MUNICIPAL STORMWATER MANAGEMENT PLAN

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Developed for:
The City of Newark
Department of Water and Sewer Utilities

By:

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1.0 Introduction

The City of Newark, the largest city in New Jersey and the county seat of Essex County is home to over a quarter million residents. Its urban landscape is the product of hundreds of years of development and economic growth. A city the size of Newark has a complex infrastructure, including a sewer system that conveys stormwater from its streets and parking lots to prevent neighborhoods from flooding during storm events.

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for the City of Newark ("Newark") to address stormwater-related impacts primarily from new development and redevelopment projects that discharge into Newark's municipal separate stormwater sewer system (MS4). The creation of this plan is required by New Jersey Administrative Code (N.J.A.C.) 7:8 Stormwater Management regulations and New Jersey Department of Environmental Protection's (NJDEP) Tier A Municipal Stormwater General Permit ("the Permit") (effective March 1, 2009) as part of their New Jersey Pollution Discharge Elimination System (NJPDES) program. The plan addresses groundwater recharge, stormwater quantity, and stormwater quality impacts by incorporating stormwater design and performance standards for new major development, defined as projects that disturb one or more acre of land. These standards are intended to minimize the adverse impact of stormwater runoff on water quality and water quantity and the loss of groundwater recharge that provides baseflow in receiving water bodies. The plan describes long-term operation and maintenance measures for existing and future stormwater facilities.

The plan also addresses the review of and reference to Newark's Municipal Code and other State regulations to allow for project designs to include low impact development techniques, before considering structural Best Management Practices (BMP). The process of project review and approval is well documented in the Municipal Code and should be referenced in regards to project requirements that apply.

2.0 Plan Goals

In accordance with N.J.A.C 7:8-2.2 and the Permit, 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 management basins.

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

3.0 Stormwater Runoff and the Hydrologic Cycle

Stormwater must be managed and collected to minimize pollutant discharges and control flooding, especially in urban areas where much of the ground is paved. In Newark, stormwater runoff is collected into storm drains and catch basins, and transported to either a treatment plant or directly into local waterways. The sewer systems that transport runoff are differentiated as either combined or separate as follows:

- Combined Sewer System (CSS) –is designed to carry both sanitary sewage (domestic, commercial, and industrial wastewater) and stormwater runoff in a single pipe to a treatment facility. During dry weather and small rain events, a CSS conveys all water to the treatment facility; however in periods of heavy rainfall, total wastewater flows may exceed the capacity of the CSS and/or treatment facility. When this occurs the combined sewer overflow (CSO) is diverted directly into the rivers and bays (Figure 1).
- Municipal Separate Storm Sewer System (MS4) – is designed to carry stormwater runoff only. Sanitary sewage is conveyed separately to a treatment facility and the storm drains and catch basins in streets and parking lots transport stormwater runoff separately to local waterways (Figure 2).

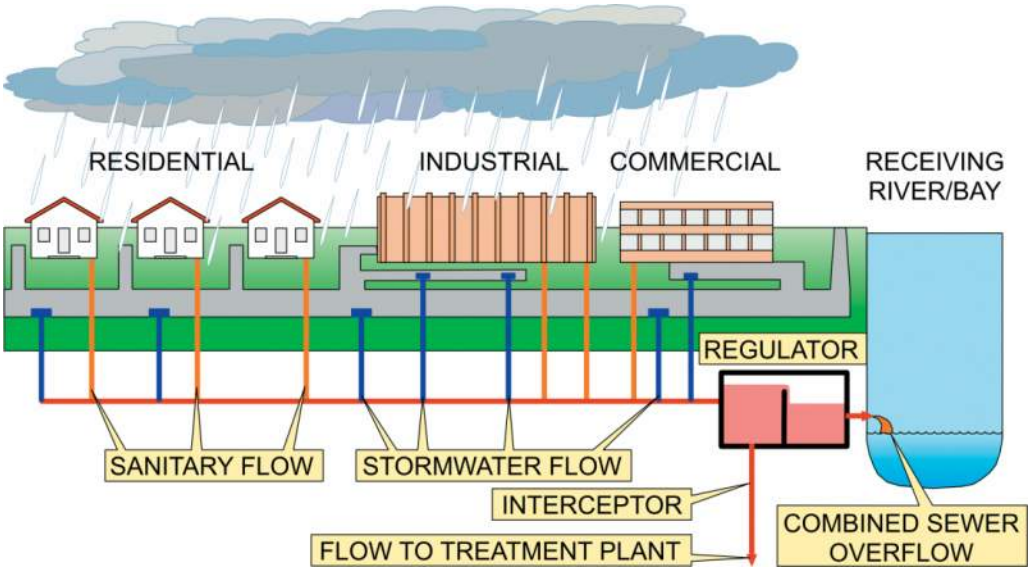


Figure 1: Combined Sewer System

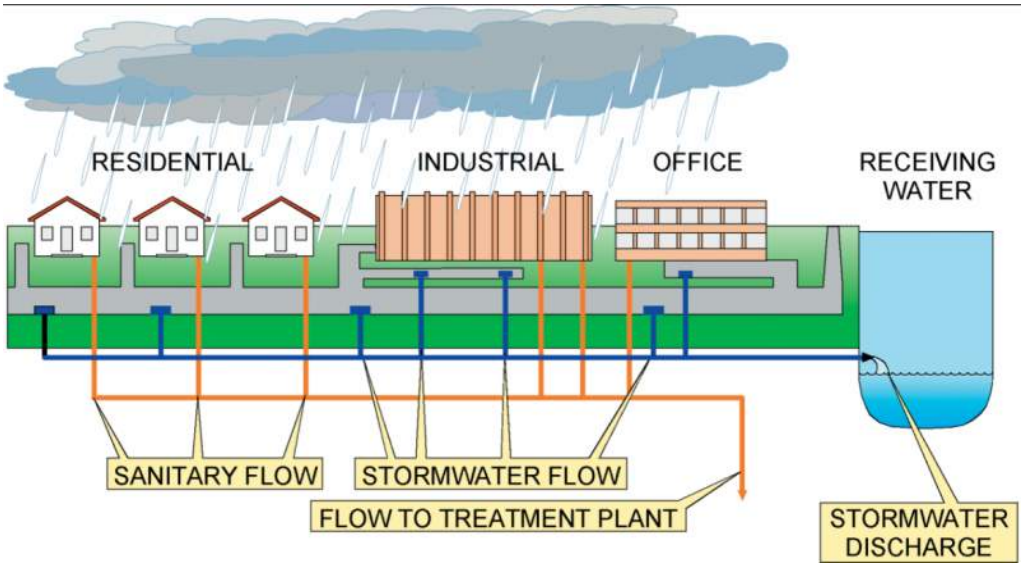


Figure 2: Separate Sewer System

Approximately 50% of Newark is serviced by an MS4 as shown in Figure 3. The largest MS4 area is the Port Authority of New York and New Jersey's Port Newark industrial area, and the Newark Liberty International Airport located in the southeastern portion of Newark. Sewers in the airport and seaport areas are operated by the Port Authority[1]. MS4 areas operated by the City of Newark are located in parts of the South, West, North and East Wards of Newark. The rest of Newark (predominately the Central Ward) is serviced by a CSS, where flow is transported to the Newark Bay Treatment Plant operated by the Passaic Valley Sewerage Commissioners (PVSC). During heavy rain events, CSO may be discharged through several outfalls along the Passaic River and/or drainage ditches.

[1] The Port Authority and its tenants maintain separate NJPDES permits for stormwater discharge from the Newark Airport Complex and Port Newark. Those areas and discharges are not covered under this MSWMP.

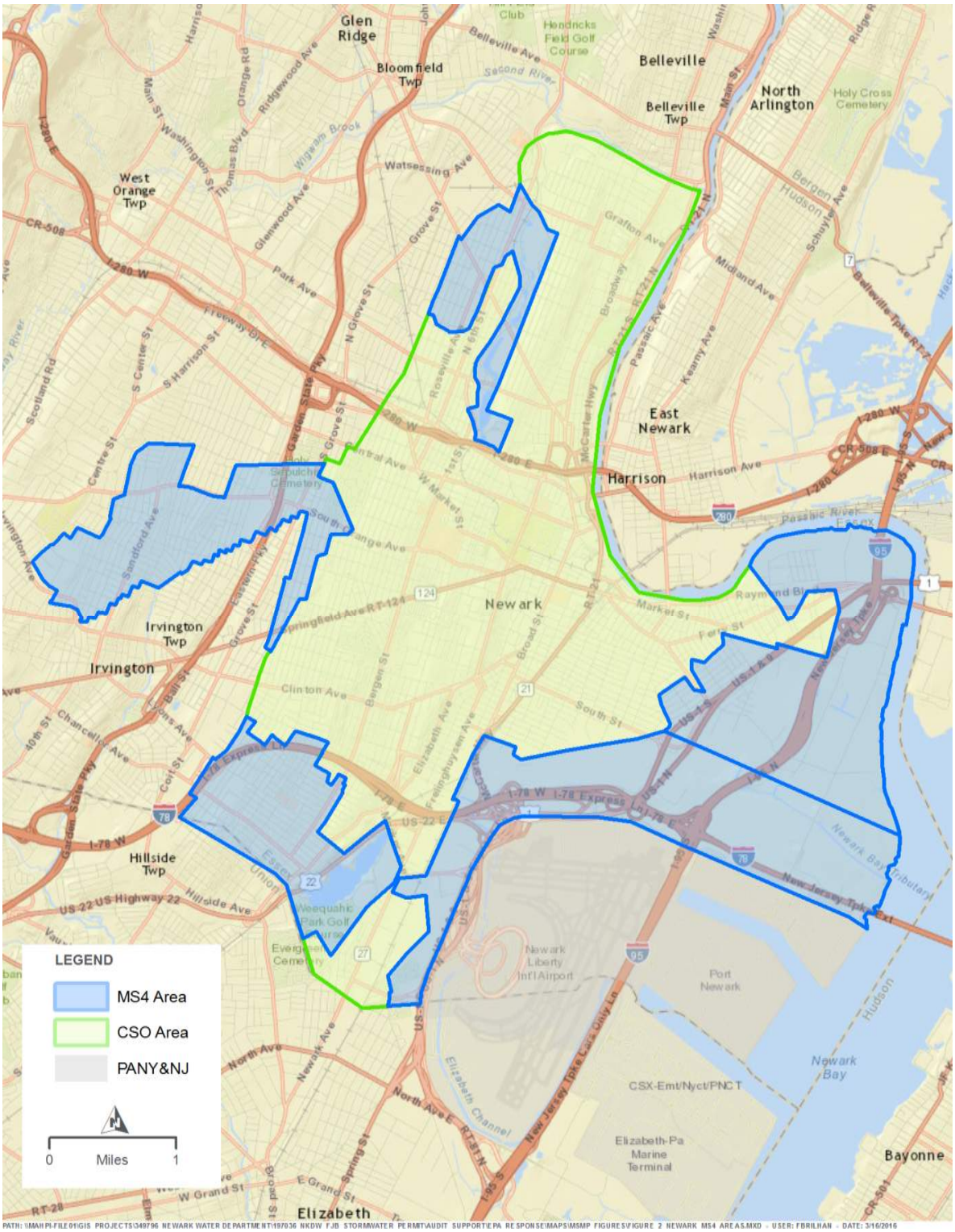
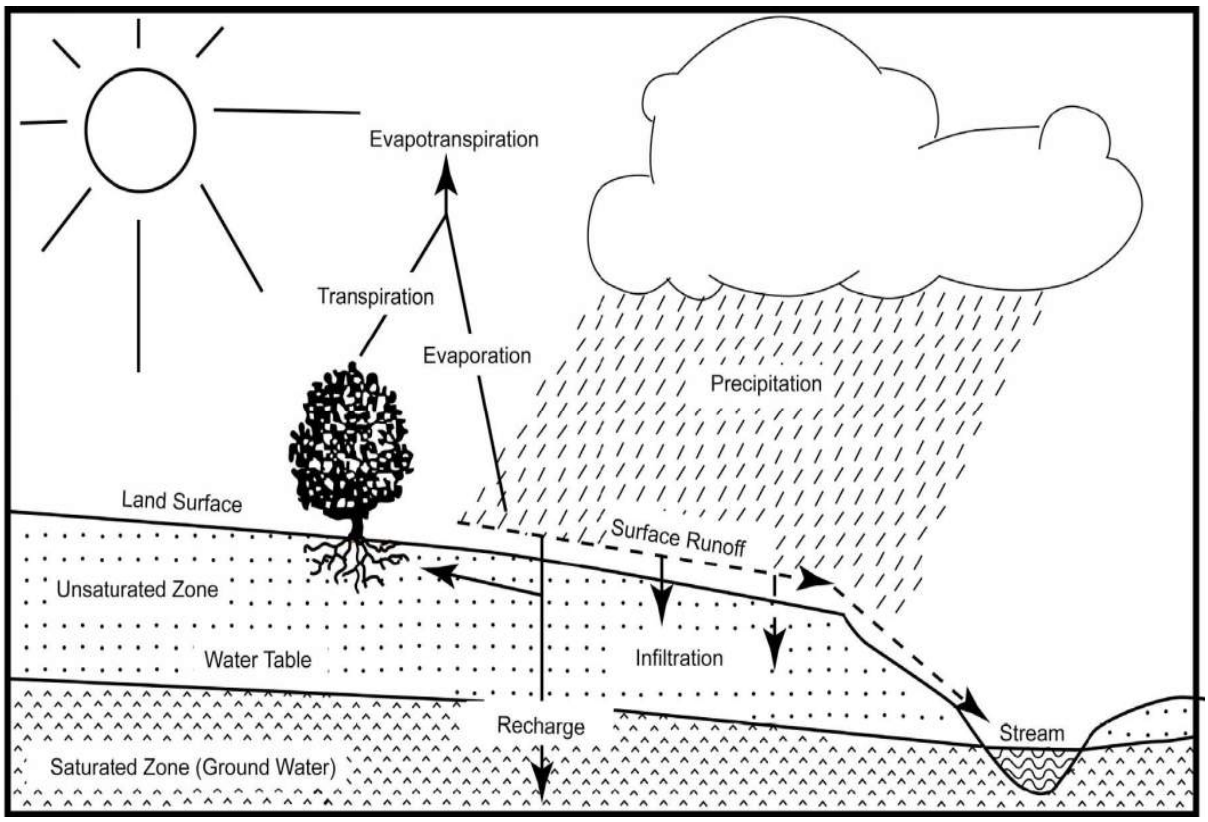


Figure 3: Separate vs. Combined Areas in Newark

The land in and around Newark was developed many years ago with impervious surfaces that altered the hydrologic cycle (See Figure 4) and, ultimately, an entire watershed. Instead of allowing precipitation to evapotranspire and return to the atmosphere from ground surfaces or infiltrate into the soil, rainfall and snow quickly runs off impervious surfaces into streams and waterways. By developing the land with impervious surfaces, groundwater recharge is also no longer possible. Paving over a site increases the flow into storm sewers, which increases the flow into waterways and may cause downstream flooding. Lastly, stormwater runoff may pick up pollutants (i.e. oils, chemicals) and trash and discharge these into the local waterway, affecting the plants and animals that live in those waterways.



Source: New Jersey Geological Survey Report GSR-32.

Figure 4: The Hydrologic Cycle

4.0 Newark's Land Use and Waterways

Newark encompasses a 24-square mile area in Essex County, New Jersey. Figures 5 and 6 depict Newark's boundary on an aerial photo and USGS quadrangle map. The population of Newark according to the 2010 U.S. Census was 277, 140 and was estimated in 2014 to be 280,579. Overall the population number remains fairly constant since the 1990 census (275,221). Newark saw tremendous growth in its population through the 1950's and then saw a steady decline from the 1960's through the 1980's. Newark's population was at its peak with 438,776 people accounted for during the 1950 census survey.

Figure 5: Aerial Photo showing Newark Boundary

Figure 6: USGS Quadrangle Map showing Newark Boundary

4.1 Land Use

The major land use within Newark is residential. Figure 7 shows current land use in Newark. Newark is split up into 20 neighborhoods or districts and land use is designated as residential, commercial, mixed use, industrial, institutional, open space, cemeteries, Port Authority property, and special districts. Note the large southeastern/eastern portion of Newark consists of the transportation systems of Newark Liberty Airport/Port Newark, and Newark's Industrial District. In general, Newark is fully developed with practically no land remaining as undeveloped or used for agriculture. According to NJDEP's New Jersey Stormwater Best Management Practices Manual (BMP Manual), Appendix C (2004), if the combined total of vacant/barren or agricultural land is less than one square mile, a municipality is not required to complete a build-out analysis. Hence, there is no build-out analysis completed for Newark.

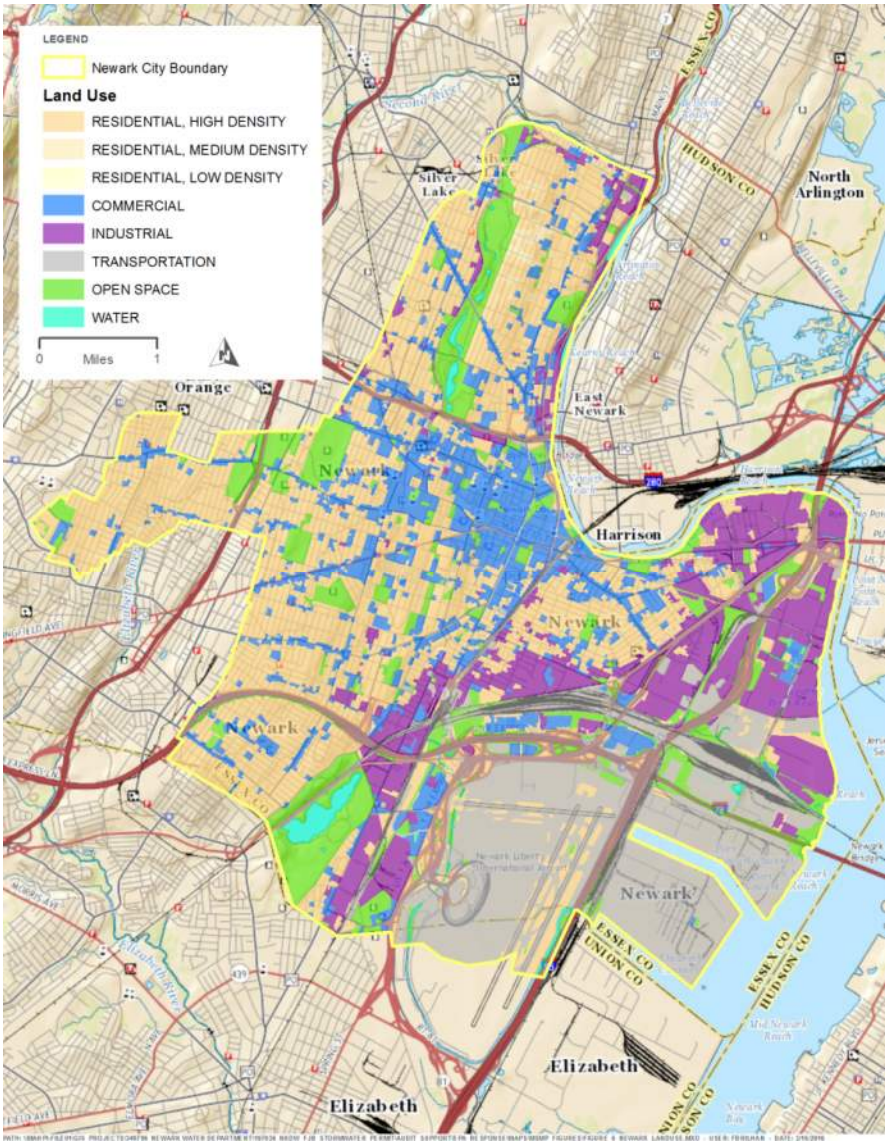


Figure 7: Newark Land Use Map

4.2 Waterways

Figure 8 illustrates the waterways in and around Newark, including three waterways that border Newark to the north, the east, and the southeast (Second River, Passaic River, and Newark Bay, respectively) and a number of waterbodies located within Newark's boundary including Elizabeth River, Weequahic Lake, Peripheral Ditch, Branch City Brook and various drainage ditches. The waterbodies considered impaired by the United States Environmental Protection Agency (EPA) include sections of the Passaic and Elizabeth Rivers, the Peripheral Ditch and Newark Bay.

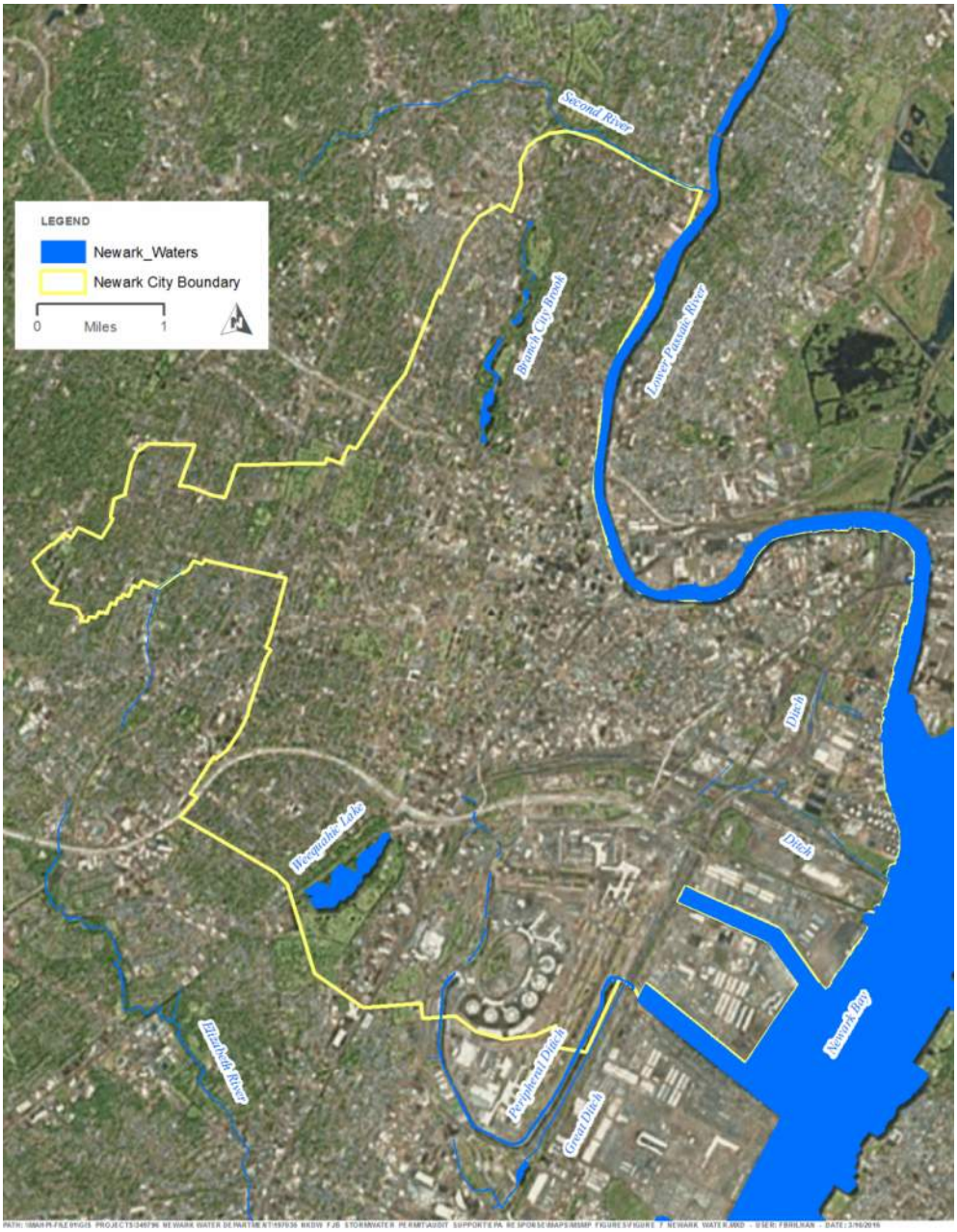


Figure 8: Newark's Waterways

4.3 Water Quality Standards

Water quality standards have been established for surface waters within the State as per NJAC 7:9B. These are based on designated uses (i.e. drinking water, recreational, etc.) and waterways are assessed to ensure that standards are being met. An 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 by the State. This combined report presents the extent to which New Jersey waters are attaining water quality standards, and identifies waters that are impaired. Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more Total Maximum Daily Loads (TMDL) are needed.

NJDEP has been developing a Total Maximum Daily Load (TMDL) for certain pollutants in impaired waterways where the State's water quality standards are not being met. 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 wastewater treatment plant discharges, which require a NJPDES permit to discharge; CSO discharges, which are regulated by NJDEP under another permit; and nonpoint sources including stormwater runoff from commercial, industrial and residential areas. Provisions may also be made for future sources in the form of reserve capacity.

4.4 Groundwater Recharge

The significant extent of imperviousness across and around Newark has significantly reduced groundwater recharge and, in turn, decreased base flows in streams during dry weather periods. Lower base flows can have a negative impact on instream habitat during the summer months. In addition, groundwater quality needs to be protected, especially in areas where it's pumped and used as a public water supply. A Well Head Protection Area (WHPA) in New Jersey is the area around a Public Community Water Supply (PCWS) well in New Jersey that delineates the horizontal extent of ground water captured by a well pumping at a specific rate over a two-, five-, and twelve-year period of time for confined wells. The area of capture over these durations is shown in Figure 9. A limited portion of the Vailsburg District in the western part of Newark is within a Tier 3 or 12-year wellhead protection area. However, due to Newark's imperviousness (reduced infiltration), residential use and lack of waterways in this neighborhood, pollutants entering the groundwater in these areas are most likely minimal.

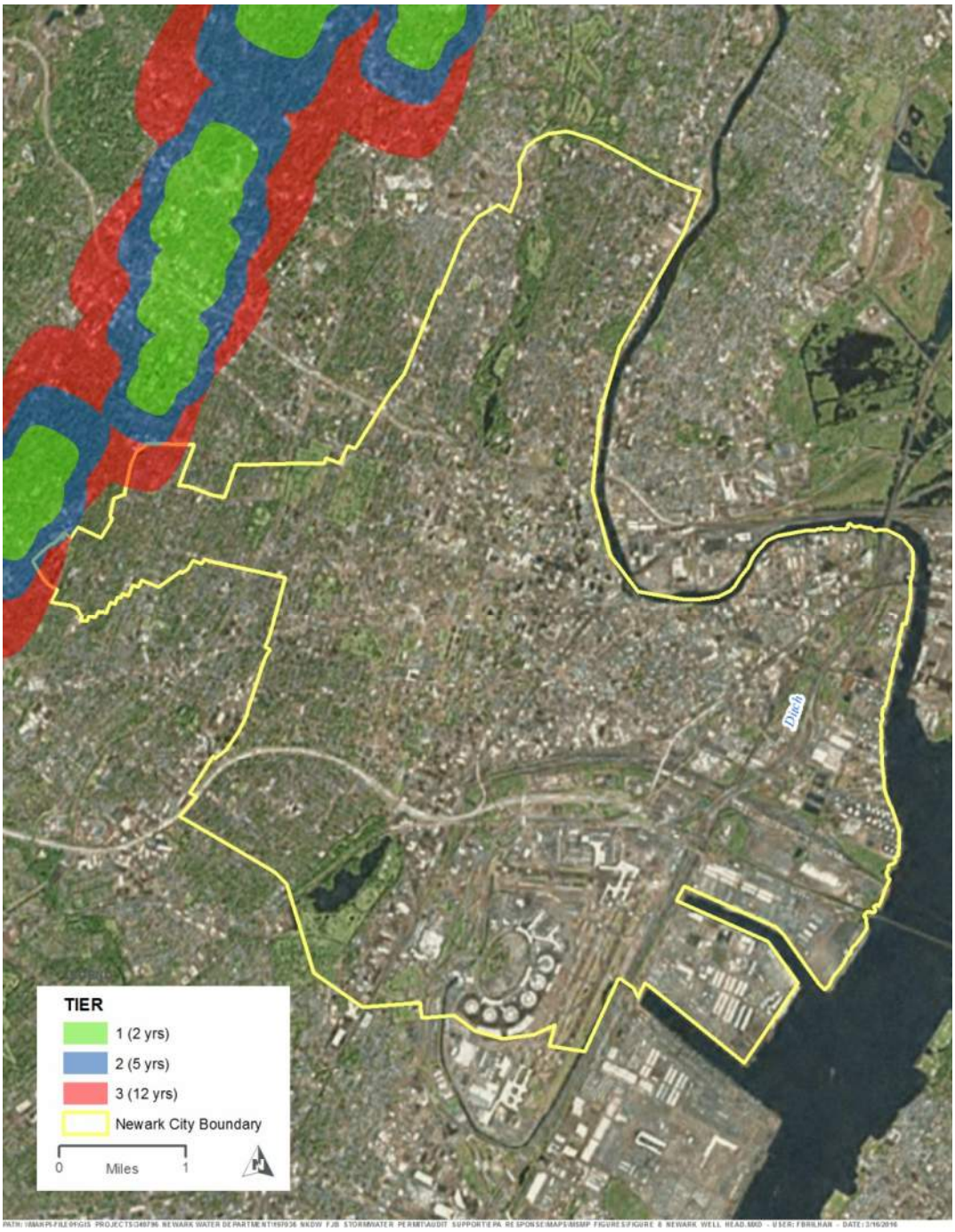


Figure 9: Well Head Protection Areas

The NJDEP Geological Survey (NJGS) developed the original ground water recharge data sets. NJGS personnel used several data factors, such as land use patterns, impervious surface amounts, soil types, precipitation, and evaporation rates, among others, to calculate the amount of water each area of the state normally contributes to the underlying aquifers. As shown in Figure 10, there are no groundwater recharge areas located within Newark. As per N.J.A.C. 7:8-5.4, the minimum design and performance standards for groundwater recharge are not applicable to projects within the "urban redevelopment

area." Based on the State Plan Policy Map (http://www.nj.gov/state/planning/spc-research-resources-maps.html), Newark is part of an urban redevelopment area due to its delineations as an Urban Center and Metropolitan Planning Area.

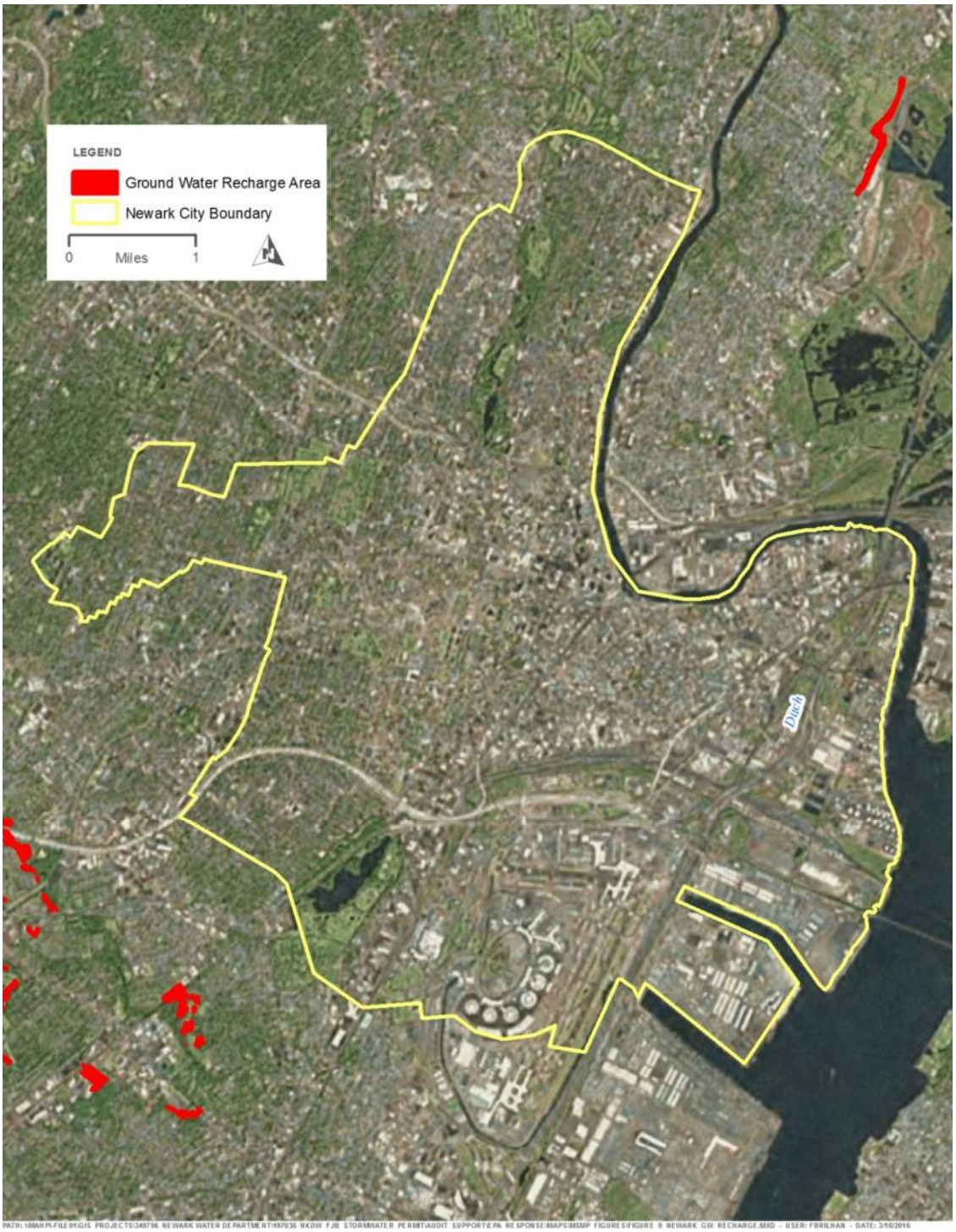


Figure 10: Groundwater Recharge Areas

5.0 Design and Performance Standards

Newark's stormwater design and performance standards are referenced in the Municipal Code as Title 40: Newark Zoning and Land Use Regulations (http://planning.ci.newark.nj.us/zoning-revision/). All new development and redevelopment must comply with the Municipal Code, as described below. Not all technical details of the design and performance standards are discussed in this Plan; therefore those seeking to comply with the regulations must reference the Municipal Code directly. Title 40 was last updated and adopted by the Newark City Council in February 2015. Chapter 17 – Storm Drainage (previously the Stormwater Ordinance) focuses on stormwater management measures and requirements for "major" development within Newark for erosion control, groundwater recharge, runoff quantity control and runoff quality treatment.

5.1 Defining Major Development

Newark's code defines major development as "any development that provides for ultimately disturbing one half (1/2) acre or more land." Disturbance for the purpose of this rule is the placement of impervious surface or exposure and/or movement of soil or bedrock or clearing, cutting, or removing vegetation. For the purpose of compliance with the Permit, NJDEP requires that a stormwater management plan be implemented for new and redevelopment projects that disturb one or more acre; therefore Newark's requirements to ensure proper management of stormwater runoff are more stringent than the State's. All major development on property owned by Newark and property not owned by Newark ("Subject Property") must comply with the Municipal Code and therefore require a Site Development Stormwater Plan (discussed further in Section 5.6).

5.2 Non-Structural Stormwater Management Measures

The Municipal Code requires development designs to incorporate non-structural stormwater management strategies to the maximum extent possible, prior to considering structural stormwater management measures to meet the design standards. If non-structural techniques are not feasible in the design, the development applicant must show intent and provide a basis for contention. As per the Municipal Code and the BMP Manual, designs shall incorporate the following non-structural measures:

- Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss;
- Minimize impervious surfaces by breaking up and disconnecting the flow of runoff over impervious surfaces, and utilize velocity reduction strategies;
- Maximize the protection of natural drainage features and vegetation;
- Minimize the decrease in the time of concentration from pre-construction;[2]
- Minimize land disturbance including clearing and grading;
- Minimize soil compaction;
- Provide low maintenance landscaping that encourages vegetative uptake and planting of native vegetation with minimal use of lawns, fertilizers and pesticides;

[2] "Time of concentration" is defined as the time it takes for runoff to travel from the hydraulically most distant point of the drainage area to the point of interest within a watershed. For the purposes of these requirements, the point of interest would be the storm drain or catch basin connected to both the MS4 and CSS system.

- Provide vegetated open channel conveyance systems discharging into and through stable vegetated areas provided that the approving board deems this arrangement to be safe for the public and that all safety regulations are met (see Municipal Code Title 40:17-8. Safety Standards for Stormwater Management Basins).

5.3 Structural Stormwater Management Measures

Also known as structural BMP's, structure stormwater management measures utilize physical, chemical and biological processes to reduce runoff rates, reduce pollutant loadings and maximize groundwater recharge. The BMP Manual discusses applicability, design criteria, considerations, recommendations and maintenance for a number of structural BMPs including green infrastructure, porous pavement, rooftop and subsurface technologies:

- Bioretention Systems
- Stormwater Constructed Wetlands
- Dry Wells
- Detention Basins
- Infiltration Basins
- Manufactured Treatment Devices
- Pervious Paving Systems
- Sand Filters
- Vegetated Strip Filters
- Wet Ponds
- Grass Swales
- Subsurface Gravel Wetlands
- Green/Blue Roofs

Structural stormwater measures must comply with Newark's Municipal Code, Title 40:17-6 and standards in regards to trash rack dimensions for floatables control and outlet structure requirements. Property owners must provide Newark with a maintenance plan to ensure BMPs will continue to operate properly.

5.4 Erosion Control, Groundwater Recharge and Runoff Quantity Standards

These standards seek to control erosion, encourage and control infiltration and groundwater recharge, and control stormwater runoff quantity impacts of major development. The requirements of the Municipal Code, Title 40:17-4-6 offer detailed runoff and groundwater recharge calculations, as well as requirements to demonstrate that new development or redevelopment post-construction stormwater peak runoff rates do not exceed pre-construction. Erosion control standards are to follow the Soil Erosion and Sediment Control Act, New Jersey Statutes Annotated (NJSA) 4:24-39 et seq., as well as Municipal Code, Title 28 (Soil Erosion and Sediment Control) and implementing rules. As stated earlier, no groundwater recharge is required for projects within an Urban Redevelopment Area, which Newark is considered. Groundwater recharge is not permitted within areas of high pollutant loading or areas with a high risk of toxic spills as per the Municipal Code, Title 40:17-4-6(b)(ii).

5.5 Runoff Quality Standards

For Subject Properties located in Newark's MS4 area, stormwater management measures shall be designed to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff by 80% of the anticipated load from the developed site, expressed as an annual average. This does not apply to property owners covered under an existing NJPDES permit. The Newark Municipal Code and the BMP Manual furnish presumed TSS removal rates for certain structural BMP's. Stormwater management measures should also be designed to reduce, to the maximum extent possible, post-construction nutrient loads (i.e. nitrogen and phosphorus), while still achieving performance standards for erosion control, groundwater recharge and run off quantity.

5.6 Checklist for the Site Development Stormwater Plan

As part of Newark's site plan approval process through the Central Planning and Zoning Boards, a project applicant for a major development is required to submit a Site Development Stormwater Plan which is reviewed by the Engineering and Water & Sewer Departments and includes the following items:

- Topographic Base Map
- Environmental Site Analysis
- Project Description and Site Plan
- Land Use Planning and Source Control Plan
- Stormwater Management Facilities Map
- Runoff and Groundwater Recharge Calculations
- Maintenance and Repair Plan
- Waiver from Checklist Submission Requirements

Each item in the checklist is discussed in more detail in the Municipal Code, Title 40:17-9-3.

5.7 Maintenance and Repair Plan

Subject Properties must furnish a Maintenance and Repair Plan for the stormwater management measures incorporated into the Site Development Stormwater Plan, as noted in the submittal list above. In general, this plan contains information on maintenance tasks, schedules, responsible person(s) for implementing the plan, and cost estimates for maintenance. Maintenance shall be performed to preserve the functionality of the stormwater management measures over time and logs shall be kept by property owners to document maintenance and repairs. Under the Permit and N.J.A.C. 7:8, Newark is responsible for ensuring the long-term operation and maintenance of BMPs. Newark's Municipal Code (Title 40:17-10) provides the process to ensure that BMPs are properly operated and maintained in the future, and is incorporated into this MSWMP by reference. By way of summary, the person responsible for the Subject Property will be required to prepare a Maintenance and Repair Plan that shall include, in part, preventative and corrective measures, including replacement, related to the maintenance of such BMPs. The person responsible shall perform those preventative and corrective measures as necessary, including regular inspections, and maintain a detailed log of any such measures performed and inspections for the Subject Property. The responsible person shall evaluate the Maintenance and Repair Plan for effectiveness annually, and adjust the plan as necessary. Newark will inspect all subject

properties annually, including an audit of the Maintenance Plan and all required logs and related documentation if necessary, to verify that those BMP's are being adequately maintained. Newark will also maintain an inventory of BMPs.

6.0 Safety Standards

Standards are set and required for the safe design and implementation of new stormwater management basins, as per the Newark Municipal Code, Title 40:17-8. This includes the design standards for trash racks and overflow grates. Bars and grates are affixed to outlet structures to reduce the amount of litter from entering the stormwater system and are also designed to reduce the potential risk of human safety. Escape provisions (i.e. installation of steps, ladders, rungs, etc.) must also be considered for new stormwater management basins, as well maximum slope for earthen dams, embankments or berms.

7.0 Plan Consistency

This MSWMP is compliant with State and Federal requirements and is consistent with the following rules and regulations:

- Residential Site Improvement Standards (RSIS) (N.J.A.C. 5:21)
- NJ Standards for Soil Erosion and Sediment Control Standards, 2014
- NJ Stormwater Management Rules (N.J.A.C. 7:8)

8.0 Variances & Mitigation

Newark has an application process to grant variances from its zoning ordinance and use, but does not grant variances from its stormwater ordinance, Title 40:17. However, if a variance from the stormwater ordinance is considered the following mitigation plan to offset any developments that can't meet the stormwater standards will be followed.

Mitigation Project Criteria

1. The mitigation project must be implemented in the same drainage area as the proposed development. The project must provide additional groundwater recharge benefits, or protection of stormwater runoff quality and quantity from a previously developed property that does not currently meet the design and performance standards outlined in this MSWMP. The developer must ensure the long-term maintenance of the project, including the maintenance requirements discussed in previous sections of this MSWMP.

    a. With guidance from the Department of Engineering, the applicant can select a stormwater improvement project of similar drainage area size to compensate for the deficit from the performance standards resulting from the proposed development project.

2. If a suitable site cannot be located in the same drainage area as the proposed development, as discussed in Option 1, the mitigation project may provide mitigation that is not equivalent to the impacts for which the variance or exemption is sought, but that addresses the same issue. For example, if a variance is given because the 80 percent TSS requirement is not met, the selected project may address water quality impacts due to a nutrient or fecal loading impairment.

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

9.0 Other Ordinances

As part of both Municipal Code Title 40 and other Titles, Newark has incorporated preventative actions to assist in the reduction of pollutants and/or floatables in stormwater runoff. The Municipal Code may be accessed at the following link (http://www.ci.newark.nj.us/government/departments/city-clerk/) and the associated Title is listed below with each ordinance. Newark departments that are responsible for enforcing both the stormwater rules and these ordinances include the Police Department, Department of Neighborhood and Recreational Services and/or other Municipal Officials of the City of Newark.

- Refuse Containers/Dumpsters (Title 40:17-11)
- Private Storm Drain Inlet Retrofitting (Title 40:17-12)
- Pet Solid Waste Disposal (Title 6:1-12)
- Litter Control (Title 15:9)
- Feeding Wildlife (Title 20:20-1(f))
- Illicit Discharges into the Separate Storm Sewer (Title 32:1-2)