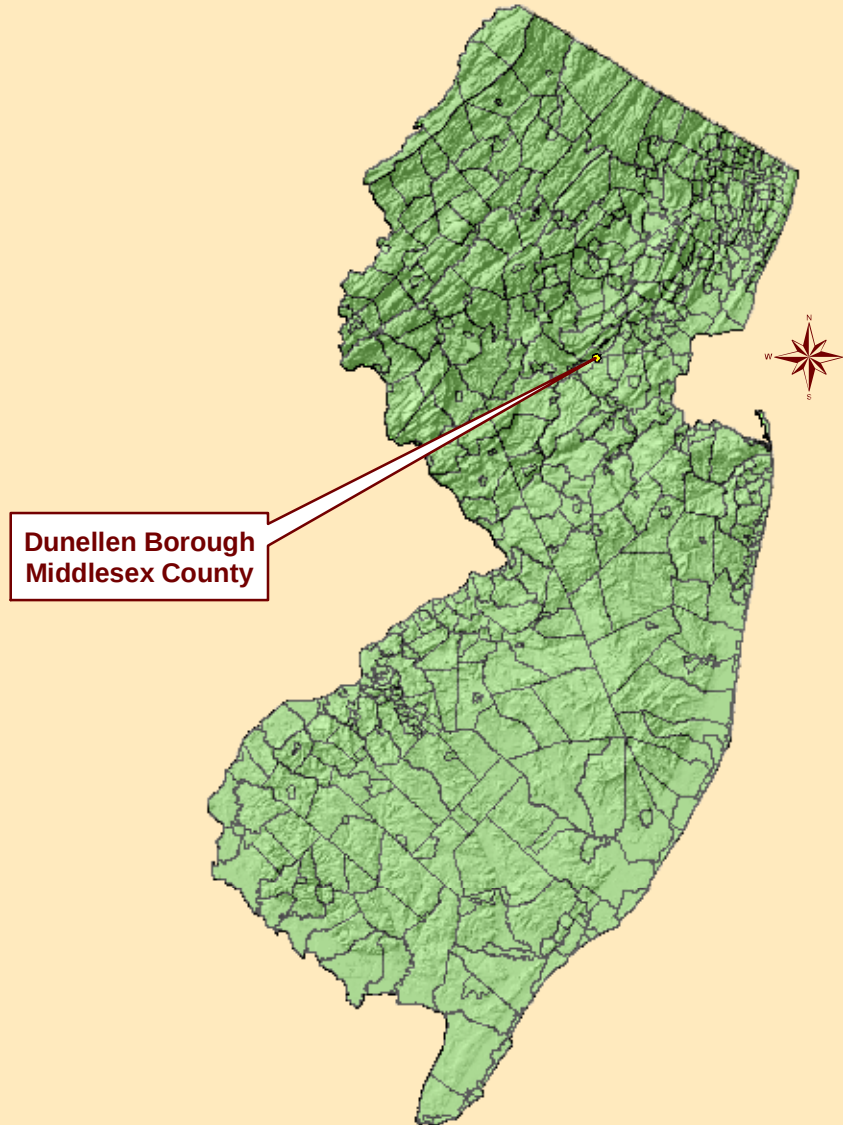


Municipal Stormwater Management Plan
Master Plan Element
for the:

Borough of Dunellen
Middlesex County, New Jersey



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Introduction

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for Borough of Dunellen (“the Borough”) to address stormwater-related impacts. The creation of this plan is required by N.J.A.C. 7:14A-25 Municipal Stormwater Regulations. This plan contains all of the required elements described in N.J.A.C. 7:8 Stormwater Management Rules. The plan addresses groundwater recharge, stormwater quantity, and stormwater quality impacts by incorporating stormwater design and performance standards for new major development, generally defined as projects that disturb one or more acre of land. These standards are intended to minimize the adverse impact of stormwater runoff on water quality, water quantity and the loss of groundwater recharge that provides base-flow in receiving water bodies.

The plan addresses long-term operation and maintenance measures for existing and future stormwater facilities. The final component of this plan is a mitigation strategy for when a variance or exemption of the design and performance standards is sought. As part of the mitigation section of the stormwater plan, specific stormwater management measures are identified to lessen the impact of existing development.

Goals

The goals of this MSWMP are to:

- reduce flood damage, including damage to life and property;
- minimize, to the extent practical, any increase in stormwater runoff from any new development;
- reduce soil erosion from any development or construction project;

- assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
- maintain groundwater recharge;
- prevent, to the greatest extent feasible, an increase in nonpoint pollution;
- maintain the integrity of stream channels for their biological functions, as well as for drainage;
- minimize pollutants in stormwater runoff from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the state, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of water; and
- protect public safety through the proper design and operation of stormwater basins.
- promote public education and involvement, via the Stormwater Pollution Prevention Plan (SPPP) as implemented by the Borough as of April 1, 2005.

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

Consideration should be given to a reasonable, efficient funding mechanism for the implementation of stormwater management by all levels of government. Developers will be required

to absorb some of the associated costs. State law should be established to permit use of mechanisms such as a stormwater utility.

Stormwater Discussion

Land development can dramatically alter the hydrologic cycle (*See Figure 1: Groundwater Recharge in the Hydrologic Cycle*) of a site and, ultimately, an entire watershed. Prior to development, native vegetation can either directly intercept precipitation or draw that portion that has infiltrated into the ground and return it to the atmosphere through evapotranspiration. Development can remove this beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates. Clearing and grading a site can remove depressions that store rainfall. Construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site. Impervious areas that are connected to each other through gutters, channels, and storm sewers can transport runoff more quickly than natural areas. This shortening of the transport or travel time quickens the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak faster and higher than natural conditions.

These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel. Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease opportunities for infiltration, 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.

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

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

Background

Borough Demographics

The Borough encompasses a 1.04 square mile area in Middlesex County, New Jersey (see *Figure 2: Dunellen Vicinity Map*). In recent years, the Borough population has increased from 6,528 persons in 1990, to 6,823 persons in 2000, resulting in an 4.5% population increase. Consequently, the population density has increased from 6,277 persons per square mile in 1990 to 6,574 persons per square mile in 2000. The Borough has experienced an increase in its population; development and redevelopment have continued through the Borough, and the amount of impervious area may

have increased. The high population density and continued development and redevelopment have resulted in an increase in surface runoff and have affected waterway systems and their function.

Figure 3: Existing Land Use depicts the Borough's current land use and the existing land area that has been developed. *Figure 4: Zoning Districts* displays the existing zoning districts and dictates the extent to which the existing land can be redeveloped. As observed in *Figure 4*, the Borough is predominantly zoned for residential single family (RA) and a large portion is also zoned for two family housing (RB). Business districts are scattered throughout the Borough. There is a single area zoned for industrial activity (I).

Borough Water Features

There are two (2) water features within the Borough: Bonygut Brook and Green Brook. Green Brook forms the Borough's northern border separating the Borough from Green Brook Township. Bonygut Brook originates within Piscataway Township; the Brook continues through the southern portion of the Borough and forms a portion of the western border between the Borough and Middlesex Borough. *Figure 5: Borough Waterways* illustrates the waterways in the Borough. *Figure 6: Boundary on USGS Quadrangle* depicts the Borough's boundary on the USGS quadrangle maps and provides a spatial representation of the Borough and its surrounding features. There are no Category One waterways in the Borough.

Future Developable Land

As presented in *Figure 7: Developable and Un-developable Land*, there is little to vacant no developable land within the Borough, which is based upon information provided by the New Jersey Department of Environmental Protection (NJDEP) and Borough of Dunellen. Since the amount of future developable land (i.e. vacant and agricultural land, excluding: wetlands, wetlands transition areas and open space) is less than one square mile, the Borough is not required to reevaluate the

master plan and provide future non-point source pollutant loads assuming full build-out, in accordance with N.J.A.C. 7:8-4.3(a).

Existing Water Quality Issues

Ambient Biomonitoring Network (AMNET) Study

Changes in the landscape caused by development have most likely increased stormwater runoff volumes and pollutant loads to the waterways of the municipality. It is necessary to monitor the health of waterways and determine methods to mitigate pollution where encountered. Studies, programs and networks have been developed to document the health of waterways, such as the Ambient Biomonitoring Network (AMNET) established by the NJDEP. There are over 800 AMNET sites throughout the state of New Jersey. These sites are sampled for benthic macroinvertebrates by the NJDEP on a five-year cycle and the ratio of pollution tolerant to pollution sensitive benthic macroinvertebrates coupled with a visual inspection are examined to classify water quality. The AMNET study waterways are classified as non-impaired, moderately impaired, or severely impaired. The data is used to generate a New Jersey Impairment Score (NJIS), which is based on a number of biometrics related to benthic macroinvertebrate community dynamics.

There are no AMNET assessment site locations within the Borough; however, there is one (1) study location situated upstream on the Green Brook. The assessment site is located approximately 0.9 miles northeast of the Borough's borders and is classified as moderately impaired.

The above-analyzed AMNET site is situated within an adjacent municipality, North Plainfield Borough, and is located within the same watershed management area (WMA) as the Borough of Dunellen. See *Appendix B* for the data examined in the 1999 Raritan Region AMNET study.

New Jersey Integrated Water Quality Monitoring and Assessment Report

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

Waterways are categorized into Sublists, ranging from Sublist 1, which indicates a healthy functioning waterway, to Sublist 5, which indicates an unhealthy waterway not meeting its intended use. Sublist 1 waterways attain water quality standards and none of the designated uses are threatened. Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more Total Maximum Daily Loads (TMDLs) are needed. Waterways are placed on Sublist 3 because there is insufficient data or the guidelines/criteria to conduct a use attainment assessment is unavailable; therefore, it can not be determined if a designated use is threatened. Sublist 4 waterways are those impaired or threatened for one or more uses, but do not require the development of a TMDL.

Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more Total Maximum Daily Loads (TMDLs) are needed. A TMDL is the amount of a pollutant that can be accepted by a waterbody without exceeding 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 NJPDES permit to discharge, and non-point sources, which includes stormwater runoff from agricultural and residential areas, along with a margin of safety. Provisions may also be made for future sources in the form of reserve capacity. An implementation

plan may be developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies can include improved stormwater treatment plants, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems, and other BMPs, whether structural or non-structural.

The New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d)), issued June 2004, examined Green Brook. The same assessment site as noted in the AMNET study was also evaluated and reported on the Integrated List. The site is currently on Sublist 5 for exceeding the allowable limit for benthic macroinvertebrates, as also noted in the AMNET study. See *Figure 9: Water Quality Assessment Locations* for the locations of the monitoring site examined. Also see *Appendix C* for the list of Integrated Water Quality Monitoring and Assessment report locations.

Streams within the Borough of Dunellen originate outside of the Borough's borders; hence, some degree of impairment is caused by regional factors and is not exclusive to the Borough of Dunellen. In implementing the new NJDEP regulations, N.J.A.C. 7:8 Stormwater Management, the Borough anticipates improvement within the streams relating to water quality.

Existing Water Quantity Issues

In addition to water quality problems, the Borough has exhibited severe water quantity problems including flooding, stream bank erosion, and diminished base-flow in its streams. Bonygut Brook has exhibited many water quantity problems throughout its length. Chronic flooding has resulted in unstable stream banks and ponding on properties that border the stream. Some residents have experienced property damage, as the increased stormwater runoff and lessened stream capacity has caused chronic flooding through the region. The Green Brook exhibits the same water quantity problems as the Bonygut Brook.

Many of the culverts associated with road crossings in the Borough are undersized. During storm events, these undersized culverts do not have adequate capacity, thereby causing a backwater effect and flooding upstream. Backwater effects occur down stream of the Borough, which contributes to the existing water quantity problem experienced within the Borough. Please refer to *Figure 14: FEMA Q3 Flood Data* for areas with chronic flooding issues.

The undersized culverts may have been designed for much different hydrologic conditions (i.e., less impervious area) than presently exist in the Borough and downstream of the Borough. As the impervious coverage increased, the peak flows and runoff volumes of the streams also increased. The increased amount of water resulted in stream bank erosion, which resulted in unstable areas at roadway/bridge crossings, and degraded stream habitats. The high impervious coverage of the Borough has significantly decreased groundwater recharge; hence, decreasing base flows in the streams during dry weather periods. Lower base flows can have a negative impact on stream habitat during the summer months. A map of the groundwater recharge areas is depicted in *Figure 10: Groundwater Recharge Areas*.

Hydrologic Unit Code 14 (HUC14)

Watersheds are defined by the USGS and the NJDEP. The most basic defined watershed area or hydrologic unit is a unique defined feature having a minimum size of 3,000 acres. The base hydrologic unit is given a unique hydrologic unit code (HUC), which is fourteen (14) digits long; hence, the terminology Hydrologic Unit Code 14 (HUC14). The hydrologic unit network is hierarchical. Larger watersheds can be defined by utilizing different portions of the HUC14 boundaries. HUCs are combined to identify larger watershed areas such as HUC11, HUC8, HUC6, HUC4, WMAs, watershed regions and so on.

There is one (1) HUC14 area within the Borough, the Green Brook HUC14 watershed. This HUC14 falls within the Lower Raritan, South River and Lawrence WMA, WMA ID 09, and the Raritan

watershed region. Please see *Figure 8: Hydrologic Unit Codes 14 (HUC14)* for the defined HUC 14 boundary within the Borough.

Borough Features

There are wellhead protection areas throughout the Borough, specifically encompassing the northern portion of the Borough. There are three Tiers associated with wellhead protection areas, Tiers 1 through 3, which delineates the extent of ground water captured by a pump at a specified rate calculated over a 2, 5 and 12-year periods, respectively. Wellhead protection areas are delineated by the NJDEP Source Water Protection Program (SWAP) and acted upon in response to the Safe Drinking Water Act Amendments of 1986 and 1996. Please see *Figure 11: Wellhead Protection Areas* for wellhead protection area locations.

A map of the wetlands and other constrained land is displayed in *Figure 12: Wetlands and Water Land Uses Constrained Land*. A soil map of the Borough is provided and references the latest SSURGO soil survey; see *Figure 13: Soils (SSURGO)*.

Design and Performance Standards

The Borough will adopt the design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5, via the Stormwater Control Ordinance, to minimize the adverse impact of stormwater runoff on water quality, water quantity and loss of groundwater recharge in receiving water bodies for residential and commercial site development. Generally, projects meeting the definition of a major development are required to meet the regulations stated under N.J.A.C. 7:8-5. Said regulations address erosion control, groundwater recharge, runoff quantity standards, stormwater runoff quality standards, standards for calculating stormwater runoff and groundwater recharge, structural stormwater management standards, and maintenance

requirements, as stated above. The major development must meet the established design and performance standards set forth in the Soil Erosion and Sediment Control Act.

Low Impact Development (LID) Techniques

The N.J.A.C. 7:8: Stormwater Management regulations promote stormwater management measures for major developments that minimize the adverse impact of stormwater runoff on water quantity, water quality and the loss of groundwater recharge to receiving water bodies. In N.J.A.C. 7:8-5.3 and Chapter 2 of the *New Jersey Stormwater Best Management Practices (BMP) Manual 2004* stormwater management design techniques are focused on non-structural stormwater management strategies. Non-structural Stormwater Management Strategies, Low Impact Development (LID) techniques, are enumerated as follows:

1. "Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss;" (N.J.A.C. 7:8-5.3(b)1.)

i.e., preserve forested areas, riparian corridors and high groundwater or aquifer recharge capabilities and any other natural area with significant hydrologic function, specific legal and/or procedural measures to ensure areas remain preserved in the future and, reestablish wooded and forested areas that were disturbed
2. "Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces;" (N.J.A.C. 7:8-5.3(b)2.)

i.e., use vegetative filters and buffers, promote sheet flow over vegetated areas, use level and/or curb cuts at appropriate locations, utilize the minimum pavement widths, vegetate/landscape islands, utilize pervious materials at appropriate locations and locate parking underground or beneath buildings

3. “Maximize the protection of natural drainage features and vegetation;” (N.J.A.C. 7:8-5.3(b)3.)

i.e., preserve forested areas, riparian corridors and high groundwater or aquifer recharge capabilities and any other natural area with significant hydrologic function and take specific legal and/or procedural measures to ensure areas remain preserved in the future
4. “Minimize the decrease in the pre-construction “time of concentration;” (N.J.A.C. 7:8-5.3(b)4.)

i.e., increase sheet flow, disconnect impervious areas, use vegetative stormwater conveyance systems and dense vegetation at appropriate locations, utilize natural features and reduce slopes
5. “Minimize land disturbance including clearing and grading;” (N.J.A.C. 7:8-5.3(b)5.)

i.e., preserve forested areas, riparian corridors and high groundwater or aquifer recharge capabilities and any other natural area with significant hydrologic function and reduce lawn areas
6. “Minimize soil compaction;” (N.J.A.C. 7:8-5.3(b)6.)

i.e., use light weight equipment during construction and minimize disturbed land areas
7. “Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides;” (N.J.A.C. 7:8-5.3(b)7.)

i.e., use of native plants will result in lower fertilizer and water needs, will promote infiltration characteristics similar to those of natural area and can attract native wildlife and provide better habitats
8. “Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas;” (N.J.A.C. 7:8-5.3(b)8.)

i.e., use vegetated channels and swales at appropriate locations to increase surface roughness and decrease flow velocities and ensure vegetative conveyance systems are tolerant to higher frequency storms

9. “Provide other source controls to prevent or minimize the use or exposure of pollutants at the site in order to prevent or minimize the release of those pollutants into stormwater runoff.” (N.J.A.C. 7:8-5.3(b)9.)

i.e., provide trash receptacles, litter fences, require regular sweepings, provide “pet waste stations,” provide storm drain inlets and trash racks, utilize berms and secondary containment systems (This section is more specifically geared towards commercial and industrial areas or areas with high residential population densities.)

The applicant submitting for review must address the nonstructural stormwater management strategies utilized in the proposed design. If these strategies are not incorporated into the design, the applicant must state reasons for contention. All nonstructural stormwater management strategies must be incorporated to the “maximum extent practical.” An applicant should demonstrate the design has exhausted all measures to implement the nonstructural strategies prior to the use of the structural methods.

“...nonstructural LID-BMPs are to be given preference over structural BMPs. Where it is not possible to fully comply with the Stormwater Management Rules solely with nonstructural LID-BMPs, they should then be used in conjunction with LID and standard structural BMPs to meet the Rules’ requirements.” (NJ Stormwater BMP Manual 2004, page 2-3)

NJAC 7:8-5.3(a) states:

“To the maximum extent practical, the standards in NJAC 7:8-5.4 and 5.5 shall be met by incorporating nonstructural stormwater management strategies at NJAC 7:8-5.3 into the design. The persons submitting an application for review shall identify the nonstructural strategies incorporated into the design of the project. If the applicant contends that it is not feasible for engineering, environmental, or safety reasons to incorporate any nonstructural stormwater management strategies identified in (b) below [NJAC 7:8-5.3(b)] into the design of a particular project, the applicant shall identify the strategy and provide basis for the contention.”

See Appendix A of the *NJ Stormwater BMP Manual 2004* for Low Impact Development Checklists provided by the NJDEP.

Stormwater Management Regulations Overview

Groundwater Recharge Requirements

Major developments must also meet one of two standards for groundwater recharge (N.J.A.C. 7:8-5.4(a)2.): (1) maintain 100 percent of the average annual pre-construction groundwater recharge volume for the site or (2) infiltrate the increase in the stormwater runoff volume from pre-construction to post-construction for the two-year storm.

Stormwater Quality Requirements

For water quality (N.J.A.C. 7:8-5.5), stormwater management measures shall be designed to reduce the post-construction load of total suspended solids (TSS) in the stormwater runoff generated by the water quality design storm by 80 percent of the anticipated load from the major development. To control stormwater runoff quantity impacts (N.J.A.C. 7:8-5.4 3.), a major development must meet one of three design standards:

- (1) demonstrate at no point in time that the post-construction runoff hydrograph exceed the pre-construction runoff hydrograph,
- (2) demonstrate there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the 2, 10, 100-year storm event and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site, and
- (3) demonstrate the post-construction peak runoff rates for the 2, 10 and 100-year storm events are 50, 75 and 80 percent, respectively, of the pre-construction runoff rates.

However, for stormwater water runoff quantity requirement (3), stream encroachment standards (N.J.A.C. 7:13-2.8) will require for the 100-year storm event 75 percent of the pre-construction peak runoff rates.

Maintenance, Safety and Ordinances

The design and performance standards include the language for maintenance of stormwater management measures consistent with the stormwater management rules at N.J.A.C. 7:8-5.8 Maintenance Requirements, and language for safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. These sections address long-term operation and maintenance measures for existing and future stormwater facilities.

The Stormwater Control Ordinance must be submitted to the county for review and approval within 24 months of the effective date of the Stormwater Management Rules, April 2006. The Borough must adopt the following ordinances and meet the minimum requirements set forth in the Tier A Municipal Stormwater General Permit (NJG0150649). If the following ordinances already exist then they must be reviewed and updated where necessary.

Those ordinances are as follows, but are not limited to:

1. Pet Waste Ordinance – will require owners and keepers to immediately and properly dispose of their pet's solid waste and will require information provided by NJDEP to be distributed with pet licenses regarding said ordinance;
2. Litter Ordinance – will meet the minimum standards set forth in the State Litter Statue (N.J.S.A. 13:1E-99.3);
3. Improper Disposal of Waste Ordinance – will prohibit spilling, dumping or disposing of any materials other than stormwater into the municipal separate storm sewer system;
4. Wildlife Feeding Ordinance – will prohibit feeding of non-confined wildlife in any public park or property owned/operated by the municipality;
5. Illicit Connection Ordinance – will prohibit illicit connections to the municipal separate storm sewer system.

During construction, Borough inspectors will observe the construction of the project to ensure that the stormwater management measures are constructed and function as designed. Operation and Maintenance Manuals will be required for structural BMPs to ensure long-term maintenance strategies.

As a requirement of the Borough's Stormwater Pollution Prevention Plan (SPPP), implemented April 1, 2005, the public will be provided education material and the opportunity to participate in annual events focusing on stormwater management issues. From the implementation of the SPPP, the public will be knowledgeable of stormwater issues and capable of relating stormwater management concerns to the above stated ordinances and recognizing their importance. As public education and involvement continues, it is anticipated that the public will work towards preventing stormwater quality, quantity and groundwater recharge problems within the Borough.

Plan Consistency

Regional Stormwater Management Plan (RSWMP)

The Borough is not within a Regional Stormwater Management Planning Area; therefore, it does not need to be consistent with any Regional Stormwater Management Plans (RSWMPs). Currently, the U.S. Army Corps of Engineers is working in conjunction with the NJDEP on a regional watershed restoration project to alleviate flooding in the Raritan River Basin Green Brook Sub-Basin, Green Brook Flood Control Project. The Borough is located within this subject area. If at any time a Regional Stormwater Management Plan (RSWMP) is adopted, the Borough will revise this Municipal Stormwater Management Plan (MSWMP) to be consistent with the RSWMP.

Total Maximum Daily Loads (TMDL)

At this time, no TMDLs have been established or adopted for waters within the Borough; however, the EPA has recommended a TMDL upstream of the Borough, within Plainfield City. This site is classified as “biologically moderately impaired.” If any TMDLs are developed in the future, this MSWMP will be updated to be consistent. See *Appendix D* for TMDL data reports.

Residential Site Improvement Standards (RSIS)

The Municipal Stormwater Management Plan is consistent with the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21. The municipality will utilize the most current update of the RSIS in the stormwater management review of residential areas. This Municipal Stormwater Management Plan will be updated to be consistent with any future updates to the RSIS.

Freehold Soil Conservation District (FSCD)

The Borough’s Stormwater Control Ordinance will require all new development and redevelopment plans to comply with the Freehold Soil Erosion and Sediment Control (SESC) Standards. FSCD is the enforcement and review agency for soil erosion and sediment control.

Mitigation Plans

This mitigation plan is provided for a proposed development that is granted a variance or exemption from the stormwater management design and performance standards. However, approval of variances or exemptions from N.J.A.C. 7:8 are a last resort and all non-structural and structural BMPs should be explored prior to a variance or exemption being granted. Non-structural BMPs are highly recommended and shall be the initial design technique utilized. The Borough Engineer, Board and professionals will ensure all BMP options are explored prior to granting a

variance or exemption. The Borough Engineer shall be consulted to determine availability of mitigation projects. All mitigation projects are subject to approval of the Borough Engineer.

Mitigation Project Criteria

The mitigation project must be implemented within the same drainage area as the proposed development. If a suitable site cannot be located in the same drainage area as the proposed development, the mitigation project may provide mitigation that is not equivalent to the impacts for which the variance or exemption is sought, but that addresses the same issue. The project must provide additional groundwater recharge benefits, or protection from stormwater runoff quality and quantity from previously developed property, which does not currently meet the design and performance standards as outlined in the Municipal Stormwater Management Plan. The developer must ensure the long-term maintenance of the project, including the maintenance requirements under Chapters 8 and 9 of the NJDEP Stormwater BMP Manual.

The Borough Engineer must be contacted to obtain a list of potential mitigation projects to compensate for the deficit from the performance standards resulting from the proposed project. More detailed information on the mitigation projects shall be obtained from the Borough Engineer. The Borough maintains the right to update the mitigation project list and is not held accountable for time frames or to construct any of the mitigation projects or potential mitigation projects addressing groundwater recharge, water quality and water quantity.

Mitigation projects are environmental enhancement projects that provide groundwater recharge, control flooding or control non-point source pollution. The Borough Engineer shall be contacted for availability, description and any other necessary information pertaining to mitigation projects.

Mitigation projects are subject to the approval of the Planning Board and Borough Engineer. Each project is approved upon an individual basis considering the extent of the variance, waiver or exception granted. Mitigation projects may require cooperation with outside agencies such as the Freehold Soil Conservation District, Mosquito Commission, Army Corp of Engineers, NJDEP, etc.

The municipality may require a developer to provide funding or partial funding to the municipality for an environmental enhancement project that has been identified in a MSWMP, or towards the development of a RSWMP. Funding quantities are subject to the approval of the Borough Engineer and Governing Body and will include costs or partial costs, including those associated with purchasing a property or easement for mitigation, and those associated with the long-term maintenance requirements of the mitigation measure.

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New Jersey Dept. of Environmental Protection. TMDLs for Fecal Coliform to Address 48 Streams in the Raritan Water Region. 2003. Division of Watershed Management: 25 Jan. 2005 <<http://www.nj.gov/dep/watershedmgt/tmdl>

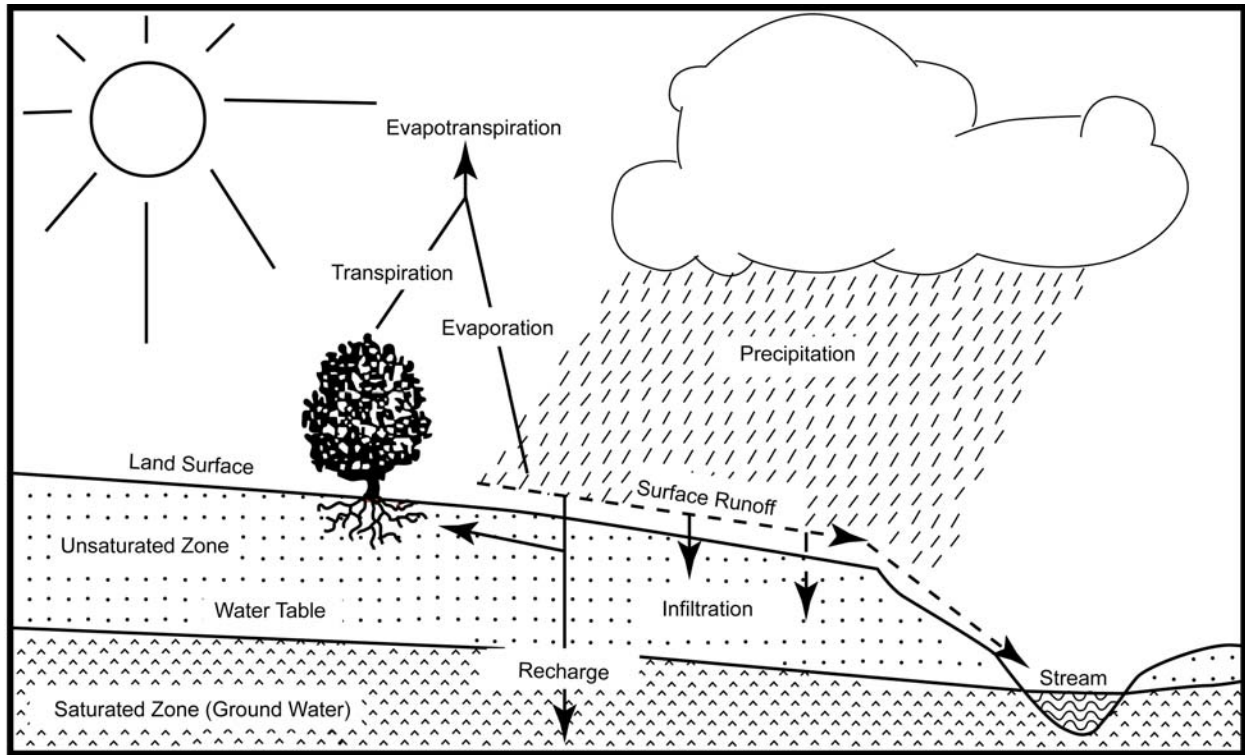
U.S. Environmental Protection Agency. TMDLs- 2002 Section 303(d) List Fact Sheet for NEW JERSEY. 2003. USEPA: 25 Jan. 2005. http://oaspub.epa.gov/waters/state_rept.control

APPENDICES

Appendix A

Appendix of Figures

Figure 1: Groundwater Recharge in the Hydrologic Cycle



Source: New Jersey Geological Survey Report GSR-32.

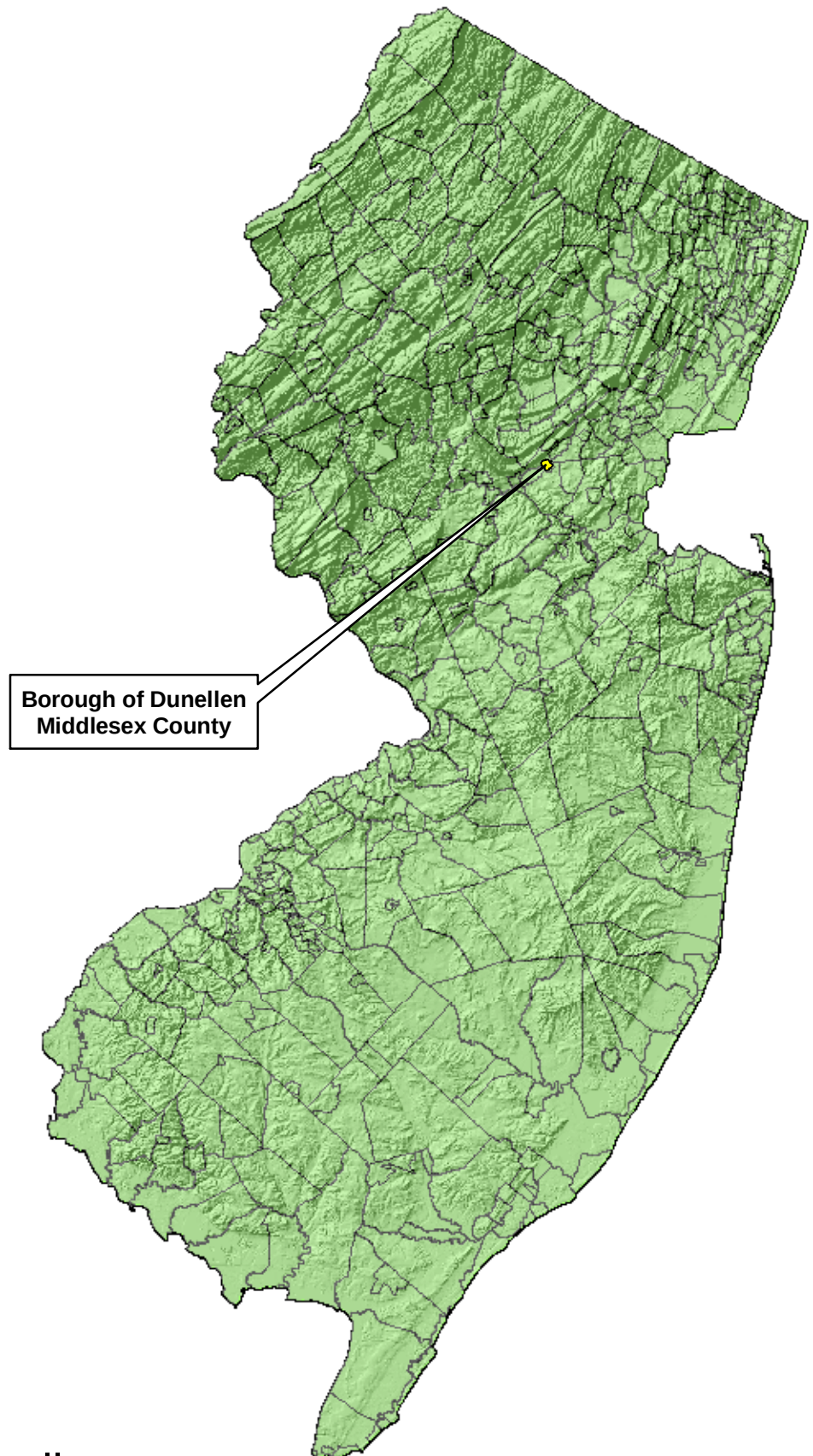
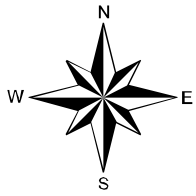


Figure 2:
Vicinity Map
Borough of Dunellen
Middlesex County, NJ

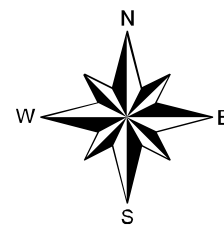


LEGEND

LAND USE (1995/97)

- BARREN LAND
- FOREST
- URBAN
- WATER
- WETLANDS
- DUNELLEN_STREAMS
- DUNELLEN_LAKES

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



GREEN BROOK

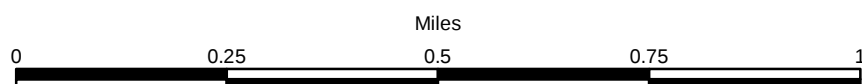
PLAINFIELD

MIDDLESEX

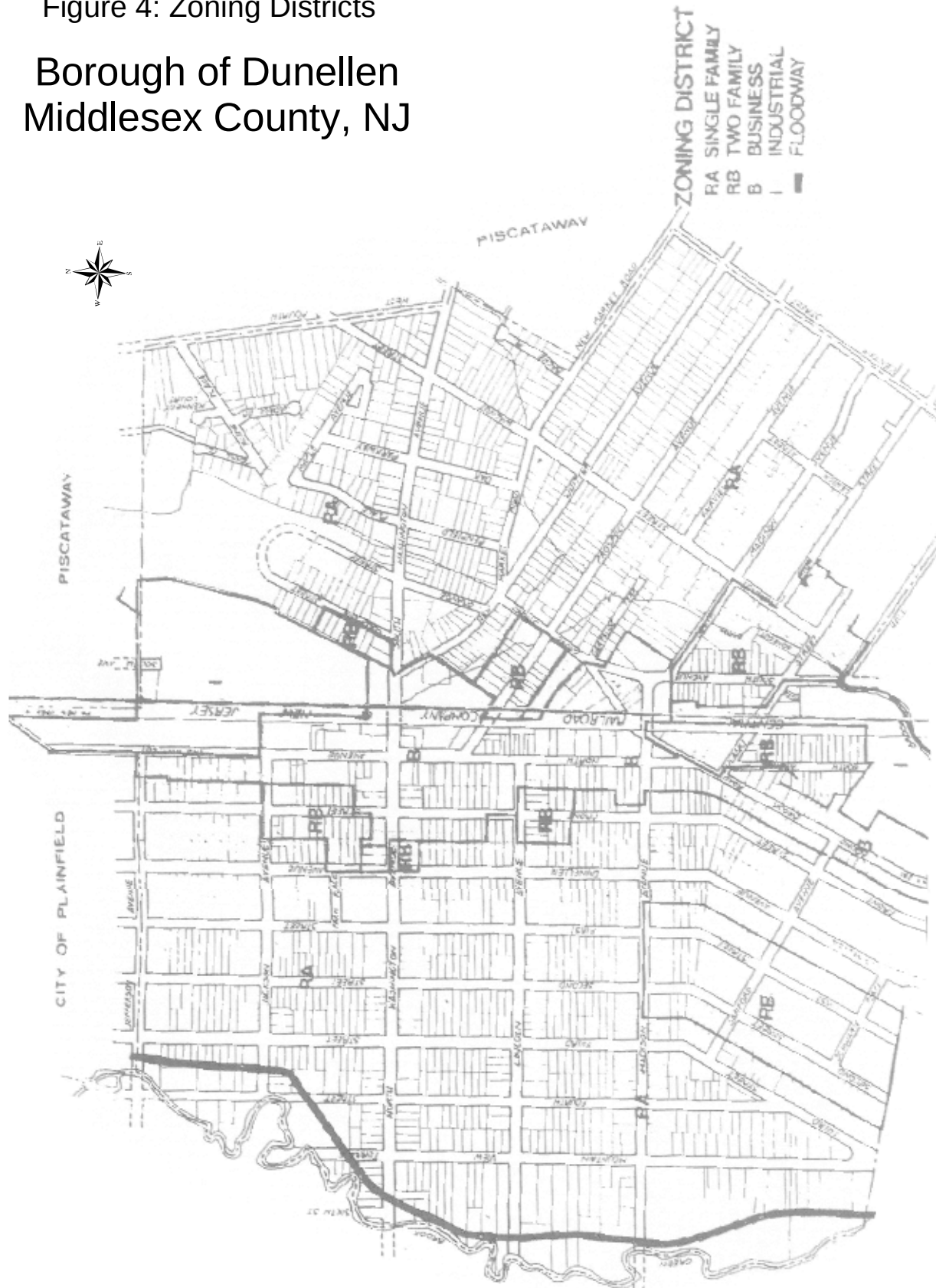
PISCATAWAY

Figure 3:
Existing Land Use

Borough of Dunellen
Middlesex County, NJ



Borough of Dunellen
Middlesex County, NJ



LEGEND

-  DUNELLEN_STREAMS
-  DUNELLEN_LAKES

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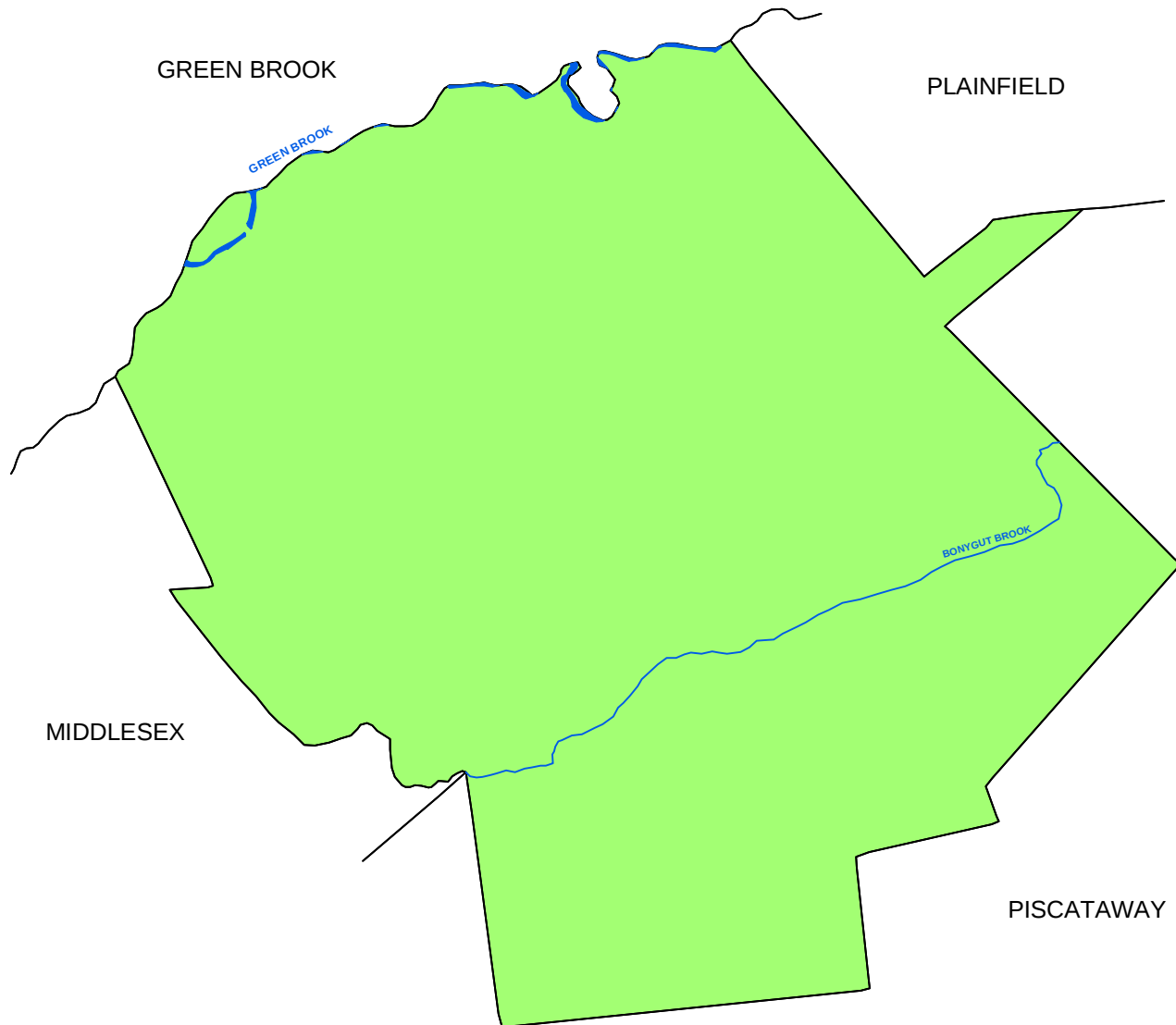
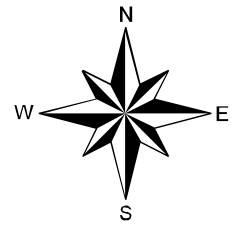
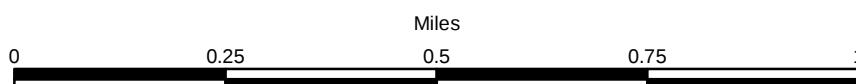


Figure 5: Borough Waterways

Borough of Dunellen
Middlesex County, NJ



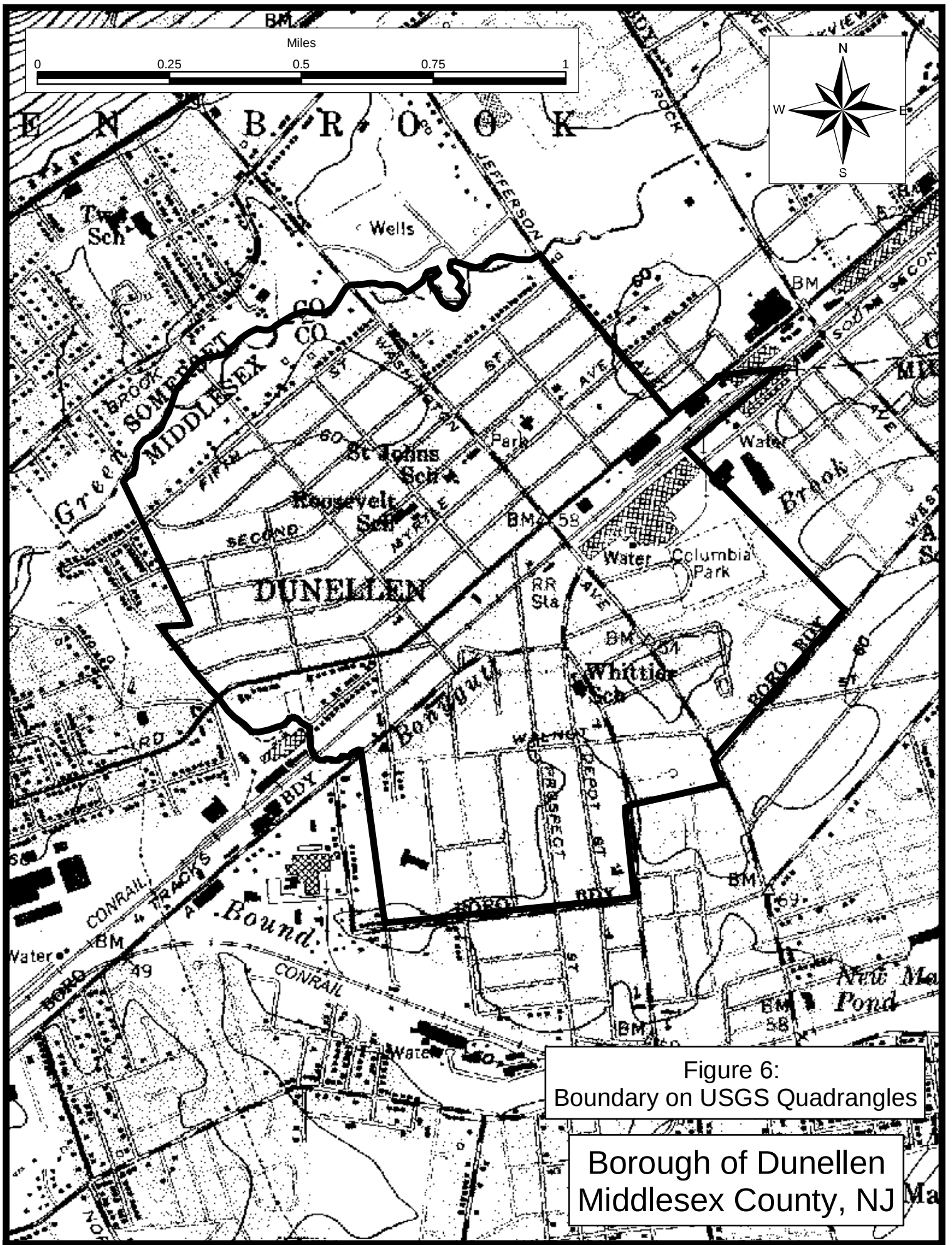


Figure 6:
Boundary on USGS Quadrangles

Borough of Dunellen
Middlesex County, NJ

LEGEND

- Future Developable Land - 0.000 Sq. Miles
- Developed / Re-developable Land - 0.982 Sq. Miles
- Preserved / Undevelopable Land - 0.079 Sq. Miles

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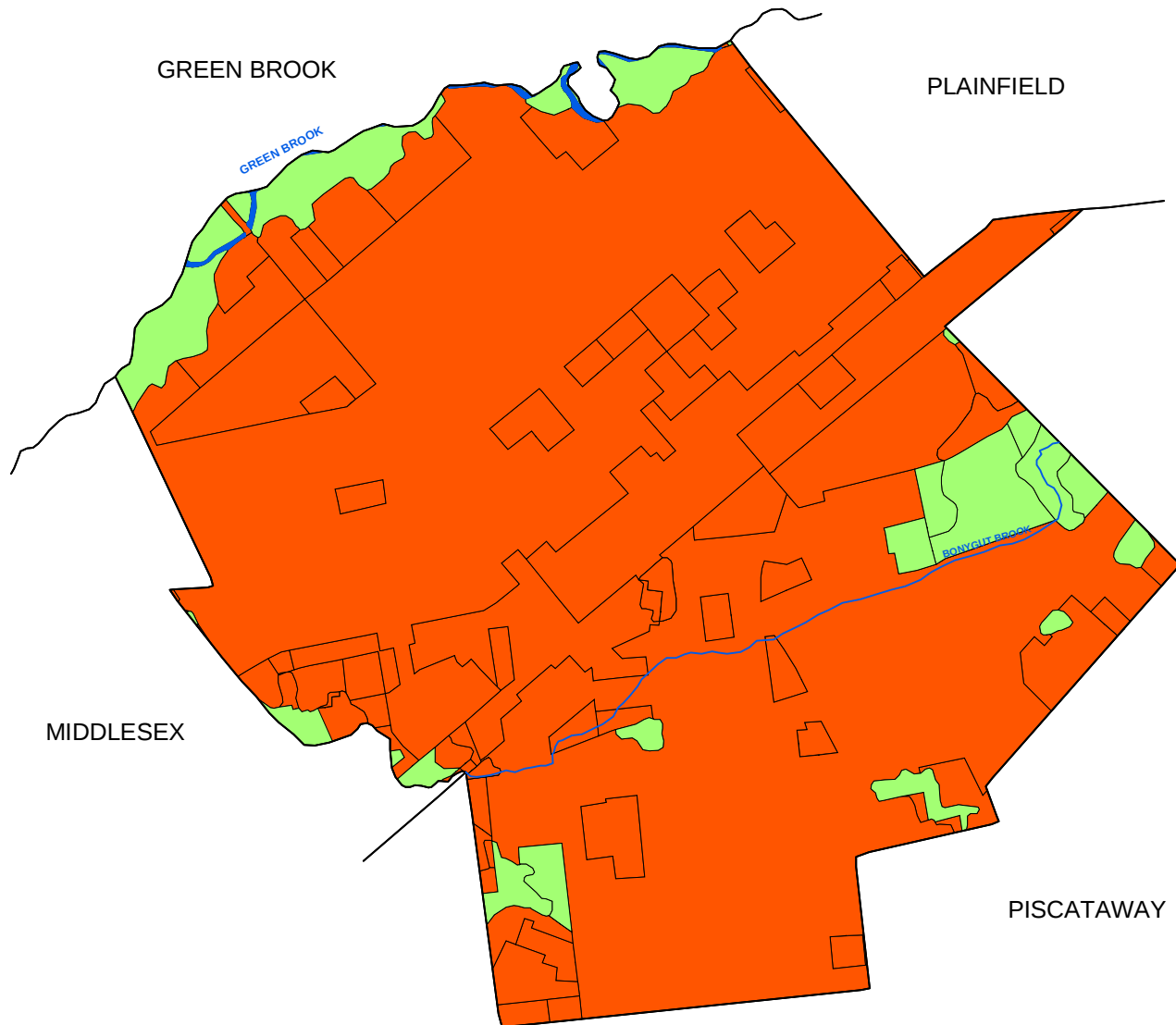
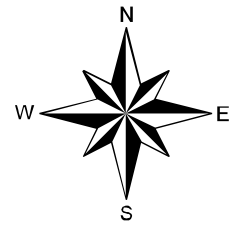
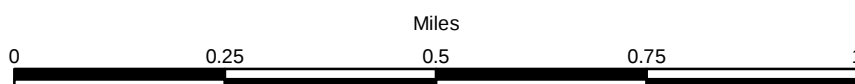


Figure 7:
Developable and
Un-developable Land

Borough of Dunellen
Middlesex County, NJ



LEGEND

HUC 14

02030105120040

DUNELLEN STREAMS

DUNELLEN LAKES

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

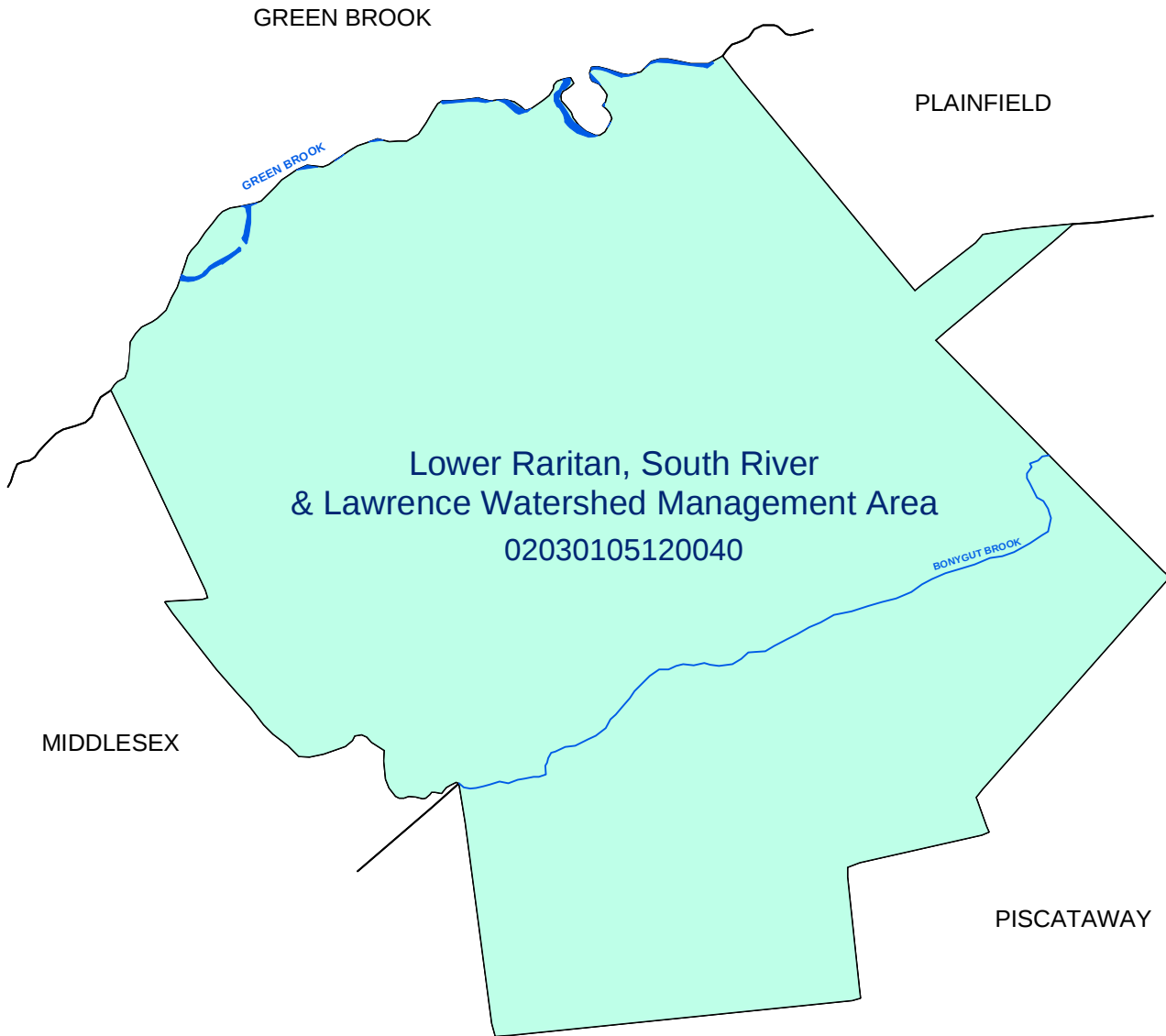
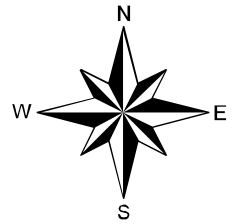


Figure 8:
Hydrologic Unit Code 14
(HUC 14)

Borough of Dunellen
Middlesex County, NJ

LEGEND

- AMNET BIOLOGICAL MONITORING SITE (2000)
- INTERGRATED WATER QUALITY MONITORING STATION
- DUNELLEN_LAKES
- ~ STREAMS

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

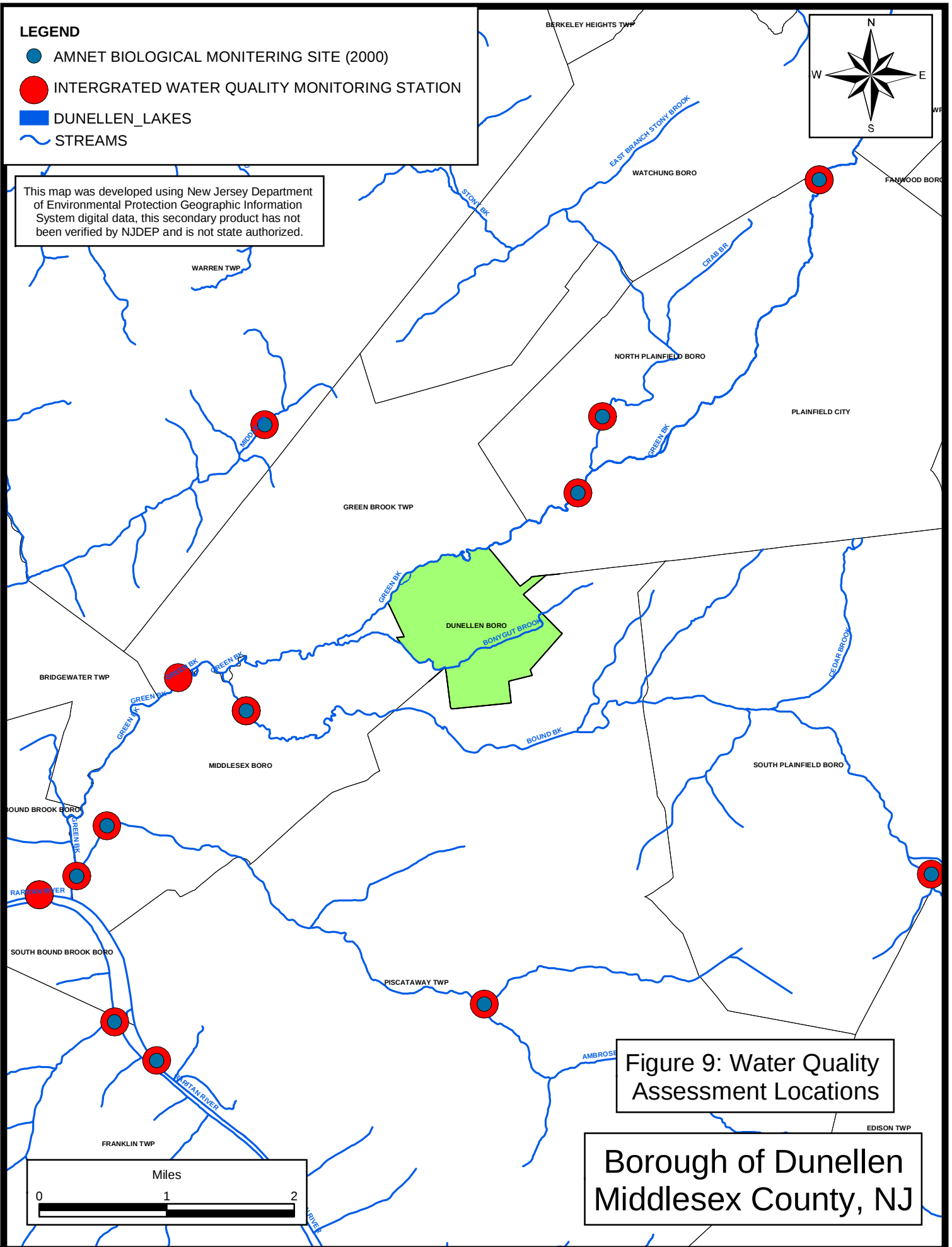
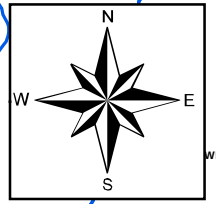


Figure 9: Water Quality Assessment Locations

Borough of Dunellen
Middlesex County, NJ

LEGEND

Groundwater Recharge (inches per year)

0.00

0.01 - 6.00

6.01 - 12.00

12.01 - 14.00

14.01 - 15.69

DUNELLEN LAKES

DUNELLEN STREAMS

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

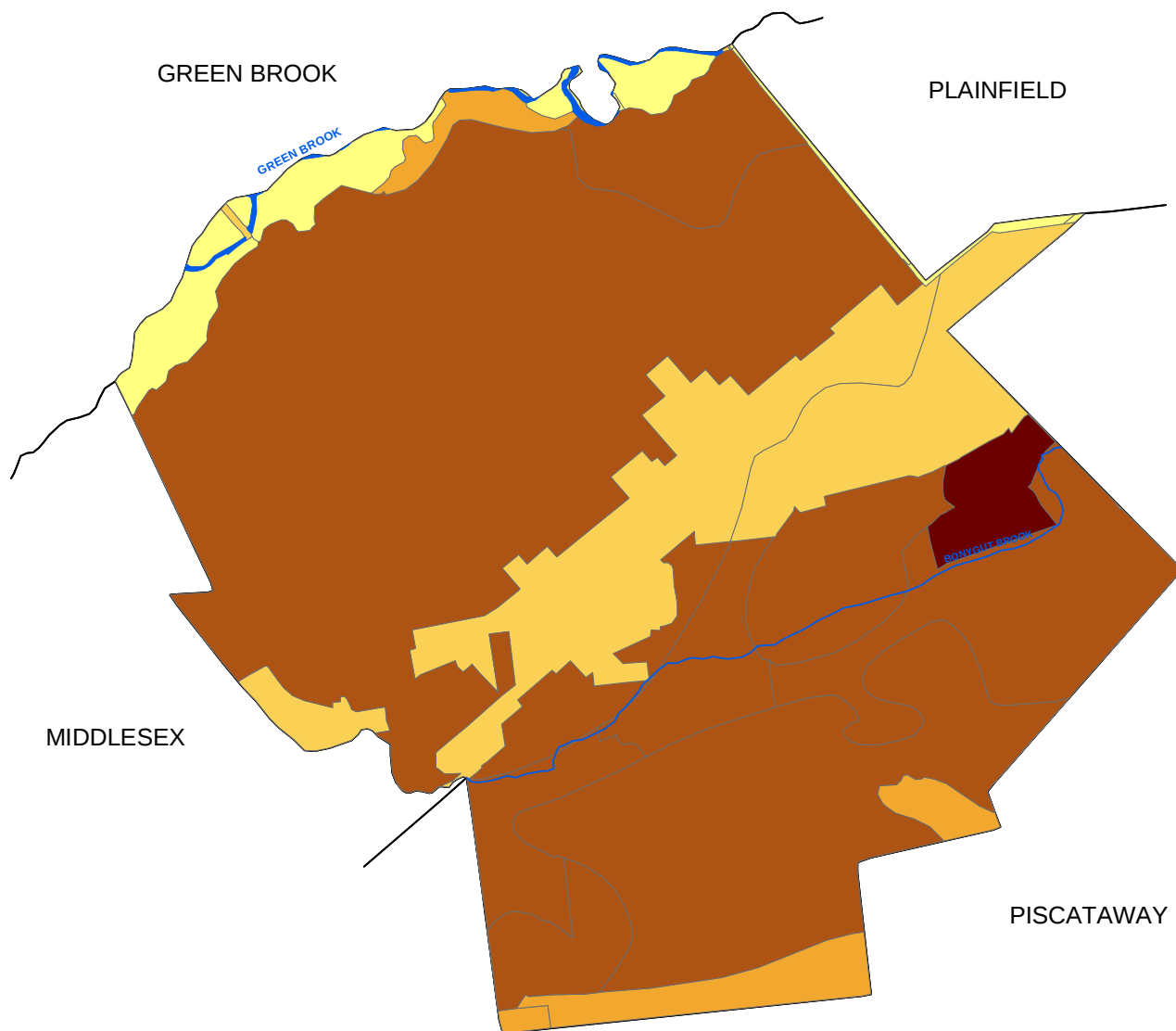
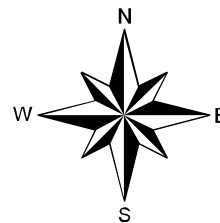


Figure 10:
Groundwater Recharge Areas
Borough of Dunellen
Middlesex County, NJ

LEGEND

WELLHEAD PROTECTION AREAS

TIER

0

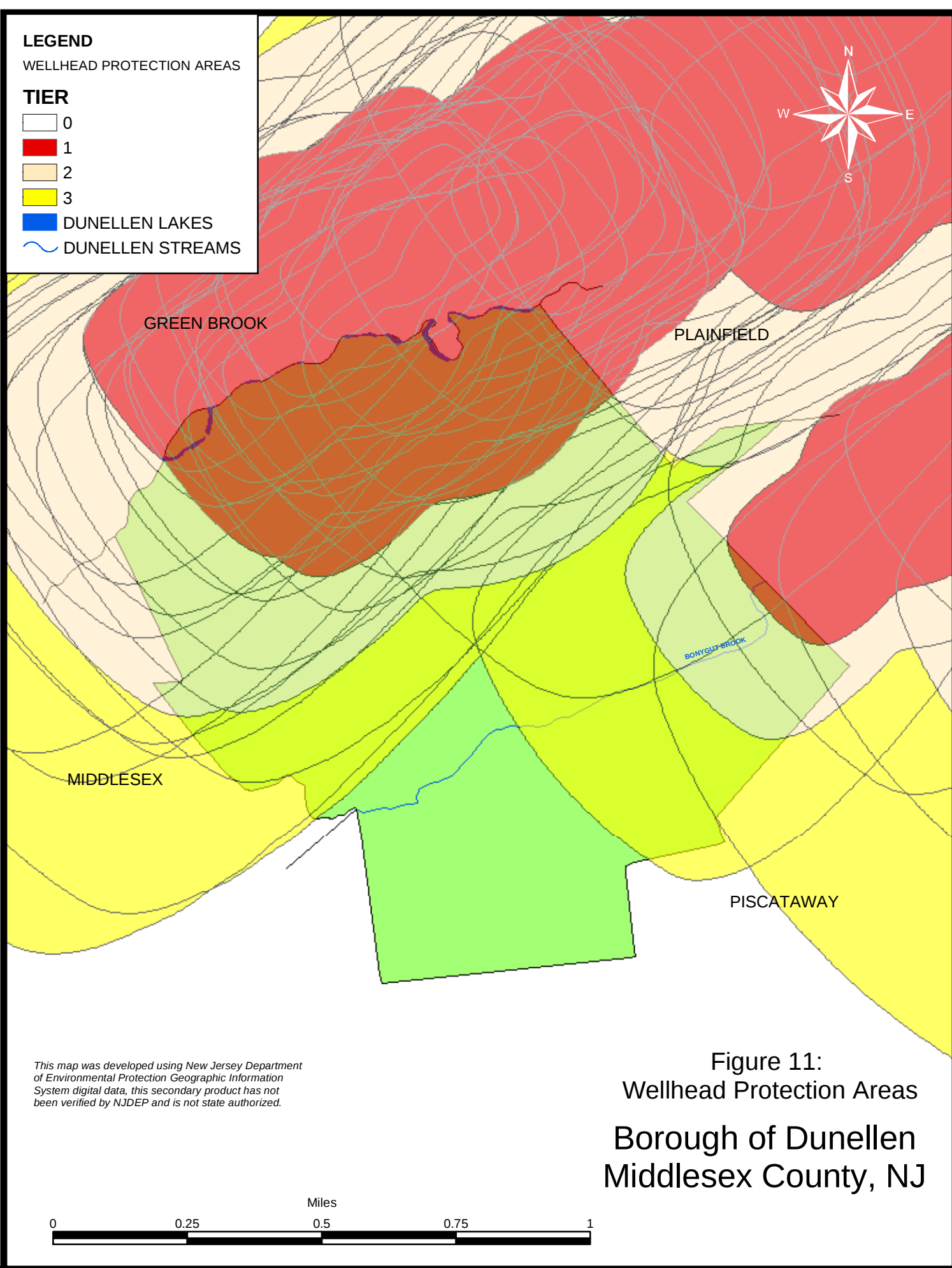
1

2

3

DUNELLEN LAKES

DUNELLEN STREAMS



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

Figure 11:
Wellhead Protection Areas
Borough of Dunellen
Middlesex County, NJ

LEGEND

-  DUNELLEN LAKES
-  DUNELLEN STREAMS
-  DUNELLEN WETLANDS

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

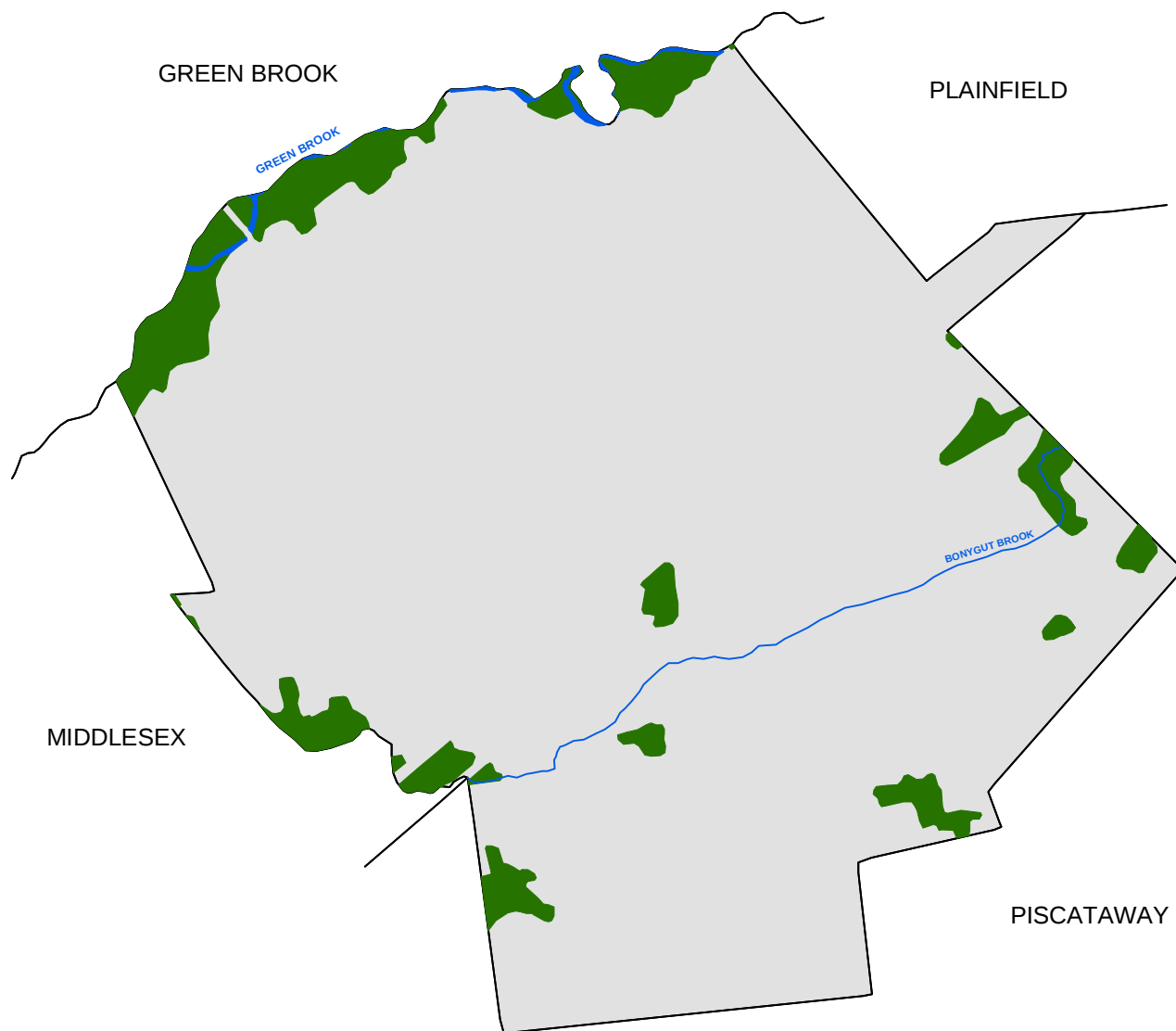
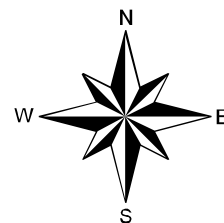
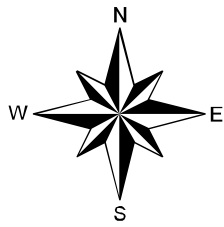


Figure 12:
Wetlands and Water Land Uses
Constrained Land
Borough of Dunellen
Middlesex County, NJ



This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, this secondary product has not been verified by NJDEP and is not state authorized. The SSURGO soils layer was developed by the Natural Resources Conservation Service (NRCS), of the US Department of Agriculture, as part of the National Cooperative Soil Survey. The data are from the Soil Survey Geographic (SSURGO) database developed and maintained by the NRCS. This data set consists of georeferenced digital map data and computerized attribute data. All soil delineations and coding were performed by NRCS soil scientists. The NJDEP was responsible only for converting the original data to the ARCVIEW shapefiles in New Jersey State Plane Feet, NAD83, that are presented here. The New Jersey NRCS webpage (<http://www.nj.nrcs.usda.gov>) should be referenced for questions concerning the data.

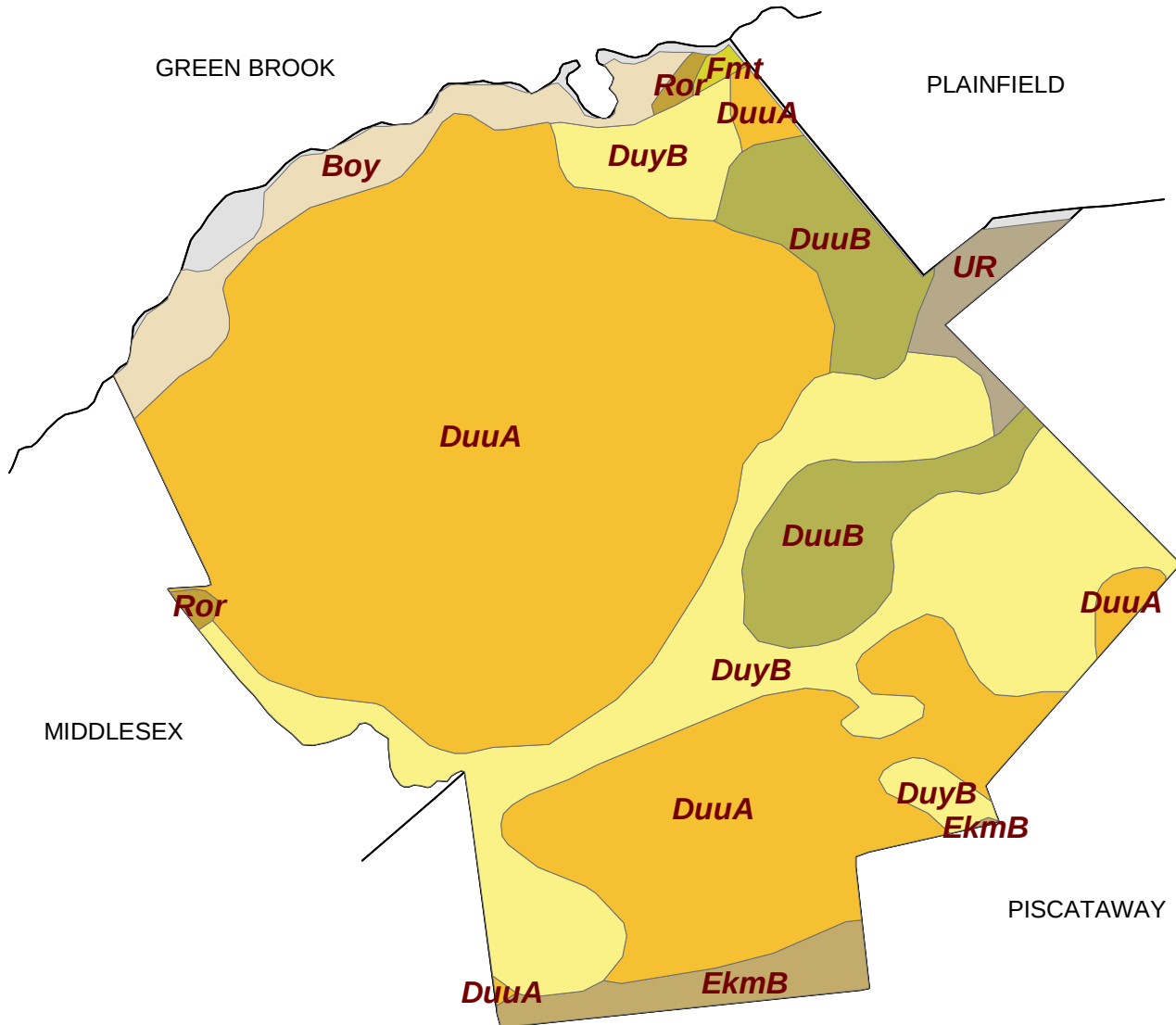
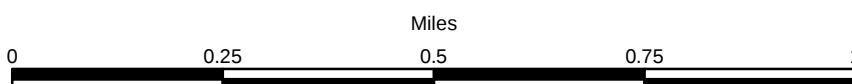


Figure 13:
Soils (SSURGO)

Borough of Dunellen
Middlesex County, NJ

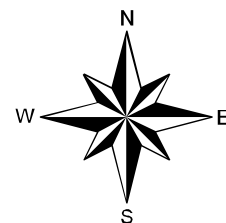


LEGEND

FEMA Q3 FLOOD ZONES

ZONE

-  AE (AREA OF 100 YR. FLOOD)
-  X (OUTSIDE FLOOD ZONE)
-  X500 (AREA OF 500 YR. FLOOD)



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GREEN BROOK

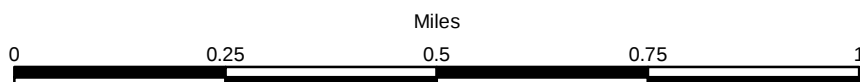
PLAINFIELD

MIDDLESEX

PISCATAWAY

Figure 14: FEMA Q3 Flood Data

Borough of Dunellen
Middlesex County, NJ



Appendix B

1999 Ambient Biomonitoring Network (AMNET) Data: Raritan Region

Benthic Macroinvertebrate Report Data

Station: AN0423
 Green Brook, Clinton Ave., Plainfield, Union & Somerset County
 Plainfield USGS Quadrangle
 Date Sampled: 02/22/99

Family	Family Tolerance Value (FTV)	Number of Individuals
Tubificidae	10	43
Gammaridae	4	26
Chironomidae	6	4
Elmidae	4	2
Lumbricidae	10	2
Sphaeriidae	8	2
Oniscidae	7	2
Hydropsychidae	4	2
Enchytraeidae	10	1
Lebertiidae	4	1
Corydalidae	0	1
Planariidae	4	1
BloodRed Chironomidae	8	1

Statistical Analysis

Number of Taxa: 13
 Total Number of Individuals: 88
 % Contribution of Dominant Family: 48.86 % (Tubificidae)
 Family Biotic Index: 7.39
 Scraper/Filterer Collector Ratio: 0.50
 Shredder/Total Ratio: 0.00
 E+P+T (Ephemeroptera, Plecoptera, Trichoptera): 1
 % EPT: 2.27
 EPT/C: 0.40
 NJIS Rating: 9
 Biological Condition: Moderately Impaired
 Habitat Analysis: 97
 Deficiency(s) noted:
 - Significant Organic Pollution - Paucity of Clean Water Organisms -

Observations

Streamwater: Clear....Flow: Moderate....Width/Depth (ft): 20-25/1-2
 Substrate: Gravel/Sand, Silt....StreamBank Vegetation/Stability: Trees, Shrubs,
 Grass/Poor
 Canopy: Mostly Open....Other: Urban, Forested (county park); Trash & Debris
 Waterfowl abundant, Minnows; Water temp. 2.9C / pH 7.9SU / DO 16.5mg/L / Cond. 505umhos

Appendix C

2004 Integrated Water Quality Monitoring & Assessment Report

Integrated List Report Data

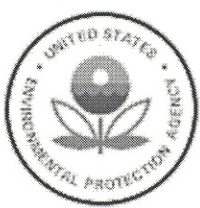
New Jersey's
2004 Integrated List of Waterbodies

Sublist	Wtrshd Region	WMA	Station Name/Waterbody	Site ID	Parameters	Data Source
5	Raritan	09	Green Brook at Clinton Ave in North Plainfield	AN0423	Benthic Macroinvertebrates	NJDEP AMNET

Appendix D

Total Maximum Daily Loads (TMDL)

Total Maximum Daily Load Report Data



Total Maximum Daily Loads

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Listed Water Information

CYCLE : 2002

[Click here](#) to see metadata for this report.

Cycle: 2002 State: NJ List ID: NJ-02030105120140-AN0423

Waterbody Name: GREEN BROOK

State Basin Name: 06 NORTHEAST

Listed Water Map Link: [MAP 303\(d\)](#)

State List IDs:

Cycle	State List ID
2002	AN0423

State Impairments:

State Impairment	Parent Impairment	Priority	Rank	Targeted Flag	Anticipated TMDL Submittal
BIOLOGY MODERATELY IMPAIRED	BIOLOGICAL CRITERIA	LOW		N	DEC-31-2003

Potential Sources of Impairment:

There were no potential sources reported to EPA by the state.

Total Maximum Daily Load (TMDL) Information:

There were no TMDLs reported to EPA by the state.

Watershed Information:

Watershed Name	Watershed States
RARITAN	NEW JERSEY

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Last updated on Friday, April 15th, 2005

URL: file:///C:/Documents%20and%20Settings/Internet/Desktop/Environmental%20Protection%20Agency.htm