The Watershed Resources Registry (WRR)

An Innovative, Collaborative Approach to Improving Regulatory Streamlining, and Achieving Sustainable Watershed Restoration & Protection

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AASHTO 2014 National Stormwater Practitioners Meeting
July 31, 2014
Washington, D.C.
Coming together is a beginning; keeping together is progress; working together is success.

Henry Ford
History

- A collaborative national/regional pilot that grew out of the **Green Highways Partnership** and the Maryland State Highway Administration (MDSHA) proposal for making the Route 301 Project the 1st **Green Highway** in Maryland.

- **Purpose 1**: Develop transferable framework for integrated watershed management to address the Federal Compensatory Mitigation Rule – ultimately enabling creation of “watershed banking” capability.

- **Purpose 2**: Achieve increased regulatory efficiencies through integration of CWA Sections 401, 402, and 404 (303(d), 319, etc.) in a watershed context – thereby also enabling greener (more sustainable) stormwater management.
What is the WRR?

• It is a comprehensive replicable framework and GIS-based targeting tool that:
  – Integrates and streamlines regulatory programs
  – Guides resource planners
  – Saves time and $$, and increases program efficiencies
  – Screens for preferred actions and maximizes watershed benefits
  – Is transparent, predictable and reliable
  – Facilitates multiagency input and coordination
Why is the WRR unique?

Unlike many mapping and targeting tools...

There is extensive participation by federal, state and local government, including:

- EPA
- USACE
- FWS
- MES
- FHWA
- MDE
- MDNR
- MDP
- MDSHA
- ICPRB
- County Governments

There is agency collaboration and program integration between:

- CWA 319, 401,402,404, 303(d)
  - Watershed planning, permit review, mitigation assessments
  - TMDL and WIP applications
  - Stormwater management
- NEPA review
- Green Print and Rural Legacy priorities
- Section 7 (Endangered Species Act)
- Transportation and land use planning
- Resource conservation/ environmental resource planning
Interagency Partnering - Objectives:

• 1. Integrate watershed data from multiple agencies and programs in a single database

• Increase decision-making efficiency regarding users’ particular priorities

• Achieve secondary benefits to watershed as a whole; the decision of one regulator or planner aids the priority of another.

• Addresses both agency and watershed needs
2. Increase regulatory and non-regulatory program integration via the watershed approach

- Begin with CWA 401, 404, 402, 303(d), and 319
- Provide support to local planning & watershed efforts
- Seek best ways to coordinate and streamline application of regulatory tools to address greatest watershed-driven resource needs for sustainable performance & results
• 3. Streamline and improve regulatory efficiencies and resource planning via minimization of redundancies in decision-making

• Ensure compliance with federal compensatory mitigation rule

• Incorporate all information into the decision-making framework for regulators, planners, nongovernmental organizations, permit applicants, industry, and others.
Linked permit process with NEPA

Collaborative decision making process among agencies – linked review of 7-11 additional processes & resources

Collaborative decision-making process with GIS and Ecological Analysis tool

Watershed based analysis tool used to streamline many agency decision-making processes. Collaborative development of tool by multiple regulatory agencies

**WRR NEPA Streamlining & Regulatory Efficiency**

<table>
<thead>
<tr>
<th>Time &amp; Dollar Savings</th>
<th>Other Benefits</th>
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<tbody>
<tr>
<td>60 to 80% time reduction &amp; 10-13% cost reduction</td>
<td>Brought the 401/404 regulators evaluations into the NEPA phase of project development thereby reducing redesign and re-analysis of project designs after NEPA</td>
</tr>
<tr>
<td><strong>5.6 Yrs Reduced to ~ 2 Yrs</strong></td>
<td>Provided a framework for integrated and collaborative decision-making. Allowed Regulatory/Resource agencies to deliberate a balance decision among varied resources</td>
</tr>
<tr>
<td>Additional 20 to 30% time and cost reduction</td>
<td>~ 1-1.2 yr</td>
</tr>
<tr>
<td><strong>Additional 30% reduction in time and cost with decisions based on integrated ecological analysis</strong></td>
<td>Provides a broader regional or ecosystem analysis for infrastructure processes. Identification and evaluation of impacts and also assists in developing regional conservation planning.</td>
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<tr>
<td>~ 9 mos – 1 yr</td>
<td>Multiple endusers for WRR tool from private sector to many levels of public sector. Can encompass planning &amp; project development &amp; permitting and regulatory/non-regulatory analyses.</td>
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</tbody>
</table>

WRR can provide an additional 50% reduction in each step of the process that involves data collection, analysis, and evaluation

~ 4-5 mos (Projected)
Standard (MD) CWA 401/404 Permit Process

Corps permit reviewer meets with applicant to explain requirements of 404 including the amount and type of aquatic resource information needed.

Currently 66% or more of applications are not considered complete at time of submittal and often require several iterations before considered federally complete.

Analyzing alternatives including avoidance & minimization can require numerous iterations of data gathering and analysis including field reviews. This includes determination of potential mitigation sites.

Average Time: 120 days

CWA 401/404 Permit Process with WRR

Corps permit reviewer can show the applicant to the WRR website/tool and explain the process and information requirements. Reviewer at this time could ascertain the Corps jurisdiction on the project.

The WRR can assist applicants in submitting complete permits quicker and with less revisions. Permit Reviewer will be able to ascertain jurisdiction and type of permit earlier. Initial WRR Perf. Target = Reduce 66% to 30% or less.

Applicant, permit reviewer and agencies can work to identify any additional avoidance & minimization changes using the WRR. Also potential mitigation sites can be evaluated using the WRR. Field reviews can be expedited.

Projected Average Time: 60-80 days
WRR Suitability Analyses (SA)

- Upland Preservation
- Upland Restoration
- Wetland Preservation
- Wetland Restoration
- Riparian Zone Preservation
- Riparian Zone Restoration
- Preserve Healthy Stormwater Systems
- Restore Degraded Stormwater Systems
Factors for Preserving Healthy Natural Stormwater Infrastructure

**Relative Factors**
- in a Blue Infrastructure watershed
- in area with well-drained soils
- in a 100-year (1 point) or 500-year (½ point) floodplain
- within 100 ft (1 point) or 500 ft (½ point) of an impaired (303-D listed) stream
- in a Tier II watershed
- in a Stronghold Watershed (1 point for “1”; ½ point for “2”)
- in Chesapeake Bay Commission Critical Area (LDA or RCA only)
- in a Green Infrastructure hub or corridor
- in an area of potential Forest Interior Dwellings Species Habitat

**Absolute Factors**
- is forested riparian buffer (1 point if within 200 ft of stream; 2/3 point if within 400 ft of stream; 1/3 point if within 600 ft of stream)
- is relatively high in impervious surfaces
- is forested near (200 ft) or in an area where impervious surfaces are relatively higher
- in an unprotected Targeted Ecological Area (GreenPrint)
- is within 200 ft of a protected Targeted Ecological Area (GreenPrint)
- is near (200 ft) but not in a protected Targeted Ecological Area (GreenPrint)
- in a Priority Funding Area
- in a wetland

**Absolute Factors**
- cannot already be protected
- cannot be open water
Factors for Restoring Degraded/Failing Stormwater Infrastructure Systems

- in a Blue Infrastructure watershed
- in a Biological Restoration Initiative (BRI) watershed
- in an area that was probably developed before 1985 (1 point) or between 1985 and 2000 (1/2 point)
- is an area of relatively higher impervious surfaces
- in an impaired watershed (as indicated by §303-d)
- is within 200’ (1 point) or within 600’ (1/2 point) of a stream designated for uses II, II or IV
- in a Stronghold Watershed (1 point for “1”; ½ point for “2”)
- in a Tier II watershed

Discouraged Factors

- flood plains
- forested areas
- karst geology
- in a wetland
Philosophy of the WRR: Stormwater Models

• Any relatively healthy or intact system (including wetlands, streams, uplands, etc.) will have positive stormwater benefits and should be preserved.

• Direct users to general areas that should be considered for restoration (or preservation) and to sway them away from areas that are less desirable for restoration (or preservation) based on landscape characteristics or other factors.

• The intent is not to identify all areas that are technically feasible but to use the Watershed Approach to guide users to areas that are both strategic and preferred for restoring healthy hydrology.
  – For example, the goal is to direct users to areas of high imperviousness rather than previous approaches which directed users to existing green space.
Setting the Stage: How did we get here?

- Not intended to be site specific
- Planning level tool designed to direct users to a general area that then needs to be ground investigated
- Feedback from stakeholders that the model outputs were too general
- Potential to refine and increase the utility of the tool by applying NPDES – specific BMP data
Request for Input from Agency Stakeholders

• Letter of request sent out in July of 2013 with initial comment end date of 8/16
  – Stormwater Model Criteria
  – Potential New Data Sources

• Continued follow up and interagency coordination throughout the fall

• Weekly stormwater conference calls between EPA and MES – intermittent participation by DNR and SHA
Avoid and Minimize Using the WRR

Considerations for Potential Alignments:
- Wetlands
- Streams
- Floodplains
- Green/Blue Infrastructure
- Land Use/Land Cover
- Forest Interior Dwelling Species
- Targeted Ecological Areas
- Sensitive Species Area
- Chesapeake Bay Critical Area
- Property Owner Information

Watershed Resources Registry Case Study
Potential Preservation Impacts:

Wetland Preservation
Potential Preservation Impacts:
Stormwater Preservation
## Avoidance and Minimization Results

<table>
<thead>
<tr>
<th>Impact Types</th>
<th>No-Build Alternative</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 3A</th>
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<td>Community Impacts</td>
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<td>Residential Displacements</td>
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<td>Range of Natural Environmental Impacts</td>
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<td>100-Year Floodplain Affected (acres)</td>
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<td>1.64</td>
<td>1.78</td>
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<tr>
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<td>WRR Preservation Opportunity Impacts</td>
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<td>Riparian Preservation (acres)</td>
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<td>28.65</td>
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<td>11.52</td>
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Typical PACM Matrix Using the WRR Results

Watershed Resources Registry Case Study
Using the WRR to Identify Mitigation Sites

Watershed Resources Registry Case Study

Overlay

Upland Restoration

Stormwater Restoration

Upper Big Pipe Creek Watershed

Project Area

Potential Mitigation Site
Stormwater Facilities

Watershed Resources Registry Case Study
Alternative Strategies

I-695 and MD 150
Baltimore County
Site Score: 3

Watershed Resources Registry Case Study
# Capitol Program

<table>
<thead>
<tr>
<th></th>
<th>Costs</th>
<th>Time</th>
<th>Cost Savings with WRR</th>
<th>Time Savings with WRR</th>
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<tr>
<td>Site Search</td>
<td>$50,000</td>
<td>4 months</td>
<td>$37,500</td>
<td>3 months</td>
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<tr>
<td>Design</td>
<td>$210,000</td>
<td>18 months</td>
<td>$60,000</td>
<td>6 months</td>
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<tr>
<td>Agency Coordination/Regulatory Review</td>
<td>$10,000</td>
<td>12 months</td>
<td>$2,500</td>
<td>3 months</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$270,000</strong></td>
<td><strong>2.8 years</strong></td>
<td><strong>$100,000</strong></td>
<td><strong>1 year</strong></td>
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</table>

*Cost/time savings would be post Location Approval and includes only mitigation tasks.*
In Summary, the WRR is....

• **Transferable**
  – National datasets and Maryland datasets
  – Uses web services for readily available & public domain datasets

• **Transparent**
  – All applicants have same results available to them, consistent approach to protection
  – Maps and scores governmental agencies’ preservation and restoration priorities
  – Information is available prior to making large investments of time and money
  – Tool developed collaboratively with widespread agreement among multitude of regulatory agencies
In Summary, the WRR is....

• Predictable
  – Tool developed collaboratively with widespread agreement among multitude of regulatory agencies
  – WRR Suitability Analyses incorporate CWA guidelines allowing for early designs to meet regulatory requirements

• Efficient
  – Saves applicant design & agency review time: no need to recreate an analytic review tool for each application, or when mitigation is offered.

• Effective
  – Improved transportation & environmental outcomes
In Summary, the WRR is....

• Highly Adaptive
  – Tool allows the transfer of data into other personal GIS platforms

• Compatible
  – Can be used in conjunction with other tools, such as the EPA National Stormwater Calculator, to determine most cost effective BMP options within WRR opportunity sites
EPA National Stormwater Calculator

http://www2.epa.gov/water-research/national-stormwater-calculator
National & Regional Roll-out Strategies

- AASHTO Technical Implementation Grant Awarded (September, 2013)
- National Workshop Planned (October 15 & 16, 2014, Inner Harbor of Baltimore, Holiday Inn)
  - 19 States will be invited
  - EPA Regions, Corps’ Districts, and DOT’s Invited, among others
- Watershed driven GIS tools such as WRR mentioned in (Section 5102 of The Grow America Act) for Transportation
  
  “watershed-driven web-based geographic information systems; and use of innovations in design, procurement and purchasing to improve project delivery and efficiency and reduce costs”

- Development of Prototypes for Chesapeake Bay States
  - Maryland WRR Implemented & Complete
  - Delaware held first Meeting May 9, 2014
    - DNREC, DELDOT, Corps’ and EPA
  - Others to follow
New WRR Application Interface
The American Association of State Highway and Transportation Officials (AASHTO) has selected the Watershed Resources Registry (WRR), (http://www.watershedresourcesregistry.com/) for accelerated advancement to transportation agencies nationwide.

**Keynote Speakers:**

- **Nancy Stoner**, Acting Assistant Administrator for the Office of Water, US EPA
- **Eric Beightel**, Senior Environmental Policy Advisor, US DOT
- **Jennifer Moyer**, Acting Regulatory Chief, US ACE
The 1½-day event will provide an overview, including:

- WRR background and development
- Benefits/applications of use
- What’s needed for early adopters
- Implementation assistance
- Implementation plan and timeline

Join us to learn how the WRR has helped drive a shared watershed vision for the transportation and regulatory/resources communities in Maryland. And, more importantly, how it can help you, too!

Hosted by the AASHTO Innovation Initiative and MD SHA:
Using the WRR to Avoid, Minimize, and Mitigate
Scenario 1

• Transportation Planner
• Engineers have provided several roadway alignment options in ESRI Shapefile format for upcoming project
• **Need** to perform avoidance and minimization techniques to determine what would be the best alignment with the least amount of environmental and financial impacts
• **Need** to find potential mitigation opportunities within the watershed
• **Need** to share findings with inter-agency review team
Loading Data into the WRR

- Use Add Data Button to overlay shapefile atop map
- Shapefile must be compressed into zip file format
- Projection must be defined in Shapefile
- Zooms user to immediate extents
Using Location Details Tool

• Quickly determine and assess watershed, soils, green infrastructure hubs, gaps, corridors, impairments, potential restoration and preservation opportunities, site visits, etc. at the click of a button
Using Location Details Tool Continued

• Results are returned in the Details tab just left of the mapping interface
• Follow links to metadata, criteria sheets, and to view watershed profile
• Click on buttons to find Site Visit Information near your map selection along with printing the map and report

Soils
Metadata
Mapunit Symbol: BrC
Mapunit Name: Brinklow channery loam, 8 to 15 percent slopes
Slope Gradient: null
Drainage Class: Well drained
Hydrologic Group: B
Hydric Classification: Not Hydric

Green Infrastructure
There are no hubs within 500 ft.
There are no gaps within 500 ft.
There are no corridors within 500 ft.

Metadata: Hub | Gap | Corridor

Blue Infrastructure
Metadata
There is no blue infrastructure within 500 ft.

Metadata: FIDs

Species Related Data
There are no forest interior dwelling species areas within 500 ft.

Metadata: FIDv
Conduct Visual Analyses

• ~50 Layers Available by default in TOC
• Choose from 9 ESRI Basemaps
• Online linkage to MD iMap data
Export Information for Field Verification

• Key Lat/Long from Print Map into GPS unit for navigating in the field.
Export Information for Field Verification Continued

• Add notes and site description characteristics directly to print map page
Upload Site Visit Information

- Login
- Click on Button to Add Site Description
- Click on Map Location
- Fill Out Form
- Upload Photographs/Documents
- Click Save
Share Results

• Provide Coordinates from location details or print map to isolate location of Interest. Using XY tool, key Coordinates and click Zoom
• Provide Site ID to isolate specific site visit. Key ID into search panel
Search Site Visits

Using the following criteria
Site Visit ID: 12002

Zoom View ID Date
12002 12/32

Site Visit Information
- Site Name: Test Site
- Date of Site Visit: 12/32/1969
- Project Name: Project A
- Site Description: Sample

Consent to having contact information being made
- Looking for the following opportunities:
  - Upland Preservation
  - Wetland Preservation
  - Riparian Preservation
  - Stormwater Natural Infrastructure Preservation

Site Suitability Comments:
- Overall Ecological Quality of the Existing Site
- General Comments:
- Land Owner Willingness: Null
- Habitat: BlackTailed

Land Use:
- Commercial
- Medium Density Residential
- Industrial
- Open Space

Land Type:
- Low Density Residential
- High Density Residential
- Agricultural

Results
View Id Date Organization
12001 12/22/1969 MES
12002 12/32/1969 MES

Click for Site Visit Information Within 500ft
Scenario 2

• Transportation Planner
• Find Stormwater Restoration-type Opportunities within Back River-Hawk Cove Watershed in Baltimore County, Maryland
• Determine planning-level efficiencies that could be gained by performing activity in this location on State-owned land
### Find Opportunities

**Model:** Stormwater Compromised Infrastructure Restoration  
**County:** Baltimore County  
**Watershed:** 020600030703  
**Score >= 5**  
**Acreage > 50**

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**Select Potential Opportunities:**  
- Upland Preservation  
- Wetland Preservation  
- Riparian Preservation  
- Stormwater Natural Infrastructure Preservation  
- Upland Restoration  
- Wetland Restoration  
- Riparian Restoration  
- Stormwater Compromised Infrastructure Restoration

**Select Score:**
- ![Star Icon]  
- ![Star Icon]  
- ![Star Icon]  
- ![Star Icon]  
- ![Star Icon]  

**Select Score Operator:**  
- [ ] >=  
- [ ] Where Acres is Greater Than (>):  
  - 50  
- [ ] Where Acres is Less Than (<):  
  - Any Area  

**Find Opportunities**

---

**Log in:**
- Login to add Site Visit Information

**Zoom to County:**
- Zoom to Watershed

---

**Logos:**
- [MDE Logo]  
- [SHA Logo]  
- [Maryland Environmental Service Logo]  
- [Maryland Planning Logo]  
- [US Army Corps of Engineers Logo]
Exploring Find Opportunity Results

- Use Zoom tool in Results panel by clicking on Zoom icon to review areas
- Remove records from Results panel by clicking on Remove icon
Exploring Find Opportunity Results Continued

• Run location details tool to determine desktop-level site characteristics
• Toggle layers on/off to perform visual analyses
Determine Property Ownership

- Use Parcel Layer to determine property boundary
- Use Identify tool to click on parcel boundary to determine ownership status
- Direct linkage to Maryland Department of Assessments and Taxation Database
Export Information for Supplemental Desktop Analyses & Field Verification

• Key Lat/Long from Print Map into Stormwater Calculator for further site-specific LID BMP’s that could be implemented.
• Key Lat/Long from Print Map into GPS unit for navigating in the field post Desktop Analyses.
EPA National Stormwater Calculator

Welcome to the EPA National Stormwater Calculator

This calculator estimates the amount of stormwater runoff generated from a land parcel under different development and control scenarios over a long-term period of historical rainfall.

The analysis takes into account local soil conditions, topography, land cover and meteorology. Different types of low impact development (LID) practices can be employed to help capture and retain rainfall on-site. Localized climate change scenarios can also be analyzed.

Site information is provided to the calculator using the tabbed pages listed above. The Results page is where the site's runoff is computed and displayed.

This program was produced by the U.S. Environmental Protection Agency and was subject to both internal and external technical review. Please check with local authorities about whether and how it can be used to support local stormwater management goals and requirements.
Location Selection:

- Address/zip code
- X/Y coordinates
- Site Area
Soil Type:

- runoff potential
- soil survey data
Soil Drainage Rate:

– drainage rate (inches/hr)
Topography:

- View soil survey data:
  - Flat (2% Slope)
  - Moderately Flat (5% Slope)
  - Moderately Steep (10% Slope)
  - Steep (above 15% Slope)

When soil survey data is displayed you can select a slope category directly from the map.
Precipitation Rate:
- rain gauge location
- hourly rainfall data
Evaporation Rates:
– select closest weather station
Percent Change in Monthly Rainfall

Climate Change:
- select scenario
- select time period
Percent Land Cover:
- forest
- meadow
- lawn
- desert
- impervious
LID Controls:

- Disconnection
- Rain Harvesting
- Rain Gardens
- Green Roofs
- Street Planters
- Infiltration Basins
- Permeable Pavement
Results

Runoff Scenario Comparison
**Results**

**Site Description**

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<tr>
<th>Parameter</th>
<th>Current Scenario</th>
<th>Baseline Scenario</th>
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<td>Green Roofs</td>
<td>10 / 100</td>
<td>0</td>
</tr>
<tr>
<td>Street Planters</td>
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<td>0</td>
</tr>
<tr>
<td>Infiltration Basins</td>
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</tr>
<tr>
<td>Porous Pavement</td>
<td>20 / 100</td>
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<tr>
<td><strong>Analysis Options</strong></td>
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<tr>
<td>Ignore Consecutive Wet Days</td>
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<tr>
<td>Wet Day Threshold (inches)</td>
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</tr>
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Runoff results are up to date.
Results

Rainfall/Runoff Exceedance Frequency
Results

Rainfall Retention Frequency
Results

Runoff By Rainfall Percentile
Results

Extreme Event Rainfall/Runoff
Modifying LID Parameters

Low Impact Development (LID) controls are landscaping practices designed to collect runoff from impervious surfaces and retain it on site.

Enter the percent of the site’s impervious area you would like to be treated by the listed LID practices.

Click a practice to learn more about it or to change its design parameters.

Entering a non-zero design storm depth will allow you to automatically size an LID control to capture storms of that size when you click on the LID’s name to bring up its design form.
Disconnection refers to the practice of directing runoff from impervious areas, such as roofs or parking lots, onto pervious areas such as lawns or vegetative strips, instead of directly into storm drains. This gives the runoff an opportunity to infiltrate into the soil before leaving the site.

The Capture Ratio is the ratio of the pervious area receiving the runoff (such as a lawn area) to the impervious area that generates the runoff.

For example, if 5,000 sq. ft. of roof area is directed onto 3,000 sq. ft. of lawn area.
Rain Gardens are shallow depressions filled with an engineered soil mix that supports vegetative growth. They are usually used on individual home lots to capture roof runoff.

Typical soil depths range from 6 to 18 inches.

- Ponding Height (inches): 6
- Soil Media Thickness (inches): 12
- Soil Media Conductivity (in/hr): 10.00
- % Capture Ratio: 5
Green Roofs (also known as Vegetated Roofs) are bio-retention systems placed on roof surfaces that capture and temporarily store rainwater in a soil growing medium. They consist of a layered system of roofing designed to support plant growth and retain water for plant uptake while preventing ponding on the roof surface.

- Soil Media Thickness (inches): 4
- Soil Media Conductivity (in/hr): 10.00
Infiltration basins are shallow depressions filled with grass or other natural vegetation that capture runoff from adjoining areas and allow it to infiltrate into the soil.

The calculator assumes that the infiltration rate from the basin is the same as for site’s native soil.

Basin Depth (inches) 6

% Capture Ratio 5

Learn more...
Continuous Permeable Pavement systems are excavated areas filled with gravel and paved over with a porous concrete or asphalt mix.

Modular Block systems are similar except that permeable block pavers are used instead.

- Pavement Thickness (inches): 6
- Gravel Layer Thickness (inches): 18
- % Capture Ratio: 100
THANK YOU

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http://watershedresourcesregistry.org

http://www2.epa.gov/water-research/national-stormwater-calculator