3. Regional and Municipal Stormwater Management Planning

Introduction

There are two sets of New Jersey State rules that establish a comprehensive framework for addressing the stormwater runoff quality impacts associated with stormwater runoff discharges. Pursuant to the United States Environmental Protection Agency (EPA) "Phase II" regulations, the first set of rules intended to address and reduce pollutants associated with stormwater runoff are the New Jersey Pollutant Discharge Elimination System (NJPDES) Municipal Stormwater Regulation Program rules at N.J.A.C. 7:14A-25. These NJPDES rules govern the issuance of permits to entities that own or operate small municipal separate storm sewer systems (MS4s). The MS4 permits issued under the NJPDES rules require those permittees to provide information regarding the adoption and implementation of MSWMPs and RSWMPs to address permit requirements.

The second set of rules are the Stormwater Management rules (N.J.A.C. 7:8). These rules set forth the required components of an RSWMP and an MSWMP. This chapter provides guidance for meeting the standards for these stormwater management plans.

Stormwater Management Plan (SWMP)

All stormwater management plans and stormwater control ordinances shall include the goals of stormwater management planning as listed in N.J.A.C. 7:8-2.2. In summary, the goals of stormwater management plans shall be designed to:

- reduce flood damage,
- minimize stormwater runoff from any new development,
- reduce soil erosion from any development or construction project,
- maintain groundwater recharge,
- minimize pollutants in stormwater runoff from new and existing development and
- protect public safety

Stormwater management plans shall include stormwater management measures, including green infrastructure and nonstructural strategies to meet the stormwater management goals. A stormwater management plan and any stormwater management ordinance shall be coordinated with any other stormwater management plans related to the same river basin or drainage area. The municipalities may coordinate their plans at the regional level. For both Regional and Municipal Stormwater Management Plans that are developed pursuant to N.J.A.C. 7:8-3 and 4, "nonstructural stormwater management strategies" may include one or more of the practices listed at N.J.A.C. 7:8-2.4(g). These strategies, as published in the Stormwater Management rules, include approaches such as maximizing protection of

natural drainage features and minimization of land disturbance, including clearing and grading, which are important principles to guide a stormwater planning effort.

Regional Stormwater Management Plan (RSWMP)

Regional stormwater management planning is a comprehensive approach to stormwater management practices that is applied on a regional scale. A regional stormwater management plan shall address stormwater-related water quality, groundwater recharge and/or water quantity impacts of new and existing land uses in a regional stormwater management planning area, which shall consist of one or more continuous drainage areas. For example, a drainage area could be an area defined by a hydrologic unit code 14 (HUC14) as defined by the United States Geological Survey. The plan must address a stormwater-related water quantity issue - such as localized flooding, an existing water quality issue - such as excess pollutant loading - or issues of water quantity and quality that may be generated by future development. Regional stormwater planning creates a combination of regulations and actions tailored to the specific needs of a drainage area, but it does not reduce environmental protection. Rather, it allows for more flexibility to match the concerns, conditions, and features of regions that are connected by a common drainage area.

Well-designed RSWMPs share common elements. First, they are collaborative. Adoption and implementation of an RSWMP depends on the cooperation of county and municipal governing bodies, regulatory agencies and environmental organizations. Effectively involving various interest groups and agencies as to where and how development occurs in relation to stormwater management can help communities balance development decisions while protecting natural resources. Second, they focus on identifying and solving specific problems. Shared regional problems, such as recurring flooding, lakes that are unsuitable for swimming, reduced stream flows or contaminated public water supplies, can drive the collaboration needed to trigger and sustain the planning and adoption process. Specific problems also lend themselves to specific, measurable, and quantifiable implementation steps. For example, an RSWMP can spell out the specific measures required to reduce pollutant loads determined by the TMDL (Total Maximum Daily Load) process, which is further discussed beginning on Page 4. Third, the recommendations in an RSWMP are based on sound engineering and science and geared to local land use conditions. All measures included in an RSWMP must be supported by a rationale that includes a feasibility analysis for achieving specific objectives, as well as a monitoring plan to gauge long term effectiveness of each measure. Plans must be reviewed every five years, at a minimum. Fourth, and finally, RSWMPs must include a strong emphasis to ensure long-term functioning of the structures, measures, and programs - such as a TMDL program, educational programs, and watershed management regulatory programs -recommended by the RSWMP.

Regional stormwater management planning represents a fundamental shift in thinking and execution from projects being under the review of an individual municipality to a watershed level based approach. While the stormwater management plan and the associated stormwater control ordinance that regulate individual sites within a municipality boundary are a minimum standard, regional stormwater management planning expands the boundary and the standards to solve the stormwater issues that may affect multiple municipalities in a watershed.

To address the stormwater impacts from multiple sites spread across the municipalities in a watershed, for example, an RSWMP may develop a TMDL program when a TMDL is established for the watershed, or

an RSWMP may establish higher water quality standards for the upstream portion of a watershed to resolve the issue of accumulated pollutants in downstream areas of the watershed. .

RSWMPs optimize the flexible use of stormwater management measures, green infrastructure and nonstructural strategies by providing the authority to create new, customized regulatory requirements and by setting priorities for actions that address the specific stormwater runoff quality, quantity and recharge objectives within the planning area. Although N.J.A.C. 7:8-3.6 allows an RSWMP to set forth drainage area-specific design and performance standards for the regional stormwater management planning area, RSWMPs must avoid adverse impacts downstream of the planning area. Regional planning also creates more options for groundwater recharge. Local topography, geology and soil conditions that restrict infiltration may present daunting design challenges for some sites and municipalities, while well-suited recharge sites may be located nearby. In each case, better solutions become available with regional planning.

Drainage Area Sizing in an RSWMP

As previously stated, an RSWMP must address at least one continuous drainage area. Furthermore, an RSWMP must be developed based on the needs of a specific drainage area, as well as consider the preservation of open space and critical ecological features, encourage development in already degraded areas and use land efficiently for the overall improvement of stormwater management and protection of water quality on a regional basis. In accordance with N.J.A.C. 7:8-3, an RSWMP shall specifically address stormwater related water quality, groundwater recharge and/or water quantity impacts of new and existing land uses in a regional stormwater management planning area. Establishing the drainage area will ultimately cross many boundaries, including those possibly of individual properties, neighborhoods, municipalities and even county borders. For example, a drainage area could be defined by a hydrologic unit code 14 (HUC14), which means "*an area within which water drains to a particular receiving surface water body, also known as a subwatershed, which is identified by a 14-digit hydrologic unit boundary designation, delineated in New Jersey by the United States Geological Survey*."

Regional stormwater management is fundamentally a problem-centered planning process, so the size of an RSWMP drainage area may depend on the nature and location of previously identified local concerns such as water quality impairment, erosion damage, reduced stream flows, sedimentation, inadequate groundwater recharge or flooding. RSWMPs are created to address existing and/or potential stormwater-related problems. Local interest groups may additionally have specific concerns that can be addressed with a regional plan. TMDL implementation plans may identify regional stormwater management plans as a long-term management measure to address impairment for a specific stream segment. A build-out analysis may identify additional problems during the assessment portion of regional plan development. Below are three hypothetical examples:

- A regional plan developed for the watershed of a brook was initially driven by flooding concerns, but it also proposes improvements to reduce pollutant loads projected under full development conditions.
- A regional plan proposed for a watershed seeks to anticipate and address concerns about the impacts of development to an environmentally sensitive area as increasing impervious coverage of developments in municipalities of the watershed may cumulatively reduce groundwater recharge and potentially affect the hydrology and hydraulics of the environmentally sensitive area.

- A regional plan proposed to protect water quality in a stream that is the source of drinking water for downstream municipalities and upstream municipalities are being developed. Protection is achieved by incorporating for higher water quality design and performance standards for the watershed to minimize water quality impacts and prevent increased treatment costs for drinking water.

Available funding is a key variable in determining the size of a regional area for a plan. Budgets for developing RSWMPs are typically quite large because they often require extensive collection and complex analysis of field data. Those costs tend to limit the size of the drainage area to be studied. The cost of implementing an RSWMP, of course, depends on its findings and recommendations and is dependent on the goals and objectives of the plan and the specific conditions of the area.

Regional stormwater planning requires municipalities to align their zoning and development standards with the plan. Drainage areas that include three or four neighboring municipalities with a common concern may have a better chance of aligning their development standards.

Beginning the RSWMP Process

Plan development begins with characterizing and assessing the drainage area by gathering and reviewing all relevant water quality and quantity information currently available. This requires searching for all available data from sources including, but not limited to:

- State and Federal Emergency Management Agency (FEMA) floodplain maps,
- Hydraulic analysis and stream cross section data from stream encroachment permits,
- Topographic data from aerial photos with contours spaced two feet apart,
- Field observations from the local Soil Conservation Districts pertaining to stream banks, erosion and scouring,
- Water quality data from New Jersey Pollution Discharge Elimination System (NJPDES) permits or intake waters from local water treatment facilities and
- Monitoring data from the U.S. Geological Survey, the Environmental Protection Agency's STORET database, the NJDEP, local health departments, environmental commissions and watershed associations.
- TMDLs are requirements placed upon each state by the Federal Clean Water Act to address impaired, "unhealthy" waterbodies. TMDLs diagnose the source of the problem and quantify the water quality recovery, assisting DEP in achieving its priorities of waters that are swimmable, fishable and safe for drinking. A TMDL is the maximum amount of a pollutant that a waterbody can receive and still meet surface water quality standards. The TMDL is calculated considering critical conditions and seasonal variation along with a margin of safety (MOS) to account for uncertainty. The TMDL is allocated to the various sources of the pollutant, including both nonpoint and point sources, as well as natural background sources. Point sources, regulated by a New Jersey Pollutant Discharge Elimination System (NJPDES) permit, such as wastewater treatment facilities, combined sewer overflows and stormwater, receive Wasteload Allocations

(WLAs). Nonpoint sources, such as overland runoff and air deposition, receive Load Allocations (LAs). Provisions may also be made for future sources in the form of reserve capacity. A TMDL implementation plan is developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies may include requiring specific parameter limitations or other control measures in wastewater or stormwater discharge permits, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems and other BMPs. A list of resources is provided below.

- The TMDL Look-Up Tool may be used to identify TMDL information associated with any segment of waterbody within or bordering the municipality and is found online at https://www.nj.gov/dep/dwq/msrp-tmdl-rh.htm.
- To find a spreadsheet of all approved or adopted TMDLs in New Jersey, visit https://dep.nj.gov/wms/bears/tmdls/ and select "Table of New Jersey TMDLs and Approval Status."
- See also the NJDEP's Bureau of Environmental Analysis, Restoration and Standards web page at https://dep.nj.gov/wms/bears/.
- The US Environmental Protection Agency's TMDL web site at https://www.epa.gov/tmdl is another resource for TMDL-related information.
- One may also explore an interactive waterway assessment tool at USEPA's "How's My Waterway?" available online at https://mywaterway.epa.gov/.
- Additionally, the NJDEP MS4 New Jersey - Watershed Evaluation Tool (NJ-WET) available at https://experience.arcgis.com/experience/f40f65d807bb4372bd92b48bb98f1972 allows the user to view and download data for a specific municipality, including TMDLs, Water Quality Impairments Related to Stormwater, MS4 Infrastructure, Overburdened Communities and Impervious Surfaces.

Additional information regarding local conditions may be available from the Division of Water Monitoring, Standards and Pesticide Control and local environmental organizations. Recent watershed characterization studies, if available, also provide data to focus planning efforts on water quality issues. If a watershed characterization study is not available, consider performing a relatively quick and inexpensive Geographic Information Systems (GIS) analysis that matches water supply sources with reported water quality degradations and potential pollutant sources.

Steps to Create, Implement and Adopt an RSWMP

Planning the RSWMP Process

Because an RSWMP is both a technical planning procedure and a regulatory process, it requires active participation from organizations that would likely be affected by the plan. Pursuant to N.J.A.C. 7:8-3.2, the first step in the RSWMP process is to create a regional stormwater management planning committee and select a lead planning agency for the express purpose of developing a regional plan. The committee is charged with soliciting information from the following interested groups and organizations:

- municipalities,
- interstate agencies,

- regional agencies,
- counties,
- designated planning agencies under N.J.A.C. 7:15,
- Soil Conservation Districts,
- regional environmental commissions,
- Pinelands Commission,
- mosquito control and extermination commissions,
- public water supply and wastewater treatment utilities and agencies,
- lake associations,
- watershed associations,
- the watershed management planning area public advisory committee,
- environmental organizations,
- businesses,
- the Department and other appropriate State and Federal agencies and
- members of the general public in the drainage area(s) to be addressed by the proposed plan

The planning committee must designate a lead planning agency to serve as the primary contact for the committee. The lead agency must submit a request for the recognition of the regional stormwater plan committee to the NJDEP. This request must include a draft work plan, schedule of activities and the information used to invite organizations to participate in the planning committee. The NJDEP has 45 days to approve or deny the request or ask for more information.

Required Elements of the RSWMP

In accordance with N.J.A.C. 7:8-3.3, the RSWMP must incorporate all of the following elements, at a minimum:

1. Identification of the lead planning agency and a description of the structure and members of the committee,

2. A statement of authority to develop and implement a stormwater management plan from public entities, as appropriate, represented on the regional stormwater management planning committee,

3. A characterization and assessment of the regional stormwater management planning area prepared in accordance with N.J.A.C. 7:8-3.4, including a climate change resilience strategy that incorporates the requirements found in N.J.A.C. 7:8-3.4.(a)7.i-iii, which is covered in further detail on Page 15.

4. A statement of drainage area-specific stormwater runoff quality, groundwater recharge and water quantity objectives established under N.J.A.C. 7:8-3.5,

5. In some cases, TMDLs require Additional Measures (AM) be implemented, and N.J.A.C. 7:8-5.5(j) specifies that “Stormwater management measures shall be designed to incorporate any Additional Measures specified in a TMDL(s) approved or established by EPA, unless otherwise required pursuant to N.J.A.C. 7:14A-25.6(e)."

6. The drainage area-specific stormwater-related stormwater runoff quality, groundwater recharge and water quantity design and performance standards established under N.J.A.C. 7:8-3.6,

7. The stormwater management measures selected in accordance with N.J.A.C. 7:8-3.7 and a summary of the rationale for the selection of each measure,

8. A description of the strategy for implementing the selected stormwater management measures for the regional stormwater management planning area and for evaluating the effectiveness of the regional stormwater management plan in accordance with N.J.A.C. 7:8-3.8, including a long-term monitoring program and

9. To the extent elements of the plan do not represent the consensus of the committee, the plan shall identify and provide a discussion of the majority and minority positions.

RSWMP Data Gathering and Priority Setting

Data gathering and priority setting can be the most expensive steps in the process because they often require time-intensive collection of field data on variables such as stream elevations, erosion hot spots and water quality. To minimize the cost of gathering this data, the Department encourages planners to make maximum use of existing information, including information on the Department's GIS website at: www.nj.gov/dep/gis or developed through the watershed management process. This task is ideally suited for analysis and display on Geographic Information Systems, and all maps developed must meet New Jersey's digital data standards in N.J.A.C. 7:1D. In accordance with N.J.A.C. 7:8-3.4, the following items should be included in the assessment unless they are not pertinent to a specific analysis.

Maps

In accordance with N.J.A.C. 7:8-3.4(a)1, the maps must provide all of the listed information. They must first clearly delineate the drainage area boundaries, showing both existing and projected land uses assuming full development under current zoning. The following layers of information should be included: soils, topography, flood hazard areas, well protection and groundwater recharge areas. All water bodies designated as water quality-limited surface waters as well as environmentally sensitive areas or special classifications should be identified, including river areas designated under the New Jersey Wild and Scenic Rivers Act or the Federal Wild and Scenic Rivers Act. These maps must identify stormwater management structures, surface water intakes and public water supply reservoirs in addition to features that are outside the regional planning areas but discharge or flow into the drainage area. In addition, see items vii and viii, at N.J.A.C. 7:8-3.4(a)1, for the information required pertaining to coastal wetlands and flood hazard areas, respectively.

Key Stormwater Management Features

The assessment must include an inventory of all key stormwater management features, including slopes, swales, outfall structures, culverts and impoundment areas pertinent to stormwater management and required for analyzing the drainage area. Often this data can be gathered only by physically walking stream corridors to record features such as stream widths, streambank conditions, pollutant sources, eroded areas and other relevant data. This data collection requires trained eyes in the field and often accounts for a substantial portion of the cost of developing an RSWMP.

Modeling and Analysis

Analysis of the drainage area or a water quality, groundwater recharge and water quantity hydrologic and hydraulic model may need to be performed if new performance standards are being proposed. This analysis is critical to identifying the current or potential concerns that drive the entire plan. The analysis must include existing and projected land uses assuming full development under current zoning.

Relevant Current Regulations

The assessment must identify and evaluate existing municipal, county, state, federal and other rules related to stormwater management, groundwater recharge, stormwater runoff quality and water quantity using stormwater management measures, including green infrastructure and nonstructural stormwater management strategies. This assessment must include programs to develop total maximum daily load (TMDLs).

Once the characterization and assessment of the drainage area is complete, the RSWMP must identify current stormwater-related stormwater runoff quality concerns and forecast future ones, assuming full development under current zoning. The inventory should include current and potential stormwater pollutant sources in the regional planning area including urban and suburban development, roads, storm sewers, agricultural or mining operations and waterfront development. 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. Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants for which one or more TMDLs are needed. A link to the GIS Maps and Applications for the Integrated summary report is available online at:

https://dep.nj.gov/wms/bears/water-quality-assessment/integrated-report/.

Once identified, these water-quality concerns must be ranked based on criteria determined by the planning committee. These concerns may include, but are not limited to, the threat to public health, safety and welfare; damage to water supplies; risk of damage to the biological integrity of water bodies; mosquito control; groundwater depletion and impacts to the ecosystem, among others.

If a TMDL has been adopted for any part of a water body in the planning area, these water-quality objectives must incorporate the loading reductions established in the TMDL for stormwater runoff. If any part of a water body is on Sublist 5 of the Integrated List due to stormwater-related impacts, the plan's objectives must specifically address those pollutants of concern.

Regional stormwater management plans must also identify and rank issues of water quantity and groundwater recharge as well as stormwater runoff quality. Thus, the broad goal of the plan is to eliminate, reduce or minimize stormwater-related impacts associated with current and future land use. The minimum standard of protection is the level that would be achieved by conforming to the design and performance standards established under N.J.A.C. 7:8-5 when implemented throughout the regional stormwater management planning area.

Designing Regional Stormwater Solutions

An RSWMP shall identify drainage area-specific design and performance standards to meet the drainage area-specific water quality, groundwater recharge and water quantity objectives identified under N.J.A.C. 7:8-3.5. However, because an RSWMP addresses concerns on a regional basis, the design and performance standards need not be uniform throughout the planning area if they satisfy N.J.A.C. 7:8-5, when considered as a whole. Any alternative standards must be at least as protective when implemented throughout the regional stormwater management planning area.

Once the objectives and performance standards have been identified, an RSWMP must outline the stormwater management measures needed to achieve the objectives. The plan may include the following guidelines for new or existing land uses or other measures:

- green infrastructure in accordance with the NJ Stormwater Best Management Practices Manual,
- design and performance standards for stormwater runoff quality, stormwater quantity or groundwater recharge for new major developments,
- modifications to existing stormwater management measures,
- elimination of illegal or illicit discharges,
- prevention or minimization of the exposure of pollutants to stormwater and
- control of floatables.

The plan shall include nonstructural stormwater management strategies and green infrastructure best management practices (BMPs) to enhance, protect or preserve land or water areas for purposes of flood control, water quality protection or conservation of natural resources. The nonstructural stormwater management strategies are found at N.J.A.C. 7:8-2.4(g). The use of green infrastructure BMPs, such as pervious paving systems, infiltration basins and bioretention systems will more effectively reduce stormwater runoff volume; reduce erosion; encourage infiltration and groundwater recharge; and maintain, or reproduce as closely as possible, the natural hydrologic cycle and minimize the discharge of stormwater-related pollutants, such as TSS and nutrients. Because many stormwater management concerns can be traced directly to the lifestyle choices of watershed residents, a plan may choose to emphasize public education programs that address root causes of water quantity and quality impacts.

Whatever measures are selected, the plan must include two important additional features. First, the plan must explain the committee's rationale for including the selected measure. The rationale should include a feasibility and cost/benefit analysis, an estimate of reduction in pollutant loads and a projection of performance longevity. Second, the plan must specifically address maintenance requirements for each stormwater management measure, including preventative and corrective maintenance, a long-term maintenance implementation schedule and clear identification of the organization or entity responsible for implementation and maintenance.

RSWMP Climate Resilience Strategy

Pursuant to N.J.A.C. 7:8-3.4(a)7, RSWMPs must also incorporate a climate resilience strategy which includes the following:

- An evaluation of the impact of climate change on stormwater management, including a consideration of impacts created by sea level rise, increased flooding frequency and extent, and increased rainfall depth and intensity, which means investigating the increases in the extent of

flooding that will be caused by increased tidal and/or fluvial water surfaces due to increases in precipitation data caused by climate change,

- An identification of areas and infrastructure vulnerable to flooding and/or sea level rise, which means applying the information from the bulleted item above to a map of the stormwater-related assets such as stormwater management basins, collection systems, inlets, outfalls, culverts, manufactured treatment devices, pump stations, and other facilities to ascertain which assets who functionality may be affected by climate change, and

- Measures, such as green infrastructure, infrastructure modifications and enhancement, ordinances and policies, that will be implemented to reduce the impacts and maintain the capacity of stormwater conveyance systems.

Resilience is not an end-state, but a dynamic state-of-being that will grow more difficult to attain as the climate continues to change. To assist the public in becoming more resilient to climate change, the Department has created a program called Resilient NJ . The program's website can be found at https://www.nj.gov/dep/bcrp/resilientnj/. Under the tab labeled *Resilient NJ* is a link to regional planning projects which may serve as inspiration in the development of climate change strategies for an RSWMP that address stormwater management.

RSWMP Strategy for Implementing and Evaluating the Effectiveness of Stormwater Management Measures

The implementation strategy, included at N.J.A.C. 7:8-3.8, begins by identifying the agency assigned to coordinate plan implementation, including long-term monitoring requirements. The plan must identify the agency appointed to implement and monitor each measure in the plan along with a timetable for implementation. It must include a process to evaluate the entire plan at least once every five years and should include a budget that projects both long and short-term costs for each measure. The strategy should identify possible current and potential funding sources to implement the RSWMP.

The long-term monitoring program should provide information about land use, water quality, water quantity, groundwater, and riparian and aquatic habitat conditions. Monitoring data may include information from watershed management agencies and monitoring programs operated by other agencies, including volunteer programs.

RSWMP Review, Adoption and Amendments/Revisions

In accordance with N.J.A.C. 7:8-3.9, once complete, an RSWMP must be submitted for review to the NJDEP and, if applicable, to the designated water quality management planning agency as an amendment to areawide water quality management plans. If the plan is approved, the Department will propose to amend the areawide water quality management plan as outlined in N.J.A.C. 7:15-3.5. In accordance with N.J.A.C. 7:8-3.10, any performance standards developed under an RSWMP adopted by the NJDEP in effect supersedes the minimum design and performance standards in N.J.A.C. 7:8-5 of the Stormwater Management rules. The Department will use the plan requirements to review stormwater management requirements for activities currently regulated by the Freshwater Wetland Protection Act, the Coastal Zone Management Rules, the Flood Hazard Area Control Act Rules, the New Jersey Pollution Discharge Elimination System Rules and the Dam Safety Standards. Each municipality in the regional stormwater

management planning area must incorporate the applicable provisions of the plan into a new or amended municipal stormwater management plan. In accordance with the Residential Site Improvement Standards at N.J.A.C. 5:21-7, if a stormwater management plan for the region has been approved by the Department, stormwater management systems must conform with that plan. When the requirements of the RSWMP and other regulatory program's requirements both have the jurisdiction on a development located in the regional stormwater management planning area, the requirements of the RSWMP apply only to the extent of stormwater management components. The Department shall not issue a permit for a project or activity that conflicts with an Areawide Water Quality Management Plan pursuant to N.J.A.C. 7:15-3.2. Since the RSWMP will be adopted into the WQM Plan, the Department will not issue permits that conflict with the plan.

Municipal Stormwater Management Plans (MSWMP)

A municipal stormwater management plan (MSWMP) describes the municipality's strategy, structure and process for addressing stormwater runoff from new development and redevelopment to ensure compliance with the Stormwater Management rules at N.J.A.C. 7:8. An MSWMP is required by the Environmental Protection Agency's Phase II Stormwater Permitting rules; the mandatory elements of the plan are described in the Stormwater Management rules.

Required Elements of the MSWMP

The MSWMP must address and achieve the goals of stormwater management discussed in N.J.A.C. 7:8-2 and plan shall include stormwater management measures, including green infrastructure and nonstructural stormwater management strategies necessary to meet the goals of subchapter 2, as stated in N.J.A.C. 7:8-2.4(a). In the development of an MSWMP, nonstructural stormwater management strategies may include one or more of the practices listed at N.J.A.C. 7:8-2.4(g). An MSWMP must address the performance standards for stormwater quantity, stormwater runoff quality and groundwater recharge for major development found in the Stormwater Management rules at N.J.A.C. 7:8-5, which requires the use of green infrastructure to meet these standards. If alternate standards have been established by an adopted regional stormwater management plan (RSWMP), the MSWMP must be consistent with the RSWMP. A copy of the ordinances incorporating the performance standards must be included in the plan.

In accordance with N.J.A.C. 7:8-4.2, the following apply to an MSWMP:

- An MSWMP shall address stormwater-related water quality, groundwater recharge and water quantity impacts of major development, and may also address stormwater-related water quality, water quantity and groundwater recharge impacts of existing land uses.
- An MSWMP and stormwater control ordinance(s) (SCO) shall conform with applicable regional stormwater management plan(s).
- An MSWMP shall address, at a minimum, the following items:

    1. Describe how the municipal stormwater management plan will achieve the goals of stormwater management planning set forth at N.J.A.C. 7:8-2.2;

2. Include maps showing water bodies based on Soil Surveys published by the U.S. Department of Agriculture; the U.S. Geological Survey Topographic Map, 7.5 minute quadrangle series; or other sources of information depicting water bodies in similar or greater detail;

3. Map groundwater recharge areas and well head protection areas based on maps prepared by the Department under N.J.S.A. 58:11A-13 or a municipal ordinance;

4. Describe how the municipal stormwater management plan incorporates design and performance standards in N.J.A.C. 7:8-5 or alternative design and performance standards adopted as a part of a regional stormwater management plan or water quality management plan;

5. Describe how adequate long-term operation as well as preventative and corrective maintenance (including replacement) of the selected stormwater management measures will be ensured;

6. Describe how the plan will ensure compliance with Safety Standards for Stormwater Management Basins at N.J.A.C. 7:8-6;

7. Describe how the municipal stormwater management plan is coordinated with the appropriate Soil Conservation District and any other stormwater management plans, including any adopted regional stormwater management plan, prepared by any stormwater management planning agency related to the river basins or drainage areas to which the plans and/or ordinances apply;

8. Evaluate the extent to which the municipality's entire master plan (including the land use plan element), official map and development regulations (including the zoning ordinance) implement green infrastructure and the principles expressed in the nonstructural stormwater management strategies at N.J.A.C. 7:8-2.4. This evaluation shall also be included (with updating as appropriate) in the reexamination report adopted under N.J.S.A. 40:55D-89;

9. Include a map of the municipality showing:

    i. Projected land uses assuming full development under existing zoning; and

    ii. The hydrologic unit code 14 (HUC 14) drainage areas as defined by the United States Geological Survey; and an estimate, for each HUC 14 drainage area, of the total acreage in the municipality of impervious surface and associated future nonpoint source pollutant load assuming full build out of the projected land uses.

10. At the option of the municipality, document that it has a combined total of less than one square mile of vacant or agricultural lands rather than provide the information required in (c)8 and 9 above. Agricultural lands may be excluded if the development rights to these lands have been permanently purchased or restricted by covenant, easement or deed. Vacant or agricultural lands in environmentally constrained areas may be excluded if the documentation also includes an overlay map of these areas at the same scale as the map described below:

    Documentation shall include an existing land use map at an appropriate scale to display the land uses of each parcel within the municipality. Such a map shall display the following land uses: residential (which may be divided into single family, two-to-four family, and other multi-family), commercial, industrial, agricultural, parkland, other public uses, semipublic uses, and vacant land.

11. In order to grant a variance or exemption from the stormwater management measures set forth in its approved municipal stormwater management plan and stormwater control ordinance(s), include a mitigation plan that identifies what measures are necessary, 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.

12. Include a copy of the recommended implementing stormwater control ordinance(s) requiring stormwater management measures;

13. The municipal stormwater management plan may also include a stream corridor protection plan to address protection of areas adjacent to waterbodies;

14. If a municipality that includes an area served by a combined sewer system or a separate storm sewer system that is hydraulically connected to a combined sewer system seeks to establish a community basin(s), include a demonstration, through hydrologic and hydraulic analysis, that the community basin(s) would alleviate existing or prevent potential flood damage or combined sewer overflow. A municipality may allow developments to use the community basin to meet the stormwater runoff quantity control standards at N.J.A.C. 7:8-5.6, provided the following minimum requirements are met:

    i. Each contributory site to the community basin is presently served by a combined sewer system or a separate storm sewer system that is hydraulically connected to the combined sewer system;

    ii. The runoff from each contributory site meets the green infrastructure, groundwater recharge, and water quality standards at N.J.A.C. 7:8-5.3, 5.4, and 5.5, as applicable, before leaving the site, unless a variance is granted pursuant to N.J.A.C. 7:8-4.6;

    iii. The conveyance from each contributory site to the community basin is capable of carrying the 100-year storm to the community basin without overflow;

    iv. The community basin has sufficient capacity to meet the stormwater runoff quantity standards considering all stormwater contributing to the community basin;

    v. The municipality is the party responsible for the maintenance of the community basin in accordance with N.J.A.C. 7:8-5.8; and

    vi. The municipality adopts ordinances to regulate the conditions and limitations of the inflow contributing to the community basin to ensure the continued function of the community basin; and

15. Include a climate change resilience strategy providing the following information:

    i. An evaluation of the impact of climate change on stormwater management, including a consideration of impacts created by sea level rise, increased flooding frequency and extent, and increased rainfall depth and intensity;

    ii. An identification of areas and infrastructure vulnerable to flooding and/or sea level rise; and

    iii. Measures, such as green infrastructure, that will be implemented to reduce the impacts and maintain the capacity of stormwater conveyance systems.

Additionally, an MSWMP shall also incorporate Additional Measures whose implementation are required under a TMDL, in accordance with N.J.A.C. 7:8-5.5(j), which specifies that "Stormwater management measures shall be designed to incorporate any Additional Measures specified in a TMDL(s) approved or established by EPA, unless otherwise required pursuant to N.J.A.C. 7:14A-25.6(e)."

MSWMPs are subject to review by county planning agencies to determine whether they meet the standards required by the Stormwater Management rules. A copy of the proposed plan must also be sent to the Department of Environmental Protection, Division of Watershed Protection and Restoration. The county must approve, conditionally approve or disapprove the plan in writing within 60 days. Generally, the plan becomes effective upon approval by the county; however, in the case of conditional approvals, the plan becomes effective after the municipality meets the conditions of approval.

A sample municipal stormwater management plan is available online at https://dep.nj.gov/stormwater/bmp-manual.

Community Basin

A community basin, as defined by N.J.A.C. 7:8-1.2, means an infiltration basin, sand filter designed to infiltrate, standard constructed wetland or wet pond, established in accordance with N.J.A.C. 7:8-4.2(c)14, that is designed and constructed in accordance with the New Jersey Stormwater Best Management Practices Manual - or an alternate design, approved in accordance with N.J.A.C. 7:8-5.2(g), for an infiltration basin, sand filter designed to infiltrate, standard constructed wetland or wet pond and that complies with the requirements of N.J.A.C. 7:8.

The municipality area served by a combined sewer system (CSS) or a separate storm sewer system that is hydraulically connected to a combined sewer system may establish community basins to address the flooding and/or CSO problem and also to address stormwater from the surrounding lots. In these situations, the community basin could result in a net positive for the surrounding developments by reducing the footprint of land required to be dedicated for stormwater management, reducing the costs to the community - by allowing it to address an existing problem in a cost-effective manner - and improving water quality through reduced CSOs while still meeting the standards contained in the Stormwater Management rules.

The community basin is intended to provide stormwater runoff quantity control for the contributory sites in a manner that helps alleviate potential flood damage or CSO. The rule ensures that every aspect of the system, from the water leaving the contributory sites, to the manner of conveying the stormwater to the community basin or to the basin itself, achieves the goals for meeting stormwater quantity control. In accordance with N.J.A.C. 7:8-4.(c)14.iii and iv, the conveyance from each contributory site to the community basin must be capable of carrying the 100-year design storm without overflow and the community basin must be capable of providing sufficient quantity control to address all of the stormwater draining into it.

The community basin can only be used for stormwater runoff quantity control. Stormwater runoff quality, groundwater recharge, and green infrastructure requirements are required to be met on each contributory site, unless a variance or waiver (which would require mitigation) has been granted. In accordance with the rule, the municipality must maintain the basin and adopt ordinances to regulate the use of the basin for ensuring the intended function to alleviate or prevent flood damage or CSOs into the future.

Climate Change Resilience Strategies

Climate change is a global challenge, but the impacts are experienced locally. Changes in precipitation, extreme temperatures, sea-level rise, and species shifts place stress on infrastructure, natural resources and social and economic systems. How towns, cities, and counties prepare and respond to these stresses now will define New Jersey's resilience in the future. On February 4, 2021, Governor Murphy signed Senate Bill No. 2607 which required the integration of climate vulnerability assessments into future municipal master plan updates. Pursuant to this legislation, many municipalities have prepared or are preparing a climate change-related hazard vulnerability assessment in their land use plan elements to analyze current and future threats associated with climate change related natural hazards, including increased temperatures, drought, flooding, hurricanes and sea-level rise.

With the adoption of the NJPACT rules, each municipality is required to incorporate climate resilience strategies that identify how the municipality will address the effects of climate change on its stormwater management system(s), pursuant to N.J.A.C. 7:8-4.2(c)15. In accordance with the Stormwater Management rules, a municipality is required to create and implement climate resilience strategies for its stormwater management that accomplishes the following:

1. Evaluates the impact of climate change on stormwater management, including a consideration of impacts created by sea level rise, increased flooding frequency and extent, and increased rainfall depth and intensity,

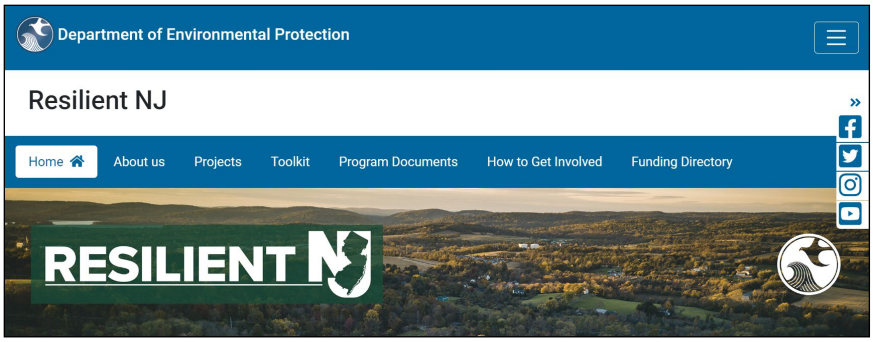
2. Identifies areas and infrastructure vulnerable to flooding and/or sea level rise and

3. Indicates which measures, such as green infrastructure, that will be implemented to reduce the impacts to the management of stormwater runoff in the municipality and maintain the capacity of stormwater conveyance systems and best management practices (BMPs) owned and operated by the municipality.

Integrating climate change into municipal decisions regarding capacity, development and redevelopment and open space, among others, along with any planning efforts, is imperative to ensure the municipality's resilience to withstand the conditions of tomorrow. This section of the chapter will focus on the actions and measures a municipality may pursue regarding its stormwater management.

The information provided on the Resilient NJ website is meant for the local resilience planning over the social, environmental, or economic impacts, but it may be helpful in the creation of the climate change resilience strategies pertaining to the management of stormwater runoff. The website is found at https://www.nj.gov/dep/bcrp/resilientnj/. The toolkit provided for the aforementioned vulnerability assessments that can also be applied to the climate resilience strategies. To access the toolkit, start by navigating to the toolbar and select the Toolkit, which can be directly accessed at:

https://experience.arcgis.com/experience/9daab51c2f5542969d50437522e012c4.



In addition to redirecting the user to a designated page corresponding to the topic identified in the tab title, each of the tabs contain pull-down menus. It is recommended the user start with the overview tab. By working through the tabs, from left to right, the municipality can develop the climate resilience strategies, which will incorporate capability and capacity building actions, identifying ways to reduce risk, and an evaluation of each strategy. One useful feature is the Resilience Library, which has many links to technical reports, planning legislation and requirements, template worksheets , training, sample meeting and communications - related guidance and much more.

Of particular interest to the development of the required climate resilience strategies is the tab labeled "2. Understand Your Vulnerability," which includes subheadings to guide the user in gathering data, creating a self-assessment and additional information on advanced assessments. See the Climate Resilience Strategies subsection of *Appendix C: Sample MSWMP* available online at https://dep.nj.gov/stormwater/bmp-manual for guidance on using GIS to incorporate climate change data in conjunction with a compilation of stormwater-related municipal assets to develop a ranking system to assess risks by level of importance. There is a Vulnerability Assessment Matrix Template that can be downloaded from:

> https://experience.arcgis.com/experience/9daab51c2f5542969d50437522e012c4/page/SELF-ASSESSMENT?views=COMMUNITY-AND-REGIONAL-PLANS%2CHELPFUL-TOOLS-%26-DATA.

Keep in mind that becoming more resilient to climate change requires a municipality to initiate a process whereby it will adapt as the climate continues to change, meaning the municipality needs to develop its ability to respond better and more efficiently to future adverse situations, not simply return to the pre-event baseline. In other words, the focus should be on adaptation and further evolution rather than "bouncing back." Too often when recovering from a crisis, there is pressure to return to "normal," which misses key opportunities to maximize co-benefits through transformative recovery activities. Recovery and resilience activities should enhance the municipality's ability to respond better and more efficiently to adverse situations, not simply revert to what was considered normal prior to the event. It should be noted though, existing inequities place some communities more at-risk than others so the goal of adaptation is more challenging for some municipalities.

Climate Resilience Strategy Development for Stormwater Management

As previously stated, the Stormwater Management rules require the municipal climate resilience strategy include three components. An overview of what is required is provided below. A sample MSWMP is provided as *Appendix C: Sample MSWMP* online at https://dep.nj.gov/stormwater/bmp-manual, and it provides guidance on where to obtain GIS data and other information , as well as how a municipality may go about developing its climate resilience strategies.

Item 1: Evaluation of the Impacts of Climate Change

For the required evaluation, the municipality shall assess the impacts of climate change created by sea level rise, increased flooding frequency and extent, and increased rainfall depth and intensity. The Department has developed various standalone tools and webpages to help the municipality in its efforts to identify areas of flooding due to increased precipitation or sea level rise. Examples include the following:

- The NJ Climate Change website - https://dep.nj.gov/climatechange/
- The NJ Extreme Precipitation Projection tool - https://njprojectedprecipitationchanges.com/
- The NJ Flood Mapper - https://www.njfloodmapper.org/
- The NJ Flood Risk Indicator Tool - https://dep.nj.gov/climatechange/flood-tool/
- The NJ Wet Tool - https://experience.arcgis.com/experience/f40f65d807bb4372bd92b48bb98f1972

However, the most comprehensive GIS tool is NJ-GeoWeb, which is available online at https://njdep.maps.arcgis.com/apps/webappviewer/index.html?id=02251e521d97454aabadfd8cf168e44d. Information on using this resource, along with guidance for importing external data, is included in *Appendix C*. The following layers are very helpful in completing this requirement:

- The Federal Emergency Management Agency (FEMA) National Flood Hazard layer, at: https://hazards.fema.gov/arcgis/rest/services/FIRMette/NFHLREST_FIRMette/MapServer,
- The NJ Inland Design Flood Elevation layer at: https://services1.arcgis.com/ze0XBzU1FXj94DJq/arcgis/rest/services/NJ_FEMA_FP3_4_9_2024/FeatureServer.
- The Tidal Climate Adjusted Flood Elevation (CAFE) can be added directly through NJ GeoWeb under the "Water" tab.
- The LULC Urban 2015 with Future Flooding layer can be added directly through NJ GeoWeb under the "Land" tab.
- The Height Above Nearest Drainage (HAND) Average Flood Event at: https://tiles.arcgis.com/tiles/ze0XBzU1FXj94DJq/arcgis/rest/services/HAND_Average_Flood_Event/MapServer.

- The Sea Level Rise of 2, 3 and 4 Feet layer can be added directly through NJ GeoWeb under the "Water" tab.

It is important to note that all available internal and local resources should/shall also be used to accurately evaluate climate change impacts to the fullest extent possible. In order to become the basis for the second requirement of N.J.A.C. 7:8-4.2(c)15, the end product for this requirement is a comprehensive set of GIS layers reflecting climate change impacts created by sea level rise, increased flooding frequency and extent, increased rainfall depth and increased intensity.

Item 2: Identification of Vulnerabilities

For the required identification of areas and infrastructure vulnerable to flooding and/or sea level rise, the municipality shall collect and maintain location, capacity and elevation information for existing stormwater management facilities and critical infrastructure such as stormwater management conveyance systems, pump stations, stormwater management basins and outfalls, whether owned by the municipality or private entities. Adding these existing facilities to the municipal GIS map will help identify areas that will be in jeopardy due to climate change when these assets are added to the evaluation of

impacts required under Item 1 above. For more information on adding stormwater facilities to GIS, the municipal stormwater coordinator should reach out to the MS4 Case Manager identified at:

https://dep.nj.gov/njpdes-stormwater/municipal-stormwater-regulation-program/ms4-case-manager-list/.

It is important to note that all available internal and local resources should also be used to accurately identify stormwater management facilities to the fullest extent possible. Additional GIS resources can also be used to overlap and manipulate the layers from Steps 1 and 2 because this type of automatic analysis cannot be accomplished through NJ GeoWeb.

After plotting the locations of stormwater management facilities, a vulnerability assessment matrix should be completed to determine the risk level for each identified area and facility. After a risk level is determined for each facility for each climate impact (increased temperature, sea level rise, precipitation, ocean acidification and drought/water supply), the spreadsheet will automatically calculate the overall vulnerability for that facility. The vulnerability assessment matrix can be found here:

https://www.nj.gov/dep/bcrp/resilientnj/docs/vulnerability-assessment-matrix-template.xlsx

The matrix with its itemized vulnerability ratings will help prioritize potential issues for municipalities and lead to the development of a set of actions the municipality can implement to address climate change impacts.

Item 3: Measures to be Implemented

For the measures to be implemented to reduce the impacts and maintain the capacity of stormwater conveyance systems, the municipality shall incorporate measures such as green infrastructure (GI). For further information on understanding what GI is and the benefits it provides, refer to Pages 1 and 2 of the document entitled "Meeting the Green Infrastructure Requirement," found online at https://dep.nj.gov/wp-content/uploads/stormwater/meeting-the-gi-requirement-fact-sheet-2.pdf**.**

The GI projects implemented by a municipality to meet this requirement do not have to meet the definition of major development. Smaller versions of the various GI BMPs included in Chapter 9 of the BMP Manual have already been successfully implemented in urban areas and should be considered for increased climate-change related resilience. Small-scall bioretention systems, i.e., rain gardens, can be added alongside roadways or within traffic medians. Parking lot islands might also be converted to rain gardens. Planter boxes, dry wells or cisterns can be installed to receive roof runoff from buildings. If space and site constraints permit, consider removing curb from a municipal parking lot and direct runoff to a vegetative filter strip and grass swale system. For areas with suitable soil permeability and adequate separation from the seasonal high water table, small-scale sand filters can be added to infiltrate runoff. These examples are just a small sample of the opportunities a municipality can take to meet this requirement.

The municipality may also incorporate other measures from the nonstructural strategies, or retrofit existing basins, to reduce the impacts of surface flows generated by increased precipitation on the stormwater conveyance system. This could include enhancements to existing stormwater BMPs owned or operated by the municipality, whether or not they are connected to the municipal collection system, so as to reduce local flooding. The following is a list of improvements to be considered; however, there may be other actions the municipality should include:

- Where the points of discharge will become submerged due to climate change, consider if check valves will be required to prevent the intrusion of floodwaters into the system and how those points of discharge will function when submerged.
- Determine whether the increased depths of precipitation will exceed the capacity of any stormwater pump stations and pipe collection systems and whether the municipality will need to increase their capacity.
- Also consider the capacity of existing stormwater BMPs owned or operated by the municipality, whether or not they are connected to the municipal collection system, and address whether a particular BMP will result in localized flooding. If this is the case, modification will be required and the changes required should be itemized.
- For privately owned and operated BMPs, consider the upgrades that may be necessary to enhance the ability of these BMPs to address increases in runoff from climate change and anticipated local flooding so as to minimize the impacts to the municipality.

The municipality should also review its ordinances, such as the stormwater control ordinance (SCO), zoning, tree planting and open space planning, to determine if modification is needed to address climate change impacts. The SCO can be more strict that the Model SCO available from the Department at, which would allow the municipality to tailor resiliency related requirements to align with its climate resilience strategies. For example, a municipality may wish to implement a tree planting program to offset increases in impervious cover that could otherwise increase flooding due to increases in the anticipated precipitation caused by climate change. Similarly, requiring a project set aside open space may enhance resiliency.

All of the measures to be implemented should be incorporated into a matrix to document the actions and their individual ability to address climate change and impacts. More information on matrices is found under each of the subtopics under the heading of "Develop A Strategy" on the Resilient NJ website https://experience.arcgis.com/experience/9daab51c2f5542969d50437522e012c4/page/3_-DEVELOP-A-STRATEGY, at the bottom of the page.

Variances from the Design and Performance Standards

While MSWMPs must incorporate the design and performance standards for major development found at N.J.A.C. 7:8-5.2 and described at the beginning of this chapter, there may be instances where the site constraints make it technically impracticable for a major development project to meet the green infrastructure or other design and performance standards on site. In these instances, municipalities may grant variances from those design and performance standards for stormwater management measures set forth in its approved municipal stormwater management plan and stormwater control ordinance(s), **ONLY** if:

1. the applicant demonstrates that it is technically impracticable to meet any one or more of the design and performance standards on-site due to engineering, environmental and/or safety reasons and
2. the MSWMP already includes a mitigation plan that meets the regulatory requirements at N.J.A.C. 7:8-4.2(c)11 and the conditions under 4.6(a).

Although N.J.A.C. 7:8 4.6(a)3.i allows a mitigation project to be selected from the municipal mitigation plan, an applicant may propose a mitigation project, provided that the proposed project meets the requirements under N.J.A.C. 7:8 4.6(a)3.ii through x. Opportunities to provide mitigation may arise at any time whenever a municipality identifies or anticipates stormwater management issues; therefore, the plan should be updated to add or revise mitigation projects as new information becomes available. .

Mitigation Plan Requirements

More specifically, the rules set requirements which a municipality must meet in order to grant a variance from the design and performance standards set forth in its approved MSWMP and SCO(s), provided the municipality has a mitigation plan adopted as part of it MSWMP and the proposed mitigation measures meet the conditions at N.J.A.C. 7:8-4.6. The mitigation plan must identify what measures are necessary, potential mitigation projects, and/or criteria to evaluate mitigation projects that can be used to offset the deficit created by granting the variance, in accordance with N.J.A.C. 7:8-4.6. Any approved variance shall be submitted by the municipal review agency to the county review agency and the Department, describing the variance, as well as the required mitigation, in writing and within 30 days of the approval.

The use of non-green infrastructure BMPs in Table 5.3 at N.J.A.C. 7:8-5.2(f) is intended to be limited to instances in which strict compliance with the requirements of the rules is technically impracticable and only if the design and performance standard cannot be met based on engineering, environmental or safety reasons. Note that cost is not a factor in determining technical impracticability. In other words, municipalities need to include information in the mitigation plans, such as a list of specific projects (or specify the location, such as a website, where specific projects are listed), or specify the project criteria to be used to evaluate potential mitigation projects, that developers can refer to if they are considering requesting a variance. This list should include the types of mitigation projects that will apply to the design standards for which the municipality plans to grant variances, i.e. mitigation projects that will compensate for green infrastructure, groundwater recharge, stormwater runoff quality and quantity impacts. Identifying projects for mitigation is simplified when the municipality identifies and ranks a series of projects from which an applicant can select, especially on land owned or controlled by the municipality. The selection process should be clearly stated so the applicant and the municipality have predictability in the mitigation process. In its mitigation plan, a municipality rank proposed projects that use green infrastructure to address groundwater recharge, stormwater runoff quantity and/or stormwater runoff quality within the HUC14 drainage area.

The goal for any development project is to maintain natural hydrology and manage stormwater runoff close to its source. A variance may therefore be approved only if the applicant demonstrates that the proposed design results in the greatest possible on-site compliance with the design and performance standard from which the variance is granted and that the variance complies with the requirements of N.J.A.C. 7:8-4.6.

Mitigation Requirements

The MSWMP must include a mitigation plan that ensures a mitigation project be completed within the same 14-digit hydrologic unit code (HUC14) drainage area of the project where a variance was granted, and for the same design and performance standard for which the mitigation was granted. Specific requirements of the mitigation project are found at N.J.A.C. 7:8-4.6(a)3 and are listed below:

1. The mitigation project may be selected from the municipal mitigation plan or may be proposed by the applicant, provided it meets the criteria in the municipal mitigation plan.

2. The mitigation project shall be approved no later than preliminary or final site plan approval of the major development.

3. The mitigation project shall be located in the same HUC 14 as the area of the major development subject to the variance.

4. The mitigation project shall be constructed prior to, or concurrently with, the major development.

5. The mitigation project shall comply with the green infrastructure standards at N.J.A.C. 7:8-5.3.

6. If the variance that resulted in the mitigation project being required is from the green infrastructure standards at N.J.A.C. 7:8-5.3, then the mitigation project must use green infrastructure BMPs in Table 5-1, and/or an alternative stormwater management measure approved in accordance with N.J.A.C. 7:8-5.2(g) that meets the definition of green infrastructure to manage an equivalent or greater area of impervious surface and an equivalent or greater area of motor vehicle surface as the area of the major development subject to the variance.

7. If a variance is required from the groundwater recharge standards, pursuant to N.J.A.C. 7:8-4.3.a.vii, the mitigation project must provide a volume of groundwater recharge at least equal to the average groundwater recharge deficit created by the proposed major development or provide a volume of runoff infiltrated during the projected two-year storm that equals or exceeds the deficit resulting from the proposed major development for the same two-year design storm. For example, because of natural site constraints, a proposed development project might be unable to fully meet the groundwater recharge criteria, in that the projected impact creates an annual net loss of 50,000 cubic feet of groundwater recharge volume. In this case, a mitigation plan might require recovery of the lost recharge volume by capturing that 50,000 cubic feet from existing runoff from an impervious area on a site within the same HUC14 drainage basin.

8. If the variance is required from the stormwater runoff water quality standards, (2 items under 4.a.3.viii) the mitigation project must provide sufficient removal of total suspended solids to equal or exceed the deficit requiring the variance.

9. If a variance is required from the stormwater runoff quantity control standards, the mitigation project must provide an equivalent peak flow rate attenuation upstream and discharge to the same water course.

10. The applicant or the entity assuming maintenance responsibility for the associated major development shall be responsible for preventive and corrective maintenance (including replacement) of the mitigation project and shall be identified as such in the maintenance plan established in accordance with N.J.A.C. 7:8-5.8. This responsibility is not transferable to any entity other than a public agency, in which case, a written agreement with that public agency must be submitted to the review agency.

Applicants can be directed to identify potential properties suitable for the mitigation project and secure the easements necessary to implement the projects.

Mitigation Considerations

All mitigation plans and reviews should consider the location of mitigation projects in relation to the property where the projected damage will occur. For example, if a project is unable to achieve the stormwater runoff quantity performance standards upstream of an inadequate culvert, a mitigation project downstream of that culvert would not offer similar protection. If groundwater recharge is the major contributor to a wetlands area, the new project should continue to provide recharge to the wetlands area. Plans can be as simple or as complex as the municipality chooses, provided they afford sufficient protection of the water resources. However, mitigation cannot be allowed until it is clearly demonstrated that on-site compliance is technically impracticable as per N.J.A.C. 7:8-4.6(a)1.

Mitigation requirements should include a hierarchy of courses of actions to be followed that clearly offset the effect on groundwater recharge, stormwater runoff quantity control and/or stormwater runoff quality control that was created by granting the variance. Mitigation must occur within the same designated HUC14 drainage basin area as that of the proposed development so that it provides benefits and protection similar to those that would have been achieved if the stormwater and recharge performance standards had been completely satisfied at the proposed development. Because these problems may span political boundaries, mitigation projects could be located in other municipalities within the drainage area with the cooperation of those municipalities, especially if a regional stormwater management plan has been developed for the drainage basin. The mitigation planning and approval process must ensure that long-term maintenance is achieved by clearly assigning fiscal and physical responsibility for maintenance. Maintenance practices must be incorporated in accordance with the rules found at N.J.A.C. 7:8-5.8 and the guidance found in Chapters 8 through 11 of the NJ BMP Manual.

Mitigation plans can differ greatly from municipality to municipality. As part of the mitigation plan development, consideration should be given to the specific municipality's water resource needs and ability to implement the plan. The text box on the following page is an example of a mitigation plan.

Sample Portion of a Mitigation Plan

If a proposed development requests a variance from strict compliance with the green infrastructure, groundwater recharge, stormwater runoff quantity and/or stormwater runoff quality requirements outlined in the Municipal Stormwater Management Plan and ordinances, the applicant must provide mitigation in accordance with the following:

1. A mitigation project must be implemented in the same drainage area delineated by a 14-digit hydrologic unit code (HUC14), as defined at N.J.A.C. 7:8-1.2, as the proposed development. The project must provide additional green infrastructure, groundwater recharge benefits or protection from stormwater runoff quality and stormwater runoff quantity from previously developed property that does not currently meet the design and performance standards outlined in the Municipal Stormwater Management Plan.

    - The mitigation project must be completed prior to or concurrent with the major development project for which the mitigation is required.
    - The applicant can either select a project from the municipal mitigation plan or propose a mitigation project, provided that the proposed mitigation project meets the criteria in the municipal mitigation plan and N.J.A.C. 7:8-4.6(a)3.
    - The applicant must ensure the long-term maintenance of the project including the maintenance requirements under Chapters 8 through 11 of the NJ BMP Manual.

Build-Out

A build-out analysis allows a municipality to project future development based on existing zoning and land use regulations. It develops a picture, projected visually on a map, of what will happen if land is developed to the maximum extent allowed by law. A build-out analysis is not only useful for communities with undeveloped land as areas with significant redevelopment potential should also be considered in developing a build-out analysis. Many urban and older suburban municipalities contain properties that are not developed to the full extent allowed under current zoning. One such example is that properties zoned for industrial use may contain residential developments. A second example is that a developer might assemble several small residential and retail properties for demolition and redevelopment as an office complex. A build-out analysis can identify those properties and project impacts of their potential redevelopment.

Each MSWMP is required to include a build-out analysis with information about the municipality based on the HUC14 boundaries. The definition of a HUC14 is provided on Page 3. For every individual HUC14 area in the municipality, the full development area of impervious cover and the anticipated pollutant loading, based on full development, must be determined.

A build-out analysis has two phases. The first visually depicts changes on a map and is best performed using a Geographic Information System (GIS), which is a computerized system for developing, analyzing and displaying locational data. GIS allows planners to combine data sources such as zoning maps, tax

maps, HUC14s and topographic maps, into "layers" that can be displayed on one map. The following steps comprise the first phase:

- Begin by constructing a base map of the community that includes the following:

  - the municipal boundary,
  - existing roads,
  - surface water bodies,
  - HUC14 boundaries,
  - impervious cover,
  - existing development by land use types,
  - groundwater recharge areas and
  - wellhead protection area layers.

  Existing GIS information sources may be helpful in the development of this plan, such as the NJDEP-GIS website at https://dep.nj.gov/gis/. Counties, watershed associations and universities may also have information useful for the development of the base map.

- Identify and delineate land that cannot be developed because of legal restrictions, physical constraints or environmental sensitivity. Examples include lands in permanently preserved open space, public ownership, deed restrictions, utility easements, steep slopes, wetlands, floodplains and Category 1 Waters with the associated special water resource protection areas.

- Identify and delineate developable land under current zoning and land use regulations, as well as land that is not currently developed or restricted as discussed above. Identify and delineate developed areas within the municipality that have significant redevelopment potential and that have not been developed to the maximum allowed. For these undeveloped and underdeveloped areas, determine the maximum future development by projecting the largest number of housing units allowed in residential zones and the largest number of buildings and most intensive land uses in commercial and industrial zones.

The second phase quantifies the impact of the changes based on information provided by the maps. This includes calculations of percentage of impervious surfaces, number of housing units and their density and remaining farmland and open space acreage. GIS can also assist in this computation by providing values for specific sets of layers such as the combination of the municipality, HUC14 and impervious area layers. This set of variables can provide the impervious cover for each HUC14 required by the Stormwater Management rules. Values can be exported to other programs from GIS for more comprehensive computations, including the pollutant loading calculations also required by the regulations.

The pollutant load computation is a planning tool that helps municipalities evaluate anticipated pollutant loads from future development. Nonpoint source pollutant loads from current conditions should be compared to build-out conditions. If BMPs are required for the development of undeveloped or underdeveloped areas by regulation, the implementation of BMPs and their impacts on loading should be incorporated into the analysis.

To calculate pollutant loads from land uses for both current and build-out conditions, the table of values below for total suspended solids, nitrogen, and phosphorus can be used for a broad perspective on a municipal level. To utilize the table, relate the zones on the zoning map to the listed land uses. Other pollutant loading values may also be used provided that the values are a better depiction of the

municipality. Pollutant loads are required for each HUC14 in the municipality. For each land use within the HUC14, multiply the total acreage by the assigned load factor, which is given in pounds per acre per year.

The total pollutant load for the HUC14 will be the sum of the loads for each land use.

Table 3-1: Pollutant Loads by Land Cover

Land Cover	TP load (lbs/acre/yr)	TN load (lbs/acre/yr)	TSS load (lbs/acre/yr)
High, Medium Density Residential	1.4	15	140
Low Density, Rural Residential	0.6	5	100
Commercial	2.1	22	200
Industrial	1.5	16	200
Urban, Mixed Urban, Other Urban	1.0	10	120
Agriculture	1.3	10	300
Forest, Water, Wetlands	0.1	3	40
Barren Land/Transitional Area	0.5	5	60

Note: References for Table 3-1 are provided at the end of this chapter.

The build-out analysis can go further than the requirements in the regulations. In addition to pollutant loads and impervious surfaces, the analysis can be used to assess open space plans and to project school population and demand on municipal services. The build-out analysis can greatly benefit a municipality by envisioning its future so that steps can be taken to prevent unwanted impacts or plan for future needs. Finally, the build-out analysis should include a summary with critical findings, conclusions and recommendations.

It is important to note that, although the pollutant loads for agricultural lands are higher than those for low density residential for the parameters in Table 3-1, converting agricultural lands to residential use typically results in an increase in pollutant loads for metals and petroleum hydrocarbons; it is recommended that each municipality calculate build-out pollutant loads for each. Although the total load of suspended solids from stormwater runoff may decrease by the conversion of agricultural lands to low density residential use, the percentage of impervious cover increases dramatically. If the additional stormwater runoff peak flow rates caused by additional impervious are not managed properly, these higher flow rates will increase stream bank erosion, thereby increasing sediment loads to the receiving waters.

Evaluation of Master Plan and Municipal Ordinances

The master plan and ordinances of the municipality must be analyzed as part of the requirements for the municipal stormwater management plan as required by the Municipal Land Use Law at N.J.S.A. 40:55D-

28 and in the Tier A MS4 permit at Part IV.E.2.a.i. They must be assessed to determine which aspects of the master plan and ordinances limit the use of nonstructural stormwater management strategies, as listed at N.J.A.C. 7:8-2.4. These strategies include minimum disturbance, disconnection and minimization of impervious surfaces, pollution prevention techniques and minimization of lawns. Elements of the plan and ordinances to be evaluated can include items such as minimum parking spaces, curbing, minimum lawn areas and landscaping. Recommendations for revisions to the master plan and ordinances should be included in the MSWMP.

Municipalities must review and update their master plans (including the land use plan element), official maps and development regulations - including zoning ordinance(s) - to implement the principles of the nine nonstructural stormwater strategies (NSS). The use of green infrastructure standards in accordance with the rules should be evaluated as an option to implement NSS for the town as a whole. Chapters 9 and 10 in the BMP Manual and the document entitled "Meeting the Green Infrastructure Requirement," both of which may be found online at https://dep.nj.gov/stormwater/bmp-manual/ can assist municipalities in the review of these documents to determine where changes should be made.

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References for Table 3-1: Pollutant Loads by Land Cover

Database of Total Phosphorus, Total Nitrogen, and Total Suspended Solids Export Coefficients

A database of literature values was assembled that includes approximately 4,000 values accompanied by site-specific characteristics such as location, soil type, mean annual rainfall and site percent-impervious. In conjunction with the database, the contractor reported on recommendations for selecting values for use in New Jersey. Analysis of mean annual rainfall data revealed noticeable trends and, of the categories analyzed, was shown to have the most influence on the reported export coefficients. Incorporating this and other contractor recommendations, NJDEP took steps to identify appropriate export values by first filtering the database to include only those studies whose reported mean annual rainfall was between 40 and 51 inches. From the remaining studies, total phosphorus, total nitrogen and total suspended solids values were selected based on best professional judgment for eight land use categories.

The sources incorporated in the database include a variety of governmental and non-governmental documents. All values used to develop the database and the total phosphorus values in this document are included in the following reference list.

- Export Coefficient Database Reference List

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