

Frangione Engineering, LLC
 15 Snowberry Lane
 New Canaan, CT 06840
 Phone: 203.554.9551
 Web: www.frangione.net

**Drainage Summary Report
 Prepared for Kaeser Custom Homes
 7 Hills End Lane, Weston, CT**

The owner proposes constructing a house and driveway on their property at 7 Hills End Lane. The parcel is presently a wooded, vacant lot. The proposed improvements to the 2.182-acre site will result in the creation of approximately 7,500 square feet of impervious area. This report will show that there will be no increase in runoff from new impervious surfaces and that there will not be an adverse impact on downslope properties or drainage facilities caused by this project.

Presently runoff from the site flows generally to two (2) points of concern (“POC”). There is an existing stone wall that bifurcates the property and acts as a delineator of the two sub-watersheds to the two POCs. Runoff from the western portion of the parcel flows generally from south to north across the property towards the wetlands and woods and ultimately adjacent parcels. This sub-watershed has been identified as “Site West” in the enclosed hydrologic analysis and will remain undeveloped. Runoff from the eastern portion of the site flows generally from southwest to northeast and has been identified as “Site East” in the enclosed hydrologic analysis. All proposed development and impervious areas will occur in this sub-watershed. The POCs do not change for the post-development condition. All of the proposed activities are occurring in the portions of the site with well-draining, Hydrologic Soil Group “C” soils. The proposed activities will not alter the overall drainage pattern of the site.

Using the SCS TR-20 Method, we have computed the existing and proposed runoff rates for the 1-, 2-, 5- 10-, 25-, and 50-Year, 24-Hour Storms generated by the proposed activities. In the existing conditions hydrologic analysis, the site has been identified as “Site West” and “Site East”. The majority of the proposed driveway, as well as the front of the house and the lawn that will drain to the front of the house, has been identified as “To Front Cultecs”; the area of the rear of the house and remainder of the driveway by the proposed garage has been identified as “To Rear Cultecs” in the post-development analysis. The remainder of the site, which includes the proposed lawn areas near the house and driveway, is included in the “Site East” sub-watershed. Tables I & II summarize the existing and proposed runoff rates generated by the two sub-watersheds.

Table I – Summary of Runoff Rates from Site West

Storm Event	Flow/Volume	Existing	Proposed	Δ	Δ(%)
1-Year	q (cfs)	0.95	0.95	0.00	0.00%
	v (CF)	4,051.00	4,051.00	0.00	0.00%
2-Year	q (cfs)	1.38	1.38	0.00	0.00%
	v (CF)	5,739.00	5,739.00	0.00	0.00%
5-Year	q (cfs)	2.13	2.13	0.00	0.00%
	v (CF)	8,751.00	8,751.00	0.00	0.00%
10-Year	q (cfs)	2.77	2.77	0.00	0.00%
	v (CF)	11,381.00	11,381.00	0.00	0.00%

25-Year	q (cfs)	3.68	3.68	0.00	0.00%
	v (CF)	15,159.00	15,159.00	0.00	0.00%
50-Year	q (cfs)	4.38	4.38	0.00	0.00%
	v (CF)	18,070.00	18,070.00	0.00	0.00%

Table II – Summary of Runoff Rates from Site East

Storm Event	Flow/Volume	Existing	Proposed	Δ	$\Delta(\%)$
1-Year	q (cfs)	0.59	0.53	-0.06	-10.17%
	v (CF)	2,910.00	2,563.00	-347.00	-11.92%
2-Year	q (cfs)	0.97	0.86	-0.11	-11.34%
	v (CF)	4,449.00	3,877.00	-572.00	-12.86%
5-Year	q (cfs)	1.69	1.46	-0.23	-13.61%
	v (CF)	7,343.00	6,329.00	-1,014.00	-13.81%
10-Year	q (cfs)	2.33	2.01	-0.32	-13.73%
	v (CF)	9,968.00	8,776.00	-1,192.00	-11.96%
25-Year	q (cfs)	3.27	2.80	-0.47	-14.37%
	v (CF)	13,846.00	12,730.00	-1,116.00	-8.06%
50-Year	q (cfs)	4.01	4.00	-0.01	-0.25%
	v (CF)	16,896.00	15,826.00	-1,070.00	-6.33%

Runoff from the front of the house and majority of the driveway will flow to eighteen (18) Cultec Recharger 330XL units with a storage volume of 1,426.7 CF. Runoff from the rear of the house and remainder of the driveway will flow to eight (8) Cultec Recharger 330XL units with a storage volume of 634.1 CF. The Cultec units will have more than enough volume to store the Water Quality Volume (WQV) of 419.3 CF for the new impervious areas in the front and 204.8 CF for the new impervious area in the rear. Cultec units have a Total Suspended Solids (“TSS”) removal rate that exceeds 80%. Once runoff has backed up in the Cultec units it will be metered out via a 6” PVC pipe to a splash pad in the rear yard. Runoff will then continue to flow along existing drainage paths.

Furthermore, this project employs “Low Impact Development” or “LID” techniques as outlined in the August 2011 addendum to the Manual entitled, “Low Impact Development Appendix to the *Connecticut Stormwater Quality Manual*”. LID techniques specifically incorporated in this project include:

- Disconnection of impervious surfaces –Runoff from the house and driveway will be detained in underground rechargers. The amount of disconnected area is equal to 100% of the proposed impervious area increase.
- Infiltration of runoff from new impervious areas;
- Preservation of existing storm water travel paths;
- Minimizing site disturbance – the house and driveway will be constructed towards the front of the property to lessen the amount of driveway required.
- Protection of existing trees – all development is proposed greater than 100 feet from wetlands, and thus all the trees from the 100-foot upland review limit to the western property line will remain. The trees along the northern and eastern property lines will remain and be protected during construction.

With the proposed drainage structures in place, it is our professional opinion that there will be no adverse hydrological or hydraulic impacts caused to surrounding or downstream properties or drainage facilities by this development. To the best of my knowledge, this drainage proposal complies with the Town of Weston Planning and Zoning Regulations.

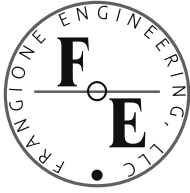


Respectfully submitted,
Frangione Engineering, LLC

A handwritten signature in blue ink, appearing to read "R. Frangione". The signature is stylized and written over the printed name below.

Robert M. Frangione, P.E.
Owner & Chief Engineer
January 11, 2024

Enclosures



Frangione Engineering, LLC
15 Snowberry Lane
New Canaan, CT 06840
Phone: 203.554.9551
Web: www.frangione.net

Storm Water Quality Calculations
Property of Kaeser Custom Homes – 7 Hills End Lane, Weston, CT
January 11, 2024

Water Quality Volume (WQV) – Front:

Proposed Impervious Area (House & driveway) = 5,031 SF

$$\text{WQV} = (1'' \times A)/12$$

$$= (1'' \times 5,031 \text{ SF})/12 \text{ in./ft.} = 419.3 \text{ CF}$$

Proposed Detention Facility: (18) Cultec Recharger 330XL units surrounded by 12" of stone.

Volume of Storage Provided: 18 units x 79.26 CF/unit = 1,426.7 CF >> WQV

Water Quality Volume (WQV) – Rear:

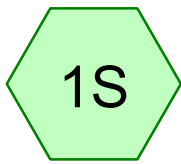
Proposed Impervious Area (House & driveway) = 2,457 SF

$$\text{WQV} = (1'' \times A)/12$$

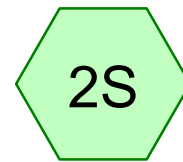
$$= (1'' \times 2,457 \text{ SF})/12 \text{ in./ft.} = 204.8 \text{ CF}$$

Proposed Detention Facility: (8) Cultec Recharger 330XL units surrounded by 12" of stone.

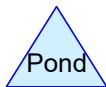
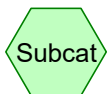
Volume of Storage Provided: 8 units x 79.26 CF/unit = 634.1 CF >> WQV



Site West



Site East



7 Hills End Existing

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 50-Year Rainfall=7.47"

Printed 1/10/2024

Events for Subcatchment 2S: Site East

Event	Runoff (cfs)	Volume (cubic-feet)
1-Year	0.59	2,910
2-Year	0.97	4,449
5-Year	1.69	7,343
10-Year	2.33	9,968
25-Year	3.27	13,846
50-Year	4.01	16,896

7 Hills End Existing

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 50-Year Rainfall=7.47"

Printed 1/10/2024

Events for Subcatchment 1S: Site West

Event	Runoff (cfs)	Volume (cubic-feet)
1-Year	0.95	4,051
2-Year	1.38	5,739
5-Year	2.13	8,751
10-Year	2.77	11,381
25-Year	3.68	15,159
50-Year	4.38	18,070

7 Hills End Existing

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 1-Year Rainfall=2.96"

Printed 1/10/2024

Page 2

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 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 1S: Site West

Runoff Area=44,341 sf 0.00% Impervious Runoff Depth>1.10"
Flow Length=238' Tc=15.2 min CN=78 Runoff=0.95 cfs 4,051 cf

Subcatchment 2S: Site East

Runoff Area=50,693 sf 0.00% Impervious Runoff Depth>0.69"
Flow Length=252' Tc=16.2 min CN=70 Runoff=0.59 cfs 2,910 cf

7 Hills End Existing

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.58"

Printed 1/10/2024

Page 3

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 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 1S: Site West

Runoff Area=44,341 sf 0.00% Impervious Runoff Depth>1.55"
Flow Length=238' Tc=15.2 min CN=78 Runoff=1.38 cfs 5,739 cf

Subcatchment 2S: Site East

Runoff Area=50,693 sf 0.00% Impervious Runoff Depth>1.05"
Flow Length=252' Tc=16.2 min CN=70 Runoff=0.97 cfs 4,449 cf

7 Hills End Existing

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 5-Year Rainfall=4.60"

Printed 1/10/2024

Page 4

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 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 1S: Site West

Runoff Area=44,341 sf 0.00% Impervious Runoff Depth>2.37"
Flow Length=238' Tc=15.2 min CN=78 Runoff=2.13 cfs 8,751 cf

Subcatchment 2S: Site East

Runoff Area=50,693 sf 0.00% Impervious Runoff Depth>1.74"
Flow Length=252' Tc=16.2 min CN=70 Runoff=1.69 cfs 7,343 cf

7 Hills End Existing

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.44"

Printed 1/10/2024

Page 5

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 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 1S: Site West

Runoff Area=44,341 sf 0.00% Impervious Runoff Depth>3.08"
Flow Length=238' Tc=15.2 min CN=78 Runoff=2.77 cfs 11,381 cf

Subcatchment 2S: Site East

Runoff Area=50,693 sf 0.00% Impervious Runoff Depth>2.36"
Flow Length=252' Tc=16.2 min CN=70 Runoff=2.33 cfs 9,968 cf

7 Hills End Existing

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.60"

Printed 1/10/2024

Page 6

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 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 1S: Site West

Runoff Area=44,341 sf 0.00% Impervious Runoff Depth>4.10"
Flow Length=238' Tc=15.2 min CN=78 Runoff=3.68 cfs 15,159 cf

Subcatchment 2S: Site East

Runoff Area=50,693 sf 0.00% Impervious Runoff Depth>3.28"
Flow Length=252' Tc=16.2 min CN=70 Runoff=3.27 cfs 13,846 cf

7 Hills End Existing

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 50-Year Rainfall=7.47"

Printed 1/10/2024

Page 7

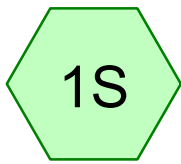
Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Site West

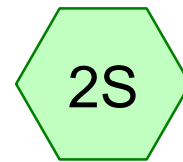
Runoff Area=44,341 sf 0.00% Impervious Runoff Depth>4.89"
Flow Length=238' Tc=15.2 min CN=78 Runoff=4.38 cfs 18,070 cf

Subcatchment 2S: Site East

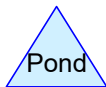
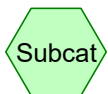
Runoff Area=50,693 sf 0.00% Impervious Runoff Depth>4.00"
Flow Length=252' Tc=16.2 min CN=70 Runoff=4.01 cfs 16,896 cf



Site West



Site East



7 Hills End Existing

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 50-Year Rainfall=7.47"

Printed 1/10/2024

Page 2

Summary for Subcatchment 1S: Site West

Runoff = 4.38 cfs @ 12.21 hrs, Volume= 18,070 cf, Depth> 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Type III 24-hr 50-Year Rainfall=7.47"

Area (sf)	CN	Description
* 28,082	83	Woods, Poor, HSG D (wetlands)
16,259	70	Woods, Good, HSG C
44,341	78	Weighted Average
44,341		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	118	0.0760	0.14		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.50"
1.5	120	0.0667	1.29		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
15.2	238	Total			

Summary for Subcatchment 2S: Site East

Runoff = 4.01 cfs @ 12.22 hrs, Volume= 16,896 cf, Depth> 4.00"

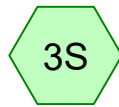
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Type III 24-hr 50-Year Rainfall=7.47"

Area (sf)	CN	Description
50,693	70	Woods, Good, HSG C
50,693		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	107	0.0570	0.13		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.50"
1.9	145	0.0620	1.24		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
16.2	252	Total			



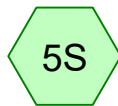
Site West



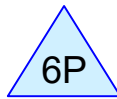
To Front Cultecs



Front Cultecs



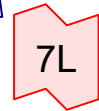
To Rear Cultecs



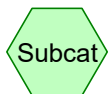
Rear Cultecs



Site East



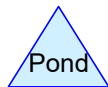
POC-East



Subcat



Reach



Pond



Link

Routing Diagram for 7 Hills End Proposed
Prepared by Frangione Engineering, LLC, Printed 1/11/2024
HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

7 Hills End Proposed

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 50-Year Rainfall=7.47"

Printed 1/11/2024

Events for Link 7L: POC-East

Event	Primary (cfs)	Volume (cubic-feet)
1-Year	0.53	2,563
2-Year	0.86	3,877
5-Year	1.46	6,329
10-Year	2.01	8,776
25-Year	2.80	12,730
50-Year	4.00	15,826

7 Hills End Proposed

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 50-Year Rainfall=7.47"

Printed 1/11/2024

Events for Subcatchment 1S: Site West

Event	Runoff (cfs)	Volume (cubic-feet)
1-Year	0.95	4,051
2-Year	1.38	5,739
5-Year	2.13	8,751
10-Year	2.77	11,381
25-Year	3.68	15,159
50-Year	4.38	18,070

7 Hills End Proposed

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 1-Year Rainfall=2.96"

Printed 1/11/2024

Page 2

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 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 1S: Site West

Runoff Area=44,341 sf 0.00% Impervious Runoff Depth>1.10"
Flow Length=238' Tc=15.2 min CN=78 Runoff=0.95 cfs 4,051 cf

Subcatchment 2S: Site East

Runoff Area=41,906 sf 0.00% Impervious Runoff Depth>0.73"
Flow Length=252' Tc=16.2 min CN=71 Runoff=0.53 cfs 2,563 cf

Subcatchment 3S: To Front Cultecs

Runoff Area=6,134 sf 82.02% Impervious Runoff Depth>2.31"
Tc=6.0 min CN=94 Runoff=0.37 cfs 1,181 cf

Subcatchment 5S: To Rear Cultecs

Runoff Area=2,653 sf 92.61% Impervious Runoff Depth>2.51"
Tc=6.0 min CN=96 Runoff=0.17 cfs 555 cf

Pond 4P: Front Cultecs

Peak Elev=375.46' Storage=699 cf Inflow=0.37 cfs 1,181 cf
Discarded=0.01 cfs 668 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 668 cf

Pond 6P: Rear Cultecs

Peak Elev=380.10' Storage=311 cf Inflow=0.17 cfs 555 cf
Discarded=0.01 cfs 360 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 360 cf

Link 7L: POC-East

Inflow=0.53 cfs 2,563 cf
Primary=0.53 cfs 2,563 cf

7 Hills End Proposed

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 2-Year Rainfall=3.58"

Printed 1/11/2024

Page 3

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 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 1S: Site West

Runoff Area=44,341 sf 0.00% Impervious Runoff Depth>1.55"
Flow Length=238' Tc=15.2 min CN=78 Runoff=1.38 cfs 5,739 cf

Subcatchment 2S: Site East

Runoff Area=41,906 sf 0.00% Impervious Runoff Depth>1.11"
Flow Length=252' Tc=16.2 min CN=71 Runoff=0.86 cfs 3,877 cf

Subcatchment 3S: To Front Cultecs

Runoff Area=6,134 sf 82.02% Impervious Runoff Depth>2.91"
Tc=6.0 min CN=94 Runoff=0.45 cfs 1,488 cf

Subcatchment 5S: To Rear Cultecs

Runoff Area=2,653 sf 92.61% Impervious Runoff Depth>3.12"
Tc=6.0 min CN=96 Runoff=0.20 cfs 690 cf

Pond 4P: Front Cultecs

Peak Elev=375.87' Storage=927 cf Inflow=0.45 cfs 1,488 cf
Discarded=0.01 cfs 744 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 744 cf

Pond 6P: Rear Cultecs

Peak Elev=380.47' Storage=405 cf Inflow=0.20 cfs 690 cf
Discarded=0.01 cfs 404 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 404 cf

Link 7L: POC-East

Inflow=0.86 cfs 3,877 cf
Primary=0.86 cfs 3,877 cf

7 Hills End Proposed

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 5-Year Rainfall=4.60"

Printed 1/11/2024

Page 4

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 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 1S: Site West

Runoff Area=44,341 sf 0.00% Impervious Runoff Depth>2.37"
Flow Length=238' Tc=15.2 min CN=78 Runoff=2.13 cfs 8,751 cf

Subcatchment 2S: Site East

Runoff Area=41,906 sf 0.00% Impervious Runoff Depth>1.81"
Flow Length=252' Tc=16.2 min CN=71 Runoff=1.46 cfs 6,329 cf

Subcatchment 3S: To Front Cultecs

Runoff Area=6,134 sf 82.02% Impervious Runoff Depth>3.91"
Tc=6.0 min CN=94 Runoff=0.60 cfs 1,999 cf

Subcatchment 5S: To Rear Cultecs

Runoff Area=2,653 sf 92.61% Impervious Runoff Depth>4.13"
Tc=6.0 min CN=96 Runoff=0.27 cfs 914 cf

Pond 4P: Front Cultecs

Peak Elev=376.66' Storage=1,311 cf Inflow=0.60 cfs 1,999 cf
Discarded=0.02 cfs 873 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 873 cf

Pond 6P: Rear Cultecs

Peak Elev=381.13' Storage=564 cf Inflow=0.27 cfs 914 cf
Discarded=0.01 cfs 478 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 478 cf

Link 7L: POC-East

Inflow=1.46 cfs 6,329 cf
Primary=1.46 cfs 6,329 cf

7 Hills End Proposed

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 10-Year Rainfall=5.44"

Printed 1/11/2024

Page 5

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 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 1S: Site West

Runoff Area=44,341 sf 0.00% Impervious Runoff Depth>3.08"
Flow Length=238' Tc=15.2 min CN=78 Runoff=2.77 cfs 11,381 cf

Subcatchment 2S: Site East

Runoff Area=41,906 sf 0.00% Impervious Runoff Depth>2.45"
Flow Length=252' Tc=16.2 min CN=71 Runoff=2.01 cfs 8,541 cf

Subcatchment 3S: To Front Cultecs

Runoff Area=6,134 sf 82.02% Impervious Runoff Depth>4.74"
Tc=6.0 min CN=94 Runoff=0.72 cfs 2,422 cf

Subcatchment 5S: To Rear Cultecs

Runoff Area=2,653 sf 92.61% Impervious Runoff Depth>4.97"
Tc=6.0 min CN=96 Runoff=0.32 cfs 1,098 cf

Pond 4P: Front Cultecs

Peak Elev=377.10' Storage=1,457 cf Inflow=0.72 cfs 2,422 cf
Discarded=0.02 cfs 949 cf Primary=0.03 cfs 207 cf Outflow=0.05 cfs 1,156 cf

Pond 6P: Rear Cultecs

Peak Elev=381.74' Storage=673 cf Inflow=0.32 cfs 1,098 cf
Discarded=0.01 cfs 537 cf Primary=0.01 cfs 27 cf Outflow=0.02 cfs 564 cf

Link 7L: POC-East

Inflow=2.01 cfs 8,776 cf
Primary=2.01 cfs 8,776 cf

7 Hills End Proposed

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 25-Year Rainfall=6.60"

Printed 1/11/2024

Page 6

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 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 1S: Site West

Runoff Area=44,341 sf 0.00% Impervious Runoff Depth>4.10"
Flow Length=238' Tc=15.2 min CN=78 Runoff=3.68 cfs 15,159 cf

Subcatchment 2S: Site East

Runoff Area=41,906 sf 0.00% Impervious Runoff Depth>3.38"
Flow Length=252' Tc=16.2 min CN=71 Runoff=2.80 cfs 11,797 cf

Subcatchment 3S: To Front Cultecs

Runoff Area=6,134 sf 82.02% Impervious Runoff Depth>5.89"
Tc=6.0 min CN=94 Runoff=0.88 cfs 3,009 cf

Subcatchment 5S: To Rear Cultecs

Runoff Area=2,653 sf 92.61% Impervious Runoff Depth>6.12"
Tc=6.0 min CN=96 Runoff=0.39 cfs 1,353 cf

Pond 4P: Front Cultecs

Peak Elev=377.31' Storage=1,517 cf Inflow=0.88 cfs 3,009 cf
Discarded=0.02 cfs 994 cf Primary=0.25 cfs 703 cf Outflow=0.26 cfs 1,696 cf

Pond 6P: Rear Cultecs

Peak Elev=381.89' Storage=692 cf Inflow=0.39 cfs 1,353 cf
Discarded=0.01 cfs 565 cf Primary=0.10 cfs 230 cf Outflow=0.11 cfs 794 cf

Link 7L: POC-East

Inflow=2.80 cfs 12,730 cf
Primary=2.80 cfs 12,730 cf

7 Hills End Proposed

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 50-Year Rainfall=7.47"

Printed 1/11/2024

Page 7

Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 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 1S: Site West

Runoff Area=44,341 sf 0.00% Impervious Runoff Depth>4.89"
Flow Length=238' Tc=15.2 min CN=78 Runoff=4.38 cfs 18,070 cf

Subcatchment 2S: Site East

Runoff Area=41,906 sf 0.00% Impervious Runoff Depth>4.11"
Flow Length=252' Tc=16.2 min CN=71 Runoff=3.41 cfs 14,350 cf

Subcatchment 3S: To Front Cultecs

Runoff Area=6,134 sf 82.02% Impervious Runoff Depth>6.75"
Tc=6.0 min CN=94 Runoff=1.01 cfs 3,450 cf

Subcatchment 5S: To Rear Cultecs

Runoff Area=2,653 sf 92.61% Impervious Runoff Depth>6.99"
Tc=6.0 min CN=96 Runoff=0.44 cfs 1,545 cf

Pond 4P: Front Cultecs

Peak Elev=377.46' Storage=1,557 cf Inflow=1.01 cfs 3,450 cf
Discarded=0.02 cfs 1,021 cf Primary=0.43 cfs 1,086 cf Outflow=0.45 cfs 2,107 cf

Pond 6P: Rear Cultecs

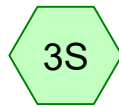
Peak Elev=381.97' Storage=703 cf Inflow=0.44 cfs 1,545 cf
Discarded=0.01 cfs 580 cf Primary=0.19 cfs 389 cf Outflow=0.20 cfs 970 cf

Link 7L: POC-East

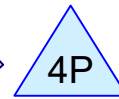
Inflow=4.00 cfs 15,826 cf
Primary=4.00 cfs 15,826 cf



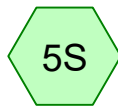
Site West



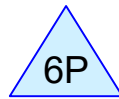
To Front Cultecs



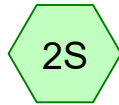
Front Cultecs



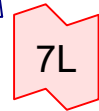
To Rear Cultecs



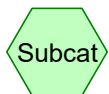
Rear Cultecs



Site East



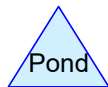
POC-East



Subcat



Reach



Pond



Link

Routing Diagram for 7 Hills End Proposed

Prepared by Frangione Engineering, LLC, Printed 1/11/2024
HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

7 Hills End Proposed

Prepared by Frangione Engineering, LLC
HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 50-Year Rainfall=7.47"

Printed 1/11/2024

Page 2

Summary for Subcatchment 1S: Site West

Runoff = 4.38 cfs @ 12.21 hrs, Volume= 18,070 cf, Depth> 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Type III 24-hr 50-Year Rainfall=7.47"

Area (sf)	CN	Description
* 28,082	83	Woods, Poor, HSG D (wetlands)
16,259	70	Woods, Good, HSG C
44,341	78	Weighted Average
44,341		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.7	118	0.0760	0.14		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.50"
1.5	120	0.0667	1.29		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
15.2	238	Total			

Summary for Subcatchment 2S: Site East

Runoff = 3.41 cfs @ 12.22 hrs, Volume= 14,350 cf, Depth> 4.11"
Routed to Link 7L : POC-East

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Type III 24-hr 50-Year Rainfall=7.47"

Area (sf)	CN	Description
26,333	70	Woods, Good, HSG C
15,573	74	>75% Grass cover, Good, HSG C
41,906	71	Weighted Average
41,906		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	107	0.0570	0.13		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.50"
1.9	145	0.0620	1.24		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
16.2	252	Total			

Summary for Subcatchment 3S: To Front Cultecs

Runoff = 1.01 cfs @ 12.08 hrs, Volume= 3,450 cf, Depth> 6.75"
Routed to Pond 4P : Front Cultecs

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
Type III 24-hr 50-Year Rainfall=7.47"

7 Hills End Proposed

Type III 24-hr 50-Year Rainfall=7.47"

Prepared by Frangione Engineering, LLC

Printed 1/11/2024

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Page 3

	Area (sf)	CN	Description
*	3,379	98	Pr. Drive
*	1,652	98	Pr. House
	1,103	74	>75% Grass cover, Good, HSG C
	6,134	94	Weighted Average
	1,103		17.98% Pervious Area
	5,031		82.02% Impervious Area

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

Summary for Subcatchment 5S: To Rear Cultecs

Runoff = 0.44 cfs @ 12.08 hrs, Volume= 1,545 cf, Depth> 6.99"
 Routed to Pond 6P : Rear Cultecs

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs
 Type III 24-hr 50-Year Rainfall=7.47"

	Area (sf)	CN	Description
*	1,028	98	Pr. House
*	1,429	98	Pr. Drive
	196	74	>75% Grass cover, Good, HSG C
	2,653	96	Weighted Average
	196		7.39% Pervious Area
	2,457		92.61% Impervious Area

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

Summary for Pond 4P: Front Cultecs

Inflow Area = 6,134 sf, 82.02% Impervious, Inflow Depth > 6.75" for 50-Year event
 Inflow = 1.01 cfs @ 12.08 hrs, Volume= 3,450 cf
 Outflow = 0.45 cfs @ 12.26 hrs, Volume= 2,107 cf, Atten= 55%, Lag= 10.7 min
 Discarded = 0.02 cfs @ 12.26 hrs, Volume= 1,021 cf
 Primary = 0.43 cfs @ 12.26 hrs, Volume= 1,086 cf
 Routed to Link 7L : POC-East

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 377.46' @ 12.26 hrs Surf.Area= 709 sf Storage= 1,557 cf

Plug-Flow detention time= 194.5 min calculated for 2,107 cf (61% of inflow)
 Center-of-Mass det. time= 90.0 min (852.4 - 762.5)

7 Hills End Proposed

Type III 24-hr 50-Year Rainfall=7.47"

Prepared by Frangione Engineering, LLC

Printed 1/11/2024

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Page 4

Volume	Invert	Avail.Storage	Storage Description
#1A	374.00'	620 cf	10.67'W x 66.50'L x 3.54'H Field A 2,512 cf Overall - 961 cf Embedded = 1,551 cf x 40.0% Voids
#2A	374.50'	961 cf	Cultec R-330XLHD x 18 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		1,582 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	374.00'	0.520 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 371.00'
#2	Primary	377.00'	6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 12.26 hrs HW=377.45' (Free Discharge)
 ↳ **1=Exfiltration** (Controls 0.02 cfs)

Primary OutFlow Max=0.43 cfs @ 12.26 hrs HW=377.45' (Free Discharge)
 ↳ **2=Orifice/Grate** (Orifice Controls 0.43 cfs @ 2.29 fps)

Summary for Pond 6P: Rear Cultecs

Inflow Area = 2,653 sf, 92.61% Impervious, Inflow Depth > 6.99" for 50-Year event
 Inflow = 0.44 cfs @ 12.08 hrs, Volume= 1,545 cf
 Outflow = 0.20 cfs @ 12.26 hrs, Volume= 970 cf, Atten= 55%, Lag= 10.4 min
 Discarded = 0.01 cfs @ 12.26 hrs, Volume= 580 cf
 Primary = 0.19 cfs @ 12.26 hrs, Volume= 389 cf
 Routed to Link 7L : POC-East

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 2
 Peak Elev= 381.97' @ 12.26 hrs Surf.Area= 336 sf Storage= 703 cf

Plug-Flow detention time= 213.5 min calculated for 970 cf (63% of inflow)
 Center-of-Mass det. time= 109.1 min (862.3 - 753.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	378.70'	300 cf	10.67'W x 31.50'L x 3.54'H Field A 1,190 cf Overall - 440 cf Embedded = 750 cf x 40.0% Voids
#2A	379.20'	440 cf	Cultec R-330XLHD x 8 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 2 rows
		740 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	378.70'	0.520 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 376.70'

7 Hills End Proposed

Prepared by Frangione Engineering, LLC

HydroCAD® 10.20-4a s/n 11202 © 2023 HydroCAD Software Solutions LLC

Type III 24-hr 50-Year Rainfall=7.47"

Printed 1/11/2024

Page 5

#2 Primary 381.70' **6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 12.26 hrs HW=381.97' (Free Discharge)

↑1=Exfiltration (Controls 0.01 cfs)

Primary OutFlow Max=0.19 cfs @ 12.26 hrs HW=381.97' (Free Discharge)

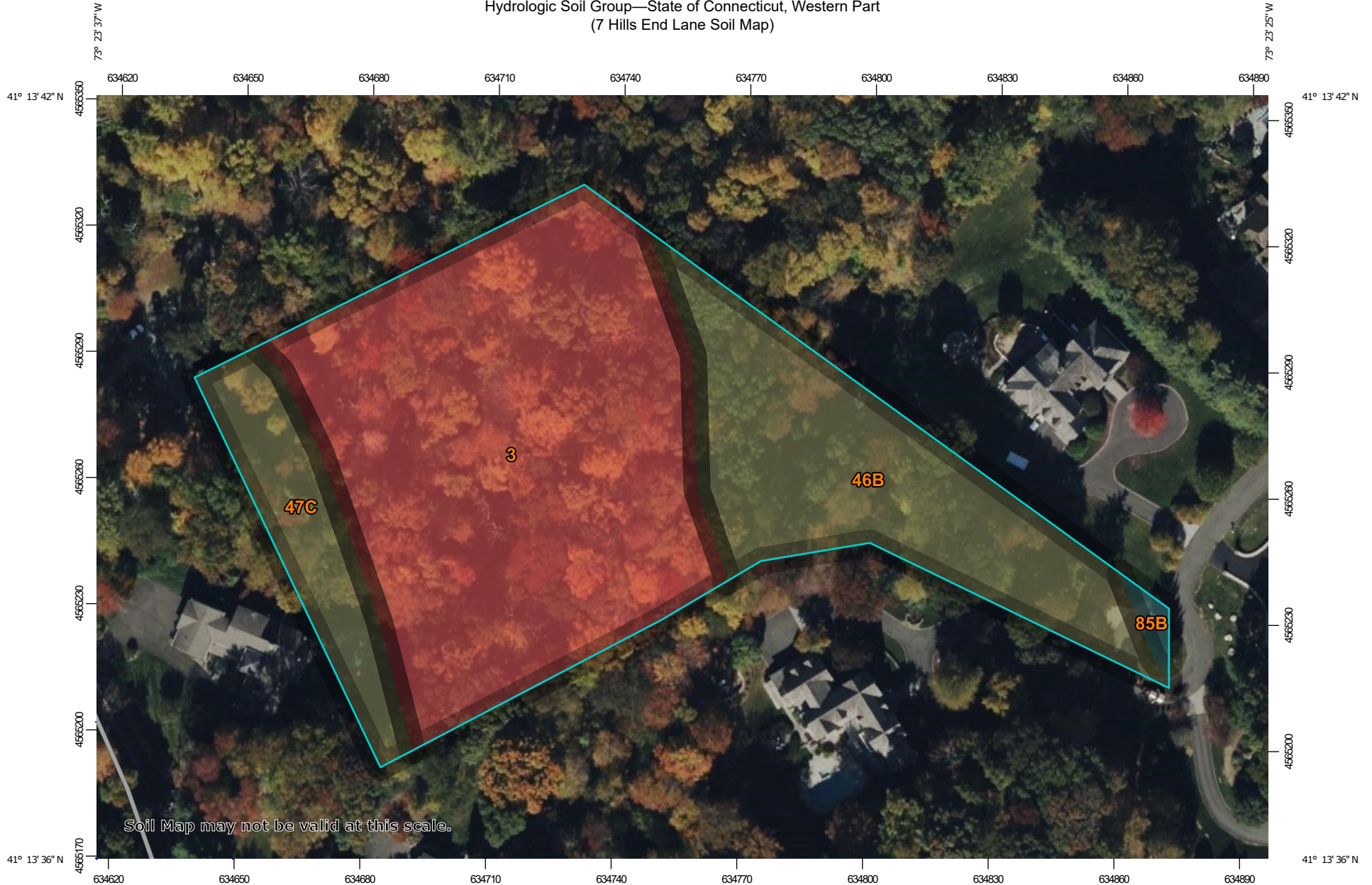
↑2=Orifice/Grate (Orifice Controls 0.19 cfs @ 1.76 fps)

Summary for Link 7L: POC-East

Inflow Area = 50,693 sf, 14.77% Impervious, Inflow Depth > 3.75" for 50-Year event
Inflow = 4.00 cfs @ 12.24 hrs, Volume= 15,826 cf
Primary = 4.00 cfs @ 12.24 hrs, Volume= 15,826 cf, Atten= 0%, Lag= 0.0 min

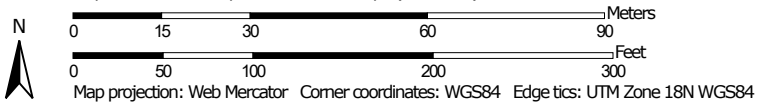
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs

Hydrologic Soil Group—State of Connecticut, Western Part
(7 Hills End Lane Soil Map)




Soil Map may not be valid at this scale.

Map Scale: 1:1,280 if printed on A landscape (11" x 8.5") sheet.



MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils

Soil Rating Polygons





 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines


 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available


Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

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, Western Part
 Survey Area Data: Version 1, Sep 15, 2023

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

Date(s) aerial images were photographed: Oct 21, 2022—Oct 27, 2022

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
3	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	D	2.2	60.2%
46B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	C/D	1.0	28.0%
47C	Woodbridge fine sandy loam, 3 to 15 percent slopes, extremely stony	C/D	0.4	11.0%
85B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes, very stony	C	0.0	0.8%
Totals for Area of Interest			3.7	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