
HYDROLOGY & STORMWATER MANAGEMENT REPORT

**MALDEN WOODS
WORCESTER, MA**

**August 22, 2018
Revised August 23, 2018
Revised November 1, 2018
Revised February 27, 2019
Revised April 16, 2019
Revised November 5, 2019
Revised February 5, 2020
Revised July 20, 2020**



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**PREPARED BY
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H. S. & T. Group, Inc. used HydroCAD software, Version 10.00-19 to conduct hydrologic analyses. The analysis points have been evaluated under the pre-development and post-development conditions to estimate the stormwater runoff rates under the 2-year, 10-year, 25-year and 100-year, Type III, 24-hour storm events. Rainfall values for each of these return periods have been obtained from the NOAA Atlas 14, Volume 10, Version 3.

The HydroCAD input and output data generated in the analysis for each storm event is included in the appendices to this report. The results are listed below in Table 1:

Storm Event	API	
	Existing	Proposed
2-year	1.04	1.02
10-year	7.60	5.33
25-year	14.63	9.90
100-year	29.40	22.93

Table 1: Pre-development and Post-development Runoff Rates

Massachusetts Stormwater Management Policy Standards

A MassDEP Stormwater Management Checklist is provided in Appendix G.

1. *No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

The standard is met. No new stormwater conveyances discharge untreated stormwater directly to or cause erosion to wetlands or waters of the Commonwealth.

2. *Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.*

The standard is met. The individual building units and Cultec units were also added to the Hydro-Cad model.

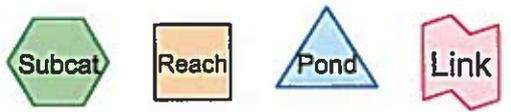
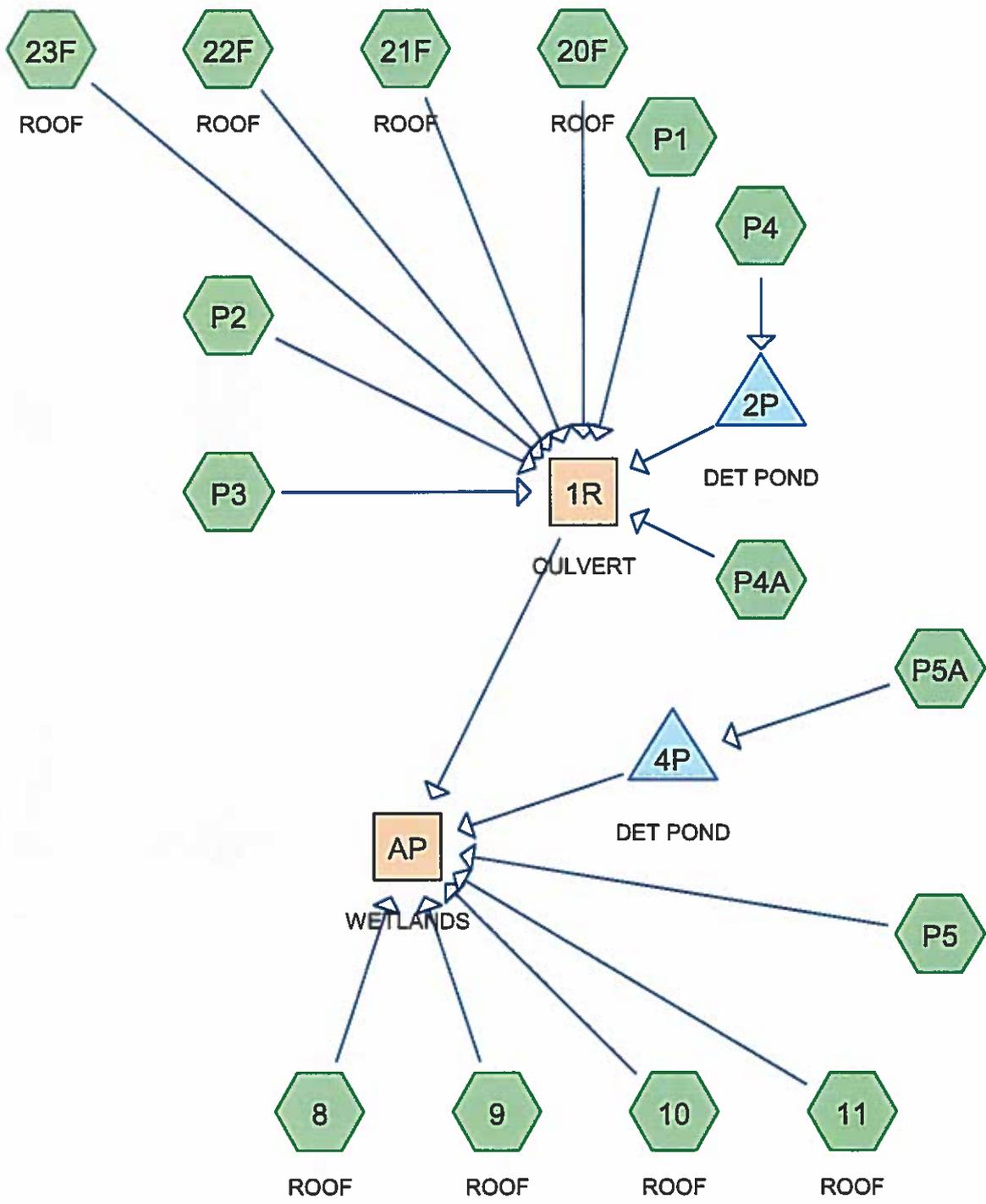
3. *Loss of annual recharge to groundwater should be minimized through the use of infiltration measures to the maximum extent practicable. The annual recharge from the post-development site should approximate the annual recharge rate from the pre-development or existing site conditions, based on soil types.*

On-site soils are described as Hydrologic Soil Group A by the USDA Soil Conservation Service soil report in the areas that are proposed to be impervious.

Total Proposed Impervious areas = 98,000 square feet (sf)

$$\begin{aligned}
 \text{HSG A} &= 0.60'' \text{ of runoff} \times (\text{impervious area}) \\
 &= 0.60'' \times (98,000 \text{ sf}) \times 1\text{ft}/12'' \\
 &= 4,900 \text{ ft.}^3 \text{ required for recharge}
 \end{aligned}$$

2" orifice is at elevation 635.50 providing 4,504 cf of storage, v-notch is at 637.50 providing 11,799 cf, this along with the individual cultec units at the houses should provide an excess of required volume.



Routing Diagram for MALDEN-PR-new
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Time span=0.00-48.00 hrs, dt=0.45 hrs, 108 points x 3
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 8: ROOF	Runoff Area=901 sf 100.00% Impervious Runoff Depth=2.93" Tc=6.0 min CN=98 Runoff=0.04 cfs 220 cf
Subcatchment 9: ROOF	Runoff Area=901 sf 100.00% Impervious Runoff Depth=2.93" Tc=6.0 min CN=98 Runoff=0.04 cfs 220 cf
Subcatchment 10: ROOF	Runoff Area=1,250 sf 100.00% Impervious Runoff Depth=2.93" Tc=6.0 min CN=98 Runoff=0.05 cfs 305 cf
Subcatchment 11: ROOF	Runoff Area=995 sf 100.00% Impervious Runoff Depth=2.93" Tc=6.0 min CN=98 Runoff=0.04 cfs 243 cf
Subcatchment 20F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=2.93" Tc=6.0 min CN=98 Runoff=0.02 cfs 139 cf
Subcatchment 21F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=2.93" Tc=6.0 min CN=98 Runoff=0.02 cfs 139 cf
Subcatchment 22F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=2.93" Tc=6.0 min CN=98 Runoff=0.02 cfs 139 cf
Subcatchment 23F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=2.93" Tc=6.0 min CN=98 Runoff=0.02 cfs 139 cf
Subcatchment P1:	Runoff Area=195,620 sf 0.00% Impervious Runoff Depth=0.33" Flow Length=970' Tc=16.8 min CN=58 Runoff=0.53 cfs 5,335 cf
Subcatchment P2:	Runoff Area=138,097 sf 4.21% Impervious Runoff Depth=0.21" Flow Length=570' Slope=0.0100 '/ Tc=16.1 min CN=54 Runoff=0.19 cfs 2,447 cf
Subcatchment P3:	Runoff Area=54,613 sf 31.50% Impervious Runoff Depth=0.33" Flow Length=480' Tc=15.2 min CN=58 Runoff=0.14 cfs 1,489 cf
Subcatchment P4:	Runoff Area=86,743 sf 13.89% Impervious Runoff Depth=0.27" Flow Length=750' Tc=10.6 min CN=56 Runoff=0.16 cfs 1,931 cf
Subcatchment P4A:	Runoff Area=53,316 sf 34.12% Impervious Runoff Depth=0.24" Tc=6.0 min CN=55 Runoff=0.08 cfs 1,063 cf
Subcatchment P5:	Runoff Area=64,488 sf 3.92% Impervious Runoff Depth=0.00" Tc=6.0 min CN=38 Runoff=0.00 cfs 0 cf
Subcatchment P5A:	Runoff Area=239,339 sf 32.02% Impervious Runoff Depth=0.50" Flow Length=1,240' Tc=9.6 min CN=63 Runoff=1.33 cfs 10,004 cf
Reach 1R: CULVERT	Avg. Flow Depth=0.43' Max Vel=0.84 fps Inflow=0.96 cfs 11,095 cf n=0.035 L=42.0' S=0.0031 '/ Capacity=32.30 cfs Outflow=0.97 cfs 11,095 cf

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Type III 24-hr 2yr Rainfall=3.16"

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Reach AP: WETLANDS

Inflow=1.02 cfs 12,082 cf
Outflow=1.02 cfs 12,082 cf

Pond 2P: DET POND

Peak Elev=637.08' Storage=1,867 cf Inflow=0.16 cfs 1,931 cf
Outflow=0.01 cfs 207 cf

Pond 4P: DET POND

Peak Elev=634.47' Storage=1,852 cf Inflow=1.33 cfs 10,004 cf
Discarded=0.56 cfs 10,068 cf Primary=0.00 cfs 0 cf Outflow=0.56 cfs 10,068 cf

Total Runoff Area = 838,535 sf Runoff Volume = 23,811 cf Average Runoff Depth = 0.34"
83.45% Pervious = 699,791 sf 16.55% Impervious = 138,744 sf

Summary for Subcatchment 8: ROOF

Runoff = 0.04 cfs @ 12.13 hrs, Volume= 220 cf, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 2yr Rainfall=3.16"

Area (sf)	CN	Description
901	98	Roofs, HSG A
901		100.00% Impervious Area

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

Summary for Subcatchment 9: ROOF

Runoff = 0.04 cfs @ 12.13 hrs, Volume= 220 cf, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 2yr Rainfall=3.16"

Area (sf)	CN	Description
901	98	Roofs, HSG A
901		100.00% Impervious Area

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

Summary for Subcatchment 10: ROOF

Runoff = 0.05 cfs @ 12.13 hrs, Volume= 305 cf, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 2yr Rainfall=3.16"

Area (sf)	CN	Description
1,250	98	Roofs, HSG A
1,250		100.00% Impervious Area

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

Summary for Subcatchment 11: ROOF

Runoff = 0.04 cfs @ 12.13 hrs, Volume= 243 cf, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 2yr Rainfall=3.16"

Area (sf)	CN	Description
995	98	Roofs, HSG A
995		100.00% Impervious Area

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

Summary for Subcatchment 20F: ROOF

Runoff = 0.02 cfs @ 12.13 hrs, Volume= 139 cf, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 2yr Rainfall=3.16"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

Summary for Subcatchment 21F: ROOF

Runoff = 0.02 cfs @ 12.13 hrs, Volume= 139 cf, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 2yr Rainfall=3.16"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

Summary for Subcatchment 22F: ROOF

Runoff = 0.02 cfs @ 12.13 hrs, Volume= 139 cf, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 2yr Rainfall=3.16"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

Summary for Subcatchment 23F: ROOF

Runoff = 0.02 cfs @ 12.13 hrs, Volume= 139 cf, Depth= 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 2yr Rainfall=3.16"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

Summary for Subcatchment P1:

Runoff = 0.53 cfs @ 12.61 hrs, Volume= 5,335 cf, Depth= 0.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 2yr Rainfall=3.16"

Area (sf)	CN	Description
5,530	30	Woods, Good, HSG A
36,594	55	Woods, Good, HSG B
52,829	70	Woods, Good, HSG C
1,710	77	Woods, Good, HSG D
60,418	39	>75% Grass cover, Good, HSG A
2,853	61	>75% Grass cover, Good, HSG B
13,940	74	>75% Grass cover, Good, HSG C
21,746	80	>75% Grass cover, Good, HSG D
195,620	58	Weighted Average
195,620		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0280	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	90	0.0470	1.08		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
4.6	830		3.00		Direct Entry, CHANNEL
16.8	970	Total			

Summary for Subcatchment P2:

Runoff = 0.19 cfs @ 12.69 hrs, Volume= 2,447 cf, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 2yr Rainfall=3.16"

Area (sf)	CN	Description
* 35,541	89	Woods, WETLAND, HSG D
96,747	39	>75% Grass cover, Good, HSG A
* 5,809	98	IMPERVIOUS
138,097	54	Weighted Average
132,288		95.79% Pervious Area
5,809		4.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0100	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.1	130	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.2	390		3.00		Direct Entry, CHANNEL
16.1	570	Total			

Summary for Subcatchment P3:

Runoff = 0.14 cfs @ 12.59 hrs, Volume= 1,489 cf, Depth= 0.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 2yr Rainfall=3.16"

Area (sf)	CN	Description
34,603	39	>75% Grass cover, Good, HSG A
* 17,203	98	IMPERVIOUS
1,815	30	Woods, Good, HSG A
* 992	89	WOODS wetland D
54,613	58	Weighted Average
37,410		68.50% Pervious Area
17,203		31.50% Impervious Area

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Type III 24-hr 2yr Rainfall=3.16"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.0250	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
10.1	430	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
15.2	480	Total			

Summary for Subcatchment P4:

Runoff = 0.16 cfs @ 12.59 hrs, Volume= 1,931 cf, Depth= 0.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 2yr Rainfall=3.16"

Area (sf)	CN	Description
20,000	39	>75% Grass cover, Good, HSG A
13,000	39	>75% Grass cover, Good, HSG A
36,691	61	>75% Grass cover, Good, HSG B
* 12,052	98	IMPERVIOUS
5,000	30	Woods, Good, HSG A
86,743	56	Weighted Average
74,691		86.11% Pervious Area
12,052		13.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0600	0.16		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
1.9	250	0.0950	2.16		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	150	0.0860	1.47		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.7	300		3.00		Direct Entry, CHANNEL
10.6	750	Total			

Summary for Subcatchment P4A:

Runoff = 0.08 cfs @ 12.54 hrs, Volume= 1,063 cf, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 2yr Rainfall=3.16"

Area (sf)	CN	Description
27,845	30	Woods, Good, HSG A
6,773	39	>75% Grass cover, Good, HSG A
507	74	>75% Grass cover, Good, HSG C
* 18,191	98	IMPERVIOUS
53,316	55	Weighted Average
35,125		65.88% Pervious Area
18,191		34.12% Impervious Area

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

Summary for Subcatchment P5:

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 2yr Rainfall=3.16"

Area (sf)	CN	Description
* 2,526	98	IMPERVIOUS HSG A
36,455	39	>75% Grass cover, Good, HSG A
25,507	30	Woods, Good, HSG A
64,488	38	Weighted Average
61,962		96.08% Pervious Area
2,526		3.92% Impervious Area

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

Summary for Subcatchment P5A:

Runoff = 1.33 cfs @ 12.27 hrs, Volume= 10,004 cf, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 2yr Rainfall=3.16"

Area (sf)	CN	Description
* 76,644	98	IMPERVIOUS HSG A
120,195	39	>75% Grass cover, Good, HSG A
28,396	61	>75% Grass cover, Good, HSG B
14,104	74	>75% Grass cover, Good, HSG C
239,339	63	Weighted Average
162,695		67.98% Pervious Area
76,644		32.02% Impervious Area

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Type III 24-hr 2yr Rainfall=3.16"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	40	0.0500	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
0.1	40	0.2000	7.20		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.2	260	0.0480	3.53		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
5.0	900		3.00		Direct Entry, gutter and pipe flow
9.6	1,240	Total			

Summary for Reach 1R: CULVERT

Inflow Area = 530,661 sf, 10.46% Impervious, Inflow Depth > 0.25" for 2yr event
 Inflow = 0.96 cfs @ 12.60 hrs, Volume= 11,095 cf
 Outflow = 0.97 cfs @ 12.61 hrs, Volume= 11,095 cf, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3
 Max. Velocity= 0.84 fps, Min. Travel Time= 0.8 min
 Avg. Velocity = 0.28 fps, Avg. Travel Time= 2.5 min

Peak Storage= 48 cf @ 12.61 hrs
 Average Depth at Peak Storage= 0.43'
 Bank-Full Depth= 1.60' Flow Area= 16.0 sf, Capacity= 32.30 cfs

Custom cross-section, Length= 42.0' Slope= 0.0031 '
 Constant n= 0.035 High grass
 Inlet Invert= 633.80', Outlet Invert= 633.67'



‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	635.40	0.00
9.50	633.80	1.60
20.00	635.40	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.60	16.0	20.3	672	32.30

Summary for Reach AP: WETLANDS

Inflow Area = 838,535 sf, 16.55% Impervious, Inflow Depth > 0.17" for 2yr event
 Inflow = 1.02 cfs @ 12.57 hrs, Volume= 12,082 cf
 Outflow = 1.02 cfs @ 12.57 hrs, Volume= 12,082 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3

Summary for Pond 2P: DET POND

Inflow Area = 86,743 sf, 13.89% Impervious, Inflow Depth = 0.27" for 2yr event
 Inflow = 0.16 cfs @ 12.59 hrs, Volume= 1,931 cf
 Outflow = 0.01 cfs @ 24.10 hrs, Volume= 207 cf, Atten= 94%, Lag= 690.5 min
 Primary = 0.01 cfs @ 24.10 hrs, Volume= 207 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3
 Peak Elev= 637.08' @ 24.10 hrs Surf.Area= 2,089 sf Storage= 1,867 cf

Plug-Flow detention time= 912.4 min calculated for 205 cf (11% of inflow)
 Center-of-Mass det. time= 704.8 min (1,658.7 - 953.9)

Volume	Invert	Avail.Storage	Storage Description
#1	636.00'	11,054 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
636.00	1,366	0	0
638.00	2,705	4,071	4,071
640.00	4,278	6,983	11,054

Device	Routing	Invert	Outlet Devices
#1	Primary	637.00'	24.0" Round Culvert L= 44.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 637.00' / 636.50' S= 0.0114 ' S= 0.0114 ' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	637.00'	2.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	638.50'	2.7' long x 1.40' rise Sharp-Crested Vee/Trap Weir Cv= 2.62 (C= 3.28)

Primary OutFlow Max=0.01 cfs @ 24.10 hrs HW=637.08' TW=633.96' (Dynamic Tailwater)

- 1=Culvert (Passes 0.01 cfs of 0.04 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.01 cfs @ 0.96 fps)
- 3=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

Summary for Pond 4P: DET POND

Inflow Area = 239,339 sf, 32.02% Impervious, Inflow Depth = 0.50" for 2yr event
 Inflow = 1.33 cfs @ 12.27 hrs, Volume= 10,004 cf
 Outflow = 0.56 cfs @ 13.02 hrs, Volume= 10,068 cf, Atten= 58%, Lag= 45.1 min
 Discarded = 0.56 cfs @ 13.02 hrs, Volume= 10,068 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3

Peak Elev= 634.47' @ 13.02 hrs Surf.Area= 2,224 sf Storage= 1,852 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 30.0 min (939.3 - 909.2)

Volume	Invert	Avail.Storage	Storage Description
#1	633.50'	25,452 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
633.50	1,630	0	0
634.00	1,915	886	886
636.00	3,240	5,155	6,041
638.00	4,800	8,040	14,081
638.50	5,230	2,508	16,589
640.00	6,588	8,864	25,452

Device	Routing	Invert	Outlet Devices
#1	Discarded	633.50'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 631.00'
#2	Primary	635.00'	24.0" Round Culvert L= 44.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 635.00' / 634.50' S= 0.0114 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#3	Device 2	635.50'	2.0" Vert. Orifice/Grate C= 0.600
#4	Device 2	637.50'	2.7' long x 1.40' rise Sharp-Crested Vee/Trap Weir Cv= 2.62 (C= 3.28)

Discarded OutFlow Max=0.56 cfs @ 13.02 hrs HW=634.46' (Free Discharge)

←1=Exfiltration (Controls 0.56 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=633.50' TW=0.00' (Dynamic Tailwater)

←2=Culvert (Controls 0.00 cfs)

←3=Orifice/Grate (Controls 0.00 cfs)

←4=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

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Type III 24-hr 10yr Rainfall=4.89"

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Time span=0.00-48.00 hrs, dt=0.45 hrs, 108 points x 3
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 8: ROOF	Runoff Area=901 sf 100.00% Impervious Runoff Depth=4.65" Tc=6.0 min CN=98 Runoff=0.06 cfs 349 cf
Subcatchment 9: ROOF	Runoff Area=901 sf 100.00% Impervious Runoff Depth=4.65" Tc=6.0 min CN=98 Runoff=0.06 cfs 349 cf
Subcatchment 10: ROOF	Runoff Area=1,250 sf 100.00% Impervious Runoff Depth=4.65" Tc=6.0 min CN=98 Runoff=0.08 cfs 485 cf
Subcatchment 11: ROOF	Runoff Area=995 sf 100.00% Impervious Runoff Depth=4.65" Tc=6.0 min CN=98 Runoff=0.07 cfs 386 cf
Subcatchment 20F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=4.65" Tc=6.0 min CN=98 Runoff=0.04 cfs 220 cf
Subcatchment 21F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=4.65" Tc=6.0 min CN=98 Runoff=0.04 cfs 220 cf
Subcatchment 22F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=4.65" Tc=6.0 min CN=98 Runoff=0.04 cfs 220 cf
Subcatchment 23F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=4.65" Tc=6.0 min CN=98 Runoff=0.04 cfs 220 cf
Subcatchment P1:	Runoff Area=195,620 sf 0.00% Impervious Runoff Depth=1.11" Flow Length=970' Tc=16.8 min CN=58 Runoff=2.46 cfs 18,075 cf
Subcatchment P2:	Runoff Area=138,097 sf 4.21% Impervious Runoff Depth=0.87" Flow Length=570' Slope=0.0100 '/ Tc=16.1 min CN=54 Runoff=1.16 cfs 9,982 cf
Subcatchment P3:	Runoff Area=54,613 sf 31.50% Impervious Runoff Depth=1.11" Flow Length=480' Tc=15.2 min CN=58 Runoff=0.72 cfs 5,046 cf
Subcatchment P4:	Runoff Area=86,743 sf 13.89% Impervious Runoff Depth=0.99" Flow Length=750' Tc=10.6 min CN=56 Runoff=1.08 cfs 7,123 cf
Subcatchment P4A:	Runoff Area=53,316 sf 34.12% Impervious Runoff Depth=0.93" Tc=6.0 min CN=55 Runoff=0.68 cfs 4,113 cf
Subcatchment P5:	Runoff Area=64,488 sf 3.92% Impervious Runoff Depth=0.15" Tc=6.0 min CN=38 Runoff=0.03 cfs 793 cf
Subcatchment P5A:	Runoff Area=239,339 sf 32.02% Impervious Runoff Depth=1.44" Flow Length=1,240' Tc=9.6 min CN=63 Runoff=5.17 cfs 28,714 cf
Reach 1R: CULVERT	Avg. Flow Depth=0.83' Max Vel=1.24 fps Inflow=5.14 cfs 43,486 cf n=0.035 L=42.0' S=0.0031 '/ Capacity=32.30 cfs Outflow=5.06 cfs 43,486 cf

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Type III 24-hr 10yr Rainfall=4.89"

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Reach AP: WETLANDS

Inflow=5.33 cfs 46,832 cf
Outflow=5.33 cfs 46,832 cf

Pond 2P: DET POND

Peak Elev=638.00' Storage=4,061 cf Inflow=1.08 cfs 7,123 cf
Outflow=0.10 cfs 5,388 cf

Pond 4P: DET POND

Peak Elev=636.80' Storage=8,891 cf Inflow=5.17 cfs 28,714 cf
Discarded=1.34 cfs 27,788 cf Primary=0.12 cfs 984 cf Outflow=1.46 cfs 28,773 cf

**Total Runoff Area = 838,535 sf Runoff Volume = 76,297 cf Average Runoff Depth = 1.09"
83.45% Pervious = 699,791 sf 16.55% Impervious = 138,744 sf**

Summary for Subcatchment 8: ROOF

Runoff = 0.06 cfs @ 12.13 hrs, Volume= 349 cf, Depth= 4.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 10yr Rainfall=4.89"

Area (sf)	CN	Description
901	98	Roofs, HSG A
901		100.00% Impervious Area

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

Summary for Subcatchment 9: ROOF

Runoff = 0.06 cfs @ 12.13 hrs, Volume= 349 cf, Depth= 4.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 10yr Rainfall=4.89"

Area (sf)	CN	Description
901	98	Roofs, HSG A
901		100.00% Impervious Area

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

Summary for Subcatchment 10: ROOF

Runoff = 0.08 cfs @ 12.13 hrs, Volume= 485 cf, Depth= 4.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 10yr Rainfall=4.89"

Area (sf)	CN	Description
1,250	98	Roofs, HSG A
1,250		100.00% Impervious Area

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

Summary for Subcatchment 11: ROOF

Runoff = 0.07 cfs @ 12.13 hrs, Volume= 386 cf, Depth= 4.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 10yr Rainfall=4.89"

Area (sf)	CN	Description
995	98	Roofs, HSG A
995		100.00% Impervious Area

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

Summary for Subcatchment 20F: ROOF

Runoff = 0.04 cfs @ 12.13 hrs, Volume= 220 cf, Depth= 4.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 10yr Rainfall=4.89"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

Summary for Subcatchment 21F: ROOF

Runoff = 0.04 cfs @ 12.13 hrs, Volume= 220 cf, Depth= 4.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 10yr Rainfall=4.89"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

Summary for Subcatchment 22F: ROOF

Runoff = 0.04 cfs @ 12.13 hrs, Volume= 220 cf, Depth= 4.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 10yr Rainfall=4.89"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

Summary for Subcatchment 23F: ROOF

Runoff = 0.04 cfs @ 12.13 hrs, Volume= 220 cf, Depth= 4.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 10yr Rainfall=4.89"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

Summary for Subcatchment P1:

Runoff = 2.46 cfs @ 12.34 hrs, Volume= 18,075 cf, Depth= 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 10yr Rainfall=4.89"

Area (sf)	CN	Description
5,530	30	Woods, Good, HSG A
36,594	55	Woods, Good, HSG B
52,829	70	Woods, Good, HSG C
1,710	77	Woods, Good, HSG D
60,418	39	>75% Grass cover, Good, HSG A
2,853	61	>75% Grass cover, Good, HSG B
13,940	74	>75% Grass cover, Good, HSG C
21,746	80	>75% Grass cover, Good, HSG D
195,620	58	Weighted Average
195,620		100.00% Pervious Area

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Type III 24-hr 10yr Rainfall=4.89"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0280	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	90	0.0470	1.08		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
4.6	830		3.00		Direct Entry, CHANNEL
16.8	970	Total			

Summary for Subcatchment P2:

Runoff = 1.16 cfs @ 12.42 hrs, Volume= 9,982 cf, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 10yr Rainfall=4.89"

Area (sf)	CN	Description
* 35,541	89	Woods, WETLAND, HSG D
96,747	39	>75% Grass cover, Good, HSG A
* 5,809	98	IMPERVIOUS
138,097	54	Weighted Average
132,288		95.79% Pervious Area
5,809		4.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0100	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.1	130	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.2	390		3.00		Direct Entry, CHANNEL
16.1	570	Total			

Summary for Subcatchment P3:

Runoff = 0.72 cfs @ 12.30 hrs, Volume= 5,046 cf, Depth= 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 10yr Rainfall=4.89"

Area (sf)	CN	Description
34,603	39	>75% Grass cover, Good, HSG A
* 17,203	98	IMPERVIOUS
1,815	30	Woods, Good, HSG A
* 992	89	WOODS wetland D
54,613	58	Weighted Average
37,410		68.50% Pervious Area
17,203		31.50% Impervious Area

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Type III 24-hr 10yr Rainfall=4.89"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.0250	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
10.1	430	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
15.2	480	Total			

Summary for Subcatchment P4:

Runoff = 1.08 cfs @ 12.25 hrs, Volume= 7,123 cf, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 10yr Rainfall=4.89"

Area (sf)	CN	Description
20,000	39	>75% Grass cover, Good, HSG A
13,000	39	>75% Grass cover, Good, HSG A
36,691	61	>75% Grass cover, Good, HSG B
* 12,052	98	IMPERVIOUS
5,000	30	Woods, Good, HSG A
86,743	56	Weighted Average
74,691		86.11% Pervious Area
12,052		13.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0600	0.16		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
1.9	250	0.0950	2.16		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	150	0.0860	1.47		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.7	300		3.00		Direct Entry, CHANNEL
10.6	750	Total			

Summary for Subcatchment P4A:

Runoff = 0.68 cfs @ 12.21 hrs, Volume= 4,113 cf, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 10yr Rainfall=4.89"

Area (sf)	CN	Description
27,845	30	Woods, Good, HSG A
6,773	39	>75% Grass cover, Good, HSG A
507	74	>75% Grass cover, Good, HSG C
* 18,191	98	IMPERVIOUS
53,316	55	Weighted Average
35,125		65.88% Pervious Area
18,191		34.12% Impervious Area

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

Summary for Subcatchment P5:

Runoff = 0.03 cfs @ 14.10 hrs, Volume= 793 cf, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 10yr Rainfall=4.89"

Area (sf)	CN	Description
* 2,526	98	IMPERVIOUS HSG A
36,455	39	>75% Grass cover, Good, HSG A
25,507	30	Woods, Good, HSG A
64,488	38	Weighted Average
61,962		96.08% Pervious Area
2,526		3.92% Impervious Area

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

Summary for Subcatchment P5A:

Runoff = 5.17 cfs @ 12.21 hrs, Volume= 28,714 cf, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 10yr Rainfall=4.89"

Area (sf)	CN	Description
* 76,644	98	IMPERVIOUS HSG A
120,195	39	>75% Grass cover, Good, HSG A
28,396	61	>75% Grass cover, Good, HSG B
14,104	74	>75% Grass cover, Good, HSG C
239,339	63	Weighted Average
162,695		67.98% Pervious Area
76,644		32.02% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	40	0.0500	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
0.1	40	0.2000	7.20		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.2	260	0.0480	3.53		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
5.0	900		3.00		Direct Entry, gutter and pipe flow
9.6	1,240	Total			

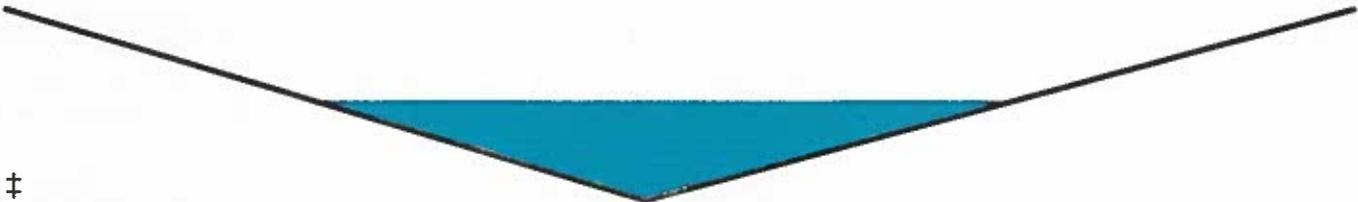
Summary for Reach 1R: CULVERT

Inflow Area = 530,661 sf, 10.46% Impervious, Inflow Depth > 0.98" for 10yr event
 Inflow = 5.14 cfs @ 12.32 hrs, Volume= 43,486 cf
 Outflow = 5.06 cfs @ 12.35 hrs, Volume= 43,486 cf, Atten= 2%, Lag= 1.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3
 Max. Velocity= 1.24 fps, Min. Travel Time= 0.6 min
 Avg. Velocity = 0.38 fps, Avg. Travel Time= 1.8 min

Peak Storage= 171 cf @ 12.35 hrs
 Average Depth at Peak Storage= 0.83'
 Bank-Full Depth= 1.60' Flow Area= 16.0 sf, Capacity= 32.30 cfs

Custom cross-section, Length= 42.0' Slope= 0.0031 '/
 Constant n= 0.035 High grass
 Inlet Invert= 633.80', Outlet Invert= 633.67'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	635.40	0.00
9.50	633.80	1.60
20.00	635.40	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.60	16.0	20.3	672	32.30

Summary for Reach AP: WETLANDS

Inflow Area = 838,535 sf, 16.55% Impervious, Inflow Depth > 0.67" for 10yr event
 Inflow = 5.33 cfs @ 12.34 hrs, Volume= 46,832 cf
 Outflow = 5.33 cfs @ 12.34 hrs, Volume= 46,832 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3

Summary for Pond 2P: DET POND

Inflow Area = 86,743 sf, 13.89% Impervious, Inflow Depth = 0.99" for 10yr event
 Inflow = 1.08 cfs @ 12.25 hrs, Volume= 7,123 cf
 Outflow = 0.10 cfs @ 16.93 hrs, Volume= 5,388 cf, Atten= 91%, Lag= 281.2 min
 Primary = 0.10 cfs @ 16.93 hrs, Volume= 5,388 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3
 Peak Elev= 638.00' @ 16.93 hrs Surf.Area= 2,702 sf Storage= 4,061 cf

Plug-Flow detention time= 471.3 min calculated for 5,388 cf (76% of inflow)
 Center-of-Mass det. time= 374.2 min (1,269.3 - 895.1)

Volume	Invert	Avail.Storage	Storage Description
#1	636.00'	11,054 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
636.00	1,366	0	0
638.00	2,705	4,071	4,071
640.00	4,278	6,983	11,054

Device	Routing	Invert	Outlet Devices
#1	Primary	637.00'	24.0" Round Culvert L= 44.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 637.00' / 636.50' S= 0.0114 ' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	637.00'	2.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	638.50'	2.7' long x 1.40' rise Sharp-Crested Vee/Trap Weir Cv= 2.62 (C= 3.28)

Primary OutFlow Max=0.10 cfs @ 16.93 hrs HW=638.00' TW=634.17' (Dynamic Tailwater)

- 1=Culvert (Passes 0.10 cfs of 5.36 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.10 cfs @ 4.60 fps)
- 3=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

Summary for Pond 4P: DET POND

Inflow Area = 239,339 sf, 32.02% Impervious, Inflow Depth = 1.44" for 10yr event
 Inflow = 5.17 cfs @ 12.21 hrs, Volume= 28,714 cf
 Outflow = 1.46 cfs @ 13.04 hrs, Volume= 28,773 cf, Atten= 72%, Lag= 50.0 min
 Discarded = 1.34 cfs @ 13.04 hrs, Volume= 27,788 cf
 Primary = 0.12 cfs @ 13.04 hrs, Volume= 984 cf

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3
 Peak Elev= 636.80' @ 13.04 hrs Surf.Area= 3,866 sf Storage= 8,891 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 72.5 min (943.8 - 871.3)

Volume	Invert	Avail.Storage	Storage Description
#1	633.50'	25,452 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
633.50	1,630	0	0
634.00	1,915	886	886
636.00	3,240	5,155	6,041
638.00	4,800	8,040	14,081
638.50	5,230	2,508	16,589
640.00	6,588	8,864	25,452

Device	Routing	Invert	Outlet Devices
#1	Discarded	633.50'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 631.00'
#2	Primary	635.00'	24.0" Round Culvert L= 44.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 635.00' / 634.50' S= 0.0114 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#3	Device 2	635.50'	2.0" Vert. Orifice/Grate C= 0.600
#4	Device 2	637.50'	2.7' long x 1.40' rise Sharp-Crested Vee/Trap Weir Cv= 2.62 (C= 3.28)

Discarded OutFlow Max=1.34 cfs @ 13.04 hrs HW=636.80' (Free Discharge)

←1=Exfiltration (Controls 1.34 cfs)

Primary OutFlow Max=0.12 cfs @ 13.04 hrs HW=636.80' TW=0.00' (Dynamic Tailwater)

←2=Culvert (Passes 0.12 cfs of 13.74 cfs potential flow)

←3=Orifice/Grate (Orifice Controls 0.12 cfs @ 5.31 fps)

←4=Sharp-Crested Vee/Trap Weir (Controls 0.00 cfs)

Time span=0.00-48.00 hrs, dt=0.45 hrs, 108 points x 3
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 8: ROOF	Runoff Area=901 sf 100.00% Impervious Runoff Depth=5.73" Tc=6.0 min CN=98 Runoff=0.07 cfs 430 cf
Subcatchment 9: ROOF	Runoff Area=901 sf 100.00% Impervious Runoff Depth=5.73" Tc=6.0 min CN=98 Runoff=0.07 cfs 430 cf
Subcatchment 10: ROOF	Runoff Area=1,250 sf 100.00% Impervious Runoff Depth=5.73" Tc=6.0 min CN=98 Runoff=0.10 cfs 597 cf
Subcatchment 11: ROOF	Runoff Area=995 sf 100.00% Impervious Runoff Depth=5.73" Tc=6.0 min CN=98 Runoff=0.08 cfs 475 cf
Subcatchment 20F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=5.73" Tc=6.0 min CN=98 Runoff=0.05 cfs 271 cf
Subcatchment 21F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=5.73" Tc=6.0 min CN=98 Runoff=0.05 cfs 271 cf
Subcatchment 22F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=5.73" Tc=6.0 min CN=98 Runoff=0.05 cfs 271 cf
Subcatchment 23F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=5.73" Tc=6.0 min CN=98 Runoff=0.05 cfs 271 cf
Subcatchment P1:	Runoff Area=195,620 sf 0.00% Impervious Runoff Depth=1.74" Flow Length=970' Tc=16.8 min CN=58 Runoff=4.28 cfs 28,335 cf
Subcatchment P2:	Runoff Area=138,097 sf 4.21% Impervious Runoff Depth=1.42" Flow Length=570' Slope=0.0100 '/ Tc=16.1 min CN=54 Runoff=2.33 cfs 16,384 cf
Subcatchment P3:	Runoff Area=54,613 sf 31.50% Impervious Runoff Depth=1.74" Flow Length=480' Tc=15.2 min CN=58 Runoff=1.25 cfs 7,910 cf
Subcatchment P4:	Runoff Area=86,743 sf 13.89% Impervious Runoff Depth=1.58" Flow Length=750' Tc=10.6 min CN=56 Runoff=1.95 cfs 11,411 cf
Subcatchment P4A:	Runoff Area=53,316 sf 34.12% Impervious Runoff Depth=1.50" Tc=6.0 min CN=55 Runoff=1.22 cfs 6,667 cf
Subcatchment P5:	Runoff Area=64,488 sf 3.92% Impervious Runoff Depth=0.39" Tc=6.0 min CN=38 Runoff=0.14 cfs 2,070 cf
Subcatchment P5A:	Runoff Area=239,339 sf 32.02% Impervious Runoff Depth=2.16" Flow Length=1,240' Tc=9.6 min CN=63 Runoff=8.08 cfs 42,991 cf
Reach 1R: CULVERT	Avg. Flow Depth=1.02' Max Vel=1.45 fps Inflow=9.23 cfs 70,048 cf n=0.035 L=42.0' S=0.0031 '/ Capacity=32.30 cfs Outflow=9.09 cfs 70,048 cf

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Type III 24-hr 25yr Rainfall=5.97"

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Reach AP: WETLANDS

Inflow=9.90 cfs 79,059 cf
Outflow=9.90 cfs 79,059 cf

Pond 2P: DET POND

Peak Elev=638.58' Storage=5,785 cf Inflow=1.95 cfs 11,411 cf
Outflow=0.34 cfs 9,667 cf

Pond 4P: DET POND

Peak Elev=637.92' Storage=13,678 cf Inflow=8.08 cfs 42,991 cf
Discarded=1.77 cfs 38,014 cf Primary=1.38 cfs 5,008 cf Outflow=3.14 cfs 43,022 cf

Total Runoff Area = 838,535 sf Runoff Volume = 118,787 cf Average Runoff Depth = 1.70"
83.45% Pervious = 699,791 sf 16.55% Impervious = 138,744 sf

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Type III 24-hr 25yr Rainfall=5.97"

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Summary for Subcatchment 8: ROOF

Runoff = 0.07 cfs @ 12.13 hrs, Volume= 430 cf, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 25yr Rainfall=5.97"

Area (sf)	CN	Description
901	98	Roofs, HSG A
901		100.00% Impervious Area

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

Summary for Subcatchment 9: ROOF

Runoff = 0.07 cfs @ 12.13 hrs, Volume= 430 cf, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 25yr Rainfall=5.97"

Area (sf)	CN	Description
901	98	Roofs, HSG A
901		100.00% Impervious Area

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

Summary for Subcatchment 10: ROOF

Runoff = 0.10 cfs @ 12.13 hrs, Volume= 597 cf, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 25yr Rainfall=5.97"

Area (sf)	CN	Description
1,250	98	Roofs, HSG A
1,250		100.00% Impervious Area

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

Summary for Subcatchment 11: ROOF

Runoff = 0.08 cfs @ 12.13 hrs, Volume= 475 cf, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 25yr Rainfall=5.97"

Area (sf)	CN	Description
995	98	Roofs, HSG A
995		100.00% Impervious Area

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

Summary for Subcatchment 20F: ROOF

Runoff = 0.05 cfs @ 12.13 hrs, Volume= 271 cf, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 25yr Rainfall=5.97"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

Summary for Subcatchment 21F: ROOF

Runoff = 0.05 cfs @ 12.13 hrs, Volume= 271 cf, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 25yr Rainfall=5.97"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

Summary for Subcatchment 22F: ROOF

Runoff = 0.05 cfs @ 12.13 hrs, Volume= 271 cf, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 25yr Rainfall=5.97"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

Summary for Subcatchment 23F: ROOF

Runoff = 0.05 cfs @ 12.13 hrs, Volume= 271 cf, Depth= 5.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 25yr Rainfall=5.97"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

Summary for Subcatchment P1:

Runoff = 4.28 cfs @ 12.29 hrs, Volume= 28,335 cf, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 25yr Rainfall=5.97"

Area (sf)	CN	Description
5,530	30	Woods, Good, HSG A
36,594	55	Woods, Good, HSG B
52,829	70	Woods, Good, HSG C
1,710	77	Woods, Good, HSG D
60,418	39	>75% Grass cover, Good, HSG A
2,853	61	>75% Grass cover, Good, HSG B
13,940	74	>75% Grass cover, Good, HSG C
21,746	80	>75% Grass cover, Good, HSG D
195,620	58	Weighted Average
195,620		100.00% Pervious Area

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Type III 24-hr 25yr Rainfall=5.97"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0280	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	90	0.0470	1.08		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
4.6	830		3.00		Direct Entry, CHANNEL
16.8	970	Total			

Summary for Subcatchment P2:

Runoff = 2.33 cfs @ 12.31 hrs, Volume= 16,384 cf, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 25yr Rainfall=5.97"

Area (sf)	CN	Description
* 35,541	89	Woods, WETLAND, HSG D
96,747	39	>75% Grass cover, Good, HSG A
* 5,809	98	IMPERVIOUS
138,097	54	Weighted Average
132,288		95.79% Pervious Area
5,809		4.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0100	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.1	130	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.2	390		3.00		Direct Entry, CHANNEL
16.1	570	Total			

Summary for Subcatchment P3:

Runoff = 1.25 cfs @ 12.27 hrs, Volume= 7,910 cf, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 25yr Rainfall=5.97"

Area (sf)	CN	Description
34,603	39	>75% Grass cover, Good, HSG A
* 17,203	98	IMPERVIOUS
1,815	30	Woods, Good, HSG A
* 992	89	WOODS wetland D
54,613	58	Weighted Average
37,410		68.50% Pervious Area
17,203		31.50% Impervious Area

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Type III 24-hr 25yr Rainfall=5.97"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.0250	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
10.1	430	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
15.2	480	Total			

Summary for Subcatchment P4:

Runoff = 1.95 cfs @ 12.22 hrs, Volume= 11,411 cf, Depth= 1.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 25yr Rainfall=5.97"

Area (sf)	CN	Description
20,000	39	>75% Grass cover, Good, HSG A
13,000	39	>75% Grass cover, Good, HSG A
36,691	61	>75% Grass cover, Good, HSG B
* 12,052	98	IMPERVIOUS
5,000	30	Woods, Good, HSG A
86,743	56	Weighted Average
74,691		86.11% Pervious Area
12,052		13.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0600	0.16		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
1.9	250	0.0950	2.16		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	150	0.0860	1.47		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.7	300		3.00		Direct Entry, CHANNEL
10.6	750	Total			

Summary for Subcatchment P4A:

Runoff = 1.22 cfs @ 12.19 hrs, Volume= 6,667 cf, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 25yr Rainfall=5.97"

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Type III 24-hr 25yr Rainfall=5.97"

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Area (sf)	CN	Description
27,845	30	Woods, Good, HSG A
6,773	39	>75% Grass cover, Good, HSG A
507	74	>75% Grass cover, Good, HSG C
* 18,191	98	IMPERVIOUS
53,316	55	Weighted Average
35,125		65.88% Pervious Area
18,191		34.12% Impervious Area

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

Summary for Subcatchment P5:

Runoff = 0.14 cfs @ 12.62 hrs, Volume= 2,070 cf, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 25yr Rainfall=5.97"

Area (sf)	CN	Description
* 2,526	98	IMPERVIOUS HSG A
36,455	39	>75% Grass cover, Good, HSG A
25,507	30	Woods, Good, HSG A
64,488	38	Weighted Average
61,962		96.08% Pervious Area
2,526		3.92% Impervious Area

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

Summary for Subcatchment P5A:

Runoff = 8.08 cfs @ 12.19 hrs, Volume= 42,991 cf, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 25yr Rainfall=5.97"

Area (sf)	CN	Description
* 76,644	98	IMPERVIOUS HSG A
120,195	39	>75% Grass cover, Good, HSG A
28,396	61	>75% Grass cover, Good, HSG B
14,104	74	>75% Grass cover, Good, HSG C
239,339	63	Weighted Average
162,695		67.98% Pervious Area
76,644		32.02% Impervious Area

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Type III 24-hr 25yr Rainfall=5.97"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	40	0.0500	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
0.1	40	0.2000	7.20		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.2	260	0.0480	3.53		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
5.0	900		3.00		Direct Entry, gutter and pipe flow
9.6	1,240	Total			

Summary for Reach 1R: CULVERT

Inflow Area = 530,661 sf, 10.46% Impervious, Inflow Depth > 1.58" for 25yr event
 Inflow = 9.23 cfs @ 12.28 hrs, Volume= 70,048 cf
 Outflow = 9.09 cfs @ 12.29 hrs, Volume= 70,048 cf, Atten= 2%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3
 Max. Velocity= 1.45 fps, Min. Travel Time= 0.5 min
 Avg. Velocity = 0.44 fps, Avg. Travel Time= 1.6 min

Peak Storage= 264 cf @ 12.30 hrs
 Average Depth at Peak Storage= 1.02'
 Bank-Full Depth= 1.60' Flow Area= 16.0 sf, Capacity= 32.30 cfs

Custom cross-section, Length= 42.0' Slope= 0.0031 '/'
 Constant n= 0.035 High grass
 Inlet Invert= 633.80', Outlet Invert= 633.67'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	635.40	0.00
9.50	633.80	1.60
20.00	635.40	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.60	16.0	20.3	672	32.30

Summary for Reach AP: WETLANDS

Inflow Area = 838,535 sf, 16.55% Impervious, Inflow Depth > 1.13" for 25yr event
 Inflow = 9.90 cfs @ 12.34 hrs, Volume= 79,059 cf
 Outflow = 9.90 cfs @ 12.34 hrs, Volume= 79,059 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3

Summary for Pond 2P: DET POND

Inflow Area = 86,743 sf, 13.89% Impervious, Inflow Depth = 1.58" for 25yr event
 Inflow = 1.95 cfs @ 12.22 hrs, Volume= 11,411 cf
 Outflow = 0.34 cfs @ 14.11 hrs, Volume= 9,667 cf, Atten= 83%, Lag= 113.2 min
 Primary = 0.34 cfs @ 14.11 hrs, Volume= 9,667 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3
 Peak Elev= 638.58' @ 14.12 hrs Surf.Area= 3,164 sf Storage= 5,785 cf

Plug-Flow detention time= 455.6 min calculated for 9,667 cf (85% of inflow)
 Center-of-Mass det. time= 386.4 min (1,265.1 - 878.6)

Volume	Invert	Avail.Storage	Storage Description
#1	636.00'	11,054 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
636.00	1,366	0	0
638.00	2,705	4,071	4,071
640.00	4,278	6,983	11,054

Device	Routing	Invert	Outlet Devices
#1	Primary	637.00'	24.0" Round Culvert L= 44.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 637.00' / 636.50' S= 0.0114 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	637.00'	2.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	638.50'	2.7' long x 1.40' rise Sharp-Crested Vee/Trap Weir Cv= 2.62 (C= 3.28)

Primary OutFlow Max=0.32 cfs @ 14.11 hrs HW=638.58' TW=634.36' (Dynamic Tailwater)

- 1=Culvert (Passes 0.32 cfs of 11.33 cfs potential flow)
- 2=Orifice/Grate (Orifice Controls 0.13 cfs @ 5.89 fps)
- 3=Sharp-Crested Vee/Trap Weir (Weir Controls 0.19 cfs @ 0.91 fps)

Summary for Pond 4P: DET POND

Inflow Area = 239,339 sf, 32.02% Impervious, Inflow Depth = 2.16" for 25yr event
 Inflow = 8.08 cfs @ 12.19 hrs, Volume= 42,991 cf
 Outflow = 3.14 cfs @ 12.72 hrs, Volume= 43,022 cf, Atten= 61%, Lag= 31.8 min
 Discarded = 1.77 cfs @ 12.80 hrs, Volume= 38,014 cf
 Primary = 1.38 cfs @ 12.70 hrs, Volume= 5,008 cf

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Type III 24-hr 25yr Rainfall=5.97"

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3
 Peak Elev= 637.92' @ 12.80 hrs Surf.Area= 4,734 sf Storage= 13,678 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 77.8 min (936.6 - 858.7)

Volume	Invert	Avail.Storage	Storage Description
#1	633.50'	25,452 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
633.50	1,630	0	0
634.00	1,915	886	886
636.00	3,240	5,155	6,041
638.00	4,800	8,040	14,081
638.50	5,230	2,508	16,589
640.00	6,588	8,864	25,452

Device	Routing	Invert	Outlet Devices
#1	Discarded	633.50'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 631.00'
#2	Primary	635.00'	24.0" Round Culvert L= 44.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 635.00' / 634.50' S= 0.0114 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#3	Device 2	635.50'	2.0" Vert. Orifice/Grate C= 0.600
#4	Device 2	637.50'	2.7' long x 1.40' rise Sharp-Crested Vee/Trap Weir Cv= 2.62 (C= 3.28)

Discarded OutFlow Max=1.70 cfs @ 12.80 hrs HW=637.73' (Free Discharge)
 ↳1=Exfiltration (Controls 1.70 cfs)

Primary OutFlow Max=1.23 cfs @ 12.70 hrs HW=637.74' TW=0.00' (Dynamic Tailwater)
 ↳2=Culvert (Passes 1.23 cfs of 21.27 cfs potential flow)
 ↳3=Orifice/Grate (Orifice Controls 0.15 cfs @ 7.08 fps)
 ↳4=Sharp-Crested Vee/Trap Weir (Weir Controls 1.07 cfs @ 1.62 fps)

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Type III 24-hr 100yr Rainfall=7.64"

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Time span=0.00-48.00 hrs, dt=0.45 hrs, 108 points x 3
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 8: ROOF	Runoff Area=901 sf 100.00% Impervious Runoff Depth=7.40" Tc=6.0 min CN=98 Runoff=0.09 cfs 556 cf
Subcatchment 9: ROOF	Runoff Area=901 sf 100.00% Impervious Runoff Depth=7.40" Tc=6.0 min CN=98 Runoff=0.09 cfs 556 cf
Subcatchment 10: ROOF	Runoff Area=1,250 sf 100.00% Impervious Runoff Depth=7.40" Tc=6.0 min CN=98 Runoff=0.13 cfs 771 cf
Subcatchment 11: ROOF	Runoff Area=995 sf 100.00% Impervious Runoff Depth=7.40" Tc=6.0 min CN=98 Runoff=0.10 cfs 614 cf
Subcatchment 20F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=7.40" Tc=6.0 min CN=98 Runoff=0.06 cfs 350 cf
Subcatchment 21F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=7.40" Tc=6.0 min CN=98 Runoff=0.06 cfs 350 cf
Subcatchment 22F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=7.40" Tc=6.0 min CN=98 Runoff=0.06 cfs 350 cf
Subcatchment 23F: ROOF	Runoff Area=568 sf 100.00% Impervious Runoff Depth=7.40" Tc=6.0 min CN=98 Runoff=0.06 cfs 350 cf
Subcatchment P1:	Runoff Area=195,620 sf 0.00% Impervious Runoff Depth=2.85" Flow Length=970' Tc=16.8 min CN=58 Runoff=7.54 cfs 46,524 cf
Subcatchment P2:	Runoff Area=138,097 sf 4.21% Impervious Runoff Depth=2.44" Flow Length=570' Slope=0.0100 '/' Tc=16.1 min CN=54 Runoff=4.44 cfs 28,056 cf
Subcatchment P3:	Runoff Area=54,613 sf 31.50% Impervious Runoff Depth=2.85" Flow Length=480' Tc=15.2 min CN=58 Runoff=2.19 cfs 12,989 cf
Subcatchment P4:	Runoff Area=86,743 sf 13.89% Impervious Runoff Depth=2.64" Flow Length=750' Tc=10.6 min CN=56 Runoff=3.51 cfs 19,117 cf
Subcatchment P4A:	Runoff Area=53,316 sf 34.12% Impervious Runoff Depth=2.54" Tc=6.0 min CN=55 Runoff=2.19 cfs 11,289 cf
Subcatchment P5:	Runoff Area=64,488 sf 3.92% Impervious Runoff Depth=0.93" Tc=6.0 min CN=38 Runoff=0.58 cfs 4,975 cf
Subcatchment P5A:	Runoff Area=239,339 sf 32.02% Impervious Runoff Depth=3.39" Flow Length=1,240' Tc=9.6 min CN=63 Runoff=13.04 cfs 67,571 cf
Reach 1R: CULVERT	Avg. Flow Depth=1.27' Max Vel=1.69 fps Inflow=16.89 cfs 117,626 cf n=0.035 L=42.0' S=0.0031 '/' Capacity=32.30 cfs Outflow=16.69 cfs 117,626 cf

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Reach AP: WETLANDS

Inflow=22.93 cfs 144,286 cf
Outflow=22.93 cfs 144,286 cf

Pond 2P: DET POND

Peak Elev=638.90' Storage=6,820 cf Inflow=3.51 cfs 19,117 cf
Outflow=1.79 cfs 17,367 cf

Pond 4P: DET POND

Peak Elev=638.49' Storage=16,537 cf Inflow=13.04 cfs 67,571 cf
Discarded=2.02 cfs 48,389 cf Primary=8.88 cfs 19,189 cf Outflow=10.90 cfs 67,578 cf

Total Runoff Area = 838,535 sf Runoff Volume = 194,418 cf Average Runoff Depth = 2.78"
83.45% Pervious = 699,791 sf 16.55% Impervious = 138,744 sf

Summary for Subcatchment 8: ROOF

Runoff = 0.09 cfs @ 12.13 hrs, Volume= 556 cf, Depth= 7.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 100yr Rainfall=7.64"

Area (sf)	CN	Description
901	98	Roofs, HSG A
901		100.00% Impervious Area

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

Summary for Subcatchment 9: ROOF

Runoff = 0.09 cfs @ 12.13 hrs, Volume= 556 cf, Depth= 7.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 100yr Rainfall=7.64"

Area (sf)	CN	Description
901	98	Roofs, HSG A
901		100.00% Impervious Area

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

Summary for Subcatchment 10: ROOF

Runoff = 0.13 cfs @ 12.13 hrs, Volume= 771 cf, Depth= 7.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 100yr Rainfall=7.64"

Area (sf)	CN	Description
1,250	98	Roofs, HSG A
1,250		100.00% Impervious Area

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

Summary for Subcatchment 11: ROOF

Runoff = 0.10 cfs @ 12.13 hrs, Volume= 614 cf, Depth= 7.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 100yr Rainfall=7.64"

Area (sf)	CN	Description
995	98	Roofs, HSG A
995		100.00% Impervious Area

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

Summary for Subcatchment 20F: ROOF

Runoff = 0.06 cfs @ 12.13 hrs, Volume= 350 cf, Depth= 7.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 100yr Rainfall=7.64"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

Summary for Subcatchment 21F: ROOF

Runoff = 0.06 cfs @ 12.13 hrs, Volume= 350 cf, Depth= 7.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 100yr Rainfall=7.64"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

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Summary for Subcatchment 22F: ROOF

Runoff = 0.06 cfs @ 12.13 hrs, Volume= 350 cf, Depth= 7.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 100yr Rainfall=7.64"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

Summary for Subcatchment 23F: ROOF

Runoff = 0.06 cfs @ 12.13 hrs, Volume= 350 cf, Depth= 7.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 100yr Rainfall=7.64"

Area (sf)	CN	Description
568	98	Roofs, HSG A
568		100.00% Impervious Area

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

Summary for Subcatchment P1:

Runoff = 7.54 cfs @ 12.26 hrs, Volume= 46,524 cf, Depth= 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 100yr Rainfall=7.64"

Area (sf)	CN	Description
5,530	30	Woods, Good, HSG A
36,594	55	Woods, Good, HSG B
52,829	70	Woods, Good, HSG C
1,710	77	Woods, Good, HSG D
60,418	39	>75% Grass cover, Good, HSG A
2,853	61	>75% Grass cover, Good, HSG B
13,940	74	>75% Grass cover, Good, HSG C
21,746	80	>75% Grass cover, Good, HSG D
195,620	58	Weighted Average
195,620		100.00% Pervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0280	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
1.4	90	0.0470	1.08		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
4.6	830		3.00		Direct Entry, CHANNEL
16.8	970	Total			

Summary for Subcatchment P2:

Runoff = 4.44 cfs @ 12.27 hrs, Volume= 28,056 cf, Depth= 2.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 100yr Rainfall=7.64"

Area (sf)	CN	Description
* 35,541	89	Woods, WETLAND, HSG D
96,747	39	>75% Grass cover, Good, HSG A
* 5,809	98	IMPERVIOUS
138,097	54	Weighted Average
132,288		95.79% Pervious Area
5,809		4.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	50	0.0100	0.08		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
3.1	130	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
2.2	390		3.00		Direct Entry, CHANNEL
16.1	570	Total			

Summary for Subcatchment P3:

Runoff = 2.19 cfs @ 12.24 hrs, Volume= 12,989 cf, Depth= 2.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 100yr Rainfall=7.64"

Area (sf)	CN	Description
34,603	39	>75% Grass cover, Good, HSG A
* 17,203	98	IMPERVIOUS
1,815	30	Woods, Good, HSG A
* 992	89	WOODS wetland D
54,613	58	Weighted Average
37,410		68.50% Pervious Area
17,203		31.50% Impervious Area

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Type III 24-hr 100yr Rainfall=7.64"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.0250	0.16		Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
10.1	430	0.0200	0.71		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
15.2	480	Total			

Summary for Subcatchment P4:

Runoff = 3.51 cfs @ 12.20 hrs, Volume= 19,117 cf, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 100yr Rainfall=7.64"

Area (sf)	CN	Description
20,000	39	>75% Grass cover, Good, HSG A
13,000	39	>75% Grass cover, Good, HSG A
36,691	61	>75% Grass cover, Good, HSG B
* 12,052	98	IMPERVIOUS
5,000	30	Woods, Good, HSG A
86,743	56	Weighted Average
74,691		86.11% Pervious Area
12,052		13.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	50	0.0600	0.16		Sheet Flow, Grass: Dense n= 0.240 P2= 3.20"
1.9	250	0.0950	2.16		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	150	0.0860	1.47		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.7	300		3.00		Direct Entry, CHANNEL
10.6	750	Total			

Summary for Subcatchment P4A:

Runoff = 2.19 cfs @ 12.18 hrs, Volume= 11,289 cf, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 100yr Rainfall=7.64"

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Type III 24-hr 100yr Rainfall=7.64"

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Area (sf)	CN	Description
27,845	30	Woods, Good, HSG A
6,773	39	>75% Grass cover, Good, HSG A
507	74	>75% Grass cover, Good, HSG C
* 18,191	98	IMPERVIOUS
53,316	55	Weighted Average
35,125		65.88% Pervious Area
18,191		34.12% Impervious Area

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

Summary for Subcatchment P5:

Runoff = 0.58 cfs @ 12.27 hrs, Volume= 4,975 cf, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 100yr Rainfall=7.64"

Area (sf)	CN	Description
* 2,526	98	IMPERVIOUS HSG A
36,455	39	>75% Grass cover, Good, HSG A
25,507	30	Woods, Good, HSG A
64,488	38	Weighted Average
61,962		96.08% Pervious Area
2,526		3.92% Impervious Area

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

Summary for Subcatchment P5A:

Runoff = 13.04 cfs @ 12.18 hrs, Volume= 67,571 cf, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs
Type III 24-hr 100yr Rainfall=7.64"

Area (sf)	CN	Description
* 76,644	98	IMPERVIOUS HSG A
120,195	39	>75% Grass cover, Good, HSG A
28,396	61	>75% Grass cover, Good, HSG B
14,104	74	>75% Grass cover, Good, HSG C
239,339	63	Weighted Average
162,695		67.98% Pervious Area
76,644		32.02% Impervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.3	40	0.0500	0.20		Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
0.1	40	0.2000	7.20		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
1.2	260	0.0480	3.53		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
5.0	900		3.00		Direct Entry, gutter and pipe flow
9.6	1,240	Total			

Summary for Reach 1R: CULVERT

Inflow Area = 530,661 sf, 10.46% Impervious, Inflow Depth = 2.66" for 100yr event
 Inflow = 16.89 cfs @ 12.28 hrs, Volume= 117,626 cf
 Outflow = 16.69 cfs @ 12.29 hrs, Volume= 117,626 cf, Atten= 1%, Lag= 0.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3
 Max. Velocity= 1.69 fps, Min. Travel Time= 0.4 min
 Avg. Velocity = 0.49 fps, Avg. Travel Time= 1.4 min

Peak Storage= 415 cf @ 12.30 hrs
 Average Depth at Peak Storage= 1.27'
 Bank-Full Depth= 1.60' Flow Area= 16.0 sf, Capacity= 32.30 cfs

Custom cross-section, Length= 42.0' Slope= 0.0031 '/'
 Constant n= 0.035 High grass
 Inlet Invert= 633.80', Outlet Invert= 633.67'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	635.40	0.00
9.50	633.80	1.60
20.00	635.40	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
1.60	16.0	20.3	672	32.30

Summary for Reach AP: WETLANDS

Inflow Area = 838,535 sf, 16.55% Impervious, Inflow Depth = 2.06" for 100yr event
 Inflow = 22.93 cfs @ 12.47 hrs, Volume= 144,286 cf
 Outflow = 22.93 cfs @ 12.47 hrs, Volume= 144,286 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3

Summary for Pond 2P: DET POND

Inflow Area = 86,743 sf, 13.89% Impervious, Inflow Depth = 2.64" for 100yr event
 Inflow = 3.51 cfs @ 12.20 hrs, Volume= 19,117 cf
 Outflow = 1.79 cfs @ 12.69 hrs, Volume= 17,367 cf, Atten= 49%, Lag= 29.4 min
 Primary = 1.79 cfs @ 12.69 hrs, Volume= 17,367 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3
 Peak Elev= 638.90' @ 12.78 hrs Surf.Area= 3,412 sf Storage= 6,820 cf

Plug-Flow detention time= 294.5 min calculated for 17,367 cf (91% of inflow)
 Center-of-Mass det. time= 248.1 min (1,110.3 - 862.2)

Volume	Invert	Avail.Storage	Storage Description
#1	636.00'	11,054 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
636.00	1,366	0	0
638.00	2,705	4,071	4,071
640.00	4,278	6,983	11,054

Device	Routing	Invert	Outlet Devices
#1	Primary	637.00'	24.0" Round Culvert L= 44.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 637.00' / 636.50' S= 0.0114 ' / Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	637.00'	2.0" Vert. Orifice/Grate C= 0.600
#3	Device 1	638.50'	2.7' long x 1.40' rise Sharp-Crested Vee/Trap Weir Cv= 2.62 (C= 3.28)

Primary OutFlow Max=1.59 cfs @ 12.69 hrs HW=638.80' TW=634.86' (Dynamic Tailwater)
 1=Culvert (Passes 1.59 cfs of 13.76 cfs potential flow)
 2=Orifice/Grate (Orifice Controls 0.14 cfs @ 6.31 fps)
 3=Sharp-Crested Vee/Trap Weir (Weir Controls 1.45 cfs @ 1.79 fps)

Summary for Pond 4P: DET POND

Inflow Area = 239,339 sf, 32.02% Impervious, Inflow Depth = 3.39" for 100yr event
 Inflow = 13.04 cfs @ 12.18 hrs, Volume= 67,571 cf
 Outflow = 10.90 cfs @ 12.59 hrs, Volume= 67,578 cf, Atten= 16%, Lag= 24.7 min
 Discarded = 2.02 cfs @ 12.59 hrs, Volume= 48,389 cf
 Primary = 8.88 cfs @ 12.59 hrs, Volume= 19,189 cf

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.15 hrs, dt= 0.45 hrs / 3
 Peak Elev= 638.49' @ 12.59 hrs Surf.Area= 5,221 sf Storage= 16,537 cf

Plug-Flow detention time= 68.8 min calculated for 66,953 cf (99% of inflow)
 Center-of-Mass det. time= 68.5 min (913.8 - 845.3)

Volume	Invert	Avail.Storage	Storage Description
#1	633.50'	25,452 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
633.50	1,630	0	0
634.00	1,915	886	886
636.00	3,240	5,155	6,041
638.00	4,800	8,040	14,081
638.50	5,230	2,508	16,589
640.00	6,588	8,864	25,452

Device	Routing	Invert	Outlet Devices
#1	Discarded	633.50'	8.270 in/hr Exfiltration over Surface area Conductivity to Groundwater Elevation = 631.00'
#2	Primary	635.00'	24.0" Round Culvert L= 44.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 635.00' / 634.50' S= 0.0114 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#3	Device 2	635.50'	2.0" Vert. Orifice/Grate C= 0.600
#4	Device 2	637.50'	2.7' long x 1.40' rise Sharp-Crested Vee/Trap Weir Cv= 2.62 (C= 3.28)

Discarded OutFlow Max=2.01 cfs @ 12.59 hrs HW=638.47' (Free Discharge)
 ↳1=Exfiltration (Controls 2.01 cfs)

Primary OutFlow Max=8.73 cfs @ 12.59 hrs HW=638.48' TW=0.00' (Dynamic Tailwater)
 ↳2=Culvert (Passes 8.73 cfs of 26.82 cfs potential flow)
 ↳↳3=Orifice/Grate (Orifice Controls 0.18 cfs @ 8.19 fps)
 ↳↳↳4=Sharp-Crested Vee/Trap Weir (Weir Controls 8.55 cfs @ 3.24 fps)