BIRDSALL ENGINEERING, INC.
CONSULTING & ENVIRONMENTAL ENGINEERS

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MUNICIPAL STORMWATER MANAGEMENT PLAN

LONG BRANCH CITY
MONMOUTH COUNTY, NEW JERSEY

LONG BRANCH PLANNING BOARD

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COMPANY

STORMWATER MANAGEMENT PLAN
CITY OF LONG BRANCH

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1.0 INTRODUCTION

The City of Long Branch has consulted with Birdsall Engineering, Inc. (BEI) to devise a Municipal Stormwater Management Plan (MSWMP) for the City. This MSWMP outlines a strategy for Long Branch to alleviate the City's stormwater management problems through the incorporation of more stringent stormwater policies within their Land Use Regulations. The creation of this MSWMP is required through N.J.A.C. 7:14A-25 Municipal Stormwater Regulations, which were proposed in the New Jersey Registrar on January 6, 2003, and were made effective on February 2, 2004. This plan also includes a Stormwater Control Ordinance (Appendix A) which would incorporate both the goals of this plan and the new stormwater management standards into existing City regulations by applying the newly adopted design standards to "Major Development", which includes development or redevelopment projects that either disturb one or more acres of land, or propose to add ¼ acre or more of impervious surface.

This plan will incorporate all of the required elements described in N.J.A.C. 7:8 Stormwater Management Rules as well as the nine planning goals that should be addressed when devising municipal level stormwater management plans (N.J.A.C. 7:8-2.2). Further, the plan addresses groundwater recharge, stormwater quantity, and stormwater quality impacts by incorporating the newly adopted stormwater design and performance standards to new development proposals. These standards are intended to minimize the adverse impact of stormwater runoff on water quality and water quantity and the loss of groundwater recharge that provides baseflow to receiving water bodies. Also, to reduce the discharge of pollutants to the maximum extent practicable and protect water quality, the plan incorporates the six control measures outlined within the Phase II New Jersey Pollutant Discharge Elimination System Stormwater Regulation Program Rules (N.J.A.C. 7:14A).

To accomplish these ends, Birdsall Engineering has completed a review of the City's existing ordinances, the Long Branch Master Plan, and other planning documents to ensure that nonstructural stormwater management techniques have been integrated into these documents to the maximum extent practicable. Also included is a Mitigation Plan (Section 6.4) that allows Long Branch, in limited circumstances, to waive the strict compliance of one or more of the stormwater management design and performance standards where full compliance cannot be reasonably accommodated on site.

Pursuant N.J.A.C. 7:8-4.2, municipalities that feature a total vacant and agricultural land area less than one square mile are not required to include a build-out analysis within their Municipal Stormwater Management Plan. As the City of Long Branch contains approximately .249 square miles of vacant and/or agricultural lands (New Jersey Parcel Mapping Software, accessed August 26, 2008), a build-out analysis pursuant to N.J.A.C. 7:8 4-2 has not been included in this report.

2.0 GOALS AND OBJECTIVES

To improve water quality, reduce the risk of flooding, and in turn improve the quality of life for residents of Long Branch, the incorporation of more stringent stormwater management techniques has been identified as a priority by both state and local level government agencies. The new stormwater management requirements and best management practices will advance the goals and objectives of both the New Jersey Department of Environmental Protection, and the City of Long Branch. The "Significant Changes in Assumptions, Policies, Objectives, and Standards" that were established through the City's most recent Master Plan reexamination (2007) state:

- The Master Plan and Zoning Ordinance sections dealing with...the conservation of natural resources, recycling and energy conservation may require upgrading or changes based on input from the City's Environmental Commission."
- Also, the Conservation Areas portion of the City's Master Plan states, "Of particular importance with regard to conservation is the treatment and protection of flood hazard areas. It is especially important to deter further construction within floodplains which would pose danger directly to occupants of that construction or by obstructing the ability of flood waters to recede through natural channels as a result of the construction itself or debris which it may create if destroyed by flood."

As the incorporation of more stringent stormwater management regulations are designed to reduce the risk of flooding and help protect environmentally sensitive areas, the goals of this plan are consistent with those of the City of Long Branch. Further, the New Jersey Department of Environmental Protection (NJDEP) has established a minimum set of goals and objectives that all municipal stormwater management plans should follow, they include to:

- Reduce flood damage, including damage to life and property;
- Minimize, to the extent practical, any increase in stormwater runoff from any new development;
- Reduce soil erosion from any development or construction project;
- Assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
- Maintain groundwater recharge;
- Prevent, to the greatest extent feasible, an increase in nonpoint pollution;
- Maintain the integrity of stream channels for their biological functions, as well as for drainage;
- Minimize pollutants in stormwater runoff from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the state, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of water; and
- Protect public safety through the proper design and operation of stormwater basins.

This Municipal Stormwater Management Plan will also incorporate the Goals and Objectives that have been established for municipalities within Watershed Management Area 12 which include:

- Providing healthy and naturally diverse habitats to support plants and wildlife that will enrich the lives of residents;
- Maintaining safe and plentiful drinking water supplies;
- Preserving the integrity of the freshwater and tidal benthic communities that support commercial and recreational water-related uses including boating, bathing, fishing and sightseeing;
- Development and redevelopment in Area 12 will be well-planned and environmentally responsible while maintaining, enhancing and integrating the historic, cultural, scenic, recreational and open space resources that define and strengthen the unique identities of each community.

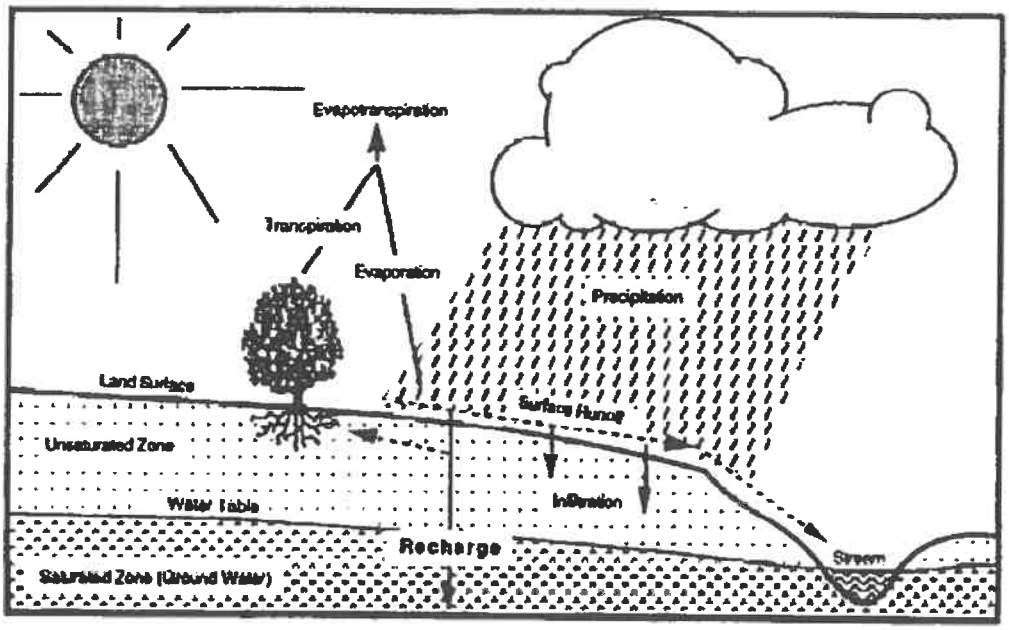
Source: Monmouth Coastal Watershed Partnerships website: http://www.shore.co.monmouth.nj.us/area12/, Accessed March 8, 2005.

To achieve these goals, this plan examines the most pressing stormwater related issues facing Long Branch, and in turn proposes possible amendments to the City's design and performance standards to incorporate a more comprehensive code for managing stormwater. By examining the City's history, demographics, and current conditions concerning water quality, water quantity, and flooding issues, a clearer picture can be drawn in regards to what the stormwater management issues are at this time, and what type of policy amendments should be taken to improve them. This plan also calls for additional stormwater management regulations to be adopted by the City in order to ensure that preventative and corrective maintenance strategies have been formulated to ensure the long-term efficiency of stormwater management facilities.

3.0 EFFECTS OF STORMWATER RUNOFF

The hydrologic cycle is defined as the constant cyclical movement of water from the ground to the atmosphere and back to the ground. As illustrated by the figure below, this process includes evaporation, transpiration, evapotranspiration, condensation, transport, precipitation, infiltration, percolation, surface runoff, interflow, and groundwater flow. Land development has a dramatic effect on the natural function of this process.

GROUNDWATER RECHARGE IN THE HYDROLOGIC CYCLE



Source: New Jersey Geological Survey Report GSR-32.

Prior to development, native vegetation acts to both intercept falling precipitation, and return water that has infiltrated into the ground through evapotranspiration. By clearing vegetation, compacting soil, and replacing it with impervious cover, lawns, or landscaping, the development process serves to reduce the natural rate of water that may infiltrate into the soil, and in turn evapotranspiration.

In developed areas, following a precipitation event, both the volume and the rate of stormwater runoff will increase in proportion to the amount of additional impervious cover generated through a given development. Often gutters, channels and storm sewers, are the tools with which this additional stormwater is carried to local waterways. These man-made stormwater management tools transport water more quickly which causes the stormwater flows in downstream waterways to peak faster and higher than would be produced in a natural state. The increased peak flow during and shortly after a precipitation event produces greater fluctuations between normal and storm flow rates, which can increase channel erosion.

Table 1: The Effect of Impervious Cover on Runoff	
Share of Land With Impervious Cover	**Share of Rainwater that Becomes Runoff**
0% (natural state)	10 %
10-20%	20%
35-50%	30%
75-100%	75-100%
Source: NJDEP *Planning for Clean Water: The Municipal Guide* Trenton, NJ 2000.	

Not only does the development process increase the peak rate of stormwater flows, the addition of impervious cover also results in water pollution. Pollutants carried within stormwater runoff can take the form of nutrients such as nitrogen and phosphorous which encourage the growth of algae in downstream water ways, or trash and oils that accumulate on sidewalks and roadways between precipitation events. In locations where stormwater sewers discharge runoff directly into a stream, the aggregate accumulation of sediment and pollutants that are carried within it are dumped directly into local waterways. In addition to the chemical and physical contaminants, runoff from impervious systems also requires another form of pollution, heat. When rain falls on pavement that has collected heat through the day, the temperature of runoff can reach as high as 83 degrees Fahrenheit, which is sufficiently warm enough to damage sensitive plant and animal species. Table 2 includes a comprehensive list of the possible pollutants contained within untreated stormwater flows.

Table 2: Pollutants Carried in Stormwater
The following pollutants collected and carried in stormwater runoff can seriously degrade water quality in the community:
Nutrients- Include nitrogen and phosphorous, which plants need to grow. However, high levels can cause a health hazard in drinking water and stimulate excessive aquatic plant growth, which can ultimately lower dissolved oxygen levels in the water, causing fish and other aquatic life to smother. Algae blooms are examples of how excess nutrients pollute. Sources of excess nutrients include animal waste, fertilizers, septic systems, road salt applications and auto emissions. About half of the fertilizers applied to lawns in the New Jersey coastal zone enter streams and head to the bay and ocean.
Pathogens- Are disease causing bacteria and viruses associated with the presence of fecal matter. They affect human health directly when people contact contaminated water and consume shellfish. Sources include failing septic systems, animal waste, and boat sanitation facilities.
Sediment- Is fine particles of eroded soil or sand. Common origins are concentrated, excessive stormwater runoff from construction sites. Sediment smothers aquatic habitat, carries pollutants bound to soil particles, makes water cloudy and inhibits the breeding and movement of aquatic species.
Toxic Contaminants- Include pesticides as well as heavy metals such as copper, lead and zinc which are commonly found in old paint, tires, lawn chemicals and preservatives. They attach to sediments, resist breakdown, accumulate in organisms and represent threats to the food chain.
Debris- Consists of various items of trash, such as old tires, shopping carts and plastics. It comes from illegal dumping, street litter, and boating waste. It threatens aquatic life and detracts from recreational and aesthetic values.
Oil- Is one of the worst offenders. One gallon of oil dumped down a storm drain can create a slick up to 8 acres and may pollute up to 1 million gallons of water.
Thermal Stress- From elevated water temperatures reduces survival rates and disease resistance of valued native species and allows the spread of non-native (exotic) species. Water temperature rises because of increased pavement near streams, loss of vegetated stream buffers and stream channelization.
Source: Association of New Jersey Environmental Commissions (1998, Spring). *ANJEC Report*

4.0 CURRENT CONDITONS

4.1 SETTING

Located on the central eastern coast of Monmouth County, the City of Long Branch is a highly developed community of 5.10 square miles. Long Branch contains among the most varied range of housing types of any town in the County. The City's housing stock includes single- family homes, oceanfront high-rise condominiums, townhouses and apartments. In addition, the City also features its distinguished Elberon section. Renowned for its grand Victorian and Gothic architecture, Elberon was nicknamed the Newport of the Jersey Shore at the turn of the 20th century. The City's setting is illustrated through Figure 1-USGS Quad Map. Further, a map depicting land uses in the ~~Borough~~ City has been included within this MSWMP as Figure 2, titled "Land Use Map".

The city of Long Branch contains a wide variety of soils, which are illustrated through Figure 3-Soils Map. In all, sixteen different soil types can be found in the city. Generally speaking these soils are well draining in nature and do not contain steep slopes. Additional information pertaining to the characteristics of the soils in Long Branch can be obtained through the Monmouth County Soils Survey, which is accessible on-line at http://soils.usda.gov/survey/online_surveys/new_jersey/index.html.

The City of Long Branch is also proud of its Community Development Block Grant (CDBG) and Urban Enterprise Zone (UEZ) programs; the CDBG program is working to assist low to moderate-income individuals and households, and the UEZ program is responsible for improving the business districts and commercial zones.

4.2 DEMOGRAPHICS

The City of Long Branch contained 31,340 residents as of the 2000 census. In the period of time between 1980 and the present, Long Branch has maintained a steady population of around 30,000 people. Though the growth rate has fluctuated, the previous decade has been characterized by an overall increase in population. While Monmouth County as a whole has become the fourth fastest growing county in the state of New Jersey, Long Branch's population has been fairly stable due to the near build-out conditions of the City.

Table 3: City of Long Branch Population Characteristics

Year	Population	% Change
1980	29,819	N/A
1990	28,658	-3.9%
2000	31,340	9.4%
2004 (Estimated)	31,722	1.2%

Source: Monmouth County Planning Board *At A Glance: Files and Data* accessed on January 12, 2005.
http://www.monmouthplanning.com/AtAGlanceFiles/Long%20Branch.pdf

4.3 WATERWAYS

In addition to being located on the Atlantic Ocean, and proximate to the Shrewsbury River, the City of Long Branch contains several waterways that bisect the city. These water bodies include: Whale Pond Brook, which flows through the southerly portion of the city into Lake Takanassee, Turtle Mill Brook, Branchport Creek, Mannahasset Creek, Lanes Creek, and Troutmans Creek, all of which are tributaries of the Shrewsbury River. The mapped waterways that flow through the City of Long Branch are illustrated through Figure 4-Waterways Map. To date, the City of Long Branch has not adopted a Stream Corridor Protection Plan (SCPP) for any of these waterbodies.

Also, after being nominated by the City, the Mannahasset Creek was deemed a "unique" area within the North Coast Region by the Monmouth County Planning Board in January of 1998. Both the creek itself and the Mannahasset's corresponding stream corridor provide habitat for diverse waterfowl and mammals. Mannahasset Creek Park and Jackson Woods, both of which are municipally owned, undeveloped wooded sites are adjacent to the creek, and serve as active recreational facilities. The creek, which flows to the Shrewsbury River, is primarily an estuarine system. It is considered valuable as a wetland, waterfowl habitat and mammalian habitat, in part because of its location within a highly developed community.

4.4 WATER QUALITY

Water quality will remain a critical factor to maintain a high quality of life for residents of the Long Branch community. Environmental concerns have brought about the development of studies, programs and networks intended to monitor the health of waterways and aid in determining methods to mitigate pollution where encountered. Among many programs, the New Jersey Department of Environmental Protection (NJDEP) has established an Ambient Biomonitoring Network (AMNET) to document the health of the State's waterways. There are now over 800 AMNET sites throughout the state of New Jersey. These sites are sampled for benthic macroinvertebrates by NJDEP on a five-year cycle. Streams are classified as "non-impaired", "moderately impaired", or "severely impaired" based upon a standardized inspection process. The data is used to generate a New Jersey Impairment Score (NJIS). According to these scores, a studied waterway is then classified as "non-impaired", "moderately impaired", or "severely impaired". These designations are determined by the following criteria:

Table 4: New Jersey Department of Environmental Protection AMNET Program Waterway Classification Criteria	
Non-Impaired	Benthic community comparable to other undisturbed streams within the region. A community characterized by maximum taxa richness, balanced taxa groups and good representation of intolerant individuals.
Moderately Impaired	Macroinvertebrate richness is reduced, in particular EPT taxa. Taxa composition changes result in reduced community balance and intolerant taxa become absent.
Severely Impaired	A dramatic change in the benthic community has occurred. Macroinvertebrates are dominated by a few taxa that are very abundant. Tolerant taxa are the only individuals present.
Source: New Jersey Department of Environmental Protection Bureau of Freshwater and Biological Monitoring (NJDEP/BFBM): *http://www.state.nj.us/dep/wmm/bfbm/*. Accessed: March 30, 2005.	

The City of Long Branch contains one point that has been tested through the AMNET program. Using the parameters listed in Table 4, Whale Pond Brook, which was tested in August of 2000, qualified as a "severely impaired" waterbody.

In addition to the AMNET data, the NJDEP and other regulatory agencies also collect water quality chemical data from streams within the state. The New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d) (Integrated List)) is required by the federal Clean Water Act to be prepared biennially and is a valuable source of water quality information. The integrated list is divided into five different sublists. The following table illustrates how those sublists were determined:

Table 5: New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d) Integrated List) Sublist Criteria	
Sublist 1	Attaining a water quality standard and no use is threatened.
Sublist 2	Attaining some of the designated uses; no use is threatened; and insufficient or no data and information is available to determine if the remaining uses are attained or threatened.
Sublist 3	Insufficient or no data and information to determine if any designated use is attained.
Sublist 4	Impaired or threatened for one or more designated uses but does not require the development of a TMDL. (Three Categories). 1.TMDL has been completed. 2.Other enforceable pollution control requirements are reasonably expected to result in the attainment of the water quality standard in the near future. 3. Impairment is not caused by a pollutant.

Table 5: New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d) Integrated List) Sublist Criteria (Cont'd)	
Sublist 5	The water quality standard is not attained. The waterbody is impaired or threatened for one or more designated uses by a pollutant(s), and requires a TMDL.
Source: New Jersey Department of Environmental Protection: http://www.state.nj.us/dep/wmm/sgwqt/wat/integratedlist/integratedlist2004.html. Accessed March 30, 2005	

Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more TMDL's are needed. A Total Maximum Daily Load (TMDL) is the amount of a pollutant that can be accepted by a waterbody without causing an exceedance of water quality standards or interfering with the ability to use a waterbody for one or more of its designated uses. The allowable load is allocated to the various sources of the pollutant such as stormwater and wastewater discharges, which require an NJPDES permit to discharge, and non-point sources, such as agricultural areas and residential areas, along with a margin of safety. Provisions may also be made for future sources in the form of reserve capacity. An implementation plan is developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies may include improved stormwater treatment plants, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems and other BMP's.

The Monmouth County Health Department (MCHD) also conducts water quality sampling along a number of waterbodies that flow through the county. The MCHD currently tests six sites in the City of Long Branch. The testing locations include:

- Branchport Creek at Berdan Place
- Lanes Creek at Edwards Avenue
- Mannahasset Creek at Mannahasset Avenue
- Troutmans Creek at Atlantic Avenue
- Troutmans Creek at Joline Avenue
- Lake Takanassee at Ocean Avenue

Currently, all six of these testing locations have been allocated to Sublist 5 due to excessive fecal coliform levels. In order to rectify these contamination issues, the City of Long Branch will seek funding through both State and Federal initiatives to retrofit its aging infrastructure. A complete history of water quality testing results for each of these locations is contained within Appendices B, C, and D of this report.

In addition, the City is also home to contaminated former industrial sites, the presence of which degrades water quality. One such site is the New Jersey Natural Gas Company's former Long Branch Plant. The site, located at 100 Brook Street, is a 17-acre property located in a primarily residential area of Long Branch. Troutmans Creek, a tributary of the Shrewsbury River, flows through the site. Between 1860 and the 1950s, a series of utility companies operated a

manufactured gas plant (MGP) at the property that extracted gas from coal. This process generated a viscous waste known as coal tar, which leaked into the ground. Although MGP operations were phased out more than 50 years ago, contaminants from the operations remained in the soil, sediments, and ground water. The primary contaminants associated with the MGP residues are polycyclic aromatic hydrocarbons (PAHs) and metals.

New Jersey Natural Gas (NJNG) acquired the site in 1952, when it purchased the natural gas properties of Jersey Central Power & Light. The City of Long Branch and several private individuals also currently own portions of the former MGP site, including the original Jerry Morgan Park. NJNG has been addressing the soil, sediment, and ground water contamination that resulted from the MGP's operations since entering into an Administrative Consent Order with NJDEP in 1991. NJNG has removed contaminated soil from the former MGP and several off-site areas, including the original Jerry Morgan Park, backfilled the excavated areas with clean soil, and installed engineering controls. NJNG has also removed contaminated sediment from the majority of the on-site portion of Troutmans Creek and plans to remove additional sediment in the future. To facilitate remediation of the Seaview Manor Housing Development, NJNG will demolish the adjacent residential buildings that are owned by the Long Branch Housing Authority and remove contaminated soil from these properties. Additional on-site and off-site remediation of soil and product is planned once NJNG negotiates final arrangements with the affected property owners. As noted above, NJNG has removed most of the contaminated sediments from the portion of Troutmans Creek that runs through the site and is working with NJDEP to delineate the sediment contamination in the off-site portion of the creek north of the site. The results of this sampling will be used to determine the extent of remediation that NJNG will be required to conduct in the off-site portion of Troutmans Creek.

NJNG must also remediate the ground water contamination associated with the former MGP and is currently evaluating ground water quality by sampling on-site and off-site monitoring wells. The data obtained from the sampling will allow NJNG to determine the extent of ground water contamination and design an appropriate remedial action.

4.5 WATER QUANTITY

Long Branch has exhibited water quantity problems including flooding, steam bank erosion, and many of the culverts associated with road crossings in the City are undersized. As such, the design of culverts has been cited as a contributor to both the frequency and the severity of stormwater flow flooding, which is experienced in several locations in the City. Long Branch's most pressing stormwater quantity management issues are discussed in greater detail in Section 4.6 *Flooding & Proposed Solutions.*

The high imperviousness the City has significantly decreased groundwater recharge, and in turn contributed to the stormwater management issues that exist in Long Branch. The average annual groundwater recharge rates are shown graphically in Figure 5- Ground Water Recharge Areas. New Jersey Geologic Survey (NJGS) estimates groundwater recharge using methodology from NJGS Report GSR-32 "A Method for Evaluation of Ground-Water-Recharge Areas in New Jersey". Land-use/land-cover, soil and municipality-based climatic data were combined and used

to produce an estimate of ground-water recharge in inches/year. Recharge was then ranked by volume (billions of gallons/year) using natural breaks in the percentage of total volume.

The City of Long Branch is located in the CAPRA Coastal Metropolitan Planning Area, which represents the most urbanized portions within the CAFRA designated jurisdiction. The amended rules specify that the maximum percentage of lot coverage permitted within the Metropolitan Planning Area will be 80%. Therefore any new development will be limited to 80% maximum lot coverage.

Wellhead protection areas, also required as part of the MSWMP, are illustrated in Figure 6-Wellhead Protection Areas. As this map indicates, there are no Wellhead Protection Areas in the City of Long Branch. According to the NJDEP, "A Well Head Protection Area (WHPA) in New Jersey is a map area calculated around a Public Community Water Supply (PCWS) well that delineates the horizontal extent of ground water captured by a well pumping at a specific rate over a two, five, and twelve-year period of time for unconfined wells. ...The confined wells have a fifty foot radius delineated around each well serving as the well head protection area to be controlled by the water purveyor in accordance with Safe Drinking Water Regulations" (see NJAC 7:10-11.7(b) 1). Well Head Protection Area delineations are 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 delineations are the first step in defining the sources of water to a public supply well. Within these areas, potential contamination will be assessed and appropriate monitoring will be undertaken as subsequent phases of the NJDEP SWAP program. However, it is important to note that the NJDEP's Wellhead Protection Mapping effort only includes wellhead protection areas for public supply wells. As such, individual home or property owner wells are excluded.

In regards to potable water supplies, the Bureau of Safe Drinking Waters Water Supply Administration within the New Jersey Department of Environmental Protection administers the Source Water Assessment Program (SWAP). According to the 2004 Source Water Assessment Report for the City of Long Branch, the City receives potable water from one single water supply entity, NJ American Water Company.

The NJ American Water Company, whose Monmouth system serves the residents of Long Branch, is a public community water system consisting of twelve wells, five surface water intakes, and three purchased ground water sources. The system's source water comes from the following aquifers and/or surface water bodies: The upper Potomac-Raritan-Magothy aquifer, Swimming River Reservoir, Shark River, middle Potomac-Raritan-Magothy aquifer, Jumping Brook, Manasquan Reservoir (NJWSA Manasquan System), and Glendola Reservoir (Shark River) Also, this system purchases water from the following water systems: Shorelands WC, Red Bank Water, and the Allenhurst Water Department.

In addition, independent water-quality laboratories regularly test water samples from across the City. The results of these water tests show no contaminants present that exceed maximum contaminants levels (MCL's), as established by Federal and NJ State government agencies.

Under Federal law, all water users now receive an annual report on the quality of their drinking water, listing only the contaminants that are detected in the water.

4.6 FLOODING & PROPOSED SOLUTIONS

To inform both public and private land use decision makers of areas that are subject to flooding, the 1984 Federal Emergency Management Agency Flood Insurance Rate Maps (FIRM) for the City of Long Branch were reviewed. Immediately along the banks of Cranberry Brook, Lake Takanassee, Troutmans Creek and the Mannahasset Creek lie areas that have been designated as an A zone by the FIRM maps. Figure 7-FEMA Flood Zone Map reproduces the FEMA flood zone delineations for the entire City of Long Branch. In addition, areas along the oceanfront have been designated as a V6 zone, which also falls within the 100-year floodplain. A significant amount of long standing development located within these areas, especially on the north end of Long Branch. However, specific base flood elevation has only been determined at a few points within the City. The specific points, along with the base flood elevation are listed in Table 5.

Table 5: Elevation Reference Marks within the City of Long Branch

Elevation in Feet	Location
13.05	Standard NJGCS disk set in concrete monument No. 6279 on east side Ocean Avenue 0.4 mile south of North Long Branch RR. Station approximately 0.35 miles north of intersection of Ocean Avenue and Seaview Avenue.
13.21	Standard NJGCS disk set in concrete monument No. 6280. 20.41 feet south of centerline of Sea View Avenue at intersection with Ocean Avenue approximately 132 feet east of Fay Street.
17.61	Standard NJGCS disk set in concrete monument No. 6236 approximately 35 feet south of centerline of South Lake Drive at intersection with Ocean Avenue disk, which is flush with the ground.
30.94	Standard NJGCS disk set in concrete east of Ocean Avenue in front of private beach club and flush with the ground approximately 2.7 miles south of intersection of Broadway-Long Branch and Ocean Avenue.

Source: FEMA *Flood Insurance Rate Map (FIRM)—City of Long Branch New Jersey, Monmouth County, New Jersey Map* Revised January 5, 1984.

The portions of Long Branch that are effected by excess stormwater flows extend beyond the floodplains since many of the existing structural stormwater management facilities cannot sustain the flow of water created from severe storm events. During these events, the existing facilities do not have adequate capacity, thereby causing a backwater effect and increased flooding upstream. The increased amounts of water result in stream bank erosion, under-cutting,

scouring, overbank erosion, habitat loss and degradation of roadways and bridge crossings. Through the adoption of more stringent stormwater management regulations, and the development and incorporation of a mitigation plan into these policies, a coordinated systematic system of retrofitting and reconstruction to improve stormwater flooding and quality management will emerge.

The City of Long Branch actively addresses drainage and flooding issues as they arise and are reported by residents. Each year, Long Branch considers drainage improvements as part of its Capital Improvement Program (CIP). As such, most of the reported flooding and drainage problems in the City have been corrected. Long Branch will continue to utilize this program, along with its Mitigation Plan, which is included within this report as Section 6.4, as tools to remediate the most pressing flooding and stormwater management issues that face the City.

5.0 STORMWATER MANAGEMENT

5.1 INFRASTRUCTURE

Long Branch receives nearly 44 inches of rain in an average year. To manage the public risk that flooding imposes on residents, a substantial stormwater management system has been developed. As illustrated earlier through Table 2, both the amount, and the condition of stormwater that finds its way into local waterways is in large part determined by the amount of impervious cover the land contains. With less absorption of rainwater into the ground, the increased runoff moves faster and collects more pollutants from the surface, which promotes erosion, damages stream banks, and in turn dumps sediment into streambeds.

N.J.A.C. 7:8 spells out guidelines for how to manage stormwater more effectively and also how to incorporate best management practices into the planning stages of project design. These standards now require stormwater detention capacity to hold and slowly release the runoff from storms that have a likelihood of occurring once every two, ten and one hundred years. Some sites may be able to achieve these standards through vegetative swales, and buffers, and landscaping to control non-point source pollution. Other sites may require the building of a stormwater basin. In these cases, where the development of structural stormwater facilities is necessary, the New Jersey Department of Environmental Protection's BMP guide should be consulted as it outlines alternatives and strategies to incorporate Best Management Practices into a project's site design. The potential alternatives include surface structures such as Bioretention Basins, Sand Filters, constructed wetlands, and Pervious Paving Systems. Generally, the utilization of surficial BMP's is preferred by the DEP due to the difficulties associated with maintaining and repairing subsurface structures. However, guidance on which BMP would be most suited for a particular site can be not only be found within the DEP's BMP Manual. but also on-line as the DEP has prepared a draft document entitled "Matching the BMP to Site and Watershed Conditions" at:
http://72.14.203.104/search?q=cache:lU5IILBHCZkJ:www.state.nj.us/dep/watershedmgt/DOCS/BMP_DOCS/chapter4.PDF

These BMP's are strongly encouraged to be incorporated into the City's existing stormwater management infrastructure to enhance groundwater recharge and reduce the amount of runoff that originates on site; thus improving both the quality and quantity of stormwater in Long Branch.

5.2 STORM DRAINS

The City of Long Branch has an annual Capital Improvement Program through which infrastructure improvements are designed and constructed. The construction or reconstruction of drainage best management practices, and stormwater management improvements are included in this program.

Further, to inform the public of the presence of storm drains, Long Branch has initiated a storm drain-labeling program. The Public Works Department will label all storm drain inlets that are along municipal streets with sidewalks, and all storm drain inlets within plazas, parking areas, or maintenance yards that are operated by the City. Additional support for the storm drain labeling program will be enlisted from volunteer organizations that are willing to participate. The City will use plastic labels ordered from das Manufacturing, Inc. (or a suitable substitute). The labels bear the message "No Dumping, Drains to Waterways", and will be applied using adhesive. The City of Long Branch has completed the labeling of 50% of the storm drain inlets and the program has continued as planned and is on schedule to be completed by April of 2009. During the annual catch basin cleaning program, the labels will be checked to ensure that they are still visible, those labels that are no longer visible will be replaced as soon as possible.

Long Branch has also initiated programs to more effectively maintain and manage its existing stormwater infrastructure. In accordance with the Sewage Infrastructure Improvement Act (SIAA) regulations, maps showing the location of the end of all MS4 outfall pipes that are operated by the City, and that discharge within the City's jurisdiction to a surface water body, have been prepared by T& M Associates, a consultant to the City of Long Branch. The maps show both the location and name of each outfall pipe, and have also been given an alphanumeric identifier that is noted on the map. In accordance with N.J.A.C. 7:22A-4.3, the scale of the map is 1:4800 (one inch=400 feet). Through the future, as new development and/or redevelopment changes the current storm sewer system through the creation of new outfalls, these maps have been, and will continue to be, updated accordingly.

Long Branch will also investigate the storm drains for illicit connections and will check outfall pipes for signs of scouring. The City will begin performing the initial inspection of outfall pipes within 18 months of the EDPA (by October 1,2005) and will complete the initial physical inspection of all outfall pipes within 60 months of the EDPA (April 2009). The City will use the NJ Department of Environmental Protection (NJDEP) Illicit Connection Inspection Report Form to conduct these inspections, and each of these forms will be kept within the SPPP records. Outfall pipes that are found to have dry weather flow or evidence of an intermittent non-stormwater flow will be investigated to locate the illicit connection. If the City is able to locate the illicit connection (and the connection is located within Long Branch), the responsible party will be cited, and the connection will be eliminated immediately. If an illicit connection is found to originate from another public entity, Long Branch City will report the illicit connection to the NJDEP.

As part of its illicit connection elimination program, the City is also checking outfall points for signs of scouring. All sites where scouring is observed will be placed on a prioritized list and repairs will be made in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey. Those repairs that do not need NJDEP permits for implementation may be done first. Each repair will be followed up to ensure that scouring has not resumed. This plan has been implemented and is an ongoing monitoring program.

Further, Long Branch will implement a stormwater facility maintenance program to insure that all stormwater facilities operated by the City's are functioning properly. The City will implement

an annual catch basin cleaning program to maintain catch basin function and efficiency. All catch basins will be inspected once a year. If, at the time of inspection, no sediment, trash, or debris is observed in the catch basin, then that basin will not be cleaned. All catch basins within Long Branch will be inspected annually, even if they had been found to be "clean" the previous year. At the time of cleaning, the catch basins will also be inspected for proper function and maintenance will be performed on those facilities that are not operating to capacity. The catch basin cleaning and maintenance will be recorded through the " Stormwater Facility Inspection and Maintenance Log", which will be submitted to the NJDEP annually.

5.3 STORMWATER BASINS

As most of the development in Long Branch occurred prior to the 1970's, the City's stormwater management system relies primarily on storm basins. However, there are two types of stormwater basins and both are present in Long Branch. The first are "detention basins", which are designed to stay dry between storm events, detain stormwater for a period of time, while releasing water at a slow and controlled rate. A second type of basin that is designed to manage stormwater flows is a "retention basin". These basins are designed to stay wet by retaining a permanent pool so as to mimic a natural pond or lake.

A number of the existing stormwater basins in Long Branch are suited to be retrofitted to accommodate more volume, or to improve the quality of stormwater that is dispended into the basin. As flooding and/or drainage issues arise in the City, due to their ability to improve water quality, maintain water quantity, and provide groundwater recharge, the retrofitting of stormwater basins may be initiated by the City itself, or included within an adopted Mitigation Plan which would allow applicants who are not able to meet the stormwater design standards on site, to provide mitigation by means of retrofitting a proximate stormwater basin. Through mapping, maintenance, and retrofitting, these coordinated stormwater basin operation and maintenance programs will enable the City to improve the way stormwater is managed in Long Branch

5.4 WATERSHED

The Watersheds and Hydrology in Watershed Management Area #12 Map, which is posted on the NJDEP's website at http://www.state.nj.us/dep/wmm/sgwqt/wat/area12-fig2.1-2htm, illustrates that the City of Long Branch is contained within the Shrewsbury River watershed, and is therefore contained in New Jersey Department of Environmental Protection Watershed Management Area#12.

To delineate watersheds on an even smaller scale, the United States Geological Service has developed a method for identifying and inventorying watersheds in the U.S. called the hydrologic unit code system. Through this system all U.S. watersheds have a name and a corresponding number, this number is called the hydrologic unit code (HUC) or watershed address. The term "HUC-14" is from the hydrologic unit code system for delineating and identifying drainage areas. The system starts with the largest possible drainage area (basin) and progressively breaks it down into smaller subdivisions (subbasins, watersheds and subwatersheds

respectively). These subdivisions are delineated and numbered in a nested fashion. A drainage area with a 14-digit address, or HUC-14, is a subwatershed of a larger watershed with 11 digits, or a HUC-11. There are 921 HUC-14 subwatersheds in New Jersey that average 8.5 square miles. There are 150 HUC-11 watersheds in New Jersey with an average size of 51.9 square miles. A statewide graphic depiction of the breakdown of these watershed areas is available at: http://www.nj.gov/dep/watershedmgt/hucmap.htm (Source: NJDEP – Division of Watershed Management).

Long Branch is located within the bounds of 4 different HUC-14 subwatersheds. These subwatersheds which have been identified as HUC-14 unit codes 0203014920020 (Atlantic Coast (Navesink River to Whale Pond), 0230104930010 (Atlantic Coast- Whale Pond to Shark River), 02030104090010 (Whale Pond Brook), and 02030104080030(Branchport Creek). These HUC-14 boundaries are illustrated within Figure 4-Wetlands and Waterways Map.

6.0 DESIGN AND PERFORMANCE STANDARDS

To minimize the adverse impact of stormwater runoff on water quality, water quantity and the loss of groundwater recharge in receiving water bodies, the City will adopt design and performance standards that comply with the stormwater management measures as presented in N.J.A.C. 7:8. The design and performance standards include amended language for the inclusion of maintenance requirements, and safety standards consistent with N.J.A.C. 7:8-6. The ordinances will be submitted to the County for review and approval within 24 months of the effective date of permit authorization (EDPA).

Further, it is the intention of the City of Long Branch to incorporate both structural and nonstructural stormwater management strategies as presented in N.J.A.C. 7:8-5 to the maximum extent practicable. Major developments must meet one of two standards for groundwater recharge (N.J.A.C. 7:8-5.4(a)2.): (1) maintain 100 percent of the average annual pre-construction groundwater recharge volume for the site or (2) infiltrate the increase in the stormwater runoff volume from pre-construction to post-construction for the two-year storm. For water quality (N.J.A.C. 7:8-5.5), stormwater management measures shall be designed to reduce the post-construction load of total suspended solids (TSS) in the stormwater runoff generated by the water quality design storm by 80 percent of the anticipated load from the major development.

To control stormwater runoff quantity impacts (N.J.A.C. 7:8-5.4 3.), a major development must also meet one of three design standards: (1) demonstrate at no point in time that the post-construction runoff hydrograph exceed the pre-construction runoff hydrograph, (2) demonstrate there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the 2, 10, 100-year storm event and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site, and (3) demonstrate the postconstruction peak runoff rates for the 2, 10 and 100-year storm events are 50, 75 and 80 percent, respectively, of the pre-construction runoff rates. However, for stormwater water runoff quantity requirement (3), stream encroachment standards (N.J.A.C. 7:13-2.8) will require for the 100-year storm event 75 percent of the pre-construction peak runoff rates. Prior to adoption, these ordinances will all be submitted to the Monmouth County Stormwater Technical Advisory Committee for review and approval within 24 months of the EDPA.

The second set of rules are the Phase II New Jersey Pollutant Discharge Elimination System Stormwater Regulation Program Rules (N.J.A.C. 7:14A). These Rules are intended to address and reduce pollutants associated with existing stormwater runoff. The Rules establish a regulatory program for existing stormwater discharges as required under the Federal Clean Water Act. These rules govern the issuance of permits to entities that own or operate "small" (those serving less than 100,000 customers), municipal separate storm sewer systems known as MS4s. Under this program permits must be secured by municipalities, certain public complexes such as universities and hospitals, and State, interstate and Federal agencies that operate or maintain highways. The permit program establishes the Statewide Basic Requirements that must be implemented to reduce nonpoint source pollutant loads from these sources. The Statewide Basic Requirements include measures such as: the adoption of ordinances (litter control, pet waste,

wildlife feeding, proper waste disposal, etc.); the development of a municipal stormwater management plan and implementing ordinance(s); requiring certain maintenance activities (such as street sweeping and catch basin cleaning); locating discharge points and stenciling catch basins; and a public education component

In compliance with these regulations, owners and operators of small MS4's are required to develop and implement a storm water management program designed to reduce the discharge of pollutants to the maximum extent practicable and protect water quality. Control measures are expected to include, at a minimum, the following components:

- Public education and outreach
- Public involvement and participation
- Illicit discharge detection and elimination
- Construction site storm water runoff control
- Post-construction storm water management in new development and redevelopment
- Pollution prevention/good housekeeping for municipal operations

6.1 IMPLEMENTING NON-STRUCTURAL STORMWATER MANAGEMENT STRATEGIES

The implementation of non-structural Best Management Practices are strongly encouraged to be added to the City's existing development regulations and applied to all new site design proposals. Whenever possible, the following nine strategies should be incorporated into site design:

- Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss;
- Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces;
- Maximize the protection of natural drainage features and vegetation;
- 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;
- Minimize land disturbance including clearing and grading;
- Minimize soil compaction;
- Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides;
- Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas; and
- 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.

Also, Chapter's 17 "Zoning" and 18 "Land Subdivision and Site Plan Application" of the City's Code was reviewed to evaluate the extent to which non-structural stormwater management techniques have been implemented into the site deign of a proposed development. This review included, but was not limited to existing provisions for Curbs and Gutters, Driveways and Accessways, Off-Street Parking and Loading, Streets, and Sidewalks. A summary of the of the pertinent provisions is presented below:

Chapter 345, Section 11A (Preservation of Natural Features) This section, which is within the City General Regulations stipulates that in order to preserve natural features that: "No structure shall be built within 100 feet of the top of the bank of a flowing body of water. No building shall be constructed on land subject to periodic overflow or on land, which has an average water table within two feet of the ground surface. No person shall strip, excavate or otherwise remove topsoil for sale or other use other than on the premises from which taken, except in connection with the construction or alteration of a building on such premises and excavating or grading incidental thereto, or except as hereinafter specified. Existing natural features such as trees, brooks, drainage channels and view shall be retained. Whenever such features interfere with the proposed use of such property, a retention of the maximum amount of such features consistent with the use of the property shall be required, whenever possible, at the discretion of the Planning Board." These provisions spell out many of the principles of Low Impact Development. However, the city many want to consider incorporating additional language to further promote nonstructural BMP's to preserve natural features such as erosion and sediment loss; disconnect the flow of runoff over, etc.

Chapter 300 Section 11G. (Required Improvements-Drainage) This section outlines the acceptable calculations, methods and material to utilize when constructing stormwater piping and catch basins.

Chapter 345 Section 17 (Floodplain Regulations) This section outlines the City of Long Branch's Floodplain Ordinance. This section regulates development within both the "floodplain" and the "flood hazard area" which have been delineated by the USACE and the Town Engineer.

Chapter 300 Section 11 (Additional Drainage Criteria) This section, which was adopted to supplement Section 11G outlines additional provisions for land development proposals to adhere to. The requirements state that "All basins shall be designed for a twenty-five-year storm capacity and be able to maintain existing flows for the two-, five- and ten-year storms. Basins shall be designed using the Modified Rationale for sites 15 acres or less and TR 55 for those over 15 acres. Existing conditions will be calculated assuming the site is unpaved. Emergency overflows shall be provided. The site grading shall be such that the site floods before the public road system. Major trunk lines shall be designed for at least a fifty-year storm." Further, special provisions are established for upland areas. These include that "The applicant shall provide the calculations showing the capacity of the downstream system to adequately handle the additional flow. Detention requirements will be required on a project-to-project basis upon the recommendation of the City Engineer, based on the capacity calculations. The site shall be designed to handle a twenty-five-year storm." These standards will be amended when the City adopts amended stormwater control ordinances per N.J.A.C. 7:8.

Chapter 345 Section 42 (Off-Street Parking Regulations) This section of the ordinance outlines screening provisions, and recommends for screening areas that accept stormwater to be comprised of native vegetation. Within residential districts a (9x18) foot parking space is outlined. The minimum number of parking spaces required for commercial and retail uses are also outlined. These provisions are encouraged to be examined to possibly reduce the required ratio and incorporate shared parking on a broader scale (shared parking an option for "projects of special community benefit" Chapter 345 Section 93-Tax Incentives).

Chapter 300 Section 18 (Additional Drainage Criteria) This section stipulates that the applicant shall, to the extent practical, minimize impervious areas and use porous pavement and porous landscaping. The City is encouraged to consider revising the ordinance to promote the utilization of curb cuts or flush curbs in screening areas and, if applicable, to disconnect large existing areas of impervious cover to act as stormwater filtration and groundwater recharge devices.

In addition, Appendix A provides a model ordinance that has been provided by the NJDEP to assist municipalities in drafting stormwater control ordinances that comply with the State's newly adopted stormwater management design and performance standards. Following the adoption of this plan a new Stormwater Management Control Ordinance per the NJDEP's new Stormwater Management Rules will be prepared and adopted by the City. A number of additional provisions relating to stormwater basin fees and maintenance, design standards pertaining to both structural and nonstructural methods that must be incorporated into a projects design, safety standards for stormwater basins, and maintenance and repair fees and responsibility will all be included within the amended ordinance. Upon completion, the ordinances will then be sent to the Monmouth County Stormwater Technical Advisory Committee for review and approval within 24 months of the EDPA. A copy will also be sent to the Department of Environmental Protection at the time of submission.

As illustrated above, Long Branch has adopted a number of provisions to incorporate nonstructural stormwater management practices into their Land Development Regulations. However, several sections of the existing ordinance may be examined to determine if additional nonstructural language is practicable. For example, the City's landscaping requirements may be

revised to require the use of native vegetation (which requires less fertilization and watering than non-native species). Also, buffer areas may be utilized for stormwater management to disconnect impervious areas and to filter and treat stormwater. Secondly, design standards may be amended so as to promote the use of pervious paving materials along sidewalks, driveways, and parking areas. Although amendments may be made, the City's existing provisions have been found to be compatible with N.JA.C. 7:8-5.3 (Nonstructural Stormwater Management Strategies).

6.2 IMPLEMENTING STRUCTURAL STORMWATER MANAGEMENT STRATEGIES

As mentioned earlier, the NJDEP has implemented more rigid regulations regarding the volume, rate, and quality of stormwater originating on a new development site. Some sites may be able to achieve these standards through vegetative swales, and buffers, and landscaping to control non-point source pollution. Other sites may require the building of a stormwater basin. In these cases, where the development of structural stormwater facilities is necessary, the New Jersey Department of Environmental Protection's BMP guide should be consulted. The structural BMP's utilized in low impact development concentrate on the following practices to be utilized in site development in conjunction with the non-structural methods described above:

- Bio-retention Systems – A bioretention system consists of a soil bed planted with native vegetation located above and underdrained sand layer. It can be configured either as a basin or a swale.
- Constructed Stormwater Wetlands – Constructed wetlands are wetlands systems designed to maximize the removal of pollutants from stormwater runoff through settling and both uptake and filtering by the vegetation.
- Dry Wells - A dry well is a subsurface storage facility that receives and temporarily stores stormwater runoff from roofs and structures. Discharge of the accumulated stormwater from a dry well occurs through infiltration into the surrounding soils.
- Extended Detention Basins - An extended detention basin is a facility constructed through excavation or embankments that provides temporary storage of stormwater runoff. It has an outlet structure that detains runoff inflow and allows for controlled outflow to aid in mitigating stormwater flows from development. Usually this type of structure is utilized to provide both water quantity and water quality mitigation.
- Infiltrative Basins – Infiltration Basins are similar to detention basins in that they both temporarily store stormwater runoff generated from development project. The principal outlet to this type of basin is not a constructed outlet structure, but rather the highly permeable soils allowing for infiltration into the surrounding subsoils.
- Manufactured Treatment Devices – A manufactured treatment device is a pre-fabricated stormwater treatment structure utilizing settling, filtration, absorptive materials, vortex separation, vegetative components, and/or other appropriate technology to remove pollutants from stormwater runoff.
- Pervious Paving Systems – Pervious pavement utilizes paving material which allows for stormwater to infiltrate through the pavement rather than accumulate as is the case with standard paving material. Pervious pavement utilizes void areas within the paving material to provide for this permeable feature.

- Sand Filters – A sand filter consists of a forebay and an underdrained sand bed. Runoff entering the sand filter is conveyed first through the forebay, which removes trash, debris and coarse sediments, and then infiltrates through the sand bed to an outlet pipe at the bottom of said filter.
- Vegetative Filters – A vegetative filter is an area designed to remove suspended solids and other pollutants from stormwater runoff flowing through a length of vegetation, called a vegetative filter strip. The vegetation in a filter strip can range from turf grass to woody vegetation.
- Wet Ponds - A wet pond is a facility constructed through excavation or embankments that provides both permanent and temporary storage of stormwater runoff. It has an outlet structure that creates a permanent pool and detains and attenuates runoff inflows promoting the settlement of pollutants.

Further, all structural stormwater management measures (structural BMP's) shall be designed according to the following conditions:

- They should 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).
- They should 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 be 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 N.J.A.C. 7:8-7.D.
- They should be designed, constructed, and installed to be strong, durable, and corrosion resistant. Measures that are consistent with the relevant portions of the Residential Site Improvements Standards at N.J.A.C. 5:21-7.3, 7.4, and 7.5 shall be deemed to meet this requirement.
- 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.
- Stormwater management basins shall be designed to meet the minimum safety standards for stormwater management basins at Section N.J.A.C. 7:8-7.
- 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 this subchapter.
- 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.

- In order to ensure adequate long term operation as well as preventative and corrective maintenance of stormwater management measures and structural BMP's, the designers of such facilities should submit to the municipality a *Maintenance Plan* indicating specific maintenance tasks and schedules as indicated in N.J.A.C. 7:8-5.8 "Maintenance Requirements". This maintenance plan will require the ultimate user of said structural BMP's to provide an annual certification that the stormwater management measures approved are functioning as designed and that the proper maintenance and inspection of said measures have been performed. Random spot inspections by the municipality will be conducted to ensure compliance along with appropriate enforcement actions such as fines to be levied should non-compliance result.

By adhering to the State's newly adopted design standards, the BMP's engineered for each proposed development project will serve to improve stormwater quality, enhance groundwater recharge, and reduce stormwater runoff. Combined, these methods will serve to improve the environment and protect the public interest by minimizing the risk of flooding and maintain the City's water supply through the future.

6.3 PLAN CONSISTENCY

Currently, no land within Long Branch is contained within the bounds of an adopted a Regional Stormwater Management Plan (RSWMP) and at this time, no Total Maximum Daily Loads (TMDL's) have been developed for waters within the City. Therefore, this plan does not need to be consistent with any Regional Stormwater Management Plans, nor any TMDL's. However, if more stringent stormwater management measures were put to be put in place through the adoption of either one of these items, then this MSWMP would be amended to incorporate the newly adopted standards.

As it reinforces the principles and design standards that have already been adopted in the State of New Jersey's Residential Site Improvement Standards (RSIS), this MSWMP is consistent with the RSIS (N.J.A.C. 5:21) and the City will utilize the most current update of the RSIS in the stormwater management review of residential areas. Further, major development must meet the established design and performance standards set forth in the Soil Erosions and Sediment Control Act as all new development and redevelopment plans must comply with New Jersey's Soil Erosion and Sediment Control standards. During construction activities, municipal inspectors will observe land disturbance as well as on-site soil erosion and sediment control measures and will report any inconsistency to the Freehold Soil Conservation District. Lastly, the City's Stormwater Control Ordinance ensures compliance with the Safety Standards for Stormwater Management Basins within N.J.A.C. 7:8-6.

The ecologically sensitive measures that are being pursued through this plan and other City initiatives are consistent with the State Plan. As the entire City of Long branch has been designated as a (PA1) Metropolitan Planning Area, the goals and objectives outlined within this plan will serve to encourage compact redevelopment of an appropriate scale where land is suited for development to integrate environmentally sensitive stormwater management techniques into

the site design of a land development project, to then in turn, protect environmentally sensitive lands from development.

Further, the stormwater management methods that are discussed within this Municipal Stormwater Management Plan are consistent with and incorporate the objectives and polices of the Monmouth County Growth Management Guide, which was adopted by the Monmouth County Planning Board in December 1995.

6.4 MITIGATION PLAN

OVERVIEW

A municipal mitigation plan is an element of the Municipal Stormwater Management Plan that allows municipalities to grant a waiver from the design and performance standards for stormwater runoff quality, stormwater runoff quantity, and groundwater recharge established in N.J.A.C. 7:8-5, and adopted into the municipal stormwater control ordinance. The existence of a mitigation plan does not preclude the requirement that an applicant meet the design and performance standards for any one of the three key stormwater requirements, namely maintaining pre-development recharge, stormwater runoff quantity reduction and stormwater runoff quality. Instead, this mitigation plan, once it has been approved by the Monmouth County Planning Board, will allow the City of Long Branch, in limited circumstances to waive the strict compliance with one or more of the performance standards where full compliance cannot be reasonably accommodated on site. In addition, approval of a waiver or exemption from one of the three criteria outlined above provides no guarantee that, if requested, an exemption or waiver will be granted for either or both of the remaining criteria. However, under no circumstances shall Long Branch waive the Special Resources Protection Area (SRPA) established under the stormwater management rules at N.J.A.C. 7:8-5.5 (h).

To date, the City of Long Branch has required full compliance for all development approved by the Planning Board and Board of Adjustment. Any relief sought an applicant by either Board will be analyzed on a case-by-case basis.

Supporting evidence for an exemption or waiver shall be prepared in the form of a "stormwater management report" which will be signed and sealed by a New Jersey licensed professional engineer. The report shall include at a minimum:

- Detailed hydrologic and hydraulic calculations identifying the sizing criteria for each BMP and the stormwater collection system based upon the anticipated peak flow and/or volume.

- A map of the planned project showing existing conditions with drainage boundaries and land features, including delineated wetlands, proposed improvements, including all BMPs, grading, utilities, impervious features, and landscaping.

- Construction details for each BMP with appropriate contact information.

When applying for a waiver, the applicants professional engineer must first demonstrate that on-site compliance is either a) not possible, or b) possible but would result in tangible negative environmental or structural impacts. Such impacts may include:

- If the strict application of the regulations would result in a reduction of open space and/or undisturbed buffer areas. It is important to note that in this situation, the applicant must demonstrate that such reductions are caused by compliance with State and local regulations and not an attempt to maximize buildable area.

- The degradation of groundwater quality due to the infiltration of poor quality runoff. For example, if runoff from a shopping plaza with heavy traffic volume will be directed to a protected water supply aquifer to achieve compliance, alternative recharge locations may be more practical and environmentally sound.

- The modification to the elevation of the groundwater table due to rapid infiltration of stormwater will have demonstrable negative impacts on local structures and/or local groundwater quality. For example, rapid infiltration in a highly pervious soil near a basement may cause flooding and settlement; and also

- Flooding due to changes in the time of peak for a storm attenuated in compliance with *N.J.A.C. 7:8* and the *New Jersey Stormwater Best Management Practices Manual.* Despite the requirement for peak reductions to be applied to the 2-year, 10-year and 100-year events, peak runoff from a sub-basin of a HUC-14 may actually experience increases due to changes to peak timing.

An applicant may also propose a mitigation project on a site that has not been identified in this mitigation plan. However, in each circumstance the selection of a mitigation project must incorporate the following requirements:

- The project must be within the same area that would contribute to the receptor impacted by that project. If there is no specific sensitive receptor impacted, then the location of the mitigation project may be located anywhere within the municipality, preferably at a location that would provide the greatest benefit.

- Legal authorization must be obtained to construct the project at the location selected. This includes the maintenance and any access needs for the project throughout its operation.

- The mitigation project should be located close to the original development project. If possible, the mitigation project should be located 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 a project for which a waiver is obtained discharges to a tributary, but the closest location discharges to the main branch of a waterway, it may be more beneficial to identify a location discharging to the same tributary.

- 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.

- The project location must demonstrate no adverse impacts to other properties.

- For projects addressing the groundwater recharge performance standard, a mitigation project site upstream of the location of the actual project site is preferable to a downstream location.

- Mitigation projects that address stormwater runoff quantity can choose to provide storage for proposed increases in runoff volume, as opposed to a direct peak flow reduction.

- Mitigation projects that address stormwater runoff quality can choose to address another pollutant other than TSS, which has been demonstrated to be of particular concern, such as streams that have been listed as an impaired waterbody for other pollutants. However, care must be taken to ensure that waivers that are granted for the TSS requirements do not result in the impairment of an existing unimpaired area.

All mitigation plans and reviews should consider the location of the mitigation project in relation to the property where the projected damage will occur. For example, if a project were unable to achieve the stormwater quantity performance standards upstream of an inadequate culvert, a mitigation project downstream of that culvert would not offer similar protection. Or, if the groundwater recharge is the major contributor to a wetlands area, the new project should continue to provide recharge to the wetlands area.

Also, in environmentally critical areas, the quality of stormwater that is being directed to infiltration facilities should be assessed. If the quality of stormwater that would be infiltrated following development poses a threat to groundwater supplies, off-site mitigation should be considered. Off-site mitigation should also be undertaken when on-site recharge is precluded by site conditions, or when stormwater quality assessments indicate that on-site stormwater infiltration will degrade ambient groundwater quality in environmentally sensitive areas. Environmentally critical areas include locations where groundwater is classified by the State as holding either special ecological significance, wellhead protection areas, areas of known groundwater contamination, or areas of on-going groundwater remediation. Groundwater recharge is of particular concern in areas discharging to Category 1 (C1) groundwater or in wellhead protection areas. Options for off-site groundwater recharge include:

- Retrofitting an existing stormwater basin
- Reducing the amount of impervious cover on site by adding vegetation or incorporating pervious paving materials
- Splitting flows to isolate high quality runoff and constructing infiltration basins to receive only the high quality runoff
- Acquiring upland recharge areas

SENSITIVE RECEPTORS

Within Figure 8, entitled Sensitive Receptor Map, Long Branch has indicated the sensitive receptor areas within the City that are especially susceptible to stormwater changes. As many of the mitigation measures that will be employed to these sensitive receptor areas are in the planning stage, when appropriate, Long Branch will allow developers to fund studies to plan and engineer the most suitable mitigation measure for each project site, and each performance standard. An applicant may also provide compensatory mitigation through the contribution of funds when, due to the small amount of the waiver given for the performance standard, it is not practical to provide a full mitigation project. In these circumstances, the receipt of financial contributions shall be considered the completion of mandatory mitigation for that project. However, in these instances, the City of Long Branch itself would be responsible to ensure that mitigation occurs based on the collection of these funds. If such a situation were to arise, a detailed description of the circumstances, funding amount and performance standard that was mitigated will be provided in Long Branch's annual NJPDES report.

MITIGATION CRITERIA

The mitigation requirements listed below offer a hierarchy of options that are intended to offset the effect on groundwater recharge, stormwater quantity control, and/or stormwater quality control to an equal or greater extent than was created by the granting of a waiver or exemption from the stormwater management requirements.

The mitigation criteria are listed below in order of preference:

1) **Identify, design, and implement a compensating measure to mitigate impacts-** The preferred option is to identify and develop a compensating mitigation project in the same drainage area as the proposed development. In these cases, the applicant will address the same issue within the design and performance standards for which the variance or exemption is being sought, and demonstrate that the proposed mitigating measures provide equal or greater compensation to offset the non-complying aspect of the stormwater management system on site. The developer must also ensure the long-term maintenance of the project as outlined in Chapters 8 and 9 of the NJDEP Stormwater BMP Manual. If the City agrees to control a new stormwater management facility, arrangement in the form of an escrow account will be made to stipulate the payment amount, schedule, and long term responsibilities of the facility to ensure that it functions to capacity.

2) **Complete a project identified by the municipality as equivalent to the environmental impact created by the exemption or variance-** If a suitable site cannot be located in the same drainage area as the proposed development, as discussed in option 1, the mitigation project may provide measures that are not directly equivalent to the impacts for which the variance or exemption is being sought, but that addresses the same issue to an equal or greater extent. For example if a variance is given because the 80% TSS requirement has

not been met, the selected project may address water quality impacts that increase the siltation of a waterbody within the applicable HUC 14 subwatershed.

It shall be the responsibility of the applicant that is requesting hardship to identify, quantity, and complete a compensatory mitigation alternative that will compensate for the relief that is being sought form the stormwater design and performance standards to an equal or greater extent.

First and foremost, the applicant is encouraged to identify and proposes a compensatory mitigation project within the confines of the drainage area within which the proposed project is located. However, an appropriate mitigation measure may take place within the larger confines of a proposed projects HUC-14 subwatershed area, or another portion of the City, rather than the contributing area if the Long Branch Planning Board or Zoning Board of Adjustment finds that the mitigation will equally protect public health, safety and welfare, the environment, and public and private property.

3) **Provide funding for municipal projects that would address existing stormwater impacts-** The third and least preferable stormwater mitigation option is for the applicant to provide funding or partial funding for an environmental enhancement project that has been identified in the Municipal Stormwater Management Plan, or towards the development of a Regional Stormwater Management Plan. The contributed funds must be equal or greater than the cost to implement the required on-site stormwater measure for which relief is requested including the cost of land, easements, engineering design, and long-term maintenance. However, with this option, the City, and not the applicant is ultimately responsible for the design, property acquisition, construction, construction management, maintenance (short-term and long-term) and follow-up study, unless that project and its prospective costs have been outlined within this Mitigation Plan.

REQUIREMENTS FOR MITIGATION PROJECTS

Whether the applicant is proposing the mitigation project, or Long Branch has identified the project within this Mitigation Plan, the following requirements for mitigation must be included in the project submission.

- **Impact from noncompliance-** The applicant must provide a table to show the required values, and the values provided in the project, and include an alternatives analysis that demonstrates that on-site compliance was maximized to the greatest extent practicable.

- **Narrative and Supporting Information Regarding the Need for the Waiver-** The waiver cannot be granted for a condition that was created by the applicant. If the applicant can provide compliance with the stormwater rules through a reduction in the scope of the project, the applicant has created the condition and a waiver cannot be issued. The applicant must provide a discussion and supporting information of the site conditions that would not allow the construction of a stormwater management facility to provide compliance with these requirements, and/or if the denial of the application would

impose an extraordinary hardship on the applicant brought about by circumstances peculiar to the subject property. The site conditions to be considered are soil type, the presence of limestone, acidic soils, a high groundwater table, any other unique conditions that would create an unsafe design, as well as conditions that may provide a detrimental impact to public health, welfare, and safety.

- **Sensitive Receptor**- Identify the sensitive receptor related to the performance standard for 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**- The mitigation project submission must list the party or parties responsible for the construction or maintenance of the mitigation project. Documentation must be provided to demonstrate that the responsible party is aware of, has authority to perform, and accepts the responsibility for the construction and the maintenance of the mitigation project. Under no circumstances shall the responsible party be an individual single-family homeowner.

- **Maintenance**- The applicant must include a maintenance plan that addresses the maintenance criteria at N.J.A.C. 7:8-5 as part of a mitigation plan. In addition, if the maintenance responsibility is being transferred to Long Branch, or another entity, the entity responsible for the cost of the maintenance must be identified. Long Branch provides applicants with the option of conveying the mitigation project to the City, provided that the applicant funds the cost of long-term maintenance of the facility in perpetuity.

- **Permits**- The applicant is solely responsible to obtain any and all necessary local, State, or other applicable permits for the identified mitigation project or measure. The applicable permits must be obtained prior to the municipal approval of the project for which the mitigation is being sought.

- **Construction**- The applicant must 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 application permit 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 the City's own projects must be completed within six months of the completion of the municipal project, in order to remain in compliance with Long Branch's NJPDES General Permit.

APPENDIX A

NJDEP MODEL 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 the following major developments that require preliminary or final site plan or subdivision review:

   a. Non-residential major developments; and

   b. Aspects of residential major developments that are not pre-empted by the Residential Site Improvement Standards at N.J.A.C. 5:21.

2. This ordinance shall also be applicable to all major developments undertaken by said municipality.

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 to be 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.

"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. 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, [*insert name of municipality*], 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.

"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 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 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.

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.

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, 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.

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 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 management measures shall only be required for water quality control if an additional 1/4 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 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

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		

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.

Note: The provisions of this section 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 Sections 8.B.1, 8.B.2, and 8.B.3 for trash racks, overflow grates, and escape provisions at outlet structures.

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

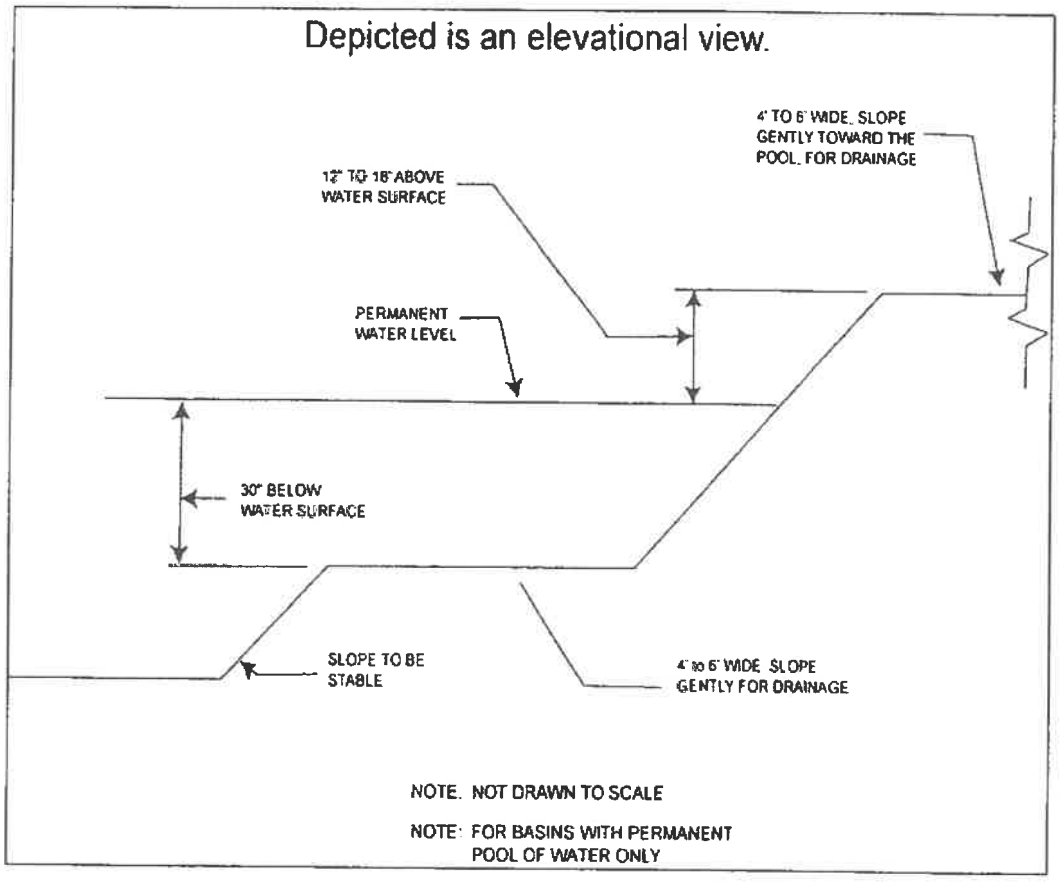
approximately two and one-half feet below the permanent water surface, and the second step shall be located one to one and one-half feet above the permanent water surface. See Section 8.D for an illustration of safety ledges in a stormwater management basin.

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 Checklist for the Site Development Stormwater Plan at Section 9.C below 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 [*specify number*] copies of the materials listed in the checklist 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 the engineer retained by the Planning and/or Zoning Board (as appropriate) to determine if all of the checklist requirements have been satisfied and to determine if the project meets the standards set forth in this ordinance.

C. Checklist 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 municipal engineer, 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 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.

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, 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.

Note: It may be appropriate to delete requirements in the maintenance and repair plan that are not applicable if the ordinance requires the facility to be dedicated to the municipality. If the municipality does not want to take this responsibility, the ordinance should require the posting of a two year maintenance guarantee in accordance with N.J.S.A. 40:55D-53. Guidelines for developing a maintenance and inspection program are provided in the New Jersey Stormwater Best Management Practices Manual and the NJDEP Ocean County Demonstration Study, Stormwater Management Facilities Maintenance Manual, dated June 1989 available from the NJDEP, Watershed Management Program.

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 municipal engineer 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.

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 who erects, constructs, alters, repairs, converts, maintains, or uses any building, structure or land in violation of this ordinance shall be subject to the following penalties: [*Municipality to specify*].

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

MONMOUTH COUNTY HEALTH DEPARTMENT WATER QUALITY TESTING RESULTS

The Monmouth County Department of Health (MCHD) monitors 62 representative stations throughout Monmouth County. Stations are sampled quarterly for fecal coliform and twice annually for ammonia and total phosphorus. The MCHD Environmental Laboratory analyzes the samples. Standards are: Fecal Coliform - 200 fecal colonies/100 ml, Ammonia - 0.05 mg/L, Phosphorus - 0.1 mg/l

LANE'S CREEK, LONG BRANCH

Collection Date	Fecal	Ammonia	Phosphorus	Ph	TSS	Turbidity	SWQS	Salinity	Temperature (Celsius)
6/30/2005	7100			7.06	27.2	37.2	SE1	5.5	23
3/22/2005	10	0.22	0.035	8.06	16.8	7.06		19.1	8.9
11/16/2004	20		0.18	7.48	34.8	18.8		14.6	7.7
8/19/2004	60			7.17	20.8	14.3		20.1	25.5
5/27/2004	310	0.23	0.04	7.54	7.2	8.6		1.8	21
3/18/2004	80			7.74	10.8	14.2			
9/29/2003	80	< 0.1	0.06	7.4	8.8	17.1			
6/26/2003	600			7.26	6.8	8.96			
3/26/2003	30	0.24	0.07	7.61	8.4	11.9			
12/3/2002	70			7.5	45.6	15.4			
10/9/2002	230	< 0.05	0.39	7.93	40.8	14.7			
6/4/2002	2070			7.6	1	12.3			
3/5/2002	< 10	0.28	0.08	7.4	8				
12/11/2001	600			7.39	12				
10/2/2001	960	0.48	0.08	7.44	10				
6/5/2001	2480			7.79	8				
3/13/2001	1200	0.25	0.14	7.21	16				
12/5/2000	550								
10/3/2000	230	0.42	0.128						
6/6/2000	> 600								
3/7/2000	20	0.35	0.08						
12/7/1999	1560								
10/5/1999	2380	0.12	0.09						
6/8/1999	680								
3/2/1999	20	< 0.03	0.07						

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MANNAHASSET CREEK, LONG BRANCH

Collection Date	Fecal	Ammonia	Phosphorus	Ph	TSS	Turbidity
11/16/2004	140		0.1	7.48	18.4	6.94
8/19/2004	10			7.59	10	6.58
6/3/2004	160	0.1	0.15	7.79	14	5.98
3/18/2004	< 10			8.24	47.2	5.61
9/25/2003	990	< 0.1	0.17	7.8	20.8	9.23
6/26/2003	70			8.02	41.6	13.4
3/31/2003	10	0.28	0.14	7.56	10.8	6.3
12/3/2002	< 10			8	15.2	8.4
10/8/2002	10	2	0.25		85.6	8.3
6/4/2002	370			7.7	42	7.8
12/11/2001	700			8.14	34	
10/2/2001	1150	< 0.07	0.12	7.57	8	
6/5/2001	440			7.5	12	
3/13/2001	750	1.55	0.11	7.71	14	
12/5/2000	10					
10/3/2000	290	0.32	0.24			
6/6/2000	2400					
3/7/2000	< 10	< 0.05	0.08			
12/7/1999	1000					
10/5/1999	2950	0.28	0.131			
6/8/1999	10					
3/2/1999	< 10	0.14	0.27			

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TROUTMAN'S CREEK, ATLANTIC AVENUE, LONG BRANCH

Collection Date	Fecal	Ammonia	Phosphorus	Ph	TSS	Turbidity
11/16/2004	70		0.1	7.81	12	10.3
8/19/2004	10			8.28	15.2	7.51
5/27/2004	80	0.1	0.11	7.78	34	5.77
3/18/2004	1			7.91	15.2	15.4
9/25/2003	260	< 0.1	0.17	7.9	8.4	8.8
6/26/2003	290			8.63	9.2	5.93
3/26/2003	< 10	0.1	0.07	7.02	8.4	3.8
12/3/2002	< 10			8.1	9.2	4.3
10/9/2002	60	0.64	0.16	8.04	13.2	6.5
6/4/2002	< 10			8.4	44	16.8
3/5/2002	< 10	< 0.1	0.1	8.3	63	
12/11/2001	130			8.24	33	
10/2/2001	1180	< 0.07	0.16	7.65	6	
6/5/2001	10			7.93	14	
3/13/2001	460	0.14	0.09	7.93	57	
12/5/2000	< 10					
10/3/2000	90	0.14	0.13			
6/6/2000	140					
3/7/2000	30	0.16	0.07			
12/7/1999	2040					
10/5/1999	2170	< 0.03	0.183			
6/8/1999	200					
3/2/1999	20	0.18	0.07			

The Monmouth County Department of Health (MCHD) monitors 62 representative stations throughout Monmouth County. Stations are sampled quarterly for fecal coliform and twice annually for ammonia and total phosphorus. The MCHD Environmental Laboratory analyzes the samples. Standards are: Fecal Coliform - 200 fecal colonies/100 ml, Ammonia - 0.05 mg/L, Phosphorus - 0.1 mg/l

TROUTMAN'S CREEK, JOLINE AVENUE, LONG BRANCH

Collection Date	Fecal	Ammonia	Phosphorus	Ph	TSS	Turbidity
12/8/2004	1380		0.13	7.27	7.2	19.3
8/19/2004	560			8.12	19.2	10.3
5/27/2004	300	0.3	0.15	7.14	17.2	9.25
4/1/2004	6580			7.51	12.8	13.4
9/29/2003	1580	< 0.1	0.15	7.5	37.2	11.9
6/26/2003	110			6.95	2.4	7.36
3/26/2003	110	0.16	0.27	8.32	24.4	14.6
12/3/2002	10			7.7	11.6	10
10/9/2002	130	2.3	0.24	8.04	10	7.2
6/4/2002	1070			7.6	58	28.3
3/5/2002	40	0.6	0.14	7.3	14	
12/11/2001	580			7.35	11	
10/2/2001	860	0.1	0.08	7.33	4	
6/5/2001	1950			7.76	11	
4/2/2001		0.11	0.84			
3/13/2001	1120			7.12	17	
12/5/2000	640					
10/3/2000	320	0.35	0.16			
6/6/2000	2720					
3/7/2000	10	0.19	0.11			
12/7/1999	3240					
10/5/1999	2180	0.6	0.083			
6/8/1999	1660					
3/2/1999	230	0.45	0.1			

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MANNAHASSET CREEK, LONG BRANCH

Collection Date	Fecal	Ammonia	Phosphorus	Ph	TSS	Turbidity	SWQS	Salinity	Temperature (Celsius)
6/30/2005	1690			7.3	15.6	26.5	SE1	11.8	24
3/22/2005	10	0.15	0.04	8.44	24.8	3.91		14.3	10
11/16/2004	140		0.1	7.48	18.4	6.94		11.4	6.8
8/19/2004	10			7.59	10	6.58		20	24.9
6/3/2004	160	0.1	0.15	7.79	14	5.98		17	27.3
3/18/2004	< 10			8.24	47.2	5.61			
9/25/2003	990	< 0.1	0.17	7.8	20.8	9.23			
6/26/2003	70			8.02	41.6	13.4			
3/31/2003	10	0.28	0.14	7.56	10.8	6.3			
12/3/2002	< 10			8	15.2	8.4			
10/8/2002	10	2	0.25		85.6	8.3			
6/4/2002	370			7.7	42	7.8			
12/11/2001	700			8.14	34				
10/2/2001	1150	< 0.07	0.12	7.57	8				
6/5/2001	440			7.5	12				
3/13/2001	750	1.55	0.11	7.71	14				
12/5/2000	10								
10/3/2000	290	0.32	0.24						
6/6/2000	2400								
3/7/2000	< 10	< 0.05	0.08						
12/7/1999	1000								
10/5/1999	2950	0.28	0.131						
6/8/1999	10								
3/2/1999	< 10	0.14	0.27						

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LAKE TAKANASSEE, ELBERON

Collection Date	Fecal	Ammonia	Phosphorus	Ph	TSS	Turbidity	SWQS	Salinity	Temperature (Celsius)
6/28/2005	580			7	3.6	10.3	FW2NT	0.2	26.7
3/22/2005	10	0.25	0.011	7.14	5.6	8.88		0.02	10.9
12/8/2004	190		0.07	7.92	4.4	11.3		0.1	12.6
9/15/2004	470			9.21	2.8	6.04		0.1	24.9
5/27/2004	100	0.24	0.06	7.34	11.2	9.28		0.1	24.5
3/18/2004	50			7.08	10	12			
9/29/2003	1320	< 0.1	0.05	7.2	20	13.8			
6/26/2003	100			6.86	10.4	16.3			
3/26/2003	10	0.1	0.09	7.24	8.4	20.3			
12/3/2002	10			7.7	32	6.3			
10/9/2002	210	< 0.05	0.08	8.55	4	7.2			
6/4/2002	50			7.4	66	13.7			
3/5/2002	210	0.11	0.08	7.9	26				
12/11/2001	440			7.44	7				
10/2/2001	80	0.12	0.04	7.38	2				
6/5/2001	220			7.65	4				
3/13/2001	300	0.35	0.02	7	7				
12/5/2000	< 10								
10/3/2000	200	0.1	0.8						
6/6/2000	1560								
3/7/2000	20	< 0.05	0.04						
12/7/1999	440								
10/5/1999	830	0.27	0.04						
6/8/1999	160								
3/2/1999	50	0.23	0.06						

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BRANCHPORT CREEK, LONG BRANCH

Collection Date	Fecal	Ammonia	Phosphorus	Ph	TSS	Turbidity	SWQS	Salinity	Temperature (Celsius)
6/30/2005	3000			7.24	30.8	47.5	SE1	30.8	23
3/22/2005	10	0.14	0.057	7.69	16.8	10		14.5	12
11/16/2004	140		0.09	7.8	9.6	5.95		16	7.5
8/19/2004	1260			7.54	26.4	10.7		20.7	25.8
6/3/2004	1090	0.17	0.11	7.6	9.2	6.66		17.3	26.4
3/18/2004	10			7.6	10.4	16.9			
9/29/2003	470	< 0.1	0.15	7.9	36.8	6.86			
6/26/2003	780			7.13	5.6	7.34			
3/31/2003	50	0.23	0.1	7.13	15.2	8.1			
12/3/2002	< 10								
10/9/2002	60	0.96	0.2	7.82	17.2	7.6			
3/5/2002	10	0.14	0.27	8.2	67				
12/11/2001	1600			7.58	21				
10/2/2001	170	0.22	0.14	7.48	10				
6/5/2001	720			7.97	28				
3/13/2001	190	0.16	0.09	7.29	11				
12/19/2000	16								
10/3/2000	70	0.37	0.218						
6/6/2000	> 600								
3/7/2000	20	< 0.05	0.06						
12/7/1999	880								
10/5/1999	3220	0.15	0.166						
6/8/1999	1180								
3/2/1999	10	0.13	0.07						

APPENDIX C

2004 NEW JERSEY LIST OF INTEGRATED WATERBODIES

Waterbodies in the City of Long Branch That Have Been Included on New Jersey's 2004 Integrated List of Waterbodies

Sublist	Watershed Region	WMA	Station Name/Waterbody	Site ID	Parameters	Data Source
5	Atlantic Coast	12	Lake Takanassee-12	50	Phosphorus, Fecal Coliform	Monmouth Co HD
5	Atlantic Coast	12	Troutmans Creek at Atlantic Ave in Long Branch	47	Fecal Coliform	Monmouth Co HD
5	Atlantic Coast	12	Troutmans Creek at Joline Ave in Long Branch	62	Fecal Coliform	Monmouth Co HD
5	Atlantic Coast	12	Turtle Mill Brook-Tidal	R05	Fecal Coliform	Monmouth Co HD
5	Atlantic Coast	12	Whale Pond Brook at Larchwood Ave in Ocean	AN0477	Benthic Macroinvertebrates	NJDEP AMNET
1	Atlantic Coast	12	Whale Pond Brook at Route 35 in Eatontown	01407617, 31	Phosphorus, Temperature, Dissolved Oxygen, Nitrate, Dissolved Solids, Total Suspended Solids, Unionized Ammonia	NJDEP/USGS Data, Monmouth Co HD
4	Atlantic Coast	12	Whale Pond Brook at Route 35 in Eatontown	01407617, 31	Fecal Coliform	NJDEP/USGS Data, Monmouth Co HD
5	Atlantic Coast	12	Whale Pond Brook at Route 35 in Eatontown	01407617, 31	pH	NJDEP/USGS Data, Monmouth Co HD

APPENDIX D

NJDEP AMNET PROGRAM TESTING RESULTS

Station: AN0477
Whale Pond Brook, Larchwood Ave., Ocean County
Long Branch USGS Quadrangle
Date Sampled: 08/08/00

Family	Family Tolerance Value (FTV)	Number of Individuals
Tubificidae	10	48
Gammaridae	4	35
Lumbriculidae	8	8
BloodRed Chironomidae	8	4
Planariidae	4	2
Chironomidae	6	2
Planorbidae	6	1

Statistical Analysis

Number of Taxa: 7
Total Number of Individuals: 100
% Contribution of Dominant Family: 48.00 % (Tubificidae)
Family Biotic Index: 7.42
Scraper/Filterer Collector Ratio: 0.00
Shredder/Total Ratio: 0.00
E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 0
% EPT: 0.00
EPT/C: 0.00
NJIS Rating: 6
Biological Condition: Severely Impaired
Habitat Analysis: 108
Deficiency(s) noted: Significant Organic Pollution · Paucity of Clean Water Organisms

Observations

Streamwater: Slightly Turbid....Flow: Moderate....Width/Depth (ft): 15 / 1'
Substrate: Gravel/sand....StreamBank Vegetation/Stability: Shrubs/Poor
Canopy: Mostly Closed....Other: Suburban; storm sewers present, sewage odor;
Construction nearby, pumping station; iron precipitate
Water temp. 19.7 C/pH 6.3 SU/DO 6.8 mg/L /Cond. 127 umhos;

FIGURES