



MS4 Stormwater Program, SPDES Permits and Land Use Board Reviews

Tying Together Administrative Review and Technical Requirements



Presented by:

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Speaker: Timothy Wales, PE

- Professional Civil Engineer with 30+ Years Experience
- 24 Years in Private Practice as Consulting Engineer
- Saratoga Springs City Engineer 2011-2019
- Stormwater Management Officer (SMO)
- Responsible for City MS4 Compliance with SPDES General Permit for Municipal Separate Storm Sewer Systems (MS4) GP-0-15-003
- MS4 Program Audit by NYSDEC and USEPA
- Responsible for Enforcement of Compliance with SPDES General Permit for Stormwater Discharges from Construction Activity: GP-0-20-001

Lets Set the Stage - Presentation Overview

- MS4 Requirements for Stormwater Management
- Planning Board Review Process Relating to Stormwater Management
- Stormwater Pollution Prevention Plans
- Post Construction Stormwater Management Practices
- Green Infrastructure and Sustainability

History of Stormwater Regulatory Requirements

- 1948 Clean Water Act (CWA)
 - Established Structure to Regulate Pollutants
 - Water Quality Standards
- 1972 CWA Amendments
 - Unlawful to Discharge any Point Source Pollutant into Navigable Waterway without Permit
- 1987 CWA Amendments
 - Established Phased Approach to Address Water Quality Degradation cause by Stormwater
 - Addressed Non-Point Source Pollution

Phase I Stormwater Rules (1990)

- Establishes the National Pollution Discharge Elimination System (NPDES)
- Est. the base unit of Municipal Separate Storm Sewer System (MS4) to mitigate high level pollution in urban stormflow.
- A National permit system controlling “medium” (pop. 100K-249,999) and “large” (pop. 250K +) Municipalities and construction ≥ 5 Acres
- Est. the oversight hierarchy of
 - NPDES→SPDES(NYS)→MS4(County/Local)

MS4



National *Pollutant Discharge Elimination* System (NPDES)

Municipal Separate Storm Sewer System (MS4)

A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains) owned or operated by the United States, a State, city, town, county, district, association, or other public body...that discharges to waters of the United States or waters of the State that is designed or used for collecting or conveying stormwater...

Phase II Stormwater Rules (2003)

- Regulation of “small” MS4 communities
- Small is defined as “...any MS4 not already covered by Phase I NPDES...”
- Density-dependent 1,000 people/sq.mi.
- Part of a larger, contiguous Urbanized Area (UA)...*crosses OVER municipal and county boundaries*
- Construction projects \geq 1 Acre

SPDES Phase II Program

- EPA Delegates Administration of Program to NYSDEC
- SPDES General Permit for Construction Activity – GP-0-20-001
- SPDES General Permit for Municipal Separate Storm Sewer Systems (MS4) – GP-0-15-003
- SPDES Multi-Sector General Permit (MSGP) for Stormwater Discharges Associated with Industrial Activity – GP-0-17-004

3 Categories of MS4's

- Traditional MS4 with Land-Use Control
 - City, Town or Village with land use control authority
- Traditional MS4 without Land-Use Control
 - County Agencies without land use authority
- Non-Traditional
 - DOT, Thruway Authority, County Highway Departments, Other State Agencies & Authorities, Airports, State and Community Colleges, School Districts, Post Offices, VA Hospitals, Military Bases, Prisons, Water, Sewer and other Special Districts

MS4 Program Requirements

MS4 Operators must implement a Stormwater Management Program (SWMP) that:

- Contains 6 Minimum Control Measures
- Utilizes approved Best Management Practices (BMP's)
- Implement the Program to the Maximum Extent Practicable
- Designate Stormwater Management Officer

6 Minimum Control Measures

1. Public Education and Outreach
2. Public Participation and Involvement
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff
5. Post-Construction Stormwater Management
6. Pollution Prevention & Good Housekeeping

MCM 4: Construction Site Runoff Controls

Develop, Implement and Enforce a Program that:

- Provides equivalent protection to the SPDES General Permit for Stormwater Discharges from Construction
- Addresses Stormwater runoff from construction activities that result in land disturbance of 1 Acre or more.
- Enact and Implement Regulatory Mechanisms to require a SWPPP and Erosion & Sediment Control for applicable sites
- Describes Process for SWPPP Review
- Describes Procedures for Inspections and Enforcement

MCM5: Post-Construction Stormwater Management

Develop, Implement and Enforce a Program that:

- Provides equivalent protection to the SPDES General Permit for Stormwater Discharges from Construction
- Addresses Stormwater runoff from development and redevelopment projects that result in land disturbance of 1 Acre or more.
- Includes a local law or Regulatory Mechanisms requiring post-construction Runoff Controls from development and redevelopment projects
- Includes a combination of structural or non-structural management practices according to the NYS Stormwater Design Manual to reduce the discharge of pollutants to the Maximum Extent Practical

MCM5: Post-Construction Stormwater Management Cont'd

Develop, Implement and Enforce a Program that:

- Includes a combination of structural or non-structural management practices according to the NYS Stormwater Design Manual to reduce the discharge of pollutants to the Maximum Extent Practical
- Describes Process for SWPPP Review and perform inspections in accordance with MCM 4
- Maintain an Inventory of post-construction stormwater management practices. (at a minimum, those practices installed since 2003)
- Describes Procedures for inspections to ensure that Post-construction stormwater management practices are maintained effectively

3 Goals Of Stormwater Management



Satisfy the water quality requirements of the Clean Water Act for Non-Point Source Pollution



Reduce pollutant discharge to the maximum extent practicable



Protect Local Water Quality

Impacts of Increasing Imperviousness



Impacts of Stormwater -Pollution:



Impacts of Stormwater -Pollution:



Stormwater Runoff Dangers



Impacts of Stormwater - Erosion



Climate Change and Development Impacts

Climate Change

(Weather)

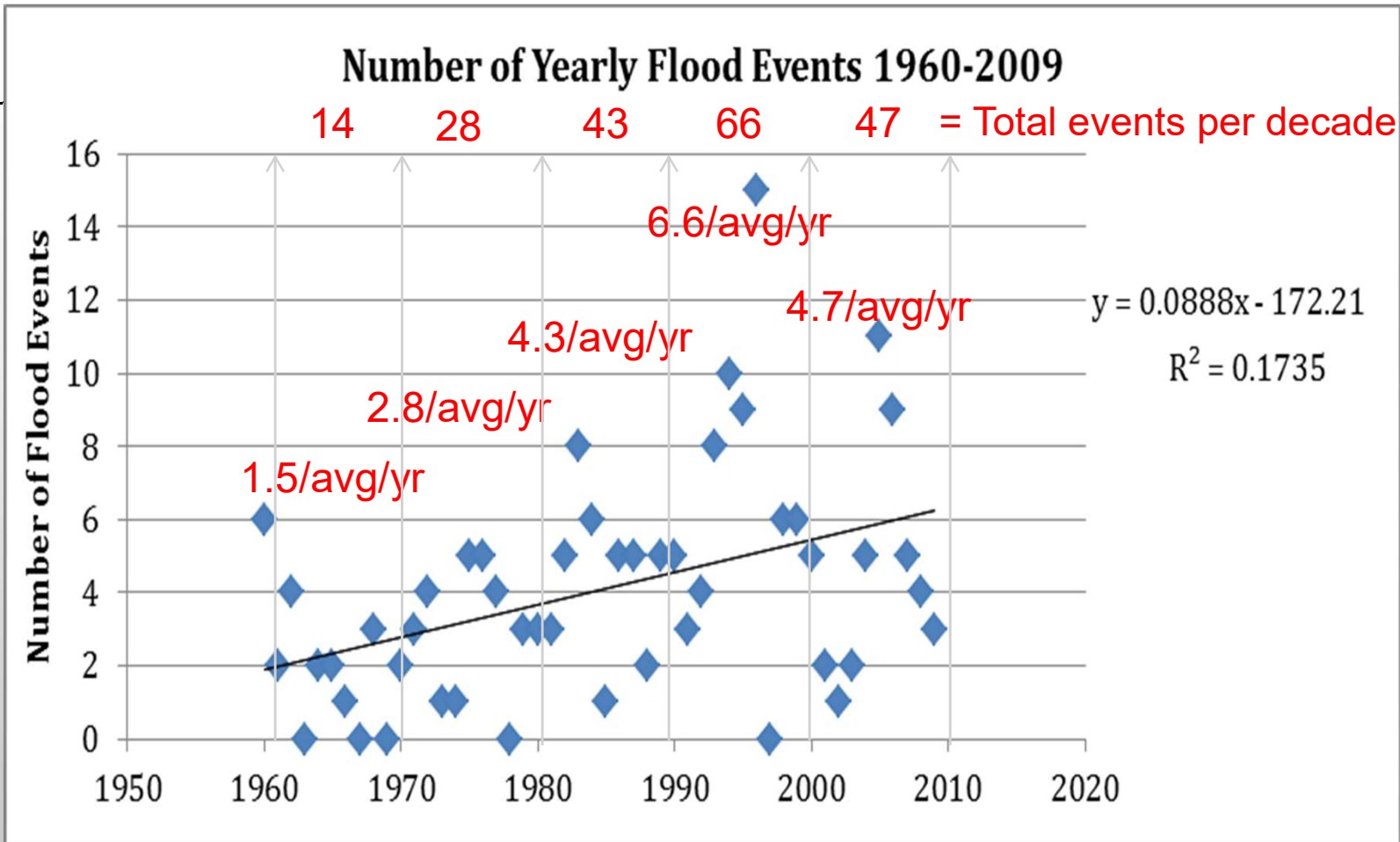
- Increases in rain, decreases in snowfall
- Increases in extreme events (i.e. the 100-year storm; 5.5 inches here) to as frequently as 10-22 years
- “Infrastructure will be increasingly compromised by climate-related hazards...” –U.S. Global Change Research Program

Sprawling Development

(People)

- Development patterns/trends of the last century continue today – lower density residential & S-FHs, stand-alone commercial/retail
- 50% more land consumed = less green space, more lawns, roads, parking lots
- Still relying on grey v. green infrastructure to handle precip/runoff

Extreme Weather



AVG Floods per year 1960-1980

2.1

AVG Floods per year 1980-2010

5.2



I-87 in Warren County; June 2005

Stormwater Impacts - Flooding



TS Irene at “The Stockade”, Schenectady, NY

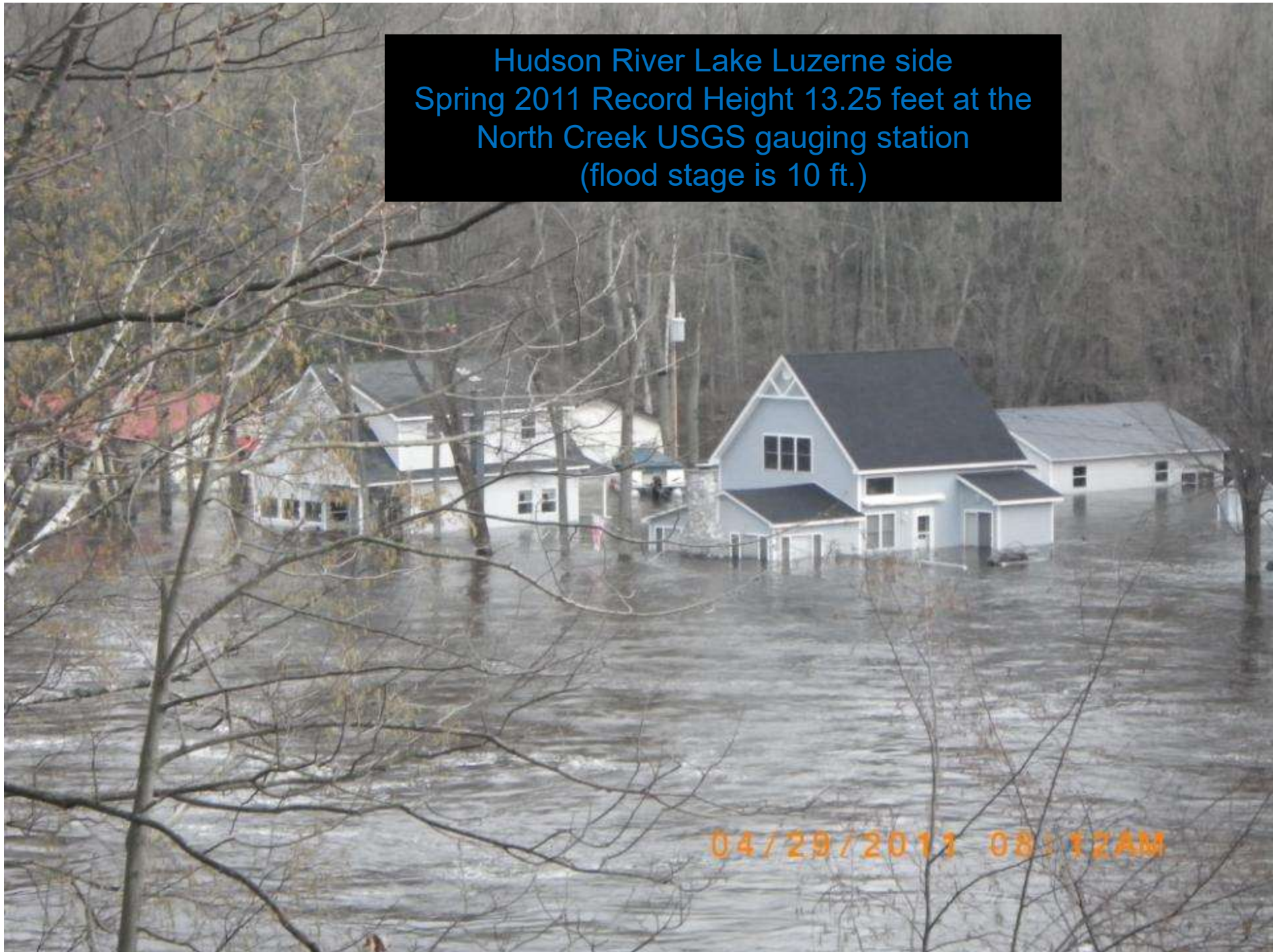
TS Irene, Scotia NY 2011



TS Irene in Windham, NY



Hudson River Lake Luzerne side
Spring 2011 Record Height 13.25 feet at the
North Creek USGS gauging station
(flood stage is 10 ft.)



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What Does That Mean for PB Review

- Ensure Land Use Board has Review Authority
- Ensure SWPPP Provisions for Erosion & Sediment Control During Construction
- Ensure SWPPP Provisions for Post-Construction Stormwater Management Practices and O&M



Planning Board/Land Use Board Review Process

- Pre-Application Meeting
- Application Submitted for Site Plan or Subdivision
- Initial Review for Completeness of Application
 - Application Forms and Fees
 - SEQR Form, Complete Streets Forms, etc.
 - Engineering Reports
 - Drawings: Survey/Plat, Erosion & Sediment Control Plan, Grading and Drainage Plan, Layout Plans, Utility Plans, Landscape & Lighting, Details
 - Stormwater Pollution Prevention Plan (SWPPP)

Planning Board Review Process Cont'd

- Technical Review:
 - Review Period: 30 days?
 - Planning & Zoning Staff
 - Engineering Staff or TDE – SMO Ensures SWPPP Review
 - Building Department and Code Enforcement
 - Public Safety
 - Public Works/Utilities
 - County Planning, NYSDOT, SHPO, etc.
- Preliminary Comments
- Planning Board Meeting & Presentation
- SEQRA Complete
- Final Comments Addressed
- SWPPP Acceptance Form
- Plans Signed

Stormwater Pollution Plans (SWPPP)

The SWPPP is the Plan:

- A site-specific strategy for Erosion and Sediment Control During Construction.
- A site-specific strategy for Post-Construction stormwater management.
- Full SWPPP Required for one Acre or more of non-residential disturbance.
- Partial SWPPP Required for one to five Acres of Residential Project Disturbance.
- Local Laws May be More Stringent

Stormwater Pollution Plans Cont'd

SWPPP Contents:

- Describes Existing and Proposed Site Design
- Provisions for Erosion & Sediment Control
- Best Management Practices and Housekeeping
- Modeling of Pre and Post Development Runoff and Water Quality Conditions
- Demonstrate RRv vs WQv Reductions
- Post Construction Stormwater Management Practices
- Operation and Maintenance Plan

GI planning measures



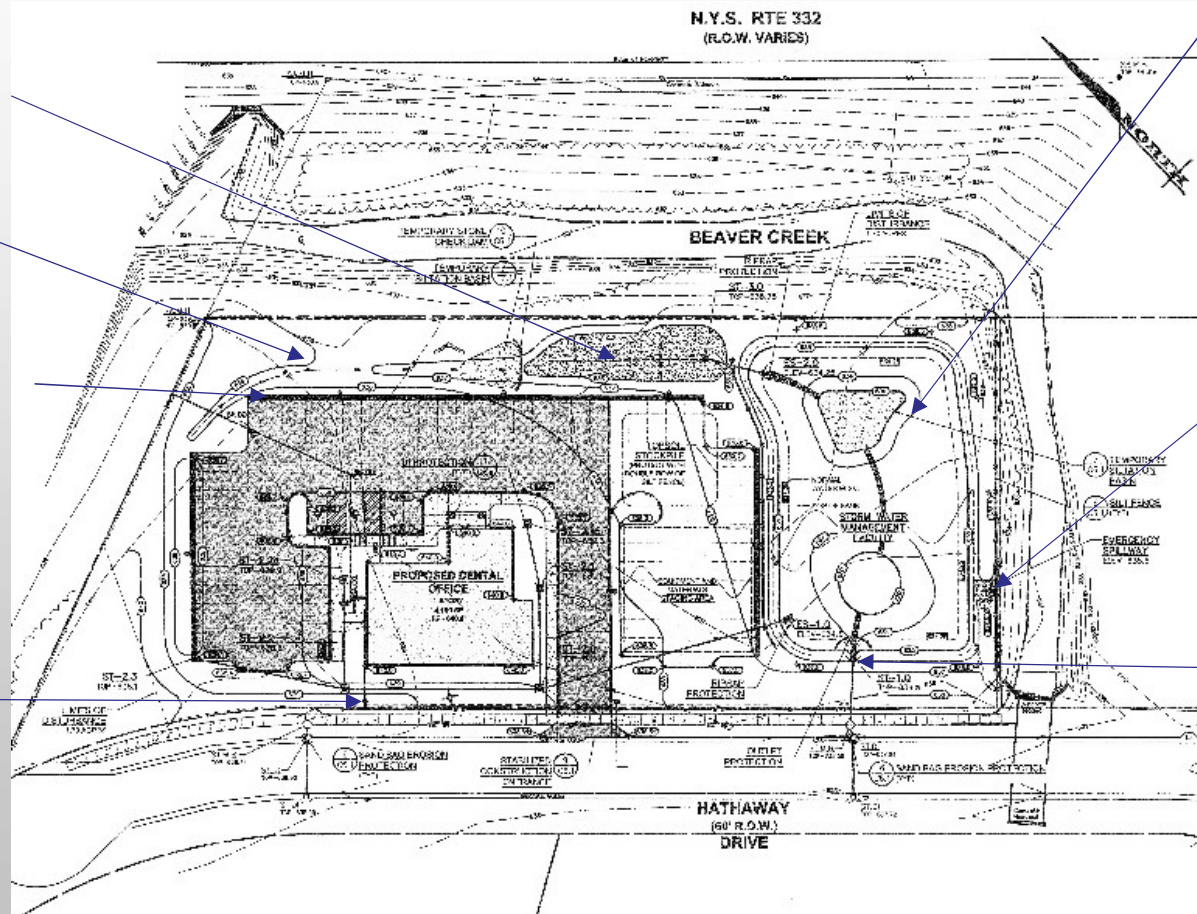
- SWPPP must include an evaluation of all the GI planning measures as they apply to the site.
 - Develop a map that identifies natural resource areas and drainage patterns
 - Wetlands (jurisdictional, wetland of special concern)
 - Waterways (major, perennial, intermittent, springs)
 - Buffers (stream, wetland, forest, etc.)
 - Floodplains
 - Forest, vegetative cover
 - Critical areas
 - Topography (including existing flow paths)
 - Soil (hydrologic soil groups, highly erodible soils, etc.)
 - Bedrock, significant geology features

Reviewing the Application

Bio Retention
Facility
Vegetative
Swale

Pea Gravel
Diaphragm

Storm Water
Inlet



Storm Water
Management
Facility

Emergency
Overflow

Storm
Water
Outlet
Structure

Construction Process

- Final Comments Addressed and Plans Signed
- SMO SWPPP Acceptance and NOI
- Pre-Construction Meeting
 - Municipal Rules and Requirements for Construction
 - Notifications and Coordination of Officials
 - Review of SWPPP Provisions and Requirements
 - Weekly Inspections – PE or E&SC Training
 - Site Stabilization and NOT
 - As-built Drawings and Release of LOC
 - Maintenance and Inspection of Post-Construction Stormwater Management Practices

During Construction

Municipality, Design Consultant or TDE performs weekly SWPPP inspections for the project.

This is to verify it's compliance with the Stormwater Permit, and MS4 criteria.

Once Project is completed, and the site is stabilized, the Municipality approves and signs the "Notice of Termination" (NOT).

SWPPP INSPECTION REPORT EXAMPLE

Inspection Frequency: ☐ Twice a Week ☐ Weekly ☐ Monthly ☐ Follow-up ☒ Other: _____

Closeout inspection by MS4's consultant

Approximate Area Opened: < 0.1 AC ± Has a 5-Acre Waiver Been Issued: ☐ Yes ☒ No ☐ NA

- Are the adjacent properties negatively impacted by the proposed construction? ☐ Yes ☒ No ☐ NA
- At the discharge points of the site, are there traces of turbidity or sedimentation leaving the site? ☐ Yes ☒ No ☐ NA
- At the natural surface waterbodies located within or immediately adjacent to the project, is there evidence of impacts from the project construction? ☐ Yes ☒ No ☐ NA
- Are the public roads and site access roads being kept clean of mud and debris? ☒ Yes ☐ No ☐ NA
- Is construction site litter and debris being properly managed? ☒ Yes ☐ No ☐ NA
- Have all necessary erosion and sediment control measures been installed? ☐ Yes ☐ No ☒ NA
- Are the installed erosion and sediment control measures functioning properly? ☐ Yes ☐ No ☒ NA
- Are additional erosion control measures needed? ☐ Yes ☒ No ☐ NA
- Are there areas disturbed that should be stabilized? ☒ Yes ☐ No ☐ NA
- Are soil stockpiles in appropriate locations, properly stabilized, and/or protected? ☐ Yes ☐ No ☒ NA
- Have temporary stabilization measures, no longer needed, been removed? ☒ Yes ☐ No ☐ NA
- In regard to stormwater management, is the Contractor generally following the approved plans and sequence of construction? ☐ Yes ☐ No ☒ NA
- Have deficiencies been identified with the constructed post-construction stormwater practices? ☒ Yes ☐ No ☐ NA
- Is the concrete washout area being properly maintained and utilized? ☐ Yes ☐ No ☒ NA

Undisturbed Soils – Limit Disturbance



Post-Construction Stormwater Management Practices

What are these?

- Permanent, Engineered Practices that reduce the impact of stormwater from a developed site on the Environment
- Mitigate runoff from impervious surfaces to pre-development levels
- Approved Design Practices - NYSDEC Stormwater Management Design Manual 2015
- State and Local Law Purview

~Post-Construction Runoff Control~

☁️ Two Post-Construction management requirements under Phase II:

☁️ Manage water quality (WQv = Water Quality volume; the 90th % event or 0.9 inches in our region)

☁️ Manage water quantity (1-, 10-, 100-year events)**

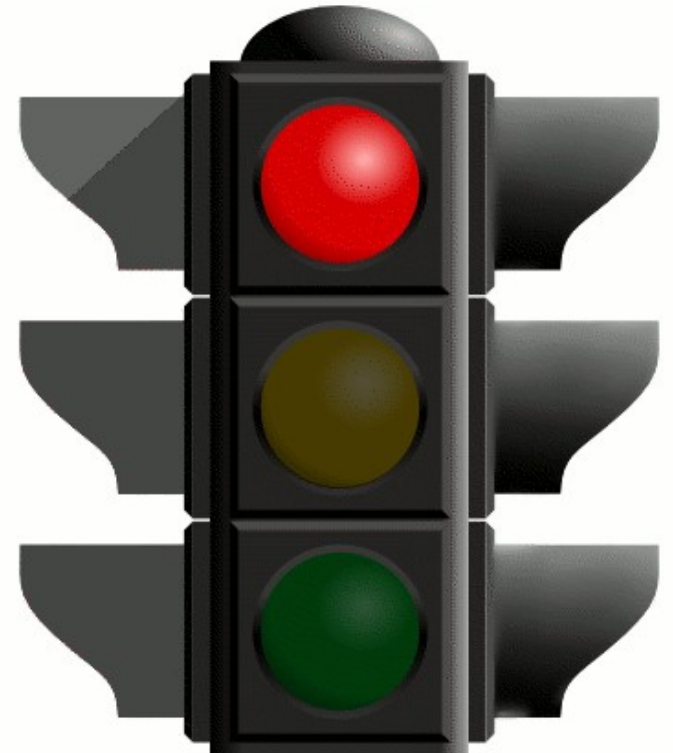
All post-construction stormwater management systems must include 100%* treatment of the WQv and runoff rates and volumes cannot exceed the pre-development condition.

NOTES: *only 75% WQv for redevelopment projects

****Waived for direct discharges to 4th-Order streams**

Possible exceptions to the rule:

- High Groundwater
- Bedrock
- Impermeable soils
- Steep Slopes
- Karst geology



Stormwater, Development, and Water Quality - Two Areas of Impact

Impervious Cover

- Flooding
- Stream Degradation
- Habitat Loss
- Infrastructure Stress

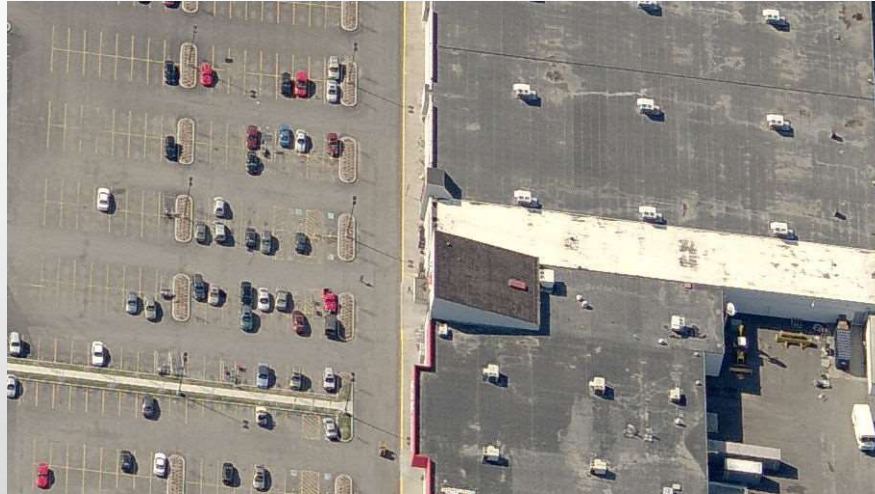
Pollutants

- Erosion/Sediment
- Phosphorous/Nitrogen
- Fertilizers
- Human/Ag/Pet Waste
- Heavy Metals
- Toxins
- Bacteria
- Trash/Debris
- BOD/COD
- PAH
- Petroleum & Petro-chemicals
- Chlorine/Sodium & Calcium Chloride
- Mercury
- Acid Deposition
- Particulates/dust

5 PATHWAYS To Reduce Runoff:

- **Minimize Development Footprint** (buildings)
- **Minimize Impervious Surfaces** (parking lot/s, driveways, sidewalks, alternative porous materials)
- **Area Reductions** (total area disturbed or DA to a single practice)
- **Impervious Disconnection** (grey-to-green, not grey-to-grey or green-to-grey)
- **Source Control Treatment** (source area-to-practice, directly)

Area Reduction Practices: Minimize Impervious Surfaces



- Minimize Roadways, sidewalks and driveways
- Minimize Parking and consider Porous Materials
- Minimize Building Footprint (GO Vertical!)

Area Reductions

- Preservation of Natural Areas
- Sheet Flow to Buffers/Strips
- Tree Planting
- Rooftop Disconnection



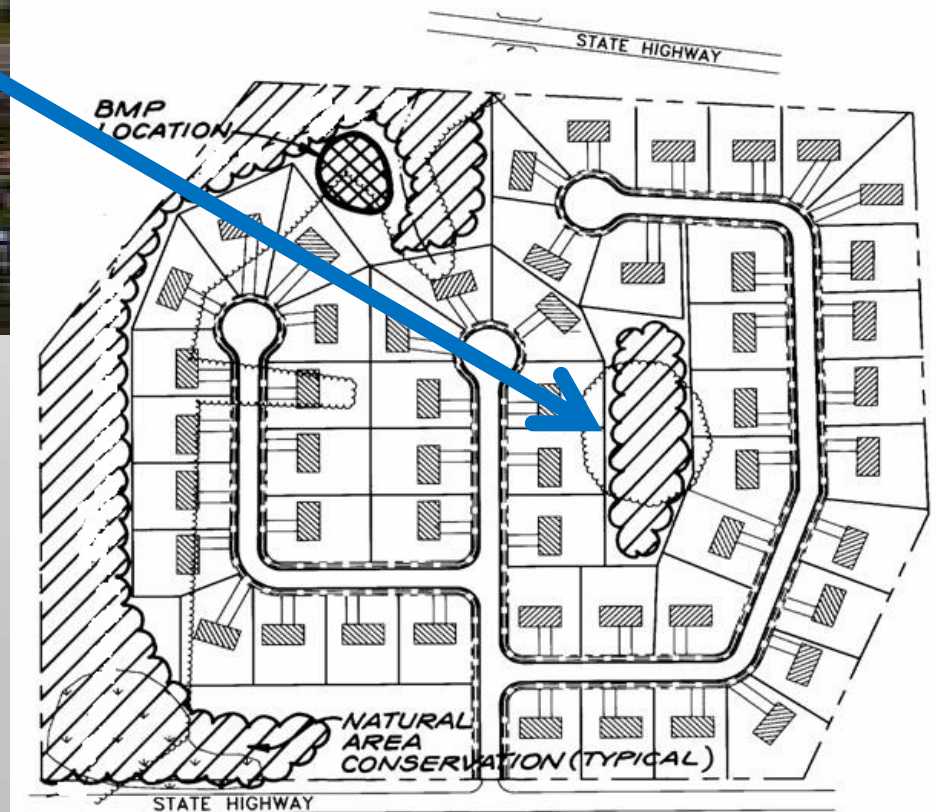
Areas are
deducted from
watershed
computations for
WQv.



Preservation of Natural Areas



CRITICAL ELEMENTS :
1. Size (YES! It Matters.)
2. Ecology
(connections)
3. Protection (Buffers)



Smart Planning



Preventative Medicine...at the site:

With proper planning and design a project can:

- **Avoid** creating the impacts, at the outset;
- **Minimize** the impacts that are unavoidable, then
- **Mitigate** using Green Infrastructure

Stormwater Management Planning – GI Approach

Green infrastructure can:

- Reduce runoff volume, peak flow, and flow duration
- Slow down the flow
 - increases T_c & promotes infiltration and evapotranspiration
- Improve groundwater recharge
- Protect downstream water resources
- Reduce downstream flooding and property damage.
- Reduce incidence of combined sewer overflow (CSO)
- Reduce treatment costs
- Reduce thermal pollution
- Improve wildlife habitat



Approved Stormwater Management Practices in: *NYS Stormwater Management Design Manual*



“Alternative” Practices



Rain Gardens



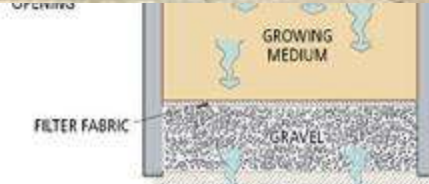
Rain Barrels



Green Roofs



Porous Paving



Planter Boxes

Green Infrastructure - Strategically planned and managed networks of natural lands, working landscapes and other open spaces that conserve ecosystem values and functions and provide associated benefits to human populations.



Using Green Infrastructure for Runoff Reduction

- Ensure SWPPP Provisions and Requirements for Post-Construction Stormwater Management Practices are met.



1. Conservation of Natural Areas



- Reduces runoff treatment volume & SMP storage volume and size
- Saves cost & possible land consumption for SMPs
- Provides permanent protection of open space that appeals to many residents & may increase property value
- Promotes protection of natural hydrologic balance that maintains pre-developed groundwater recharge characteristics

Natural Area Buffer Protection



2. Sheet flow to Bioretention Buffers, Filter Strips



- Can be used to filter & infiltrate stormwater runoff
- Provides a valuable corridor for protection of stream or wetland & shoreline habitats
- Reduces the runoff volume & SMP storage volume & size
- Saves cost & possible land consumption for SMPs
- Promotes protection of natural hydrologic balance that maintains pre-developed groundwater recharge characteristics
- Reduces pollutant load delivery to receiving waters

Bioretention Areas



Green Streets



3. Vegetated Swale



- Reduces the cost of road & stormwater conveyance construction
- Provides some runoff storage & infiltration, as well as treatment
- The post-development peak discharges used to calculate “quantity” controls will likely be lower, due to a slightly longer T_c for the site
- Note that these vary from the wet and dry swales in the design process

Open Swales, Bio-filtration, Ponds, Constructed Wetlands



Open Swales, Bio-filtration, Ponds, Constructed Wetlands



group

4. Tree Planting/Tree Pit



- Reduces stormwater volumes & velocities discharging from impervious areas through rainfall interception & evapotranspiration
- Increases nutrient uptake, aids in infiltration, can provide bird habitat, provides shading, & reduces mowing costs
- Contributes to air purification & oxygen regeneration
- Reduces urban heat island effect, decreases heating & cooling costs, & blocks UV radiation
- Buffers wind & noise
- Increases property values

Tree Benefits

- Stormwater mitigators
- Air conditioners
- Air quality Regulators
- Habitat providers.



Tree Trench



5. Rooftop Disconnection

- Sending runoff to pervious areas and lower-impact practices increases overland flow time and reduces peak flows
- Vegetated and pervious areas can filter and infiltrate runoff, thus increasing water quality



6. Stream Daylighting

- Improves water quality
- Prevents flooding by increasing storage & reducing peak flows
- Increases habitat & wildlife value
- Increases pedestrian traffic & general public use
- Increases property values
- Aesthetic appeal of daylighted streams can add appeal to neighborhoods or urban areas



7. Rain Gardens



- Pollutant treatment for residential rooftops and driveways
- Groundwater recharge augmentation
- Micro-scale habitat
- Aesthetic improvement to turfgrass or otherwise hard urban surfaces
- Ease of maintenance (couple with routine landscaping maintenance)
- Require a modest land area to effectively capture and treat residential runoff from storms up to approximately the 1-inch precipitation event (note 100% for A&B, 40% for C&D)

Rain Gardens



up

Rain Gardens



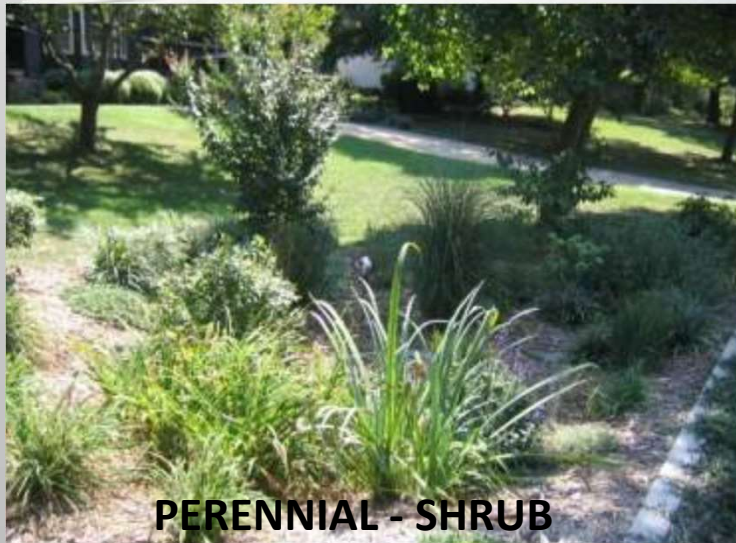
Biotic Variations



PERENNIAL GARDEN



TREE – TURF



PERENNIAL - SHRUB



TREE – SHRUB – MULCH

Sustainable Practices



8. Green Roofs



- Reduces total annual runoff volumes
- Moderates interior building temperatures & provides insulation from the heat & cold
 - Providing energy and HVAC savings to the owner
- It is estimated that green roofs can extend the life of a standard roof by as long as 20 years by protecting rooftop materials from UV radiation & extreme temperature fluctuations
- Green roofs can be designed to insulate the building interior from outside noise, & sound-absorbing properties of green roof infrastructure can make surrounding areas quieter
- Fully saturated green roofs provide fire resistance & inhibit the spread of fire from adjacent buildings
- Reduce the urban heat island effect by cooling & humidifying the surrounding air.
- Filters & binds airborne dust & other particulates, improving air quality
- Creates habitat for birds and butterflies
- Can be aesthetically pleasing & improve views from neighboring buildings
- A benefit specific to intensive green roofs is pedestrian access to a scenic space within an urban environment

Green Roofs



9. Stormwater Planter



- If site is not suitable for infiltration, flow-through or contained stormwater planters enable filtration treatment
- Reduces stormwater discharge volumes & velocities
- Flow-through or contained planters do not require a setback from a building foundation, though appropriate waterproofing technology should be incorporated into the design
- Creates an aesthetic landscape element, as well as providing micro-habitat within an urban environment

Stormwater Planters



10. Rain Barrel/Cistern

- Reduced stormwater runoff entering the drainage system, not only reduced volumes, but also delayed and/or reduced peak runoff flow rates during the water quality storm event
- Reduced transport of pollutants associated with atmospheric deposition onto rooftops
- Reduced water consumption for nonpotable uses
- Use as retrofits in urban redevelopment scenarios to reduce runoff volumes in areas where there is a high percentage of impervious cover, soils are compacted, groundwater levels are high, and/ or hot-spot conditions exist that preclude infiltration of runoff



Cisterns/ Water Recycling



up

11. Porous Pavement



- Groundwater recharge augmentation
- Runoff reduction
- Effective pollutant treatment for solids, metals, nutrients, and hydrocarbons
- Aesthetic improvement to otherwise hard urban surfaces
- Detailed Construction and Inspection Requirements

Porous Pavements



Conclusions

- Familiarity with MS4 Requirements
- Understand the basis and importance of Stormwater Review during Planning Process
- Familiarity with the Design Process and Post-Construction Stormwater Management Practices
- Look for Designers to use all the tools available to minimize the impact of development on water quality.
- Encourage Sustainability and Green Infrastructure Practices in Planning Board Projects

Balancing Development and Environment



Questions?

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Thanks to Blue Neils, Saratoga County Stormwater Coordinator

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Saratogastormwater.org



Cornell University
Cooperative Extension
Saratoga County



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MRB | *group*