

EXISTING GRADE, INC.

Land Surveyors - Civil Engineers

November 09, 2022

Town of Bourne Planning Department
Ms. Jennifer Copeland – Town Planner
Bourne Town Hall
24 Perry Avenue – Room 201
Buzzards Bay, Massachusetts 02532

**RE: *Narrative for Stormwater Summary – Lot 61
Eastern Sky, LLC
61 Wildwood Lane
Bourne, Massachusetts***

Ms. Copeland:

This memo serves to provide supporting documentation and narrative regarding the proposed Stormwater Management and Best Management Practices (BMP's) for Eastern Sky, LLC (Proponent) for the property located at 61 Wildwood Lane, Bourne (Assessors Map 7, Parcel 100, Lot 61). The Stormwater Management information is being submitted at the request of the Town of Bourne Planning Department regarding the proposed site plans for Lot 61, Wildwood Lane – Buildings 1 through 7.

The proposed parking area consists of two separate infiltration systems, each with a typical deep sump catch basin feeding 3 underground leaching chambers with 3' of crushed stone. The leaching chambers have been sized to fully infiltrate the typical 25-year storm event as shown on the attached HydroCAD drainage analysis. The building recharge systems consist of a standard Cultec R-330XLHD infiltration bed which has been designed to maximize infiltration for the roof runoff of the typical 1" water quality storm event. Any excess runoff from the site will flow into the roadway drainage system, ensuring no increase in peak rate of runoff to abutting properties.

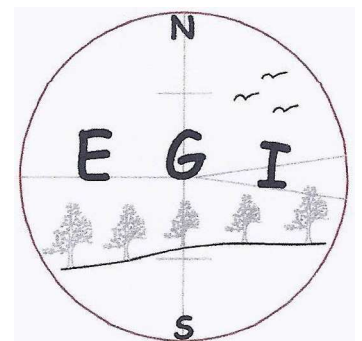
Please reference the attached HydroCAD drainage reports, web soil survey mapping, and supporting area calculation plan for further detail. Please do not hesitate to call the undersigned at (508) 694-6501 with any questions or concerns.

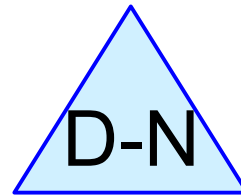
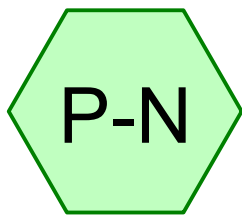
EXISTING GRADE INC.

Edwin Gless, PE, PLS
President



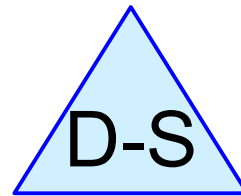
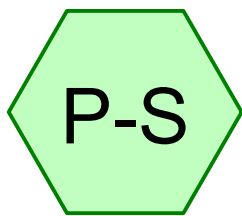
62 Riedell Road
Douglas, MA 01516
(508) 694-6501





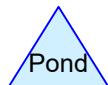
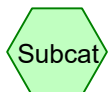
PAVEMENT NORTH

3xLeach Pits



PAVEMENT SOUTH

3xLeach Pits



1292_LOT 61 DRAINAGE

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.483	98	Paved parking, HSG A (P-N, P-S)
0.483	98	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.483	HSG A	P-N, P-S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.483		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.483	0.000	0.000	0.000	0.000	0.483	Paved parking	P-N, P-S
0.483	0.000	0.000	0.000	0.000	0.483	TOTAL AREA	

1292_LOT 61 DRAINAGE

Type II 24-hr 2-YR Rainfall=3.41"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-N: PAVEMENTNORTH Runoff Area=7,435 sf 100.00% Impervious Runoff Depth>2.94"
Tc=6.0 min CN=98 Runoff=0.80 cfs 0.042 af

Subcatchment P-S: PAVEMENTSOUTH Runoff Area=13,593 sf 100.00% Impervious Runoff Depth>2.94"
Tc=6.0 min CN=98 Runoff=1.46 cfs 0.076 af

Pond D-N: 3xLeachPits Peak Elev=82.40' Storage=0.015 af Inflow=0.80 cfs 0.042 af
Outflow=0.10 cfs 0.042 af

Pond D-S: 3xLeachPits Peak Elev=85.19' Storage=0.033 af Inflow=1.46 cfs 0.076 af
Outflow=0.10 cfs 0.076 af

Total Runoff Area = 0.483 ac Runoff Volume = 0.118 af Average Runoff Depth = 2.94"
0.00% Pervious = 0.000 ac 100.00% Impervious = 0.483 ac

1292_LOT 61 DRAINAGE

Type II 24-hr 2-YR Rainfall=3.41"

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Summary for Subcatchment P-N: PAVEMENT NORTH

Runoff = 0.80 cfs @ 11.96 hrs, Volume= 0.042 af, Depth> 2.94"

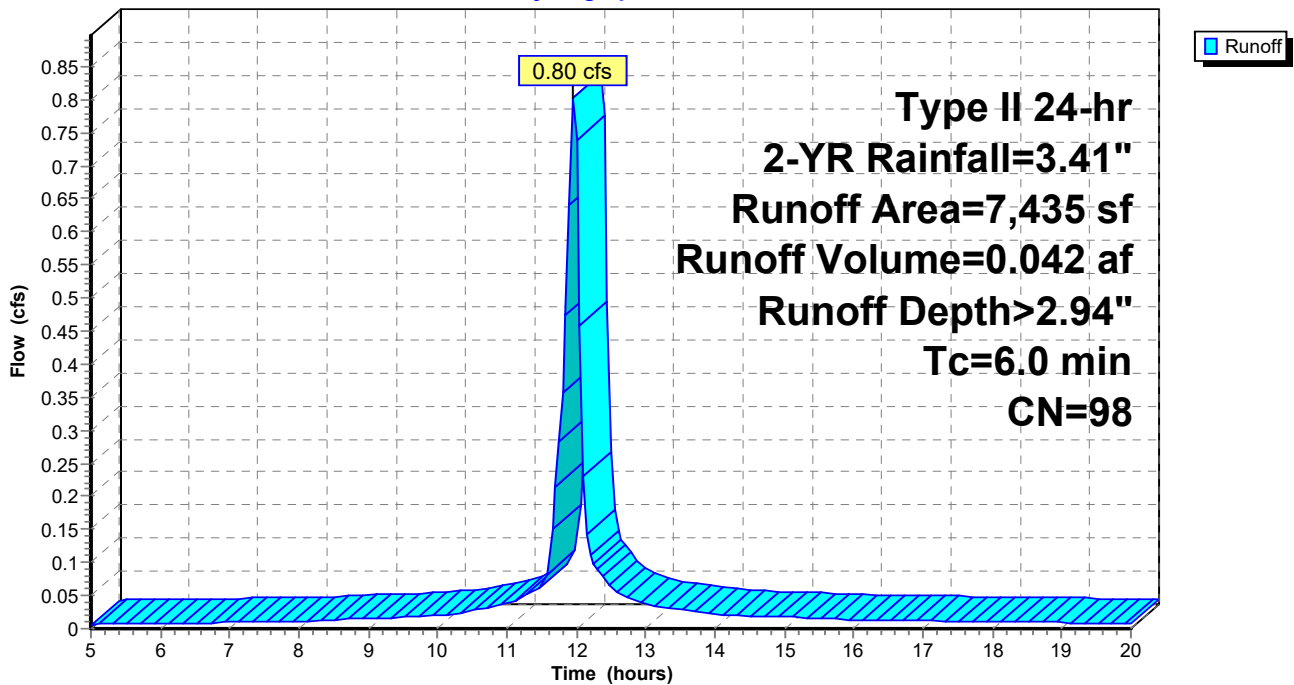
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-YR Rainfall=3.41"

Area (sf)	CN	Description
7,435	98	Paved parking, HSG A
7,435		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, MINIMUM TC

Subcatchment P-N: PAVEMENT NORTH

Hydrograph



1292_LOT 61 DRAINAGE

Type II 24-hr 2-YR Rainfall=3.41"

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Summary for Subcatchment P-S: PAVEMENT SOUTH

Runoff = 1.46 cfs @ 11.96 hrs, Volume= 0.076 af, Depth> 2.94"

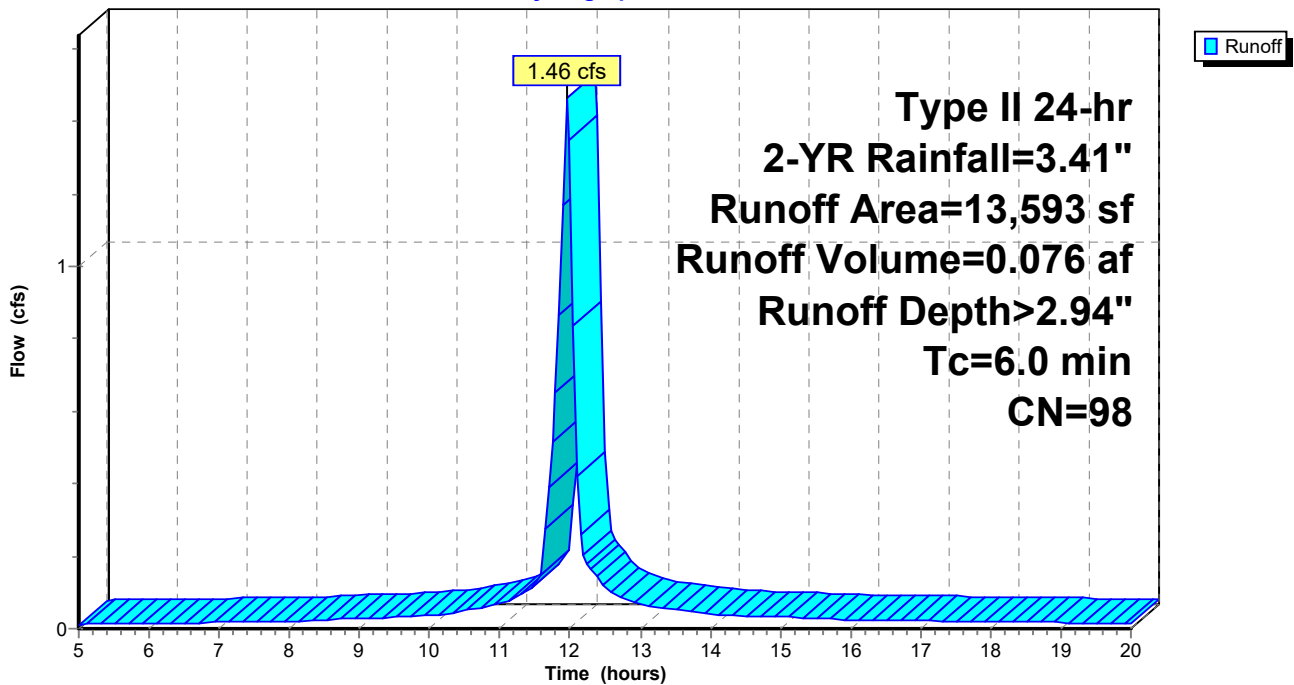
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 2-YR Rainfall=3.41"

Area (sf)	CN	Description
13,593	98	Paved parking, HSG A
13,593		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, MINIMUM TC

Subcatchment P-S: PAVEMENT SOUTH

Hydrograph



1292_LOT 61 DRAINAGE

Type II 24-hr 2-YR Rainfall=3.41"

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Summary for Pond D-N: 3xLeach Pits

Inflow Area = 0.171 ac, 100.00% Impervious, Inflow Depth > 2.94" for 2-YR event
 Inflow = 0.80 cfs @ 11.96 hrs, Volume= 0.042 af
 Outflow = 0.10 cfs @ 12.27 hrs, Volume= 0.042 af, Atten= 88%, Lag= 18.4 min
 Discarded = 0.10 cfs @ 12.27 hrs, Volume= 0.042 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 82.40' @ 12.27 hrs Surf.Area= 0.011 ac Storage= 0.015 af

Plug-Flow detention time=46.8 min calculated for 0.042 af (100% of inflow)
 Center-of-Mass det. time=45.8 min (778.4 - 732.6)

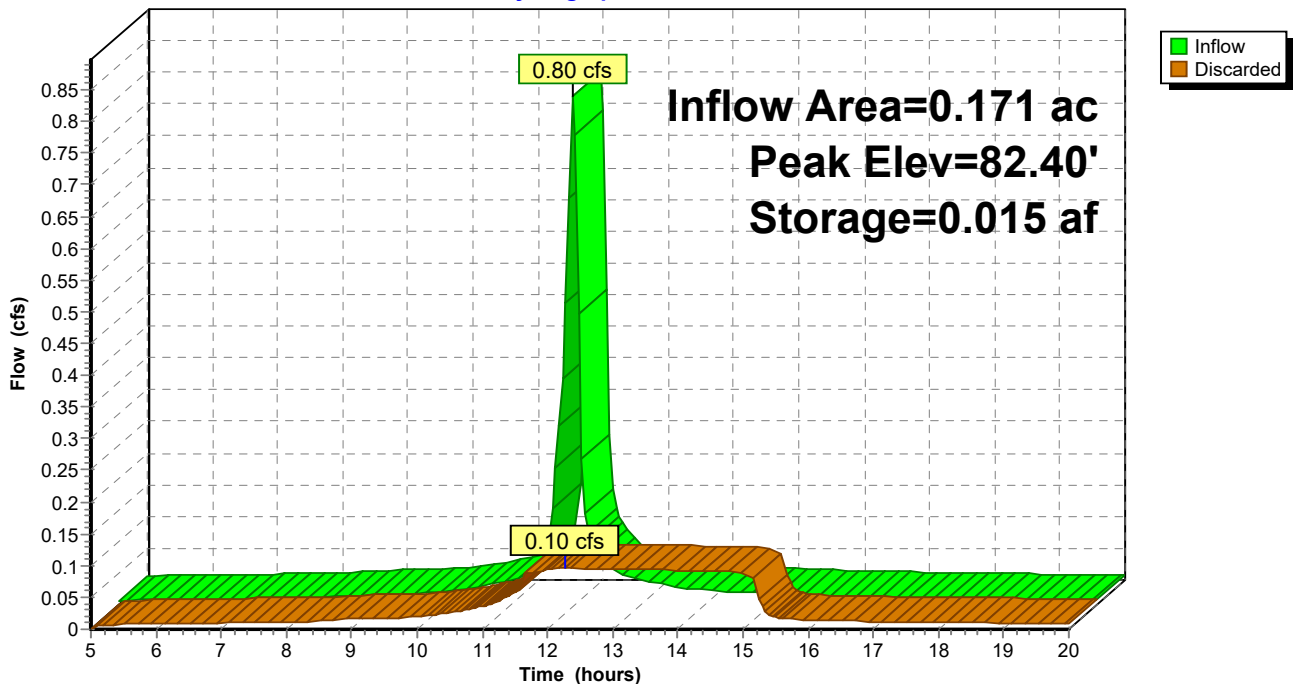
Volume	Invert	Avail.Storage	Storage Description
#1	80.00'	0.052 af	14.00'D x 12.00'H 4' Stone Surround 3 0.127 af Overall - 0.023 af Embedded= 0.104 af x 50.0% Voids
#2	80.00'	0.023 af	6.00'D x 12.00'H Vertical Cone/Cylinder 3 Inside #1
		0.075 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	80.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 50.00'

Discarded OutFlowMax=0.10 cfs @ 12.27 hrs HW=82.40' (Free Discharge)
 ↑1=Exfiltration (Controls 0.10 cfs)

Pond D-N: 3xLeach Pits

Hydrograph



1292_LOT 61 DRAINAGE

Type II 24-hr 2-YR Rainfall=3.41"

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Summary for Pond D-S: 3xLeach Pits

Inflow Area = 0.312 ac, 100.00% Impervious, Inflow Depth > 2.94" for 2-YR event
 Inflow = 1.46 cfs @ 11.96 hrs, Volume= 0.076 af
 Outflow = 0.10 cfs @ 12.55 hrs, Volume= 0.076 af, Atten= 93%, Lag= 35.5 min
 Discarded = 0.10 cfs @ 12.55 hrs, Volume= 0.076 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 85.19' @ 12.55 hrs Surf.Area= 0.011 ac Storage= 0.033 af

Plug-Flow detention time=107.7 min calculated for 0.076 af (99% of inflow)
 Center-of-Mass det. time=106.4 min (839.1 - 732.6)

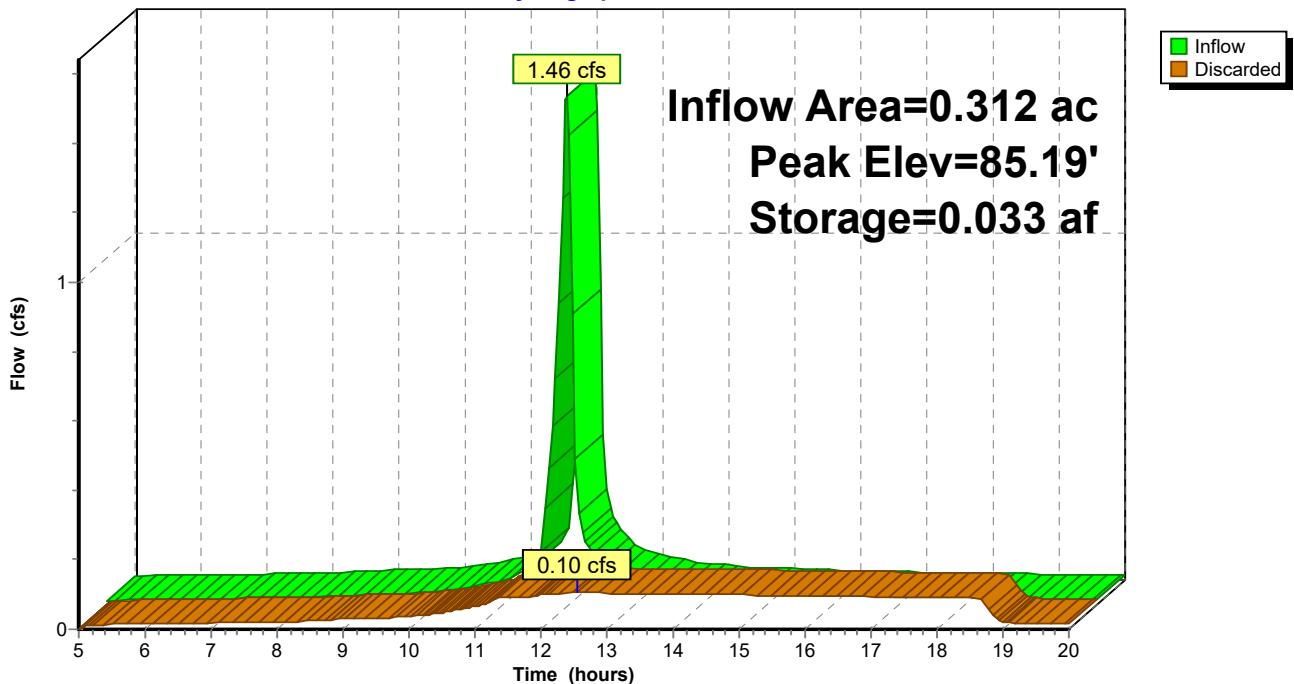
Volume	Invert	Avail.Storage	Storage Description
#1	80.00'	0.052 af	14.00'D x 12.00'H 4' Stone Surround 3 0.127 af Overall - 0.023 af Embedded= 0.104 af x 50.0% Voids
#2	80.00'	0.023 af	6.00'D x 12.00'H Vertical Cone/Cylinder 3 Inside #1
		0.075 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	80.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 50.00'

Discarded OutFlow Max=0.10 cfs @ 12.55 hrs HW=85.19' (Free Discharge)
 ↑1=Exfiltration (Controls 0.10 cfs)

Pond D-S: 3xLeach Pits

Hydrograph



1292_LOT 61 DRAINAGE

Type II 24-hr 10-YR Rainfall=4.98"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-N: PAVEMENTNORTH Runoff Area=7,435 sf 100.00% Impervious Runoff Depth>4.35"
Tc=6.0 min CN=98 Runoff=1.18 cfs 0.062 af

Subcatchment P-S: PAVEMENTSOUTH Runoff Area=13,593 sf 100.00% Impervious Runoff Depth>4.35"
Tc=6.0 min CN=98 Runoff=2.15 cfs 0.113 af

Pond D-N: 3xLeachPits Peak Elev=83.94' Storage=0.025 af Inflow=1.18 cfs 0.062 af
Outflow=0.10 cfs 0.062 af

Pond D-S: 3xLeachPits Peak Elev=88.47' Storage=0.053 af Inflow=2.15 cfs 0.113 af
Outflow=0.11 cfs 0.097 af

Total Runoff Area = 0.483 ac Runoff Volume = 0.175 af Average Runoff Depth = 4.35"
0.00% Pervious = 0.000 ac 100.00% Impervious = 0.483 ac

1292_LOT 61 DRAINAGE

Type II 24-hr 10-YR Rainfall=4.98"

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Summary for Subcatchment P-N: PAVEMENT NORTH

Runoff = 1.18 cfs @ 11.96 hrs, Volume= 0.062 af, Depth> 4.35"

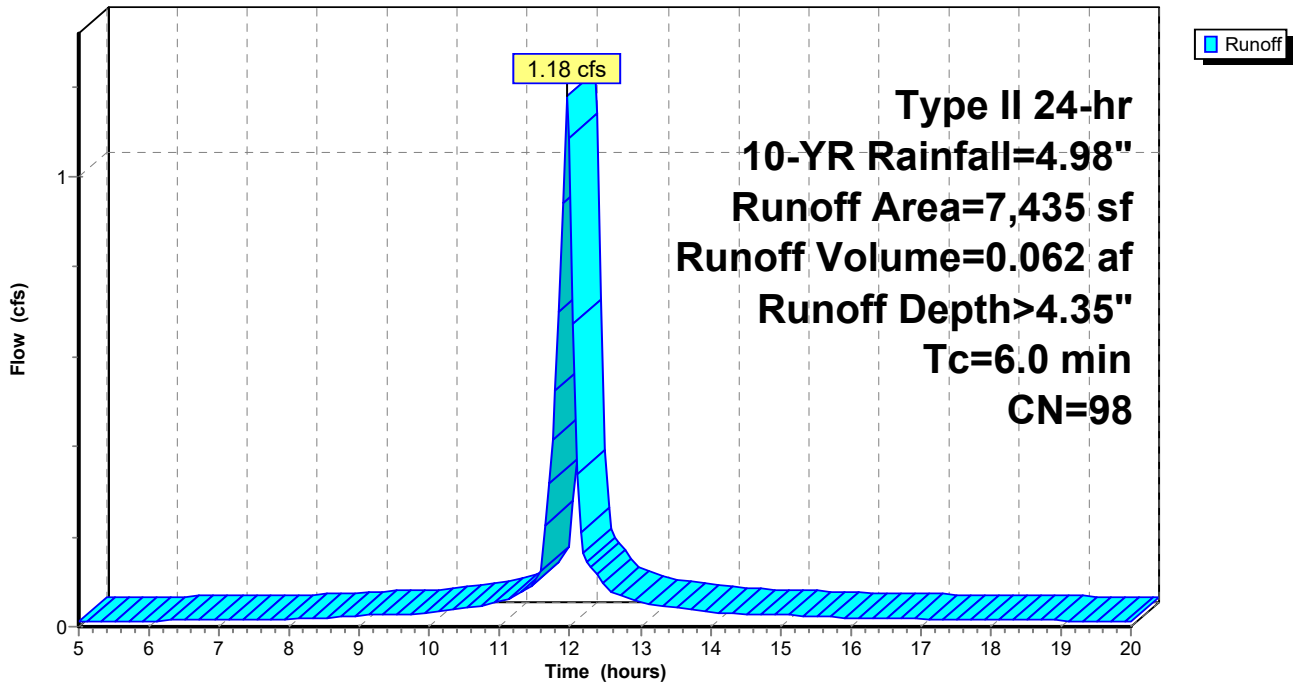
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-YR Rainfall=4.98"

Area (sf)	CN	Description
7,435	98	Paved parking, HSG A
7,435		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, MINIMUM TC

Subcatchment P-N: PAVEMENT NORTH

Hydrograph



1292_LOT 61 DRAINAGE

Type II 24-hr 10-YR Rainfall=4.98"

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Summary for Subcatchment P-S: PAVEMENT SOUTH

Runoff = 2.15 cfs @ 11.96 hrs, Volume= 0.113 af, Depth> 4.35"

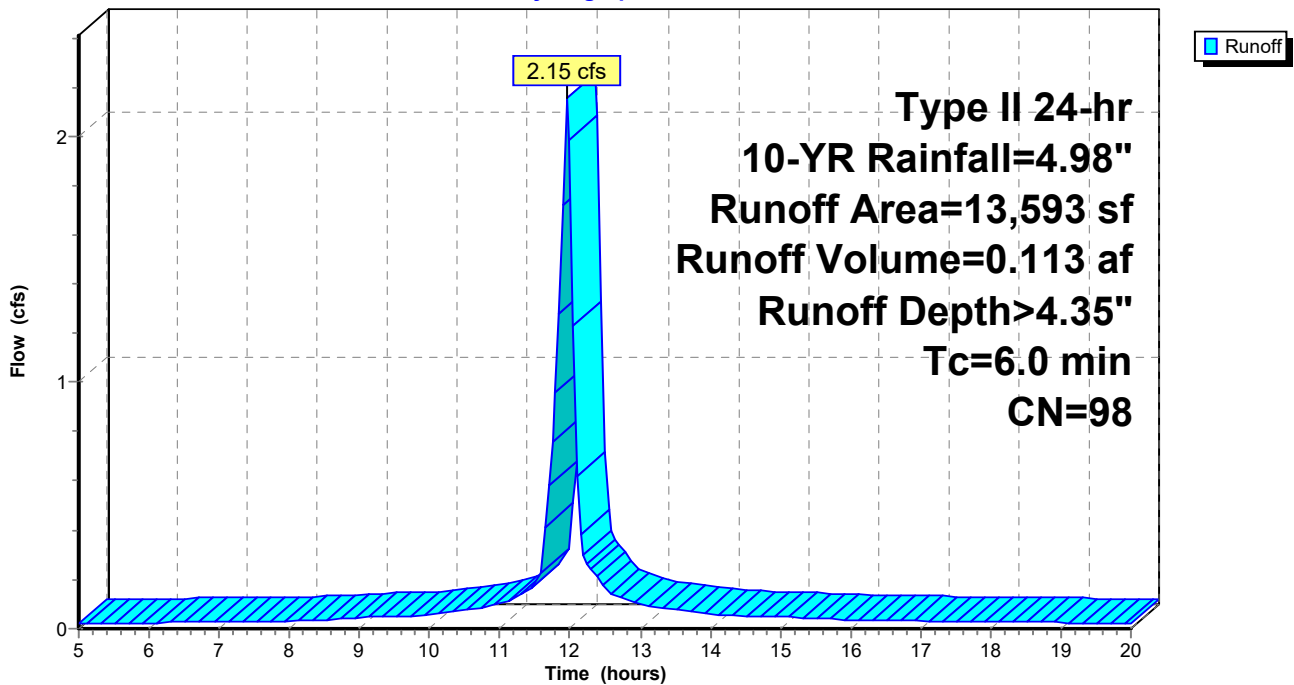
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-YR Rainfall=4.98"

Area (sf)	CN	Description
13,593	98	Paved parking, HSG A
13,593		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, MINIMUM TC

Subcatchment P-S: PAVEMENT SOUTH

Hydrograph



1292_LOT 61 DRAINAGE

Type II 24-hr 10-YR Rainfall=4.98"

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Summary for Pond D-N: 3xLeach Pits

Inflow Area = 0.171 ac, 100.00% Impervious, Inflow Depth > 4.35" for 10-YR event
 Inflow = 1.18 cfs @ 11.96 hrs, Volume= 0.062 af
 Outflow = 0.10 cfs @ 12.46 hrs, Volume= 0.062 af, Atten= 91%, Lag= 30.0 min
 Discarded = 0.10 cfs @ 12.46 hrs, Volume= 0.062 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 83.94' @ 12.46 hrs Surf.Area= 0.011 ac Storage= 0.025 af

Plug-Flow detention time=79.3 min calculated for 0.062 af (99% of inflow)
 Center-of-Mass det. time=78.1 min (808.1 - 730.1)

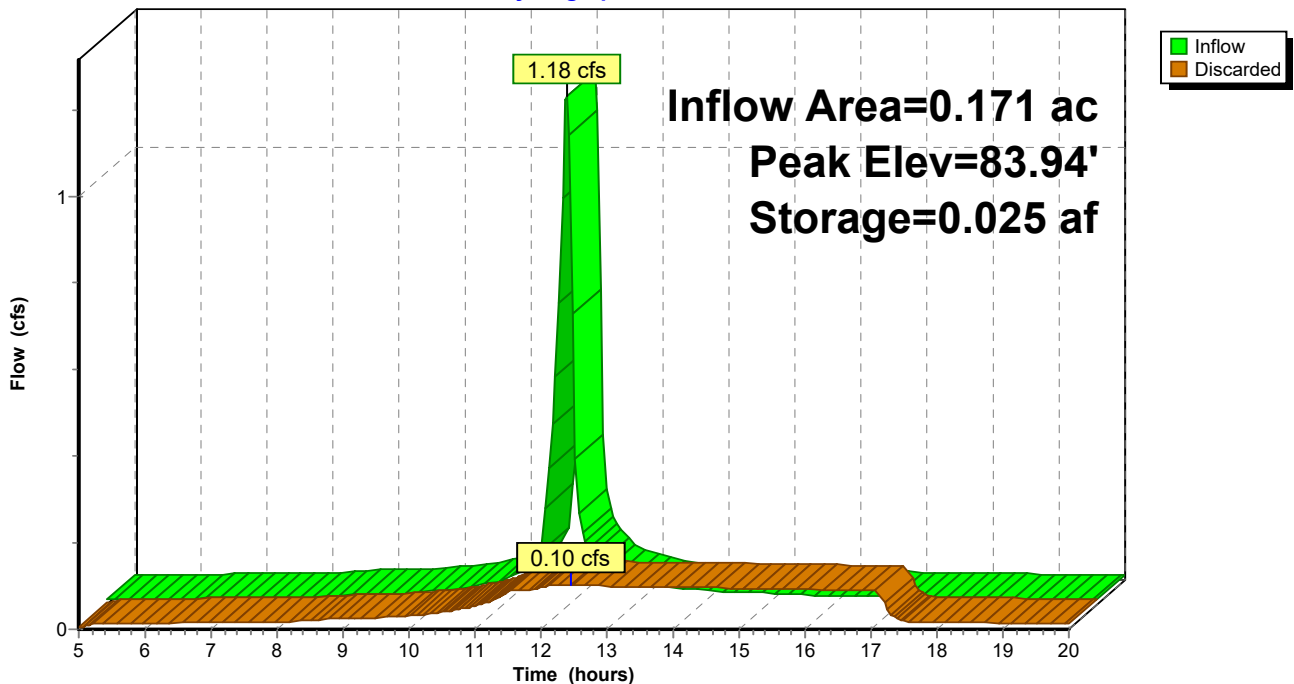
Volume	Invert	Avail.Storage	Storage Description
#1	80.00'	0.052 af	14.00'D x 12.00'H 4' Stone Surround 3 0.127 af Overall - 0.023 af Embedded= 0.104 af x 50.0% Voids
#2	80.00'	0.023 af	6.00'D x 12.00'H Vertical Cone/Cylinder 3 Inside #1
		0.075 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	80.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 50.00'

Discarded OutFlow Max=0.10 cfs @ 12.46 hrs HW=83.94' (Free Discharge)
 ↑1=Exfiltration (Controls 0.10 cfs)

Pond D-N: 3xLeach Pits

Hydrograph



1292_LOT 61 DRAINAGE

Type II 24-hr 10-YR Rainfall=4.98"

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Summary for Pond D-S: 3xLeach Pits

Inflow Area = 0.312 ac, 100.00% Impervious, Inflow Depth > 4.35" for 10-YR event
 Inflow = 2.15 cfs @ 11.96 hrs, Volume= 0.113 af
 Outflow = 0.11 cfs @ 12.87 hrs, Volume= 0.097 af, Atten= 95%, Lag= 54.6 min
 Discarded = 0.11 cfs @ 12.87 hrs, Volume= 0.097 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 88.47' @ 12.87 hrs Surf.Area= 0.011 ac Storage= 0.053 af

Plug-Flow detention time=162.3 min calculated for 0.097 af (86% of inflow)
 Center-of-Mass det. time=118.3 min (848.3 - 730.1)

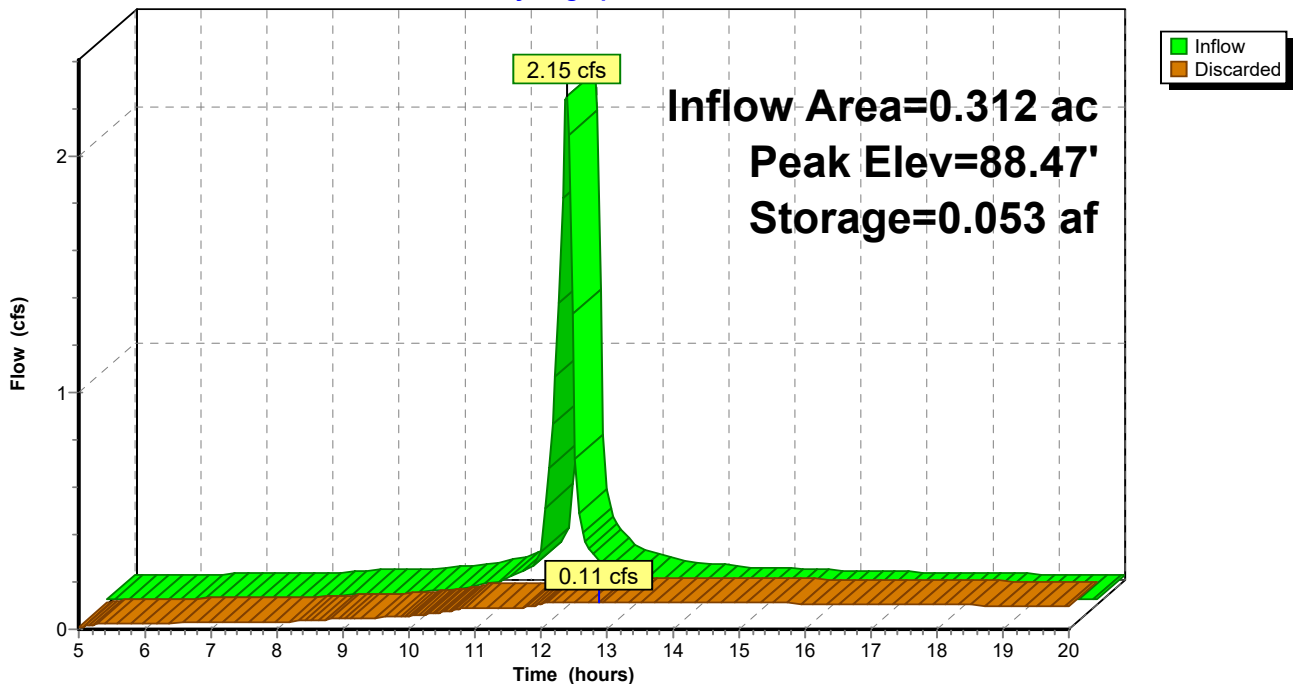
Volume	Invert	Avail.Storage	Storage Description
#1	80.00'	0.052 af	14.00'D x 12.00'H 4' Stone Surround 3 0.127 af Overall - 0.023 af Embedded= 0.104 af x 50.0% Voids
#2	80.00'	0.023 af	6.00'D x 12.00'H Vertical Cone/Cylinder 3 Inside #1
		0.075 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	80.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 50.00'

Discarded OutFlowMax=0.11 cfs @ 12.87 hrs HW=88.47' (Free Discharge)
 ↑1=Exfiltration (Controls 0.11 cfs)

Pond D-S: 3xLeach Pits

Hydrograph



1292_LOT 61 DRAINAGE

Type II 24-hr 25-YR Rainfall=5.95"

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-N: PAVEMENTNORTH Runoff Area=7,435 sf 100.00% Impervious Runoff Depth>5.22"
Tc=6.0 min CN=98 Runoff=1.41 cfs 0.074 af

Subcatchment P-S: PAVEMENTSOUTH Runoff Area=13,593 sf 100.00% Impervious Runoff Depth>5.22"
Tc=6.0 min CN=98 Runoff=2.57 cfs 0.136 af

Pond D-N: 3xLeachPits Peak Elev=84.96' Storage=0.031 af Inflow=1.41 cfs 0.074 af
Outflow=0.10 cfs 0.074 af

Pond D-S: 3xLeachPits Peak Elev=90.63' Storage=0.067 af Inflow=2.57 cfs 0.136 af
Outflow=0.12 cfs 0.106 af

Total Runoff Area = 0.483 ac Runoff Volume = 0.210 af Average Runoff Depth = 5.22"
0.00% Pervious = 0.000 ac 100.00% Impervious = 0.483 ac

1292_LOT 61 DRAINAGE

Type II 24-hr 25-YR Rainfall=5.95"

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Summary for Subcatchment P-N: PAVEMENT NORTH

Runoff = 1.41 cfs @ 11.96 hrs, Volume= 0.074 af, Depth> 5.22"

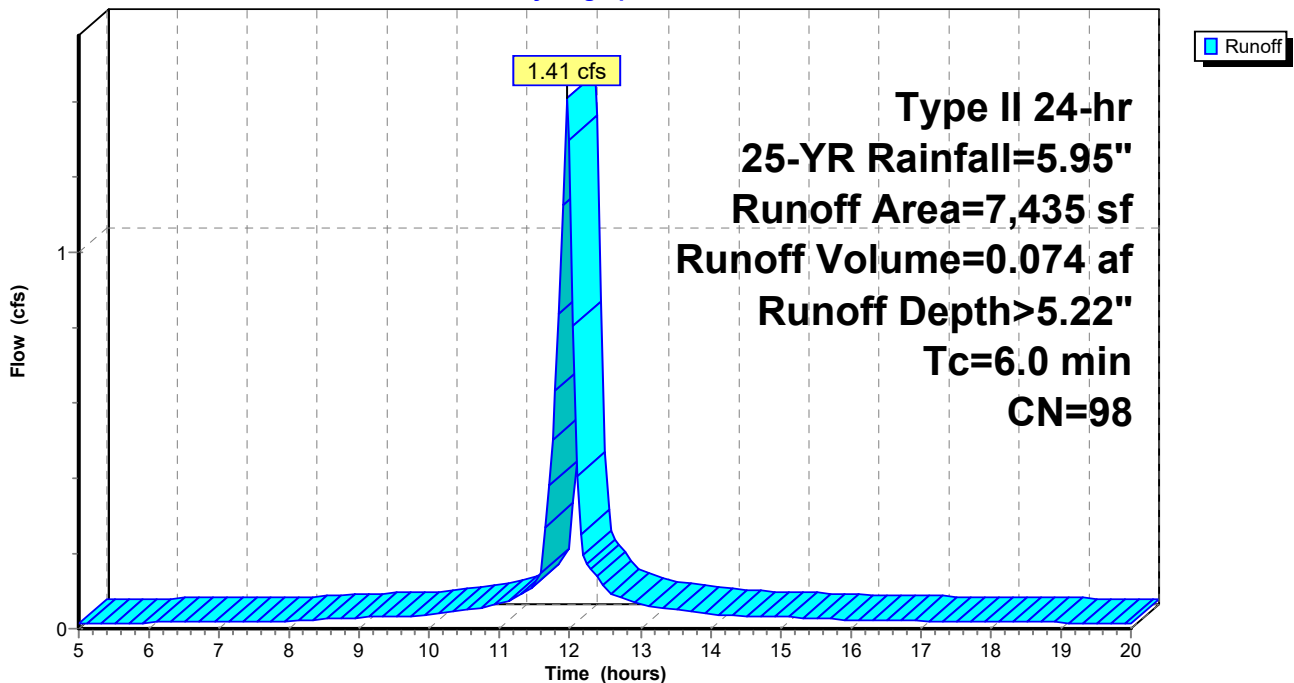
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Type II 24-hr 25-YR Rainfall=5.95"

Area (sf)	CN	Description
7,435	98	Paved parking, HSG A
7,435		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, MINIMUM TC

Subcatchment P-N: PAVEMENT NORTH

Hydrograph



1292_LOT 61 DRAINAGE

Type II 24-hr 25-YR Rainfall=5.95"

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Summary for Subcatchment P-S: PAVEMENT SOUTH

Runoff = 2.57 cfs @ 11.96 hrs, Volume= 0.136 af, Depth> 5.22"

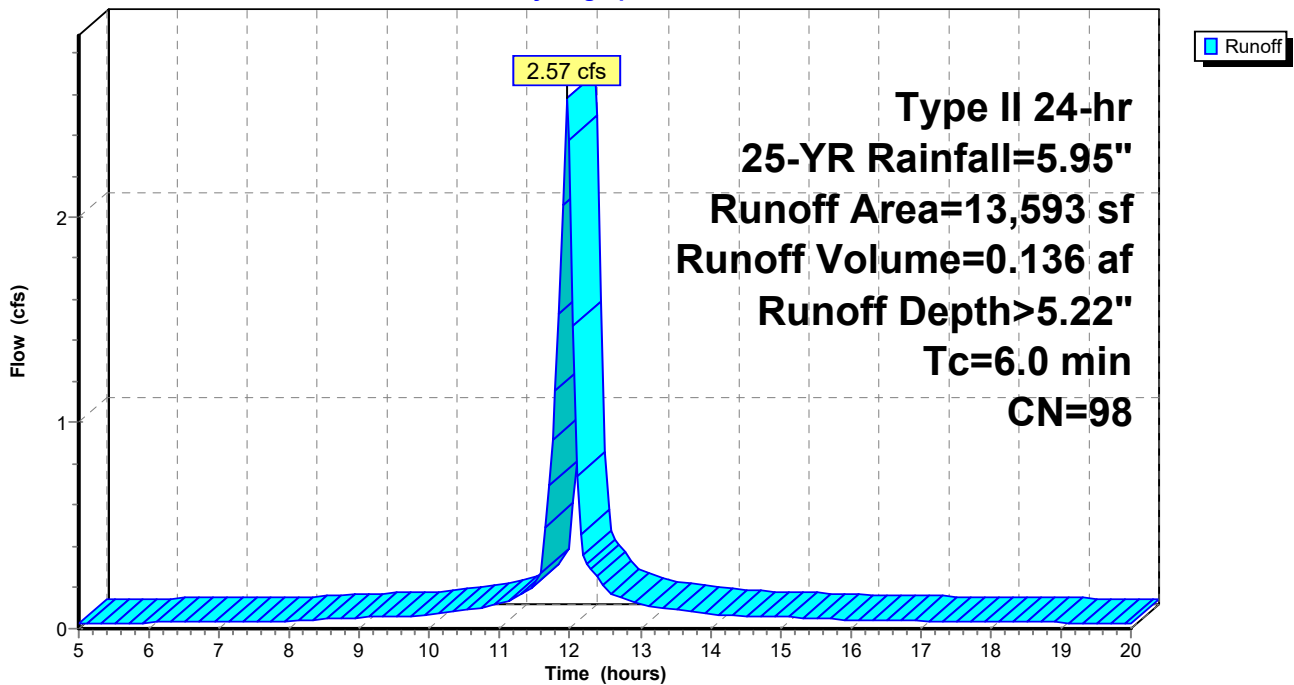
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 25-YR Rainfall=5.95"

Area (sf)	CN	Description
13,593	98	Paved parking, HSG A
13,593		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, MINIMUM TC

Subcatchment P-S: PAVEMENT SOUTH

Hydrograph



1292_LOT 61 DRAINAGE

Type II 24-hr 25-YR Rainfall=5.95"

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Summary for Pond D-N: 3xLeach Pits

Inflow Area = 0.171 ac, 100.00% Impervious, Inflow Depth > 5.22" for 25-YR event
 Inflow = 1.41 cfs @ 11.96 hrs, Volume= 0.074 af
 Outflow = 0.10 cfs @ 12.53 hrs, Volume= 0.074 af, Atten= 93%, Lag= 34.4 min
 Discarded = 0.10 cfs @ 12.53 hrs, Volume= 0.074 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 84.96' @ 12.53 hrs Surf.Area= 0.011 ac Storage= 0.031 af

Plug-Flow detention time=101.0 min calculated for 0.074 af (100% of inflow)
 Center-of-Mass det. time=99.9 min (829.2 - 729.2)

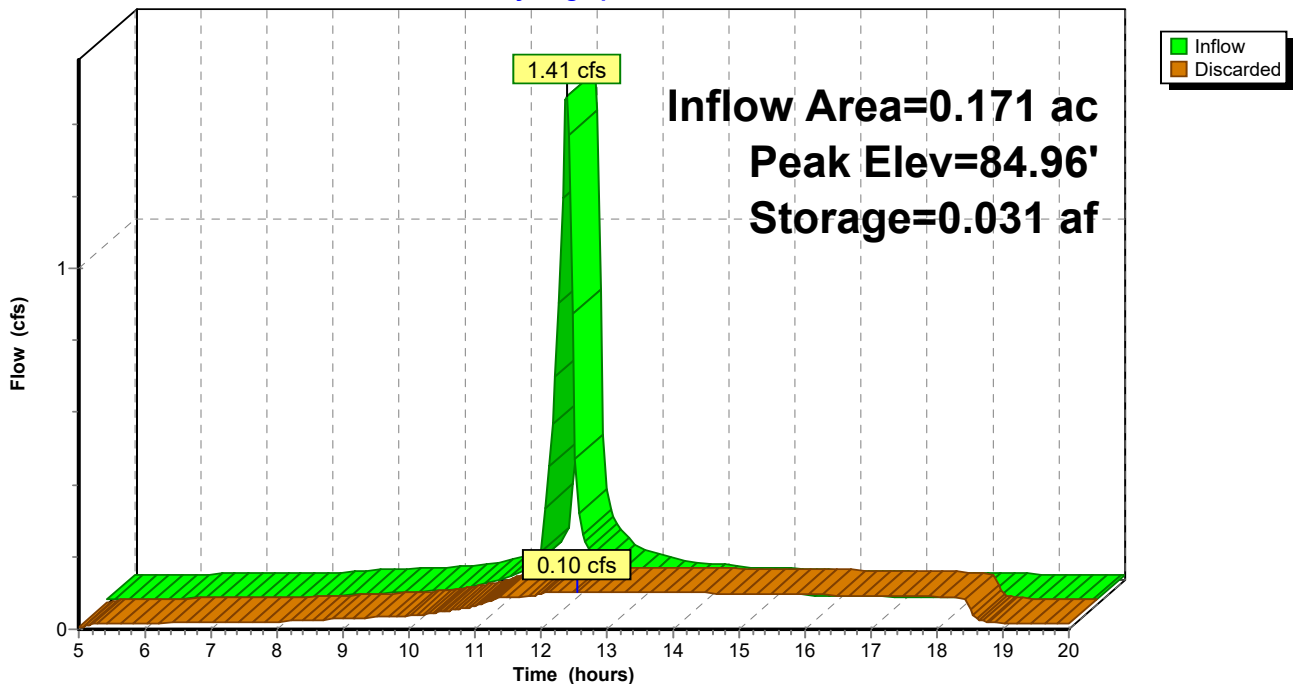
Volume	Invert	Avail.Storage	Storage Description
#1	80.00'	0.052 af	14.00'D x 12.00'H 4' Stone Surround 3 0.127 af Overall - 0.023 af Embedded= 0.104 af x 50.0% Voids
#2	80.00'	0.023 af	6.00'D x 12.00'H Vertical Cone/Cylinder 3 Inside #1
		0.075 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	80.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 50.00'

Discarded OutFlowMax=0.10 cfs @ 12.53 hrs HW=84.96' (Free Discharge)
 ↑1=Exfiltration (Controls 0.10 cfs)

Pond D-N: 3xLeach Pits

Hydrograph



1292_LOT 61 DRAINAGE

Type II 24-hr 25-YR Rainfall=5.95"

Prepared by {enter your company name here}

Printed 11/9/2022

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Summary for Pond D-S: 3xLeach Pits

Inflow Area = 0.312 ac, 100.00% Impervious, Inflow Depth > 5.22" for 25-YR event
 Inflow = 2.57 cfs @ 11.96 hrs, Volume= 0.136 af
 Outflow = 0.12 cfs @ 13.04 hrs, Volume= 0.106 af, Atten= 95%, Lag= 64.4 min
 Discarded = 0.12 cfs @ 13.04 hrs, Volume= 0.106 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
 Peak Elev= 90.63' @ 13.04 hrs Surf.Area= 0.011 ac Storage= 0.067 af

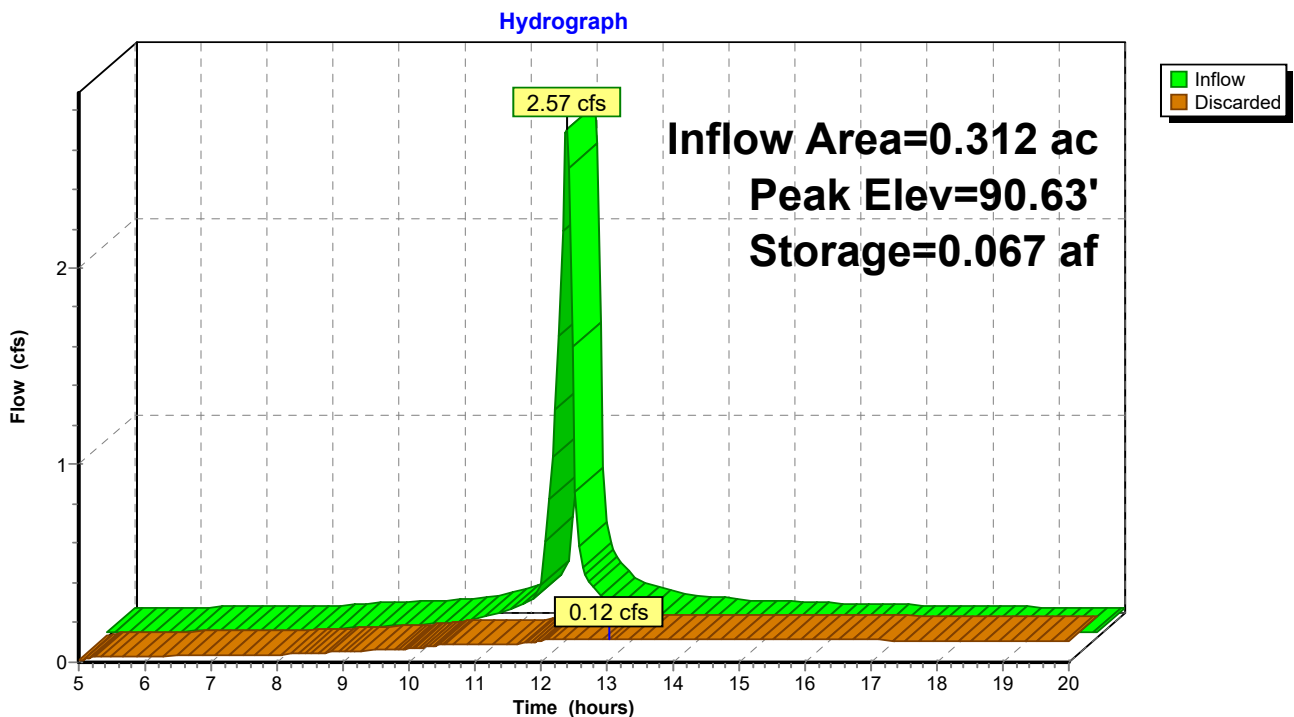
Plug-Flow detention time=169.7 min calculated for 0.106 af (78% of inflow)
 Center-of-Mass det. time=111.7 min (840.9 - 729.2)

Volume	Invert	Avail.Storage	Storage Description
#1	80.00'	0.052 af	14.00'D x 12.00'H 4' Stone Surround 3 0.127 af Overall - 0.023 af Embedded= 0.104 af x 50.0% Voids
#2	80.00'	0.023 af	6.00'D x 12.00'H Vertical Cone/Cylinder 3 Inside #1
		0.075 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	80.00'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 50.00'

Discarded OutFlowMax=0.12 cfs @ 13.04 hrs HW=90.63' (Free Discharge)
 ↑1=Exfiltration (Controls 0.12 cfs)

Pond D-S: 3xLeach Pits





NOAA Atlas 14, Volume 10, Version 3
Location name: Sagamore Beach, Massachusetts, USA*

Latitude: 41.7895°, Longitude: -70.5398°
Elevation: 98.46 ft**

* source: ESRI Maps
 ** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

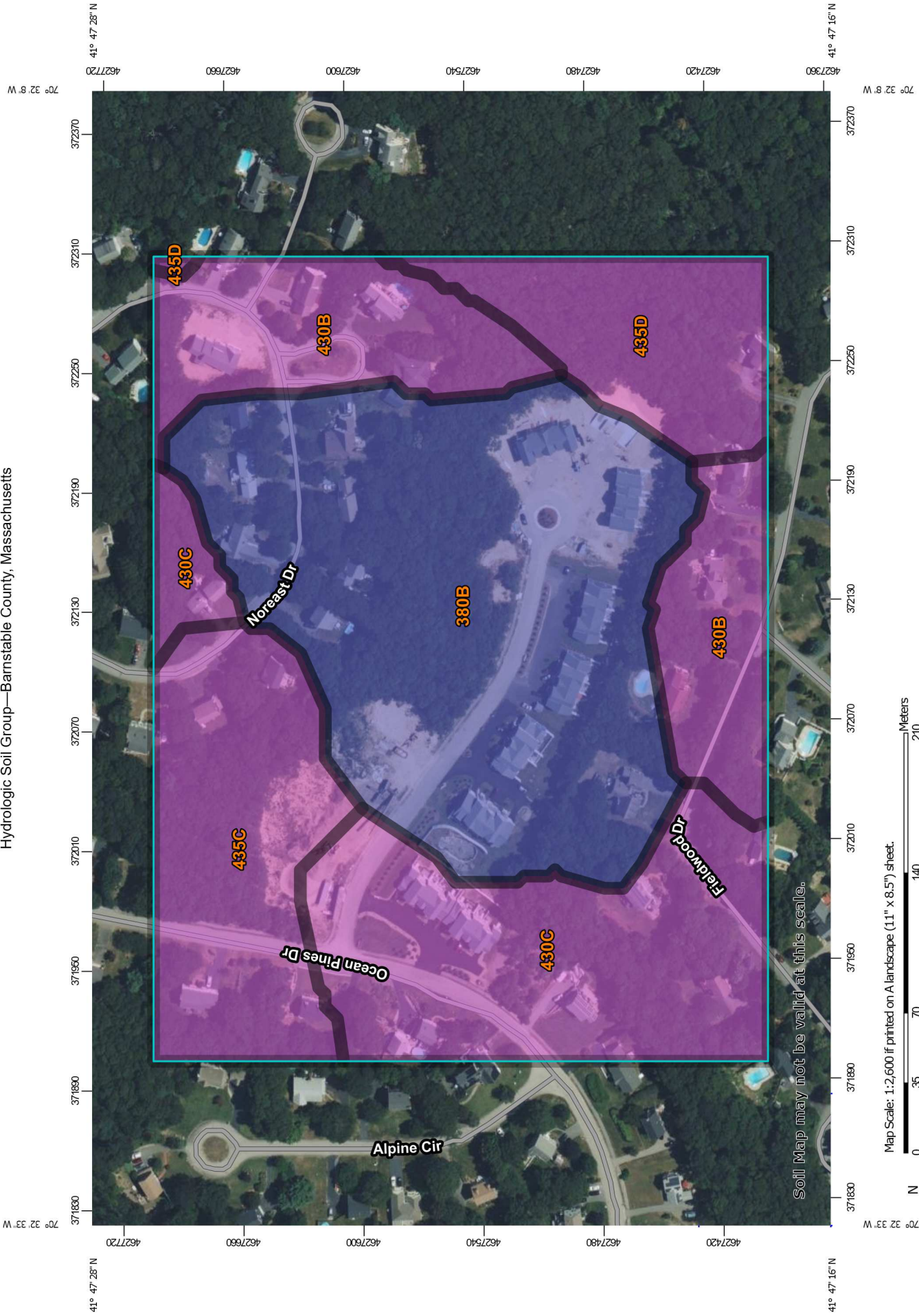
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.289 (0.235-0.352)	0.360 (0.293-0.440)	0.477 (0.387-0.584)	0.574 (0.463-0.706)	0.708 (0.552-0.906)	0.807 (0.616-1.05)	0.913 (0.678-1.23)	1.04 (0.722-1.41)	1.23 (0.820-1.72)	1.39 (0.904-1.97)
10-min	0.409 (0.334-0.499)	0.511 (0.416-0.623)	0.677 (0.549-0.828)	0.814 (0.657-1.00)	1.00 (0.782-1.28)	1.14 (0.873-1.49)	1.29 (0.961-1.75)	1.47 (1.02-2.00)	1.74 (1.16-2.43)	1.97 (1.28-2.79)
15-min	0.482 (0.392-0.587)	0.601 (0.489-0.733)	0.795 (0.645-0.974)	0.957 (0.771-1.18)	1.18 (0.920-1.51)	1.34 (1.03-1.75)	1.52 (1.13-2.06)	1.73 (1.20-2.35)	2.05 (1.37-2.86)	2.32 (1.51-3.29)
30-min	0.693 (0.565-0.846)	0.863 (0.703-1.05)	1.14 (0.925-1.40)	1.37 (1.11-1.69)	1.69 (1.32-2.16)	1.93 (1.47-2.51)	2.18 (1.62-2.94)	2.48 (1.72-3.37)	2.93 (1.96-4.10)	3.32 (2.16-4.71)
60-min	0.905 (0.738-1.10)	1.13 (0.916-1.37)	1.49 (1.21-1.82)	1.79 (1.44-2.20)	2.20 (1.71-2.81)	2.50 (1.91-3.27)	2.83 (2.11-3.83)	3.23 (2.24-4.38)	3.82 (2.55-5.33)	4.32 (2.81-6.13)
2-hr	1.22 (1.00-1.48)	1.52 (1.25-1.84)	2.01 (1.64-2.44)	2.42 (1.96-2.95)	2.97 (2.34-3.78)	3.39 (2.61-4.39)	3.83 (2.88-5.15)	4.38 (3.07-5.89)	5.20 (3.50-7.19)	5.91 (3.89-8.30)
3-hr	1.44 (1.19-1.74)	1.79 (1.47-2.16)	2.35 (1.93-2.85)	2.82 (2.30-3.43)	3.46 (2.74-4.38)	3.94 (3.05-5.08)	4.46 (3.37-5.95)	5.08 (3.59-6.80)	6.03 (4.09-8.29)	6.85 (4.54-9.56)
6-hr	1.88 (1.56-2.26)	2.30 (1.90-2.75)	2.97 (2.46-3.57)	3.54 (2.90-4.26)	4.31 (3.43-5.40)	4.88 (3.81-6.22)	5.50 (4.18-7.24)	6.23 (4.44-8.25)	7.33 (5.02-9.97)	8.26 (5.53-11.4)
12-hr	2.39 (2.00-2.85)	2.86 (2.38-3.40)	3.62 (3.01-4.32)	4.25 (3.51-5.09)	5.12 (4.10-6.34)	5.77 (4.53-7.26)	6.45 (4.92-8.36)	7.24 (5.22-9.48)	8.37 (5.81-11.3)	9.31 (6.31-12.7)
24-hr	2.89 (2.43-3.41)	3.41 (2.87-4.03)	4.26 (3.57-5.05)	4.98 (4.14-5.92)	5.95 (4.80-7.30)	6.69 (5.29-8.33)	7.46 (5.72-9.53)	8.31 (6.05-10.8)	9.50 (6.66-12.6)	10.5 (7.16-14.1)
2-day	3.33 (2.82-3.90)	3.93 (3.33-4.61)	4.91 (4.15-5.78)	5.73 (4.81-6.76)	6.85 (5.57-8.32)	7.70 (6.13-9.49)	8.58 (6.63-10.8)	9.54 (7.03-12.2)	10.9 (7.72-14.3)	12.0 (8.29-16.0)
3-day	3.65 (3.11-4.26)	4.28 (3.64-5.00)	5.31 (4.50-6.21)	6.16 (5.19-7.24)	7.33 (5.99-8.87)	8.22 (6.58-10.1)	9.14 (7.10-11.5)	10.1 (7.51-12.9)	11.5 (8.23-15.1)	12.6 (8.80-16.7)
4-day	3.93 (3.36-4.58)	4.57 (3.90-5.33)	5.62 (4.78-6.56)	6.49 (5.49-7.60)	7.69 (6.30-9.26)	8.60 (6.90-10.5)	9.53 (7.43-11.9)	10.5 (7.84-13.4)	11.9 (8.55-15.5)	13.0 (9.12-17.2)
7-day	4.67 (4.01-5.40)	5.33 (4.58-6.17)	6.42 (5.49-7.45)	7.32 (6.23-8.52)	8.56 (7.06-10.2)	9.52 (7.68-11.5)	10.5 (8.20-12.9)	11.5 (8.62-14.5)	12.8 (9.28-16.5)	13.8 (9.79-18.1)
10-day	5.35 (4.61-6.16)	6.04 (5.20-6.96)	7.17 (6.15-8.28)	8.10 (6.92-9.40)	9.39 (7.77-11.1)	10.4 (8.42-12.5)	11.4 (8.94-13.9)	12.4 (9.36-15.5)	13.7 (9.99-17.6)	14.7 (10.5-19.1)
20-day	7.36 (6.40-8.42)	8.15 (7.07-9.33)	9.43 (8.16-10.8)	10.5 (9.04-12.1)	12.0 (9.98-14.1)	13.1 (10.7-15.6)	14.2 (11.2-17.2)	15.3 (11.7-19.0)	16.6 (12.3-21.1)	17.6 (12.7-22.6)
30-day	9.06 (7.91-10.3)	9.93 (8.66-11.3)	11.4 (9.87-13.0)	12.5 (10.8-14.4)	14.2 (11.9-16.5)	15.4 (12.7-18.2)	16.7 (13.2-20.0)	17.8 (13.7-21.9)	19.2 (14.3-24.1)	20.1 (14.6-25.7)
45-day	11.2 (9.83-12.7)	12.2 (10.7-13.8)	13.8 (12.0-15.7)	15.1 (13.1-17.2)	16.9 (14.2-19.6)	18.4 (15.1-21.5)	19.7 (15.7-23.4)	20.9 (16.2-25.6)	22.3 (16.7-27.9)	23.3 (17.0-29.5)
60-day	13.0 (11.5-14.8)	14.1 (12.4-16.0)	15.8 (13.9-17.9)	17.3 (15.0-19.6)	19.2 (16.3-22.2)	20.8 (17.2-24.3)	22.3 (17.8-26.3)	23.5 (18.3-28.7)	25.0 (18.8-31.1)	25.9 (19.1-32.7)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.

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PF graphical

Hydrologic Soil Group—Barnstable County, Massachusetts

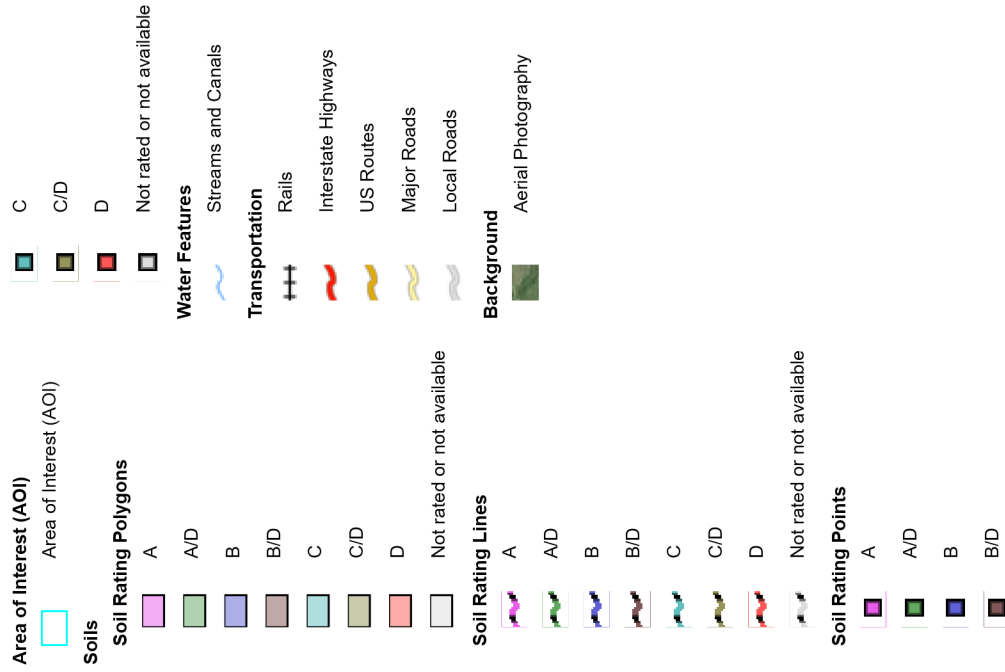


Map Scale: 1:2,600 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND



MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Barnstable County, Massachusetts
 Survey Area Data: Version 19, Sep 9, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 5, 2020—Sep 7, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
380B	Nantucket sandy loam, 3 to 8 percent slopes	B	11.8	38.3%
430B	Barnstable sandy loam, 3 to 8 percent slopes	A	5.1	16.4%
430C	Barnstable sandy loam, 8 to 15 percent slopes	A	6.6	21.5%
435C	Plymouth loamy coarse sand, 8 to 15 percent slopes	A	4.5	14.6%
435D	Plymouth loamy coarse sand, 15 to 35 percent slopes	A	2.8	9.2%
Totals for Area of Interest			30.8	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

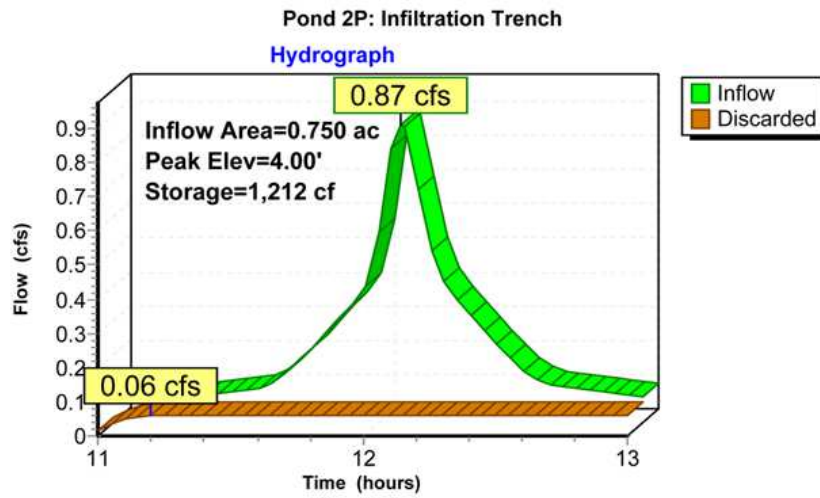


Table 2.3.3. 1982 Rawls Rates¹⁸

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate Inches/Hour
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

¹⁸ Rawls, Brakensiek and Saxton, 1982

