

MUNICIPAL STORMWATER MANAGEMENT PLAN MASTER PLAN ELEMENT

BOROUGH OF UNION BEACH
MONMOUTH COUNTY, NEW JERSEY

PREPARED FOR:

BOROUGH OF UNION BEACH PLANNING BOARD

ADOPTED MARCH 30, 2005
AMENDED FEBRUARY 2007

PREPARED BY:

EDWARD G. BROBERG, P.E., P.P
BOROUGH OF UNION BEACH ENGINEER

OF THE FIRM



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A handwritten signature in black ink, appearing to read 'Edward G. Broberg'. The signature is written in a cursive style and is positioned above a horizontal line.

EDWARD G. BROBERG, P.E., P.P
LICENSED PROFESSIONAL ENGINEER – NO. GE18001
LICENSED PROFESSIONAL PLANNER NO. 1000

JANUARY 2007

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Members of the 2007 Planning Board

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John Roche, Vic-Chairman

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Cheryl L. Hammel, Esq., Board Attorney

Edward G. Broberg, P.E., P.P., Board Engineer/ Planner

Madeline Russo, Board Secretary

**RESOLUTION OF THE PLANNING BOARD OF
THE BOROUGH OF UNION BEACH**

WHEREAS, the Planning Board is a duly constituted authority created pursuant to the provisions of N.J.S.A. 40:55D-23 of the Municipal Land Use Law; and

WHEREAS, pursuant to N.J.S.A. 40:55D-28, the Planning Board may prepare, and after public hearing, amend a Master Plan or component parts thereof to guide the use of lands within the municipality in a manner which protects public health and safety and promotes the general welfare; and

WHEREAS, pursuant to N.J.A.C. 7:8-4.3(a), a municipality shall adopt a Municipal Stormwater Management Plan as an integral part of its Master Plan; and

WHEREAS, pursuant to N.J.A.C. 7:8-1.1 et seq., the Planning Board prepared a Municipal Stormwater Management Plan – Master Plan Element, which was adopted on March 30, 2005, in order to comply with the requirements set forth in the New Jersey Administrative Code for Municipal Stormwater Management Planning; and

WHEREAS, Union Beach's Stormwater Master Plan Element was submitted to the Monmouth County Planning Board for review and approval, in accordance with N.J.A.C. 7:8; and

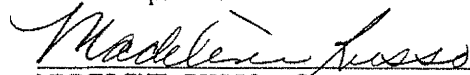
WHEREAS, in 2006, the Monmouth County Planning Board conditionally approved Union Beach's Municipal Stormwater Management Plan – Master Plan Element subject to the Borough amending its Stormwater Master Plan Element to address certain comments outlined in the Monmouth County Planning Board's Stormwater Technical Advisory Committee's Synopsis of Comments; and

WHEREAS, the Planning Board has prepared an amended Municipal Stormwater Management Plan – Master Plan Element Amendment (Amendment), to address the County's comments; and

WHEREAS, pursuant to N.J.S.A. 40:55D-1 et seq., and specifically N.J.S.A. 40:55D-28 and N.J.S.A. 40:55D-13, the Planning Board conducted a public hearing on the 28th day of February 2007, due notice of said meeting has been given in accordance with New Jersey Statute the Open Public Meetings Act, and the Municipal Land Use Law, and a quorum of the Planning Board being present, the Planning Board reviewed and considered the proposed Amendment together with the public comment thereon, and the Planning Board determined that the Amendment is in compliance with the requirements of the Municipal Land Use Law and that requirement for Stormwater Management pursuant to the applicable sections of the New Jersey Administrative Code.

NOW, THEREFORE, BE IT RESOLVED by the Planning Board of the Borough of Union Beach on this 28 day of February, 2007, that the action of the Planning Board taken on February 28, 2007 adopting the Municipal Stormwater Management Plan -Master Plan Element Amendment prepared by T&M Associates, dated January 19, 2007 be and the same is hereby approved.

BE IT FURTHER RESOLVED, that the Board Secretary is hereby authorized and directed to cause a notice of this Resolution to be published in the *Asbury Park Press* at the Borough's expense and to send a certified copy of this Resolution to the County, the Borough Clerk and the Borough Engineer, to affix a copy of this resolution and the Amendment to the official Stormwater Management Plan Master Plan Element Amendment and the make same available to all other interested parties.


MADELINE RUSSO, Secretary
Planning Board
Borough of Union Beach

DATE:

Moved by: Mr. Andreuzzi

Seconded by: Mr. Wells

Those in favor: Cocuzza, Wells, Steiner, Andreuzzi, Roche, Coffey, Schultz, Tuberon and Chepulis

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INTRODUCTION

As required by the Municipal Stormwater Regulations (N.J.A.C. 7:14A-25), the Borough of Union Beach has developed this Municipal Stormwater Management Plan (plan) to outline their approach to address the impacts resulting from stormwater related issues associated with future development, redevelopment, and land use changes. This plan 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 and/or result in more than one quarter acre of additional impervious coverage. 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, this plan provides long term operation and maintenance measures for existing and proposed stormwater management facilities.

This plan provides recommendations for ordinance modifications in order to expedite the implementation of stormwater management strategies. The plan also includes mitigation strategies to permit 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 plan 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 or redevelopment;
3. Reduce soil erosion from any development, redevelopment or construction project;
4. Seek to assure 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 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, industrial, and other uses of water;
9. Protect public safety through the proper design and operation of stormwater basins and best management practices.
10. Increase public awareness of stormwater management through public education.
11. Improve stormwater management along the bay front, roads and intersections through effective infrastructure, maintenance and replacement.
12. To achieve the stormwater quality standards established by the New Jersey Department of Environmental Protection.
13. Preserve and upgrade existing utility infrastructures, including water, stormwater management and wastewater treatment.
14. Encourage regularly scheduled infrastructure maintenance consistent with long-range plans to avoid system failure.
15. Maintain facilities that are in current use and renovate or reuse obsolete facilities for other uses.
16. To encourage sensitive design in the conservation and re-use of the buildings and their environment and to mitigate the effects of adjoining developments.

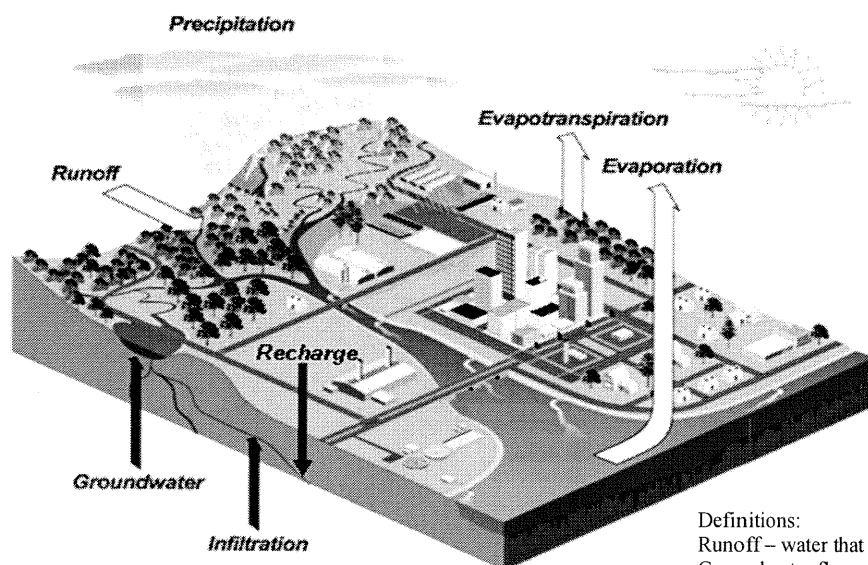
To achieve these goals, the plan outlines specific stormwater design and performance standards for new development and proposes stormwater management controls for addressing impacts from existing developments. Preventive and corrective maintenance strategies are also included to ensure the long-term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

STORMWATER DISCUSSION

HYDROLOGIC CYCLE

The hydrologic cycle or water cycle, as shown in 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, water bodies, vegetation and even land surfaces, continuously 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 water bodies. 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 surface water flows overland. Water flows across or below the surface to reach major water bodies 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: Hydrologic Cycle



Definitions:

Runoff – water that travels over the ground surface to a channel
Groundwater flow – movement of water through the subsurface
Infiltration – penetration of water through the ground surface
Recharge – water that reaches saturated zone

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

IMPACTS OF STORMWATER

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 evapotranspiration and infiltration. Re-grading and clearing of property 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 paved parking lots that drain 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, erosion, and sedimentation in stream channels. Furthermore, connected impervious surfaces do not allow pollutants to be filtered, or for infiltration and groundwater recharge to occur, prior to reaching the receiving waters. Increase volume, combined with reduced base flows, results in a greater fluctuation between normal and storm flows causing greater channel erosion. Additionally, reduced base flows, increase fluctuation, and soil erosion can affect the downstream hydrology of the watershed, impacting ecological integrity.

Water quantity impacts, combined with land development, often adversely impact stormwater quality. Impervious surfaces collect pollutants from the atmosphere, animal waste, 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 storm events, these pollutants are washed directly into the municipal storm sewer systems. In addition to chemical and biological pollution, thermal pollution can occur from water collected or stored on impervious surfaces or in stormwater impoundments, which have been heated by the sun. 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.

As towns and cities develop from rural agricultural communities, the landscape is altered in dramatic ways. Both residential and non-residential development on former vacant lots can have 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 that development site.

Proper stormwater management will help mitigate the negative impact of land development and its effects on stormwater. This plan outlines the Borough's proposal 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 Union Beach is a small 1.8 square mile municipality located in the northern part of Monmouth County. Union Beach is surrounded by the Raritan Bay to the north, Thorns Creek to the east, Hazlet Township to the south and Chingarora Creek to the west. Additionally, Flat Creek and East Creek flow through the Borough. All of the creeks within the Borough flow north and discharge in the Raritan Bay. Figure 2 delineates the Borough boundaries on a United States Geological Survey (USGS) quadrangle map. As shown on this map, the topography of Union Beach can be characterized by low, flat terrain, with elevations ranging between zero feet NGVD (Sea Level) to approximately 20 feet NGVD in the extreme southeastern and southwestern portions of the Borough. Wide stretches of swampy marshlands are located along the various creeks in the Borough.

DEMOGRAPHICS AND LAND USE

Union Beach is an established community as shown on Table 1 below. The Borough's population, according to the 2000 US Census, is 6,649 and has remained fairly stable for the past forty years. This is evident in the fact the Borough has only grown at an average rate of which is less than the county and state growth rates. Additional information regarding the Borough's historical population growth can be found in the *Borough of Union Beach Master Plan*, last revised September 1985.

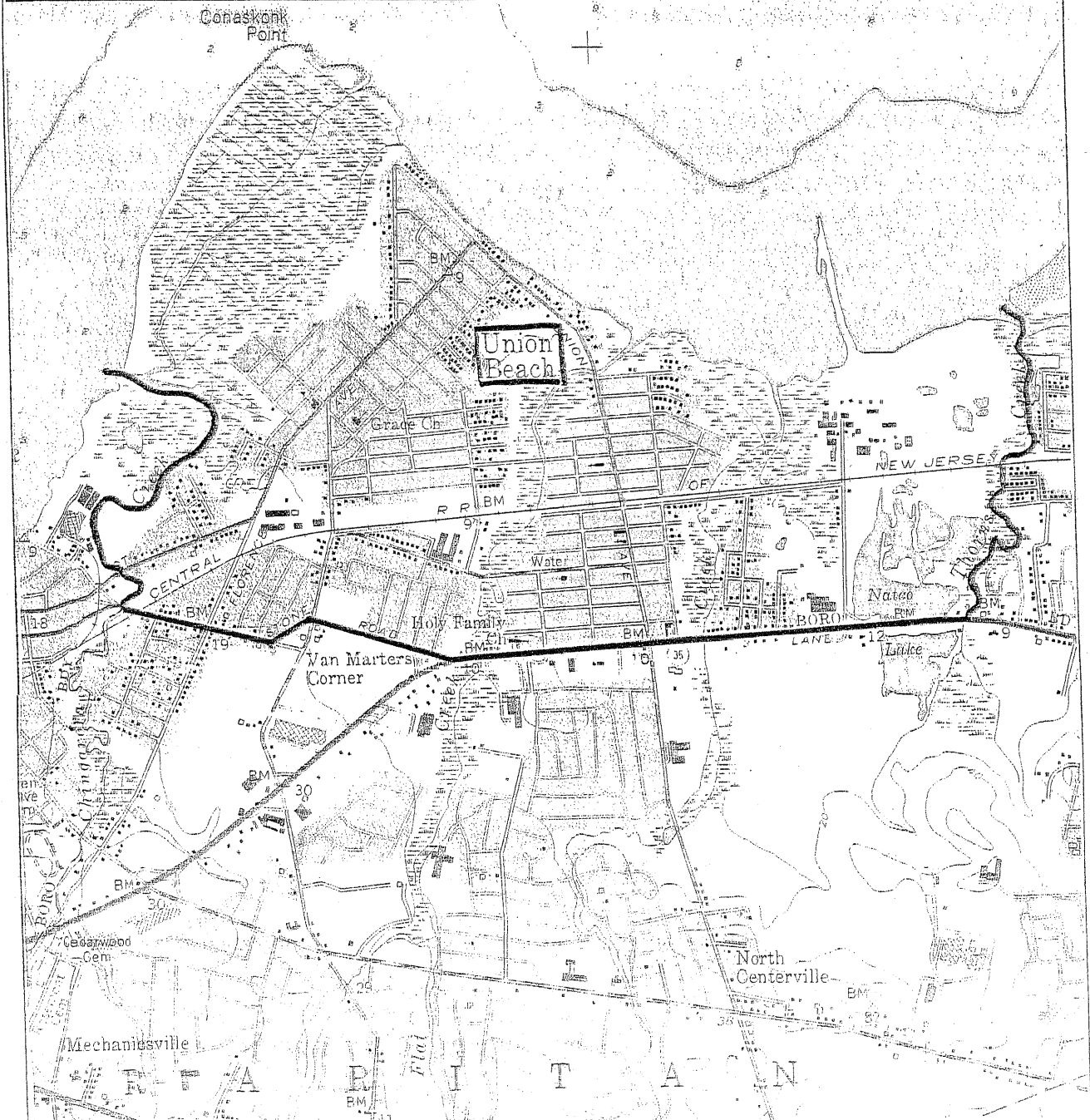
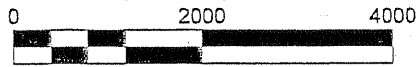
Table 1: Historical Population Growth 1930 – 2000

Year	Borough of Union Beach		Monmouth County		New Jersey	
	Total Population	Average Annual Growth Rate Over the Prior 10-year Period	Total Population	Average Annual Growth Rate Over the Prior 10-year Period	Total Population	Average Annual Growth Rate Over the Prior 10-year Period
1930	1,893	–	147,209	–	4,041,334	2.8%
1940	2,076	0.9%	161,238	0.9%	4,160,165	0.3%
1950	3,636	5.8%	225,327	4.0%	4,835,329	1.6%
1960	5,862	4.9%	334,401	4.8%	6,066,782	2.6%
1970	6,472	1.0%	461,849	3.8%	7,171,112	1.8%
1980	6,354	-0.2%	503,173	0.9%	7,364,823	0.3%
1990	6,156	-0.3%	553,124	1.0%	7,730,118	0.5%
2000	6,649	0.8%	615,305	1.1%	8,414,350	0.9%

Figure 2: Topographic Map
Borough of Union Beach
Monmouth County, New Jersey



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



Union Beach has 2,143 residential dwellings, 45 commercial properties and 8 industrial properties. As shown in Table 2 below, approximately 96% of the properties are occupied.

Table 2: General Housing Characteristics

	1990		2000		Change Number
	Number	Percent	Number	Percent	
Occupancy Status					
Total Housing Units	2,080	100	2,229	100	149
Occupied Housing Units	1,978	95.1	2,143	96.1	165
Vacant Housing Units	102	4.9	86	3.9	- 16
Tenure					
Occupied Housing Units	1,978	100	2,143	100	156
Owner- Occupied Housing Units	1,700	85.5	1,800	84	100
Renter- Occupied Housing Units	287	14.5	343	16	56
Population					
	6,156	100	6,649	100	493
Households					
Family Household	1,619	81.9	1,722	80.4	103
Non-Family Household	359	18.2	421	19.6	62
Persons/ Household	3.11	-	3.10	-	- 0.1

Source: 1990, 2000 US Census

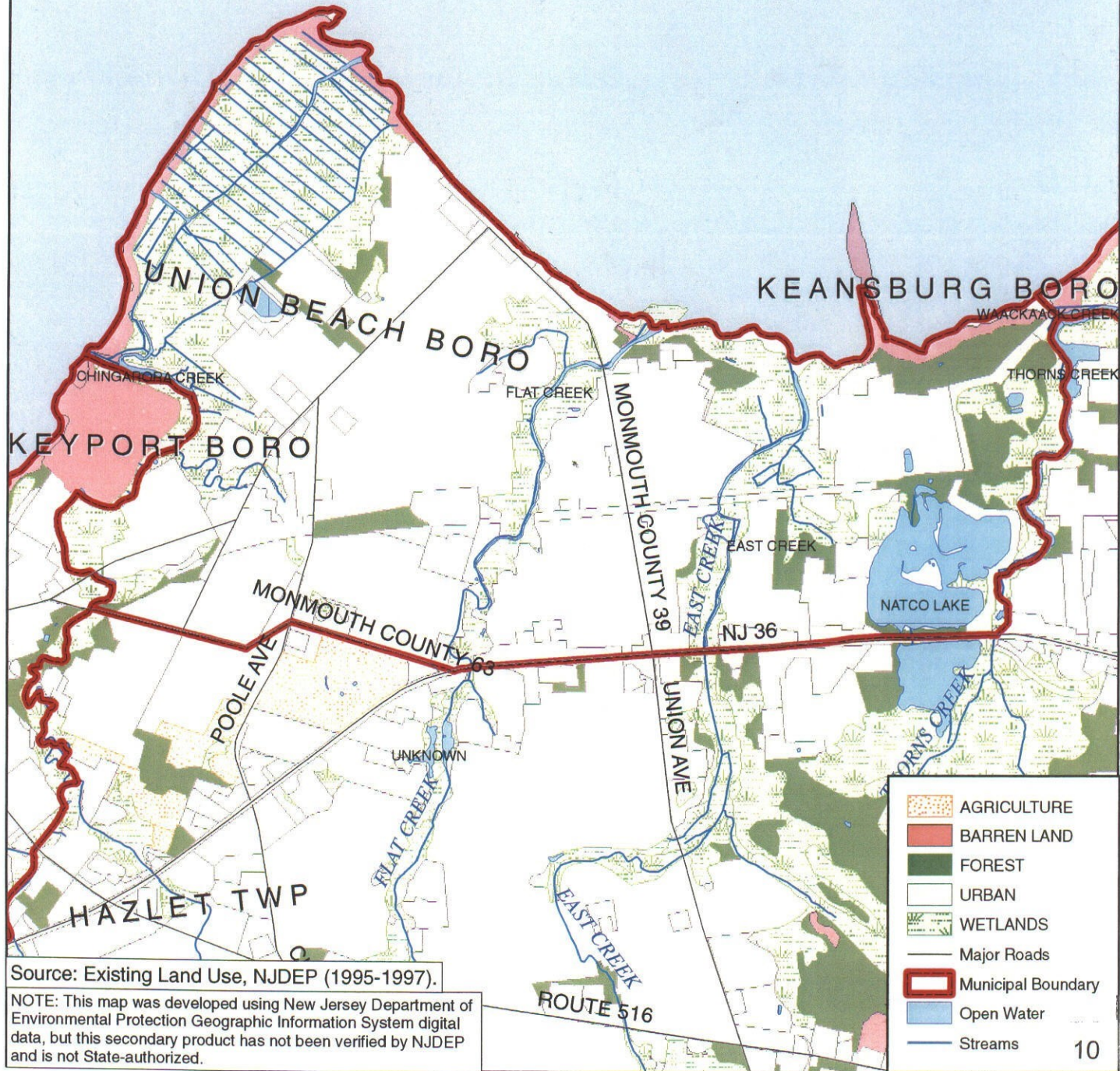
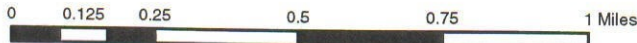
It should be noted though that according to the September 1985 *Borough of Union Beach Master Plan*, the Borough is nearly fully developed and has very little land available for development that is not impacted by environmental constraints. Most development in the Borough is redevelopment, rehabilitation of older housing stock or infill development in established neighborhoods. This is demonstrated in Figure 3 which shows the existing land use within the Borough and Figure 4 which shows the current zoning throughout the Borough.

Table 3: Existing Land Use

Usage	Area (Ac)	% of the Total Land Area	% of the Developable Land Area
Vacant/ Developable	581.8/183.5	50.5	15.9
Residential	289.4	25.1	50.8
Commercial/Office	12.3	1.1	2.2
Industrial	42.4	3.7	7.4
Parks/ Open Spaces	4.5	0.4	0.8
Public/Community Facilities	54.9	4.7	9.6
Quasi-Public	4.9	0.4	0.9
Former Railroad ROW	25.1	2.2	4.5
Streets	136.0	11.9	23.8
Total	1151.3	100	100

Source: Borough of Union Beach Master Plan, 1985

Figure 3: Existing Land Use
 Borough of Union Beach
 Monmouth County, New Jersey



- AGRICULTURE
- BARREN LAND
- FOREST
- URBAN
- WETLANDS
- Major Roads
- Municipal Boundary
- Open Water
- Streams

Source: Existing 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.

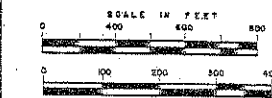
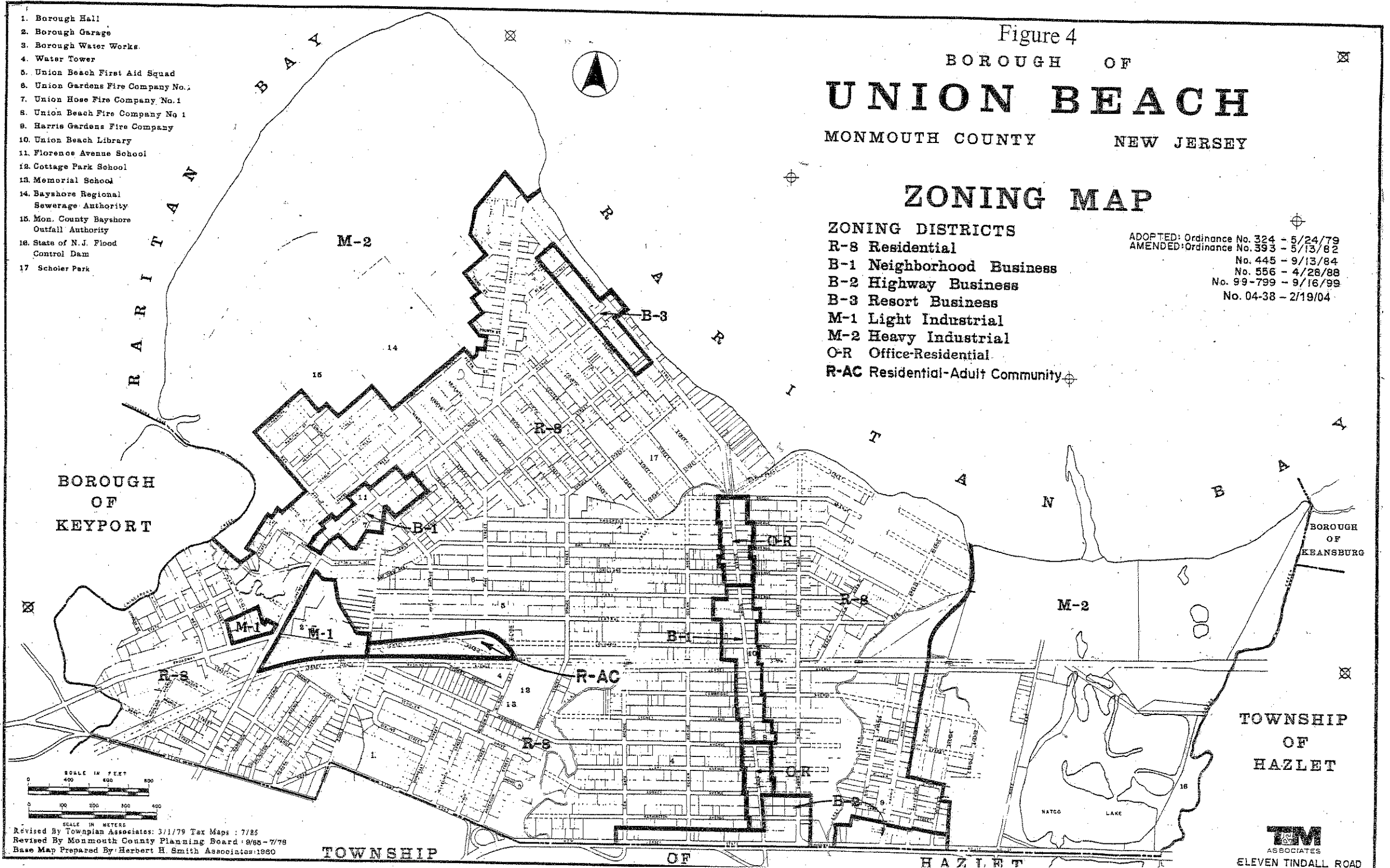
1. Borough Hall
2. Borough Garage
3. Borough Water Works
4. Water Tower
5. Union Beach First Aid Squad
6. Union Gardens Fire Company No. 1
7. Union Hose Fire Company No. 1
8. Union Beach Fire Company No. 1
9. Harris Gardens Fire Company
10. Union Beach Library
11. Florence Avenue School
12. Cottage Park School
13. Memorial School
14. Bayshore Regional Sewerage Authority
15. Mon. County Bayshore Outfall Authority
16. State of N.J. Flood Control Dam
17. Scholer Park

Figure 4
BOROUGH OF
UNION BEACH
MONMOUTH COUNTY NEW JERSEY

ZONING MAP

- ZONING DISTRICTS**
- R-8 Residential
 - B-1 Neighborhood Business
 - B-2 Highway Business
 - B-3 Resort Business
 - M-1 Light Industrial
 - M-2 Heavy Industrial
 - O-R Office-Residential
 - R-AC Residential-Adult Community

ADOPTED: Ordinance No. 324 - 5/24/79
 AMENDED: Ordinance No. 393 - 5/13/82
 No. 445 - 9/13/84
 No. 556 - 4/28/88
 No. 99-799 - 9/16/99
 No. 04-38 - 2/19/04



Revised By Townplan Associates: 3/1/79 Tax Maps: 7/85
 Revised By Monmouth County Planning Board: 9/85-7/78
 Base Map Prepared By: Herbert H. Smith Associates: 1980

TOWNSHIP OF HAZLET

TM
ASSOCIATES
ELEVEN TINDALL ROAD

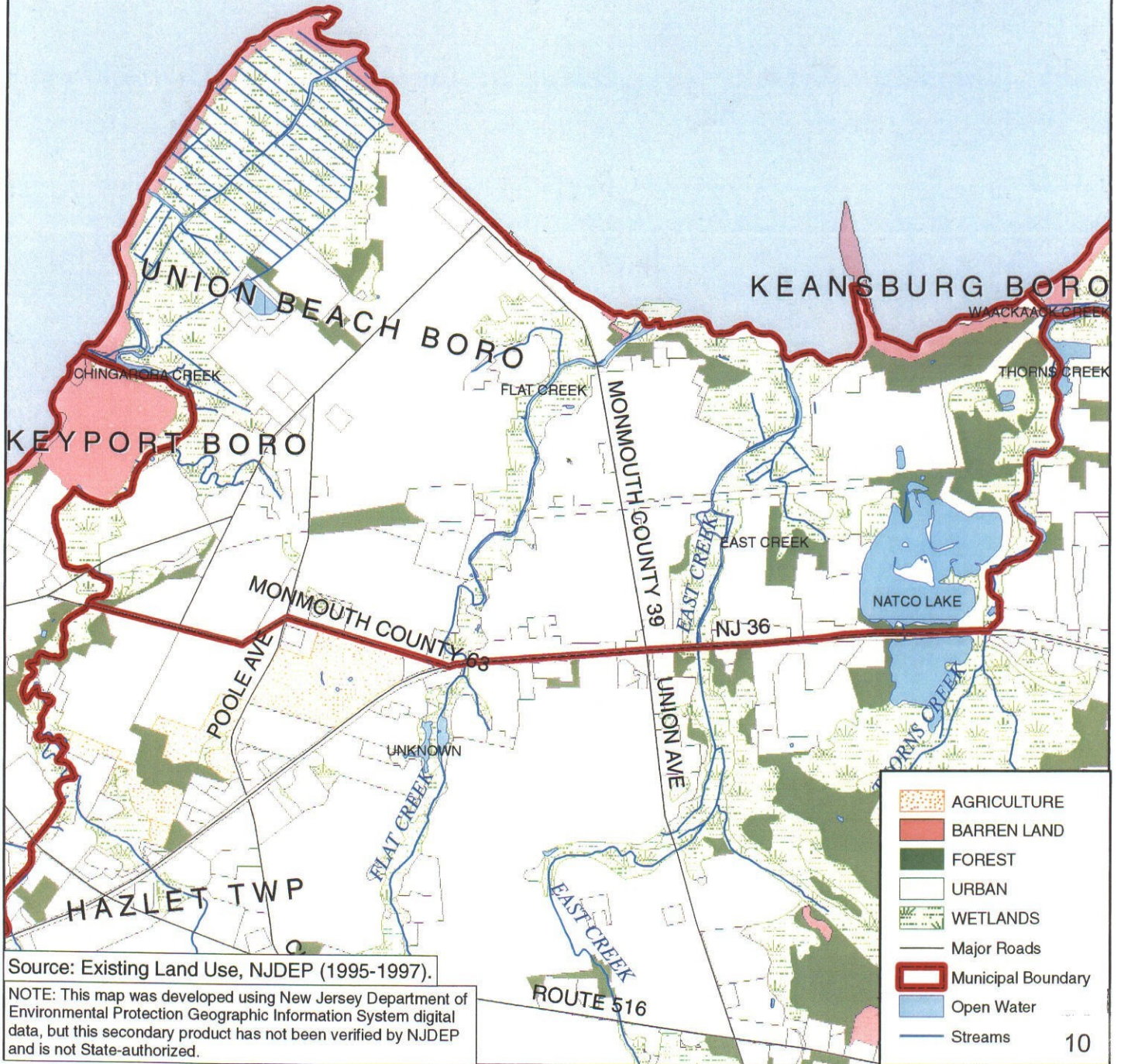
WATER BODIES










As stated above, the Borough's water bodies include Flat Creek, East Creek, and Chingarora Creek. All creeks within the Borough flow north and discharge directly into the Raritan Bay. Figure 5 illustrates the water bodies of the Borough.

The Borough's drainage system consists of approximately 38 outfalls, approximately 6.5 miles of storm sewer pipe ranging between 12 inches and 48 inches in diameter and approximately 400 inlets. The approximate location of the outfalls and inlets are shown in Figure 6. The Borough does not have any other municipally owned drainage facilities or structural stormwater management facilities. One of the outfalls discharges directly into the Raritan Bay, one discharges into Natco Lake, six discharge into East Creek, approximately 16 discharge into Flat Creek, approximately 10 discharge into the marsh area along the western edge of the Borough and four discharge into the marshland along the eastern edge of the Borough.

Natco Lake is a large man-made lake, located on the north side of Route 36, just east of Rose Lane. There is a second lake on the south side of Route 36 in adjacent Hazlet Township. In the 1930's the majority of the land was owned by the National Fireproofing Company (commonly known as NatCo). At the time the company used the land as commercial clay pits and manufactured fire bricks and clay on adjacent Rose Lane. During the mining operation, an underground spring was discovered, which accidentally filled in the clay pits and created Natco Lake. This lake is tidally influenced and provides limited stormwater management function.

Figure 3: Existing Land Use
 Borough of Union Beach
 Monmouth County, New Jersey



-  AGRICULTURE
-  BARREN LAND
-  FOREST
-  URBAN
-  WETLANDS
-  Major Roads
-  Municipal Boundary
-  Open Water
-  Streams

Source: Existing 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.



- LEGEND**
- ▲ OUTFALL
 - INLET
 - STORM MANHOLE

<p>TM ASSOCIATES 11 TINDALL ROAD MIDDLETOWN, NJ 07748 TEL 732-671-6400 FAX 732-671-7365</p>	BOROUGH OF UNION BEACH		FIGURE NO. 6
	STORMWATER FACILITIES LOCATION MAP		
UBCH.0191D	UB191-SM	FEB. 2005	

WATER QUALITY

The Ambient Biomonitoring Network (AMNET) was established by the New Jersey Department of Environmental Protection (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/>).

In addition to the biological health, chemical data is gathered by the NJDEP, the Monmouth County Health Department, and other organizations, and is used to determine the health of waterways. The impaired waterways are summarized on the New Jersey 2004 Integrated List of Water Bodies. This list is then broken down into five sublists based on priority. The water bodies on Sublist 5 are classified as being the most severely impaired or threatened, whereas the water bodies on Sublist 1 are the least threatened or impaired. A summary of the impaired Borough’s water bodies is present in Table 4 below.

Table 4: Union Beach Borough Impaired Water Bodies

<i>Stream Location</i>	<i>ID Number</i>	<i>Sublist Number</i>	<i>Priority For Sublist 5 Water Bodies</i>	<i>Impairment(s)</i>	<i>Data Source</i>
Chingarora Creek	R6436	5 5	High Medium	Fecal Coliform Dissolved Oxygen	Monmouth County Health Department and NJDEP Coastal Monitoring
Flat Creek	AN0457	5	Low	Benthic Macro-invertebrates	NJDEP AMNET

Sources: <http://www.state.nj.us/dep/wmm/bfbm/Sub-List>, New Jersey’s 2004 Integrated List of Water Bodies, dated June 22, 2004

This water quality data is used by NJDEP to develop Total Daily Maximum Loads (TMDL). A TMDL is the quantity of a pollutant that can enter a water body without exceeding water quality standards or interfering with the ability to use the water body for its designated usage. Point and non-point 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. 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 water body. TMDLs can be used to prevent further deterioration of a water body, or to improve the current water quality. Currently, there are no established stormwater TMDLs in Union Beach. As TMDLs are developed, the Borough will revise its plan to be consistent with any adopted TMDL in the future. In addition, the Borough should encourage future monitoring of the Borough's water bodies and Natco Lake and mitigation as necessary.

WATER QUANTITY

Stormwater runoff often causes water quantity issues. In Union Beach, however, stormwater only exacerbates existing tidal flooding issues. The flat grade of the streams and the low relief of the adjacent area make the Borough vulnerable to flooding during periods of heavy rain. Severe thunderstorm activity causes the creeks to overtop and spread their floodwaters over the broad floodplain. There are several streets where stormwater compounds the tidal flooding, including the low-lying streets of Florence Avenue, Union Avenue and Front Street. The Borough is working with the state and county to undertake short-term strategies to address these problem areas. Since Union Beach is on the down gradient receiving end of four (4) watersheds, the Borough sees the most impact. The Borough should work with the upstream communities to establish a regional watershed management plan to encourage upstream communities to reduce runoff and lessen the frequency of flooding throughout the Borough

Most residential and commercial development is located between the low-lying marshland and is below 16 feet NGVD. A majority of the buildings are located within the 100-year floodplain. In

fact, extensive development has occurred up to the very edge of the surrounding wetlands. The United States Army Corp of Engineers in conjunction with the New Jersey Department of Environmental Protection studied flooding and shore protection problems and identified a number of solution alternatives. After review of a number of alternatives, the Army Corp of Engineers' evaluation recommends a combination of structural methods, be implemented to address flooding and provide flood protection measures to reduce flood damage by approximately 90-percent. The recommended measures include the construction of a series of levees and floodwalls, the construction of storm closure gates and tide gates and the construction of stormwater pumping stations. The cost of these recommendations is estimate to be over \$90,000,000.00.

Additionally, the Borough has studied the flooding within the Borough and has prepared a detailed Floodplain Management Plan, which identifies the problems associated with tidal flooding and provides goals and recommendations to reduce the effects on the Borough citizens and their property. Copies of both the United States Army Corp of Engineers study as well as the Borough's Floodplain Management Plan are available for review in both the Borough Clerk's and the Borough Engineer's offices.

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 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 hydraulic 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. A map showing groundwater recharge areas within the Borough is located in Figure 7. This map was developed using the New Jersey Department of

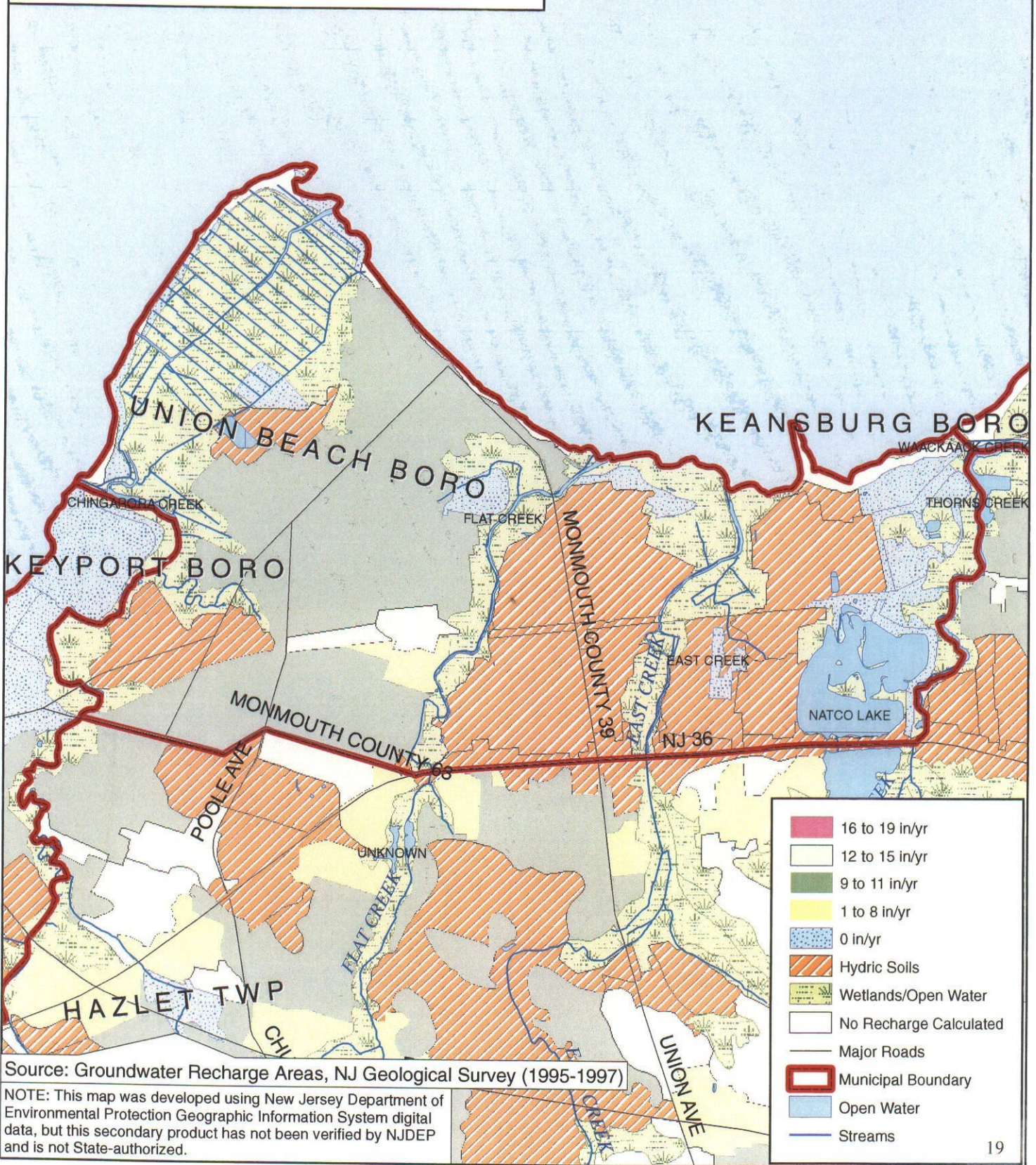
Environmental Protection Geographic Information System digital data and the New Jersey Geological Survey data prepared in 1995-1997.

The Borough's water source is not directly affected by the reduction of groundwater recharge, since the Borough does not have any existing wells. However, Shorelands Water Company has two (2) wells at their facility on Union Avenue in adjacent Hazlet Township. Since the movement of groundwater refreshes aquifers, stormwater infiltration and groundwater recharge are very important for maintaining the aquifer. Figure 8 illustrates the location of the wellhead protection areas for the Shorelands Water Company facilities in Hazlet Township.

Figure 7: Groundwater Recharge Areas
 Borough of Union Beach
 Monmouth County, New Jersey



0 0.125 0.25 0.5 0.75 1 Miles



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

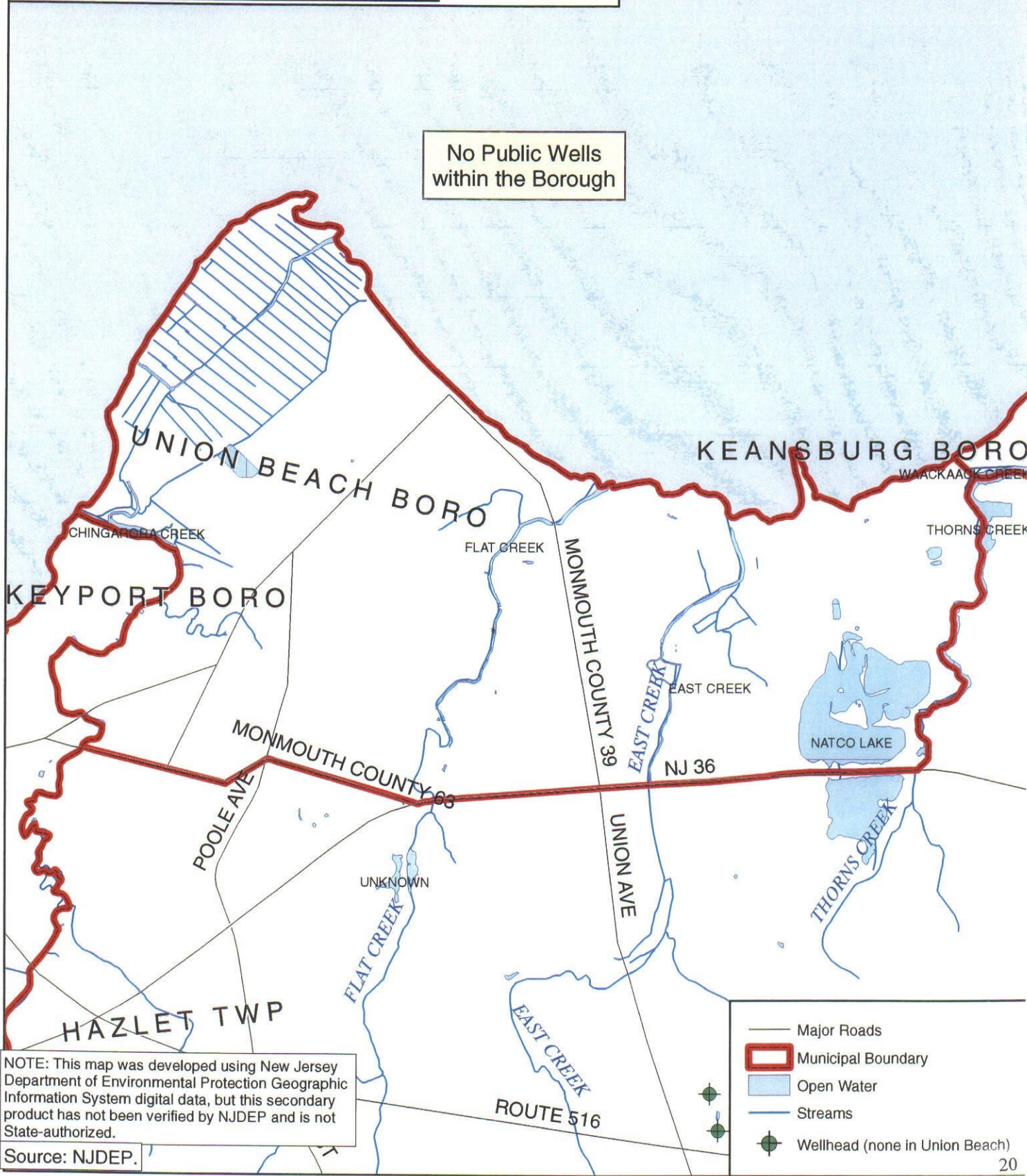
NOTE: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not State-authorized.

Figure 8: Wellhead Protection Areas Borough of Union Beach Monmouth County, New Jersey



0 0.125 0.25 0.5 0.75 1 Miles

No Public Wells
within the Borough



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: NJDEP.

DESIGN AND PERFORMANCE STANDARDS

The Borough shall 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 water bodies. The section of this plan, entitled Stormwater Management Strategies, indicates actions which are appropriate for various types of development in Union Beach. 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 includes language for safety standards consistent with N.J.A.C. 7:8-6 - Safety Standards for Stormwater Management Basins. Ordinances must be submitted to the Monmouth County Planning Board for review and approval within 12 months of adoption of this plan.

A number of 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 construction, inspection and maintenance are critical components for the successful performance of a stormwater management system. During construction, Borough personnel will observe construction of the project to ensure that the appropriate stormwater management measures are constructed and that they function as designed.

The Borough is presently preparing a Stormwater Pollution Prevention Plan (SPPP) to address inspection and maintenance for existing stormwater infrastructures throughout the Borough. Also included in the SPPP plan is the development of a Local Public Education Program to educate property owners on methods to reduce non-point stormwater pollution such as proper waste disposal, solids and floatable controls, fertilizer and pesticide use. New development and redevelopment projects will be required to develop and submit a detailed operation and

maintenance plan for each stormwater management strategy implemented in accordance with N.J.A.C. 7:8 - 5.8. Recommendations for proper maintenance procedures are available in the NJDEP's *Best Management Practices (BMPs) Manual*. Copies of the maintenance plan(s) must be filed with the Borough Department of Public Works.

Borough personnel will perform periodic inspections during the first two years of operation and after significant storms to ensure the system is functioning properly and to identify maintenance needs, if any. 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 unwanted or invasive vegetation or accumulated debris/materials.

Borough ordinances should indicate that the inspection of stormwater systems is permissible on private property, provided the necessary easements are in place, upon giving reasonable notice. Ordinances should also indicate a timeframe for maintenance procedures to occur upon receiving notice from the Borough that maintenance is required.

PLAN CONSISTENCY

REGIONAL STORMWATER MANAGEMENT PLANS

Currently, there are no adopted Regional Stormwater Management Plans developed for water bodies located “within” the Borough’s boundaries. This plan will be updated to be consistent with any Regional Stormwater Management Plans that are established in the future. Union Beach will take part in the development of any proposed Regional Stormwater Management Plans that may affect water bodies within or adjacent to the Borough.

TOTAL MAXIMUM DAILY LOADS (TMDL)

The NJDEP has not yet established a non-point source pollution TMDL for any waterbodies in the Borough. This plan will be updated to be consistent with any future stormwater TMDL established by the NJDEP.

RESIDENTIAL SITE IMPROVEMENT STANDARDS (RSIS)

This plan is consistent with regulations established under the Residential Site Improvement Standards (RSIS) or 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 requires 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.

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
- Promote the protection of non-renewable natural resources; and
- Encouraging the protection and conservation of all water resources; and
- Promote the preservation and improvements of coastal water resources; and
- Promote the preservation and improvements of surface water quality; and
- Encourage the preservation and improvements of groundwater quality and quantity; and
- Promote 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 of Union Beach in the Metropolitan Planning Area (PA1). Exceptions to the PA1 designation are wetlands and floodplain areas that are located within the Environmentally Sensitive Planning Area (PA5). 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 new comprehensive Master Plan, adopted on October 26, 2005 and its pertinent development ordinances for consistency with the new stormwater regulations. Based on its review, the Board finds that the following sections must be modified in order to incorporate the NJDEP's nonstructural strategies for stormwater management. It should be noted that the Borough is fully developed and minimal "major development"¹ is anticipated.

- **Section 13-5.13: Preserving Natural Features:** This Section requires natural features such as wetlands and floodplains be preserved to the extent feasible. This Section should be updated to require areas within 300 feet of a Category-1, unless approval is obtained from the NJDEP to permit a reduction of the buffer width to 150 feet.

- **Section 13-6.5.a: Minor Subdivisions Required Documents:** This Section outlines the items that must be submitted to the Board for review and approval prior to the application being deemed completed and a public hearing being scheduled. This Section should be updated to also require the applicant to submit a completed copy of the NJDEP Best Management Practices Manual Low Impact Development Checklist as part of any site plan or subdivision application. This Section should also be revised to allow the inclusion of the "Design and Performance Standards" requirements outlined in this plan.

- **Section 13-6.6.a: Preliminary Plat of a Major Subdivision Required Documents:** This Section outlines the items that must be submitted to the Board for review and approval prior to the application being deemed completed and a public hearing being scheduled. This Section should be updated to also require the applicant to submit a completed copy of the NJDEP Best Management Practices Manual Low Impact Development Checklist as part of a

¹ Major Development – means any development that provides for ultimately disturbing one or more acres of land or increases impervious surface by one-quarter acre or more. 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."

major subdivision application. This Section should also be revised to allow the inclusion of the "Design and Performance Standards" requirements outlined in this plan.

- **Section 13-6.7.a: Preliminary Plat of a Site Plan Required Documents:** This Section outlines the items that must be submitted to the Board for review and approval prior to the application being deemed completed and a public hearing being scheduled. This Section should be updated to also require the applicant to submit a completed copy of the NJDEP Best Management Practices Manual Low Impact Development Checklist as part of any minor or preliminary site plan application. This Section should also be revised to allow the inclusion of the "Design and Performance Standards" requirements outlined in this plan.

- **Section 13-6.8.a: Final Plat of a Major Subdivision Required Documents:** This Section outlines the items that must be submitted to the Board for review and approval prior to the application being deemed completed and a public hearing being scheduled. This Section should be updated to also require the applicant to submit a completed copy of the NJDEP Best Management Practices Manual Low Impact Development Checklist as part of any final subdivision application. This Section should also be revised to allow the inclusion of the "Design and Performance Standards" requirements outlined in this plan.

- **Section 13-6.9.a: Final Plat of a Major Site Plan Required Documents:** This Section outlines the items that must be submitted to the Board for review and approval prior to the application being deemed completed and a public hearing being scheduled. This Section should be updated to also require the applicant to submit a completed copy of the NJDEP Best Management Practices Manual Low Impact Development Checklist as part of any final site plan application. This Section should also be revised to allow the inclusion of the "Design and Performance Standards" requirements outlined in this plan.

- **Section 13-7.3: Off-Tract Improvements:** This Section details the requirement for off-tract improvements. Language should be added to require stormwater management and drainage improvements to conform to the "Design and Safety Standards" of this plan.

- **Section 13-7.7: Site Maintenance During Construction:** This Section outlines the developer's responsibility to maintain the sites during construction. This Section should be updated to require developers to also comply with the Soil Erosion and Sediment Control Standards of New Jersey.

- **Section 13-8.1 General Improvement Standards:** This Section outlines the Standard Specification and Construction Details requirement. This Section should be amended to require developers to also comply with the Soil Erosion and Sediment Control Standards of New Jersey, the New Jersey Stormwater Best Management Practices, the standards set forth in the plan and the stormwater control ordinances required by N.J.A.C. 7:8.

- **Section 13-8.4: Buffer Areas, Screening, Landscaping and Shade Trees:** This Section outlines the requirement for landscaping within the Borough. This Section should be updated to require the use of native vegetation (where feasible) that require less fertilization and watering. This Section should also be updated to allow the use of buffer areas for stormwater management and to encourage the separation or disconnection of impervious surfaces with vegetated areas to provide some filter or treatment of the runoff.

- **Section 13-8.7: Clearing and Grading:** This Section outlines the requirement for clearing and grading. This Section should be updated to require the use of native vegetation (where feasible) that require less fertilization and watering. This Section should also be revised to allow the inclusion of the "Design and Performance Standards" requirements outlined in this plan.

- **Section 13-8.9: Common Open Spaces and Public Open Spaces:** This Section outlines the requirement for any common or public open space created as part of a site plan or subdivision application. This Section should be revised to encourage the preservation of existing treed areas as well as the use of native vegetation (where feasible), since they require less fertilization and watering.

- **Section 13-8.10: Curbs or Curbs and Gutters:** This Section requires that curbs or combination curbs and gutters be constructed along both sides of all existing and proposed streets. This Section should be amended to allow the use of curb cuts or flushed curbing with curb stops to allow vegetative swales to be used as stormwater conveyances and to allow the separation of impervious areas.

- **Section 13-8.20: Off-Street Parking:** This Section outlines the requirements for parking areas. Buffer strips are required, as well as curbing and landscaping between parking areas and the street and buildings. This Section should be modified to encourage the use of native vegetation (where feasible) for landscaping, which requires less fertilizer and water than ornamental plantings. Additionally, the use of landscape islands should be encouraged to separate impervious surfaces. The curbing requirement should also be amended to allow the use of curb cuts or flush curbing with curb stops to allow vegetative swales to be used as stormwater conveyances and to allow the separation of impervious areas. This Section should also be amended to permit a portion of the required parking spaces to be “banked” and left as green space unless needed and to permit the use of pervious pavement (where feasible) to minimize the amount of impervious coverage.

- **Section 13-8.22: Roadway Construction:** This Section describes the roadway pavement requirements. This Section should be updated to permit the use of pervious pavement (where feasible) to reduce the amount of impervious coverage.

- **Section 13-8.25: Sidewalks and Aprons:** This Section requires all streets have sidewalks and aprons constructed from poured concrete. This Section should be amended to allow the use of porous paving materials in areas with low pedestrian traffic. Language should be added to require new sidewalks and aprons to direct stormwater to neighboring lawns, where feasible. This design criterion will allow for the disconnection of impervious surfaces.

- **Section 13-8.28: Storm Drainage Facilities:** This Section outlines the requirement for all storm drainage facilities. This Section should be updated to encourage the use of the New Jersey Stormwater Best Management Practices and to comply with the standards set forth in the plan, as well as the stormwater control ordinances required by N.J.A.C. 7:8.

- **Section 13-8.29: Street Design:** This Section describes minimum street widths, right of ways, shoulders, cul-de-sac radii, the limit of through streets, etc. This Section should be updated to encourage the limitation of on-street parking, thereby allowing narrower streets where public safety permits. This Section should be updated to be consistent with RSIS.

Revisions of the ordinances identified above will allow the incorporation of the non-structural strategies. Drafts of the updated ordinances will be submitted to Monmouth County for review and approval within 12 months of the plan adoption.

NONSTRUCTURAL STRATEGIES

The plan recommends the practical use of the following nonstructural strategies for all major developments¹ in accordance with Subchapter 5 of the NJDEP *Best Management Practices (BMPs) 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.

¹ Major Development – means any development that provides for ultimately disturbing one or more acres of land or increases impervious surface by one-quarter acre or more. 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.”

7. Provide vegetated open-channel conveyance systems that discharge into and through stable vegetated areas.
8. Provide preventative source controls. In addition, Subchapter 5 further requires an applicant seeking approval for a major development¹ 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 engineered stormwater conveyance systems that treat small drainage areas. Generally, a vegetated filter strip consists of a level spreader and planted vegetation. The level spreader ensures uniform flow over the vegetation that filters out pollutants, and promotes infiltration of the stormwater.

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 corridor buffer strips:

¹ Major Development – means any development that provides for ultimately disturbing one or more acres of land or increases impervious surface by one-quarter acre or more. 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 provide buffer protection along a stream 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 development 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.

- **Deterrence of Geese**

Maintaining or planting dense woody vegetation around the perimeter of a pond or wetland is the most effective means of deterring geese from taking over and contaminating local water bodies and ponds. Minimizing the amount of land that is mowed will also limit the preferred habitat for geese. Other deterrence methods and/or actions should also be investigated.

- **Fertilizers**

The use of fertilizers to create the “perfect lawn” is an increasingly common problem in many residential areas. Fertilizer runoff increases the level of nutrients in water bodies and can accelerate eutrophication² 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

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.

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 MANAGEMENT³

In Chapter 9 of its *Stormwater Management Best Management Practices (BMP) Manual*, the Department of Environmental Protection 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%.

- **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

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

vegetation. Constructed stormwater wetlands temporarily store runoff in relatively shallow pools that support conditions suitable for the growth of wetland plants. The adopted TSS removal rate for constructed stormwater wetlands is 90%.

- **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 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, 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 drywells 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 ranges between 40 and 60%, 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 adopted TSS removal rate for infiltration basins is 80%.

- **Manufactured Treatment Devices**

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

- **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 pavers 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%.

- **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 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 multistage facility that also 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%, depending on the permanent pool storage volume in the pond and the length of the retention time provided by the pond.

Each of these structures has advantages and disadvantages to manage stormwater. As previously noted Union Beach is a fully developed community and anticipates the majority of new construction as residential infill development that will disturb less than 1-acre of land and have less than 1-acre of additional impervious coverage.

LAND USE/ BUILD-OUT ANALYSIS

The Borough of Union Beach has less than one square mile of developable or vacant land and therefore is exempt from the NJDEP regulations requiring the development of a build-out analysis which would indicate the potential for development within the Borough. The limited amount of vacant land within the Borough is shown on Figure 3, which outlines the existing land uses within the Borough. Figure 9 illustrates the Hydrologic Units (HUC-14s), or sub watersheds, within the Borough and Figure 10 shows the constrained lands such as wetlands and open waters within the Borough. Except for a very small area in the northeast corner of the Borough, Union Beach is located within the Chingarora Creek to Thorns Creek HUC -14.

Figure 9: Hydrologic Units: HUC-14s Borough of Union Beach Monmouth County, New Jersey



0 0.125 0.25 0.5 0.75 1 Miles



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).






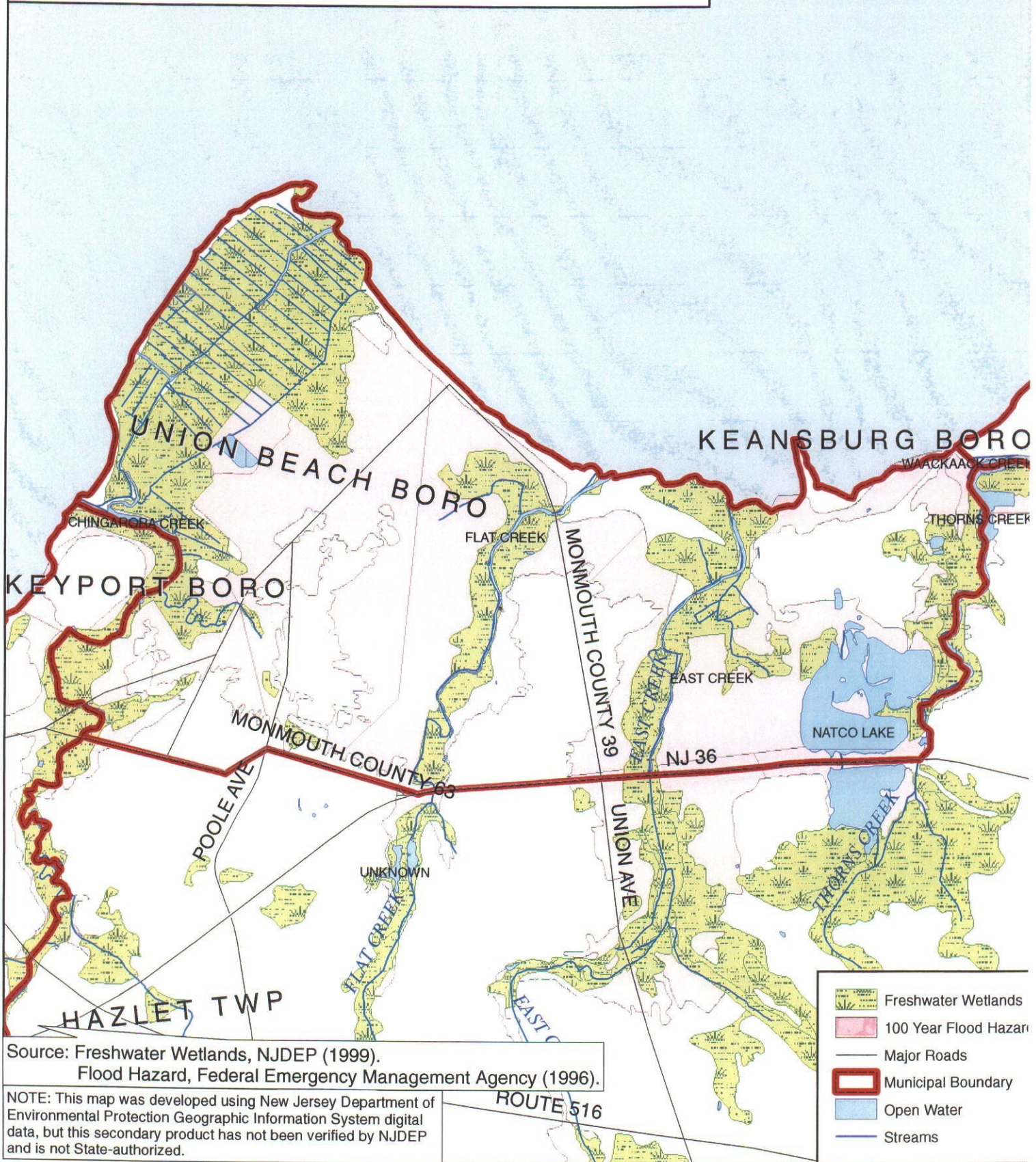
-  Subwatersheds
-  Major Roads
-  Municipal Boundary
-  Open Water
-  Streams

Figure 10: Wetlands and Water Land Uses
 Borough of Union Beach
 Monmouth County, New Jersey



0 0.125 0.25 0.5 0.75 1 Miles



-  Freshwater Wetlands
-  100 Year Flood Hazard
-  Major Roads
-  Municipal Boundary
-  Open Water
-  Streams

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.

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 plan 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 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 plan. Mitigation projects should also be as close in terms of hydrology and hydraulics to the proposed development/redevelopment as possible.

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 required maintenance, 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 lack of vacant or developable land, it is anticipated that the majority of the mitigation projects proposed will result in retrofitting/rehabilitation of existing stormwater facilities and natural infrastructures. The Borough does not currently have any specific mitigation projects developed at this time. However, this plan recognizes that other projects may be identified in the future by the Borough and/or the Regional Stormwater Planning Area, subject to the approval of the Planning Board or Borough Engineer. The following strategies have been identified to date, as possible mitigation strategies:

- Installation of new inlet casting heads on existing Borough streets, not the subject of a rehabilitation project, for solids and floatable control.
- Disconnecting of impervious surfaces, such as redirecting existing roof drains from the storm sewer system to an overland discharge.
- Removal of accumulated silt and sediment from Borough Streams in flood prone areas to provide additional storage volume.
- Retrofitting of existing Borough stormwater management facilities to improve water quality, water quantity and/or groundwater recharge.

More detailed information is 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.

RECOMMENDATIONS

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

Recommendation A: Review and update the existing Land Development and Zoning Regulations to implement the principals 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 Land Development and Zoning Regulations are inconsistent with recently adopted New Jersey Department of Environmental Protection (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 update their existing regulations to be in conformance with these regulations and to minimize inconsistencies or conflicts. Since the Borough of Union Beach is also at the downstream end of several watersheds, the Borough should work with the adjacent municipalities to establish a regional watershed management plan to encourage the upstream communities to reduce runoff and lessen the frequency of non-tidal flooding within the Borough.

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: Educate residents on techniques to deter geese.

Geese population can take over and contaminate local water bodies. The planting of vegetation around the perimeter of a water body is an effective means of deterring geese.

Recommendation D: Seek to ensure the proper 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.

Additionally, there are a number of privately maintained stormwater facilities within the Borough. The Borough should work with the various property owners, residents and business owners to identify maintenance and/or improvements needs and develop strategies for regular inspection and maintenance of these facilities.

The Borough should also encourage the use of low impact design methods and non-structural strategies that require less maintenance.

Recommendation E: Encourage existing storm drains to be replaced with bicycle safe grates and Campbell Foundry Model #N-2-ECO inlet heads (or approved equal) to prevent floatable and solid debris from entering the stormwater conveyance system.

Typical roadway debris, such as bottles and cans, can easily enter stormwater conveyance systems through typical inlet openings. This debris is then transported downstream into the

receiving water bodies. By replacing existing storm drain inlets with new inlet grates and inlet heads, which have a maximum opening size of 2 inches by 4 inches, the amount of debris entering the stream can be reduced, improving water quality.

Recommendation F: Work with the Monmouth County Mosquito Commission to monitor existing and proposed BMP's.

Many of the recommended non-structural and structural strategies are designed to retain water for a period of time to promote groundwater recharge. Standing water, remaining greater than 72 hours, could become a mosquito larva habitat. To date, there is limited information documenting the creation of mosquito habitat with newer designs of best management practices and non-structural and structural strategies. The Borough should coordinate new development and redevelopment projects using non-structural and structural strategies with the Monmouth County Mosquito Extermination Commission so that these facilities can be periodically monitored, inspected and treated as needed for mosquito control. Developers and the Borough should also solicit input from the Monmouth County Mosquito Extermination Commission early in the design process for new facilities to obtain additional guidance and recommendations.

Recommendation G: To reduce erosion and sedimentation in streams, encourage residents and property owners to minimize the amount of re-grading and to employ techniques to minimize soil erosion.

During construction, large amounts of disturbance or exposed soil are prone to soil erosion. This can result in accumulation and/or sedimentation in streams and elevated amounts of Total Suspended Solids, which can impact the existing vegetation and wildlife.

BIBLIOGRAPHY

Borough of Union Beach, Union Beach Planning Board. *Borough of Union Beach Flood Plain Management Plan*, Revised through Spring 2002.

Borough of Union Beach, Union Beach Planning Board. *Borough of Union Beach Master Plan*, 1985.

Borough of Union Beach, Union Beach Planning Board. *Borough of Union Beach Master Plan*, October 26, 2005.

Borough of Union Beach, *Land Development Ordinance*. < <http://www.ordinance.com>>

Linsley, Ray K., Franzini, Joseph B., Freyber, David L, and George Tchobanoglous. *Water resources Engineering*. 4th ed. New York, New York: Irwin McGraw-Hill, 1992

New Jersey Department of Environmental Protection, Division of Watershed Management. *Amendment to the Atlantic Water Quality Management Plan, Cape May County Water Quality Management Plan, Monmouth County Water Quality Management Plan, Ocean County Water Quality Management Plan, and Tri-County Water Quality Management Plan Total Maximum Daily Loads for Fecal Coliform to Address 31 Streams in the Atlantic Water Region*. Proposed Apr. 2003.

New Jersey Department of Environmental Protection, Division of Watershed Management *New Jersey Stormwater Best Management Practices Manual* April 2004.

New Jersey Department of Environmental Protection, Division of Watershed Management. *Tier A Municipal Guidance Document: NJPDES General Permit No. NJ0141852*. April 2004.

United States Army Corp of Engineers *Union Beach Feasibility for Hurricane and Storm Drainage Reduction Study*, September 2003.

United States Army Corp of Engineers *Union Beach Combined Flood Control and Shore Protection Feasibility Study*, September 2003.

United States Census Bureau. Profile of General Demographic Characteristics: 1990, 1990

United States Census Bureau. Profile of General Demographic Characteristics: 2000, 2000.

United States Census Bureau. 1990 Summary Tape File (STF 1), 1990.

Kern River Connections. The Hydrologic Cycle.
<<http://www.creativille.org/kernriver/watershed.htm>>

New Jersey Administrative Code N.J.A.C. 7:14A-25: NJPDES Stormwater Rules. Jan. 5, 2004.

New Jersey Administrative Code, N.J.A.C. 7:8, Stormwater Management Rules, Feb. 2, 2004.

New Jersey Department of Environmental Protection. *The Ambient Biomonitoring Network Watershed Management Area 12, 13, 14, 15, and 16, Atlantic Region*. March 2001.
(<http://www.state.nj.us/dep/wmm/bfbm/>).

New Jersey Department of Environmental Protection. List of Category One Streams, Lakes and Reservoirs <http://www.nj.gov/dep/cleanwater/c1_waters_list.pdf. >

New Jersey Department of Environmental Protection. Division of Watershed Management. Total Maximum Daily Loads. <<http://www.state.nj.us/dep/watershedmgt/tmdl.htm>> Sept. 1, 2004.

New Jersey Department of Environmental Protection. Division of Watershed Management. <<http://www.state.nj.us/dep/watershedmgt/index.htm>> Dec. 15, 2004.

New Jersey Department of Environmental Protection. Stormwater and Nonpoint Source Pollution, <www.njstormwater.org> August 30, 2004.

New Jersey Department of Environmental Protection. Sub-list 1-5, New Jersey's 2004 Integrated List of Water Bodies <<http://www.state.nj.us/dep/wmm/bfbm/>>, June 22, 2004

