Stormwater Management Plan Update

August 11, 2025

Project Site:
Township of Bloomfield
1 Municipal Plaza
Bloomfield, New Jersey 07003
NJG 0150096
PI 468123

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Report Date

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1.0 INTRODUCTION

Remington & Vernick Engineers (RVE) is pleased to present this Municipal Stormwater Management Plan (MSWMP) in accordance with the Stormwater Management Rules (Rules, New Jersey Administrative Code (N.J.A.C.) 7:8). This MSWMP documents the strategy for the Township of Bloomfield (Township) to address stormwater-related impacts and updates the Municipal Storm Water Management Plan dated April 2006, authored by PMK Engineers. The creation of this plan is required by the Municipal Stormwater Regulations (N.J.A.C. 7:14A-25) and contains the required elements described in the Rules. The plan addresses groundwater recharge, stormwater quantity, and stormwater quality impacts by incorporating stormwater design and performance standards for new major development, defined as projects that disturb one or more acres of land or increasing impervious surface by one-quarter acre or more. These standards are intended to minimize the adverse impact of stormwater runoff on water quality and water quantity and the loss of groundwater recharge that provides baseflow in receiving water bodies. The plan describes long-term operation and maintenance measures for existing and future stormwater facilities. The MSWMP is supported by the study entitled "Bloomfield Stormwater Drainage Study, Stormwater Modeling & Conceptual Recommendations, Remington & Vernick Engineers, May 2024 (Drainage Study)" provided in **Appendix A**.

The total land area of the Township is 5.33 square miles. According to the 2002 MP and the recent 2025 MP, the Township is fully developed; therefore, a "build-out" analysis is not required. However, the plan addresses the review and update of existing ordinances, the 2002 MP, and other planning documents to allow for project designs that include minimal 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.

2.0 GOALS

This **MSWMP is** directed towards improvement of water quality in the Township. The goals of this **MSWMP** are to:

- Reduce soil erosion from any development or construction project,
- Reduce flood damage, including damage to life and property; minimize, to the extent practical, any increase in stormwater runoff from any new development,
- 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,
- Protect public safety through the proper design and operation of stormwater basins, increase public awareness of stormwater management through public education, and
- Prioritize path forward mitigation pans and stormwater facility asset upgrades.

Within the Township's MSWMP, the following goals relative to stormwater management were described as preserving and upgrading the existing utility infrastructure including stormwater management (Goal Numbers 1 through 18 of MP). To achieve these goals, this plan outlines specific stormwater design and performance standards for new development and redevelopment. Additionally, the plan proposes stormwater management controls to address impacts from existing development. Preventative and corrective maintenance strategies are included in the plan to ensure long-term effectiveness of stormwater management facilities. The plan also outlines safety standards for stormwater infrastructure to be implemented to protect public safety.

Goals 1 through 18 of the MP follows:

1. Follow appropriate regulations, i.e., N.J.A.C. 7:8 and N.J.A.C. 7:14A-25, et seq. for any new construction in the floodplain. The Township's 2025 Supplemental Questionnaire indicated only one (1) Major Development Project, 1552 Broad Street, which disturbed 0.35 acres, and received appropriate variances MS4 Permit, Part IV.B.4.b work out of floodplain area. The Township indicated that no new construction occurred or is planned for the floodplain areas in the municipality in 2025. A Major Development project is planned for 675-699 Bloomfield Avenue, 30-40 State Street, Block 244, Lots 10, 15, 19, 42, and 46, but lots are outside the 100-year floodplain. The lots are in the vicinity of Toney's Brook and Stream Encroachment Permits have been applied for by the developer.
2. Investigate and actively seek all available federal, state, and county funding to buy flood impacted properties. The Township received a Stormwater Assistance Grant from the state in 2023, dedicated to stormwater opportunity planning and analysis. These funds were used to update and digitize stormwater asset mapping with extensive land surveying, conducted by RVE. Funding was used to identify existing stormwater assets and related stormwater concerns highlighted in this MSWMP, identifying areas subject to excessive stormwater flows/flooding. To this end, funding should continue to be pursued, and a listing of available federal, state, and local funding sources is provided in **Appendix B.** The Township has initiated applications for these funds.
3. Continue to install gabion walls to prevent bank erosion along the Third River as has been done between Baldwin Street and Hoover Avenue to prevent continuous erosion along the private properties that face Broad Street. Similarly, the Township plans to stabilize the stream bank along the Second and Third Rivers and Wigwam Brook. To this end the Township has initiated a program to inspect the 137 outfalls in the Township and gabion walls, and the Township department of Public Works has completed work maintenance and repair activities on a few of them. The remaining work is being initiated by the Township through private contractors for completion by December 31, 2025. A Scope is provided in **Appendix D.**
4. Perform a feasibility study on the storm sewer system to determine the best solution to reduce an alleviate flooding on Ampere Parkway east to the Newark border. There is a high-water table in this area: many homes have sump pumps that are constantly running;

and the Township is currently cleaning out the existing sewers on a routine basis. To these ends, the Township completed the Drainage Study in 2024 (**Appendix A**) on the storm sewer system and provided findings, conclusions, and recommendations going forward are provided in Section 6 of the MSWMP. These recommendations included prioritizing improvements to the storm sewer on Ampere Parkway east to the Newark border to alleviate flooding.

5. Conduct outreach to property owners in flood-prone areas that are repeatedly impacted by flood waters to providing information on mitigation measures. To this end, a listing of locations in the flood-prone areas is provided in **Appendix E**. The Township will be providing notification/outreach to these properties this year.

6. Develop a Debris Management Plan implementing a pre-storm planning process providing information on debris clearing and collection. Location of where materials will be stored, and a health and safety plan. To these ends, the Township debris management plan is part of best management practices (BMPs) and the Stormwater Pollution Prevention Plan (SPPP) implemented by the Township.

7. Continue river de-snagging and maintenance with local, County and State Resources. To conclude, the Township de-snagging and stream maintenance is part of best management practices (BMPs) and the SPPP implemented by the Township. The Essex County Parks Department County removes debris from the trash net on the Second River.

8. Adopt a Flood Damage Prevention Ordinance (FDPO) consistent with the New Jersey department of Environmental Protection's (NJDEP's) model template ordinance. The FDPO applies to development in the "special flood hazard area," which is the FEMA 100-year floodplain. Without an FDPO in place, the Township cannot participate in the National Flood Insurance Program (NFIP) and residents are not eligible to obtain flood insurance. To this end a FDPO template has been provided in **Appendix E**. The Township will pass an FDPO by December 31, 2025.

9. Update the Township Floodplain Map to reflect promulgated Inland Flood Protection Rules and develop a GIS inventory of all properties encumbered by the floodplain. Provide certified mail notice to all property owners within the floodplain so that they are aware of any risk and/or mitigation strategies. The Township should develop educational programs to inform residents of public health and safety risks associated with flooding as well as

where it occurs in the Township. To these ends, a Drainage and flood plain map were updated on January 1, 2024. In addition, to this end, a listing of properties in the flood-prone areas is provided in **Appendix E**. The Township will be providing notification/outreach to these properties this year.

10. Develop a Flood Risk Assessment and Mitigation Study to identify areas of greatest risk and benefit from both local and regional mitigation projects. To this end, the Drainage Study provided in **Appendix A** identifies identify areas of greatest risk and benefit from both local and regional mitigation projects.

11. A Stormwater Control Ordinance (SCO) was adopted in September 24, 2024, Ordinance, 2-46-9-23-24 Amend Chapter 494 Stormwater Control, File Path: https://www.bloomfieldtwpnj.com/DocumentCenter/View/14647/ORD-24-46-9-23-24-Amend-Chapter-494-Stormwater-Control. Routinely review and re-adopt the Township's SCO to assure NJDEP Best Management Practices (BMPs) are continuously implemented as well as SCO requirements for Major Development in compliance with all future amendments to N.J.A.C. 7:8.

12. Develop an Asset Management Study for existing municipal storm sewer capacity, including a municipal infrastructure capital improvement plan to reduce anticipated flood impacts supporting future planned development. To these ends, an Asset Management Study is in progress.

13. Continue to implement strategies identified in the Essex County All Municipalities Mitigation Plan by seeking grant opportunities to implement identified strategies.

14. Support NJPDES MS4 Tier A Permit planning effort compliance with routine review and revision of the MSWMP as part of all Master Plan updates and/or re-examinations. To these ends, NJPDES Permit Annual reports and Supplemental Questionnaires are routinely reviewed by the Township engineering staff and DPW, and area of concern identified are addressed. The MSWMP has factored the MP findings and this MSWMP updates the prior plan dated 2006.

15. Develop a Stormwater Mitigation Plan in accordance with N.J.A.C. 7:8-4.2 (c)11 that identifies what measures are necessary for potential mitigation projects, and/or criteria to evaluate mitigation projects that can be used to offset the deficit created by granting a

variance in accordance with N.J.A.C. 7:8-4.6. To this end, the Drainage study provided findings, conclusions, and recommendations and criteria to evaluate mitigation projects that can be used to offset the deficit created by granting a variance in accordance with N.J.A.C. 7:8-4.6. This MSWMP fulfills this goal.

16. Review and adopt NJDEP's New Jersey Model Code Coordinated Ordinances to ensure continued compliance with National Flood Insurance Program (NFIP) requirements. To this end, NFIP requirements are continuously reviewed.

17. Investigate the Meadowbrook sewer located and operated by three (3) municipalities, Bloomfield, Newark, and Bellville, to ensure its functioning properly. To these ends, the Drainage Study identified Meadowbrook sewer for upgrade, and the Township is contacting the municipal stakeholders to implement coordinated upgrade efforts going forward. This includes coordination and reviewing all storm water initiatives with project stakeholders, including the Township of Bloomfield Flood Mitigation Advisory Committee and the Environmental Commission.

18. **Continue Township programs for upgrading and improving existing storm drainage systems, including increasing pipe sizes, and adding additional catch basins to help minimize local flooding problem areas. These improvements are on-going and have been incorporated into the Township Roadway Programs when they occur in areas of low-lying flooding or areas where there is an insufficient amount of catch basins to capture overland runoff.**

3.0 STORMWATER DISCUSSION

3.0 HYDROLOGIC CYCLE

The hydrologic cycle or water cycle (**Figure 1**) is the continuous circulation of water between the ocean, atmosphere, and land. Figure 1, entitled "Groundwater Recharge in Hydraulic Cycles," describes this system in which, water stored in oceans, depressions, streams, rivers, waterbodies, vegetation and even land surface, continuously evaporates due to solar energy. The driving force of this natural cycle is the sun. This water vapor then condenses in the atmosphere to form clouds and fog. After water condenses, it precipitates, usually in the form of rain or snow, onto land surfaces and waterbodies. Precipitation falling on land surfaces is often intercepted by vegetation. Plants and trees transpire water vapor back into the atmosphere, as well as aid in the infiltration of water into the soil. The vaporization of water through transpiration and evaporation is called evapotranspiration. Infiltrated water percolates through the soil as groundwater, while surface water flows overland. Groundwater and surface water flow to major waterbodies and eventually flow to the Earth's seas and oceans. This constant process of evapotranspiration, condensation, precipitation, and infiltration comprises the hydrologic cycle.

3.1 STORMWATER IMPACTS

Land development can dramatically alter the hydrologic cycle of a site, and an entire watershed. Prior to development, native vegetation can either directly intercept precipitation or draw that portion that has infiltrated into the ground and return it to the atmosphere through evapotranspiration. Development can remove this beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates. Clearing and grading a site can remove depressions that store rainfall. Construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site.

Impervious areas that are connected to each other through gutters, channels, and storm sewers can transport runoff more quickly than natural areas. This shortening of the transport or travel time quickens the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak faster and higher than natural conditions. These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel. Filtration of runoff and removal of pollutants by surface and channel vegetation is

eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease opportunities for infiltration which, in turn, reduces stream base flow and groundwater recharge. Reduced base flows and increased peak flows produce greater fluctuations between normal and storm flow rates, which can increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Finally, erosion and sedimentation can destroy habitat from which some species cannot adapt.

Water quantity impacts combined with land development often adversely impact stormwater quality. Impervious surfaces and areas that have been cleared, created by development collect pollutants from the atmosphere, fertilizers and pesticides, animal wastes, as well as pollutants from motor vehicle usage. Pollutants such as metals, suspended solids, hydrocarbons, pathogens, and nutrients collect and concentrate on impervious surfaces. During storm events, these pollutants are washed directly into municipal sewer systems.

In addition to chemical and biological pollution, thermal pollution can occur when water travels over heated impervious surfaces or collects in stormwater impoundments that are not shielded from the sun. Thermal pollution can affect aquatic habitats, adversely impacting cold-water fish species such as trout. Removal of shade trees and stabilizing vegetation from stream banks also contributes to thermal pollution.

Proper stormwater management will help mitigate the negative impact of land development and its effect on stormwater. This MSWMP outlines the Township's plan to improve stormwater quality, decrease stormwater quantity, and increase groundwater recharge. By managing stormwater, the Township will improve the quality of aquatic ecosystems and restore some of the natural balance to the environment.

4.0 BACKGROUND

4.0 TOWNSHIP CHARACTERISTICS

The Township land area footprint encompasses a 5.33 square mile area in Essex County, New Jersey and contains:

- 77.39 Miles of roadway surface maintained by the Township,
- 13.77 Miles of roadway surface maintained by Essex County, and
- 4.23 miles of roadway surface maintained by the New Jersey Turnpike Authority.

According to the 2025 MP, the Township is characterized as a mature suburban community with a development pattern that is heavily influenced by its geography and location in northeastern Essex County. Several river and stream corridors traverse the Township, including Third River, Second River, Toney's Brook, and Wigwam Brook. The topography throughout the Township is characterized in the MP as 'gently rolling' with level areas and areas of slopes greater than ten (10) percent. **Figure 2,** entitled "Township Waterways," shows a plan of the Township, waterways identified by name, locations, and receiving waters. **Figure 3,** entitled "USGS Topographic Maps," provides a United States Geologic Survey (USGS) Topographic Map, Orangs Quadrangle, depicting the Township boundary on USGS 7.5-minute series quadrangle maps, dated 1981.

4.0.1 Population and Housing Trends

According to U.S. *Census Bureau data,* the population of the Township was 53,105 persons in 2020, 47,683 persons in 2000, a 17.9% increase in population from 45,061 persons in 1990. According to the 2025 MP, the Township is a densely developed community with a stable population and little remaining vacant land. The number of housing units increased only slightly from 1990 to 2000. According to U.S. Census Bureau data, there were 19,508 housing units in the Township in 2000, 21,713 housing units in 2020, an approximate 12.5% increase from 19,293 housing units in 1990.

4.0.2 Land Use

According to the MP, residential development comprises 92.8% of the Township. Commercial development comprises 5.5% and industrial uses comprise 0.4% of the Township. Only 1.3% of the Township's parcels are vacant. The exact acreage of vacant land is not provided in the MP.

4.0.3 Water and Sewer Service

According to 2025 MP, the Township owns and operates its potable water distribution system. The Township also owns and maintains its sanitary sewer collection system. Sewage treatment is conducted at the Passaic Valley Sewerage Commission in Newark, New Jersey. The discharge is released to Newark Bay. No septic tanks remain in the Township.

4.0.4 State *Development and Redevelopment Plan*

The purpose of the State Development and Redevelopment Plan (State Plan) is to coordinate planning activities and establish State-wide planning objectives in the areas of land use, housing, economic development, transportation, natural resource conservation, agriculture and farmland retention, recreation, urban and suburban redevelopment, historic preservation, public facilities and services, and intergovernmental coordination. The State Plan designates planning areas that share common conditions regarding development and environmental features:

- Areas for Growth: Metropolitan Planning Areas (PA-1), Suburban Planning Areas (PA-2), and Designated Centers in any planning area.
- Areas for Limited Growth: Fringe Planning Areas (PA-3), Rural Planning Areas (PA-4), and Environmentally Sensitive Planning Areas (PA-5). In these planning areas, planning should promote a balance of conservation and limited growth-environmental constraints affect development and preservation is encouraged in large contiguous tracts.
- Areas for Conservation: Fringe Planning Area (PA-3), Rural Planning Areas (PA-4), and Environmentally Sensitive Planning Areas (PA-5).

According to NJDEP iMap, the entire Township is in the Metropolitan Planning Area, PA-1.

4.0.5 Brownfields Sites and Known Contaminated Sites

A brownfield is defined under NJ state law New Jersey Statutes Annotated (N.J.S.A.) ***(N.J.S.A. 58:10B-23. d)*** as "any former or current commercial or industrial site that is currently vacant or underutilized and on which there has been, or there is suspected to have been, a discharge of a contaminant." According to the 2025 MP, there are four (4) major brownfield sites in the Township:

1. Westinghouse Electric Company at 1 Westinghouse Plaza
2. Ray Lar Tool and Manufacturing Company at 179 Walnut Street
3. Scientific Glass at 735 Broad Street off Lion Gate Drive
4. Semonian Service Station at 200 Darling Avenue

The ***Known Contaminated Sites (KCS) according to the NJDEP KKS in Bloomfield, New Jersey, Inactive Sites*** is a municipal listing of sites where contamination of soil and/or ground water is confirmed at levels greater than the applicable cleanup criteria or standards. Sites with a confirmed on-site source(s) of contamination, as well as some sites where the source(s) of contamination is unknown, are included in the list. In addition, the report lists sites where the completed remediation requires engineering and/ or institutional controls. The **KCS Report** indicates that there are forty-nine (49) sites with on-site sources of contamination, and six (6) closed inactive sites with restrictions in the Township. These sites include Exon 313539 Belleville Avenue, Glen Ridge Radium Site (partial), North America Philips Lighting, and Scientific Glass.

4.1 WATERWAYS

The following watercourses are in or immediately adjacent to the Township:

- Clarks (Yantacaw) Brook,
- Second River (a portion of which is locally known as Toney's Brook),
- An unnamed tributary to Springer Brook,
- Third River (and an unnamed tributary), and
- Wigwam Brook.

Clarks Pond, a surface water body is also located in the Township. Figure 2, Township, and its Waterways, illustrates the waterways and Clarks Pond in the Township. The Township is located within Watershed Management Area 4 (WMA #4), subtitled Lower Passaic and Saddle. A Watershed Management Area is subdivided into smaller drainage area units which are defined as HUC-14s. The term "HUC-14" is from the hydrologic unit code system developed by the United States Geological Service for delineating and identifying drainage areas. The system starts with the largest possible drainage areas and progressively smaller subdivisions of the drainage area are delineated and numbered in a nested fashion. A drainage area with a hydrologic unit code (HUC) designation with 14 numbers, or HUC-14, is one of several sub-watersheds of a larger watershed. There are portions of two (2) HUC-14s within the Township:

- 02030103150010 -Third River
- 02030103150020 - Second River

Figure 4, entitled "Hydrologic Units (HUC-14)," illustrates the HUC-14 units within the Township. HUC-14 refers to a specific type of hydrologic unit code, especially relevant in the context of watershed management in New Jersey. All the waterways are classified as Fresh Water 2, Non-Trout, Saline Estuarine 2 (FW2-NT / SE2 (C-2)). FW2 is the general surface water classification applied to those fresh waters that are not designated as FW1 or Pinelands waters. NT (non-trout) means fresh waters that have not been designated in N.J.A.C. 7:9B-1.15(b) through (h) as trout production or trout maintenance waters. SE2 is the general surface water classification applied to saline waters of estuaries, where the designated uses are maintenance, migration, and propagation of the natural and established biota; migration of diadromous fish; maintenance of wildlife; secondary contact recreation; and any other reasonable uses. C-2 (Category Two) waters, means those waters not designated as Category One.

4.2 WATER QUALITY

The NJDEP has established an Ambient Biomonitoring Network (AMNET) to document the health of the state's waterways. There are over 800 AMNET sites throughout the state of New Jersey. These sites are sampled for benthic macroinvertebrates by NJDEP on a five-year cycle. Streams are classified as non-impaired, moderately impaired, or severely

impaired based on AMNET data. The data is used to generate a New Jersey Impairment Score (NJIS), which is based on several biometrics related to benthic macroinvertebrate community dynamics.

AMNET information was available only for the Second and Third Rivers. The following are the watercourses with their AMNET testing location and classification:

- Second River, McCarter Highway, Newark/Belleville - Moderately Impaired (AMNET Station AN0293),
- Third River, West Passaic Avenue, Bloomfield - Moderately Impaired (AMNET Station AN0292A), and
- Third River, Kingland Avenue, Nutley - Moderately Impaired (AMNET Station AN0292).

In addition to the AMNET data, the NJDEP and other regulatory agencies collect biological and chemical water quality data on the streams in the state. The New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d)) (Integrated List) is required by the federal Clean Water Act to be prepared biennially and is a valuable source of water quality information. This combined report presents the extent to which New Jersey waters are attaining water quality standards identifying waters that are impaired. The Integrated List is composed of the following four (4) Sub lists:

- Sub list 1: Attaining the water quality standard and no use is threatened.
- Sub list 3: Insufficient or no data and information to determine if any designated use is threatened.
- Sub list 4: Impaired or threatened for one or more designated uses but does not require the development of a Total Maximum Daily Load (TMDL).
- Sub list 5: The water quality standard is not attained. The waterway is impaired or threatened for one or more designated uses by a pollutant(s) requiring a TMDL.

A TMDL is the amount of a pollutant that can be accepted by a waterbody without causing an exceedance of water quality standards or interfering with the ability to use a waterbody for one

or more of its designated uses. The allowable load is allocated to the various sources of the pollutant, such as stormwater and wastewater discharges, which require a New Jersey Pollutant Discharge Elimination System (NJPDES) permit to discharge, and nonpoint source, which includes stormwater runoff from agricultural areas and residential areas, along with a margin of safety.

Provisions may also be made for future sources in the form of reserve capacity. An implementation plan is developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies may include improved stormwater treatment plants, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems, and other BMPs.

The following are the watercourses with their locations, sub list, and constituents:

- Second River at Union Avenue in Newark is on Sub list 1 for dissolved oxygen, temperature, and unionized ammonia and Sub list 5 for phosphorus, fecal coliform, and pH.
- Second River at McCarter Highway in Belleville is on Sub list 5 for benthic macroinvertebrates.
- Third River at West Passaic Avenue in Bloomfield is on Sub list 3 for benthic macroinvertebrates.
- Third River at Kingland Avenue in Clifton is on Sub list 5 for benthic macroinvertebrates.

No data is available for the other waterways. A representative of the firm authoring the 2025 PMK MSWMP spoke with Kimberly Cenno, Supervising Environmental Specialist of NJDEP Bureau of Environmental Analysis and Restoration regarding the Sub list 5 listings of the Second and Third Rivers. Ms. Cenno indicated that Second River at Union Avenue in Newark is impaired due to a combined sewer overflow, which is scheduled to be eliminated in 2006. Therefore, establishment of a TMDL is not the appropriate response for this impairment, and no TMDL will be developed. Additionally, Ms. Cenno indicated that the NJDEP had not yet begun to develop TMDLs for biological impairments (i.e., benthic macroinvertebrates). Ms. Cenno estimated that TMDLs addressing biological impairments would be developed around 2007 or 2008. However, to date, no TMDLs for Dissolved Oxygen, Mercury, Fecal Coliforms, or Total Phosphorous have been developed for the Second and Third Rivers in Bloomfield, New Jersey.

4.3 WATER QUANTITY

According to Township stormwater professionals, the following areas experience frequent or prolonged flooding.

1. Ampere Parkway (The Drainage Study indicated that Ampere Parkway a has a "saddle" or low point, in between Chester and Abington Avenues),
2. Brookside Park in the vicinity of Hoover Avenue,
3. Newark Avenue,
4. Glenwood Avenue (Llewellyn Avenue Area around Watsessing Park, Prospect Street, Maolis Avenue, Evergreen Avenue, and Llewellyn Avenue), and
5. Lakewood Terrace (areas along the Third River north of Clark Place).

A summary of these and other most severely impacted streets and areas in the Township is provided in **Table 1**.

4.4 GROUNDWATER RECHARGE

According to NJDEP digital Geographic Information System (GIS) data, there are no mapped groundwater recharge areas in the Township as noted in **Figure 5**, entitled "Ground Water Recharge Areas."

4.5 WELLHEAD PROTECTION AREAS

Public community water systems either pipe water for human consumption to at least 15 service connections used by year-round residents or regularly serve at least 25 year-round residents (e.g., municipality or subdivision). There is one (1) mapped public community water supply well and associated wellhead protection areas located in the Township. Additionally, wellhead protection areas from neighboring municipalities extend into the Township. **Figure 6** entitled "Wellhead Protection Areas," shows areas for this designation in the Township. Well Head Protection Areas (WHPAs), are both areas modeled around an unconfined Public Community Water Supply (PCWS) well in New Jersey that delineates the horizontal extent of groundwater captured by a well pumping at a specific rate over two (2) -, five (5) -, and twelve-year periods of time for unconfined wells and a fifty ft radius delineated around each confined PCWS well (This

corresponds to the water purveyor controlled wellhead area as defined in the Safe Drinking Water Regulations (see N.J.A.C.7:10-11.7 (b)1)).

5.0 BLOOMFIELD STORMWATER DRAINAGE STUDY (STORMWATER MODELING & CONCEPTUAL RECOMMENDATIONS)

The Township will adopt the design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5 to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving water bodies. The design and performance standards include the language for maintenance of stormwater management measures consistent with the Rules at N.J.A.C. 7:8-5.8 Maintenance Requirements, and language for safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. The ordinances passed related to stormwater management and dates submitted to the County for review follow:

- Pet Waste Ordinance 1367 Resolution dated 09/08/2005, submitted to County 10/08/2005, **amendment date 12/11/2023.**
- Wildlife Feeding, Resolution dated 09/15/205 submitted to County 10/15/2005, **amendment date 12/11/2023.**
- Litter Control Ordinance, Resolution dated 09/15/2005, submitted to County 10/15/2005.
- Containerized Yard Waste 1367, Resolution dated 09/08/2005, submitted to County 10/08/2005, **amendment date 5/20/2024.**
- Private Stormdrain Retrofitting 1492, Resolution dated 09/20/2010, submitted to County 10/20/2010.
- Stormwater Control Ordinance 24-46-9-23-24, Resolution amendment date 09/23/2024, submitted to County 10/24/2024.
- Improper Disposal of Waste Ordinance 12/01/1976.
- Illicit Connection Ordinance 11/17/1962.
- Refuse Container Ordinance 11/17/1962.

6.0 DESIGN & PERFORMANCE STANDARDS

The 2002 MP and Chapters 130 (Flood Damage Prevention), 225 (Site Plan Review), 230 (Streets and Sidewalks), 234 (Subdivision of Land), 247 (Trees), and 271 (Zoning) of the Township Code were reviewed with regarding incorporation of nonstructural stormwater management strategies. The current MP and Chapters 130 (Flood Damage Prevention), 225 (Site Plan Review), 230 (Streets and Sidewalks), 234 (Subdivision of Land), 247 (Trees), and 271 (Zoning) of the Township Code were reviewed regarding incorporation of nonstructural stormwater management strategies. Below is a list of recommended revisions to existing ordinances and new strategies that the Township should consider implementing to incorporate the NJDEP's nonstructural strategies for stormwater management. It should be noted that while the Township is fully developed and future development projects will be required to meet revised and more stringent "major development" criteria, definition provided in Section 2 of the recently passed SCO discussed previously.

During redevelopment activities, Township inspectors will continue to perform periodic inspections of the construction of the project to ensure that the stormwater management measures are constructed and function as designed to implement and enhance BMPs identified in the SPPP.

6.1 Development of a Greenway Network

One of the objectives under the Parks, Recreation and Open Space section of the 2025 MP indicates that the Township is interested in the development of a Greenway network along stream corridors linking residential neighborhoods to parks and major activity centers.

To date the Greenway plan includes.

- Maximizing the opportunities for enhancement and/or expansion of trailways and greenways, as well as open space and recreation resources near existing trailways and greenways, as well as open space and recreation resources near existing trailways and greenways. The existing and planned trail system will facilitate non-vehicular travel between Bloomfield neighborhoods and Bloomfield and neighboring communities. The Township should work to obtain land including access easements to complete the completed sections of the Morris Canal Greenway and Hudson-Essex Greenway in

Bloomfield. To this end, the Township should continue its program to **complete development of the Hudson-Essex Greenway (the Greenway) which runs through the Township, particularly at Benson Street. The Township should continue collaborative efforts with NJDEP to improve existing drainage facilities along the Township's section of the Greenway to better handle upstream runoff. Similarly, to this end, the Township is currently working on improvement in the area behind Benson Street, as part of the continuing joint project with Glen Ridge (the upstream tributary municipality).**

- Continuing to identify large parcels of land for potential open space development. Particular attention should be given to large parcels of open land, located adjacent to or near any route of the Greenway or contiguous park or recreational facility.

6.2 Residential Site Improvement Standards (RSIS/SJ)

The MP includes the State Residential Site Improvement Standards (RSIS) which have been incorporated into the zoning ordinances to ensure consistency for new residential development. These statements are consistent with NJDEP recommendations, and the zoning ordinance should be updated to reflect the most current State RSIS standards.

6.3 Conservation Plan Element

In recent years there has been efforts in open space planning to include conservation and/or restoration of native landscape, flora, fauna, wildlife, and wildlife-habitat areas. A balanced system of playgrounds, recreation areas, and habitat restoration sites is now considered BMPs towards a live able and sustainable community. Recommendation 13 of the Conservation Plan Element states that the Township should establish a critical areas ordinance to protect natural features (streams, lakes, ponds, floodplains, wetlands, and steep slopes) and adjacent areas. Passive recreation areas put minimal stress on a site's resources; as a result, they can provide ecosystem service benefits and are highly compatible with natural resource protection. As part of this effort the Township should continue to eliminate invasive species in the Township's parks and open spaces. Non-native insects and plant species negatively impact the Township's trees and natural

landscaping. This includes the Spotted Lanternfly, Emerald Ash Borer Beatle, and the Tree farm heaven, among others. This recommendation is consistent with NJDEP recommendations, and the Township should consider adoption of such an ordinance that fosters these goals.

Recommendations 1 and 5 of the Conservation Plan Element states that the Township should promote environmentally friendly development through amendments to the Zoning Ordinance including regulations for lot/building coverage, buffers/setbacks and site design including increased landscaping, use of species native to New Jersey and street trees. This recommendation is consistent with NJDEP recommendations, and the Township should consider such amendments to the Zoning Ordinance.

The 2025 Conservation Plan Element states that the Township should consider amending the Zoning Ordinance to require an Environmental Assessment Report for certain types of intensive development. This recommendation is consistent with NJDEP recommendations, and the Township should consider amending the Zoning Ordinance to require said report.

7.0 ORDINANCE REVIEW

7.1 Chapter 494: Flood Control Ordinance 4647 Ordinance 24-46-23-24 Amend Chapter 494

Section 494-4 Purpose and Objectives

Section 494-4 was passed considering the severity of storms and frequency of rain events, requiring the Township to have in place appropriate standards for the construction, installation, and maintenance of stormwater control systems applying recently updated guidelines with model language from recently published NJDEP templates for implementing stormwater control ordinances. This amendment requires that through hydrologic and hydraulic analysis for stormwater leaving a site, the post construction runoff hydrographs for the current and projected two (2), 10, and 100-year storm events, as defined on 494-5(c) and 494-5 (d), respectively do not exceed, at any time, the preconstruction runoff hydrographs for these events. Regarding the information that is required for a development permit application. Since all flood plain and watercourse activities must comply with the NJDEP Flood Hazard Area Control Act Rules (N.J.A.C. 7:13 Section 250 - 3), was` amended to require that "proof or statement of compliance with the Flood Hazard Area Control Act Rules (N.J.A.C. 7:13)" be provided as part of the development permit application. This Section should also be amended to state that a watercourse cannot be altered or relocated resulting from a proposed development since it is inconsistent with the NJDEP Flood Hazard Area Control Act Rules (N.J.A.C. 7:13*).* Any work on a water course should be permitted upon application for and receipt of a Stream Encroachment Permit. Based on recommendations of the prior Township of Bloomfield Stormwater Management Plan recommendations, confirmed by this Plan, e-Code Administrative Legislation should be modified as follows:

7.2 Code Administration Législation, eCode, Section 250-3

Section 250, new subsection M, should also be added to state: "Alteration of watercourses is prohibited except where necessary to control existing flooding and/or erosion which threatens life or property or in cases in which the New Jersey Department of Environmental Protection (NJDEP) determines that the effects of channelization are offset by the resulting restoration or improvement of the natural characteristics of the nearby environment. Any alteration to a watercourse requires an NJDEP-issued permit."

In cases where the Building Inspector is required to make interpretations where needed as to the exact location of the boundaries of the areas of special flood hazards (for example, where there appears to be a conflict between a mapped boundary and actual field conditions). This section should be amended to add Section 250 -11c (5) which states: "In areas where there appears to be a conflict between a mapped boundary and actual field conditions, the flood elevation shall be established by a New Jersey Licensed Land Surveyor based on the Flood Insurance Rate Map (FIRM) flood elevations."

7.3 Code Administration Legislation, e-Code, Section 225: Site Plan Review

Section 315-17: Site Plan Details

Section 315-17 B (3)(e) of this section should be modified to state that site plans must show the location of existing rock outcrops, high points, watercourses, depressions, ponds, marshes, wooded areas, single trees not in wooded areas, with a diameter of six (6) inches or more as measured three (3) ft above the base of the trunk or other significant existing features as determined by survey.

Section 315-17: Principles and standards for site plan review

Section 315-17 B (1) of this section should be modified to state of this Section encourages preservation of existing natural resources on the site, where feasible, and contribution to the environmental quality of the surrounding properties and neighborhood.

Section 315-17 B (4) (a) of this section should be modified to encourage site development that facilitates the protection and conservation of soils from erosion by wind or water or from excavation or grading. This statement is consistent with NJDEP recommendations.

7.4 Code Administration Legislation, e-Code, Section 497: Streets and Sidewalks

This section states that all new sidewalks shall be not less than four (4) feet (ft) wide and shall be constructed of concrete unless the Township Council shall direct or authorize the construction of a flagstone sidewalk. In constructing new flag sidewalks and in relaying existing sidewalks each flagstone shall not be less than two (2)-inches thick. Four (4)-ft wide and 2 ½ ft long. They shall be laid on sand or other approved subgrade material. Flagstone sidewalks are also permitted. Language should be added Section 497-28C to this section to recommend that sidewalks be graded to discharge to grass areas where possible, and to encourage the use of permeable paving materials where appropriate

***7.5 Administration Legislation, e-Code, Section 497: Subdivision of Land,* Sketch Plat**

Section 497-57 should state that the sketch plat must show all existing structures and wooded areas within the portion to be subdivided and within two hundred (200) ft thereof. To be consistent with NJDEP recommendations, a description of the conditions in the existing vegetated areas should also be provided.

7.6 Administration Legislation, e-Code, Section 535: Permit Required to Cut or Prune Trees

Section 525.1 (c) should be added expanding requirements stating that it shall be unlawful for any person, without a written permit from the Township Engineer, to cut, break or injure any tree or plant or portion of any tree or plant planted or growing in any public highway, parking strip area or park or to cause, authorize or procure any person to cut, break or injure any such tree or plant or any portion thereof within the township. This language is consistent with the NJDEP

recommendations. The Township should also pass a resolution on tree removal using the most updated NJDEP resolution Guidance.

7.7 Code Administration Legislation, e-Code, Section 250: Driveways

Section 250-77 of this section, Retaining Walls, Structures and Driveways, should include restrictions stating that for one and two-family dwellings, the minimum driveway width is eight (8) ft, and the maximum driveway width is 10 ft or the width of garage. The NJDEP recommends minimum driveway widths of nine (9) and eighteen (18) ft for one (1)-lane and two (2)-lanes, respectively. Therefore, this section is consistent with the NJDEP recommendations. Of note, language should be added to allow the use of pervious paving materials to minimize stormwater runoff and promote groundwater recharge.

7.8 Code Administration Legislation, e-Code: Parking Stalls

Several sections of the Township Code states that parking spaces should be nine (9) ft wide and eighteen (18) ft long with a minimum aisle width of twenty-two (22) ft. Specifically, this ordinance applies to the R-T, C-1, C-2, M-1, and O - zones and community shopping centers in the 8-2 zone. Section 271-26A states that the required space in all other zones shall be ten (10) ft wide and twenty ft long. The NJDEP recommends that parking stalls be nine (9) ft wide by 18 ft long. Therefore, applicable Sections should be amended to allow the minimum parking stall size to be 9 ft wide by 18 ft long.

7.9 Code Administration Legislation, e-Code: Specific Off-Street Parking Requirements

Town e-code requirements for off-street parking state that new and expanded office buildings in the B-1 Central Business Zone must provide off-street parking at the rate of one (1) space for every 400 square feet (ft^2) of gross-floor area (GFA). This rate is equivalent to 2.5 spaces per 1,000 ft^2 of GFA. This rate is consistent with NJDEP recommendations.

For example, Section 315 (4) indicates that community shopping centers shall provide a minimum of one (1) parking space for every 200 ft^2 of sales areas. This rate is equivalent to five (5) spaces per 1,000 SF of sales area. The Low Impact Development Parking Space Ratios provided by the NJDEP indicate that ratios at shopping centers shall be less than 4.5 spaces per 1,000 ft^2 of GFA. Therefore, the parking ratios should be reduced to meet the Low Impact Development ratios where practical.

Section 315 (4) states that office and research buildings in the 0, C-1 and C-2 Zones shall provide parking at the rate of at least one (1) parking space for each 300 SF of GFA or two (2) parking spaces for each three (3) employees on the largest shift, whichever is greater. The required parking rate is equivalent to 3.3 spaces per 1,000 ft^2 of GFA. The Low Impact Development Parking Space Ratios provided by the NJDEP indicate that ratios at professional office buildings shall be less than 3.0 spaces per 1,000 ft^2 GFA. The parking ratios should be reduced to meet the Low Impact Development ratios where practical. Additionally, this section should be amended to allow and encourage the use of multi-level parking decks and shared parking, where practical.

7.10 New Ordinances

The Township is required to pass new ordinances, make amendments to older ordinances, and consider new ordinances for various issues discussed below. These include

- Required Ordinances,
- Ordinances to be amended to implement recent NJDEP requirements using updated NJDEP templates, and
- Ordinances recommended, but not required,

A summary follows.

7.11 Ordinances Recommended but Not Required

These can be issued as ordinances implemented via executed Township Resolutions, or added as updates to the MP, enumerated as Township BMPs in Mayor communications to the residents, or described in handouts distributed during Township picnics and activities.

Unconnected Impervious Areas

Disconnection of impervious areas can occur in both low-density development and high-density commercial development, provided sufficient vegetated area is available to accept dispersed stormwater flows. Areas for disconnection include parking lot or cul-de-sac islands, lawn areas, and other vegetated areas. Applicants should be required to disconnect impervious surfaces, where practical, to promote pollutant removal and groundwater recharge. To this end, the Township **should continue efforts related to the most recent**

parking lot improvement program at Pitt Street. The project has been completed and was designed to reduce impervious surfaces as well as adding a rain garden to further reduce surface runoff.

Parking Areas

Landscaping islands should be required in parking lots. The vegetation shall be beneficial for stormwater quality, groundwater recharge, and/or stormwater quantity but not interfere with driver vision. Additionally, the use of multi-level underground or shared parking should be encouraged where practical. Other low-impact development options include the use of pervious paving materials to reduce the amount of impervious cover, or vehicle overhang into a vegetated area to allow for shorter parking stall lengths.

Soil Movement

Currently, there is no ordinance regarding soil movement in the Township. Therefore, an ordinance should be created which states that all soil activities must comply with New Jersey's *Soil Erosion and Sediment Control Standards.* During construction, Township inspectors should perform periodic inspection of on-site soil erosion and sediment control measures and report any inconsistencies to the Hudson, Essex & Passaic Soil Conservation District.

Depiction of Existing Conditions

A new ordinance should be adopted which requires that environmentally critical or constrained areas are identified as part of the depiction of existing conditions. Environmentally critical areas are areas or features with significant environmental value, such as steep slopes, stream corridors, natural heritage priority (historic) sites, and habitats of threatened or endangered species. Environmentally constrained areas are those with development restrictions, such as wetlands, floodplains, and sites of endangered species.

Minimization of Turf Grass Lawn Areas

To minimize turf grass lawn areas, a new ordinance should be established to discourage the enlargement of existing turf lawn areas without proper justification.

Vegetated Open Channels

The use of vegetated channels, rather than the standard concrete curb and gutter configuration, can decrease flow velocity, and allow for stormwater filtration and re-infiltration. Section 5.3(b)8 of the *Rules* indicates that nonstructural stormwater management strategies incorporated into site design shall provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas. The Township has no existing ordinances regarding the use of vegetated open channels. Therefore, a new ordinance should be adopted to encourage the use of vegetated open channel conveyance instead of the standard curb and gutter design where practical. One design option is for vegetated channels that convey smaller storm events and provide an overflow into a storm sewer for larger storm events.

Ordinances to be amended to implement recent NJDEP requirements/ updated NJDEP templates include:

- Litter Control Ordinance Illicit Connections Ordinance,
- Wildlife Feeding Ordinance,
- Pet Waste Ordinance,
- Private Inlet Retrofitting Ordinance,
- Refuse Container/Dumpster, and
- Improper Disposal of Waste.

Required Ordinances

- Tree Removal-Replacement Ordinance,
- Well Head Protection Areas Ordinance, and
- Flood Damage Prevention Ordinance.

These ordinances and ordinance updates have been prepared in draft, are currently in review by the Township, and are scheduled for adoption on 11-23-2025.

8.0 NON-STRUCTURAL & STRUCTURAL STORMWATER MANAGEMENT STRATEGIES

The Township encompasses a 5.33 square mile area. According to both the 2002 MP and the 2025 MP, the Township is fully developed; therefore, a "build-out" analysis is not required.

Figure 7, entitled "Existing Land Use," shows existing land use in the Township based on 1995/97 GIS information from NJDEP. As shown, the Township is primarily comprised of high- and medium-density residential areas with modest commercial areas. The Township has some considerable parcels of recreational land. A Land Use Plan Map can also be obtained from the MP.

Figure 8, entitled "Township of Bloomfield Zoning Map," is currently utilized by the Township to depict various land use zones in the Township. Wetlands and flood plains are located throughout the Township in the vicinity of the Township's waterways. **Figure 9,** entitled "Constrained Land," shows the constrained lands within the Township. These lands are constrained by regulatory development restrictions. Small development projects not meeting the definition of "major development" must comply with existing ordinances.

9.0 LAND USE & BUILD OUT STRATEGIES

This mitigation plan is provided for proposed development or redevelopment projects that seek a variance or exemption from the Township MSWMP or the Rules. Approval of the option to utilize a mitigation plan and choice of mitigation plan shall be under the sole discretion of the Township agency providing review, i.e., Board of Adjustment, Planning Board, Township Council, and the Township Engineer.

Any relief from this MSWMP or the Rules via a mitigation plan option shall utilize an option to provide equal or greater, quantifiable benefit than the specific relief being sought. For example, if a relief for stormwater quality is sought for a particular project, the necessary amount of stormwater quality improvements shall be accomplished via the mitigation plan. Calculations shall be provided indicating the parameter of relief being sought along with equal or greater benefit via the mitigation plan option. These calculations shall be reviewed and approved by the Township Engineer before being approved by the appropriate reviewing authority.

In general, the mitigation project must be implemented in the same drainage area as the proposed development. The applicant must ensure the long-term maintenance of the project, including the maintenance requirements under Chapters 8 and 9 of the NJDEP Stormwater BMP Manual. If a suitable site cannot be in the same drainage area as the proposed development, a mitigation project may be recommended that is not within the same drainage area but does provide equal relief. As a third option, in the case of mitigation plan options that do not address the variance or relief sought, the applicant may create a new mitigation option or provide a cash contribution to the Township of Bloomfield which will be used by the Township for Township-wide drainage improvements and stormwater management improvement planning. The amount of the contribution shall be based on the relief being sought, the applicant's opinion on the cost impacts to meet this Plan and the Rules, at the discretion of the Township agency providing review, i.e., Board of Adjustment, Planning Board, Township Council, and the Township Engineer.

The applicant can select one of the following projects listed to compensate for the deficit in the performance standards resulting from the proposed project. The applicant will also be responsible for any State, Federal, County, or local approvals required to implement the mitigation project. More detailed information on the projects can be obtained from the Township Engineer. A current list of mitigation projects shall be maintained by the Township Engineer. Listed below are specific projects that may be used to address the mitigation requirement.

1. Retrofit and rehabilitate storm sewer inlets within the drainage sub-basin of the proposed development. The number of inlets to be retrofitted will be determined by the Township Engineer based upon the size or acreage of the proposed development.
2. Perform slope stabilization along a designated stream or drainage ditch within the Township. The location of the proposed slope stabilization will be determined by the Township Engineer based upon the size or acreage of the proposed development. The Mitigation Plan should include the acquisition of all required environmental permits or a cash contribution toward the cost of obtaining said permits.
3. Reconstruct or rehabilitate a municipal parking facility to the following standards:

a. Reduce the amount of impervious area through the introduction of landscaped areas.
b. Introduce or install stormwater quality structures such as grassed channels, sand filters, etc.
c. Reduce the peak amount of stormwater runoff from the parking facility to those prescribed within the stormwater management plan.
d. Provide any other improvement to meet the standards of the stormwater management plan subject to review and approval by the Township Engineer.
e. The location and size of the project will be specified by the Township Engineer.

4. Perform slope stabilization along areas of steep slopes within the Township that are subject to erosion due to stormwater runoff.
5. Perform storm drainage improvements to alleviate flooding. A list of such projects is on file with the Township Engineer. The size and scope of these projects will be based upon the size and acreage of the proposed development.

10.0 MITIGATION PLAN

The Bloomfield Stormwater Management Plan identified 1,400 ft of storm drainage facilities, 86 inlet additions or improvements and 136.4 acre-ft of potential bio-retention areas and/or storm drainage detention facilities that could improve the drainage of the Township. These improvements coupled with BMPs identified during the previous Training program, would contribute significantly to improvements of stormwater management in the Township. The Drainage Study provided in Appendix A indicates that the cost for these improvements is preliminarily estimated at 171.2 million dollars. Cost breakdowns are identified in the Drainage Study provided in **Appendix A**. A listing of potential funding sources id provided in **Appendix B**. RVE would be happy to prioritize the improvements discussed in this report. Implementation over a five (5)-year period could be recommended based on grants available and Township finances. These improvements when completed would retain stormwater from a one (1) inch storm and significantly reduce the impact of larger storms. The MSWMP supports the path forward recommendations identified as immediate, interim, and long range in the Drainage Study Provided in **Appendix A.**

Immediate recommendations follow:

1. CCTT video critical pipelines to ensure that current flows are not impeded by clogs and broken pipes.
2. Limit future development in flood plain areas. This limitation, as documented in the MSWMP was followed by the Township in 2024 and 2025.
3. Continue training appropriate staff on BMPs and implementation of the SPPP.
4. Prepare and post on the Township website, an updated Stormwater Management Plan which requires renewal under NJPDES rules. This MSWMP fulfills this recommendation.
5. Upgrade stormwater facilities including upsizing pipe, adding and reconstructing inlets as part of the annual road resurfacing program. Inlets require repairs by 2028**.**
6. Upgrade piping identified in the Drainage study as having insufficient capacity in critical locations.

Short-term recommendations follow:

1.Issue of an updated SCO conforming with the latest NJDEP rules and requirements for owners and operators of private stormwater facilities.

2. Form a joint Township Stormwater Management Review Committee with the neighboring Municipalities. To this end, the Township should continue Assemblyman Michael Venezia's coordination efforts with various Essex County municipalities, including Bloomfield, Belleville, Glen Ridge, Montclair, and Nutley. These efforts have already yielded a report by the Army Corps of Engineers related to flooding within these municipalities (See Appendix F), while coordinating these efforts with the Township Flood Mitigation Advisory Committee.

3. Review DPW inspection and cleaning equipment and upgrade if needed.

4. Continue efforts to have operators of private stormwater assets to inspect, maintain, and repair their assets as needed.

5. Continue to purchase property to be utilized as future stormwater facilities, as opportunities arise.

6. Continue upgrading stormwater facilities including upsizing pipe, adding and reconstructing inlets as part of annual road resurfacing program.

7. Design and installation of stormwater bioretention facilities on Township owned property intended for this purpose.

8. Design and implementation of surface wetland and stream restoration projects.

Long range recommendations follow:

1. Design and installation of underground detention facilities.

2. Continue upgrading stormwater facilities including upsizing pipe, adding and reconstructing inlets as part of annual road resurfacing program.

3. Design and installation of stormwater bioretention facilities

These improvements may be implemented over a five (5)- year period depending on Township capital budgets and funding resources. It is recommended that these upgrades be implemented as

soon as possible as future increases in precipitation factors are planned in accordance N.J.A.C. 7:8.Of note, as part of the recommendations associated with the MSWMP, the following outfalls require rehabilitation to improve performance of the stormwater drainage facility assets in the Township of Bloomfield (Township). On March 14, 2028, The Township DPW (Joseph Caprio) and the Township Stormwater Program Coordinator (SPC) inspected 12 outfalls and one (1) stream bed obstruction for issues related to outfall blockage, maintenance issues, evidence of scouring, detached headwalls/aprons, and related issues. The inspection was the Township response to an August 1, 2022, EPA Order on Consent (AOC). Certain outfalls were identified with upstream catch basin inlets with significant residual build up to be addressed as part of short term redial measures. These outfalls were identified by the Township Engineer and SPC as high priority stormwater assets requiring both short term maintenance and longer-term repairs. The 12 outfalls, and one (1) stream obstruction, were identified for immediate attention and action by DPW to be completed on, or about July 1, 2024, and six (6) facilities listed in Table 2, on the following page (Outfalls BT-03, BT-17, BT-20, BT-21, BT-29, and ID-1), are to be upgraded as part of stormwater facility improvements recommended as part of this report.

- GIS mapping – completed for 57 miles of stormwater piping, 1,300 curb inlets, 575 manholes and 102 outfalls, 116 garden state parkway outfalls, & 25 recharge basins
- Regulatory compliance – the Township responded to an administrative consent order (ACO) regarding 17 EPA areas of concern on 11/23/2023 and 12/12/2024 committing to various action items. All have been addressed or in the process of being addressed by the Township.
- Training – DPW, Township personnel & selected council members received training on Tier A MS4 requirements on September 19, 2023. The stormwater program coordinator & Susan Banzon received additional SPC training NJDEP training on 9/5/2023.
- Compliance activities scheduled for 2025
    - MSWMP – provided as this submittal
    - Outfall repairs – DPW and private contractors, scope of work provided in Appendix D.

- Inspections, maintenance, repairs, reporting, notifications, public participation, bet management practices, and stormwater pollution prevention plan – ongoing annually – outfalls, SW infrastructure, illicit connects
- Tier A MS4 permitting – due May 2025 (Completed)

- Future and pending stormwater initiatives and proposals requiring Township actions/authorizations
- Preparation of recommendations for stormwater management upgrades based on application of sewer gems model to updated mapping
  - Geographic Information Systems (GIS) import to the Hoyt Sector (HTH) model. The HTH Model is a land use model is a modification of the concentric zone model of city development.
  - Hydraulic evaluation and assessment of existing system
  - Hydrological delineation of contributing areas
  - Hydrologic and hydraulic recommendations for improved drainage capacity
    - Existing hydraulic physical deficiencies
    - Probable hydraulic improvements for improved drainage capacity
- Preliminary stormwater specific upgrades currently under consideration based on preliminary delineation of contributing drainage areas and hydrologic and hydraulic recommendations for improved drainage capacity follow:
  - Provide backflow prevention on selected outfalls that are submerged under dry weather conditions
  - Upgrade stormwater assets in certain flood prone areas such as Lakewood Ave, Claremont Ave, and drainage facilities in the vicinity of the third avenue pedestrian bridge,
  - Increase the storm drain capacity of the main trunk line beneath Maolis Ave. This primary drainage artery is a critical piece of the northwestern portion of the Township

and drains into the second river via outfall (BT-17). One of sixteen (16) outfalls scheduled for maintenance and repairs by the Township.

- GIS surface drainage asset collection identified the need for additional inlets to reduce surface roadway spread flooding. Township wide best management practice to have one surface inlet every 400 ft of curbline where practicable.
- Increase the size and slopes of piping in flood prone areas. Flood prone areas are identified in **Table 1**. These areas were identified in the Drainage Study, Township photo-documentation and communications identifying flood areas during Hurricane Irene (a 100 Year seven (7) inch rain event), and the Township of Bloomfield Training Program.
- A full universe of problem areas during extreme rain events inventoried in the Drainage Study include areas previously identified by the Township Engineer as typical areas subjected to storm
- The Drainage Study also indicated numerous parking lots that could be redeveloped with storm water retention facilities where practicable based on topographical and existing infrastructure conditions and location of plausible new retention basins to retain flows originating from Montclair and Glen Ridge, New Jersey.
- Identification of existing hydraulic deficiencies in existing critical drainage infrastructure.
- Probable hydraulic improvements for maximum increase in drainage capacity with respect to inherent existing constraints.
- The New Jersey Turnpike Authority operates 116 outfalls, accounting for a significant contribution of stormwater runoff to both the second and third rivers within the Township.
    - Preparation of specific recommendations regarding maintenance and repairs for these outfalls.

        - Recommendations for retention practices within GSP right-of-way upstream of these contributing outfalls.

- RVE will be prepared shortly to discuss the scope and size of a future drainage facility assets upgrade program and potential state funding mechanisms to defray costs.
- The Township, following the 2025 MP recommendations, should encourage additional BMPs for developers that can be implemented along building facades or roofs consisting of downspout rerouting and green/blue roofs. Downspout rerouting can be comprised of collecting stormwater in cisterns or rain barrels that would otherwise flow into the municipal stormwater system and can be later have reused for a different purpose and/or slowly released to the soil.

TABLE 2
STORMWATER OUTFALL ASSETS IDENTIFIED FOR REMEDIAL MEASURES

OUTFALL	GPS COORDINATES		LOCATION	COMMENTS	REMEDIAL MEASURE
	X	Y			
BT-03	573266.693631	711024.803606	Cleveland Terrace	Undersized outfall	Drainage to be evaluated and identified for remedial measures as part of this report as part of overall stormwater asset upgrades.
BT-17	575275.68380	712049.075759	950 ft upstream of 2nd River, 950 ft east of Locust Ave	Stream scour	1-2 - inch stone rip rap to be placed at outfall design improvements to recommended as part of Stormwater Management Plan in progress (12/31/2024) as part of overall stormwater asset upgrades.
ID-20	580663.0225	713863.2234	Montgomery Street	Broken wall, scour	Repair Wall, install 1 to 2 - inch stone rip rap to be placed at outfall to recommended as part of Stormwater Management Plan in progress (12/31/2024) as part of overall stormwater asset upgrades.
ID-21	579629.79634	718005.792035	Near Davey Street	Detached Headwall	Repair Wall, as part of Stormwater Management Plan in progress (12/31/2024) as part of overall stormwater asset upgrades.
BT-29	574864.260991	713785.312920	2nd River 860ft upstream of Wigwam Brook	Stream Scour	1-2 - inch stone rip rap to be placed at outfall design improvements to recommended as part of Stormwater Management Plan in progress (12/31/2024) as part of overall stormwater asset upgrades.
ID-1	58281.7139	730082.8788	Lindbergh Blvd	Outfall Blockage	Re-attach Headwall, as part of Stormwater Management Plan in progress (12/31/2024) as part of overall stormwater asset upgrades.

END OF NARRATIVE

FIGURES

1. Groundwater Recharge in Hydraulic Cycle

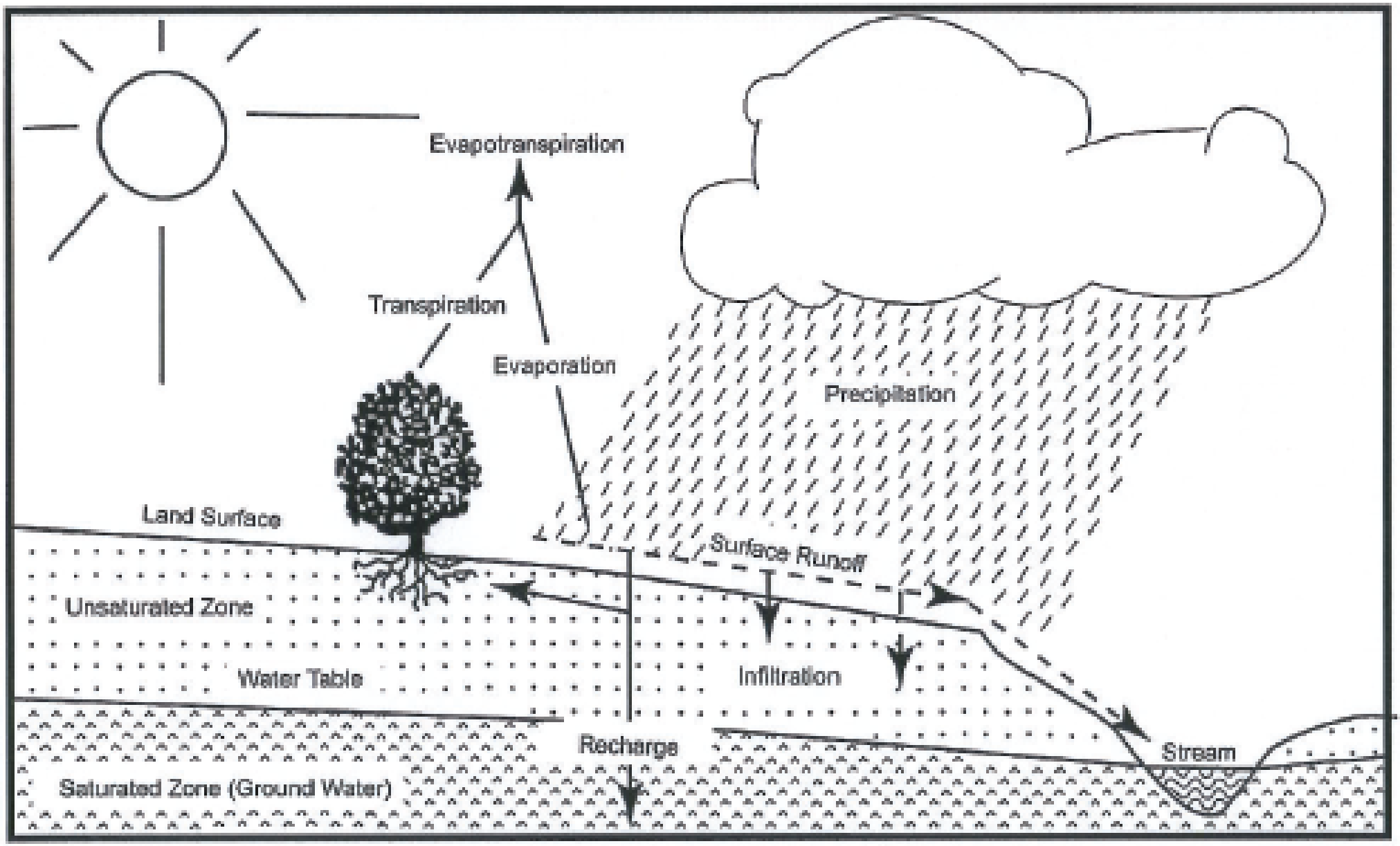

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Figure 1: Groundwater Recharge in Hydraulic Cycles

Source: Township of Bloomfield Stormwater Management Plan, dated April 2006

2. Township Waterways

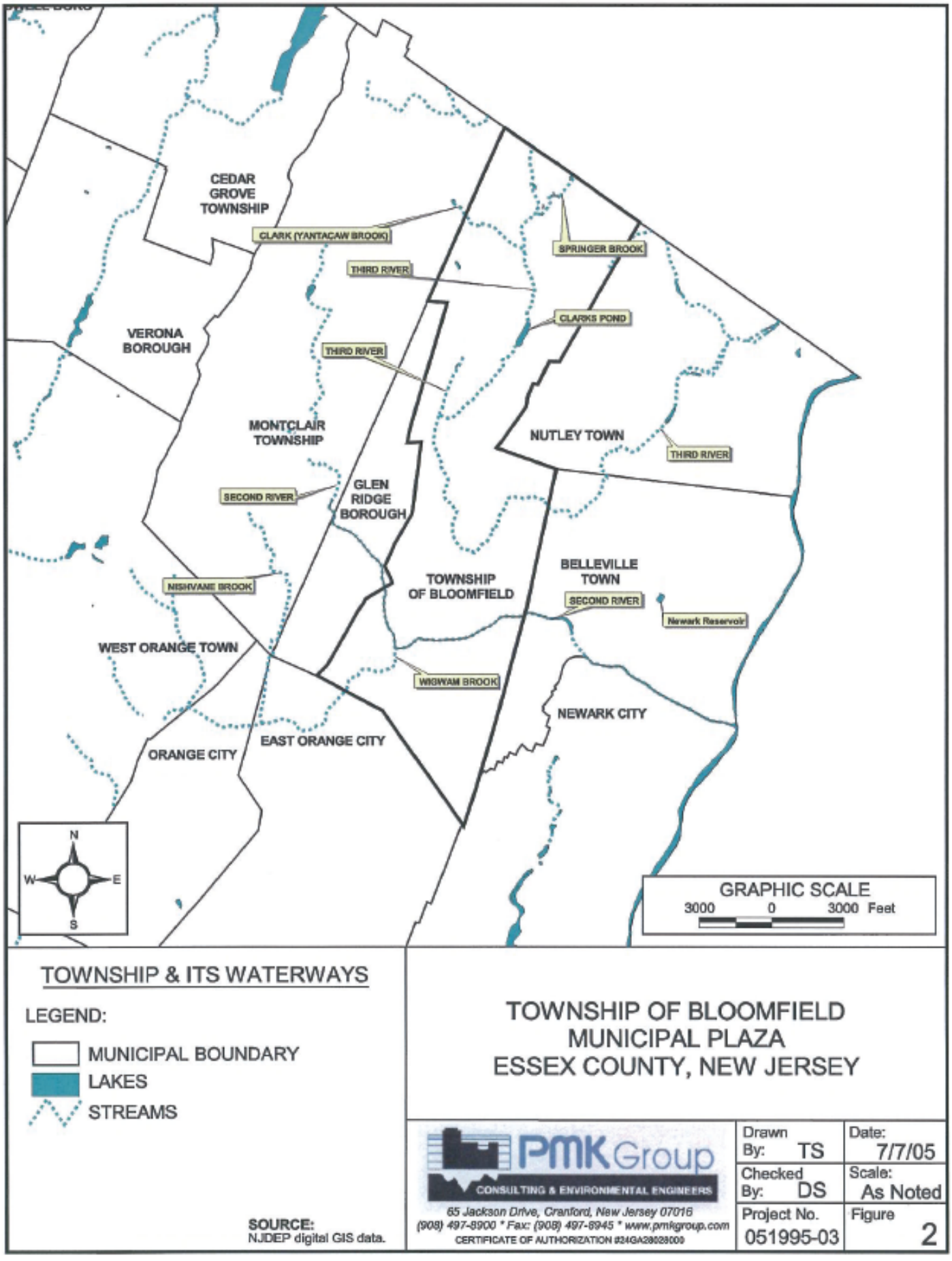

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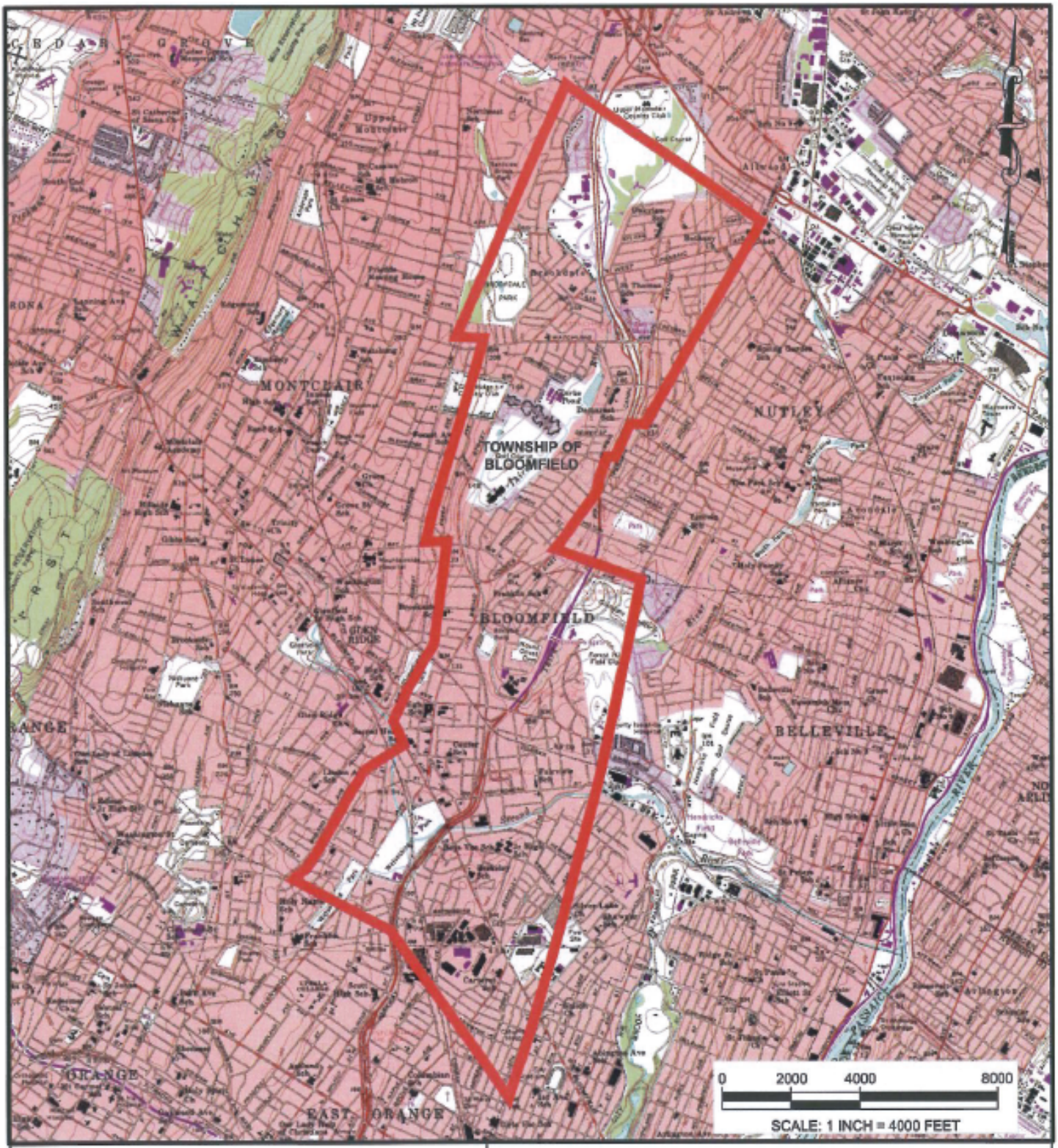
Figure 2: Township Waterways

Source: Township of Bloomfield Stormwater Management Plan, dated April 2006

3. USGS Topographical Map



SOURCE: U.S.G.S. 7.5 MINUTE SERIES
ORANGE QUADRANGLE, (1981)

USGS TOPOGRAPHIC MAP

TOWNSHIP OF BLOOMFIELD
MUNICIPAL PLAZA
ESSEX COUNTY, NEW JERSEY

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CERTIFICATE OF AUTHORIZATION #24GA28003300

DRAWN BY:	TS	DATE:	7/7/05
CHECKED BY:	DS	SCALE:	1"=4000'
PROJECT NO:	051995-03	FIGURE	3

RVE 1901
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Figure 3: USGS Topographical Map

Source: Township of Bloomfield Stormwater Management Plan, dated April 2006

4. Hydrologic Units (HUC-14)

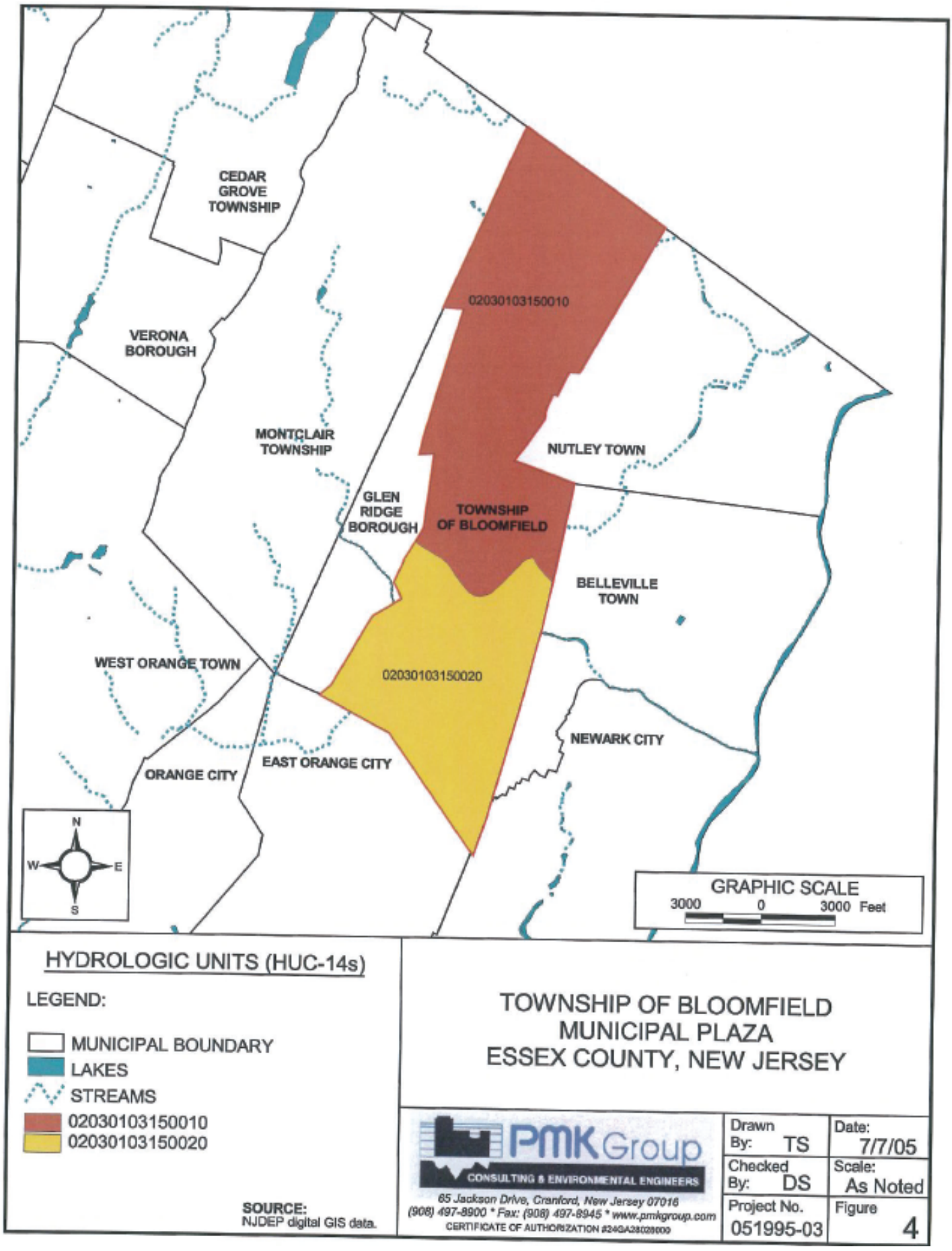

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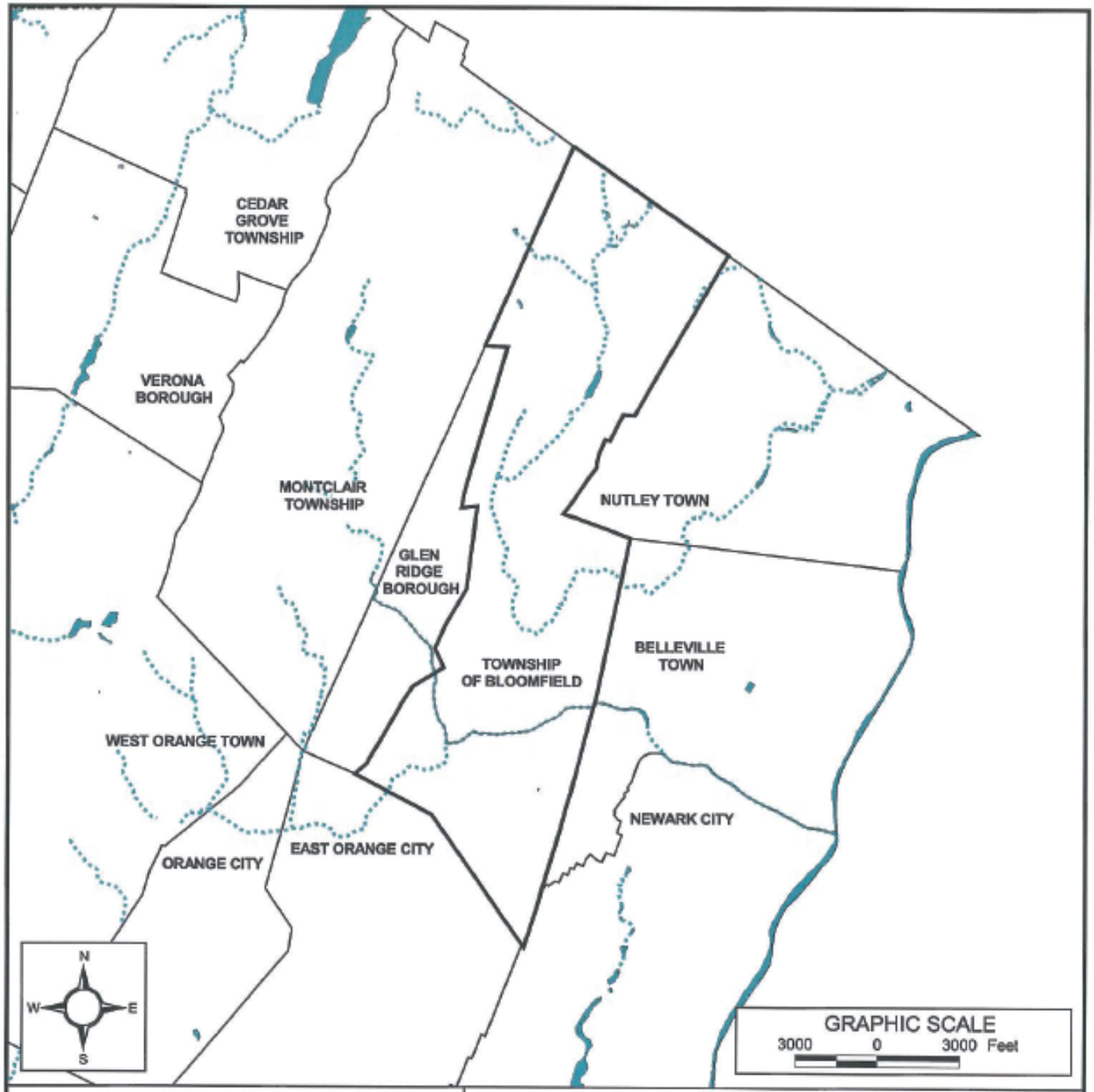
Figure 4: Hydrologic Units (HC-14)

Source: Township of Bloomfield Stormwater Management Plan, dated April 2006

5. Groundwater Recharge Areas



GROUNDWATER RECHARGE AREAS

LEGEND:

- MUNICIPAL BOUNDARY
- LAKES
- STREAMS

THERE ARE NO MAPPED GROUNDWATER RECHARGE AREAS IN THE TOWNSHIP OF BLOOMFIELD

SOURCE: NJDEP digital GIS data.

TOWNSHIP OF BLOOMFIELD
MUNICIPAL PLAZA
ESSEX COUNTY, NEW JERSEY

PMK Group
CONSULTING & ENVIRONMENTAL ENGINEERS
65 Jackson Drive, Cranford, New Jersey 07016
(908) 497-8900 * Fax: (908) 497-8945 * www.pmkgroup.com
CERTIFICATE OF AUTHORIZATION #24GA28028000

Drawn By: TS	Date: 7/7/05
Checked By: DS	Scale: As Noted
Project No. 051995-03	Figure 5

RVE 1901
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Figure 5: Groundwater Recharge Areas

Source: Township of Bloomfield Stormwater Management Plan, dated April 2006

6. Wellhead Protection Areas

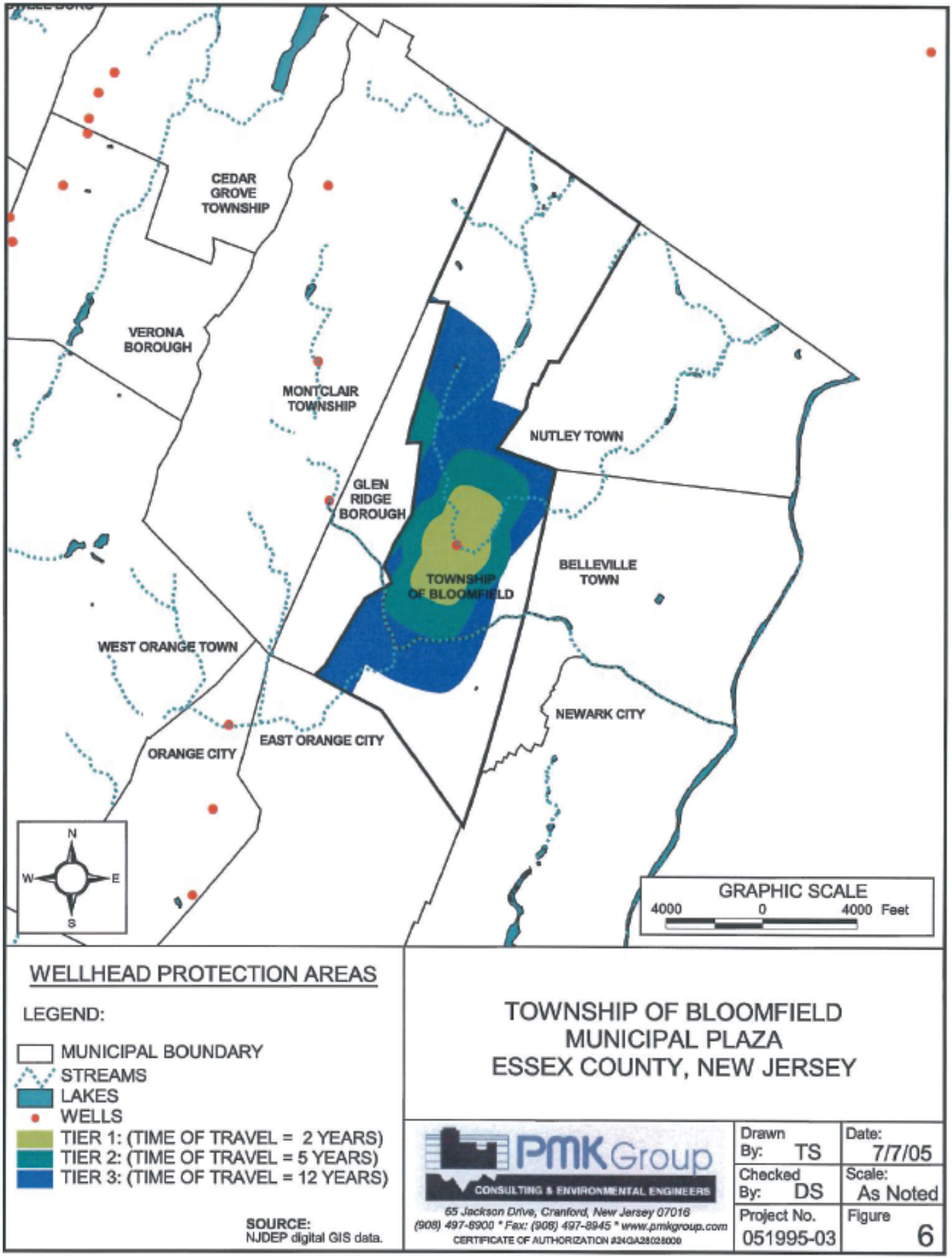

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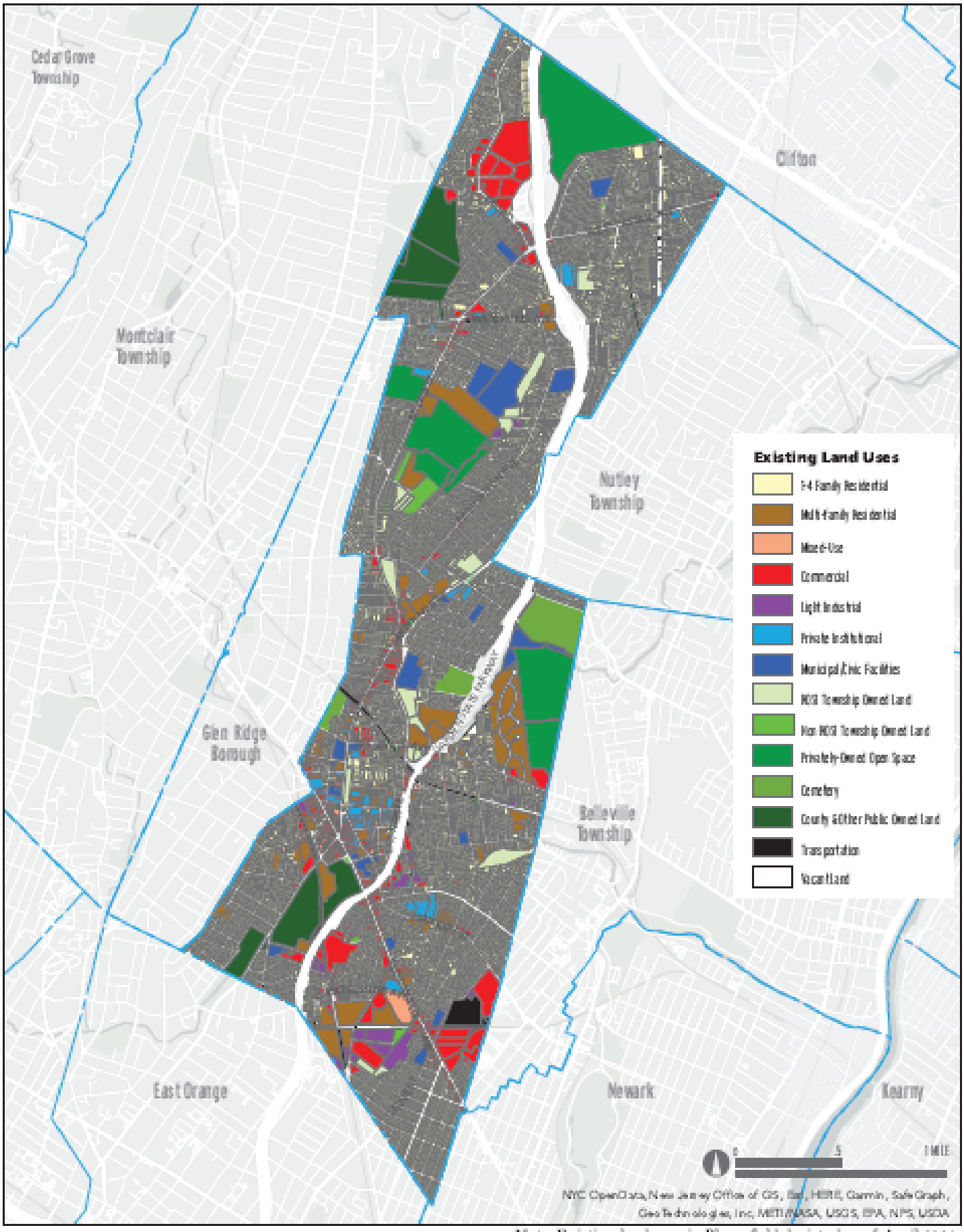
Figure 6: Wellhead Protection Areas

Source: Township of Bloomfield Stormwater Management Plan, dated April 2006

7. Existing Land Use



Note: Existing land uses in Bloomfield depicted as of April 2024.

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Figure 7: Existing Land Use

Source: 2025 Master Plan for the Township of Bloomfield, Essex County, New Jersey, prepared by Phillips Preiss Hyrgiel Leheny Hughes LLC, Planning & Real Estate Consultants

8. Township of Bloomfield Zoning Map

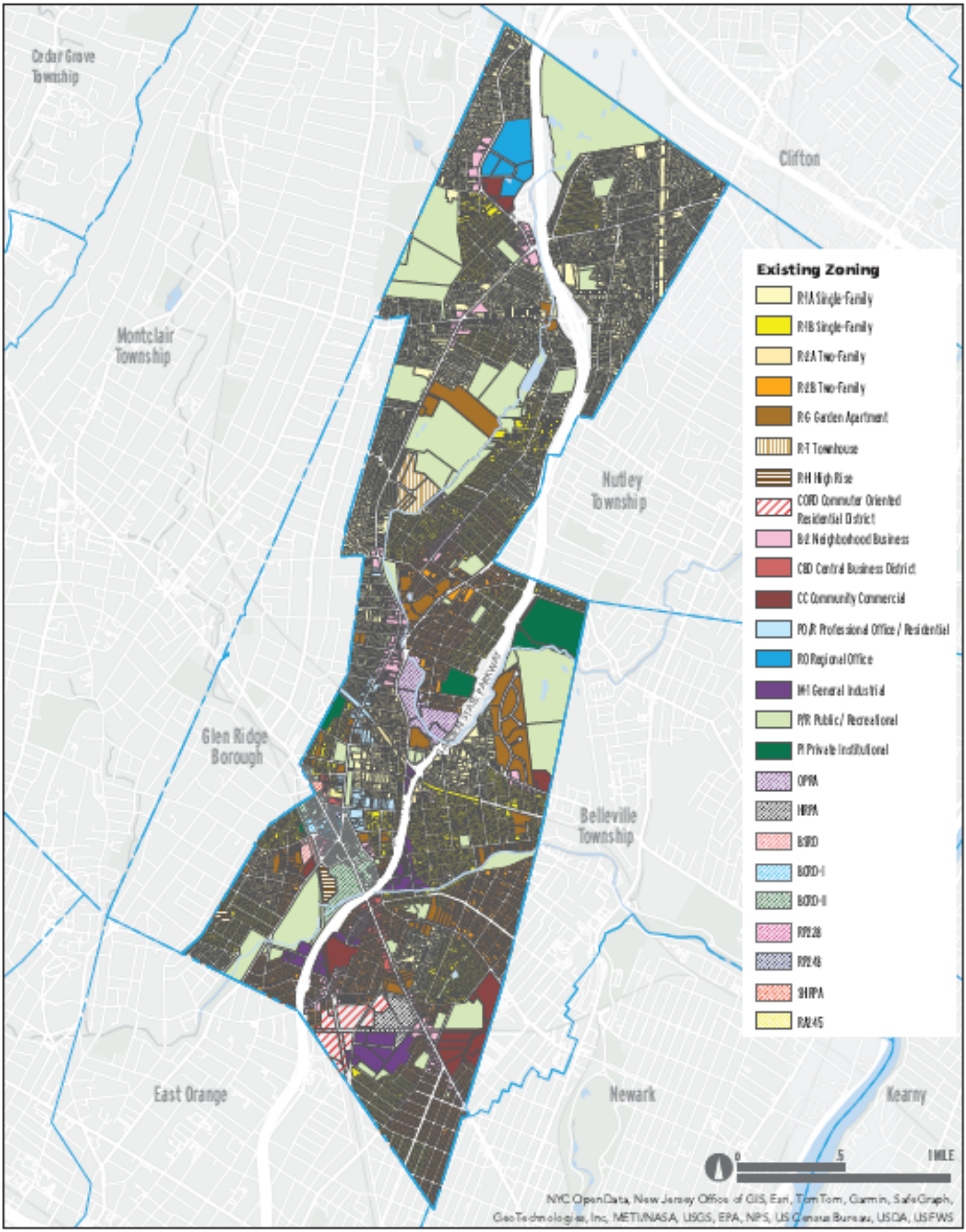

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Figure 8: Township of Bloomfield Zoning Map

Source: 2025 Master Plan for the Township of Bloomfield, Essex County, New Jersey, prepared by Phillips Preiss Hyrgiel Leheny Hughes LLC, Planning & Real Estate Consultants

9. Constrained Land

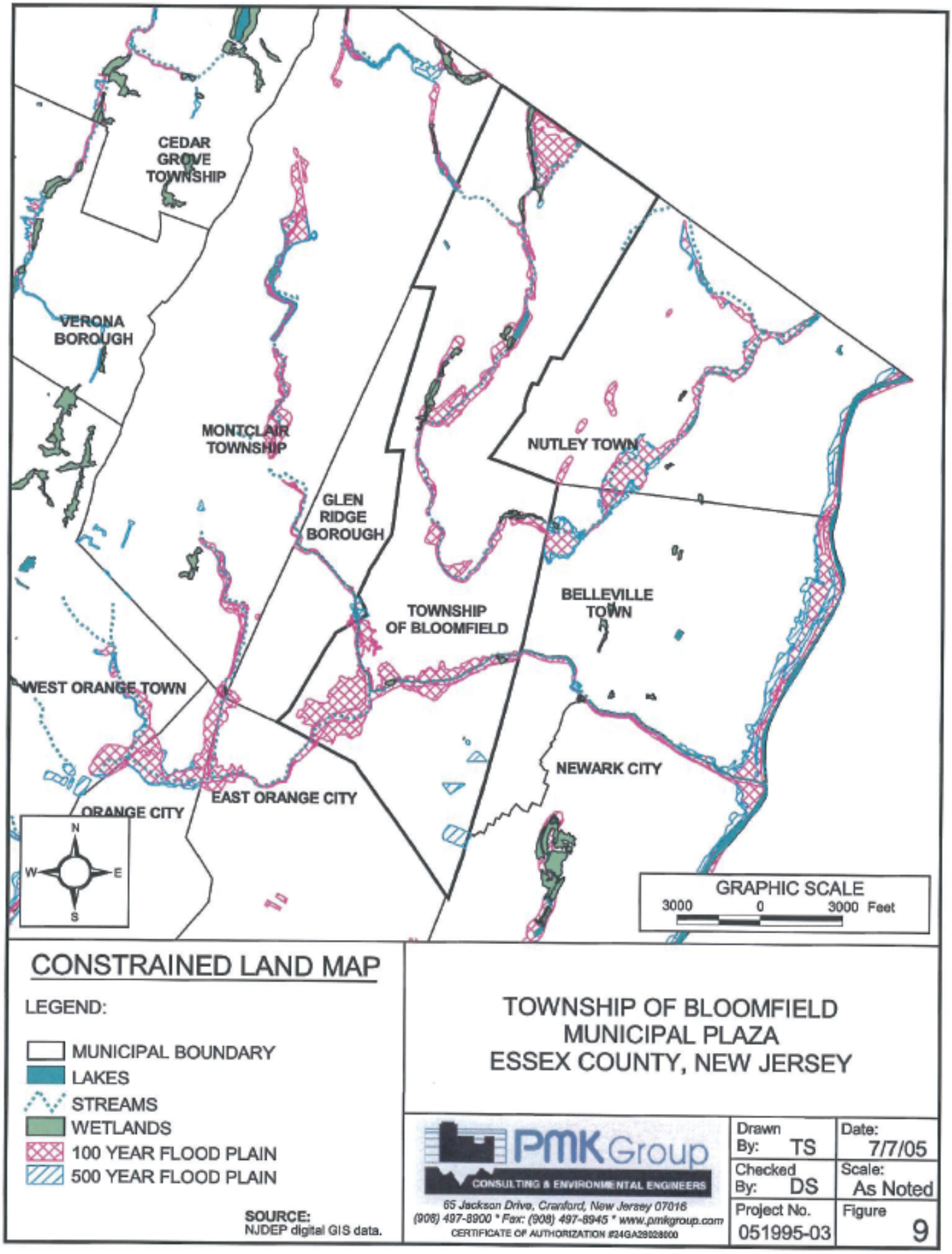

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Figure 9: Constrained Land

Source: Township of Bloomfield Stormwater Management Plan, dated April 2006

Appendix A – Bloomfield Stormwater Drainage Study (Stormwater Modeling & Conceptual Recommendations), Remington & Vernick Engineers, May 2024 (Drainage Study)

BLOOMFIELD STORMWATER DRAINAGE STUDY

STORMWATER MODELING AND CONCEPTUAL RECOMMENDATIONS

BLOOMFIELD TOWNSHIP
1 MUNICIPAL PLAZA
BLOOMFIELD, NEW JERSEY 07003

PREPARED BY:

REMINGTON & VERNICK ENGINEERS
ONE HARMON PLAZA, SUITE 201
SECAUCUS, NEW JERSEY 07094

MAY 2024

CONTACT: ROBERT KLEIN, PE
OFFICE PHONE: (201)-401-0939

REMINGTON & VERNICK ENGINEERS

1.1 BACKGROUND INFORMATION

Bloomfield Township (Township) has tasked Remington & Vernick Engineers (RVE) with mapping drainage assets using GIS technology and for the development of a hydrologic and hydraulic (H&H) model of the collected assets. The mapping work is aligned with Municipal Separate Storm Sewer Systems (MS4) permit requirements mandated by the New Jersey Department of Environmental Protection (NJDEP). The Township and its residents have experienced repeated and severe stormwater flooding issues in numerous areas within Township limits. The H&H modeling will analyze causes and identify solutions to improve these flooding issues for the Township and its residents.

For this assessment, the Township identified specific study areas including topographic lowpoints, areas of frequent inundation, and other areas of observed surface flooding during wet weather events. Township residents in these areas have experienced chronic flooding issues. The Township has tasked RVE with taking inventory of and mapping the drainage assets and developing a comprehensive H&H model. The Township intends to utilize this model to identify improvements that may alleviate some of the documented flooding issues within the study areas, among other hydraulic deficiencies discovered in the process of locating the numerous drainage assets.

Recommendations are focused on addressing flooding issues within the Township, but are not limited to those areas exclusively, especially when considering that any improvements made will have an impact on other drainage infrastructure both upstream and downstream. RVE has collected GIS mapping information for all stormwater assets within Township limits, compiled the data in ArcGIS software, and used this GIS mapping to develop a Hydrologic & Hydraulic (H&H) model utilizing Bentley's SewerGEMS software. The H&H model provides a baseline of the existing physical characteristics of the interconnected drainage assets and is capable of modeling various storm events and numerous possible improvements to the stormwater networks.

1.2 METHODOLOGY

The drainage networks were mapped initially using archived historical plans provided by the Township and various as-built plans from recent capital projects and land development projects. These maps served as a general "roadmap" providing a baseline understanding of the existing drainage networks in the Township. Field verification was needed to locate each of the stormwater assets and to locate numerous additional assets constructed after the available mapping was completed. RVE located stormwater assets via field verification and geolocation input. Data was gathered using a Trimble Geo7x GNSS and was collected over several weeks during the summer and fall of 2023. During these site visits, the GIS team collected information on 2,556 stormwater inlets/catch basins, 1,125 manholes, 3,540 stormwater pipes (>57 miles), and 147 outfalls. Structure types, sizes, materials, and photos were logged for each discoverable stormwater asset. This digital geodatabase has been compiled in ArcGIS and provided to the Township for future additions and continual updating as new drainage structures are constructed.

This data was then imported into SewerGEMS to develop an H&H model capable of simulating hydraulic performance of the various networks for design storms of various frequencies. The impacts of these synthesized storms as they are applied to the existing drainage systems was used to evaluate the hydraulic grade line (HGL) and water surface elevations (WSE) within the various drainage networks. By simulating

these storm events, existing hydraulic restrictions are identified, and various upgrades were explored to improve the overall hydraulic capacity of the various drainage systems.

1.3 HYDROLOGY & HYDRAULICS

The scope of this project limits the ability to individually evaluate each and every individual drainage structure in the study areas. The focus of this study is to identify inlets of interest, such as low points (or "sumps"), network convergence points, critical hydraulic restrictions (undersized pipes) and structural best management practices (BMP)s in the drainage networks.

Since individual analysis of individual drainage assets is not the focus of this study, RVE identified critical upstream inlets to delineate drainage area sub-catchment areas and delineated the exterior drainage area limits contributing runoff to those points. Drainage areas were preliminarily delineated using USGS Stream Stats. Within the Township, sub-catchment drainage area limits were modified based on known subsurface connections (pipes) and identified surface conditions that alter the contributing area which is strictly dependent on surface contours. StreamStats was utilized to determine peak flows for specific design storms contributing to each drainage network. The hydrologic soil groupings were obtained from the NRCS Web Soil Survey website. Eighty (80) percent of the Township is classified as urban fill and class D hydrologic soil grouping. Due to the scope of the project and largely impervious nature of the Township, drainage areas were generally given a time of concentration (Tc) of ten (10) minutes. The peak flow rates were calculated using the compound rational method or by direct entry in Bentley's SewerGEMS software, using the NOAA-Atlas-14 Rainfall Intensity Duration Frequency (IDF) table for Bloomfield.

RVE's focus on improvements to reduce flooding and increasing the hydraulic capacity of stormwater drainage networks initially targeted physical improvements, such as inlet and pipe size increases. Hydraulic restrictions such as a lack of surface runoff interception (inlets) and undersized pipes (larger pipes upstream of smaller pipes). These physical elements were considered as well as the addition of stormwater quantity BMPs (detention/retention facilities) in available open space to provide additional surface runoff storage. The locations discussed in this report focus on using public right-of-way areas and Township-owned properties and open space areas, requiring little to no right-of-way acquisitions. The downside of any of these drainage improvements is the inherent cost of construction, but the benefits of adding these facilities ultimately align with the goal of decreasing flood damage impacts and costs to the Township and its residents. The structural BMPs explored in this report are potential beneficial additions to the community to prevent localized flooding of Township residences and roadways. In conjunction with these structural BMPs, implementation by the Township of enhanced stormwater ordinances requirements and other non-structural BMPs (e.g. street sweeping, pipe flushing, community engagement) can help alleviate many of the Township's frequent stormwater flooding and associated impacts to the study areas and beyond.

1.4 STRUCTURAL HYDRAULIC IMPROVEMENTS

Upon review of data gathered from numerous stormwater drainage assets across the study areas, it became evident that the most effective approach to mitigate flooding in these vulnerable areas is to increase the hydraulic capacity of the dated drainage networks beneath them. By examining the interconnected hydraulic model, hydraulic deficiencies can be identified. Some of the hydraulic

deficiencies were easily identifiable after compiling the network of inlets, manholes, and interconnecting pipes. These hydraulic deficiencies include the following:

- Drainage Inlets – A lack of surface interception points can lead to excessive runoff building up along curblines and flooding roadways. Outdated inlet top units are susceptible to clogging and a decrease in runoff interception capacity.

- Pipe Size – Beneath drainage inlets is a network of interconnected pipes that drain downhill by gravity. Once drainage assets are gathered and conglomerated into a comprehensive hydraulic model, undersized pipes can be identified and analyzed to determine their impact on overall hydraulic capacity of the system. A larger pipe conveying flow into a smaller pipe is an easily identifiable restriction that can have a significant impact on the overall drainage system.

- Pipe Slope – Pipes are designed to be pitched downhill for gravity flow toward an open outfall to maximize hydraulic capacity. In construction or over time pipes may settle in such a way that they are shallowly sloped or even sloped backwards. Data collection included as part of this study included taking measurements at each drainage structure from the surface down to the invert of incoming and outgoing pipes. Pipe slopes between consecutive drainage structures were calculated and evaluated in the hydraulic model.

1.4.1 Inlet Addition, Rehabilitation, and Improvements

Like most communities, Bloomfield's original drainage network was built in iterations as the Township developed. Today, many of the storm pipes, inlets, and archways are decades old, with some dating back to the 1930's and even earlier. For most stormwater infrastructure (e.g. concrete drainage structures, reinforced concrete pipe, etc.), 100 years is a reasonable maximum life expectancy before deteriorations manifest and repair or replacement becomes a common need. Terra cotta pipe and metal pipe still in use today have far outperformed their life expectancy since installation of these materials was largely discontinued over 60 years ago. Even if they are still functioning, they are likely compromised by cracks and roots or corrosion and performing at a fraction of their original capacity. Many of these structures are not up to current construction standards or were never designed to handle current day stormwater flows which have increased with increased development. During the field data collection, many assets were observed to be in need of repairs or replacements. The Township's Public Works Department is tasked with maintaining this vast network of infrastructure, with more comprehensive stormwater infrastructure upgrades being completed through land development projects and capital projects.

Additional Inlets / Increased Surface Interception

Additional surface inlets placed near existing underlying drainage infrastructure can provide effective surficial flooding mitigation when placed correctly. Industry standard varies in distance between inlets (200-500') when designing a new roadway and new drainage network. This distance is dependent upon several factors including contributing drainage area, width of roadway, longitudinal slope of the roadway, and roadway cross section amongst others. For the purpose of this study, lengths of roadway with a drainage trunkline already existing beneath the surface and a lack of inlets over ~500' have been identified as areas for the possible addition of inlets. Additionally, stretches of roadway where inlets could be

constructed at topographically feasible locations and connected to existing drainage infrastructure with less than ~200 feet of additional pipe construction are included as secondary alternatives. Any of these areas chosen could help alleviate documented instances of surface flooding in close proximity and improving the hydraulic effectiveness of existing systems in removing runoff from roadways and adjacent properties. This reduction of surface runoff will improve safety on roadways and potential flooding of properties in close proximity throughout the Township. Eighty six (86) locations have been identified as areas where inlets could be added to curblines with little to no additional pipe needed to tie into existing drainage networks. Appendix C shows each of these locations. These maps also include 41 other locations where inlets could be added with the addition of less than 200 feet of additional pipe with a total length of 4,900 linear feet of new pipe to tie into existing networks.

Potential improvements to the stormwater infrastructure network include the replacement of inlet top units and the inclusion of flanking inlets uphill of sump locations. Replacement of inlet top units would result in higher capacity flows for the networks and increase safety at sump inlets due to less ponding in the immediate vicinity and within the travelway. Flanking inlets would increase interception capacity and roadway drainage ability, provide a secondary flow path for roadway flooding to enter the subsurface trunkline, and act as safety valves slightly uphill from potential clogging of the low point inlets. The number of inlets with outdated inlet top units is great, and the Township should consider replacement as construction and roadway rehabilitation progresses throughout

1.4.2 Pipe Replacement and Size Increase

Another common cause of surface flooding issues in a stormwater network is that the downstream pipe network is undersized and does not have the hydraulic capacity to convey runoff downstream any faster. The result is a backup of stormwater runoff which eventually surcharges to the surface. A direct solution to this problem is to increase the size of pipes that are at capacity during storm events, thereby increasing their maximum flow capacity and reducing the frequency of upstream flooding and surcharging.

A pipe replacement generally requires minimal new construction, with no new drainage network branches or pipes being added to the existing system. The majority of drainage network pipes are underneath public roadways that the Township owns and maintains.

The construction cost will depend on the amount of pipe being replaced, with price scaling relatively linearly with the length of increased pipe diameter needed. For this reason, pipe replacements are preferable for situations where only a portion of the downstream network needs to be upsized.

There are numerous locations throughout the Township where pipe diameters are under capacity and pipe integrity is likely deteriorated based on life expectancy for each material. Because it would be a large cost and high traffic inconvenience to simply replace each of these pipes based on these factors alone, it is not recommended to replace them all. The Township is encouraged to consider underlying drainage networks when redeveloping roadway corridors for the potential to replace this infrastructure with appropriately sized reinforced concrete pipe or high density polyethylene pipe as roadway reconstruction is performed and the underlying networks may be disturbed.

1.5 STORMWATER STRUCTURAL BMP UPGRADES

The redesign and retrofit of existing stormwater structural Best Management Practices (BMP) is an important opportunity when considering options to improve any interconnected stormwater conveyance network. Structural BMPs include surface detention basins, subsurface detention basins, rain gardens, infiltration facilities, water quality units, and a range of other constructed stormwater facilities. The benefits of upsizing, reshaping, and redesigning these existing facilities is that they have already been constructed, the space is already allocated for this purpose, and they are already in-line with existing stormwater infrastructure both upstream and downstream. The downside of these areas of opportunity is that they are already in use (on-line), may have deteriorated over time, and may have been designed poorly in the past. In some cases, structural BMPs are privately-owned and any improvements would require new agreements with property owners. The cost to revitalize some outdated facilities can sometimes outweigh the future benefits. The following are descriptions of structural BMP upgrades considered to be feasible within the Township limits to improve stormwater conveyance capacity and water quality treatment.

1.5.1 Basin Retrofits

Traditional stormwater basins capture stormwater runoff and detain a volume of water before discharging through an outlet structure, spillway, or ground infiltration. The purpose of these facilities is to detain stormwater runoff and reduce peak discharge flow rates and associated downstream flooding frequency and duration. Retention basins differ from detention basins because they hold a permanent pool of water. Generally, these basins were designed to convey smaller storms quickly, while only reducing the peak flow rates for larger storm events. There are several existing stormwater detention basins throughout Bloomfield that are owned and operated by either the Township or private companies.

A basin retrofit is an alteration and/or redesign of an existing basin to improve its stormwater management capabilities. These alterations can include the planting of vegetation native to the area, the excavation or expansion of the basin to increase the size/capacity, and modification or replacement of the outlet structures. Retrofits can improve the existing stormwater basin's ability to reduce peak flow rates for smaller storms, improve stormwater quality via pollutant removal, and increase storage capacity. Compared to other structural BMPs, these retrofits are less expensive than the construction of new basins, can improve aesthetics, provide habitat benefits for native species, and are eligible for several grant funding opportunities. The Lion Gate Wetland restoration project is a recent example of naturally low-lying space being restored as a wetland area and provides storage for runoff during wet weather events. No specific basins were identified as part of this report as candidates for retrofitting, but the Township should consider this as a possibility for future watershed-wide restoration efforts.

1.5.2 Bump-Out Bioretention Rain Gardens

Bioretention rain gardens are areas that are separated from the travel-way within an existing road's right-of-way (ROW). Curb extensions protrude into space otherwise unnecessary or unused for normal traffic operations or parking and provide an area of vegetation contained between two curblines and collect surface stormwater runoff from the roadway. Stormwater runoff is discharged by transpiration through vegetation, infiltrating into the groundwater, and/or discharging to existing downstream drainage infrastructure. Systems traditionally consist of a stone layer at the bottom that is separated with a pervious geotextile from an upper layer of soil and plants. Curb cut openings provide the opportunity for

roadway runoff to enter the area where it can be stored, infiltrated, and absorbed by the plants and soil media. In addition to a reduction of stormwater flow, bioretention rain gardens are largely beneficial in providing water quality treatment through filtration via vegetation and soil media designed to capture pollutants. These BMPs also provide benefits in velocity and thermal reductions. Secondary benefits of these facilities include pedestrian safety and when properly designed can assist in traffic calming.

#1 – Ampere Parkway at Beardsley Avenue

Ampere Parkway has been identified as a problem area by the Township with frequent surface inundation occurring during and after wet weather events. Further investigation of the area confirms that Ampere Parkway has a "saddle" (low point) in the roadway profile from Chester Avenue to Abington Avenue. As shown in the roadway profile below in Figure 1, there is not a clear direction of drainage from north to south (left to right).

Figure 1: Ampere Parkway Roadway Profile – North to South from Royalton Pl to 1st Ave

The roadway profile along Beardsley Avenue is shallowly sloped from west to east but does flatten out significantly from the intersection at Ampere Parkway to the low point at 15th and 13th Streets. Ampere Parkway is not at the overall sump location in the area but is generally flat in the north south direction.

With an open space median in the middle of the corridor, the median curbs could be removed, a bioretention area regraded, and drainage tied into the existing network beneath. The benefit of this revised roadway section through the lowpoint in the corridor would allow runoff to pool off of the travelway and into the median where additional storage volume can be provided via open space regrading before entering the underlying drainage network. The primary benefit of this reconfiguration is that runoff is removed from Ampere Parkway faster and less prone to flooding. Additional runoff storage provided in the median allows infiltration and biological uptake to reduce total runoff volume entering the underlying system as well as water quality improvements.

Between Chester Avenue and Abington Avenue (extended low point in the profile), the total length of open median space available for bio-retention is 1,050 linear feet with an average width of 20 feet. At an assumed 3 feet of available depth for storage in the regraded median, ~470,000 gallons (1.45 acre-feet) can be collected within in Township ROW before entering the drainage network beneath.

#01A - Benson Street Railroad Greenway Flooding

A documented area of flooding has been observed at Benson Street with large volumes of runoff inundating Benson Street resident's properties. The drainage infrastructure beneath the abandoned railroad was not included as part of this study and Township owned drainage systems do not run directly through the area of concern. The Township has investigated the area and has identified evidence of failed drainage infrastructure beneath the surface including sink holes. While the owner of this infrastructure is unclear, it is crucial that the Township investigates the situation and makes the repairs necessary to regain conveyance of runoff in this immediate area. Deteriorated pipes will only continue to degrade further and make the situation worse as subsequent storms move more debris toward the problem area.

#11 – Davey Street at Belleville Avenue Island

This is a much smaller area of opportunity for a bio-retention rain garden and may already be an important area to the community, but the Township could propose use changes for the open space in the median island to provide a small but visible environmental upgrade to the community as seen in Figure 2.

Figure 2: Davey Street Median Island

The Township could work with residents to keep the area well manicured while incorporating runoff storage volume design in the area. It is a smaller area so the runoff retention may be limited, but immediately adjacent areas could drain to the open space of the island and provide 72,000 gallons (0.22 acre-feet) of storage and water quality treatment before runoff enters the underlying drainage network. Educational signage could be designed and erected within what appears to be a high foot-traffic area.

<u>#20 – Broad Street at Watchung Avenue Abandoned Lot (SE quadrant)</u>

This area is at a major intersection and also provides the high visibility opportunity to provide an environmentally beneficial bio-retention area to the community. Preliminary investigation does not reveal any prohibitive designations for the abandoned paved building site as seen in Figure 3. A larger ~100 foot wide by ~200 foot long parcel measures an available area of 20,000 square feet (1/2 acre) for redevelopment into a bio-retention area and ~400,000 gallons of storage (0.12 acre-feet) and water quality treatment before runoff enters the underlying 72” drainage trunkline that outfalls into the Third River to the east.

Figure 3: Broad Street at Watchung Avenue Bio-retention Area

The area is privately owned unlike the prior two suggestions within Township ROW so the cost of parcel acquisition may be prohibitive. It is located adjacent to a major trunkline (72") draining down Watchung Avenue so diverting local drainage to this area prior to entering the main trunkline is beneficial in reducing the stress put on the downstream system. It is another high-traffic, high-visibility area that could serve as an example to the community of putting stormwater management at the forefront. The available storage depth in this area may be greater than the assumed 3 feet above because it is a ½ acre parcel. Acceptable side slopes to a flat bottom facility could provide additional storage volume in this space.

<u>#26 – Township-owned Vacant Parcel Bloomfield Avenue at Broad Street (Roxy Florist)</u>

This parcel is owned by the Township so there would be no cost of acquisition. It is located near a major trunkline running south down Bloomfield Avenue. Runoff contributing to this trunkline could be intercepted prior to reaching the major vein of conveyance. The area is small at about 1/10 of an acre, but as a central location in the Township, it is highly visible to the public and could serve as an educational opportunity highlighting runoff reduction efforts by the Township. For that reason, a natural surface facility such as a bioretention basin or rain garden are recommended.

Figure 26: Bloomfield Avenue at Broad Street Township owned parcel

Drainage infrastructure upstream of Bloomfield Avenue could be redirected to the regraded parcel planted with native, low-maintenance vegetation. The 5,500 square foot area could provide ~125,000 gallons of runoff retention during wet weather events and reduce stresses applied to the Bloomfield Avenue trunkline before outfalling into the Second River. Educational signing could be provided to highlight the purpose of such green spaces within the Township.

The specific corridors discussed above are good candidates for this type of restoration that removes runoff from the roadway while also providing additional storage in open space, but consideration of other similar corridors throughout the Township should be evaluated for improvements in drainage patterns to improve the safety of the road and use of available open space for runoff retention to relieve stresses on existing drainage infrastructure. The sites were chosen with consideration of existing adjacent drainage infrastructure so that tie-ins are simple and cost-effective.

1.5.3 Subsurface Detention Basins

A subsurface detention basin is an underground structure that is used to detain and release stormwater to reduce peak flow rates during storm events, resulting in less frequent and severe flooding issues. Basins are designed to fully discharge between storm events, thereby providing storage capacity for subsequent storm events. Being underground allows these basins to connect to existing drainage networks while minimally impacting any above-ground land uses. Underground basins can fit into almost any size or space, depending on the area available for a specific project need and project site type. This flexibility allows for a basin to have a significant impact on the peak flow rate if the basin collects form a large enough drainage area, or a basin can be on a much smaller scale to handle a single property's runoff.

Compared to basin retrofits and bump-out rain gardens, underground detention basins tend to be more expensive, requiring considerable excavation and installation procedures for the project as well as a larger project area. Additionally, underground detention basins require regular maintenance at a higher frequency than basin retrofits and rain gardens. Additionally, given the nature of the BMP being entirely underground, there is little aesthetic or environmental improvement for the project site area unlike basins and rain gardens that include native vegetation that enhances aesthetics and creates habitat for native fauna.

For the purpose of this study, the depth available for runoff storage is assumed to be 5 feet. Any volumes discussed here on are based on that assumption. If chosen as a candidate for further exploration and final design, utilities, required finished cover, and other factors may show that less or possibly more storage is available at any given site. The areas selected are all confirmed to be immediately adjacent to major Township drainage trunklines so that any overflow will have an immediate tie-in to existing infrastructure without the possibility of flooding surface areas in close proximity.

#02A – Carteret Elementary School Parking Lot

This parcel is owned by the School District so could be a collaboration with the Township with summer construction and return to use for the school year. The lot is located near a contributing trunkline on Grove Street and the major drainage trunkline running north on Bloomfield toward the Second River as seen in Figure 4.

Figure 4: Carteret Elementary School Parking Lot

A potential ~1.25 million gallons (3.8 acre-feet) of runoff storage could be provided beneath the surface of this dedicated parking area on school district property. This storage could relieve some of the peak flow stresses on the Bloomfield Avenue trunkline and reduce downstream surcharging and surface flooding due to hydraulic backup. Runoff can be diverted to this area prior to reaching the main trunkline without the need for diverting the significant upstream contributing drainage area toward the parking lot.

#02B – Staples Parking Lot

This parcel would require an agreement between the Township and private ownership of the lot, but much like the school district parking lot on the other side of Bloomfield Avenue, flows could

be diverted to this subsurface storage area prior to reaching the main drainage trunkline. Upon completion of construction, the area would still be available for parking as seen in Figure 5.

Figure 5: Staples Parking Lot

This large parking lot could provide a subsurface detention volume of ~3.5 million gallons (10+ acre-feet). The potential to divert flows from trunklines running south down Grove Street and west down Bloomfield Avenue before entering the main trunkline decreasing downstream surcharges and potential upstream backwater effects reducing overall hydraulic capacity.

#03 – Berkeley Elementary School Parking Lot

This parcel is owned by the School District so could be a collaboration with the Township with summer construction and return to use for the school year. The lot is located near the major drainage trunkline running north on Bloomfield toward the Second River as seen in Figure 6.

Figure 6: Berkeley Elementary School Parking Lot

A potential ~1.25 million gallons (3.9 acre-feet) of runoff storage could be provided beneath the surface of this dedicated parking area on school district property. This storage could relieve some of the peak flow stresses on the Bloomfield Avenue trunkline and reduce downstream surcharging and surface flooding due to hydraulic backup. Localized runoff can be diverted to this area prior to reaching the main trunkline without the need for diverting the significant upstream contributing drainage area toward the parking lot. If the Township chose to explore final design of this facility, determination of exactly how much of the localized drainage could be collected and diverted to this area would determine the most appropriate size of the facility.

#04 – Home Depot Parking Lot

This parcel would require an agreement between the Township and private ownership of the lot. Localized runoff could be diverted to this subsurface storage area prior to entering the to reaching the main drainage trunkline flowing North on Orange Street and to the Second River. Upon completion of construction, the area would still be available for parking as seen in Figure 7.

Figure 7: Home Depot Parking Lot

This large parking lot could provide a subsurface detention volume of ~3.9 million gallons (14+ acre-feet). The potential to divert flows from trunklines from Charles Street and Cross Street before reaching the main 36" trunkline flowing north on Orange Street could relieve surcharging from the trunkline and potential upstream backwater effects reducing overall hydraulic capacity.

#05B – Watsessing Elementary School Parking Lot

This parcel is owned by the School District so could be a collaboration with the Township with summer construction and return to use for the school year. The lot is located in close proximity to the Second River so the potential to relieve stress on downstream systems may be harder to

realize. The contributing drainage area may be limited to localized runoff detention in the immediate area between the Parkway and the Second River as seen in Figure 8.

Figure 8: Watsessing Elementary School Parking Lot

A potential ~2.6 million gallons (8 acre-feet) of runoff storage could be provided beneath the surface of this dedicated parking area on school district property. Localized runoff can be diverted to this area prior to reaching the Second River or nearby drainage networks. If the Township chose to explore final design of this facility, determination of exactly how much of the localized drainage could be collected and diverted to this area would determine the most appropriate size of the facility.

<u>#07 – Llewellyn Avenue Parking Lot</u>

This area is a privately owned and operated parking lot, but the Township could enter into an agreement with the owner to return the area back to its original use as a parking lot with the design of a subsurface detention area on Llewellyn Avenue as seen in Figure 9. An additional benefit of selection of this site is that the majority of runoff contributing to this point is derived from Glen Ridge and the trunkline located near the limits of the Township is a substantial 30" trunkline. Since the majority of the runoff contributing to this point comes from Glen Ridge, a shared cost of construction and operation may be negotiable.

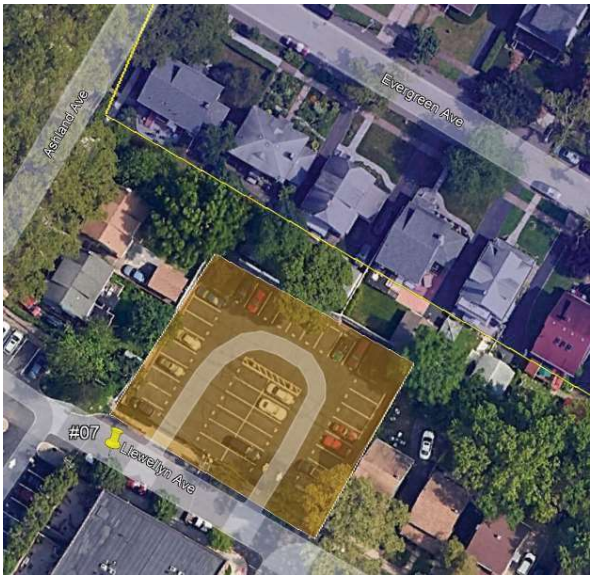


Figure 9: Llewellyn Avenue Parking Lot

This smaller parking lot could provide a subsurface detention volume of ~0.5 million gallons (~1.6 acre-feet). The potential to divert flows from minor contributing networks exists but in order to provide storage from runoff derived from upstream Glen Ridge contributing drainage areas, an overflow mechanism would likely be designed to relieve increased stress on the downstream Llewellyn 36" trunkline where surcharging has been documented during high intensity events. This runoff detention facility could relieve surcharging from the trunkline and from causing potential backwater effects reducing upstream hydraulic capacity.

#09 – Fairview Elementary School

This parcel is owned by the School District so could be a collaboration with the Township with summer construction and return to use for the school year. The lot is located high in the contributing watershed for the 24" trunkline running south down Berkeley Avenue and across Montogomery Street. Runoff upstream (north of this area) could be diverted to the detention facility before entering the major trunkline as seen in Figure 10.

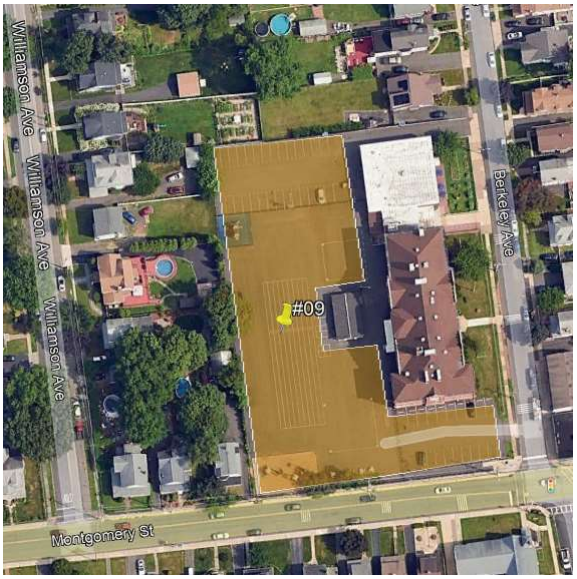


Figure 10: Fairview Elementary School Parking Lot

This parking lot has the potential to provide subsurface storage for ~1.8 million gallons (~5 acre-feet) of runoff. Final design would dictate the ultimate practicable sizing of the facility, but considering the significant upstream area contributing runoff to this location, a 1 million gallon facility would relieve appreciable hydraulic loads on downstream drainage infrastructure.

#10 – Bloomfield College Parking Lot

This parcel is owned by the College so could be a collaboration with the Township with summer construction and return to use for the school year. This subsurface detention facility is located high in the watershed and could provide runoff storage before entering the Liberty Street trunkline which contributes to a major trunkline on Bloomfield Avenue. This site can be seen in Figure 11.

Figure 11: Bloomfield College Parking Lot

This site could potentially provide storage for >2.5 million gallons (~8 acre-feet) of runoff. Final design would dictate the ultimate size of this facility, but significant runoff detention will be practicable at this location. The runoff temporarily stored at this site could reduce the hydraulic load contributing to wet weather peak flows along Bloomfield Avenue and the Second River.

#12 – Insurance Building Parking Lot on Broad Street

The privately owned parking lot at 265 Broad Street at Almira Street is located immediately adjacent to a 54" trunkline draining east to an outfall into the Third River. Collaboration with a private property owner may be complicated although the space will ultimately still be available for its current use as a parking lot. It is located along Almira Street at the southeast quadrant of the intersection of Broad Street as seen in Figure 12.

Figure 12: Almira Street Parking Lot Subsurface Detention Area

The maximum available area is shown and measures 11,600 square feet. The possible volume of runoff detention is ~0.5 million gallons (~1.5 acre-feet) and could include high flow diversion as well as local direct connection. This detention facility could provide relief to the major 54" trunkline flowing east down Almira Street and decrease surcharging on the downstream drainage network.

#13A – 300 Broad Street at Benson Street (Grocery Store Parking Lot)

The privately owned parking lot at 300 Broad Street at Almira Street is located immediately adjacent to a 30" trunkline draining north on Broad Street to an outfall into the Third River. Collaboration with a private property owner may be complicated although the space will ultimately still be available for its current use as a parking lot. It is located in the southwest quadrant of the intersection of Benson Street and Broad Street as seen in Figure 13A.

Figure 13A: 300 Broad Street Parking Lot

The maximum available area is shown and measures 6,800 square feet. The possible volume of runoff detention is ~0.25 million gallons (0.75 acre-feet). This detention facility could provide relief to the 30" trunkline flowing north on Broad Street and decrease surcharging on the downstream drainage network.

#13B – 314 Broad Street at Benson Street (Day Care Parking Lot)

This smaller site is privately owned but could also provide subsurface detention along Benson Street prior to the junction at Broad Street as seen in Figure 13B.

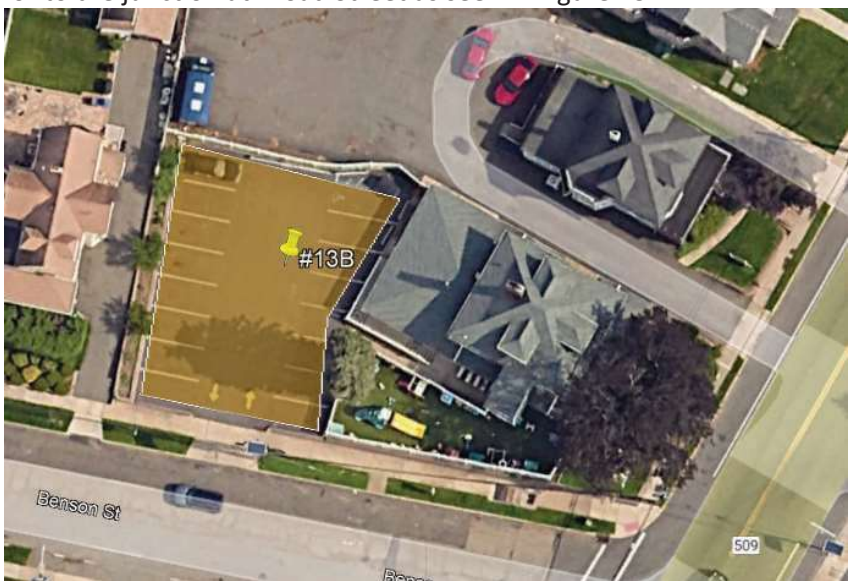


Figure 13B: 314 Broad Street Parking Lot

The detention facility is in line with a contributing drainage network running east down Benson Street and could add an additional ~140,000 gallons (0.4 acre-feet) of runoff storage. It is located at a point within the watershed that may allow inline connection to the Benson Street trunkline but final design may reveal that a high flow diversion toward the site is recommended. This storage would reduce the frequency and severity of surcharging on the Broad Street drainage trunkline.

#13C – 324 Broad Street at Osborne Street

This smaller site is privately owned but could also provide subsurface detention along Osborne Street prior to the junction at Broad Street as seen in Figure 13C.

Figure 13C: 324 Broad Street Parking Lot

The detention facility is in line with a contributing drainage network running east down Osborne Street and could add an additional ~150,000 gallons (0.5 acre-feet) of runoff storage. It is located at a point within the watershed that may allow inline connection to the Benson Street trunkline but final design may reveal that a high flow, partial diversion toward the site is recommended. This storage would reduce the frequency and severity of surcharging on the downstream Broad Street drainage trunkline.

#14 – Brookside Manor Parking Lot

The space is owned by Brookside Manor and so any proposed facility at this location would require collaboration between the Township and the private property owner. The proposed subsurface detention facility would be located in the parking lot of Brookside Manor as seen in Figure 14.

Figure 14: Brookside Manor Parking Lot

Final design would dictate exactly which trunklines could be intercepted but trunklines continuing down both Baldwin and Pitt Streets could potentially be impacted positively. The maximum storage space available beneath the surface of this parking lot is ~675,000 gallons (2 acre-feet) and would return the land area back to its current use as a parking lot upon completion of construction. Runoff detention in this area would lessen the frequency and severity of downstream system surcharging on Baldwin, Pitt, and Broad Streets. With the majority of runoff reaching this site being derived from Glen Ridge properties, the opportunity for collaboration between Townships exists and could help to diffuse the costs of construction and upkeep over the life of the facility.

#15 – Baldwin Street at Broad Street Parking Lot

This Township owned parking lot along Broad Street is a very good candidate for subsurface detention not only because it is already owned but due to its topographic proximity to major drainage networks and its location within the watershed. As seen in Figure 15, the lot is located near Broad Street at the intersections of Pitt and Baldwin Streets.

Figure 15: Baldwin Street at Broad Street Parking Lot

The site could potentially store more than 1 million gallons (3.4 acre-feet) of runoff largely derived from Glen Ridge contributing drainage areas. Final design would dictate the most practicable size of the facility but between the two drainage networks flowing down Baldwin and Pitt Street would allow for maximization of the facility size. This facility would provide runoff detention during wet weather events and decrease the burden on the downstream Broad Street trunkline before outfalling into the Third River.

#16 – Franklin Elementary School Parking Lot

This parcel is owned by the School District so could be a collaboration with the Township with summer construction and return to use for the school year. As seen in Figure 16, the lot is located high in the contributing watershed for the two trunklines running east down Gillespie and Valentine Roads and beneath the Parkway to the Third River.

Figure 16: Franklin Elementary School Parking Lot

This subsurface detention facility could provide ~1.5 million gallons (4.6 acre-feet) of runoff retention during wet weather events. Final design would determine the ultimate size of the facility but this detention facility high in the watershed would relieve pressure on all downstream systems.

<u>#18 – Pulaski Park Baseball Outfield</u>

This Township owned park area is a very good candidate for subsurface detention. As seen in Figure 18, it is located at the intersection of Mount Vernon Avenue and Howard Street.

Figure 18: Pulaski Park Baseball Outfield

The available open space and outfield area in the park of 1.6 acres and could potentially provide sub-surface detention of > 2 million gallons (~6.5 acre-feet) of runoff storage. Its location is directly in line with a major 48" trunkline running down Pleasant Avenue and ultimately to Hoover Avenue. Final design would include diversion of a portion of the total trunkline flow for detention beneath the ballfield. This detention facility would provide relief to the downstream trunkline to the Third River and reduce the frequency and severity of surcharging on Hoover Avenue.

#19 – Ackerman Street Parking Lot and Adjacent Township Tennis Courts

This Township owned park area is another candidate for subsurface detention. As seen in Figure 19, it is located along the Third River at the end of Dewey Street.

Figure 19: Ackerman Street Parking Lot

This site should be considered as a candidate for subsurface detention if the tennis courts are reconstructed or redeveloped and possible acquisition of additional private property could be included. The area shown in Figure 19 could provide > 1 million gallons (~3.6 acre-feet) of runoff detention volume. Due to its close proximity to the Third River, detention in this area would only lessen the burden on the river itself.

#21 – South Meadow – Open Space Ballfields

This space is another potential candidate for subsurface detention. The space shown in Figure 21 is owned by the Branch Brook Park Alliance and so any proposed construction or repurposing of this space would need to be a collaboration between the Township and the Alliance.

Figure 21: South Meadow Open Space

A major 48" trunkline passes directly under the park and runoff in this trunkline could be diverted into the facility. Potential subsurface volume available in the shown location could be a maximum ~12 million gallons (~36 acre-feet). Its topographic location makes this site ideal for a detention facility as it sits in the watershed. Final design would dictate the ultimate size of the facility beneath the surface, but a significant amount of runoff passes through the park and could be detained. Any detention in this area could significantly reduce the load put on the Watchung Avenue trunkline leading to less surcharging along its length.

#22 – St. Thomas Church Parking Lot

This proposed location is owned by the church so an agreement would need to be reached with the Church for the proposed subsurface detention facility. The space would be returned to its current purpose upon completion of construction and is shown in Figure 22.

Figure 22: St. Thomas Church Parking Lot

A 30" trunkline runs directly beneath the park and the parking lot. A potential ~2 million gallons (6 acre-feet) of runoff detention volume can be provided in the space shown. The diversion or full interception of upstream contributing flows to this point would be determined during final design, but could provide significant benefits to downstream Township infrastructure before entering the Third River.

#23 – Brookdale Elementary School Parking Lot

This parcel is owned by the School District so could be a collaboration with the Township with summer construction and return to use for the school year. As seen in Figure 23, the lot is located adjacent to Broad Street.

Figure 23: Brookdale Elementary School Parking Lot

This subsurface detention facility could provide ~675,000 gallons (~2 acre-feet) of runoff retention during wet weather events. It is located immediately adjacent to a Broad Street trunkline and during final design would be sized appropriately to effectively collect areas directly contributing to the site.

<u>#24 – Broadacres Drive Parking Lot</u>

This is a privately owned parking lot for the business park buildings so an agreement would be needed from the Township, but the parking lot could be returned to its current usage upon completion of construction. It is located immediately adjacent to Broad Street as shown in Figure 24.

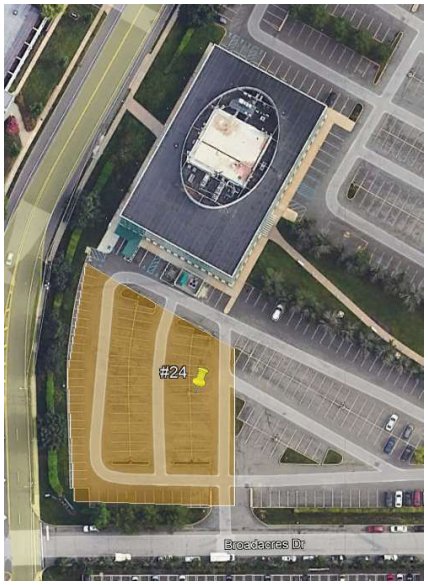


Figure 24: Broadacres Drive Parking Lot

The maximum potential subsurface runoff detention for this area is >1 million gallons (~3.4 acre-feet). It is located just offline of a 30" trunkline flowing south down Broad Street to the Third River. This detention facility could provide storage upstream of the trunkline daylighting roadside at the intersection of Mountain Avenue on the east side of Broad Street. This could reduce peak flows observed in highly channelized open channel flowing next to Broad Street.

#25 – Oak View School Parking Lot

This parcel is owned by the School District so could be a collaboration with the Township with summer construction and return to use for the school year. As seen in Figure 25, the lot is located adjacent to School Street and could provide significant relief to a documented flooding issue on Garner Avenue.

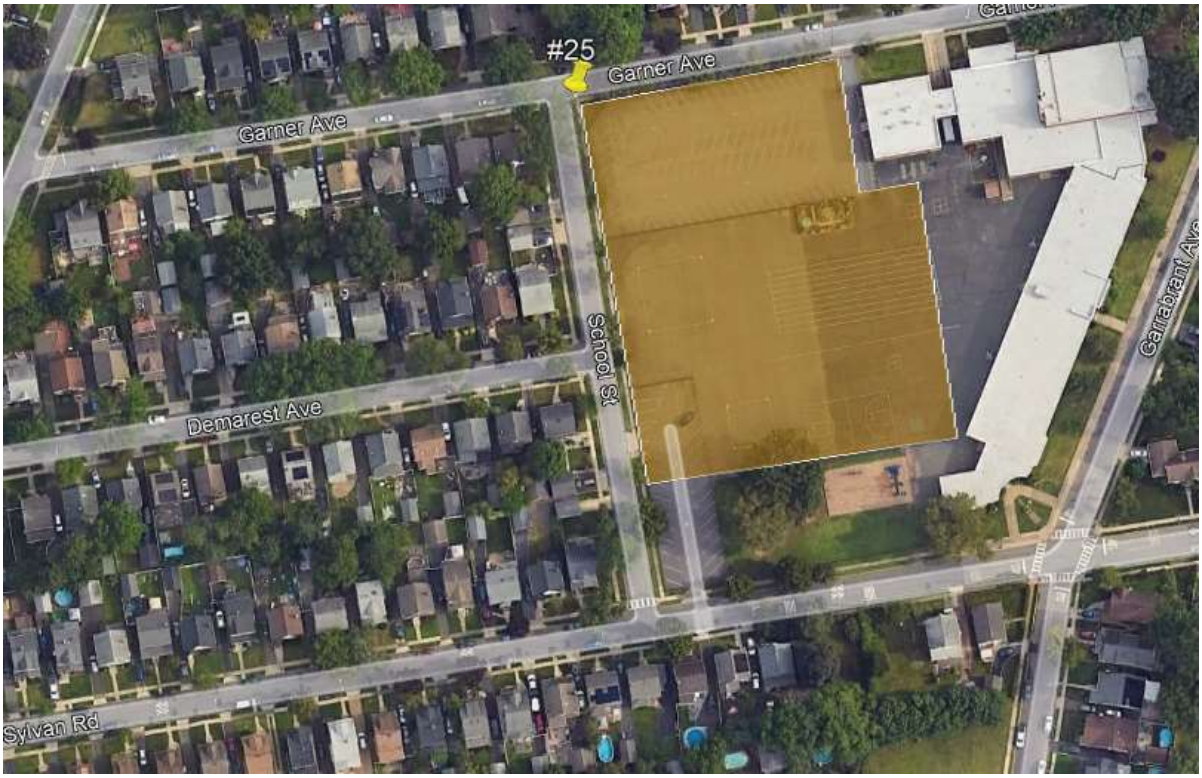


Figure 25: Oak View School Parking Lot

The paved grade of the parking lot is from southeast to northwest, so direct interception of this sheet flow along with possible other contributors could be intercepted and detained beneath the surface of the parking lot. The shaded area in Figure 25 is ~100,000 square feet and could provide ~3.2 million gallons (10 acre-feet) of runoff detention. This site is not directly adjacent to any known existing Township drainage infrastructure, but a proposed run of 500 feet of pipe and inlets down Garner Avenue would serve as a new trunkline to alleviate flooding in the corridor as well as a defined subsurface overflow mechanism for the detention facility.

#34 - Myrtle Street Parking Lot

This site is Township owned and is an approximate 1/3 acre parcel dedicated to parking. A nearby trunkline can be diverted to pass through the site to provide sub-surface detention during wet weather events between JFK Drive and Orange Street.

Figure 34: Myrtle Street Parking Lot

The sub-surface detention facility could provide ~500,000 gallons of runoff retention and relieve stress on the downstream trunkline.

#35 – Berkeley Vo-Tech School Ballfield

This open space recreational field is located just upstream of a 24" trunkline that passes beneath Newark Avenue and outfalls into the Third River. Preliminary assessment shows an available 200 foot by 400 foot space for sub-surface detention that could still be utilized as recreational space.

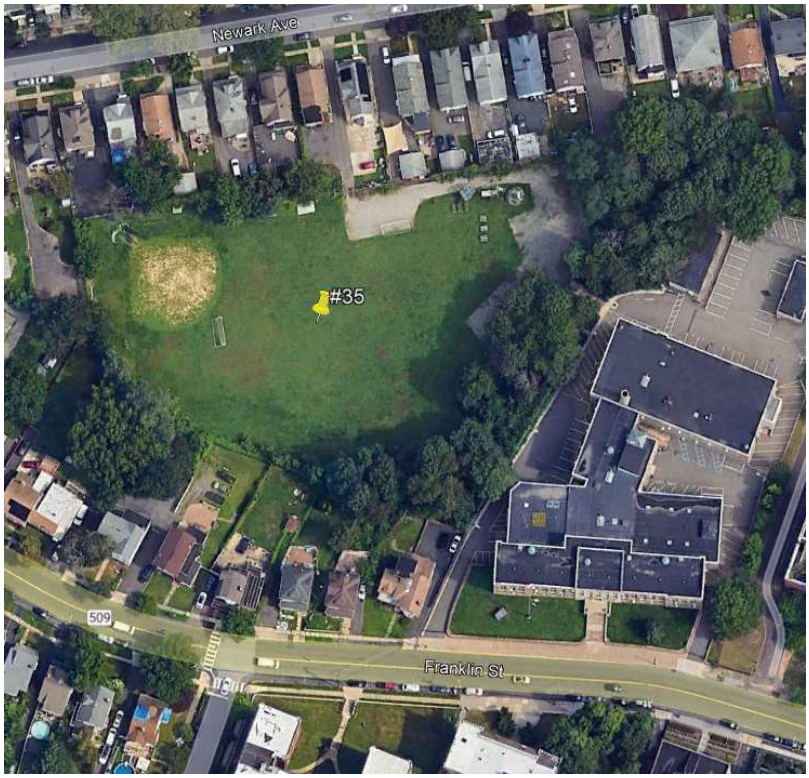


Figure 35: Berkeley Heights Park

The park could be revitalized and during construction, nearly 3 million gallons of runoff detention could be provided. It should be noted that this area is very hydrologically high in the watershed and may not have enough drainage area to utilize the full capture volume available. Runoff from local drainage areas may not provide enough runoff to build out the full retention volume identified, but final design would determine the most appropriate size. Being high in the watershed is still highly beneficial as it can reduce the load on downstream drainage infrastructure.

Of the areas proposed above, Township input will be critical in selection of a site for further investigation and possible final design. The Township has the inherent knowledge of public use of that space by residents sporadically or regularly throughout the year. A dedicated restored wetland area would be the most effective and environmentally beneficial flood mitigation practice. If the area is deemed to be of value to the community for specific purposes a few days a year (i.e. Town Festival, etc.) the facility could be designed to still be of use to the public aside from days surrounding wet weather events. An example of this type of area already existing within the Township would be the athletic fields adjacent to Clarks Pond at the Bloomfield Middle School.

1.5.4 Surface Wetlands

Designating certain open spaces immediately adjacent to either the Second or Third River will not reduce the amount of runoff reaching these major bodies of water. They do provide an environmental uplift to these critical riverine systems that have been channelized over time as

development has increased. Restoring some of the natural mechanics of overbank flow reaching large flat areas creates environmentally beneficial ecosystems that have largely been eliminated over time. The areas selected in this study are located in open space park land adjacent to the rivers and could be designed to be aesthetically pleasing and educational to the public. These overbank overflow pools will help reduce velocities in the rivers during wet weather events, provide an area of storage and deposition, and reduce flooding damage downstream both within and outside of Township limits.

#05WtA - Abandoned Lot (71 Locust Avenue)

This site was chosen due to its close proximity to Wigwam Brook (tributary to the Second River). Preliminary investigation does not reveal a prohibitive land classification such as a designation as a brownfield or historic preservation. The paved space could be restored to its natural condition and allow for an overflow area dissipating stream velocities and reducing erosive forces within the narrow streambanks. A known amount of existing pavement would need to be removed from the surface along with the possibility of additional foundation or

#05WtB – Watsessing Elementary School Parking Lot

This site was chosen due to its close proximity to Wigwam Brook (tributary to the Second River). The area is currently used as a parking lot for the school but coordination with the school is plausible and while an open air wetland is likely not feasible, a subsurface detention area may be possible. There is also a high likelihood that groundwater elevations could be elevated and prohibitive to any subsurface detention facility considering the proximity to Wigwam Brook.

#06Wt - Watsessing Park Open Space (Cleveland Terrace at Llewellyn Avenue)

This space is another potential candidate for stream corridor restoration to a natural wetland. The space is owned by the Branch Brook Park Alliance and so any proposed repurposing of this space would need to be a collaboration between the Township and the Alliance. With its close proximity to Wigwam Brook, it is another candidate area for overbank restoration and a possible wet weather wetland storage area. The open area is approximately 300 feet wide and 550 feet long immediately adjacent to the streambanks and even a partial repurposing of some of this space could provide significant stream corridor benefits both within the Township and downstream.

#17Wt – Brookside Park Open Space (Outfield)

This Township owned park is a candidate for stream corridor restoration. Design could incorporate the current essential functions of the open space for all times other than the days surrounding a wet weather event.

Several other existing park/open space/ballfield areas currently exist along the Third River where the open space areas becoming temporary wetland overbanks during wet weather events. The Township is able to utilize these areas for their intended purpose for the remainder of the year. Further investigation could be put into these areas to provide more effective flood management capacity during wet weather events. This type of work would not prevent these specific areas

from experiencing inundation but could help alleviate downstream flooding and velocities by providing overbank storage area for large runoff events. Memorial Park, Wright's Field, and Clarks Pond South are just a few of the areas identified as candidates to provide such storage.

1.5.5 Outfall Rehabilitation

Outfall rehabilitation can improve the hydraulic capacity of Township stormwater conveyance systems and overall sustainability of the systems of stream of each outfall into the Second River, Third River, Wigwam Branch, or any of their tributaries. On March 14, 2024, The Township DPW (Joseph Caprio) and the Township Stormwater Program Coordinator (SPC) inspected twelve (12) outfalls and one (1) stream bed obstruction for issues related to outfall blockage, maintenance issues, evidence of scouring, detached headwalls/aprons, and related issues. The inspection was the Township response to an August 1, 2022, EPA Administrative Order on Consent (AOC). Certain outfalls were identified with upstream catch basin inlets with significant residual build up to be addressed as part of short-term remedial measures. These outfalls were identified by the Township Engineer and SPC as high priority stormwater assets requiring both short term maintenance and longer-term repairs. The twelve (12) outfalls, and one (1) stream obstruction, were identified for immediate attention and action by DPW to be completed on, or about July 1, 2024. The six (6) identified outfalls listed in Table 1, on the following page (Outfalls BT-03, BT-17, ID-20, ID-21, BT-29, and ID-1), are to be upgraded as part of stormwater facility improvements recommended as part of this report.

Table 1: Stormwater Outfall Rehabilitation Locations

STORMWATER OUTFALLS IDENTIFIED FOR REMEDIAL MEASURES					
OUTFALL	GPS COORDINATES		LOCATION	COMMENTS	REMEDIAL MEASURE
	X	Y			
BT-03	573266.6936	711024.8036	Cleveland Terrace	Undersized outfall	Stone rip rap (d50 = 9") to be placed at a 20" minimum depth of bed at outfall
BT-17	575275.6838	712049.0758	950 feet upstream of 2nd River, 950 ft east of Locust Ave	Stream scour	Stone rip rap (d50 = 9") to be placed at a 20" minimum depth of bed at outfall
ID-20	580663.0225	713863.2234	Montgomery Street	Broken wall, scour	Repair wall, install stone rip rap (d50 = 9") to be placed at a 20" minimum depth of bed at outfall
ID-21	579629.7963	718005.7920	Near Davey Street	Detached Headwall	Repair wall and place stone rip rap (d50 = 9") to be placed at a 20" minimum depth of bed at outfall
BT-29	574864.2610	713785.3129	2nd River 860 feet upstream of Wigwam Brook	Stream Scour	Stone rip rap (d50 = 9") to be placed at a 20" minimum depth of bed at outfall
ID-1	58281.7139	730082.8788	Lindbergh Blvd	Outfall Blockage	Re-attach headwall and place stone rip rap (d50 = 9") to be placed at a 20" minimum depth of bed at outfall

1.6 CONCLUSION

Potential improvements to Bloomfield's various drainage networks are numerous and any of the suggested improvements are proposed within this report at a conceptual level. Any conceptual improvements are intended for consideration by the Township to determine plausibility and selection for further investigation. The suggested areas of improvement have been conceptually identified based on the following factors:

- Proximity to existing drainage infrastructure
- Hydraulic potential (plausible elevation available)
- Hydrologic location (location within a drainage area)
- Possible acquisition or collaboration with open area Owners

Outfall remediation efforts have been identified as part of this work and recommendations for repair and maintenance have been made separate to this stormwater drainage assessment and some have already begun construction by Township maintenance staff. The land areas suggested in this report have been conceptually identified for constructability based on available space within Township Right-Of-Ways, private open spaces, and The Township should select areas for further investigation determined to be most plausible based on constructability, knowledge of existing utilities, known land uses, and known flooding issues in proximity to the sites proposed.

The Bloomfield Stormwater Drainage study identified 1,400 ft of storm drainage facilities, 86 inlet additions or improvements and 136.4 acre-feet of potential bio-retention areas and/or storm drainage detention facilities that could improve the drainage of the Township. These improvements coupled with BMPs identified during the previous Training program, would contribute significantly to improvements of stormwater management in the Township. The cost for these improvements would range from 25 to 30 million dollars and would be eligible for funding. RVE would be happy to prioritize the improvements discussed in this report. Implementation over a five (5)-year period could be recommended based on grants available and Township finances. These improvements when completed would approximately retain stormwater from a three (3) inch storm and significantly reduce the impact of larger storms.

Appendix B – Funding Sources

New Jersey offers various funding sources for stormwater management projects, including grants and loans from the NJ Department of Environmental Protection (NJDEP), New Jersey Infrastructure Bank, and the Clean Water State Revolving Fund (CWSRF). These programs target various aspects of stormwater management, from infrastructure projects to planning and resilience initiatives.

Specific Funding Sources and Programs:

A. **NJDEP Water Quality Restoration Grants: -** This program supports projects that improve and restore water quality through activities like stormwater management, riparian buffer restoration, and erosion control.
B. **Lake Stormwater Management Grants:** - Specifically targets projects that improve or protect the use of publicly accessible lakes for recreation and conservation.
C. **American Rescue Plan Act (ARP) funding**: - NJDEP has implemented programs using ARP funding to support stormwater resilience initiatives and infrastructure projects.
D. **New Jersey Water Bank (NJWB) Program:** - Provides financing for various infrastructure projects, including stormwater management, with the potential for Smart Growth Financing Packages.
E. **Clean Water State Revolving Fund (CWSRF):** - A federal program administered in New Jersey that provides low-interest loans for various water infrastructure projects, including stormwater management.
F. **New Jersey Infrastructure Bank (NJIB):** - Offers loan programs for infrastructure projects, including stormwater management.
G. **New Jersey Municipal Stormwater Assistance Grants:** - Specifically targets municipal stormwater management projects.
H. **Ready to Be Resilient Stormwater and Resilience Funding Program: -** Funded by the American Rescue Plan Act, this program offers grants and technical assistance for stormwater planning, vulnerability assessments, and watershed management.
I. **State Infrastructure Financing Authority (SWIFIA) Loan Program:** - A loan program exclusively for State infrastructure financing authority borrowers, potentially used for stormwater projects.
J. **Water Infrastructure Finance and Innovation Act (WIFIA):** - A federal credit program for water and wastewater infrastructure projects, including stormwater management.
K. **Sewer Overflow and Stormwater Reuse Municipal Grants (OSG): -** Provides funding for infrastructure projects related to combined sewer overflows, sanitary sewer overflows, and stormwater management.
L. **County Green Stormwater Infrastructure "Green Streets" Grants:** - Provides grants for planning green street projects along county roads to improve stormwater management.

Appendix C
Properties in Flood Prone Areas

Bloomfield's flood prone areas include low-lying areas near rivers, particularly along Wigwam Brook in Watsessing Park, Second River, Third River, and in the northern end of the Township east of the Garden State Parkway. These areas are also classified as Special Flood Hazard Areas (SFHAs) by FEMA and are identified in SWMP Figure 9. Specific Areas of Concern are identified as follows::

-

A. Watsessing Park:

The area along Wigwam Brook in Watsessing Park is identified as a wetland area and a potential flood zone.

B. Second River:

Areas near Second River, particularly along the Township's eastern border, are susceptible to flooding.

C. Third River:.

Areas along the Third River, north of Bay Street and south of Brookdale Gardens, are also identified as flood prone.

D. Northern End of Township (east of Garden State Parkway):

This area, east of the Garden State Parkway, is another location where wetlands and floodplains are concentrated.

Appendix D

Outfall Maintenance, Repair, & Mitigation

Scope of Work

Outfall Repairs

As part of the recommendations associated with this report, the following outfalls require rehabilitation to improve performance of the stormwater drainage facility assets in the Township of Bloomfield (Township). On March 14, 2023, Joseph Caprio from the Township Department of Public Works (DPW) and the Township Stormwater Program Coordinator (SPC) inspected twelve (12) outfalls and one (1) stream bed obstruction for issues related to outfall blockage, maintenance issues, evidence of scouring, detached headwalls/aprons, and related issues. This inspection was the Township's response to an Administrative Order of Consent (AOC) issued by the Environmental Protection Agency (EPA) on August 1, 2022. Certain outfalls were identified as having upstream catch basin inlets with significant residual build-up, to be addressed as part of short-term remedial measures. These outfalls were identified by the Township Engineer and SPC as high-priority stormwater assets requiring both short-term maintenance and long-term repairs. The twelve (12) outfalls and one (1) stream obstruction were identified for immediate attention and action by DPW to be completed on, or around, July 1, 2024. Additionally, six (6) facilities listed in Table 1 on the following page (Outfalls BT-03, BT-17, BT-20, BT-21, BT-29, and ID-1), are to be upgraded as part of stormwater facility improvements recommended in this report.

TABLE 1 (1 OF 2)
STORMWATER ASSETS IDENTIFIED FOR REMEDIAL MEASURES

OUTFALL	GPS COORDINATES		LOCATION	COMMENTS	REMEDIAL MEASURE
	X	Y			
BT-15	575234.757060	711744.30668	Southbound JFK Drive	Blockage	Clear upstream catch basin. Eighteen (18)-inch-diameter outfall to be power flushed with a twelve (12)-inch diameter router, equipped with four thousand (4,000) pounds per square inch (psi) power jet with half (½)-inch-to-three-quarter (¾)-inch thread dowels.
BT-17	575275.68380	712049.075759	Five hundred (500) ft upstream of the second (2nd) River, nine hundred and fifty (950) ft east of Locust Ave	Stream scour	Placement of twenty-five (25) square feet (3.75 tons) of six (6)-to-nine (9)-inch stone rip-rap to be placed at eight (8)-inch outfall to remediate scour potential.
BT-29	574864.260991	713785.312920	Second (2nd) River, eight hundred and sixty (860) ft upstream of Wigwam Brook, two hundred and sixty (260) ft north of Broad Street	Stream scour	Placement of fifty (50) square feet (3.75tons) of fifteen (15)-to-twenty-four (24)-inch stone rip-rap to be placed at outfall to remediate scour potential.
BT-72	72 576991.213241	720705.042596	Broad Street, third (3rd) River	Blockage	Clear upstream catch basin. Eighteen (18)-inch-diameter outfall to be power flushed with a twelve (12)-inch diameter router, equipped with four thousand (4,000) psi power jet with half (½)-inch-to-three-quarter (¾)-inch thread dowels.
BT-29	574864.260991	713785.31292	Second (2nd) River, eight hundred and sixty (860) ft upstream of Wigwam Brook	Stream Scour	Place twenty-five (25) square feet (3.75 tons) of six (6)-to-nine (9)-inch rip-rap at eight (8)-inch diameter outfall within outfall terminus.
ID-1			Second (2nd) River, Glenwood Avenue	Obstruction in Stream	Remove manhole obstruction from stream.

TABLE 1 (2 OF 2)
STORMWATER ASSETS IDENTIFIED FOR REMEDIAL MEASURES

OUTFALL	GPS COORDINATES		LOCATION	COMMENTS	REMEDIAL MEASURE
	X	Y			
ID-1	58281.7139	730082.8788	Lindbergh Blvd	Blockage	Clear upstream catch basin. Eighteen (18)-inch-diameter outfall to be power flushed with a twelve (12)-inch diameter router, equipped with four thousand (4,000) psi power jet with half (½)-inch-to-three-quarter (¾)-inch thread dowels. Placement of ten (10) square feet of nine (9)-to-eighteen (18)-inch rip-rap at headwall.
ID-6	577863.7821	722364.1691	Lions Gate Dr.	Blockage	Clear upstream catch basin. Eighteen (18)-inch-diameter outfall to be power flushed with a twelve (12)-inch diameter router, equipped with four thousand (4,000) psi power jet.
ID-7	577849.0474	722390.0327	Lions Gate Dr.	Blockage	Clear blockage and brush at outfall.
ID-10	577666.194	722482.6198	Lions Gate Dr.	Blockage	Clear blockage and brush at outfall.
ID-11	577308.018	722797.814	Lions Gate Dr.	Blockage	Clear blockage downstream of outfall.
ID-13	577337.8758	722848.2685	Lions Gate Dr.	Blockage	Clear blockage downstream of outfall.
ID-14	577226.2743	722820.499	Lions Gate Dr.	Blockage	Clear blockage downstream of outfall.
ID-20	580863.0225	3863.2234	Near Montgomery Street	Wall repair/rip rap	Repair wall, place a five (5) foot-by-five (5)-foot area of six (6)-to-nine (9)-inch rip-rap (3.75 tons) below eight (8)-inch outfall.
ID-21	579629.79634	718005.792035	Near Davey Street	Detached Headwall	Re-fasten headwall to outfall.
ID-22	579877.6235	718333.9086	Near Davey Street	Rip Rap	Clear debris from eighteen (18)-inch outfall, place a ten (10)-foot-by-ten (10)-foot area of rip-rap (3.75 Tons) adjacent to eroded concrete apron.

Municipality Requirements – DPW Asset Maintenance

Zone 1, Outfall BT-15,
Southbound JFK Dr.
X 575234.757069
Y 711744.30668

BLOOMFIELD TOWNSHIP
New Jersey

Visible blockage of outfall

Municipality Requirements – DPW Asset Maintenance

Zone 1, Outfall BT-17,
X 575275.68380, Y 712049.075759
500 ft upstream 2nd River, 950 ft east Locust Ave

Stream scour,
place rip rap
outlet at outfall

BLOOMFIELD TOWNSHIP
New Jersey

Municipality Requirements – DPW Asset Maintenance

Zone 1, near Glenwood Avenue
Second River,

Remove Brick Manhole from stream

BLOOMFIELD TOWNSHIP
New Jersey

Municipality Requirements – DPW Asset Maintenance

Zone 1, Outfall BT-29,
X 574864.260991, Y 713785.312920
Second River, 860 ft upstream of Wigwam Brook,
260 ft north of Broad Street

Stream scour,
place rip rap
outlet at outfall

BLOOMFIELD TOWNSHIP
New Jersey

Municipality Requirements – DPW Asset Maintenance

Zone 4, Outfall BT-72,
Broad St, Third River
X 576991.213241
Y 720705.042596

Clear Outfall of Blockage

BLOOMFIELD TOWNSHIP
New Jersey

Municipality Requirements – DPW Asset Maintenance

Zone II, Lindbergh Blvd.
NO ID - 1,
X 578084.744563
Y 722441.94148

Clear Outfall Blockage

Re-attach endwall

BLOOMFIELD TOWNSHIP
New Jersey

Municipality Requirements – DPW Asset Maintenance

Zone 4, NO ID - 6,
Lions Gate Dr.,
X 577863.7821, Y 722364.1691

Clear Blockage of Outfall

BLOOMFIELD TOWNSHIP New Jersey

Municipality Requirements – DPW Asset Maintenance

Zone 4, NO ID - 7, Lions Gate Dr.
X 577849.0414, Y 722390.0327

Clear Endwall Blockage & Brush

BLOOMFIELD TOWNSHIP
New Jersey

Municipality Requirements – DPW Asset Maintenance

Zone 4, NO ID - 10,
Lions Gate Dr.
X 577666.194 Y 722482.6198

Clear
Headwall
Blockage

BLOOMFIELD TOWNSHIP
New Jersey

Municipality Requirements – DPW Asset Maintenance

Zone 4, NO ID - 11,
Lions Gate Dr.
X 577308.0179, Y 722797.814

Clear Outfall
Blockage

BLOOMFIELD TOWNSHIP
New Jersey

Municipality Requirements – DPW Asset Maintenance

Clear blockage downstream of outfall

Zone 4, NO ID - 13,
Lions Gate Dr.
X 577337.8758 Y 722848.2685

Clear blockage downstream of outfall

Clear Outfall
Blockage

BLOOMFIELD TOWNSHIP
New Jersey

Municipality Requirements – DPW Asset Maintenance

Zone 4, NO ID - 14
Lions Gate Dr.
X 577226.2743 Y 722820.449

Clear Outfall Blockage

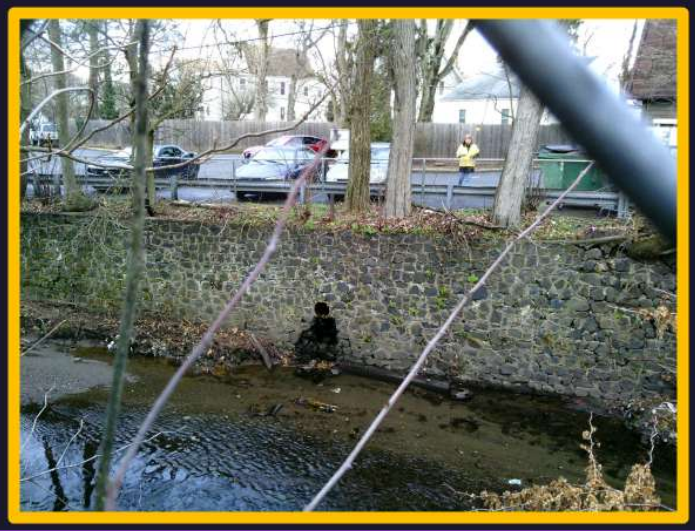
BLOOMFIELD TOWNSHIP
New Jersey

Municipality Requirements – DPW Asset Maintenance

- Zone 5, NO ID. Outfall 20, near Montgomery Street
- X 580663.0225, Y 713863.2234

Repair wall/

Place riprap energy dissipator



BLOOMFIELD TOWNSHIP New Jersey

Municipality Requirements – DPW Asset Maintenance

Zone 5, NO ID - 21, near Davey St

X 579629.7963

Y 718005.792

[illegible]21	579629.79634	718005.79203	Near Davey Street	Detached Headwall	Repair Wall as part of Stormwate progress (12 [illegible] as part of o upgrades.
		5			

Clear blockage
Re-attach headwall

BLOOMFIELD TOWNSHIP
New Jersey

Municipality – DPW Asset Maintenance Requirements

Zone 5, NO ID - 22, Davey St
X 579877.6235
Y 718333.9086

Clear outfall of blockage/repair apron/rip rap for stream scour

BLOOMFIELD TOWNSHIP
New Jersey

STORMWATER DRAINAGE SYSTEM – OUTFALLS TO BE REPAIRED

General Notes and Data Sources:

This Geographic Information System (GIS) map is for demonstration purposes only. any use of this product with respect to accuracy and precision shall be the sole responsibility of the end user.

The various stormwater utilities shown on this map are referenced, in part, from ground surveys, aerial surveys and recorded plans, and documents, and are to be used for approximate location purposes only.

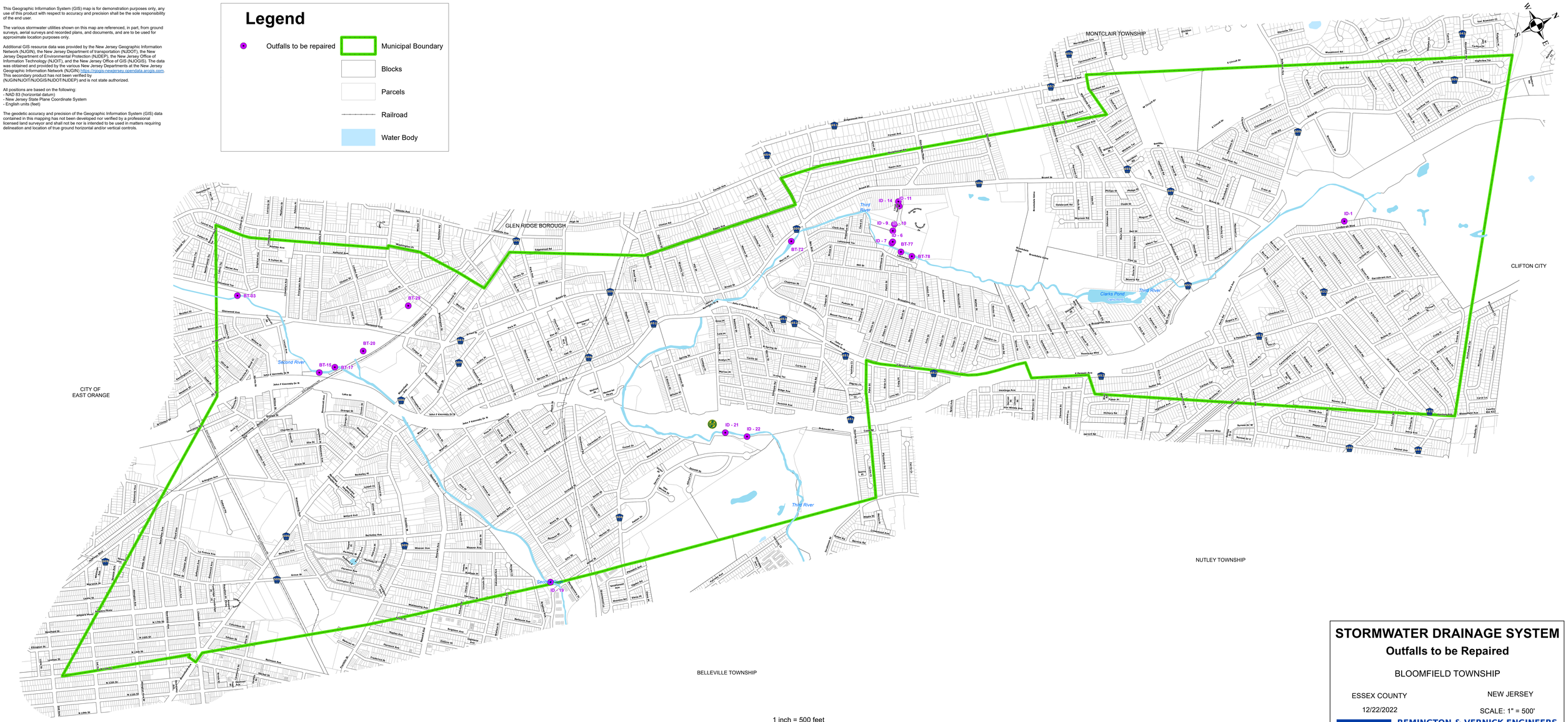
Additional GIS resource data was provided by the New Jersey Geographic Information Network (NJGIN), the New Jersey Department of transportation (NJDOT), the New Jersey Department of Environmental Protection (NJDEP), the New Jersey Office of Information Technology (NJOIT), and the New Jersey Office of GIS (NJOGIS). The data was obtained and provided by the various New Jersey Departments at the New Jersey Geographic Information Network (NJGIN) https://njgin-newjersey.opendata.arcgis.com. This secondary product has not been verified by (NJGIN/NJOIT/NJOGIS/NJDOT/NJDEP) and is not state authorized.

All positions are based on the following:
- NAD 83 (horizontal datum)
- New Jersey State Plane Coordinate System
- English units (feet)

The geodetic accuracy and precision of the Geographic Information System (GIS) data contained in this mapping has not been developed nor verified by a professional licensed land surveyor and shall not be nor is intended to be used in matters requiring delineation and location of true ground horizontal and/or vertical controls.

Legend

- Outfalls to be repaired
- Municipal Boundary
- Blocks
- Parcels
- Railroad
- Water Body



STORMWATER DRAINAGE SYSTEM

Outfalls to be Repaired

BLOOMFIELD TOWNSHIP

ESSEX COUNTY NEW JERSEY

12/22/2022 SCALE: 1" = 500'

DRAFT

REMINGTON & VERNICK ENGINEERS
2059 SPRINGDALE ROAD, CHERRY HILL, NJ 08003
(856) 795-9595, FAX (856) 795-1882, RVE.COM
Certificate of Authorization: 24 GA 28003300
Excellence • Innovation • Service

Appendix E

Flood Damage Prevention Ordinance

Township Council
1 Municipal Plaza
Bloomfield, NJ 07003

Louise M. Palagano
Municipal Clerk

http://www.bloomfieldtwpnj.com

Meeting: 09/23/24 07:00 PM

ORD 24
46

2024 ORDINANCE AMENDMENT

AN ORDINANCE OF THE MUNICIPAL COUNCIL OF THE TOWNSHIP OF BLOOMFIELD, IN THE COUNTY OF ESSEX, STATE OF NEW JERSEY, TO AMEND CHAPTER 494 (STORMWATER CONTROL) OF THE CODE OF THE TOWNSHIP OF BLOOMFIELD

WHEREAS, due to the increased number and severity of storms and resulting rainfall, it is necessary for the Township of Bloomfield to have in place appropriate standards for the construction, installation, and maintenance of stormwater control systems; and

WHEREAS, the New Jersey Department of Environmental Protection has recently updated guidelines as to stormwater control and has provided municipality with model language for ordinance implementation; and

WHEREAS, these updated guidelines serve to protect persons and property and ensure the safety and well-being of the residents of the Township of Bloomfield; and

WHEREAS, the Municipal Council has found it proper to amend the language of the Code accordance therewith;

NOW THEREFORE BE IT RESOLVED by the Municipal Council of the Township of Bloomfield, that Chapter 494, Stormwater Control, of the Code of the Township of Bloomfield, is hereby amended and supplemented as follows:

§494-1:

C:

3. An application required by ordinance pursuant to (c)1 above that has been submitted prior to September 9, 2024, shall be subject to the stormwater management requirements in effect on September 8, 2024.

4. An application required by ordinance for approval pursuant to (c)1 above that has been submitted on or after March 2, 2021, but prior to September 9, 2024, shall be subject to the stormwater management requirements in effect on September 8, 2024.

5. Notwithstanding any rule to the contrary, a major development for any public roadway or railroad project conducted by a public transportation entity that has determined a preferred alternative or reached an equivalent milestone before July 17, 2023, shall be subject to the stormwater management requirements in effect prior to July 17, 2023.

§494-2:

"Public roadway or railroad" means a pathway for use by motor vehicles or trains that is intended for public use and is constructed by, or on behalf of, a public transportation entity. A public roadway or railroad does not include a roadway or railroad constructed as part of a private development, regardless of whether the roadway or railroad is to be dedicated to and/or maintained by a governmental entity.

"Public transportation entity" means a Federal, State, county, or municipal government, an independent State authority, or a statutorily authorized public-private partnership program pursuant to P.L. 2018, c. 90 (N.J.S.A. 40A:11-52 et seq.), that performs a public roadway or railroad project that includes new construction, expansion, reconstruction, or improvement of a public roadway or railroad.

§494-4:

E. Tables 1 through 3 below summarize the ability of stormwater best management practices identified and described in the New Jersey BMP Manual to satisfy the green infrastructure, groundwater recharge, stormwater runoff quality and stormwater runoff quantity standards specified in Section IV.O, P, Q and R. When designed in accordance with the most current version of the New Jersey Stormwater BMP Manual, the stormwater management measures found at N.J.A.C. 7:8-5.2 (f) Tables 5-1, 5-2 and 5-3 and listed below in Tables 1, 2 and 3 are presumed to be capable of providing stormwater controls for the design and performance standards as outlined in the tables below. Upon amendments of the New Jersey Stormwater BMP Manual to reflect additions or deletions of BMPs meeting these standards, or changes in the presumed performance of BMPs designed in accordance with the New Jersey Stormwater BMP Manual, the Department shall publish in the New Jersey Registers a notice of administrative change revising the applicable table. The most current version of the New Jersey Stormwater BMP Manual can be found on the Department's website at: <https://dep.nj.gov/stormwater/bmp-manual/>.

P. Groundwater Recharge Standards

2. The design engineer shall, using the assumptions and factors for stormwater runoff and groundwater recharge calculations at §494-5, either:

i. Demonstrate through hydrologic and hydraulic analysis that the site and its stormwater management measures maintain 100% of the average annual pre-construction groundwater recharge volume for the site, or

ii. Demonstrate through hydrologic and hydraulic analysis that the increase of stormwater runoff volume from pre-construction to post-construction

for the projected 2-year storm, as defined and determined pursuant to §494-5(d) of this ordinance, is infiltrated.

4. The following types of storm water shall not be recharged:

i. Stormwater from areas of high pollutant loading. High pollutant loading areas are areas in industrial and commercial developments where solvents and/or petroleum products are loaded/unloaded, stored, or applied, areas where pesticides are loaded/unloaded or stored; areas where hazardous materials are expected to be present in greater than "reportable quantities" as defined by the United States Environmental Protection Agency (EPA) at 40 CFR 302.4; areas where recharge would be inconsistent with Department approved remedial action work plan approved pursuant to the Administrative Requirements for the Remediation of Contaminated Sites (ARRCS) rules, N.J.A.C. 7:26C, or Department landfill closure plan and areas; and areas with high risks for spills of toxic materials, such as gas stations and vehicle maintenance facilities; and

R. Stormwater Runoff Quantity Standards

2. To control stormwater runoff quantity impacts, the design engineer shall, using the assumptions and factors for stormwater runoff calculations at Section V, complete one of the following:

i. Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the current and projected two (2), 10, and 100-year storm events, as defined and determined in §494-5(c) and §494-5(d), respectively, of this ordinance, do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events,

ii. Demonstrate through hydrologic and hydraulic analysis that there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the current and projected two (2), 10, and 100-year storm events, as defined and determined in §494-5(c) and §494-5(d), respectively, of this ordinance, and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site. This analysis shall include the analysis of impacts of existing land uses and projected land uses assuming full development under existing zoning and land use ordinances in the drainage area,

iii. Design stormwater management measures so that the post-construction peak runoff rates for the current and projected two (2), 10, and 100-year storm events, as defined and determined in §494-5(c) and §494-5(d), respectively, of this ordinance, are 50, 75 and 80%, respectively, of the pre-construction peak runoff rates. The percentages apply only to the post-construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed, or

iv. In tidal flood hazard areas, stormwater runoff quantity analysis in accordance with 2.i, ii and iii above is required unless the design engineer

demonstrates through hydrologic and hydraulic analysis that the increased volume, change in timing, or increased rate of the stormwater runoff, or any combination of the three will not result in additional flood damage below the point of discharge of the major development. No analysis is required if the stormwater is discharged directly into any ocean, bay, inlet, or the reach of any watercourse between its confluence with an ocean, bay, or inlet, and downstream of the first water control structure.

§494-5:

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

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

The USDA Natural Resources Conservation Service (NRCS) methodology, including the NRCS Runoff Equation and Dimensionless Unit Hydrograph, as described in Chapters 7, 9, 10, 15 and 16 *Part 630, Hydrology National Engineering Handbook*, incorporated herein by reference as amended and supplemented. This methodology is additionally described in *Technical Release 55 - Urban Hydrology for Small Watersheds* (TR-55), dated June 1986, incorporated herein by reference as amended and supplemented. Information regarding the methodology is available from the Natural Resources Conservation Service website at:

<https://directives.sc.egov.usda.gov/viewerFS.aspx?hid=21422>

or at United States Department of Agriculture Natural Resources Conservation Service (NRCS), New Jersey State Office.

2. For calculating curve numbers and groundwater recharge, there is a presumption that the pre-construction condition of a site or portion thereof is wooded land use with good hydrologic condition. The term "curve number" applies to the NRCS methodology above at §494-5(a)(1). A curve number or a groundwater recharge land cover for an existing condition may be used on all or a portion of the site if the design engineer verifies that the hydrologic condition has existed on the site or portion of the site for at least five years without interruption prior to the time of application. If more than one land cover has existed on the site during the five years immediately prior to the time of application, the land cover with the lowest runoff potential shall be used for the computations. In addition, there is the presumption that the site is in good hydrologic condition (if the land use type is pasture, lawn, or park), with good cover (if the land use type is woods), or with good hydrologic condition and conservation treatment (if the land use type is cultivation).

C. The precipitation depths of the current two (2), 10, and 100-year storm events shall be determined by multiplying the values determined in accordance with items 1 and 2 below:

1. The applicant shall utilize the National Oceanographic and Atmospheric Administration (NOAA), National Weather Service's Atlas 14 Point Precipitation Frequency Estimates: NJ, in accordance with the location(s) of the drainage area(s) of the site. This data is available at:

<https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=nj>,and

2. The applicant shall utilize Table 5: Current Precipitation Adjustment Factors below, which sets forth the applicable multiplier for the drainage area(s) of the site, in accordance with the county or counties where the drainage area(s) of the site is located. Where the major development lies in more than one county, the precipitation values shall be adjusted according to the percentage of the drainage area in each county. Alternately, separate rainfall totals can be developed for each county using the values in the table below.

Table 5: Current Precipitation Adjustment Factors

County	Current Precipitation Adjustment Factors		
	2-year Design Storm	10-year Design Storm	100-year Design Storm
Bergen	1.01	1.03	1.06
Essex	**1.01**	**1.03**	**1.06**
Passaic	1.00	1.02	1.05

D. Table 6: Future Precipitation Change Factors provided below sets forth the change factors to be used in determining the projected two (2), 10, and 100-year storm events for use in this chapter, which are organized alphabetically by county. The precipitation depth of the projected two (2), 10, and 100-year storm events of a site shall be determined by multiplying the precipitation depth of the two (2), 10, and 100-year storm events determined from the National Weather Service's Atlas 14 Point Precipitation Frequency Estimates pursuant to (c)1 above, by the change factor in the table below, in accordance with the county or counties where the drainage area(s) of the site is located. Where the major development and/or its drainage area lies in more than one county, the precipitation values shall be adjusted according to the percentage of the drainage area in each county. Alternately, separate rainfall totals can be developed for each county using the values in the table below.

Table 6: Future Precipitation Change Factors

County	Future Precipitation Change Factors		
	2-year Design Storm	10-year Design Storm	10-year Design Storm
Bergen	1.20	1.23	1.37
Essex	**1.19**	**1.22**	**1.33**
Passaic	1.21	1.27	1.50

§494-6:

A. Technical guidance for stormwater management measures can be found in the documents listed below, which are available to download from the Department's website at:

<https://dep.nj.gov/stormwater/bmp-manual/>.

1. Guidelines for stormwater management measures are contained in the New Jersey Stormwater Best Management Practices Manual, as amended, and supplemented. Information is provided on stormwater management measures such as, but not limited to, those listed in Tables 1, 2, and 3.

2. Additional maintenance guidance is available on the Department's website at:

<https://dep.nj.gov/stormwater/maintenance-guidance/>.

B. Submissions required for review by the Department should be mailed to:

The Division of Watershed Protection and Restoration, New Jersey Department of Environmental Protection, Mail Code 501-02A, PO Box 420, Trenton, New Jersey 08625-0420.

§494-8:

A.

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

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

ii. The overflow grate spacing shall be no greater than two inches across the smallest dimension.

iii. The overflow grate shall be constructed and installed to be rigid, durable, and corrosion resistant, and shall be designed to withstand a perpendicular live loading of 300 pounds per square ft.

NOW, THEREFORE, BE IT FURTHER ORDAINED that:

1. Ordinances, resolutions and regulations or parts of ordinances, resolutions and regulations inconsistent herewith are hereby repealed to the extent of such inconsistency; and
2. If any section, subsection, clause or phrase of this Ordinance is for any reason held to be unconstitutional or invalid by a court of competent jurisdiction, such a decision shall not affect the remaining portion of the Ordinance; and
3. Except as hereby amended, the Code of the Township of Bloomfield shall remain in full force

and effect.

4. This Ordinance shall take effect twenty days after final passage and publication in accordance with law.

......*...*

Approved as to form and procedure on basis of facts set forth.

Director of Law-Township Attorney

I hereby certify that the above ordinance was duly adopted by the Mayor and Council of the Township of Bloomfield at a meeting of said Township Council held on September 24, 2024.

Municipal Clerk of the Township of Bloomfield

Mayor of the Township of Bloomfield

✓ Vote Record - Ordinance						
☐ Adopt ☐ Deny ☐ Withdrawn ☐ Table ☐ Not Discussed ☐ First Reading ☐ Table with no Vote ☐ Approve ☐ Veto by Mayor ☐ Discussion ☐ Defeated ☐ Discussion No Vote			Yes/Aye	No/Nay	Abstain	Absent
	Jenny Mundell		☑	☐	☐	☐
	Nicholas Joanow		☑	☐	☐	☐
	Sarah Cruz		☑	☐	☐	☐
	Wartyna Davis		☑	☐	☐	☐
	Monica Charris Tabares		☑	☐	☐	☐
	Richard Rockwell		☑	☐	☐	☐
	Ted Gamble		☑	☐	☐	☐

✓ Vote Record - Ordinance						
☐ Adopt ☐ Deny ☐ Withdrawn ☐ Table ☐ Not Discussed ☐ First Reading ☐ Table with no Vote ☐ Approve ☐ Veto by Mayor ☐ Discussion ☐ Defeated ☐ Discussion No Vote			Yes/Aye	No/Nay	Abstain	Absent
	Jenny Mundell		☑	☐	☐	☐
	Nicholas Joanow		☑	☐	☐	☐
	Sarah Cruz		☑	☐	☐	☐
	Wartyna Davis		☑	☐	☐	☐
	Monica Charris Tabares		☐	☐	☐	☑
	Richard Rockwell		☑	☐	☐	☐
	Ted Gamble		☑	☐	☐	☐

Appendix F

US army Corps of Engineers, CENAN-PL-F Memorandum for Record: Second and Third Rivers, Municipalities: Montclair, Bloomfield, Belleville, Glen Ridge, Nutley, Essex County New Jersey, April 16, 2025

In New Jersey, flood damage prevention is managed through a combination of state regulations and local ordinances, including the Flood Damage Prevention Ordinance (PDPO). The NJDEP, in coordination with FEMA, plays a key role in ensuring communities meet the requirements for participation in the National Flood Insurance Program (NFIP).

Key aspects of flood damage prevention in New Jersey:

A The NJDEP is responsible for setting statewide standards and regulations related to flood hazard areas, including flood zone mapping, flood elevation requirements, and construction standards.

B. Each municipality in New Jersey is required to have a PDPO that implements the NJDEP's regulations and complies with the NFIP's requirements.

C. The municipality designates a Floodplain Administrator to enforce the PDPO and ensure compliance with flood regulations.

D. Communities participating in the NFIP must have accurate flood hazard area maps (FIRM) and base flood elevations (BFE).

E. Construction in flood hazard areas must meet specific building codes and elevation requirements to minimize flood damage.

F. Property owners in flood hazard areas may be required to have flood insurance, especially if they have a federally backed mortgage.

G. In New Jersey, sellers and landlords are required to disclose flood risk information to potential buyers or renters before a real estate transaction.

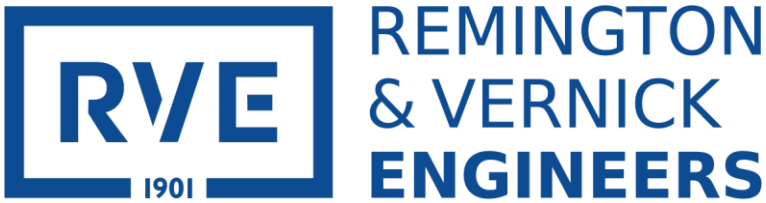
H. The NJDEP's Inland Flood Protection Rule sets contemporary design flood elevation standards for specific types of new construction and redevelopment.

I. The NJDEP provides model ordinances for communities to adapt and adopt, ensuring consistency and compliance with state and federal regulations.

J. The PDPO and related regulations in New Jersey aim to:

- Protect human life and health.
- Minimize flood damage to property and infrastructure.
- Ensure compliance with the NFIP's requirements for federally subsidized flood insurance.
- Promote sustainable development practices in flood hazard areas.
- Increase public awareness of flood risks.

For specific information about flood damage prevention in Bloomfield, NJ, you can consult the Township's PDPO and contact their local Floodplain Administrator or Engineering Department.



END OF REPORT