

DRAINAGE ANALYSIS

LOCATED AT
90 HAVILAND ROAD – LOT 2C
STAMFORD, CONNECTICUT

PREPARED FOR
STEVE AIVALIS

August 30, 2024
Revised: September 24, 2024



Jim Kousidis, P.E.
CT License No. 26830

Site Vicinity Map



Kousidis Engineering, LLC

Land Development Consultants & Site Design

Note: This report has been prepared to depict the feasibility for a potential subdivision of the existing parcel located at 90 Haviland Road, Stamford, CT. This report provides analysis for the potential impervious area depicted on the “Subdivision Feasibility Plan” prepared by Kousidis Engineering, LLC, dated August 30, 2024, last revised September 24, 2024. The impervious area accounted for in this report is based on an assumed house footprint, potential driveway layout, and potential patio area. Any deviation from the “Subdivision Feasibility Plan” will require an amended Site Development Plan and Drainage Analysis to comply with the City of Stamford standards and any revisions.

1. EXISTING CONDITIONS

This 43,522-sq. ft. residential property is currently undeveloped woodland. Test pits at the site indicate highly pervious soils that are adequate to accept a subsurface storm drain system. The topography of the property slopes to the north and east. According to the Web Soil Survey website (map and soil table attached) the soils in the subject area consist of Canton and Charlton fine sandy loams, 3 to 8 percent slopes, a well-drained soil with a Hydrologic Soil Group “B”.

2. PROPOSED CONDITIONS

A new development is being proposed for the subject property. The owner is proposing to subdivide the parcel into two independent single-family lots. Each of the lots has been analyzed for drainage and septic feasibility based on an assumed house footprint, with an attached garage, new driveway, and new pool with attached patio, with associated site improvements. The total accounted for impervious surface is 5,800-sq.ft. Stormwater retention systems have been designed based on the assumed potential impervious areas and will need to be installed to satisfy the City of Stamford’s requirements of zero increase in runoff for the 24-hour, type III rainfall, 1 through 50-year storm events. The new roof area, patio areas and the driveway drains must be directed to the proposed retention systems as depicted on the Site Development Plan provided by Kousidis Engineering, LLC dated 08/30/2024, last revised 09/24/2024.

3. DRAINAGE

Under proposed conditions, the entire site will maintain historic flow patterns as depicted in the attached watershed maps. Refer to the following table for a summary of all existing vs. proposed peak stormwater flow rates and volumes. For all watersheds, the proposed flow is below or equivalent to the existing flow.

EXISTING vs PROPOSED CONDITIONS DRAINAGE SUMMARY TABLE
Peak Flows (cfs) & Runoff Volumes (cf)

Description	POC	Flow/Volume	Existing	Proposed	Δ	Δ%
1 yr	1	$Q(ft^3/sec)$	0.24	0.23	-0.01	-4%
		$V(ft^3)$	1,480	1,348	-132	-9%
2 yr	1	$Q(ft^3/sec)$	0.58	0.53	-0.05	-9%
		$V(ft^3)$	2,901	2,589	-312	-11%
5 yr	1	$Q(ft^3/sec)$	0.95	0.85	-0.10	-11%
		$V(ft^3)$	4,378	3,868	-510	-12%
10 yr	1	$Q(ft^3/sec)$	1.41	1.25	-0.16	-11%
		$V(ft^3)$	6,267	5,591	-676	-11%
25 yr	1	$Q(ft^3/sec)$	2.31	2.02	-0.29	-13%
		$V(ft^3)$	9,945	9,529	-416	-4%
50 yr	1	$Q(ft^3/sec)$	2.93	2.54	-0.39	-13%
		$V(ft^3)$	12,491	12,220	-271	-2%

In addition to the above, the drainage systems were checked for the capacity to hold 1.3” of runoff (First Flush Runoff) from all the new impervious surfaces. Using the State of Connecticut 2024 Stormwater Quality Manual, the required Water Quality Volume for the property is 802.19 cf. The provided storage in the detention systems below the overflow orifice elevation is 2,303 cf. The calculations are shown below:

Water Quality Volume :

$$WQV=(1.3'')*(R)*(A)/12$$

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

R=volumetric runoff coefficient

I= Percent Impervious Cover

A= Site Area

$$R= 0.05+(0.009*13.27)=0.1695$$

$$WQV = (1.3''*0.1695*43,696)/12 = 802.19 \text{ C.F.}$$

Volume provided: 2,303 C.F. > 802.19 C.F. Required

4. CONCLUSION

The proposed development will increase the amount of impervious area to this site, resulting in higher peak runoff rates. However, with the installation of the proposed stormwater retention systems, the original flow patterns will be maintained and there will be no increase in peak runoff up to the 50-year storm event. In addition to controlling stormwater peak runoff, the proposed design incorporates stormwater treatment to control pollution and provide groundwater recharge capacity. The implementation of these techniques and the overall site design layout will result in a finished project that will minimize sediment and erosion impacts during construction and will have no adverse impacts to adjoining properties upon completion. Based on the above information, the proposed improvements are designed in accordance with the City of Stamford Stormwater Drainage Manual and will not adversely impact adjacent or downstream properties or City-owned drainage facilities.

Drawdown Time Calculations

(DB2C-1)

24” High Concrete Galleries

$$TIME = Vol/(K*Bottom Area) = 424 / (0.52(1/12)*260)$$

$$Time = 37.63 \text{ hrs} < 72 \text{ hrs}$$

(DB2C-2)

24” High Concrete Galleries

$$TIME = Vol/(K*Bottom Area) = 623 / (0.52(1/12)*364)$$

$$Time = 40.07 \text{ hrs} < 72 \text{ hrs}$$

(DB2C-3)

24” High Concrete Galleries

$$TIME = Vol/(K*Bottom Area) = 1,247 / (0.52(1/12)*676)$$

$$Time = 42.57 \text{ hrs} < 72 \text{ hrs}$$

Conveyance Calculations

For the **6" PVC** Pipes @ a minimum 0.5% Slope, the maximum flow does not exceed 0.40 cfs under the 100-year storm event from the driveway area. Utilizing the Manning's Equation, the capacity of the 6" pvc pipe at full gravity flow is 0.468 cfs:

$$Q = (0.463/n)(d)^{2.667}(S)^{0.5} = (0.463/0.011)(0.50)^{2.667}(0.005)^{0.5}$$
$$Q = 42.09*0.1571*0.0707 = \mathbf{0.468\ cfs > 0.40\ cfs}$$

For the **4" PVC** Pipes @ a minimum 1% Slope the maximum flow does not exceed 0.20 cfs under the 100-year storm event from the roof area. Utilizing the Manning's Equation, the capacity of the 4" pipe at full gravity flow is 0.665 cfs:

$$Q = (0.463/n)(d)^{2.667}(S)^{0.5} = (0.463/0.011)(0.33)^{2.667}(0.005)^{0.5}$$
$$Q = 42.09*0.052*0.01 = \mathbf{0.219\ cfs > 0.20\ cfs}$$

All proposed pipe flows are below the maximum conveyance capabilities of the pipe.

EXISTING DRAINAGE CONDITIONS

EXHIBIT "A"

90 HAVILAND ROAD, STAMFORD, CT

PREPARED FOR

STEVE AIVALIS



KOUSIDIS ENGINEERING, LLC

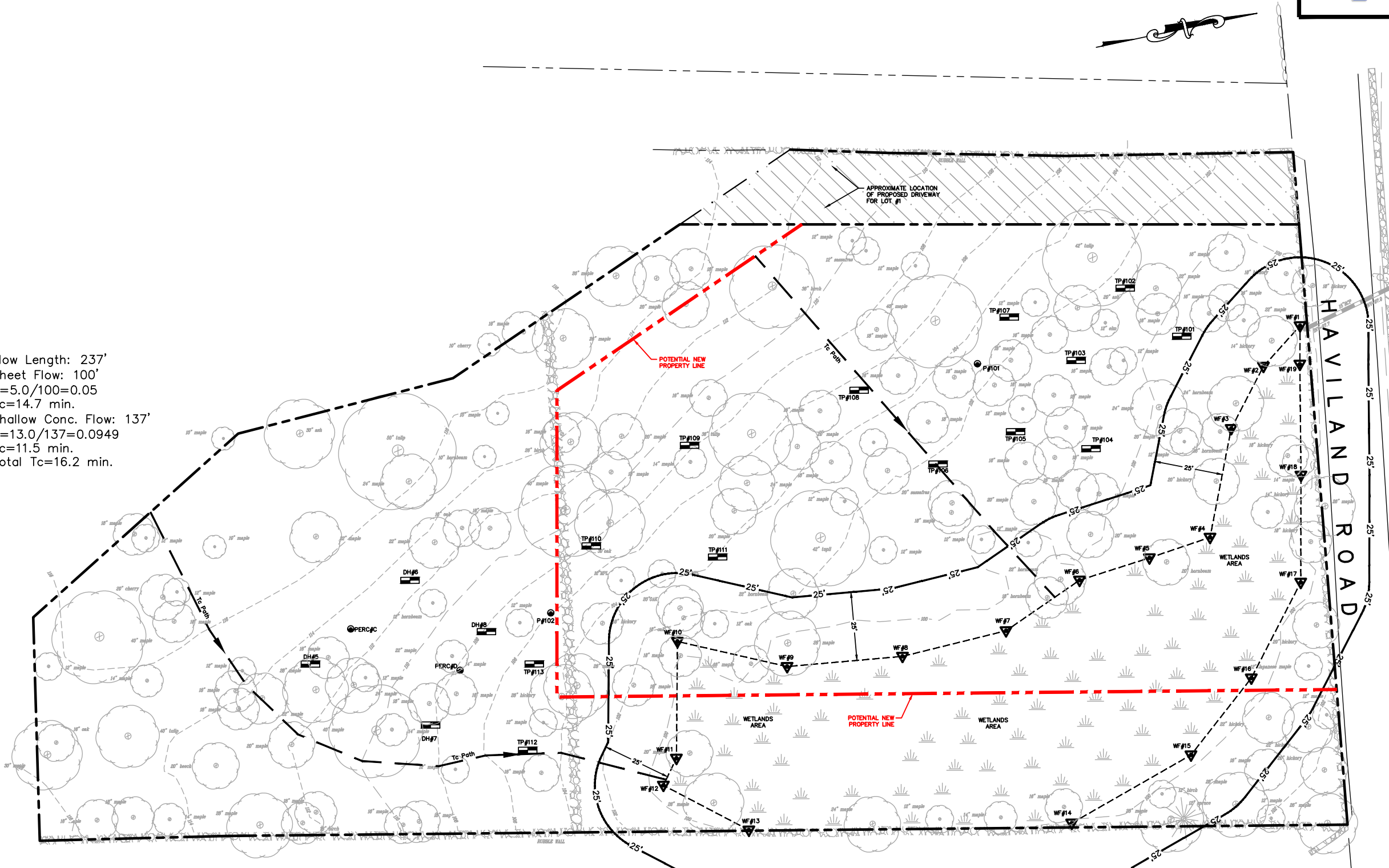
Land Development Consultants and Site Design

1525 Black Rock Turnpike, Fairfield, CT 06825 P: 203-557-8943

E: jim@kousidisengineering.com Web: www.kousidisengineering.com

Flow Length: 237'
Sheet Flow: 100'
 $S=5.0/100=0.05$
 $T_c=14.7$ min.
Shallow Conc. Flow: 137'
 $S=13.0/137=0.0949$
 $T_c=11.5$ min.
Total $T_c=16.2$ min.

Flow Length: 166'
Sheet Flow: 100'
 $S=11.0/100=0.11$
 $T_c=10.7$ min.
Shallow Conc. Flow: 66'
 $S=3.0/66=0.0455$
 $T_c=1.0$ min.
Total $T_c=11.7$ min.



SCALE:

1" = 40'

PROPOSED DRAINAGE CONDITIONS

EXHIBIT "B"

90 HAVILAND ROAD, STAMFORD, CT

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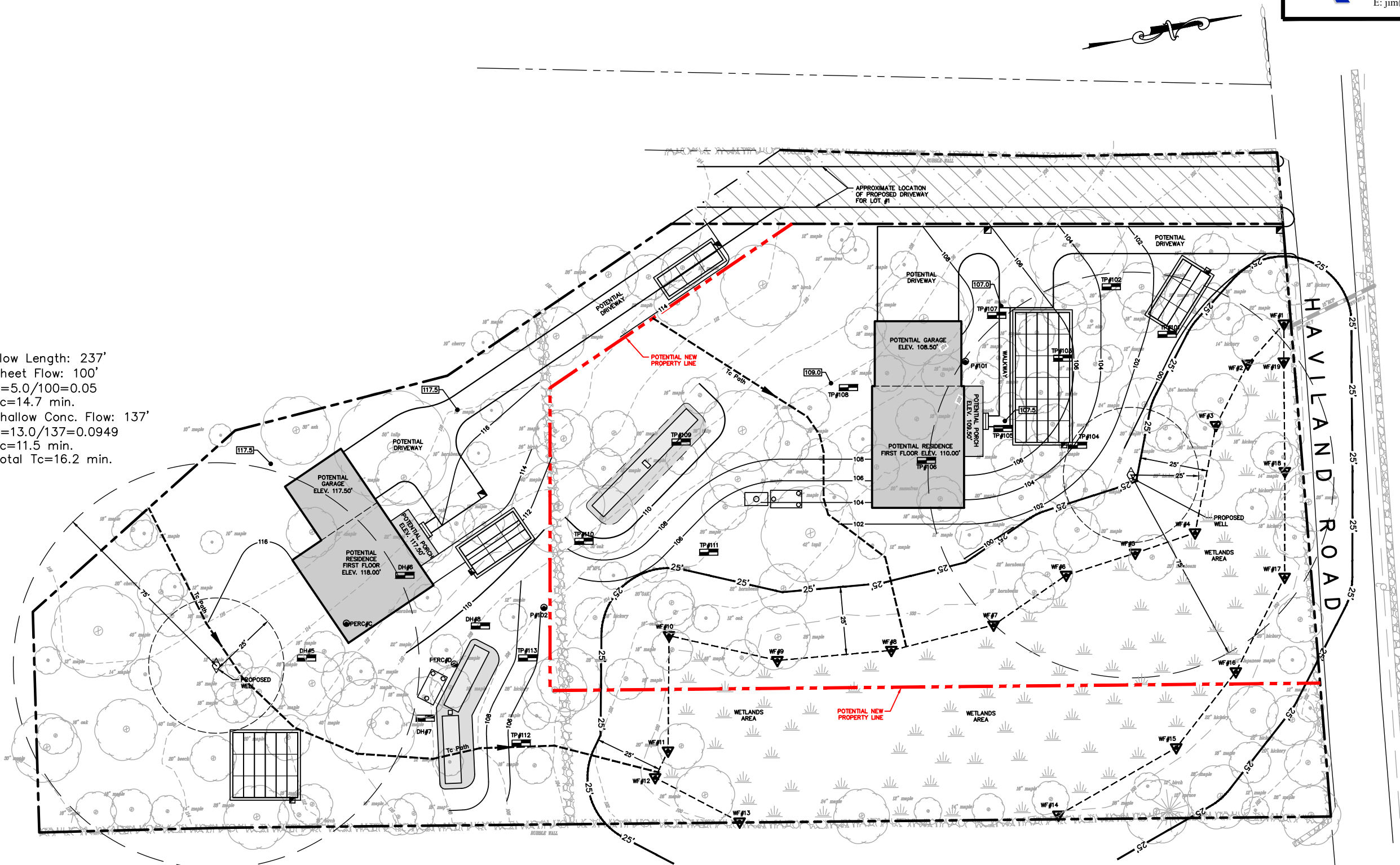
Land Development Consultants and Site Design

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Flow Length: 237'
Sheet Flow: 100'
 $S=5.0/100=0.05$
 $T_c=14.7$ min.
Shallow Conc. Flow: 137'
 $S=13.0/137=0.0949$
 $T_c=11.5$ min.
Total $T_c=16.2$ min.

Flow Length: 166'
Sheet Flow: 100'
 $S=11.0/100=0.11$
 $T_c=10.7$ min.
Shallow Conc. Flow: 66'
 $S=3.0/66=0.0455$
 $T_c=1.0$ min.
Total $T_c=11.7$ min.



SCALE:
1" = 40'



Existing Conditions
Runoff Lot 2C



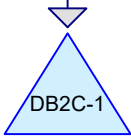
Impervious Area to
Detention System 2C-1



Proposed Bypass Area
Lot 2C



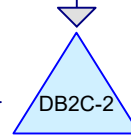
Impervious Area to
Detention System 2C-2



24" High Precast
Concrete Galleries



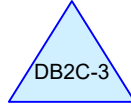
Overall Runoff



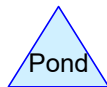
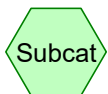
24" High Precast
Concrete Galleries



Impervious Area to
Detention System 2A-3



24" High Precast
Concrete Galleries



Routing Diagram for 90HavilandRd(09-24-24)_Exist&PropConditionsLot2C

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90HavilandRd(09-24-24)_Exist&PropConditionsLot2C

Type III 24-hr 1 yr Rainfall=2.70"

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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 PA2C-1: Impervious Area to Runoff Area=1,225 sf 85.71% Impervious Runoff Depth>1.97"
Tc=6.0 min CN=93 Runoff=0.06 cfs 201 cf

Subcatchment PA2C-2: Impervious Area to Runoff Area=2,500 sf 60.00% Impervious Runoff Depth>1.21"
Tc=6.0 min CN=83 Runoff=0.08 cfs 252 cf

Subcatchment PA2C-3: Impervious Area to Runoff Area=3,250 sf 100.00% Impervious Runoff Depth>2.47"
Tc=6.0 min CN=98 Runoff=0.19 cfs 668 cf

Subcatchment PB2C: Proposed Bypass Runoff Area=36,711 sf 0.00% Impervious Runoff Depth>0.44"
Flow Length=237' Tc=16.2 min CN=67 Runoff=0.23 cfs 1,348 cf

Subcatchment XC2C: Existing Conditions Runoff Area=43,696 sf 0.00% Impervious Runoff Depth>0.41"
Flow Length=237' Tc=16.2 min CN=66 Runoff=0.24 cfs 1,480 cf

Pond DB2C-1: 24" High Precast Concrete Peak Elev=112.70' Storage=201 cf Inflow=0.06 cfs 201 cf
Outflow=0.00 cfs 0 cf

Pond DB2C-2: 24" High Precast Concrete Peak Elev=107.05' Storage=252 cf Inflow=0.08 cfs 252 cf
Outflow=0.00 cfs 0 cf

Pond DB2C-3: 24" High Precast Concrete Peak Elev=109.83' Storage=668 cf Inflow=0.19 cfs 668 cf
Outflow=0.00 cfs 0 cf

Link OR2C: Overall Runoff Inflow=0.23 cfs 1,348 cf
Primary=0.23 cfs 1,348 cf

Summary for Subcatchment PA2C-1: Impervious Area to Detention System 2C-1

Runoff = 0.06 cfs @ 12.09 hrs, Volume= 201 cf, Depth> 1.97"

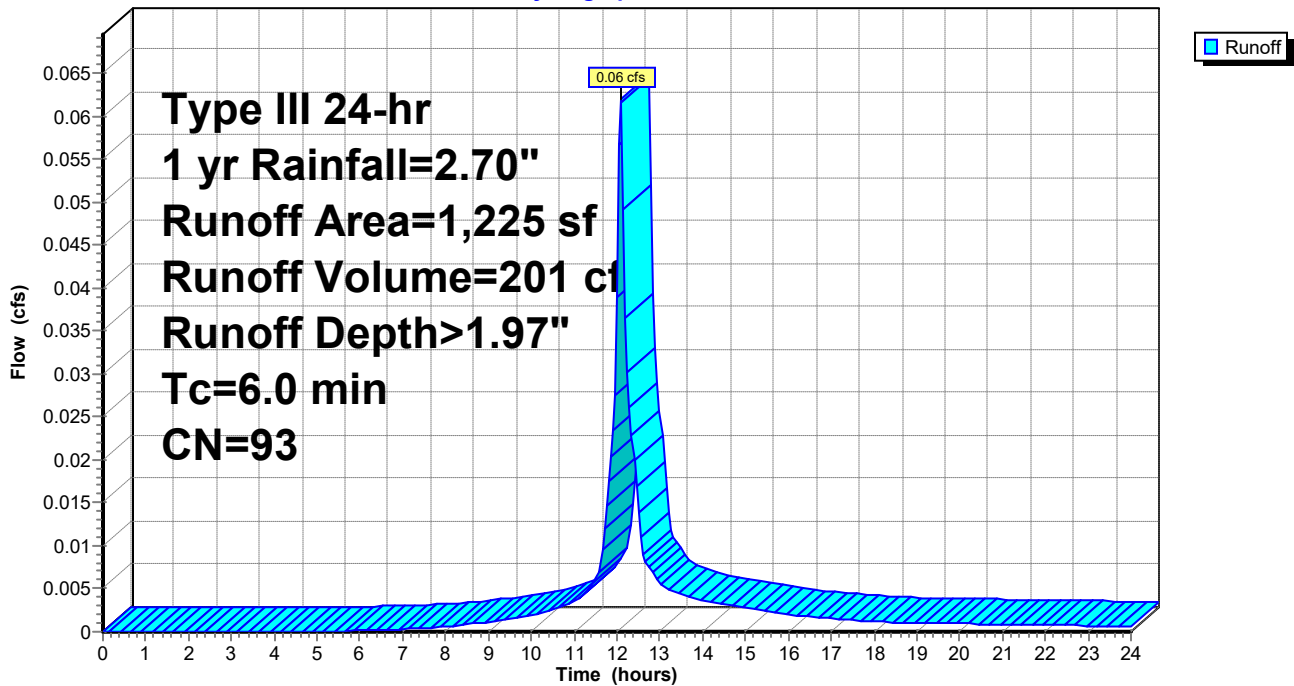
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 1 yr Rainfall=2.70"

	Area (sf)	CN	Description
*	1,050	98	Driveway
	175	61	>75% Grass cover, Good, HSG B
	1,225	93	Weighted Average
	175		14.29% Pervious Area
	1,050		85.71% Impervious Area

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

Subcatchment PA2C-1: Impervious Area to Detention System 2C-1

Hydrograph



Summary for Subcatchment PA2C-2: Impervious Area to Detention System 2C-2

Runoff = 0.08 cfs @ 12.10 hrs, Volume= 252 cf, Depth> 1.21"

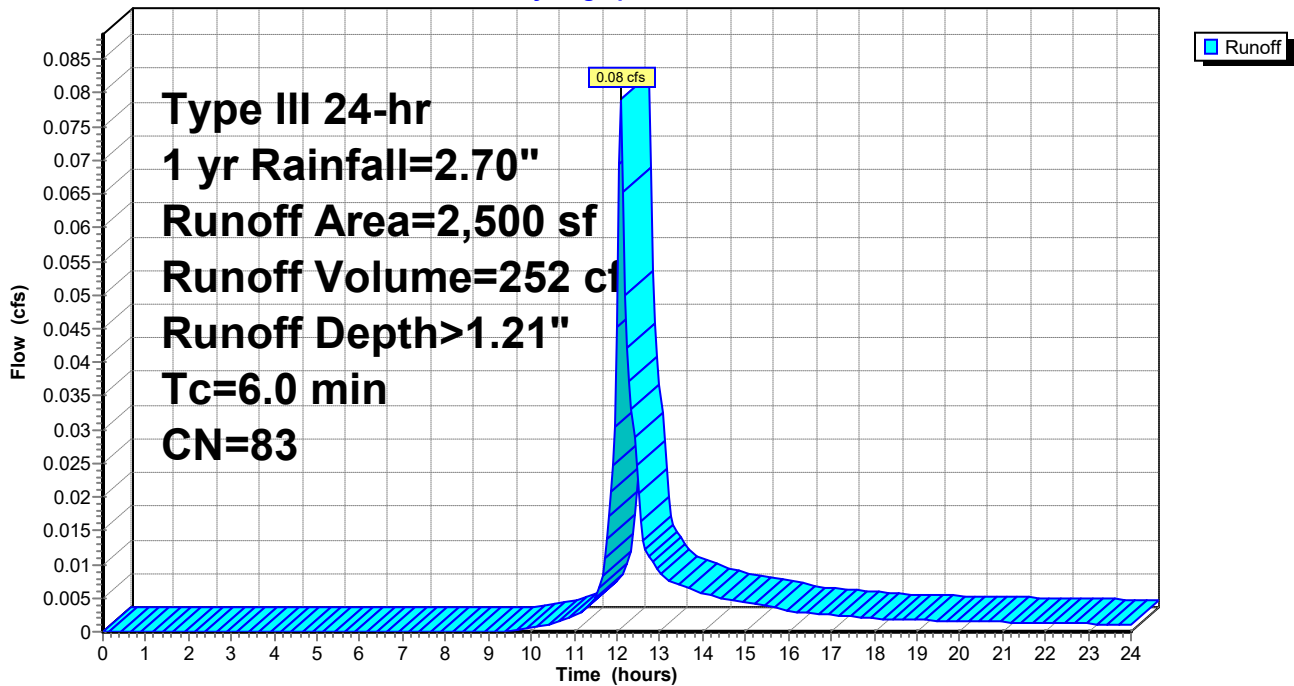
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 yr Rainfall=2.70"

	Area (sf)	CN	Description
*	1,500	98	Driveway
	1,000	61	>75% Grass cover, Good, HSG B
	2,500	83	Weighted Average
	1,000		40.00% Pervious Area
	1,500		60.00% Impervious Area

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

Subcatchment PA2C-2: Impervious Area to Detention System 2C-2

Hydrograph



Summary for Subcatchment PA2C-3: Impervious Area to Detention System 2A-3

Runoff = 0.19 cfs @ 12.09 hrs, Volume= 668 cf, Depth> 2.47"

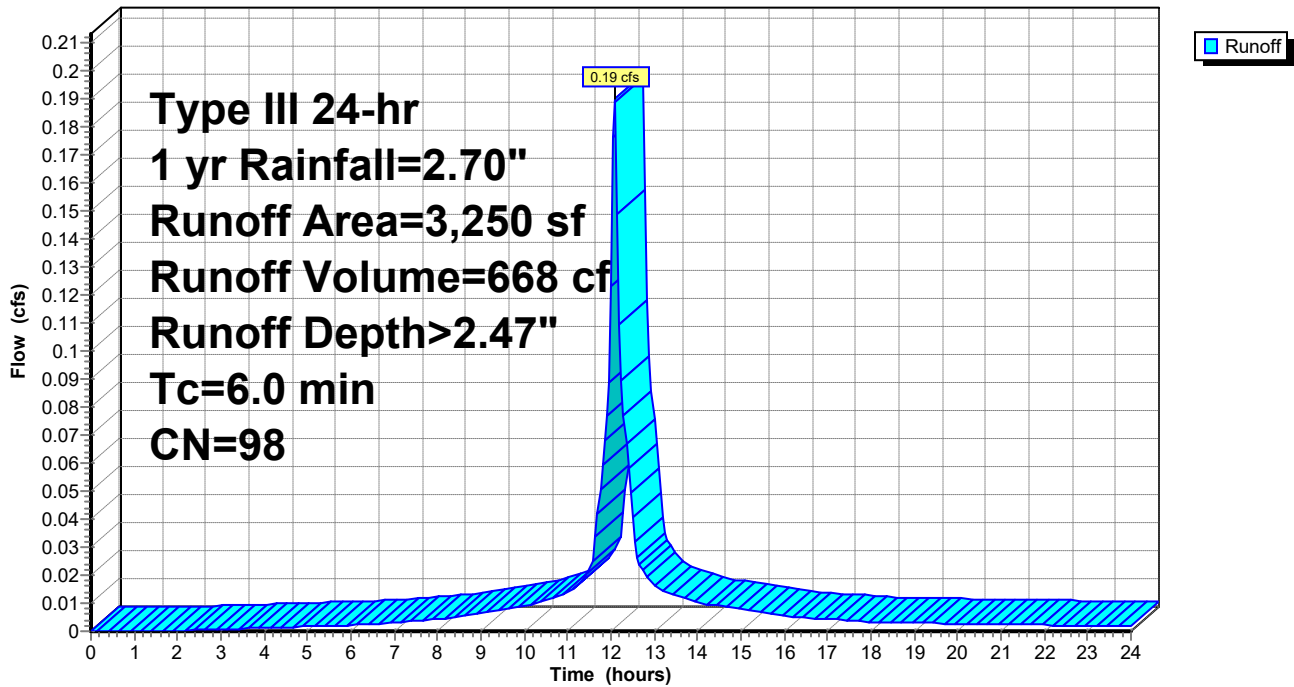
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 1 yr Rainfall=2.70"

	Area (sf)	CN	Description
*	2,500	98	Building
*	750	98	Patio/Walks
	3,250	98	Weighted Average
	3,250		100.00% Impervious Area

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

Subcatchment PA2C-3: Impervious Area to Detention System 2A-3

Hydrograph



Summary for Subcatchment PB2C: Proposed Bypass Area Lot 2C

Runoff = 0.23 cfs @ 12.30 hrs, Volume= 1,348 cf, Depth> 0.44"

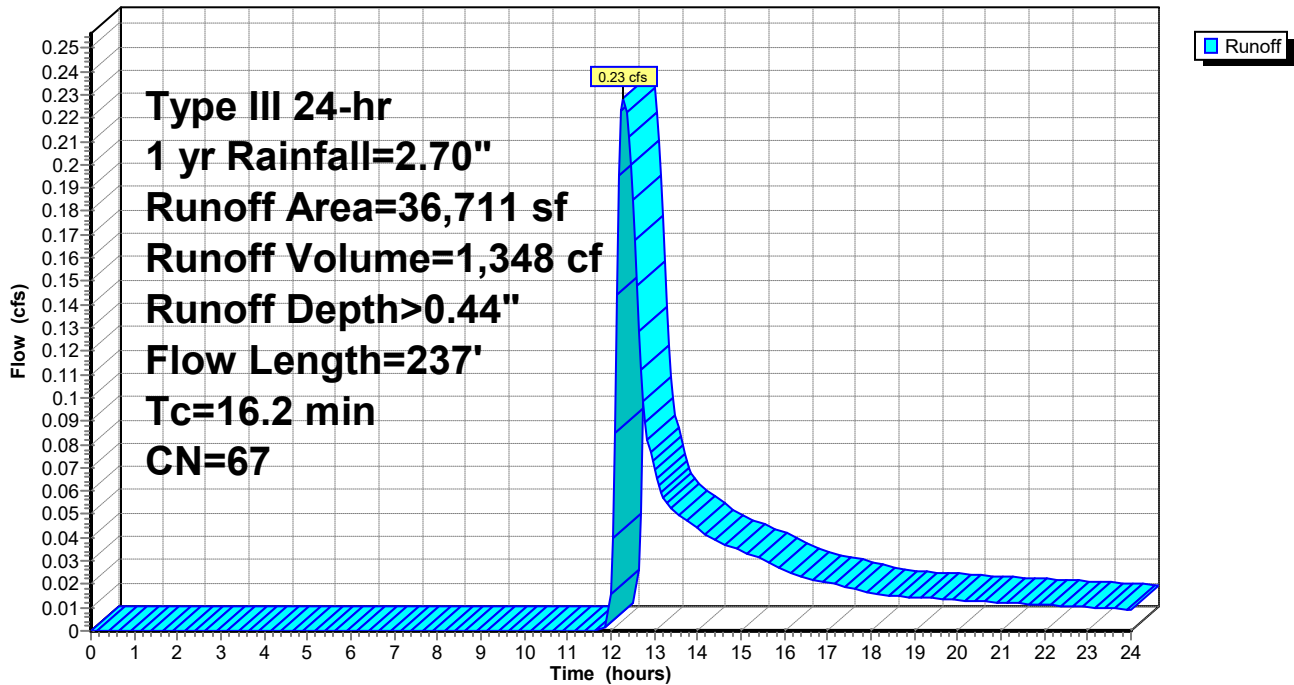
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 yr Rainfall=2.70"

Area (sf)	CN	Description
11,325	61	>75% Grass cover, Good, HSG B
16,655	60	Woods, Fair, HSG B
* 8,731	89	<50% Grass cover, Poor, HSG D (Wetlands)
36,711	67	Weighted Average
36,711		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.7	100	0.0500	0.11		Sheet Flow, Sheet Flow
					Woods: Light underbrush n= 0.400 P2= 3.30"
1.5	137	0.0949	1.54		Shallow Concentrated Flow, Shallow Concentrated Flow
					Woodland Kv= 5.0 fps
16.2	237	Total			

Subcatchment PB2C: Proposed Bypass Area Lot 2C

Hydrograph



Summary for Subcatchment XC2C: Existing Conditions Runoff Lot 2C

Runoff = 0.24 cfs @ 12.31 hrs, Volume= 1,480 cf, Depth> 0.41"

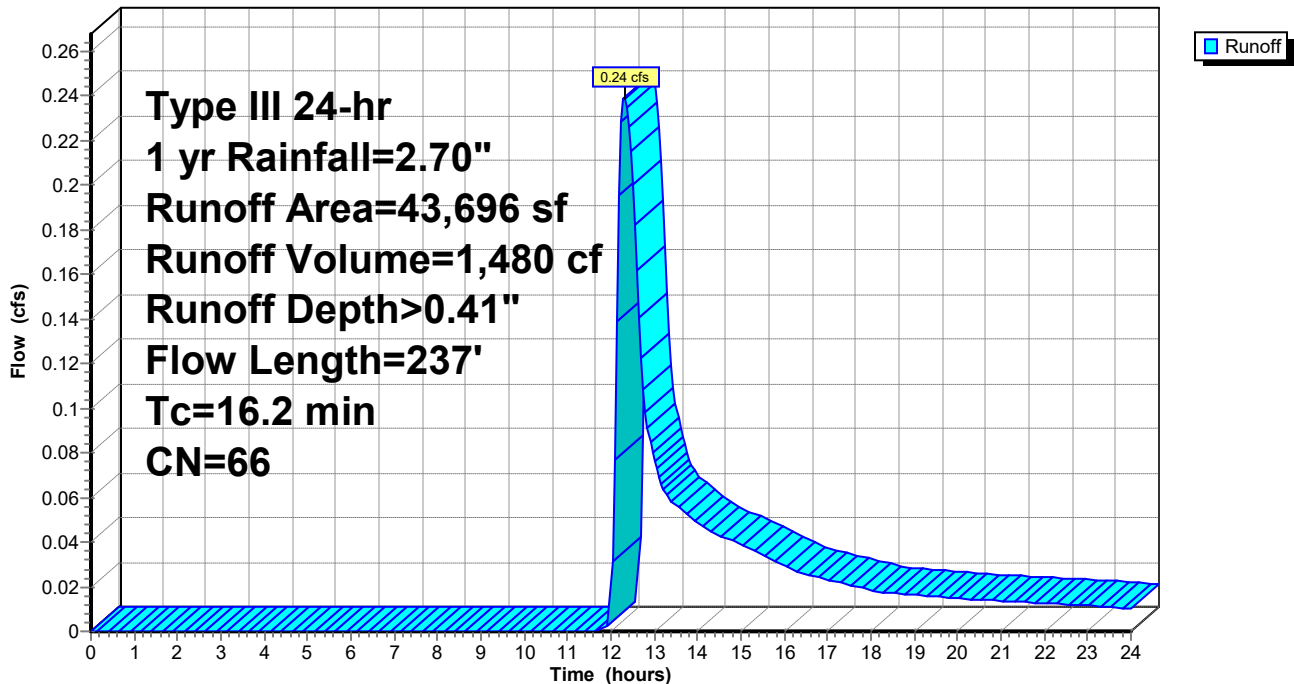
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Type III 24-hr 1 yr Rainfall=2.70"

Area (sf)	CN	Description
34,965	60	Woods, Fair, HSG B
* 8,731	89	<50% Grass cover, Poor, HSG D (Wetlands)
43,696	66	Weighted Average
43,696		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.7	100	0.0500	0.11		Sheet Flow, Sheet Flow
					Woods: Light underbrush n= 0.400 P2= 3.30"
1.5	137	0.0949	1.54		Shallow Concentrated Flow, Shallow Concentrated Flow
					Woodland Kv= 5.0 fps
16.2	237	Total			

Subcatchment XC2C: Existing Conditions Runoff Lot 2C

Hydrograph



Summary for Pond DB2C-1: 24" High Precast Concrete Galleries

Inflow Area = 1,225 sf, 85.71% Impervious, Inflow Depth > 1.97" for 1 yr event
 Inflow = 0.06 cfs @ 12.09 hrs, Volume= 201 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 112.70' @ 24.00 hrs Surf.Area= 292 sf Storage= 201 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

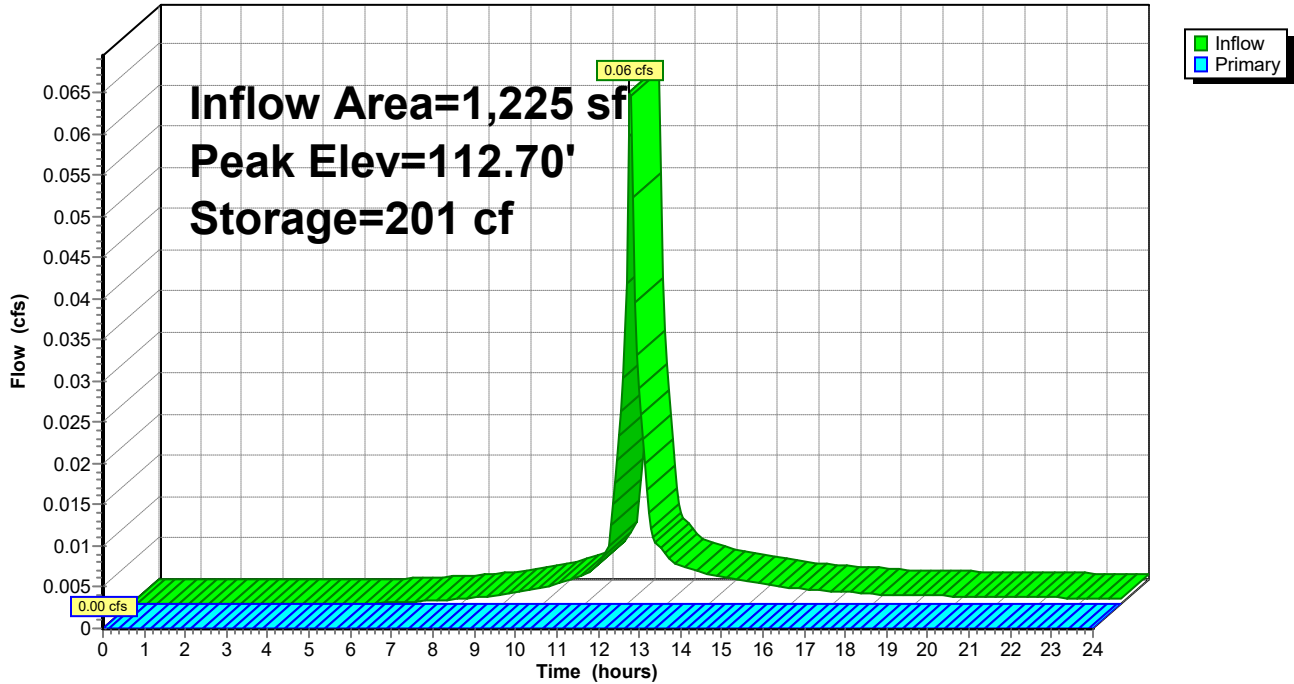
Volume	Invert	Avail.Storage	Storage Description
#1	111.50'	136 cf	6.00'W x 8.00'L x 2.50'H Stone Bed x 6 720 cf Overall - 380 cf Embedded = 340 cf x 40.0% Voids
#2	112.00'	272 cf	Concrete Galley 4x8x2 x 6 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 7.50'L = 45.3 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 8.00'L = 63.4 cf
#3	111.50'	16 cf	2.00'W x 2.00'L x 4.00'H Yard Drain
		424 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	114.00'	8.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=111.50' (Free Discharge)
 ↑1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond DB2C-1: 24" High Precast Concrete Galleries

Hydrograph



Stage-Area-Storage for Pond DB2C-1: 24" High Precast Concrete Galleries

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
111.50	0	114.10	418
111.55	6	114.15	418
111.60	12	114.20	419
111.65	18	114.25	419
111.70	24	114.30	419
111.75	30	114.35	419
111.80	36	114.40	419
111.85	42	114.45	420
111.90	48	114.50	420
111.95	54	114.55	420
112.00	60	114.60	420
112.05	70	114.65	420
112.10	80	114.70	421
112.15	90	114.75	421
112.20	100	114.80	421
112.25	110	114.85	421
112.30	120	114.90	421
112.35	130	114.95	422
112.40	140	115.00	422
112.45	150	115.05	422
112.50	160	115.10	422
112.55	170	115.15	422
112.60	180	115.20	423
112.65	190	115.25	423
112.70	200	115.30	423
112.75	210	115.35	423
112.80	220	115.40	423
112.85	230	115.45	424
112.90	240	115.50	424
112.95	250		
113.00	260		
113.05	270		
113.10	280		
113.15	290		
113.20	300		
113.25	310		
113.30	320		
113.35	331		
113.40	341		
113.45	351		
113.50	361		
113.55	371		
113.60	380		
113.65	389		
113.70	398		
113.75	407		
113.80	409		
113.85	411		
113.90	413		
113.95	416		
114.00	418		
114.05	418		

Summary for Pond DB2C-2: 24" High Precast Concrete Galleries

Inflow Area = 2,500 sf, 60.00% Impervious, Inflow Depth > 1.21" for 1 yr event
 Inflow = 0.08 cfs @ 12.10 hrs, Volume= 252 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 107.05' @ 24.00 hrs Surf.Area= 436 sf Storage= 252 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

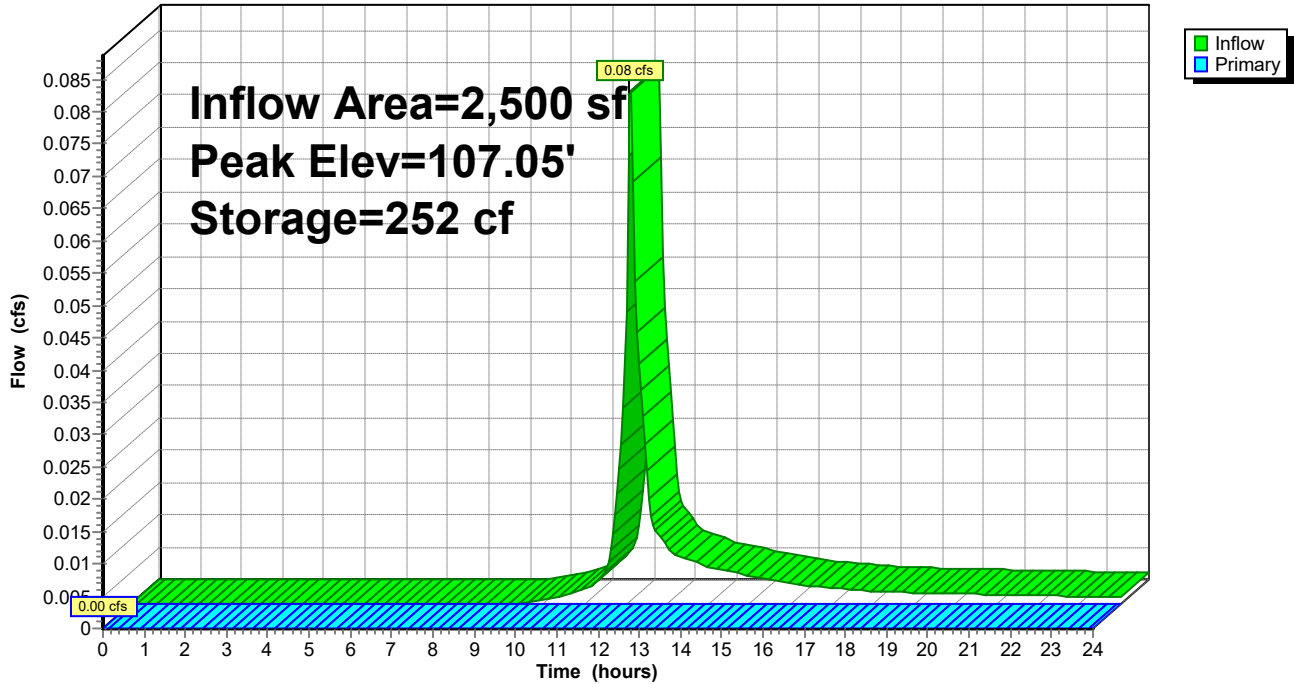
Volume	Invert	Avail.Storage	Storage Description
#1	106.00'	204 cf	6.00'W x 8.00'L x 2.50'H Stone Bed x 9 1,080 cf Overall - 570 cf Embedded = 510 cf x 40.0% Voids
#2	106.50'	408 cf	Concrete Galley 4x8x2 x 9 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 7.50'L = 45.3 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 8.00'L = 63.4 cf
#3	106.50'	20 cf	2.00'W x 2.00'L x 5.00'H Yard Drain
		632 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	110.50'	8.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=106.00' (Free Discharge)
 ↑1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond DB2C-2: 24" High Precast Concrete Galleries

Hydrograph



Stage-Area-Storage for Pond DB2C-2: 24" High Precast Concrete Galleries

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
106.00	0	108.08	559	110.16	626
106.04	7	108.12	570	110.20	626
106.08	14	108.16	580	110.24	627
106.12	21	108.20	591	110.28	627
106.16	28	108.24	601	110.32	627
106.20	35	108.28	606	110.36	627
106.24	41	108.32	608	110.40	627
106.28	48	108.36	611	110.44	627
106.32	55	108.40	613	110.48	628
106.36	62	108.44	616	110.52	628
106.40	69	108.48	618	110.56	628
106.44	76	108.52	620	110.60	628
106.48	83	108.56	620	110.64	628
106.52	92	108.60	620	110.68	628
106.56	104	108.64	620	110.72	628
106.60	116	108.68	620	110.76	629
106.64	128	108.72	620	110.80	629
106.68	140	108.76	621	110.84	629
106.72	152	108.80	621	110.88	629
106.76	164	108.84	621	110.92	629
106.80	176	108.88	621	110.96	629
106.84	188	108.92	621	111.00	630
106.88	200	108.96	621	111.04	630
106.92	212	109.00	622	111.08	630
106.96	224	109.04	622	111.12	630
107.00	236	109.08	622	111.16	630
107.04	248	109.12	622	111.20	630
107.08	260	109.16	622	111.24	631
107.12	272	109.20	622	111.28	631
107.16	284	109.24	623	111.32	631
107.20	296	109.28	623	111.36	631
107.24	308	109.32	623	111.40	631
107.28	320	109.36	623	111.44	631
107.32	332	109.40	623	111.48	632
107.36	344	109.44	623		
107.40	356	109.48	624		
107.44	367	109.52	624		
107.48	379	109.56	624		
107.52	391	109.60	624		
107.56	403	109.64	624		
107.60	415	109.68	624		
107.64	427	109.72	624		
107.68	439	109.76	625		
107.72	451	109.80	625		
107.76	463	109.84	625		
107.80	475	109.88	625		
107.84	487	109.92	625		
107.88	499	109.96	625		
107.92	511	110.00	626		
107.96	523	110.04	626		
108.00	535	110.08	626		
108.04	547	110.12	626		

Summary for Pond DB2C-3: 24" High Precast Concrete Galleries

Inflow Area = 3,250 sf, 100.00% Impervious, Inflow Depth > 2.47" for 1 yr event
 Inflow = 0.19 cfs @ 12.09 hrs, Volume= 668 cf
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 100%, Lag= 0.0 min
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 109.83' @ 24.00 hrs Surf.Area= 868 sf Storage= 668 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
 Center-of-Mass det. time= (not calculated: no outflow)

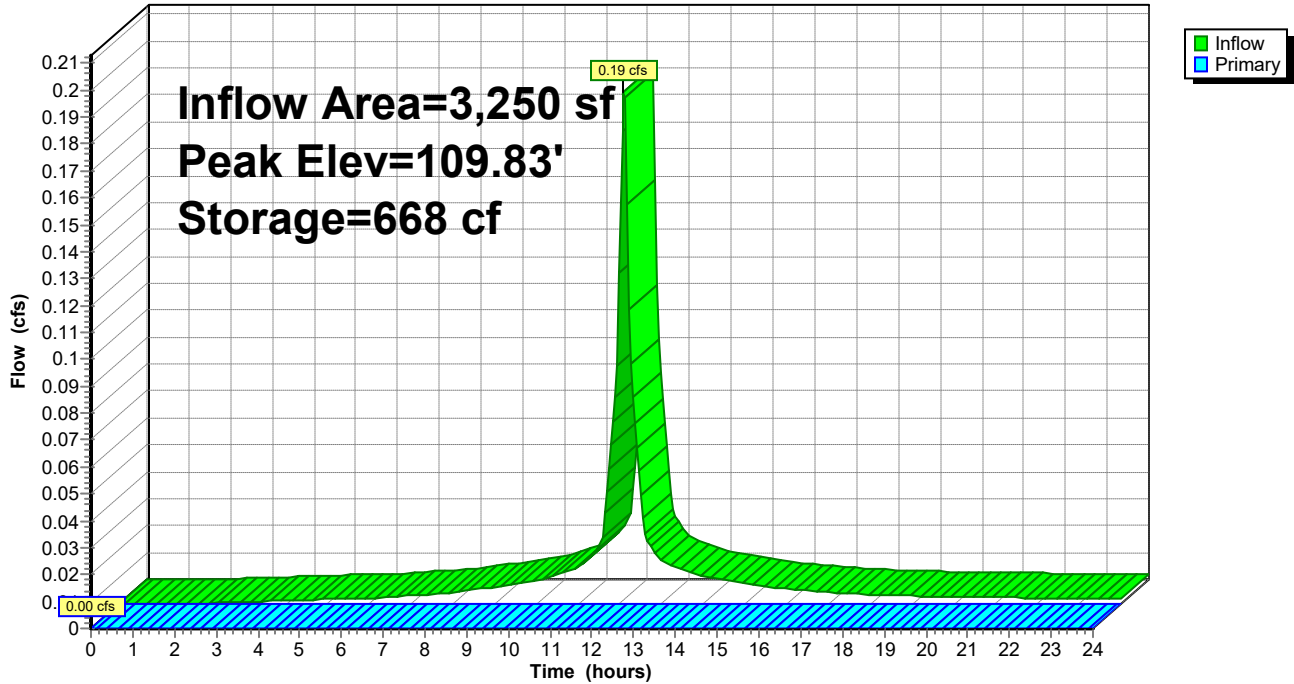
Volume	Invert	Avail.Storage	Storage Description
#1	108.50'	408 cf	6.00'W x 8.00'L x 2.50'H Stone Bed x 18 2,160 cf Overall - 1,140 cf Embedded = 1,020 cf x 40.0% Voids
#2	109.00'	815 cf	Concrete Galley 4x8x2 x 18 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 7.50'L = 45.3 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 8.00'L = 63.4 cf
#3	108.50'	24 cf	2.00'W x 2.00'L x 6.00'H Yard Drain
		1,247 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	112.00'	8.0' long Sharp-Crested Rectangular Weir 2 End Contraction(s)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=108.50' (Free Discharge)
 ↑1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond DB2C-3: 24" High Precast Concrete Galleries

Hydrograph



Stage-Area-Storage for Pond DB2C-3: 24" High Precast Concrete Galleries

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
108.50	0	110.58	1,113	112.66	1,240
108.54	14	110.62	1,135	112.70	1,240
108.58	28	110.66	1,156	112.74	1,240
108.62	42	110.70	1,177	112.78	1,240
108.66	56	110.74	1,198	112.82	1,240
108.70	70	110.78	1,206	112.86	1,241
108.74	84	110.82	1,211	112.90	1,241
108.78	98	110.86	1,216	112.94	1,241
108.82	112	110.90	1,221	112.98	1,241
108.86	126	110.94	1,226	113.02	1,241
108.90	140	110.98	1,231	113.06	1,241
108.94	154	111.02	1,233	113.10	1,242
108.98	168	111.06	1,233	113.14	1,242
109.02	187	111.10	1,234	113.18	1,242
109.06	210	111.14	1,234	113.22	1,242
109.10	234	111.18	1,234	113.26	1,242
109.14	258	111.22	1,234	113.30	1,242
109.18	282	111.26	1,234	113.34	1,243
109.22	305	111.30	1,234	113.38	1,243
109.26	329	111.34	1,235	113.42	1,243
109.30	353	111.38	1,235	113.46	1,243
109.34	377	111.42	1,235	113.50	1,243
109.38	401	111.46	1,235	113.54	1,243
109.42	424	111.50	1,235	113.58	1,244
109.46	448	111.54	1,235	113.62	1,244
109.50	472	111.58	1,236	113.66	1,244
109.54	496	111.62	1,236	113.70	1,244
109.58	519	111.66	1,236	113.74	1,244
109.62	543	111.70	1,236	113.78	1,244
109.66	567	111.74	1,236	113.82	1,244
109.70	591	111.78	1,236	113.86	1,245
109.74	614	111.82	1,236	113.90	1,245
109.78	638	111.86	1,237	113.94	1,245
109.82	662	111.90	1,237	113.98	1,245
109.86	686	111.94	1,237	114.02	1,245
109.90	709	111.98	1,237	114.06	1,245
109.94	733	112.02	1,237	114.10	1,246
109.98	757	112.06	1,237	114.14	1,246
110.02	781	112.10	1,238	114.18	1,246
110.06	804	112.14	1,238	114.22	1,246
110.10	828	112.18	1,238	114.26	1,246
110.14	852	112.22	1,238	114.30	1,246
110.18	876	112.26	1,238	114.34	1,247
110.22	899	112.30	1,238	114.38	1,247
110.26	923	112.34	1,239	114.42	1,247
110.30	947	112.38	1,239	114.46	1,247
110.34	971	112.42	1,239	114.50	1,247
110.38	995	112.46	1,239		
110.42	1,018	112.50	1,239		
110.46	1,042	112.54	1,239		
110.50	1,066	112.58	1,240		
110.54	1,090	112.62	1,240		

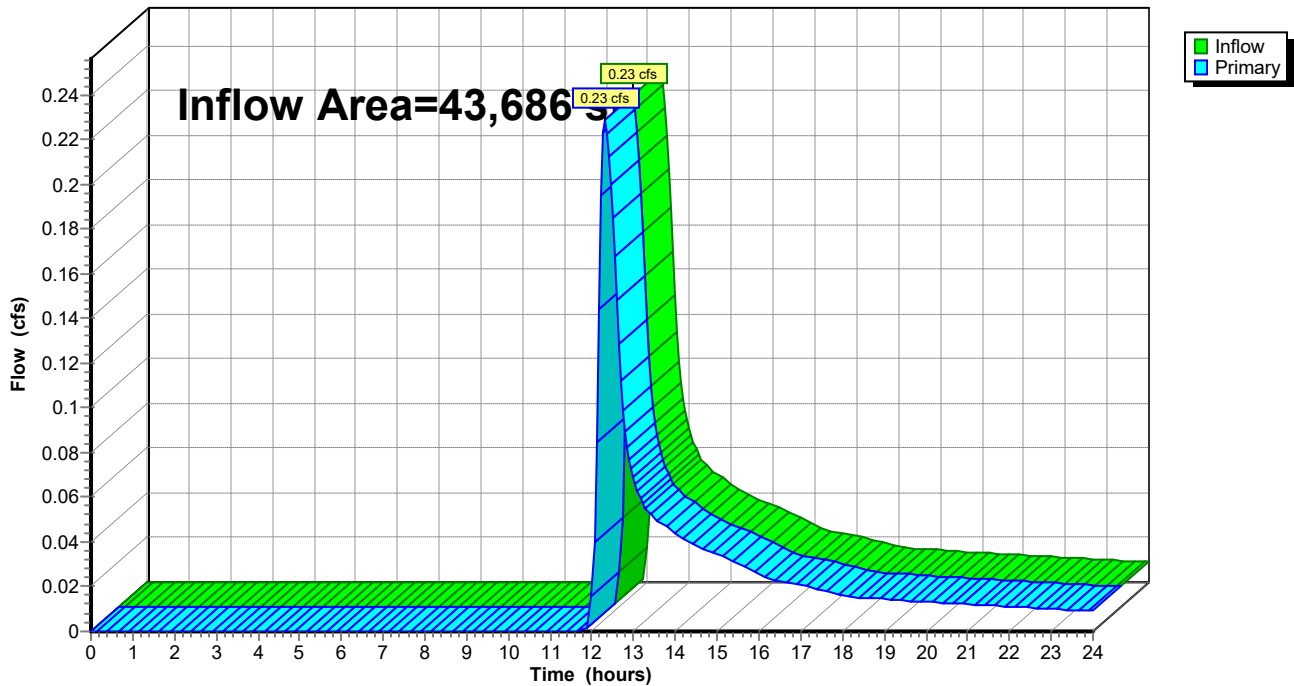
Summary for Link OR2C: Overall Runoff

Inflow Area = 43,686 sf, 13.28% Impervious, Inflow Depth > 0.37" for 1 yr event
Inflow = 0.23 cfs @ 12.30 hrs, Volume= 1,348 cf
Primary = 0.23 cfs @ 12.30 hrs, Volume= 1,348 cf, Atten= 0%, Lag= 0.0 min

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

Link OR2C: Overall Runoff

Hydrograph



90HavilandRd(09-24-24)_Exist&PropConditionsLot2C

Type III 24-hr 2 yr Rainfall=3.50"

Prepared by Kousidis Engineering, LLC

Printed 9/24/2024

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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 PA2C-1: Impervious Area to Runoff Area=1,225 sf 85.71% Impervious Runoff Depth>2.73"
Tc=6.0 min CN=93 Runoff=0.08 cfs 279 cf

Subcatchment PA2C-2: Impervious Area to Runoff Area=2,500 sf 60.00% Impervious Runoff Depth>1.86"
Tc=6.0 min CN=83 Runoff=0.12 cfs 387 cf

Subcatchment PA2C-3: Impervious Area to Runoff Area=3,250 sf 100.00% Impervious Runoff Depth>3.26"
Tc=6.0 min CN=98 Runoff=0.25 cfs 884 cf

Subcatchment PB2C: Proposed Bypass Runoff Area=36,711 sf 0.00% Impervious Runoff Depth>0.85"
Flow Length=237' Tc=16.2 min CN=67 Runoff=0.53 cfs 2,589 cf

Subcatchment XC2C: Existing Conditions Runoff Area=43,696 sf 0.00% Impervious Runoff Depth>0.80"
Flow Length=237' Tc=16.2 min CN=66 Runoff=0.58 cfs 2,901 cf

Pond DB2C-1: 24" High Precast Concrete Peak Elev=113.09' Storage=279 cf Inflow=0.08 cfs 279 cf
Outflow=0.00 cfs 0 cf

Pond DB2C-2: 24" High Precast Concrete Peak Elev=107.50' Storage=387 cf Inflow=0.12 cfs 387 cf
Outflow=0.00 cfs 0 cf

Pond DB2C-3: 24" High Precast Concrete Peak Elev=110.19' Storage=884 cf Inflow=0.25 cfs 884 cf
Outflow=0.00 cfs 0 cf

Link OR2C: Overall Runoff Inflow=0.53 cfs 2,589 cf
Primary=0.53 cfs 2,589 cf

90HavilandRd(09-24-24)_Exist&PropConditionsLot2C

Type III 24-hr 5 yr Rainfall=4.20"

Prepared by Kousidis Engineering, LLC

Printed 9/24/2024

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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 PA2C-1: Impervious Area to Runoff Area=1,225 sf 85.71% Impervious Runoff Depth>3.41"
Tc=6.0 min CN=93 Runoff=0.10 cfs 348 cf

Subcatchment PA2C-2: Impervious Area to Runoff Area=2,500 sf 60.00% Impervious Runoff Depth>2.46"
Tc=6.0 min CN=83 Runoff=0.16 cfs 512 cf

Subcatchment PA2C-3: Impervious Area to Runoff Area=3,250 sf 100.00% Impervious Runoff Depth>3.96"
Tc=6.0 min CN=98 Runoff=0.30 cfs 1,073 cf

Subcatchment PB2C: Proposed Bypass Runoff Area=36,711 sf 0.00% Impervious Runoff Depth>1.26"
Flow Length=237' Tc=16.2 min CN=67 Runoff=0.85 cfs 3,868 cf

Subcatchment XC2C: Existing Conditions Runoff Area=43,696 sf 0.00% Impervious Runoff Depth>1.20"
Flow Length=237' Tc=16.2 min CN=66 Runoff=0.95 cfs 4,378 cf

Pond DB2C-1: 24" High Precast Concrete Peak Elev=113.44' Storage=348 cf Inflow=0.10 cfs 348 cf
Outflow=0.00 cfs 0 cf

Pond DB2C-2: 24" High Precast Concrete Peak Elev=107.92' Storage=512 cf Inflow=0.16 cfs 512 cf
Outflow=0.00 cfs 0 cf

Pond DB2C-3: 24" High Precast Concrete Peak Elev=110.51' Storage=1,073 cf Inflow=0.30 cfs 1,073 cf
Outflow=0.00 cfs 0 cf

Link OR2C: Overall Runoff Inflow=0.85 cfs 3,868 cf
Primary=0.85 cfs 3,868 cf

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 PA2C-1: Impervious Area to	Runoff Area=1,225 sf	85.71% Impervious	Runoff Depth>6.46"
	Tc=6.0 min	CN=93	Runoff=0.19 cfs 660 cf
Subcatchment PA2C-2: Impervious Area to	Runoff Area=2,500 sf	60.00% Impervious	Runoff Depth>5.31"
	Tc=6.0 min	CN=83	Runoff=0.34 cfs 1,106 cf
Subcatchment PA2C-3: Impervious Area to	Runoff Area=3,250 sf	100.00% Impervious	Runoff Depth>7.06"
	Tc=6.0 min	CN=98	Runoff=0.52 cfs 1,911 cf
Subcatchment PB2C: Proposed Bypass	Runoff Area=36,711 sf	0.00% Impervious	Runoff Depth>3.54"
	Flow Length=237'	Tc=16.2 min	CN=67
			Runoff=2.54 cfs 10,818 cf
Subcatchment XC2C: Existing Conditions	Runoff Area=43,696 sf	0.00% Impervious	Runoff Depth>3.43"
	Flow Length=237'	Tc=16.2 min	CN=66
			Runoff=2.93 cfs 12,491 cf
Pond DB2C-1: 24" High Precast Concrete	Peak Elev=114.01'	Storage=418 cf	Inflow=0.19 cfs 660 cf
			Outflow=0.05 cfs 242 cf
Pond DB2C-2: 24" High Precast Concrete	Peak Elev=110.53'	Storage=628 cf	Inflow=0.34 cfs 1,106 cf
			Outflow=0.18 cfs 483 cf
Pond DB2C-3: 24" High Precast Concrete	Peak Elev=112.04'	Storage=1,237 cf	Inflow=0.52 cfs 1,911 cf
			Outflow=0.22 cfs 677 cf
Link OR2C: Overall Runoff			Inflow=2.54 cfs 12,220 cf
			Primary=2.54 cfs 12,220 cf

Directly Connected Impervious Area Tracking Worksheet
City of Stamford Drainage Manual



Note to user: complete all cells of this color only, as indicated by section headings

Part 1: General Information (All Projects)	
Project Name	90 Haviland
Project Address	90 Haviland Road Lot 2A
Project Applicant	Stavros Aivalis
Title of Plan	Site Development Plan
Revision Date of Plan	24-Sep-24
Tax Account Number	003-4226

Part 2: Project Details (All Projects)	
1. What type of development is this? (choose from dropdown)	Redevelopment
2. What is the total area of the project site?	43,696 ft ²
3. What is the total area of land disturbance for this project?	30,000 ft ²
4. Does project site drain to High Quality Waters, a Direct Waterfront, or within 500 ft. of Tidal Wetlands? (Yes/No)	No
Does Standard 1 apply based on information above?	Yes


Part 3: Water Quality Target Total (Only for Standard 1 Projects)	
5. What is the <u>current</u> (pre-development) DCIA for the site?	0 ft ²
6. Will the proposed development increase DCIA (without consideration of proposed stormwater management)? (Yes/No)	Yes
7. What is the <u>proposed-development</u> total impervious area for the site?	5,800 ft ²
Water Quality Volume (WQV)	617.1 ft ³
Standard 1 requirement	Retain WQV on-site
Required retention volume	617.1 ft ³
Provided retention volume for proposed development	2,894.0 ft ³

Part 4: Proposed DCIA Tracking (Only for Standard 1 Projects)	
<u>Pre-development</u> total impervious area	0 ft ²
<u>Current</u> DCIA	0 ft ²
<u>Proposed-development</u> total impervious area	5,800 ft ²
<u>Proposed-development</u> DCIA (after stormwater management)	0 ft ²
<u>Net change in DCIA</u> from <u>current</u> to <u>proposed-development</u>	0 ft ²

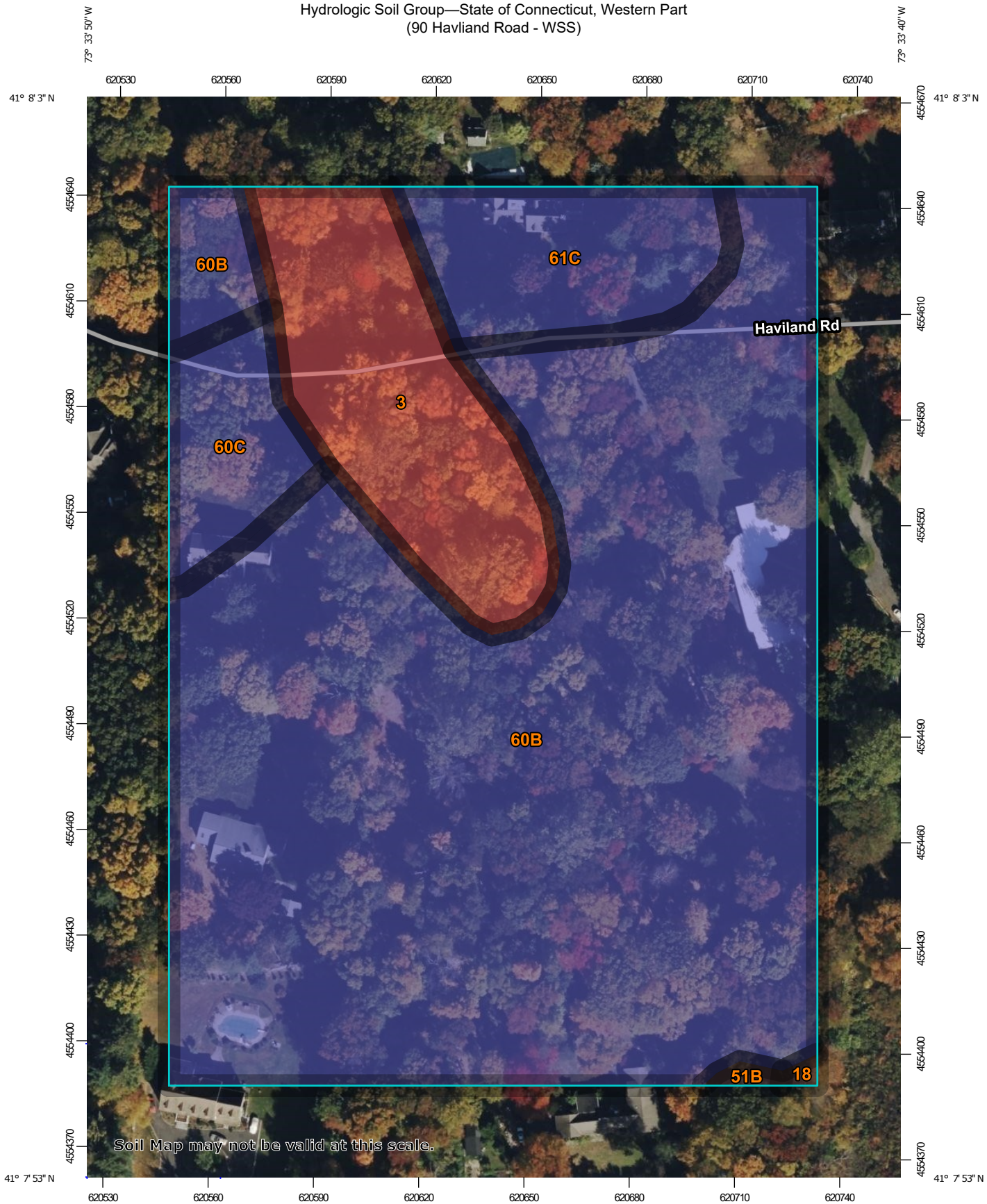
Part 5: Post-Development (As-Built Certified) DCIA Tracking (Only for Standard 1 Projects)	
<u>Post-development</u> (per as-built) total impervious area	ft ²
<u>Post-development</u> (per as-built) DCIA (after stormwater management)	ft ²
<u>Net change in DCIA</u> from <u>current</u> to <u>post-development</u>	ft ²

Certification Statement

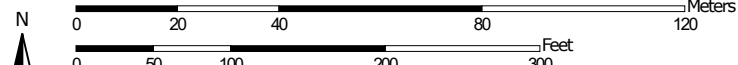
I hereby certify that the information contained in this worksheet is true and correct.

Engineer's Signature J. Verito at 09/24/2024 Engineer's Seal 

Hydrologic Soil Group—State of Connecticut, Western Part
(90 Haviland Road - WSS)



Map Scale: 1:1,490 if printed on A portrait (8.5" x 11") sheet.



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



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	1.5	12.7%
18	Catden and Freetown soils, 0 to 2 percent slopes	B/D	0.0	0.1%
51B	Sutton fine sandy loam, 0 to 8 percent slopes, very stony	B/D	0.0	0.2%
60B	Canton and Charlton fine sandy loams, 3 to 8 percent slopes	B	8.7	74.5%
60C	Canton and Charlton fine sandy loams, 8 to 15 percent slopes	B	0.6	4.7%
61C	Canton and Charlton fine sandy loams, 8 to 15 percent slopes, very stony	B	0.9	7.6%
Totals for Area of Interest			11.7	100.0%

September 24, 2024

Lindsey Cohen
Associate Planner
Land Use Bureau
City of Stamford
888 Washington Boulevard
Stamford, CT 06901

**RE: 90 Haviland Road,
Letter addressing the subdivision of the aforementioned property**

Dear Ms. Cohen,

The owner of 90 Haviland Road is proposing to subdivide the property into two independent parcels. Our firm has provided a “Site Development Plan” and “Drainage Analysis” which depict potential residences, driveways with parking areas, subsurface sewage disposal systems, stormwater detention systems, drinking wells, and a grading scheme for each lot. These plans have been prepared to depict compliance with the City of Stamford Stormwater Drainage Manual dated June 10, 2020, and its applicable standards, as well as the State of Connecticut Public Health Code, last revised January 2024.

With the implementation and maintenance of the stormwater infrastructure, septic systems, grading scheme, and sediment and erosion control measures, no adverse impacts are anticipated to the on-site wetlands or down-gradient properties associated with this potential development. Alterations to any portion of the “Site Development Plan” will require re-analysis of all elements of the plans to ensure consistency with the aforementioned standards, with approvals through the appropriate City departments and Bureaus.

Please feel free to contact me directly with any questions or comments.

Sincerely,



Jim Kousidis, P.E.,
CT Lic. #26830