Watershed Restoration as a Driver for TMDL Action

November 3, 2014
Montgomery County, Maryland

507 square miles
Over 1,000,000 residents
Near Washington DC & Baltimore
Incorporated cities – Rockville, Gaithersburg
Unincorporated locales – Bethesda, Silver Spring, Germantown

About 11% imperviousness
Over 1,500 miles of streams
Montgomery County’s “Stormwater Permit”

• Issued by Maryland Department of the Environment (DEP)
• Permit term of five years
• First permit issued in 1996
• Third permit issued in 2010
• Phase 1 permit with co-permittees (MCPS, 5 towns, 1 village)
• Does not cover agricultural lands and areas covered under other MS4 permits
• Model for subsequent “3rd generation” permits in Maryland
Requirements for Current Stormwater Permit

Accelerate watershed restoration and Achieve reductions for Total Maximum Daily Loads (TMDLs)

- Use Environmental Site Design (ESD) to MEP
- Inter-agency coordination
- Assure public input and stewardship opportunities
- Discharge characterization
- Source identification
- Monitoring
- Stormwater facility inspection and maintenance enforcement
- Annual reporting
- Illicit discharge detection and elimination
Accelerating Watershed Restoration

Restore 20% of existing impervious area that is not currently treated

- Total County Area: 507 sq mi
- Impervious Surface: 56.2 sq mi (11%)
- MS4 permit area: 216.6 sq mi (43%)
- MS4 permit Imp. Surface: 39.2 sq mi
  (18% of MS4 area)
Accelerating Watershed Restoration

County Progress to Date (per FY13 Annual Report)

- Completed = 548 impervious acres
- Under construction = 185 impervious acres
- In design = 2,425 impervious acres (33 task orders, 120+ individual projects)
- Scheduled for design = 476 impervious acres
- Internal and external partnership projects = 342 impervious acres

County MS4 area with MEP Stormwater Management:

5,239 (21%)

Under/Un-Controlled Impervious Area subject to MS4 permit:

19,880 acres (79.3%)

Impervious Area to Restore During Current Permit Cycle:

3,976 acres (20%)
Achieving Reductions for TMDLs

County Watersheds on Maryland’s Impaired List, January 2014

20+ local TMDLs
Phosphorus
Nutrients
Sediment
Bacteria
PCBs
Trash

EPA approved TMDLs shown in red
County Progress to Date (per FY13 Annual Report)

• Achieving reductions for Total Maximum Daily Loads (TMDLs)
  • Watershed implementation plans (WIPs) developed in 2012
  • Multiple WIPs currently in progress or being updated
Meeting MS4 Permit and TMDL Requirements

How do we do this?

Watershed assessment approach is the framework for identifying and directing restoration projects for MS4 Permit and TMDL compliance.
Watershed Study Process

1. Identify Watershed
2. Data Collection
3. Data Analysis and Prioritize Projects
4. Public Meeting
5. Draft Watershed Assessment
6. Finalize and Publish Watershed Assessment
7. Watershed Implementation Plan
1. Identify Watershed
2. Data Collection

Desktop Analysis (Focus in the MS4 area)

Upland Projects
- Large stormwater outfalls
- Large contiguous impervious surfaces
- Neighborhoods with HOAs
- high property ownership
- Large unforested areas

Stream Projects
- Stream corridors not previously assessed
- Known problem areas (erosion, localized flooding, etc.)
2. Data Collection

Identify Potential Restoration Projects: Field Work

**Upland:**
- RainScapes in Neighborhoods
- New Best Management Practices (BMPs)
- Retrofits of Existing BMPs
- Reforestation Sites

**Stream Corridor:**
- Stream Restoration
- Outfall Repair/Restoration
- Riparian Reforestation
2. Data Collection

Field Assessments for Upland Projects

New BMPs – Modified CWP RRI

<table>
<thead>
<tr>
<th>Drainage Area to Proposed BMP(s)</th>
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</thead>
<tbody>
<tr>
<td>Drainage Area (sq ft)</td>
</tr>
<tr>
<td>Imperviousness (percent)</td>
</tr>
<tr>
<td>Proposed Location</td>
</tr>
<tr>
<td>Imperviousness Area (sq ft)</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Existing Stormwater Management</th>
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<tbody>
<tr>
<td>Existing Stormwater Practice</td>
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<tr>
<td>Existing storm drain mapping</td>
</tr>
<tr>
<td>Existing Site Conditions (drainage, conveyance)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Proposed New BMP</th>
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<tbody>
<tr>
<td>Number of BMP(s) Identified</td>
</tr>
<tr>
<td>New BMP Purpose</td>
</tr>
<tr>
<td>New BMP Target Storage</td>
</tr>
<tr>
<td>New BMP Available Storage (ft3)</td>
</tr>
<tr>
<td>Proposed Treatment Option</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Site Constraints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property for sale or lease</td>
</tr>
<tr>
<td>Adjacent Land Use</td>
</tr>
<tr>
<td>Adjacent Land Use Conflicts</td>
</tr>
<tr>
<td>Site Access</td>
</tr>
<tr>
<td>Utility Conflicts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Soils</th>
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<tbody>
<tr>
<td>Soils - Poor Infiltration</td>
</tr>
<tr>
<td>Soils - Shallow Bedrock</td>
</tr>
<tr>
<td>Soils - High Water Table</td>
</tr>
</tbody>
</table>
3. Data Analysis and Prioritize Projects

- Treatment Potential
- Feasibility
- Cost Effectiveness

Tiered Groupings
3. Data Analysis and Prioritize Projects

Upland Concepts

New BMPs

New BMP Assessment Summary for DSLE-R1-002

Location: 17514-17524 Hoskinson Rd, Poolesville, Montgomery County, MD
Subwatershed: Lower Dry Seneca Creek
Property Ownership: Private (Summerhill HOA)
Assessment ID Description: DSLE-R1-002, Summerhill Homes Residential Parking Lot
Assessment Date: 08-08-2013

Drainage Area: 20,200 square feet, 13,900 square feet Impervious (69%), Residential land use
Major Project Components: Flow Splitter, Bioretention Cell
Targeted Stormwater Criteria: Water Quality, Recharge, Demonstration/Education
Targeted Filter Area / Available Area: 900 square feet / 1,000 square feet
Targeted Water Quality Volume / Provided Storage: 1,100 cubic feet / 1,100 cubic feet
Impervious Cover Treated (Percent of Total): 0.32 acres (100%)
Pollutant Load Reduction: 3.1 lbs/yr TN, 0.5 lbs/yr TP, 0.14 tons/yr TSS

Site Description: Parking stalls, drive lane, and rooftop runoff all drain to the center of the parking lot drive lane and then travel south to a curb inlet in the southwest corner of a parking stall lane (Figure 1). A bioretention cell is proposed for infiltration and filtration in the available open pervious space adjacent to the existing storm drain inlet and yard drain (Figure 2). The inlet can be retrofitted to split flows such that the first flush water quality volume is diverted to the bioretention and larger flows are bypassed to the existing drainage network. The bioretention cell can be designed with an underdrain if parent soils have poor infiltration capacity or to limit ponding periods. Soil types are assumed to be poor for infiltration due to compaction, but no high water table or shallow bedrock is expected. Storm drain invert elevations need to be confirmed, as the existing storm drain mapping is missing from the available DPS GIS database.

Table 1: New BMP Assessment Results

<table>
<thead>
<tr>
<th>Measure</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impervious Cover Treated</td>
<td>0.3 ac</td>
</tr>
<tr>
<td>Subwatershed Biological Condition</td>
<td>Fair</td>
</tr>
<tr>
<td>Site Access</td>
<td>Good</td>
</tr>
<tr>
<td>Utility Conflicts</td>
<td>Many (Sewer, Water, Gas, Cable, Electric)</td>
</tr>
<tr>
<td>Permitting Constraints</td>
<td>None</td>
</tr>
<tr>
<td>Land Use Conflicts</td>
<td>None</td>
</tr>
<tr>
<td>Property Ownership</td>
<td>Private</td>
</tr>
<tr>
<td>Planning Level Design &amp; Construction Cost</td>
<td>$83,600</td>
</tr>
</tbody>
</table>
3. Data Analysis and Prioritize Projects

Planning Level Cost Estimates for New BMPs (King and Hagen)

Multiply contributing impervious acreage by initial unit cost
Add $25,000

<table>
<thead>
<tr>
<th>STORMWATER BMP</th>
<th>COST PER IMPERVIOUS ACRE TREATED</th>
<th>County-based Costs</th>
<th>Lifetime Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(7) Initial Cost</td>
<td>(8) Average Annual Maintenance Cost</td>
<td>(9) Total (Over 20 Years)</td>
</tr>
<tr>
<td>WET PONDS AND WETLANDS (NEW)</td>
<td>$24,115</td>
<td>$763</td>
<td>$39,368</td>
</tr>
<tr>
<td>WET PONDS AND WETLANDS (RETROFIT)</td>
<td>$63,998</td>
<td>$763</td>
<td>$79,251</td>
</tr>
<tr>
<td>DRY DETENTION PONDS (NEW)</td>
<td>$39,000</td>
<td>$1,231</td>
<td>$63,620</td>
</tr>
<tr>
<td>HYDRODYNAMIC STRUCTURES (NEW)</td>
<td>$42,000</td>
<td>$3,531</td>
<td>$112,620</td>
</tr>
<tr>
<td>DRY EXTENDED DETENTION PONDS (NEW)</td>
<td>$39,000</td>
<td>$1,231</td>
<td>$63,620</td>
</tr>
<tr>
<td>DRY EXTENDED DETENTION PONDS (RETROFIT)</td>
<td>$67,500</td>
<td>$1,231</td>
<td>$92,120</td>
</tr>
<tr>
<td>INFILTRATION PRACTICES W/O SAND, VEG. (NEW)</td>
<td>$58,450</td>
<td>$866</td>
<td>$75,770</td>
</tr>
<tr>
<td>INFILTRATION PRACTICES W/ SAND, VEG. (NEW)</td>
<td>$61,250</td>
<td>$906</td>
<td>$79,370</td>
</tr>
<tr>
<td>FILTERING PRACTICES (SAND, ABOVE GROUND)</td>
<td>$49,000</td>
<td>$1,431</td>
<td>$77,495</td>
</tr>
<tr>
<td>FILTERING PRACTICES (SAND, BELOW GROUND)</td>
<td>$56,000</td>
<td>$1,631</td>
<td>$88,620</td>
</tr>
<tr>
<td>BIORETENTION (NEW - SUBURBAN)</td>
<td>$46,875</td>
<td>$1,531</td>
<td>$77,495</td>
</tr>
<tr>
<td>BIORETENTION (RETROFIT - HIGHLY URBAN)</td>
<td>$183,750</td>
<td>$1,531</td>
<td>$214,370</td>
</tr>
<tr>
<td>VEGETATED OPEN CHANNELS</td>
<td>$24,000</td>
<td>$610</td>
<td>$36,207</td>
</tr>
<tr>
<td>BIOSWALE (NEW)</td>
<td>$42,000</td>
<td>$931</td>
<td>$60,620</td>
</tr>
<tr>
<td>PERMEABLE PAVEMENT W/O SAND, VEG. (NEW)</td>
<td>$239,580</td>
<td>$2,188</td>
<td>$283,347</td>
</tr>
<tr>
<td>PERMEABLE PAVEMENT W/ SAND, VEG. (NEW)</td>
<td>$335,412</td>
<td>$3,060</td>
<td>$396,603</td>
</tr>
<tr>
<td>IMPERVIOUS URBAN SURFACE REDUCTION TO PERVERIOUS</td>
<td>$96,250</td>
<td>$885</td>
<td>$113,957</td>
</tr>
</tbody>
</table>
4. Public Meetings
5&6. Watershed Assessment

Watershed Treatment Model, WTM (Center for Watershed Protection)

- **Land Use**
  - EMC (Urban)
  - Unit Load (Non-urban)

- **Soils & Rainfall**
  - Annual Runoff Volume

- **Pollutant Load**
  - Before treatment

- **BMPs**
  - Performance Code
  - Removal Efficiency

- **Discount Factors**
  - BMP specific
  - Treatability Factor

- **Pollutant Reduction**
  - Applied to baseline load
5&6. Watershed Assessment

Resource for Determining WLA

Recommendations of the Expert Panel to Define Removal Rates for Individual Stream Restoration Projects

Joe Berg, Josh Burch, Deb Cappuccitti, Solange Filho, Lisa Frailey-McNeal, Dave Goerman, Natural Hardman, Sujay Kaushal, Dan Modini, Matt Meyers, Bob Kerr, Steve Stewart, Bethiela Sullivan, Robert Waller and Julie Zinners

Accepted by Urban Stormwater Work Group: February 19, 2013
Approved by Watershed Technical Work Group: April 5, 2013
Final Approval by Water Quality Goal Implementation Team: May 13, 2013
Test-Drive Revisions Approved by the Expert Panel: January 17, 2014

Prepared by:
Tom Schudler, Chesapeake Stormwater Network and
Bill Stack, Center for Watershed Protection
## 5&6. Watershed Assessment

<table>
<thead>
<tr>
<th>Implementation Phase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTM Baseline Conditions</td>
<td>The WTM was run under existing conditions approach with the MDP year 2002 land use/land cover data and existing BMPs.</td>
</tr>
<tr>
<td>WTM 2.0 Completed as of 2009; High Priority; Low Priority and Other Potential Projects</td>
<td>The WTM was run with a series of future management practices, which were proposed projects from the County inventory of restoration sites. These practices cover new ponds, retrofits of existing BMPs, and some ESD practices from the proposed projects list.</td>
</tr>
<tr>
<td>WTM 3.0 ESD Strategies and Other Structural BMPs</td>
<td>The County’s inventory for other project types that include public properties (e.g., libraries and parking lots), public schools, and open section roads available for ESD retrofits was reviewed, as were areas for private property ESD retrofits.</td>
</tr>
<tr>
<td>WTM 4.0 Habitat Restoration</td>
<td>This category includes any pollutant reduction or volume reduction that can be attributed to specific stream rehabilitation, wetland restoration and or riparian reforestation projects planned for construction in the watershed for the permit cycle</td>
</tr>
<tr>
<td>WTM 5.0 MS4 Programmatic Practices</td>
<td>See description above.</td>
</tr>
</tbody>
</table>
7. Watershed Implementation Plan
7. Watershed Implementation Plan

Identifies stormwater management projects, watershed restoration projects and programmatic actions

Present potential pollutant load reduction

Determines ability to meet applicable TMDLs

Provided a schedule and cost estimate for meeting TMDLs
Countywide Coordinated Implementation Strategy

Prioritization across County

Driven by compliance vs. current funding
Conclusions

- Facilitates identification of cost-effective measures to meet TMDL requirements
- Allows discussion and ranking across restoration project types
- Provides a framework for making decisions within watershed health and biological uplift context
- Modeling at the watershed scale helps to determine how much implementation is needed
87th Annual WEFTEC Conference

Watershed Restoration as a Driver for TMDL Action

November 3, 2014

Thank you!

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