JERSEY CITY
STORMWATER MANAGEMENT PLAN

Prepared for:

Jersey City

Prepared by:

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17-17 Route 208 North
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TABLE OF CONTENTS

Page

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

TABLE OF CONTENTS (Continued)

LIST OF FIGURES (Continued)

LIST OF APPENDICES

1.0 INTRODUCTION

This document presents the Stormwater Management Plan (SWMP) for the City of Jersey City (the City). The SWMP is required by the N.J.A.C 7:14A-25 Municipal Stormwater Regulations and has been created in accordance with N.J.A.C. 7:8, Stormwater Management Rules. The SWMP addresses groundwater recharge, stormwater quantity, and stormwater quality by implementing the General Permit requirements referred to as the statewide basic requirements (SBRs).

The goals of the Stormwater Management Rules N.J.A.C. 7:8-2.2 are stated below and incorporated into this SWMP. The Stormwater Management Rules are directed toward "new development" and provide the foundation to develop municipal stormwater management plans. New development is defined as any development that disturbs more than one acre of land or adds ¼ of an acre of impervious cover. The City must prepare and implement a Stormwater Pollution Prevention Plan (SPPP) that requires the preparation and adoption of a municipal stormwater management plan along with a stormwater control ordinance, and the incorporation of a local public education program. The SPPP also addresses the improper disposal of waste, illicit connection elimination and MS4 outfall pipe mapping, implementation of solids and floatable controls, proper maintenance yard operation and employee training. The City's SPPP planning forms are attached in Appendix B.

1.1 STORMWATER MANAGEMENT PLAN GOALS

The SWMP is a course of action for the City to reduce nonpoint sources of water pollution by developing a comprehensive and dynamic stormwater management plan. The City's SWMP is a series of strategies, designed in accordance with governmental agencies and laws, intended to reduce the amount of stormwater pollutants which enter local waterways. The goals of the City and SWMP, along with "How" they will be met, are as follows:

- Reduce Flood Damage: this goal is met by implementing the measures addressed in Section 4 through either non-structural or structural Best Management Practices (i.e. stormwater management measures) for achieving stormwater runoff quantity control.

- Minimize stormwater runoff from new developments: this goal is met by implementing the measures addressed in Section 4 through either non-structural or structural Best Management Practices (i.e. stormwater management measures) for achieving stormwater runoff quantity control.

- Reduce soil erosion from any developments or construction projects: this goal is met by requiring implementation of stormwater management measures described in Section 4.2 and 4.4 such that they satisfy the requirements of the Soil Erosion and Sediment Control Act, N.J.S.A 4:24-39 et seq. and implementing rules.

- Assure adequately designed culverts, bridges, and other in-stream structures: this goal is met by adhering to the design and performance standards for Structural Best Management Practices presented in Section 4.4 of the SWMP.

- Maintain groundwater recharge: this goal is met by implementing the measures addressed in Section 4 through either non-structural or structural Best Management Practices (i.e. stormwater management measures) for meeting groundwater recharge requirements.

- Preventing increases of Non Point Source (NPS) pollution: this goal is met by addressing the goal related to minimizing stormwater runoff pollutants described in Chapters 3 and 4.

- Maintain the biological integrity of streams and drainage channels: this goal is met by selecting the BMP's that are allocated a 'high' to 'medium' rating in Table 4.2: BMP's Applicable to Various Land Uses, Stormwater Management Goals, and Other Factors for meeting the groundwater recharge enhancement and runoff quality improvement goals.

- Minimizing stormwater runoff pollutants from new and existing developments: this goal is met by implementing the measures addressed in Section 4.2 through either non-structural or structural Best Management Practices (i.e. stormwater management measures) for achieving stormwater runoff quality control.

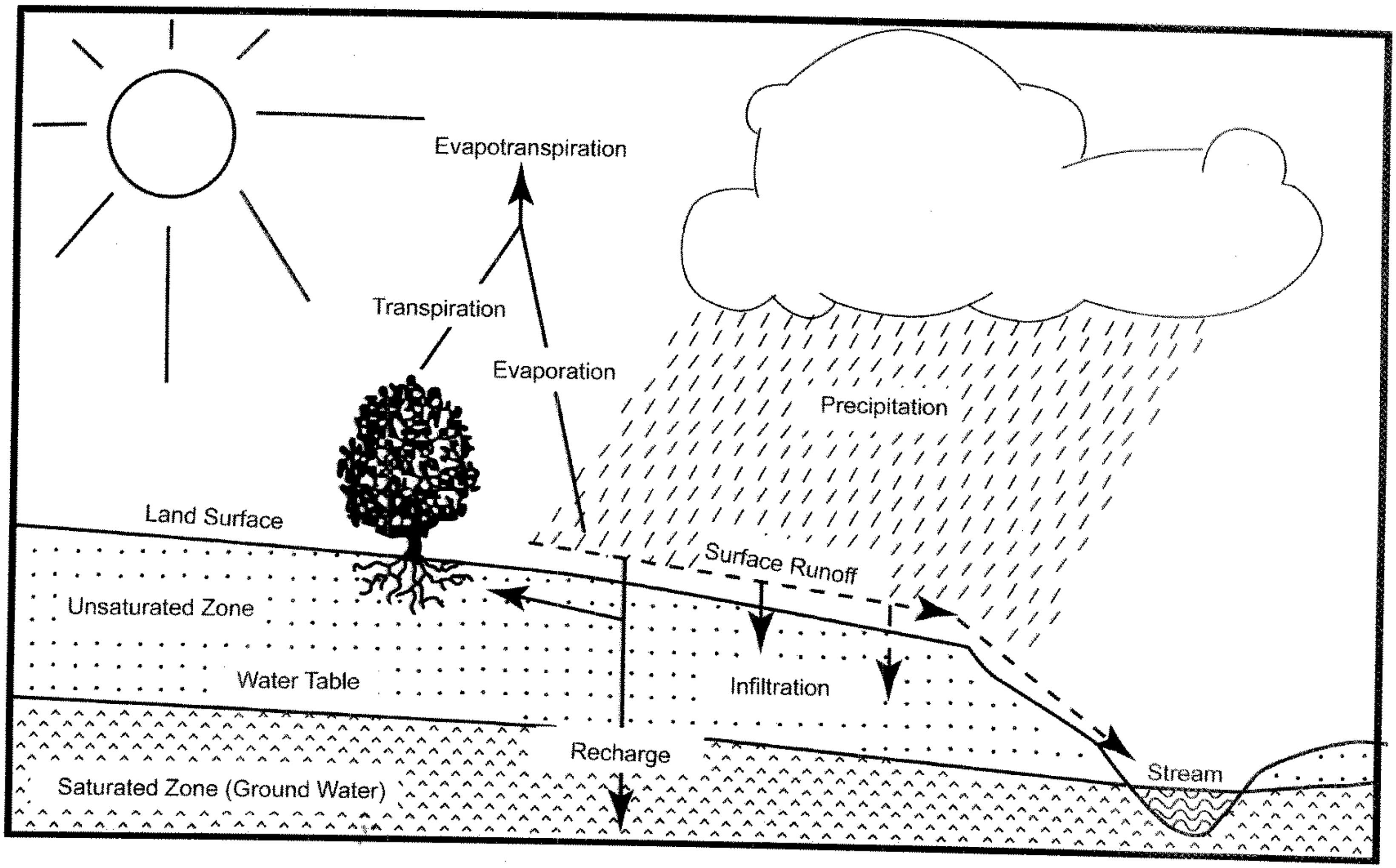
- Protecting public safety through proper design and operation of stormwater management facilities: this goal is met by requiring adherence to the design and performance standards discussed in Section 4.2 and requiring adoption of comprehensive safety measures, described in Section 3.3.3 and an operation and maintenance plan that meets the requirements described in Section 3.3.2.

To achieve these goals, this SWMP outlines specific stormwater design and performance standards for new development and preventive maintenance strategies to ensure the effectiveness of the stormwater management facilities. Safety standards for the stormwater infrastructure will be implemented to protect public safety.

1.2 STORMWATER DISCUSSION

Stormwater pollution is generated when rain or wash water runs over impervious surfaces such as pavement and building rooftops, and accumulates pollutants such as oil and grease, chemicals, nutrients, metals, and bacteria as it travels across land. Then the stormwater and pollutants enter the storm drain system and are disposed directly into our waterways. Pollutants include metals, suspended solids, hydrocarbons, pathogens and nutrients. Currently, stormwater is not generally pretreated prior to discharge.

The hydrologic cycle consists of inflows, outflows, and storage. Prior to urban development, stormwater was filtered through the land surface to the aquifer, or returned to the atmosphere through evapotranspiration or discharged from an aquifer to a stream as shown in the Figure 1-1. The percolation of water into the ground is an inflow to the aquifer. If the inflows to the aquifer are less than the outflows, the amount of water stored in the aquifer decreases. Increased urban development has increased impervious surfaces resulting in decreased groundwater recharge and has increased the volume and rate of stormwater runoff. The increased flow into waterways causes flooding, erosion, habitat destruction, decreased water quality, and reduced groundwater recharge.



Source: New Jersey Geological Survey Report GSR-32.

MALCOLM PIRNIE	JERSEY CITY STORMWATER MANAGEMENT PLAN JERSEY CITY, NEW JERSEY HYDROLOGIC CYCLE	MALCOLM PIRNIE, INC. FIGURE 1-1 JUNE 2005

2.0 BACKGROUND

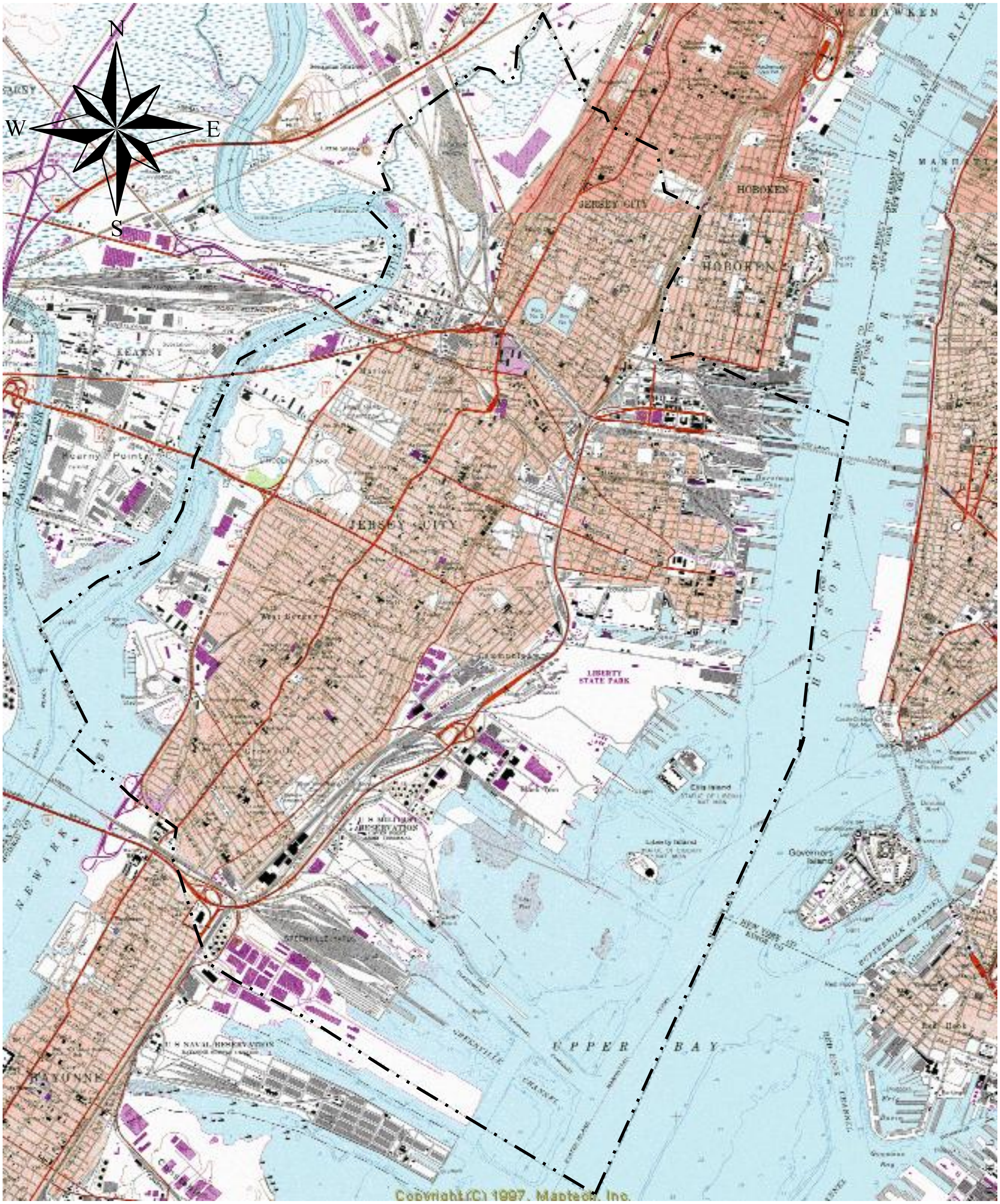
2.1 MUNICIPAL INFORMATION

The City is 21.23 square miles (9,473 acres of land and 4,116 acres of water) located in Hudson County (Figure 2-1). Its geographic boundaries consists of the Hudson River to the East and the Hackensack River to the West, Newark Bay borders the southwest and the Upper Bay borders the southeast and Penhorn Creek runs along the northwest border. Political boundaries include Union City and Hoboken to the North, Hudson River and New York City make up the western border, Bayonne borders the South and Kearny and Secaucus are located to the East of the City. Two national monuments, Ellis Island and the Statue of Liberty located in the Hudson River, are also within the borders of the City but are not owned by the City.

The City's stormwater system discharges untreated stormwater into the bordering waterways. Figure 2-2 shows the Jersey City storm drain system. The City also has a combined wastewater and stormwater drainage system which services an area of 6,190 acres, as shown on Figure 2-2. The combined sewer area covers approximately 63% of the City's wastewater and stormwater drainage. The combined sewer areas are regulated by a separate permit for combined sewer overflow (CSO) since the CSOs are recognized as a point source pollutant. There are two CSO drainage areas in the City which are identified as Jersey City East Drainage Area and Jersey City West Drainage Area. The boundary between the two drainage areas consists of a ridge line running from north to south dividing the City's gravity sewer flows to the East and West pumping stations. The East drainage area is approximately 3,718 acres and flows to the City's East Pumping Station. The West drainage area is approximately 2,472 acres and flows to the City's West Pumping Station. The two drainage areas are further divided into eleven subdrainage areas on the west side and sixteen subdrainage areas on the east side. Although the CSO facilities are regulated under a separate permit, the CSO drainage areas are included in the SWMP for completeness since they discharge untreated stormwater, including wastewater, to the waterways.

2.1.1 Watershed Areas, Subwatershed Areas, Wetlands and Waterways

The City is located within two Watershed Management Areas (WMAs) identified as WMA07 and WMA05, which consists of the Arthur Kill watershed, and the Hackensack, Hudson, and



Source: Maptech, Inc.

United States Geological Survey (USGS) Map:
Jersey City: Year Created 1967 photo revised 1981
Weehawken Quad: Year Created 1967 photo revised 1981

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JERSEY CITY STORMWATER MANAGEMENT PLAN
JERSEY CITY, NEW JERSEY
USGS SITE LOCATION MAP

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FIGURE 2-1

JUNE 2005

Pascack River watershed, respectively. The WMAs are made up of subwatersheds which are defined in the "HUC System," which is the national hydrologic unit code (HUC) system used by the United States Geological Survey. The NJDEP also utilizes the HUC system as a way to identify individual subwatershed areas. This plan examines the subwatersheds defined by 14-digit Hydrologic Unit Codes (HUC14). The HUC14s within the City are listed below. Table 2-1 lists the HUC 14 subwatershed areas. Figure 2-3 shows the HUC14 subwatershed areas within the City.

Table 2-1:
Subwatersheds (HUC14) in the City of Jersey City

Subwatershed	HUC14	WMA	SWMP Report Id
Hudson River	02030101170010	05	Hudson River
Hackensack River (below Amtrak Bridge)	02030103180100	05	Hackensack River
Newark Bay / Kill Van Kull	02030104010020	07	Newark Bay
Upper NY Bay / Kill Van Kull	02030104010030	07	Upper NY Bay

State and Federal wetland areas identified within the City consist of disturbed and managed wetlands, herbaceous wetlands, and saline marshes which are shown on Figure 2-4. There are 416 acres of state wetlands identified within the City and 392 acres of Federal wetlands. "Freshwater wetland" or "wetland" means an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation; provided, however, that the Department, in designating a wetland, shall use the three-parameter approach (that is, hydrology, soils and vegetation) enumerated in the 1989 Federal Manual as defined in this section. These include tidally influenced wetlands which have not been included on a promulgated map pursuant to the Wetlands Act of 1970, N.J.S.A. 13:9A-1 et seq. The wetland areas are protected by Freshwater Wetlands Protection Act Rules N.J.A.C. 7:7A.

The establishment of Total Maximum Daily Load (TMDLs) represents the assimilative or carrying capacity of a receiving water taking into consideration, point and nonpoint sources of pollution, natural background, and surface water withdrawals. Waste Load Allocations (WLA) are developed to identify contributors and the allowable quantities of pollutants that can be discharged to surface water without exceeding the waterbody's TMDL. Each WLA is intended to prevent adverse surface water quality impacts by setting load reduction goals for specific pollutants.

The DEP has designated a special level of protection for a number of waterways in New Jersey. This protection is known as Category One (C1). Category One waters typically provides

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JERSEY CITY, NEW JERSEY

CSO AND STORMWATER SUBDRAINAGE AREA AND SEWERS

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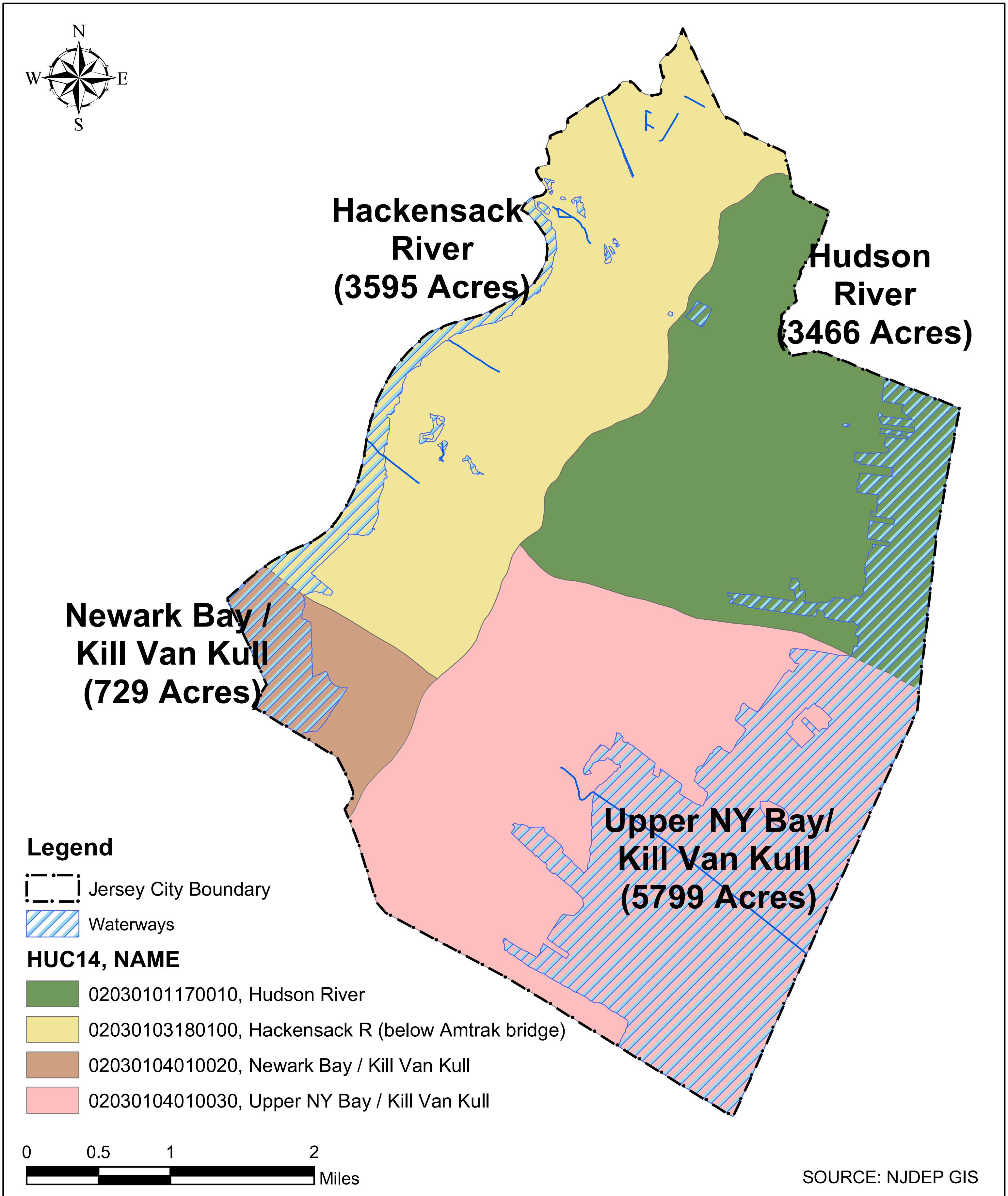
FIGURE 2-2



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JERSEY CITY STORMWATER MANAGEMENT PLAN
JERSEY CITY, NEW JERSEY
SUBWATERSHEDS (HUC14) IN JERSEY CITY

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FIGURE 2-3

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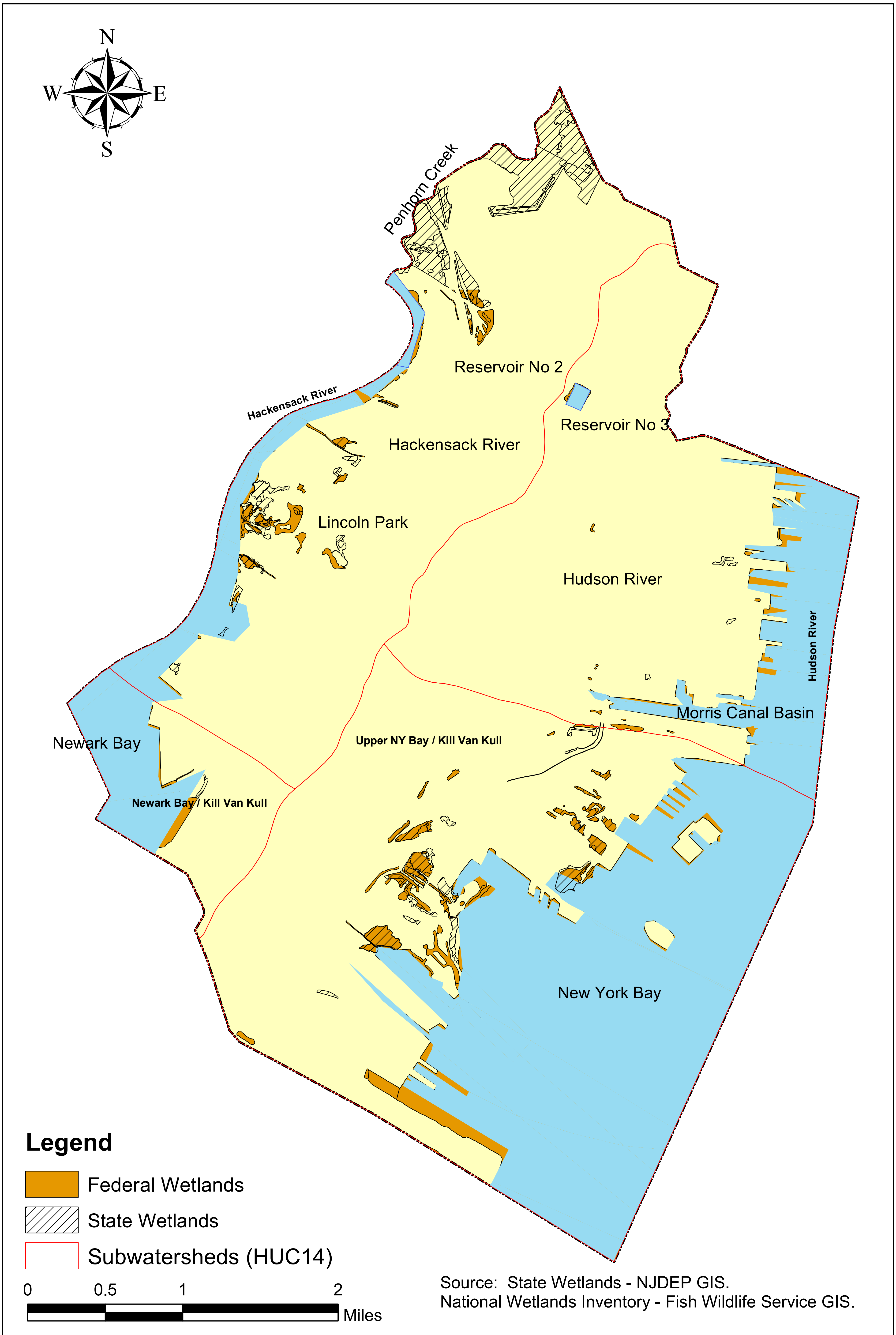


Source: State Wetlands - NJDEP GIS.
National Wetlands Inventory - Fish Wildlife Service GIS.

	JERSEY CITY STORMWATER MANAGEMENT PLAN **JERSEY CITY, NEW JERSEY** **STATE AND NATIONAL WETLANDS INVENTORY MAP**	MALCOLM PIRNIE, INC. FIGURE 2-4 JUNE 2005

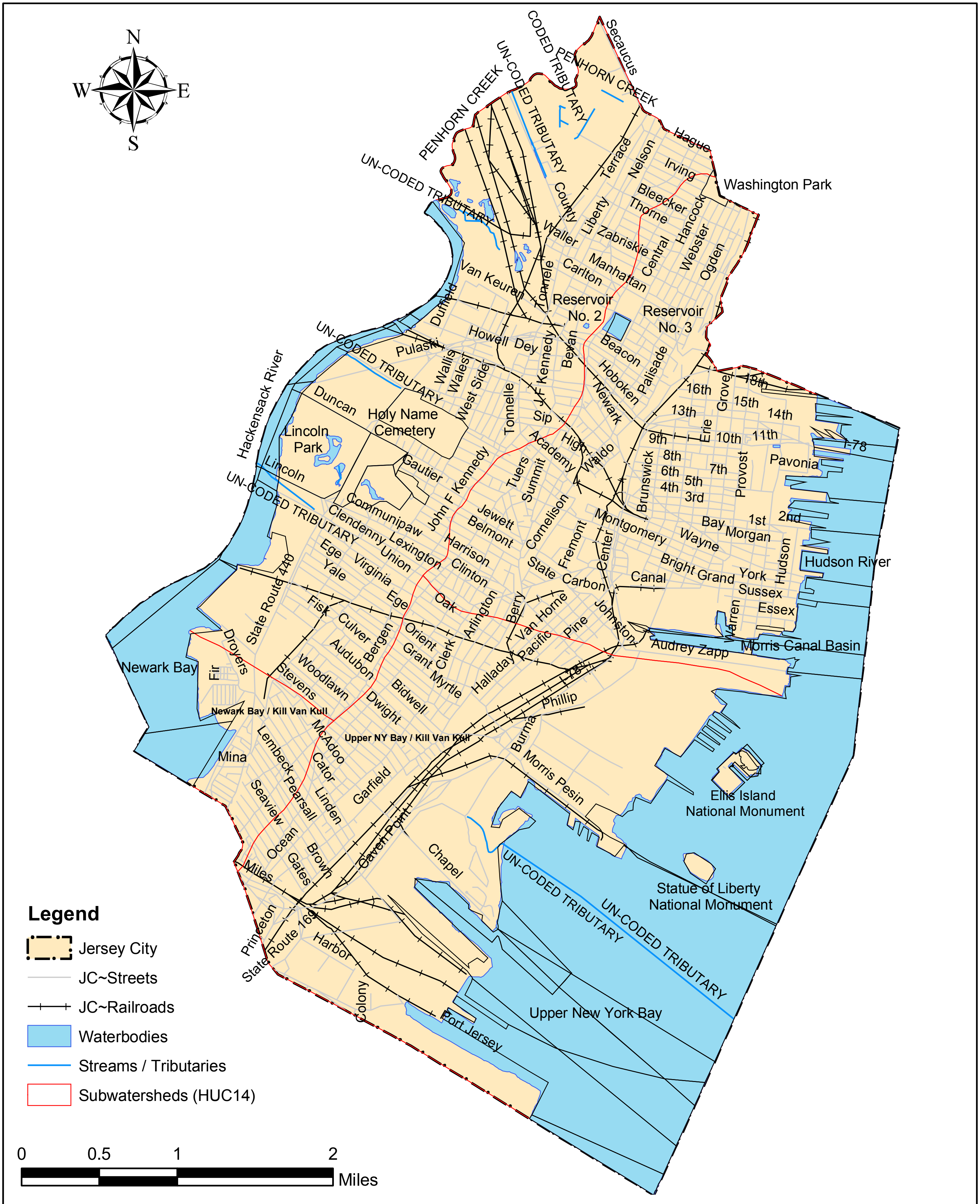
drinking water, habitat for Endangered and Threatened species, and popular recreational and/or commercial species, such as trout or shellfish. The Surface Water Quality Standards (N.J.A.C. 7:9B) define Category One waters as follows:

> "Category one waters" means those waters designated in the tables in N.J.A.C. 7:9B-1.15(c) through (h), for purposes of implementing the antidegradation policies set forth at N.J.A.C. 7:9B-1.5(d), for protection from measurable changes in water quality characteristics because of their clarity, color, scenic setting, other characteristics of aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resource(s). These waters may include, but are not limited to:
>
> 1. Waters originating wholly within Federal, interstate, State, county, or municipal parks, forests, fish and wildlife lands, and other special holdings that have not been designated as FW1 at N.J.A.C. 7:9B-1.15(h) Table 6;
>
> 2. Waters classified at N.J.A.C. 7:9B-1.15(c) through (g) as FW2 trout production waters and their tributaries;
>
> 3. Surface waters classified in this subchapter as FW2 trout maintenance or FW2
>
> 4. Nontrout that are upstream of waters classified in this subchapter as FW2 trout production;
>
> 5. Shellfish waters of exceptional resource value; or
>
> 6. Other waters and their tributaries that flow through, or border, Federal, State, county, or municipal parks, forests, fish and wildlife lands, and other special holdings.

According to rules for C1 waterbodies, a 300 ft. buffer is mandatory to prevent degradation to water quality. A buffer is also required on certain tributaries to C1 classified waterbodies. No waterbodies in the City of Jersey City have been designated as C1 Waterbodies.

The following waterways have been identified in the City and are shown on Figure 2-5.

- The Hackensack River (HUC14 id 02030103180100) is 32 miles long, and rises in Rockland County, New York and flows south through the Meadowlands to Newark Bay. The lower Hackensack is heavily industrialized and economically tied to the ports on Newark Bay and to the industrial development on the nearby Passaic River. The river's upper course is dammed to form three reservoirs that supply water to Rockland County, New York and Bergen counties in New Jersey. The River makes up the western border of the City. The Hackensack River is a C1 waterbody from the New York/New Jersey border to Oradell Dam, located north of Jersey City. C1 restrictions do not apply to the reach of the Hackensack River located in Jersey City. A TMDL for Nickel (Ni) has been



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JERSEY CITY STORMWATER MANAGEMENT PLAN
JERSEY CITY, NEW JERSEY
WATERBODIES

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FIGURE 2-5

JUNE 2005

established by the Environmental Protection Agency (EPA). The TMDL for Nickel is discussed on page 5-2.

- Penhourn Creek (HUC14 id 02030103180100) is a tributary to the Hackensack River. The Creek, is a narrow, shallow non-navigable ditch, which collects stormwater from a small drainage area.

- Hudson River – (HUC 14 id 02030101170010) The Hudson River is a tidal river which flows south to New York Bay.

- Upper New York Bay - (HUC 14 id 02030104010030) New York Bay is divided into an Upper Bay and Lower Bay which are connected by the Narrows and fed by the Hudson River. Ellis Island, The Statue of Liberty, and Governors Island are located within the Upper New York Bay. The Upper New York Bay borders Jersey City. New York Bay serves regional and national shipping.

- Newark Bay – (HUC 14 id 02030104010020) is located at the mouth of the Hackensack and Passaic Rivers. Newark Bay serves regional and national shipping. The Bay drains through the Kill Van Kull and Arthur Kill. This highly industrialized bay is contaminated, especially with dioxin. It is spanned by the Newark Bay Bridge connecting Jersey City and Newark.

2.1.2 Population

The image of the City is more reflective of the City of New York located across the Hudson River. The population of the City is approximately 240,055 (Census 2000) within a land area of 14.9 square miles. Table 2-2 contains population and housing unit data.

Table 2-2:
Housing Units and Population in Jersey City

Year	Housing Units	Population	Percent Growth
1980*	87,999	223,532	
1990*	90,723	228,537	2.2%
2000*	93,648	240,055	5%
2010 (projected)**	Not Available	265,610	10.6%
2020 (projected)**	Not Available	296,340	11.6%

* United States Census
** North Jersey Transportation Planning Authority

2.1.3 Groundwater Recharge Areas

Groundwater recharge (GWR) is defined by the NJDEP as the water that infiltrates the ground and reaches the water table regardless of the underlying geology. GWR supports aquifer recharge, stream baseflow and wetlands. The GWR for the City was not calculated by the NJDEP and NJGS Report GSR-32. The City is an urbanized area with significant amounts of impervious surface that has relatively little groundwater recharge capability regardless of underlying soils. Approximately 55 percent of the City's surface area is impervious (0.00 inches/year).

According to the Rules, a "major development" project, which is one that disturbs at least 1 acre of land or creates at least 0.25 acres of new or additional impervious surface, must include nonstructural and/or structural stormwater management measures that prevent the loss of groundwater recharge at the project site. Urban redevelopment and certain linear development projects are exempt from the groundwater recharge requirements. The Stormwater Management Rules require that a proposed major land development comply with one of the following two groundwater recharge requirements:

- Requirement 1: That 100 percent of the site's average annual pre-developed groundwater recharge volume be maintained after development; or
- Requirement 2: That 100 percent of the difference between the site's pre- and post-development 2-Year runoff volumes be infiltrated.

While the Stormwater Management Rules require groundwater recharge, in Jersey City they are not emphasized for the following reasons:

- There are no public ground water well supplies in Jersey City and surrounding cities
- There is a risk of groundwater contamination due to leaching from Chromium contaminated soils locate in Jersey City.

2.1.4 Wellhead Protection Areas

A Wellhead Protection Area (WHPA) is a map area calculated around a Public Community Water Supply (PCWS) and Non Public Community Water Supply (NPCWS) wells that delineates the horizontal extent of groundwater captured by a well pumping at a specific rate over a 2 (Tier 1), 5 (Tier 2), and 12 (Tier 3) year period of time. The WHPA delineations were conducted in response to the Safe Drinking Water Act Amendments of 1986 and 1996 as part of the Source Water Area Protection Program (SWAP). The delineation depicts the time of travel that a groundwater contaminant could be expected to reach a PCWS or NPCWS. There are no PCWS, NPCWS or WHPA located within the City.

2.1.5 Flood Sensitive Areas

Figure 2-2 shows a number of known flood sensitive areas that are within the boundaries of dark lined ellipses shown on this map. These known flood sensitive areas have been identified by the JCMUA Chief Engineer as being areas that flood more frequently than other locations in Jersey City. All of these areas are within the combined sewer system subdrainage areas and not within stormsewer subdrainage areas. Jersey City's sewer system is very sensitive to storm events, and storms of almost any intensity will cause flooding somewhere in the City. The addition of more than 0.25 acres of impervious cover must be accompanied by additional detention in both the stormwater and CSO areas of the City.

2.2 EXISTING STORMWATER MANAGEMENT SYSTEM

The City has completed the Stormwater Pollution Prevention Plan Forms which are attached in Appendix B. The SPPP outlines how the City will prevent stormwater pollution from new and existing land areas.

2.3 LAND USE / BUILD-OUT ANALYSIS

Land use effects groundwater and surface water quantity and quality. Pervious surfaces such as forested and wetland areas benefit water quality by absorbing water and filter out pollutants. Stormwater runoff increases over impervious surfaces and causes erosion and flooding. The following table shows the land use classifications for the City:

Table 2-3:
Land Use Classifications and Percent Impervious Surface Area

Land Use / Landcover	Total Acres	% Impervious
High/ Medium Residential	2856.20	64%
Commercial	1316.58	89%
Industrial	1539.71	86%
Mixed Urban	2474.89	34%
Forest, Wetlands	1139.00	1%
Barren Land	145.66	8%

Figure 2-6 shows the relative distribution of the various land uses in the city. A detailed land use analysis was conducted within each subwatershed area of the City. The subwatershed areas are defined in Section 2.1.1 and illustrated in Figure 2-3. The land use coverage in the

City is based on the 1995/1997 land use / land cover (LU/LC) geographic information system (GIS) dataset from the NJDEP and shown on Figure 2-7.

The full build out analysis was conducted by subwatershed within the municipality. The full build out analysis presents the maximum acreage of land area available for development or redevelopment. The constrained and non-constrained areas are shown on Figure 2-8. Constrained areas include wetlands, water, and the meadowlands. To complete the full build out analysis the following information was determined:

- The City was divided into subwatersheds (HUC14).
- The total land area of each subwatershed within the City was determined.
- The LU/LC within each subwatershed area was calculated in acres.
- The total area of constrained lands within each subwatershed was calculated in acres.
- Constrained lands consist of wetlands and waterways.

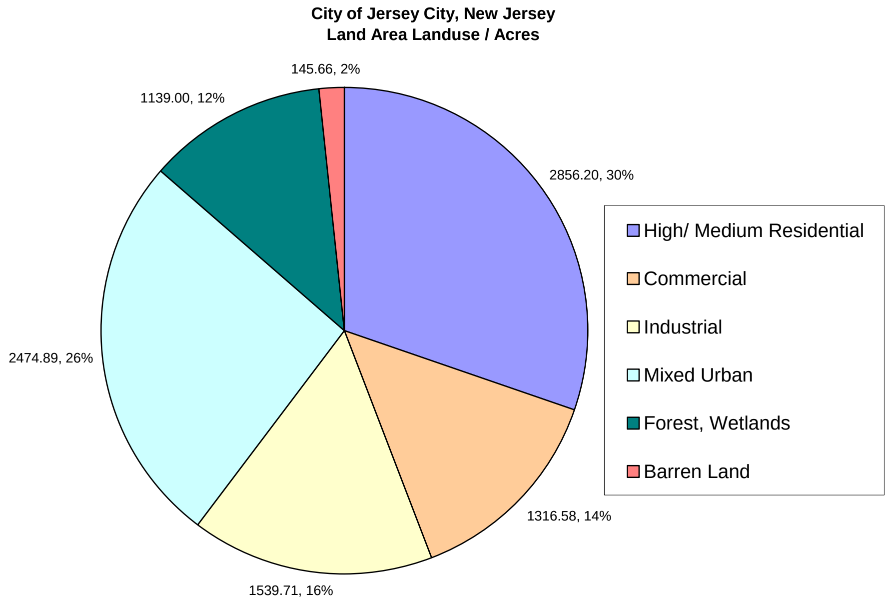
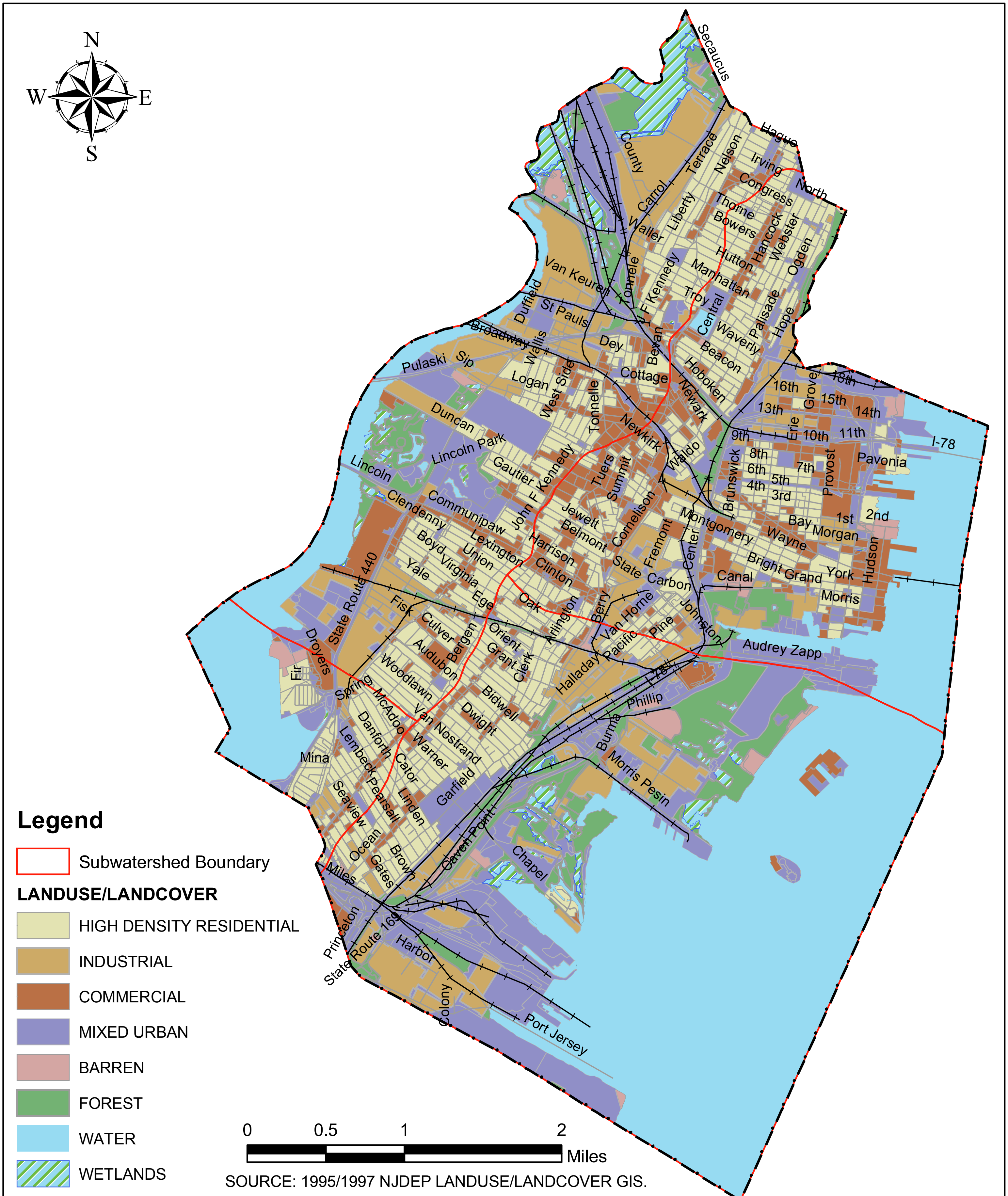


Figure 2-6: Distribution of Land Use / Land Cover

The City has no agricultural or low density housing areas. Fifty six percent of the City is high density land use typical of an urban city. According to the land use distribution within the city a full build out analysis was not required because there is less than 640 acres (1 square mile) of vacant, developable land. However, due to the variable rate of redevelopment in the City, a build out and analysis has also been included.



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JERSEY CITY STORMWATER MANAGEMENT PLAN
JERSEY CITY, NEW JERSEY
LAND USE/LAND COVER

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FIGURE 2-7

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	JERSEY CITY STORMWATER MANAGEMENT PLAN JERSEY CITY, NEW JERSEY CONSTRAINED AND NON-CONSTRANED AREAS	MALCOLM PIRNIE, INC. FIGURE 2-8 JUNE 2005

TABLE 2-6
JERSEY CITY STORMWATER MANAGEMENT PLAN
JERSEY CITY, NEW JERSEY
POLLUTANT LOADING

Subwatershed ID Landuse / Landcover Classification	HUC 14	Land Area (Sq. Feet)	Acres	TP lbs./Year	TN lbs./Year	TSS lbs./Year	NH3-N lbs./Year	LEAD lbs./Year	ZINC lbs./Year	COPPER lbs./Year	CADMIUM lbs./Year	BOD lbs./Year	COD lbs./Year	NO2+NO3 lbs./Year	Ni lbs./Year
Newark Bay / Kill Van Kull	**02030104010020**														
High/ Medium Residential		10790056.22	247.71	346.79	3715.58	34678.70	161.01	73.44	82.98	112.21	NS	6341.25	37799.78	421.10	7.08
Commercial		2202385.23	50.56	106.17	1112.30	10111.80	96.06	48.28	44.14	39.64	0.10	2128.53	33500.39	156.73	1.45
Industrial		1176720.08	27.01	40.52	432.22	5402.80	5.40	38.06	43.17	25.12	0.08	848.24	NS	35.12	0.77
Mixed Urban		3292155.54	75.58	75.58	755.79	9069.48	132.26	242.99	131.73	115.56	0.19	5078.91	13967.00	268.31	2.16
Forest, Water, Wetlands		13608830.24	312.46	31.25	937.38	12498.40	NS	2.81	5.62	8.44	NS	2874.63	624.92	93.74	8.94
Barren Land		704284.48	16.17	8.08	80.84	970.08	NS	NS	0.03	NS	NS	50.12	NS	NS	0.46
Subtotal			729.49	**608.39**	**7034.11**	**72731.26**	**394.74**	**405.59**	**307.68**	**300.97**	**0.37**	**17321.68**	**85892.10**	**974.99**	**20.86**
Upper NY Bay / Kill Van Kull	**02030104010030**														
High/ Medium Residential		26931753.94	618.26	865.57	9273.95	86556.82	401.87	183.31	207.12	280.07	NS	15827.53	94346.93	1051.05	17.68
Commercial		6565482.27	150.72	316.51	3315.86	30144.20	286.37	143.94	131.58	118.17	0.30	6345.35	99867.73	467.24	4.31
Industrial		21743703.68	499.16	748.75	7986.62	99832.80	99.83	703.32	797.66	464.22	1.50	15673.75	NS	648.91	14.28
Mixed Urban		46641306.40	1070.72	1070.72	10707.23	128486.76	1873.77	3442.37	1866.27	1637.14	2.68	71952.59	197869.61	3801.07	30.62
Forest, Water, Wetlands		147717284.80	3391.11	339.11	10173.32	135644.28	NS	30.52	61.04	91.56	NS	31198.18	6782.21	1017.33	96.99
Barren Land		2996823.23	68.80	34.40	343.99	4127.82	NS	NS	0.14	NS	NS	213.27	NS	NS	1.97
Subtotal			5798.78	**3375.06**	**41800.97**	**484792.68**	**2661.84**	**4503.47**	**3063.81**	**2591.16**	**4.48**	**141210.68**	**398866.49**	**6985.59**	**165.84**
Hudson River	**02030101170010**														
High/ Medium Residential		45453863.54	1043.47	1460.86	15652.08	146086.08	678.26	309.39	349.56	472.69	NS	26712.88	159233.83	1773.90	29.84
Commercial		30536158.36	701.02	1472.13	15422.33	140203.00	1331.93	669.47	611.99	549.60	1.40	29512.73	464492.54	2173.15	20.05
Industrial		12659216.84	290.61	435.92	4649.82	58122.80	58.12	409.48	464.40	270.27	0.87	9125.28	NS	377.80	8.31
Mixed Urban		26280607.26	603.32	603.32	6033.16	72397.92	1055.80	1939.66	1051.58	922.47	1.51	40542.84	111492.80	2141.77	17.25
Forest, Water, Wetlands		34281116.26	786.98	78.70	2360.95	31479.28	NS	7.08	14.17	21.25	NS	7240.23	1573.96	236.09	22.51
Barren Land		1791869.48	40.43	20.22	202.15	2425.80	NS	NS	0.08	NS	NS	125.33	NS	NS	1.16
Subtotal			3465.83	**4071.14**	**44320.49**	**450714.88**	**3124.11**	**3335.08**	**2491.78**	**2236.28**	**3.78**	**113259.30**	**736793.13**	**6702.71**	**99.12**
Hackensack River	**02030103180100**														
High/ Medium Residential		41241129.14	946.76	1325.47	14201.46	132546.96	615.40	280.72	317.17	428.88	NS	24237.16	144476.19	1609.50	27.08
Commercial		18046449.74	414.29	870.00	9114.29	82857.20	787.14	395.64	361.67	324.80	0.83	17441.44	274505.90	1284.29	11.85
Industrial		31490404.91	722.92	1084.37	11566.66	144583.20	144.58	1018.59	1155.22	672.31	2.17	22699.56	NS	939.79	20.68
Mixed Urban		725.27	725.27	725.27	7252.73	87032.76	1269.23	2331.75	1264.15	1108.94	1.81	48738.35	134030.45	2574.72	20.74
Forest, Water, Wetlands		33328470.55	765.12	76.51	2295.35	30604.60	NS	6.89	13.77	20.66	NS	7039.06	1530.23	229.53	21.88
Barren Land		882561.94	20.26	10.13	101.30	1215.60	NS	NS	0.04	NS	NS	62.81	NS	NS	0.58
Subtotal			3594.61	**4091.76**	**44531.78**	**478840.32**	**2816.35**	**4033.59**	**3112.02**	**2555.60**	**4.81**	**120218.37**	**554542.77**	**6637.83**	**102.81**
TOTAL (LBS / YEAR)				12146.35	137687.3	1487079.14	8997.037	12277.72	8975.285	7684	13.439514	392010	1776094.49	21301.13	388.6369
PERCENTAGE OF DEVELOPABLE LAND AREA THAT IS STORM WATER DRAINAGE=			35%												
Annual Pollutant loads from Jersey City Stormwater Drainage=				**4251.22**	**48190.57**	**520477.70**	**3148.96**	**4297.20**	**3141.35**	**2689.40**	**4.70**	**137203.51**	**621633.07**	**7455.40**	**136.02**
Annual Pollutant loads from Jersey City CSO Drainage=				**7895.13**	**89496.78**	**966601.44**	**5848.07**	**7980.52**	**5833.94**	**4994.60**	**8.74**	**254806.52**	**1154461.42**	**13845.73**	**252.61**
Annual Nickel loads from Jersey City Stormwater Drainage to Hackensack River =															**35.98**

Notes:

NS = No Standard

Land use/Landcover data was obtained from the 1995/1997 NJDEP LULC GIS dataset.

All Areal Loading Factor referenced in Table 2-4 of Chapter 2.0 are taken from a local study for watershed management area 5 to determine the pollutant loads.

TABLE 2-5
STORMWATER MANAGEMENT PLAN
JERSEY CITY, NEW JERSEY
FULL BUILD OUT ANALYSIS

HUC 14 Landuse / Landcover	Area (Square Feet)	Acres	Impervious Surface (Acres)	Impervious Surface (%)	Constrained Land (Acres)	Developable / Redevelopable (Acres)
Newark Bay / Kill Van Kull (02030104010020)						
High/ Medium Residential	10790056.22	247.71	174.51	70%	0.00	247.71
Commercial	2202385.23	50.56	45.28	90%	0.00	50.56
Industrial	1176720.08	27.01	22.00	81%	0.00	27.01
Mixed Urban	3292155.54	75.58	20.17	27%	14.49	61.09
Forest, Water, Wetlands	13608830.24	312.42	0.09	0%	312.109	0.31
Barren Land	704284.48	16.17	0.81	5%	0.00	16.17
Subtotal		**729.44**	**262.85**	**36%**	**326.60**	**402.84**
Upper NY Bay / Kill Van Kull (02030104010030)						
High/ Medium Residential	26931753.94	618.26	424.84	69%	0.00	618.26
Commercial	6565482.27	150.72	117.71	78%	0.00	150.72
Industrial	21743703.68	499.16	421.62	84%	0.00	499.16
Mixed Urban	46641306.40	1070.72	346.86	32%	0.00	1070.72
Forest, Water, Wetlands	147717284.80	3391.11	3.71	0%	2923.228	467.88
Barren Land	2996823.23	68.80	6.68	10%	0.00	68.80
Subtotal		**5798.78**	**1321.42**	**23%**	**2923.23**	**2875.55**
Hudson River (02030101170010)						
High/ Medium Residential	45453863.54	1043.47	647.78	62%	0.00	1043.47
Low/Rural Residential	0.00	0.00	0.00	0%	0.00	0.00
Commercial	30536158.36	701.02	628.75	90%	0.00	701.02
Industrial	12659216.84	290.61	245.87	85%	0.00	290.61
Mixed Urban	26280607.26	603.32	220.29	37%	0.00	603.32
Forest, Water, Wetlands	34281116.26	786.98	4.46	1%	13.149	773.83
Barren Land	1791869.48	40.43	1.67	4%	0.00	40.43
Subtotal		**3465.83**	**1748.83**	**50%**	**13.149**	**3452.68**
Hackensack River (02030103180100)						
High/ Medium Residential	41241129.14	946.76	567.15	60%	0.00	946.76
Commercial	18046449.74	414.29	377.83	91%	0.00	414.29
Industrial	31490404.91	722.92	628.50	87%	0	722.92
Mixed Urban	725.27	725.27	261.95	36%	0.00	725.27
Forest, Water, Wetlands	33328470.55	765.12	2.24	0%	528.839	236.28
Barren Land	882561.94	20.26	2.37	12%	0.00	20.26
Subtotal		**3594.61**	**1840.04**	**51%**	**528.839**	**3065.78**

Constrained Lands include water and wetland areas.

TOTAL DEVELOPABLE AREA OF JERSEY CITY CSO AND STORM SEWER DRAINAGE AREA=	9796.84
TOTAL DEVELOPABLE CSO SEWER DRAINAGE AREA OF JERSEY CITY =	6190.00
TOTAL DEVELOPABLE STORM SEWER DRAINAGE AREA OF JERSEY CITY =	3606.84
PERCENTAGE OF DEVELOPABLE LAND AREA THAT IS STORM WATER DRAINAGE=	37%

2.4 POLLUTANT LOADING SUMMARY

Table 2-4 shows Area Pollutant Loading Factors which were taken from the New Jersey Stormwater Best Management Practices Manual, as well as from current literature on those values not available from NJDEP. The land use for each subwatershed was taken from the 1995/97 LULC NJDEP GIS layer.

Table 2-4:
Nonpoint Source Analysis: Area Pollutant Loading Factor per Land Use in lbs./Acre/Year.

LU/LC	TP	TN	TSS	NH3-N	LEAD	ZINC	COPPER	CADMIUM	BOD	COD	NO2+NO3	Ni
High/ Medium Residential	1.4	15	140	0.65	0.2965	0.335	0.453	ns	25.6	152.6	1.7	0.0286
Low/Rural Residential	0.6	5	100	0.02	0.217	0.172	0.19	ns	ns	ns	0.1	0.0286
Commercial	2.1	22	200	1.9	0.955	0.873	0.784	0.002	42.1	662.6	3.1	0.0286
Industrial	1.5	16	200	0.2	1.409	1.598	0.93	0.003	31.4	ns	1.3	0.0286
Mixed Urban	1	10	120	1.75	3.215	1.743	1.529	0.0025	67.2	184.8	3.55	0.0286
Agriculture	1.3	10	300	ns	0.071	0.089	0.027	ns	15.45	ns	ns	0.0286
Forest, Water, Wetlands	0.1	3	40	ns	0.009	0.018	0.027	ns	9.2	2	0.3	0.0286
Barren Land	0.5	5	60	ns	ns	0.002	ns	ns	3.1	ns	ns	0.0286

Annual non point source (NPS) loads for each subwatershed were calculated using the following loading equation: *Load = Loading Coefficients x Area*

The loading coefficients per land use are in pounds per acre per year (lbs/acre/yr). The loading equation provides an approximation for annual NPS loads on a subwatershed basis per land use. This allows for the comparison of loading between subwatershed areas and provides a method to prioritize areas for restoration and/or preservation.

The stormwater management measures used to reduce the average annual TSS and nutrient loads can be non-structural and/or structural. To achieve the reduction requirements, they must be designed to treat the stormwater runoff generated by various design storms variable rate rainfall event. Nonstructural and structural stormwater management measures, also known as Best Management Practices (BMPs), are presented in Chapter 3.0 and 4.0.

The Full-Buildout Analysis and Annual Pollutant Loads at Full Buildout are shown on Tables 2-5 and 2-6, respectively.

2.5 The Water Quality and Health of the Waterbodies in Jersey City

The Water Quality of the Waterbodies in Jersey City is addressed in the 2006 Integrated Water Quality Monitoring and Assessment Report (Report) issued by the NJDEP. The Report shows that all four HUC 14 subwatersheds of which the City is a part contain impaired waterbodies. The Report defines an impaired waterbody as one that does not attain one or more of the surface water quality standards despite the implementation of technology based effluent limits. Water quality data used to determine impairment comes from a number of sources (outlined in Appendix F of the Report) including Ambient Biomonitoring Network (AMNET). There are no AMNET monitoring sites in Jersey City or Hudson County. Impairments are listed in Table 2-7 and should be taken into account during the implementation of future stormwater BMPs. It should be noted that Penhorn Creek is located in the Hackensack River (below Amtrak bridge) assessment unit, which is not immediately obvious from the assessment unit's name.

Table 2-7: Jersey City's Impaired Subwatersheds

Watershed Management Area	Assessment Unit ID	Assessment Unit Name	Pollutant of Concern	Ranking
5	02030103180100-01	Hackensack R (below Amtrak bridge)	Dioxin	Moderate
5	02030103180100-01	Hackensack R (below Amtrak bridge)	Dissolved Oxygen	Moderate
5	02030103180100-01	Hackensack R (below Amtrak bridge)	Mercury	Moderate
5	02030103180100-01	Hackensack R (below Amtrak bridge)	PCBs	Moderate
5	02030103180100-01	Hackensack R (below Amtrak bridge)	pH	Moderate
5	02030103180100-01	Hackensack R (below Amtrak bridge)	Turbidity	Low
5	02030101170010-01	Hudson River	PCBs	Moderate
5	02030101170010-01	Hudson River	Dioxin	Moderate
5	02030101170010-01	Hudson River	Pollutant Unknown	Low
7	02030104010020-02	Newark Bay / Kill Van Kull (74d 07m 30s)	Dioxin	Moderate
7	02030104010020-02	Newark Bay / Kill Van Kull (74d 07m 30s)	PAHs	Moderate
7	02030104010020-02	Newark Bay / Kill Van Kull (74d 07m 30s)	PCBs	Moderate
7	02030104010020-02	Newark Bay / Kill Van Kull (74d 07m 30s)	Pesticides	Moderate
7	02030104010030-02	Upper NY Bay / Kill Van Kull (74d07m30s)	Dioxin	Moderate
7	02030104010030-02	Upper NY Bay / Kill Van Kull (74d07m30s)	PAHs	Moderate
7	02030104010030-02	Upper NY Bay / Kill Van Kull (74d07m30s)	PCBs	Moderate
7	02030104010030-02	Upper NY Bay / Kill Van Kull (74d07m30s)	Pesticides	Moderate

The Report also shows that each of the assessment units is on one or more sublists. Assessment units are placed on sublists based on the degree of attainment of a specified use, the amount of data available for determining attainment, and the cause or source of non-attainment. Table 2-8 presents the sublist designations for uses designated in the Report for each assessment unit.

Table 2-8: 2006 Integrated List Sublist Designations for Assessment Units of which Jersey City is Part

Table WMA	Assessment Unit ID	Assessment Unit Name	Aquatic Life (General) Sublist No.	Primary Contact Recreation Sublist No.	Secondary Contact Recreation Sublist No.	Drinking Water Supply Sublist No.	Agricultural /Industrial Water Supply Sublist No.	Shellfish Harvest	Fish Consumption
5	02030101170010-01	Hudson River	5	3	3	N/A	N/A	N/A	3
5	02030103180100-01	Hackensack River (below Amtrak bridge)	5	3	3	3	3/2	N/A	5
7	02030104010020-02	Newark Bay / Kill Van Kull (74d 07m 30s)	5	N/A	3	N/A	N/A	N/A	5
7	02030104010030-02	Upper NY Bay / Kill Van Kull (74d07m30s	5	N/A	3	N/A	N/A	N/A	5

Notes:
Sublist 2 - The designated use is assessed and attained but one or more designated uses in the assessment unit are not attained and/or there is insufficient information to make a determination.
Sublist 3 - Insufficient data is available to determine if the designated use is attained.
Sublist 5 - The designated use is not attained or is threatened by a pollutant(s) and a TMDL is required.
N/A indicates that the designated use does not apply to an assessment unit.

3.0 DESIGN AND PERFORMANCE STANDARDS

3.1 GENERAL DISCUSSION

The City has adopted the design and performance standards for stormwater management measures presented in N.J.A.C 7:8-5. These standards are designed to minimize the adverse impacts of stormwater runoff on water quality, water quantity, and loss of groundwater recharge in receiving water bodies. The standards for these measures also address erosion control. This plan also incorporates a maintenance plan consistent with N.J.A.C. 7:8-5.8 for stormwater management measures and safety standards consistent with N.J.A.C. Safety Standards for Stormwater Management Basins. These standards and measures are adopted by the municipality by means of the Stormwater Management Ordinance presented in Appendix A.

To ensure compliance with these standards, City inspectors will observe the construction of future projects and make certain that the stormwater management measures are constructed and function as designed.

The plan emphasizes that to the maximum extent practicable, the major stormwater management standards must be met by incorporating nonstructural stormwater management strategies consistent with N.J.A.C. 7:8-5.3 and described in Section 4.2 of this plan. It is upon exhaustion of all possible nonstructural strategies that structural stormwater management measures must be considered to ensure compliance with the standards incorporated in this plan.

3.2 MAJOR GOALS

The major goals of stormwater management measures, structural or non-structural, are to control erosion, sedimentation, infiltration and groundwater recharge, and control stormwater runoff quality and quantity impacts of major development. These specific goals are as follows:

3.2.1 Erosion and Sedimentation Control

The minimum design and performance standards for erosion control are those established under the Soil Erosion and Sediment Control Act, N.J.S.A 4:24-39 et seq. More specifically, erosion and sedimentation controls are regulated by the Soil Conservation Districts in each county which ensure compliance with *Standards for Soil Erosion and Sediment Contro*l, (July 1999).

3.2.2 Groundwater Recharge

The minimum design and performance standards for groundwater recharge are those established under N.J.A.C. 7:8-5.4. The design engineer for the developer is provided with a choice of two methods to ensure that loss of groundwater recharge is being mitigated. The engineer must either demonstrate that 100 percent of the average annual pre-construction recharge volume is being maintained, or that the increase of stormwater runoff volume due to construction for the two-year storm is infiltrated. It must be noted that groundwater recharge design and performance standards do not apply to projects in an "urban redevelopment area" or in areas that fall under the following categories:

- Industrial and commercial areas with solvent/petroleum related activity.
- Areas where hazardous/toxic materials may be present.
- Areas with high risks of toxic material spills (e.g. gas stations and vehicle maintenance facilities).
- Areas where stormwater runoff is exposed to industrial materials or machinery that could act as a pollutant source.

Jersey City doesn't emphasize groundwater recharge due primarily to the fact that they have no water wells and that the soil is contaminated with chromium which could also contaminate the water.

3.2.3 Stormwater Runoff Volume and Peak Abatement

The minimum design and performance standards for controlling stormwater runoff quantity impacts are those established under N.J.A.C. 7:8-5.4. Using the assumptions and factors for stormwater runoff calculations, the developer's design engineer must demonstrate one of the following:

- For stormwater leaving the site, post-construction runoff hydrographs for two, ten and 100-year storm (the design storms) events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events.

- There is no increase in peak runoff rates of stormwater leaving the site for the two, ten and 100-year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site.

- The post-construction peak runoff rates for the two, ten and 100-year storm events are 50, 75, and 80 percent, respectively, of the pre-construction peak runoff rates.

The engineer must provide proof that these criteria can be met by using SWMM 5, XP-SWMM, TR-55 or the Rational Method model in order to provide adequate proof that these criteria can be met. If more than three pipes or conveyance reaches are necessary for the proposed developments, the TR-55 or Rational Methods may not be appropriate and are not recommended.

3.2.4 Reduction of Stormwater Runoff Pollutant Quantities

The minimum design and performance standards controlling stormwater runoff quantity impacts are those established under N.J.A.C. 7:8-5.5. Measures for stormwater quality control are only required for proposed developments that create an additional one-quarter acre of impervious surface. The stormwater management measures must be designed to remove 80% of the post-construction total suspended solids (TSS) load in stormwater runoff generated from the water quality design storm. The design storm is defined as 1.25 inches of rainfall in two hours with the hourly distribution shown in Table 3.1.

TABLE 3-1: Distribution of a 1.25-inch 2 hour Storm in New Jersey

Minutes	Cumulative Rainfall (inches	Minutes	Cumulative Rainfall (inches)
0	0.0000	65	0.8917
5	0.0083	70	0.9917
10	0.0166	75	1.0500
15	0.0250	80	1.0840
20	0.0500	85	1.1170
25	0.0750	90	1.1500
30	0.1000	95	1.1750
35	0.1330	100	1.2000
40	0.1660	105	1.2250
45	0.2000	110	1.2334
50	0.2583	115	1.2417
55	0.3583	120	1.2500
60	0.6250		

The engineer must use this distribution with one of the aforementioned models in order to provide adequate proof that the 80% TSS requirement can be met. If more that three pipes or conveyance reaches are necessary for the proposed development, the TR-55 or Rational Method may not be appropriate. Reduction of post-construction nutrient load, to the maximum extent feasible, from the runoff of a water quality design storm must also be accomplished by the stormwater management measures.

3.3 DEVELOPER REQUIREMENTS

Developers constructing new developments or retrofitting old developments must not only meet the stormwater management goals discussed in the previous sections, but also achieve four other requirements. Developers must comply with the Natural Heritage Program, create stormwater management maintenance plans for each stormwater management method or technology they use, institute safety requirements outlined in N.J.A.C. 7.8-6, and comply with total maximum daily load requirements.

3.3.1 Natural Heritage Program Compliance

In response to the New Jersey Department of Environmental Protection's Natural Heritage Program, developers required to institute stormwater management measures shall ensure that the best management practice selected avoids damage to habitats of threatened and endangered species, particularly the swamp pink (*Helonias bullata*) and the bog turtle (*Clemmys muhlnebergii*). Developers should submit a request for information regarding endangered species in the selected project site. The request consists of a short letter explaining the project, a USGS quad map delineating project site boundaries, and a completed data request form. The data request form is available on the NJDEP website at http://www.nj.gov/dep/parksandforests/natural/heritage/datareq.html. Additional information regarding the Natural Heritage Program is available at http://www.nj.gov/dep/parksandforests/natural/heritage/. It should be noted that average turn around time for a request is two weeks. A minimum charge of $20 (plus $20 per hour for each additional hour, billed in half hour increments) will be assessed for each request.

3.3.2 Stormwater Management Maintenance Plans

N.J.A.C. 7.8-5.8(a) requires each stormwater management measure to have a maintenance plan. The maintenance plan must contain the names, addresses, and telephone numbers of the persons responsible for maintenance practices. It must also contain specific preventative and corrective tasks, an inspection and task schedule, maintenance cost estimates, and logs of all maintenance activities performed. In addition to the required information, the maintenance plan should contain sources of tools and equipment required for maintenance, corrective responses for emergencies, safety plans for maintenance practices, a list of disposal and recycling sites, copies of warranties for measure components, and copies of relevant construction documents. The maintenance plan should also contain information on access to the site, personnel training, and impacts of the stormwater management measure's aesthetics on the surrounding area.

Upon completion of the maintenance plan, copies shall be provided to the stormwater management measure's owner and operator as well as the County, the designated stormwater review agency for the City. The title and date of the plan and the name, address, and telephone number of the party responsible for measure maintenance must be recorded on the deed to the property on which the measure is located. If requested, the person responsible for plan maintenance must furnish the plan and any associated logs or records to public entities with administrative, health, environmental or safety authority over the site. More information regarding stormwater measure maintenance is available in Chapter 8 of the *New Jersey Best Management Practices Manual*: Maintenance and Retrofit of Stormwater Management Measures.

3.3.3 Safety

N.J.A.C. 7.8-6.2 sets safety requirements for best management practices involving stormwater basins. Requirements are set for trash racks, overflow grates and escape provisions. These requirements apply to all best management practices involving basins, such as wet ponds and detention basins. All basins and ponds with open water shall be enclosed and secured from public access with a minimum 6-foot tall steel fence or other material approved for use by the City's building department. Variances and exemptions to the following safety requirements can only be granted if the reviewing agency finds that the variance or exemption will not be a threat to public safety.

3.3.3.1 Trash Racks

Trash racks, much like the grates over storm water catch basins, are designed to catch trash and debris and prevent clogging. Trash racks are to be installed at the intake to the outlet from the stormwater management basin. They are to have parallel bars spaced no farther than six inches apart and shall not negatively affect the flow of the outlet. Average flow through the trash rack should not exceed 2.5 ft/s over the course of a storm. Trash racks shall be constructed from rigid, durable, corrosion-resistant material capable of withstanding a load of 300 psi.

3.3.3.2 Overflow Grates

Overflow grates are designed to prevent obstruction of overflow structures. An overflow grate shall be secured to the outlet but shall also be removable. Open spaces in the grate shall be no greater than two inches across the smallest dimension. Like trash racks, overflow grates shall be constructed from rigid, durable, corrosion-resistant material capable of withstanding a load of 300 psi and/or H-20 loading if trucks will possibly drive over the grates.

3.3.3.3 Escape Provisions

Stormwater basins with outflows shall incorporate permanent ladders, steps, rungs or other escape methods into the basin's structure. Basins more than 2.5 feet deep must have safety ledges. These safety ledges shall consist of two steps, each four to six feet in width. The first step shall be 1.5 to 2 feet below the permanent water surface, and the second step shall be located 1 to 1.5 feet above the permanent water surface. Dams, embankments and berms used in stormwater basins shall not have a slope greater than 3:1 horizontal.

3.3.4 Total Maximum Daily Load (TMDL) and Waste Load Allocations (WLAs)

Developers should be aware of and comply with Waste Load Allocations. These quantities are determined based on the substance's sources, point and nonpoint. The sum of the waste load allocations is equal to the total maximum daily load or TMDL. TMDLs are developed for water bodies that cannot meet the surface water requirements after installation of effluent-based treatment measures. The TMDL establishes Waste Load Allocations (WLA).

The State of New Jersey has a four phase process for TMDLs. A proposed TMDL is considered 'proposed' when it is published for public review in the New Jersey Register as a proposed amendment to the appropriate water quality management plan. Next, public comments are incorporated and the TMDL is submitted to EPA Region 2 for a 30-day review period. The TMDL is 'established' during this phase. The third phase is approval of the amendment by EPA Region 2. The TMDL is considered 'adopted' after it has been approved by EPA Region 2 and adopted by NJDEP as a water quality management plan amendment. The process ends when the amendment's adoption notice is published in the New Jersey Register. Developers should consult the Plan Consistency chapter of this report for TMDLs in effect in Jersey City. More information on TMDLs including a list of TMDLs in New Jersey can be found on the NJDEP's website at http://www.state.nj.us/dep/watershedmgt/tmdl.htm. Developers are required to remove pollutants to achieve the specified annual pollutant load for their proposed land area development, which is the WLA.

3.4 EXEMPTIONS AND WAIVERS

All developments disturbing more than one acre of land or creating more than one quarter of an acre of impervious surface are subject to the stormwater treatment standards outlined in N.J.A.C. 7.8-5.4 and 5.5, with specific exemptions for urban redevelopment areas, high pollutant loading and runoff from source material outlined in N.J.A.C. 7.8-5.4(a)2ii and 2iii. Waivers may be granted for developments in areas subject to tidal influence where non-tidal water surfaces do not exist. Three types of linear development projects are exempt from the groundwater recharge and the stormwater quality and quantity requirements set forth in N.J.A.C. 7.8-5.4 and 5.5:

1. Underground utility line construction projects (provided that disturbed areas are revegetated upon project completion);
2. Aboveground utility line construction projects (provided that pre-project conditions are maintained to the maximum extent possible); and
3. Public pedestrian access projects, such as sidewalks or trails that are less than 14 feet wide (provided the access is constructed from permeable material).

Waivers from strict compliance with N.J.A.C. 7.8-5.4 and 5.5 can be obtained for projects concerning the enlargement of an existing public roadway, enlargement of a public railroad or the construction or enlargement of a public pedestrian access if the following four criteria are met:

1. The waiver applicant shows public need for the project and it cannot be accomplished any other way;
2. The applicant completes an alternatives analysis showing that the use of nonstructural and structural stormwater management measures complies with N.J.A.C. 7.8-5.4 and 5.5 (i.e.; the major goals discussed in Section 3.2) to the maximum extent practicable;

3. The applicant shows that compliance with N.J.A.C. 7.8-5.4 and 5.5 would require existing structures currently in use to be condemned; and

4. The applicant does not own or have rights to areas that would allow for additional mitigation opportunities that are not achievable on-site. This item, however, is not applicable to the City's SWMP since mitigation is permitted under the criteria set in Chapter 6.0.

4.0 SPECIFIC BEST MANAGEMENT PRACTICES (BMPS)

4.1 LOW IMPACT DEVELOPMENT VERSUS STRUCTURAL BMPS

Effective low impact development includes the use of both nonstructural and structural stormwater management measures that are a subset of a larger group of practices and facilities known as Best Management Practices or BMPs. The BMPs utilized in low impact development, known as LID-BMPs, focus first on minimizing both the quantitative and qualitative changes to the pre-developed hydrology of a site through nonstructural practices and then providing treatment as necessary through a network of structural facilities distributed throughout the site. In doing so, low impact development places an emphasis on nonstructural stormwater management measures, seeking to maximize their use prior to utilizing structural BMPs.

Nonstructural BMPs used in low impact development seek to reduce stormwater runoff impacts through sound site planning and design. Nonstructural LID-BMPs include such practices as minimizing site disturbance, preserving important site features, reducing and disconnecting impervious cover, flattening slopes, utilizing native vegetation, minimizing turf grass lawns, and maintaining natural drainage features and characteristics. Structural BMPs used to control and treat runoff are also considered LID-BMPs if they perform these functions close to the source of runoff. As such, they are typically smaller than standard structural BMPs. Structural LID-BMPs include various types of basins, filters, surfaces, and devices located on individual lots in a residential development or throughout a commercial, industrial, or institutional development site in areas not typically suited for larger, centralized structural facilities.

4.2 LOW IMPACT DEVELOPMENT OR NONSTRUCTURAL BMPS

The City will review its ordinances and provide a list of the sections in the City land use and zoning ordinances that are to be modified to incorporate nonstructural stormwater management strategies. Once the ordinance texts are completed, they will be submitted to the County for review and approval. A copy will also be submitted to the NJDEP.

4.2.1 Buffers

The ordinance will require buffer areas along all lot and street lines separating residential uses from arterial and collector streets, separating a nonresidential use from either a residential use or residential zoning district line, and along all street lines where loading and storage areas can be seen from the street. The landscape requirements for these buffer areas in the existing section will not recommend the use of native vegetation. The language of this section will require the use of native vegetation, which requires less fertilization and watering than non-native species. Language will be included to allow buffer areas to be used for stormwater management by disconnecting impervious surfaces and treating runoff from these impervious surfaces. The City should determine if this section will require preservation of natural wood and tracts and limit land disturbance for new construction.

4.2.2 Cluster Development

The ordinance will provide for a cluster development option to preserve land for public and agricultural purposes, to prevent development on environmentally sensitive areas, and to aid in reducing the cost of providing streets, utilities and services in residential developments. The cluster option is a tool for reducing impervious roads and driveways. The option allows for smaller lots with smaller front and side yard setbacks than traditional development options. It also minimizes the disturbance of large tracts of land, which is a key nonstructural stormwater management strategy. The cluster option will require that a percentage of the total tract be preserved as common open space for residential area. The cluster option will not require that 25 percent of the green or common area be landscaped with trees and/or shrubs. This language will promote the use of native vegetation, which requires less fertilization and watering than non-native ornamental plants. Although the cluster option requires public concrete sidewalks to be installed along all streets, the option requires paths in open space to be mulched or stone to decrease the impervious area.

4.2.3 Vegetated Swale Curbs and Gutters

The ordinance will require that concrete curb and gutter, concrete curb, or Belgian block curb be installed along every street within and fronting on a development whenever possible. This section may allow for curb cuts or flush cuts with curb stops to allow vegetated swales to be used for stormwater conveyance and to allow the disconnection of impervious areas.

4.2.4 Use of Natural Swales for Drainage

The ordinance will require that all streets be provided with inlets and pipes where the same are necessary for proper drainage and it will encourage the use of natural vegetated swales instead of inlets and pipes.

4.2.5 Permeable Pavement Driveways and Access Ways

The ordinance will describe the procedure for construction of any new driveway or access way to any street and will promote the use of pervious paving materials to minimize stormwater runoff and promote groundwater recharge.

4.2.6 Preservation of Natural Features

The ordinance will require that natural features such as trees, brooks, swamps, hilltops, and views be preserved whenever possible, and that care be taken to preserve selected trees to enhance soil stability and landscaped treatment of the area. This section will allow developers to expand trees to forested areas, to ensure that leaf litter and other beneficial aspects of the forest are maintained in addition to the trees.

4.2.7 Vegetation on Roofs

The ordinance will require that roofs or rooftops be lined with a vegetated cover, when feasible. The vegetated roof will retain stormwater and aid in the reduction of stormwater runoff.

4.2.8 Restrictions on Nonconforming Uses, High Impervious Area Structures or Lots

The ordinance will not permit proposed additions to existing single family homes proposing additions that will exceed the maximum percent of impervious cover. The homeowner will be required to reduce or mitigate the impact of the additional impervious surfaces unless the stormwater management plan for the development provided for these increases in impervious surfaces. This mitigation effort must address water quality, flooding, and groundwater recharge.

4.2.9 Off-site and Off-tract Improvements

The ordinance will describe essential off-site and off-tract improvements. Language will be added to this section to require that any off-site and off-tract stormwater management and drainage improvements must conform to the design and performance standards described in this plan.

4.2.10 Off-street Parking and Loading

The ordinance will include details of off-street parking and loading requirements. All parking lots with more than 10 spaces and all loading areas will be required to have concrete or Belgian block curbing around the perimeter of the parking and loading areas. This section will also require that concrete or Belgian block curbing be installed around all landscaped areas within the parking lot or loading areas. It will also allow for flush curb with curb stop, or curbing with curb cuts to encourage developers to allow for the discharge of impervious areas into landscaped areas for stormwater management whenever possible. Language will also be added to allow for use of natural vegetated swales for the water quality design storm, with overflow for larger storm events into storm sewers. This section will promote the usage of pervious paving in areas providing overflow parking, vertical parking structures, smaller parking stalls, and shared parking.

4.2.11 Shade Trees

The ordinance will encourage land owners and home owners to plant shade trees in their yards. In addition to this section, the City will have a Tree Preservation Ordinance that restricts and otherwise controls the removal of mature trees throughout the City. This ordinance recognizes that the preservation of mature trees and forested areas is a key strategy in the management of environmental resources, particularly watershed management, air quality, and ambient heating and cooling. These sections will set out a "critical footprint area" that extends beyond the driveway and building footprint where clearing of trees cannot occur. This will comply with minimizing land disturbance, which is a nonstructural stormwater management strategy. These sections will require the identification of forested areas, and that a percentage of forested areas are protected from disturbance.

4.2.12 Use of Narrow Streets

The ordinance will describe the requirements for streets in the City. The City has several street classifications, with various right-of-way widths. Street paving widths are a function of the number of units served, whether a street is curbed, whether on-street parking is permitted, whether the interior streets serve lots of two acres or larger, and whether on-site topographical constraints allow design flexibility. Depending on these factors, paving width for secondary local streets has a range from 20 to 32 feet. This section will encourage developers to limit on-street parking to allow for narrower paved widths. This section will also require that cul-de-sacs 35 foot turning radius be minimized to reduce impervious area. Normal radius cul-de-sacs with landscaped islands will be used as planted tree or pond areas or designed with flush curbs with a reinforced shoulder to accommodate larger equipment and emergency vehicles.

4.2.13 Steep Slopes

This ordinance would require terraced landscaping design or other flow velocity reduction methods be used with steep slope areas. One option is to construct flumes designed in accordance with "Standard for Slope Protection Structures" of the *Standards for Soil Erosion and Sediment Control in New Jersey*, which would follow the philosophy of moving the "fast" flows off the steep slopes without erosion to an area where the stormwater can be managed more effectively.

4.3 STRUCTURAL BEST MANAGEMENT PRACTICES BMPs

These BMPs should only be considered when nonstructural BMPs do not meet the goals identified in Section 3.2. These structural BMPs are as follows:

4.3.1 Bioretention Basins

Bioretention systems filter stormwater runoff through vegetative layer planted on a soil layer and convey the water downstream by means of an underdrained sand layer below the soil bed. These systems are used to remove a wide range of pollutants including suspended solids, nutrients, metals, hydrocarbons, and bacteria. They are also capable of reducing peak runoff rates and increasing stormwater infiltration if design features related to providing additional storage, and hydraulics that raise the invert of lowest outlet above the maximum design storm water surface, are incorporated into the design.

Runoff from both residential and nonresidential developments, impervious areas and lawns can be handled by bioretention systems. They can be installed in lawns, median strips, parking lot islands, unused lot areas, and certain easements. Detailed information for designing bioretention systems is provided in Chapter 9.1 of the *New Jersey Stormwater Best Management Practices Manual.* Some of the critical design criteria are discussed below.

Bioretention basins must be designed with enough storage volume to treat the runoff volume generated by the stormwater quality design storm (as calculated from methods described in Chapter 5 of the *New Jersey Stormwater Best Management Practices Manual*) without overflow. The surface area should be large enough such that the maximum water depth during treatment is 12 inches in a basin and 18 inches in a swale. The hydraulics of the soil bed and the sand underdrain should be such that the entire volume of a stormwater quality design storm can be drained within 72 hours. This in turn requires adherence to the soil permeability criteria discussed later. In conducting field or laboratory testing to determine soil permeability, a safety factor of two shall be applied to account for temporal variations due to continued operation of the basin. The system must be designed with enough hydraulic capacity so as to safely convey stormwater to downstream drainage systems. Any stormwater management measures classified as dams under the NJDEP Dam Safety Standards stipulated by N.J.A.C. 7:20 must also meet the overflow requirements of these standards.

The applicability of using bioretention systems depends on a few important criteria. Because bioretention basins rely upon an underdrain system to rapidly convey runoff to downstream areas after filtration, a high Seasonal High Water Table (SHWT) can be detrimental to a bioretention basin's effectiveness. Bioretention basins are appropriate when the SHWT is at least 1 foot below the bottom of the bioretention basin's underdrain during non-drought conditions. Furthermore, if the system relies on infiltration through the soil layer underneath the system instead of an underdrain, soil permeability must be greater than 0.5 inches/hour to ensure proper functioning (based on design criteria for Infiltration Basins, another BMP described in Chapter 9.5 of the *New Jersey Stormwater Best Management Practices Manual*). Bioretention systems should not be planned in areas where removal of mature trees would be involved.

4.3.2 Constructed Stormwater Wetlands

Constructed stormwater wetlands use vegetation to maximize the removal of pollutants from runoff through settling, uptake, and filtration while providing a means for erosion and flood control. The wetlands are designed to temporarily store runoff in shallow pools that provide suitable conditions for growth of wetland plants. Constructed stormwater wetlands can also be used to reduce peak runoff rates if designed as a multi-function, multi-stage facility and owing to the vegetation, can provide wildlife habitat and aesthetic features to the development.

The wetlands consist of three zones: the permanent pool, marsh, and semi-wet zones. Depending on the presence and relative storage volume of the zones, these systems can be classified as pond wetland, marsh wetland, or extended detention wetland. Pond wetlands are more appropriate when higher pollutant removal efficiencies are required. They have also been demonstrated to be the most reliable in terms of overall performance compared to the other types. Detailed information for designing constructed stormwater wetlands is provided in Chapter 9.2 of the *New Jersey Stormwater Best Management Practices Manual*. Some of the critical design criteria are discussed below.

The total volume of the three zones must equal the design runoff volume. An exception can be made for systems designed as extended detention wetlands. The detention time requirements in the semi-wet zone of an extended detention wetland (above the normal standing water level) are identical to those for an extended detention basin. The requirements state that the detention time must be long enough such that a minimum of 10 percent of the runoff volume generated by the stormwater quality design storm remains in the basin 24 hours after the peak basin water surface and maximum runoff storage volume is achieved.

Constructed stormwater wetlands are appropriate when sufficient drainage area requirements, dry weather base flow, and soil permeability requirements are met. Depending on the type of constructed wetland, the minimum drainage area to a constructed stormwater wetland ranges from 10 acres i.e. 2 football fields, for extended detention, to 25 acres i.e. 5 football fields for pond/marsh wetlands. The reliability of pollutant removal tends to increase as the stormwater wetland to watershed ratio increases. Dry weather base flows are an important criteria for marsh wetlands where it is necessary to support emergent plants and minimize mosquito breeding. Since the marsh area is quite large in this type of wetland, the drainage area requirements are greater. The greater marsh area necessitates greater rates of normal inflow to generate the required flow velocities and volume changeover rates. Thus, the design engineer must conduct a water budget which demonstrates that there will be a continuous supply of water to sustain the constructed stormwater wetland. It must also be demonstrated that the dry periods will not exceed two months since periods of a longer duration have been shown to be detrimental to the plant community richness. The location of the bedrock relative to the surface is an important criteria for determining the appropriateness of constructed wetlands. The high excavation costs in cases where bedrock in close to the surface may make these systems infeasible. Due to the critical function served by the permanent pool that must be maintained in constructed stormwater wetlands, the soil at the wetland site must be sufficiently impermeable to prevent excessive seepage, otherwise construction of an impermeable liner or other soil modifications will be necessary. This stormwater management measure is best suited for medium-fine texture soils (such as loams and silt loams) as they are ideal for establishing vegetation, surface water retention, groundwater recharge, and capture of pollutants. Constructed stormwater wetlands are also constrained by available land area requirements due to the minimum setback requirements from the following structures:

- Septic System Leach Field – 50 ft. Distance
- Septic System Tank – 25 ft. Distance
- Property Line – 10 ft. Distance
- Private Well – 50 ft. Distance

4.3.3 Dry Wells

Dry wells may either be structural chambers or excavated pits filled with aggregate that are designed to serve as subsurface storage facilities receiving and temporarily storing stormwater runoff from roofs of structures. The stored runoff is held until it infiltrates into the surrounding soils.

The primary purpose of a dry well is to reduce the volume of stormwater runoff caused by roofs of buildings (which is a major component of the overall increased runoff volume from development sites) by providing storage capacity and promoting infiltration. Thus, it greatly facilitates groundwater recharge and can be used to meet the groundwater recharge requirements of the NJDEP Stormwater Management Rules. Dry wells are ideally suited for reducing the amount of stormwater quality design storm runoff volume that must be treated by other downstream stormwater management facilities, thereby indirectly enhancing water quality. Detailed information for designing dry wells is provided in Chapter 9.3 of the *New Jersey Stormwater Best Management Practices Manual*. A detailed discussion relating to the use of this measure to meet the groundwater recharge requirements of the NJDEP Stormwater Management rules is presented in Chapter 6 of the *New Jersey Stormwater Best Management Practices Manual*. Some of the critical design criteria are discussed below.

Dry wells must be designed with enough hydraulic capacity to treat the total runoff volume generated by the dry well's maximum design storm. This in turn is determined by the dry well's proposed use, whether it is intended to handle a groundwater recharge storm or a stormwater quality design storm. The design should ensure that the entire runoff volume from the maximum design storm will be drained within 72 hours. The bottom of a dry well must be at least 2 feet above the seasonal high water table or bedrock and be as level as possible to uniformly distribute runoff infiltration over the subgrade soils. Furthermore, construction of a dry well must be conducted without compacting the subgrade soils. This must achieved by equipment placed outside the dry well whenever possible.

The applicability of dry wells as a stormwater management measure is influenced by a variety of factors. Dry wells cannot be used to directly comply with the suspended solids and nutrient removal requirements mandated by the NJDEP Stormwater Management Rules under N.J.A.C. 7:8 as they are primarily designed for handling roof runoff, which has a relatively low level of expected pollutants. Consequently, dry wells are inappropriate for use in the following areas where high pollutant or sediment loading is anticipated as this entails the potential for groundwater contamination:

- Industrial and Commercial areas with solvent/petroleum related activity
- Areas with a probability of presence of hazardous/toxic materials
- Areas with high risks of toxic material spills (eg. gas stations and vehicle maintenance facilities)
- Areas where stormwater runoff is exposed to industrial materials or machinery that could be a source of pollutants.

Dry wells must not be used where their installation would create a significant risk for basement seepage or flooding, cause surficial flooding of groundwater, or interfere with the operation of subsurface sewage disposal systems and other subsurface structures.

Stemming from the fact that dry wells rely entirely upon infiltration, their use is applicable only when subgrade soils conform to the required permeability rates presented below:

Table 4-1
Design Permeability Rates Required for Dry Wells and Infiltration Basins

Maximum Design Storm	Minimum Design Permeability Rate (inches/hour)
Groundwater Recharge	0.2
Stormwater Quality	0.5

Dry wells are recommended only for storms smaller than or equal to stormwater quality design storm. Approval for the use of dry wells for larger storm events is contingent upon review of and the criteria for design, construction, and maintenance for such systems by all applicable reviewing agencies. If the dry well is used for storms greater than the Groundwater Recharge Storm, then this management measure can only be constructed in areas with Hydrologic Soil Group A and B Soils.

Group A soils are sand, loamy sand, or sandy loam soils which have low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sand or gravel and have a high rate of water transmission (greater than 0.30 in/hr).

Group B soils are silt loam or loam soils have moderate infiltration rates when thoroughly wetted and consist chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission (0.15-0.30 in/hr).

Soil with the more impermeable clays should be avoided for use with this BMP.

Finally, drainage area requirements stipulate that the maximum drainage area to a dry well must be 1 acre.

4.3.4 Extended Detention Basins

Extended detention basins are designed for temporary storage of runoff. They are basins constructed through filling and/or excavation which detains runoff inflows and provides a conducive environment for settlement of pollutants before being conveyed downstream through an outlet structure. These systems are usually designed as multi-staged facilities wherein the higher stages of the basin attenuate peak rates of runoff from large storms, thereby providing flood and erosion control, while the lower stages store runoff from stormwater quality design storms for extended time periods to enhance pollutant removal through sedimentation.

This stormwater management measure is used for both stormwater quality and quantity management. The TSS removal that can be achieved through this measure is strongly dependent on the duration of detention time provided in the basin. They are suited for use at residential, commercial, and industrial development sites where significant increases in runoff from development is expected. Detailed information for designing Extended Detention Basins is provided in Chapter 9.4 of the *New Jersey Stormwater Best Management Practices Manual*. Some of the critical design criteria are discussed below.

Extended detention basins should be designed to treat the runoff volume generated by the water quality design storm (as calculated from methods described in Chapter 5 of the *New Jersey Stormwater Best Management Practices Manual*). The detention time in extended detention basins must long enough such that a minimum of 10 percent of the runoff volume generated by the stormwater quality design storm remains in the basin 24 hours after the peak basin water surface and maximum runoff storage volume is achieved. Any stormwater management measure classified as a dam under the NJDEP Dam Safety Standards stipulated by N.J.A.C. 7:20 must also meet the overflow requirements of these standards. Owing to sediment removal and its consequent accumulation over the course of operation of these basins, a loss of detention time volume must be accounted for in the design. This could be achieved by increasing the initial maximum storage volume for compensation of the inevitable loss later. To increase the degree of sedimentation, narrow basin configurations with length to width ratios from 2:1 to 3:1 should be designed. The designer must avoid reducing surface area of the basin since shallow basins with larger surface area will provide better pollutant removal efficiencies than smaller, deeper basins.

The depth to the seasonal high water table (SHWT) can be a limiting condition since interception of groundwater by the basin can result in a loss of storage volume, mosquito breeding, and difficulty maintaining the basin bottom. Extended detention basins are appropriate only when the SHWT is at least one foot below the lowest elevation in the basin. Soil conditions on the site should be such that it is neither relatively impermeable (USDA Hydrologic Soil Group “D”), leading to problems associated with standing water, nor very permeable (Group “A”) sue to excessive seepage into groundwater and the ramifications of possible contamination. Furthermore, close proximity to bedrock could increase excavation costs associated with such systems, making them infeasible. Finally, in Karst landscapes, other alternatives to detention basins should be examined.

4.3.5 Infiltration Basins

Infiltration basins are facilities constructed with highly permeable soils and no structural outlet to discharge runoff in order to promote infiltration to the surrounding soils. They provide temporary storage of the stormwater runoff from a stormwater quality design storm though they can be combined with an extended detention basin to provide additional storage volume for larger storms thereby accomplishing stormwater quantity management as well. This stormwater management measure relies upon the infiltration of runoff though underlying soil as well as biological and chemical activity within the soil to achieve pollutant removal.

Infiltration basins are primarily used on development sites that must achieve pollutant removal as well as reduce peak rate and total runoff volume. They may also be used to meet the groundwater recharge requirements of the NJDEP Stormwater Management Rule. A detailed discussion relating to the use of this measure to meet the above mentioned rule is presented in Chapter 6 of the *New Jersey Stormwater Best Management Practices Manual*. Appropriate soil and drainage area conditions can permit the combination of an infiltration basin with a detention basin to provide runoff quantity control in the detention portion of the basin. This would involve raising the invert of the lowest stormwater quantity control outlet above the maximum stormwater quality design storm water surface. Detailed information for designing Infiltration Basins is provided in Chapter 9.5 of the *New Jersey Stormwater Best Management Practices Manual*. The most critical design criteria for these systems are identical to those for dry wells described earlier. In addition to those requirements, infiltration basins classified as dams under the NJDEP Dam Safety Standards stipulated by N.J.A.C. 7:20 must also meet the overflow requirements of these standards.

Similar to the limitations of other BMPs that rely on infiltration, such as Dry wells, infiltration basins are inappropriate for use in areas where high pollutant or sediment loading is anticipated as this entails the potential for groundwater contamination. Chapter 9.5 of *the New Jersey Stormwater Best Management Practices Manual* mentions specific land uses which preclude dry wells as an alternative. These are briefly summarized below:

- Industrial and commercial areas with solvent/petroleum related activity
- Areas with a probability of presence of hazardous/toxic materials
- Areas with high risks of toxic material spills (eg. gas stations and vehicle maintenance facilities)
- Areas where stormwater runoff is exposed to industrial materials or machinery that could be a source of pollutants.

Infiltration basins must not be used where their installation would create a significant risk for basement seepage or flooding, cause surficial flooding of groundwater, or interfere with the operation of subsurface sewage disposal systems and other subsurface structures.

As stated in Section 4.3.3, stemming from the fact that this measure relies largely upon infiltration, its use is applicable only when subgrade soils conform to the required permeability rates presented Table 4.1.

If the basins are used for storms greater than the Groundwater Recharge Storm, then this management measure can only be constructed in areas with Hydrologic Soil Group A and B Soils: sands, loamy sands, sandy loams, silt loams, or loam.

The feasibility of using infiltration basins as a stormwater control measure for attenuation of water quality problems is considerably influenced by the quality of runoff entering the basin. This makes it imperative to determine the pollutants expected to be present in the runoff and their possible impacts on groundwater quality. This analysis must be complimented by ascertaining whether the existing soil column below the infiltration basin are capable of attenuating the pollutants or let them pass through to the groundwater table. It has been shown that certain soils are only partially capable of treating bacteria and soluble forms of nitrogen, phosphorous, and other pollutants such as pesticides and road salts. In general, it is observed that soils that exhibit the highest permeability, thereby making them optimal candidates for infiltration basin design, also have the least ability to treat problematic pollutants. In these cases, the developers design engineer must consider pretreatment of soluble pollutants prior to entry into the infiltration basin. These pretreatment measures could include vegetative filters, bioretention systems (in which case the standard underdrain can be replaced by the infiltration basin), and certain sand filters. If enhancement of the treatment systems is not possible on the site, the native soil below the proposed basin should be augmented or replaced by soils with greater pollutant removal rates if there is any indication that groundwater quality might be compromised.

Other constraints that may limit the applicability of infiltration basins are proximity to geologic and ecologically sensitive areas in the vicinity of the site. Infiltrations basins should be avoided in areas containing foundations (to avoid seepage problems), near drinking water supply wells, and where surrounding slopes are greater than 10 percent. Finally, infiltration basins must be avoided if a minimum distance of 100 feet from adjacent drinking water supply wells cannot be ensured.

4.3.6 Manufactured Treatment Devices

Manufactured treatment devices (MTDs) are pre-fabricated stormwater treatment structures used to remove pollutants from stormwater runoff. These devices use one or more of a variety of treatment methods, including settling, filtration, and vegetative components. Manufactured treatment devices can only be used to treat stormwater if their pollutant removal rates are certified by the NJDEP Division of Science, Research and Technology. For this reason, the City is advising the developers that they will consider such devices as a water quality control measure but the developer/owner is responsible for ensuring that this water quality goal is met. MTDs are best suited to treat runoff from small areas with a high percentage of impervious cover (such as small parking lots and gas stations) where the stormwater runoff contains a large amount of sediment and hydrocarbons.

4.3.6.1 Vortechnics

The Vortechs © system manufactured by Vortechnics is one example of a manufactured treatment device that has been used in New Jersey. Stormwater enters a grit chamber where vortex separation removes large particles. From the grit chamber, the stormwater passes under a baffle wall, behind which floatables are trapped. The water is removed from the system as it passes through an orifice or weir in a flow control wall (depending on the water level in the system), and into the outflow. Vortechs © systems have been used in Harding Township, NJ and at the Continental Airport Terminal at Newark Liberty International Airport. Information on these two projects is presented in Appendix E.

4.3.6.2 CDS

The Inline Unit manufactured by CDS Technologies is another example of a manufactured treatment system. Like the Vortechs © system, the Inline Unit relies on vortexing to remove suspended solids. Solids enter the separation chamber where vortexing causes them to settle in the sump, where they remain until the unit is cleaned. The treated stormwater flows through a separation screen (which traps floatables) and under an oil baffle before it reenters the storm drain. CDS Technologies reports that the Inline Unit removes 80% of total suspended solids and 100% of floatables.

4.3.7 Pervious Paving Systems

Pervious paving systems are utilized to reduce runoff from areas that would ordinarily be paved with conventional pavement materials. There are three types of pervious paving systems: porous paving, use of permeable pavers with a storage bed, and use of permeable pavers without a storage bed. Porous paving consists of a layer of porous asphalt over a storage bed of broken stone. The use of permeable pavers is similar to that of porous pavement, where impervious concrete blocks are laid out in a pattern that allows water to infiltrate through spaces between pavers and into the storage bed. The use of either porous paving or permeable pavers results in a reduction in the volume of stormwater runoff and up to an 80% reduction in total suspended solids (TSS) content. These two systems allow runoff to infiltrate the surface and be stored in a storage layer until the water can infiltrate the subgrade soils. The third system, use of permeable pavers without a storage bed, functions similarly to the others, but with a much shorter retention time due to lack of a storage bed. This shorter retention time does not allow for significant TSS removal.

Pervious paving systems are not appropriate for use in areas where high pollutant or sediment loading is expected, as infiltration of these waters can lead to groundwater contamination. Standards for Pervious Paving Systems (Chapter 9.7 of the *New Jersey Stormwater Best Management Practices Manual*) contains a list of example areas in which pervious paving systems are not to be used. Pervious paving systems should not be used in areas where they may increase the risk of basement seepage or flooding, cause groundwater flooding, or interfere with subsurface structures such as septic systems.

Because porous pavement and permeable pavers with storage beds require permeable soils beneath the storage bed to properly function, they can only be used in areas with Hydrologic Soil Group A and B soils. Part 618.35(b) of the National Soil Survey Handbook defines Group A soils as those with low runoff potential. Group A soils have high infiltration rates even when wet, and are generally sands and gravels. Group B soils have moderate infiltration rates and are moderately fine to moderately coarse in texture.

Porous paving should not be used in areas that are sandy in adverse weather, as the sand will clog the surface pores. Care should also be taken when using pervious pavement in areas where salt is applied, as it may infiltrate the water table. The use of pervious paving systems should be limited to areas such as parking lots, sidewalks, emergency access lanes, single family residence driveways, and other areas not subject to high traffic or heavy vehicles. Porous paving systems should be vacuum-swept and hosed down a minimum of four times a year to remove particulate materials that may have become lodged in the surface. Permeable pavers should be maintained according to manufacturer's recommendations.

4.3.8 Sand Filters

A sand filter uses the processes of sedimentation, filtration and absorption to remove hydrocarbons, metals, floatables, bacteria and sediment from stormwater. Sand filters can be surface, subsurface or perimeter sand filters. All three types of sand filters typically consist of four sections: a forebay or sedimentation basin, a filtration basin, an underdrain and an overflow. Water enters the sedimentation basin, where floatables and heavy sediments leave the water column before entering the filtration basin. In the filtration basin, the stormwater runoff travels through a sand bed. The filtered runoff leaves the filter through an underdrain system and enters either a stormwater drainage system or surface waters. The overflow allows stormwater in excess of the volume of the pore space in the sand bed to leave the system without traveling through the sand bed or underdrain and immediately be discharged.

The sedimentation basin should be sized to accommodate one-half the design storm runoff volume. The sand bed should be sized to hold one-half of the design storm runoff volume. The sand bed's volume includes the sand, pore spaces in the sand, and the water above the sand bed surface that has not yet entered the bed itself. Sample schematics and general design criteria for the three types of sand filters are available in Chapter 9.9 of the *New Jersey Stormwater Management Practices Manual*, Standards for Sand Filters. Additional design criteria are available in 'Standards for Sand Filters', Chapter 40 of *Standards for Soil Erosion and Sediment Control in New Jersey*.

Sand filters are not recommended for use in areas where stormwater runoff contains large amounts of coarse sediment or organic material such as leaves. This sediment will quickly clog the filter and lead stormwater to bypass the filter bed and pass immediately to the overflow without treatment. If a sand filter must be used to treat this type of water, it should be paired with additional stormwater treatment technology that can act as pretreatment. Filter media must be periodically replaced to avoid clogging. Use of impermeable basin or chamber bottoms can prevent contaminated runoff from coming into contact with groundwater. Sand filters should not be used in areas where high concentrations of toxic pollutants are expected in the runoff.

Sand filters are effective at removing contaminants from large amounts of water with low concentrations of coarse particulates. They are intended to be used for water quality enhancement rather than increasing groundwater recharge or decreasing stormwater runoff volume. Sand filters are best suited to treat runoff from small impervious areas with a low sediment load, such as rooftops, parking lots, and urban areas with drainage areas up to five acres[1].

4.3.9 Vegetative Filters

Vegetative filters are areas designed to remove suspended solids and pollutants from stormwater runoff as it flows through a vegetated area. The total suspended solids removal efficiency of a vegetative strip depends on its length and the type of plants used in the strip. Information on calculating TSS removal efficiency is available in Chapter 9.10 of the *New Jersey Stormwater Best Management Practices Manual*, Standards for Vegetative Filters. Vegetative strips can treat drainage from pervious surfaces less than 150 feet in length and impervious surfaces less than 100 feet in length, and must be a minimum of 20 feet in length in both cases. Plants used in vegetative strips can range from native grasses to forest floor vegetation, but it must be dense and healthy. More information on plant selection for vegetative filters can be found in Chapter 7 of the *New Jersey Stormwater Best Management Practices Manual*, Landscaping. Additional design criteria are available in 'Standards for Vegetative Filter Strips', Chapter 41 of *Standards for Soil Erosion and Sediment Control in New Jersey*.

Vegetative filters are only effective where runoff can enter and leave the strip as a sheet of flow. To achieve this goal, vegetative filters must be mildly sloped with a uniform grade. Slopes of less than five percent are the most efficient, as steeper slopes require a longer treatment strip. The drainage area must also be uniformly graded to allow the flow to enter the strip as a sheet. Soil type plays a role in determining the slope of a vegetative strip. This information can be found in County Soil Surveys or through soil investigations.

The use of a vegetative strip as a stormwater treatment method works best in areas such as parking and residential lots. Vegetation must be trimmed regularly and inspected for density and diversity at least twice annually.

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[1] *Standards for Sediment Control in New Jersey*, July 1999.

4.3.10 Wet Ponds

Wet ponds, also known as retention basins, are intended to provide both permanent and temporary stormwater runoff storage. A wet pond treats stormwater through the processes of sedimentation and bacterial pollutant removal that occur during long-term storage of stormwater runoff. They are designed to hold a predetermined volume of stormwater for enough time to allow sufficient sedimentation and bacterial pollutant removal to occur to meet the 80 percent TSS removal goal. Techniques for calculating runoff volume are described in Chapter 5 of the *New Jersey Stormwater Best Management Practices Manual*: Computing Stormwater Runoff Rates and Volumes.

Wet ponds require sufficient dry weather or base flow to maintain a water depth of three to six feet in the permanent pool. Deeper pools allow thermal stratification and shallower pools allow algal blooms (much like those in swamps) and resuspension of sediment. The base or dry weather flow not only maintains the water level in the wet pond, but controls mosquito breeding and prevents stagnation. The incorporation of a fountain can also help control these problems. The use of aquatic vegetation in the pond's landscaping not only enhances the aesthetic value of the pond, but can limit algae growth and aid in regulation of the pond's water temperature.

Ponds must be designed with a length to width ratio of at least 1.5 to 1 to allow stormwater sufficient time for sedimentation and bacterial pollutant removal to occur. Soils in the site must be sufficiently impermeable to prevent seepage. If the soils are too permeable, an impermeable liner may be used. Wet ponds need a minimum drainage area of 20 acres and a permanent pool surface area of at least 0.25 acres. The drainage area should have a slope of less than 15 percent. Additional design criteria are available in 'Standards for Wet Ponds', Chapter 42 of *Standards for Soil Erosion and Sediment Control in New Jersey*.

Due to space requirements, wet ponds are not a good choice in urban areas. Wet Ponds should not be sited in natural ponds or wetlands. They are a good option for residential and commercial areas where the nutrient load in the stormwater runoff is expected to be high.

4.4 COMPARISON BMPS FOR VARIOUS LAND USES AND GOALS

Table 4-2 presents information concerning the structural and nonstructural BMPs discussed earlier in this chapter. The purpose of this table is to aid future developers in the process of selecting a BMP appropriate for use at their particular site.

In addition to presenting BMP applicability, Table 4-2 also rates the ability of each BMP to meet the stormwater management goals presented in N.J.A.C. 7.8-5.4 and 5.5, which are discussed in Section 3.2 of this report. The table also ranks BMPs by cost, design complexity and construction complexity relative to the other BMPs. This table does not take all possible BMPs into account, rather those discussed in this chapter. There are many types of BMPS which have not been discussed, as this municipal stormwater management plan is intended to act as a starting point rather than an absolute guide. Information regarding additional structural and low-impact BMPs is available from the EPA's website at http://www.epa.gov/owm/mtb/mtbfact.htm under the 'Storm Water' subheading.

4.5 BMPS IN SERIES

The total suspended solids (TSS) removal rates for individual BMPs and these rates are presented in Table 4-2. These are the official NJDEP-adopted removal rates stated in Table 4-1 of the *New Jersey Stormwater Best Management Practices Manual*. The Stormwater Management Rule requirement of 80 percent TSS reduction in the post construction runoff from a land development site that increases impervious surface by 0.25 acres or more can, however, also be met by arranging multiple BMPs in series if it is deemed that a single BMP by itself would be inadequate. The total removal rate of such a BMP treatment train is computed by applying the removal rate of the second BMP applied to the fraction of the TSS loading remaining after the runoff has been processed by the first BMP. The equation to be used for calculating the total TSS removal rate for two BMPs in series is as follows:

Table 4-2

BMPs Applicable to the Various Land Uses, Stormwater Management Goals and other Factors

BMPs and Land Uses						A Rating of the BMPs Ability of Meeting the Five Stormwater Management Goals					Other Restriction and Factors				
Applicable Non-Structural Category BMPs (in Column) for the Landuses and other BMP factors (in Row to Left)	*High/Medium Residential*	*Low/Rural Residential*	*Commercial*	*Industrial*	*Mixed Urban*	*Effective BMP for Erosion and Sedimentation Control*	*Groundwater Recharge Enhancement*	*Runoff Quantity Reduction*	*Runoff Flow Peak Reduction*	*Runoff Water Quality Improvement*	*Cost Relative to other BMP in its Category*	*Minimum Drainage Area Requirements*	*Design complexity*	*Construction Complexity*	*Structural BMP TSS Removal Rate*
Buffers	Yes	Yes	Yes	Yes	Yes	Medium	Medium	High	Medium	Medium	Low	NA	Low	Low	NA
Cluster Development	Yes	Yes	Yes	Yes	Yes	Medium	High	High	Medium	Medium	Low	25% OF AREA	Medium	Medium	NA
Vegetated Swale Curbs and Gutters	Yes	Yes	Yes	Yes	Yes	Low	Medium	Medium	Low	Low	Low	NA	Low	Low	NA
Use of Natural Swales for Drainage	Yes	No	Yes	Yes	Yes	Medium	Medium	Medium		Low	Low	NA	Medium	Medium	NA
Permeable Pavement Driveways and Accessways	Yes	Yes	Yes	Yes	Yes	Low	Medium	Medium	Medium	Low	Low	NA	Medium	Medium	NA
Preservation of Natural Features	Yes	Yes	Yes	Yes	Yes	High	High	High	High	High	Low	NA	Low	Low	NA
Vegetation on Roofs	Yes	No	Yes	Yes	Yes		Medium	Medium	Medium	Medium	Low	NA	Low	Low	NA
Restrictions on Nonconforming Uses, Structures or Lots	Yes	Yes	Yes	Yes	Yes		Low				Low	NA	Medium	Medium	NA
Off-site and Off-tract Improvements	Yes	Yes	Yes	Yes	Yes		Low				Low	NA	Medium	Medium	NA
Off-street Parking and Loading	No	No	Yes	Yes	Yes		Low				Low	NA	Medium	Medium	NA
Shade Trees	Yes	Yes	Yes	Yes	Yes	High	Medium	High	Medium	Medium	Low	NA	Low	Low	NA
Use of Narrow Streets	Yes	Yes	Yes	Yes	Yes	Low	Medium	Medium	Medium	Low	Low	NA	Medium	Medium	NA
Applicable Structural Category BMPs (in Column) for the Landuses and other BMP factors (in Row to Left)	*High/Medium Residential*	*Low/Rural Residential*	*Commercial*	*Industrial*	*Mixed Urban*	*Effective BMP for Erosion and Sedimentation Control*	*Groundwater Recharge Enhancement*	*Runoff Quantity Reduction*	*Runoff Flow Peak Reduction*	*Runoff Water Quality Improvement*	*Cost Relative to other BMP in its Category*	*Minimum Drainage area requirements*	*Design complexity*	*Construction Complexity*	*Structural BMP TSS Removal Rate*
Bioretention System	Yes	Yes	Yes	Yes	Yes	Medium	Medium	Medium	Medium	Medium	Medium	NA	High	Medium	90%
Constructed Wetlands	No	No	Yes	Yes	Yes	High	High	High	High	High	High	10 TO 25 ACRES	High	High	90%
Dry Wells	Yes	Yes	Yes	Yes	Yes	Low	Medium	Low	Low	Low	Medium	NA	High	Medium	N/A
Extended Detention Basins	Yes	No	Yes	Yes	Yes	High	Medium	Low	High	Medium	Medium	10 TO 25 ACRES	High	High	40-60%
Infiltration Basins	Yes	Yes	Yes	Yes	Yes	Low	Medium	Low	Medium	Low	Low	NA	High	Medium	80%
Manufactured Treatment Devices	Yes	No	Yes	Yes	Yes	High	Low	Low	Low	High	Medium	NA	High	Medium	Device specific
Pervious Paving Systems	Yes	Yes	No	No	No	Low	Medium	Medium	Medium	Low	Medium	NA	High	Medium	0 without storage bed, 80% with storage bed
Sand Filters	Yes	No	Yes	Yes	Yes	Low	Low	Low	Low	High	High	NA	High	High	80%
Vegetative Filters	Yes	Yes	Yes	Yes	Yes	Medium	Medium	Medium	Low	Medium	Low	NA	High	Medium	60-80%, depending on plant type
Wet Ponds	Yes	Yes	Yes	Yes	Yes	High	High	High	High	High	High	10 TO 25 ACRES	High	High	50-90%

$$R = A + B - [(A \times B)/100]$$

where:

R = Total TSS Removal Rate

A = TSS removal rate of Upstream BMP

B = TSS removal rate of Downstream BMP

General guidelines for selecting the order of the individual BMPs in a series are presented in Chapter 4 of the New Jersey Stormwater Best Management Practices Manual. These are summarized below:

- BMPs should ideally be arranged upstream to downstream in ascending order of TSS and Nutrient removal rate.
- BMPs should be arranged from upstream to downstream so that the BMP with the greater ease of sediment removal is placed upstream.
- BMPs should be preliminarily arranged in accordance with their relative TSS removal rates. The arrangement should be subsequently refined by considering relative nutrient removal rates followed by considerations of ease of sediment removal.

5.0 PLAN CONSISTENCY

5.1 REGIONAL COMPLIANCE

As of the date on which this plan was submitted, Jersey City is not within a Regional Stormwater Management Planning Area. This plan, therefore, does not need to be consistent with any regional stormwater management plans (RSWMPs). If any RSWMPs are developed in the future, this Municipal Stormwater Management Plan will be updated in order to remain consistent. Hudson County created a new master plan in 2002, and this Municipal Stormwater Management Plan is consistent with the master plan. This plan is also consistent with the goals of presented in the January 2004 Meadowlands Commission Master Plan, specifically preserving and enhancing wetlands and natural resources and working towards long term sustainability.

This plan is consistent with the Residential Site Improvement Standards (RSIS) outlined in N.J.A.C. 5.21. The City will use the most current RSIS in the stormwater management review process for future residential developments. This municipal storm water management plan will be updated in order to remain consistent with the RSIS.

5.2 TOTAL MAXIMUM DAILY LOAD: PHOSPHOROUS AND NICKEL

A total maximum daily load (TMDL) requirement for phosphorous was approved for Lincoln Park Lakes in June 2003. The phosphorous loading capacity for Lincoln Park Lakes was determined to be 33 kg Total Phosphorous/year, including an 11 kg margin of safety. The only phosphorous sources to the lakes are air deposition and stormwater runoff, with stormwater runoff constituting 21.5 of the 22 kilograms of total phosphorous load entering the lake under the approved TMDL. Developers in the Lincoln Park Lakes Lakeshed shall remove all phosphorous from their runoff to comply with the approved TMDL. This plan is in compliance with these TMDLs and will be updated should Jersey City institute additional ordinances or measures. This plan will also be updated upon the adoption of the TMDL as an amendment to the Northeast Water Quality Management

Plan. Detailed information on this TMDL including a lake shed map and land use distribution is available in Appendix J.

A TMDL requirement for nickel was adopted in December 1999. This TMDL set the load allocation of nickel that can be discharged into the Hackensack River at 4.98 lbs/day. The stormwater waste load allocation (WLA) is 0.81 lbs/day. It should also be noted that a phosphorous TMDL was approved in September 2003 for Lincoln Park Lakes. This plan is in compliance with these TMDLs and will be updated should Jersey City institute additional ordinances or measures to comply with the TMDLs. Please refer to Appendix J for more information on the nickel and phosphorous TMDLs.

A simple mathematical analysis supports the idea that new developments should not be permitted to discharge stormwater runoff containing nickel. As previously stated, the current stormwater waste load allocation (WLA) for nickel is 0.81 lbs Ni/day, or 295.85 lbs Ni/year. If this WLA is applied uniformly over the New Jersey portion of the Hackensack River Watershed, a fraction of the 295.85 lbs Ni/year should be allocated to Jersey City. Jersey City contains 3,595 acres of the 87,033-acre Hackensack River Watershed. Of these 3,595 acres, 2,265 acres (63%) are served by a CSO system and the remaining 1,330 acres are served by stormwater sewer systems. These 1,330 acres compose 1.5% of the total area of the New Jersey portion of the Hackensack River Watershed. Jersey City should be allocated 1.5%, or 4.5 lbs Ni/year, of the total 295.85 lbs Ni/year entering the Hackensack River. It should be noted that Watershed Management Area 5 is composed of the Hackensack River Watershed, the Hudson River Watershed, and the Pascack River Watershed (which is a tributary of the Hackensack River, and thus included in the Hackensack River Watershed for the purposes of this report).

The nickel concentrations calculated in the buildout analysis portion of this report are adjusted to account for fraction of the City's area served by CSOs. It can be estimated that Jersey City's stormwater currently contributes 36.0 lbs Ni/year to the Hackensack River. Using this figure and the allocated 4.5 lbs Ni/year, developers will be required to reduce the nickel present in stormwater runoff by 87.5%, leaving only a small amount of nickel in runoff treated using a best management practice. It should be noted that for the purposes of both the buildout and this analysis all types of land cover were assumed to contribute equally to the nickel content of stormwater runoff.

6.0 STORMWATER CONTROL AND MITIGATION PLANS FOR PROPOSED LAND DEVELOPMENT IN THE CITY

Each new development that occurs after April 1, 2006 will require the completion of an approved Stormwater Control Plan or a Stormwater Mitigation Plan for the site that is being developed. Stormwater Control Plans are the normal method that will be used to implement stormwater controls that are consistent with the requirements stated in this Municipal Stormwater Management Plan at the site being proposed for development. Stormwater Mitigation Plans are an alternative to the Stormwater Control Plan that is offered by the City when constrained, restricted, or other unusual circumstances prevent the developer/owner from implementing stormwater controls at the actual site development location. Mitigation will only be acceptable to the City if unusual circumstances prevent the developer from meeting the requirements of this Municipal Stormwater Management Plan at the site development, or if it can be demonstrated that implementing a stormwater mitigation will result in a greater environmental benefit to the waterbody.

6.1 STORMWATER CONTROL PLAN REQUIREMENTS

Under normal circumstances when stormwater controls can be provided at the site, the site developer will be required to obtain an approved Stormwater Control Plan (SCP) for any site development planned after April 1, 2006. The SCP is required to provide stormwater BMPs that meet the requirements in Chapter 3.0 and/or 4.0 of this Municipal Stormwater Management Plan at the site that is being developed unless unusual circumstances prohibit application of any of these BMPs at the site. In this case, the developer will be required to mitigate in accordance with Section 6.2.

The contents of a Stormwater Control Plan that can be approved by the City must contain the following:

- A completed checklist of the items listed below.
- A written letter of request describing the proposed development from the land owner or developer to the City Planning Department including the Site Address with corresponding Lot and Block number.

- An existing site plan at scale 1 inch = 50 feet shall be completed indicating all features, superstructures, substructures, utilities, waterbody boundaries, topography, and separate location map.

- A proposed development site plan shall be completed using the existing site plan as a base map and indicate all proposed contours and BMPs identifying how this site will be modified to meet the stormwater control requirements in this Municipal Stormwater Management Plan.

- An explanation of the type and number of stormwater BMPs and goals that will be implemented on the development site plan to comply the confirmed stormwater management goals must be furnished. The explanation must describe the size, design criteria, details, estimated pollutant removal rates, materials, and other characteristics of each BMP and how they will meet the goals and other requirements of this Municipal Stormwater Management Plan.

- A maintenance plan, as defined in N.J.A.C. 7:8-5.8, must be completed and submitted to the City upon installation of a stormwater BMP. The maintenance plan shall also include standard operating procedures shall be provided for each BMP. The OWNER is responsible for performing the standard operating procedure and maintenance.

- Calculations and/or hydrologic model simulations that demonstrate that all of the hydrologic peak flow control and treatment goals of this Municipal Stormwater Management Plan are met. Groundwater recharge is not a high priority stormwater management goal within the limits of Jersey City do to the absence of recharge locations.

- A schedule for completion of a Stormwater Mitigation Plan for Site Address with Lot and Block number along with the proposed time period for design and construction.

Upon submittal of the Stormwater Control Plan, the City will review the SCP and issue a notice within 3 weeks stating that the Plan is “Approved”, “Approved-as-Corrected”, needs revisions by noting “Revise and Resubmit” or “Unacceptable”. If the Plan is “Approved” or “Approved-as-Corrected” the developer may proceed with the development provided that all other City and State permits have been acquired as required by NJAC and that all of the minor corrections shown in the “Approved-as-Corrected” Plan are made. If the Plan is marked “Revise and Resubmit” then it has the potential to be approved and may be resubmitted once the revisions and modifications are made but the developer is not permitted to proceed with the development until it is

“Approved” or “Approved-as-Corrected”. “Unacceptable” Stormwater Control Plans will not be reviewed if resubmitted since they do not appear to present an acceptable plan to the City that will meet the Municipal Stormwater Control Plan.

6.2 STORMWATER MITIGATION PLAN REQUIREMENTS

In the event that the site developer cannot meet the requirements in Chapter 3.0 and/or 4.0 of the Stormwater Management Plan due to site constraints, insufficient area, or other justifiable reasons, the City will consider granting a variance on a case by case basis using Alternate Area Mitigation or other approved and regulatory agency accepted methods.

Mitigation will only be considered for approval by the City if the following requirements are met:

- A written letter of request for mitigation is formally submitted by the land owner or developer to the City Planning Department indicating Site Address with corresponding Lot and Block number.

- This request must state the reason(s) that justify why they cannot meet the storm water planning criteria on their specific site or why the proposed the proposed mitigation will be better for the environment.

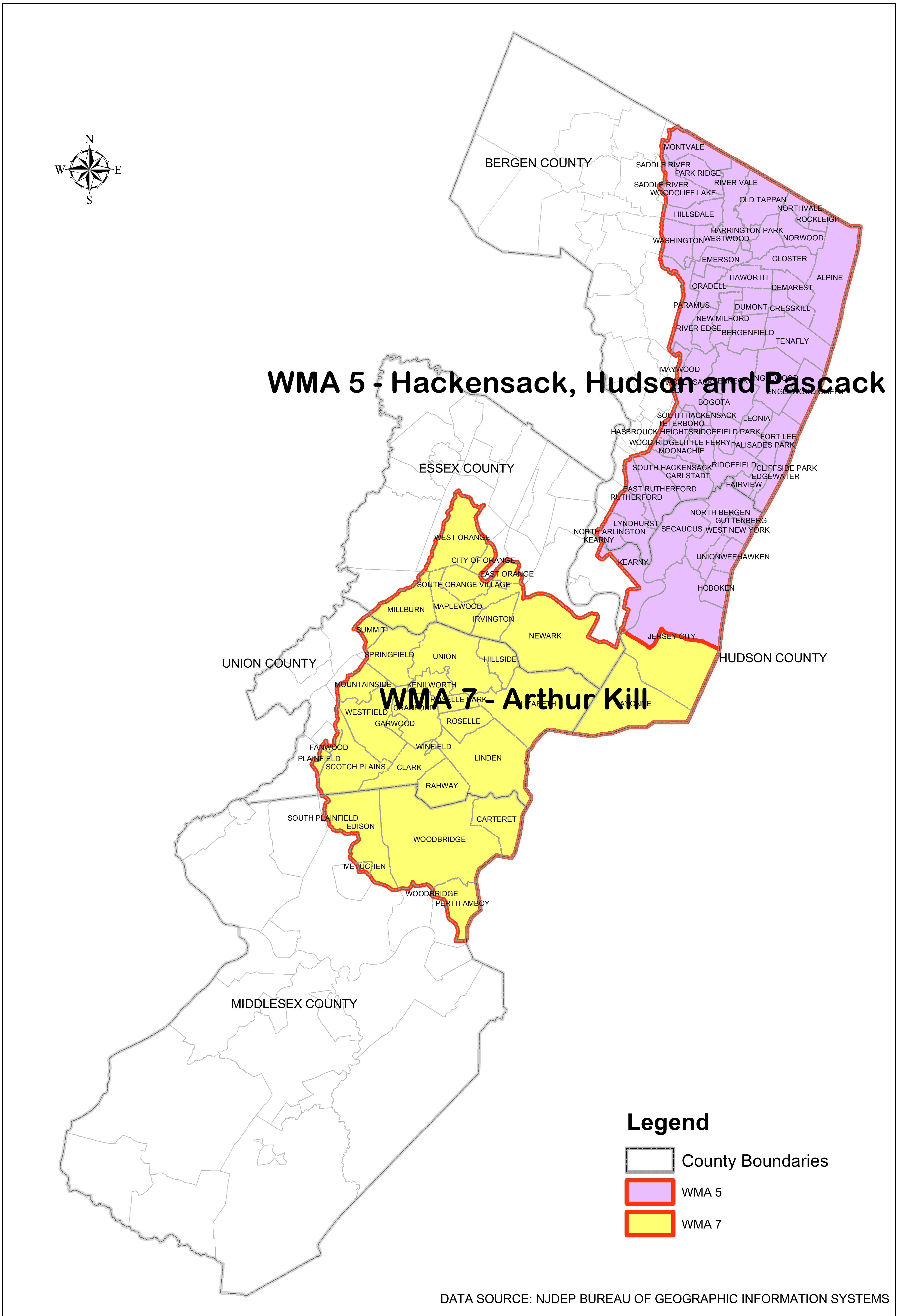
- The request must clearly identify who the land owner and developer is that is requesting the mitigation and the request must be signed by both entities.

- The request must include a schedule for completion of a Stormwater Mitigation Plan along with Site Address with Lot and Block number and proposed time period for design and construction.

- The proposed method of mitigation must be within the boundaries of Watershed Management Area 5 or 7 where the boundaries and municipalities are identified in Figure 6-1 and must address all sensitive receptors identified as by Jersey City Stormwater Control Plan Review staff.

- Site development locations in Jersey City proposing mitigation for stormwater controls must do so in which ever Watershed Management Area (WMA) the site to be developed is to be located. WMA 5 developments must mitigate in WMA5. WMA 7 developments must mitigate in WMA7.

- Mitigation shall be in conformance with the limitations of Section 6.2.4.



JERSEY CITY STORMWATER MANAGEMENT PLAN
JERSEY CITY, NEW JERSEY
WATERSHED MANAGEMENT AREAS 5 AND 7 MUNICIPALITIES

MALCOLM PIRNIE, INC.

FIGURE 6-1

JUNE 2005

- The mitigation plan shall include a Stormwater Control Plan for the area to be mitigated and a site plan of the site to be developed such that they can be used to compare area and stormwater calculation on each site.

- Mitigation must address all sensitive receptors as defined in the "Guidance for Development of a Mitigation Plan, February 2006". The primary sensitive receptors in Jersey City are, but are not limited to, the following

    - Restricted channels, streams, or sewer pipe areas as determined by the JCMUA.
    - Wetlands in the NJ Meadowlands region and other areas as identified by JCMUA staff.
    - Waterbodys with TMDLs , or Water quality or use impairment such as the the Hackensack River located to the north west of Jersey City and the Lincoln Park Lakes
    - Areas sensitive to street flooding or sewer surcharging (see Fig 2-2)

- All of the administrative requirements listed in the "Guidance for Development of a Mitigation Plan, February 2006" (See Appendix I)

Upon submittal of the request for mitigation, the City will review the request and issue a notice stating that the request to submit a mitigation plan is "Approved" or "Unacceptable". If approved, the developer has approval to submit to the City a full Stormwater Mitigation Plan as described in their request. The City approval process will use the same submittal review method as required for a Stormwater Control Plan submittal. All Mitigation Plans are still required to demonstrate compliance with the MSWMP by implementation of one or more of the stormwater controls described in Chapters 3.0 and, if needed, Chapter 4.0. The specific mitigation conditions are described in more detail in the following sections.

6.2.1 Alternate Area Mitigation

Alternate Area Mitigation is the only mitigation that is currently considered applicable by the regulatory agencies and the City at the present time. Alternate Area Mitigation involves implementation of a Stormwater Control Plan at an alternate City and County location other than the developed site. For example, certain city owned sections of the 150 foot buffer zone along the Hackensack River may be available for implementing stormwater BMPs which may be able to act as a substitute equivalent to counter the stormwater impacts from the site being developed where stormwater BMPs cannot be implemented.

If a request for this form of mitigation is approved by the City, the developer would be required to complete a Stormwater Mitigation Plan which would include the similar submittal items as described in the Stormwater Control Plan describe above but with the following modifications and additional requirements:

- Calculations to quantify the difference in the stormwater impacts between the pre-existing site conditions and the developed site conditions of the proposed development.

- A site plan of the existing conditions at the proposed mitigation site and with the proposed stormwater BMPs.

- Calculations that show that the goals of the MSWMP can be met at the mitigation site that will offset the impacts at the developed site.

If the selected BMP is a Constructed Wetland for this mitigation plan, the area determined necessary to mitigate the stormwater impacts from the developed site must be 2 to 1 or double due to the risk of low survival associated with Constructed Wetlands. Mitigation of any kind cannot be allowed to encroach or impose other adverse impacts or threats on existing State or Federal Wetlands, Waters, Inter-tidal areas, or other sensitive environmental areas. See Figure 2-4 for known buffer zones and/or Wetland boundaries.

6.2.2 Effluent Pollutant Trading

The U.S.E.P.A. introduced the concept of Effluent Trading; however, this concept is a relatively new and developing area within EPA regulations. The City does not consider it as a possible option at the present time because the concept is relatively new and no formal policy is known to exist that addresses how this mitigation procedure should be implemented. Therefore, the City would consider effluent trading option only if letters which promote this concept are obtained from the land owner, the County, and either the U.S.E.P.A or NJDEP and the US Corps of

Engineers if the City believes that they have jurisdiction in regard to the proposed effluent trading action.

6.2.3 Mitigation Bank Contributions

This method of mitigation requires the purchase of buffer strips, wetlands or intertidal mitigation credits from known mitigation banks that have been accepted in the past for this purpose by the U.S. Army Corps of Engineers or the NJDEP Land Use Regulation Program (LURP). While it is accepted by most regulatory agencies, there are currently no known sources for Mitigation Banks within WMA 5 and 7, Until these types of banks become available they will not be considered for Jersey City stormwater mitigation and control.

6.2.4. Mitigation limitations:

- Effluent Pollutant Trading or any other mitigation shall be prohibited for developments determined to influence the Phosphorus levels into the Lincoln Park Lakes.

- Effluent Pollutant Trading and other mitigation for developments creating stormwater discharges to the Hackensack River, particularly regarding nickel, shall be limited to trading only on sites located with the boundaries of the Hackensack River that have the same Nickel TMDL. A developer developing a site that discharges to the Hackensack River will not be permitted to address the stormwater requirements by use of Effluent Pollutant Trading or other mitigation unless approval letters are provided by the County and NJDEP or USEPA and US Corps of Engineers (Corps), if deemed under the Corps jurisdiction.

- All Effluent Pollutant Trading and other mitigation shall address appropriate level of stormwater controls for all sensitive receptors and pollutants of concern being discharged to the waterbodies around Jersey City as determined by the 305(b) report and 303(d) lists as issued by NJDEP and USEPA.

- The stormwater water hydrologic controls at the mitigation site need to meet the hydrologic criteria requirements at the developed site and may not be substituted with water quality controls that do not meet the hydrologic criteria. Similarly, the stormwater quality controls at the mitigation site need to meet the water quality criteria at the developed site and may not be substituted with hydrologic controls that do not meet the water quality criteria.

7.0 MUNICIPAL STORMWATER MANAGEMENT PLAN HISTORY AND SCHEDULED UPDATES

The City's Municipal Stormwater Management Plan will be updated as required but at least every 6 years. During the initial stages of the MSWMP development the review, modification, and revision process is scheduled as follows:

- The first submittal of the Jersey City Municipal Storm Water Management Plan and SPPP Forms to Hudson County Division of Planning and the NJDEP were made April 1, 2005. Minor editorial changes were made afterward and it was reissued in June 2005.
- The JCMUA made a presentation to there Planning Board on November 29, 2005. The Municipal Storm Water Management Plan was revised based on comments received during that presentation and an additional meeting with the City's Planning Department and other City Agencies and Departments regarding ordinances. The revisions were submitted to the JCMUA on October 29, 2006 as supplements to be added to the SWMP.
- As per the requirements of NJAC 7:8, the Jersey City Planning Board adopted the SWMP shortly thereafter. This approval was required before County review could begin.
- As per the requirements of NJAC 7:8, the City Council first adopted the Ordinance 07-056 regarding Stormwater Control. Ordinance 07-056 was adopted on April 11, 2007 and an amendment with Penalties (Ordinance 07-133) was adopted August 08, 2007.
- Afterwards comments on Ordinance 07-056 and the SWMP dated June 2005 were received from a Hudson County Division of Planning in a letter dated June 19, 2007.
- This current SWMP update (June 2005 amended August 2008) includes all these previous revisions as well as the responses to the County consultant's comments dated June, 19 2007 and July 2008.
- Future updates or revisions to the SWMP will occur on an as needed basis when determined to be necessary by the Jersey City Municipal Utilities Authority and the Jersey City Planning Department or at a minimum once every 6 years.

APPENDIX A

STORMWATER ORDINANCES

Stormwater Control Ordinance

Section 1: Scope and Purpose

A. Policy Statement

Flood control, groundwater recharge, and pollutant reduction through nonstructural or low impact techniques shall be explored before relying on structural BMPs. Structural BMPs should be integrated with nonstructural stormwater management strategies and proper maintenance plans. Nonstructural strategies include both environmentally sensitive site design and source controls that prevent pollutants from being placed on the site or from being exposed to stormwater. Source control plans should be developed based upon physical site conditions and the origin, nature, and the anticipated quantity or amount of potential pollutants. Multiple stormwater management BMPs may be necessary to achieve the established performance standards for water quality, quantity, and groundwater recharge.

B. Purpose

It is the purpose of this ordinance to establish minimum stormwater management requirements and controls for "major development," as defined in Section 2.

C. Applicability

1. This ordinance shall be applicable to all site plans and subdivisions for all major developments that require preliminary or final site plan or subdivision review.

2. This ordinance shall also be applicable to all major developments undertaken by the City of Jersey City or any other governmental body.

D. Compatibility with Other Permit and Ordinance Requirements

Development approvals issued for subdivisions and site plans pursuant to this ordinance are to be considered an integral part of development approvals under the subdivision and site plan review process and do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act, or ordinance. In their interpretation and application, the provisions of this ordinance shall be held as the minimum requirements for the promotion of the public health, safety, and general welfare. This ordinance is not intended to interfere with, abrogate, or annul any other ordinances, rule or regulation, statute, or other provision of law except that, where any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule or regulation, or other provision of law, the more restrictive provisions or higher standards shall control.

Section 2: Definitions

Unless specifically defined below, words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application. The definitions below are the same as or based on the corresponding definitions in the Stormwater Management Rules at N.J.A.C. 7:8-1.2.

“CAFRA Planning Map” means the geographic depiction of the boundaries for Coastal Planning Areas, CAFRA Centers, CAFRA Cores and CAFRA Nodes pursuant to N.J.A.C. 7:7E-5B.3.

“CAFRA Centers, Cores or Nodes” means those areas within boundaries accepted by the Department pursuant to N.J.A.C. 7:8E-5B.

“Combined Sewer System” means a system that consists of a single conduit that collects and transports domestic sewage and industrial wastewater, along with stormwater runoff.

“Compaction” means the increase in soil bulk density.

“Core” means a pedestrian-oriented area of commercial and civic uses serving the surrounding municipality, generally including housing and access to public transportation.

“County review agency” means an agency designated by the County Board of Chosen Freeholders to review municipal stormwater management plans and implementing ordinance(s). The county review agency may either be:

A county planning agency; or

A county water resource association created under N.J.S.A 58:16A-55.5, if the ordinance or resolution delegates authority to approve, conditionally approve, or disapprove municipal stormwater management plans and implementing ordinances.

“Department” means the New Jersey Department of Environmental Protection.

“Designated Center” means a State Development and Redevelopment Plan Center as designated by the State Planning Commission such as urban, regional, town, village, or hamlet.

“Design engineer” means a person professionally qualified and duly licensed in New Jersey to perform engineering services that may include, but not necessarily be limited to, development of project requirements, creation and development of project design and preparation of drawings and specifications.

“Development” means the division of a parcel of land into two or more parcels, the construction, reconstruction, conversion, structural alteration, relocation or enlargement of any building or structure, any mining excavation or landfill, and any use or change in the use of any building or other structure, or land or extension of use of land, by any person, for which permission is required under the Municipal Land Use Law, N.J.S.A. 40:55D-1 et seq. In the case of development of agricultural lands, development means: any activity that requires a State permit; any activity reviewed by the County Agricultural Board (CAB) and the State Agricultural Development Committee (SADC), and municipal review of any activity not exempted by the Right to Farm Act , N.J.S.A 4:1C-1 et seq.

“Drainage area” means a geographic area within which stormwater, sediments, or dissolved materials drain to a particular receiving waterbody or to a particular point along a receiving waterbody.

“Environmentally critical areas” means an area or feature which is of significant environmental value, including but not limited to: stream corridors; natural heritage priority sites; habitat of endangered or threatened species; large areas of contiguous open space or upland forest; steep slopes; and well head protection and groundwater recharge areas. Habitats of endangered or threatened species are identified using the Department’s Landscape Project as approved by the Department’s Endangered and Nongame Species Program.

“Empowerment Neighborhood” means a neighborhood designated by the Urban Coordinating Council “in consultation and conjunction with” the New Jersey Redevelopment Authority pursuant to N.J.S.A 55:19-69.

“Erosion” means the detachment and movement of soil or rock fragments by water, wind, ice or gravity.

“Impervious surface” means a surface that has been covered with a layer of material so that it is highly resistant to infiltration by water.

“Infiltration” is the process by which water seeps into the soil from precipitation.

“Major development” means any “development” that provides for ultimately disturbing one or more acres of land or placement or replacement of one quarter (1/4) acre or more of impervious cover. 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.

“Municipality” means any city, borough, town, township, or village.

“Node” means an area designated by the State Planning Commission concentrating facilities and activities which are not organized in a compact form.

“Nutrient” means a chemical element or compound, such as nitrogen or phosphorus, which is essential to and promotes the development of organisms.

“Person” means any individual, corporation, company, partnership, firm, association, or political subdivision of this State subject to municipal jurisdiction pursuant to the Municipal Land Use Law , N.J.S.A. 40:55D-1 et seq. Person shall also include the City of Jersey City.

“Pollutant” means any dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, refuse, oil, grease, sewage sludge, munitions, chemical wastes, biological materials, medical wastes, radioactive substance (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.), thermal waste, wrecked or discarded equipment, rock, sand, cellar dirt, industrial, municipal, agricultural, and construction waste or runoff, or other residue discharged directly or indirectly to the land, ground waters or surface waters of the State, or to a domestic treatment works. “Pollutant” includes both hazardous and nonhazardous pollutants.

“Recharge” means the amount of water from precipitation that infiltrates into the ground and is not evapotranspired.

“Sediment” means solid material, mineral or organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water or gravity as a product of erosion.

“Separate Sewer System” means a system in which the sanitary and storm sewer systems are not interconnected. In this system, the sanitary sewer system is tributary to a wastewater treatment facility, and the storm sewer system discharges directly to the receiving waters.

“Site” means the lot or lots upon which a major development is to occur or has occurred.

“Soil” means all unconsolidated mineral and organic material of any origin.

"State Development and Redevelopment Plan Metropolitan Planning Area (PA1)" means an area delineated on the State Plan Policy Map and adopted by the State Planning Commission that is intended to be the focus for much of the state's future redevelopment and revitalization efforts.

"State Plan Policy Map" is defined as the geographic application of the State Development and Redevelopment Plan's goals and statewide policies, and the official map of these goals and policies.

"Stormwater" means water resulting from precipitation (including rain and snow) that runs off the land's surface, is transmitted to the subsurface, or is captured by separate storm sewers or other sewage or drainage facilities, or conveyed by snow removal equipment.

"Stormwater runoff" means water flow on the surface of the ground or in storm sewers, resulting from precipitation.

"Stormwater management basin" means an excavation or embankment and related areas designed to retain stormwater runoff. A stormwater management basin may either be normally dry (that is, a detention basin or infiltration basin), retain water in a permanent pool (a retention basin), or be planted mainly with wetland vegetation (most constructed stormwater wetlands).

"Stormwater management measure" means any structural or nonstructural strategy, practice, technology, process, program, or other method intended to control or reduce stormwater runoff and associated pollutants, or to induce or control the infiltration or groundwater recharge of stormwater or to eliminate illicit or illegal non-stormwater discharges into stormwater conveyances.

"Tidal Flood Hazard Area" means a flood hazard area, which may be influenced by stormwater runoff from inland areas, but which is primarily caused by the Atlantic Ocean.

"Urban Coordinating Council Empowerment Neighborhood" means a neighborhood given priority access to State resources through the New Jersey Redevelopment Authority.

"Urban Enterprise Zones" means a zone designated by the New Jersey Enterprise Zone Authority pursuant to the New Jersey Urban Enterprise Zones Act, N.J.S.A. 52:27H-60 et. seq.

"Urban Redevelopment Area" is defined as previously developed portions of areas:

(1) Delineated on the State Plan Policy Map (SPPM) as the Metropolitan Planning Area (PA1), Designated Centers, Cores or Nodes;

(2) Designated as CAFRA Centers, Cores or Nodes;

(3) Designated as Urban Enterprise Zones; and

(4) Designated as Urban Coordinating Council Empowerment Neighborhoods.

"Waters of the State" means the ocean and its estuaries, all springs, streams, wetlands, and bodies of surface or ground water, whether natural or artificial, within the boundaries of the State of New Jersey or subject to its jurisdiction.

"Wetlands" or "wetland" means an area that is inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation.

Section 3: General Standards

A. Design and Performance Standards for Stormwater Management Measures

1. Stormwater management measures for major development shall be developed to meet the erosion control, groundwater recharge, stormwater runoff quantity, and stormwater runoff quality standards in Section 4. To the maximum extent practicable, these standards shall be met by incorporating nonstructural stormwater management strategies into the design. If these strategies alone are not sufficient to meet these standards, structural stormwater management measures necessary to meet these standards shall be incorporated into the design.

2. The standards in this ordinance apply only to new major development and are intended to minimize the impact of stormwater runoff on water quality and water quantity in receiving water bodies and maintain groundwater recharge. The standards do not apply to new major development in areas with a separate sewer system that is neither directly nor indirectly connected to a combined sewer system to the extent that alternative design and performance standards are applicable under a regional stormwater management plan or Water Quality Management Plan adopted in accordance with Department rules. Alternative standards shall provide at least as much protection from stormwater quantity and water quality impacts of major development projects as would be provided under the standards in N.J.A.C. 7:8-5. The standards in this ordinance always apply to new major development in areas with a combined sewer system or in areas with a separate sewer system that is either directly or indirectly connected to a combined sewer system.

Section 4: Stormwater Management Requirements for Major Development

A. The development shall incorporate a maintenance plan for the stormwater management measures incorporated into the design of a major development in accordance with Section 10.

B. Stormwater management measures shall avoid adverse impacts of concentrated flow on habitat for threatened and endangered species as documented in the Department' Landscape Project or Natural Heritage Database established under N.J.S.A. 13:1B-15.147 through 15.150, particularly *Helonias bullata* (swamp pink) and/or *Clemmys muhlnebergi* (bog turtle).

C. The following linear development projects are exempt from the groundwater recharge, stormwater runoff quantity, and stormwater runoff quality requirements of Sections 4.F and 4.G:

1. The construction of an underground utility line provided that the disturbed areas are revegetated upon completion;

2. The construction of an aboveground utility line provided that the existing conditions are maintained to the maximum extent practicable; and

3. The construction of a public pedestrian access, such as a sidewalk or trail with a maximum width of 14 feet, provided that the access is made of permeable material.

D. A waiver from strict compliance from the groundwater recharge, stormwater runoff quantity, and stormwater runoff quality requirements of Sections 4.F and 4.G may be obtained for the enlargement of an existing public roadway or railroad; or the construction or enlargement of a public pedestrian access, provided that the following conditions are met:

1. The applicant demonstrates that there is a public need for the project that cannot be accomplished by any other means;

2. The applicant demonstrates through an alternatives analysis, that through the use of nonstructural and structural stormwater management strategies and measures, the option selected complies with the requirements of Sections 4.F and 4.G to the maximum extent practicable;

3. The applicant demonstrates that, in order to meet the requirements of Sections 4.F and 4.G, existing structures currently in use, such as homes and buildings, would need to be condemned; and

4. The applicant demonstrates that it does not own or have other rights to areas, including the potential to obtain through condemnation lands not falling under D.3 above within the upstream drainage area of the receiving stream, that would provide additional opportunities to mitigate the requirements of Sections 4.F and 4.G that were not achievable on-site.

E. Nonstructural Stormwater Management Strategies

1. To the maximum extent practicable, the standards in Sections 4.F and 4.G shall be met by incorporating nonstructural stormwater management strategies set forth at Section 4.E into the design. The applicant shall identify the nonstructural measures incorporated into the design of the project. If the applicant contends that it is not feasible for engineering, environmental, or safety reasons to incorporate any nonstructural stormwater management measures identified in Paragraph 2 below into the design of a particular project, the applicant shall identify the strategy considered and provide a basis for the contention.

2. Nonstructural stormwater management strategies incorporated into site design shall:

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

   b. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces;

   c. Maximize the protection of natural drainage features and vegetation;

   d. Minimize the decrease in the "time of concentration" from pre-construction to post construction. "Time of concentration" is defined as the time it takes for runoff to travel from the hydraulically most distant point of the watershed to the point of interest within a watershed;

   e. Minimize land disturbance including clearing and grading;

   f. Minimize soil compaction;

   g. Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides;

   h. Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas;

i. Provide other source controls to prevent or minimize the use or exposure of pollutants at the site, in order to prevent or minimize the release of those pollutants into stormwater runoff. Such source controls include, but are not limited to:

   (1) Site design features that help to prevent accumulation of trash and debris in drainage systems, including features that satisfy Section 4.E.3. below;

   (2) Site design features that help to prevent discharge of trash and debris from drainage systems;

   (3) Site design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at industrial or commercial developments; and

   (4) When establishing vegetation after land disturbance, applying fertilizer in accordance with the requirements established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq., and implementing rules.

3. Site design features identified under Section 4.E.2.i.(2) above shall comply with the following standard to control passage of solid and floatable materials through storm drain inlets. For purposes of this paragraph, "solid and floatable materials" means sediment, debris, trash, and other floating, suspended, or settleable solids. For exemptions to this standard see Section 4.E.3.c below.

   a. Design engineers shall use either of the following grates whenever they use a grate in pavement or another ground surface to collect stormwater from that surface into a storm drain or surface water body under that grate:

      (1) The New Jersey Department of Transportation (NJDOT) bicycle safe grate, which is described in Chapter 2.4 of the NJDOT Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines (April 1996); or

      (2) A different grate, if each individual clear space in that grate has an area of no more than seven (7.0) square inches, or is no greater than 0.5 inches across the smallest dimension.

      Examples of grates subject to this standard include grates in grate inlets, the grate portion (non-curb-opening portion) of combination inlets, grates on storm sewer manholes, ditch grates, trench grates, and grates of spacer bars in slotted drains. Examples of ground surfaces include surfaces of roads (including bridges), driveways, parking areas, bikeways, plazas, sidewalks, lawns, fields, open channels, and stormwater basin floors.

   b. Whenever design engineers use a curb-opening inlet, the clear space in that curb opening (or each individual clear space, if the curb opening has two or more clear spaces) shall have an area of no more than seven (7.0) square inches, or be no greater than two (2.0) inches across the smallest dimension.

   c. This standard does not apply:

      (1) Where the review agency determines that this standard would cause inadequate hydraulic performance that could not practicably be overcome by using additional or larger storm drain inlets that meet these standards;

      (2) Where flows from the water quality design storm as specified in Section 4.G.1 are conveyed through any device (e.g., end of pipe netting facility, manufactured treatment device, or a catch

basin hood) that is designed, at a minimum, to prevent delivery of all solid and floatable materials that could not pass through one of the following:

(a) A rectangular space four and five-eighths inches long and one and one-half inches wide (this option does not apply for outfall netting facilities); or

(b) A bar screen having a bar spacing of 0.5 inches.

(3) Where flows are conveyed through a trash rack that has parallel bars with one-inch (1”) spacing between the bars, to the elevation of the water quality design storm as specified in Section 4.G.1; or

(4) Where the New Jersey Department of Environmental Protection determines, pursuant to the New Jersey Register of Historic Places Rules at N.J.A.C. 7:4-7.2(c), that action to meet this standard is an undertaking that constitutes an encroachment or will damage or destroy the New Jersey Register listed historic property.

4. Any land area used as a nonstructural stormwater management measure to meet the performance standards in Sections 4.F and 4.G shall be dedicated to a government agency, subjected to a conservation restriction filed with the appropriate County Clerk’s office, or subject to an approved equivalent restriction that ensures that measure or an equivalent stormwater management measure approved by the reviewing agency is maintained in perpetuity.

5. Guidance for nonstructural stormwater management strategies is available in the New Jersey Stormwater Best Management Practices Manual. The BMP Manual may be obtained from the address identified in Section 7, or found on the Department’s website at www.njstormwater.org.

F. Erosion Control, Groundwater Recharge and Runoff Quantity Standards

1. This subsection contains minimum design and performance standards to control erosion, encourage and control infiltration and groundwater recharge, and control stormwater runoff quantity impacts of major development.

a. The minimum design and performance standards for erosion control are those established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq. and implementing rules.

b. The minimum design and performance standards for groundwater recharge are as follows:

(1) The design engineer shall, using the assumptions and factors for stormwater runoff and groundwater recharge calculations at Section 5, either:

(a) Demonstrate through hydrologic and hydraulic analysis that the site and its stormwater management measures maintain 100 percent of the average annual pre-construction groundwater recharge volume for the site; or

(b) Demonstrate through hydrologic and hydraulic analysis that the increase of stormwater runoff volume from pre-construction to post-construction for the 2-year storm is infiltrated.

(2) This groundwater recharge requirement does not apply to projects within the “urban redevelopment area,” or to projects subject to (3) below.

(3) The following types of stormwater shall not be recharged:

(a) Stormwater from areas of high pollutant loading. High pollutant loading areas are areas in industrial and commercial developments where solvents and/or petroleum products are loaded/unloaded, stored, or applied, areas where pesticides are loaded/unloaded or stored; areas where hazardous materials are expected to be present in greater than “reportable quantities” as defined by the United States Environmental Protection Agency (EPA) at 40 CFR 302.4; areas where recharge would be inconsistent with Department approved remedial action work plan or landfill closure plan and areas with high risks for spills of toxic materials, such as gas stations and vehicle maintenance facilities; and

(b) Industrial stormwater exposed to “source material.” “Source material” means any material(s) or machinery, located at an industrial facility, that is directly or indirectly related to process, manufacturing or other industrial activities, which could be a source of pollutants in any industrial stormwater discharge to groundwater. Source materials include, but are not limited to, raw materials; intermediate products; final products; waste materials; by-products; industrial machinery and fuels, and lubricants, solvents, and detergents that are related to process, manufacturing, or other industrial activities that are exposed to stormwater.

(4) The design engineer shall assess the hydraulic impact on the groundwater table and design the site so as to avoid adverse hydraulic impacts. Potential adverse hydraulic impacts include, but are not limited to, exacerbating a naturally or seasonally high water table so as to cause surficial ponding, flooding of basements, or interference with the proper operation of subsurface sewage disposal systems and other subsurface structures in the vicinity or downgradient of the groundwater recharge area.

c. In order to control stormwater runoff quantity impacts from areas of the City with a separate storm sewer system that is neither directly nor indirectly connected to a combined sewer system, the design engineer shall, using the assumptions and factors for stormwater runoff calculations at Section 5, complete one of the following:

(1) Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the two, 10, and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events;

(2) Demonstrate through hydrologic and hydraulic analysis that there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the two, 10, and 100-year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site. This analysis shall include the analysis of impacts of existing land uses and projected land uses assuming full development under existing zoning and land use ordinances in the drainage area;

(3) Design stormwater management measures so that the post-construction peak runoff rates for the 2, 10 and 100 year storm events are 50, 75 and 80 percent, respectively, of the pre-construction peak runoff rates. The percentages apply only to the post-construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed. The percentages shall not be applied to post-construction stormwater runoff into tidal flood hazard areas if the increased volume of stormwater runoff will not increase flood damages below the point of discharge; or

(4) In tidal flood hazard areas, stormwater runoff quantity analysis in accordance with (1), (2) and (3) above shall only be applied if the increased volume of stormwater runoff could increase flood damages below the point of discharge.

d. In order to control stormwater runoff quantity impacts from all areas of the City with a combined sewer system or with a sewer system that is either directly or indirectly connected to a combined sewer system, the design engineer shall, using the assumptions and factors for stormwater runoff calculations at Section 5, design Combined Sewer Subdrainage Area management measures so that the post-construction peak runoff rates for the 2, 10 and 100 year storm events are 50, 75 and 80 percent, respectively, of the pre-construction peak runoff rates. The percentages apply only to the post-construction Combined Sewer Subdrainage Area runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed.

2. Any application for a new agricultural development that meets the definition of major development at Section 2 shall be submitted to the appropriate Soil Conservation District for review and approval in accordance with the requirements of this section and any applicable Soil Conservation District guidelines for stormwater runoff quantity and erosion control. For the purposes of this section, “agricultural development” means land uses normally associated with the production of food, fiber and livestock for sale. Such uses do not include the development of land for the processing or sale of food and the manufacturing of agriculturally related products.

G. Stormwater Runoff Quality Standards

1. Stormwater quality management measures shall be designed to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff by 80 percent of the anticipated load from the developed site, expressed as an annual average. Stormwater quality management measures shall only be required for major developments in areas with a separate sewer system that is neither directly nor indirectly connected to a combined sewer system. The requirement to reduce TSS does not apply to any stormwater runoff in a discharge regulated under a numeric effluent limitation for TSS imposed under the New Jersey Pollution Discharge Elimination System (NJPDES) rules, N.J.A.C. 7:14A, or in a discharge specifically exempt under a NJPDES permit from this requirement. The water quality design storm is 1.25 inches of rainfall in two hours. Water quality calculations shall take into account the distribution of rain from the water quality design storm, as reflected in Table 1. The calculation of the volume of runoff may take into account the implementation of non-structural and structural stormwater management measures.

Table 1: Water Quality Design Storm Distribution			
Minutes	**Cumulative Rainfall (inches**	**Minutes**	**Cumulative Rainfall (inches)**
0	0.0000	65	0.8917
5	0.0083	70	0.9917
10	0.0166	75	1.0500
15	0.0250	80	1.0840
20	0.0500	85	1.1170
25	0.0750	90	1.1500
30	0.1000	95	1.1750
35	0.1330	100	1.2000
40	0.1660	105	1.2250
45	0.2000	110	1.2334
50	0.2583	115	1.2417
55	0.3583	120	1.2500
60	0.6250		

2. For purposes of TSS reduction calculations, Table 2 below presents the presumed removal rates for certain BMPs designed in accordance with the New Jersey Stormwater Best Management Practices Manual. The BMP Manual may be obtained from the address identified in Section 7, or found on the Department's website at www.njstormwater.org. The BMP Manual and other sources of technical guidance are listed in Section 7. TSS reduction shall be calculated based on the removal rates for the BMPs in Table 2 below. Alternative removal rates and methods of calculating removal rates may be used if the design engineer provides documentation demonstrating the capability of these alternative rates and methods to the review agency. A copy of any approved alternative rate or method of calculating the removal rate shall be provided to the Department at the following address: Division of Watershed Management, New Jersey Department of Environmental Protection, PO Box 418 Trenton, New Jersey, 08625-0418.

3. If more than one BMP in series is necessary to achieve the required 80 percent TSS reduction for a site, the applicant shall utilize the following formula to calculate TSS reduction:

   R = A + B – (AXB)/100

   Where

   R = total TSS percent load removal from application of both BMPs, and

   A = the TSS percent removal rate applicable to the first BMP

   B = the TSS percent removal rate applicable to the second BMP

Table 2: TSS Removal Rates for BMPs

Best Management Practice	TSS Percent Removal Rate
Bioretention Systems	90
Constructed Stormwater Wetland	90
Extended Detention Basin	40-60
Infiltration Structure	80
Manufactured Treatment Device	See Section 6.C
Sand Filter	80
Vegetative Filter Strip	60-80
Wet Pond	50-90

4. If there is more than one onsite drainage area, the 80 percent TSS removal rate shall apply to each drainage area, unless the runoff from the subareas converge on site in which case the removal rate can be demonstrated through a calculation using a weighted average.

5. Stormwater management measures shall also be designed to reduce, to the maximum extent feasible, the post-construction nutrient load of the anticipated load from the developed site in stormwater runoff generated from the water quality design storm. In achieving reduction of nutrients to the maximum extent feasible, the design of the site shall include nonstructural strategies and structural measures that optimize nutrient removal while still achieving the performance standards in Sections 4.F and 4.G.

6. Additional information and examples are contained in the New Jersey Stormwater Best Management Practices Manual, which may be obtained from the address identified in Section 7.

7. In accordance with the definition of FW1 at N.J.A.C. 7:9B-1.4, stormwater management measures shall be designed to prevent any increase in stormwater runoff to waters classified as FW1.

8. Special water resource protection areas shall be established along all waters designated Category One at N.J.A.C. 7:9B, and perennial or intermittent streams that drain into or upstream of the Category One waters as shown on the USGS Quadrangle Maps or in the County Soil Surveys, within the associated HUC14 drainage area. These areas shall be established for the protection of water quality, aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, and exceptional fisheries significance of those established Category One waters. These areas shall be designated and protected as follows:

   a. The applicant shall preserve and maintain a special water resource protection area in accordance with one of the following:

      (1) A 300-foot special water resource protection area shall be provided on each side of the waterway, measured perpendicular to the waterway from the top of the bank outwards or from the centerline of the waterway where the bank is not defined, consisting of existing vegetation or vegetation allowed to follow natural succession is provided.

      (2) Encroachment within the designated special water resource protection area under Subsection (1) above shall only be allowed where previous development or disturbance has occurred (for example, active agricultural use, parking area or maintained lawn area). The encroachment shall only be allowed where applicant demonstrates that the functional value and overall condition of the special water resource protection area will be maintained to the maximum extent practicable. In no case shall the remaining special water resource protection area be reduced to less than 150 feet as measured perpendicular to the top of bank of the waterway or centerline of the waterway where the bank is undefined. All encroachments proposed under this subparagraph shall be subject to review and approval by the Department.

   b. All stormwater shall be discharged outside of and flow through the special water resource protection area and shall comply with the Standard for Off-Site Stability in the “Standards For Soil Erosion and Sediment Control in New Jersey,” established under the Soil Erosion and Sediment Control Act , N.J.S.A. 4:24-39 et seq.

   c. If stormwater discharged outside of and flowing through the special water resource protection area cannot comply with the Standard For Off-Site Stability in the “Standards for Soil Erosion and Sediment Control in New Jersey,” established under the Soil Erosion and Sediment Control Act , N.J.S.A. 4:24-39 et seq., then the stabilization measures in accordance with the requirements of the above standards may be placed within the special water resource protection area, provided that:

      (1) Stabilization measures shall not be placed within 150 feet of the Category One waterway;

(2) Stormwater associated with discharges allowed by this section shall achieve a 95 percent TSS post-construction removal rate;

(3) Temperature shall be addressed to ensure no impact on the receiving waterway;

(4) The encroachment shall only be allowed where the applicant demonstrates that the functional value and overall condition of the special water resource protection area will be maintained to the maximum extent practicable;

(5) A conceptual project design meeting shall be held with the appropriate Department staff and Soil Conservation District staff to identify necessary stabilization measures; and

(6) All encroachments proposed under this section shall be subject to review and approval by the Department.

d. A stream corridor protection plan may be developed by a regional stormwater management planning committee as an element of a regional stormwater management plan, or by a municipality through an adopted municipal stormwater management plan. If a stream corridor protection plan for a waterway subject to Section 4.G(8) has been approved by the Department of Environmental Protection, then the provisions of the plan shall be the applicable special water resource protection area requirements for that waterway. A stream corridor protection plan for a waterway subject to G.8 shall maintain or enhance the current functional value and overall condition of the special water resource protection area as defined in G.8.a.(1) above. In no case shall a stream corridor protection plan allow the reduction of the Special Water Resource Protection Area to less than 150 feet as measured perpendicular to the waterway subject to this subsection.

e. Paragraph G.8 does not apply to the construction of one individual single family dwelling that is not part of a larger development on a lot receiving preliminary or final subdivision approval on or before February 2, 2004 , provided that the construction begins on or before February 2, 2009.

Section 5: Calculation of Stormwater Runoff and Groundwater Recharge

A. Stormwater runoff shall be calculated in accordance with the following:

1. The design engineer shall calculate runoff using one of the following methods:

a. The USDA Natural Resources Conservation Service (NRCS) methodology, including the NRCS Runoff Equation and Dimensionless Unit Hydrograph, as described in the NRCS National Engineering Handbook Section 4 – Hydrology and Technical Release 55 – Urban Hydrology for Small Watersheds; or

b. The Rational Method for peak flow and the Modified Rational Method for hydrograph computations.

2. For the purpose of calculating runoff coefficients and groundwater recharge, there is a presumption that the pre-construction condition of a site or portion thereof is a wooded land use with good hydrologic condition. The term "runoff coefficient" applies to both the NRCS methodology at Section 5.A.1.a and the Rational and Modified Rational Methods at Section 5.A.1.b. A runoff coefficient or a groundwater recharge land cover for an existing condition may be used on all or a portion of the site if the design engineer verifies that the hydrologic condition has existed on the site or portion of the site

for at least five years without interruption prior to the time of application. If more than one land cover have existed on the site during the five years immediately prior to the time of application, the land cover with the lowest runoff potential shall be used for the computations. In addition, there is the presumption that the site is in good hydrologic condition (if the land use type is pasture, lawn, or park), with good cover (if the land use type is woods), or with good hydrologic condition and conservation treatment (if the land use type is cultivation).

3. In computing pre-construction stormwater runoff, the design engineer shall account for all significant land features and structures, such as ponds, wetlands, depressions, hedgerows, or culverts, that may reduce pre-construction stormwater runoff rates and volumes.

4. In computing stormwater runoff from all design storms, the design engineer shall consider the relative stormwater runoff rates and/or volumes of pervious and impervious surfaces separately to accurately compute the rates and volume of stormwater runoff from the site. To calculate runoff from unconnected impervious cover, urban impervious area modifications as described in the NRCS Technical Release 55 – Urban Hydrology for Small Watersheds and other methods may be employed.

5. If the invert of the outlet structure of a stormwater management measure is below the flood hazard design flood elevation as defined at N.J.A.C. 7:13, the design engineer shall take into account the effects of tailwater in the design of structural stormwater management measures.

B. Groundwater recharge may be calculated in accordance with the following:

1. The New Jersey Geological Survey Report GSR-32 A Method for Evaluating Ground-Water Recharge Areas in New Jersey, incorporated herein by reference as amended and supplemented. Information regarding the methodology is available from the New Jersey Stormwater Best Management Practices Manual; at http://www.state.nj.us/dep/njgs/; or at New Jersey Geological Survey, 29 Arctic Parkway, P.O. Box 427 Trenton, New Jersey 08625-0427; (609) 984-6587.

Section 6: Standards for Structural Stormwater Management Measures

A. Standards for structural stormwater management measures are as follows:

1. Structural stormwater management measures shall be designed to take into account the existing site conditions, including, for example, environmentally critical areas, wetlands; flood-prone areas; slopes; depth to seasonal high water table; soil type, permeability and texture; drainage area and drainage patterns; and the presence of solution-prone carbonate rocks (limestone).

2. Structural stormwater management measures shall be designed to minimize maintenance, facilitate maintenance and repairs, and ensure proper functioning. Trash racks shall be installed at the intake to the outlet structure as appropriate, and shall have parallel bars with one-inch (1”) spacing between the bars to the elevation of the water quality design storm. For elevations higher than the water quality design storm, the parallel bars at the outlet structure shall be spaced no greater than one-third (1/3) the width of the diameter of the orifice or one-third (1/3) the width of the weir, with a minimum spacing between bars of one-inch and a maximum spacing between bars of six inches. In addition, the design of trash racks must comply with the requirements of Section 8.D.

3. Structural stormwater management measures shall be designed, constructed, and installed to be strong, durable, and corrosion resistant. Measures that are consistent with the relevant portions of the Residential Site Improvement Standards at N.J.A.C. 5:21-7.3, 7.4, and 7.5 shall be deemed to meet this requirement.

4. At the intake to the outlet from the stormwater management basin, the orifice size shall be a minimum of two and one-half inches in diameter.

5. Stormwater management basins shall be designed to meet the minimum safety standards for stormwater management basins at Section 8.

B. Stormwater management measure guidelines are available in the New Jersey Stormwater Best Management Practices Manual. Other stormwater management measures may be utilized provided the design engineer demonstrates that the proposed measure and its design will accomplish the required water quantity, groundwater recharge and water quality design and performance standards established by Section 4 of this ordinance.

C. Manufactured treatment devices may be used to meet the requirements of Section 4 of this ordinance, provided the pollutant removal rates are verified by the New Jersey Corporation for Advanced Technology and certified by the Department.

Section 7: Sources for Technical Guidance

A. Technical guidance for stormwater management measures can be found in the documents listed at 1 and 2 below, which are available from Maps and Publications, New Jersey Department of Environmental Protection, 428 East State Street, P.O. Box 420, Trenton, New Jersey, 08625; telephone (609) 777-1038.

1. Guidelines for stormwater management measures are contained in the New Jersey Stormwater Best Management Practices Manual, as amended. Information is provided on stormwater management measures such as: bioretention systems, constructed stormwater wetlands, dry wells, extended detention basins, infiltration structures, manufactured treatment devices, pervious paving, sand filters, vegetative filter strips, and wet ponds.

2. The New Jersey Department of Environmental Protection Stormwater Management Facilities Maintenance Manual, as amended.

B. Additional technical guidance for stormwater management measures can be obtained from the following:

1. The "Standards for Soil Erosion and Sediment Control in New Jersey" promulgated by the State Soil Conservation Committee and incorporated into N.J.A.C. 2:90. Copies of these standards may be obtained by contacting the State Soil Conservation Committee or any of the Soil Conservation Districts listed in N.J.A.C. 2:90-1.3(a)4. The location, address, and telephone number of each Soil Conservation District may be obtained from the State Soil Conservation Committee, P.O. Box 330, Trenton, New Jersey 08625; (609) 292-5540;

2. The Rutgers Cooperative Extension Service, 732-932-9306; and

3. The Soil Conservation Districts listed in N.J.A.C. 2:90-1.3(a)4. The location, address, and telephone number of each Soil Conservation District may be obtained from the State Soil Conservation Committee, P.O. Box 330, Trenton, New Jersey, 08625, (609) 292-5540.

Section 8: Safety Standards for Stormwater Management Basins

A. This section sets forth requirements to protect public safety through the proper design and operation of stormwater management basins. This section applies to any new stormwater management basin.

B. Requirements for Trash Racks, Overflow Grates and Escape Provisions

1. A trash rack is a device designed to catch trash and debris and prevent the clogging of outlet structures. Trash racks shall be installed at the intake to the outlet from the stormwater management basin to ensure proper functioning of the basin outlets in accordance with the following:

   a. The trash rack shall have parallel bars, with no greater than six inch spacing between the bars.

   b. The trash rack shall be designed so as not to adversely affect the hydraulic performance of the outlet pipe or structure.

   c. The average velocity of flow through a clean trash rack is not to exceed 2.5 feet per second under the full range of stage and discharge. Velocity is to be computed on the basis of the net area of opening through the rack.

   d. The trash rack shall be constructed and installed to be rigid, durable, and corrosion resistant, and shall be designed to withstand a perpendicular live loading of 300 lbs/ft sq.

2. An overflow grate is designed to prevent obstruction of the overflow structure. If an outlet structure has an overflow grate, such grate shall meet the following requirements:

   a. The overflow grate shall be secured to the outlet structure but removable for emergencies and maintenance.

   b. The overflow grate spacing shall be no less than two inches across the smallest dimension.

   c. The overflow grate shall be constructed and installed to be rigid, durable, and corrosion resistant, and shall be designed to withstand a perpendicular live loading of 300 lbs./ft sq.

3. For purposes of this paragraph 3, escape provisions means the permanent installation of ladders, steps, rungs, or other features that provide easily accessible means of egress from stormwater management basins. Stormwater management basins shall include escape provisions as follows:

   a. If a stormwater management basin has an outlet structure, escape provisions shall be incorporated in or on the structure. With the prior approval of the reviewing agency identified in Section 8.C a free-standing outlet structure may be exempted from this requirement.

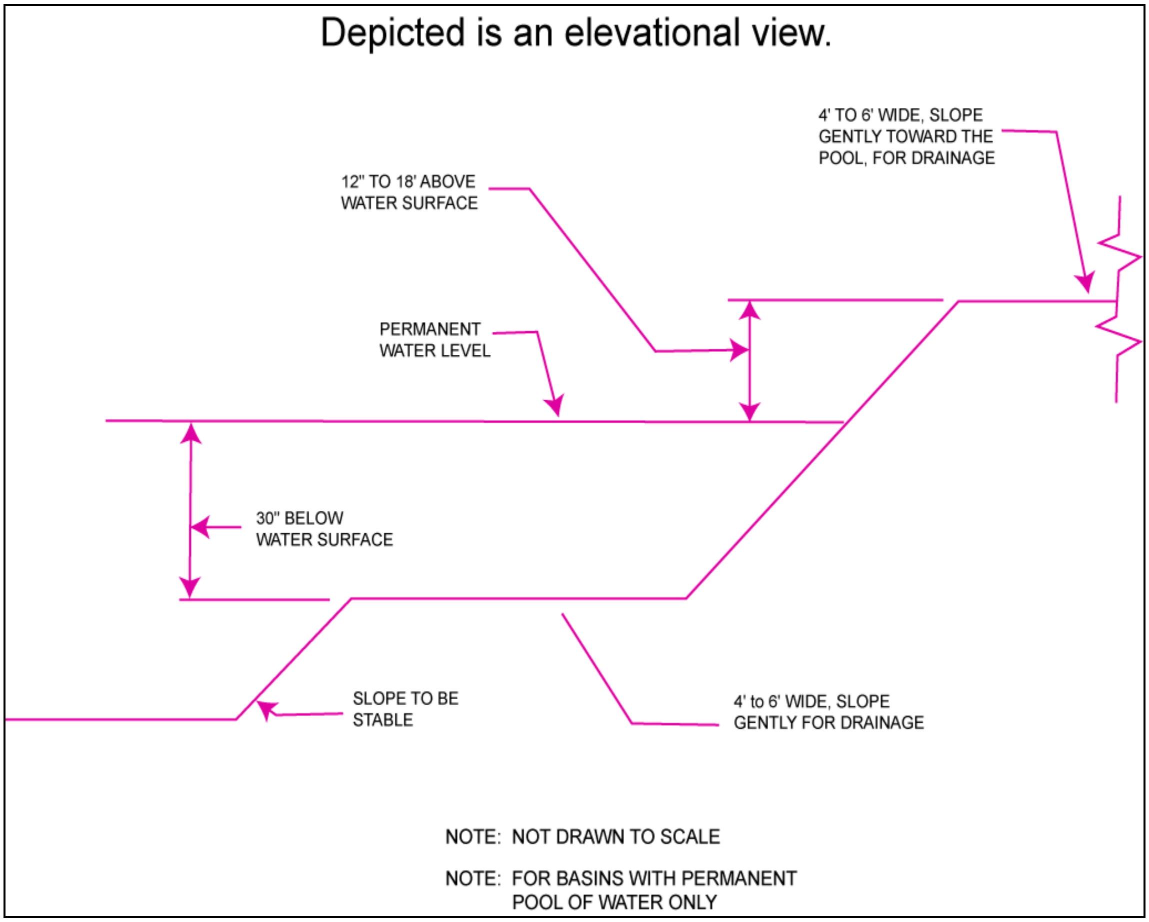
   b. Safety ledges shall be constructed on the slopes of all new stormwater management basins having a permanent pool of water deeper than two and one-half feet. Such safety ledges shall be comprised of two steps. Each step shall be four to six feet in width. One step shall be located approximately two and one-half feet below the permanent water surface, and the second step shall be located one to one and one-half feet above the permanent water surface. See Section 8.D for an illustration of safety ledges in a stormwater management basin.

   c. In new stormwater management basins, the maximum interior slope for an earthen dam, embankment, or berm shall not be steeper than 3 horizontal to 1 vertical.

C. Variance or Exemption from Safety Standards

1. A variance or exemption from the safety standards for stormwater management basins may be granted only upon a written finding by the appropriate reviewing agency (municipality, county or Department) that the variance or exemption will not constitute a threat to public safety.

D. Illustration of Safety Ledges in a New Stormwater Management Basin



Section 9: Requirements for a Site Development Stormwater Plan

A. Submission of Site Development Stormwater Plan

1. Whenever an applicant seeks municipal approval of a development subject to this ordinance, the applicant shall submit all of the required components of the submittal for the Site Development Stormwater Plan at Section 9.C below and any additional components as specified in the City's Stormwater Management Plan latest revisions as part of the submission of the applicant's application for subdivision or site plan approval.

2. The applicant shall demonstrate that the project meets the standards set forth in this ordinance.

3. The applicant shall submit five (5) copies of the materials listed in the submittal for site development stormwater plans in accordance with Section 9.C of this ordinance.

B. Site Development Stormwater Plan Approval

The applicant's Site Development project shall be reviewed as a part of the subdivision or site plan review process by the municipal board or official from which municipal approval is sought. That municipal board or official shall consult with the Engineers of the JCMUA and be guided by them to determine if all of the submittal requirements have been satisfied and to determine if the project meets the standards set forth in this ordinance.

C. Submittal Requirements

The following information shall be required:

1. Topographic Base Map

The reviewing engineer may require upstream tributary drainage system information as necessary. It is recommended that the topographic base map of the site be submitted which extends a minimum of 200 feet beyond the limits of the proposed development, at a scale of 1"=200' or greater, showing 2-foot contour intervals. The map as appropriate may indicate the following: existing surface water drainage, shorelines, steep slopes, soils, erodible soils, perennial or intermittent streams that drain into or upstream of the Category One waters, wetlands and flood plains along with their appropriate buffer strips, marshlands and other wetlands, pervious or vegetative surfaces, existing man-made structures, roads, bearing and distances of property lines, and significant natural and manmade features not otherwise shown.

2. Environmental Site Analysis

A written and graphic description of the natural and man-made features of the site and its environs. This description should include a discussion of soil conditions, slopes, wetlands, waterways and vegetation on the site. Particular attention should be given to unique, unusual, or environmentally sensitive features and to those that provide particular opportunities or constraints for development.

3. Project Description and Site Plan(s)

A map (or maps) at the scale of the topographical base map indicating the location of existing and proposed buildings, roads, parking areas, utilities, structural facilities for stormwater management and sediment control, and other permanent structures. The map(s) shall also clearly show areas where alterations occur in the natural terrain and cover, including lawns and other landscaping, and seasonal high ground water elevations. A written description of the site plan and justification of proposed changes in natural conditions may also be provided.

4. Land Use Planning and Source Control Plan

   This plan shall provide a demonstration of how the goals and standards of Sections 3 through 6 are being met. The focus of this plan shall be to describe how the site is being developed to meet the objective of controlling groundwater recharge, stormwater quality and stormwater quantity problems at the source by land management and source controls whenever possible.

5. Stormwater Management Facilities Map

   The following information, illustrated on a map of the same scale as the topographic base map, shall be included:

   a. Total area to be paved or built upon, proposed surface contours, land area to be occupied by the stormwater management facilities and the type of vegetation thereon, and details of the proposed plan to control and dispose of stormwater.

   b. Details of all stormwater management facility designs, during and after construction, including discharge provisions, discharge capacity for each outlet at different levels of detention and emergency spillway provisions with maximum discharge capacity of each spillway.

6. Calculations

   a. Comprehensive hydrologic and hydraulic design calculations for the pre-development and post-development conditions for the design storms specified in Section 4 of this ordinance.

   b. When the proposed stormwater management control measures (e.g., infiltration basins) depends on the hydrologic properties of soils, then a soils report shall be submitted. The soils report shall be based on onsite boring logs or soil pit profiles. The number and location of required soil borings or soil pits shall be determined based on what is needed to determine the suitability and distribution of soils present at the location of the control measure.

7. Maintenance and Repair Plan

   The design and planning of the stormwater management facility shall meet the maintenance requirements of Section 10.

8. Waiver from Submission Requirements

   The municipal official or board reviewing an application under this ordinance may, in consultation with the Chief Engineer of the JCMUA, waive submission of any of the requirements in Sections 9.C.1 through 9.C.6 of this ordinance when it can be demonstrated that the information requested is impossible to obtain or it would create a hardship on the applicant to obtain and its absence will not materially affect the review process.

Section 10: Maintenance and Repair

A. Applicability

1. Projects subject to review as in Section 1.C of this ordinance shall comply with the requirements of Sections 10.B and 10.C.

B. General Maintenance

1. The design engineer shall prepare a maintenance plan for the stormwater management measures incorporated into the design of a major development.
2. The maintenance plan shall contain specific preventative maintenance tasks and schedules; cost estimates, including estimated cost of sediment, debris, or trash removal; and the name, address, and telephone number of the person or persons responsible for preventative and corrective maintenance (including replacement). Maintenance guidelines for stormwater management measures are available in the New Jersey Stormwater Best Management Practices Manual. If the maintenance plan identifies a person other than the developer (for example, a public agency or homeowners' association) as having the responsibility for maintenance, the plan shall include documentation of such person's agreement to assume this responsibility, or of the developer's obligation to dedicate a stormwater management facility to such person under an applicable ordinance or regulation.
3. Responsibility for maintenance shall not be assigned or transferred to the owner or tenant of an individual property in a residential development or project, unless such owner or tenant owns or leases the entire residential development or project.
4. If the person responsible for maintenance identified under Section 10.B.2 above is not a public agency, the maintenance plan and any future revisions based on Section 10.B.7 below shall be recorded upon the deed of record for each property on which the maintenance described in the maintenance plan must be undertaken.
5. Preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including repairs to or replacement of the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of nonvegetated linings.
6. The person responsible for maintenance identified under Section 10.B.2 above shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.
7. The person responsible for maintenance identified under Section 10.B.2 above shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed.
8. The person responsible for maintenance identified under Section 10.B.2 above shall retain and make available, upon request by any public entity with administrative, health, environmental, or safety authority over the site including the JCMUA, the maintenance plan and the documentation required by Sections 10.B.6 and 10.B.7 above.
9. The requirements of Sections 10.B.3 and 10.B.4 do not apply to stormwater management facilities that are dedicated to and accepted by the municipality or another governmental agency.

10. In the event that the stormwater management facility becomes a danger to public safety or public health, or if it is in need of maintenance or repair, the municipality shall so notify the responsible person in writing. Upon receipt of that notice, the responsible person shall have fourteen (14) days to effect maintenance and repair of the facility in a manner that is approved by the Chief Engineer of the JCMUA or his designee. The municipality, in its discretion, may extend the time allowed for effecting maintenance and repair for good cause. If the responsible person fails or refuses to perform such maintenance and repair, the municipality or County may immediately proceed to do so and shall bill the cost thereof to the responsible person.

11. The JCMUA has the authority to institute a permit system to enforce the maintenance and repair requirements in this section.

B. Nothing in this section shall preclude the municipality in which the major development is located from requiring the posting of a performance or maintenance guarantee in accordance with N.J.S.A. 40:55D-53.

Section 11: Penalties

Any person, firm or corporation who violates, disobeys, omits, neglects or refuses to comply with or who resists the enforcement of any of the provisions of this chapter or any order, decision or determination by the Jersey City Municipal Utilities Authority or Jersey City Planning Department and who refuses to abate said violation within fourteen (14) days after written notice has been served upon them by registered mail or by personal service shall, for each and every violation, be punishable as provided in Chapter 1, General Provisions. Each and every day that such violation continues after such notice shall be considered a separate and specific violation of this chapter without the service of an additional notice. The Jersey City Municipal Utilities Authority may also withhold water meters to ensure compliance with this ordinance.

Section 12: Effective Date

This ordinance shall take effect immediately upon the approval by the county review agency, or sixty (60) days from the receipt of the ordinance by the county review agency if the county review agency should fail to act.

Section 13: Severability

If the provisions of any section, subsection, paragraph, subdivision, or clause of this ordinance shall be judged invalid by a court of competent jurisdiction, such order of judgment shall not affect or invalidate the remainder of any section, subsection, paragraph, subdivision, or clause of this ordinance.

APPENDIX B

THE STORMWATER POLLUTION PREVENTION PLAN (SPPP) FORMS

FOR THE CITY OF JERSEY CITY

Tier A Municipal Stormwater Regulation Program

Stormwater Pollution Prevention Team Members

Number of team members may vary.

Completed by: *Joseph Beckmeyer, PE*
Title: *JCMUA Chief Engineer*
Date: *April 1, 2005*
Municipality: *City of Jersey City*
County: *Hudson County*
NJPDES #: NJG*0154091*
PI ID #: *203005*

Stormwater Program Coordinator: *Joseph Beckmeyer*
Title: *JCMUA Chief Engineer*
Office Phone #: *201-432-1150*
Emergency Phone #: *201-432-1150*

Public Notice Coordinator: *Maureen Caporino*
Title: *JCMUA Administrative Assistant*
Office Phone #: *201-432-1150*
Emergency Phone #: *201-432-1150*

Post-Construction Stormwater Management Coordinator: *Joseph Beckmeyer, PE*
Title: *JCMUA Chief Engineer*
Office Phone #: *201-432-1150*
Emergency Phone #: *201-432-1150*

Local Public Education Coordinator: *Joseph Beckmeyer, PE*
Title: *JCMUA Chief Engineer*
Office Phone #: *201-432-1150*
Emergency Phone #: *201-432-1150*

Ordinance Coordinator: *Robert Cotter*
Title: *City Planner*
Office Phone #: *201-547-5056*
Emergency Phone #: *201-547-5050*

Public Works Coordinator: *Joseph Beckmeyer, PE*
Title: *JCMUA Chief Engineer*
Office Phone #: *201-432-1150*
Emergency Phone #: *201-432-1150*

Employee Training Coordinator: *Joseph Beckmeyer, PE*
Title: *JCMUA Chief Engineer*
Office Phone #: *201-432-1150*
Emergency Phone #: *201-432-1150*

Other: *Joseph Beckmeyer, PE*
Title: *JCMUA Chief Engineer*
Office Phone #: *201-432-1150*
Emergency Phone #: *201-432-1150*

SPPP Form 2 - Public Notice

Municipality Information

Municipality: City of Jersey City County: Hudson

NJPDES # : NJG0154091 PI ID #:203005

Team Member/Title: Joseph Beckmeyer, Chief Engineer

Effective Date of Permit Authorization (EDPA): 4/1/04

Date of Completion: Ongoing Date of most recent update: 3/30/05

Briefly outline the principal ways in which you comply with applicable State and local public notice requirements when providing for public participation in the development and implementation of your stormwater program.

The City of Jersey City (the City) complies with all applicable State and local public notice requirements for meetings where public notice is required. Specifically, the City complies with the following Open Public Meetings Act statute:

1) N.J.S.A. 10:4-6 et seq

The City complies with all applicable State and local requirements with respect to the public notice requirements for passage of ordinances. Specifically, the City complies with the following statute:

2) N.J.S.A. 40:49-1 et sq.

The City complies with all applicable State and local public notice requirements with respect to municipal actions where public notice is required. Specifically, the City complies with the following Municipal Land Use Law:

3) N.J.S.A. 40:55D-1 et seq.

Measurable Goal - The City will certify annually that all applicable State and local public notice requirements were followed.

SPPP Form 3 – New Development and Redevelopment Program

Municipality Information

Municipality: City of Jersey City County: Hudson

NJPDES # : NJG0154091 PI ID #: 203005

Team Member/Title: Joseph Beckmeyer, Chief Engineer

Effective Date of Permit Authorization (EDPA): 4/1/04

Date of Completion: Ongoing Date of most recent update: 3/30/05

Describe in general terms your post-construction stormwater management in new development and redevelopment program (post-construction program), and how it complies with the Tier A Permit minimum standard. This description must address compliance with the Residential Site Improvement Standards for stormwater management; ensuring adequate long-term operation and maintenance of BMPs (including BMPs on property that you own or operate); design of storm drain inlets (including inlets that you install); and preparation, adoption, approval, and implementation of a municipal stormwater management plan and municipal stormwater control ordinance(s). Attach additional pages as necessary. Some additional specific information (mainly about that plan and ordinance(s)) will be provided in your annual reports.

To control stormwater from new development and redevelopment projects throughout the City, we will undertake the following:

The City currently, and will continue to ensure, that all new residential development and redevelopment projects that are subject to the Residential Site Improvement Standards for stormwater management (including the NJDEP Stormwater Management Rules, N.J.A.C. 7:8) are in compliance with those standards. Our planning and zoning boards ensure such compliance prior to issuing preliminary or final subdivision or site plan approvals under the Municipal Land Use Law.

Should the City decide to construct a project before the municipal stormwater control ordinance takes effect, we will ensure adequate long-term operation and maintenance of best management practices (BMPs) for that project by requiring a project maintenance plan similar to the maintenance plan described in our draft ordinance, and by requiring funding the implementation of that plan. We will require all storm drain inlets in the separated stormwater and sanitary sewer drainage areas that we install to comply with the design standard in Attachment C of our permit. Once the ordinance takes effect, we will ensure such operation and maintenance for any new development or redevelopment projects within City limits by complying with the maintenance requirements in the ordinance. In addition, any storm drain inlets we install for such projects will comply with the ordinance's standard for such inlets.

The City and JCMUA Engineer will jointly review the Sample Municipal Stormwater Management Plan and the Model Stormwater Control Ordinance in the NJ Stormwater BMP Manual. The JCMUA is in the process of drafting a municipal stormwater management plan and municipal stormwater control ordinance for City's review.

SPPP Form 3 – New Development and Redevelopment Program – *cont'd*

Subsequent to completion, the Jersey City plan and ordinance will be similar to the BMP sample and model adopted by the City planning board and Council, respectively, by the deadlines specified in the permit, and will be submitted to Hudson County for approval.

Once approved, the ordinance will control stormwater from non-residential development and redevelopment projects. Where it is necessary to implement the municipal stormwater management plan, the approved ordinance will also control aspects of residential development and redevelopment projects that are not subject to the Residential Site Improvement Standards.

For any BMP that is installed in order to comply with the requirements of our post-construction program, the City will ensure adequate long-term operation as well as preventative and corrective maintenance (including replacement) of BMPs. For BMPs on private property that the City does not own or operate, the City intends to adopt and enforce a provision in the municipal stormwater control ordinance that requires the private entity to perform the operation and maintenance, with penalties if the private entity does not comply.

The City will also enforce, through the municipal stormwater control ordinance, compliance with the design standard in Attachment C of our permit to control passage of solid and floatable materials through storm drain inlets.

SPPP Form 4- Local Public Education Program

Municipality Information

Municipality: City of Jersey City County Hudson

NJPDES # : 0154091 PI ID #: 203005

Team Member/Title: Joseph Beckmeyer, Chief Engineer

Effective Date of Permit Authorization (EDPA): 4/1/04

Date of Completion: Ongoing Date of most recent update: 3/30/05

Local Public Education Program

Describe your Local Public Education Program. Be specific on how you will distribute your educational information, and how you will conduct your annual event. Attach additional pages with the date(s) of your annual mailing and the date and location of your annual event.

The City anticipates utilizing three different venues for the distribution of educational information. These venues include:

1. Local newspapers including the Jersey Journal and Star Ledger

2. The City's Website, and

3. an Annual Event.

Local Newspapers - Jersey Journal and Star Ledger:

The City will publish the NJDEP brochure in its entirety in the local newspaper, including the Jersey Journal and Star Ledger. The Jersey Journal and Star Ledger is available to all residents and businesses within the City. The City plans to publish the brochure in the newspaper twice a year; once in the month of April and once in the month of July.

Website:

The City will also publish the NJDEP brochure on its website by June 2005.

Annual Event:

Our Annual Stormwater Event will be set up in 2005. For this event, we will set up a "Stormwater Awareness" table and distribute the NJDEP brochure and other items such as pencils, jar openers,coloring pages, etc. with related stormwater best management practice topics identified. The City will be soliciting participation from its commercial establishments to offset a portion of the costs associated with this effort. The City will also solicit participation from the local High Schools and the Boy and Girl Scouts of America.

SPPP Form 5 – Storm Drain Inlet Labeling

Municipality Information

Municipality: *City of Jersey City* County *Hudson*

NJPDES # : *0154091* PI ID #: *202005*

Team Member/Title: *Joseph Beckmeyer, Chief Engineer*

Effective Date of Permit Authorization (EDPA): *4/1/04*

Date of Completion: *Ongoing* Date of most recent update: *3/30/05*

Storm Drain Inlet Labeling

Describe your storm drain inlet labeling program, including your labeling schedule, the details of your long-term maintenance plan, and plans on coordinating with watershed groups or other volunteer organizations.

The City will elect to utilize storm drain markers to label all of the approximately 300 storm drain inlets. The City will purchase sufficient markers with "No Dumping - Drains to River", a fish logo and inlet number imprinted. This program will be complete after the MS4 Sewer Subcatchments have been mapped.

These markers will be installed by the JCMUA staff, being the City is instituting a storm drain inlet numbering program concurrently with its inlet labeling program and tracking the program stats. It is envisioned that the storm drain inlets will be labeled on or before March 31, 2007.

During street sweeping and catch basin cleaning activities, the City will be checking the markers to ensure that they remain visible and legible. Should a marker be so damaged that it is illegible, it will be replaced.

SPPP Form 6 – MS4 Outfall Pipe Mapping

Municipality Information

Municipality: *City of Jersey City* County *Hudson*

NJPDES # : *0154091* PI ID #: *203005*

Team Member/Title: *Joseph Beckmeyer, Chief Engineer*

Effective Date of Permit Authorization (EDPA): *4/1/05*

Date of Completion: *Ongoing* Date of most recent update: *3/30/05*

Explain how you will prepare your map (include its type and scale, and the schedule for the mapping process). Who will prepare your map (e.g., municipal employees, a consultant, etc.)?

The City has existing sewer maps which will be used as a basis to prepare the MS4 Outfall Maps. The City will be performing work to locate catch basins and manholes by a handheld GPS system. The JCMUA will produce a map by the end of 2005. This existing map has the combined sewer subdrainage areas, delineated which represents approximately 63% of the entire sewer system service area; where the remaining 37% are served by separate storm and sanitary systems. The separated storm sewer areas exist around the combined sewer drainage areas, on the periphery. This map will also show the coordinate locations and name of the Stormwater Outfalls in Jersey City and the locations of any illicit connection monitoring points for each outfall that were necessary.

The City will prepare individual maps of each of the storm sewer outfalls and any associated monitoring points. The Mapping process will be completed as follows:

1) *preliminary maps will be prepared based on existing and historical sewer maps,*
2) *field investigations will be performed to identify the location of each outfall not previously identified through other City initiatives,*
3) *outfalls final discharge locations and monitoring points will be located by handheld GPS,*
4) *each stormwater subdrainage area will be labeled and its associated isolated sewer system will be identified on the maps by the street name on wich the outfall is located and each storm sewer subdrainage area will be assigned a number (i.e. SSDA-W1, SSDA-W2, SSDA-E1 for East and West side subdrainage areas etc.)*

SPPP Form 7 – Illicit Connection Elimination Program

Municipality Information

Municipality: *Cityof Jersey City* County *Hudson*

NJPDES # : *0154091* PI ID #: *203005*

Team Member/Title: *Joseph Beckmeyer, Chief Engineer*

Effective Date of Permit Authorization (EDPA): *4/1/05*

Date of Completion: *Ongoing* Date of most recent update: *4/1/05*

Describe your Illicit Connection Elimination Program, and explain how you plan on responding to complaints and/or reports of illicit connections (e.g., hotlines, etc.). Attach additional pages as necessary.

We will conduct the initial physical inspection of all of our outfall pipes during the mapping process. We will use the NJDEP Illicit Connection Inspection form (SPPP8) to conduct these inspections, and each of these forms will be kept with our SPPP records. Outfall pipes that are found to have dry weather flow or evidence of an intermittent non-stormwater flow will be rechecked again to locate the illicit connection. We will utilize the procedure as described on the following page to identify the illicit connection. If we are able to locate the illicit connection and the connection is within the City's jurisdiction, we will issue a summons to the responsible individual for violation of the City's Illicit Connection Ordinance and require the connection to be eliminated immediately. If, after the investigation we are unable to locate the source of the illicit connection, we will submit the Closeout Investigation Form with our Annual Inspection and Recertification. Should the illicit connection be found to originate from another public entity, the City of Jersey City will report the illicit connection to the NJDEP.

SPPP Form 7 – Illicit Connection Elimination Program – *cont'd*

Illicit Connection Identification Procedure:

Upon completion of the MS4 Sewer and Outfall Maps, the maps will be used to determine 3 key sewer junctions where the selected Storm Sewer Subdrainage Areas (SSDA) can be further divided to isolate 3 subareas. Each of the 3 key junction and monitoring locations will be clearly marked on the MS4 Sewer and Outfall Maps. Three field inspections will be performed on different random days at each of the SSDA's 3 key sewer junctions where a team of trained engineers and scientist will check the following :

1. Each site will be physically observed and inspected 3 times on different days for debris, waste, and/or odors that are normal indications of the presence of surfactants. With field chemical tests, we will detect whether wastewater or sanitary wastewater is present during dry weather periods.

2. Each site will have its dry weather sewer water flow tested, if present, for the presence of surfactants with field chemical tests. If surfactants are present at known high concentrations, it will be recorded as an indication grey wastewater is present during dry weather periods.

3. Each site will have its dry weather sewer water flow tested, if present, 3 times for the presence of ammonia with field chemical tests. If ammonia is present in concentrations normally associated with sewage, this will be an indication that sanitary wastewater is present during dry weather periods.

If a majority of the physical and chemical data indicates the presents of wastewater, it will warrant further investigation. The same procedure will be followed anytime an illegal report is report to the DPW.

SPPP Form 8 – Illicit Connection Records

Municipality Information

Municipality: *City of Jersey City* County *Hudson*

NJPDES # : *0154091* PI ID #: *203005*

Team Member/Title: *Joseph Beckmeyer, Chief Engineer*

Effective Date of Permit Authorization (EDPA): *4/1/04*

Date of Completion: *Ongoing* Date of most recent update: *3/30/05*

Prior to May 2, 2006

Note: *Attach a copy of each illicit connection report form for outfalls found to have a dry weather flow.*

Total number of inspections performed this year? _____

Number of outfalls found to have a dry weather flow? _____

Number of outfalls found to have an illicit connection? _____

How many illicit connections were eliminated? _____

Of the illicit connections found, how many remain? _____

May 2, 2006 – May 1, 2007

Note: *Attach a copy of each illicit connection report form for outfalls found to have a dry weather flow.*

Total number of inspections performed this year? _____

Number of outfalls found to have a dry weather flow? _____

Number of outfalls found to have an illicit connection? _____

How many illicit connections were eliminated? _____

Of the illicit connections found, how many remain? _____

May 2, 2007 – May 1, 2008

Note: *Attach a copy of each illicit connection report form for outfalls found to have a dry weather flow.*

Total number of inspections performed this year? _____

Number of outfalls found to have a dry weather flow? _____

Number of outfalls found to have an illicit connection? _____

How many illicit connections were eliminated? _____

Of the illicit connections found, how many remain? _____

May 2, 2008 – May 1, 2009

Note: *Attach a copy of each illicit connection report form for outfalls found to have a dry weather flow.*

Total number of inspections performed this year? _____

Number of outfalls found to have a dry weather flow? _____

Number of outfalls found to have an illicit connection? _____

How many illicit connections were eliminated? _____

Of the illicit connections found, how many remain? _____

SPPP Form 9 – Yard Waste Ordinance/Collection Program

Municipality Information

Municipality: *City of Jersey City* County *Hudson*

NJPDES # : *NJG0154091* PI ID #: *203005*

Team Member/Title: *Joseph Beckmeyer, Chief Engineer*

Effective Date of Permit Authorization (EDPA): *4/1/04*

Date of Completion: *Ongoing* Date of most recent update: *3/30/05*

Please describe your yard waste collection program. Be sure to include the collection schedule and how you will notify the residents and businesses of this schedule. Attach additional pages as necessary.

The City provides yard waste collection (leaves, trees, etc.) in the Fall. Collection is provided weekly by the City during this period. For collection of yard waste, the City is divided into multiple sectors. Collection is provided weekly with the recycling collection every Monday and Tuesday. Residents are required to place yard waste in brown bio-degradable bags or in open containers. No plastic bags are allowed. The schedule for collection and description of acceptable yard waste containers is published in the City's annual recycling calendar.

The City also currently provides weekly leaf collection during the months of October, November and December. Leaves are collected during this period if placed in piles at the curb. Collection is provided weekly during this period. The City will amend its ordinance requiring that yard waste be placed, at minimum, no closer than 10 feet from any storm sewer inlet and be placed at the curb or along the street no more than seven days prior to collection. The routes and associated collection schedule change annually.

SPPP Form 10 - Ordinances

Municipality Information

Municipality: *City of Jersey City* County *Hudson*

NJPDES # : *0154091* PI ID #: *203005*

Team Member/Title: *Joseph Beckmeyer, Chief Engineer*

Effective Date of Permit Authorization (EDPA): *4/1/04*

Date of Completion: *ongoing* Date of most recent update: *03/30/05*

For each ordinance, give the date of adoption. If not adopted, explain the development status:

Pet Waste *Currently being prepared for adoption.*

Are information sheets regarding pet waste distributed with pet licenses? Y ( ) N ( )

Litter *1995 (most recent amendment)*

Improper Waste Disposal *Currently being prepared for adoption.*

Wildlife Feeding *Currently being prepared for adoption.*

Yard Waste *Currently active*

Illicit Connections *Currently being prepared for adoption*

How will these ordinances be enforced?

The Sanitary Inspector, Health Inspector, Property Maintenance Inspectors and City Police Officers have and will continue to enforce these ordinances. Currently, violators of ordinances are issued a written warning upon the initial violation and a summons upon the citing of continued non-compliance. This violation process will continue to be implemented by the City.

The JCMUA will also prepare and distribute a "Pet Waste Pollutes Our Waters" brochure.

SPPP Form 11 – Storm Drain Inlet Retrofitting

Municipality Information

Municipality: City of Jersey City County Hudson

NJPDES # :NJG0154091 PI ID #: 203005

Team Member/Title: Joseph Beckmeyer, Chief Engineer

Effective Date of Permit Authorization (EDPA): 4/1/04

Date of Completion: Ongoing Date of most recent update: 3/30/05

What type of storm drain inlet design will generally be used for retrofitting?

Since 1995 the JCMUA has been installing new storm drain inlets which restrict solids and floatables at all new construction locations.

Repaving, repairing, reconstruction or alteration project name	Projected start date	Start date	Date of completion	# of storm drain inlets	# of storm drains w/ hydraulic exemptions

Are you claiming any alternative device exemptions or historic place exemptions for any of the above projects? Please explain:

The City is not claiming any alternative device exemptions or historic place exemptions for any of the projects noted above.

The City is replacing catch basins with the drain inlets which meet the standard contained in Attachment C of the Stormwater Permit. Specifically, the City is installing drain inlets in accordance with the specifications contained in the permit.

SPPP Form 12 – Street Sweeping and Road Erosion Control Maintenance

Municipality Information

Municipality: City of Jersey City County: Hudson

NJPDES # : NJG0154091 PI ID #: 203005

Team Member/Title: Joseph Beckmeyer, Chief Engineer

Effective Date of Permit Authorization (EDPA): *4/1/04*

Date of Completion: *Ongoing* Date of most recent update: *3/30/05*

Street Sweeping

Please describe the street sweeping schedule that you will maintain.
(NOTE: Attach a street sweeping log containing the following information: date and area swept, # of miles swept and the total amount of materials collected.)

The City currently provides diligent sweeping of all City owned curbed streets on a weekly basis.

A listing of the City's street sweeping routes will be provided in the MSWMP Appendices in the future.

Road Erosion Control Maintenance

Describe your Road Erosion Control Maintenance Program, including inspection schedules. A list of all sites of roadside erosion and the repair technique(s) you will be using for each site should be attached to this form.
(NOTE: Attach a road erosion control maintenance log containing the following information: location, repairs, date)

All of the City's owned roads are curbed. There are no shoulders, embankment, or ditches that are not adjacent to a curb.

SPPP Form 13 – Stormwater Facility Maintenance

Municipality Information

Municipality: City of Jersey City County: Hudson

NJPDES # :NJG0154091 PI ID #: 203005

Team Member/Title: Joseph Beckmeyer, Chief Engineer

Effective Date of Permit Authorization (EDPA): 4/1/04

Date of Completion: Ongoing Date of most recent update: 3/30/05

Please describe your annual catch basin cleaning program and schedule. Attach a map/diagram or additional pages as necessary.

A map will provide the location of each catch basin in the City in accordance with the MS4 Outfall mapping. 63% of area is the combined sewered areas of the City. The City will inspect each catch basin in the separated stormwater collection system drainage area on an annual basis. Those catch basins observed with debris, will be cleaned and inspected for proper function. Should catch basin repair be necessary, it will be scheduled for maintenance. The annual catch basins cleaning program is currently operating to clean Jersey City's more than 6000 catch basins within the storm and combined sewer systems.

Please describe your stormwater facility maintenance program for cleaning and maintenance of all stormwater facilities operated by the municipality. Attach additional pages as necessary.
(NOTE: Attach a maintenance log containing information on any repairs/maintenance performed on stormwater facilities to ensure their proper function and operation.)

The City will implement a stormwater facility maintenance program to ensure that all stormwater facilities operated by the City function properly. The City operates the following types of stormwater facilities:

- *catch basins*
- *storm drains*
- *infiltration basins*

These stormwater facilities will be inspected annually to ensure that they are functioning properly. In high risk areas, preventative maintenance will be performed on all stormwater facilities to ensure that they do not begin to fail.

SPPP Form 14 - Outfall Pipe Stream Scouring Remediation

Municipality Information

Municipality: City of Jersey City County: Hudson

NJPDES # : NJG0154091 PI ID #: 203005

Team Member/Title: Joseph Beckmeyer, Chief Engineer

Effective Date of Permit Authorization (EDPA): *4/1/04*

Date of Completion: *Ongoing* Date of most recent update: *3/30/05*

Describe your stormwater outfall pipe scouring detection, remediation and maintenance program to detect and control active, localized stream and stream bank scouring. Attach additional pages as necessary.

(NOTE: Attach a prioritized list of sites observed to have outfall pipe stream and stream bank scouring, date of anticipated repair, method of repair and date of completion.)

The City will implemen outfall pipe mapping and illicit connection programs as noted in SPPP Form 6 – MS4 Outfall Pipe Mapping and SPPP Form 7 – Illicit Connection Elimination Program. As noted on the forms, during the identification of the outfalls and illicit connection activities, the City will be also be checking for signs of scouring from outfall pipes operated by the City. Should scouring be evident, the City will place the outfall on the priority list and repair the area in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey (N.J.A.C. 2:90-1 (e.g., Conduit Outlet Protection 12-1). Those outfall areas in need of repair that do not require NJDEP permits may be done prior to other areas requiring a permit.

The City will use the form provided to identify all of the sites with outfall pipe stream scouring, the date repair is anticipated to be performed, the method of repair and the date the actual repair was completed. Subsequent to completion of the repair, the City will perform an annual inspection of the site to ensure that scouring has not resumed.

SPPP Form 15 – De-icing Material Storage

Municipality Information

Municipality: *City of Jersey City* County *Hudson*

NJPDES # : *NJG0154091* PI ID #: *203005*

Team Member/Title: *Joseph Beckmeyer, Chief Engineer*

Effective Date of Permit Authorization (EDPA): *4/1/04*

Date of Completion: *Ongoing* Date of most recent update: *3/30/05*

De-icing Material Storage

Describe how you currently store your municipality's de-icing materials, and describe your inspection schedule for the storage area. If your current storage practices do not meet the de-icing material storage SBR describe your construction schedule and your seasonal tarping interim measures. If you plan on sharing a storage structure, please include its location, as well as a complete list of all concerned public entities. If you store sand outdoors, describe how it meets the minimum standard.

The City currently stores its de-icing material in a stockpile located on a site on Route 440 at the Incinerator Authority.

SPPP Form 67 – Standard Operating Procedures

Municipality Information	
	Municipality: *City of Jersey City* County *Hudson*
	NJPDES # : *NJG0154091* PI ID #: *203005*
	Team Member/Title: *Joseph Beckmeyer, Chief Engineer*
	Effective Date of Permit Authorization (EDPA): *4/1/04*
	Date of Completion: *Ongoing* Date of most recent update: *3/30/05*

BMP	Date SOP went into effect	Describe your inspection schedule
Fueling Operations (including the required practices listed in Attachment D of the permit)		*Regular inspections will be conducted to ensure that the standard operating procedures (SOP) are being met.*
Vehicle Maintenance (including the required practices listed in Attachment D of the permit)		*Regular inspections will be conducted to ensure that the standard operating procedures (SOP) are being met.*
Good Housekeeping Practices (including the required practices listed in Attachment D of the permit) **Attach inventory list required by Attachment D of the permit.**		*Regular inspections will be conducted to ensure that the standard operating procedures (SOP) are being met.*

SPPP Form 17 – Employee Training

Municipality Information	
	Municipality: *City of Jersey City* County *Hudson*
	NJPDES # : *0154091* PI ID #: *203005*
	Team Member/Title: *Joseph Beckmeyer, Chief Engineer*
	Effective Date of Permit Authorization (EDPA): *4/1/04*
	Date of Completion: *Ongoing* Date of most recent update: *3/30/05*

Describe your employee training program. For each required topic, list the employees that will receive training on that topic, and the date the training will be held. Attach additional pages as necessary.

The courses and applicable attendees are noted below:

Waste Disposal Education: DPW, JCMUA, and JCIA employees, enforcement code officials, health department officials

Municipal Ordinances: DPW, JCMUA, and JCIA employees, code enforcement officials, City police, health department officials

Yard Waste Collection Program: DPW, JCMUA, and JCIA employees, code enforcement officials, City police

Illicit Connection Elimination and Outfall Pipe Mapping: DPW, JCMUA, and JCIA employees (field training)

Street Sweeping Program: DPW, JCMUA, and JCIA employees

Stormwater Facility Maintenance: DPW, JCMUA, and JCIA employees

Road Erosion Control: N/A

Outfall Pipe Stream Scouring Remediation: DPW, JCMUA, and JCIA employees

Maintenance Yard Operations: DPW, JCMUA, and JCIA employees

Construction Activity/Post-Construction Stormwaer Management in New Development and Redevelopment: Land Use Administrator

Unless otherwise noted, training of the above noted topics will either be provided in a classroom setting or through a computer generated training program. Training dates yet to be determined.

APPENDIX C

N.J.A.C. 7:8 “STORMWATER MANAGEMENT”

7:8-1.1 Scope and purpose

(a) This chapter establishes general requirements for stormwater management plans and stormwater control ordinances, as well as content requirements and procedures for the adoption and implementation of regional stormwater management plans and municipal stormwater management plans under the Municipal Land Use Law N.J.S.A. 40:55D-1 et seq.; the Water Quality Planning Act, N.J.S.A. 58:11A-1 et seq.: the Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq.; and the Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 et seq.; and implementing rules.

(b) This chapter establishes design and performance standards for stormwater management measures required by rules pursuant to the Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 et seq.; the Coastal Area Facility Review Act, N.J.S.A. 13:19-1 et seq.; the Wetlands Act of 1970, N.J.S.A. 13:9A-1 et seq.; the Waterfront Development Law, N.J.S.A. 12:5-3; the Freshwater Wetlands Protection Act, N.J.S.A. 13:9B-1 et seq.; and the Dam Safety Act, N.J.S.A. 58:4-1 et seq.

(c) This chapter establishes safety standards for stormwater management basins pursuant to N.J.S.A. 40:55D-95.1.

7:8-1.2 Definitions

The following words and terms, when used in this chapter, shall have the following meanings unless the context clearly indicates otherwise.

"CAFRA Planning Map" means the geographic depiction of the boundaries for Coastal Planning Areas, CAFRA Centers, CAFRA Cores and CAFRA Nodes pursuant to N.J.A.C. 7:7E-5B.3.

"CAFRA Centers, Cores or Nodes" means those areas within boundaries accepted by the Department pursuant to N.J.A.C. 7:8E-5B.

"Compaction" means the increase in soil bulk density.

"Core" means a pedestrian-oriented area of commercial and civic uses serving the surrounding municipality, generally including housing and access to public transportation.

"County review agency" means an agency designated by the County Board of Chosen Freeholders to review municipal stormwater management plans and implementing ordinance(s). The county review agency may either be:

1. A county planning agency; or

2. A county water resources association created under N.J.S.A. 58:16A-55.5, if the ordinance or resolution delegates authority to approve, conditionally approve, or disapprove municipal stormwater management plans and implementing ordinances.

"Department" means the Department of Environmental Protection.

"Designated Center" means a State Development and Redevelopment Plan Center as designated by the State Planning Commission such as urban, regional, town, village, or hamlet.

"Design engineer" means a person professionally qualified and duly licensed in New Jersey to perform engineering services that may include, but not necessarily be limited to, development of project requirements, creation and development of project design and preparation of drawings and specifications.

"Development" means the division of a parcel of land into two or more parcels, the construction, reconstruction, conversion, structural alteration, relocation or enlargement of any building or structure, any mining excavation or landfill, and any use or change in the use of any building or other structure, or land or extension of use of land, for which permission is required under the Municipal Land Use Law, N.J.S.A. 40:55D-1 et seq.

In the case of development on agricultural land, development means: any activity that requires a State permit; any activity reviewed by the County Agricultural Boards (CAB) and the State Agricultural Development Committee (SADC), and municipal review of any activity not exempted by the Right to Farm Act, N.J.S.A. 4:1C-1 et seq.

"Drainage area" means a geographic area within which stormwater runoff, sediments, or dissolved materials drain to a particular receiving waterbody or to a particular point along a receiving waterbody.

"Environmentally constrained area" means the following areas where the physical alteration of the land is in some way restricted, either through regulation, easement, deed restriction or ownership such as: wetlands, floodplains, threatened and endangered species sites or designated habitats, and parks and preserves. Habitats of endangered or threatened species are identified using the Department's Landscape Project as approved by the Department's Endangered and Nongame Species Program.

"Environmentally critical area" means an area or feature which is of significant environmental value, including but not limited to: stream corridors; natural heritage priority sites; habitats of endangered or threatened species; large areas of contiguous open space or upland forest; steep slopes; and well head protection and groundwater recharge areas. Habitats of endangered or threatened species are identified using the Department's

Landscape Project as approved by the Department's Endangered and Nongame Species Program.

"Empowerment Neighborhoods" means neighborhoods designated by the Urban Coordinating Council "in consultation and conjunction with" the New Jersey Redevelopment Authority pursuant to N.J.S.A. 55:19-69.

"Erosion" means the detachment and movement of soil or rock fragments by water, wind, ice or gravity.

"Impervious surface" means a surface that has been covered with a layer of material so that it is highly resistant to infiltration by water.

"Infiltration" is the process by which water seeps into the soil from precipitation.

"Lead planning agency" means one or more public entities having stormwater management planning authority designated by the regional stormwater management planning committee pursuant to N.J.A.C. 7:8-3.2, that serves as the primary representative of the committee.

"Major development" means any "development" that provides for ultimately disturbing one or more acres of land or increasing 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."

"Municipality" means any city, borough, town, township, or village.

"Node" means an area designated by the State Planning Commission concentrating facilities and activities which are not organized in a compact form.

"Nutrient" means a chemical element or compound, such as nitrogen or phosphorus, which is essential to and promotes the development of organisms.

"Person" means any individual, corporation, company, partnership, firm, association, political subdivision of this State and any state, interstate or Federal agency.

"Pollutant" means any dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, refuse, oil, grease, sewage sludge, munitions, chemical wastes, biological materials, medical wastes, radioactive substance (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. §§2011 et seq.)), thermal waste, wrecked or discarded equipment, rock, sand, cellar dirt, industrial, municipal, agricultural, and construction waste or runoff or other residue discharged directly or indirectly to the land, ground waters or surface waters of the State, or to a domestic treatment works. "Pollutant" includes both hazardous and nonhazardous pollutants.

"Recharge" means the amount of water from precipitation that infiltrates into the ground and is not evapotranspired.

"Sediment" means solid material, mineral or organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water or gravity as a product of erosion.

"Site" means the lot or lots upon which a major development is to occur or has occurred.

"Soil" means all unconsolidated mineral and organic material of any origin.

"State Development and Redevelopment Plan Metropolitan Planning Area (PA1)" means an area delineated on the State Plan Policy Map and adopted by the State Planning Commission that is intended to be the focus for much of the State's future redevelopment and revitalization efforts.

"State Plan Policy Map" is defined as the geographic application of the State Development and Redevelopment Plan's goals and Statewide policies, and the official map of these goals and policies.

"Stormwater" means water resulting from precipitation (including rain and snow) that runs off the land's surface, is transmitted to the subsurface, or is captured by separate storm sewers or other sewage or drainage facilities or conveyed by snow removal equipment.

"Stormwater runoff" means water flow on the surface of the ground or in storm sewers, resulting from precipitation.

"Stormwater management basin" means an excavation or embankment and related areas designed to retain stormwater runoff. A stormwater management basin may either be normally dry (that is, a detention basin or infiltration basin), retain water in a permanent pool (a retention basin), or be planted mainly with wetland vegetation (most constructed stormwater wetlands).

"Stormwater management measure" means any structural or nonstructural strategy, practice, technology, process, program, or other method intended to control or reduce stormwater runoff and associated pollutants, or to induce or control the infiltration or groundwater recharge of stormwater or to eliminate illicit or illegal nonstormwater discharges into stormwater conveyances.

"Stormwater management planning agency" means a public body authorized by legislation to prepare stormwater management plans.

"Stormwater management planning area" means the geographic area for which a stormwater management planning agency is authorized to prepare stormwater management plans, or a specific portion of that area identified in a stormwater management plan prepared by that agency.

"Tidal Flood Hazard Area" means a flood hazard area, which may be influenced by stormwater runoff from inland areas, but which is primarily caused by the Atlantic Ocean.

"Urban Coordinating Council Empowerment Neighborhood" means a neighborhood given priority access to State resources through the New Jersey Redevelopment Authority.

"Urban Enterprise Zones" means a zone designated by the New Jersey Urban Enterprise Zone Authority pursuant to the New Jersey Urban Enterprise Zones Act, N.J.S.A. 52:27H-60 et seq.

"Urban Redevelopment Area" is defined as previously developed portions of areas:
1. Delineated on the State Plan Policy Map (SPPM) as the Metropolitan Planning Area (PA1), Designated Centers, Cores or Nodes;
2. Designated as CAFRA Centers, Cores or Nodes;
3. Designated as Urban Enterprise Zones; and
4. Designated as Urban Coordinating Council Empowerment Neighborhoods.

"Waters of the State" means the ocean and its estuaries, all springs, streams, wetlands, and bodies of surface or ground water, whether natural or artificial, within the boundaries of the State of New Jersey or subject to its jurisdiction.

"Wetlands" or "wetland" means an area that is inundated or saturated by surface water or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation.

7:8-1.3 Program information

Questions or submissions regarding this chapter should be directed to the Division of Watershed Management, New Jersey Department of Environmental Protection, P.O. Box 418, Trenton, New Jersey 08625.

7:8-1.4 Severability

If the provisions of any section, subsection, paragraph, or clause of this chapter shall be judged invalid by a court of competent jurisdiction, such order or judgment shall not affect or invalidate the remainder of any section, subsection, paragraph, or clause of this chapter.

7:8-1.5 Relationship to other regulatory programs

(a) Nothing in this chapter shall be construed as preventing the Department or other agencies or entities from imposing additional or more stringent stormwater management requirements necessary to implement the purposes of any enabling legislation including those measures necessary to achieve the Surface Water Quality Standards at N.J.A.C. 7:9B.

(b) If a stormwater management measure is used as a soil erosion or sediment control measure, the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq., shall also apply.

(c) These stormwater requirements are the Department's standards referenced by the stormwater management provisions of the Residential Site Improvement Standards at N.J.A.C 5:21-7.

7:8-1.6 Applicability to Major Development

(a) Except as provided in (b) below, all major development shall comply with the requirements of this chapter.

(b) The following major development shall be subject to the stormwater management requirements in effect on February 1, 2004, copies of which are available from the Department at the address specified in N.J.A.C. 7:8-1.3:

1. Major development which does not require any of the Department permits listed in (c) below and which has received one of the following approvals pursuant to the Municipal Land Use Law (N.J.S.A. 40:55D-1 et seq.) prior to February 2, 2004:

i. Preliminary or final site plan approval;

ii. Final municipal building or construction permit;

iii. Minor subdivision approval where no subsequent site plan approval is required;

iv. Final subdivision approval where no subsequent site plan approval is required; or

v. Preliminary subdivision approval where no subsequent site plan approval is required;

2. Major development which has received one of the approvals pursuant to the Municipal Land Use Law (N.J.S.A. 40:55D-1 et seq.) in (1) above prior to February 2, 2004 and has secured at least one of the applicable permits listed in (c) below from the Department by February 2, 2004, and provided that the permit included a stormwater management review component.

3. Major development undertaken by any government agency, which does not require approval under the Municipal Land Use Law, N.J.S.A. 40:55D-1 et seq., provided the project has secured at least one of the applicable Department permits listed in (c) below prior to February 2, 2004, and provided that the permit included a stormwater management review component.

(c) For the purposes of this section, the term "permit" shall include transition area waivers under the Freshwater Wetlands Protection Act. In order to qualify under (b)2 or 3 above, the major development must have obtained at least one Department permit granted under the following statutes and, provided that the permit included a stormwater management review component, prior to February 2, 2004:

1. Flood Hazard Area Control Act, N.J.S.A. 58-16A-50 et seq.;

2. Freshwater Wetlands Protection Act, N.J.S.A. 13:9B-1 et seq.;

3. Coastal Area Facility Review Act, N.J.S.A. 13:19-1 et seq.;

4. Waterfront and Harbor Facilities Act, N.J.S.A. 12:5-3;

(d) An exemption provided by (b) above shall expire with the expiration, termination or other loss of duration or effect of either of the qualifying local approval or Department permit, whichever comes first. The expiration of local approvals under (b)1 above shall be governed by local ordinance. In the event there are multiple qualifying Department permits under (c) above, the expiration date is governed by that permit which expires last provided that the permit is still in effect. Once the exemption expires, the major development shall be subject to all requirements of this chapter upon reapplication for that permit and all subsequent permits or local approval(s) under the Municipal Land Use Law.

(e) An exemption under (b) above is limited to the land area and the scope of the project addressed by the qualifying approval(s) and permit(s). Exemptions under this section shall be deemed void if revisions are made to the qualifying approval or permit in (b) above, including approvals under the Municipal Land Use Law, unless upon application, the Department determines that each revision would have a de minims impact on water resources. In making this determination, the Department shall consider the extent of any impacts on water resources resulting from the revision, including, but not limited to:

1) increases in stormwater generated;

2) increases in impervious surface;

3) increases in stormwater pollutant loading;

4) changes in land use;

5) new encroachments in special water resource protection areas; and,

6) changes in vegetative cover.

(f) In case of conflict with the Coastal Permit Program Rules at N.J.A.C. 7:7-4.4(a)4, the requirements of this chapter shall supersede.

SUBCHAPTER 2. GENERAL REQUIREMENTS FOR STORMWATER MANAGEMENT PLANNING

7:8-2.1 Scope

This subchapter provides general principles applicable to all stormwater management plans and stormwater control ordinances, including the goals of stormwater management planning, the process for identification of stormwater management planning agencies, and stormwater management plan requirements.

7:8-2.2 Goals of stormwater management planning

(a) All stormwater management plans and stormwater control ordinances shall be designed to:

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. 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 nonpoint pollution;

7. Maintain the integrity of stream channels for their biological functions, as well as for drainage;

8. Minimize pollutants in stormwater runoff from new and existing development in order 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; and

9. Protect public safety through the proper design and operation of stormwater management basins.

7:8-2.3 Stormwater management planning agencies

(a) The following entities may be stormwater management planning agencies provided they are authorized under their enabling legislation to prepare stormwater management plans:

1. A municipality;
2. A county;
3. A county water resources agency or association;
4. A designated planning agency under N.J.A.C. 7:15;
5. A Soil Conservation District, in coordination with the State Soil Conservation Committee;
6. The Delaware River Basin Commission;
7. The Pinelands Commission;
8. The Delaware and Raritan Canal Commission;
9. The New Jersey Meadowlands Commission;
10. The Department; or
11. Other regional, State or interstate agencies.

7:8-2.4 Stormwater management plan requirements

(a) A stormwater management plan shall include structural and nonstructural stormwater management strategies necessary to meet the stormwater management goals of this chapter.

(b) A regional stormwater management plan shall comply with the requirements of this subchapter and N.J.A.C 7:8-3.

(c) A municipal stormwater management plan shall comply with the requirements of this subchapter and N.J.A.C 7:8-4.

(d) A stormwater management plan shall incorporate the safety standards for stormwater management basins at N.J.A.C. 7:8-6.

(e) In developing a stormwater management plan and identifying appropriate stormwater management measures thereunder, each stormwater management planning agency shall consider the physical characteristics and ecological resources of the stormwater management planning area.

(f) A stormwater management plan and any stormwater management ordinance shall be coordinated with any other stormwater management plans related to the same river basin or drainage area.

7:8-2.5 Exemptions

A municipality or other entity conducting stormwater management planning under this chapter may petition the Department at the address provided at N.J.A.C. 7:8-1.3 for an exemption to the requirements of this chapter by submitting documentation to demonstrate that, if granted, the exemption will not result in an increase in flood damage, water pollution, including threats to the biological integrity, or constitute a threat to the public safety.

SUBCHAPTER 3. REGIONAL STORMWATER MANAGEMENT PLANNING
7:8-3.1 Scope

(a) This subchapter describes stormwater management planning and implementation at the regional level, including plan elements; planning process; characterization; development of drainage area-specific objectives and standards; selection of stormwater management measures; strategy for implementing the measures and evaluating the effectiveness of the regional stormwater management plan; plan review, adoption, amendment or revision; and implementation and periodic evaluation of the plan.

(b) A regional stormwater management plan shall address stormwater-related water quality, ground water recharge and/or water quantity impacts of new and existing land uses in a regional stormwater management planning area. A regional stormwater management planning area shall consist of one or more continuous drainage areas. For example, a drainage area could be an area defined by a hydrologic unit code 14 (HUC14) as defined by the United States Geological Survey.

7:8-3.2 Regional stormwater management planning committee and lead planning agency

(a) A regional stormwater management planning committee (the committee) shall be established for the purposes of creating a regional stormwater management plan.

(b) A person or entity seeking to establish a regional stormwater management committee shall solicit participation from municipalities, interstate agencies, regional agencies, counties, designated planning agencies under N.J.A.C. 7:15, Soil Conservation

Districts, regional environmental commissions, Pinelands Commission, mosquito control and extermination commissions, public water supply and wastewater treatment utilities and agencies, lake associations, watershed associations, the watershed management planning area public advisory committee, environmental organizations, businesses, the Department and other appropriate State and Federal agencies and, members of the general public in the drainage area(s) to be addressed by the proposed plan. The solicitation for members of the general public to be part of the regional stormwater management planning committee can be performed through notices in local paper.

(c) The regional stormwater management planning committee shall designate a lead planning agency, which shall be recognized as the primary contact for the committee. The regional stormwater management planning committee, through the lead planning agency, shall:

1. Prepare the regional stormwater management plan;

2. Coordinate the regional stormwater management planning process with any applicable watershed management area planning process;

3. Provide opportunities for public participation throughout the regional stormwater management planning process; and

4. Perform other activities appropriate to facilitate the regional stormwater management planning process, including mediation, public information, providing technical assistance, and seeking and providing grants or other financial assistance, as available, to municipalities and/or local or regional agencies pursuant to N.J.S.A. 40:55D-99 or other applicable authority.

(d) A request for recognition as a regional stormwater management planning committee shall be submitted to the Department at the address listed in N.J.A.C. 7:8-1.3 by the lead planning agency, and include the following information:

1. A draft work plan and schedule for completing a regional stormwater management plan;

2. A copy of the mailing list used to solicit participation, including the entities identified in (b) above;

3. A copy of the letter of invitation to participate in the committee;

4. A copy of each response to the letter of invitation; and

5. In cases where no response from a public entity to the letter of invitation is

received within 60 days, the group shall send a follow-up request by certified mail, return receipt requested, and submit proof of such follow-up.

(e) The Department shall respond in writing within 45 days of the receipt of a complete request for recognition as a regional stormwater management planning committee. The Department shall either approve the application, request additional information or deny the request for recognition. Denials will include a justification for the decision.

The Department shall base approval or denial on the information submitted in the draft work plan and schedule for plan completion, completion of the requirements to involve and notify impacted parties, and whether there are other competing or overlapping requests for recognition for the same regional stormwater management planning area.

7:8-3.3 Regional stormwater management plan and elements

(a) A regional stormwater management plan shall incorporate, at a minimum, the following elements:

1. Identification of the lead planning agency and a description of the structure and members of the committee;

2. A statement of authority to develop and implement a stormwater management plan from public entities, as appropriate, represented on the regional stormwater management planning committee.

3. A characterization and assessment of the regional stormwater management planning area prepared in accordance with N.J.A.C. 7:8-3.4;

4. A statement of drainage area-specific water quality, groundwater recharge, and water quantity objectives established under N.J.A.C. 7:8-3.5;

5. The drainage area-specific stormwater-related water quality, groundwater recharge and water quantity design and performance standards established under N.J.A.C. 7:8-3.6;

6. The stormwater management measures selected in accordance with N.J.A.C. 7:8-3.7 and a summary of the rationale for the selection of each measure;

7. A description of the strategy for implementing the selected stormwater management measures for the regional stormwater management planning area and for evaluating the effectiveness of the regional stormwater management plan in accordance with N.J.A.C. 7:8-3.8, including a long-term monitoring program; and

8. To the extent elements of the plan do not represent the consensus of the committee, the plan shall identify and provide a discussion of the majority and minority positions.

(b) The regional stormwater management plan may also include:

1. Innovative stormwater measures and strategies such as nonpoint source pollutant trading, mitigation strategies, or special protection measures; and

2. A stream corridor protection plan to address protection of areas adjacent to waterbodies. For waterbodies subject to N.J.A.C. 7:8-5.5(h), the plan shall provide, at a minimum, protections equivalent to those provided at N.J.A.C. 7:8-5.5(h) and demonstrate that the functional value and overall condition of the special water resource protection area will be maintained or enhanced.

7:8-3.4 Characterization and assessment of the regional stormwater management planning area

(a) The regional stormwater management plan shall include a characterization and assessment that addresses the following components, unless the committee determines that a component is not appropriate for the regional stormwater management planning area and provides a rationale for not including the component:

1. Maps showing the following information. Maps developed on a Geographical Information System shall meet the Digital Data standards in N.J.A.C. 7:1D unless a rationale for a different format is provided.

i. The regional stormwater management planning area boundary;

ii. Existing land uses;

iii. Projected land uses assuming full development under existing zoning;

iv.. Soil mapping units based on the detailed soil maps in County Soil Surveys published by the U.S. Department of Agriculture or, in areas for which County Soil Surveys are not available, on information obtained from Soil Conservation Districts;

v. Topography based on the U.S. Geological Survey Topographic Map, 7.5 minute quadrangle series, or other sources of information depicting topography in similar or greater detail;

vi. Water bodies based on detailed map sheets in County Soil Surveys published by the U.S. Department of Agriculture; the U.S. Geological Survey Topographic Map, 7.5 minute quadrangle series; or other sources of information depicting water bodies in similar or greater detail;

vii. Coastal wetlands based on maps prepared by the Department under the Wetlands Act of 1970, N.J.S.A. 13:9A-1 et seq., and freshwater wetlands based on maps prepared by the Department under the Freshwater Wetlands Protection Act, N.J.S.A. 13:9B-1 et seq.;

viii. Flood hazard areas based on delineations made by the Department under the Flood Hazard Area Control Act, N.J.S.A. 58:16A-50 et seq. For a water body for which the Department has not delineated the flood hazard area, a map of the flood hazard area prepared in accordance with N.J.A.C. 7:13 is acceptable;

ix. Groundwater recharge areas and well head protection areas based on maps prepared by the Department or ordinances of an affected municipality;

x. Environmentally constrained areas and environmentally critical areas;

xi. River areas designated under the New Jersey Wild and Scenic Rivers Act, N.J.S.A. 13:8-45 et seq., or the Federal Wild and Scenic Rivers Act, 16 U.S.C. §§1278 et seq.;

xii. For each waterbody in the regional stormwater management planning area, identification of the waterbody or waterbody segment, the drainage area, and the classification of the waterbody pursuant to N.J.A.C. 7:9B-1.15;

xiii. Each waterbody designated as a water quality limited surface water pursuant to N.J.A.C. 7:15-6;

xiv. Man-made stormwater conveyance, storage and discharge systems, including municipal separate storm sewer outfall pipes and the drainage areas as appropriate for these outfall structures; and

xv. Source water areas of potable public surface water supply intakes and public water supply reservoirs available on the Departments webpage at www.nj.gov/dep/swap/;

2. A map showing jurisdictional boundaries within the regional stormwater management planning area of municipal, county, and other agencies with responsibility for implementing stormwater management;

3. Identification of the physical characteristics of the regional stormwater management planning area pertinent to stormwater management, such as slopes, swales and impoundment areas as necessary for completing the analysis in N.J.A.C. 7:8-3.4(a)4;

4. A water quality, groundwater recharge and water quantity hydrologic and hydraulic model or analysis of the regional stormwater management planning area which addresses existing land uses and projected land uses assuming full development under existing zoning and taking into account permanently preserved lands;

5. An identification and evaluation of existing municipal, county, State, Federal, and other stormwater-related groundwater recharge, water quality and water quantity regulations and programs shall be conducted, including, where applicable, programs to develop total maximum daily loads (TMDLs) in accordance with N.J.A.C. 7:15-7; and

6. A summary of information that has been identified as useful for purposes of stormwater management planning but that is not available for technical, financial, or other reasons.

(b) The Department encourages the use of existing information to the extent that it is available to minimize the cost of data acquisition, such as information available on the Department's Geographical Information System web site (www.state.nj.us/dep/gis) or as developed through a watershed planning process.

(c) The characterization and assessment shall include information on locations and activities outside the regional stormwater management planning area that drain into the planning area (for example, stormwater originating in an adjacent drainage area that is transferred to the stormwater management planning area).

(d) Using the modeling or other information obtained under (a) through (c) above, the stormwater-related water quality impacts of existing land uses and projected land uses assuming full development under existing zoning shall be identified and ranked in accordance with the following process:

1. Inventory existing and potential stormwater-related pollutant sources and stormwater-related pollutants in the regional stormwater management planning area.

i. Stormwater-related pollutant sources include, for example, urban and suburban development, roads, storm sewers, agriculture, mining, and waterfront development.

ii. Stormwater-related pollutants include, for example, nutrients, pathogens, hydrocarbons, metals, pesticides, sediments, and suspended solids;

2. For surface water bodies and/or segments thereof and aquifers and/or portions thereof in the regional stormwater management planning area, identify and describe the existing or designated uses that are or may be adversely affected by stormwater-related pollutants, and to the extent feasible, identify the source(s) of the pollutant. The use of the report and list prepared by the Department to comply with Federal Clean Water Act, Section 303(d) and 305(b) (33 USC §§1313(d) and 1315(b)) and underlying data, including biological assessments, is encouraged; and

3. Identify and rank the most significant existing and potential stormwater-related pollutants and, for each pollutant, identify and rank the sources.

(e) Using the modeling or other information obtained under (a) through (c) above for stormwater-related water quantity impacts and stormwater-related groundwater recharge impacts of existing and projected land uses assuming full development under existing zoning, the most significant existing and potential stormwater-related water quantity problems, including flooding, erosion, mosquitoes, base-flow reduction, ground water depletion, and associated ecosystem impacts, shall be identified and described. The problems shall be ranked based on consideration of threat to public health, safety, and welfare as evidenced by history of or potential for flood damage; risk of loss of or damage to water supplies; and risk of damage to the biological integrity of water bodies.

7:8-3.5 Drainage area-specific water quality, groundwater recharge and water quantity objectives

(a) The regional stormwater management plan shall identify drainage area-specific water quality, groundwater recharge and water quantity objectives that are consistent with the goals of stormwater management planning at N.J.A.C. 7:8-2.3, and address each of the stormwater-related pollutant sources and pollutants ranked under N.J.A.C. 7:8-3.4(d) and the water quantity and groundwater recharge problems ranked under N.J.A.C. 7:8-3.4(e). The objectives shall address the elimination, reduction, or minimization of stormwater-related impacts associated with new and existing land uses. The objectives developed for the regional stormwater management plan may take into consideration environmental, social, and economic factors.

(b) Notwithstanding (a) above, the drainage area -specific objectives for major development shall provide, at a minimum, the protection that would be achieved through the application of N.J.A.C. 7:8-5, Design and Performance Standards for Stormwater Management Measures.

(c) If a TMDL has been established pursuant to N.J.A.C. 7:15 for a waterbody or waterbody segment in the regional stormwater management planning area, drainage area-specific objectives shall incorporate the loading reductions established in the TMDL for stormwater sources of pollution. In addition, if a waterbody or waterbody segment in the regional stormwater management planning area is on the Department's list prepared to comply with Federal Clean Water Act, Section 303(d) (33 USC §§1313(d)) for one or more designated uses by stormwater runoff, then drainage area objectives shall be included that address the pollutants or pollution for which the waterbody is threatened or impaired.

7:8-3.6 Drainage area-specific design and performance standards

(a) The regional stormwater management plan shall identify drainage area-specific design and performance standards in order to meet the drainage area-specific water quality, groundwater recharge and water quantity objectives identified under N.J.A.C. 7:8-3.5.

(b) Drainage area-specific design and performance standards may include performance standards for control of stormwater quantity, erosion, groundwater recharge and stormwater quality, as well as design standards for particular structural and nonstructural stormwater management strategies.

(c) The design and performance standards for stormwater management measures for major development described in N.J.A.C. 7:8-5 shall be incorporated into the regional stormwater management plan. Alternative drainage area-specific design and performance standards may be developed provided the alternative standard is at least as protective as would be achieved under N.J.A.C. 7:8-5 when considered on a regional stormwater management planning area basis.

(d) For structural stormwater management measures, drainage area-specific design and performance standards shall conform to the general standards at N.J.A.C. 7:8-5.7.

(e) Drainage area-specific design and performance standards do not have to be uniform throughout a drainage area provided the drainage area, when considered in its entirety, satisfies N.J.A.C. 7:8-5.

7:8-3.7 Selection of stormwater management measures

(a) The regional stormwater management plan shall identify stormwater management measures necessary to achieve the drainage area-specific water quality, groundwater recharge and water quantity objectives developed in accordance with N.J.A.C. 7:8-3.5, and design and performance standards developed in accordance with N.J.A.C. 7:8-3.6.

(b) Stormwater management measures in the following categories shall be considered and selected, as appropriate:

1. Stormwater management measures for new land uses;

2. Stormwater management measures for existing land uses, including, for example, retrofit measures for the modification of existing structural stormwater management measures or other structures affecting stormwater runoff; elimination of illicit or illegal discharges; prevention or minimization of the exposure of pollutants to stormwater; and control of floatables;

3. Stormwater management measures that enhance, protect, and/or preserve land or water areas possessing characteristics or features that provide for flood control, maintenance or improvement of water quality, or conservation of natural resources (for example, land use controls, local and regional open space plans and taxes, buffer zones, redirecting, recharging or minimizing stormwater discharges, pretreatment and/or end-of-pipe treatment); and

4. Public education programs that address stormwater quantity and quality.

(c) A written rationale shall be provided for each selected stormwater management measure, including an analysis of feasibility, benefits and costs, estimated percent pollutant load reduction and anticipated performance longevity;

(d) Each selected stormwater management measure shall include, as appropriate, a program for preventative and corrective maintenance, including a long-term implementation schedule and identification of the entity responsible for implementation and maintenance.

7:8-3.8 Strategy for implementing and evaluating effectiveness of stormwater management measures

(a) The regional stormwater management plan shall include a strategy for implementing the stormwater management measures. The lead planning agency or another entity designated by the committee shall be responsible for coordination and tracking of the implementation of the regional stormwater management plan, including the long-term monitoring program.

(b) The implementation strategy shall:

1. Identify agencies and/or entities necessary to implement the measures and conduct the long-term monitoring program;

2. Identify the respective measures and/or monitoring each agency and/or entity will implement and the enabling mechanisms by which the measures will be implemented, including, for example, new or amended municipal ordinances or interagency agreements;

3. Establish a schedule for the implementation of the measures based on priority, including specific milestones for all mechanisms identified under (b)2 above;

4. Provide an estimate of short term and long term implementation costs to be incurred; and

5. Identify existing and potential private, local, State, and Federal funding sources to implement the regional stormwater management plan.

(c) The implementation strategy shall include a long-term monitoring program that will provide information about land use, water quality, water quantity, groundwater resources and riparian and aquatic habitat condition, as appropriate. Information for the monitoring program may include data obtained through watershed management, local, county, State, interstate, and/or Federal monitoring programs, including volunteer monitoring programs.

(d) The implementation strategy shall include a procedure for evaluating and then updating as necessary, at least every five years, the effectiveness of the implemented measures in achieving the objectives and design and performance standards established in the regional stormwater management plan.

7:8-3.9 Regional stormwater management plan review, adoption, and amendment and/or revision

(a) Upon completion of a regional stormwater management plan, the lead planning agency shall submit the plan to the Department and, if applicable, to the designated water quality management planning agency as an amendment to the areawide water quality management plan(s) in accordance with the Water Quality Management Planning Rules at N.J.A.C. 7:15.

(b) In reviewing a regional stormwater management plan submitted under (a) above, the Department shall determine whether the plan conforms to the requirements of this chapter. The Department will disapprove, return for additional information or proceed with a proposed amendment in accordance with N.J.A.C. 7:15-3.4(g).

(c) Modifications to an adopted regional stormwater management plan shall be processed as an amendment or revision in accordance with N.J.A.C. 7:15-3.4(b)5 or 3.5(b)5, as applicable.

7:8-3.10 Implementation of adopted regional stormwater management plan

(a) Once the regional stormwater management plan has been adopted pursuant to N.J.A.C. 7:8-3.9, implementation responsibilities are as follows:

1. The Department will use the adopted regional stormwater management plan as the basis for reviewing the stormwater management aspects of projects or activities regulated pursuant to Coastal Permit Program rules, N.J.A.C. 7:7; the Freshwater Wetland Protection Act rules, N.J.A.C. 7:7A; the Coastal Zone Management rules, N.J.A.C. 7:7E; the Flood Hazard Area Control Act rules, N.J.A.C. 7:13; the New Jersey Pollutant Discharge Elimination System rules, N.J.A.C 7:14A; and the Dam Safety Standards, N.J.A.C. 7:20. The requirements of this chapter are considered to be the minimum stormwater standards. Additional requirements may be imposed as necessary under the respective programs.

2. Each municipality in the regional stormwater management planning area shall incorporate the applicable provisions of the regional stormwater management plan into a new or amended municipal stormwater management plan and ordinances.

3. In accordance with the Residential Site Improvement Standards at N.J.A.C. 5:21-7, if a stormwater management plan for the region has been approved by the Department, stormwater management systems must conform with that plan.

4. The Department shall not issue a permit for a project or activity that conflicts with an Areawide Water Quality Management Plan pursuant to N.J.A.C. 7:15-3.1.

SUBCHAPTER 4. MUNICIPAL STORMWATER MANAGEMENT PLANNING

7:8-4.1 Scope

This subchapter describes stormwater management planning and implementation at the municipal level, including plan elements, county review and technical assistance, the schedule for adoption of the plan and ordinances, and variance or exemption from design and performance standards for stormwater management measures.

7:8-4.2 Municipal stormwater management plan and elements

(a) A municipal stormwater management plan shall address stormwater-related water quality, groundwater recharge and water quantity impacts of major development, and may also address stormwater-related water quality, water quantity and groundwater recharge impacts of existing land uses. For purposes of this subchapter, major development is limited to projects that ultimately disturb one or more acres of land.

(b) A municipal stormwater management plan and stormwater control ordinance(s) shall conform with applicable regional stormwater management plan(s).

(c) A municipal stormwater management plan shall, at a minimum:

1. Describe how the municipal stormwater management plan will achieve the goals of stormwater management planning set forth at N.J.A.C. 7:8-2.3;

2. Include maps showing water bodies based on Soil Surveys published by the U.S. Department of Agriculture; the U.S. Geological Survey Topographic Map, 7.5 minute quadrangle series; or other sources of information depicting water bodies in similar or greater detail;

3. Map groundwater recharge areas and well head protection areas based on maps prepared by the Department under N.J.S.A. 58:11A-13 or a municipal ordinance;

4. Describe how the municipal stormwater management plan incorporates design and performance standards in N.J.A.C.7: 8-5 or alternative design and performance standards adopted as a part of a regional stormwater management plan or water quality management plan;

5. Describe how adequate long-term operation as well as preventative and corrective maintenance (including replacement) of the selected stormwater management measures will be ensured;

6. Describe how the plan will ensure compliance with Safety Standards for Stormwater Management Basins at N.J.A.C. 7:8-6;

7. Describe how the municipal stormwater management plan is coordinated with the appropriate Soil Conservation District and any other stormwater management plans, including any adopted regional stormwater management plan, prepared by any stormwater management planning agency related to the river basins or drainage areas to which the plans and/or ordinances apply;

8. Evaluate the extent to which the municipality's entire master plan (including the land use plan element), official map and development regulations (including the zoning ordinance) implement the principles expressed in N.J.A.C. 7:8-5.3(b). This evaluation shall also be included (with updating as appropriate) in the reexamination report adopted under N.J.S.A. 40:55D-89;

9. Include a map of the municipality showing:

i. Projected land uses assuming full development under existing zoning, and

ii. The hydrologic unit code 14 (HUC14) drainage areas as defined by the United States Geological Survey; and an estimate, for each HUC14 drainage area, of the total acreage in the municipality of impervious surface and associated future nonpoint source pollutant load assuming full build out of the projected land uses.

10. At the option of the municipality, document that it has a combined total of less than one square mile of vacant or agricultural lands rather than provide the information required in (c)8 and 9 above. Agricultural lands may be excluded if the development rights to these lands have been permanently purchased or restricted by covenant, easement or deed. Vacant or agricultural lands in environmentally constrained areas may be excluded if the documentation also includes an overlay map of these areas at the same scale as the map under (c)10i below.

i. Documentation shall include an existing land use map at an appropriate scale to display the land uses of each parcel within the municipality. Such a map shall display the following land uses: residential (which may be divided into single family, two-to-four family, and other multi-family), commercial, industrial, agricultural, parkland, other public uses, semipublic uses, and vacant land;

11. In order to grant a variance or exemption from the design and performance standards in N.J.A.C. 7:8-5, include a mitigation plan that identifies what measures are necessary to offset the deficit created by granting the variance or exemption. The mitigation plan shall ensure that mitigation is completed within the drainage area and for the performance standard for which the variance or exemption was granted;

12. Include a copy of the recommended implementing stormwater control ordinance(s) requiring stormwater management measures, and

13. The municipal stormwater management plan may also include a stream corridor protection plan to address protection of areas adjacent to waterbodies. For waterbodies subject to N.J.A.C. 7:8-5.5(h), the plan shall provide, at a minimum, protections equivalent to those provided at N.J.A.C. 7:8-5.5(h) and be approved by the Department.

7:8-4.3 Schedule for adoption of municipal stormwater management plan and ordinances

(a) A municipality shall adopt a municipal stormwater management plan as an integral part of its master plan and official map in accordance with the schedule in (a)1 or 2 below, whichever is sooner. The requirements in N.J.A.C. 7:8-4.2(c)8 and 9 are not operative until February 2, 2006.

1. By the deadline established in a New Jersey Pollutant Discharge Elimination System permit obtained by the municipality for a municipal separate storm sewer system under N.J.A.C. 7:14A; or

2. By the next reexamination of the master plan under N.J.S.A. 40:55D-89, if a grant for 90 percent of the costs for the preparation of the municipal stormwater management plan has been made available to a municipality by the Department;

(b) Within one year after the municipality adopts the municipal stormwater management plan, the municipality shall adopt stormwater control ordinance(s) to implement the adopted plan and shall submit the adopted municipal stormwater management plan and ordinance(s) to the county review agency for approval. The adopted municipal stormwater management plan and ordinance(s) shall not take effect without approval by the county review agency.

(c) The municipality shall amend the municipal stormwater management plan and stormwater control ordinance(s) as necessary and submit the amended plan and amended ordinance(s) to the county review agency for approval.

(d) The municipality shall reexamine the municipal stormwater management plan at each reexamination of the municipality's master plan in accordance with N.J.S.A. 40:55D-89.

(e) Within one year of the adoption of a regional stormwater management plan as an amendment to the Areawide Water Quality Management Plan, or an amendment thereto, each municipality within the regional stormwater management planning area shall amend their respective municipal stormwater management plans and stormwater control ordinance(s) to implement the regional stormwater management plan.

7:8-4.4 County review process

(a) A municipality shall submit a copy of the adopted stormwater management plan and stormwater control ordinance(s) to the county review agency and the Department.

(b) In reviewing the adopted municipal stormwater management plan and ordinance(s), the county review agency shall consider whether the plan and ordinance(s) conform with the requirements of this chapter.

(c) In accordance with N.J.S.A. 40:55D-97, it is the county review agency's responsibility to review and approve, conditionally approve (specifying the necessary amendments to the plan and ordinance(s)) or disapprove the adopted municipal stormwater management plan and ordinance(s) within 60 calendar days of receipt of the plan and ordinance(s). If the county review agency does not approve, conditionally approve, or disapprove the plan or ordinance(s) within 60 calendar days, the plan and ordinance(s) shall be deemed approved. The county review agency shall issue a written decision to the municipality, with a copy to the Department.

(d) A municipal stormwater management plan and ordinance(s) approved under (c) above shall take effect immediately. A municipal stormwater management plan and ordinance(s) conditionally approved under (c) above shall take effect upon adoption by the municipality of the amendments specified by the county review agency.

(e) Within 30 days of the effective date of the municipal stormwater management plan and ordinance(s) under (d) above, the municipality shall place the plan and ordinance(s) on its website and notify the Department, the Soil Conservation District and State Soil Conservation Committee, or:

1. Submit a copy of the approved municipal stormwater management plan and ordinance(s) to the Department; and

2. Provide notice of such approval to the Soil Conservation District and the State Soil Conservation Committee and, upon request, submit a copy of the approved plan and ordinance(s).

7:8-4.5 Reservation of rights

The Department reserves the right to review stormwater management plans and ordinances for compliance with this subchapter and make recommendations to correct any deficiencies.

7:8-4.6 Variance or exemption from the design and performance standards for stormwater management measures

A municipality may grant a variance or exemption from the design and performance standards for stormwater management measures set forth in its approved municipal stormwater management plan and stormwater control ordinance(s), provided the municipal plan includes a mitigation plan in accordance with N.J.A.C. 7:8-4.2(c)11 and the municipality submits a written report to the county review agency and the Department describing the variance or exemption and the required mitigation.

SUBCHAPTER 5 DESIGN AND PERFORMANCE STANDARDS FOR STORMWATER MANAGEMENT MEASURES

7:8-5.1 Scope

(a) This subchapter establishes design and performance standards for stormwater management measures for major development intended to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving water bodies.

(b) The standards specified in this subchapter do not apply to major development if alternative design and performance standards that are at least as protective as would be achieved through this subchapter when considered on a regional stormwater management area basis are applicable under a regional stormwater management plan adopted in accordance with this chapter or a water quality management plan adopted in accordance with N.J.A.C. 7:15.

7:8-5.2 Stormwater management measures for major development

(a) Stormwater management measures for major development shall be developed to meet the erosion control, groundwater recharge, stormwater runoff quantity, and stormwater runoff quality standards at N.J.A.C. 7:8-5.4 and 5.5. To the maximum extent practicable, these standards shall be met by incorporating nonstructural stormwater management strategies at N.J.A.C. 7:8-5.3 into the design. If these measures alone are not sufficient to meet these standards, structural stormwater management measures at N.J.A.C. 7:8-5.7 necessary to meet these standards shall be incorporated into the design.

(b) The development shall incorporate a maintenance plan under N.J.A.C. 7:8-5.8 for the stormwater management measures.

(c) Stormwater management measures shall avoid adverse impacts of concentrated flow on habitat for threatened and endangered species as documented in the Department's Landscape Project or Natural Heritage Database established under N.J.S.A. 13:1B-15.147 through 15.150, particularly *Helonias bullata* (swamp pink) and/or *Clemmys muhlnebergi* (bog turtle).

(d) The following linear development projects are exempt from the groundwater recharge, stormwater runoff quantity, and stormwater runoff quality requirements at N.J.A.C. 7:8-5.4 and 5.5:

1. The construction of an underground utility line provided that the disturbed areas are revegetated upon completion;

2. The construction of an aboveground utility line provided that the existing conditions are maintained to the maximum extent practicable; and

3. The construction of a public pedestrian access, such as a sidewalk or trail with a maximum width of 14 feet, provided that the access is made of permeable material.

(e) A waiver from strict compliance from the groundwater recharge, stormwater runoff quantity, and stormwater runoff quality requirements at N.J.A.C. 7:8-5.4 and 5.5 may be obtained for the enlargement of an existing public roadway or railroad, or the construction or enlargement of a public pedestrian access, provided that the following conditions are met:

1. The applicant demonstrates that there is a public need for the project that cannot be accomplished by any other means;

2. The applicant demonstrates through an alternatives analysis, that through the use of nonstructural and structural stormwater management strategies and measures, the option selected complies with the requirements of N.J.A.C. 7:8-5.4 and 5.5 to the maximum extent practicable;

3. The applicant demonstrates that, in order to meet the requirements at N.J.A.C. 7:8-5.4 and 5.5 existing structures currently in use, such as homes and buildings would need to be condemned; and

4. The applicant demonstrates that it does not own or have other rights to areas, including the potential to obtain through condemnation lands not falling under (e)3 above within the upstream drainage area of the receiving stream, that would provide additional opportunities to mitigate for requirements of N.J.A.C. 7:8-5.4 and 5.5 that were not achievable on-site.

7:8-5.3 Nonstructural stormwater management strategies

(a) To the maximum extent practicable, the standards in N.J.A.C. 7:8-5.4 and 5.5 shall be met by incorporating nonstructural stormwater management strategies at N.J.A.C. 7:8-5.3 into the design. The persons submitting an application for review shall identify the nonstructural strategies incorporated into the design of the project. If the applicant contends that it is not feasible for engineering, environmental, or safety reasons to incorporate any nonstructural stormwater management strategies identified in (b) below into the design of a particular project, the applicant shall identify the strategy and provide a basis for the contention.

(b) Nonstructural stormwater management strategies incorporated into site design shall:

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 "time of concentration" from pre-construction to post-construction. "Time of Concentration" is defined as the time it takes for runoff to travel from the hydraulically most distant point of the drainage area to the point of interest within a watershed;

5. Minimize land disturbance including clearing and grading;

6. Minimize soil compaction;

7. Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides;

8. Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas; and

9. Provide other source controls to prevent or minimize the use or exposure of pollutants at the site in order to prevent or minimize the release of those pollutants into stormwater runoff. These source controls include, but are not limited to:

i. Site design features that help to prevent accumulation of trash and debris in drainage systems;

ii. Site design features that help to prevent discharge of trash and debris from drainage systems;

iii. Site design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at industrial or commercial developments; and

iv. When establishing vegetation after land disturbance, applying fertilizer in accordance with the requirements established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq., and implementing rules.

(c) Any land area used as a non structural stormwater management measure to meet the performance standards in N.J.A.C. 7:8-5.4 and 5.5 shall be dedicated to a government agency, subjected to a conservation restriction filed with the County Clerk's office, or subject to Department approved or equivalent restriction that ensures that measure or an equivalent stormwater management measure approved by the reviewing agency is maintained in perpetuity.

(d) Guidance for nonstructural stormwater management strategies is available in the New Jersey Stormwater Best Management Practices Manual available from the Department through the address listed at N.J.A.C. 7:8-1.3.

7:8-5.4 Erosion control, groundwater recharge and runoff quantity standards

(a) This section contains minimum design and performance standards to control erosion, encourage and control infiltration and groundwater recharge, and control stormwater runoff quantity impacts of major development.

1. The minimum design and performance standards for erosion control are those established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq. and implementing rules.

2. The minimum design and performance standards for groundwater recharge are as follows:

i. The design engineer shall, using the assumptions and factors for stormwater runoff and groundwater recharge calculations at N.J.A.C. 7:8-5.6, either:

(1) Demonstrate through hydrologic and hydraulic analysis that the site and its stormwater management measures maintain 100 percent of the average annual pre-construction groundwater recharge volume for the site; or

(2) Demonstrate through hydrologic and hydraulic analysis that the increase of stormwater runoff volume from pre-construction to post-construction for the two-year storm is infiltrated.

ii. This groundwater recharge requirement does not apply to projects within the "urban redevelopment area," or to projects subject to iii below.

iii.The following types of stormwater shall not be recharged:

(1) Stormwater from areas of high pollutant loading. High pollutant loading areas are areas in industrial and commercial developments where solvents and/or petroleum products are loaded/unloaded, stored, or applied, areas where pesticides are loaded/unloaded or stored; areas where hazardous materials are expected to be present in greater than 'reportable quantities' as defined by the United States Environmental Protection Agency (EPA) at 40 CFR 302.4; areas where recharge would be inconsistent with Department approved remedial action work plan or landfill closure plan and areas with high risks for spills of toxic materials, such as gas stations and vehicle maintenance facilities; and

(2) Industrial stormwater exposed to "source material." "Source material" means any material(s) or machinery, located at an industrial facility, that is directly or indirectly related to process, manufacturing or other industrial activities, which could be a source of pollutants in any industrial stormwater discharge to groundwater. Source materials include, but are not limited to, raw materials; intermediate products; final products; waste materials; by-products; industrial machinery and fuels, and lubricants, solvents, and detergents that are related to process, manufacturing, or other industrial activities that are exposed to stormwater.

iv. The design engineer shall assess the hydraulic impact on the groundwater table and design the site so as to avoid adverse hydraulic impacts. Potential adverse hydraulic impacts include, but are not limited to, exacerbating a naturally or seasonally high water table so as to cause surficial ponding, flooding of basements, or interference with the proper operation of subsurface sewage disposal systems and other subsurface structures in the vicinity or downgradient of the groundwater recharge area.

3. In order to control stormwater runoff quantity impacts, the design engineer shall, using the assumptions and factors for stormwater runoff calculations at N.J.A.C. 7:8-5.6, complete one of the following:

i. Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the two, 10, and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events;

ii. Demonstrate through hydrologic and hydraulic analysis that there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the two, 10, and 100-year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site. This analysis shall include the analysis of impacts of existing land uses and projected land uses assuming full development under existing zoning and land use ordinances in the drainage area;

iii.Design stormwater management measures so that the post-construction peak runoff rates for the two, 10 and 100-year storm events are 50, 75 and 80 percent, respectively, of the pre-construction peak runoff rates. The percentages apply only to the post-construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed; or

iv. In tidal flood hazard areas, stormwater runoff quantity analysis in accordance with i, ii, and iii above shall only be applied if the increased volume of stormwater runoff could increase flood damages below the point of discharge.

(b) Any application for a new agricultural development that meets the definition of major development at N.J.A.C. 7:8-1.2 shall be submitted to the Soil Conservation District for review and approval in accordance with the requirements of this section and any applicable Soil Conservation District guidelines for stormwater runoff quantity and erosion control. For purposes of this section, "agricultural development" means land uses normally associated with the production of food, fiber and livestock for sale. Such uses do not include the development of land for the processing or sale of food and the manufacture of agriculturally related products.

7:8-5.5 Stormwater runoff quality standards

Stormwater management measures shall be designed to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff generated from the water quality design storm by 80 percent of the anticipated load from the developed site, expressed as an annual average. Stormwater management measures shall only be required for water quality control if an additional one-quarter acre of impervious surface is being proposed on a development site. The requirement to reduce TSS does not apply to any stormwater runoff in a discharge regulated under a numeric effluent limitation for TSS imposed under the New Jersey Pollutant Discharge Elimination System (NJPDES) rules, N.J.A.C. 7:14A, or in a discharge specifically exempt under a NJPDES permit from this requirement. The water quality design storm is 1.25 inches of rainfall in two hours. Water quality calculations shall take into account the distribution of rain from the water quality design storm, as reflected in Table 1 below. The calculation of the volume of runoff may take into account the implementation of non-structural and structural stormwater management measures.

Table 1: Water Quality Design Storm Distribution

Time (Minutes)	Cumulative Rainfall (Inches)	Time (Minutes)	Cumulative Rainfall (Inches)
0	0.0000	65	0.8917
5	0.0083	70	0.9917
10	0.0166	75	1.0500
15	0.0250	80	1.0840
20	0.0500	85	1.1170
25	0.0750	90	1.1500
30	0.1000	95	1.1750
35	0.1330	100	1.2000
40	0.1660	105	1.2250
45	0.2000	110	1.2334
50	0.2583	115	1.2417
55	0.3583	120	1.2500
60	0.6250		

(b) For purposes of TSS reduction calculations, Table 2 below presents the presumed removal rates for certain BMPs designed in accordance with the New Jersey Stormwater Best Management Practices Manual. The BMP manual may be obtained from the address identified in N.J.A.C. 7:8-1.3 or found on the Department's website at www.njstormwater.org. The BMP manual and other sources of technical guidance are listed in N.J.A.C. 7:8-5.9(a). TSS reduction shall be calculated based on the removal rates for the BMPs in Table 2 below. Alternative removal rates and methods of calculating removal rates may be used if the design engineer provides documentation demonstrating the capability of these alternative rates and methods to the review agency. Where the Department is not the review agency, a copy of any approved alternative rate or method of calculating the removal rate shall be provided to the Department at the address at N.J.A.C. 7:8-1.3.

(c) If more than one BMP in series is necessary to achieve the required 80 percent TSS reduction for a site, the applicant shall utilize the following formula to calculate TSS reduction:

$$R = A + B - (AXB)/100$$

Where

R = total TSS percent load removal from application of both BMPs, and
A = the TSS percent removal rate applicable to the first BMP
B = the TSS percent removal rate applicable to the second BMP

Table 2: TSS Removal Rates for BMPs

Best Management Practice	TSS Percent Removal Rate
Bioretention Systems	90

Constructed Stormwater Wetland	90
Extended Detention Basin	40-60
Infiltration Structure	80
Manufactured Treatment Device	See N.J.A.C. 7:8-5.7(d)
Sand Filter	80
Vegetative Filter Strip	60-80
Wet Pond	50-90

(d) If there is more than one onsite drainage area, the 80 percent TSS removal rate shall apply to each drainage area, unless the runoff from the subareas converge on site in which case the removal rate can be demonstrated through a calculation using a weighted average.

(e) Stormwater management measures shall also be designed to reduce, to the maximum extent feasible, the post-construction nutrient load of the anticipated load from the developed site in stormwater runoff generated from the water quality design storm. In achieving reduction of nutrients to the maximum extent feasible, the design of the site shall include nonstructural strategies and structural measures that optimize nutrient removal while still achieving the performance standards in N.J.A.C. 7:8-5.4 and 5.5.

(f) Additional information and examples are contained in the New Jersey Stormwater Best Management Practices Manual, which may be obtained from the address identified in N.J.A.C. 7:8-1.3.

(g) In accordance with the definition of FW1 at N.J.A.C. 7:9B-1.4, stormwater management measures shall be designed to prevent any increase in stormwater runoff to waters classified as FW1.

(h) Special water resource protection areas shall be established along all waters designated Category One at N.J.A.C. 7:9B and perennial or intermittent streams that drain into or upstream of the Category One waters as shown on the USGS Quadrangle Maps or in the County Soil Surveys, within the associated HUC 14 drainage. These areas shall be established for the protection of water quality, aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, and exceptional fisheries significance of those established Category One waters. These areas shall be designated and protected as follows:

1. The applicant shall preserve and maintain a special water resource protection area in accordance with one of the following:

i. A 300-foot special water resource protection area shall be provided on each side of the waterway, measured perpendicular to the waterway from the top of bank outwards, or from the centerline of the waterway where the bank is not defined, consisting of existing vegetation or vegetation allowed to follow natural succession is provided.

ii. Encroachment within the designated special water resource protection area under (h)1i above shall only be allowed where previous development or disturbance has occurred (for example, active agricultural use, parking area or maintained lawn area). The encroachment shall only be allowed where applicant demonstrates that the functional value and overall condition of the special water resource protection area will be maintained to the maximum extent practicable. In no case shall the remaining special water resource protection area be reduced to less than 150 feet as measured perpendicular to the top of bank of the waterway or centerline of the waterway where the bank is undefined. All encroachments proposed under this subparagraph shall be subject to review and approval by the Department.

2. All stormwater shall be discharged outside of but may flow through the special water resource protection area and shall comply with the Standard For Off-Site Stability in the "Standards for Soil Erosion and Sediment Control in New Jersey," established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq. (See N.J.A.C. 2:90-1.3).

3. If stormwater discharged outside of and flowing through the special water resource protection area cannot comply with the Standard For Off-Site Stability in the "Standards for Soil Erosion and Sediment Control in New Jersey," established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq., (see N.J.A.C. 2:90-1.3), then the stabilization measures in accordance with the requirements of the above standards may be placed within the special water resource protection area, provided that:

i. Stabilization measures shall not be placed within 150 feet of the waterway;
ii. Stormwater associated with discharges allowed by this paragraph shall achieve a 95 percent TSS post construction removal rate;
iii. Temperature shall be addressed to ensure no impact on receiving waterway;
iv. The encroachment shall only be allowed where the applicant demonstrates that the functional value and overall condition of the special water resource protection area will be maintained to the maximum extent practicable;
v. A conceptual project design meeting shall be held with the appropriate Department staff and Soil Conservation District staff to identify necessary stabilization measures; and
vi. All encroachments proposed under this section shall be subject to review and approval by the Department.

4. A stream corridor protection plan may be developed by a regional stormwater management planning committee as an element of a regional stormwater management plan, or by a municipality through an adopted municipal stormwater management plan. If a stream corridor protection plan for a waterway subject to this subsection has been approved by the Department, then the provisions of the plan shall be the applicable special water resource protection area requirements for that waterway. A stream corridor protection plan for a waterway subject to this subsection shall maintain or enhance the

current functional value and overall condition of the special water resource protection area as defined above in (h)1i. In no case shall a stream corridor protection plan allow reduction of the Special Water Resource Protection Area to less than 150 feet as measured perpendicular to the waterway subject to this subsection.

5. This subsection does not apply to the construction of one individual single family dwelling that is not part of a larger development on a lot receiving preliminary or final subdivision approval on or before February 2, 2004, provided that the construction begins on or before February 2, 2009.

7:8-5.6 Calculation of stormwater runoff and groundwater recharge

(a) Stormwater runoff shall be calculated in accordance with the following:

1. The design engineer shall calculate runoff using one of the following methods:

i. The USDA Natural Resources Conservation Service (NRCS) methodology, including the NRCS Runoff Equation and Dimensionless Unit Hydrograph, as described in Section 4, National Engineering Handbook (NEH-4), dated July 2002, incorporated herein by reference as amended and supplemented. This methodology is additionally described in Technical Release 55 - Urban Hydrology for Small Watersheds (TR-55), dated June 1986, incorporated herein by reference as amended and supplemented. Information regarding the methodology is available from the Natural Resources Conservation Service website at http://www.wcc.nrcs.usda.gov/water/quality/common/neh630/4content.html or at Natural Resources Conservation Service, 220 Davidson Avenue, Somerset, New Jersey 08873; (732) 537-6040; or

ii. The Rational Method for peak flow and the Modified Rational Method for hydrograph computations. The rational and modified rational methods are described in "Appendix A-9 Modified Rational Method" in the Standards for Soil Erosion and Sediment Control in New Jersey, July 1999. This document is available from the State Soil Conservation Committee or any of the Soil Conservation Districts listed at N.J.A.C. 2:90-1.3(a)4. The location, address, and telephone number or each Soil Conservation District is available from the State Soil Conservation Committee, P.O. Box 330, Trenton, NJ 08625, 609-292-5540.

2. For the purpose of calculating runoff coefficients and groundwater recharge, there is a presumption that the pre-construction condition of a site or portion thereof is a wooded land use with good hydrologic condition. The term "runoff coefficient" applies to both the NRCS methodology at N.J.A.C. 7:8-5.6(a)1i and the Rational and Modified Rational Methods at N.J.A.C. 7:8-5.6(a)1i. A runoff coefficient or a groundwater recharge land cover for an existing condition may be used on all or a portion of the site if the design engineer verifies that the hydrologic condition has existed on the site or portion of the site for at least five years without interruption prior to the time of application. If more than

one land cover have existed on the site during the five years immediately prior to the time of application, the land cover with the lowest runoff potential shall be used for the computations. In addition, there is the presumption that the site is in good hydrologic condition (if the land use type is pasture, lawn, or park), with good cover (if the land use type is woods), or with good hydrologic condition and conservation treatment (if the land use type is cultivation.)

3. In computing pre-construction stormwater runoff, the design engineer shall account for all significant land features and structures, such as ponds, wetlands, depressions, hedgerows, or culverts, that may reduce pre-construction stormwater runoff rates and volumes.

4. In computing stormwater runoff from all design storms, the design engineer shall consider the relative stormwater runoff rates and/or volumes of pervious and impervious surfaces separately to accurately compute the rates and volume of stormwater runoff from the site. To calculate runoff from unconnected impervious cover, urban impervious area modifications as described in the NRCS Technical Release-55, Urban Hydrology for Small Watersheds or other methods may be employed.

5. If the invert of the outlet structure of a stormwater management measure is below the flood hazard design flood elevation as defined at N.J.A.C. 7:13, the design engineer shall take into account the effects of tailwater in the design of structural stormwater management measures.

(b) Groundwater recharge may be calculated in accordance with the following:

1. The New Jersey Geological Survey Geological Survey Report GSR-32 A Method for Evaluating Ground-Water-Recharge Areas in New Jersey, incorporated herein by reference as amended and supplemented. Information regarding the methodology is available from the New Jersey Stormwater Best Management Practices Manual; at New Jersey Geological Survey website at http://www.state.nj.us/dep/njgs/, or at New Jersey Geological Survey, 29 Arctic Parkway, P.O. Box 427, Trenton, NJ 08625-0427; (609) 984-6587.

7:8-5.7 Standards for structural stormwater management measures

(a) Standards for structural stormwater management measures are as follows:

1. Structural stormwater management measures shall be designed to take into account the existing site conditions, including, for example, environmentally critical areas; wetlands; flood-prone areas; slopes; depth to seasonal high water table; soil type, permeability and texture; drainage area and drainage patterns; and the presence of solution-prone carbonate rocks (limestone).

2. Structural stormwater management measures shall be designed to minimize maintenance, facilitate maintenance and repairs, and ensure proper functioning. Trash racks shall be installed at the intake to the outlet structure as appropriate. The parallel bars at the outlet structure shall be spaced no greater than one-third the width of the diameter of the orifice or one-third the width of the weir, with a minimum spacing between bars of one-inch and a maximum spacing between bars of six inches. For outlets with a width or diameter less than three inches, the parallel bars shall be spaced one inch apart. In addition, the design of trash racks must comply with the requirements of N.J.A.C. 7:8-6.2(a).

3. Structural stormwater management measures shall be designed, constructed, and installed to be strong, durable, and corrosion resistant. Measures that are consistent with the relevant portions of the Residential Site Improvement Standards at N.J.A.C. 5:21-7.3, 7.4 and 7.5 shall be deemed to meet this requirement.

4. At the intake to the outlet from the stormwater management basin, the orifice size shall be a minimum of two and one-half inches in diameter.

5. Stormwater management basins shall be designed to meet the minimum safety standards for stormwater management basins at N.J.A.C. 7:8-6.

(b) Stormwater management measure guidelines are available in the New Jersey Stormwater Best Management Practices Manual. Other stormwater management measures may be utilized provided the design engineer demonstrates that the proposed measure and its design will accomplish the required water quantity, ground water recharge and water quality design and performance standards established by this subchapter.

(c) Manufactured treatment devices may be used to meet the requirements of this subchapter, provided the pollutant removal rates are verified by the New Jersey Corporation for Advanced Technology and certified by the Department.

7:8-5.8 Maintenance requirements

(a) The design engineer shall prepare a maintenance plan for the stormwater management measures incorporated into the design of a major development.

(b) The maintenance plan shall contain specific preventative maintenance tasks and schedules; cost estimates, including estimated cost of sediment, debris, or trash removal; and the name, address, and telephone number of the person or persons responsible for preventative and corrective maintenance (including replacement). Maintenance guidelines for stormwater management measures are available in the New Jersey Stormwater Best Management Practices Manual. If the maintenance plan identifies a person other than the developer (for example, a public agency or homeowners' association) as having the responsibility for maintenance, the plan shall include documentation of such person's agreement to assume this responsibility, or of the developer's obligation to dedicate a stormwater management facility to such person under an applicable ordinance or regulation.

(c)Responsibility for maintenance shall not be assigned or transferred to the owner or tenant of an individual property in a residential development or project, unless such owner or tenant owns or leases the entire residential development or project.

(d) If the person responsible for maintenance identified under (b) above is not a public agency, the maintenance plan and any future revisions based on (h) below shall be recorded upon the deed of record for each property on which the maintenance described in the maintenance plan must be undertaken.

(e) Preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of nonvegetated linings.

(f) The person responsible for maintenance identified under (b) above shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.

(g) The person responsible for maintenance identified under (b) above shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed.

(h) The person responsible for maintenance identified under (b) above shall retain and make available, upon request by any public entity with administrative, health, environmental or safety authority over the site, the maintenance plan and the documentation required by (f) and (g) above.

(i) Nothing in this section shall preclude the municipality in which the major development is located from requiring the posting of a performance or maintenance guarantee in accordance with N.J.S.A. 40:55D-53.

7:8-5.9 Sources for technical guidance

(a) Technical guidance for stormwater management measures can be found in the documents listed at (a)1 and 2 below, which are available from Maps and Publications, Department of Environmental Protection, 428 East State Street, P.O. Box 420, Trenton, New Jersey, 08625; telephone (609) 777-1038.

1. Guidelines for stormwater management measures are contained in the New Jersey Stormwater Best Management Practices Manual, 2002 as amended. Information is provided on stormwater management measures such as:

i. Bioretention systems;
ii. Constructed stormwater wetlands;
iii. Dry wells;
iv. Extended detention basins;
v. Infiltration structures;
vi. Manufactured treatment devices;
vii. Pervious paving;
viii. Sand filters;
ix. Vegetative filter strip, and
x. Wet pond.

2. The New Jersey Department of Environmental Protection Stormwater Management Facilities Maintenance Manual, as amended.

(b) Additional technical guidance for stormwater management measures can be obtained from the following:

1. The "Standards for Soil Erosion and Sediment Control in New Jersey" promulgated by the State Soil Conservation Committee and incorporated into N.J.A.C. 2:90. Copies of these standards may be obtained by contacting the State Soil Conservation Committee or any of the Soil Conservation Districts listed in N.J.A.C. 2:90-1.3(a)4. The location, address, and telephone number of each Soil Conservation District may be obtained from the State Soil Conservation Committee, P.O. Box 330, Trenton, New Jersey 08625, 609-292-5540;

2. The Rutgers Cooperative Extension Service, 732-932-9306; and

3. The Soil Conservation Districts listed in N.J.A.C. 2:90-1.3(a)4. The location, address, and telephone number of each Soil Conservation District may be obtained from the State Soil Conservation Committee, P.O. Box 330, Trenton, New Jersey 08625, 609-292-5540.

SUBCHAPTER 6. SAFETY STANDARDS FOR STORMWATER MANAGEMENT BASINS

7:8-6.1 Scope

(a) This subchapter sets forth requirements to protect public safety through the proper design and operation of stormwater management basins. This subchapter applies to any new stormwater management basin.

(b) The provisions of this subchapter are not intended to preempt more stringent municipal or county safety requirements for new or existing stormwater management basins. Municipal and county stormwater management plans and ordinances may, pursuant to their authority, require existing stormwater management basins to be retrofitted to meet one or more of the safety standards in N.J.A.C. 7:8-6.2(a), (b) and (c)1 for trash racks, overflow grates, and escape provisions at outlet structures.

7:8-6.2 Requirements for trash racks, overflow grates and escape provisions

(a) A trash rack is a device designed to catch trash and debris and prevent the clogging of outlet structures. Trash racks shall be installed at the intake to the outlet from the stormwater management basin to ensure proper functioning of the basin outlets in accordance with the following:

1. The trash rack shall have parallel bars, with no greater than six-inch spacing between the bars;

2. The trash rack shall be designed so as not to adversely affect the hydraulic performance of the outlet pipe or structure;

3. The average velocity of flow through a clean trash rack is not to exceed 2.5 feet per second under the full range of stage and discharge. Velocity is to be computed on the basis of the net area of opening through the rack; and

4. The trash rack shall be constructed of rigid, durable, and corrosion resistant material and designed to withstand a perpendicular live loading of 300 lbs./ft sq.

(b) An overflow grate is designed to prevent obstruction of the overflow structure. If an outlet structure has an overflow grate, the grate shall comply with the following requirements:

1. The overflow grate shall be secured to the outlet structure but removable for emergencies and maintenance;

2. The overflow grate spacing shall be no greater than two inches across the smallest dimension; and

3. The overflow grate shall be constructed of rigid, durable, and corrosion resistant material and designed to withstand a perpendicular live loading of 300 lbs./ft sq.

(c) Stormwater management basins shall include escape provisions as follows:

1. If a stormwater management basin has an outlet structure, escape provisions shall be incorporated in or on the structure. Escape provisions include the installation of permanent ladders, steps, rungs, or other features that provide easily accessible means of egress from stormwater management basins. With the prior approval of the reviewing agency pursuant to N.J.A.C. 7:8-6.3(a), a free-standing outlet structure may be exempted from this requirement;

2. Safety ledges shall be constructed on the slopes of all new stormwater management basins having a permanent pool of water deeper than two and one-half feet. Safety ledges shall be comprised of two steps. Each step shall be four to six feet in width. One step shall be located approximately two and one-half feet below the permanent water surface, and the second step shall be located one to one and one-half feet above the permanent water surface. See N.J.A.C. 7:8-6 Appendix A for an illustration of safety ledges in a stormwater management basin; and

3. In new stormwater management basins, the maximum interior slope for an earthen dam, embankment, or berm shall not be steeper than three horizontal to one vertical.

7:8-6.3 Variance or exemption from safety standards

A variance or exemption from the safety standards for stormwater management basins may be granted only upon a written finding by the appropriate reviewing agency (municipality, county or Department) that the variance or exemption will not constitute a threat to public safety.

Appendix A: Illustration of safety ledges in a new stormwater management basin. Depicted is an elevational view.

CHAPTER 13
FLOOD HAZARD AREA CONTROL

SUBCHAPTER 2. PROJECT STANDARDS

7:13-2.8 Stormwater management

If a project or activity meets the definition of "major development" at N.J.A.C. 7:8-1.2, then the project or activity shall comply with the Stormwater Management rules at N.J.A.C. 7:8.

CHAPTER 15
WATER QUALITY MANAGEMENT PLANNING

SUBCHAPTER 3. PLAN ASSESSMENT, AMENDMENT AND ADOPTION

7:15-3.4 Water quality management plan amendment procedures

(a) (No change.)

(b) Procedures for amendment of the Statewide WQM Plan are as follows:

1. Water quality related provisions in present and future rules adopted by the Department shall be considered to be part of the Statewide WQM Plan. Such provisions may not be adopted, amended, or repealed through the WQM plan amendment process under (b) 6 below.

2. Priority systems, intended use plans and project priority lists for wastewater facilities that are developed by the Department and accepted by the United States Environmental Protection Agency (USEPA) pursuant to USEPA regulations, or that otherwise are developed by the Department under N.J.A.C. 7:22, shall be considered to be part of the Statewide WQM Plan. Such priority systems and project priority lists shall be adopted or revised in accordance with USEPA regulations and N.J.A.C. 7:22, as appropriate, and shall not be adopted or revised through the WQM plan amendment process under (b) 6 below.

3. Statewide Sludge Management Plans, District Sludge Management Plans and sludge management rules that are promulgated or approved by the Department pursuant to N.J.S.A. 13:1E-1 et seq. shall be considered to be part of the Statewide WQM Plan. Such plans and rules shall be promulgated, revised, updated or approved in accordance with N.J.S.A. 13:1E-1 et seq., and shall not be promulgated, revised, updated, or approved through the WQM plan amendment process under (b) 6 below.

4. Lists of water quality limited segments, lists of segments where TMDLs will be developed, and project priority lists for TMDL development which are developed by the Department under N.J.A.C. 7:15-6 shall be adopted as amendments to the Statewide WQM Plan. TMDLs developed in accordance with N.J.A.C. 7:15-7 shall be adopted as amendments to the relevant Areawide WQM Plan(s). However, such lists, and TMDLs shall be adopted or revised in accordance with N.J.A.C. 7:15-6 or 7:15-7, as appropriate, and shall not be adopted or revised through the WQM plan amendment process under (b) 6 below. The Department may also publish a draft amendment as an Interested Party Review document or as a pre-proposal prior to formal proposal of the amendment.

5. A regional stormwater management plan prepared in accordance with N.J.A.C. 7:8-3 shall be submitted only by a lead planning agency as a proposed amendment to the applicable areawide WQM plan. In addition, the following changes to an adopted

regional stormwater management plan shall be processed as amendments to applicable areawide WQM Plans under this section:

i. The addition, deletion or modification to any of the drainage area-specific water quality, ground water recharge or water quantity objectives identified under N.J.A.C. 7:8-3.5;

ii. The addition, deletion or modification to any drainage area-specific design or performance standard developed under N.J.A.C. 7:8-3.6;

iii. Any modification to a regional stormwater management plan that the Department or designated planning agency determines is likely to have a significant environmental, social, or economic impact; or

iv. Any modification that the applicant requests be processed as an amendment.

6. Components of the Statewide WQM Plan other than (b)1 through 5 above may be amended by using the procedure specified in (g) below, except that the Commissioner shall render the final decision identified in (g)9 below.

(c)-(f) (No change.)

(g) Except as provided in (h) below, the Department procedure for amendment of areawide WQM plans is as follows:

1. – 2. (No change.)

3. The Department shall notify the applicant and the applicable designated planning agency, if any, in writing of its decision under (g)2 above. If the Department's decision is to proceed further with the amendment request under (g)2iii above, then this notification shall include the public notice that shall be given for the proposed amendment. If the proposed amendment is a regional stormwater management plan, the Department shall also notify the Department of Community Affairs and the Department of Agriculture. The applicant shall request written statements of consent under (g)4 below, and shall give public notice by publication in a newspaper of general circulation at the applicant's expense. The Department shall maintain a list identifying the newspaper that shall be used for this purpose in each planning area. The public notice shall also be published in the New Jersey Register. In cases where such Department decisions include a requirement for a non-adversarial public hearing, the public notice shall provide at least 30 days notice of the hearing.

4.-11. (No change.)

(h)-(l) (No change.)

7:15-3.5 Water quality management plan review, revision, and certification

(a) (No change.)

(b) The Department and the designated planning agencies shall prepare revisions to Statewide and areawide WQM Plans under this section whenever such revisions are necessary to:

1. - 2. (No change.)

3. Revise schedules for submission of wastewater management plans under N.J.AC. 7:15-5.23(g);

4. Provide for the following substantive changes in Statewide and areawide WQM plans where the Department determines no significant individual or cumulative impacts will occur to environmentally sensitive areas or other natural resources (such as water supplies) due to the proposed revision (individually or in combination with past revisions in the area), that the changes are consistent with N.J.AC. 7:15-3.6 and 3.7, and that certain directly affected municipal and county agencies and other interests as identified by the Department have been provided an opportunity to review and comment on the proposed revision:

i. - iv. (No change.)

v. Expansion of a future sewer service area to contiguous lots, where the expansion involves less than 100 acres, contributes less than 8,000 gallons per day of additional wastewater flow, and does not create a significantly new pattern of sewered development such that a significant potential or incentive is created for additional revisions or amendments to open new areas to sewered development; or

5. Provide for any modification in an adopted regional stormwater management plan that does not require an amendment under N.J.A.C. 7:15-3.4(b)5.

(c) - (f) (No change.)

CHAPTER 20
DAM SAFETY STANDARDS

SUBCHAPTER 1. APPLICATION PROCEDURE; DESIGN CRITERIA FOR DAM CONSTRUCTION; DAM INSPECTION PROCEDURE

7:20-1.3 Permit-by-rule

(a) All dams must be designed, constructed, operated, maintained or removed in compliance with the rules in this subchapter except as set forth below:

1. Owners and operators of Class IV dams (see N.J.A.C. 7:20-1.8), Dam classification) are not required to file documents with nor obtain a permit from the Department, but must meet the following requirements, in addition to those set forth elsewhere in this subchapter:

i. (No change.)

ii. All necessary local approvals must be obtained;
iii. A New Jersey licensed professional engineer must design the Class IV Dam to meet all technical requirements of this subchapter; and

iv. If the Class IV dam is designed or constructed for stormwater management purposes, the dam shall comply with the Stormwater Management Rules at N.J.A.C. 7:8.

2. (No change.)

(c) (No change.)

APPENDIX D

EPA BMP FACT SHEETS AND

MANUFACTURERS' STORMWATER TREATMENT DEVICES

United States
Environmental Protection
Agency

Office of Water
Washington, D.C.

EPA 832-F-99-007
September 1999

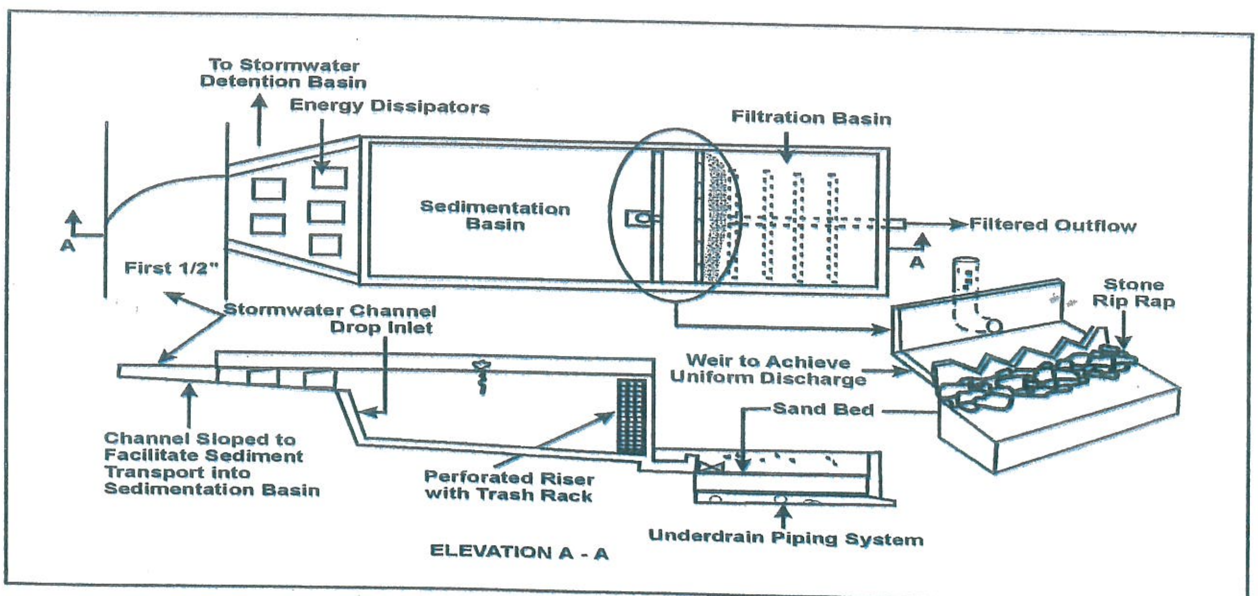
Storm Water Technology Fact Sheet
Sand Filters

DESCRIPTION

Sand filters have proven effective in removing several common pollutants from storm water runoff. Sand filters generally control storm water quality, providing very limited flow rate control.

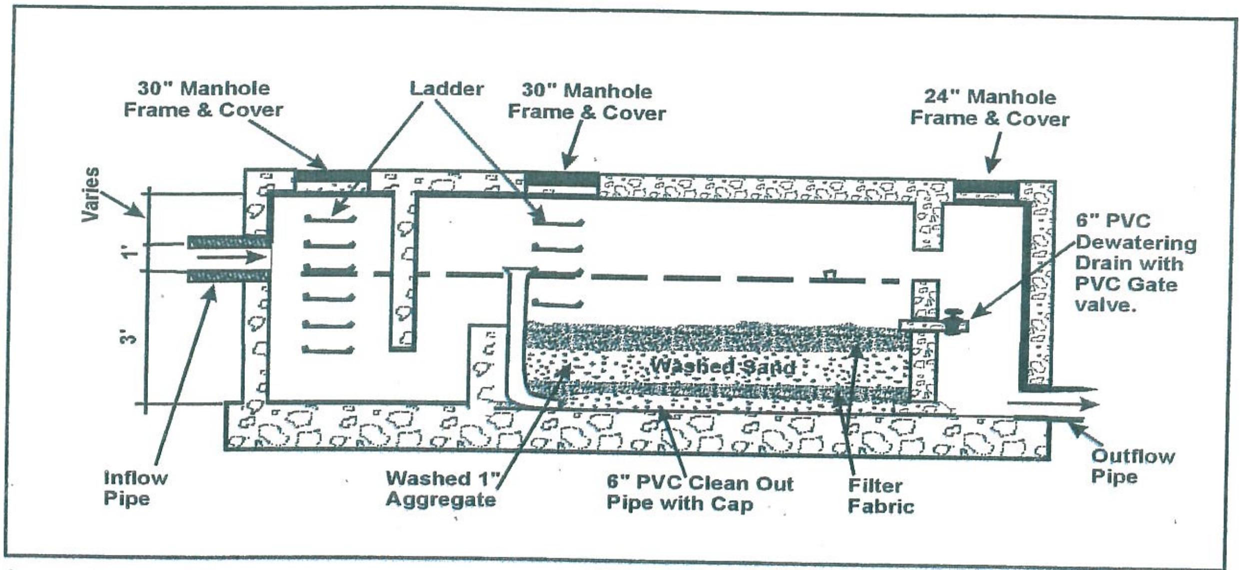
A typical sand filter system consists of two or three chambers or basins. The first is the sedimentation chamber, which removes floatables and heavy sediments. The second is the filtration chamber, which removes additional pollutants by filtering the runoff through a sand bed. The third is the discharge chamber. The treated filtrate normally is then discharged through an underdrain system either to a storm drainage system or directly to surface waters. Sand filters take up little space and can be used on highly developed sites and sites with steep slopes. They can be added to retrofit existing sites. Sand filters are able to achieve high removal efficiencies for sediment, biochemical oxygen demand (BOD), and fecal coliform bacteria. Total metal removal, however, is moderate, and nutrient removal is often low.

There are three main sand filter designs currently in common use: the Austin sand filter (Figure 1); the Washington, D.C., sand filter (Figure 2); and the



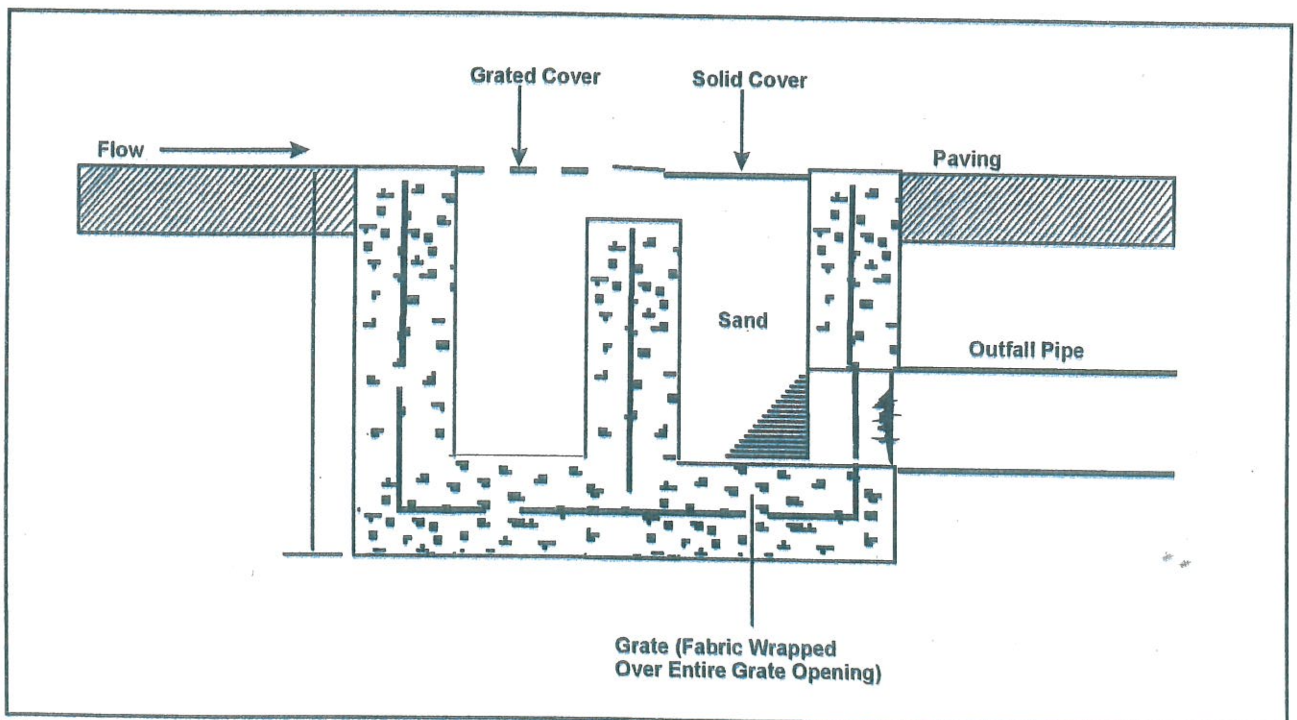
Source: Schueler, 1992.

FIGURE 1 TYPICAL AUSTIN SAND FILTER DESIGN



Source: Troung, 1989.

FIGURE 2 TYPICAL WASHINGTON, D.C. SAND FILTER DESIGN



Source: Shaver, 1991.

FIGURE 3 TYPICAL DELAWARE SAND FILTER DESIGN

Delaware sand filter (Figure 3). The primary differences among these designs are location (i.e., above or below ground), the drainage area served, their filter surface areas, their land requirements, and the quantity of runoff they treat.

Modifications that may improve sand filter design and performance are being tested. One modification is the addition of a peat layer in the filtration chamber. The addition of peat to the sand filter may increase microbial growth within the sand filter and improve metals and nutrient removal rates.

APPLICABILITY

Sand filters are intended primarily for water quality enhancement. In general, sand filters are preferred over infiltration practices, such as infiltration trenches, when contamination of groundwater with conventional pollutants - BOD, suspended solids, and fecal coliform - is of concern. This usually occurs in areas where underlying soils alone cannot treat runoff adequately - or ground water tables are high. In most cases, sand filters can be constructed with impermeable basin or chamber bottoms, which help to collect, treat, and release runoff to a storm drainage system or directly to surface water with no contact between contaminated runoff and groundwater.

The selection of a sand filter design depends largely on the drainage area's characteristics. For example, the Washington, D.C., and Delaware sand filter systems are well suited for highly impervious areas where land available for structural controls is limited, since both are installed underground. They are often used to treat runoff from parking lots, driveways, loading docks, service stations, garages, airport runways/taxiways, and storage yards. The Austin sand filtration system is more suited for large drainage areas that have both impervious and pervious surfaces. This system is located at grade and is often used at transportation facilities, in large parking areas, and in commercial developments.

In general, all three types of sand filters can be used as alternatives for water quality inlets. They are more frequently used to treat runoff contaminated with oil and grease from drainage areas with heavy vehicle usage. In regions where evaporation exceeds rainfall and a wet pond would be unlikely to maintain the required permanent pool, the Austin sand filtration system can be used.

ADVANTAGES AND DISADVANTAGES

Sand filters can be highly effective storm water best management practices (BMPs). All three types of sand filters achieve high removal rates for sediment, BOD, and fecal coliform bacteria. The filter media is periodically removed from the filter unit, thus also permanently removing trapped contaminants. Waste media from the filters does not appear to be toxic and is environmentally safe for landfill disposal. If they are designed with an impermeable basin liner, sand filters can also reduce the potential for groundwater contamination. Finally sand filters also generally require less land than other BMPs, such as ponds or wetlands.

The size and characteristics of the drainage area, as well as the pollutant loading, will greatly influence the effectiveness of the sand filter system. For example, sand filters may be of limited value in some applications because of they are designed to handle runoff from relatively small drainage areas and they have low nutrient removal and metal removal capabilities. In these cases, other BMPs, such as wet ponds, may be less costly and/or more effective. The system also requires routine maintenance to prevent sediment from clogging the filter. In some cases, filter media may need to be replaced 3 to 5 years. Lastly, sand filters generally do not control storm water flow, and consequently, they do not prevent downstream stream bank and channel erosion.

Climatic conditions may also limit the filter's performance. For example, it is not yet known how well sand filters will operate in colder climates or in freezing conditions.

DESIGN CRITERIA

Typically the Austin sand filter system is designed to handle runoff from drainage areas up to 20 hectares (50 acres). The collected runoff is first diverted to the sedimentation basin, where heavy sediments and floatables are removed. There are two designs for the sedimentation basin: the full sedimentation system, as shown in Figure 1; and a partial sedimentation system, where only the initial flow is diverted. Both systems are located off-line and are designed to collect and treat the first 1.3 centimeters (0.5 inches) of runoff. The partial system has the capacity to hold only a portion (at least 20 percent) of the first flush volume in the sedimentation basin, whereas the full system captures and holds the entire flow volume.

Equations used to determine the sedimentation basin surface areas (As) in square and meters acres are shown in Table 1.

TABLE 1 SURFACE AREA EQUATION FOR AUSTIN SAND FILTER SYSTEM

Partial Sedimentation	Full Sedimentation
As=(AD)(H)/(1/Ds-1/10)	As=(AD)(H)/10
Af=(AD)(H)/10	Af=(AD)(H)/18

Note: Designed to collect and treat 0.5 inches of runoff.
Ds (feet)=depth of the sedimentation basin.
H (feet)=depth of rainfall, 0.042ft (0.5 in).
AD(acres)=impervious and pervious areas that provide contributing drainage.

Source: Galli, 1990.

Flow is conveyed from the sedimentation basin, through a perforated riser, a gabion wall, or a berm, to the filtration basin. The filtration basin consists of a 45-centimeter (18-inch) layer of sand particles 0.05 to 0.10 centimeters (0.02 to 0.04 inches) in diameter that may be underlain by a gravel layer. Equations used to determine the surface areas (Af) in acres are also shown in Table 1. The filtrate is discharged from the filtration basin through underdrain piping 10 to 15 centimeters (4 to 6 inches) in diameter with 1-centimeter (0.4 inch) perforations. Filter fabric is placed around the underdrain piping to prevent sand and other particulates from being discharged.

Typically, the Washington, D.C., sand filter system is designed to handle runoff from completely impervious drainage areas of 0.4 hectares (1 acre) or less. The system, as shown in Figure 2, consists of three underground chambers: a sedimentation chamber, a filtration chamber, and a discharge chamber. The sand filter system is designed to accept the first 1.3 centimeters (0.5 inches) of runoff. Coarse sediments and floatables are removed from the runoff within the sedimentation chamber. Runoff is discharged from the sedimentation chamber through a submerged weir, into the filtration chamber, which consists of a combination of sand and gravel layers totaling 1 meter (3 feet) in depth with underdrain piping wrapped in filter fabric. The underdrain system collects the filtered water and discharges it to the third chamber, where the water is collected and discharged to a storm water channel or sewer system. An overflow weir is located between the second and third chambers to bypass excess flow. The Washington, D.C., sand filter is often constructed on-line, but can be constructed off-line. When the system is off-line, the overflow between the second and third chambers is not included.

The Delaware sand filter, shown in Figure 3, is similar to the Washington, D.C., sand filter in that both utilize underground concrete vaults. However, the Delaware sand filter has only two chambers: a sedimentation chamber and a filtration chamber. A 2.5-centimeter (1 inch) design storm was selected for sizing the sedimentation basin because it is representative of large storm events: in Delaware, 92 percent of all storms are less than 2.5 centimeters (1 inch) in depth. Runoff enters the sedimentation chamber through a grated cover and then overflows into the filtration chamber, which contains a sand layer 45 centimeters (18 inches) in depth. Gravel is not normally used in the filtration chamber although the filter can be modified to include it. Typical systems are designed to handle runoff from drainage areas of 2 hectares (5 acres) or less. A major advantage of the Delaware sand filter is its shallow structure depth of only 76 centimeters (30 inches), which reduces construction and maintenance costs.

Proper design and maintenance are also critical factors in maintaining the operating life of any filter system. The life of the filter media may be increased by a number of methods, including:

- Stabilizing the drainage area so that sediment loadings in the runoff are minimized.
- Providing adequate storm water detention times to enhance sedimentation and filtration.
- Inspecting and maintaining the sand filter frequently enough to ensure proper operation.

PERFORMANCE

Sand filters are currently in use in Delaware, Maryland, Florida, Texas, Virginia, and Washington, D.C. Studies on the systems' pollutant removal efficiencies are currently being performed in Washington, D.C., and Austin, TX. Additional evaluations are needed to evaluate alternative sand filter designs and media. Sand filters remove particulates in both the sedimentation and the filtration chambers. The City of Austin has estimated their systems' pollutant removal efficiencies based on preliminary findings of their storm water monitoring program (Austin, 1988). The estimates shown in Table 2 are average values for various sand filters serving drainage areas of several different sizes. As shown in Table 2, no removal of nitrate was observed. No other dissolved pollutants were monitored. Additional monitoring is currently being performed by the City of Austin to supplement the preliminary estimates.

TABLE 2 TYPICAL POLLUTANT REMOVAL EFFICIENCY

Pollutant	Percent Removal
Fecal Coliform	76
Biochemical Oxygen Demand (BOD)	70
Total Suspended Solids (TSS)	70
Total Organic Carbon (TOC)	48
Total Nitrogen (TN)	21
Total Kjeldahl Nitrogen (TKN)	46
Nitrate as Nitrogen (NO_3-N)	0
Total Phosphorus (TP)	33
Iron (Fe)	45
Lead (Pb)	45
Zinc (Zn)	45

Source: Galli, 1990

OPERATION AND MAINTENANCE

All filter system designs must provide adequate access to the filter for inspection and maintenance. The sand filters should be inspected after all storm events to verify that they are working as intended. Since the Washington, D.C., and Austin sand filter systems can be deep, they may be designated as confined spaces and require compliance with confined space entry safety procedures.

Typically, sand filters begin to experience clogging problems within 3 to 5 years (NVPDC, 1992). Accumulated trash, paper and debris should be removed from the sand filters every 6 months or as necessary to keep the filter clean. A record should be kept of the dewatering times for all sand filters to determine if maintenance is necessary. Corrective maintenance of the filtration chamber includes removal and replacement of the top layers of sand, gravel and/or filter fabric that has become clogged. The removed media may usually be disposed in a landfill. The City of Austin tests their waste media before disposal. Results thus far indicate that the waste media is not toxic and can be safely landfilled (Schueler, 1992). Sand filter systems may also require the periodic removal of vegetative growth.

COSTS

The construction cost for an Austin sand filtration system is approximately $18,500 (1997 dollars) for a 0.4 hectare- (1 acre-) drainage area. The cost per hectare decreases with increasing drainage area. The cost for precast Washington, D.C. sand filters, with drainage areas of less than 0.4 hectares (1 acre), ranges between $6,600 and $11,000 (1997 dollars). This is considerably less than the cost for the same size cast-in-place system. Costs for the Delaware sand filter are similar to that of the D.C. system, with the exception of the lower excavation costs due to the Delaware filters' shallowness.

Annual costs for maintaining sand filter systems average about 5 percent of the initial construction cost (Schueler, 1992). Media is replaced as needed. Currently the sand is being replaced in the D.C. filter systems about every 2 years. The cost to replace the gravel layer, filter fabric and top portion of the sand for D.C. sand filters is approximately

$1,700 (1997 dollars). Improvements in Washington, D.C.'s maintenance procedures may extend the life of the filter media and reduce the overall maintenance costs.

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OWM MTB
Excellence in compliance through optimal technical solutions
MUNICIPAL TECHNOLOGY BRANCH

Vortechs® System Project Profile

Continental Airport Terminal - Newark, NJ

Vortechnics®
A CONTECH Company

The combination of flexibility in design, easy installation, and ability to handle high flows made the Vortechs® System the obvious choice for stormwater treatment at the new Continental Airport Terminal.

In 1996 a group of scientists from NOAA (National Oceanic and Atmospheric Association) conducted a sediment toxicity survey of 22 estuaries in the United States. Newark Bay topped that list for concentrations of toxicity. The bay's proximity to high hubs of industry and transportation – including Newark Liberty International Airport – has meant that it has long been the receptacle of industrial waste, as well as high doses of non-point source pollution.

Above, the Vortechs® cast-in-place System during construction. Each of the roof slabs for the cast-in-place units include a steel cross beam to help meet the loading specifications.

When Continental Airlines opened its much awaited Global Gateway at Newark Liberty International Airport in late 2001, airline passengers reveled in the improved traffic flow, easier check-in and arrival procedures, increased gate capacity (by nearly 50 percent), and award-winning concessions featuring mall-style retailers and an international food court. But Terminal C, the centerpiece of the $1.4 billion expansion of Newark Liberty also included some cutting edge stormwater treatment technologies to help remove pollutants from the runoff of the airport's roadways, runways and airplane taxiways prior to discharge into Newark Bay. While few will ever see the technology, now buried beneath the tarmac of the airport's taxiways, the system demonstrates the effectiveness of applying stormwater treatment technology to an already congested area where competition for space is fierce.

Airports, in general, can potentially generate enormous amounts of polluted stormwater runoff. In addition to hydrocarbons such as oil and fuel from cars, trucks and planes, winter weather brings added sand and salt to the roadways. Expanding the terminal area for Continental's new Global Gateway included increasing the paved areas around the terminal to accommodate the new taxiways and roadways. Stormwater runoff volumes increase as a result of the additional impervious surfaces, and so does the resultant non-point source pollution.

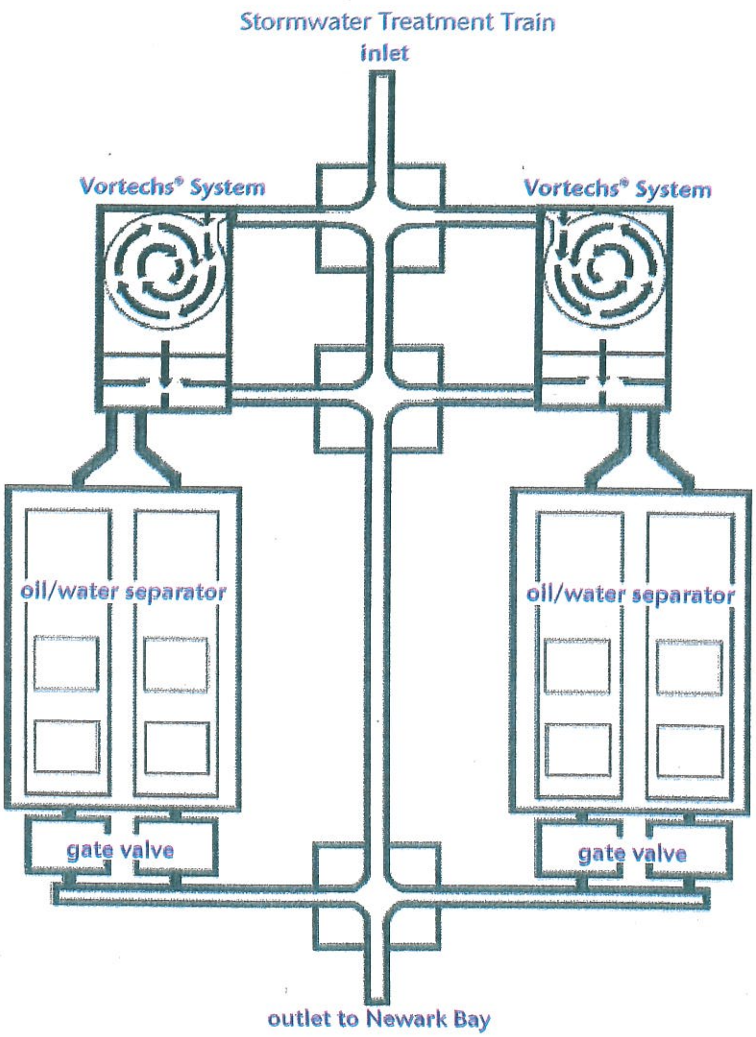
The completed Vortechs® System will be able to meet load bearing requirements for a 747 aircraft.

The expansion of the terminal triggered the need for stormwater permits under Phase I of NPDES, which required that runoff be treated to ensure that oil/hydrocarbon concentrations did not exceed 15 parts per million (ppm), and that solids be reduced through treatment down to the 50 micron particle level. Prior to the expansion, stormwater from the paved terminal and parking areas was directed to a peripheral ditch – nearly 60 feet wide – that led to a pump station that discharged the water directly into Newark Bay. Now, stormwater from the site is directed first to a stormwater treatment train that will remove solids such as sediment, debris and hydrocarbons such as oil and fuel, before being released into the ditch.

Due to the size of the treatment area, the storm flows from the paved areas around the terminal will be quite large, so runoff is conveyed via a 66-inch pipe that can handle flows of up to 80 cubic feet per second (cfs). The water hits a flow splitting device which routes the runoff to two separate treatment trains. Project engineers designed the treatment train to incorporate two cast-in-place Vortechs® Systems combined with four oil and water separators.

Stormwater runoff from the paved areas of Terminal C is directed first to a pair of Vortechs® Systems. Because the Vortechs® System can be cast-in-place, it was the most practical system to install to handle the large flows from the site. Each of the Vortechs® Systems are 18 feet wide by 30 feet long, and nine feet three inches deep. And because the units are buried under taxiways for the terminal, they had to be constructed to meet B-747-400 Aircraft loading requirements.

"It is somewhat uncommon for treatment equipment like this to be buried under pavement requiring the kind of load bearings necessary for a 747," said Francis Tighe, vice president of Vortechnics. "We designed each of the roof slabs for the cast-in-place units with a steel cross beam to help meet the loading specifications. And there are steel reinforced concrete columns in the baffle walls of the units for additional structural strength."



After treatment in the Vortechs® Systems, the stormwater enters one of four oil and water separators manufactured by Highland Tank to further remove oily contaminants from the stormwater. The tanks for the oil and water separators were specially constructed of three-eighths inch steel with one-half inch by six-inch reinforcement rings to ensure the tanks could withstand pressure from the burial depth and surface loading. The combination of Vortechs® Systems and the oil and water separators are designed to reduce oil concentrations to 10 ppm, which is five ppm less than dictated by the permit.

The two systems complement each other, with the Vortechs® Systems helping to optimize the coalescing capacity of the oil and water separators. The result is that water discharged from the units into the perimeter ditch is now free of most of the solids and debris carried from the roadway in stormwater, and oil is reduced to 10 parts per million. From the ditch, the cleaner treated water is then pumped into Newark Bay.

According to Henry Meyers, president of Anselmi and DeCicco, Inc. the general contractor for the job, the underground installation of the units happened while the airport was operational. This meant work had to stop any time a plane traveled near the excavation.

"We had to install these huge units into a hole that was 22 feet deep. The aircraft's wing came within 20 feet of the excavation site, and it wasn't feasible to just dig a big hole in the ground," he said. "The wheel loading for a Boeing 747 is very large, so we wanted to make sure that the taxiway was far away from any soil that could give way. Plus, we didn't want to have a big exposed hole in the ground and have the jet engines sucking debris from the hole.

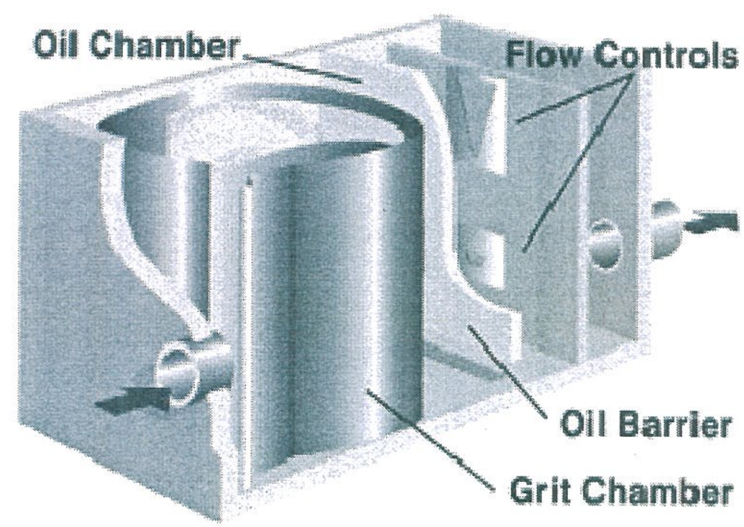
"So we ended up using sheeted excavation to help maintain the integrity of the taxiways and keep the construction zone compact. By driving steel sheeting for excavation with internal bracing, we could keep the hole as small as possible."

Once installed, the stormwater treatment systems were covered by tarmac and are accessible for inspection and maintenance from grade. Vortechnics recommends quarterly inspections during the first year, followed by annual inspections and cleanout with a vacuum truck to remove accumulated sediment and debris as needed. The oil and water separators include a corrugated plate to trap solids and oil coalescing material to trap oil, both of which should be inspected every six months and power washed as needed.

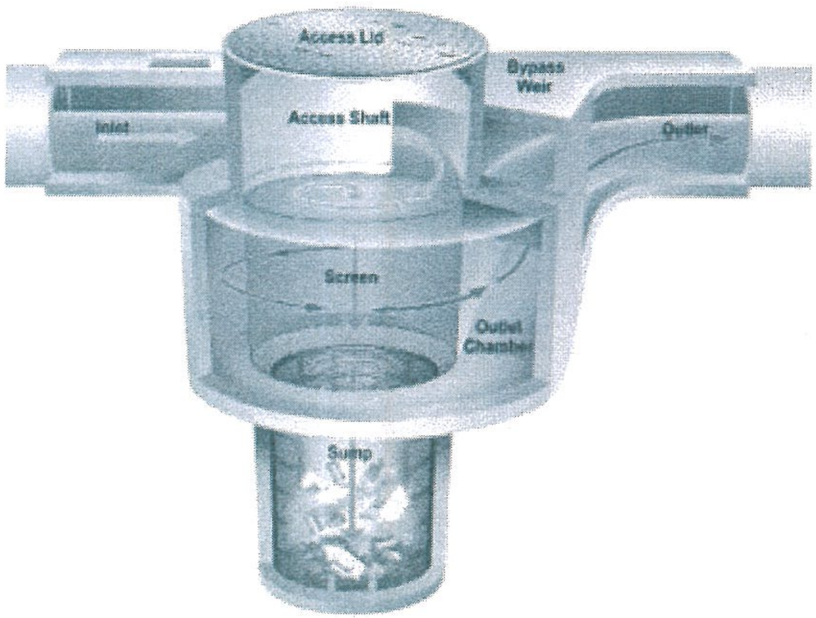
Airport sites in general pose a variety of environmental challenges in terms of air and water pollution. The stormwater treatment systems in place at Continental's new Global Gateway at Newark Liberty Airport demonstrate how new stormwater treatment technologies can help control non-point source pollution and ensure cleaner water, even in highly industrialized areas.

Vortechs ® *Stormwater Treatment System*

- Hydrodynamic Separator (MTD)
- Very low head loss in system
- Treats peak flows without bypassing
- Flexible design fits multiple site constraints
- 64% TSS removal verified by NJDEP and NJCAT



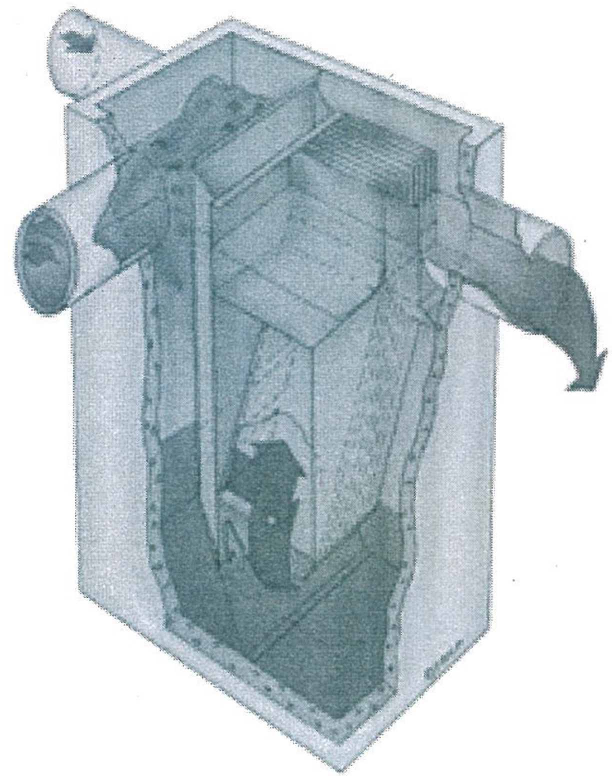
CDS – *High Efficiency Unit*



- Continuous deflection separation technology
- Operation independent of flow
- Unobstructed maintenance access
- Malcolm Pirnie has implemented and followed up on the unit since 2005 without any problems
- 73.7% TSS removal verified by NJDEP and NJCAT

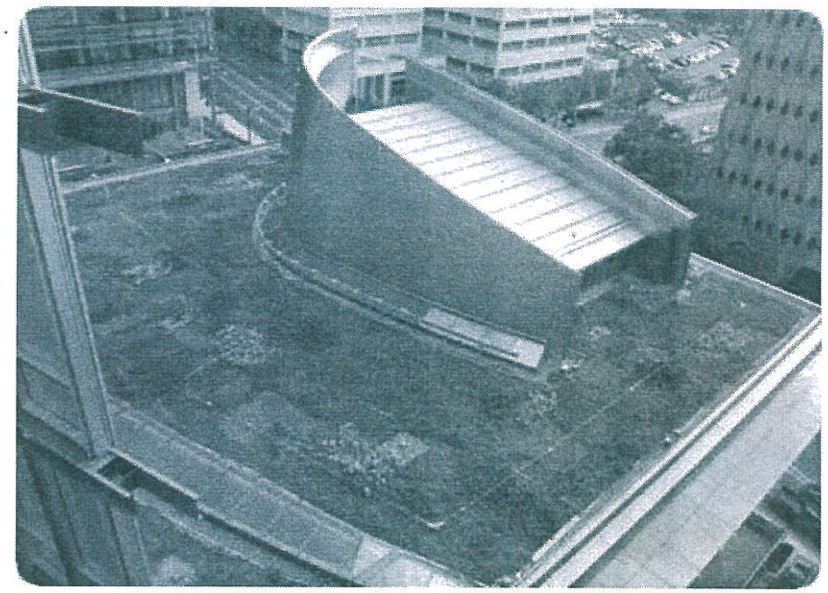
Terre Kleen *Stormwater Device*

- Hydrodynamic Separator (MTD)
- Stacked inclined plate sedimentation area
- Entire flow enters unit, floatables, oil, continuous capture
- EPA ETV NSF certified
- Has been shown to have 78% TSS removal verified by NJDEP and NJCAT.

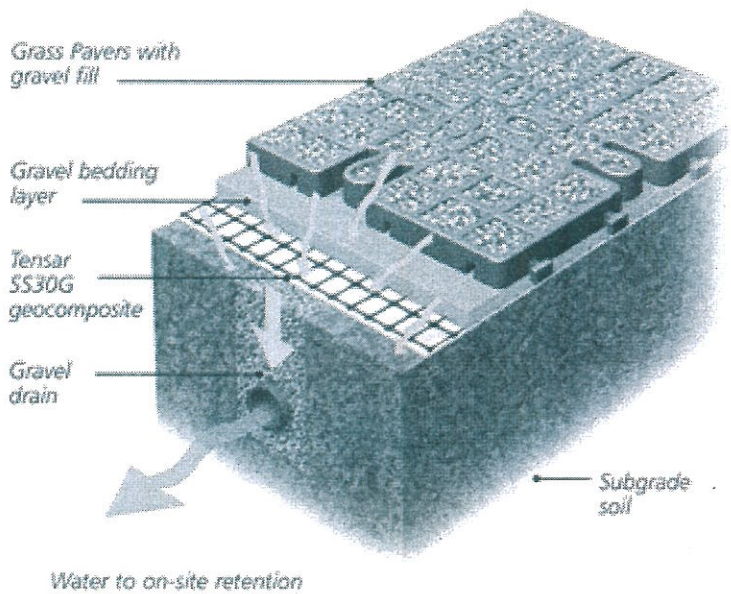


Green Roofs

- Roofs generally planted with drought and wind tolerant vegetation
- Designed to retain and slow rain water runoff on top of roofs
- Minimize energy use.
- Insulate the building.



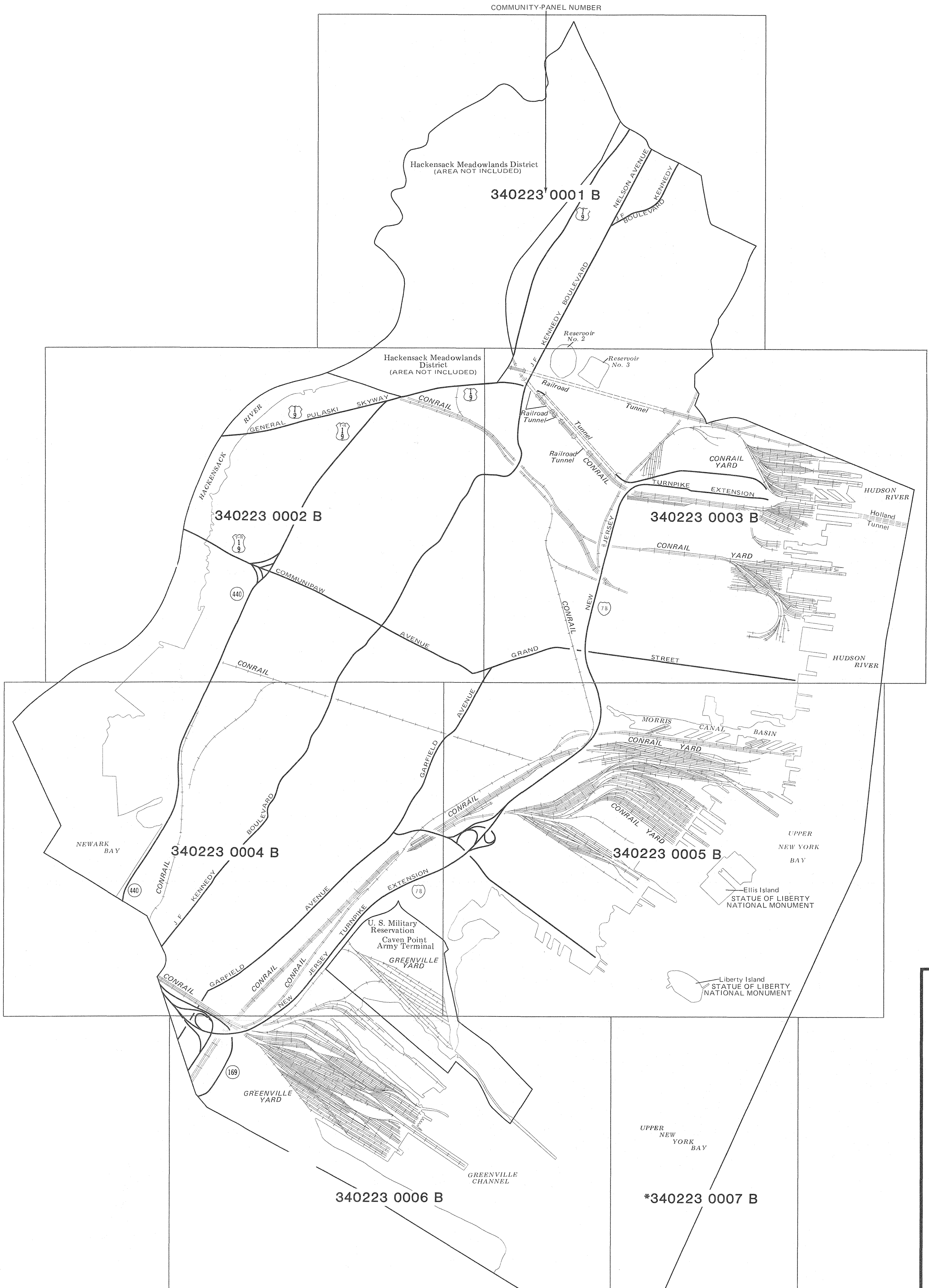
Porous Pavement



- Load bearing systems consisting of durable surfaces and underlying layered structures to cool, filter, and temporarily store stormwater.
- Modular interlocking paving blocks.
- Porous Concrete- open graded concrete that allows water to infiltrate to lower layers of system.

APPENDIX E

FEMA FLOODPLAIN MAPS



NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
JERSEY CITY,
NEW JERSEY
HUDSON COUNTY

MAP INDEX

PANELS PRINTED: 1, 2, 3, 4, 5, 6

COMMUNITY-PANEL NUMBERS
340223 0001–0007

EFFECTIVE DATE:
MARCH 1, 1984

Federal Emergency Management Agency

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION IN FT. (NGVD)[1]	DESCRIPTION OF LOCATION
RM 1	128.99	Chiseled X cut in hydrant on west side Central Avenue in front of Building 311; located approximately 115 feet south of centerline of Griffith Street.

[1] National Geodetic Vertical Datum of 1929

KEY TO MAP

500-Year Flood Boundary	ZONE B
100-Year Flood Boundary	
Zone Designations*	ZONE A1 / ZONE A5
100-Year Flood Boundary	
500-Year Flood Boundary	ZONE B
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
JULY 25, 1975

FLOOD HAZARD BOUNDARY MAP REVISIONS:
AUGUST 13, 1976

FLOOD INSURANCE RATE MAP EFFECTIVE:
MARCH 1, 1984

FLOOD INSURANCE RATE MAP REVISIONS:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

N

APPROXIMATE SCALE
400 0 400 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
JERSEY CITY,
NEW JERSEY
HUDSON COUNTY

PANEL 1 OF 7
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
340223 0001 B

EFFECTIVE DATE:
MARCH 1, 1984

Federal Emergency Management Agency

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION IN FT. (NGVD)[1]	DESCRIPTION OF LOCATION
RM 2	9.68	Chiseled square cut in center headwall on west side of Interstate Routes 1 and 9 across extended centerline of Sip Avenue.
RM 3	31.78	Chiseled square cut on top of northeast corner of southwest abutment of Lincoln Park pedestrian bridge over Interstate Routes 1 and 9.
RM 4	12.61	Arrow cut on top of hydrant on west side of State Route 440 across State Route 440 from J & F Oldsmobile; located approximately 120 feet north of centerline of main entrance to Hudson Mall.
RM 5	14.65	Chiseled X cut in hydrant located on north side of Communipaw Avenue approximately 460 feet west of Mallory Avenue.

[1] National Geodetic Vertical Datum of 1929

KEY TO MAP

500-Year Flood Boundary	ZONE B
100-Year Flood Boundary	ZONE A1
Zone Designations*	ZONE A5
100-Year Flood Boundary	ZONE B
500-Year Flood Boundary	
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
JULY 26, 1975

FLOOD HAZARD BOUNDARY MAP REVISIONS:
AUGUST 13, 1976

FLOOD INSURANCE RATE MAP EFFECTIVE:
MARCH 1, 1984

FLOOD INSURANCE RATE MAP REVISIONS:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

N

APPROXIMATE SCALE
400 0 400 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
JERSEY CITY,
NEW JERSEY
HUDSON COUNTY

PANEL 2 OF 7
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
340223 0002 B

EFFECTIVE DATE:
MARCH 1, 1984

Federal Emergency Management Agency

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION IN FT. (NGVD)[1]	DESCRIPTION OF LOCATION
RM 6	107.90	Northernmost bolt on hydrant located 250 feet southwest of intersection of Pauls and Palisade Avenues.
RM 7	86.43	Chiseled X cut in hydrant located southwest of Newark Avenue and Palisade Avenue intersection.
RM 8	10.616	Standard NJC&GS disk stamped 7234 set in concrete 8 inches below sidewalk in cast iron box flush with sidewalk at northeast corner of intersection of Grove and Wayne Streets, southwest of southwest corner of J. W. Greene Furniture Co., Inc.
RM 9	6.157	Standard NJC&GS disk stamped 1146 set in concrete flush with sidewalk on southeast corner of Grand and Grove Streets in front of four-story brick building, store 326 Grand Street.
RM 10	19.03	Water valve on post office, 2.2 feet above sidewalk on top of threaded pipe at southeast corner of Montgomery and Washington Streets, 6.0 feet south of northwest corner of building.

[1] National Geodetic Vertical Datum of 1929

KEY TO MAP

500-Year Flood Boundary — ZONE B
100-Year Flood Boundary
Zone Designations* — ZONE A1 / ZONE A5
100-Year Flood Boundary — ZONE B
500-Year Flood Boundary

Base Flood Elevation Line With Elevation In Feet** — 513
Base Flood Elevation in Feet Where Uniform Within Zone** — (EL 987)
Elevation Reference Mark — RM7×
Zone D Boundary
River Mile — •M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
JULY 25, 1975
FLOOD HAZARD BOUNDARY MAP REVISIONS:
AUGUST 13, 1976

FLOOD INSURANCE RATE MAP EFFECTIVE:
MARCH 1, 1984
FLOOD INSURANCE RATE MAP REVISIONS:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

APPROXIMATE SCALE
400 0 400 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
JERSEY CITY,
NEW JERSEY
HUDSON COUNTY

PANEL 3 OF 7
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
340223 0003 B

EFFECTIVE DATE:
MARCH 1, 1984

Federal Emergency Management Agency

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION IN FT. (NGVD)[1]	DESCRIPTION OF LOCATION
RM 11	14.73	Arrow cut on top of hydrant on east side of southbound State Route 440; located approximately 80 feet south of centerline of Pinecrest Road
RM 12	11.334	Standard NJC&GS disk stamped 4293 set in concrete 8 inches below surface in cast iron box, flush with sidewalk on the south-east corner of intersection of Danforth Avenue and southbound State Route 440.
RM 13	18.374	Standard NJC&GS disk stamped 4292 set in concrete 8 inches below surface in cast iron box, flush with surface on southwest side of Danforth Avenue in south angle of private right-of-way entrance to Wilson & Bennet Plant.
RM 14	11.05	Arrow cut on top of hydrant located on south side of Carbon Place, 95 feet east of centerline of northbound State Route 440.
RM 15	51.536	Standard NJC&GS disk stamped 7226 set in concrete below grade in cast iron box, flush with surface of sidewalk on the east side of Garfield Avenue and opposite frame dwelling 625 Garfield Avenue.
RM 16	56.58	Arrow cut on top of hydrant located on north side of Skyline Drive, approximately 85 feet east of centerline of Garfield Avenue.
RM 17	50.764	Standard NJC&GS disk stamped 7227 set in concrete 8 inches below grade in cast iron box, flush with sidewalk on east side of Garfield Avenue, 20.6 feet north of north curb line of Wilkinson Avenue extended and in driveway behind eight-story brick building 687-700 Garfield Avenue.
RM 18	27.13	Arrow cut on top of hydrant located on west side of Garfield Avenue, 150 feet south of Caven Point Road.

[1] National Geodetic Vertical Datum of 1929

KEY TO MAP

500-Year Flood Boundary
100-Year Flood Boundary
Zone Designations*
100-Year Flood Boundary
500-Year Flood Boundary

ZONE B
ZONE B

Base Flood Elevation Line With Elevation In Feet** — 513

Base Flood Elevation in Feet Where Uniform Within Zone** — (EL 987)

Elevation Reference Mark — RM7×

Zone D Boundary

River Mile — •M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
JULY 25, 1975

FLOOD HAZARD BOUNDARY MAP REVISIONS:
AUGUST 13, 1976

FLOOD INSURANCE RATE MAP EFFECTIVE:
MARCH 1, 1984

FLOOD INSURANCE RATE MAP REVISIONS:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

N

APPROXIMATE SCALE
400 0 400 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

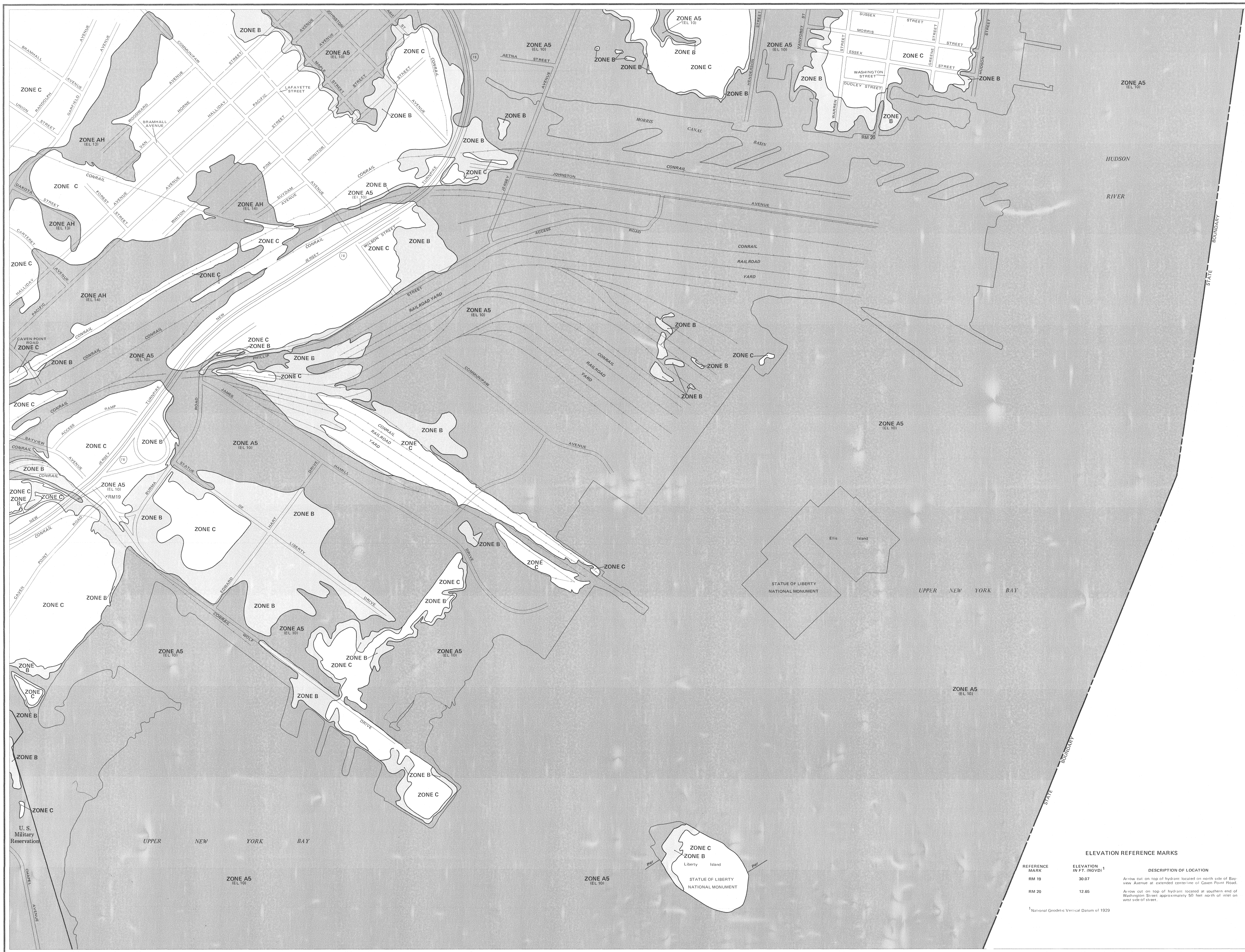
CITY OF
JERSEY CITY,
NEW JERSEY
HUDSON COUNTY

PANEL 4 OF 7
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
340223 0004 B

EFFECTIVE DATE:
MARCH 1 1984

Federal Emergency Management Agency



ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION IN FT. (NGVD)[1]	DESCRIPTION OF LOCATION
RM 19	30.07	Arrow cut on top of hydrant located on north side of Bayview Avenue at extended centerline of Caven Point Road.
RM 20	12.65	Arrow cut on top of hydrant located at southern end of Washington Street approximately 50 feet north of inlet on west side of street.

[1] National Geodetic Vertical Datum of 1929

KEY TO MAP

500-Year Flood Boundary	ZONE B
100-Year Flood Boundary	ZONE A1
Zone Designations*	ZONE A5
100-Year Flood Boundary	ZONE B
500-Year Flood Boundary	
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.

This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
JULY 25, 1975
FLOOD HAZARD BOUNDARY MAP REVISIONS:
AUGUST 13, 1976

FLOOD INSURANCE RATE MAP EFFECTIVE:
MARCH 1, 1984
FLOOD INSURANCE RATE MAP REVISIONS:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

N

APPROXIMATE SCALE
400 0 400 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

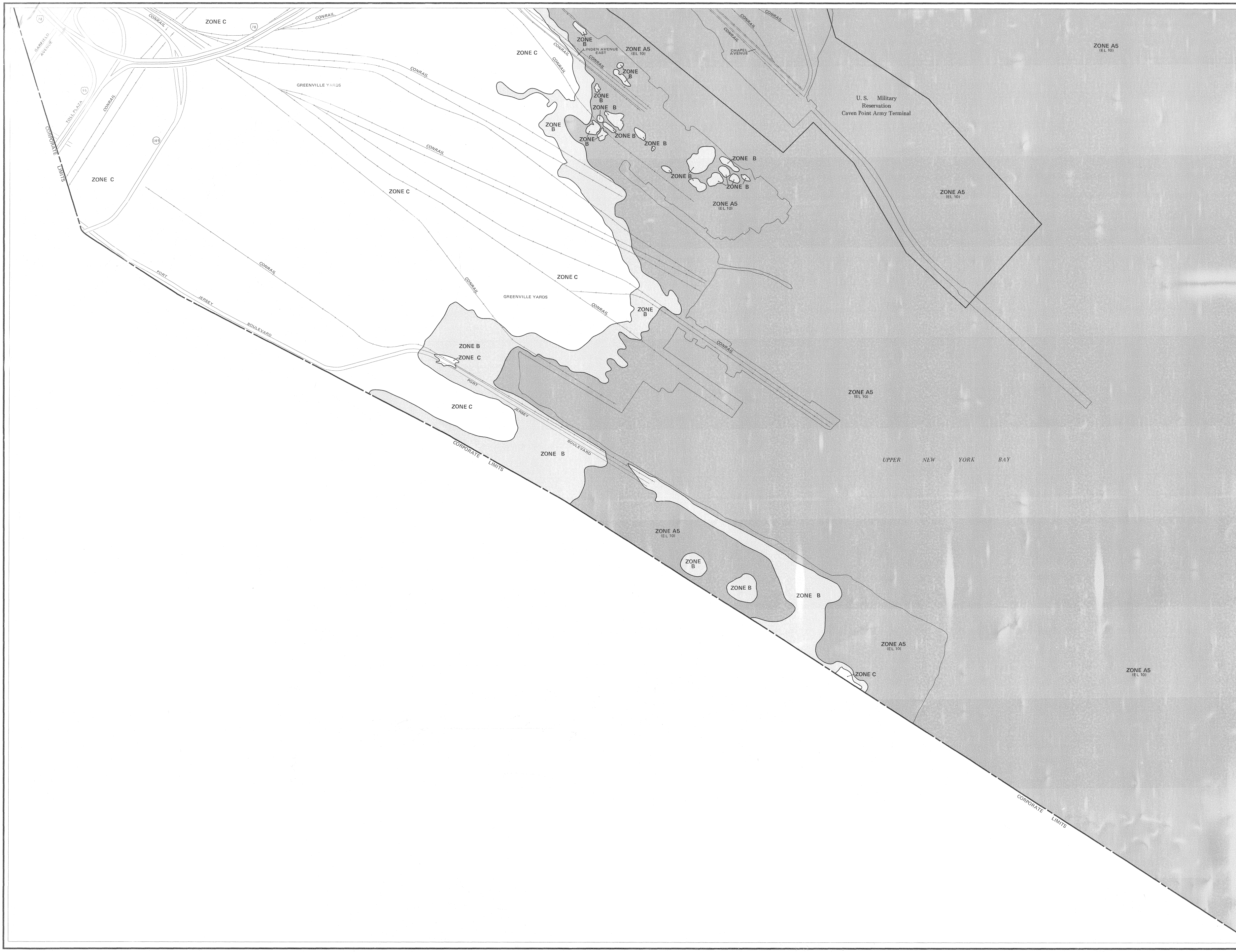
CITY OF
JERSEY CITY,
NEW JERSEY
HUDSON COUNTY

PANEL 5 OF 7
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
340223 0005 B

EFFECTIVE DATE:
MARCH 1, 1984

Federal Emergency Management Agency



KEY TO MAP

500-Year Flood Boundary	ZONE B
100-Year Flood Boundary	ZONE A1
Zone Designations*	ZONE A5
100-Year Flood Boundary	ZONE B
500-Year Flood Boundary	
Base Flood Elevation Line With Elevation In Feet**	513
Base Flood Elevation in Feet Where Uniform Within Zone**	(EL 987)
Elevation Reference Mark	RM7×
Zone D Boundary	
River Mile	•M1.5

**Referenced to the National Geodetic Vertical Datum of 1929

*EXPLANATION OF ZONE DESIGNATIONS

ZONE	EXPLANATION
A	Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
A0	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH	Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99	Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B	Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C	Areas of minimal flooding. (No shading)
D	Areas of undetermined, but possible, flood hazards.
V	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30	Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.

NOTES TO USER

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This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.

For adjoining map panels, see separately printed Index To Map Panels.

INITIAL IDENTIFICATION:
JULY 25, 1975
FLOOD HAZARD BOUNDARY MAP REVISIONS:
AUGUST 13, 1976

FLOOD INSURANCE RATE MAP EFFECTIVE:
MARCH 1, 1984
FLOOD INSURANCE RATE MAP REVISIONS:

Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.

To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620.

N

APPROXIMATE SCALE
400 0 400 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
JERSEY CITY,
NEW JERSEY
HUDSON COUNTY

PANEL 6 OF 7
(SEE MAP INDEX FOR PANELS NOT PRINTED)

COMMUNITY-PANEL NUMBER
340223 0006 B

EFFECTIVE DATE:
MARCH 1, 1984

Federal Emergency Management Agency

APPENDIX F

JERSEY CITY STREET SWEEPING ROUTES

ROUTE A MONDAY & THURSDAY

	STREET	FROM	TO
6:00AM	14TH	JERSEY	COLES
	15TH	JERSEY	COLES
	16TH	JERSEY	COLES
	GROVE	16TH	STATEHWY
	ERIE	STATEHWY	16TH
	15th	MARIN BLVD	ERIE
	PAVONIA	RIVER DR SOUTH	WASHINGTON BLVD
	NEWPORT PKY	WASHINGTON	RIVER DR SOUTH
	RIVER DR SOUTH	NEWPORT	END
8:00AM	BRIGHT	GRAND	MONMOUTH
	CENTER	GRAND	YORK
	YORK	CENTER	JERSEY
	GRAND	MARIN BLVD	PRIOR
	FREMONT	COLDEN	BRIGHT
	BRIGHT	FREMONT	MERSELES
	FLEORENCE	MONTGOMERY	BRIGHT
	BRIGHT	CORNILSON	FREMONT
	GRAND	PRIOR	JOHNSTON
	JOHNSTON	GRAND	CORNILSON
	BISHOP	GRAND	CORNILSON
	STATE	GRAND	CORNILSON
	WESTERVELT	CORNILSON	GRAND
	IVY	GRAND	CORNISON
	GRAND	JOHNSTON	IVY
10:00AM	CHOPIN CT	MONTGOMERY	WAYNE
	WAYNE	MERSELES	FACTORY
	FACTORY	WAYNE	MERCER
	MERCERLOOP	ALL AROUND	
	RISTANIO	MONTGOMERY	WAYNE
	MILL RD	MONTGOMERY	MERCER
	MERCER	MILL RD	SUMMIT
	WAYNE	SUMMIT	MILLRD
	MILL RD	WAYNE	MERCER
	MERCER	SUMMIT	TUERS
	JORDAN	VROOM	MONTGOMERY
	ORCHARD	MONTGOMERY	JORDAN
	JORDAN	ORCHARD	MONTGOMERY
	ORCHARD	JORDAN	CRAWFORD
	CRAWFORD	ORCHARD	SUMMIT
	MAIDEN LN	SUMMIT	ORCHARD
	HOWARD PL	SUMMIT	STORMS
	JEWIT	SUMMIT	MONTICELLO
	FAIRVIEW	MONTICELLO	FAIMOUNT
	FAIRMOUNT	MONTICELLO	STORMS
	FAIRMOUNT	MONTICELLO	BERGAN
	STORMS	BERGAN	SUMMIT
	CLIFTON PL	SUMMIT	BALDWIN

219 GARCIA

MONDAY & THURSDAY

ROUTE: A

	STREET	FROM	TO
1:00 PM	2nd	MARIN BLVD	SADDLEWOOD
	SADDLEWOOD CT	DEAD END	
	2nd	SADDLEWOOD CT	MERSELES
	MERSELES	3rd	1st
	1st	MERSELES	LAURAL CT
	LAURAL CT	DEAD END	
	1st	LAURAL CT	MARIN BLVD
	BAY	MARIN	GROVE
	MORGAN	GROVE	MARIN BLVD
	YORK	MARIN BLVD	GREENE
	GRAND	MARIN BLVD	WARREN
	WARREN	GRAND	DUDLEY
	DUDLEY	WARREN	WASHINGTON -> U-Turn
	GRAND	WARREN	GREENE
	SUSSEX	GREENE	VAN VORST (left to Morris)
	MORRIS	VAN VORST	GREENE (right at the light)
	WASHINGTON	DUDLEY	MONTGOMERY

219 GARCIA

TUESDAY & FRIDAY

ROUTE: A

	STREET	FROM	TO
1:00 PM	2nd	MARIN BLVD	SADDLEWOOD
	SADDLEWOOD	DEAD END	
	2nd	SADDLEWOOD	MERSELES
	MERSELES	3rd	1st
	1st	MERSELES	LAURAL CT
	LAURAL CT	DEAD END	
	1st	LAURAL CT	MARIN BLVD
	BAY	MARIN BLVD	GROVE
	MORGAN	GROVE	MARIN BLVD
	WASHINGTON	MONTGOMERY	DUDLEY
	DUDLEY	WASHINGTON	WARREN
	WARREN	DEAD END	ESSEX
	MORRIS	VAN VORST	GREENE
	GREENE	MORRIS	GRAND
	SUSSEX	GREENE	VAN VORST
	WARREN	GRAND	ESSEX
	VAN VORST	ESSEX	GRAND
	YORK	MARIN BLVD	GREENE
	GRAND	GREENE	MARIN BLVD

ROUTE A	STREET	TUESDAY & FROM	FRIDAY TO
6:00 AM	14^{TH}	JERSEY	COLES
	15^{TH}	JERSEY	COLES
	16^{TH}	JERSEY	COLES
	GROVE	16^{TH}	STATE HWY
	ERIE	STATE HWY	16^{TH}
	15^{TH}	MARIN BLVD	ERIE
	PAVONIA	WASHINGTON	RIVER DR SOUTH
	RIVER DR SOUTH	PAVONIA	NEWPORT
	NEWPORT	RIVER DR SOUTH	WASHINGTON
8:00 AM	BRIGHT	MONMOUTH	GRAND
	YORK	CENTER	JERSEY
	FREMONT	COLDEN	BRIGHT
	BRIGHT	MERSELES	CORNILSON
	FLORENCE	BRIGHT	MONTGOMERY
	JOHNSTON	CORNILSON	GRAND
	BISHOP	GRAND	CORNILSON
	STATE	CORNILSON	GRAND
	WESTERVELT	CORNILSON	GRAND
	GRAND	COMMUNIPAW	MARIN BLVD
10:00 AM	MERSELES	CC DRIVE	BRIGHT
	CHOPIN CT	MONTGOMERY	WAYNE
	CHOPIN CT	WAYNE	MONTGOMERY
	WAYNE	MERSELES	FACTORY
	FACTORY	WAYNE	MERCER LOOP
	MERCERLOOP	ALL AROUND	
	RISTANIO	WAYNE	MONTGOMERY
	MERCER	MILL RD	SUMMIT
	WAYNE	SUMMIT	MILL RD
	MERCER	SUMMIT	TUERS
	JORDAN	VROOM	MONTGOMERY
	ORCHARD	MONTGOMERY	JORDAN
	JORDAN	ORCHARD	MONTGOMERY
	ORCHARD	JORDAN	CRAWFORD
	CRAWFORD	DEADEND	SUMMIT
	MAIDEN LN	SUMMIT	ORCHARD
	HOWARD PL	SUMMIT	STORMS
	JEWITT	SUMMIT	MONTICELLO
	FAIRVIEW	MONTICELLO	FAIRMOUNT
	FAIRMOUNT	MONTICELLO	STORMS
	STORMS	BERGAN	NEVIN
	NEVIN	STORMS	DEADEND
	STORMS	NEVIN	SUMMIT
	CLIFTON PL	SUMMIT	BALDWIN

B ROUTE MONDAY & THURSDAY

	STREET	FROM	TO
7:30 am	MLK	Bidwell	Communipaw
		EVERYDAY MONDAY-SATURDAY	
9:00 am	MLK	Communipaw	Bidwell
		EVERYDAY MONDAY –SATURDAY	
8:00 – 10:00am	Grand St	Bramhall	Communipaw
	Harmon	Garfield	Grand St
	McDougal	Arlington	Randolph
	Arlington 1	Grand	Bayview
	Ocean 4	Bidwell	Bramhall
	Clerk St. 3	Bramhall	Wilkinson
	Randolph 2	Wilkinson	Communipaw
10:00 – 12:00pm	Beergen	VanNostrand	Duncan
		(MONDAY-WEDNESDAY-FRIDAY)	
	Union	Bergen	Westside
	Willliams	Westside	Bennett
	Also three small side streets (Everett, Miller & Norton)		
	Boyd	Bennett	Bergen
	Virginia	Bergen	Bennett
	Ege	Bennett	Bergen
1:00 – 3:00pm	Union	Garfield	Bergen
	Minerva	Union	Deadend
	Atlantic	Bergen	MLK
	Forrest	MLK	Ocean
	Oak	Ocean	Bergen
	Forrest	Bergen	MLK
	Virginia	MLK	Bergen
	Ege	Bergen	MLK
	Kearny	MLK	Bergen
	Morton Place	Bergen	Deadend
	Orient	Ken. Blvd.	Ocean
	Rose	Orient	Cartaret
	Myrtle	Ocean	Garfield
	Cartaret	Garafield	Ocean
	Virginia	MLK	Ocean

B ROUTE MONDAY & THURSDAY

	STREET	FROM	TO
3:00 – 5:00	Claremont	Garfield	Bergen
	Grant	Bergen	Ocean
	Myrtle	Ocean	Bergen
	Bostwick	Bergen	Ocean
	Wilkerson	Ocean	Bergen
	Bayview	Bergen	Garfield
	Wilkerson	Garfield	Ocean
	Union	Mallory	Westside

B ROUTE TUESDAY & FRIDAY

7:30 am	STREET	FROM	TO
	MLK	Bidwell	Communipaw
		EVERYDAY MONDAY-SATURDAY	
9:00 am	MLK	Communipaw	Bidwell
		EVERYDAY MONDAY –SATURDAY	
8:00 – 10:00am	Grand St	Communipaw	Bramhall
	Ocean	Bramhall	Bidwell
	Arlington	Bayview	Grand
	McDougal	Arlington	Randolph
	Harmon	Garfield	Grandl
	Clerk St.	Bramhall	Wilkinson
	Randolph	Wilkinson	Communipaw
10:00 – 12:00pm	Bergen	Fairmount	VanNostrand
	Union	Bergen	Westside
	Willliams	Westside	Bennett
	Also three small side streets (Everett, Miller & Norton)		
	Boyd	Bennett	Bergen
	Virginia	Bergen	Bennett
	Ege	Bennett	Bergen
1:00 – 3:00pm	Union	Garfield	Bergen
	Atlantic	Bergen	MLK
	Forrest	MLK	Ocean
	Oak	Ocean	Bergen
	Forrest	Bergen	MLK
	Virginia	MLK	Bergen
	Bernicus Ct.	Virginia	Deadend
	Ege	Bergen	MLK
	Kearny	MLK	Bergen
	Morton Place	Bergen	Deadend
	Orient	Ken. Blvd.	Ocean
	Rose	Orient	Cartaret
	Myrtle	Ocean	Garfield
	Cartaret	Garafield	Ocean
	Virginia	MLK	Ocean

B ROUTE TUESDAY & FRIDAY

	STREET	FROM	TO
3:00 – 5:00	Claremont	Bergen	Garfield
	Grant	Bergen	Ocean
	Myrtle	Ocean	Bergen
	Bostwick	Bergen	Ocean
	Wilkerson	Ocean	Bergen
	Bayview	Bergen	Garfield
	Wilkerson	Garfield	Ocean
	Union	Mallory	Westside

C ROUTE MONDAY & THURSDAY

6:00-6:30am	STREET	FROM	TO
	CC Drive	Marin	Warren
	Warren	CC Drive	Montgomery
	CC Drive	Warren	Greene
	Newark	Grove	4th Street
	4th Street	Newark	Merselles
	3rd Street	Merselles	Newark
	Newark	3rd Street	Tonnelle
	Newark	Tonnelle	Grove
8:00-10:00am	Grove	Grand	CC Drive
	Montgomery	Grove	Marin Blvd.
	VanVorst	York	Grand
	Marin Blvd.	Grand	Montgomery
	Montgomery	Marin	Warren
	Warren	Montgomery	York
	Montgomery	Warren	Greene
	Mercer	Marin	Monmouth
	Montgomery	Brunswick	Jersey
	Jersey	Grand	8th Street
	West Hamilton	8th Street	9th Street
	Jersey Ave.	9th Street	10th Street
	Manilla	10th Street	Newark
10:00-12:00pm	CC Drive	Brunswick	Grove
	Wayne	Varrick	Grove
	Wayne	Marin Blvd.	Grove
	York	Jersey Ave.	Marin Blvd.
	Barrow	Grand	Newark
	Erie	Newark	12th Street
	Coles Street	10th Street	CC Drive
	Varrick	CC Drive	Bright
	Monmouth	Bright	10th Street

C ROUTE MONDAY & THURSDAY

1:00-3:00pm

STREET	FROM	TO
Pavonia	Brunswick	W. Hamilton
10th Street	Brunswick	Manilla
Brunswick	10th Street	Bright
9th Street	Brunswick	Marin Blvd.
8th Street	Marin	Erie
Pavonia	Erie	8th Street
8th Street	Erie	Division
Division	8th Street	Newark
7th Street	Newark	Erie
6th Street	Marin Blvd.	Division
5th Street	Newark	Manilla
4th Street	Manilla	Newark
3rd	Newark	Manilla

C ROUTE TUESDAY & FRIDAY

TIME	STREET	FROM	TO
1:00-3:00pm	Pavonia Ave	W. Hamilton	Brunswick St
	10Th Street	Brunswick Street	Manilla Ave
	Brunswick Street	10th Street	Bright Street
	9th Street	Brunswick Street	Marin Blvd
	8th Street	Marin Blvd	Erie Street
	Pavonia Ave	Erie Street	8th Street
	8th Street	Erie Street	Division St
	Division Street	8th Street	Newark Ave
	7th Street	Newark Ave	Erie Street
	6th Street	Marin Blvd	Division St
	5th Street	Newark Ave	Manilla Ave
	4th Street	Manilla Ave	Newark Ave
	3rd Street	Newark Ave	Manilla Ave

C ROUTE TUESDAY & FRIDAY

TIME	STREET	FROM	TO
6:00-7:00am	C.C. Drive	Greene	Warren
	Warren	CC Drive	Montgomery
	4TH Street	Newark	Merselles
	Merseles	Newark	3rd Street
	3rd Street	Merselles	Newark
7:00am	Newark Ave.	C.C.Drive	Tonnelle Ave.
	Newark Ave.	Tonnelle Ave.	Grove Street
8:00-10:00am	Grove Street(TUES.Only)	C.C. Drive	Grand Street
	Grand Street (FRI.ONLY)	Grand Street	C.C. Drive
	Van Vorst Street	York Street	Grand Street
	Montgomery Street	Greene	Warren
	Warren	Montgomery	York Street
	Montgomery Street	Warren	Marin Blvd
	Marin Blvd	Montgomery Street	Grand Street
	Montgomery Street	Marin Blvd	Brunswick St
	Mercer Street	Marin Blvd	Monmouth St
	West Hamilton	8th Street	9th Street
	Jersey Ave	9th Street	10th Street
	Manilla Ave	10th Street	Newark Ave
	Jersey Ave	8th Street	Grand Street
10:00-12:00pm	CC Drive	Brunswick Street	Grove Street
	Wayne	Varrick	Grove
	Wayne	Marin Blvd.	Grove Street
	York Street	Jersey Ave	Marin Blvd.
	Barrow Street	Grand Street	Newark Ave
	Erie Street	Newark Ave	12th Street
	Coles Street	10th Street	CC Drive
	Varrick Street	CC Drive	Bright Street
	Monmouth bStreet	Bright Street	10th Street

D ROUTE TUESDAY& FRIDAY

1:00 – 3:00 pm	STREET	FROM	TO
	LARCH	DEADEND	ST. PAUL
	ST. PAUL	LARCH	TONNELLE
	BERKELY	LIBERTY	TONNELLE
	VAN WINKLE	SENATE	TONNELLE
	VAN WINKLE	TONNELLE	SKILLMAN
	SKILLMAN	VAN WINKLE	ST. PAUL
	SKILLMAN	ST. PAUL	DEADEND
	LIBERTY	DEADEND	VAN WINKLE
	VAN WINKLE	SKILLMAN	KEN. BLVD.
	BROOKS PLAC	KENNEDY	HURON.
	HURON	BROOKS PL.	ST. PAUL
	ST. PAUL	KENNEDY	BEVAN.
	BEVAN	HOPKINS	STATE HWY.
	ST. PAUL	BEVAN	STATE HWY.
	FLEET	CENTRAL	PALISADE
	ST. PAUL	PALISADE	PERRY
	PERRY	HOPKINS	DEADEND
	ST. PAUL	PERRY	SUMMIT
	HOPKINS	SUMMIT	PALISADE
	BEACON	PALISADE	KEN. BLVD.
	COLLARD	DEADEND	STATE HWY.
	HOPKINS	COLLARD	SUMMIT
	LAIDLAW	SUMMIT	PALISADE

3:00 – 5:00 pm	STREET	FROM	TO
	HOBOKEN	OAKLAND	SUMMIT
	COOK	HOBOKEN	NEWARK
	OAKLAND	NEWARK	WASHBURN
	WASHBURN	OAKLAND	BALDWIN
	COURTHOUSE PL	BALDWIN	McPHERSON
	WASHBURN	PALISADE	BALDWIN
	COURTHOUSE PL	BALDWIN	OAKLAND
	OAKLAND	WASHBURN	HOBOKEN
	COTTAGE	SUMMIT	KEN. BLVD.
	COTTAGE	DEADEND	KEN. BLVD.
	VAN REIPEN AVE	KEN. BLVD.	SUMMIT
	2 PAVONIA	~~SUMMIT~~ Baldwin	WALDO
	1 MAGNOLIA	Summit ~~SUMMIT~~ ~~Baldwin~~	WALDO
	WALDO	DEADEND	NEWARK
	~~PAVONIA~~	~~NEWARK~~	~~SUMMIT~~

D ROUTE TUESDAY & FRIDAY

8:00 – 10:00 am

STREET	FROM	TO
Henry	Chestnut	Deadend
~~CHESTNUT~~	~~HENRY~~	~~ALLAN TER~~
~~HENRY~~	~~CHESTNUT~~	~~DEADEND~~
CHESTNUT	-ALAN TER	TRENTON
TRENTON	CHESTNUT	DEADEND
WALDO	TRENTON	ELIZABETH
ELIZABETH	WALDO	CHESTNUT
ALLAN TER.	CHESTNUT	WALDO
HENRY	WALDO	CHESTNUT
CHESTNUT	HENRY	NEWARK
BALDWIN	NEWARK	PROSPECT
WEBSTER	PROSPECT	PATERSON PL
NEW YORK	PATERSON PLK	RAVINE
OGDEN	GRIFFITH	DEADEND
CUNEO	OGDEN	PALISADE
OGDEN	GRIFFITH	HOBSON
HOBSON	OGDEN	PALISADE
OGDEN	HOBSON	DEADEND
PALISADE	PATERSON PLK	STATE HWY.

10:00 – 12:00 am

STREET	FROM	TO
CONCORD	STATE HWY	DEADEND
OAKLAND	STATE HWY	PROSPECT
SHERMAN AVE	FERRY	NORTH
HANCOCK	NORTH	FRANKLIN
CAMBRIDGE	FRANKLIN	NORTH
NORTH	CENTRAL	PALISADE
CONGRESS	PATERSON PLK	CENTRAL
SOUTH	CENTRAL	OGDEN

E ROUTE MONDAY & THURSDAY

	STREET	FROM	TO
7:30 – 10:00am	Westside	Culver	Montgomery
	DeKalb	Ken. Blvd.	Westside
	Stuyvesant	Van Reypen	Westside
	Sip	Emerson	Ken. Blvd.
	Pavonia	Tonnelle	Westside
	Broadway	Wallis	Tonnelle
	St. Paul	Ken. Blvd.	Tonnelle
	Westside	Broadway	Danforth
10:00 – 12:00pm	Magnolia	Tonnelle	Deadend
	Pavonia	Deadend	Tonnelle
	Bryan Place	Van Reypen	Deadend
	Van Reypen	Deadend	Tonnelle
	Garrison	Tonnelle	Bond
	Bond	Garrison	Ken. Blvd.
	Garrison	Bond	DeKalb
	Romaine	Stuyvesant	Broadway
	Van Wagenen	Deadend(Broadway)	Pavonia
	Van Wagenen	Sip(Deadend)	Stuyvesant
	Weldon	Stuyvesant	DeKalb
	Corbin	Stuyvesant	Deadend
	Giles	Broadway(deadend)	Fox Place
	Fox Place	Giles	Westside
	Pavonia	Westside	Giles
	Marion Place	Giles	Westside
	Logan	Westside	Bryant
	Wright	Logan	Broadway
	Wales	Broadway(deadend)	Logan
	Logan	Bryant	Freeman
	Dales	Logan	Broadway
	Wallis	Broadway	Logan
	Emerson	Logan	Deadend
	Holmes	Deadend	Sip
	Bryant	Deadend	Logan
	Hawthorne	Deadend	Sip
	Whitman	Deadend	Sip

E ROUTE MONDAY & THURSDAY

1:00 – 3:00pm

STREET	FROM	TO
Kensington	Deadend	Westside
Delaware	Kensington	Deadend
Gautier	Westside	Belvedere
Belvedere	Condict	Deadend
Gautier	Belvedere	Mallory
Mallory	Gautier	Deadend
Condict	Mallory	Delaware
Duncan	Westside	Olean
Olean	Duncan	Deadend
Duncan	Olean	Belvedere
Belvedere	Duncan	Deadend
Duncan	Belvedere	Nunda
Nunda	Duncan	Deadend
Duncan	Nunda	Plainfield
Plainfield	Duncan	Deadend
Duncan	Plainfield	Freeman
Freeman	Duncan	Deaedend
Duncan	Freeman	Route 440
Kensington	Westside	Bergen
Bentley	Bergen	Westside
Gifford	Westside	Bergen

E ROUTE MONDAY & THURSDAY

3:00 – 5:00

STREET	FROM	TO
Stevens	Ken. Blvd.	Highview Rd.
Highview	Stevens	Deadend
Stevens	Highview	Westside
Van Nostrand	Westside	Ken. Blvd.
Armstrong	Ken. Blvd.	Westside
Woodlawn	Westside	Ken. Blvd.
Fulton	Ken. Blvd.	Westside
Stegman Pkwy.	Westside	Stegman Ct.
Stegman Ct.	Stegman Pkwy.	Deadend
Stegman Pkwy.	Stegman Ct.	Stegman Place
Stegman Place	Deadend	Stegman Pkwy.
Stegman Pkwy	Stegman Place	Stegman Terrace
Stegman Terrace	Deadend	Stegman Pkwy
Stegman Pkwy	Stegman Ter.	Ken. Blvd.
Van Houten	Ken. Blvd.	Deadend
Casper Ct.	Deadend	Van Houten
Iorio Ct.	Van Houten	Deadend
Westminster Lane	Iorio Ct.	Ken. Blvd.

E ROUTE TUESDAY & FRIDAY

1:00 – 3:00pm

STREET	FROM	TO
Kensington	Deadend	Westside
Delaware	Kensington	Deadend
Gautier	Westside	Belvedere
Belvedere	Condict	Deadend
Gautier	Belvedere	Mallory
Mallory	Gautier	Deadend
Condict	Mallory	Delaware
Olean	Deadend	Duncan
Belvedere	Deadend	Duncan
Nunda	Deadend	Duncan
Plainfield	Deadend	Duncan
Freeman	Deadend	Duncan
Duncan	Rte. 440	Westside
Kensington	Westside	Bergen
Bentley	Bergen	Westside
Gifford	Westside	Bergen

E ROUTE TUESDAY & FRIDAY

	STREET	FROM	TO
3:00 – 5:00	Stevens	Ken. Blvd.	Westside
	Van Nostrand	Westside	Ken. Blvd.
	Armstrong	Ken. Blvd.	Westside
	Woodlawn	Westside	Ken. Blvd.
	Fulton	Ken. Blvd.	Westside
	Stegman Ct.	Deadend	Stegman Pky
	Stegman Pl.	Stegman Pkwy	Deadend
	Stegman Terrace	Deadend	StegmanPkwy
	Iorio Court	Deadend	Van Houten
	Casper Court	Deadend	Van Houten
	Van Houten	Deadend	Ken. Blvd.
	Stegman Pkwy.	Ken. Blvd.	Westside

E ROUTE TUESDAY & FRIDAY

	STREET	FROM	TO
7:30 – 10:00	1 Westside	Danforth	Broadway
	7 Stuyvesant	Van Reypen	Westside
	8 DeKalb	Ken. Blvd.	Westside
	6 Sip	Ken. Blvd.	Emerson
	5 Pavonia	Westside	Tonnelle
	2 St. Pauls	Tonnelle	Ken. Blvd.
	3 Tonnelle	St. Paul	Broadway
	4 Broadway	Tonnelle	Wallis
900	Westside	Montgomery	Culver
10:00 – 12:00	Magnolia	Deadend	Tonnelle
	Pavonia	Tonnelle	Deadend
	Van Reipen	Tonnelle	Deadend
	Bryan Place	Van Reipen	Deadend
	Garrison	Tonnelle	Bond
	Bond	Garrison	Ken. Blvd.
	Garrison	Bond	DeKalb
	Romaine	Stuyvesant	Broadway
	Van Wagenan	Deadend(Broadway)	Pavonia
	Van Wagenan	Deadend(Sip)	Stuyvesant
	Weldon	Stuyvesant	DeKalb
	Corbin	Stuyvesant	Deadend
	Giles	Deadend(Broadway)	Deadend(fox)
	Fox Place	Giles	Westside
	Pavonia	Westside	Giles
	Marion Place	Giles	Westside
	Logan	Westside	Bryant
	Wright	Logan	Broadway
	Wales	Deadend(Broadway)	Logan
	Logan	Bryant	Freeman
	Dales	Logan	Broadway
	Wallis	Broadway	Logan
	Emerson	Logan	Deadend
	Holmes	Deadend	Sip
	Bryant	Deadend	Logan
	Hawthorne	Deadend	Sip
	Whitman	Deadend	Sip

F ROUTE Monday & THURSDAY

	STREET	FROM	TO
6:00am			
	Corneilison	Summit	Florence
	Montgomery	Center	Baldwin
7:00am	Bergen Ave.	Fairmount	Sip
	Enos Place	Sip	Newkirk
	Jones Place	Newkirk	Sip
	Journal Square	CH Martins	Tonnelle
	Journal Square	Tonnelle	Sip
	Bergen Ave	Ken. Blvd.	Duncan
8:00am	MONDAY, WEDNESDAY AND FRIDAY ONLYL		
	Monticello	Communipaw	Orchard Street
8:00-10:00am	Astor Place	Monticello	Summit
	Prescott	Grand	Deadend
	Belmont	Monticello	Summit
	Gardner	Monticello	Summit
	Crescent	Belmont	Communipaw
	Clinton	Grand	Crescent
	Harmon	Grand	Crescent
	Clinton	Crescent	Monticello
	Monticello	Clinton	Bramhall
	Madison	Bramhall	Communipaw
	Jackson	Communipaw	Clinton
	Clinton	Jackson	Bergen Ave
	Seidler	Communipaw	Bramhall
	Sackett	Oak Street	Communipaw
	Fairmount	Summit	Grand Street
	Pacific	Grand	Caven Point Rd.
	Halladay	Ash Street	Forrest
10:00-12:00pm	Johnston Ave.	Monitor	Grand Street
	Colden Street	Freemont	Grand
	Barbara Place	Grand Street	Pacific Ave.
	Woodward	Grand Street	Johnston Ave.
	Ash Street	Johnston	Pine Street
	Pine Street	Ash Street	Deadend
	Whitton	Deadend	Ash Street
	Monitor	Deadend	Communipaw
	Lafayette	Pacific	Monitor
	Maple	Monitor	Deadend
	Lafayette	Pacific	Deadend

E ROUTE MONDAY & THURSDAY

	STREET	FROM	TO
10:00-12:00	Woodward	Lafayette	Deadend
	Bramhall	Woodward	Pacific
	VanHorne	Deadend	Lafayette
1:00-3:00pm	Bramhall	Garfield	Bergen
	Oxford	Bergen	Sackett
	Harrison	Westside	Communipaw
	Brinkerhoff	Crescent	Bergen
	Emory	Bergen	Monticello
	Belmont	Monticello	Ken. Blvd.
	Fairview	Ken. Blvd.	Monticello
	Reed	Monticello	Bergen
	Jewett	Monticello	Westside
	Fairview	Westside	Ken. Blvd.

F ROUTE TUESDAY & FRIDAY

	STREET	FROM	TO
6:00am			
	Corneilison	Fairmount	Ivy Place
	Montgomery	Baldwin	Center
7:00am	Bergen Ave.	Fairmount	Sip
	Enos Place	Sip	Newkirk
	Jones Place	Newkirk	Sip
	Journal Square	CH Martins	Tonnelle
	Journal Square	Tonnelle	Sip
	Bergen Ave	Ken. Blvd.	Duncan
8:00am	TUESDAY, THURSDAY AND SATURDAY ONLY		
	Monticello	Orchard	Communipaw
8:00-10:00am	Astor Place	Monticello	Summit
	Prescott	Grand	Deadend
	Park St.	Communipaw	Astor Place
	Belmont	Monticello	Summit
	Gardner	Monticello	Summit
	Crescent	Belmont	Communipaw
	Clinton	Grand	Crescent
	Harmon	Grand	Crescent
	Clinton	Crescent	Monticello
	Monticello	Clinton	Bramhall
	Madison	Bramhall	Communipaw
	Jackson	Communipaw	Clinton
	Clinton	Jackson	Bergen Ave
	Seidler	Communipaw	Bramhall
	Sackett	Oak Street	Communipaw
	Fairmount	Summit	Grand Street
	Halladay	Ash Street	Forrest
	Pacific	Grand	Caven Point Rd.
10:00-12:00pm	Pine Street	Johnston	Ash
	Ash	Pine	Johnston
	Colden	Grand	Freemont
	Barbara Place	Grand Street	Pacific Ave.
	Woodward	Grand Street	Johnston Ave.
	Pine Street	Johnston	Deadend
	Whitton	Deadend	Ash Street
	Maple	Monitor	Deadend
	Woodward	Lafayette	Deadend

F ROUTE TUESDAY&FRIDAY

10:00-12:00	STREET	FROM	TO
	Bramhall	Woodward	Pacific
	Van Horne	Deadend	Lafayette
	Lafayette	Manning	Monitor
1:00-3:00pm	Bramhall	Bergen	Garfield
	Oxford	Bergen	Sackett
	Harrison	Westside	Communipaw
	Brinkerhoff	Crescent	Bergen
	Emory	Bergen	Monticello
	Belmont	Monticello	Ken. Blvd.
	Fairview	Ken. Blvd.	Monticello
	Reed	Monticello	Bergen
	Jewett	Monticello	Westside
	Fairview	Westside	Ken. Blvd.

G ROUTE MONDAY ONLY

	STREET	FROM	TO
7:00am	Communipaw Ave	Westside Ave	Suydam Ave
	Suydam Ave	Communipaw Ave	Deadend
7:30am	MLK	McAdoo Ave	Bidwell Ave
8:00am	Long St	Rose Ave	MLK
	Rose Ave	Warner Ave	Old Bergen
	Old Bergen Rd.	Danforth Ave	McAdoo Ave
	Old Bergen Rd.	Merritt St	Danforth Ave
	Danforth Ave	Old Bergen Rd	Princeton Ave
	Ocean Ave	Merritt Street	Bidwell Ave
	Vreeland Ave	Garfield Ave	Deadend
	Wegman Place	Garfield Ave	Deadend
	Skyline Drive	Garfield Ave	Deadend
9:00 am	MLK	Bidwell	McAdoo
10:00am	East Bidwell	Deadend	Garfield Ave
	Wegman Pkwy	Garfield	Ocean Ave
	Stegman Street	Ocean	Garfield
	Bidwell	Garfield	Bergen
	Wegman Pky	MLK	Bergen
	Wegman Pky	MLK	Van Cleef
	Van Cleef	Deadend	Stegman
	Wegman Pky	Van Cleef	Ocean Ave
	Stegman Street	Ocean Ave	Ken Blvd
	Dwight Street	Ken Blvd	Van Cleef
	Freedom Place	Garfield Ave	Deadend
	Richard Street	Garfield Ave	Deadend
	Fulton Ave	Garfield Ave	Fulton Ave
	Bayside Place	Fulton Ave	Deadend
	Fulton Ave	Bayside Pl	Vreeland Pl
	Vreeland Pl	Fulton Ave	Deadend
	Fulton Ave	Vreeland Pl	Corcoran
	Corcoran	Fulton Ave	Woodlawn Av
	Fulton Ave	Corcoran	Rose Ave
	Rose Ave	Armstrong Ave	Deadend
	Fulton Ave	Rose Ave	Ken Blvd

G ROUTE MONDAY AND THURSDAY

- Woodlawn Ave
- Bayside Park Drive
- Armstrong Ave

- Ken Blvd
- Garfield Ave
- Garfield Ave

- Garfield Ave
- Deadend
- Bergen Ave

1:00-3:00PM

- Orient
- Claremont
- Grant Ave
- Kearny Ave
- Clarke Ave
- Yale
- Pollack
- Fisk
- Culver Ave
- College Street
- Culver
- Broadman Pky

- Ken Blvd
- Westside
- Bergen
- Westside
- Wesrside
- Deadend
- Westside
- Water Street
- Water Street
- Culver Ave
- College-Street
- Ken Blvd

- Halstead St
- Bergen
- Westside
- Deadend
- Rte 440
- Westside
- Mallory
- Westside
- College St
- Audobon
- Ken Blvd
- Deadend

3:00-5:00pm

- Cator Ave
- Spring
- Terhune
- Mc Adoo
- Surburbia Dr
- Surburbia Ter
- Surburbia Ct
- Norcroft
- Oakdale
- Pinecrest
- Riverview
- Mina
- Country Village RD
- Briarwood
- Sycamore Rd

- Ken Blvd
- Westside
- Spring
- Ken Blvd
- Bartholdi
- Surburbia DR
- Surburbia Dr
- Sycamore
- Riverview
- Oakdale
- Pinecrest
- Sycamore
- Mina
- Country Village Rd
- Briarwood

- Westside
- McAdoo
- Ken Blvd
- Westside
- Surburbia Ter
- Surburbia DR
- Surburbia Dr
- Riverview
- Sycamore
- Riverview
- Mina
- Riverview
- Briarwood
- Sycamore
- Delmar

Make a U TURN

- Crossgate
- Delmar
- Sycamore
- Ferncliff
- Exeter
- Sycamore
- Sullivan Way

- Sycamore
- Country Village Rd
- Delmar
- Sycamore
- Country Village
- Ferncliff
- Bartholdi

- Country Village
- Sycamore
- Fercliff
- Exeter
- Sycamore
- Sullivan Way
- Westside Ave

G ROUTE THURSDAY ONLY

	STREET	FROM	TO
7:00am	Communipaw Ave	Westside Ave	Suydam Ave
	Suydam Ave	Communipaw Ave	Deadend
7:30am	MLK	McAdoo Ave	Bidwell Ave
8:00am	Ocean Ave	Bidwell	Merritt
	Old Bergen Rd	Merritt	Danforth
	Long	Rose Ave	McAdoo Ave
	Rose Ave	Warner Ave	Old Bergen
	Old Bergen Rd	Danforth Ave	McAdoo Ave
	Danforth Ave	Westside Ave	Princeton Ave
	Vreeland Ter	Garfield Ave	Deadend
	Wegman Pl	Garfield Ave	Deadend
	Skyline Dr	Garfield Ave	Deadend
9:00 am	MLK	Bidwell	McAdoo
10:00am	East Bidwell	Deadend	Garfield Ave
	Wegman Pkwy	Garfield	Ocean Ave
	Stegman Street	Ocean	Garfield
	Bidwell	Garfield	Bergen
	Wegman Pky	MLK	Bergen
	Wegman Pky	MLK	Van Cleef
	Van Cleef	Deadend	Stegman
	Wegman Pky	Van Cleef	Ocean Ave
	Stegman Street	Ocean Ave	Ken Blvd
	Dwight Street	Ken Blvd	Van Cleef
	Freedom Place	Garfield Ave	Deadend
	Richard Street	Garfield Ave	Deadend
	Fulton Ave	Garfield Ave	Fulton Ave
	Bayside Place	Fulton Ave	Deadend
	Fulton Ave	Bayside Pl	Vreeland Pl
	Vreeland Pl	Fulton Ave	Deadend
	Fulton Ave	Vreeland Pl	Corcoran
	Corcoran	Fulton Ave	Woodlawn Av
	Fulton Ave	Corcoran	Rose Ave
	Rose Ave	Armstrong Ave	Deadend
	Fulton Ave	Rose Ave	Ken Blvd

G ROUTE MONDAY AND THURSDAY

Woodlawn Ave
Bayside Park Drive
Armstrong Ave

Ken Blvd
Garfield Ave
Garfield Ave

Garfield Ave
Deadend
Bergen Ave

1:00-3:00PM

Orient
Claremont
Grant Ave
Kearny Ave
Clarke Ave
Yale
Pollack
Fisk
Culver Ave
College Street
Culver
Broadman Pky

Ken Blvd
Westside
Bergen
Westside
Wesrside
Deadend
Westside
Water Street
Water Street
Culver Ave
College Street
Ken Blvd

Halstead St
Bergen
Westside
Deadend
Rte 440
Westside
Mallory
Westside
College St
Audobon
Ken Blvd
Deadend

3:00-5:00pm

Cator Ave
Spring
Terhune
Mc Adoo
Surburbia Dr
Surburbia Ter
Surburbia Ct
Norcroft
Oakdale
Pinecrest
Riverview
Mina
Country Village RD
Briarwood
Sycamore Rd

Crossgate
Delmar
Sycamore
Ferncliff
Exeter
Sycamore
Sullivan Way

Ken Blvd
Westside
Spring
Ken Blvd
Bartholdi
Surburbia DR
Surburbia Dr
Sycamore
Riverview
Oakdale
Pinecrest
Sycamore
Mina
Country Village Rd
Briarwood
Make a U TURN
Sycamore
Country Village Rd
Delmar
Sycamore
Country Village
Ferncliff
Bartholdi

Westside
McAdoo
Ken Blvd
Westside
Surburbia Ter
Surburbia DR
Surburbia Dr
Riverview
Sycamore
Riverview
Mina
Riverview
Briarwood
Sycamore
Delmar

Country Village
Sycamore
Fercliff
Exeter
Sycamore
Sullivan Way
Westside Ave

G ROUTE TUESDAY ONLY

7:00 am	STREET	FROM	TO
	Communipaw	Suydam	Garfield
	Suydam	Communipaw	Deadend
7:30am	MLK	McAdoo	Bidwell
8:00am	Garfield	Bidwell	Danforth
	Danforth	Princeton	Rose
	Rose	Danforth	Warner
	Long	McAdoo	Rose
	Danforth	Old Bergen Rd.	Westside
	Ocean	Bidwell	Merritt
	Vreeland Terrace	Garfield	Deadend
	Wegman Pkwy	Garfield	Deadend
	Skyline Drive	Garfield	Deadend
9:00am	MLK	Bidwell	McAdoo
10:00-12:00am	Eastview Ct.	Deadend	E. Bidwell
	East Bidwell	Deadend	Garfield
	Wegman Pkwy	Garfield	Ocean
	Stegman Street	Ocean	Garfield
	Bidwell	Garfield	Bergen
	Stegman Street	Bergen	MLK
	Wegman Pkwy	MLK	Bergen
	Wegman Pkwy	MLK	VanCleef
	VanCleef	Deadend	Stegman
	Wegman Pkwy	VanCleef	Ocean
	Stegman Street	Ocean	Kennedy Blvd
	Dwight	Ken. Blvd.	VanCleef
	VanCleef	Dwight	Armstrong
	Dwight	VanCleef	Garfield
	Freedom Place	Garfield	Deadend
	Richard Street	Garfield	Deadend
	Bayside Terrace	Richard Street	Deadend
	Fulton	Garfield	Corcoran
	Corcoran	Fulton	Woodlawn
	Fulton	Corcoran	Rose
	Rose	Armstrong	Deadend
	Fulton	Rose	Ken. Blvd.
	Woodlawn	Ken. Blvd.	Garfield
	Armstrong	Garfield	Ken. Blvd.

G ROUTE FRIDAY ONLY

7:00am	STREET	FROM	TO
	Communipaw	Suydam	Garfield
	Suydam	Communipaw	Deadend
7:30am	MLK	McAdoo	Bidwell
8:00am	Garfield	Bidwell	Danforth
	Danforth	Princeton	Rose
	Rose	Danforth	Warner
	Long	McAdoo	Rose
	Danforth	Old Bergen Rd.	Westside
	Ocean	Merritt St.	Bidwell
	Vreeland Terr.	Garfield	Deadend
	Wegman Pkwy	Garfield	Deadend
	Skyline Drive	Garfield	Deadend
9:00am	MLK	Bidwell	McAdoo
10:00-12:00pm	Eastview Ct.	Deaadend	E. Bidwell
	East Bidwell	Deadend	Garfield
	Wegman Pkwy	Garfield	Ocean
	Stegman Street	Ocean	Garfield
	Bidwell	Garfield	Bergen
	Stegman Street	Bergen	MLK
	Wegman Pkwy	MLK	Bergen
	Wegman Pkwy	MLK	VanCleef
	VanCleef	Deadend	Stegman
	Wegman Pkwy	VanCleef	Ocean
	Stegman Street	Ocean	Ken. Blvd.
	Dwight	Ken. Blvd.	VanCleef
	VanCleef	Dwight	Armstrong
	Dwight	VanCleef	Garfield
	Freedom Place	Garfield	Deadend
	~~Richard Street~~	Garfield	Deadend
	Bayside Terrace	Richard Street	Deadend
	Fulton	Garfield	Corcoran
	Corcoran	Fulton	Woodlawn
	Fulton	Corcoran	Rose
	Rose	Armstrong	Deadend
	Fulton	Rose	Ken. Blvd.
	Woodlawn	Ken. Blvd.	Garfield
	Armstrong	Garfield	Ken. Blvd.

G ROUTE TUESDAY & FRIDAY ONLY

	STREET	FROM	TO
1:00-3:00pm	Orient	Ken. Blvd.	Halstead
	Claremont	Halstead	Bergen
	Grant	Bergen	Westside
	Kearny	Westside	Deadend
	Clarke	Westside	Rte.440
	Claremont	Mallory	Westside
	Pollack	Westside	Mallory
	Yale	Deadend	Westside
	Culver	Westside	Rte.440
	Fisk	Water Street	Westside
	Broadman Pkwy.	Deadend	Ken. Blvd.
	Culver	Ken. Blvd.	College St.
	College Street	Audobon	Culver
	Culver	College St.	Westside
3:00-5:00pm	McAdoo	Westside	Ken. Blvd.
	Spring	Westside	McAdoo
	Cator	Ken. Blvd.	Westside
	Terhune	Spring	Ken. Blvd.
	Surburbia Dr.	Bartholdi	Surburbia Ter.
	Surburbia Ter.	Surburbia Ct.	Surburbia Dr.
	Surburbia Ct.	Surburbia Dr.	Surburbia Dr.
	Sycamore	Surburbia	Mina
	Mina	Sycamore	Country Village Rd.
	Norcroft	Sycamore	Riverview
	Oakdale	Riverview	Sycamore
	Pinecrest	Oakdale	Riverview
	Riverview	Pinecrest	Mina
	Country Village Rd.	Mina	Briarwood
	Briarwood	Country Village Rd	Sycamore Rd.
	Crossgate	Sycamore Rd.	Country Village Rd.
	Sycamore	Briarwood	Mina
	Delmar	Country Village Rd.	Sycamore Rd.
	Exeter	Sycamore Rd.	Country Village Rd.
	Ferncliff	Exeter	Sycamore Rd.

G ROUTE TUESDAY & FRIDAY ONLY

	STREET	FROM	TO
1:00-3:00pm			
	Orient	Ken. Blvd.	Halstead
	Claremont	Halstead	Bergen
	Grant	Bergen	Westside
	Kearny	Westside	Deadend
	Clarke	Westside	Rte.440
	Claremont	Mallory	Westside
	Pollack	Westside	Mallory
	Yale	Deadend	Westside
	Culver	Westside	Rte.440
	Fisk	Water Street	Westside
	Broadman Pkwy.	Deadend	Ken. Blvd.
	Culver	Ken. Blvd.	College St.
	College Street	Audobon	Culver
	Culver	College St.	Westside
3:00-5:00pm	McAdoo	Westside	Ken. Blvd.
	Spring	Westside	McAdoo
	Cator	Ken. Blvd.	Westside
	Terhune	Spring	Ken. Blvd.
	Surburbia Dr.	Bartholdi	Surburbia Ter.
	Surburbia Ter.	Surburbia Ct.	Surburbia Dr.
	Surburbia Ct.	Surburbia Dr.	Surburbia Dr.
	Sycamore	Surburbia	Mina
	Mina	Sycamore	Country Village Rd.
	Norcroft	Sycamore	Riverview
	Oakdale	Riverview	Sycamore
	Pinecrest	Oakdale	Riverview
	Riverview	Pinecrest	Mina
	Country Village Rd.	Mina	Briarwood
	Briarwood	Country Village Rd	Sycamore Rd.
	Crossgate	Sycamore Rd.	Country Village Rd.
	Sycamore	Briarwood	Mina
	Delmar	Country Village Rd.	Sycamore Rd.
	Exeter	Sycamore Rd.	Country Village Rd.
	Ferncliff	Exeter	Sycamore Rd.

H ROUTE MONDAY & THURSDAY

7:00am	STREET	FROM	TO
	Central Ave.	Pavonia	Newark
7:30am	Central Ave.	Leonard St.	Reservoir Ave
	Pershing Plaza	Central Ave	Summit Ave
8:00-10:00am	Summit Ave.	Sip Ave	Communipaw
	Summit Ave	Ivy Place	Fairmount Ave.
	Baldwin Ave	Clifton Place	State Hwy.
	Central Ave	State Hwy.	Reservoir Ave
9:00am	Central Ave	Reservoir Ave	Paterson Plank
10:00-12:00pm	Secaucus Rd.	Ken. Blvd.	Paterson Plank
	Hague St.	Central Ave	Nelson Ave
	Leonard St.	Nelson Ave	Central Ave
	Grace St	Central Ave	Nelson Ave
	Poplar St	Nelson Ave	Central Ave
	Irving St	Central Ave	Nelson Ave
	North St	~~Nelson Ave~~ Terrace	Central Ave
	Graham St	Central Ave	Nelson Ave
	Congress St	Nelson Ave	Pierce
	Pierce	Congress St	South St
	Congress	Pierce	Passaic
	Passaic	Congress St	South St
	Congress St	Passaic	Central Ave
	Paterson St	Central Ave	Ken. Blvd.
	Bleecker St	Ken Blvd	Central Ave
	South St	Central Ave	Ken Blvd
	Bleecker St	Ken Blvd	Terrace Ave
	~~North St~~	~~Terrace Ave~~	~~Nelson Ave~~

H ROUTE MONDAY & THURSDAY

1:00-3:00pm	STREET	FROM	TO
	Thorne St	Liberty Ave	Central Ave
	Charles St	Central Ave	Milton Ave
	Milton Ave	Charles St	Griffith St
	Charles St	Milton Ave	Ken Blvd.
	Bower St	Ken Blvd	Central Ave
	Ferry St	Central Ave	Abbett St
	Abbett St	Booraem Ave	Ferry St
	Ferry St	Abbett St	New York Ave
	Ravine Ave	Abbett St	Palisade Ave
	Booraem Ave	Palisade Ave	Lineau Pl
L	Lineau Pl	Booraem Ave	Waverly St
	Booraem Ave	Lineau Pl	Nesbitt
	Nesbitt	Booraem Ave	Reservoir Ave
	Booraem Ave	Nesbitt	Central Ave
	Reservoir Ave	Central Ave	Palisade Ave
	Prospect St	Palisade Ave	Central Ave
	Waverly St	Central Ave	Palisade Ave
	Jefferson Ave	Palisade Ave	Summit Ave
3:00-5:00pm	Montgomery St	Westside Ave	Fairmount Ter
	Fairmount Ter	Montgomery	Britton
	Britton	Fairmount	Montgomery
	Montgomery	Britton	Baldwin Ave
	Tuers Ave	Montgomery	Vroom St
	Mercer	Tuers	Bergen Ave
	Glenwood Ave	Bergen Ave	Westside Ave
	Highland Ave	Westside Ave	Bergen Ave
	Fairmount Ave	Westside Ave	Bergen Ave
	Duncan Ave	Bergen Ave	Duncan Ct.
	Duncan Ct	Duncan Ave	Deadend
	Duncan Ave	Duncan Ct	Apollo St
	Apollo St	Duncan Ave	Deadend
	Duncan Ave	Apollo St	Westside

H ROUTE TUESDAY& FRIDAY

7:00am	STREET	FROM	TO
	Central Ave	Newark Ave	Pavonia Ave
7:30am	Central Ave	Leonard Ave	Reservoir Ave
	Pershing Plaza	Central Ave	Summit Ave
8:00-10:00am	Central Ave	Reservoir Ave	Hoboken Ave
	Baldwin Ave	Hoboken Ave	Clifton Place
	Summit Ave	Fairmount Ave	Clifton Place
	Summit Ave	Clifton Place	Sip Avenue
9:00am	Central Ave	Reservoir Ave	Paterson Plank
10:00-12:00pm	Hague Street	Central Ave	Nelson Ave
	Leonard St	Nelson Ave	Central Ave
	Grace St	Central Ave	Nelson Ave
	Poplar St	Nelson Ave	Central Ave
	Irving St	Central Ave	Nelson Ave
	North St	~~Nelson Ave~~ Terrace	Central Ave
	Graham St	Central Ave	Nelson Ave
	Congress St	Nelson Ave	Pierce
	Pierce	Congress St	South St
	Congress St	Pierce	Passaic
	Passaic	Congress St	South St
	Congress St	Passaic	Central Ave
	Paterson St	Central Ave	Ken Blvd.
	Bleecker St	Ken Blvd.	Central Ave
	South St	Central Ave	Ken Blvd
	Bleecker St	Ken Blvd	Terrace Ave
	~~North St~~	~~Terrace Ave~~	~~Nelson Ave~~

H ROUTE TUESDAY & FRIDAY

	STREET	FROM	TO
1:00-3:00pm	Thorne St	Liberty Ave	Central Ave
	Charles St	Central Ave	Milton Ave
	Milton Ave	Griffith St	Charles St
	Charles St	Milton Ave	Ken Blvd.
	Bower St	Central Ave	Ken Blvd
	Ferry St	Central Ave	Abbett St
	Abbett St	Ferry St	Booraem Ave
	Ferry St	Abbett St	New York Ave
	Ravine Ave	Palisade Ave	Abbett St
	Booraem Ave	Palisade Ave	Lineau Pl
	Lineau Pl	Waverly St	Booraem Ave
	Booraem Ave	Lineau Pl	Nesbitt
	Nesbitt	Booraem Ave	Reservoir Ave
	Booraem Ave	Nesbitt	Central Ave
	Reservoir Ave	Central Ave	Palisade Ave
	Prospect St	Palisade Ave	Central Ave
	Waverly St	Central Ave	Palisade Ave
	Jefferson Ave	Palisade Ave	Summit Ave
3:00-5:00pm	Montgomery	Baldwin Ave	Tuers Ave
	Tuers Ave	Montgomery	Vroom St
	Mercer St	Tuers Ave	Bergen Ave
	Glenwood	Bergen Ave	Westside Ave
	Highland Ave	Westside Ave	Bergen Ave
	Montgomery	Bergen Ave	Westside Ave
	Fairmount Ave	Westside Ave	Fairmount Terr
	Fairmount Terr	Fairmount Ave	Montgomery
	Fairmount Ave	Fairmount Terr	Britton
	Britton	Fairmount Ave	Montgomery
	Fairmount Ave	Britton	Bergen Ave
	Duncan Ave	Bergen Ave	Duncan Ct.
	Duncan Ct	Deadend	Duncan Ave
	Duncan Ave	Duncan Ct	Apollo
	Apollo	Deadend	Duncan Ave
	Duncan Ave	Apollo	Westside

I ROUTE MONDAY & THURSDAY

	STREET	FROM	TO
8:00-10:00am			
	Audobon	Bergen	College Street
	Towers	College Street	Culver
	Westview Ct.	Culver	Broadman Pky.
	Audobon	College Street	College Drive
	College Dr.	Culver	Audobon
	Audobon	College Dr.	Westside
	Mallory	Fisk	Communipaw
	Mallory Terrace	Clendenny	Roosevelt
	Lexington	Mallory	Marcy
	Roosevelt	Marcy	Westside
	Lexington	Bergen	Mallory
	Clendenny	Marcy	Bergen
	Clinton	Bergen	Westside
	Delaware	Communipaw	Deadend
	Olean	Communipaw	Deadend
	Belvedere	Communipaw	Deadend
	Nunda	Communipaw	Deadend
10:00-12:00pm	Sterling	Fulton(deadend)	McAdoo
	Van Nostrand	Bergen	Garfield
	Eastern Pkwy	Garfield	Ocean
	Rutgers	Cator	VanNostrand
	Stevens Ave.	Ocean	Ken. Blvd.
	Wade	Ken. Blvd.	Ocean
	Warner	Ocean	Parnell
	Parnell	Warner	McAdoo
	Warner	Parnell	Ken. Blvd.
	Fowler	Ken. Blvd.	Greenville
	Linden	Fowler	Ken. Blvd.
	Greenville	Ken. Blvd.	Fowler
	Lembeck	Ken. Blvd.	Greico Dr.
	Greico Dr.	Lembeck	Brother Stan Dr
	Mssgr Wojitcha	the entire length	
	Pearsall	Brother Stan Dr.	Ken. Blvd.
	Bartholdi	Ken. Blvd.	Country Village
	Winfield	Romar	Sayles
	Sayles	Roman	Neptune
	Neptune	Sayles	Ken. Blvd.
	Winfield	Ken Blvd.	Romar
	Seaview	Ken. Blvd.	Romar
	Romar	Seaview	Greenville

I ROUTE MONDAY& THURSDAY

1:00-3:00pm	STREET	FROM	TO
	1 Pamrapo	Ken. Blvd.(deadend)	Old Bergen Rd
	2 Custer	Ken. Blvd.	Old Bergen Rd.
	3 Neptune	Old Bergen Rd.	Ken. Blvd
	6 Pearsall	Ken. Blvd.	Old Bergen Rd
	7 Lembeck	Old Bergen Rd	Ken. Blvd.
	4 Winfield	Ken. Blvd.	Old Bergen Rd
	5 Bartholdi	Ocean	Ken. Blvd.
	8 Linden	Ken. Blvd.	Old Bergen Rd
	9 Greenville	Old Bergen Rd	Ken. Blvd.
	Mc Adoo	Ken. Blvd.	Rutgers
	Chapel	Rutgers	Ocean
	Sheffield	Ocean	Rutgers
	New Street	Rutgers	Ludlow
	Ludlow	New Street	Chapel
	New Street	Ludlow	Ocean
	Cator Ave	Princeton	Ken. Blvd.
3:00-5:00pm	Linden	Old Bergen Rd	Princeton
	Linden Court	Linden Ave	Deadend
	Albert Place	Linden Ave.	Deadend
	Lembeck	Princeton	Old Bergen Rd
	Pearsall	Old Bergen Rd	Princeton
	Neptune	Princeton	Garfield
	Brown Place	Garfield	Princeton
	Neptune	Garfield	Old Bergen Rd
	Winfield	Old Bergen Rd	Princeton
	Gates	Princeton(deadend)	Ken. Blvd.
	Seaview	Ken. Blvd.	Princeton
	Garfield	Merritt Street	Danforth
	Princeton	Cator Avenue	Gates Ave.

I ROUTE TUESDAY & FRIDAY

8:00-10:00am	STREET	FROM	TO
	Audobon	Westside	Bergen Ave
	Towers	College Street	Culver
	~~Westview Ct.~~	~~Culver~~	~~Broadman Pky~~
	College Dr.	Culver	Audobon
	Lexington	Mallory	Marcy
	Roosevelt	Marcy	Mallory
	Mallory Terrace	Clendenny	Roosevelt
	Roosevelt	Mallory	Westside
	Lexington	Bergen	Mallory
	Clendenny	Marcy	Bergen Ave
	Clinton	Bergen	Westside
	Delaware	Deadend	Communipaw
	Olean	Deadend	Communipaw
	Belvedere	Deadend	Communipaw
	Nunda	Deadend	Communipaw
	Mallory	Communipaw	Fisk
10:00-12:00pm	Sterling	Mc Adoo	Deadend
	VanNostrand	Bergen Ave	Garfield Ave
	Eastern Pkwy	Garfield Ave	Ocean Ave
	Rutgers	Cator Ave	VanNostrand
	Stevens	Ocean Ave	Ken. Blvd.
	Wade	Ken. Blvd	Ocean
	Warner	Ocean	Parnell
	Parnell	Warner	Mc Adoo
	Warner	Parnell	Ken. Blvd.
	Fowler	Ken. Blvd.	Greenville
	Linden	Fowler	Ken. Blvd.
	Greenville	Ken. Blvd.	Fowler
	Lembeck	Ken. Blvd.	Greico Dr.
	Greico Dr.	Lembeck	Brother Stan Dr.
	Mssgr Wojitcha	Entire Length	
	Pearsall	Brother Stan Dr.	Ken. Blvd.
	Bartholdi	Ken. Blvd.	Country Village
	Winfield	Romar	Sayles
	Sayles	Romar	Neptune
	Neptune	Sayles	Ken. Blvd.
	Winfield	Ken. Blvd.	Romar
	Seaview	Ken. Blvd.	Romar
	Romar	Seaview	Greenville

I ROUTE TUESDAY & FRIDAY

	STREET	FROM	TO
1:00-3:00pm	1 Pamrapo	Old Bergen Rd	Deadend
	2 Custer	Ken. Blvd.	Old BergenRd
	3 Neptune	Old Bergen Rd	Ken. Blvd.
	~~4~~ Pearsall	Ken. Blvd.	Old BergenRd
	Lembeck	Old Bergen Rd	Ken. Blvd.
	4 Winfield	Ken. Blvd.	Old BergenRd
	5 Neptune	Old Bergen Rd	Garfield
	6 Bartholdi	Ocean	Ken. Blvd.
	Linden	Ken. Blvd.	Old BergenRd
	Greenville	Old Bergen Rd	Ken. Blvd
	Mc Adoo	Ken. Blvd.	Rutgers
	Chapel	Rutgers	Ocean
	Sheffield	Ocean	Rutgers
	New	Rutgers	Ludlow
	Ludlow	New	Chapel
	New	Ludlow	Ocean
	Cator	Princeton	Ken. Blvd.
3:00-5:00pm	Linden	Old Bergen Rd	Princeton
	Linden Ct.	Linden	Deadend
	Albert Place	Linden	Deadend
	Lembeck	Princeton	Old BergenRd
	Pearsall	Old Bergen Rd	Princeton
	Neptune	Princeton	Garfield
	Brown Place	Garfield	Princeton
	Winfield	Old Bergen Rd	Princeton
	Gates Ave	Princeton(deadend)	Ken. Blvd
	Seaview	Ken. Blvd.	Princeton
	Princeton	Gates Ave	Cator Ave
	Garfield	Danforth	Merritt Street

J ROUTE MONDAY & THURSDAY

8:00-10:00am	STREET	FROM	TO
	Summit Ave	Sip Ave	Manhattan
	Carlton Ave	Liberty Ave	Summit Ave
	Lake St	Montrose	Liberty Ave
	Carlton Ave	Liberty Ave	Tonnelle Avea
	Beach St	Tonnelle Ave	Summit Ave
	Stagg St	Ken Blvd	Liberty Ave
	Cliff St	Liberty Ave	Ken Blvd
	Spruce St	Tonnelle Ave	Collard St
	Floyd St	Ken Blvd	Deadend
	Manhattan Ave	Tonnelle Ave	Summit Ave
	Summit Ave	Manhattan Ave	Secaucus Rd
10:00-12:00pm	Zabriskie St	Summit Ave	Central Ave
	Griffith St	Central Ave	Deadend
	Bower St	Ogden Ave	Central Ave
	Lincoln St	Central Ave	Ken Blvd.
	Griffith St	Ken Blvd	Central Ave
	Sherman Place	Central Ave	Ken Blvd
	Zabriskie St	Ken Blvd	Western
	Hutton St	Liberty Ave	Summit Ave
	Zabriske St	Summit Ave	Ken Blvd
	Sanford Place	Zabriskie St	Summit Ave
	Troy St	Summit Ave	Montrose
	Montose	Troy	Manhattan Ave
	Hutton St	Summit Ave	Sherman Ave
	Hutton St	Palisade Ave	Sherman Ave
	Franklin St	Ogden Ave	Central Ave
	Manhattan Ave	Sherman Ave	Central Ave

J ROUTE MONDAY& THURSDAY

1:00-3:00pm	STREET	FROM	TO
	Nelson Ave	Ken Blvd	City Line
	Columbia Ave	Leonard St	Secaucus Rd
	Secaucus Rd	Columbia Ave	Ken Blvd
	Columbia Ave	Leonard St	Zabriskie St
	Lincoln St	Columbia Ave	Western Ave
	Western Ave	Lincoln St	Reserve Ave
	Reserve Ave	Terrace Ave	Deadend
	Western Ave	Reserve Ave	Manhattan Ave
	Terrace Ave	Manhattan Ave	Leonard St
	Liberty Ave	Secaucus Rd	Deadend
3:00-5:00pm	High St	Baldwin Ave	Perrine Ave
	Perrine Ave	High St	Deadend
	Perrine Ave	Deadend	High St
	High St	Perrine Ave	Summit Ave
	Newkirk St	Summit Ave	Sip Ave
	Tonnelle Ave	Sip Ave	Van Reypen St
	Van Reypen St	Tonnelle Ave	Highland Ave
	Vroom St	Bergen Ave	Gray St
	Gray St	Mercer St	Academy St
	Front St	Both Sides	
	Academy St	Front St	Tuers Ave
	Tuers Ave	Both Sides	
	Academy St	Tuers Ave	Van Reypen St

J ROUTE TUESDAY & FRIDAY

8:00-10:00am	STREET	FROM	TO
	Summit Ave	Secaucus Rd	Troy St
	Manhattan Ave	Central Ave	Tonnelle Ave
	Lake St	Montrose	Liberty Ave
	Cliff St	Liberty Ave	Ken Blvd
	Stagg St	Ken Blvd	Liberty Ave
	Spruce St	Liberty Ave	Collard St
	Floyd St	Ken Blvd	Deadend
	Carlton Ave	Summit Ave	Tonnelle Ave
	Beach St	Tonnelle Ave	Summit Ave
	Summit Ave	Beach St	Newark Ave
10:00-12:00pm	Zabriskie St	Summit Ave	Central Ave
	Griffith St	Central Ave	Deadend
	Bower St	Ogden Ave	Central Ave
	Lincoln St	Central Ave	Ken Blvd
	Griffith St	Ken Blvd	Central Ave
	Sherman Pl	Central Ave	Ken Blvd
	Zabriskie	Ken Blvd	Western Ave
	Hutton St	Liberty Ave	Sanford Pl
	Zabriskie St	Summit Ave	Ken Blvd
	Sanford Place	Zabriskie St	Summit Ave
	Troy St	Summit Ave	Montrose
	Montrose	Troy St	Manhattan Ave
	Manhattan Ave	Sherman Ave	Central Ave
	Franklin St	Central Ave	Ogden Ave
	Hutton St	Palisade Ave	Sanford Pl

J ROUTE TUESDAY & FRIDAY

1:00-3:00pm	STREET	FROM	TO
	Liberty Ave	Spruce St	Secaucus Rd
	Terrace Ave	Leonard St	Manhattan Ave
	Western Ave	Manhattan Ave	Reserve Ave
	Reserve Ave	Deadend	Terrace Ave
	Western Ave	Reserve Ave	Lincoln St
	Lincoln St	Western Ave	Columbia Ave
	Columbia Ave	Zabriskie St	Secaucus Rd
	Nelson Ave	Secaucus Rd	Ken Blvd
3:00-5:00pm	Tonnelle Ave	Sip Ave	VanReypen St
	Academy St	VanReypen St	Cornelison Ave
	Gray St	Mercer St	Academy St
	Rock St	Baldwin Ave	Summit Ave
	Newkirk St	Summit Ave	Baldwin Ave
	Rock St	Baldwin Ave	Summit Ave
	Vroom St	Bergen Ave	Gray St
	Vroom St	Bergen Ave	VanReypen St
	VanReypen St	Vroom St	Sip Ave

K ROUTE MONDAY AND THURSDAY

	STREET	FROM	TO
8:00 – 10:00	Ken. Blvd.	Pamrapo	Sip Ave.
10:00 – 12:00	Ken. Blvd.	Brooks Place	Secaucus Road
1:00 – 3:00	Merritt	Old Bergen	Into Curries Woods

K ROUTE TUESDAY & FRIDAY

	STREET	FROM	TO
8:00 – 10:00	Ken. Blvd.	Secaucus Rd.	Sip Ave.
10:00 – 12:00	Ken. Blvd.	Sip Ave.	Pamrapo
1:00 – 3:00	Merritt	Old Bergen	Into Curries Woods

SATURDAY ROUTE 1

Bergen Ave.	Fairview to Montgomery	East
Montgomery St.	Bergen to Orchard	South
Montgomery St.	Tuers to Boland	North
Montgomery St.	Boland to Bergen	South
Bergen	Montgomery to Sip	East
Sip	Bergen to Summit	South
Sip	Summit to Blvd.	North
Sip	Blvd. to Bergen	South
Jo. Square area by Concourse and across Bank		Both sides
Bergen	Sip to Fairview	West
Baldwin	Montgomery to Clifton	West
Baldwin	Clifton to Montgomery	East

7:30 9:00	West Side Ave.	Culver to Fayette	East
8 - 10	Monticello Ave.	Orchard to Communipaw	West
9 - 10	West Side Ave.	Fayette to Culver	West

SATURDAY ROUTE #2

7:30 to 9:00	M.L.K. Dr.	McAdoo to Communipaw	East
8 - 10	Ocean Ave.	Bramhall to Merritt	West
9 - 10	M.L.K Dr.	Bramhall to McAdoo	West
10 - 12	Bergen Ave.	Duncan to Van Nostrand	West

SATURDAY ROUTE #3
INDUSTRIAL ROUTE

START 6:00 A.M.

GARFIELD AVE.	BAYVIEW AVE. TO COMMUNIPAW	BOTH SIDES
C. C. DRIVE	GROVE ST. TO RIVER	BOTH SIDES
HUDSON ST.	C. C. DRIVE TO YORK ST.	BOTH SIDES
MONTGOMERY ST.	HUDSON TO GREEN ST. & ISLAND	BOTH SIDES
WARREN ST.	1st ST. TO YORK ST.	BOTH SIDES
WASHINGTON ST.	6th ST. TO C. C. DRIVE	BOTH SIDES
7:30 TO 9 :00 A.M.		
NEWARK AVE.	HENDERSON TO 1&9 CIRCLE	NORTH SIDE
ST. PAULS AVE.	TONNELE TO DUFFIELD ST.	BOTH SIDES
WEST SIDE AVE.	ST. PAULS AVE. TO VAN KUREN	BOTH SIDES
JAMES ST.	DEY ST. TO VAN KUREN AVE.	BOTH SIDES
LARCH AVE.	ST. PAULS TO DEAD END	BOTH SIDES
LEWIS ST.	ST. PAULS TO DEAD END	BOTH SIDES
DEY ST.	CHARLOTTE TO DEAD END	BOTH SIDES
CHARLOTTE AVE.	ST. PAULS AVE. TO CIRCLE	BOTH SIDES
DUFFIELD ST.		BOTH SIDES
VAN REIPEN AVE.	OFF CIRCLE	BOTH SIDES
HOWARD ST.	OFF CIRCLE	BOTH SIDES
9:00 TO 10:00 A.M.		
NEWARK AVE.	1&9 CIRCLE TO HENDERSON	SOUTH SIDE
10:00 TO 12:00 NOON		
GROVE ST.	10TH ST. TO CITY LINE	BOTH SIDES
JERSEY AVE.	10TH ST. TO CITY LINE	BOTH SIDES
ERIE ST.	10TH ST. TO CITY LINE	BOTH SIDES
HENDERSON ST.	10TH ST. TO CITY LINE	BOTH SIDES

	6:00 A.M.	
RT. 440	CULVER AVE. TO COMMUNIPAW	EAST
COMMUNIPAW AVE.	RT. 440 TO MIDDLE OF BRIDGE	SOUTH
COMMUNIPAW AVE.	MIDDLE OF BRIDGE TO RT. 440	
RT. 440	COMMUNIPAW AVE. TO CIRCLE	ALL JUG HANDLES
RT. 440	CIRCLE TO COMMUNIPAW AVE.	ALL JUGHANDLES
	7:30 A.M. TO 9:00 A.M	
MARTIN LUTHER	MC ADOO AVE. TO COMMUNIPAW AVE.	EAST
	8:00 A.M. TO 10:00 A.M.	
MONTICELLO AVE.	ORCHARD ST. TO COMMUNIPAW AVE.	WEST
OCEAN AVE.	BRAMHALL AVE. TO MERRITT ST.	WEST
	9:00 A.M. TO 10:00 A.M.	WEST
MARTIN LUTHER	BRAMHALL AVE. TO MC ADOO AVE.	WEST
	10:00 A.M. TO 11:00 A.M.	
BERGEN AVE.	DUNCAN AVE. TO VAN NORSTRAND AVE.	WEST
	11:00 A.M. TO NOON LUNCH	
	12:00 NOON TO 1:00 P.M.	
CAVEN PT RD.	BURMA RD. & PHILLIP ST. FM CHAPEL AVE. TO AUDREY ZAPP DR. U-TURN	EAST
AUDREY ZAPP DR.	PHILLIP ST. TO BURMA RD. TO MC GOVERN ROAD LEFT	WEST
MC GOVERN RD.	TO DEAD END U-TURN	SOUTH
MC GOVERN RD.	TO BURMA RD. LEFT	NORTH
BURMA RD.	TO CONRAD TO DEAD END U-TURN	SOUTH
CONRAD DR.	HART DR. RIGHT	NORTH
HART DR.	TO MC GOVERN DR. U-TURN	EAST
HART DR.	TO MORRIS PESIN DR. U-TURN	WEST
HART DR.	TO CONRAD DR. LEFT	EAST
CONRAD DR.	TO BURMA RD. LEFT	NORTH
BURMA RD.	INTO CAVEN PT. RD.	WEST
CAVEN PT. RD.	TO CHAPEL AVE. LEFT	WEST
CHAPEL AVE.	TO DEAD END U-TURN	NORTH
CHAPEL AVE.	TO CAVEN PT. RD.	SOUTH

APPENDIX G

JERSEY CITY ZONING MAP

JERSEY CITY, NEW JERSEY
ZONING MAP
Adopted APRIL 11, 2001
Amended OCTOBER 16, 2003[1]
Amended MARCH 10, 2004[2]
Amended APRIL 28, 2004[3]
Amended JULY 15, 2004[4]
Amended AUGUST 11, 2004[5]
Amended SEPTEMBER 8, 2004[6]
Amended OCTOBER 6, 2004[7]
Amended OCTOBER 27, 2004[8]
Amended FEBRUARY 9, 2005[9]
Amended MARCH 23, 2005[10]
Amended MAY 18, 2005[11]
Amended JUNE 22, 2005[12]
Amended SEPTEMBER 28, 2005[13]
Amended NOVERMBER 18, 2005[14]
Amended FEBRUARY 22, 2006[15]
Amended MARCH 22, 2006[16]
Amended APRIL 12, 2006[17]
Amended APRIL 26, 2006[18]
Amended MAY 24, 2006[19]
ZONING DISTRICTS
R-1 ONE AND TWO FAMILY HOUSING
R-2 MULTI-FAMILY ATTACHED HOUSING (4 STORIES OR LESS)
R-3 MULTI-FAMILY MID-RISE
R-4 MULTI-FAMILY HIGH-RISE
H HISTORIC DISTRICTS
OR OFFICE/RESIDENTIAL
NC NEIGHBORHOOD COMMERCIAL
C/A COMMERCIAL/AUTOMOTIVE
HC HIGHWAY COMMERCIAL
CBD CENTRAL BUSINESS DISTRICT
U UNIVERSITY
M MEDICAL
G GOVERNMENT
I INDUSTRIAL
PI PORT INDUSTRIAL
WPD WATERFRONT PLANNED DEVELOPMENT
DT DESTINATION TOURISM
C CEMETERY
P/O PARKS/OPEN SPACE
NJMC NEW JERSEY MEADOWLANDS COMMISSION
REDEVELOPMENT PLAN AREAS
see top right panel for full listing.
OVERLAY DISTRICTS
HISTORIC DISTRICTS
RESTAURANT ROW OVERLAY
PALISADE PROTECTION OVERLAY
MARION WORKS OFFICE/RESIDENTIAL
SUBDISTRICT A
SUBDISTRICT B
REDEVELOPMENT PLAN AREAS
1 Armory
2 Bates Street
3 Beacon Avenue
4 Betz Brewery
5 Boland Street
6 Boyd McGuiness Park
7 Caven Point
8 Claremont Industrial
9 Colgate
10 Columbus Corner
11 Communipaw West Community Center
12 Dixon Crucible
13 Droyers Point
14 Exchange Place
15 Exchange Place North
16 Grand Jersey
17 Grand Street
18 Green Villa
19 Greenville Industrial
20 Gregory Park
21 Grove and Mercer
22 Grove Street NDP
23 Grove Street Station
24 Grove Street II
25 Henderson Street South
26 Holland Tunnel
27 Hudson Exchange
28 Jackson Avenue
29 Jersey Avenue
30 Journal Square
31 Lafayette Park
32 Liberty Harbor
33 Liberty Harbor North
34 Luis Munoz Marin
35 MLK Drive
36 Majestic Theater
37 Majestic Theatre II
38 Marine Industrial
39 Medical Center
40 Merseles Street
41 Montgomery Gateway
42 Montgomery Street
43 Monticello Avenue
44 Morgan Grove Marin
45 Morris Canal
46 Newkirk
47 Newport
48 Ninth Street
49 Ninth Street II
50 NJCU West Campus
51 Ocean /Bayview
52 Paulus Hook
53 Powerhouse Arts District
54 Republic Container
55 School #2
56 Sip Avenue Gateway
57 Sip/Van Wagenen
58 St. Francis
59 St. John's
60 Summit Community Center
61 Tidewater
62 Turnkey
63 Village
64 Water Street
65 Wayne Street
66 Webster Avenue
67 Western Gateway
68 West Side Avenue
New Jersey Meadowlands Commission
Hackensack River
Hudson River
Upper New York Bay
Ellis Island
Liberty Island
Tidewater Basin
New Jersey
New York
[1]Amended to add the Western Gateway Redevelopment Plan Area.
[2]Amended to add the Sip Aveune Gateway Redevelopment Plan Area.
[3]Amended to add the Boland Street Redevelopment Plan Area.
[4]Amended to adjust zoning boundaries in accordance with amendments to the Jersey City Master Plan.
[5]Amended to add the Columbus Cornor Redevelopment Plan
[6]Amended to adjust the boundaries of the Water Street Redevelopment Plan Area.
[7]Amended to add the Warehouse Historic District.
[8]Amended to add the Powerhouse Redevelopment Plan.
[9]Amended to add the NJCU West Campus Redevelopment Plan.
[10]Amended to add the West Side Avenue Redevelopment Plan Area.
[11]Amended to add Marion Works Office/Residential District and new HC and R-3 zone boundaries.
[12]Amended to adjust the boudaries of the Martin Luther King Drive Redevelopment Plan Area.
[13]Amended to remove a Medical District zone at the St. Francis Hospital site.
[14]Amended to remove the Warehouse Historic District
[15]Amended to add the Morgan Grove Marin Redevelopment Plan Area.
[16]Amended to add the Majestic II and Merseles Street Redevelopment Plans.
[17]Green Villa Redevelopment Plan Amended.
[18]Amended to add the St. Francis Redevelopment Plan Area.
[19]Amended to add the Bates Street Redevelopment Plan.
This map was produced by Jeffrey Wenger, AICP Jersey City Division of City Planning in New Jersey State Plan Coordinate System, North American Datum of 1983. Digitized at an original scale of 1:4800. Adopted by the Jersey City Municipal Council on April 11, 2001.
JERRAMIAH T. HEALY, Mayor
Barbara A. Netchert, Director
Department of Housing Economic Development and Commerce
Robert D. Cotter, PP, AICP, Director
Division of City Planning
Jersey City Planning Division
30 Montgomery Street Suite 1400
Jersey City, NJ 07302-3821
Phone: 201.547.5010
Fax: 201.547.4323
N
0 400 800 1,600 2,400 3,200 4,000 Feet
0 0.5 1 Miles
1 inch equals 800 feet

APPENDIX H

HUDSON COUNTY COMMENTS AND RESPONSES

ELEVEN TINDALL ROAD, MIDDLETOWN, NJ 07748-2792
(732) 671-6400 * fax (732) 671-7365 * www.tandmassociates.com

T&M ASSOCIATES

HUDS-00291

August 26, 2008

RECEIVED
AUG 28 2008
Malcolm Pirnie, Inc.

Stephen D. Marks, P.P., A.I.C.P.
County of Hudson Division of Planning
Brennan Court House
583 Newark Avenue
Jersey City, NJ 07306

Re: Draft Jersey City Municipal Stormwater Management Plan And Municipal Stormwater Control Ordinance Review

Dear Mr. Marks:

We have completed our review of the draft revisions of the City of Jersey City's Municipal Stormwater Management Plan (MSWMP) and Stormwater Control Ordinance, which were received on July 15, and August 11, 2008. Based on our review of the amended documents, all comments have been addressed. Therefore, we recommend the County issue formal approval of the MSWMP and ordinance once the City submits final copies of the amended documents along with their adopting resolutions.

If you have any questions, or require additional information please contact Rose Santos or Elizabeth Engelbert at (732) 671-6400.

Very truly yours,

T&M ASSOCIATES

Rick D

RICK DONOHOE, P.E.
ASSOCIATE

CRD:RRS:EAE:scb
Enclosure
cc: Jonathan Luck, Hudson County, Division of Planning
City of Jersey City
Rajiv Prakash, JCMUA
John Minnet Malcolm Pirnie, Inc.

H:\HUDS\00291\Correspondence\MSWMP Reviews\Marks_RD_Revised Jersey City MSWMP Review.doc

RP

JERSEY CITY MUNICIPAL UTILITIES AUTHORITY

555 ROUTE #440 ·JERSEY CITY, NEW JERSEY 07305 · TEL: (201) 432-1150 · FAX: (201) 432-1576

July 30, 2008

Elizabeth Engelbert,
T& M Associates
Eleven Tindall Road
Middletown, NJ 07748

RE: Jersey City Municipal Utilities Authority
Your Project HUDS-00291

Dear Ms. Engelbert:

The following is in response to your fax dated July 23, 2008:

Municipal Stormwater Management Plan

Comment 1: Section 4.2 describes 13 sections of the city's land use and zoning ordinances that are to be modified. If any modifications were made, copies should be forwarded to the County for review.
Response 1: *If any modifications are made to land use and zoning ordinances with reference to the 13 "Low Impact Development or Non Structural BMP" for Stormwater Control, those copies will be forwarded to the County. No new ordinances regarding this topic have been issued to date. This language has been included in the SWMP on pages 4-1 and 4-2. These pages are enclosed with this letter.*

Comment 2: The Mitigation Plan should state that mitigation performed must be on a "like for like" basis for the requirement the applicant is requesting a waiver or exemption.

Response 2: As per our telephone conversation yesterday with John Minnett and I, it was clarified that the term 'like for like" is intended to apply the criteria specifically. In other words, "The stormwater water hydrologic controls at the mitigation site need to meet the hydrologic criteria requirements at the developed site and may not be substituted with water quality controls that do not meet the hydrologic criteria. Similarly, the stormwater quality controls at the mitigation site need to meet the water quality criteria at the developed site and may not be substituted with hydrologic controls that do not meet the water quality criteria."

The language stated above in quotes has been added to Section 6.2.4. Mitigation Limitations, as an additional bullet on page 6-6 of the SWMP. Enclosed is the replacement page 6-6 which is now amended to the SWMP.

Comment 3: Maps of the Groundwater Recharge Areas and Wellhead Protection areas within the City are an NJDEP requirement and must be included in the MSWMP regardless if the is available or is groundwater recharge/well head protection areas exist with the City.

Response 3: *Please note the last line Paragraph 2.1.4. on page 2-5 of the SWMP. No Groundwater Recharge Areas or Wellhead Protection Areas exist within Jersey City to our knowledge based upon our research of the NJDEP web site sources, so no figure has been provided since it is not a concern in Jersey City. However, as per your request, we have enclosed Figures H1 and H2 which have been added to Appendix H of the SWMP showing that there are no Groundwater Recharge or Well Head Protection Areas noted in the NJDEP data for Hudson County.*

Comment 4: Section 7 provides a schedule of Plan updates. This section should be revised to reflect current status and is consistent with the title page of the report.

Response 4: *Enclosed is an updated Chapter 7.0 showing current status and an updated schedule for planned updates to the Jersey City MSWMP. An updated replacement page for Chapter 7.0 and the reports title page is enclosed with updated dates per your request.*

<u>Stormwater Control Ordinance</u>

Comment 1: Section 2 Definitions: The definition of "Person" should be revised to include the City of Jersey City.

Response 1: *Enclosed is the revised ordinance with the revised definition as requested.*

Should you have any questions please do not hesitate to contact us. We trust these revisions now have met all of your requirements. If so, please provide us with a letter stating that if the enclosed replacement pages are amended to the Jersey City SWMP and Ordinance then the County will approve of both documents once Jersey City has adopted them as the latest amended versions. Once that letter is received we will go to City to obtain the adoption documentation and will submit complete copies of the adopted amended SWMP and Ordinance to the County as the County approved documents.

Very truly yours,

Rajiv Prakash

RAJIV PRAKASH
Staff Engineer

RP:mb

cc: Daniel F. Becht, Esq., Executive Director
Joseph Beckmeyer, P.E., Chief Engineer

October 17, 2007

Stephen P. Marks PP, AICP
Director of Division of Planning
Hudson County Division of Planning
Brennan Court House
583 Newark Avenue
Jersey City, NJ 07306

Re: Jersey City Municipal Utilities Authority (JCMUA)
Tier A Municipal Stormwater Permit Compliance
Stormwater Management Plan (SWMP)
Responses to County Comments

Dear Mr. Marks,

This is in response to comments made on Jersey City Stormwater Control Ordinance and Municipal Stormwater Management Plan (MSWMP) in letter from Rick Donohoe of T&M Associates dated June 19, 2007. Enclosed is a revised copy of the Jersey City MSWMP for your review. Regarding your June 19, 2007 letter regarding requested revisions to the Jersey City Stormwater Control Ordinance and Jersey City Municipal Storm Water Management Plan, enclosed are the original comments followed by our italicized responses :

<u>Stormwater Control Ordinance</u>

Comment 1: Section 2 Definitions: The Definition of "Person" should be revised to include The City of Jersey City.

Response 1: *Since the City of Jersey City is a political subdivision of the State of New Jersey, it is already included in the definition. Hence no change is required.*

Comment 2: Section 4. G. 1. – Water Quality Design Storm Revise Table 1 to be consistent with the NJDEP Sample Ordinance.

Response 2: *We will replace Table 1: Water Quality Design Storm Distribution with the one provided in the model ordinance from the DEP.*

Comment 3: Section 11: Please revise this section to include Penalties

Response 3: *City ordinance 07-133 adopted Aug. 8, 2007 added penalties to the Stormwater Control Ordinance adopted earlier.*

An updated copy of the proposed ordinance is included in the Appendix of the MSWMP.

<u>Municipal Stormwater Management Plan</u>

Comment 1: The MSWMP should include additional detailed information concerning the health of the waterways located within the City, including information regarding the New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d) (Integrated List) (Sublists 1-5).

Response 1: *We have added Section 2.5 "The Water Quality and Health of the Waterbodies in Jersey City" to address this issue. It summarizes the report findings of the NJ 305(b) Report and 303(d) Integrated List and Sublists for Penhorn Creek, Hackensack River, Newark Bay, New York Bay, and the Lower Hudson River which surround Jersey City as well as Lincoln Park.*

Comment 2: Table 3-1: Distribution of a 1.25-inch 2 hour design storm in New Jersey does not correspond to the distribution outlined in the NJDEP model stormwater control ordinance. Table 3-1 should be revised accordingly, or supporting material for the use of an alternative design storm provided.

Response 2: *Table 3-1 has been replaced with the Table from the sample ordinance.*

Comment 3: Section 4.2 describes 13 sections of the City's land use and zoning ordinances that are to be modified. If any modifications were made, copies should be forwarded to the County for review.

Response 3: *If any modifications are made to land use and zoning ordinances with reference to the 13 "Low Impact Development or Non Structural BMP" for Stormwater Control, those copies will be forwarded to the County. No new ordinances regarding this topic have been issued to date.*

Comment 4: The Mitigation Plan provides a developer three options for mitigating projects including "Alternate Area Mitigation," "Effluent Pollution Trading in Watershed Management Area 5 (WMA5)," and "Mitigation Bank Contributions." The first and last options are outlined in the NJDEP's guidance materials and noted as acceptable and recommended by the NJDEP. However, the pollution trading option has not been previously discussed by the NJDEP as an acceptable mitigation option. Therefore, our office contacted the NJDEP for clarification. Enclosed for your review is the NJDEP's response. It is our recommendation that the City review the NJDEP's comments and revise the mitigation plan accordingly.

Response 4: *After review of your comments and those from NJDEP and subsequent conversation between our Consultant and Sandra Blick, the City has decided to modify Chapter 6 where mitigation by use of the pollutant trading and mitigation bank is no longer being consider by Jersey City as an accepted method unless certain conditions and approvals are obtained. Stronger mitigation limitations have been added to address those areas with TMDL or other sensitive receptors. More details have been added regarding what the developer must submit to address sensitive receptors in their proposed mitigation plans.*

Comment 5: Mapping and Figures:

a. Maps of the Groundwater Recharge Areas and Wellhead Protection Areas within the City are an NJDEP requirement and should be included with the body of the MSWMP.
b. Figure 2-2: CSO and Stormwater Subdrainage Areas and Sewers was omitted, a copy of this map should be included with the final copy of the MSWMP.
c. Figure 2-4: State and National Wetlands Inventory Map and Figure 2-8; Constrained and Non-Constrained areas are difficult to read. Please provide color copies or larger size figures in the final copy of the MSWMP.

Response 5:

a. *Please note the last line Paragraph 2.1.4. on page 2-5 of the SWMP. No Groundwater Recharge Areas or Wellhead Protection Areas exist within Jersey City to our knowledge based upon our research of the NJDEP web site sources, so no figure has been provided since it is not a concern in Jersey City.*

b. *Figure 2-2 is now enclosed for your review and approval. The Figure must have been inadvertently omitted from the copy that you had received.*

c. *Clearer and larger copies of the Figures 2-4 and 2-8 have now been enclosed per your request.*

Comment 6: Section 7 provides a schedule of Plan updates. This section should be revised to reflect current status.

Response 6: *Enclosed is an updated Chapter 7.0 showing current status and an updated schedule for planned updates to the Jersey City MSWMP.*

If you have any questions or comments or should you require any additional information, please do not hesitate to contact me. Please inform us in writing whether these responses are acceptable and to you and if the above mentioned changes will lead to the approval of our Stormwater Control Ordinance and MSWMP.

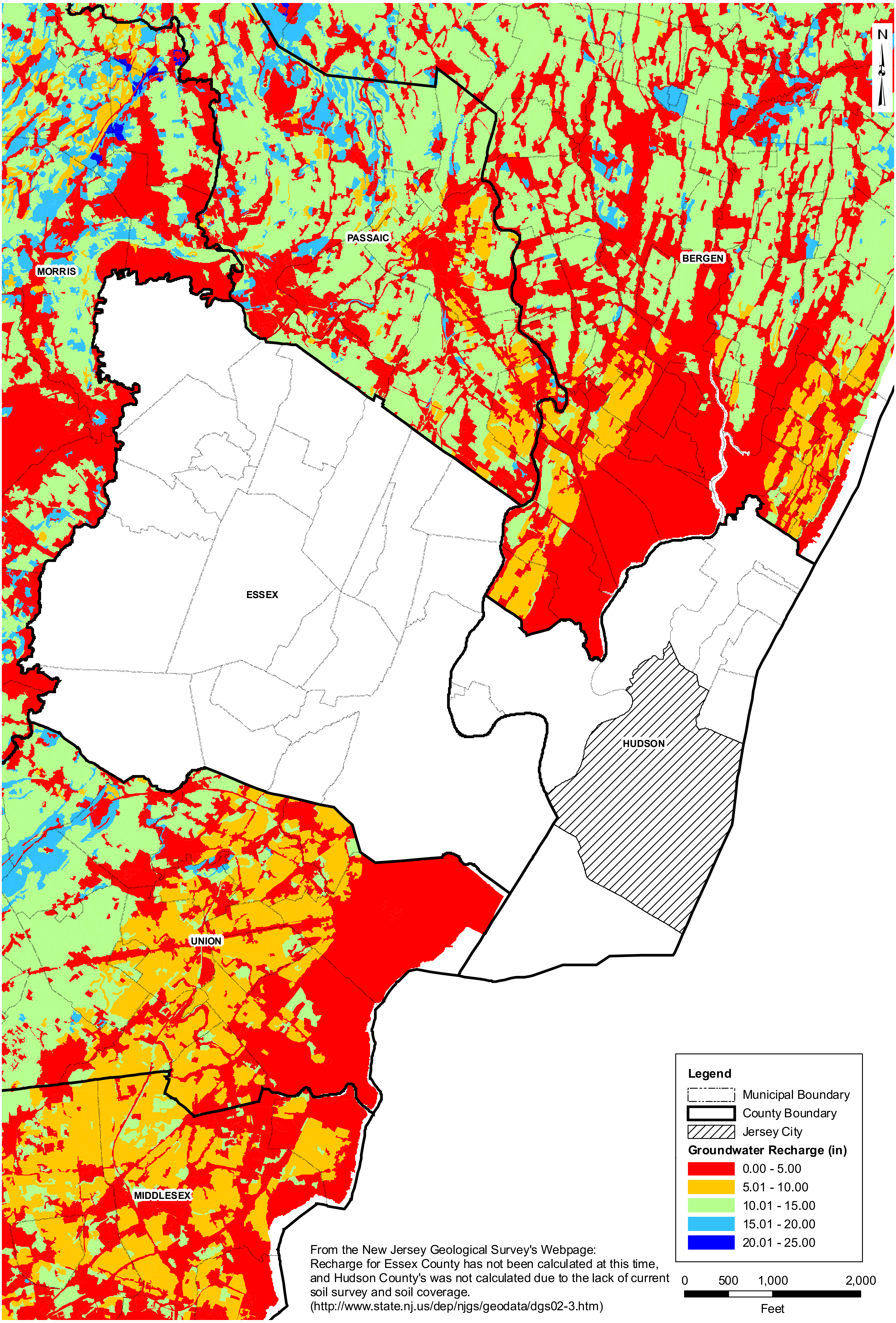
Very truly yours,

JERSEY CITY MUNICIPAL UTILITIES AUTHORITY

Joseph Beckmeyer, P.E.
JCMUA Chief Engineer

c   Robert Cotter, Jersey City Planning Director
     Rajiv Prakash, JCMUA Assistant Engineer
     Mark P. Del Bove, Malcolm Pirnie

\\northernnj\project\1129139\correspondence\jcmua_stormwater_plan_response_to_county_comments.doc

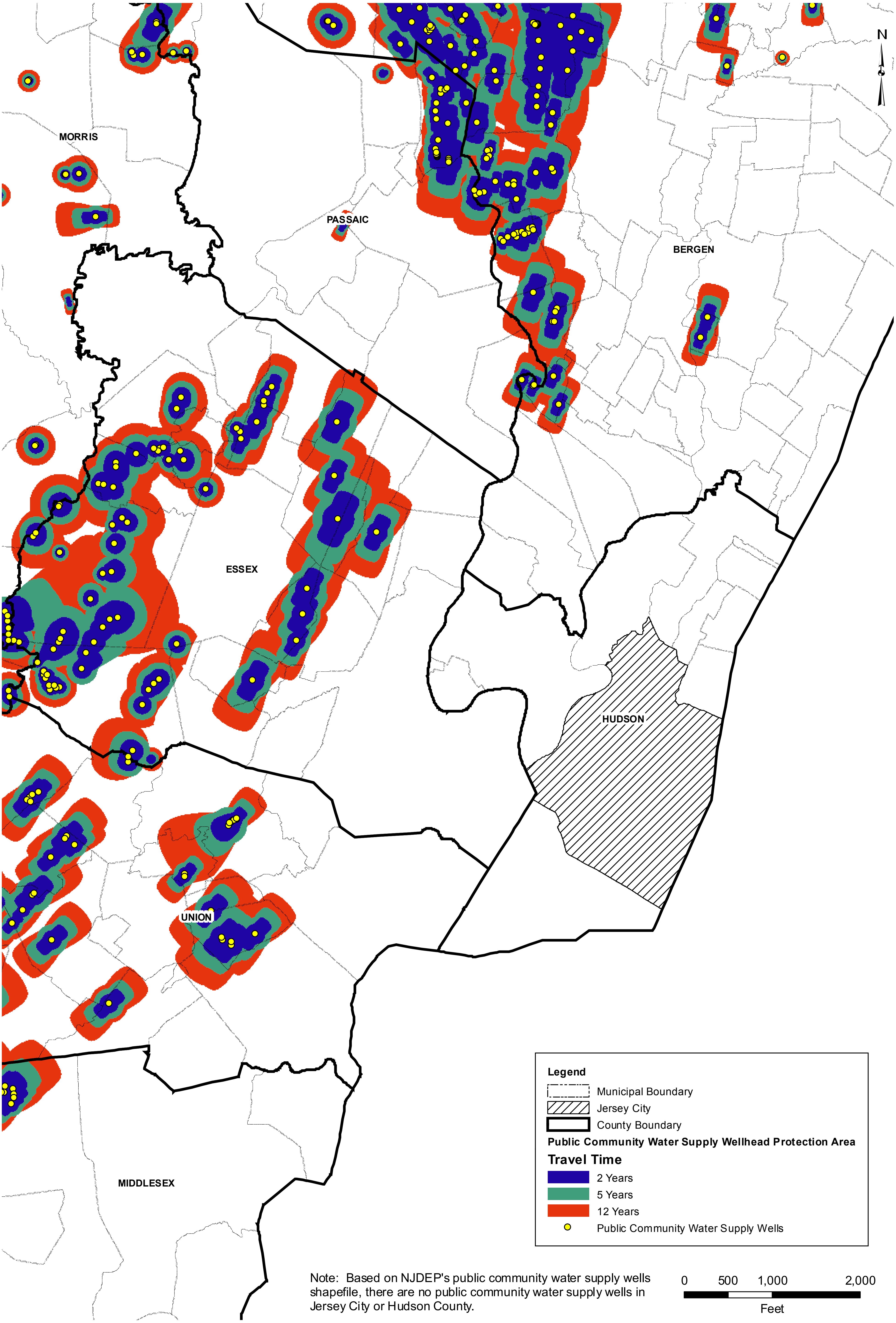


MALCOLM PIRNIE

JERSEY CITY MUNICIPAL UTILITIES AUTHORITY
STORMWATER MANAGEMENT PLAN
GROUNDWATER RECHARGE

MALCOLM PIRNIE, INC.

FIGURE H1



Note: Based on NJDEP's public community water supply wells shapefile, there are no public community water supply wells in Jersey City or Hudson County.

MALCOLM PIRNIE

JERSEY CITY MUNICIPAL UTILITIES AUTHORITY
STORMWATER MANAGEMENT PLAN
WELLHEAD PROTECTION AREAS

MALCOLM PIRNIE, INC.

FIGURE H2

APPENDIX I

GUIDANCE FOR DEVELOPMENT OF A MITIGATION PLAN

FEBRUARY 2006

Guidance for the Development of Municipal Mitigation Plans – February 2006

Purpose

The Stormwater Management rules, N.J.A.C. 7:8, establish design and performance standards for management of stormwater that address water quality, water quantity and recharge. These standards are to be met on the site of the proposed development and, to the maximum extent practicable, using nonstructural stormwater management strategies. The Department recognizes that situations may arise in which the design and performance standards may be impossible to meet on the site of a proposed project because of site constraints such as soils or slope. Therefore, at N.J.A.C. 7:8-4, the Stormwater Management rules allow a municipality to develop a mitigation plan to accommodate these special cases.

A municipal mitigation plan is an optional element of a Municipal Stormwater Management Plan, but is required for a municipality to grant a variance or exemption to the design and performance standards for stormwater runoff quality, stormwater runoff quantity, and ground water recharge, established under the Stormwater Management rules at N.J.A.C. 7:8-5. A municipal mitigation plan must identify the measures necessary to offset the deficit created with respect to the design and performance standard(s) that would result from the grant of a variance or exemption at a project site. The plan must ensure that the mitigation is completed in the drainage area and for the performance standard(s) for which the variance or exemption was granted for a project. In order to be in effect, a municipal mitigation plan must be adopted into the municipal stormwater control ordinance and approved by the county review agency.

The existence of a mitigation plan does not supersede the requirements that an applicant meet the design and performance standards for ground water recharge, stormwater quantity, and stormwater quality on site to the maximum extent practicable and that the standards be met using nonstructural techniques to the maximum extent practicable. Instead, it allows municipalities, in limited circumstances, to waive strict compliance with one or more of the performance standards, where full compliance cannot reasonably be accommodated on site, provided there is mitigation of the effect of the deficient compliance provided in accordance with an approved mitigation plan. The test of reasonable accommodation includes reducing the size, scale or layout of the proposed project in order to meet the design and performance standards on site and thereby avoid the need to seek a variance or exemption. A waiver cannot be granted if the project requesting a waiver/exemption would result in a localized adverse impact or create a compliance deficit that can not be compensated for by off site mitigation.

It should be noted that the standards for the Special Water Resource Protection Area (SWRPA) established under the Stormwater Management rules at N.J.A.C. 7:8-5.5(h) cannot be waived through the municipal mitigation plan. A municipality is authorized to develop a Stream Corridor Protection Plan, in accordance with N.J.A.C. 7:8-4.2(c)13, which can adjust the spatial extent within which the SWRPA requirements apply. All Stream Corridor Protection Plans must be approved by both the county review agency and the New Jersey Department of Environmental Protection, Division of Watershed Management prior to implementation.

Subject to the caveats for applicability and consistent with the provisions of an approved mitigation plan, a municipality may waive one or more of the design and performance standards for projects reviewed under the Municipal Land Use Law, or for projects undertaken by the municipality that are not subject to MLUL. Waivers for linear development projects must be evaluated using the requirements under N.J.A.C. 7:8-5.2(e), which includes the requirement to address mitigation for the performance standard for which strict compliance was not obtained. Where the Department issues a permit that includes a stormwater management review and an associated waiver under the provisions of the specific permit, the municipality is not required to further consider the project under the provisions of the municipal mitigation plan. However, the municipality may choose to require mitigation for projects receiving a waiver from the Department.

Beyond the specific regulatory purpose described, a mitigation plan can also be used to identify existing problems resulting from current stormwater management practices and the means to address them proactively. In addition, where current stormwater management practices contribute to water quality problems or designated use impairments, TMDL implementation plans can target problem areas and prioritize funding available for watershed restoration. Further, measures to address existing stormwater management problems can become a regulatory requirement when they are identified as "additional measures" in a municipal stormwater permit. "Additional measures" become a permit requirement when they are identified in an adopted TMDL or water quality management plan amendment.

Mitigation Plan Requirements

There are two basic approaches that can be used to identify mitigation projects through a municipal mitigation plan. Municipalities may identify a pool of specific mitigation projects that could be selected by an applicant to offset the effect of a requested waiver/exemption or to address an existing stormwater problem, or choose to provide a process through which an applicant has the flexibility and responsibility to identify an appropriate mitigation project and a location to implement the mitigation project to offset the deficit that would be created by the grant of a waiver/exemption or to address a stormwater based impairment. Ideally, municipalities will offer both options.

In order to select an appropriate mitigation project to respond to a requested waiver/exemption requires, an assessment of the impact that would result from the requested deviation from full compliance with the standard(s) in the drainage area affected by the proposed project is required. For example, a waiver for stormwater quantity requirements must focus on the impacts of increased runoff on flooding, considering both quantity and location. Stormwater quality mitigation must aim to prevent an increase in pollutant load to the waterbodies that would be affected by the waiver/exemption. Ground water recharge mitigation must seek to maintain the baseflow and aquifer recharge in the area that would be affected by the waiver/exemption. For the purpose of this discussion, the term "sensitive receptor" is used to refer to a specific area or feature that would be sensitive to the impact assessed above.

Selection of an appropriate mitigation project for a requested waiver/exemption must adhere to the following requirements:

1. The project must be within the same area that would contribute to the receptor impacted by the project. *Note that depending on the specific performance standard waived, the sensitive receptor and/or the contributory area to that receptor may be different.* If there are no specific sensitive receptors that would be impacted as the result of the grant of the waiver/exemption, then the location of the mitigation project can be located anywhere within the municipality, and should be selected to provide the most benefit relative to an existing stormwater problem in the same category (quality, quantity or recharge).

2. Legal authorization must be obtained to construct the project at the location selected. This includes the maintenance and any access needs for the project in the future.

3. The project should be close to the location of the original project, and if possible, be located upstream at a similar distance from the identified sensitive receptor. This distance should not be based on actual location, but on a similar hydraulic distance to the sensitive receptor. For example, if the project for which a waiver is obtained discharges to a tributary, but the closest location discharges to the main branch, it may be more beneficial to identify a location discharging to the same tributary.

4. For ease of administration, if sensitive receptors are addressed, it is preferable to have one location that addresses any and all of the performance standards waived, rather than one location for each performance standard.

5. It must be demonstrated that implementation of the mitigation project will result in no adverse impacts to other properties.

6. Mitigation projects that address stormwater runoff quantity can provide storage for proposed increases in runoff volume, as opposed to a direct peak flow reduction.

Stormwater Quantity Considerations

Increased stormwater runoff volume from new development can cause damages to property and habitat due to increased flood elevations and/or flood velocities. Mitigation project areas can include locations that will provide for additional storage and slower release of excess stormwater. Mitigation of stormwater quantity can be accomplished by increasing flood storage areas along the waterway, creating new best management practices (BMPs) to control previously uncontrolled runoff or by retrofitting existing stormwater structures to decrease the volume and peak of runoff.

In areas adjacent to the stream, a hydrologic and hydraulic analysis can be performed to determine if increasing storage capacity would offset the additional volume of runoff and associated peak increase from sites upstream of the storage area. Increases in the storage capacity of an existing structure, such as upstream of a bridge or culvert, can also be considered provided that it is demonstrated that such an increase does not exacerbate flooding at other areas.

Note that work in regulated areas, such as floodplains and wetlands must be performed in accordance with applicable regulations such as the Flood Hazard Area Control Act Rules and the Freshwater Wetland Act Rules. Also, many areas of open space in New Jersey have received funding by the Department's Green Acres Program and many of those encumbered lands have restrictions placed on them as a result of that funding. Any and all restrictions placed on these lands must be investigated by the municipality before these areas can be utilized for mitigation to ensure that there are no conflicts.

Some examples of areas or features sensitive to changes with regard to flooding include:

Culverts and bridges—these features may constrict flow and cause flooding or may provide storage that, if lost, would cause downstream flooding problems
Property subject to flooding—areas of concern include those where there is historical evidence of recurrent problems, particularly if exacerbated over time because of increasing impervious surface in the contributing watershed
Eroding/widening stream banks or channels—particularly if due to changes in hydrology due to effects of development
Category One waters—flooding affects could alter habitat that was the basis for the designation
Wetlands—changes in hydrology can affect viability of wetlands, either by increasing or decreasing volumes and velocities of water discharging to the wetlands

Stormwater Quality Considerations

Stormwater quality is regulated for the purpose of minimizing/preventing nonpoint source pollution from reaching the waterway. Mitigation for stormwater quality can be achieved either by directing the runoff from the water quality design storm into a natural area where it can be filtered and/or infiltrated into the ground, by constructing a new BMP to intercept previously untreated runoff or by retrofitting existing stormwater systems that previously did not provide sufficiently for water quality.

Existing forested and other vegetated non-wetland areas can also be used as a water quality mitigation area if runoff is discharged as sheet flow through the area in a non-erosive manner, and the vegetated area is restricted from future development. A discussion of the appropriate widths for these vegetative filters is provided in Chapter 9 of the New Jersey Stormwater Best Management Practices Manual (BMP Manual).

If a mitigation project cannot be identified that would compensate for a waiver related to water quality, and provided the project requiring a waiver would not result in a measurable change in water quality relative to TSS and nutrients, the mitigation project could be designed to address another parameter of concern in the watershed (as indicated by an impairment listing and/or an adopted TMDL) for which stormwater is a source, such as fecal coliform.

Some examples of areas or features sensitive to water quality changes include:

Trout associated waters—chemical pollutants and temperature effects can diminish viability of populations
Lakes, ponds or other impoundments—these waterways are sensitive to addition of nutrients
Threatened and endangered species or their habitats—sensitive to both quality and quantity changes
Drinking water supplies—adverse affects on quality can increase the cost of treatment or threaten the use
Category One waters—an issue where quality was the basis of the designation
Waterways with a water quality or use impairment—deterioration of quality in an impaired waterway will increase the cost and challenge of restoration

Ground Water Recharge Considerations

Recharge is regulated to maintain the availability of ground water as a water supply source as well as to provide a stable source of baseflow in streams.

There are two requirements associated with the recharge standard. The first is that 100 percent of the site's average annual pre-developed ground water recharge volume be maintained after development and the second is that 100 percent of the difference between the site's pre- and post-development 2-year runoff volumes be infiltrated. To mitigate for groundwater recharge design requirements, either computational method can be utilized to determine the volume lost that needs to be provided by the mitigation project.

One method to accomplish ground water recharge mitigation is to discharge runoff as sheet flow across a vegetated area to allow for the infiltration of runoff. It should be noted that, if this measure is used, calculating compliance with the recharge standard is limited to the 2-year storm standard, given existing methods.

Some examples of areas or features sensitive to ground water recharge changes include:

Springs, seeps, wetlands, white cedar swamps—sensitive to changes in ground water level/hydrology
Threatened and endangered species or their habitats—some are sensitive to changes in ambient ground water levels
Streams with low base flow or passing flow requirements—would be particularly sensitive to changes in hydrology
Aquifer recharge zones—loss of recharge in these areas can adversely affect ground water supply
Category One waters—loss of base flow can affect many of the bases for designation

Identification of Specific Mitigation Projects

As discussed above, mitigation projects should be selected after examining existing problems related to stormwater quality, quantity, and recharge in the affected drainage area. Municipal mitigation plans can be a very effective means to address existing problems resulting from stormwater management while ensuring that existing problems are not made worse and new problems are avoided.

Where a list of mitigation projects is identified, the plan must also identify the type of design and performance standard the individual projects may mitigate. Wherever possible, quantification of the mitigation provided by each project relative to the applicable standard should also be included.

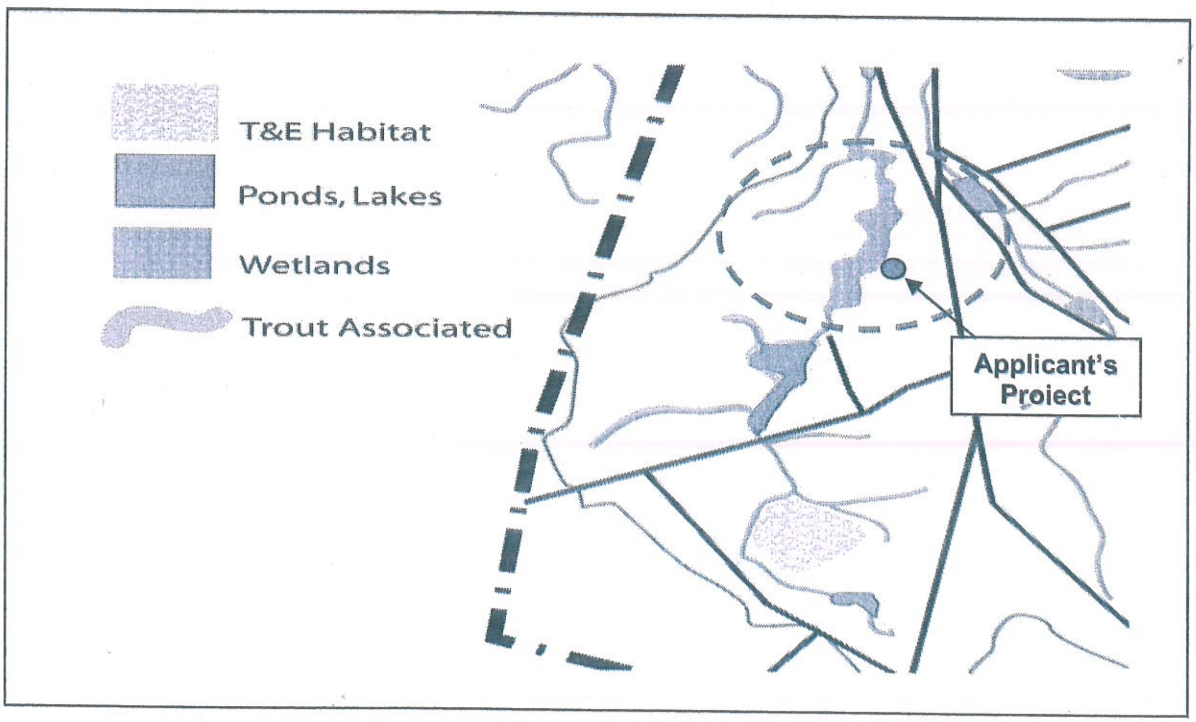
Initially, some municipalities may wish to allow developers to fund analyses to identify potential mitigation projects that could be used to address deficits in complying with each of the performance standards. However, the funding option shall only be allowed where the project requesting the waiver will have no measurable impact with respect to flooding, erosion, water quality degradation, etc. The funding option may also be appropriate in situations where the size of an individual project requesting a waiver/exemption is small, or the degree of deficit in complying with the design and performance standard(s) is small. Or, where the project requiring mitigation is for one individual single family home, given authority constraints, a financial contribution may be a preferred option. In these situations, it may not be practical to implement a commensurate mitigation project and may be preferable to accumulate funds to implement a larger mitigation project. In such cases, the receipt of the financial contribution shall satisfy the mitigation obligation for the project. However, the municipality becomes responsible to ensure that the mitigation occurs in a timely fashion and must provide a detailed discussion of the status of the mitigation fund and funded projects in the annual report required under the NJPDES municipal stormwater permit.

The identification of sensitive receptor areas for stormwater quantity, stormwater quality and stormwater recharge will require collecting and organizing, preferably in a Geographic Information System (GIS) format, both existing and new monitoring data, flooding information and unique local knowledge about conditions in the municipality. This identification process may be done by the municipality to establish a menu of specific mitigation projects or project locations, or by an individual developer as part of the mitigation process established in the mitigation plan.

Preliminary screening information to identify sensitive receptors is available in GIS format from the Department's GIS website at http://www.nj.gov/dep/gis/. However, information from existing GIS coverages must be supplemented by local information about locally flood prone areas, including specific stream segments and drainage areas that have inadequate bridges or culverts, areas with stormwater induced stream bank or channel erosion, waterways that have been listed as impaired for water quality or designated uses, etc.

For each of sensitive receptor or groups of receptors, the pertinent drainage area must be identified. The pertinent drainage area is that which encompasses the area that would affect the sensitive receptor(s). Typically, the pertinent drainage area would be the contributory drainage area to the receptor. However, depending on the receptor, only portions of the contributory drainage area may be appropriate to consider locating a mitigation project that would adequately address the impact of a waiver/exemption on a particular sensitive receptor.

In the example below sensitive receptors for water quality are depicted in a drainage area. In order to mitigate for the performance standard waived, the mitigation project must take place in an area that contributes to the same sensitive receptor.



For example, the wetlands area circled is a sensitive receptor relative to water quality. The applicant has a project upstream of the wetland that is unable to comply with the water quality performance standards. Therefore, the mitigation project may be located in the drainage area to the same wetlands complex. However, there is a pond upstream of the wetlands that may reduce the effectiveness of a mitigation project relative to the wetlands if placed upstream of the impoundment. Therefore, the mitigation project should be located downstream of the impoundment, even though the contributory drainage area to this wetlands complex includes the impoundment and areas upstream.

Administrative Requirements

Each municipality that received a Tier A or Tier B NJPDES Municipal Stormwater General Permit is required to file an annual report to demonstrate continuing compliance with the permit requirements. The municipality must indicate in the annual report form whether any variances or exemptions from stormwater management standards have been given. When submitting the annual report as required by the NJPDES permit, the municipality must provide an annual submission of its variances, exemptions, and related mitigation projects to the NJDEP Division of Watershed Management (DWM). This annual report to DWM must includes both projects reviewed by the municipality under the Municipal Land Use Law, as well as the municipality's own projects unable to fully comply with the design and performance standards. The following information is required for each waiver granted from the performance standard(s).

- **Impact from noncompliance.** Provide a table quantifying what would be required for the project to achieve the standards, the extent to which this value will be achieved on site and the extent to which the value must be mitigated off site.

- **Narrative and supporting information regarding the need for the waiver including:**
  - The waiver cannot be due to a condition created by the applicant. If the applicant can comply with the Stormwater Management rules through a reduction in the scope of the project, the applicant has created the condition and a waiver **cannot** be issued. Demonstrate that the need for a waiver is not created by the applicant.

  - Provide a discussion and supporting documentation of the site conditions peculiar to the subject property that prevent the construction of a stormwater management facility that would achieve full compliance with the design and performance standards. Site conditions may include soil type, the presence of karst geology, acid soils, a high groundwater table, unique conditions that would create an unsafe design, as well as conditions that may provide a detrimental impact to public health, welfare, and safety.

  - Demonstration that the grant of the requested waiver/exemption would not result in an adverse impact that would not be compensated for by off site mitigation.

- **Sensitive Receptor:** Identify the sensitive receptor(s) related to the performance standard from which a waiver is sought. Demonstrate that the mitigation site contributes to the same sensitive receptor.

- **Design of the Mitigation Project:** Provide the design details of the mitigation project. This includes, but is not limited to, drawings, calculations, and other information needed to evaluate the mitigation project.

- **Responsible Party**: List the party or parties responsible for the construction and the maintenance of the mitigation project. Documentation must be provided to demonstrate that the responsible party is aware of, has authority to, and accepts the responsibility for construction and maintenance. Under no circumstance shall the responsible party be an individual single-family homeowner. Selection of a project location that is under municipal authority avoids the need to obtain authority from a third party for the construction and future maintenance of the project.

- **Maintenance:** Include a maintenance plan that addresses the maintenance criteria at N.J.A.C. 7:8-5.8. In addition, if the maintenance responsibility is being transferred to the municipality or another entity, the entity responsible for the cost of the maintenance must be identified. The municipality may provide the option for the applicant to convey the mitigation project to the municipality, if the applicant provides for the cost of maintenance in perpetuity.

- **Permits**: Obtain any and all necessary local, State or other applicable permits for the mitigation measure or project must be obtained prior to the municipal approval of the project for which mitigation is being provided.

- **Construction**: Demonstrate that the construction of the mitigation project coincides with the construction of the proposed project. A certificate of occupancy or final approval by the municipality for the project requiring mitigation cannot be issued until the mitigation project or measure receives final approval. Any mitigation projects proposed by the municipality to offset the stormwater impacts of that municipality's own projects must be completed within 6 months of the completion of the municipal project, in order to remain in compliance with their NJPDES General Permit.

Appendix J

TMDLs and

Amendment to the

Northeast Water Quality Management Plan

Division of Watershed Management

Total Maximum Daily Loads

Description	Format	Size	Updated
TMDL Factsheet: What is a TMDL?	Adobe Pdf	236 KB	2003
TMDL Factsheet: Expedited Lake TMDLs	Adobe Pdf	272 KB	2003
TMDL Factsheet: Expedited Fecal Coliform TMDLs	Adobe Pdf	243 KB	2003

INTRODUCTION TO TMDLs

Total Maximum Daily Loads (TMDLs) represent the assimilative or carrying capacity of the receiving water taking into consideration point and nonpoint sources of pollution, natural background, and surface water withdrawals. A TMDL is developed as a mechanism for identifying all the contributors to surface water quality impacts and setting goals for load reductions for specific pollutants as necessary to meet surface water quality standards. TMDLs are required, under Section 303(d) of the federal Clean Water Act, to be developed for waterbodies that cannot meet surface water quality standards after the implementation of technology-based effluent limitations. TMDLs may also be established to help maintain or improve water quality in waters that are not impaired. A TMDL establishes Waste Load Allocations and Load Allocations for point and nonpoint sources, respectively. Regulations concerning TMDLs are contained in EPA's Water Quality Planning and Management Regulations (40 CFR 130). "A TMDL is established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality." (40 CRF 130.7(c)). The federal TMDL rules have recently been revised but are not yet effective. Revisions to New Jersey's TMDL requirements have recently been proposed as part of the Water Quality Management Planning rules. Where TMDLs are required to address documented surface water quality impairment, allocations are made to the varying sources contributing to the water quality problem in order to reduce the total pollutant load received by the waterbody. Load reduction goals established through TMDLs are achieved through the issuance of wasteload allocations for points source discharges and load allocations for nonpoint source discharges. Since nonpoint source pollution, by definition, does not come from discrete, identifiable sources, load allocations would consist of the identification of categories of nonpoint sources that contribute to the parameters of concern. The load allocation would also include specific load reduction measures for those categories of sources, to be implemented through best management practices (BMPs) including local ordinances for stormwater management and nonpoint source pollution control, headwaters protection practices, or other mechanisms for addressing the priority issues of concern.

back to top

STATEWIDE TMDL TIMELINE

The following is a timeline for establishing New Jersey's TMDLs under the MOA with EPA, categorized by water region and watershed/waterbody. The intermediate deadlines are milestones for TMDL development and are subject to refinement. The deadlines for establishing the TMDLs is also subject to change as further amendments to the MOA, as agreed by both NJDEP and EPA Region 2.

- New Jersey TMDL 2 yr. Development Timeline (June 2004)
- TMDL MOA with EPA Region 2 September 16, 2002
- Water Assessment Team website

back to top

TMDL ISSUES

There will be a number of policy issues regarding Total Maximum Daily Load (TMDL) development that will need to be addressed during TMDL development including, but not limited to, the following:

- What are the critical environmental conditions to which the TMDL should be directed? For wet weather flows, will the TMDL modeling incorporate a stream design flow or a statistical analysis?
- Where a waterbody does not meet criteria, options for allocating wasteload allocations to individual point source inputs and load allocations for individual or aggregate nonpoint source inputs will need to be addressed. Allocations may be based on concentration, loading, reduction costs, and other factors. What role should net implementation costs play?
- Whether or not a waterbody exceeds standards, a series of model simulations reflecting a range of management options that will result in attainment of the ambient criteria will need to be run. Management options could include the use of Best Management Practices, the trading of pollutant loading allocations, or the use of water conservation measures to restore streamflow, among others. What scenarios should be depicted by model simulations?

- What implementation schedules are appropriate to ensure that results are achieved?

back to top

THE PROCESSES OF TMDLs

A TMDL is considered "proposed" when NJDEP publishes the TMDL Report as a proposed Water Quality Management Plan Amendment in the New Jersey Register (NJR) for public review and comment. A TMDL is considered to be "established" when NJDEP finalizes the TMDL Report after considering comments received during the public comment period for the proposed plan amendment and formally submits it to EPA Region 2 for thirty (30)-day review and approval. The TMDL is considered "approved" when the NJDEP-established TMDL is approved by EPA Region 2. The TMDL is considered to be "adopted" when the EPA-approved TMDL is adopted by NJDEP as a water quality management plan amendment and the adoption notice is published in the NJR. The Department is in the process of adopting each of the approved TMDLs to the appropriate management plan and does not anticipate that there will be significant, if any change to TMDL implementation plans upon its adoption.

TMDL DOCUMENTS

Description
TMDL to Address Arsenic in the Wallkill River and the Papakating Creek Northwest Water Region

Proposed	Established	Approved	Adopted
July 2004			

Description
TMDL to Address Temperature in the Pequannock River Northeast Water Region

Proposed	Established	Approved	Adopted
June 2004			

Description
TMDL for Phosphorus to Address Greenwood Lake in the Northeast Water Region

Proposed	Established	Approved	Adopted
June 2004			

Description
TMDL for Total Phosphorus to Address Four Stream Segments and Two Lakes in Cooper River Watershed in Camden County Lower Delaware Water Region

Proposed	Established	Approved	Adopted
April 2004			

Description

TMDL to Address Phosphorus in the Clove Acres Lake and Papakating Creek Northwest Water Region

Proposed	Established	Approved	Adopted
April 2004			

Description

TMDL for Fecal Coliform to Address Three Streams in the Atlantic Water Region

Proposed	Established	Approved	Adopted
April 2004			

Description

TMDL for Fecal Coliform to Address 48 Streams in the Raritan Water Region

Proposed	Established	Approved	Adopted
April 2003			

Description

TMDL for Fecal Coliform to Address 27 Streams in the Lower Delaware Water Region

Proposed	Established	Approved	Adopted
April 2003			

Description

TMDL for Phosphorus to Address 9 Eutrophic Lakes in the Atlantic Coastal Water Region

Proposed	Established	Approved	Adopted
April 2003	June 2003		

Description

TMDL for Fecal Coliform to Address 28 Streams in the Northwest Water Region

Proposed	Established	Approved	Adopted
April 2003			

Description

TMDL for Phosphorus to Address 6 Eutrophic Lakes in the Raritan Water Region

Proposed	Established	Approved	Adopted
Jan. 2003	March 2003	Sept. 2003	

Description

TMDL for Phosphorus to Address 13 Eutrophic Lakes in the Lower Delaware Water Region

Proposed	Established	Approved	Adopted
April 2003	June 2003		

Description

TMDL for Fecal Coliform to Address 32 Streams in the Northeast Water Region

Proposed	Established	Approved	Adopted
Jan. 2003	March 2003		

Description

TMDL for Phosphorus To Address 3 Eutrophic Lakes in the Northeast Water Region

Proposed	Established	Approved	Adopted
Jan. 2003	March 2003	Sept. 2003	

Description

TMDL for Phosphorus To Address 4 Eutrophic Lakes in the Northwest Water Region

Proposed	Established	Approved	Adopted
Jan. 2003	March 2003	Sept. 2003	

Description

TMDL for Fecal Coliform To Address 31 Streams in the Atlantic Water Region

Proposed	Established	Approved	Adopted
April 2003			

Description

TMDL for Nickel in the Hackensack River

Proposed	Established	Approved	Adopted
			Dec. 1999

Description

TMDL for Fecal Coliform and an Interim Total Phosphorus Reduction Plan for the Whippany River Watershed

Proposed	Established	Approved	Adopted
			Dec. 1999

Description

TMDL for Phosphorus in the Lower Sylvan Lake

Proposed	Established	Approved	Adopted
			June 2000

Description

TMDL for Phosphorus in Strawbridge Lake

Proposed	Established	Approved	Adopted
			Sept. 2000

Description

Delaware River VO TMDL

Proposed	Established	Approved	Adopted
			Jan. 2000

back to top

TMDL SEGMENTS

List of 25 new Fecal Coliform TMDL segments from throughout the state. Includes an aerial map as well as a topo map of each segment.

- 25 New Fecal Coliform TMDL Segments

OTHER RELATED LINKS

- New Jersey Environmental Digital Library
- EPA's Surf Your Watershed Page
- EPA TMDL Website

back to top

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P. O. Box 402
Trenton, NJ 08625-0402

Last Updated: March 29, 2005

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATERSHED MANAGEMENT

ADOPTION OF THE AMENDMENT TO THE NORTHEAST WATER QUALITY MANAGEMENT PLAN TO ESTABLISH A TOTAL MAXIMUM DAILY LOAD FOR NICKEL IN THE HACKENSACK RIVER

Public Notice

Take notice that on April 27,2000, pursuant to the provisions of the New Jersey Water Quality Planning Act, N.J.S.A. 58:11A-1 et seq., and the Statewide Water Quality Management Planning Rules (N.J.A.C. 7:15-3.4), an amendment to the Northeast Water Quality Management Plan was adopted by the Department of Environmental Protection (Department). This amendment established a Total Maximum Daily Load (TMDL) for Nickel in the Hackensack River.

Total Maximum Daily Loads (TMDLs) represent the assimilative or carrying capacity of the receiving water taking into consideration point and nonpoint sources of pollution, as well as surface water withdrawals. A TMDL is developed as a mechanism for identifying all the contributors to surface water quality impacts and setting goals for load reductions for specific pollutants as necessary to meet surface water quality standards. TMDLs are required, under Section 303(d) of the federal Clean Water Act, to be developed for waterbodies that cannot meet water quality standards after the implementation of technology-based effluent limitations. TMDLs may also be established to help maintain or improve water quality in waters that are not impaired. A TMDL establishes waste load allocations and load allocations for point and nonpoint sources, respectively.

Regulations concerning TMDLs are contained in USEPA's Water Quality Planning and Management Regulations (40 CFR 130).

Where TMDLs are required to address documented surface water quality impairment, such changes are to be made to the varying sources contributing to the water quality problem in order to reduce the total pollutant load received by the waterbody. Load reduction goals established through TMDLs are achieved through the issuance of wasteload allocations (WLAs) for points source discharges, load allocations (LAs) for nonpoint source discharges, and a margin of safety. Since nonpoint source pollution, by definition, does not come from discrete, identifiable sources, load allocations would consist of the identification of categories of nonpoint sources that contribute to the parameters of concern. The load allocation would also include specific load reduction measures for those categories of sources, to be implemented through best management practices (BMPs) including local ordinances for stormwater management and nonpoint source pollution control, headwaters protection practices, or other mechanisms for addressing the priority issues of concern.

USEPA established a TMDL for Nickel in the Hackensack River effective December 27, 1999 pursuant to 40 CFR 130.7 (d), see volume 65 of the Federal Register, page 2398, dated January 14, 2000. Under N.J.A.C. 7:15-7(l), TMDLs established by USEPA are considered part of the appropriate areawide WQM plan.

Table 1. TMDL/WLAs/LAs for nickel in the Hackensack River.

Source:	Existing load (lbs/day)	WLA/LA (lbs/day)
Bergen County Utilities Authority [NJPDES Permit #NJ0020028]	11.3	2.2[1]
North Bergen Sewage Treatment Plant (STP) [NJPDES Permit #NJ0034339]	0.28	0.38[2]
Secaucus STP [NJPDES Permit #NJ0025038]	0.04	0.06[3]
Combined Sewage Overflows	0.10	0.10
Storm Water	0.81	0.81
ΣWLAs..................	....	3.55
Atmospheric................	1.06	1.06
Boundary (Background)	0.37	0.37[4]
TMDL...................	....	4.98

[1] The WLA of 2.2 lbs/day is established at an effluent concentration of 3.6 µg/l (total recoverable) and flow of 75 mgd. If the effluent flow is 109 mgd, the WLA is 3.3 lbs/day with an effluent concentration of 3.6 µg/l.

[2] Based on design flow of 10 mgd and means effluent concentration of 4.6 µg/l (total recoverable).

[3] Based on design flow of 10 mgd and mean effluent concentration of 1.5 µg/l (total recoverable).

[4] Calculated at the boundary condition of the Hackensack River upstream at the Oradell Dam.

Lance R. Miller
Director
Division of Watershed Management
Department of Environmental Protection

Date

Amendment to the Northeast Water Quality Management Plan

Total Maximum Daily Loads for Fecal Coliform to Address 32 Streams in the Northeast Water Region

Watershed Management Area 3
(Pompton, Pequannock, Wanaque, and Ramapo Rivers)
Watershed Management Area 4
(Lower Passaic and Saddle Rivers)
Watershed Management Area 5
(Hackensack River, Hudson River, and Pascack Brook)
Watershed Management Area 6
(Upper & Middle Passaic, Whippany, and Rockaway Rivers)

Proposed: January 21, 2003
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Approved (by EPA Region 2):
Adopted:

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Contents

Figures

Tables

1.0 Executive Summary

In accordance with Section 305(b) of the Federal Clean Water Act (CWA), the State of New Jersey developed the *2002 Integrated List of Waterbodies*, addressing the overall water quality of the State's waters and identifying impaired waterbodies for which Total Maximum Daily Loads (TMDLs) may be necessary. The *2002 Integrated List of Waterbodies* identified several waterbodies in the Northeast Water Region as being impaired by pathogens, as indicated by the presence of fecal coliform concentrations in excess of standards. This report, developed by the New Jersey Department of Environmental Protection (NJDEP), establishes 32 TMDLs addressing fecal coliform loads to the waterbodies identified in Table 1.

Table 1 Fecal coliform-impaired stream segments in the Northeast Water Region, identified in Sublist 5 of the 2002 Integrated List of Waterbodies, for which fecal coliform TMDLs are being established.

TMDL Number	WMA	Station Name/Waterbody	Site ID	County(s)	River Miles
1	3	Macopin River at Macopin Reservoir	01382450	Passaic	1.8
2	3	Wanaque River at Highland Avenue	01387010	Passaic	1.5
3	3	Ramapo River Near Mahwah	01387500	Passaic and Bergen	17.7
4	4	Passaic R. below Pompton R. at Two Bridges	01389005	Passaic	1.83
5	4	Preakness Brook Near Little Falls	01389080	Passaic	8.9
6	4	Deepavaal Brook at Fairfield	01389138	Essex	6.3
7	4	Passaic River at Little Falls	01389500	Passaic and Essex	15.0
8	4	Peckman River at West Paterson	01389600	Passaic and Essex	7.7
9	4	Goffle Brook at Hawthorne	01389850	Passaic and Bergen	10.5
10	4	Diamond Brook at Fair Lawn	01389860	Passaic and Essex	2.5
11	4	WB Saddle River at Upper Saddle River	01390445	Bergen	2.4
12	4	Saddle River at Ridgewood	01390500	Bergen	24.0
13	4	Ramsey Brook at Allendale	01390900	Bergen	6.4
14	4	HoHoKus Brook at Mouth at Paramus	01391100	Bergen	6.2
15	4	Saddle River at Fairlawn	01391200	Bergen	5.0
16	4	Saddle River at Lodi	01391500	Bergen	3.8
17	5	Hackensack River at River Vale	01377000	Bergen	10.0
18	5	Musquapsink Brook at River Vale	01377499	Bergen	7.3
19	5	Pascack Brook at Westwood	01377500	Bergen	6.6
20	5	Tenakill Brook at Cedar Lane at Closter	01378387	Bergen	10.2
21	5	Coles Brook at Hackensack	01378560	Bergen	11.1
22	6	Black Brook at Madison	01378855	Morris	2.4
23	6	Passaic River near Millington	01379000	Morris and Somerset	5.2
24	6	Dead River near Millington	01379200	Somerset	21.9
25	6	Passaic River near Chatham	01379500	Somerset, Union, Essex, and Morris	25.2
26	6	Canoe Brook near Summit	01379530	Essex	17.6
27	6	Rockaway River at Longwood Valley	01379680	Sussex and Morris	11.6
28	6	Rockaway River at Blackwell Street	01379853	Morris	3.5
29	6	Beaver Brook at Rockaway	01380100	Morris	17.0
30	6	Stony Brook at Boonton	01380320	Morris	13.1
31	6	Rockaway River at Pine Brook	01381200	Morris	6.8

TMDL Number	WMA	Station Name/Waterbody	Site ID	County(s)	River Miles
32	6	Passaic River at Two Bridges	01382000	Morris and Essex	14.1
Total River Miles:					305.0

These thirty-two TMDLs will serve as management approaches or restoration plans aimed at identifying the sources of fecal coliform and for setting goals for fecal coliform load reductions in order to attain applicable surface water quality standards (SWQS).

As stated in N.J.A.C. 7:9B-1.14(c) of the New Jersey Surface Water Quality Standards, "Fecal coliform levels shall not exceed a geometric average of 200 CFU/100 ml nor should more than 10 percent of the total sample taken during any 30-day period exceed 400 CFU/100 ml in FW2 waters." Nonpoint and stormwater point sources are the primary contributor to FC loads in these streams and can include storm-driven loads transporting fecal coliform from sources such as geese, farms, and domestic pets to the receiving water. Nonpoint sources also include steady-inputs from sources such as failing sewage conveyance systems and failing or inappropriately located septic systems. Because the total point source contribution other than stormwater (i.e. Publicly-Owned Treatment Works, POTWs) is an insignificant fraction of a percent of the total load, these fecal coliform TMDLs will not impose any change in current practices for POTWs and will not result in changes to existing effluent limits.

Using ambient water quality data monitoring conducted during the water years 1994-2000, summer and all season geometric means were determined for each Category 5 listed segment. Given the two surface water quality criteria of 200 CFU/100 ml and 400 CFU/100 ml in FW2 waters, computations were necessary for both criteria and resulted in two values for percent reduction for each stream segment. The higher (more stringent) percent reduction value was selected as the TMDL and will be applied to nonpoint and stormwater sources as a whole or apportioned to categories of nonpoint and stormwater sources within the study area. The extent to which nonpoint and stormwater sources have been identified and the process by which they will become identified will vary by study area based on data availability, watershed size and complexity, and pollutant sources. Implementation plans for activities to be established in these watersheds are addressed in this report.

Each TMDL shall be proposed and adopted by the Department as an amendment to the appropriate area wide water quality management plan(s) in accordance with N.J.A.C. 7:15-3.4(g).

This TMDL Report is consistent with EPA's May 20, 2002 guidance document entitled: "Guidelines for Reviewing TMDLs under Existing Regulations issued in 1992," (Suftin, 2002) which describes the statutory and regulatory requirements for approvable TMDLs.

2.0 Introduction

Sublist 5 (also known as List 5 or, traditionally, the 303(d) List) of the State of New Jersey's proposed *2002 Integrated List of Waterbodies* identified several waterbodies in the Northeast Water Region as being impaired by pathogens, as evidenced by the presence of high fecal coliform concentrations. This report establishes 32 TMDLs, which address fecal coliform loads to the identified waterbodies. These TMDLs serve as management approaches or restoration plans aimed toward reducing loadings of fecal coliform from various sources in order to attain applicable surface water quality standards for the pathogen indication. Several of these waterbodies are listed in Sublist 5 for impairment cause by other pollutants. These TMDLs address only fecal coliform impairments. Separate TMDL evaluations will be developed to address the other pollutants of concern. The waterbodies will remain on Sublist 5 until such time as TMDL evaluations for all pollutants have been completed and approved by the United States Environmental Protection Agency (USEPA).

3.0 Background

3.1. 305(b) Report and 303(d) List

In accordance with Section 305(b) of the Federal Clean Water Act (CWA) (33 U.S.C. 1315(B)), the State of New Jersey is required to biennially prepare and submit to the United States Environmental Protection Agency (USEPA) a report addressing the overall water quality of the State's waters. This report is commonly referred to as the 305(b) Report or the Water Quality Inventory Report.

In accordance with Section 303(d) of the CWA, the State is also required to biennially prepare and submit to USEPA a report that identifies waters that do not meet or are not expected to meet surface water quality standards (SWQS) after implementation of technology-based effluent limitations or other required controls. This report is commonly referred to as the 303(d) List. The listed waterbodies are considered water quality-limited and require total maximum daily load (TMDLs) evaluations. For waterbodies identified on the 303(d) List, there are three possible scenarios that may result in a waterbody being removed from the 303(d) List:

Scenario 1: A TMDL is established for the pollutant of concern;
Scenario 2: A determination is made that the waterbody is meeting water quality standards (no TMDL is required); or
Scenario 3: A determination is made that a TMDL is not the appropriate mechanism for achieving water quality standards and that other control actions will result in meeting standards

Where a TMDL is required (Scenario 1), it will: 1) specify the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards; and 2) allocate pollutant loadings among point and nonpoint pollutant sources.

Recent EPA guidance (Suftin, 2002) describes the statutory and regulatory requirements for approvable TMDLs, as well as additional information generally needed for USEPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations. The Department believes that this TMDL report, which includes thirty-two TMDLs, addresses the following items in the May 20, 2002 guideline document:

1. Identification of waterbody(ies), pollutant of concern, pollutant sources and priority ranking.
2. Description of applicable water quality standards and numeric water quality target(s).
3. Loading capacity – linking water quality and pollutant sources.
4. Load allocations.
5. Wasteload allocations.
6. Margin of safety.
7. Seasonal variation.
8. Reasonable assurances.
9. Monitoring plan to track TMDL effectiveness.
10. Implementation (USEPA is not required to and does not approve TMDL implementation plans).
11. Public Participation.
12. Submittal letter.

3.2. Integrated List of Waterbodies

In November 2001, USEPA issued guidance that encouraged states to integrate the 305(b) Report and the 303(d) List into one report. This integrated report assigns waterbodies to one of five categories. In general, Sublists 1 through 4 include waterbodies that are unimpaired, have limited assessment or data availability or have a range of designated use impairments, whereas Sublist 5 constitutes the traditional 303(d) List for waters impaired or threatened by a pollutant for which one or more TMDL evaluations are needed. Where more than one pollutant is associated with the impairment for a given waterbody, that waterbody will remain in Sublist 5 until one of the three possible delisting scenarios are completed. In the case of an Integrated List, however, the waterbody is not delisted but moved to one of the other categories.

Following USEPA's guidance, the Department chose to develop an Integrated Report for New Jersey. New Jersey's proposed *2002 Integrated List of Waterbodies* is based upon these five categories and identifies water quality limited surface waters in accordance with N.J.A.C. 7:15-6 and Section 303(d) of the CWA. These TMDLs address fecal coliform impairments, as listed on Sublist 5 of the State of New Jersey's proposed *2002 Integrated List of Waterbodies*.

3.3. Total Maximum Daily Loads (TMDLs)

A Total Maximum Daily Load (TMDL) represents the assimilative or carrying capacity of a waterbody, taking into consideration point and nonpoint sources of pollutants of concern, natural background and surface water withdrawals. A TMDL quantifies the amount of a pollutant a water body can assimilate without violating a state's water quality standards and allocates that load capacity to known point and nonpoint sources in the form of wasteload allocations (WLAs), load allocations (LAs), and a margin of safety. A TMDL is developed as a mechanism for identifying all the contributors to surface water quality impacts and setting goals for load reductions for pollutants of concern as necessary to meet the SWQS.

Once one of the three possible delisting scenarios, noted above, is completed, states have the option to remove the waterbody and specific pollutant of concern from Sublist 5 of the *2002 Integrated List of Waterbodies* or maintain the waterbody in Sublist 5 until SWQS are achieved. The State of New Jersey will be removing the waterbodies for fecal impairment from Sublist 5 once these TMDLs are approved by USEPA.

4.0 Pollutant of Concern and Area of Interest

The pollutant of concern for these TMDLs is pathogens, the presence of which is indicated by the elevated concentration of fecal coliform bacterial. Fecal coliform concentrations have been found to exceed New Jersey's Surface Water Quality Standards (SWQS) published at N.J.A.C. 7-9B et seq. As reported in the proposed *2002 Integrated List of Waterbodies*, the New Jersey Department of Environmental Protection (NJDEP) identified waterbodies as being impaired by fecal coliform. The Northeast Water Region listings for fecal coliform impairment are identified in Table 2. Also identified in Table 2 are the river miles and management response associated with each listed segment. All of these waterbodies have a high priority ranking, as described in the *2002 Integrated List of Waterbodies*.

Table 2 Abridged Sublist 5 of the 2002 Integrated List of Waterbodies, listed for fecal coliform impairment in the Northeast Water Region.

TMDL No.	WMA	Station Name/Waterbody	Site ID	River Miles	Management Response
1	3	Macopin River at Macopin Reservoir	1382450	1.8	establish TMDL
	3	Pequannock River at Macopin Intake Dam	1382500	19.1	none; Re-assessment shows non-impairment
	3	Wanaque River at Wanaque	1387000	0.6	water quality monitoring needed to identify if an impairment exists
2	3	Wanaque River at Highland Ave.	1387010	1.5	establish TMDL
3	3	Ramapo River near Mahwah	1387500	17.7	establish TMDL
4	4	Passaic River below Pompton River at Two Bridges	1389005	1.8	establish TMDL
5	4	Preakness Brook Near Little Falls	1389080	8.9	establish TMDL
6	4	Deepavaal Brook at Fairfield	1389138	6.3	establish TMDL
7	4	Passaic River at Little Falls	1389500	15.0	establish TMDL
8	4	Peckman River at West Paterson	1389600	7.7	establish TMDL
9	4	Goffle Brook at Hawthorne	1389850	10.5	establish TMDL
10	4	Diamond Brook at Fair Lawn	1389860	2.5	establish TMDL

TMDL No.	WMA	Station Name/Waterbody	Site ID	River Miles	Management Response
	4	Passaic River at Elmwood Park	1389880	**13.8**	CSO influence
11	4	WB Saddle River at Upper Saddle River	1390445	**2.4**	establish TMDL
12	4	Saddle River at Ridgewood	1390500	**24.0**	establish TMDL
13	4	Ramsey Brook at Allendale	1390900	**6.4**	establish TMDL
14	4	HoHoKus Brook at Mouth at Paramus	1391100	**6.2**	establish TMDL
15	4	Saddle River at Fairlawn	1391200	**5.0**	establish TMDL
16	4	Saddle River at Lodi	1391500	**3.8**	establish TMDL
17	5	Hackensack River at River Vale	1377000	**10.0**	establish TMDL
18	5	Musquapsink Brook at River Vale	1377499	**7.3**	establish TMDL
19	5	Pascack Brook at Westwood	1377500	**6.6**	establish TMDL
20	5	Tenakill Brook at Cedar Lane at Closter	1378387	**10.2**	establish TMDL
	5	Hackensack River at New Milford	1378500	**1.1**	water quality monitoring needed to identify if an impairment exists
21	5	Coles Brook at Hackensack	1378560	**11.1**	establish TMDL
22	6	Black Brook at Madison	1378855	**2.4**	establish TMDL
23	6	Passaic River near Millington	1379000	**5.2**	establish TMDL
24	6	Dead River Near Millington	1379200	**21.1**	establish TMDL
25	6	Passaic River near Chatham	1379500	**25.2**	establish TMDL
26	6	Canoe Brook near Summit	1379530	**17.6**	establish TMDL
27	6	Rockaway River at Longwood Valley	1379680	**11.6**	establish TMDL
28	6	Rockaway River at Blackwell Street	1379853	**3.5**	establish TMDL
29	6	Beaver Brook at Rockaway	1380100	**17.0**	establish TMDL
30	6	Stony Brook at Boonton	1380320	**13.1**	establish TMDL
31	6	Rockaway River at Pine Brook	1381200	**6.8**	establish TMDL
	6	Whippany River at Morristown	1381500	**6.6**	TMDL completed in 1999
	6	Whippany River near Pine Brook	1381800	**6.6**	TMDL completed in 1999
32	6	Passaic River at Two Bridges	1382000	**14.1**	establish TMDL

These thirty-two TMDLs will address 305 river miles or approximately 87% of the total river miles impaired by fecal coliform (352 total FC impaired river miles) in the northeast watershed region. Based on the detailed county hydrography stream coverage, 847 stream miles, or 47% of the stream segments in the northeast region (1800 total miles) are directly affected by the 32 TMDLs due to the fact that the implementation plans cover entire watersheds; not just impaired waterbody segments.

Table 2 identifies six segments for which TMDLs will not be developed at this time based on investigations following the *2002 Integrated List of Waterbodies* proposal. These segments, which are identified as requiring a management response other than "establish TMDL," are discussed in Appendix A along with the listing Sublist to which they will be moved.

These include: #01382500, Pequannock River at Macopin Intake Dam, #01387000, Wanaque River at Wanaque, #01378500, Hackensack River at New Milford, #01381500, Whippany

River at Morristown, #01381800, Whippany River near Pine Brook, and #01389880, Passaic River at Elmwood Park. For each of these segments an explanation of the management response is provided in Appendix A.

4.1. Description of the Northeast Water Region and Sublist 5 Waterbodies

4.1.1. Watershed Management Area 3

Watershed Management Area 3 (WMA 3) includes watersheds that receive water from the Highlands portion of New Jersey. The Pequannock, Wanaque and Ramapo Rivers all flow into the Pompton River. The Pompton River is, in turn, a major tributary to the Upper Passaic River. WMA 3 contains some of the State's major water supply reservoir systems including the Wanaque Reservoir, the largest surface water reservoir in New Jersey. There are four watersheds in WMA 3: Pompton, Ramapo, Pequannock and Wanaque River Watersheds. WMA 3 lies mostly in Passaic County but also includes parts of Bergen, Morris, and Sussex Counties.

The **Pequannock River Watershed** is 30 miles long and has a drainage area of 90 square miles. The headwaters are in Sussex County and the Pequannock River flows east, delineating the Morris/Passaic County boundary line. The Pequannock River joins the Wanaque River and flows to the Pompton River in Wayne Township. Some of the major impoundments within this watershed are Kikeout Reservoir, Lake Kinnelon Reservoir, Clinton Reservoir, Canistear Reservoir, Oak Ridge Reservoir, and Echo Lake Reservoir. The great majority of the land within this watershed is forested and protected for water supply purposes and parklands.

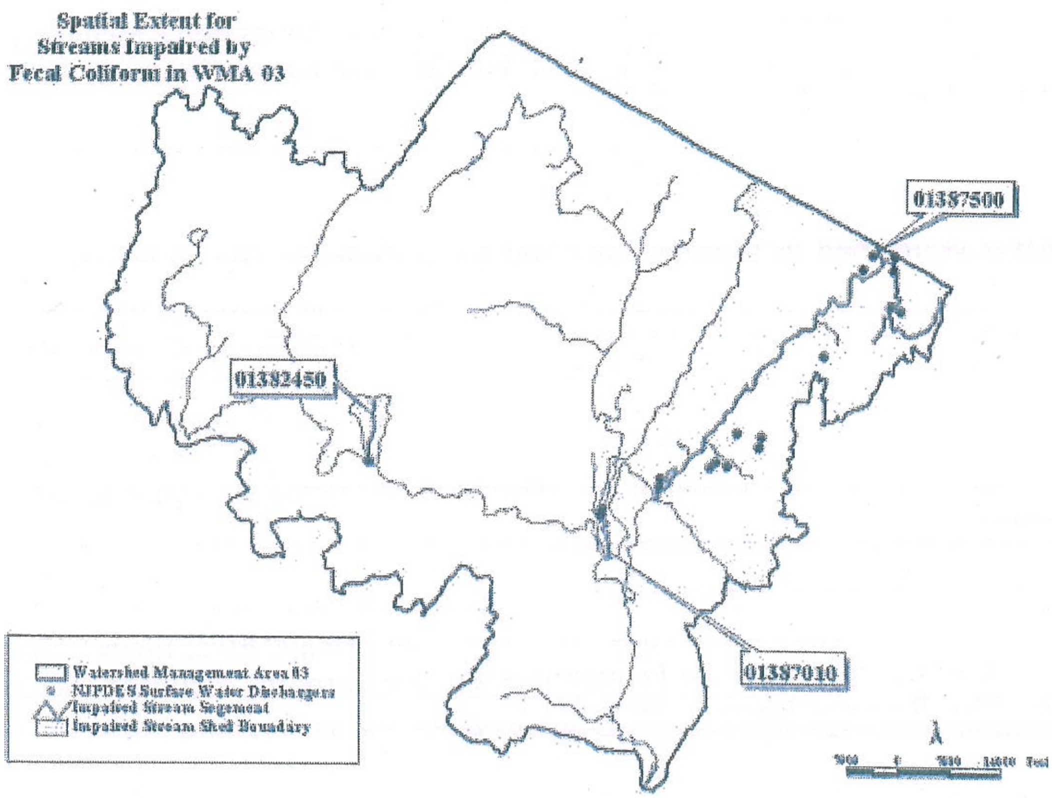
The **Ramapo River and Pompton River Watersheds** comprise a drainage area of about 160 square miles; 110 square miles of which are in New York State. The Ramapo River flows from New York into Bergen County and enters the Pequannock River to form the Pompton River in Wayne Township. The Ramapo River is 15 miles long on the New Jersey side. The Pompton River, a tributary to the Passaic River, is 7 miles long. Some of the major impoundments within this watershed include Point View Reservoir #1, Pompton Lakes, and Pines Lake. Over one-half of this watershed is undeveloped; however, new development is extensive in many areas.

The **Wanaque River Watershed** has a total drainage area of 108 square miles. The headwaters of the river lie within New York State as a minor tributary to Greenwood Lake (located half in New Jersey and half in New York). The New Jersey portion lies in West Milford, Passaic County. The Wanaque River joins up with the Pequannock River in Riverdale Township. The Wanaque River is 27 miles in length. Some of the major impoundments and lakes with this watershed are the Wanaque Reservoir, Greenwood Lake, Arcadia Lake and Lake Inez. Most of the land in this watershed is undeveloped, consisting of vacant lands, reservoirs, parks and farms.

Sublist 5 Waterbodies in WMA 3

Three river segments of the thirty-two impaired segments addressed in this report, the Macopin River (#01382450), Wanaque River (#01387010), and Ramapo River (#01387500) are located in WMA 3. The spatial extent of each segment is identified in Figure 1. River miles, watershed sizes and land use\land cover by percent area associated with each segment are listed in Table 3.

Figure 1 Spatial extent of Sublist 5 segments for which TMDLs are being developed in WMA 3



Segment #01382450, the Macopin River at Macopin Reservoir, has a watershed area of approximately 1.1 mi^2. Water quality from stations #01382410 and #01382450 were used in assessing the status and spatial extent of bacterial contamination. The length of the impaired stream segment is approximately 1.8 miles and is located on the Macopin River upstream of the confluence of the Macopin and the Pequannock Rivers. A total of 1.9 stream miles (based on county hydrologic stream coverage) are located within its watershed and will be included in the implementation plan.

Table 3 **River miles, Watershed size, and Anderson Landuse classification for three Sublist 5 segments, listed for fecal coliform, in WMA 3.**

	Segment ID		
	1382450	1387010	1387500
Sublist 5 impaired river miles (miles)	1.8	1.5	17.7
Total river miles within watershed and included in the implementation plan (miles)	1.9	4.0	87.8
Watershed size (acres)	711	708	26084
Landuse/Landcover			
Agriculture	0.00%	0.00%	0.43%
Barren Land	0.15%	0.17%	0.78%
Forest	89.74%	29.65%	51.20%
Urban	4.11%	55.19%	37.64%
Water	1.97%	4.71%	3.05%
Wetlands	4.04%	10.29%	6.89%

Segment #01387010, the Wanaque River at Highland Avenue at Wanaque, is located on the Wanaque River from the inlet of the Wanaque River at Inez Lake to the confluence of the Wanaque and Pequannock Rivers. Water quality from stations #01387014 and #01387041 were used in assessing the spatial extent of bacterial contamination. The stream segment length is approximately 1.5 miles with a watershed area of approximately 708 acres or 1.1 mi^2.

Segment #01387500, the Ramapo River near Mahwah, is located on the Ramapo River between the NJ-NY borders to the inlet at Pompton Lake. Water quality from station #01387500 was used to assess the spatial extent of bacterial contamination. The impaired stream segment length is approximately 17.7 miles. A total of 87.8 stream miles are located within its watershed and will be included in the implementation plan. The total drainage area for this segment is approximately 26084 acres or 40.8 mi^2.

4.1.2. Watershed Management Area 4

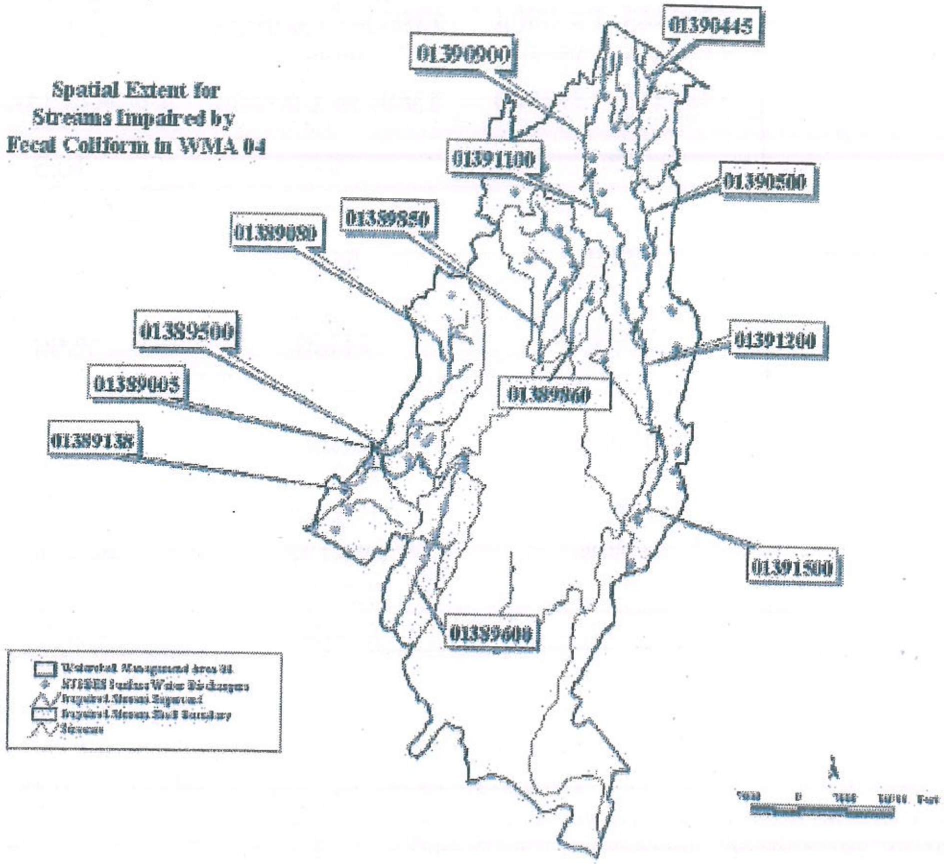
Watershed Management Area 4 (WMA 4) includes the Lower Passaic River (from the Pompton River confluence downstream to the Newark Bay) and its tributaries, including the Saddle River. The WMA 4 drainage area is approximately 180 square miles and lies within portions of Passaic, Essex, Hudson, Morris and Bergen Counties.

Two watersheds comprise WMA 4: the Lower Passaic River Watershed and Saddle River River Watershed. The **Lower Passaic River Watershed** originates from the confluence of the Pompton River downstream to the Newark Bay. This 33-mile section meanders through Bergen, Hudson, Passaic, and Essex Counties and includes a number of falls, culminating with the Great Falls at Paterson. This watershed has a drainage area of approximately 129 square miles. The major tributaries to this section of the Passaic River are the Saddle River, Preakness Brook, Second River, and Third River. The Saddle River is one of the larger tributaries to the Lower Passaic River. The **Saddle River Watershed** has a drainage area of approximately 51 square miles. Land in this watershed is extensively developed and contains many older cities and industrial centers including Newark, Paterson, Clifton, and East Orange.

Sublist 5 Waterbodies inWMA 4

Thirteen of the thirty-two TMDLs in the Northeast region are located in WMA 4. Included are several segments of the Saddle River (#01390500, #01391200 and #01391500), West Branch of the Saddle River (#01390445), Ramsey Brook (#01390900), Hohokus Brook (#01391100), the Passaic River (#01389005 and #01389500), Preakness Brook (#01389080), Deepavaal Brook (#01389138), Diamond Brook (#01389860), Goffle Brook (#01389850), and the Peckman River (#01389600). Several of these stream segments are geographically located in close proximity, thus, when these segments were found to contain similar levels of bacteria contamination (geometric means value), water quality data from these segments were grouped when calculating the TMDL. The spatial extent of each segment is identified in Figure 2. River miles, watershed sizes and land use\land cover by percent area associated with each segment are listed in Table 4.

Figure 2 **Spatial extent of Sublist 5 segments for which TMDLs are being developed in WMA 4**



Given the proximity and similarity in impairment of several stations in the Saddle River watershed, six segments were grouped for the purposes of this report. These segments include: the West Branch Saddle River at Upper Saddle River (#01390445), Saddle River at Ridgewood (#01390500), Ramsey Brook at Allendale (#01390900), Hohokus Brook at Paramus (#01391100), Saddle River at Fairlawn (#01391200), and the Saddle River at Lodi (#01391500). These stream segments extend from the New York-New Jersey border to the confluence of the Saddle and Passaic Rivers and is contained within a 32933 acres, or 51.5 mi^2, watershed. The combined six stream segments total a length of 45.7 miles. The implementation plan will address all of streams located in this watershed (97.3 miles). Stations #01390445, #01390470, #01390510, #01390518, #01390900, #01391100, #01391490, and #01391500 were used to assess the status and spatial extent of bacterial contamination.

Table 4 River miles, Watershed size, and Anderson Landuse classification for thirteen Sublist 5 segments, listed for fecal coliform, in WMA 4.

	Segment ID		
	1390445, 1390500, 1390900, 1391100, 1391200, 1391500	1389005,1389500, 1389080, 1389138,1389600	1389850,1389860
Sublist 5 impaired river miles (miles)	45.7	29.8	10.5
Total river miles within watershed and included in the implementation plan (miles)	97.3	56.1	13.3
Watershed size (acres)	32933	14450	7590
Landuse/Landcover			
Agriculture	0.51%	0.12%	0.07%
Barren Land	0.20%	0.79%	0.27%
Forest	10.59%	20.81%	7.96%
Urban	81.89%	69.81%	88.51%
Water	1.06%	1.59%	0.46%
Wetlands	5.75%	6.88%	2.74%

Five Sublist 5 segments, the Passaic River below Pompton River at Two Bridges (#01389005), Passaic River at Little Falls (#1389500), Preakness Brook near Little Falls (#1389080), Deepavaal Brook at Fairfield (#01389138) and Peckman River at West Paterson (#01389600) were grouped based on similarities in geography and bacterial concentrations. Water quality from stations #01389500, #01389080, #01389138, #01382000, and #01389600 were used to assess the status and spatial extent of bacterial contamination. The combined length of the impaired stream segments is approximately 29.8 miles. A total of 56.1 stream miles are located within its watershed and will be included in the implementation plan. The total drainage area for this segment is approximately 14450 acres, or 22.6 mi^2.

Stream segments #01389850 and #01389860 were also grouped in calculating the TMDL percent reduction. Segment #01389850, Goffle Brook at Hawthorne, consists of the entire length of Goffle Brook to the confluence of Goffle Brook with the Passaic River. Segment #01389860, Diamond Brook at Fair Lawn, consists of the entire length of Diamond Brook to the confluence of Diamond Brook with the Passaic River. Water quality from stations #01389850 and #01389860 were used in assessing the status and spatial extent of bacterial contamination for these segments. The length of the impaired #01389850 stream segment is approximately 10.5 miles in a watershed area of approximately 5658 acres or 8.8 mi^2. A total of 13.3 river miles are in the watershed and will be included in the implementation plan. The length of the impaired #01389860 stream segment is approximately 2.5 miles in a watershed area of approximately 1932 acres or 3.0 mi^2.

4.1.3. Watershed Management Area 5

Watershed Management Area 5 (WMA 5) includes parts of Hudson and Bergen Counties and has a watershed area of approximately 165 square miles. WMA 5 is comprised of three watersheds: Hackensack River Watershed, Hudson River Watershed and Pascack Brook Watershed. The Hackensack River originates in New York State and flows south to the Newark Bay. New Jersey's portion of the river is 31 miles long. The Hackensack River Watershed is approximately 85 square miles. Major tributaries include the Pascack Brook, Berry's Creek, Overpeck Creek, and Wolf Creek. The **Pascack Brook Watershed** has a drainage area of approximately 51 square miles.

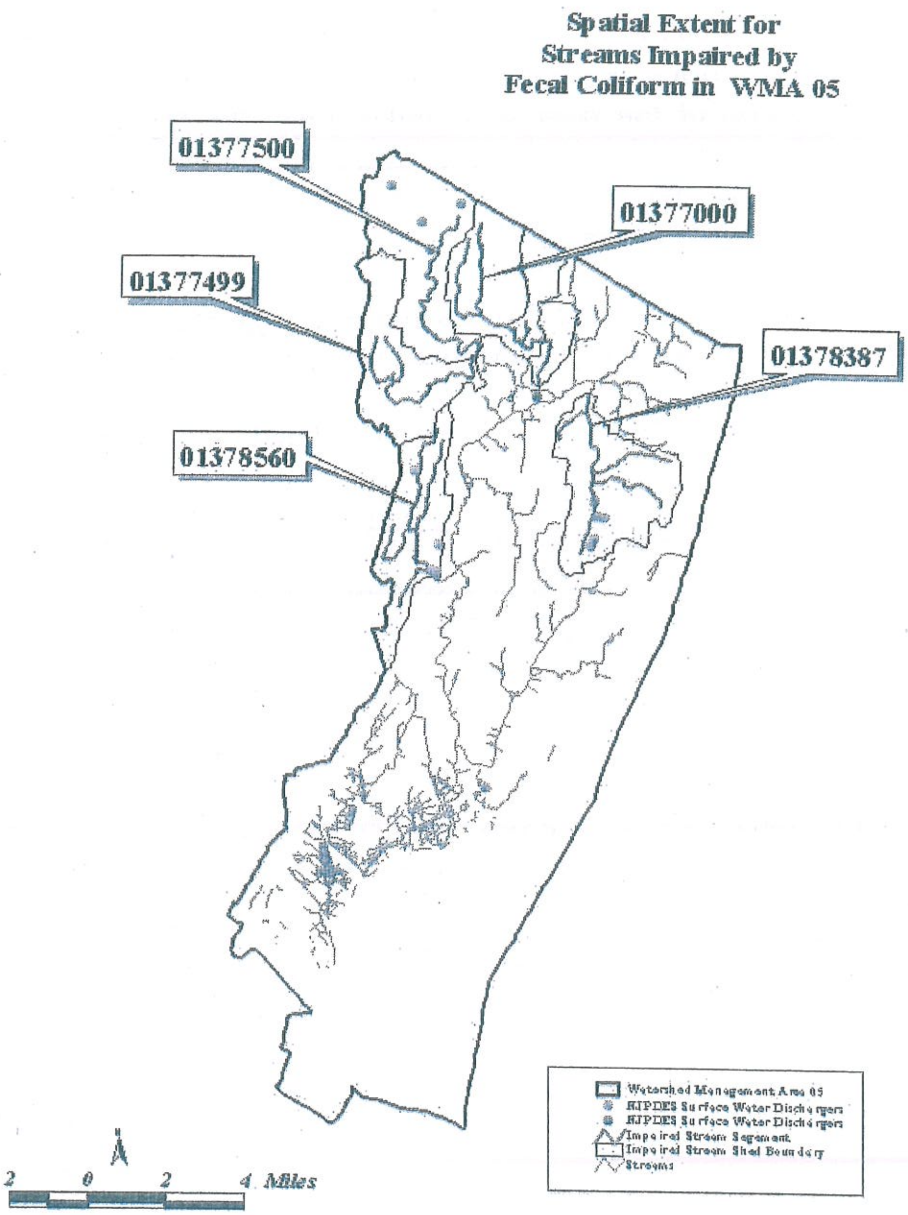
The New Jersey portion of the Hudson River is 315 miles long and begins in New York State at Lake Tear of the Clouds on the southwest side of Mount Marcy, New York's highest peak. The New Jersey portion of the **Hudson River Watershed** is approximately 29 square miles. The Hudson River forms the boundary between New Jersey and New York States.

Although WMA 5 is the most populated of all the WMAs, approximately 50% of the land is still undeveloped, with more than 30% residential development. The remaining developed land is commercial/industrial use. Much of the lower **Hackensack River Watershed** is tidal marsh known as the Hackensack Meadowlands. The Meadowlands are home to more than 700 plant and animal species including several rare and threatened species

Sublist 5 Waterbodies in WMA 5

Five of the thirty-two TMDLs in this report are located in WMA 5. Included are segments in the Hackensack River (#01377000), Pascack Brook (#01377500), Musquapsink Brook (#01377499), Tenakill Brook (#01378387), and Coles Brook (#01378560). The spatial extent of each segment is identified in Figure 3. River miles, watershed size and land use\land cover by percent area associated with each segment are listed in Table 5.

Figure 3 **Spatial extent of Sublist 5 segments for which TMDLs are being developed in WMA 5**



Hackensack River at River Vale, (segment #01377000) flows across the New Jersey/New York State line in River Vale/Old Tappan and extends to the inlet of the Oradell Reservoir. Water quality from stations #01377000 and #01376970 (Hackensack River at Old Tappan) were used in assessing the status and spatial extent of bacterial contamination for this segment. The length of the impaired stream segment is approximately 10.0 miles in a watershed area of approximately 5912 acres or 9.2 mi², however a total of 20.3 river miles are located in the watershed and will be included in the implementation plan.

Table 5 River miles, Watershed size, and Anderson Landuse classification for five Sublist 5 segments, listed for fecal coliform, in WMA 5.

	Segment ID			
	1377000	1377499, 1377500	1378387	1378560
Sublist 5 impaired river miles (miles)	10.0	13.8	10.2	11.1
Total river miles within watershed and included in the implementation plan (miles)	20.3	33.3	10.8	14.8
Watershed size (acres)	5902	10430	5626	4241
Landuse/Landcover				
Agriculture	0.07%	0.95%	0.17%	0.00%
Barren Land	0.42%	0.30%	0.13%	0.18%
Forest	13.85%	11.53%	11.32%	4.98%
Urban	65.52%	79.72%	84.43%	91.80%
Water	12.09%	2.31%	0.44%	0.19%
Wetlands	8.05%	5.18%	3.51%	2.84%

Pascack Brook at Westwood, segment #01377500, and Musquapsink Brook at River Vale segment #01377500, were also grouped based on similarities in geography and extent of bacterial contamination. Water quality from stations #01377499 and #01377500 were used in assessing the status and spatial extent of bacterial contamination for these segments. The combined length of the impaired stream segments is approximately 13.8 miles in a watershed area of approximately 10429 acres or 16.3 mi², however a total of 33.3 river miles are located within the watershed and will be included in the implementation plan.

Tenakill Brook at Cedar Lane at Closter, segment #01378387, consists of the entire length of Tenakill Brook upstream of USGS station #01378387. Water quality from this station #01378387 was used in assessing the status and spatial extent of bacterial contamination for this segment. The length of the impaired stream segment is approximately 10.2 miles in a watershed area of approximately 5625 acres or 8.8 mi². A total of 10.8 river miles are included in this watershed and will be included in the implementation plan

Coles Brook at Hackensack, segment #01378560, consists of the entire length of Coles Brook upstream of USGS station #01378560. Water quality from station #01378560 was used in assessing the status and spatial extent of bacterial contamination for this segment. The length of the impaired stream segment is approximately 11.1 miles in a watershed area of approximately 4240 acres or 6.6 mi². A total of 14.8 river miles are included in this watershed and will be included in the implementation plan.

4.1.4. Watershed Management Area 6

Watershed Management Area 6 (WMA 6) represents the area drained by waters from the upper reaches of the Passaic River Basin including the Passaic River from its headwaters in Morris County to the confluence of the Pompton River. Extensive suburban development and reliance upon ground water sources for water supply characterize WMA 6. WMA 6 lies in portions of Morris, Somerset, Sussex and Essex counties and includes the Upper & Middle Passaic River, Whippany River and Rockaway River Watersheds.

The **Upper Passaic River Watershed** is approximately 50 miles long and consists of a drainage area approximately 200 square miles in portions of Somerset, Morris, and Essex Counties. This section of the Passaic River is a significant source of drinking water for a much of northeastern New Jersey. Major tributaries to the Upper Passaic River include the Dead River, Rockaway River, Whippany River, and Black Brook. The Great Swamp National Wildlife Refuge is located within the Upper Passaic River Watershed. Approximately one-half of this watershed is undeveloped or vacant, with the remainder primarily residential and commercial; however, this watershed is facing significant development in the vacant areas. This watershed is subject to frequent flooding.

The **Middle Passaic River Watershed** includes Great Piece Meadows and Deepavaal Brook. The Great Piece Meadows is a freshwater wetland with a drainage area of approximately 12 square miles and is prone to flooding. Various owners privately own the Great Piece Meadows.

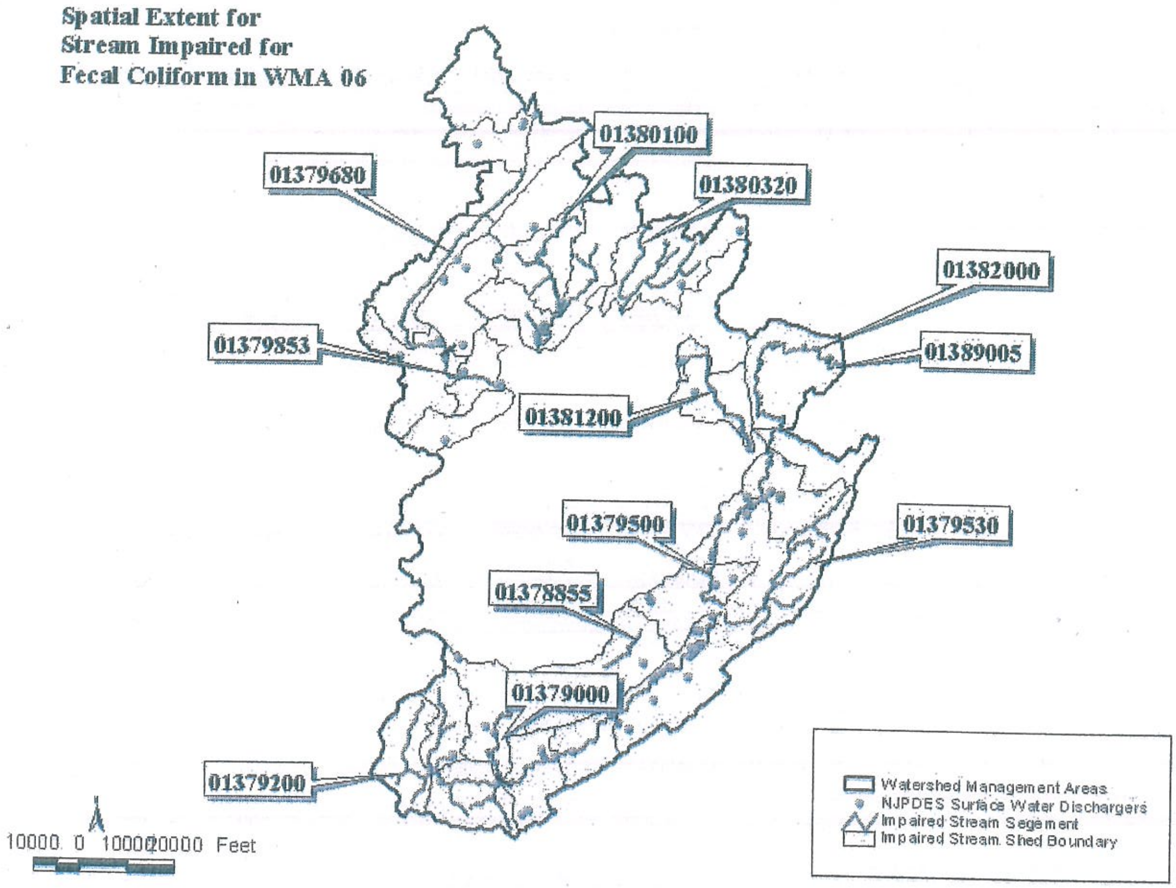
The **Rockaway River Watershed** has a drainage area of approximately 133 square miles and is approximately 37 miles long. The Rockaway River flows east to its confluence with the Whippany River at Pine Brook. Major tributaries include Stone Brook, Mill Brook, Beaver Brook, and Den Brook. The land use patterns in this area are complex and include vacant areas, parklands, residential development and industrial/commercial uses.

The **Whippany River Watershed** drains approximately 69 square miles and is located entirely within Morris County. The river is approximately 18 miles long and flows to the Passaic River. Two major tributaries are Black Brook and Troy Brook. The population is centered in Morristown, Parsippany-Troy Hills, Hanover Township and East Hanover Township.

Sublist 5 Waterbodies WMA 6

Eleven of the thirty-two TMDLs in this report are located in WMA 6. Included are segments in the Black Brook (#01378855), Dead River (#01379200), Passaic River (#01379000, #01379500, and #01382000), Rockaway River (#01379680, #01379853, and #01381200), Canoe Brook (#01379530), Beaver Brook (#01380100), and Stony Brook (#01380320). The spatial extent of each segment is identified in Figure 4. River miles, watershed size and land use\land cover by percent area associated with each segment are listed in Table 6.

Figure 4 Spatial extent of Sublist 5 segments for which TMDLs are being developed in WMA 6



Five segments, the Black Brook at Madison (#01378855), Passaic River near Millington (#01379000), Dead River near Millington (#01379200), the Passaic River near Catham (#01379500), and Canoe Brook near Summit (#01379530), comprise a large portion of the Passaic River headwater region and were grouped based on geographical similarities and bacterial geometric mean concentrations. Water quality from stations #01378855, #01379000, #01379200, #001379500, and #01379530 were used to assess the status and spatial extent of bacterial contamination. The combined length of the impaired stream segments is approximately 71.0 miles. A total of 204.8 stream miles are located within its watershed and will be included in the implementation plan. The total drainage area for this segment is approximately 66,759 acres, or 104.3 mi^2.

Table 6 **River miles, Watershed size, and Anderson Landuse classification for eleven Sublist 5 segments, listed for fecal coliform, in WMA 6.**

	Segment ID					
	1378855,1379000, 1379200,1379500, 1379530	1379680 1379853	1380100	1380320	1381200	1382000
Sublist 5 impaired river miles (miles)	71.0	15.1	16.9	13.1	6.8	14.9
Total river miles within watershed and included in the implementation plan (miles)	204.8	105.8	43.0	25.0	18.4	53.0
Watershed size (acres)	66759	39246	14528	7864	4861	11019
Landuse/Landcover						
Agriculture	2.23%	0.36%	0.16%	2.00%	1.44%	0.52%
Barren Land	0.90%	1.23%	2.66%	0.36%	1.62%	0.51%
Forest	19.21%	55.51%	63.14%	62.92%	13.07%	11.83%
Urban	51.57%	27.70%	17.22%	21.24%	66.79%	42.42%
Water	1.45%	3.75%	7.08%	4.03%	2.14%	3.00%
Wetlands	24.65%	11.44%	9.74%	9.46%	14.94%	41.72%

Rockaway River at Longwood Valley, (#01379680), and Rockaway River at Blackwell St. (#01379853) were grouped based on similarities in geography and bacterial contamination. Water quality from stations #01379680, #01379700 and #01379853 were used in assessing the spatial extent of bacterial contamination for these segments. The combined length of the impaired stream segments is approximately 15.1 miles in a watershed area of approximately 39246 acres or 61.3 mi^2. A total of 105.8 river miles are located within the watershed and will be included in the implementation plan.

Beaver Brook at Rockaway, segment #01380100, consists of the entire Beaver Brook to the confluence of Beaver Brook and the Rockaway River. Water quality from station #01380100 was used to assess the status and spatial extent of bacterial contamination. The impaired stream segment length is approximately 16.9 miles. A total of 43.0 stream miles are located within its watershed and will be included in the implementation plan. The total drainage area for this segment is approximately 14528 acres or 22.7 mi^2.

Segment #01380320, Stony Brook at Boonton, consists of the entire Stony Brook to the confluence of Stony Brook and the Rockaway River. Water quality from station #01380100 was used to assess the status and spatial extent of bacterial contamination. The impaired stream segment length is approximately 13.1 miles. A total of 25.0 stream miles are located within its watershed and will be included in the implementation plan. The total drainage area for this segment is approximately 7864 acres or 12.3 mi^2.

Segment #01381200, Rockaway River at Pine Brook, is located on the downstream portion of the Rockaway River between the outlet of the Boonton Reservoir and the confluence of the

Rockaway and the Whippany Rivers. Water quality from station #01381200 was used to assess the status and spatial extent of bacterial contamination. The impaired stream segment length is approximately 6.8 miles. A total of 18.4 stream miles are located within its watershed and will be included in the implementation plan. The total drainage area for this segment is approximately 4861 acres or 7.6 mi^2.

Segment #01382000, Passaic River at Two Bridges, is located on the Passaic River between the confluence of the Whippany and Passaic Rivers to the confluence of the Passaic and Pompton Rivers. Water quality from station #01382000 was used to assess the status and spatial extent of bacterial contamination. This segment was not grouped with other segments based on its relatively lower bacterial concentrations compared with those found in up and downstream on the Passaic River. The impaired stream segment length is approximately 14.9 miles in a drainage area of approximately 11019 acres or 17.2 mi^2. A total of 53.0 stream miles are located within its watershed and will be included in the implementation plan.

4.2. Data Sources

The Department's Geographic Information System (GIS) was used extensively to describe northeast watershed characteristics. In concert with USEPA's November 2001 listing guidance, the Department is using Reach File 3 (RF3) in the 2002 Integrated Report to represent rivers and streams. The following is general information regarding the data used to describe the watershed management area:

- Land use/Land cover information was taken from the 1995/1997 Land Use/Land cover Updated for New Jersey DEP, published 12/01/2000 by Office of Information Resources Management (OIRM), Bureau of Geographic Information and Analysis (BGIA), delineated by watershed management area.
- 2002 Assessed Rivers coverage, NJDEP, Watershed Assessment Group, unpublished coverage.
- County Boundaries: Published 11/01/1998 by the NJDEP, Office of Information Resources Management (OIRM), Bureau of Geographic Information and Analysis (BGIA), "NJDEP County Boundaries for the State of New Jersey." Online at: http://www.state.nj.us/dep/gis/digidownload/zips/statewide/stco.zip
- Detailed stream coverage (RF3) by County: Published 11/01/1998 by the NJDEP, Office of Information Resources Management (OIRM), Bureau of Geographic Information and Analysis (BGIA). "Hydrography of XXX County, New Jersey (1:24000)." Online at: http://www.state.nj.us/dep/gis/digidownload/zips/strm/
- NJDEP 14 Digit Hydrologic Unit Code delineations (DEPHUC14), published 4/5/2000 by Department of Environmental Protection (NJDEP), New Jersey Geological Survey (NJGS) Online at: http://www.state.nj.us/dep/gis/digidownload/zips/statewide/dephuc14.zip
- NJPDES Surface Water Discharges in New Jersey, (1:12,000), published 02/02/2002 by Division of Water Quality (DWQ), Bureau of Point Source Permitting - Region 1 (PSP-R1).

5.0 Applicable Water Quality Standards

5.1. New Jersey Surface Water Quality Standards for Fecal Coliform

As stated in N.J.A.C. 7:9B-1.14(c) of the New Jersey SWQS, the following are the criteria for freshwater fecal coliform:

> "Fecal coliform levels shall not exceed a geometric average of 200 CFU/100 ml nor should more than 10 percent of the total sample taken during any 30-day period exceed 400 CFU/100 ml in FW2 waters".

All of the waterbodies covered under these TMDLs have a FW1 or FW2 classification (NJAC 7:9B-1.12). The designated use, i.e. surface water uses, both existing and potential, that have been established by the Department for waters of the State, for all of the waterbodies in the Northeast Water Region is as stated below:

In all FW1 waters, the designated uses are:

1. Set aside for posterity to represent the natural aquatic environment and its associated biota;
2. Primary and secondary contact recreation;
3. Maintenance, migration and propagation of the natural and established aquatic biota; and
4. Any other reasonable uses.

In all FW2 waters, the designated uses are:

1. Maintenance, migration and propagation of the natural and established aquatic biota;
2. Primary and secondary contact recreation;
3. Industrial and agricultural water supply;
4. Public potable water supply after conventional filtration treatment (a series of processes including filtration, flocculation, coagulation and sedimentation, resulting in substantial particulate removal but no consistent removal of chemical constituents) and disinfection; and
5. Any other reasonable uses.

5.2. Pathogen Indicators in New Jersey's Surface Water Quality Standards (SWQS)

A subset of total coliform, fecal coliform, originates from the intestines of warm-blooded animals. Therefore, because they do not include organisms found naturally in soils, fecal coliform is preferred over total coliform as a pathogen indicator. In 1986, USEPA published a document entitled *"Implementation Guidance for Ambient Water Quality Criteria for Bacteria – 1986"* that contained their recommendations for water quality criteria for bacteria to protect bathers from gastrointestinal illness in recreational waters. The water quality criteria established levels of indicator bacteria *Escherichia coli* (*E. coli*) for fresh recreational water and enterococci for fresh and marine recreational waters in lieu of fecal coliforms. Historically, the New Jersey has listed water bodies for exceedances of the fecal coliform criteria.

Therefore, the Department is obligated to develop TMDLs for Sublist 5 water bodies based upon fecal coliform, at least until New Jersey has the transition to *E. coli* and enterococci in the Department's SWQS and until sufficient data have been collected to either develop a TMDL or to support a proposal to move the waterbodies to one of the other four categories.

6.0 Source Assessment

In order to evaluate and characterize fecal coliform loadings in the waterbodies of interest in these TMDLs, and thus propose proper management responses, source assessments are warranted. Source assessments include identifying the types of sources and their relative contributions to fecal coliform loadings, in both time and space variables.

6.1. Assessment of Point Sources other than Stormwater

Municipal point sources of fecal coliform for these TMDLs are listed in Appendix B. Municipal treatment plants are required to disinfect effluent prior to discharge and to meet surface water quality criteria for fecal coliform in their effluent. While there are some industrial treatment plants that also treat domestic wastewater, these facilities are few in number and are also required to disinfect effluent prior to discharge. In addition, New Jersey's Surface Water Quality Standards at N.J.A.C. 7:9B-1.5(c)4 reads "No mixing zones shall be permitted for indicators of bacterial quality including, but not limited to, fecal coliforms and enterococci". This mixing zone policy is applicable to both municipal and industrial treatment plants.

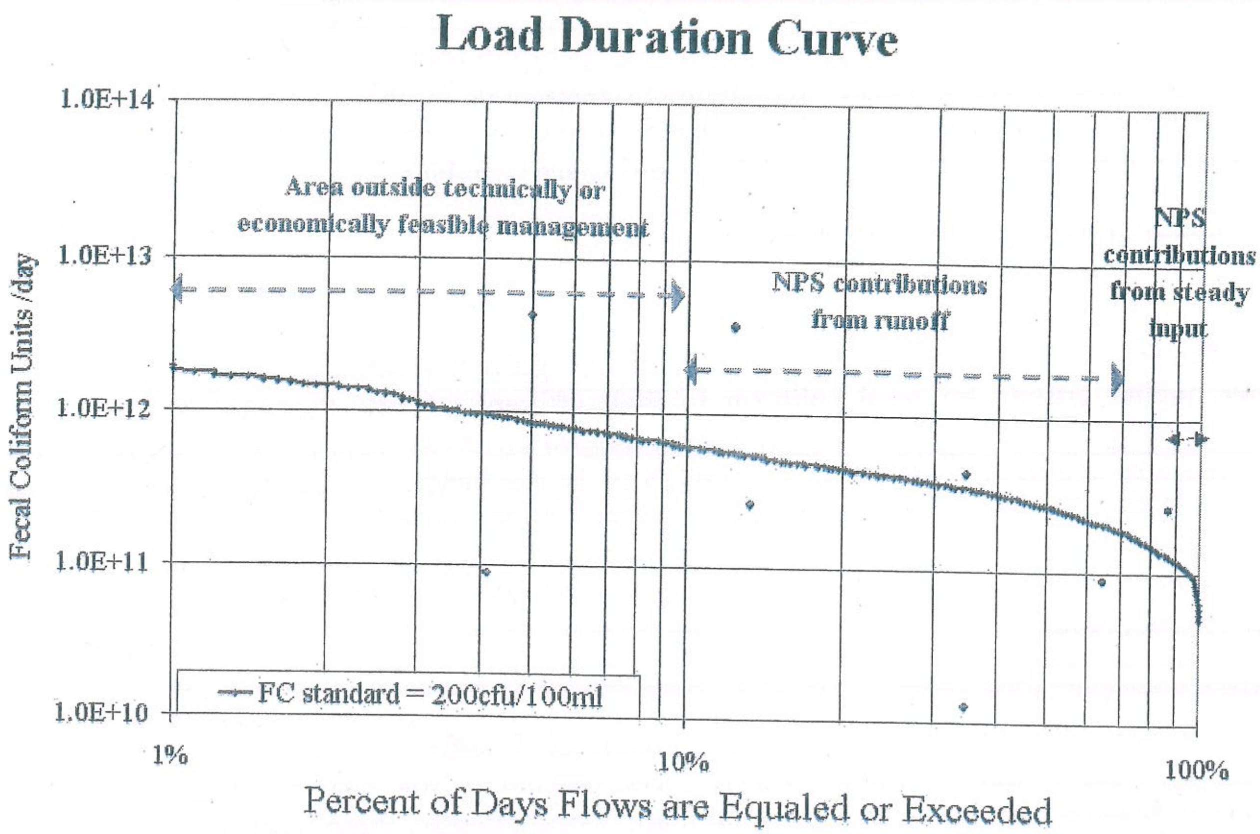
Since POTWs and industrial treatment plants routinely achieve essentially complete disinfection (less than 20 CFU/100ml), the requirement to disinfect is, in effect, more stringent than the fecal coliform effluent criteria. The percent of the total point source contribution is an insignificant fraction of the total load. Consequently, these fecal coliform TMDLs will not impose any change in current practices for POTWs and industrial treatment plants and will not result in changes to existing effluent limits. The methodology used in this report is inappropriate for use in areas affected by combined sewer overflows (CSOs) or in areas influenced by tidal action. Therefore, stream segments falling into these two categories will be excluded from the discussion of TMDLs in this report.

6.2. Assessment of Nonpoint and Stormwater Sources

Nonpoint and stormwater sources include storm-driven loads such as runoff from various land uses that transport fecal coliform from sources such as geese, farms, and domestic pets to the receiving water. Domestic pet waste, geese waste, as well as loading from storm water detention basins will be addressed by the Phase II MS4 program. Nonpoint sources also include steady-inputs from "illicit" sources such as failing sewage conveyance systems, sanitary sewer overflows (SSOs), and failing or inappropriately located septic systems. When "illicit" sources are identified, appropriate enforcement measures will be taken to eliminate them.

When streamflow gauge information is available, a load duration curve (LDC) is useful in identifying and differentiating between storm-driven and steady-input sources. As an example, Figure 5 represents a LDC using the 200 CFU/100 ml criterion.

Figure 5 **Example Load Duration Curve (LDC)**



The load duration curve method is based on comparison of the frequency of a given flow event with its associated water quality load. A LDC can be developed using the following steps:

1. Plot the Flow Duration Curve, Flow vs. % of days flow exceeded.
2. Translate the flow-duration curve into a LDC by multiplying the water quality standard, the flow and a conversion factor, the result of this multiplication is the maximum allowable load associated with each flow
3. Graph the LDC, maximum allowable load vs. percent of time flow is equaled or exceeded
4. Water quality samples are converted to loads (sample water quality data multiplied by daily flow on the date of sample).
5. Plot the measured loads on the LDC.

Values that plot below the LDC represent samples below the concentration threshold whereas values that plot above represent samples that exceed the concentration threshold. Loads that plot above the curve and in the region between 85 and 100 percent of days in which flow is exceeded indicate a steady-input source contribution. Loads that plot in the region between 10 and 70 percent suggest the presence of storm-driven source contributions. A combination of both storm-driven and steady-input sources occurs in the transition zone between 70 and 85 percent. Loads that plot above 99 percent or below 10 percent represent values occurring during either extreme low or high flows conditions and are thus considered to be outside the region of technically and economically feasible management. In this report, LDCs are used only for TMDL implementation and not in calculating TMDLs.

7.0 Water Quality Analysis

Relating pathogen sources to in-stream concentrations is distinguished from quantifying that relationship for other pollutants given the inherent variability in population size and dependence not only on physical factors such as temperature and soil characteristics, but also on less predictable factors such as re-growth media. Since fecal coliform loads and concentrations can vary many orders of magnitude over short distances and over time at a single location, dynamic model calibrations can be very difficult to calibrate. Options available to control non-point sources of fecal coliform typically include measures such as goose management strategies, pooper-scooper ordinances, and septic system maintenance. However, the effectiveness of these control measures is not easily measured. Given these considerations, detailed water quality modeling may not provide adequate insight or guidance toward the development of implementation plans for fecal coliform reductions.

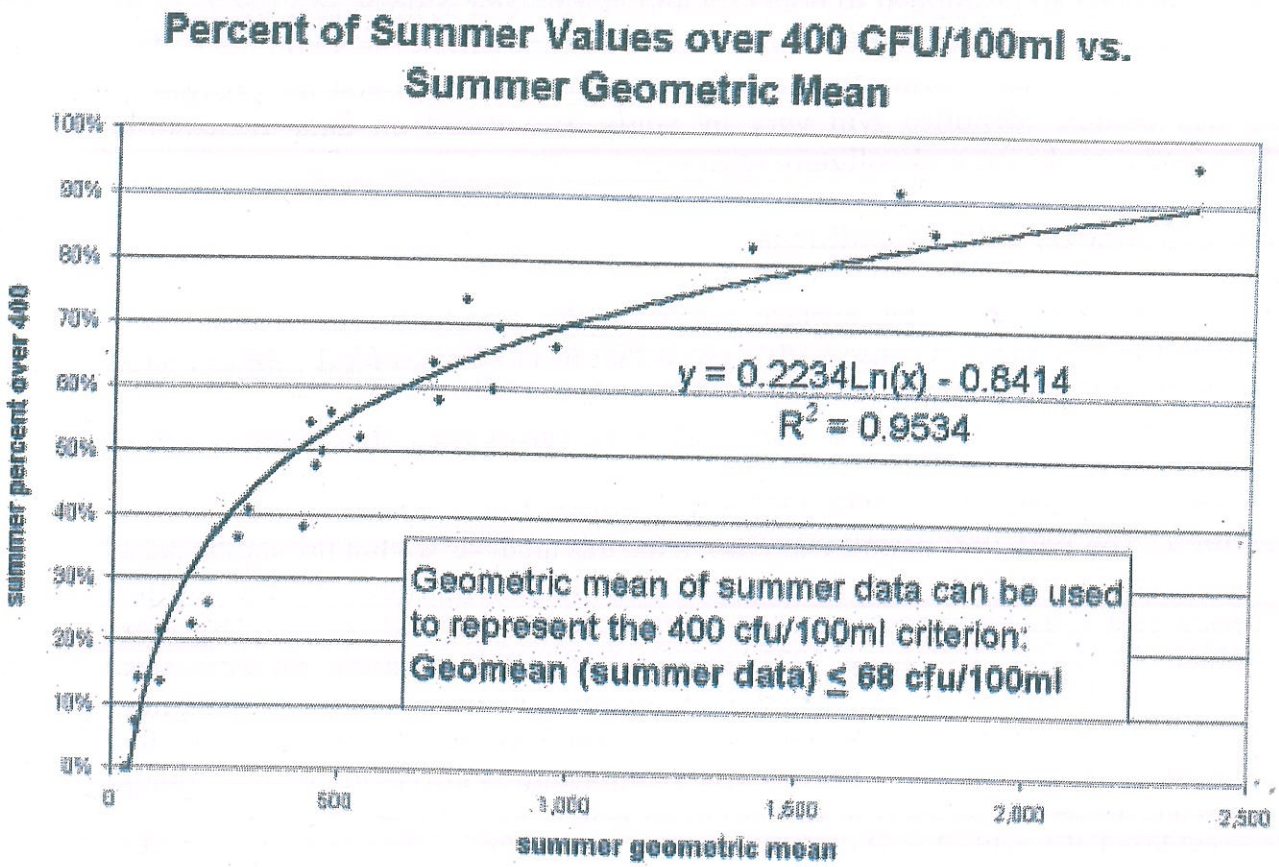
As described in EPA guidance, a TMDL identifies the loading capacity of a waterbody for a particular pollutant. EPA regulations define loading capacity as the greatest amount of loading that a waterbody can receive without violating water quality standards (40 C.F.R. 130.2). The loadings are required to be expressed as either mass-per-time, toxicity, or other appropriate measures (40 C.F.R. 130.2(i)). For these TMDLs, the load capacity is expressed as a concentration set to meet the state water quality standard. For bacteria, it is appropriate and justifiable to express the components of a TMDL as percent reduction based on concentration. The rationale for this approach is that:

- expressing a bacteria TMDL in terms of concentration provides a direct link between existing water quality and the numeric target;
- using concentration in a bacteria TMDL is more relevant and consistent with the water quality standards, which apply for a range of flow and environmental conditions; and
- follow-up monitoring will compare concentrations to water quality standards.

Given the two criteria of 200 CFU/100 ml and 400 CFU/100 ml in FW2 waters, computations were necessary for both criteria and resulted in two percent reduction values. The higher percent reduction value was applied in the TMDL so that both the 200 CFU/100 ml and 400 CFU/100 ml criteria were satisfied.

To satisfy the 200 CFU/100ml criteria, the geometric mean of all available data between water years 1994-2000 was compared to an adjusted target concentration. The adjusted target accounts for an explicit margin of safety and is equal to 200 minus the margin of safety. A calculation incorporating all available data is generally conservative since most samples are taken during the summer when fecal coliform is generally higher. A geometric mean of summer data was used to develop a percent reduction to satisfy the 400 CFU/100 ml criteria. A summer geometric mean can be used to represent the 400 criteria by regressing the percent over 400 CFU/100 ml against the geometric mean (Figure 6). Thus, each datapoint on Figure 6 represents all the data from one individual monitoring station. Sites with 20 or more summer data points were used to develop this regression, in order to make use of more significant values for percent exceedance. The resulting regression has an r-squared value of 0.9534. Solving for X when Y is equal to 10% yields a geometric mean threshold of 68 CFU/100ml. This means that, using summer data, a geometric mean of 68 can be used to represent the 400 CFU/100ml criterion. Since the geometric mean is a more reliable statistic than percentile when limited data are available, 68 CFU/100ml was used to represent the 400 CFU/100ml criterion for all sites. The inclusion of all data from summer months (May through September) to compare with the 30-day criterion is justified because summer represents the critical period when primary and secondary contact with water bodies is most prevalent. A more detailed justification for using summer data can be found in Section 7.1,"Seasonal Variation and Critical Conditions."

Figure 6 Percent of summer values over 400 CFU/100ml as a function of summer geometric mean values



$y = 0.2234\ln(x) - 0.8414$

$R^2 = 0.9534$ Equation 1

Geometric mean, and summer geometric mean, and percent reductions were determined at each location for both criteria using Equations 2 through 4. To satisfy the 200 CFU/100ml criteria, equations 2 and 3 were applied. Equations 2 and 4 were used in satisfying the 400 CFU/100ml criteria.

$$Geometric\ Mean\ for\ 200CFU\ criteria = \sqrt[n]{y_1 y_2 y_3 y_4 \ldots y_n}$$ Equation 2

where:

y = sample measurement

n = total number of samples

$$200\ CFU\ criteria\ Percent\ Reduction = \frac{(Geometric\ mean - (200 - e))}{Geometric\ mean} \times 100\ \%$$ Equation 3

$$400\ CFU\ criteria\ Percent Reduction = \frac{(Summer Geometric\ mean - (68 - e))}{Summer Geometric\ mean} \times 100\ \%$$ Equation 4

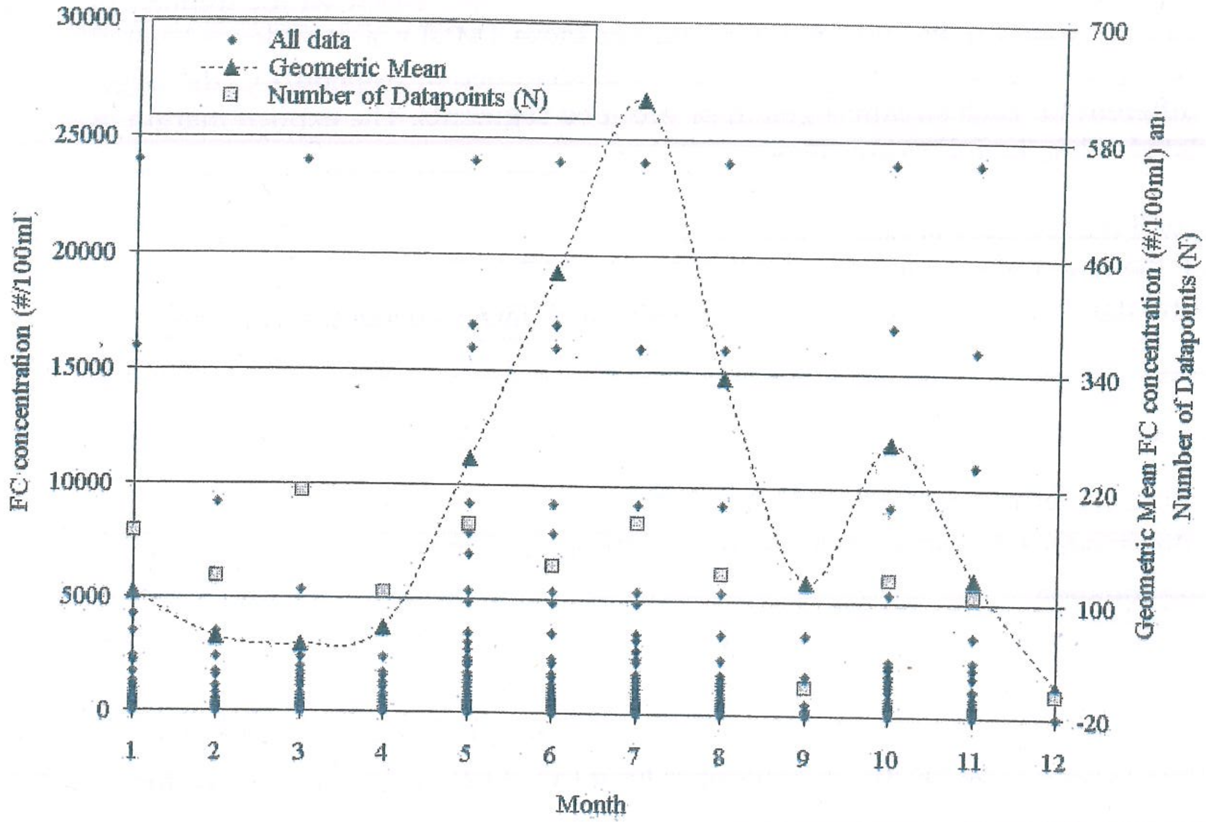
where:
e = (margin of safety)

This percent reduction can be applied to nonpoint and stormwater sources as a whole or be apportioned to categories of nonpoint and stormwater sources within the study area. The extent to which nonpoint and stormwater sources have been identified and the process by which they will become identified will vary by study area based on data availability, watershed size and complexity, and pollutant sources.

7.1. Seasonal Variation/Critical Conditions

These TMDLs will attain applicable surface water quality standards year round. The approach outlined in this paper is conservative given that in most cases fecal coliform data were collected during the summer months, a time when in-stream concentrations are typically the highest. This relationship is evidenced when calculating, on a monthly basis, the geometric mean of fecal coliform data collected statewide. Statewide fecal coliform geometric means during water years 1994-1997 were compared on a monthly basis and are shown in Figure 7. The 1994-1997 period was chosen for this analysis so that the significance of the number of individual datapoints for any given month was minimized. During the 1994-1997 period year-round sampling for fecal coliform was conducted by sampling four times throughout the year. Following 1997, the fecal coliform sampling protocol was changed to five samples during a 30-day period in the summer months. As evident in Figure 7, higher monthly geometric means are observed between May and September with the highest values occurring during mid-summer. This relationship is also evident when using the entire 1994-2002 dataset or datasets from individual water years. Given this relationship, summer is considered the critical period for violating fecal coliform SWQS and, as such, sampling during this period is considered adequate for meeting year round protections and designated uses.

Figure 7 **Statewide monthly fecal coliform geometric means during water years 1994-1997 using USGS/NJDEP data.**



7.2. Margin of Safety

A Margin of Safety (MOS) is provided to account for "lack of knowledge concerning the relationship between effluent limitations and water quality" (40 CFR 130.7(c)). For these TMDLs calculations, both an implicit and explicit Margin of Safety (MOS) are incorporated. Implicitly, a MOS is inherent in the estimates of current pollutant loadings, the targeted water quality goals (New Jersey's SWQS) and the allocations of loading. This was accomplished by taking conservative assumptions throughout the TMDL evaluation and development. Examples of some of the conservative assumptions include treating fecal coliform as a conservative substance, applying the fecal coliform criteria to stormwater sources, and applying the fecal coliform criteria to the stream during all weather conditions. Fecal coliforms decay in the environment (i.e. outside the fecal tract) relatively rapidly, yet this analysis assumes a linear relationship between fecal load and instream concentration. Furthermore, it is generally recognized that fecal contamination from stormwater poses much less risk of illness than fecal contamination from sewage or septic system effluent (Cabelli, 1989). Finally, much of the fecal coliform is flushed into the system during rainfall events and passes through the system in a short time. Primary and secondary recreation generally occur during dry periods.

An explicit MOS is provided by incorporating a confidence level multiplier associated with log-normal distributions in the calculation of the load reduction for both the 200 and 400 standards. Using this method, the 200 and 400 targets are reduced based on the number of data points and the variability within each data set. For these TMDLs, a confidence level of 90% was used in calculating the MOS. As a result, and as identified in Appendix C, the target value will be different for each stream segment or grouped segments. The explicit margin of safety is calculated using the following steps:

1- FC data (x) will transformed to Log form data (y),
2- the mean of the Log- transformed data (y) is determined, $\bar{y}$
3- Determine the standard deviation of the Log-transformed data, S_y using the following equation:

$$S_y = \sqrt{\frac{\sum_i (y_i - \bar{y})^2}{N-1}}$$

4- Determine the Geometric mean of the FC data (GM)
5- Determine the standard deviation of the mean (standard error of the mean), $s_{\bar{y}}$, using the following equation:

$$s_{\bar{y}} = \frac{s_y}{\sqrt{N}}$$

6- For the 200 standard ($x_{standard}$), $y_{standard}$ = Log(200)= 2.301, thus for a confidence level of 90%, the target value will be the lower confidence limit (n= -1.64), $y_{target} = y_{std} - n \cdot s_{\bar{y}}$, for example, the 200 criteria: y_{target} = 2.301- n* $s_{\bar{y}}$
7- The target value for x, $x_{target} = 10^{y_{target}}$
8- The margin of safety (e) therefore will be e = $x_{standard} - x_{target}$
9- Finally, the load reduction = $\frac{GM - x_{target}}{GM} \cdot 100\%$, for example the 200 criteria will be defined as: $\frac{(GM - (200 - e))}{GM} \cdot 100\%$

The 400 criteria would be defined as: $\frac{(GM - (68 - e))}{GM} \cdot 100\%$

8.0 TMDL Calculations

Because these TMDLs are calculated based on ambient water quality data, the allocations are provided in terms of percent reductions. In the same way, the loading capacity of each stream is expressed as a function of the current load:

$LC = (1 - PR) \times L_o$, where

LC = loading capacity for a particular stream;
PR = percent reduction as specified in Tables 7-10;

L_o = current load.

8.1. Wasteload Allocations and Load Allocations

For the reasons discussed previously, these TMDLs do not include WLAs for traditional point sources (POTWs, industrial, etc.). WLAs are hereby established for all NJPDES-regulated point sources (including NJPDES-regulated stormwater), while LAs are established for all stormwater sources that are not subject to NJPDES regulation, and for all nonpoint sources. Both WLAs and LAs are expressed as percentage reductions for particular stream segments.

Table 7 identifies the required percent reduction necessary for each stream segment or group of segments to meet the fecal coliform SWQS. The reductions reported in these tables include a margin of safety factor and represent the higher percent reduction (more stringent) required of the two criteria. Reductions that are required under each criteria are located in Appendix C. In all cases, the 400 CFU/100ml criteria was the more stringent of the two criteria, thus values reported in Table 7 were equal to the percent required to meet the 400 CFU/100ml criteria.

Table 7 **TMDLs for fecal coliform-impaired stream segments in the Northeast Water Region as identified in Sublist 5 of the 2002 Integrated List of Waterbodies. The reductions reported in this table represent the higher, or more stringent, percent reduction required of the two fecal colifom criteria.**

TMDL No.	WMA	Station Name/Waterbody	Sublist 5 Segment	Summer Geometric Mean CFU/100ml	MOS as a percent of the target conc.[1]	Percent Reduction (LA) without MOS	Percent Reduction (LA) with MOS	Wasteload Allocation (WLA) as a Percent Reduction, with MOS
1	3	Macopin River at Macopin Reservoir	01382450	59	46%	-16%	**37%**	**37%**
2	3	Wanaque River at Highland Avenue	01387010	208	53%	67%	**85%**	**85%**
3	3	Ramapo River near Mahwah	01387500	431	44%	84%	**91%**	**91%**

TMDL No.	WMA	Station Name/Waterbody	Sublist 5 Segment	Summer Geometric Mean CFU/100ml	MOS as a percent of the target conc.[1]	Percent Reduction (LA) without MOS	Percent Reduction (LA) with MOS	Wasteload Allocation (WLA) as a Percent Reduction, with MOS
4	4	West Branch Saddle River at Upper Saddle R.	01390445	1,144	30%	94%	**96%**	**96%**
5	4	Saddle River at Saddle River	01390500					
6	4	Saddle River at Ridgewood Ave at Ridgewood	01390900					
7	4	Hohokus Brook at Mouth at Paramus	01391100					
8	4	Saddle River at Rochelle Park	01391200					
9	4	Saddle River at Lodi	01391500					
10	4	Passaic R. below Pompton R. at Two Bridges	01389005	652	30%	90%	**93%**	**93%**
11	4	Passaic River at Little Falls	01389500					
12	4	Preakness Brook near Little Falls	01389080					
13	4	Peckman River at West Paterson	01389600					
14	4	Deepavaal Brook at Fairfield	01389138					
15	4	Diamond Brook at Fair Lawn	01389860	1,544	47%	96%	**98%**	**98%**
16	4	Goffle Brook at Hawthorne	01389850					
17	5	Hackensack River at River Vale	01377000	294	34%	77%	**85%**	**85%**
18	5	Musquapsink Brook at River Vale	01377499	709	54%	90%	**96%**	**96%**
19	5	Pascack Brook at Westwood	01377500					
20	5	Tenakill Brook at Cedar Lane at Closter	01378387	159	91%	57%	**96%**	**96%**
21	5	Coles Brook at Hackensack	01378560	1,093	68%	94%	**98%**	**98%**
22	6	Black Brook at Madison	01378855	1,370	29%	95%	**96%**	**96%**
23	6	Passaic River near Millington	01379000					
24	6	Dead River Near Millington	01379200					
25	6	Passaic River near Chatham	01379500					
26	6	Canoe Brook near Summit	01379530					
27	6	Rockaway River at Longwood Valley	01379680	373	54%	82%	**92%**	**92%**
28	6	Rockaway River at Blackwell Street	01379853					
29	6	Beaver Brook at Rockaway	01380100	362	43%	81%	**89%**	**89%**
30	6	Stony Brook at Boonton	01380320	214	32%	68%	**78%**	**78%**
31	6	Rockaway River at Pine Brook	01381200	571	28%	88%	**91%**	**91%**
32	6	Passaic River at Two Bridges	01382000	276	33%	75%	**83%**	**83%**

[1] MOS as a percent of target is equal to: $\frac{e}{200\ CFU/100\,ml}$ or $\frac{e}{68\ CFU/100\,ml}$ where "e" is defined as the MOS in Section 7.2

8.2. Reserve Capacity

Reserve capacity is an optional means of reserving a portion of the loading capacity to allow for future growth. Reserve capacities are not included at this time. The loading capacity of each stream is expressed as a function of the current load (Section 8.0), and both WLAs and LAs are expressed as percentage reductions for particular stream segments (Section 8.1). Therefore, the percent reductions from current levels must be attained in consideration of any new sources that may accompany future development.

9.0 Follow - up Monitoring

The NJDEP's primary surface water quality monitoring unit is the Office of Water Monitoring Management. In association with the Water Resources Division of the U.S. Geological Survey, the NJDEP have cooperatively operated the Ambient Stream Monitoring Network (ASMN) in New Jersey since the 1970s. The ASMN currently includes approximately 115 stations that are routinely monitored on a quarterly basis. Bacteria monitoring, as part of the ASMN network, are conducted five times during a consecutive 30-day summer period each year. The data from this network has been used to assess the quality of freshwater streams and percent load reductions. Although other units also perform monitoring functions, the ASMN will remain a principal source of FC monitoring.

10.0 Implementation

When bacterial sources are easily identifiable, measures outlined in section 10.2, Source Categories and Best Management Practices (BMPs), will be applied to reduce bacterial loading to meet SWQ standards. When bacterial sources are not easily identifiable, load duration curves will be used in conjunction with bacterial source tracking, if necessary, to identify pathogen sources.

Much of the stormwater discharged to the surface waters in question is discharged through "small municipal separate storm sewer systems" (small MS4s) that are proposed to be regulated under the Department's proposed Phase II NJPDES stormwater rules for the Municipal Stormwater Regulation Program. Under those proposed rules and associated draft general permits, nearly all municipalities (and various county, State, and other agencies) in the Northeast Region will be required to implement various control measures that should substantially reduce bacteria loadings, including measures to eliminate "illicit connections" of domestic sewage and other waste to the small MS4, adopt and enforce a pet waste ordinance, prohibit feeding of unconfined wildlife on public property, clean catch basins, perform good housekeeping at maintenance yards, and provide related public education and employee training. The WLAs and LAs in Table 7 are not themselves "Additional Measures" under proposed N.J.A.C. 7:14A-25.6 or 25.8.

Sections 10.2 and 10.4 identify BMPs and monitoring measures that in some respects are in addition to the control measures required in these general permits. These BMPs and monitoring measures are also not "Additional Measures" under proposed N.J.A.C. 7:14A-25.6 or 25.8. However, the Department will seek to have these BMPs and monitoring measures implemented through means other than requirements in these general permits. Also, in the future, the Department may propose and adopt WQM plan amendments that identify one or more of these BMPs (or other BMPs) and monitoring measures as "Additional Measures" for some or all of the permittees under these general permits.

10.1. Load Duration Curve (LDC)

As explained in Section 6.2, a LDC can be a beneficial tool as a first step in identifying potential pathogen sources. LDCs for listed segments in the Northeast region are located in Appendix D. In each case, thirty (30) years of USGS gage flow data (water years 1970-2000), from the listed station, were used in generating the curve. When a recent 30-year period was not available at the listed station, an adjacent station was selected based on station correlation information in US Geological Survey Open File Report 81-1110 (USGS, 1982). When an adjacent station was used in the manner, flows were adjusted to the station of interest based on a ratio of watershed size. LDCs were not developed for stations in which a satisfactory correlation could not be found.

10.2. Source Categories and Best Management Practices

The TMDLs developed in this report were developed with the assistance of stakeholders in WMAs 3, 4, 5 and 6 as part of the Department's ongoing watershed management efforts. Through the creation of the watershed management planning process over the past several years, Public Advisory Committees (PACs) and Technical Advisory Committees (TACs) were created in all 20 WMAs. Whereas the PACs serve in an advisory capacity to the New Jersey Department of Environmental Protection, and examined and commented on a myriad of issues in the watersheds, the TACs were focused on the scientific, ecological, and engineering issues relevant to the mission of the PAC. The Department in collaboration with the Northeast TACs narrowed the scope of the primary sources of fecal contamination to the following:

Non-Human Sources of Fecal Coliform

- Canada geese
- Pet Waste
- Stormwater basins
- Direct stormwater discharges to waterbodies
- Farms, zoos and livestock

Human Sources of Fecal Coliform

- Malfunctioning or older improperly sized septic systems

- Failing sewage conveyance systems
- Improper garbage storage and disposal

10.3. Management Strategies

Management measures are "economically achievable measures for the control of the addition of pollutants from existing and new categories and classes of nonpoint and stormwater sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint and stormwater source pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives" (USEPA, 1993). A combination of best management practices and direct remedies of illicit sources that are found through track-down monitoring will be used to implement these TMDLs.

10.3.1. Short-Term Management Strategies

Short-term management strategies include existing projects dubbed "Action Now" that are on the ground projects funded by the Department to address fecal and other NPS impairments to an impaired waterbody. These projects include stream bank restoration projects, ordinance development and catchbasin cleanouts. Funding sources include Clean Water Act 319(h) funds and State sources. Since 1998, 319(h) funds have provided approximately $3 million annually.Priority is given to funding projects that address TMDL implementation, development of stormwater management plans and projects that address impairment based on Sublist 5 listed waterbodies.

An example of such a project is a two-year project evaluating stormwater quality in a low-density residential area located in Hanover Township, Morris County. As part of the study, catch basin cleaning and public education and outreach were conducted. The outreach program targeted homeowners, landscapers and pet owners and was based on enhancing awareness and effecting behaviors that would reduce specific potential sources of NPS contaminants.

10.3.2. Long-Term Management Strategies

While short-term management measures will begin to reduce sources of fecal coliform in the Northeast Water Region, additional measures will be needed to verify and further reduce or eliminate these sources. Some of these measures may be implemented now, where resources are available and sources have already been identified as causing the fecal impairment. Both short-term and long-term management strategies that address fecal reduction related to these identified sources may be eligible for future Departmental funding.

Source Categories for Long-Term Management Strategies

1) Canada Geese

Geese are migratory birds that are protected by the Migratory Bird Treaty Act of 1918 and other Federal and State Laws. Resident Canada geese are those birds that do not migrate, but are protected by this and other legislation. The United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS)-Wildlife Services program reports that the 1999 estimated population of non-migratory geese in New Jersey was 83,000. Geese and other pest waterfowl have been identified as one of several primary sources of pathogen loading to impaired water bodies in the Northeast Region. Geese may produce up to 1½ pounds of fecal matter a day.

Canada Goose Damage Management Plan

Because geese are free to move about and commonly graze and rest on large grassy areas associated with schools, parks, golf courses, corporate lawns and cemeteries, solutions are best developed and conducted at the community level through a community-based goose damage management program. USDA's Wildlife Services program recommends that a community prepare a written Canada Goose Damage Management Plan that may include the following actions:

- Initiate a fact-finding and Communication Plan
- Enact and Enforce a No Feeding Ordinance
- Conduct Goose Damage Control Activities such as Habitat Modification
- Review and Update Land Use Policies
- Reduce or Eliminate Goose Reproduction (permit required)
- Hunt Geese to Reinforce Nonlethal Actions (permit required)

Procedures such as handling nests and eggs, capturing and relocating birds, and the hunting of birds require a depredation permit from either the USDA APHIS Wildlife Services or U.S. Fish and Wildlife Services. Procedures requiring permits should be a last resort after a community has exhaustedthe other listed measures. The Department's draft guide *Management of Canada Geese in Suburban Areas, March 2001,* which may be found at www.state.nj.us/dep/watershedmgt under publications, provides extensive guidance on how to modify habitat to serve as a deterrent to geese as well as other prevention techniques such as education through signage and ordinances.

2) Stormwater Detention Basins and Impoundments

Stormwater detention basins may act as sources of fecal coliform due to the accumulation of geese and pet waste in basins. Under certain conditions, coliform will increase in numbers in basins. As a result, significant quantities of fecal coliform can be discharged during storm events.

Impoundments created by small dams across streams have been a measure commonly used for flood control by municipalities in New Jersey. In addition to flood control, the impoundments were often incorporated into public parks in order to provide recreational opportunities for residents. Many of the impoundments are surrounded by mowed turf areas, which in combination with open water serve as an ideal habitat for geese and an attraction for pet walking. Specific management measures to reduce fecal coliform inputs to these waterbodies include:

- Development of Stormwater Management Plan
- Establishment of Riparian Buffers and "no mow" zones
- No feed ordinances for all waterfowl and wildlife and signage
- Retrofit of detention/retention basins to achieve water quality control
- Conduct regularly scheduled stormwater basin cleanout and maintenance, storm sewer inlet cleanouts and street sweeping programs

3) Pet Waste

Specific management measures to reduce pet waste include:

- Adoption of pet waste disposal i.e. pooper scooper ordinances
- Signage in parks and other public recreation areas
- Provide plastic bags dispensers in public recreation areas

4) Agricultural

Agricultural activities are potential sources of fecal coliform. Possible contributors are direct contributions from livestock permitted to traverse streams and stream corridors, manure management from feeding operations, use of manure as a soil fertilizer/amendment. Implementation of conservation management plans and best management practices are the best means of controlling agricultural sources of fecal coliform. Several programs are available to assist farmers in the development and implementation of conservation management plans and best management practices.

Agricultural Conservation Programs

The Natural Resource Conservation Service is the primary source of assistance for landowners in the development of resource management pertaining to soil conservation, water quality improvement, wildlife habitat enhancement, and irrigation water management. The USDA Farm Services Agency performs most of the funding assistance. All agricultural technical assistance is coordinated through the locally led Soil Conservation Districts. There are a number of USDA farm programs currently addressing NPS pollution. A few of these include:

- **The Environmental Quality Incentive Program (EQIP)** is designed to provide technical, financial, and educational assistance to farmers/producers for conservation practices that address natural resource concerns, such as water quality. Practices under this program include integrated crop management, grazing land management, well sealing, erosion control systems, agri-chemical handling facilities, vegetative filter strips/riparian buffers, animal waste management facilities and irrigation systems.

- **The Conservation Reserve Program (CRP)** is designed to provide technical and financial assistance to farmers/producers to address the agricultural impacts on water quality and to maintain and improve wildlife habitat. CRP practices include the establishment of filter strips, riparian buffers and permanent wildlife habitats. This program provides the basis for the Conservation Reserve Enhancement Program (CREP).

- **The Wetland Reserve Program (WRP)** is designed to address the restoration of previously farmed wetlands. Easements are purchased for a 10-year, 30-year, or permanent duration.

- **Integrated Crop Management** is a best management practice designed to reduce the application of fertilizers and herbicides using soil samples and education to control nutrient and pesticide application to cropland.

- **The Farmland Preservation Program (FPP)** is designed to strengthen the agricultural industry and preserve important farmlands to enhance the economy and quality of life in the Garden State. Four different programs are available: The eight-year Program, where landowners voluntarily restrict non-agricultural development on their land for 8 years. In exchange, participants are eligible for cost-sharing grants for soil and water conservation projects, as well as other statutory benefits and protections. The Easement Purchase Program, where landowners sell the development rights on their land to the County Agriculture Development Board (CADB), non-profit organizations or directly to the State. Compensation for this sale is based upon the appraised value of the development rights on the land. The landowner retains ownership of the land and is eligible for cost-sharing grants for soil and water conservation projects and other benefits. The Fee Simple Program, where farms are acquired by the State Agriculture Development Committee (SADC, which is in but not of, the NJDA) based upon their fair market value and auction them off to private owners, after agricultural deed restrictions have been placed on the land. Lastly, there is the Easement Donation Program, where landowners donate their development easements to the SADC or the CADB. All of these programs have been in place since 1983.

- **The Soil & Water Conservation Cost-Sharing Program** is available to participants in a Farmland Preservation Program pursuant to the Agriculture Retention and Development Act. A Farmland Preservation Program (FPP) means any voluntary FPP or municipally approved FPP, the duration of which is at least 8 years, which has as its principal purpose as long term preservation of significant masses of reasonably contiguous agricultural land within agricultural development areas. The maintenance and support of increased agricultural production must be the first priority use of the land. Eligible practices include erosion control, animal waste control facilities, and water management practices. Cost sharing is provided for up to 50% of the cost to establish eligible practices.

- **The State Conservation Cost Share Program (CCSP)** is administered by the State Soil Conservation Committee and is integrated with the federal Environmental Quality Incentives Program (EQIP). It provides technical and financial assistance to producers for prevention and control of nonpoint sources of pollution. Cost sharing is provided for up to 75%, and in some cases 90% of the cost of installing approved conservation practices. Applications are approved based upon their environmental benefits and water quality enhancements.

- **Conservation Reserve Enhancement Program (CREP).** The New Jersey Departments of Environmental Protection and Agriculture, in partnership with the Farm Service Agency and Natural Resources Conservation Service, has recently submitted a proposal to the USDA to offer financial incentives for agricultural landowners to voluntarily implement conservation practices on agricultural lands. The NJ Conservation Reserve Enhancement Program (NJ CREP) will be part of the USDA's Conservation Reserve Program (CRP). The enrollment of farmland into CREP in New Jersey is expected to improve stream health through the installation of water quality conservation practices on New Jersey farmland. Following are some highlights of the New Jersey CREP proposal:

    - 30,000 acres of agricultural land are targeted for conservation, with 4,000 acres of agricultural land targeted for permanent conservation easement. Farmland enrolled but not permanently preserved will be under rental contract for 10-15 years
    - Conservation practices under the program are riparian buffers, filter strips, contour buffer strips, and grass waterways.
    - Water quality benefits of the program are expected to assist in achieving biologically healthy streams.
    - Permanent preservation of 4,000 acres of CREP lands will aid in reaching open space preservation goals.
    - The proposal is for a $100 million program representing a 3:1 Federal/State match, with New Jersey providing $23 million and USDA - Commodity Credit Corporation committing $77 million.

5) Stormwater Management

The Department has recently proposed Stormwater Management Rules and NJPDES Phase II Municipal Stormwater Regulation Rules that will establish standards and a regulatory program for stormwater management. Stormwater general permits issued by the Municipal Stormwater Regulation Program will address stormwater pollution

6) Malfunctioning and Older Improperly Sized Septic Systems; Illicit Connections of Domestic Sewage

Malfunctioning and older improperly sized septic systems contribute to fecal coliform loading in two ways: the system may fail hydraulically, where there is surface break out; or hydrogeologically, under conditions when soils are inadequate to filter pathogens. Specific management measures include the implementation of the NJPDES Municipal Stormwater Regulation Program, Sanitary Surveys, Septic System Management Programs and future sewer service area designations for service to domestic treatment works.

Sanitary surveys are conducted in an effort to evaluate the water quality of natural surface waters and identify those components that affect water quality, including geographic factors and pollution sources. The focus of the sanitary survey is to identify nonpoint and stormwater source contribution of fecal coliform within the watershed. It is accomplished by sampling for various types of fecal indicators (fecal coliform, enterococcus, fecal streptococcus, *E. coli* and coliphage) during wet and dry weather conditions. Where potential problems with septic systems are identified, as described below, a trackdown study may be warranted. This could lead to an analysis of alternatives to address any identified inadequacies, such as rehabilitation of septic systems or connection to a sewage treatment system, as appropriate.

10.4. Potential Sources of Fecal Impairment to Impaired Water Bodies

In an effort to locate pathogen sources to streams listed in this report, each stream segment was walked and potential sources noted based on the source categories listed in Section 10.2. The information gathered during those site visits is listed below by their respective WMA. The below are not considered to be a list of comprehensive sources, rather they will be used in conjunction with additional site visits, LDCs, and as appropriate, bacterial source tracking to identify actual pathogen sources.

10.4.1. Watershed Management Area 3

Macopin River at Macopin Reservoir (Site ID #01382450)

Potential sources noted within this watershed include detention basins at the upper end of Echo Lake, stables (Echo Lake Stables) located on east Echo Lake Road near Echo Lake above Macopin Gorge, and potential septic source located on Route 23 (City of Newark).

Wanaque River at Highland Avenue (Site ID #01387010)

Canada Geese were observed at a number of locations within this watershed. These areas include: the Wanaque Athletic Fields, Lake Inez, Lower Twin Lake (large geese population), and Skyland Lake. Possible problem stormwater detention basins were noted specifically at Pompton Lakes, Lake Inez and Skyland Lake. Potential failing septics noted at Dupont Village and Wanaque; these areas in the process of being sewered. . Possible pet sources observed at Lower Twin Lake and Skyland Lake.

Ramapo River near Mahwah (Site ID #01387500)

Potential sources in failing septic systems located in Oakland. Almost all Oakland is on septic systems, many failing and solid rock below ~3-feet. Stormwater outfalls present where Masonicus Brook and Mahwah Rivers converge. Canada geese observed at Ramapo College atlethic fields, and other recreational fields. Horse farms located across from Ramapo College. Crystal Lake (bathing beach) has been closed several times due to high fecal concentrations.

10.4.2. Watershed Management Area 4

Passaic River below Pompton River at Two Bridges (Site ID #01389005)

This entire segment is highly developed with many stormwater outfalls, however, much of this area was developed prior to the practice of constructing detention basins. This area may benefit from stormwater management retrofits. Sources upstream on the Pompton River at Packanack Lake (Site ID #01388600) include potential failing septic systems in the Hoffman Grove section of Wayne (110 homes potential); open manure storage observed on Black Oak Ridge Road and Cross Road. Canada Geese observed at Wayne Municipal Park (Sheffield Fields), Packanack Lake Country Club, Pompton Lakes crossroads at golf driving range, Old MacDonald Park, Pequannock Park (directly above testing site), and Kehum Park.

Preakness Brook near Little Falls (Site ID #01389080)

Potential sources include: animal agriculture from Van Pien Dairy Farm, pet sources from Tintle Park, wildlife and geese sources from Preakness Golf Course, High School on Valley Road, High Mountain Golf Course, Wetland area,

Deepavaal Brook at Fairfield (Site ID #01389138)

Geese were observed at Mountain Ridge Golf Course and Green Brook Country Club.

Passaic River at Little Falls (Site ID #01389500)

Geese observed at the Passaic County Golf Course on River Road and island middle of Passaic River. Potential human source from a significant homeless population. Several stormwater pipes observed to discharge directly to the river.

Peckman River at West Paterson (Site ID #01389600)

Geese and wildlife were observed in several areas including: town parks, reservoir lands, golf course, and Essex County park. Other potential sources included pet waste from residential areas located adjacent to the river and stormwater pipes discharging directly to river north of the golf course.

Goffle Brook at Hawthorne (Site ID #01389850)

Site visit confirmed over 200 geese, 150 ring-billed and laughing gulls, 75 ducks and 100 pigeons, and pets at Goffle Brook Park. Potential source includes failing septic systems in upper reach.

Diamond Brook at Fair Lawn (Site ID #01389860)

Geese, wildlife, pet wildlife observed at the Passaic County Park System. Geese observed at the Vander Plat Park fields. Garbage, including disposable diapers, observed behind Pathmark on Hemlock Ave. Geese observed at Fair Lawn Memorial Cemetery.

WB Saddle River at Upper Saddle River (Site ID #01390445)

Stormwater, Geese, and wildlife noted as potential sources.

Saddle River at Ridgewood (Site ID #01390500)

Potential septic system impact from homes located directly beside the river on Old Stone Church Road. Gulls, cormorants (16) and over 80 geese observed at Otto C. Pehle Section of Saddle River Park. Pets, wildlife observed throughout the watershed and potential impact from Wild Duck Pond Park.

Ramsey Brook at Allendale (Site ID #01390900)

Wildlife (geese, deer, foxes, and dogs) observed at Crestwood Park. Geese and other wildlife observed at Apple Ridge golf course, Ramsey Country Club golf course, Lake Street at Ramsey, and Napolekao Pond. Potentially failing septics in Mahwah.

HoHoKus Brook at the mouth of the Saddle River, Paramus (Site ID #01391100)

Potential failing septic systems in HoHoKus and Wyckoff. Geese observed or apparent at Whites' Pond, Saddle River Park, Glen Rock Section (50 geese observed), Dunkerhook Park, and Wild Duck Pond. Dog walking observed at Saddle River Park, Glen Rock Section and Dunkerhook Park. Poultry farm observed and appears to be an enclosed operation.

Saddle River at Fairlawn (Site ID #01391200)

Wildlife (150 geese, 75 seagulls, 25 doves) observed at Saddle River park, Wild Duck Pond area. No-feed signs posted (dog and waterfowl both), however, people observed still feeding waterfowl. At the Saddle River Park at Rochelle Park, no geese were observed but physical signs apparent and ducks appear to be fed. Geese observed at Bergen County Golf Courses and Ridgewood Country Club.

Saddle River at Lodi (Site ID #01391500)

Geese and pet walking observed at the Main St. Cemetery.

10.4.3. Watershed Management Area 5

Hackensack River at River Vale (Site ID #01377000)

Geese observed at Golf Course, Open Spaces, and County Park. Septic Systems in Old Tappan recently converted to sewers.

Musquapsink Brook at River Vale (Site ID #01377499)

Canada Geese observed at elementary school ballfields and nearby cemeteries. No septics are located in this area. Pumping from the Saddle River and discharging to the Musquapsink Brook represents a potential source of FC.

Pascack Brook at Westwood (Site ID #01377500)

No septics are located in this area. Potential sources included: Woodcliff Lake Reservoir, Corporate Parks in Montvale (source of geese droppings to Bear Brook which feeds into Pascack Brook), waste management transfer station, geese around the Woodcliff Lake, stormdrains discharge into Woodcliff Lake, and street sweeping materials from DPWs for Park Ridge, Hillsdale, and Westwood.

Tenakill Brook at Cedar Lane at Closter (Site ID #01378387)

Potential sources include: failing septics in Alpine, geese and waterfowl at Tenakill Middle School ballfields, Alpine Country Club, Tenafly Park, Demarest Nature Center, and Demarest Park/Duck Pond. The municipal park is located adjacent to Demarest Duck pond along Tenakill Brook and is subjected to geese and other waterfowl depositing droppings on turf areas within the park. Demarest Duck Pond is also the receiving body for stormwater outfalls that capture runoff from nearby roads, residential areas and commercial areas. Dredging of Demarest Duck Pond is slated for completion during 2003. Demarest Borough is committed to the shoreline restoration and nonpoint source improvement to the pond and park area and has sought additional funding to stabilize 1,600 linear feet of degraded shoreline around Demarest Duck Pond along Tenakill Brook with a 20 foot wide native vegetative buffer. The Environmental Commission has already implemented several small restoration projects along Tenakill Brook and is an active participant in the Department's Watershed process.

Coles Brook at Hackensack (Site ID #01378560)

No septics or agriculture are located in this watershed. Geese/Waterfowl, disposable diapers, and dog waste observed at Van Saun Park. Potential sources of pet waste include Oradell, River Edge, Paramus, and Emerson residential areas. Geese observed at the Emerson Golf Course, Paramus Middle School alongside Bkanky Brook (feeds into Coles Brook). Zoo observed, however, recently tied to sanitary sewer.

10.4.4. Watershed Management Area 6

Black Brook at Madison (Site ID #01378855)

The headwaters of this segment include the Fairmount Country Club where geese are a contributing factor. At Green Village Packing Company on Britten Road in Green Village, residents have reported that the company has, in recent years, dumped its animal wastes and scraps into local woods. Following complaints, the company has been shipping them out via truck. Recent complaints are that the trucks leak. Other potential sources include: Miele Kennel, Rolling Knolls Landfill, Britten Road, Chatham, and wildlife (deer and geese)

Passaic River Near Millington (Site ID #01379000)

This segment is directly adjacent to the Great Swamp Wildlife Refuge, thus wildlife are a potential source. Geese populations were observed at the following locations: AT&T Corporation grounds off Madisonville Road, Somerset County Environmental Education Center ponds, Southard Park, Basking Ridge Golf Course, northeast of the intersection of White Bridge Road and Carlton Road, at the Southwest corner of the intersection of White Bridge Road and Pleasant Plains Road, east of Pleasant Plains Road, north of White Bridge Road; east of the Passaic River, north of Stone House Road; and south of White Bridge Road, east of Pleasant Plains Road in Long Hill Township. The majority of this watershed contains urbanized landuse that has many detention basins, pets, and deer. Other potential sources include: Somerset County horse stables and horse trails through Lord Stirling Park and livestock populations at the southwest corner of the intersection of White Bridge Road and Carlton Road; east of the Passaic River, north of Stone House Road; and east of Pleasant Plains Road between White Bridge Road and Sherwood Lane.

Dead River Near Millington (Site ID #01379200)

Potential sources in this watershed include: Geese (New Jersey National Golf Course, Pleasant Valley road near King George Road where a large geese population of approximately 1000 was observed), pets, livestock and pastures present.

Passaic River Near Chatham (Site ID #01379500)

The following potential sources in this watershed include: geese (at Canoe Brook Country Club, Brook Lake Country Club and Cedar Ridge Country Club), wildlife, failing septics, pets, detention basins, and landfills (Bradley Loren Landfill, Florham Park Borough Waste Landfill, Vitto Marchetto Sanitary Landfill, Passaic Township Sanitary Landfill)

Canoe Brook Near Summit (Site ID #01379530)

Geese are suspected at Essex Fells Country Club, Crestmont Country Club, East Orange Golf Club and Summit Municipal Golf Course. Wildlife, especially deer, and pets are also thought to contribute a bacteria load.

Rockaway River at Longwood Valley (Site ID #01379680)

Wildlife and failing septics noted as potential sources.

Rockaway River at Blackwell Street (Site ID #01379853)

Potential sources include Hurd Park (goose population, no riparian buffer), and landfills.

Beaver Brook near Rockaway (Site ID #01380100)

This watershed contains several lake communites; many of which are on septic systems. Thus the potential for failing septics exist throughout the watershed. A portion of this watershed is designated as wildlife management area or reservoir protection area, thus, wildlife contribution is a potential. Geese observed at Rockaway Township recreational field located off of Old Beach Glen.

Stony Brook at Boonton (Site ID #01380320)

Canada geese observed at the picnic area of Pyramid Mountain Natural Historic Area, and at Rockaway Valley athletic fields off of Rockaway Valley Road, in Caterbury, and on Hill Road. Livestock operations are located off of Hill Road abutting a tributary to the impaired segment, near intersection of Kingsland and Rockaway Valley, and at intersection of Birchwood and Valley.

Rockaway River at Pine Brook (Site ID #01381200)

Potential sources include: Sharkey Landfill, Ecology Lake Club Sanitary Land Fill, Knoll East County Club Golf Course, wildlife, and geese.

Passaic River at Two Bridges (Site ID #01382000)

Wildlife and leaking septics noted as potential sources.

10.5. Pathogen Indicators and Bacterial Source Tracking

Advances in microbiology and molecular biology have produced several methodologies that discriminate among sources of fecal coliform and thus more accurately identify pathogen sources. The numbers of pathogenic microbes present in polluted waters are few and not readily isolated nor enumerated. Therefore, analyses related to the control of these pathogens must rely upon indicator microorganisms. The commonly used pathogen indicator organisms are the coliform groups of bacteria, which are characterized as gram-negative, rod-shaped bacteria. Coliform bacteria are suitable indicator organism because they are generally not found in unpolluted water, are easily identified and quantified, and are generally more numerous and more resistant than pathogenic bacteria (Thomann and Mueller, 1987).

Tests for fecal organisms are conducted at an elevated temperature (44.5°C), where the growth of bacteria of non-fecal origin is suppressed. While correlation between indicator organisms and diseases can vary greatly, as seen in several studies performed by the EPA and others, two indicator organisms *Esherichia coli* (*E. coli*) and enterococci species showed stronger correlation with incidence of disease than fecal coliform (USEPA, 2001). Recent advances have allowed for more accurate identification of pathogen sources. A few of these methods, including, molecular, biochemical, and chemical are briefly described in the following paragraph.

Molecular (genotype) methods are based on the unique genetic makeup of different strains, or subspecies, of fecal bacteria (Bowman et al, 2000). An example of this method includes "DNA fingerprinting" (i.e., a ribotype analysis which involves analyzing genomic DNA from fecal *E. coli* to distinguish human and non-human specific strains of *E. coli*.). Biochemical (phenotype) methods include those based on the effect of an organism's genes actively producing a biochemical substance (Graves et al., 2002; Goya et al 1987). An example of this method is multiple antibiotic resistance (MAR) testing of fecal *E. coli*. In MAR testing, *E. coli* are isolated from fecal samples and exposed to 10-15 different antibiotics. In theory, *E. coli* originating from wild animals should show resistance to a smaller number of antibiotics than *E. coli* originating from humans or pets. Given this general trend, MAR patterns or '"signatures" can be defined for each class of *E. coli* species. Chemical methods are based on finding chemical compounds associated with human wastewater, and useful in determining if the sources are human or non-human. Such methods measure the presence of optical brighteners, which are contained in all laundry detergents, and soap surfactants in the water column. Unlike the optical brightener method, the measurement of surfactants may allow for some quantification of the source.

BST methods have already been successfully employed at the NJDEP in the past decade. Since 1988, the Department's Bureau of Marine Water Monitoring has worked cooperatively with the University of North Carolina in developing and determining the application of RNA coliphage as a pathogen indicator. This research was funded through USEPA and Hudson River Foundation grants. These studies showed that the RNA coliphages are useful as an indicator of fecal contamination, particularly in chlorinated effluents and that they can be serotyped to distinguish human and animal fecal contamination. Through these studies, the Department has developed an extensive database of the presence of coliphages in defined contaminated areas (point human, non-point human, point animal, and non-point animal). More recently, MAR and DNA fingerprinting analyses of *E. coli* are underway in the Manasquan estuary to identify potential pathogen sources (Palladino and Tiedemann, 2002). These studies along with additional sampling within the watershed will be used to implement the necessary percent load reduction.

10.6. Reasonable Assurance

With the implementation of follow-up monitoring, source identification and source reduction, the Department is reasonably assured that New Jersey's Surface Water Quality Standards will be attained for fecal coliform. Activities directed in the watersheds to reduce fecal coliform loading shall include options, included but not limited to education projects that teach best management practices, approval of projects funded by CWA Section 319 Nonpoint Source (NPS) Grants, recommendations for municipal ordinances regarding feeding of wildlife and pooper-scooper laws, and stormwater control measures.

The fecal coliform reductions proposed in these TMDLs assume that existing NJPDES permitted municipal facilities will continue to meet New Jersey's Surface Water Quality Standard requirements for disinfection. Any future facility will be required to meet water quality standards for disinfection.

11.0 Public Participation

The Water Quality Management Planning Rules NJAC 7:15-7.2 require the Department to initiate a public process prior to the development of each TMDL and to allow public input to the Department on policy issues affecting the development of the TMDL. Accordingly the Department shall propose each TMDL as an amendment to the appropriate areawide water quality management plan. As part of the public participation process for the development and implementation of the TMDLs for fecal coliform in the Northeast Water Region, the NJDEPs, Division of Watershed Management, Northeast Bureau worked collaboratively with a series of stakeholder groups throughout New Jersey as part of the Department's ongoing watershed management efforts.

The Department's watershed management process was designed to be a comprehensive stakeholder driven process that is representative of members from each major stakeholder group (agricultural, business and industry, academia, county and municipal officials, commerce and industry, purveyors and dischargers, and environmental groups). As stated previously, through the creation of this watershed management planning process over the past several years Public Advisory Committees (PACs) and Technical Advisory Committees (TACs) were created in all 20 WMAs. Whereas the PACs serve in an advisory capacity to the Department, and examined and commented on a myriad of issues in the watersheds, the TACs were focused on scientific, ecological, and engineering issues relevant to the mission of the PAC.

The Northeast Bureau discussed with the WMA 3, WMA 4, WMA 5 and WMA 6 TAC members the Department's TMDL process through a series of presentations and discussions that culminated in the development of the 32 TMDLs for Streams Impaired by Fecal Coliform in the Northeast Water Region. The below paragraphs outline public involvement.

- Integrated Listing Methodology presentations were made by the Northeast Bureau within the DWM to the Northeast TACs throughout the month June; requesting that they review the Integrated List and submit comments to the Department by the September deadline. Presentations were made to WMA 5 TAC on June 18, 2002; WMA 6 TAC on June 20, 2002; WMA 3 TAC on June 21, 2002; and WMA 4 TAC on June 27, 2002.
- Expedited Fecal Coliform and Lake TMDL presentations were given at the September TAC meetings. The finalized Sublist 5 list was also disseminated. The TACs were briefed about the executed Memorandum of Agreement between the Department and EPA Region 2 with the imminent timeline. The TACs were asked to review sites and think about sources for discussion at the October TAC meetings at which time the Northeast Bureau would bring maps with municipalities and impaired stream segments and other features to facilitate the conversation.
- At the October TAC meetings (WMA 5: October 15, 2002; WMA 3 October 19, 2002; WMA 4 October 24, 2002 and WMA 6 October 28, 2002) TAC members were asked to identify based on their local knowledge potential sources of impairment. Draft copies of the Northeast Fecal TMDL report were distributed for informational purposes only. TAC members were advised that the formal comment period would be during the New Jersey Register Notice, but that the Department was interested in their input on policy issues affecting the development of the TMDL.
- At the November and December TAC meetings, the draft Fecal TMDL Report was distributed for informal comments prior to the NJR Notice.

Additional public participation and input was received through the NJ EcoComplex. The Department contracted with Rutgers NJ EcoComplex (NJEC) in July 2001. The role of NJEC is to provide comments on the Department's management strategies, including those related to the development of TMDL values. NJEC consists of a review panel of New Jersey University professors who provide a review of the technical approaches developed by the Department. The New Jersey Statewide Protocol for Developing Fecal TMDLs was presented to NJEC on August 7, 2002 and was subsequently reviewed and approved. The statewide approach was also presented the Passaic TMDL Workgroup in May 2002 for their input and approval. The New Jersey's Statewide Protocol for Developing Lake and Fecal TMDLs was presented by the Northeast Bureau at the SETAC Fall Workshop on September 13, 2002 and met with their approval.

11.1. AmeriCorps Participation

AmeriCorps is a national service initiative that was started in 1993 and is the domestic Peace Corps. The New Jersey Watershed Ambassadors Program is a community-oriented AmeriCorps environmental program designed to raise awareness about watershed issues in New Jersey. Through this program, AmeriCorps members are placed in watershed management areas across the state to serve their local communities. Watershed Ambassadors monitor the rivers of New Jersey through River Assessment Teams (RATs) and Biological Assessment Teams (BATs) volunteer monitoring programs.

Representatives from the Department in conjunction with the Watershed Ambassadors conducted RATs surveys on each of the impaired segments. These visual assessments were conducted from October to December 2002.

11.2. Public Participation Process

In accordance with N.J.A.C. 7:15-7.2(g), these TMDLs are hereby proposed by the Department as an amendment to the Northeast Water Quality Management Plan. N.J.A.C. 7:15-3.4(g)5 states that when the Department proposes to amend the areawide plan on its own initiative, the Department shall give public notice by publication in a newspaper of general circulation in the planning area, shall send copies of the public notice to the applicable designated planning agency, if any, and may hold a public hearing or request written statements of consent as if the Department were an applicant. The public notice shall also be published in the New Jersey Register.

Notice of these TMDLs was published January 21, 2003 pursuant to the above noted Administrative Code, in order to provide the public an opportunity to review the TMDLs and submit comments. The Department has determined that due to the level of interest in these TMDLs, a public hearing will be held. Public notice of the hearing, provided at least 30 days before the hearing, was published in the New Jersey Register and in two newspapers of general circulation and will be mailed to the applicable designated planning agency, if any, and to each party, if any, who was requested to issue written statement of consents for the amendment.

All comments received during the public notice period and at any public hearings will become part of the record for these TMDLs. All comments will be considered in the establishment of these TMDLs and the ultimate adoption of these TMDLs. When the Department takes final agency action to establish these TMDLs, the final decision and supporting documentation will be sent to U.S.E.P.A. Region 2 for review and approval pursuant to 303(d) of the Clean Water Act (33 U.S.C. 1313(d)) and 40 CFR 130.7.

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Appendix A: Explanation of stream segments in Sublist 5 of the *2002 Integrated List of Waterbodies* for which TMDLs will not be developed in this report.

Data to support removing River Segments from List 5 to List 1 for Fecal Coliform.

- Pequannock River at Macopin Intake Dam, Station #01382500

Re-assessments of data from station #01382500, the Pequannock River at Macopin Intake Dam, indicate that the water quality standards are met at this location. Measurements taken between 2/22/1994 and 7/17/00 at Station #01382500, show a geometric mean of 34 CFU/100 ml, and that 7.8% of values are over 400 CFU/100ml.

River segments to be moved from Sublist 5 to Sublist 3 for fecal coliform.

- Wanaque River at Wanaque, #01387000;
- Hackensack River at New Milford, #01378500

Two segments listed on Sublist 5, station #01387000, the Wanaque River at Wanaque (WMA 3), and station #01378500 the Hackensack River at New Milford (WMA 5), were included on Sublist 5 based on their listings on previous 303(d) lists with no recent data to assess their current attainment status. Therefore, TMDLs will not be developed for these locations until and unless recent data indicated violations of the surface water quality standards.

River segments to be moved from Sublist 5 to Sublist 4 for fecal coliform.

- Whippany River at Morristown, #01381500;
- Whippany River near Pine Brook, #01381800

Two segments, #01381500, the Whippany River at Morristown, and #01381800, the Whippany River near Pine Brook, were included as part of the Whippany River Watershed Fecal Coliform TMDL adopted on 4/16/2000 and published in the New Jersey Register on 6/5/2000. Upon adoption of this TMDL Report, the Department will remove these two waterbodies for fecal coliform from Sublist 5 to move them to Sublist 4 as identified in the below table.

Sublist 5 river segments listed for fecal coliform for which TMDLs will not be developed in this report.

- Passaic River at Elmwood Park, #01389880

The Passaic River at Elmwood Park, segment #01389880, is located in an area affected by combined sewer overflows (CSOs). CSOs are sewage systems that use a single pipe to transport both stormwater runoff from rainstorms and sewage from households, businesses and industries to sewage treatment plants. During dry weather, combined sewers send all wastewater to the STPs. During wet weather, stormwater quickly fills the combined sewers, which carry both sanitary sewage and runoff from streets, parking lots, and rooftops. The overflows carry bacteria from the untreated sewage as well as other pollutants in the stormwater. Additional potential FC sources were identified during a site visit on October 24, 2002 and include geese (at park on River Road across from High School), homeless populations, and dog pounds/shelters.

The methodology employed in this report is not appropriate for use in areas affected CSOs, thus, this stream segment will be addressed with a separate management approach.

List of Sublist 5 segments to be moved to Categories 1, 3 or 4 based upon reassessment of data, the need for current data, or the prior completion of a TMDL report.

WMA	Station Name/Waterbody	Site ID	New Sublist Listing	Explanation
03	Pequannock River at Macopin Intake Dam	01382500	Sublist 1	Re-assessment shows non-impairment
03	Wanaque River at Wanaque	01387000	Sublist 3	Updated monitoring needed
04	Passaic River at Elmwood Park	01389880	No change	CSO influence
05	Hackensack River at New Milford	01378500	Sublist 3	Updated monitoring needed
06	Whippany River at Morristown	01381500	Sublist 4	TMDL completed in 1999
06	Whippany River near Pine Brook	01381800	Sublist 4	TMDL completed in 1999

Appendix B: Municipal POTWs Located in the TMDLs' Project Areas

WMA	Station #	NJPDES	Facility Name	Discharge Type	Receiving waterbody
3	1387500	NJ0027774.001A	Oakland Boro - Oakwood Knolls	MMI	Ramapo River via storm sewer
3	1387500	NJ0080811.001A	Oakland Twp - Riverbend	MMI	Ramapo River
3	1387500	NJ0021253.001A	Ramapo BOE - Indian High	MMI	Pond Creek (Ramapo River)
3	1387500	NJ0053112.001A	Oakland Boro - Chapel Hill Estates	MMI	Ramapo River via pond and storm sewer
3	1387500	NJ0021342.001A	Oakland Boro Skyview-Highbrook STP	MMI	Caille Lk via unnamed tributary & storm sewer
3	1387500	NJ0021946.001A	US Army - Nike Base	MMI	Darlington Brook via unnamed tributary
3	1387500	NJ0030384.001A	Oakland BOE - Manito Ave	MMI	Caille Lake via unnamed tributary and storm sewer
3	1387500	NJ0030384.001V	Oakland BOE - Manito Ave	MMI	Caille Lake via unnamed tributary and storm sewer
4	1389600	NJ0025330.001A	Cedar Grove Twp STP	MMJ	Peckman River
4	1389600	NJ0024490.004A	Verona Twp	MMJ	Peckman River
4	1389600	NJ0021687.001A	Essex County Hospital	MMJ	Peckman River
4	1389080	NJ0028002.001A	Wayne Twp - Mountain View	MMJ	Singac Brook (Preakness)
4	1389080	NJ0021261.001A	NJDHS-NJ Development Center	MMI	Passaic River
6	1379200	NJ0022845.001A	Harrison Brook STP	MMJ	Dead River
6	1379500	NJ0020427.001A	Caldwell Boro STP	MMJ	Passaic River via unnamed tributary
6	1379500	NJ0024511.001A	Livingston Twp	MMJ	Passaic River
6	1379500	NJ0025518.001A	Florham Park SA	MMJ	Passaic River
6	1379500	NJ0024937.001A	Molitor Water Pollution	MMJ	Passaic River
6	1379500	NJ0021636.001A	New Providence Boro	MMJ	Passaic River
6	1379500	NJ0024937.002A	Molitor Water Pollution	MMJ	Passaic River
6	1379500	NJ0027961.001A	Berkeley Heights	MMJ	Passaic River
6	1379500	NJ0020427.SL3A	Caldwell Boro STP	MMJ	Sludge Application
6	1379500	NJ0020427.SL3B	Caldwell Boro STP	MMJ	Sludge Application
6	1379500	NJ0020427.SL3M	Caldwell Boro STP	MMJ	Sludge Application
6	1381200	NJ0022349.001A	Rockaway Valley SA	MMJ	Rockaway River
6	1381200	NJ0024970.001A	Parsippany-Troy Hills SA	MMJ	Whippany River
6	1378855	NJ0020290.001A	Chatham Township - Main	MMI	Black Brook
6	1379200	NJ0021083.001A	Veterans Adm Medical Center	MMI	Harrisons Brook via unnamed tributary
6	1379200	NJ0022497.001A	Warren Twp SA - Stage 4	MMI	Dead River
6	1379200	NJ0050369.001A	Warren Twp SA - Stage 5	MMI	Dead River
6	1379500	NJ0020281.001A	Chatham Hill STP	MMI	Passaic River
6	1379500	NJ0052256.001A	Chatham Township - Chatham Glen	MMI	Passaic River

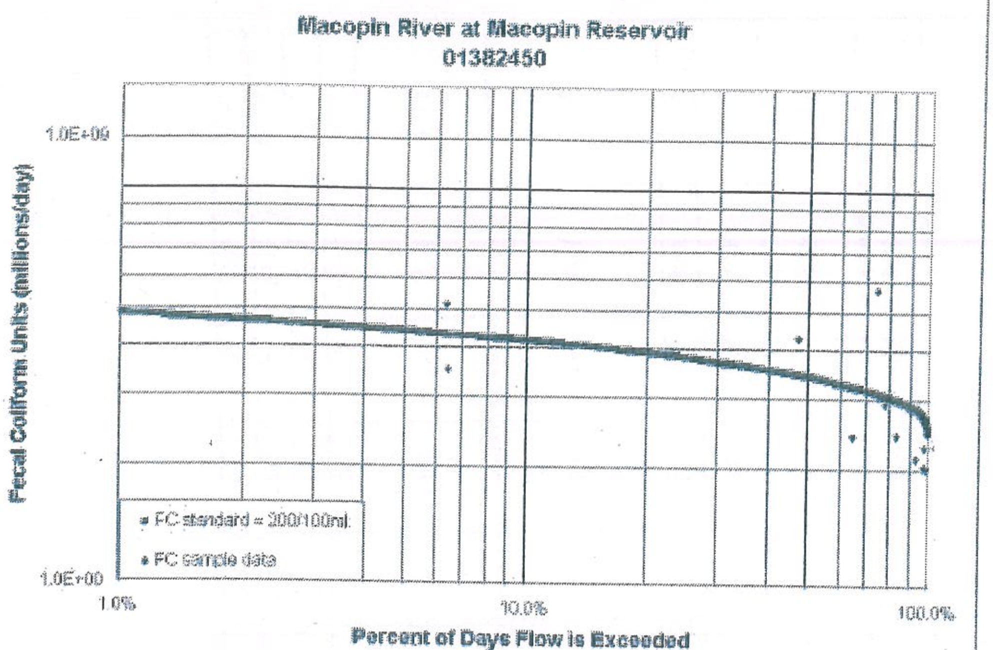
6	1379500	NJ0022489.001A	Warren Twp SA - Stage 1 & 2	MMI	Passaic River
6	1379500	NJ0024465.001A	Long Hill Twp STP - Stirling Hills	MMI	Passaic River
6	1379500	NJ0021938.001A	US Army - Nike Base	MMI	Passaic River
6	1380320	NJ0022276.001A	Stonybrook School	MMI	Untermeyer Lake via storm sewer
6	1379680	NJ0021091.001A	Jefferson Twp High - Middle School	MMI	Edison Brook
6	1379680	NJ0026867.001A	Jefferson Twp - White Rock	MMI	Mitt Pond (Russia Brook)
6	1379853	NJ0026603.001A	Randolph Twp BOE - High School	MMI	Mill Brook via unnamed tributary
6	1379853	NJ0032808.001A	Rockaway Townsquare Mall	MMI	Green Pond Brook

Appendix C: TMDL Calculations

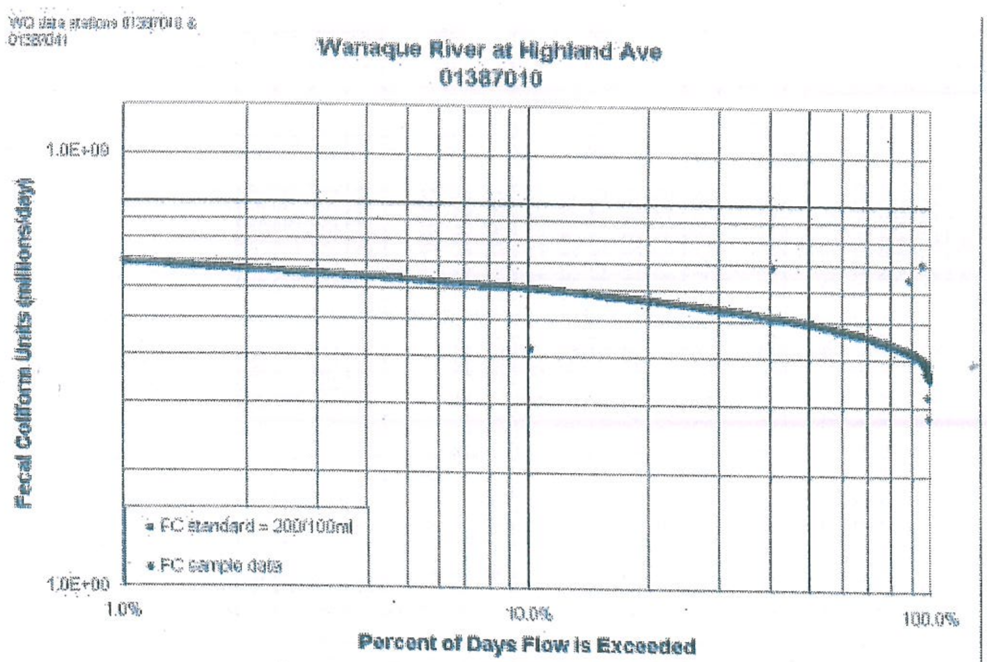
WMA	Station Names	303(d) Category 5 Segments	Water Quality Stations	Load Allocation (LA) and Margin of Safety (MOS)								Wasteload Allocation (WLA)
				200 FC/100ml Standard				400 FC/100ml Standard				
				Geometric mean CFU/100ml	MOS as a percent of the target concentration	Percent reduction without MOS	Percent reduction with MOS	Summer geometric mean CFU/100ml	MOS as a percent of the target concentration	Percent reduction without MOS	Percent reduction with MOS	
3	Macopin R at Echo Lake, Macopin R at Macopin Reservoir	01382450	01382410, 01382450	59	46%	-240%	-85%	59	46%	-16%	37%	37%
3	Wanaque R at Highland Avenue, Wanaque R at Pompton Lakes	01387010	01387010, 01387041	160	53%	-25%	42%	208	53%	67%	85%	85%
3	Ramapo R near Mahwah	01387500	01387500	291	44%	31%	61%	431	44%	84%	91%	91%
4	West Branch Saddle R at Upper Saddle River, Saddle R at Saddle River, Saddle R at Ridgewood Ave, Saddle R at Grove St., Ramsey Bk at Allendale, Hohokus Bk at Paramus, Saddle R at Rochelle Park, and Saddle R at Lodi	01390445, 01390500, 01390900, 01391100, 01391200, 01391500	01390445, 01390470, 01390510, 01390518, 01390900, 01391100, 01391490, 01391500	1,157	30%	83%	88%	1,144	30%	94%	96%	96%
4	Passaic R below Pompton R at Two Bridges, Passaic R at Little Falls, Preakness Bk, near Little Falls, Peckman R at W. Patterson, and Deepavaal Bk at Fairfield	01389005, 01389500, 01389080, 01389600, 01389138	01389500, 01389080, 01389600, 01389138	583	30%	66%	76%	652	30%	90%	93%	93%
4	Goffle Bk at Hawthorne, Diamond Bk at Fair Lawn	01389850, 01389860	01389850, 01389860	1,515	47%	87%	93%	1,544	47%	96%	98%	98%

WMA	Station Names	303(d) Category 5 Segments	Water Quality Stations	Load Allocation (LA) and Margin of Safety (MOS)								Wasteload Allocation (WLA)
				200 FC/100ml Standard				400 FC/100ml Standard				
				Geometric mean CFU/100ml	MOS as a percent of the target concentration	Percent reduction without MOS	Percent reduction with MOS	Summer geometric mean CFU/100ml	MOS as a percent of the target concentration	Percent reduction without MOS	Percent reduction with MOS	
5	Hackensack R. at Rivervale	01377000	01377000, 01376970	248	34%	19%	46%	294	34%	77%	85%	85%
5	Pascack Br at Westwood and Musquapsink Br at Rivervale	01377499, 01377500	01377499, 01377500	709	54%	72%	87%	709	54%	90%	96%	96%
5	Tenakill Br at Cedar Lane at Closter	01378387	01378387	159	91%	-26%	88%	159	91%	57%	96%	96%
5	Coles Br at Hackensack	01378560	01378560	1,093	68%	82%	94%	1,093	68%	94%	98%	98%
6	Black Brook at Madison, Passaic R nr Millington, Dead R nr Millington, Canoe Brook nr Summit, Passaic R nr Catham	01378855, 01379000, 01379200, 01379530, 01379500	01378855, 01379000, 01379200, 01379530, 01379500	675	29%	70%	79%	1,370	29%	95%	96%	96%
6	Rockaway R at Longwood Valley, Rockaway R at Berkshire Valley, Rockaway R at Blackwell St.	01379680, 01379853	01379680, 01379700, 01379853	253	54%	21%	64%	373	54%	82%	92%	92%
6	Beaver Brook at Rockaway	01380100	01380100	362	43%	45%	68%	362	43%	81%	89%	89%
6	Stony Brook at Boonton	01380320	01380320	214	32%	7%	37%	214	32%	68%	78%	78%
6	Rockaway R at Pine Brook	01381200	01381200	281	28%	29%	49%	571	28%	88%	91%	91%
6	Passaic R at Two Bridges	01382000	01382000	227	33%	12%	41%	276	33%	75%	83%	83%

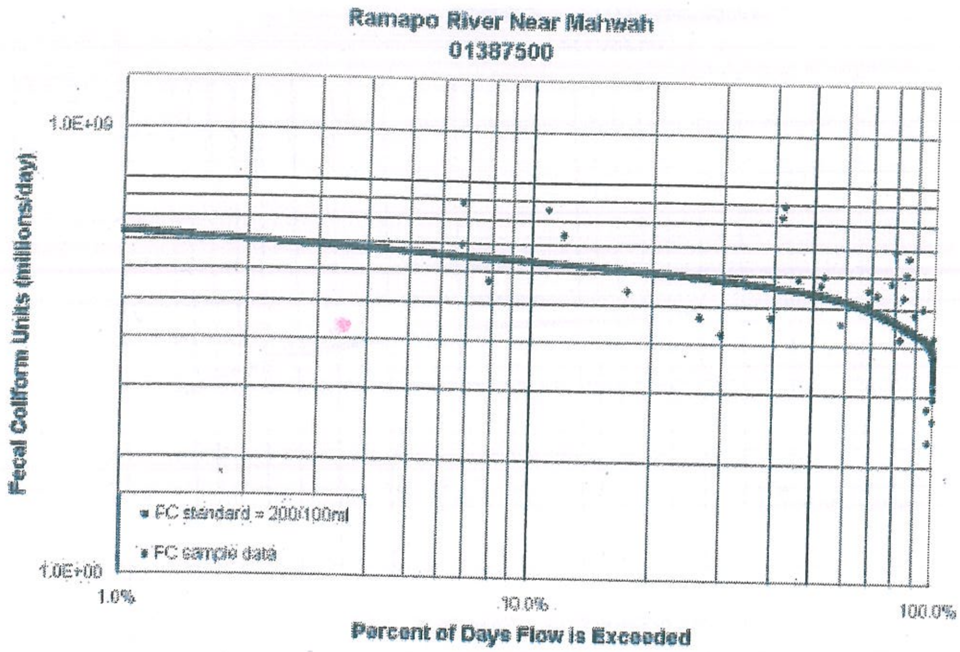
Appendix D: Load Duration Curves for each listed waterbody



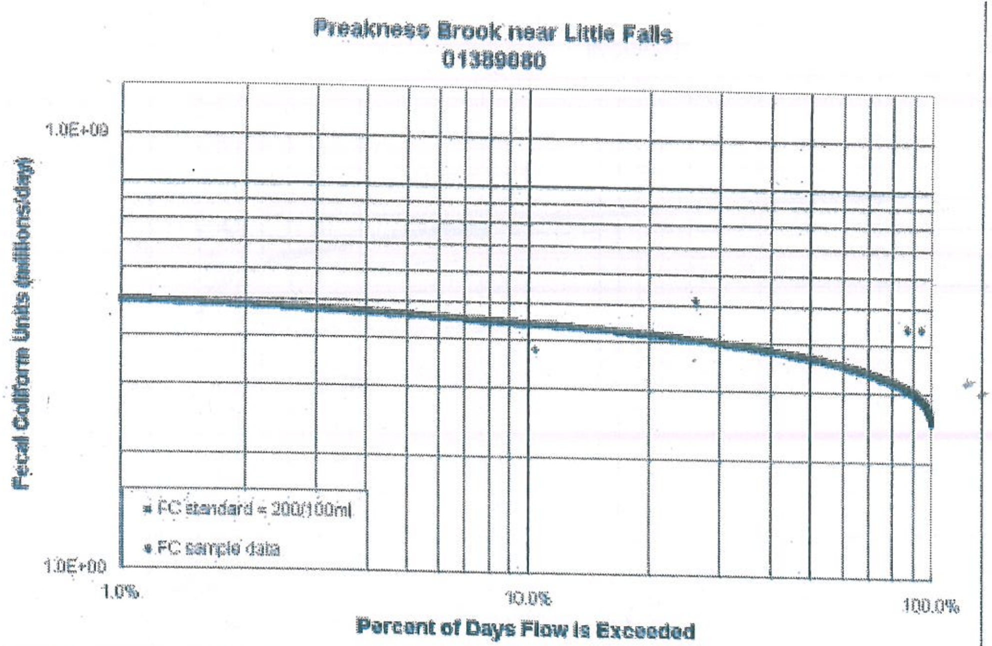
Load Duration Curve for Macopin River at Macopin Reservoir. Fecal coliform data from USGS station #01382450 during the period 10/1997 through 8/2000. Water years 1970-2000 from USGS station #01388500 (Pompton River at Pompton Plains NJ) were used in generating the FC standard curve.



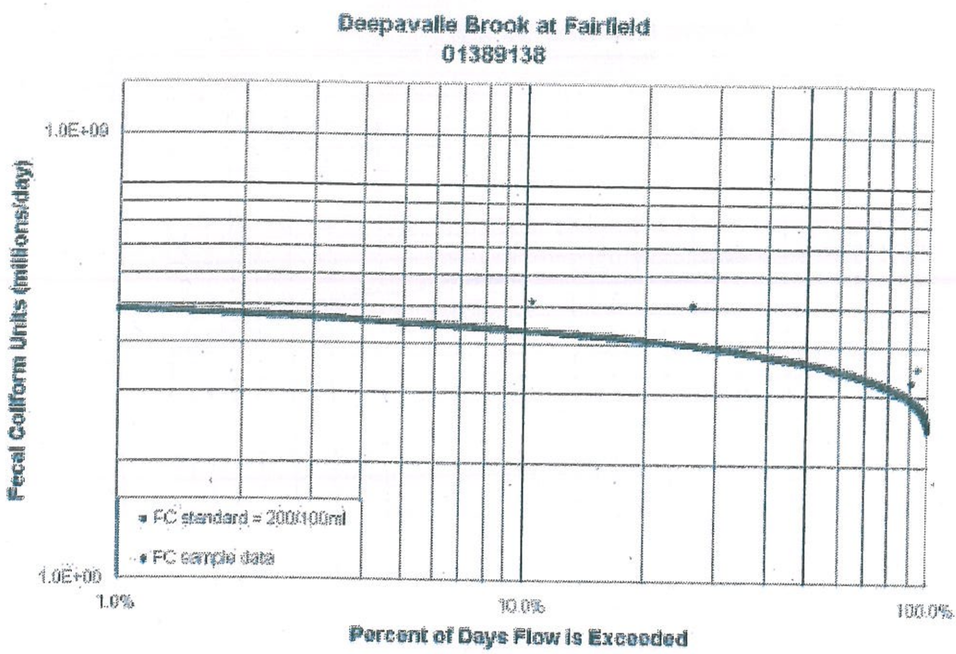
Load Duration Curve for Wanaque River at Highland Ave. Fecal coliform data from USGS station # 01387010 & 01387041 during the period 1/27/97 through 8/9/99. Water years 1970-2000 from USGS station # 01388500 (Pompton River at Pompton Plains NJ) were used in generating the FC standard curve.



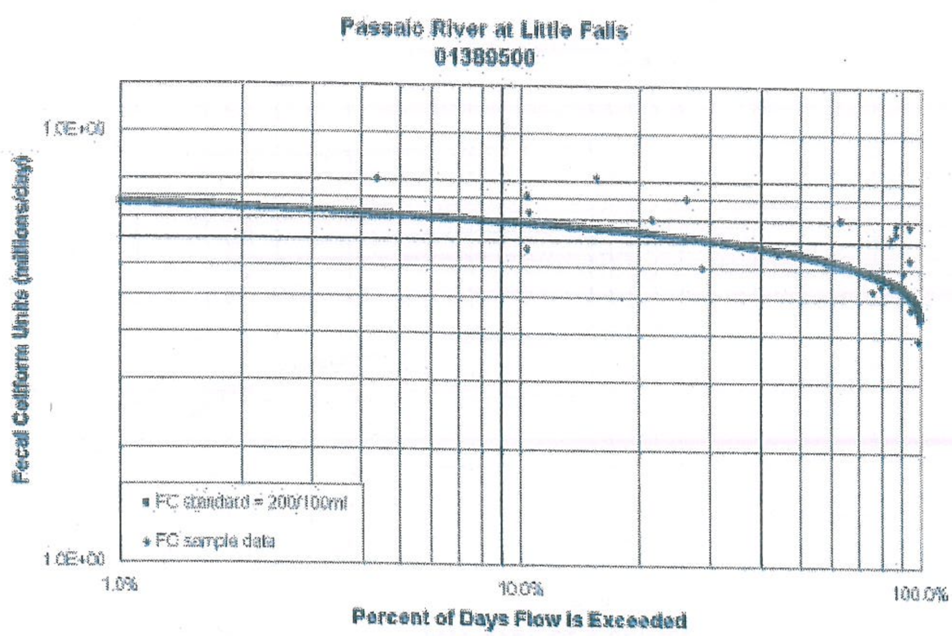
Load Duration Curve for Ramapo River Near Mahwah. Fecal coliform data from USGS station #01387500 during the period 2/24/94 8/3/00. Water years 1970-2000 from USGS station #01387500 (Ramapo River Near Mahwah) were used in generating the FC standard curve.



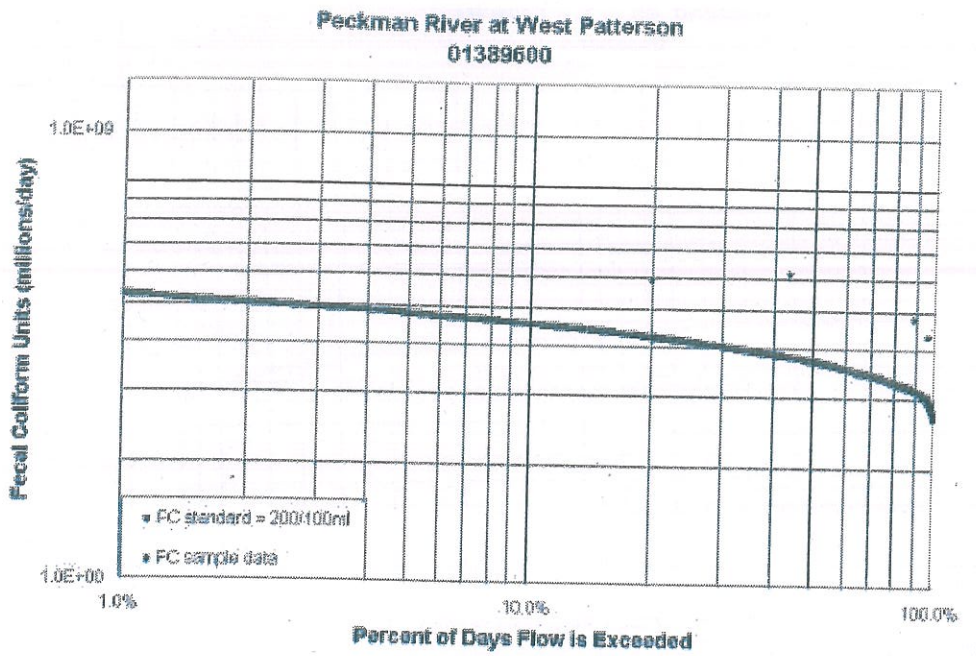
Load Duration Curve for Preakness Brook Near Little Falls. Fecal coliform data from USGS station #01389080 during the period 4/16/98 through 9/23/98. Water years 1970-2000 from USGS station #01389500 (Passaic River at Little Falls) were used in generating the FC standard curve.



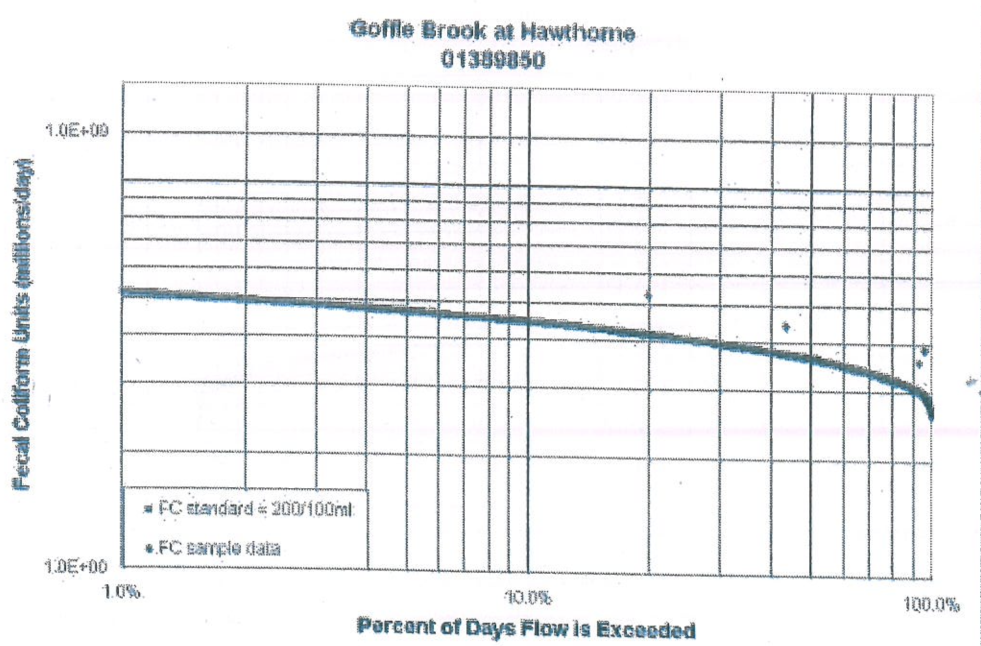
Load Duration Curve for Deepavalle Brook at Fairfield. Fecal coliform data from USGS station #01389138 during the period 4/16/98 through 9/23/98. Water years 1970-2000 from USGS station #01389500 (Passaic River at Little Falls) were used in generating the FC standard curve.



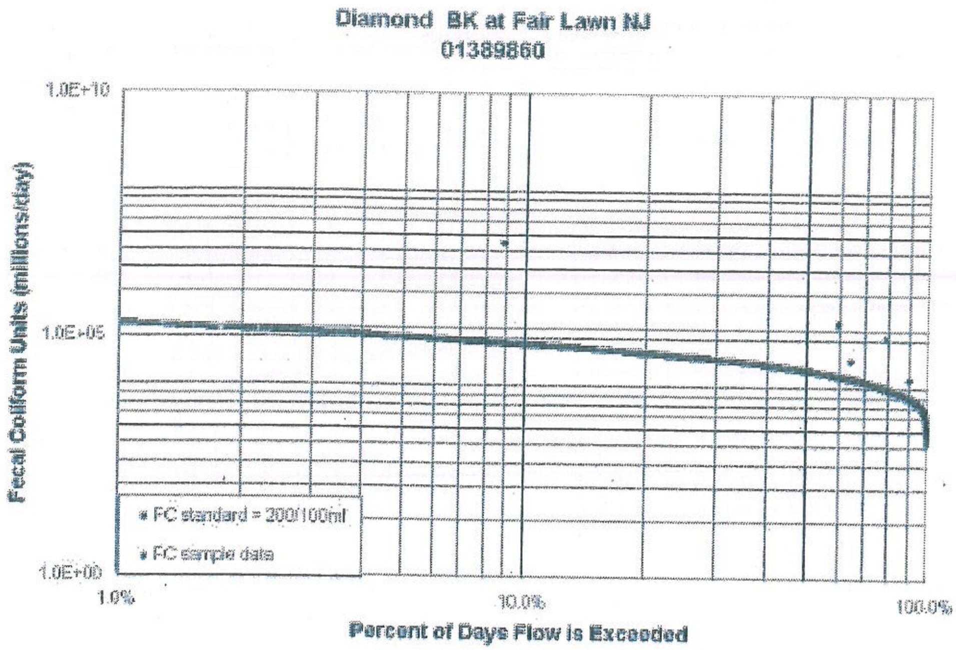
Load Duration Curve for Passaic River at Little Falls. Fecal coliform data from USGS station #01389500 during the period 2/18/94 through 9/23/98. Water years 1970-2000 from USGS station #01389500 (Passaic River at Little Falls) were used in generating the FC standard curve.



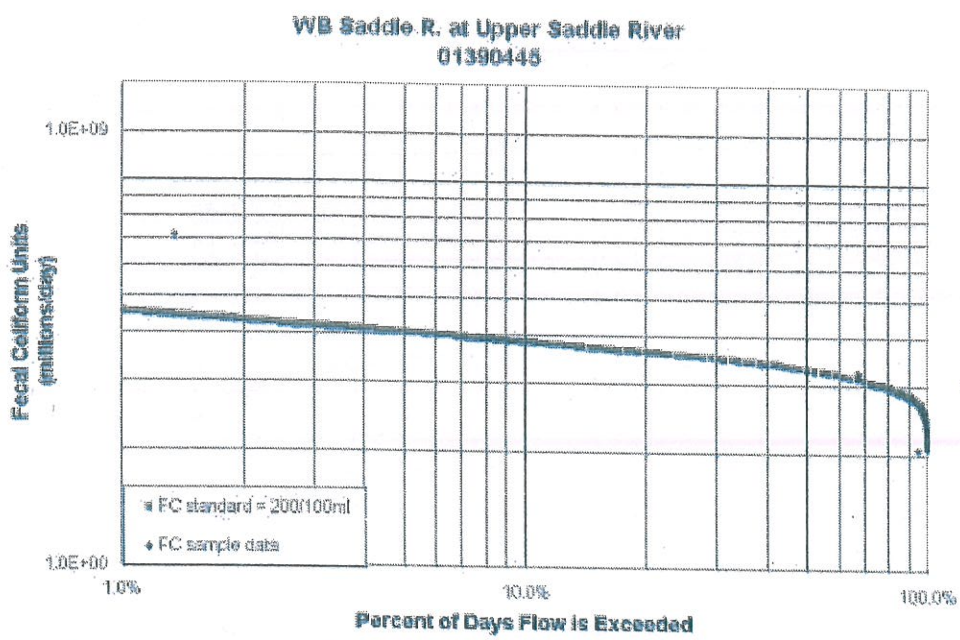
Load Duration Curve for Peckman River at West Patterson. Fecal coliform data from USGS station #01389600 during the period 4/23/98 through 9/24/98. Water years 1970-2000 from USGS station #01388500 (Pompton River at Pompton Plains NJ) were used in generating the FC standard curve.



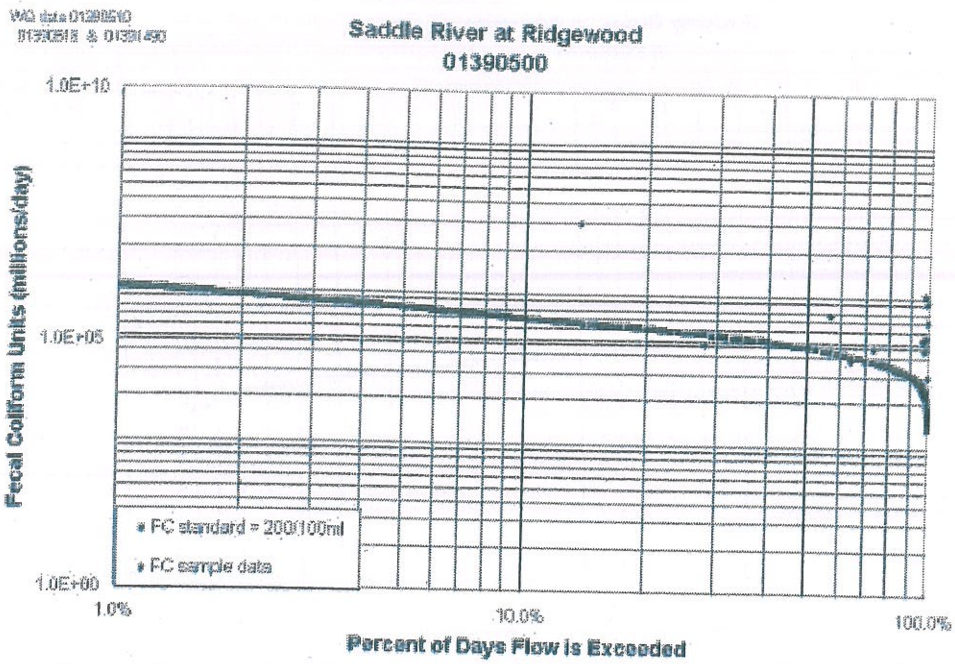
Load Duration Curve for Goffle Brook at Hawthorne. Fecal coliform data from USGS station #01389850 during the period 4/23/98 through 9/24/98. Water years 1970-2000 from USGS station #01388500 (Pompton River at Pompton Plains NJ) were used in generating the FC standard curve.



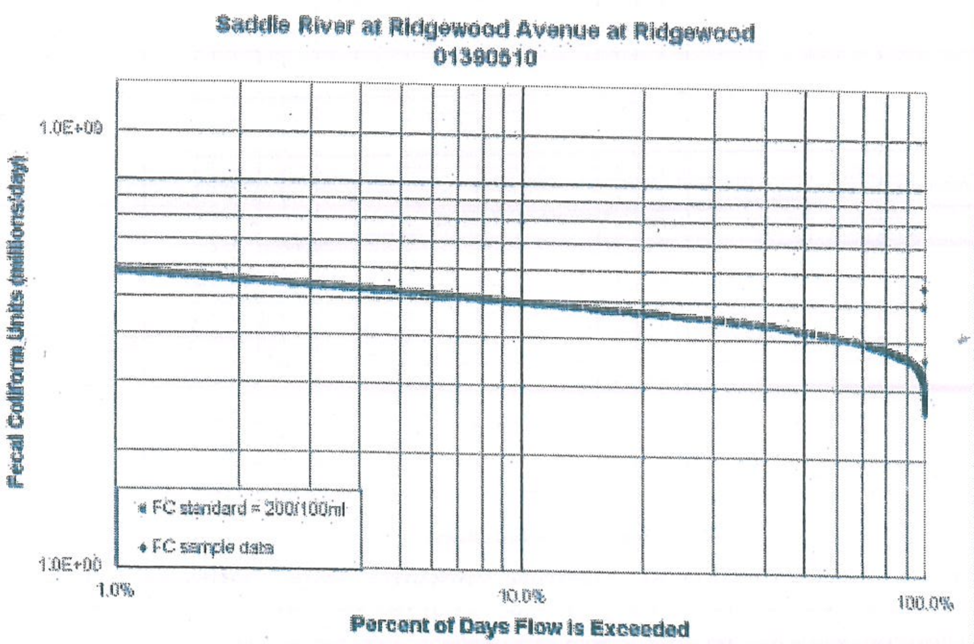
Load Duration Curve for Diamond Brook at Fair Lawn. Fecal coliform data from USGS station # 01389860 during the period 6/29/00-7/27/00. Water years 1970-2000 from USGS station # 01388500 (Pompton River at Pompton Plains NJ) were used in generating the FC standard curve



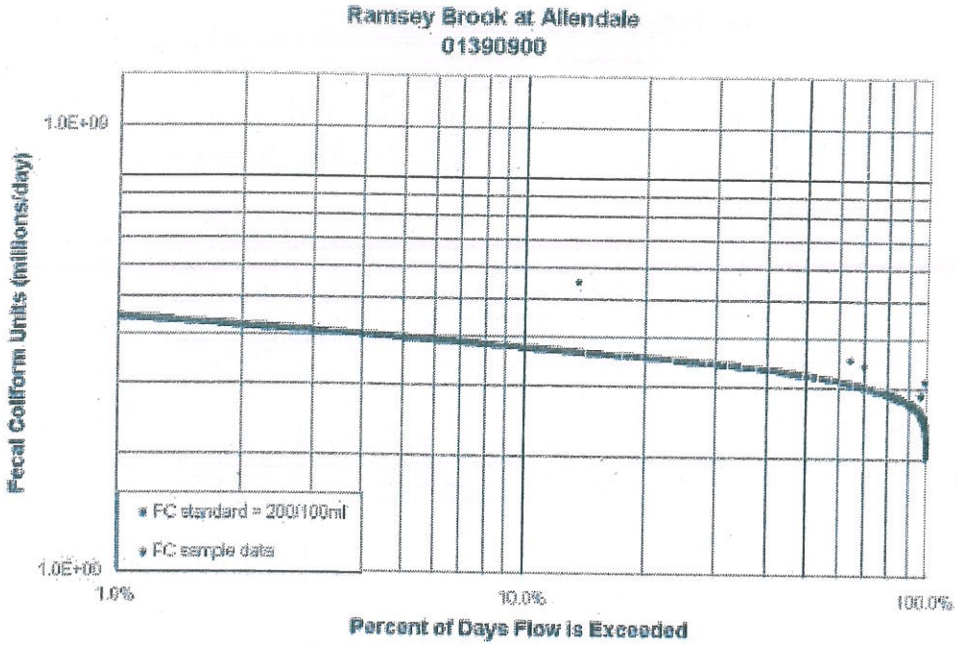
Load Duration Curve for WB Saddle R at Upper Saddle River. Fecal coliform data from USGS station #01390445 during the period 11/4/99 through 8/7/00. Water years 1970-2001 from USGS station #01390500 (Saddle River at Ridgewood) were used in generating the FC standard curve.



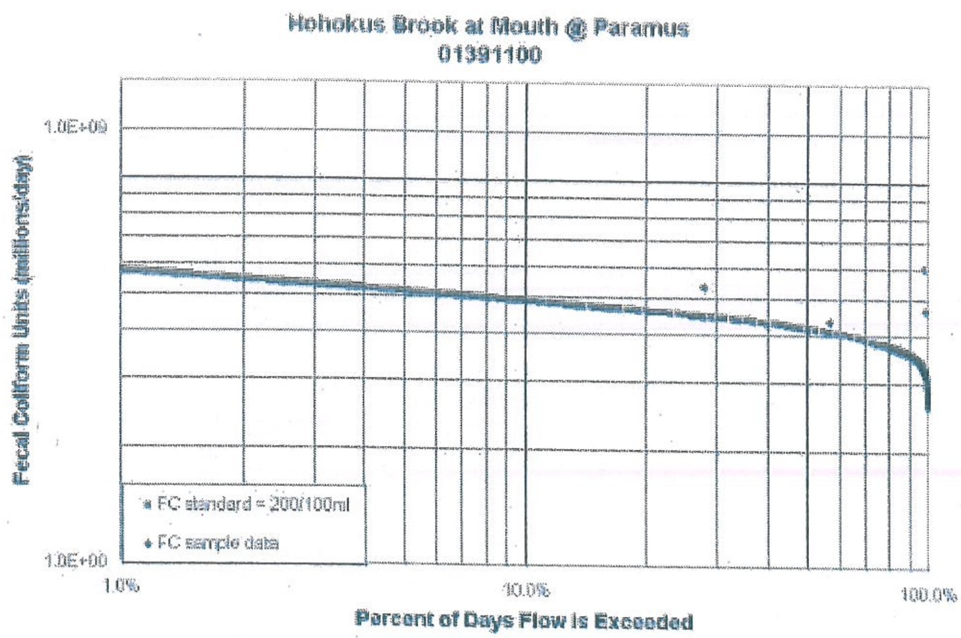
Load Duration Curve for the Saddle River at Ridgewood. Fecal coliform data from USGS stations #01390510, #01390518, and #01391490.during the period 11/6/97-8/9/99. Water years 1970-2001 from USGS station #01390500 (Saddle River at Ridgewood) were used in generating the FC standard curve.



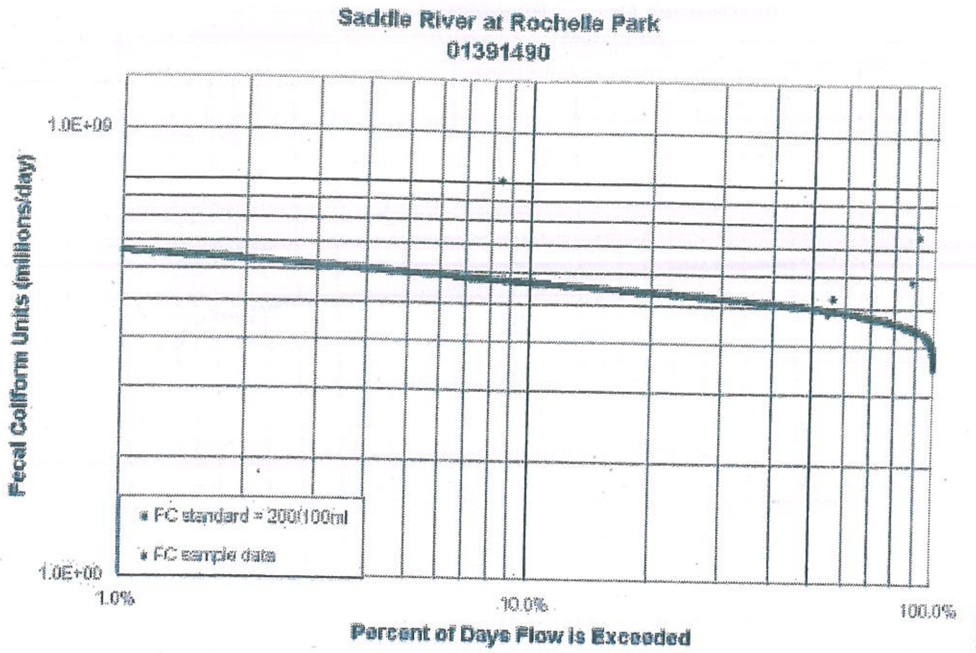
Load Duration Curve for Saddle River at Ridgewood Avenue at Ridgewood. Fecal coliform data from USGS station #01390510 during the period 7/13/99 through 8/9/99. Water years 1970-2001 from USGS station #01390500 (Saddle River at Ridgewood) were used in generating the FC standard curve.



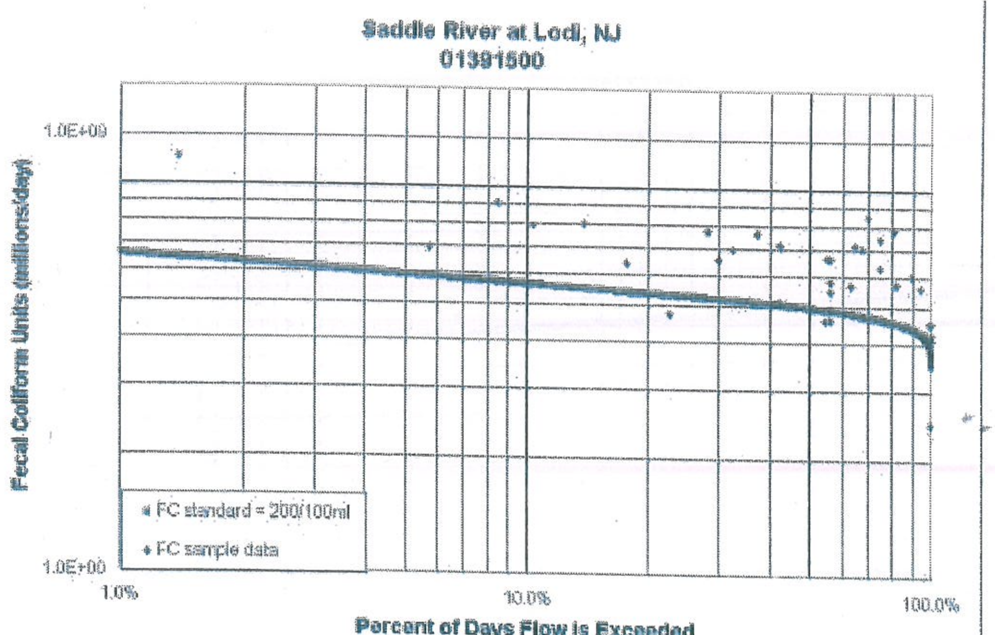
Load Duration Curve for Ramsey Brook at Allendale. Fecal coliform data from USGS station #01390900 during the period 11/6/97 through 9/1/98. Water years 1970-2000 from USGS station #01390500 (Saddle River at Ridgewood) were used in generating the FC standard curve.



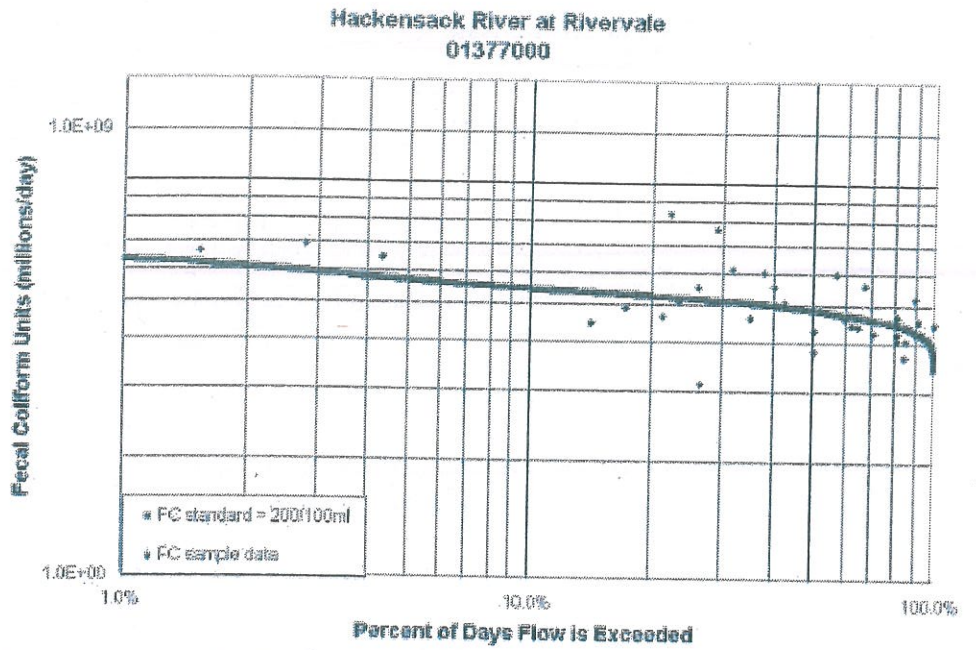
Load Duration Curve for Hohokus Brook at Mouth@ Paramus. Fecal coliform data from USGS station #01391100 during the period 4/23/98 through 9/24/98. Water years 1970-2000 from USGS station #01390500 (Saddle River at Ridgewood) were used in generating the FC standard curve.



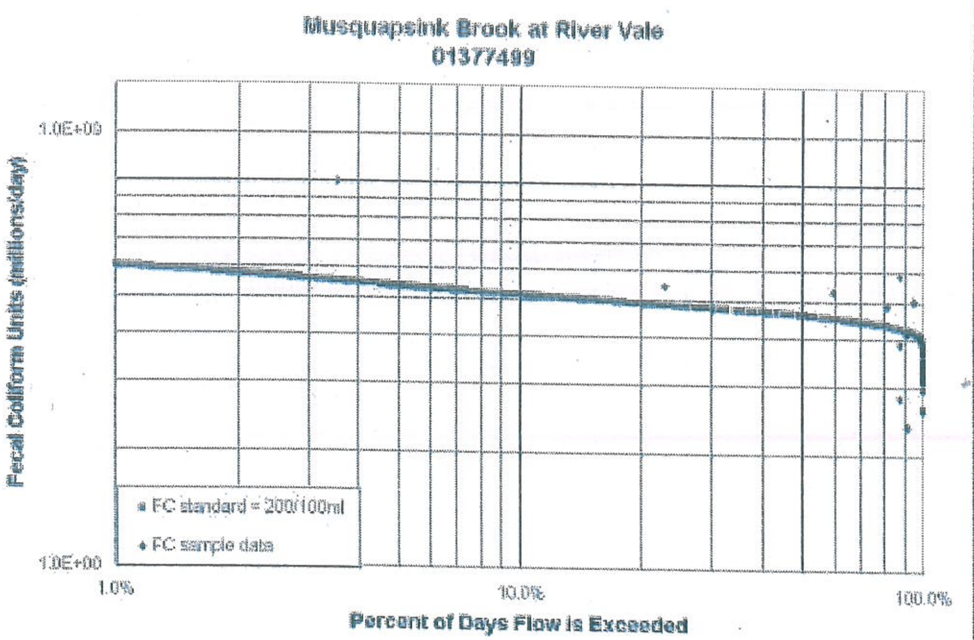
Load Duration Curve for the Saddle River at Rochelle Park. Fecal coliform data from USGS station #01391490 during the period 11/6/97 through 9/16/98. Water years 1970-2001 from USGS station #01391500 (Saddle River at Lodi) were used in generating the FC standard curve.



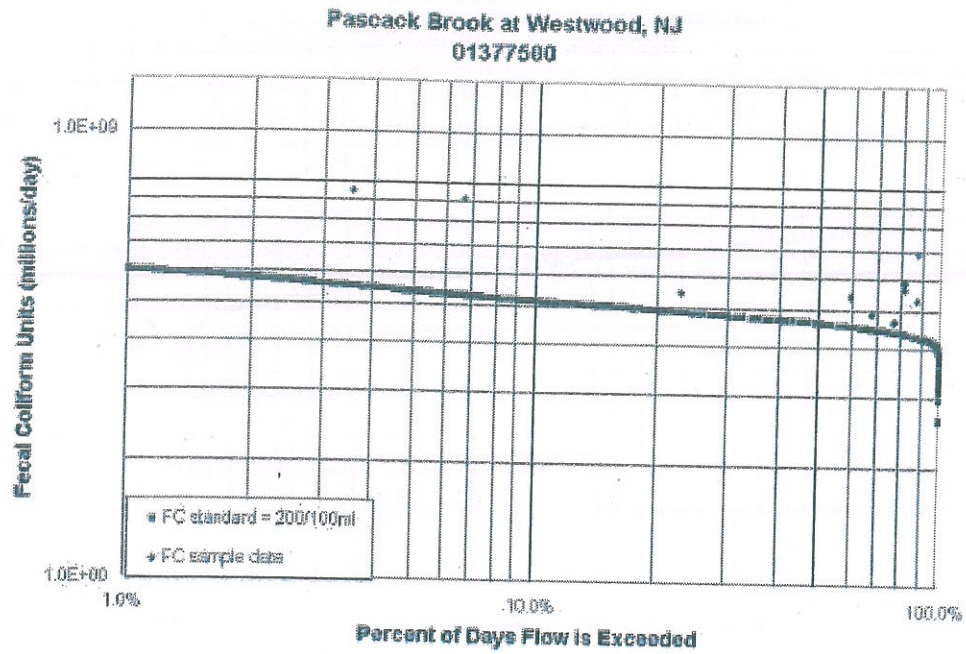
Load Duration Curve for the Saddle River at Lodi. Fecal coliform data from USGS station #01391500 during the period 2/22/94 through 9/13/00. Water years 1970-2000 from USGS station #01391500 (Saddle River at Lodi) were used in generating the FC standard curve.



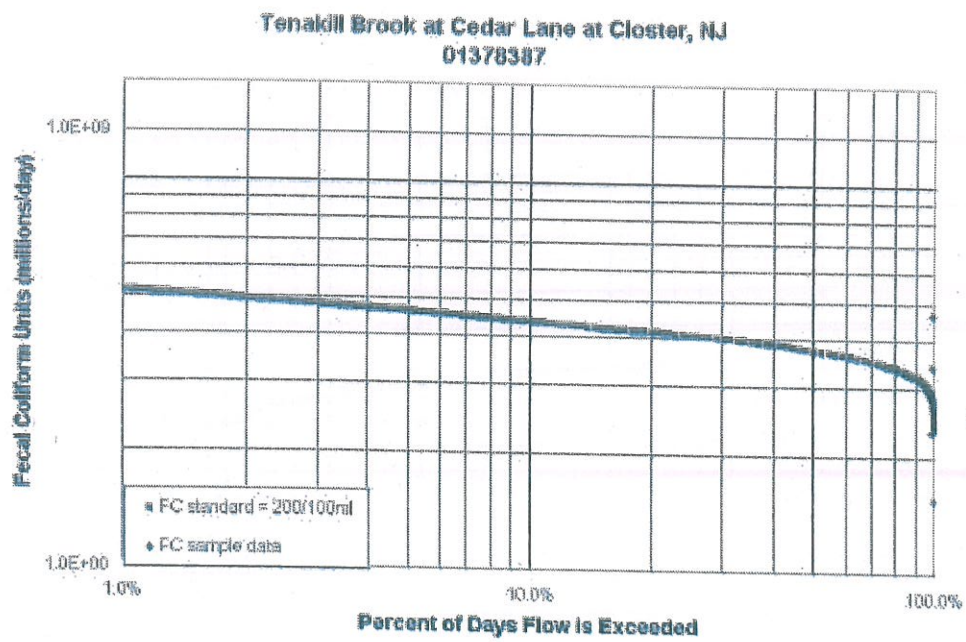
Load Duration Curve for the Hackensack River at River Vale. Fecal coliform data from USGS station #01377000 during the period 2/17/94 through 8/3/00. Water years 1970-2000 from USGS station #01377000 (Hackensack River at River Vale) were used in generating the FC standard curve.



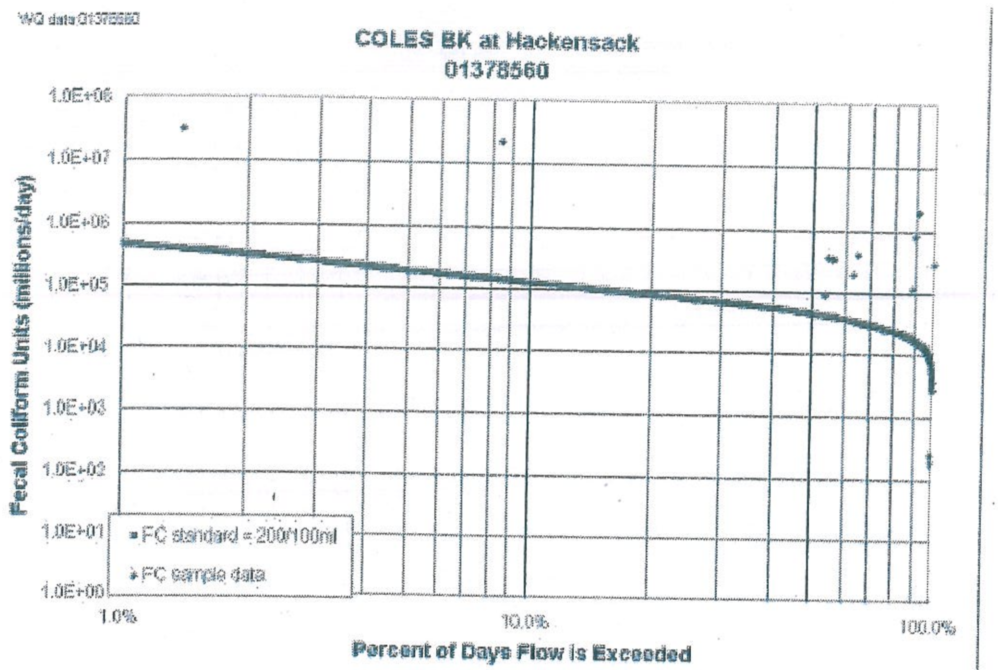
Load Duration Curve for the Musquapsink Brook at River Vale. Fecal coliform data from USGS station #01377499 during the period 7/13/99 through 9/7/00. Water years 1970-2000 from USGS station #01377499 (Musquapsink Brook at River Vale) were used in generating the FC standard curve.



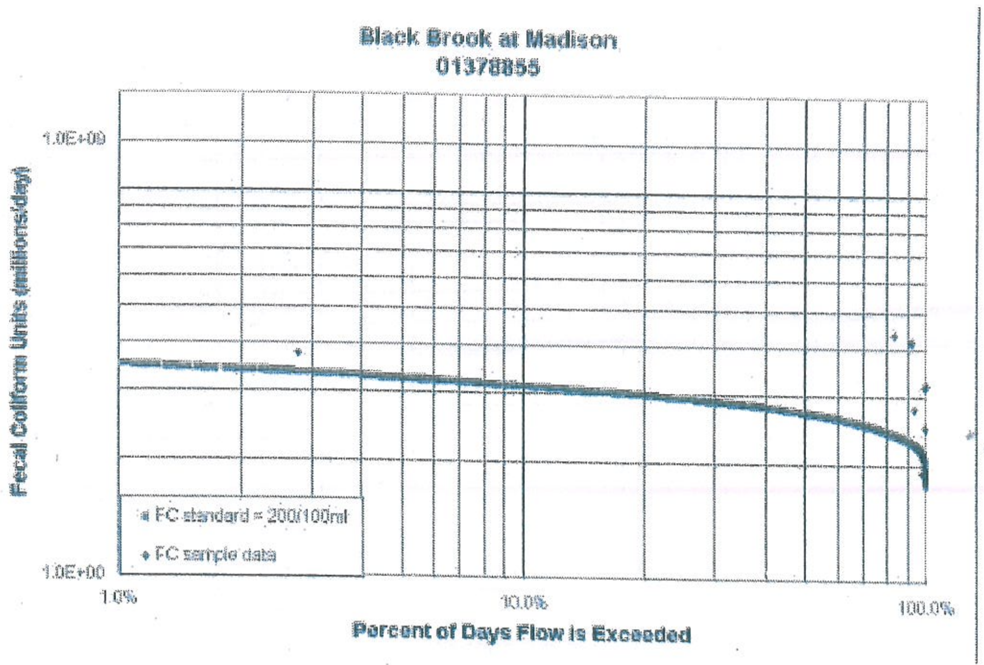
Load Duration Curve for the Pascack Brook at Westwood. Fecal coliform data from USGS station #01377500 during the period 6/1/98 through 9/6/98. Water years 1970-2000 from USGS station #01377500 (Pascack Brook at Westwood) were used in generating the FC standard curve.



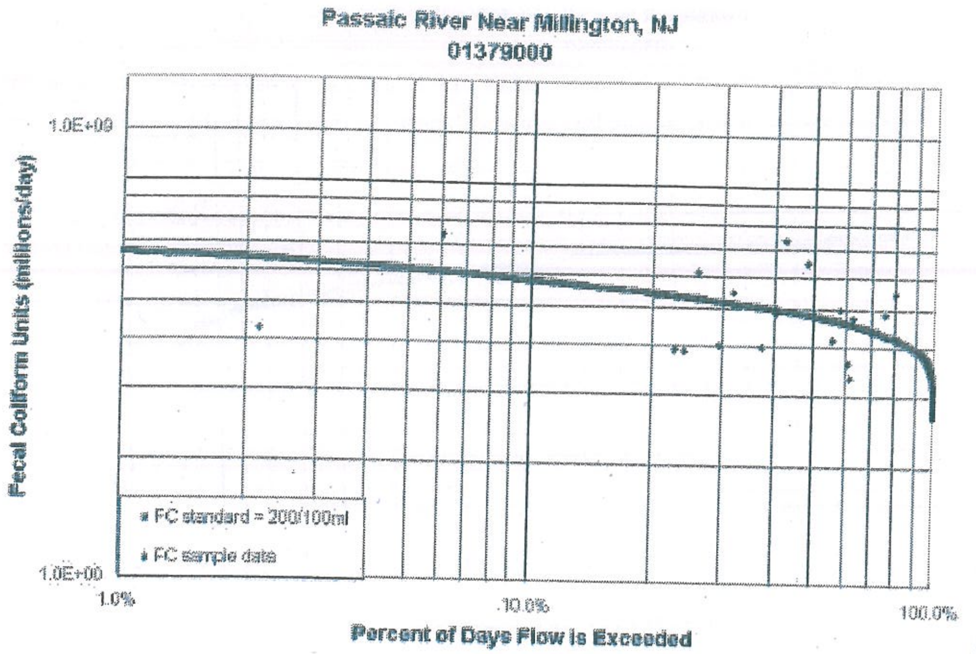
Load Duration Curve for the Tenakill Brook at Cedar Lane at Closter. Fecal coliform data from USGS station #01378387 during the period 7/13/99 through 8/9/99. Water years 1970-2001 from USGS station #01390500 (Saddle River at Ridgewood) were used in generating the FC standard curve.



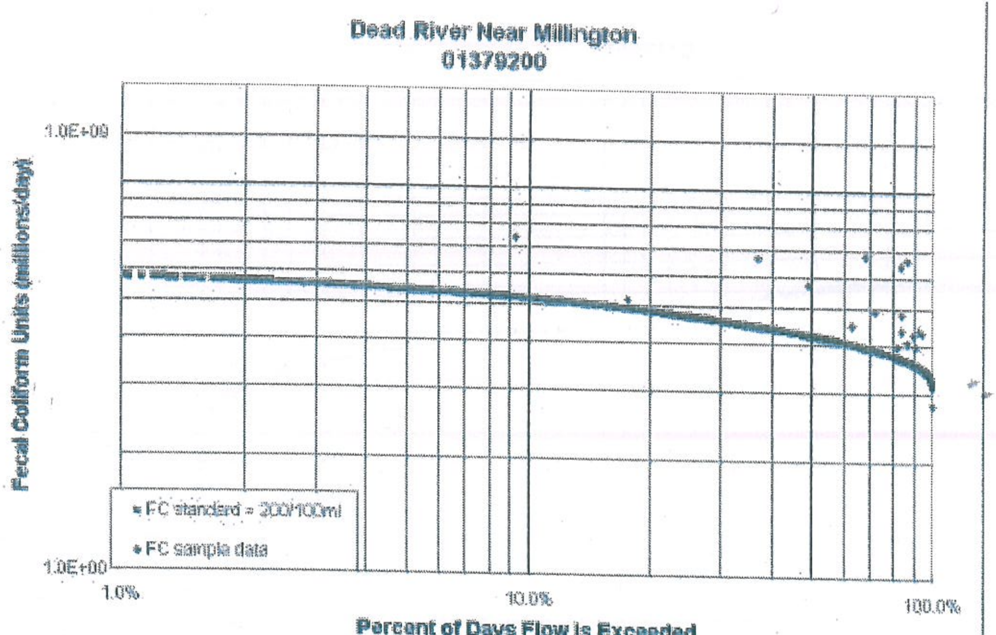
Load Duration Curve for Coles Brook at Hackensack. Fecal coliform data from USGS station # 01378387 during the period 11/5/97 through 8/23/00. Water years 1970-2001 from USGS station # 01391500 (Saddle River at Lodi) were used in generating the FC standard



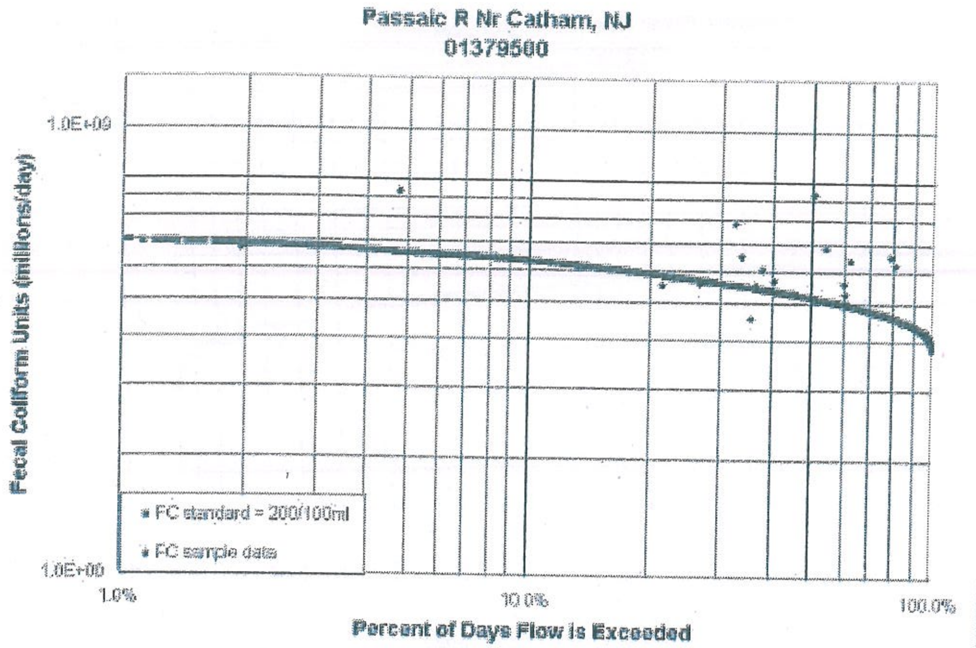
Load Duration Curve for the Black Brook at Madison. Fecal coliform data from USGS station #01378855 during the period 11/18/97 through 9/1/99. Water years 1970-2000 from USGS station #01380500 (Rockaway River above Reservoir at Boonton) were used in generating the FC standard curve.



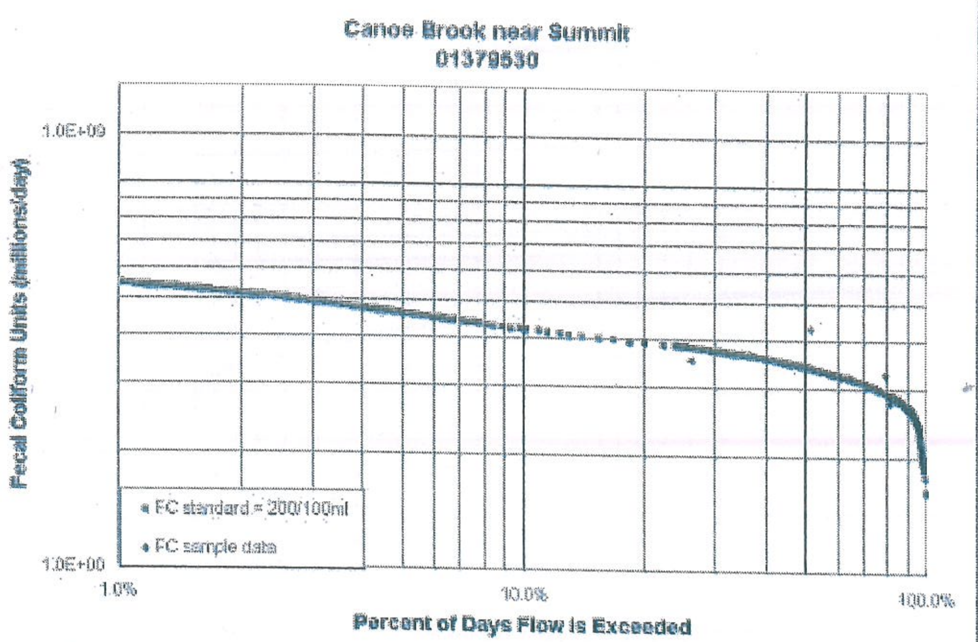
Load Duration Curve for the Passaic R Nr Millington. Fecal coliform data from USGS station #01379000 during the period 10/1997 through 8/2000. Water years 1970-2000 from USGS station #01379000 (Passaic R Nr Millington) were used in generating the FC standard curve.



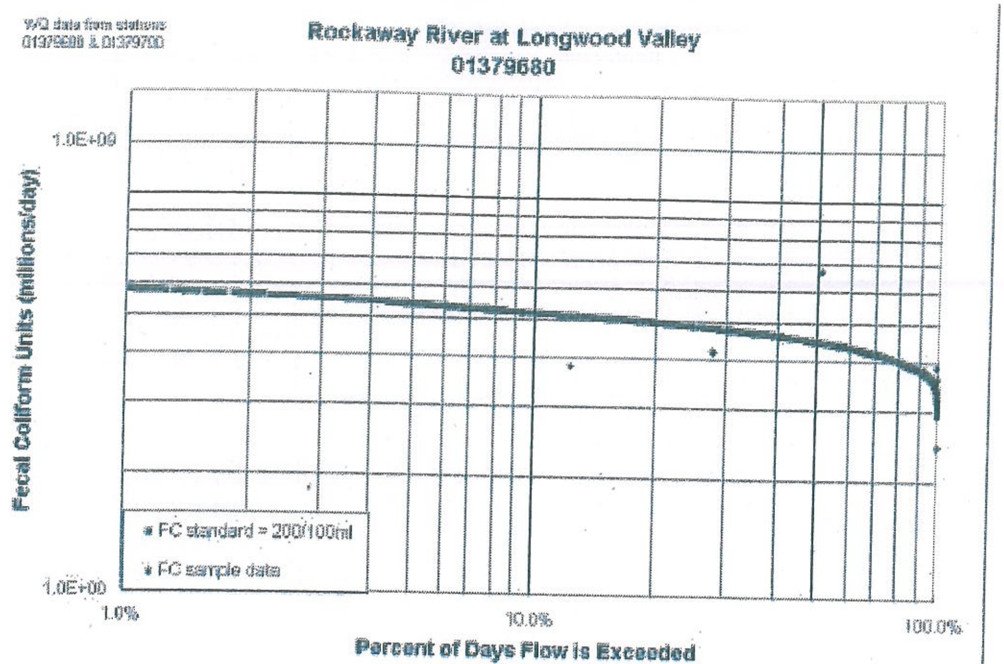
Load Duration Curve for the Dead River near Millington. Fecal coliform data from USGS station #01379200 during the period 10/1997 through 8/2000. Water years 1970-2000 from USGS station #01379500 (Passaic R Nr Catham) were used in generating the FC standard curve.



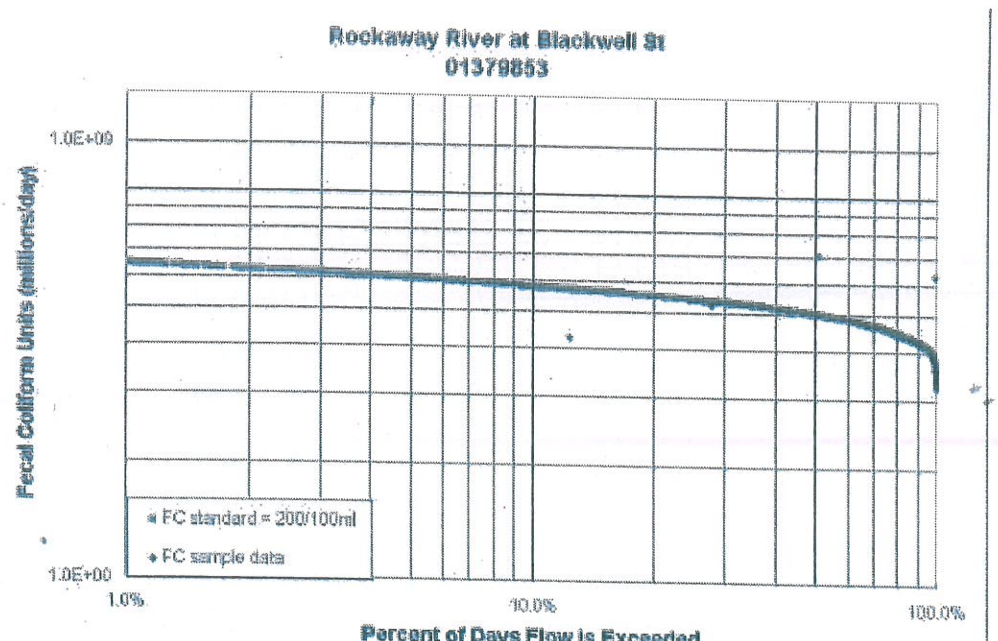
Load Duration Curve for the Passaic R Nr Catham. Fecal coliform data from USGS station #01379500 during the period 10/1997 through 8/2000. Water years 1970-2000 from USGS station #01379500 (Passaic R Nr Catham) were used in generating the FC standard curve.



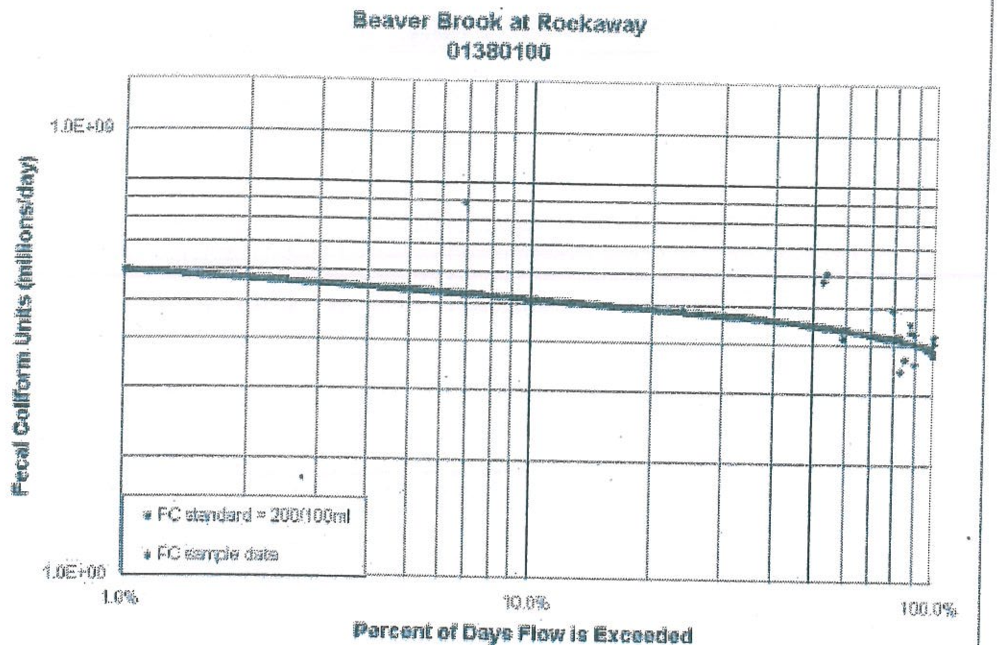
Load Duration Curve for Canoe Brook near Summit. Fecal coliform data from USGS station #01379530 during the period 10/1997 through 8/2000. Water years 1970-2000 from USGS station #01379530 (Canoe Brook near Summit) were used in generating the FC standard curve.



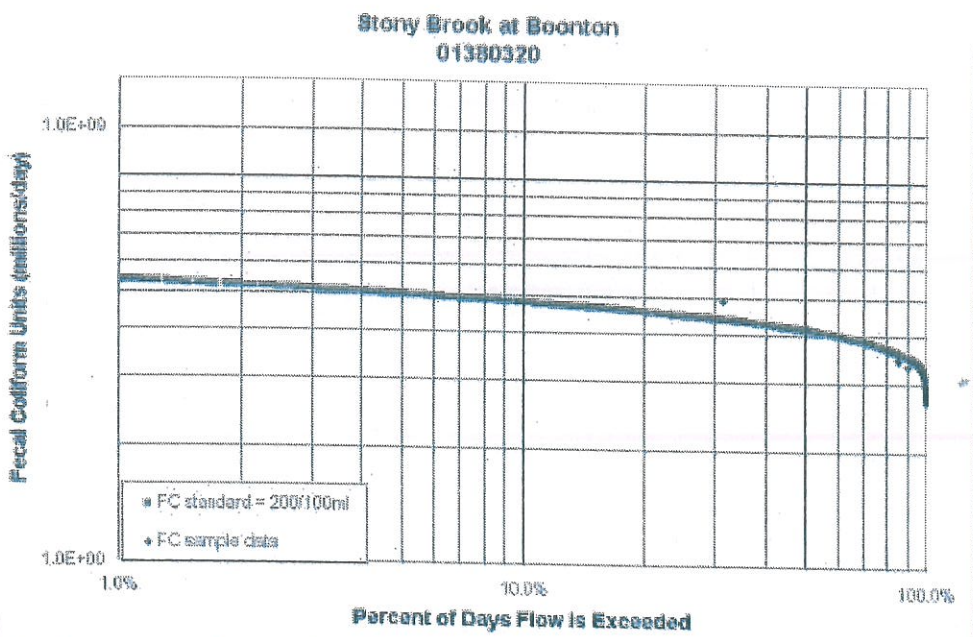
Load Duration Curve for Rockaway River at Longwood Valley. Fecal coliform data from USGS station # 01379680 & 01379700 during the period 1/27/97 through 9/2/99. Water years 1970-2000 from USGS station # 01380500 (Rockaway River above Reservoir at Boonton) were used in generating the FC standard curve.



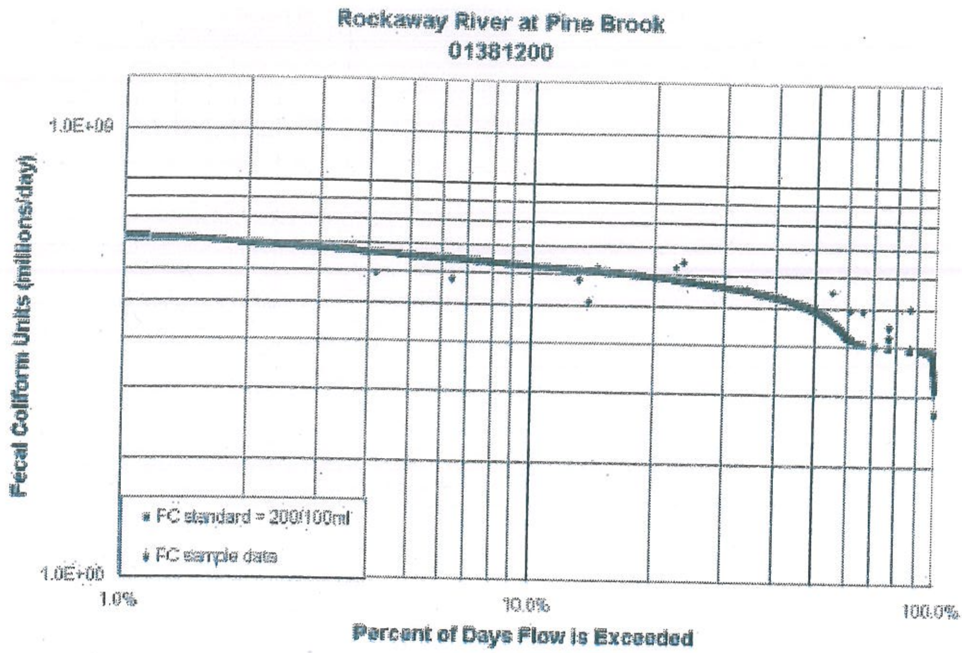
Load Duration Curve for Rockaway River at Blackwell St. Fecal coliform data from USGS station #01379853 during the period 4/15/98 through 9/22/98. Water years 1970-2000 from USGS station #01380500 (Rockaway River above Reservoir at Boonton) were used in generating the FC standard curve.



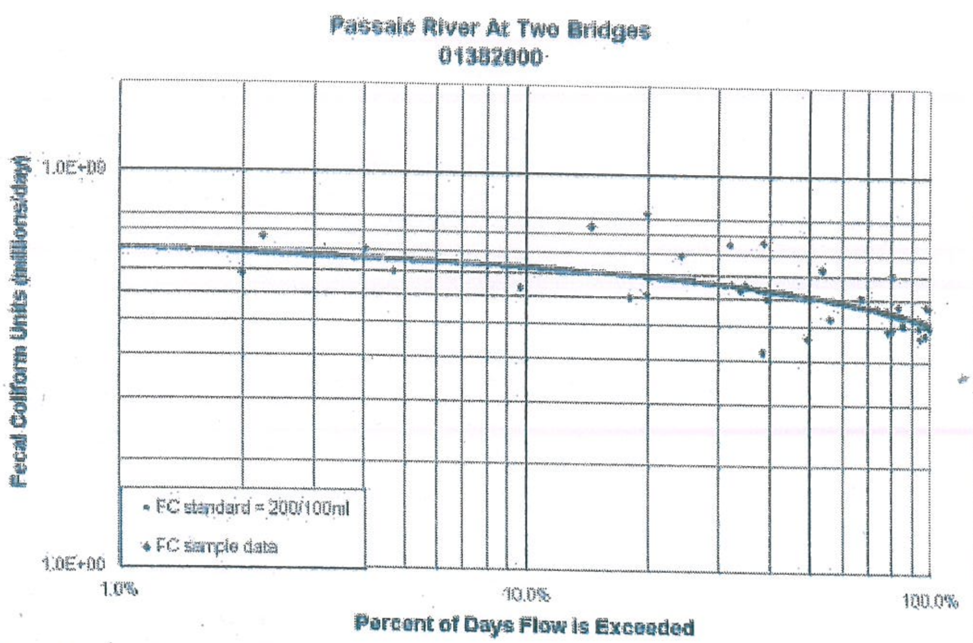
Load Duration Curve for the Beaver Brook At Rockaway. Fecal coliform data from USGS station #01380100 during the period 11/13/97 through 8/7/2000. Water years 1970-2000 from USGS station #01381500 (Whippany River at Morristown, NJ) were used in generating the FC standard curve.



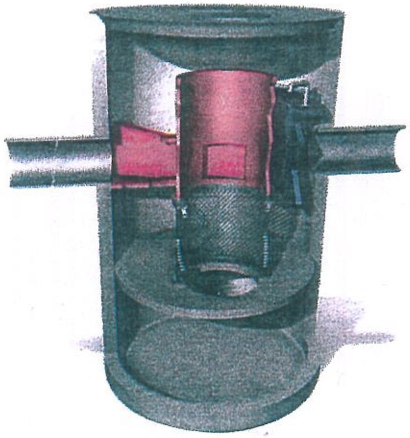
Load Duration Curve for Stony Brook at Boonton. Fecal coliform data from USGS station #01380320 during the period 12/13/99 through 9/7/00. Water years 1970-2000 from USGS station #01380500 (Rockaway River above Reservoir at Boonton) were used in generating the FC standard curve.



Load Duration Curve for the Rockaway R at Pine Brook. Fecal coliform data from USGS station #01381200 during the period 10/1997 through 8/2000. Water years 1970-2000 from USGS station #01381000 (Rockaway River below Reservoir at Boonton, NJ) were used in generating the FC standard curve.



Load Duration Curve for the Passaic River at Two Bridges. Fecal coliform data from USGS station #01382000 during the period 1/27/94 through 810/2000. Water years 1970-2000 from USGS station #01381900 (Passaic R at Pine Brook, NJ) were used in generating the FC standard curve.



INLINE UNIT

Polluted storm water runoff comes under control with the CDS Inline Unit. Placed on the main storm drain within one manhole, its unique configuration meets multiple engineering objectives by combining both treatment and bypass capabilities in one structure. By utilizing CDS' patented non-blocking screening technology, the Inline Unit ensures removal of both fine and suspended solids along with oil, grease, trash and debris.

Offering a remarkably small footprint, the Inline Unit can be incorporated into new development projects or retro-fitted into existing storm water collection systems. The unit is totally underground, has no moving parts and requires no supporting infrastructure.

Process

Developed to complement CDS' offline storm water treatment systems, the Inline Unit also uses continuous deflective separation (CDS) technology.

1. A channeling weir collects the flow for entrance into the separation chamber.
2. Storm water enters the diversion chamber.
3. The natural vortex in the separation chamber separates suspended and fine sediments to the center of the chamber for eventual settling in the sump.
4. Because of the washing vortex, the patented separation screen will not become blocked and screened liquid passes through.
5. After flowing beneath the oil baffle, screened flow discharges from the unit.

Advantages

- One structure meets multiple engineering objectives.
- The sump is an important design feature of all CDS units. Sumps prevent scour because deposited material is not stored within the treatment flow path.
- Handles treatment flows greater than 20-cfs.
- Capable of bypassing flows in excess of 50-cfs.
- CDS can customize design for larger treatment and bypass flow events.
- The Inline Unit removes 80% of total suspending solids (TSS) as well as 100% of floatables and neutrally buoyant material, plus oil and grease.
- Due to its non-blocking screen and non-mechanical function, the Inline Unit is a low maintenance treatment option.

Maintenance

As a general rule, CDS recommends removing solids with a standard vactor truck once a year. Depending on each site's pollutant loading characteristics, more cleanouts may be necessary. Seasonal sump cleanout and annual inspection of the screen surface are typically the only requirements necessary to promote successful and efficient operation of the CDS Inline Unit.

Once the access hatch into the CDS unit is opened, the maintenance crew will remove the contents of the sump and separation chamber using a vactor truck as the best cleaning method.

The CDS screen and sump can then be visually inspected for any remaining debris. At this point the procedure is complete. There is no need for manned entry into the unit, which prevents any direct contact with captured materials.

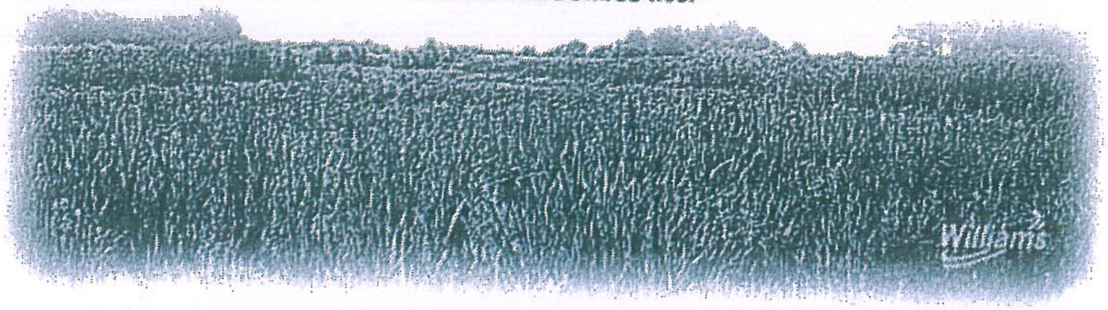
CASE NO 01 STUDY

Nation's largest CDS unit trusted to treat 175-cfs of California highway runoff

In California, expected runoff from a six-mile stretch of Interstate 210 - an eight lane freeway bounding northern Los Angeles - was a major worry for the California Department of Transportation (Caltrans). The sunken concrete roadway runs through an area of many homes and space was tight for installation of storm water units. This did not favor installing runoff catch units that hold large volumes of water, in which pollutants separate over time. By contrast, the CDS technology was chosen for its ability to quickly and effectively separate pollutants and debris from storm water runoff. Five separate CDS units were installed for this project, including the nation's largest Offline unit, built to filter a water quality runoff event of 175-cfs.

CDS screening technology prevents pollutants from California's I-210 from entering the Pacific Ocean.

MARSH RESOURCES INC.



Mitigation Banks

MARSH RESOURCES MEADOWLANDS MITIGATION BANK (Meadowlands) is a 206-acre site located within the Hackensack Meadowlands District in the Borough of Carlstadt, Bergen County, New Jersey and has a "service area" of the Hackensack River Drainage Basin and Newark Bay and the New Jersey Side of the Hudson River. The site is being converted from a degraded Phragmites (common reed) choked system to a more natural inter-tidal, salt marsh-estuarine, island/channel/mud flat ecosystem. Historically, the site was a complex wetland system which supported a diverse array of freshwater and estuarine plant and animal species. Over the last 100 years intense development and mosquito ditching led to a total degradation of the site. Phragmites, an invasive reed took over the site at the expense of all other plant species. This led to an overall loss of wetland functions and values as well as eliminating the site's beneficial and desirable wildlife habitat.

The bank has been created to restore a low value wetland area to its natural pristine state, thereby generating wetland mitigation credits. The amount and ratio of required mitigation when using the Meadowlands Bank will be determined on a case-by-case basis by the permitting agency. Marsh Resources Inc. (MRI) will assist in agency negotiations for use of the Meadowlands Bank as a part of the purchase price for mitigation acre-credits. The price for mitigation credit will be based on market demand and can be negotiated prior to, concurrent with, or after permit issuance. The price for mitigation credits will include land cost, design, bank permits, construction, maintenance, agency negotiations for use of the bank and all ongoing monitoring requirements. Mitigation acre-credits are currently available.

- **Meadowlands Update 6/22/00**

Page last updated 07/19/00

Page last updated 06/22/00

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MARSH RESOURCES INC.

Mitigation Banking

How does mitigation banking work?
Why use a mitigation bank?
Common mitigation banking misconceptions

On Nov. 28, 1995, U.S. Department of the Army Corps of Engineers in conjunction with the Environmental Protection Agency, the Department of Agriculture (Natural Resources Conservation Service), the Department of the Interior (Fish and Wildlife Service), and the Department of Commerce (National Oceanic and Atmospheric Administration) issued a document entitled "Federal Guidance for the Establishment, Use and Operation of Mitigation Banks." With the release of this guidance document, the concept and implementation of wetland mitigation banking has become a reality. Use of mitigation banks is fully embraced by permitting and resource agencies. In some cases, use of a mitigation bank is the preferred alternative to satisfying a permit condition.

The federal guidance document defines mitigation banking as "the restoration, creation, enhancement and, in exceptional circumstances, preservation of wetland, and/or other aquatic resources expressly for the purpose of providing compensatory mitigation in advance of authorized impacts to similar resources."

Although mitigation banks are an accepted and sometimes preferred mitigation method, the adherence to the CWA Section 404(b)(1) sequencing guidelines is required. A project must first avoid then minimize impacts to aquatic resources including wetlands. If impacts are considered unavoidable, mitigation is often required.

Although on-site mitigation is still preferred, the federal guidance documents states, "In general, use of a mitigation bank to compensate for minor aquatic resource impacts (e.g., numerous, small impacts ...) is preferable to on-site mitigation."

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Marsh Resources Inc. (MRI) is a wetland mitigation banking company whose goals include wise land use and environmental responsibility to promote the concept of sustainable development.

Home | Mitigation Banking | Mitigation Banks | Acreage Availability | Contact Us

Page last updated 08/14/00

Mitigation Banking Mitigation Banks Contact Us

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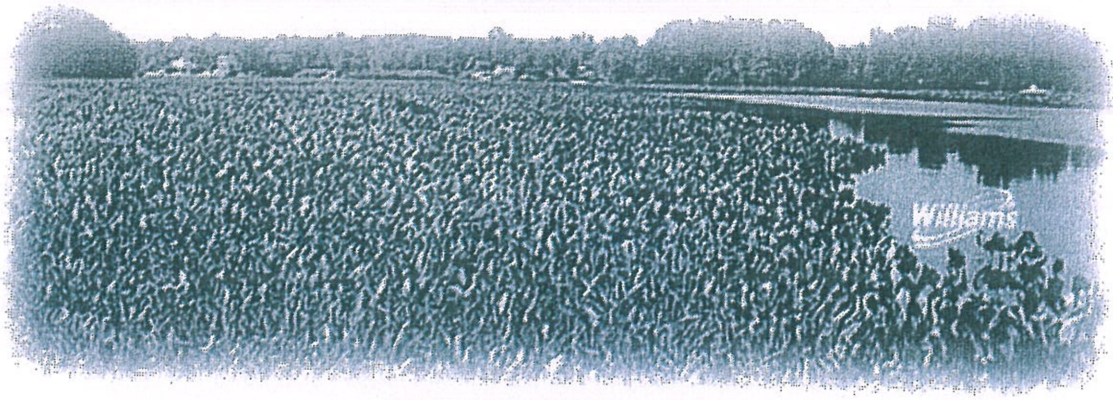

Available Acreage

Wetland mitigation acreage is available in 1998 and there after. Mitigation ratios will be determined by the permitting agency during the permit process. Ratios may be determined by the Indicator Value Assessment (IVA) methodology or current method of impact assessment. MRI will assist in agency coordination if the bank is to be used to satisfy a mitigation requirement. Mitigation acreage prices will be dependent on current market demands. Although mitigation acre - credits are currently available there is a limited supply and it may be years before more are on the market.

The service area for the Meadowlands Bank includes the Hackensack River Drainage Basin and Newark Bay as mapped on the New Jersey Department of Environmental Protection's Drainage Basin Map of New Jersey dated 1972.

For more information or to check on credit availability you can call us at (713) 215-2427, e-mail at Daniel.L.Merz@williams.com, or fill in the contact box.

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Page last updated 06/24/03

Appendix K

SOPs

JCMUA Standard Operating Procedures (SOP)

The SOPs listed below are in accordance with Appendix D of the Jersey City Stormwater permit and are required per N.J.A.C 7:22 to be clearly posted, in a prominent area of the each fueling, storage, or maintenance facility. In the event of a spill emergency or other violation, Contact Joseph Beckmeyer, JCMUA Chief Engineer, or Rajiv Prakesh, Jersey City Stormwater Program Coordinator 201-432-1150.

I. Fueling Procedures:

- Shut off engines during fueling process
- Anyone performing the fueling operation must remain in attendance at the fuel hose nozzle at all times.
- Smoking or use of cell phones or any other such activity that can ignite the fuel is not permitted.
- Check to see that hoses are tightly connected
- When done pumping, empty the contents into your vehicle before pulling out the nozzle
- When removing the fuel nozzle, hold the nozzle upright between the fuel tank and the pump.
- The operator of the fuel pump shall record the number of gallons pumped into the vehicle condition report
- No topping off vehicles, mobile fuel tanks, and storage tanks.
- Drip pans must be used under all hose and pipe connections and other leak-prone areas during bulk transfer of fuels

II. Additional Fueling SOPs for refueling of Bulk Storage Tanks

- Block storm sewer inlets, or contain tank trucks used for bulk transfer, with temporary berms or temporary absorbent booms during the transfer process.
- If temporary berms are being used instead of blocking the storm sewer inlets, all hose connection points associated with the transfer of fuel must be within the temporary berms during the loading/unloading of bulk fuels.
- A trained employee must always be present to supervise during bulk fuel transfer
- Any equipment, tanks, pumps, piping and fuel dispensing equipment found to be leaking or in disrepair must immediately be repaired or replaced.

III. Vehicle Maintenance

Perform all vehicle and equipment maintenance at an indoor location with a paved floor whenever possible. For projects that must be performed outdoors that last more than one day, portable tents or covers must be placed over the equipment being serviced when not being worked on, and drip pans must be used.

IV. Municipal Maintenance Yard Operations Inventory

Each Jersey City department is legally required to have and has at least one full and complete notebook of all substances on the premises which includes their site specific Materials Safety Data Sheets (MSDS) as a part of the "Right to Know Act". Each City Department Director and there appointed Supervisors shall provide these MSDS notebooks upon request.

V. General Good Housekeeping

- All employees shall properly mark or label all containers. Labels must be kept clean and visible.
- All containers must be kept in good condition and tightly closed when not in use.
- When practical, containers must be stored indoors.
- If indoor storage is not practical, containers may be stored outside as long as they are covered and placed on spill platforms or within a secondary containment are
- Outdoor storage locations must be regularly maintained.
- The Jersey City Stormwater Coordinator shall annually inspect sweeping and housekeeping procedures at JCIA deicing operations, DPW vehicle maintenance, and Jersey City fueling stations to ensure the proper procedures are being followed.

VI. Spill cleanup procedures

- <u>Conduct cleanups of any spills or liquids or dry materials immediately after discovery with a dry, absorbent material such as Speedi Dri, Oil Dri, kitty litter, sawdust, spill blankets,etc.</u>
- <u>The department supervisor and Jersey City Stormwater Coordinator shall be notified of all spills in excess of 3 gallons.</u>
- Clean all maintenance areas with dry cleaning methods only. Spills shall be cleaned up with a dry, absorbent material (i.e., kitty litter, sawdust, etc.) and the rest of the area is to be swept. Collected waste is to be disposed of properly in trash cans not recycling bins.
- Supervisors shall provide clean-up materials, spill kits and drip pans near any liquid transfer areas and these items shall be protected from contact with rainfall.

VII. Good Housekeeping Practices for Salt and De-icing Material Handling

- All Jersey City de-icing material storage or maintenance yard operations shall be conducted by the Jersey City Incinerator Authority (JCIA)
- The JCIA shall conduct their operations in a manner as to prevent or minimize the exposure of salt and de-icing materials to storm water runoff from storage, loading and unloading areas and activities
- The JCIA shall prevent or minimize the spillage of salt and de-icing materials during loading and unloading activities.
- The JCIA shall remove all spilled salt and deicing materials using dry cleaning methods at the completion of loading and unloading activities
- All deicing materials shall either be reused or properly discarded at in the trash dumpsters when necessary.
- Storage, loading, and unloading areas shall be swept by hand or mechanical means on a regular basis.
- More frequent sweeping shall be conducted during loading and unloading activities.
- Sweeping shall also be conducted immediately following, as practicable, loading and unloading activities.
- Tracking of materials from storage, loading and unloading areas shall be minimized.
- Minimize the distance salt and de-icing materials are transported during loading and unloading activities.
- Cover all de-icing materials that are not in use (i.e. inactive) and are exposed to rainfall or other precipitation with at least a tarp or other impermeable cover
- The storage of de-icing materials (salt and de-icing products) outside is limited to October 15th through April 30th.
- Remove all salt and de-icing materials from temporary storage site on May 1st
- No salt and de-icing materials may be stored outside from May 1st through October 15th.

973 690 5936

Speedy Dri

OIL-DRI

CORPORATION OF AMERICA
410 North Michigan Avenue
Chicago, IL 60611

Material Safety Data Sheet

Floor Absorbent (#1003000)

(312)321-1515 information (800)424-9300 emergency

1. PRODUCT IDENTIFICATION

Post-it® Fax Note 7671		Date	# of pages ▶
To	Stella	From	Veckridge
Co./Dept.	DPW JC	Co.	
Phone #		Phone #	973 344 1818
Fax #	2015475581	Fax #	

MSDS Number: 1003000

Identity: Floor Absorbent

Issued: January 18, 2002

Chemical Name: Fullers Earth

2. COMPOSITION

Component	CAS Number	Amount	Exposure Limit
Quartz (crystalline silica) 0.000085% in the respirable range	14808-60-7	10-20% bulk	PEL - 10 mg/m³/%SiO2+2 TWA TLV - 0.05 mg/m³ TWA
Fullers Earth	8031-18-3	80-90%	PEL - 5 mg/m³ TWA (respirable fraction) TLV - 3 mg/m³ TWA (respirable fraction) TLV - 10 mg/m³ TWA (inhalable dust)

PEL- OSHA Permissable Exposure Limit. TLV- American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value. TWA- 8 hour Weighted Average. STEL-Short Term Exposure Limit.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

This product is a non-combustible, chemically inert mineral. This mineral sample contains a small amount of naturally-occurring crystalline silica as quartz. Prolonged overexposure to respirable crystalline silica may cause lung disease (silicosis). IARC, in Monograph 68, has concluded that crystalline silica inhaled in the form of quartz from occupational sources is carcinogenic to humans (Group 1); however, carcinogenicity was not detected in all industrial circumstances studied. Because applications and exposure data indicate that exposure to respirable quartz in this product with normal use is well below the OSHA Permissible Exposure Limit (PEL) and ACGIH Threshold Limit Value (TLV); and because the company is not aware of any scientific or medical data available indicating that exposure to dust from this product under conditions of normal use will cause silicosis or cancer; adverse effects would not be expected from normal use of this product.

HEALTH HAZARDS

INGESTION: No adverse effects expected with unused material.

INHALATION: Inhalation of excessive concentrations of dust may cause irritation of mucous membranes and upper respiratory tract.

EYE: Contact may cause mechanical irritation and possible injury.

SKIN: No adverse effects expected.

SENSITIZATION: No adverse effects expected.

ENGELHARD

Material Safety Data Sheet

MSDS Code: ATTAPULGITE-NC

All Attapulgite Products, Non-Calcined

Revision Date: 07/31/2000

Date Printed: 10/04/2000

NFPA Classification:
Health: 0
Flammability: 0
Instability: 0
Special Hazards:

HMIS Classification:
Health: 1 *
Flammability: 0
Reactivity: 0
Personal Protection:
* Indicates possible chronic health effects.

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Common Name: Attapulgite Clay Speedi - Dri

Chemical Name: Hydrated Aluminum-magnesium Silicate

Formula: $(Mg,Al)_5Si_8O_{22}(OH)_4.4H_2O$ & SiO_2

CAS No: 12174-11-7

Product Use: Extender. Absorbent.

Supplier: ENGELHARD CORPORATION
SPECIALTY PIGMENTS & ADDITIVES
101 WOOD AVENUE
ISELIN, NJ 08830-0770
1-732-205-6913 FOR CUSTOMER SERVICE
1-502-775-7288 FOR ENVIRONMENT, HEALTH, AND SAFETY

For Chemical Emergency Call CHEMTREC (24 hours):
1-800-424-9300 (US, Canada, Puerto Rico, Virgin Islands)
1-703-527-3887 (Outside Above Area)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	Weight in Product (%)	Notes
Magnesium Aluminum Silicate* 12174-11-7	90-99	None.
Silica, Crystalline (Quartz) 14808-60-7	1-10	None.

Engelhard
Material Safety Data Sheet

MSDS code: ATTAPULGITE-NC
Revision Date: 07/31/2000

Magnesium Oxide 01309-48-4	1-2	None.

3. HAZARDS IDENTIFICATION

Emergency Overview:

Color: Tan
Form: Powder
Odor: Odorless
Nonflammable

Most Important Hazards: Contains SUSPECT CANCER HAZARD. (Attapulgite contains naturally occurring crystalline silica.) However, in reviewing this material, IARC has determined that there is inadequate evidence of carcinogenicity to humans and experimental animals (Group 3). Prolonged or repeated exposure effects: Inhalation of dust may cause a disabling, progressive pulmonary fibrosis.

Potential Health Effects:

Inhalation: May cause irritation of the respiratory tract. Prolonged or repeated exposure causes lung damage.

Ingestion: No adverse health effects are expected from swallowing.

Skin Contact: May cause skin irritation.

Eye Contact: Dust may cause irritation and inflammation.

Carcinogenicity:

Ingredient	Weight in Product (%)	NTP (Y/N)	IARC (See Notes)	OSHA (Y/N)	ACGIH (See Notes)
Magnesium Aluminum Silicate* 12174-11-7	90-98	N	N3	N	N
Silica, Crystalline (Quartz) 14808-60-7	1-10	Y	Y1	N	A2
Magnesium Oxide 01309-48-4	1-2	N	N	N	N

Notes:
IARC: Y1=Carcinogenic to humans; Y2A=Probably carcinogenic to humans; Y2B=Possibly carcinogenic to humans; N3=Not classifiable as to its carcinogenicity; N=Not studied or probably not carcinogenic.
ACGIH: A1=Confirmed human carcinogen; A2=Suspected human carcinogen; A3=Confirmed animal carcinogen; A4=Not classifiable as a human carcinogen; A5=Not suspected as a human carcinogen; N=Not studied.

Carcinogenicity: The clay component, like other naturally occurring minerals, contains crystalline silica.

Engelhard
Material Safety Data Sheet

MSDS code: ATTAPULGITE-NC
Revision Date: 07/31/2000

Chronic Health Hazards: NIOSH has studied the exposure effects of Attapulgite, which contains crystalline silica, on pulmonary function and has determined that there is no evidence of significant respiratory morbidity. Prolonged or repeated inhalation of crystalline silica dust may cause disabling, progressive pulmonary fibrosis (silicosis). May cause chronic bronchitis.

Aggravated Medical Conditions: Pulmonary disorders. Allergies.

4. FIRST AID MEASURES

Inhalation: Move person to fresh air. Aid in breathing, if necessary, and get immediate medical attention.

Ingestion: Get medical attention! If vomiting occurs, keep head lower than hips to prevent aspiration.

Skin Contact: Flush skin with large amounts of water. If irritation persists, get medical attention.

Eye Contact: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

5. FIRE FIGHTING MEASURES

Autoignition Temperature, °C: Nonflammable
Lower Explosive Limit, %: Not Applicable
Upper Explosive Limit, %: Not Applicable

Extinguishing Media: None - does not burn. Use extinguishing media appropriate for surrounding fire.

Fire Fighting Procedures: Positive pressure, self-contained breathing apparatus. Wear full protective clothing.

Unusual Fire and Explosion Hazards: Not a fire or explosion hazard.

6. ACCIDENTAL RELEASE MEASURES

Spill Procedures: Contain spillage. Scoop up or vacuum into a container for reclamation or disposal. Avoid dusting.

7. HANDLING AND STORAGE

Wash thoroughly after handling

Engelhard
Material Safety Data Sheet

MSDS code: ATTAPULGITE-NC
Revision Date: 07/31/2000

Keep container closed.
Avoid generating or breathing dust.

Avoid breathing dust.
Avoid contact with eyes.
Use only with adequate ventilation.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Ingredient	Weight in Product (%)	OSHA PEL:	ACGIH TLV:
Magnesium Aluminum Silicate* 12174-11-7	90-99	15 mg/m3 (Total dust) 5 mg/m3 (Respirable dust)	10 mg/m3 (Inhalable particulate) 3 mg/m3 (Respirable particulate)
Silica, Crystalline (Quartz) 14808-60-7	1-10	0.1 mg/m3 (Respirable dust)	0.05 mg/m3 (Respirable fraction)
Magnesium Oxide 01309-48-4	1-2	None Established	None Established

Unless otherwise noted, all values are reported as 8-hour Time-Weighted Averages (TWAs) and total dust (particulates only). All ACGIH TLVs refer to the 2000 standards. All OSHA PELs refer to 29 CFR Part 1910 Air Contaminants: Final Rule, January 19, 1989.

Personal Protective Equipment: Safety glasses with side shields.

Respiratory Protection: Use approved respiratory protection if exposure limits are exceeded, or overexposure is likely.

Ventilation: General ventilation. Local exhaust ventilation is recommended to control exposures to within applicable limits.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form:	Powder
Color:	Tan
Odor:	Odorless
Specific Gravity:	Min: 1.0
Solubility (in water):	insoluble

10. STABILITY AND REACTIVITY

Stability Data: Stable

Engelhard
Material Safety Data Sheet

MSDS code: ATTAPULGITE-NC
Revision Date: 07/31/2000

Conditions/Hazards to Avoid:	None anticipated
Incompatibility (Materials to Avoid):	None anticipated.
Hazardous Decomposition Products:	None anticipated
Polymerization:	Will not occur.
Polymerization - Avoid:	None anticipated.

11. TOXICOLOGICAL INFORMATION

Information on Product:
Information on Components:

Ingredient	Weight in Product (%)	Acute Toxicity - Oral	Acute Toxicity - Inhalation	Acute Toxicity - Dermal	Acute Toxicity - Other
Magnesium Aluminum Silicate* 12174-11-7	90-99	Not Available	Not Available	Not Available	Not Available
Silica, Crystalline (Quartz) 14808-60-7	1-10	Not Available	Not Available	Not Available	Not Available
Magnesium Oxide 01309-48-4	1-2	Not Available	Not Available	Not Available	Not Available

12. ECOLOGICAL INFORMATION

Information on Product:
Environmental Fate: No data available.
Ecotoxicological Information: No data available.

13. DISPOSAL CONSIDERATIONS

US EPA Waste Number: Not Regulated
Disposal of Waste Method: This product, if disposed as received, is a non-hazardous waste. Local disposal laws and regulations will determine the proper waste disposal/recycling/reclamation procedure. Disposal requirements are dependent on the hazard classification and will vary by location and the type of disposal selected.

14. TRANSPORT INFORMATION

International Transport Regulations:
UN/PIN Number: Not Regulated

US Transportation Regulations:

Engelhard
Material Safety Data Sheet

MSDS code: ATTAPULGITE-NC
Revision Date: 07/31/2000

DOT Classification: Not Regulated

Canadian Transportation of Dangerous Goods (TDG):
TDG Classification: Not Regulated

15. REGULATORY INFORMATION

International Inventories:

United States:	This product or its ingredients are listed on or compliant with the TSCA Inventory.
Canada:	This product or its ingredients are listed on or compliant with the DSL.
Europe:	This product or its ingredients are listed on or compliant with EINECS.
Japan:	This product or its ingredients are listed on or compliant with MITI.
Australia:	This product or its ingredients are listed on or compliant with AICS.
Korea:	Not Determined

US Federal Regulations:

Ingredient	Weight in Product (%)	Subject to SARA 313 Reporting
Magnesium Aluminum Silicate* 12174-11-7	90-99	No
Silica, Crystalline (Quartz) 14808-60-7	1-10	No
Magnesium Oxide 01309-48-4	1-2	No

SARA 311/ 312 Hazard Categories:
Chronic Health Hazard

CAA 602 Ozone Depleting Substances (ODS):
This product neither contains nor is manufactured with an ozone depleting substance subject to the labeling requirements of the Clean Air Act Amendments 1990 and 40 CFR Part 82.

US State Regulations:
California Proposition 65 - Carcinogen:
WARNING: This product contains chemicals known to the State of California to cause cancer.

VOC Content (CARB): None

Canadian Regulations:
WHMIS Classification:
Class D Division 2 Subdivision A

Engelhard
Material Safety Data Sheet

MSDS code: ATTAPULGITE-NC
Revision Date: 07/31/2000

16. OTHER INFORMATION

Revision number: 0

Prepared By: Engelhard Corporate Environmental Health & Safety Group

The information in this Material Safety Data Sheet should be provided to all who will use, handle, store, transport, or otherwise be exposed to this product. This information has been prepared for the guidance of plant engineering, operations, management and for persons working with or handling this product. The information presented in the MSDS is premised upon proper handling and anticipated uses, and is for the material without chemical additions/alterations. We believe this information to be reliable and up-to-date as of the date of publication, but make no warranty that it is. Additionally, if this Material Safety Data Sheet is more than three years old, please contact the supplier at the phone number listed in Section 1 to make certain that this sheet is current. End of MSDS......

WARNING: *This product contains chemicals known to the State of California to cause cancer.*

VOC Content (CARB): *None*

Canadian Regulations:
WHMIS Classification:
Class D Division 2 Subdivision A