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 in /24 hrs * (1 ft / 12 in) * 18660 sf
Q = 5,631 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 x2.5ft = 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 ac-ft
WQV = 1031 ft^3

Sediment Forebay Volume Required:

V = 0 ft^3 (10% 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
	Total	**27140**	**sf**	**0.69**

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 in /24 hrs * (1 ft / 12 in) * 27140 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 x2.5ft = 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

= (7868.33833333333 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 ac-ft
WQV = 1612 ft^3

Sediment Forebay Volume Required:

V = 0 ft^3 (10% 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.*)