2016 Metro Stormwater SWMM Revision

SWAC

2/9/16

TODAY'S TALKING POINTS…

- ☑ Our Stormwater Reg Revision Process
- ☑ The 2016 SWMM Changes
  - ☑ 1" Capture/LID (Stormwater Post-Development Water Quality Standard in Metro)
  - ☑ History of LID in Metro
  - ☑ 1" Capture/LID criteria
- ☑ Main 2016 SWMM changes
- ☑ Looking Forward…

OUR STORMWATER REG REVISION PROCESS…

Make changes only as/when needed…

- ☑ **Catalog List of Potential Changes**
  - ☑ **Regulators/Other Depts/Customers/Staff**
  - ☑ **Internal Staff Meetings to Discuss**
  - ☑ **Validity/Necessity/Impacts of Changes**
- ☑ **Come to Consensus on Necessary Changes**
- ☑ **Change Management Process**
- ☑ **Implementation Schedule**

The 2016 Stormwater Management Manual revisions became effective on February 1, 2016. For projects that applied under the previous regulations, the following deadlines must be met:

- Grading Permit Application submitted to the Metro Stormwater Design Review Section by: 1/29/16, and
- Grading Permit Application passes Sufficiency Review by: 3/31/16, and
- Grading Permit Application passes Technical Review (approved) by: 7/31/16

1” CAPTURE/LID (STORMWATER POST-DEVELOPMENT WATER QUALITY REGULATIONS IN METRO)…80% TSS = PREVIOUS STD

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The Mayor's Green Ribbon Committee on Environmental Sustainability

Alicia Batson, M.D.* - Physician and Market Grower, Hungry Gnome Farm

Michael Blosser* - Vice President of Environmental Health and Safety, Louisiana Pacific

Linda Breggin† - Senior Attorney and Director of Southeast Environmental Programs, Environmental Law Institute

Laurel Creech - Director, Team Green

Anne Davis†- Chair, Mayor's Advisory Committee on Environment

Gary Gaston* - Design Studio Director, Nashville Civic Design Center

Jennifer Hagan-Dier* - Assistant Commissioner, State Department of Revenue

Tom Hardin - Retired, Resident of Historic Edgefield

Doug Hausken - Executive Director, Cumberland River Compact

John Ingram, Chairman, Ingram Industries Inc., Co-Chair, Green Ribbon Committee

Jamie D. Isabel, Sr. - President and Founder, Dalmatian Creative Agency, and former Metro Council Member

Lawrence Jackson - Retired, formerly President and CEO of Global Procurement for Wal-Mart

Ellen Jacobson, M.D. – Dermatologist

Decosta Jenkins* - President and CEO, Nashville Electric Service

Skip Lawrence* - Chief Managing Officer, Lawrence Bros., LLC

Randy Lowry - President, Lipscomb University, Co-Chair, Green Ribbon Committee

Bert Mathews - President, The Mathews Co.

Diane Miller Mulloy - President, Milagro Biofuels

Diane Neighbors - Vice Mayor, Metropolitan Government of Nashville and Davidson County

Jean Nelson† - President and Executive Director, Land Trust for Tennessee

Mike Pearigen - Attorney, Farmer and Luna PLLC

Dave Pelton - President, Trust for the Future

Greer Tidwell* - Director of Environmental Management, Bridgestone Americas Tire Operations

Steve Turner - Principal, MarketStreet Enterprises

Rose Wang - Chair, Mayor's Youth Council, and student, Martin Luther King Academic Magnet School

David Williams - Vice Chancellor for University Affairs and Athletics, General Counsel, Secretary of the University and Professor of Law, Vanderbilt University

Tiffany Wilmot* - President, Wilmot Inc.

*Subcommittee Co-Chairs

†Writing Committee

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- Feb-2009 – BL2008-345 Adopted

BL2008-345…(PASSED FEB-2010)

SUBSTITUTE ORDINANCE NO. BL2008-345

An ordinance amending Title 15 of the Metropolitan Code to create a stormwater master planning district.

WHEREAS, approximately 14 square miles of central Davidson County is served by a Combined Sewer System (the "CSS") in which sanitary sewage and stormwater are conveyed in the same pipe; and

WHEREAS, during periods of wet weather, the amount of stormwater entering the CSS often exceeds the capacity of the system and leads to Combined Sewer System Overflows ("CSO"); and

WHEREAS, in 2007, 765.2 million gallons of CSO was discharged into the Cumberland River; and

WHEREAS, in August 2007, the Metropolitan Government signed a consent decree with the Department of Justice and the State of Tennessee that called for a 9 year plan to reduce raw sewage overflows in Davidson County's waterways; and

WHEREAS, the development of the area served by the CSS has [illegible]ed in more impervious surfaces and increased demands on the CSS; and

WHEREAS, the use of Green Infrastructure to encourage stor[illegible]sorption and infiltration is an attractive and cost- effective way to reduce use of the CSS and enhance its function; and

WHEREAS, other parts of Davidson County not served by the CSS will also benefit from use of Green Infrastructure to reduce flooding and enhance water quality.

NOW, THEREFORE, BE IT ENACTED BY THE COUNCIL OF THE METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY:

Section 1. That Section 15.64.010 of the Metropolitan Code is hereby amended by adding the following new definitions to Section 15.64.010:

"Stormwater Master Planning District" means a defined geographical area that will benefit from the use of Green Infrastructure to augment or replace conventionally engineered stormwater management solutions.

"Green Infrastructure" means an approach to wet weather management that is cost-effective, sustainable, and environmentally friendly, which incorporates management approaches and technologies that infiltrate, evapotranspire, capture and reuse stormwater to maintain or restore natural hydrologies. Green Infrastructure practices include, but are not limited to open space, rain gardens, porous pavements, green roofs, infiltration planters, trees and tree boxes, swales, and curb extensions.

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Water

GOAL: Remove 100% of Davidson County's streams from EPA's 303(d) list by 2020

In Nashville and Davidson County, there are about 2,500 total miles of streams and currently 350 miles are on the 303(d) list of impaired waters. By 2020, 100% of the total stream miles will not be listed. It is an ambitious goal that will only be attained by a concerted effort by Metropolitan Government and citizens. It will take all of the other recommendations related to water made by the Green Ribbon Committee to achieve the goal (low impact development (LID), green infrastructure, stream buffers, full cost pricing, etc.). Currently the 350 miles of streams (70 segments) are listed as impaired for various reasons including pathogens, nutrients, siltation, and habitat alterations.

A new committee should be formed to study this goal and set milestones and more detailed objectives in achieving the goal. The committee should be made up of Metropolitan Government staff, nonprofit leaders, and citizens with knowledge and interest in making this goal a reality. Metro Water Services should have an important role in providing leadership and information.

MID-TERM GOAL…

2. Increase utilization of Low Impact Development (LID) techniques and encourage Better Site Design (BSD) on all new or significantly redeveloped sites in Nashville: Low Impact Development is a site design strategy that aims to mimic natural hydrology, with an emphasis on the infiltration of stormwater. Traditional stormwater designs are highly impervious and route stormwater immediately offsite or to a central location resulting in greater volumes of stormwater and pollutants reaching our streams. LID designs include green stormwater infrastructure such as bioretention, green roofs, conservation areas, permeable paving, vegetated swales, and stormwater harvesting.

It is recommended that the Metropolitan Government:

- Increase the utilization of Low Impact Development (LID) techniques and encourage Better Site Design (BSD) on all new or significantly redeveloped sites in Nashville.
- Require LID on all new private developments in Nashville. The requirement will be phased in based upon watershed imperviousness and 303(d) status.
- All new development and significant redevelopment Metropolitan Government projects will be required to utilize LID beginning July 1, 2009.

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BL2010-794…(PASSED DEC-2010)

SUBSTITUTE ORDINANCE NO. BL2010-794

An ordinance amending Chapter 15.64 of the Metropolitan Code pertaining to low impact development practices, no adverse impact design, and associated incentives.

WHEREAS, an extensive rain event that began on May 1, 2010, caused widespread flooding throughout the area of the Metropolitan Government of Nashville and Davidson County; and

WHEREAS, the flooding resulted in substantial and tragic harm to citizens and catastrophic damage to their property; and

WHEREAS, the Metropolitan Government of Nashville and Davidson County desires to reduce the probability of its citizens being impacted by flooding during future storm events; and

WHEREAS, the Metro Council has previously limited development in the floodway and flood plain; and

WHEREAS, Low Impact Development (LID) is a comprehensive land planning and engineering design approach intended to maintain and enhance the natural hydrologies of urban and developing watersheds; and

WHEREAS, Green Infrastructure, which is an approach to stormwater management that incorporates approaches and technologies that promote infiltration, evapotranspiration and the capture and reuse of stormwater, is a primary component of LID; and

WHEREAS, LID and Green Infrastructure approaches to stormwater management are attractive and cost-effective ways to reduce the risk of flooding and enhance water quality, thereby preventing and reducing risk to human life and property; and

WHEREAS, based on the recommendations of the Mayor's Green Ribbon Committee on Environmental Sustainability, it is a priority of the Mayor's Office of Environment and Sustainability to increase the utilization of LID techniques on all new or significantly redeveloped sites in Nashville; and

WHEREAS, Title 15 of the Metropolitan Code of Laws grants the Department of Water and Sewerage Services the authority to promulgate and enforce rules and regulation for the implementation of Green Infrastructure techniques to address stormwater issues associated with private development.

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4. Page 15, Section 3.2.5.2.1 (Runoff Reduction (infiltration or green infrastructure))

Metro Nashville would prefer to have the ability to select our own incentive criteria and associated runoff reduction credit program. Flexibility will allow Metro to adjust incentives to meet the changing needs of the development community and will afford Metro Nashville a better ability to control the direction of various water quality programs. It will also allow water quality incentives the flexibility to align and grow with other "green" Metro Nashville programs. For example, infill redevelopment can cost a developer far more than developing a "green field" site. Metro Nashville envisions the possibility of providing a greater incentive than 10% for such projects as it could increase the number of such redevelopments initiated. As a result, more

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STATE OF TENNESSEE

NPDES PERMIT

No. TNS068047

Authorization to discharge under the
National Pollutant Discharge Elimination System (NPDES)

Issued By

Tennessee Department of Environment and Conservation
Division of Water Pollution Control
401 Church Street
6th Floor, L & C Annex
Nashville, Tennessee 37243-1534

Under authority of the Tennessee Water Quality Control Act of 1977 (T.C.A. 69-3-101 et seq.) and the delegation of authority from the United States Environmental Protection Agency under the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 (33 U.S.C. 1251, et seq.)

Discharger: **NASHVILLE/DAVIDSON COUNTY MUNICIPAL SEPARATE STORM SEWER SYSTEM**

is authorized to discharge stormwater runoff, in accordance with the following stormwater quality management program(s), effluent limitations, monitoring requirements and other provisions as set forth in Parts I through IX herein, from all portions of the MS4, owned or operated by Metropolitan Government of Nashville to Waters of the State of Tennessee.

This permit shall become effective on: February 1, 2012

This permit shall expire on: January 31, 2017

Issuance date: January 1, 2012

B Jarrett FOR

Paul E. Davis, Director
Division of Water Pollution Control

CN-0759

RDAs 2352 and 2366

3.2.5.2.1 Runoff Reduction (infiltration or green infrastructure)

This element of the MS4 program must enable the permittee to develop site design standards for all new development and significant redevelopment. These standards shall require, in combination or alone, management measures that are designed, built and maintained to infiltrate, evapotranspire, harvest and/or use, at a minimum, the stormwater runoff generated at a site by the first inch of every rainfall event preceded by 72 hours of no measurable precipitation. This site runoff from the first inch of rainfall must be 100% managed with no discharge to surface waters. For all new and significant redevelopment on private property, the permittee may opt to have controls installed on that private property, in the public right-of-way, or a combination of both.

Limitations to the application of runoff reduction requirements include, but are not limited to:

- Where a potential for introducing pollutants into the groundwater exists, unless pretreatment is provided;
- Where pre-existing soil contamination is present in areas subject to contact with infiltrated runoff;
- Presence of sinkholes or other karst features.
- Where pre-development infiltrative capacity of soils limit selection of runoff reduction management measures.

When engineering analyses conclude that there are limitations to the application of runoff reduction requirements, this element of the program shall incorporate traditional stormwater treatment practices at a minimum.

3.2.5. Permanent Stormwater Management in New Development and Redevelopment

3.2.5.1 Permit requirements

The permittee shall develop, implement, and enforce a program to address permanent (post-construction) stormwater runoff management from new development and redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale, that discharge into the MS4. This program element must ensure that controls are in place that would prevent or minimize water quality impacts.

The program for this element shall develop and implement strategies which include a combination of structural and/or non-structural best management practices (BMPs) appropriate for the community.

The program for this element shall develop and implement a set of requirements to establish, protect and maintain water quality buffer along all streams at new development and redevelopment projects.

The program for this element must use an ordinance or other regulatory mechanism to address permanent runoff from new development and redevelopment projects that would reflect an MEP-level of control and is consistent with and to the extent allowable by state and local law. Revisions to ordinances or other regulatory mechanisms to accommodate permanent stormwater management must be implemented within 48 months of the effective date of this permit.

The program for this element shall encompass or consider the following sub-elements as differentiated below:

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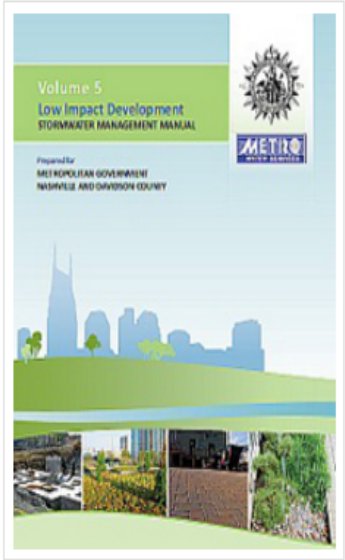
Low Impact Development

The LID (Low Impact Development) Manual is a site design approach that utilizes Green Infrastructure to meet a development site's post development stormwater runoff water quality requirements. This approach satisfies the new MS4 Permit requirement to infiltrate, evapotranspire, or harvest and use the first inch of rain.

- LID Manual 2016 (full version)

Green Infrastructure Practices (GIP's)

- GIP-01 Bioretention
- GIP-02 Urban Bioretention
- GIP-03 Permeable Pavement
- GIP-04 Infiltration
- GIP-05 Water Quality Swale
- GIP-06 Extended Detention Pond
- GIP-07 Downspout Disconnection
- GIP-08 Grass Channel
- GIP-09 Sheet Flow
- GIP-10 Reforestation



LID Manual Training Video

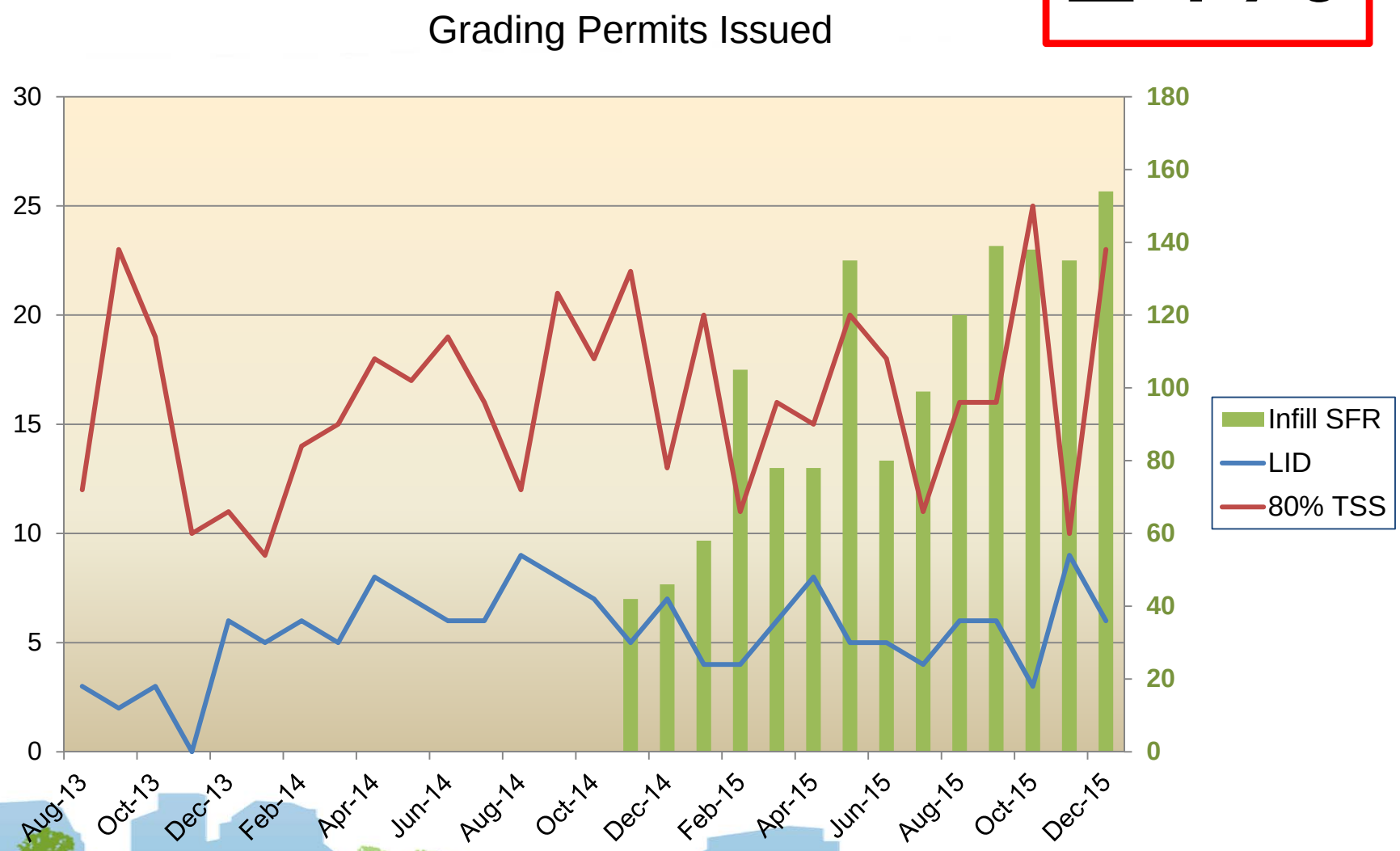
A training video was created to introduce the LID Manual methodology and describe how to design a site in accordance with the Manual. The video includes examples using the LID Site Design Tool. The video lasts approximately one hour and twenty minutes and the breakdown of the topics and their start times is listed below. The presentation is available for download in case you have trouble seeing the slides in the video.

Video time stamps & topics:

- 0:00:00 Overview of Green Infrastructure and the Runoff Reduction Method
- 0:28:52 Green Infrastructure Design Steps and Green Infrastructure Practices (GIPs)
- 0:45:54 LID Site Design Tool and Simple Example
- 1:02:07 Adjusted Curve Number

LID Manual - Results

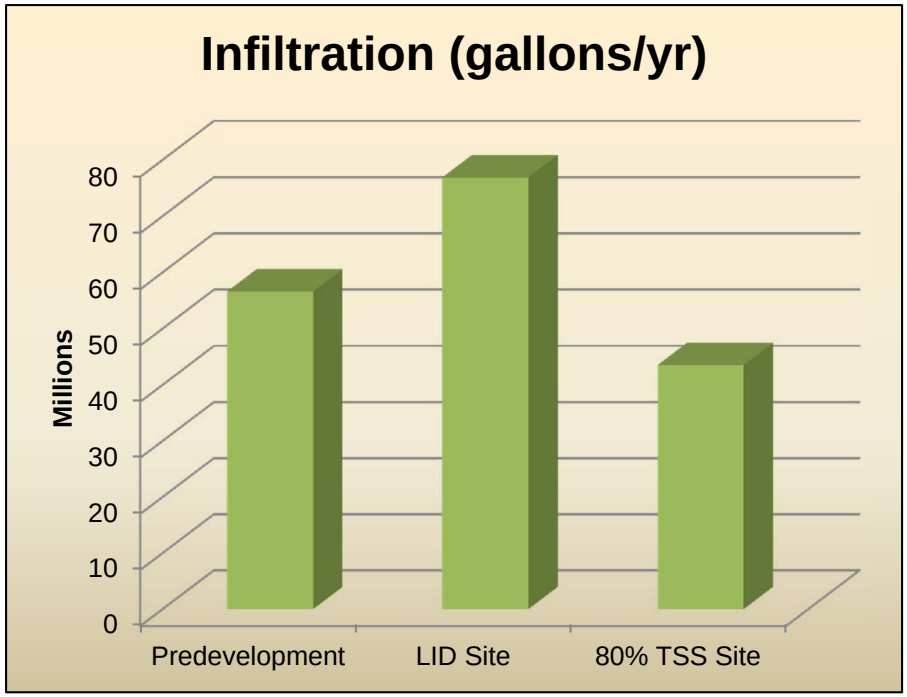
24%

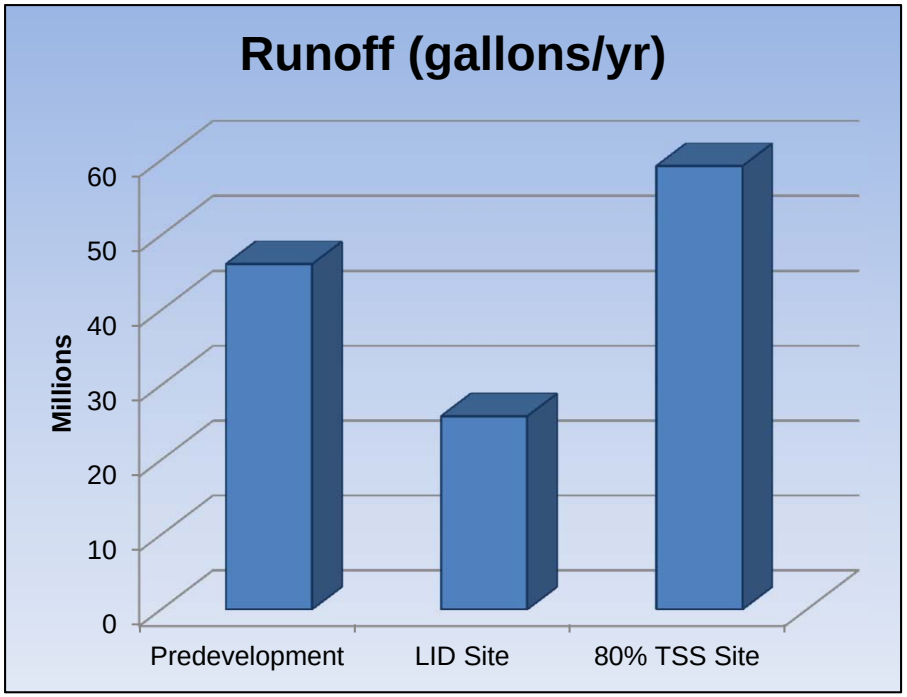


24% of issued Grading Permits voluntarily used the LID Manual

LID Manual - Results

LID sites infiltrated 30 M gallons > Traditional (80% TSS)
LID sites infiltrated 20 M > Predevelopment





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1” CAPTURE/LID CRITERIA…

VOLUME 1
REGULATIONS

STORMWATER MANAGEMENT MANUAL

METROPOLITAN GOVERNMENT OF
NASHVILLE AND DAVIDSON COUNTY
DEPARTMENT OF WATER AND SEWERAGE SERVICES
STORMWATER DIVISION
NASHVILLE, TENNESSEE

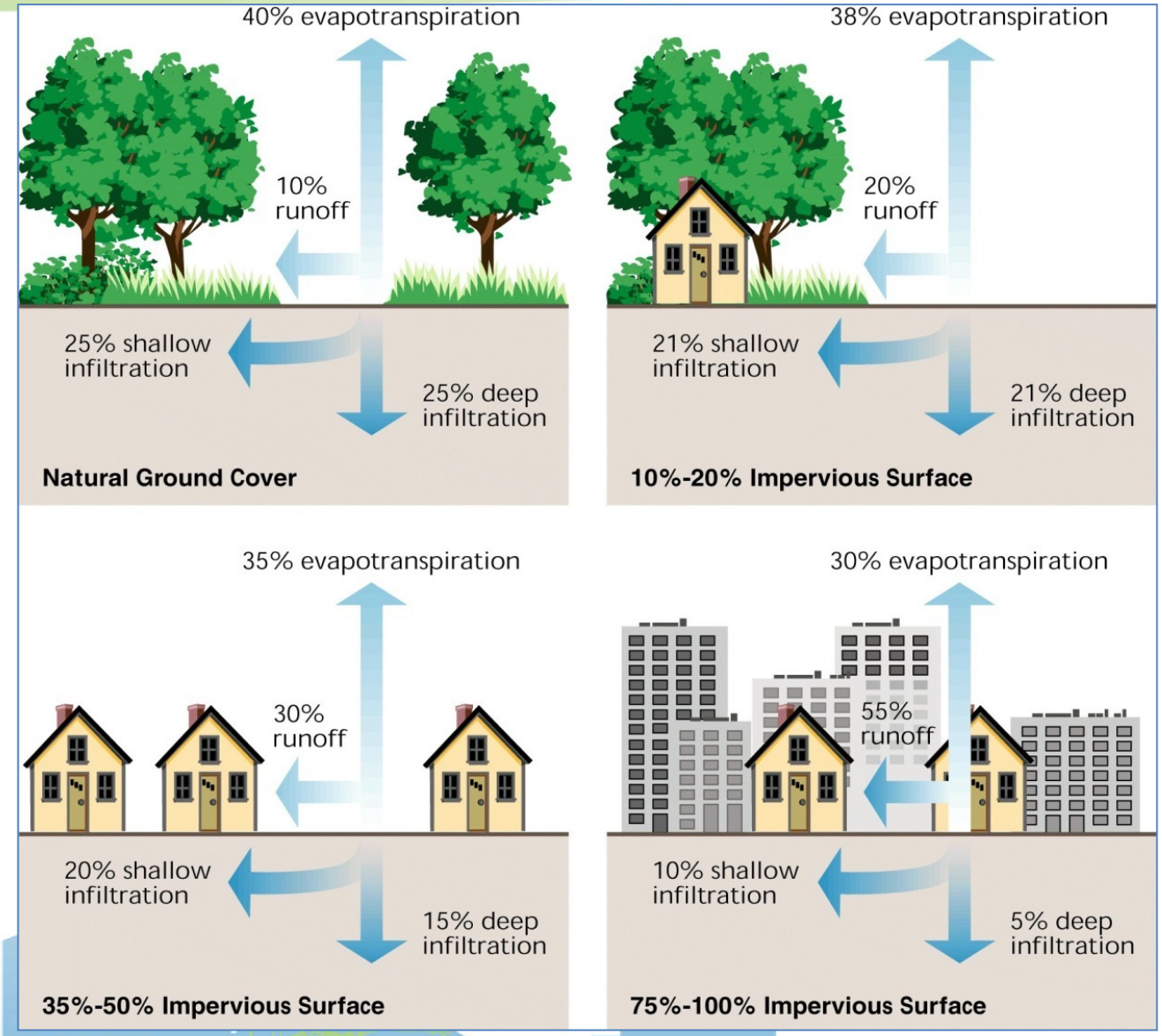
February 2016

LID Defined…

Low Impact Development (LID) & Green Infrastructure are:

- Conservation strategies
- Design that works to mimic natural hydrology
  - Infiltrate
  - Evapotranspire
  - Capture
  - Reuse
  - Include bioretention, pervious pavements, green roofs, cisterns, infiltration trench

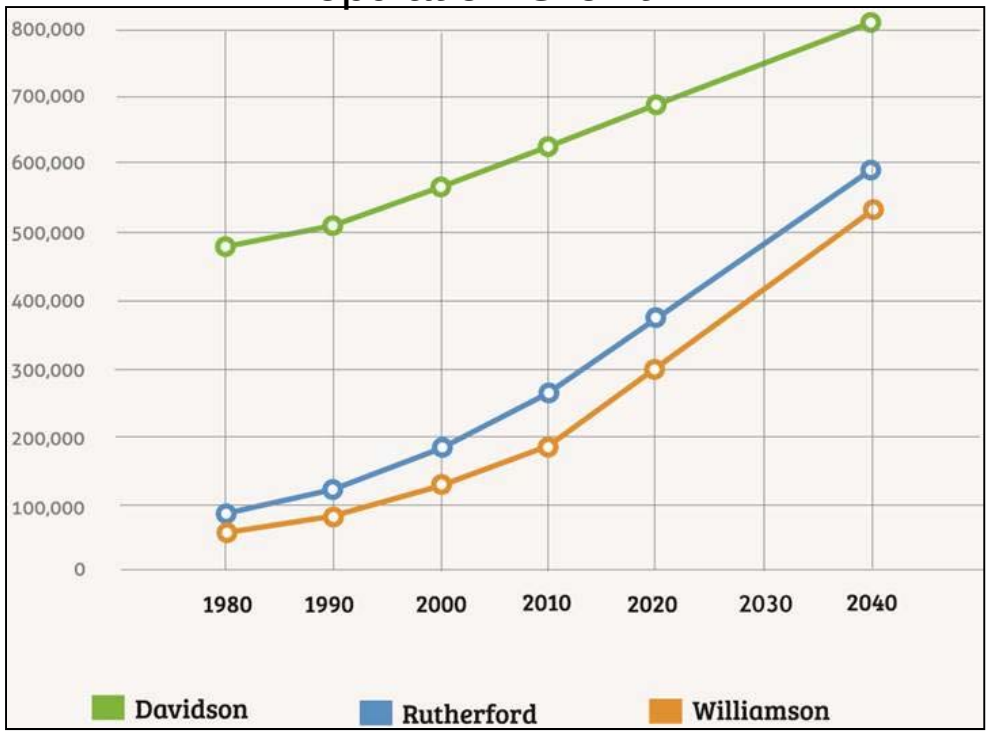
Why Green Infrastructure?



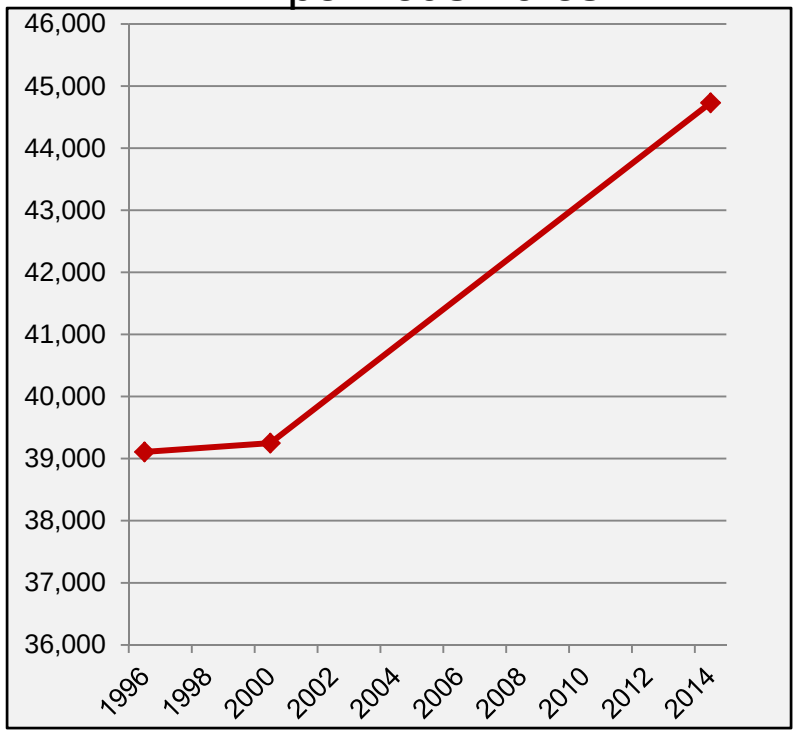
Federal Interagency Stream Restoration Working Group 1998

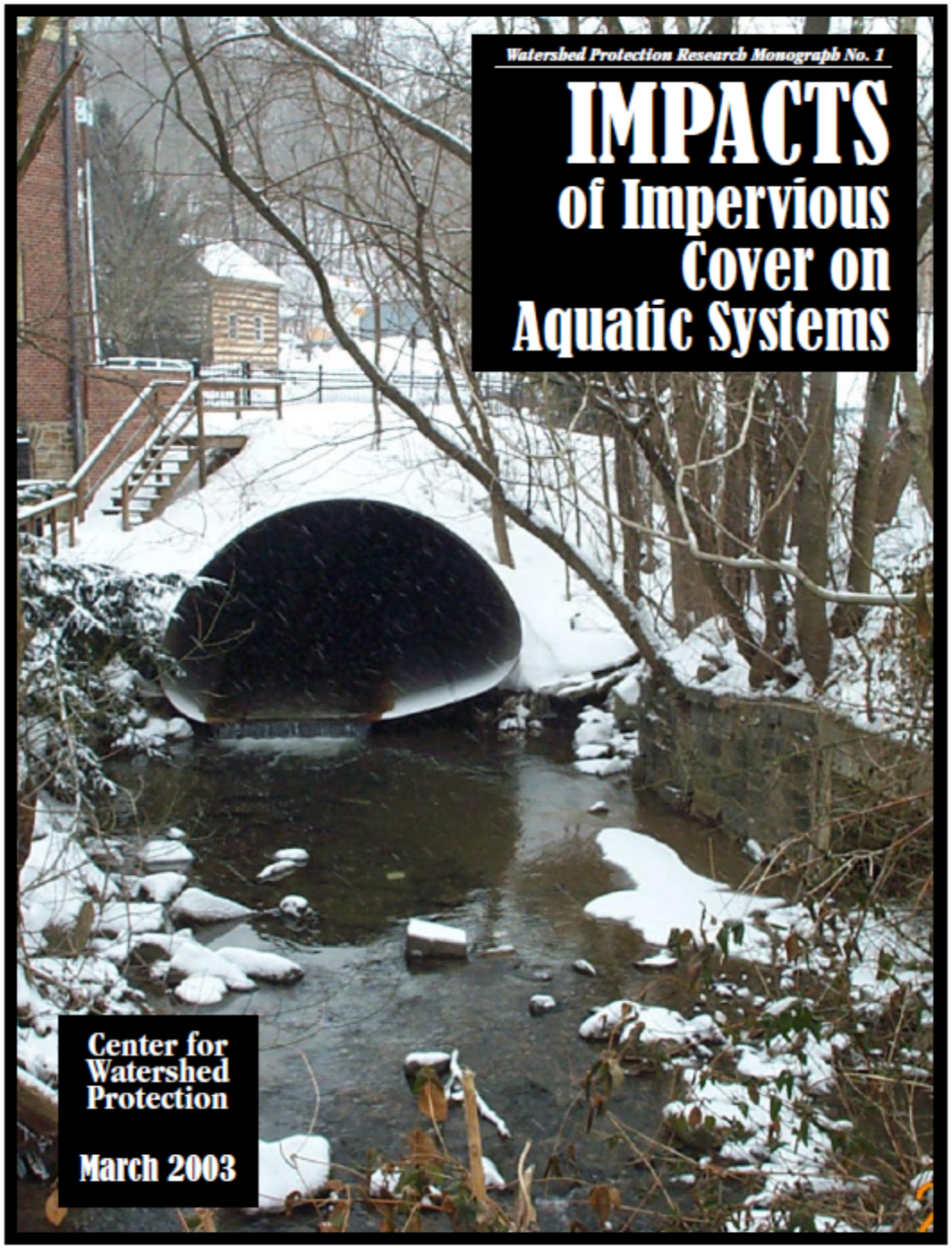
Why Green Infrastructure?

Population Growth



Impervious Acres




Watershed Protection Research Monograph No. 1
IMPACTS
of Impervious
Cover on
Aquatic Systems
Center for
Watershed
Protection
March 2003

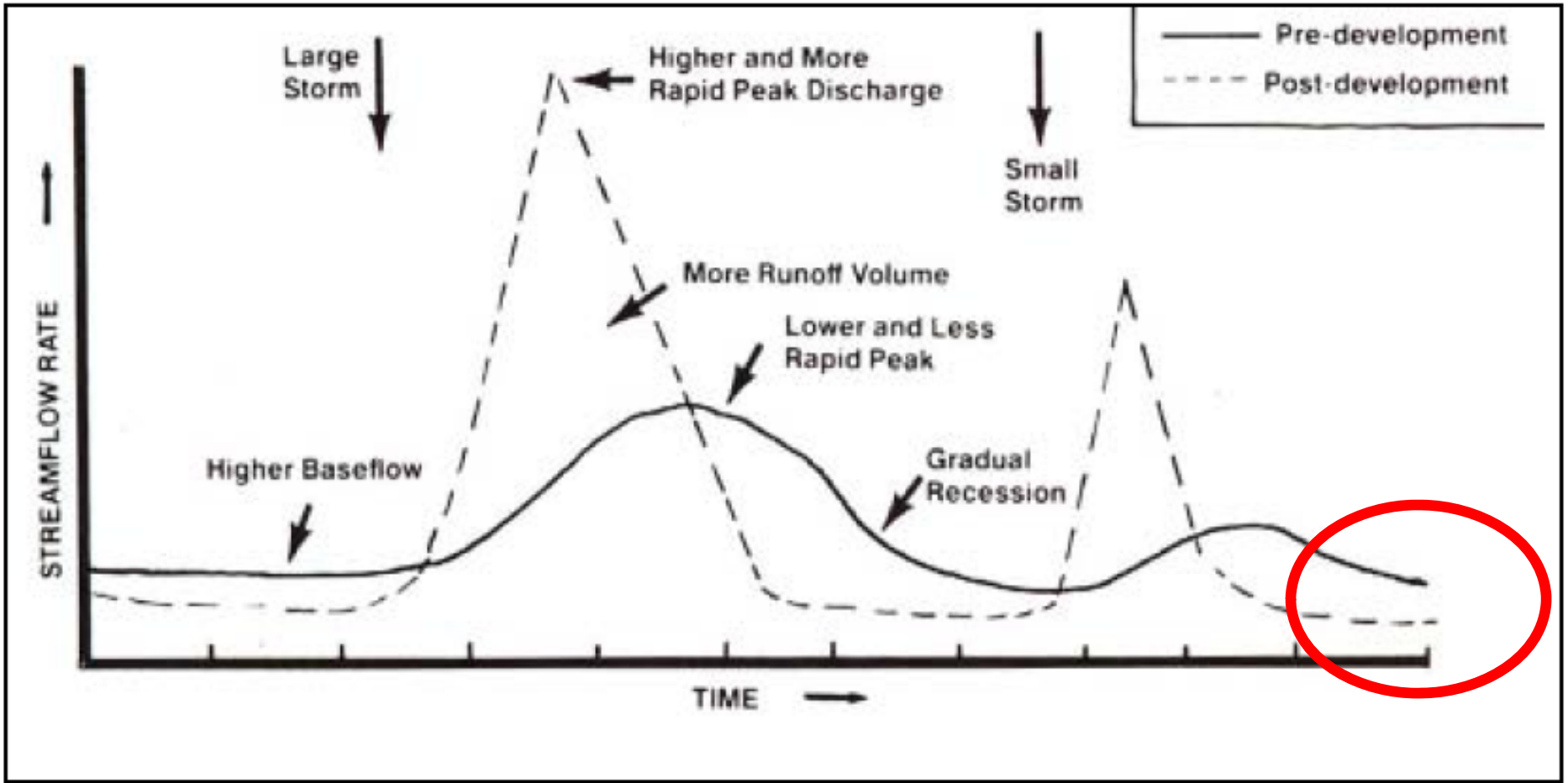


Figure 6: Altered Hydrograph in Response to Urbanization (Schueler, 1987)

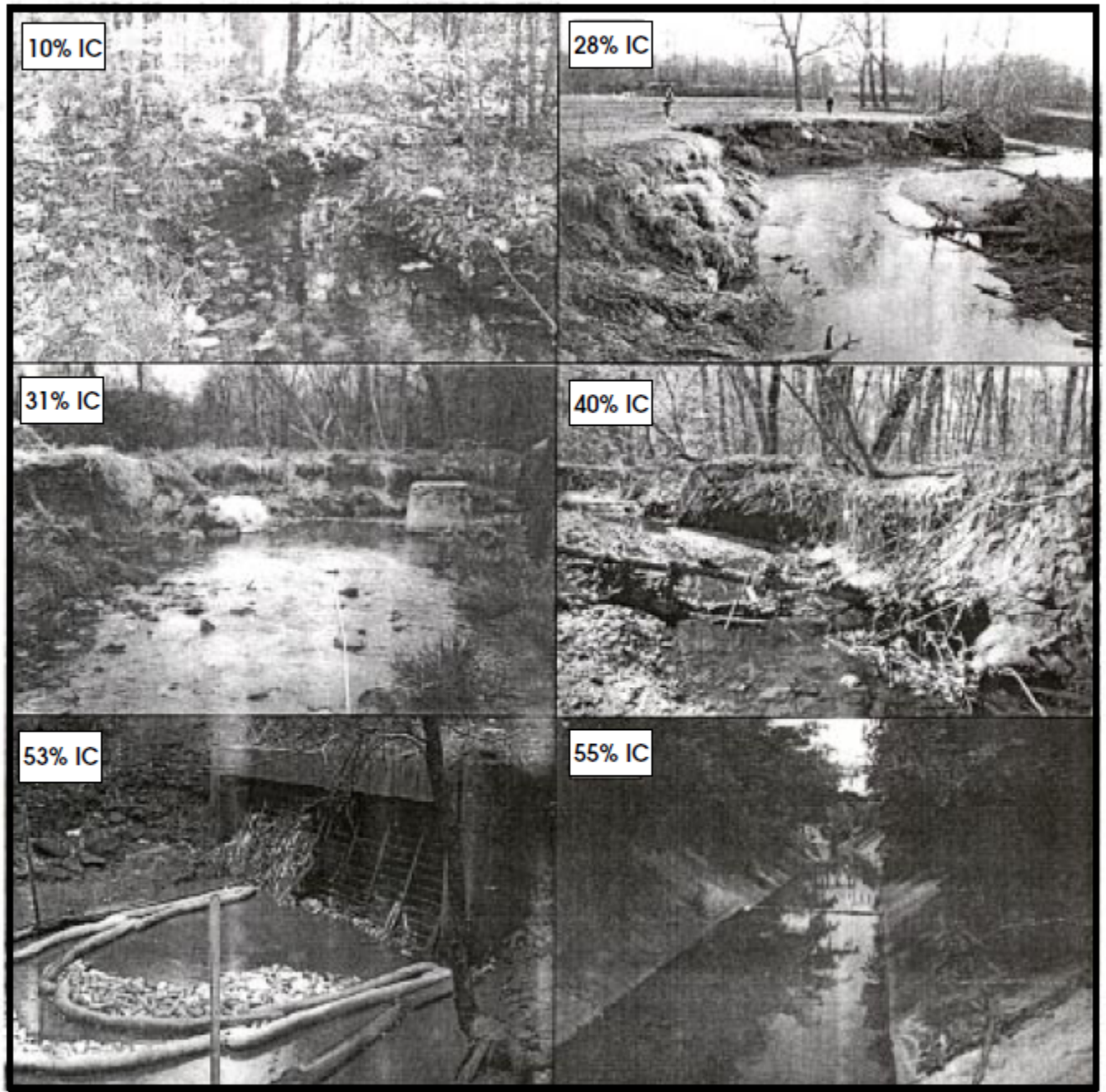


Figure 19: Urban Stream Channels with Progressively Greater IC

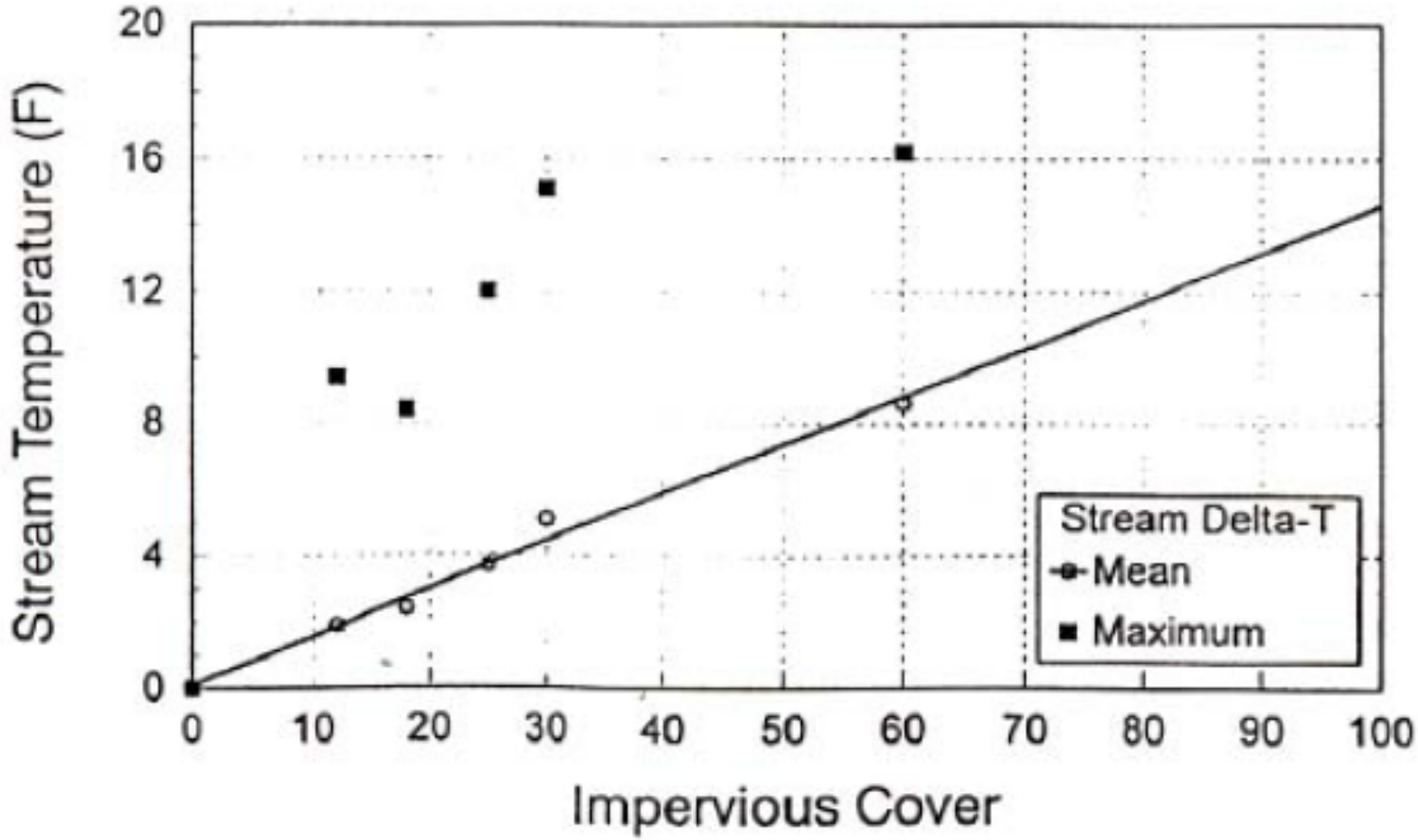


Figure 26: Stream Temperature Increase in Response to IC in Maryland Piedmont Streams (Galli, 1990)

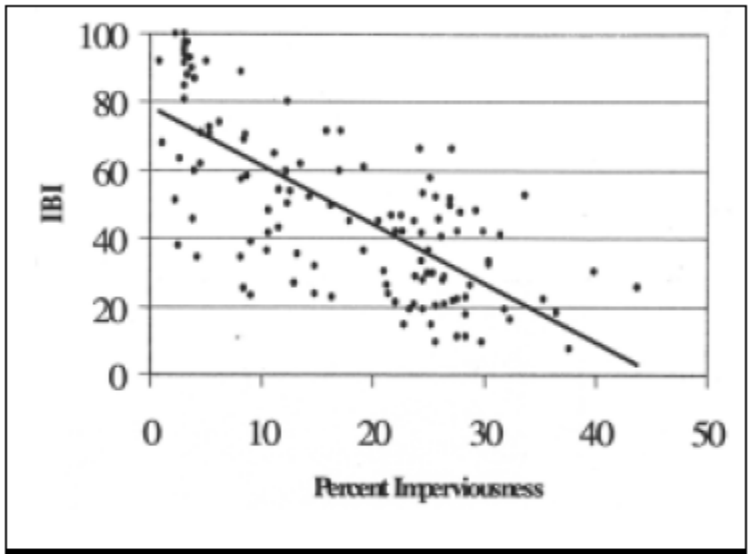


Figure 43: Trend Line Indicating Decline in Benthic IBI as IC Increases in Northern VA Streams (Fairfax County, 2001)

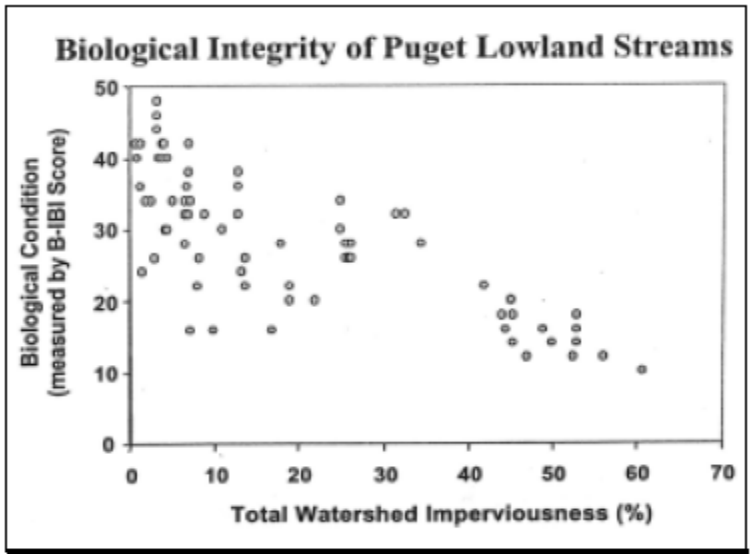


Figure 44: Relationship Between IC and B-IBI Scores in Aquatic Insects in Streams of the Puget Sound Lowlands (Booth, 2000)

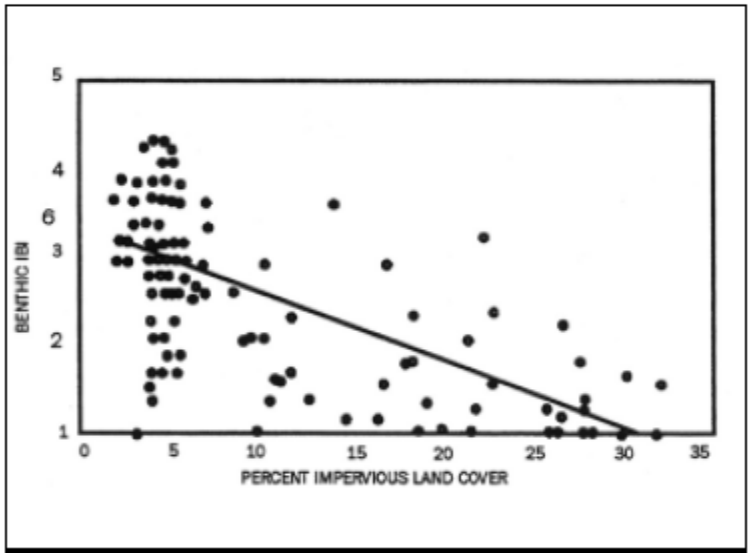


Figure 45: IC and B-IBI at Stream Sites in the Patapsco River Basin, MD (Dail *et al.*, 1998)

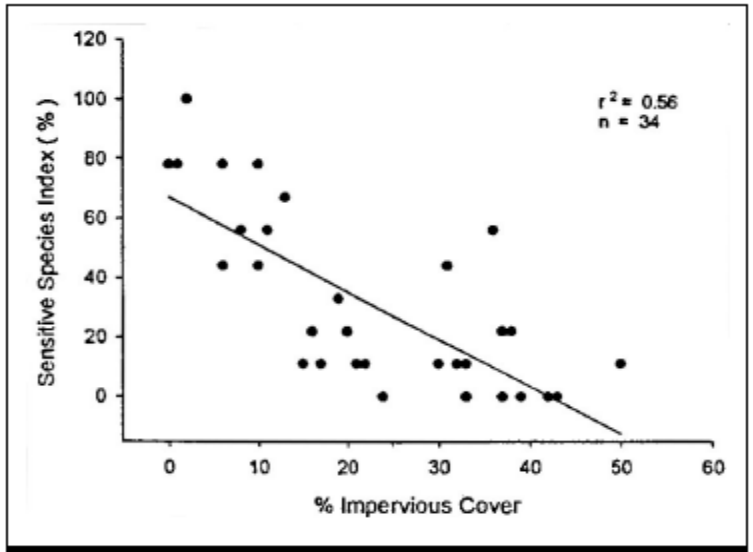


Figure 46: IC vs. Aquatic Insect Sensitivity - EPT Scores in Delaware Streams (Maxted and Shaver, 1997)

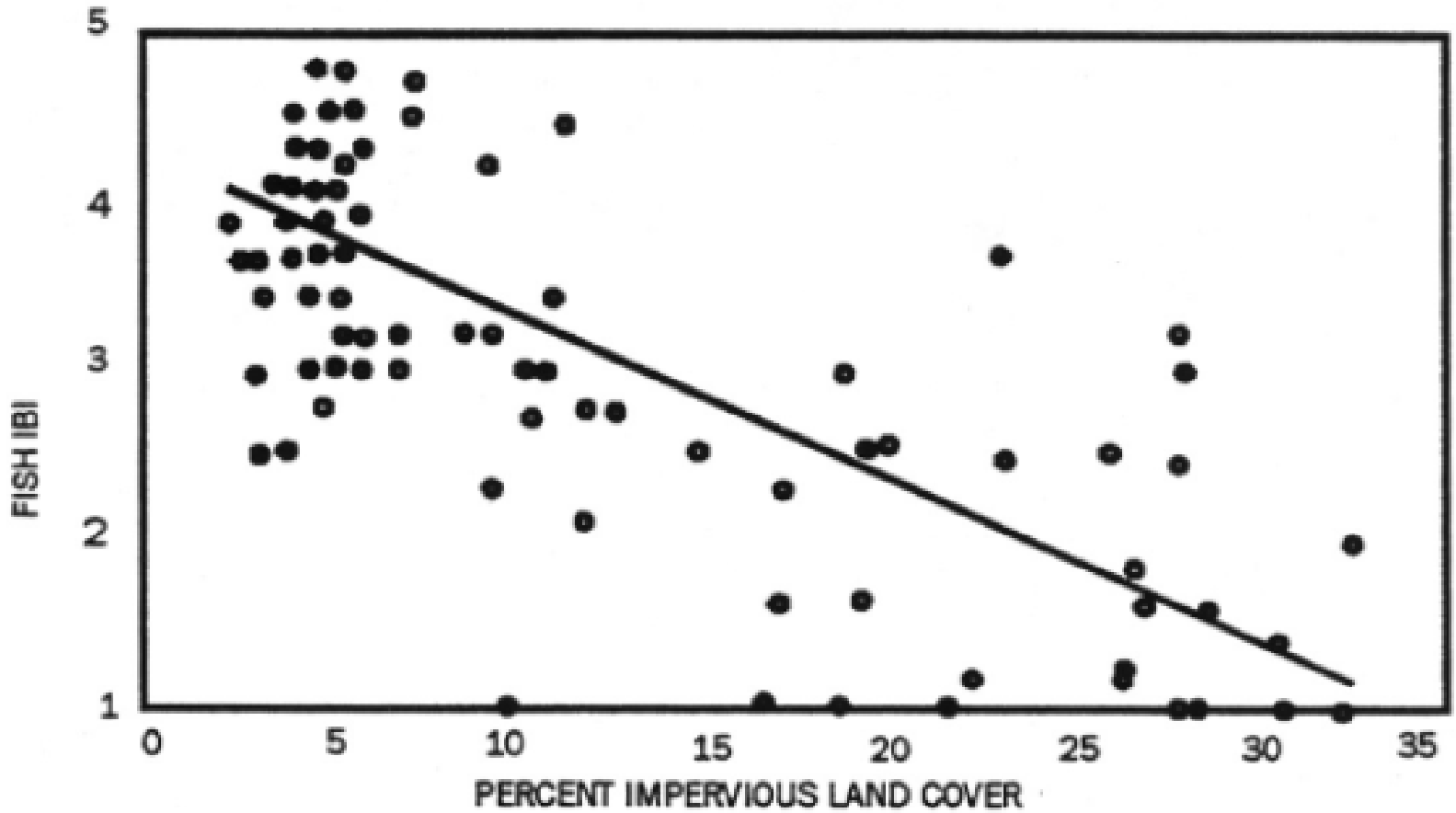
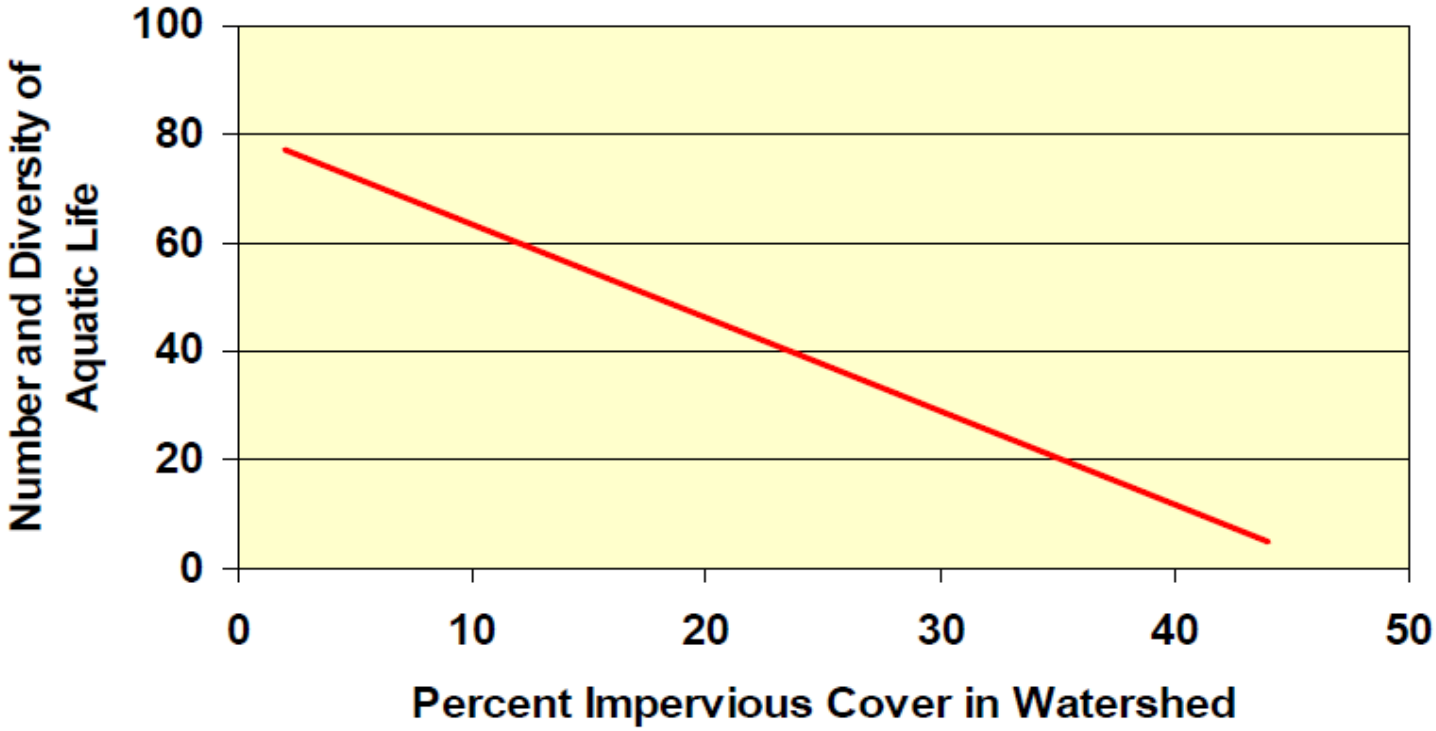


Figure 48: Fish-IBI vs. Watershed IC for Streams in the Patapsco River Basin, MD (Dail *et al.*, 1998)

Impervious Cover Impacts

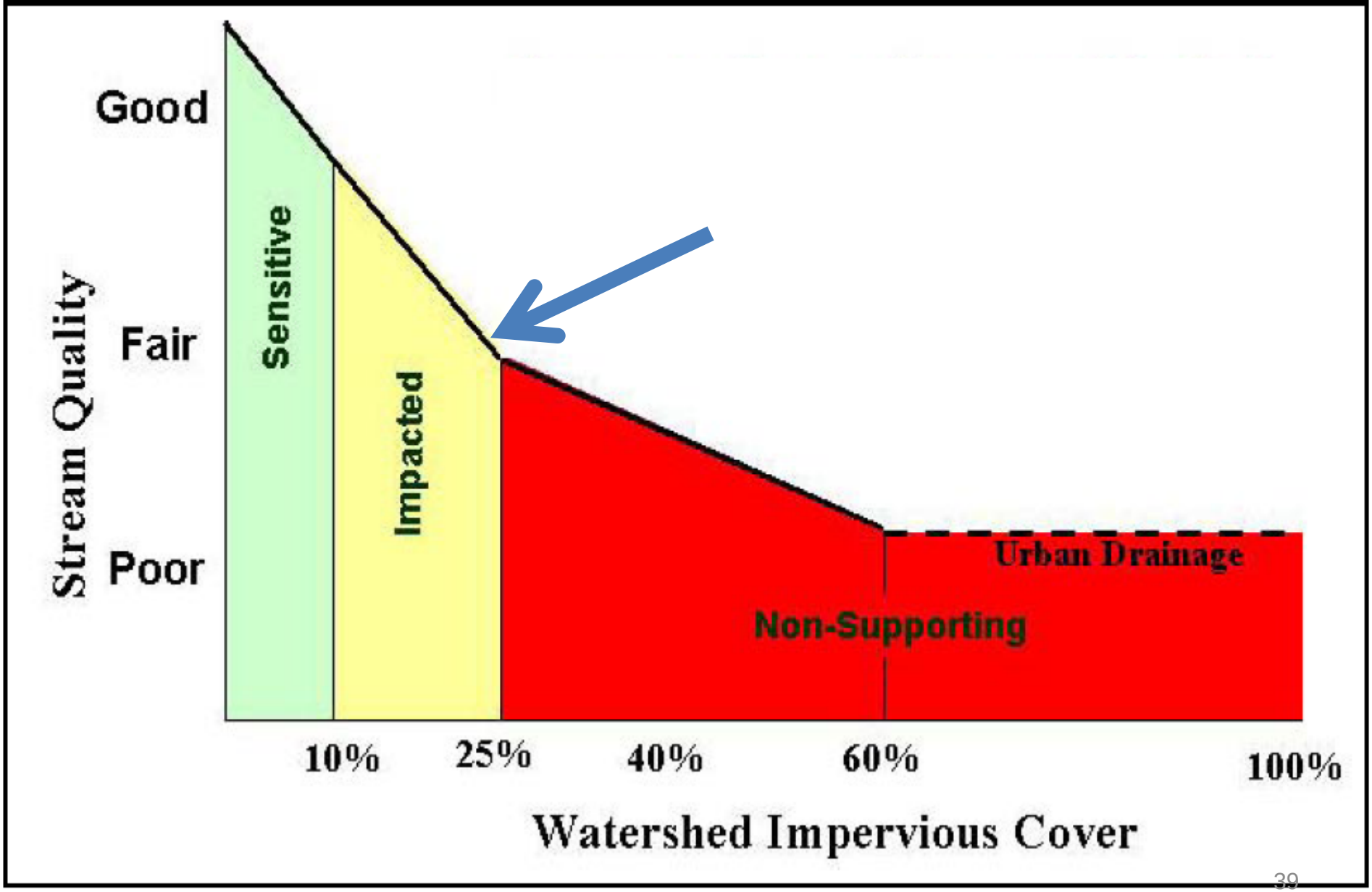
Biological / Habitat



As the amount of impervious cover increases, the number and diversity of aquatic species decreases.

Scott Millar-RIDEM

Figure 1: Impervious Cover Model



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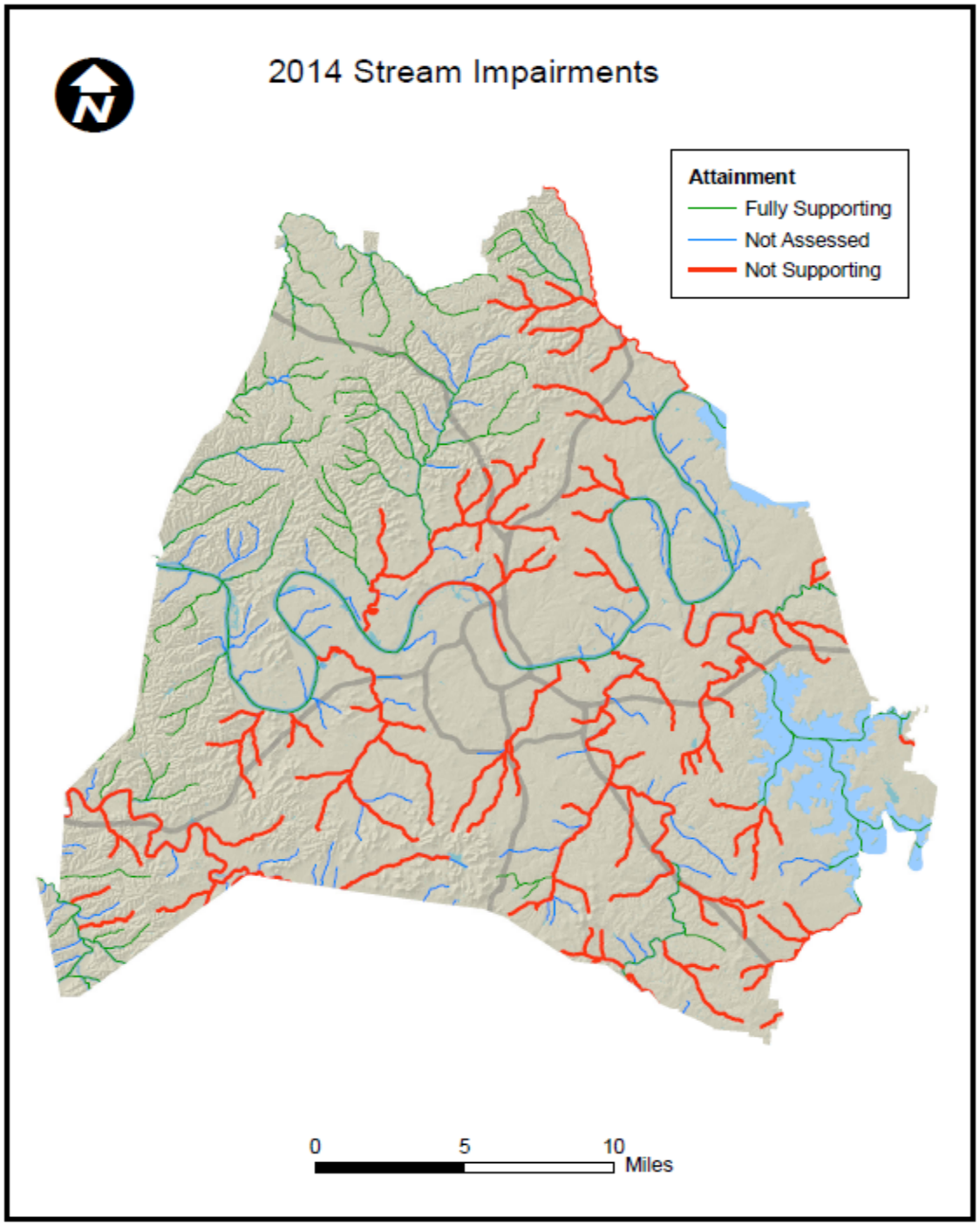
Date: Oct. 15, 2008
Contacts: Jennifer Walsh, Media Relations Officer
Alison Burnette, Media Relations Assistant
Office of News and Public Information
202-334-2138; e-mail <news@nas.edu>

FOR IMMEDIATE RELEASE

EPA'S STORMWATER PROGRAM NEEDS A SIGNIFICANT OVERHAUL TO IMPROVE ITS EFFECTIVENESS AND THE QUALITY OF URBAN STREAMS

STATE	NEW DEVELOPMENT PERFORMANCE STANDARD	RAIN DEPTH CONTROLLED
DC	Retain runoff volume on-site	1.2"
DE	Provide runoff reduction to have zero effective impervious for RPE	2.7"
EPA	Control 95% storm event on-site using RR to METF	1.4 - 1.7"
MD	Use ESD to the MEP to achieve runoff for woods in good condition	2.7"
NY	Provide runoff reduction for a fraction of WQv for 90% rain event	0.8 - 1.2"
PA	No increase in total runoff volume for all events up to the two year storm	2.8"
VA	TP load from new development may not exceed 0.41 lbs/ac/yr	1.0"
WV	Provide on-site runoff reduction	1.0"


2014 Stream Impairments
Attainment
Fully Supporting
Not Assessed
Not Supporting
0
5
10
Miles

1” CAPTURE/LID CRITERIA…

VOLUME 1
REGULATIONS

STORMWATER MANAGEMENT MANUAL

METROPOLITAN GOVERNMENT OF
NASHVILLE AND DAVIDSON COUNTY
DEPARTMENT OF WATER AND SEWERAGE SERVICES
STORMWATER DIVISION
NASHVILLE, TENNESSEE

February 2016

PHASE I VS II MS4 PERMITS…

1972 – Clean Water Act (CWA) adopted – established National Discharge Elimination System (NPDES) Permits for discharges to waters of the U.S.

1987 - CWA Amendments – established Ph I & II MS4 NPDES Stormwater permits

- 1990 – Phase I MS4 Permitting for larger cities went into effect
- 2003 – Phase II MS4 Permitting for smaller cities went into effect

CWA/NPDES permits have significant noncompliance ramifications (fines and/or criminal charges)

"Major" Phase I Individual MS4 Permit – Big 4 Cities in TN are each issued permits
"Minor" Phase II General MS4 Permit – 93 Cities/Counties/Facilities submit NOI and are granted coverage under the (one) General Permit

Phase I:

- Individual permit reflective of specific city considerations
- More specific/detailed requirements than Phase II permits
- Per CWA, Ph I permits are considered a "Major" permit (review/approval by EPA Region IV)

PHASE I VS II MS4 PERMITS…

Metro Stormwater staff have stayed in close communication with TDEC re Ph II – post-development implementation delay and draft permit reissuance re if, and if so, how it was to impact our permit's Feb-2016 – 1" capture permit requirement/deadline:

- participated in various TNRRAT meetings
- 2/6/15 – call
- 3/15/15 – call
- 6/26/15 – call
- 11/15/15 – call
- 12/16/15 – meeting
- 1/21/16 – call
- 2/8/16 – email
- 2/9/16 – conference call w/TDEC re Ph II matter (Bills 1892-1830)

From: Robert Karesh [mailto:Robert.Karesh@tn.gov]
Sent: Monday, February 08, 2016 2:55 PM
To: Hunt, Michael (WS)
Cc: Erin O'Brien; Steven Turaski
Subject: RE: From Within an SCM

Hi Michael. Thanks for your email. As discussed, the proposed General Phase II MS4 permit revisions do not affect the requirements and timelines specified in Metro's individual Phase I MS4 permit. Metro is expected to continue implementing/maintaining its entire stormwater management program, including the permanent stormwater management provisions. Additionally, we consider your recently implemented permanent stormwater program to be equivalent to that found in the proposed General permit. Therefore, you'll have the choice to either keep your program as is, or transition to the language in the new General permit at the time of your individual permit reissuance. I hope this helps and please let me know if you need more detail or want to discuss. Thanks, Robby

TN Department of Environment & Conservation

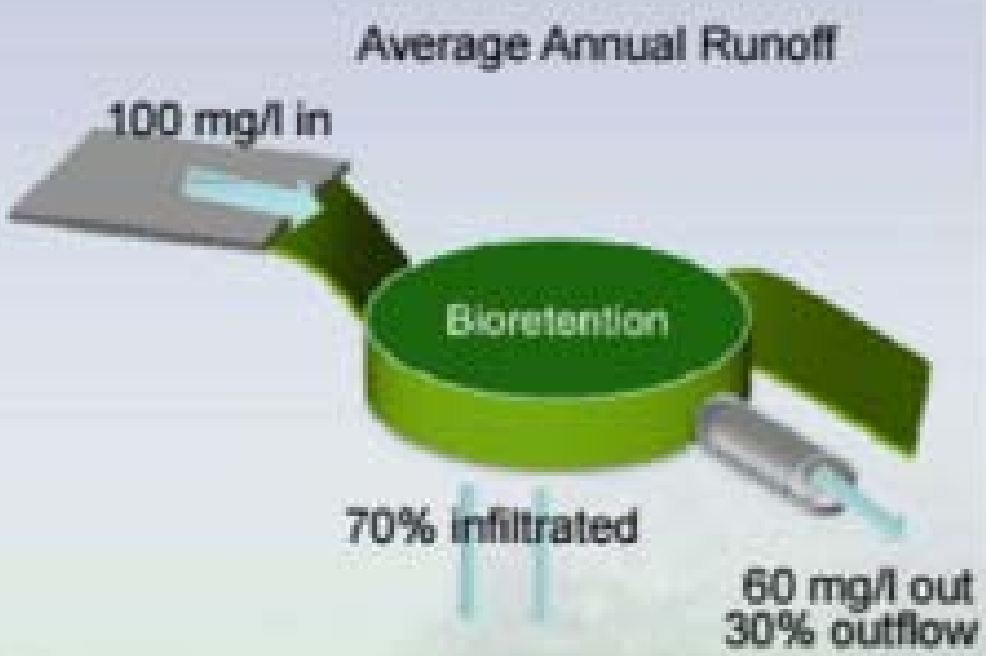
Robert Karesh | Statewide Stormwater Coordinator
Division of Water Resources
William R. Snodgrass Tennessee Tower, 11th Floor
312 Rosa L. Parks Ave, Nashville, TN 37243
p. 615-253-5402 | robert.karesh@tn.gov
Please tell us how you think we're doing by completing this survey: TDEC Customer Satisfaction Survey

SONIC

TONIC

Why Is Volume Reduction Important?

- **Why Volume**
  - Groundwater recharge, maintain baseflow, reduce bank erosion
  - Volume is surrogate for pollution
  - Volume carries pollutants
- **Controls that remove volume are "golden"**



Old way = 40% TSS removal

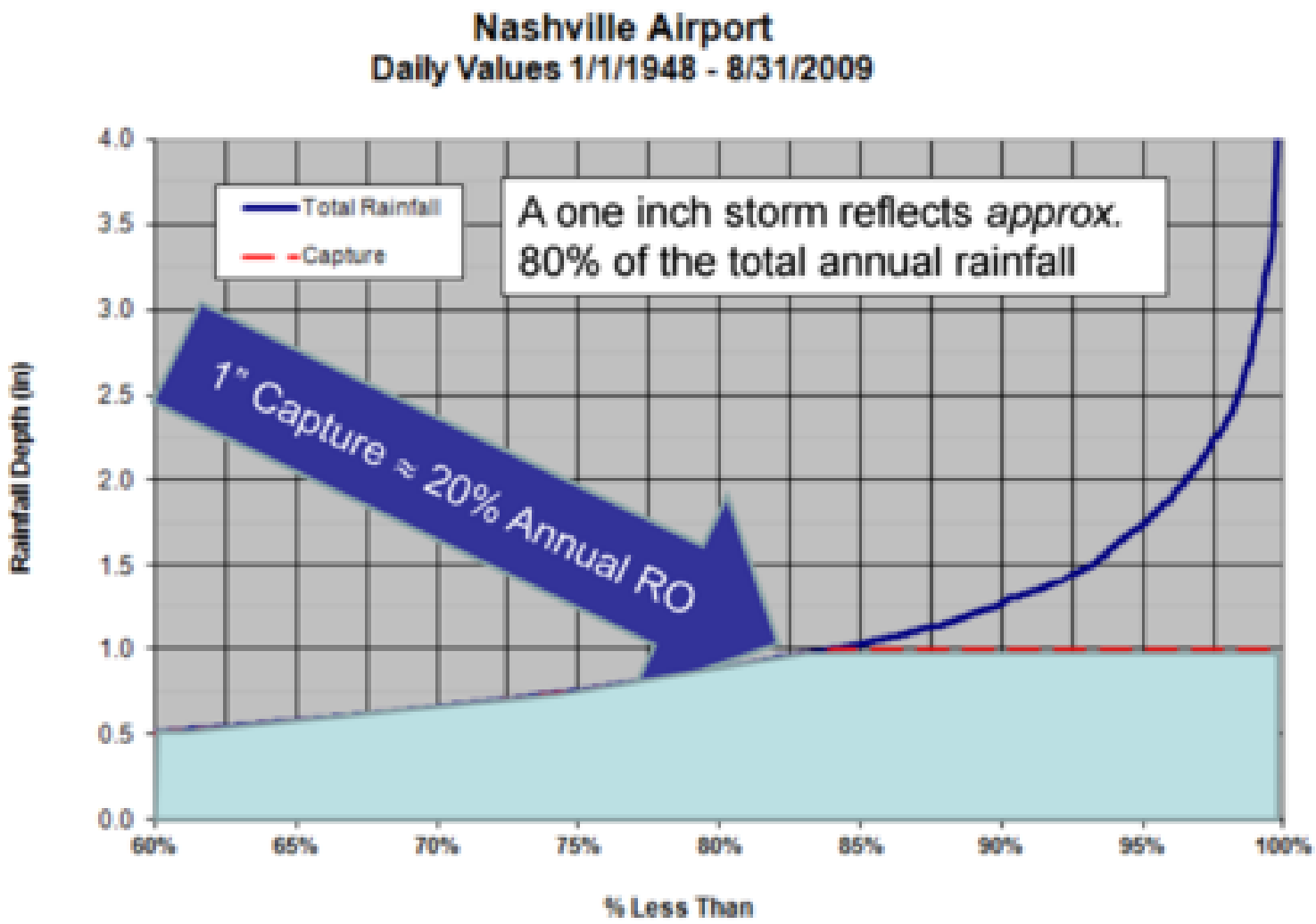
New way = 82% TSS removal
also accounts for volume removal

Permit Language

…built and maintained to infiltrate, evapotranspire, harvest and/or use… the stormwater runoff generated at a site by the **first inch** of every rainfall event preceded by 72 hours of no measurable precipitation… no runoff

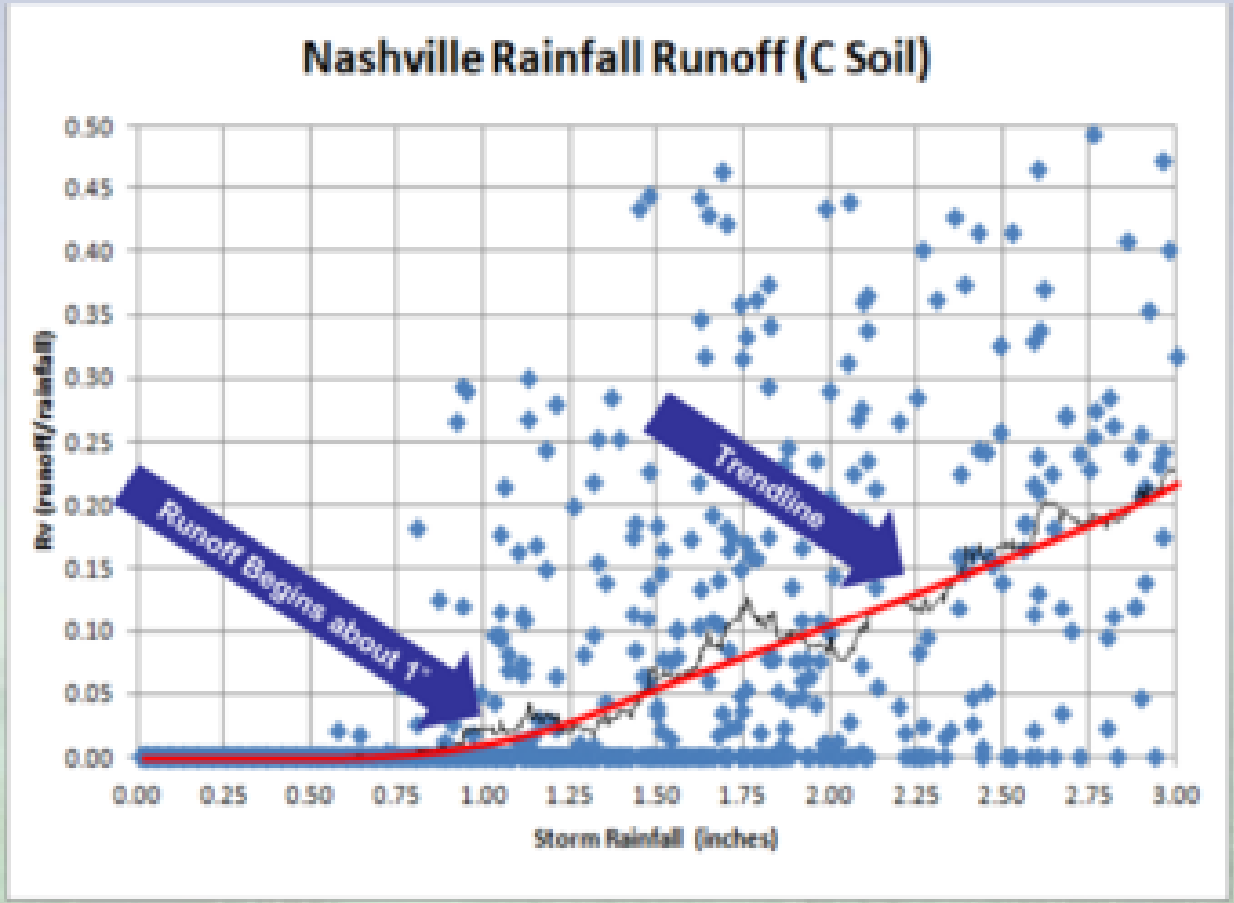
Section 4.2.5.2.1

Rainfall Capture



Choice of C Soil as Standard

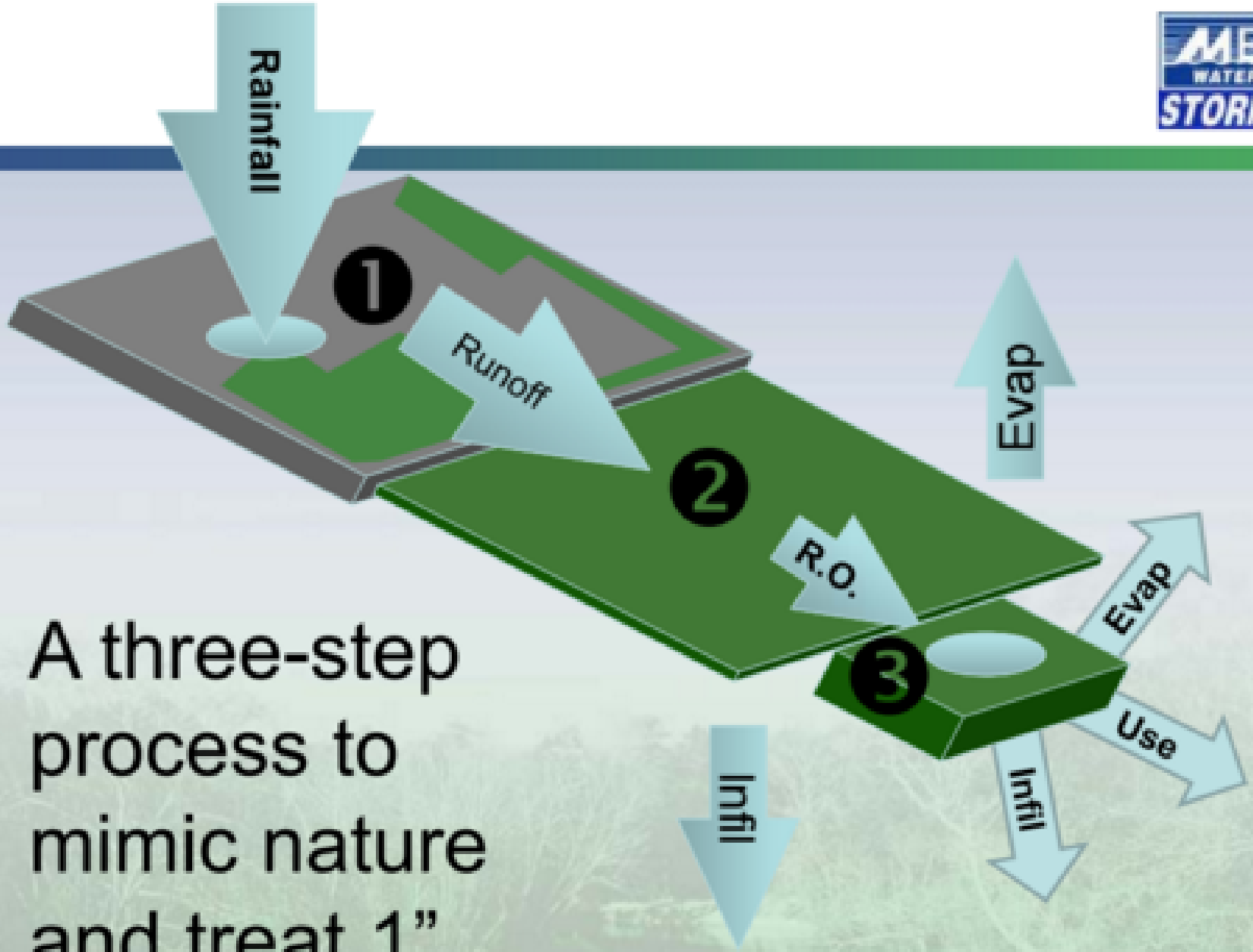
- 72 hr IEDP Storms
- C Soil with turf demonstrates an ability to capture the first inch of most storms and give an overall Rv of 0.20



MWS Standard

- Capture values based on national data and the Chesapeake Bay approach, modified by local analysis, and simplified
- One single criteria: Rv ≤ 0.20 is compliance
  - If the site has an Rv ≤ 0.20 then on average the site captures the first inch of rainfall
  - Structures are designed to capture the right volume to bring about an Rv ≤ 0.20

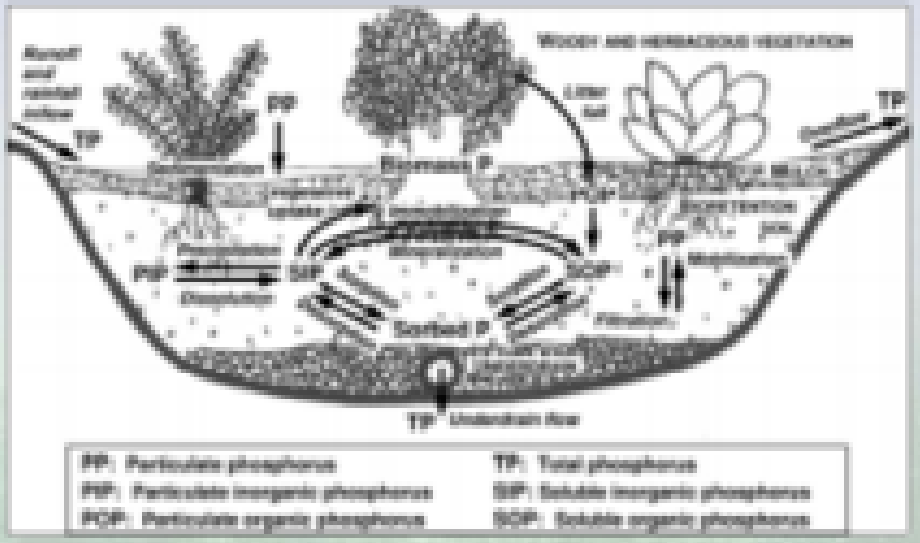
So – defining a site with an annual Rv of 0.20 is like saying we will capture one inch



A three-step process to mimic nature and treat 1”

Routing Pollutants to Soil Media

- **Studies have shown that with the exception of runoff from highly polluted urban hotspots groundwater is not contaminated and pollutants are broken down naturally or the concentrations are insufficient to cause pollution problems.**



Phosphorus Cycle within a typical Bioretention Cell Published in *Environ. Rev.* 18:159-173.

Weiss, et al, "Contamination of Soil and Groundwater Due to Stormwater Infiltration Practices – a Literature Review", University of Minnesota Proj. Rpt. No. 515, June 2008

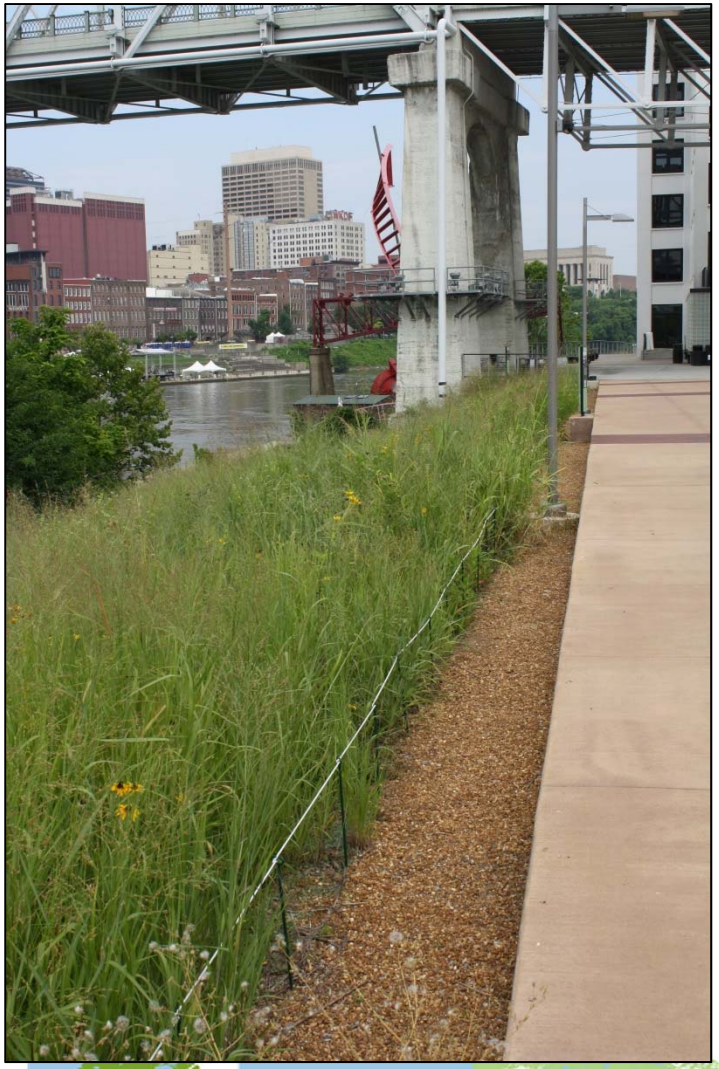
LID Manual - Background

History of Nashville's LID Manual

- Green Ribbon Committee
- Increase Utilization of LID
- How????
- FLOOD!!!
- Started 11/10 & Released 8/12

Photos: *The Tennessean*

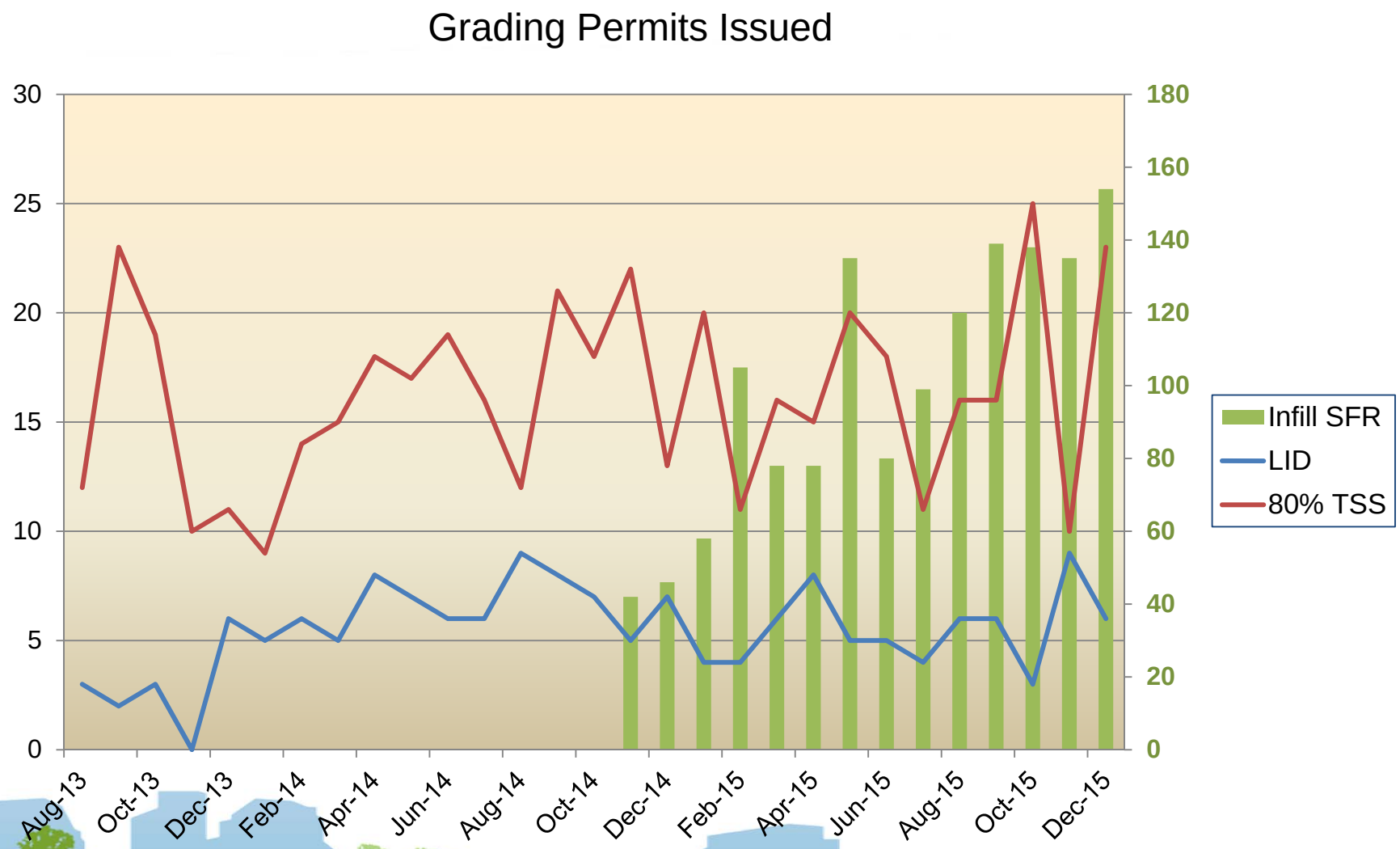
LID Manual - Background



New NPDES MS4 Permit Requirements

- Infiltrate, evapotranspire, or capture & reuse first 1”
- Currently 2 Compliance Paths
- Trial period to test & identify problems
- Integrate into Metro Regulations in 2/2016
- 1st in Tennessee to implement!!!

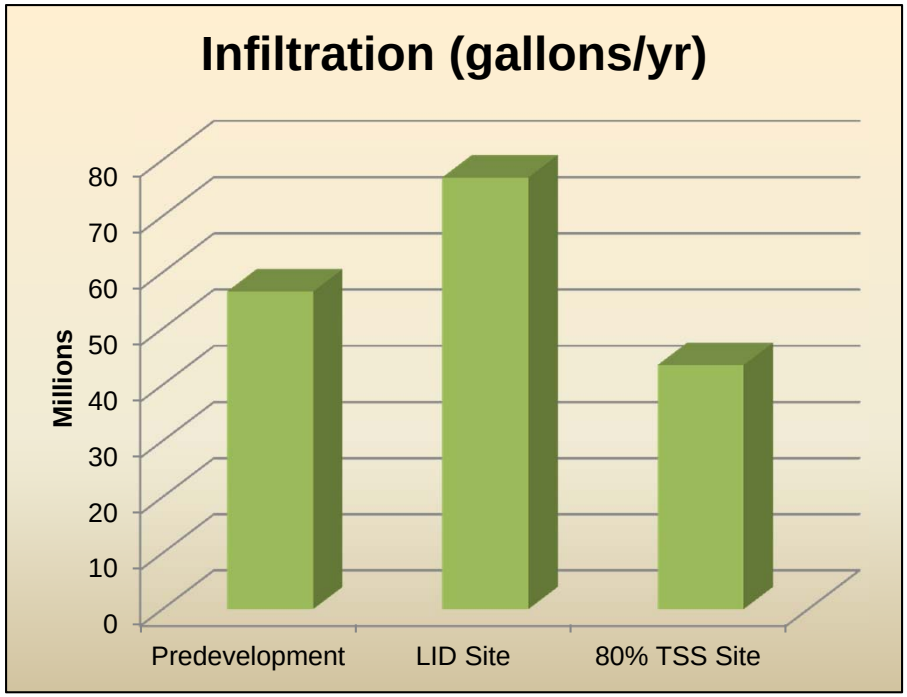
LID Manual - Results

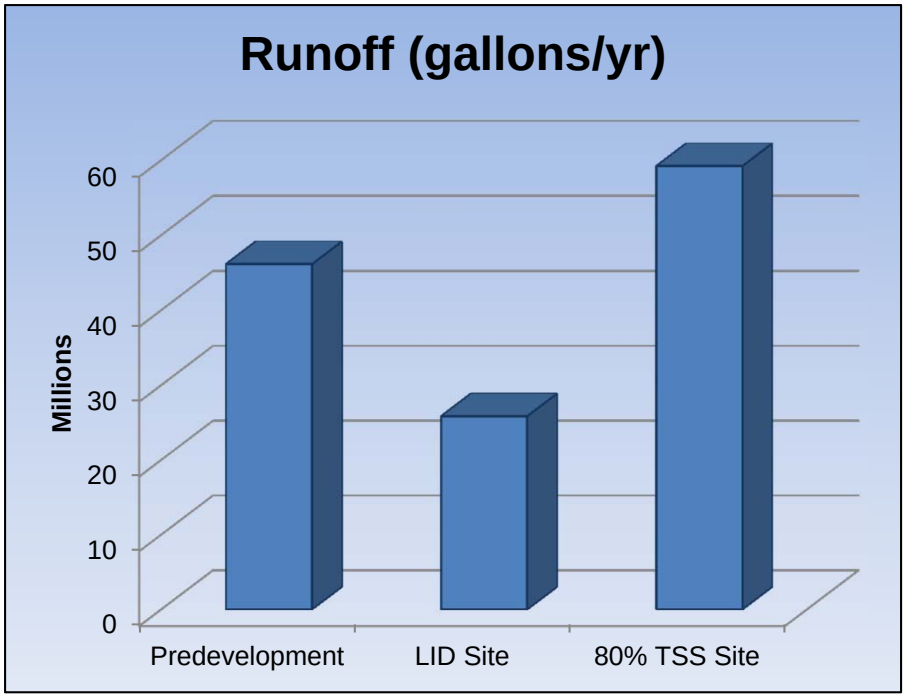


24% of issued Grading Permits voluntarily used the LID Manual

LID Manual - Results

LID sites infiltrated 30 M gallons > Traditional (80% TSS)
LID sites infiltrated 20 M > Predevelopment





LID Manual - Changes

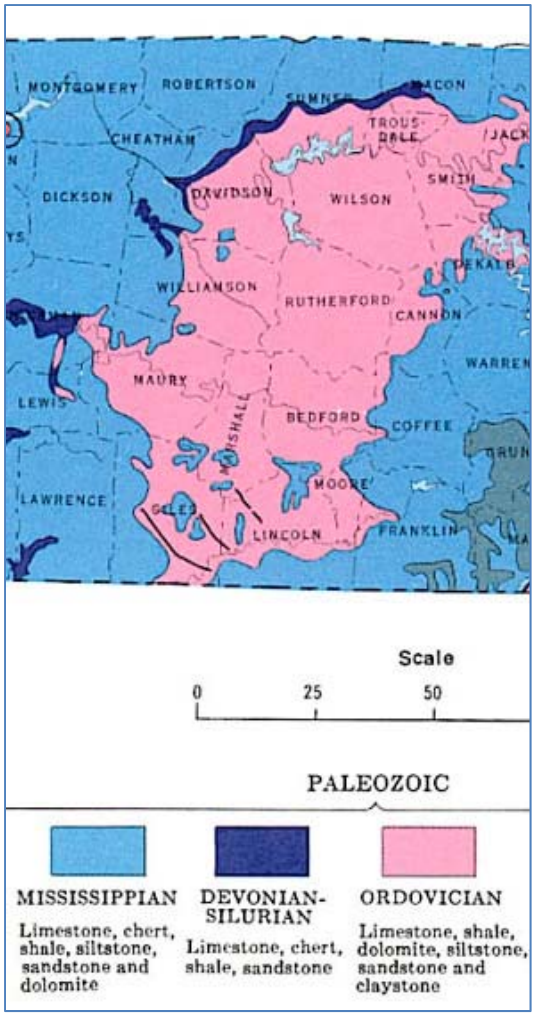
Waiving the 1” Requirement

- Can’t everyone have a cistern & a green roof?
- Site Constraints
  - Karst
  - Soil conditions
  - High water table
  - Brownfields
  - Hotspots
- Review Committee
- Downtown Limitations

LID Manual - Changes

KARST!!!!!!!!

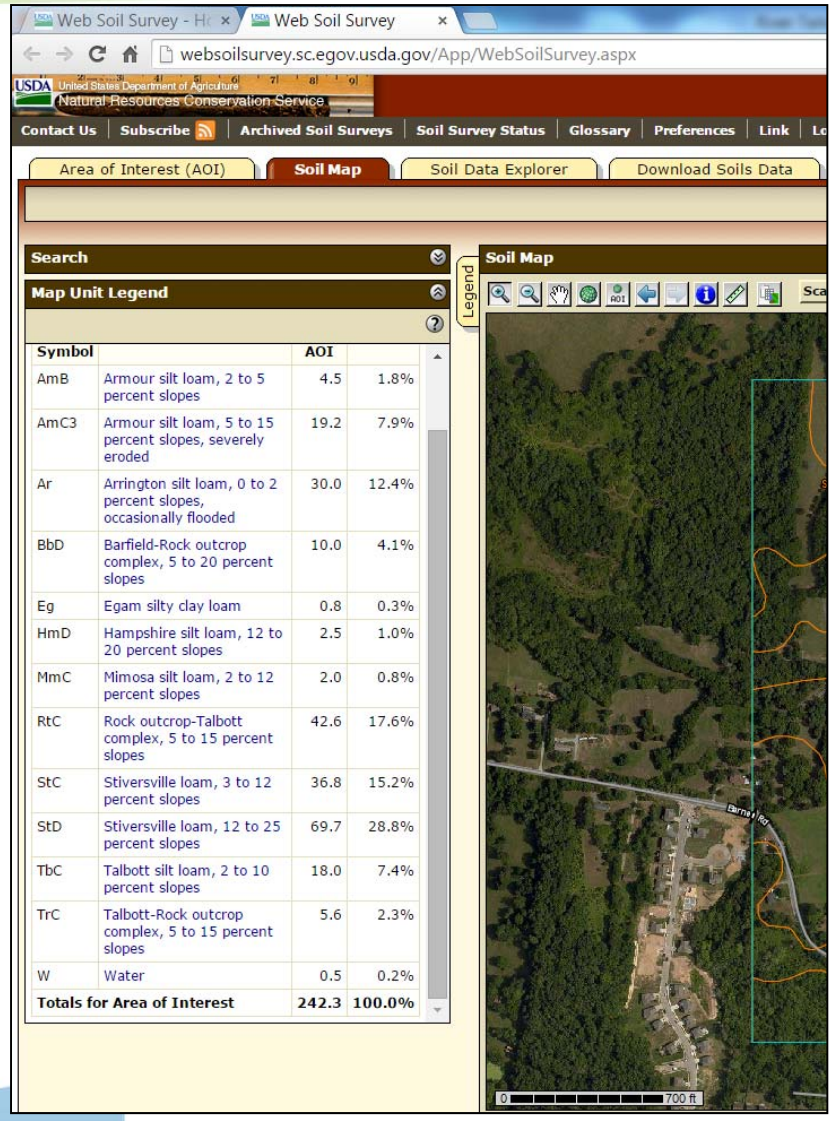
- Underlying carbonate rock
- Sinkholes, caves, springs
- Challenges of Development
  - Subsidence & collapse
  - Increased runoff
  - Highly variable subsurface
  - Groundwater contamination
- Davidson County: 609 sinkholes & 87 caves (www.http://tnlandforms.us/)



LID Manual - Changes

Site Investigations

- Preliminary
  - Geologic maps, aerials, site visit
- Test Pits / Borings / Probes
  - Soil type
  - Depth to water table / bedrock
  - Cavities
- Infiltration Tests
- Environmental Site Assessments



Symbol		AOI	
AmB	Armour silt loam, 2 to 5 percent slopes	4.5	1.8%
AmC3	Armour silt loam, 5 to 15 percent slopes, severely eroded	19.2	7.9%
Ar	Arrington silt loam, 0 to 2 percent slopes, occasionally flooded	30.0	12.4%
BbD	Barfield-Rock outcrop complex, 5 to 20 percent slopes	10.0	4.1%
Eg	Egam silty clay loam	0.8	0.3%
HmD	Hampshire silt loam, 12 to 20 percent slopes	2.5	1.0%
MmC	Mimosa silt loam, 2 to 12 percent slopes	2.0	0.8%
RtC	Rock outcrop-Talbott complex, 5 to 15 percent slopes	42.6	17.6%
StC	Stiversville loam, 3 to 12 percent slopes	36.8	15.2%
StD	Stiversville loam, 12 to 25 percent slopes	69.7	28.8%
TbC	Talbott silt loam, 2 to 10 percent slopes	18.0	7.4%
TrC	Talbott-Rock outcrop complex, 5 to 15 percent slopes	5.6	2.3%
W	Water	0.5	0.2%
Totals for Area of Interest		**242.3**	**100.0%**

LID WAIVER…

https://www.nashville.gov/Water-Services/Developers/Stormwater-Review/Stormwater-Management-Manual/Regulations.aspx

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- Who Needs A Grading Permit
- Applications & Forms
- Variance & Appeal Information
- Regulated Residential Infill
- Water and Sewer
- Low Impact Development
- Water Quality Buffers
- Post Construction
- Development Guides
- Procurement Info
- **Stormwater Maintenance**
- **Pollution Prevention**
- **Environmental Compliance**
- **Clean Water Nashville**

- Chapter 6: Technical Guidelines and Criteria
- Chapter 7: Post-Construction Water Quality Policies & Procedures
- Chapter 8: Regulated Residential Infill
- Appendix A: Plan Submittal Information
- Appendix B: Definitions & Acronyms
- Appendix C: Stormwater Control Measure (SCM) Maintenance Document
- Appendix D: Metropolitan Code of Laws §15.64.010 et. seq.: and Stormwater Management Ordinance No.78-840
- Appendix E: Flood Plain Overlay District Ordinance No. 78-843 and Metropolitan Code of Laws 17.36.170 et, seg
- Appendix F: Stormwater Management Committee Internal Operating Rules & Procedures and Application for Variance or Appeal
- Appendix G: Memorandum of Understanding
- Appendix H: Regulated Residential Infill Guidance

If a project has sufficient site limitations that preclude it from meeting the Low Impact Development requirement, they will need to submit a Low Impact Development Waiver Application to:

LID WAIVER…

Metro Water Services
Stormwater Division

Low Impact Development
Waiver Application

	Owner / Applicant	Engineer / Architect
Name:		
Email:		
Phone number:		
Signature:		

Project Information

Project Name (if known):_____

Address:_____

Map & Parcel:_____Size (acres):_____Site Weighted Runoff Coefficient (Rv):_____

Project Scope:_____

Waiver Justification (cannot be based solely upon economic hardship)

- ☐ Groundwater pollution potential (hotspots)
- ☐ Soil contamination (Brownfields)
- ☐ Karst geology / sinkholes
- ☐ Limited infiltrative capacity (shallow soils, low permeability soils, high water table)
- ☐ Other (attach additional pages if needed)_____

Please provide justification that the project cannot use a cistern or construct a green roof:_____

Supporting Documentation

The application must contain adequate documentation to support the request for waiver. This can include, but is not limited to site plans, geotechnical reports, environmental site assessments, and engineering analysis.

Please note – the results of the waiver assessment apply only to this project and are not transferable.

LID Manual - Changes

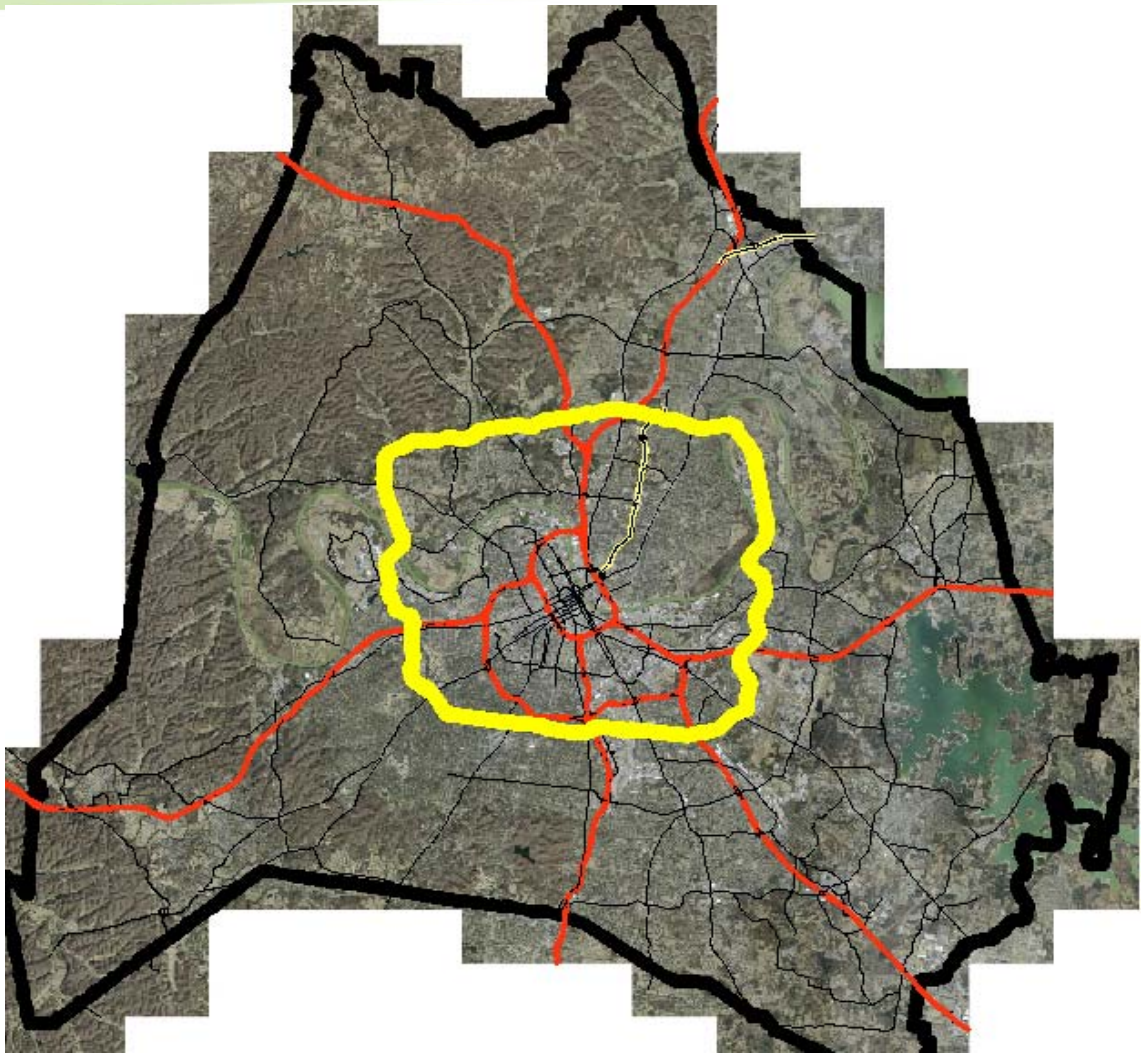
Current incentives

- ✓ Stormwater User Fee Reduction
- × Bonus Runoff Reduction Credit for Green Roofs & Bioretention
  - Green Roof Rebate in CSS!!!
- ✓ Reduce stormwater detention quantity
- × Plan Review Fee Waiver
- 👍 Reduced Stormwater Requirements for Infill

LID Manual - Changes

Infill incentive (0.2 to 0.4 Rv)

- Existing infrastructure
- Reduce sprawl
- Only applies to previously developed sites
- Expanded to **New Redevelopment Incentive**

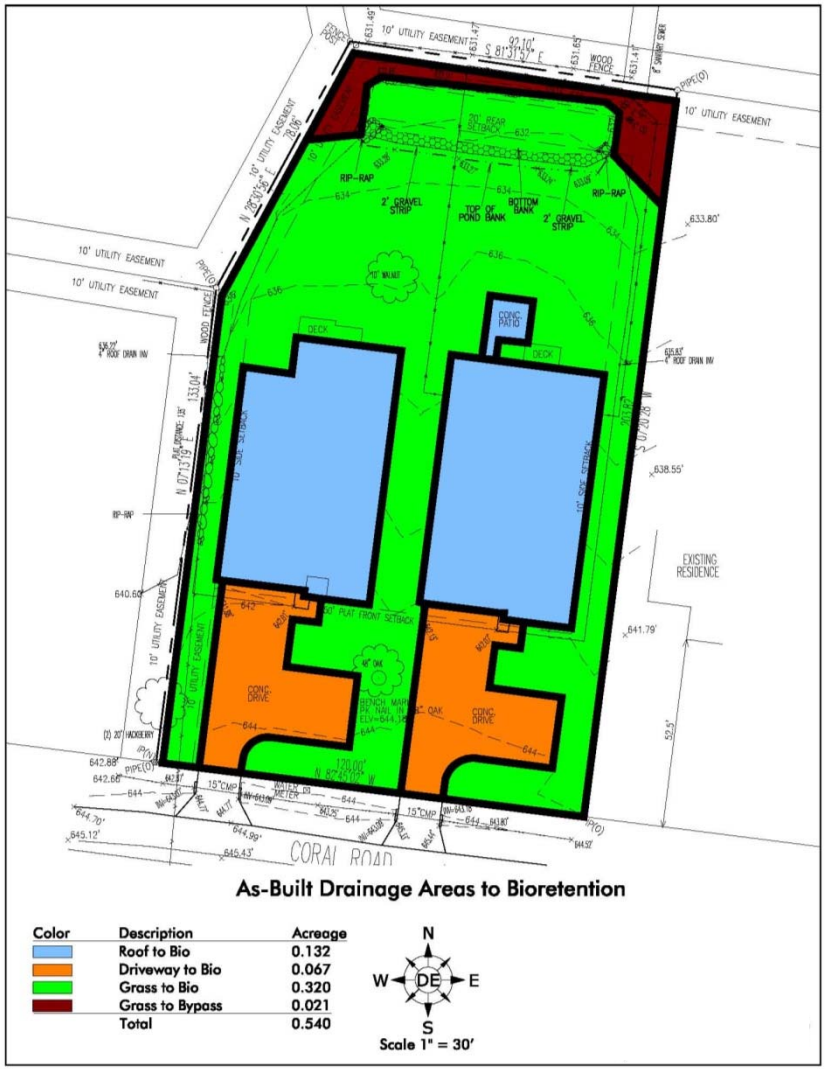


LID Manual - Schedule

Important Dates

- Regulations Released: 12/8/15
- Become Effective: 2/1/16
- Plans Sufficient by: 3/31/16
- Plans Pass Technical Review by: 7/31/16
- 6 months to Pre-con & 6 months from Pre-con to start

LID Manual - Changes



As-builts

- Water Quality Buffers
- Site Design Spreadsheet
- e-submittal: CAD Drawing
- Video of Public SW Infrastructure

GIP Specifications

- Choker stone layer
- Pervious pavement CDA

Project Name	0
Parcel Identification #	0

Combined Sewer Overlay?		
Pre-Development Impervious Area (acres)		
Pre-Development Rv =		
Target Runoff Reduction Requirement	80%	See Section 7.2.1 in Metro SWMM Volume 1

Capture Depth=	1	inch	
Cistern Capture=		% Total Vol captured	From Cistern Design Tool

Instructions

1. Input cells are in Green.
2. Break Site Into Sub areas by single soils and land use type combinations.
3. Assign a code to each subarea and input the code into column T. Descriptions can be entered in column S.
4. Input the subarea drainage area in column U.
5. Input treatment credit code (Column W) for the first tier of treatments
6. Input additional treatment code as desired (Column Z) for any subarea
7. Adjust until you reach 80% reduction or better (Cell AE41 turns green if 80% reached).
8. If 80% reduction is not reached and it has been decided that GIPs in series is an option use Step 3a to place GIPs in series . Their respective treatment volumes are calculated in column AN. This volume is separate from GIPs upstream.
9. When using GIPs in Series the user will look to Cell AK41 for confirmation the 80% goal has been met.

	GI Practice	Level	Lookup Table Code	R Credit	Rv	Tv Multipli
Step 2 Intrinsic GIPs	Downspout Disconnection	A/B Soil	DAB	0.5	0.5	0.00
		C/D Soil	DCD	0.25	0.75	0.00
		Amended	DAS	0.5	0.5	0.00
	Sheet Flow	Conv Area A/B	SAB	0.75	0.25	0.00
		Conv Area C/D	SCD	0.5	0.5	0.00
		Strip A	SA	0.5	0.5	0.00
		Strip Amended	SAS	0.5	0.5	0.00
Step 3 & 3a Structural GIPs	Permeable Pavement (see Notes below)	1	P1	0.45	0.55	1.00
		1(P1 Land Use)	PP1	0	1	1.00
		2 (No Runon)*	P2	0	1	1.10
	Grass Channel	A/B Soil	GAB	0.2	0.8	0.00
		C/D Soil	GCD	0.1	0.9	0.00
		A/B Amended	GAA	0.4	0.6	0.00
		C/D amended	GCA	0.2	0.8	0.00
	Bioretention	1	B1	0.4	0.6	1.00
		2	B2	0.8	0.2	1.25
	Water Quality Swales	1	S1	0.4	0.6	1.00
		2	S2	0.6	0.4	1.10
	Infiltration Trench	1	I1	0.5	0.5	1.00
		2	I2	0.9	0.1	1.10
	Urban Bioretention	1	UB	0.4	0.6	1.00
	Ext Detention Pond		D1	0.15	0.85	1.00
	Cistern		CIS	0	1	0.00

Notes for Permeable Pavement

1. Change PP1 in Structural GIP for actual area of the Level 1 Permeable Pavement, otherwise use P1 for run-on areas.
2. Level 2 Permeable Pavement cannot have run-on, therefore P2 can only be chosen as Structural GIP for Modified Land Use of P2

Text in Column AC will turn red if these conditions are not met.

Percent Volume Reduction-Based Calculations

Step 1: Lay out the site and divide it into sub-areas each of a specific land use type and Rv.

Step 1a: Change any basic land use types through reforesting, permeable pavement or green roofs - or through use of open space for a GIP.

Step 2: Treat impervious areas through the use of disconnection or sheet flow

Step 3: Treat primarily impervious areas with structural GIPs either in series with Step 3 intrinsic GIPs or alone downstream from Step 1

Size controls for Step 3 by assigning structure ID to each sub-area, combining sub-areas into one structure if appropriate.

Step 3a Treatment in Series Calculation - Place Structural GIPs in same row as upstream GIP

Size controls for Step 3a in series by assigning a sequential structure ID to each area treated in series.

Step 1 Basic Land Use					Step 1a Modified LU			Step 2 Intrinsic GIPs			Step 3 Structural GIPs			Structure ID	IA Capture		Step 3a Structural GIPs in Series			Structure ID	IA Capture		Nominal Curve Number	
Subarea	Description	Code	Acres	Base Rv	Code	Acres	Eff Rv1	Code	Trtmt VR1	Eff Rv2	Code	Trtmt VR2	Eff Rv3		Tv Multiplier	Tv (cf)	Code	Trtmt VR2	Eff Rv4	Site GIP ID Number	Tv Multiplier	Structure in Series Tv	Step 1	Step 1A
1				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
2				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
3				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
4				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
5				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
6				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
7				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
8				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
9				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
10				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
11				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
12				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
13				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
14				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
15				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
16				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
17				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
18				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
19				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
20				0.00		0	0.00		0	0.00		0	0.00		0.00	-		0	0.00		0.00	-	0	0
		Weighted Rv		#DIV/0!	Weighted Rv		#DIV/0!	Weighted Rv		#DIV/0!	Weighted Rv		#DIV/0!		Step 3 Tv Total	0			#DIV/0!		Final Tv Total	0	#DIV/0!	#DIV/0!
		Total Area	0	0.00	Total Area	0	0.00			0.00			0.00						0.00					
	% Removal			#DIV/0!	% Removal		#DIV/0!	% Removal		#DIV/0!	% Removal		####				% Removal		####					

THIS CELL WILL TURN GREEN WHEN TARGET RUNOFF REDUCTION MET

THIS CELL WILL TURN GREEN WHEN TARGET RUNOFF REDUCTION MET

Project Name	0
Parcel Identification #	0

PreDev	

METRO RAINFALL	
Return Period	**Rainfall**
2-yr	3.39
5-yr	4.50
10-yr	5.23
25-yr	6.16
50-yr	6.85
100-yr	7.53

Curve Number Instructions

1. Enter the composite pre-development curve number (CN), to the left, for the watershed.
2. The tool automatically assigns curve numbers for each subarea based on MWS policy matching the land uses of Steps 1 and 1a to curve numbers (see column **G**).
3. Curve numbers are shown for both Step 1 and Step 1a in columns AO and AP as well as the composite curve number for the site in line 39 of those columns.
4. The ratio of the **Tv provided/Tv required** for each GIP (as a %) is entered in column AX (e.g. if only required Tv is provided then this should be 100%).
5. Select the rainfall in **Cell AT19** based on return periods shown in table to left.
6. Adjusted curve numbers for each subarea are shown in the table below in column **BB**, as well as the composite adjusted curve number in **Cell BB39**, for the rainfall selected. If this value is greater than the composite Pre-Development CN then **Cell BB40** will state "Detention Required"
7. These are the curve numbers to be used in flood control design calculations. Each watershed must be calculated independently. If there are multiple watersheds for the project, then the composite pre-development curve number and composite adjusted curve number should be compared for each watershed to determine if detention is required.
8. If there are GIPs in series, use the 2nd table to calculate the additional reduction in CN.

Adjusted Curve Number Calculations (Step 3 only)

No Controls				With Structural Controls &Treatment Vol Removed						
Original CN	Rainfall (in	S (in)	Q (in)	Tv required	Tv provided	RO Vol Red (cu	Q reduction (in	Q adj (in)	Adjusted CN	Difference
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
#####		#DIV/0!	#DIV/0!	0			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Note that this assumes the same Pre- and Post-developmentTc an #DIV/0!
if this is not the case additional routing calculations will be required

Adjusted Curve Number Calculations (Step 3a added)

No Controls				With Structural Controls &Treatment Vol Removed						
Adjusted	Rainfall (in	S (in)	Q (in)	Tv required	Tv provided	RO Vol Red (cu	Q reduction (in	Q adj (in)	Adjusted CN	Difference
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
0.0	7.53	-	-	-			0	-	0.0	0.0
####		#DIV/0!	#DIV/0!	0			#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

Note that this assumes the same Pre- and Post-developmentTc an #DIV/0!
if this is not the case additional routing calculations will be required

$$Q = \frac{(P - 0.2 \times S)^2}{(P + 0.8 \times S)} \quad \text{and} \quad S = \frac{1000}{CN} - 10$$

Equation 3.6

$$Q_{adj} = Q - \frac{12 \cdot T_v}{43560 \cdot CDA}$$

Equation 3.7

FITNESS
Scaffmark

GREEN ROOF

2016 SWMM CHANGES…

Word Doc…

LOOKING FORWARD…

- ☑ Start evaluating new revisions and any needed tweaks
- ☑ Follow State and National Stormwater considerations that create a need for us to modify our MS4 permit
  - ☑ State Ph II permit (final draft due out soon)
  - ☑ State Bills?
  - ☑ EPA Ph II "public notice" rule, etc.
  - ☑ Our MS4 permit reissuance process starts 2/1/17
- ☑ Begin working on next reg revision

Thanks!

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