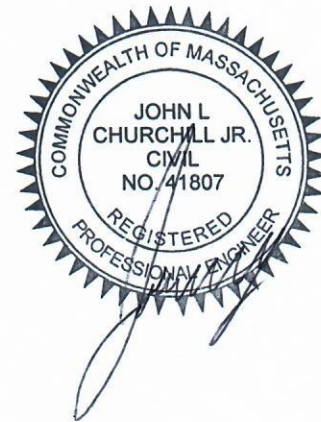


**DRAINAGE CALCULATIONS
&
STORMWATER REPORT**

8 & 10 Charge Pond Road
Wareham, MA

May 10, 2022



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8 & 10 CHARGE POND ROAD

WAREHAM, MA

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1. Project Overview

The project is located at 8 & 10 Charge Pond Road in Wareham and consists of Lots 1035 & 1076 as shown on Assessor's Map 110. These properties lie partially within the General Commercial Zoning District and Residence 60 Zoning District. The total land area of the two lots is 140,003 square feet. Currently, this is a vacant wooded lot. The topography is relatively flat and pitches southerly and westerly off the property.

Under proposed conditions, the applicant would like to construct a 6,1000 s.f. structure to be used for a landscaping company services. The structure will be made up of office space as well as garage storage and will require a total of 43 parking spaces. The parking area is proposed to be paved and will have a total of 51 parking spaces, including two handicap spaces as well as 18 company vehicle parking spaces. Landscaping is proposed between the roadway and building. To aid in buffering along Charge Pond Road, a proposed privacy fence will be installed at the front face of the structure.

2. Impact Statement

Water and Sewer System

The proposed building will be serviced by Town Water and a Private Septic System. An existing fire hydrant has been located only 30' from the northern property line.

Fire and Police Protection

The proposed parking lot entrances will provide adequate accessibility for fire and police. The aisle widths are proposed at minimum of 24' wide and the two entrances off Charge Pond Road allow for vehicular circulation throughout the entire site.

Schools and Parks

This is a proposed commercial development; therefore, no additional residences are proposed that may impact the student population or existing park uses.

Traffic and Pedestrian

There will not be an adverse impact to the traffic and pedestrian movement from the proposed development. The project is located directly off Charge Pond Road. Another landscaping service company exists directly across the street. Lighting will be added to both entrances to assist traffic when visibility is limited due to darkness.

Ecology

A majority of the site is wooded and does not contain any wetland resource areas. The proposed drainage system is designed so that stormwater runoff leaving the site post-development will not exceed what currently exists. The proposed development also includes the installation of numerous trees, shrubs, and landscaped areas.

2. Stormwater Management

Methodology

Stormwater runoff was evaluated for the 2-year, 10-year, 25-year, and 100-year, Type III, 24-hour storm for post-development conditions. The runoff generated from the area of the lot to be developed currently drains towards the south and west. Once this project is completed, a majority of the runoff will be captured and infiltrated onsite, therefore, considerably reducing the amount of runoff that exits the property. Four proposed catch basins will capture the runoff generated from the parking area and direct the runoff to two detention basins. A proposed leaching chamber will be situated as the bottom of both detention basins to provide additional storage and infiltration. The proposed grading is very similar to the current topography, therefore, not major changes in drainage patterns are proposed.

The Pre- and Post-development conditions were modeled using HydroCAD software, which combines USDA Soil Conservation Service hydrology and hydraulic techniques (commonly known as SCS TR-55 and TR-20) to generate hydrographs (calculations are provided in the supplemental section of this report). The rainfall amounts used for calculating runoff for the 2-year, 10-year, and 100-year storm events were obtained from the HydroCAD Manual.

General Soils Information

Existing soil classifications and hydrologic soil groups for the site were obtained from the USDA Soil Conservation Service, Soil Survey of Plymouth County, Massachusetts, Southern Part (1969). The soil types found within the limits of the drainage analysis are classified as the following:

- 1.) Windsor Loamy Sand, 3 to 8 percent slopes (255B)

Windsor Loamy Sand is considered excessively drained, exhibits a hydrological classification group "A", and is the primary soil type over the project site.

An on-site examination of the soils in the vicinity of the proposed detention basin and leaching chambers were performed and found to be consistent with the properties of Windsor soils (see attached Test Pits Logs).

Proposed Stormwater Management System and Mitigation

The purpose of the proposed stormwater management system is to remove a minimum of 80% total of the suspended solids, while preventing off-site flooding and adverse environmental impacts from the 2-year, 10-year, 25-year, and 100-year storm events. Additionally, a goal of a site's stormwater management plan also includes the improvement of water quality through the design and implementation of best management practices (BMPs) for the site. BMPs can include physical features, such as infiltration structures, detention basins and swales, as well as maintenance procedures and other management techniques. Several regulatory standards or policies are applicable for the proposed site, including the Town of Wareham Subdivision Rules and Regulations and Zoning Bylaws.

Criteria for the management of stormwater runoff were designed in accordance with the applicable criteria for drainage design of the Department of Environmental Protection (DEP) Stormwater Management Policy.

The stormwater will be captured by a four deep sump catch basins and will be infiltrated through two detention basins, which are designed to capture and infiltrate the 100-year storm event. A proposed leaching pit will be situated at the bottom of each detention basin to provide additional storage and infiltration. The catch basin, sediment forebay, and detention basin, combined, will remove a minimum of 80% total suspended solids.

Pre-Development Drainage Conditions

The site was modeled into one sub-catchment area under existing conditions. Area DA-1 is the offsite runoff which comprises the entire site.

Refer to the Existing Drainage Areas Plan prepared by this office at the end of this report.

Post-Development Drainage Conditions

Post-development drainage conditions and patterns were maintained to the maximum extent possible. DA-1 and DA-2 contribute to the onsite drainage systems and are recharged directly. DA-3 is the remaining portion of the property that contributes to the offsite runoff.

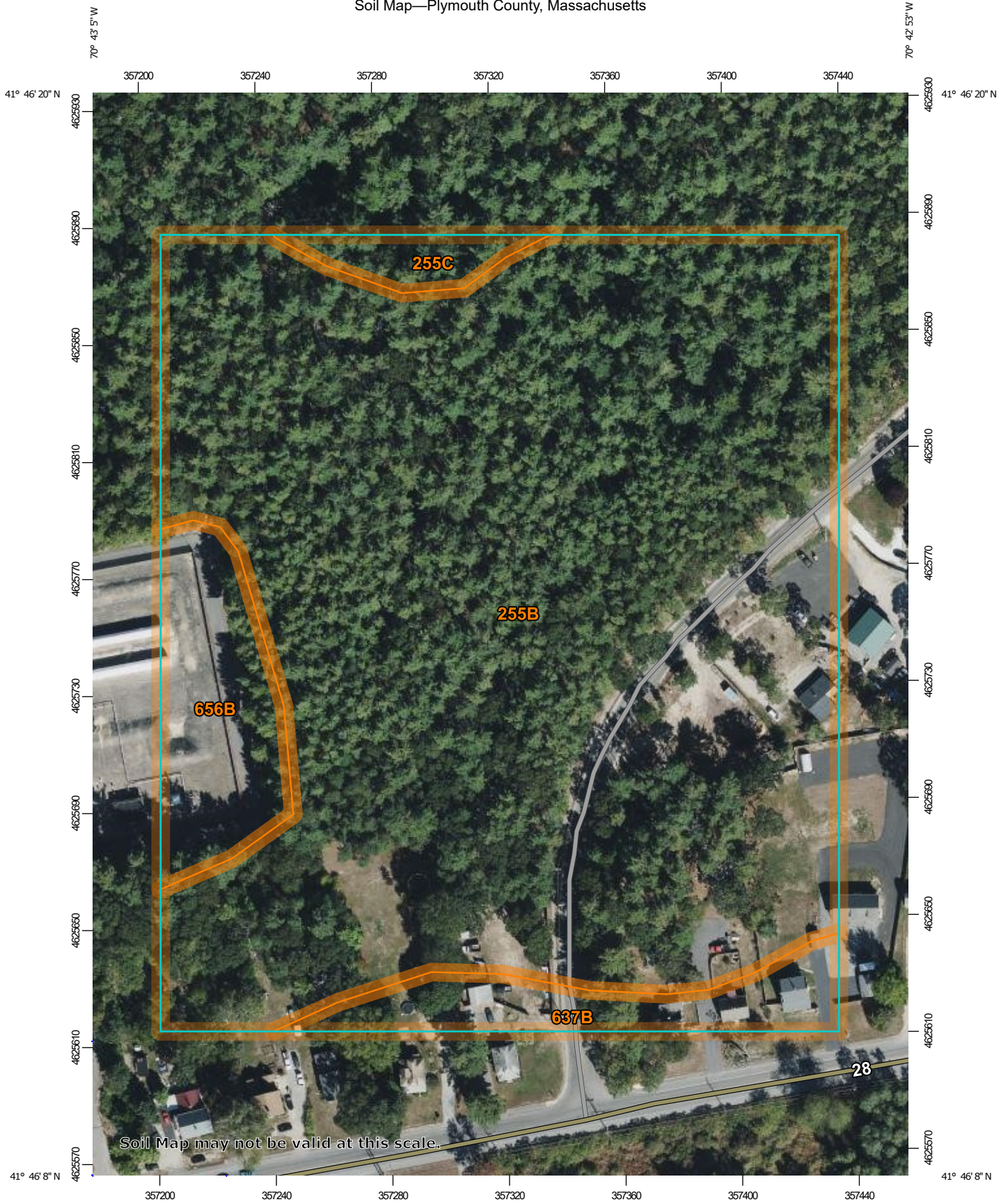
Refer to the Proposed Drainage Areas Plan prepared by this office at the end of this report.

Table 1 compares below the pre-development and post-development peak runoff rates and volumes for the 2-year, 10-year, and 100-year storm events at the offsite design points.

	Ex. Flow (cfs)	Prop. Flow (cfs)	Ex. Vol. (af)	Prop. Vol. (af)
Storm Event				
2-Yr Event	0.00	0.00	.003	.002
10-Yr Event	0.05	0.08	.031	.017
25-Yr Event	0.23	0.20	.081	.033
100-Yr Event	1.04	0.56	.198	.064

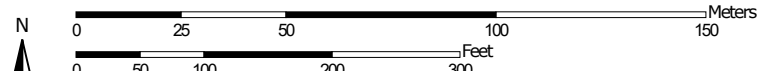
Table 1 – Comparison of Off-site Stormwater Flows and Volumes

Soil Map—Plymouth County, Massachusetts



Soil Map may not be valid at this scale.

Map Scale: 1:1,800 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Plymouth County, Massachusetts

Survey Area Data: Version 14, Sep 2, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 25, 2020—Oct 9, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
255B	Windsor loamy sand, 3 to 8 percent slopes	13.6	86.3%
255C	Windsor loamy sand, 8 to 15 percent slopes	0.3	1.8%
637B	Carver - Urban land complex, 0 to 8 percent slopes	0.8	5.1%
656B	Udorthents - Urban land complex, 0 to 8 percent slopes	1.1	6.8%
Totals for Area of Interest		15.7	100.0%

GROUNDWATER RECHARGE VOLUME CALCULATION
8 & 10 Charge Pond Road
WAREHAM, MASSACHUSETTS

PR DA-1:

- Total Proposed Impervious Area = 21,755 S.F.
- Recharge Factor:
(A-Soils) = 0.60 inches/s.f. of impervious area
- **Groundwater Recharge Volume Required:**
21,755 s.f. x (0.60 inches x 1/12) = **1,088 c.f. required**
- **Recharge Volume Provided:**
Volume Provided in Pond 2P
= **12,998 c.f. provided (>1,088 c.f. required)**

PR DA-2:

- Total Proposed Impervious Area = 32,015 S.F.
- Recharge Factor:
(A-Soils) = 0.60 inches/s.f. of impervious area
- **Groundwater Recharge Volume Required:**
32,015 s.f. x (0.60 inches x 1/12) = **1,601 c.f. required**
- **Recharge Volume Provided:**
Volume Provided in Pond 4P
= **23,817 c.f. provided (>1,601 c.f. required)**

WATER QUALITY VOLUME CALCULATION
8 & 10 Charge Pond Road
WAREHAM, MASSACHUSETTS

Water Quality Depth: *one-inch for exfiltration to soils with infiltration rate greater than 2.4 inches/hour or greater II (D_{WQ})*

PR DA-1:

- Total Proposed Impervious Area = 21,755 S.F.

- $V_{WQ} = (D_{WQ}/12 \text{ inches/foot}) * (A_{IMP} * 43,560 \text{ square feet/acre})$
= $(1''/12) * 21,755 \text{ S.F.}$
= **1,813 C.F.**

- **Water Quality Volume Provided:**
Volume Provided in Pond 2P
= **12,998 c.f. provided (>1,813 c.f. required)**

PR DA-2:

- Total Proposed Impervious Area = 32,015 S.F.

- $V_{WQ} = (D_{WQ}/12 \text{ inches/foot}) * (A_{IMP} * 43,560 \text{ square feet/acre})$
= $(1''/12) * 32,015 \text{ S.F.}$
= **2,668 C.F.**

- **Water Quality Volume Provided:**
Volume Provided in Pond 4P
= **23,817 c.f. provided (>2,668 c.f. required)**

DRAINDOWN TIME CALCULATIONS
8 & 10 Charge Pond Road
WAREHAM, MASSACHUSETTS

PR DA-1

- Maximum Drain Time = 72 hours
- Provided Drain Time = Storage Volume* / (K x Basin Bottom Area*)
= 12,998 c.f. / [(2.41 in/hr) (1ft/12 inches) x 1,725 s.f.]
= **37.5 hours**, which is less than max. drain time of 72 hours, therefore **OK**.

*Refer to HydroCAD output for Pond 2P

1,000 Gal Leaching Pits (PR DA-R2):

- Maximum Drain Time = 72 hours
- Provided Drain Time = Storage Volume* / (K x Basin Bottom Area*)
= 23,817 c.f. / [(2.41 in/hr) (1ft/12 inches) x 3,553 s.f.]
= **33.4 hours**, which is less than max. drain time of 72 hours, therefore **OK**.

*Refer to HydroCAD output for Pond 4P

TSS REMOVAL WORKSHEET

PROPOSED DRAINAGE AREAS

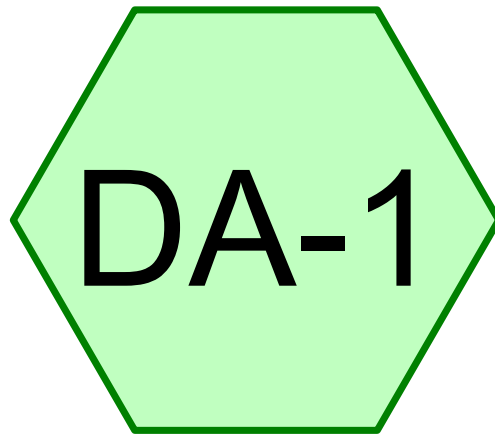
BMP	TSS REMOVAL RATE	STARTING TSS LOAD	AMOUNT REMOVED	REMAININ G LOAD
DEEP SUMP CATCH BASIN	0.25	1.000	0.250	0.750
INFILTRATION BASIN W/ SEDIMENT FOREBAY	0.80	0.75	0.60	0.15
TOTAL=			85.0%	

PIPE SIZING CALCULATIONS

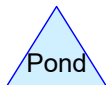
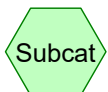
Design for 25 Year Storm

Pipe Coeff. "n" = 0.013

Drainage Structure		Type of Area	RUNOFF						PIPE				STRUCTURE ELEVATION				
			Tributary Area		Runoff Coeff. "C"	Time of Flow Tc (min)	Rainfall Intensity I (in/hr)	Discharge Q=CIA		Length (ft.)	Dia. (in.)	Design Slope (ft/ft)	Min. Slope (ft/ft)	From Struct	Invert In (feet)	Invert Out (feet)	Rim (feet)
			A Incr. (acres)	A Total (acres)				Q Incr. (cfs)	Total (cfs)								
No.	Sta.																
CB-1		Imp.	0.340		0.98												
to DMH1		Woods	0.350		0.36												
		Grass	0.210		0.49												
		Total	0.900		0.625	12	6.05	3.401	3.401	110	11.8	0.010					
										Use	12						
CB-2		Imp.	0.390		0.98												
to DMH 1		Woods	0.260		0.36												
		Grass	0.120		0.49												
		Total	0.770		0.694	17.9	6.05	3.234	3.234	20	11.6	0.010					
										Use	12						
DMH 1		Imp.	0.730		0.98												
to FES #4		Woods	0.610		0.36												
		Grass	0.330		0.49												
		Total	1.670		0.657	17.9	6.05	6.635	6.635	20	15.1	0.010					
										Use	16						
CB-3		Imp.	0.390		0.98												
to FES #2																	
		Total	0.390		0.98	1.5	6.05	2.312	2.312	12	10.2	0.010					
										Use	12						
CB-4		Imp.	0.110		0.98												
to FES #1																	
		Grass	0.010		0.49												
		Total	0.120		0.939	2	6.05	0.682	0.682	102	6.45	0.010					
										Use	12						



Offsite Runoff



Existing Conditions

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Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.214	36	Woods, Fair, HSG A (DA-1)
3.214	36	TOTAL AREA

Existing Conditions

Prepared by JC Engineering Inc.

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
3.214	HSG A	DA-1
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
3.214		TOTAL AREA

Existing Conditions

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Page 4

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
3.214	0.000	0.000	0.000	0.000	3.214	Woods, Fair	DA-1
3.214	0.000	0.000	0.000	0.000	3.214	TOTAL AREA	

Existing Conditions

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Type III 24-hr 2-year Rainfall=3.44"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment DA-1: Offsite Runoff

Runoff Area=140,003 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=340' Tc=16.0 min CN=36 Runoff=0.00 cfs 0.000 af

Total Runoff Area = 3.214 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
100.00% Pervious = 3.214 ac 0.00% Impervious = 0.000 ac

Existing Conditions

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Type III 24-hr 2-year Rainfall=3.44"

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Summary for Subcatchment DA-1: Offsite Runoff

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

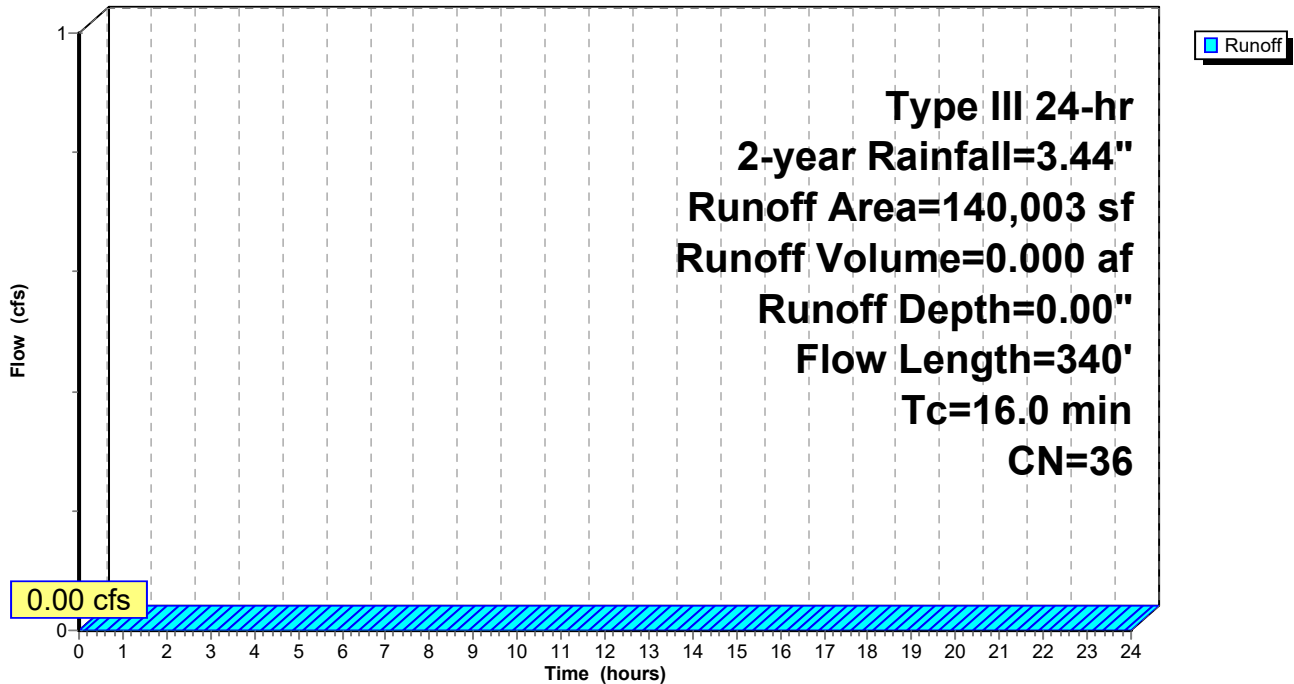
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.44"

Area (sf)	CN	Description
140,003	36	Woods, Fair, HSG A
140,003		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
5.8	290	0.0280	0.84		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
16.0	340	Total			

Subcatchment DA-1: Offsite Runoff

Hydrograph



Existing Conditions

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Type III 24-hr 10-year Rainfall=5.05"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment DA-1: Offsite Runoff

Runoff Area=140,003 sf 0.00% Impervious Runoff Depth>0.11"
Flow Length=340' Tc=16.0 min CN=36 Runoff=0.05 cfs 0.031 af

Total Runoff Area = 3.214 ac Runoff Volume = 0.031 af Average Runoff Depth = 0.11"
100.00% Pervious = 3.214 ac 0.00% Impervious = 0.000 ac

Existing Conditions

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Type III 24-hr 10-year Rainfall=5.05"

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Summary for Subcatchment DA-1: Offsite Runoff

Runoff = 0.05 cfs @ 14.95 hrs, Volume= 0.031 af, Depth> 0.11"

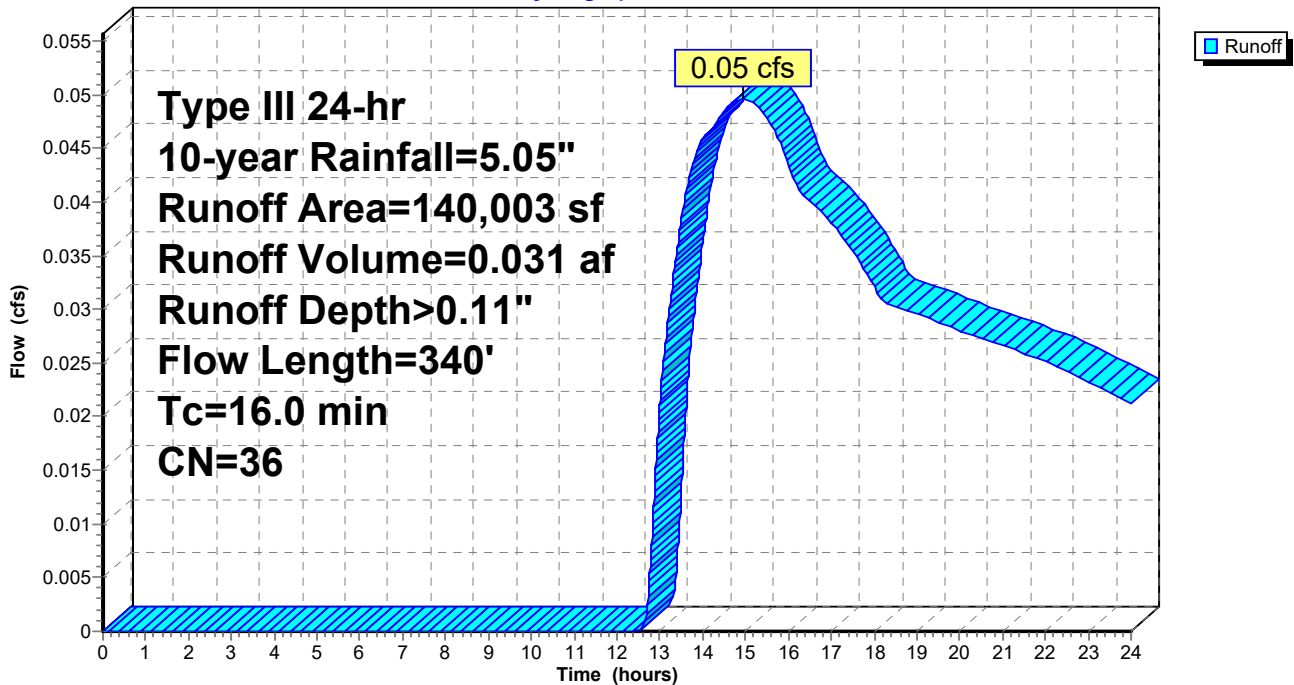
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.05"

Area (sf)	CN	Description
140,003	36	Woods, Fair, HSG A
140,003		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
5.8	290	0.0280	0.84		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
16.0	340	Total			

Subcatchment DA-1: Offsite Runoff

Hydrograph



Existing Conditions

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Type III 24-hr 25-year Rainfall=6.05"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment DA-1: Offsite Runoff

Runoff Area=140,003 sf 0.00% Impervious Runoff Depth>0.30"
Flow Length=340' Tc=16.0 min CN=36 Runoff=0.23 cfs 0.081 af

Total Runoff Area = 3.214 ac Runoff Volume = 0.081 af Average Runoff Depth = 0.30"
100.00% Pervious = 3.214 ac 0.00% Impervious = 0.000 ac

Existing Conditions

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Type III 24-hr 25-year Rainfall=6.05"

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Summary for Subcatchment DA-1: Offsite Runoff

Runoff = 0.23 cfs @ 12.57 hrs, Volume= 0.081 af, Depth> 0.30"

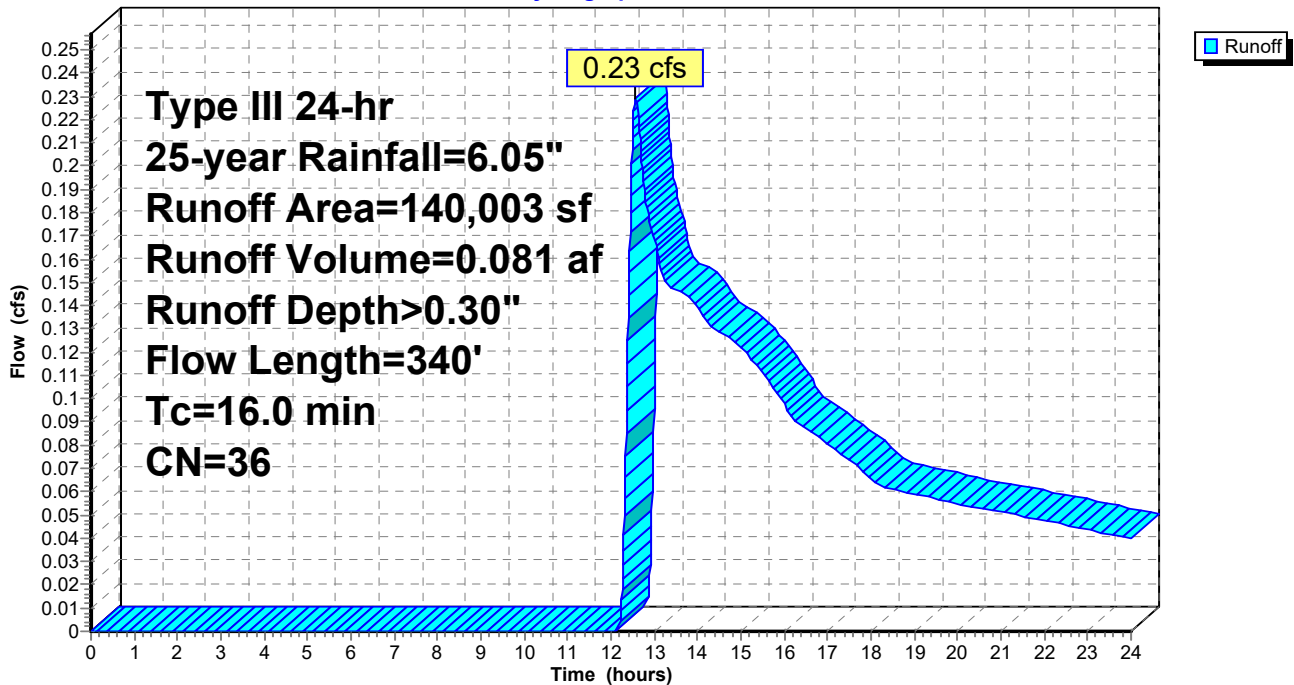
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.05"

Area (sf)	CN	Description
140,003	36	Woods, Fair, HSG A
140,003		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
5.8	290	0.0280	0.84		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
16.0	340	Total			

Subcatchment DA-1: Offsite Runoff

Hydrograph



Existing Conditions

Prepared by JC Engineering Inc.

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Type III 24-hr 100-year Rainfall=7.59"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment DA-1: Offsite Runoff

Runoff Area=140,003 sf 0.00% Impervious Runoff Depth>0.74"
Flow Length=340' Tc=16.0 min CN=36 Runoff=1.04 cfs 0.198 af

Total Runoff Area = 3.214 ac Runoff Volume = 0.198 af Average Runoff Depth = 0.74"
100.00% Pervious = 3.214 ac 0.00% Impervious = 0.000 ac

Existing Conditions

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Type III 24-hr 100-year Rainfall=7.59"

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Summary for Subcatchment DA-1: Offsite Runoff

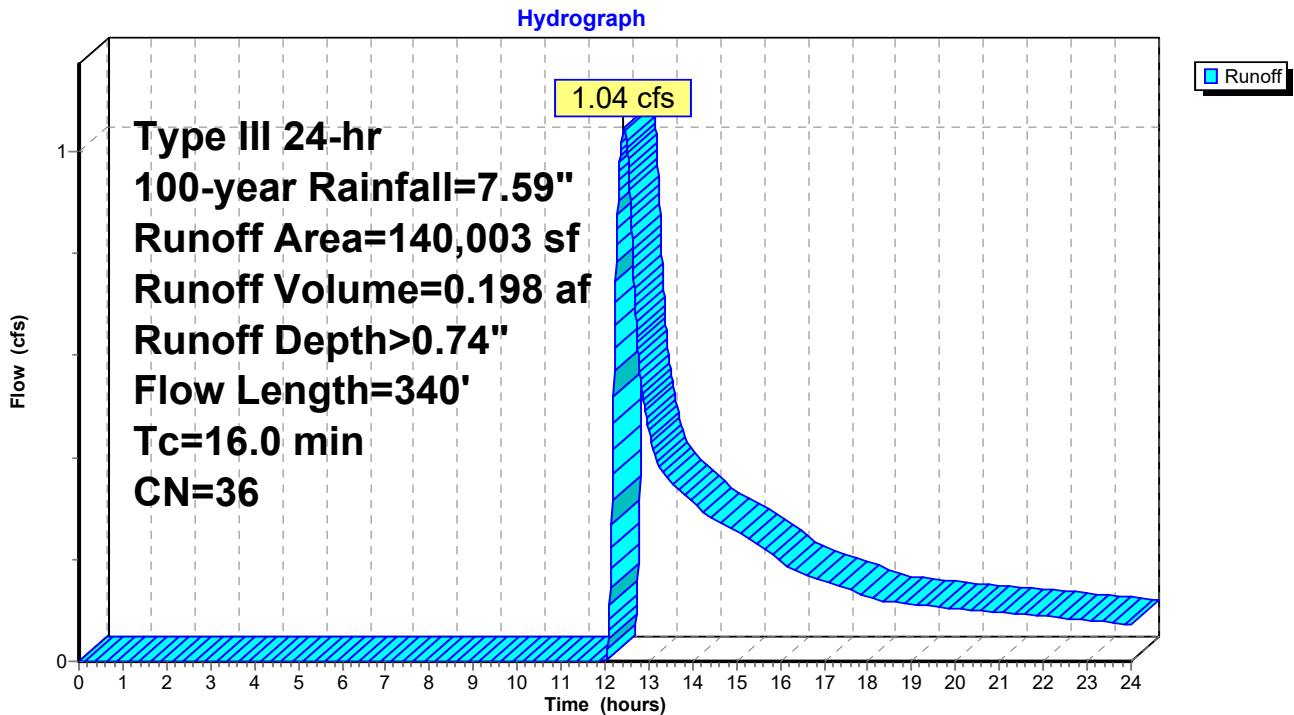
Runoff = 1.04 cfs @ 12.43 hrs, Volume= 0.198 af, Depth> 0.74"

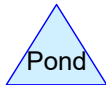
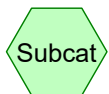
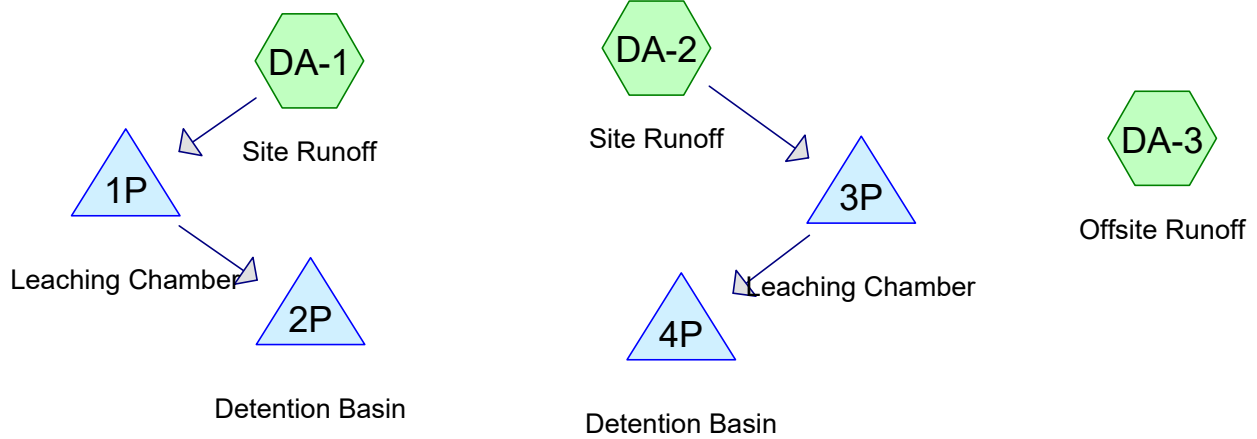
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.59"

Area (sf)	CN	Description
140,003	36	Woods, Fair, HSG A
140,003		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
5.8	290	0.0280	0.84		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
16.0	340	Total			

Subcatchment DA-1: Offsite Runoff





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Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.166	49	Pasture/grassland/range, Fair, HSG A (DA-1, DA-2, DA-3)
1.251	98	Paved parking, HSG A (DA-1, DA-2, DA-3)
1.334	36	Woods, Fair, HSG A (DA-1, DA-2, DA-3)
3.751	61	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
3.751	HSG A	DA-1, DA-2, DA-3
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
3.751		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.166	0.000	0.000	0.000	0.000	1.166	Pasture/grassland/range, Fair	DA-1, DA-2, DA-3
1.251	0.000	0.000	0.000	0.000	1.251	Paved parking	DA-1, DA-2, DA-3
1.334	0.000	0.000	0.000	0.000	1.334	Woods, Fair	DA-1, DA-2, DA-3
3.751	0.000	0.000	0.000	0.000	3.751	TOTAL AREA	

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Type III 24-hr 2-year Rainfall=3.44"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment DA-1: Site Runoff Runoff Area=32,772 sf 66.38% Impervious Runoff Depth>1.66"
Flow Length=168' Slope=0.0100 '/' Tc=1.9 min CN=81 Runoff=1.69 cfs 0.104 af

Subcatchment DA-2: Site Runoff Runoff Area=105,667 sf 30.30% Impervious Runoff Depth>0.46"
Flow Length=355' Tc=17.9 min CN=59 Runoff=0.60 cfs 0.094 af

Subcatchment DA-3: Offsite Runoff Runoff Area=24,949 sf 2.88% Impervious Runoff Depth>0.04"
Flow Length=105' Slope=0.0300 '/' Tc=11.3 min CN=43 Runoff=0.00 cfs 0.002 af

Pond 1P: Leaching Chamber Peak Elev=26.56' Storage=417 cf Inflow=1.69 cfs 0.104 af
Discarded=0.04 cfs 0.043 af Primary=1.81 cfs 0.057 af Outflow=1.85 cfs 0.101 af

Pond 2P: Detention Basin Peak Elev=26.70' Storage=1,435 cf Inflow=1.81 cfs 0.057 af
Outflow=0.12 cfs 0.057 af

Pond 3P: Leaching Chamber Peak Elev=26.40' Storage=417 cf Inflow=0.60 cfs 0.094 af
Discarded=0.04 cfs 0.037 af Primary=0.95 cfs 0.048 af Outflow=0.99 cfs 0.085 af

Pond 4P: Detention Basin Peak Elev=26.09' Storage=377 cf Inflow=0.95 cfs 0.048 af
Outflow=0.20 cfs 0.048 af

Total Runoff Area = 3.751 ac Runoff Volume = 0.200 af Average Runoff Depth = 0.64"
66.65% Pervious = 2.500 ac 33.35% Impervious = 1.251 ac

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Type III 24-hr 2-year Rainfall=3.44"

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Summary for Subcatchment DA-1: Site Runoff

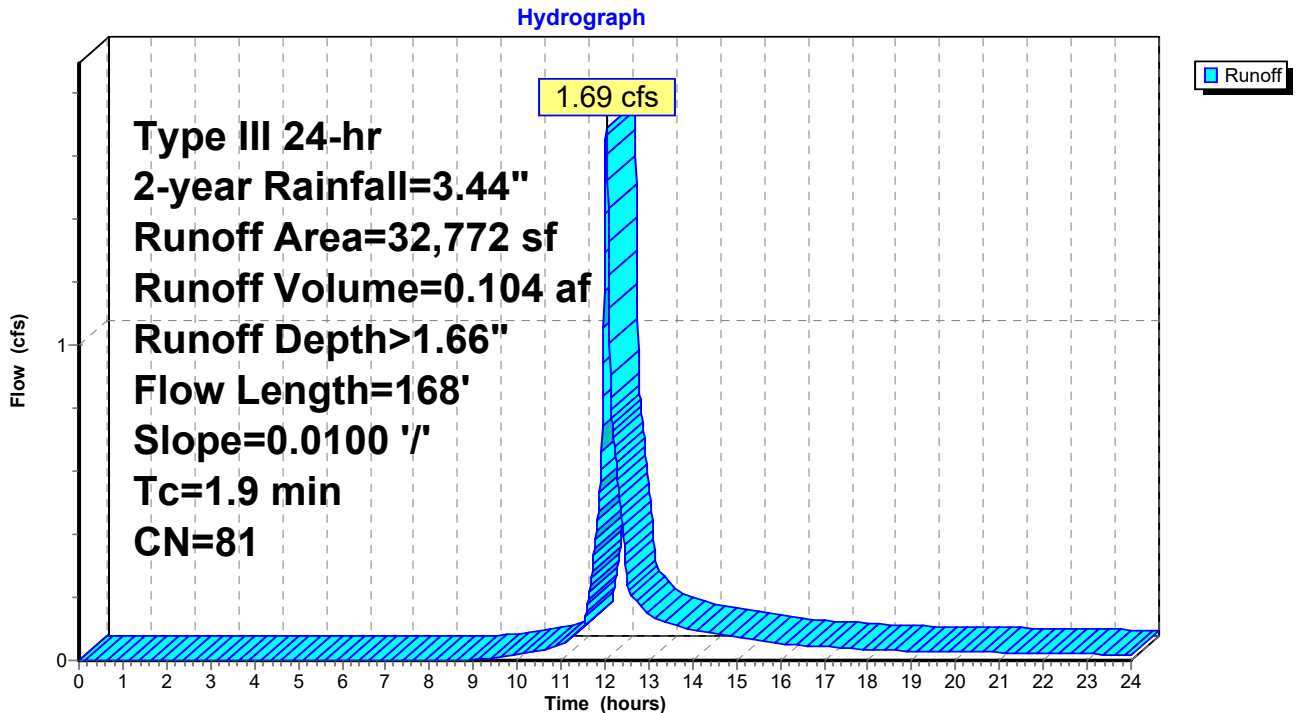
Runoff = 1.69 cfs @ 12.03 hrs, Volume= 0.104 af, Depth> 1.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.44"

Area (sf)	CN	Description
21,755	98	Paved parking, HSG A
1,140	36	Woods, Fair, HSG A
9,877	49	Pasture/grassland/range, Fair, HSG A
32,772	81	Weighted Average
11,017		33.62% Pervious Area
21,755		66.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		Sheet Flow, A-B Smooth surfaces n= 0.011 P2= 3.40"
1.0	118	0.0100	2.03		Shallow Concentrated Flow, B-C Paved Kv= 20.3 fps
1.9	168	Total			

Subcatchment DA-1: Site Runoff



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Type III 24-hr 2-year Rainfall=3.44"

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Summary for Subcatchment DA-2: Site Runoff

Runoff = 0.60 cfs @ 12.36 hrs, Volume= 0.094 af, Depth> 0.46"

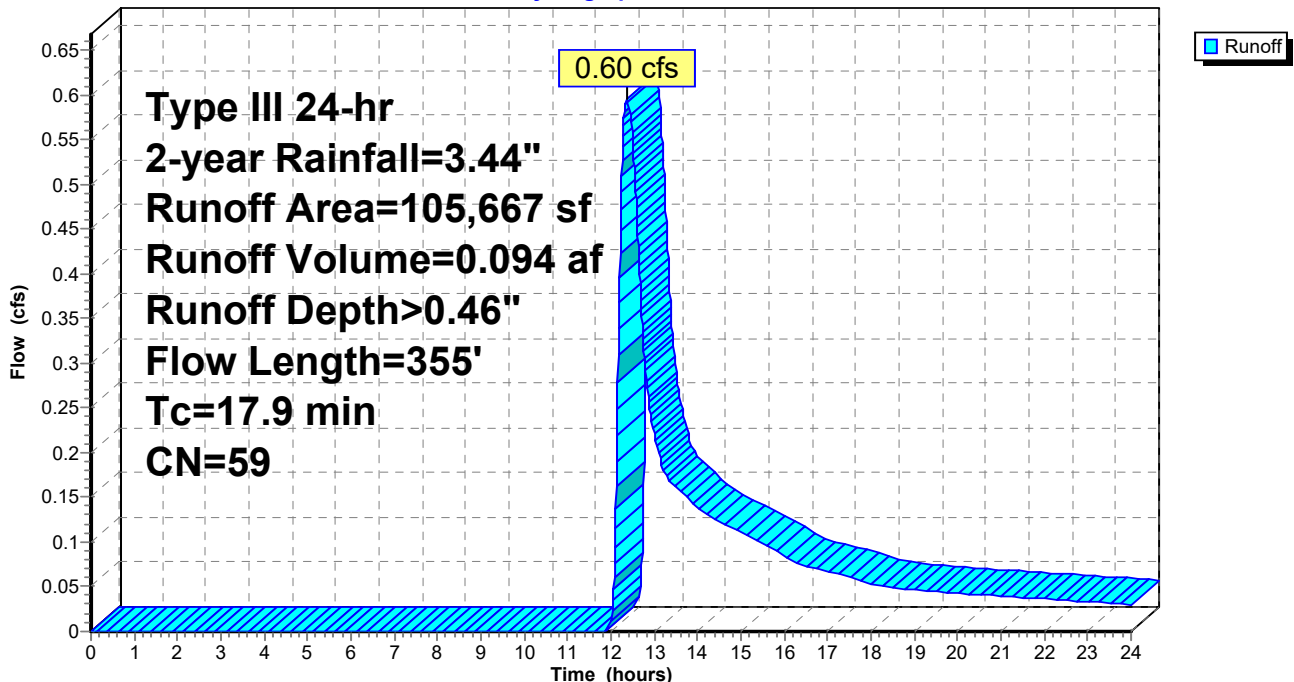
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.44"

Area (sf)	CN	Description
32,015	98	Paved parking, HSG A
42,960	36	Woods, Fair, HSG A
30,692	49	Pasture/grassland/range, Fair, HSG A
105,667	59	Weighted Average
73,652		69.70% Pervious Area
32,015		30.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	50	0.0200	0.07		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
5.1	215	0.0200	0.71		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
0.4	30	0.0300	1.21		Shallow Concentrated Flow, C-D Short Grass Pasture Kv= 7.0 fps
0.4	60	0.0150	2.49		Shallow Concentrated Flow, D-E Paved Kv= 20.3 fps
17.9	355	Total			

Subcatchment DA-2: Site Runoff

Hydrograph



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Type III 24-hr 2-year Rainfall=3.44"

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Summary for Subcatchment DA-3: Offsite Runoff

Runoff = 0.00 cfs @ 15.48 hrs, Volume= 0.002 af, Depth> 0.04"

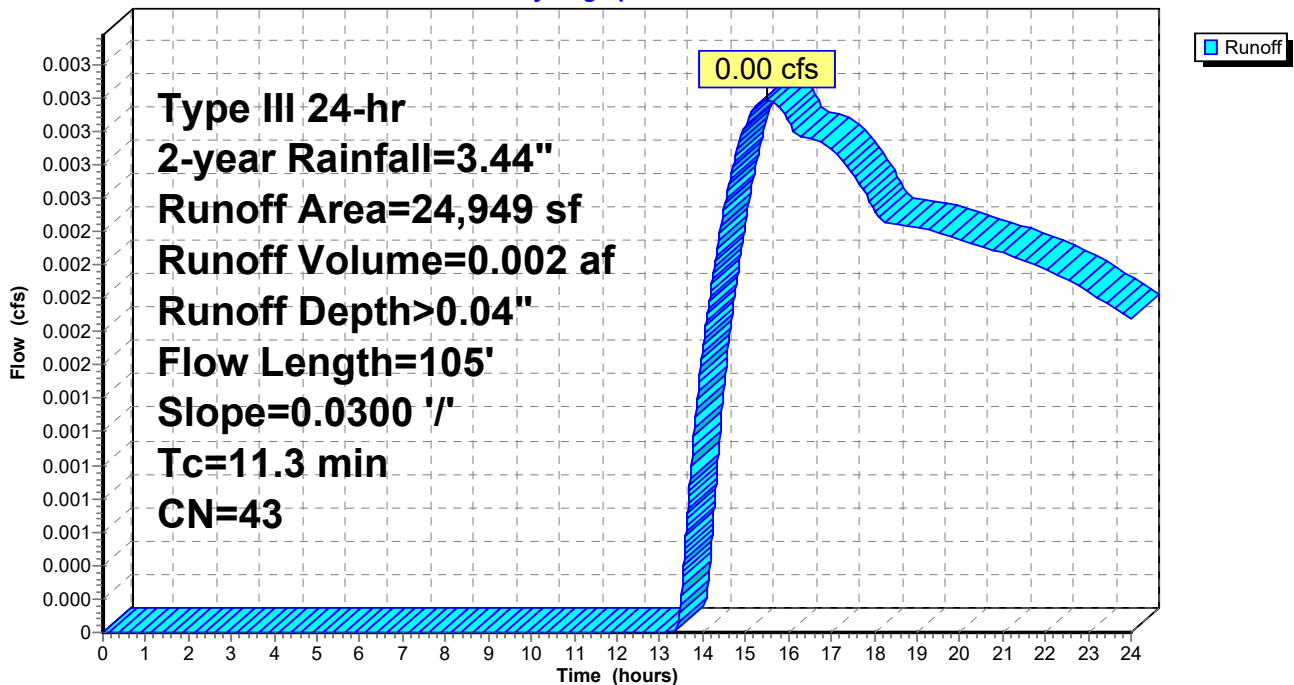
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.44"

Area (sf)	CN	Description
718	98	Paved parking, HSG A
14,007	36	Woods, Fair, HSG A
10,224	49	Pasture/grassland/range, Fair, HSG A
24,949	43	Weighted Average
24,231		97.12% Pervious Area
718		2.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
1.1	55	0.0300	0.87		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
11.3	105	Total			

Subcatchment DA-3: Offsite Runoff

Hydrograph



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Type III 24-hr 2-year Rainfall=3.44"

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Summary for Pond 1P: Leaching Chamber

[93] Warning: Storage range exceeded by 2.06'

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=258)

Inflow Area = 0.752 ac, 66.38% Impervious, Inflow Depth > 1.66" for 2-year event
Inflow = 1.69 cfs @ 12.03 hrs, Volume= 0.104 af
Outflow = 1.85 cfs @ 12.03 hrs, Volume= 0.101 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.04 cfs @ 10.76 hrs, Volume= 0.043 af
Primary = 1.81 cfs @ 12.03 hrs, Volume= 0.057 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 26.56' @ 12.03 hrs Surf.Area= 196 sf Storage= 417 cf

Plug-Flow detention time= 59.2 min calculated for 0.101 af (97% of inflow)
Center-of-Mass det. time= 41.5 min (873.4 - 832.0)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	107 cf	5.50'D x 4.50'H Vertical Cone/Cylinder Inside #2
#2	20.00'	310 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
			882 cf Overall - 107 cf Embedded = 775 cf x 40.0% Voids
417 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	196	0	0
24.50	196	882	882

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	26.00'	24.0" Vert. Orifice/Grate C= 0.600

Discarded OutFlow Max=0.04 cfs @ 10.76 hrs HW=20.08' (Free Discharge)
↑1=**Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=1.81 cfs @ 12.03 hrs HW=26.56' (Free Discharge)
↑2=**Orifice/Grate** (Orifice Controls 1.81 cfs @ 2.54 fps)

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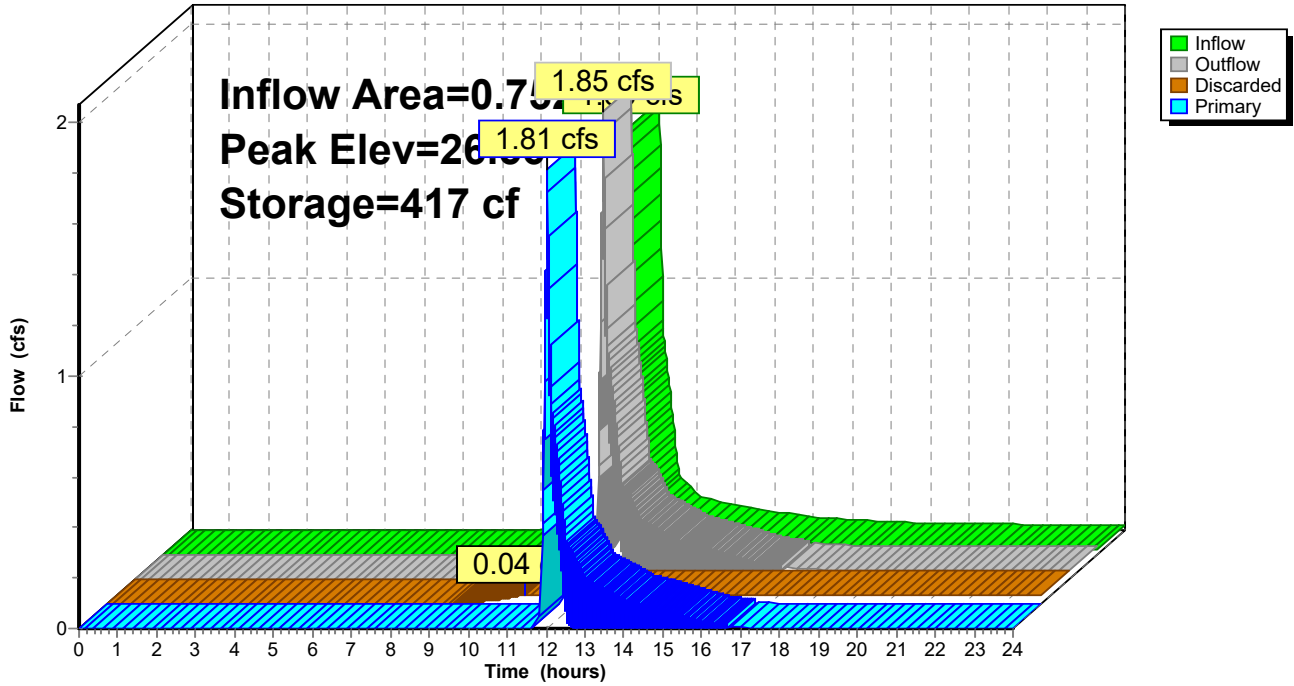
Type III 24-hr 2-year Rainfall=3.44"

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Pond 1P: Leaching Chamber

Hydrograph



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Type III 24-hr 2-year Rainfall=3.44"

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Summary for Pond 2P: Detention Basin

[81] Warning: Exceeded Pond 1P by 4.45' @ 23.99 hrs

Inflow Area = 0.752 ac, 66.38% Impervious, Inflow Depth = 0.92" for 2-year event
 Inflow = 1.81 cfs @ 12.03 hrs, Volume= 0.057 af
 Outflow = 0.12 cfs @ 12.90 hrs, Volume= 0.057 af, Atten= 93%, Lag= 52.0 min
 Discarded = 0.12 cfs @ 12.90 hrs, Volume= 0.057 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 26.70' @ 12.90 hrs Surf.Area= 2,206 sf Storage= 1,435 cf

Plug-Flow detention time= 130.4 min calculated for 0.057 af (100% of inflow)
 Center-of-Mass det. time= 130.4 min (893.1 - 762.7)

Volume	Invert	Avail.Storage	Storage Description		
#1	26.00'	12,998 cf	Custom Stage Data (Conic) Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
26.00	1,725	0	0	1,725	
27.00	2,415	2,060	2,060	2,433	
28.00	3,214	2,805	4,865	3,254	
29.00	4,010	3,605	8,470	4,078	
30.00	5,067	4,528	12,998	5,162	

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.12 cfs @ 12.90 hrs HW=26.70' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.12 cfs)

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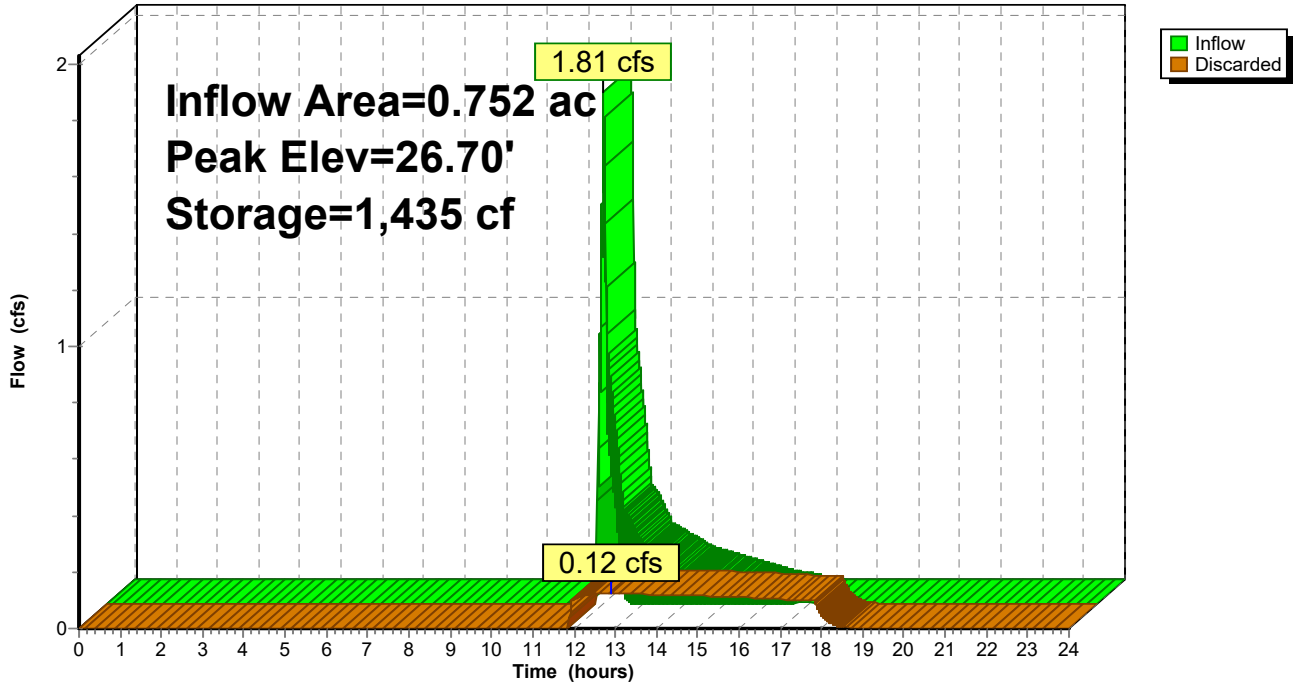
Type III 24-hr 2-year Rainfall=3.44"

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Pond 2P: Detention Basin

Hydrograph



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Type III 24-hr 2-year Rainfall=3.44"

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Summary for Pond 3P: Leaching Chamber

[93] Warning: Storage range exceeded by 1.90'

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=424)

Inflow Area = 2.426 ac, 30.30% Impervious, Inflow Depth > 0.46" for 2-year event
Inflow = 0.60 cfs @ 12.36 hrs, Volume= 0.094 af
Outflow = 0.99 cfs @ 12.39 hrs, Volume= 0.085 af, Atten= 0%, Lag= 1.9 min
Discarded = 0.04 cfs @ 12.09 hrs, Volume= 0.037 af
Primary = 0.95 cfs @ 12.39 hrs, Volume= 0.048 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 26.40' @ 12.39 hrs Surf.Area= 196 sf Storage= 417 cf

Plug-Flow detention time= 69.0 min calculated for 0.085 af (91% of inflow)
Center-of-Mass det. time= 25.1 min (948.7 - 923.6)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	107 cf	5.50'D x 4.50'H Vertical Cone/Cylinder Inside #2
#2	20.00'	310 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
			882 cf Overall - 107 cf Embedded = 775 cf x 40.0% Voids
417 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	196	0	0
24.50	196	882	882

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	26.00'	24.0" Vert. Orifice/Grate C= 0.600

Discarded OutFlow Max=0.04 cfs @ 12.09 hrs HW=20.09' (Free Discharge)
↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.95 cfs @ 12.39 hrs HW=26.40' (Free Discharge)
↑2=Orifice/Grate (Orifice Controls 0.95 cfs @ 2.15 fps)

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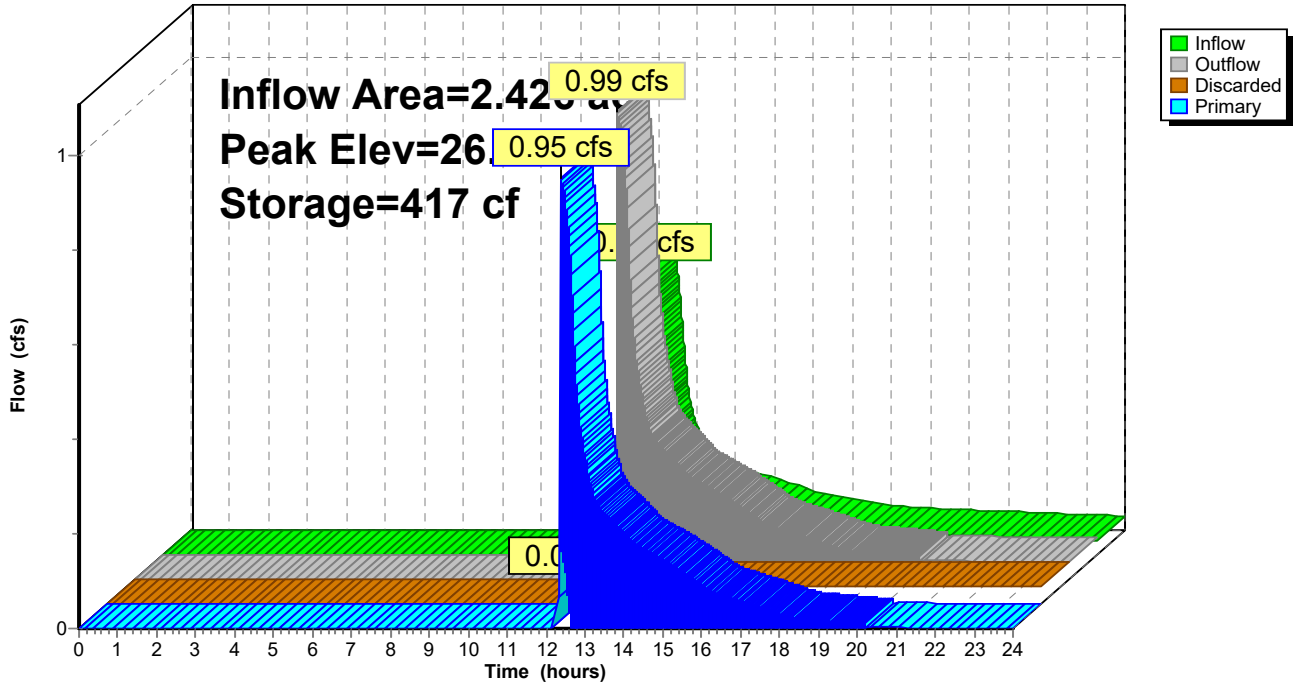
Type III 24-hr 2-year Rainfall=3.44"

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Pond 3P: Leaching Chamber

Hydrograph



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Type III 24-hr 2-year Rainfall=3.44"

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Summary for Pond 4P: Detention Basin

[81] Warning: Exceeded Pond 3P by 1.83' @ 23.99 hrs

Inflow Area = 2.426 ac, 30.30% Impervious, Inflow Depth = 0.24" for 2-year event
 Inflow = 0.95 cfs @ 12.39 hrs, Volume= 0.048 af
 Outflow = 0.20 cfs @ 12.92 hrs, Volume= 0.048 af, Atten= 79%, Lag= 31.8 min
 Discarded = 0.20 cfs @ 12.92 hrs, Volume= 0.048 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 26.09' @ 12.92 hrs Surf.Area= 3,652 sf Storage= 377 cf

Plug-Flow detention time= 18.8 min calculated for 0.048 af (100% of inflow)
 Center-of-Mass det. time= 18.8 min (864.4 - 845.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	26.00'	23,817 cf	Custom Stage Data (Conic) Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
26.00	3,553	0	0	3,553	
27.00	4,626	4,078	4,078	4,650	
28.00	6,075	5,334	9,412	6,121	
29.00	7,198	6,629	16,040	7,281	
30.00	8,369	7,776	23,817	8,493	

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.20 cfs @ 12.92 hrs HW=26.09' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.20 cfs)

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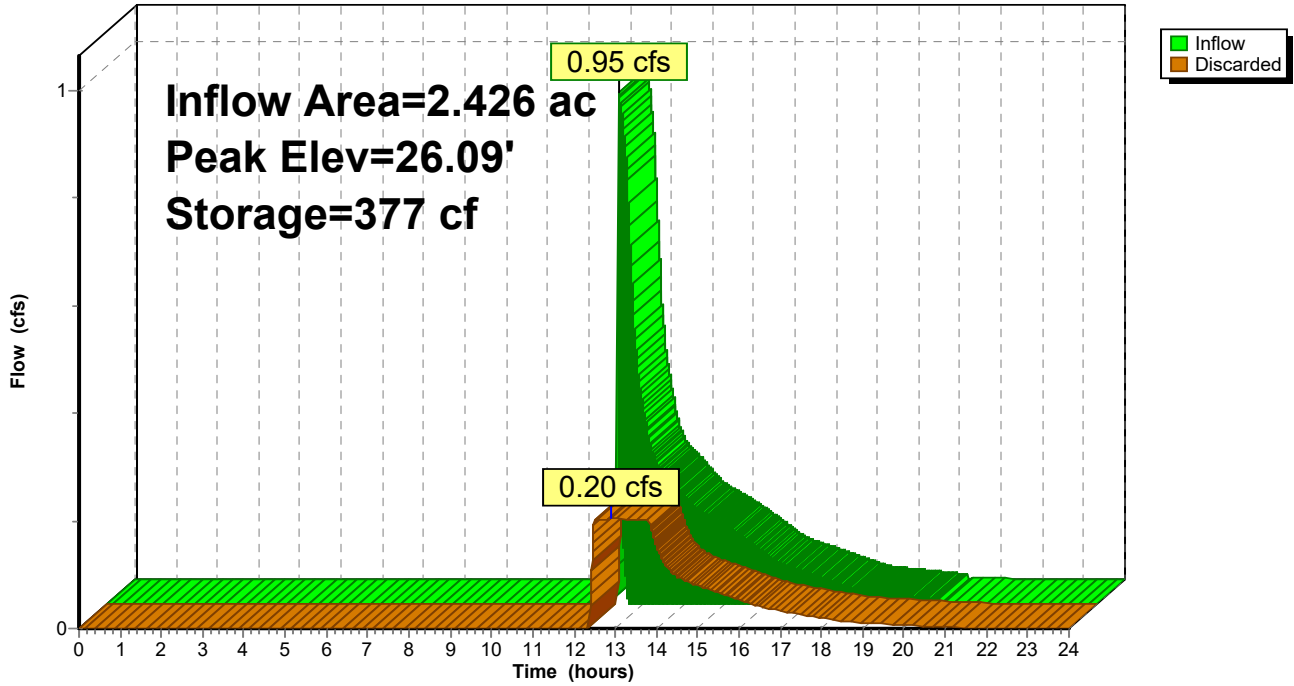
Type III 24-hr 2-year Rainfall=3.44"

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Pond 4P: Detention Basin

Hydrograph



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Type III 24-hr 10-year Rainfall=5.05"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment DA-1: Site Runoff Runoff Area=32,772 sf 66.38% Impervious Runoff Depth>3.03"
Flow Length=168' Slope=0.0100 '/' Tc=1.9 min CN=81 Runoff=3.10 cfs 0.190 af

Subcatchment DA-2: Site Runoff Runoff Area=105,667 sf 30.30% Impervious Runoff Depth>1.26"
Flow Length=355' Tc=17.9 min CN=59 Runoff=2.22 cfs 0.254 af

Subcatchment DA-3: Offsite Runoff Runoff Area=24,949 sf 2.88% Impervious Runoff Depth>0.37"
Flow Length=105' Slope=0.0300 '/' Tc=11.3 min CN=43 Runoff=0.08 cfs 0.017 af

Pond 1P: Leaching Chamber Peak Elev=26.73' Storage=417 cf Inflow=3.10 cfs 0.190 af
Discarded=0.04 cfs 0.048 af Primary=3.04 cfs 0.133 af Outflow=3.08 cfs 0.181 af

Pond 2P: Detention Basin Peak Elev=27.54' Storage=3,585 cf Inflow=3.04 cfs 0.133 af
Outflow=0.16 cfs 0.133 af

Pond 3P: Leaching Chamber Peak Elev=26.68' Storage=417 cf Inflow=2.22 cfs 0.254 af
Discarded=0.04 cfs 0.038 af Primary=2.63 cfs 0.206 af Outflow=2.66 cfs 0.244 af

Pond 4P: Detention Basin Peak Elev=26.98' Storage=3,991 cf Inflow=2.63 cfs 0.206 af
Outflow=0.26 cfs 0.206 af

Total Runoff Area = 3.751 ac Runoff Volume = 0.461 af Average Runoff Depth = 1.48"
66.65% Pervious = 2.500 ac 33.35% Impervious = 1.251 ac

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Type III 24-hr 10-year Rainfall=5.05"

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Summary for Subcatchment DA-1: Site Runoff

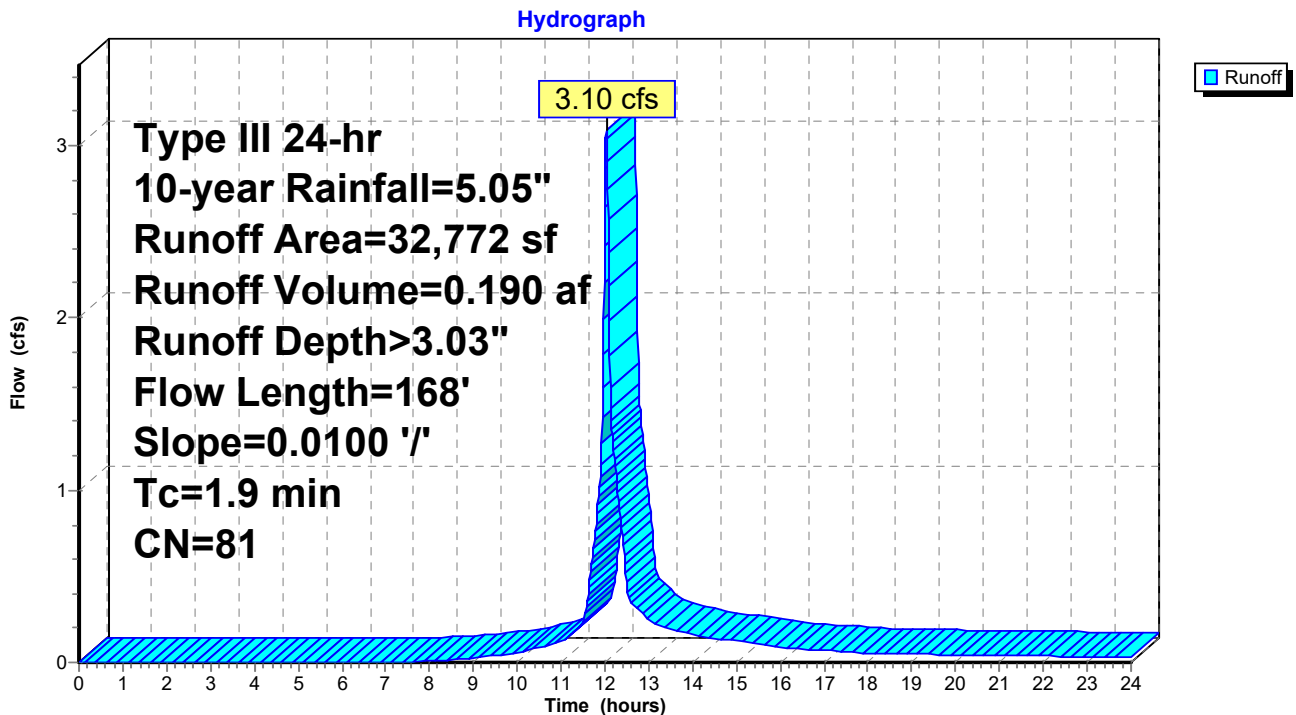
Runoff = 3.10 cfs @ 12.03 hrs, Volume= 0.190 af, Depth> 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.05"

Area (sf)	CN	Description
21,755	98	Paved parking, HSG A
1,140	36	Woods, Fair, HSG A
9,877	49	Pasture/grassland/range, Fair, HSG A
32,772	81	Weighted Average
11,017		33.62% Pervious Area
21,755		66.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		Sheet Flow, A-B Smooth surfaces n= 0.011 P2= 3.40"
1.0	118	0.0100	2.03		Shallow Concentrated Flow, B-C Paved Kv= 20.3 fps
1.9	168	Total			

Subcatchment DA-1: Site Runoff



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Type III 24-hr 10-year Rainfall=5.05"

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Summary for Subcatchment DA-2: Site Runoff

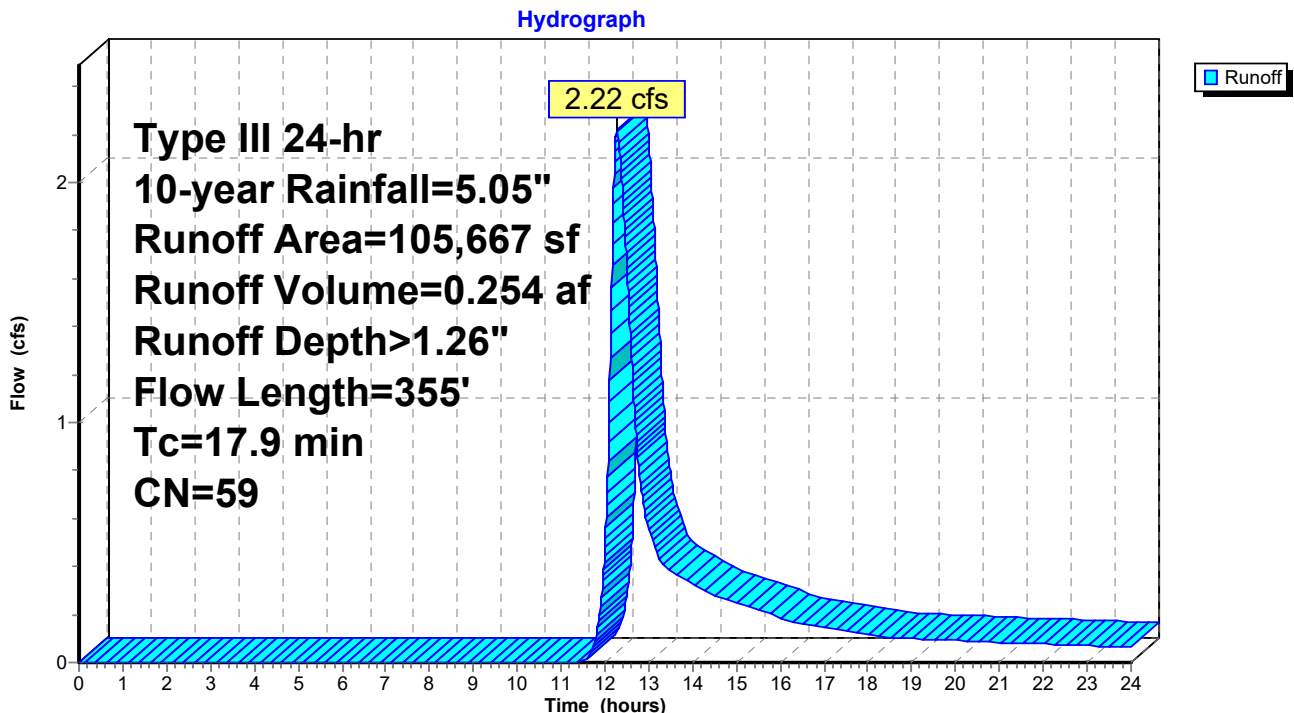
Runoff = 2.22 cfs @ 12.28 hrs, Volume= 0.254 af, Depth> 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.05"

Area (sf)	CN	Description
32,015	98	Paved parking, HSG A
42,960	36	Woods, Fair, HSG A
30,692	49	Pasture/grassland/range, Fair, HSG A
105,667	59	Weighted Average
73,652		69.70% Pervious Area
32,015		30.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	50	0.0200	0.07		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
5.1	215	0.0200	0.71		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
0.4	30	0.0300	1.21		Shallow Concentrated Flow, C-D Short Grass Pasture Kv= 7.0 fps
0.4	60	0.0150	2.49		Shallow Concentrated Flow, D-E Paved Kv= 20.3 fps
17.9	355	Total			

Subcatchment DA-2: Site Runoff



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Type III 24-hr 10-year Rainfall=5.05"

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Summary for Subcatchment DA-3: Offsite Runoff

Runoff = 0.08 cfs @ 12.44 hrs, Volume= 0.017 af, Depth> 0.37"

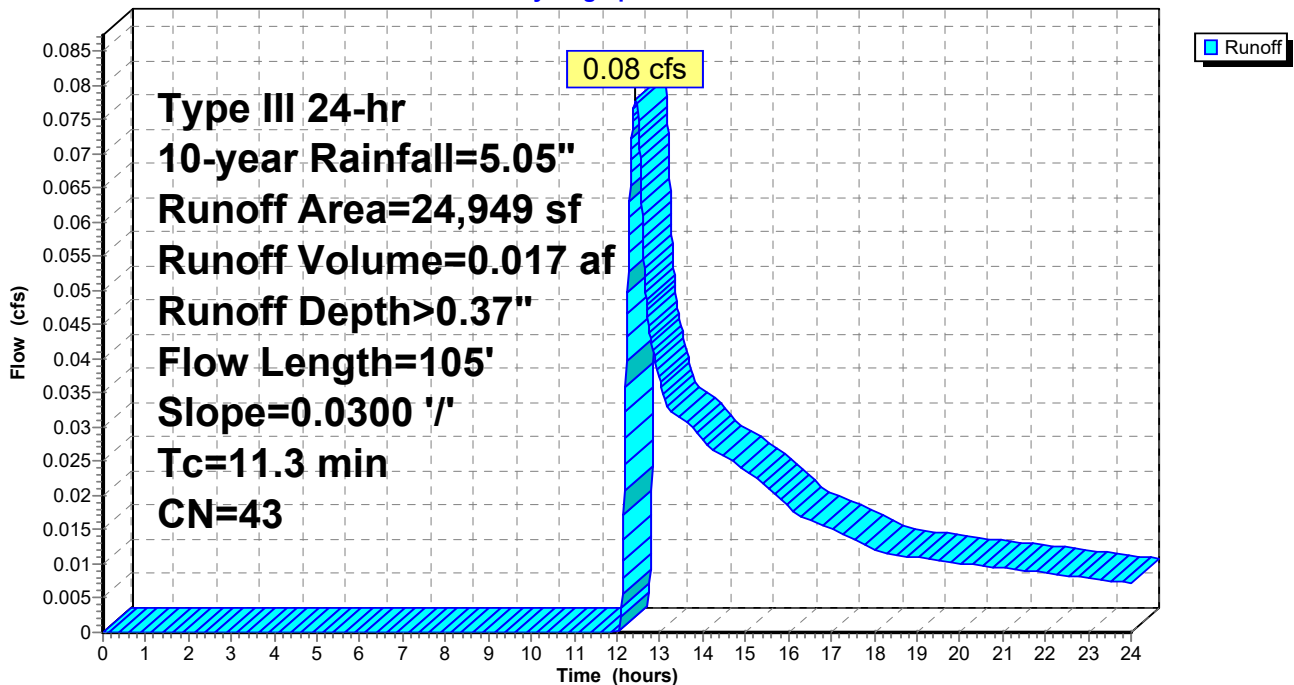
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=5.05"

Area (sf)	CN	Description
718	98	Paved parking, HSG A
14,007	36	Woods, Fair, HSG A
10,224	49	Pasture/grassland/range, Fair, HSG A
24,949	43	Weighted Average
24,231		97.12% Pervious Area
718		2.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
1.1	55	0.0300	0.87		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
11.3	105	Total			

Subcatchment DA-3: Offsite Runoff

Hydrograph



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Type III 24-hr 10-year Rainfall=5.05"

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Summary for Pond 1P: Leaching Chamber

[93] Warning: Storage range exceeded by 2.23'

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=362)

Inflow Area = 0.752 ac, 66.38% Impervious, Inflow Depth > 3.03" for 10-year event
Inflow = 3.10 cfs @ 12.03 hrs, Volume= 0.190 af
Outflow = 3.08 cfs @ 12.03 hrs, Volume= 0.181 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.04 cfs @ 9.44 hrs, Volume= 0.048 af
Primary = 3.04 cfs @ 12.03 hrs, Volume= 0.133 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 26.73' @ 12.03 hrs Surf.Area= 196 sf Storage= 417 cf

Plug-Flow detention time= 36.7 min calculated for 0.181 af (95% of inflow)
Center-of-Mass det. time= 11.2 min (825.9 - 814.6)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	107 cf	5.50'D x 4.50'H Vertical Cone/Cylinder Inside #2
#2	20.00'	310 cf	Custom Stage Data (Prismatic) Listed below (Recalc) 882 cf Overall - 107 cf Embedded = 775 cf x 40.0% Voids
		417 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	196	0	0
24.50	196	882	882

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	26.00'	24.0" Vert. Orifice/Grate C= 0.600

Discarded OutFlow Max=0.04 cfs @ 9.44 hrs HW=20.08' (Free Discharge)
↑1=**Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=3.04 cfs @ 12.03 hrs HW=26.73' (Free Discharge)
↑2=**Orifice/Grate** (Orifice Controls 3.04 cfs @ 2.91 fps)

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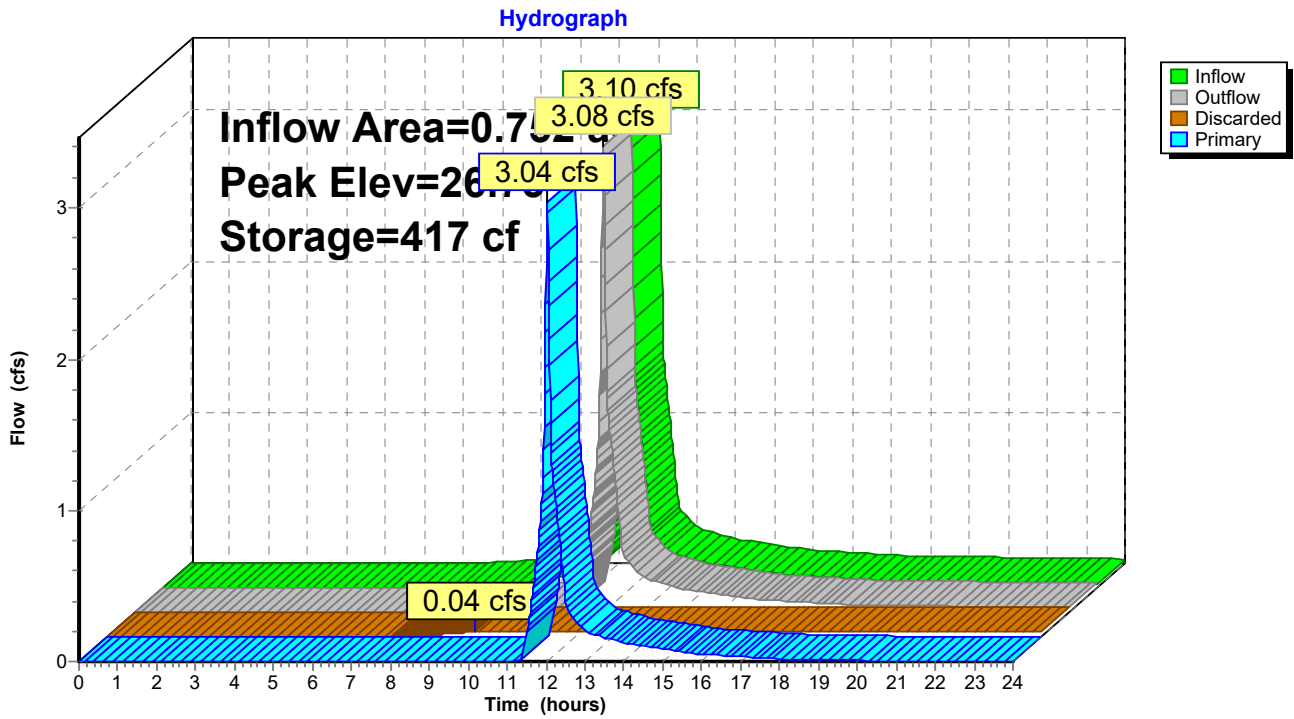
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Type III 24-hr 10-year Rainfall=5.05"

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Pond 1P: Leaching Chamber



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Type III 24-hr 10-year Rainfall=5.05"

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Summary for Pond 2P: Detention Basin

[81] Warning: Exceeded Pond 1P by 2.51' @ 18.37 hrs

Inflow Area = 0.752 ac, 66.38% Impervious, Inflow Depth = 2.13" for 10-year event
 Inflow = 3.04 cfs @ 12.03 hrs, Volume= 0.133 af
 Outflow = 0.16 cfs @ 13.52 hrs, Volume= 0.133 af, Atten= 95%, Lag= 89.5 min
 Discarded = 0.16 cfs @ 13.52 hrs, Volume= 0.133 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 27.54' @ 13.52 hrs Surf.Area= 2,849 sf Storage= 3,585 cf

Plug-Flow detention time= 258.3 min calculated for 0.133 af (100% of inflow)
 Center-of-Mass det. time= 257.8 min (1,029.5 - 771.7)

Volume	Invert	Avail.Storage	Storage Description		
#1	26.00'	12,998 cf	Custom Stage Data (Conic) Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
26.00	1,725	0	0	1,725	
27.00	2,415	2,060	2,060	2,433	
28.00	3,214	2,805	4,865	3,254	
29.00	4,010	3,605	8,470	4,078	
30.00	5,067	4,528	12,998	5,162	

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.16 cfs @ 13.52 hrs HW=27.54' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.16 cfs)

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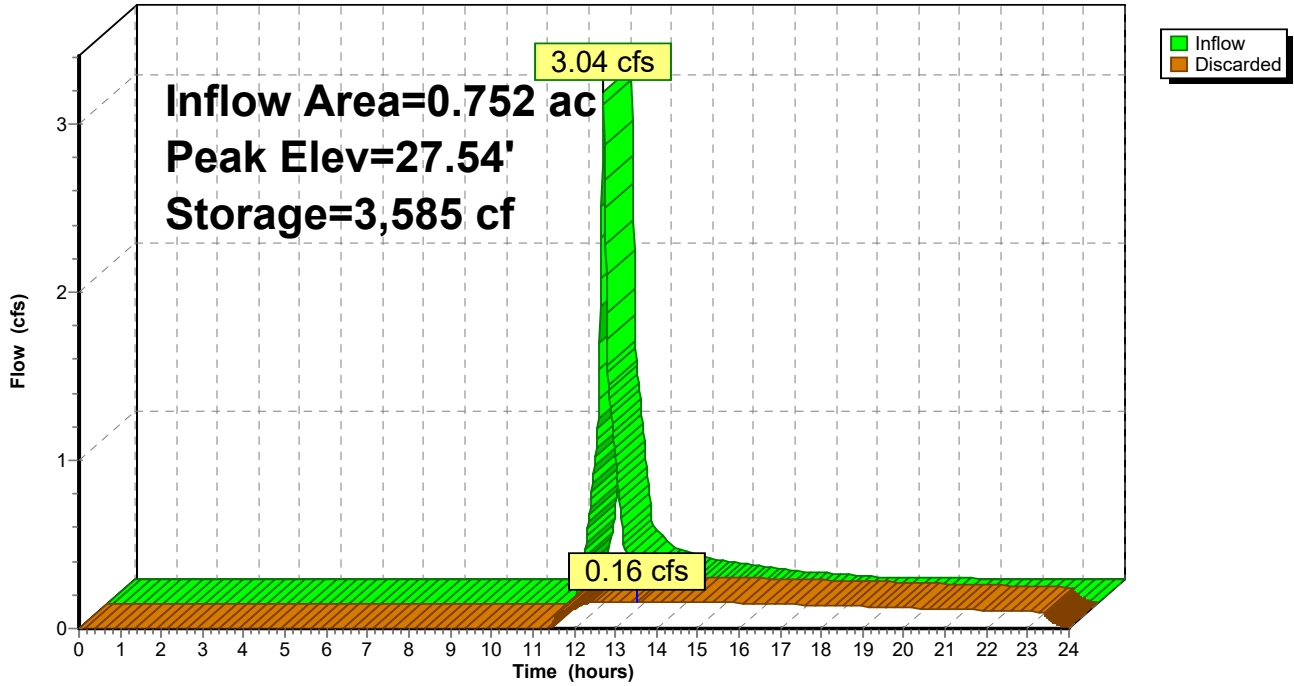
Type III 24-hr 10-year Rainfall=5.05"

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Pond 2P: Detention Basin

Hydrograph



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Type III 24-hr 10-year Rainfall=5.05"

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Summary for Pond 3P: Leaching Chamber

[93] Warning: Storage range exceeded by 2.18'

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=592)

Inflow Area = 2.426 ac, 30.30% Impervious, Inflow Depth > 1.26" for 10-year event
Inflow = 2.22 cfs @ 12.28 hrs, Volume= 0.254 af
Outflow = 2.66 cfs @ 12.27 hrs, Volume= 0.244 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.04 cfs @ 11.74 hrs, Volume= 0.038 af
Primary = 2.63 cfs @ 12.27 hrs, Volume= 0.206 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 26.68' @ 12.27 hrs Surf.Area= 196 sf Storage= 417 cf

Plug-Flow detention time= 26.2 min calculated for 0.244 af (96% of inflow)
Center-of-Mass det. time= 6.5 min (892.3 - 885.8)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	107 cf	5.50'D x 4.50'H Vertical Cone/Cylinder Inside #2
#2	20.00'	310 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
			882 cf Overall - 107 cf Embedded = 775 cf x 40.0% Voids
417 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	196	0	0
24.50	196	882	882

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	26.00'	24.0" Vert. Orifice/Grate C= 0.600

Discarded OutFlow Max=0.04 cfs @ 11.74 hrs HW=20.09' (Free Discharge)
↑1=**Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=2.62 cfs @ 12.27 hrs HW=26.68' (Free Discharge)
↑2=**Orifice/Grate** (Orifice Controls 2.62 cfs @ 2.80 fps)

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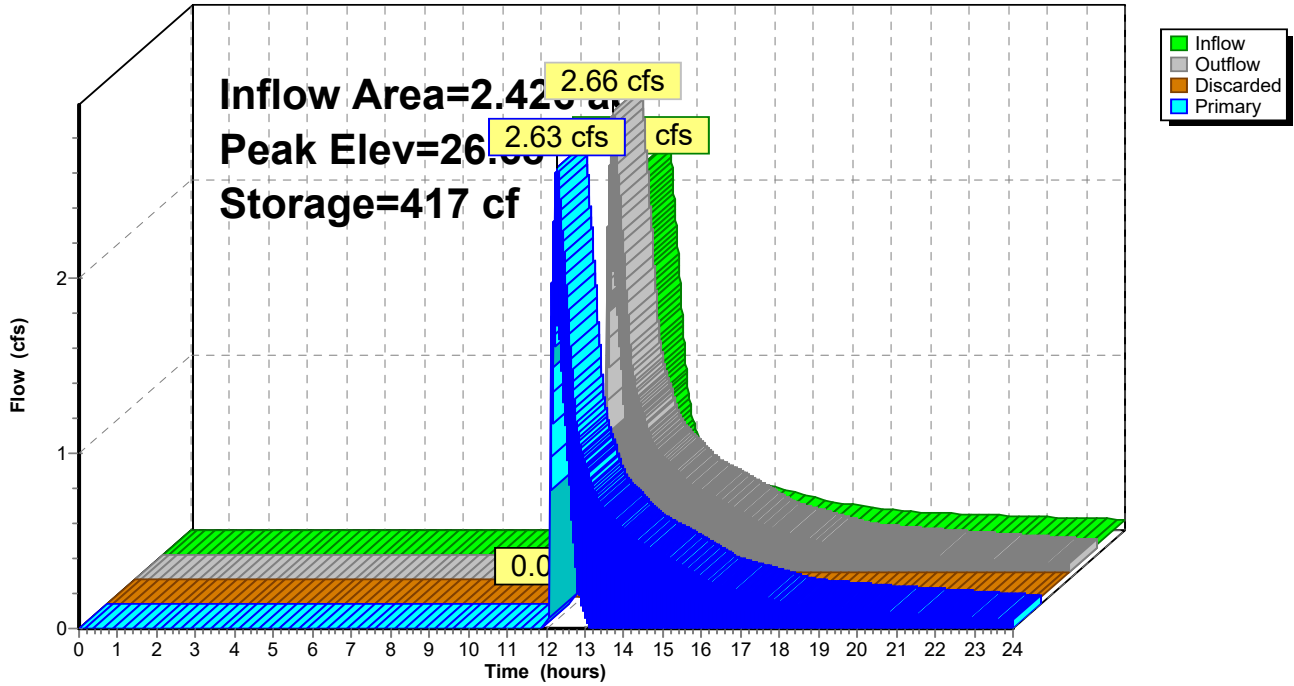
Type III 24-hr 10-year Rainfall=5.05"

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Pond 3P: Leaching Chamber

Hydrograph



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Type III 24-hr 10-year Rainfall=5.05"

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Summary for Pond 4P: Detention Basin

[81] Warning: Exceeded Pond 3P by 2.48' @ 14.24 hrs

Inflow Area = 2.426 ac, 30.30% Impervious, Inflow Depth > 1.02" for 10-year event
 Inflow = 2.63 cfs @ 12.27 hrs, Volume= 0.206 af
 Outflow = 0.26 cfs @ 14.28 hrs, Volume= 0.206 af, Atten= 90%, Lag= 120.7 min
 Discarded = 0.26 cfs @ 14.28 hrs, Volume= 0.206 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 26.98' @ 14.28 hrs Surf.Area= 4,603 sf Storage= 3,991 cf

Plug-Flow detention time= 176.0 min calculated for 0.206 af (100% of inflow)
 Center-of-Mass det. time= 174.6 min (1,033.9 - 859.3)

Volume	Invert	Avail.Storage	Storage Description		
#1	26.00'	23,817 cf	Custom Stage Data (Conic) Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
26.00	3,553	0	0	3,553	
27.00	4,626	4,078	4,078	4,650	
28.00	6,075	5,334	9,412	6,121	
29.00	7,198	6,629	16,040	7,281	
30.00	8,369	7,776	23,817	8,493	

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.26 cfs @ 14.28 hrs HW=26.98' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.26 cfs)

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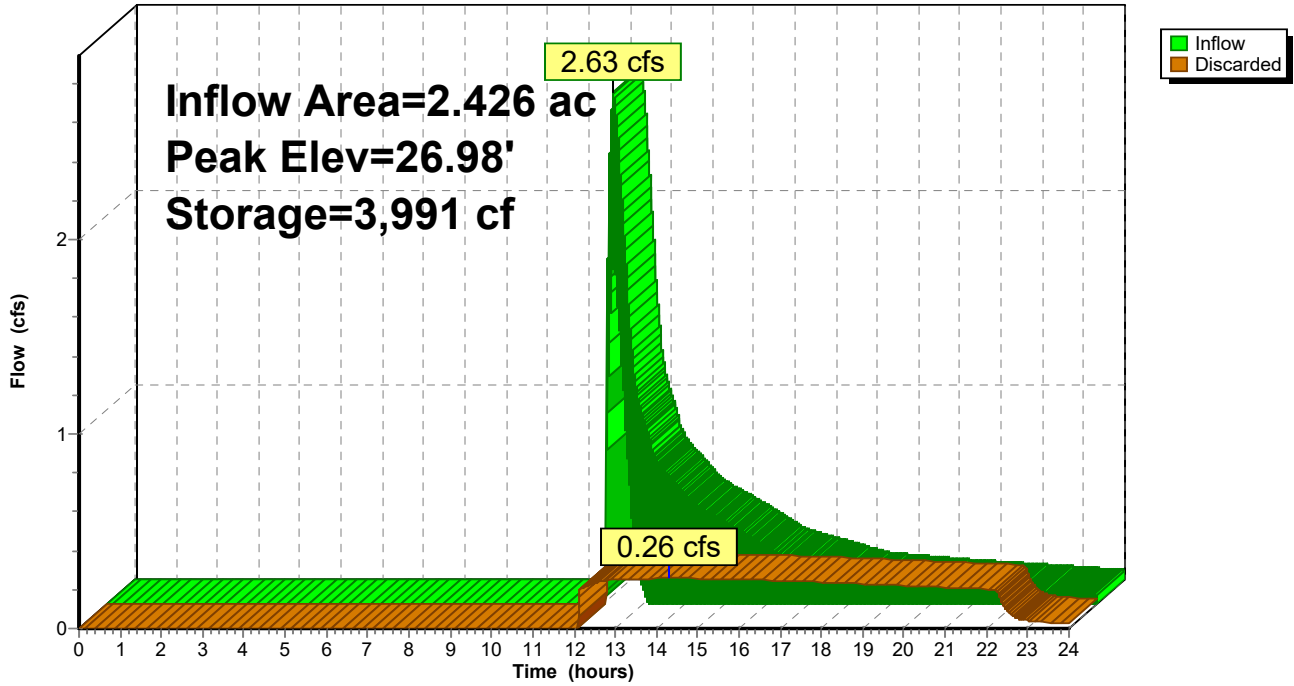
Type III 24-hr 10-year Rainfall=5.05"

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Pond 4P: Detention Basin

Hydrograph



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Type III 24-hr 25-year Rainfall=6.05"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment DA-1: Site Runoff Runoff Area=32,772 sf 66.38% Impervious Runoff Depth>3.93"
Flow Length=168' Slope=0.0100 '/' Tc=1.9 min CN=81 Runoff=3.99 cfs 0.246 af

Subcatchment DA-2: Site Runoff Runoff Area=105,667 sf 30.30% Impervious Runoff Depth>1.86"
Flow Length=355' Tc=17.9 min CN=59 Runoff=3.49 cfs 0.376 af

Subcatchment DA-3: Offsite Runoff Runoff Area=24,949 sf 2.88% Impervious Runoff Depth>0.69"
Flow Length=105' Slope=0.0300 '/' Tc=11.3 min CN=43 Runoff=0.20 cfs 0.033 af

Pond 1P: Leaching Chamber Peak Elev=26.85' Storage=417 cf Inflow=3.99 cfs 0.246 af
Discarded=0.04 cfs 0.050 af Primary=4.03 cfs 0.187 af Outflow=4.07 cfs 0.237 af

Pond 2P: Detention Basin Peak Elev=28.05' Storage=5,052 cf Inflow=4.03 cfs 0.187 af
Outflow=0.18 cfs 0.163 af

Pond 3P: Leaching Chamber Peak Elev=26.79' Storage=417 cf Inflow=3.49 cfs 0.376 af
Discarded=0.04 cfs 0.040 af Primary=3.49 cfs 0.327 af Outflow=3.53 cfs 0.367 af

Pond 4P: Detention Basin Peak Elev=27.61' Storage=7,328 cf Inflow=3.49 cfs 0.327 af
Outflow=0.31 cfs 0.276 af

Total Runoff Area = 3.751 ac Runoff Volume = 0.656 af Average Runoff Depth = 2.10"
66.65% Pervious = 2.500 ac 33.35% Impervious = 1.251 ac

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Type III 24-hr 25-year Rainfall=6.05"

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Summary for Subcatchment DA-1: Site Runoff

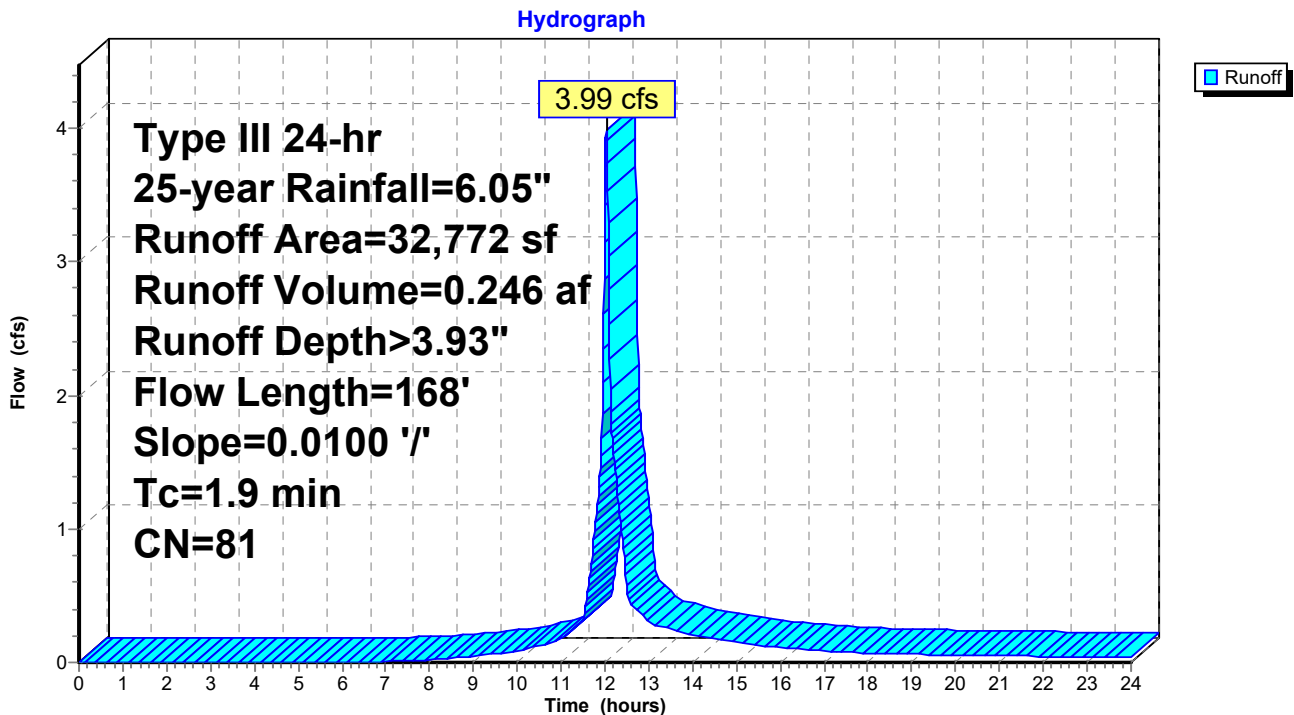
Runoff = 3.99 cfs @ 12.03 hrs, Volume= 0.246 af, Depth> 3.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.05"

Area (sf)	CN	Description
21,755	98	Paved parking, HSG A
1,140	36	Woods, Fair, HSG A
9,877	49	Pasture/grassland/range, Fair, HSG A
32,772	81	Weighted Average
11,017		33.62% Pervious Area
21,755		66.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		Sheet Flow, A-B Smooth surfaces n= 0.011 P2= 3.40"
1.0	118	0.0100	2.03		Shallow Concentrated Flow, B-C Paved Kv= 20.3 fps
1.9	168	Total			

Subcatchment DA-1: Site Runoff



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Summary for Subcatchment DA-2: Site Runoff

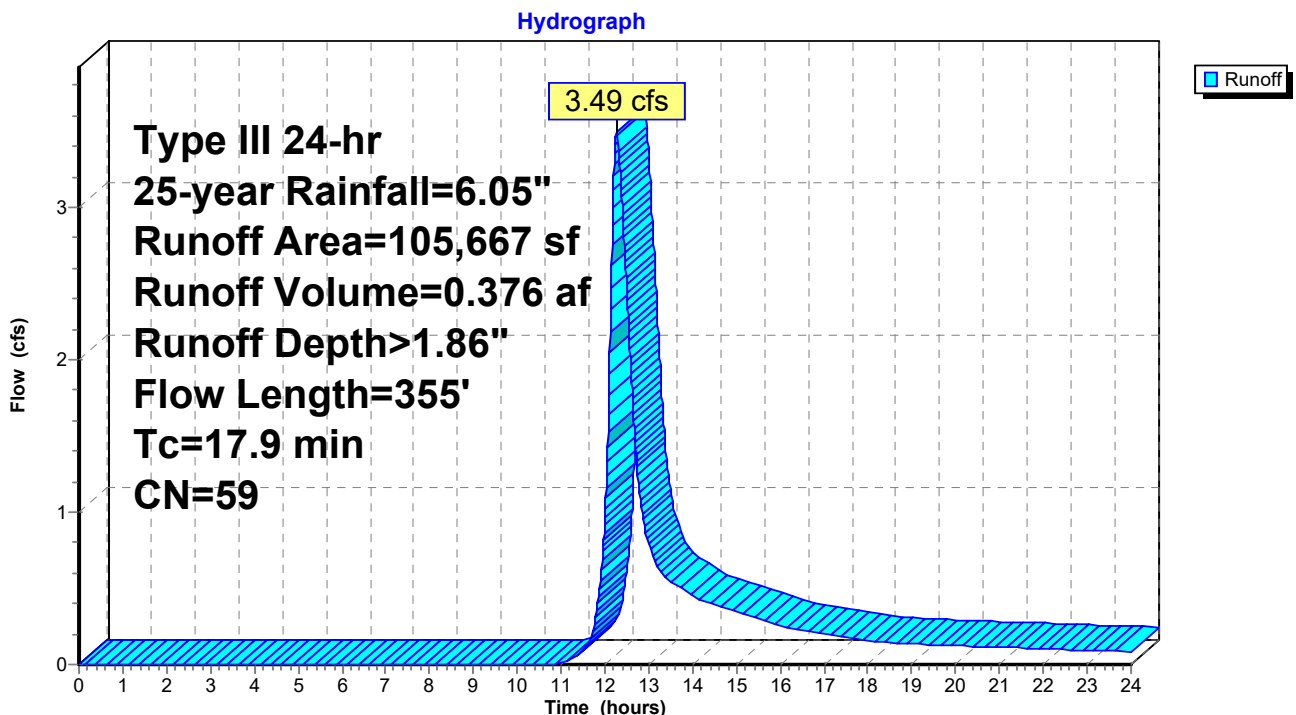
Runoff = 3.49 cfs @ 12.27 hrs, Volume= 0.376 af, Depth> 1.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.05"

Area (sf)	CN	Description
32,015	98	Paved parking, HSG A
42,960	36	Woods, Fair, HSG A
30,692	49	Pasture/grassland/range, Fair, HSG A
105,667	59	Weighted Average
73,652		69.70% Pervious Area
32,015		30.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	50	0.0200	0.07		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
5.1	215	0.0200	0.71		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
0.4	30	0.0300	1.21		Shallow Concentrated Flow, C-D Short Grass Pasture Kv= 7.0 fps
0.4	60	0.0150	2.49		Shallow Concentrated Flow, D-E Paved Kv= 20.3 fps
17.9	355	Total			

Subcatchment DA-2: Site Runoff



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Summary for Subcatchment DA-3: Offsite Runoff

Runoff = 0.20 cfs @ 12.29 hrs, Volume= 0.033 af, Depth> 0.69"

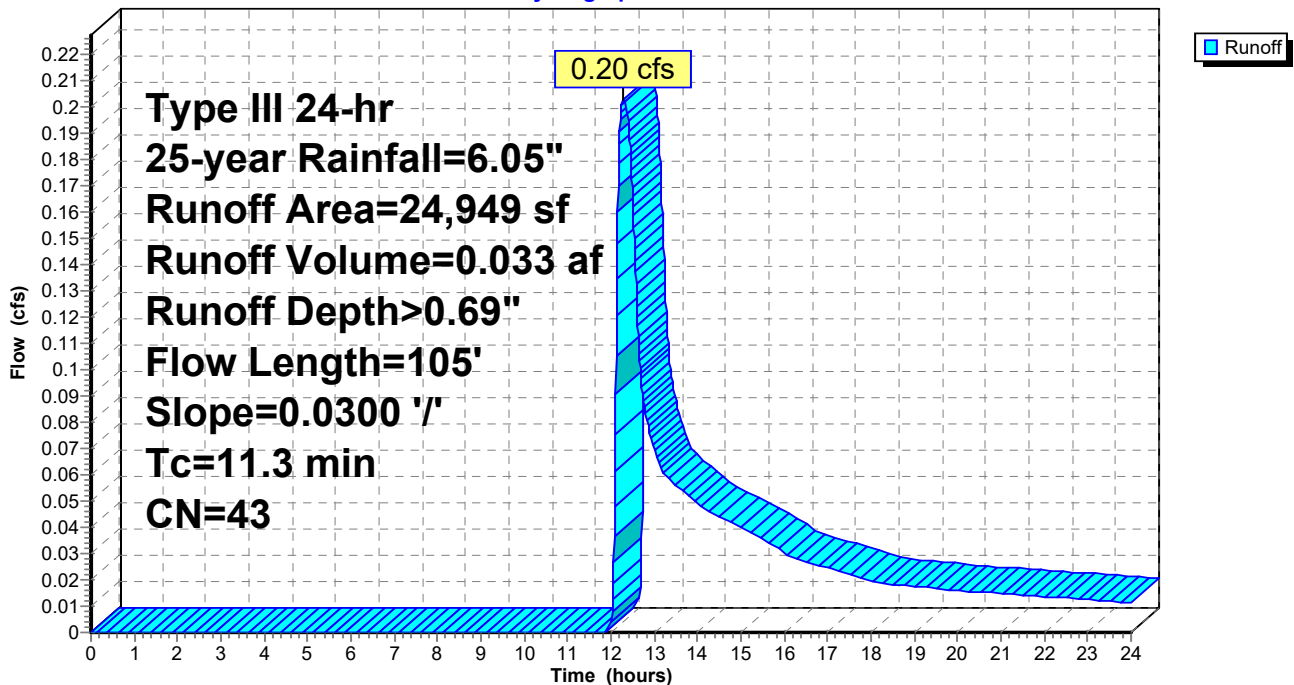
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-year Rainfall=6.05"

Area (sf)	CN	Description
718	98	Paved parking, HSG A
14,007	36	Woods, Fair, HSG A
10,224	49	Pasture/grassland/range, Fair, HSG A
24,949	43	Weighted Average
24,231		97.12% Pervious Area
718		2.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
1.1	55	0.0300	0.87		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
11.3	105	Total			

Subcatchment DA-3: Offsite Runoff

Hydrograph



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Type III 24-hr 25-year Rainfall=6.05"

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Summary for Pond 1P: Leaching Chamber

[93] Warning: Storage range exceeded by 2.35'

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=510)

Inflow Area = 0.752 ac, 66.38% Impervious, Inflow Depth > 3.93" for 25-year event
Inflow = 3.99 cfs @ 12.03 hrs, Volume= 0.246 af
Outflow = 4.07 cfs @ 12.03 hrs, Volume= 0.237 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.04 cfs @ 8.78 hrs, Volume= 0.050 af
Primary = 4.03 cfs @ 12.03 hrs, Volume= 0.187 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 26.85' @ 12.03 hrs Surf.Area= 196 sf Storage= 417 cf

Plug-Flow detention time= 29.9 min calculated for 0.237 af (96% of inflow)
Center-of-Mass det. time= 7.8 min (815.1 - 807.2)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	107 cf	5.50'D x 4.50'H Vertical Cone/Cylinder Inside #2
#2	20.00'	310 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
			882 cf Overall - 107 cf Embedded = 775 cf x 40.0% Voids
417 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	196	0	0
24.50	196	882	882

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	26.00'	24.0" Vert. Orifice/Grate C= 0.600

Discarded OutFlow Max=0.04 cfs @ 8.78 hrs HW=20.08' (Free Discharge)
↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=4.03 cfs @ 12.03 hrs HW=26.85' (Free Discharge)
↑2=Orifice/Grate (Orifice Controls 4.03 cfs @ 3.15 fps)

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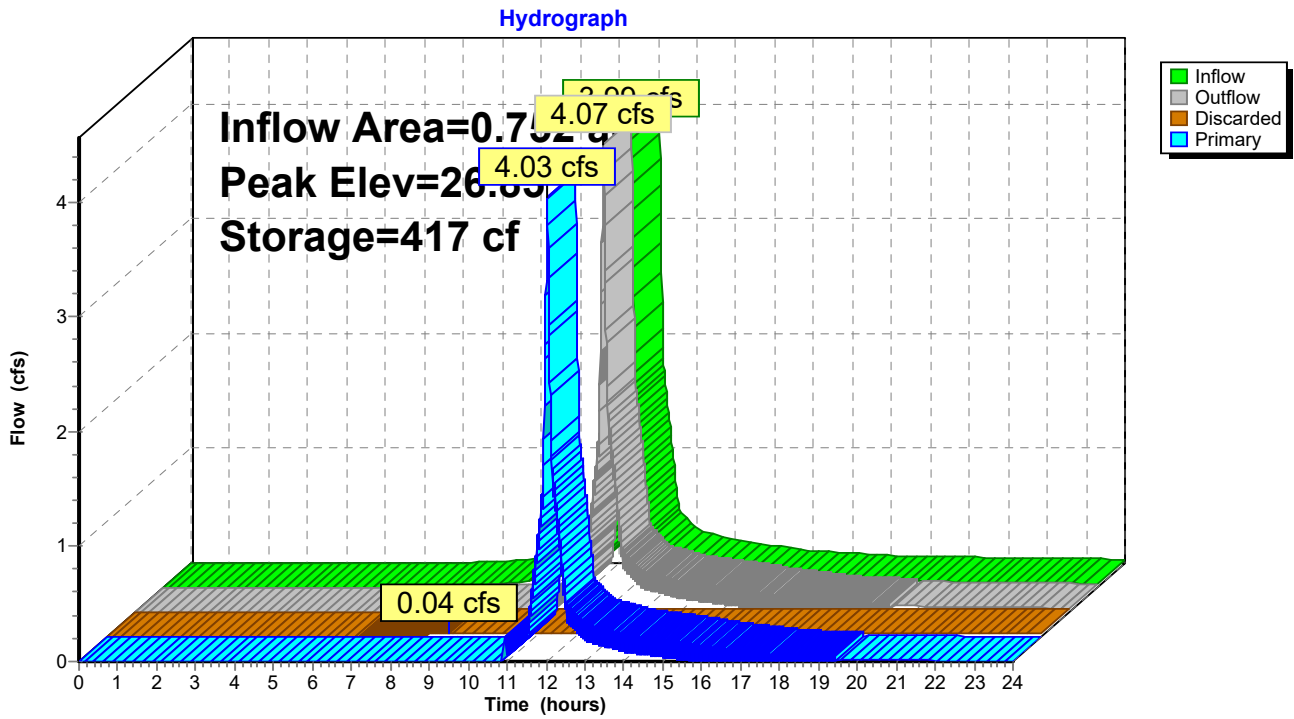
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Type III 24-hr 25-year Rainfall=6.05"

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Pond 1P: Leaching Chamber



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Type III 24-hr 25-year Rainfall=6.05"

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Summary for Pond 2P: Detention Basin

[81] Warning: Exceeded Pond 1P by 3.42' @ 15.84 hrs

Inflow Area = 0.752 ac, 66.38% Impervious, Inflow Depth = 2.98" for 25-year event
 Inflow = 4.03 cfs @ 12.03 hrs, Volume= 0.187 af
 Outflow = 0.18 cfs @ 13.81 hrs, Volume= 0.163 af, Atten= 95%, Lag= 106.5 min
 Discarded = 0.18 cfs @ 13.81 hrs, Volume= 0.163 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 28.05' @ 13.81 hrs Surf.Area= 3,255 sf Storage= 5,052 cf

Plug-Flow detention time= 294.4 min calculated for 0.163 af (87% of inflow)
 Center-of-Mass det. time= 259.0 min (1,036.5 - 777.4)

Volume	Invert	Avail.Storage	Storage Description		
#1	26.00'	12,998 cf	Custom Stage Data (Conic) Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
26.00	1,725	0	0	1,725	
27.00	2,415	2,060	2,060	2,433	
28.00	3,214	2,805	4,865	3,254	
29.00	4,010	3,605	8,470	4,078	
30.00	5,067	4,528	12,998	5,162	

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.18 cfs @ 13.81 hrs HW=28.05' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.18 cfs)

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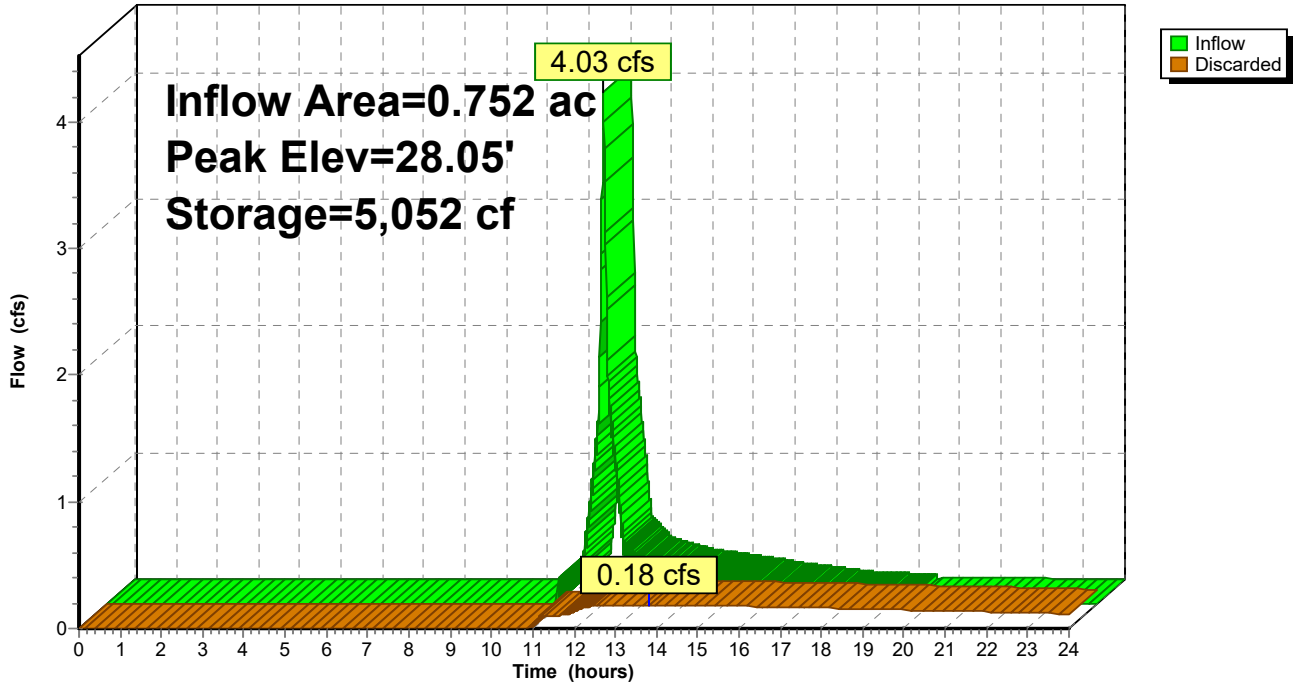
Type III 24-hr 25-year Rainfall=6.05"

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Pond 2P: Detention Basin

Hydrograph



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Type III 24-hr 25-year Rainfall=6.05"

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Summary for Pond 3P: Leaching Chamber

[93] Warning: Storage range exceeded by 2.29'

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=589)

Inflow Area = 2.426 ac, 30.30% Impervious, Inflow Depth > 1.86" for 25-year event
Inflow = 3.49 cfs @ 12.27 hrs, Volume= 0.376 af
Outflow = 3.53 cfs @ 12.26 hrs, Volume= 0.367 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.04 cfs @ 11.31 hrs, Volume= 0.040 af
Primary = 3.49 cfs @ 12.26 hrs, Volume= 0.327 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 26.79' @ 12.26 hrs Surf.Area= 196 sf Storage= 417 cf

Plug-Flow detention time= 18.1 min calculated for 0.367 af (97% of inflow)
Center-of-Mass det. time= 4.4 min (877.6 - 873.2)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	107 cf	5.50'D x 4.50'H Vertical Cone/Cylinder Inside #2
#2	20.00'	310 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
			882 cf Overall - 107 cf Embedded = 775 cf x 40.0% Voids
417 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	196	0	0
24.50	196	882	882

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	26.00'	24.0" Vert. Orifice/Grate C= 0.600

Discarded OutFlow Max=0.04 cfs @ 11.31 hrs HW=20.08' (Free Discharge)
↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=3.48 cfs @ 12.26 hrs HW=26.79' (Free Discharge)
↑2=Orifice/Grate (Orifice Controls 3.48 cfs @ 3.02 fps)

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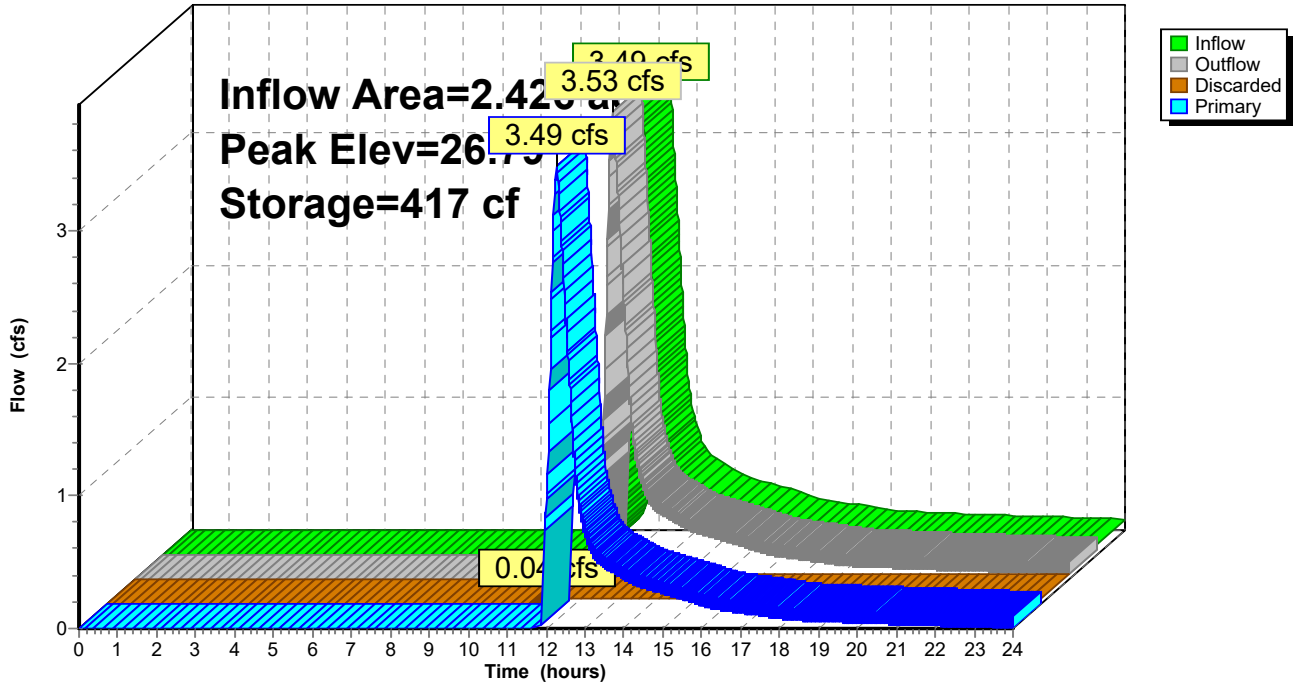
Type III 24-hr 25-year Rainfall=6.05"

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Pond 3P: Leaching Chamber

Hydrograph



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Type III 24-hr 25-year Rainfall=6.05"

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Summary for Pond 4P: Detention Basin

[81] Warning: Exceeded Pond 3P by 1.42' @ 15.67 hrs

Inflow Area = 2.426 ac, 30.30% Impervious, Inflow Depth > 1.62" for 25-year event
 Inflow = 3.49 cfs @ 12.26 hrs, Volume= 0.327 af
 Outflow = 0.31 cfs @ 15.02 hrs, Volume= 0.276 af, Atten= 91%, Lag= 165.4 min
 Discarded = 0.31 cfs @ 15.02 hrs, Volume= 0.276 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 27.61' @ 15.02 hrs Surf.Area= 5,509 sf Storage= 7,328 cf

Plug-Flow detention time= 273.1 min calculated for 0.275 af (84% of inflow)
 Center-of-Mass det. time= 211.6 min (1,067.5 - 856.0)

Volume	Invert	Avail.Storage	Storage Description		
#1	26.00'	23,817 cf	Custom Stage Data (Conic) Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
26.00	3,553	0	0	3,553	
27.00	4,626	4,078	4,078	4,650	
28.00	6,075	5,334	9,412	6,121	
29.00	7,198	6,629	16,040	7,281	
30.00	8,369	7,776	23,817	8,493	

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.31 cfs @ 15.02 hrs HW=27.61' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.31 cfs)

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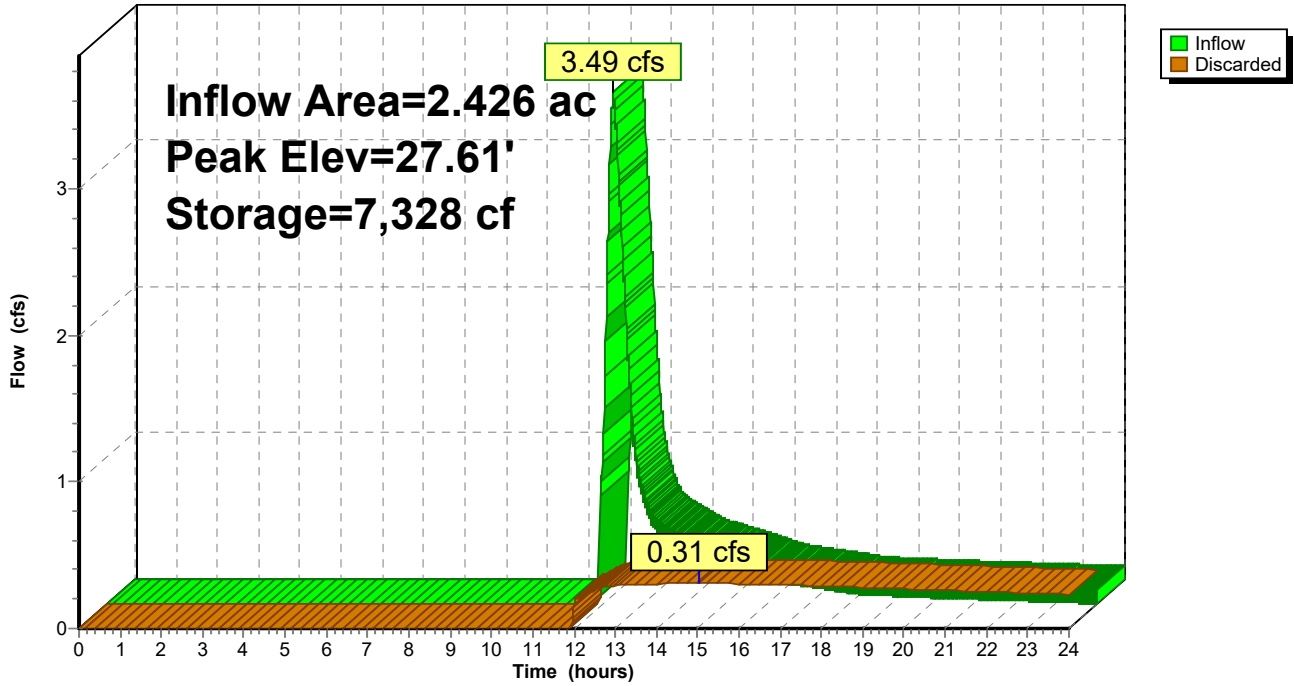
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Pond 4P: Detention Basin

Hydrograph



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Type III 24-hr 100-year Rainfall=7.59"

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

Subcatchment DA-1: Site Runoff Runoff Area=32,772 sf 66.38% Impervious Runoff Depth>5.35"
Flow Length=168' Slope=0.0100 '/' Tc=1.9 min CN=81 Runoff=5.39 cfs 0.336 af

Subcatchment DA-2: Site Runoff Runoff Area=105,667 sf 30.30% Impervious Runoff Depth>2.91"
Flow Length=355' Tc=17.9 min CN=59 Runoff=5.68 cfs 0.588 af

Subcatchment DA-3: Offsite Runoff Runoff Area=24,949 sf 2.88% Impervious Runoff Depth>1.34"
Flow Length=105' Slope=0.0300 '/' Tc=11.3 min CN=43 Runoff=0.56 cfs 0.064 af

Pond 1P: Leaching Chamber Peak Elev=27.00' Storage=417 cf Inflow=5.39 cfs 0.336 af
Discarded=0.04 cfs 0.053 af Primary=5.37 cfs 0.273 af Outflow=5.41 cfs 0.326 af

Pond 2P: Detention Basin Peak Elev=28.73' Storage=7,487 cf Inflow=5.37 cfs 0.273 af
Outflow=0.21 cfs 0.203 af

Pond 3P: Leaching Chamber Peak Elev=27.05' Storage=417 cf Inflow=5.68 cfs 0.588 af
Discarded=0.04 cfs 0.042 af Primary=5.84 cfs 0.537 af Outflow=5.87 cfs 0.579 af

Pond 4P: Detention Basin Peak Elev=28.62' Storage=13,529 cf Inflow=5.84 cfs 0.537 af
Outflow=0.38 cfs 0.357 af

Total Runoff Area = 3.751 ac Runoff Volume = 0.988 af Average Runoff Depth = 3.16"
66.65% Pervious = 2.500 ac 33.35% Impervious = 1.251 ac

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Summary for Subcatchment DA-1: Site Runoff

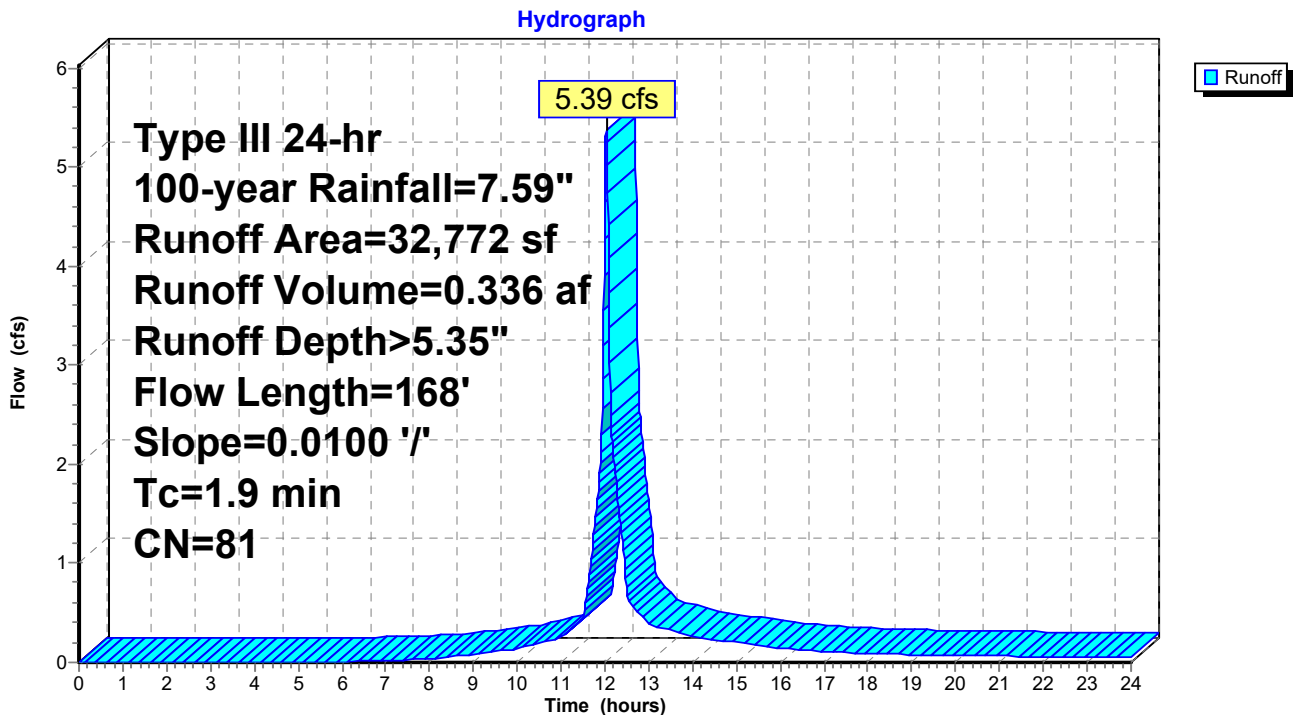
Runoff = 5.39 cfs @ 12.03 hrs, Volume= 0.336 af, Depth> 5.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.59"

Area (sf)	CN	Description
21,755	98	Paved parking, HSG A
1,140	36	Woods, Fair, HSG A
9,877	49	Pasture/grassland/range, Fair, HSG A
32,772	81	Weighted Average
11,017		33.62% Pervious Area
21,755		66.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		Sheet Flow, A-B Smooth surfaces n= 0.011 P2= 3.40"
1.0	118	0.0100	2.03		Shallow Concentrated Flow, B-C Paved Kv= 20.3 fps
1.9	168	Total			

Subcatchment DA-1: Site Runoff



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Summary for Subcatchment DA-2: Site Runoff

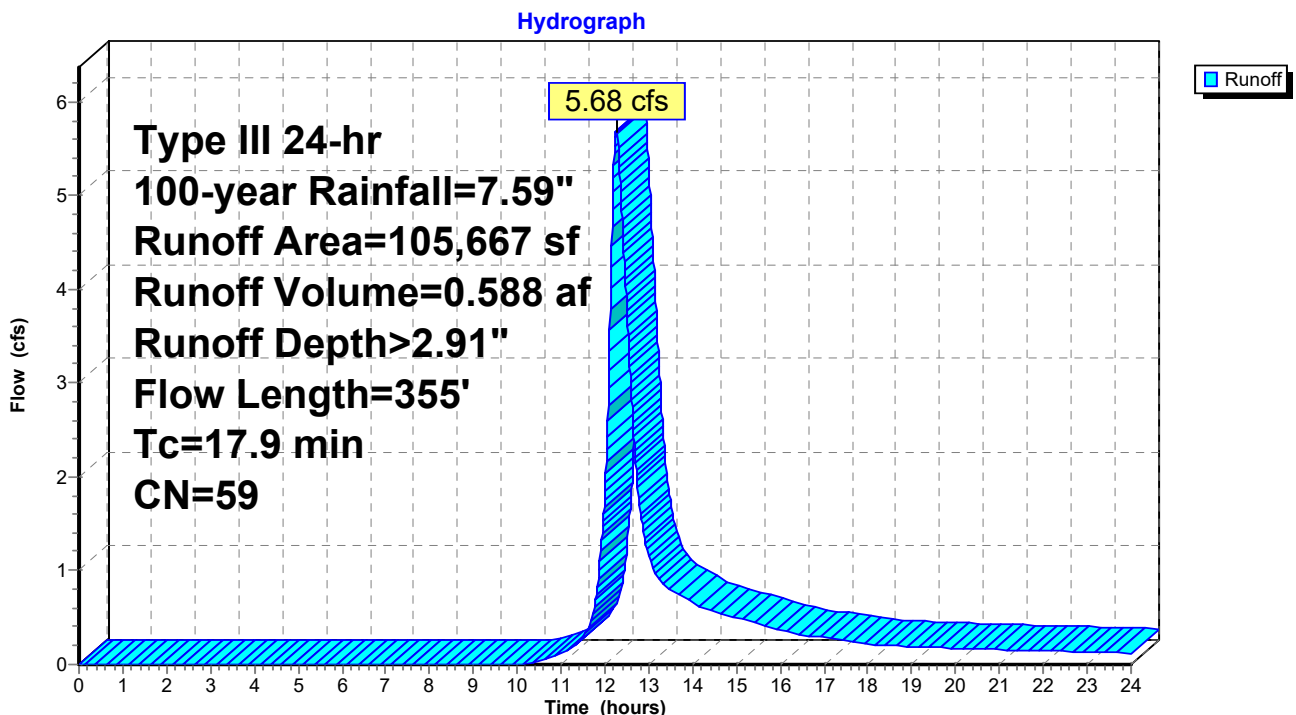
Runoff = 5.68 cfs @ 12.26 hrs, Volume= 0.588 af, Depth> 2.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.59"

Area (sf)	CN	Description
32,015	98	Paved parking, HSG A
42,960	36	Woods, Fair, HSG A
30,692	49	Pasture/grassland/range, Fair, HSG A
105,667	59	Weighted Average
73,652		69.70% Pervious Area
32,015		30.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	50	0.0200	0.07		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
5.1	215	0.0200	0.71		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
0.4	30	0.0300	1.21		Shallow Concentrated Flow, C-D Short Grass Pasture Kv= 7.0 fps
0.4	60	0.0150	2.49		Shallow Concentrated Flow, D-E Paved Kv= 20.3 fps
17.9	355	Total			

Subcatchment DA-2: Site Runoff



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Summary for Subcatchment DA-3: Offsite Runoff

Runoff = 0.56 cfs @ 12.19 hrs, Volume= 0.064 af, Depth> 1.34"

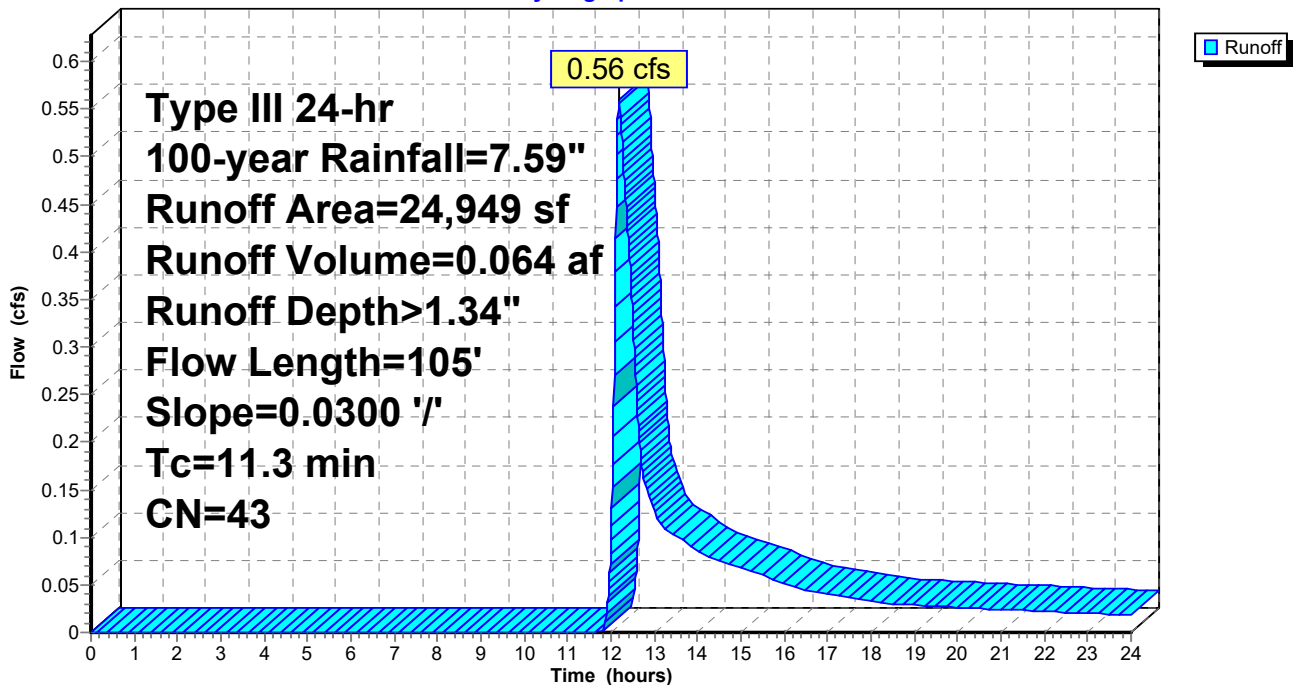
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=7.59"

Area (sf)	CN	Description
718	98	Paved parking, HSG A
14,007	36	Woods, Fair, HSG A
10,224	49	Pasture/grassland/range, Fair, HSG A
24,949	43	Weighted Average
24,231		97.12% Pervious Area
718		2.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		Sheet Flow, A-B Woods: Light underbrush n= 0.400 P2= 3.40"
1.1	55	0.0300	0.87		Shallow Concentrated Flow, B-C Woodland Kv= 5.0 fps
11.3	105	Total			

Subcatchment DA-3: Offsite Runoff

Hydrograph



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Type III 24-hr 100-year Rainfall=7.59"

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Summary for Pond 1P: Leaching Chamber

[93] Warning: Storage range exceeded by 2.50'

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=596)

Inflow Area = 0.752 ac, 66.38% Impervious, Inflow Depth > 5.35" for 100-year event
Inflow = 5.39 cfs @ 12.03 hrs, Volume= 0.336 af
Outflow = 5.41 cfs @ 12.03 hrs, Volume= 0.326 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.04 cfs @ 7.98 hrs, Volume= 0.053 af
Primary = 5.37 cfs @ 12.03 hrs, Volume= 0.273 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 27.00' @ 12.03 hrs Surf.Area= 196 sf Storage= 417 cf

Plug-Flow detention time= 23.6 min calculated for 0.326 af (97% of inflow)
Center-of-Mass det. time= 6.8 min (805.3 - 798.5)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	107 cf	5.50'D x 4.50'H Vertical Cone/Cylinder Inside #2
#2	20.00'	310 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
			882 cf Overall - 107 cf Embedded = 775 cf x 40.0% Voids
417 cf			Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	196	0	0
24.50	196	882	882

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	26.00'	24.0" Vert. Orifice/Grate C= 0.600

Discarded OutFlow Max=0.04 cfs @ 7.98 hrs HW=20.08' (Free Discharge)
↑1=Exfiltration (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=5.36 cfs @ 12.03 hrs HW=27.00' (Free Discharge)
↑2=Orifice/Grate (Orifice Controls 5.36 cfs @ 3.41 fps)

Proposed Conditions

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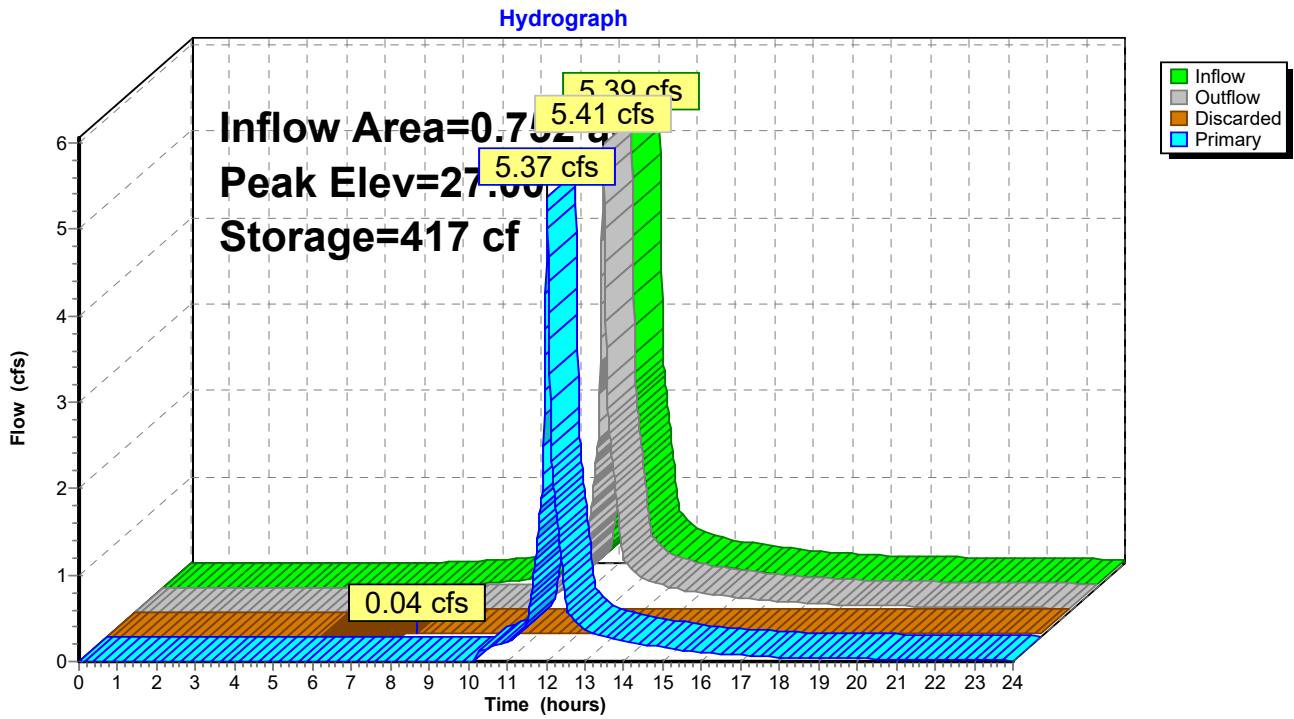
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Pond 1P: Leaching Chamber



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Summary for Pond 2P: Detention Basin

[81] Warning: Exceeded Pond 1P by 3.23' @ 21.98 hrs

Inflow Area = 0.752 ac, 66.38% Impervious, Inflow Depth > 4.36" for 100-year event
 Inflow = 5.37 cfs @ 12.03 hrs, Volume= 0.273 af
 Outflow = 0.21 cfs @ 14.18 hrs, Volume= 0.203 af, Atten= 96%, Lag= 129.2 min
 Discarded = 0.21 cfs @ 14.18 hrs, Volume= 0.203 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 28.73' @ 14.18 hrs Surf.Area= 3,793 sf Storage= 7,487 cf

Plug-Flow detention time= 312.5 min calculated for 0.203 af (74% of inflow)
 Center-of-Mass det. time= 251.7 min (1,033.4 - 781.6)

Volume	Invert	Avail.Storage	Storage Description		
#1	26.00'	12,998 cf	Custom Stage Data (Conic) Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
26.00	1,725	0	0	1,725	
27.00	2,415	2,060	2,060	2,433	
28.00	3,214	2,805	4,865	3,254	
29.00	4,010	3,605	8,470	4,078	
30.00	5,067	4,528	12,998	5,162	

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.21 cfs @ 14.18 hrs HW=28.73' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.21 cfs)

Proposed Conditions

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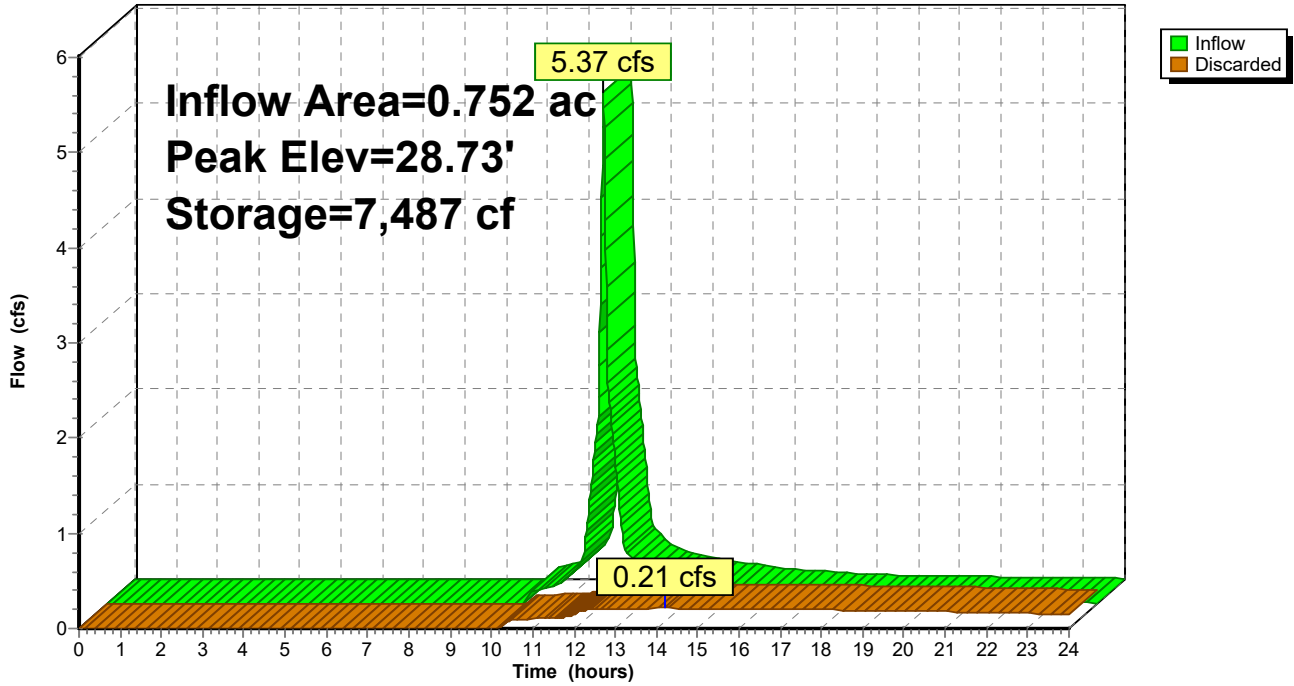
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Pond 2P: Detention Basin

Hydrograph



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Type III 24-hr 100-year Rainfall=7.59"

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Summary for Pond 3P: Leaching Chamber

[93] Warning: Storage range exceeded by 2.55'

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=618)

Inflow Area = 2.426 ac, 30.30% Impervious, Inflow Depth > 2.91" for 100-year event
 Inflow = 5.68 cfs @ 12.26 hrs, Volume= 0.588 af
 Outflow = 5.87 cfs @ 12.26 hrs, Volume= 0.579 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 10.55 hrs, Volume= 0.042 af
 Primary = 5.84 cfs @ 12.26 hrs, Volume= 0.537 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 27.05' @ 12.26 hrs Surf.Area= 196 sf Storage= 417 cf

Plug-Flow detention time= 12.2 min calculated for 0.579 af (98% of inflow)
 Center-of-Mass det. time= 3.1 min (862.8 - 859.7)

Volume	Invert	Avail.Storage	Storage Description
#1	20.00'	107 cf	5.50'D x 4.50'H Vertical Cone/Cylinder Inside #2
#2	20.00'	310 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
			882 cf Overall - 107 cf Embedded = 775 cf x 40.0% Voids
		417 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
20.00	196	0	0
24.50	196	882	882

Device	Routing	Invert	Outlet Devices
#1	Discarded	20.00'	8.270 in/hr Exfiltration over Surface area
#2	Primary	26.00'	24.0" Vert. Orifice/Grate C= 0.600

Discarded OutFlow Max=0.04 cfs @ 10.55 hrs HW=20.08' (Free Discharge)
 ↑1=**Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=5.83 cfs @ 12.26 hrs HW=27.05' (Free Discharge)
 ↑2=**Orifice/Grate** (Orifice Controls 5.83 cfs @ 3.49 fps)

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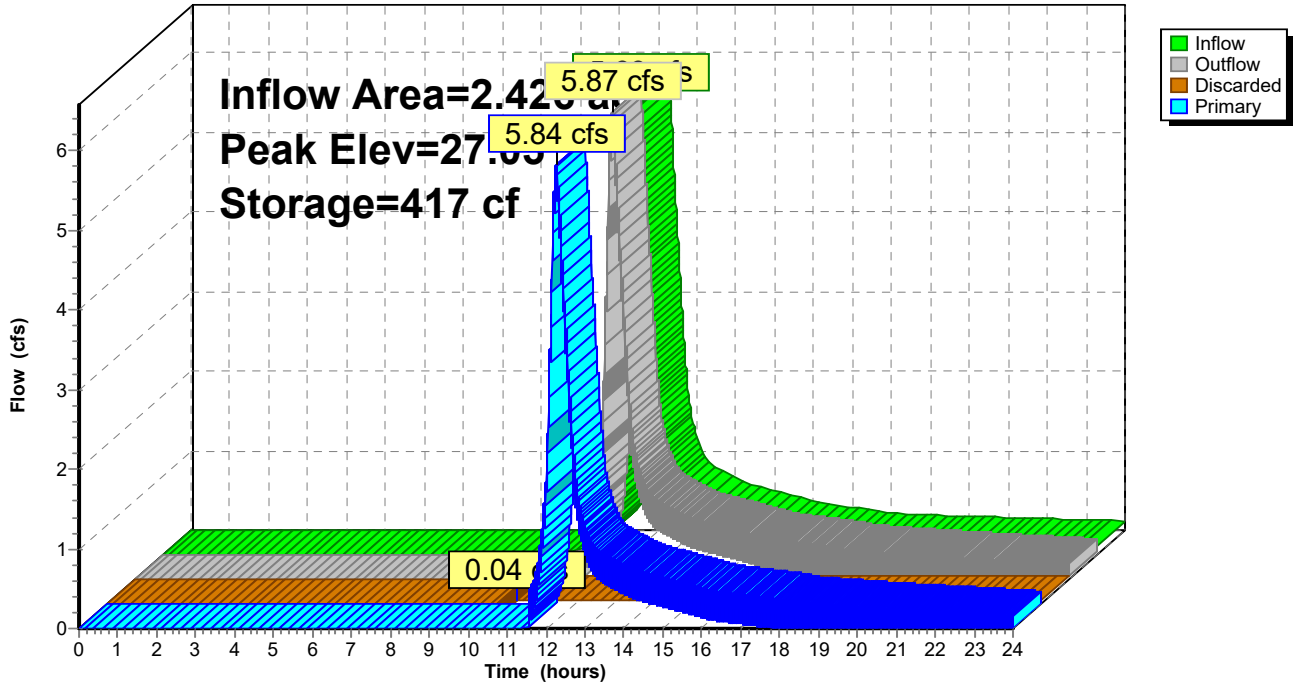
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Pond 3P: Leaching Chamber

Hydrograph



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Type III 24-hr 100-year Rainfall=7.59"

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Summary for Pond 4P: Detention Basin

[81] Warning: Exceeded Pond 3P by 3.98' @ 17.97 hrs

Inflow Area = 2.426 ac, 30.30% Impervious, Inflow Depth > 2.65" for 100-year event
 Inflow = 5.84 cfs @ 12.26 hrs, Volume= 0.537 af
 Outflow = 0.38 cfs @ 15.64 hrs, Volume= 0.357 af, Atten= 94%, Lag= 203.1 min
 Discarded = 0.38 cfs @ 15.64 hrs, Volume= 0.357 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 28.62' @ 15.64 hrs Surf.Area= 6,773 sf Storage= 13,529 cf

Plug-Flow detention time= 317.3 min calculated for 0.357 af (67% of inflow)
 Center-of-Mass det. time= 221.2 min (1,070.7 - 849.5)

Volume	Invert	Avail.Storage	Storage Description		
#1	26.00'	23,817 cf	Custom Stage Data (Conic) Listed below		
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
26.00	3,553	0	0	3,553	
27.00	4,626	4,078	4,078	4,650	
28.00	6,075	5,334	9,412	6,121	
29.00	7,198	6,629	16,040	7,281	
30.00	8,369	7,776	23,817	8,493	

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.38 cfs @ 15.64 hrs HW=28.62' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.38 cfs)

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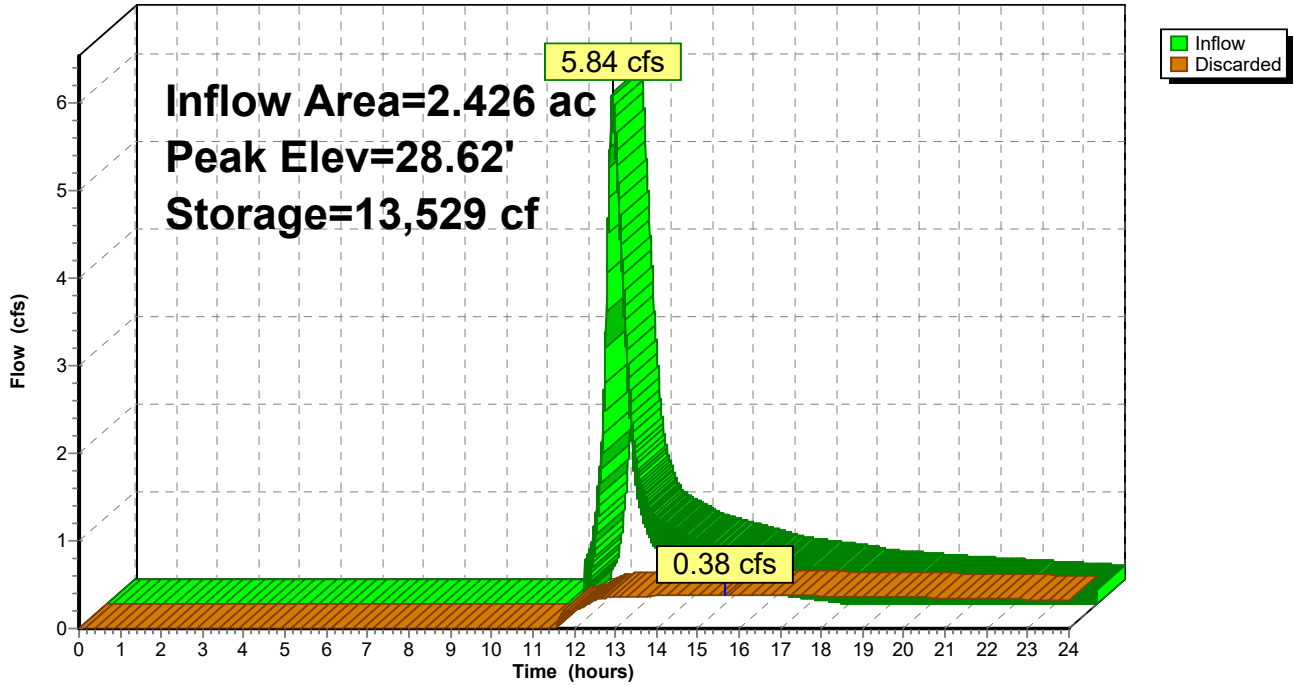
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Pond 4P: Detention Basin

Hydrograph





Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

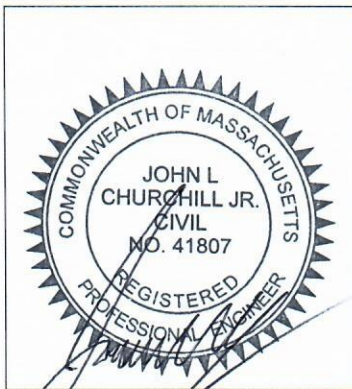
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



[Handwritten Signature] 5/10/22

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- No disturbance to any Wetland Resource Areas
- Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- Reduced Impervious Area (Redevelopment Only)
- Minimizing disturbance to existing trees and shrubs
- LID Site Design Credit Requested:
 - Credit 1
 - Credit 2
 - Credit 3
- Use of "country drainage" versus curb and gutter conveyance and pipe
- Bioretention Cells (includes Rain Gardens)
- Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- Treebox Filter
- Water Quality Swale
- Grass Channel
- Green Roof
- Other (describe): _____

Standard 1: No New Untreated Discharges

- No new untreated discharges
- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static
 - Simple Dynamic
 - Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - is within the Zone II or Interim Wellhead Protection Area
 - is near or to other critical areas
 - is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - involves runoff from land uses with higher potential pollutant loads.
 - The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- The BMP is sized (and calculations provided) based on:
 - The ½" or 1" Water Quality Volume or
 - The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- The NPDES Multi-Sector General Permit does **not** cover the land use.
- LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- All exposure has been eliminated.
- All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
 - Redevelopment Project
 - Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance tasks;
 - Plan showing the location of all stormwater BMPs maintenance access areas;
 - Description and delineation of public safety features;
 - Estimated operation and maintenance budget; and
 - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

Stormwater Operations and Maintenance Plan

DATE: May 10, 2022

The project site will be privately owned and maintained. The responsible party will be responsible for the required inspections and maintenance of the stormwater management system including catch basins, proprietary treatment devices, bioretention areas, and infiltration system.

Owner of record:

William Lee Jr.
Barbara A. Lee
70 Fuller Road
Trumbull, CT 06611

Responsible party:

David Sergi
21 Patterson Brook Road
Suite G
W. Wareham, MA 02576

Project Address:

8 & 10 Charge Pond Road
Wareham, MA 02571

Engineering By:

JC Engineering, Inc.
2854 Cranberry Highway
East Wareham, MA 02538

Pre-Construction Requirements

Prior to the start of any construction on the site the following procedures are to be implemented.

- Hay bale dikes and silt fence are to be installed down gradient of all earthwork proposed in that particular phase of work. Hay bales and silt fence are to be installed at the limit of work and/or adjacent to the wetland resource areas and/or natural areas to be protected as shown on the plans.
- All major trees designated to be saved are to be flagged in the field and fenced off as necessary to prevent damage during construction.
- A temporary settling pool is to be constructed on the up-gradient side of silt fences and hay bale dikes at the limit of work such that stormwater runoff is channeled to the temporary settling pool and filtered through the hay bales prior to leaving the site.

- Safety barriers, warnings and fences to be installed as necessary to protect the general public prior to the start of the work adjacent to the roadway.
- A temporary construction entrance is to be constructed at the access point to the site. The entrance is to be stabilized in such a manner as to prevent the tracking of soil onto the public way. (see detail on site plan)
- A dust monitoring plan will be established prior to the start of construction.
- Weekly training sessions will be conducted for all site contractors at the job.
- A person responsible for daily inspection of all erosion control methodologies and action plan for corrections/repairs when needed will be established.

Construction Period Pollution Prevention

- The contractor must install erosion control measures as shown on the plans and details prior to starting any other work on the site construction. Erosion control must be installed at every inlet structure and inlet swale and maintained for the duration of the project. Silt fence and/or haybales as shown on plans shall be inspected, repaired and/or maintained by the contractor weekly and within 12 hours of each storm event.
- Water and/or covers to minimize dust and erosion from newly graded areas and stock piles of earth will be implemented during construction as needed or when conditions are anticipated to be greater than 20 m.p.h. Application rate of water shall be enough to moisten soil to not create runoff and/or ponding. No surfactants shall be used.
- A person will be assigned to monitor the perimeter erosion control methodologies on a daily basis.
- Owner or its representative shall perform weekly review/training sessions.
- Construction of a temporary settling area is to be utilized as a method of controlling concentrated flows from areas that are under construction.
- Temporary settling areas are to be constructed on an as needed basis and located throughout the construction phase as required by earthwork activities.
- At the beginning of earthwork operations on the site a mechanical on-site sweeper is to be maintained such that the public way can be kept clean during the construction phase.

- As elements of the drainage system are installed, silt fences and “silt sacs” are to be installed around all catch basins and under grates until the tributary area to that basin is completely stabilized.
- As general earthwork is completed the exterior perimeters of the areas that have been completed are to be stabilized using erosion control grass.
- Stabilize slopes steeper than 3:1 (horizontal to vertical) with seed, secured geotextile fabric, or rock rip-rap as required to prevent erosion during construction.
- Sediment shall be contained within the construction site and shall be removed when they reach a depth of 6 inches.
- Clean out catch basins, drain manholes and storm drain pipes after completion of construction.
- No stormwater shall be allowed to enter the structures until all catch basins, drain manholes and storm drain pipes have been cleaned, the binder course is installed, and all disturbed areas are stabilized.
- If the binder course is in place for more than 3 months without a wearing course, the contractor shall set the rim elevation of the drainage structures level with the binder course. The rim elevations shall be reset just prior to placing the wearing course.
- The contractor is responsible for all stormwater best management practices being in place to contain stormwater in the event that drainage structures are not at pavement grade during a storm event, and all cleanup in the event that such measures fail during said storm event.
- Temporary surfaces should be stabilized with as soon as active grading is suspended. Temporary measures include seeding with grass, jute netting, or straw mulch. Permanent stabilization should be established early in the Fall to allow good cover before cold weather comes.
- A construction entrance in accordance with construction details shall be installed at the site entrance to prevent sediments from being tracked offsite.
- It is the responsibility of the contractor to maintain and supplement the specified sedimentation controls as necessary to prevent sedimentation of off-site areas and/or any regulated resource areas. Failure by the contractor to control erosion, pollution and/or siltation shall be cause for the owner to employ outside assistance or to use own forces to provide the necessary corrective measures, the cost of such assistance plus project engineering costs will be the contractor's responsibility. If the owner shall fail their

responsibility of this Plan, the Town has the right to enter upon property after 15 days notice to take corrective actions and bill the Owner for their Services.

- Haybales and Silt Fence shall be installed at the following locations: Toe of slope of embankment construction, Toe of temporary earthwork stockpiles. All locations as indicated on the Plans.
- A log of regular inspections and maintenance is to be maintained by the construction superintendent.
- When all areas tributary to any catch basin on the site are stabilized with permanent plantings and paving, that catch basin is to be cleaned of all sediment and debris that has accumulated during construction and the “silt sacs” removed.
- During construction of the project, the owner and/or its representative, is to be the responsible party for enforcing the installation and maintenance of all erosion control devices. A permanent file is to be established for recording daily inspections, problems and maintenance of the erosion control devices. A 24 hour emergency hotline is to be established with the number posted on a sign at the construction entrance to the project and on the construction trailer indicating who can be contacted in case of an emergency on the site.

Long-Term Operation and Maintenance Program

- At the end of construction on the project, the owner is to be provided with a certified as built plan of all utilities constructed on the site.

- **Catch Basin Maintenance**

All Catch basins shall be inspected by the owner/operator on a quarterly basis or after a major storm event. Catch basins sumps will be cleaned annually during the early spring or when the sediment rises to within half the available sump height of the catch basin, whichever comes first.

- **Subsurface Infiltration System**

Once the system is operational, inspections of the Infiltration should occur after every major storm event for the first few months. After the system is in operation, inspections should be every six months. Special attention should be directed towards the depth of sediment in the leaching chambers. Sediment removal from the leaching chambers should be accomplished as needed by means of a labor crew. Sediment shall be removed off-site and disposed of in a legal manner. Inspections should also include checking for potential problems that include but are not limited to, settlement of the leaching chamber bottom, any forms of erosion, tree growth in the leaching area, and

sediment accumulation, etc. Trash and debris accumulated within any portion of the Infiltration Structures should be removed at this time. Silt and debris are to be removed using vacuum pumping techniques as required.

- An annual report on the status of each inspection and the completion of the required maintenance shall be filed with the Planning Department on or by June 1st each year.
- The Owner, is to be responsible for the maintenance of the project after construction has been completed. The owner is to provide the appropriate r with a contact name and telephone number for purposes of communication between the owner and the Town Boards and Commissions. At each time that the contact person changes, the above Boards and Commission are to be notified of the new contact information.
- The Owner shall hire a Stormwater Professional to inspect the system as required.
- This Operations and Maintenance plan is to be incorporated into all necessary documents with the Stormwater operations and maintenance plan to ensure that a long-term maintenance program is adhered to by the developer and all future property owners.
- Waste shall be properly stored in sealed containers if stored outside. The preferred method is to store waste either indoors or in a structure with a locking cover to prevent entrance from animals. The containers shall be covered to prevent rainfall from leaching through the household waste.
- Yard maintenance equipment, including lawn mowers and chainsaws shall be stored in a covered area. Periodic maintenance shall be performed on all equipment to ensure that no gas or oil leak into the ground.
- Yard waste shall be disposed in an approved off-site disposal facility or stored on-site in a composting pile.
- Septic systems shall be properly maintained and inspected in accordance with the state environmental code, title 5. A failing septic systems shall be repaired immediately to prevent effluent from discharging into the storm drains. Never discharge gasoline, oils or chemicals into septic systems.
- Gasoline and oils shall be stored in sealed containers and in a covered, secure, and level area to prevent accidental spills. All gasoline, oil, and chemical spills shall be reported to the Fire Department and Regional DEP office.

- Lawn fertilizers and pesticides shall be in sealed containers within a covered area and remain dry. Slow release lawn fertilizers shall be used to limit the amount of fertilizer entering the groundwater. Limit the application of fertilizers to lawn area only. Sweep up any spills on impervious material to prevent runoff into the storm drains.
- Pet waste shall be properly disposed of to prevent bacteria from washing into storm drains. Small amounts of waste can be buried or sealed in a plastic bag and thrown into the trash. The preferred method is to flush the waste down the toilet.
- Snow shall be removed from all parking surfaces and fire truck clearance areas to provide adequate access for all safety vehicles. Snow shall be removed from all catch basin grates to avoid flooding during snow melt. Snow shall be plowed and stored off pavement surface to allow debris and sand to be filtered and removed during the springtime.
- All sand and loam piles stored on-site shall be properly stabilized or covered to prevent sediment from entering the storm drains. All piles shall be contained in a level, upland area and surrounded by a silt fence and/or haybales.
- All structural and non-structural stormwater management facilities shall be maintained to ensure proper working condition during construction and shall be fully maintained in accordance with this plan. The owner shall be responsible for maintaining the site's storm water management system in compliance with Federal, state, and local requirements and in accordance with best management practices. In the event that the Town determines that the owner has materially failed in its obligation to maintain the drainage system in accordance with best management practices and the Stormwater Operation and Maintenance Plan, the Town shall have the right, upon written notice to the Owner, and Owner's failure to remedy the maintenance issue within fifteen (15) days' notice thereof, to enter upon the site to perform the required maintenance. All costs incurred by the Town in connection with its performance of such required maintenance on the site shall be reimbursed by the Owner to the Town within thirty (30) days of the Owner's receipt of the Town's invoice for such costs.

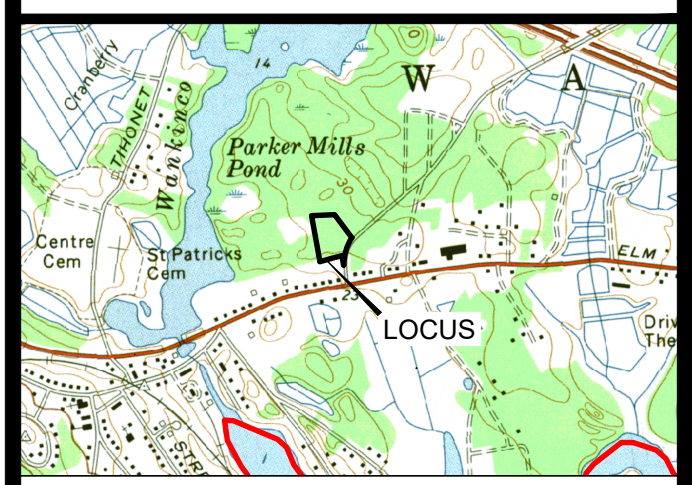
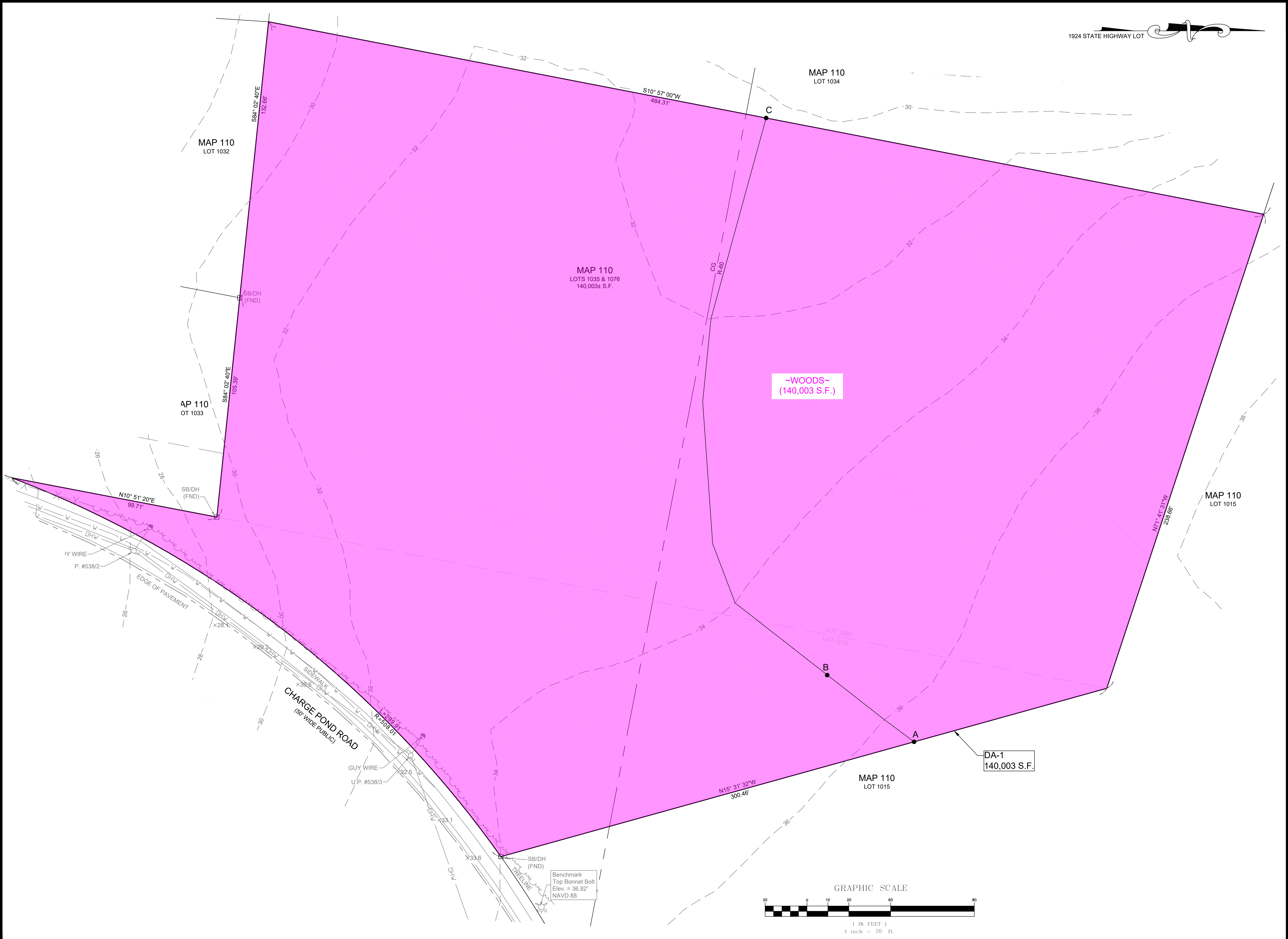
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U.S. Soil Conservation Service. June 1986. *Urban Hydrology for Small Watersheds
(Technical Release 55)*



LOCUS MAP
SCALE 1" = 2000'

JOHN L. CHURCHILL JR., P.L.S. DATE

JOHN L. CHURCHILL JR., P.E. DATE

PROPOSED SITE PLAN
AT
8 & 10 CHARGE POND ROAD
IN
WAREHAM MASSACHUSETTS
(PLYMOUTH COUNTY)
EXISTING DRAINAGE AREAS

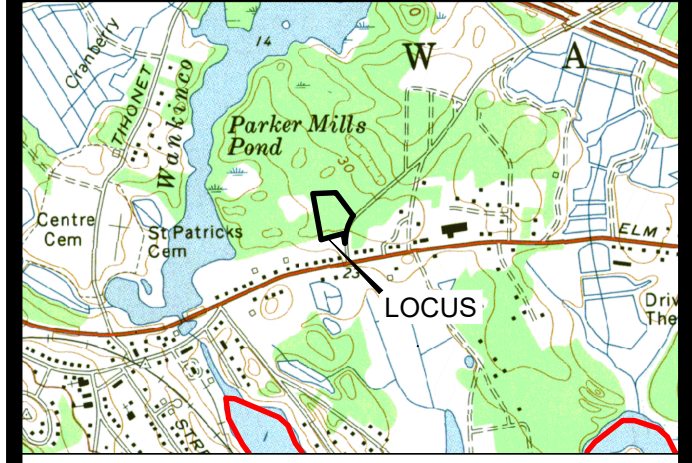
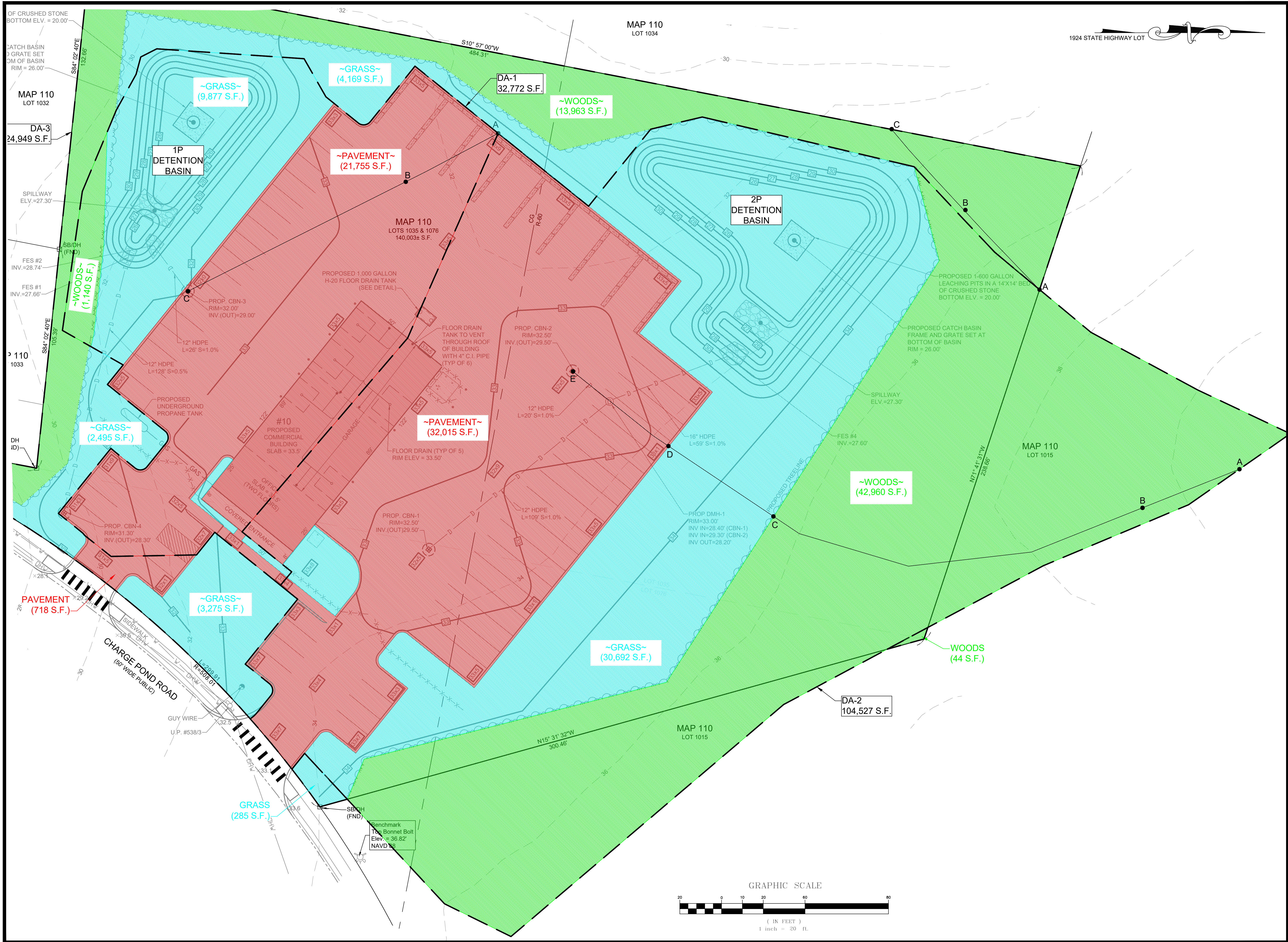
REVISIONS:

No.	DATE	DESC.
1	2-5-22	BUILDING LAYOUT
2	5-10-22	REVIEW COMMENTS

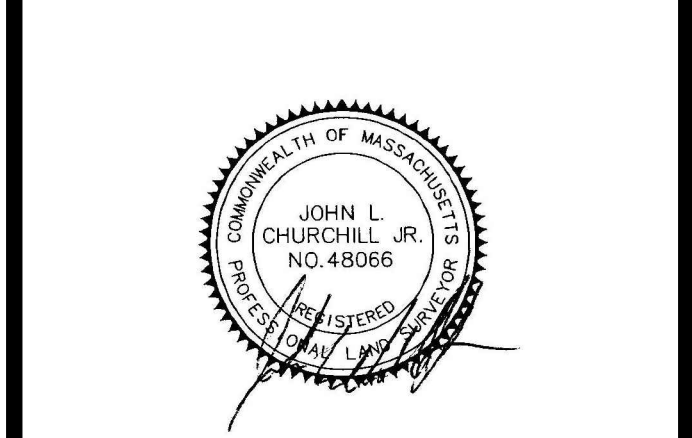
PREPARED FOR:
DAVID SERGI
21 PATTERSON BROOK ROAD
SUITE G
W. WAREHAM, MA 02576

PREPARED BY:
JC ENGINEERING, INC
2854 CRANBERRY HIGHWAY
EAST WAREHAM, MA 02538
508-273-0377

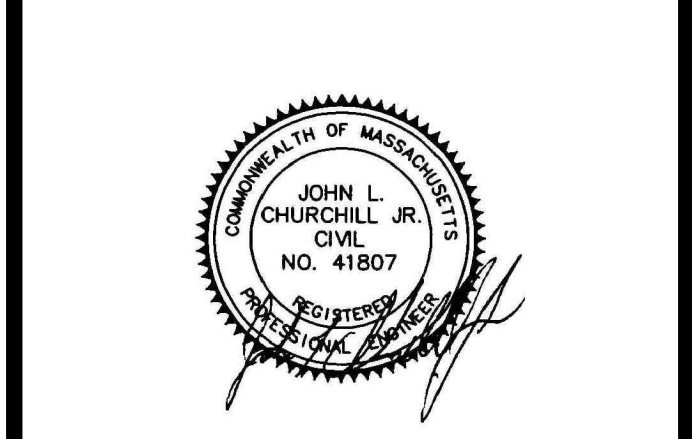
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FIELD:	CB/RB
CALC./DESIGN:	SJI
DRAWN:	SJI
CHECK:	JLC
JOB NO:	5942



LOCUS MAP
SCALE 1" = 2000'



JOHN L. CHURCHILL JR., P.L.S. DATE



JOHN L. CHURCHILL JR., P.E. DATE

PROPOSED SITE PLAN
AT
8 & 10 CHARGE POND ROAD
IN
WAREHAM MASSACHUSETTS
(PLYMOUTH COUNTY)
PROPOSED DRAINAGE AREAS

REVISIONS:

No.	DATE	DESC.
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