

EVERETT M
BROOKS
COMPANY

PROJECT ADDRESS: 21 Windsor Road
Wellesley, MA

PROJECT NO.: 26049

SHEET:

OF:

CALCULATIONS BY: ES

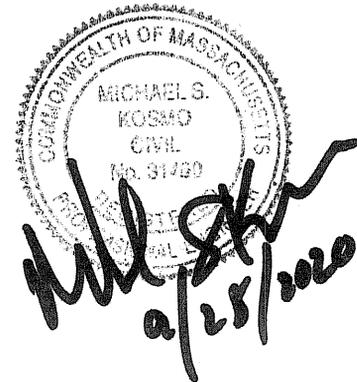
DATE: 9/28/20

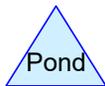
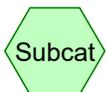
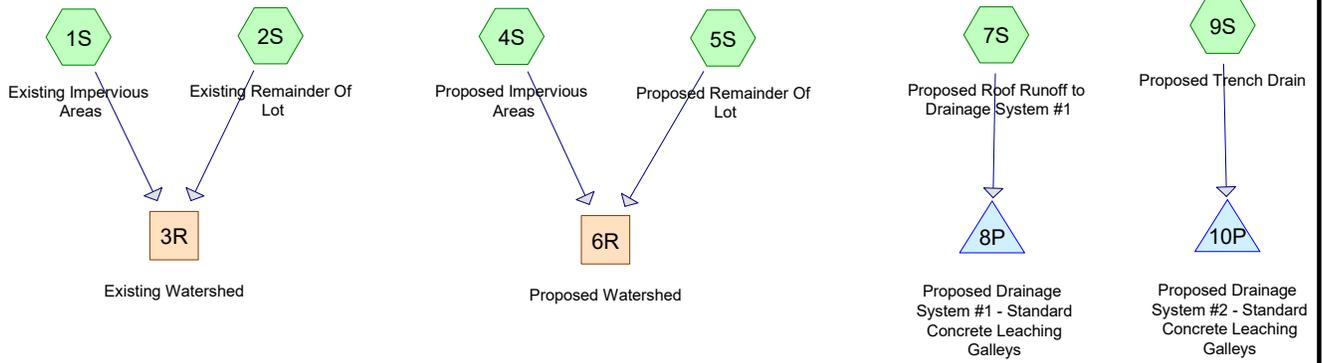
CHECKED BY: *MSK*

DATE: *9/28/20*

Drainage Summary – Peak Storm Flow

	Existing Conditions	Proposed Conditions
100 - Year Storm Event	0.96 cfs	0.68 cfs





Time span=0.00-25.00 hrs, dt=0.01 hrs, 2501 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Impervious Areas Runoff Area=0.130 ac Runoff Depth=6.05"
Flow Length=206' Tc=3.0 min CN=92 Runoff=0.95 cfs 0.066 af

Subcatchment 2S: Existing Remainder Of Lot Runoff Area=0.414 ac Runoff Depth=0.77"
Flow Length=206' Tc=12.9 min CN=39 Runoff=0.15 cfs 0.027 af

Subcatchment 4S: Proposed Impervious Areas Runoff Area=0.089 ac Runoff Depth=6.76"
Flow Length=206' Tc=3.0 min CN=98 Runoff=0.68 cfs 0.050 af

Subcatchment 5S: Proposed Remainder Of Lot Runoff Area=0.314 ac Runoff Depth=0.77"
Flow Length=206' Tc=12.9 min CN=39 Runoff=0.12 cfs 0.020 af

Subcatchment 7S: Proposed Roof Runoff to Drainage System Runoff Area=0.058 ac Runoff Depth=6.76"
Flow Length=200' Tc=3.0 min CN=98 Runoff=0.44 cfs 0.033 af

Subcatchment 9S: Proposed Trench Drain Runoff Area=0.073 ac Runoff Depth=5.37"
Flow Length=75' Tc=3.0 min CN=86 Runoff=0.49 cfs 0.033 af

Reach 3R: Existing Watershed Inflow=0.96 cfs 0.092 af
Outflow=0.96 cfs 0.092 af

Reach 6R: Proposed Watershed Inflow=0.68 cfs 0.070 af
Outflow=0.68 cfs 0.070 af

Pond 8P: Proposed Drainage System #1 - St Peak Elev=158.95' Storage=0.012 af Inflow=0.44 cfs 0.033 af
Outflow=0.03 cfs 0.033 af

Pond 10P: Proposed Drainage System #2 - S Peak Elev=157.65' Storage=0.013 af Inflow=0.49 cfs 0.033 af
Outflow=0.03 cfs 0.033 af

Total Runoff Area = 1.078 ac Runoff Volume = 0.228 af Average Runoff Depth = 2.53"

Subcatchment 1S: Existing Impervious Areas

Runoff = 0.95 cfs @ 12.04 hrs, Volume= 0.066 af, Depth= 6.05"

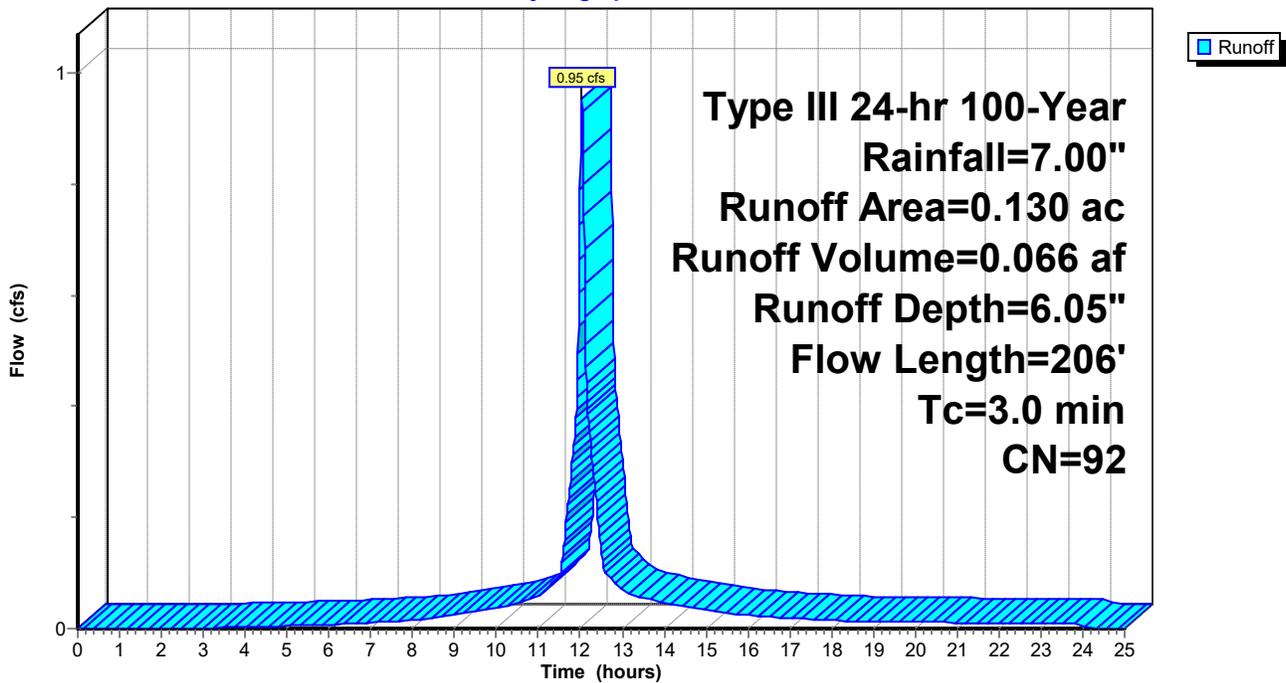
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.049	98	Existing House & Steps
0.008	98	Existing Garage
0.018	98	Existing Asphalt Drive
0.036	76	Existing Gravel Drive
0.019	98	Existing Walks, Walls, Patio
0.130	92	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	206	0.0420	1.2		Lag/CN Method,
2.8	206	Total, Increased to minimum Tc = 3.0 min			

Subcatchment 1S: Existing Impervious Areas

Hydrograph



Subcatchment 2S: Existing Remainder Of Lot

Runoff = 0.15 cfs @ 12.34 hrs, Volume= 0.027 af, Depth= 0.77"

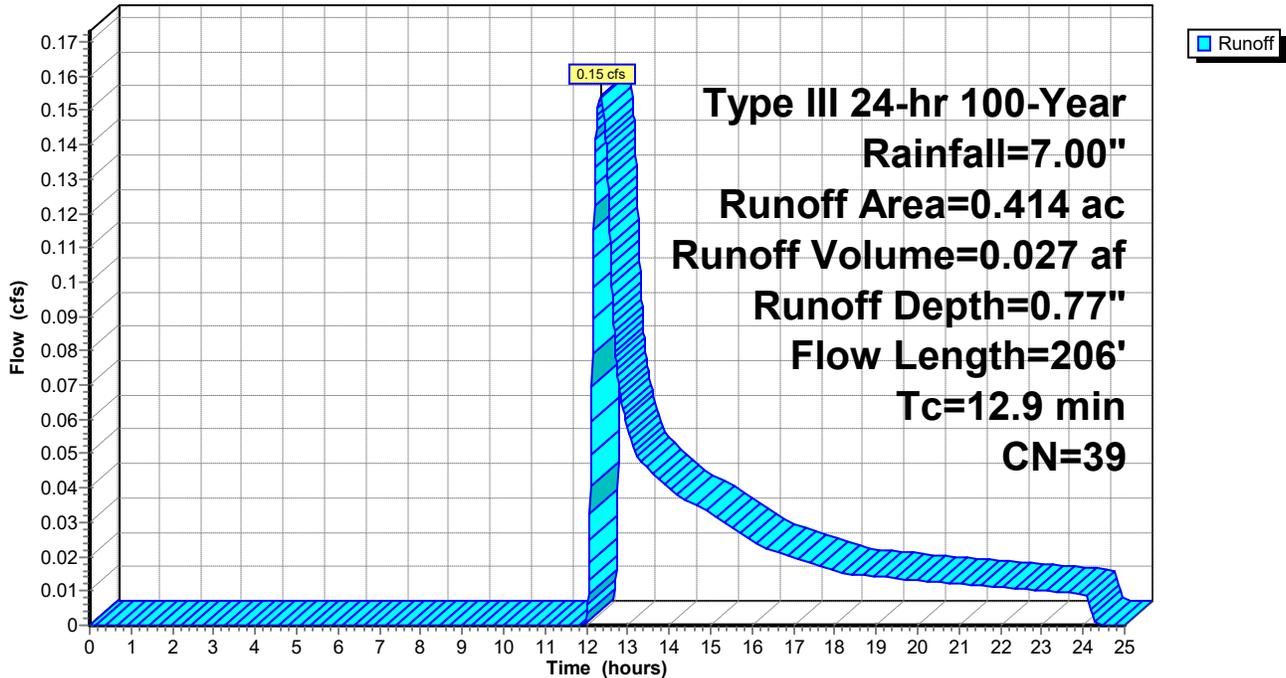
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.414	39	>75% Grass cover, Good, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	206	0.0430	0.3		Lag/CN Method,

Subcatchment 2S: Existing Remainder Of Lot

Hydrograph



Subcatchment 4S: Proposed Impervious Areas

Runoff = 0.68 cfs @ 12.04 hrs, Volume= 0.050 af, Depth= 6.76"

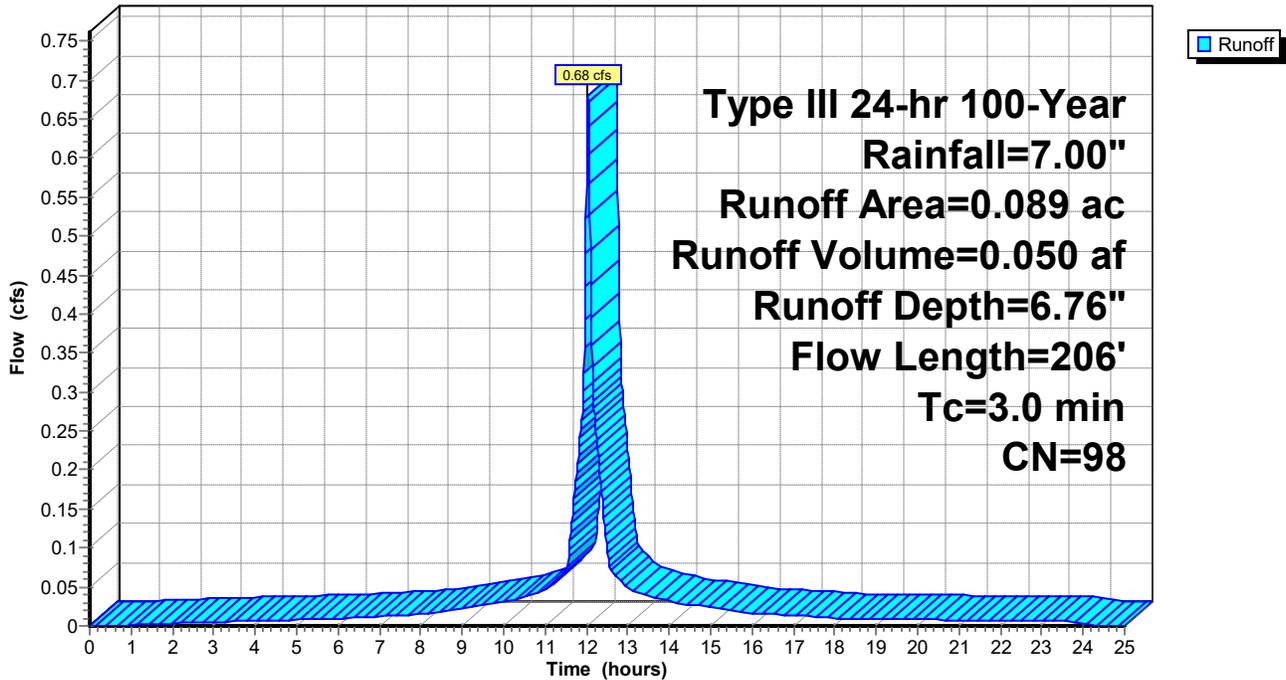
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.048	98	Remainder of Prop House & Steps
0.008	98	Remainder of Prop Drive
0.033	98	Remainder of Prop Walks, Walls, Patio
0.089	98	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.1	206	0.0430	1.7		Lag/CN Method,
2.1	206	Total, Increased to minimum Tc = 3.0 min			

Subcatchment 4S: Proposed Impervious Areas

Hydrograph



Subcatchment 5S: Proposed Remainder Of Lot

Runoff = 0.12 cfs @ 12.34 hrs, Volume= 0.020 af, Depth= 0.77"

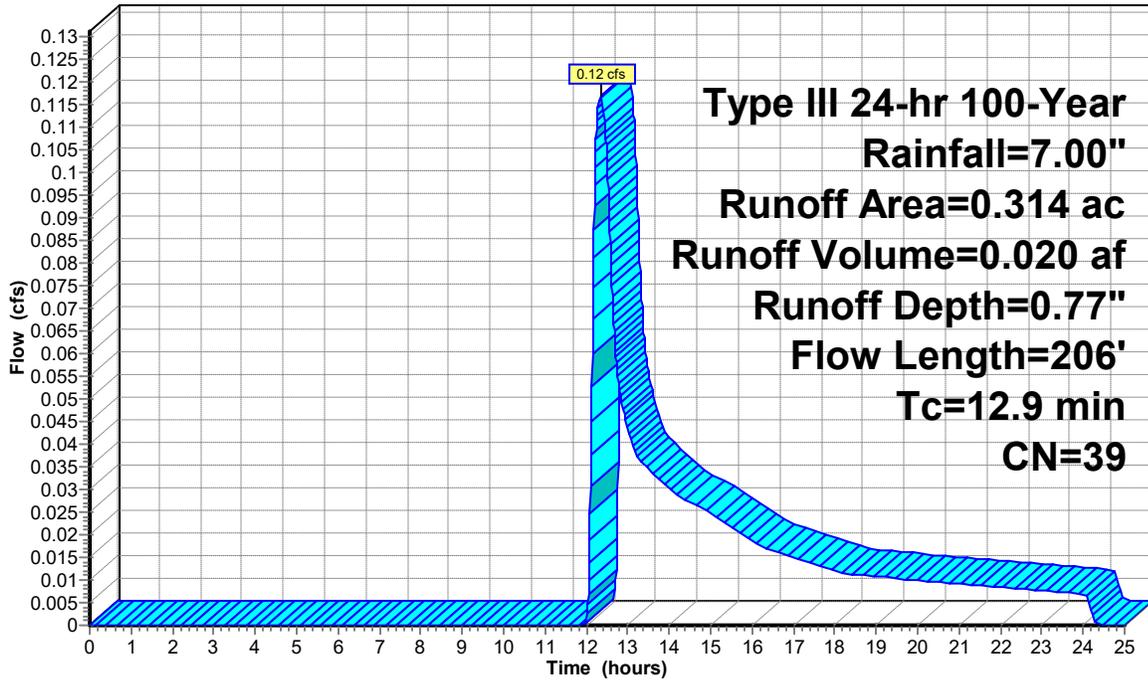
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.314	39	>75% Grass cover, Good, HSG A

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.9	206	0.0430	0.3		Lag/CN Method,

Subcatchment 5S: Proposed Remainder Of Lot

Hydrograph



**Type III 24-hr 100-Year
 Rainfall=7.00"
 Runoff Area=0.314 ac
 Runoff Volume=0.020 af
 Runoff Depth=0.77"
 Flow Length=206'
 Tc=12.9 min
 CN=39**

Subcatchment 7S: Proposed Roof Runoff to Drainage System #1

Runoff = 0.44 cfs @ 12.04 hrs, Volume= 0.033 af, Depth= 6.76"

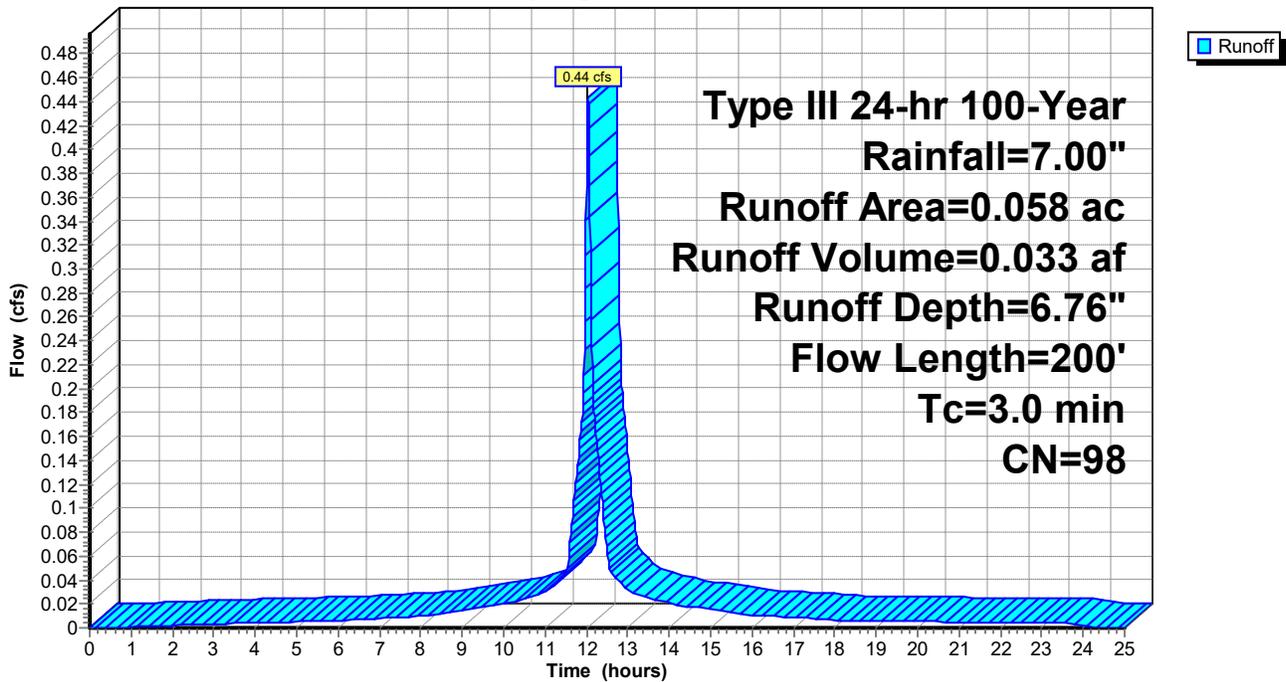
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.058	98	Roof Runoff to Drainage System

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	200	0.2500	4.0		Lag/CN Method,
0.8	200	Total, Increased to minimum Tc = 3.0 min			

Subcatchment 7S: Proposed Roof Runoff to Drainage System #1

Hydrograph



Subcatchment 9S: Proposed Trench Drain

Runoff = 0.49 cfs @ 12.04 hrs, Volume= 0.033 af, Depth= 5.37"

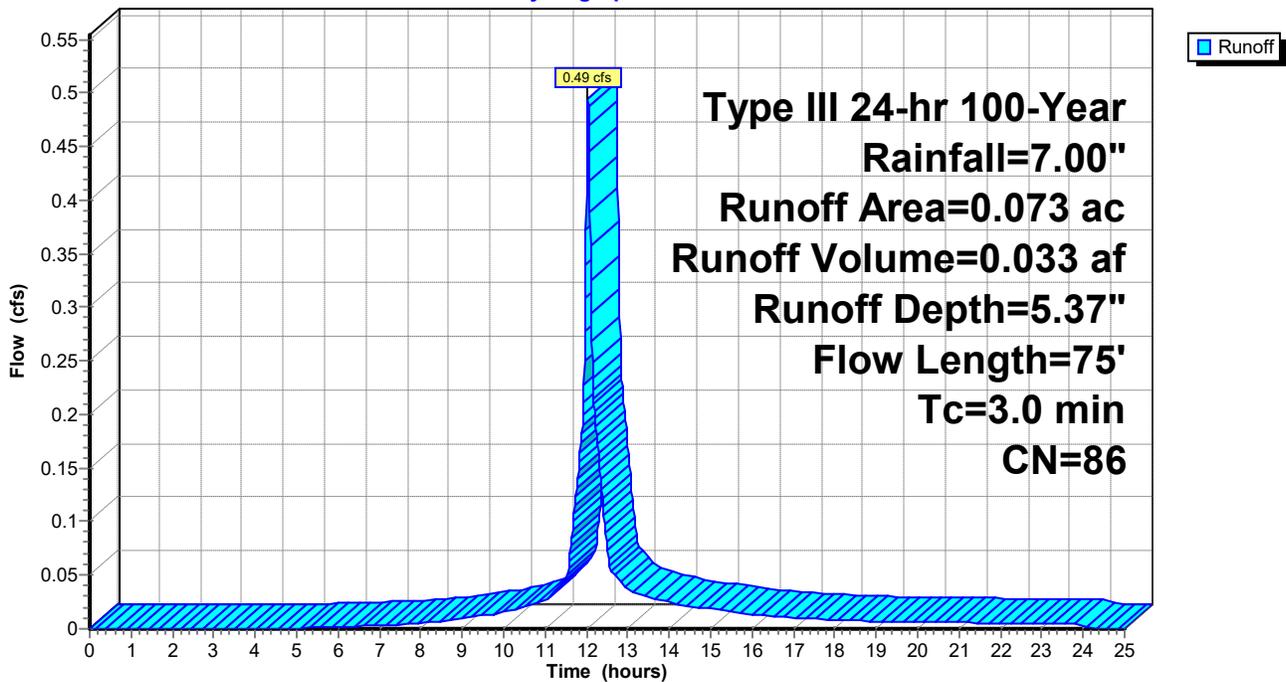
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-Year Rainfall=7.00"

Area (ac)	CN	Description
0.058	98	Paved parking & roofs
0.015	39	>75% Grass cover, Good, HSG A
0.073	86	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	75	0.0173	0.5		Lag/CN Method,
2.5	75	Total, Increased to minimum Tc = 3.0 min			

Subcatchment 9S: Proposed Trench Drain

Hydrograph



Reach 3R: Existing Watershed

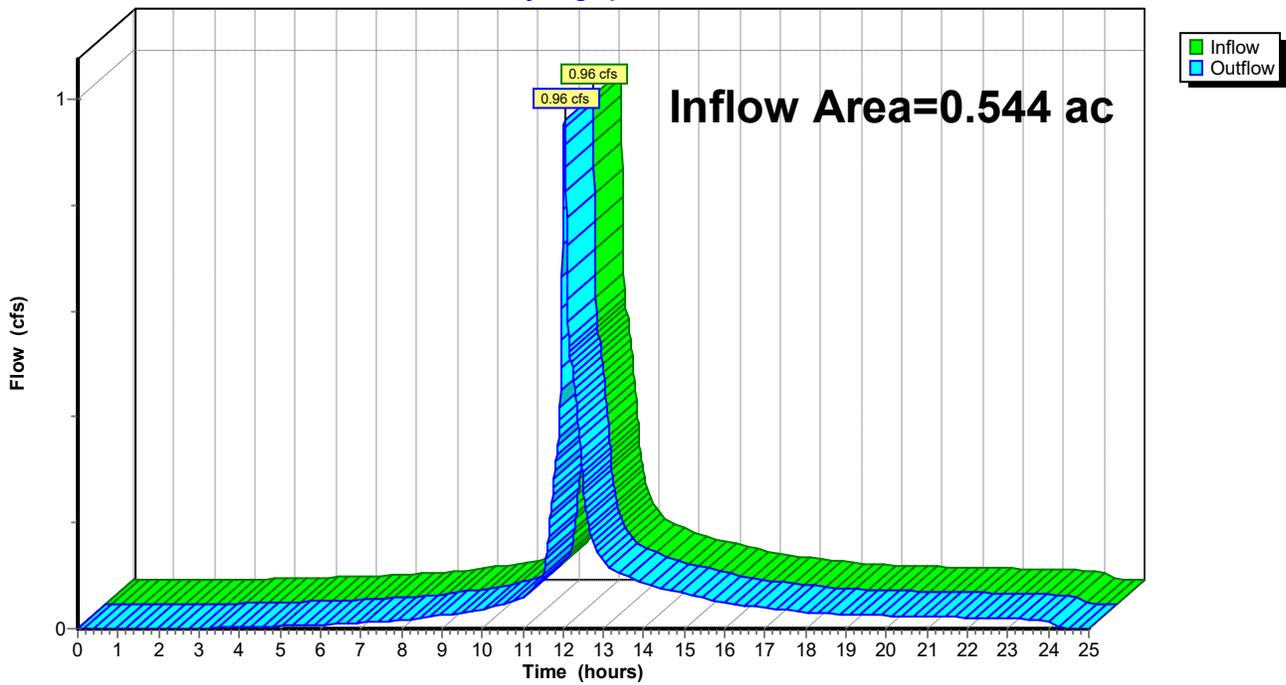
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.544 ac, Inflow Depth = 2.03" for 100-Year event
Inflow = 0.96 cfs @ 12.04 hrs, Volume= 0.092 af
Outflow = 0.96 cfs @ 12.04 hrs, Volume= 0.092 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Reach 3R: Existing Watershed

Hydrograph



Reach 6R: Proposed Watershed

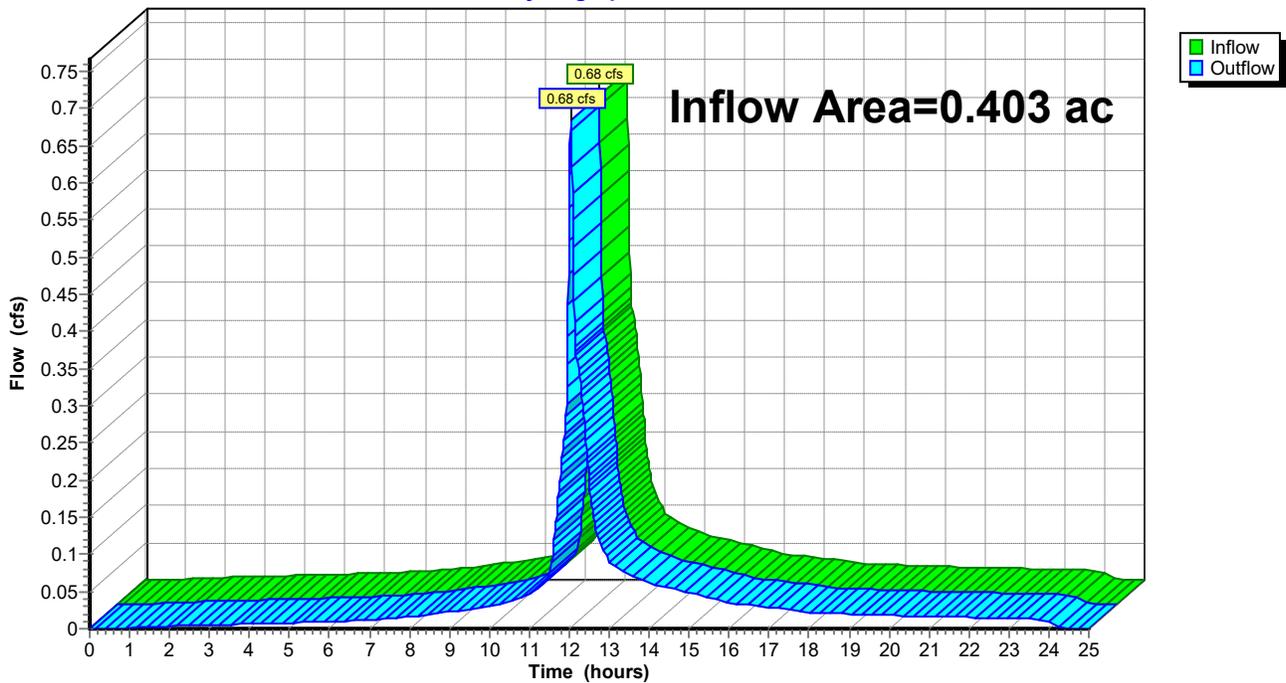
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.403 ac, Inflow Depth = 2.09" for 100-Year event
Inflow = 0.68 cfs @ 12.04 hrs, Volume= 0.070 af
Outflow = 0.68 cfs @ 12.04 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Reach 6R: Proposed Watershed

Hydrograph



Pond 8P: Proposed Drainage System #1 - Standard Concrete Leaching Galleys

Provide: (10) Standard Concrete Leaching Galleys: 4' x 4' x 3.25' effective depth with 5' stone surround and 6" of stone beneath the entire system.

Rawls Rate = 2.41 in/hr

Inflow Area = 0.058 ac, Inflow Depth = 6.76" for 100-Year event
 Inflow = 0.44 cfs @ 12.04 hrs, Volume= 0.033 af
 Outflow = 0.03 cfs @ 11.06 hrs, Volume= 0.033 af, Atten= 93%, Lag= 0.0 min
 Discarded = 0.03 cfs @ 11.06 hrs, Volume= 0.033 af

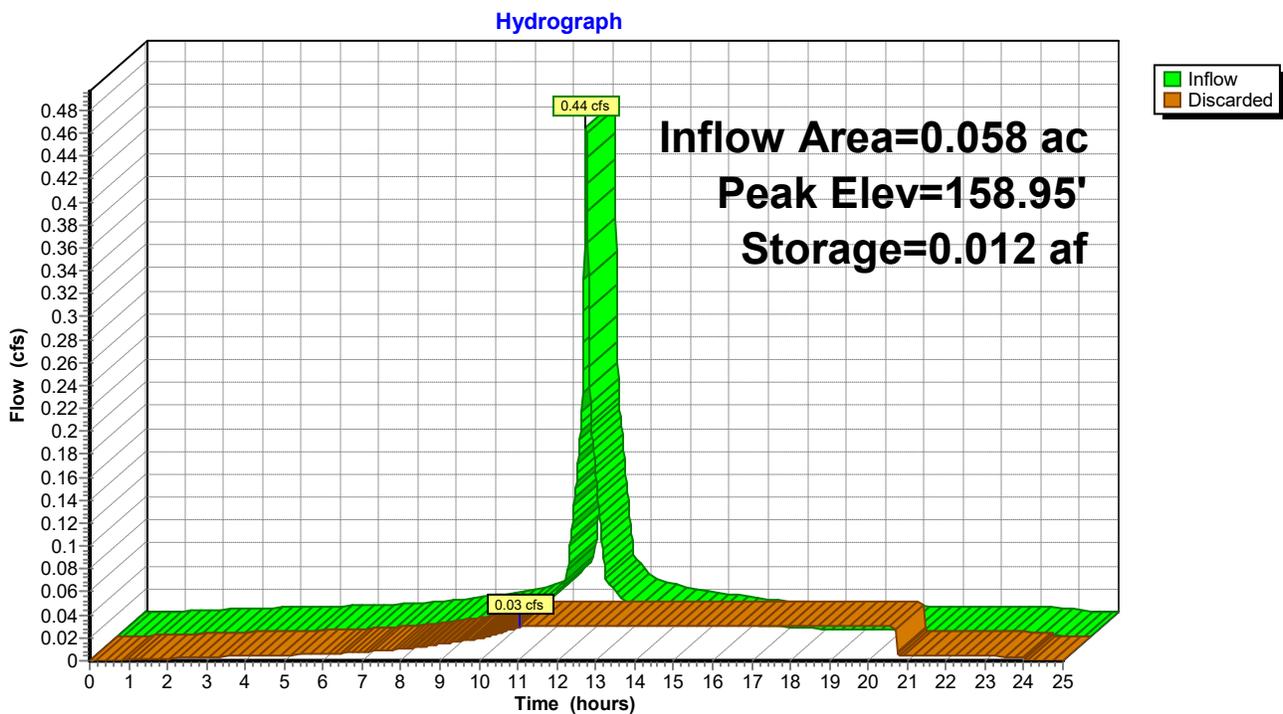
Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 158.95' @ 13.04 hrs Surf.Area= 0.012 ac Storage= 0.012 af
 Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 121.7 min (861.5 - 739.9)

Volume	Invert	Avail.Storage	Storage Description
#1	155.25'	0.000 af	18.00'W x 30.00'L x 3.75'H Gravel 0.046 af Overall - 0.012 af Embedded = 0.035 af x 0.3% Voids
#2	155.75'	0.012 af	8.00'W x 20.00'L x 3.25'H Galley Inside #1
		0.012 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	155.20'	2.410 in/hr Exfiltration over Surface area above invert Excluded Surface area = 0.000 ac

Discarded OutFlow Max=0.03 cfs @ 11.06 hrs HW=155.29' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Pond 8P: Proposed Drainage System #1 - Standard Concrete Leaching Galleys



Pond 10P: Proposed Drainage System #2 - Standard Concrete Leaching Galleys

Provide: (12) Standard Concrete Leaching Galleys: 4' x 4' x 3.25' effective depth with 5' stone surround and 6" of stone beneath the entire system.

Rawls Rate = 2.41 in/hr

Inflow Area = 0.073 ac, Inflow Depth = 5.37" for 100-Year event
 Inflow = 0.49 cfs @ 12.04 hrs, Volume= 0.033 af
 Outflow = 0.03 cfs @ 11.23 hrs, Volume= 0.033 af, Atten= 93%, Lag= 0.0 min
 Discarded = 0.03 cfs @ 11.23 hrs, Volume= 0.033 af

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 157.65' @ 13.14 hrs Surf.Area= 0.014 ac Storage= 0.013 af
 Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 132.3 min (921.5 - 789.2)

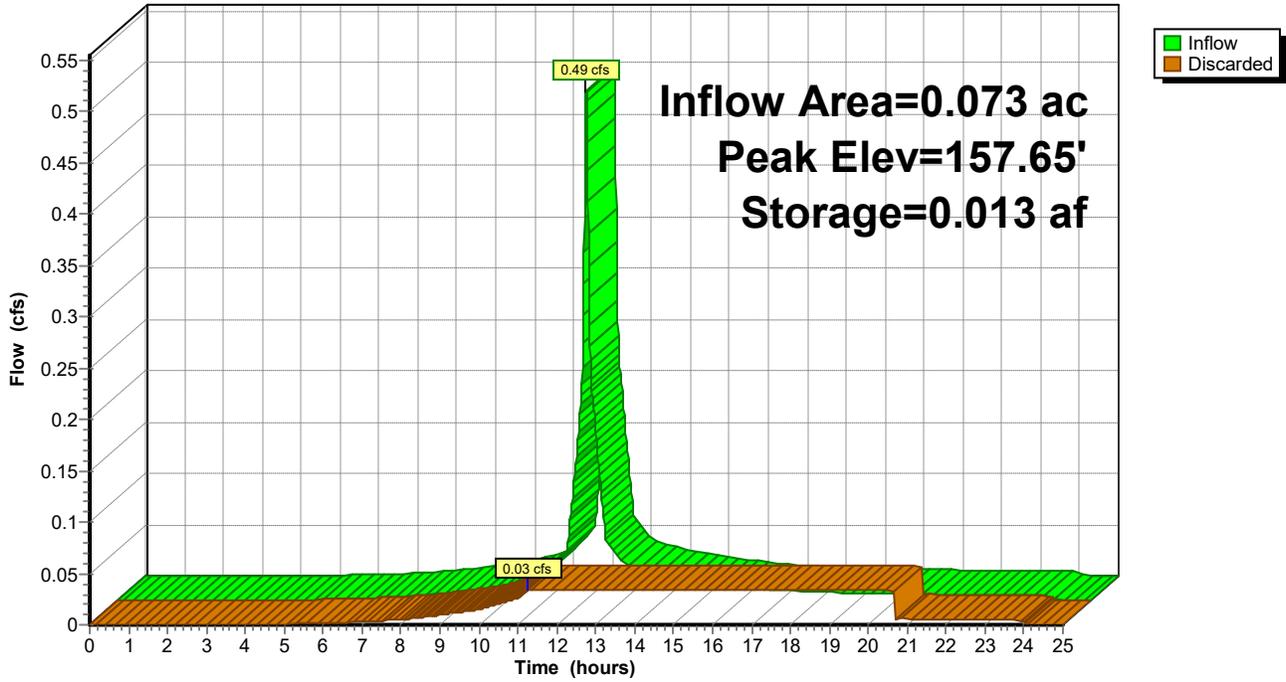
Volume	Invert	Avail.Storage	Storage Description
#1	154.25'	0.000 af	18.00'W x 34.00'L x 3.75'H Gravel 0.053 af Overall - 0.014 af Embedded = 0.038 af x 0.3% Voids
#2	154.75'	0.014 af	8.00'W x 24.00'L x 3.25'H Galley Inside #1
		0.014 af	Total Available Storage

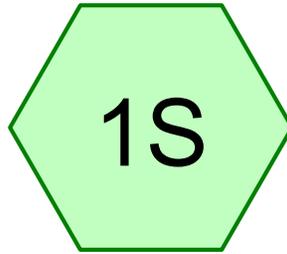
Device	Routing	Invert	Outlet Devices
#1	Discarded	154.20'	2.410 in/hr Exfiltration over Surface area above invert Excluded Surface area = 0.000 ac

Discarded OutFlow Max=0.03 cfs @ 11.23 hrs HW=154.29' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

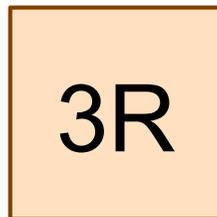
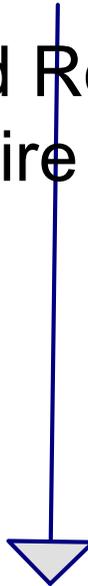
Pond 10P: Proposed Drainage System #2 - Standard Concrete Leaching Galleys

Hydrograph

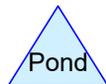
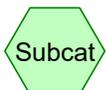




Proposed Roof Runoff
(Entire Roof)



Proposed Roof Runoff
(Undetained)



26049_21 Windsor Rd, Wellesley - Roof Calc.

Type III 24-hr 1 inch Rainfall=1.00"

Prepared by {enter your company name here}

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Time span=0.00-25.00 hrs, dt=0.01 hrs, 2501 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1S: Proposed Roof Runoff (Entire Roof)

Runoff Area=4,530 sf Runoff Depth=0.79"

Flow Length=100' Tc=3.0 min CN=98 Runoff=0.10 cfs 0.007 af

Reach 3R: Proposed Roof Runoff (Undetained)

Inflow=0.10 cfs 0.007 af

Outflow=0.10 cfs 0.007 af

Total Runoff Area = 0.104 ac Runoff Volume = 0.007 af Average Runoff Depth = 0.79"

26049_ 21 Windsor Rd, Wellesley - Roof Calc.

Type III 24-hr 1 inch Rainfall=1.00"

Prepared by {enter your company name here}

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Subcatchment 1S: Proposed Roof Runoff (Entire Roof)

Runoff = 0.10 cfs @ 12.04 hrs, Volume= 0.007 af, Depth= 0.79"

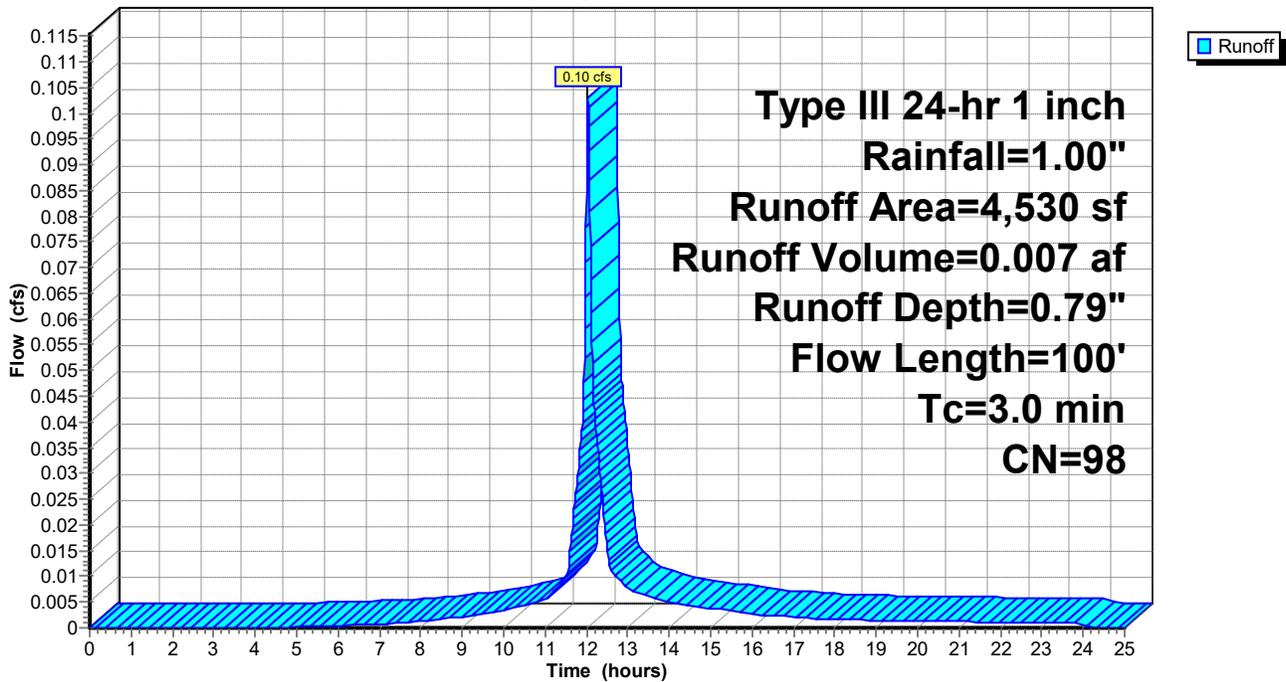
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
4,530	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	100	0.2500	3.5		Lag/CN Method,
0.5	100	Total, Increased to minimum Tc = 3.0 min			

Subcatchment 1S: Proposed Roof Runoff (Entire Roof)

Hydrograph



Reach 3R: Proposed Roof Runoff (Undetained)

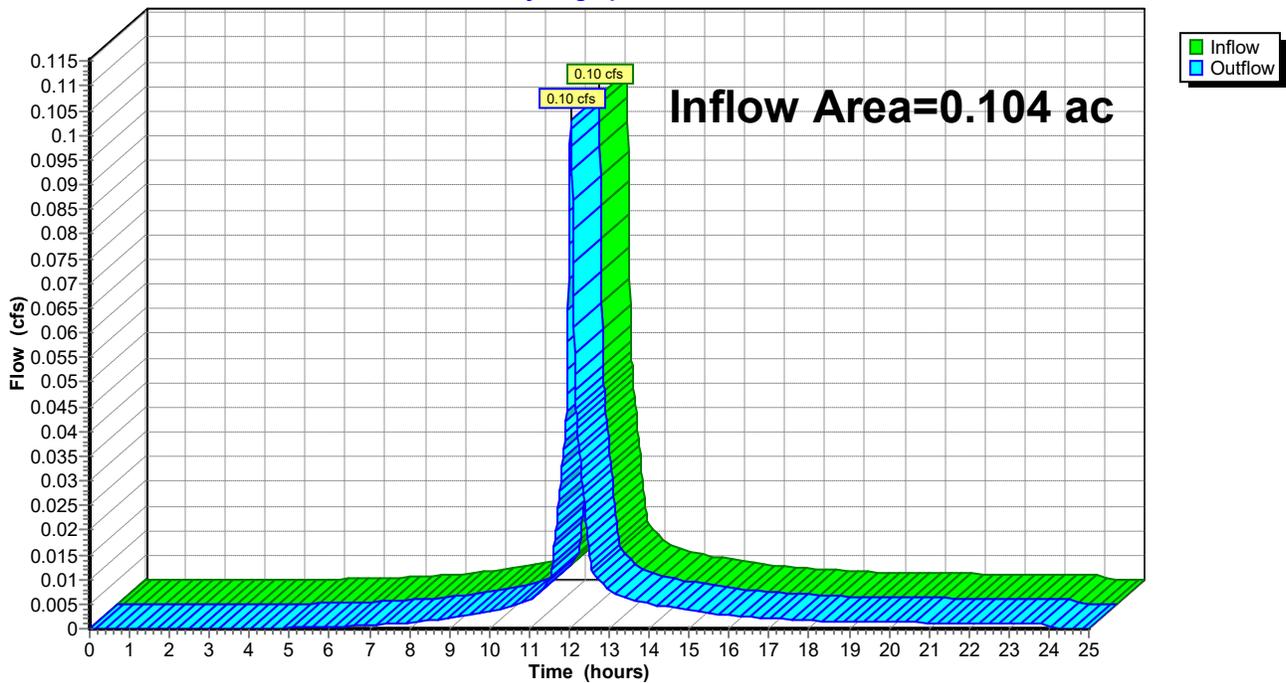
[40] Hint: Not Described (Outflow=Inflow)

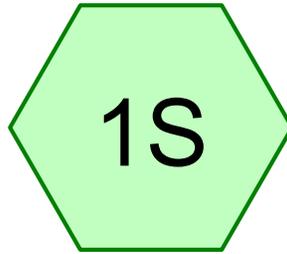
Inflow Area = 0.104 ac, Inflow Depth = 0.79" for 1 inch event
Inflow = 0.10 cfs @ 12.04 hrs, Volume= 0.007 af
Outflow = 0.10 cfs @ 12.04 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

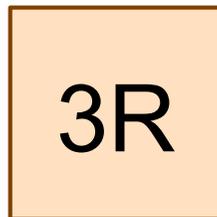
Reach 3R: Proposed Roof Runoff (Undetained)

Hydrograph

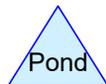
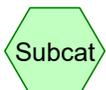




Proposed Roof Runoff
(Entire Roof)



Proposed Roof Runoff
(Undetained)



26049_21 Windsor Rd, Wellesley - Roof Calc.

Type III 24-hr 100-Year Rainfall=7.00"

Prepared by {enter your company name here}

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9/28/2020

Time span=0.00-25.00 hrs, dt=0.01 hrs, 2501 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment 1S: Proposed Roof Runoff (Entire Roof)

Runoff Area=4,530 sf Runoff Depth=6.76"

Flow Length=100' Tc=3.0 min CN=98 Runoff=0.79 cfs 0.059 af

Reach 3R: Proposed Roof Runoff (Undetained)

Inflow=0.79 cfs 0.059 af

Outflow=0.79 cfs 0.059 af

Total Runoff Area = 0.104 ac Runoff Volume = 0.059 af Average Runoff Depth = 6.76"

Subcatchment 1S: Proposed Roof Runoff (Entire Roof)

Runoff = 0.79 cfs @ 12.04 hrs, Volume= 0.059 af, Depth= 6.76"

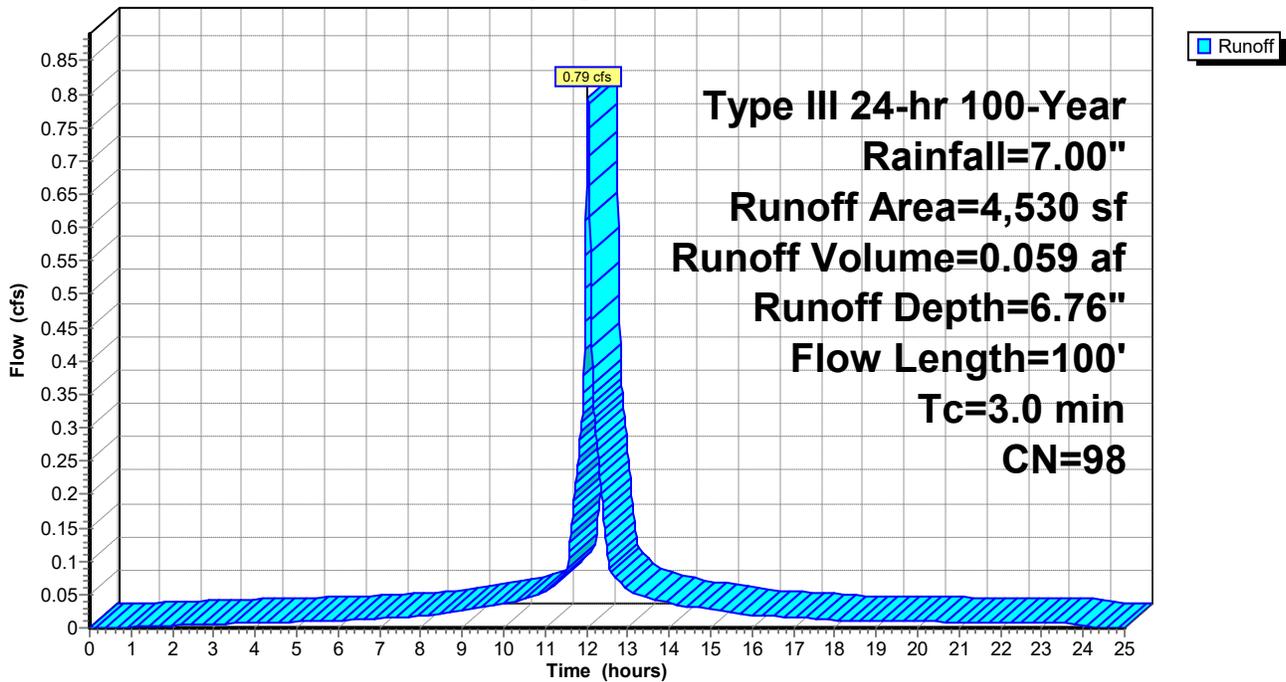
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs
 Type III 24-hr 100-Year Rainfall=7.00"

Area (sf)	CN	Description
4,530	98	Paved parking & roofs

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	100	0.2500	3.5		Lag/CN Method,
0.5	100	Total, Increased to minimum Tc = 3.0 min			

Subcatchment 1S: Proposed Roof Runoff (Entire Roof)

Hydrograph



Reach 3R: Proposed Roof Runoff (Undetained)

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.104 ac, Inflow Depth = 6.76" for 100-Year event
Inflow = 0.79 cfs @ 12.04 hrs, Volume= 0.059 af
Outflow = 0.79 cfs @ 12.04 hrs, Volume= 0.059 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-25.00 hrs, dt= 0.01 hrs

Reach 3R: Proposed Roof Runoff (Undetained)

Hydrograph

