ENHANCED MODEL MUNICIPAL STORMWATER MANAGEMENT PLAN

MAY 2025

This is a model municipal stormwater management plan. This model is intended to assist municipalities in developing municipal stormwater management plans per the requirements of the Stormwater Management Rules (New Jersey Administrative Code (NJAC) 7:8) and the Municipal Stormwater Regulation Program (NJAC 7:14A-25). This model contains all required plan elements as outlined in NJAC 7:8-4.2 (Municipal Stormwater Management Plan and Elements). Additionally, this model includes other, recommended elements to help municipalities better manage the impacts of stormwater runoff, especially given changing climatic conditions.

The model is based on the original model plan developed by the New Jersey Department of Environmental Protection (NJDEP) in 2004, but reflects changes to NJAC 7:8 adopted over the last 21 years. Further, this model reflects the new standards for stormwater management and modeling included in the recently adopted Inland Flood Protection (IFP) Rule and the proposed Resilient Environments and Landscapes (REAL) Rule. The intention of these new rules is to modernize New Jersey regulations to better respond to threats posed by climate change, including worsening floods and sea-level rise. By integrating new standards, this model will help municipalities establish a more comprehensive approach to stormwater management.

INSTRUCTIONS

Throughout the document, italicized text provides guidance for municipalities preparing their own plans. ***Sections written in italicized text are intended for instructional purposes and should not be included in actual municipal stormwater management plans.***

Please note that portions of this model are fictional and intended only to assist municipalities in the development of their own plans. It is anticipated that municipalities will provide more detail and information than what is presented in this model.

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INTRODUCTION

Every plan should include an introduction to identify why the plan is being prepared. The introduction should also summarize the contents of the plan. Here is sample language.

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for the Municipality of ABC (the Municipality) to address stormwater-related impacts from new and existing developments. The MSWMP also includes strategies to address stormwater-related threats driven by climate change, such as worsening floods and rising sea levels. This MSWMP conforms with the requirements outlined in New Jersey Administrative Code (NJAC) 7:8-4.2.

According to the New Jersey Department of Environmental Protection (NJDEP), most of New Jersey's waters are polluted and do not meet the water quality limits established by the federal Clean Water Act and state Water Pollution Control Act. Stormwater runoff is a major driver of water pollution in the state. This MSWMP, and the accompanying stormwater management control ordinances, outline strategies to restore water quality in the Municipality in accordance with federal and state standards.

The Municipality is also obligated to address stormwater runoff through the Municipal Separate Storm Sewer System (MS4) permit program. The Municipality has been issued a Tier A MS4 permit by NJDEP, which requires the development of methods to reduce water pollution and flooding from stormwater runoff. This MSWMP addresses the MS4 permit requirements by recommending ordinances to improve stormwater quality, quantity, and groundwater retention.

GOALS

Each MSWMP may have different goals; however, listed below are the minimum set of goals that should be included in all MSWMPs based on the requirements of NJAC 7:8-4.2 and the proposed Resilient Environments and Landscapes (REAL) Rule.

The goals of this MSWMP, per the Stormwater Management Rules (NJAC 7:8-4.2), are to:

- Reduce flood damage within the Municipality, including damage to life and property.
- Minimize, to the extent practical, increases in stormwater runoff from new developments, reconstruction projects, and redevelopment projects.
- Reduce soil erosion from new developments, reconstruction projects, and redevelopment projects.
- Assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures.
- Maintain groundwater recharge.

- Prevent, to the greatest extent feasible, increases 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.
- Protect public safety through the proper design and operation of stormwater basins.

To achieve these goals, the MSWMP outlines specific stormwater design and performance standards for new major development (defined on page 6). Additionally, the MSWMP proposes stormwater management controls to address impacts from existing development. Preventative and corrective maintenance strategies are included in the plan to ensure the long-term effectiveness of stormwater management facilities. The MSWMP also outlines safety standards for stormwater infrastructure to protect public safety.

This model MSWMP includes additional goals related to climate change. While these goals are not required per NJAC 7:8-4.2, these goals are recommended to maximize the potential benefits of the plan.

This MSWMP addresses additional goals related to climate change:

- Prepare for climate change by considering how risks such as chronic flooding and sea-level rise will impact stormwater quantity, stormwater quality, and groundwater recharge.
- Assess how climate change will impact existing stormwater infrastructure and identify mitigation strategies to ensure the continued operation of key facilities.
- Facilitate climate resilience by supporting green infrastructure and nature-based solutions for both new and existing developments.
- Use best available data to ensure new investments in infrastructure and development are well-suited to manage current levels of rainfall, runoff, and flooding, as well as anticipated future conditions.

To achieve these climate-related goals, the MSWMP requires stormwater Best Management Practices (BMPs) be designed to manage runoff for both existing and future storms. The MSWMP also requires the use of best available data for assessing current and future flood elevations and identifying coastal flood hazard areas.

PLAN ELEMENTS

The primary purpose of the MSWMP is to address the stormwater-related impacts of development, such as stormwater quality, stormwater quantity, and groundwater recharge impacts. To address stormwater-related impacts, the MSWMP outlines stormwater design and performance standards for new major developments. Once the State of New Jersey adopts the proposed Resilient Environments and Landscapes (REAL) Rule, the Municipality will define major developments as projects that either individually or collectively result in:

1. The disturbance of one or more acres of land since February 2, 2004;
2. The creation of one-quarter acre or more of "regulated impervious surface" since February 2, 2004;
3. The creation of one-quarter acre or more of "regulated motor vehicle surface" since March 2, 2021;
4. The reconstruction of one-quarter acre or more of "regulated motor vehicle surface" or "regulated impervious surface" since the adoption of the REAL Rule; or
5. A combination of 2, 3, and 4 above that totals an area of one-quarter acre or more.

It is important to note that municipalities may adopt a more restrictive definition of major development compared to the definition proposed by the REAL Rule. Both New Jersey Future *and* The Watershed Institute *have developed enhanced stormwater management ordinances to help municipalities, and both model ordinances reduce the threshold for what is considered major development.*

The creation of this MSWMP is required by the Municipal Stormwater Regulation Program (NJAC 7:14A-25). This MSWMP contains all required elements as outlined in the Stormwater Management Rules (NJAC 7:8). The plan elements are as follows:

- Description of how the MSWMP will achieve the goals of stormwater management planning set forth in NJAC 7:8-2.2.
- Maps showing water bodies, groundwater recharge areas, and wellhead protection areas in the Municipality.
- An assessment of the climate resiliency of the Municipality and its stormwater infrastructure per the requirements of NJAC 7:8-4.2(c), as amended by the REAL Rule.
- Proposed stormwater design and performance standards.
- Long-term operation and maintenance measures for existing and future stormwater facilities.

- Measures to ensure compliance with the safety standards for stormwater management basins as outlined in NJAC 7:8-6.
- Coordination with other plans relevant to stormwater management.
- Proposed revisions to the Municipality's Master Plan and development regulations to better incorporate green infrastructure strategies.
- Build-out analysis by hydrologic unit code 14 (HUC14) drainage area and assessment of future nonpoint source pollutant loads by HUC14 assuming full build-out.
- Mitigation plan to offset the impacts of variances from the stormwater management measures set forth in the MSWMP, including options for onsite or offsite mitigation.
- Copy of the recommended and/or updated stormwater control ordinance(s) requiring developments to incorporate the required stormwater management measures.

NEW STORMWATER RULES

The New Jersey Department of Environmental Protection (NJDEP) recently adopted new rules to improve stormwater management standards and to better address the current and anticipated impacts of climate change on New Jersey. In particular, New Jersey has already begun to experience more extreme precipitation patterns due to climate change; statewide annual precipitation levels increased by about 7% (3.3 inches per year) over the last century, and 2011 and 2018 were the wettest years on record.[1] Rather than being evenly distributed throughout the year, however, New Jersey is experiencing more intense rain events followed by prolonged drought periods. More extreme precipitation events result in greater volumes of stormwater runoff, increased stormwater velocities, and higher flood elevations, challenging the capacity of existing stormwater infrastructure across the state.

The Inland Flood Protection (IFP) Rule was adopted in 2023. The purpose of the IFP Rule is to ensure new development is resilient to worsening floods. The Resilient Environments and Landscapes (REAL) Rule is expected to be adopted by August 2025. The purpose of the REAL Rule is to modernize New Jersey's environmental land use rules to better respond to climate risks such as chronic flooding and sea-level rise.

This MSWMP complies with both the IFP and anticipated REAL Rules by utilizing best available precipitation and flood data and including a climate resiliency assessment. This plan also recommends the use of green infrastructure as a flood mitigation strategy. By incorporating NJDEP's new recommendations for flood and stormwater management, the MSWMP aims to mitigate both current and future stormwater risks, as well as maintain the environmental integrity of the Municipality's waterways.

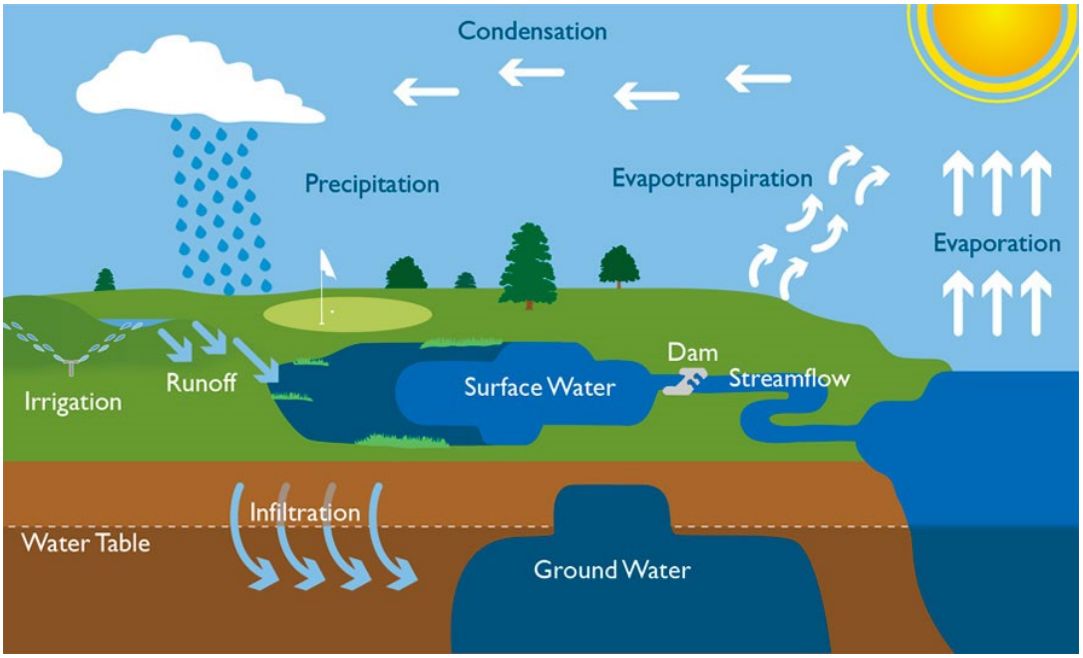
[1] Robinson, D., Teale, N., & Soldo, L. (2022, Dec.). *Examining precipitation across the Garden State from 1900 to 2020* [PDF]. NJDEP.

STORMWATER DISCUSSION

Some of the readers of the plan may have limited knowledge of stormwater related issues. A brief description of the hydrologic cycle and how development affects the cycle may be useful to the reader. Sample language is provided below.

The hydrologic cycle, or the water cycle, refers to the circulation of water from the ground to the atmosphere and back again (Figure 1). Prior to development, native vegetation promotes rainwater infiltration, reducing runoff and replenishing groundwater storage. Native vegetation also returns groundwater to the atmosphere through evapotranspiration, which is the loss of water from plants and soil.

Figure 1: Ground Water Recharge in the Hydrologic Cycle



Source: Northeast Regional Climate Center. (2018, July). *What happens to water underground?* Northeast Regional Climate Center, Cornell University.

Land development alters the hydrologic cycle of a site, and ultimately the watershed, by removing native vegetation and replacing it with impervious surfaces or lawns, reducing infiltration and evapotranspiration rates. Clearing and grading activities can also remove depressions that store rainfall and compact the soils, diminishing infiltration rates even further. Taken together, these impacts result in increased stormwater runoff from developed sites. The amount of impervious surface in the watershed has exponential impacts on the volume of stormwater runoff; when more than 10 to 20% of a watershed has impervious cover, the volume of runoff doubles compared to natural conditions.[2]

[2] Yount, B. (2024, August 16). *Impervious surfaces and stormwater impacts.* PennState Extension.

Grey stormwater infrastructure refers to conventional, human-engineered technologies used to manage and remove stormwater runoff from a site, while green infrastructure refers to measures that mimic natural hydrologic conditions, and thus typically incorporate native vegetation, to manage runoff close to its source. Grey infrastructure transports runoff from developed sites faster than runoff travels across natural areas. This shortening of the transport time quickens the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak faster and higher compared to waterways in natural landscapes. Rapid and significant flow increases can result in downstream flooding and cause erosion problems, increasing the quantity of sediment in the channel.

Developing more impervious surfaces results in decreased infiltration rates, reducing stream base flows and groundwater recharge rates. Reduced base flows negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on natural waterways. Further, reduced base flows combined with increased peak flows during storm events means there are greater fluctuations between normal and storm flow rates within the waterway, increasing channel erosion even further. Excessive erosion and sedimentation can permanently destroy habitats and the functioning of key waterways.

In addition to impacting runoff peaks, volumes, and groundwater recharge rates, land development often increases the amount of pollution entering local waterbodies; stormwater runoff mobilizes and transports pollutants into nearby waterways. Storm sewers also eliminate the ability for surface and channel vegetation to filter runoff and remove pollutants before water is discharged, exacerbating the negative impacts of development on water quality. Newly developed areas accumulate a variety of pollutants from the atmosphere, fertilizers, animal wastes, and vehicles. Typical pollutants found on developed sites include metals, suspended solids, hydrocarbons, pathogens, and nutrients.

Land development can adversely affect water quality and stream biota in more subtle ways as well. For instance, stormwater falling on impervious surfaces or stored in detention or retention basins can become heated and raise the temperature of downstream waterway, adversely affecting cold water fish species such as trout. Development sometimes removes trees along stream banks that normally provide shading, stabilization, and leaf litter, a common food source for aquatic species.

CLIMATE CHANGE AND STORMWATER

Climate change is driven by increasing concentrations of greenhouse gases within Earth's atmosphere. New Jersey will experience direct and secondary impacts to its environment because of climate change[3], including more intense precipitation events, more frequent and prolonged drought conditions, worsening floods, and rising sea levels. These impacts will exacerbate the stormwater management challenges already experienced in developed areas of the state by further increasing stormwater runoff, resulting in worse flooding conditions.

[3] NJDEP. (2020, June 30). *2020 New Jersey Scientific Report on Climate Change*. NJDEP.

BACKGROUND ON THE CITY

The plan should include background information on the municipality to help the reader understand its characteristics – size in square miles, population, population changes, waterways, and health of these waterways. For example, is the municipality a rural community rapidly becoming developed or is it an older established community where land use is fairly stable? Are waterways in the municipality impaired? Are there flooding concerns in the municipality? Maps should be included to help the reader visualize the municipality and its physical features.

A municipality was selected for this model plan so that the mapping and municipal characteristics can be presented along with information on where to obtain the environmental, land use, and infrastructure data shown. Due to the sample nature of this plan, this section does not present a comprehensive background of the municipality and its stormwater-related issues.

Municipal population information is available from the US Census Bureau*. The MSWMP mapping requirements require Geographic Information System (GIS) software. Publicly available GIS resources, including mapping tools, GIS data files, and free online trainings, can be found at the* NJDEP GIS website*. Many local watershed associations and environmental commissions can help create maps for MSWMPs.* Rutgers University Center for Remote Sensing and Spatial Analysis *can also provide mapping assistance.*

The Municipality encompasses 8.2 square miles along the Delaware River in Mercer County. Approximately 7.5% of the Municipality's area is water. Figure 2 illustrates the waterways in the Municipality, and Figure 3 depicts the Municipality's boundaries on the United States Geological Survey (USGS) quadrangle maps.

The Municipality's population peaked at 128,009 residents in 1950, when thousands of people worked in local mills and factories. The subsequent decline in local industry caused the Municipality's population to decline to 84,913 residents by 2010. The population has since increased, however, as the Municipality recorded a population of 90,858 in 2020. This equates to a population density of 11,080 people per square mile.

The Municipality's industrial history and high population density means that most parcels are already developed; however, many areas are also slated for redevelopment. There are multiple blighted and underutilized former industrial sites throughout the Municipality and along the Municipality's waterways that have been designated as Redevelopment Areas under New Jersey redevelopment laws. Further, over three in four housing units were built before 1960, meaning there will be a growing need to reconstruct the aging housing stock. Both redevelopment and reconstruction projects can potentially increase stormwater runoff volumes and pollution loads, but they also present opportunities to incorporate green infrastructure and install new stormwater BMPs. If redevelopment or reconstruction projects incorporate new stormwater BMPs, the projects can ultimately *reduce* stormwater runoff volumes and pollution loads.

Figure 2: Wetlands and Waterways in the Municipality

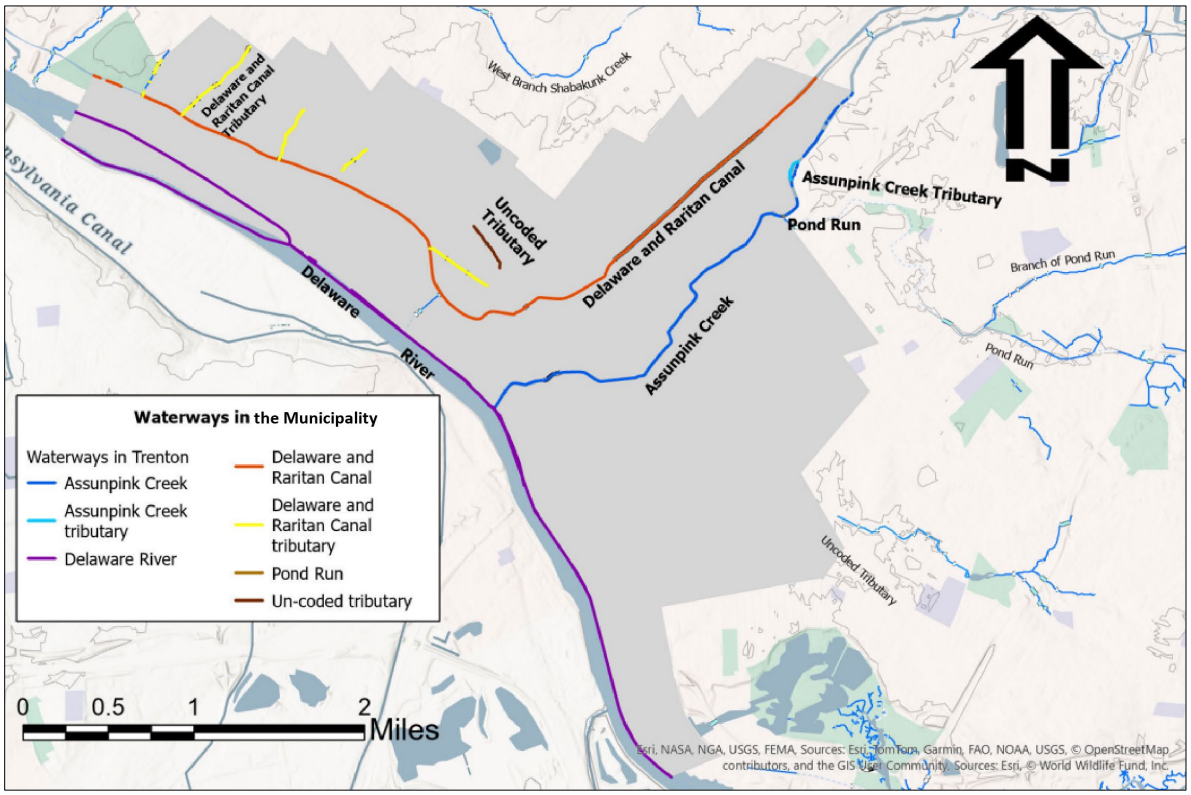
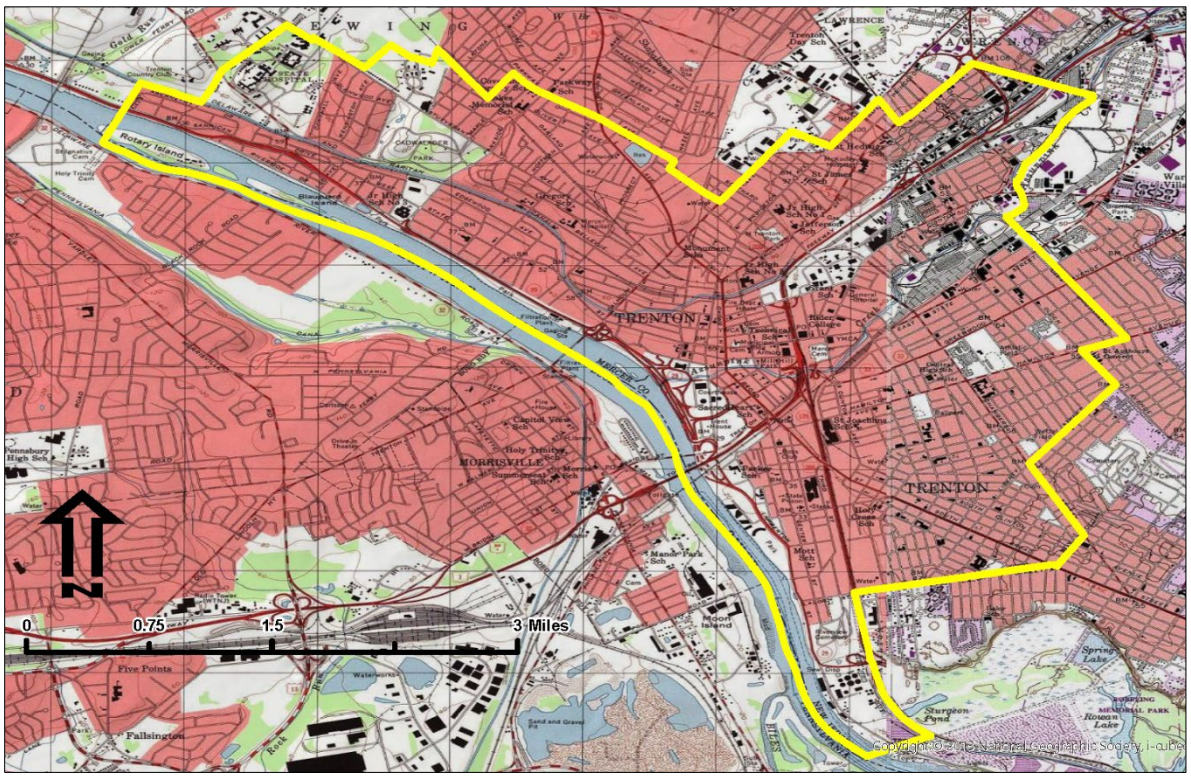


Figure 3: Municipality Boundary on USGS Quadrangle Maps



WATER QUALITY

The NJDEP Ambient Biomonitoring Network assesses the health of the state's waterways. This data can be used to assess water quality within a municipality.

NJDEP has established the Ambient Biomonitoring Network (AMNET) to document the health of the state's waterways. Under the program, sites in each of New Jersey's five Water Regions are sampled for benthic macroinvertebrates on a rotating schedule (once every five years). The sampling results are then incorporated into New Jersey's Environmental Performance Partnership Agreement (NEPPS) with the United States (US) Environmental Protection Agency (EPA) as a primary indicator of water quality impairment.

Historically, the New Jersey Impairment Score (NJIS), which was based on several biometrics related to benthic macroinvertebrate community dynamics, was used to assess waterways across the state. Under the NJIS system, waterways were ranked as non-impaired, moderately impaired, or severely impaired. The NJIS has since been replaced with new, regionally specific indices: the High Gradient Macroinvertebrate Index (above the Fall Line), the Coastal Plain Macroinvertebrate Index (Coastal Plain excluding the Pinelands), and the Pinelands Macroinvertebrate Index (the boundary of the Pinelands National Reserve plus a 5-kilometer buffer). These indices use four levels of assessment: excellent, good, fair, and poor.

The Municipality is bordered by the Central Delaware River and bisected by Assunpink Creek, both of which are considered in fair condition based on AMNET data. Nearby waterways that are technically outside of the Municipality boundaries include Pond Run, Miry Run, and Shabakunk Creek; both Pond and Miry Runs are in poor condition and Shabakunk Creek is in fair condition based on AMNET data.

The NJ Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d)), including Sublist 5 (303(d)), can be found at https://dep.nj.gov/wms/bears/integrated-wq-assessment-report-2022/.

NJDEP is required by the Clean Water Act to prepare the biennial New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d)), also referred to as the Integrated Report. The Integrated Report identifies and prioritizes waterways for protection, restoration, and monitoring based on whether waterways are attaining water quality standards. Based on the most recent Integrated Report, which was completed in 2022, instream total phosphorous concentrations in both the Central Delaware River and Assunpink Creek exceed water quality standards.

Sublist 5 (303(d) of the Integrated Report lists waterways which require Total Maximum Daily Loads (TMDLs). 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 for a waterbody to be used for one or more of its designated uses. Portions of the TMDL are then allocated to the various sources of the pollutant, such as stormwater and wastewater discharges, through the New Jersey Pollution Discharge Elimination System (NJPDES) permit process. TMDL calculations consider pollution generated by nonpoint sources, such as

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. After TMDLs are established, implementation plans are prepared outlining how the various nonpoint pollution sources will be reduced to the designated allocations. Implementation strategies may include improved water treatment plants, installing bioretention systems, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems, or other BMPs.

There are three TMDLs that apply to waterways in or near the Municipality. These TMDLs are summarized in Table 1.

Table 1: Applicable Stream TMDLs in the Municipality

Stream(s)	Restricted Pollutants	Year Instated
Assunpink Creek, Shabakunk Creek, Little Shabakunk Creek, Pond Run	Fecal Coliform	2003
Shabakunk Creek	Mercury	2017
Delaware River and Tributaries	Polychlorinated Biphenyls (PCBs)	2003

Source: NJDEP. *Total Maximum Daily Load (TMDL) Look-Up Tool.* Accessed April 8, 2025.

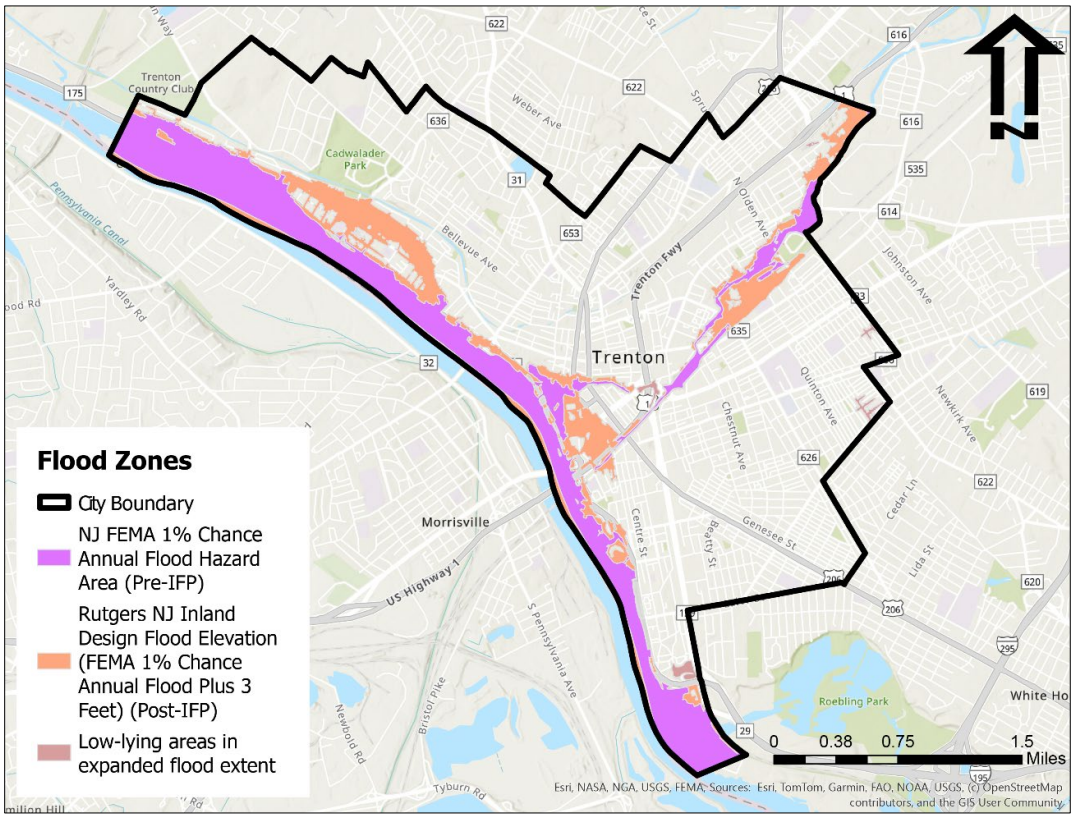
WATER QUANTITY

Municipalities should list specific areas that are affected by stormwater quantity problems and describe the extent of these problems. For example, the MSWMP should mention if any areas experienced flooding during post Tropical Storm Ida, which ranged from a 0.1% annual chance flood (1,000-year flood) to a 4% annual chance flood (25-year flood) along the New Jersey storm track. The annual chance floods, or recurrence year floods, are categorized based on the statistical probability of occurrence of rainfall depth and intensity associated with a storm duration. Flood Zone data can be found at https://njdep.maps.arcgis.com/apps/webappviewer/index.html.

The Municipality experiences water quantity issues such as flooding and stream bank erosion. Figure 4 shows the areas of the Municipality that are within Federal Emergency Management Agency (FEMA) Flood Zone A, or areas which are subject to inundation by the 1%-chance-annual-flood. Further, Figure 4 also shows areas that are below the Inland Design Flood Elevation per the IFP Rule, which is equal to the FEMA Base Flood Elevation (BFE) for the 1%-chance-annual-flood plus 3 feet. Areas below the Inland Design Flood Elevation have increased flood propensity due to rising sea levels and more intense precipitation events.

As shown in Figure 4, most flood-prone areas within the Municipality are near the Delaware River, a portion of which is tidally influenced. Flooding and erosion issues are exacerbated by the tidal nature of the Delaware River, which means the River's water levels regularly rise and fall with the ocean tides. Officials evacuated hundreds of residents from neighborhoods near the Delaware River during Tropical Storm Ida due to flooding driven by the compounding effects of record-high rainfall and high-tide conditions on the Delaware River.

Figure 4: Flood Zones in the Municipality



The Municipality was predominantly built out prior to present climatic conditions (i.e., higher river levels and more extreme storms). Additionally, the Municipality was developed before many modern stormwater or green infrastructure BMPs had been established. Instead, the Municipality mostly relies on traditional, grey infrastructure for stormwater management, including a network of stormwater drains, pipes, and culverts, and, in some areas, an aging combined sewer system (CSS), which carries both wastewater and stormwater in the same pipes. Given the Municipality's high imperviousness, proximate location to the Delaware River, and historic stormwater infrastructure, worsening water quantity issues due to climate change are likely.

Municipalities may want to adopt specific ordinances to protect wellhead protection areas to minimize the infiltration of pollutants into aquifers.

The high amount of impervious cover throughout the Municipality also negatively impacts groundwater recharge by limiting stormwater infiltration. Limited infiltration rates mean that more pollution enters waterways during rain events and stream base flows are lower during dry weather periods. Climate change will increase the likelihood of drought conditions across New Jersey, exacerbating the negative instream habitat conditions that already occur in the Municipality's waterways during the summer months. A map of the Municipality's groundwater recharge areas is shown in Figure 5. Wellhead protection areas, which also need to be mapped in the MSWMP, are shown in Figure 6.

Figure 5: Groundwater Recharge Areas in the Municipality

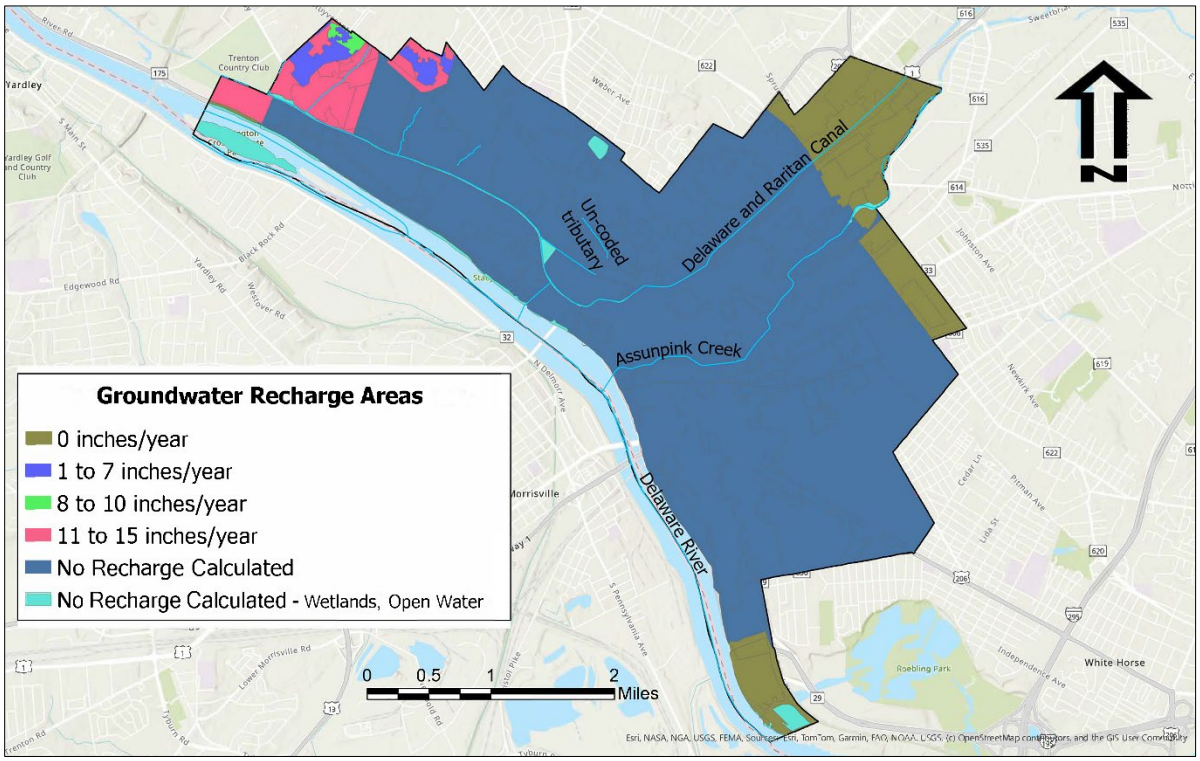
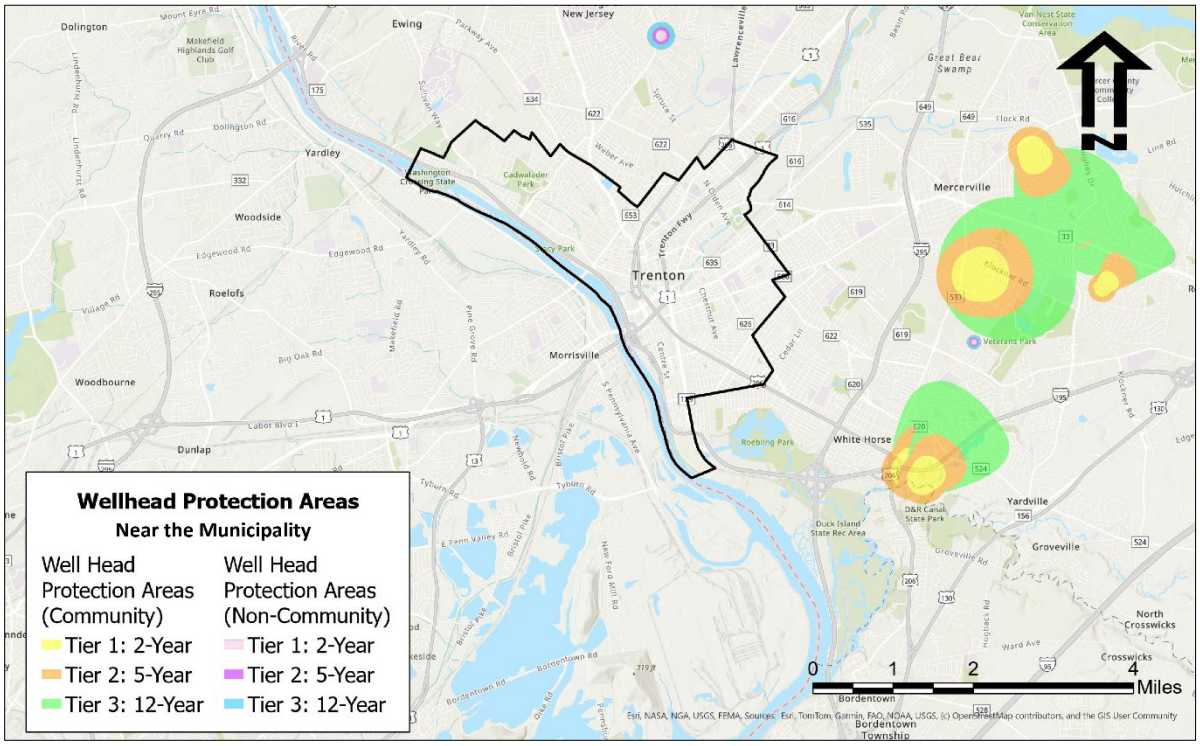


Figure 6: Wellhead Protection Areas in the Municipality



CLIMATE RESILIENCY ASSESSMENT

Once adopted, the REAL Rule will amend the Stormwater Management Rules (NJAC 7:8) to require all municipalities to incorporate climate resiliency planning into their MSWMPs. The climate resiliency plan element will need to evaluate how climate change impacts such as increased flooding frequency and extents, increased rainfall intensity, and sea level rise will impact stormwater management within the municipality. The plan element will also need to identify stormwater infrastructure, as well as broader areas within the municipality, that are vulnerable to climate change and recommend mitigation measures.

The climate resiliency planning requirement for MSWMPs will be similar to the new Climate Change-Related Hazard Assessment (CCRHVA) component of municipal master plans. In 2021, the State of New Jersey amended the New Jersey Municipal Land Use Law (MLUL) to require municipalities to include a CCRHVA in the land use element of their master plans. The CCRHVA analyzes current and future vulnerabilities of the municipality to climate change-related hazards such as flooding, sea level rise, and drought, among others. The CCRHVA evaluates the impact of natural hazards in relation to master plan components and identifies strategies and design standards to mitigate these hazards. Most municipalities will be able to use their CCRHVAs as the basis for the climate resiliency assessment within the MSWMPs.

This section of the model plan presents a high-level climate resiliency assessment for the example Municipality. Actual MSWMPs should include more a comprehensive and detailed review of existing stormwater infrastructure within the municipality, the potential impacts of climate change on said infrastructure, and the mitigation strategies being proposed to minimize climate change-related impacts.

New Jersey is already experiencing, and will continue to experience, the impacts of climate change. The New Jersey Scientific Report on Climate Change (2020) identified several key climate impacts that will affect municipalities across the state, including rising temperatures, more extreme precipitation, rising sea levels, and worsening water quality, among others.

The Municipality will experience many of the climate change impacts affecting the State of New Jersey at large. In particular, the Municipality's location near multiple waterbodies means it will be susceptible to more frequent coastal, fluvial, and pluvial flooding conditions. Flood zones within the Municipality were shown previously in Figure 4. As shown, several areas within the Municipality are designated as FEMA Flood Zone A, meaning they would be subject to inundation by the 1-percent-annual chance flood. Even more areas are below the Inland Design Flood Elevation. As the FEMA Flood Zones do not identify all areas subject to flooding, local flood maps should also be consulted for additional flood information.

There are multiple reasons why the Municipality will face increasing flood risk due to climate change. First, a portion of the Delaware River bordering the Municipality is tidal, therefore rising sea levels will increase the likelihood of flooding, especially during high-tide conditions. Second, more intense rainfall will increase the likelihood of flooding near both the Delaware River and Assunpink Creek. Third, more intense rainfall will also generate higher quantities of stormwater runoff, increasing the likelihood of flooding along the Delaware and Raritan Canal and other

culverts. These issues will all be exacerbated as upstream communities continue to develop, resulting in increased quantities of stormwater runoff moving downstream.

The Municipality's Climate Change-Related Hazard Vulnerability Assessment (CCRHVA) identified four water management or treatment facilities that are at risk from flooding:

- Waterworks A
- Sewer Utility A
- Pump Station B
- Lift Station C

If any of these facilities are inoperable during an emergency or storm event, it may result in contamination of local waterbodies. Additionally, the failure of these facilities would increase the risk of flooding within the Municipality and impacts to stormwater, wastewater, water supply operations, and the community at large. To minimize future flooding risks, the Municipality will incorporate new design strategies to reduce flooding-related hazards whenever the facilities need to be reconstructed or improved. The Municipality will also try to relocate/locate water management and treatment facilities out of designated flood hazard zones whenever feasible.

The Municipality has both a MS4 of approximately 150 pipe outfalls and a combined sewer system (CSS) of 1 combined sewer overflow (CSO) outfall to receiving water bodies. In the MS4 area, stormwater and wastewater are conveyed in different pipes and systems. In the CSS, the combined volume of both wastewater and stormwater are conveyed in the same collection system. During rainfall events, this combined volume can sometimes exceed the capacity for conveying flow to the treatment facility, causing a CSO into the Delaware River. CSOs represent significant risks to environmental and human health. The Municipality experiences very few CSOs per year, in large part because the Municipality uses a large detention basin to detain excess CSS flow until it can be treated and released. This system utilizes aging pumps that need to be replaced. The capacity of both the MS4 and CSS will also be increasingly exceeded as the Municipality experiences more intense rainfall events, which will strain the capacity of related infrastructure, including pipes, detention basins, aging pumps, and treatment facilities, as well as staff. To reduce the likelihood of experiencing more frequent CSOs due to climate change, the Municipality is planning to allocate funding to replace the stormwater pumps during the next budget cycle.

Climate change will also stress existing green infrastructure within the Municipality. Prolonged drought conditions will threaten wetlands along the Delaware River and Assunpink Creek, minimizing the ability for these ecosystems to mitigate floods and prevent streambank erosion. Trees and plants will also be threatened by prolonged drought conditions, increasing the risk these plants may die and need to be removed or replaced. The removal of trees and plants decreases the ability for stormwater to infiltrate into the soil, worsening both stormwater quantity and quality.

The Municipality's CCRHVA recommends multiple strategies to mitigate flooding caused by increased rainfall and more intense storms. One of the primary strategies recommended in the CCRHVA is to increase on-site stormwater capture in order to reduce the rate and quantity of stormwater entering the Municipality's stormwater infrastructure during major rainfall events. The CCRHVA also recommends minimizing impervious surfaces to increase stormwater infiltration on-site. Other specific strategies that are recommended include:

- Blue roofs.
- Green roofs.
- On-site cisterns.
- Retain existing trees and vegetation as much as possible.
- Mandate new construction incorporate rain gardens, bioswales, and pervious zones.
- Incentivize the installation of rain gardens, bioswales, and pervious zones at existing developments.

Depending on funding and feasibility, the Municipality may pursue other strategies, such as constructing basins, grass swales, or pervious paving or planting new wetlands or trees, to mitigate the impacts of climate change on stormwater infrastructure and enhance the Municipality's green infrastructure network. More information on green infrastructure best management practices can be found in Chapter 9 and 10 of the New Jersey Stormwater Best Management Practices Manual.

DESIGN AND PERFORMANCE STANDARDS

MSWMPs must incorporate design and performance standards from NJAC 7:8-5. MSWMPs can include alternative design and performance standards adopted as a part of a regional stormwater management plan or water quality management plan if these standards, when applied on a regional basis, are at least as protective as the standards in 7:8-5. Further information on stormwater best management practices can be found in the New Jersey Stormwater Best Management Practices Manual.

To be compliant with the requirements of NJAC 7:8-4, the design and performance standards included in the MSWMP need to be incorporated into the municipality's stormwater management ordinance. The MSWMP should clearly state that the municipality will adopt ordinances regulating the design and performance, maintenance, and safety of stormwater infrastructure per the requirements of NJAC 7:8-5, 5.8, and 6. The MSWMP should also indicate steps the municipality will take to ensure compliance. NJDEP provides a sample ordinance *to assist municipalities with incorporating the design and performance standards into municipal codes. The simplest way to meet the requirements for MSWMPs is to adopt the language in the Stormwater Management Rules (NJAC 7:8) and* sample ordinance. *To achieve stronger stormwater protections, municipalities can go above and beyond the state's minimum requirements by adopting an enhanced stormwater management control ordinance.*

The Municipality will adopt the updated design and performance standards for stormwater management measures as presented in the most recent version of NJAC 7:8-5. These standards will help to minimize the adverse impacts of stormwater runoff on water quality, water quantity, and groundwater recharge. Additionally, the design and performance standards aim to mitigate impacts of climate change, such as more intense rain events, more frequent drought conditions, and increased flooding, on the Municipality's residents, natural resources, and infrastructure. The Municipality will require major developments to meet the design and performance standards for stormwater quality, stormwater quantity, and groundwater recharge by incorporating green infrastructure in accordance with NJAC 7:8-5.3.

NJAC 7:8-5.8 outlines maintenance requirements for stormwater management measures incorporated into major developments. Municipalities can adopt these requirements as described or adjust these standards if warranted. For example, some municipalities have designated entities responsible for maintaining stormwater infrastructure. In these cases, the municipality may choose to assume the responsibility for maintaining stormwater measures rather than designating the responsibility to the developer. The municipality may also choose to revise land use and zoning ordinances to prescribe how nonstructural stormwater management measures must be addressed. Additional information on the relationship of nonstructural stormwater management measures and ordinances is provided in Chapter 2, Chapter 3, and Appendix B of the New Jersey Stormwater Best Management Practices Manual.

The Municipality will require developers to prepare maintenance plans for stormwater measures incorporated into major developments. Maintenance plans must meet the requirements as outlined in NJAC 7:8-5.8. The Municipality will also require developers to apply the safety standards outlined in NJAC 7:8-6 to stormwater measures for major developments.

The Municipality will submit its revised ordinances for the design and performance, maintenance, and safety of stormwater management measures for major developments to the County for review. The County will review and approve the new ordinances after the required public comment period.

During and after construction, Municipality inspectors will observe the construction of the project to ensure stormwater management measures are constructed and function as designed or required.

PLAN CONSISTENCY

MSWMPs must be coordinated with other relevant planning documents, including any plans prepared by the appropriate Soil Conservation District, adopted regional stormwater management plans, master plans, resiliency plans, or any other plans about stormwater management. MSWMPs can include short paragraphs similar to what is shown below to demonstrate consistency with other planning documents unless there is a TMDL for any of the waterways within the municipality.

If a TMDL is in place and requires reductions in nonpoint sources within the municipality, the TMDL requirements should be incorporated into the MSWMP. For example, if a TMDL for fecal coliform identified the need for a goose management plan to control the impact from the resident geese at a local park, the goose management plan should be incorporated into the MSWMP. Another example is if a TMDL identified over-fertilization of lawns as impacting area waterways and recommended development of a no-phosphorus ordinance, the no-phosphorus ordinance should be incorporated into the MSWMP.

Regional Stormwater Management Plan

The Municipality is not within a Regional Stormwater Management Planning Area. If one is developed in the future, the Municipality will update this MSWMP to be consistent with the Regional Stormwater Management Plan developed and adopted by the lead planning agency.

Climate Change-Related Hazard Vulnerability Assessment (CCRHVA)

The Municipality adopted its CCRHVA in 2024. The CCRHVA analyzes current and future vulnerabilities of the Municipality to climate change-related hazards such as flooding, sea level rise, and drought, among others. The CCRHVA also recommends strategies and design standards for responding to climate change-related natural hazards, and a policy statement of alignment and consistency with other plans. The climate resiliency element of this MSWMP includes the strategies and design standards recommended in the CCRHVA.

Total Maximum Daily Loads (TMDLs)

The US EPA has established TMDLs to regulate the amount of polychlorinated biphenyls (PCBs) released into the Delaware River or its tributaries. The Municipality is located within Zone 2 of the Delaware River Estuary. The Municipality has received authorization to discharge municipal stormwater to the Delaware River under the NJPDES Tier A MS4 Stormwater Permit system. This MSWMP is consistent with the standards of the Municipality's NJPDES permit.

Residential Site Improvement Standards

This MSWMP is consistent with the Residential Site Improvement Standards (RSIS) at NJAC 5:21. The Municipality will utilize the most current update of the RSIS in the stormwater management review of residential plans submitted to the Municipality for approval. The MSWMP will be updated to be consistent with any future updates to the RSIS.

It is important to note that municipalities can implement enhanced stormwater management requirements for residential developments if the municipality adopts enhanced ordinances as Additional Measures as allowed by the MS4 permit. Municipalities can also adopt enhanced ordinances as part of their zoning codes in addition to the RSIS.

Soil Erosion and Sediment Control Standards

The Municipality's Stormwater Management Ordinance requires all new development, reconstruction, and redevelopment, plans to comply with New Jersey's Soil Erosion and Sediment Control Standards. During construction, Municipality inspectors will observe on-site soil erosion and sediment control measures and report any inconsistencies to the local Soil Conservation District. Additionally, the Municipality will copy the Soil Conservation District on key correspondence.

GREEN INFRASTRUCTURE STORMWATER MANAGEMENT STRATEGIES

MSWMPs must evaluate how the municipal master plan and land use and zoning ordinances should be amended to incorporate green infrastructure BMPs as outlined in NJAC 7:8-5.3. Green infrastructure BMPs mimic natural hydrologic conditions and encourage infiltration and the use of native vegetation. More information on green infrastructure BMPs can be found in Chapters 9 and 10 of the New Jersey Stormwater BMP Manual. Appendix B: Municipal Regulations Checklist *is a tool to assist municipalities with identifying the specific ordinances that should be evaluated, and the types of changes that may be necessary, to address the requirements of the MSWMP.*

This section of the model MSWMP lists example ordinances and describes the subsequent changes implemented by the model Municipality to accommodate green infrastructure BMPs. This section does not include an exhaustive list of every ordinance that should be evaluated, but merely presents some examples. Since many municipal codes are similar, the recommendations provided in this model MSWMP may prove useful to other municipalities.

When submitting the MSWMP and accompanying ordinances to the county for review, all revised ordinances, master plans, and maps must be attached, along with an adoption schedule. The municipality must submit a copy of the revised ordinances and supporting materials to NJDEP as well. The municipality must complete the required public comment process before adopting revised ordinances.

The Municipality has reviewed its Master Plan and associated land use and zoning ordinances. Based on this review, the Municipality has identified ordinance sections to modify to incorporate green infrastructure BMPs. This section of the MSWMP lists the ordinances identified for revision and summarizes the proposed changes. Once the ordinance texts are completed, they will be submitted to the County Agency for review and approval. A copy of the revised ordinances will also be sent to NJDEP at the time of submission.

Multiple chapters of the Municipality's code were reviewed to determine how to incorporate green infrastructure BMPs, including Chapters 109 (Flood Damage Prevention), 254 (Stormwater Management), 257 (Streets and Sidewalks), and 315 (Land Development), among others. Additionally, the code was reviewed for opportunities to incorporate the new standards included in NJDEP's IFP and REAL Rules. Several changes were made to incorporate green infrastructure BMPs and climate resiliency strategies, as listed below:

- *Section 109-7: Basis for Establishing Areas of Special Flood Hazard*. Currently, the Municipality defines areas of special flood hazard based on the scientific report "Flood Insurance Study" and the Flood Insurance Rate Map. This section was amended to replace the existing "flood hazard area design flood elevation" with the new "climate-adjusted flood elevation," which is calculated by adding five feet to the 100-year base flood elevation established by FEMA for tidal flood hazard areas.

- *Section 109-7: Basis for Establishing Areas of Special Flood Hazard*. This section was amended to allow the Municipality to establish an Inundation Risk Zone within tidal flood hazard areas per the requirements of the proposed REAL Rule.

- *Sections 109-16 and 109-17: General Standards and Specific Standards*. These two sections of the Municipality code outline design standards for development within flood hazard areas. Currently, the Municipality requires developers to comply with the Uniform Construction Code (NJAC 5:23) or the standards outlined in Sections 109:16 and :17 of the Municipality code, depending on whichever is most restrictive. These sections of the Municipality code were modified to include the recommended standards for new or improved residential buildings, critical buildings, and critical infrastructure within the Inundation Risk Zone as outlined in the proposed REAL Rule.

- *Section 254-2: Definitions.* This section was modified to include the new definition for major development based on the proposed REAL Rule:
    - Major development refers to projects that either individually or collectively result in:
        1. The disturbance of one or more acres of land since February 2, 2004;
        2. The creation of one-quarter acre or more of "regulated impervious surface" since February 2, 2004;
        3. The creation of one-quarter acre or more of "regulated motor vehicle surface" since March 2, 2021;
        4. The reconstruction of one-quarter acre or more of "regulated motor vehicle surface" or "regulated impervious surface" since the adoption of the REAL Rule; or
        5. A combination of 2, 3, and 4 above that totals an area of one-quarter acre or more.
- *Section 254-2: Definitions.* This section was modified to include new definitions for reconstruction and retention based on the proposed REAL Rule:
    - Reconstruction: the replacement, rebuilding, or restoration of a lawfully existing structure.
    - Retention: retainment of stormwater runoff generated from development by infiltration, evapotranspiration, or reuse of stormwater runoff without the discharge of the stormwater runoff directly or indirectly to surface water or to a treatment works.
- *Section 254-4: Stormwater Management Requirements for Major Development*. This section includes the stormwater management design and performance standards for major developments as adopted in the previous update to the Municipality's MSWMP. This section has been modified to include requirements for reduction in runoff volumes from major developments to ensure a significant portion of stormwater volume, particularly during more frequent, small storm events, is not discharged offsite. The new ordinance also provides an alternative for major development to meet the volumetric reduction standards through the removal of existing impervious surfaces or retaining stormwater off-site within the same HUC14.

- *Section 254-4: Stormwater Management Requirements for Major Development*. New standards were added to require Total Suspended Solid (TSS) removal from stormwater runoff from both new and redeveloped motor vehicle surfaces, with flexibility provided to public transportation projects.

- *Section 254-24: Privately-Owned Refuse Containers and Dumpsters*. This section was modified to match the language included in NJDEP's updated model ordinance requiring dumpsters and other refuse containers that are outdoors and exposed to stormwater to be covered with a lid at all times.

- *Section 254-30: Illicit Connections - Purpose*. This section was modified to match the language included in NJDEP's updated model ordinance prohibiting illegal connections to the municipal stormwater sewer system.

- *Section 315-11.4: Landscape Standards*. The Municipality requires new rowhouse, multifamily, and nonresidential and mixed-use developments or parking lots of 15 or more spaces to have a landscape plan. This section of the code has been amended to require all proposed plant materials consist of native plants, which require less fertilization and watering compared to non-native species.

- *Section 315-11.8: Buffer Yard Requirements*. The Municipality requires buffer yards located within rear and interior side setbacks be reserved for planting material and screening. The landscaping requirements for buffer yards do not explicitly recommend the use of native plants. The language of this section has been amended to require the use of native plantings.

LAND USE / BUILD-OUT ANALYSIS

If a municipality can document that it has a combined total of less than one square mile of vacant or agricultural lands, the municipality is not required to complete the following build-out analysis. If a municipality has more than one square mile of vacant or agricultural lands, a build-out analysis must be conducted for each HUC14 drainage area in the municipality. The build-out analysis should assume full development under the existing zoning code.

To satisfy the minimum requirements for MSWMPs, the results of the build-out analysis should be reported as the expected acreage of impervious surface by HUC14 and the associated nonpoint pollutant loadings that would be expected based on the projected land-use distribution at build-out. Although not required by the regulations, MSWMPs can also include a quantitative analysis of the full impacts of the build-out scenario, such as the projected change in population size and number of school-age children, housing units and housing density, traffic, tax revenues, demands on schools, water supply, sewage, electrical production, and police force. Additional information on the build-out analysis is provided in Chapter 3 *of the New Jersey Stormwater Best Management Practices Manual.*

There are four steps to preparing a build-out analysis that satisfies the MSWMP requirements:

1. *Determine the total land area within each of the HUC14s in the municipality.*

2. *Determine the area of constrained lands (ex., waterbodies or protected parklands) within each of the HUC14s.*

3. *Determine the land available for development within each HUC14 by subtracting the constrained lands from the total land area. Typically, the land available for development within each HUC14 will be equal to the total area of agricultural, forest and/or barren lands. Existing residential, commercial, and industrial areas should also be considered as land available for development, however, as it is possible that existing developments could be redeveloped to increase density.*

4. *Use the municipal zoning map and applicable ordinances to determine the possible acreage of new development that could be built within each HUC14 assuming a full build-out scenario. Once the build-out acreage of each land use is determined, nonpoint pollution source loadings can be determined by multiplying the pollution coefficients by the expected increase in impervious acreage at build-out.*

There are many resources which can provide technical assistance to help municipalities prepare the build-out analysis. Some resources include the Association of New Jersey Environmental Commissions, The Watershed Institute, *the* Rutgers University Center for Remote Sensing and Spatial Analysis, *and the* Nonpoint Education of Municipal Officials (NEMO) program, *which is administered by the University of Connecticut. Municipalities will need GIS software to complete the mapping and querying functions required for the build-out analysis.*

Land use impacts stormwater management, as certain land uses tend to have more impervious surfaces and generate more stormwater runoff. Additionally, different land uses are associated with different pollution sources, resulting in variable impacts on stormwater quality. MSWMPs require municipalities to conduct a build-out analysis to determine the potential impacts of future land use changes to stormwater runoff quantity and quality.

Figure 7 shows land use in the Municipality as of 2020, as calculated by NJDEP GIS files. Figure 8 depicts the HUC14s within the Municipality, and Figure 9 illustrates the constrained lands *(Note: For this model plan, not every constrained land was mapped).* The land-use map shows that most land in the Municipality has already been developed (over 86%), which is typical of many urban areas. ***The land-use map also shows that the Municipality has less than one square mile of vacant or agricultural lands, meaning the Municipality is not required to conduct a build-out analysis.***

Figure 7: Municipality's Existing Land Use (2020)

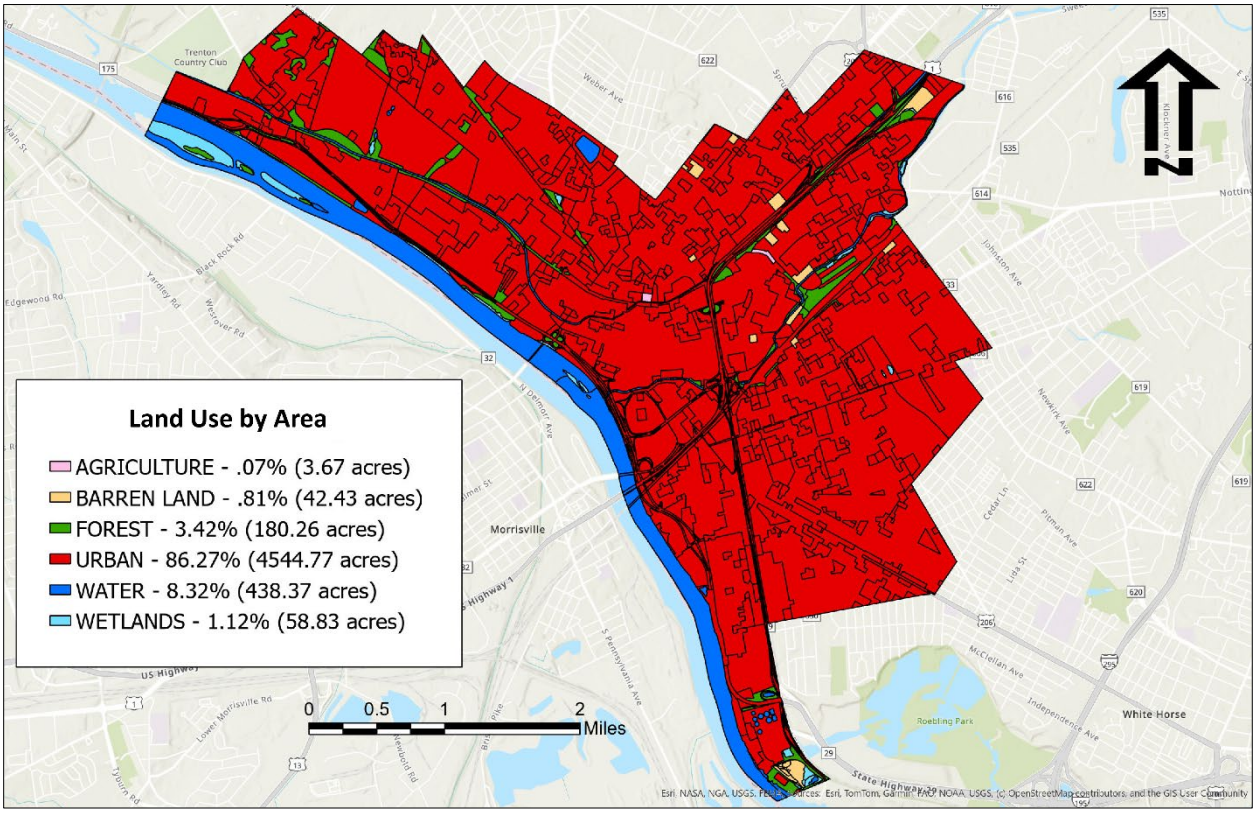


Figure 8: HUC14s within the Municipality

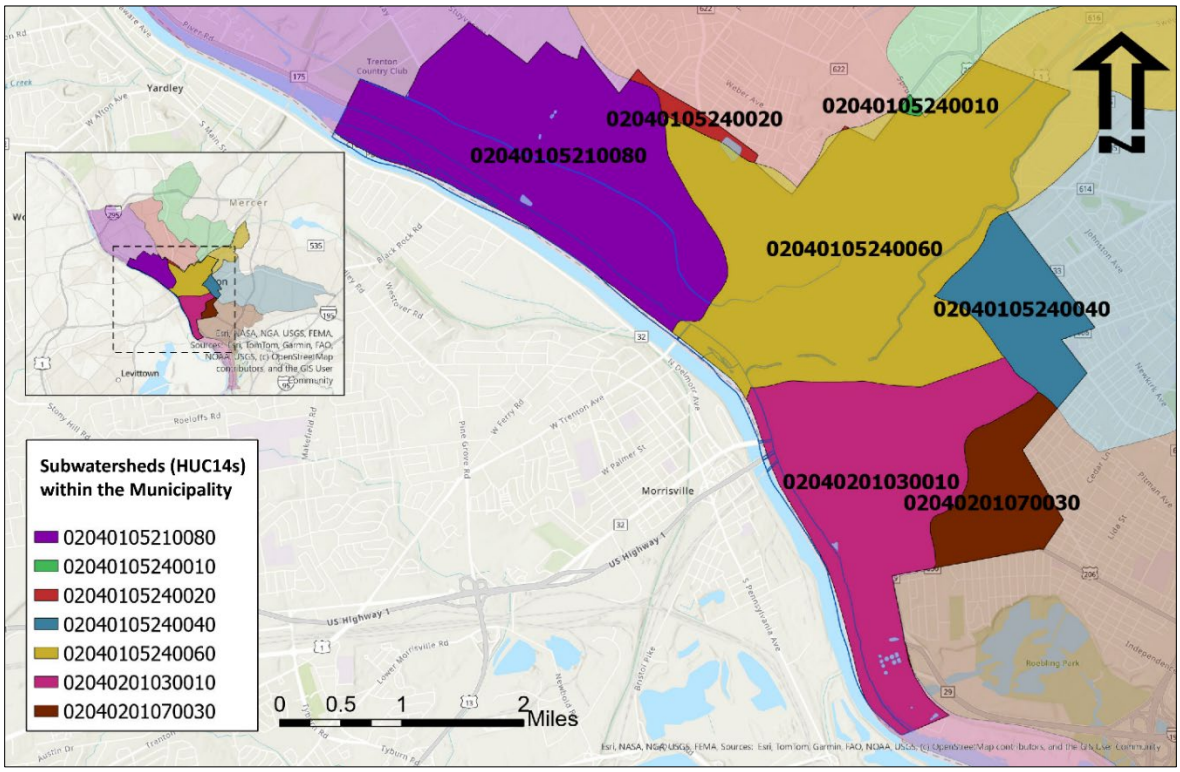
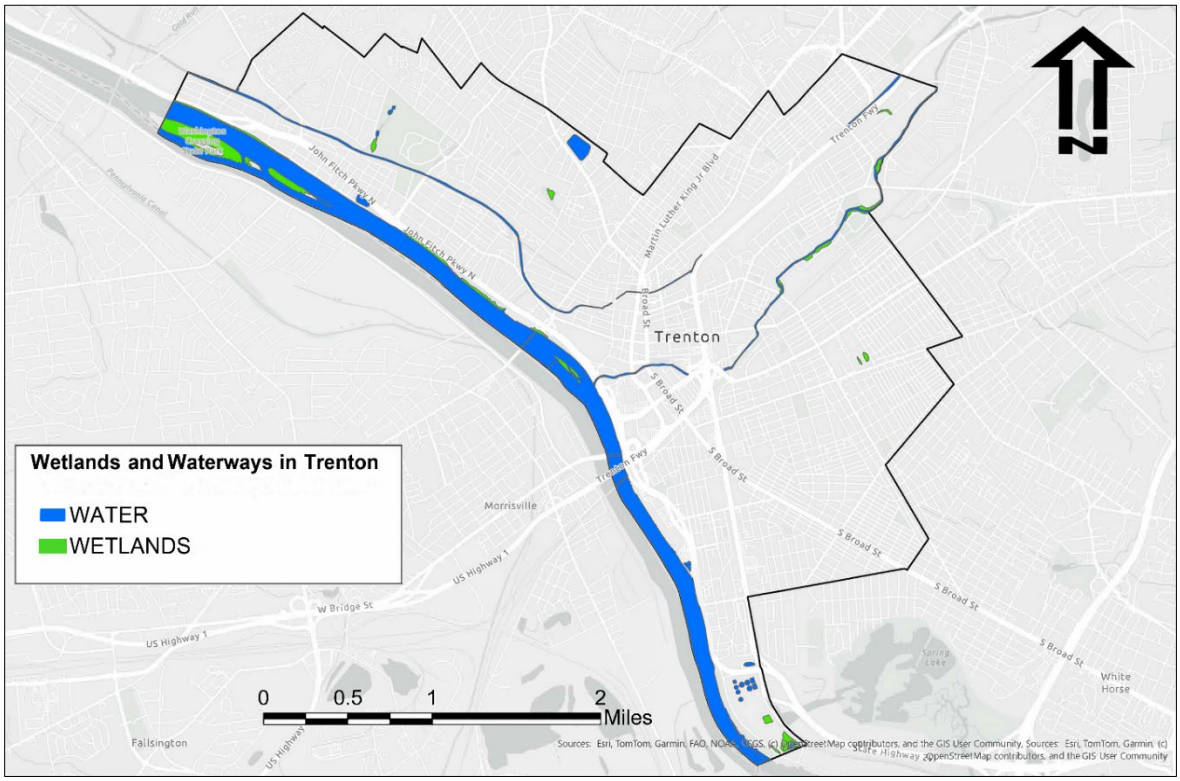


Figure 9: Constrained Lands within the Municipality



As there is less than one square mile of developable land within the model Municipality, the Municipality would not be required to complete the build-out analysis. ***To demonstrate how the build-out analysis is completed, however, this model plan includes sample calculations for one HUC14 in an adjacent municipality, referred to as Municipality B.*** *To complete an actual build-out analysis, municipalities would also need to develop a map visually depicting the anticipated increase in development. This map is not included in this model plan. More information on the mapping component of the build-out analysis can be found in Chapter 3 of the New Jersey Stormwater Best Management Practices Manual.*

Figure 10 shows the zoning map for Municipality B, which is located upstream of the model Municipality. Additional development in Municipality B would likely impact stormwater quality and quantity in the model Municipality. Table 2 includes build-out calculations for one HUC14 within Municipality B. The analyzed HUC14 includes Little Shabakunk Creek, a tributary of Assunpink Creek, which runs through the model Municipality. The build-out calculations show the expected acreage of impervious cover that would be present within the HUC14 under a build-out scenario based on the existing zoning code, and therefore how much more additional area would have reduced stormwater infiltration capacity.

Figure 10: Municipality B Zoning Map

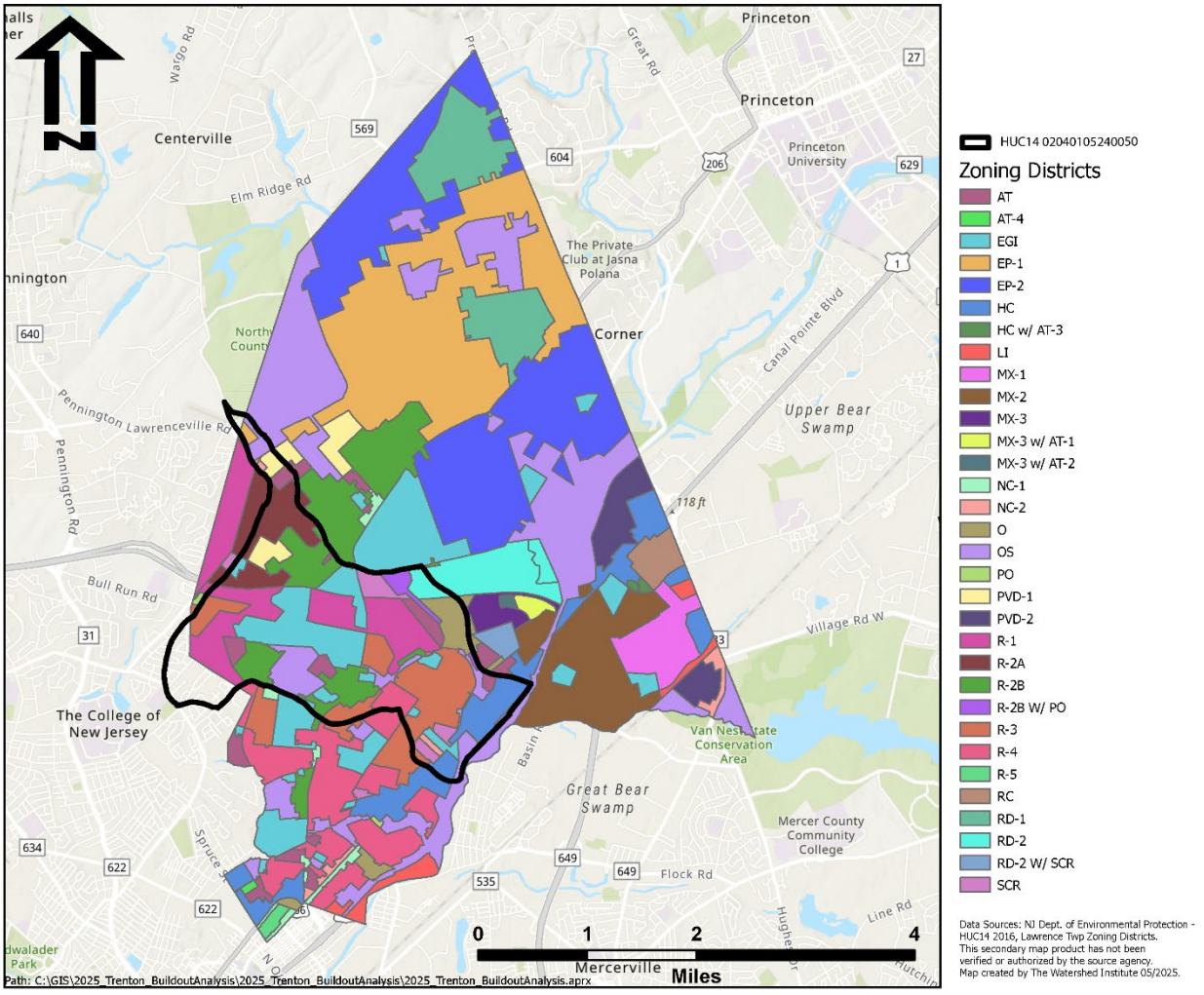


Table 2: Sample Build-Out Calculations for a HUC14 within the Municipality

HUC14	Zone	Total Area (Acres)	Wetlands/ Water Area (Acres)	Developable Area (Acres)	Existing Impervious Area		Allowable Impervious (%)	Total Impervious Surfaces at Build-Out (Acres)
					% Area	Acres		
02040105240050	Apartment & Townhouse (AT)	112.3	9.4	102.8	52%	58.1	75%	77.1
	Education, Government, & Institutions (EGI)	400.1	73.3	326.7	34%	136.6	60%	332.6
	Environmental Protection 1 (EP-1)	13.3	0.0	13.3	10%	1.4	25%	4.7
	Highway Commercial (HC)	153.8	18.4	135.4	67%	103.3	60%	184.5
	Neighborhood Center 1 (NC-1)	1.4	0.0	1.4	43%	0.6	80%	1.7
	Neighborhood Center 2 (NC-2)	12.2	1.8	10.4	56%	6.8	80%	15.1
	Office (O)	85.2	8.0	77.2	61%	51.7	75%	109.6
	Open Space (OS)	220.5	87.4	133.2	7%	15.8	15%	35.7
	Planned Village District 1 (PVD-1)	65.9	7.5	58.4	43%	28.1	60%	63.1
	Residential 1 (R-1)	429.4	77.8	351.6	20%	84.0	25%	171.9
	Residential 2A (R-2A)	200.4	7.2	193.2	28%	56.2	25%	104.5
	Residential 2B (R-2B)	308.9	61.2	247.7	25%	78.3	50%	202.1
	Residential 2B w/ Prof. Office (R-2B/ PO)	42.5	2.1	40.4	32%	13.4	70%	41.7
	Residential 3 (R-3)	390.6	13.5	377.1	35%	136.7	50%	325.3
	Residential 4 (R-4)	50.1	0.0	50.1	44%	21.8	60%	51.9
	Research & Development 2 (RD-2)	42.7	3.9	38.8	7%	2.9	75%	32.0
	Senior Citizen Residential (SCR)	77.1	10.4	66.8	27%	20.8	50%	54.2
	TOTAL	**2,606.5**	**381.8**	**2,224.7**	**31%**	**816.4**	**69%**	**1,807.9**

The second portion of the build-out calculations requires municipalities to determine how the build-out conditions would impact pollutant loads. It is important to note that converting agricultural lands to low density residential uses typically increases pollutant loads for metals and petroleum hydrocarbons, even though Table 3 shows the pollutant load coefficients for agricultural lands as being higher than those for low density residential areas. Converting agricultural lands to low density residential uses typically decreases the total suspended solids loads in stormwater runoff, but the significant increase in impervious surfaces increases the overall stormwater runoff volume. If these increases in stormwater runoff flows are not managed properly, the high flows will likely increase streambank erosion, thereby increasing sediment loads to receiving waters and other waterway impacts. It is recommended that each municipality calculate build-out pollutant loads for both agricultural and residential lands to fully determine the potential impacts of developing agricultural lands.

Table 3 presents pollutant load coefficients for different types of land cover. Table 4 presents the expected pollutant loads that would be generated by the HUC14 at full build-out. The expected pollutant loads were calculated by multiplying the pollutant load coefficients shown in Table 3 by the acreage of developable area within each zone, as shown in Table 2. This data can be used to help both the model Municipality and Municipality B evaluate anticipated pollutant loads from future development in Municipality B and determine if there are any steps the two communities want to take to prevent unwanted stormwater-related impacts.

Table 3: Pollutant Loads by Land Cover

Land Cover	Total Phosphorus Load (lbs/Acre/Year)	Total Nitrogen Load (lbs/Acre/Year)	Total Suspended Solids Load (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	1.0	10	120
Agricultural	1.3	10	300
Forest, Water, Wetlands	0.1	3	40
Barren Land/Transitional Area	0.5	5	60

Source: NJDEP. (2004). *Chapter 3: Regional and Municipal Stormwater Management Plans.* New Jersey Stormwater Best Management Practices Manual.

Table 4: Nonpoint Source Loads at Build-Out for Example HUC14

HUC14	Zone	Developable Area (Acres)	Total Phosphorus (lbs/Acres/Yr)	Total Phosphorus (lbs/Yr)	Total Nitrogen (lbs/Acres/Yr)	Total Nitrogen (lbs/Yr)	Total Suspended Solids (lbs/Acres/Yr)	Total Suspended Solids (lbs/Yr)
02040105240050	Apartment & Townhouse (AT)	102.8	1.4	140	15	1,540	140	14,400
	Education, Government, & Institutions (EGI)	326.7	1	330	10	3,270	120	39,210
	Environmental Protection 1 (EP-1)	13.3	0.1	0	3	40	40	530
	Highway Commercial (HC)	135.4	1	140	10	1,350	120	16,250
	Neighborhood Center 1 (NC-1)	1.4	1.4	0	15	20	140	190
	Neighborhood Center 2 (NC-2)	10.4	1.4	10	15	160	140	1,460
	Office (O)	77.2	1	80	10	770	120	9,270
	Open Space (OS)	133.2	0.5	70	5	670	60	7,990
	Planned Village District 1 (PVD-1)	58.4	1.4	80	15	880	140	8,180
	Residential 1 (R-1)	351.6	0.6	210	5	1,760	100	35,160
	Residential 2A (R-2A)	193.2	0.6	120	5	970	100	19,320
	Residential 2B (R-2B)	247.7	0.6	150	5	1,240	100	24,770
	Residential 2B w/ Prof. Office (R-2B/ PO)	40.4	0.6	20	5	200	100	4,040
	Residential 3 (R-3)	377.1	0.6	230	5	1,890	100	37,710
	Residential 4 (R-4)	50.1	1.4	70	15	750	140	7,010
	Research & Development 2 (RD-2)	38.8	1	40	10	390	120	4,660
	Senior Citizen Residential (SCR)	66.8	0.6	40	5	330	100	6,680
	TOTAL	2,224.7	--	1,730	--	16,230	--	236,830

MITIGATION PLANS

Municipalities must have a mitigation plan to grant a variance or exemption from the design and performance standards of the MSWMPs. The mitigation plan should identify criteria to evaluate mitigation projects and/or potential mitigation projects. The mitigation requirements should offer a hierarchy of options that clearly offset the effect on groundwater recharge, stormwater quantity control, and/or stormwater quality control that was created by granting the variance or exemption. The following section outlines example criteria, as well as fictional project ideas, that a municipality could include in its mitigation plan.

The Municipality prepared the following mitigation plan to offset the effects on groundwater recharge, stormwater quantity, and/or stormwater quality resulting from variances or exemptions from the design and performance standards outlined in this MSWMP. The mitigation plan identifies criteria to evaluate potential mitigation projects. The mitigation plan also describes example mitigation projects. The list of mitigation projects provides a hierarchy of options to offset the impacts of the variance or exemption.

MITIGATION PROJECT CRITERIA

The following criteria will be used by the Municipality to evaluate potential mitigation projects, including those proposed by developers:

1. The mitigation project must be implemented in the same HUC14 as the proposed development.

    a. If mitigation projects cannot be implemented in the same HUC14, the projects will not be required to provide benefits equivalent to the impacts for which the variances or exemptions were sought. Mitigation projects implemented in other areas will still be required to address the same issues for which the variances or exemptions were granted. For example, if a variance is given because the 80 percent total suspended solids (TSS) requirement is not met, the mitigation project should address sources of TSS, such as erosion, agricultural runoff, and wastewater discharge.

2. The project must provide additional groundwater recharge benefits *or* mitigate from stormwater runoff quality and quantity issues generated by previously developed property that does not meet the current design and performance standards outlined in the MSWMP.

3. The applicant can select a project listed in the MSWMP or the applicant can propose its own mitigation project that meets the requirements as outlined in the MSWMP.

4. The developer must ensure the long-term maintenance of the project per the requirements of NJAC 7:8-5.8.

5. If applicable, the developer must ensure compliance with the safety standards for stormwater infrastructure as outlined in NJAC 7:8-6.

EXAMPLE MITIGATION PROJECTS

Developers can select pre-qualified mitigation projects if the MSWMP includes a list of environmental enhancement projects that increase groundwater recharge or mitigate flooding or nonpoint source pollution. This section of the MSWMP includes fictitious projects for the purpose of providing examples. Although only a brief description of each project is presented here, actual MSWMPs should provide sufficient information on the pre-qualified projects, including the 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 requires that applicants seeking a variance or exemption from the design and performance standards identified in the MSWMP refer to the list of qualifying mitigation projects prepared by the Municipality Engineer. Some specific project examples that can be used to meet the mitigation requirements are listed below.

1. Projects to address groundwater recharge impacts:

    a. Retrofit the A.B.C. Middle School site and detention basin to provide an additional 300,000 cubic feet (cf) of average annual groundwater recharge.

    b. Replace the existing 20,000 square feet (sf) of impervious parking lot at the Park with permeable paving to provide 150,000 cf of additional average annual groundwater recharge.

2. Projects to address stormwater quality impacts:

    a. Retrofit the existing stormwater management facility at the Elementary School to remove 80 percent of TSS from the parking lot runoff.

    b. Retrofit the existing parking area at the Municipal Complex to remove 80 percent of TSS. The retrofit BMP cannot reduce the existing number of parking spaces.

3. Projects to address stormwater quantity impacts:

    a. Install green infrastructure BMPs to reduce the peak flow from the upstream development on the receiving stream by 20 cubic feet per second (cfs), 35 cfs, and 100 cfs for the 2-, 10-, and 100-year storms, respectively.

Listed below are example mitigation projects that can be used if the project cannot be located in the same HUC14 as the proposed development.

1. Projects to address stormwater quality impacts:

    a. Re-establish a vegetative buffer (minimum 50 foot wide) along 1,500 linear feet of the Delaware River shoreline as a pollution control measure and to filter stormwater runoff from high pollution areas.

    b. Install rain gardens to increase stormwater infiltration and reduce nonpoint pollution loads entering the Municipality's waterways.

The Municipality may allow a developer to provide funding or partial funding for an environmental enhancement project that has been identified in the MSWMP as a condition of the development permit approval instead of requiring them to implement a project themselves. The Municipality may also allow the developer to provide funding towards the development of a Regional Stormwater Management Plan. If the developer opts to provide the Municipality with funding to mitigate the impacts of the variance or exemption from the design and performance standards, the funding must be equal to or greater than the cost to implement the mitigation standards. Funding must cover the costs associated with purchasing the property or easement for mitigation, and the long-term maintenance requirements of the mitigation measure.

DEVELOPER PROPOSED MITIGATION PROJECTS

This section outlines general requirements for developer-initiated mitigation projects. Municipalities should provide more details in their MSWMPs about what information developers are required to provide for the municipality to approve a developer-initiated mitigation project.

The Municipality will consider developer-initiated mitigation projects if the proposal includes the following required information:

1. General information such as the project name, location, drainage area, cost estimate, the property owner's name and address, and the developer's name and address.

2. Documentation that the project will offset the impacts of the variance or exemption on groundwater recharge, stormwater quantity, and/or stormwater quality.

3. If the applicant is proposing to implement a mitigation project in a different drainage area than the proposed development, the applicant needs to identify why the project cannot be mitigated within the same drainage area.

4. Details of the mitigation project, including, but not limited to, drawings or calculations.

5. Information for the party or parties responsible for the construction and maintenance of the mitigation project.

6. Maintenance plan per the requirements of NJAC 7:8-5.8.

7. List of required permits obtained by the developer for the mitigation project.