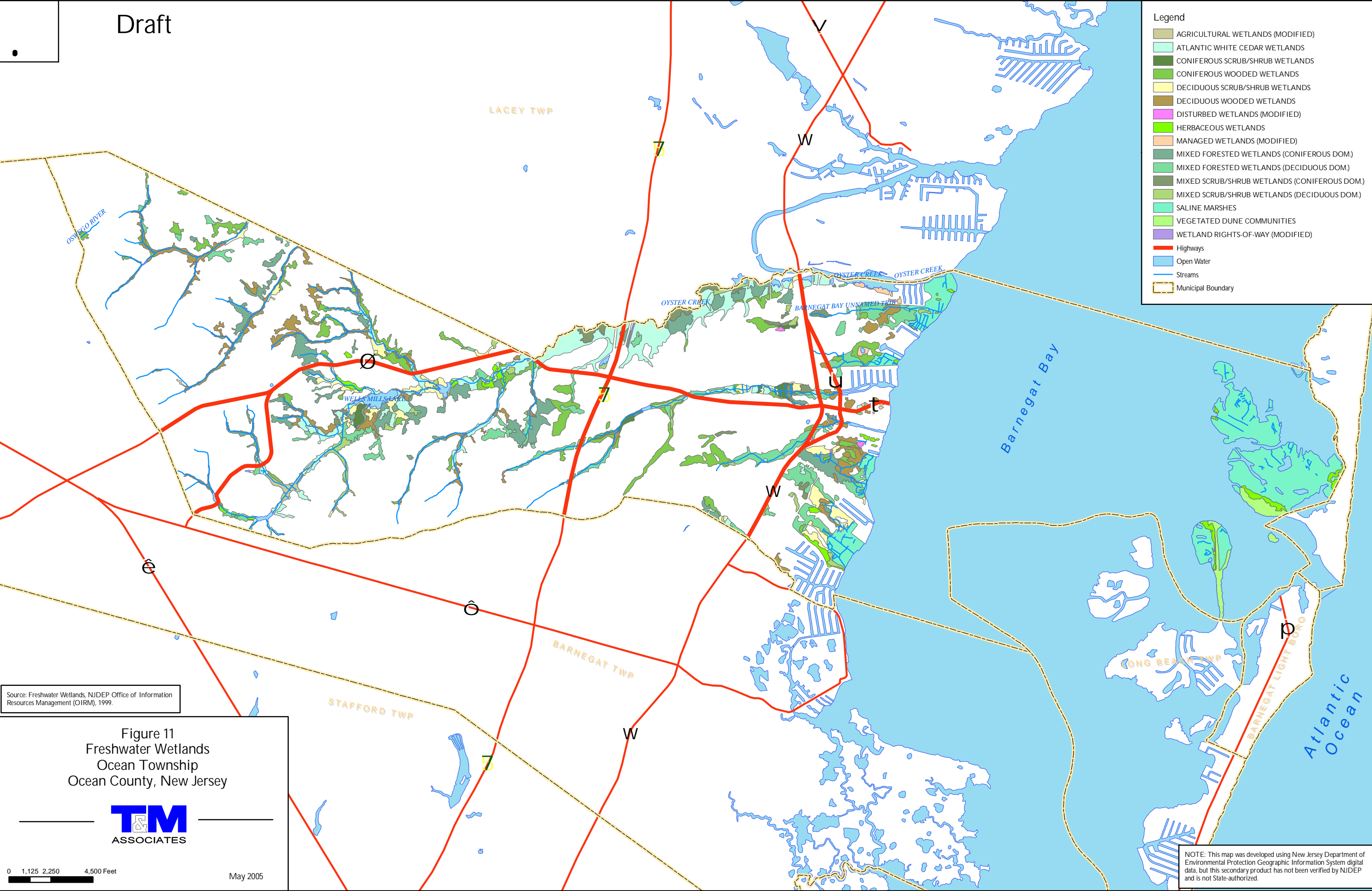
There is intense pressure for dredge and fill due to the popularity of the area. Residential and commercial development pressures are serve to this wetland area.

³Manahawkin Lake Wetlands, Stafford Twp., Ocean County (U.S.G.S. Quadrangle(s): West Creek). The resource value of this wetland area is that it supports the State endangered Pine Barrens treefrog, includes State rare flora species and contains a good population of a federally listed plant species. There are severe threats of development in this wetland, especially in upstream areas.

⁴Manahawkin Swamp, Stafford Twp., Ocean County (U.S.G.S. Quadrangle(s): Ship Bottom, West Creek). The southern portion is listed in the National Registry of Natural Landmarks. The resource value of this 300 acre swamp is the diversity of wetland habitat interspersed with upland areas; the breeding sites for resident barred owls, red shouldered hawks, hooded and prothonary warblers, and acadian flycatchers and the preserves of globally and state rare plant species. There are significant threats of development pressure along the western edge of the Manahawkin Swamp.

⁵Reedy Creek/Herring Point, Brick Township, Ocean County (U.S.G.S. Quadrangle(s): Point Pleasant). This area is approximately 1,700 acres of forested and coastal wetlands, interspersed with upland areas. The resource value provides critical habitat for numerous bird species, including the state listed great blue heron, little blue heron, osprey, cooper's hawk and barred owl. Heavy avian use during fall and summer migration periods, contains federally endangered, and state protected plant species, and provides resident and migratory habitat for between 107-120 species of birds. Threats to this resource are residential development in the forested area.

Draft



WILDLIFE AND VEGETATION

The New Jersey Department of Environmental Protection, Division of Fish and Wildlife, Endangered and Nongame Species Program—*New Jersey's Landscape Project, Version 2.0* defines the area that Ocean Township is located in as the Atlantic Coastal and Pinelands Landscapes. The Atlantic Coastal Landscape encompasses parts of Monmouth, Ocean and Atlantic counties. New Jersey's Atlantic Coast beaches and marshes are ecologically significant and commercially important. The landscape supports important portions of Atlantic Coast populations of colonial nesting birds, ospreys and peregrine falcons. The Pinelands Landscape encompasses all or parts of Atlantic, Ocean, Burlington, Camden and Gloucester counties. This area is not only an internationally recognized ecosystem its waterways support aquatic communities unique among the Mid-Atlantic states. The Pinelands contains numerous cedar swamps and wetland systems that supports reptile, amphibian and invertebrate populations, numerous insect species, as well as Neotropical bird populations.

The Landscape Project lists federal and state endangered, threatened and priority species by habitat type. Habitat type is categorized as forested wetland, forest and grassland. Forest wetlands are swamps that contain saturated soils during the growing season, and standing water during certain times of the year. The highly organic soils of swamps form a thick, black, nutrient-rich environment for the growth of water-tolerant trees such as the Atlantic white cedar (*Chamaecyparis thyoides*). Swamps are dominated by woody plants and play vital roles in flood protection and nutrient removal.

Ocean is located within the Atlantic Coastal and Pinelands Landscapes which exhibit a forest, grassland and forested wetland ecology (Figure 12). In Ocean 53.24% (10,790.69 acres) is forest cover, 11.52% (2,334.76 acres) forested wetland, 4.53% (918.24 acres) is emergent, 0.13% (26.74 acres) is grassland and 0.10% (20.10 acres) is beach. For both emergent wetlands and beach habitat, Landscapes Project reports that there are federally listed species and does not identify them by species name. Exhibit 6 lists endangered and threatened wildlife species contained in Ocean based on the species habitat preferences.

Draft Natural Resource Inventory
Township of Ocean, Ocean County

The Baltimore Oriole is a Neotropical bird that prefers Interior Forest and is vulnerable to forest fragmentation. The Blue-Winged Warbler listed as a species on the State priority list is Neotropical. The Brown Thrasher and the Grey Catbird both exhibit a short distance migratory pattern; the Grey Catbird prefers Interior Forest and is susceptible to habitat fragmentation. The Carolina Chickadee, a “resident” species, is also vulnerable to habitat fragmentation.

Exhibit 6: Atlantic Coastal and Pinelands Landscapes Endangered, Threatened and Priority Species by Habitat Type, Ocean Township

Atlantic Coastal and Pinelands	Forested Wetland	Forest	Grassland
Birds			
State Threatened			
Baltimore Oriole <i>Icterus galbula</i>		X	
Priority Species			
Blue-Winged Warbler <i>Vermivora pinus</i>	X	X	
Brown Thrasher <i>Toxostoma rufum</i>	X	X	
Carolina Chickadee <i>Parus carolinensis</i>	X	X	
Gray Catbird <i>Dumetella carolinensis</i>	X	X	
Herptiles			
Priority Species			
Carpenter Frog <i>Rana virgatipes</i>	X		
Coastal Plain Milk Snake <i>Lampropeltis triangulum triangulum</i>			X
Eastern Box Turtle <i>Terrapene carolina carolina</i>		X	X
Fowler's Toad <i>Bufo fowleri</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 May 23, 2005.

The NJDEP also documents rare vegetative species and ecological community habitat in the Natural Heritage Database administered through the Office of Natural Lands Management contained in Ocean Township (Figure 13). The database is based on the presences of a rare plant species/ecological community in a Geographic Information System grid. There are 100 grid cells totaling 358 and 372 acres in size. Recording of a

Draft Natural Resource Inventory
Township of Ocean, Ocean County

plant species is based on an occurrence in a grid cell, meaning that the whole grid will be coded as containing said species.

Exhibit 6 lists all the designations of endangered and threatened vegetative species in Ocean. 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

Exhibit 7: Ocean Township Federal, State and Rare Vegetative Species

	Global ⁶	Federal		State		Rare
		Endangered	Threatened	Endangered	Threatened	
Awne Mountain-Mint <i>Pycnanthemum setosum</i>	G3					X
Bog Asphodel <i>Narthecium ossifragum</i>	G2			X		
Carolina Fimbry <i>Fimbristylis Caroliniana</i>	G4					X
Curly Grass Fern <i>Schizaea pusilla</i>	G3					X
Knieskern's Beaked Rush <i>Rhynchospora kneiskernii</i>	G1		X	X		
New Jersey Rush <i>Juncus caesariensis Coville</i>	G2			X		
Pine Barren Boneset <i>Eupatorium resinosum</i>	G3			X		
Rose-Color Coreopsis <i>Coreopsis rosea</i>	G3					X
Slender Marsh-Pink <i>Sabatia campanulata</i>	G5					X
Swamp Pink <i>Helonias bullata</i>	G3		X	X		

Source: New Jersey Department of Environmental Protection, Office of Natural Lands Management. Natural Heritage Database. Web search May 23, 2005.

⁶**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.

Draft Natural Resource Inventory
Township of Ocean, Ocean County

exceptional resource value and provides specific habitat discussions for two vegetative species contained in Ocean: Knieskern's Beaked Rush and Swamp Pink. The identification of suitable wetland habitat includes defining the presence, absence, and distribution of each species and identifying associated vegetative species.

In New Jersey there are approximately thirty known sites of Knieskern's Beaked Rush in freshwater wetland habitats in Atlantic, Burlington, Camden, Monmouth and Ocean counties. Knieskern's Beaked Rush is a member of the sedge family (*Cyperaceae*) and is a grass-like annual or, occasionally a perennial. The obligate hydrophyte grows from 1.5-60 cm (0.6-24 in) in height, is slender with short, narrowly linear leaves and its flowers occur in numerous small clusters. Fruiting occurs from July to October, persisting into the winter months.

The Knieskern's Beaked Rush prefer early successional habitats which may be threatened by hydrological changes by both other vegetative species succession because the low productivity of preferred soils, heavy duff mat, and incidents of fire, and various human related activities (e.g. dumping, dirt biking, trampling). Natural habitats are wet bog-iron sites often adjacent to slow-moving streams and contain Pitch Pine *Pinus rigida* lowland swales and pine barrens savannahs. Man-made environments include abandoned clay pits and borrow pits which hold water in ephemeral ponds, ditches, unimproved roads, power line and railroad right-of-ways and due to the fluctuations of the environmental conditions require management to maintain these habitats.

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

Bog Asphodel	Brownish Beaked-Rush	Cranberry
<i>Narthecium americanum</i>	<i>Rhynchospora capitellata</i>	<i>Vaccinium macrocarpon</i>
Curly Grass Fern	Loosehead Beaked-Rush	Meadow Beauty
<i>Schizaea pusilla</i>	<i>Rhynchospora chalarocephala</i>	<i>Rhexia virginica</i>
New Jersey Rush	Nuttall's Lobelia	Nut Rush
<i>Juncus caesariensis</i>	<i>Lobelia nuttallii</i>	<i>Scleria reticularis</i> var. <i>pubescens</i>
Pale Beaked-Rush	Pine Barren Reedgrass	Pine Barren Smoke Grass
<i>Rhynchospora pallida</i>	<i>Calamovilfa brevipilis</i>	<i>Muhlenbergia torreyana</i>
Slender Clubmoss	Slender Nut Rush	Smoke Grass
<i>Lycopodium carolinianum</i>	<i>Scleria minor</i>	<i>Muhlenbergia uniflora</i>

Draft Natural Resource Inventory
Township of Ocean, Ocean County

Spatula Leaf Sundew
Drosera intermedia
Three-Awned Grass
Aristida longespica

St. John's Wart
Hypericum canadense
Wand-Like Three
Awned Grass *A. virgata*

Toothed Flatsedge
Cyperus dentatus
White-bracted Bonset
Eupatorium leucolepis

The most important factor affecting the occurrence of Swamp Pink is the hydrologic regime of the habitat and the dominate woodland species 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, reaches as far north as Middlesex and Monmouth counties and, historically, was in Mercer county. The Swamp Pink represents in excess of 70% 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 sensitivity, therefore NJDEP generally discourages direct discharge of stormwater into *Helonias* habitats and the United States Fish and Wildlife Services requests 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
Back Spruce *Picea mariana*

Atlantic White cedar
Chamaecyparis thyoides
Carolina Holly
Ilex ambigua
Common Elderberry
Sambucus canadensis

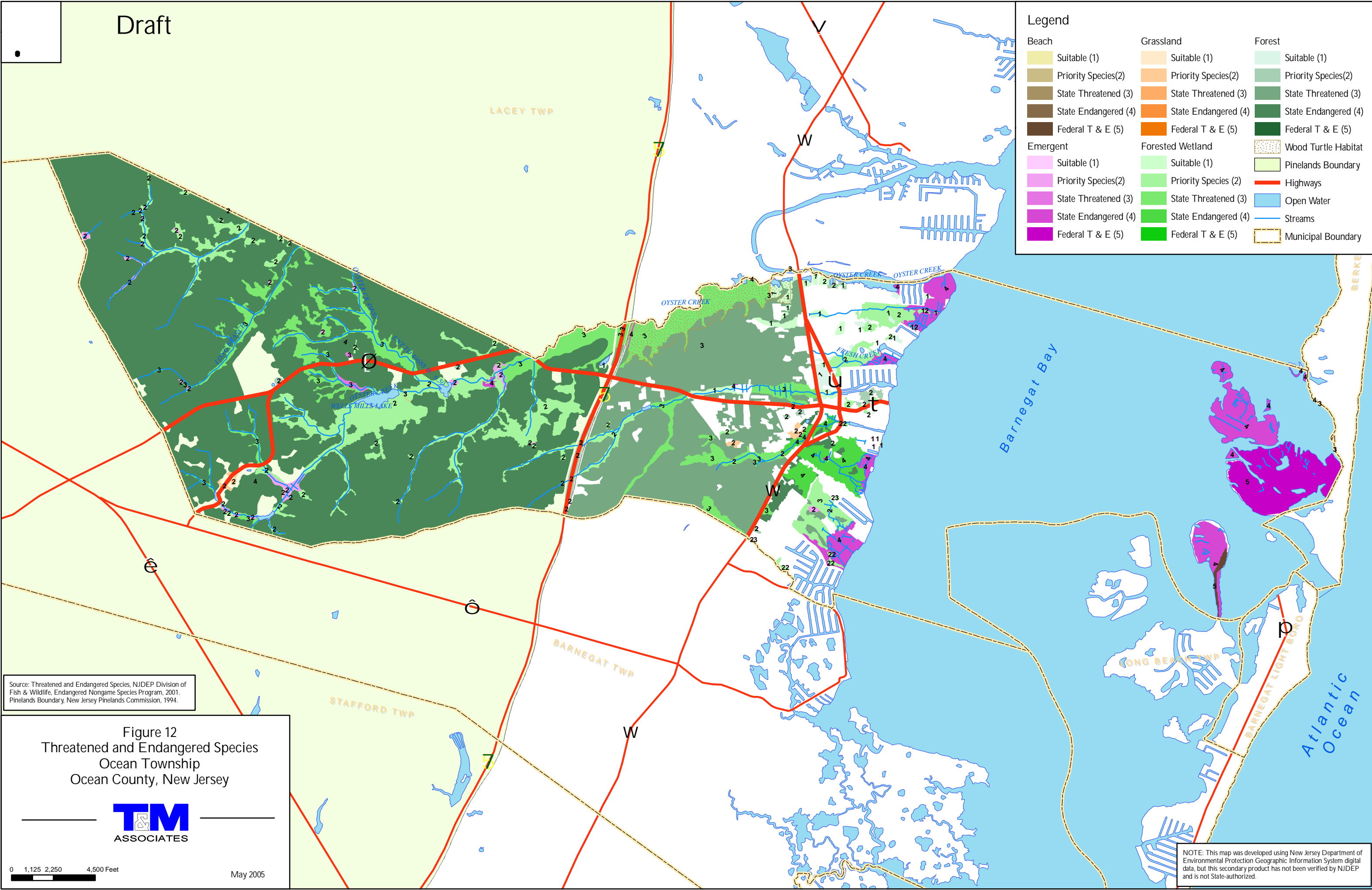
Black Gum
Nyssa sylvatica
Cinnamon Fern
Osmunda cinnamomea
Common Winterberry
Ilex verticillata

Draft Natural Resource Inventory
 Township of Ocean, Ocean County

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 Oine <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>

In Ocean there are two critical ecology communities: Coastal Dune Woodland & Dry-Oak Pine Forest. Information is provided on coastal dune woodland community ecology. Coastal dune woodlands can be described as a maritime forest dominated by Red Cedar (*Juniperus virginiana*). Trees and shrubs associated trees with this community ecology , include American Holly (*Ilex opaca*), Black Cherry (*Prunus serotina*), Sassafras (*Sasssafras albidum*), Willow Oak (*Quercus phellos*), Southern Red Oak (*Quercus falcate*), and Serviceberry (*Amelanchier Canadensis*); and shrubs include Bayberry (*Myrica pensylvanica*), Multiflora Rose (*Rosa multiflora*), blueberry, sweet pepperbush, hackberry and vines. These ecological communities can also be dominated by Pitch Pine (*Pinus rigida*) a more open woodlands with Atlantic White Cedar and scattered holly and oak trees and a shrub layer dominated by highbush blueberry and sheep laurel.

Draft



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Legend

Natural Heritage Grid

Documented Location (within 1.5 miles)

Specific Location

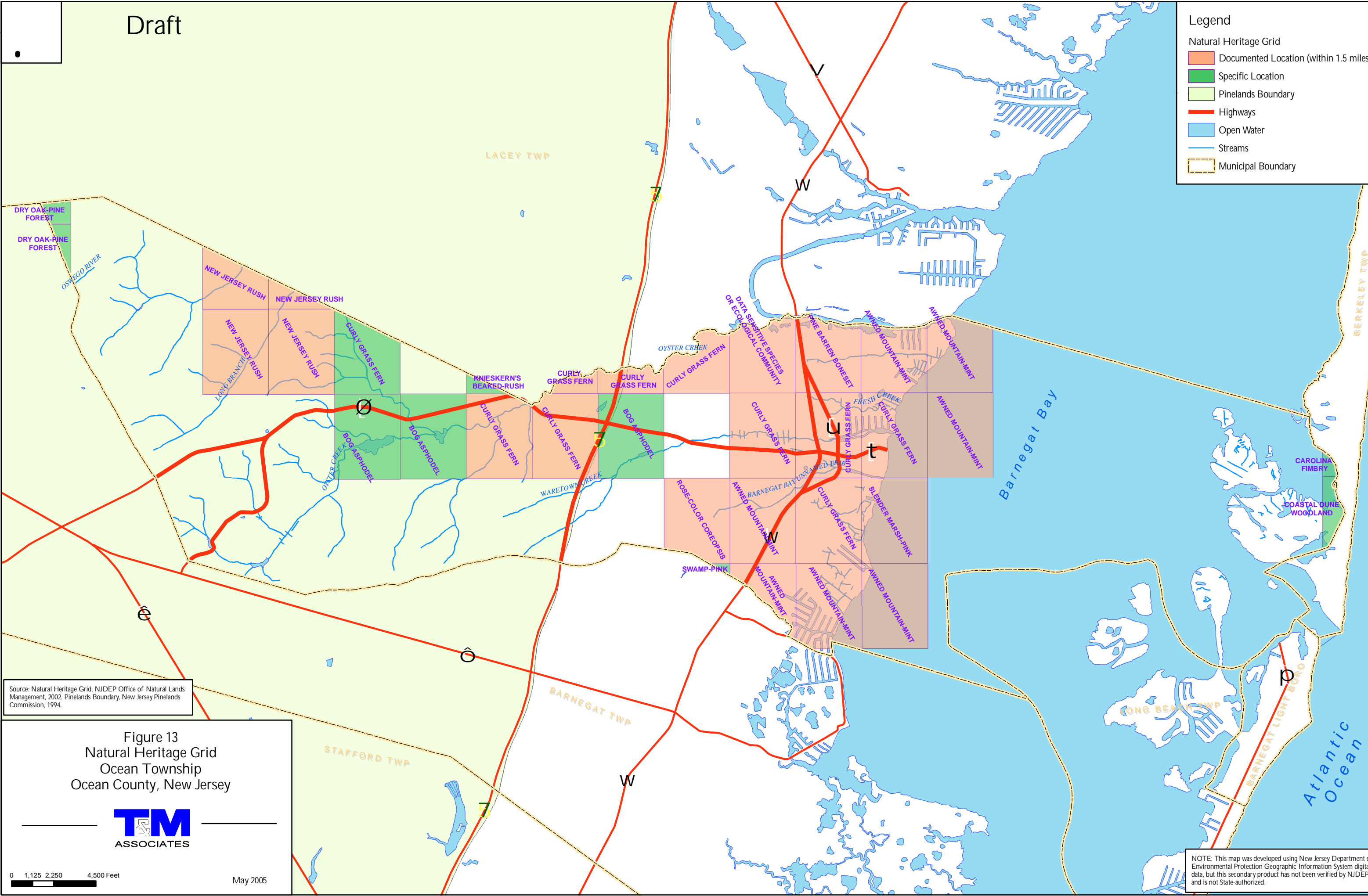
Pinelands Boundary

Highways

Open Water

Streams

Municipal Boundary



Source: Natural Heritage Grid, NJDEP Office of Natural Lands Management, 2002. Pinelands Boundary, New Jersey Pinelands Commission, 1994.

Figure 13
Natural Heritage Grid
Ocean Township
Ocean County, New Jersey



0 1,125 2,250 4,500 Feet

May 2005

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, the soils suitability for cultivated crops and woodland species.

I. Appoquinimink-Transquaking-Mispillion complex, very frequently flooded (AptAv)

AptAv slope is 0 to 1 percent. This competent is comprised of three soil series: Appoquinimink series, Transquaking series and the Mispillion series.

The Appoquinimink series consists of very deep, very poorly drained soils that formed in silty sediments overlying organic material. These soils are located on salt-water tidal marshes and estuaries of the mid-Atlantic coastal plain. Appoquinimink soils are continuously saturated and are flooded by tidal waters twice daily. Water ponds on the surface during periods of low tide. Mean annual soil temperature is 57 degrees F and mean annual precipitation is 44 inches.

The Transquaking series consists of very deep, very poorly drained soils formed in thick organic deposits overlying high N value loamy mineral sediments of the Mid-Atlantic coastal plain. This series is formed on brackish estuarine marshes along tidally influenced rivers and creeks. Typically the surface layer is very dark brown peat 9 inches thick. The subsurface layer is black mucky peat to 22 inches. The upper substratum from 22 to 65 inches is very dark gray mucky peat and muck. The lower substratum to 80 inches is very dark gray silty clay.

Horizons

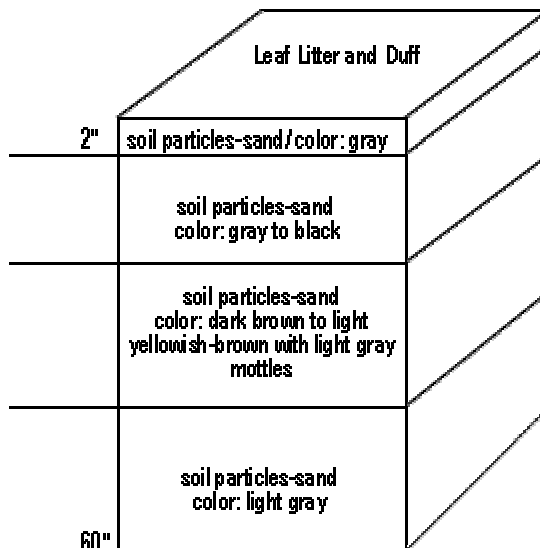
Depth

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.

Draft Natural Resource Inventory
Township of Ocean, Ocean County

The Mispillion series consists of very deep, very poorly drained soils formed in organic deposits overlying loamy mineral fluvial and marine soil materials that have low strength. They are located on salt water tidal marshes and estuaries of the Atlantic coastal plain. Typically, the surface layer is very dark brown mucky peat 10 inches thick followed by very dark grayish brown mucky peat 14 inches thick. The subsurface layer to 40 inches is black and very dark brown muck. The substratum from 40 to 80 inches is black mucky silt loam followed by dark gray silty clay loam and silt.

II. Atsion series

The Atsion series formed in the coastal plain sediments. AtsAr 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.

The series contains two components in Ocean:

Atsion sand (AtsA)

Atsion sand, tide flooded (AtsAt)

III. Aura sandy loam (AugB)

Aura sandy loam (AugB) formed in moderately fine textured coastal plain sediments. AugB consists of very deep well drained soils on uplands with a slope range from 2 to 5 percent. Typically, these soils have a dark grayish brown sandy loam surface layer 8 inches thick. The upper subsoil from 8 to 22 inches is strong brown sandy loam and gravelly sandy clay loam. The subsoil from 22 to 59 inches is massive very firm yellowish red and red gravelly sandy loam and gravelly sandy clay loam. The substratum ranges from 59 to 72 inches is very firm yellowish red gravelly loamy coarse sand. The depth to a restrictive feature is 15 to 40 inches to a fragipan. 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.

IV. 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

Draft Natural Resource Inventory
Township of Ocean, Ocean County

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 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 Ocean:

Berryland sand, rarely flooded (BerAr)

Berryland sand, frequently flooded (BerAt)

V. 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 with a slope range from 0 to 30 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.

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.

VI. 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 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.

VII. 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.

VIII. Hooksan fine sand (HorsC)

This component consists of very deep, droughty, sandy soils. They occur as nearly level areas and dunes along the coast. Typically, these soils have grayish brown sand surface layers underlain by pale yellow and light yellowish brown sand. HorsC slope range from 2 to 10 percent.

IX. 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 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.

X. Lakehurst sand (LakB)

The Lakehurst sand formed in acid sandy coastal plain sediments. LakB consists of deep, moderately well or somewhat poorly drained soils on uplands with a slope of 0 to 5 percent. 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. 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. 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.

XI. 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.

XII. 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.

XIII. 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.

XIV. 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 (PsbB)—This component is formed from inactive sanitary landfills. These areas contain smoothed or uneven accumulations and general refuse.

XV. 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.

XVI. Woodsmanie series

The Woodmansie formed in coastal plain sediment and consist of deep, well drained soils on uplands. Typically these soils in a wooded area have a dark gray sand surface layer 2 inches thick. From 2 to 8 inches is gray sand and from 8 to 17 inches is light yellowish brown sand. The subsoil between 17 to 30 inches is yellowish brown sandy loam. The substratum from 30 to 60 inches is stratified yellow sand and reddish yellow sandy loam.

Woodsmanie sand (WobB)—WobB slope ranges from 0 to 5 percent.

Woodsmanie sand (WobC)— WobC slope ranges from 5 to 10 percent.

APPENDIX B

Contaminated Sites

The United States Environmental Protection Agency (USEPA) lists properties that meet the criteria set by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 (42 USC Section 9610). CERCLA provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances by defining liability of responsible parties. The law authorized both short-term and long-term remedial responses. The National Priority list is such a response to sites that do not pose immediate threat to human health. The Act also established a trust fund, entitled Superfund, to provide for cleanup when no responsible party could be identified. The Superfund tax is levied on the chemical and petroleum industries. In New Jersey the Site Remediation Program of the Department of Environmental Protection (NJDEP) administers the Superfund program.

The National Priority List (NPL) identifies the Southern Ocean Sanitary Landfill as a State-lead remedial activity site in Ocean. On the NJDEP web site there is no reference of the remedial activities of this site in the *2000 Publicly Funded Cleanups Site Status Report*. This site is also listed on the NJDEP Known Contaminated Sites list discussed briefly below.

The Site Remediation Program also provides a listing of the Known Contaminated Sites where contamination of soil or ground water is confirmed. In Ocean there are 9 sites all with on-site source(s) of contamination.

The Site Remediation & Waste Management, Division of Remediation Support and the Division of Remediation, Management and Response administers the Industrial Site Recovery Act of 1993 (ISRA) (N.J.S.A. 13:1K and N.J.A.C. 7:26B). ISRA is directed toward the regulation of both the owner of the real property and operator of an industrial establishment and affects the sale, transfer, or closure of said operations. An “industrial establishment” refers to the North American Industry Classification System (NAICS) code listed in N.J.A.C. 7:26 B - Appendix C with specified exceptions and limitations; the start of operations on or after December 31, 1983; and business activities that involve the generation, manufacture, refining, transportation, treatment, storage, handling, or disposal of hazardous substances or hazardous wastes. ISRA also addresses adaptive reuse of brownfield sites and the funding mechanisms for remediation of sites. The goal is to ensure that these sites are not abandoned for State cleanup.

ISRA encompasses three elements: discharge response, industrial site evaluation and responsible party cleanup. The industrial site evaluation element is the most crucial for the Ocean. Part of this element includes properties that are in compliance with the Underground Storage Tank requirements. NJDEP lists one ISRA site in Ocean, Sunoco Service Station on Route 9 & Main Street. This site is contained on the Known Contaminated Site list. In addition, ISRA includes sites listed on the Brownfield Site Mart, Department of Community Affairs, New Jersey Brownfields Redevelopment Task Force. There are no properties listed for Ocean.

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