DRAINAGE REPORT 4 Primrose Lane Westport, CT

- PREPARED FOR -

Siho Ham & Melody Jones

August 28, 2024

- PREPARED BY -

Ochman Associates, Inc. Engineers & Surveyors PO Box 76, Easton, CT 06612 PH: 203 268 9194



Mark Ochmun

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1. <u>Site Description:</u>

The subject property is a 1.511-acre parcel of land located on the east corner of Cross Highway and Primrose Lane.

2. <u>Existing Conditions:</u>

The site currently supports a recently built residence, asphalt driveway, covered porch and side and rear patio. The property slopes from north to south. The residence is served by public water and on-site septic. There are some wetlands on the property located on the northern side of the property as noted on the site plan. Upland soils on the property are listed as Charlton-Complex & Hollis-Chatfield-Rock outcrop complex, soil type "B" as per the NRCS Soils Map.

3. <u>Proposed Conditions:</u>

The client is proposing to construct a 20' x 40' inground pool, pool patio, and pool equipment pad. In order to attenuate runoff from the new impervious surfaces and to provide groundwater recharge, a subsurface detention system will be utilized to detain the runoff from a portion of the proposed pool patio and the pool overflow.

4. Design Objectives:

In order to meet or exceed the Town of Westport storm drainage requirements, the detention system will be designed to accommodate the 25-year, 24-hour, Type III storm (6.4 inches). The post-construction peak flow rate of the site will be less than or equal to the pre-construction peak flow rate for the site. Exfiltration was considered in our design based on a percolation rate of 1" in 10 minutes. A factor of safety of 1.5 was applied against the percolation rate. The pre-construction conditions were analyzed as vacant lawn. The post-construction conditions were analyzed with the inclusion of the proposed improvements and proposed detention system. Section 5 of the report is a summary of pre- and post-development peak flows from the site for the 25-year storm event. The system was also designed for water quality volume or to be able to store the first 1" of runoff for all new impervious surfaces (Appendix D).

5. Summary of Peak Flow Rates

Storm Event	25 Year
24-hour rainfall (in)	6.4
Pre-Dev. Peak Flow (cfs)	0.11
Post Dev. Peak Flow (cfs)	0.06

6. <u>Conclusion</u>:

A total of (4) Cultec 150 XLHD units embedded in 1"- 2" crushed washed stone will be more than sufficient to meet the design objectives (See location and details of the proposed detention systems on the site plan). In order to collect the runoff from a large portion of the patio, (2) area drains are proposed along the northern side of the proposed patio along with a slot drain along the eastern side of the patio. The patio runoff along with the pool overflow will be routed through the (4) Cultec 150XLHD units.

In conclusion, the pre-construction peak flow rate for the 25-year, 24-hour, Type III storm event is 0.11 cfs. The post construction peak flow rate, with detention, is 0.06 cfs and less than the pre-construction conditions of the site (See Section 5). The Water Quality Volume storage is also met for all new impervious surfaces on the site (See Appendix C, 121 cf required & 260 cf provided). There is also no increase in impervious cover with a direct hydraulic connection to the Town of Westport storm drainage system (See Appendix E).

APPENDIX A – HydroCAD Analysis (Pre-Construction 25 Year Type III Storm Event)



PRIMROSE LANE_4_PRE_REV 08-28-24 Prepared by Ochman Associates, Inc

Ochman Associates Inc Type III 24-hr 25 yr storm Rainfall=6.40" Printed 8/28/2024 HydroCAD® 10.20-5b s/n 06744 © 2023 HydroCAD Software Solutions LLC Page 2

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 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 EX - 1: Treated As Lawn Runoff Area=1,835 sf 0.00% Impervious Runoff Depth>2.28" Tc=5.0 min CN=61 Runoff=0.11 cfs 348 cf

> Total Runoff Area = 1,835 sf Runoff Volume = 348 cf Average Runoff Depth = 2.28" 100.00% Pervious = 1,835 sf 0.00% Impervious = 0 sf

Summary for Subcatchment EX - 1: Treated As Lawn

Runoff = 0.11 cfs @ 12.09 hrs, Volume= Routed to nonexistent node 3L 348 cf, Depth> 2.28"

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 yr storm Rainfall=6.40"

Ar	ea (sf)	CN	Description			
	1,835	61	>75% Grass cover, Good, HSG B			
	1,835		100.00% Pe	ervious Are	а	
Tc (min)	Length (feet)	Slope (ft/ft	e Velocity) (ft/sec)	Capacity (cfs)	Description	
5.0					Direct Entry, Direct	

Subcatchment EX - 1: Treated As Lawn



APPENDIX B – HydroCAD Analysis (Post-Construction With Detention 25 Year Type III Storm Event)



			Ochman	Associate	es Inc
PRIMROSE LANE_4_POST_REV 08-28	3-24 <i>Ty</i>	pe III 24-hr	25 yr storm	Rainfall=	6.40"
Prepared by Ochman Associates, Inc			Pri	nted 8/28	/2024
HydroCAD® 10.20-5b s/n 06744 © 2023 HydroC	AD Software Solution	is LLC		P	age 2
					<u> </u>
Time span=0.00-2	24.00 hrs, dt=0.05 hrs	s, 481 points	S		
Runoff by SCS TR-2	20 method, UH=SCS	, Weighted-	CN		
Reach routing by Stor-Ind+Trar	ns method - Pond re	outing by Ste	or-Ind method	ł	
0.7		0,			
Subcatchment BYPASS: BYPASS	Runoff Area=310 sf	100.00% Im	pervious Ru	noff Depth>	>6.16"
	Тс	c=3.0 min C	N=98 Runoff	=0.05 cfs	159 cf
Subcatchment PR-DA 1: Patio To Drainage	Runoff Area=725 sf	100.00% Im	npervious Rui	noff Depth>	>6.16"
	Тс	c=3.0 min C	N=98 Runoff	=0.11 cfs 🗧	372 cf
Subcatchment PR-DA 2: Pool Overflow To	Runoff Area=800 sf	100.00% Im	pervious Ru	noff Depth>	>6.16"
	To	c=3.0 min C	N=98 Runoff	=0.12 cfs 4	411 cf
			000 () (0.04 6	700 (
Pond 1P: (4) Cuitec 150 XLHD Units	Peak Elev=203.	95° Storage=		=0.24 CTS	/ 83 CT
Discarded=0.	.02 cts 759 ct Prima	ry=0.05 cts	30 cf Outflow	=0.06 cts	790 CT
Link 21 - Combined Hydrograph			Inflow	-0.06 cfs	100 cf
Link SL. Combined Hydrograph			Drimory	-0.00 cls	100 of
			rinnary	-0.00 015	190 01
Total Dupoff Area = 1.925	of Dupoff Volumo	- 042 of A	vorago Bunot	ff Donth -	6 16"

Total Runoff Area = 1,835 sfRunoff Volume = 942 cfAverage Runoff Depth = 6.16"0.00% Pervious = 0 sf100.00% Impervious = 1,835 sf

Summary for Subcatchment BYPASS: BYPASS

Runoff = 0.05 cfs @ 12.05 hrs, Volume= Routed to Link 3L : Combined Hydrograph 159 cf, Depth> 6.16"

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 yr storm Rainfall=6.40"



Summary for Subcatchment PR-DA 1: Patio To Drainage System

Runoff = 0.11 cfs @ 12.05 hrs, Volume= Routed to Pond 1P : (4) Cultec 150 XLHD Units 372 cf, Depth> 6.16"

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 yr storm Rainfall=6.40"



Summary for Subcatchment PR-DA 2: Pool Overflow To Drainage System

Runoff = 0.12 cfs @ 12.05 hrs, Volume= Routed to Pond 1P : (4) Cultec 150 XLHD Units 411 cf, Depth> 6.16"

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 yr storm Rainfall=6.40"



PRIMROSE LANE_4_POST_REV 08-28-24

Summary for Pond 1P: (4) Cultec 150 XLHD Units

Inflow Area	a =	1,525 sf,	100.00% In	npervious,	Inflow Depth >	6.16"	for 25 y	/r storm event
Inflow	=	0.24 cfs @	12.05 hrs,	Volume=	783 c	f	-	
Outflow	=	0.06 cfs @	12.42 hrs,	Volume=	790 c	f, Atten	= 73%,	Lag= 22.2 min
Discarded	=	0.02 cfs @	11.15 hrs,	Volume=	759 c	f		-
Primary	=	0.05 cfs @	12.42 hrs,	Volume=	30 c	f		
Routed to Link 3L : Combined Hydrograph								

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2 Peak Elev= 203.95' @ 12.40 hrs Surf.Area= 186 sf Storage= 260 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow) Center-of-Mass det. time= 102.3 min (843.6 - 741.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	200.50'	144 cf	8.00'W x 23.25'L x 2.54'H Field A
			473 cf Overall - 113 cf Embedded = 360 cf x 40.0% Voids
#2A	201.00'	113 cf	Cultec R-150XLHD x 4 Inside #1
			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 2 rows
#3	201.00'	4 cf	1.25'D x 3.00'H 15" Dia. Area Drain - Impervious
		260 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices		
#1	Discarded	200.50'	4.000 in/hr Exfiltration ov	ver Surface	area
#2	Primary	203.90'	4.0" Horiz. Orifice/Grate	C= 0.600	Limited to weir flow at low heads
Discord	ad OutFlow	Max-0.02 of	a = 0.11.15 hrs = 11 M = 200.54	' (Eroo Dia	vohorgo)

Discarded OutFlow Max=0.02 cfs @ 11.15 hrs HW=200.54' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.04 cfs @ 12.42 hrs HW=203.95' (Free Discharge) ←2=Orifice/Grate (Weir Controls 0.04 cfs @ 0.73 fps)

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PRIMROSE LANE_4_POST_REV 08-28-24

Pond 1P: (4) Cultec 150 XLHD Units - Chamber Wizard Field A

Chamber Model = Cultec R-150XLHD (Cultec Recharger® 150XLHD)

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= $+0.75' \times 2.65$ sf x 2 rows

33.0" Wide + 6.0" Spacing = 39.0" C-C Row Spacing

2 Chambers/Row x 10.25' Long +0.75' Row Adjustment = 21.25' Row Length +12.0" End Stone x 2 = 23.25' Base Length 2 Rows x 33.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 8.00' Base Width 6.0" Stone Base + 18.5" Chamber Height + 6.0" Stone Cover = 2.54' Field Height

4 Chambers x 27.2 cf +0.75' Row Adjustment x 2.65 sf x 2 Rows = 112.6 cf Chamber Storage

472.8 cf Field - 112.6 cf Chambers = 360.2 cf Stone x 40.0% Voids = 144.1 cf Stone Storage

Chamber Storage + Stone Storage = 256.6 cf = 0.006 af Overall Storage Efficiency = 54.3% Overall System Size = 23.25' x 8.00' x 2.54'

4 Chambers 17.5 cy Field 13.3 cy Stone

Pond 1P: (4) Cultec 150 XLHD Units

PRIMROSE LANE_4_POST_REV 08-28-24

Prepared by Ochman Associates, Inc HydroCAD® 10.20-5b s/n 06744 © 2023 HydroCAD Software Solutions LLC

Stage-Area-Storage for Pond 1P: (4) Cultec 150 XLHD Units

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
200.50	186	0	203.05	186	259
200.55	186	4	203.10	186	259
200.60	186	7	203.15	186	259
200.65	186	11	203.20	186	259
200.70	186	15	203.25	186	259
200.75	186	19	203.30	186	259
200.80	186	22	203.35	186	260
200.85	186	26	203.40	186	260
200.90	180	30	203.45	180	260
200.95	186	37	203.50	186	200
201.00	186	57 44	203.55	186	200
201.00	186	51	203.65	186	260
201.15	186	58	203.70	186	260
201.20	186	65	203.75	186	260
201.25	186	71	203.80	186	260
201.30	186	78	203.85	186	260
201.35	186	85	203.90	186	260
201.40	186	92	203.95	186	260
201.45	186	98	204.00	186	260
201.50	186	105			
201.55	186	111			
201.60	186	118			
201.00	100	120			
201.70	186	137			
201.80	186	144			
201.85	186	150			
201.90	186	156			
201.95	186	162			
202.00	186	168			
202.05	186	174			
202.10	186	180			
202.15	186	185			
202.20	186	191			
202.20	100	190			
202.30	186	201			
202.00	186	200			
202.45	186	210			
202.50	186	218			
202.55	186	222			
202.60	186	226			
202.65	186	230			
202.70	186	233			
202.75	186	237			
202.80	186	241			
202.85	180	245			
202.90	100	240 252			
202.95	186	256			
200.00	100	200			

Summary for Link 3L: Combined Hydrograph

Inflow Are	ea =	1,835 sf,100.00% Impervious,	Inflow Depth > 7	1.24" fc	or 25 yr storm event
Inflow	=	0.06 cfs @ 12.41 hrs, Volume=	190 cf		
Primary	=	0.06 cfs @ 12.41 hrs, Volume=	190 cf,	Atten=	0%, Lag= 0.0 min

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

Link 3L: Combined Hydrograph

APPENDIX C – Water Quality Volume Calculations

WATER QUALITY VOLUME DESIGN CALCULATIONS FOR # 4 PRIMROSE LANE

Water Quality Volume (WQV):

WQV	=	1"(R)(A)/12
R	=	site cover runoff coefficient = $RvI \times \%I + RvT \times \%T + RvF \times \%F$
RvI	=	runoff coefficient for impervious cover
RvT	=	runoff coefficient for lawn or managed turf
RvF	=	runoff coefficient for forested cover & open space
%I	=	percent of site in impervious cover
%T	=	percent of site in lawn or managed turf
%F	=	percent of site in forested cover & open space
Α	=	site area

Water Quality Volume Calculations For "1P"

Watershed Input Data:

Watershed Area to 1P = $1,525 \text{ ft}^2$ Impervious Coverage = $1,525 \text{ ft}^2$ Pervious Coverage = 0 ft^2 R = (0.95 x 1) + (0.20 x 0) = 0.95A = $1,525 \text{ ft}^2$

WQV = 1"/12 (0.95) x (1,525 ft²) = 121 ft³

Water Quality Volume Required = 121 ft^3

Subsurface Retention Storage Calculations For "1P"

Water Quality Volume will be retained within the (4) Cultec 150 XLHD units. The total storage volume of the system up to the overflow drain is 260 ft³

Total Retention Storage Volume = 260 ft^3 > Water Quality Volume = 121 ft^3

APPENDIX D NRCS Soils Map

Conservation Service

Web Soil Survey National Cooperative Soil Survey

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
13	Walpole sandy loam, 0 to 3 percent slopes	0.0	0.1%
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	2.4	26.2%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	1.3	13.9%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	1.8	19.6%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	3.7	39.7%
701A	Ninigret fine sandy loam, 0 to 3 percent slopes	0.0	0.4%
Totals for Area of Interest		9.3	100.0%

State of Connecticut, Western Part

75C—Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9Iqn Elevation: 0 to 1,200 feet Mean annual precipitation: 43 to 56 inches Mean annual air temperature: 45 to 55 degrees F Frost-free period: 140 to 185 days Farmland classification: Not prime farmland

Map Unit Composition

Hollis and similar soils: 35 percent
Chatfield and similar soils: 30 percent
Rock outcrop: 15 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis

Setting

Landform: Hills, ridges Down-slope shape: Convex Across-slope shape: Convex Parent material: Loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material *A - 1 to 6 inches:* gravelly fine sandy loam *Bw1 - 6 to 9 inches:* channery fine sandy loam *Bw2 - 9 to 15 inches:* gravelly fine sandy loam *2R - 15 to 80 inches:* bedrock

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 1.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6s Hydrologic Soil Group: D Ecological site: F144AY033MA - Shallow Dry Till Uplands Hydric soil rating: No

Description of Chatfield

Setting

Landform: Hills, ridges Down-slope shape: Convex Across-slope shape: Linear Parent material: Coarse-loamy melt-out till derived from granite and/or schist and/or gneiss

Typical profile

Oa - 0 to 1 inches: highly decomposed plant material *A - 1 to 6 inches:* gravelly fine sandy loam *Bw1 - 6 to 15 inches:* gravelly fine sandy loam *Bw2 - 15 to 29 inches:* gravelly fine sandy loam *2R - 29 to 80 inches:* unweathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Low to high (0.01 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 6s Hydrologic Soil Group: B Ecological site: F144AY034CT - Well Drained Till Uplands Hydric soil rating: No

Description of Rock Outcrop

Typical profile

R - 0 to 0 inches: bedrock

Properties and qualities

Slope: 3 to 15 percent Depth to restrictive feature: 0 inches to lithic bedrock Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 8 Hydrologic Soil Group: D Hydric soil rating: Unranked

Minor Components

Charlton

Percent of map unit: 7 percent Landform: Hills Down-slope shape: Linear Across-slope shape: Linear Hydric soil rating: No

Sutton, very stony

Percent of map unit: 5 percent Landform: Depressions, drainageways Down-slope shape: Concave Across-slope shape: Linear Hydric soil rating: No

Leicester

Percent of map unit: 5 percent Landform: Depressions, drainageways Down-slope shape: Linear Across-slope shape: Concave Hydric soil rating: Yes

Brimfield

Percent of map unit: 1 percent Landform: Hills, ridges Down-slope shape: Convex Across-slope shape: Convex Hydric soil rating: No

Unnamed, red parent material

Percent of map unit: 1 percent Hydric soil rating: No

Unnamed, sandy subsoil

Percent of map unit: 1 percent Hydric soil rating: No

Data Source Information

Soil Survey Area: State of Connecticut, Western Part Survey Area Data: Version 1, Sep 15, 2023

APPENDIX E – MS4 Impervious Cover Reduction Worksheet

Town of Westport Department of Public Works

Town Hall, 110 Myrtle Ave. Westport, Connecticut 06880 (203) 341-1120 By: Ochman Associates Inc Dated: 08/24/23 Revised:

MS4 Impervious Cover Reduction Worksheet

Address:	4 Primrose La	ne	
GIS ID #:	G15-012-0	000	
Lot Area:	65,826	SF	

	Area (SF)	
Impervious Items	Disconnected	Connected
Ex. Bldg Cov.	2,689	0
Ex. Driveway	2,150	880
Ex. Patio/Walk	600	0
	0	0
	0	0

Existing Conditions

Totals 5,439 880 SF

Area (SF) Impervious Items Disconnected Connected Ex. Bldg Cov. 2,689 0 Ex. Driveway 2,150 880 Ex Patio/Walk 600 0 0 Pr. Pool 800 990 Pr. Patio 0 Pool Equip. Pad 45 0 0 0 0 0 0 0

Totals

7,274 880 SF

Connected Impervious Area Reduction

Existing Connected Impervious Cover880SFProposed Connected Impervious Cover880SFReduction0SFPercent Reduction0.0%

Proposed Conditions