Stormwater Management Plan

TOWNSHIP OF MILLSTONE

Monmouth County, New Jersey

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Table of Contents

Introduction	**Page 5**
Goals	**Page 6**
Plan Elements	**Page 9**
New Stormwater Rules	**Page 11**
Stormwater Discussion	**Page 12**
Climate Change and Stormwater	**Page 15**
Background	**Page 16**
Demographics	**Page 17**
Land Use	**Page 19**
Natural Features	**Page 21**
Water Quality	**Page 28**
Water Quantity	**Page 46**
Climate Resiliency Assessment	**Page 51**
Design and Performance Standards	**Page 54**
Plan Consistency	**Page 55**
Green Infrastructure Stormwater Management Strategies	**Page 59**
Land Use / Build-Out Analysis	**Page 60**
Mitigation Plans	**Page 70**
Mitigation Project Criteria	**Page 71**
Example Mitigation Projects	**Page 72**
Developer Proposed Mitigation Projects	**Page 73**
Figures	
Appendices	

Tables

Table 1:	**Population Change 1920 – 2023**	**Page 17**
Table 2:	**Age Distribution**	**Page 18**
Table 3:	**Soil Series & Pedons**	**Page 21**
Table 4:	**Agricultural Quality of Soils**	**Page 22**
Table 5:	**Subwatersheds by WMA**	**Page 27**
Table 6:	**General Surface Water Quality Criteria for FW2-NT Waters**	**Page 30**
Table 7:	**AMNET Sites**	**Page 35**
Table 8:	**Millstone River Sampling Data**	**Page 35**
Table 9:	**Water Quality Impairments by Parameter**	**Page 36**
Table 10:	**TMDLs by Parameter**	**Page 38**
Table 11:	**Build-out Analysis Calculations**	**Page 60**
Table 12:	**Pollutant Loading Coefficients**	**Page 63**
Table 13:	**Pollutant Load by Subwatershed**	**Page 64**

Figures

Figure 1:	**Hydrologic Cycle (embedded on Page 12)**
Figure 2:	**State Location**
Figure 3:	**Location and Municipal Borders**
Figure 4a: **Figure 4b:**	**Land Use Land Cover 2020**
Figure 5a: **Figure 5b:**	**Property Classes**
Figure 6a: **Figure 6b:**	**Zoning**
Figure 7a: **Figure 7b:**	**USGS Quadrangle Map**
Figure 8a: **Figure 8b:**	**Soils**

Figure 9:	**HUC 14 Drainage Areas**
Figure 10a: **Figure 10b:**	**Wetlands**
Figure 11a: **Figure 11b:**	**Surface Water Quality Classifications**
Figure 12a: **Figure 12b:**	**Category One Waterbodies**
Figure 13a: **Figure 13b:**	**AMNET Sites**
Figure 14:	**TMDLs by Parameter**
Figure 15a: **Figure 15b:**	**Flood Hazard Areas**
Figure 16a: **Figure 16b:**	**Aquifers**
Figure 17a: **Figure 17b:**	**Impervious Area**
Figure 18a: **Figure 18b:**	**Groundwater Recharge Areas**
Figure 19a: **Figure 19b:**	**Well Head Protection Areas**
Figure 20a: **Figure 20b:**	**Developable Land and Constraints**

Appendices

Appendix A: **Ambient Macroinvertebrate Network (AMNET) Data Sheets**

Appendix B: **Millstone River Water Sampling Resources**

Appendix C: **NJDEP Model Stormwater Control Ordinance**

Introduction

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for the Township of Millstone ("the Township") to address stormwater-related impacts from new and existing developments, and describes long-term operation and maintenance measures for existing and future stormwater facilities. This MSWMP also includes strategies to address stormwater-related threats driven by climate change, such as worsening floods and rising sea levels. 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 also addresses the review and update of existing ordinances, the 2017 Township 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.

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 Township in accordance with federal and state standards.

The Township is also obligated to address stormwater runoff through the Municipal Separate Storm Sewer System (MS4) permit program. The Township 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

The goals of this MSWMP, per the Stormwater Management Rules (N.J.A.C. 7:8-4.2), 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;
- Encourage incorporation of Low Impact Development Strategies into new and future site development plans, to ensure nonstructural stormwater management requirements are met; and
- Protect public safety through the proper design and operation of stormwater basins.

In addition to the minimum goals required by the NJPDES General Permit, consideration should be given to complying with the goal statements and objectives for "Land Use," "Open Space, Recreation, and Conservation," and "Farmland Preservation" set forth in the 2017 Township Master Plan, which include:

1. Land Use
    a. Promote the establishment of appropriate rural population densities and concentrations that will contribute to the well-being of persons, neighborhoods, communities, and regions and preservation of the environment.

b. Promote the conservation of historic sites and districts, open space, energy resources, and valuable natural resources and to prevent urban sprawl and degradation to the environment through improper use of land.
c. Continue to enforce and implement site design regulations and performance standards related to land conservation and the mitigation of environmental impacts.
d. Encourage cluster development options and other flexible development controls that provide incentives for preserving larger tracts of contiguous open space.
e. Continue to make public investments that maintain the bucolic atmosphere of the Township by preserving open space, parkland, and farmlands.
f. Protect water quality by limiting impervious surface rates and requiring buffers along streams and other environmentally sensitive features.
g. Maintain a desirable visual environment through design guidelines that require new development to match existing aesthetic and architectural pattens with the Township.
h. Encourage Township actions that will guide the appropriate use and management of lands within Millstone Township in a manner which will promote the public health, safety, morals and general welfare.
i. Provide sufficient space in appropriate locations within the Township for agricultural, residential, business, office, light industrial uses, public and quasi-public uses, and open space in a manner which will provide for balanced Township growth and development and meet public needs.
j. Encourage the appropriate and efficient expenditure of public funds by the coordination of public development with land use policies.
k. Encourage the coordination of the various public and private procedures and activities shaping land development with a view of lessening the cost of such development and of increasing the efficient use of land.

2. Open Space, Recreation, and Conservation
    a. Prioritize open space preservation that has the dual benefit of conserving environmentally sensitive natural features.
    b. Create a true network of environmental features and open space areas by pursuing purchase or easement of linear bridal paths as well as large land tracts.

c. Encourage recreational activities that build off of Millstone's inherent natural and scenic qualities, such as long-distance cycling, bird watching, and other similar forms of recreation.
d. Establish scenic corridors that respect and showcase the natural beauty and environmental qualities of the Township.
e. Promote recreational activities that reach currently underserved populations in the Township, such as teenage children and senior citizens.
f. Ensure that active recreational parks with structures, fields and improvements have minimal impact on surrounding natural areas.

3. Farmland Preservation
    a. Actively pursue all opportunities for farmland preservation within the Township's ADA in order to achieve the one-year, five-year and ten-year acreage targets contained in the Millstone Farmland Preservation Plan.
    b. Work with the County on an ongoing basis to accomplish farmland preservation.
    c. Proactively approach property owners and advertise farmland preservation opportunities.

Millstone Township is widely known for its unique and diverse environmental features, valued by residents and municipal officials alike. This MSWMP recognizes the importance of Millstone's exceptional natural qualities and intends to highlight them as a focal point when implementing future stormwater management regulations and strategies. These include but are not limited to:

- Agricultural soils – over 60% within the Township are deemed prime farmland, farmland of statewide importance, or farmland of unique importance;
- Five (5) Watershed Management Areas and fifteen subwatersheds, many of which stem from headwaters in the Township;
- Approximately 5,000 acres of wetlands alongside waterways and in floodplains;
- Open space with numerous wildlife corridors and contiguous patches of habitat; and
- Pervious area consisting of more than 90% of the Township, allowing for high levels of groundwater recharge.

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. Since the State of New Jersey adopted the Resilient Environments and Landscapes (REAL) Rules in January 2026, the Township will define major developments going forward 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 "motor vehicle surface" or "impervious surface" since January 20, 2026; or
5. A combination of 2, 3, and 4 above that totals an area of one-quarter acre or more. The same surface shall not be counted twice when determining if the combination area equals one-quarter acre or more.

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

- Description of how the MSWMP will achieve the goals of stormwater management planning set forth in N.J.A.C. 7:8-2.2.
- Maps showing water bodies, groundwater recharge areas, and wellhead protection areas in the Township.
- An assessment of the climate resiliency of the Township and its stormwater infrastructure per the requirements of N.J.A.C. 7:8-4.2(c), as amended by the REAL Rules.
- 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 N.J.A.C. 7:8-6.
- Coordination with other plans relevant to stormwater management.
- Proposed revisions to the Township'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) Rules were adopted in 2026. The purpose of the REAL Rules is to modernize New Jersey's environmental land use rules to better respond to climate risks such as chronic flooding and sea-level rise.

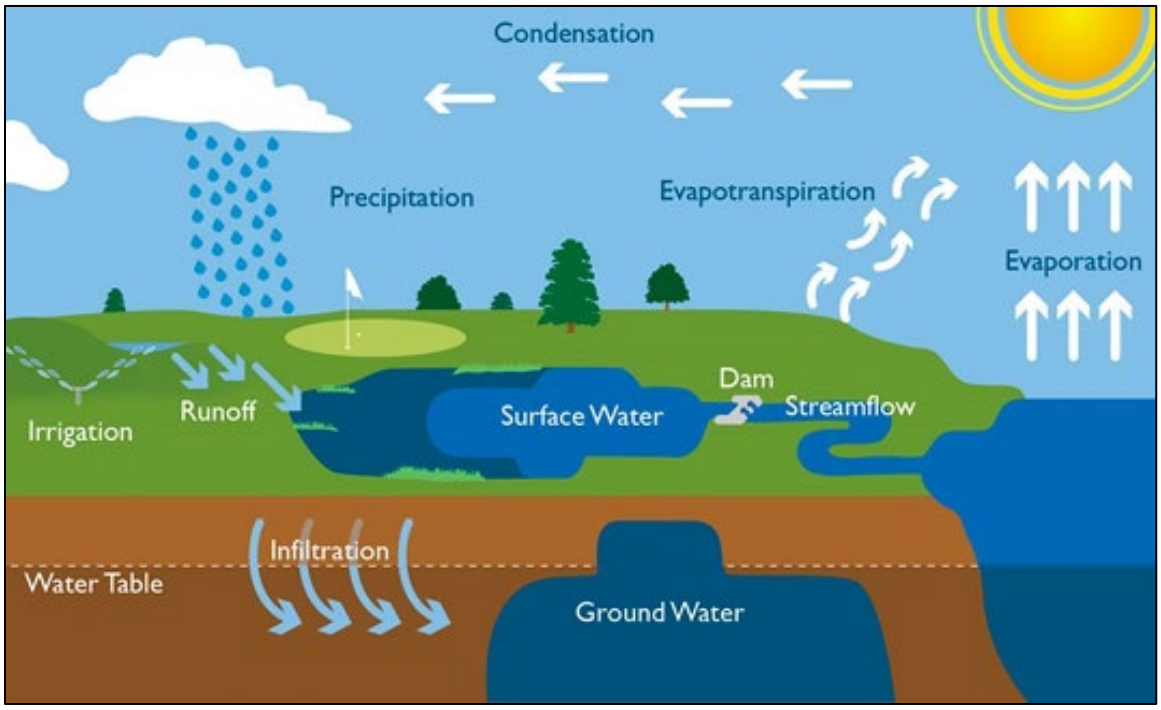
This MSWMP complies with both the IFP and REAL Rules by utilizing best available precipitation and flood data and including a climate resiliency assessment. This plan also recommends the use of green infrastructure as a flood mitigation strategy. By incorporating NJDEP's new recommendations for flood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

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: 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]

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.

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

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

The Township of Millstone is located in the heart of central New Jersey, in the western portion of Monmouth County (Figure 2) and contains a land area of approximately 37.4 square miles. Despite tremendous growth pressure resulting from the close proximity to both the New York and Philadelphia metropolitan areas, Millstone maintains a rural character. The Township is surrounded by numerous other municipalities situated in Mercer, Middlesex, Monmouth, and Ocean County (Figure 3):

- Mercer County
    - Township of East Windsor (northeast)
- Middlesex County
    - Township of Monroe (north)
- Monmouth County
    - Township of Freehold (southeast)
    - Township of Manalapan (northeast)
    - Borough of Roosevelt (west)
    - Township of Upper Freehold (southwest)
- Ocean County
    - Township of Jackson (south)

The Township is environmentally significant because it is situated on a major topographic divide which separates the Raritan River, Delaware River, and Atlantic Coastal drainage basins. As a result, Millstone is part of five (5) New Jersey Watershed Management Areas (WMAs):

- WMA 09 – Lower Raritan, South River, and Lawrence
- WMA 10 – Millstone
- WMA 11 – Central Delaware
- WMA 13 – Barnegat Bay
- WMA 20 – Assiscunk, Crosswicks, and Doctors

Other environmentally sensitive features include extensive freshwater wetlands, prime agricultural soils, steep sloped hills, and exceptional water quality. Maintaining a balance to preserve these natural and indigenous qualities while providing for planned growth is one of the greatest challenges facing the Township today.

Demographics

As per 2023 American Community Survey (ACS) 5-Year Estimates data, the population of Millstone Township was 10,354. Since 1920, the Township has experienced the most population growth from 1970 through 2010, more than quadrupling in population size. Another large period of growth occurred from 1940 through 1960, lining up with the baby boom after World War II and general population trends throughout Monmouth County. From 2010 through 2023, Millstone Township has declined in population size by 202 people. This matches the recent trend of population stagnation in Monmouth County as a whole. It is unlikely that the Township will experience a rate of population growth comparable to what was seen in the late 20th century due to the restrictive residential zoning regulations within the Township intended to preserve its farmland and natural features. Another factor contributing to a lack of population growth in the Township is declining average family size observed statewide. Based on 2023 ACS 5-Year Estimates data, the population density of Millstone Township was 277 residents per square mile. As expected in a rural community such as Millstone, this is approximately 80% lower than the population density of Monmouth County (1,372 residents per square mile).

Table 1: Population Change 1920 – 2023

Year	**Millstone Township**		**Monmouth County**	
	Population	***Percent Gain/Loss***	***Population***	***Percent Gain/Loss***
1920	1,405	-	104,925	-
1930	1,428	1.64%	147,209	40.30%
1940	1,466	2.66%	161,238	9.53%
1950	2,100	43.25%	225,327	39.75%
1960	2,550	21.43%	334,401	48.41%
1970	2,535	-0.59%	459,379	37.37%
1980	3,926	54.87%	503,173	9.53%
1990	5,069	29.11%	553,124	9.93%
2000	8,970	76.96%	615,301	11.24%
2010	10,556	17.68%	630,380	2.45%
2020	10,376	-1.71%	643,615	2.10%
2023	10,354	-0.21%	642,799	-0.13%

Source: U.S. Census Bureau, American Community Survey 5-Year Estimates (Table DP05)
U.S. Census Bureau, Decennial Census of Population and Housing

As per 2023 ACS 5-Year Estimates data, the median age of Millstone Township residents was 47.4 years. This is 3.8 years older than the Monmouth County median age of 43.6 years. Overall, the age distributions of Millstone Township and Monmouth County are similar. The most notable difference is the increased percentage of "Working Age" (20-64) residents in the Township compared to the County.

Table 2: Age Distribution

Age Class (years)	**Millstone Township**		**Monmouth County**	
	Number	***Percent of Total***	***Number***	***Percent of Total***
0-4 *(Pre-school Age)*	258	2.49%	32,449	5.05%
5-19 *(School Age)*	1,926	18.60%	115,619	17.99%
20-64 *(Working Age)*	6,562	63.38%	367,385	57.15%
>65 *(Senior Age)*	1,608	15.53%	127,346	19.81%
Total	**10,354**	**100%**	**642,799**	**100%**
Source: U.S. Census Bureau, American Community Survey 5-Year Estimates (Table S0101)				

Land Use

As per Land Use Land Cover 2020 data, Millstone Township contains a variety of land use types (Figure 4). Clusters of urban land can be found throughout the Township, often adjacent to agricultural land. Large tracts of forest and wetlands buffer the many waterways in the Township. There are very few patches of barren land in Millstone Township.

Based on property tax class data, the Township mainly consists of residential and agricultural land (Figure 5). Parcels listed as public property are dispersed throughout the Township, usually containing undeveloped land. Vacant land remaining in the Township typically aligns with environmentally constrained areas such as wetlands. The two main commercial clusters are found along County Highway 537 and State Route 33. A majority of the Township's industrial parcels are also found near State Route 33. Additionally, tax exempt properties such as churches and cemeteries are interspersed throughout Millstone.

The Township consists of thirteen (13) zoning districts (Figure 6):

- RU-P Rural Preservation Zone
- RU-C Rural Conservation Zone
- R-170 Rural Environmental Zone
- R-130 Rural Residential Zone
- R-80 Rural Residential Zone
- R-MF Rural Multi-Family Zone
- R-20 Residential Zone
- NC Neighborhood Commercial Zone
- HC Highway Commercial Zone
- HC-1 Highway Commercial Zone
- PCD Planned Commercial Development
- BP Business Park
- RC Recreation Camp Zone

As per the New Jersey 2025 State Development and Redevelopment Plan (SDRP), most of the Township is within the PA4B Rural/Environmentally Sensitive Planning Area, but land

surrounding Assunpink Lake, Rising Sun Lake, and the Charleston Springs Golf Course are all designated as part of the PA8 Open Space Planning Area. Communities within the PA4B Rural/Environmentally Sensitive Planning Area are generally described as having a population density of less than 1,000 people per square mile, area greater than one (1) square mile, land used for agricultural purposes with prime soils, large tracts of undeveloped/natural areas, and many individual wells and septic systems. Millstone Township fits well into this category, aligning with the description provided above. The 2025 SDRP states that the intent for PA4B regions is to:

- Maintain the Environs as large contiguous areas of farmland, open space, and forested areas;
- Enhance habitats and sensitive lands;
- Accommodate growth in Centers, excluding floodprone areas;
- Reverse auto-oriented patterns of development;
- Promote a viable agricultural or forestry industry;
- Revitalize cities, towns, and other traditional settlements;
- Protect, enhance, and support local agricultural economies;
- Confine programmed sewers and public water services to Centers, except where public health is at stake; and
- Recognize those areas which also have one or more environmental resources.

Additionally, the 2025 SDRP states that the intent for PA8 regions is to:

- Protect critical natural resources;
- Provide for public recreational and educational opportunities;
- Promote continued maintenance of associated facilities; and
- Incentivize the connection of these areas to a system of open lands.

Natural Features

The Township of Millstone lies in two geographic areas – the Outer Coastal Plain to the southeast, and the Inner Coastal Plain to the northwest. Both of these areas constitute the Atlantic Coastal Plain Physiographic Province of New Jersey. This province is formed on unconsolidated and semi-consolidated marine alluvial sediments. These sediments include clay, silt, sand, and gravel which were deposited as sea level rose and fell during the end of the Cretaceous Period of the Mesozoic Era and the Tertiary Period of the Cenozoic Era. The topography of Millstone is varied, containing numerous hills as well as flatter regions suitable for agriculture (Figure 7). Ground elevation within the Township ranges from approximately 80 to 350 feet relative to NAVD88. These conditions are unusual within the Atlantic Coastal Plain and are a leading factor in why Millstone Township contains the headwaters for many waterbodies and is within five (5) WMAs.

A total of 28 soil series and three (3) great groups lie within Millstone Township (Figure 8). Table 3 provides details on the ten (10) most prevalent soil series/great groups in Millstone. Sandy loam and loam dominate the Township's soil profile. Loamy sand and sand are also found in high quantities. Soil slopes range up to 25% due to the Township's topography. Many of the soils found in Millstone are of excellent quality for agriculture. Table 4 lists Township soils by each category of agricultural importance as defined by USDA-NCRS.

Table 3: Soil Series & Pedons

Soil Series	***Soil Pedon***	***Soil Pedon Description***	***Percent of Township Area***
Freehold	FrfB	Freehold loamy sand, 0-5% slopes	21.46%
	FrfC	Freehold loamy sand, 5-10% slopes	
	FrkB	Freehold sandy loam, 2-5% slopes	
	FrkC	Freehold sandy loam, 5-10% slopes	
	FrkC2	Freehold sandy loam, 5-10% slopes, eroded	
	FrkD	Freehold sandy loam, 10-15% slopes	
	FrkD2	Freehold sandy loam, 10-15% slopes, eroded	
	FrkE2	Freehold sandy loam, 15-25% slopes, eroded	
	FroA	Freehold loam, 0-2% slopes	
Sassafras	SacB	Sassafras sandy loam, 2-5% slopes, Northern Coastal Plain	13.90%
	SacC	Sassafras sandy loam, 5-10% slopes, Northern Coastal Plain	

	SacD	Sassafras sandy loam, 10-15% slopes	
	SacE	Sassafras sandy loam, 15-25% slopes	
	SadB	Sassafras gravelly sandy loam, 2-5% slopes	
	SadC	Sassafras gravelly sandy loam, 5-10% slopes	
	SafA	Sassafras loam, 0-2% slopes	
Tinton	ThgB	Tinton loamy sand, 0-5% slopes	10.83%
	ThgC	Tinton loamy sand, 5-10% slopes	
	ThgE	Tinton loamy sand, 10-25% slopes	
Evesboro	EveB	Evesboro sand, 0-5% slopes	7.97%
	EveC	Evesboro sand, 5-10% slopes	
	EveD	Evesboro sand, 10-15% slopes	
	EveE	Evesboro sand, 15-25% slopes	
Shrewsbury	ShrA	Shrewsbury sandy loam, 0-2% slopes	6.93%
Collington	CokB	Collington sandy loam, 2-5% slopes	5.99%
	CokC2	Collington sandy loam, 5-10% slopes, eroded	
	CokD3	Collington sandy loam, 10-15% slopes, severely eroded	
	ConA	Collington loam, 0-2% slopes	
Holmdel	HocA	Holmdel sandy loam, 0-2% slopes	4.11%
	HocB	Holmdel sandy loam, 2-5% slopes	
	HofB	Holmdel-Urban land complex, 0-5% slopes	
Humaquepts*	HumAt	Humaquepts, 0-3% slopes, frequently flooded	3.93%
Woodstown	WoeB	Woodstown sandy loam, 2-5% slopes, Northern Coastal Plain	2.56%
	WogA	Woodstown loam, 0-2% slopes, Northern Coastal Plain	
Lakewood	LasB	Lakewood sand, 0-5% slopes	2.40%
	LasC	Lakewood sand, 5-10% slopes	
		Less abundant soil series not listed above	*19.92%*
		Total	**100.00%**
*Humaquepts is not a soil series; it is a great group.			
Source: USDA-NRCS Official Soil Series Descriptions			

Table 4: Agricultural Quality of Soils

Agricultural Quality ***(sorted top to bottom by importance)***	***Soils***	***Percent of Township Area***
Prime Farmland	Adelphia loam	40.26%
	Collington loam	
	Collington sandy loam	
	Colts neck sandy loam	
	Downer sandy loam	
	Freehold loam	
	Freehold loamy sand	

	Freehold sandy loam	
	Holmdel sandy loam	
	Keyport sandy loam	
	Marlton loam	
	Matapeake loam	
	Sassafras gravelly sandy loam	
	Sassafras sandy loam	
	Sassafras loam	
	Woodstown loam	
	Woodstown sandy loam	
Farmland of Unique Importance	Atsion sand	2.64%
	Manahawkin muck	
Farmland of Statewide Importance	Collington sandy loam (moderate slope, eroded)	21.13%
	Colts Neck sandy loam (moderate slope)	
	Downer loamy sand	
	Freehold loamy sand (moderate slope)	
	Freehold sandy loam (moderate slope)	
	Hammonton loamy sand	
	Keyport sandy loam (moderate slope)	
	Klej loamy sand	
	Marlton sandy loam	
	Mattapex & Bertie loams	
	Pemberton loamy sand	
	Sassafras gravelly sandy loam (moderate slope)	
	Sassafras sandy loam (moderate slope)	
	Tinton loamy sand	
Farmland of Statewide Importance, if drained	Elkton loam	10.01%
	Fallsington loam	
	Kresson loam	
	Shrewsbury sandy loam	
Farmland of Local Importance	N/A	0%
Not Prime Farmland	Colemantown loam (occasionally flooded)	25.96%
	Collington sandy loam (steep slope, severely eroded)	
	Colts Neck sandy loam (steep slope, eroded)	
	Evesboro sand	
	Fluvaquents	
	Freehold sandy loam (steep slope)	
	Hatboro-Codorus complex	
	Humaquepts	
	Keyport sandy loam (steep slope)	
	Lakehurst sand	
	Lakewood sand	

	Phalanx loamy sand	
	Sassafras sandy loam (steep slope)	
	Tinton sandy loam (steep slope)	
	Udorthents	
	Total	**100.00%**
Source: USDA-NRCS Prime and other Important Farmlands		

Freehold Series

The Freehold series is generally described as very deep, well drained, strongly acidic, and derived from a parent material of marine sediments containing glauconite. It is part of the taxonomic class of fine-loamy, mixed, active, mesic Typic Hapludults. Hapludults is a great group of Udults, which is a suborder of Ultisols. The "ud-" prefix in Udults refers to the soil being typically found in humid climates with well-distributed rainfall throughout the year. The "hapl-" prefix in Hapludults refers to the general lack of horizon development or stratification found in these soils.

Sassafras Series

The Sassafras series is generally described as very deep, well drained, strongly acidic, and derived from a parent material of loamy fluviomarine sediments. It is part of the taxonomic class of fine-loamy, siliceous, semiactive, mesic Typic Hapludults. Hapludults is a great group of Udults, which is a suborder of Ultisols. The "ud-" prefix in Udults refers to the soil being typically found in humid climates with well-distributed rainfall throughout the year. The "hapl-" prefix in Hapludults refers to the general lack of horizon development or stratification found in these soils.

Tinton Series

The Tinton series is generally described as very deep, well drained, slightly to very strongly acidic, and derived from a parent material of sandy eolian deposits over glauconite bearing fluviomarine deposits. It is part of the taxonomic class of loamy, mixed, semiactive, mesic Arenic Hapludults. Hapludults is a great group of Udults, which is a suborder of Ultisols. The "ud-" prefix in Udults refers to the soil being typically found in humid climates with well-distributed rainfall throughout the year. The "hapl-" prefix in Hapludults refers to the general lack of horizon development or stratification found in these soils.

Evesboro Series

The Evesboro series is generally described as very deep, excessively drained, strongly to extremely acidic, and derived from a parent material of sandy marine and eolian deposits. It is part of the taxonomic class of Mesic, coated Lamellic Quartzipsamments. Quartzipsamments is a great group of Psamments, which is a suborder of Entisols. The "psamm-" prefix in Psamments refers to the soil having a sandy texture. The "quartz-" prefix in Quartzipsamments refers to the high quartz content of the soil.

Shrewsbury Series

The Shrewsbury series is generally described as very deep, poorly drained, very strongly to extremely acidic, and derived from a parent material of marine sediments containing moderate amounts of glauconite. It is part of the taxonomic class of fine-loamy, mixed, active, mesic Typic Endoaquults. Endoaquults is a great group of Aquults, which is a suborder of Ultisols. The "aqu-" prefix in Aquults refers to the aquic conditions typically found in these soils. The "endo-" prefix in Endoaquults refers to the soil being influenced by the groundwater table as opposed to a perched water table.

Collington Series

The Collington series is generally described as very deep, well drained, strongly to extremely acidic, and derived from a parent material of glauconite bearing eolian and/or fluviomarine deposits. It is part of the taxonomic class of fine-loamy, mixed, active, mesic Typic Hapludults. The "ud-" prefix in Udults refers to the soil being typically found in humid climates with well-distributed rainfall throughout the year. The "hapl-" prefix in Hapludults refers to the general lack of horizon development or stratification found in these soils.

Holmdel Series

The Holmdel series is generally described as very deep, moderately well to somewhat poorly drained, very strongly to extremely acidic, and derived from a parent material of loamy glauconite bearing marine and/or fluviomarine sediments. It is part of the taxonomic class of fine-loamy, mixed, active, mesic Aquic Hapludults. The "ud-" prefix in Udults refers to the soil being typically found in humid climates with well-distributed rainfall throughout the year. The "hapl-"

prefix in Hapludults refers to the general lack of horizon development or stratification found in these soils.

Humaquepts Great Group

Humaquepts is a great group of Aquepts, which is a suborder of Inceptisols. The “aq-“ prefix in Aquepts refers to it being a group of wet soils with poor drainage. They are typically somewhat acidic and have ground water near or at the topmost horizon for part of the year. The “hum-” prefix in Humaquepts refers to the increased humus, or organic matter, typically seen in these soils. As seen in Millstone Township, these soils often support wetlands.

Woodstown Series

The Woodstown series is generally described as very deep, moderately well drained, strongly to extremely acidic, and derived from a parent material of sandy marine and old alluvial sediments. It is part of the taxonomic class of fine-loamy, mixed, active, mesic Aquic Hapludults. The “ud-“ prefix in Udults refers to the soil being typically found in humid climates with well-distributed rainfall throughout the year. The “hapl-“ prefix in Hapludults refers to the general lack of horizon development or stratification found in these soils.

Lakewood Series

The Lakewood series is generally described as very deep, excessively drained, very strongly to extremely acidic, and derived from a parent material of sandy marine sediments. It is part of the taxonomic class of mesic, coated Spodic Quartzipsamments. The “psamm-“ prefix in Psamments refers to the soil having a sandy texture. The “quartz-“ prefix in Quartzipsamments refers to the high quartz content of the soil.

Millstone is within five (5) New Jersey Watershed Management Areas (WMAs). Numerous Hydrologic Unit Code 14 (HUC 14) areas, also known as subwatersheds, can be found throughout each WMA. Situated at the headwaters for multiple WMAs, Millstone Township contains 15 subwatersheds.

Table 5: Subwatersheds by WMA

WMA		***Subwatershed***	
#	***Name***	***HUC 14 Code***	***Name***
09	Lower Raritan, South River, and Lawrence	02030105140010	Manalapan Brook (above 40d 16m 15s)
		02030105140020	Manalapan Brook (includes Lake Manalapan to 40d16m15s)
10	Millstone	02030105100010	Millstone River (above Route 33)
		02030105100020	Millstone River (Applegarth Road to Route 33)
		02030105100040	Rocky Brook (above Monmouth County line)
		02030105100050	Rocky Brook (below Monmouth County line)
		02030105100070	Cranbury Brook (above NJ Turnpike)
11	Central Delaware	02040105230010	Assunpink Creek (above Assunpink Lake)
		02040105230020	Assunpink Creek (New Sharon Bridge to/including Lake)
13	Barnegat Bay	02040301020010	Metedeconk River NB (above I-195)
		02040301030010	Metedeconk River SB (above I-195 Exit 21 Road)
		02040301060010	Toms River (above Francis Mills)
20	Assiscunk, Crosswicks, and Doctors	02040201050010	Lahaway Creek (above Prospertown)
		02040201060010	Doctors Creek (above 74d28m40s)
		02040201060020	Doctors Creek (Allentown to 74d28m40s)

Water Quality

Wetlands

Wetlands are generally defined by the presence of three (3) characteristics (Federal Interagency Committee for Wetland Delineation 1989):

1. Hydrology – the site should be inundated with water for at least a portion of the year.
2. Vegetation – a majority of the site should contain vegetation that only grow in wetlands (obligate wetlands plants), typically grow in wetlands (facultative wetlands plants), and/or are equally likely to grow in wetlands or other habitats (facultative plants).
3. Soils – the site should have hydric soils, which are saturated for enough time in the growing season to create anaerobic conditions in the upper horizon(s).

Wetlands are crucial to maintaining biodiversity within our region. They contain many types of habitat for wildlife such as nurseries for fish to develop in and hunting grounds for wading birds. Additionally, they help improve the quality of our water and air. Wetland vegetation slows down runoff and filters out pollutants before it reaches adjacent waterbodies, acting as a natural buffer and improving water quality and quantity. This vegetation also removes a significant amount of carbon dioxide from the air via photosynthesis. The carbon in the plants will then be transferred to the soil through root exchange and decomposition of plant matter. This process, known as carbon sequestration, creates sinks of carbon stored in the soil where they no longer contribute to the greenhouse gas effect. Wetlands are excellent at sequestering carbon into soils due to their high rate of decomposition and abundance of plant life found in them.

Due to being poor quality land for development purposes and a breeding ground for mosquitoes among other reasons, much of the country's wetlands have been filled or drained, permanently altering those ecosystems. Replacing natural vegetation with impervious surfaces removes the buffering and carbon sequestration abilities of the land, often reversing the direction of net carbon flow back into the atmosphere instead of into the soil. Preserving what wetlands remain, especially in highly developed regions such as Monmouth County is imperative.

Approximately 20.97% of Millstone Township's land area consists of wetlands. Most of these wetlands surround the many waterbodies interlaced throughout the Township. Notably less

wetlands are found in areas further from the water table and higher in elevation, particularly in the south-central portion of the Township (Figure 10).

While current State regulations limit disturbance of wetland areas, encroachment into these environmentally sensitive areas is still seen. Efforts should be made to further protect these areas from disturbance. Potential wetlands control measures to be implemented include:

- Requiring conservating easements along wetland buffer lines;
- Requiring conservation markers to be installed along easements to prevent homeowners from encroaching into wetland and/or buffer areas;
- Providing a NJDEP wetland map including property lot lines to the Township. Educating Township employees in the zoning and building departments to refer to the wetland map to determine if wetlands are located in the vicinity of a property proposing any construction, including decks, sheds, garages, etc. If wetlands are in the vicinity of the property, requiring a Letter of Interpretation prior to issuance of a permit;
- Strict enforcement of the NJDEP imposed wetland buffer for construction activity on all proposed building sites; and
- Restricting tree clearings in wetland and/or buffer areas to dead, diseased, or hazard trees only.

Surface Water Quality Standards

The New Jersey Surface Water Quality Standards (N.J.A.C. 7:9B) establish the designated uses to be attained and specify the water quality criteria required to protect the State's waters. Designated uses include potable water, propagation of fish and wildlife recreation, agricultural and industrial supplies, and navigation. These are reflected in use classifications assigned to specific waters. By providing surface water quality classifications for waters across the State, communities can more easily identify water quality issues and work towards quantifiable goals during remediation efforts.

Within Millstone Township, almost all waterbodies have a surface water quality classification of FW2-NT. The North Branch Metedeconk River, Assunpink Lake, and portions of Assunpink Creek have a surface water quality classification of FW2-NTC1 (Figure 11). "FW" stands for fresh water. FW1 waters are not subject to any man-made wastewater discharges due to their ecological

significance, whereas FW2 waters are. “NT” stands for non-trout, meaning trout do not use these waterways. As per N.J.A.C. 7:9B, in all FW2 waters the designated uses are:

- Maintenance, migration, and propagation of the natural and established biota;
- Primary contact recreation;
- Industrial and agricultural water supply;
- Public potable water supply after conventional filtration treatment (a series of processes including filtration, flocculation, coagulation, and sedimentation, resulting in substantial particulate removal but no consistent removal of chemical constituents) and disinfection; and
- Any other reasonable uses.

“C1” stands for Category One, a group of waterbodies which NJDEP has assigned a special level of protection to. The C1 designation targets water bodies that provide drinking water, habitat for endangered and threatened species, and popular recreational and/or commercial species, such as trout or shellfish. The Category One designation provides increased protection to water bodies to help prevent water quality degradation and discourage development where it would impair or destroy natural resources and environmental quality. Category One waterbodies in the Township are limited to the North Branch Metedeconk River, Assunpink Lake, and portions of Assunpink Creek (Figure 12).

Table 6: General Surface Water Quality Criteria for FW2-NT Waters

Substance	***Criteria***
Bacterial quality (counts/100mL)	*E. coli* levels shall not exceed a geometric mean of 100/100 mL over a 90-day period and a Statistical Threshold Value of 320/100 mL, which shall not be greater than 10 percent excursion frequency over a 90-day period.
Dissolved Oxygen (mg/L)	24 hour average not less than 5.0, but not less than 4.0 at any time. Supersaturated dissolved oxygen values shall be expressed as their corresponding 100 percent saturation values for purposes of calculating 24 hour averages.
Floating, colloidal, color and settleable solids; petroleum	None noticeable in the water or deposited along the shore or on the aquatic substrata in quantities detrimental to the natural biota. None which would render the waters unsuitable for the designated uses.

hydrocarbons and other oils and grease			
Nutrients	General	Except as due to natural conditions, nutrients shall not be allowed in concentrations that render the waters unsuitable for the existing or designated uses due to objectionable algal densities, nuisance aquatic vegetation, diurnal fluctuations in dissolved oxygen or pH indicative of excessive photosynthetic activity, detrimental changes to the composition of aquatic ecosystems, or other indicators of use impairment caused by nutrients.	
	Phosphorus (mg/L)	Concentrations of total P shall not exceed 0.1 in any stream, unless site-specific criteria or watershed-specific translators are established pursuant to N.J.A.C. 7:9B-1.5(g)2 or if the Department determines that concentrations do not render the waters unsuitable. Concentrations of total P shall not exceed 0.05 in any lake, pond or reservoir, or in a tributary at the point where it enters such bodies of water, unless site-specific criteria or watershed-specific translators are developed pursuant to N.J.A.C. 7:9B-1.5(g)2 or if the Department determines that concentrations do not render the waters unsuitable.	
pH	Upper Delaware River Basin Waters		6.5 – 8.5
	Atlantic Coastal Basin, Lower Delaware River Basin, & Lower Raritan River and Raritan Bay Basin Waters		4.5 – 7.5
Radioactivity	Prevailing regulations including all amendments and future supplements thereto adopted by the U.S. Environmental Protection Agency pursuant to Sections 1412, 1445, and 1450 of the Public Health Services Act, as amended by the Safe Drinking Water Act (PL 93-523)		
Suspended Solids (mg/L)	40.0		

Total Dissolved Solids (mg/L)	No increase in background which may adversely affect the survival, growth or propagation of the aquatic biota. Compliance with water quality-based WET limitations or LC50 ≥ 50 percent, whichever is more stringent, shall be deemed to meet this requirement. No increase in background which would interfere with the designated or existing uses, or 500 mg/L, whichever is more stringent.
Sulfate (mg/L)	250
Taste and odor producing substances	None offensive to humans or which would produce offensive taste or odors in water supplies and biota used for human consumption. None which would render the water unsuitable for the designated uses.
Temperature	Temperatures shall not exceed a daily maximum of 31 degrees Celsius or rolling seven-day average of the daily maximum of 28 degrees Celsius, unless due to natural conditions.
Toxic Substances	None, either alone or in combination with other substances, in such concentrations as to affect humans or be detrimental to the natural aquatic biota, produce undesirable aquatic life, or which would render the waters unsuitable for the designated uses. Toxic substances shall not be present in concentrations that cause acute or chronic toxicity to aquatic biota, or bioaccumulate within an organism to concentrations that exert a toxic effect on that organism or render it unfit for consumption. The concentrations of nonpersistent toxic substances in the State's waters shall not exceed one-twentieth (0.05) of the acute definitive LC50 or EC50 value, as determined by appropriate bioassays conducted in accordance with N.J.A.C. 7:18. The concentration of persistent toxic substances in the State's waters shall not exceed one-hundredeth (0.01) of the acute definitive LC50 or EC50 value, as determined by appropriate bioassays conducted in accordance with N.J.A.C. 7:18. None which would cause standards for drinking water to be exceeded after appropriate treatment.
Turbidity (Nephelometric	Maximum 30-day average of 15 NTU, a maximum of 50 NTU at any time.

Turbidity Unit-NTU)	
Source: New Jersey Surface Water Quality Standards (N.J.A.C. 7:9B-1.14(d))	

Ambient Macroinvertebrate Network (AMNET)

NJDEP has established the Ambient Macroinvertebrate Network (AMNET) to help estimate and document how well waterways are meeting their surface water quality classification criteria. There are over 900 AMNET sites spread throughout all twenty (20) WMAs in New Jersey. These sites are sampled for benthic macroinvertebrates by NJDEP on a five-year cycle. Benthic macroinvertebrates are invertebrate organisms dwelling on the beds of waterbodies that are visible to the naked eye. Common benthic macroinvertebrates include insects & insect larvae, worms, and snails. These organisms are used to estimate water quality for a variety of reasons:

- They are easy to sample;
- They are common throughout New Jersey's waters;
- Most do not travel far, making for a good sample of a specific site area;
- Certain indicator species/genera are intolerant of pollutants, whereas others are potentially indicative of pollution due to their tolerance; and
- They can have a response to low levels of pollutants undetectable by directly sampling for said pollutants with conventional equipment/methods.

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 system has since been replaced with three (3) new, regionally specific indices: High Gradient Macroinvertebrate Index (HGMI), Coastal Plain Macroinvertebrate Index (CPMI), and Pinelands Macroinvertebrate Index (PMI). These indices were created to better assess the nuanced benthic invertebrate communities within each region. Waterbodies within HGMI typically have a higher gradient (slope) than lower gradient CPMI waterbodies, which are situated on the relatively-flatter coastal plain. The difference in gradients results in the development of macroinvertebrate communities with different compositions from one another. PMI is distinguished from both HGMI and CPMI due to the unique chemical,

physical, and biological properties characteristic of waters contained within and surrounding the Pinelands area, creating another distinct community composition.

Millstone Township falls within the Coastal Plain and thus uses the CPMI to judge benthic macroinvertebrate samples. A higher diversity of macroinvertebrate genera present in a sample generally results in a higher score. The range of scores a waterway can receive are separated into four (4) discrete groups classified as excellent, good, fair, and poor (NJDEP, Bureau of Freshwater and Biological Monitoring 2007):

- **Excellent:** Minimal changes in structure of biological community and minimal changes in ecosystem function. Virtually all native taxa are maintained with some changes to biomass and/or abundance; ecosystem functions are fully maintained within the range of natural variability.
- **Good:** Some evident changes in structure of the biotic community and minimal changes in ecosystem function. Some changes in structure due to loss of some rare native taxa; shifts in relative abundance of taxa but sensitive-ubiquitous taxa are common and abundant; ecosystem functions are fully maintained.
- **Fair:** Moderate to major changes in structure of biological community and moderate changes in ecosystem function. Sensitive taxa are markedly diminished; conspicuously unbalanced distribution of major groups from that expected; organism condition shows signs of physiological stress; system function shows reduced complexity.
- **Poor:** Extreme changes in structure of biological community and major loss of ecosystem function. Extreme changes in structure; wholesale changes in taxonomic composition; extreme alterations from normal densities and distributions; organism condition is often poor; ecosystem functions are severely altered.

There are seven (7) AMNET sites within Millstone Township, and an additional two (2) AMNET sites within 1,000 feet of the Township. Impairment rating data from these sites ranges from “Good” to “Poor.” Due to the limited number of AMNET sites across the Township and an infrequent 5-year sampling schedule for each site, there is insufficient data to draw any significant conclusions from. It can be said that the sampled waters are all somewhat impaired based on the CPMI, a sentiment mirrored throughout almost all AMNET sites in Monmouth County. AMNET data sheets from each sampling round for the sites discussed above can be found in Appendix A.

Table 7: AMNET Sites

Site #	*Waterbody*	*Latest Sampling Date*	*Impairment Rating*
AN0108	Assunpink Creek	06/06/2018	Fair
AN0123	Ivanhoe Brook	07/20/2011	Good
AN0127B	Doctors Creek	09/20/2016	Good
AN0378	Millstone River	08/25/2009	Good
AN0379	Millstone River	07/21/2014	Poor
AN0380	Rocky Brook	07/17/2014	Fair
AN0437	Manalapan Brook	10/14/2014	Good
AN0517	Toms River	06/15/2010	Fair
AN0518	Toms River	06/15/2010	Fair

Environmental Commission Water Sampling

The Millstone Township Environmental Commission has performed monthly water sampling of a portion of the Millstone River near Stillhouse Road since May 2025, monitoring phosphorus concentrations. This site routinely exceeds phosphorus concentration limits set by NJDEP for FW2-NT waters. This aligns with the total phosphorus TMDLs listed in the Millstone River subwatersheds (see Table 10). Observed characteristics of the waterway include dense mats of iron-oxidizing bacteria and prominent algal growth. It is speculated that groundwater seepage from a spring is the main contributor of contaminants based on upstream sampling results at two (2) test points. A map of the Millstone River sampling site & test points, pictures of the sampling site & test points, and copies of the monthly water sampling data sheets can be found in Appendix B.

Table 8: Millstone River Sampling Data

Date	Site	Time Since Last Rainfall or Snowmelt	Nitrate (mg/L)	Phosphate (mg/L)	pH	DO (mg/L)
5/17/2025	MRA	<24 hours	<0.2	0.6	6.75	5.90
6/21/2025	MRA	24-48 hours	<0.2	0.5	6.50	5.90
7/20/2025	MRA	>48 hours	<0.2	0.5	6.50	5.30
8/16/2025	MRA	>48 hours	<0.2	0.6	6.50	4.65
10/18/2025	MRA	>48 hours	<0.2	0.3	6.50	6.30
11/15/2025	MRA	>48 hours	<0.2	0.2	6.50	6.05
1/17/2026	MRA	>48 hours	<0.2	0.3	6.50	9.70
2/21/2026	MRA	<24 hours	<0.2	<0.2	5.50	11.10
3/14/2026	MRA	24-48 hours	<0.2	<0.2	6.50	10.60

4/19/2026	MRA	<24 hours	<0.2	0.3	6.50	7.40
5/16/2026	MRA	>48 hours	<0.2	0.5	6.00	7.00
6/20/2026	MRA	>48 hours	<0.2	0.4	6.50	4.35

Impairments & TMDLs

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 303(d) list, which was completed in 2022, a total of 35 water quality impairments (parameters that exceed water quality standards) are present in subwatersheds within Millstone Township, as seen in Table 8 below.

Table 9: Water Quality Impairments by Parameter

Subwatershed	***Parameter***	***1st Cycle Listed***	***Priority Ranking for TMDL***
Assunpink Creek (above Assunpink Lake)	Arsenic	2012	Low
	E. coli	2012	Medium
	Total Phosphorus	2012	Medium
Assunpink Creek (New Sharon Bridge to/including Lake)	Arsenic	2012	Low
	Dissolved Oxygen	2016	Medium
	Total Phosphorus	2010	Medium
Cranbury Brook (above NJ Turnpike)	None	N/A	N/A
Doctors Creek (above 74d28m40s)	Arsenic	2012	Low
Doctors Creek (Allentown to 74d28m40s)	Arsenic	2022	Low
	TSS	2018	Medium
Lahaway Creek (above Prospertown)	Arsenic	2018	Low
	Mercury in Fish Tissue	2018	Low
	Total Phosphorus	2018	Medium
Manalapan Brook (includes Lake Manalapan to 40d16m15s)	DDT in Fish Tissue	2022	Low
	PCBs in Fish Tissue	2016	Low
Manalapan Brook (above 40d16m15s)	None	N/A	N/A
Metedeconk River NB (above I-195)	Arsenic	2008	Low
	Chlordane in Fish Tissue	2010	Low
	DDT in Fish Tissue	2010	Low
	Dissolved Oxygen	2014	Medium

	Lead	2012	Low
	Mercury in Fish Tissue	2010	Low
	PCBs in Fish Tissue	2010	Low
	Turbidity	2012	Medium
Metedeconk River SB (above I-195 Exit 21 Road)	Arsenic	2008	Low
	E. coli	2016	Medium
	TDS	2016	High
	Turbidity	2016	Medium
Millstone River (Applegarth Road to Route 33)	Arsenic	1998	Low
Millstone River (above Route 33)	Arsenic	1998	Low
Rocky Brook (above Monmouth County line)	Arsenic	1998	Low
Rocky Brook (below Monmouth County line)	Arsenic	2004	Low
	Dieldrin in Fish Tissue	2018	Low
	Dissolved Oxygen	2010	Medium
	PCBs in Fish Tissue	2012	Low
Toms River (above Francis Mills)	Dissolved Oxygen	2014	Medium
	Total Phosphorus	2002	Medium
Source: NJDEP, New Jersey's 2022 303(d) List			

Sublist 5 (303(d) of the Integrated Report) lists waterways which require Total Maximum Daily Loads (TMDLs). A TMDL is the amount of 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 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 Best Management Practices (BMPs). A total of 37 established TMDLs are present in subwatersheds within Millstone Township, as seen in Table 9 below. (Figure 14).

Table 10: TMDLs by Parameter

Subwatershed	*TMDL Type*	*Parameter*	*Year Instated*
Assunpink Creek (above Assunpink Lake)	None	N/A	N/A
Assunpink Creek (New Sharon Bridge to/including Lake)	Streamsheds	Mercury	2011
Cranbury Brook (above NJ Turnpike)	Streamsheds Pre-2008	Fecal Coliform	2003
	Streamsheds	Total Phosphorus	2016
Doctors Creek (above 74d28m40s)	Streamsheds Pre-2008	Total Phosphorus	2007
	Streamsheds	PCBs	2003
		VOCs	2003
Doctors Creek (Allentown to 74d28m40s)	Lakesheds	Total Phosphorus	2003
	Streamsheds Pre-2008	Total Phosphorus	2007
		Fecal Coliform	2003
	Streamsheds	PCBs	2003
		VOCs	2003
Lahaway Creek (above Prospertown)	Streamsheds	PCBs	2003
		VOCs	2003
Manalapan Brook (includes Lake Manalapan to 40d16m15s)	Lakesheds	Total Phosphorus	2003
	Streamsheds Pre-2008	Fecal Coliform	2003
	Streamsheds	Mercury	2010
Manalapan Brook (above 40d16m15s)	Lakesheds	Total Phosphorus	2003
	Streamsheds Pre-2008	Fecal Coliform	2003
Metedeconk River NB (above I-195)	Shellfish	Total Coliform	2006
	Streamsheds Pre-2008	Total Phosphorus	2005
		Fecal Coliform	2003
Metedeconk River SB (above I-195 Exit 21 Road)	Lakesheds	Fecal Coliform	2007
	Shellfish	Total Coliform	2006
Millstone River (Applegarth Road to Route 33)	Streamsheds Pre-2008	Fecal Coliform	2003
	Streamsheds	Total Phosphorus	2016
		TSS	2016
Millstone River (above Route 33)	Streamsheds Pre-2008	Fecal Coliform	2003
	Streamsheds	Total Phosphorus	2016
		TSS	2016
Rocky Brook (above Monmouth County line)	Streamsheds	Total Phosphorus	2016
		TSS	2016
Rocky Brook (below Monmouth County line)	Streamsheds Pre-2008	Fecal Coliform	2003
	Streamsheds	Total Phosphorus	2016
		TSS	2016
		Mercury	2020
Toms River (above Francis Mills)	Shellfish	Total Coliform	2006

	Streamsheds Pre-208	Fecal Coliform	2003
Source: NJDEP, TMDL publications			

Listed below are summaries of the TMDLs and impairments found within the subwatersheds of Millstone Township (NJDEP, "Pollutants of Concern"). Mercury is not listed on the "Pollutants of Concern" document, so an excerpt from "Total Maximum Daily Load for Mercury Impairments Based on Concentration in Fish Tissue Caused Mainly by Air Deposition to Address 122 HUC 14s Statewide" adopted June 10, 2010 (obtained from NJDEP, establishes the mercury TMDL in Manalapan Brook) is used instead. Arsenic is not listed on the "Pollutants of Concern" document, so excerpts from the NJDEP Division of Science and Research arsenic website are used instead:

Arsenic:

"Arsenic (As) is a naturally-occurring element in the earth's crust, and traces of arsenic can be found throughout the environment. Arsenic in soil may originate naturally, and past human activities may have added to these levels in some areas. Historically, the heaviest use of arsenic in this country has been as a pesticide. The current predominant use of arsenic is as a wood preservative. In ground water, arsenic occurs primarily in two forms, As+3 (arsenite) and As+5 (arsenate). Organic arsenicals are not known to occur at significant levels in ground water. Arsenic may change chemical form in the environment, but it does not degrade.

Arsenic is one of a relatively small number of chemicals that has been classified by USEPA as a known human carcinogen, based on human epidemiological data. The carcinogenicity (or cancer-causing characteristics) of arsenic is difficult to study because it does not consistently induce cancer in laboratory animals, yet it is a known human carcinogen. Unlike most other carcinogens of environmental concern, arsenic does not induce cancer in the animal models in which it has been tested, perhaps due to differences in metabolism between the test animals and humans. Quantitative estimates of risks of arsenic in drinking water come from human epidemiological studies, rather than studies in laboratory animals. The exposures to arsenic in these individuals are not controlled, as in laboratory studies, but must be estimated from information on drinking water arsenic levels and water consumption data in the populations of interest."

Dissolved Oxygen (DO):

"Dissolved oxygen (DO) refers to the concentration of oxygen gas incorporated into the water. Oxygen enters the water by direct absorption from the atmosphere and is enhanced by turbulence. Running water, such as that of a swift moving stream, normally contains more dissolved oxygen than the still water of a pond or lake. Water also absorbs oxygen released by aquatic plants during photosynthesis. Sufficient DO is essential to growth and reproduction of aerobic aquatic life (e.g., see Murphy 2006, Giller and Malmqvist 1998, Allan 1995; https://www.epa.gov/caddis-vol2/dissolved-oxygen). Low levels of oxygen (hypoxia) or no oxygen levels (anoxia) can occur when excess organic materials are decomposed by microorganisms. During this decomposition process, the DO in the water is consumed. In some water bodies, DO levels fluctuate periodically, seasonally, and even as part of the natural daily ecology of the aquatic resource. As DO levels drop, some sensitive animals may move away, decline in health, or even die. DO is considered an important measure of water quality as it is a direct indicator of an aquatic resource's ability to support aquatic life. While each organism has its own DO tolerance range, generally, DO levels below 3 milligrams per liter (mg/L) are of concern and waters with levels below 1 mg/L are considered hypoxic and are usually devoid of life.

Stormwater runoff containing nutrients such as nitrate, phosphorus, and organic TSS matter and animal and pet waste cause the levels of dissolved oxygen to decrease in the receiving waters. An increase in these materials transported via stormwater runoff will have a greater impact on receiving waters." (pg. 4)

<u>Lead:</u>

Lead is a naturally occurring elemental metal that is extremely toxic to humans and animals. Some common uses of lead today are lead acid batteries, including those used in automobiles, bullets and shotgun shot, fishing sinkers, industrial grade and non-domestic paint, boat keels, radiation shielding, and soldering.

Lead enters the environment through the manufacture and use of consumer products and by contamination of soils and water. Any lead occurring in soils can be mobilized into waterbodies through stream scouring and erosion. Lead in these forms makes its way into waterbodies, including those used for drinking water sources, through stormwater runoff. The Tier A MS4 permit prohibits the improper disposal of waste, such as paint, as well as a program to detect and eliminate illicit discharges. (pgs. 4-5)

Mercury:

"Mercury is a persistent, bio-accumulative toxin that can be found in solid, liquid, or vapor form. Mercury can cause a variety of harmful health effects including damage to the brain, central nervous system, and kidneys and is particularly harmful to children and pregnant and nursing women. Mercury comes from various natural and anthropogenic sources, including volcanic activity, burning of some forms of coal, use in dental procedures and manufacturing, use and disposal of products containing mercury. Most often, mercury enters the environment in gas or particulate form and is deposited on surfaces, often through precipitation, which washes deposited mercury into waterways. There it undergoes a natural chemical process and is converted to a more toxic form – methyl mercury. The methyl mercury builds up in the tissues of fish and animals, increasing its concentration as it moves up through the food chain, which results in high levels of mercury in some of the foods we eat. At certain levels, fish consumption advisories are triggered." (pg. 9)

Pathogens (Enterococcus, E. Coli, Fecal Coliform, Total Coliform):

"Pathogens, including enterococcus, E. Coli, fecal coliform, and total coliform, enter the receiving waters when stormwater comes into contact with sources of these pathogens, such as pet waste, animal waste from geese and other wildlife, some farming activities, illicit discharges, failing sewage conveyance systems and septic systems, combined sewage overflows, and sanitary sewer overflows (SSOs). While sewage treatment plants contribute a steady input of treated sewage to their receiving waters, stormwater runoff is the primary contributor to pathogen loads in the surface waters of the state.

Many of these pathogens affect the designated uses of the receiving waters and are harmful to human or animal health when ingested causing intestinal disease. Pathogens can attack the immune system and cause infections that may result in abdominal issues, respiratory problems, fever, headache, skin rashes, etc.

When receiving surface waters include shellfish harvesting as a designated use, pathogens also pose additional concerns. Proximity to potential sources such as marinas, development served by septic systems and concentrated stormwater outfall locations warrant precautionary closures of shellfish waters on a seasonal or full-time basis. The National Shellfish Sanitation Program has

established criteria for pathogens that are used to determine support of the shell fishing use." (pg. 7)

Phosphorus/Total Phosphorus:

"Phosphorus is a key nutrient for plant growth and is often the limiting nutrient in a freshwater setting. Total phosphorous is the sum of particulate and dissolved phosphorous which includes the total amount of phosphorous in both organic and inorganic forms. High concentrations of phosphorus in receiving waters may result from stormwater runoff due to poor agricultural practices, urban areas, leaking septic systems, illicit discharges or SSOs. Additional stormwater runoff sources of phosphorous include the breakdown of plant and leaf litter (including grass clippings), soil particles, pet and animal waste, fertilizer from lawns, and atmospheric deposition of phosphorus particles. Contribution from runoff from lawns and roads accounts for the greatest loading in many receiving waters. An excess of phosphorus into a water body can have a detrimental effect on designated uses related to both public health and aquatic health. For instance, too much phosphorus in a surface water can cause increased growth of algae and large aquatic plants (a process called eutrophication) causing significant swings in pH and dissolved oxygen, which can in turn result in the violation of surface water quality criteria for these parameters and adversely affect the aquatic community.

Additionally, high levels of phosphorus can also lead to HABs, that produce toxins which can be harmful to human and animal health. The presence of excessive plant biomass can also interfere with other designated uses, such as swimming or boating. When algae are present in large amounts, drinking water purveyors must also increase the use of disinfectants and oxidants to treat the algae, which can lead to an increase in disinfection byproducts such as trihalomethanes, listed as likely carcinogens by EPA." (pgs. 8-9)

Polychlorinated Biphenyls (PCBs):

The term 'PCBs' (Polychlorinated Biphenyls) represents a broad class of toxic industrial chemicals first discovered and synthesized in the late 19th century. Their novel chemical properties led to widespread industrial production and usage peaking between the 1930's and late-1960's. Some products may continue to contain PCBs, including electrical equipment, motor and hydraulic oils, oil-based paint, and some plastics. The recognition of PCB associated health hazards were

first noted in the 1960's and their production finally banned in 1979. PCBs can accumulate in the leaves and above-ground parts of plants and food crops. They are also taken up into the bodies of small organisms and fish. As a result, people who ingest fish may be exposed to PCBs that have bioaccumulated in the fish they are ingesting. Their oily nature allows them to accumulate in fatty animal tissues and bioaccumulate up the global food chain where they contribute to organ damage and carcinogenesis in higher-tiered species.

PCBs are easily carried away as TSS by stormwater runoff from products containing the compounds which are exposed to stormwater and known and unknown contaminated areas. PCBs have a moderate level of volatility, which means that their vapors are also readily carried aloft by the wind. They are then deposited on exposed surfaces via air deposition. (pg. 9)

Total Dissolved Solids (TDS):

Total Dissolved Solids (TDS) is the measure of the concentration of dissolved inorganic substances, such as calcium, chlorides nitrate, phosphorus, iron, sulfur, and other ion particles, in water that can pass through a filter with pores of approximately 0.002 cm. TDS differs from TSS in that TSS particles will not pass through the same filter. TDS affects aquatic and human health by altering the water balance in the cells of organisms. For instance, when an aquatic organism is placed in water with very low TDS, such as distilled water, it will swell up because water will tend to move into its cells, which have a higher concentration of solids. Conversely, an organism placed in water with high TDS will shrink somewhat because the water in its cells will tend to move out. This will in turn affect the organism's ability to maintain the proper cell density, making it difficult to keep its position in the water column by causing it to float up or sink down to depths to which it is not adapted, and it might not survive. High concentrations of TDS may also cause adverse health effects due to the chemicals making up the TDS, make drinking water unpalatable and cause additional adverse health effects on people who are not used to drinking such water. Levels of TDS that are too high or too low can also adversely affect industrial processes that use raw water.

TDS is discharged into the receiving waters via stormwater as the runoff picks up various substances on the ground surface, such as salts and brine solutions used for de-icing of motor vehicle surfaces and walkways, fertilizers, motor vehicle parts and fluids, illicit connections, and soil particles through erosion. (pg. 11)

Total Suspended Solids (TSS):

Stormwater runoff can pick up particulates, also known as Total Suspended Solids (TSS), from the land surface and carry the particulates into the receiving waterbodies. TSS is one of the most common pollutants found in stormwater runoff. TSS originates from many sources including areas such as roadways, parking lots and developments, erosion of pervious surfaces such as construction sites and dust, litter and other particles deposited on impervious surfaces from human activities. TSS can be made up of particles from pavement (from wear), vehicle exhaust emissions, vehicle parts, building and construction material, road salt, road paint, pedestrian debris, soil material, plant and leaf litter, and may contain heavy metals as well as atmospheric deposition of particles that may be transported from outside of the municipality (Hopke et al., 1980; Taylor and Owens, 2009; Total Suspended Solids (TSS) in stormwater - Minnesota Stormwater Manual).

High concentrations of TSS in the receiving waters can cause problems and negatively impact multiple designated uses, including those related to human health and aquatic life. Excessive TSS can bury benthic organisms and affect the viability of organisms that reside in the water column. These materials can easily become suspended due to stormwater runoff, erosion, and resuspension from seasonal water flow. TSS can impact not only aquatic organisms but drinking water as well. Organic TSS, such as decomposing matter or sewage effluent from illicit connections and/or SSOs include high levels of microorganisms such as protozoa, bacteria, and viruses. Such pathogens contribute to waterborne diseases like cryptosporidiosis, cholera, and giardiasis. Turbid water, whether due to organic or inorganic material, cannot be easily disinfected at potable water treatment facilities, as the suspended particles will "hide" these microorganisms. Turbidity may also reduce visibility of underwater structures such as logs or large boulders, negatively affecting a water body's recreational use. (pgs. 11-12)

Turbidity:

Turbidity refers to water's transparency and the amount of TSS that the water contains and is measured by how well light can pass through water. Turbid waters containing a larger amount of TSS have a low transparency and visibility, which can allow the waterbody to absorb more heat from the sunlight, thus increasing the temperature and decreasing the dissolved oxygen. High turbidity can negatively impact a waterbody's designated uses by reducing the ability of the

waterbody to support aquatic life due to these effects, reducing the aesthetic quality of the receiving water, having a harmful impact on recreation and tourism, and increasing the cost of water treatment for drinking and industrial uses such as food processing. Municipal stormwater runoff can create turbid conditions in water when it picks up particulate debris from hard surfaces and transports it to water bodies. Turbidity in stormwater runoff is usually made up of rock and soil fragments, dirt and debris from roads and vehicles, and other materials as noted under TSS. (pgs. 12-13)

Volatile Organic Compounds (VOCs):

Volatile Organic Compounds (VOCs) is the name given to a large group of chemical compounds that vaporize into the air and can dissolve into the water from certain solids or liquids at varying rates. VOCs are released or "off-gassed" into the air by many products that are used to build and maintain motor vehicles and houses, such as paints, glues, caulk, solvents, fuels and other vehicle fluids, cleansers and disinfectants, aerosol sprays, pesticides, and wood preservatives. Common examples of VOCs are benzene, ethylene glycol, formaldehyde, methylene chloride, tetrachloroethylene, toluene, xylene, and 1,3 butadiene. While many VOCs can cause adverse effects on aquatic life, there are also several adverse human health risks associated with encountering VOCs, including worsening asthma symptoms, cancer, liver and kidney damage, and central nervous system damage.

Stormwater can come in contact with VOCs from vehicle surfaces, roads, parking lots, driveways, and litter or other wastes. Once these improperly disposed materials containing VOCs encounter stormwater runoff they are discharged to the surface and ground waters of the state which are in turn used for drinking water supplies and the protection and propagation of aquatic life.

Surface water quality criteria serve to protect water quality for designated uses such as supporting the survival, growth, and reproduction of aquatic life, protecting the quality of drinking water sources, maintaining good water quality for primary and secondary contact recreational uses, and keeping fish safe for human consumption. (pg. 13)

Water Quantity

FEMA Effective Flood Hazard Areas

The Federal Emergency Management Agency (FEMA) has prepared Flood Insurance Rate Maps (FIRMs) which identify 100-year (1% annual chance flood) and 500-year (0.2% annual chance flood) flood hazard areas. Portions of Millstone Township are present in ten (10) FIRM panels:

- 34025C0115F
- 34025C0120F
- 34025C0235F
- 34025C0255F
- 34025C0260F
- 34025C0265F
- 34025C0266F
- 34025C0267F
- 34025C0268F*
- 34025C0280F

*FIRM panel has not been printed because no Special Flood Hazard Areas exist within its range.

All ten (10) FIRM panels have an effective date of September 25, 2009. These FIRMs help delineate the environmentally sensitive areas which extend along waterways, known as floodplains. Riverine floodplains in the Township do not extend far beyond the waterways which feed them during flood events, and align with the Township's listed wetlands fairly well. Most development is outside of the Special Flood Hazard Area due to the Township's elevation and topographic features. Implementing anchored foundations, floodproof building materials, a raised ground flood above the design flood elevation (DFE), and other floodproofing mechanisms should be considered during new development or redevelopment in the 1% annual chance flood hazard area (Figure 15).

Aquifers

Aquifers are geological formations which hold groundwater. They are typically composed of a more permeable layer of soil or unconsolidated rock sitting above a less permeable layer (confining layer); groundwater will enter the more permeable layer and cannot easily infiltrate further down

into the less permeable layer, forming the aquifer. Aquifers directly interfacing with the water table are described as unconfined, whereas aquifers located below confining layer(s) and generally not in contact with the surface water table are confined. Groundwater is replenished by infiltration of surface water and precipitation through soil, known as groundwater recharge. This recharge usually occurs at outcrops, locations where geological formations emerge at the surface and are unconfined.

Aquifers are important to regional communities and ecosystems for various reasons. They supply water for potable, agricultural, commercial, and industrial use throughout New Jersey through wells. Groundwater recharge helps to mitigate flooding by allowing water to infiltrate into the soil instead of ponding at the surface. Conversely, groundwater will keep streams fed via baseflow and communities supplied with water during periods of drought.

There are four (4) aquifer and two (2) groundwater confining unit outcrops found across Millstone Township. These formations are described below in order by depth moving southeast, with the Kirkwood-Cohansey system beginning at the surface and each subsequent aquifer occurring in lower elevations. It should be noted that other aquifer systems lie further below Millstone but are not mentioned due to their primary groundwater recharge occurring northwest of the Township's location (Figure 16).

The Kirkwood-Cohansey aquifer system encompasses coastal regions of New Jersey from southern Monmouth County to parts of Cape May County. It also stretches further west in southern New Jersey, reaching as far as Salem County. Water from the aquifer system is generally described as being fresh, acidic, highly corrosive, and low in dissolved solids. The system as a whole is unconfined and may range up to 500+ feet in depth. This aquifer system typically has a high yield when water is pumped from high-capacity wells. The majority of water pumped from this system is used for drinking water, agriculture, and mining purposes.

Composite confining units are a patchwork of silt and clay layers found throughout much of northern and western Monmouth County at the surface and are made up of numerous geological formations. Outcrops of sand within this region form the composite confining unit aquifers, which are unconfined at the surface and then become less permeable as the units move deeper. This often causes waterbodies and streams to form in these regions. The composite confining unit aquifers

vary greatly in pumping yield and provide much of the baseflow for the Township's waterways during the drier months.

The Mt. Laurel-Wenonah aquifer outcrop runs southwest to northeast adjacent to the composite confining unit. Water from the aquifer is generally described as being fresh, alkaline, and containing a moderate amount of dissolved soils. This aquifer does not have a high rate of groundwater recharge and runs the risk of being depleted if overpumped for a long period of time. Pumping yield from the aquifer is moderate on average.

The Marshalltown-Wenonah confining unit is a relatively thin formation separating the Mt. Laurel-Wenonah and Englishtown aquifers. Small lenses of sand exist within the unit containing groundwater, but it has a poor yield rate from pumping and requires chemical treatment.

The Englishtown aquifer system outcrop forms a band running from western Salem County northeast to northern Monmouth County and Sandy Hook. Many Monmouth and Ocean county communities draw from the aquifer for drinking water, which makes up the large majority of its use. Water from the aquifer system is generally described as being fresh, alkaline, and containing a moderate amount of dissolved solids. A corehole taken in Sea Girt Borough measured the Englishtown aquifer system spanning a depth of approximately 685 to 870 feet below the surface. This system has a fairly high yield rate on average when pumped.

Impervious Area & Groundwater Recharge

Millstone Township maintains a low percentage of impervious cover compared to many other communities within Monmouth County, likely due to its agricultural nature, abundance of sensitive environmental features, and restrictive development regulations. Much of the development within the Township predates modern stormwater and green infrastructure BMPs which have since been established. Instead, grey infrastructure is the main system for stormwater management, featuring a network of stormwater inlets, pipes, and outfalls.

The most common form of development seen in the Township is low density and rural residential, spaced out along cul-de-sacs which provide ample room for groundwater recharge. Major roadways such as State Route 33 and County Highway 537 contain strips of commercial development; a few neighborhood commercial centers can also be found on prominent Township roads. Large tracts of land are still dedicated for agricultural purposes, some of which are preserved

farmland. Numerous parks and recreational facilities such as the Charleston Springs Golf Course, Perrineville Lake Park, and Assunpink Wildlife Management Area are dotted throughout (Figure 17).

Groundwater recharge rates in Millstone Township are very high, averaging 11 to 15 inches per year in almost all regions. Pockets of higher and lower recharge exist in small quantities. Groundwater recharge appears to slow slightly near the northwest border of the Township, particularly along State Route 33 (Figure 18). The impressive level of groundwater recharge seen in the Township is an invaluable resource and will help to regulate its climate through wet and dry periods in the future. Millstone Township should take special care to uphold their established impervious coverage limits and other development regulations that are beneficial to groundwater recharge and preservation of open space.

Well Head Protection Areas

Well Head Protection Areas (WHPAs) are map areas calculated around both public community and public non-community wells in New Jersey that delineate the horizontal extent of ground water captured by a well pumping at a specific rate over a two-, five-, and twelve-year period of time for unconfined wells. The confined wells have a fifty-foot radius delineated around each well serving as the well head protection area to be controlled by the water purveyor in accordance with Safe Drinking Water Regulations (see N.J.A.C. 7:10-11.7(b)1).

WHPA delineations are conducted in response to the Safe Drinking Water Act amendments of 1986 and 1996 as part of the Source Water Area Protection Program (SWAP). The delineations are the first step in defining the sources of water to a public supply well. Within these areas, potential contamination will be assessed and appropriate monitoring will be undertaken in subsequent phases of SWAP. This program allows NJDEP to focus their efforts on groundwater protection where it is needed most.

Millstone Township has one (1) WHPA surrounding a public community well located at 839 Perrineville Road (Millstone Manor assisted living facility). The well is unconfined and has a 425 foot radius for the twelve-year extent of groundwater capture. This site is also listed as a public non-community well per NJDEP GIS mapping data.

There are 40 WHPAs surrounding public non-community wells within Millstone Township. Five (5) of the wells are not within the Township, but their surrounding WHPAs are. Areas with high concentrations of public non-community wells include State Route 33, County Highway 537, the portion of Stage Coach Road in Clarksburg along which the Millstone Township municipal building is located, and the portion of Perrineville Road near Perrineville Lake. All community and non-community wells with mapped WHPAs have two-, five,- and twelve- year period groundwater capture zones, suggesting that they all pump water from unconfined aquifers (Figure 19).

Climate Resiliency Assessment

As New Jersey and many other parts of the world continue to experience the effects of climate change, it is important to look to the future and identify trends that will pose the greatest threat to communities. Millstone Township should expect to observe an increase in annual temperature, water temperature, drought periods, severe weather events, rainfall frequency & volume, and flooding frequency & volume over the coming decades. Like many other communities throughout New Jersey, it is important for the Township to develop resiliency strategies in order to minimize damage to lives, property, infrastructure, and ecosystems from climate change impacts.

Expected Impact & Vulnerable Areas

Increased rainfall events will create strain on the existing grey infrastructure used to convey stormwater within the Township. Most stormwater infrastructure in use today is based on outdated ten (10) year storm event (10% chance of occurring annually) data. As the frequency and severity of rainfall increases, the Township stormwater system will fail to adequately convey precipitation to surface water more often, instead backing up onto streets and property. On average, more precipitation will accumulate during rain events and longer periods of drought will occur between these events. As a result, the depths of the Township's many streams and waterbodies will fluctuate to a greater extent, eroding the waterways and degrading their ecosystems.

As high precipitation events occur more frequently, riverine flooding will continue to become a greater issue. The Inland Flood Protection (IFP) Rule introduced a new climate-adjusted flood elevation for fluvial (non-tidal) waters, which is either two (2) feet above the NJDEP flood mapping (if available), or three (3) feet above the FEMA 1% annual chance flood zone Base Flood Elevation (BFE). As a result, the fluvial flood zones have expanded to cover regions that are up to three (3) feet above the FEMA 1% annual chance flood zone in elevation.

Approximately 105 buildings previously not in any regulated flood zone are now within the NJDEP fluvial climate-adjusted flood zone. However, the majority of these are accessory structures and not primary residences. This now results in a total of about 140 structures in a regulated flood zone in Millstone Township. Roadways within the climate-adjusted flood zone are more likely to become impassable during a flood (Figure 15).

Mitigation Measures

There are a number of different approaches that can be taken by the Township to help mitigate the effects of climate change. Aging stormwater infrastructure will need to be replaced in part over the coming decades. When these activities take place, it should be seen as an opportunity to incorporate green infrastructure and other non-structural stormwater management strategies into the MS4 system. These structures should also be rebuilt to handle projected future design storm events modeled with climate change as a factor in order for them to remain effective throughout their lifetime, as mandated in the IFP Rule. The Township's Stormwater Control Ordinance (SCO) was amended in 2024 to reflect these changes, and should be amended again to reflect additional changes made in the REAL Rules. New Jersey Future has created an Enhanced Model Stormwater Control Ordinance that adds more stringent development regulations to the existing NJDEP model SCO. The Township should consider adopting the enhanced SCO offered by New Jersey Future to better manage stormwater runoff coming from new development and redevelopment.

Based on the composition of the Township and location of the areas most vulnerable to climate change, a few types of green infrastructure and other Best Management Practices stand out as advantageous to implement. Cisterns (also known as rain barrels) allow for the capture and storage of rainwater from roof gutters, which can then be used in dry periods to water plants and wash vehicles & equipment. This both reduces the volume of runoff during precipitation events and allows for the use of water during drought periods without having to tap into the water main. Cisterns would be most effective when installed next to the Township's residential properties, as well as commercial properties to a lesser extent. Agricultural parcels could also benefit from cisterns which are specifically designed for irrigation purposes.

Grass swales and vegetative filter strips should continue to be implemented in the Township adjacent to roadways and waterbodies. This type of green infrastructure utilizes vegetation to slow down and filter stormwater before it reaches surface water. This improves the quality and quantity of stormwater entering waterbodies during precipitation events in a similar manner to wetlands. By emulating the filtration and velocity reduction capabilities of wetlands, vegetative filter strips also reduce the amount of stress experienced by the Township's existing wetlands.

Infiltration and bioretention basins are great options for large residential or commercial development projects. These types of development are likely to create significant increases in

localized stormwater runoff which should be addressed before reaching waterbodies. Both types of basins temporarily contain stormwater runoff, allowing for pollutants to settle out of the water and groundwater recharge to occur. This also prevents runoff from immediately entering waterbodies, reducing water quantity loadings during a high precipitation event. Outlet control structures are included in these systems in the event of water exceeding the basin's capacity. Overall, infiltration basins are more focused on groundwater recharge whereas bioretention basins are geared toward vegetative filtering.

In addition to implementing green infrastructure, putting emphasis on the conservation of existing open space, wetlands, and trees is a cost-effective method of retaining the stormwater runoff mitigation services that these natural features provide. As part of the NJPDES 2023-2028 MS4 permit cycle, the Township has adopted a Tree Removal and Replacement Ordinance, which poses a fee on property owners wishing to remove trees and even higher rates for those who do not elect to replace them. Additional regulations should be considered to be codified in law to protect the Township's natural resources beyond NJDEP standards. Plans to increase the amount of native vegetation present in the Township and replace dead or other hazard trees over a set time period through scheduled plantings and maintenance could also be discussed.

Awareness of flood hazard information from the FEMA FIRMs and the IFP Rule's climate-adjusted flood elevation is important so residents know how to floodproof their properties and what to do in the event of a flood to minimize injury and loss of life. This is especially pertinent with the IFP Rule as it is not mandated through FEMA, meaning homeowners outside the 1% annual flood hazard area but within the IFP Rule's climate-adjusted flood elevation have not been subject to regulation previously and may be unaware of their climate change-adjusted flood risk and state regulations.

Design and Performance Standards

The Township of Millstone 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, water quantity, and loss of groundwater recharge on receiving water bodies. 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 Township's residents, natural resources, and infrastructure.

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 Township 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 N.J.A.C. 7:8-5.3. Any additional ordinances required in the future will be submitted to the County for review and approval.

The Township, through its Department of Public Works (DPW), will be inspecting outfalls, performing street erosion edge inspections, and catch basin inspections. These inspections cover the entire town with no exceptions. If a violation is found or an area of need is located, the responsible party will be notified and the situation will be rectified. If the party does not respond, a summons will be issued and the situation corrected.

Plan Consistency

Regional Stormwater Management Plan (RSWMP)

The Township is not within a Regional Stormwater Management Planning Area and no RSWMP has been developed for the waters within the Township at this time. This plan will be updated to be consistent with any RSWMP that may be established in the future, as it affects waterbodies within the municipality.

Climate Change-Related Hazard Vulnerability Assessment (CCRHVA)

A CCRHVA has not been developed for or adopted by the Township at this time. This plan will be updated to be consistent with any CCRHVA that may be established in the future, as it relates to the "Climate Resiliency Assessment" section of this plan.

Total Maximum Daily Loads (TMDLs)

This Municipal Stormwater Management Plan has been updated to be consistent with the following approved TMDLs (for more details, see Table 9 and the "Water Quality" section of this plan):

- Assunpink Creek (above Assunpink Lake)
    - None
- Assunpink Creek (New Sharon Bridge to/including Lake)
    - Mercury (Streamsheds)
- Cranbury Brook (above NJ Turnpike)
    - Fecal Coliform (Streamsheds Pre-2008)
    - Total Phosphorus (Streamsheds)
- Doctors Creek (above 74d28m40s)
    - Total Phosphorus (Streamsheds Pre-2008)
    - PCBs, VOCs (Streamsheds)
- Doctors Creek (Allentown to 74d28m40s)
    - Total Phosphorus (Lakesheds)
    - Total Phosphorus, Fecal Coliform (Streamsheds Pre-2008)
    - PCBs, VOCs (Streamsheds)
- Lahaway Creek (above Prospertown)
    - PCBs, VOCs (Streamsheds)

- Manalapan Brook (includes Lake Manalapan to 40d16m15s)
    - Total Phosphorus (Lakesheds)
    - Fecal Coliform (Streamsheds Pre-2008)
    - Mercury (Streamsheds)
- Manalapan Brook (above 40d16m15s)
    - Total Phosphorus (Lakesheds)
    - Fecal Coliform (Streamsheds Pre-2008)
- Metedeconk River NB (above I-195)
    - Total Coliform (Shellfish)
    - Total Phosphorus, Fecal Coliform (Streamsheds Pre-2008)
- Metedeconk River SB (above I-195 Exit 21 Road)
    - Fecal Coliform (Lakesheds)
    - Total Coliform (Shellfish)
- Millstone River (Applegarth Road to Route 33)
    - Fecal Coliform (Streamsheds Pre-2008)
    - Total Phosphorus, TSS (Streamsheds)
- Millstone River (above Route 33)
    - Fecal Coliform (Streamsheds Pre-2008)
    - Total Phosphorus, TSS (Streamsheds)
- Rocky Brook (above Monmouth County line)
    - Total Phosphorus, TSS (Streamsheds)
- Rocky Brook (below Monmouth County line)
    - Fecal Coliform (Streamsheds Pre-2008)
    - Total Phosphorus, TSS, Mercury (Streamsheds)
- Toms River (above Francis Mills)
    - Total Coliform (Shellfish)
    - Fecal Coliform (Streamsheds Pre-2008)

The Township has received authorization to discharge municipal stormwater to waterbodies within its jurisdiction under the NJPDES Tier A MS4 Stormwater Permit system. This MSWMP is consistent with the standards of the Township's NJPDES permit.

Residential Site Improvement Standards (RSIS)

This Municipal Stormwater Management Plan is consistent with the RSIS at N.J.A.C. 5:21. The Township will utilize the most current version of the RSIS in the stormwater management review of residential plans submitted to the Township for approval. This MSWMP will be updated to be consistent with any future updates to the RSIS.

Soil Erosion and Sediment Control Standards

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

Monmouth County 2016 Master Plan

This MSWMP is consistent with the Monmouth County 2016 Master Plan's objectives for Natural Resources as follows:

1. Encourage county and municipal actions to identify, promote, and protect natural resources and significant natural features, unique areas, critical habitats, and the potential or known habitats of resident and migratory populations of rare, endangered, and threatened species, particularly those that have municipal, county, or statewide significance.
2. Protect, conserve, and enhance the county's significant, diverse, natural, and scenic resources utilizing sound ecological protection and restoration measures.
3. Protect habitat and ecological diversity by encouraging the preservation of large, contiguous tracts of land.
4. Encourage the sustainable use of public lands in concert with natural resource protection.
5. Encourage the protection and conservation of all water sources, including the reuse of water, through responsible water resource management planning.
6. Ensure high water quality through the implementation of Best Management Practices (BMPs).

7. Promote the consideration of such overarching issues as sea level rise, saltwater intrusion, and development impacts on aquifer recharge and stormwater management in decision making related to water supply and wastewater.
8. Promote public awareness of environmental issues through outreach and educational opportunities including the relationship between the protection and enhancement of natural resources and economic value to the community.
9. Support the creation of municipal land use regulations and programs that protect environmentally sensitive areas based on constraints, building suitability, natural resource value, and environmental criteria.

State Development and Redevelopment Plan (SDRP)

This Municipal Stormwater Management Plan is consistent with the plans and policies of the New Jersey SDRP, which was adopted on December 17, 2025. The SDRP places most of the Township within the PA4B Rural/Environmentally Sensitive Planning Area, but land surrounding Assunpink Lake, Rising Sun Lake, and the Charleston Springs Golf Course are all designated as part of the PA8 Open Space Planning Area. According to the SDRP, most communities within the PA4B Rural/Environmentally Sensitive Planning Area are generally described as having a population density of less than 1,000 people per square mile, area greater than one (1) square mile, land used for agricultural purposes with prime soils, large tracts of undeveloped/natural areas, and many individual wells and septic systems. Millstone Township fits well into this category, aligning with the description provided above. This MSWMP is consistent with the SDRP by recommending actions which will enhance habitats and sensitive lands; preserve large contiguous areas of farmland, open space, and forested areas; protect, enhance, and support local agricultural economies; promote growth outside of floodprone areas; and recognize areas which also have one or more environmental resources. This MSWMP will be updated to be consistent with any future updates to the SDRP.

Green Infrastructure Stormwater Management Strategies

The Township of Millstone has reviewed its master plan and ordinances, and has found that no ordinances require revision to incorporate nonstructural stormwater management strategies at this time. The Township has continued to adopt the model stormwater management ordinances set forth by the NJDEP and required as part of the MS4 permit.

In the future, if ordinances are identified for further revision, once the ordinance texts are completed, they will be submitted to the county review agency for review and approval within 12 months of the effective date of the Stormwater Management Rules. A copy will be sent to the Department of Environmental Protection at the time of submission.

Land Use/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 quality and quantity.

The purpose of this analysis is to calculate the amount of additional pollutant loading that can be anticipated in each subwatershed (HUC 14) upon ultimate build-out. The Township was broken down into sections by subwatershed, then into subsections by zone within each subwatershed. Vacant and developable land areas were summarized based on current zoning regulations within each subwatershed. These land areas were adjusted to account for roadways and environmentally sensitive lands, which cannot be developed (Figure 20). In order to determine the amount of total impervious coverage anticipated at full build-out, the adjusted area of developable land remaining was multiplied by the maximum lot coverage in each respective zone.

In most cases the Township's maximum lot coverage zoning regulations were the limiting factor in how much development/redevelopment could be achieved in a full build-out scenario, leaving sizeable tracts of unconstrained land as permeable surface. In some instances, the amount of total impervious coverage anticipated at full build-out for a given zone within a subwatershed exceeds the amount of developable land remaining. This is because although municipal roadways are generally not developable or redeveloped, they still count toward total impervious surface. Table 10 summarizes the build-out calculations and the anticipated amount of total impervious surface at full build-out for each subwatershed within the Township.

Table 11: Build-out Analysis Calculations

Zone	Total Area (acres)	Constrained Area		Developable Area (acres)	Existing Impervious Area		Maximum Permitted Impervious Area (%)	Total Impervious Surface at Full Build-out (acres)
		Road (acres)	Wetlands and Waterbodies (acres)		% Area	Acres		
Assunpink Creek (above Assunpink Lake) 02040105230010								
RU-P	1314.83	20.26	263.62	1030.95	1.48%	19.46	10	131.48
R-170	25.71	2.09	6.96	16.66	16.30%	4.19	20	5.14

R-130	352.83	24.56	25.69	302.58	12.52%	44.19	20	70.57
R-80	377.92	30.41	18.96	328.55	14.71%	55.58	20	75.58
TOTAL	**2071.29**	**77.32**	**315.23**	**1678.74**	**5.96%**	**123.42**	**N/A**	**282.77**
Assunpink Creek (New Sharon Bridge to/including Assunpink Lake) 02040105230020								
RU-P	824.63	20.41	405.76	398.46	2.13%	17.60	10	82.46
R-130	154.13	8.66	24.77	120.70	11.46%	17.67	20	30.83
TOTAL	**978.76**	**29.07**	**430.53**	**519.16**	**3.60%**	**35.27**	**N/A**	**113.29**
Cranbury Brook (above NJ Turnpike) 02030105100070								
R-80	203.36	14.51	64.05	124.80	14.22%	28.91	20	40.67
HC	80.24	11.85	30.82	37.57	32.93%	26.42	50	40.12
PCD	76.17	5.62	13.98	56.57	12.03%	9.16	55	41.89
TOTAL	**359.77**	**31.98**	**108.85**	**218.94**	**17.93%**	**64.49**	**N/A**	**122.68**
Doctors Creek (above 74d28m40s) 02040201060010								
RU-P	1211.71	42.38	246.89	922.44	3.67%	44.45	10	121.17
R-170	229.71	10.56	45.35	173.80	6.42%	14.75	20	45.94
R-130	283.82	40.56	41.22	202.04	10.75%	30.51	20	56.76
R-80	373.49	31.33	16.86	325.30	15.47%	57.79	20	74.70
NC	95.88	9.15	11.48	75.25	19.60%	18.79	70	67.12
BP	27.81	2.00	6.47	19.34	10.64%	2.96	50	13.91
RC	124.77	6.38	14.89	103.50	19.12%	23.85	10	23.85
TOTAL	**2347.19**	**142.36**	**383.16**	**1821.67**	**8.23%**	**193.10**	**N/A**	**403.45**
Doctors Creek (Allentown to 74d28m40s) 02040201060020								
RU-P	61.53	0.00	0.00	61.53	0.11%	0.07	10	6.15
R-130	4.51	0.32	0.00	4.19	8.65%	0.39	20	0.90
TOTAL	**66.04**	**0.32**	**0.00**	**65.72**	**0.70%**	**0.46**	**N/A**	**7.05**
Lahaway Creek (above Prospertown) 02040201050010								
RU-P	1372.73	47.32	551.80	773.61	2.90%	39.81	10	137.27
RU-C	2.71	0.00	0.00	2.71	0.00%	0.00	20	0.54
R-170	16.14	1.29	7.47	7.38	9.98%	1.61	20	3.23
R-130	238.02	19.43	43.12	175.47	10.28%	24.48	20	47.60
R-80	90.71	10.26	5.02	75.43	14.90%	13.52	20	18.14
NC	22.24	3.19	1.17	17.88	28.60%	6.36	70	15.57
HC	37.05	3.32	10.49	23.24	9.99%	3.70	50	18.53
HC-1	128.83	19.80	30.76	78.27	19.23%	24.77	50	64.42
BP	241.49	22.82	106.40	112.27	8.87%	21.42	50	120.75
TOTAL	**2149.92**	**127.43**	**756.23**	**1266.26**	**6.31%**	**135.67**	**N/A**	**426.05**
Manalapan Brook (including Lake Manalapan to 40d16m15s) 02030105140020								
R-80 (TOTAL)	67.17	4.48	23.44	39.25	10.93%	7.34	20	13.43
Manalapan Brook (above 40d16m15s) 02030105140010								
RU-P	1234.39	19.52	292.76	922.11	3.55%	43.77	10	123.44
R-170	131.43	5.99	67.51	57.93	5.50%	7.23	20	26.29
R-130	798.83	59.22	125.62	613.99	12.52%	99.98	20	159.77
RC	54.72	0.97	22.57	31.18	9.92%	5.43	10	5.47
TOTAL	**2219.37**	**85.70**	**508.46**	**1625.21**	**7.05%**	**156.41**	**N/A**	**314.97**

Metedeconk River NB (above I-195) 02040301020010								
RU-P	1.20	0.00	0.00	1.20	11.67%	0.14	10	0.14
R-130	72.48	6.22	2.60	63.66	11.22%	8.13	20	14.50
HC	17.90	1.61	2.58	13.71	26.98%	4.83	50	8.95
TOTAL	**91.58**	**7.83**	**5.18**	**78.57**	**14.30%**	**13.10**	**N/A**	**23.59**
Metedeconk River SB (above I-195 Exit 21 Road) 02040301030010								
R-130 (TOTAL)	19.27	2.86	0.00	16.41	19.67%	3.79	20	3.85
Millstone River (Applegarth Road to Route 33) 02030105100020								
RU-P	912.53	26.36	340.58	545.59	3.36%	30.68	10	91.25
R-170	225.48	16.88	42.23	166.37	14.90%	33.59	20	45.10
R-130	352.30	21.93	35.96	294.41	10.09%	35.55	20	70.46
R-80	136.14	12.18	23.35	100.61	14.15%	19.26	20	27.23
HC	54.88	5.60	7.85	41.43	25.91%	14.22	50	27.44
PCD	245.32	16.72	115.58	113.02	5.73%	14.06	55	129.74
BP	337.32	10.73	181.17	145.42	9.59%	32.36	50	156.15
TOTAL	**2263.97**	**110.40**	**746.72**	**1406.85**	**7.94%**	**179.72**	**N/A**	**547.37**
Millstone River (above Route 33) 02030105100010								
RU-P	2581.11	57.03	629.78	1894.30	4.87%	125.58	10	258.11
RU-C	5.62	0.17	0.00	5.45	6.23%	0.35	20	1.12
R-170	44.56	1.57	5.94	37.05	5.88%	2.62	20	8.91
R-130	1123.81	74.05	114.58	935.18	11.78%	132.35	20	224.76
R-80	643.45	50.06	64.26	529.13	14.09%	90.65	20	128.69
HC	54.68	4.77	12.61	37.30	15.80%	8.64	50	27.34
PCD	253.85	8.10	75.82	169.93	13.63%	34.61	55	139.62
TOTAL	**4707.08**	**195.75**	**902.99**	**3608.34**	**8.39%**	**394.80**	**N/A**	**788.55**
Rocky Brook (above Monmouth County line) 02030105100040								
RU-P	2514.92	41.24	523.93	1949.75	3.39%	85.26	10	251.49
RU-C	56.36	1.73	0.00	54.63	29.42%	16.58	20	16.58
R-170	60.34	4.38	5.59	50.37	11.75%	7.09	20	12.07
R-130	748.45	50.75	111.69	586.01	11.03%	82.52	20	149.69
R-80	515.00	40.76	30.16	444.08	13.04%	67.18	20	103.00
R-MF	34.59	0.18	22.07	12.34	2.83%	0.98	50	12.52
R-20	34.34	6.15	6.92	21.27	26.73%	9.18	35	12.02
NC	58.87	5.11	19.33	34.43	20.79%	12.24	70	39.54
TOTAL	**4022.87**	**150.30**	**719.69**	**3152.88**	**6.99%**	**281.03**	**N/A**	**596.91**
Rocky Brook (below Monmouth County line) 02030105100050								
RU-P	288.56	8.38	118.03	162.15	5.64%	16.27	10	28.86
R-130	58.71	3.17	9.28	46.26	9.62%	5.65	20	11.74
R-MF	13.92	0.67	7.75	5.50	7.69%	1.07	50	6.17
NC	3.30	0.08	1.80	1.42	33.33%	1.10	70	1.50
TOTAL	**364.49**	**12.30**	**136.86**	**215.33**	**6.61%**	**24.09**	**N/A**	**48.27**
Toms River (above Francis Mills) 02040301060010								
RU-P	281.58	10.82	16.99	253.77	4.17%	11.73	10	28.16
RU-C	380.95	7.93	116.18	256.84	4.02%	15.30	20	76.19

R-170	221.03	10.88	55.99	154.16	8.58%	18.96	20	44.21
R-130	307.85	25.19	22.61	260.05	13.44%	41.39	20	61.57
R-80	769.32	52.40	93.36	623.56	12.90%	99.25	20	153.86
NC	1.48	0.18	0.00	1.30	40.54%	0.60	70	1.04
HC	74.84	4.71	23.25	46.88	18.73%	14.02	50	37.42
BP	34.40	4.74	12.55	17.11	25.03%	8.61	50	17.20
TOTAL	**2071.45**	**116.85**	**340.93**	**1613.67**	**10.13%**	**209.86**	**N/A**	**419.65**

In order to determine the additional pollutants that can be expected to reach the Township's waterways as a result of future development, the total impervious surface at full build-out was multiplied by the NJDEP pollutant-loading coefficients for Total Phosphorus (TP), Total Nitrogen (TN), and Total Suspended Solids (TSS). These coefficients, which are summarized in Table 11 below, represent the anticipated amount of pollutant per acre per year which can be anticipated as a result of future development.

Table 12: Pollutant Loading Coefficients

Land Cover	TP Load (lbs/acre/year)	TN Load (lbs/acre/year)	TSS Load (lbs/acre/year)
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 Stormwater BMP Manual, 2004			

Each zone within the Township was assigned a land cover type based on existing and permitted development. The corresponding pollutant loading coefficients were then used to find total pollutant loading values. The total pollutant loadings for the Township as a result of future development for each zone within each subwatershed is summarized in Table 12.

Table 13: Pollutant Load by Subwatershed

Zone	Land Cover Type	Total Impervious Surface at Full Build-out (acres)	TP Load Coefficient (lbs/acre/year)	TP Load (lbs/year)	TN Load Coefficient (lbs/acre/year)	TN Load (lbs/year)	TSS Load Coefficient (lbs/acre/year)	TSS Load (lbs/acre/year)
Assunpink Creek (above Assunpink Lake) 02040105230010								
RU-P	Rural Residential	131.48	0.6	78.89	5	657.40	100	13148
R-170	Rural Residential	5.14	0.6	3.08	5	25.70	100	514
R-130	Rural Residential	70.57	0.6	42.34	5	352.85	100	7057
R-80	Rural Residential	75.58	0.6	45.35	5	377.90	100	7558
TOTAL	**Rural Residential**	**282.77**	**0.6**	**169.66**	**5**	**1413.85**	**100**	**28277**
Assunpink Creek (New Sharon Bridge to/including Assunpink Lake) 02040105230020								
RU-P	Rural Residential	82.46	0.6	49.48	5	412.30	100	8246
R-130	Rural Residential	30.83	0.6	18.50	5	154.15	100	3083
TOTAL	**Rural Residential**	**113.29**	**0.6**	**67.97**	**5**	**566.45**	**100**	**11329**
Cranbury Brook (above NJ Turnpike) 02030105100070								
R-80	Rural Residential	40.67	0.6	24.40	5	203.35	100	4067
HC	Commercial	40.12	2.1	84.25	22	882.64	200	8024
PCD	Commercial	41.89	2.1	87.97	22	921.58	200	8378
TOTAL	**N/A**	**122.68**	**N/A**	**196.62**	**N/A**	**2007.57**	**N/A**	**20469**
Doctors Creek (above 74d28m40s) 02040201060010								
RU-P	Rural Residential	121.17	0.6	72.70	5	605.85	100	12117
R-170	Rural Residential	45.94	0.6	27.56	5	229.70	100	4594
R-130	Rural Residential	56.76	0.6	34.06	5	283.80	100	5676
R-80	Rural Residential	74.70	0.6	44.82	5	373.50	100	7470
NC	Commercial	67.12	2.1	140.95	22	1476.64	200	13424
BP	Industrial	13.91	1.5	20.87	16	222.56	200	2782
RC	Agricultural	23.85	1.3	31.01	10	238.50	300	7155
TOTAL	**N/A**	**403.45**	**N/A**	**371.96**	**N/A**	**3430.55**	**N/A**	**53218**
Doctors Creek (Allentown to 74d28m40s) 02040201060020								
RU-P	Rural Residential	6.15	0.6	3.69	5	30.75	100	615
R-130	Rural Residential	0.90	0.6	0.54	5	4.50	100	90
TOTAL	**Rural Residential**	**7.05**	**0.60**	**4.23**	**5**	**35.25**	**100**	**705**
Lahaway Creek (above Prospertown) 02040201050010								
RU-P	Rural Residential	137.27	0.6	82.36	5	686.35	100	13727
RU-C	Rural Residential	0.54	0.6	0.32	5	2.70	100	54
R-170	Rural Residential	3.23	0.6	1.94	5	16.15	100	323
R-130	Rural Residential	47.60	0.6	28.56	5	238.00	100	4760
R-80	Rural Residential	18.14	0.6	10.88	5	90.70	100	1814
NC	Commercial	15.57	2.1	32.70	22	342.54	200	3114
HC	Commercial	18.53	2.1	38.91	22	407.66	200	3706
HC-1	Commercial	64.42	2.1	135.28	22	1417.24	200	12884

BP	Industrial	120.75	1.5	181.13	16	1932.00	200	24150
TOTAL	**N/A**	**426.05**	**N/A**	**512.09**	**N/A**	**5133.34**	**N/A**	**64532**
Manalapan Brook (including Lake Manalapan to 40d16m15s) 02030105140020								
R-80 (TOTAL)	Rural Residential	13.43	0.6	8.06	5	67.15	100	1343
Manalapan Brook (above 40d16m15s) 02030105140010								
RU-P	Rural Residential	123.44	0.6	74.06	5	617.20	100	12344
R-170	Rural Residential	26.29	0.6	15.77	5	131.45	100	2629
R-130	Rural Residential	159.77	0.6	95.86	5	798.85	100	15977
RC	Agricultural	5.47	1.3	7.11	10	54.70	300	1641
TOTAL	**N/A**	**314.97**	**N/A**	**192.81**	**N/A**	**1602.20**	**N/A**	**32591**
Metedeconk River NB (above I-195) 02040301020010								
RU-P	Rural Residential	0.14	0.6	0.08	5	0.70	100	14
R-130	Rural Residential	14.50	0.6	8.70	5	72.50	100	1450
HC	Commercial	8.95	2.1	18.80	22	196.90	200	1790
TOTAL	**N/A**	**23.59**	**N/A**	**27.58**	**N/A**	**270.10**	**N/A**	**3254**
Metedeconk River SB (above I-195 Exit 21 Road) 02040301030010								
R-130 (TOTAL)	Rural Residential	3.85	0.6	2.31	5	19.25	100	385
Millstone River (Applegarth Road to Route 33) 02030105100020								
RU-P	Rural Residential	91.25	0.6	54.75	5	456.25	100	9125
R-170	Rural Residential	45.10	0.6	27.06	5	225.50	100	4510
R-130	Rural Residential	70.46	0.6	42.28	5	352.30	100	7046
R-80	Rural Residential	27.23	0.6	16.34	5	136.15	100	2723
HC	Commercial	27.44	2.1	57.62	22	603.68	200	5488
PCD	Commercial	129.74	2.1	272.45	22	2854.28	200	25948
BP	Industrial	156.15	1.5	234.23	16	2498.40	200	31230
TOTAL	**N/A**	**547.37**	**N/A**	**704.73**	**N/A**	**7126.56**	**N/A**	**86070**
Millstone River (above Route 33) 02030105100010								
RU-P	Rural Residential	258.11	0.6	154.87	5	1290.55	100	25811
RU-C	Rural Residential	1.12	0.6	0.67	5	5.60	100	112
R-170	Rural Residential	8.91	0.6	5.35	5	44.55	100	891
R-130	Rural Residential	224.76	0.6	134.86	5	1123.80	100	22476
R-80	Rural Residential	128.69	0.6	77.21	5	643.45	100	12869
HC	Commercial	27.34	2.1	57.41	22	601.48	200	5468
PCD	Commercial	139.62	2.1	293.20	22	3071.64	200	27924
TOTAL	**N/A**	**788.55**	**N/A**	**723.57**	**N/A**	**6781.07**	**N/A**	**95551**
Rocky Brook (above Monmouth County line) 02030105100040								
RU-P	Rural Residential	251.49	0.6	150.89	5	1257.45	100	25149
RU-C	Rural Residential	16.58	0.6	9.95	5	82.90	100	1658
R-170	Rural Residential	12.07	0.6	7.24	5	60.35	100	1207
R-130	Rural Residential	149.69	0.6	89.81	5	748.45	100	14969
R-80	Rural Residential	103.00	0.6	61.80	5	515.00	100	10300
R-MF	High Density Residential	12.52	1.4	17.53	15	187.80	140	1752.8
R-20	Low Density Residential	12.02	0.6	7.21	5	60.10	100	1202

NC	Commercial	39.54	2.1	83.03	22	869.88	200	7908
TOTAL	**N/A**	**596.91**	N/A	427.47	N/A	3781.93	N/A	64145.8
Rocky Brook (below Monmouth County line) 02030105100050								
RU-P	Rural Residential	28.86	0.6	17.32	5	144.30	100	2886
R-130	Rural Residential	11.74	0.6	7.04	5	58.70	100	1174
R-MF	High Density Residential	6.17	1.4	8.64	15	92.55	140	863.8
NC	Commercial	1.50	2.1	3.15	22	33.00	200	300
TOTAL	**N/A**	**48.27**	**N/A**	**36.15**	**N/A**	**328.55**	**N/A**	**5223.8**
Toms River (above Francis Mills) 02040301060010								
RU-P	Rural Residential	28.16	0.6	16.90	5	140.80	100	2816
RU-C	Rural Residential	76.19	0.6	45.71	5	380.95	100	7619
R-170	Rural Residential	44.21	0.6	26.53	5	221.05	100	4421
R-130	Rural Residential	61.57	0.6	36.94	5	307.85	100	6157
R-80	Rural Residential	153.86	0.6	92.32	5	769.30	100	15386
NC	Commercial	1.04	2.1	2.18	22	22.88	200	208
HC	Commercial	37.42	2.1	78.58	22	823.24	200	7484
BP	Industrial	17.20	1.5	25.80	16	275.20	200	3440
TOTAL	**N/A**	**419.65**	**N/A**	**324.96**	**N/A**	**2941.27**	**N/A**	**47531**

Summary by Subwatershed

Assunpink Creek (above Assunpink Lake) 02040105230010

This subwatershed is exclusively zoned for uses that generally fit into the rural residential land use type. Impervious cover makes up only 5.96% of the Township's 2,071.29 acres of land within this subwatershed. Based on current zoning regulations, it is anticipated that 282.77 acres of impervious surface will exist at full build-out. This would produce annual loadings of approximately 169.66 pounds of TP, 1,413.85 pounds of TN, and 28,277 pounds of TSS.

Assunpink Creek (New Sharon Bridge to/including Assunpink Lake) 02040105230020

This subwatershed is also zoned for rural residential uses only, located at the western tip of the Township. Impervious cover makes up 3.60% of the Township's 978.76 acres of land within this subwatershed. Based on current zoning regulations, it is anticipated that 113.29 acres of impervious surface will exist at full build-out. This would produce annual loadings of approximately 67.97 pounds of TP, 566.45 pounds of TN, and 11,329 pounds of TSS.

Cranbury Brook (above NJ Turnpike) 02030105100070

A mix of commercial uses along State Route 33 and low density & rural residential uses to the east are present in this subwatershed. Impervious cover makes up a significant 17.93% of the Township's 359.77 acres of land within this subwatershed. Based on current zoning regulations, it

is anticipated that 122.68 acres of impervious surface will exist at full build-out. This would produce annual loadings of approximately 196.62 pounds of TP, 2,007.57 pounds of TN, and 20,469 pounds of TSS.

Doctors Creek (above 74d28m40s) 02040201060010

Rural residential, commercial, industrial, and agricultural land use types can be found in this subwatershed; however, the most prevalent use is rural residential. Impervious cover makes up 8.23% of the Township's 2,347.19 acres of land within this subwatershed. Based on current zoning regulations, it is anticipated that 403.45 acres of impervious surface will exist at full build-out. This would produce annual loadings of approximately 371.96 pounds of TP, 3,430.55 pounds of TN, and 53,218 pounds of TSS.

Doctors Creek (Allentown to 74d28m40s) 02040201060020

This small portion of the Doctors Creek (Allentown to 74d28m40s) subwatershed is fully utilized as rural residential land. Impervious cover makes up only 0.70% of the Township's 66.04 acres of land within this subwatershed. Based on current zoning regulations, it is anticipated that 7.05 acres of impervious surface will exist at full build-out. This would produce annual loadings of approximately 4.23 pounds of TP, 35.25 pounds of TN, and 705 pounds of TSS.

Lahaway Creek (above Prospertown) 02040201050010

Rural residential, commercial, and industrial uses are all present in this subwatershed. Rural residential land dominates the western portion of the subwatershed, while industrial business parks are found to the east of Interstate 195. The commercial uses are clustered along County Highway 537. Impervious cover makes up 6.31% of the Township's 2,149.92 acres of land within this subwatershed. Based on current zoning regulations, it is anticipated that 426.05 acres of impervious surface will exist at full build-out. This would produce annual loadings of approximately 512.09 pounds of TP, 5,133.34 pounds of TN, and 64,532 pounds of TSS.

Manalapan Brook (including Lake Manalapan to 40d16m15s) 02030105140020

This region is entirely zoned as R-80 and made up of rural residential uses, located along and east of Indian Path Road. Impervious cover makes up 10.93% of the Township's 67.17 acres of land within this subwatershed. Based on current zoning regulations, it is anticipated that 13.43 acres of impervious surface will exist at full build-out. This would produce annual loadings of approximately 8.06 pounds of TP, 67.15 pounds of TN, and 1,343 pounds of TSS.

Manalapan Brook (above 40d16m15s) 02030105140010

This subwatershed only contains rural residential and agricultural land use types, located at the Township's eastern extremity. Impervious cover makes up 7.05% of the Township's 2,219.37 acres of land within this subwatershed. Based on current zoning regulations, it is anticipated that 314.97 acres of impervious surface will exist at full build-out. This would produce annual loadings of approximately 192.81 pounds of TP, 1,602.20 pounds of TN, and 32,591 pounds of TSS.

Metedeconk River NB (above I-195) 02040301020010

This subwatershed is largely utilized as rural residential land, with a cluster of commercial development along County Highway 537. Impervious cover makes up 14.30% of the Township's 91.58 acres of land within this subwatershed. Based on current zoning regulations, it is anticipated that 23.59 acres of impervious surface will exist at full build-out. This would produce annual loadings of approximately 27.58 pounds of TP, 270.10 pounds of TN, and 3,254 pounds of TSS.

Metedeconk River SB (above I-195 Exit 21 Road) 02040301030010

This is smallest of all subwatershed tracts in Millstone Township, fully zoned as R-130 with rural residential land use. Impervious cover makes up a sizeable 19.67% of the Township's 19.27 acres of land within this subwatershed. Based on current zoning regulations, it is anticipated that 3.85 acres of impervious surface will exist at full build-out. This is only 0.06 acres of additional impervious surface compared to existing impervious surface, so one can reasonably say this area is already fully built-out. This would produce annual loadings of approximately 2.31 pounds of TP, 19.25 pounds of TN, and 385 pounds of TSS.

Millstone River (Applegarth Road to Route 33) 02030105100020

This subwatershed occupies the northern-central portion of Millstone Township, and contains a sampling of rural residential, commercial, and industrial uses. Impervious cover makes up 7.94% of the Township's 2,263.97 acres of land within this subwatershed. Based on current zoning regulations, it is anticipated that 547.37 acres of impervious surface will exist at full build-out. This would produce annual loadings of approximately 704.73 acres of TP, 7,126.56 acres of TN, and 86,070 acres of TSS.

Millstone River (above Route 33) 02030105100010

This is the largest subwatershed tract within Millstone Township, covering most of the eastern third of the Township. The subwatershed is almost entirely contained within the Township. Rural

residential land dominates the area, with some commercial development along State Route 33. Impervious cover makes up 8.39% of the Township's 4,707.08 acres of land within this subwatershed. Based on current zoning regulations, it is anticipated that 788.55 acres of impervious surface will exist at full build-out. This would produce annual loadings of approximately 723.57 pounds of TP, 6,781.07 pounds of TN, and 95,551 pounds of TSS.

Rocky Brook (above Monmouth County line) 02030105100040

This subwatershed spans most of central Millstone Township and has rural residential, high density residential, low density residential, and commercial uses. Rural residential land occupies the vast majority of this subwatershed. Two groupings of neighborhood commercial development are located along Sweetmans Lane and Perrineville Road. Impervious cover makes up 6.99% of the Township's 4,022.87 acres of land within this subwatershed. Based on current zoning regulations, it is anticipated that 596.91 acres of impervious surface will exist at full build-out. This would produce annual loadings of approximately 427.47 pounds of TP, 3,781.93 pounds of TN, and 64,145.8 pounds of TSS.

Rocky Brook (below Monmouth County line) 02030105100050

Largely rural residential land but also featuring small tracts of high density residential and commercial uses, this subwatershed is located in the vicinity of Windor Road. Impervious cover makes up 6.61% of the Township's 364.49 acres of land within this subwatershed. Based on current zoning regulations, it is anticipated that 48.27 acres of impervious surface will exist at full build-out. This would produce annual loadings of approximately 36.15 pounds of TP, 328.55 pounds of TN, and 5,223.8 pounds of TSS.

Toms River (above Francis Mills) 02040301060010

This subwatershed is located in the southern-central portion of the Township, containing rural residential, commercial, and industrial uses. Rural residential land occupies most of the subwatershed, while commercial land is located along County Highway 537 and industrial business parks are situated west of Trenton Lakewood Road. Impervious cover makes up 10.13% of the Township's 2,071.45 acres of land within this subwatershed. Based on current zoning regulations, it is anticipated that 419.65 acres of impervious surface will exist at full build-out. This would produce annual loadings of approximately 324.96 pounds of TP, 2,941.27 pounds of TN, and 47,531 pounds of TSS.

Mitigation Plans

This mitigation plan is provided for proposed developments or redevelopment projects that seek a variance or exemption from the stormwater management design and performance standards set forth in this Municipal Stormwater Management Plan and N.J.A.C. 7:8-5 when stormwater criteria cannot be met.

Mitigation Project Criteria

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

1. The mitigation project must be implemented in the same drainage area or watershed as the proposed development.
2. The mitigation project must provide groundwater recharge benefits, or protection from stormwater runoff quality and quantity within previously developed property.
3. The mitigation project must be completed for the performance standard for which the variance or exemption is requested and must provide comparable benefits to those being waived should the variance be granted.
4. The developer must ensure the long term maintenance of the approved mitigation system, which includes the maintenance requirements developed in the NJDEP BMP Manual.
5. It shall be the developer's responsibility to prove to the satisfaction of the municipality that should the variance be granted and mitigation approved, there will be no detrimental impact on adjoining properties.
6. The developer shall enter into a developer's agreement with the municipality, which addresses all issues related to the construction and maintenance of the mitigation project.

Example Mitigation Projects

The Applicant may select one of the following strategies to be developed into potential mitigation projects. It is the developer's responsibility to provide a detailed study of any proposed mitigation project, and to provide the Township with a proposed mitigation plan for review and approval.

1. Groundwater Recharge mitigation includes rehabilitation of existing detention or retention basins, installation of permeable pipe underdrains, and encouraging infiltration of runoff to groundwater recharge.
2. Water Quality and Water Quantity mitigation includes rehabilitation of culverts and/or ditches in major watershed basins; desilting and desnagging of stream corridors; rehabilitation of existing ponds, lakes, and waterways; installation of structural BMPs within the municipal drainage system and/or at outfall locations; and encouraging total suspended solid and nutrient load reduction.
3. Stream Corridor Protection mitigation includes stream bank stabilization, vegetative enhancement, and restoration of floodplain areas.

Developer Proposed Mitigation Projects

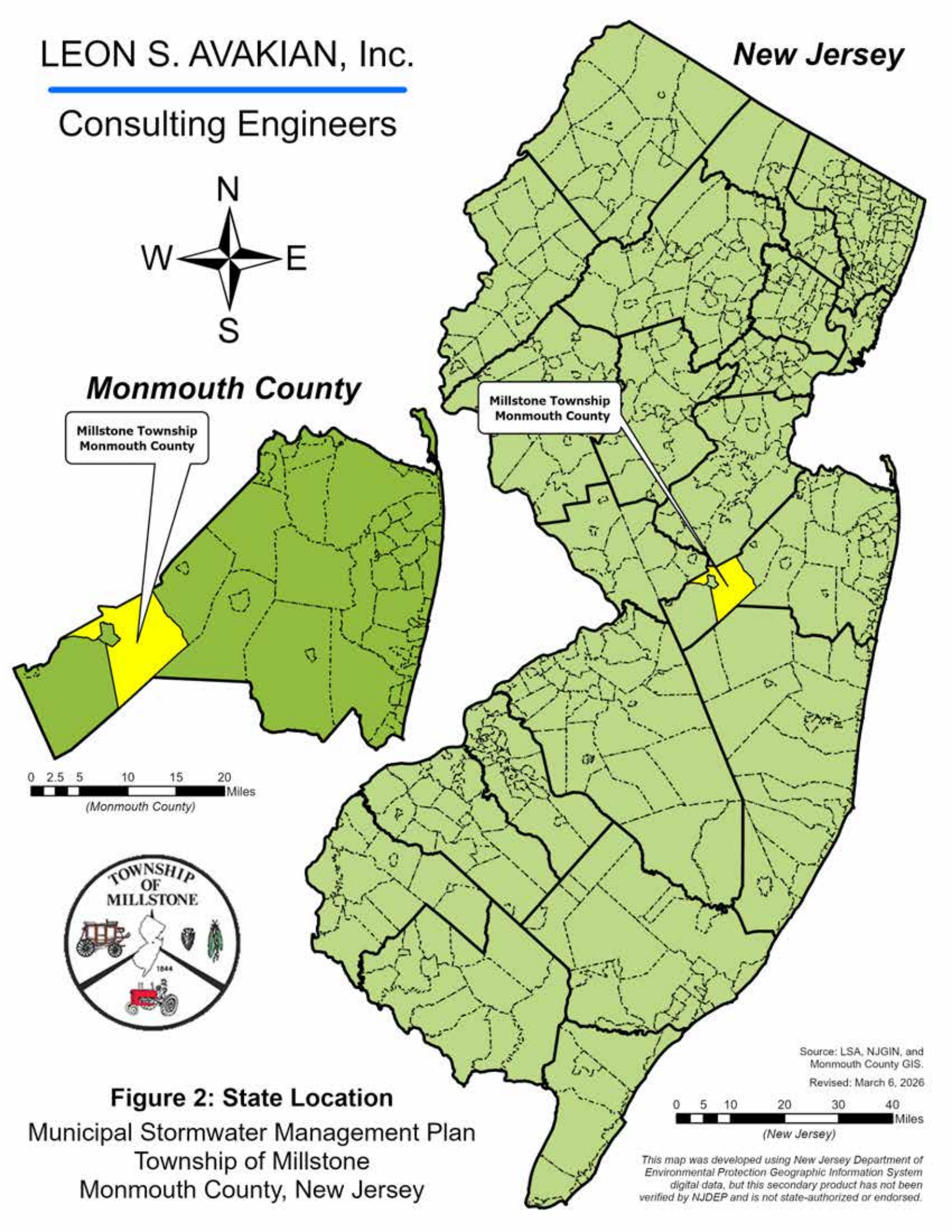
The Township will consider developer-initiated mitigation projects if the proposal includes the following required information:

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 N.J.A.C. 7:8-5.8.
7. List of required permits obtained by the developer for the mitigation project.

FIGURES

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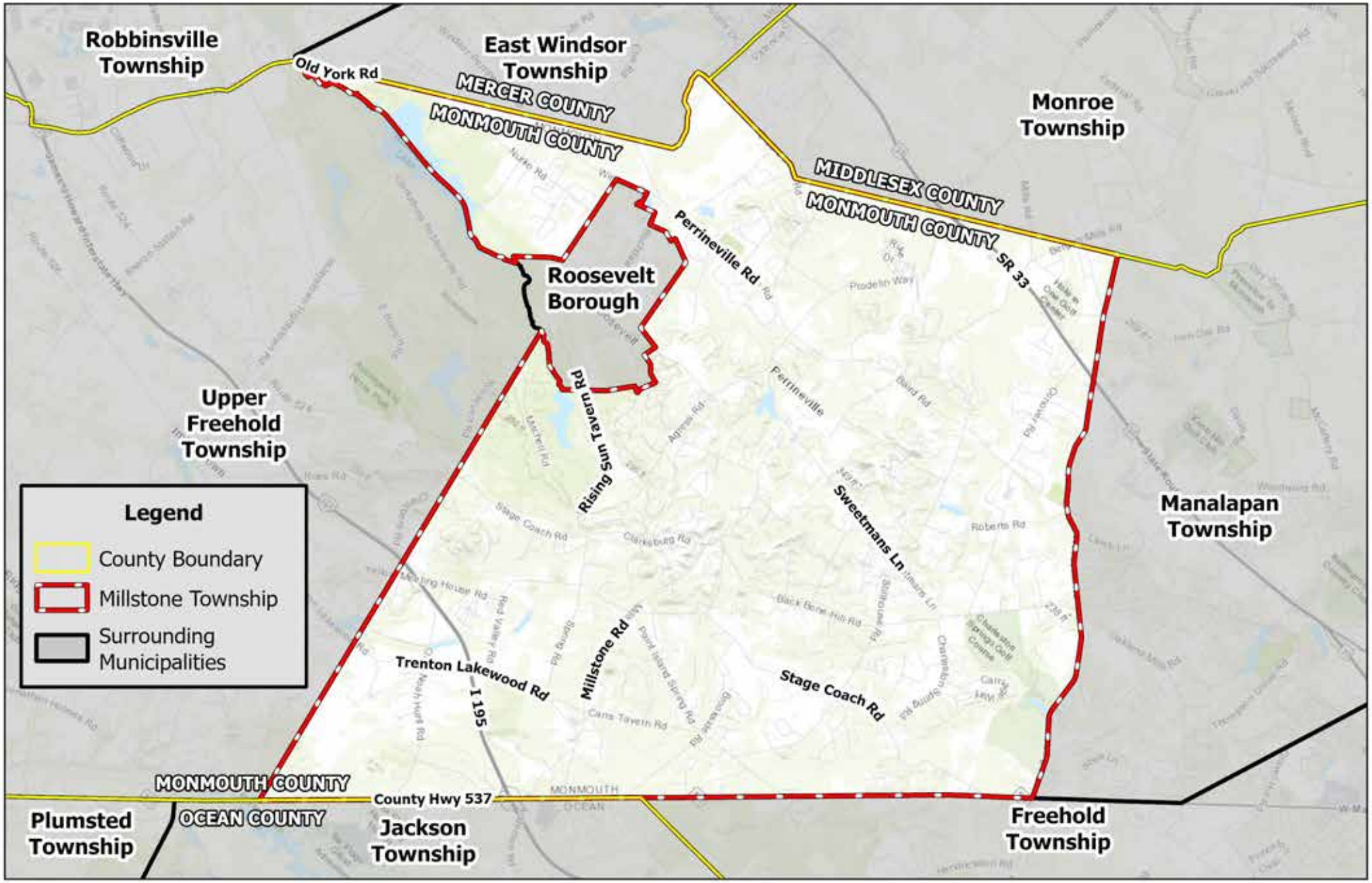
Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 6, 2026

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

Figure 2: State Location

Municipal Stormwater Management Plan
Township of Millstone
Monmouth County, New Jersey



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0 0.63 1.25 1.88 2.5 Miles

Scale: 1in = 1.25mi

Figure 3: Location and Municipal Borders

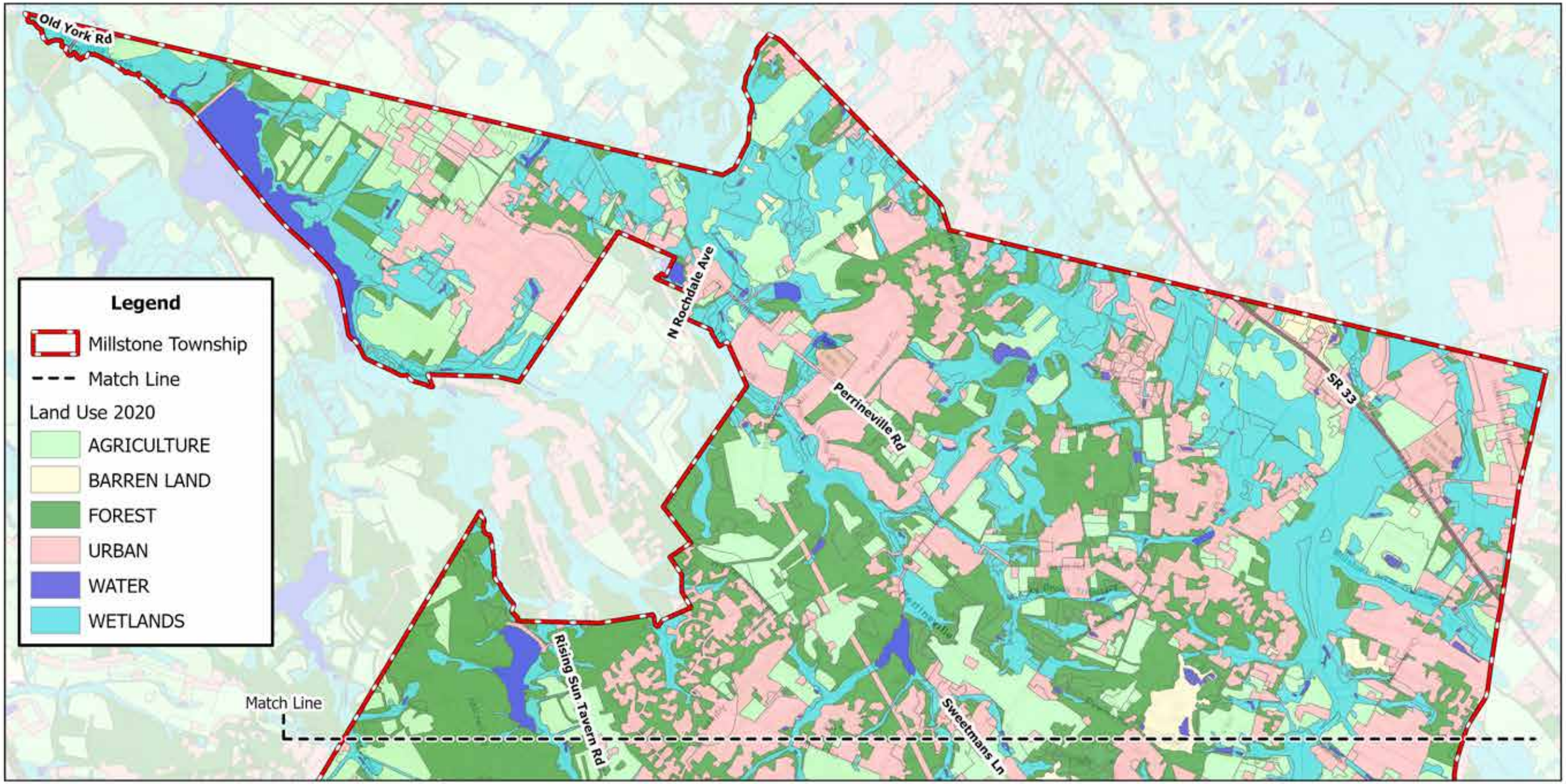
Municipal Stormwater Management Plan
Township of Millstone
Monmouth County, New Jersey

N

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 06, 2026

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0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

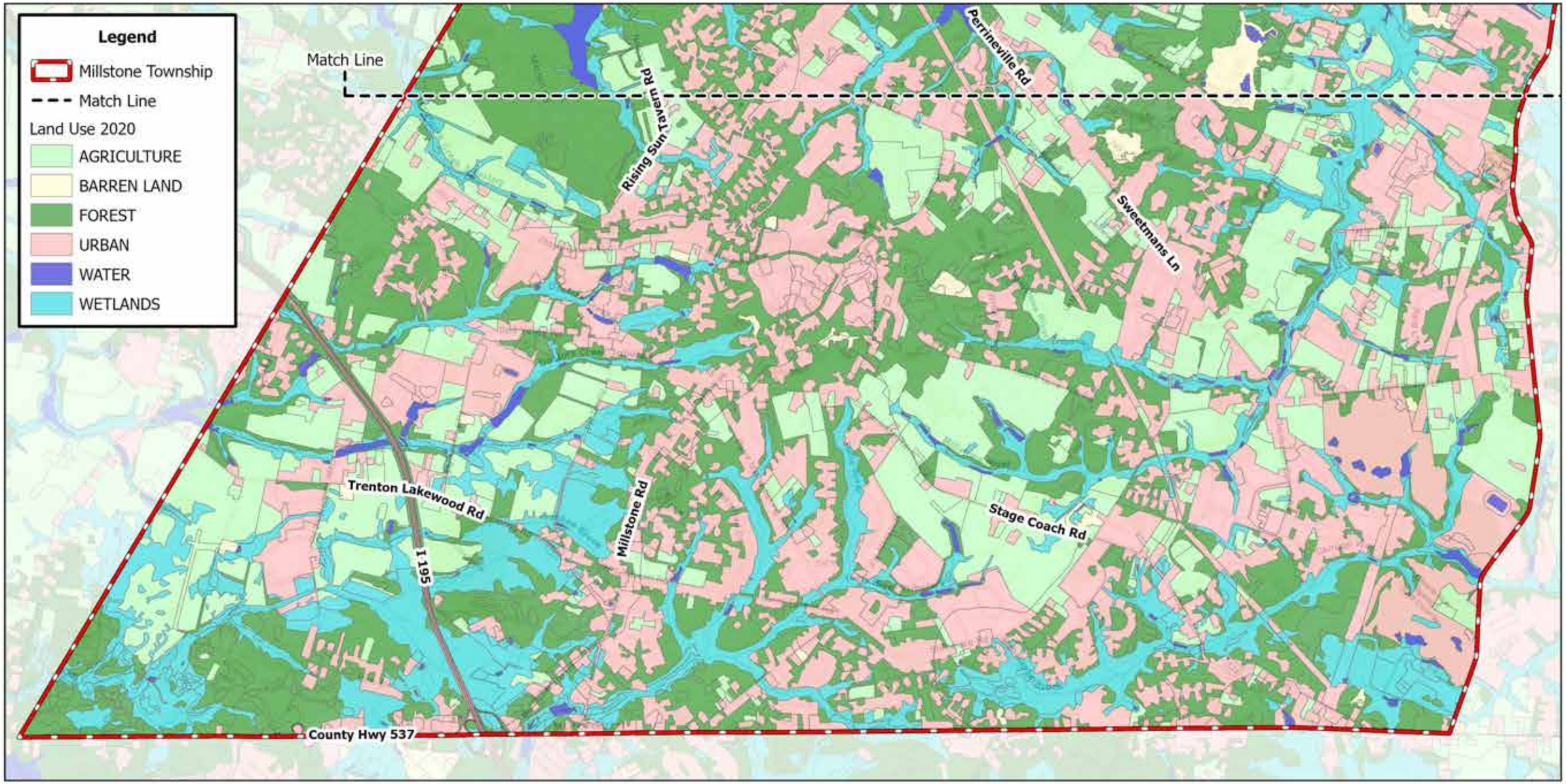
Figure 4a: Land Use Land Cover 2020

Municipal Stormwater Management Plan
Township of Millstone - Northwest
Monmouth County, New Jersey

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 06, 2026

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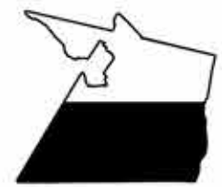
Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

Figure 4b: Land Use Land Cover 2020

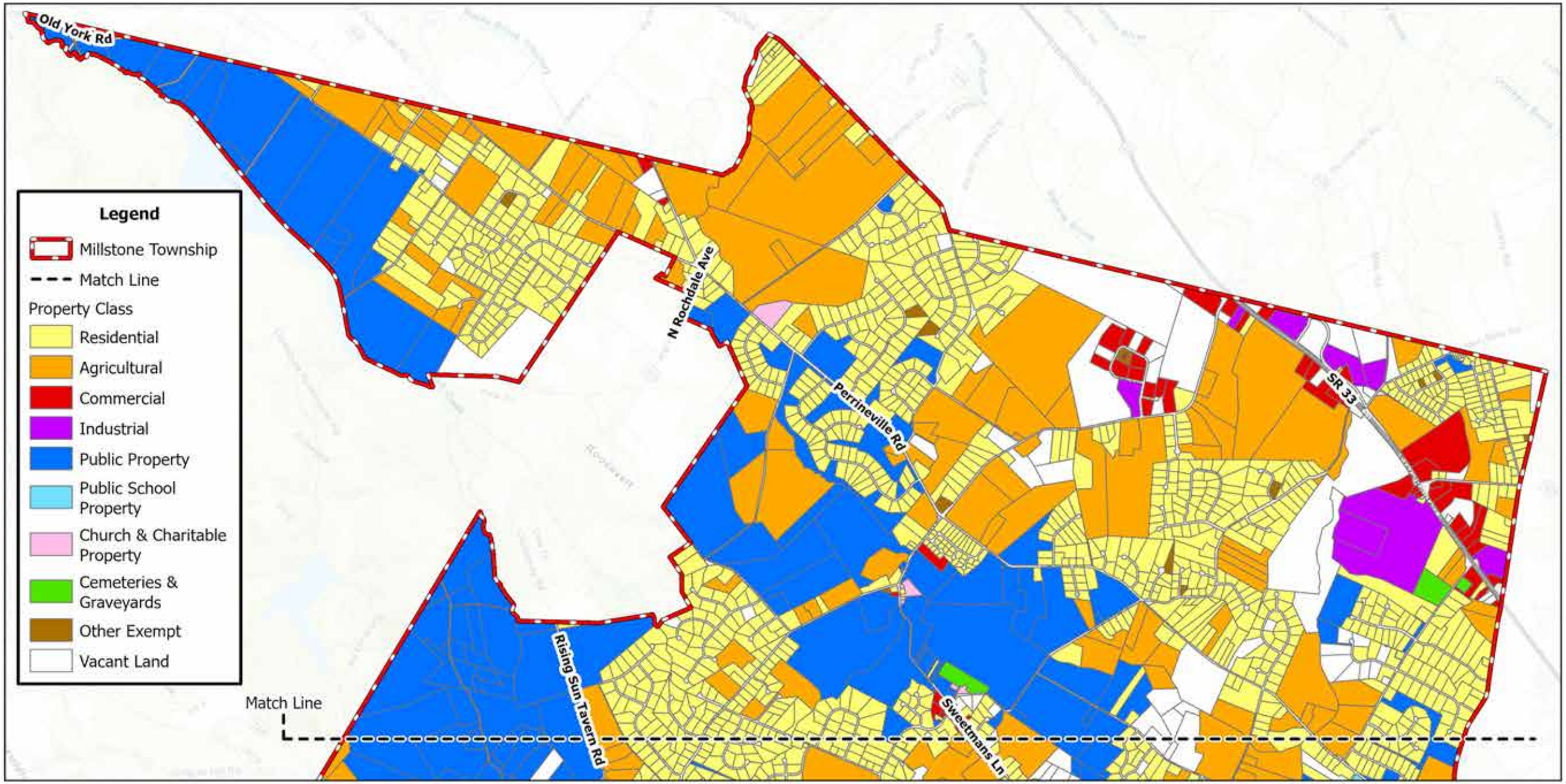
Municipal Stormwater Management Plan
Township of Millstone - Southeast
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 06, 2026

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LEON S. AVAKIAN, Inc.

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0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

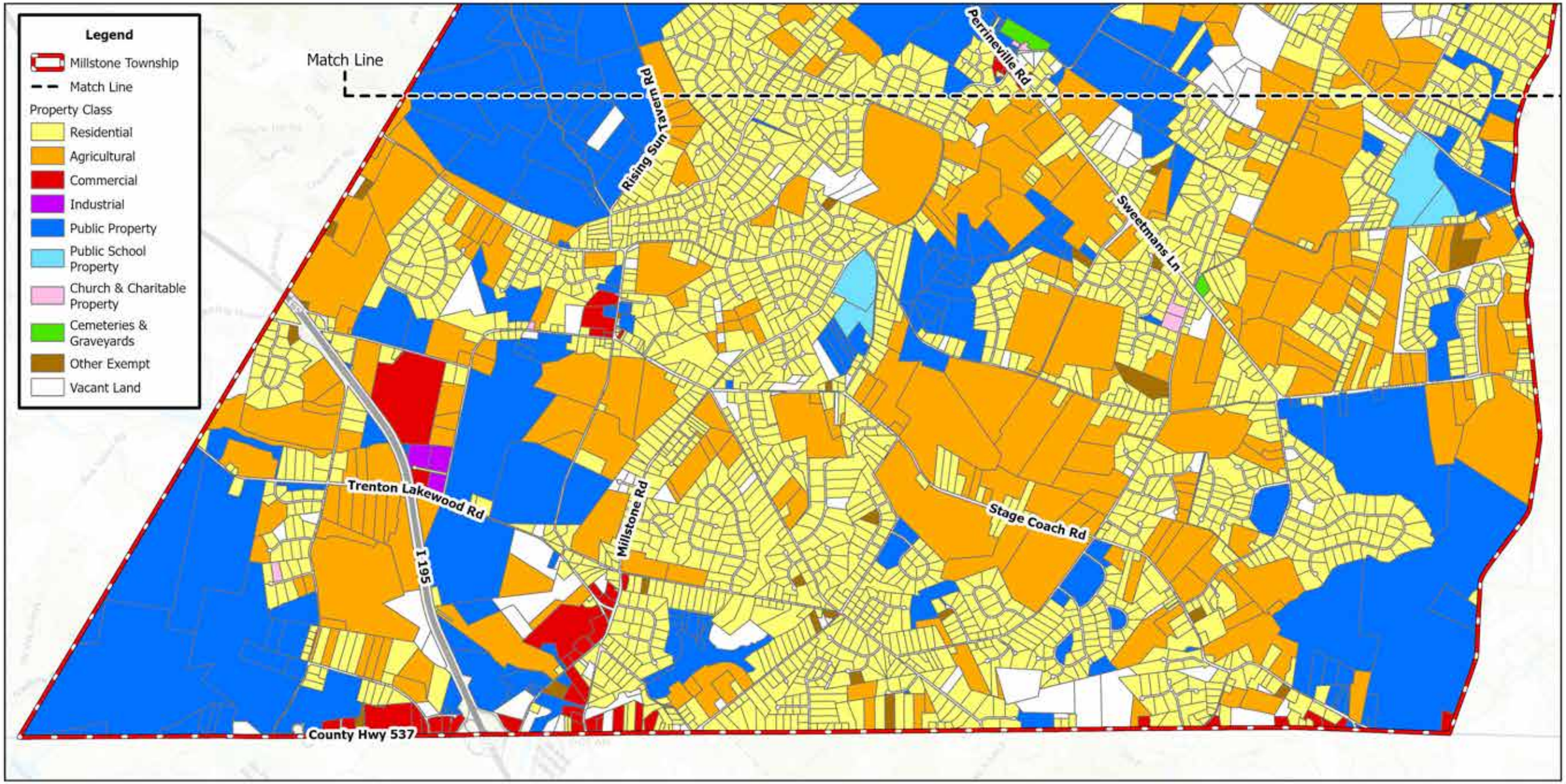
Figure 5a: Property Classes

Municipal Stormwater Management Plan
Township of Millstone - Northwest
Monmouth County, New Jersey

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 06, 2026

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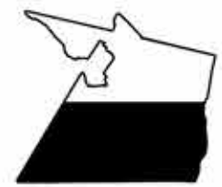
Consulting Engineers

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Scale: 1in = 0.6mi

Figure 5b: Property Classes

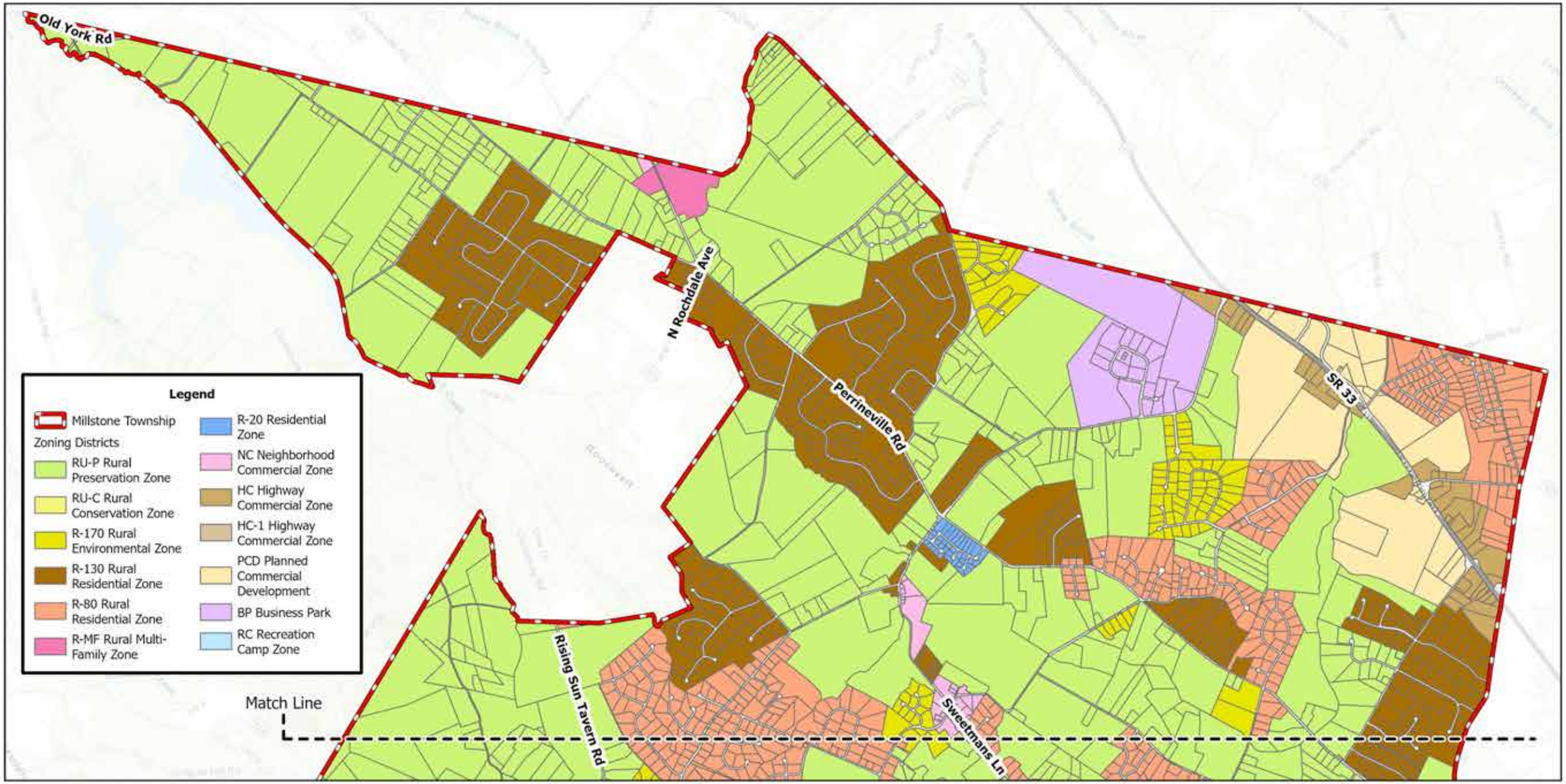
Municipal Stormwater Management Plan
Township of Millstone - Southeast
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 06, 2026

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0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

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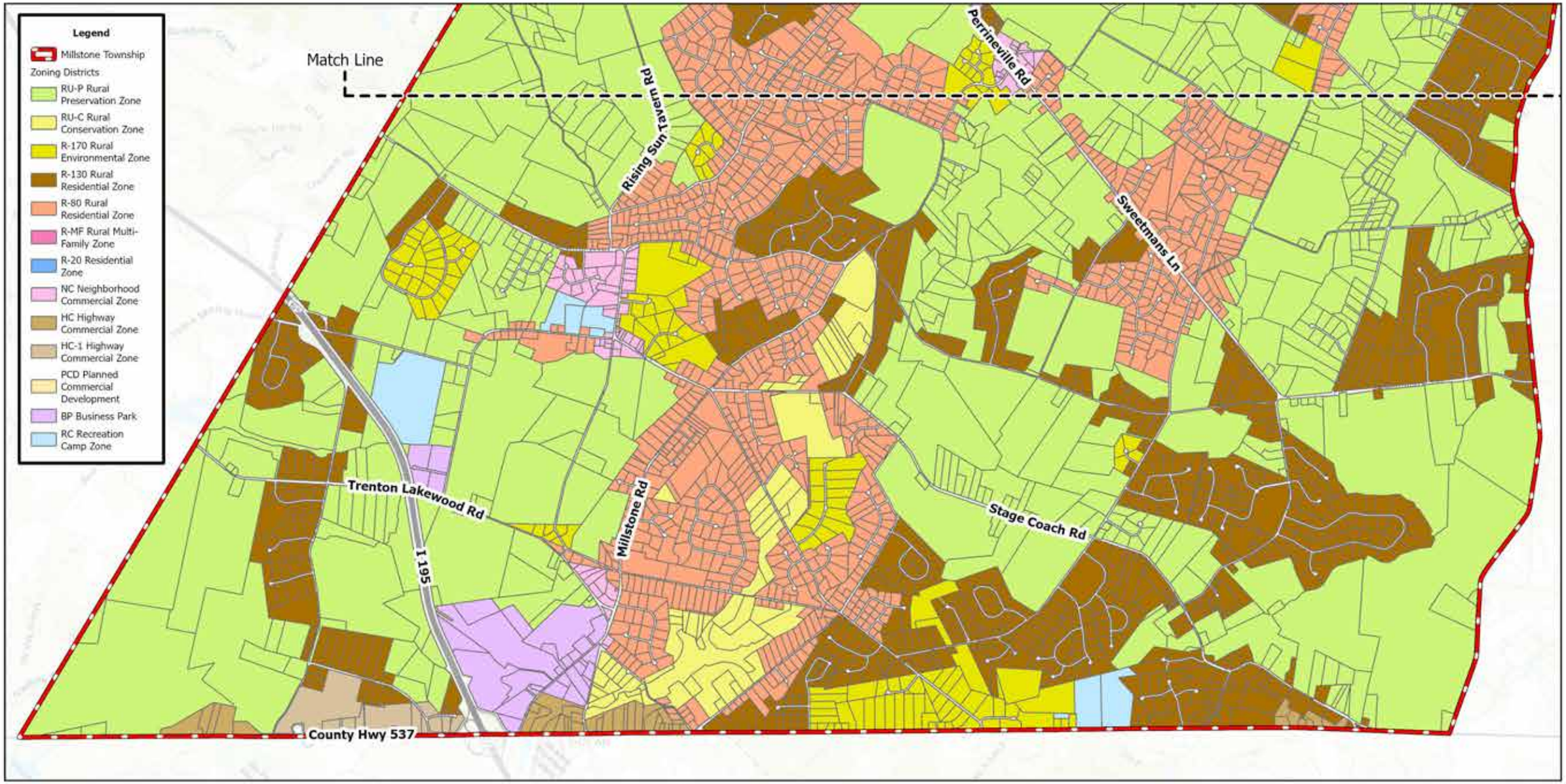
Figure 6a: Zoning

Municipal Stormwater Management Plan
Township of Millstone - Northwest
Monmouth County, New Jersey

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 20, 2026

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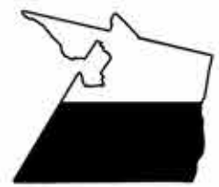
Consulting Engineers

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Scale: 1in = 0.6mi

Figure 6b: Zoning

Municipal Stormwater Management Plan
Township of Millstone - Southeast
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 20, 2026

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Consulting Engineers

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Scale: 1in = 0.6mi

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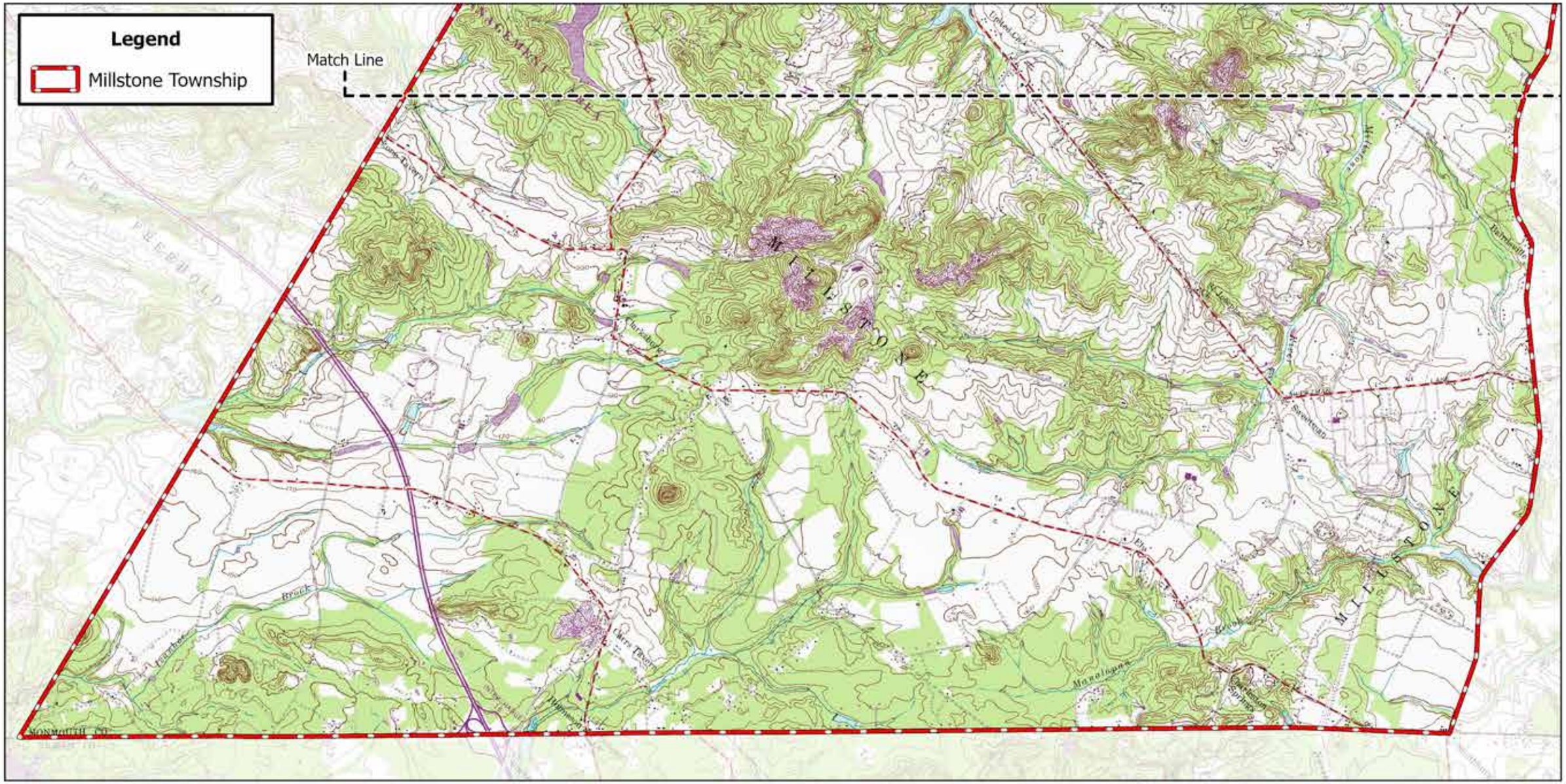
Figure 7a: USGS Quadrangle Map

Municipal Stormwater Management Plan
Township of Millstone - Northwest
Monmouth County, New Jersey

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 20, 2026

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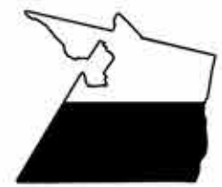
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Scale: 1in = 0.6mi

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Figure 7b: USGS Quadrangle Map

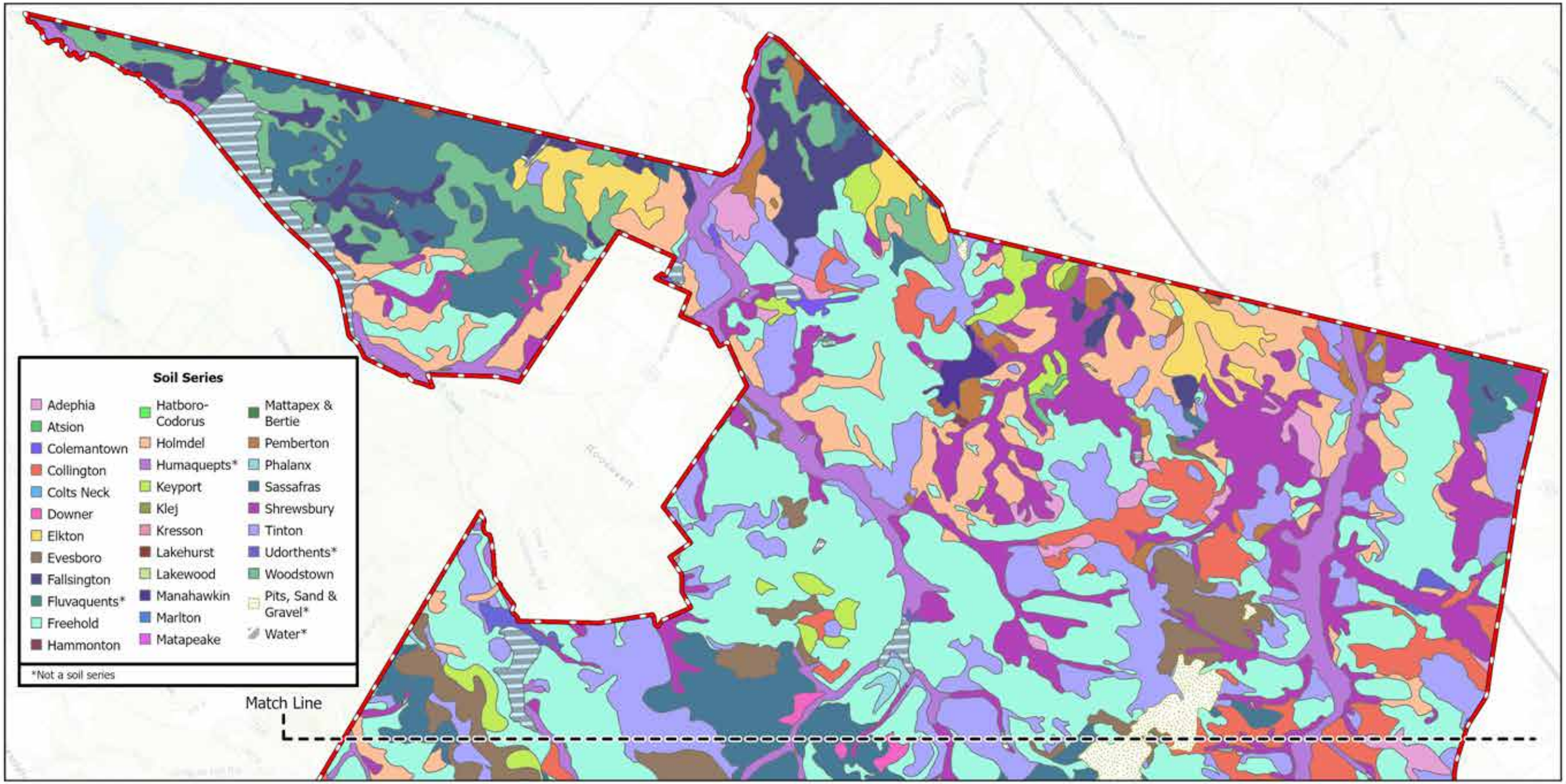
Municipal Stormwater Management Plan
Township of Millstone - Southeast
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 20, 2026

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0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

Figure 8a: Soils

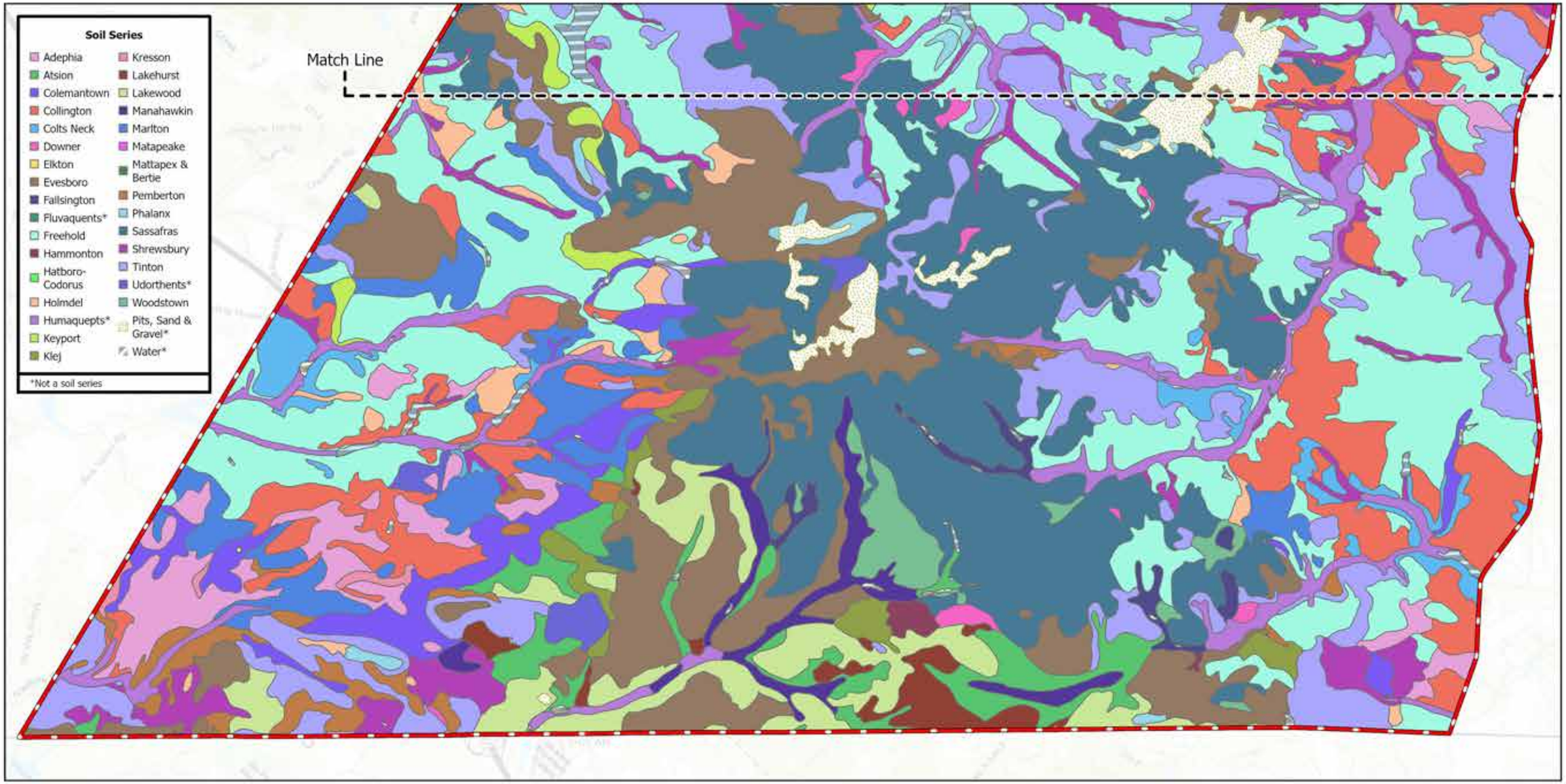
Municipal Stormwater Management Plan
Township of Millstone - Northwest
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: April 10, 2026

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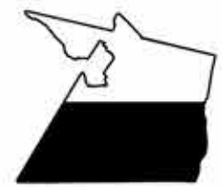
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Scale: 1in = 0.6mi

N

Figure 8b: Soils

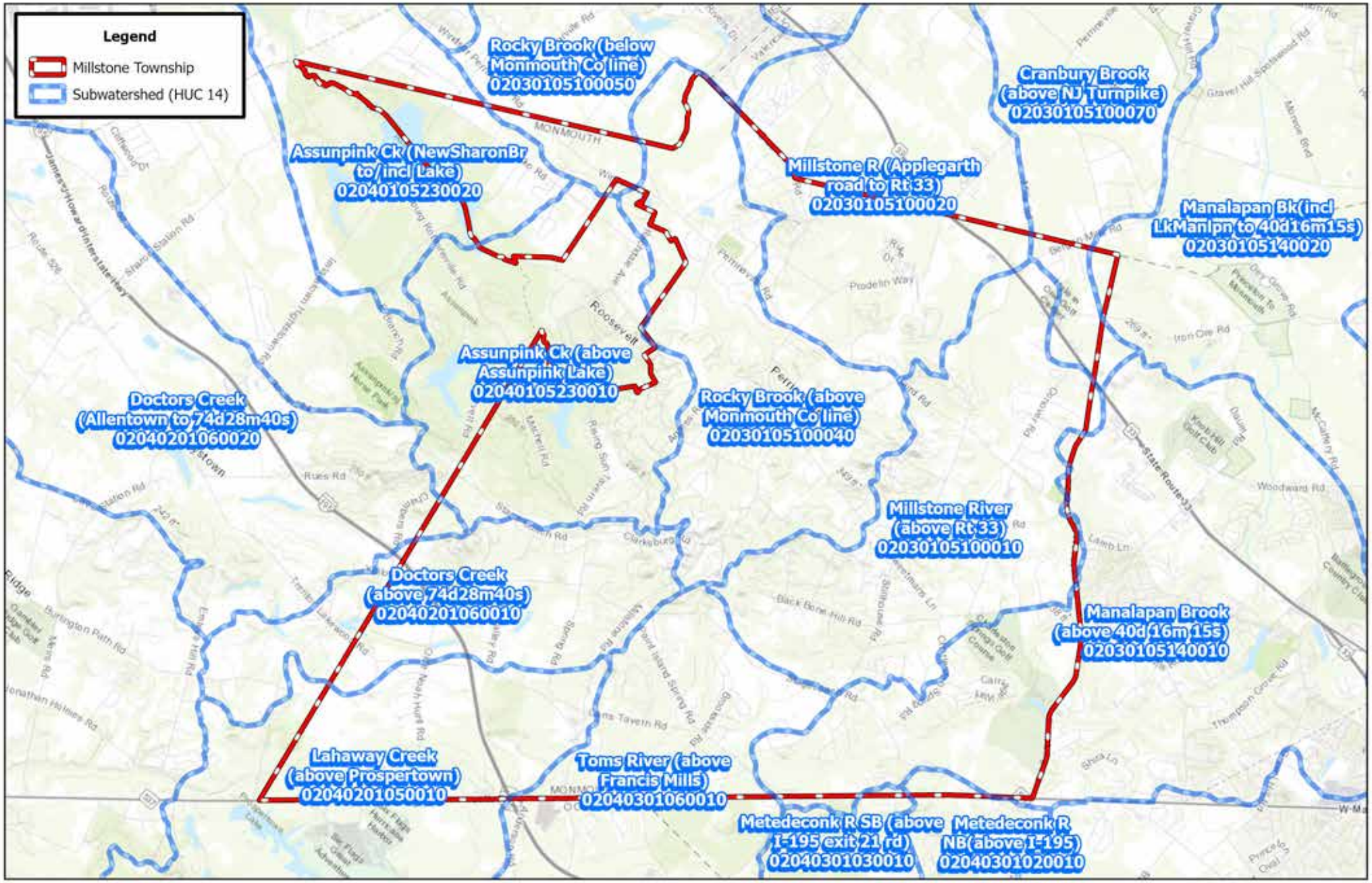
Municipal Stormwater Management Plan
Township of Millstone - Southeast
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: April 10, 2026

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Consulting Engineers

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Scale: 1in = 1.25mi

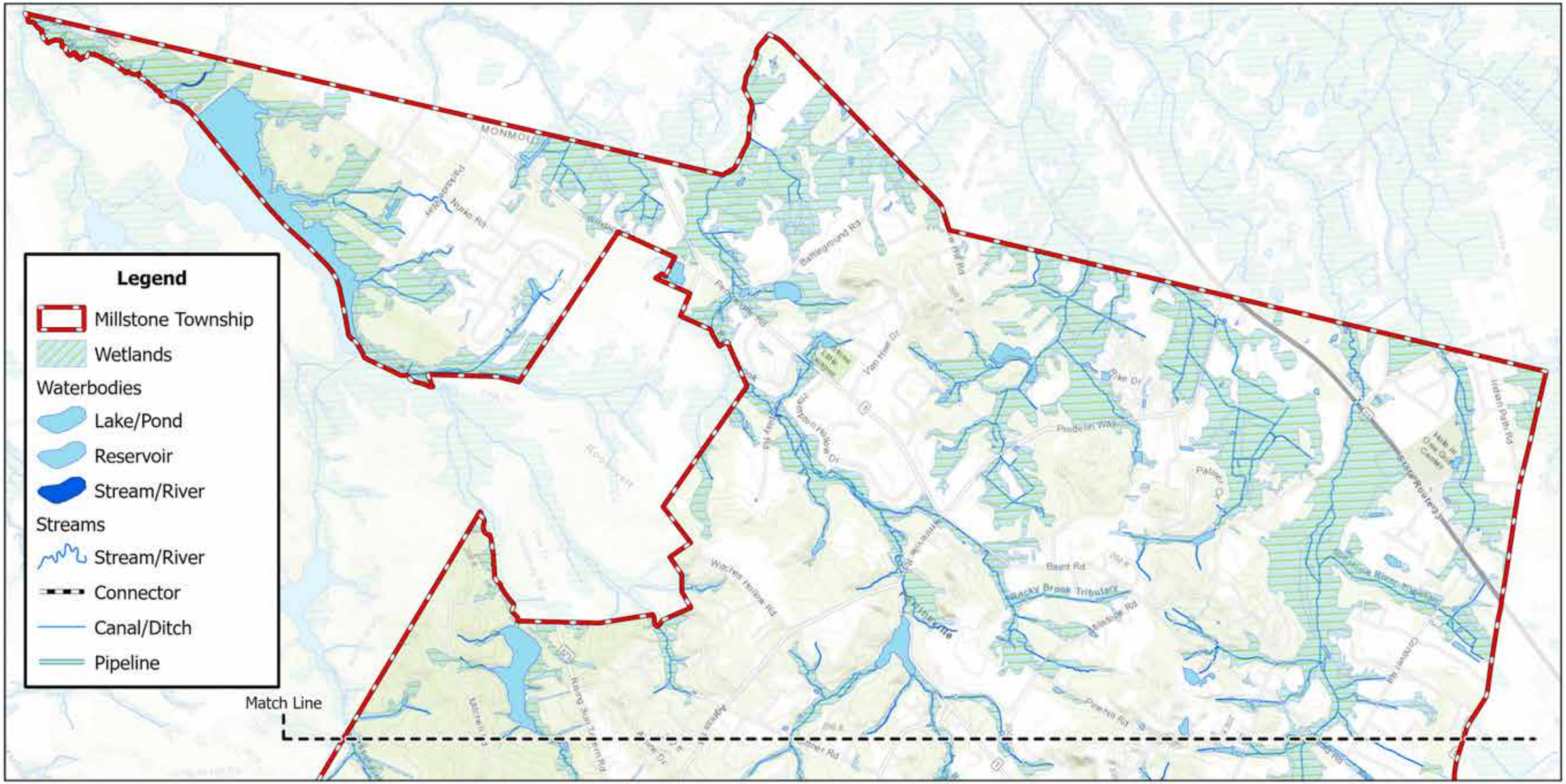
Figure 9: HUC 14 Drainage Areas

Municipal Stormwater Management Plan
Township of Millstone
Monmouth County, New Jersey

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 20, 2026

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LEON S. AVAKIAN, Inc.

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Scale: 1in = 0.6mi

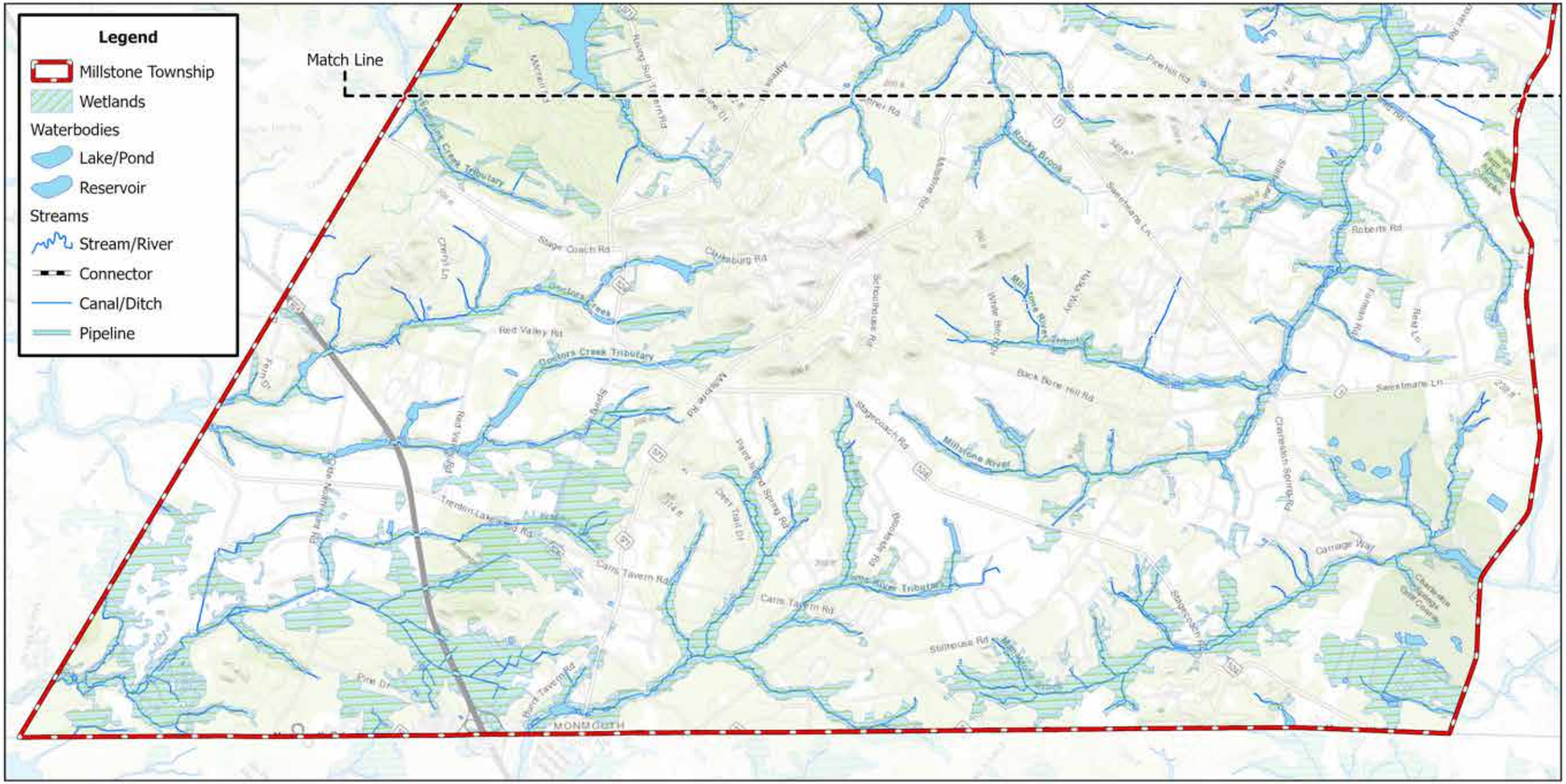
Figure 10a: Wetlands

Municipal Stormwater Management Plan
Township of Millstone - Northwest
Monmouth County, New Jersey

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 20, 2026

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LEON S. AVAKIAN, Inc.

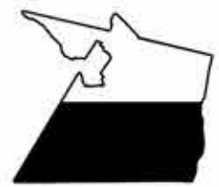
Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

Figure 10b: Wetlands

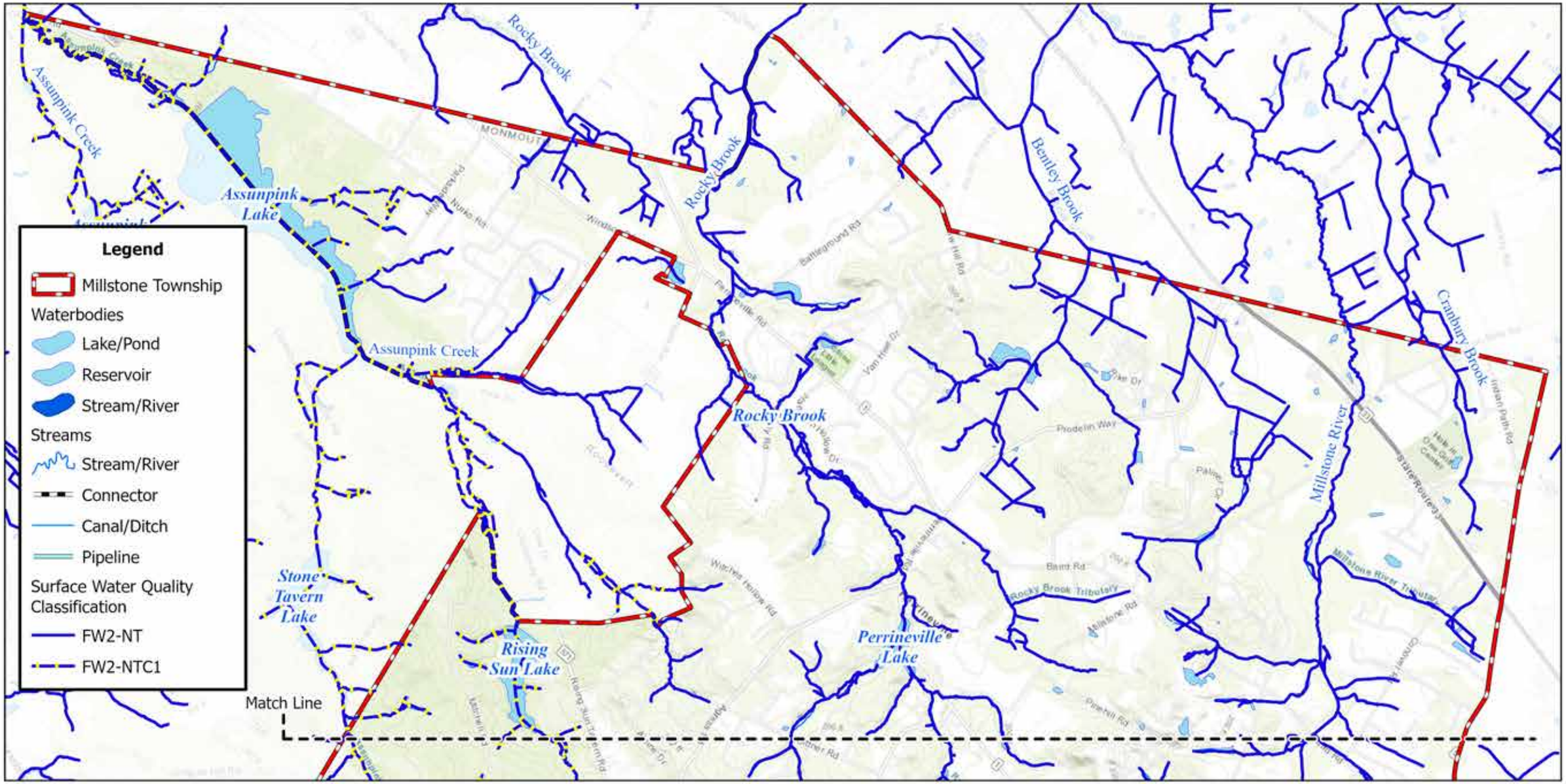
Municipal Stormwater Management Plan
Township of Millstone - Southeast
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 20, 2026

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



LEON S. AVAKIAN, Inc.

Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

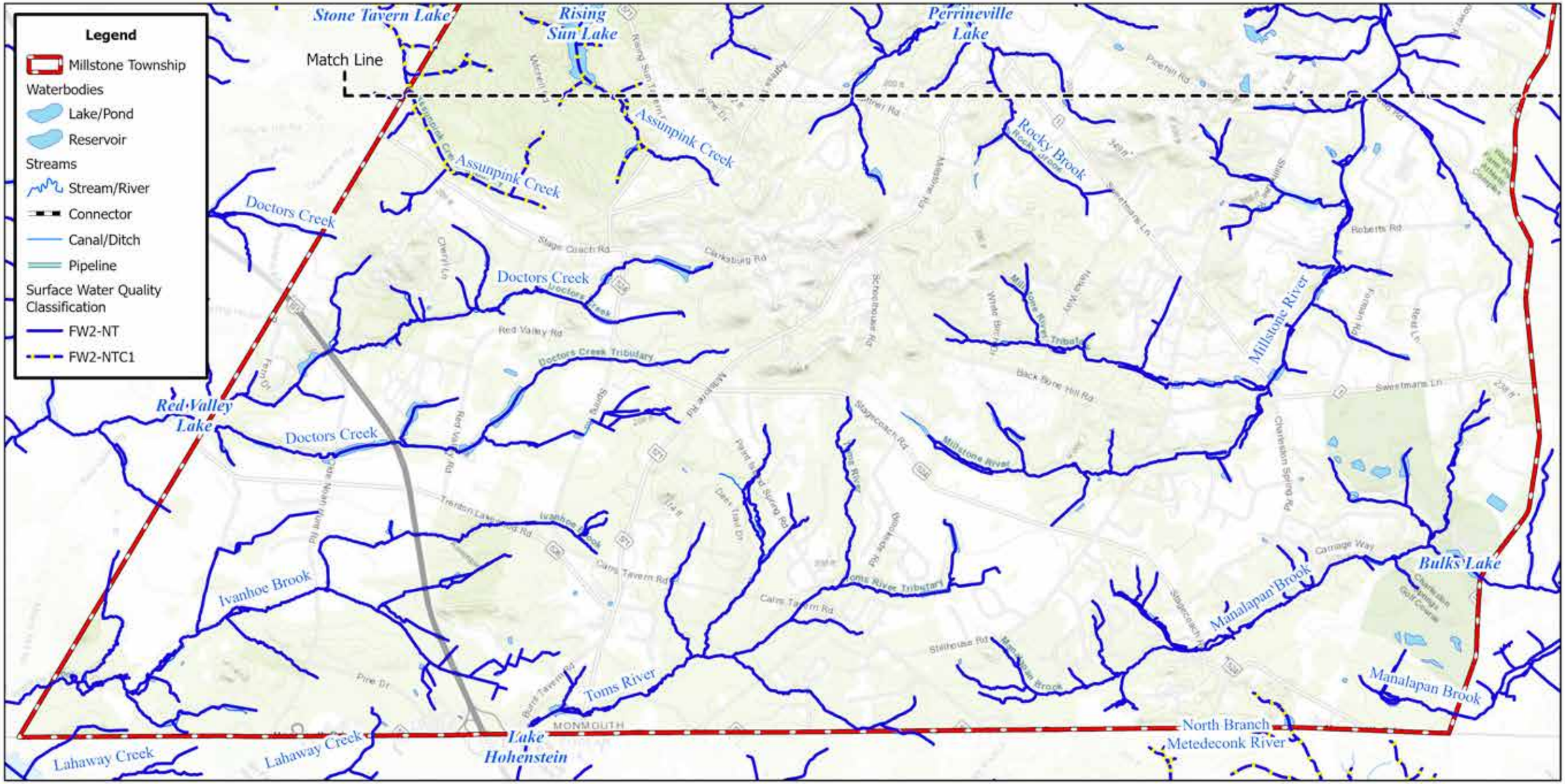
Figure 11a: Surface Water Quality Classifications

Municipal Stormwater Management Plan
Township of Millstone - Northwest
Monmouth County, New Jersey

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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



LEON S. AVAKIAN, Inc.

Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

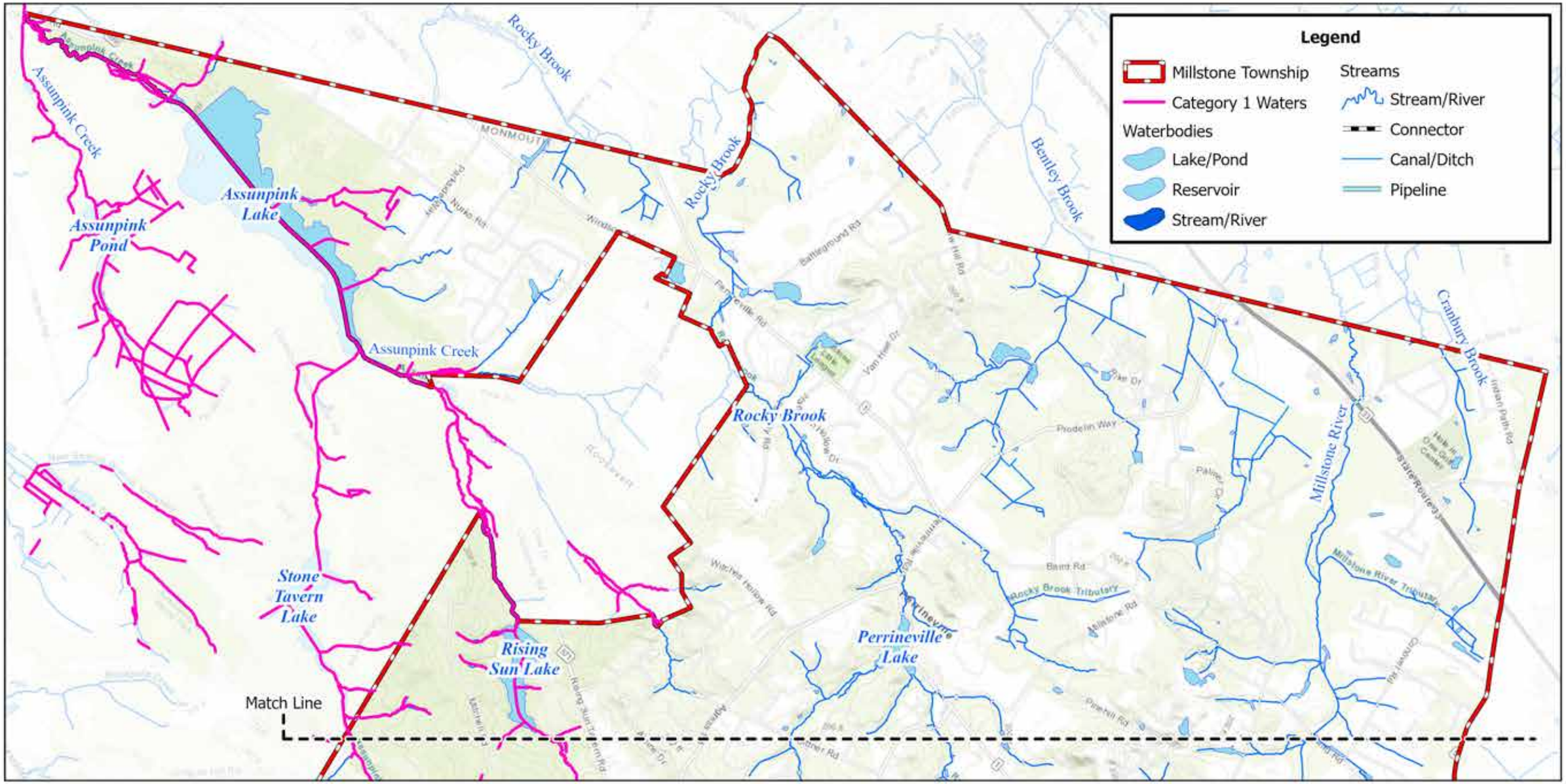
Figure 11b: Surface Water Quality Classifications

Municipal Stormwater Management Plan
Township of Millstone - Southeast
Monmouth County, New Jersey

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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LEON S. AVAKIAN, Inc.

Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

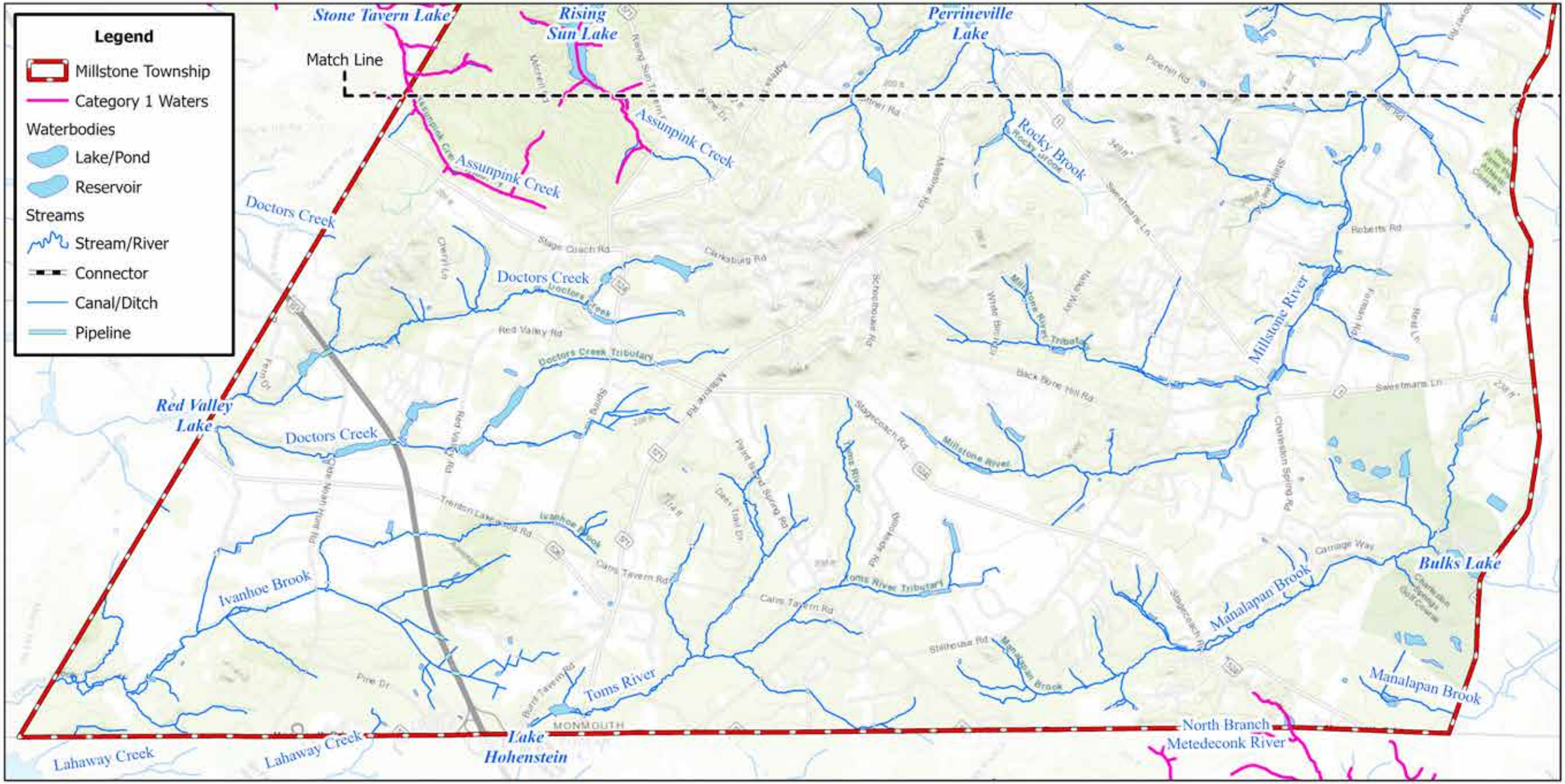
Figure 12a: Category One Waterbodies

Municipal Stormwater Management Plan
Township of Millstone - Northwest
Monmouth County, New Jersey

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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LEON S. AVAKIAN, Inc.

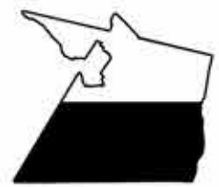
Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

Figure 12b: Category One Waterbodies

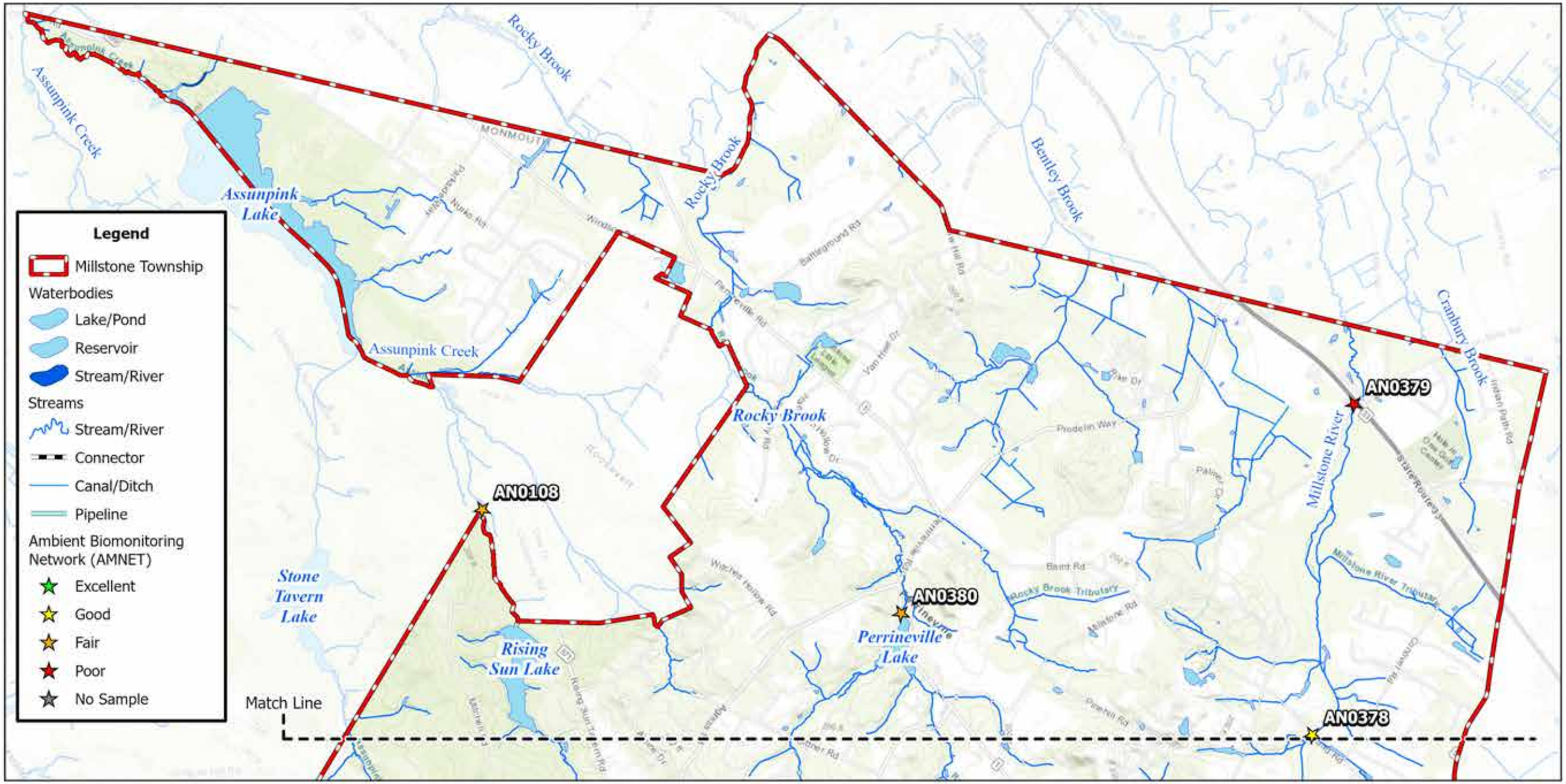
Municipal Stormwater Management Plan
Township of Millstone - Southeast
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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



LEON S. AVAKIAN, Inc.

Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

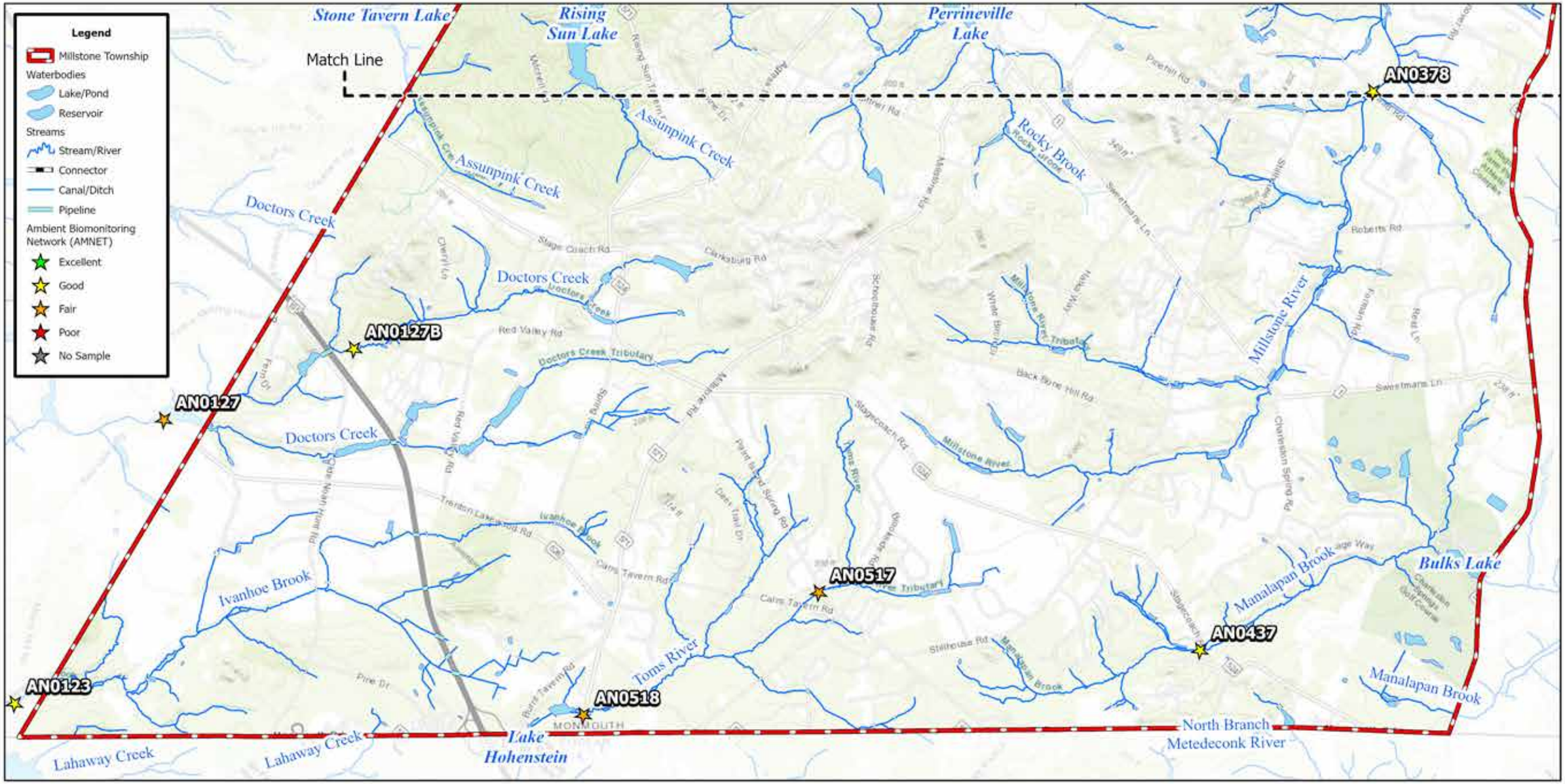
Figure 13a: AMNET Sites

Municipal Stormwater Management Plan
Township of Millstone - Northwest
Monmouth County, New Jersey

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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



LEON S. AVAKIAN, Inc.

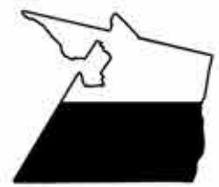
Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

Figure 13b: AMNET Sites

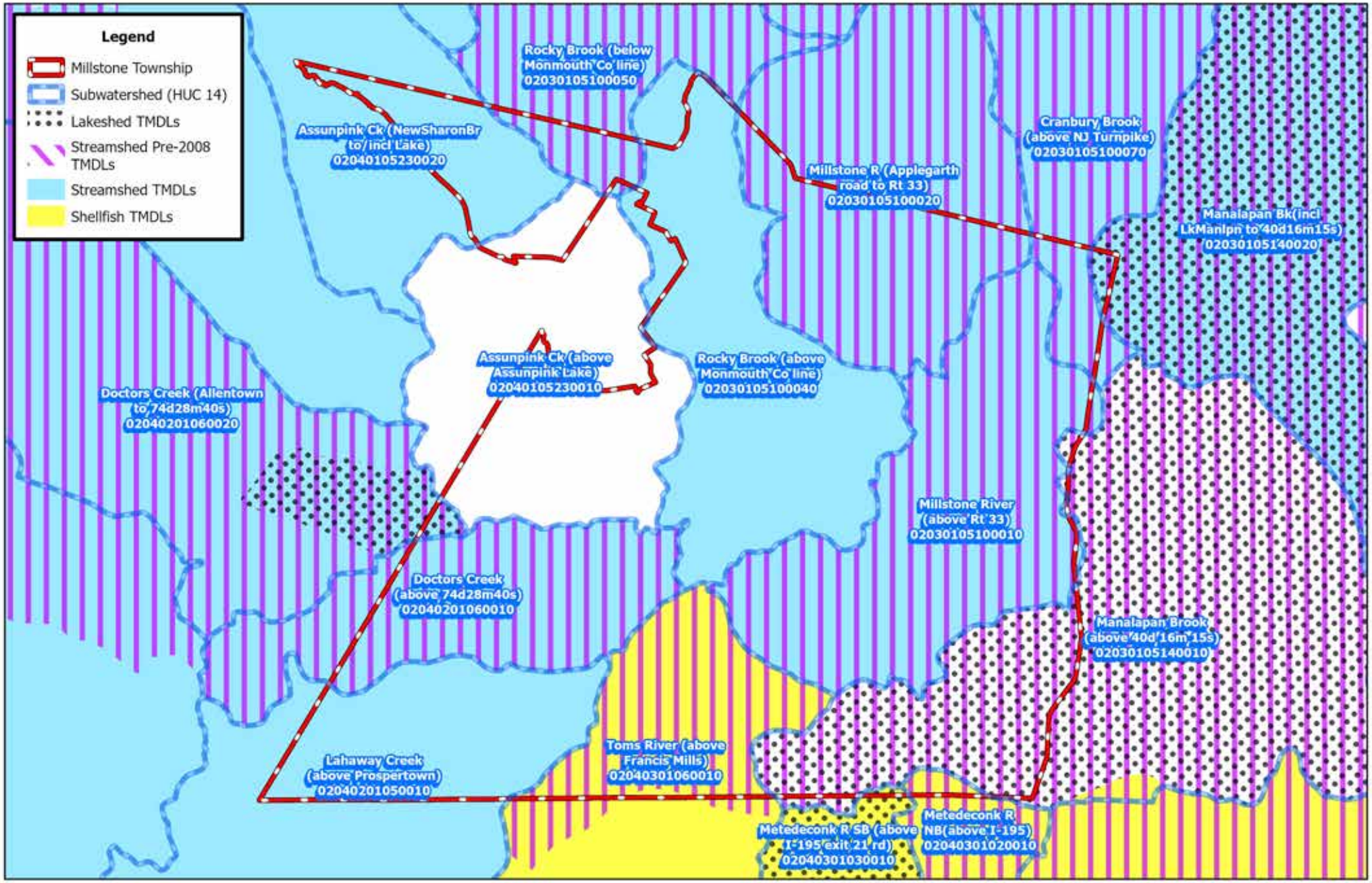
Municipal Stormwater Management Plan
Township of Millstone - Southeast
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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LEON S. AVAKIAN, Inc.

Consulting Engineers

0 0.63 1.25 1.88 2.5 Miles

Scale: 1in = 1.25mi

Figure 14: TMDLs by Parameter

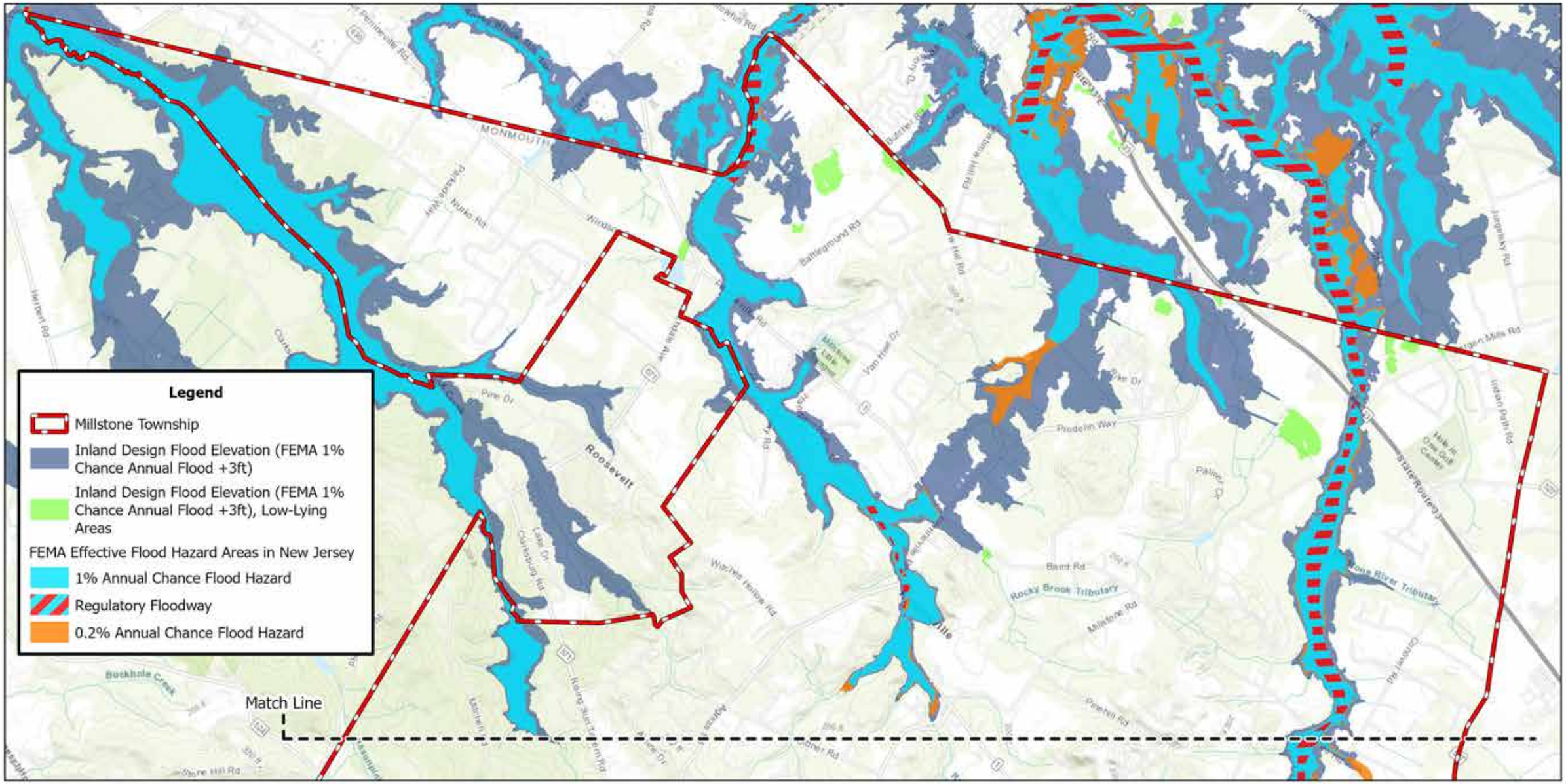
Municipal Stormwater Management Plan
Township of Millstone
Monmouth County, New Jersey

N

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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



LEON S. AVAKIAN, Inc.

Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

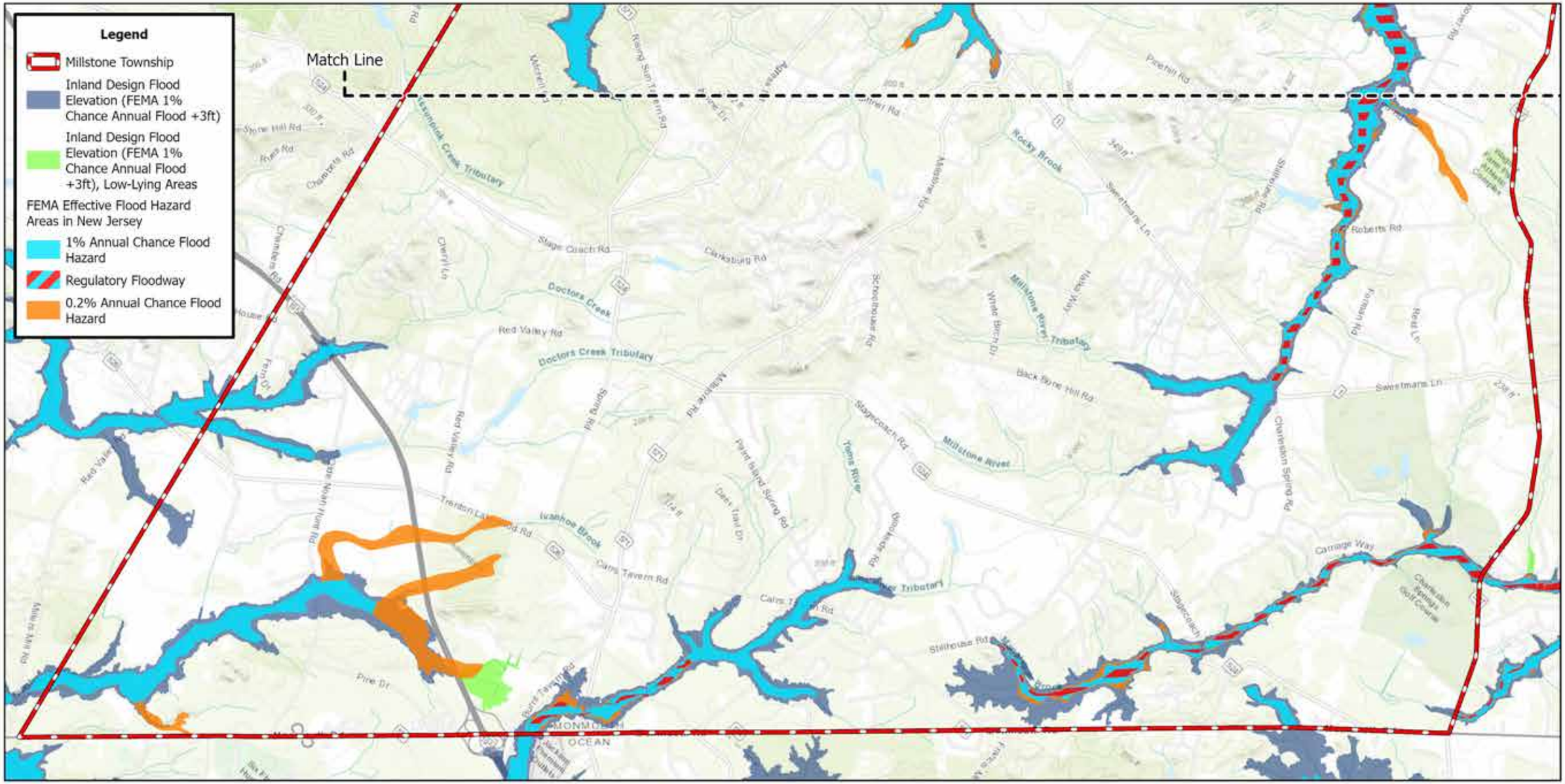
Figure 15a: Flood Hazard Areas

Municipal Stormwater Management Plan
Township of Millstone - Northwest
Monmouth County, New Jersey

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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LEON S. AVAKIAN, Inc.

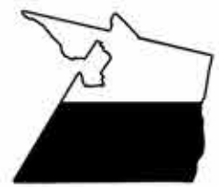
Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

Figure 15b: Flood Hazard Areas

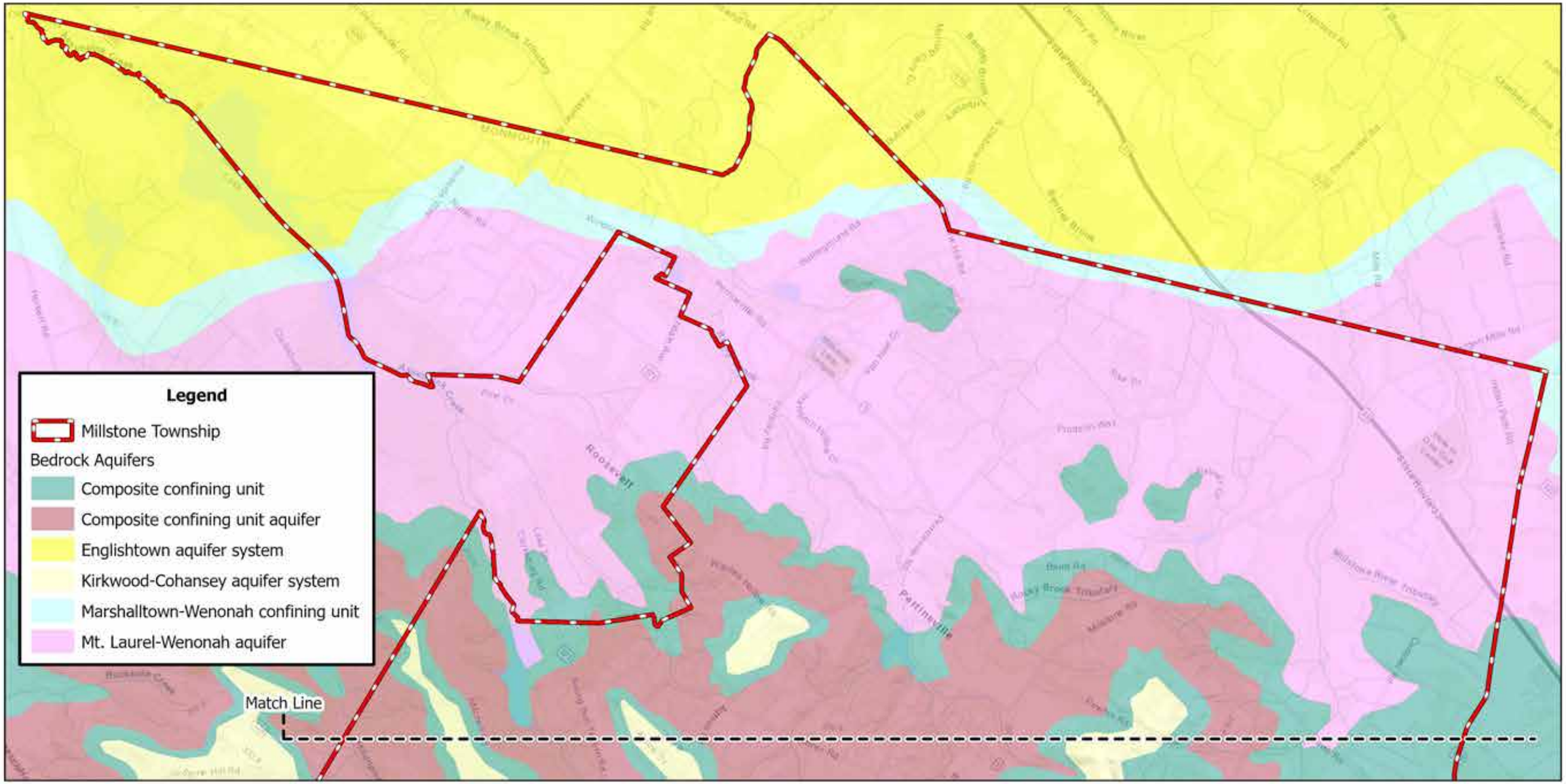
Municipal Stormwater Management Plan
Township of Millstone - Southeast
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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LEON S. AVAKIAN, Inc.

Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

Figure 16a: Aquifers

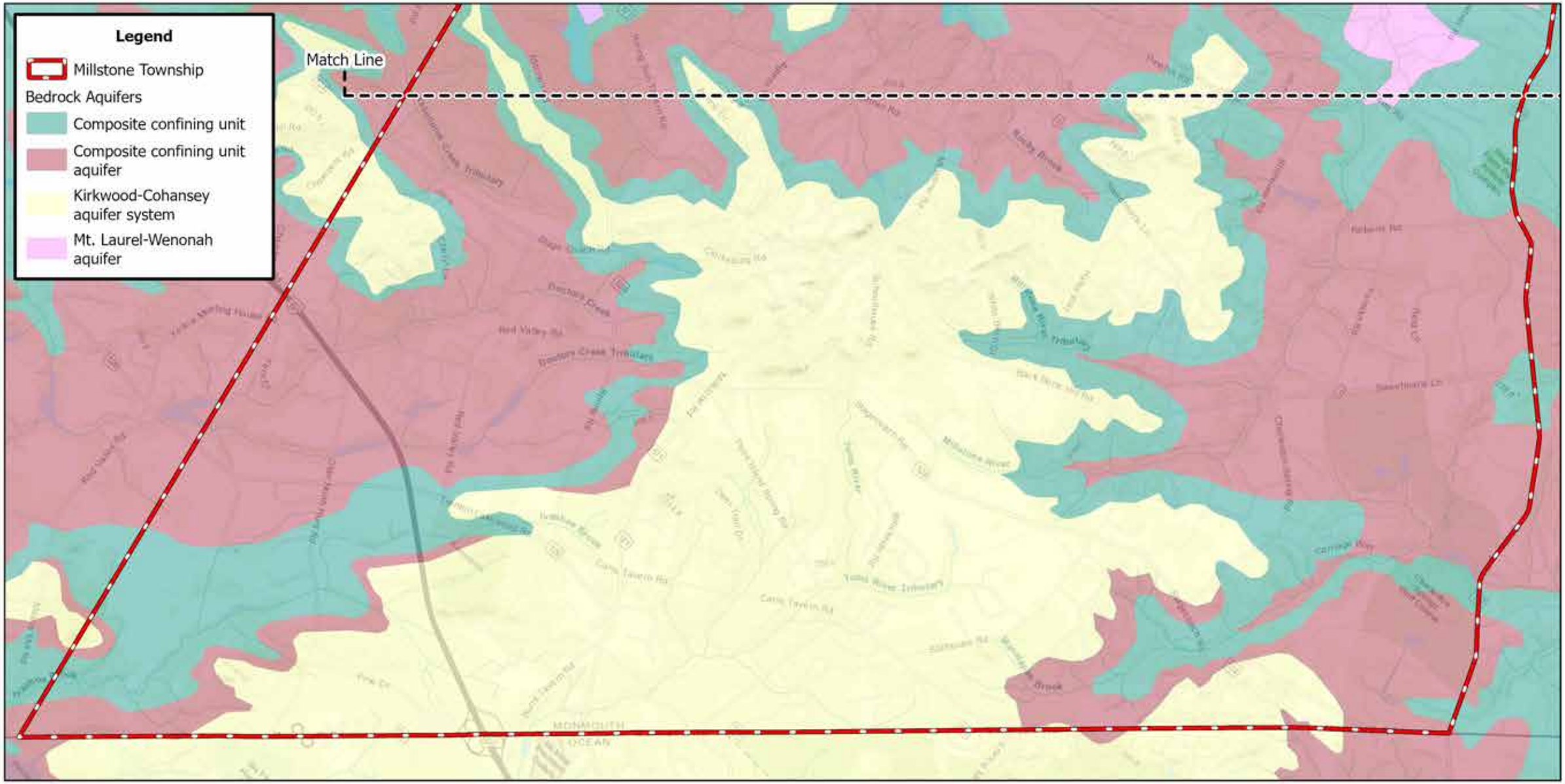
Municipal Stormwater Management Plan
Township of Millstone - Northwest
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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LEON S. AVAKIAN, Inc.

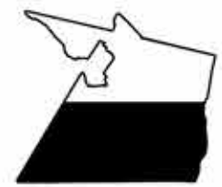
Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

Figure 16b: Aquifers

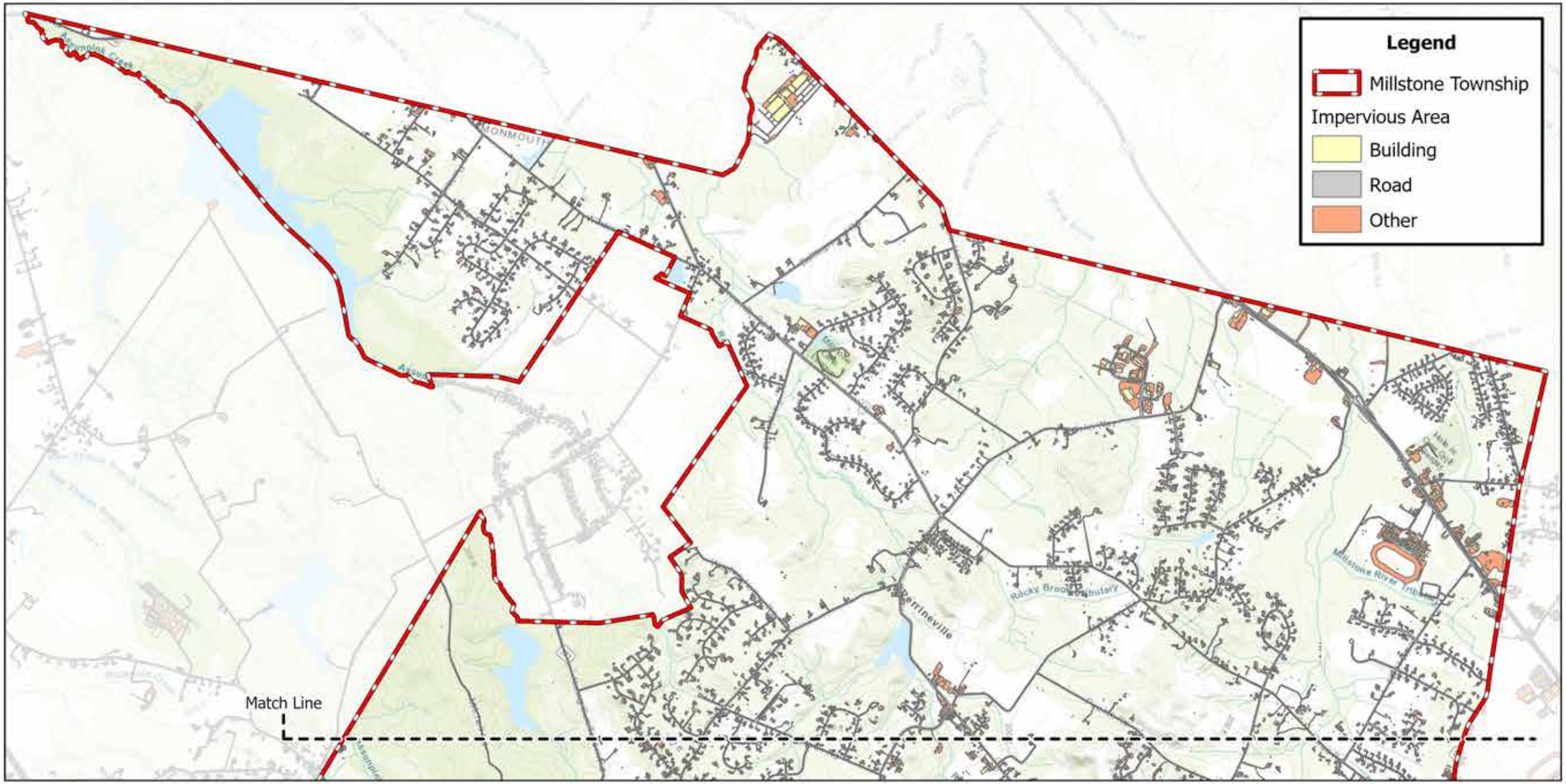
Municipal Stormwater Management Plan
Township of Millstone - Southeast
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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



LEON S. AVAKIAN, Inc.

Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

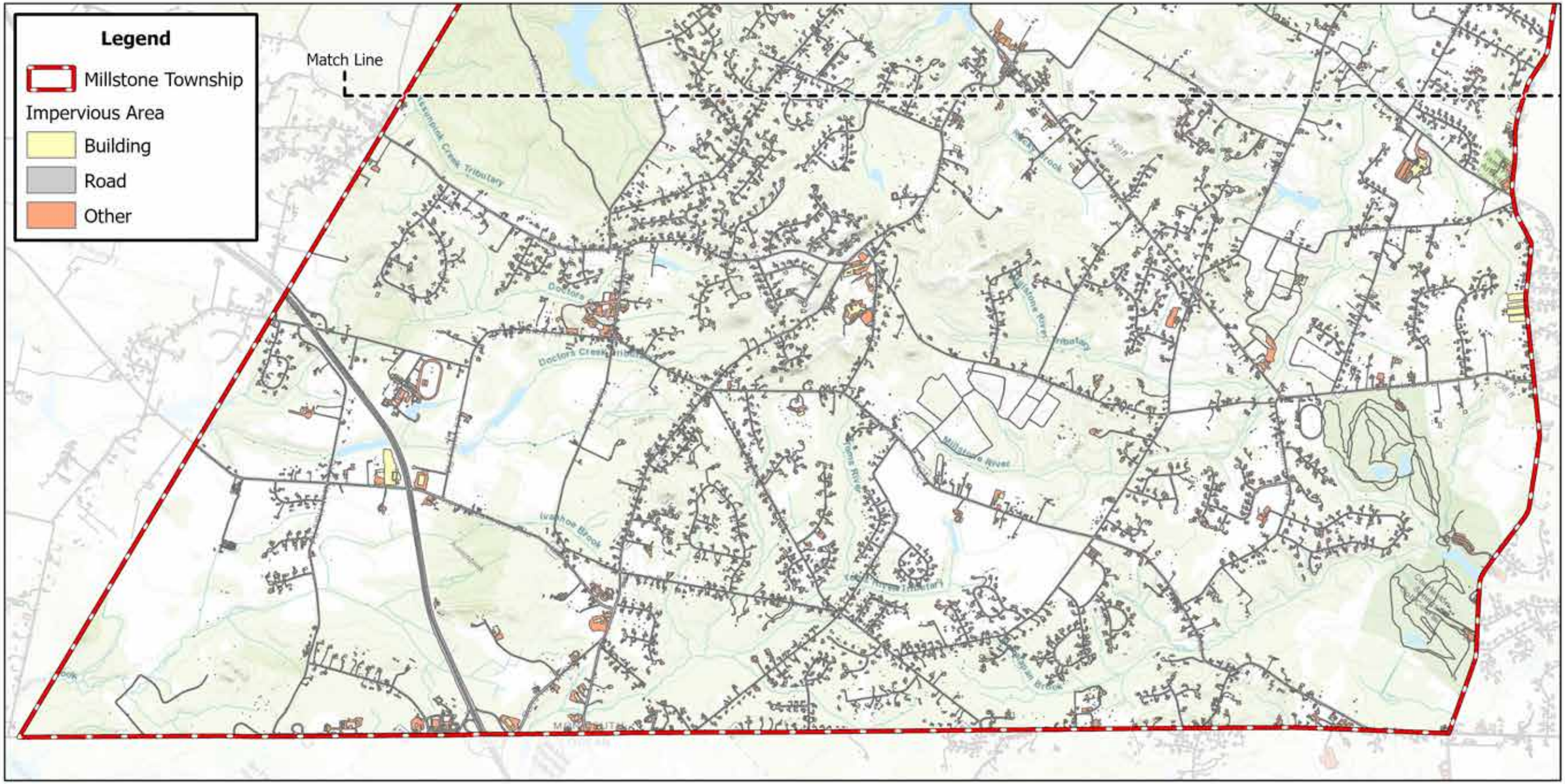
Figure 17a: Impervious Area

Municipal Stormwater Management Plan
Township of Millstone - Northwest
Monmouth County, New Jersey

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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LEON S. AVAKIAN, Inc.

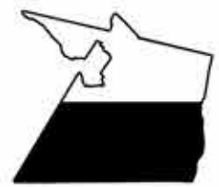
Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

Figure 17b: Impervious Area

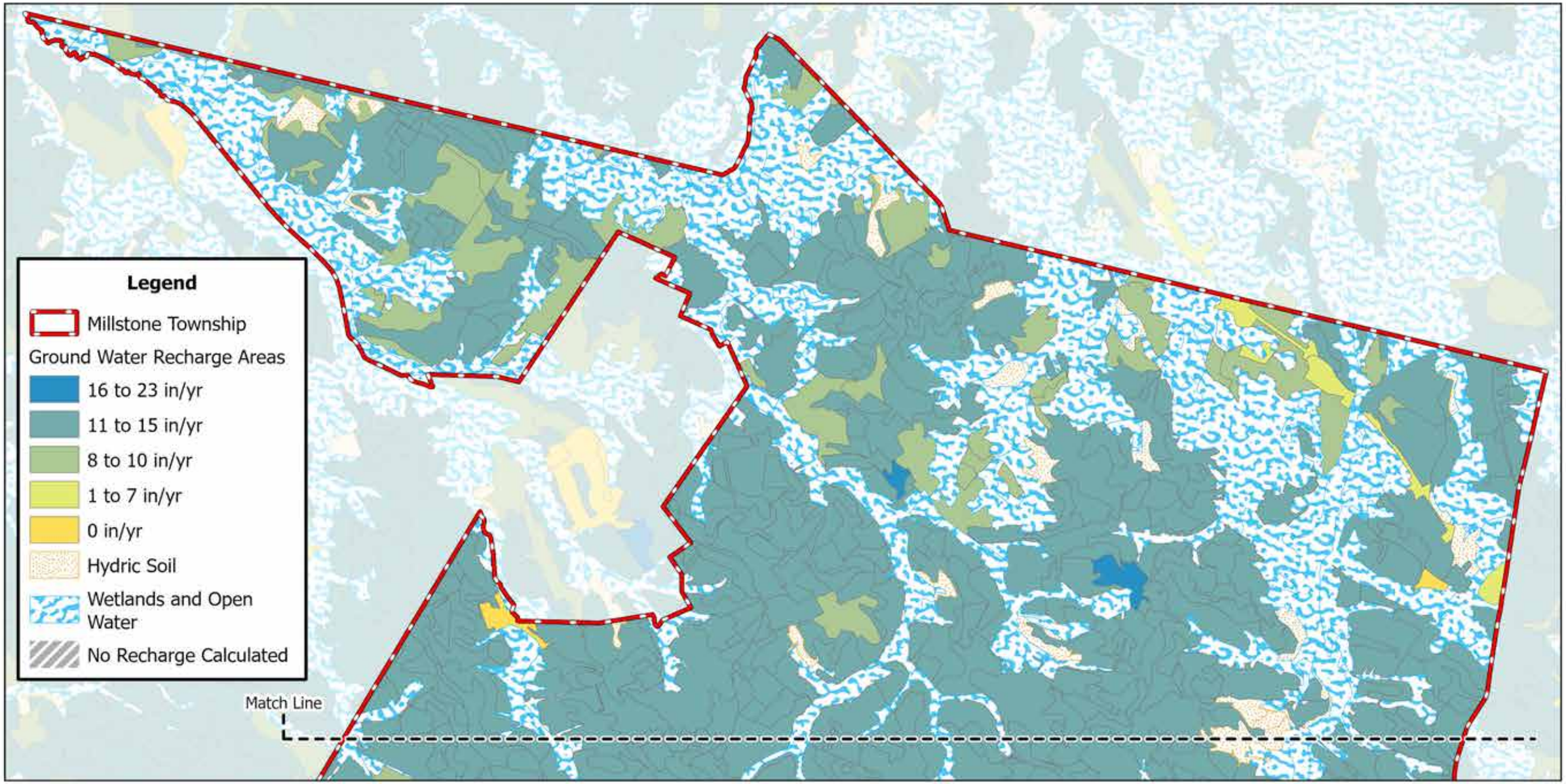
Municipal Stormwater Management Plan
Township of Millstone - Southeast
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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LEON S. AVAKIAN, Inc.

Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

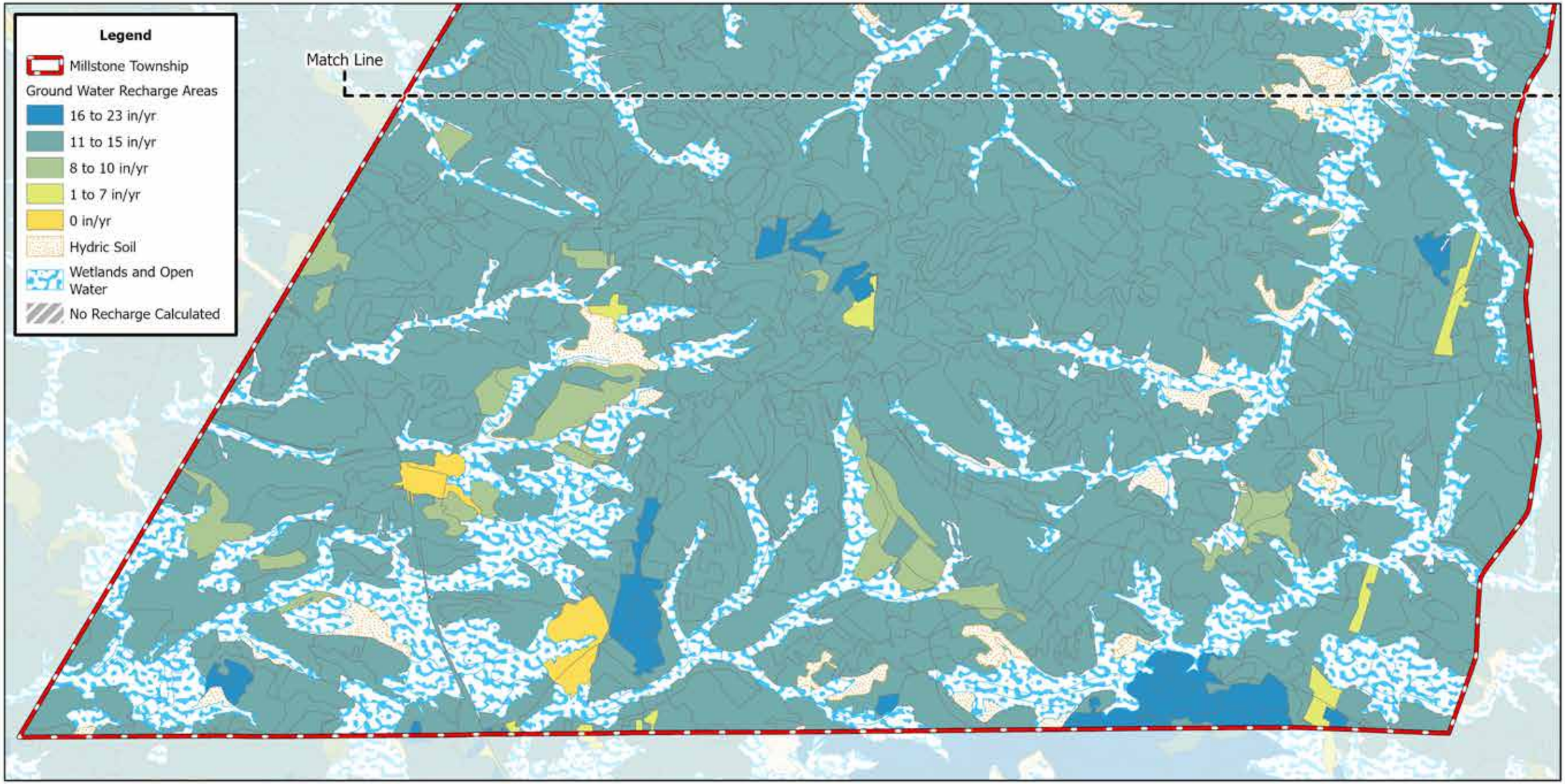
Figure 18a: Groundwater Recharge Areas

Municipal Stormwater Management Plan
Township of Millstone - Northwest
Monmouth County, New Jersey

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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LEON S. AVAKIAN, Inc.

Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

Figure 18b: Groundwater Recharge Areas

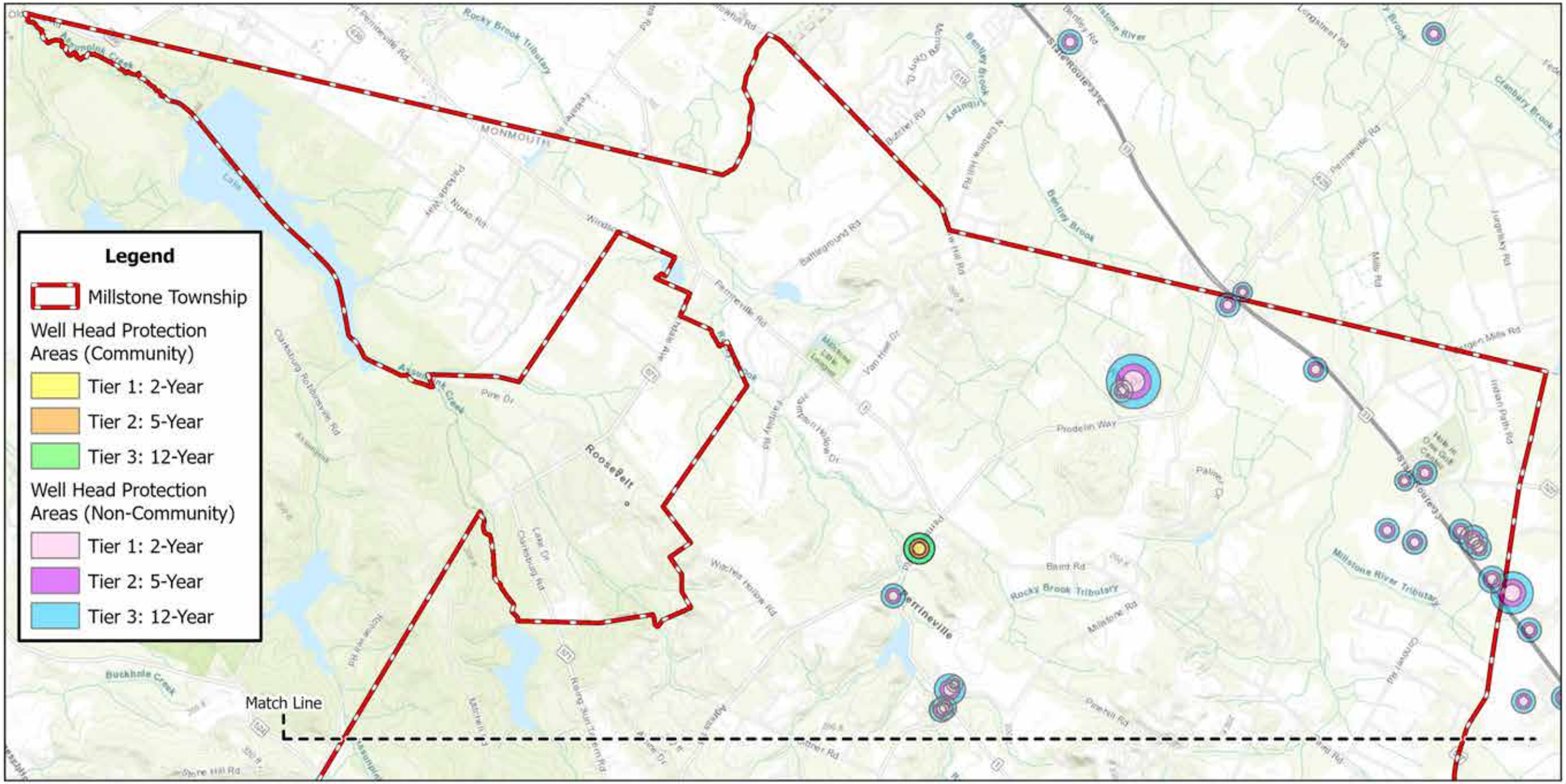
Municipal Stormwater Management Plan
Township of Millstone - Southeast
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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



LEON S. AVAKIAN, Inc.

Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

Figure 19a: Well Head Protection Areas

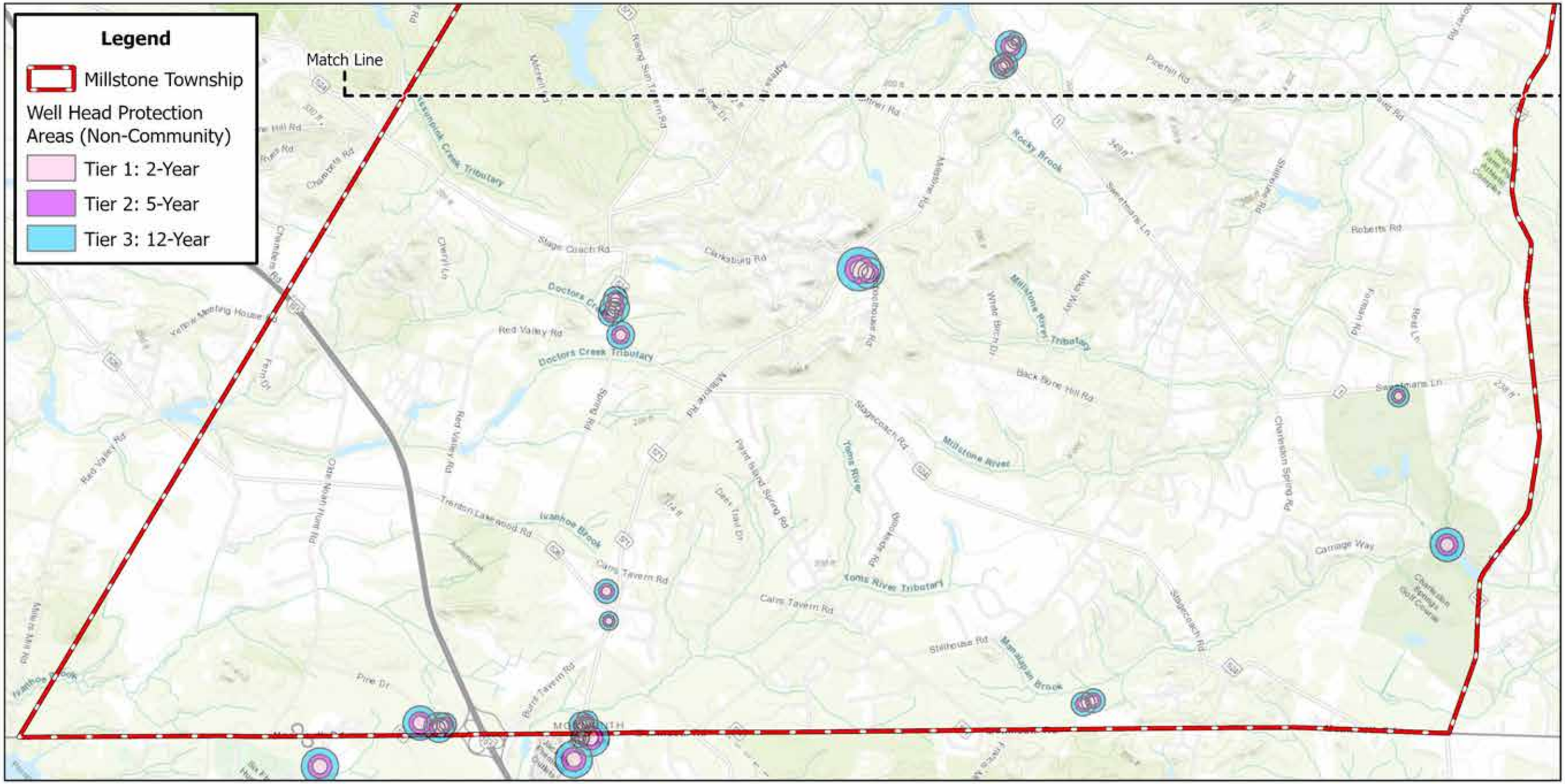
Municipal Stormwater Management Plan
Township of Millstone - Northwest
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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LEON S. AVAKIAN, Inc.

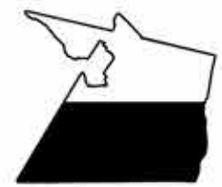
Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

Figure 19b: Well Head Protection Areas

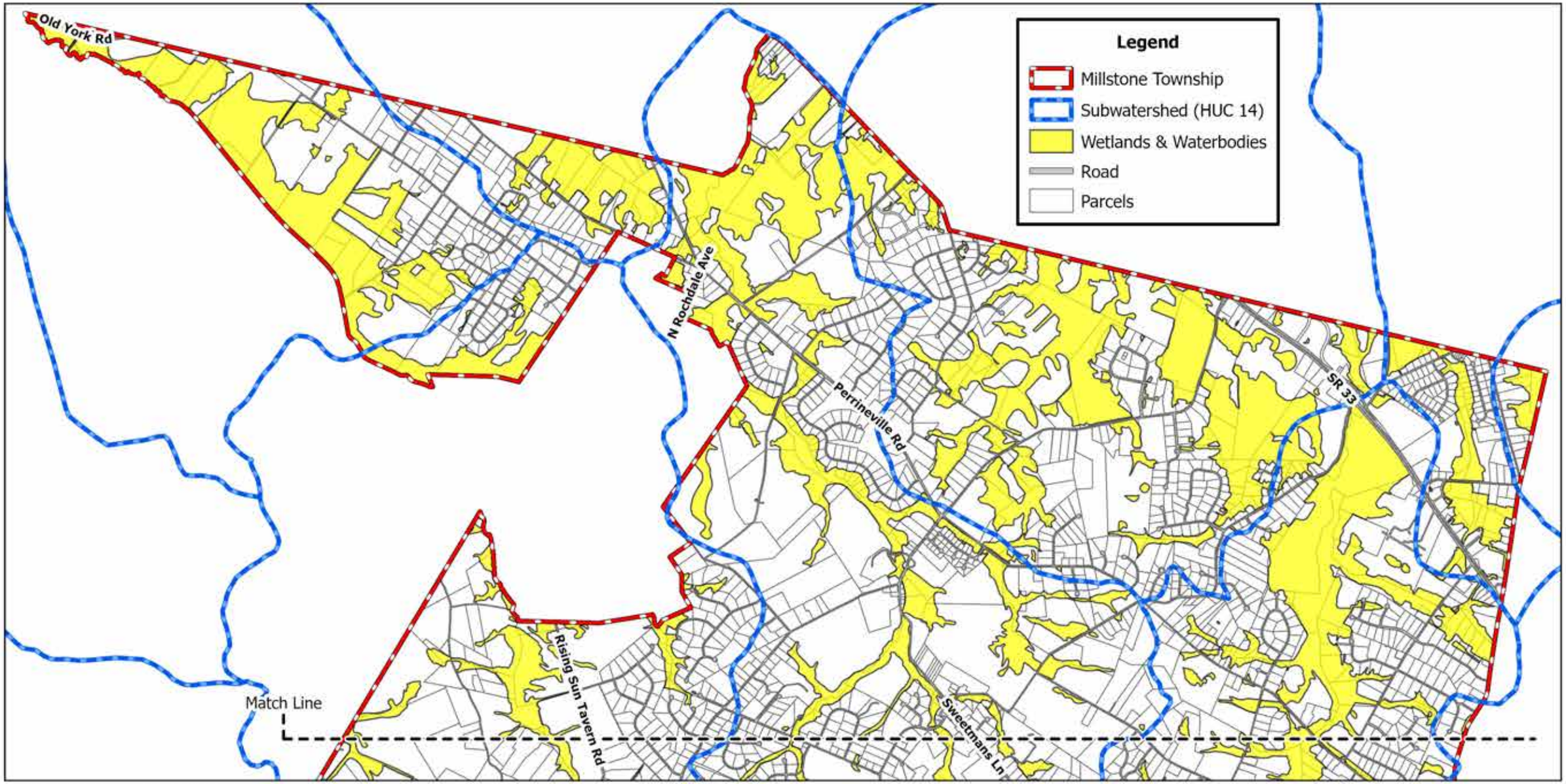
Municipal Stormwater Management Plan
Township of Millstone - Southeast
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: March 23, 2026

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



LEON S. AVAKIAN, Inc.

Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

Figure 20a: Developable Land and Constraints

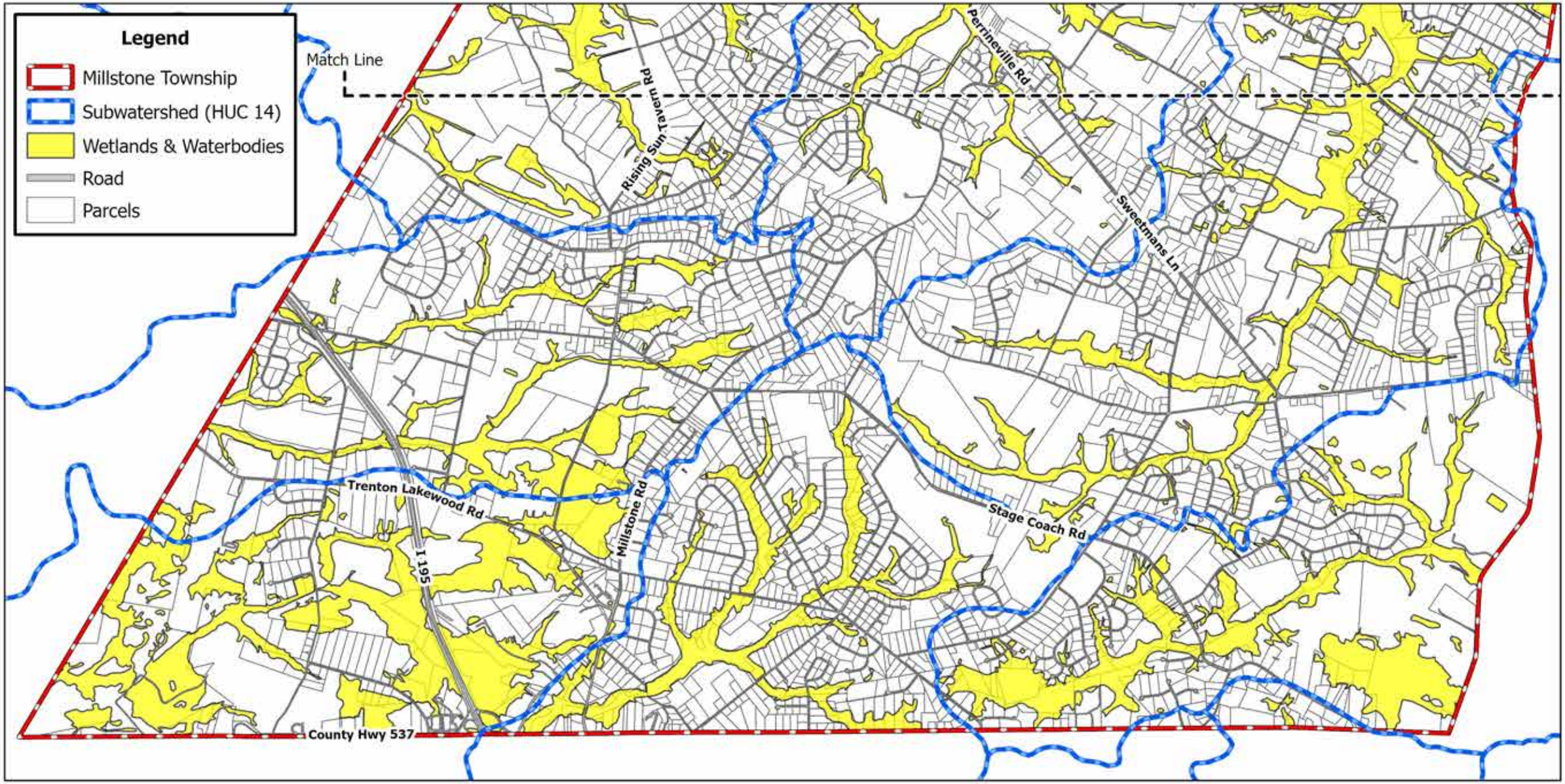
Municipal Stormwater Management Plan
Township of Millstone - Northwest
Monmouth County, New Jersey



Source: LSA, NJGIN, and Monmouth County GIS.

Revised: April 02, 2026

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



LEON S. AVAKIAN, Inc.

Consulting Engineers

0 0.15 0.3 0.6 0.9 1.2 Miles

Scale: 1in = 0.6mi

Figure 20b: Developable Land and Constraints

Municipal Stormwater Management Plan
Township of Millstone - Southeast
Monmouth County, New Jersey

Source: LSA, NJGIN, and Monmouth County GIS.

Revised: April 02, 2026

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

APPENDICES

APPENDIX A

Ambient Macroinvertebrate Network (AMNET) Data Sheets

Delaware Basin - Roosevelt USGS Quadrangle
Station AN0108
Assunpink Creek, Roosevelt Road, Roosevelt
March 4, 1992

Family	Number of Individuals	Family Tolerance Value (FTV)
Simuliidae	91	6
Chironomidae	2	6
Sphaeriidae	4	8
BloodRedChironomidae	1	8
Lepidostomatidae	1	1
Naididae	1	7

Statistical Analysis

Number of Taxa = 6
Total Number of Individuals = 100
% Contribution of Dominant Family = 91.00
Family Biotic Index = 6.06
Scraper/Filterer Collector Ratio = 0.00
Shredder/Total Ratio = 0.02
E+P+T* = 1 *(Ephemeroptera, Plecoptera and Trichoptera)
%EPT = 1.00
EPT/C* = 0.33 *(Chironomidae)
NJIS Rating = 6
Biological Condition = severely impaired
Deficiency(s) noted: paucity of clean water organisms
Simuliidae overwhelmingly dominant

Observations

Streamwater: clear...Flow: moderate...Width/Depth(ft): 5/<1...
Substrate: clay/sand...Streambank Vegetation/Stability: fair/fair.
..Canopy: open...Other: wooded; iron precipitate

Station: AN0108
Assunpink Ck, Roosevelt Rd , Roosevelt, Monmouth County
Roosevelt USGS Quadrangle
Date Sampled: 03/04/98

Family	Family Tolerance Value (FTV)	Number of Individuals
Simulidae	6	61
Sphaeriidae	8	15
Chironomidae	6	13
Tubificidae	10	2
BloodRed Chironomidae	8	2
Cypridae	6	1
Lumbriculidae	8	1
Elmidae	4	1
Hydrophilidae	5	1
Phryganeidae	4	1
Limnephilidae	4	1
Sialidae	4	1

Statistical Analysis

Number of Taxa: 12
Total Number of Individuals: 100
% Contribution of Dominant Family: 61.00 % (Simulidae)
Family Biotic Index: 6.35
Scraper/Filterer Collector Ratio: 0.00
Shredder/Total Ratio: 0.03
E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 2
% EPT: 2.00
EPT/C: 0.13
NJIS Rating: 9
Biological Condition: Moderately Impaired
Habitat Analysis: 158
Deficiency(s) noted: Simulidae Family Overwhelmingly Dominant
Paucity of Clean Water Organisms

Observations

Streamwater: Clear....Flow: Moderate....Width/Depth (ft): 8/2
Substrate: Cobbles,sand....StreamBank Vegetation/Stability: Trees,shrubs/Unstable
Canopy: Mostly Closed....Other: Forested/Suburban; Water temp.8.8 /pH 7.0 /DO 10.0/Cond.66

AMNET Site # **AN0108** *Stream Name* **Assunpink Ck**

Location: **off Rt 571 Roosevelt Rd (S. Rochdale Rd); Roosevelt Boro; Monmouth County**

Collection Date: ***5/15/2003*** *USGS Topo Map* **Roosevelt**

Genus	*Tolerance Value*	*Amount*
Aulodrilus	8	25
Caecidotea	8	12
Heterotanytarsus	6	12
Enchytraeidae	10	9
Paratendipes	8	9
Clinotanypus	8	6
Limnodrilus	10	5
Pisidium	6.8	4
Sphaerium	8	3
Stratiomyidae	10	3
Thienemannimyia	6	3
Bezzia	6	2
Brillia	5	2
Dicranota	3	2
Cnephia	4	1
Lumbriculus	8	1
Nais	8	1

** (EPT organism)* *Taxa Richness:* 17 *Population* 100

%Dominance / Dominant Taxon(s): 25.0% Aulodrilus

Hilsenhoff Biotic Index (HBI): 7.75 *%Clingers:* 1.00%

** E+P+T:* 0 ( ) Ephemeroptera, ( ) Plecoptera, ( ) Trichoptera *%Ephemeroptera:* 0.00%

CPMI Rating: **4 Poor**

Habitat Analysis: 144 Suboptimal USEPA Protocol

Observations: Water temp: 13.2 C; Cond: 89 umhos; DO: 8.8 mg/L; pH: 6.6 SU

Clarity: clear; Flow Rate: moderate; Width/Depth: 5.0' / <1.0'; Substrate: gravel, sand, mud, silt

Canopy: closed; Bank Stability: good; Bank Vegetation: trees, shrubs

Stream Gradient: Low Gradient Stream; Land Uses: rural, forested

Other: filamentous algae, orange flock, frog, macrophytes observed.

AMNET Site # **AN0108** *Stream Name* **Assunpink Ck**

Location: **off Rt 571 Roosevelt Rd (S. Rochdale Rd); Roosevelt Boro; Monmouth County**

Collection Date: ***5/20/2008*** *USGS Topo Map* **Roosevelt**

Genus	*Tolerance Value*	*Amount*
Musculium	5	20
Thienemannimyia	6	14
Spirosperma	10	13
Caecidotea	8	11
Nais	8	5
Simulium	6	5
Chironomus	10	4
Pentaneura	6	4
Prodiamesa	3	4
Parametriocnemus	5	3
Tanytarsus	6	3
Dicranota	3	2
Polypedilum	6	2
Sialis	4	2
Ablabesmyia	8	1
Bezzia	6	1
Limnodrilus	10	1
Microvelia	6	1
Nematoda	6	1
Phaenopsectra	7	1
Rheotanytarsus	6	1
Rheumatobates	8	1

** (EPT organism)* *Taxa Richness:* 22 *Population* 100

%Dominance / Dominant Taxon(s): 20.0% Musculium

Hilsenhoff Biotic Index (HBI): 6.64 *%Clingers:* 7.00%

** E+P+T:* 0 ( ) Ephemeroptera, ( ) Plecoptera, ( ) Trichoptera *%Ephemeroptera:* 0.00%

CPMI Rating: **6 Fair**

Habitat Analysis: 127 Suboptimal USEPA Protocol

Observations: Water temp: 13.49 C; Cond: 69 umhos; DO: 8.10 mg/L; pH: 5.93 SU

Clarity: clear; Flow Rate: slow; Width/Depth: 8' / <1'; Substrate: sand, snags, undercut banks

Canopy: partly open; Bank Stability: poor; Bank Vegetation: trees, shrubs

Stream Gradient: Low Gradient Stream; Land Uses: forested

Other: frogs, excessive orange floc, sand stained reddish-brown, Assunpink WMA

AMNET Site # **AN0108** *Stream Name:* **Assunpink Ck**

Location: **off Rt 571 Roosevelt Rd (S. Rochdale Rd); Roosevelt Boro; Monmouth County**

Collection Date: ***4/18/2013*** *USGS Topo Map:* **Roosevelt**

	Genus	*Tolerance Value*	*Amount*
	Pisidiidae	8	23
	Rheocricotopus	6	20
	Cnephia	4	9
	Polypedilum	6	7
	Aulodrilus	8	6
	Caecidotea	8	4
	Prosimulium	2	4
	Nais	8	3
	Pseudorthocladius	0	3
	Bezzia	6	2
	Limnodrilus	10	2
	Thienemannimyia	6	2
	Agabus	5	1
	Cricotopus	7	1
*	Ironoquia	3	1
	Limnophila	3	1
	Limonia	6	1
	Paratendipes	8	1
	Psectrocladius	8	1
*	Ptilostomis	5	1
	Simulium	6	1
	Slavina	7	1

** (EPT organism)* *Taxa Richness:* 22 *Population:* 95

%Dominance / Dominant Taxon(s): 24.2% Pisidiidae

Hilsenhoff Biotic Index (HBI): 6.27 *%Clingers:* 15.79%

** E+P+T:* 2 ( ) Ephemeroptera, ( ) Plecoptera, (2) Trichoptera *%Ephemeroptera:* 0.00%

CPMI Rating: **6 Fair**

Habitat Analysis: 128 Suboptimal USEPA Protocol

Observations: Water temp: 14.47 C; Cond: 98 umhos; DO: 11.30 mg/L; pH: 6.55 SU; Turbidity: NTU

Clarity: clear; Flow Rate: moderate; Width/Depth: 9' / 1'; Substrate: gravel, sand, mud, silt, snags

Canopy: open; Bank Stability: fair; Bank Vegetation: trees, shrubs, grasses, weeds

Stream Gradient: Low Gradient stream; Land Uses: rural, forested

Other: frogs, periphytes, filamentous algae; iron precipitate; creosote odor near bridge; Assunpink WMA

AMNET Site # **AN0108** *Stream Name:* **Assunpink Ck**

Location: **off Rt 571 Roosevelt Rd (S. Rochdale Rd); Roosevelt Boro; Monmouth County**

Collection Date: **6/6/2018** *USGS Topo Map:* **Roosevelt**

Genus	*Tolerance Value*	*Amount*
Musculium	5	32
Simulium	6	17
Parametriocnemus	5	13
Caecidotea	8	8
Limnodrilus	10	5
Tubifex	10	5
Nais	8	4
Bittacomorpha	8	2
Dicranota	3	2
Tanytarsus	6	2
Tipula	4	2
Clinotanypus	8	1
Cryptochironomus	8	1
Helisoma	7	1
Paratendipes	8	1
Polypedilum	6	1
Procladius	9	1
Rheopelopia	4	1
Xylotopus	2	1

** (EPT organism)* *Taxa Richness:* 19 *Population:* 100

%Dominance / Dominant Taxon(s): 32.0% Musculium

Hilsenhoff Biotic Index (HBI): 6.17 *%Clingers:* 17.00%

** E+P+T:* 0 ( ) Ephemeroptera, ( ) Plecoptera, ( ) Trichoptera *%Ephemeroptera:* 0.00%

CPMI100 Rating: **25.80 Fair**

Habitat Analysis: 145 Suboptimal USEPA Protocol

Observations: Water temp: 19.12 C; Cond: 113.8 umhos; DO: 7.33 mg/L; pH: 6.25 SU; Turbidity: 16.6 NTU

Clarity: slightly turbid; Flow Rate: moderate; Width/Depth: 6' / 1-2'; Substrate: gravel, sand, mud, silt, snags

Canopy: closed; Bank Stability: good; Bank Vegetation: trees, shrubs

Stream Gradient: Low Gradient stream; Land Uses: rural, forested

Other: frogs, iron floc

Delaware Basin - Roosevelt USGS Quadrangle
Station AN0123
Ivanhoe Brook, Millers Mill Road, Prospertown
January 19, 1993

Family	Number of Individuals	Family Tolerance Value (FTV)
Tipulidae	7	3
Chironomidae	4	6
Simuliidae	4	6
Limnephilidae	1	4

Statistical Analysis

Number of Taxa = 4
Total Number of Individuals = 16
% Contribution of Dominant Family = 43.75
Family Biotic Index = 4.56
Scraper/Filterer Collector Ratio = 0.00
Shredder/Total Ratio = 0.50
E+P+T* = 1 *(Ephemeroptera, Plecoptera and Trichoptera)
%EPT = 6.25
EPT/C* = 0.25 *(Chironomidae)
NJIS Rating = 9
Biological Condition = moderately impaired
Deficiency(s) noted: low diversity
paucity of clean water organisms

Observations

Streamwater: turbid...Flow: moderate...Width/Depth(ft): 8/variable ...Substrate: sand/clay/ironstone...Streambank Vegetation/ Stability: poor/poor...Canopy: open...Other: wooded; substrate covered with thin layer of iron precipitate

Station: AN0123
Ivanhoe Bk, Millers Mill Rd., Upper Freehold Twp., Monmouth County
Roosevelt USGS Quadrangle
Date Sampled: 1/9/01

Family	Family Tolerance Value (FTV)	Number of Individuals
Chironomidae	6	58
Tubificidae	10	25
Sphaeriidae	8	3
Sialidae	4	3
Elmidae	4	2
Coenagrionidae	9	2
Stratiomyidae	10	2
BloodRed Chironomidae	8	2
Ptychopteridae	8	1
Astacidae	7.2	1
Dytiscidae	5	1
Taeniopterygidae	2	1
Corduliidae	5	1

Statistical Analysis

Number of Taxa: 13
Total Number of Individuals: 102
% Contribution of Dominant Family: 56.86 % (Chironomidae)
Family Biotic Index: 7.09
Scraper/Filterer Collector Ratio: 0.00
Shredder/Total Ratio: 0.01
E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 1
% EPT: 0.98
EPT/C: 0.02
NJIS Rating: 9
Biological Condition: Moderately Impaired
Habitat Analysis: 148
Deficiency(s) noted:
- Significant Organic Pollution - Paucity of Clean Water Organisms -

Observations

Streamwater: Turbid....Flow: Slow....Width/Depth (ft): 8-10/2-2.5
Substrate: Mud, silt....StreamBank Vegetation/Stability: Shrubs, trees/Fair
Canopy: Partly Open....Other: rural, forested; Water temp. 1.0C / pH 6.8SU / DO 11.3mg/L / Cond. 300umhos

AMNET Site # **AN0123** *Stream Name:* **Ivanhoe Bk**

Location: **Millers Mill Rd; Upper Freehold Twp; Monmouth County**

Collection Date: ***5/11/2006*** *USGS Topo Map:* **Roosevelt**

	Genus	*Tolerance Value*	*Amount*
	Cricotopus	7	19
	Chironomus	10	15
	Paratendipes	8	10
	Tanytarsus	6	9
	Orthocladius	6	7
	Parakiefferiella	4	7
	Ablabesmyia	8	4
	Simulium	6	4
	Heterotrissocladius	0	3
	Polypedilum	6	3
	Rheocricotopus	6	3
	Ancyronyx	2	2
	Dromogomphus	4	2
	Limnodrilus	10	2
	Psectrocladius	8	2
	Rheotanytarsus	6	2
	Argia	6	1
	Calopteryx	6	1
	Enchytraeidae	10	1
	Musculium	5	1
*	Oecetis	8	1
	Thienemanniella	6	1

** (EPT organism)* *Taxa Richness:* 22 *Population:* 100

%Dominance / Dominant Taxon(s): 19.0% Cricotopus

Hilsenhoff Biotic Index (HBI): 6.80 *%Clingers:* 29.00%

** E+P+T:* 1 ( ) Ephemeroptera, ( ) Plecoptera, (1) Trichoptera *%Ephemeroptera:* 0.00%

CPMI Rating: **8 Fair**

Habitat Analysis: 140 Suboptimal USEPA Protocol

Observations: Water temp: 15.3 C; Cond: 115 umhos; DO: 9.8 mg/L; pH: 6.6 SU

Clarity: slightly turbid; Flow Rate: slow; Width/Depth: 16' / 1.5'; Substrate: mud

Canopy: partly open; Bank Stability: poor; Bank Vegetation: shrubs, grasses, trees

Stream Gradient: Low Gradient Stream; Land Uses: rural, forested

Other: bank erosion undercut banks, macrophytes, minnows, green frogs, soft clay bottom, extensive siltation

AMNET Site # **AN0123** *Stream Name:* **Ivanhoe Bk**

Location: **Millers Mill Rd; Upper Freehold Twp; Monmouth County**

Collection Date: ***7/20/2011*** *USGS Topo Map:* **Roosevelt**

	Genus	*Tolerance Value*	*Amount*
	Simulium	6	21
	Calopteryx	6	8
	Gomphus	5	8
	Thienemannimyia	6	5
	Ancyronyx	2	4
	Boyeria	2	4
*	Hydropsyche	4	4
	Procladius	9	4
	Tribelos	5	4
	Limnodrilus	10	3
	Xylotopus	2	3
	Nigronia	2	2
*	Oecetis	8	2
*	Polycentropus	6	2
	Prostoma	7	2
	Sialis	4	2
	Stenochironomus	5	2
	Ablabesmyia	8	1
	Bezzia	6	1
*	Cheumatopsyche	5	1
	Chironomus	10	1
	Chrysops	6	1
	Dubiraphia	6	1
	Dytiscidae	5	1
	Macromia	2	1
	Microvelia	6	1
*	Nyctiophylax	5	1
	Orthocladius	6	1
	Pachydiplax	10	1
	Paratanytarsus	6	1
	Phaenopsectra	7	1
	Pisidium	6.8	1
	Placobdella	8	1
	Polypedilum	6	1
	Rhagovelia	9	1
	Tanytarsus	6	1
	Trepobates	8	1

** (EPT organism)* *Taxa Richness:* 37 *Population:* 100

%Dominance / Dominant Taxon(s): 21.0% Simulium

Hilsenhoff Biotic Index (HBI): 5.64 *%Clingers:* 41.00%

** E+P+T:* 5 ( ) Ephemeroptera, ( ) Plecoptera, (5) Trichoptera *%Ephemeroptera:* 0.00%

CPMI Rating: **16 Good**

Habitat Analysis: 106 Marginal USEPA Protocol

Observations: Water temp: 23.73 C; Cond: 148 umhos; DO: 6.70 mg/L; pH: 6.56 SU

Clarity: turbid; Flow Rate: slow; Width/Depth: 17' / < 1'; Substrate: gravel, sand, mud, silt, snags, root mats

Canopy: mostly closed; Bank Stability: poor; Bank Vegetation: trees, shrubs, grasses

Stream Gradient: Low Gradient Stream; Land Uses: forested

Other: frogs, fish, macrophytes, iron floc

AMNET Site # **AN0127B** *Stream Name:* **Doctors Ck**

Location: **Haven Hollow Rd; Millstone Twp; Monmouth County**

Collection Date: ***9/20/2016*** *USGS Topo Map:* **Roosevelt**

	Genus	*Tolerance Value*	*Amount*
	Pisidiidae	8	28
	Dubiraphia	6	10
	Aulodrilus	8	8
*	Limnephilidae	4	7
	Gomphus	5	6
	Stenelmis	5	6
	Calopteryx	6	5
	Chrysops	6	3
	Polypedilum	6	3
	Prostoma	7	3
	Hemerodromia	6	2
	Nais	8	2
	Ancyronyx	2	1
	Ceratopogonidae	6	1
	Corixidae	9	1
	Curculionidae	7	1
	Elmidae	4	1
	Gyrinus	4	1
	Helichus	5	1
*	Hydropsyche	4	1
	Libellula	9	1
	Limnodrilus	10	1
	Nigronia	2	1
*	Oecetis	8	1
	Paratanytarsus	6	1
*	Phryganeidae	4	1
	Procladius	9	1
	Sialis	4	1
	Tanytarsus	6	1

** (EPT organism)* *Taxa Richness:* 29 *Population:* 100

%Dominance / Dominant Taxon(s): 28.0% Pisidiidae

Hilsenhoff Biotic Index (HBI): 6.50 *%Clingers:* 24.00%

** E+P+T:* 4 ( ) Ephemeroptera, ( ) Plecoptera, (4) Trichoptera *%Ephemeroptera:* 0.00%

CPMI100 Rating: **42.66 Good**

Habitat Analysis: 132 Suboptimal USEPA Protocol

Observations: Water temp: 19.51 C; Cond: 328.9 umhos; DO: 8.47 mg/L; pH: 6.35 SU; Turbidity: 8.86 NTU

Clarity: clear; Flow Rate: slow; Width/Depth: 10' / < 1'; Substrate: gravel, sand, silt, snags, root mats, undercut banks

Canopy: mostly closed; Bank Stability: fair; Bank Vegetation: trees, weeds

Stream Gradient: Low Gradient stream; Land Uses: rural, forested

Other: fish, iron surface sheen, invasive plants, creosote odor

Raritan Basin - Roosevelt USGS Quadrangle
Station AN0378
Millstone River, Baird Road, Millstone
April 8, 1993

Family	Number of Individuals	Family Tolerance Value (FTV)
Simuliidae	39	6
Hydropsychidae	5	4
Ephemerellidae	1	1
Chironomidae	36	6
Lumbriculidae	2	8
Tipulidae	6	3
Nematoda	5	6
Asellidae	1	8
Bryozoa	1	7
Tubificidae	1	10
Lumbricidae	1	10
Gastropoda	1	7
Nemertea	1	5

Statistical Analysis

Number of Taxa: 13
Total Number of Individuals: 100
% Contribution of Dominant Family: 39.00
Family Biotic Index: 5.82
Scraper/Filterer Collector Ratio: 0.02
Shredder/Total Ratio: 0.08
E + P + T*: 2 *(Ephemeroptera, Plecoptera and Trichoptera)
%EPT: 6.00
EPT/C*: 0.17 *(Chironomidae)
NJIS Score: 15
Biological Condition: moderately impaired
Deficiency(s) noted: paucity of clean water organisms

Observations

Streamwater: turbid…Flow: moderate…Width/Depth(ft): 10/ < 1…Substrate: sand/some cobbles…Streambank Vegetation/Stability: good/good…Canopy: open…Other: brush-lined (tree-lined upstr of bridge); silt

Station: AN0378
Millstone River, Baird Rd., Millstone Twp., Monmouth County
Roosevelt USGS Quadrangle
Date Sampled: 04/22/99

Family	Family Tolerance Value (FTV)	Number of Individuals
Simuliidae	6	47
Chironomidae	6	35
Tubificidae	10	10
Hydropsychidae	4	2
Elmidae	4	2
BloodRed Chironomidae	8	2
Empididae	6	1
Heptageniidae	4	1
Tipulidae	3	1

Statistical Analysis

Number of Taxa: 9
Total Number of Individuals: 101
% Contribution of Dominant Family: 46.53 % (Simuliidae)
Family Biotic Index: 6.31
Scraper/Filterer Collector Ratio: 0.02
Shredder/Total Ratio: 0.38
E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 2
% EPT: 2.97
EPT/C: 0.08
NJIS Rating: 9
Biological Condition: Moderately Impaired
Habitat Analysis: 117
Deficiency(s) noted:
- Paucity of Clean Water Organisms -

Observations

Streamwater: Clear....Flow: Moderate....Width/Depth (ft): 10/<1
Substrate: Gravel/Sand, Snags....StreamBank Vegetation/Stability: Trees, Shrubs, Grass/Poor
Canopy: Mostly Open....Other: Agriculture-cropland & livestock; Forested
Water temp. 10.3C / pH 8.7SU / DO 12.0mg/L / Cond. 96umhos;

AMNET Site # **AN0378** *Stream Name:* **Millstone River**

Location: **Baird Rd; Millstone Twp; Monmouth County**

Collection Date: ***8/5/2004*** *USGS Topo Map:* **Roosevelt**

	Genus	Tolerance Value	Amount
*	Maccaffertium	3	39
	Sphaeriidae	8	11
	Tribelos	5	8
	Aulodrilus	8	6
	Saetheria	4	4
*	Cheumatopsyche	5	3
	Dicranota	3	3
	Stenelmis	5	3
	Tanytarsus	6	3
	Ancyronyx	2	2
	Gomphus	5	2
*	Hydropsyche	4	2
	Macronychus	2	2
	Polypedilum	6	2
	Sialis	4	2
	Calopterygidae	5	1
	Cryptochironomus	8	1
	Orconectes	6	1
	Prostoma	7	1
	Stenochironomus	5	1

** (EPT organism)* *Taxa Richness:* 20 *Population:* 97

%Dominance / Dominant Taxon(s): 40.2% Maccaffertium

Hilsenhoff Biotic Index (HBI): 4.57 *%Clingers:* 52.58%

** E+P+T:* 3 (1) Ephemeroptera, ( ) Plecoptera, (2) Trichoptera *%Ephemeroptera:* 40.21%

CPMI Rating: **22** **Excellent**

Habitat Analysis: 112 Suboptimal USEPA Protocol

Observations: Water temp: 22.3 C; Cond: 128 umhos; DO: 7.3 mg/L; pH: 7.1 SU

Clarity: slightly turbid; Flow Rate: moderate; Width/Depth: 12.5' / <1.0'; Substrate: sand, silt, snags

Canopy: partly open; Bank Stability: good; Bank Vegetation: trees, shrubs

Stream Gradient: Low Gradient Stream; Land Uses: agriculture-cropland & livestock, forested

Other: frogs present

AMNET Site # **AN0378** *Stream Name:* **Millstone River**

Location: **Baird Rd; Millstone Twp; Monmouth County**

Collection Date: ***8/25/2009*** *USGS Topo Map:* **Roosevelt**

	Genus	Tolerance Value	Amount
	Polypedilum	6	16
*	Cheumatopsyche	5	14
*	Maccaffertium	3	11
	Sphaeriidae	8	11
	Macronychus	2	10
	Simulium	6	7
*	Hydropsyche	4	6
	Nais	8	6
	Dubiraphia	6	4
	Aulodrilus	8	2
	Brillia	5	2
	Calopteryx	6	2
	Rheocricotopus	6	2
	Stenelmis	5	2
	Ancyronyx	2	1
*	Lype	2	1
	Phaenopsectra	7	1
	Rheotanytarsus	6	1
	Thienemannimyia	6	1

** (EPT organism)* *Taxa Richness:* 19 *Population:* 100

%Dominance / Dominant Taxon(s): 16.0% Polypedilum

Hilsenhoff Biotic Index (HBI): 5.28 *%Clingers:* 58.00%

** E+P+T:* 4 (1) Ephemeroptera, ( ) Plecoptera, (3) Trichoptera *%Ephemeroptera:* 11.00%

CPMI Rating: **18 Good**

Habitat Analysis: 137 Suboptimal USEPA Protocol

Observations: Water temp: 21.57 C; Cond: 155 umhos; DO: 7.02 mg/L; pH: 6.65 SU

Clarity: clear; Flow Rate: moderate; Width/Depth: 11' / < 1'; Substrate: sand, silt, snags, root mats, undercut banks

Canopy: mostly closed; Bank Stability: good; Bank Vegetation: trees, shrubs, grasses

Stream Gradient: Low Gradient Stream; Land Uses: rural

Other: crayfish

Raritan Basin - Jamesburg USGS Quadrangle
Station AN0379
Millstone River, Route 33, Bergen Mills
July 25, 1990

Family	Number of Individuals	Family Tolerance Value (FTV)
Hydropsychidae	25	4
Chironomidae	6	6
Heptageniidae	15	4
Tubificidae	7	10
Dytiscidae	4	4
Bryozoa	18	7
Cordulegastridae	1	3
Gastropoda	3	7
Nemertea	5	5
Ephemerellidae	1	1
Corydalidae	2	0
Tipulidae	4	3
BloodRedChironomidae	3	8
Sphaeriidae	2	8
Gomphidae	1	1
Aeshnidae	2	3
Elmidae	1	4

Statistical Analysis

Number of Taxa: 17
Total Number of Individuals: 100
% Contribution of Dominant Family: 25.00
Family Biotic Index: 5.21
Scraper/Filterer Collector Ratio: 0.02
Shredder/Total Ratio: 0.22
E + P + T*: 3 *(Ephemeroptera, Plecoptera and Trichoptera)
%EPT: 41.00
EPT/C*: 4.56 *(Chironomidae)
NJIS Score: 24
Biological Condition: non-impaired
Deficiency(s) noted: none

Observations

Streamwater: slightly turbid…Flow: moderate…Width/Depth(ft): 15/ < 1…Substrate: gravel…Streambank Vegetation/Stability: good/good…Canopy: open…Other: brush-lined/commercial

Station: AN0379
Millstone River, NJ Rt. 33, Millstone Twp., Monmouth
Jamesburg USGS Quadrangle
Date Sampled: 07/01/99

Family	Family Tolerance Value (FTV)	Number of Individuals
Tubificidae	10	28
Chironomidae	6	18
Hydrobiidae	8	7
Corixidae	9	6
BloodRed Chironomidae	8	5
Hydropsychidae	4	4
Planorbidae	6	4
Simuliidae	6	4
Heptageniidae	4	4
Dytiscidae	5	3
Sphaeriidae	8	3
Baetidae	4	2
Aeshnidae	3	2
Elmidae	4	2
Cambaridae	5	2
Physidae	7	2
Gyrinidae	3	1
Empididae	6	1
Hydrophilidae	5	1
Lymnaeidae	6	1

Statistical Analysis

Number of Taxa: 20
Total Number of Individuals: 100
% Contribution of Dominant Family: 28.00 % (Tubificidae)
Family Biotic Index: 7.23
Scraper/Filterer Collector Ratio: 1.55
Shredder/Total Ratio: 0.05
E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 3
% EPT: 10.00
EPT/C: 0.43
NJIS Rating: 18
Biological Condition: Moderately Impaired
Habitat Analysis: 143
Deficiency(s) noted:
- Significant Organic Pollution -

Observations

Streamwater: Slightly Turbid....Flow: Slow....Width/Depth (ft): 10-12/1-2
Substrate: Gravel/Sand, Silt....StreamBank Vegetation/Stability: Shrubs/Good
Canopy: Mostly Open....Other: Rural (Agriculture-cropland nearby); Sampled dwnstr of bridge
Tadpoles, Minnows, Large mussels, Macrophytes; Water temp. 21.0C / pH 7.8SU / DO 8.1mg/L / Cond. 110umhos

AMNET Site # **AN0379** *Stream Name:* **Millstone River**

Location: **Rt 33; Millstone Twp; Monmouth County**

Collection Date: ***6/15/2004*** *USGS Topo Map:* **Jamesburg**

Genus	*Tolerance Value*	*Amount*
Tribelos	5	86
Limnodrilus	10	4
Pisidium	6.8	3
Sialis	4	3
Ablabesmyia	8	2
Orconectes	6	2
Paratendipes	8	2
Polypedilum	6	2
Gomphus	5	1
Molophilus	3	1
Phaenopsectra	7	1
Procladius	9	1
Tanytarsus	6	1

** (EPT organism)* *Taxa Richness:* 13 *Population:* 109

%Dominance / Dominant Taxon(s): 78.9% Tribelos

Hilsenhoff Biotic Index (HBI): 5.40 *%Clingers:* 0.92%

** E+P+T:* 0 ( ) Ephemeroptera, ( ) Plecoptera, ( ) Trichoptera *%Ephemeroptera:* 0.00%

CPMI Rating: **6 Fair**

Habitat Analysis: 150 Suboptimal USEPA Protocol

Observations: Water temp: 20.6 C; Cond: 158 umhos; DO: 6.5 mg/L; pH: 7.2 SU

Clarity: turbid; Flow Rate: slow; Width/Depth: 12.0' / 2.5'; Substrate: mud

Canopy: open; Bank Stability: good; Bank Vegetation: shrubs, grass

Stream Gradient: Low Gradient Stream; Land Uses: suburban

Other: site sampled between Rt. 33 and adjacent to side road and U-turn exit.

AMNET Site # **AN0379** *Stream Name:* **Millstone River**

Location: **Rt 33; Millstone Twp; Monmouth County**

Collection Date: ***8/25/2009*** *USGS Topo Map:* **Jamesburg**

	Genus	*Tolerance Value*	*Amount*
	Polypedilum	6	15
	Spirosperma	10	12
	Pisidium	6.8	11
*	Maccaffertium	3	10
	Caecidotea	8	7
	Simulium	6	5
	Tanytarsus	6	5
	Macronychus	2	4
	Brillia	5	3
	Gomphus	5	3
*	Hydropsyche	4	3
	Prostoma	7	3
*	Cheumatopsyche	5	2
	Dubiraphia	6	2
	Phaenopsectra	7	2
	Rheopelopia	4	2
	Tubifex	10	2
	Cardiocladius	5	1
	Cryptochironomus	8	1
	Cura	4	1
	Hemerodromia	6	1
	Nais	8	1
*	Oecetis	8	1
	Oulimnius	4	1
*	Polycentropus	6	1
	Rhagovelia	9	1

** (EPT organism)* *Taxa Richness:* 26 *Population:* 100

%Dominance / Dominant Taxon(s): 15.0% Polypedilum

Hilsenhoff Biotic Index (HBI): 6.24 *%Clingers:* 31.00%

** E+P+T:* 5 (1) Ephemeroptera, ( ) Plecoptera, (4) Trichoptera *%Ephemeroptera:* 10.00%

CPMI Rating: **14 Good**

Habitat Analysis: 112 Suboptimal USEPA Protocol

Observations: Water temp: 20.83 C; Cond: 169 umhos; DO: 6.41 mg/L; pH: 6.42 SU

Clarity: turbid; Flow Rate: slow; Width/Depth: 21' / 2'; Substrate: sand, mud, silt, snags, root mats

Canopy: mostly closed; Bank Stability: fair; Bank Vegetation: trees, shrubs, grasses

Stream Gradient: Low Gradient Stream; Land Uses: rural

Other: crayfish, beaver dam

AMNET Site # **AN0379** *Stream Name:* **Millstone River**

Location: **Rt 33; Millstone Twp; Monmouth County**

Collection Date: ***7/21/2014*** *USGS Topo Map:* **Jamesburg**

	Genus	*Tolerance Value*	*Amount*
	Tribelos	5	43
	Limnodrilus	10	17
	Polypedilum	6	7
	Tanytarsus	6	5
	Phaenopsectra	7	4
	Peltodytes	5	3
	Dicrotendipes	8	2
	Dubiraphia	6	2
	Enallagma	9	2
	Paratanytarsus	6	2
	Procladius	9	2
	Trichocorixa	9	2
	Arigomphus	1	1
	Chironomus	10	1
	Chrysops	6	1
	Endochironomus	10	1
	Labrundinia	7	1
*	Oecetis	8	1
	Pericoma	4	1
	Stylaria	8	1
	Tubifex	10	1

** (EPT organism)* *Taxa Richness:* 21 *Population:* 100

%Dominance / Dominant Taxon(s): 43.0% Tribelos

Hilsenhoff Biotic Index (HBI): 6.58 *%Clingers:* 8.00%

** E+P+T:* 1 ( ) Ephemeroptera, ( ) Plecoptera, (1) Trichoptera *%Ephemeroptera:* 0.00%

CPMI Rating: **6 Fair**

Habitat Analysis: 104 Marginal USEPA Protocol

Observations: Water temp: 21.16 C; Cond: 214 umhos; DO: 7.13 mg/L; pH: 6.39 SU; Turbidity: 15.2 NTU

Clarity: turbid, brown; Flow Rate: slow; Width/Depth: 36' / 3 - 4'; Substrate: sand, mud

Canopy: open; Bank Stability: fair; Bank Vegetation: trees, shrubs, weeds

Stream Gradient: Low Gradient stream; Land Uses: urban

Other: fish, frogs

Raritan Basin - Roosevelt USGS Quadrangle
Station AN0380
Rocky Brook, Perrineville Road, Perrineville
August 31, 1993

Family	Number of Individuals	Family Tolerance Value (FTV)
Hydropsychidae	71	4
Chironomidae	16	6
Turbellaria	2	4
Simuliidae	5	6
Sphaeriidae	2	8
Bryozoa	4	7

Statistical Analysis

Number of Taxa: 6
Total Number of Individuals: 100
% Contribution of Dominant Family: 71.00
Family Biotic Index: 4.62
Scraper/Filterer Collector Ratio: 0.00
Shredder/Total Ratio: 0.00
E + P + T*: 1 *(Ephemeroptera, Plecoptera and Trichoptera)
%EPT: 71.00
EPT/C*: 4.44 *(Chironomidae)
NJIS Score: 15
Biological Condition: moderately impaired
Deficiency(s) noted: Hydropsychidae overwhelmingly dominant, paucity of clean water organisms

Observations

Streamwater: slightly turbid…Flow: slow…Width/Depth(ft): 10/ < 1…Substrate: gravel…Streambank Vegetation/Stability: poor/poor…Canopy: half open…Other: wooded/rural/residential; algae; sunfish

Station: AN0380
Rocky Bk, Perrineville Rd , Perrineville, Monmouth County
Roosevelt USGS Quadrangle
Date Sampled: 08/20/98

Family	Family Tolerance Value (FTV)	Number of Individuals
Chironomidae	6	25
Paludicellidae	7	17
Hydropsychidae	4	16
Planariidae	4	13
Naididae	7	11
BloodRed Chironomidae	8	7
Tetrastemmatidae	7	4
Coenagrionidae	9	2
Ceratopogonidae	6	1
Viviparidae	6	1
Gammaridae	4	1
Simuliidae	6	1
Gerridae	8	1

Statistical Analysis

Number of Taxa: 13
Total Number of Individuals: 100
% Contribution of Dominant Family: 25.00 % (Chironomidae)
Family Biotic Index: 5.94
Scraper/Filterer Collector Ratio: 0.02
Shredder/Total Ratio: 0.32
E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 1
% EPT: 16.00
EPT/C: 0.50
NJIS Rating: 18
Biological Condition: Moderately Impaired
Habitat Analysis: 174
Deficiency(s) noted:
- Paucity of Clean Water Organisms -

Observations

Streamwater: Turbid....Flow: Moderate....Width/Depth (ft): 10/<1
Substrate: Cobbles,gravel,sand....StreamBank Vegetation/Stability: Trees/Unstable
Canopy: Mostly Closed....Other: Rural/Forested/Lake upstream; Water temp.22.5 /pH 8.5 /DO 7.3 /Cond.126

AMNET Site # **AN0380** *Stream Name:* **Rocky Bk**

Location: **Perrineville Rd (Sweetman's Ln); Millstone Twp; Monmouth County**

Collection Date: ***9/16/2004*** *USGS Topo Map:* **Roosevelt**

	Genus	Tolerance Value	Amount
	Musculium	5	26
	Polypedilum	6	22
*	Cheumatopsyche	5	20
	Gammarus	6	9
*	Hydropsyche	4	5
*	Oecetis	8	4
	Dugesia	4	3
	Lirceus	8	3
	Ischnura	9	2
	Simulium	6	2
	Argia	6	1
*	Chimarra	4	1
	Helobdella	8	1
	Rheotanytarsus	6	1

** (EPT organism)* *Taxa Richness:* 14 *Population:* 100

%Dominance / Dominant Taxon(s): 26.0% Musculium

Hilsenhoff Biotic Index (HBI): 5.58 *%Clingers:* 34.00%

** E+P+T:* 4 ( ) Ephemeroptera, ( ) Plecoptera, (4) Trichoptera *%Ephemeroptera:* 0.00%

CPMI Rating: **12 Good**

Habitat Analysis: 148 Suboptimal USEPA Protocol

Observations: Water temp: 23.2 C; Cond: 170 umhos; DO: 7.3 mg/L; pH: 7 SU

Clarity: clear; Flow Rate: moderate; Width/Depth: 37.0' / <1.0-2.0'; Substrate: cobbles, gravel/sand

Canopy: mostly closed; Bank Stability: fair; Bank Vegetation: trees, shrubs, grass

Stream Gradient: Low Gradient Stream; Land Uses: suburban

Other: Weir upstream. fish, turtle present

AMNET Site # **AN0380** *Stream Name:* **Rocky Bk**

Location: **Perrineville Rd (Sweetman's Ln); Millstone Twp; Monmouth County**

Collection Date: ***8/25/2009*** *USGS Topo Map:* **Roosevelt**

	Genus	Tolerance Value	Amount
	Amnicola	4.8	21
	Gammarus	6	21
	Dugesia	4	13
	Polypedilum	6	9
	Musculium	5	6
*	Cheumatopsyche	5	5
*	Hydroptila	6	4
	Tanytarsus	6	4
*	Caenis	7	2
	Nais	8	2
	Stylaria	8	2
*	Callibaetis	9	1
	Campeloma	7	1
	Dero	10	1
	Dicrotendipes	8	1
	Hyalella	8	1
	Lirceus	8	1
*	Mystacides	4	1
*	Oxyethira	3	1
	Pedicia	6	1
	Prostoma	7	1
	Slavina	7	1

** (EPT organism)* *Taxa Richness:* 22 *Population:* 100

%Dominance / Dominant Taxon(s): 21.0% Amnicola & Gammarus

Hilsenhoff Biotic Index (HBI): 5.59 *%Clingers:* 9.00%

** E+P+T:* 6 (2) Ephemeroptera, ( ) Plecoptera, (4) Trichoptera *%Ephemeroptera:* 3.00%

CPMI Rating: **10 Fair**

Habitat Analysis: 130 Suboptimal USEPA Protocol

Observations: Water temp: 26.40 C; Cond: 169 umhos; DO: 7.58 mg/L; pH: 7.01 SU

Clarity: clear; Flow Rate: moderate; Width/Depth: 22' / < 1'; Substrate: cobble, gravel, sand, root mats, undercut banks

Canopy: mostly closed; Bank Stability: fair; Bank Vegetation: trees, shrubs

Stream Gradient: Low Gradient Stream; Land Uses: rural, forested

Downstream of Impoundment: below dam

Other: fish, frogs, clams / mussels, macrophytes

AMNET Site # **AN0380** *Stream Name:* **Rocky Bk**

Location: **Perrineville Rd (Sweetman's Ln); Millstone Twp; Monmouth County**

Collection Date: ***7/17/2014*** *USGS Topo Map:* **Roosevelt**

	Genus	*Tolerance Value*	*Amount*
	Polypedilum	6	30
*	Cheumatopsyche	5	19
	Cura	4	14
	Musculium	5	10
*	Hydropsyche	4	7
	Gammarus	6	6
	Caecidotea	8	2
	Endochironomus	10	2
	Paratanytarsus	6	2
	Prostoma	7	2
	Valvata	2	2
	Nais	8	1
*	Oecetis	8	1
	Slavina	7	1
	Stylaria	8	1

** (EPT organism)* *Taxa Richness:* 15 *Population:* 100

%Dominance / Dominant Taxon(s): 30.0% Polypedilum

Hilsenhoff Biotic Index (HBI): 5.42 *%Clingers:* 29.00%

** E+P+T:* 3 ( ) Ephemeroptera, ( ) Plecoptera, (3) Trichoptera *%Ephemeroptera:* 0.00%

CPMI Rating: **8 Fair**

Habitat Analysis: 125 Suboptimal USEPA Protocol

Observations: Water temp: 23.99 C; Cond: 121 umhos; DO: 6.40 mg/L; pH: 6.28 SU; Turbidity: 11.3 NTU

Clarity: turbid, cedar; Flow Rate: moderate; Width/Depth: 36' / < 1'; Substrate: cobble, gravel, sand, silt

Canopy: mostly closed; Bank Stability: fair; Bank Vegetation: trees, shrubs, weeds

Stream Gradient: Low Gradient stream; Land Uses: rural, community park

Downstream of Impoundment: Perrineville lake

Other: fish, frogs, macrophytes, periphytes

Raritan Basin - Roosevelt USGS Quadrangle
Station AN0437
Manalapan Brook, Route 524, Ely
September 29, 1993

Family	Number of Individuals	Family Tolerance Value (FTV)
Lumbriculidae	3	8
Sphaeriidae	10	8
Elmidae	2	4
Hydropsychidae	38	4
Simuliidae	23	6
Nemertea	5	5
Hemiptera	2	8
Tipulidae	3	3
Baetidae	5	4
Phryganeidae	1	4
Ephemerellidae	1	1
Coenagrionidae	1	9
Haplotaxidae	1	8
Brachycentridae	1	1
Chironomidae	1	6
Tubificidae	1	10
Pyralidae	1	5
Psychomyiidae	1	2

Statistical Analysis

Number of Taxa: 18
Total Number of Individuals: 100
% Contribution of Dominant Family: 38.00
Family Biotic Index: 5.18
Scraper/Filterer Collector Ratio: 0.00
Shredder/Total Ratio: 0.10
E + P + T*: 6 *(Ephemeroptera, Plecoptera and Trichoptera)
%EPT: 47.00
EPT/C*: 47.00 *(Chironomidae)
NJIS Score: 27
Biological Condition: non-impaired
Deficiency(s) noted: none

Observations

Streamwater: clear cedar…Flow: moderate…Width/Depth(ft): 10/ < 1…Substrate: sand/gravel…Streambank Vegetation/Stability: good/good…Canopy: half open…Other: tree-lined; fish

Station: AN0437
Manalapan Bk, Rt 524 , Ely { Millstone Twp }, Monmouth County
Roosevelt USGS Quadrangle
Date Sampled: 09/10/98

Family	Family Tolerance Value (FTV)	Number of Individuals
Simuliidae	6	19
Fredericellidae	2	17
Chironomidae	6	15
Brachycentridae	1	10
Baetidae	4	9
BloodRed Chironomidae	8	4
Elmidae	4	4
Hydropsychidae	4	4
Tubificidae	10	3
Tipulidae	3	2
Pyralidae	5	2
Physidae	7	2
Tetrastemmatidae	7	2
Gyrinidae	3	1
Planorbidae	6	1
Leptophlebiidae	2	1
Polycentropodidae	6	1
Sphaeriidae	8	1
Lymnaeidae	6	1
Limnephilidae	4	1

Statistical Analysis

Number of Taxa: 20
Total Number of Individuals: 100
% Contribution of Dominant Family: 19.00 % (Simuliidae)
Family Biotic Index: 4.57
Scraper/Filterer Collector Ratio: 0.12
Shredder/Total Ratio: 0.03
E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 6
% EPT: 26.00
EPT/C: 1.37
NJIS Rating: 27
Biological Condition: Nonimpaired
Habitat Analysis: 167
Deficiency(s) noted:
-

Observations

Streamwater: Clear....Flow: Slow....Width/Depth (ft): 7/1
Substrate: Gravel,sand,silt....StreamBank Vegetation/Stability: Trees,shrubs/Stable
Canopy: Mostly Closed....Other: Rural/Forested; Water temp.14.4 /pH 7.4 /DO 7.4 /Cond.193

AMNET Site # **AN0437** *Stream Name:* **Manalapan Bk**

Location: **Rt 524; Millstone Twp; Monmouth County**

Collection Date: ***6/15/2004*** *USGS Topo Map:* **Roosevelt**

	Genus	*Tolerance Value*	*Amount*
	Pisidium	6.8	22
	Tribelos	5	14
*	Brachycentrus	1	10
*	Polycentropus	6	8
	Procladius	9	6
	Thienemannimyia	6	6
	Dubiraphia	6	4
*	Leuctra	0	4
	Ablabesmyia	8	3
	Dicranota	3	3
	Sphaerium	8	3
	Apsectrotanypus	5	2
	Corixidae	9	2
	Heterotrissocladius	0	2
	Paratendipes	8	2
	Stenelmis	5	2
	Aulodrilus	8	1
	Boyeria	2	1
	Brillia	5	1
	Chironomini	6	1
*	Hydropsyche	4	1
*	Lepidostoma	1	1
	Limnodrilus	10	1
	Lumbriculus	8	1
*	Oecetis	8	1
	Rheotanytarsus	6	1

** (EPT organism)* *Taxa Richness:* 26 *Population:* 104

%Dominance / Dominant Taxon(s): 21.2% Pisidium

Hilsenhoff Biotic Index (HBI): 5.49 *%Clingers:* 30.77%

** E+P+T:* 6 ( ) Ephemeroptera, (1) Plecoptera, (5) Trichoptera *%Ephemeroptera:* 0.00%

CPMI Rating: **14 Good**

Habitat Analysis: 158 Suboptimal USEPA Protocol

Observations: Water temp: 17.7 C; Cond: 267 umhos; DO: 8.7 mg/L; pH: 7.2 SU

Clarity: clear; Flow Rate: moderate; Width/Depth: 7.0' / <1.0-1.0'; Substrate: gravel/sand, mud

Canopy: mostly open; Bank Stability: good; Bank Vegetation: shrubs, trees, grass

Stream Gradient: Low Gradient Stream; Land Uses: rural, forested

Other: frogs present

AMNET Site # **AN0437** *Stream Name:* **Manalapan Bk**

Location: **Rt 524; Millstone Twp; Monmouth County**

Collection Date: ***8/25/2009*** *USGS Topo Map:* **Roosevelt**

	Genus	*Tolerance Value*	*Amount*
	Simulium	6	25
	Musculium	5	21
	Pisidium	6.8	10
	Limnodrilus	10	5
	Polypedilum	6	4
	Trichocorixa	9	4
	Procladius	9	3
	Cura	4	2
	Helisoma	7	2
*	Hydropsyche	4	2
	Nais	8	2
*	Phryganeidae	4	2
	Prostoma	7	2
	Slavina	7	2
	Spirosperma	10	2
	Corynoneura	4	1
	Cricotopus	7	1
	Gomphus	5	1
*	Neureclipsis	7	1
*	Oecetis	8	1
*	Paraleptophlebia	1	1
*	Polycentropus	6	1
	Prosimulium	2	1
	Rheotanytarsus	6	1
*	Siphlonurus	7	1
	Stagnicola	7	1
	Stylodrilus	10	1

** (EPT organism)* *Taxa Richness:* 27 *Population:* 100

%Dominance / Dominant Taxon(s): 25.0% Simulium

Hilsenhoff Biotic Index (HBI): 6.32 *%Clingers:* 33.00%

** E+P+T:* 7 (2) Ephemeroptera, ( ) Plecoptera, (5) Trichoptera *%Ephemeroptera:* 2.00%

CPMI Rating: **14 Good**

Habitat Analysis: 142 Suboptimal USEPA Protocol

Observations: Water temp: 18.99 C; Cond: 283 umhos; DO: 6.54 mg/L; pH: 5.77 SU

Clarity: clear, cedar brown; Flow Rate: slow; Width/Depth: 11' / < 1'; Substrate: gravel, sand, mud, snags, root mats

Canopy: closed; Bank Stability: good; Bank Vegetation: trees, shrubs, grasses

Stream Gradient: Low Gradient Stream; Land Uses: rural, forested

Other: fish, frogs, macrophytes, wild turkeys

AMNET Site # **AN0437** *Stream Name:* **Manalapan Bk**

Location: **Rt 524; Millstone Twp; Monmouth County**

Collection Date: ***10/14/2014*** *USGS Topo Map:* **Roosevelt**

	Genus	*Tolerance Value*	*Amount*
	Musculium	5	36
*	Polycentropus	6	12
	Calopteryx	6	7
	Limnodrilus	10	6
	Simulium	6	6
*	Cheumatopsyche	5	5
*	Agrypnia	7	3
	Argia	6	2
	Enchytraeidae	10	2
	Nematoda	6	2
	Pisidium	6.8	2
	Pseudosuccinea	6	2
	Trichocorixa	9	2
*	Baetidae	4	1
	Cricotopus	7	1
	Dromogomphus	4	1
	Microvelia	6	1
*	Molanna	6	1
*	Oxyethira	3	1
	Paraponyx	5	1
*	Phryganeidae	4	1
	Polypedilum	6	1
	Prostoma	7	1
	Stylodrilus	10	1
	Tipula	4	1
	Tubifex	10	1

** (EPT organism)* *Taxa Richness:* 26 *Population:* 100

%Dominance / Dominant Taxon(s): 36.0% Musculium

Hilsenhoff Biotic Index (HBI): 6.00 *%Clingers:* 26.00%

** E+P+T:* 7 (1) Ephemeroptera, ( ) Plecoptera, (6) Trichoptera *%Ephemeroptera:* 1.00%

CPMI Rating: **16 Good**

Habitat Analysis: 139 Suboptimal USEPA Protocol

Observations: Water temp: 14.48 C; Cond: 292 umhos; DO: 7.55 mg/L; pH: 5.92 SU; Turbidity: 18.5 NTU

Clarity: slightly turbid, brown; Flow Rate: slow; Width/Depth: 15' / 1 - 2'; Substrate: mud, silt, snags

Canopy: mostly open; Bank Stability: good; Bank Vegetation: trees, shrubs, grasses, weeds

Stream Gradient: Low Gradient stream; Land Uses: rural, forested

Other: fish, macrophytes, oil sheen, invasive plants

AN0517 # Toms R, Paint Island Rd, Millstone Twp
USGS Quad + Roosevelt

October 29, 1990

Taxon (Family Level)	FTV	NOI
TUBIFICIDAE	10	2
NAIDIDAE	7	1
LUMBRICIDAE	10	1
SPHAERIIDAE	8	2
ENTOMOBRYIDAE	10	1
LEPTOPHLEBIIDAE	2	1
EPHEMERELLIDAE	1	3
LEUCTRIDAE	0	42
PTILODACTYLIDAE	1	7
CORYDALIDAE	0	1
PSYCHOMYIIDAE	2	1
HYDROPSYCHIDAE	4	12
LIMNEPHILIDAE	4	1
POLYCENTROPODIDAE	6	4
TIPULIDAE	3	2
CERATOPOGONIDAE	6	2
CHIRONOMIDAE	6	17

Number of Taxa + 17 # Population + 100

Dominant Family(s) + LEUCTRIDAE 42.00%
Family Biotic Index + 2.73
Scraper/Filterer Collector Ratio + 0.00
Shredder/Total Ratio + 0.69
E(phemeroptera)+P(lecoptera)+T(richoptera) + 7
%EPT + 64.00
EPT/Chironomids + 3.76

NJIS/Rating + 27/non-impaired

OBSERVATIONS

Clarity + clear
Flow + moderate
Width/Depth(ft) + 2/<1
Substrate + sand/gravel
Streambank Vegetation/Stability + good/good
Canopy + partly open
Other + tree-lined/agricultural

Station: AN0517
Toms R., Paint Island Rd., Monmouth County
Roosevelt USGS Quadrangle
Date Sampled: 10/5/99

Family	Family Tolerance Value (FTV)	Number of Individuals
Sphaeriidae	8	27
Physidae	7	13
Tubificidae	10	10
Planorbidae	6	6
Naididae	7	6
Haliplidae	5	5
Calopterygidae	5	3
Coenagrionidae	9	3
Enchytraeidae	10	3
Corduliidae	5	2
Chironomidae	6	1
Aeshnidae	3	1
Chrysomelidae	5	1
Planariidae	4	1
Elmidae	4	1
Curculionidae	7	1
Corydalidae	0	1

Statistical Analysis

Number of Taxa: 17
Total Number of Individuals: 85
% Contribution of Dominant Family: 31.76 % (Sphaeriidae)
Family Biotic Index: 7.31
Scraper/Filterer Collector Ratio: 0.74
Shredder/Total Ratio: 0.07
E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 0
% EPT: 0.00
EPT/C: 0.00
NJIS Rating: 12
Biological Condition: Moderately Impaired
Habitat Analysis: 180
Deficiency(s) noted: Significant Organic Pollution - Paucity of Clean Water Organisms

Observations

Streamwater: Turbid....Flow: Moderate....Width/Depth (ft): 7/<1
Substrate: Gravel/sand....StreamBank Vegetation/Stability: Trees, grass/Fair
Canopy: Mostly Closed....Other: Agriculture-cropland, Rural, Forested; Water temp. 14.8 C/ pH 5.6SU / DO 8.0mg/L / Cond. 249umhos
Iron precipitate, oily film;

AMNET Site # **AN0517** *Stream Name:* **Toms River**

Location: **Paint Island Rd; Millstone Twp; Monmouth County**

Collection Date: ***6/2/2005*** *USGS Topo Map:* **Roosevelt**

Genus	*Tolerance Value*	*Amount*
Pisidium	6.8	25
Thienemannimyia	6	24
Cricotopus	7	14
Aulodrilus	8	12
Brillia	5	4
Limnodrilus	10	4
Prodiamesa	3	4
Dubiraphia	6	2
Lumbriculus	8	2
Ancyronyx	2	1
Enchytraeidae	10	1
Ephydridae	6	1
Micropsectra	7	1
Peltodytes	5	1
Pentaneura	6	1
Psectrocladius	8	1
Rheotanytarsus	6	1
Slavina	7	1

** (EPT organism)* *Taxa Richness:* 18 *Population:* 100

%Dominance / Dominant Taxon(s): 25.0% Pisidium

Hilsenhoff Biotic Index (HBI): 6.65 *%Clingers:* 18.00%

** E+P+T:* 0 ( ) Ephemeroptera, ( ) Plecoptera, ( ) Trichoptera *%Ephemeroptera:* 0.00%

CPMI Rating: **8 Fair**

Habitat Analysis: 169 Optimal USEPA Protocol

Observations: Water temp: 13.6 C; Cond: 287 umhos; DO: 7.7 mg/L; pH: 5.8 SU

Clarity: clear; Flow Rate: moderate; Width/Depth: 6' / 1-2'; Substrate: cobble, gravel, sand, mud, snags

Canopy: partly open; Bank Stability: good; Bank Vegetation: trees, shrubs, grasses

Stream Gradient: Low Gradient Stream; Land Uses: rural

Pipes / Ditches: small drainage pipes

Other: fish, salamander, macrophytes, large rocks placed across to form a riffle, upstream slightly turbid, upstream on right bank some trees removed and mulch placed for aesthetics

AMNET Site # **AN0517** *Stream Name:* **Toms River**

Location: **Paint Island Rd; Millstone Twp; Monmouth County**

Collection Date: ***6/15/2010*** *USGS Topo Map:* **Roosevelt**

	Genus	Tolerance Value	Amount
	Tubifex	10	24
	Musculium	5	14
	Tanytarsus	6	13
	Physella	9.1	7
	Rheopelopia	4	5
	Rheotanytarsus	6	5
*	Cheumatopsyche	5	3
	Limnodrilus	10	3
	Polypedilum	6	3
	Procladius	9	3
	Prodiamesa	3	3
	Alotanypus	6	2
	Stylodrilus	10	2
	Tribelos	5	2
	Aeshna	5	1
	Cura	4	1
	Helisoma	7	1
	Heterotrissocladius	0	1
	Nais	8	1
	Orthocladius	6	1
	Potamonectes	5	1
	Prostoma	7	1
	Ptychopteridae	8	1
	Spirosperma	10	1
	Trichocorixa	9	1

** (EPT organism)* *Taxa Richness:* 25 *Population:* 100

%Dominance / Dominant Taxon(s): 24.0% Tubifex

Hilsenhoff Biotic Index (HBI): 7.12 *%Clingers:* 8.00%

** E+P+T:* 1 ( ) Ephemeroptera, ( ) Plecoptera, (1) Trichoptera *%Ephemeroptera:* 0.00%

CPMI Rating: **6 Fair**

Habitat Analysis: 143 Suboptimal USEPA Protocol

Observations: Water temp: 20.35 C; Cond: 337 umhos; DO: 7.66 mg/L; pH: 6.36 SU

Clarity: clear; Flow Rate: moderate; Width/Depth: 8' / < 1'; Substrate: gravel, sand, mud, silt, root mats

Canopy: partly open; Bank Stability: good; Bank Vegetation: trees, shrubs, grasses

Stream Gradient: Low Gradient Stream; Land Uses: suburban

Other: fish, frogs, salamander, macrophytes; oil sheen

AN0518 # Toms R, Rt 571, Holmson
USGS Quad + Roosevelt

October 12, 1994

Taxon (Family Level)	FTV	NOI
PROSTOMATIDAE	7	1
LUMBRICULIDAE	8	2
TUBIFICIDAE	10	13
PLANORBIDAE	6	6
SPHAERIIDAE	8	44
GOMPHIDAE	1	1
COENAGRIONIDAE	9	1
ELMIDAE	5	2
SIALIDAE	4	2
HYDROPSYCHIDAE	4	13
PHRYGANEIDAE	4	2
LEPTOCERIDAE	4	2
BRACHYCENTRIDAE	1	7
POLYCENTROPODIDAE	6	1
TIPULIDAE	3	1
SIMULIIDAE	6	1
CHIRONOMIDAE	6	1

Number of Taxa + 17 # Population + 100

Dominant Family(s) + SPHAERIIDAE 44.00%
Family Biotic Index + 6.65
Scraper/Filterer Collector Ratio + 0.00
Shredder/Total Ratio + 0.01
E(phemeroptera)+P(lecoptera)+T(richoptera) + 5
%EPT + 25.00
EPT/Chironomids + 25.00

NJIS/Rating + 18/moderately impaired

OBSERVATIONS

Clarity + clear black
Flow + slow
Width/Depth(ft) + 15/<1-4
Substrate + sand/silt
Streambank Vegetation/Stability + good/good
Canopy + half open
Other + tree-lined; several fish

Station: AN0518
Toms River, Rt. 571, Monmouth County
Roosevelt USGS Quadrangle
Date Sampled: 10/5/99

Family	Family Tolerance Value (FTV)	Number of Individuals
Sphaeriidae	8	36
Coenagrionidae	9	25
Asellidae	8	10
Chironomidae	6	10
Planorbidae	6	10
BloodRed Chironomidae	8	5
Tubificidae	10	2
Lumbriculidae	8	2
Haliplidae	5	2
Tipulidae	3	2
Glossiphoniidae	8	1
Tabanidae	6	1

Statistical Analysis

Number of Taxa: 12
Total Number of Individuals: 106
% Contribution of Dominant Family: 33.96 % (Sphaeriidae)
Family Biotic Index: 7.73
Scraper/Filterer Collector Ratio: 0.42
Shredder/Total Ratio: 0.13
E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 0
% EPT: 0.00
EPT/C: 0.00
NJIS Rating: 12
Biological Condition: Moderately Impaired
Habitat Analysis: 147
Deficiency(s) noted: Significant Organic Pollution - Paucity of Clean Water Organisms

Observations

Streamwater: Turbid....Flow: Slow....Width/Depth (ft): 15/3
Substrate: Mud, Snags....StreamBank Vegetation/Stability: Trees, Grass, Shrubs/Fair
Canopy: Open....Other: Suburban / Forested; Water temp. 14.4 C/ pH 5.1SU / DO 7.6mg/L / Cond. 162umhos

AMNET Site # **AN0518** *Stream Name:* **Toms River**

Location: **Rt 571; Millstone Twp; Monmouth County**

Collection Date: ***6/2/2005*** *USGS Topo Map:* **Roosevelt**

Genus	*Tolerance Value*	*Amount*
Microtendipes	7	33
Phaenopsectra	7	13
Prodiamesa	3	11
Limnodrilus	10	7
Sphaerium	8	7
Tanytarsus	6	7
Cladotanytarsus	7	4
Menetus	6	4
Polypedilum	6	4
Thienemannimyia	6	3
Chironomus	10	2
Argia	6	1
Dero	10	1
Enallagma	9	1
Gyrinus	4	1
Rheotanytarsus	6	1

** (EPT organism)* *Taxa Richness:* 16 *Population:* 100

%Dominance / Dominant Taxon(s): 33.0% Microtendipes

Hilsenhoff Biotic Index (HBI): 6.72 *%Clingers:* 48.00%

** E+P+T:* 0 ( ) Ephemeroptera, ( ) Plecoptera, ( ) Trichoptera *%Ephemeroptera:* 0.00%

CPMI Rating: **8 Fair**

Habitat Analysis: 146 Suboptimal USEPA Protocol

Observations: Water temp: 13.5 C; Cond: 233 umhos; DO: 7.9 mg/L; pH: 5.4 SU

Clarity: clear; Flow Rate: slow; Width/Depth: 21' / 3-4'; Substrate: gravel, sand, mud, silt, snags

Canopy: mostly closed; Bank Stability: good; Bank Vegetation: trees, shrubs

Stream Gradient: Low Gradient Stream; Land Uses: suburban

Pipes / Ditches: storm sewers

Other: frogs, wetland/pond upstream, very slow-almost no flow and ponded near bridge, oily sheen on surface, adjacent to autobody shop

AMNET Site # **AN0518** *Stream Name:* **Toms River**

Location: **Rt 571; Millstone Twp; Monmouth County**

Collection Date: ***6/15/2010*** *USGS Topo Map:* **Roosevelt**

	Genus	*Tolerance Value*	*Amount*
	Musculium	5	15
	Dubiraphia	6	11
	Limnodrilus	10	10
	Orthocladius	6	9
	Pisidium	6.8	8
	Simulium	6	8
	Menetus	6	6
	Procladius	9	5
	Helisoma	7	4
	Tribelos	5	4
	Caecidotea	8	2
	Cryptochironomus	8	2
	Nematoda	6	2
	Stylaria	8	2
	Tubifex	10	2
	Ablabesmyia	8	1
	Ancyronyx	2	1
	Argia	6	1
	Cricotopus	7	1
	Lumbriculus	8	1
*	Mystacides	4	1
	Phaenopsectra	7	1
	Physella	9.1	1
	Rheopelopia	4	1
	Spirosperma	10	1

** (EPT organism)* *Taxa Richness:* 25 *Population:* 100

%Dominance / Dominant Taxon(s): 15.0% Musculium

Hilsenhoff Biotic Index (HBI): 6.72 *%Clingers:* 23.00%

** E+P+T:* 1 ( ) Ephemeroptera, ( ) Plecoptera, (1) Trichoptera *%Ephemeroptera:* 0.00%

CPMI Rating: **8 Fair**

Habitat Analysis: 140 Suboptimal USEPA Protocol

Observations: Water temp: 20.73 C; Cond: 280 umhos; DO: 9.12 mg/L; pH: 6.08 SU

Clarity: slightly turbid; Flow Rate: slow; Width/Depth: 21' / 2'; Substrate: mud, snags

Canopy: mostly open; Bank Stability: good; Bank Vegetation: trees, shrubs, grasses

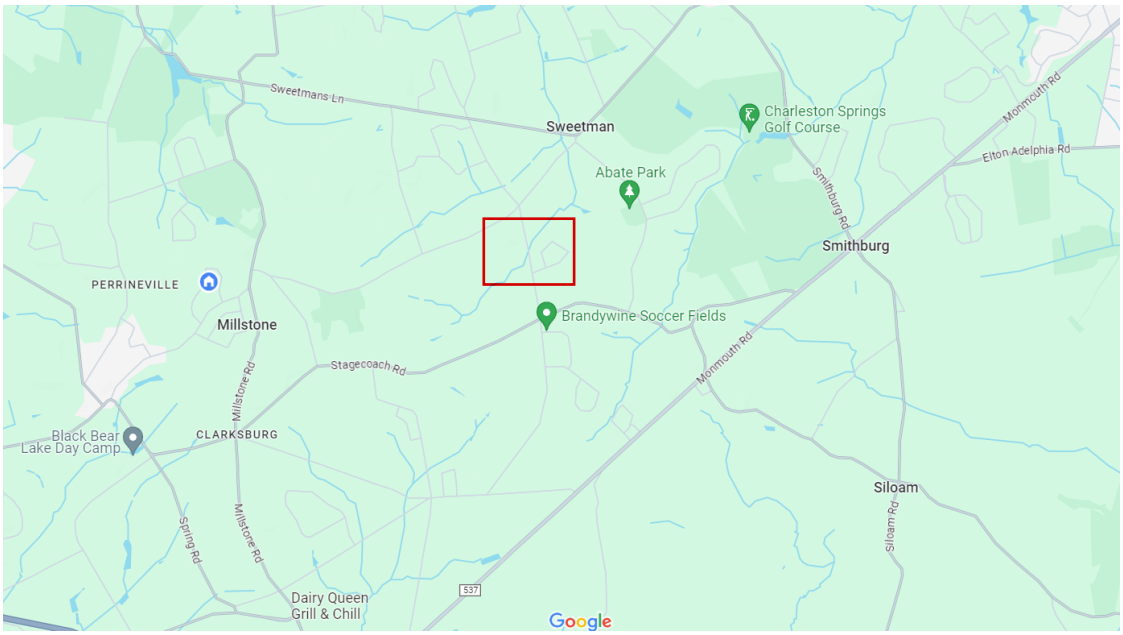
Stream Gradient: Low Gradient Stream; Land Uses: suburban, wetlands

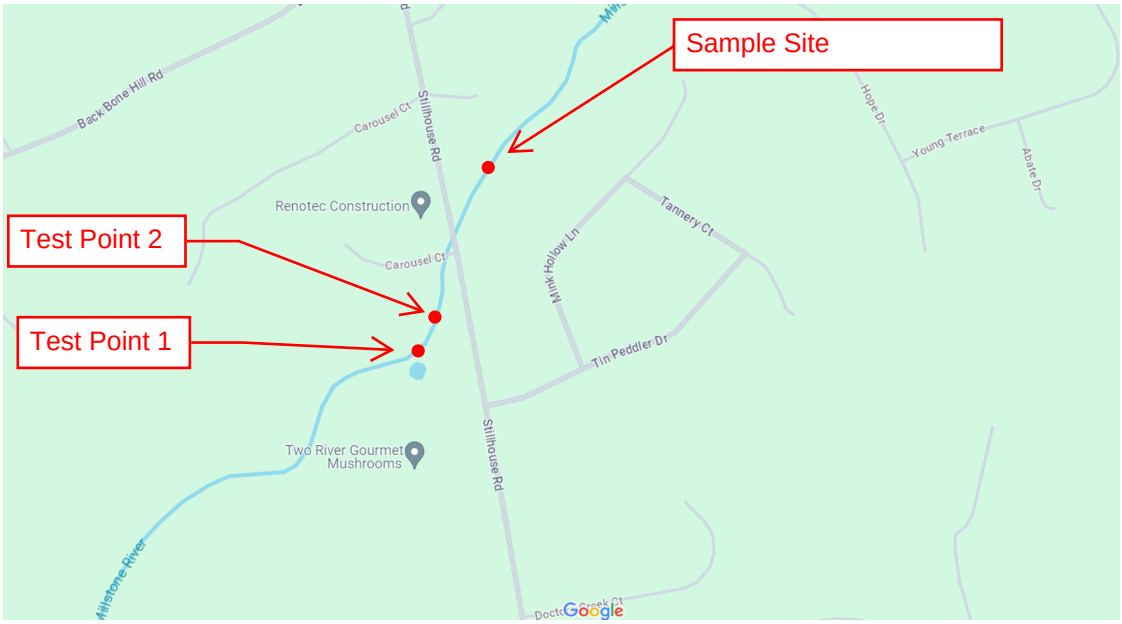
Pipes / Ditches: storm sewers

Other: frogs, macrophytes, phragmites; USGS gage: 0.45

APPENDIX B

Millstone River Water Sampling Resources


Sweetmans Ln
Sweetman
Charleston Springs Golf Course
Monmouth Rd
Elton Adelphia Rd
Abate Park
Smithburg Rd
Smithburg
PERRINEVILLE
Millstone
Brandywine Soccer Fields
Stagecoach Rd
Millstone Rd
Monmouth Rd
Black Bear Lake Day Camp
CLARKSBURG
Siloam
Siloam Rd
Spring Rd
Millstone Rd
Dairy Queen Grill & Chill
537
Google


Sample Site
Back Bone Hill Rd
Carousel Ct
Stillhouse Rd
Hope Dr
Young Terrace
Abate Dr
Renotec Construction
Test Point 2
Carousel Ct
Tannery Ct
Mink Hollow Ln
Test Point 1
Tin Peddler Dr
Two River Gourmet Mushrooms
Stillhouse Rd
Millstone River
Google


Back Bone Hill Rd
Carousel Ct
Stillhouse Rd
Hope Dr
Renotec Construction
Tannery Ct
Carousel Ct
Mink Hollow Ln
Tin Peddler Dr
Millstone River
Two River Gourmet Mushrooms
Stillhouse Rd
Google


Test Point 1
Feed Point


Test Point 2


Test Point 2
Source


Sample Site

The Watershed Institute | FIELD MEASUREMENT DATA SHEET | 1

CLEAR FORM

Date:	Project Name:	Investigators:
06/20/26	StreamWatch CAT	Doug Lischick
Site:	**Time:**	
MRA	10:00	

Comments: Very low water level.
deer, frogs, birds

Current Weather:
- ☒ Sunny
- ☐ Partly cloudy
- ☐ Overcast
- ☐ Light rain
- ☐ Heavy rain
- ☐ Snow
- ☐ Snowmelt

Time Since Last Rain or Snowmelt:
- ☐ Within 24 hours
- ☐ 24-48 hours ago
- ☒ More than 2 days ago
- ☐ Unknown

PARAMETERS	METER # OR METHOD	MEASUREMENT
Air Temp (°C)	144	20.5
Water Temp (°C)	144	16.0
Nitrate (mg/l)	Lamotte	☒ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☐ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
		If >1.0, repeat test w/ dilution (1 part sample:3 parts DI water) ____ Multiply x 4 for final result ____
Phosphate (mg/l)	"	☐ <0.2 ☐ 0.2 ☐ 0.3 ☒ 0.4 ☐ 0.5 ☐ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
pH	"	☐ <4.5 ☐ 4.5 ☐ 5.0 ☐ 5.5 ☐ 6.0 ☒ 6.5 ☐ 7.0 ☐ 7.5 ☐ 8.0 ☐ 8.5 ☐ 9.0 ☐ 9.5 ☐ 10.0 ☐ >10.0
Turbidity (JTU)	"	Sample size: ☐ 25 ☒ 50 — ml added: 0.5 — JTU: 5
D.O. 1 (mg/l)	"	4.3
D.O. 2 (mg/l)	"	4.4
D.O. 3 (mg/l)	"	Avg DO: 4.35

If results are greater than 0.6 mg/l apart, perform third test

VISUAL ASSESSMENT

Odor:
- ☒ Normal
- ☐ Anaerobic
- ☐ Sulfuric
- ☐ Sewage
- ☐ Petroleum
- ☐ Other:

Aquatic Vegetation:
- ☒ Absent
- ☐ Scarce
- ☐ Moderate
- ☐ Abundant

Turbidity:
- ☒ Clear
- ☐ Tea-stained
- ☐ Slightly turbid
- ☐ Turbid/Muddy
- ☐ Milky
- ☐ Green "pea soup"

Water Movement:

Streams	Lakes
☒ Slow	Still
☐ Moderate	Ripples
☐ Swift	Waves
☐ Rapids	Choppy

Surface Coating:
- ☐ None
- ☐ Foam
- ☒ Scum
- ☐ "Paint" streaks
- ☐ Duckweed/Vegetation
- ☐ Oil
- ☐ Other:

Algae

Type:
- ☐ Biofilm
- ☒ Filamentous
- ☐ Floating
- ☐ Suspected HAB

Amount:
- ☐ Absent
- ☐ Scarce
- ☒ Moderate
- ☐ Abundant

Water Color: orange -brown tint
- ☒ Clear
- ☐ Green
- ☐ Blue-green
- ☐ Brown
- ☐ Yellow
- ☐ Gray
- ☐ Other:

Data entered: _____ (Date) _____ (Initials)

The Watershed Institute | FIELD MEASUREMENT DATA SHEET | 1

CLEAR FORM

Date:	Project Name:	Investigators:
05/17/25	StreamWatch CAT	Doug Lischick
Site:	**Time:**	
MRA	11:30	

Comments: High water level.

Current Weather:
- ☐ Sunny
- ☒ Partly cloudy
- ☐ Overcast
- ☐ Light rain
- ☐ Heavy rain
- ☐ Snow
- ☐ Snowmelt

Time Since Last Rain or Snowmelt:
- ☒ Within 24 hours
- ☐ 24-48 hours ago
- ☐ More than 2 days ago
- ☐ Unknown

PARAMETERS	METER # OR METHOD	MEASUREMENT
Air Temp (°C)	44	25
Water Temp (°C)	44	17.5
Nitrate (mg/l)	Lamotte	☒ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☐ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
		If >1.0, repeat test w/ dilution (1 part sample:3 parts DI water) ☐ Multiply x 4 for final result ☐
Phosphate (mg/l)	"	☐ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☒ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
pH	"	☐ <4.5 ☐ 4.5 ☐ 5.0 ☐ 5.5 ☐ 6.0 ☒ 6.5 ☒ 7.0 ☐ 7.5 ☐ 8.0 ☐ 8.5 ☐ 9.0 ☐ 9.5 ☐ 10.0 ☐ >10.0
Turbidity (JTU)	"	Sample size: ☐ 25 ☒ 50 — ml added: 0.5 — JTU: 5
D.O. 1 (mg/l)	"	6.2
D.O. 2 (mg/l)	"	5.6
D.O. 3 (mg/l)	"	Avg DO: 5.9

If results are greater than 0.6 mg/l apart, perform third test

VISUAL ASSESSMENT

Odor:
- ☒ Normal
- ☐ Anaerobic
- ☐ Sulfuric
- ☐ Sewage
- ☐ Petroleum
- ☐ Other:

Aquatic Vegetation:
- ☒ Absent
- ☐ Scarce
- ☐ Moderate
- ☐ Abundant

Turbidity:
- ☒ Clear
- ☐ Tea-stained
- ☐ Slightly turbid
- ☐ Turbid/Muddy
- ☐ Milky
- ☐ Green "pea soup"

Water Movement:

Streams	Lakes
☐ Slow	Still
☒ Moderate	Ripples
☐ Swift	Waves
☐ Rapids	Choppy

Surface Coating:
- ☐ None
- ☒ Foam
- ☐ Scum
- ☐ "Paint" streaks
- ☐ Duckweed/Vegetation
- ☐ Oil
- ☐ Other:

Algae

Type:
- ☐ Biofilm
- ☒ Filamentous
- ☐ Floating
- ☐ Suspected HAB

Amount:
- ☐ Absent
- ☐ Scarce
- ☐ Moderate
- ☒ Abundant

Water Color: orange -brown tint
- ☒ Clear
- ☐ Green
- ☐ Blue-green
- ☐ Brown
- ☐ Yellow
- ☐ Gray
- ☐ Other:

Data entered: _____ (Date) _____ (Initials)

The Watershed Institute | FIELD MEASUREMENT DATA SHEET | 1

CLEAR FORM

Date:	Project Name:	Investigators:
05/17/25	StreamWatch CAT	Doug Lischick
Site:	**Time:**	
MRA	11:30	

Comments: High water level.

Current Weather:
- ☐ Sunny
- ☒ Partly cloudy
- ☐ Overcast
- ☐ Light rain
- ☐ Heavy rain
- ☐ Snow
- ☐ Snowmelt

Time Since Last Rain or Snowmelt:
- ☒ Within 24 hours
- ☐ 24-48 hours ago
- ☐ More than 2 days ago
- ☐ Unknown

PARAMETERS	METER # OR METHOD	MEASUREMENT
Air Temp (°C)	44	25
Water Temp (°C)	44	17.5
Nitrate (mg/l)	Lamotte	☒ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☐ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
		If >1.0, repeat test w/ dilution (1 part sample:3 parts DI water) ☐ Multiply x 4 for final result ☐
Phosphate (mg/l)	"	☐ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☒ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
pH	"	☐ <4.5 ☐ 4.5 ☐ 5.0 ☐ 5.5 ☐ 6.0 ☒ 6.5 ☒ 7.0 ☐ 7.5 ☐ 8.0 ☐ 8.5 ☐ 9.0 ☐ 9.5 ☐ 10.0 ☐ >10.0
Turbidity (JTU)	"	Sample size: ☐ 25 ☒ 50 — ml added: 0.5 — JTU: 5
D.O. 1 (mg/l)	"	6.2
D.O. 2 (mg/l)	"	5.6
D.O. 3 (mg/l)	"	Avg DO: 5.9

If results are greater than 0.6 mg/l apart, perform third test

VISUAL ASSESSMENT

Odor:
- ☒ Normal
- ☐ Anaerobic
- ☐ Sulfuric
- ☐ Sewage
- ☐ Petroleum
- ☐ Other:

Aquatic Vegetation:
- ☒ Absent
- ☐ Scarce
- ☐ Moderate
- ☐ Abundant

Turbidity:
- ☒ Clear
- ☐ Tea-stained
- ☐ Slightly turbid
- ☐ Turbid/Muddy
- ☐ Milky
- ☐ Green "pea soup"

Water Movement:

Streams	Lakes
☐ Slow	Still
☒ Moderate	Ripples
☐ Swift	Waves
☐ Rapids	Choppy

Surface Coating:
- ☐ None
- ☒ Foam
- ☐ Scum
- ☐ "Paint" streaks
- ☐ Duckweed/Vegetation
- ☐ Oil
- ☐ Other:

Algae

Type:
- ☐ Biofilm
- ☒ Filamentous
- ☐ Floating
- ☐ Suspected HAB

Amount:
- ☐ Absent
- ☐ Scarce
- ☐ Moderate
- ☒ Abundant

Water Color: orange -brown tint
- ☒ Clear
- ☐ Green
- ☐ Blue-green
- ☐ Brown
- ☐ Yellow
- ☐ Gray
- ☐ Other:

Data entered: _____ (Date) _____ (Initials)

The Watershed Institute | FIELD MEASUREMENT DATA SHEET | 1

CLEAR FORM

Date:	Project Name:	Investigators:
05/17/25	StreamWatch CAT	Doug Lischick
Site:	**Time:**	
MRA	11:30	

Comments: High water level.

Current Weather:
- ☐ Sunny
- ☒ Partly cloudy
- ☐ Overcast
- ☐ Light rain
- ☐ Heavy rain
- ☐ Snow
- ☐ Snowmelt

Time Since Last Rain or Snowmelt:
- ☒ Within 24 hours
- ☐ 24-48 hours ago
- ☐ More than 2 days ago
- ☐ Unknown

PARAMETERS	METER # OR METHOD	MEASUREMENT
Air Temp (°C)	44	25
Water Temp (°C)	44	17.5
Nitrate (mg/l)	Lamotte	☒ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☐ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
		If >1.0, repeat test w/ dilution (1 part sample:3 parts DI water) ☐ Multiply x 4 for final result ☐
Phosphate (mg/l)	"	☐ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☒ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
pH	"	☐ <4.5 ☐ 4.5 ☐ 5.0 ☐ 5.5 ☐ 6.0 ☒ 6.5 ☒ 7.0 ☐ 7.5 ☐ 8.0 ☐ 8.5 ☐ 9.0 ☐ 9.5 ☐ 10.0 ☐ >10.0
Turbidity (JTU)	"	Sample size: ☐ 25 ☒ 50 — ml added: 0.5 — JTU: 5
D.O. 1 (mg/l)	"	6.2
D.O. 2 (mg/l)	"	5.6
D.O. 3 (mg/l)	"	Avg DO: 5.9

If results are greater than 0.6 mg/l apart, perform third test

VISUAL ASSESSMENT

Odor:
- ☒ Normal
- ☐ Anaerobic
- ☐ Sulfuric
- ☐ Sewage
- ☐ Petroleum
- ☐ Other:

Aquatic Vegetation:
- ☒ Absent
- ☐ Scarce
- ☐ Moderate
- ☐ Abundant

Turbidity:
- ☒ Clear
- ☐ Tea-stained
- ☐ Slightly turbid
- ☐ Turbid/Muddy
- ☐ Milky
- ☐ Green "pea soup"

Water Movement:

Streams	Lakes
☐ Slow	Still
☒ Moderate	Ripples
☐ Swift	Waves
☐ Rapids	Choppy

Surface Coating:
- ☐ None
- ☒ Foam
- ☐ Scum
- ☐ "Paint" streaks
- ☐ Duckweed/Vegetation
- ☐ Oil
- ☐ Other:

Algae

Type:
- ☐ Biofilm
- ☒ Filamentous
- ☐ Floating
- ☐ Suspected HAB

Amount:
- ☐ Absent
- ☐ Scarce
- ☐ Moderate
- ☒ Abundant

Water Color: orange -brown tint
- ☒ Clear
- ☐ Green
- ☐ Blue-green
- ☐ Brown
- ☐ Yellow
- ☐ Gray
- ☐ Other:

Data entered: _____ (Date) _____ (Initials)

The Watershed Institute | FIELD MEASUREMENT DATA SHEET | 1

CLEAR FORM

Date:	Project Name:	Investigators:
05/17/25	StreamWatch CAT	Doug Lischick
Site:	**Time:**	
MRA	11:30	

Comments: High water level.

Current Weather:
- ☐ Sunny
- ☒ Partly cloudy
- ☐ Overcast
- ☐ Light rain
- ☐ Heavy rain
- ☐ Snow
- ☐ Snowmelt

Time Since Last Rain or Snowmelt:
- ☒ Within 24 hours
- ☐ 24-48 hours ago
- ☐ More than 2 days ago
- ☐ Unknown

PARAMETERS	METER # OR METHOD	MEASUREMENT
Air Temp (°C)	44	25
Water Temp (°C)	44	17.5
Nitrate (mg/l)	Lamotte	☒ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☐ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
		If >1.0, repeat test w/ dilution (1 part sample:3 parts DI water) ☐ Multiply x 4 for final result ☐
Phosphate (mg/l)	"	☐ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☒ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
pH	"	☐ <4.5 ☐ 4.5 ☐ 5.0 ☐ 5.5 ☐ 6.0 ☒ 6.5 ☒ 7.0 ☐ 7.5 ☐ 8.0 ☐ 8.5 ☐ 9.0 ☐ 9.5 ☐ 10.0 ☐ >10.0
Turbidity (JTU)	"	Sample size: ☐ 25 ☒ 50 — ml added: 0.5 — JTU: 5
D.O. 1 (mg/l)	"	6.2
D.O. 2 (mg/l)	"	5.6
D.O. 3 (mg/l)	"	Avg DO: 5.9

If results are greater than 0.6 mg/l apart, perform third test

VISUAL ASSESSMENT

Odor:
- ☒ Normal
- ☐ Anaerobic
- ☐ Sulfuric
- ☐ Sewage
- ☐ Petroleum
- ☐ Other:

Aquatic Vegetation:
- ☒ Absent
- ☐ Scarce
- ☐ Moderate
- ☐ Abundant

Turbidity:
- ☒ Clear
- ☐ Tea-stained
- ☐ Slightly turbid
- ☐ Turbid/Muddy
- ☐ Milky
- ☐ Green "pea soup"

Water Movement:

Streams	Lakes
☐ Slow	Still
☒ Moderate	Ripples
☐ Swift	Waves
☐ Rapids	Choppy

Surface Coating:
- ☐ None
- ☒ Foam
- ☐ Scum
- ☐ "Paint" streaks
- ☐ Duckweed/Vegetation
- ☐ Oil
- ☐ Other:

Algae

Type:
- ☐ Biofilm
- ☒ Filamentous
- ☐ Floating
- ☐ Suspected HAB

Amount:
- ☐ Absent
- ☐ Scarce
- ☐ Moderate
- ☒ Abundant

Water Color: orange -brown tint
- ☒ Clear
- ☐ Green
- ☐ Blue-green
- ☐ Brown
- ☐ Yellow
- ☐ Gray
- ☐ Other:

Data entered: _____ (Date) _____ (Initials)

The Watershed Institute | FIELD MEASUREMENT DATA SHEET | 1

CLEAR FORM

Date:	Project Name:	Investigators:
05/17/25	StreamWatch CAT	Doug Lischick
Site:	**Time:**	
MRA	11:30	

Comments: High water level.

Current Weather:
- ☐ Sunny
- ☒ Partly cloudy
- ☐ Overcast
- ☐ Light rain
- ☐ Heavy rain
- ☐ Snow
- ☐ Snowmelt

Time Since Last Rain or Snowmelt:
- ☒ Within 24 hours
- ☐ 24-48 hours ago
- ☐ More than 2 days ago
- ☐ Unknown

PARAMETERS	METER # OR METHOD	MEASUREMENT
Air Temp (°C)	44	25
Water Temp (°C)	44	17.5
Nitrate (mg/l)	Lamotte	☒ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☐ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
		If >1.0, repeat test w/ dilution (1 part sample:3 parts DI water) ☐ Multiply x 4 for final result ☐
Phosphate (mg/l)	"	☐ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☒ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
pH	"	☐ <4.5 ☐ 4.5 ☐ 5.0 ☐ 5.5 ☐ 6.0 ☒ 6.5 ☒ 7.0 ☐ 7.5 ☐ 8.0 ☐ 8.5 ☐ 9.0 ☐ 9.5 ☐ 10.0 ☐ >10.0
Turbidity (JTU)	"	Sample size: ☐ 25 ☒ 50 — ml added: 0.5 — JTU: 5
D.O. 1 (mg/l)	"	6.2
D.O. 2 (mg/l)	"	5.6
D.O. 3 (mg/l)	"	Avg DO: 5.9

If results are greater than 0.6 mg/l apart, perform third test

VISUAL ASSESSMENT

Odor:
- ☒ Normal
- ☐ Anaerobic
- ☐ Sulfuric
- ☐ Sewage
- ☐ Petroleum
- ☐ Other:

Aquatic Vegetation:
- ☒ Absent
- ☐ Scarce
- ☐ Moderate
- ☐ Abundant

Turbidity:
- ☒ Clear
- ☐ Tea-stained
- ☐ Slightly turbid
- ☐ Turbid/Muddy
- ☐ Milky
- ☐ Green "pea soup"

Water Movement:

Streams	Lakes
☐ Slow	Still
☒ Moderate	Ripples
☐ Swift	Waves
☐ Rapids	Choppy

Surface Coating:
- ☐ None
- ☒ Foam
- ☐ Scum
- ☐ "Paint" streaks
- ☐ Duckweed/Vegetation
- ☐ Oil
- ☐ Other:

Algae

Type:
- ☐ Biofilm
- ☒ Filamentous
- ☐ Floating
- ☐ Suspected HAB

Amount:
- ☐ Absent
- ☐ Scarce
- ☐ Moderate
- ☒ Abundant

Water Color: orange -brown tint
- ☒ Clear
- ☐ Green
- ☐ Blue-green
- ☐ Brown
- ☐ Yellow
- ☐ Gray
- ☐ Other:

Data entered: _____ (Date) _____ (Initials)

The Watershed Institute | FIELD MEASUREMENT DATA SHEET | 1

CLEAR FORM

Date:	Project Name:	Investigators:
05/17/25	StreamWatch CAT	Doug Lischick
Site:	**Time:**	
MRA	11:30	

Comments: High water level.

Current Weather:
- ☐ Sunny
- ☒ Partly cloudy
- ☐ Overcast
- ☐ Light rain
- ☐ Heavy rain
- ☐ Snow
- ☐ Snowmelt

Time Since Last Rain or Snowmelt:
- ☒ Within 24 hours
- ☐ 24-48 hours ago
- ☐ More than 2 days ago
- ☐ Unknown

PARAMETERS	METER # OR METHOD	MEASUREMENT
Air Temp (°C)	44	25
Water Temp (°C)	44	17.5
Nitrate (mg/l)	Lamotte	☒ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☐ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
		If >1.0, repeat test w/ dilution (1 part sample:3 parts DI water) ☐ Multiply x 4 for final result ☐
Phosphate (mg/l)	"	☐ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☒ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
pH	"	☐ <4.5 ☐ 4.5 ☐ 5.0 ☐ 5.5 ☐ 6.0 ☒ 6.5 ☒ 7.0 ☐ 7.5 ☐ 8.0 ☐ 8.5 ☐ 9.0 ☐ 9.5 ☐ 10.0 ☐ >10.0
Turbidity (JTU)	"	Sample size: ☐ 25 ☒ 50 — ml added: 0.5 — JTU: 5
D.O. 1 (mg/l)	"	6.2
D.O. 2 (mg/l)	"	5.6
D.O. 3 (mg/l)	"	Avg DO: 5.9

If results are greater than 0.6 mg/l apart, perform third test

VISUAL ASSESSMENT

Odor:
- ☒ Normal
- ☐ Anaerobic
- ☐ Sulfuric
- ☐ Sewage
- ☐ Petroleum
- ☐ Other:

Aquatic Vegetation:
- ☒ Absent
- ☐ Scarce
- ☐ Moderate
- ☐ Abundant

Turbidity:
- ☒ Clear
- ☐ Tea-stained
- ☐ Slightly turbid
- ☐ Turbid/Muddy
- ☐ Milky
- ☐ Green "pea soup"

Water Movement:

Streams	Lakes
☐ Slow	Still
☒ Moderate	Ripples
☐ Swift	Waves
☐ Rapids	Choppy

Surface Coating:
- ☐ None
- ☒ Foam
- ☐ Scum
- ☐ "Paint" streaks
- ☐ Duckweed/Vegetation
- ☐ Oil
- ☐ Other:

Algae

Type:
- ☐ Biofilm
- ☒ Filamentous
- ☐ Floating
- ☐ Suspected HAB

Amount:
- ☐ Absent
- ☐ Scarce
- ☐ Moderate
- ☒ Abundant

Water Color: orange -brown tint
- ☒ Clear
- ☐ Green
- ☐ Blue-green
- ☐ Brown
- ☐ Yellow
- ☐ Gray
- ☐ Other:

Data entered: _____ (Date) _____ (Initials)

The Watershed Institute | FIELD MEASUREMENT DATA SHEET | 1

CLEAR FORM

Date:	Project Name:	Investigators:
05/17/25	StreamWatch CAT	Doug Lischick
Site:	**Time:**	
MRA	11:30	

Comments: High water level.

Current Weather:
- ☐ Sunny
- ☒ Partly cloudy
- ☐ Overcast
- ☐ Light rain
- ☐ Heavy rain
- ☐ Snow
- ☐ Snowmelt

Time Since Last Rain or Snowmelt:
- ☒ Within 24 hours
- ☐ 24-48 hours ago
- ☐ More than 2 days ago
- ☐ Unknown

PARAMETERS	METER # OR METHOD	MEASUREMENT
Air Temp (°C)	44	25
Water Temp (°C)	44	17.5
Nitrate (mg/l)	Lamotte	☒ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☐ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
		If >1.0, repeat test w/ dilution (1 part sample:3 parts DI water) ☐ Multiply x 4 for final result ☐
Phosphate (mg/l)	"	☐ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☒ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
pH	"	☐ <4.5 ☐ 4.5 ☐ 5.0 ☐ 5.5 ☐ 6.0 ☒ 6.5 ☒ 7.0 ☐ 7.5 ☐ 8.0 ☐ 8.5 ☐ 9.0 ☐ 9.5 ☐ 10.0 ☐ >10.0
Turbidity (JTU)	"	Sample size: ☐ 25 ☒ 50 — ml added: 0.5 — JTU: 5
D.O. 1 (mg/l)	"	6.2
D.O. 2 (mg/l)	"	5.6
D.O. 3 (mg/l)	"	Avg DO: 5.9

If results are greater than 0.6 mg/l apart, perform third test

VISUAL ASSESSMENT

Odor:
- ☒ Normal
- ☐ Anaerobic
- ☐ Sulfuric
- ☐ Sewage
- ☐ Petroleum
- ☐ Other:

Aquatic Vegetation:
- ☒ Absent
- ☐ Scarce
- ☐ Moderate
- ☐ Abundant

Turbidity:
- ☒ Clear
- ☐ Tea-stained
- ☐ Slightly turbid
- ☐ Turbid/Muddy
- ☐ Milky
- ☐ Green "pea soup"

Water Movement:

Streams	Lakes
☐ Slow	Still
☒ Moderate	Ripples
☐ Swift	Waves
☐ Rapids	Choppy

Surface Coating:
- ☐ None
- ☒ Foam
- ☐ Scum
- ☐ "Paint" streaks
- ☐ Duckweed/Vegetation
- ☐ Oil
- ☐ Other:

Algae

Type:
- ☐ Biofilm
- ☒ Filamentous
- ☐ Floating
- ☐ Suspected HAB

Amount:
- ☐ Absent
- ☐ Scarce
- ☐ Moderate
- ☒ Abundant

Water Color: orange -brown tint
- ☒ Clear
- ☐ Green
- ☐ Blue-green
- ☐ Brown
- ☐ Yellow
- ☐ Gray
- ☐ Other:

Data entered: _____ (Date) _____ (Initials)

The Watershed Institute | FIELD MEASUREMENT DATA SHEET | 1

CLEAR FORM

Date:	Project Name:	Investigators:
05/17/25	StreamWatch CAT	Doug Lischick
Site:	**Time:**	
MRA	11:30	

Comments: High water level.

Current Weather:
- ☐ Sunny
- ☒ Partly cloudy
- ☐ Overcast
- ☐ Light rain
- ☐ Heavy rain
- ☐ Snow
- ☐ Snowmelt

Time Since Last Rain or Snowmelt:
- ☒ Within 24 hours
- ☐ 24-48 hours ago
- ☐ More than 2 days ago
- ☐ Unknown

PARAMETERS	METER # OR METHOD	MEASUREMENT
Air Temp (°C)	44	25
Water Temp (°C)	44	17.5
Nitrate (mg/l)	Lamotte	☒ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☐ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
		If >1.0, repeat test w/ dilution (1 part sample:3 parts DI water) ☐ Multiply x 4 for final result ☐
Phosphate (mg/l)	"	☐ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☒ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
pH	"	☐ <4.5 ☐ 4.5 ☐ 5.0 ☐ 5.5 ☐ 6.0 ☒ 6.5 ☒ 7.0 ☐ 7.5 ☐ 8.0 ☐ 8.5 ☐ 9.0 ☐ 9.5 ☐ 10.0 ☐ >10.0
Turbidity (JTU)	"	Sample size: ☐ 25 ☒ 50 — ml added: 0.5 — JTU: 5
D.O. 1 (mg/l)	"	6.2
D.O. 2 (mg/l)	"	5.6
D.O. 3 (mg/l)	"	Avg DO: 5.9

If results are greater than 0.6 mg/l apart, perform third test

VISUAL ASSESSMENT

Odor:
- ☒ Normal
- ☐ Anaerobic
- ☐ Sulfuric
- ☐ Sewage
- ☐ Petroleum
- ☐ Other:

Aquatic Vegetation:
- ☒ Absent
- ☐ Scarce
- ☐ Moderate
- ☐ Abundant

Turbidity:
- ☒ Clear
- ☐ Tea-stained
- ☐ Slightly turbid
- ☐ Turbid/Muddy
- ☐ Milky
- ☐ Green "pea soup"

Water Movement:

Streams	Lakes
☐ Slow	Still
☒ Moderate	Ripples
☐ Swift	Waves
☐ Rapids	Choppy

Surface Coating:
- ☐ None
- ☒ Foam
- ☐ Scum
- ☐ "Paint" streaks
- ☐ Duckweed/Vegetation
- ☐ Oil
- ☐ Other:

Algae

Type:
- ☐ Biofilm
- ☒ Filamentous
- ☐ Floating
- ☐ Suspected HAB

Amount:
- ☐ Absent
- ☐ Scarce
- ☐ Moderate
- ☒ Abundant

Water Color: orange -brown tint
- ☒ Clear
- ☐ Green
- ☐ Blue-green
- ☐ Brown
- ☐ Yellow
- ☐ Gray
- ☐ Other:

Data entered: _____ (Date) _____ (Initials)

The Watershed Institute | FIELD MEASUREMENT DATA SHEET | 1

CLEAR FORM

Date:	Project Name:	Investigators:
05/17/25	StreamWatch CAT	Doug Lischick
Site:	**Time:**	
MRA	11:30	

Comments: High water level.

Current Weather:
- ☐ Sunny
- ☒ Partly cloudy
- ☐ Overcast
- ☐ Light rain
- ☐ Heavy rain
- ☐ Snow
- ☐ Snowmelt

Time Since Last Rain or Snowmelt:
- ☒ Within 24 hours
- ☐ 24-48 hours ago
- ☐ More than 2 days ago
- ☐ Unknown

PARAMETERS	METER # OR METHOD	MEASUREMENT
Air Temp (°C)	44	25
Water Temp (°C)	44	17.5
Nitrate (mg/l)	Lamotte	☒ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☐ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
		If >1.0, repeat test w/ dilution (1 part sample:3 parts DI water) ☐ Multiply x 4 for final result ☐
Phosphate (mg/l)	"	☐ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☒ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
pH	"	☐ <4.5 ☐ 4.5 ☐ 5.0 ☐ 5.5 ☐ 6.0 ☒ 6.5 ☒ 7.0 ☐ 7.5 ☐ 8.0 ☐ 8.5 ☐ 9.0 ☐ 9.5 ☐ 10.0 ☐ >10.0
Turbidity (JTU)	"	Sample size: ☐ 25 ☒ 50 — ml added: 0.5 — JTU: 5
D.O. 1 (mg/l)	"	6.2
D.O. 2 (mg/l)	"	5.6
D.O. 3 (mg/l)	"	Avg DO: 5.9

If results are greater than 0.6 mg/l apart, perform third test

VISUAL ASSESSMENT

Odor:
- ☒ Normal
- ☐ Anaerobic
- ☐ Sulfuric
- ☐ Sewage
- ☐ Petroleum
- ☐ Other:

Aquatic Vegetation:
- ☒ Absent
- ☐ Scarce
- ☐ Moderate
- ☐ Abundant

Turbidity:
- ☒ Clear
- ☐ Tea-stained
- ☐ Slightly turbid
- ☐ Turbid/Muddy
- ☐ Milky
- ☐ Green "pea soup"

Water Movement:

Streams	Lakes
☐ Slow	Still
☒ Moderate	Ripples
☐ Swift	Waves
☐ Rapids	Choppy

Surface Coating:
- ☐ None
- ☒ Foam
- ☐ Scum
- ☐ "Paint" streaks
- ☐ Duckweed/Vegetation
- ☐ Oil
- ☐ Other:

Algae

Type:
- ☐ Biofilm
- ☒ Filamentous
- ☐ Floating
- ☐ Suspected HAB

Amount:
- ☐ Absent
- ☐ Scarce
- ☐ Moderate
- ☒ Abundant

Water Color: orange -brown tint
- ☒ Clear
- ☐ Green
- ☐ Blue-green
- ☐ Brown
- ☐ Yellow
- ☐ Gray
- ☐ Other:

Data entered: _____ (Date) _____ (Initials)

The Watershed Institute | FIELD MEASUREMENT DATA SHEET | 1

CLEAR FORM

Date:	Project Name:	Investigators:
05/17/25	StreamWatch CAT	Doug Lischick
Site:	**Time:**	
MRA	11:30	

Comments: High water level.

Current Weather:
- ☐ Sunny
- ☒ Partly cloudy
- ☐ Overcast
- ☐ Light rain
- ☐ Heavy rain
- ☐ Snow
- ☐ Snowmelt

Time Since Last Rain or Snowmelt:
- ☒ Within 24 hours
- ☐ 24-48 hours ago
- ☐ More than 2 days ago
- ☐ Unknown

PARAMETERS	METER # OR METHOD	MEASUREMENT
Air Temp (°C)	44	25
Water Temp (°C)	44	17.5
Nitrate (mg/l)	Lamotte	☒ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☐ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
		If >1.0, repeat test w/ dilution (1 part sample:3 parts DI water) ☐ Multiply x 4 for final result ☐
Phosphate (mg/l)	"	☐ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☒ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
pH	"	☐ <4.5 ☐ 4.5 ☐ 5.0 ☐ 5.5 ☐ 6.0 ☒ 6.5 ☒ 7.0 ☐ 7.5 ☐ 8.0 ☐ 8.5 ☐ 9.0 ☐ 9.5 ☐ 10.0 ☐ >10.0
Turbidity (JTU)	"	Sample size: ☐ 25 ☒ 50 — ml added: 0.5 — JTU: 5
D.O. 1 (mg/l)	"	6.2
D.O. 2 (mg/l)	"	5.6
D.O. 3 (mg/l)	"	Avg DO: 5.9

If results are greater than 0.6 mg/l apart, perform third test

VISUAL ASSESSMENT

Odor:
- ☒ Normal
- ☐ Anaerobic
- ☐ Sulfuric
- ☐ Sewage
- ☐ Petroleum
- ☐ Other:

Aquatic Vegetation:
- ☒ Absent
- ☐ Scarce
- ☐ Moderate
- ☐ Abundant

Turbidity:
- ☒ Clear
- ☐ Tea-stained
- ☐ Slightly turbid
- ☐ Turbid/Muddy
- ☐ Milky
- ☐ Green "pea soup"

Water Movement:

Streams	Lakes
☐ Slow	Still
☒ Moderate	Ripples
☐ Swift	Waves
☐ Rapids	Choppy

Surface Coating:
- ☐ None
- ☒ Foam
- ☐ Scum
- ☐ "Paint" streaks
- ☐ Duckweed/Vegetation
- ☐ Oil
- ☐ Other:

Algae

Type:
- ☐ Biofilm
- ☒ Filamentous
- ☐ Floating
- ☐ Suspected HAB

Amount:
- ☐ Absent
- ☐ Scarce
- ☐ Moderate
- ☒ Abundant

Water Color: orange -brown tint
- ☒ Clear
- ☐ Green
- ☐ Blue-green
- ☐ Brown
- ☐ Yellow
- ☐ Gray
- ☐ Other:

Data entered: _____ (Date) _____ (Initials)

The Watershed Institute | FIELD MEASUREMENT DATA SHEET | 1

CLEAR FORM

Date:	Project Name:	Investigators:
05/17/25	StreamWatch CAT	Doug Lischick
Site:	**Time:**	
MRA	11:30	

Comments: High water level.

Current Weather:
- ☐ Sunny
- ☒ Partly cloudy
- ☐ Overcast
- ☐ Light rain
- ☐ Heavy rain
- ☐ Snow
- ☐ Snowmelt

Time Since Last Rain or Snowmelt:
- ☒ Within 24 hours
- ☐ 24-48 hours ago
- ☐ More than 2 days ago
- ☐ Unknown

PARAMETERS	METER # OR METHOD	MEASUREMENT
Air Temp (°C)	44	25
Water Temp (°C)	44	17.5
Nitrate (mg/l)	Lamotte	☒ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☐ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
		If >1.0, repeat test w/ dilution (1 part sample:3 parts DI water) ☐ Multiply x 4 for final result ☐
Phosphate (mg/l)	"	☐ <0.2 ☐ 0.2 ☐ 0.3 ☐ 0.4 ☐ 0.5 ☒ 0.6 ☐ 0.7 ☐ 0.8 ☐ 0.9 ☐ 1.0 ☐ >1.0
pH	"	☐ <4.5 ☐ 4.5 ☐ 5.0 ☐ 5.5 ☐ 6.0 ☒ 6.5 ☒ 7.0 ☐ 7.5 ☐ 8.0 ☐ 8.5 ☐ 9.0 ☐ 9.5 ☐ 10.0 ☐ >10.0
Turbidity (JTU)	"	Sample size: ☐ 25 ☒ 50 — ml added: 0.5 — JTU: 5
D.O. 1 (mg/l)	"	6.2
D.O. 2 (mg/l)	"	5.6
D.O. 3 (mg/l)	"	Avg DO: 5.9

If results are greater than 0.6 mg/l apart, perform third test

VISUAL ASSESSMENT

Odor:
- ☒ Normal
- ☐ Anaerobic
- ☐ Sulfuric
- ☐ Sewage
- ☐ Petroleum
- ☐ Other:

Aquatic Vegetation:
- ☒ Absent
- ☐ Scarce
- ☐ Moderate
- ☐ Abundant

Turbidity:
- ☒ Clear
- ☐ Tea-stained
- ☐ Slightly turbid
- ☐ Turbid/Muddy
- ☐ Milky
- ☐ Green "pea soup"

Water Movement:

Streams	Lakes
☐ Slow	Still
☒ Moderate	Ripples
☐ Swift	Waves
☐ Rapids	Choppy

Surface Coating:
- ☐ None
- ☒ Foam
- ☐ Scum
- ☐ "Paint" streaks
- ☐ Duckweed/Vegetation
- ☐ Oil
- ☐ Other:

Algae

Type:
- ☐ Biofilm
- ☒ Filamentous
- ☐ Floating
- ☐ Suspected HAB

Amount:
- ☐ Absent
- ☐ Scarce
- ☐ Moderate
- ☒ Abundant

Water Color: orange -brown tint
- ☒ Clear
- ☐ Green
- ☐ Blue-green
- ☐ Brown
- ☐ Yellow
- ☐ Gray
- ☐ Other:

Data entered: _____ (Date) _____ (Initials)

APPENDIX C

NJDEP Model Stormwater Control Ordinance

Sample Municipal Stormwater Control Ordinance

Ordinance #[*insert number*] – Stormwater Control

Section I. Scope and Purpose:

A. Policy Statement

Flood control, groundwater recharge, and pollutant reduction shall be achieved through the use of stormwater management measures, including green infrastructure Best Management Practices (GI BMPs) and nonstructural stormwater management strategies. GI BMPs should be utilized to meet the goal of maintaining natural hydrology to reduce stormwater runoff volume, reduce erosion, encourage infiltration and groundwater recharge, and reduce pollution. GI BMPs should be developed based upon physical site conditions and the origin, nature and the anticipated quantity, or amount, of potential pollutants. Multiple stormwater management BMPs may be necessary to achieve the established performance standards for green infrastructure, water quality, quantity, and groundwater recharge.

B. Purpose

The purpose of this ordinance is to establish minimum stormwater management requirements and controls for "major development," as defined below in Section II.

C. Applicability

1. This ordinance shall be applicable to the following major developments:

   i. Non-residential major developments and redevelopment projects; and
   ii. Aspects of residential major developments and redevelopment projects that are not pre-empted by the Residential Site Improvement Standards at N.J.A.C. 5:21 et seq.

2. This ordinance shall also be applicable to all major developments undertaken by [*insert name of municipality*].

3. A complete application required by ordinance pursuant to C.1 Municipal Land Use Law at N.J.S.A. 40:55D-10.5 and above that has been submitted prior to ***{adoption date of this ordinance}***, shall be subject to the stormwater management requirements in effect on the date the complete application was received.

4. Notwithstanding 5 below or any rule to the contrary, major developments for any public roadway or railroad project conducted by a public transportation entity that has determined a preferred alternative or reached an equivalent milestone shall be subject to the requirements of this ordinance as follows:

   i. A major development that reached a preferred alternative or equivalent milestone prior to March 2, 2021, is subject to the requirements of this ordinance in effect on March 1, 2021; and

ii. A major development that reached a preferred alternative or equivalent milestone on or after March 2, 2021, is subject to the requirements of this ordinance in effect on the date the preferred alternative or equivalent milestone is reached.

5. Should a public transportation entity initiate a substantial change to a major development that had previously reached a preferred alternative or equivalent milestone, the major development shall instead be subject to the requirements of this ordinance in effect when the amended milestone is reached.

6. Applicability of this ordinance to major developments shall comply with last amended N.J.A.C. 7:8-1.6, incorporated herein by reference.

D. Maintenance Requirement Applicability to the Stormwater Management Measures Prior Constructed Stormwater Management Measures

Under the authorization by the conditions in Part V.F.4.a of municipality's Tier A Municipal Stormwater General Permit, the maintenance requirement in Section X.B.6 through 9 shall be also applicable to stormwater management measures constructed after February 7, 1984.

E. Compatibility with Other Permit and Ordinance Requirements

Development approvals issued pursuant to this ordinance are to be considered an integral part of development approvals and do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act, or ordinance. In their interpretation and application, the provisions of this ordinance shall be held to be the minimum requirements for the promotion of the public health, safety, and general welfare.

This ordinance is not intended to interfere with, abrogate, or annul any other ordinances, rule or regulation, statute, or other provision of law except that, where any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule or regulation, or other provision of law, the more restrictive provisions or higher standards shall control.

Section II. Definitions:

For the purpose of this ordinance, the following terms, phrases, words and their derivations shall have the meanings stated herein unless their use in the text of this ordinance clearly demonstrates a different meaning. When not inconsistent with the context, words used in the present tense include the future, words used in the plural number include the singular number, and words used in the singular number include the plural number. The word "shall" is always mandatory and not merely directory. The definitions used in this ordinance shall be the same as the last amended Stormwater Management Rules at N.J.A.C. 7:8-1.2, incorporated herein by reference.

Section III. Design and Performance Standards for Stormwater Management Measures:

This section establishes design and performance standards for stormwater management measures for major development intended to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving water bodies. Design and performance standards for stormwater management measures shall comply with last amended N.J.A.C. 7:8-5, incorporated herein by reference.

Section IV. Solids and Floatable Materials Control Standards:

A. Site design features identified under Section III above, or alternative designs in accordance with Section III above, to prevent discharge of trash and debris from drainage systems shall comply with the following standard to control passage of solid and floatable materials through storm drain inlets. For purposes of this subsection, "solid and floatable materials" means sediment, debris, trash, and other floating, suspended, or settleable solids. For exemptions to this standard see A.2 below.

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

   i. The New Jersey Department of Transportation (NJDOT) bicycle safe grate, which is described in Chapter 2.4 of the NJDOT Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines; or
   ii. A different grate, if each individual clear space in that grate has an area of no more than seven (7.0) square inches, or is no greater than 0.5 inches across the smallest dimension. Note that the Residential Site Improvement Standards at N.J.A.C. 5:21 include requirements for bicycle safe grates.

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

   iii. For curb-opening inlets, including curb-opening inlets in combination inlets, the clear space in that curb opening, or each individual clear space if the curb opening has two or more clear spaces, shall have an area of no more than seven (7.0) square inches, or be no greater than two (2.0) inches across the smallest dimension.

2. The standard in A.1. above does not apply:

   i. Where each individual clear space in the curb opening in existing curb-opening inlet does not have an area of more than nine (9.0) square inches;
   ii. Where the municipality agrees that the standards would cause inadequate hydraulic performance that could not practicably be overcome by using additional or larger storm drain inlets;

iii. Where flows from the water quality design storm as specified in the last amended Stormwater Management rules at N.J.A.C. 7:8 et seq. are conveyed through any device (e.g., end of pipe netting facility, manufactured treatment device, or a catch basin hood) that is designed, at a minimum, to prevent delivery of all solid and floatable materials that could not pass through one of the following:

   a. A rectangular space four and five-eighths (4.625) inches long and one and one-half (1.5) inches wide (this option does not apply for outfall netting facilities); or
   b. A bar screen having a bar spacing of 0.5 inches.

   Note that these exemptions do not authorize any infringement of requirements in the Residential Site Improvement Standards for bicycle safe grates in new residential development (N.J.A.C. 5:21-4.18(b)2 and 7.4(b)1).

iv. Where flows are conveyed through a trash rack that has parallel bars with one-inch (1 inch) spacing between the bars, to the elevation of the Water Quality Design Storm as specified in N.J.A.C. 7:8; or

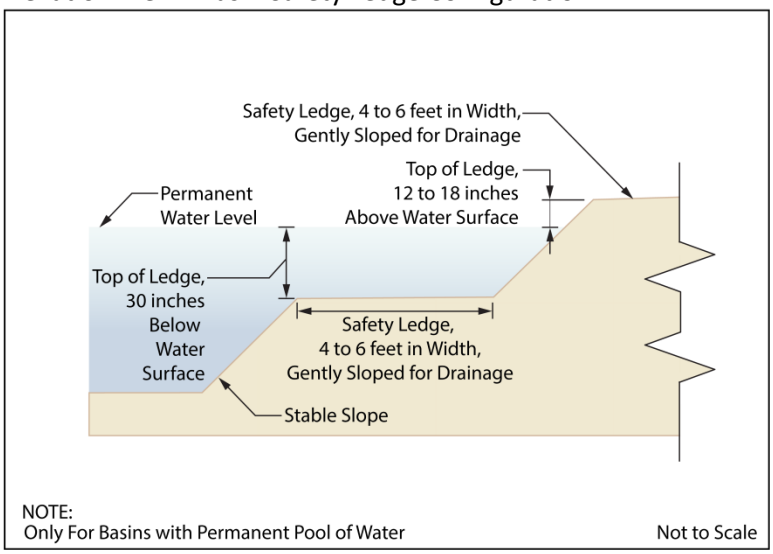
v. Where the New Jersey Department of Environmental Protection determines, pursuant to the New Jersey Register of Historic Places Rules at N.J.A.C. 7:4-7.2(c), that action to meet this standard is an undertaking that constitutes an encroachment or will damage or destroy the New Jersey Register listed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

Section V. Safety Standards for Stormwater Management Basins:

A. This section sets forth requirements to protect public safety through the proper design and operation of stormwater management basins. This section applies to any new stormwater management basin. Safety standards for stormwater management measures shall comply with last amended N.J.A.C. 7:8-6, incorporated herein by reference.

B. Safety Ledge Illustration

Elevation View –Basin Safety Ledge Configuration



Section VI. Requirements for a Site Development Stormwater Plan:

A. Submission of Site Development Stormwater Plan

1. Whenever an applicant seeks municipal approval of a development subject to this ordinance, the applicant shall submit all of the required components of the Checklist for the Site Development Stormwater Plan at Section VI.C below as part of the submission of the application for approval.

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

3. The applicant shall submit [*specify number*] copies of the materials listed in the checklist for site development stormwater plans in accordance with Section VI.C of this ordinance.

B. Site Development Stormwater Plan Approval

The applicant's Site Development project shall be reviewed as a part of the review process by the municipal board or official from which municipal approval is sought. That municipal board or official shall consult the municipality's review engineer to determine if all of the checklist requirements have been satisfied and to determine if the project meets the standards set forth in this ordinance.

C. Submission of Site Development Stormwater Plan

The following information shall be required:

1. Topographic Base Map

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

2. Environmental Site Analysis

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

3. Project Description and Site Plans

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

4. Land Use Planning and Source Control Plan

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

5. Stormwater Management Facilities Map

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

i. Total area to be disturbed, paved or built upon, proposed surface contours, land area to be occupied by the stormwater management facilities and the type of vegetation thereon, and details of the proposed plan to control and dispose of stormwater.
ii. Details of all stormwater management facility designs, during and after construction, including discharge provisions, discharge capacity for each outlet at different levels of detention and emergency spillway provisions with maximum discharge capacity of each spillway.

6. Calculations

i. Comprehensive hydrologic and hydraulic design calculations for the pre-development and post-development conditions for the design storms specified in Section III of this ordinance.
ii. A soil report providing the information necessary to determine the suitability and distribution of soil present at the development, as explained in Chapter 12 of the BMP Manual shall be submitted.

7. Maintenance and Repair Plan

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

8. Waiver from Submission Requirements

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

Section VII. Maintenance and Repair:

A. Applicability

Projects subject to review as in Section I.C of this ordinance shall comply with the requirements of Section VII.B and VII.C.

B. General Maintenance

1. Maintenance for stormwater management measures shall comply with last amended N.J.A.C. 7:8-5.8, incorporated herein by reference.

2. The following requirements of N.J.A.C. 7:8-5.8 do not apply to stormwater management facilities that are dedicated to and accepted by the municipality or another governmental agency, subject to all applicable municipal stormwater general permit conditions, as issued by the Department:

i. If the maintenance plan identifies a person other than the property owner (for example, a developer, a public agency or homeowners' association) as having

the responsibility for maintenance, the plan shall include documentation of such person's or entity's agreement to assume this responsibility, or of the owner's obligation to dedicate a stormwater management facility to such person under an applicable ordinance or regulation; and

ii. Responsibility for maintenance shall not be assigned or transferred to the owner or tenant of an individual property in a residential development or project, unless such owner or tenant owns or leases the entire residential development or project. The individual property owner may be assigned incidental tasks, such as weeding of a green infrastructure BMP, provided the individual agrees to assume these tasks; however, the individual cannot be legally responsible for all of the maintenance required.

Note: It may be appropriate to delete requirements in the maintenance and repair plan that are not applicable if the ordinance requires the facility to be dedicated to the municipality. If the municipality does not want to take this responsibility, the ordinance should require the posting of a two year maintenance guarantee in accordance with N.J.S.A. 40:55D-53. Maintenance and inspection guidance can be found on the Department's website at:

https://www.njstormwater.org/maintenance_guidance.htm.

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

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

Section VIII. Variance from the design and performance standards for stormwater management measures {*Optional Section if the municipality wants to grant variance to major developments*)

A. A variance from the design and performance standards for stormwater management measures set forth in this ordinance and the municipal stormwater management plan, provided the municipal stormwater management plan includes a mitigation plan or a mitigation plan in accordance with the conditions in this Section:

1. The applicant demonstrates that it is technically impracticable to meet any one or more of the design and performance standards on-site. For the purposes of this analysis, technical impracticability exists only when the design and performance standard cannot be met for engineering, environmental, or safety reasons. The

approval of a variance shall apply to an individual drainage area and design and performance standard and shall not apply to an entire site or project, unless an applicant provides the required analysis for each drainage area within the site and each design and performance standard;

2. The applicant demonstrates that the proposed design achieves the maximum possible compliance with the design and performance standards on-site; and

3. A mitigation project in accordance with the following is implemented.

   i. The mitigation project may be selected from the municipal mitigation plan or may be proposed by the applicant, provided it meets the criteria in the municipal mitigation plan.
   ii. The mitigation project shall be approved no later than preliminary or final site plan approval of the major development.
   iii. The mitigation project shall be located in the same HUC 14 as the area of the major development subject to the variance.
   iv. The mitigation project shall be constructed prior to, or concurrently with, the major development.
   v. The mitigation project shall comply with the green infrastructure standards at Section IV.O.
   vi. If the variance that resulted in the mitigation project being required is from the green infrastructure standards at Section IV.O, then the mitigation project must use green infrastructure BMPs in Table 1, and/or an alternative stormwater management measure approved in accordance with Section IV.G that meets the definition of green infrastructure to manage an equivalent or greater area of impervious surface and an equivalent or greater area of motor vehicle surface as the area of the major development subject to the variance. Grass swales and vegetative filter strips may only be used in the mitigation project if the proposed project additionally includes a green infrastructure BMP other than a grass swale or vegetative filter strip. The green infrastructure used in the mitigation project must be sized to manage the water quality design storm, as defined at Section IV.Q, at a minimum, and is subject to the applicable contributory drainage area limitation specified at Section IV.Q or Section IV.O, as applicable.
   vii. A variance from the groundwater recharge standards at Section IV.P may be granted if one of the following is met:
      (1) The average annual groundwater recharge provided by the mitigation project must equal or exceed the average annual groundwater recharge deficit resulting from granting the variance for the major development; or
      (2) Runoff infiltrated during the two-year storm from the mitigation project must equal or exceed the deficit resulting from granting the variance from the required infiltration of the increase in runoff volume from pre-construction to post-construction from the major development.
   viii. A variance from the stormwater runoff quality standards at Section IV.Q may be granted if the following are met:
      (1) The total drainage area of motor vehicle surface managed by the mitigation project(s) must equal or exceed the drainage area of the area of the major development subject to the variance and must provide sufficient TSS

removal to equal or exceed the deficit resulting from granting the variance for the major development; and

(2) The mitigation project must remove nutrients to the maximum extent feasible in accordance with Section IV.Q.

ix. A variance from the stormwater runoff quantity standards at Section IV.Q may be granted if the following are met:

(1) The applicant demonstrates, through hydrologic and hydraulic analysis, including the effects of the mitigation project, that the variance will not result in increased flooding damage below each point of discharge of the major development;

(2) The mitigation project discharges to the same watercourse and is located upstream of the major development subject to the variance; and

(3) The mitigation project provides peak flow rate attenuation in accordance with Section IV.Q for an equivalent or greater area than the area of the major development subject to the variance. For the purposes of this demonstration, equivalent includes both size of the area and percentage of impervious surface and/or motor vehicle surface.

x. The applicant or the entity assuming maintenance responsibility for the associated major development shall be responsible for preventive and corrective maintenance (including replacement) of the mitigation project and shall be identified as such in the maintenance plan established in accordance with Section X. This responsibility is not transferable to any entity other than a public agency, in which case, a written agreement with that public agency must be submitted to the review agency.

B. Any approved variance shall be submitted by the municipality to the county review agency and the New Jersey Department of Environmental Protection, by way of a written report describing the variance, as well as the required mitigation, within 30 days of the approval.

Section VIII. {*Section IX if the option Section VIII above is incorporated*} Penalties:

Any person(s) who erects, constructs, alters, repairs, converts, maintains, or uses any building, structure or land in violation of this ordinance shall be subject to the following penalties:

{*Municipality to specify}*

Section IX. {*Section X if the optional Section VIII above is incorporated*} Severability:

Each section, subsection, paragraph, subparagraph, clause, sentence, and phrase of this ordinance is declared to be an independent section, subsection, sentence, clause and phrase, and the finding or holding of any such portion of this ordinance to be unconstitutional, void, or ineffective for any cause, or reason, shall not affect any other portion of this ordinance.

Section X. {*Section XI if the optional Section VIII above is incorporated*} Effective Date:

This ordinance shall be in full force and effect from and after its adoption and any publication as required by law.

ALL OF WHICH IS ADOPTED THIS _____ day of _____, 20___, by the {insert name of municipal representative, office, board or organization} of {insert name of municipality}.