



Reconnecting the Great Lakes Water Cycle

# STORMWATER MANAGEMENT CALCULATOR

## SIMPLE STEPS GUIDE

<http://bit.ly/GreenInfrastructureOptimizationTool>

### STEP 1: Calculating Runoff

1. Click on the “Land Cover User Input” tab.

**Step 1: Calculating Runoff**

**Establish the Rainfall Event**

Tip: Typically, the 12 inch rain event is considered the "first flush" event.

Use the pull-down menu to select the rain event in inches for which you're planning. Your selection will be used to determine the volume of stormwater runoff generated for your site.

Rain Event: **0.2** inches

[User Enter Data Here](#)

**Enter Land Cover Areas**

Use the pull-down menu below to enter the area for each land cover type that occurs on the site. Then select the condition in the next column, followed by the hydrologic soil type (note that condition and hydrologic type do not apply for impervious land cover).

Tip: See the Land Cover Key for common land covers. More information about hydrologic soil types can be found in the book: [www.nrcs.usda.gov](http://www.nrcs.usda.gov)

**Land Cover Key:**  
Open Space - Parks, Lawns, Street Medians  
Pasture - Pasture, Cropland  
Woods - Open Field, Non-irrigated  
Woods - Wooded Wetland  
Woods - Wooded Forest  
Woods - Wooded Forest

**Project Totals**

Site Area (ac) 5.60 acres  
Impervious Area (ac) 3.37 acres  
Runoff Volume (ft<sup>3</sup>) 4,348 cubic feet

Land Cover	Conditions	Hydrologic Soil Type (classified as per USDA NRCS)	Approximate Area (sq ft)	Area (ac)	Curve Number (CN2)	S	Q	Runoff Volume (ft <sup>3</sup> )
Impervious Building	NA	NA	30,000	0.68	98	0.2	0.02	744.74
Grass	NA	NA	10,000	0.23	69	0.2	0.02	244.90
Asphalt	NA	NA	10,000	0.23	98	0.2	0.02	244.90
Gravel	NA	NA	10,000	0.23	98	0.2	0.02	244.90
Concrete	NA	NA	10,000	0.23	98	0.2	0.02	244.90
Other	NA	NA	10,000	0.23	98	0.2	0.02	244.90

[User Enter Data Here \(note in blue require data input by the user\)](#)

Computed Automatically from User Entered Data

Site Area (ac) 5.60 acres  
Impervious Area (ac) 3.37 acres  
Runoff Volume (ft<sup>3</sup>) 4,348 cubic feet

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2. Select the desired rainfall event in inches by using the pull down menu.

**Step 1: Calculating Runoff**

**Establish the Rainfall Event**

Tip: Typically, the 12 inch rain event is considered the "first flush" event.

Use the pull-down menu to select the rain event in inches for which you're planning. Your selection will be used to determine the volume of stormwater runoff generated for your site.

Rain Event: **0.5** inches

[User Enter Data Here](#)

**Enter Land Cover Areas**

Use the pull-down menu below to enter the area for each land cover type that occurs on the site. Then select the condition in the next column, followed by the hydrologic soil type (note that condition and hydrologic type do not apply for impervious land cover).

Tip: See the Land Cover Key for common land covers. More information about hydrologic soil types can be found in the book: [www.nrcs.usda.gov](http://www.nrcs.usda.gov)

**Land Cover Key:**  
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**Project Totals**

Site Area (ac) 5.60 acres  
Impervious Area (ac) 3.37 acres  
Runoff Volume (ft<sup>3</sup>) 4,348 cubic feet

3. Select Land Cover by using the pull down menu.

**Enter Land Cover Areas**

Use the pull-down menu below to enter the area for each land cover type that occurs on the site. Then select the condition in the next column, followed by the hydrologic soil type (note that condition and hydrologic type do not apply for impervious land cover).

Tip: See the Land Cover Key for common land covers. More information about hydrologic soil types can be found in the book: [www.nrcs.usda.gov](http://www.nrcs.usda.gov)

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**Project Totals**

Site Area (ac) 5.60 acres  
Impervious Area (ac) 3.37 acres  
Runoff Volume (ft<sup>3</sup>) 4,348 cubic feet

Land Cover	Conditions	Hydrologic Soil Type (classified as per USDA NRCS)	Approximate Area (sq ft)	Area (ac)	Curve Number (CN2)	S	Q	Runoff Volume (ft <sup>3</sup> )
Impervious Building	NA	NA	30,000	0.68	98	0.2	0.02	1,326.46
Grass	NA	NA	30,000	0.68	69	0.2	0.02	744.74
Asphalt	NA	NA	10,000	0.23	98	0.2	0.02	244.90
Gravel	NA	NA	10,000	0.23	98	0.2	0.02	244.90
Concrete	NA	NA	10,000	0.23	98	0.2	0.02	244.90
Other	NA	NA	10,000	0.23	98	0.2	0.02	244.90

[User Enter Data Here \(note in blue require data input by the user\)](#)

Computed Automatically from User Entered Data

Site Area (ac) 5.60 acres  
Impervious Area (ac) 3.37 acres  
Runoff Volume (ft<sup>3</sup>) 4,348 cubic feet

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- Select Condition and Hydrologic Soil Type by using the pull down menus.

**Condition** is a general assessment to the overall quality of the Land Cover selected.

- Good: 75% to 100% coverage
- Fair: 50% to 75% coverage
- Poor: 0% to 50% coverage

Some land cover types are not affected by coverage. In these cases, N/A will be the only selectable option.

**Hydrological Soil Type** classifies a soil's ability to infiltrate water.

- A soils - Well Drained
- B soils - Moderately Well Drained
- C soils - Somewhat Poorly Drained
- D soils - Poorly Drained

Land cover types that involve impervious surfaces do not have hydrological soil classifications and will have "N/A" as the only selectable feature.

Land Cover	Condition	Hydrologic Soil Type (classifies a soil's ability to infiltrate water)	Approximate Area (Square Feet) for Land Cover Type
Existing Building	N/A	N/A	80,000
Proposed Building	N/A	N/A	30,000
Existing Paved Parking Area	N/A	N/A	10,000
Proposed Paved Parking Area	N/A	N/A	10,000
Existing Paved Roadway	N/A	N/A	1,000
Proposed Paved Roadway	N/A	N/A	500
Existing Roadway	N/A	N/A	25,000
Proposed Roadway	N/A	N/A	10,000
Open Space	Poor (0%-50% coverage)	D soils - poorly drained	6,000
Pasture	Fair (50%-75% coverage)	C soils - somewhat poorly drained	2,000
Meadow	N/A	C soils - somewhat poorly drained	1,000
Shrub	Poor (0%-50% coverage)	D soils - poorly drained	3,000
Woodland/Grassland	Good (75%-100% coverage)	C soils - somewhat poorly drained	10,000
Roads	Good (75%-100% coverage)	C soils - somewhat poorly drained	50,000
Bank Soil	N/A	D soils - poorly drained	25,000

- Enter square footage of the land cover type.

Land Cover	Condition	Hydrologic Soil Type (classifies a soil's ability to infiltrate water)	Approximate Area (Square Feet) for Land Cover Type
Existing Building	N/A	N/A	80,000
Proposed Building	N/A	N/A	30,000
Existing Paved Parking Area	N/A	N/A	10,000
Proposed Paved Parking Area	N/A	N/A	10,000
Existing Paved Roadway	N/A	N/A	1,000
Proposed Paved Roadway	N/A	N/A	500
Existing Roadway	N/A	N/A	25,000
Proposed Roadway	N/A	N/A	10,000
Open Space	Poor (0%-50% coverage)	D soils - poorly drained	6,000
Pasture	Fair (50%-75% coverage)	C soils - somewhat poorly drained	2,000
Meadow	N/A	C soils - somewhat poorly drained	1,000
Shrub	Poor (0%-50% coverage)	D soils - poorly drained	3,000
Woodland/Grassland	Good (75%-100% coverage)	C soils - somewhat poorly drained	10,000
Roads	Good (75%-100% coverage)	C soils - somewhat poorly drained	50,000
Bank Soil	N/A	D soils - poorly drained	25,000

## STEP 2: Green Infrastructure Planning

- Click on the "Volumes for GI" tab.

**Step 2: Green Infrastructure Planning**

Select Management Practices

Use the pull-down menus to select the management practice for the land cover. Some land covers may only allow a single option. Best indicates the area and the design elements with respect to the selected management practice. Use a 0 in the surface area field to void the storage calculation.

Note: Percent volumes greater than 100% indicate that there is a surplus of storage. Negative volumes indicate the total surplus storage.

Assumptions: Storage is provided above the ground surface and within the base media and base case. The volume of the voids within the planting media is 0.2 cft. The volume of the voids within the storage base is 0.35 cft.

Types: This column calculates the volume of unmeasured storm water with respect to the management practice selected and reports that quantity to the user. This column calculates the remaining stormwater volume provided.

1 Existing Building

Management Practice	Surface Area (sf)	Ponding Depth (ft) (If 0, 0.5, 1.0, 2.0)	Planting Media Depth (ft) (If 0, 0.5, 1.0, 2.0)	Storm Base Depth (ft) (If 0, 0.5, 1.0, 2.0)	Storage Volume (cft)	Remaining Unstored Volume (cft)	Percent Volume Stored
Green Roof	100	4	0	0	217	1,323	13.0%
Green Roof	100	4	0	0	33	1,338	2.3%
Green Roof	200	4	0	0	166	1,251	0.0%
Total Runoff without GI:						1,588	
Total Storage from GI:						286	
Total Remaining Volume:						1,291	

- For each land cover type selected in Step 1, select the preferred management practice by using the drop down menu.

6 Proposed Paved Walkway

Management Practice	Surface Area (sf)	Ponding Depth (ft) (If 0, 0.5, 1.0, 2.0)	Planting Media Depth (ft) (If 0, 0.5, 1.0, 2.0)	Storm Base Depth (ft) (If 0, 0.5, 1.0, 2.0)	Storage Volume (cft)	Remaining Unstored Volume (cft)	Percent Volume Stored
Pervious Pavers	0	0	0	12	0	13	0.0%
Pervious Pavers	100	0	0	12	33	-22	264.2%
Pervious Pavers	0	0	0	12	0	-22	0.0%
Total Runoff without GI:						13	
Total Storage from GI:						33	
Total Remaining Volume:						20	

7 Existing Roadway

Management Practice	Surface Area (sf)	Ponding Depth (ft) (If 0, 0.5, 1.0, 2.0)	Planting Media Depth (ft) (If 0, 0.5, 1.0, 2.0)	Storm Base Depth (ft) (If 0, 0.5, 1.0, 2.0)	Storage Volume (cft)	Remaining Unstored Volume (cft)	Percent Volume Stored
Pervious Pavers	1,500	0	0	12	522	127	73.3%
Rain Garden	100	4	12	12	60	60	13.3%
Pervious Pavers	200	0	0	12	98	38	13.2%
Total Runoff without GI:						892	
Total Storage from GI:						790	
Total Remaining Volume:						102	

8. Enter the Surface Area.

7 Existing Roadway

User Enter Data Here (cells in blue require data input by the user)

Management Practice	Surface Area (sf)	Ponding Depth (ft)	Planting Media Depth (ft)	Stone Base Depth (ft)	Storage Volume (ft <sup>3</sup> )	Remaining Unstored Volume (ft <sup>3</sup> )	Percent Volume Stored
Permeable Pavement	1,589	0	0	12	525	137	79.3%
Rain Gardens	198	4	12	12	88	48	13.3%
Perforated Pavers	292	0	0	12	88	70	13.2%
Total Runoff without GI:						862	
Total Storage from GI:						791	
Total Remaining Volume:						291	

9. Enter the Ponding Depth, Planting Media Depth and Stone Base Depth using the pull down menus.

7 Existing Roadway

User Enter Data Here (cells in blue require data input by the user)

Management Practice	Surface Area (sf)	Ponding Depth (ft)	Planting Media Depth (ft)	Stone Base Depth (ft)	Storage Volume (ft <sup>3</sup> )	Remaining Unstored Volume (ft <sup>3</sup> )	Percent Volume Stored
Permeable Pavement	1,589	0	0	12	525	137	79.3%
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Perforated Pavers	292	0	0	12	88	70	13.2%
Total Runoff without GI:						862	
Total Storage from GI:						791	
Total Remaining Volume:						291	

Note: changes to the management practice will not automatically update the design criteria columns. These cells will require the user to update manually.

### Step 3: Cost Analysis

10. Click on the "Cost Estimation" tab to view the results of the information provided by the user.

Step 3: Cost Analysis

Notes: For land covers where the management practices selected do not store all of the projected stormwater runoff volume, it is assumed that the balance of the volume will be captured using underground storage or a cistern. It is assumed that underground storage and cisterns will not be implemented for land covers that are not impervious.

Cost Comparison: Total Cost without Green Infrastructure: \$ 56,220.15; Total Cost with Green Infrastructure: \$ 101,038.73; Lowest Cost Option: \$ 48,279.14

Assumptions: Assumes that no underground storage or cisterns are constructed alternatives to GI on land covers that are not impervious. Cost is generated by using the lowest cost option for each land cover category.

Land Cover	Management Practice	Size	Unit	Unit Price	Construction Cost	Maintenance Cost (estimated on an annual basis)	Total Cost	Cost Using no GI	Cost Using GI
1 Existing Building	Green Roof	900	SF	\$ 15.00	\$ 7,500.00	\$ 205.00	\$ 7,705.00		
	Blue Roof	100	SF	\$ 4.00	\$ 400.00	\$ 25.00	\$ 425.00		
	Green Roof	250	SF	\$ 15.00	\$ 3,750.00	\$ 103.00	\$ 3,853.00	\$ 15,974.20	\$ 24,532.84
	Cistern	1,233	CF	\$ 10.00	\$ 12,311.49	\$ 61.56	\$ 12,373.04		
2 Proposed Building	Blue Roof	1,000	SF	\$ 4.00	\$ 4,000.00	\$ 200.00	\$ 4,200.00		
	Green Roof	900	SF	\$ 15.00	\$ 7,500.00	\$ 205.00	\$ 7,705.00		
	Blue Roof	-	SF	\$ 4.00	\$ -	\$ -	\$ -	\$ 7,987.15	\$ 14,385.65
	Cistern	345	CF	\$ 10.00	\$ 3,447.41	\$ 12.24	\$ 3,459.65		
3 Existing Paved Parking Area	Permeable Pavement	2,000	SF	\$ 7.00	\$ 14,000.00	\$ 303.00	\$ 14,303.00		
	Perforated Pavers	100	SF	\$ 9.00	\$ 900.00	\$ 3.60	\$ 903.60	\$ 1,987.64	\$ 15,223.60
	Underground Storage	-	CF	\$ 0.00	\$ -	\$ -	\$ -		
	Perforated Pavers	200	SF	\$ 9.00	\$ 1,800.00	\$ 7.20	\$ 1,807.20		
4 Proposed Paved Parking Area	Permeable Pavement	200	SF	\$ 7.00	\$ 1,400.00	\$ 32.00	\$ 1,432.00		
	Perforated Pavers	-	SF	\$ 7.00	\$ -	\$ -	\$ -	\$ 1,987.64	\$ 4,119.84
	Underground Storage	125	CF	\$ 7.00	\$ 874.40	\$ 6.25	\$ 880.65		
	Permeable Pavement	1,000	SF	\$ 7.00	\$ 7,000.00	\$ 160.00	\$ 7,160.00		
5 Existing Paved Walkway	Permeable Pavement	-	SF	\$ 7.00	\$ -	\$ -	\$ -	\$ 289.15	\$ 7,100.00
	Permeable Pavement	-	SF	\$ 7.00	\$ -	\$ -	\$ -		

Intro Land Cover User Input Volumes for GI Cost Estimation