Emerging Trends: Green Infrastructure and Stormwater Permits

Bob Newport
U.S. EPA Region 5
November 4, 2009

Significant EPA Activity to Promote/ Communicate About G.I.

- Memo from EPA Assistant Administrator **Using Green Infrastructure to Protect Water Quality in Stormwater, CSO, Nonpoint Source and other Water Programs**
- **Green Infrastructure Statement of Intent**, signed by NRDC, NACWA, LID Center, ASIWPCA, EPA
- **Use of Green Infrastructure in NPDES Permits and Enforcement**, jointly issued by Water Permits Division and Water Enforcement Division.
  - The memo clarifies that green infrastructure technologies are consistent with NPDES permitting and enforcement frameworks, and encourages use of these techniques where appropriate.

National Research Council Report

Urban Stormwater Management in the United States

Presently the regulation of stormwater is hampered by a statute that focus primarily on specific pollutants and largely ignores the volume of discharges

Committee on Reducing Stormwater Discharge Contributions to Water Pollution

Claire Welty, *Chair*, University of Maryland, Baltimore County
Lawrence E. Band, University of North Carolina
Roger Bannerman, Wisconsin Department of Natural Resources
Derek B. Booth, Stillwater Sciences, Inc.
Richard R. Horner, University of Washington
Charles R. O'Melia (NAE), Johns Hopkins University
Robert E. Pitt, University of Alabama
Edward T. Rankin, Midwest Biodiversity Institute
Thomas R. Schueler, Center for Watershed Protection
Kurt Stephenson, Virginia Polytechnic Institute and State Univ.
Xavier Swamikannu, CalEPA, Los Angeles Regional Water Board
Robert G. Traver, Villanova University
Wendy Wagner, University of Texas School of Law
William E. Wenk, Wenk Associates, Inc.

Major Findings and Recommendations

- Most stormwater discharges are regulated on an individual basis without accounting for the cumulative contributions from multiple sources in the same watershed.
- Report recommends converting the current piecemeal system into a watershed-based permitting system.
  - Compliance based on achieving watershed-specific objectives related to attainment of beneficial uses

Major Recommendations

Flow and related parameters like impervious cover should be considered for use as proxies for stormwater pollutant loading. These analogs . . . have great potential . . . because they provide specific measurable targets, . . . [and] focus on water degradation resulting from increased volume as well as increased pollutant loadings in stormwater runoff.

Flow and related parameters like impervious cover should be considered as proxies for stormwater pollutant loadings

Language In Stormwater Permits
Wisconsin

- Performance standards include requirements for total suspended solids, peak flow, infiltration
- Infiltration. This performance standard requires that, to the MEP, a portion of the runoff volume be infiltrated:
  - Residential – 90 percent of pre-development infiltration volume or 25 percent of the 2 year-24 hour design storm.
  - Non-residential – 60 percent of predevelopment infiltration volume or 10 percent of the 2 year-24 hour design storm.
- To protect groundwater, the WI standards identify areas where infiltration is discouraged.

Language In Stormwater Permits
Ohio – Big Darby Watershed

- Groundwater Recharge Requirements. The SWPPP shall ensure that the overall site post-development groundwater recharge equals or exceeds the pre-development groundwater recharge.
- The SWPPP shall describe the conservation development strategies, BMPs and other practices deemed necessary by the permittee to maintain or improve pre-development rates of groundwater recharge.

New Jersey

The New Jersey Stormwater Management Rules require that a "major development" project must comply with one of the following groundwater recharge requirements:

- *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*
- *Demonstrate through hydrologic and hydraulic analysis that the increase of stormwater runoff volume from pre-construction to post-construction for the 2-year storm is infiltrated*

North Carolina

Permit to Construct, Operate and Maintain Impervious Areas and BMPs Associated with Residential Development Disturbing < 1 acre

Use rain barrels, rain gardens, permeable pavements, and/or other stormwater best management practices to control and treat the stormwater runoff from all built upon areas of the site from the first 1.5 inches of rain

California – Another way of getting at flow/volume

The Los Angeles Regional Water Quality Control Board has included the following standard in the draft MS4 permit for Ventura County:

Permittees shall require that new development and redevelopment projects control pollutants, pollutant loads, and runoff volume emanating from impervious surfaces through percolation, infiltration, storage, or evapotranspiration, by reducing the percentage of Effective Impervious Area to less than 5 percent of total project area

Michigan MS4 General Permit

- The minimum treatment volume standard shall be one inch of runoff from the entire site (opportunity to establish alternative value)
- Treatment methods designed to achieve:
  - A minimum of 80% TSS removal of TSS; or
  - Discharge concentration of TSS not to exceed 80 mg/l
- Channel protection criteria: post-development runoff volume and peak flows at or below existing levels up to a 2-year 24-hour storm

Ohio MS4 General Permit

- **Large Construction Activities.** For all large construction activities (> 5 acres) post construction BMP(s) must be planned and implemented to detain storm water runoff for protection of the stream channels, stream erosion control, and protecting water quality.
- The BMP(s) chosen must be sized to treat the water quality volume (WQv) and meet Water Quality Standards
  - The WQv shall be equivalent to the volume of runoff from a 0.75-inch rainfall

Ohio MS4 General Permit (continued)

- **Large Construction Activities.** An additional volume equal to 20 percent of the WQv shall be incorporated into the BMP for sediment storage
- Ohio EPA may authorize the offsite mitigation of the post-construction requirements on a case by case basis
- The size of the structural post-construction can be reduced by incorporating non-structural post-construction BMPs into the design.
  - Practices such as preserving open space will reduce the runoff coefficient and, thus, the WQv.
  - Encourages the implementation of riparian and wetland setbacks.
- Practices which reduce stormwater runoff include permeable pavements, green roofs, rain barrels, conservation development, smart growth, low-impact development, and other site design techniques contained in the Ohio Balanced Growth Program

West Virginia

Manage a 1-inch storm

West Virginia DEP has issued a small MS4 permit with performance standards for new and redevelopment projects:

Performance Standards. The permittee must implement and enforce via ordinance and/or other enforceable mechanism(s) the following requirements for new and redevelopment: […] Site design standards for all new and redevelopment that require, in combination or alone, management measures that infiltrate, evapotranspirate and reuse of, at a minimum, the first one inch of rainfall from a 24-hour storm. This first one inch of rainfall must be 100% managed with no discharge to surface waters

Is Managing a 1-Inch Storm Roughly Equivalent to Pre-Development Hydrology?

Just about…

- Under most conditions in the Midwest and Mideast it is estimated that under predevelopment conditions 80-90% of the annual stormwater volume was infiltrated or evapotranspirated
- This generally corresponds to control of a 1 inch storm with green infrastructure techniques (infiltration, plant uptake or storage for reuse with no discharge)

Measuring/Quantifying Big Darby CGP

- Pre-development and post-development groundwater recharge shall be calculated using the following equation:

  Vrex = Ax * Drex / 12

  where:

  X = Represents a land use and hydrologic soil group pair

  Vrex = Volume of total annual recharge from land use-soil group X (in acre-ft)

  Drex = Depth of total annual recharge associated with land-use-soil group X from Tables 1 or 2 (in inches)

  Ax = Area of land use-soil group X (in acres)

Maintenance and Assurances
Language In Wisconsin CGP

- For any permanent structures, provisions shall be made for long-term maintenance with the municipality or other responsible party.
- For an NOI submitted to the Department, **a copy of the signed long-term maintenance agreement shall be submitted to the Department with the NOI** unless the Department agrees that it may be submitted by an alternative date prior to termination of permit coverage.
- The Department may withhold permit coverage until the long-term maintenance agreement is submitted to the Department.

Maintenance and Assurances
Big Darby Creek CGP

- Protection of open space (infiltration areas) shall be by binding conservation easements that identify a third party management agency, such as a homeowners association/condominium association, political jurisdiction or third party land trust.

Stormwater Runoff Requirements for Federal Development Projects

The sponsor of any development or redevelopment project involving a Federal facility with a footprint that exceeds 5,000 square feet shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow

Requirements to Manage Flow and Address Hydrology have the effect of Encouraging Green Infrastructure Solutions

Green Infrastructure Practices:

- Increase Infiltration
- Increase Evapotranspiration
- Store and reuse stormwater
- **Reduce the Volume of Runoff**

Green Infrastructure SEPs

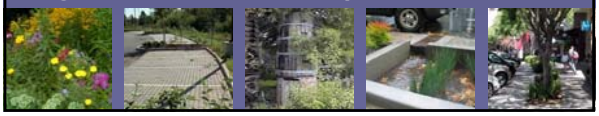
- **Baltimore County, Maryland** Restoration of several stream areas degraded by urban impacts
- **Washington Suburban Sanitary Commission, Maryland** Establishment of conservation easements and/or purchasing undeveloped real estate to reduce pollutant flows and assisting certain low income residents to disconnect storm water drains
- **Atlanta, Georgia** A $27.5 M greenway acquisition project to acquire and maintain greenway areas along designated streams and clean up along select streams
- **District of Columbia Water and Sewer Authority** $1.7 million for low impact development projects throughout the District, and a $300 k green roof demonstration project;
- **Cincinnati, Ohio** $5.3 million for a greenway project, in-stream habitat restoration, and plan for a landfill;
- **Honolulu, Hawaii** $20 million for a water re-use project, and $10 million for a sludge re-use project;

Green Infrastructure SEPs

- **Jefferson County, Alabama** -- $30 million for greenway and stream buffer project,
- **Toledo, Ohio** -- $1.0 million for restoring and providing public access to wetlands in the Duck Creek basin near the east bank of the Maumee River, and cleaning up contaminated properties near the Ottawa River;
- **Sanitation Dist No. 1 of Northern Kentucky** -- $0.636 million to reduce excess flows into the sewer system from residences and to extend sewer service to areas currently served by defective septic tanks or straight pipes discharging raw sewage; four State projects involving land conservation, monitoring of water quality, public education on water quality issues, and watershed restoration.

Green Infrastructure in a CSO LTCP

- The planned level of green infrastructure implementation (activities)
- Performance contribution of green infrastructure (gallons)
- Methods and milestones for tracking/ measuring, monitoring the effects of green infrastructure implementation



Quantifying the Degree of Green Infrastructure Implementation

In New Jersey, 90% of rainfall events are less than 1.25 in., approximately 44 total in. of rain per year. If rain gardens are sized to handle 1.25 inches of rain from a drainage area of 1,000 sq. ft., each rain garden will take in 25,000 gallons per year.

Build 40 of these gardens in your neighborhood and you keep 1,000,000 gallons of rain water out of your system annually!

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Adaptive Management

- Through the measurement and monitoring work we will learn a great deal about green infrastructure implementation and effectiveness
  - For example, after some initial implementation steps we may find that efforts to install green roofs are achieving good success, but we are having problems with some infiltration techniques
- Using an adaptive management approach allows us to adjust some of the specific elements of the green infrastructure program based on what we learn as work proceeds
- A clear, solid green infrastructure implementation target, but provide for opportunities to fine-tune approaches in terms of exactly how the target is met

Bob Newport
U.S. EPA Region 5
newport.bob@epa.gov
www.epa.gov/greeninfrastructure