ENVIRONMENTAL RESOURCE INVENTORY

CITY OF LONG BRANCH

MONMOUTH COUNTY, NEW JERSEY

May 2011

Adopted by the City of Long Branch Planning Board on

May 17, 2011

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Environmental Resource Inventory

City of Long Branch

Monmouth County, New Jersey

May 2011

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This inventory was prepared with the assistance of a Smart Growth Planning Grant from the Association of New Jersey Environmental Commissions and in conjunction with the City of Long Branch Planning Department and Environmental Commission

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Note: Base mapping and text resources from 2009 adopted Long Branch Master Plan, prepared by CMX

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The original of this Environmental Resource Inventory was signed and sealed in accordance with N.J.S.A. 45:14A-12

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Table of Contents

Figures

Tables

Appendix A - Maps

- Map 1– Existing Land Use
- Map 2 – Non-Vehicular Mobility
- Map 3 – Wind Energy Map
- Map 4 – Subsurface Geologic Formation
- Map 5 – Topography and Steep Slopes
- Map 6 – Subwatersheds – HUC 14
- Map 7 – Soils
- Map 8 – Wetlands
- Map 9 – FEMA Flood Hazard Areas
- Map 10 – 1984 FEMA Flood Hazard Areas
- Map 11 – Threatened and Endangered Species Habitat
- Map 12 – Historic Sites and Districts
- Map 13 – Existing Parks and Open Space
- Map 14 – Photograph Location Map

Appendix B - Photographs

Appendix C – Wind Study

Appendix D – Checklist of Plants

- Takanassee Lake
- Jackson Woods

Appendix E – Wildlife/Habitat Lists from Ecological Resource Inventory for the Mid-Coast Environmental Planning Region, Monmouth County, NJ

Appendix F – City of Long Branch Christmas Bird Count

- Birds of the City of Long Branch

Appendix G – Natural Heritage Program Correspondence

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EXECUTIVE SUMMARY

In June 2010, the City of Long Branch Environmental Commission (LBEC) was awarded a Smart Growth Planning Grant from the Association of New Jersey Environmental Commissions (ANJEC) to develop its first Environmental Resource Inventory (ERI). A detailed ERI serves to inform the planning process by providing a factual basis for land use decision-making. The mapping and description of sensitive areas facilitate the proper use and protection of existing natural areas, the appropriate development of the few remaining vacant, privately-owned land parcels, and the redevelopment of developed lands. This inventory can serve in the refinement of zoning regulations and land use ordinances. The identification and understanding of natural systems and their inherent and regulatory limitations for development serve to prevent future environmental problems and associated mitigation costs. The inventory can identify possibilities for regional partnerships and planning activities that can improve environmental conditions and quality of life in the City.

Prior to the preparation of this Environmental Resource Inventory (ERI), the City of Long Branch took the following actions:

- The Planning Board adopted the 2009 updated Maser Plan on March 16, 2010. Base mapping and some data from the Master Plan is used for this ERI.
- The Open Space Element of the Master Plan recommended that the City's Environmental Commission prepare an ERI.
- The Mayor and City Council approved the proposal to move forward with the Master Plan recommendation for the ERI in the late Spring of 2010.
- The City worked with members of the Long Branch Environmental Commission (LBEC) to obtain a Smart Growth Planning Grant from the Association of New Jersey Environmental Commissions (ANJEC) to help fund the ERI. The Grant was awarded to the LBEC in June of 2010.
- The ERI is funded through the ANJEC Grant with a 50% match by the City of Long Branch and 50% match of volunteer hours by city representatives, the LBEC and its associates.

The City of Long Branch is located on the Inner Coastal Plain of New Jersey in the northeastern portion of Monmouth County. The City's land area of approximately 5.2 square miles is intensively developed for the most part. Its population of approximately 40,000 persons reflects a density of more than 7,000 persons per square mile. It is bordered to the south by Deal, to the west by the Township of Ocean and the Borough of West Long Branch, the Borough of Oceanport, to the north by the Borough of Monmouth Beach, and to the east by the Atlantic Ocean. Regional access to the City is gained by Highways 36 and 71 and via the New Jersey Transit North Jersey Coast Line (City of Long Branch Planning and Zoning Office and CMX 2009).

Geologically, the City is underlain by the unconsolidated sediments of the Manasquan, Vincentown and Hornerstown Formations. The Upper Potomac-Raritan-Magothy aquifer provides drinking water to residents of Long Branch. Most of the City drains to the Atlantic Ocean and a portion ultimately drains to Sandy Hook Bay, via the Shrewsbury and Navesink Rivers. The Atlantic Coastal Watershed in Long Branch is divided between the Branchport Creek, Parkers Creek/Oceanport Creek, Poplar Brook, Shrewsbury River and Whale Pond Brook subwatersheds. The remainder of the City is situated within the Shrewsbury River subwatershed.

Portions of the City of Long Branch are located within the 100-year floodplain of the Atlantic Ocean. Lands within the 100-year floodplain occur along Branchport Creek and Manahassett Creek and along the Shrewsbury River and their tributaries. The 100-year floodplain is also present along the dammed portions of Whale Pond Brook, which includes Takanassee Lake. Wetlands are mapped within the City Boundary. Wetland types present within the City of Long Branch include Palustrine Aquatic Bed, Palustrine Emergent Wetlands, Palustrine Scrub-shrub Wetlands and Palustrine Forested Wetlands. There are also a number of upland plant communities present. These include the Successional Old Field, Successional Shrubland, Successional Red Cedar Woodland, and Successional Southern Hardwoods, and lands characterized by Mowed Lawn and Mowed Lawn with Trees.

The City of Long Branch mainly consists of developed lands. This Environmental Resource Inventory (ERI) focuses on two relatively natural areas existing within the City: the areas surrounding Takanassee Lake and Jackson Woods. These areas were visited and detailed environmental inventories of plant and terrestrial wildlife were prepared. These areas serve as reference sites for the highest value of native floral diversity in plant communities, which is mirrored by a similar diversity in fauna, particularly for birds and butterflies. Threatened and endangered plants and animals are only associated with beaches and dunes in the City of Long Branch.

The City of Long Branch has retained a portion of its historical heritage. Properties have been identified in the City of Long Branch that are listed or eligible for listing on the National and New Jersey Registers of Historic Places. Monmouth County has prepared an inventory of historic sites. The sum of these resources and the awareness thereof helps to establish a sense of place for the City of Long Branch citizens. This inventory can provide the framework for planning the future of the City. Valuable environmental resources can be preserved and the restoration of degraded resources can be undertaken. The inventory of historic resources from the 2009 Master Plan, prepared by CMX, is included in this document.

The mapping and description of sensitive areas facilitate the proper use and protection of existing natural areas, the appropriate development of the few remaining vacant, privately-owned land parcels and the redevelopment of developed lands. This inventory can serve in the refinement of zoning regulations and land use ordinances and in targeting land appropriate for preservation. The identification and understanding of natural systems and their inherent and regulatory limitations for development serve to prevent future environmental problems and associated mitigation costs. The inventory can identify possibilities for regional partnerships and planning activities including ecological restoration efforts that can protect and also enhance environmental resources as well as the quality of life in the City of Long Branch.

INTRODUCTION

An Environmental Resource Inventory (ERI) is a compilation of all of the environmental features and characteristics in a municipality. It integrates a variety of data from multiple sources to give the most complete description of natural and cultural resources, critical areas, and other environmental features. A detailed natural resources inventory serves to inform the planning process by providing a factual basis for land use decision-making. The mapping and description of sensitive areas facilitates their proper use and protection, the appropriate development of the few remaining vacant, privately-owned land parcels and the redevelopment of developed lands. It can serve in the refinement of zoning regulations and land use ordinances. The identification and understanding of natural systems and their inherent and regulatory limitations enhances effective management. The inventory can identify possibilities for regional partnerships and planning activities that can improve environmental conditions and quality of life in the City of Long Branch.

In June 2010, the City of Long Branch Environmental Commission (LBEC) was awarded a Smart Growth Planning Grant from the Association of New Jersey Environmental Commissions (ANJEC) to develop its first ERI. The City of Long Branch (City) partnered with ANJEC to fund the ERI.

The benefits of preparing an ERI are many. These include:

- The ANJEC grant requires that the City adopt the ERI as part of their Master Plan. Once the Planning Board adopts the ERI as part of the Master Plan, the justification and foundation is in place for the implementation of ordinances for resource protection, conservation and preservation.
- Another added benefit of the development of the ERI, particular to the City, has to do with Plan Endorsement. The City has been engaged in Plan Endorsement since June 2007 to retain its Regional Center and to pursue Urban Center Designation. An ERI is required as part of the Plan Endorsement process and upon completion the ERI will be submitted to the State as part of the City's Petition.
- Submission to Sustainable Jersey for certification points.
- Ongoing studies can be identified and performed by the Environmental Commission. Some could include:
    - Takanassee Lake Water Quality.
    - Jackson Woods Invasive Species Control.
    - Manahassett Creek and Troutman's Creek Shoreline Stabilization.
    - Urban Forest Plan.
- The Resources identified will help identify and enhance the "green ordinance" process already underway in the City.

The primary source of information for the ERI is the City's current 2009 Master Plan. The scope of the ERI includes:

- A description of the Physical Resources and Conditions in Section 2.0;
- Water Resources and Conditions in Section 3.0;
- Biological Resources in Section 4.0;
- Cultural Resource Inventory in Section 5.0;
- Focused Study Site in Section 6.0; and
- Section 7.0 provides Recommendations for a path forward.

The ERI mapping is contained in Appendix A. Photographs are in Appendix B.

1.0 LOCATION

1.1 Regional Setting

The regional setting of a city is important because it establishes context. It is important to understand the regional physiography, geography, climate and geography, which are driving forces behind the localized formation of soils, plant and animal communities. These factors, in turn, affect the human context of land development and its regulation. In this section the location of the City, key environmental regulations governing land use and managing natural resources, land use and climate will be discussed.

1.2 City of Long Branch Location

The City of Long Branch is located in the northeastern portion of Monmouth County, on the coastal portion of the Inner Coastal Plain of New Jersey. It is bordered to the south by Deal; to the west by the Township of Ocean, the Borough of West Long Branch, and the Borough of Oceanport; to the north by the Borough of Monmouth Beach; and to the east by the Atlantic Ocean (Map 1). Regional access to the City is gained by Highways 36 and 71 and via the New Jersey Transit North Jersey Coast Line (City of Long Branch Planning and Zoning Office and CMX 2009).

1.3 Key Environmental Regulations

New Jersey's coastline is a rich and diverse fabric of natural wonders and economic engines that improve our quality of life and enrich our economy. Businesses, tourists, and residents are drawn to New Jersey's coast for its many economic and recreational opportunities. Coastal industries contribute enormously to New Jersey's economy. Coastal land provides crucial habitat for a wealth of wildlife, including migrating birds, commercially valuable fish and shellfish, and sporting and recreational species.

Yet the State's coastline is under threat from human activities. Hasty, uncoordinated development along the New Jersey shore has already had an impact on this fragile ecosystem. Regulations are necessary to prevent pollution, destruction of vital wildlife habitat, increases in rainwater runoff, and destruction of the natural beauty that attracts visitors. Regulation of coastal activities is also necessary in some cases to prevent loss of life and property from coastal storms, erosion, and flooding (NJDEP Website).

The State of New Jersey has established several areas, and designated certain natural resources, within the State for extra protection. A number of these areas and resources occur within the City of Long Branch. These are the State's Coastal Zone, coastal wetlands, freshwater wetlands and their associated upland transition areas, tidelands, and streams and their associated riparian corridors. Rules and regulations have been adopted by the State to regulate development in these areas. The entire City of Long Branch falls within the State's Coastal Zone.

The Federal Coastal Zone Management Act of 1972 gave States the authority to devise strategies and policies to manage development and use of coastal land and water areas. The Coastal Zone in New Jersey is regulated under the Coastal Permit Program Rules (N.J.A.C. 7:7) and the Coastal Zone Management Rules (N.J.A.C. 7:7E). The three major coastal statutes regulating development in the State's, and the City of Long Branch's, Coastal Zone are the Wetlands Act of 1970, the Waterfront Development Law and the Coastal Area Facility Review Act (CAFRA).

1.3.1 Coastal Area Facility Review Act (CAFRA) (N.J.S.A. 13:19)

The CAFRA area begins where the Cheesequake Creek enters Raritan Bay in Old Bridge, Middlesex County. It extends 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. The CAFRA area varies in width from a few thousand feet to 24 miles, measured straight inland from the shoreline. The entire City of Long Branch is located within the State's CAFRA Zone.

The law divides the CAFRA area into pieces or zones, and regulates different types of development in each zone. Generally, the closer you are to the water, the more likely it is that your development will be regulated. The CAFRA law regulates almost all development activities involved in residential, commercial, or industrial development, including construction, relocation, and enlargement of buildings or structures; and all related work, such as excavation, grading, shore protection structures, and site preparation (NJDEP Website).

The City of Long Branch applied for, and received, a special designation for its waterfront Redevelopment Zone from the NJDEP under the CAFRA Rules. CAFRA General Permit N.J.A.C. 7:7-7.4 (Long Branch Redevelopment Zone Permit) was established to facilitate an expedited review of any projects proposed within the City's Redevelopment Zone. Any project proposed for the Redevelopment Zone must only comply with the special conditions listed at N.J.A.C. 7:7-7.4 in order to be in compliance with the CAFRA Regulations. By demonstrating compliance with these special conditions, private development designed in accordance with the City's Redevelopment Plan Ordinance and the Design Guidelines Ordinance can be approved by the Planning Board of the City of Long Branch. Public development requiring CAFRA approval is approved by the City Council or the Redevelopment Agency of the City of Long Branch (City of Long Branch Planning and Zoning Office and CMX 2009).

All projects proposed outside of the Redevelopment Zone and which meet the CAFRA thresholds must submit an individual CAFRA permit application to the NJDEP. The City of Long Branch received "regional center" designation from the NJDEP under the CAFRA Rules which determines the allowable impervious cover and tree preservation requirements under the Coastal Zone Management Rules (N.J.A.C. 7:7E). Currently projects occurring in CAFRA regional centers are allowed 80% impervious cover and are required to preserve 10% of any portion of the site that is determined to be forested.

1.3.2 Waterfront Development Law (N.J.S.A. 12:5-3)

The Waterfront Development Law is a very old law, passed in 1914, that seeks to limit problems that new development could cause for existing navigation channels, marinas, moorings, other existing uses, and the environment. If you are proposing any development in a tidally flowed waterway anywhere in New Jersey, you need a Waterfront Development Permit. Examples of projects that need a Waterfront Development Permit include docks, piers, pilings, bulkheads, marinas, bridges, pipelines, cables, and dredging. Any projects proposed below the mean high water line within the City of Long Branch are subject to the NJDEP's Waterfront Development Rules (NJDEP Website).

1.3.3 Wetlands Act of 1970 (N.J.S.A. 13:9A)

The land immediately adjacent to a tidal water often contains coastal wetlands. These wetland areas are a vital coastal resource serving as habitat for many creatures. The wetlands also serve as buffers that protect upland areas from the flooding and damage caused by storms.

The Wetlands Act of 1970 requires the NJDEP to regulate development in coastal wetlands. Any time land is located near tidal water, there is a good possibility of coastal wetlands on the property. Some signs that may indicate the presence of wetlands are tall reeds and grasses, or ground that is often soggy. The regulated coastal wetlands are shown on maps prepared by the NJDEP. Unlike NJDEP's freshwater wetlands maps, the coastal wetlands maps are used to determine jurisdiction representing the regulatory limits of the State's authority under the Wetlands Act of 1970. These maps are available for public inspection at each county clerk's office (NJDEP Website).

You must have a Coastal Wetlands Permit to excavate, dredge, fill or place a structure on any coastal wetland shown on the maps.

1.3.4 Tidelands Act (N.J.S.A. 12:3)

In accordance with the State of New Jersey's Tidelands Act, lands that are now, or formally, flowed by the mean high water line are owned by the State of New Jersey and are referred to as tidelands. This includes lands that were previously flowed by the tide but have been filled and are no longer flowed by the tide. These lands are owned by the people of the State of New Jersey. You must first get permission from the State to use these lands, in the form of a tidelands license, lease or grant, and you must pay for this use. A Tidelands Grant conveys, through a purchase agreement, complete ownership rights to the tidelands from the State to the property owner. A Tidelands Lease or License allows a party to "rent" the use of the tidelands from the State for a fee for a designated period of time. Activities proposed below the mean high water line of any tidal water body require review and approval from the New Jersey Department of Environmental Protection ("NJDEP") Bureau of Tidelands.

1.3.5 New Jersey Freshwater Wetlands Protection Act (N.J.S.A. 13:9B)

Unmapped coastal wetlands and freshwater wetlands are regulated by the NJDEP under the Freshwater Wetlands Protection Act. The Freshwater Wetlands Protection Act regulates all activities in freshwater wetlands and their adjacent upland areas referred to as 'transition areas". Freshwater wetlands are commonly referred to as swamps, marshes, or bogs. However, many freshwater wetlands in New Jersey are forested and do not fit the classic picture of a swamp or marsh. Previously misunderstood as wastelands, wetlands are now being recognized for their vital ecological and socioeconomic contributions.

Freshwater wetlands contribute to the social, economic, and environmental health of our nation in many ways:

- Wetlands protect drinking water by filtering out chemicals, pollutants, and sediments that would otherwise clog and contaminate our waters.
- Wetlands soak up runoff from heavy rains and snow melts, providing natural flood control.
- Wetlands release stored flood waters during droughts.
- Wetlands provide critical habitats for a major portion of the State's fish and wildlife, including endangered, commercial and recreational species.
- Wetlands provide high quality open space for recreation and tourism.

Many of these values were not widely appreciated until the 1970s and 1980s. By then, more than half of the nation's wetlands were destroyed. The New Jersey freshwater wetlands program protects freshwater wetlands, and upland areas within 150 feet of wetlands (called transition areas or "buffers"), from development which will impair the wetlands' ability to provide the values listed above.

If your land contains freshwater wetlands, you are very limited in what you may do in the wetlands. The Freshwater Wetlands Protection Act requires the NJDEP to regulate virtually all activities proposed in the freshwater wetlands, including cutting of vegetation, dredging, excavation or removal of soil, drainage or disturbance of the water level, filling or discharge of any materials, driving of pilings, and placing of obstructions.

The most common type of freshwater wetlands permit is a general permit. General permits cover a limited number of very minor activities, such as:

- repair of existing structures
- short roads or driveways
- docks
- utility lines
- stream bank stabilization
- septic system repair

If your activity is not eligible for authorization under a general permit, DEP may, in very limited circumstances, issue an individual freshwater wetlands permit. Individual permits require an extensive alternatives analysis and are therefore much less common than general permits (NJDEP Website).

When the Freshwater Wetland Protection Act was adopted it was structured such that the State of New Jersey would assume jurisdiction over freshwater wetlands regulated by the Federal Government under Section 404 of the Clean Water Act. The State of New Jersey is only one of two states (the other being Michigan) which have assumed Section 404 authority from the Federal Government.

1.3.6 Flood Hazard Area Control Act (N.J.A.C. 7:13)

Unless properly controlled, development within flood hazard areas can increase the intensity and frequency of flooding by reducing flood storage, increasing stormwater runoff and obstructing the movement of floodwaters. In addition, structures that are improperly built in flood hazard areas are subject to flood damage and threaten the health, safety and welfare of those who use them. Furthermore, healthy vegetation adjacent to surface waters is essential for maintaining bank stability and water quality. The indiscriminate disturbance of such vegetation can destabilize channels, leading to increased erosion and sedimentation that exacerbates the intensity and frequency of flooding. The loss of vegetation adjacent to surface waters also reduces filtration of stormwater runoff and thus degrades the quality of these waters.

The Flood Hazard Area Control Act (FHACA) Rules regulate activities in flood hazard areas (floodways and floodplains) as well as in riparian corridors. The NJDEP has adopted these new rules in order to better protect the public from the hazards of flooding, preserve the quality of surface waters, and protect the wildlife and vegetation that exist within and depend upon such areas for sustenance and habitat. The rules incorporate stringent standards for development in flood hazard areas and adjacent to surface waters in order to mitigate the adverse impacts to flooding and the environment that can be caused by such development.

The riparian zone width depends on the environmental resources being protected, with the most protective 300-ft riparian zone applicable to waters designated as Category One and certain upstream tributaries. Certain waters supporting trout, or habitats of threatened or endangered species critically dependant on the watercourse to survive, or watercourses which flow through areas that contain acid-producing soil deposits, receive a 150-ft riparian buffer.

Within the City of Long Branch, these rules would apply to Branchport Creek, Manahassett Creek, Parkers Creek, Oceanport Creek, Poplar Brook, Shrewsbury River, and Whale Pond Brook as well as the riparian corridors adjacent to these waterways.

1.3.7 Rivers and Harbors Act of 1899 (Federal)

The Rivers and Harbors Act of 1899 is the oldest federal environmental law in the United States. It is administered by the U.S. Army Corps of Engineers (USACOE). Section 10 of this Act gives the USACOE the authority to regulate the discharge of refuse matter of any kind into the navigable waters of the United States, or their tributaries. This would include many of the coastal wetlands areas within the City of Long Branch (located below the mean high water line). Section 10 of the Rivers and Harbors Act also gives the USACOE the authority to regulate any dredging or placement of structures below the mean high water line of a navigable water of the United States. Therefore, any structures (docks, piers, buoys, mooring piles, bulkhead, etc.) proposed below the mean high water line of a navigable water of the United States requires a permit from the USACOE. Likewise, any dredging or placement of fill below the mean high water line also requires a permit from the USACOE.

1.3.8 Clean Water Act (Federal)

The Federal Clean Water Act (also known as the Federal Water Pollution Control Act of 1972) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. "Clean Water Act" became the Act's common name with amendments in 1977.

Section 404 of the Clean Water Act (CWA) gives the USACOE the authority to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. In New Jersey this included all freshwater wetlands until the State adopted its own Freshwater Wetlands Protection Act Rules. As mentioned previously, when the Freshwater Wetland Protection Act was adopted it was structured such that the State of New Jersey would assume jurisdiction over freshwater wetlands regulated by the USACOE under Section 404 of the Clean Water Act. Under the "assumption process" the USACOE relinquished regulatory authority over all freshwater wetlands within the State of New Jersey within the exception of those located with 1000 ft. of the mean high water line.

Therefore, in New Jersey and the City of Long Branch, permits for work in freshwater wetlands are required from the NJDEP for those freshwater wetlands located more than 1000 ft. from the mean high water line. Permits are required from both the USACOE and the NJDEP for work in freshwater wetlands located within 1000 ft. of the mean high water line.

Proposed activities are regulated by the USACOE through a permit review process. An *individual permit* is required for potentially significant impacts. Individual permits are reviewed by the U.S. Army Corps of Engineers, which evaluates applications under a public interest review, as well as the environmental criteria set forth in the CWA Section 404(b)(1) guideline. However, for most discharges that will have only minimal adverse effects, a *general permit* may be suitable. General permits are issued on a nationwide, regional, or State basis for particular categories of activities. The general permit process eliminates individual review and allows certain activities to proceed with little or no delay, provided that the general or specific conditions for the general permit are met. For example, minor road activities, utility line backfill, and bedding are activities that can be considered for a general permit.

1.3.9 Federal Emergency Management Agency (Federal)

The Federal Emergency Management Agency (FEMA) FEMA released a draft revised Flood Insurance Rate Map (FIRM) for the City of Long Branch in November 2008 (Map 9). The 1984 FIRM for the City of Long Branch was included with the Master Plan and was the basis for existing development; therefore, this map has also been provided (Map10). The extent of flood hazards areas within the City of Long Branch was more extensive on the 2008 mapping when compared to the 1984 mapping. Flood Hazard Areas in Long Branch are found along Branchport Creek, Manahassett Creek, Shrewsbury River, Takanassee Lake, and along the oceanfront. Applicable Flood Hazard Areas (Maps 9 and 10) are as follows:

- AE: An area inundated by 100 year flooding, for which Base Flood Elevations (BFE) have been determined.
- VE: An area inundated by 100-year flooding with velocity hazard (wave action); Base flood elevations have been determined.
- X500: An area inundated by 500-year flooding; an area inundated y 100-year flooding with average depths of less than one foot or with drainage areas less than one square mile; or an area protected by levees for 100-year flooding.

Any construction within the A and V zones must meet certain construction standards which elevate habitable areas above the base flood elevation line. The NJDEP regulates development in floodplains under the Flood Hazard Area Control Act Rules (N.J.A.C. 7:13).

1.3.10 Historic Preservation

Historic Resources must entertain regulations set forth by the State Historic Preservation Office (SHPO). See Section 5.2 for details.

1.4 Existing Land Use and Land Cover

The City's land area of approximately 5.2 square miles is intensively developed for the most part. Its population of approximately 40,000 persons reflects a density of more than 7,000 persons per square mile.

As summarized in the City's Municipal Self Assessment Report and the Community Profile of the 2009 Master Plan, adopted in 2010 and shown on the Existing Land Use Map (Map 1) shows the distribution of the use of land within the City as follows:

Table 1: Existing Land Use (CMX 2010)

Land Use Category	Parcel Acres	% of Total Acres
Residential	1,876.75	68.2
Commercial	208.01	7.6
Farmland	5.53	0.2
Industrial/Utilities	21.68	0.8
Railroad	45.39	1.6
Public School	100.72	3.7
Public Buildings/Facilities	27.40	1.0
Institutional, Church & Charitable	100.75	3.7
Parks and Public Open Space	242.54	8.8
Public Vacant Land	18.00	0.6
Private Vacant land	102.95	3.8
Total	2,749.71	100.0

These data show that 242.54 acres (8.8%) of the City's 2,749.71 acres (excluding streets and public rights of way) are currently devoted to parks and open space located primarily on the oceanfront, including the beach and promenades (25.98 acres), and Seven Presidents Park & Skate Park (66 acres). Other significant waterfront open space areas include Takanassee Lake (22.46 acres) and Manahassett Creek Park (23.85 acres). Most of these parks and public open space areas provide habitat (e.g. urban forest) and public access to the water bodies.

The table above indicates that 120.95 acres of public and private vacant land remain in the City. The Existing Land Use Map (Map 1) shows that several of the private vacant parcels have frontage, or are adjacent to, Branchport Creek, Manahassett Creek and Takanassee Lake.

1.5 Non-vehicular Mobility

Encouraging pedestrian and bicycle mobility as an alternative to the automobile is at the core of reducing Vehicle Miles Traveled (VMT) and the associated emission of greenhouse gasses that affect climate change. Air quality also improves, when fewer motorized vehicles are utilized. Choosing to walk or bike to the bus stop or train station results in fewer automobile trips and less congestion and engine emissions. Building on the Circulation Element of the Long Branch Master Plan adopted in 2010, the Non-Vehicular Mobility map of the ERI (Map 2) combines the factual information of the roadway classifications and transit availability with an emphasis on walking distance to transit. Long Branch has numerous walkable streets, a generally well developed sidewalk system, two train stations and bus stops served by two major bus lines (NJ Transit and Academy). A ferry terminal is also planned in the future.

The Non-Vehicular Mobility Map (Map 2) applies the criteria of the LEED for Neighborhood Development (LEED-ND) Rating System under the category of "Site Location and Linkage", in Prerequisite 1, Option 3 (walking distance to transit). This Prerequisite is met for neighborhoods where 50% or more of the building entrances are within a ½ mile walking distance to a train station, Bus Rapid Transit (BRT) stop or ferry terminal, or a ¼ mile walking distance to a bus stop. The Map applies ½ mile and ¼ mile circles to illustrate this relationship, although more detailed walking distance documentation would be required to demonstrate compliance in the LEED-ND certification process.

2.0 PHYSICAL RESOURCES AND CONDITIONS

In this section, a regional description of the climate and physiographic setting of the City of Long Branch is presented, along with a description of topography, soils and geology. These factors are important, because they determine and influence the type of biological resources likely to be present and they constrain human uses of the environment.

2.1 Climate

According to the Koppen climate classification, the portion of New Jersey, in which the City of Long Branch is situated, experiences a humid mesothermal climate (Strahler and Strahler 1992). The undulating flow of air masses, generally moving from west to east across the continent of North America dominates the climate of New Jersey. This pattern of air mass movement is called the westerlies. Since these streams of air vary in intensity and can be wet or dry, cold or warm, New Jersey weather is highly variable on a day to day basis. Despite its small size, differences in geology, proximity to the Atlantic Ocean and the pattern of north-south variation in the track of air masses across the State, allow five distinct climate regions to be delineated. These five regions are Northern, Central, Pine Barrens, Southwest and Coastal (ONJSC 2006a).

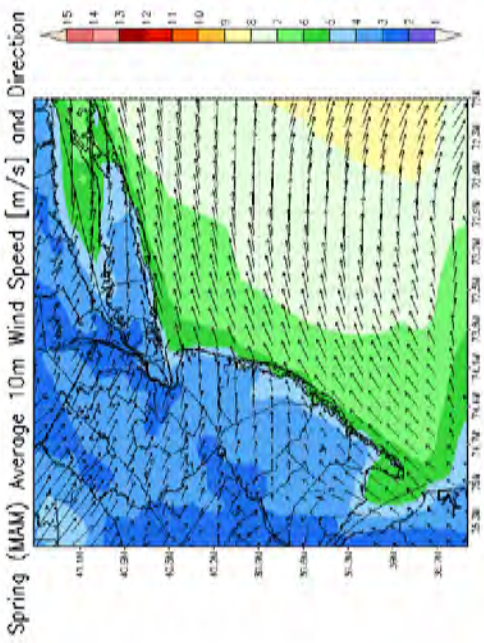
The City of Long Branch is located in the Coastal Region of the State of New Jersey in terms of climate characteristics. The adjacent Atlantic Ocean tempers and sometimes dominates the continental climate prevalent over inland areas. Because of this, seasonal temperatures are subject to less variation (ONJSC Accessed 2006a). The sea breeze causes local changes in temperature, humidity, wind speed, wind direction, cloud cover, and sometimes precipitation. Weather forecasts for near-shore locales must consider its modifying effects of sea breezes on weather conditions for the general public, as well as for boaters (Dunk 2005).

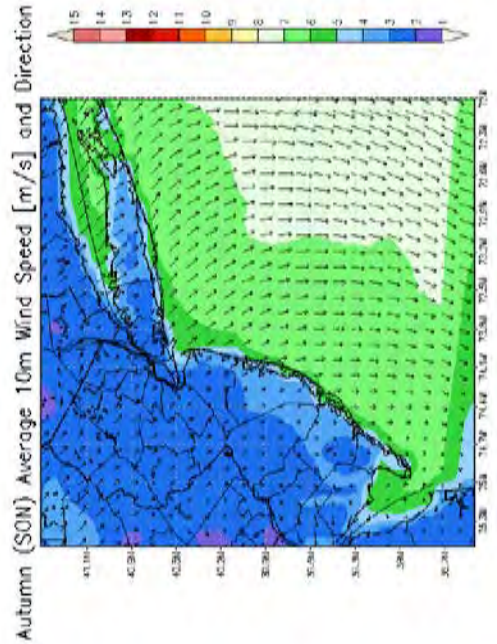
In the autumn and winter, air over the ocean is warmer than over the land and ocean breezes moderate the cold. The opposite is true in the spring and summer, when the ocean's influence is cooling. During spring and summer, land heats more quickly than the water. As the air over land rises, cooler air over the ocean moves inland (ONJSC 2006a). The patterns of prevalent seasonal wind direction are shown on Figure 1. The distribution of sea surface temperature along and near the shore both influences and is influenced by sea breezes. During prolonged periods of southwesterly wind flow resulting from pressure differences in the atmosphere, the upwelling of colder water from below the ocean surface can be induced. This upwelling can produce near-shore pockets of water that are at least 5 to 10 degrees Centigrade (C) colder than the surrounding ocean. These cold pockets of upwelling help to get sea breezes started (Dunk 2005).

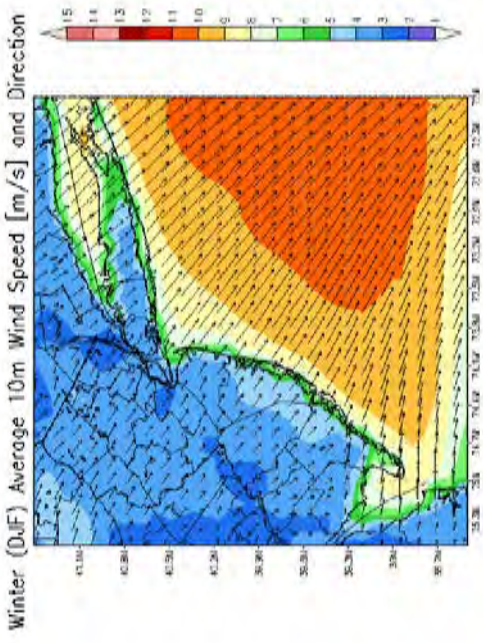
This ERI includes a Wind Energy Map (Map 3) depicting average wind speeds for the City of Long Branch. The Wind Energy Map shows the entire City of Long Branch within an area with wind speeds of 6.0 to 6.5 meters per second at 80 meters of altitude. The City of Long Branch is in the area shown with "Fair" Resource Potential with an average wind speed of 6.4 to 7.0 m/s at 50 meters of altitude (USDOE 2010). A wind study was undertaken by ARC Renewable Energy, L.L.C. between March 9, 2010 and May 4, 2010. The average wind speed, during this period was 8.52 miles per hour. These results show that the City of Long Branch is characterized by above average wind speeds and consistently high wind speeds. Even a small wind turbine could be expected to generate energy 80 percent of the time (ARC 2010). The wind study is included in Appendix C.

The National Oceanic and Atmospheric Agency (NOAA) operated a climate monitoring station in Long Branch (Station #284987) from Jan. 1, 1874 - Jan. 4, 2007 (with a 19 year hiatus) for which data is available on the web sites of the (ONJSC) and the Natural Resources Conservation Service. All stations in New Jersey have registered temperature readings of 100 degrees Fahrenheit (F) or higher and have records of 0 degrees F or below. The average monthly temperatures range from 31.7 to 74.1 degrees F at this station. The monthly average daily minimum temperatures recorded at the Oakhurst-Long Branch monitoring site were 22.8 to 65.5 degrees F in January and June, respectively. The average monthly maximums range from 40.6 degrees F to 82.6 degrees. Average monthly temperatures, average daily minimum and maximum temperatures extending to the year 2000 are depicted in Table 2. The monthly temperatures above freezing constitute a growing season that extends from approximately March 25 to November 20 in the City of Long Branch (Robichaud, Collins & Anderson 1994).

Figure 1: Seasonal Off-shore Wind Direction (Dunk 2005)







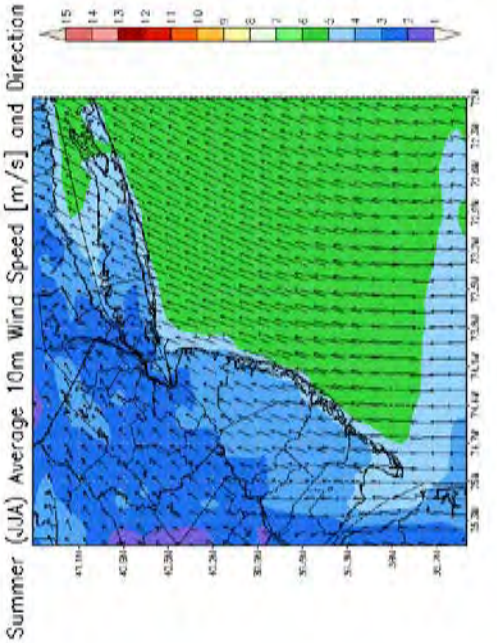


Table 2: Temperatures Measured at Long Branch-Oakhurst[1] (ONJSC) 2010)			
Month	Average Daily Minimum (Degrees Fahrenheit)	Average Daily Maximum (Degrees Fahrenheit)	Monthly Average
January	22.8	40.6	31.7
February	24.4	42.4	33.4
March	32.1	49.5	40.8
April	40.1	58.6	49.4
May	50.2	67.9	59.1
June	60.0	77.1	68.6
July	65.5	82.6	74.1
August	64.0	81.0	72.5
September	56.9	75.1	66.0
October	45.4	64.7	55.1
November	36.7	55.4	46.1
December	28.3	45.7	37.0
Annual	43.9	61.7	52.8
1. Data from 1971 to 2000			

A useful measure connecting temperature and potential energy usage are degree days. A degree day is a quantitative index demonstrated to reflect demand for energy to heat or cool houses and businesses. This index is derived from daily temperature observations at nearly 200 major weather stations in the contiguous United States. The "heating year" during which heating degree days are accumulated extends from July 1st to June 30th and the "cooling year" during which cooling degree data are accumulated extends from January 1st to December 31st. A mean daily temperature (average of the daily maximum and minimum temperatures) of 65°F is the base for both heating and cooling degree day computations. Heating degree days are summations of negative differences between the mean daily temperature and the 65°F base; cooling degree days are summations of positive differences from the same base (NOAA. NWS 2005). The heating and cooling degree days for the Long Branch-Oakhurst Station are depicted in Table 3.

Table 3: Heating and Cooling Degree Days at Long Branch-Oakhurst[1] (ONJSC 2010)		
Month	Heating Degree Days	Cooling Degree Days
January	1032	0
February	885	0
March	750	0
April	469	0
May	200	15
June	26	132
July	0	280
August	2	236
September	50	79
October	317	8
November	569	0
December	868	0
Annual	5168	750
1. Data from 1971 to 2000		

In the State of New Jersey, the average annual precipitation ranges from about 40 inches along the southeast coast to 51 inches in north-central parts of the State. Coastal storms, often called "nor'easters", frequently occur between October and April and can constitute a large proportion of the yearly precipitation amounts when they occur. These storms mainly impact coastal areas and may extend up to several hundred miles offshore, bringing strong winds and heavy rains. Typically at least one significant coastal storm occurs each winter, although as many as ten storms can be experienced in a season some years. Tropical storms and hurricanes, with their strong winds and storm surges can be extremely damaging to the natural and built environments. Table 4, below, shows the average monthly precipitation amounts recorded at the Long Branch-Oakhurst weather stations. Snowstorms in at the Long Branch-Oakhurst station produce an average of 22.3 inches of snowfall per year (ONJSC 2010a).

Table 4: Monthly Average Precipitation Measured Long Branch-Oakhurst[1] (ONJSC 2010)

Month	Monthly Average Snowfall (inches)	Monthly Average Rainfall (inches)
January	6.4	4.12
February	7.5	3.30
March	4.5	4.16
April	0.6	4.17
May	0.0	4.46
June	0.0	3.25
July	0.0	4.47
August	0.0	5.04
September	0.0	4.01
October	0.0	3.78
November	0.3	3.97
December	4.5	3.90
Annual	22.3	48.63
1. Data from 1971 to 2000		

The monthly mean temperatures in coastal New Jersey, which includes portions of Atlantic, Cape May, Monmouth, and Ocean counties within 10 miles of the coast measured from 1895-2010 has been rising. Between 1895 and 1970 the mean of monthly temperatures was 53.0 degrees F, between 1971 and 2000 the mean was 54.1 degrees F, and between 2001 and 2009 the mean of monthly temperatures was 55.5 degrees F (ONJSC Accessed 2010).

As a coastal municipality, the City of Long Branch could experience significant impacts from global warming. Storm frequency and intensity could increase. The frequency of storm-associated floods would result, with the likelihood that events such as a 100-year storm and its attendant flooding could occur at intervals much less than 100 years. Storm surges and coastal erosion can be expected to occur in conjunction with stronger and more frequent storms. Other hazards include saltwater intrusion into aquifers and surface waters, which would cause the salinization of drinking water supplies and altering freshwater aquatic and wetland ecosystems (Gournich, Couch & Hartig 2002).

2.2 Physiography

Areas that have similar rock types, geologic structures, landforms, and geologic histories are organized into regions called physiographic provinces. New Jersey has five Physiographic Provinces, which make it a complex State for its small size. From northwest to southeast across the State, the provinces are known by the descriptive terms: (1) the Valley and Ridge, (2) Highlands, (3) Piedmont, (4) Inner Coastal Plain, and (5) Outer Coastal Plain. Each name refers to the rock belt that underlies the area. The City of Long Branch is located within the Inner Coastal Plain Province.

The Coastal Plain is characterized by unconsolidated sand, gravel, silt, and clay thickening seaward from a featheredge at the Fall Line to more than 6,500 feet (ft) thick in southern Cape May County (Gill and Farlekas 1976). The Coastal Plain Physiographic Province extends along the entire Atlantic Coast from Maine to the Gulf of Mexico. Differences in the amount and type of erosion, coupled with variability in underlying rock composition, influence the nature of sediments throughout the Coastal Plain. In general, the Atlantic Coastal Plain, including Long Branch, is flat and slopes gently seaward.

The City of Long Branch is located in the coastal portion of the Inner Coastal Plain Province of New Jersey, which begins with rolling hills at the Piedmont Fall Line gradually leveling off into its boundary with the Outer Coastal Plain. The Inner Coastal Plain is underlain by unconsolidated Cretaceous and lower Tertiary deposits (Map 6). The fertile, loamy soil of the Inner Coastal Plain makes the land ideal for agriculture and is responsible for New Jersey's nickname, the "Garden State". The deposits of Greensand marl from the rich sediments contain potash, which was used since colonial days by farmers to fertilize their fields. The marl belt of New Jersey begins in the vicinity of Long Branch (New York Times 1869),

2.3 Geology

2.3.1 Subsurface Geologic Formations

The deposits underlying the City of Long Branch are tilted southeastward in a series of increasingly younger marine deposits from northwest to southeast (the Hornerstown, Vincentown, and Manasquan formations), all of which are considered lower Tertiary in age, i.e. the Paleocene and Eocene Epochs.

The Hornerstown Formation is the oldest (lower Paleocene Epoch) and underlies the northern portion of the City (Map 4). It is composed of sand and glauconite; is locally clayey; massive; and dark to dusky-green (Owens et al. 1998). The Hornerstown weathers readily to iron oxide (dusky yellow to red) because of the high iron content in the glauconite, which is relatively pure in some locations. In some portions of its occurrence, the Hornerstown overlies several older formations unconformably on an erosional surface; whereas in many areas it is contiguous with the Navesink Formation, separated by a biturbation layer. The Hornerstown Formation is 5 – 23 feet thick (Owens et al. 1998) and represents the first material deposited locally following the close of the Cretaceous Period and the Age of Dinosaurs. It crops out in the western portion of the state. There are no apparent outcrops of the Hornerstown Formation within the City.

The Vincentown Formation is upper Paleocene in age and underlies the central and largest portion of the City of Long Branch (Map 4). It is composed of medium-grained sand, is dusk yellow to pale gray and weathers orange brown to red brown; is typically very glauconitic and clayey near the base (Owens et al. 1998). It is best exposed in the Pemberton, New Egypt and Mount Holly quadrangles, the type locality being located near Vincentown in Southampton Township. A basal core sample near New Egypt was dated at 56.4 +/- 18 MYA (Owens et al. 1998). In Monmouth County, the Vincentown Formation is exposed as unweathered sand along the Manasquan River near Farmingdale. The formation averages 10 – 49 ft in thickness, but extends to 98 ft. The contact with the underlying Hornerstown is disconformable, i.e. represented by a hiatus and period of erosion, and often is characterized by fossil shell beds of two 5 ft thick in some areas (Owen's et al. 1998). Important and well-studied fossiliferous calcarenite beds up to 25 ft thick and characterized by an abundance of bryozoans occur, for example, at Vincentown and represent a reef ecosystem. There are no apparent outcrops of the Vincentown Formation within the City of Long Branch.

The Manasquan Formation is Lower Eocene in age, hence the youngest in the local sequence of sediments, and underlies the southern portion of the City of Long Branch (Map 4). It is composed of several different sediment types including a clayey, quartz-glauconite sand in the northern portion as exposed along the Manasquan River in Farmingdale. An upper fine-grained quartz sand or silt is exposed along Hog Swamp Brook west of Deal (Owens et al. 1998). In Burlington County, the lower part is 16 ft and the upper part is 26 ft thick. The Manasquan Formation lies

disconformably on the Vincentown Formation and may contain reworked material from it. Casts of marine mollusks from Manasquan time occur in some of the outcrops (Owens et al. 1998). The Manasquan Formation crops out in the City along the coastal bluff south of Pullman Avenue.

2.3.2 Surficial Geology

Because of the extensive and long-term alteration of land associated with urbanization of the region, surface material within the City of Long Branch is composed of a combination of soils derived directly from the parent material (i.e., fluvio-marine Tertiary quartz and glauconitic sands), Aeolian surface deposits of coastal sands and reworked parent material, and fill and/or disturbed original soil material. A comparison of the maps of the subsurface formations (i.e., sediments) and soils (Map 4), provide an illustration of the mapped parent material and the resulting native and altered soils of the surficial landscape.

2.4 Topography and Slopes

The topography within and adjacent to the City Limits extends from sea level, to a maximum height of approximately 60 ft MSL (Map 5). The subsurface geologic formations (Map 4), topography and slopes (Map 5), and subwatersheds (Map 6) provide insight into the relationship among the physical aspects of the landscape. For example, the Branchport Creek and Whale Pond Brook drainages trend in the NE-SW direction of the underlying sediments. The surficial geology including the soils within the City Limits (Map 4) also show affinities to the broader landscape features.

The City of Long Branch includes four subwatersheds (Map 6): Branchport Creek; Long Branch direct Atlantic drainage; Whale Pond Brook; and Poplar Brook. The northern Branchport Creek subwatershed is underlain by the older sediments of the Hornerstown and Vincentown formations and is the lowest portion of the City, with elevations generally less than 20 ft. draining to tributaries of the Shrewsbury River, but rising to 40 + ft. along the western portion of the southern watershed divide. The central Long Branch direct Atlantic drainage subwatershed is underlain by the Vincentown Formation and lies at about 20 ft. elevation, draining east to the beach and ocean, but rising to the higher divide to the north, while maintaining a lower elevation to the southern divide with Whale Pond Brook. The Whale Pond Brook subwatershed is underlain by the Vincentown Formation to the north and the Manasquan Formation to the south of Takanassee Lake, with southward and northward sloping flanks of the coastal pond ranging from 20 ft. to the north and 40 + ft. to the south, and drainage eastward to the beach and ocean. The Poplar Brook subwatershed is underlain by the Manasquan Formation, the youngest in the local sequence, and is the overall highest area, with elevations in the 20 – 60 ft. range, but sloping east to the beach and ocean.

2.5 Soils

Soil is composed of varying proportions of sand, silt and clay particles derived from underlying geologic parent material. These particles are the result of long term forces acting on mountains and rock to break down these large masses into small particles. The native soils of the City of Long Branch were formed in the sediments laid down in glacial outwash plains and marine sediments when the ocean covered this land area. Coastal Plain soils represent a “geologic-ecologic” blend. Unlike soils in the northern part of the State which can be identified with a particular location, the Coastal Plain soils are influenced by greater variability during geologic formation and subsequent modification.

The Soil Conservation Act of 1935 led to the establishment of the Soil Conservation Service and with it a focus on soil characteristics. Today we draw on a combination of factors to describe soils. The United States Department of Agriculture (USDA) has taken the lead in describing the characteristics of soils in New Jersey. Because of the complexity, soils are described as groups with similar characteristics, often based on location (NRCS 2006)

The soil types found in the City of Long Branch are depicted on Map 7 and are described below. Owing to the placement of fill, and other land alterations associated with development in the City of Long Branch, native surficial soils have been extensively altered.

Appoquinimink-Transquaking-Mispillion complex, 0 to 1 percent slopes (AptAv). The soil complex consists of mucky silt loam, silt loam, and mucky peat, and is very frequently flooded and frequently ponded. It is associated with tidal marshes. This soil is very poorly drained and annual ponding is frequent. The parent material consists of loamy stream sediments over herbaceous material. This soil type is considered hydric, and as such is an indicator of the potential presence of wetlands (See section 5.3).

Atsion sand, 0 to 2 percent slopes (AtsA). This soil consists of sand with a top layer of peat and has no flooding or ponding. It occurs on flats and is poorly drained. The parent material is sandy fluvio-marine deposits.

Evesboro sand, 5 to 10 percent slopes (EveC). This soil consists of sand to loamy sand and has no flooding or ponding. It occurs on low hills and is excessively drained. The parent material is sandy aeolian deposits and/or sandy fluvio-marine deposits.

Evesboro-Urban land complex, 0 to 5 percent slopes (EvuB). This soil complex consists of sand and loamy sand and has no flooding or ponding. It occurs on low hills and is excessively drained. The percent material is sandy aeolian deposits and/or sandy fluvio-marine deposits.

Freehold sandy loan, 2 to 5 percent slopes (FrkB). This soil consists of sandy loan to sandy clay loam and has no flooding or ponding. It occurs on low hills and knolls and is well drained. The parent material is glauconite bearing loamy Aeolian deposits and/or glauconite bearing loamy fluvio-marine deposits.

Freehold sandy loam, 2 to 10 percent slopes (FrkC). This soil consists of sandy loam and sandy clay loam and has no flooding or ponding. It occurs on hill slopes and knolls and is well drained. The parent material is glauconite bearing loamy Aeolian deposits and/or glauconite bearing loamy fluvio-marine deposits.

Freehold-Urban land complex, 0 to 10 percent slopes (FrrC). This soil complex consists of sandy loam and sandy clay loam and has no flooding or ponding. It occurs on low hills and knolls and is well drained. The parent material is glauconite bearing loamy Aeolian deposits and/or glauconite bearing loamy fluvio-marine deposits. The Urban land includes surfaces covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil.

Holmdel-Urban land complex, 0 to 5 percent slopes (HofB). This soil complex consists of sandy loam, sandy clay loam, and sand and has no flooding or ponding. It occurs on low hills and is moderately well drained. The parent material is glauconite bearing loamy marine deposits and/or fluvio-marine deposits. The Urban land includes surfaces covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil.

Hooksan sand, 0 to 5 percent slopes, rarely flooded (HorBr). This soil consists of sand, rarely floods, and has no ponding. It occurs on barrier beaches and is excessively drained. The parent material is sandy beach sand.

Humaquents, 0 to 3 percent slopes, frequently flooded (HorBr). This soil consists of loam and sand and frequently floods and ponds. It occurs on floodplains and is poorly drained. The parent material is loamy alluvium.

Klej loamy sand-Urban land complex, 0 to 5 percent slopes (KkhB). This soil complex consists of Klej loamy sand and sand and has no flooding or ponding. It occurs on dunes and is somewhat poorly drained. The parent material is unconsolidated sandy marine deposits. The Urban land includes surfaces covered by pavement, concrete, buildings, and other structures underlain by disturbed and natural soil.

Shrewsbury sandy loam, 0 to 2 percent slopes (ShrA). This soil consists of sandy loam, sandy clay loam, and loamy sand and has no flooding or ponding. It occurs on flats and is poorly drained. The parent material is fine-loamy marine deposits containing moderate amounts of glauconite.

Udorthents, 0 to 8 percent slopes (UdaB). This soil consists of loam and sandy loam and has no flooding or ponding. It occurs on low hills and is well drained. The parent material is fill and/or disturbed original soil material.

Udorthents-Urban land complex, 0 to 8 percent slopes (UdauB). This complex consists of loam and sandy loam and has no flooding or ponding. It occurs on low hills and is well drained. The parent material is fill and/or disturbed original soil material. The Urban land includes buildings, pavement, and other impervious surfaces over fill and/or disturbed original soil material.

The Soils Map (Map 7) shows the soil survey mapping units. The table below shows the limitations of the City of Long Branch soils for certain types of development.

Table 5: Development Limitations of Soils (Jablonski & Baumley 1989)

Mapping Units	Depth to Seasonal High Water Table (inches)	Septic Limitations: Absorption fields	Limitations for Building Foundations (with basements)
Appoquinimink-Transquaking-Mispillion complex, 0 to 1 percent slopes (AptAv)	0	Severe: seepage, wetness	Severe: wetness, flooding
Atsion sand, 0 to 2 percent slopes (AtsA)	>80	Severe wetness; poor filter	Severe: wetness
Evesboro sand, 5 to 10 percent slopes (EveC)	>80	Severe: poor filter	Slight
Evesboro-Urban land complex, 0 to 5 percent slopes (EvuB)	>80	Variable	Variable
Freehold sandy loan, 2 to 5 percent slopes (FrkB)	>80	Severe: poor filter	Slight
Freehold sandy loam, 2 to 10 percent slopes (FrkC).	>80	Severe: poor filter	Slight
Freehold-Urban land complex, 0 to 10 percent slopes (FrrC)	>80	Variable	Variable
Holmdel-Urban land complex, 0 to 5 percent slopes (HofB)	6 – 36	Variable	Variable, including severe: wetness
Hooksan sand, 0 to 5 percent slopes, rarely flooded (HorBr)	48 – 118	Severe: poor filter	Severe: wetness; flooding
Humaquents, 0 to 3 percent slopes, frequently flooded (HorBr).	0 – 12	Severe: seepage, wetness	Severe: flooding
Klej loamy sand-Urban land complex, 0 to 5 percent slopes (KkhB).	12 – 24	Severe: seepage, wetness	Severe: wetness
Shrewsbury sandy loam, 0 to 2 percent slopes (ShrA).	0 – 12	Severe: wetness,	Severe: wetness
Udorthents, 0 to 8 percent slopes (UdaB).	>80	Variable	Variable
Udorthents-Urban land complex, 0 to 8 percent slopes (UdauB)	>80	Variable	Variable

3.0 Water Resources and Conditions

Water is a critical resource for life. Groundwater provides wells with drinking water and contributes to the base flow of streams and water bodies. Groundwater is found below the ground surface in the spaces between soil and sediment particles in unconsolidated sediment and in the cracks and pore space within bedrock and subsurface formations. Surface water, in contrast to groundwater, is water flowing in natural channels carved into the surface of the earth. We refer to this water as streams, rivers, or creeks. Surface water has many uses, including drinking water and recreation for humans. It provides habitat for fish and other aquatic life. Historically, surface water also had an enormous role in waste disposal until surface waters became degraded and required remediation. Groundwater also has been subject to degradation by underground septic disposal, over-application of fertilizers and pesticides and leaking underground fuel and other chemical storage tanks. This experience has shown that it is technically and economically much easier to take steps to avoid contamination than it is to restore the resource to the original state. The groundwater and surface water resources of the City of Long Branch are described below.

3.1 Groundwater Resources

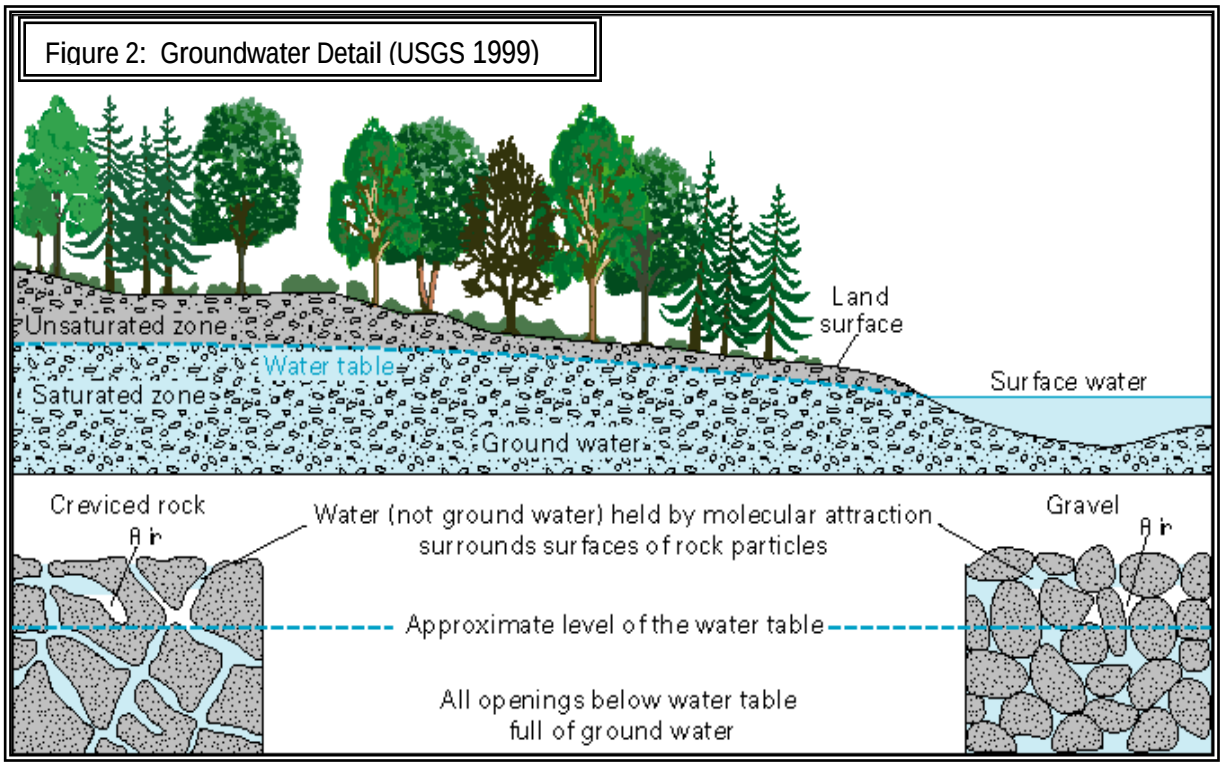
3.1.1 Aquifers

An aquifer is a water-bearing bed or stratum of permeable rock, sand or gravel through which subsurface water can move to supply springs and wells. Groundwater, contained primarily in subsurface formations, is one of our most important resources. Sources of groundwater recharge include direct precipitation and discharge from wetlands and surface water bodies; groundwater may also discharge, or replenish, wetlands and surface water bodies. Since the City of Long Branch is largely developed with impervious surface, recharge areas are limited to impermeable areas throughout the City.

Extensive groundwater withdrawal from Coastal Plain aquifers in some areas has resulted in a 'cone of depression' where saline marine waters replace underground freshwater aquifers. This saltwater intrusion has been documented throughout New Jersey and resulted in groundwater that is no longer potable without treatment.

The diagram below shows how the ground below the water table (the blue area) is saturated with water. The "unsaturated zone" above the water table (the greenish area) still contains water (plant roots live in this area), but it is not totally saturated with water.

Figure 2: Groundwater Detail (USGS 1999)



Aquifers at or near the land surface in the City of Long Branch consist of the composite confining unit (ccu/ccua). This aquifer system consists of silt and clay with confining units comprised of the following geologic formations: Shark River, Manasquan, Hornerstown, Tinton Formations and the Sandy Hook Member of the Red Bank Formations (Herman et. al., 1998).

Beneath Long Branch, groundwater is contained in the Manasquan, Hornerstown, Tinton Formations, and occurs under water table conditions. That is, the surface of groundwater is influenced by atmospheric pressure, with elevations varying with conditions at the land surface. The New Jersey American Water Company is the purveyor of potable groundwater for the City of Long Branch. Our water supply is derived from the Upper Potomac-Raritan-Magothy aquifer by a series of municipal wells.

3.2 Surface Water Resources

3.2.1 Wetlands

3.2.2 Definition and Classification

According to the U.S. Army Corps of Engineers (USACE) and U.S. Environmental Protection Agency (USEPA) regulations described in Section 404 of the Clean Water Act (33 CFR Section 328.3 and 40 CFR Section 230.3) respectively, wetlands are "...areas that are inundated or saturated with surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Identification and delineation of wetlands are based on a functional approach that is commonly called the three-parameter approach and is outlined in the Federal Manual for Identifying

and Delineating Jurisdictional Wetlands, an Interagency Cooperative Publication issued in 1989. The three parameters defining jurisdictional wetlands are hydric soils, hydrophytic vegetation, and wetland hydrology. Other types of non-jurisdictional wetlands can occur at a site based upon different definitions, such as that used for the U.S. Fish and Wildlife Service Classification of Wetlands and Deepwater Habitats of the United States (Cowardin et al. 1970), which also has broad acceptance and is used to classify wetlands in general.

Wetlands can be classified into systems, subsystems, classes, subclasses, and dominance, soil and habitat types, and other hierarchical categories. Cowardin et al. (1979) identified five systems of wetlands for the United States: Marine, Estuarine, Riverine, Lacustrine, and Palustrine. Marine wetlands occur along the intertidal shorelines of oceans, as contrasted to the Marine subtidal deepwater habitats. Estuarine Wetlands occur in the intertidal zones of estuaries, as contrasted to the Estuarine subtidal deepwater habitats. Riverine Wetlands are characterized by non-persistent plants when vegetated and occur in shallow or intermittent river and stream channels and along shores affected by the energy of flowing water, as compared to subtidal deepwater habitats in channels. Lacustrine Wetlands are characterized by non-persistent plants when vegetated and occur in the littoral zones of lakes generally greater than 20 acres and with wave-formed shorelines, as contrasted to the limnetic deepwater habitats of lakes. Palustrine Wetlands include those types not classified in the other systems and are represented, for example, by freshwater marshes, floodplain forested, vernal pools, bogs, seeps, and wetland types. There are no deepwater habitats in the Palustrine System. Wetlands in the City of Long Branch include examples classified as Marine Wetlands (e.g., intertidal beaches), Estuarine Wetlands (e.g., intertidal salt marshes and mud flats), and Palustrine Wetlands (e.g., freshwater marshes, scrub-shrub wetlands, and forested wetlands). Minor occurrences of Riverine Wetlands may also be indentified in ditches and channels (Map 7). A discussion of wetland vegetation within the City is located in Section 4.0 Biological Resources.

In New Jersey, use of freshwater wetlands is regulated by the Freshwater Wetlands Protection Act, N.J.S.A 13:9B-1 et seq. (http://www.state.nj.us/dep/landuse/13_9b.pdf) as described in Section 1.3.3 of this document. Wetlands are recognized as important features of the landscape and provide many functions that are also beneficial to people and wildlife.

3.2.3 Wetland Habitats, Functions, and Values

Wetland habitats have been defined as “part of the physical environment in which plants and animals live” (Novitzki et al. 1997). Wetlands are among the most productive habitats in the world, providing food, water, and shelter for fish, shellfish, birds, herpetofauna, and mammals. They serve as breeding grounds for numerous species and many endangered plant and animal species are dependent on wetland habitats for survival (Mitsch & Gosselink 1986; National Academy of Sciences 2001).

Wetland habitat functions and values have been considered a vital aspect of wetlands for many years. A national workshop was convened in 1983 to address the topic (Sather and Stuber 1984) and an overview of functions and values, also referenced as “functional values”, was published subsequently by the US Fish and Wildlife Service (Sather and Smith 1984). Wetland “ecosystem functions” have been defined as a process or series of processes that take place within a wetland (Novitzki et al. 1997). They also have been identified as the normal or characteristic activities that take place in wetland ecosystems. These include, for example, the storage of water, transformation of nutrients, growth of living matter, and diversity of wetland plants, which have value for the wetland itself, for the surrounding ecosystem, and for people. Wetland “values” have been defined as attributes that are worthwhile, beneficial, or desirable (Novitzki 1997). The value of a wetland lies in the benefits it provides to the environment or to people, the latter of which also have been called “socio-economic values”. Although there have been various approaches proposed to categorize functions and values, the approach to ecosystem functions designed for the U.S Army Corps of Engineers (Smith et al. 1995) is adopted herein for the purpose this ERI:

Wetland Ecosystem Functions (Smith et al. 1995)

Functions Related to Hydrologic Processes

- Short-term Storage of Surface Water
- Flood storage and conveyance
- Long-term Storage of Surface Water
- Storage of Subsurface Water
- Moderation of Groundwater Flow or Discharge
- Aquifer recharge and discharge
- Dissipation of Energy
- Erosion control
- Shoreline stabilization

Functions Related to Biogeochemical Processes

- Cycling of Nutrients
- Primary productivity of autotrophs
- Nutrient utilization
- Decomposition
- Denitrification
- Food-chain support of heterotrophs
- Export of organic carbon
- Removal of Elements or Compounds
- Toxicant removal
- Retention of Particulates
- Sediment removal

Functions Related to Habitat

- Maintenance of Plant and Animal Communities
- Plant diversity
- Submersed aquatic plants
- General habitat suitability
- Threatened and Endangered Species habitat
- Aquatic invertebrate & shellfish habitat
- Wetland associated vertebrates (herps, fish, birds, mammals)

Wetland Socio-economic Values (Sather & Smith 1884)

Consumptive Values

- Harvesting (fish, shellfish, lumber, agriculture)
- Grazing

Non-consumptive Values

- Recreation
- Cultural
- Education and Scientific
- Heritage sites (uniqueness)
- Aesthetic Values

3.2.4 City of Long Branch Wetlands

Wetlands mapped as delineated by the New Jersey Department of Environmental Protection (NJDEP) within the City of Long Branch are shown on the Wetlands Map (Map 8 and Table 6). Examples listed include representatives from three wetland systems (Marine, Estuarine, and Palustrine). The Marine types are intertidal beaches and hence lack the vegetation parameter. Excluded types from the NJDEP mapping are Aquatic Bed Wetland vegetation (Palustrine) associated with Takanassee Lake and Submerged Aquatic Vegetation (Estuarine) potentially associated with intertidal zones (and deepwater habitats) of the Shrewsbury River Estuary. Various wetlands such as Palustrine Scrub-shrub Wetlands observed at Takanassee Lake, are not mapped by NJDEP and hence are not illustrated on the Wetlands Map (Map 8). A thorough inventory, classification, and mapping of wetlands in the City of Long Branch could provide a more accurate map of the resources. Refer to the discussion of vegetated wetlands in section 4.0 Biological Resources for more details, specifically section 4.1 through 4.1.2.

Table 6. Long Branch Wetlands as Provided by NJDEP (2010)

System	Wetland Type	Number	Cover (Acres)
Palustrine	Agricultural Wetlands (Modified)	1	1.33
Palustrine	Deciduous Scrub/Shrub Wetlands	15	16.56
Palustrine	Deciduous Wooded Wetlands	14	9.13
Palustrine	Herbaceous Wetlands	4	2.85
Palustrine	Disturbed Wetlands (Modified)	2	2.12
Palustrine	Managed Wetlands	7	5.45
Palustrine	Phragmites Wetlands	3	1.87
Estuarine	Saline Marsh (High)	6	2.13
Marine	Beaches	9	10.46
	Total NJDEP Mapped Wetlands	61	51.90

3.3 Watersheds

The New Jersey Department of Environmental Protection (NJDEP) defines watershed as "the area of land that drains into a body of water such as a river, lake, stream or bay. It is separated from other systems in the area by high points such as hills or slopes. It includes not only the waterway itself but also the entire land area that drains to it" (NJDEP Division of Watershed Management 2005)

Watershed Management Areas are a designation used by NJDEP. The City of Long Branch is located within the Atlantic Coastal Drainage Basin. This basin drains lands located adjacent to the Atlantic Ocean. For NJDEP purposes, the entire municipality is located within Watershed Management Area # 12: Monmouth Watersheds: Raritan Bay and tributaries – Shrewsbury River, Navesink River and Atlantic Ocean and tributaries, including Shark River and Manasquan River. Refer to the Watershed HUC 14 Map (Map 6) to view the boundaries of the subwatersheds within the municipality.

In addition to the NJDEP Watershed Management Area designation, the USGS uses watershed units for the purpose of surface water management. The USGS designates Hydrologic Unit Codes (HUC 11 and HUC 14) for watersheds. The HUC 14 area is displayed on the Watershed Map (Map 6). At the HUC 14 level, the City of Long Branch is divided between four different subwatersheds discussed below.

3.3.1 Branchport Creek Subwatershed

The Branchport Creek Subwatershed (Map 6) is the northernmost subwatershed in the City of Long Branch and covers approximately 1406 acres of mostly urbanized land within the City Limits. Land cover types include, for example, residential, multi-family residential, commercial, schools, and parks (Map 6). It is underlain by the older glauconitic sediments of the Hornerstown and Vincentown formations and is generally the lowest portion of the City of Long Branch, with elevations frequently less than 20 ft., draining north-northwest to tidal tributaries of the

Shrewsbury River Estuary (i.e., the South Shrewsbury River, Manahassett Creek, Troutman's Creek, and Branchport Creek). Elevations rise to + 40 ft. along the western portion of the watershed and along the southern watershed divide. Characteristic soils include Freehold-Urban land complex; Holmdel-Urban land complex; Shrewsbury sandy loam; Udorthents; Udorthents-Urban land complex. This watershed includes the Jackson Woods open space with the upper drainage of Manahassett Creek, which flows into the Shrewsbury River. Adjacent portions of the subwatershed are located in West Long Branch Borough to the west, Oceanport Borough to the northwest, and Monmouth Beach Borough to the north. The headwaters of the subwatershed are located in Eatontown Borough. Formerly, the Monmouth Park Racetrack in Oceanport discharged manure-laden stormwater runoff Into Branchport Creek. In 1996, the racetrack was mandated by NJDEP to divert all stable runoff (except during a 25-year storm) into the Two Rivers Water Reclamation Authority, rather than into Branchport Creek (MCHD 2005).

3.3.2 Long Branch Direct Atlantic Drainage Subwatershed

The central Long Branch Direct Atlantic Drainage Subwatershed (Map 6) covers approximately 1098 acres of mostly urbanized land within the City Limits. Land use types (Map 1) include, for example, residential, multi-family residential, commercial, institutional, and parks. It is underlain by the glauconitic sands of the Vincentown Formation. The watershed lies at about 20 ft elevation, draining east to the beach and ocean, but rising to the higher divide with the Branchport Subwatershed to the north at approximately 40 ft, while maintaining a lower elevation to the southern divide with Whale Pond Brook Subwatershed. Adjacent portions of the subwatershed are located in West Long Branch Borough. Characteristic soils include Freehold-Urban land complex; Holmdel-Urban land complex; Klej loamy sand – Urban land complex; Hooksan sand; Udorthents-Urban land complex; and Udorthents-Urban land complex (Map 7). The headwaters of this watershed are located within West Long Branch Borough. Of interest in this watershed is the exposure of the eroding Manasquan Formation along the southerly beachfront of the City of Long Branch. This exposure appears to be the last remnant of the coastal bluffs, for which the City of Long Branch was historically famous for (Wayne Ferren, personal communication 2011) (Photo 14).

3.3.3 Whale Pond Brook Subwatershed

The Whale Pond Brook Subwatershed (Map 6) covers approximately 365 acres of mostly residential land within the City Limits. Land use types (Map 1) include, for example, residential, multi-family residential, institutional, and parkland. The subwatershed is underlain by the Vincentown Formation to the north of Takanassee Lake and the Manasquan Formation to the south of the coastal pond. It is not unusual for a water course such as Whale Pond Brook (Takanassee Lake) to follow the weakest elements of subsurface geologic formations, including the contracts between formations. Hence, the geology, hydrology, and habitats are apparently correlated in this boundary. Southward and northward sloping flanks of the coastal pond watershed range from a high of approximately 20 ft to the north and + 40 ft to the south. Drainage is eastward to the beach and ocean. The subwatershed includes Takanassee Lake Park, the downstream portion of the Whale Pond Brook drainage, which empties through a controlled gate into the Atlantic Ocean. The upstream boundary of this subwatershed surrounds the headwaters of Whale Pond Brook in Tinton Falls. Portions of Eatontown Borough, Ocean Township and West Long Branch Borough also contain the subwatershed, upgradient from the City of Long Branch. Characteristic soils include Evesboro sand; Evesboro-Urban land complex; Freehold sandy loam; and Udorthents-Urban land complex.

3.3.4 Poplar Brook Subwatershed

The Poplar Brook Subwatershed (Map 6) is the southernmost subwatershed and covers approximately 367 acres of mostly residential land. Land use types (Map 1) include, for example, residential, school, commercial, institutional, and farmland. It is underlain by the Manasquan Formation, the youngest in the local geological sequence. The subwatershed is the overall highest within the City, with elevations in the 20 – 60 ft range, sloping east to the beach and ocean. Adjacent portions of the subwatershed are located in Deal Borough to the south and Ocean Township to the west. Characteristic soils include Atsion sand; Hooksan sand; Evesboro-Urban land complex; Klej loamy sand-Urban land complex. The Poplar Brook subwatershed includes portions of Deal Borough and Ocean Township.

Poplar Brook in Deal is the last freshwater stream on the East Coast with a direct, unchanneled discharge onto an ocean beach (MCHD 2005).

3.4 Surface Water Quality

3.4.1 Surface Water Classification

The NJDEP has established use designations in its Surface Water Quality Standards (N.J.A.C. 7:9-4.1). These designations are described briefly below.

- FW – signifies fresh waters and include all nontidal and tidal waters with a salinity of less than 3.5 parts per thousand.
- FW-1 – signifies fresh waters that originate in and are wholly within federal or state parks, forests, fish and wildlife lands, and other special holdings, that are to be maintained in their natural state of quality and not subject to any man-made wastewater discharges.
- FW-2 – refers to fresh waters that are not designated FW1 or PL.
- PL – includes all waters within the boundaries of the Pinelands Area, as established in the Pinelands Protection Act.
- SE – is a general surface water classification of waters with a salinity greater than 3.5 parts per thousand.
- C1 (Category One) - waters are to be protected "…from measurable changes in water quality characteristics because of their clarity, color, scenic setting, other characteristics of aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resource(s)" (NJDEP 2011, p. 3).

Waters that are classified by the NJDEP as Category One waters receive extra protection under the State's Stormwater Management Rules (N.J.A.C.7:8) and Flood Hazard Area Control Act Rules (N.J.A.C. 7:13). Under the Stormwater management Rules, development projects that involve the disturbance of at least one acre of land or the placement of an additional one quarter acre of impervious cover on a site are subject to a 300 ft. special water resource protection areas (SWRPA) which extends inland from the top of bank of the waterway. This includes perennial or intermittent streams that drain into or upstream of the Category One waters as shown on the USGS Quadrangle Maps or in the County Soil Surveys, within the associated HUC 14 drainage area. Also, under the Flood Hazard Area Control Act Rules, a 300 ft. riparian zone is established along all Category One waters and their tributaries. This 300 ft. riparian zone also extends inland from the top of bank of the waterway. Permits must be obtained from the NJDEP for any encroachments into the 300 ft. SWRPA or 300 ft. riparian zone.

The Shrewsbury River is a classified as a Category One water from its source to the Route 36 Highway Bridge. Those portions of Manahassett Creek and Branchport Creek, which are tributaries to the Shrewsbury River, located within the city limits of the City of Long Branch are not classified as Category One waters. Although Branchport Creek is upstream of the Shrewsbury River in this location, the boundary of the HUC 14 watershed of the Shrewsbury River containing Branchport Creek (ID# 12CA03, HUC 14 Code-02030104080030) is beyond the boundaries of the Category One classification. No land areas in the City of Long Branch are impacted by the 300 foot SWRPA or riparian zones buffer associated with Category one waters.

According to the same rules, "…all those streams and segments of streams that flow directly into the Atlantic Ocean or into back bays of the Ocean which are not included elsewhere in this list, are not within the boundaries of the Pinelands Protection or Preservation Areas and are not mapped as C1 waters by the Department are classified as FW2-NT/SE" (NJDEP 2011). Tidal waterbodies, such as Manahassett Creek and Branchport Creek within the drainage area of City of Long Branch are classified as FW2-NT/SE1 waters. Whale Pond Brook, which flows into Takanassee Lake and upstream impoundments and non-tidal tributaries to Branchport Creek and Manahassett Creek also receive the FW2-NT/SE1 water quality designation.

All classifications have designated uses. For example, FW2 waters are designated for maintenance, mitigation and propagation of natural land and established biota, for primary and secondary contact recreation, for industrial and agricultural water supply, for public potable water supply after conventional filtration treatment (a series of sedimentation, resulting in substantial particulate removal but no consistent removal of chemical constituents) and disinfection and for other reasonable uses. SE1 designated uses are for shellfish harvesting in accordance with N.J.A.C. 7:12, for the maintenance, migration and propagation of the natural and established biota, for primary and secondary contact recreation and for any other reasonable uses.

3.4.2 Shellfish Harvest Areas

The NJDEP Bureau of Marine Monitoring periodically assesses water quality in the location of shellfish beds to determine the safety of ingesting shellfish growing there. The transmission of shellfish borne infectious diseases begins with the contamination of growing waters with fecal matter. Contamination can reach shellfish growing waters through stormwater runoff from urban and agricultural areas and from direct discharges such as wastewater treatment facilities and septic systems. Since shellfish filter large quantities of water through their bodies while feeding, microorganisms, heavy metals and chemicals become concentrated in their tissues, which can lead to disease or poisoning in humans ingesting contaminated shellfish (Watkins 1998).

The shellfish growing waters adjacent to the City of Long Branch include the Atlantic Ocean, the Shrewsbury River, Manahassett Creek and Branchport Creek. Branchport Creek and the waters of the Atlantic Ocean off the City of Long Branch are classified as prohibited areas for shellfish harvesting. The Shrewsbury River and Manahassett Creek are classified as special restricted areas.. The designation indicates that further processing under special permit is required for shellfish harvested in these waters (NJDEP Bureau of Marine Water Monitoring 2009).

3.5 Floodways and Floodplains

The Federal Emergency Management Agency (FEMA) FEMA released a draft revised Flood Insurance Rate Map (FIRM) for the City of Long Branch in November 2008 (Map 9). The 1984 FIRM for the City of Long Branch was included with the Master Plan and was the basis for existing development; therefore, this map has also been provided (Map10). The extent of flood hazards areas within the City of Long Branch was more extensive on the 2008 mapping when compared to the 1984 mapping. Flood Hazard Areas in Long Branch are found along Branchport Creek, Manahassett Creek, Shrewsbury River, Takanassee Lake, and along the oceanfront. Applicable Flood Hazard Areas (Maps 9 and 10) are as follows:

- AE: An area inundated by 100 year flooding, for which Base Flood Elevations (BFE) have been determined.
- VE: An area inundated by 100-year flooding with velocity hazard (wave action); Base flood elevations have been determined.
- X500: An area inundated by 500-year flooding; an area inundated y 100-year flooding with average depths of less than one foot or with drainage areas less than one square mile; or an area protected by levees for 100-year flooding.

Any construction within the A and V zones must meet certain construction standards which elevate habitable areas above the base flood elevation line. The NJDEP regulates development in floodplains under the Flood Hazard Area Control Act Rules (N.J.A.C. 7:13).

4.0 BIOLOGICAL RESOURCES

Biological resources include flora and fauna that inhabit an area. Owing to its location on the Atlantic Ocean, bisected and bordered by estuarine rivers and their tributaries, and along with its intense development pressure, the City of Long Branch continues to support a rich diversity of marine and freshwater, aquatic and terrestrial resources that are discussed in this document.

4.1 Botanical Resources (including wetlands)

Botanical resources are located in a variety of natural and man-made wetland and upland environments. Examples of these situations are described herein as they occur within or on the periphery of the City of Long Branch. Wetlands can occur in five systems within New Jersey (marine, estuarine, riverine, lacustrine, and palustrine). Within and along the shores of the City of Long Branch, plant communities occur only within the estuarine and palustrine systems.

4.1.1 Estuarine Plant Communities

Estuarine plant communities are located in estuaries, coastal embayments inundated by oceanic tides at least part of the year and with salinities from ocean-derived salts exceeding 0.5 PPT (part per thousand) during low-flow conditions. They can occur in subtidal deepwater habitats in the form of Estuarine Aquatic Bed vegetation, also known as Submerged Aquatic Vegetation (SAV), or Emergent Wetlands dominated by herbaceous species; and in intertidal wetlands in the form of SAV, Emergent Wetlands, and Scrub-shrub or Forested Wetlands dominated by woody species.

In the City of Long Branch, estuarine plant communities occur as wetlands in small patches and narrow bands along the tidal shores of the Shrewsbury River Estuary and associated tributaries, (Photos. 1 & 2) and Troutman's Creek (Photos 3 & 4 in Appendix B). Estuarine Emergent Wetlands are dominated by Salt Marsh Cordgrass (*Spartina alterniflora*) in low marsh habitats. Estuarine Scrub-shrub communities occur as patches and linear bands of vegetation in the vicinity of high tide (Photos 1 & 2), dominated by Marsh Elder (*Iva frutescens*) and Groundsel Bush (*Baccharis halimifolia*). Subtidal bottom habitats within the Shrewsbury River Estuary include mapped Estuarine Aquatic Bed or SAV communities dominated by Eelgrass (*Zostera marina*) and also including various species of macro-algae (NJDEP 1979). The original 1979 mapping of SAV resources remains as the state standard.

4.1.2 Palustrine Plant Communities

The Palustrine System of wetlands includes those wetlands not influenced by oceanic tides (marine and estuarine) unless the salinity is less than 0.5 PPT at low flow and the habitat is not a channel; those wetlands not influenced by the flow of water in river of stream channels (riverine); and those wetlands not occurring in true lakes (lacustrine), which are generally greater than 20 acres, may have deepwater limnetic zones, and exhibit wave-formed shorelines. Hence, freshwater marshes and swamps (tidal or not), floodplain forests, ponds and small lakes without wave-formed shorelines; and bogs, dune swales, seeps and springs, etc. are considered palustrine wetlands. Unlike the other four systems, there are no deepwater habitats in the Palustrine System.

Palustrine Aquatic Bed (PAB, or SAV as noted above) wetlands are located in Takanassee Lake and are dominated by one submerged aquatic plant species. Water Feather (*Myriophyllum aquaticum*), an introduced species, is abundant in several of the basins that compose the lake (Photo 5). Other species associated with Water Feather include Common Water-weed (*Elodea canadensis*), Tape Grass (*Vallisneria americana*), and Hornwort (*Ceratophyllum demersum*). Portions of the bottom of the lake are covered with a low-growing mat of Needle Spikerush (*Eleocharis acicularis*), another form of submerged vegetation. The various submerged species provide important food for waterfowl, especially dabbling ducks and swans.

Palustrine Emergent Wetlands, which are dominated by herbaceous species that are emergent from ponded or saturated lands, are located for example along the margins of Takanassee Lake and in portions of Jackson Woods (Photo 6). At the downstream and largest portion of Takanassee Lake, emergent species form a narrow band of Palustrine Emergent Wetland (PEW) characterized, for example, by Arrow-arum (*Peltandra virginica*), Broad-fruited Bur-reed (*Sparganium eurycarpum*), American Three-square Bulrush (*Schoenoplectus americanus*), Soft Rush (*Juncus effusus*), and Tussock Sedge (*Carex stricta*). Purple Loosestrife (*Lythrum salicaria*), an invasive exotic plant species, also occurs within this community along the margins of the lake. A relatively extensive example of a degraded PEW is located at Jackson Woods. This marsh habitat is dominated by an introduced form of Common Reed (*Phragmites australis*), which is an invasive exotic species (Photo 7).

Palustrine Scrub-shrub Wetlands are dominated by hydrophytic shrubs. At Takanassee Lake, the toe of the bank includes scattered patches of this community (Photo 8) characterized, for example, by Buttonbush (*Cephalanthus occidentalis*), Elder Berry (*Sambucus canadensis*), Smooth Alder (*Alnus serrulata*), and Swamp Rose-mallow (*Hibiscus palustris*).

Palustrine Forested Wetlands (PFW) are dominated by hydrophytic trees. At Jackson Woods, PFW are located along a small channelized ditch or stream channel that traverses the open space, and on the margins and backwater habitats of a pond created by diverting some of the stream flow (Photo 9). Characteristic species include Pin Oak (*Quercus palustris*), Swamp White Oak (*Quercus bicolor*), Willow Oak (*Quercus phellos*), Black Willow (*Salix nigra*), Sour Gum (*Nyssa sylvatica*), and Sweet Gum (*Liquidambar styraciflua*). Representative understory shrub species include Elderberry (*Sambucus canadensis*), Highbush Blueberry (*Vaccinium corymbosum*), and Arrowwood (*Viburnum dentatum*). Because of the land use history of the site and the disturbed nature of the habitats, many introduced tree and shrub species not typical of forested wetlands, also have colonized the site.

4.1.3 Terrestrial Plant Communities

Terrestrial plant communities occur as natural and cultural types. Although virtually all examples of terrestrial or "upland" plant communities have been altered in some manner in the Long Branch area, recovery of altered forms and planted and maintained landscapes provide important open spaces within the City.

4.1.3.1 Natural Plant Communities

Remnant examples of Coastal Dunes are located at Seven President's County Park in the Central Beach Recreational Zone (Photo 10), within the North Beach Protected Zone (Photos 11 & 12), and south of Takanassee Lake within the South Beach Protected Zone (Photos 13 & 14) within the Beach Management Plan Area. The dominant plant is a native grass, American Beach Grass (*Ammophila breviligulata*), which also has been planted in the region to help protect and stabilize the coast. Seaside Goldenrod (*Solidago sempervirens*) is the most common associated species. Regulations, management issues, and recovery goals regarding the Beach Management Area within the City are contained in the *City of Long Branch Beach Management Plan for the Protection of Federally and State-Listed Species* (NJDEP and USFWS 2008).

In addition to various types of Palustrine Wetlands, patches of natural terrestrial/upland vegetation, which is generally disturbed and characterized by a mixture of native and exotic species, have been observed at Jackson Woods. Although difficult to classify and map and also associated with wetland vegetation, these plant communities likely include elements of Successional Old Field, Successional Shrubland, Successional Red Cedar Woodland, and Successional Southern Hardwoods. At Jackson Woods (Photo 15), native trees of these successional communities include Black Cherry (*Prunus serotina*) and Silver Maple (*Acer saccharinum*), whereas exotic tree species include Tree of Heaven (*Ailanthus altissima*) and Norway Maple (*Acer platanoides*). Numerous weedy shrubs and herbaceous species also characterized the open areas and understory including, for example, Common Mugwort (*Artemisia vulgaris*), Japanese Honeysuckle (*Lonicera japonica*), and Multiflora Rose (*Rosa multiflora*). At

Takanassee Lake, the upper banks above the wetland vegetation (Palustrine Scrub-shrub Wetland) are characterized by Successional Scrubland vegetation dominated by the introduced Indigo Bush (*Amorpha fruticosa*).

4.1.3.2 Cultural Plant Communities

Cultural plant communities or land cover types include those spaces maintained as landscapes either for aesthetic or recreational purposes. The most common example is Mowed Lawn and Mowed Lawn with Trees, which occurs along the upland periphery of Takanassee Lake (Photo 16). Planted or naturalized trees include, for example, White Mulberry (*Morus alba*), Black Locust (*Robinia pseudoacacia*), and Black Cherry (*Prunus serotina*).

4.1.4 Rare Vegetation Communities and Unique Areas

No "Ecological Communities" listed by the NJDEP Natural Heritage Program for Monmouth County (NJDEP-NHP 2011) are known to occur in the City of Long Branch. The listed "Floodplain Forest" type listed for Monmouth County, however, may be considered for the Palustrine Forested Wetlands at Jackson Woods because they are within a Flood Hazard Area as mapped by FEMA (Maps 9 and 10). Among the "unique" ecological areas considered for Monmouth County, none are listed for the City of Long Branch (Monmouth County Environmental Commission 1988).

Other ecological communities or habitat types known to occur in the City of Long Branch, which are usually considered to have environmental sensitivity due to their rarity and/or susceptibility to impacts, include Wetlands in general; Coastal Ponds (Takanassee Lake); Coastal Salt Marsh (Manahassett Creek, Photos 1 & 2); Submerged Aquatic Vegetation (Shrewsbury River Estuary); and Coastal Strand habitats including intertidal beaches (Marine Wetlands) and Coastal Dunes (North Beach Protected Zone and South Beach Protected Zone of the Beach Management Plan Area, Photos 11 - 14).

4.1.5 Rare Plant Species

Although no threatened, endangered, or rare plant species were noted for the City of Long Branch as a result of the requested search of the records of the Natural Heritage Program (NJDEP-NHP 2010), the following rare species are known to occur or may occur within the City Limits:

Seabeach Amaranth (*Amaranthus pumilus*): Seabeach Amaranth, which is federally-listed as threatened and state-listed as endangered, is an annual plant species that generally occurs in the vicinity of the high tide wrack line along sandy ocean beaches, including those of Monmouth County. Sparsely vegetated areas with limited wrack accumulation and lack of inundation during the flowering period of May to November are required for this plant to complete successfully in the coastal zone. The seeds are dispersed by the dynamic coastal processes including those affected by wind and water.

The City of Long Branch population of Seabeach Amaranth has ranged from 1-24 plants since the species was first observed in the City in the year 2000 (City of Long Branch 2008). Recovery goals for Seabeach Amaranth include a long-term population size of at least 10 plants and a minimum one-year size of 5 plants (City of Long branch 2008). If the southern end of the City of Long Branch (south of Lake Takanassee) receives beach nourishment, the goal should be revised to a long-term average population size of 100 plants, and a minimum one-year size of 20 plants (City of Long Branch 2008).

Seabeach Knotweed (*Polygonum glaucum*): Seabeach Knotweed, which is state-listed as endangered, is an annual plant species that also occurs along the sandy ocean beaches of Monmouth County from May to November, where it typically grows above high tide.

Within the City of Long Branch, from 2001 to 2004, the number of plants averaged 3 – 10; 11 plants were documented in 2005; no data were available in 2006; and one plant was documented in 2007 (City of Long Branch 2008). Regarding the recovery goals for Seabeach Knotweed, the protection of plants is to be provided as they are documented on the beaches (City of Long Branch 2008).

Additional rare plant species that are known from elsewhere in New Jersey and may potentially occur on the beaches of the City of Long Branch (City of Long Branch 2008) include the following:

- Seabeach Evening Primrose (*Oenothera humifusa*): beach/ dune habitats; state endangered.
- Sea-milkwort (*Glaux maritima*): beach and salt marsh habitats; state endangered.
- Seabeach Sandwort (*Hockenya peploides*): beach habitats; state species of concern.
- Seabeach Purslane (*Sesuvium maritimum*): beach habitats; state species of concern.

Additional rare plant species that are known from coastal ponds in Monmouth County (Ferren & Olson 2005; NJDEP-NHP 2011), some of which may potentially occur at Lake Takanassee include the following:

- Parker's Pipewort (*Eriocaulon parkeri*): freshwater tidal wetlands and tidal ponds; state species of concern.
- Whorled Marsh Pennywort (*Hydrocotyle verticillata var. verticillata*): freshwater and slightly brackish wetlands and ponds; state species of concern.
- Mudwort (*Limosella australis*): freshwater tidal and slightly brackish wetlands and ponds; state endangered.
- Slender Water Milfoil (*Myriophyllum tenellum*): freshwater ponds; state endangered.
- Small Waterwort (*Elatine minima*): freshwater tidal wetlands and ponds; state species of concern.

Additional rare plant species that are known from coastal salt marshes and related environments in Monmouth County (NJDEP-NHP 2010), some of which may potentially occur in wetlands along the Shrewsbury River Estuary, including the following:

- Salt-marsh Spikerush (*Eleocharis halophila*): salt marshes; state species of concern.
- Salt-marsh Alkali Grass (*Puccinellia fasciculata*): salt marshes and shores; state species of concern.
- Seaside Plantain (*Plantago maritima var. juncoides*): salt marshes and shores; state species of concern.
- Seaside Buttercup (*Ranunculus cymbalaria*): mud in brackish marshes; state-listed endangered.
- Salt-marsh Bulrush (*Bolboschoenus (Scirpus) maritimus*): brackish and salt marshes; state-listed endangered.
- Seaside Arrow-grass (*Triglochin maritima*): brackish marshes; state-listed endangered.

4.1.6 Invasive Plant Species

Based on the two focused studies of Jackson Woods and Takanassee Lake, a number of invasive exotic plants species have been observed at open spaces within the City of Long Branch. Refer to section 7.0 Focused Study Sites for additional information and Appendix D for checklists of the exotic and native plant species for each site.

Regarding wetlands, perhaps the most serious impact is from Common Reed (Phragmites australis), which dominates the Palustrine Emergent Wetland at Jackson Woods (Photo 7) and along the tidal margins of Troutman's Creek (Photo 4). Purple Loosestrife (*Lythrum salicaria*) has invaded wetlands at both sites but is not yet a dominant species. Water Feather (*Myriophyllium aquaticum*) has invaded Takanassee Lake and dominates portions of the six basins.

Margins of wetlands at Jackson Woods and Takanassee Lake have been colonized by a number of woody exotics including Multiflora Rose (*Rosa multiflora*), Indigo Bush (*Amorpha fruticosa) (*Photo 20), and Japanese Knotweed (*Polygonum cuspidatum) (*Photo 18). Several vines are becoming threats to native vegetation including English Ivy (*Hedera helix*), Oriental Bittersweet (*Celastrus orbiculatus*), Japanese Honeysuckle (*Lonicera japonica*), and Sweet Autumn Clematis (*Clematis paniculata*). Common invasive exotic trees include Norway Maple (*Acer platanoides*) and

Tree-of-Heaven (*Ailanthus altissima).* A species of bamboo has colonized a portion of the northern margin of Jackson Woods, apparently invading the site from an adjacent private yard.

Numerous herbaceous plant species not native to the region also have established at Jackson Woods and the parkland adjacent to Takanassee Lake (see checklists in Appendix D). Although most of these exotic species are not necessarily invasive, most are indicative of the disturbed nature of the habitats.

4.1.7 The Urban Forest

An urban forest is a collection of trees that grow in a municipal setting. Care and management of urban forests is called urban forestry. Urban forests play important roles in the ecology of human habitats in many ways: they filter air, water, and sunlight; provide shelter to animals and recreational areas for humans. They moderate local environments, help reduce noise and wind, help conserve energy by shading structures to conserve energy, and are critical in cooling the urban heat island effect. Benefits of urban trees and shrubs include but are not limited to beautification; reduction of heat, erosion and stormwater runoff, and air and noise pollution; contribute to carbon sequestration and active pollutant removal; enhance property values; improve wildlife habitat; and mitigate the overall urban environmental impact.

The Urban Forest Project is an environmental, public arts, and educational initiative around the world resulting in a series of outdoor exhibitions in various cities including the creation of banners employing the form of a tree to make a visual statement through the communities. Funding associated with the project is used to support various local environmental and forestry initiatives.

In the City of Long Branch, local urban forestry efforts can be enhanced by using trees native to the region, including those growing within the City Limits. Examples of locally native trees include those known to occur at or in the vicinity of the two study sites focused upon in this study: Jackson Woods and Takanassee Lake Park. Representative native tree species from these sites include the following:

Table 7: Native Trees in Jackson Woods and Lake Takanassee

Common Name	Scientific Name	Common Name	Scientific Name
Red Maple	*Acer rubrum*	Silver Maple	*Acer saccharinum*
Gray Birch	*Betula populifolia*	American Beech	*Fagus grandifolia*
White Ash	*Fraxinus americana*	Black Walnut	*Juglans nigra*
American Holly	*Ilex opaca*	Black Cherry	*Prunus serotina*
Sweet Gum	*Liquidambar styraciflua*	Cottonwood	*Populus deltoides*
Tulip Tree	*Liriodendron tulipifera*	Sycamore	*Platanus occidentalis*
White Oak	*Quercus alba*	Sour/Black Gum	*Nyssa sylvatica*
Swamp White Oak	*Quercus bicolor*	Black Willow	*Salix nigra*
Willow Oak	*Quercus phellos*	Pussy Willow	*Salix discolor*
Pin Oak	*Quercus palustris*	Black Locust	*Robinia pseudoacacia*
Scarlet Oak	*Quercus coccinea*	Sassafras	*Sassafras albidum*
Pitch PIne	*Pinus rigida*		

Refer to section 6.3 “Walking Tour of Heritage Trees” for examples of tree locations in the vicinity of Takanasse Lake.

Additional native tree species known to occur in other nearby coastal sites within Monmouth County include, but are not limited to, the following species:

Table 8: Trees of Coastal Monmouth County			
Common Name	Scientific Name	Common Name	Scientific Name
River Birch	*Betula nigra*	Flowering Dogwood	*Cornus florida*
Black-jack Oak	*Quercus marilandica*	Big-tooth Aspen	*Populus grandidentata*
Red Oak (NJ State Tree)	*Quercus rubra*	American Elm	*Ulmus americana*
Black Oak	*Quercus velutina*		

4.2 Zoological Resources

Urbanization affects aquatic habitats, due to contaminants and pollutants present in stormwater and the warming of runoff coming from impervious surfaces. These factors reduce the diversity of freshwater aquatic animals (Adams 1994). In spite of the high level of development, the City of Long Branch can support wildlife, including some threatened and endangered species, particularly those that find suitable habitat unique to a beach/dune ecosystem. The Ecological Inventory for the Mid-Coast Region of Monmouth County indentifies several different wildlife habitat types for each category of animal. These tables list the common wildlife expected to be present and indicate the habitat most likely used by the species. Thirteen habitat classifications were used in that document: Landscaped Open space, Agricultural Land, Forest, Cultivated Trees and Shrubs, Shrubland, Forested Wetland, Shrub Wetland, Freshwater March, (Non-tidal), Freshwater Tidal Marsh, Saltwater Marsh, Beach and Unvegetated Area habitats. The wildlife lists from the Ecological Inventory are included in Appendix E. The City of Long Branch Christmas Bird Count, augmented with some summer species observed at Sandy Hook is included in Appendix F. These species were observed in the City of Long Branch or would be highly likely to be present.

4.2.1 Terrestrial Fauna (including mammals, reptiles and birds)

Dozens of species of terrestrial fauna are known to reside in New Jersey including mammals, reptiles, and birds. Because the City of Long Branch contains extensive urban development, necessary habitats for some terrestrial wildlife species, such as extensive forest, woodland or grassland habitats will be absent. Still, the variety of wildlife present in an urban setting can be surprising. Species, which achieve the greatest numbers in such settings will be small to medium-sized herbivores, which are habitat generalists. Residents of the City of Long Branch can expect to see species such as Chipmunks, Gray squirrels, Raccoons, Opossums, House mouse and Eastern mole in their backyard. Landscaped yards provide cover, nesting and feeding habitats for local and migrating songbirds. Birds likely to visit backyard bird feeders include Juncos, House sparrow, House finch, Cardinal, Black-capped chickadee, Blue jay, Tufted titmouse, Mourning dove and House wren. The ubiquitous Turkey vulture and various species of hawk and gull commonly grace the skies overhead.

The smaller, disturbance-tolerant mammals have an easier time finding habitat than larger mammals, although one of New Jersey's larger mammals, the White-tailed deer frequently occurs in urban/suburban settings. A deer sighting would be most likely in a wooded area, such as Jackson Woods. They are also likely to wander the old estate properties surrounding the impoundments of Whale Pond Brook. Table 9 lists the common and widespread wildlife species readily observable in the City of Long Branch.

Table 9: Common Terrestrial Wildlife of the City of Long Branch			
Mammals		*Mammals*	
Common Name	Scientific Name	Common Name	Scientific Name
Opossum	*Didelphis marsupialis*	Eastern Cottontail	*Sylvilagus floridanus*
Gray Squirrel	*Sciurus carolinensis*	Eastern Chipmunk	*Tamias striatus*
Raccoon	*Procyon lotor*	Woodchuck	*Marmota monax*
Striped Skunk	*Mephitis mephitis*	House Mouse	*Mus musculus*
Red Fox	*Vulpes vulpes*	White-tailed Deer	*Odocoileus virginianus*
Eastern Mole	*Scalopus aquaticus*	Marsh Rice Rat	*Oryzomys palustris*
Little Brown Bat	*Myotis lucifugus*	White-footed Mouse	*Peromyscus leucopus*
Big Brown Bat	*Eptesicus fuscus*		
Reptiles and Amphibians		*Reptiles and Amphibians*	
Common Snapping Turtle	*Chelydra serpentina*	Eastern Garter Snake	*Thamnophis sirtalis sirtalis*
Fowlers Toad	*Bufo woodhousei fowleri*	Eastern Milk Snake	*Lampropeltis triangulum*
Bullfrog	*Ranas catesbiana*	New Jersey Chorus Frog	*Pseudacris triseriata*
		Spring Peeper	*Hyla crucifer*
Birds		*Birds*	
Mallard	*Anas platyrhynchos*	Great Blue Heron	*Ardia herodias*
Northern Junco	*Junco hyemalis*	Northern Cardinal	*Cardinalis cardinalis*
House Sparrow	*Passer domesticus*	House Finch	*Carpodacus mexicanus*
Black-capped Chickadee	*Parus atricapillus*	Blue Jay	*Cyanocitta cristata*
Tufted Titmouse	*Parus bicolor*	Mourning Dove	*Zenaida macroura*
House Wren	*Troglodytes aedon*	Turkey Vulture	*Cathartes aura*
Northern Mockingbird	*Mimus polyglottus*	Laughing Gull	*Larus atricilla*
Red-tailed Hawk	*Buteo jamaicensis*	Herring Gull	*Larus argentatus*
Canada Goose	*Branta canadensis*	Red-winged Blackbird	*Agelaius phoenicus*
Semi-palmated Sandpiper	Calidris pusilla	American Crow	*Corvus brachyrhynchus*
European Starling	Sturnus vulgaris	Double-crested Cormorant	*Phalacrocourax auritus*
American Robin	*Turdus migratorius*	Fish Crow	*Corvus ossifragus*
Purple Finch	*Carpodacus purpureus*	Gray Catbird	*Dumetella carolinensis*
Snowy Egret	*Egretta thula*	Common Tern	*Sterna hirundo*

Forested, scrub-shrub and emergent wetlands are found in Jackson Woods and in the Takanassee Lake area. The shyer wildlife species, such as Shrews, Voles and Bats are more likely to be found in such areas. The American woodcock, Flycatchers and various herons will seek the quieter parts of the City. Eastern Coyote is on the increase. This species has been observed in suburban settings in NJ (Greenwire 2010). The black bear has even been observed in every county in NJ. Other shyer or uncommon species should occur, but would be less easily observed. A listing of NJ mammals is depicted in Table 10, most of which could potentially occur, at least occasionally, within the boundaries of the City.

Table 10: New Jersey Mammals*					
Common Name	Scientific Name	Status	Common Name	Scientific Name	Status
Opossum	*Didelphis marsupialis*	S	Eastern Cottontail	*Sylvilagus floridanus*	S
Masked Shrew	*Sorex cinereus*	S	Eastern Chipmunk	*Tamias striatus*	S
Short-tailed Shrew	*Blarina brevicauda*	S	Woodchuck	*Marmota monax*	S
Least Shrew	*Crytotis parva*	U	Gray Squirrel	*Sciurus carolinensis*	S
Eastern Mole	*Scalopus aquaticus*	S	Raccoon	*Procyon lotor*	S
Star-nosed Mole	*Condylura cristata*	U	Striped Skunk	*Mephitis mephitis*	S
Little Brown Bat	*Myotis lucifugus*	S	Beaver	*Castor candensis*	INC

Table 10: New Jersey Mammals*					
Common Name	Scientific Name	Status	Common Name	Scientific Name	Status
Keen Myotis	*Myotis septentrionalis*	U	Marsh Rice Rat	*Oryzomys palustris*	S
Silver-haired Bat	*Lasionycteris noctivagans*	U	White-footed Mouse	*Peromyscus leucopus*	S
Eastern Pipistrel	*Pipistrellus subflavus*	U	Red-backed Vole	*Clethrionomys gapperi*	S
Big Brown Bat	*Eptesicus fuscus*	S	Meadow Vole	*Microtus pennsylvanicus*	S
Red Bat	*Lasiurus borealis*	S	Pine Vole	*Microtus pinetorum*	S
Hoary Bat	*Lasiurus cinereus*	U	Muskrat	*Ondatra zibethicus*	S
Meadow Jumping Mouse	*Zapus hudsonius*	U	House Mouse	*Mus musculus*	I
Red Fox	*Vulpes vulpes*	S	White-tailed Deer	*Odocoileus virginianus*	D
Black Bear	*Ursus americanus*	INC	Eastern Coyote	*Canius latrans*	INC
St – Status E - Endangered D - Decreasing INC - Increasing S - Stable U – Undetermined I - Introduced P – Peripheral *(NJDEP, DFW 2005b, Wolgast 1998, MCPB and MCEC 2000)					

New Jersey is home to numerous reptiles. As is the case for plants and other terrestrial animals, one of the reasons for this diversity is that many species are at the limits of their geographical ranges, particularly southern Coastal Plain species. However, because the City of Long Branch is largely developed and most of its waters are saline or brackish, many of the species may be absent from the municipality. Garter snakes, Common snapping turtle and Eastern box turtle are the reptile species most likely to be encountered in the developed areas of the City of Long Branch (MCPB and MCEC 2000). Table 11 lists reptiles found in Monmouth County, which could occur in the City, but are not the most common or the most easily observed species.

Table 11: Monmouth County Reptiles (NJDEP, DFW 2001)			
Common Name	Scientific Name	Common Name	Scientific Name
Northern Water Snake	*Nerodia sipedon sipedon*	Northern Brown (Dekay's) Snake	*Storeria dekayi dekayi*
Northern Redbelly Snake	*Storeria occipitomaculata occipitomaculata*	Eastern Garter Snake	*Thamnophis sirtalis sirtalis*
Eastern Ribbon Snake	*Thamnophis sauritas sauritas*	Eastern Smooth Earth Snake	*Virginia valeriae valeriae*
Northern Ringneck Snake	*Diaphis punctatus edwarsdsi*	Southern Ringneck Snake	*Diaphis punctatus punctatus*
Eastern Worm Snake	*Carphophis amnoenus amoenus*	Rought Green Snake	*Opheodrys vernalis*
Black Rat Snake	*Elaphe obsolete obsolete*	Eastern Milk Snake	*Lampropeltis triangulum triangulum*
Scarlet Kingsnake	*Lampropeltis triangulum elapsoides*	"Coastal Plain" Milk Snake Intergrade	*:. T. triangulum X L. t. elapsoides*
Northern Scarlet Snake	*Cemophora coccinea copei*	Common Snapping Turtle	*Chelydra serpentine*
Common Musk Turtle (Stinkpot)	*Sternotherus odoratus*	Eastern Mud Turtle	*Kinosternon subrubrum subrubrum*
Spotted Turtle	*Clemmys guttata*	Eastern Box Turtle	*Terrapene carolina carolina*
Northern Diamondback	*Malaclemys terrapin terrapin*	Red-eared Slider	*Trachemys scripta elegans*
Redbelly Turtle	*Pseudemys rubriventris*	Eastern Painted Turtle	*Chrysemys picta picta*

Amphibians are terrestrial animals in their adult life stage, but they require aquatic environments for breeding and early life stages. Degraded aquatic habitats subject to warmed and contaminated stormwater runoff will limit the ability of amphibians to breed within the City of Long Branch. In addition, many individuals may be lost to road kill, attempting to move from aquatic breeding habitats to the terrestrial habitats suited to adult stages (Adams 1994). An ephemeral pond, identified in Jackson Woods, and small floodplain ponds, could potentially provide breeding habitat for amphibians, if contamination or lack of adequate upland habitat is not an issue. Spring peepers and New Jersey chorus frogs and Bullfrogs may be heard singing their Spring breeding songs in these waters and in inundated wetlands. A listing of Monmouth County amphibians is listed in the following:

Table 12: Monmouth County Amphibians (NJDEP, DFW 2001)			
Common Name	Scientific Name	Common Name	Scientific Name
Marbled Salamander	*Ambystocum opacum*	Spotted Salamander	*Ambystoma maculatum*
Red-spotted Newt	*Notophthalmus viridescens viridescens*	Northern Dusky Salamander	*Desmognathus fuscus fuscus*
Redback Salamander	*Plethedon cinereus*	Northern Slimy Salamander	*Plethedon glutinosus*
Four-toed Salamander	*Hemidactylium scutatum*	Northern Red Salamander	*Pseudotriton ruber ruber*
Northern Two-lined Salamander	*Eurycea bislineata*	Eastern Spadefoot	*Scaphiopus holbrookii holbrookii*
Fowler's Toad	*Bufo woodhousii fowleri*	Northern Cricket Frog	*Acris crepitans crepitans*
Northern Spring Peeper	*Pseudacris crucifer crucifer*	Bullfrog	*Rana caesbiana*
Carpenter Frog	*Rana virgatipes*	Green Frog	*Rana clamintans clamitans*
Wood Frog	*Rana sylvatica*	Southern Leopard Frog	*Rana utricularis*
Pickerel Frog	*Rana palustris*		

The diversity of terrestrial fauna, present, even in an urban environment is exemplified by the birds. The City of Long Branch contains several important habitat types for avian species. The coastal ponds, characterized by Lake Takanassee and other impoundments provide excellent habitat for waterfowl, both local and migrating species. A visit to one of these impoundments might provide sightings of the very common Mallard. You might also observe Canvasbacks, Blue-winged teals, Ring-necked ducks and Greater or Lesser scaups. A Great blue heron may be feeding in the shallows at the edge of the pond. These species also make use of the surrounding wetland areas.
The coastal sand dunes and beaches, ocean and estuaries provide important shorebird habitat. Sandpipers dart back and forth between the waves at the beach, and Herring gulls or Laughing gulls very likely tried to steal a lunch. Red fox and even feral cats can be observed on City beaches. Appendix F contains an extensive list of avian species observed in the Audobon Society's Christmas Bird Counts.

4.2.2 Aquatic Fauna (including marine mammals, fish, invertebrates and amphibians)

The aquatic fauna are found in the various aquatic habitats within the City of Long Branch and include representative species of mammals, fish, invertebrates and amphibians. The surface waters of the City of Long Branch are mostly salty ocean waters to brackish rivers and creeks, with the exception of some human-made freshwater features (Lake Takanassee and other impoundments) and an ephemeral pond and ditch in Jackson Woods. Commonly observed freshwater species are found in Table 13.

Table 13: Freshwater Fish of the City of Long Branch (LBEC 2011, MCPB and MCEC 2000)			
Freshwater Species		Freshwater Species	
Common Name	*Scientific Name*	*Common Name*	*Scientific Name*
American Eel	*Anguilla rostrata*	Common Carp	*Cyprinus carpio*
Blue Catfish	*Ictalarus spp..*	Green Sunfish	*Lepomis cyanellus*
Bluegill	*Lepomis macrochinus*	Largemouth Bass	*Icropterus salmoides*
Brook Trout	*Salvelinus fontenalis*	Northern Pike	*Esox lucius*
Brown Trout	*Salmo trutta*	Smallmouth Bass	*Micropterus dolomieu*
Bullhead Catfish	*Ameirus spp.*	Banded Sunfish	*Enneacanthus obesus*
Calico Bass (Black Crappie)	*Pomoxis nigromaculatus*	Tiger Trout	*Salmo trutta X Salvelinus fontinalis*
Calico Bass (White Crappie)	*Pomoxis annularis*	White Perch	*Morone saxitilis*
Catfish	*Ameirus spp.*	Yellow Perch	*Perca flavescens*
Chain Pickerel	*Exox niger*	Alewife	*Alosa pseudoharengus*
White Sucker	*Catostomus comersoni*	Bluespotted Sunfish	*Enneacanthus gloriosus*
Creek Chubsucker	*Erimyzon oblongus*	Pumpkin Seed	*Lepomis gibbosus*
Mud Sunfish	*Lepomis punctatus*	Red Breasted Sunfish	*Lepomis sauritus*
Common Shiner	*Lxilus cornutus*	Inland Silverside	*Menidia beryllina*
Golden Shiner	*Notremigoonus crysoleucus*		

The bays, estuaries and marine waters of New Jersey can be home to 336 marine finfish at some point during the year. The adults of the finfish species will occur in the waters of the Atlantic Ocean. Other life stages may occur in the estuaries within, and adjacent to, the City of Long Branch. Anadromous fish, which spawn in freshwater, but live the bulk of their lives in salt water, such as American Eel, Herring or Shad, migrate upstream and breed in Manahassett, Troutman's and Branchport Creeks and the Shrewsbury River. The estuarine waters of Branchport Creek, Troutman's Creek and Manahassett Creek, as well as the Shrewsbury River, are teeming with pre-adult life stages of fishes. These estuaries are designated as essential fish habitat for spawning young life stages of Whiting, Red hake, Witch flounder, Winter flounder, Yellowtail flounder, Windowpane flounder, Monkfish, Bluefish, Summer flounder, Black sea bass, King mackerel, Spanish mackerel, Cobia, Blue shark, Dusky shark, Sandbar shark, Shortfin mako shark, Tiger shark and Bluefin tuna (NOAA).

Surf fisherman hope for a Bluefish or a Weakfish, while out in the boats, fishermen drift for Winter or Summer flounder, and maybe the occasional Windowpane (a type of flounder). The ocean waters outshore of the City of Long Branch area are also considered as essential fish habitat for most of the previously mentioned fishes in their adult stages as well as the following species: Atlantic cod, Haddock, Pollock, Offshore hake, White hake, Redfish, American plaice, Ocean pout, Atlantic sea scallop, Atlantic sea herring, Long finned squid, Short finned squid, Atlantic butterfish, Atlantic mackerel, Scup, Spiny dogfish, Tilefish and Skipjack tuna. Fish species known to occur in the waters outshore of the City of Long Branch are contained in Table 14.

Table 14: Anadromous and Saltwater Fish of the City of Long Branch (LBEC 2011)

Common Name	*Scientific Name*	*Common Name*	*Scientific Name*
Anadromous Fish		Anadromous Fish	
American Eel	*Anguilla rostrata*	Atlantic Sea Herring	*Clupea harengus*
Saltwater Fish		Saltwater Fish	
Albacore	*Thunnus alalunga*	Red Drum	*Sciaenops ocellatus*
American Eel	*Anguilla rostrata*	Redfish	*Sebastes fasciatus*
American Plaice	*Hippoglossoides platessoides*	Red Hake	*Urophycis chuss*
Atlantic Butterfish	*Peprilus triacanthus*	Sandbar (Brown) Shark	*Carcharhinus plumbeus*
Atlantic Halibut	*Hippoglossus hippoglossus*	Sand Tiger Shark	*Carcharias taurus*
Atlantic Mackerel	*Scomber scombrus*	Scup (Porgy)	*Senotomus chrysops*
Atlantic Bonito	*Sarda sarda*	Shortfin Mako shark	*Isurus oxyrinchus*
Atlantic Cod	*Gadus morhua*	skipjack Tuna	*Katsuwonus pelamis*
Black Sea Bass	*Centropristis striata*	Spanish Mackerel	*Scomberomorusmaculates*
Blackfish	*Tautoga onitis*	Spiny Dogfish	*Squalus acanthias*
Bluefin Tuna	*Thunnus thynnus*	Spot	*Leiostomus xanthurus*
Bluefish	*Pomatomus saltatrix*	Striped Bass	*Morone saxitilus*
Dusky Shark	*Carcharhinus obscurus*	Summer Flounder (Fluke)	*Paralichtus dentatus*
Haddock	*Melanogrammus aeglefinus*	Tiger Shark	*Galeocerdo cuvieri*
Hickory Shad	*Alosa mediocris*	Tilefish	*Lopholatilus chamaeleonticeps*
King Mackerel	*Scomberomorus cavalla*	Weakfish	*Cynoscion regallis*
Little Tunny	*Euthynnus alletteratus*	Whiting	*Merluccius bilinearis*
Lobster	*Homarus americanus*	Windowpane Flounder	*Scophthalmus aquosus*
Monkfish	*Lophius americanus*	Witch Flounder	*Glyptocephalus cynoglossus*
Obia	*Rachycentron canadum*	Winter Flounder	*Pleuronectes americanus*
Ocean Pout	*Macrozoarces americanus*	Winter Skate	*Raja ocellata*
Pollock	*Pollachius virens*	Yellowtail Flounder	*Limanda ferruginea*

At the ocean, in the City of Long Branch there are Moon and Comb Jellies, Blue crab and the prehistoric strangeness of a Horseshoe crab. These waters are also essential fish habitat for the invertebrate Surf clam and Ocean quahog. Walking along the beach you'll find the exoskeletons or shells of the invertebrates living in the intertidal and subtidal ocean waters. In addition to Surf clam and Ocean quahog, shells of Ribbed mussel, Common oyster, Hard-shelled clam, Boatsnail and Moon snail may be found on the beaches of the City of Long Branch.Off the shore of New Jersey 28 marine mammals are known to occur, although few species are observed in the waters directly adjacent to the City. Table15 lists the more common non-fish aquatic species.

Table 15: Common Aquatic (non-fish) Species of the City of Long Branch (Grant 2010, LBEC 2011, NOAA 2011)

Common Name	Scientific Name	Common Name	Scientific Name
Marine Mammals		*Marine Mammals*	
Harbor Seal	*Phoca vitulina*	Fin Whale	*Balaenoptera physalus*
Gray Seal	*Halichoerus grypus*	Bottlenose Dolphin	*Tursiops truncatus*
Mollusks		*Mollusks*	
Arks	*Anadara spp.*	Softshell Clam	*Mya arenaria*
Hardshelled Clam	*Mercenaria mercenaria*	Common Oyster	*Crassostrea virginica*
Chestnut Astarte	*Astarte castanea*	Atlantic Surf Clam	*Spisula solidissima*
Angel Wing	*Cyrtopleura costata*	Cocina	*Donax variabilis*
Jingle Shells	*Anomia simplex*	Razor Clam	*Ensis directus*
Blue Mussel	*Mytilus edulus*	Ribbed Mussel	*Modilus demisis*
Northern Moon Snail	*Lunatia heros*	Common Slipper Snail	*Crepidula fornicata*
Knobbed Whelk	*Buyscon carica*	Lobed Moon Snail	*Polinices duplicatus*
Common MarshSnail	*Melampus bidentatus*	SeaScallop	*Placopecten magellanicus*
Channeled Whelk	*Busycon canaliculatum*	False Angel Wing	*Petricola pholadiformis*
Rough Periwinkle	*Littorina littorea*	Bay Scallop	*Aequipecten irradians*
Tunicates		*Tunicates*	
Sea Grapes	*Mogula manhattensis*	Salp	*Salpidae family*
Echinoderms		*Echinoderms*	
Sand Dollars	*Echinarachnius parma*	Purple Sea-urchin	*Arabicapunctulata*
Forbes Asterias Sea Star	*Asterias forbesii*		
Crustaceans		*Crustaceans*	
Blue Crab	*Callinectes sapidus*	Horseshoe Crab	*Limulus polyphemus*
Rock Crab	*Cancer irroratus*	Lady Crab	*Ovalipes ocellatus*
Hermit Crab	*Pagarus spp.*	Spider Crab	*Linina enmarginata*
Mud Fiddler Crab	*Uca pugnax*	Green Crab	*Carcinus onaenus*
Rough Barnacle	*Balanus balanus*	Ghost Crab	*Ocypods quadrata*
Northern Lobster	*Homarus americanus*	Mole Crab	*Emerita talpoida*
Cnidarians		*Cnidarians*	
Moon Jelly	*Aurelia aurita*	Beroe's Comb Jellies	*Beroe spp.*
Crown Jelly	*Nausithoe punctata*		
Cephalopods		*Aquatic Reptiles*	
Long Finned Squid	*Loligo pealeii*	Diamondback Terrapin	
Short Finned Squid	*Illex illecebrosus*		

4.3 Rare Species and Species of Special Concern

The State of New Jersey maintains a database of records for occurrences of threatened and endangered wildlife species, rare plants or natural communities, and critical wildlife habitat within the State. A search of the New Jersey Department of Environmental Protection Natural Heritage Program (NHP) Database was performed (see Appendix G) and the New Jersey Landscape Mapping Project was reviewed for the City of Long Branch. Several threatened and endangered animals and habitats associated with them are known to occur within City of Long Branch (Table 16) (Map 11). Rare vertebrates are listed below. No rare, threatened or endangered invertebrates were identified within the City of Long Branch or in the immediate vicinity of the City.

Table 16: Rare Vertebrate Animals of the Vicinity of the City of Long Branch (NJDEP 2010)

Common Name	Scientific Name	Status	Common Name	Scientific Name	Status
Atlantic Leather Back	*Dermochelys coriacea*	LE,E	Least Tern	*Sterna antillarum*	E
Atlantic Loggerhead	*Caretta caretta*	LT, E	Piping Plover	*Charadrius melodus*	LT, E
Fin Whale	*Balaenoptera physalus*	LE, E	Great Blue Heron	*Ardea herodias*	SC/S

E – Endangered; T – Threatened; S – Stable; SC – Special Concern
E/T, T/T, T/S – Dual Status, letter before the slash is status of breeding population, letter after the slash is for the migratory population
(LT) – Federal Status, formally listed as threatened, LE – formally listed as endangered.

Three searches of the NHP databases were requested and received: Long Branch, Jackson Woods, and Takanassee Lake, each of which provided information regarding rare vertebrate animals (see Appendix G). Atlantic leather back, Atlantic loggerhead, and Fin whale are not addressed in the 2008 *Beach Management Plan* (City of Long Branch 2008) and hence are not considered herein to be of significance for the coastal habitats within the City Limits. The Threatened or Endangered Species Habitat Map (Map 11) illustrates threatened or endangered species habitat, including habitat for "Bald Eagle, Carpenter Frog, and Black Skimmer". None of the species were listed in the NHP searches or by the NJDEP iMap program. Areas included on the map for these species are only known for occurrences of Least tern.

Least terns (State endangered) are small colonial nesting sea birds that occur along the New Jersey shore from April to September. According to the *Beach Management Plan*, a colony with a peak number of 128 adults was observed in the City in 2003 (in the beachfront area at Pier Village), but this area is no longer suitable habitat. Least tern is also listed for Takanassee Lake and Seven Presidents County Park, and is listed by the NJDEP iMap program for various sites along the tidal shores of the Shrewsbury River, Branchport Creek, and Manahassett Creek, highlighted as emergent wetlands on Map 11.

Piping plovers (Federal threatened and State endangered) are small, colonial nesting shorebirds present along the New Jersey shore between March and August. According to the *Beach Management Plan*, one pair nested in the City in 2003 in the beachfront area at Pier Village, but this area is no longer suitable habitat. Piping plovers are also known to occur at Seven Presidents County Park (Map 11).

Great blue heron is a wading bird that is a State species of special concern listed for Takanassee Lake.

4.4 Critical Habitats and Special Ecological Communities

The New Jersey Department of Environmental Protection's (NJDEP) Division of Fish and Wildlife has developed maps identifying critical areas for threatened and endangered species based on land-use classifications and species location. This effort was coordinated through a study known as the Landscape Project. The project focuses on large areas throughout the State that are ecologically similar in regard to plant and animal communities referred to as Landscape Regions. The City of Long Branch is located within the Atlantic Coast Region, identified as one of the most productive coastal habitats in the United States.

The Landscape Project divides the State into five habitat classes: forest, grassland, forested wetland, emergent wetland and beaches. These classes are based on information extracted from the NJDEP's Land Use/Land Cover data. Habitat patches within these areas are classified by a ranking system based on the status of the species present in each. The prioritized ranking system is as follows:

- Rank 5 is assigned to areas containing one or more occurrences of at least one wildlife species listed on as endangered or threatened on the Federal list of endangered and threatened species.
- Rank 4 is assigned to areas containing one or more occurrences of at least one State endangered species.
- Rank 3 is assigned to areas containing one or more occurrences of at least one State threatened species.
- Rank 2 is assigned to areas containing one or more occurrences of at least one non-listed State priority species.
- Rank 1 is assigned to areas that meet habitat-specific suitability requirements such as minimum size criteria for endangered, threatened or priority wildlife species, but do not intersect with any confirmed occurrences of such species.

As shown on the Threatened and Endangered Species Map (Map 11), the City of Long Branch's critical habitat is identified as beach or emergent wetlands. Each of these habitats are reported to contain State endangered species (Rank 4). The beach habitat also is associated with Federally endangered species, as discussed in section 4.3.

5.0 CULTURAL RESOURCE INVENTORY

5.1 Prehistoric Context

Before European settlers arrived, the Lenni Lenape tribe occupied land adjacent to the Jersey shore, camping in woodlands referred to as the "Big Woods," during the winter and utilizing the abundant fisheries and shellfisheries resources along the shore in warmer seasons. Land encompassing the current City of Long Branch was purchased from the Lenni Lenape for 20 shillings, or the equivalent of $170,000 (Hazard 2010). No archaeological sites documenting this phase are listed in the New Jersey and National List of Historic Sites.

5.2 Historic Context

The historical times of the City of Long Branch are well-documented, in contrast to its prehistory. The first European settlers were associates of the Monmouth Patent. These settlers negotiated with the Lenni Lenape to purchase lands including Long Branch and mainly took up farming the interior land, avoiding the coast at first. The name "Long Branch" comes from the municipality's location along the longest branch of the Shrewsbury River. In 1844, when the Jersey Coast was surveyed, the City of Long Branch perched on a 5-mile long and 20 foot high bluff. Much earlier in the century, the City was already known as a premier seaside resort. In 1906, the rudimentary beginnings of a boardwalk were constructed along the ocean shore (Hazard 2010). Due to its prominence as a premier seaside resort, the City of Long Branch attracted prominent people in business and the arts, including 7 Presidents of the United States, as seasonal and sometimes permanent residents. Because of this, the City of Long Branch has accumulated a wealth of historic architectural resources.

Historic resources in the City of Long Branch can be placed in at least three categories: (1) those listed on the New Jersey and National Registers of Historic Places; (2) Properties eligible for listing as determined by the State Historic Preservation Office; and (3) Locally identified historic resources.

The National Register of Historic Places is the official list of the nation's historic resources worthy of preservation, and the New Jersey Register is the official list of New Jersey's historic resources of local, state and national interest. The New Jersey Register is maintained by the State Historic Preservation Office (SHPO) within the New Jersey Department of Environmental Protection (CMX 2010). The four sites listed in Table 17 and located on the Historic Sites and Districts Map (Map 12) are listed on the State and/or National Registers of Historic Places.

Table 17: SHPO Listed Properties (CMX 2010)		
Site Name & Inventory Number	Location	Designation
"Chauncey Jerome" Shipwreck Site ID #3353	Offshore of Seven Presidents Park	SR: 1/5/96 NR: 3/1/96 (Ref. # 96000205)
Church of the Presidents (St. James Church) ID #2006	1260-1266 Ocean Avenue	SR: 10/17/75 NR: 11/7/76 (Ref. # 76001169)
North Long Branch School (Primary No. 3; Church Street School) ID #48	469 Church Street	SR: 5/27/99 NR: 7/28/99 (Ref. # 99000906)
Long Branch Post Office ID #2008	60 Third Avenue	SR: 1/31/86

Properties eligible for listing have been issued a SHPO Opinion, which is an opinion of eligibility issued by the State Historic Preservation Officer (SHPO). This opinion is in response to a federally funded activity, such as a road project, that will have an effect on historic properties not listed on the National Register (CMX 2010). There are six other eligible or "opinioned" historic sites in the City (Map 12 & Table 18).

Table 18: SHPO Eligible Properties (CMX 2010)		
Site Name & Inventory Number	Location	Designation
ID #2009	468 Ocean Avenue	SHPO Opinion: 12/27/76
Patten Point Yacht Club ID #4014	676 Patten Avenue	SHPO Opinion: 6/5/2002
St. Michael's R.C. Church ID #4647	796 Ocean Avenue	SHPO Opinion: 8/29/2006
Summer Cottage ID #43530	109 Park Avenue	SHPO Opinion: 8/20/2004
US Lifesaving Station #5 & Takanassee Beach Club Historic District ID #4646	805 Ocean Avenue & District	SHPO Opinion: 8/29/2006
Broadway School ID #3352	540 Broadway	SHPO Opinion: 1/3/1985

Monmouth County keeps a "Monmouth County Historic Sites Inventory" which includes all properties considered to have historical significance, in addition to those recognized by the National and New Jersey Historic registers (CMX 2010). Table 19, below, provides a list of the inventoried properties that were still intact as of March 16, 2010. These sites can also be found on Map 12.

Table 19: Monmouth County Historic Sites Inventory – Long Branch (CMX 2010)	
Site Name or Inventory Number	Address
(1325-3)	573 Berdan Place
(1325-4)	99 Branchport Avenue
(1325-5)	207 Branchport Avenue
Slocum House (1325-6)	291 Branchport Avenue
Hotel Norwood (1325-7)	336 Branchport Avenue
Long Branch Record Building (1325-9-2)	192 Broadway
St. Luke's M.E. Church (1325-10)	NE cr. Broadway and Washington Street
Garfield Grant Hotel (1325-11)	275 Broadway
(1325-12)	290 Broadway

Table 19: Monmouth County Historic Sites Inventory – Long Branch (CMX 2010)	
St. James Episcopal Church (1325-13)	300 Broadway
Long Branch Public Library (1325-14)	328 Broadway
(1325-15)	415 Broadway
(1325-16)	426 Broadway
(1325-17)	479 Broadway
First Reformed Church (1325-19)	646 Broadway
Star of the Sea Lyceum (1325-24)	NE cr. Chelsea Avenue and Third Avenue
(1325-25)	127 Chelsea Avenue
(1325-27)	163 Chelsea Avenue
Benjamin White House (1325-28)	464 Church Street
(1325-29)	25 Fifth Avenue
(1325-31)	77 Grand Avenue
(1325-32)	29 Jackson Avenue
(1325-33)	331 Liberty Street
Gerard House (1325-35)	55 Lincoln Avenue
Fraley House (1325-36)	100 Lincoln Avenue
Elberon Library (1325-37)	168 Lincoln Avenue
(1325-38)	389 Morris Avenue
The Reservation/ Navaho Lodge (1325-39)	NW of Seven Presidents Park
Sea Cliff Villa/James M. Brown House (1325-46)	981 Ocean Avenue
(1325-47)	1035 Ocean Avenue
Elberon Memorial Presbyterian Church (1325-50)	70 Park Avenue
Flinn House (1325-51)	67 Pearl Street
(1325-53)	140 Second Avenue
First Presbyterian Church (1325-55)	SW cr. Third Avenue and Chelsea Avenue
Murray's Inn (1325-56)	103 West End Avenue
Hulick House (1325-57)	119 West End Avenue
Hulick House (1325-58)	123 West End Avenue
Windmill Restaurant (1325-59)	SW cr. West End Plaza & Montgomery Avenue
(1325-60)	692 Westwood Avenue
Asbury M.E. Church (1325-61)	61 Atlantic Avenue
Star of the Sea Church (1325-62) *Christ the King Parish*	101 Chelsea Avenue
Simpson Memorial M.E. Church (1325-64)	206 Garfield Avenue
(1325-66)	337 Liberty Street

5.3 Open Space and Public Land

Open space, for the purpose of this inventory, is defined as undeveloped land which is permanently deed restricted. The presence of open space confers social, economic and ecological benefits to municipalities that preserve and protect it. Much of the tourist industry in coastal municipalities is based on the presence of public open space containing beaches and dunes and fishable waters. Extensive wetlands attract birds and birdwatchers and provide habitat for the juveniles of many commercial and sport fish species. Two County Parks, Seven Presidents Park and the Monmouth County Skate Park, are located in the City of Long Branch.

The City of Long Branch is committed to providing abundant opportunities for outdoor recreation. Numerous municipal parks are also present within the City (Map 14). The municipal parks are listed in Table 20.

Table 20: Municipal Parks (CMX 2010)		
Name	Location	Acres
Bath Avenue Park	NW corner of North Bath Ave. & 3rd Ave.	0.24
Beach	Ocean Ave. & Atlantic Ocean	17.34
Branchport Park	Atlantic Ave. & Branchport Ave.	3.01
Elberon Park (aka Truax Park)	Truax St. & Eaton Ter.	5.10
Fireman's Park	Hoey Ave. & Overlook Ave.	7.50
Florence Avenue	Florence Ave. & Mac Arthur Ave.	.49
George Naylor Park	Cherry St. & Jeffrey St.	2.38
Great Lawn	Pier Village	2.94
Hoey Avenue Park	Hoey Ave.	6.34
Jackson Woods	Calvert Ave. & Ocean Blvd.	12.78
Jerry Morgan Park*	Union Ave. & Monmouth Ave.	3.20
Manahassett Creek Park*	Long Branch Ave. & Naberal Ave.	23.85
MLK Memorial	Atlantic Ave. & Atlantic Dr.	.40
Ocean Place Promenade	Ocean Ave. between Madison & Ocean Terr.	5.00
Pinsky Plaza	Broadway & Long Branch Ave.	.60
Pleasure Bay Park	Atlantic Ave. & Pleasure Bay Dr.	5.19
Presidents Promenade	Ocean Ave. between Brighton & S. Bath Ave.	3.64
Slocum Park/Library/City Hall	N. Broadway at Lippincott Ave.	5.58
Takanassee Lake	Takanassee Lake at Lake Dr.	22.46
Third Avenue Park	3rd Ave. & Union Ave.	.19
Third Avenue Triangle	Westwood Ave. & 3rd Ave.	.19
Troutman's Greenway	Atlantic Dr. at Branchport Creek	2.00
Van Court Park	Van Court Ave. & Overlook Ave.	7.23
West End Park	Ocean Blvd. & Brighton Ave.	.92
Wilbur Ray Avenue Park	Wilbur Ray Ave. & Liberty Street	1.89
	Total	140.46
* Former Brownfields Site		

5.3.1 Remediation Efforts

One of the strategies the City of Long Branch has implemented to increase open space and recreational lands in the City has been the mitigation of abandoned or underutilized contaminated sites to create access, recreation and viable uses for the City. Recent projects are described below:

Manahassett Creek Park

This parcel was subject to well testing and monitoring by NJDEP for a 50'x30' portion of the park. This portion of the site was remediated by capping with a parking lot. The more than 23 acres comprising Manahassett Creek Park serves as the centerpiece for the City's recreation program. The park has baseball fields, Pop Warner football fields, soccer fields, a recreation building and snack bar, off-street parking, walking trails, basketball courts, tennis courts and boat ramps on the Manahassett Creek.

Jerry Morgan Park

The remediation and construction of this park was completed in 2005-2006. This site was previously a NJ Natural Gas Manufacturing Plant – MGP Site. Remediation began in the late 1990s and was led by the NJDEP. Remediation efforts included excavating 2 feet of topsoil and refilling with clean soil and re-piping for drainage. After remediation, a walkway was constructed over the creek to meet Memorial Plaza. Remediation at Memorial Plaza was completed in 2007 and Memorial Plaza was then connected to Jerry Morgan Park.

Cherry Street Park (George Naylor Park)

To fulfill a Green Acres requirement, a Phase I Assessment, as part of renovations to park, was performed. Hot spots were found in areas used by the railroad and the other business that used the property. Remediation, which included excavation and removal of topsoil, then capping and preparation of a deed restriction for digging depth, was monitored by Green Acres. Remediation, except for the monitoring of wells, is complete at the site. This park is used for baseball and basketball and also has a tot lot.

Pinksky Park (Broadway Park)

This former deteriorated 0.6 acre parking lot was remediated, constructed and completed in 2007. It hosts an interactive water feature one block from Ocean Boulevard.

Van Court Park

To fulfill a Green Acres requirement, a Phase I Assessment was performed and the required remediation was completed on this site as part of renovations to the park.

Coal Gasification Plant

The cleanup and remediation of the 12 acre Coal Gas Site on Long Branch Avenue is underway, resulting in a cleaner Troutman's Creek (Photo 3).

6.0 FOCUSED STUDY SITES

Two focused study sites were chosen for assessment as part of the field work associated with this environmental inventory: Jackson Woods and Lake Takanassee. Site visits were conducted (11-19-10 and 02-17-11) by a team including representatives from Maser Consulting P.A. and the City of Long Branch Environmental Commission (LBEC). Checklists of plants organized by life form (Trees and Saplings; Shrubs and Vines; and Herbaceous Species) including scientific and common names and habitat affiliation, were developed in the form of updated memoranda to the EC, provided herein as Appendix D. Suboptimal weather conditions, due in part to the seasons during which the study was conducted, restricted the level of detail evaluation that was possible. Nonetheless, extensive checklists of plant species (native and introduced) were developed based upon the information obtained from field observations.

6.1 Jackson Woods

Jackson Woods (Photos 6, 7, 9, 15, 17, 18) is a remnant tract of disturbed land, approximately 10.6 acres in size, located in a mostly residential setting, and characterized by a mixture of Palustrine Forested and Emergent Wetland vegetation and various forms of successional upland vegetation, as described above in Section 4.0 Biological Resources. A portion of it is used by the City to stockpile mulch; trails which provide for public access traverse the landscape; parking is provided off Ocean Boulevard, and several trails lead to adjacent streets providing neighborhood access. A largely intermittent, channelized stream flows northwestward through the parcel from Ocean Boulevard.

Common trees in the Palustrine Forested Wetland include Sour Gum (*Nyssa sylvatica*), Pin Oak (*Quercus palustris*), and Willow Oak (*Quercues phellos*). The Palustrine Emergent Wetlands are dominated by Common Reed (*Phragmites australis*), an invasive exotic species. Other invasive species include, for example, Tree of Heaven (*Ailanthus altissima*), Norway Maple (*Acer platanoides*), Japanese Knotweed (*Polygonum cuspidatum*), English Ivy (*Hedera helix*), Privet (*Ligustrum sp.),* Japanese Honeysuckle (*Lonicera japonica*), and Multiflora Rose (*Rosa multiflora*). The preliminary inventory of species (Appendix D) includes 23 trees, 21 shrubs and vines, and 58 herbaceous species.

Wildlife observed during the two site visits included mammals such as Gray squirrel and Cottontail rabbit; and birds such as Red-winged blackbird (associated with the large stand of Common Reed), Cardinal, Black-capped chickadee, Mourning dove, Blue jay, American Crow, and an unidentified species of hawk.

6.2 Takanassee Lake

Takanassee Lake (Photos 5, 8, 16, 19-25) is the downstream portion of Whale Pond Brook and is divided into six basins, separated by roads or railroad. The larger portion located west of Ocean Blvd. is generally identified by the name, but all six basins also are known as Takanassee Lake. A second large basin historically was called Hollywood Lake and a basin located upstream of Hollywood Lake historically was known as Ross Lake. The small basin west of the railroad berm is located within Hoey Avenue Park. The associated parkland along the entire lake is positioned on the banks and adjacent terraces, which include mowed lawns, seating areas, at least one fountain aerator, planted trees and shrubs, and Fireman's Memorial Park. Palustrine Aquatic Bed, Emergent, and Scrub-shrub Wetlands, as described above in Section 4.0 Biological Resources, occur in, or on the periphery of, the coastal pond. Invasive species include, for example, Indigo Bush (*Amorpha fruticosa),* Japanese Honeysuckle (*Lonicera japonica*), Multiflora Rose (*Rosa multiflora*), and Water Feather (*Myriophyllum aquaticum*). The inventory of species (Appendix D) includes 23 trees, 21 shrubs and vines, and 56 herbaceous species.

Wildlife observed during the two site visits include common mammals such as Gray squirrel and Eastern mole. Birds observed during the site visits include House sparrow, House finch, Cardinal, Black-capped chickadee, Blue jay, Canada goose, American crow, American kestrel, Turkey vulture, Mallard duck, and Canada goose, and an unidentified species of swan.

Whale Pond Brook Watershed Biological Assessment (Tiedeman and Lisa 2007) was initiated in response to the mission of the Monmouth Coastal Watershed Partnership (MCWP), which formed to develop a comprehensive approach to regional watershed management, establishing a goal to develop strategic plans to limit degradation of stream habitat quality and restore impaired streams within Monmouth County (MCWP 2002). The aquatic life of Whale Pond Brook and Takanassee Lake, which is an impoundment of Whale Pond Brook, have been sampled by Monmouth University as part of the Whale Pond Brook Biological Assessment. This study provides an inventory of freshwater fish and aquatic invertebrates residing in the fresh waters of the City of Long Branch. The freshwater fish, listed in the following table were observed. In addition, Takanassee Lake is stocked four times per year by the New Jersey Division of Fish and Wildlife to enhance recreational fishery.

Table 21: Freshwater Fishes of Long Branch (Tiedeman and Lisa 2007)

Common Name	Scientific Name	Common Name	Scientific Name
American Eel	*Anguila rostrata*	Eastern Mudminnow	*Umbra pygmaea*
Redfin Pickerel	*Exox americanus*	Common Carp	*Cyprinus carpio*
Golden Shiner	*Noteminonus crysoleucas*	Blacknose Dace	*Rhinicthys atratulus*
Common Shiner	*Luxilus cornuts*	Ironcolor Shiner	*Notropis chalybaeus*
White Sucker	*Catostomus commeroni*	Creek Chubsucker	*Erimyzon oblongus*
Eastern Banded Killifish	*Fundulus diaphanous diaphanous*	Black Crappie	*Pomoxis nigromaculatus*
Largemouth Bass	*Micropterus salmoides*	Bluegill	*Lepomis macrochirus*
Pumpkinseed	*Lepomis gibbosus*		

As part of the Whale Pond Brook Biological Assessment, aquatic invertebrates were also identified. These organisms possess varying sensitivities to pollution and are, therefore, useful in assessing the water quality of surface waterbodies. The observed invertebrates are listed in the following table.

Table 22: Aquatic Macroinvertbrates of Long Branch (Tiedeman and Lisa 2007)

Common Name	Phylum/Subphylum	Class/Subclass	Order/Family
Aquatic Worms	Annelida	varies	Oligochaeta
Leeches	Annelida	Not identified	Hirudinea
Gilled Snails	Mollusca	Gastropoda/Prosobranchia	n/a
Physid Snails	Mollusca	Gastropoda/Pulmonata	n/a
Aquatic Sowbugs	Arthropoda/Crustacea	Malocostraca	Isopoda/Oniscidae
Scuds	Arthropoda	Malacostraca	Amphipoda
Dragonfly Larvae	Arthropoda/Atelocerata	Hexapoda/Insecta	Odonata/Anisoptera
Damselfly Larvae	Arthropoda/Atelocerata	Hexapoda/Insecta	Odonata/Zygoptera
Hellgrammites (Dobsonfly Larvae)	Arthropoda/Atelocerata	Hexapoda/Insecta	Megaloptera/Corydalidae
Beetle Larvae	Arthropoda/Atelocerata	Hexapoda/Insecta	Coleoptera/varies
Cranefly Larvae	Arthropoda/Atelocerata	Hexapoda/Insecta	Diptera/Tipulidae
Blackfly Larvae	Arthropoda/Atelocerata	Hexapoda/Insecta	Siptera/Simulidae

The eastern most portion of Takanassee Lake is unique in its connection to the Atlantic Ocean through a historical flume structure. This connection represents a potential for reintroduction of species such as Alewife and Blueback Herring (River Herring), which could become re-established in the freshwaters of the watershed. River Herring are a vital part of the marine food web and require both fresh and marine waters to complete their life cycle. During the spring of each year, Alewife and Blueback herring would sense the freshwater outflow and swim into the lake system and freshwater habitat looking for suitable spawning grounds. The existing manmade impediment blocks the River Herring at the base of the dam. Man made 'fish ladders' are engineered structures that facilitate fish passage through systems such as this. River Herring are a "species of concern" and are close to being re-classified as an "Endangered species"; few remain in Northern Monmouth County.

Whale Pond Brook Watershed Biological Assessment (Tiedeman and Lisa 2007) included a series of recommendations to improve the water quality of Whale Pond Brook.

- Maximize the quality of stream riparian corridor along Whale Pond Brook.
- Improve in-stream characteristics of Whale Pond Brook.
- Restoration of ponds on Whale Pond Brook and Takanassee Lake.
    - Improve recreational opportunities and fishery habitat.
    - Address nonpoint source pollutants entering into the lake and ponds.
    - Provide a plan for addition of native plants and vegetation along the banks and adjacent mowed areas to serve as a buffer zone to collect nutrients, sediments, and other pollutants and enhance the wildlife habitats around the lakes and ponds.
    - Implement a "Streamside Living Program" to educate homeowners and private landowners on proper stewardship practices.

6.3 Walking Tour of Heritage Trees

As a result of the two site visits to the various portions of Takanassee Lake and the adjacent parkland, an opportunity to design one of several walking tours of the City's important, large, or unusual trees has become apparent. Native, naturalized, and planted trees (individual or rows of street trees) make up this rich assemblage. The following grouping of important trees can be observed at (1) Hoey Avenue Park (west of the railroad berm across the lake); (2) walking west to Woodgate Avenue; (3) continuing west to Norwood Avenue (and then to Red Oak Drive) where

Whale Pond Brook empties into the upper end of Takanassee Lake at the boundary between Ocean Township and the City of Long Branch. Additional tree species also can be observed at the various sites, but these are common, small, or otherwise potentially less significant. From a diversity perspective, however, the total of all tree species (ca. 24) for Takanassee Lake Park and vicinity (see Appendix D) is impressive.

East of Hoey Avenue to railroad berm (Hoey Avenue Park and vicinity)

- Black Locust *Robinia pseudoacacia* (grove on north margin of park)
- Cottonwood *Populus deltoides* (one tree along railroad berm)
- Smooth Alder *Alnus serrulata* (Hoey Avenue Park, lake margin)
- Sour/Black Gum *Nyssa sylvatica* (grove in Hoey Avenue Park)
- Sycamore *Platanus occidentalis* (Overlook Avenue in private yard)

West of Hoey Avenue to Woodgate Avenue

- Swamp White Oak *Quercus bicolor* (one tree on north side of lake)

Woodgate Avenue west to Van Court Avenue

- Pin Oak *Quercus palustris* (planted along Overlook Avenue)
- Tulip Tree *Liriodendron tulipifera* (one tree on Overlook Avenue, lake margin)
- White Ash *Fraxinus americana* (planted along Overlook and Van Court Avenues)

Van Court Avenue west to Norwood Avenue

- American Beech *Fagus grandifolia* (row along Red Oak Drive, private yard)
- Bald Cypress *Taxodium distichum* (one tree at Van Court and Elinore Avenues)
- Black Locust *Robinia pseudoacacia* (lake margin, Red Oak Drive)
- Linden/Basswood *Tilia americana* (Elinore Avenue and Highland Avenue)
- Smooth Alder *Alnus serrulata* (lake margin, Van Court Avenue)
- Sycamore *Platanus occidentalis* (lake margin, Red Oak Drive)

Jackson Woods also has several heritage trees of note. Particularly large examples of Willow Oak occur along the stream channel and large examples of Sour Gum are located in the southwest portion of the site. Refer to Appendix D for a checklist of all trees (native, naturalized, and planted) observed at Jackson Woods and Takanassee Lake and Park and adjacent lands.

6.4 Fisherman's Survey

The Environmental Commission of the City of Long Branch interviewed local fishermen to find out what fish species they were catching in the City of Long Branch and in the nearby tidal estuaries and ocean waters. Table 23 presents the results of this survey.

Table 23: Observed Game Fish Species of the City of Long Branch (LBEC 2011)

Freshwater Species		Freshwater Species	
Common Name	*Scientific Name*	*Common Name*	*Scientific Name*
American Eel	*Anguilla rostrata*	Common Carp	*Cyprinus carpio*
Blue Catfish	*Ictalarus spp..*	Green Sunfish	*Lepomis cyanellus*
Bluegill	*Lepomis macrochinus*	Largemouth Bass	*Icropterus salmoides*
Brook Trout	*Salvelinus fontenalis*	Northern Pike	*Esox lucius*
Brown Trout	*Salmo trutta*	Smallmouth Bass	*Micropterus dolomieu*
Bullhead Catfish	*Ameirus spp.*	Sunfish	*Eliacanthus spp.*
Calico Bass (Black Crappie)	*Pomoxis nigromaculatus*	Tiger Trout	*Salmo trutta X Salvelinus fontinalis*

Table 23: Observed Game Fish Species of the City of Long Branch (LBEC 2011)			
Calico Bass (White Crappie)	*Pomoxis annularis*	White Perch	*Morone saxitilis*
Catfish	*Ameirus spp.*	Yellow Perch	*Perca flavescens*
Chain Pickerel	*Exox niger*		
Saltwater Species		Saltwater Species	
Albacore	*Thunnus alalunga*	Red Drum	*Sciaenops ocellatus*
American Eel	*Anguilla rostrata*	Sandbar (Brown) Shark	*Carcharhinus plumbeus*
Atlantic Bonito	*Sarda sarda*	Scup (Porgy)	*Senotomus chrysops*
Atlantic Cod	*Gadus morhua*	Spanish Mackerel	*Scomberomorusmaculates*
Black Sea Bass	*Centropristis striata*	Spot	*Leiostomus xanthurus*
Blackfish	*Tautoga onitis*	Striped Bass	*Morone saxitilus*
Bluefish	*Pomatomus saltatrix*	Summer Flounder (Fluke)	*Paralichtus dentatus*
Hickory Shad	*Alosa mediocris*	Weakfish	*Cynoscion regallis*
Little Tunny	*Euthynnus alletteratus*	Winter Flounder	*Pleuronectes americanus*
Lobster	*Homarus americanus*	Winter Skate	*Raja ocellata*
Pollock	*Pollachius virens*		
*As reported by local fisherman			

7.0 FUTURE CONSIDERATIONS

By its nature, this ERI mostly focused on readily available existing information to characterize the environmental resources of Long Branch. Some of this information is based on empirical data, while other information is somewhat dated and may not accurately reflect actual conditions. Future consideration to fill these data gaps may include but not be limited to:

- Better understanding of vacant land and its environmental sensitivity.
- Mapping of significant groundwater recharge areas.
- Literature review of existing surface water quality data.
- Literature review of existing biological data for aquatic resources.
- Creel surveys to better document recreational fishing.
- Field verification and mapping of all wetlands.
- Identification and mapping of sensitive habitats and resources.
- Mapping and prioritizing for eradication of major stands of invasive exotic plant species.
- General field verification of existing data sources.
- Development of enhancement and management plans for Jackson Woods and Takanassee Lake and Park.
- Development of conceptual watershed management plans for Manahassett Creek including Jackson Woods, and for Whale Pond Brook including Takanassee Lake.

Ongoing studies by the Long Branch Environmental Commission could also include items such as but not limited to:

- Takanassee Lake Water Quality.
- Jackson Woods Invasive Species Control.
- Manahassett and Troutman's Creek's Shoreline Stabilization.
- Urban Forest Plan.
- Heritage Tree Walking Tours.

8.0 REFERENCES

Adams, LW. Urban Wildlife Habitats: A Landscape Perspective of Wildlife Habitats, Volume 3). U Minnesota Press, Minneapolis, MN: 186 pp.

Bascom, W. 1980. *Waves and Beaches*. Anchor Press/Doubleday, Garden City, New York. p.366.

Beahm, J. 2008. Municipal Stormwater Management Plan, Long Branch City, Monmouth County, New Jersey Long Branch Planning Board, Long Branch, NJ

City of Long Branch Planning and Zoning Office and CMX. 2009. Municipal Self-Assessment Report, City of Long Branch, Monmouth County, New Jersey: 94 pp

City of Long Branch. 2008. City of Long Branch Beach Management Plan for the protection of Federally and State-listed Species. In cooperation with New Jersey Department of Environmental Protection, Division of Fish and Wildlife, Endangered and Nongame Species Program and United States Department of the Interior, Fish and Wildlife Service, New Jersey Field Office.

Cowardin, L. M., V. Carter, F. Golet, and E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Office of Biological Sciences, U. S. Fish and Wildlife Service. FWS/OBS-79/31.

CMX (in conjunction with The City of Long Branch, Office of Administration, Office of Planning and Zoning). 2010. 2009 Master Plan, City of Long Branch, Monmouth County New Jersey, adopted March 16, 2010.

Dunk, Richard.2005. *Offshore Wind Analysis for New Jersey and Delaware*. Rutgers University Institute of Marine and Coastal Sciences (http://marine.rutgers.edu/cool/weather/wind_analysis/phase2.pdf). (Accessed 01-04-11).

Federal Interagency Committee for Wetland Delineation. 1989. Federal Manual for Identifying and Delineating Jurisdictional Wetlands. US Army Corps of Engineers, US Environmental Protection Agency, Us Fish and Wildlife Service, and USDA Soil Conservation Service. Washington, DC Cooperative technical publication: 76 p. plus appendices

Ferren and Olson. 2005. Rare Plant Assessment for Wreck Pond, Boroughs of Sea Girt, Spring Lake, and Spring Lake Heights, and Township of Wall, Monmouth County, New Jersey. Prepared for Natural and Historic Resources Office of Engineering and Construction, New Jersey DEP, Toms River, NJ. Prepared by Maser Consulting PA., Red Bank, NJ, October 27, 2005. MC Project No. 05000710A.

Gournich, V, S. Couch and EK Hartig. 2002. Impacts of Sea Level Rise in the New York City Metropolitan Area. *Global and Planetary Changes 32: 61-88*

Grant, D. 2009 Birds at Sandy Hook. (http://ux.brookdalecc.edu/staff/sandyhook/tripdata/creature/bird/index.htm). (Accessed 02-06-11).

Grant, D. 2010 Sandy Hook's Linnean List. (http://ux.brookdalecc.edu/staff/sandyhook/taxonomy/index.htm). (Accessed 05-09-11).

Hazard, S. 2010The City Beyond the Bluffs: The Life and Times of Long Branch. Donning Co. Virginia Beach, VA: 142 pp.

Greenwire. 2010. Wildlife: An urban jungle grows wild as it greens (http://www.eenews.net/public/Greenwire/2010/08/09/2). (Accessed 01-06-11).

Kane, RP. The Ecological and Biological Benefits of Open Space. New Jersey Audubon Society. (http://www.greatswamp.org/publications/kane.htm). (Accessed 01-12-11).

Long Branch Environmental Commission. 2011. Long Branch Game Fish List, personal correspondence with Carol Mellaci. Long Branch, NJ

Maser Consulting P.A. and George Henry George Partners, L.L.C. 2010. Coastal Monmouth Plan: Volume I, Regional Profile. (http://co.monmouth.nj.us/documents/24%5CCMP%20Vol%201.pdf). (Accessed 01-12-11).

Mitsch, W. J. and J. G. Gosselink. 1986. Wetlands. Von Nostrand Reinhold, New York. 537 p.

Monmouth Coastal Watersheds Partnership (MCWP). 2001. Monmouth Coastal Watersheds Partnership: Goals and Objectives. Adopted September 20111. (http://www.shore.co.monmouth.nj.us/area12)

Monmouth County Environmental Council. 1988. Natural Features Study for Monmouth County. Second reprinting with additions and deletions.

Monmouth County Health Department (MCHD). 2005. Natural and Social Features of Monmouth County. (http://co.monmouth.nj.us/documents%5C121%5CNaturalFeaturesAndHistory.pdf). (Accessed 03-03-11).

Monmouth County Planning Board (MCPB) and Monmouth County Environmental Council (MCEC). 2000. Ecological Resource Inventory. Mid-Coast Environmental Planning Region, Monmouth County, New Jersey. Publication of MCPB and MCEC. Freehold, NJ: 36pp.

National Academy of Sciences. 2001. Compensating for Wetland Losses under the Clean water Act. National Academy Press, Washington, DC. 322p.

National Audubon Society. 2011. Christmas Bird Count, New Jersey Region, Long Branch [NJLB], 40.2333°, -74.0667°, Count Year: 111. (http://birds.audubon.org/christmas-bird-count)

Natural Resource Conservation Service (NRCS). 2006. *Web Soil Survey*. (http://websoil survey.nrcs.usda.gove/app). (Accessed 01-06-11).

New Jersey Division of Fish and Wildlife (NJDFW). 2011. General Trout Information. New Jersey Fish & Wildlife Digest. (http://www.state.nj.us/dep/fgw/pdf/2011/digfsh11.pdf)

NJDEP Bureau of Marine Water Monitoring. 2009. 2009 Shellfish Growing Water Classification Chart 3. (www.nj.gov/dep/wms/bmw). (Accessed 01-13-11).

NJDEP-NHP. 2011. Rare Plant Species and Ecological Communities Presently Recorded in the Natural Heritage Database – Monmouth County. NJ Department of Environmental Protection, Natural Heritage Program. (Downloaded 01-17-11)

NJDEP. 2011. *Surface Water Quality Standards (N. J. A. C. 7:9B)*. Trenton, NJ

NOAA. 2011. Guide to Essential Fish Habitat Designations in the Northeastern United States. (http://www.nero.noaa.gov/hcd/webintro.html). (Accessed 03-03-11).

NOAA, National Weather Service. 2005. Degree Day Explanation http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/degree_days/ddayexp.shtml. (Accessed 01-04-11).

Novitzki, R. P. 1994. EMAP- Wetlands – A Program for Assessing Wetland Condition. In, W. J. Mitsch (ed.), Global Wetlands – Old World and New. Elsevier Science Publishers. P. 691-709.

Novitzki, R. P, R. D. Smith, and J. D. Fretwell. 1997. Restoration, Creation, and Recovery of Wetlands – Wetland Functions, Values, and Assessment. USGS Water Supply Paper 2425. http://water.usgs.gov/nwsum/WSP2425/functions.html. (Accessed 01-06-11).

Office of the New Jersey Climatologist (ONJSC). 2006a. *The Climate of New Jersey*. (http://climate.rutgers.edu/stateclim/?section=njcp&target=NJCoverview). (Accessed 01-04-11).

Office of the New Jersey Climatologist. 2006b. *Historical Monthly Station Data*. (http://climate.rutgers.edu/stateclim_v1/monthlydata/index.html)

Owens, JF, PJ Sugarman, NF Sohl, RA Parker, HF Houghton, RA Volkert, AA Drake, and RC Orndorff. 1998. Bedrock Geology Map of Central and Southern New Jersey. USGS and NJ Geological Survey. Series Map 1-2540-B.

Previti, A. 2002. M*aster Plan Re-Examination Report, City of Long Branch, Monmouth County, New Jersey*. Walker, Previti, Holmes & Associates, Marmora, NJ

Robichaud, Collins, BR, & KH Anderson. 1994. *Plant Communities of New Jersey: A Study in Landscape Diversity.* Rutgers University Press. New Brunswick, NJ: 287 pp.

Sather, J. H. and R. D. Smith. 1984. An Overview of Major Wetland Functions and Values. Performed for Western Energy and Land Use Team, Division of Biological Services, Fish and Wildlife Service, US Dept. of Interior. FWS/OBS-84-18. September 1984.

Strahler, Ah, AN Strahler. 1992. Modern Physical Geography (Fourth Edition). John Wiley and Sons, Inc. New York. 638 pp.

Smith, R. D., A. Ammann, C. Bartoldus, and M. M. Brinson. 1995. An Approach for Assessing Wetland Functions Using Hydrogeomorphic Classification, Reference Wetlands, and Functional Indices. US Army Corps of Engineers, Waterways Experiment Station. Wetlands Research Program Technical Report WRP-DE-9. October 1995- Final Report.

Thomas, EF. 2011. Historic Views of Long Branch. Edward F. Thomas, curator, ©2011. (www.historicLongBranch.org. (Accessed 05-03-2011)

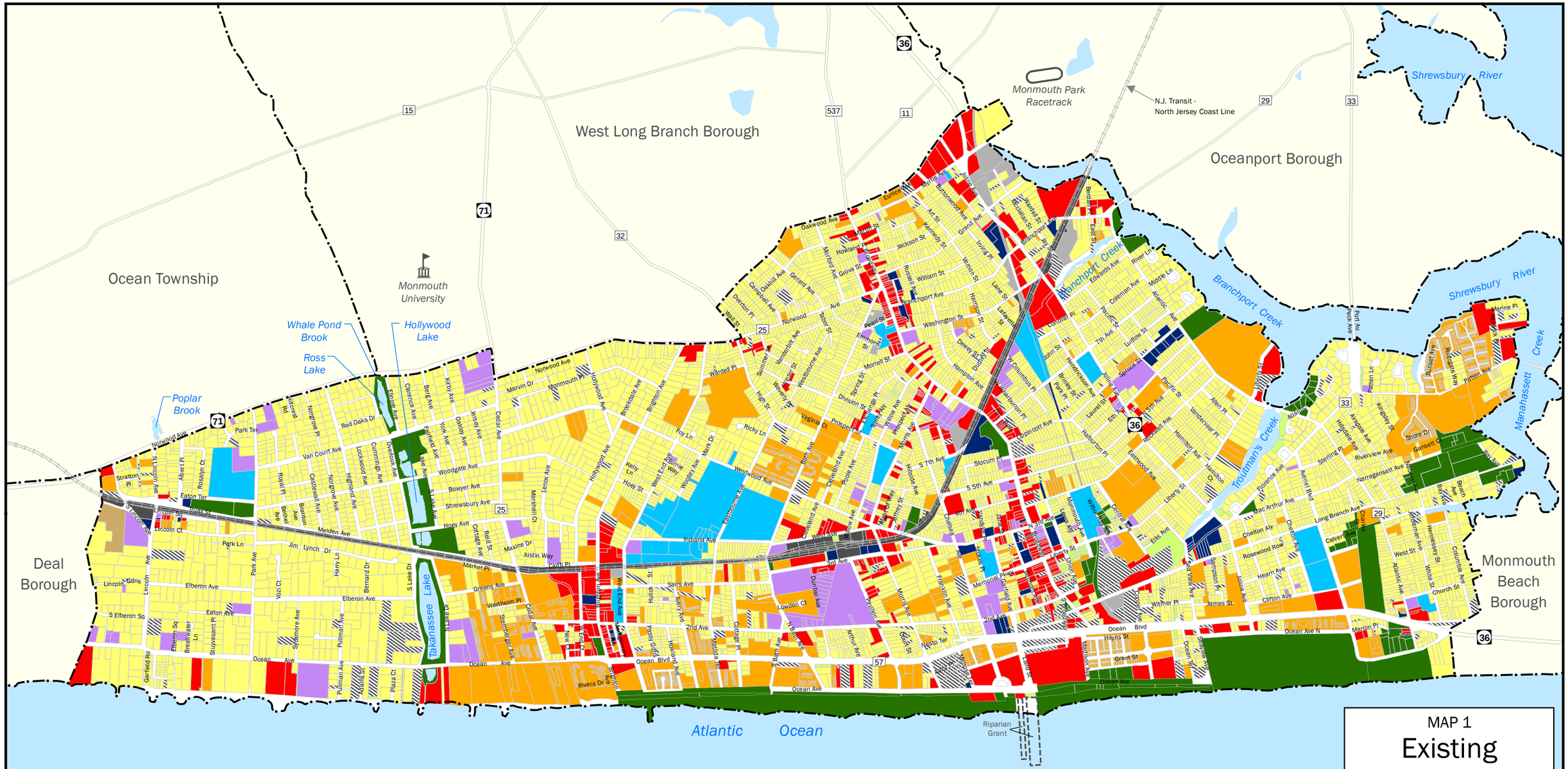
The Urban Forest Project. accessed 2011. Planting Seeds in Your Community. (http://www.ufp-global.com/). (Accessed 01--06-11)

Tiedeman, JA, J Lisa. 2007. Whale Pond Brook Watershed Biological Assessment: Final Report. Monmouth University, West Long Branch, NJ

United States Department of Energy, Wind and Water Program. 2009. New Jersey 50-Meter Wind Resource Maps. (http://www.windpoweringamerica.gov/where_is_wind_new_jersey.asp). (Accessed 02-20-11).

Appendices

Appendix A
Environmental Inventory Maps



Legend

- Railroad
- Municipal Boundary
- Parcel
- Water Body

Data Sources:
Existing Land Use:
City of Long Branch,
ModVI Data, Realquest.com &
New Jersey Association
of County Tax Boards
Other Data: Monmouth County GIS

Existing Land Use

- Residential
- Multi-Family Residential
- Commercial
- Farmland
- Industrial/Utilities
- Railroad
- Public School
- Public Buildings/Facilities
- Institutional, Church & Charitable Property
- Parks & Public Open Space
- Public Vacant Land
- Private Vacant Land

1 inch = 1,600 feet

0 400 800 1,600 2,400 Feet

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Note:
The information on this map was taken from the 2009 Master Plan for the City of Long Branch which was created by CMX, Inc.

MAP 1

Existing Land Use

2010 ENVIRONMENTAL RESOURCE INVENTORY

City of Long Branch

Monmouth County, New Jersey

November 2010

Note:
The information on this map was taken from the 2008 Master Plan for the City of Long Branch which was created by CMX, Inc.

NJ Transit # 831
to Red Bank Borough

NJ Transit # 837
to Ocean Township

West Long Branch Borough

Ocean Township

Oceanport Borough

Deal Borough

Monmouth Beach Borough

Monmouth University

Monmouth Park Racetrack

N.J. Transit -
North Jersey Coast Line

Broadway at Norwood Ave

Long Branch Station

Rail Station

Elberon Station

Whale Pond Brook

Ross Lake

Hollywood Lake

Poplar Brook

Takanassee Lake

Shrewsbury River

Branchport Creek

Trouman's Creek

Manahassett Creek

Atlantic Ocean

Riparian Grant

Proposed Pier & Ferry Terminal

Legend

- Railroad
- Municipal Boundary
- Parcel
- Water Body
- Evacuation Routes

Classification
- Urban Principal Arterial
- Urban Minor Arterial
- Urban Collector
- Transit Village (1/4 Mile)

- NJ Transit - North Jersey Coast Line
- NJ Transit Train Station
- NJ Transit Bus Stop
- Ferry Terminal

NJ Transit Bus Route
- Route 831
- Route 837

Academy Bus Stop
- Point Pleasant to Port Authority
- Long Branch to Wall St, NYC

- 1/4 Mile Walking Distance
- 1/2 Mile Walking Distance

Walking distance to Mass Transit - LEED for Neighborhood Development (LEED-ND) Rating System; Site Location and Linkage (SLL) Prerequisite 1 "Smart Location", Option 3." Source: United States Green Building Council; Leadership in Energy and Environmental Design (LEED).

Data Sources:
Functional Classification: NJDOT, 2007
City of Long Branch, 2008
Evacuation Routes: Monmouth County, 2008

Mass Transit Service: NJ Transit, 2008
Academy Bus Stop: Academy Bus, 2008
Other Data: Monmouth County GIS

1 inch = 1,600 feet

0 400 800 1,600 2,400 Feet

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MAP 2

Non-Vehicular Mobility

2010 ENVIRONMENTAL RESOURCE INVENTORY

City of Long Branch
Monmouth County, New Jersey
November 2010

West Long Branch Borough

Ocean Township

Oceanport Borough

Deal Borough

Monmouth Beach Borough

Monmouth Park Racetrack

N.J. Transit - North Jersey Coast Line

Monmouth University

Whale Pond Brook

Ross Lake

Hollywood Lake

Poplar Brook

Takanassee Lake

Branchport Creek

Shrewsbury River

Troutman's Creek

Manahassett Creek

Atlantic Ocean

Riparian Grant

Legend

- Railroad
- Municipal Boundary
- Parcel
- Water Body

Data Sources:
NJDEP
Monmouth County GIS

Note:
New Jersey Average Wind Speed needed for power generation:
6.5 m/s at 80 meters

Wind Data Source:
Wind resource estimates developed by AWS Truewind,LLC for windNavigator ®.
Web: http://navigator.awstruewind.com
www.awstruewind.com. Spatial resolution of wind resource data: 2.5 km.
Projection: UTM Zone 17 WGS84.

Wind Speed m/s

> 10.0
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
< 4.0

W N S E

1 inch = 1,600 feet

0 400 800 1,600 2,400 Feet

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MAP 3
JANUARY 2011

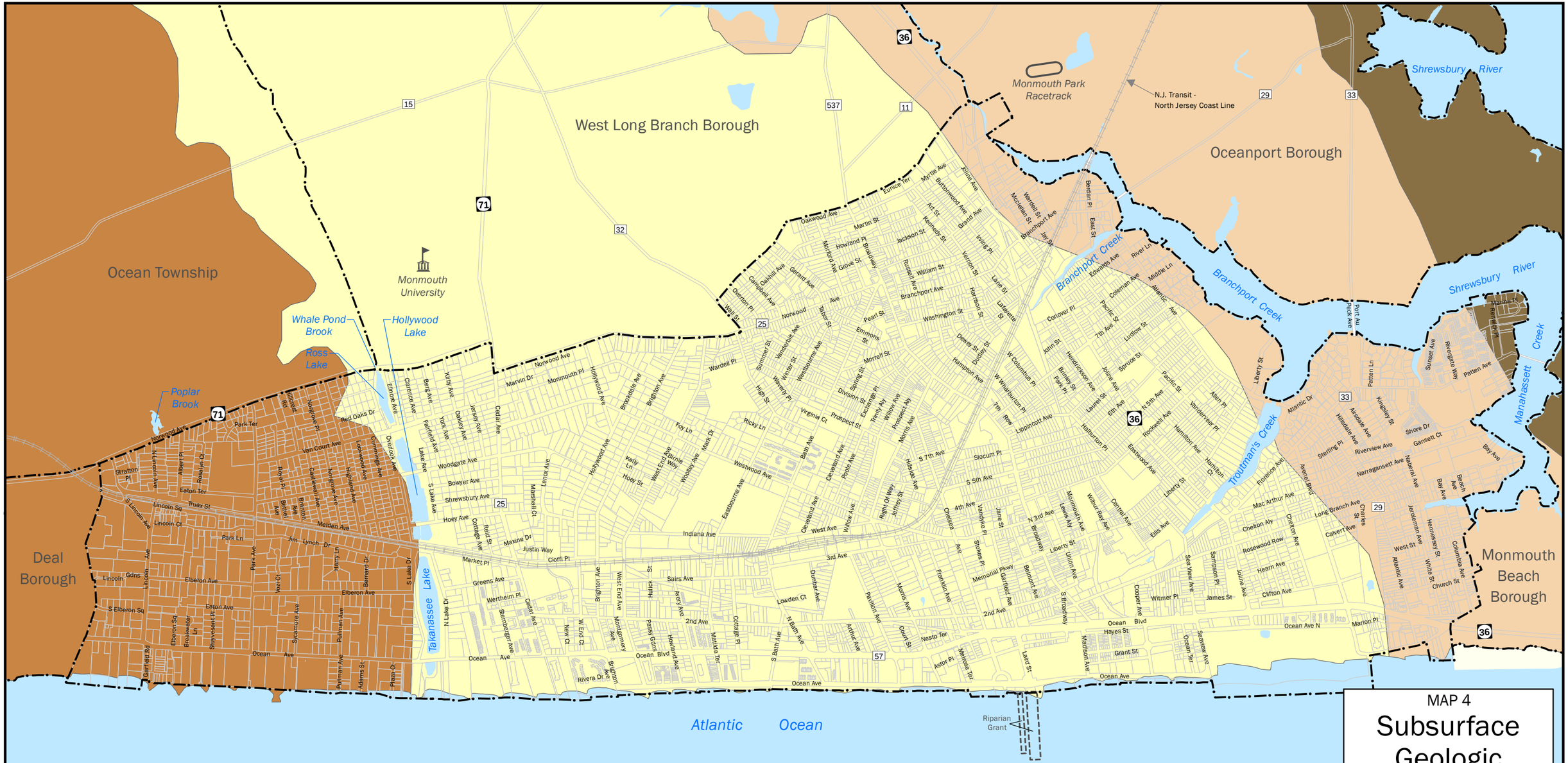
Wind Energy

2010 ENVIRONMENTAL RESOURCE INVENTORY

City of Long Branch

Monmouth County, New Jersey

November 2010



Legend

- Railroad
- Municipal Boundary
- Parcel
- Water Body

- Tht - Hornerstown Formation
- Tmq - Manasquan Formation
- Kt - Tinton Formation
- Tvt - Vincentown Formation

Data Sources:
Threatened or Endangered Species Habitat: NJDEP, Nov. 2007
May 2008 Long Branch Beach Management Plan
Other Data: Monmouth County GIS

1 inch = 1,600 feet

0 400 800 1,600 2,400 Feet

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SUBSURFACE GEOLOGIC FORMATIONS		
SYMBOL	**NAME**	**LITHOLOGY**
Kt	Tinton Formation	quartz sand, glauconitic, locally indurated
Tht	Hornerstown Formation	glauconite sand, fine- to medium-grained
Tvt	Vincentown Formation	quartz sand, medium-grained, clayey; and glauconitic near base; locally a calcarenite or coquina
Tmq	Manasquan Formation	quartz-glauconite sand, clayey; and fine grained quartz sand or silt

MAP 4

Subsurface Geologic Formations

2010 ENVIRONMENTAL RESOURCE INVENTORY

City of Long Branch

Monmouth County, New Jersey

November 2010

Legend

- Railroad
- Municipal Boundary
- Parcel
- Water Body
- Elevation Contours

Data Sources:
NJDEP
Monmouth County GIS

Steep Slope Data

- Slopes 10-15%
- Slopes 15-20%
- Slopes 20% & Greater

1 inch = 1,600 feet

0 400 800 1,600 2,400 Feet

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MAP 5

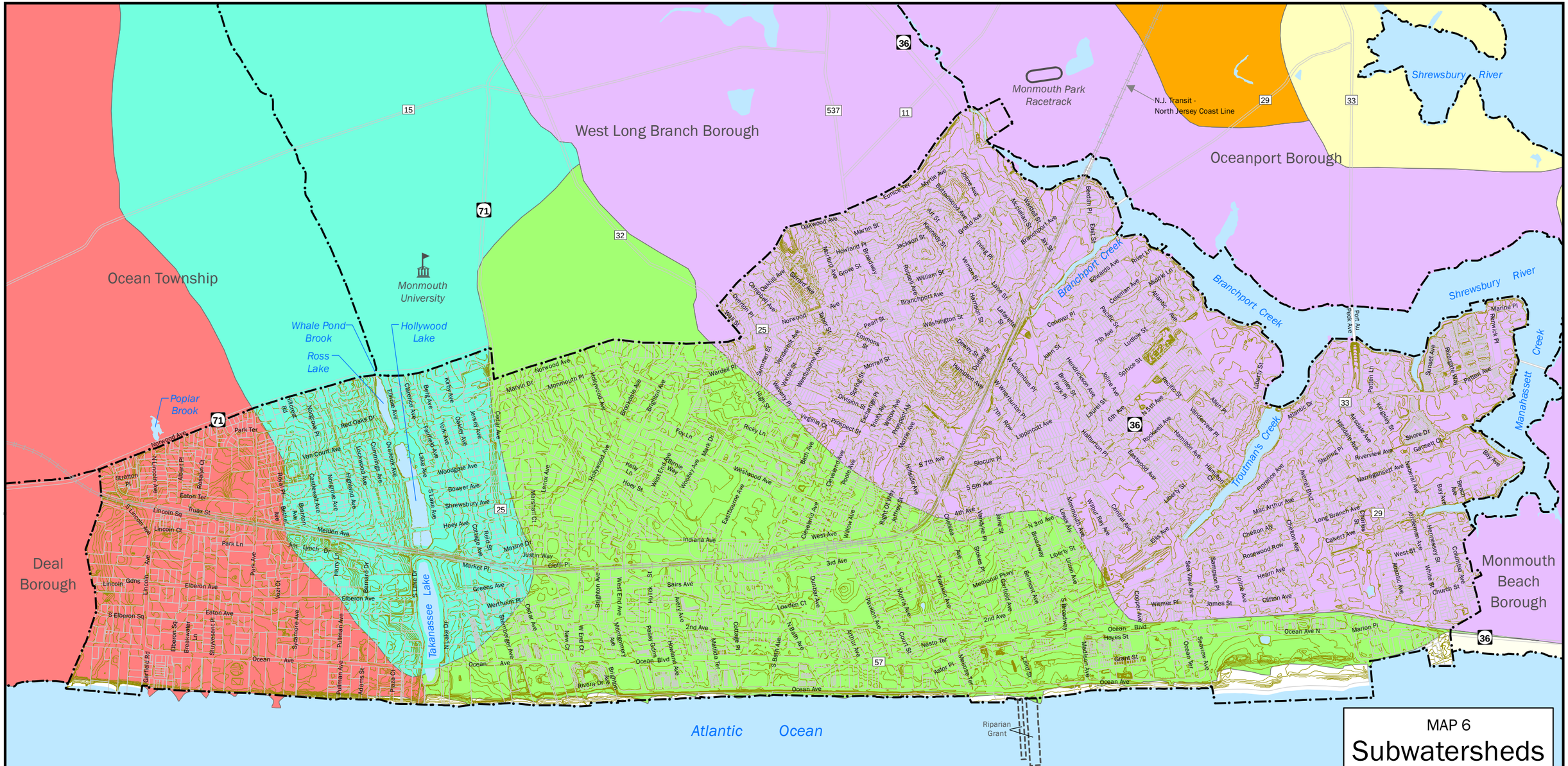
Topography & Steep Slopes

2010 ENVIRONMENTAL RESOURCE INVENTORY

City of Long Branch

Monmouth County, New Jersey

November 2010



Legend

- Railroad
- Municipal Boundary
- Parcel
- Water Body
- Elevation Contours

Data Sources:
NJDEP
Monmouth County GIS

Subwatersheds by name DEPHUC14

- Branchport Creek
- Long Branch direct Atlantic drainage
- Parkers Creek / Oceanport Creek
- Poplar Brook
- Shrewsbury River (above Navesink River)
- Whale Pond Brook

Troutman's Creek = FW2-NT/SE1
Branchport Creek = FW2-NT/SE1
Manahassett Creek = FW2-NT/SE1
Whale Pond Brook = FW2-NT/SE1
Poplar Brook = FW2-NT/SE1
Takanassee Lake = FW2-NT/SE1

(As defined in section 3.4.1, page 23 of this report)

NT = Non-Trout

N W E S

1 inch = 1,600 feet

0 400 800 1,600 2,400 Feet

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MAP 6

Subwatersheds HUC14

2010 ENVIRONMENTAL RESOURCE INVENTORY

City of Long Branch

Monmouth County, New Jersey

November 2010

West Long Branch Borough

Ocean Township

Oceanport Borough

Deal Borough

Monmouth Beach Borough

Monmouth University

Monmouth Park Racetrack

N.J. Transit - North Jersey Coast Line

Whale Pond Brook

Ross Lake

Hollywood Lake

Poplar Brook

Takanassee Lake

Branchport Creek

Troutman's Creek

Shrewsbury River

Manahassett Creek

Atlantic Ocean

Riparian Grant

FrrC HumAt UdaB EvuB ShrA HofB AptAv UdauB FrkC FrkB AtsA KkhB EveC EvuB HorBr

Legend

- Railroad
- Municipal Boundary
- Parcel
- Water Body
- Soils Data SSURGO

Data Sources:
NJDEP
Monmouth County GIS

1 inch = 1,600 feet

0 400 800 1,600 2,400 Feet

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SOILS DATA	
SYMBOL	DESCRIPTION
AptAv	Appoquinimink-Transquaking-Mispillion complex, 0 to 1 percent slopes, very frequent
AtsA	Atsion sand, 0 to 2 percent slopes
EveC	Evesboro sand, 5 to 10 percent slopes
EvuB	Evesboro-Urban land complex, 0 to 5 percent slopes
FrkB	Freehold sandy loam, 2 to 5 percent slopes
FrkC	Freehold sandy loam, 5 to 10 percent slopes
FrrC	Freehold-Urban land complex, 0 to 10 percent slopes
HofB	Holmdel-Urban land complex, 0 to 5 percent slopes
HorBr	Hooksan sand, 0 to 5 percent slopes, rarely flooded
HumAt	Humaquepts, 0 to 3 percent slopes, frequently flooded
KkhB	Klej loamy sand-Urban land complex, 0 to 5 percent slopes
ShrA	Shrewsbury sandy loam, 0 to 2 percent slopes
UdaB	Udorthents, 0 to 8 percent slopes
UdauB	Udorthents-Urban land complex, 0 to 8 percent slopes

MAP 7

Soils

2010 ENVIRONMENTAL RESOURCE INVENTORY

City of Long Branch

Monmouth County, New Jersey

November 2010

Legend

- Streams
- Railroad
- Municipal Boundary
- Pier
- Parcel
- Water Body

Data Sources:
NJDEP
Monmouth County GIS

- AGRICULTURAL WETLANDS (MODIFIED)
- DECIDUOUS SCRUB/SHRUB WETLANDS
- DECIDUOUS WOODED WETLANDS
- DISTURBED WETLANDS (MODIFIED)
- HERBACEOUS WETLANDS
- MANAGED WETLAND IN BUILT-UP MAINTAINED REC AREA
- MANAGED WETLAND IN MAINTAINED LAWN GREENSPACE
- PHRAGMITES DOMINATE INTERIOR WETLANDS
- SALINE MARSH (HIGH MARSH)
- VEGETATED DUNE COMMUNITIES

N W S E

1 inch = 1,600 feet

0 400 800 1,600 2,400 Feet

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Note:
The wetlands information shown on this map was taken from NJDEP databases. Actual wetland areas may be more or less extensive than what is shown hereon. The exact location and extent of wetlands can only be determined through field verification.

Note:
The information on this map was taken from the 2009 Master Plan for the City of Long Branch which was created by CMX, Inc.

MAP 8

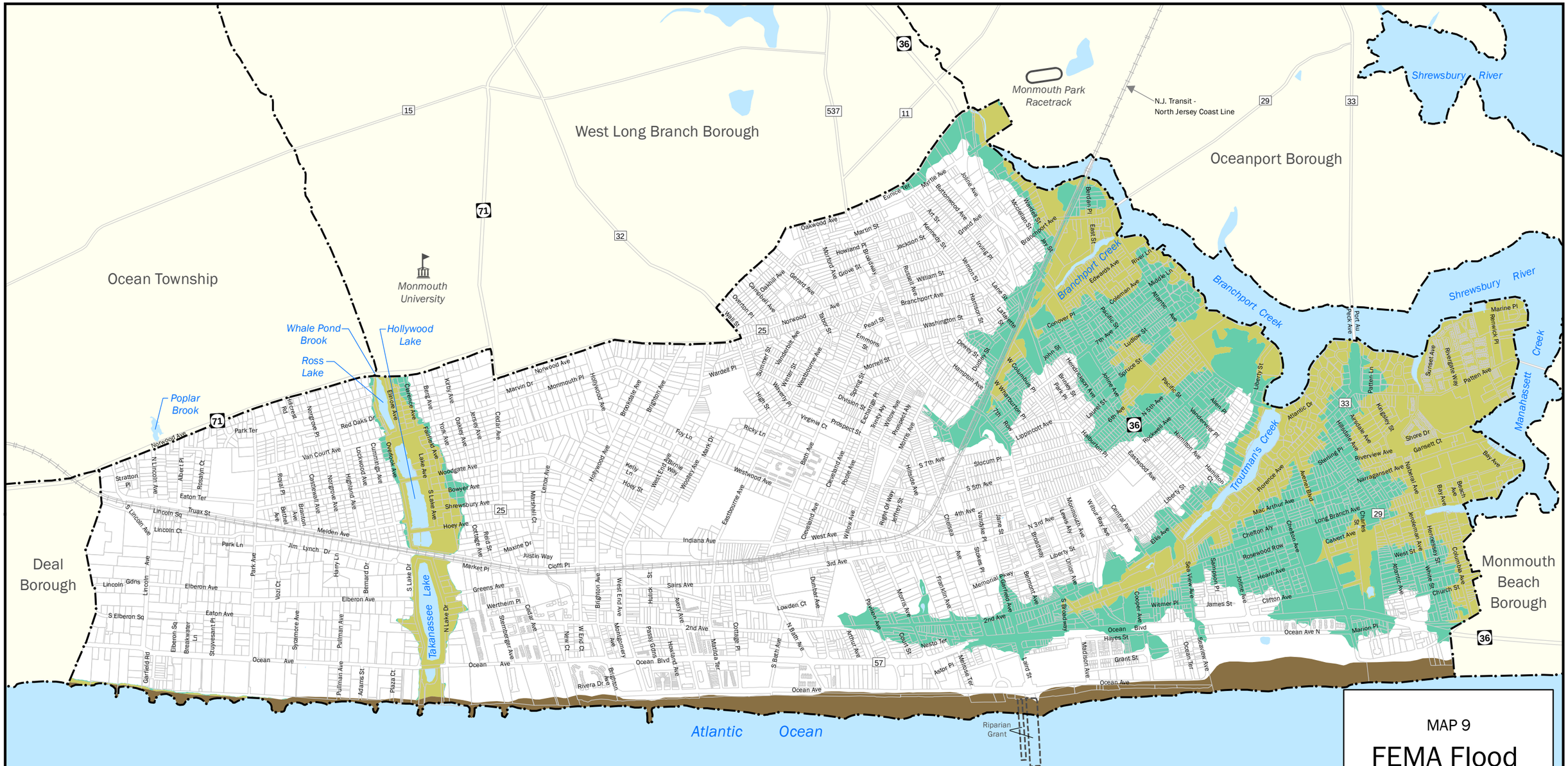
Wetlands

2010 ENVIRONMENTAL RESOURCE INVENTORY

City of Long Branch

Monmouth County, New Jersey

November 2010



Legend

- Municipal Boundary
- Railroad
- Parcel
- Water Body

Flood Hazard Area

- AE: An area inundated by 100-year flooding, for which Base Flood Elevations (BFEs) have been determined.
- VE: An area inundated by 100-year flooding with velocity hazard (wave action); Base Flood Elevations (BFEs) have been determined.
- X500: An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 100-year flooding.

Data Sources:
Flood Hazard Area:
FEMA (Draft DFIRM), 2008
Other Data: Monmouth County GIS

The Federal Emergency management Agency (FEMA) has released draft Flood Insurance Rate Maps for Long Branch. At the time of this report, the City was still reviewing the draft maps to ensure that updated road elevations and drainage improvements have been taken into account in the delineation of the flood hazard areas.

1 inch = 1,600 feet

0 400 800 1,600 2,400 Feet

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MAP 9

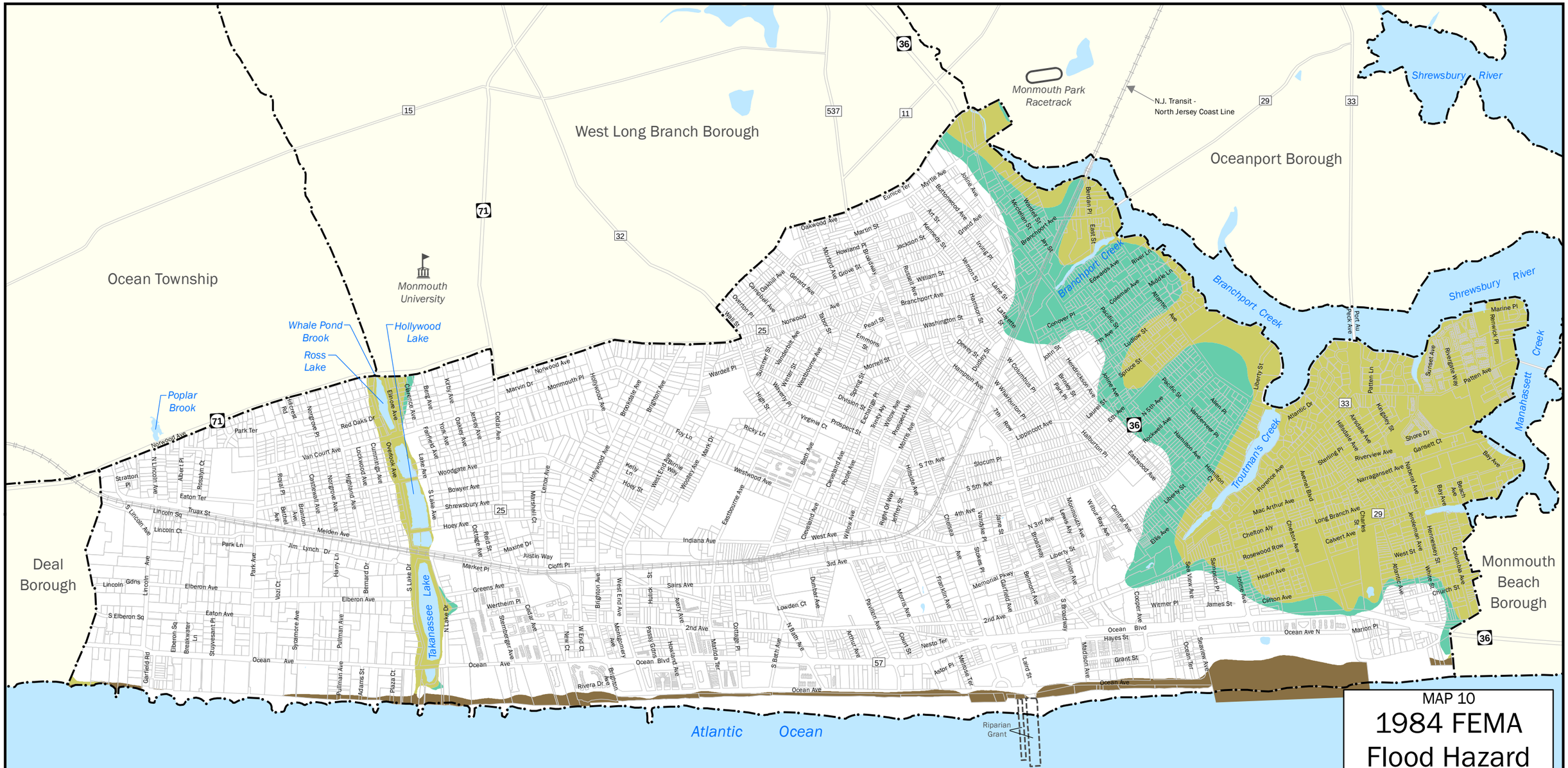
FEMA Flood Hazard Areas

2010 ENVIRONMENTAL RESOURCE INVENTORY

City of Long Branch

Monmouth County, New Jersey

November 2010



Legend

- Municipal Boundary
- Railroad
- Parcel
- Water Body

Data Sources:
Flood Hazard Area:
FEMA (Draft DFIRM), 2008
Other Data: Monmouth County GIS

AE: An area inundated by 100-year flooding, for which BFEs have been determined.

VE: An area inundated by 100-year flooding with velocity hazard (wave action); BFEs have been determined.

X500: An area inundated by 500-year flooding; an area inundated by 100-year flooding with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 100-year flooding.

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1 inch = 1,600 feet

0 400 800 1,600 2,400 Feet

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Note:
The information on this map was taken from the 2009 Master Plan for the City of Long Branch which was created by CMX, Inc.

MAP 10

1984 FEMA Flood Hazard Areas

2010 ENVIRONMENTAL RESOURCE INVENTORY

City of Long Branch

Monmouth County, New Jersey

November 2010


MAP 11
Threatened or Endangered Species Habitat
2010 ENVIRONMENTAL RESOURCE INVENTORY
City of Long Branch
Monmouth County, New Jersey
November 2010
Legend
Railroad
Municipal Boundary
Parcel
Water Body
Threatened or Endangered Species Habitat
Beach
State Endangered (4)
(Least Tern)
Federal Threatened and Endangered (5)
(Least Tern & Piping plover)
Emergent Wetland
State Endangered (4)
(Least Tern)
Data Sources:
Threatened or Endangered
Species Habitat: NJDEP, Nov. 2007
May 2008 Long Branch
Beach Management Plan
Other Data: Monmouth County GIS
1 inch = 1,600 feet
0 400 800 1,600 2,400
Feet
MASER
Note:
The information on this map was taken from the 2009 Master Plan for the City of Long Branch which was created by CMX, Inc.
West Long Branch Borough
Oceanport Borough
Ocean Township
Deal Borough
Monmouth Beach Borough
Monmouth University
Monmouth Park Racetrack
N.J. Transit - North Jersey Coast Line
Shrewsbury River
Branchport Creek
Troutman's Creek
Manahassett Creek
Whale Pond Brook
Hollywood Lake
Ross Lake
Poplar Brook
Takanassee Lake
Atlantic Ocean
Riparian Grant

Note:
The information on this map was taken from the 2009 Master Plan for the City of Long Branch which was created by CMX, Inc.

West Long Branch Borough

Ocean Township

Deal Borough

Oceanport Borough

Monmouth Beach Borough

Monmouth Park Racetrack

N.J. Transit - North Jersey Coast Line

Monmouth University

Whale Pond Brook

Ross Lake

Hollywood Lake

Poplar Brook

Takanassee Lake

Branchport Creek

Shrewsbury River

Manahassett Creek

Troutman's Creek

Atlantic Ocean

Riparian Grant

Legend

- Railroad
- Municipal Boundary
- Parcel
- Water Body
- Monmouth County Historic Sites Inventory
- National Historic Register
- State Historic Register
- State Historic Preservation Office (SHPO) Opinion

Data Sources:
Historic Sites and Districts:
National/State Historic Register &
Monmouth County Historic Sites Inventory,
Updated through April 29, 2008
Other Data: Monmouth County GIS

National Historic Register

Label ID	NAME	Address
1	Chauncey Jerome JR Shipwreck (ID # 3353)	Ocean Ave
2	Church of the Presidents (St. James Church) (ID # 2006)	1260-1266 Ocean Ave
3	North Long Branch School (Primary No. 3; Church Street School) (ID # 48)	469 Church St

State Historic Register

Label ID	NAME	Address
1	Long Branch Post Office (ID # 2008)	60 THIRD AVE

State Historic Preservation Office (SHPO) Opinion

Label ID	NAME	Address
1	468 Ocean Avenue (ID # 2009)	468 OCEAN AVE NO
2	Patten Point Yacht Club (ID # 4014)	676 PATTEN AVE
3	St. Michael's Roman Catholic Church (ID # 4647)	796 OCEAN AVE
4	Summer Cottage at 109 Park Avenue (ID # 4353)	109 PARK AVE
5	U.S. Lifesaving Station #5 & Takanassee Beach Club Historic District (ID # 4646)	805 OCEAN AVE
6	Broadway School (/BOE Office) (ID # 3352)	540 BROADWAY

Monmouth County Historic Sites Inventory

Label ID	NAME	Address
1	(1325-3)	573 Berdan Place
2	(1325-4)	99 Branchport Avenue
3	(1325-5)	207 Branchport Avenue
4	Slocum House (1325-6)	291 Branchport Avenue
5	Hotel Norwood (1325-7)	336 Branchport Avenue
6	Long Branch Record Building (1325-9-2)	192 Broadway
7	St. Luke's M.E. Church (1325-10)	NE cr. Broadway and Washington Street
8	Garfield Grant Hotel (1325-11)	275 Broadway
9	(1325-12)	290 Broadway
10	St. James Episcopal Church (1325-13)	300 Broadway
11	Long Branch Public Library (1325-14)	328 Broadway
12	(1325-15)	415 Broadway
13	(1325-16)	426 Broadway
14	(1325-17)	479 Broadway

Monmouth County Historic Sites Inventory

Label ID	NAME	Address
15	First Reformed Church (1325-19)	646 Broadway
16	Star of the Sea Lyceum (1325-24)	NE cr. Chelsea Avenue and Third Avenue
17	(1325-25)	127 Chelsea Avenue
18	(1325-27)	163 Chelsea Avenue
19	Benjamin White House (1325-28)	464 Church Street
20	(1325-29)	25 Fifth Avenue
21	(1325-31)	77 Grand Avenue
22	(1325-32)	29 Jackson Avenue
23	(1325-33)	331 Liberty Street
24	Gerard House (1325-35)	55 Lincoln Avenue
25	Fraley House (1325-36)	100 Lincoln Avenue
26	Elberon Library (1325-37)	168 Lincoln Avenue
27	(1325-38)	389 Morris Avenue
28	The Reservation/Navaho Lodge (1325-39)	NW of Seven Presidents Park
29	Sea Cliff Villa/James M. Brown House (1325-46)	981 Ocean Avenue
30	(1325-47)	1035 Ocean Avenue
31	Elberon Memorial Presbyterian Church (1325-50)	70 Park Avenue
32	Flinn House (1325-51)	67 Pearl Street
33	(1325-53)	140 Second Avenue
34	First Presbyterian Church (1325-55)	SW cr. Third Avenue and Chelsea Avenue
35	Murray's Inn (1325-56)	103 West End Avenue
36	Hulick House (1325-57)	119 West End Avenue
37	Hulick House (1325-58)	123 West End Avenue
38	Windmill Restaurant (1325-59)	SW cr. West end Plaza and Montgomery Avenue
39	(1325-60)	692 Westwood Avenue
40	Asbury M.E. Church (1325-61)	61 Atlantic Avenue
41	Star of the Sea Church (1325-62)	101 Chelsea Avenue
42	Simpson Memorial M.E. Church (1325-64)	206 Garfield Avenue
43	(1325-66)	337 Liberty Street

W S N E

1 inch = 1,600 feet

0 400 800 1,600 2,400 Feet

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MAP 12

Historic Sites and Districts

2010 ENVIRONMENTAL RESOURCE INVENTORY

City of Long Branch

Monmouth County, New Jersey

November 2010

West Long Branch Borough

Ocean Township

Oceanport Borough

Deal Borough

Monmouth Beach Borough

Monmouth Park Racetrack

N.J. Transit - North Jersey Coast Line

Monmouth University

Whale Pond Brook

Hollywood Lake

Ross Lake

Poplar Brook

Takanassee Lake

Branchport Creek

Shrewsbury River

Troutman's Creek

Manahassett Creek

Atlantic Ocean

Riparian Grant

Legend

- Railroad
- Municipal Boundary
- Parcel
- Water Body

County Park

1. (Seven Presidents/ Ocean Front Park)
2. Skate Park

Municipal Park

1. Bath Avenue Park
2. Beach
3. Branchport Park
4. Elberon Park (Truax Park)
5. Fireman's Park
6. Florence Ave
7. George Naylor Park (Cherry Street)
8. Great Lawn
9. Hoey Avenue Park
10. Jackson Woods
11. Jerry Morgan Park
12. Manahassett Creek Park
13. MLK Memorial
14. Ocean Place Promenade
15. Pinsky Plaza
16. Pleasure Bay Park
17. Presidents Promenade
18. Slocum Park/Library/City Hall
19. Takanassee Lake
20. Third Avenue Park
21. Third Avenue Triangle
22. Troutman's Greenway
23. Van Court Park
24. West End Park
25. Wilbur Ray Avenue Park

Data Sources:
Existing Parks: NJDEP/ROSI, 2008 & ModVI Data, 2008
Other Data: Monmouth County GIS

1 inch = 1,600 feet

0 400 800 1,600 2,400 Feet

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Note:
The information on this map was taken from the 2009 Master Plan for the City of Long Branch which was created by CMX, Inc.

MAP 13

Existing Parks & Open Space

2010 ENVIRONMENTAL RESOURCE INVENTORY

City of Long Branch

Monmouth County, New Jersey

November 2010

West Long Branch Borough

Ocean Township

Oceanport Borough

Deal Borough

Jackson Woods Monmouth Beach Borough

Monmouth Park Racetrack

N.J. Transit - North Jersey Coast Line

Monmouth University

Whale Pond Brook

Ross Lake

Hollywood Lake

Poplar Brook

Takanassee Lake

Branchport Creek

Shrewsbury River

Manahassett Creek

Trotman's Creek

Atlantic Ocean

Riparian Grant

Legend

- Railroad
- Municipal Boundary
- Parcel
- Water Body
- 1 Photograph Locations

Data Sources:
Threatened or Endangered Species Habitat: NJDEP, Nov. 2007
May 2008 Long Branch Beach Management Plan
Other Data: Monmouth County GIS

THE AERIAL PHOTOGRAPHY SHOWN HEREON WAS TAKEN FROM THE 2007-2008 HIGH RESOLUTION ORTHOPHOTOGRAPHY DATA CURRENTLY AVAILABLE ON THE NEW JERSEY GEOGRAPHIC INFORMATION NETWORK (NJGIN).

1 inch = 1,600 feet

0 400 800 1,600 2,400 Feet

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MAP 14

Photograph Locations

2010 ENVIRONMENTAL RESOURCE INVENTORY

City of Long Branch

Monmouth County, New Jersey

November 2010

Appendix B
Photographs

Photo 1. Estuarine Emergent Wetland: View eastward across a small tributary of the Shrewsbury River and an Estuarine Emergent Wetland dominated by Salt Marsh Cordgrass (*Spartina alterniflora*). (02-17-11)

Photo 2. Estuarine Emergent Wetland: View westward toward the Shrewsbury River along a rubble shoreline and a narrow intertidal habitat of Estuarine Emergent Wetland toward the Shrewsbury River. (02-17-11)

Photo 3. Estuarine Emergent Wetland: View eastward along Troutman's Creek with Estuarine Emergent Wetland and stabilized bank (left) and restored shoreline and upland habitat (right). (02-17-11)

Photo 4. Estuarine Emergent Wetland: View westward across Troutman's Creek towards Branchport Creek with emergent wetlands dominated by Common Reed (*Phragmites australis*) along shoreline and forested habitat on bank. (02-17-11)

Photo 5. Palustrine Aquatic Bed Wetland: View eastward across one basin of the Takanassee Lake toward emergent stems of the aquatic bed community dominated by Water Feather (*Myriophyllum aquaticum*). (11-15-10)

Photo 6. Palustrine Emergent Wetland: View northwestward across small pond in Jackson Woods characterized by emergent (marsh) wetland. (11-15-10)

Photo 7. Palustrine Emergent Wetland: View northwestward along trail in Jackson Woods through an emergent wetland dominated by Common Reed (*Phragmites australis*), an invasive species. (11-19-10)

Photo 8. Palustrine Scrub-shrub Wetland: View eastward along the shoreline of Takanassee Lake characterized by wetland scrub vegetation (right in photograph). (11-15-10)

Photo 9. Palustrine Forested Wetland: View eastward to wetland scrub vegetation (foreground) and forested wetland (background) dominated by Sour Gum (*Nyssa sylvatica*) in Jackson Woods. (08-26-10)

Photo 10. Coastal Dune Community: View northwestward across dunes in Seven Presidents Park of area dominated by American Beach Grass (*Ammophila breviligulata*). (08-26-10)

Photo 11. Coastal Dune Community: View northward toward dunes vegetated with American Beach Grass at the North Beach Protection Zone during initiation of a habitat enhancement project, sponsored by the Monmouth County Park System. 02-17-11)

Photo 12. Coastal Dune Community: View southward along the upper beach area of the North Beach Protection Zone, vegetated by American Beach Grass, during initiation of a habitat enhancement project, sponsored by the Monmouth County Park System, to provide improved habitat for threatened and endangered species. (02-17-11)

Photo 13. Coastal Dune Community: View southward from bluff, across vegetated dune habitat in the South Beach Protected Zone to bulkheaded shoreline and the Atlantic Ocean. (02-17-11)

Photo 14. Coastal Bluff Community: View northward across eroded beach and damaged bulkhead in the South Beach Protected Zone to bluff with exposed sediments of the Manasquan Formation. (02-17-11)

Photo 15. Successional Upland Forest: View northward to upland treed vegetation dominated by Tree of Heaven (*Ailanthus altissima*) in Jackson Woods. (11-15-10)

Photo 16. Mowed Lawn with Trees: View eastward along mowed parkland within Takanassee Lake Park with scattered planted trees adjacent to naturalized wetland vegetation. (11-15-)

Photo 17. Jackson Woods, City of Long Branch: View eastward from the park and parking area toward Ocean Blvd. and beach development. (11-15-10)

Photo 18. Jackson Woods, City of Long Branch: View northward to stand of Japanese Knotweed (*Polygonum cuspidatum*), and invasive exotic species, at the entrance to the park. (11-15-10)

Photo 19. Takanassee Lake, City of Long Branch: View northwest across w estern end of larger portion of coastal pond basin know as Takanassee Lake. (11-15-10)

Photo 20. Takanassee Lake, City of Long Branch: View westward along north-bank of coastal pond dominated by Indigo Bush (*Amorpha fruticosa*), an invasive exotic shrub. (11-19-10)

Photo 21. Hoey Avenue Park, Takanassee Lake: View eastward to a mature group of Black Gum (*Nyssa sylvatica*) and mowed lawn, mapped as wetland by some sources, along northern side of lake and west of railroad. (02-17-11)

Photo 22. Hoey Avenue Park, Takanassee Lake: View eastward across impounded portion of lake toward railroad berm and silhouette of a mature Cottonwood (*Populus deltoides*) in the left background. (02-17-11)

Photo 23. Hoey Avenue Park, Takanassee Lake: View we stward toward an i mpounded portion of T akanassee Lake, with a s ilhouette o f a mu lti-stemmed S mooth A lder (*Alnus serrulata*) in the foreground. (02-17-11)

Photo 24. Takanassee Lake: View northward across upper end of Takanassee Lake, the portion known historically as R oss Lake, to a s mall is land w ith a h istoric s tructure d ating to th e R oss Estate. (02-17-11)

Photo 25. Takanassee Lake: View northward to a mature Sycamore (*Platanus occidentalis*) on the south bank of the upper end of Takanassee Lake. (02-17-11)

Appendix C
Wind Study

RENEWABLE
ENERGY LLC

WIND STUDY

for

The City of Long Branch

At

Ocean Place Promenade

Long Branch, NJ
(North 40.304, West 73,992)

Conducted
March 9th 2010 – May 4th 2010

Note: This title page was inserted by Maser Consulting, PA at the request of the City of Long Branch to address the incorrect reference to the "Town" of Long Branch in the original title page by ARC Renewable Energy LLC.

Overview

Long Branch, Monmouth County, New Jersey, is nine miles southeast of Middletown, New Jersey, thirty miles south of New York City, latitude 40.304N, longitude 73.992W with a standard elevation of 20 feet.

July is typically the warmest month and January the coolest with most precipitation expected in August. With 1116 incidents recorded in the last sixty years, Long Branch gets an average of 19 major storms a year, where wind speeds can exceed 50 miles per hour, typically over the course of several days. This is much higher than most New Jersey towns, as are the average wind speeds recorded throughout the year. In fact, located in the crook of the North Eastern Seaboard, Long Branch is in one of the windiest locations in the United States according to the Government's NREL, the National Renewable Energy Laboratory (see appended map).

These consistently high winds are caused by a combination of geographical and topographical features, and of course, proximity to one of the Earth's largest bodies of water; the Atlantic Ocean. Long Branch receives masses of land-warmed air, traveling east across the country (Westerlies) on the Gulf Stream, warmer moist air brought up the coast directly from the Gulf, cooler air traveling west from the transatlantic (Easterlies and Nor'easterlies), and air traveling northwest from the much warmer equatorial region of the ocean (Northeasterly Trade Winds). Most land areas are typically in the corridor of one or possibly two main bodies of moving air. Long Branch falls in the cyclonic mix of many. Added to this the tumultuous hurricane induced winds and subsequent eddies that buffet and barrage the coast throughout the hurricane season, and the result is, windy.

Test Procedure

To take a snap shot of the wind speeds at the given location, a digital anemometer was placed in the vicinity of the proposed wind turbine. Its purpose was to measure raw data using horizontal rotations stored on permanent memory firmware. An algorithm converts the rotational counts per second into wind speed in miles per hour, once the firmware is docked with its compliant software.

The anemometer does not act like a wind turbine, it merely collects data that we can use as a guide to discern the feasibility of installing a wind turbine. Wind speed is not the only important factor in making this decision, however.

A wind turbine would be permanently installed at the optimal height and position to compensate for immediate surroundings, obstacles, buildings and the general environs. The anemometer, however, without the luxury of a permanent mounting bracket, was placed in the most logical place to avoid damage. Consequently the anemometer results recorded will be significantly less than those of a turbine.

Also note that the anemometers are, by design, lightweight and therefore have negligible momentum. They do not continue to spin after gusts. The wind turbine, because of its mass and very low friction, will continue to spin long after gusts have prevailed.

The anemometers are also designed to measure wind speed in one direction only. Crosswinds, eddy currents and buffeting will all inhibit the rotation of the anemometer and therefore prevent accurate recording. This is also true of standard vertical sail wind turbines which is why they are unsuitable for areas of 'unstable' wind conditions. They work best when strong winds are evident from one direction. The horizontal sail wind turbine, however, is specifically designed to capture, utilize, and indeed optimize, wind and gusts from multiple directions. Consequently, we anticipate much greater average wind speeds recorded at the hub of the wind turbine than those demonstrated by the anemometer results, especially given the volatility of wind behavior in Long Branch.

The anemometers are small, lightweight and catch very little air and are used as a gauge only for comparison purposes to help ascertain what prevailing conditions exist at the survey site.

The raw data from the anemometer test results is appended.

Survey Location Overview

The location is very well suited for the installation of a wind turbine. With a couple of thousand miles of ocean to the east, Gulf Stream concentration overhead, masses of land-warmed air from the west and warm moist air from the southeast, all culminating on the eastern seaboard, Long Branch is guaranteed regular wind energy in every season, all year around.

Test results were taken at the beginning of the summer, probably one of the least windy times of the year, and from those results we can discern a much higher than average speed of both wind and gusts.

Counter intuitively the wind direction, which was presumed to be predominately easterly during the early summer, seemed to emanate from multiple headings; something we would expect in the autumnal and winter months. This could be as a result of concentric currents caused by the topography of the region and the spiraling effect of all the noted bodies of air converging at this location, as discussed, or more specifically the buildings and features immediately surrounding the anemometer.

It is important to note that this phenomenon would retard the spin of the anemometer and minimize the recorded results. The wind turbine, however, will make full use of this phenomenon being designed to capture wind from multiple directions at once.

Obviously average wind speed varies by season, and indeed by month, with greater wind speeds expected in the spring and fall. Air density is higher in the colder months, but despite lower average speeds, cold winds can produce very high energy output as there are more molecules of air per cubic meter than warmer air, so more mass to drive a turbine. While air density is lower in the summer, air pressures vary greatly, because of stark temperature differences, causing air to move to cooler areas and inducing both very high air volume and very high wind speeds. Long Branch is highly susceptible to the effect of Atlantic storms, so we would expect high winds during the hurricane season, but realistically, we would expect every season on the New Jersey Coast to be a reliable source of wind energy.

It is common to experience, in any given location, periods of high wind, low wind and no wind. Obviously when there is insufficient wind to drive the sails of the turbine, no electricity can be produced. If the sails aren't spinning fast enough, the energy produced will be offset against overcoming inertia, friction and lost to the inverter. There is a threshold, therefore, that a turbine must meet to actually produce positive results. With conventional turbines, this could require very large wind speeds. With the utilitarian design of the horizontal sail turbine, however, this threshold is only 4mph.

Conversely, when wind speeds are too high, conventional turbines become ineffective, spinning too fast to efficiently convert kinetic energy to electrical. The horizontal sailed turbine does not suffer this constraint, however, as it is geared specifically to utilize such forces. In fact, in a 90mph wind, you can clearly see the sails turning significantly slower, the additional kinetic energy being converted to potential energy and 'stored' in the gearing system for conversion to electrical energy.

Designed to optimize buffeting, eddy currents and multidirectional winds, unlike anemometers and vertical axis turbines, which are slowed by such forces, the results we expect from a turbine at this location will be much greater than those recorded below. However, even based on these figures, without optimization or factoring in the turbine's design and final positioning, we can discern that this location in Long Branch will be an excellent site for a horizontal sail turbine.

Actual Results Recorded From Survey

The raw data from the survey is appended, but the averages drawn from the data are recorded in the following table. Note that these are anemometer recordings, and as explained herein, we would expect much higher results from the turbine itself.

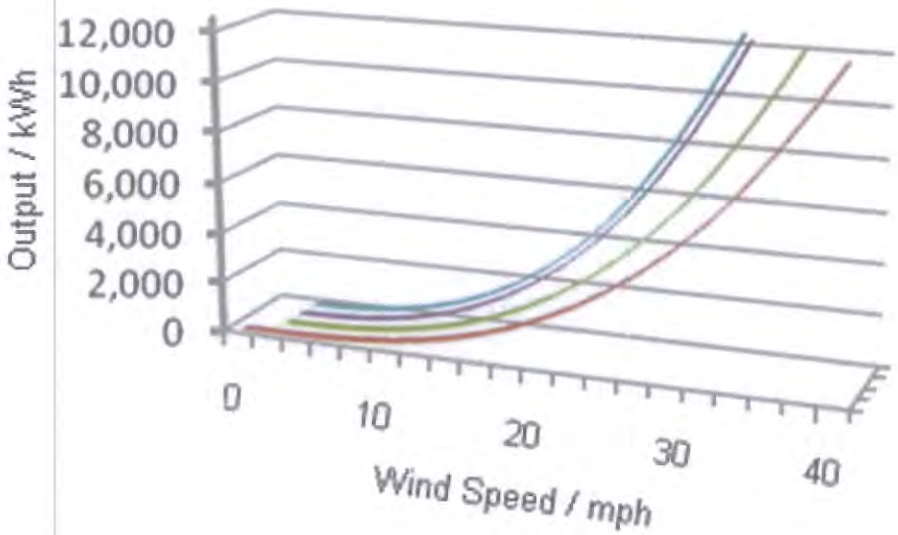
We did not factor recorded gust values when calculating the overall average value, as there is no available data to compare anemometer gust speed results with actual turbine output. The high level of gusts at this location will, however, greatly increase the approximate results cited here for review.

Maximum values are recorded below for reference only, and are not used in calculations.

Long Branch Comfort Station, NJ March 9th to May 4th 2010 Wind Study Results

Wind Speed Average (Unit 1) / mph	8.52
Max Wind Speed (Unit 1) / mph	56.05
Time Spent Above 4mph Threshold	79%
Wind Direction	varied

Graph Demonstrating Average Output at Varying Wind Speeds



As can be seen from the graph the turbine output increases exponentially with wind speed. Location is therefore extremely important, as small increases in wind speed make large increases in output. The final position will be best suited in terms of wind direction, and to optimize roof effect.

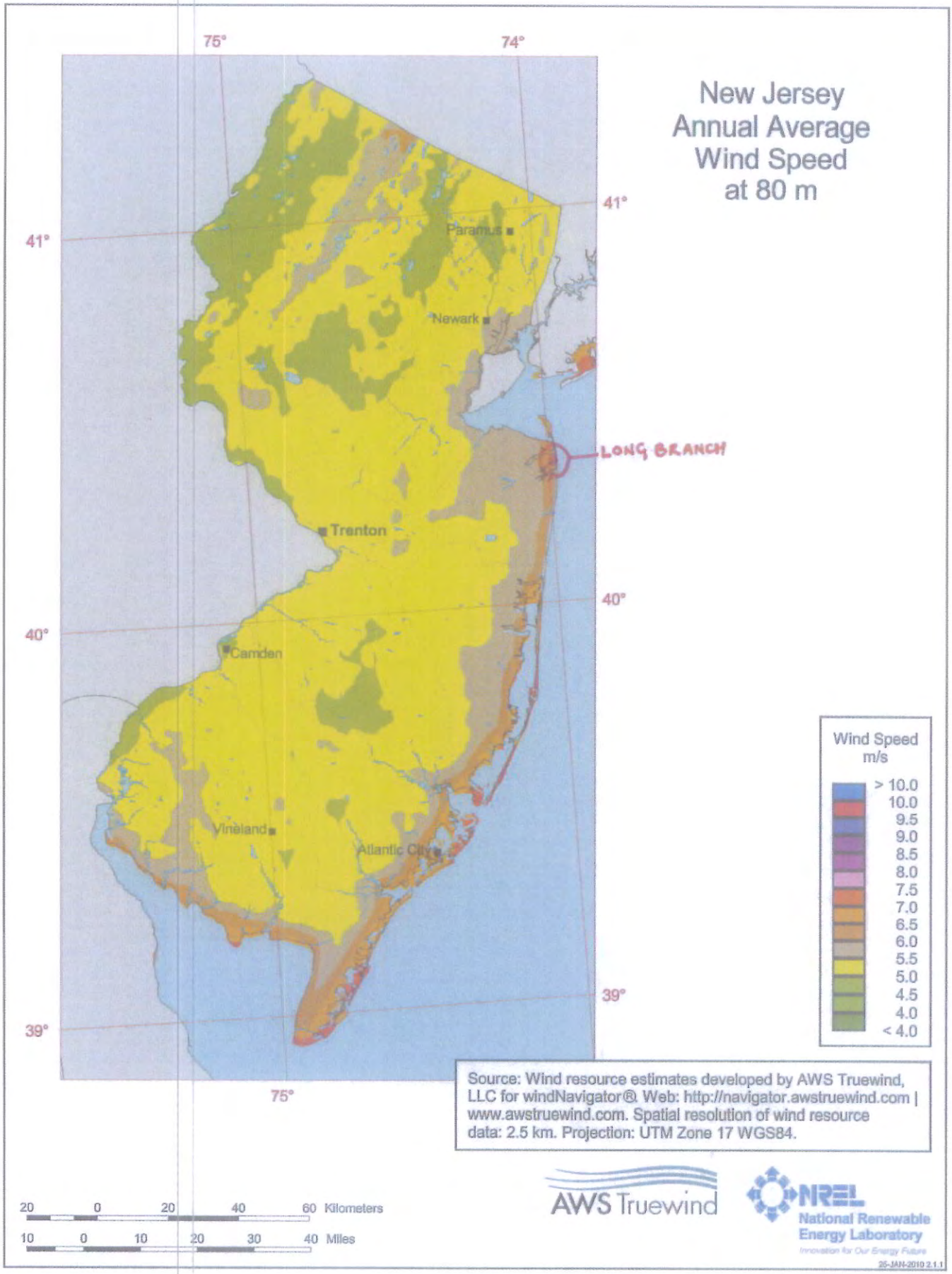
The results demonstrate that Long Branch has above average wind speeds, and also of great significance, consistently high winds. Even a small turbine at this location will generate energy 80% of the time. While there are obvious long term financial rewards to generating electricity independently, the environmental benefits speak for themselves.

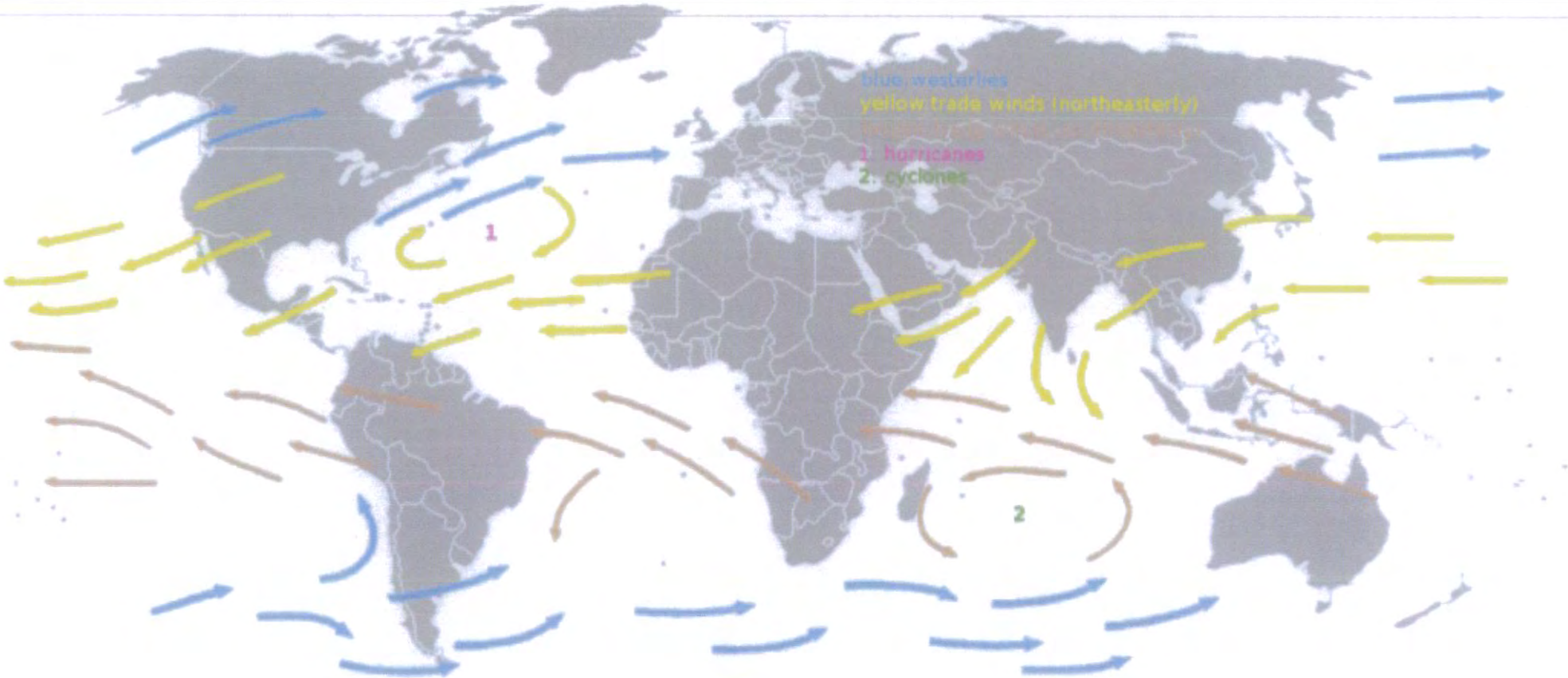
Date & Time	Wind Speed / mph
3/9/2010 0:04	3.8051219
3/9/2010 0:09	4.278283
3/9/2010 0:14	4.0006196
3/9/2010 0:19	2.3686388
3/9/2010 0:24	2.238307
3/9/2010 0:29	3.5954577
3/9/2010 0:34	2.54997

--- TRUNCATED ---

5/4/2010 18:24	5.5079352
5/4/2010 18:29	5.4031031
5/4/2010 18:34	6.0802618
5/4/2010 18:39	7.1625824
5/4/2010 18:44	6.4514241
5/4/2010 18:49	6.0519288
5/4/2010 18:54	6.1595942
5/4/2010 18:59	4.5871127
5/4/2010 19:04	3.9807865
5/4/2010 19:09	3.3546272
5/4/2010 19:14	4.4737807
5/4/2010 19:19	2.7086348
5/4/2010 19:24	3.8504547
5/4/2010 19:29	2.6718019
5/4/2010 19:34	2.6604687
5/4/2010 19:39	2.4111383
5/4/2010 19:44	2.1108085
5/4/2010 19:49	1.7169798
5/4/2010 19:54	3.9184539
5/4/2010 19:59	5.2727713
5/4/2010 20:04	3.9496202
5/4/2010 20:09	4.2187837
5/4/2010 20:14	4.6352788
5/4/2010 20:19	2.691635
5/4/2010 20:24	4.8279432
5/4/2010 20:29	3.9836198
5/4/2010 20:34	4.023286
5/4/2010 20:39	2.7256346
5/4/2010 20:44	1.558315
5/4/2010 20:49	0.6431591
5/4/2010 20:54	0.3428293
5/4/2010 20:59	0.5581601
5/4/2010 21:04	0.0594993
5/4/2010 21:09	0.0056666

Average Wind Speed	**8.52**
Maximum Recorded	**56.05**
Time Spent Above Threshol	**79%**


New Jersey
Annual Average
Wind Speed
at 80 m
75°
74°
41°
40°
39°
Paramus
Newark
LONG BRANCH
Trenton
Camden
Vineland
Atlantic City
Wind Speed
m/s
> 10.0
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
< 4.0
Source: Wind resource estimates developed by AWS Truewind, LLC for windNavigator® Web: http://navigator.awstruewind.com | www.awstruewind.com. Spatial resolution of wind resource data: 2.5 km. Projection: UTM Zone 17 WGS84.
20 0 20 40 60 Kilometers
10 0 10 20 30 40 Miles
AWS Truewind
NREL
National Renewable Energy Laboratory
Innovation for Our Energy Future
25-JAN-2010 2.1.1


blue: westerlies
yellow: trade winds (northeasterly)
1. hurricanes
2. cyclones
1
2

Appendix D
Checklist of Plants

MASER CONSULTING P.A.
Consulting, Municipal & Environmental Engineers
Planners ▪ Surveyors ▪ Landscape Architects

331 Newman Springs Road
Suite 203
Red Bank, NJ 07701
Tel: 732.383.1950 ▪ Fax: 732.383.1984

MEMORANDUM

To: **City of Long Branch**
Environmental Commission

From: **Wayne Ferren**
Ecological Services

Date: **March 3, 2011**

Re: **Checklist of Plants**
Takanassee Lake
MC Project No. 10000999G

The following checklist of plants (arranged alphabetically by genus and species within life form categories) includes those species observed at Takanassee Lake during field work (11-19-20 and 02-17.11). Native and non-native (naturalized or planted) species are included and the habitat preference is noted. † = naturalized/introduced species; ! = cultivated/planted species; A = property adjacent to lake and park; B = bank and/or adjacent lawn/terrace and open space; L = lake; M = margin of lake and lower bank.

TREES and SAPLINGS		**HABITAT**
Alnus serrulata	Smooth Alder	M
Acer platanoides	Norway Maple†	B
Acer rubrum	Red Maple	B
Acer saccharoides	Silver Maple	B
Ailanthus altissima	Tree of Heaven†	B
Carya sp.	Hickory	B
Fraxinus americana	White Ash!	B
Juglans nigra	Black Walnut	B
Liriodendron tulipifera	Tulip tree, Yellow Poplar	B
Morus alba	White Mulberry†	B
Nyssa sylvatica	Black, Sour Gum	B
Picea sp.	Spruce !	B
Populus deltoides	Cottonwood	B
Prunus serotina	Black Cherry	B
Pyrus sp.	Pear!	B
Quercus alba	White Oak	A
Quercus bicolor	Swamp White Oak	B/M
Quercus coccinea	Scarlet Oak	B
Quercus palustris	Pin Oak	A/B
Robinia pseudoacacia	Black Locust!	B
Salix babylonica	Weeping Willow!	B

Salix nigra	Black Willow	B/M
Taxodium distichum	Bald Cypress!	B/M
Tilia americana	Basswood, Linden!	A/B

SHRUBS/VINES

Alnus serrulata	Smooth Alder	M
Amorpha fruticosa	Indigo Bush†	B/M
Baccharis halimifolia	Groundsel Bush	B/M
Celastrus orbiculatus	Oriental Bittersweet†	B/M
Cephalanthus occidentalis	Buttonbush	M
Clematis dioscoreifolia	Sweet Autumn Clematis†	B
Cornus amomum (?)	Silky Dogwood	B/M
Fagus grandifolia	American Beech!	A
Hedera helix	English Ivy†	B
Hibiscus palustris	Swamp Rose-mallow	M
Lonicera japonica	Japanese Honeysuckle†	B
Parthenocissus quinquefolia	Virginia Creeper	B
Platanus X acerifolia	London Plane Tree!	A
Platanus occidentalis	Sycamore	B
Rosa multiflora	Multiflora Rose†	B
Rosa palustris	Swamp Rose	B/M
Rubus alleghaniensis	Common Blackberry	B
Sambucus canadensis	Elderberry	B/M
Smilax rotundifolia	Greenbriar	B
Toxicodendron radicans	Poison Ivy	B
Viburnum dentatum	Arrow-wood	B

HERBACEOUS PLANTS

Artemisia vulgaris	Common Mugwort†	B
Alliaria officinalis	Garlic Mustard†	B
Allium vineale	Field Garlic†	B†
Barbarea vulgaris	Winter Cress†	B
Bidens frondosa	Beggar Ticks	M
Carex sp.	Sedge	M
Carex stricta	Tussock Sedge	M
Ceratophyllum demersum	Hornwort	L
Cyperus sp.	Umbrella Sedge	M
Dactylis glomeratus	Orchard Grass †	B
Daucus carota	Wild Carrot†	B
Dicanthelium clandestinum	Deer-tongue Grass	B
Digitaria sanguinalis	Crabgrass†	B

Echinochloa crusgalli	Barnyard Grass†	M
Eleocharis acicularis (?)	Needle Spike-rush	L
Elodea canadensis (?)	Common Water-weed	L
Erechtites hieracifolia	Pilewort	B/M
Euthamia graminifolia	Narrow-leaf Flattop Goldenrod	B/M
Festuca rubra	Red Fescue	B
Glechoma hederacea	Ground Ivy†	B
Hypochoeris radicata	Hairy Cat's Ears†	B
Iris pseudacorus	Yellow Flag†	M
Juncus effusus	Soft Rush	M
Juncus tenuis	Path Rush	B
Lepidium campestre	Field Cress†	B
Ludwigia palustris	Common Water Purslane	M
Lythrum salicaria	Purple Loosestrife†	M
Myriophyllum aquaticum	Water Feather†	L
Oenothera biennis	Evening Primrose	B
Onoclea sensibilis	Sensitive Fern	M
Peltandra virginica	Arrow-arum	M/L
Phragmites australis	Common Reed†	B/M
Phytolacca americana	Pokeweed	B
Plantago lanceolata	English Plantain†	B
Plantago major	Common Plantain†	B
Polygonum cupidatum	Japanese Knotweed†	B
Polygonum punctatum	Dotted Smartweed	M
Potamogeton sp.	Pondweed	L
Rumex acetocella	Sheep Sorrel†	B
Rumex crispus	Curly Dock†	B
Schoenoplectus (*Scirpus*) *americanus*	American Three-square Bulrush	M
Scirpus cyperinus	Cottongrass	M
Setaria faberi	Nodding Foxtail†	B
Setaria glauca	Yellow Foxtail†	B
Solanum dulcamara	Bittersweet Nightshade†	B
Solanum nigrum	Black Nightshade†	B
Solidago canadense	Canada Goldenrod	B
Solidago gigantea	Giant Goldenrod	B/M
Solidago rugosa	Rough-stemmed Goldenrod	M
Sparganium eurycarpum	Broad-fruit Bur-reed	M
Stellaria media	Chickweed†	B
Symphyotrichum sp.	Aster	B
Symphyotrichum ericoides	Heath Aster	B
Taraxacum officinale	Dandelion†	B
Vallisneria americana	American Eelgrass, Tape Grass	L
Verbascum thapsus	Moon Mullein†	B

MASER CONSULTING P.A.
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Suite 203
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MEMORANDUM

To: **City of Long Branch**
Environmental Commission

From: **Wayne Ferren**
Ecological Services

Date: **March 3, 2011**

Re: **Checklist of Plants**
Jackson Woods
MC Project No. 10000999G

The following checklist of plants (arranged alphabetically by genus and species within life form categories) includes those species observed at Jackson Woods during field work (11-19-10 and 02-17-11). Native and non-native (naturalized or planted) species are included and the habitat preference is noted. See end of list for explanations of acronyms. † = naturalized/introduced species; ! = cultivated/planted species; F = forest/woodland habitats; R = ruderal (disturbed) habitats including roads, paths, lawns; W = wetlands including pond and pond margins

TREES and SAPLINGS		**HABITAT**
Acer platanoides	Norway Maple†	F
Acer rubrum	Red Maple	F
Acer saccharinum	Silver Maple	F
Ailanthus altissima	Tree of Heaven†	F
Albizia julibrissin	Mimosa, Silk Tree†	F
Betula populifolia	Gray Birch	F
Ilex opaca	American Holly	F/W
Liquidambar styraciflua	Sweet Gum	F
Morus alba	White Mulberry†	F
Nyssa sylvatica	Sour Gum, Tupelo	F/W
Pinus rigida	Pitch Pine	F/R
Pinus strobus	White Pine!	F/R
Platanus occidentalis	Sycamore	F/W
Populus deltoides	Cottonwood	F
Prunus serotina	Black Cherry	F
Quercus bicolor	Swamp White Oak (sapling)	F
Quercus coccinea	Scarlet Oak	F
Quercus phellos	Willow Oak	F
Quercus palustris	Pin Oak	F/W
Robinia pseudoacacia	Black Locust	F

Salix discolor	Willow	W
Salix nigra	Black Willow	F
Sassafras albidum	Sassafras	F

SHRUBS/VINES

Amelanchier canadensis	Juneberry, Serviceberry	W
Baccharis halimifolia	Groundsel Bush	W
Clematis dioscoreifolia	Sweet Autumn Clematis†	F/R
Hedera helix	English Ivy†	F/R
Ilex opaca	American Holly	F
Ligustrum sp.	Privet†	F/R
Lonicera japonica	Japanese Honeysuckle†	F/R
Morella pensylvanica	Bayberry	W
Parthenocissus quinquefolia	Virginia Creeper	F
Poaceae, Bambusoideae	Bamboo!	R
Rhus copallina	Winged Sumac	W/R
Rosa multiflora	Multiflora Rose†	F
Rubus hispidus (?)	Dewberry	F
Rubus occidentalis	Black Raspberry	F
Sambucus canadensis	Elderberry	F/W
Smilax rotundifolia	Greenbrier	F
Toxicodendron radicans	Poison Ivy	F
Vaccinium corymbosum	High-bush Blueberry	F/W
Viburnum dentatum	Arrow-wood	F/W
Vitus labrusca	Fox Grape	F/W
Vitis riparia	Riverbank Grape	F/W

HERBACEOUS PLANTS

Andropogon virginicus	Broom-sedge	R/W
Alliaria petiolata	Garlic Mustard†	F/R
Allium vineale	Field Garlic†	F/R
Apocynum cannabinum	Indian Hemp	W
Artemisia vulgaris	Common Mugwort†	R
Atriplex patula	Orache†	W
Barbarea vulgaris	Winter Cress†	R
Boehmeria cylindrica	False Nettle	W
Cardamine pennsylvanica	Pennsylvania Bitter Cress	R
Carex spp.	Sedge	F
Carex stricta	Tussock Sedge	W

Cyperus sp.	Cyperus, Umbrella-sedge	W
Dactylis glomeratus	Orchard Grass †	R
Daucus carota	Wild Carrot†	R
Dicanthelium clandestinum	Deer-tongue Grass	F/R
Digitaria sp.	Crabgrass†	R
Echinochloa crusgalli	Barnyard Grass†	R
Eleocharis sp.	Spikerush	W
Erechtites hieracifolia	Pilewort	W
Eupatorium perfoliatum	Boneset	W
Eupatorium rugosum	White Snakeroot	R
Euthamia graminifolia	Narrow-leaf Flattop Goldenrod	W
Festuca rubra	Red Fescue	R/W
Glechoma hederacea	Ground Ivy†	R
Juncus effusus	Soft Rush	W
Juncus tenuis	Path Rush	R
Lamium purpureum	Purple Dead-nettle	R
Lepidium campestre	Field Cress†	R
Ludwigia palustris	Common Water Purslane	W
Lythrum salicaria	Purple Loosestrife†	W
Microstegium vimineum	Stilt-grass†	R/W
Mimulus ringens	Square-stemmed Monkey-flower	W
Oenothera biennis	Evening Primrose	R
Onoclea sensibilis	Sensitive Fern	W
Panicum capillare	Witch-grass	R
Panicum virgatum	Switchgrass	R
Phragmites australis	Common Reed†	W/R
Phytolacca americana	Pokeweed	F
Plantago lanceolata	English Plantain†	R
Plantago major	Common Plantain†	R
Polygonum cupidatum	Japanese Knotweed†	R
Polygonum lapathifolium	Nodding Smartweed†	W
Polygomun punctatum	Dotted Smartweed	W
Potentilla sp.	Cinquefoil	R
Prunella vulgaris	Self-heal	R
Rumex crispus	Curly Dock†	R
Scirpus cyperinus	Cottongrass	W
Setaria faberi	Nodding Foxtail†	R
Setaria glauca	Yellow Foxtail†	R
Solanum dulcamara	Bittersweet Nightshade†	F/R
Solanum nigrum	Black Nightshade†	F/R
Solidago canadense	Canada Goldenrod	R
Solidago gigantea	Giant Goldenrod	R/W
Solidago rugosa	Rough-stemmed Goldenrod	R

Stellaria media	Chickweed†	R
Symphyotrichum (Aster) lateriflorum(?)	Small White Aster	R/W
Taraxacum officinale	Dandelion†	R
Thalictrum sp.	Meadow Rue	F
Xanthium strumarium	Cocklebur	R

Appendix E
Wildlife/Habitat Lists from Ecological Resource Inventory for the Mid-Coast Environmental Planning Region, Monmouth County, NJ

COMMON MAMMALS FOUND IN HABITATS OF THE MID-COAST REGION

COMMON NAME (1)	*SCIENTIFIC NAME*	HABITAT (2)										
		D	L	A	F	C	S	W	H	N	B	U
Short-tailed Shrew	*Blarina brevicauda*				X	X		X				
Least Shrew	*Cryptotis parva*	X	X	X				X		X		
Virginia Opossum	*Didelphis virginiana*			X	X	X	X			X		
Big Brown Bat	*Eptesicus fuscus*	X		X	X			X				
Silver-haired Bat *	*Lasionycteris noctivagans*	X			X			X				
Red Bat *	*Lasiurus borealis*			X	X	X	X	X	X			
European Hare *	*Lepus capensis*		X	X						X		
Groundhog	*Marmota monax*		X	X	X		X		X			
Meadow Vole	*Microtus pennsylvanicus*		X	X						X		
Striped Skunk	*Mephitis mephitis*	X	X	X								
House Mouse	*Mus musculus*	X	X	X								
Longtail Weasel	*Mustela frenata*			X	X		X	X	X			
Little Brown Myotis	*Myotis licifugus*	X		X								X
Virginia Whitetailed Deer *	*Odocoileus virginianus*			X	X	X	X	X	X	X		
Muskrat	*Ondatra zibethicus*	X								X		
White-footed Mouse	*Peromyscus leucopus*			X	X	X	X	X	X			
Raccoon	*Procyon lotor*							X	X			
Norway Rat	*Rattus norvegicus*	X		X								
Black Rat	*Rattus rattus*	X									X	
Eastern Mole	*Scalopus aquaticus*	X	X	X								X
Grey Squirrel	*Sciurus Carolinensis*	X	X		X			X				
Masked Shrew	*Sorex cinereus*		X		X			X	X	X		
Eastern Cottontail	*Sylvilagus floridanus*	X	X	X			X		X	X		
New England Cottontail	*Sylvilagus transitionalis*			X	X	X	X	X	X			
Eastern Chipmunk	*Tamias striatus*	X			X	X	X	X	X			
Red Fox	*Vulpes vulpes*			X	X	X	X					

HABITAT CODES: **D**=Developed, **L**=Landscaped Open Space, **A**=Agricultural Land, **F**=Forest, **C**=Cultivated Tree and Shrub, **S**=Shrubland, **W**=Forested Wetland, **H**=Shrub Wetland, **N**=Non-tidal Freshwater Marsh, **B**=Beach, **U**=Unvegetated Area

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COMMON REPTILES FOUND IN HABITATS OF THE MID-COAST REGION

COMMON NAME (1)	*SCIENTIFIC NAME*	HABITAT (2)										
		D	L	A	F	C	S	W	H	N	B	U
LIZARDS												
Five-lined Skink	*Emueces fasciatus*	X						X				
Northern Fence	*Sceloporus undulatus*				X	X	X				X	X
TURTLES												
Common Snapping	*Chelydrea serpentina*	X	X	X					X	X		
Red-Eared	*Chrysemys scripta*		X	X				X	X	X		
Eastern Painted	*Chrysemys picta*							X	X	X		
Wood Turtle * (3)	*Clemmys insculpta*			X				X	X	X		
Eastern Mud	*Kinosternon subrubrum*								X	X		
Eastern Box	*Terrapene carolina*							X	X	X		
SNAKES												
Northern Black Racer	*Coluber constrictor*		X		X	X	X					
Northern Ringneck	*Diadophis punctatus*							X	X	X		
Eastern Milk	*Lampropeitis tiangulum*	X	X	X	X	X	X	X	X	X	X	X
Northern Water	*Nerodia sipedon*		X					X	X	X		
Rough Green	*Opheodrys aestivus*							X	X			
Red-Bellied	*Storeria occipitomaculata*				X			X		X		
Eastern Ribbon	*Thamnophis sauritus*							X	X	X		
Eastern Garter	*Thamnophis siratlis*	X	X	X				X	X	X		

REPTILE HABITAT CODES: **D**=Developed (includes suburban and urban landscapes and their associated waterways), **L**=Landscaped Open Space (includes lakes and ponds in park-like settings), **A**=Agricultural Land (includes cropland, pastureland and associated buildings), **F**=Forest (includes both dense forests and open woodlands), **C**=Cultivated Tree and Shrub (includes orchards, tree nurseries, vineyards, etc.), **S**=Shrubland, **W**=Forested Wetland (includes swamps), **H**=Shrub Wetland, **N**=Non-tidal Freshwater Marshes, Lakes, Ponds and Streams, **B**=Beach, **U**=Unvegetated Area

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COMMON AMPHIBIANS FOUND IN HABITATS OF THE MID-COAST REGION

COMMON NAME (1)	*SCIENTIFIC NAME*	HABITAT (2)										
		D	L	A	F	C	S	W	H	N	B	U
TOADS												
Fowlers	*Bufo woodhousei fowleri*	X									X	
Eastern Spadefoot *	*Scalphiopus holbrooki*			X	X	X	X					
TREE FROGS												
Spring Peeper	*Hyla crucifer*							X				
Gray	*Hyla versicolor*							X	X			
New Jersey Chorus	*Pseudacris triseriata*	X	X	X			X	X	X			
TRUE FROGS												
Cricket	*Acris crepitans*		X						X	X		
Bull	*Rana catesbeiana*		X	X						X		
Green	*Rana clamitans melanota*		X					X				
Pickerel	*Rana palustris*							X	X	X		
Wood	*Rana sylvatica*							X				
Carpenter *	*Rana virgatipes*		X							X		

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COMMON BIRDS FOUND IN HABITATS OF THE MID-COAST REGION

COMMON NAME (1)	*SCIENTIFIC NAME*	HABITAT (2)										
		D	L	A	F	C	S	W	H	N	B	U
Spotted Sandpiper *	*Acitis macularia*		X							X	X	
Red-winged Blackbird	*Agelaius phoeniceus*			X					X	X		
Wood Duck *	*Aix sponsa*							X	X	X		
Sharp-tailed Sparrow	*Ammospiza caudacuta*									X		
Common Pintail	*Anas acuta*									X		
American Wigeon	*Anas americana*			X						X		
Blue-winged Teal	*Anas discors*									X		
Mallard	*Anas platyrhynchos*	X	X	X				X		X		
American Black Duck	*Anas rubripes*		X							X		
Water Pipit	*Anthus spinoletta*			X							X	X
Ruby-throated Humminingbird *	*Archilochus colubris*	X	X	X			X					
Great Blue Heron (3)	*Ardea herodias*		X					X				
Long-eared Owl * (3)	*Asio otus*				X	X	X					
Canvasback	*Aythya valisineria*									X		
Ring-necked Duck	*Aythya collaris*									X		
Lesser Scaup	*Aythya affinis*									X		
Greater Scaup	*Aythya marila*									X		
Cedar Waxwing *	*Bombycilla cedrorum*				X	X						
Ruffed Grouse	*Bonasa umbellas*				X							
American Bittern * (3)	*Botaurus lentiginosus*									X		
Canada Goose	*Branta canadensis*	X	X	X						X		
Cattle Egret	*Bubulcus ibis*	X	X	X						X		
Bufflehead	*Bucephala albeola*									X		
Red-tailed Hawk	*Buteo jamaicensis*	X	X	X	X	X						
Red-shouldered Hawk* (4)	*Buteo lineatus*				X			X				
Broad-winged Hawk	*Buteo platypterus*				X	X						
Green Heron	*Butorides striatus*		X					X		X		

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COMMON BIRDS CONTINUED		HABITATS										
COMMON NAME	*SCIENTIFIC NAME*	D	L	A	F	C	S	W	H	N	B	U
Sanderling *	*Calidris alba*									X	X	
Dunlin	*Calidris alpina*	X									X	
Purple Sandpiper	*Calidris maritima*										X	
Semipalmated Sandpiper	*Calidris pusilla*										X	
Common Snipe	*Capella gallinago*									X		
Whip-poor-will *	*Caprimulgus vociferus*				X			X				
Northern Cardinal	*Cardinalis cardinalis*	X	X	X	X	X	X					
American Goldfinch	*Carduelis tristis*	X	X	X		X	X					
House Finch	*Carpodacus mexicanus*	X	X	X								
Purple Finch	*Carpodacus purpureus*		X		X	X						
Great Egret	*Casmerodius albus*		X							X	X	
Turkey Vulture	*Cathartes aura*	X	X	X								X
Chimney Swift	*Chaetura pelagica*	X	X	X								X
Killdeer	*Charadrius vociferus*	X	X							X	X	X
Common Nighthawk	*Chordeiles minor*	X	X	X		X	X		X	X		X
Common Yellow-Shafter Flicker	*Colaptes auratus*	X	X	X	X	X						
Bobwhite	*Colinus virginianus*	X	X	X			X					
Eastern Pewee	*Contopus virens*				X	X						
American Crow	*Corvus brachyrhynchos*			X	X	X			X	X		
Northern Raven	*Corvus corax*	X	X	X	X	X	X					X
Fish Crow	*Corvus ossifragus*									X		
Blue Jay	*Cyanocitta cristata*	X			X	X						
Mute Swan	*Cygnus olor*	X	X							X		
Black-throated Blue Warbler	*Dendroica coerulescens*				X		X					
Yellow-throated Warbler	*Dendroica dominica*				X		X					
Pileated Woodpecker	*Dryocopus pileatus*				X	X						
Gray Catbird	*Dumetella carolinsis*	X	X	X			X					
Snowy Egret	*Egretta thula*		X					X		X	X	
Horned Lark	*Eremophilia alpestris*	X	X	X							X	X

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COMMON NAME	*SCIENTIFIC NAME*	D	L	A	F	C	S	W	H	N	B	U
American Kestrel	*Falco sparverius*	X	X	X			X		X			X
Little Blue Heron	*Florida caerulea*		X					X		X	X	
Common Loon	*Gavia immer*									X		
Common Yellowthroat *	*Geothlypis trichas*							X	X	X		
Evening Grosbeak	*Hesperiphona vespertina*				X							
Barn Swallow	*Hirundo rustica*	X	X	X						X		X
Wood Thrush	*Hylocichla mustelina*				X			X				
Baltimore Oriole	*Icterus galbula*		X	X	X							
Orchard Oriole	*Icterus spurius*		X	X		X						
Tree Swallow	*Iridoprocne bicolor*	X	X							X		
Northern Junco	*Junco hyemalis*				X							
Herring Gull	*Larus argentatus*	X	X	X						X	X	X
Laughing Gull	*Larus atricilla*	X									X	
Lesser Black-backed Gull	*Larus fuscus*										X	
Glaucous Gull	*Larus hyperboreus*									X	X	
Greater Black-backed Gull	*Larus marinus*										X	
Red-bellied Woodpecker	*Melanerpes carolinus*	X	X		X	X						
Swamp Sparrow	*Melospiza georgiana*								X	X		
Song Sparrow	*Melospiza melodia*			X			X		X	X		
Northern Mockingbird	*Mimus polyglottos*	X	X	X			X					
Brown-headed Cowbird	*Molothrus ater*			X		X	X		X			
Crested Flycatcher	*Myiarchus crinitus*				X	X	X	X	X			
Olive-sided Flycatcher	*Nuttallornis borealis*				X			X				
Common Screech Owl	*Otus asio*			X	X	X						
Osprey* (3)	*Pandion haliaetus*									X	X	
Black-capped Chickadee	*Parus atricapillus*	X			X	X	X					
Tufted Titmouse	*Parus bicolor*	X			X	X	X					
Carolina Chickadee	*Parus carolinensis*	X			X	X	X					
House Sparrow	*Passer domesticus*	X		X								

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COMMON NAME	*SCIENTIFIC NAME*	D	L	A	F	C	S	W	H	N	B	U
Indigo Bunting	*Passerina cyanea*			X		X	X		X			
Double-crested Cormorant	*Phalacrocorax auritus*									X		
Ring-necked Pheasant	*Phasianus colchicus*			X			X					
Rose-breasted Grosbeak	*Pheucticus ludovicianus*				X	X	X	X	X			
American Woodcock	*Philohela minor*							X	X	X		
Downy Woodpecker	*Picoides pubescens*	X			X	X		X				
Hairy Woodpecker	*Picoides villosus*	X			X	X		X				
Rufous-sided Towhee	*Pipilo erythrophthalmus*		X	X	X	X	X					
Scarlet Tanager	*Piranga olivacea*	X			X			X				
Summer Tanager	*Piranga rubra*				X	X		X				
Blue-gray Gnatcatcher	*Polioptila caerlea*				X	X	X					
Purple Martin	*Progne subis*	X	X	X						X		X
Boat-tailed Grackle *	*Quiscalus major*									X		
Common Grackle	*Quiscalus quiscula*	X		X		X				X		
Virginia Rail	*Rallus limicola*									X		
Bank Swallow	*Riparia riparia*		X	X						X		
Eastern Phoebe	*Sayornis phoebe*	X		X								
Ovenbird	*Seiurus aurocapillus*				X			X				
American Redstart	*Setophaga ruticilla*				X			X				
Eastern Bluebird *	*Sialia sialis*		X	X								X
White-breasted Nuthatch	*Sitta carolinensis*	X			X	X		X				
American Tree Sparrow	*Spizella arborea*			X			X			X		
Chipping Sparrow	*Spizella passerina*	X		X	X	X						
Field Sparrow	*Spizella pusilla*		X	X			X					
Common Tern	*Sterna hirundo*									X	X	
Barred Owl * (3)	*Strix varia*				X			X				
Eastern Meadowlark	*Sturnella magna*		X	X			X					
European Starling	*Sturnus vulgaris*	X	X	X		X	X					X
Brown Thrasher	*Toxostoma rufum*			X			X					

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COMMON NAME	*SCIENTIFIC NAME*	D	L	A	F	C	S	W	H	N	B	U
Greater Yellowlegs	*Tringa melanoleuca*									X		
House Wren	*Troglodytes aedon*	X		X			X					
Carolina Wren	*Troglodytes ludovicianus*	X		X			X					
American Robin	*Turdus migratorius*	X	X	X	X	X	X					
Eastern Kingbird	*Tyrannus tyrannus*	X		X	X	X		X	X			
Blue-winged Warbler	*Vermivora Alnus*				X		X	X	X			
Yellow-throated Vireo	*Vireos flavifrons*				X	X	X					
Red-eyed Vireo	*Vireos olivaceus*				X	X	X					
Mourning Dove	*Zenaida macroura*	X	X	X		X	X					
White-throated Sparrow	*Zonotrichia leucophrys*	X			X		X					

BIRD HABITAT CODES: **D**= Developed (includes surburban and urban landscapes and their associated waterways), **L**= Landscaped Open Space (includes lakes and ponds in park-like settings), **A**= Agricultural Land (includes cropland, pastureland and associated buildings), **F**= Forest (includes both dense forests and open woodlands), **C**= Cultivated Tree and Shrub (includes orchards, tree nurseries, vineyards, etc.), **S**= Shrubland, **W**= Forested Wetland (includes swamps), **H**= Shrub Wetland, **N**= Non-tidal Freshwater Marshes, Lakes, Ponds and Streams, **B**= Beach, **U**=Unvegetated Area.

NOTE: 1) * indicates species which are less common, but have been identified or may be found within the region.
2) X indicates typical habitat range, or high potential for the presence of this species within some segment of this habitat. However, some individual specimens may occur outside of their typical habitat range.
3) This species is threatened in New Jersey.
4) This species is endangered in New Jersey.

COMMON INVERTEBRATES FOUND IN HABITATS OF THE MID-COAST REGION

COMMON NAME (1)	*SCIENTIFIC NAME*	HABITAT (2)		
		I	T	O
many ribbed hydromedusae	*Aequorea spp.*	X	X	X
Purple Sea Urchin *	*Arabica punctulata*	X	X	X
Forbes' Asterias Sea Star	*Asterias forbesii*	X	X	X
Moon Jelly	*Aurelia aurita*	X	X	X
Rough Barnacle	*Balanus balanus*	X	X	
Northern Rock Barnacle	*Balanus balanoides*	X	X	
Beroe's comb jellies	*Beroe spp.*	X	X	X
Common Northern Comb Jelly	*Bolinopsis infundibulum*	X	X	X
Blue Crab	*Calinectes sapidus*	X	X	X
Rock Crab	*Cancer irroratus*	X	X	
Green Crab	*Carcinus onaenus*	X	X	X
Sand Shrimp	*Crangon septemspinosa*	X	X	
Common Oyster	*Crassostrea virginica*		X	X
Sand Dollar	*Echinarachnius parma*	X	X	
Striped Anenome	*Haliplanella luciae*	X	X	X
Northern Lobster	*Homarus americanus*	X	X	X
Atlantic Horseshoe Crab	*Limulus polyphemus*		X	X
Common Spider Crab	*Linina enmarginata*	X	X	X
Rough Periwinkle	*Littorina littorea*	X	X	
Krill Shrimp	*Meganyctiphanes norvegaica*			X
Hardshelled Clam	*Mercenaria mercinaria*		X	
Red Sponge	*Microcina prolifer*	X	X	
Frilled Anenome	*Mitridium senile*	X	X	X
Ribbed Mussel	*Modilus demissus*	X		
Softshell Clam	*Mya arenaria*	X	X	
Blue Mussel	*Mytilus edulus*	X	X	X
Crown Jelly	*Nausithoe punctata*			X
obelias	*Obelia sp.*	X	X	X
Ghost Crab	*Ocypods quadrata*		X	X

INVERTEBRATE HABITAT CODES: **I** = Intertidal Ocean, **T** = Subtidal Ocean, **O** = Open Ocean

NOTE: 1) * indicates species which are less common, but have been identified or may be found within the region.
2) X indicates typical habitat range, or high potential for the presence of this species within some segment of this habitat. However, some individual specimens may occur outside of their typical habitat range.

COMMON INVERTEBRATES CONTINUED		HABITAT		
COMMON NAME	*SCIENTIFIC NAME*	I	T	O
Lady Crab	*Ovalipes ocellatus*	X	X	X
hermit crabs	*Pagurus spp.*	X	X	X
Commensal Crab	*Pinnotheres spp.*	X	X	X
Marsh Crab	*Sesmarma reticulatum*	X		
Surf Clam	*Spisula solidissima*	X	X	
Green Sea Urchin *	*Strongylocentrotus drolebachiensis*	X	X	X

INVERTEBRATE HABITAT CODES: I = Intertidal Ocean, T = Subtidal Ocean, O = Open Ocean

NOTE: 1) * indicates species which are less common, but have been identified or may be found within the region.
2) X indicates typical habitat range, or high potential for the presence of this species within some segment of this habitat. However, some individual specimens may occur outside of their typical habitat range.

COMMON FISH FOUND IN HABITATS OF THE MID-COAST REGION

COMMON NAME (1)	*SCIENTIFIC NAME*	HABITAT (2)				
		P	N	B	I	O
Alewife	*Alosa pseudoharengus*	X	X	X	X	X
White Catfish	*Ameiurus catus*	X		X		
Brown Bullhead	*Ameiurus nebulosus*	X		X		
Bay Anchovy	*Anchoa mitchilli*			X		
Striped Anchovy	*Anchoa hepsetus*			X		
American Eel	*Angilla rostrata*					X
Fourspined Stickleback *	*Apeltes quadracus*			X		
Freshwater Drum *	*Aplodinotus grunniens*	X		X		
Silver Perch	*Bairdiella crysoura*			X		
White Sucker	*Catostomus comersoni*	X		X		
Scamp	*Centropristuid striata*					X
Striped Burrfish	*Chilomycterus schoepfi*			X		
Weakfish	*Cynosciaon regalis*			X		
Banded Sunfish	*Enneacanthus obesus*	X	X	X	X	
Bluespotted Sunfish	*Enneacanthus gloriosus*	X	X	X	X	
Creek Chubsucker	*Erimyzon oblongus*	X	X	X		
Chain Pickerel	*Esox niger*	X	X	X	X	
Tesellated Darter *	*Etheostoma olmstedi*	X	X	X		
Glassy Darter *	*Etheostoma vitreum*		X	X		
Eastern Sand Darter *	*Etheostoma pellucidum*		X	X		
Small Mouth	*Etropus microstomus*					X
Stripped Killifish	*Fundulud majalis*			X	X	
Mummichog	*Fundulus heteroclitus*			X	X	
Banded Killifish	*Fundulus diaphanus*			X	X	
Naked Goby *	*Gobisoma bosci*			X		
Feather Blenny *	*Hypsoblennius gentzi*					X
Bluegill	*Lepomis macrochirus*	X	X	X		
Pumpkin Seed	*Lepomis gibbosus*	X	X	X		
Mud Sunfish	*Lepomis punctatus*	X	X	X		
Red Breasted Sunfish	*Lepomis sauritus*	X	X	X		

FISH HABITAT CODES: **P** = Freshwater Ponds, **N** = Non-tidal Streams, B = Brackish Rivers and Bays, **I** = Freshwater Non-tidal Marshes, **O** = Open Oceans

NOTE: 1) * indicates species which are less common, but have been identified or may be found within the region.
2) X indicates typical habitat range, or high potential for the presence of this species within some segment of this habitat. However, some individual specimens may occur outside of their typical habitat range.

COMMON FISHES CONTINUED		HABITAT				
COMMON NAME	*SCIENTIFIC NAME*	P	N	B	I	O
Spot	*Listomus xanthrurus*			X	X	
Common Shiner	*Luxilus cornutus*	X	X	X		
Inland Silverside	*Menidia beryllina*	X	X	X	X	X
Atlantic Silverside	*Menidida menidia*					X
Atlantic Croaker	*Micropogonias undulatus*			X	X	X
Small Mouth Bass	*Micropterus dolomiew*	X		X		
Large Mouth Bass	*Micropterus salmoides*	X		X		
Striped Bass	*Morone saxatilis*			X		X
Margined Madtom *	*Noturus insignis*		X	X		
Golden Shiner	*Notremigonus crysoleucas*	X	X	X		
Oyster Toadfish	*Obsanus tau*					X
Summer Flounder	*Paralicnthys abilgutta*			X		X
Butterfish	*Peprilus triancanthus*					X
Yellow Perch	*Perca flavescens*	X	X	X		
Bluefish	*Pomotomus salatrix*			X		X
Black Sea Bass	*Pomoxis nigromaculatus*					X
Black Crappie	*Pomoxis nigromaculatus*	X	X			
Striped Sea Robin	*Prionus evolans*					X
Winter Flounder	*Pseudoplouronectes americanus*			X		X
Windowpane	*Scopthalumus aquisus*			X		X
Northern Pipefish	*Sygnathus fuscus*					X
Tautog	*Tautogoa enitis*					X
Cunner	*Tautogolabus adspersus*					X
Red Hake	*Urophysis chuss*					X

FISH HABITAT CODES: **P** = Freshwater Ponds, **N** = Non-tidal Streams, **B** = Brackish Rivers and Bays, **I** = Freshwater Non-tidal Marshes, O = Open Oceans

NOTE: 1) * indicates species which are less common, but have been identified or may be found within the region.
2) X indicates typical habitat range, or high potential for the presence of this species within some segment of this habitat. However, some individual specimens may occur outside of their typical habitat range.

Appendix F
City of Long Branch Christmas Bird Count

Birds of the City of Long Branch, New Jersey (National Audubon Society 2011, Grant, D. 2009)			
Common Name	Scientific Name	Common Name	Scientific Name
Snow Goose	*Chen caerulescens*	Double-crested Cormorant	*Phalacrocorax auritus*
Brant	*Branta bernicla*	Great Cormorant	*Phalacrocorax carbo*
Canada Goose	*Branta canadensis*	Great Blue Heron (Blue Form)	*Ardea herodias*
Canada Goose (Small Races)	*Branta canadensis*	Black-crowned Night-Heron	*Nycticorax nycticorax*
Mute Swan	*Cygnus olor*	Black Vulture	*Coragyps atratus*
Wood Duck	*Aix sponsa*	Turkey Vulture	*Cathartes aura*
Gadwall	*Anas strepera*	Bald Eagle	*Haliaeetus leucocephalus*
American Wigeon	*Anas americana*	Northern Harrier	*Circus cyaneus*
American Black Duck	*Anas rubripes*	Sharp-shinned Hawk	*Accipiter striatus*
Mallard	*Anas platyrhynchos*	Cooper's Hawk	*Accipiter cooperii*
Northern Shoveler	*Anas clypeata*	Red-tailed Hawk	*Buteo jamaicensis*
Green-winged Teal	*Anas crecca*	American Kestrel	*Falco sparverius*
Domestic Duck Sp.	*Anatinae*	Merlin	*Falco columbarius*
Ring-necked Duck	*Aythya collaris*	Peregrine Falcon	*Falco peregrinus*
Greater Scaup	*Aythya marila*	American Coot	*Fulica americana*
Lesser Scaup	*Aythya affinis*	Black-bellied Plover	*Pluvialis squatarola*
Common Eider	*Somateria mollissima)*	Killdeer	*Charadrius vociferus*
Eider Sp.	*Anatinae*	Sanderling	*Calidris alba*
Harlequin Duck	*Histrionicus histrionicus*	Purple Sandpiper	*Calidris maritima*
Surf Scoter	*Melanitta perspicillata*	Dunlin	*Calidris alpina*
White-winged Scoter	*Melanitta fusca*	Black-headed Gull	*Chroicocephalus ridibundus*
Black Scoter	*Melanitta americana*	Bonaparte's Gull	*Chroicocephalus philadelphia*
Long-tailed Duck	*Clangula hyemalis*	Ring-billed Gull	*Larus delawarensis*
Bufflehead	*Bucephala albeola*	Herring Gull	*Larus argentatus*
Canvasback	*Aythya valisineria*	Lesser Black-backed Gull	*Larus fuscus*
Hooded Merganser	*Lophodytes cucullatus*	Great Black-backed Gull	*Larus marinus*
Common Merganser	*Mergus merganser*	Laughing Gull	*Larus atricilla*
Red-breasted Merganser	*Mergus serrator)*	Ring-billed Gull	*Larus delawarensis*
Ruddy Duck	*Oxyura jamaicensis*	Storm Petrel	*Oceanodroma*
Redhead Duck	*Aythya americana*	Rock Pigeon	*Columba livia*
Ring-necked Duck	*Aythya collaris*	Mourning Dove	*Zenaida macroura*
Wild Turkey	*Meleagris gallopavo*	Eastern Screech-owl	*Megascops asio*
Red-throated Loon	*Gavia stellata*	Great Horned Owl	*Bubo virginianus*
Common Loon	*Gavia immer*	Belted Kingfisher	*Ceryle alcyon*
Pied-billed Grebe	*Podilymbus podiceps*	Boat-tailed Grackle	*Quiscalus major*
Horned Grebe	*Podiceps auritus*	Horned Lark	*Eremophila alpestris*
Eared Grebe	*Podiceps nigricollis*	Red-bellied Woodpecker	*Melanerpes carolinus*
Western Grebe	*Aechmophorus occidentalis*	Yellow-bellied Sapsucker	*Sphyrapicus varius*
Northern Gannet	*Morus bassanus*	Downy Woodpecker	*Picoides pubescens*
Northern Flicker	*Colaptes auratus*	Hairy Woodpecker	*Picoides villosus*
Blue Jay	*Cyanocitta cristata*	Orange-crowned Warbler	*Oreothlypis celata*
American Crow	*Corvus brachyrhynchos*	Yellow-rumped Warbler	*Dendroica coronata*
Fish Crow	*Corvus ossifragus*	Eastern Towhee	*Pipilo erythrophthalmus*
Horned Lark	*Eremophila alpestris*	American Tree Sparrow	*Spizella arborea*
Carolina Chickadee	*Poecile carolinensis*	Field Sparrow	*Spizella pusilla*
Tufted Titmouse	*Baeolophus bicolor*	Savannah Sparrow	*Passerculus sandwichensis*
Red-breasted Nuthatch	*Sitta canadensis*	Fox Sparrow	*Passerella iliaca*

Birds of the City of Long Branch, New Jersey (National Audubon Society 2011, Grant, D. 2009)			
White-breasted Nuthatch	*Sitta carolinensis*	Song Sparrow	*Melospiza melodia*
Brown Creeper	*Certhia americana*	White-throated Sparrow	*Zonotrichia albicollis*
Carolina Wren	*Thryothorus ludovicianus*	White-crowned Sparrow	*Zonotrichia leucophrys*
Golden-crowned Kinglet	*Regulus satrapa*	Dark-eyed Junco	*Junco hyemalis*
Ruby-crowned Kinglet	*Regulus calendula*	Snow Bunting	*Plectrophenax nivalis*
Eastern Bluebird	*Sialia sialis*	Northern Cardinal	*Cardinalis cardinalis*
Hermit Thrush	*Catharus guttatus*	Red-Winged Blackbird	*Agelaius phoeniceus*
American Robin	*Turdus migratorius*	Brown-Headed Cowbird	*Molothrus ater*
Northern Mockingbird	*Mimus polyglottos*	Baltimore Oriole	*Icterus galbula*
European Starling	*Sturnus vulgaris*	House Finch	*Carpodacus mexicanus*
Cedar Waxwing	*Bombycilla cedrorum*	Red Crossbill	*Loxia curvirostra*
House Sparrow	*Passer domesticus*	American Goldfinch	*Spinus tristis*
Tree Swallow	*Tachycineta bicolor*	Yellow-breasted Chat	*Icteria virens*
Barn Swallow	*Hirundo rustica*		

Appendix G
Natural Heritage Program Correspondence

10009996

State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Parks and Forestry
Office of Natural Lands Management
Natural Heritage Program
P.O. Box 404
Trenton, NJ 08625-0404
Tel. #609-984-1339
Fax. #609-984-1427

BOB MARTIN
Commissioner

December 15, 2010

Barbara Edelhauser
Maser Consulting P.A.
331 Newman Springs Road, Suite 203
Red Bank, NJ 07701

Re: Long Branch City Environmental Resource Inventory

Dear Ms. Edelhauser:

Thank you for your data request regarding rare species information for Long Branch City, Monmouth County.

We have checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat in Long Branch City. Please see Table 1 for species list and conservation status.

Table 1 (on referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Srank
Atlantic leatherback	*Dermochelys coriacea*	LE	E	G2	S1
Atlantic loggerhead	*Caretta caretta*	LT	E	G3	S1
fin whale	*Balaenoptera physalus*	LE	E	G3G4	S1
great blue heron	*Ardea herodias*		SC/S	G5	S3B,S4N
least tern	*Sterna antillarum*		E	G4	S1B,S1N
piping plover	*Charadrius melodus*	LT	E	G3	S1B,S1N

We have also checked the Natural Heritage Database for occurrences of rare plant species or ecological communities. The Natural Heritage Database does not have any records for rare plants or ecological communities in Long Branch City.

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

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2008.pdf.

In order to red flag the general locations of occurrences of rare and endangered plant species and ecological communities, we have prepared computer generated Natural Heritage Index Maps. Enclosed please find the map for the Long Branch USGS quadrangle. If individual projects are to be located in the areas of the map that contain letter codes, the Natural Heritage Program can be contacted for additional information.

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

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

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

Sincerely,

Robert J. Cartica
Administrator

cc: Robert J. Cartica
NHP File No. 10-4007338-6268

NATURAL HERITAGE GRID MAPS

The Natural Heritage Database documents rare species and natural community habitat to inform decision-makers who need to address the conservation of natural resources. Requests can be made for custom searches of the Natural Heritage Database to identify species and natural communities documented to occur in localized areas. Because illegal collection and vandalism threaten many rare species, release of sensitive information is restricted to limited areas and interested parties.

The Natural Heritage Grid Map is produced using geographic information system (GIS) software to provide a general portrayal of the locations of rare plant species and natural communities for the entire state without providing sensitive detailed information. It does not contain data for animal species. By consulting the map, users can do broad scale analysis of potentially sensitive areas, and learn of specific areas where a custom search of the Natural Heritage Database is needed for land use decision-making. A custom search can then be initiated by submitting a Natural Heritage Data Request Form for the specific parcels in question.

The Natural Heritage Grid Map uses a computer-generated grid that divides each USGS 1:24,000 scale topographic map into 100 cells, each cell being between 358 and 372 acres in size. If a rare plant species or natural community has been documented from anywhere within a cell, the entire cell will be coded as containing an occurrence of a rare plant species/natural community. To use these maps, locate the area of interest on the USGS topographic quadrangle base map. Determine if the cells in this area contain a letter code. There are three possible codes:

S – The location of an occurrence of a rare plant species or natural community is precisely known and falls somewhere within the cell.

M – The location of the rare plant species or natural community occurrence is not precisely known; the documented location is only known to within 1.5 miles.

B – Both precisely known (S) and less precise (M) occurrences for rare plant species or natural communities are found within the same cell.

This map is not a complete record of rare and endangered species habitat for this area. **It does not contain data for animal species.** It reflects data on known occurrences compiled as of the date printed in the lower right corner of each map. It includes both historically and recently documented habitat. Uncoded cells may also contain unsurveyed habitat that is occupied by imperiled plant species and natural communities. This product will be updated on a periodic basis. For more information, contact the Office of Natural Lands Management, PO Box 404, Trenton, NJ 08625.

The Natural Heritage Grid Map is available as an ArcView GIS shape file. The zipped version of the file is under 1 MB in size, and will be sent as an email attachment. Contact the Office of Natural Lands Management to obtain a copy of the file via email.

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

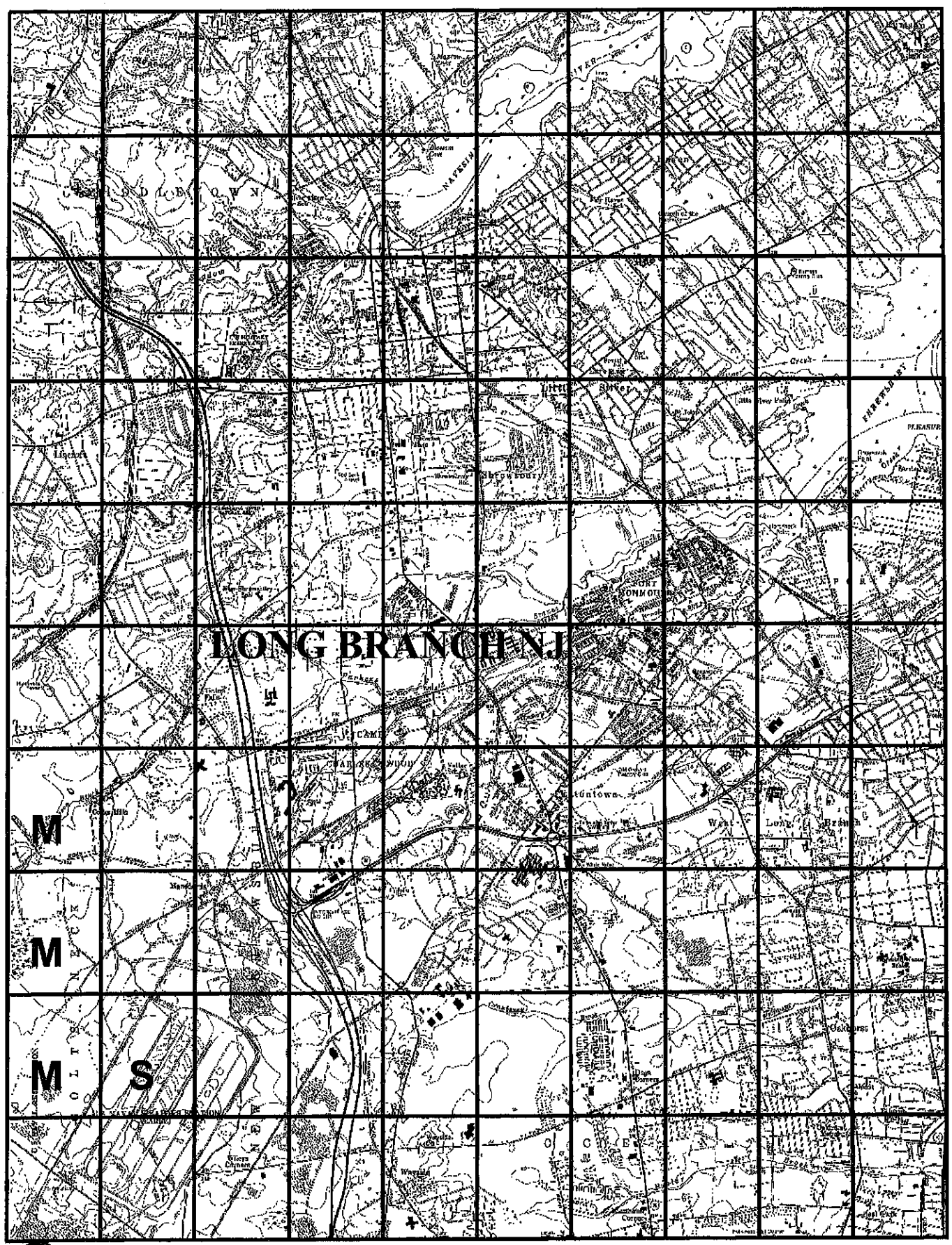
Natural Heritage Grid Map

Rare Plant Species and Natural Communities

S - Documented Location Known Precisely

M - Documented Location Known Within 1.5 Miles

B - Both 'M' and 'S' occurrences



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

0.5 0 0.5 1 Miles

February 2004

State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

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

December 15, 2010

Barbara Edelhauser
Maser Consulting P.A.
331 Newman Springs Road, Suite 203
Red Bank, NJ 07701

Re: Long Branch ERI - Jackson Woods Site

Dear Ms. Edelhauser:

Thank you for your data request regarding rare species information for the above referenced project site in Long Branch City, Monmouth County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3 for the highlands region, Version 2.1 elsewhere) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographic Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat on the referenced site. Please see Table 1 for species list and conservation status.

Table 1 (on refereneed site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Srank
least tern	*Sterna antillarum*		E	G4	S1B,S1N
piping plover	*Charadrius melodus*	LT	E	G3	S1B,S1N

We have also checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat within 1/4 mile of the referenced site. Please see Table 2 for species list and conservation status. This table excludes any species listed in Table 1.

Table 2 (additional species within 1/4 mile of referenced site).

Common Name	*Scientific Name*	Federal Status	State Status	Grank	Srank
Atlantic leatherback	*Dermochelys coriacea*	LE	E	G2	S1
Atlantic loggerhead	*Caretta caretta*	LT	E	G3	S1
fin whale	*Balaenoptera physalus*	LE	E	G3G4	S1

We have also checked the Natural Heritage Database for occurrences of rare plant species or ecological communities. The Natural Heritage Database has a record for an occurrence of *Amaranthus pumilus* that may be in the immediate vicinity of the site. The attached list provides more information about this occurrence. **Because some species are sensitive to disturbance or sought by collectors, this information is provided to you on the condition that no specific locational data are released to the general public. This is not intended to preclude your submission of this information to regulatory agencies from which you are seeking permits.**

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

Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2008.pdf.

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

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

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

Sincerely,

Robert J. Cartica
Administrator

c: NHP File No. 10-4007338-6268

Immediate Vicinity of Project Site
Based on Search of Natural Heritage Database
Rare Plant Species and Ecological Communities Currently Recorded in the New Jersey Natural Heritage Database

Scientific Name	Common Name	Federal Status	State Status	Regional Status	G Rank	S Rank	Last Obs	Ident	Location
Vascular Plant									
Amaranthus pumilus	Seabeach Amaranth	LT	E	LP, HL	G2	S1	2003-09-11	Y	Along the coast in various locations from east of Fort Hancock on Sandy Hook south to the southern end of Monmouth Beach Boro.

1 Records Selected

State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Parks and Forestry
Mail Code 501-04
ONLM -Natural Heritage Program
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Fax. #609-984-1427

BOB MARTIN
Commissioner

December 15, 2010

Barbara Edelhauser
Maser Consulting P.A.
331 Newman Springs Road, Suite 203
Red Bank, NJ 07701

Re: Long Branch ERI - Lake Takanessee Site

Dear Ms. Edelhauser:

Thank you for your data request regarding rare species information for the above referenced project site in Long Branch City, Monmouth County.

Searches of the Natural Heritage Database and the Landscape Project (Version 3 for the highlands region, Version 2.1 elsewhere) are based on a representation of the boundaries of your project site in our Geographic Information System (GIS). We make every effort to accurately transfer your project bounds from the topographic map(s) submitted with the Request for Data into our Geographie Information System. We do not typically verify that your project bounds are accurate, or check them against other sources.

We have checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat on the referenced site. Please see Table 1 for species list and conservation status.

Table 1 (on referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Srank
great blue heron	*Ardea herodias*		SC/S	G5	S3B,S4N
least tern	*Sterna antillarum*		E	G4	S1B,S1N

We have also checked the Natural Heritage Database and the Landscape Project habitat mapping for occurrences of any rare wildlife species or wildlife habitat within 1/4 mile of the referenced site. Please see Table 2 for species list and conservation status. This table excludes any species listed in Table 1.

Table 2 (additional species within 1/4 mile of referenced site).

Common Name	Scientific Name	Federal Status	State Status	Grank	Srank
Atlantic leatherback	*Dermochelys coriacea*	LE	E	G2	S1
Atlantic loggerhead	*Caretta caretta*	LT	E	G3	S1
fin whale	*Balaenoptera physalus*	LE	E	G3G4	S1

We have also checked the Natural Heritage Database for occurrences of rare plant species or ecological communities. The Natural Heritage Database does not have any records for rare plants or ecological communities on or within 1/4 mile of the site.

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

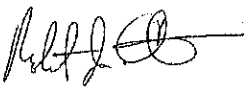
Status and rank codes used in the tables and lists are defined in EXPLANATION OF CODES USED IN NATURAL HERITAGE REPORTS, which can be downloaded from http://www.state.nj.us/dep/parksandforests/natural/heritage/nhpcodes_2008.pdf.

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

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

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

Sincerely,



Robert J. Cartica
Administrator

c: NHP File No. 10-4007338-6268

7/30/2008

Rare Plant Species and Ecological Communities Presently Recorded in the NJ Natural Heritage Database

Scientific Name	Common Name	Federal Status	State Status	Regional Status	G Rank	S Rank
County: **Monmouth**						
Internatl. Vegetation Classification						
Rhexia virginica - Panicum verrucosum Herbaceous Vegetation	Coastal Plain Muck Pondshore			HL	G2G3	S1S3
Terrestrial Community - Other Classification						
Coastal dune woodland	Coastal Dune Woodland				G2G3	S1
Floodplain forest	Floodplain Forest				G4	S3?
Maritime forest	Maritime Forest				G3?	S1
Panicum rigidulum var. pubescens - dichanthelium sp. / sphagnum spp. herbaceous vegetation	Redtop Panicgrass - Rosette Grass / Sphagnum Moss Coastal Plain Intermittent Pond Herbaceous Vegetation				G2	S2
Vascular Plant						
Agastache nepetoides	Yellow Giant-hyssop			HL	G5	S2
Amaranthus pumilus	Seabeach Amaranth	LT	E	LP, HL	G2	S1
Artemisia campestris ssp. caudata	Beach Wormwood			HL	G5T5	S2
Asclepias rubra	Red Milkweed			LP, HL	G4G5	S2
Asclepias variegata	White Milkweed			HL	G5	S2
Asimina triloba	Pawpaw		E	LP, HL	G5	S1
Aster concolor	Eastern Silvery Aster			LP, HL	G4?	S2
Aster radula	Low Rough Aster		E	LP, HL	G5	S1
Cacalia atriplicifolia	Pale Indian Plantain		E	LP, HL	G4G5	S1
Calamagrostis pickeringii	Pickering's Reed Grass		E	LP, HL	G4	S1
Calamovilfa brevipilis	Pine Barren Reedgrass			LP	G4	S4
Carex barrattii	Barratt's Sedge			LP	G4	S4
Carex cumulata	Clustered Sedge		E	LP, HL	G4?	SH

County: **Monmouth**

Carex polymorpha	Variable Sedge		E	LP, HL	G3	S1
Ceratophyllum echinatum	Spiny Coontail		E	LP, HL	G4?	S1
Crataegus calpodendron	Pear Hawthorn		E	LP, HL	G5	S1
Crataegus succulenta	Fleshy Hawthorn		E	LP, HL	G5	S1
Cyperus lancastriensis	Lancaster Flat Sedge		E	LP, HL	G5	S1
Cyperus polystachyos	Coast Flat Sedge		E	LP, HL	G5T5	S1
Desmodium humifusum	Trailing Tick-trefoil		E	LP, HL	G1G2Q	S1
Desmodium viridiflorum	Velvety Tick-treefoil			HL	G5?	S2
Diodia virginiana	Larger Buttonweed		E	LP, HL	G5T5	S1
Dirca palustris	Leatherwood			HL	G4	S2
Doellingeria infirma	Cornel-leaf Aster			HL	G5	S2
Elatine minima	Small Waterwort			HL	G5	S3
Eleocharis halophila	Salt-marsh Spike-rush			HL	G4	S2
Epilobium angustifolium ssp. circumvagum	Narrow-leaf Fireweed			HL	G5T5	S1
Eriocaulon parkeri	Parker's Pipewort			HL	G3	S2
Fraxinus profunda	Pumpkin Ash		E	LP, HL	G4	S1
Gentiana autumnalis	Pine Barren Gentian			LP, HL	G3	S3
Glaux maritima	Sea-milkwort		E	LP, HL	G5	SX.1
Helonias bullata	Swamp-pink	LT	E	LP, HL	G3	S3
Heteranthera multiflora	Bouquet Mud-plantain			HL	G4	S2
Honckenya peploides var. robusta	Seabeach Sandwort			HL	G5T4	S1
Hydrocotyle verticillata var. verticillata	Whorled Marsh-pennywort			HL	G5T5	S2
Juncus articulatus	Jointed Rush			HL	G5	S2
Juncus caesariensis	New Jersey Rush		E	LP, HL	G2	S2
Juncus greenei	Greene's Rush			HL	G5	S2

County: **Monmouth**

Lespedeza stuevei	Stueve's Downy Bush-clover		HL	G4?	S2
Liatris scariosa var. novae-angliae	Northern Blazing-star	E	LP, HL	G5?T3	SH
Limosella subulata	Awl-leaf Mudwort	E	LP, HL	G4G5	S1
Linum intercursum	Sandplain Flax	E	LP, HL	G4	S1
Listera australis	Southern Twayblade		LP, HL	G4	S2
Luzula acuminata	Hairy Wood-rush	E	LP, HL	G5T4T5	S2
Lygodium palmatum	Climbing Fern		LP, HL	G4	S2
Myriophyllum tenellum	Slender Water-milfoil	E	LP, HL	G5	S1
Obolaria virginica	Virginia Pennywort		HL	G5	S2
Onosmodium virginianum	Virginia False-gromwell	E	LP, HL	G4	S1
Panicum scabriusculum	Sheathed Panic Grass		HL	G4	S2
Paspalum dissectum	Mudbank Crown Grass		HL	G4?	S2
Phaseolus polystachios var. polystachios	Wild Kidney Bean		HL	G4TNR	S2
Phlox maculata var. maculata	Spotted Phlox		HL	G5TNR	S2
Phoradendron leucarpum	American Mistletoe		LP, HL	G5	S2
Plantago maritima var. juncoides	Seaside Plantain		HL	G5T5	S2
Plantago pusilla	Dwarf Plantain	E	LP, HL	G5	SH
Platanthera peramoena	Purple Fringeless Orchid	E	LP, HL	G5	S1
Polygala polygama	Racemed Milkwort		HL	G5	S2
Polygonum glaucum	Sea-beach Knotweed	E	LP, HL	G3	S1
Puccinellia fasciculata	Saltmarsh Alkali Grass		HL	G3G5	S2
Pycnanthemum torrei	Torrey's Mountain-mint	E	LP, HL	G2	S1
Pyrola chlorantha	Greenish-flower Wintergreen	E	LP, HL	G5	S1
Ranunculus cymbalaria	Seaside Buttercup	E	LP, HL	G5	SH
Rhynchospora globularis	Coarse Grass-like Beaked-rush	E	LP, HL	G5?	S1

County: **Monmouth**

Rhynchospora knieskernii	Knieskern's Beaked-rush	LT	E	LP, HL	G2	S2
Rhynchospora pallida	Pale Beaked-rush			HL	G3	S3
Rumex hastatulus	Engelmann's Sorrel			HL	G5	SH
Sagittaria australis	Southern Arrowhead		E	LP, HL	G5	S1
Salix lucida ssp. lucida	Shining Willow			HL	G5T5	S1
Scirpus maritimus	Saltmarsh Bulrush		E	LP, HL	G5	SH
Scleria minor	Slender Nut-rush			LP	G4	S4
Stachys hyssopifolia	Hyssop Hedge-nettle			HL	G5	S2
Tipularia discolor	Cranefly Orchid			HL	G4G5	S3
Triglochin maritima	Seaside Arrow-grass		E	LP, HL	G5	S1
Uvularia puberula var. nitida	Pine Barren Bellwort		E	LP, HL	G5T3?	S2
Verbena simplex	Narrow-leaf Vervain		E	LP, HL	G5	S1