

<p>STORMWATER MANAGEMENT</p> <p>REPORT</p> <p>for</p> <p>26 Highland Road</p> <p>Westport, CT</p> <p>January 9, 2020</p> <p>Revised: February 26, 2020</p>	
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Narrative:

The owner of 26 Highland Road, Westport, CT proposes to construct a new single family residence (re-using the existing foundation), garage addition with living space above, front porch, open slotted wood deck, pool, driveway and related improvements in the western portion of the existing developed property. Improvements are limited to the areas related to the construction of the above-listed structures and lawn areas outside the delineated wetlands as shown on the site plans prepared by LANDTECH. The only disturbance proposed beyond the delineated wetland line is to provide an enhanced wetland buffer consisting of new wetland plantings.

The property is 1.002± acres in size, it is located to the east of Highland Road. There is a significant amount of wetlands on the property and the entire site drains to the wetland areas located in the eastern half of the property.

The NRCS soils map indicates the upland soils in the western portion of the property to be Paxton and Montauk fine sandy loams, a moderately well drained soil in Hydrologic Soil Group C and Charlton-Chatfield complex, a well-drained soil in HSG B. The remainder of the upland soils in the disturbed areas are indicated as Timakwa and Natchaug soils, a poorly drained soil in HSG D. Deep test holes were performed in 2015 for a previously approved project and additional testing was performed for this proposal and both confirm the hydrologic rating of this area. Based on field observation, a conservative infiltration rate of 4"/hour (observed infiltration rate of 1" in 10 min.) was utilized in the design for the proposed rain garden. It is assumed that the underlying soils will allow the detained storm water to infiltrate within 72 hours, per CT DEEP guidance (requires a 0.21"/hour infiltration rate).

For the purposes of modeling the pre and post development conditions we have excluded the area located to the east of the delineated wetlands, which are outside the proposed development area. The eastern portion of the site is all part of the same wetland corridor, which we have identified as our Point-of-Concern (POC) in the drainage analysis. We have analyzed one (1) drainage subarea in the pre-development conditions (Subarea 1) and two (2) subareas in the post-development conditions (Subareas 1A & 1B). Subarea 1 currently discharges via sheet flow across the property from west to east into the delineated wetlands located in the eastern half of the property. Under proposed conditions, subarea 1A, which consists of the majority of the proposed impervious areas and surrounding lawn areas, will be collected in the proposed rain garden (RG 1) via a catch basin located in the driveway, roof leaders and collection piping. The runoff collected in RG 1 will discharge via a 20' overflow weir and sheet flow towards the wetlands. Subarea 1B, which consists of the proposed pool, open slotted wood deck and the remainder of lawn areas will sheet flow into the wetlands, matching existing conditions. Although the deck and pool will not be routed to RG 1, water quality will still be provided for both areas. Runoff from the deck will be collected in a 6" deep stone bed located below the deck providing the required water quality volume. Water quality volume for the pool will be achieved utilizing the 4" storage volume within the pool itself. The footing drains, which are only permitted in the rear and north side of

the proposed residence, will discharge by gravity to a 10' level spreader located to the east of the proposed residence.

The proposed rain garden is only intended to capture runoff from the proposed single family residence, driveway, and surrounding lawn areas that enter the driveway and rain garden via sheet flow. The proposed rain garden is sized based on the required water quality volume as well as runoff control for the 25-year storm event.

Table 1 summarizes the required and proposed water quality volumes (WQv) and runoff control for the 25-year storm event.

TABLE 1 – WQv & 25 YEAR STORM		
	PRE-DEV/ REQUIRED	POST DEV PROVIDED
PEAK RATE STORMWATER RUNOFF FROM SITE (cfs)	1.90	1.82
WATER QUALITY (cf)	464.60	579.80

It is our professional opinion that upon construction of the proposed improvements, stormwater discharge from the site will comply with the applicable rules and regulations of the Town of Westport.

Exhibits:

- NRCS Soils Report
- Watershed Maps
- Water Quality Volume Calculations
- Stormwater Runoff Computations

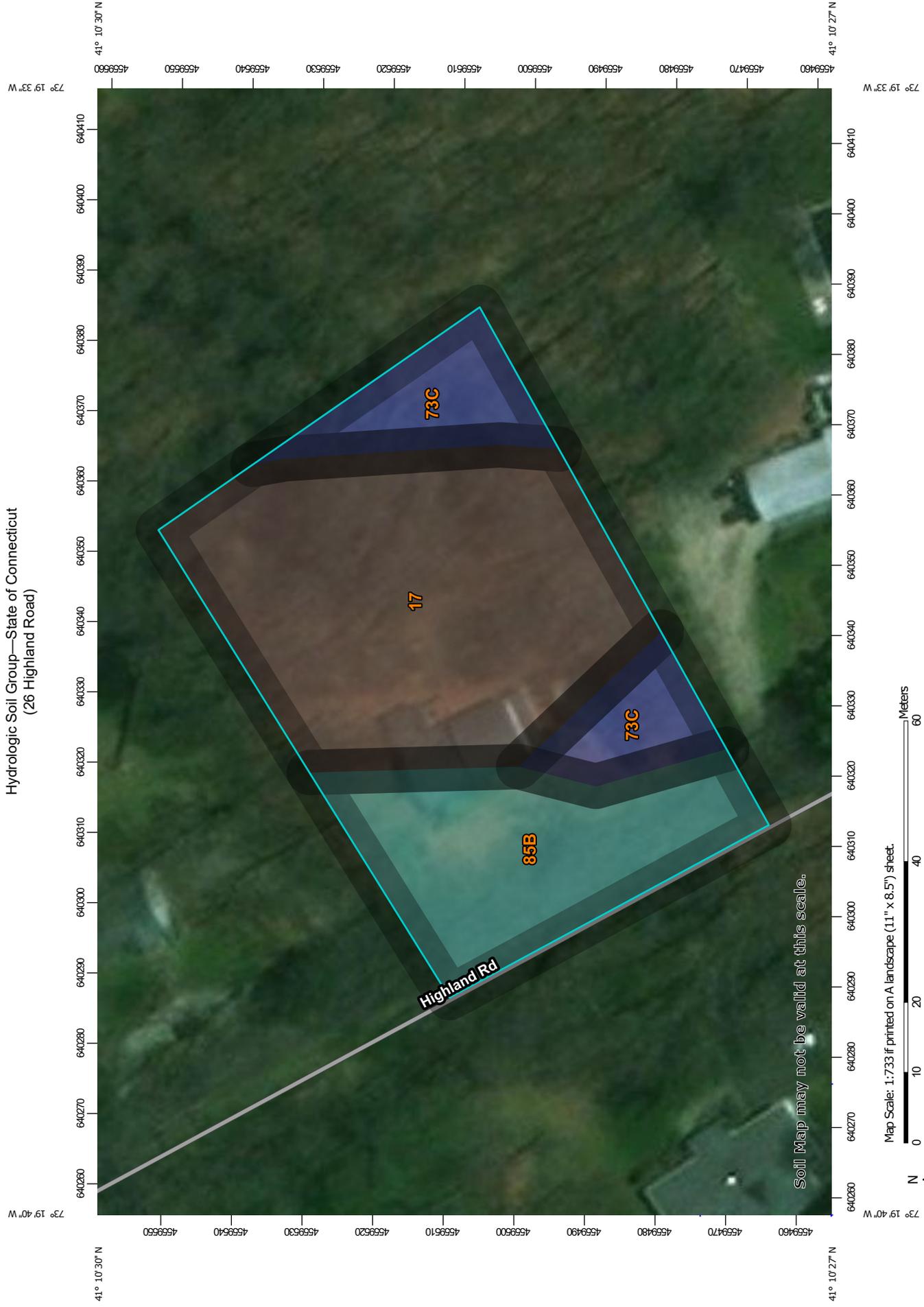
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Exhibits

NRCS Soils Report
Watershed Maps
Water Quality Volume Calculations
Stormwater Runoff Computations

NRCS Soils Report

Hydrologic Soil Group—State of Connecticut
(26 Highland Road)



Map Scale: 1:733 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

	Area of Interest (AOI)		Area of Interest (AOI)
	Soils		C
	Soil Rating Polygons		C/D
	A		D
	A/D		Not rated or not available
	B		Water Features
	B/D		Streams and Canals
	C		Transportation
	C/D		Rails
	D		Interstate Highways
	Not rated or not available		US Routes
	Soil Rating Lines		Major Roads
	A		Local Roads
	A/D		Background
	B		Aerial Photography
	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		

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 19, Sep 13, 2019

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
17	Timakwa and Natchaug soils, 0 to 2 percent slopes	B/D	0.6	55.0%
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	B	0.2	16.9%
85B	Paxton and Montauk fine sandy loams, 3 to 8 percent slopes, very stony	C	0.3	28.1%
Totals for Area of Interest			1.1	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.

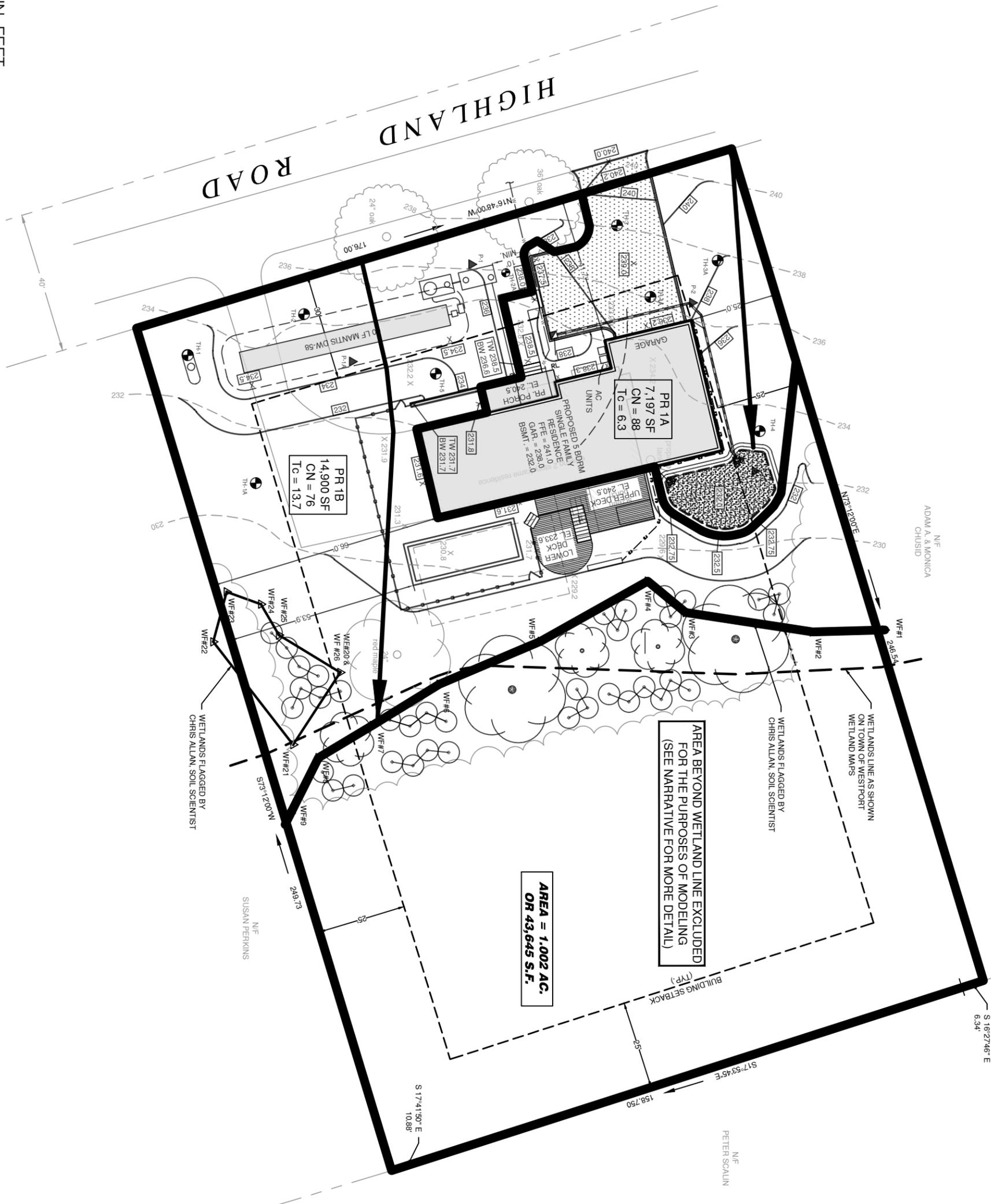
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Watershed Maps



Water Quality Volume Calculations

Project: **26 Highland Road**
Westport, CT

By: **CL**
Checked: **CL**

Date: **1/9/2020**
Revised:

1. Water Quality Volume

a. Compute volumetric runoff coefficient, R

$$R = 0.05 + 0.009(I)$$

	Proposed
Total Drainage Area, <i>A</i>	0.507 acres
Total Impervious Area	0.118 acres
Percentage of Impervious Area, <i>I</i>	23.2%
Runoff Coefficient, <i>R</i>	0.259

b. Compute water quality volume, WQV

$$WQV = [(1")(R)(A)]/12$$

Total Project Area, <i>A</i>	0.507 acres	
Runoff Coefficient, <i>R</i>	0.259	
Water Quality Volume, <i>WQV</i>	0.011 acre-foot	
Water Quality Volume, <i>WQV</i>	476.90 cf	Required

Stone Below Open Slotted Deck WQV:

Stone Layer Volume:

Stone Area =	564 sf	<i>(Excludes pool equipment area)</i>
Stone Depth =	0.5 ft	
Voids =	40%	
Stone Layer Volume =	112.80 cf	

Stone Layer Volume Provided: 112.80 cf

Pool WQV:

Ponding Volume:

Pool Area =	300 sf	
Ponding Depth =	0.33 ft	<i>(4" of Ponding Depth Allowed for Pools as per Westport DPW Standards)</i>
Ponding Volume =	99.00 cf	

Ponding Volume Provided: 99.00 cf

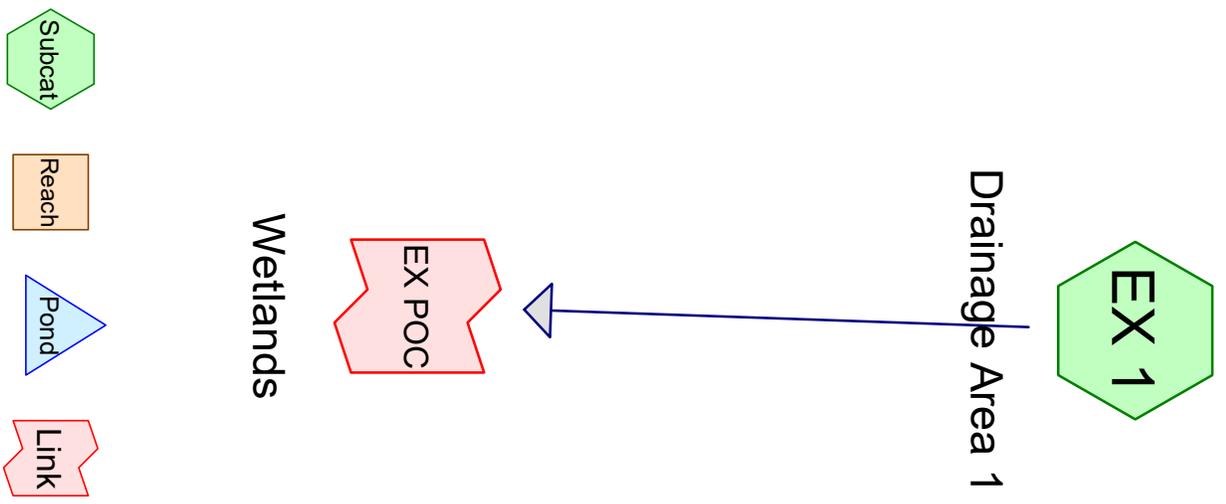
Rain Garden WQV:

Total WQV in Rain Garden 368.00 cf (Taken from HydroCAD)

Total WQV Provided 579.80 cf Provided

Water Quality Volume provided > required

Stormwater Runoff Computations



Routing Diagram for 26 Highland Rd. - Drainage
 Prepared by LANDTECH, Printed 1/9/2020
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26 Highland Rd. - Drainage

Prepared by LANDTECH

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	25yr Storm	Type III 24-hr		Default	24.00	1	6.40	2

26 Highland Rd. - Drainage

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.134	61	>75% Grass cover, Good, HSG B (EX 1, PR 1B)
0.298	74	>75% Grass cover, Good, HSG C (EX 1, PR 1A, PR 1B)
0.401	80	>75% Grass cover, Good, HSG D (EX 1, PR 1A, PR 1B)
0.014	98	Pr. Deck & Stairs (PR 1B)
0.030	98	Pr. Driveway (PR 1A)
0.009	98	Pr. Pool (PR 1B)
0.061	98	Pr. Roof (PR 1A)
0.004	98	Pr. Walkway & Stairs (PR 1A)
0.063	77	Woods, Good, HSG D (EX 1, PR 1B)
1.015	78	TOTAL AREA

26 Highland Rd. - Drainage

Type III 24-hr 25yr Storm Rainfall=6.40"

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Summary for Subcatchment EX 1: Drainage Area 1

Runoff = 1.90 cfs @ 12.13 hrs, Volume= 0.153 af, Depth> 3.62"

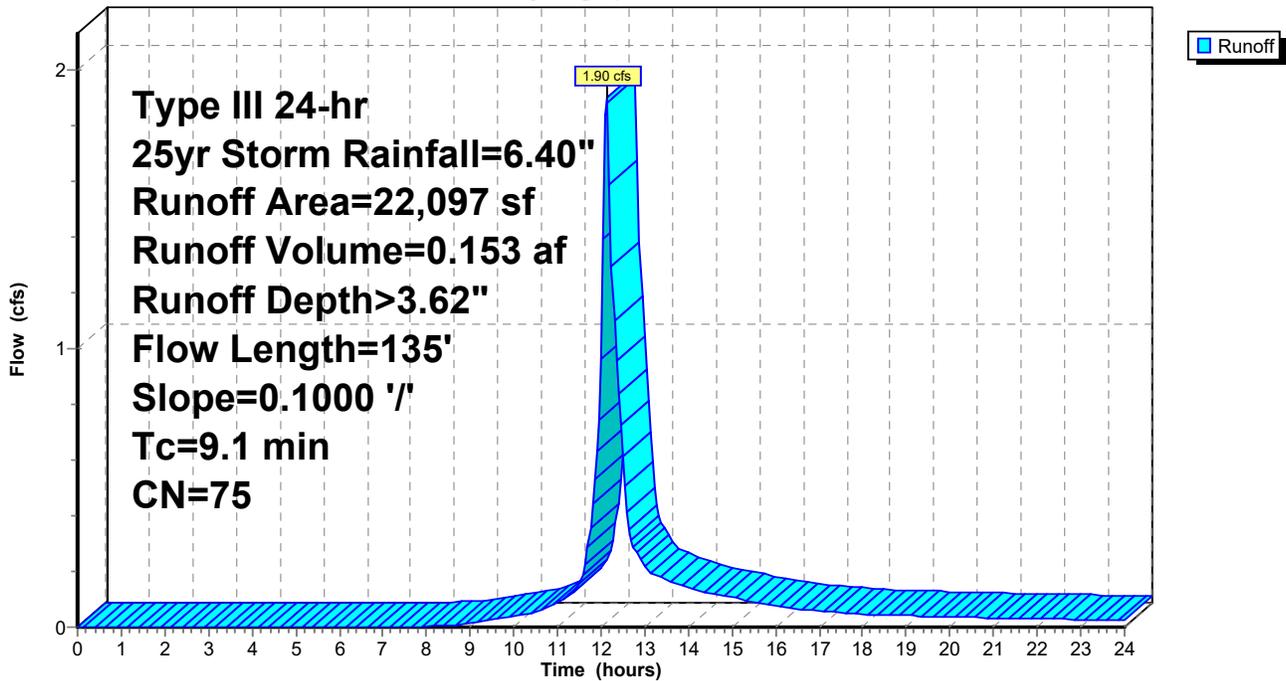
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Storm Rainfall=6.40"

Area (sf)	CN	Description
7,740	74	>75% Grass cover, Good, HSG C
2,917	61	>75% Grass cover, Good, HSG B
10,068	80	>75% Grass cover, Good, HSG D
1,372	77	Woods, Good, HSG D
22,097	75	Weighted Average
22,097		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	135	0.1000	0.25		Sheet Flow, Grass Grass: Dense n= 0.240 P2= 3.50"

Subcatchment EX 1: Drainage Area 1

Hydrograph



26 Highland Rd. - Drainage

Type III 24-hr 25yr Storm Rainfall=6.40"

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Summary for Subcatchment PR 1A: Drainage Area 1

Runoff = 0.91 cfs @ 12.09 hrs, Volume= 0.069 af, Depth> 5.01"

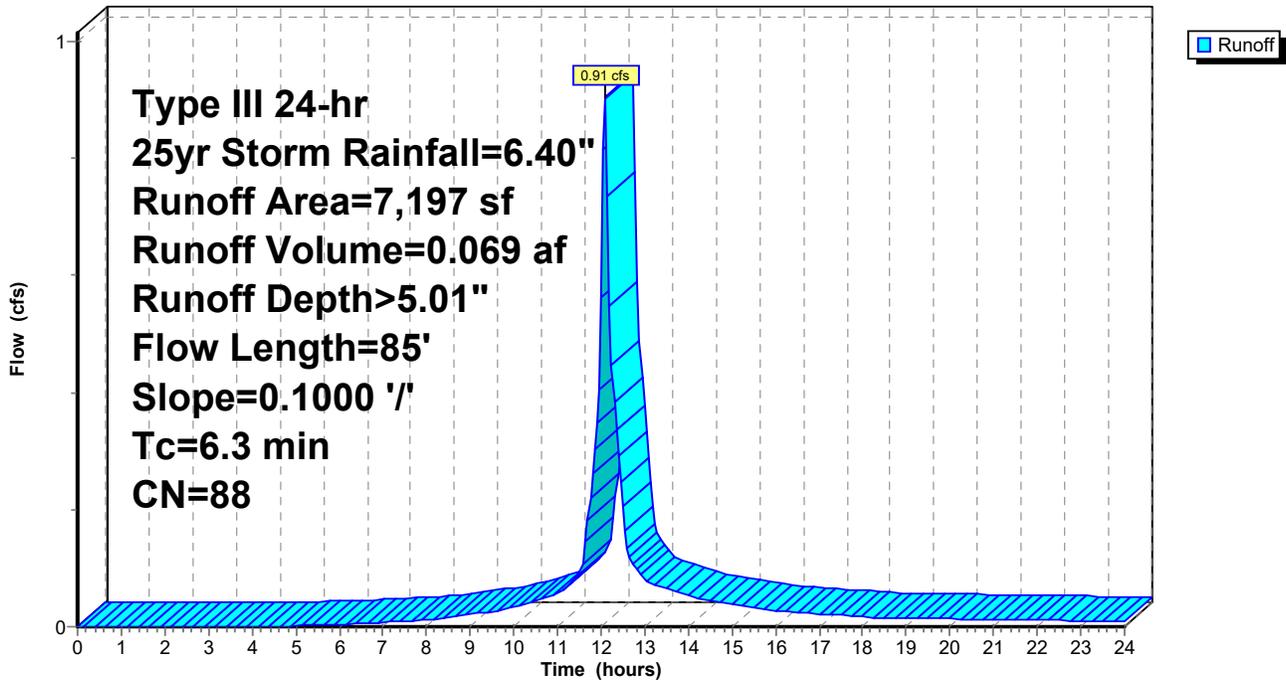
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25yr Storm Rainfall=6.40"

	Area (sf)	CN	Description
*	2,675	98	Pr. Roof
*	1,294	98	Pr. Driveway
*	163	98	Pr. Walkway & Stairs
	2,295	74	>75% Grass cover, Good, HSG C
	770	80	>75% Grass cover, Good, HSG D
	7,197	88	Weighted Average
	3,065		42.59% Pervious Area
	4,132		57.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	85	0.1000	0.23		Sheet Flow, Grass Grass: Dense n= 0.240 P2= 3.50"

Subcatchment PR 1A: Drainage Area 1

Hydrograph



26 Highland Rd. - Drainage

Type III 24-hr 25yr Storm Rainfall=6.40"

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Summary for Subcatchment PR 1B: Drainage Area 1

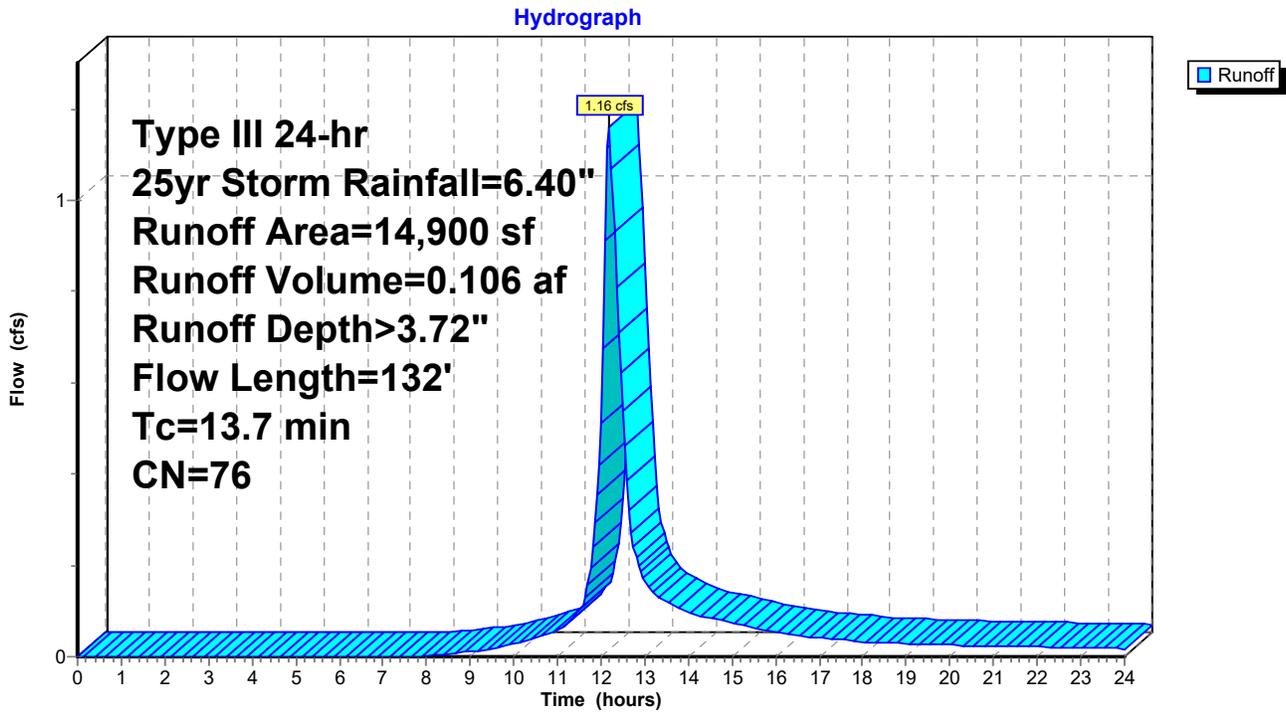
Runoff = 1.16 cfs @ 12.19 hrs, Volume= 0.106 af, Depth> 3.72"

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 25yr Storm Rainfall=6.40"

Area (sf)	CN	Description
2,961	74	>75% Grass cover, Good, HSG C
2,917	61	>75% Grass cover, Good, HSG B
6,651	80	>75% Grass cover, Good, HSG D
1,372	77	Woods, Good, HSG D
* 615	98	Pr. Deck & Stairs
* 384	98	Pr. Pool
14,900	76	Weighted Average
13,901		93.30% Pervious Area
999		6.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	32	0.0720	0.16		Sheet Flow, Grass Grass: Dense n= 0.240 P2= 3.50"
1.7	18	0.1120	0.17		Sheet Flow, Grass Grass: Dense n= 0.240 P2= 3.50"
8.7	82	0.0420	0.16		Sheet Flow, Grass Grass: Dense n= 0.240 P2= 3.50"
13.7	132	Total			

Subcatchment PR 1B: Drainage Area 1



26 Highland Rd. - Drainage

Type III 24-hr 25yr Storm Rainfall=6.40"

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Summary for Pond RG 1: Rain Garden

Inflow Area = 0.165 ac, 57.41% Impervious, Inflow Depth > 5.01" for 25yr Storm event
 Inflow = 0.91 cfs @ 12.09 hrs, Volume= 0.069 af
 Outflow = 0.89 cfs @ 12.10 hrs, Volume= 0.069 af, Atten= 2%, Lag= 0.4 min
 Discarded = 0.05 cfs @ 10.85 hrs, Volume= 0.045 af
 Primary = 0.84 cfs @ 12.10 hrs, Volume= 0.023 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 232.54' @ 12.10 hrs Surf.Area= 520 sf Storage= 391 cf

Plug-Flow detention time= 45.3 min calculated for 0.069 af (100% of inflow)
 Center-of-Mass det. time= 42.4 min (831.5 - 789.1)

Volume	Invert	Avail.Storage	Storage Description	
#1	231.25'	501 cf	Custom Stage Data (Prismatic) Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
231.25	545	0.0	0	0
231.99	545	30.0	121	121
232.00	455	100.0	5	126
232.75	545	100.0	375	501

Device	Routing	Invert	Outlet Devices											
#1	Discarded	231.25'	4.000 in/hr Exfiltration over Surface area											
#2	Primary	232.50'	35.0' long x 1.0' breadth Overflow Weir											
			Head (feet)	0.20	0.40	0.60	0.80	1.00	1.20	1.40	1.60	1.80	2.00	
				2.50	3.00									
			Coef. (English)	2.69	2.72	2.75	2.85	2.98	3.08	3.20	3.28	3.31		
				3.30	3.31	3.32								

Discarded OutFlow Max=0.05 cfs @ 10.85 hrs HW=231.27' (Free Discharge)

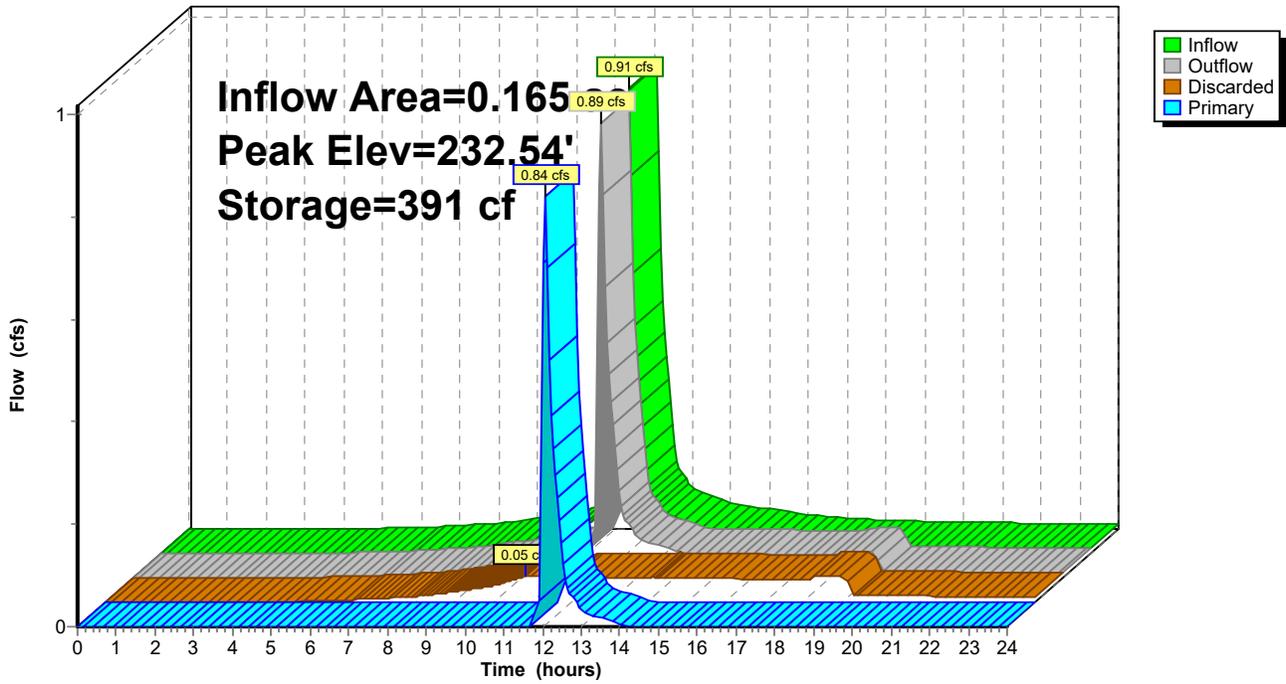
↑1=Exfiltration (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.83 cfs @ 12.10 hrs HW=232.54' (Free Discharge)

↑2=Overflow Weir (Weir Controls 0.83 cfs @ 0.56 fps)

Pond RG 1: Rain Garden

Hydrograph



26 Highland Rd. - Drainage

Type III 24-hr 25yr Storm Rainfall=6.40"

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Stage-Area-Storage for Pond RG 1: Rain Garden

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
231.25	545	0	232.29	490	263
231.27	545	3	232.31	492	273
231.29	545	7	232.33	495	283
231.31	545	10	232.35	497	293
231.33	545	13	232.37	499	303
231.35	545	16	232.39	502	313
231.37	545	20	232.41	504	323
231.39	545	23	232.43	507	333
231.41	545	26	232.45	509	343
231.43	545	29	232.47	511	353
231.45	545	33	232.49	514	363
231.47	545	36	232.51	516	374
231.49	545	39	232.53	519	384
231.51	545	43	232.55	521	394
231.53	545	46	232.57	523	405
231.55	545	49	232.59	526	415
231.57	545	52	232.61	528	426
231.59	545	56	232.63	531	436
231.61	545	59	232.65	533	447
231.63	545	62	232.67	535	458
231.65	545	65	232.69	538	469
231.67	545	69	232.71	540	479
231.69	545	72	232.73	543	490
231.71	545	75	232.75	545	501
231.73	545	78			
231.75	545	82			
231.77	545	85			
231.79	545	88			
231.81	545	92			
231.83	545	95			
231.85	545	98			
231.87	545	101			
231.89	545	105			
231.91	545	108			
231.93	545	111			
231.95	545	114			
231.97	545	118			
231.99	545	121			
232.01	456	131			
232.03	459	140			
232.05	461	149			
232.07	463	158			
232.09	466	167			
232.11	468	177			
232.13	471	186			
232.15	473	196			
232.17	475	205			
232.19	478	215			
232.21	480	224			
232.23	483	234			
232.25	485	243			
232.27	487	253			

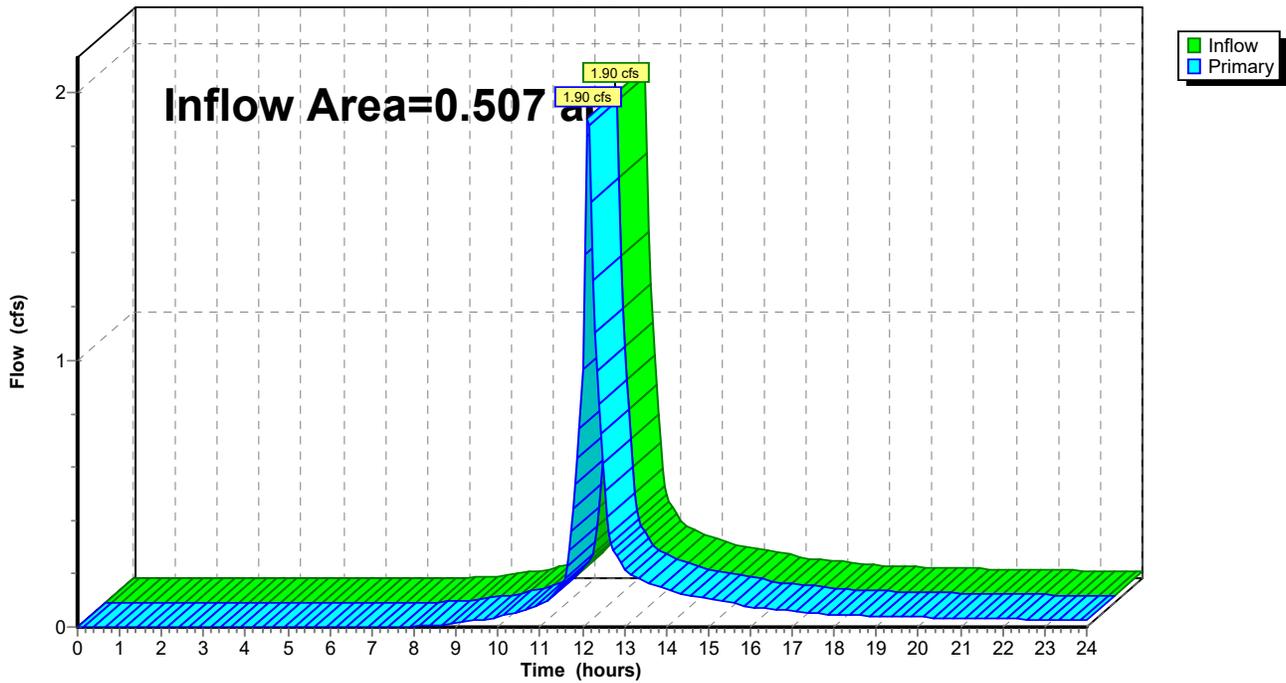
Summary for Link EX POC: Wetlands

Inflow Area = 0.507 ac, 0.00% Impervious, Inflow Depth > 3.62" for 25yr Storm event
Inflow = 1.90 cfs @ 12.13 hrs, Volume= 0.153 af
Primary = 1.90 cfs @ 12.13 hrs, Volume= 0.153 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link EX POC: Wetlands

Hydrograph

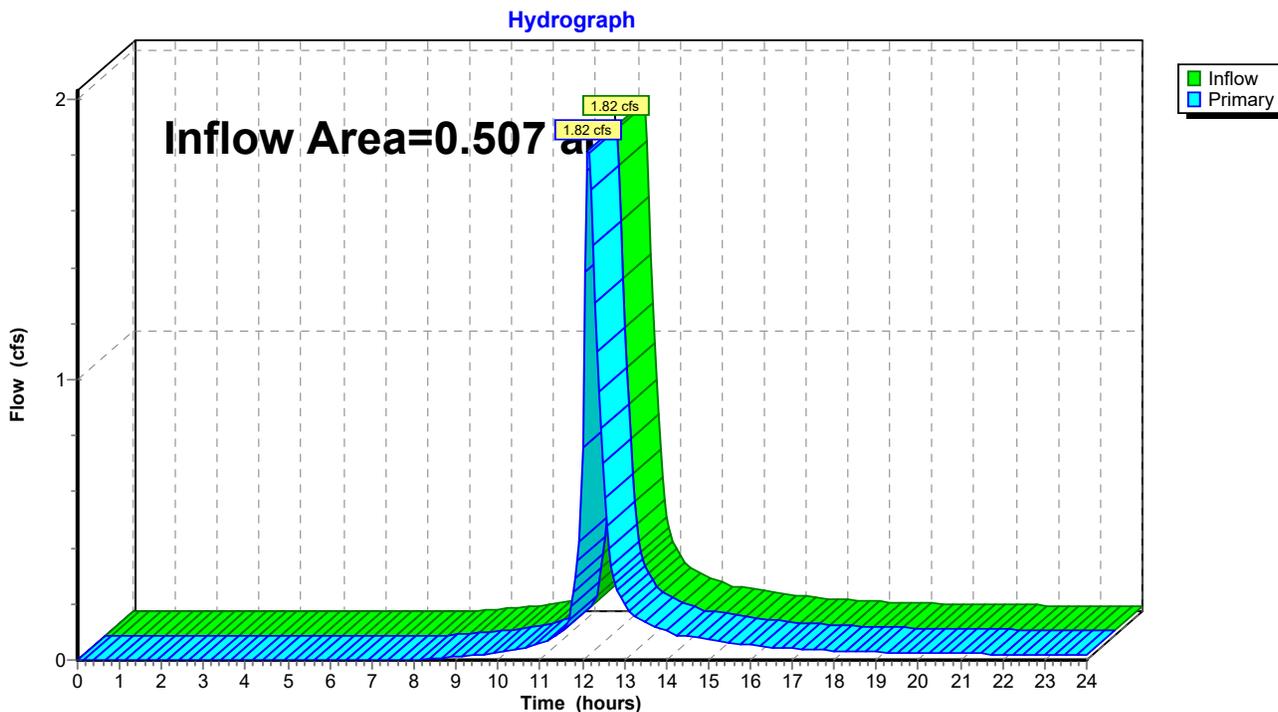


Summary for Link PR POC: Wetlands

Inflow Area = 0.507 ac, 23.22% Impervious, Inflow Depth > 3.06" for 25yr Storm event
Inflow = 1.82 cfs @ 12.14 hrs, Volume= 0.129 af
Primary = 1.82 cfs @ 12.14 hrs, Volume= 0.129 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link PR POC: Wetlands



26 Highland Rd. - Drainage

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