Briefing Document: New Jersey Stormwater Management Rules

Executive Summary

This document provides a comprehensive analysis of New Jersey's stormwater management regulations, primarily outlined in N.J.A.C. 7:8. The rules represent a fundamental shift from traditional, site-by-site stormwater planning to a more holistic regional and municipal approach focused on Green Infrastructure (GI). The core objective is to mitigate the adverse impacts of urbanization, which significantly alters natural hydrology by increasing impervious surfaces, leading to higher runoff volume and velocity, reduced groundwater recharge, and degraded water quality.

The regulations for "major developments" are built upon three foundational performance standards established in 2004:

1. **Groundwater Recharge:** Maintain 100% of the average annual pre-construction recharge volume.
2. **Water Quality:** Remove 80% of total suspended solids (TSS) from runoff generated by a 1.25-inch, 2-hour design storm.
3. **Water Quantity:** Reduce post-construction peak runoff rates for the 2, 10, and 100-year storm events to 50%, 75%, and 80% of pre-construction rates, respectively.

Subsequent amendments, particularly in 2020, have mandated the use of Green Infrastructure Best Management Practices (GI-BMPs) to meet these standards, prioritizing techniques that mimic natural processes. The most recent amendments, effective July 17, 2023, incorporate the impacts of climate change by requiring designers to use both current and projected future precipitation data when sizing stormwater control measures, ensuring infrastructure is resilient to anticipated increases in rainfall intensity. A detailed maintenance plan is also a mandatory component of any major development to ensure the long-term effectiveness of these systems.

The Rationale for Stormwater Management

Modern stormwater management rules are a direct response to the hydrological consequences of land development and the escalating effects of climate change.

The Impact of Urbanization on Natural Hydrology

Urbanization fundamentally alters the natural water cycle by replacing vegetated, permeable ground with impervious surfaces like pavement and rooftops. This transformation has multifaceted negative effects.

- **Increased Runoff Volume and Rate:** In a natural environment, only about 10% of precipitation becomes surface runoff, with 50% infiltrating the ground. In an urban environment, runoff skyrockets to 55% while infiltration plummets to just 15%. This increased volume and velocity of runoff can overwhelm natural and man-made drainage systems, leading to flooding, streambank erosion, and increased pollution in surface water bodies. The post-development hydrograph shows a significantly higher and faster peak flow compared to pre-development conditions.
- **Reduced Groundwater Recharge:** Groundwater, which is vital for potable water supplies and maintaining baseflow in streams during dry periods, is replenished by precipitation that infiltrates past the root zone. Impervious surfaces and soil compaction from development severely limit this infiltration, depleting this critical resource.
- **Degraded Runoff Quality:** Undeveloped land naturally filters pollutants. In contrast, developed landscapes with uniform topography and piped conveyance systems offer little opportunity for treatment. Runoff from impervious surfaces and lawns collects and transports pollutants such as metals, hydrocarbons, pathogens, and nutrients directly into waterbodies.

The Impact of Global Warming on Rainfall

Global warming exacerbates stormwater challenges by intensifying rainfall. The process is straightforward:

1. Higher temperatures from the sun cause greater evaporation.
2. Increased moisture in the atmosphere forms clouds.
3. This leads to heavier, more extreme rainfall events.

New Jersey Stormwater Management Rules (N.J.A.C. 7:8)

The New Jersey Administrative Code 7:8, last amended on July 17, 2023, establishes the design and performance standards for stormwater management. The rules aim to minimize the adverse impacts of runoff on water quality, water quantity, and groundwater recharge.

Applicability and Key Definitions

The rules primarily apply to "major development," which is defined as any project that individually or collectively results in one or more of the following:

1. The disturbance of one or more acres of land since February 2, 2004.
2. The creation of one-quarter acre or more of "regulated impervious surface" since February 2, 2004.
3. The creation of one-quarter acre or more of "regulated motor vehicle surface" since March 2, 2021.
4. A combination of items 2 and 3 totaling one-quarter acre or more.

Key related terms include:

- **Regulated Impervious Surface:** Includes a net increase in impervious surface or the collection of impervious surface runoff by a new or expanded stormwater conveyance system.
- **Regulated Motor Vehicle Surface:** Includes a net increase in surfaces for motor vehicles (driveways, parking areas, roads) or areas where existing water quality treatment for such surfaces is being removed or modified.

Core Design and Performance Standards

For major developments, stormwater management measures must be designed to meet three primary standards:

Standard	Requirement
Groundwater Recharge	Demonstrate that the site maintains 100% of the average annual pre-construction groundwater recharge volume, or alternatively, that the increased runoff volume from the projected 2-year storm is infiltrated.
Water Quality	Reduce the post-construction load of total suspended solids (TSS) by 80% on an annual average basis. This applies to runoff from the net increase of motor vehicle surface, generated by the "water quality design storm" (1.25 inches of rainfall in 2 hours).
Water Quantity	Demonstrate that post-construction runoff hydrographs do not exceed pre-construction hydrographs, or reduce post-construction peak runoff rates for the current and projected 2, 10, and 100-year storm events to 50%, 75%, and 80% of the pre-construction peak runoff rates, respectively.

The Central Role of Green Infrastructure (GI)

The 2020 amendments established a clear preference for Green Infrastructure Best Management Practices (GI-BMPs), which are systems designed to mimic natural hydrologic processes.

- **To satisfy Groundwater Recharge and Water Quality standards**, designers *must* utilize GI-BMPs listed in Table 5-1.
- **To satisfy Water Quantity standards**, designers may utilize BMPs from Table 5-1 or the large-scale GI-BMPs from Table 5-2.
- **Non-GI BMPs** (Table 5-3) may only be used to meet the standards if a waiver or variance is granted.

Green Infrastructure BMP Performance Summary (Table 5-1)

This table specifies small-scale GI-BMPs that may be used to satisfy the core standards.

Best Management Practice	Stormwater Runoff Quality TSS Removal Rate (%)	Stormwater Runoff Quantity	Groundwater Recharge
Cistern	0	Yes	No
Dry Well	0	No	Yes
Grass Swale	50 or less	No	No
Green Roof	0	Yes	No
Manufactured Treatment Device	50 or 80	No	No
Pervious Paving System	80	Yes	Yes/No
Small-Scale Bioretention Basin	80 or 90	Yes	Yes/No
Small-Scale Infiltration Basin	80	Yes	Yes
Small-Scale Sand Filter	80	Yes	Yes
Vegetative Filter Strip	60-80	No	No

Large-Scale GI & Non-GI BMPs (Tables 5-2 & 5-3)

These tables outline additional BMPs, which are typically used for quantity control or when a variance is obtained.

Table	Practice Category	Best Management Practices
Table 5-2	Large-Scale GI-BMPs (For Quantity, or Quality/Recharge with Waiver)	Bioretention System, Infiltration Basin, Sand Filter, Standard Constructed Wetland, Wet Pond
Table 5-3	Non-GI BMPs (Require Waiver/Variance for any use)	Blue Roof, Extended Detention Basin, Manufactured Treatment Device, Sand Filter, Subsurface Gravel Wetland, Wet Pond

Technical Specifications and Calculations

Water Quality Design Storm

The New Jersey water quality design storm is **1.25 inches of rainfall over a 2-hour period**. A critical detail is that this rainfall is **not uniformly distributed**. It has a peak intensity occurring around the 60-minute mark. As such, the average intensity of 0.625 inches/hour cannot be used for calculations in the Rational Method; instead, designers must use intensity values corresponding to the specific time of concentration.

Additional water quality provisions include:

- Reducing post-construction nutrient loads to the maximum extent feasible.
- Preventing any increase in stormwater runoff to waters classified as FW1.
- Achieving **95% TSS removal** for runoff discharged within a 300-foot riparian zone of Category One waters.

Calculation Methodologies

- **Runoff Calculation:** The design engineer must use the USDA Natural Resources Conservation Service (NRCS) methodology, as described in the National Engineering Handbook and TR-55 (Urban Hydrology for Small Watersheds).
- **Pre-construction Condition:** For calculation purposes, there is a presumption that the pre-construction condition of a site is "a wooded land use with good hydrologic condition," which establishes a conservative baseline for runoff calculations.
- **Groundwater Recharge Calculation:** This is to be calculated using the New Jersey Geological Survey Report GSR-32.

Factoring for Climate Change (2023 Amendments)

To ensure future resiliency, the rules require stormwater systems to be designed for both current and projected future storm events. Precipitation depths are determined by taking NOAA Atlas 14 data and multiplying it by county-specific adjustment factors.

Table 5-5: Current Precipitation Adjustment Factors

County	2-year Design Storm	10-year Design Storm	100-year Design Storm
Atlantic	1.01	1.02	1.03
Bergen	1.01	1.03	1.06
Burlington	0.99	1.01	1.04
...	*(and all other NJ counties)*	...	...

Table 5-6: Future Precipitation Change Factors

County	2-year Design Storm	10-year Design Storm	100-year Design Storm
Atlantic	1.22	1.24	1.39
Bergen	1.20	1.23	1.37
Burlington	1.17	1.18	1.32
Hunterdon	1.19	1.23	1.42
Morris	1.23	1.28	1.46
Passaic	1.21	1.27	1.50
Sussex	1.24	1.29	1.50
...	*(and all other NJ counties)*	...	...

Maintenance and Compliance Requirements

Long-term functionality is ensured through mandatory maintenance plans (N.J.A.C. 7:8-5.8).

- **Plan Contents:** The plan must detail specific preventative maintenance tasks, schedules, cost estimates, and the name and contact information of the responsible person or entity (e.g., a homeowners' association).
- **Deed Recording:** If the responsible party is not a public agency, the maintenance plan must be recorded on the deed for each property within the development.
- **Ongoing Duties:** The responsible party must perform all preventative and corrective maintenance, maintain a detailed log of all activities, and evaluate the effectiveness of the plan at least once per year, adjusting it as needed.

Comparative Framework: Georgia Stormwater Management Rules

For context, the state of Georgia uses a different framework focused on five sizing criteria:

Sizing Criteria	Description
Water Quality (Runoff Reduction & Treatment)	Retain/reduce runoff from the first 1.0 inch of rainfall, and treat remaining runoff from a 1.2 inch storm to reduce annual TSS loadings by 80%.
Channel Protection	Provide extended detention of the 1-year, 24-hour storm event to reduce bankfull flows and protect channels from erosive velocities.
Overbank Flood Protection	Provide peak discharge control of the 25-year, 24-hour storm so the post-development peak rate does not exceed the pre-development rate.
Extreme Flood Protection	Evaluate the effects of the 100-year, 24-hour storm and manage impacts through detention controls and/or floodplain management.