HYDRAULIC ANALYSIS AND STORMWATER DESIGN CALCULATIONS

Prepared for

CURLEY -211 KUYPER DRIVE

VILLAGE OF UPPER NYACK
ROCKLAND COUNTY, NEW YORK

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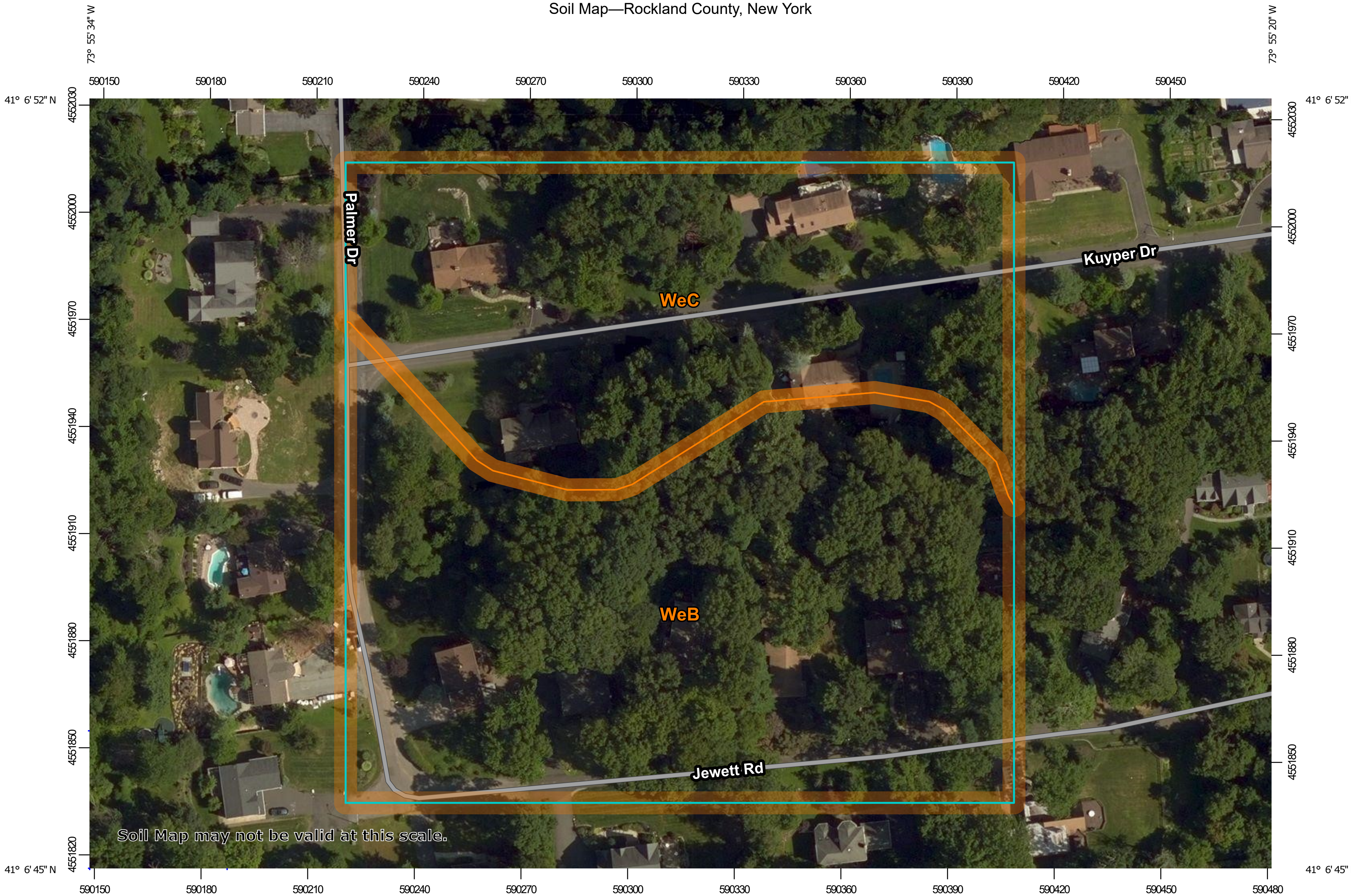

Map Scale: 1:1,520 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 20, 40, 80, 120

Feet: 0, 50, 100, 200, 300

N

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

The "Curley" plot plan is lot situated on a 0.9180 acre site, located approximately 0 feet north of the intersection of Palmer Drive and Kuyper Drive on the south side of Kuyper Drive in the Village of Upper Nyack, Rockland County, New York. The proposed plot plan consists of the construction of a pool and patio. The proposed increase in impervious area is approximately 1,330 square feet.

Under existing conditions, the run-off is carried northerly towards Kuyper Drive. 1(one) drywell will be utilized to provide zero net increase in run-off.

The Westchester Method was utilized to determine the required number of seepage pits to meet zero net increase in run-off. The pits were designed under a 24-hour, 1 in 100 year Type III storm. A 1-inch in 30-minute percolation rate was assumed at the site. The curve numbers were determined utilizing the TR-55 Worksheet 2 which has been provided in this report. The existing curve number was calculated to be 74 and the developed curve number was determined to be 98. Based on the curve numbers a run-off depth can be calculated from Table 2-1 from the Technical Release 55 manual. Using a 6-foot diameter, 6-foot deep pit with 3.0 feet of stone around it, we require 1 drywell. Copies of the calculations in spreadsheet form have been provided to show the required number of drywells that are needed to offset the increase in curve number coefficients.

A slot drain will collect the water from the pool decking and will be connected to the drywell.

Table 2-2a Runoff curve numbers for urban areas [1]

Cover description		Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area [2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

1 Average runoff condition, and $I_a = 0.2S$.

2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4 Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-1 Runoff depth for selected CN's and rainfall amounts [1]

Rainfall	Runoff depth for curve number of—												
	40	45	50	55	60	65	70	75	80	85	90	95	98
	inches												
1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.08	0.17	0.32	0.56	0.79
1.2	.00	.00	.00	.00	.00	.00	.03	.07	.15	.27	.46	.74	.99
1.4	.00	.00	.00	.00	.00	.02	.06	.13	.24	.39	.61	.92	1.18
1.6	.00	.00	.00	.00	.01	.05	.11	.20	.34	.52	.76	1.11	1.38
1.8	.00	.00	.00	.00	.03	.09	.17	.29	.44	.65	.93	1.29	1.58
2.0	.00	.00	.00	.02	.06	.14	.24	.38	.56	.80	1.09	1.48	1.77
2.5	.00	.00	.02	.08	.17	.30	.46	.65	.89	1.18	1.53	1.96	2.27
3.0	.00	.02	.09	.19	.33	.51	.71	.96	1.25	1.59	1.98	2.45	2.77
3.5	.02	.08	.20	.35	.53	.75	1.01	1.30	1.64	2.02	2.45	2.94	3.27
4.0	.06	.18	.33	.53	.76	1.03	1.33	1.67	2.04	2.46	2.92	3.43	3.77
4.5	.14	.30	.50	.74	1.02	1.33	1.67	2.05	2.46	2.91	3.40	3.92	4.26
5.0	.24	.44	.69	.98	1.30	1.65	2.04	2.45	2.89	3.37	3.88	4.42	4.76
6.0	.50	.80	1.14	1.52	1.92	2.35	2.81	3.28	3.78	4.30	4.85	5.41	5.76
7.0	.84	1.24	1.68	2.12	2.60	3.10	3.62	4.15	4.69	5.25	5.82	6.41	6.76
8.0	1.25	1.74	2.25	2.78	3.33	3.89	4.46	5.04	5.63	6.21	6.81	7.40	7.76
9.0	1.71	2.29	2.88	3.49	4.10	4.72	5.33	5.95	6.57	7.18	7.79	8.40	8.76
10.0	2.23	2.89	3.56	4.23	4.90	5.56	6.22	6.88	7.52	8.16	8.78	9.40	9.76
11.0	2.78	3.52	4.26	5.00	5.72	6.43	7.13	7.81	8.48	9.13	9.77	10.39	10.76
12.0	3.38	4.19	5.00	5.79	6.56	7.32	8.05	8.76	9.45	10.11	10.76	11.39	11.76
13.0	4.00	4.89	5.76	6.61	7.42	8.21	8.98	9.71	10.42	11.10	11.76	12.39	12.76
14.0	4.65	5.62	6.55	7.44	8.30	9.12	9.91	10.67	11.39	12.08	12.75	13.39	13.76
15.0	5.33	6.36	7.35	8.29	9.19	10.04	10.85	11.63	12.37	13.07	13.74	14.39	14.76

9.10

[1] Interpolate the values shown to obtain runoff depths for CN's or rainfall amounts not shown.

6.11

Worksheet 2: Runoff curve number and runoff

Project Curley	By PG	Date 12/3/20
Location 211 Kuyper Drive	Checked PG	Date 12/3/20

Check one: ☑ Present ☐ Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1/] Table 2-2	CN [1/] Figure 2-3	CN [1/] Figure 2-4	Area ☑ acres ☐ mi² ☐ %	Product of CN x area
Wethersfield"C"	Open Space-good condition	74			0.03	2.22
				Totals ➡	0.03	2.22

[1/] Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{2.22}{0.03} = 74$; Use CN ➡ 74

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr	100		
Rainfall, P (24-hour)	in	9.3		
Runoff, Q (Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)	in	6.11		

Worksheet 2: Runoff curve number and runoff

Project: Curley	By: PG	Date: 12/3/20
Location: 211 Kuyper Drive	Checked: PG	Date: 12/3/20

Check one: ☐ Present ☑ Developed

1. Runoff curve number

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition; percent impervious; unconnected/connected impervious area ratio)	CN [1/]			Area ☑ acres ☐ mi² ☐ %	Product of CN x area
		Table 2-2	Figure 2-3	Figure 2-4		
Wethersfield"C"	Impervious Areas	98			0.03	2.99
				Totals ➡	0.03	2.99

1/ Use only one CN source per line

CN (weighted) = $\frac{\text{total product}}{\text{total area}}$ = $\frac{2.99}{0.03}$ = 98 ; Use CN ➡ 98

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency	yr	100		
Rainfall, P (24-hour)	in	9.3		
Runoff, Q (Use P and CN with table 2-1, figure 2-1, or equations 2-3 and 2-4)	in	9.10		

(210-VI-TR-55, Second Ed., June 1986)

Drywell Design:

Wethersfield "C"

Development size =	0.0305 Acre	
Undeveloped SCS Curve No.=	74.0000	
Developed SCS Curve No.=	98.0000	
1. Select Design Storm		
100 year, 24-hour		
2. Type of subsurface disposal system:		
Precast drywell with 3.0'-3/4" crushed stone		
3. Determine Percolation Rate:		
Percolation Rate:		
Drop	1.0000 inches	
Time	30.0000 minutes	
a. Area of Percolation (Ap):		
Surface area of Cylinder		
Ac=Pi*Dhavg		
D=	1.0000 foot	
havg=	8.5000 inches	
Ac=	2.2253 Ft^2	
Bottom Area		
Ab=Pi*r^2		
Ab=	0.7854 Ft^2	
Volume of Percolation:		
Ap=Ac+Ab		
Ap=	3.0107 Ft^2	
Vp=Ab*h	0.0654 Ft^3	
Soil Percolation Rate		
Sr=volume/area/time	0.0007 Ft^3/Ft^2/Min.	
Sr=	1.0435 Ft^3/Ft^2/day	
Sr=(minus clogging factor of 25%)	0.7826 Ft^3/Ft^2/day	
4. Calculate Required Storage Volume:		
100yr, 24 hour rainfall=	9.3000 inches	
From Table 2-1 of TR-55		
Existing CN=	74.0000 therefore depth Vr=	6.11 Inches
Proposed CN=	98.0000 therefore depth Vr=	9.10 Inches
DeltaVr=	2.9900 Inches	
Vs=deltaV*Area		
Vs=	331.3917 Ft^3	
5. Calculate Volume per Drywell:		
Vw=Pi*r^2*height		
Thickness of Stone=	3.0000 feet	
Thickness of drywell wall=	0.3330 foot	
Diameter of drywell=	6.0000 feet	
Height of drywell=	6.0000 feet	
Vw=	337.6500 Ft^3	
6. Calculate 24-hour percolation volume per drywell(Vp):		
Vp=side surface area of drywell*soil percolation rate(Sr)		
Vp=Pi*D*h*Sr		
Vp=	98.6083 Ft^3/day/drywell	
*Note: Only bottom of drywell is included & not sides		
7. Calculate the total 24-hour Volume per drywell (Vt):		
Vt=Volume of drywell(Vw)percolation volume(Vp)		
Vt=	436.2583 Ft^3	
8. Determine number of drywells required (DWr):		
DWr=Req. Volume of Storage(Vs)/Total Vol. per Drywell(Vt)	0.7596	
DWr=		
	USE	1