4 – Local Ordinances and Policies

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Module Content

- Local Requirements
- Hamilton County Performance Standards
- Policies and equations

Permanent Stormwater Requirements

Hamilton County Water Quality Program Resolution

Section #	Requirement or Topic
3	• Permanent Stormwater Applicability & Exemptions • Requirement for a Post Construction Stormwater System Design & Maint. Plan • Requirement for approval of a Land Disturbance Permit
4	• Requirement to use the Hamilton County Stormwater Management Manual • Required elements of a Permanent Stormwater System Design & Mgmt. Plan • Performance Criteria for Permanent Stormwater Controls
5	• Requirement for As-Built Plans • Requirement for a Landscaping Plan for post construction practices • Inspection and Maintenance Plans, Easements, Agreements

Permanent Stormwater Requirements

- Developments & redevelopments ≥ 1 acre must meet the Runoff Reduction Requirements
- Use the 3-step Runoff Reduction Method in the Hamilton County Stormwater Management Manual

Performance Standard

Weighted Rv ≤ 0.2

"Based on national studies and standard, and supported by local rainfall-runoff analysis for Hamilton County soils, it was found that an Rv of 0.20 generally indicates the capture of the first one-inch of rainfall."

Runoff Reduction Method – Weighted Rv

- Step 1 – Layout land cover and determine weighted Rv
  - Use the Site Cover Runoff Coefficients table (Table 4, page 32)
  - Use Equation 1 (page 33)

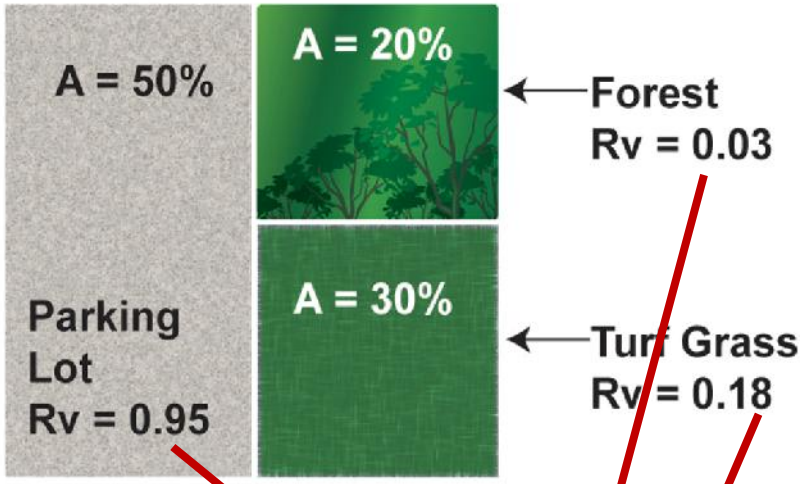
Table 4 - Site Cover Runoff Coefficients				
Soil Condition	**Volumetric Runoff Coefficient (R_V)**			
IMPERVIOUS COVER	0.95			
HYDROLOGIC SOIL GROUP	**A**	**B**	**C**	**D**
FOREST COVER	0.02	0.03	0.04	0.05
TURF	0.15	0.18	0.20	0.23

$$Weighted\ Rv = \frac{(Rv_1 \times A_1) + (Rv_2 \times A_2) + \cdots}{(A_1 + A_2 + \cdots)}$$

RRM Example Calculation

10 acre site

All on B soil →



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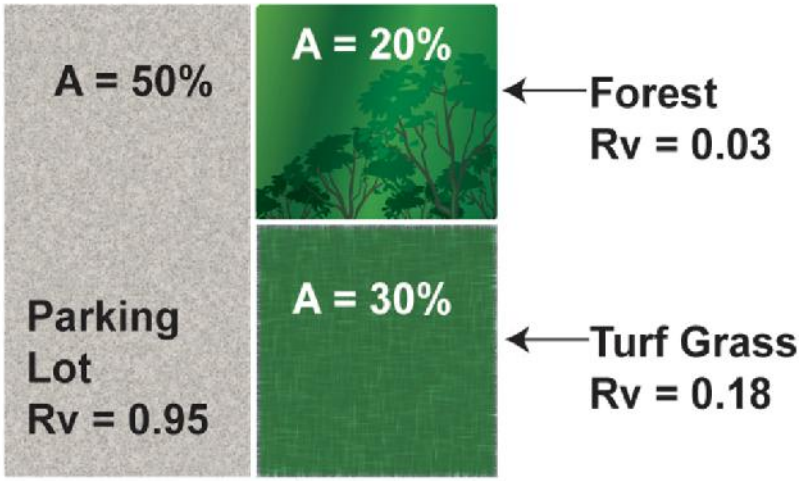


$$\boldsymbol{Weighted\ Rv} = \frac{(\boldsymbol{Rv_1} \times \boldsymbol{A_1}) + (\boldsymbol{Rv_2} \times \boldsymbol{A_2}) + \cdots}{(\boldsymbol{A_1} + \boldsymbol{A_2} + \cdots)}$$

$$Rv = \frac{(5ac\ X\ 0.95) + (2ac\ X\ 0.03) + (3ac\ X\ 0.18)}{10\ ac}$$

$$Rv = 0.54$$

Runoff Reduction Method – GIP Credits

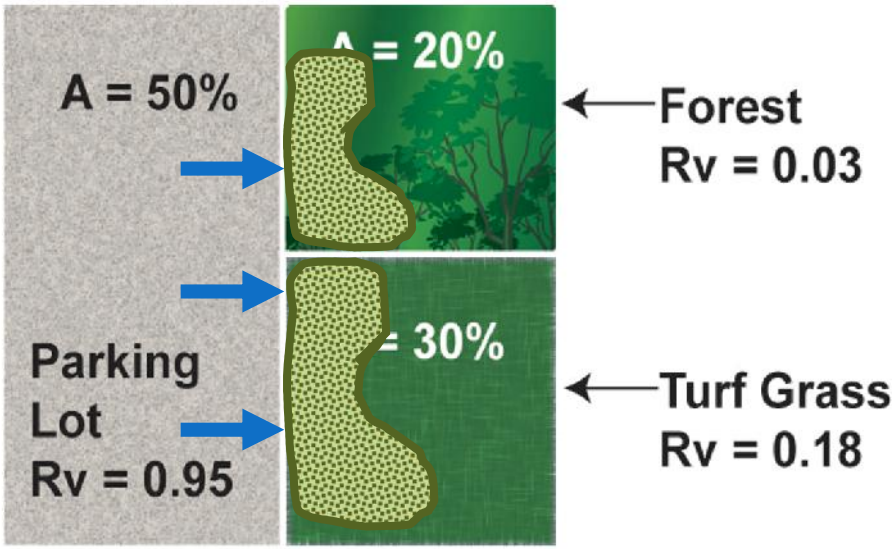
- Steps 2 and 3 - Apply Green Infrastructure Practices
  a. Use Table 5 (page 34) to find GIP Credits

Table 5 – Green Infrastructure Practices Runoff Reduction Credit Percentages								
Green Infrastructure Practice	% Rainfall Volume Removed/Captured – RR Credit							
	Level 1**				Level 2**			
1. Bioretention	60				80			
2. Urban Bioretention	60				N/A			
3. Permeable Pavement	45				75			
4. Infiltration Trench	50				90			
5. Water Quality Swale	40				60			
6. Extended Detention	15				N/A			
7. Downspout Disconnection*	25				50			
8. Grass Channel	10/20				20/30			
9. Sheet Flow *	50				75			
10. Reforestation (A, B, C, D soils)	96	94	92	90	98	97	96	95
11. Rain Tanks/Cisterns	Design dependent							
12. Green Roof	80				90			

Runoff Reduction Method – GIP Credits

- Steps 2 and 3 - Apply Green Infrastructure Practices
  a. Use Table 5 (page 34) to find GIP Credits
  b. Use Equation 2 (page 34) to calculate GIP runoff reduction

$$GIP\ Rv = CDA\ Rv(1 - RR\ Credit)$$



Bioretention at the Missouri Botanical Gardens
Source: Bohn's Farm & Greenhouses, Inc.

Example Calculation

The 5 acre parking lot discharges to Level 2 Bioretention

- CDA = 5 acres
- CDA Rv = 0.95
- RR Credit = 80% (or 0.8) for Level 2

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$$GIP\ Rv = CDA\ Rv(1 - RRCredit)$$

$$GIP\ Rv = 0.95(1 - 0.80)$$

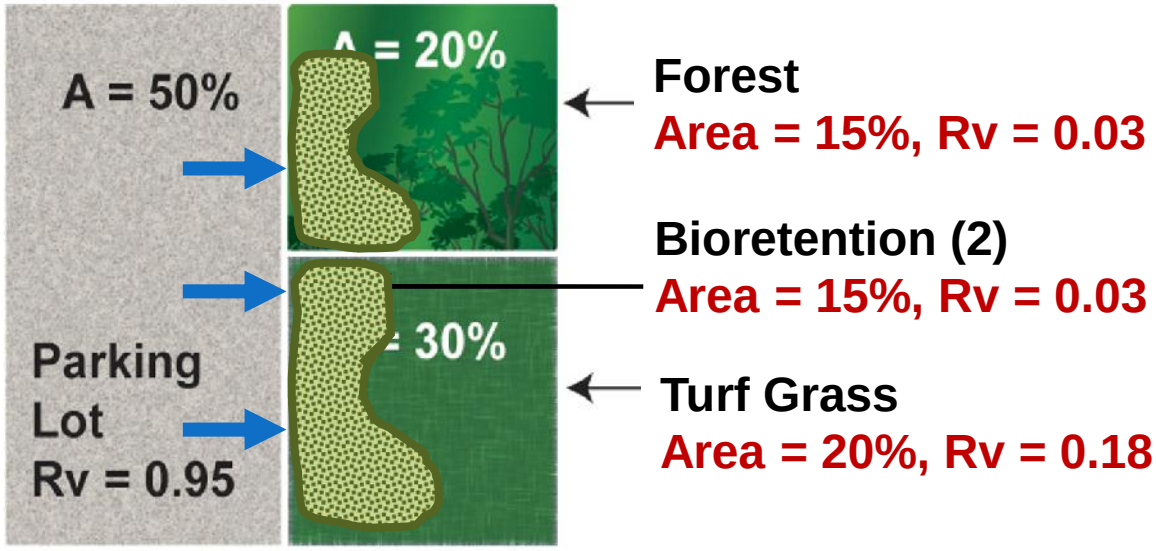
$$GIP\ Rv = 0.19$$

The Rv of the parking lot, after treatment, is now 0.19.

Example Calculation

- Steps 2 and 3 - Apply Green Infrastructure Practices
  a. Use Table 5 (page 34) to find GIP Credits
  b. Use Equation 2 (page 34) to calculate GIP runoff reduction
  c. Recalculate the weighted Rv, with bioretention included

Helpful tip: The bioretention area is considered "Forest" land cover!!



Example Calculation

- Steps 2 and 3 - Apply Green Infrastructure Practices
  a. Table 5 (page 34) provides GIP Credits
  b. Equation 2 (page 34) calculates GIP runoff reduction
  c. Recalculate the weighted Rv

Parking Lot | Bioretention | Forest | Turf

$$Rv = \frac{(5ac\ X\ 0.19) + (1.5ac\ X\ 0.03) + (1.5ac\ X\ 0.03) + (2ac\ X\ 0.18)}{10\ ac}$$

$Rv = 0.14$ ***≤ 0.2, so we are done!***

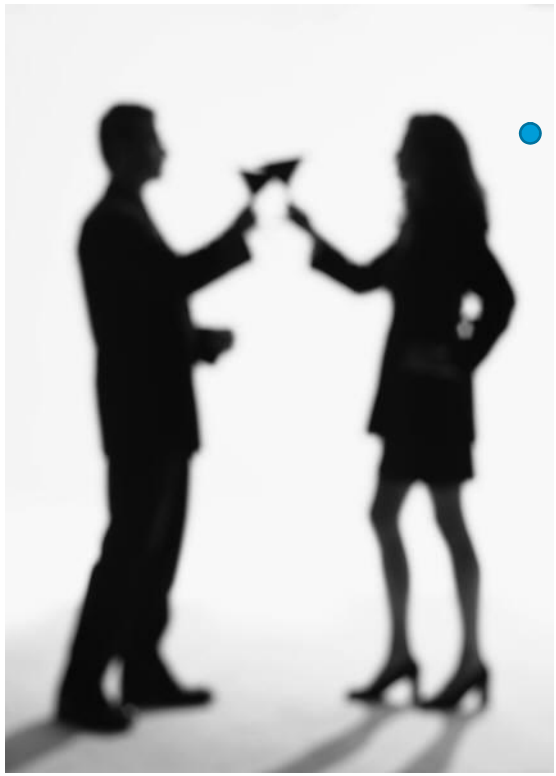
Examples

Bioretention at a Univ. of Iowa parking lot
Source: BlackHawkSWCD

Bioretention in Toronto ON
Source: UrbanToronto.ca.com

TSS Removal Waiver

- Site designs that achieve Rv ≤ 0.2 using the Runoff Reduction Method <u>are not required to comply with TSS Removal Requirements</u>



Sites with Runoff Reduction Limitations

- Limitations may prohibit a site from meeting 100% of the Runoff Reduction Requirement
  - Site designs cannot achieve Rv ≤ 0.2 using the RRM alone
- Must comply with Pollutant Removal Requirements
  - Remainder of rainfall must be addressed using the **TSS Removal Method (TRM)**

The Performance Standard

Achieve Rv ≤ 0.2 and 80% TSS removal for the remainder of the 1”

Sites with Runoff Reduction Limitations

- Qualifying Limitations
  - Potential for introducing pollutants into groundwater exists, unless pretreatment is required
  - Pre-existing soil contamination exists in areas subject to infiltration
  - Sinkholes or karst features are present (stamped geotechnical report must be provided)
  - Steep slopes are present and slope failure may occur (stamped geotechnical report must be provided)

- The cost and difficulty of implementing Runoff Reduction methods shall not be a limitation (MS4 Permit, Section 4.2.5.2)

Sites with Runoff Reduction Limitations

- Will still use the single Rv ≤ 0.2 metric, using Table 8 (page 41)

Table 8 – Approved TSS PTP Applications	
Structural Control	**TSS Credit (%)**
General Application BMPs	
Stormwater Wet Pond	80
Constructed Wetland	80
Surface Sand Filter	80
Water Quality Swale (Wet or Dry)	80
Bioretention	80
Limited Application BMPs	
Infiltration Trench/Basin	80
Organic Filter	80
Underground Sand Filter	80
Perimeter Sand Filter	80
Porous Pavement with amended sub-base	80
Porous Pavement	70
Dry Extended Detention Pond	60
Filter Strip	50
Grass Channel	50
Gravity (Oil-Grit) Separator	40

Sites with Runoff Reduction Limitations

- Site design process
  - Apply the RRM to the degree possible (infiltrate, evaportranspire, harvest & use)
  - Determine desired TSS practices to use and apply TRM.
    - Use Table 8 (page 41) to get TSS Credits
    - Equation 2 (page 39) calculates TRM runoff reduction

$$TRM\ Rv = CDA\ Rv(1 - TRM\ Credit)$$

  - Recalculate the weighted Rv
  - Continue until Rv ≤ 0.2

Sizing TSS Practices

- Calculate a Water Quality Volume (WQv)
- Can adjust for the rainfall captured using Runoff Reduction

$$P_{captured} = \frac{Tv\ X\ 12}{43560\ X\ Rv\ X\ A}$$

$$P_{remaining} = 1.0\ inches - P_{captured}$$

$$WQv = \frac{1.1\ XP_{remaining}\ X\ Rv\ X\ A}{12}\ X\ 43560$$

Flood Protection Calculations

- The volume removed through runoff reduction can be considered in detention design (Equations 6, 7 & 8, pages 34 -35)

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

$$Q_{adj} = \frac{Tv\ X\ 12}{43560\ X\ CDA}$$

$$CN_{adj} = \frac{1000}{10 + 5P + 10Q_{adj} - 10(Q_{adj}^2 + 1.25Q_{adj}P)^{1/2}}$$

Module Topic Summary

- Local Requirements
- Hamilton County Performance Standards
- Policies and equations

Questions?