

# Front Basin Infiltration Analysis based on a 100-yr Storm

Prepared for Prop. Car Wash - 593 Washington Street - Middletown, CT

6/16/21

Calculate proposed impervious surfaces and weighted 'c' value:

Proposed Area	Area		c' Value
Rooftop	0	sf	0.90
Paved	12890		0.90
Lawn	5770		0.30
Total	18660	sf	0.71

Calculate increase in runoff due to additional impervious surfaces:

$Q = c * I * A$  where Q = peak flow, c = runoff coefficient, I = intensity (in / hr) & A = area (sf)

For this analysis, the 100-yr storm event is examined:

Existing 'c' = 0.2  
Proposed 'c' = 0.71  
Difference in 'c' = 0.51  
I = 7.1 in / 24 hrs  
A = 18,660 sf

Note: Intensity calculation was calculated by assuming a 100-yr storm, 24 hour period rainfall of 7.1 in. falling in a 24 hr period.

$Q = 0.51 * 7.1 \text{ in / 24 hrs} * (1 \text{ ft / 12 in}) * 18660 \text{ sf}$   
 $Q = 5,631 \text{ cf / 24 hrs}$

Calculate infiltration and storage capability of Rain Garden

Surface Area:

= 31 ft x 82 ft = 2542.0 sq.ft.

Percolation Rate:

= 20 min / in = 0.25 ft / hr

Note: Percolation rate taken from actual perc tests in location of proposed infiltration.

Absorption:

= 2542 sf / unit \* 0.25 ft / hr \* 24 hrs = 15252 cf / 24 hrs

Storage:

= 31 ft x 82 ft x 2.5ft = 6355.00 cf

Total Storage & Absorption ( $A_T$ ):

= (15252 cf / 24 hrs) + (6355 cf) = 21607 cf / 24 hrs

Check  $A_T$  vs. Q:

Q= 5,631 cf / 24 hrs  
 $A_T$ = 21607 cf / 24 hrs

= (5630.655 cf / 24 hrs) / (21607 cf / 24 hrs)

= 26.1% Rain Garden Utilization for 100-year Storm, 24-hr Event

**Rain Garden Can Handle Over 100% of Design Flow**

# Water Quality Volume for Stormwater Retention Basin (front)

593 Washington Street - Middletown, CT

6/16/21

**Water Quality Volume:**

$$WQV = \frac{(1')(R)(A)}{12}$$

where:

- WQV = water quality volume (ac-ft)
- R = volumetric runoff coefficient = 0.05 + 0.009 \* I
- I = percent impervious cover
- A = site area in acres

**For Area draining to Detention Pond:**

- I = 68.11 % (calculated based on proposed conditions)
- R = 0.05 + 0.009 \* 68.11 = 0.66
- A = 0.4304 acres

$$WQV = [(1)(0.66)(0.4304)] / 12$$

$$WQV = 0.024 \text{ ac-ft}$$

$$WQV = 1031 \text{ ft}^3$$

**Sediment Forebay Volume Required:**

$$V = 0 \text{ ft}^3 \quad (10\% \text{ WQV Required})$$

**Storage Volume of Forebay**

Elevation	Contour Area	Incremental Storage	Cumulative Storage
0	0		
0	0	0	
0	0	0	0

**WQV Provided in Forebay: 0 (0% WQV)**

Therefore, sufficient volume has been provided in regards to Water Quality Volume (WQV.)

**Total Storage Volume of Basin below Outlet (Including Forebay)**

Elevation	Contour Area	Incremental Storage	Cumulative Storage
17	615		
18	912	764	764
19	1,260	1,086	1,850
19.5	1,465	681	2,531

**WQV Provided in Basin: 2,531 245% WQV**

Therefore, sufficient volume has been provided in regards to Water Quality Volume (WQV.)

# Rear Basin Infiltration Analysis based on a 100-yr Storm

Prepared for Prop. Car Wash - 593 Washington Street - Middletown, CT

6/16/21

Calculate proposed impervious surfaces and weighted 'c' value:

Proposed Area	Area	c' Value
Rooftop	4958 sf	0.90
Paved	12517	0.90
Lawn	9665	0.30
<b>Total</b>	<b>27140 sf</b>	<b>0.69</b>

Calculate increase in runoff due to additional impervious surfaces:

$Q = c * I * A$  where Q = peak flow, c = runoff coefficient, I = intensity (in / hr) & A = area (sf)

For this analysis, the 100-yr storm event is examined:

Existing 'c' = 0.2  
 Proposed 'c' = 0.69  
 Difference in 'c' = 0.49  
 I = 7.1 in / 24 hrs  
 A = 27,140 sf

Note: Intensity calculation was calculated by assuming a 100-yr storm, 24 hour period rainfall of 7.1 in. falling in a 24 hr period.

$Q = 0.49 * 7.1 \text{ in / 24 hrs} * (1 \text{ ft} / 12 \text{ in}) * 27140 \text{ sf}$   
**Q = 7,868 cf / 24 hrs**

Calculate infiltration and storage capability of Rain Garden

Surface Area:

= 50 ft x 92 ft = 4600.0 sq.ft.

Percolation Rate:

= 20 min / in = 0.25 ft / hr

Note: Percolation rate taken from actual perc tests in location of proposed infiltration.

Absorption:

= 4600 sf / unit \* 0.25 ft / hr \* 24 hrs = 27600 cf / 24 hrs

Storage:

= 50 ft x 92 ft x 2.5ft = 11500.00 cf

Total Storage & Absorption ( $A_T$ ):

= (27600 cf / 24 hrs) + (11500 cf) = 39100 cf / 24 hrs

Check  $A_T$  vs. Q:

Q= 7,868 cf / 24 hrs  
 $A_T$ = 39100 cf / 24 hrs

= (7868.338333333333 cf / 24 hrs) / (39100 cf / 24 hrs)

= **20.1% Rain Garden Utilization for 100-year Storm, 24-hr Event**

**Rain Garden Can Handle Over 100% of Design Flow**

# Water Quality Volume for Stormwater Retention Basin (rear)

593 Washington Street - Middletown, CT

6/16/21

## Water Quality Volume:

$$WQV = \frac{(1)(R)(A)}{12}$$

where:

WQV = water quality volume (ac-ft)

R = volumetric runoff coefficient =  $0.05 + 0.009 * I$

I = percent impervious cover

A = site area in acres

## For Area draining to Detention Pond:

I = 73.10 % (calculated based on proposed conditions)

R =  $0.05 + 0.009 * 73.1 = 0.71$

A = 0.6256 acres

$$WQV = [(1)(0.71)(0.6256)] / 12$$

$$WQV = 0.037 \text{ ac-ft}$$

$$WQV = 1612 \text{ ft}^3$$

## Sediment Forebay Volume Required:

$$V = 0 \text{ ft}^3 \quad (10\% \text{ WQV Required})$$

## Storage Volume of Forebay

Elevation	Contour Area	Incremental Storage	Cumulative Storage
0	0		
0	0	0	
0	0	0	0

WQV Provided in Forebay: 0 (0% WQV)

Therefore, sufficient volume has been provided in regards to Water Quality Volume (WQV.)

## Total Storage Volume of Basin below Outlet (Including Forebay)

Elevation	Contour Area	Incremental Storage	Cumulative Storage
17	3,845		
18	4,442	4,144	4,144
19	5,075	4,759	8,902
19.5	5,380	2,614	11,516

WQV Provided in Basin: 11,516 714% WQV

Therefore, sufficient volume has been provided in regards to Water Quality Volume (WQV.)