TMDL and Stormwater Regulations & Policy: Recent Developments and their Implications for MS4 Permit Holders

Michael F. Bloom, PE, CFM, BCEE

TOPICS

• Legal framework
• Change drivers
• Non-traditional TMDLs
• Volume control rule
• Stormwater BMP volume performance
• Integrated planning
• Green infrastructure / LID
• Summary
LEGAL FRAMEWORK

• Federal Water Pollution Control Act Amendments of 1972
  • Quality objectives
  • Grants program
  • National Pollutant Discharge Elimination System (NPDES)

• Water Quality Act of 1987
  • State Revolving Loan Fund
  • National estuary programs
  • Nonpoint source programs
  • Stormwater added to NPDES
Stormwater permits shall:

*require controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and system(s), design and engineering methods, and such other provisions as the Administrator or State determines appropriate for the control of such pollutants*

“MEP”
TOTAL MAXIMUM DAILY LOADS

WQ Standard

TMDL = WLA + LA + MOS

CHANGE DRIVERS
1996 INTERIM PERMITTING APPROACH

- Numeric WQBELs not required
- WQBELs can be BMPs
- WQBELs apply to MS4 permits

CONGRESSIONAL SCRUTINY OF STORMWATER PROGRAM
MEMORANDUM

SUBJECT: Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs

FROM: Robert H. Wayland, III, Director
Office of Wetlands, Oceans and Watersheds
James A. Haxton, Director
Office of Wastewater Management

TO: Water Division Directors
Regions 1 - 10

2002 TMDL-MS4 MEMORANDUM

• Permitted storm water must be addressed in WLA and not in the LA
• Unpermitted storm water may be addressed in LA
• May use “category” WLAs for groups of MS4 dischargers (define narrowly)
<table>
<thead>
<tr>
<th>2002 TMDL-MS4 MEMORANDUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>• WLAs and LAs must be numeric in TMDL</td>
</tr>
<tr>
<td>• MS4 permits consistent with assumptions and requirements of WLA</td>
</tr>
<tr>
<td>• WQBELs may be expressed in the form of BMPs</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>2002 TMDL-MS4 MEMORANDUM</th>
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</thead>
<tbody>
<tr>
<td>• Numeric WQBELs expected to be used only in rare instances</td>
</tr>
<tr>
<td>• When BMPs are imposed to implement TMDL WLAs the administrative record needs to support that BMPs are expected to be sufficient to implement the WLA</td>
</tr>
<tr>
<td>• MS4 permits must also specify the monitoring necessary to determine compliance with effluent limitations</td>
</tr>
</tbody>
</table>
2002 TMDL-MS4 MEMORANDUM

- Permits with BMP-based effluent limitations should specify monitoring needed to assess BMP load reductions are achieved (BMP performance data)
- Use iterative, adaptive management approach using best management practices

2008 NRC REPORT

- Summary of stormwater impacts
- Literature review
- Program recommendations
- Use flow as surrogate
- Control flow to reduce impacts
- Imposed pollutant benchmarks
- Use numeric limits in permits
- Monitor holistically
- Permit on watershed basis
- Require retrofitting
**BERNARD FOWLER VS. EPA, FILED JANUARY 2009**

- Lawsuit by C. Bernard Fowler, the Chesapeake Bay Foundation, and others against the EPA
- Alleged EPA failed to:
  - Comply with Clean Water Act to restore and preserve the Chesapeake Bay
  - Develop and adopt total maximum daily loads (TMDLs) for nutrients and sediment for the Bay

**REQUEST FOR STAKEHOLDER INPUT – DEC. 2009**

- EPA “takes seriously” the findings of the NRC report
- To propose requirements, including design or performance standards for development
- Input requested on
  - Retention practices
  - BMP costs
  - Retrofitting
  - Monitoring results
REQUEST FOR STAKEHOLDER INPUT – DEC. 2009

• Input requested on
  • Expanding regulated area
  • New development requirements
  • Merging Phase I and II
  • Retrofitting
  • Use of stream buffers or additional requirements
• Final action by November 2012

PERMIT IMPROVEMENT GUIDE – APRIL 2010

MS4 Permit Improvement Guide

• EPA headquarters pushing Regions and states to write more prescriptive small MS4 permits
• Examples:
  • Inspect all catch basins at defined frequency
  • Clean all catch basins if more than 33% full
  • Evaluate all streets for sweeping priority
  • Sweep certain streets at defined frequency
  • Develop a retrofit plan for existing sites impacting water quality
INFORMATION COLLECTION REQUEST – MAY 2010

- Clean Water Act Section 308 data collection
- Mandatory questionnaires to
  - Development entities
  - MS4 operators
  - Departments of transportation
  - State regulatory agencies

BERNARD FOWLER VS. EPA, SETTLED MAY 2010

Settlement Terms

- By September 30, 2011 EPA must propose regulations that:
  - Expand the universe of regulated stormwater discharges
  - Regulate stormwater discharges from newly developed and redeveloped sites
  - Revise stormwater requirements to more effectively achieve the objectives of the Chesapeake Bay TMDL
BERNARD FOWLER VS. EPA, SETTLED MAY 2010

Settlement Terms

• In developing the rules, EPA must consider the following elements both nationally and in the Bay watershed:
  • Additional requirements to address stormwater from newly developed and redeveloped sites
  • Requiring development and implementation of retrofit plans by MS4s
  • Expanding the definition of “regulated MS4s”

• By November 19, 2012 EPA must take final action on the regulation

PENDING NEW DEVELOPMENT REGULATION

• Match predevelopment water balance and hydrology?
• Impose retention requirements (75th, 85th, or 95th percentile)
• Require discharge treatment?
• Impose different standards for new development vs. redevelopment?
• Apply to sites above a certain size?
• Apply globally to all sites inside regulated MS4s?
• What kind of sites?
• Require detailed hydrologic analysis?
MEMORANDUM
SUBJECT: Revisions to the November 22, 2002 Memorandum “Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit Requirements Based on Those WLAs”
FROM: James A. Hardon, Director
Office of Wastewater Management
Denise Kechnor, Director
Office of Wetlands, Oceans and Watersheds
TO: Water Management Division Directors
Regions 1 - 10

2010 MEMORANDUM - BACKGROUND

- EPA summary of experiences since 2002:
  - Considerable stormwater TMDL experience
  - Increased technical capacity to monitor stormwater
  - Better BMP effectiveness information
- Justification for revisions relating to:
  - Numeric water quality based limits (WQBELs) in stormwater permits
  - Disaggregating stormwater sources in WLAs
  - Using surrogates for pollutants to establish TMDL targets
  - Designating additional stormwater sources for permitting
- EPA will consider making more revisions in the future
2010 MEMORANDUM
NUMERIC WATER QUALITY BASED EFFLUENT LIMITS

• Clarify permit requirements
• Improve accountability and enforceability
• Expressed as:
  • Pollutant concentration
  • Pollutant load
  • Flow volume (surrogate)
  • Flow percentage (surrogate)
  • Amount of impervious cover (surrogate)
• Use in “rare instances” --- > Use “where feasible”

2010 MEMORANDUM
NUMERIC WQBELS – USING BMPS

• Include objective and measurable elements as enforceable provisions
• Schedules of BMP installation
• Levels of BMP performance
• Include numeric benchmarks with monitoring requirements and protocols
• If exceeded, require permittee to take additional actions
• BMP evaluations, implementing additional BMPs, etc.
2010 MEMORANDUM
NUMERIC WQBELS – USING SURROGATES

• If WLA uses surrogate, then WQBEL in permit can use surrogate
• If WLA is numeric, then WQBEL in permit should, where feasible, be numeric

2010 MEMORANDUM
SCHEDULE AND COMPLIANCE MONITORING

• Effluent limitations must be met “as soon as possible”
• Publish sound rationale for compliance schedule
• Consider TMDL implementation plan
• Consider whether and how to impose enforceable interim dates in permit compliance schedule
• Specify monitoring needed to determine compliance with BMP-style effluent limitations
2010 MEMORANDUM
DISAGGREGATED ALLOCATIONS

- Aggregated allocations (2002)
  - Require less data to establish
  - Unclear basis for permits
  - Unclear who does what
- Now have better
  - Data
  - Experience
- Disaggregated allocations now recommended
  - Defined narrowly for MS4, industrial, and construction sources

2010 MEMORANDUM
USING SURROGATES

- Possible surrogates
  - Flow
  - Imperviousness
  - Volume
- Used for impaired waters impacted by
  - Hydrologic changes
  - Biological degradation
  - Habitat alteration
2010 MEMORANDUM
USING SURROGATES

- Establish numeric target for surrogate that is expected to result in standards attainment
- TMDL must demonstrate linkage between surrogate and impairment

2010 MEMORANDUM
DESIGNATING ADDITIONAL SOURCES

- States and EPA have not used existing “designation authority”
- Permits “afford a more effective mechanism to reduce pollutants ... than available nonpoint source control methods”
- Include permitted sources in WLA
NON-TRADITIONAL TMDLs

FLOW SURROGATE TMDL

- Aquatic life use impairment observed through biological assessments
- Watershed is 30,000 acres of developed land (73% urban)
- “Most probable” stressor is sedimentation caused by stormwater runoff
- Sediment rating curve generated, reductions in flow will yield reductions in sediment load
- Reference stream used to determine end point
Table 6-10: Summary of Existing and Allocated Stormwater Flows

<table>
<thead>
<tr>
<th>Source</th>
<th>Allocation Category</th>
<th>Acres</th>
<th>Existing Conditions (ft³/acre-day)</th>
<th>Allocation (ft³/acre-day)</th>
<th>Percent Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Point Sources (WLA)</td>
<td>MS4 Permits</td>
<td>25,237.7</td>
<td>1,086.1</td>
<td>551.9</td>
<td>49.2%</td>
</tr>
<tr>
<td></td>
<td>Construction Stormwater Permits</td>
<td>1,515.4</td>
<td>76.4</td>
<td>34.1</td>
<td>55.4%</td>
</tr>
<tr>
<td></td>
<td>Industrial Stormwater Permits</td>
<td>674.8</td>
<td>34.6</td>
<td>15.44</td>
<td>55.4%</td>
</tr>
<tr>
<td><strong>WLA Totals</strong></td>
<td></td>
<td><strong>27,427.8</strong></td>
<td><strong>1,197.2</strong></td>
<td><strong>601.42</strong></td>
<td><strong>49.8%</strong></td>
</tr>
<tr>
<td>Nonpoint Sources (LA)</td>
<td>2,879.2</td>
<td>124.5</td>
<td>63.74</td>
<td></td>
<td>48.8%</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td></td>
<td><strong>30,307</strong></td>
<td><strong>1,321.7</strong></td>
<td><strong>665.16</strong></td>
<td><strong>49.7%</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>State or Locality</th>
<th>Size Threshold</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anchorage, AK (2009)</td>
<td>10,000 sq. ft.</td>
<td>Retain runoff from first 0.52” of rain. (24 hour event, 48 hour antecedent dry period)</td>
</tr>
<tr>
<td>Denver, CO</td>
<td>1 acre</td>
<td>Manage excess urban runoff volume (approximately 1” for Denver).</td>
</tr>
<tr>
<td>Montana (2009)</td>
<td>1 acre</td>
<td>Infiltrate, evapo-transpire, or capture for reuse runoff from first 0.5” of rain.</td>
</tr>
<tr>
<td>Washington DC (2011)</td>
<td>5,000 sq. ft.</td>
<td>Onsite retention and use of first 1.2” of rain. (24 hour event, 72 hour antecedent dry period)</td>
</tr>
<tr>
<td>West Virginia (2009)</td>
<td>1 acre</td>
<td>Keep and manage on site 1” rain. (24 hour event, 48 hour antecedent dry period)</td>
</tr>
<tr>
<td>Wisconsin (2010)</td>
<td>1 acre</td>
<td>Infiltrate runoff to achieve 60% to 90% of predevelopment volume based on impervious cover level.</td>
</tr>
</tbody>
</table>
HOW PERFORMANCE STANDARD COULD BE MET

• Reduce impervious cover
• Use stormwater controls which infiltrate or evapo-transpire water
• Harvest and use the rain water
• Proper operation and maintenance
• Discharge treatment
• Off-site mitigation
• Payment in lieu of

FACTORS TO CONSIDER

• Infiltration rates
• Soil types
• Infiltration rates
• Evaporation rates
• Rainfall
• Temperature
• Humidity
• Demand for water
• Irrigation acreage
85th Percentile Precipitation Depths (Inches)
95th Percentile Precipitation Depths (Inches)

Percent of Rainfall Events* Less Than or Equal to Event Depth
Houston Hobby Airport Climate Station
Rainfall Record Jan 1, 1948- April 30, 2010

Event Depth (in)

Percent Less Than (%)
Percent of Rainfall Events\(^1\) Less Than or Equal to Event Depth

Houston Hobby Airport Climate Station
Rainfall Record Jan 1, 1948- April 30, 2010

\(^1\)Event defined as rainfall of at least 0.1" with a minimum inter-event time of 6 hours. Analysis conducted using EPA SWMM 5.0.

CLAY CONTENT OF SURFACE SOILS

CLAY CONTENT OF SURFACE SOILS

KEY ISSUES

- National stormwater rulemaking is pending
- Region 6 states are compelled to write MS4 permits consistent with rule, when finalized
- Region 6 MS4 permits will be impacted
- Land development in region will be impacted

STORMWATER BMP VOLUME PERFORMANCE

VOLUME REDUCTION AND THE BMP DATABASE

- Volumetric data available in database
- Exclude studies with data quality issues
- Useful data include
  - 1,900 paired events
  - 60 studies

Bioretention without Underdrains
(Events < 2.5 watershed-cm)

Analysis Dataset (n=1096) — Outflow = Inflow


Bioretention with Underdrains
(Events < 2.5 watershed-cm)

Analysis Dataset (n=533) — Outflow = Inflow

SELECTED CONCLUSIONS FOR VOLUME REDUCTION

- Normally-dry vegetated BMPs have substantial potential for volume reduction:
  - 30% for filter strips and grass-lined detention basins
  - 40% for grass swales
  - >50% for bioretention with underdrains
- Retention ponds and wetland basins and channels do not appear to provide substantial volume reduction on average
- Design details matter
- Site conditions matter

INTEGRATED PLANNING MEMO

MEMORANDUM

SUBJECT: Achieving Water Quality Through Integrated Municipal Stormwater and Wastewater Plans

FROM: Nancy Stoner
Acting Assistant Administrator
Office of Water (OW)

Cynthia Giles
Assistant Administrator
Office of Enforcement and Compliance Assurance (OECA)

TO: EPA Regional Administrators, OW & OECA Office & Division Directors

INTEGRATED PLANNING APPROACH FRAMEWORK

MEMORANDUM

SUBJECT: Integrated Municipal Stormwater and Wastewater Planning Approach Framework

FROM: Nancy Stoner
Acting Assistant Administrator
Office of Water

Cynthia Giles
Assistant Administrator
Office of Enforcement and Compliance Assurance

TO: EPA Regional Administrators
Regional Permit and Enforcement Division Directors
INTEGRATED PLAN PRINCIPALS

- Maintain existing regulatory standards
- Balance requirements to address most pressing issues first
- Assign responsibility for planning to municipalities
- Innovative technologies (green infrastructure) are important tools that can generated many benefits, and may be fundamental aspects for integrated solutions

PLAN ELEMENTS

- Describe water quality, human health and regulatory issues to be addressed
- Describe existing wastewater and stormwater systems and provide summary of current performance
- Outline stakeholder process
- Define process for identifying, evaluating, and selecting alternatives
- Describe process for proposing implementation schedules
- Outline process for measuring success
- Define process for making improvements to the plan
PLAN IMPLEMENTATION

- Permits
  - Reopener provisions
  - Appropriate compliance schedules
  - Green infrastructure approaches
  - Water quality trading
- Enforcement actions
  - Consent decrees
  - Administrative orders

GREEN INFRASTRUCTURE / LID
WHAT IS LID?

- Innovative stormwater management approach
- Use distributed, micro-scale controls
  - Rain gardens
  - Biofiltration units
  - Rainwater cisterns
  - Vegetated swales
  - Reduced imperviousness
- Mimic predevelopment hydrology
  - Harvest
  - Evaporate
  - Infiltrate
- View stormwater as a resource
Green = Pre-development
Red = Post-Development – No Controls
Blue = Post-Development – Conventional Controls

Increased Volume
Increased Duration
Increased Frequency

Runoff Flow Rate

POST-DEVELOPMENT WITH CONVENTIONAL CONTROLS

PRE-DEVELOPMENT

FLOW & VOLUME CONTROL PRACTICES
SUMMARY

- Legal framework
- Change drivers
- Non-traditional TMDLs
- Volume control rule
- Stormwater BMP volume performance
- Integrated planning
- Green infrastructure / LID
- Summary
QUESTIONS?

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