

# DRAINAGE ANALYSIS

PREPARED FOR

## PROPOSED POOL INSTALLATION

LOCATED AT

90 KENT ROAD

WILTON, CONNECTICUT

GE #20-5345

OCTOBER 19, 2020



**GRUMMAN ENGINEERING, LLC**  
**CONSULTING CIVIL ENGINEERS**  
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## **NARRATIVE:**

The subject of this report is a 1.236 acre parcel located at 90 Kent Road. The purpose of the report is to determine the change in stormwater runoff resulting from the proposed pool and patio installation and to provide mitigation in accordance with Town of Wilton standards.

### **EXISTING CONDITIONS:**

This site currently contains a single-family dwelling with paved driveway, located in the southern half of the site. The land slopes to the southeast with grades of 2-35%. There is a wetland corridor that runs through the site in the northern portion. The wetlands were identified by a soil scientist and marked on the property survey.

Existing upland soils at this location are identified in the NRCS Web Soil Survey as being Canton and Charlton, fine sandy loam and Charlton-Chatfield complex, HSG 'B'.

### **PROPOSED CONDITIONS:**

The proposal for this site is to install a fiberglass pool on the north side of the dwelling, along with an extension of the existing patio. Some minor grading around the pool will be required.

Per Town of Wilton requirements, no increase in peak flow or volume is allowed after development. The site was analyzed to determine the existing and proposed peak runoff rates and on-site retention using Cultec R-1500XL chambers has been proposed to store the increased runoff. Only the non-wetland area was considered in the following computations.

The following computations utilize the Hydrocad computer software and a 25-year design storm. Rainfall data was taken from the NOAA Atlas 14, for this location.

## **COMPUTATIONS:**

### **Existing Conditions:**

Dwelling -	1,370 s.f.	CN-98
Driveway -	1,495 s.f.	CN-98
Patio -	456 s.f.	CN-98
Lawn -	25,725 s.f.	CN-61
Total -	29,046 s.f.	

### **Proposed Conditions:**

Dwelling -	1,370 s.f.	CN-98
Driveway -	1,495 s.f.	CN-98
Pool -	425 s.f.	CN-98
Patio -	527 s.f.	CN-98
Lawn -	25,229 s.f.	CN-61
Total -	29,046 s.f.	

**Water Quality Volume (WQV)** – First 1" of runoff from new impervious surfaces to be stored and treated.

$$WQV = (1"/12) (496 \text{ s.f.}) = 41.3 \text{ c.f.}$$

## **SUMMARY:**

	<u>Existing</u>	<u>Proposed</u>	<u>Δ</u>	<u>%Δ</u>
Q (c.f.s.)	1.62	1.60	- 0.02	- 1.2
V (c.f.)	6,639	6,557	- 82	- 1.2

## **CONCLUSIONS:**

The installation of (1) Cultec R-150XLHD chamber collecting runoff from a portion of the dwelling roof will be adequate to provide storage of the increased peak runoff and volume, resulting from the proposed site development.

The proposed Cultec chamber will also provide the required water quality volume.

There will be no adverse impact of adjacent properties as a result of the proposed improvements.



Existing Conditions



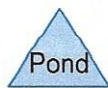
Proposed Conditions



Proposed Runoff Into  
Retention



Stormwater Retention



**Routing Diagram for 20-5345 Runoff**

Prepared by GRUMMAN ENGINEERING LLC, Printed 10/22/2020  
HydroCAD® 10.00-24 s/n 01412 © 2018 HydroCAD Software Solutions LLC



**20-5345 Runoff**

Type III 24-hr 25-Year Rainfall=6.54"

Prepared by GRUMMAN ENGINEERING LLC

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**Summary for Subcatchment 1S: Existing Conditions**

Runoff = 1.62 cfs @ 12.21 hrs, Volume= 6,639 cf, Depth&gt; 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-Year Rainfall=6.54"

	Area (sf)	CN	Description
*	1,370	98	Dwelling
*	1,495	98	Driveway
*	456	98	Patio
	25,725	61	>75% Grass cover, Good, HSG B
	29,046	65	Weighted Average
	25,725		88.57% Pervious Area
	3,321		11.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	100	0.0750	0.30		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.50"
0.3	15	0.0200	0.98		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.50"
4.5	45	0.0260	0.17		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.50"
3.9	40	0.2000	0.17		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
14.2	200	Total			

## 20-5345 Runoff

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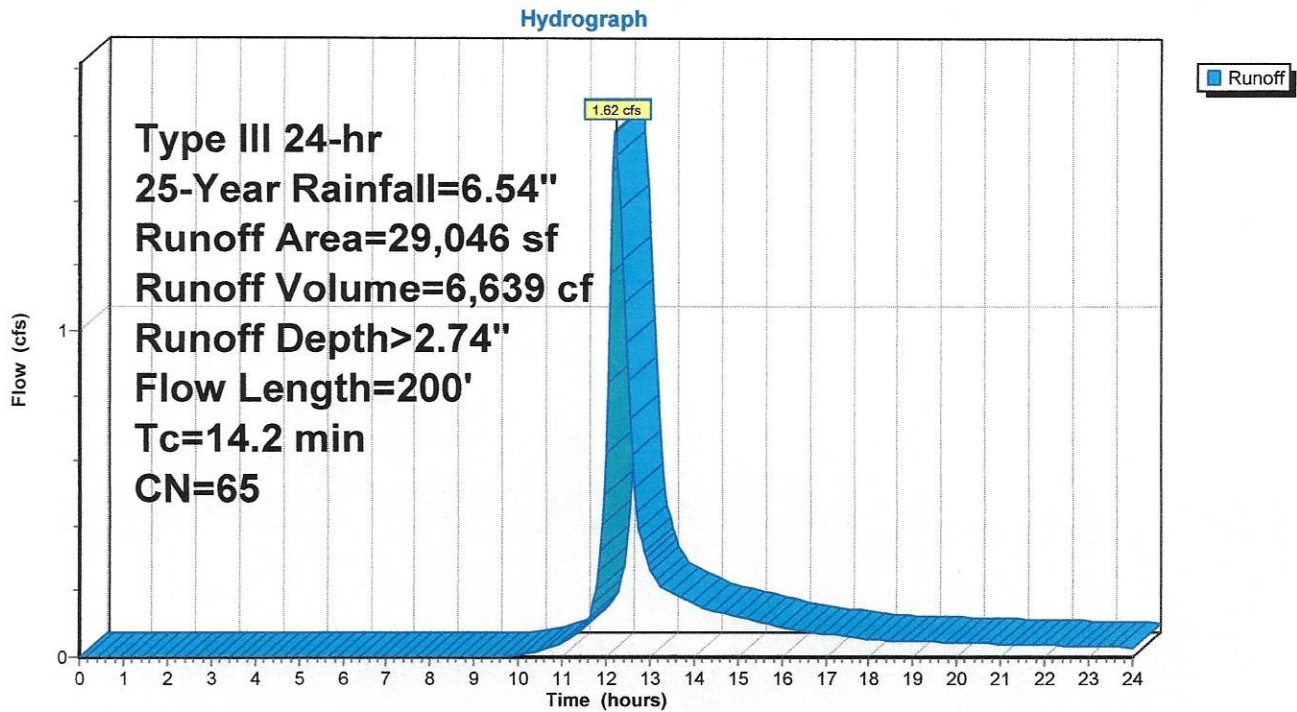
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Type III 24-hr 25-Year Rainfall=6.54"

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### Subcatchment 1S: Existing Conditions



**20-5345 Runoff**

Type III 24-hr 25-Year Rainfall=6.54"

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**Summary for Subcatchment 2S: Proposed Conditions**

Runoff = 1.60 cfs @ 12.21 hrs, Volume= 6,557 cf, Depth&gt; 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-Year Rainfall=6.54"

	Area (sf)	CN	Description
*	1,010	98	Dwelling
*	1,495	98	Driveway
*	527	98	Patio
*	425	98	Pool
	25,229	61	>75% Grass cover, Good, HSG B
	28,686	65	Weighted Average
	25,229		87.95% Pervious Area
	3,457		12.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	100	0.0750	0.30		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.50"
0.3	15	0.0200	0.98		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.50"
4.5	45	0.0260	0.17		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.50"
3.9	40	0.2000	0.17		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.50"
14.2	200	Total			



## 20-5345 Runoff

Prepared by GRUMMAN ENGINEERING LLC

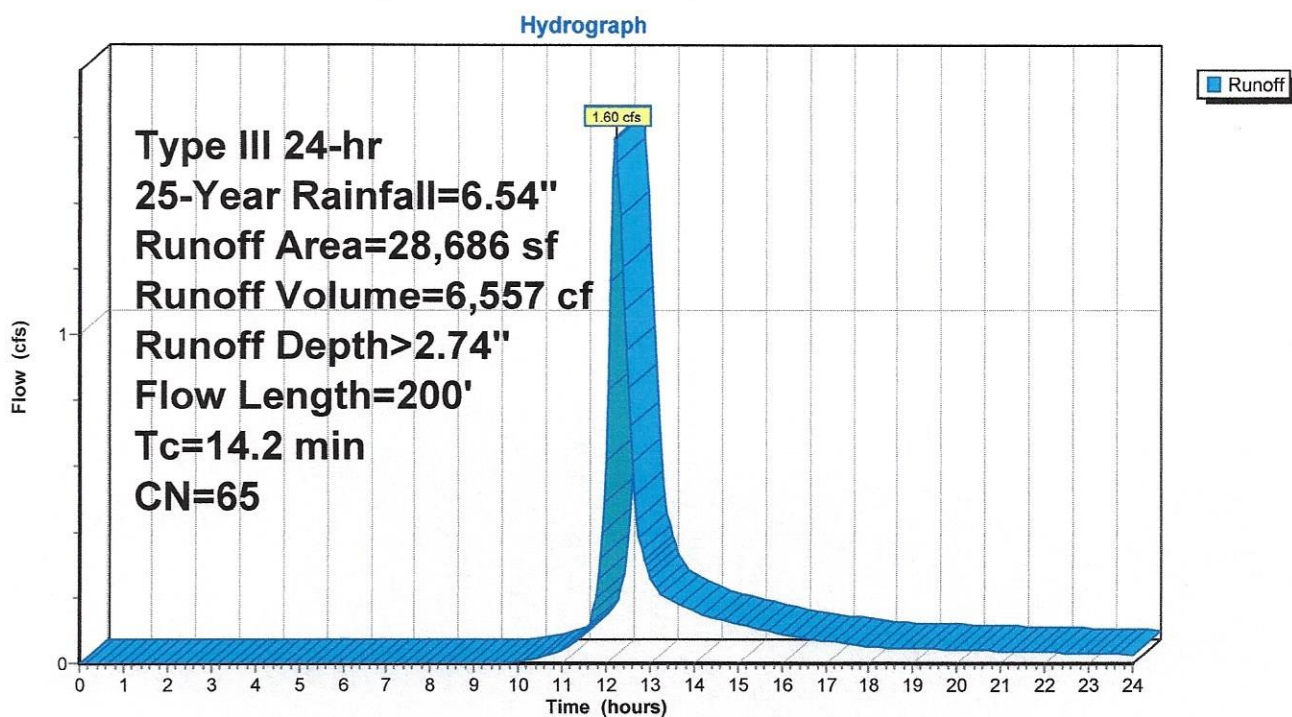
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Type III 24-hr 25-Year Rainfall=6.54"

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### Subcatchment 2S: Proposed Conditions



## 20-5345 Runoff

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Type III 24-hr 25-Year Rainfall=6.54"

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### Summary for Subcatchment 3S: Proposed Runoff Into Retention

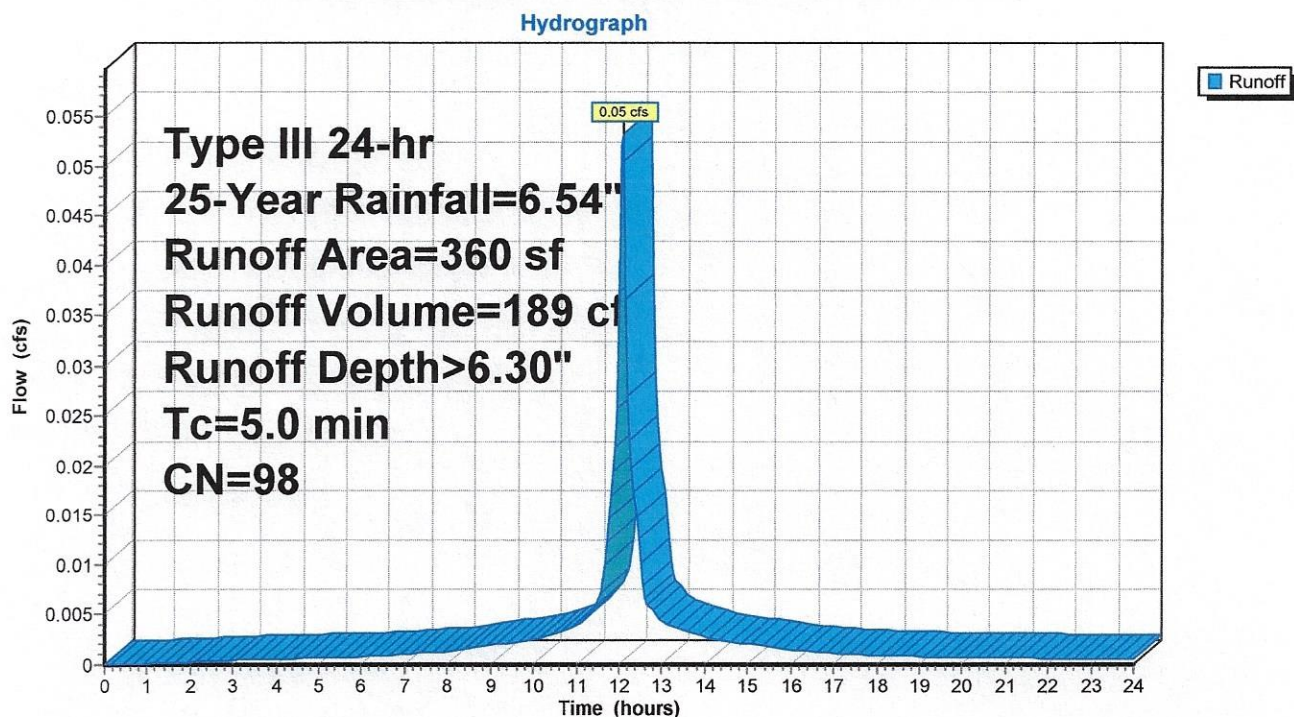
Runoff = 0.05 cfs @ 12.07 hrs, Volume= 189 cf, Depth> 6.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-Year Rainfall=6.54"

	Area (sf)	CN	Description
*	360	98	Roof
	360		100.00% Impervious Area

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

### Subcatchment 3S: Proposed Runoff Into Retention



**20-5345 Runoff**

Type III 24-hr 25-Year Rainfall=6.54"

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**Summary for Pond 4P: Stormwater Retention**

Inflow Area = 360 sf, 100.00% Impervious, Inflow Depth > 6.30" for 25-Year event  
 Inflow = 0.05 cfs @ 12.07 hrs, Volume= 189 cf  
 Outflow = 0.01 cfs @ 12.54 hrs, Volume= 189 cf, Atten= 84%, Lag= 28.4 min  
 Discarded = 0.01 cfs @ 12.54 hrs, Volume= 189 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 267.47' @ 12.54 hrs Surf.Area= 62 sf Storage= 57 cf

Plug-Flow detention time= 48.2 min calculated for 188 cf (100% of inflow)  
 Center-of-Mass det. time= 47.9 min ( 790.5 - 742.6 )

Volume	Invert	Avail.Storage	Storage Description
#1A	265.80'	51 cf	<b>4.75'W x 13.00'L x 2.54'H Field A</b> 157 cf Overall - 29 cf Embedded = 128 cf x 40.0% Voids
#2A	266.30'	29 cf	<b>Cultec R-150XLHD Inside #1</b> Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 1 rows
		80 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	265.80'	<b>3.000 in/hr Exfiltration over Wetted area</b>

Discarded OutFlow Max=0.01 cfs @ 12.54 hrs HW=267.47' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.01 cfs)



## 20-5345 Runoff

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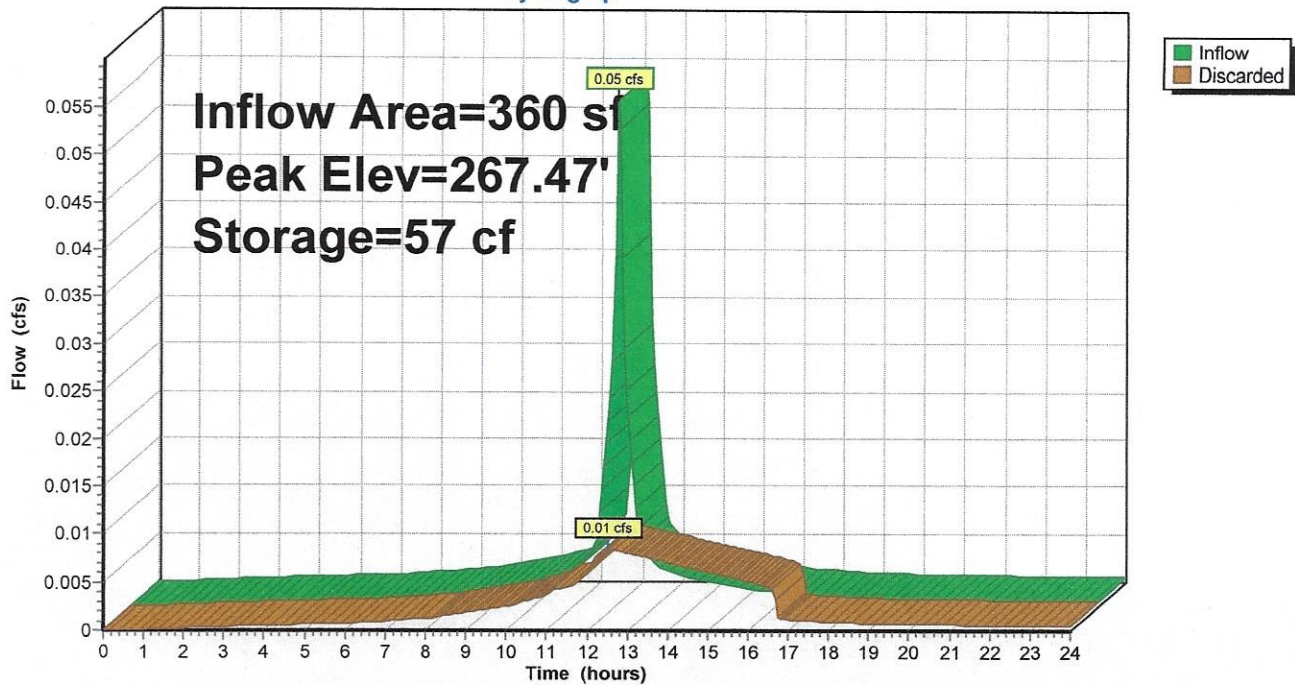
Type III 24-hr 25-Year Rainfall=6.54"

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### Pond 4P: Stormwater Retention

Hydrograph





**20-5345 Runoff**

Type III 24-hr 25-Year Rainfall=6.54"

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**Stage-Area-Storage for Pond 4P: Stormwater Retention**

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
265.80	62	0
265.85	64	1
265.90	65	2
265.95	67	4
266.00	69	5
266.05	71	6
266.10	72	7
266.15	74	9
266.20	76	10
266.25	78	11
266.30	80	12
266.35	81	14
266.40	83	16
266.45	85	18
266.50	87	20
266.55	88	22
266.60	90	24
266.65	92	26
266.70	94	28
266.75	95	30
266.80	97	32
266.85	99	34
266.90	101	36
266.95	103	38
267.00	104	40
267.05	106	42
267.10	108	44
267.15	110	46
267.20	111	48
267.25	113	50
267.30	115	51
267.35	117	53
267.40	119	55
267.45	120	57
267.50	122	58
267.55	124	60
267.60	126	61
267.65	127	63
267.70	129	64
267.75	131	66
267.80	133	67
267.85	135	68
267.90	136	69
267.95	138	71
268.00	140	72
268.05	142	73
268.10	143	74
268.15	145	76
268.20	147	77
268.25	149	78
268.30	<b>151</b>	<b>79</b>



NOAA Atlas 14, Volume 10, Version 3  
Location name: Wilton, Connecticut, USA\*  
Latitude: 41.1617°, Longitude: -73.4259°  
Elevation: 270.55 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) <sup>1</sup>										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.366 (0.287-0.461)	0.426 (0.334-0.537)	0.524 (0.410-0.663)	0.605 (0.470-0.770)	0.716 (0.537-0.945)	0.801 (0.588-1.08)	0.888 (0.630-1.23)	0.981 (0.663-1.40)	1.11 (0.720-1.63)	1.21 (0.766-1.82)
10-min	0.518 (0.407-0.653)	0.603 (0.473-0.760)	0.742 (0.580-0.939)	0.857 (0.666-1.09)	1.01 (0.761-1.34)	1.14 (0.833-1.53)	1.26 (0.893-1.75)	1.39 (0.939-1.98)	1.57 (1.02-2.32)	1.72 (1.09-2.58)
15-min	0.609 (0.479-0.768)	0.709 (0.556-0.895)	0.872 (0.682-1.10)	1.01 (0.784-1.28)	1.19 (0.895-1.58)	1.34 (0.980-1.80)	1.48 (1.05-2.06)	1.64 (1.11-2.33)	1.85 (1.20-2.73)	2.02 (1.28-3.03)
30-min	0.850 (0.667-1.07)	0.988 (0.775-1.25)	1.21 (0.948-1.54)	1.40 (1.09-1.78)	1.66 (1.24-2.19)	1.86 (1.36-2.49)	2.06 (1.45-2.84)	2.26 (1.53-3.22)	2.54 (1.65-3.74)	2.75 (1.74-4.13)
60-min	1.09 (0.856-1.37)	1.27 (0.993-1.60)	1.55 (1.22-1.97)	1.79 (1.39-2.28)	2.12 (1.59-2.80)	2.38 (1.74-3.18)	2.63 (1.86-3.63)	2.88 (1.95-4.11)	3.22 (2.09-4.75)	3.47 (2.20-5.22)
2-hr	1.39 (1.10-1.74)	1.64 (1.30-2.06)	2.05 (1.62-2.58)	2.40 (1.87-3.03)	2.86 (2.16-3.76)	3.22 (2.38-4.31)	3.59 (2.56-4.96)	3.99 (2.70-5.65)	4.55 (2.96-6.67)	5.00 (3.18-7.47)
3-hr	1.60 (1.27-1.99)	1.90 (1.51-2.37)	2.39 (1.89-3.00)	2.81 (2.20-3.53)	3.37 (2.56-4.42)	3.80 (2.82-5.08)	4.24 (3.05-5.87)	4.74 (3.22-6.70)	5.46 (3.56-7.97)	6.05 (3.85-9.00)
6-hr	2.01 (1.61-2.49)	2.41 (1.92-2.99)	3.06 (2.43-3.81)	3.60 (2.84-4.50)	4.34 (3.31-5.67)	4.90 (3.66-6.52)	5.49 (3.98-7.58)	6.17 (4.20-8.66)	7.16 (4.69-10.4)	7.99 (5.10-11.8)
12-hr	2.49 (2.00-3.06)	2.99 (2.40-3.68)	3.81 (3.04-4.70)	4.49 (3.56-5.57)	5.42 (4.16-7.03)	6.12 (4.59-8.10)	6.86 (5.00-9.42)	7.72 (5.29-10.8)	8.99 (5.90-13.0)	10.0 (6.43-14.7)
24-hr	2.91 (2.35-3.55)	3.53 (2.85-4.31)	4.54 (3.65-5.57)	5.38 (4.30-6.64)	6.54 (5.05-8.43)	7.40 (5.59-9.75)	8.32 (6.11-11.4)	9.41 (6.47-13.0)	11.0 (7.27-15.8)	12.4 (7.97-18.1)
2-day	3.20 (2.61-3.89)	3.96 (3.22-4.81)	5.20 (4.21-6.34)	6.23 (5.01-7.64)	7.65 (5.95-9.82)	8.70 (6.62-11.4)	9.83 (7.28-13.4)	11.2 (7.73-15.4)	13.3 (8.80-19.0)	15.1 (9.75-21.9)
3-day	3.43 (2.80-4.15)	4.27 (3.48-5.16)	5.63 (4.57-6.83)	6.76 (5.46-8.25)	8.32 (6.49-10.6)	9.47 (7.23-12.4)	10.7 (7.96-14.6)	12.2 (8.45-16.8)	14.6 (9.64-20.6)	16.6 (10.7-23.9)
4-day	3.66 (3.00-4.42)	4.54 (3.72-5.48)	5.98 (4.87-7.24)	7.17 (5.81-8.73)	8.82 (6.90-11.2)	10.0 (7.68-13.1)	11.4 (8.44-15.4)	12.9 (8.96-17.7)	15.4 (10.2-21.7)	17.5 (11.3-25.1)
7-day	4.34 (3.58-5.21)	5.30 (4.36-6.36)	6.87 (5.62-8.27)	8.16 (6.64-9.88)	9.95 (7.81-12.6)	11.3 (8.66-14.6)	12.7 (9.45-17.1)	14.4 (9.99-19.6)	16.9 (11.2-23.7)	19.0 (12.3-27.2)
10-day	5.02 (4.15-6.00)	6.03 (4.97-7.21)	7.67 (6.31-9.21)	9.04 (7.38-10.9)	10.9 (8.59-13.7)	12.3 (9.47-15.8)	13.8 (10.3-18.4)	15.5 (10.8-21.0)	18.0 (12.0-25.2)	20.1 (13.0-28.7)
20-day	7.07 (5.88-8.39)	8.20 (6.81-9.74)	10.1 (8.31-12.0)	11.6 (9.52-13.9)	13.7 (10.8-17.0)	15.3 (11.8-19.4)	16.9 (12.5-22.1)	18.7 (13.1-25.1)	21.1 (14.1-29.3)	23.0 (15.0-32.6)
30-day	8.79 (7.34-10.4)	10.0 (8.34-11.8)	12.0 (9.96-14.2)	13.6 (11.3-16.3)	15.9 (12.6-19.7)	17.7 (13.6-22.2)	19.4 (14.4-25.2)	21.2 (14.9-28.4)	23.6 (15.9-32.6)	25.4 (16.6-35.8)
45-day	10.9 (9.15-12.8)	12.2 (10.2-14.4)	14.4 (12.0-17.0)	16.2 (13.4-19.2)	18.7 (14.8-22.9)	20.6 (15.9-25.7)	22.5 (16.6-28.8)	24.3 (17.1-32.3)	26.6 (17.9-36.6)	28.4 (18.5-39.8)
60-day	12.7 (10.7-14.9)	14.1 (11.8-16.6)	16.4 (13.7-19.3)	18.3 (15.2-21.7)	20.9 (16.6-25.5)	23.0 (17.7-28.5)	24.9 (18.5-31.8)	26.8 (19.0-35.5)	29.2 (19.7-40.0)	30.9 (20.2-43.2)

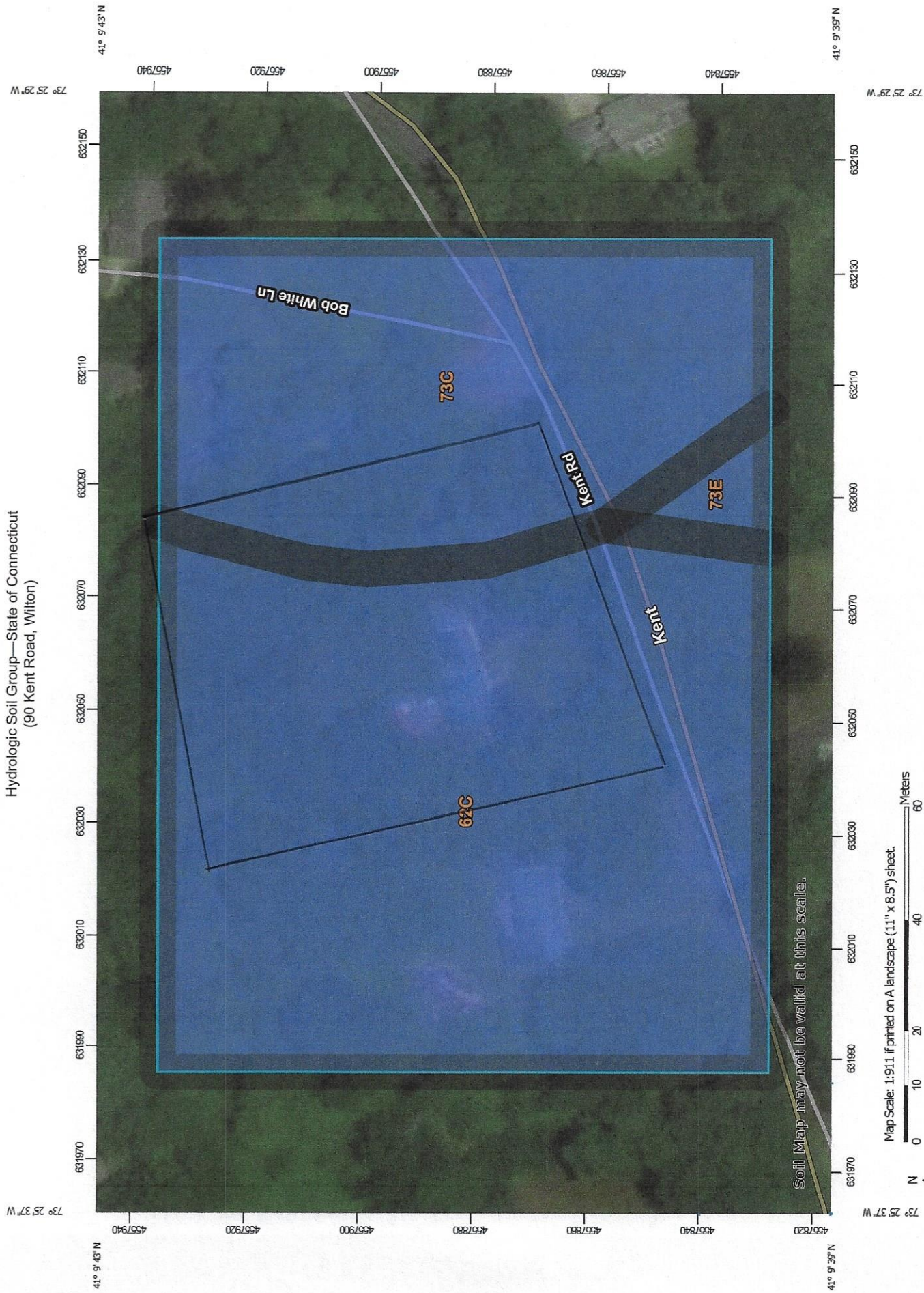
<sup>1</sup> Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration 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—State of Connecticut (90 Kent Road, Wilton)

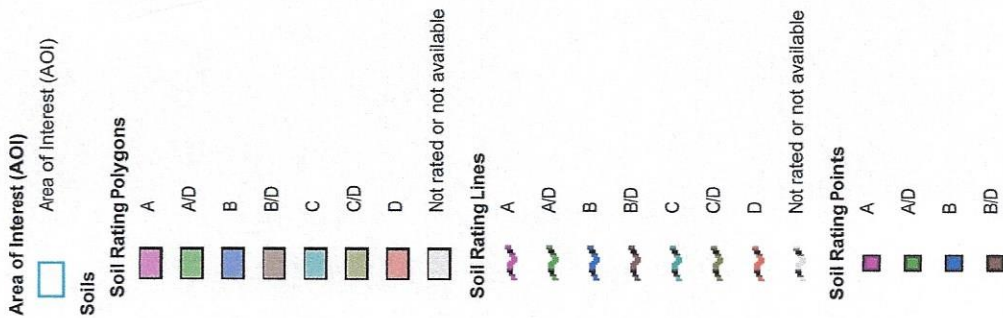


Natural Resources  
Conservation Service

Web Soil Survey  
National Cooperative Soil Survey



## MAP LEGEND



## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

**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: State of Connecticut  
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Dec 31, 2009—Oct 5, 2016

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
62C	Canton and Charlton fine sandy loams, 3 to 15 percent slopes, extremely stony	B	2.5	62.8%
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	B	1.4	35.0%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	B	0.1	2.3%
Totals for Area of Interest			4.0	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