Presentation Goals

Overview

• Understanding the effects of development on the hydrologic cycle

• Understand the design and performance standards
Understanding the effects of development on the hydrologic cycle
What is stormwater?

“Stormwater”

Water resulting from precipitation (including rain and snow) that runs off the land’s surface, is transmitted to the subsurface, or is captured by separate storm sewers or other sewage or drainage facilities, or conveyed by snow removal equipment.
What affects stormwater?

Site Conditions:

- Density of Vegetation
- Soil
- Slope
- Surface Roughness
- Groundwater
Vegetation & Rainfall

Precipitation

Evapo-transpiration

Runoff

Infiltration
Surface Roughness & Slope

- Surface detention
- Depth and velocity of overland flow increase downslope
- Depression storage (depth of depressions greatly exaggerated)
- Stream channel

http://www.cbnp.us/cbnp-hh.html
Hydrologic Cycle

- Precipitation
- Evapotranspiration
- Runoff
- Infiltration
- Groundwater Flow
Post-Development Impacts on the Hydrologic Cycle
Understanding the effects of development on the hydrologic cycle

Summary

• Increased runoff volume and rate of stormwater
• Degraded water quality
• Depleted groundwater and stream baseflow
Understanding the design and performance standards
Definitions

• Major Development
• Infiltration & Groundwater Recharge
• Design Storms (2, 10, & 100)
• Hydrograph
Overview

- Increased runoff volume and rate of stormwater
- Degraded water quality
- Depleted groundwater and stream baseflow
Runoff Quantity Control Option 1

N.J.A.C.7:8-5.4(a)3.i:

Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the 2-, 10-, and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events;
Stormwater Management Rule Requirements

Runoff Quantity Control Option 1
Stormwater Management Rule Requirements

💧 Runoff Quantity Control Option 1

FLOW RATE

TIME

exceedance
Stormwater Management Rule Requirements

Runoff Quantity Control Option 2

N.J.A.C.7:8-5.4(a)3.ii:
Demonstrate through hydrologic and hydraulic analysis that there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the 2-, 10-, and 100-year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site. This analysis shall include the analysis of impacts of existing land uses and projected land uses assuming full development under existing zoning and land use ordinances in the drainage area; or
N.J.A.C.7:8-5.4(a)3.iii:

Design stormwater management measures so that the post-construction peak runoff rates for the 2-, 10-, and 100-year storm events are 50, 75 and 80 percent, respectively, of the pre-construction peak runoff rates. The percentages apply only to the post-construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed.
Runoff Quantity Control Exemption

N.J.A.C.7:8-5.4(a)3.iv:
This requirement does not apply to projects in tidal flood hazard areas if it is clear the project will not cause downstream flooding:

Discharges into large tidally controlled watercourses, bays, inlets, the ocean, etc.
Overview

- Increased runoff volume and rate of stormwater

- **Degraded water quality**

- Depleted groundwater and stream baseflow
Stormwater Management Rule Requirements

% Runoff Quality Control

Applies when a project proposes > ¼ acre of new impervious coverage

Requirements:
- Remove 80% TSS from developed site
- Remove nutrients to max. extent feasible
Stormwater Management Rule Requirements

% Runoff Quality Control

BMPs must be designed to manage the Water Quality Design Storm:

1.25” rainfall over 2 hours

Custom Distribution shown in the rules
Stormwater Management Rule Requirements

Runoff Quality Control

This requirement does not apply to discharges that have a separate NJPDES permit with a numerical TSS effluent limitation.
Understanding the effects of development on the hydrologic cycle

Overview

- Increased runoff volume and rate of stormwater
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N.J.A.C. 7:8-5.4(a)2.i(1):
Demonstrate through hydrologic and hydraulic analysis that the site and its stormwater management measures maintain 100 percent of the average annual preconstruction groundwater recharge volume for the site; or
Stormwater Management Rule Requirements

Groundwater Recharge Option 2

N.J.A.C. 7:8-5.4(a)2.i(2):
Demonstrate through hydrologic and hydraulic analysis that the increase of stormwater runoff volume from pre-construction to post-construction for the two-year storm is infiltrated.
Groundwater Recharge Exemption

This requirement does not apply to previously developed portions of urban redevelopment areas:

Previously developed = areas cleared of woody vegetation
Stormwater Management Rule Requirements

Nonstructural Strategies

N.J.A.C. 7:8-5.2(a):
Must use nonstructural strategies to the maximum extent practicable before any structural measures may be used.
9.5 INfiltration Basins

Infiltration basins are stormwater management systems constructed with highly permeable components designed to both maximize the removal of pollutants from stormwater and to promote groundwater recharge. Pollutants are treated through settling, filtration of the runoff through, and biological and chemical activity within, the components. The total suspended solids (TSS) removal rate is 80%.

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<th>N.J.A.C. 7:8 Stormwater Management Rules - Design and Performance Standards</th>
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<td>![Grass] Nonstructural Strategy</td>
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<td>![Water] Water Quantity</td>
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Summary

Understand the effects of development on the hydrologic cycle

• Increased rate and volume of runoff

• Degraded water quality

• Depleted groundwater and base flow
Summary

Understand the design and performance standards

• Water Quantity Controls

• Water Quality Controls

• Groundwater Recharge

• Nonstructural Strategies
More Information:

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