MUNICIPAL STORMWATER MANAGEMENT PLAN
MASTER PLAN ELEMENT

BOROUGH OF KEYPORT
MONMOUTH COUNTY, NEW JERSEY

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PREPARED FOR:

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July 2005

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The original of this document has been signed and sealed in accordance with N.J.S.A. 45:14A-1 et. seq.

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INTRODUCTION

As a result of the publication of the United States Environmental Protection Agency (USEPA) Phase II rules in December 1999, the New Jersey Department of Environmental Protection (NJDEP) promulgated new stormwater regulations to address non-point source pollution entering surface and ground waters of the State of New Jersey. Under these regulations, municipalities were issued a New Jersey Pollutant Discharge Elimination System (NJPDES) Permit that established various statewide basic requirements. One of these requirements is the development and adoption of an amendment to their municipal Master Plans to address stormwater pollution associated with major development which is defined by the NJDEP as development disturbing one or more acres of land or increasing impervious surface by one-quarter acre or more.

As required by the Municipal Stormwater Regulations (N.J.A.C. 7:14A-25), the Borough of Keyport has developed this Municipal Stormwater Management Plan (MSWMP) to outline its approach to addressing the impacts resulting from stormwater related issues associated with future development, redevelopment, and land use changes. The MSWMP addresses groundwater recharge, stormwater quantity, and stormwater quality impacts through the incorporation of stormwater design and performance standards for new development and redevelopment projects that disturb one or more acres of land. The standards are intended to minimize negative or adverse impacts of stormwater runoff such as decreased water quality, increased water quantity and reduction of groundwater recharge that provides base flow to the Borough's receiving bodies of water. In addition to minimizing these impacts, the MSWMP provides long term operation and maintenance measures for existing and proposed stormwater management facilities.

The MSWMP also provides recommendations for ordinance modifications in order to expedite the implementation of stormwater management strategies and includes mitigation strategies to allow the Borough to grant variances or exemptions from proposed design and performance standards set forth by the Municipal Stormwater Regulations (N.J.A.C. 7:8-5.5).

GOALS AND OBJECTIVES

The goals of this MSWMP are:

1. Reduce flood damage, including damage to life and property;
2. Minimize, to the extent practical, any increase in stormwater runoff from any new development;
3. Reduce soil erosion from any development or construction project;
4. Encourage the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
5. Maintain groundwater recharge;
6. Prevent, to the greatest extent feasible, an increase in non-point source pollution;
7. Maintain the integrity of stream channels for their biological function, as well as for drainage;
8. Minimize pollutants in stormwater runoff from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the state, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, and other uses of water;
9. Protect public safety through the proper design and operation of stormwater basins;
10. Increase public awareness of stormwater management through public education.

Additionally, this element complements the overall goals of the 1989 *Keyport Borough Master Plan* and the 2001 *Re-examination of the Master Plan and Land Development Ordinance* including:

11. Continue a public-private partnership to enhance and expand the marine and commercial waterfront economic base of Keyport in balance with the public's right of access and enjoyment of the bay;
12. Preserve and dedicate open space within the waterfront district;
13. Develop regulations to ensure preservation and protection of stream corridors;
14. Encourage the use of indigenous vegetation landscaping, which requires less fertilizer

and is more draught tolerant;

15. Encourage the use of Low Impact Design (LID) measures for stormwater management;
16. Protect the natural and economic resources of the Borough and maintain and improve water quality to Raritan Bay.

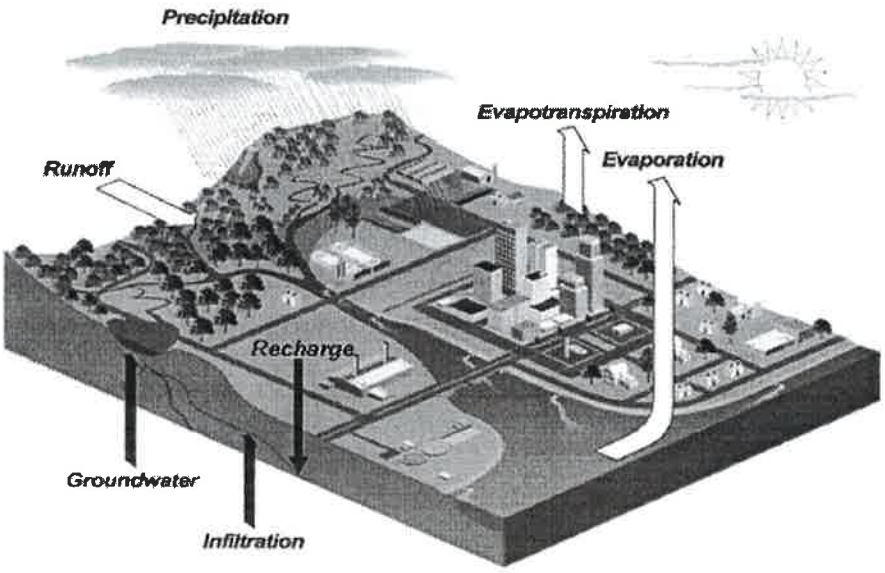
To achieve these goals, the MSWMP outlines specific stormwater design and performance standards for new development and proposes stormwater management controls for addressing impacts from existing developments. Preventive and corrective maintenance strategies are also included to ensure the long-term effectiveness of stormwater management facilities and the MSWMP outlines safety standards for stormwater infrastructure to be implemented to protect public safety.

STORMWATER DISCUSSION

HYDROLOGIC CYCLE

The hydrologic cycle, or water cycle (Figure 1), is the continuous circulation of water between the ocean, atmosphere, and the land. The driving force of this natural cycle is the sun. Water, stored in oceans, depressions, streams, rivers, waterbodies, vegetation and even land surfaces, constantly evaporates due to solar energy. This water vapor then condenses in the atmosphere to form clouds and fog. After water condenses, it precipitates, usually in the form of rain or snow, onto land surfaces and waterbodies. Precipitation falling on land surfaces is often intercepted by vegetation. Plants and trees transpire water vapor back into the atmosphere, as well as aid in the infiltration of water into the soil. The vaporization of water through transpiration and evaporation is called evapo-transpiration. Infiltrated water percolates through the soil as groundwater, while water that flows overland is called surface water. Water flows across or below the surface to reach major water bodies and aquifers and eventually flows to the Earth's seas and oceans. This constant process of evapo-transpiration, condensation, precipitation, and infiltration comprises the hydrologic cycle.

Figure 1: The Hydrologic Cycle



Source: Kern River Connections
http://www.creativille.org/kernriver/watershed.htm

IMPACTS OF DEVELOPMENT AND STORMWATER

As towns and cities develop from rural agricultural communities, the landscape is altered in dramatic ways. Both residential and non-residential development on former agricultural fields and pastures has a great impact on the hydrologic cycle for the specific site. Localized impacts to the hydrologic cycle will ultimately impact the hydrologic cycle of the entire watershed encompassing the development site.

Prior to any land development, native vegetation often intercepts precipitation directly or absorbs infiltrated runoff into their roots. Development often replaces native vegetation with lawns or impervious cover, such as pavement or structures, thereby reducing the amount of evapo-transpiration and infiltration. Regrading and clearing of lots disturbs the natural topography of rises and depressions that can naturally capture rainwater and allow for infiltration and evaporation. Construction activities often compact soil, thereby decreasing its permeability or ability to infiltrate stormwater. Development activities also generally increase the volume of stormwater runoff from a given site.

Connected impervious surfaces and storm sewers (such as roof gutters emptying into a paved parking lot that drains into a storm sewer) allow the runoff to be transported downstream more rapidly than natural areas. This shortens travel time and increases the rainfall- runoff response of the drainage area, causing downstream waterways to peak higher and quicker than natural areas, a situation that can cause or exacerbate downstream flooding, and sedimentation in stream channels. Furthermore, connected impervious surfaces do not allow pollutants to be filtered, or for infiltration and ground water recharge to occur prior to reaching the receiving waters. Increased volume combined with reduced base flows results in a greater fluctuation between normal and storm flows causing greater channel erosion. Additionally, reduced base flows, increased fluctuation, and soil erosion can affect the downstream hydrology, impacting ecological integrity.

Water quantity impacts, combined with land development, often adversely affect stormwater quality. Impervious surfaces collect pollutants from the atmosphere, animal wastes, fertilizers

and pesticides, as well as pollutants from motor vehicles. Pollutants such as hydrocarbons, metals, suspended solids, pathogens, and organic and nitrogen containing compounds, collect and concentrate on impervious surfaces. During a storm event, these pollutants are washed directly into the storm sewers (Figure 2). In addition to chemical and biological pollution, thermal pollution can occur from water collected or stored on impervious surfaces or in stormwater impoundments, which has been heated by the sun. Additionally, large amounts of impervious coverage can result in "heat islands" where the surface temperatures are up to 10 degrees warmer than the surrounding areas. Thermal pollution can affect aquatic habitats, adversely impacting cold water fish. Removal of shade trees and stabilizing vegetation from stream banks also contributes to thermal pollution.

Figure 2: Connected Impervious Surfaces

Rainwater is intercepted by roofing and collected into gutters. The water then discharges from the downspout onto a paved driveway and flows to the gutter and storm drain inlets. Alternatively, the collected water is piped underground directly to the storm sewer.
Photograph source: Titan Gutters

The Borough of Keyport is located within the regulated Coastal Area Facility Review Act (CAFRA) Zone. As such, any regulated activities must be in compliance with the Rules on Coastal Zone Management (N.J.A.C. 7:7E). The Coastal Zone Management Rules Subchapter 5B (N.J.A.C. 7:7E-5B1) sets impervious cover limits and vegetative cover percentages for sites in the CAFRA area. For a site in the CAFRA area, impervious cover limits and vegetative cover

percentages are based on the site's location in a coastal center; in a Coastal Planning Area; in a CAFRA center, CAFRA Core or CAFRA node. As such, the rules regulate the amount of new impervious surface based on the existing conditions of the site and the location of the site within designated CAFRA Planning Area.

Proper stormwater management will help to mitigate the negative impact of land development and its effect on stormwater. This Plan outlines the Borough's plan to improve stormwater quality, decrease stormwater quantity, and increase groundwater recharge. By managing stormwater, the Borough will improve the quality of aquatic ecosystems and restore some of the natural balance to the environment.

BACKGROUND

The Borough of Keyport encompasses 1.42 square miles of Monmouth County, New Jersey. The Borough borders Aberdeen Township along the Matawan Creek to the west, and Hazlet Township to the east and south along the Chingarora Creek. The Borough also borders the Borough of Union Beach along the Chingarora Creek to the northeast, and the Raritan Bay to the north. Keyport is generally a built-out town with little available vacant land, according to the 2001 *Reexamination Report*. However, there are portions of the Borough available for redevelopment. Figure 3 delineates Borough boundaries on a United States Geological Survey (USGS) quadrangle map.

DEMOGRAPHICS AND LAND USE

Since 1980, the Borough population has become stable. Prior to the 1980s, the Borough population grew at a steady rate averaging an 11.6 percent growth rate between 1940 and 1970, with an increase from 5,147 to 7,205. In general, the Borough growth rate is below that of the County and State. The exceptions to this trend are the 1940 and 1980 growth rates, which exceeded the State population growth by one percent. Table 1: "Historical Population Growth 1930 - 2000" summarizes the Borough, County and State population trends from 1930 to 2000.

Table 1 : Historical Population Growth 1930 – 2000

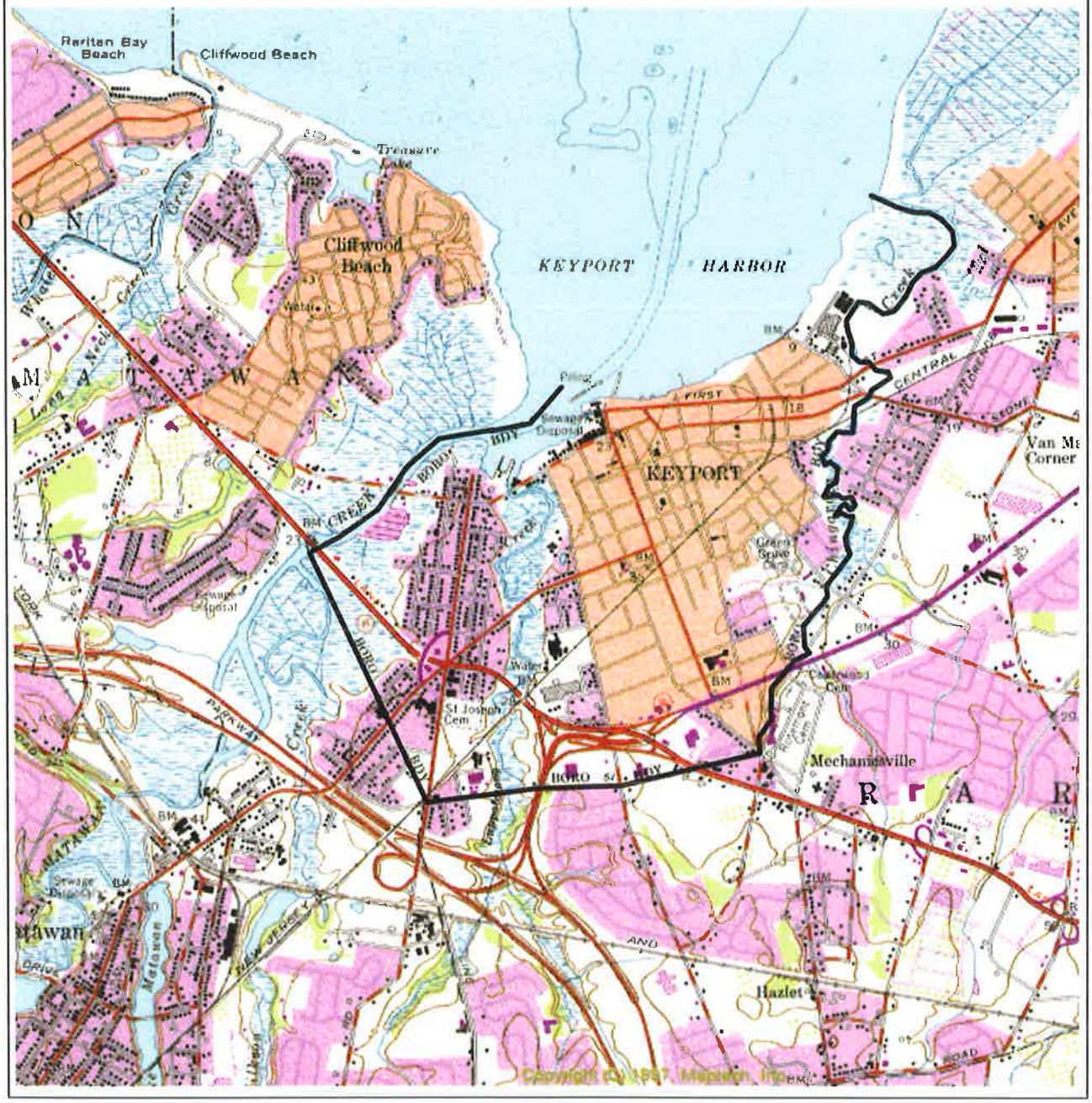
	BOROUGH		MONMOUTH COUNTY		NEW JERSEY	
Year	Population	Percent Change	Population	Percent Change	Population	Percent Change
1930	4,940	---	147,209	---	4,041,334	---
1940	5,147	4	161,238	10	4,160,165	3
1950	5,888	14	225,327	40	4,835,329	16
1960	6,440	9	334,401	48	6,066,782	25
1970	7,205	12	461,849	38	7,168,164	18
1980	7,413	3	503,173	9	7,364,158	2
1990	7,586	2	553,124	10	7,730,188	5
2000	7,568	0	615,301	11	8,414,350	9

SOURCE: US Bureau of Census 1930 – 2000. COMPILED BY: T&M ASSOCIATES

Figure 3: Topographic Map
Borough of Keyport
Monmouth County, New Jersey

0 1000 2000

Source: U.S.G.S. Keyport (1977), NJ Quadrangle Maps



The 2001 *Reexamination Report* noted that the Borough is predominantly built-out and that future growth is anticipated to occur as a result of infill development or redevelopment of previously developed tracts. As shown in Table 2: General Housing Characteristics, the decrease in the number of total housing units further suggests that the Borough is fully developed and future growth will be limited to residential infill development, redevelopment or increased occupancy rates of rental units. Remaining undeveloped land is impacted by either wetlands or located within the designated flood hazard boundaries.

Table 2: General Housing Characteristics

	1990		2000		Change
	Number	Percent	Number	Percent	Number
Occupancy Status					
Total Housing Units	3,403	100	3,400	100	- 3
Occupied Housing Units	3,161	92.9	3,264	96	103
Vacant Housing Units	242	7.1	136	4	- 106
Tenure					
Occupied Housing Units	3,161	100	3,264	100	103
Owner- Occupied Housing Units	1,561	49.4	1,645	48.4	84
Renter- Occupied Housing Units	1,600	50.6	1,619	47.6	19
Vacancy Status					
Vacant Housing Units	242	100	136	100	- 106
Population	7,586	100	7,568	100	- 18
Households	3,161	100	3,264	100	103
Family Household	1,924	60.9	1,797	55.1	- 127
1 Person Household	1,060	33.6	1,253	38.4	193
Persons/ Household	2.4	---	2.31	---	0.09

Source: 1990, 2000 US Census, "Keyport," From Monmouth County At-A-Glance

Though the Borough is predominately residential, there is marina development along the water front areas and highway commercial and industrial land uses along Routes 35 and 36. The NJDEP 1995/1997 land use data shown in Figure 4 delineates the Borough land use. See Figure 5 for the Borough zoning maps. Figure 6 shows the environmentally constrained lands within the Borough including wetlands and the 100 Flood Plain. These areas have severe restriction on development.

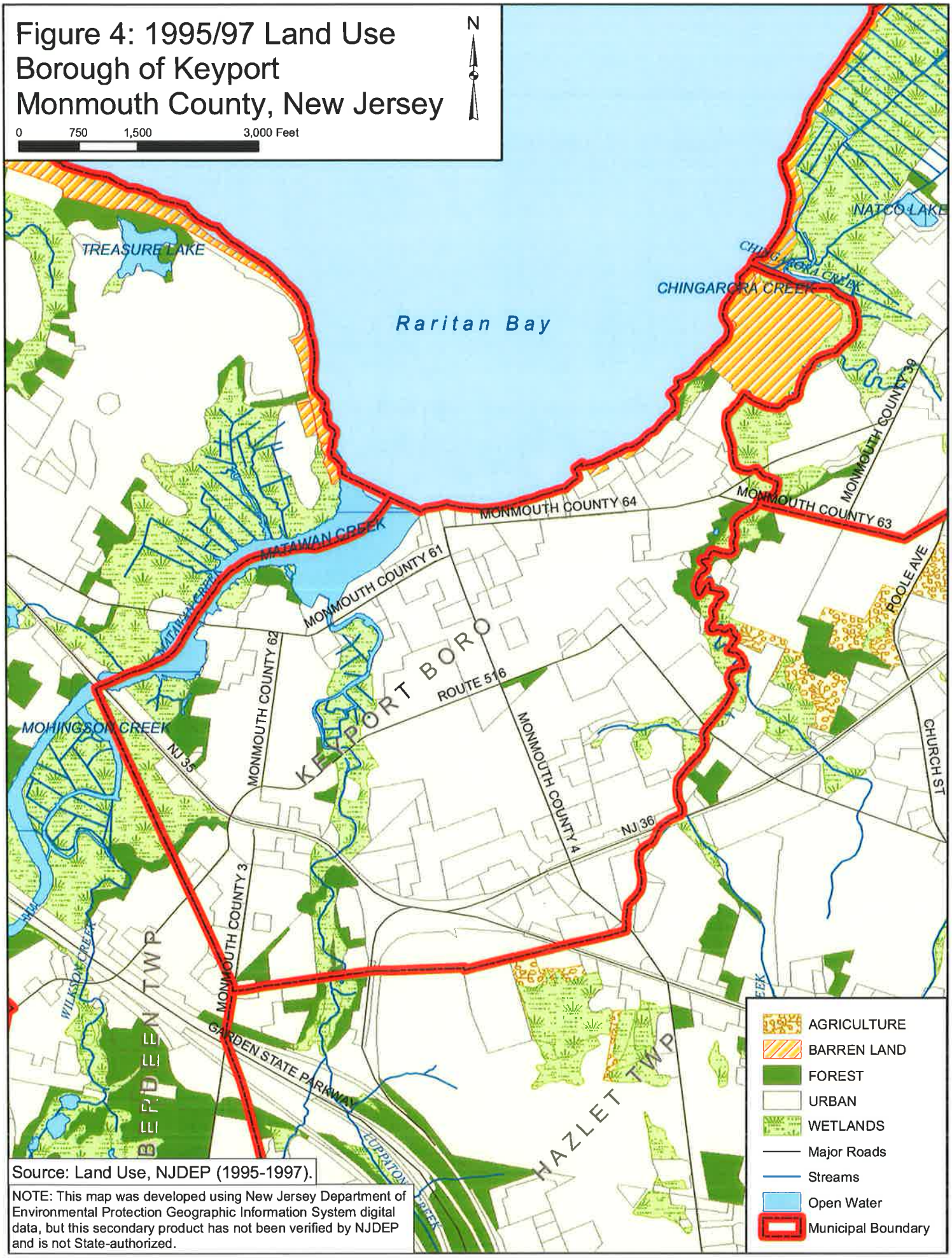
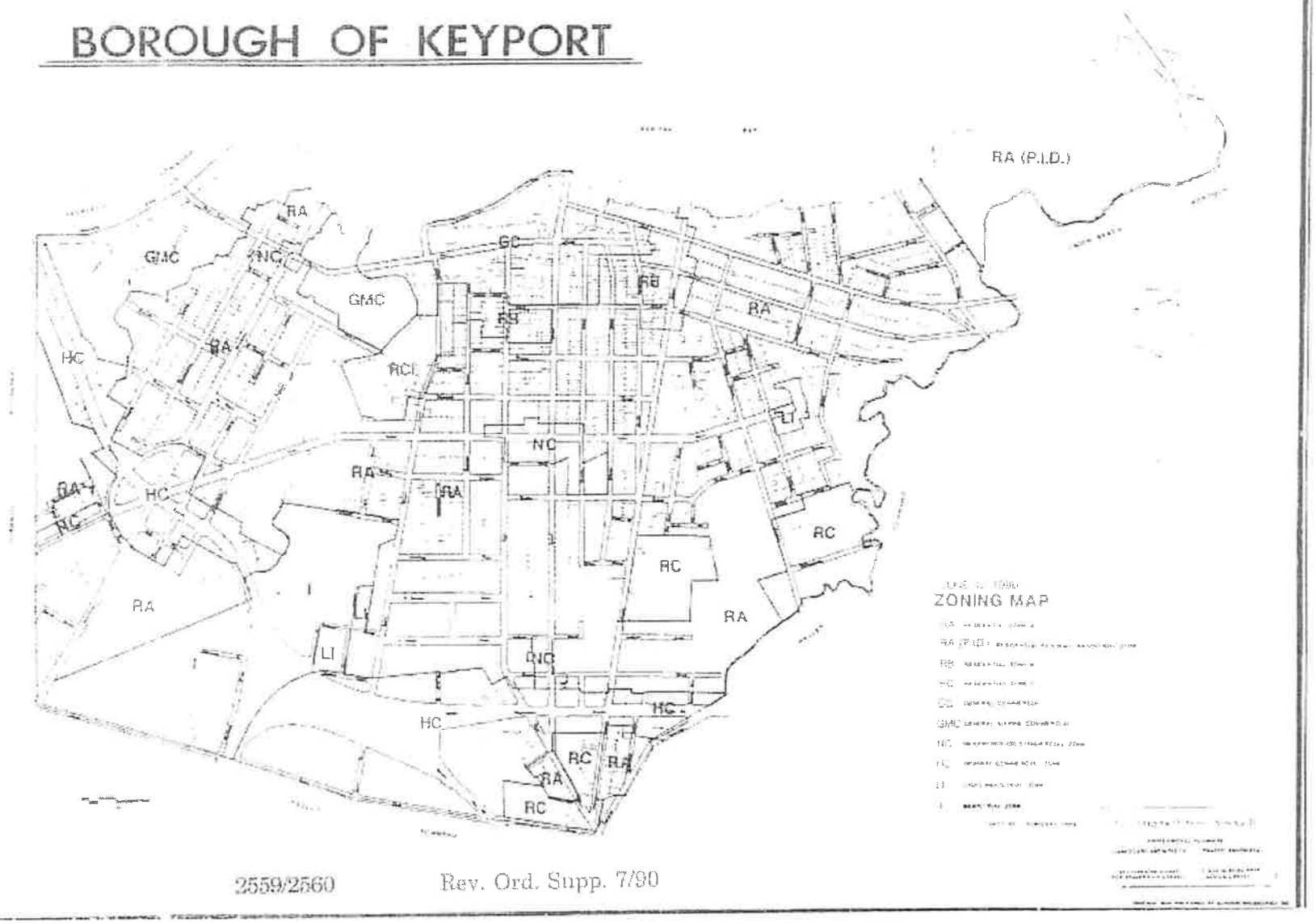


Figure 4: 1995/97 Land Use
Borough of Keyport
Monmouth County, New Jersey
N
0 750 1,500 3,000 Feet
TREASURE LAKE
Raritan Bay
NATCO LAKE
CHINGARORA CREEK
MONMOUTH COUNTY 64
MONMOUTH COUNTY 63
MONMOUTH COUNTY 38
MATAWAN CREEK
MONMOUTH COUNTY 61
MONMOUTH COUNTY 62
KEYPORT BORO
ROUTE 516
MONMOUTH COUNTY 4
ROOLEAVE
CHURCH ST
MOHINGSON CREEK
NJ 35
NJ 36
MONMOUTH COUNTY 3
WILKSON CREEK
GARDEN STATE PARKWAY
HAZLET TWP
AGRICULTURE
BARREN LAND
FOREST
URBAN
WETLANDS
Major Roads
Streams
Open Water
Municipal Boundary
Source: Land Use, NJDEP (1995-1997).
NOTE: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

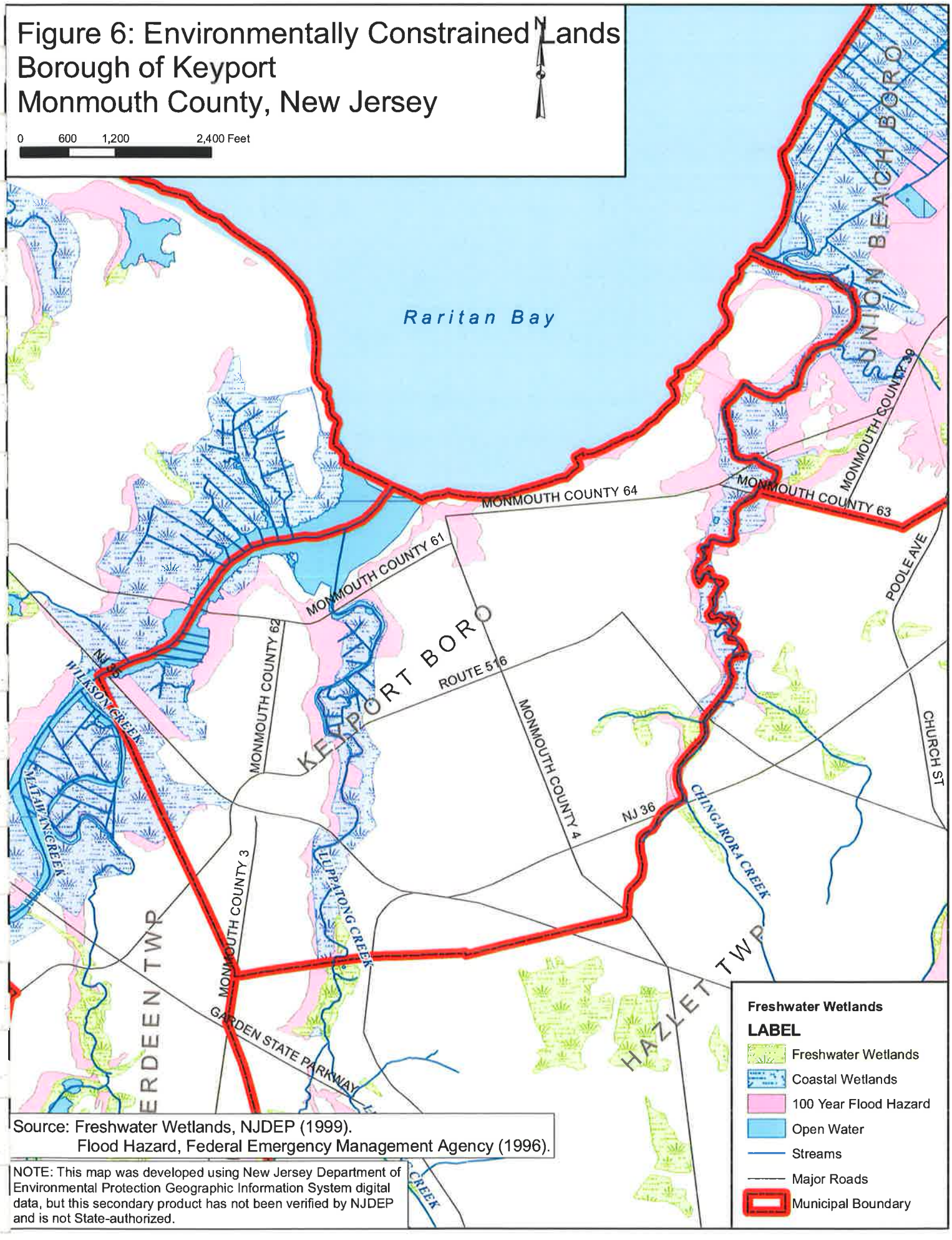
BOROUGH OF KEYPORT



2559/2560 Rev. Ord. Supp. 7/90

Figure 6: Environmentally Constrained Lands
Borough of Keyport
Monmouth County, New Jersey

0 600 1,200 2,400 Feet



Source: Freshwater Wetlands, NJDEP (1999).
Flood Hazard, Federal Emergency Management Agency (1996).

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

WATERWAYS

The Borough waterways include the Raritan Bay, Matawan Creek, Lapattatcong (Lupatatcong) Creek, and the Chingarora Creek. Figure 7 illustrates the waterways of the Borough. Keyport is part of the Raritan Bayshore watershed within the NJDEP Watershed Management Area (WMA) 12. The Raritan Bayshore watershed drains to the Raritan Bay, and includes several major tributary streams within Monmouth County. A HUC-14 subwatershed is a hydrologic unit code which NJDEP and USGS use to map small subwatersheds. HUC-14s are usually about 3,000 acres in size, according to the NJDEP. See Figure 7 for a delineation of the Borough HUC-14 subwatersheds. . The Borough waterways have always played a vital role in the Borough's history, development, and economy.

WATER QUALITY

The Ambient Biomonitoring Network (AMNET) was established by NJDEP to monitor and document the health of New Jersey's waterways. AMNET currently has 820 sites in five drainage basins that it monitors for benthic macro-invertebrates on a five-year cycle. Waterways are scored based on the data to generate the New Jersey Impairment Score (NJIS) and then categorized as severely impaired, moderately impaired, and non-impaired. The NJIS is based on biometrics and benthic macro-invertebrate health. (http://www.state.nj.us/dep/wmm/bfbm/). None of the Borough waterways have been included in the AMNET reports.

In addition to biological health, chemical data are gathered by the NJDEP and other organizations, and used to determine the health of waterways. The water quality data are used by NJDEP to determine if Total Maximum Daily Loads (TMDL) are required for the given waterbody. A TMDL is the quantity of a pollutant that can enter a waterbody without exceeding water quality standards or interfering with the ability to use the waterbody for its designated usage. Point and non-point source pollution, surface water withdrawals and natural background levels are included in the determination of a TMDL, as required by Section 303(d) of the Clean Water Act.

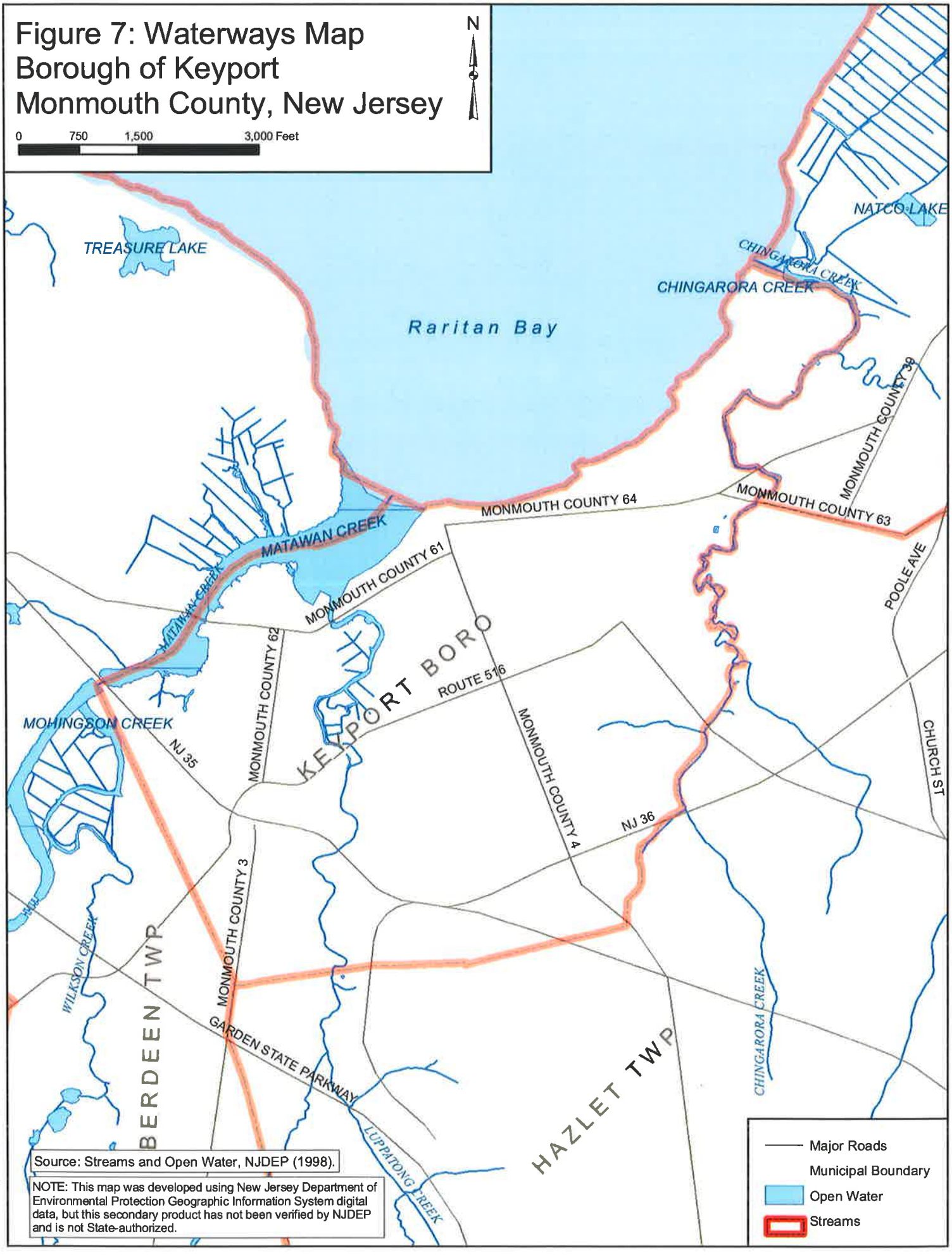
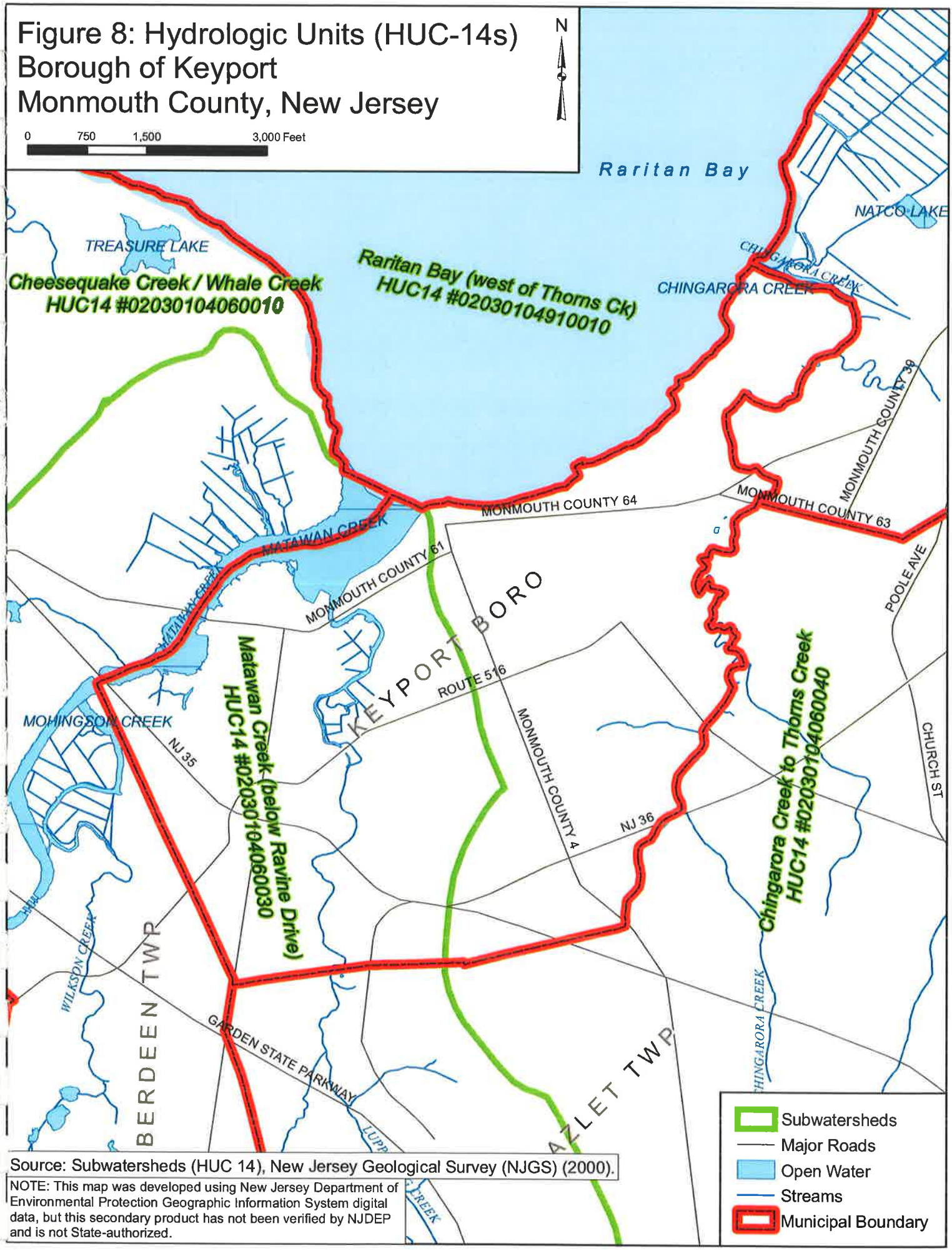


Figure 7: Waterways Map
Borough of Keyport
Monmouth County, New Jersey
N
0
750
1,500
3,000 Feet
TREASURE LAKE
Raritan Bay
NATCO LAKE
CHINGARORA CREEK
CHINGARORA CREEK
MONMOUTH COUNTY 59
MONMOUTH COUNTY 64
MONMOUTH COUNTY 63
MATAWAN CREEK
MATAWAN CREEK
MONMOUTH COUNTY 61
POOLE AVE
MONMOUTH COUNTY 62
KEYPORT BORO
ROUTE 516
MOHINGSON CREEK
NJ 35
MONMOUTH COUNTY 4
CHURCH ST
NJ 36
MONMOUTH COUNTY 3
WILKSON CREEK
BERDEEN TWP
GARDEN STATE PARKWAY
HAZLET TWP
CHINGARORA CREEK
LUPPATONG CREEK
Major Roads
Municipal Boundary
Open Water
Streams
Source: Streams and Open Water, NJDEP (1998).
NOTE: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.



Source: Subwatersheds (HUC 14), New Jersey Geological Survey (NJGS) (2000).

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

Point source pollution includes, but is not limited to NJPDES permitted discharges, while non-point source pollution can include stormwater runoff from agricultural lands or impervious surfaces. TMDLs determine the allowable load from each source, with a factor of safety, for the pollutant entering the waterbody. TMDLs are used to either limit further deterioration of waterbodies, or to improve current water quality. Some of the strategies of TMDL implementation may include, the identification of various sources of pollution, stormwater treatment, implementation of updated ordinances, restriction of impervious surfaces, retrofitting stormwater systems, disconnection of impervious surfaces, and use of other best management practices (BMPs). There are no established or proposed TMDLs for waterways within the Borough.

Each of the Borough's waterbodies are listed on the New Jersey's 2004 Integrated List of Waterbodies, in Table 3 below. (http://www.state.nj.us/dep/wmm/sgwqt/wat/ index.html). This list ranks the quality of waterbodies, with Sublist 1 having the highest quality, and Sublist 5 having the poorest water quality.

Table 3: 2004 Integrated List of Water Bodies in the Borough

Sublist	WMA	Station Name/Waterbody	Site ID	Parameters	Data Source
5	12	Chingarora Creek-Tidal	36, R64	Fecal Coliform, Dissolved Oxygen	Monmouth Co HD, NJDEP Coastal Monitoring
5	12	Lapattatong Creek at 1st St - Peterson's Marina in Keyport	51	Fecal Coliform	Monmouth Co HD
5	12	Matawan Creek-Tidal	8, R62	Fecal Coliform, Dissolved Oxygen	Monmouth Co HD, NJDEP Coastal Monitoring
1	09	Raritan Bay	Raritan Bay-1 thru7	Dissolved Oxygen, Fecal Coliform, Copper, Nickel, Lead, Mercury	NJDEP Coastal Monitoring, Shellfish Monitoring, IEC, HEP (GLEC)
5	09	Raritan Bay	Raritan Bay-1 thru 7	Total Coliform	NJDEP Coastal Monitoring, Shellfish Monitoring, IEC, HEP (GLEC)
1	09	Raritan Bay - Sandy Hook Bay	Sandy Hook Bay	Arsenic, Chromium, Copper, Lead, Mercury, Nickel, Silver, Zinc	HEP (GLEC)
5	09	Raritan Bay and Tidal Tributaries	Raritan Bay and Tidal Tributaries	Fish-PCB, Fish-Dioxin	NJDEP Fish Tissue Monitoring

Source: NJ Integrated List http://www.state.nj.us/dep/wmm/sgwqt/wat/integratedlist/integratedlist2004.html

The NJDEP also provides a list of Category One (C1) waterways. Category One waterways are areas with a special level of protection. Waterways can be designated C1 because of exceptional significance for ecological, water supply, recreational, shellfish or fisheries resources. The Borough has no C1 waterbodies within its boundaries. (http://www.nj.gov/dep/cleanwater/c1_waters_list.pdf) However, according to the *2004 Shellfish Growing Water Classification Charts*, sections of the Raritan Bay and its tributaries have the status of *Prohibited* for shellfish harvesting. NJDEP notes that marina facilities can have a negative affect on shellfish beds; therefore there is a buffer zone around marinas where the waters are considered *Prohibited.* (See Figure 9: Shellfish Classification)

In addition to state monitoring, the Monmouth County Health Department monitors the Borough waterways in the following locations: the Chingarora Creek on Broadway in Union Beach, the Matawan Creek at Amboy Avenue in Aberdeen, and the Lapattatong Creek at Pederson's Marina

on West Front Street. At these sites, fecal coliform, pH, TSS, turbidity, ammonia, and phosphorous are monitored. At the Union Beach site, the Chingarora has above standard phosphorous levels, above standard ammonia levels and an average pH of 7.22. The Matawan Creek site has slightly above standard ammonia and phosphorous levels and an average neutral pH of 7.2 over that same time period. The Lapattatong Creek site showed similar results. It should also be noted that each site has seasonal fecal coliform measurements that are above standard.

According to the County Health Department, each stream has experienced fish kills. Some of these fish kills were due to low concentrations of dissolved oxygen, while others were due to bluefish feeding frenzies. In addition, the Raritan Baykeeper is establishing oyster beds at the mouth of the Chingarora Creek. The beds will provide a future economic base as well as provide biological filtration of the waters of the Raritan Bay and Chingarora Creek.

The Monmouth Coastal Watershed Partnership, in cooperation with the Monmouth County Planning Board, compiled an *Issues List* for the Bayshore Subwatershed in 2001. This list indicated that the Bayshore area has noted issues with erosion, sedimentation, stormwater

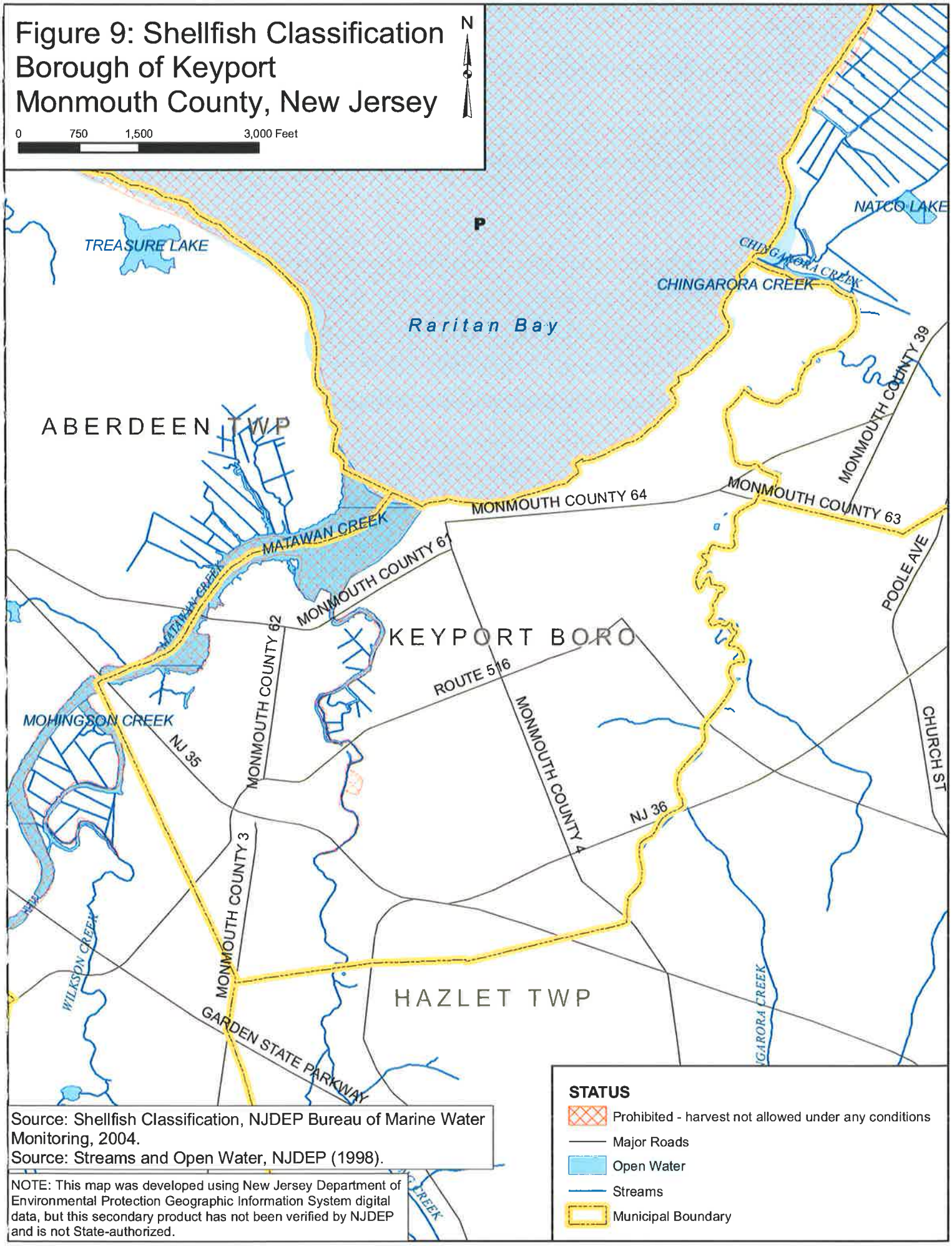


Figure 9: Shellfish Classification
Borough of Keyport
Monmouth County, New Jersey
N
0 750 1,500 3,000 Feet
TREASURE LAKE
Raritan Bay
NATCO LAKE
CHINGARORA CREEK
ABERDEEN TWP
MONMOUTH COUNTY 39
MONMOUTH COUNTY 64
MONMOUTH COUNTY 63
MATAWAN CREEK
MONMOUTH COUNTY 61
POOLE AVE
KEYPORT BORO
MONMOUTH COUNTY 62
ROUTE 516
MOHINGSON CREEK
NJ 35
MONMOUTH COUNTY 4
CHURCH ST
NJ 36
MONMOUTH COUNTY 3
WILKSON CREEK
HAZLET TWP
GARDEN STATE PARKWAY
STATUS
Prohibited - harvest not allowed under any conditions
Major Roads
Open Water
Streams
Municipal Boundary
Source: Shellfish Classification, NJDEP Bureau of Marine Water Monitoring, 2004.
Source: Streams and Open Water, NJDEP (1998).
NOTE: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

infrastructure, and public awareness. As previously mentioned, the Bayshore subwatershed also has issues with water quality and natural resource management for habitat and wetlands.

WATER QUANTITY

In addition to increased hazards from flooding, increasing the volume of stormwater runoff to a stream can cause increased erosion. The flood prone areas within the Borough are shown on Figure 10 and lie along the 100-year flood plain of the Borough waterbodies, according to the USGS Flood-Prone Areas. While many of the Borough's water quantity issues stem from tidal influences, the Borough Planning Board noted the following areas area prone to exacerbated flooding in storm conditions:

- First Street between Church and Broad Street during extremely high tides;
- West Front Street from West Washington Street to the Aberdeen border;
- Beers Street;
- Division between Third Street and Front Street;
- The intersection of Third Street and Waverly Street.

GROUNDWATER RECHARGE

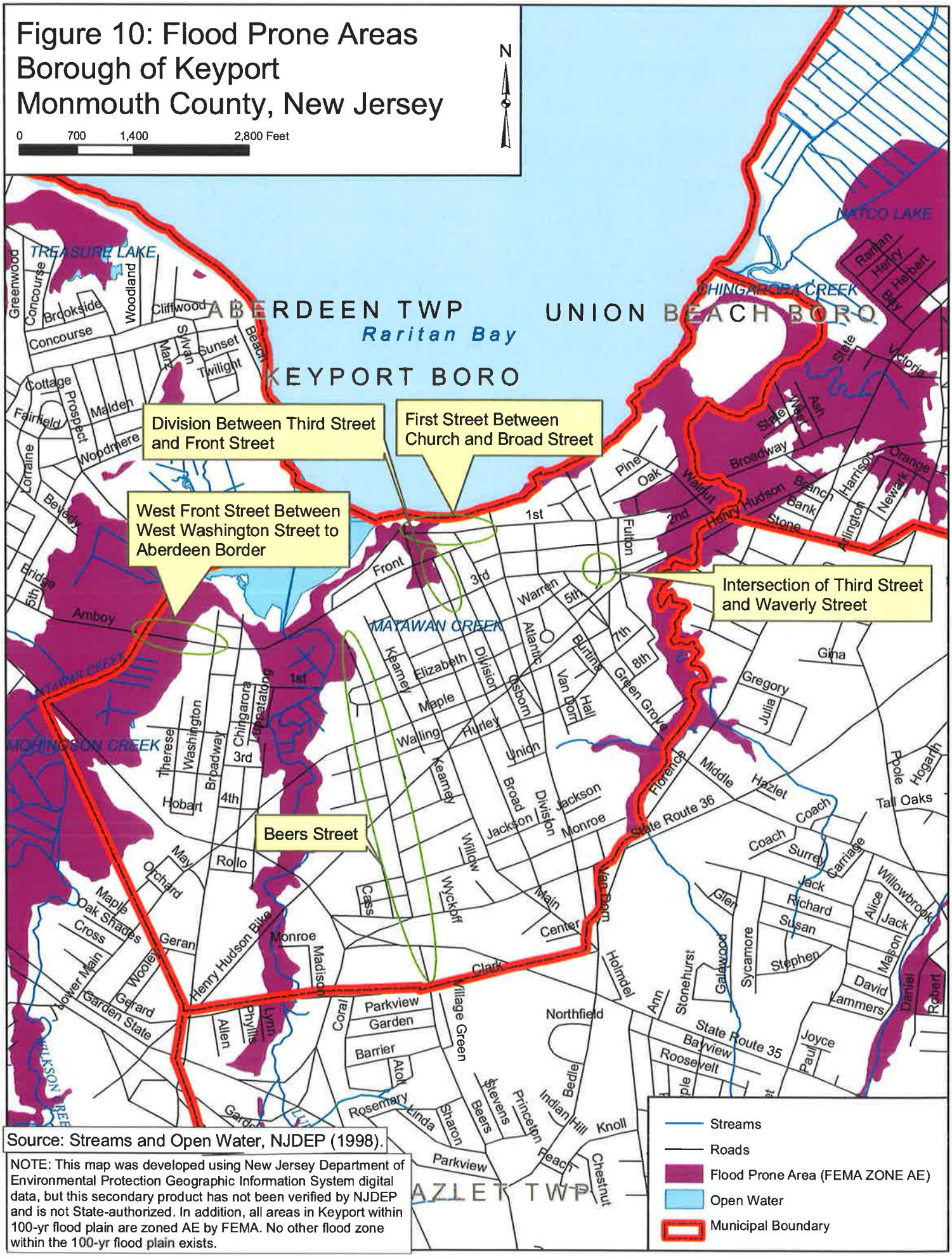
Increases in development of vacant sites have increased impervious surface areas. Impervious surface areas are portions of the development site covered with either structure and/or pavement that prevents the underlying soil from absorbing rainwater. Instead of entering the soil, rainwater from rooftops and pavement flows onto the adjacent ground, where it is partially absorbed into the ground (depending upon hydrologic soil classifications) or into drainage facilities and streams. The greater the amount of impervious surface, the greater volume of stormwater runoff that drains away from a given site. Greater volumes of stormwater can result in high water elevations in some locations along streams and can exacerbate streambed erosion, and potentially cause downstream siltation. These dynamics alter the floodplain and have negative impacts on both the stream and river ecosystems.

Sections of the Borough are located within an urban Metropolitan Planning Area as delineated on the State Plan Policy Map (SPPM). Per N.J.A.C. 7:8-5.4 (a) 2ii and N.J.A.C 7:8-1-2 there are

Figure 10: Flood Prone Areas
Borough of Keyport
Monmouth County, New Jersey

0 700 1,400 2,800 Feet

N



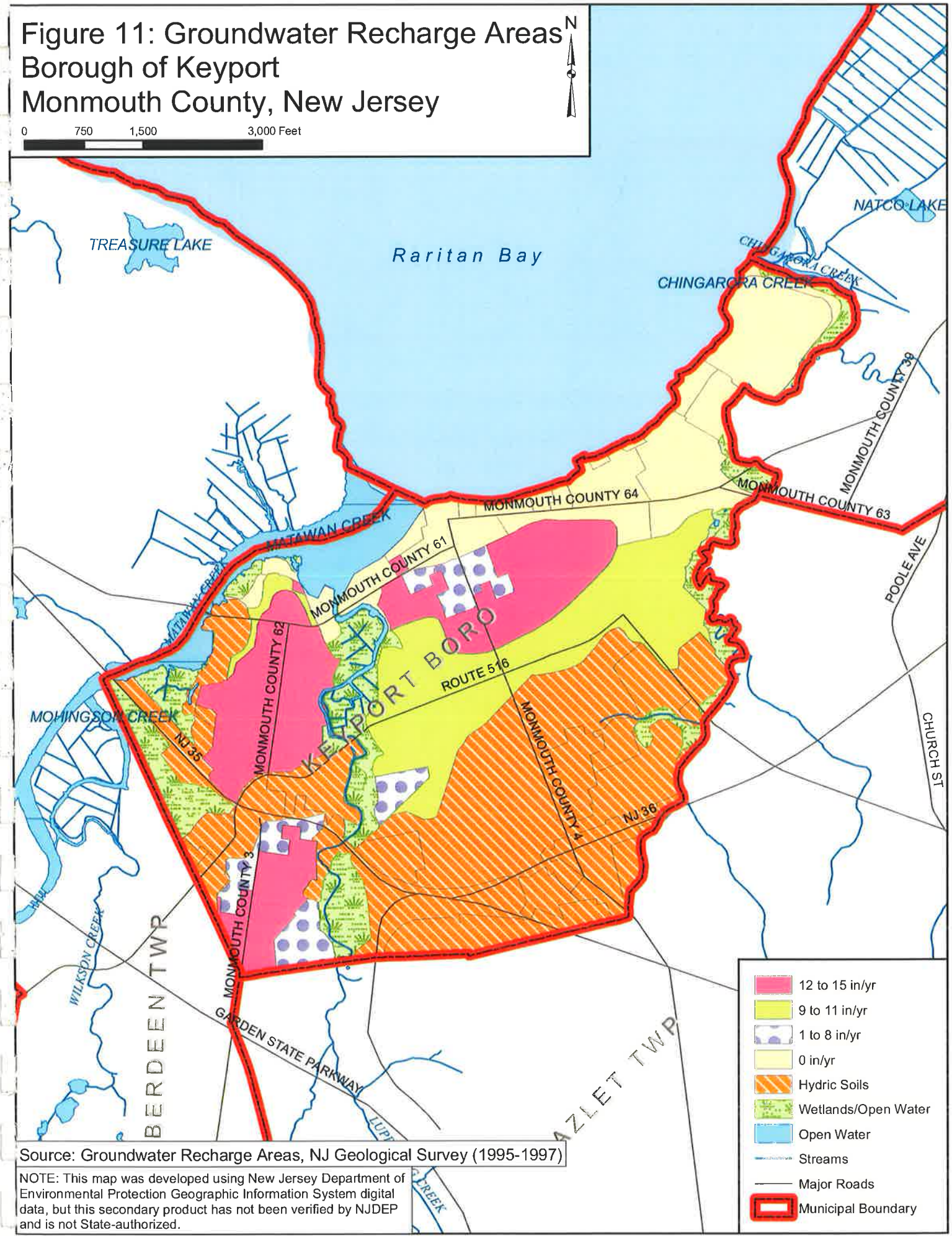
Source: Streams and Open Water, NJDEP (1998).

NOTE: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized. In addition, all areas in Keyport within 100-yr flood plain are zoned AE by FEMA. No other flood zone within the 100-yr flood plain exists.

conditions under which the Groundwater Recharge requirements for the Stormwater Management Rules do not apply for Metropolitan Planning Areas. "Previously developed" lands within urban areas are exempt from these requirements. "Previously developed" means any area on a site that is occupied by structures, been filled or graded. Areas that were deforested, but have reestablished woody vegetation are not considered "previously developed." In addition, only the areas within a given site that meet these criteria are exempt from the groundwater recharge requirements. It is possible to have a site that has partial areas of exemption, and other areas that are required to meet the requirements. Figure 11 illustrates the Borough's groundwater recharge areas.

Wellhead Protection Areas (WHPA) for public community water supplies are map delineations of the horizontal extent captured by well pumping at a given rate over a two-, five-, and twelve-year period of time. These areas are the first step in defining the source of a public drinking supply well. It should be noted, however, that all confined wells have a fifty foot radius delineation which serves as an area to protect the well head. This fifty foot radius in controlled by the water purveyor. Figure 12 delineates the Borough's well locations and wellhead protection areas within Borough boundaries. The two wells shown provide the primary source of drinking water for the Borough during the summer months, however, the Borough purchases water from the Manasquan Reservoir to meet its winter demand.

Figure 11: Groundwater Recharge Areas
Borough of Keyport
Monmouth County, New Jersey



Source: Groundwater Recharge Areas, NJ Geological Survey (1995-1997)

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

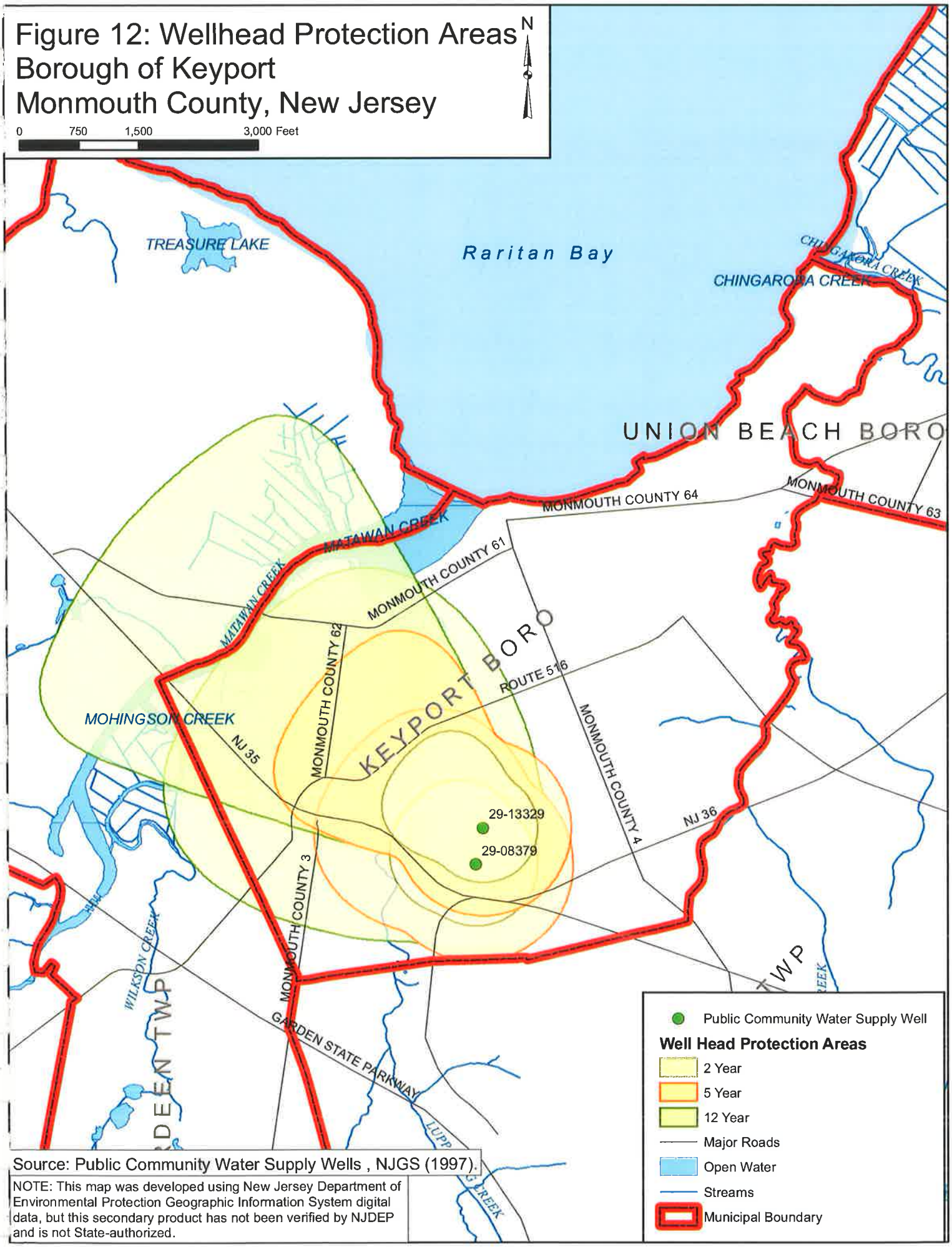


Figure 12: Wellhead Protection Areas
Borough of Keyport
Monmouth County, New Jersey
N
0 750 1,500 3,000 Feet
TREASURE LAKE
Raritan Bay
CHINGAROA CREEK
UNION BEACH BORO
MONMOUTH COUNTY 64
MONMOUTH COUNTY 63
MATAWAN CREEK
MONMOUTH COUNTY 61
MONMOUTH COUNTY 62
KEYPORT BORO
ROUTE 516
MOHINGSON CREEK
NJ 35
MONMOUTH COUNTY 4
NJ 36
29-13329
29-08379
MONMOUTH COUNTY 3
WILKSON CREEK
GARDEN STATE PARKWAY
Public Community Water Supply Well
Well Head Protection Areas
2 Year
5 Year
12 Year
Major Roads
Open Water
Streams
Municipal Boundary
Source: Public Community Water Supply Wells , NJGS (1997).
NOTE: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

DESIGN AND PERFORMANCE STANDARDS

The Borough should adopt applicable design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5 to reduce the negative impact of stormwater runoff on water quality and quantity, and loss of groundwater recharge in receiving waterbodies. Ultimately, design and performance standards will be created to contain the necessary language to maintain stormwater management measures consistent with the applicable stormwater management rules, N.J.A.C. 7:8-5.8 - Maintenance Requirements. This also will include language for safety standards consistent with N.J.A.C. 7:8-6 - Safety Standards for Stormwater Management Basins. This ordinance was adopted by the Borough on February 6, 2007.

It should be noted that a number of the structural and nonstructural strategies require water to be retained for long periods of time. These requirements may increase the promulgation of mosquito breeding habitats. New development and redevelopment activities should be coordinated with the Monmouth County Mosquito Extermination Commission so that proposed structural and nonstructural strategies are properly maintained.

Proper inspection and maintenance are critical components for the successful performance of a stormwater management system. The Borough prepared a Stormwater Pollution Prevention Plan (SPPP) to address inspection and maintenance of existing stormwater infrastructures throughout the Borough. Also included in the SPPP is the development of a Local Public Education Program to educate property owners on methods to reduce non-point source stormwater pollution such as proper waste disposal, solids and floatable controls, fertilizer and pesticide use, wildlife feeding, etc.

New development and redevelopment projects will be required to develop and submit a detailed operation and maintenance plan for each best management practice (BMP) established in accordance with the N.J.A.C. 7:8 - 5.8. Recommendations for proper maintenance procedures are available in the NJDEP's *New Jersey Stormwater Best Management Practices Manual* (BMP

Manual). Copies of the maintenance plan(s) will be filed with the Borough Department of Public Works.

Borough personnel will observe construction of the project to ensure that the appropriate stormwater management measures are constructed and function as designed. Borough personnel will also conduct periodic inspections after significant storms to ensure the system is functioning properly and to identify maintenance needs, if any. For privately owned and operated stormwater management systems, the Owner shall conduct inspections as needed. After this, annual checks will be done to identify any additional maintenance needs required. This may include clearing of blockages from inlets and/or outlet structures, removal of unhealthy vegetation or accumulated debris/materials.

Borough ordinances indicate that the inspection of systems is permissible on private property upon giving reasonable notice. Ordinances also indicate a time frame for maintenance procedures to occur upon receiving notice from the Borough that maintenance is required. Additionally, ordinances require Maintenance Plans for privately owned stormwater management systems which, at a minimum, include information such as contact information for the responsible party, schedule of required maintenance, estimated costs of maintenance, etc. in accordance with State regulations. Enforcement and penalties for noncompliance shall be in accordance with the Borough's Stormwater Control Ordinance (03-07) Section 11.

PLAN CONSISTENCY

REGIONAL STORMWATER MANAGEMENT PLANS

Currently, there are no adopted Regional Stormwater Management Plans (Regional Plans) developed for waterbodies located "within" the Borough's boundaries. This plan will be updated to be consistent with any Regional Plans that are established in the future. Keyport shall take part in the development of any proposed Regional Plans that may affect waterbodies within or adjacent to the Borough.

TOTAL MAXIMUM DAILY LOADS

There are currently no established or proposed stormwater TMDLs for waterbodies within the Borough. This plan will be updated to be consistent with any future stormwater TMDLs established by the NJDEP.

RESIDENTIAL SITE IMPROVEMENT STANDARDS (RSIS)

This MSWMP is consistent with regulations established under the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21, and will be updated to remain consistent with any future updates of RSIS. Additionally, the Borough will use the latest update of RSIS during its reviews of residential area development for stormwater management.

SOIL CONSERVATION

The Borough's Stormwater Management Control Ordinance will require that all new development and redevelopment projects comply with the Soil Erosion and Sediment Control Standards of New Jersey. In cooperation with the Freehold Soil Conservation District, Borough personnel will observe on-site soil erosion and sediment control measures as part of the construction site inspections and contact the district for enforcement and follow-up.

The Freehold Soil Conservation District requires the use of the most recent design storm rainfall data for stormwater calculations. The National Oceanographic and Atmospheric Administration

(NOAA), the agency that develops statistical estimates of rainfall amounts, has increased its estimates for the majority of storm events, particularly the larger events. The following table indicates the old and new twenty-four hour rainfall amounts in inches for Monmouth County.

Table 4: NRCS 24 Hour Design Storm Rainfall Depth (inches) – September 2004

Storm Period	1 yr.		2 yr.		5 yr.		10 yr.		25 yr.		50 yr.		100 yr.	
	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New
Monmouth County	2.8	**2.9**	3.4	**3.4**	4.4	**4.4**	5.3	**5.2**	6.0	**6.6**	6.5	**7.7**	7.5	**8.9**

Source: NOAA, New Jersey Department of Agriculture

MONMOUTH COUNTY GROWTH MANAGEMENT GUIDE

The Monmouth County Growth Management Guide, adopted in December 1995, sets forth a series of goals and objectives designed to enhance the quality of life for residents of Monmouth County. This plan is consistent with those objectives, which include:

- Encouraging the protection of the County's unique, diverse, natural and scenic natural resources; and
- Promoting the protection of non-renewable natural resources; and
- Encouraging the protection and conservation of all water resources; and
- Promoting the preservation and improvements of costal water resources; and
- Promoting the preservation and improvements of surface water quality; and
- Encouraging the preservation and improvements of groundwater quality and quantity; and
- Promoting the preservation, restoration, and enhancement of wetlands and stream corridors in order to protect the adjacent water bodies, such as streams, rivers, lakes, bays and oceans.

This plan is consistent with the County Growth Management Guide by encouraging the protection of stream corridors and encouraging flood control and ground water recharge and through the implementation of the principals of non-structural and structural strategies. This Plan is also consistent with the County Growth Management Guide, by preserving and protecting

valuable natural features within the Borough.

STATE DEVELOPMENT OR REDEVELOPMENT PLAN (SDRP)

This plan is consistent with the plans and policies of the SDRP, which was adopted in 2001. The SDRP places non-environmentally constrained areas in the Borough in the Metropolitan Planning Area (PA1). According to the State Plan, most of the communities within the PA1 planning area are fully developed or almost fully developed with little vacant land available for new development. This Plan is consistent with the State Plan by preserving and protecting the established residential character of the Borough, preserving and upgrading the existing utility infrastructure, providing adequate open space facilities, and preserving and protecting valuable natural features within the Borough.

STORMWATER MANAGEMENT STRATEGIES

The Borough has reviewed its Master Plan (1989), Reexamination Report (2001) and its pertinent development ordinances for consistency with the new stormwater regulations. Based on its review the Borough finds that the following sections must be evaluated and modified, as needed, in order to incorporate the NJDEP's nonstructural strategies for stormwater management. It should also be noted that the Borough is fully developed and minimal "major development[1]" is anticipated.

- **Chapter XVII Soil and Soil Removal:** This Chapter requires a permit for soil removal. The Borough should consider updating this chapter for compliance with all Freehold Soil Conservation District standards.

- **Chapter 25:1-14.6 Landscaping Lighting and Buffer Regulations:** This section requires the use of landscaping and buffers in non-residential areas. This section should be evaluated to encourage the use of native or indigenous vegetation, which requires less water and fertilizer.

- **Chapter 25:1-18 Off street Parking Requirements:**
  - **2. Size:** This section requires parking stalls of 9'x 20'. Sizing should be evaluated to reduce the minimum stall length to 18 feet in practical areas or allow shorter stall lengths where vehicles can overhang vegetative areas.
  - **5. Screening and Landscaping:** This section requires parking lots to be screened on the side abutting residential zones. This section may be expanded to encourage the use of native or indigenous vegetation in the screens, as well as, the use of landscaped islands as vegetative filters in larger parking lots.
  - **9. Drainage:** This section requires drainage and disposal of surface water without detriment to surrounding properties. This section should be modified to include reference

[1] Major Development – means any development that provides for ultimately disturbing one or more acres of land. Disturbance for the purpose of this rule is the placement of impervious surface or exposure and/or movement of soil or bedrock or clearing, cutting, or removing of vegetation. Projects undertaken by any government agency which otherwise meet the definition of 'major development' but which do not require approval under the Municipal Land Use Law, N.J.S.A. 40:55D-1 et seq., are also considered "major development."

to the design, safety, and maintenance standards described in this plan and as required by N.J.A.C. 7:8.

Land Subdivision and Site Plan Ordinance

- **Section 7D Improvements Required for Major Subdivisions**:
  - **2. Curbs and/or Gutters**: The section states requirement for construction of curbs/gutters. The Borough should investigate the use of flush curbing and curb cuts.
  - **3. Sidewalks:** Allowing the use of permeable or pervious paving materials should be considered.

- **Section 8D Performance Standards:**
  - **3**. Requires adequate drainage. This should be updated to include the design, safety and maintenance standards described in this MSWMP and as required by N.J.A.C. 7:8.

- **Section 14 Off-tract Improvements**: This section describes requirements and contributions for off tract improvements, including drainage requirements. Investigate the inclusion the design, safety, and maintenance standards described in this MSWMP and as required by N.J.A.C. 7:8.

Revision of the ordinances identified above will allow the incorporation of the NJDEP recommended non-structural strategies. Adopted ordinances will be submitted to the County for review and approval by April 1, 2006.

NONSTRUCTURAL STRATEGIES

This MSWMP also encourages the use of low impact design methods and recommends the practical use of the following non-structural strategies for all major developments in accordance with the NJDEP BMP Manual:

1. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.

2. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.
3. Maximize the protection of natural drainage features and vegetation.
4. Minimize the decrease in the pre-construction "time of concentration."
5. Minimize land disturbance including clearing and grading.
6. Minimize soil compaction.
7. Provide vegetated open-channel conveyance systems that discharge into and through stable vegetated areas.
8. Provide preventative source controls.

In addition, the NJDEP BMP Manual requires an applicant seeking approval for a major development to specifically identify which and how these nonstructural strategies have been incorporated into the development's design. Finally, for each of those nonstructural strategies that were not able to be incorporated into the development's design due to engineering, environmental, or safety reasons, the applicant must provide a basis for this contention.

Recommended Measures

Recommendations in the BMP Manual may be implemented through the use of:

- **Vegetated Filter Strips**

  Vegetated filter strips are best utilized adjacent to a buffer strip, watercourse or drainage swale since the discharge will be in the form of sheet flow, making it difficult to convey the stormwater downstream in a normal conveyance system (swale or pipe).

- **Stream Corridor Buffer Strips**

  Buffer strips are undisturbed areas between development and the receiving waters. There are two management objectives associated with stream and valley corridor buffer strips:

  - To provide buffer protection along a stream and valley corridor to protect existing ecological form and functions; and

- To minimize the impact of development on the stream itself (filter pollutants, provide shade and bank stability, reduce the velocity of overland flow).

Buffers only provide limited benefits in terms of stormwater management; however, they are an integral part of a system of best management practices.

- **The Stabilization of Banks, Shoreline and Slopes**

The root systems of trees, shrubs and plants effectively bind soils to resist erosion. Increasing the amount of required plant material for new and redeveloped residential and non-residential sites should be encouraged throughout the Borough. Planting schemes should be designed by a certified landscape architect to combine plant species that have complementary rooting characteristics to provide long-term stability. The usage of native plants for this purpose should be encouraged.

- **Fertilizers**

The use of fertilizers to create the "perfect lawn" is an increasingly common problem in many residential areas. Fertilizer run-off increases the level of nutrients in water bodies and an accelerate eutrophication[2] in the lakes and rivers and continue on to the coastal areas. The excessive use of fertilizer causes nitrate contamination of groundwater. Good fertilizer maintenance practices help in reducing the amount of nitrates in the soil and thereby lower its content in the water. Initially, the Borough should work with the NJDEP to educate homeowners of the impacts of the overuse of fertilizers. This discussion should include other techniques to create a "green lawn" without over fertilizing. Almost as important as the use of fertilizer, is the combination of over fertilizing and over watering lawns. In many cases this leads to nutrient rich runoff, which ultimately migrates to a nearby stream, lake or other water body. If fertilizer is applied correctly, the natural characteristics of the underlying soils will absorb or filter out the nutrients in the fertilizer.

STRUCTURAL STORMWATER MANAGEMENT[3]

In Chapter 9 of *New Jersey Stormwater Best Management Practices Manual*, the NJDEP identifies several structural stormwater management options. The Borough recommends the following structural devices. These structural methods should only be used after all non-structural strategies are deemed impracticable or unsafe. Specifically, the Borough encourages the use of structural stormwater management systems in a manner that maximizes the preservation of community character:

- **Bioretention Systems**

  A bioretention system consists of a soil bed planted with native vegetation located above an underdrained sand layer. It can be configured as either a bioretention basin or a bioretention swale. Stormwater runoff entering the bioretention system is filtered first through the vegetation and then the sand/soil mixture before being conveyed downstream by the underdrain system. Runoff storage depths above the planting bed surface are typically shallow. The adopted Total Suspended Solids (TSS) removal rate for bioretention systems is 90 percent.

- **Constructed Stormwater Wetlands**

  Constructed stormwater wetlands are wetland systems designed to maximize the removal of pollutants from stormwater runoff through settling and both uptake and filtering by vegetation. Constructed stormwater wetlands temporarily store runoff in relatively shallow pools that support conditions suitable for the growth of wetland plants. The adopted removal rate for constructed stormwater wetlands is 90 percent.

- **Dry Wells**

  A dry well is a subsurface storage facility that receives and temporarily stores stormwater runoff from roofs of structures. Discharge of this stored runoff from a dry well occurs through infiltration into the surrounding soils. A dry well may be either a structural chamber

[2] Eutrophication – The normally slow aging process by which a lake evolves into a bog or marsh and ultimately assumes a completely terrestrial state and disappears.

and/or an excavated pit filled with aggregate. Due to the relatively low level of expected pollutants in roof runoff, a dry well cannot be used to directly comply with the suspended solids and nutrient removal requirements contained in the NJDEP Stormwater Management Rules at N.J.A.C. 7:8. However, due to its storage capacity, a dry well may be used to reduce the total stormwater quality design storm runoff volume that a roof would ordinarily discharge to downstream stormwater management facilities. Care should be taken with the location and size of dry wells due to potential impacts on basements and foundations.

- **Extended Detention Basins**

  An extended detention basin is a facility constructed through filling and/or excavation that provides temporary storage of stormwater runoff. It has an outlet structure that detains and attenuates runoff inflows and promotes the settlement of pollutants. An extended detention basin is normally designed as a multistage facility that provides runoff storage and attenuation for both stormwater quality and quantity management. The adopted TSS removal rate for extended detention basins is 40 to 60 percent, depending on the duration of detention time provided in the basin.

- **Infiltration Basins**

  An infiltration basin is a facility constructed within highly permeable soils that provides temporary storage of stormwater runoff. An infiltration basin does not normally have a structural outlet to discharge runoff from the stormwater quality design storm, but may require an emergency overflow for extraordinary storm events. Instead, outflow from an infiltration basin is through the surrounding soil. An infiltration basin may also be combined with an extended detention basin to provide additional runoff storage for both stormwater quality and quantity management. The TSS removal rate for infiltration basins is 80 percent.

- **Manufactured Treatment Devices**

  A manufactured treatment device is a pre-fabricated stormwater treatment structure utilizing settling, filtration, absorptive/adsorptive materials, vortex separation, vegetative components,

[3] Definitions provided in the NJDEP – Stormwater Best Management Practices Manual at: http://www.njstormwater.org/tier_A/ bmp_manual.htm

and/or other appropriate technology to remove pollutants from stormwater runoff. The TSS removal rate for manufactured treatment devices is based on the NJDEP certification of the pollutant removal rates on a case-by-case basis. Other pollutants, such as nutrients, metals, hydrocarbons, and bacteria can be included in the verification/certification process if the data supports their removal efficiencies. Any such device should be consistent with current Borough equipment selection/approved Borough device.

- **Pervious Paving Systems**

  Pervious paving systems are paved areas that produce less stormwater runoff than areas paved with conventional paving. This reduction is achieved primarily through the infiltration of a greater portion of the rain falling on the area than would occur with conventional paving. This increased infiltration occurs either through the paving material itself or through void spaces between individual paving blocks known as pavers. Pervious paving systems are divided into three general types. Each type depends primarily upon the nature of the pervious paving surface course and the presence or absence of a runoff storage bed beneath the surface course. Porous paving and permeable paver with storage bed systems treat the stormwater quality design storm runoff through storage and infiltration. Therefore, these systems have adopted TSS removal rates similar to infiltration structures. Care must be taken with the use of pervious systems to avoid subgrade instability and frost related deterioration. Pervious paving systems also require significant maintenance to maintain their designed porosity.

- **Sand Filters**

  A sand filter consists of a forebay and underdrained sand bed. It can be configured as either a surface or subsurface facility. Runoff entering the sand filter is conveyed first through the forebay, which removes trash, debris, and coarse sediment, and then through the sand bed to an outlet pipe. Sand filters use solids settling, filtering, and adsorption processes to reduce pollutant concentrations in stormwater. The adopted TSS removal rate for sand filters is 80 percent.

- **Vegetative Filters**

  A vegetative filter is an area designed to remove suspended solids and other pollutants from stormwater runoff flowing through a length of vegetation called a vegetated filter strip. The vegetation in a filter strip can range from turf and native grasses to herbaceous and woody vegetation, all of which can either be planted or indigenous. It is important to note that all runoff to a vegetated filter strip must both enter and flow through the strip as sheet flow. Failure to do so can severely reduce and even eliminate the filter strip's pollutant removal capabilities. The total suspended solid (TSS) removal rate for vegetative filters will depend upon the vegetated cover in the filter strip.

- **Wet Ponds**

  A wet pond is a stormwater facility constructed through filling and/or excavation that provides both permanent and temporary storage of stormwater runoff. It has an outlet structure that creates a permanent pool and detains and attenuates runoff inflows and promotes the settlement of pollutants. A wet pond, also known as a retention basin, can also be designed as a multi-stage facility that provides extended detention for enhanced stormwater quality design storm treatment and runoff storage and attenuation for stormwater quantity management. The adopted TSS removal rate for wet ponds is 50 to 90 percent depending on the permanent pool storage volume in the pond and the length of the retention time provided by the pond.

Table 5, below, summarizes the approximate TSS removal rates for these structures. Final TSS removal rates should be calculated for each structure based on its final design parameters.

Table 5: Total Suspended Solids Removal Rates for Best Management Practices

Best Management Practice (BMP)	Adopted TSS Removal Rate (Percent)
Bioretention System	90
Constructed Stormwater Wetland	90
Dry Well	Volume Reduction Only
Extended Detention Basin	40-60*
Infiltration Structure	80
Manufactured Treatment Device	See N.J.A.C 7:8-5.7(d)
Pervious Paving System	Volume Reduction Or 80 (with infiltration bed)
Sand Filter	80
Vegetative Filter	60-80
Wet Pond	50-90*

*Based on volume and detention time
Source: NJDEP BMP Manual, Apr. 2004.

Each of these structures has advantages and disadvantages to manage stormwater. As previously noted, Keyport is a fully developed community and anticipates the majority of new construction as residential infill development or redevelopment of previously developed land tracts.

LAND USE/ BUILD-OUT ANALYSIS

According to the U.S. Census, approximately 0.7% (0.01 square miles) of the Borough's area is covered by water. Additionally, as seen by the Constrained Land and Flood Prone Area maps, much of the Borough falls within the 100-year Flood Hazard area, which restricts development. Additionally, in accordance with the *2001 Reexamination of Master Plan and Land Development Ordinance*, "Keyport is almost entirely built-out with little available vacant land suitable for development, many large scale in-fill projects and building demolitions have occurred over the past few decades..." Based on 2008 County Planning Board estimates, there are approximately 35 acres of remaining developable land in the Borough. The Borough of Keyport therefore has less than one (1) square mile of developable land, and is exempt from the NJDEP regulations requiring the development of a build-out analysis, which would indicate the potential for development within the Borough (see Figure 4).

Figure 8 illustrates the Hydrologic Units (HUC-14s) located within the Borough and Figure 6 shows the environmentally constrained lands.

MITIGATION PLAN

This mitigation plan is provided for proposed development or redevelopment projects that seek a variance or exemption from the stormwater management design and performance standards set forth in this MSWMP and N.J.A.C. 7:8-5.

MITIGATION PROJECT CRITERIA

To grant a variance or exemption from the stormwater regulations, new development and redevelopment plan applications must propose a mitigation project affecting the impacted sensitive receptor and located within the same drainage basin as the proposed development/redevelopment. Proposed mitigation projects must provide for additional groundwater recharge benefits, protection from stormwater runoff quantity or quality from previously developed property that does not currently meet the design and performance standards outlined in this MSWMP. Mitigation projects should also be as close in terms of hydrology and hydraulics to the proposed development/redevelopment as possible, and affect the same sensitive receptor..

Projects must be proposed on an equivalent basis. Developers must propose a mitigation project similar in kind to the variance or exemption being requested. Proposed mitigation projects cannot adversely impact the existing environment.

DEVELOPER MITIGATION PLAN REQUIREMENTS

Proposed mitigation projects shall have Mitigation Plans submitted to the Borough for review and approval prior to granting final approval for site development. Developers should include the following in a Mitigation Plan:

- Mitigation Project Name, Owner name and address, Developer name and address, Mitigation Project Location, Drainage Area, Cost Estimate;
- Proposed mitigation strategy and impact to sensitive receptor. What is being impacted, mitigated, and how;

- Legal authorization required for construction and maintenance;
- Responsible Party including: a schedule of required maintenance or maintenance plan, who will perform the maintenance, proposed cost of maintenance, and how it will be funded;
- All other permits required for construction of the mitigation project;
- Cost estimate of construction inspection; and
- Reason a waiver or exemption is requested and supporting evidence.

Due to the minimal amount of vacant or developable land available, it is anticipated that the majority of the mitigation projects proposed will result in retrofitting/rehabilitation of existing stormwater facilities and natural infrastructures, and flood relief projects. Any applicant seeking relief via a mitigation option shall provide such relief that is equal to or greater than the parameter being sought for relief. Mitigation options shall be quantifiable in order to be compared to that being substandard on the proposed site. More detailed information may be available from the Borough or the Borough Engineer's office.

It is the developer's responsibility to provide a detailed study of any proposed mitigation project, and provide the Borough with a proposed mitigation plan for review and approval. Mitigation projects should meet all applicable safety, design and performance standards. Approval of the mitigation option will be under the sole discretion of the Board based on calculations provided by the applicant and reviewed by the Board's professional consultants. The applicant will be required to submit an alternative mitigation option if one chosen is not suitable or the Board deems the selected option not applicable.

RECOMMENDATIONS

The following are additional recommendations associated with this Stormwater Management Plan Element of the *Master Plan*:

- ***Recommendation A: Review and amend existing Development/Zoning Regulations to implement the principles of non-structural and structural stormwater management strategies to reduce stormwater quantity, improve stormwater quality and to maintain or increase groundwater recharge.***

  Portions of the existing Development/Zoning Regulations are inconsistent with recently adopted NJDEP Stormwater Management Regulations and the NJDEP *Best Management Practices for the Control of Non-Point Source Pollution from Stormwater Manual*. Some of these inconsistencies are identified in the Stormwater Management Strategies section above. The Borough should evaluate and update their existing regulations, as needed, to be in conformance with these regulations and to minimize inconsistencies or conflicts. Additionally, the Borough should evaluate the need to require the submittal of Stormwater Management Plans within the Site Plan Package for review and approval by the Board and Board professionals.

- ***Recommendation B: Educate residents on the impacts of the overuse of fertilizers and good fertilizer maintenance practices.***

  As stated in the Stormwater Management Strategies section above, the overuse of fertilizers has a significant detrimental impact on surface water bodies and groundwater. The Borough should work with the NJDEP to educate residents on these impacts and encourage residents to use techniques to create a "green lawn" without over-fertilizing and/or to convert lawn areas to other kinds of vegetation that do not require fertilization and other chemical treatments. Many lawn services also "overspray" fertilizer onto roadways and adjacent properties. The Borough should investigate methods to minimize the application of

fertilizers beyond property lines.

- ***Recommendation C: Seek to ensure the inspection, monitoring, and maintenance of all stormwater management facilities and develop strategies for all existing and future maintenance and improvements.***

  Stormwater facilities require regular maintenance to ensure effective and reliable performance. Failure to perform the necessary maintenance can lead to diminished performance, deterioration and failure. In addition, a range of health and safety problems, including mosquito breeding and the potential for drowning, can result from improperly maintained facilities. To minimize these risks, the Borough should implement a procedure for regular inspection, monitoring, and maintenance of Borough owned stormwater facilities.

  The Borough should also evaluate and identify maintenance and/or improvement needs and develop procedures for regular inspection and maintenance of existing and proposed privately owned stormwater facilities. Additionally, the Borough should encourage the use of low impact design methods and non-structural strategies that require less maintenance.

- ***Recommendation D: Evaluate redefining the threshold definition for "Major Development" within the Borough.***

  The Borough is mostly built-out and does not anticipate any large areas of new development. However, residential tear downs and smaller site developments or redevelopments that do not currently meet the NJDEP's definition of "Major Development" may have a major impact on Borough stormwater management. Therefore, the need to include smaller development or redevelopment projects (i.e. 15,000 sq. ft. or greater) in certain sensitive areas may be evaluated to further minimize stormwater impacts associated with these developments.

- ***Recommendation E: Evaluate the NJDEP recommended BMPs for use within the Borough.***

The NJDEP provides several structural and non-structural strategies for stormwater management. Some of these facilities, however, may not be suitable for use within the Borough. Each measure/strategy should be evaluated to determine its long-term feasibility and effectiveness for use within the Borough.

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