

Municipal Stormwater Management Plan

**Borough of Totowa
County of Passaic**

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Introduction

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for the Borough of Totowa (Borough) to address stormwater-related impacts. The creation of this plan is required by N.J.A.C. 7:14A-25 Municipal Stormwater Regulations. This plan contains all of the required elements described in N.J.A.C. 7:8 Stormwater Management Rules. The plan addresses groundwater recharge, stormwater quantity, and stormwater quality impacts by incorporating stormwater design and performance standards for new major development, defined as projects that disturb one or more acre of land. 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 in receiving water bodies. The plan describes long-term operation and maintenance measures for existing and future stormwater facilities.

A “build-out” analysis has been included in this plan based upon existing zoning and land available for development. The plan also addresses the review and update of existing ordinances, the Borough Master Plan, and other planning documents to allow for project designs that include low impact development techniques. The final component of this plan is a mitigation strategy for when a variance or exemption of the design and performance standards is sought. As part of the mitigation section of the stormwater plan, specific stormwater management measures are identified to lessen the impact of existing development.

Goals

The goals of this MSWMP are 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.

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

With respect to the requirement for the Borough to assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures, maintaining the integrity of stream channels and minimizing pollutants in stormwater runoff from existing developments, the NJDEP has mandated the adoption of a Stormwater Pollution Prevention Plan (SPPP). The SPPP provides an outline for continued annual performance with respect to the goals of the Municipal Stormwater Management Plan and must be certified annually.

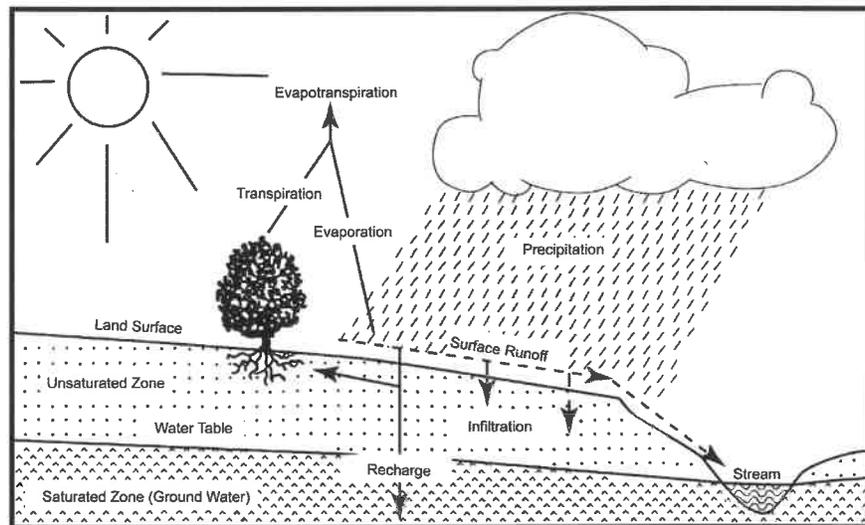
- The Borough will inspect all existing culverts and in-stream structures as part of its stormwater facility maintenance program and monitor structures that cause adverse drainage conditions. Proposed culverts and in-stream structures will be required to be designed in accordance with the most recent requirements of the NJDEP and current design standards.
- Existing stream channels will be monitored and maintained in accordance with all applicable NJDEP, County and Borough standards. Any requisite repairs will be completed using minimally intrusive repair methods, and native flora shall be utilized in revegetating eroded and disturbed areas.
- In order to minimize pollution, the Borough will complete the following:
 - investigate and eliminate illicit connections to existing stormwater control facilities,
 - label all storm drain inlets to state “Dump No Waste” on all castings,
 - enforce adopted ordinances regarding yard waste, illicit connections, litter and improper waste disposal,
 - retrofit all existing inlets with bicycle safe grates and curb openings with clear space no bigger than 2” across the smallest dimension,
 - maintain a street sweeping program in accordance with NJDEP requirements,
 - annually clean all storm drain inlets and manholes, and
 - provide educational material to the public regarding stormwater pollution prevention.

Stormwater Discussion

Land development can dramatically alter the hydrologic cycle (See Figure 1) of a site and, ultimately, an entire watershed. Prior to development, native vegetation can either directly intercept precipitation or draw that portion that has infiltrated into the ground and

return it to the atmosphere through evapotranspiration. Development can remove this beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates. Clearing and grading a site can remove depressions that store rainfall. Construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site. Impervious areas that are connected to each other through gutters, channels, and storm sewers can transport runoff more quickly than natural areas. This shortening of the transport or travel time quickens the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak faster and higher than natural conditions. These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel. Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease opportunities for infiltration that, in turn, reduces stream base flow and groundwater recharge. Reduced base flows and increased peak flows produce greater fluctuations between normal and storm flow rates, which can increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Finally, erosion and sedimentation can destroy habitat from which some species cannot adapt.

Figure 1: Groundwater Recharge in the Hydrologic Cycle



In addition to increases in runoff peaks, volumes, and loss of groundwater recharge, land development often results in the accumulation of pollutants on the land surface that runoff can mobilize and transport to streams. New impervious surfaces and cleared areas created by development can accumulate a variety of pollutants from the atmosphere, fertilizers, animal wastes, and leakage and wear from vehicles. Pollutants can include metals, suspended solids, hydrocarbons, pathogens, and nutrients.

In addition to increased pollutant loading, land development can adversely affect water quality and stream biota in more subtle ways. For example, stormwater falling on impervious surfaces or stored in detention or retention basins can become heated and raise the temperature of the downstream waterway, adversely affecting cold water fish species such as trout. Development can remove trees along stream banks that normally provide shading, stabilization, and leaf litter that falls into streams and becomes food for the aquatic community.

Background

The Borough encompasses a 4.1 square mile area in Passaic County, New Jersey. The Borough is highly developed, with minimal open space. As with most communities in the region, the Borough has been under residential and commercial development pressure. The Borough contains robust and viable commercial, industrial and business districts within which the Borough encourages redevelopment. The population of the Borough has decreased from 10,177 in 1990, to 9,892 in 2000. The current demand for new residential and commercial development have led to changes in the landscape that have most likely increased stormwater runoff volumes and pollutant loads to the waterways of the municipality. Figure 2 (Appendix A-1) illustrates the waterways in the Borough. Figure 3 (Appendix A-2) depicts the Borough boundary on the USGS quadrangle maps.

There are no Category One streams within the Borough.

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 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 on the AMNET data. The data is used to generate a New Jersey Impairment Score (NJIS), which is based on a number of biometrics related to benthic macroinvertebrate community dynamics. This information is available through the NJDEP and can be viewed at the following website: www.state.nj.us/dep/wmm/bfbm/downloads.html#neb. The Borough is bounded by the Passaic River to the south (along the border with West Paterson), and the Singac Brook and Naaktpunkt Brook to the northwest (along the border with Wayne). The Passaic River has been classified as highly impaired. The Naaktpunkt Brook has been classified with low impairment. The remaining water bodies within the Borough do not have an AMNET classification. In addition to the AMNET data, the NJDEP and other regulatory agencies collect water quality chemical data on the streams in the state. These data show that the in-stream total arsenic, copper, chromium, lead and mercury of the Passaic River frequently exceed the state's criteria. The NJDEP has received approval from the EPA on July 29, 2003 for the Passaic River at Little Falls to establish a Total Maximum Daily Load (TMDL) for fecal coliform.

A 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 nonpoint source, which includes stormwater runoff from 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 can be developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies may include improved stormwater treatment facilities, adoption of ordinances, revegetation of stream and drainage corridors, retrofitting stormwater systems, and other BMPs.

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. This combined report presents the extent to which New Jersey waters are attaining water quality standards, and identifies waters that are impaired. Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more TMDLs are needed. This information is available through the NJDEP and can be viewed at the following website: www.state.nj.us/dep/wmm/sgwqt/wat/integratedlist/integratedlist2004.html. Sublist 5 identifies the Passaic River as impaired with respect to the following: phosphorous, arsenic, cadmium, chromium, copper, lead, mercury, silver, thallium, zinc and cyanide. Sublist 5 identifies the Naachtpunkt Brook as impaired with respect to benthic macroinvertebrates. The NJDEP integrated list of waterways is continually updated and the Borough MSWMP shall be reviewed and revised, as necessary, to maintain consistency with the integrated list.

In addition to water quality problems, the Borough has exhibited water quantity problems including flooding and stream bank erosion, which are typical for the area. A majority of the flooding problems that exist are the result of portions of the Borough being located within the flood zone of the Passaic River. Isolated flooding conditions may be the result of culverts associated with road drainage in the Borough being undersized. During severe storm events, these undersized culverts do not have adequate capacity, thereby causing a backwater effect and flooding upstream. These culverts were either installed without proper design, before standardized drainage design requirements were adopted, or designed for significantly different hydrologic conditions (i.e., less impervious area) than presently exist in the Borough. Additionally, outfalls along the various water bodies and drainage channels within the Borough are not properly stabilized, and erosion occurs during high intensity rainfall events. As the impervious area has increased in the Borough, the peak and volumes of stream flows have also increased. The increased amount of water has resulted in stream bank erosion, which resulted in unstable areas and degraded stream habitats. Over time, the increased impervious area within the Borough has decreased groundwater recharge, decreasing base flows in streams during dry weather periods. Lower base flows can have a negative impact on in-stream habitat during the summer months. A map of the groundwater recharge areas is shown in Figure 4

(Appendix A-3). Wellhead protection areas, also required as part of the MSWMP, are shown in Figure 5 (Appendix A-4).

Design and Performance Standards

The Borough has adopted the design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5 to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving water bodies. The design and performance standards include the language for maintenance of stormwater management measures consistent with the stormwater management rules at N.J.A.C. 7:8-5.8 Maintenance Requirements, and language for safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. The ordinances have been submitted to the county for review and approval.

Building permits shall be issued, and Developer's Agreements shall be executed, upon approval of plans and specifications that are in strict conformance with the MSWMP, the Stormwater Control Ordinance and all other regulations. During construction of any regulated project, Borough inspectors will monitor the construction of the project to ensure that the stormwater management measures are constructed and function as designed and approved. Issuance of final certificates of occupancy, and release of posted performance and maintenance bonds, shall be subject to installation of all stormwater management measures as shown on the approved development plans, and as verified through the submission of as-built surveys prepared licensed professional surveyors.

In the event of non-compliance, the Borough may revoke building permits, issue stop-work orders, issue summonses and withhold certificates of occupancy, until such time that any non-compliance is remedied. Additionally, violations shall be reported to appropriate review and monitoring agencies, such as the NJDEP, Soil Conservation District and the County.

The requirements of N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins have been adopted as part of the Borough's Stormwater Control Ordinance. In connection with the review of new development and redevelopment applications, the Borough will ensure that all stormwater management basins are designed in accordance with the NJDEP mandated standards. Furthermore, during construction Borough inspectors will monitor the progress of work to ensure that the facilities are being installed in accordance with approved plans and specifications.

Plan Consistency

The Borough is not within a Regional Stormwater Management Planning Area; therefore this plan does not need to be consistent with any regional stormwater management plans (RSWMPs). If any RSWMPs are developed in the future, this Municipal Stormwater Management Plan will be updated to be consistent.

If a regional stormwater management plan is adopted, the Borough will coordinate with the lead implementing agency that is responsible for promoting coordination among the various implementing agencies and/or entities. The Borough will participate in tracking the implementation of the stormwater management measures selected; the long-term monitoring program developed and will encourage public involvement in plan implementation; and any other applicable responsibility identified in the implementation strategy for the RSWMP.

The Borough will amend their MSWMP and Stormwater Control Ordinance as necessary to implement an adopted regional stormwater management plan. All stormwater management plans and ordinances should be coordinated so as not to conflict with any adopted regional stormwater management plans related to the drainage areas to which the plans and ordinances apply. Furthermore, the Borough will implement an adopted regional stormwater management plan in accordance with the Residential Site Improvement Standards at N.J.A.C. 5:21.

In accordance with the Water Quality Management Planning Rules at N.J.A.C. 7:15-3.1, all projects and activities affecting water quality should be developed and conducted in a manner that does not conflict with applicable components of an adopted regional stormwater management plan. The agency having jurisdiction over a specific development application should not authorize through the issuance of a permit or approval, any project or activity that may conflict with applicable components of an adopted regional stormwater management plan.

Implementation strategies must be adopted by the Borough to comply with the TMDL for fecal coliform established for the Passaic River. When bacterial sources are easily identifiable, measures outlined below can be applied to reduce bacterial loading to meet water quality standards. When bacterial sources are not easily identifiable, load duration curves, which are part of the NJDEP TMDL document for the Passaic River, will be used in conjunction with bacterial source tracking, if necessary, to identify pathogen sources. Much of the stormwater discharged to the surface waters in question is discharged through “small municipal separate storm sewer systems” (MS4s) that are regulated under the Department’s NJPDES stormwater rules. The Borough is required to implement various control measures that should substantially reduce bacteria loadings, including measures to eliminate “illicit connections” of domestic sewage and other waste to the small MS4, adopt and enforce a pet waste ordinance, prohibit feeding of unconfined wildlife on public property, clean catch basins, perform good housekeeping at maintenance yards, and provide related public education and employee training.

The primary sources of fecal contamination in the Passaic River can be attributed to the following:

Non-Human Sources of Fecal Coliform

- Canada geese
- Pet Waste

- Stormwater basins
- Direct stormwater discharges to waterbodies

Human Sources of Fecal Coliform

- Malfunctioning or older improperly sized septic systems
- Failing sewage conveyance systems
- Improper garbage storage and disposal

Management measures are “economically achievable measures for the control of the addition of pollutants from existing and new categories and classes of nonpoint and stormwater sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint and stormwater source pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives” (USEPA, 1993). A combination of best management practices and direct remedies of illicit sources that are found through track-down monitoring will be used to implement the TMDLs identified by the NJDEP.

Short-term management strategies include stream bank restoration projects, ordinance development, catchbasin cleanouts and public education. While short-term management measures will begin to reduce sources of fecal coliform, additional measures will be needed to verify and further reduce or eliminate these sources. Some of these measures may be implemented now, where resources are available and sources have already been identified as causing the fecal impairment. Long-term management strategies that address fecal reduction related to sources identified in the NJDEP TMDL document for the Passaic River may be as follows:

Canada Geese

Because geese are free to move about and commonly graze and rest on large grassy areas associated with schools, parks, golf courses, corporate lawns and cemeteries, solutions are best developed and conducted at the community level through a community-based goose damage management program. USDA’s Wildlife Services program recommends that a community prepare a written Canada Goose Damage Management Plan that may include the following actions:

- Initiate a fact-finding and Communication Plan
- Enact and Enforce a No Feeding Ordinance
- Conduct Goose Damage Control Activities such as Habitat Modification
- Review and Update Land Use Policies
- Reduce or Eliminate Goose Reproduction (permit required)
- Hunt Geese to Reinforce Nonlethal Actions (permit required)

Procedures such as handling nests and eggs, capturing and relocating birds, and the hunting of birds require a depredation permit from either the USDA APHIS Wildlife Services or U.S. Fish and Wildlife Services. Procedures requiring permits should be a last resort after a community has exhausted the other listed

measures. The NJDEP provides extensive guidance on how to modify habitat to serve as a deterrent to geese as well as other prevention techniques such as education through signage and ordinances.

Stormwater Detention Basins

Stormwater detention basins may act as sources of fecal coliform due to the accumulation of geese and pet waste in basins. Under certain conditions, coliform will increase in numbers in basins. As a result, significant quantities of fecal coliform can be discharged during storm events. Specific management measures to reduce fecal coliform inputs to these detention basins include:

- Development of Stormwater Management Plan
- Establishment of “no mow” zones
- No feed ordinances for all waterfowl and wildlife and signage
- Retrofit of detention/retention basins to achieve water quality control
- Conduct regularly scheduled stormwater basin cleanout and maintenance, storm sewer inlet cleanouts and street sweeping programs

Pet Waste

Specific management measures to reduce pet waste include:

- Adoption of pet waste disposal ordinances
- Signage in parks and other public recreation areas
- Provide plastic bags dispensers in public recreation areas

If additional TMDLs are developed for waterways in the Borough, or for waterways within adjacent Municipalities that flow into the Borough, additional implementation strategies will be adopted by the Borough and may include the following: improved monitoring of stormwater runoff from point and non-point sources, adoption and enforcement of additional ordinances regulating products that may generate the pollutants, development of additional educational materials for residents, revegetation and stabilization of stream and drainage corridors, retrofitting stormwater systems, and other BMPs.

In all cases, implementation strategies will be coordinated with the agency that is responsible for developing the TMDL(s) for the subject waterway. The Borough will coordinate with the NJDEP, and any other agency having jurisdiction, for the appropriate methods for remediation of any pollutant loading of waterways.

The Municipal Stormwater Management Plan is consistent with the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21. The RSIS includes Appendix B, which is a direct copy of N.J.A.C. 7:8-5 and 6, to regulate stormwater management in connection with Subchapter 7 of the RSIS. As stated previously in MSWMP, under the

“Design and Performance Standards” section, the Borough has adopted a Stormwater Control Ordinance modeled after N.J.A.C. 7:8-5 and 6. Additionally, as will be mentioned later in the MSWMP under the section entitled “Nonstructural Stormwater Management Strategies”, the Borough design standard ordinances will be revised to specifically reference the most recent edition of the RSIS. The municipality will continue to utilize the most current update of the RSIS in the stormwater management review of residential areas, as required by law. Approval of residential projects within the Borough will require compliance with the terms and conditions of the MSWMP and the RSIS. Furthermore, this Municipal Stormwater Management Plan will be updated to be consistent with any future updates to the RSIS.

The Borough’s Stormwater Management Ordinance requires all new development and redevelopment plans to comply with the most recent requirements of New Jersey’s Soil Erosion and Sediment Control Standards. During construction, Borough inspectors will observe on-site soil erosion and sediment control measures and report any inconsistencies with the approved design and regulations to the local Soil Conservation District. These inspections will be coordinated with the regular inspections done by representatives of the local Soil Conservation District. Building permits will not be issued by the Borough until all applicable soil conservation approvals and plans have been submitted. Additionally, certificates of occupancy will not be issued until final approval from Hudson-Essex-Passaic Soil Conservation District have provided written final approval for projects under their jurisdiction.

The Borough is currently reviewing the Municipal Master Plan and will amend the plan to be consistent with this MSWMP, the Stormwater Control Ordinance, Passaic County requirements and any other applicable stormwater management regulation.

Groundwater Recharge

Ground water is a precious natural resource that is critical to both human and animal health. The potentially adverse impacts of land development on groundwater recharge have long been recognized. Land development activities that either cover permeable soils with impervious surfaces or reduce the soils’ permeability through disturbance and compaction will reduce the rate of groundwater recharge that occurs under pre-developed site conditions. Such reductions in groundwater recharge can adversely impact streams, wetlands, and other water bodies by reducing the volume and rate of base flow to them. Reductions in groundwater recharge to aquifers can also adversely impact the yield of water supply wells.

The Borough of Totowa is located within the Metropolitan Planning Area and is identified as a “Designated Town” (DT), as shown on the State Plan Policy Map. Pursuant to N.J.A.C. 7:8-5.4(a)2ii, groundwater recharge requirements do not apply to projects within the “urban redevelopment area”. Urban redevelopment areas are defined as lands within the Metropolitan Planning Area. However, proposed “major” development within the Borough will be encouraged to meet the groundwater recharge requirements of the NJDEP Stormwater Management Rules at N.J.A.C. 7:8. Accordingly,

any “major development” project should include nonstructural and/or structural stormwater management measures that prevent the loss of groundwater recharge at the project site.

Specifically, proposed major land development will be encouraged to comply with one of the following groundwater recharge requirements:

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

The developer is allowed to select which requirement to follow. Compliance with either of the above alternative requirements must be demonstrated through hydrologic and hydraulic analysis, which shall be reviewed and approved by the Agency having jurisdiction over the application. Ideally, the planning and design of the proposed site will have incorporated nonstructural measures to such an extent that the need for structural facilities is reduced to a practical minimum.

Source Water Quality Protection

Although there are no wellhead protection areas within the Borough, there are a small number of private wells located within the Borough. The MSWMP, Stormwater Control Ordinance and associated Borough Design Standards have been prepared to ensure the adequate protection of current or potential source waters. The provisions established in this MSWMP shall apply to proposed projects that may be identified as possible contaminating activities within areas that recharge source waters. Source water areas may be identified through drainage, groundwater and soils analyses and are considered to be essential to protection of existing or potential source waters from the effects of point and non-point source pollution or sedimentation. Methods for protection of source water shall include improved monitoring of stormwater runoff from point and non-point sources, adoption and enforcement of ordinances regulating products that may generate the pollutants, development of educational materials for residents, revegetation and stabilization of stream and drainage corridors, retrofitting stormwater systems, and other BMPs. The establishment of these regulations is intended to protect public health, insure the availability of safe drinking water, and prevent the degradation of the water supplies through the regulation of land uses and development within the Borough.

Currently, no source water quality protection plans exist for the Borough, adjacent municipalities or County. If a source water quality protection plan is adopted, the Borough will coordinate with the lead implementing agency that is responsible for promoting coordination among the various implementing agencies and/or entities. The Borough will participate in tracking the implementation of the water source protection measures selected; the long-term monitoring program developed and will encourage public involvement in plan implementation; and any other applicable responsibility identified in the implementation strategy for the water source protection plan.

Flood Damage Control

There are many alternatives that can be incorporated for flood damage reduction. The Borough utilizes a number of techniques to reduce flood damage throughout the municipality. Some of the primary options the Borough considers for flood damage reduction are structural methods, while others are termed non-structural methods. There are a variety of criteria that determine which methods are most appropriate to use when implementing a project. Two of the most important criteria are how much flood damage reduction benefit is gained by the total dollars invested in the project and making sure the project selected has appropriate regard for community and natural values.

- **Channel Modification**
Channel modification is a man-made change to a channel's characteristics, typically for the purposes of reducing flood damages by increasing its overall conveyance capacity. Capacity can be increased by widening and/or deepening the channel, reducing the friction by removing woody vegetation, or by lining the channel. It should be noted that none of the channels in the Borough's drainage infrastructure inventory are lined.
- **Stormwater Detention (Basin)**
A stormwater detention basin is another structural tool used by the Borough when implementing or approving a project. A stormwater detention basin is a large, usually excavated area of land, but can also consist of subsurface piping and structures, which is designed to receive and hold specified stormwater volumes. The detained stormwater then slowly drains over time out of the detention basin into receiving stormwater drainage facilities or water bodies.
- **Culvert Modification**
Culvert modification is another structural tool used in flood damage reduction. It involves the replacement, extension or modification of an existing culvert in order to remove an impediment to flow within a channel and/or accommodate channel modifications.

There are also other methods that are utilized in the planning process, implementation phases and maintenance of the drainage infrastructure. Those can be generally thought of as methods and materials that may help the Borough's flood damage reduction projects work more efficiently with regard for community and natural values.

An example of this would be the using Cellular Concrete Mats (or, CCM) in constructing a new channel. Rather than building a solid lining with concrete (or piping a channel), CCM is used to provide an armoring to guard against erosion while providing an opportunity to establish vegetation over its surface. Over time, holes in the interlocking blocks of concrete will naturally fill in with sediment, allowing vegetation to grow, which encourages other wildlife activity and enhances the overall aesthetics of the new channel.

Other examples of non-structural methods are the use of native plants and wildflowers that beautify a project area, protect the integrity of a channel's slopes by strengthening against erosion, and also reduce mowing cycles, saving taxpayer dollars in the long run.

Flood damage reduction methods also exist for the community-as-a-whole, as well as individual citizens.

- **Floodplain Management & Regulations**

The community is required to enforce regulations on land development projects to avoid increasing flood levels or flood hazards and to avoid creating new flood hazards. Any new development, or redevelopment, of areas within the Borough that are located within NJDEP regulated areas must be designed and completed in accordance with NJDEP standards. The Borough's ordinances and standard practices require that all work in these regulated areas be performed in strict accordance with applicable standards.

- **Flood Proofing**

Flood proofing is the modification of individual structures and facilities and their sites to keep floodwater from entering. Flood proofing of structures and property comes in a variety of methods, so the individual would have to consult with the appropriate regulatory agency before modifying a structure or property to prevent flood damage.

- **Disaster Preparedness**

Increased preparation for flooding not only lessens its impact, but may also mean the difference between life and death. Individuals living in a flood zone are encouraged to educate themselves through NJDEP publications and information brochures. The Borough has an inventory of flood prone areas and closely monitors weather events to prepare for any necessary emergency services, road closings and similar activities necessary for a flood event. Community emergency management plans and family flood preparedness plans are crucial to minimizing the misery caused by flood catastrophes.

Nonstructural Stormwater Management Strategies

The Borough has reviewed existing ordinances, and has provided a list of the sections in the Borough land use and zoning ordinances that are to be modified to incorporate nonstructural stormwater management strategies. These are the ordinances identified for revision. Once the ordinance texts are completed, they will be submitted to the county review agency for review and approval. A copy will be sent to the Department of Environmental Protection at the time of submission.

Chapter 141, Section XI, Design Standards, of the Borough Code were reviewed with regard to incorporating nonstructural stormwater management strategies. Several changes were made to these chapters to incorporate these strategies.

Section 141-56.C: Buffers requires buffer areas along all lot and street lines separating residential uses from arterial and collector streets and to separate nonresidential uses from either a residential use or residential zoning district line. The landscape requirements for these buffer areas in the existing section do not recommend the use of native vegetation. The language of this section was amended to require the use of native vegetation, which requires less fertilization and watering than non-native species. Additionally, language was included to allow buffer areas to be used for stormwater management by disconnecting impervious surfaces and treating runoff from these impervious surfaces. This section currently requires the preservation of natural wood tracts and limits land disturbance for new construction.

Section 141-56.D: Driveways describes the procedure for construction of any new driveway or access way to any street. This section was amended to allow the use of pervious paving materials to minimize stormwater runoff and promote groundwater recharge.

Section 141-56.J: Landscape and Shade Trees requires shade trees along all streets in residential zones and a minimum landscape area for nonresidential zones. This section was revised to provide language that restricts and otherwise controls the removal of mature trees throughout the Borough. This ordinance recognizes that the preservation of mature trees and forested areas is a key strategy in the management of environmental resources, particularly watershed management, air quality, and ambient heating and cooling. These sections was revised to set out a “critical footprint area” that extends a specific distance beyond the driveway and building footprint where clearing of trees should not occur. This complies with minimizing land disturbance, which is a nonstructural stormwater management strategy.

Section 141-56.I: Grading and topsoil removal provides requirements for soil removal and grading of properties throughout the Borough. This section was revised to reference, and require compliance with, the most recent edition of the New Jersey Soil Erosion and Sediment Control Standards that outlines design principles, including: whenever possible, retain and protect natural vegetation; minimize and retain water runoff to facilitate groundwater recharge; and, install diversions, sediment basins, and similar required structures prior to any on-site grading or disturbance. This section was revised to provide language encouraging the minimal disturbance of land for construction purposes for all new construction within the Borough.

Section 141-56.M: Off-street loading provides requirements for loading and unloading facilities in nonresidential zones. This section was amended to allow the use of pervious paving materials to minimize stormwater runoff and promote groundwater recharge.

Section 141-56.N: Off-street parking provides parking requirements for residential and nonresidential zones. This section was amended to allow the use of pervious paving materials to minimize stormwater runoff and promote groundwater recharge.

Section 141-56.P: Performance Standards for I-1, I-2 and I-3 Districts provides requirements for control of potentially objectionable conditions and materials within industrial zones. Language has been provided to specifically prohibit materials or wastes to be deposited upon a lot in such form or manner that they can be transferred off the lot, directly or indirectly, by natural forces such as precipitation, evaporation or wind. Language has also been provided requiring that all materials and wastes that might create a pollutant or a hazard be enclosed in appropriate containers.

Section 141-56.Q: Sidewalks describes sidewalk requirements for the Borough. Although sidewalks are not required along all streets, the Township can require them in areas where the probable volume of pedestrian traffic, the development's location in relation to other populated areas and high vehicular traffic, pedestrian access to bus stops, schools, parks, and other public places, and the general type of improvement intended indicate the advisability of providing a pedestrian-way. Sidewalks are to be a minimum of four feet wide and constructed of concrete. Language was added to this section to require developers to design sidewalks to discharge stormwater to neighboring lawns where feasible to disconnect impervious surfaces, or use permeable paving materials where appropriate.

Section 141-56.V: Stormwater drainage requires applications for construction to provide stormwater drainage to control stormwater runoff. This section was amended to reference, and require compliance with, the Residential Site Improvement Standards (RSIS), the MSWMP and Borough Stormwater Control Ordinance. This section was amended to encourage non-structural control of stormwater runoff and water quality, such as vegetated swales.

Section 141-56.W: Streets describes the requirements for all new streets in the Borough. The Borough has several street classifications listed in this section. The ordinance will be revised to reference, and require compliance with, the RSIS, with respect to roadway classifications, right-of-way widths and pavement widths and Section 98-74 of the Borough Code. Language was provided encouraging the minimal widths of pavement specified in the RSIS. This section was amended to recommend the use of pervious paving materials for driveways to minimize stormwater runoff and promote groundwater recharge. Language was added to this section to require developers to design sidewalks to discharge stormwater to neighboring lawns where feasible to disconnect these impervious surfaces, or use permeable paving materials where appropriate.

The Borough has several residential, business and residential districts. Each district has a maximum floor area ratio requirement, based upon a percentage of the lot area. The code does not provide a maximum impervious area requirement for any zone. The Borough Code will be amended to require developers to comply with the Municipal Stormwater Management Plan and Borough Stormwater Management Ordinance. The Borough ordinance will be revised to provide a maximum allowable impervious cover for each zone. The Borough also evaluated a maximum percent of disturbance for each zone, for those areas identified as natural features. Also, if a developer is given a variance to exceed the maximum allowable percent imperviousness, the developer must mitigate the impact of the additional impervious surfaces. This mitigation effort must address water

quality, flooding, and groundwater recharge as described in the Borough Code. A description of how to develop a mitigation plan is provided in the MSWMP.

Land Use/Build-Out Analysis

A detailed land use analysis for the Borough was conducted. Figure 6 (Appendix A-5) illustrates the existing land use in the Borough based on 1995/97 GIS information from NJDEP. Figure 7 (Appendix A-6) illustrates the HUC14s within the Borough. The Borough zoning map is shown in Figure 8 (Appendix A-7). Figure 9 (Appendix A-8) illustrates the constrained lands within the Borough. The build-out calculations for impervious cover are shown in Table 1. Table 2 presents the pollutant loading coefficients by land cover. The pollutant loads at full build-out are presented in Table 3.

Table 1: Build-Out Calculations for HUC14s

HUC14 and Zone	Total Area (Acres)	Wetlands/ Water Area (Acres)	Developable Area (Acres)	Allowable Impervious (%)	Build-Out Impervious (Acres)
02030103120040					
Restricted Industry (I-3)	16.34	0.00	16.34	90%	14.71
Residential - 20,000 SF (R-20)	11.03	0.00	11.03	30%	3.31
Residential - 20,000 SF (R-20A)	8.14	0.00	8.14	30%	2.44
TOTALS	35.51	0.00	35.51	58%	20.46
02030103120030					
Education and Recreation (E-R)	76.37	13.17	63.20	90%	56.88
Restricted Industry (I-3)	171.03	26.50	144.53	90%	130.08
Residential - 20,000 SF (R-20)	11.68	0.00	11.68	30%	3.50
Residential - 20,000 SF (R-20A)	12.00	0.00	12.00	30%	3.60
Residential - 40,000 SF (R-40)	179.55	14.17	165.38	30%	49.61
Residential - 7,000 SF (R-7)	28.79	1.21	27.58	65%	17.93
TOTALS	479.42	55.05	424.37	62%	261.60
02030103120100					
Local Business District (B-2)	74.81	0.71	74.10	90%	66.69
Highway Business District (B-3)	119.99	0.94	119.05	90%	107.15
Education and Recreation (E-R)	30.74	2.03	28.71	90%	25.84
Restricted Industry (I-1)	71.94	6.63	65.31	90%	58.78
Restricted Industry (I-2)	97.58	2.13	95.45	90%	85.91
Restricted Industry (I-3)	340.19	25.20	314.99	90%	283.49
Municipal Complex (MC)	3.55	0.00	3.55	90%	3.20
Residential - 20,000 SF (R-20)	155.47	1.68	153.79	30%	46.14
Residential - 20,000 SF (R-20A)	41.92	0.67	41.25	30%	12.38
Residential - 40,000 SF (R-40)	581.61	71.11	510.50	30%	153.15
Residential - 7,000 SF (R-7)	533.33	12.85	520.48	65%	338.31
Residential - Affordable Housing (R-AH)	22.72	2.98	19.74	45%	8.88
Residential - 2-Family (R-B)	28.91	0.64	28.27	30%	8.48
Residential - Senior Citizen (R-SC)	8.06	7.36	0.70	45%	0.32
TOTALS	2,110.82	134.93	1,975.89	61%	1,198.70

Table 2: Nonpoint Source Loads at Build-Out for HUC14s

HUC14 and Zone	Build-Out Zoning	Developable Area (Acres)	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/yr)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
02030103120040								
Restricted Industry (I-3)	Commercial	16.34	2.1	34.31	22	359.48	200	3,268.00
Residential - 20,000 SF (R-20)	High, Medium Density Residential	11.03	1.4	15.44	15	165.45	140	1,544.20
Residential - 20,000 SF (R-20A)	High, Medium Density Residential	8.14	1.4	11.40	15	122.10	140	1,139.60
TOTALS		35.51		61.15		647.03		5,951.80
02030103120030								
Education and Recreation (E-R)	Commercial	63.20	2.1	132.72	22	1,390.40	200	12,640.00
Restricted Industry (I-3)	Industrial	144.53	1.5	216.80	16	2,312.48	200	28,906.00
Residential - 20,000 SF (R-20)	High, Medium Density Residential	11.68	1.4	16.35	15	175.20	140	1,635.20
Residential - 20,000 SF (R-20A)	High, Medium Density Residential	12.00	1.4	16.80	15	180.00	140	1,680.00
Residential - 40,000 SF (R-40)	High, Medium Density Residential	165.38	1.4	231.53	15	2,480.70	140	23,153.20
Residential - 7,000 SF (R-7)	High, Medium Density Residential	27.58	1.4	38.61	15	413.70	140	3,861.20
TOTALS		424.37		652.81		6,952.48		71,875.60
02030103120100								
Local Business District (B-2)	Commercial	74.10	2.1	155.61	22	1,630.20	200	14,820.00
Highway Business District (B-3)	Commercial	119.05	2.1	250.01	22	2,619.10	200	23,810.00
Education and Recreation (E-R)	Commercial	28.71	2.1	60.29	22	631.62	200	5,742.00
Restricted Industry (I-1)	Industrial	65.31	1.5	97.97	16	1,044.96	200	13,062.00
Restricted Industry (I-2)	Industrial	95.45	1.5	143.18	16	1,527.20	200	19,090.00
Restricted Industry (I-3)	Industrial	314.99	1.5	472.49	16	5,039.84	200	62,998.00
Municipal Complex (MC)	Commercial	3.55	2.1	7.46	22	78.10	200	710.00
Residential - 20,000 SF (R-20)	High, Medium Density Residential	153.79	1.4	215.31	15	2,306.85	140	21,530.60
Residential - 20,000 SF (R-20A)	High, Medium Density Residential	41.25	1.4	57.75	15	618.75	140	5,775.00
Residential - 40,000 SF (R-40)	High, Medium Density Residential	510.50	1.4	714.70	15	7,657.50	140	71,470.00
Residential - 7,000 SF (R-7)	High, Medium Density Residential	520.48	1.4	728.67	15	7,807.20	140	72,867.20
Residential - Affordable Housing (R-AH)	High, Medium Density Residential	19.74	1.4	27.64	15	296.10	140	2,763.60
Residential - 2-Family (R-B)	High, Medium Density Residential	28.27	1.4	39.58	15	424.05	140	3,957.80
Residential - Senior Citizen (R-SC)	High, Medium Density Residential	0.70	1.4	0.98	15	10.50	140	98.00
TOTALS		1,975.89		2,971.61		31,691.97		318,694.20

Table 3: Pollutant Loads by Land Cover

HUC14 and Zone	TP (lbs/acre/yr)	TN (lbs/acre/yr)	TSS (lbs/acre/yr)
High, Medium Density Residential	1.4	15	140
Low Density, Rural Residential	0.6	5	100
Commercial	2.1	22	200
Industrial	1.5	16	200
Urban, Mixed Urban, Other Urban	1	10	120
Agricultural	1.3	10	300
Forest, Water, Wetlands	0.1	3	40
Barrenland/Transitional Area	0.5	5	60

Mitigation Plans

The following mitigation plan criteria are provided for proposed developments that are granted a variance or exemption from the stormwater management design and performance standards. For all mitigation plans, site plan approval and/or issuance of building permits shall be conditioned upon approval of mitigation plan(s) in accordance with the following standards, and in accordance with any other applicable regulations. Approvals shall be required from the applicable municipal agency having jurisdiction over the specific application. For example, a site plan application before the Borough Planning Board that requires a mitigation plan shall include in its application the mitigation plan, for review by the Planning Board. Additionally, any project requiring Performance Bonds shall include a line item to cover the cost of the proposed mitigation project.

The following standards shall govern mitigation projects within the Borough:

- The Municipal Stormwater Management Plan
- The Stormwater Control Ordinance
- Borough Design Standard Ordinance
- New Jersey’s Soil Erosion and Sediment Control Standards
- Other applicable Municipal, County and State regulations

Any mitigation project must verify through design calculations and documentation that the project will result in a beneficial impact on an impaired waterway, distressed aquifer or flooding problem located within the Borough. Presented is a hierarchy of options.

Mitigation Project Criteria, Option 1

The following Option 1 criteria must be met for a proposed mitigation project within the Borough:

- The mitigation project must be implemented in the same drainage area as the proposed development.

- The project must provide additional groundwater recharge benefits, or protection from stormwater runoff quality and quantity from previously developed property that does not currently meet the design and performance standards outlined in the Municipal Stormwater Management Plan and the Stormwater Control Ordinance.
- The developer must ensure the long-term maintenance of the project, including the maintenance requirements under Chapters 8 and 9 of the NJDEP Stormwater BMP Manual.

The applicant can select a mitigation project from a list to compensate for the deficit from the performance standards resulting from the proposed project. This list will be on file with the Borough, and shall be developed on an as-needed basis, since it is expected that most new development and redevelopment will be able to satisfy the applicable standards. Detailed information on the listed projects will be developed on an as-needed basis, and will be made available by the Borough Engineer, and will include size of the project, permit requirements, land ownership, and estimated project costs (i.e., permitting fees, engineering costs, construction costs, and maintenance costs). The mitigation project list will be prioritized, within the following categories: Groundwater Recharge, Water Quality, and Water Quantity. At a minimum, the mitigation project must compensate for the deficiency of the proposed project.

For equivalent mitigation projects, the following additional criteria shall apply:

- Equivalent groundwater recharge mitigation projects shall be designed and constructed to preserve ambient groundwater conditions. Applicants must provide filtration and/or treatment of stormwater runoff before the recharge system, utilizing either structural or non-structural methods. The proposed filtration/ treatment system shall be approved by the Borough. Maintenance schedules and requirements shall be established prior to final acceptance of any mitigation project.
- Equivalent stormwater quality mitigation projects shall be designed and constructed to prevent additional pollutant loading and to preserve ambient groundwater conditions. Applicants must provide filtration and/or treatment of stormwater runoff, utilizing either structural or non-structural methods. The proposed filtration/ treatment system shall be approved by the Borough. Maintenance schedules and requirements shall be established prior to final acceptance of any mitigation project.
- Equivalent stormwater quantity mitigation projects shall be designed and constructed to prevent negative impacts on existing runoff volumes in the watershed. Applicants shall provide design calculations and facilities to verify that the mitigation project will result in no increase in runoff volumes in the watershed in accordance with the MSWMP, and the design shall be approved by the Borough.

Retro-fitting mitigation projects, such as the installation of bicycle safe grates and reduced opening curb pieces, shall also be considered as acceptable and all work must be completed in strict conformance with all applicable standards for construction materials

and practices. The retrofitting mitigation project must be implemented in the same drainage area as the proposed development.

Option 2

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 mitigation that is not equivalent to the impacts for which the variance or exemption is sought, but that addresses the same issue. For example, if a variance is given because the 80 percent TSS requirement is not met, the selected project may address water quality impacts due to a fecal impairment. This list will be on file with the Borough, and shall be developed on an as-needed basis, since it is expected that most new development and redevelopment will be able to satisfy the applicable standards. Detailed information on the listed projects will be developed on an as-needed basis, and will be made available by the Borough Engineer, and will include size of the project, permit requirements, land ownership, and estimated project costs (i.e., permitting fees, engineering costs, construction costs, and maintenance costs).

The municipality may allow a developer to provide funding or partial funding to the municipality for an environmental enhancement project that has been identified in a by the Borough, or towards the development of a Regional Stormwater Management Plan. The funding must be equal to or greater than the cost to implement the mitigation outlined above, including costs associated with purchasing the property or easement for mitigation, and the cost associated with the long-term maintenance requirements of the mitigation measure.

Operation and Maintenance of Municipal Mitigation Projects

The requirements for operation and maintenance of mitigation projects must be determined prior to final approval of a project, and must be in accordance with this plan and the NJDEP Best Management Practices (BMP) Manual. Since each project will be unique, it is not possible to specify all possible maintenance requirements for the various construction methods that may be proposed by applicants. The municipal reviewing agency will require the applicant to provide a detailed and long-term analysis of the proposed mitigation project's operation and maintenance. The Borough will incorporate the maintenance plan in its regular stormwater system maintenance program, as required by the SPPP.