CARMINA WOOD
DESIGN

ENGINEER'S REPORT

for

Multi-Family Project
480 Dodge Road
Town of Amherst, Erie County, New York

Prepared for

The Green Organization

6465 Transit Road
East Amherst, NY 14051

Prepared by

Carmina Wood Design

487 Main Street, Suite 500
Buffalo, NY 14203

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March 2023
rev. December 2023
rev. January 2025
rev. April 2025
rev. August 2025

Table of Contents

Appendices

Section 1 - Location & Description

This project is a redevelopment of a 5.17 acre site located on Dodge Road in the Town of Amherst. Construction will consist of two three story multi-family buildings and six townhouse buildings with attached garages totaling 108 units, detached garage buildings, and associated utility, lighting and landscaping improvements. Currently the site is developed and utilized as a landscape nursery. All existing structures on site are to be demolished. The proposed site development area to be disturbed for this project is approximately 5.17 acres when construction is completed.

Section 2 - Water Service

Water service for the multi-family development will be tapped off the existing 8" ECWA water main on the south side of Dodge Road. The service will be a 6" Class 52 DI combined water service to cross Dodge Road, then continue into an interior utility room of the clubhouse building where the 6" meter and RPZ will be installed. Proper heat and lighting will be provided to the enclosure, drainage due to testing or failure of the RPZ will be to the outside grade. The owner will be responsible for keeping the drainage ports clear of snow and debris. Water inside the multi-family buildings and clubhouse will be used for typical domestic uses.

The three story multi-family buildings are to be sprinklered, interior fire protection system to be designed by others. One private hydrant will be installed on site and two existing public hydrants along Dodge Road will ensure fire hose coverage not exceeding 600' for sprinklered buildings and 400' for non-sprinklered buildings.

Domestic Summary:	
Peak Operating Demand:	90.75 gpm
Water Main:	8" on Dodge Road
Static Pressure:	100 psi (ECWA)
Friction Loss:	0.0 psi
Loss through meter/RPZ:	13.0 psi
Elevation Loss:	0.0 psi
Pressure after RPZ:	87.0 psi

Repairs to all devices will be made during off hours, dual backflow preventers are not required. The site is not located in a 100-year flood plain. Disinfection of the water service following installation will be continuous feed, according to AWWA C-651, latest revision.

Section 3 - Sanitary Sewer Service

The proposed multi-family development will have a private 8" SDR-35 PVC sanitary lateral at 0.4% minimum slope route through the site. All multi-family, clubhouse and townhouse buildings will connect to this 8" private sewer via a 6" SDR-35 PVC sanitary lateral at 2.0% minimum. The private 8" sanitary sewer will connect the nearest public sanitary sewer manhole along the western boundary of the project site and a new public sanitary sewer manhole will be installed on the project site to allow for the connection to the existing public sanitary sewer. This public manhole will be located in a 30'x30' easement to the Town of Amherst.

Design Parameters

1-bedroom unit:	110 gal/day/units x 36 units = 3,960 gpd
2-bedroom unit:	220 gal/day/units x 72 units = 15,840 gpd
	Total = 19,800 gpd

19,800 gpd * 4.15 = 82,163 gpd *use peaking factor of 4.15

The hydraulic loading rate is per "Design Standards for Intermediate Sized Wastewater Treatment Systems" 2014, NYSDEC.

Downstream sewer capacity analysis report is included in Appendix A of this report.

Section 4 - Storm Sewer Service

The existing site currently sheet drains in multiple directions, either towards the center of the site to an existing ditch which drains to the existing storm sewer system along Dodge Road, or north towards the Thruway property directly adjacent to the project site.

Stormwater runoff collected onsite as a result of the proposed development will be routed through the proposed storm sewer system consisting of bioretention areas, underground detention system and a wet detention basin connected by a series of manholes, catch basins, yard drains and smooth interior HDPE pipe. The bioretention areas on site are designed to provide 100% of the required runoff reduction volume (RRv). The soils in the vicinity of the bioretention areas are mainly USDA hydrologic group 'D' and therefore the system will be installed with underdrains per NYSDEC requirements. The bioretention areas will consist of 6" perforated HDPE underdrains in 12" of drainage gravel, followed by filter fabric and then finally 18" minimum of planting soil. Overflow yard drains will be installed to allow 6" maximum ponding for RRv treatment. Stormwater detention is required per NYSDEC standards and specifications. The underground detention field was designed to consist of ADS StormTech SC-740 chambers to allow for stormwater to be temporarily stored and discharged at a controlled rate. The chamber system is surrounded by stone and wrapped in geotextile fabric. Note that StormTech is one type of "chamber" system and there are several other by different manufacturers that may be used pending approval by the design engineer. Site specific shop drawings will be required from the contractor for approval by the engineer prior to construction of the specific system selected. An 8" outlet control pipe will be provided downstream of the underground detention field underdrain pipe and header pipe to include a water quality treatment unit. Discharge from the outlet pipe of the underground detention system will outlet to an existing 12" culvert pipe which crossed Dodge Road and discharges to the existing storm sewer system along the south side of Dodge Road. A wet detention pond will attenuate stormwater runoff generated in the north and west portions of the project using an 8" outlet control pipe to attenuate proposed runoff to required existing conditions prior to discharge off site. Discharge from the wet detention basin will outlet to an existing swale in the northwest corner of the property.

Chapter 9 of the NYSDEC Stormwater Management Design Manual details design requirements for redevelopment projects, which this project is categorized as. Runoff reduction is required for this project since the proposed impervious area (3.35 ac) is greater than the existing impervious area (2.30 ac). Water Quality Volume treatment is also required since there is a proposed increase in impervious area (1.05 ac). Runoff reduction volume (RRv), water quality volume (WQv) and stormwater volume attenuation for the site is designed in accordance with Chapter 4 of the NYSDEC Stormwater design manual. The bioretention areas are provided as a "green infrastructure" practice to provide runoff reduction and water quality treatment to meet the Chapter 4 requirements for the currently undeveloped areas. Runoff from the site was looked at as a whole for the calculation of volume attenuation requirements. The proposed underground detention field and wet detention basin is designed to accommodate the 1-year through 100-year storm events controlling the offsite runoff rate to less than the existing runoff rates, as well as the below stated Town stormwater runoff requirements.

<u>Town of Amherst Requirement:</u>
The Town of Amherst requires that the 25-year proposed storm event be attenuated with detention and that the outlet flowrate be restricted to the 10-year existing storm event. Since this project proposed two separate stormwater outlet points, volume attenuation is accomplished in both the dry detention basin and the underground detention system as shown by the below stormwater runoff summary tables.

Underground Detention Basin Summary:
ADS StormTech SC-740
Top of chambers = 581.67
Bottom of chambers = 579.17
Bottom of stone = 578.67
100-year storm storage volume = 14,839 cf @ 581.93

Water Quality Summary:
WQv req'd = 6,264 cf (0.144 ac-ft)
RRv min. req'd = 1,124 cf (0.026 ac-ft)
RRv provided - bioretention areas = 1,128 cf (0.026 ac-ft)
WQv provided – bioretention areas = 115 cf (0.003 ac-ft)
WQv provided – wet pond = 6,340 cf (0.146 ac-ft)
WQv provided – treatment structure = 2,991 cf (0.069 ac-ft)
Total RRv + WQv provided = 115 cf + 1,128 cf + 6,340 cf + 2,991 cf = 10,574 cf (0.243 ac-ft)

Bioretention: 100% of minimum post-development Runoff Reduction volume (RRv)
Area: 2,180 sf (total)
Bottom Elevation: 583.00

Detention: Comparison of the existing 1-year vs. the proposed 1-year runoff
Comparison of the existing 10-year vs. the proposed 10-year runoff
Comparison of the existing 10-year vs. the proposed 25-year runoff
Comparison of the existing 100-year vs. the proposed 100-year runoff

Runoff Summary (Culvert/Dodge Road):

Event	Ex. Runoff (cfs)*	Pro. Runoff (cfs)**	Result (cfs)
1-year	5.02	1.64	-3.38
10-year	10.93	2.84	-8.09
25-year	14.28	3.45	-10.83
100-year	20.94	4.75	-16.19

* Existing runoff is the summation of the runoff flowrate from subcatchments 2S and 4S shown Appendix B of this report.

** Proposed runoff flowrate is the rate controlled by the 8" outlet pipe from the underground detention basin which discharges to the existing 12" culvert pipe, which crosses Dodge Road to an existing storm drainage system along the south side of Dodge Road.

Runoff Summary (Ditch/Thruway):

Event	Ex. Runoff (cfs)*	Pro. Runoff (cfs)**	Result (cfs)
1-year	1.39	1.01	-0.38
10-year	2.94	1.61	-1.33
25-year	3.85	1.89	-1.96
100-year	5.66	2.35	-3.31

* Existing runoff is the summation of the runoff flowrate from subcatchment 1S and 3S shown Appendix B of this report.

** Proposed runoff flowrate is the rate controlled by the 8" outlet pipe from the wet detention basin which discharges to the existing along the northwest corner of the project site.

Appendix A

Sanitary Sewer and Water Demand Calculations

CARMINA WOOD DESIGN
487 MAIN STREET, SUITE 500
BUFFALO, NEW YORK, 14203
(716) 842-3165
FAX (716) 842-0263

Project No.: 22.296 Date: 3/20/2023
Project Name: Multi-Family Development rev. 8/22/25
Project Address: 480 Dodge Road Amherst, NY
Subject: Sanitary Sewer & Water Demand Calcs
Sheet: 1 of 2

Sanitary Sewage Demand Calculations:

Proposed Towhouses

110	gal/d/unit	x	36 units	=	3,960	gpd	*use 110 gallons per unit per day (1-bdrm)
220	gal/d/unit	x	72 units	=	15,840	gpd	*use 220 gallons per unit per day (2-bdrm)

Total Site Sanitary Demand: = 19,800 gpd

Find Peak Sanitary Demand:

Peaking Factor based on Population:

Total demand: 19,800 gpd / 100 gpcd = 198 per capita

Population (P) = 198 people

Peaking Factor : (18 +√P) / (4 + √P) where P is in thousands

Peaking Factor = 4.15

Peak Sanitary Demand = 19,800 x 4.15 = 82,163 gpd
= 0.082 MGD
= 0.127 cfs

Required Infiltration and Inflow Mitigation:

Peak Sanitary Flow = 82,163 gpd = 57.06 gpm

4:1 offset flow per NYSDEC requirements = 57.06 x 4 = 228.23 gpm req'd

Mitigation Credit = $250 / gpm

Mitigation Agreement Amount = $57,057.36

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Water Demand Calculations (domestic):

Proposed Multi-Family

19,800 gpd x 1.1 = 21,780 gpd *use 110% of sewage demand

*use 1.8 peaking factor and assume a 12 hour day

21,780 gpm x 1day/12hr x 1hr/60min = 30.25 gpm

30.25 gpm x 3.0 = 90.75 gpm Q_{peak}

Headlosses:

Q_{peak} = 90.75 gpm
Pipe = 6 inch Ductile Iron C = 140
Length = 125 LF (approx. distance from tap to RPZ)

$$H_L = \frac{10.44\ L\ Q^{1.85}}{C^{1.85}\ D^{4.866}} = \frac{10.44(125)(73.81)^{1.85}}{(140)^{1.85}\ (6)^{4.866}} = 0.10 \text{ ft} = 0.04 \text{ psi}$$

Δ elev = 0 ft = 0.00 psi
Loss through meter = 1 psi
Loss through RPZ = 12 psi
Total Losses = 13.0 psi
Static Pressure = 100 psi (per ECWA)
Residual Pressure Following RPZ = 100 - 13.0 = 87.0 psi (available after rpz & meter)

Residual Pressure 30" above 3rd Floor
Δ elev = 21 ft = 9.09 psi
Residual Pressure 30" above 3rd Floor = 77.9 psi

Water Demand Calculations (fire):

Proposed Multi-Family

Q = 1,000 gpd

Headlosses:

Q_{peak} = 1000 gpm
Pipe = 6 inch Ductile Iron C = 140
Length = 125 LF (approx. distance from tap to RPDA)

$$H_L = \frac{10.44\ L\ Q^{1.85}}{C^{1.85}\ D^{4.866}} = \frac{10.44(125)(1000)^{1.85}}{(140)^{1.85}\ (6)^{4.866}} = 8.11 \text{ ft} = 3.51 \text{ psi}$$

Δ elev = 0 ft = 0.00 psi
Loss Through RPZ = 12.0 psi
Total Losses = 15.5 psi
Static Pressure = 100.0 psi (per ECWA)
Residual Pressure after RPDA = 100 - 15.5 = 84.5 psi

Downstream Sewer Capacity Analysis

CARMINAWOOD
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DOWNSTREAM SANITARY SEWER CAPACITY ANALYSIS REPORT

for

Multi-Family Project

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Town of Amherst, Erie County, New York

Prepared for

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6465 Transit Road
East Amherst, NY 14051

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An existing 15" public sanitary sewer main is located adjacent to the parcel to the west of the property (460 Dodge Road) and will be utilized for this project. The proposed multi-family development will have a private 8" SDR-35 PVC sanitary lateral at 0.4% minimum slope route through the site. All multi-family, clubhouse and townhouse buildings will connect to this 8" private sewer via a 6" SDR-35 PVC sanitary lateral at 2.0% minimum. The private 8" sanitary sewer will connect the nearest public sanitary sewer manhole along the western boundary of the project site and a new public sanitary sewer manhole will be installed on the project site to allow for the connection to the existing public sanitary sewer. This public manhole will be located in a 30'x30' easement to the Town of Amherst.

Wastewater from the proposed project will flow west along Dodge Road via an 18" sewer, and then west along Dodge Road via the 60" Peanut Line sewer. Flows then continue west and are conveyed north through an 84" sewer, and then ultimately to the Town of Amherst Wastewater Treatment Facility. Refer to the sewer routing map located in the TECSmith monitoring section of this downstream sewer capacity analysis report.

Node 1 – 340 Dodge Road (18"):

Existing Peak Flow measured (wet weather event)	= 0.043 cfs (0.028 mgd)*
Proposed 480 Dodge Road Peak Flow	= 0.127 cfs**
Proposed Total Peak Flow	= 0.170 cfs

Theoretical capacity of existing 18" RCP pipe @ 0.06% = 3.038 cfs

Conclusion: The proposed total peak flow is less than the capacity of the 18" ACP pipe, therefore there is sufficient capacity. At no time during the monitoring period did flow depth exceed the pipe diameter at Node 1 of the downstream monitoring points during the rain events monitored.

Node 2 – North Ellicott Creek Road (60"):

Existing Peak Flow measured (wet weather event)	= 31.763 cfs (20.532 mgd)*
Proposed 480 Dodge Road Flow Peak Flow	= 0.127 cfs**
Proposed Total Peak Flow	= 31.890 cfs

Theoretical capacity of existing 60" RCP pipe @ 0.07% = 81.366 cfs

Conclusion: The proposed total peak flow is less than the capacity of the 60" RCP pipe, therefore there is sufficient capacity. At no time during the monitoring period did flow depth exceed the pipe diameter at Node 2 of the downstream monitoring points during the rain events monitored.

Node 3 – Peanut Line (66"):

Existing Peak Flow measured (wet weather event)	= 56.466 cfs (36.50 mgd)*
Proposed 480 Dodge Road Peak Flow	= 0.127 cfs**
Proposed Total Peak Flow	= 56.593 cfs

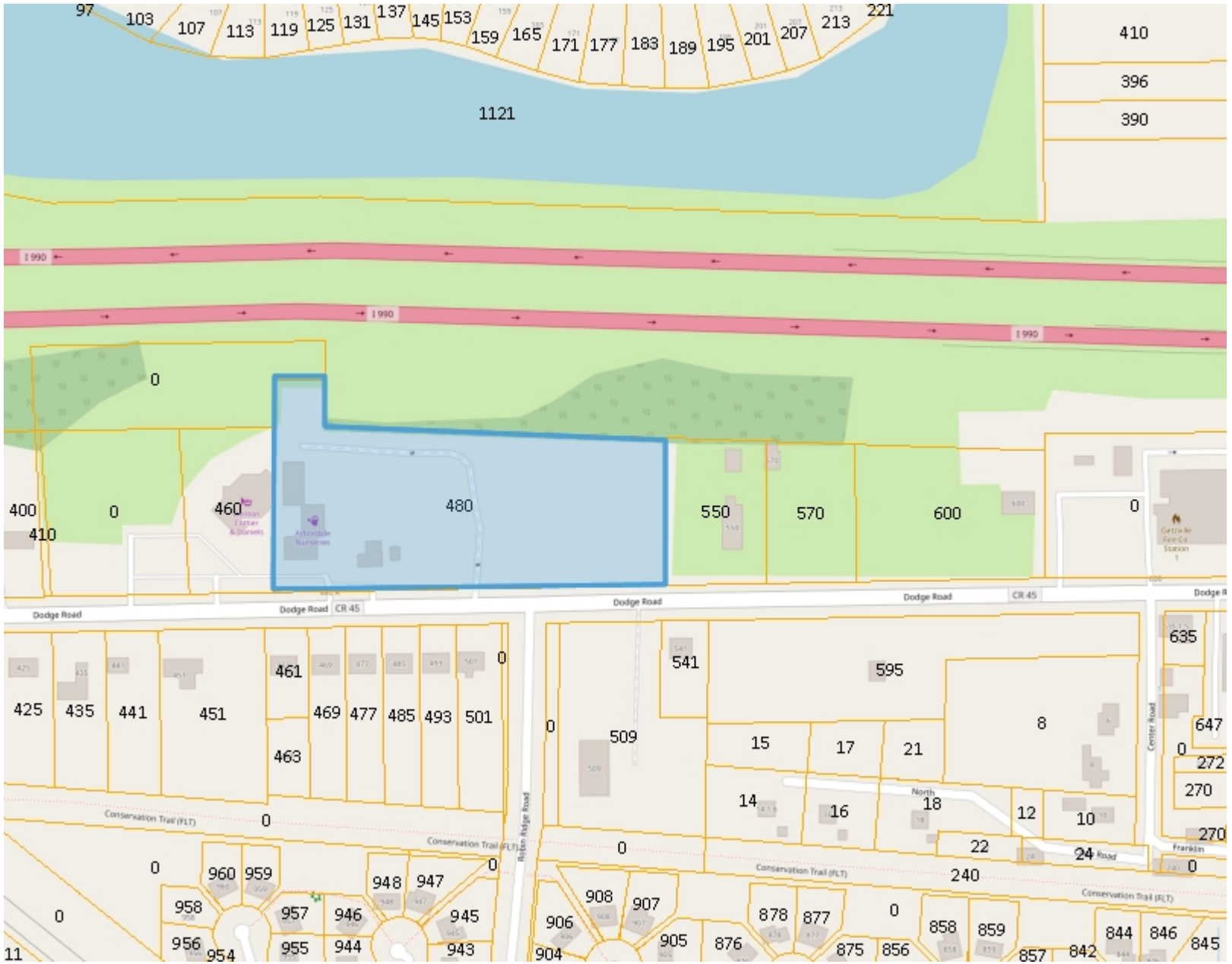
Capacity of existing 66” Peanut Line sewer = 88.798 cfs (57.4 mgd)

Conclusion: The proposed total peak flow is less than the capacity of the 66” Peanut Line sewer, therefore there is sufficient capacity.

Foot Notes:
Downstream capacity node information provided by Town of Amherst Engineering Department
*Converted from measurements in TECSmith report dated 8/12/20
**See Sanitary Sewage Demand Calculations

Location Map

Erie County On-Line Mapping Application



Legend

- Parcels

0 0.07 0.1 Miles

WGS_1984_Web_Mercator_Auxiliary_Sphere
THIS MAP IS NOT TO BE USED FOR NAVIGATION

ERIE COUNTY
DEPARTMENT OF ENVIRONMENT & PLANNING
OFFICE OF GIS

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

1: 4,514

Sanitary Demand Calculations

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Mitigation Credit = $250 / gpm

Mitigation Agreement Amount = $57,057.36

TECSmith Monitoring Report

Date	Node 1			Node 2			Rain[2]
	340 Dodge Road (18")			North Ellicott Creek Rd. (60")			
	FLOW (GAL x 1,000)	PEAK FLOW (MGD)	PEAK LEVEL (IN)	FLOW (GAL x 1,000)	PEAK FLOW (MDG)	PEAK LEVEL (IN)	(inches)
7/14/2020	2.772	0.016	1.480	6974.494	9.101	15.869	***0***
7/15/2020	4.498	0.017	1.409	6591.385	8.845	15.512	***0***
7/16/2020	8.981	0.028	1.915	9916.241	20.532	27.213	***0.86***
7/17/2020	7.891	0.023	1.581	10096.644	16.639	23.493	***0.03***
7/18/2020	4.239	0.018	1.514	8256.593	10.757	17.307	***0***
7/19/2020	4.120	0.017	1.443	7589.558	11.382	18.060	***0.21***
7/20/2020	5.074	0.018	1.463	7269.757	9.235	16.144	***0***
7/21/2020	4.950	0.021	1.574	6681.658	8.895	15.365	***0***
7/22/2020	7.724	0.025	1.803	8633.887	15.390	22.402	***0.42***
7/23/2020	6.646	0.022	1.634	7327.211	9.216	16.027	***0***
7/24/2020	4.713	0.017	1.457	6764.464	8.779	15.317	***0***
7/25/2020	4.290	0.017	1.452	6426.122	8.861	15.407	***0***
7/26/2020	3.747	0.022	1.443	6409.255	8.667	15.297	***0***
7/27/2020	7.977	0.020	1.740	6487.339	8.269	15.107	***0.03***
7/28/2020	6.442	0.017	1.514	6298.427	8.016	14.780	***0.01***
7/29/2020	7.408	0.019	1.574	8340.302	16.584	23.592	***0.18***
7/30/2020	8.040	0.024	1.628	6969.955	8.785	15.769	***0***
7/31/2020	6.650	0.021	1.577	6450.443	8.415	15.050	***0***
8/1/2020	6.228	0.022	1.525	6190.340	8.162	14.979	***0***
8/2/2020	7.807	0.025	1.638	7093.727	10.270	17.033	***0.29***
8/3/2020	8.748	0.025	1.748	6767.967	8.538	15.346	***0***
8/4/2020	8.173	0.023	1.663	6796.062	10.365	17.180	***0.9***
8/5/2020	8.747	0.026	1.743	8708.573	13.072	20.203	***0***
8/6/2020	5.549	0.024	1.538	6692.090	8.551	15.230	***0***
8/7/2020	3.728	0.022	1.634	6318.850	8.227	14.918	***0***
8/8/2020	5.740	0.022	1.580	6101.179	8.330	15.085	***0***
8/9/2020	4.715	0.017	1.563	6073.131	8.252	14.955	***0***
8/10/2020	7.088	0.020	1.628	6101.557	7.953	14.573	***0***
8/11/2020	3.030	0.019	1.576	2981.304	8.010	14.695	***0***
---	---	---	---	---	---	---	***2.93***

TECsmith

TECSMITH, Inc.
PO Box 383
Elma, New York 14059-0383
Tel: 716-462-0382
Fax: 716-687-1418

Date: August 12, 2020

SANITARY SEWER FLOW CAPACITY STUDY – Summary Review

Prepared For: 460 Dodge Road Capacity Analysis

Christopher Wood
487 Main Street, Suite 600
Buffalo, New York 14203
P: (716) 842-3165
F: (716) 842-0263

Project Name: 460 Dodge Road Capacity Analysis

Flow Monitoring Period: July 8, 2020 to August 5, 2020

Rain Events (> 0.5-inches) Monitored: July 16 (0.86”), and August (0.90”)

Number of Monitoring Nodes: Two (2) downstream manholes

Node Locations and Descriptions:

- Node 1 340 Dodge Road (18")
- Node 2 Dodge Rd 60" (60")

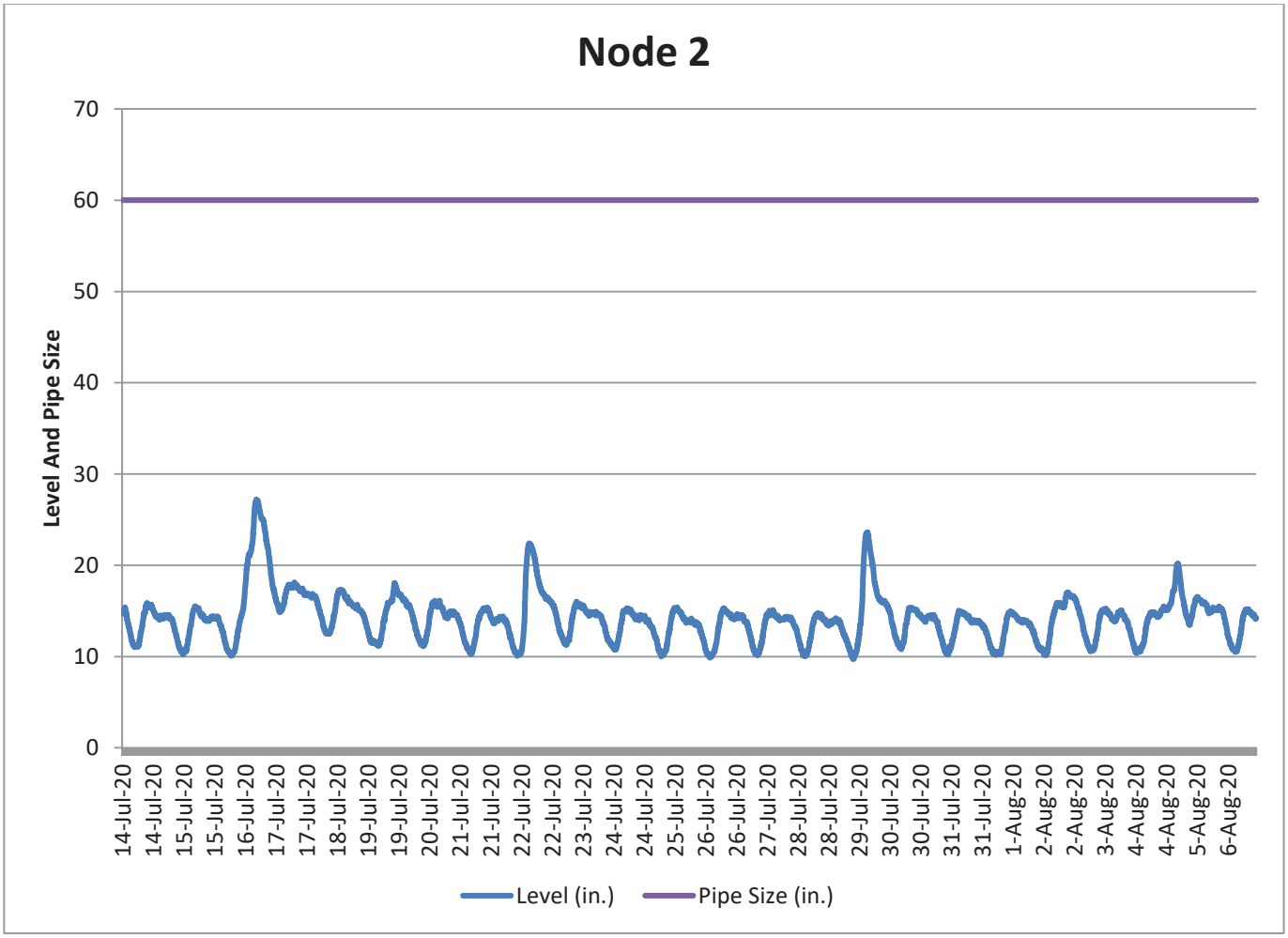
Summary Conclusion:

Based on the data presented in this report, specifically the flow depth measurements recorded (see graphs below)

- At no time did the flow depth exceed pipe diameter at any of the downstream monitoring points during the rain events monitored.
- At no time during the monitoring period did the flow at any point slow or stall which would have caused a backup or flooding at the manhole.

TECSMITH, Inc.
PO Box 383
Elma, New York 14059-0383
Tel: 716-462-0382
Fax: 716-687-1418

- At no time during the monitoring period did depth of flow exceed pipe diameter at Node 2.

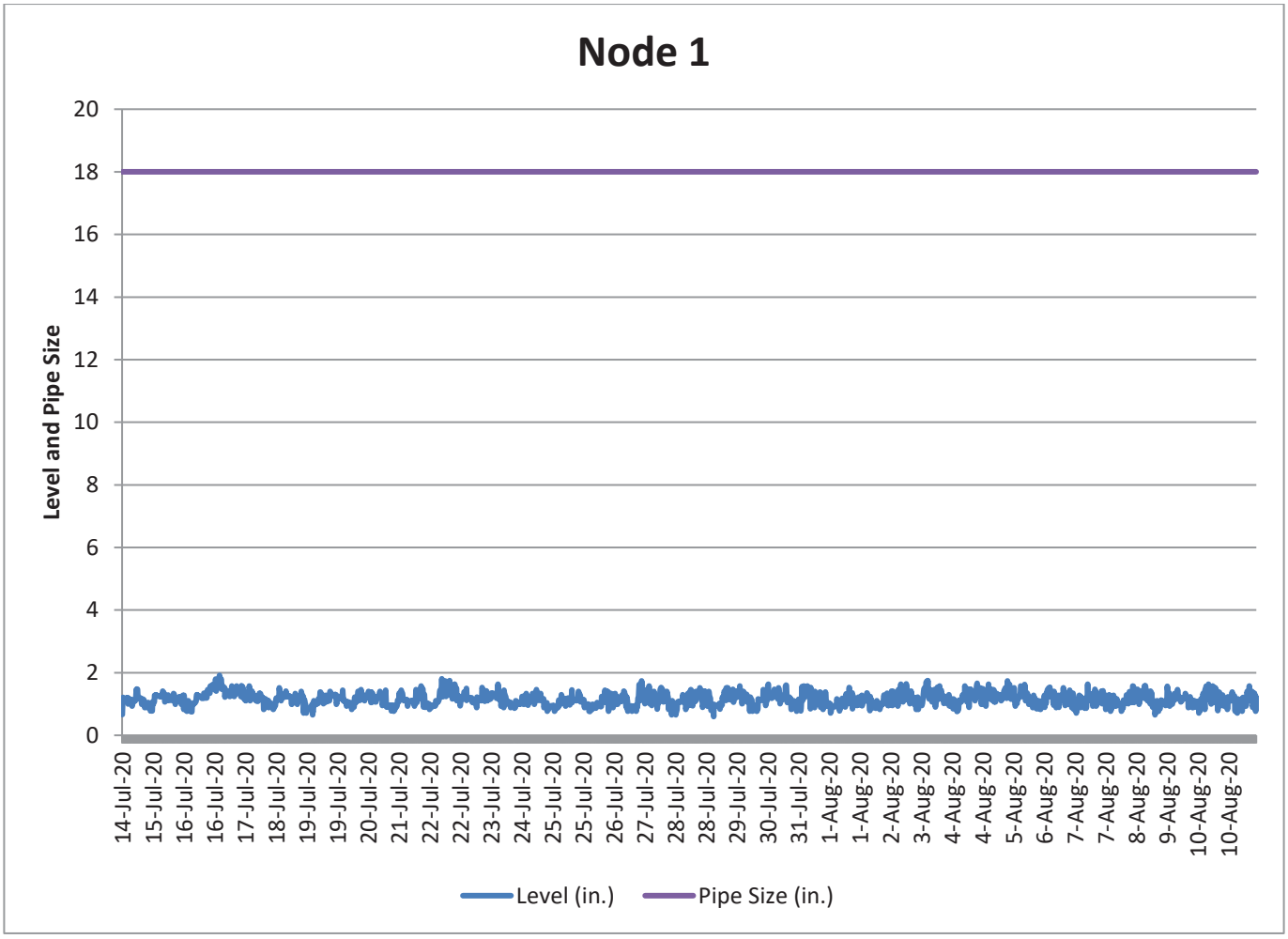


TECSMITH, Inc.
PO Box 383
Elma, New York 14059-0383
Tel: 716-462-0382
Fax: 716-687-1418

Depth of Flow Capacity Summary:

Depth of flow capacity is based on diameter of pipe. See graphs below.

- At no time during the monitoring period did depth of flow exceed pipe diameter at Node 1.



Town of Amherst Sanitary Sewer Downstream Routing Maps

Town of Amherst Engineering Department
Sewer Maintenance Division

Main Sanitary Sewer Interceptors

DOWNSTREAM SEWER

AMHERST PEANUT LINE & WEST SIDE INTERCEPTOR

460 Dodge Road - Proposed 26 Unit Apartment Building - Amherst Consolidated Sewer District

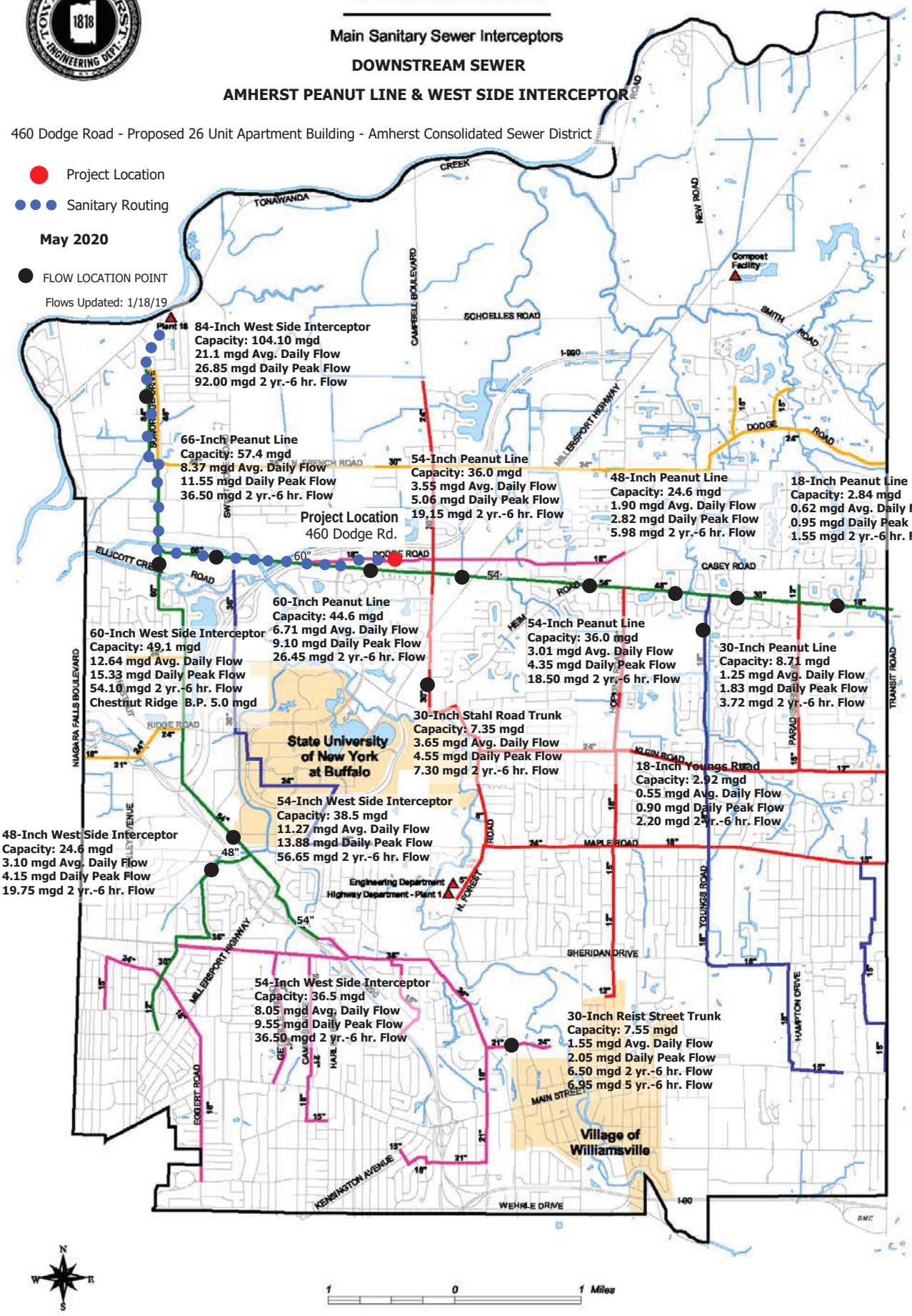
Project Location

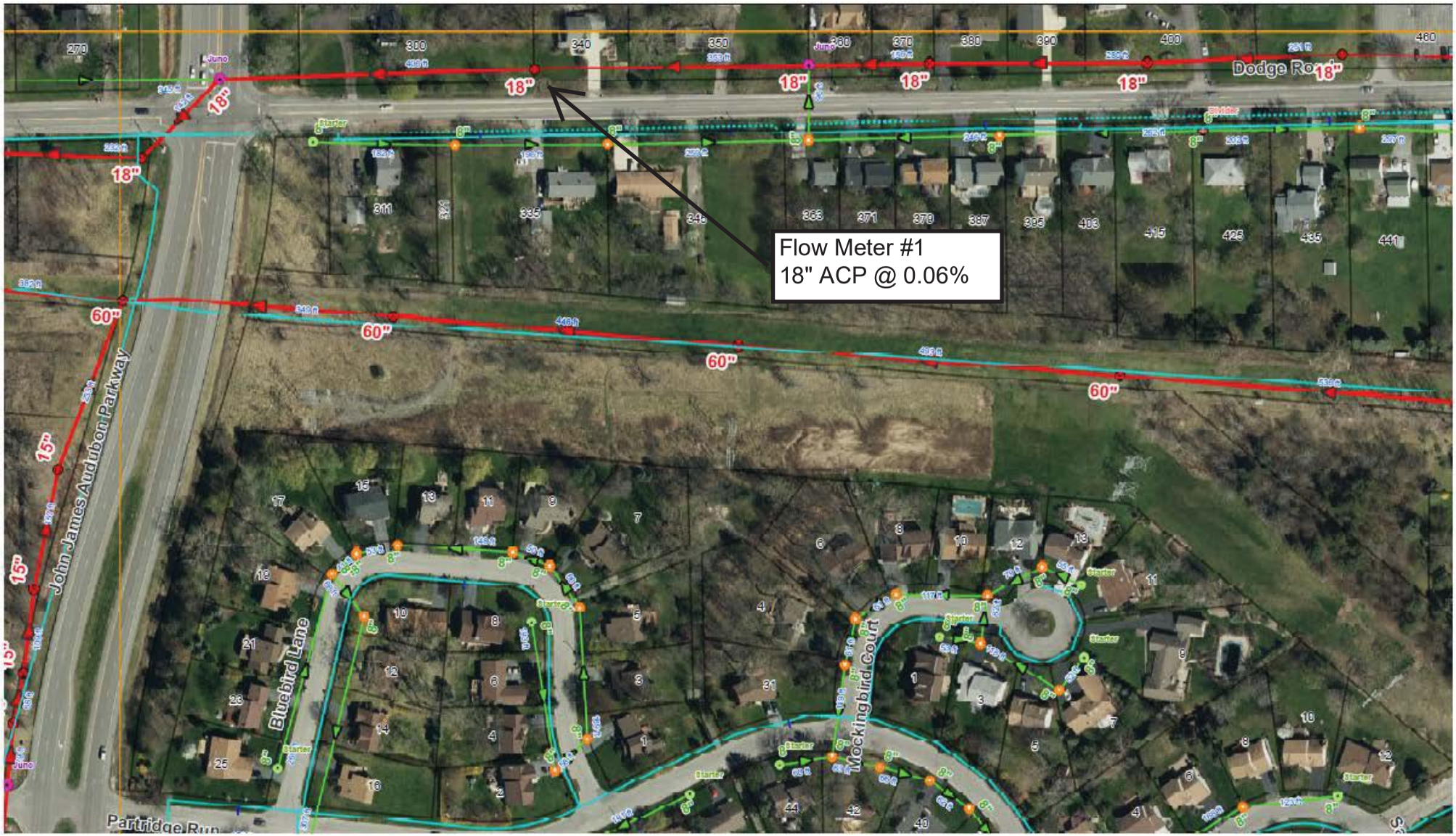
Sanitary Routing

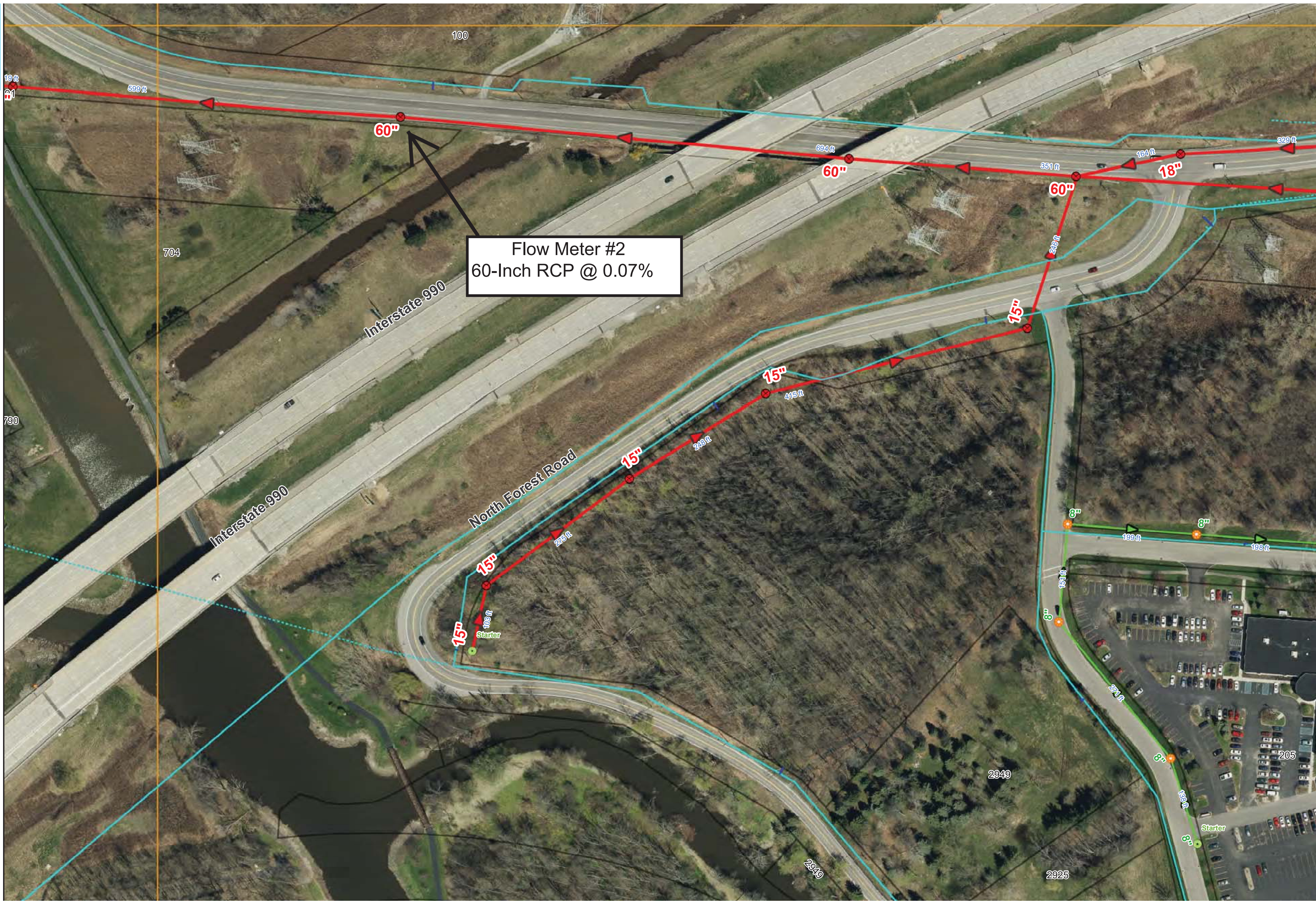
May 2020

FLOW LOCATION POINT

Flows Updated: 1/18/19




Flow Meter #1
18" ACP @ 0.06%
Dodge Rd
John James Audubon Parkway
Bluebird Lane
Mockingbird Court
Partridge Run
18"
60"
15"

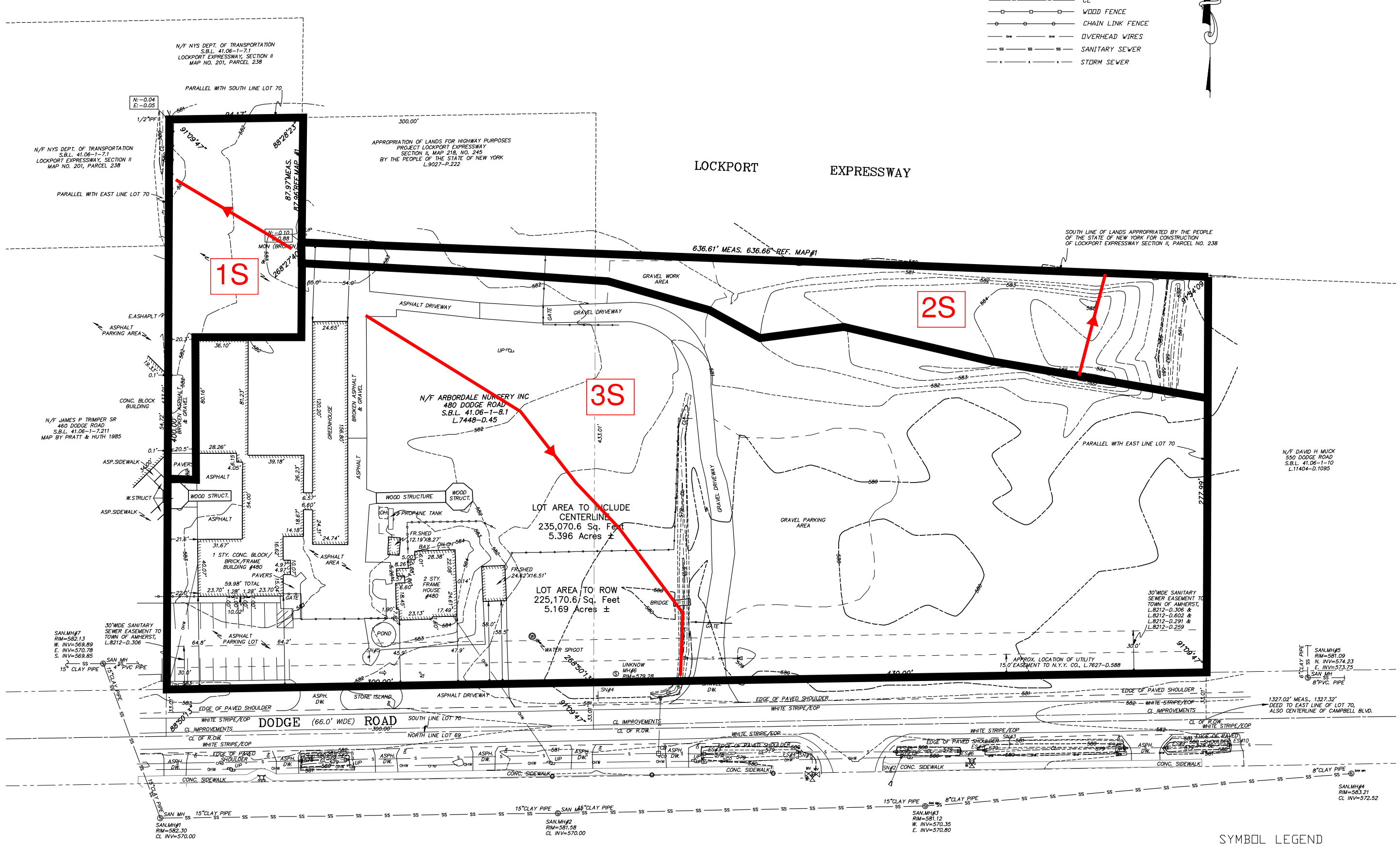

Flow Meter #2
60-Inch RCP @ 0.07%
Interstate 990
Interstate 990
North Forest Road
60"
60"
60"
18"
15"
15"
15"
15"
15"
15"
8"
8"
8"
8"
8"
Starter
Starter
599 ft
694 ft
351 ft
164 ft
329 ft
246 ft
415 ft
249 ft
275 ft
103 ft
199 ft
198 ft
151 ft
271 ft
138 ft
100
704
790
2949
2949
2925
205

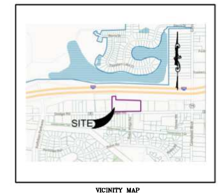
Appendix B

Storm Sewer System Drainage Calculations

Existing Runoff

EXISTING RUNOFF





LINE LEGEND

These standard symbols will be found in the drawing.

- HATCH-BUILDING
- CL
- WOOD FENCE
- CHAIN LINK FENCE
- OVERHEAD WIRES
- SANITARY SEWER
- STORM SEWER

REFERENCE MAPS:

1. MAP OF 480 DODGE ROAD BY LANDMARK LAND SURVEYING CO., JOB NO. 2040699, SURVEY UPDATED 09-26-22 FOR S.BL. 41.06-1-8.1
2. MAP OF 410-460 DODGE ROAD BY PRATT & HUTH ASSOCIATES, JOB. MO. 00490, LAST REVISED JUNE 26, 1986

UN-PLOTTABLE EASEMENTS::

1. RIGHT-OF-WAY TO NATIONAL FUEL GAS DIST. CORP. FOR GAS MAIN PER LIBER 8707 OF DEEDS, PAGE 98.
2. EASEMENT TO TOWN OF AMHERST FOR 8" SANITARY SEWER ACROSS 25' FEET SOUTHERLY REAL PROPERTY PER LIBER 8252 OF DEEDS, PAGE 455.
3. EASEMENT TO TOWN OF AMHERST FOR 30" SANITARY SEWER PER LIBER 7082 OF DEEDS, PAGE 325.
4. EASEMENT TO TOWN OF AMHERST FOR SEWER LINE PER LIBER 6828 OF DEEDS, PAGE 555.
5. RIGHT-OF-WAY TO IROQUOIS GAS CORP. FOR GAS MAIN PER LIBER 7399 OF DDEDS, PAGE 96.

ABSTRACTS OF TITLE:

1. ABSTRACT OF TITLE BY EQUITY TITLE AGENCY, LLC, SEARCH No. E22-55005AE, DATED AUGUST 18, 2022 FOR 480 DODGE ROAD, S.B.L 41.06-1-8.1
2. ABSTRACT OF TITLE BY EQUITY TITLE AGENCY, LLC, SEARCH No. E22-55006AE, DATED AUGUST 18, 2022 FOR 480 DODGE ROAD, S.B.L 41.06-1-8.1

ALL UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE. BEFORE YOU DIG, DRILL, OR BLAST, CALL UFPO AT 1-800-962-7962.

NOTE:

THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING RECORD DRAWINGS PROVIDED TO THE SURVEYOR. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. ADDITIONAL BURIED UTILITIES/STRUCTURES MAY BE ENCOUNTERED. NO EXCAVATIONS WERE MADE DURING THE PROGRESS OF THIS SURVEY TO SUBSTANTIATE BURIED UTILITIES AND STRUCTURES. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED, ALTHOUGH THEY DO CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE. BEFORE EXCAVATIONS ARE BEGUN, THE APPROPRIATE AGENCIES SHOULD BE CONTACTED FOR VERIFICATION OF UTILITY TYPE AND FOR FIELD LOCATIONS.

1. VERTICAL CONTROL REFERENCED TO NAVD 88 VERTICAL DATUM.
2. HORIZONTAL CONTROL BASED ON NY STATE PLANE COORDINATE SYSTEM – NAD83 NY WEST ZONE.

END SECTION INVERTS:

ES#1	12" CMP	577.58
ES#2	12" CMP	578.35
ES#3	12" CMP	577.84
ES#4	12" CMP	578.33
ES#5	12" CMP	578.66
ES#6	12" HDPE	578.57
ES#7	12" HDPE	578.45
ES#8	12" HDPE	578.71
ES#9	12" HDPE	578.56
ES#10	12" CMP	578.89

STREET & SITE SIGNS:

SN#1	STREET SIGN	ROBIN RIDGE RD & DODGE RD
SN#2	STOP SIGN	
SN#3	SPEED LIMIT 40MPH	
SN#4	SPEED LIMT 40 MPH	
SN#5	PYLON SIGN	ARBORDALE NURSERIES LANDSCAPING

SYMBOL LEGEND

These standard symbols will be found in the drawing.

- SIGN
- CATCHBASIN
- SANITARY SEWER
- WV WATER VALVE
- CO SEWER CLEAN OUIT
- HYDRANT
- UTILITY POLE
- SPOT ELEVATION
- WELL
- MAILBOX
- YD YARD DRAIN
- END SECTION

NOTE: UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF SECTION 7209 PROVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

NOTE: THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF AN ABSTRACT OF TITLE.

0 40 80 120

DATE	REVISION/TYPE

BOUNDARY & TOPOGRAPHIC SURVEY OF
PART OF LOT 70, TOWNSHIP 12, RANGE 7,
OF HOLLAND LAND COMPANY'S SURVEY
TOWN OF AMHERST, ERIE COUNTY, NEW YORK

GPI ENGINEERING, LANDSCAPE ARCHITECTURE & SURVEYING, LLP
ENGINEERING • SURVEYING • LANDSCAPE ARCHITECTURE
4950 GENESEE STREET, SUITE 100
BUFFALO, NEW YORK 14225
(716) 633-4844 FAX 633-4940

Job No. 10470 Date: DECEMBER 7, 2022
Scale: 1" = 40' TAX No. 41.06-1-8.1

Events for Subcatchment 1S: West

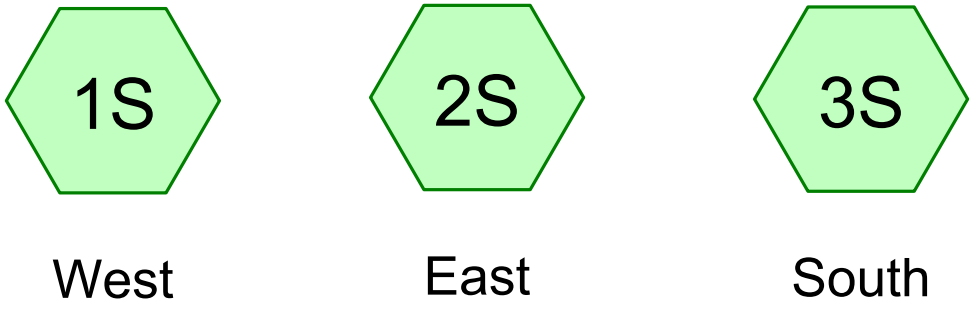
Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
1-Year	1.87	0.95	1,924	1.36
2-Year	2.20	1.15	2,370	1.67
5-Year	2.69	1.45	3,040	2.15
10-Year	3.14	1.72	3,661	2.59
25-Year	3.84	2.15	4,634	3.27
50-Year	4.48	2.53	5,528	3.90
100-Year	**5.23**	**2.98**	**6,579**	**4.65**

Events for Subcatchment 2S: East

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
1-Year	1.87	0.44	1,291	0.56
2-Year	2.20	0.63	1,793	0.78
5-Year	2.69	0.93	2,606	1.14
10-Year	3.14	1.22	3,408	1.49
25-Year	3.84	1.70	4,727	2.07
50-Year	4.48	2.14	5,988	2.62
100-Year	**5.23**	**2.68**	**7,514**	**3.29**

Events for Subcatchment 3S: South

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
1-Year	1.87	5.02	13,877	0.92
2-Year	2.20	6.51	18,016	1.20
5-Year	2.69	8.80	24,436	1.62
10-Year	3.14	10.93	30,533	2.03
25-Year	3.84	14.28	40,270	2.67
50-Year	4.48	17.35	49,354	3.28
100-Year	**5.23**	**20.94**	**60,145**	**3.99**



Subcat Reach Pond Link

Routing Diagram for 22.296 existing
Prepared by Carmina Wood Morris, PC, Printed 3/17/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	Type II 24-hr		Default	24.00	1	1.87	2
2	2-Year	Type II 24-hr		Default	24.00	1	2.20	2
3	5-Year	Type II 24-hr		Default	24.00	1	2.69	2
4	10-Year	Type II 24-hr		Default	24.00	1	3.14	2
5	25-Year	Type II 24-hr		Default	24.00	1	3.84	2
6	50-Year	Type II 24-hr		Default	24.00	1	4.48	2
7	100-Year	Type II 24-hr		Default	24.00	1	5.23	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
12,632	84	50-75% Grass cover, Fair, HSG D (1S, 3S)
58,806	96	Gravel surface, HSG D (1S, 3S)
41,382	98	Paved parking, HSG D (3S)
112,385	82	Woods/grass comb., Fair, HSG D (2S, 3S)
225,205	**89**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
225,205	HSG D	1S, 2S, 3S
0	Other	
225,205		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	0	0	12,632	0	12,632	50-75% Grass cover, Fair	
0	0	0	58,806	0	58,806	Gravel surface	
0	0	0	41,382	0	41,382	Paved parking	
0	0	0	112,385	0	112,385	Woods/grass comb., Fair	
0	**0**	**0**	**225,205**	**0**	**225,205**	**TOTAL AREA**	

Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: West Runoff Area=0.390 ac 0.00% Impervious Runoff Depth=1.36"
Flow Length=95' Slope=0.0190 '/' Tc=4.5 min CN=95 Runoff=0.95 cfs 1,924 cf

Subcatchment2S: East Runoff Area=0.630 ac 0.00% Impervious Runoff Depth=0.56"
Flow Length=90' Slope=0.0550 '/' Tc=14.9 min CN=82 Runoff=0.44 cfs 1,291 cf

Subcatchment3S: South Runoff Area=4.150 ac 22.89% Impervious Runoff Depth=0.92"
Flow Length=300' Slope=0.0100 '/' Tc=14.6 min CN=89 Runoff=5.02 cfs 13,877 cf

Total Runoff Area = 225,205 sf Runoff Volume = 17,093 cf Average Runoff Depth = 0.91"
81.62% Pervious = 183,823 sf 18.38% Impervious = 41,382 sf

Summary for Subcatchment 1S: West

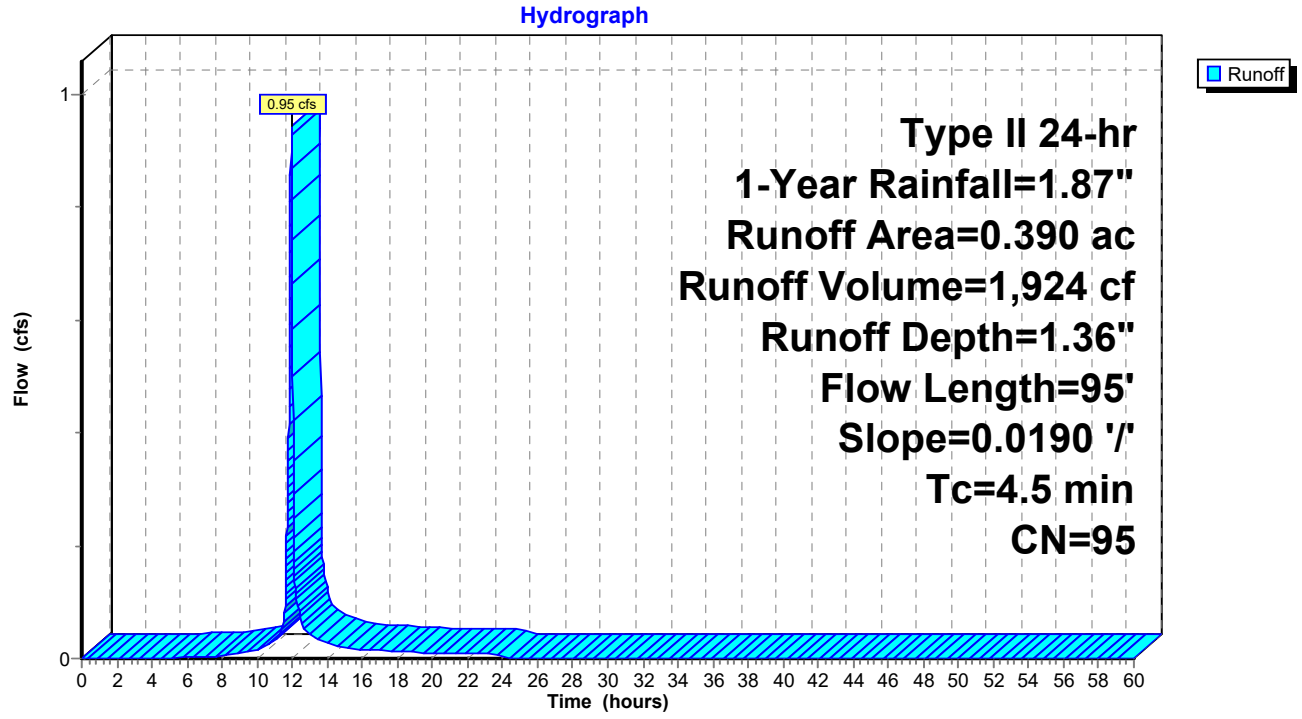
Runoff = 0.95 cfs @ 11.95 hrs, Volume= 1,924 cf, Depth= 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Year Rainfall=1.87"

Area (ac)	CN	Description
0.350	96	Gravel surface, HSG D
0.040	84	50-75% Grass cover, Fair, HSG D
0.390	95	Weighted Average
0.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	95	0.0190	0.35		**Sheet Flow, gravel** Fallow n= 0.050 P2= 2.50"

Subcatchment 1S: West



Summary for Subcatchment 2S: East

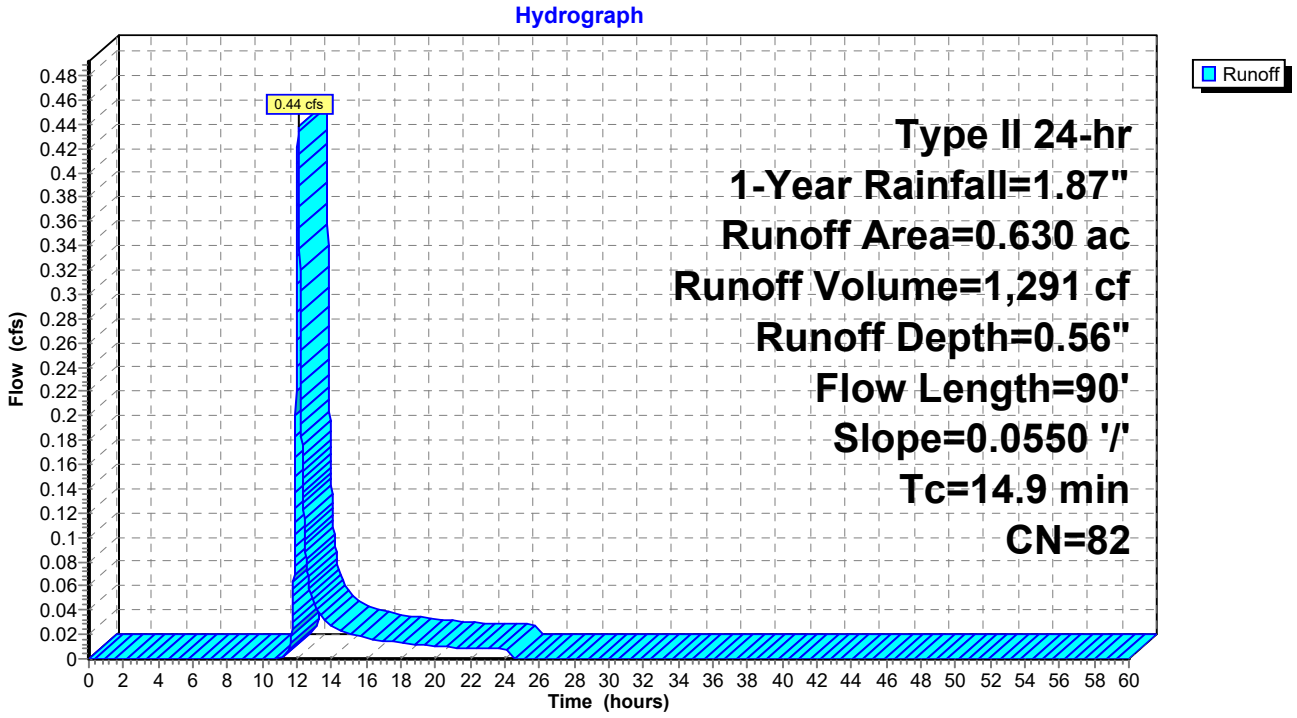
Runoff = 0.44 cfs @ 12.08 hrs, Volume= 1,291 cf, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Year Rainfall=1.87"

Area (ac)	CN	Description
0.630	82	Woods/grass comb., Fair, HSG D
0.630		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	90	0.0550	0.10		**Sheet Flow, woods/grass** Woods: Light underbrush n= 0.400 P2= 2.50"

Subcatchment 2S: East



Summary for Subcatchment 3S: South

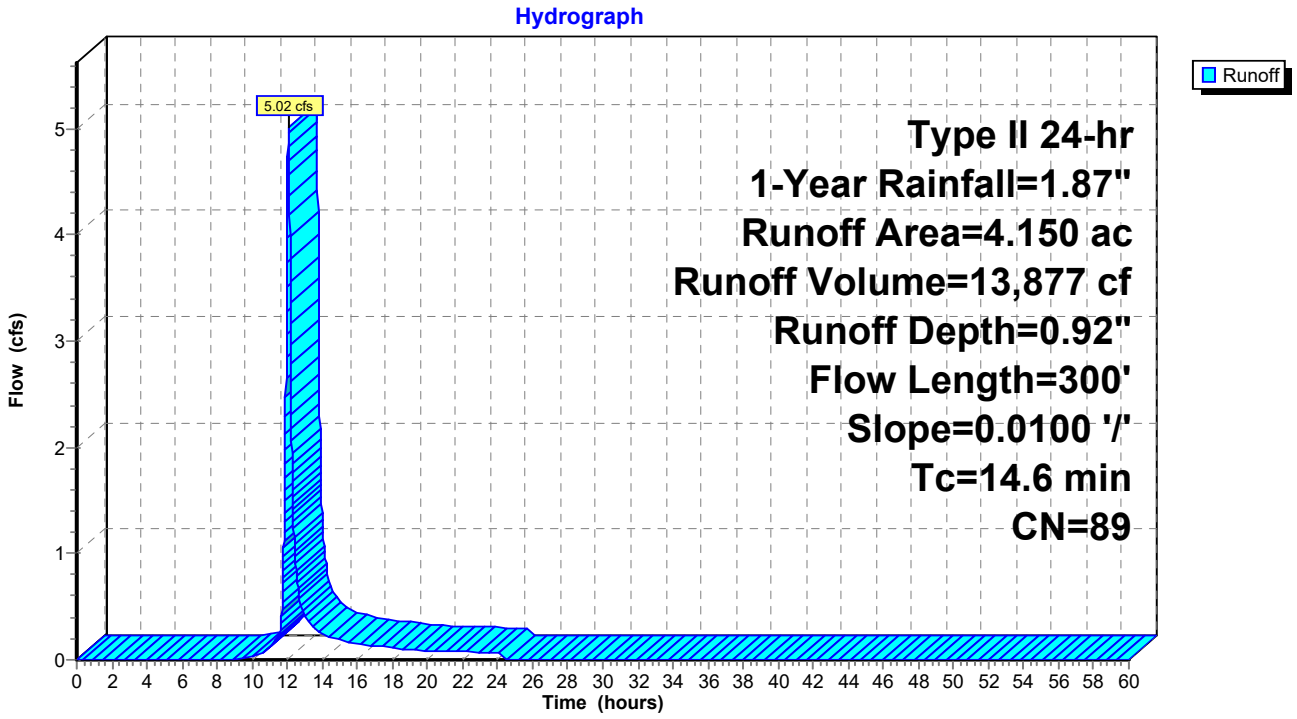
Runoff = 5.02 cfs @ 12.07 hrs, Volume= 13,877 cf, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Year Rainfall=1.87"

Area (ac)	CN	Description
0.950	98	Paved parking, HSG D
1.000	96	Gravel surface, HSG D
0.250	84	50-75% Grass cover, Fair, HSG D
1.950	82	Woods/grass comb., Fair, HSG D
4.150	89	Weighted Average
3.200		77.11% Pervious Area
0.950		22.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	300	0.0100	0.34		**Sheet Flow, gravel** Fallow n= 0.050 P2= 2.50"

Subcatchment 3S: South



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: West Runoff Area=0.390 ac 0.00% Impervious Runoff Depth=1.67"
Flow Length=95' Slope=0.0190 '/' Tc=4.5 min CN=95 Runoff=1.15 cfs 2,370 cf

Subcatchment2S: East Runoff Area=0.630 ac 0.00% Impervious Runoff Depth=0.78"
Flow Length=90' Slope=0.0550 '/' Tc=14.9 min CN=82 Runoff=0.63 cfs 1,793 cf

Subcatchment3S: South Runoff Area=4.150 ac 22.89% Impervious Runoff Depth=1.20"
Flow Length=300' Slope=0.0100 '/' Tc=14.6 min CN=89 Runoff=6.51 cfs 18,016 cf

Total Runoff Area = 225,205 sf Runoff Volume = 22,178 cf Average Runoff Depth = 1.18"
81.62% Pervious = 183,823 sf 18.38% Impervious = 41,382 sf

Summary for Subcatchment 1S: West

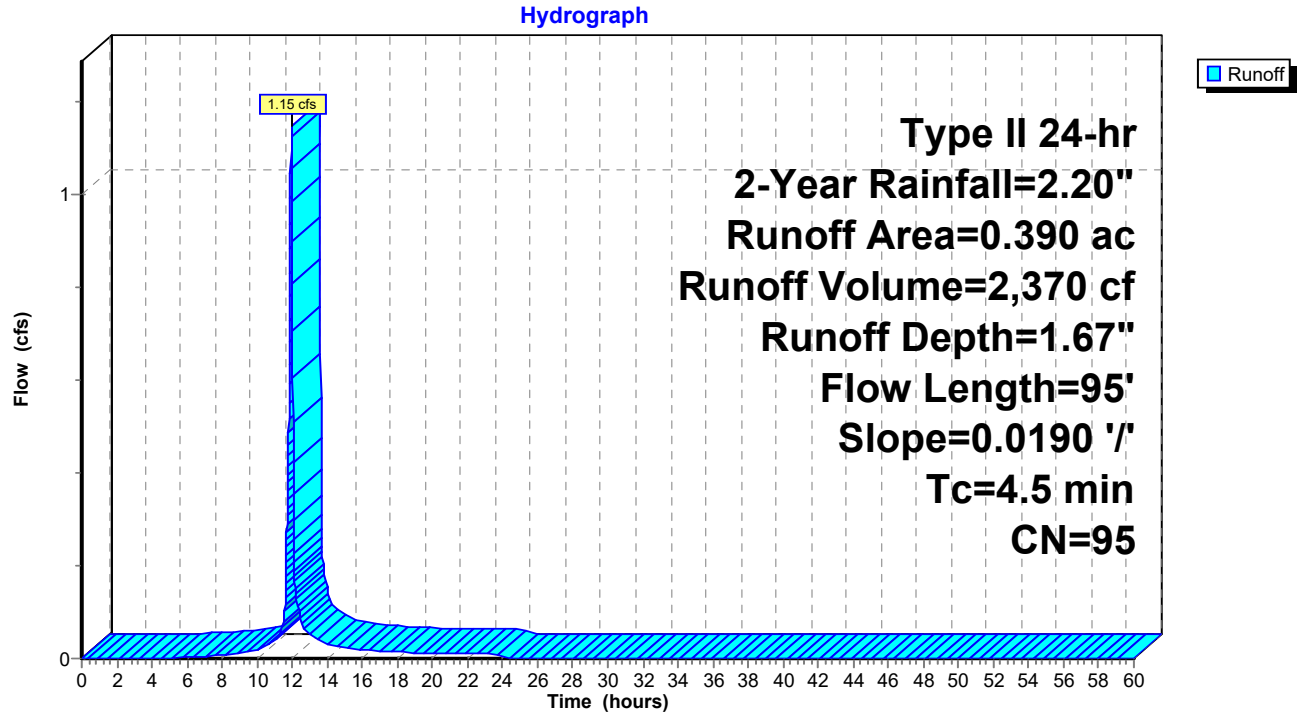
Runoff = 1.15 cfs @ 11.95 hrs, Volume= 2,370 cf, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-Year Rainfall=2.20"

Area (ac)	CN	Description
0.350	96	Gravel surface, HSG D
0.040	84	50-75% Grass cover, Fair, HSG D
0.390	95	Weighted Average
0.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	95	0.0190	0.35		**Sheet Flow, gravel** Fallow n= 0.050 P2= 2.50"

Subcatchment 1S: West



Summary for Subcatchment 2S: East

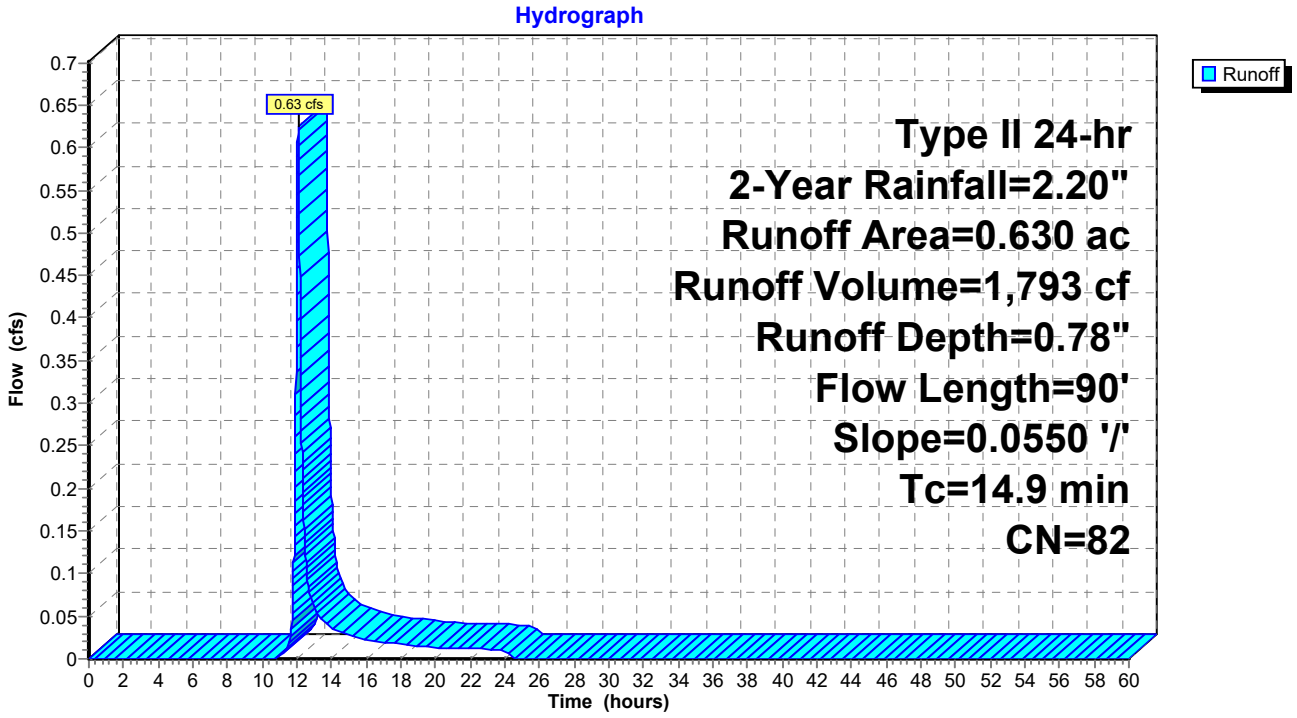
Runoff = 0.63 cfs @ 12.08 hrs, Volume= 1,793 cf, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-Year Rainfall=2.20"

Area (ac)	CN	Description
0.630	82	Woods/grass comb., Fair, HSG D
0.630		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	90	0.0550	0.10		**Sheet Flow, woods/grass** Woods: Light underbrush n= 0.400 P2= 2.50"

Subcatchment 2S: East



Summary for Subcatchment 3S: South

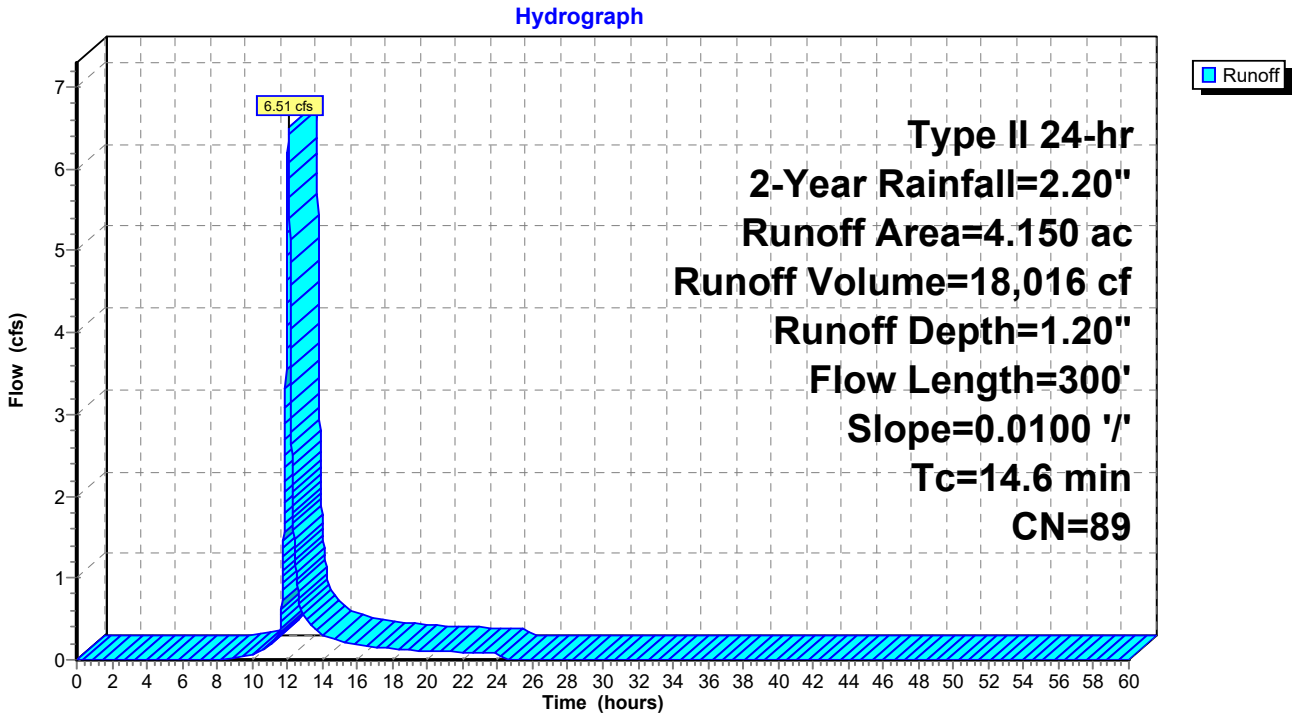
Runoff = 6.51 cfs @ 12.07 hrs, Volume= 18,016 cf, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-Year Rainfall=2.20"

Area (ac)	CN	Description
0.950	98	Paved parking, HSG D
1.000	96	Gravel surface, HSG D
0.250	84	50-75% Grass cover, Fair, HSG D
1.950	82	Woods/grass comb., Fair, HSG D
4.150	89	Weighted Average
3.200		77.11% Pervious Area
0.950		22.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	300	0.0100	0.34		**Sheet Flow, gravel** Fallow n= 0.050 P2= 2.50"

Subcatchment 3S: South



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: West Runoff Area=0.390 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=95' Slope=0.0190 '/' Tc=4.5 min CN=95 Runoff=1.45 cfs 3,040 cf

Subcatchment2S: East Runoff Area=0.630 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=90' Slope=0.0550 '/' Tc=14.9 min CN=82 Runoff=0.93 cfs 2,606 cf

Subcatchment3S: South Runoff Area=4.150 ac 22.89% Impervious Runoff Depth=1.62"
Flow Length=300' Slope=0.0100 '/' Tc=14.6 min CN=89 Runoff=8.80 cfs 24,436 cf

Total Runoff Area = 225,205 sf Runoff Volume = 30,082 cf Average Runoff Depth = 1.60"
81.62% Pervious = 183,823 sf 18.38% Impervious = 41,382 sf

Summary for Subcatchment 1S: West

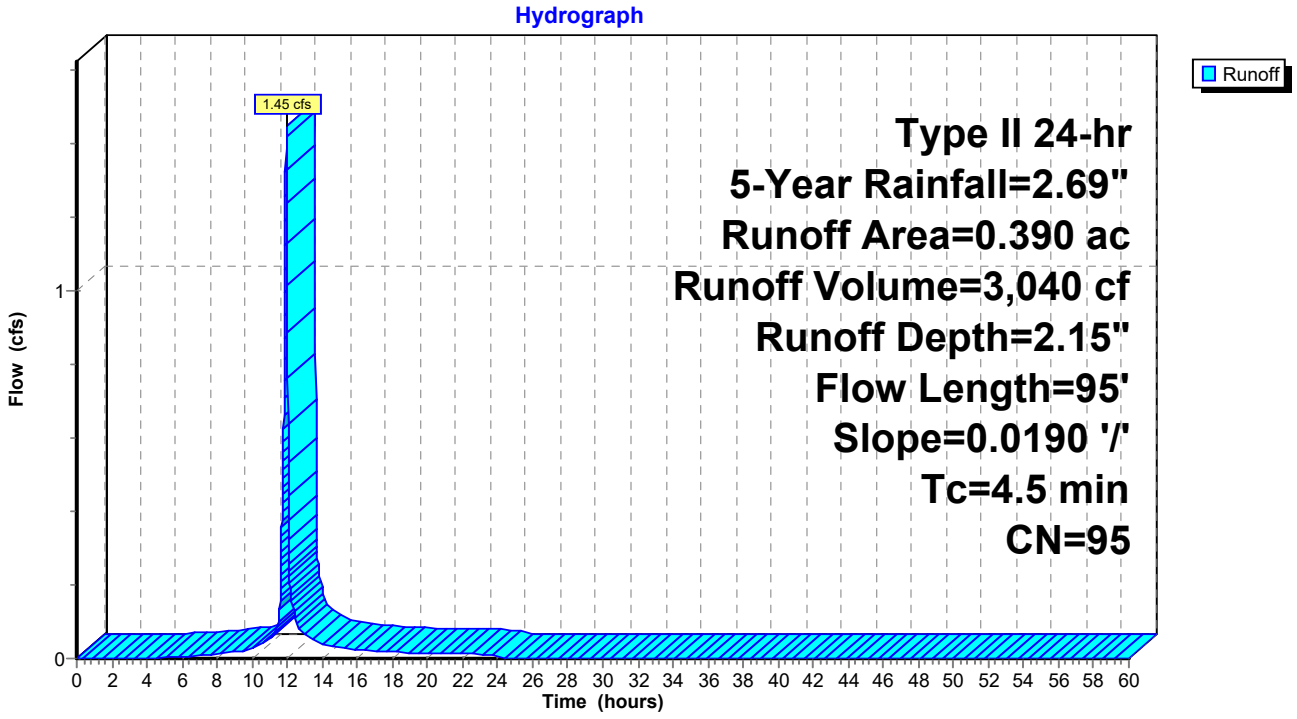
Runoff = 1.45 cfs @ 11.95 hrs, Volume= 3,040 cf, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-Year Rainfall=2.69"

Area (ac)	CN	Description
0.350	96	Gravel surface, HSG D
0.040	84	50-75% Grass cover, Fair, HSG D
0.390	95	Weighted Average
0.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	95	0.0190	0.35		**Sheet Flow, gravel** Fallow n= 0.050 P2= 2.50"

Subcatchment 1S: West



Summary for Subcatchment 2S: East

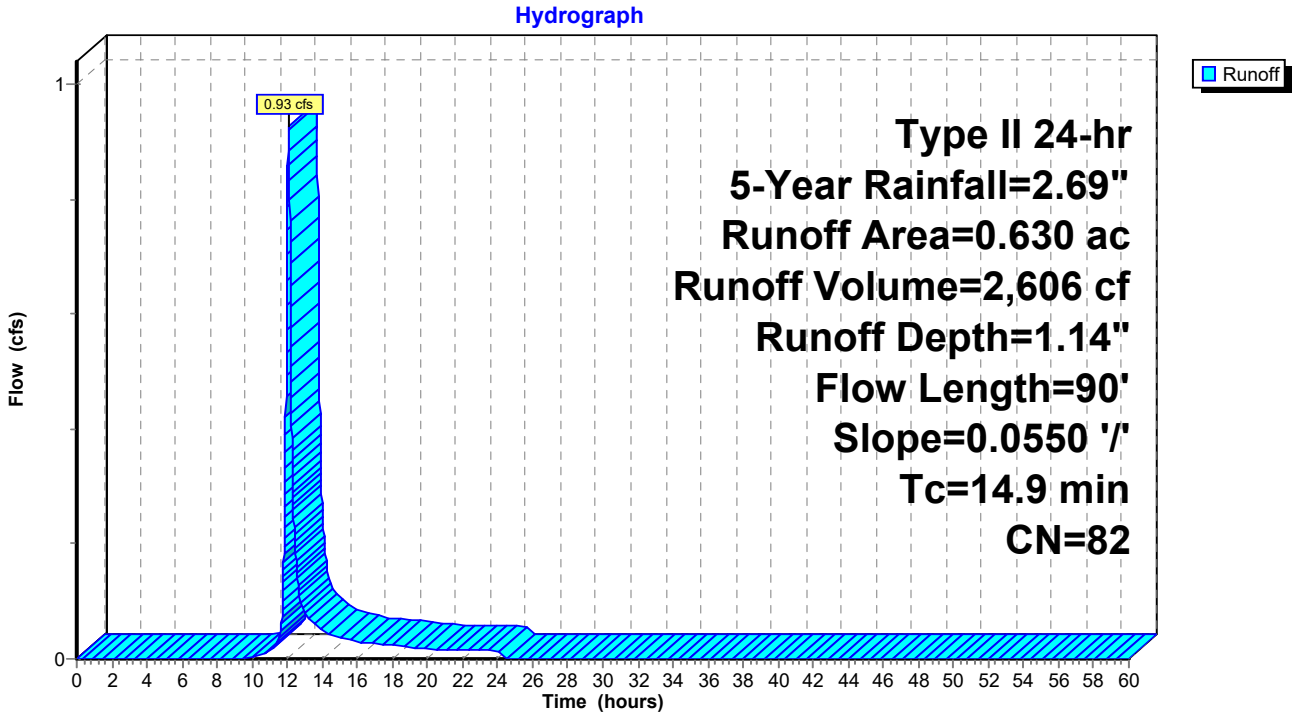
Runoff = 0.93 cfs @ 12.07 hrs, Volume= 2,606 cf, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-Year Rainfall=2.69"

Area (ac)	CN	Description
0.630	82	Woods/grass comb., Fair, HSG D
0.630		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	90	0.0550	0.10		**Sheet Flow, woods/grass** Woods: Light underbrush n= 0.400 P2= 2.50"

Subcatchment 2S: East



Summary for Subcatchment 3S: South

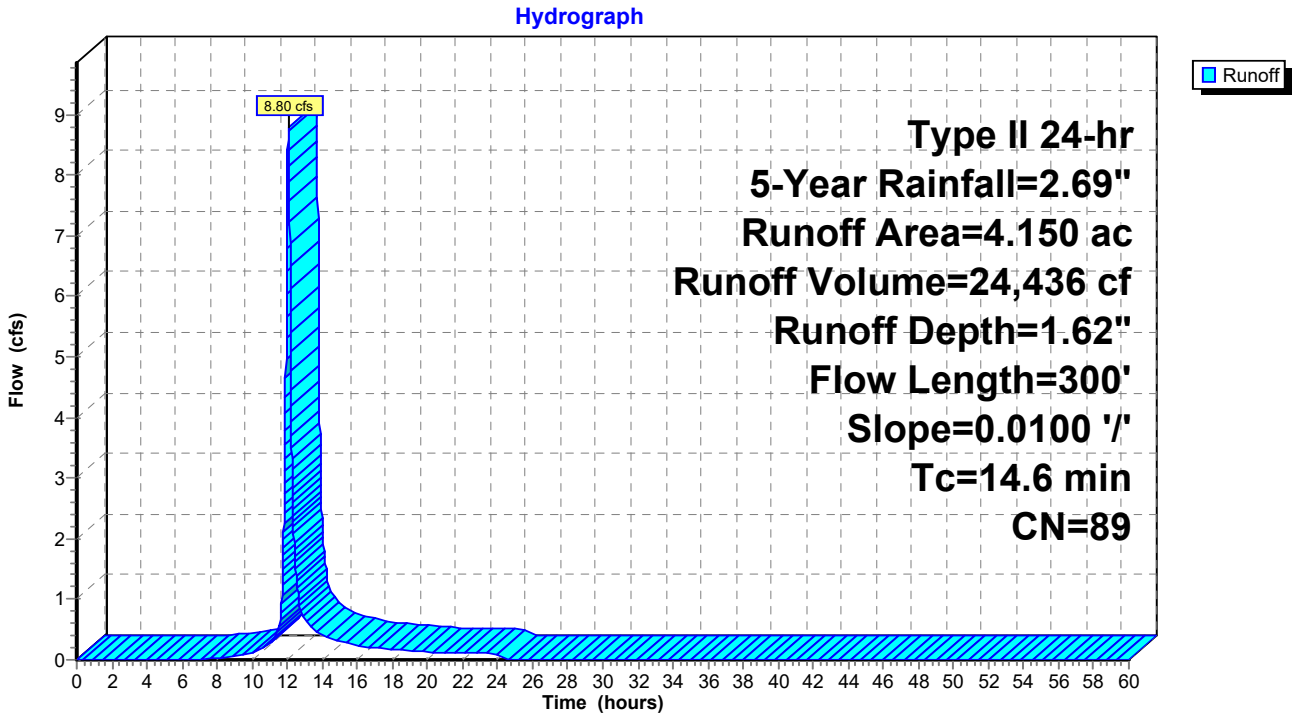
Runoff = 8.80 cfs @ 12.06 hrs, Volume= 24,436 cf, Depth= 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 5-Year Rainfall=2.69"

Area (ac)	CN	Description
0.950	98	Paved parking, HSG D
1.000	96	Gravel surface, HSG D
0.250	84	50-75% Grass cover, Fair, HSG D
1.950	82	Woods/grass comb., Fair, HSG D
4.150	89	Weighted Average
3.200		77.11% Pervious Area
0.950		22.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	300	0.0100	0.34		**Sheet Flow, gravel** Fallow n= 0.050 P2= 2.50"

Subcatchment 3S: South



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: West Runoff Area=0.390 ac 0.00% Impervious Runoff Depth=2.59"
Flow Length=95' Slope=0.0190 '/' Tc=4.5 min CN=95 Runoff=1.72 cfs 3,661 cf

Subcatchment2S: East Runoff Area=0.630 ac 0.00% Impervious Runoff Depth=1.49"
Flow Length=90' Slope=0.0550 '/' Tc=14.9 min CN=82 Runoff=1.22 cfs 3,408 cf

Subcatchment3S: South Runoff Area=4.150 ac 22.89% Impervious Runoff Depth=2.03"
Flow Length=300' Slope=0.0100 '/' Tc=14.6 min CN=89 Runoff=10.93 cfs 30,533 cf

Total Runoff Area = 225,205 sf Runoff Volume = 37,602 cf Average Runoff Depth = 2.00"
81.62% Pervious = 183,823 sf 18.38% Impervious = 41,382 sf

Summary for Subcatchment 1S: West

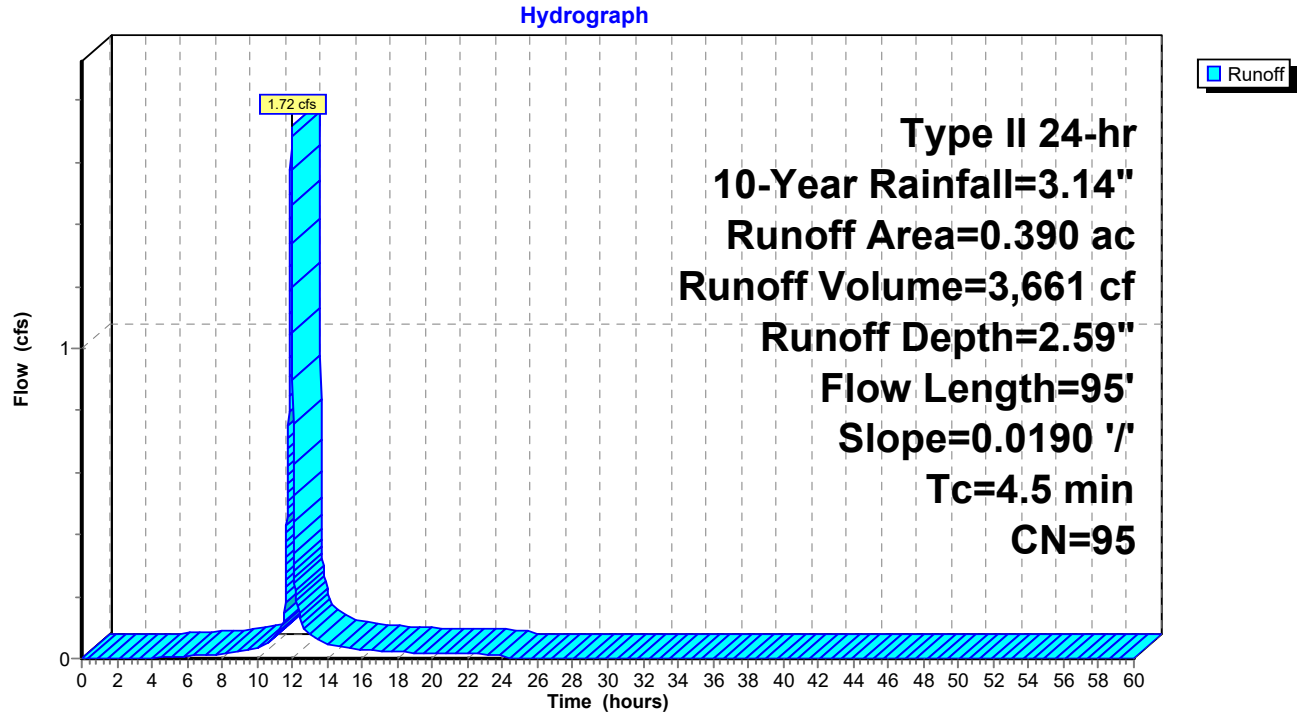
Runoff = 1.72 cfs @ 11.95 hrs, Volume= 3,661 cf, Depth= 2.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=3.14"

Area (ac)	CN	Description
0.350	96	Gravel surface, HSG D
0.040	84	50-75% Grass cover, Fair, HSG D
0.390	95	Weighted Average
0.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	95	0.0190	0.35		**Sheet Flow, gravel** Fallow n= 0.050 P2= 2.50"

Subcatchment 1S: West



Summary for Subcatchment 2S: East

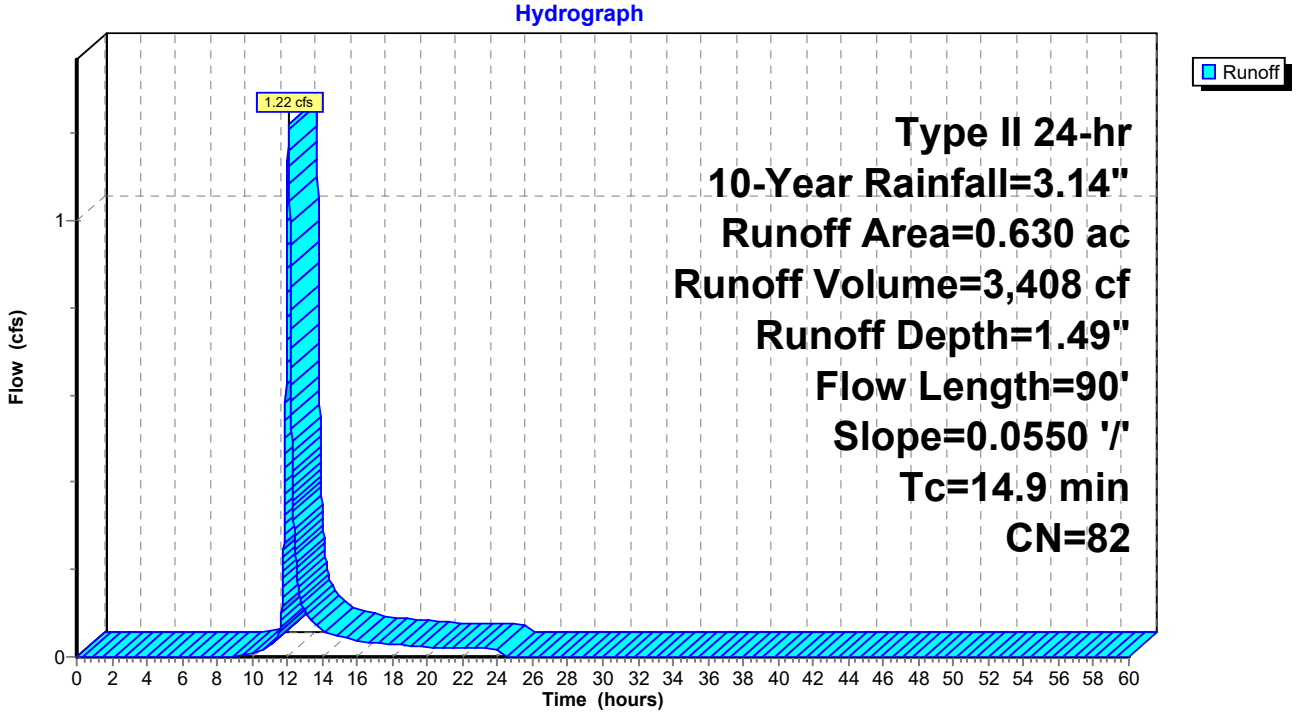
Runoff = 1.22 cfs @ 12.07 hrs, Volume= 3,408 cf, Depth= 1.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=3.14"

Area (ac)	CN	Description
0.630	82	Woods/grass comb., Fair, HSG D
0.630		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	90	0.0550	0.10		**Sheet Flow, woods/grass** Woods: Light underbrush n= 0.400 P2= 2.50"

Subcatchment 2S: East



Summary for Subcatchment 3S: South

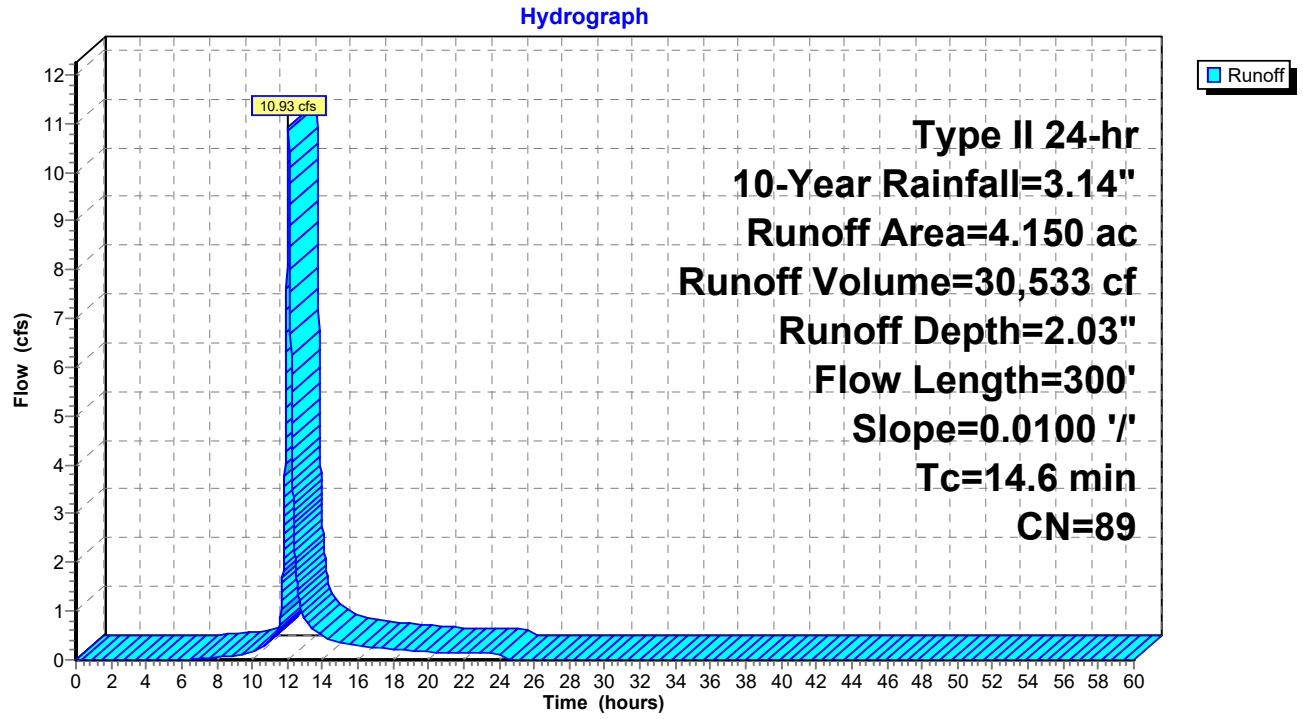
Runoff = 10.93 cfs @ 12.06 hrs, Volume= 30,533 cf, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=3.14"

Area (ac)	CN	Description
0.950	98	Paved parking, HSG D
1.000	96	Gravel surface, HSG D
0.250	84	50-75% Grass cover, Fair, HSG D
1.950	82	Woods/grass comb., Fair, HSG D
4.150	89	Weighted Average
3.200		77.11% Pervious Area
0.950		22.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	300	0.0100	0.34		**Sheet Flow, gravel** Fallow n= 0.050 P2= 2.50"

Subcatchment 3S: South



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: West Runoff Area=0.390 ac 0.00% Impervious Runoff Depth=3.27"
Flow Length=95' Slope=0.0190 '/' Tc=4.5 min CN=95 Runoff=2.15 cfs 4,634 cf

Subcatchment2S: East Runoff Area=0.630 ac 0.00% Impervious Runoff Depth=2.07"
Flow Length=90' Slope=0.0550 '/' Tc=14.9 min CN=82 Runoff=1.70 cfs 4,727 cf

Subcatchment3S: South Runoff Area=4.150 ac 22.89% Impervious Runoff Depth=2.67"
Flow Length=300' Slope=0.0100 '/' Tc=14.6 min CN=89 Runoff=14.28 cfs 40,270 cf

Total Runoff Area = 225,205 sf Runoff Volume = 49,632 cf Average Runoff Depth = 2.64"
81.62% Pervious = 183,823 sf 18.38% Impervious = 41,382 sf

Summary for Subcatchment 1S: West

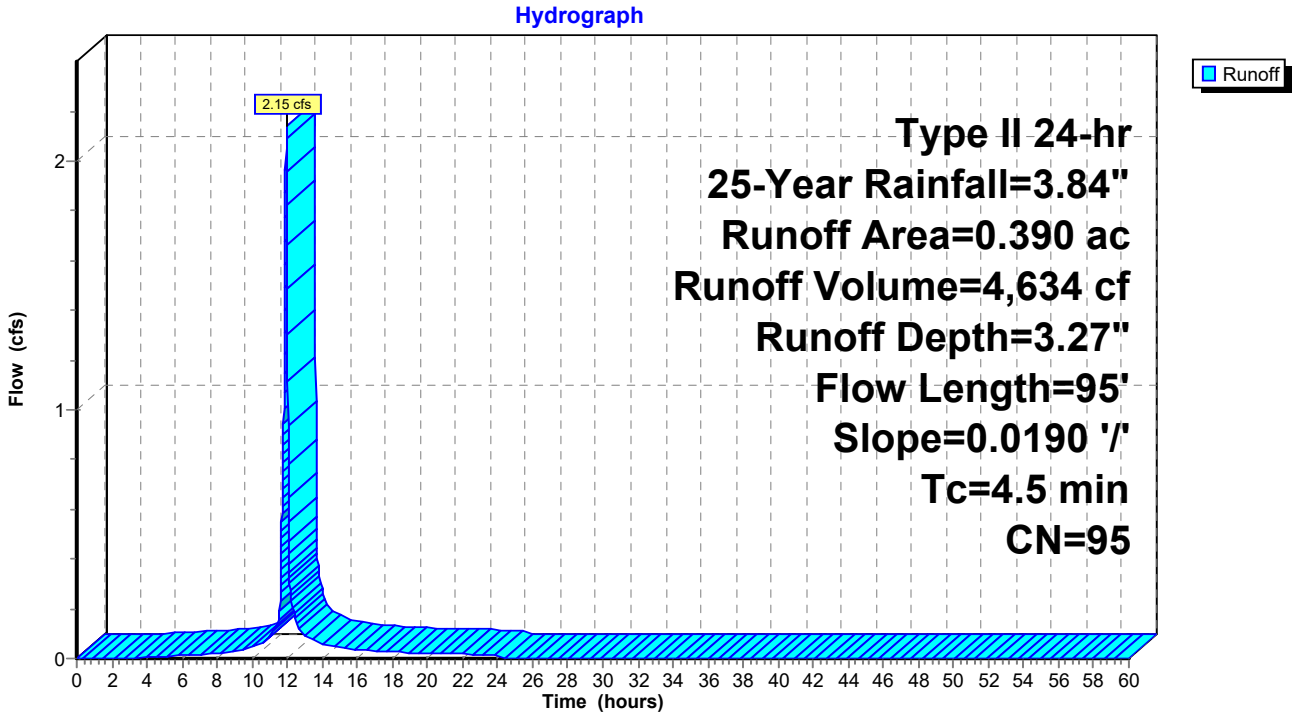
Runoff = 2.15 cfs @ 11.95 hrs, Volume= 4,634 cf, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-Year Rainfall=3.84"

Area (ac)	CN	Description
0.350	96	Gravel surface, HSG D
0.040	84	50-75% Grass cover, Fair, HSG D
0.390	95	Weighted Average
0.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	95	0.0190	0.35		**Sheet Flow, gravel** Fallow n= 0.050 P2= 2.50"

Subcatchment 1S: West



Summary for Subcatchment 2S: East

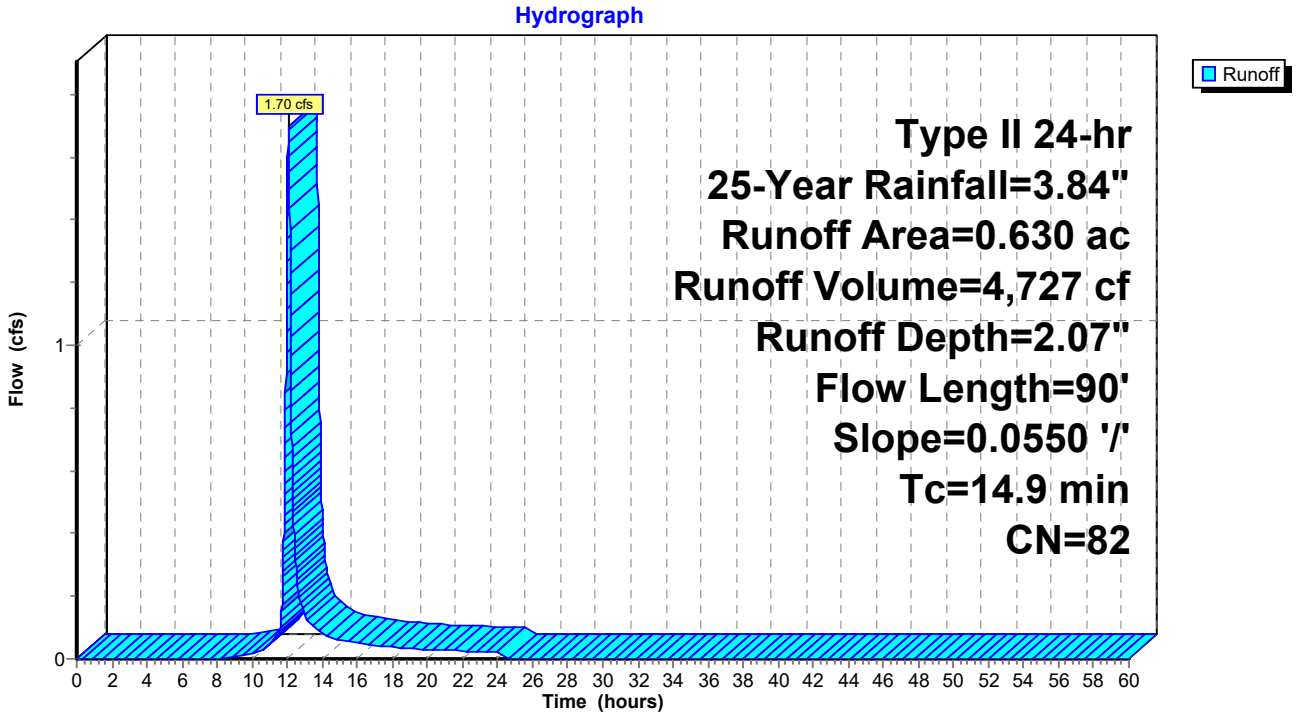
Runoff = 1.70 cfs @ 12.07 hrs, Volume= 4,727 cf, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-Year Rainfall=3.84"

Area (ac)	CN	Description
0.630	82	Woods/grass comb., Fair, HSG D
0.630		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	90	0.0550	0.10		**Sheet Flow, woods/grass** Woods: Light underbrush n= 0.400 P2= 2.50"

Subcatchment 2S: East



Summary for Subcatchment 3S: South

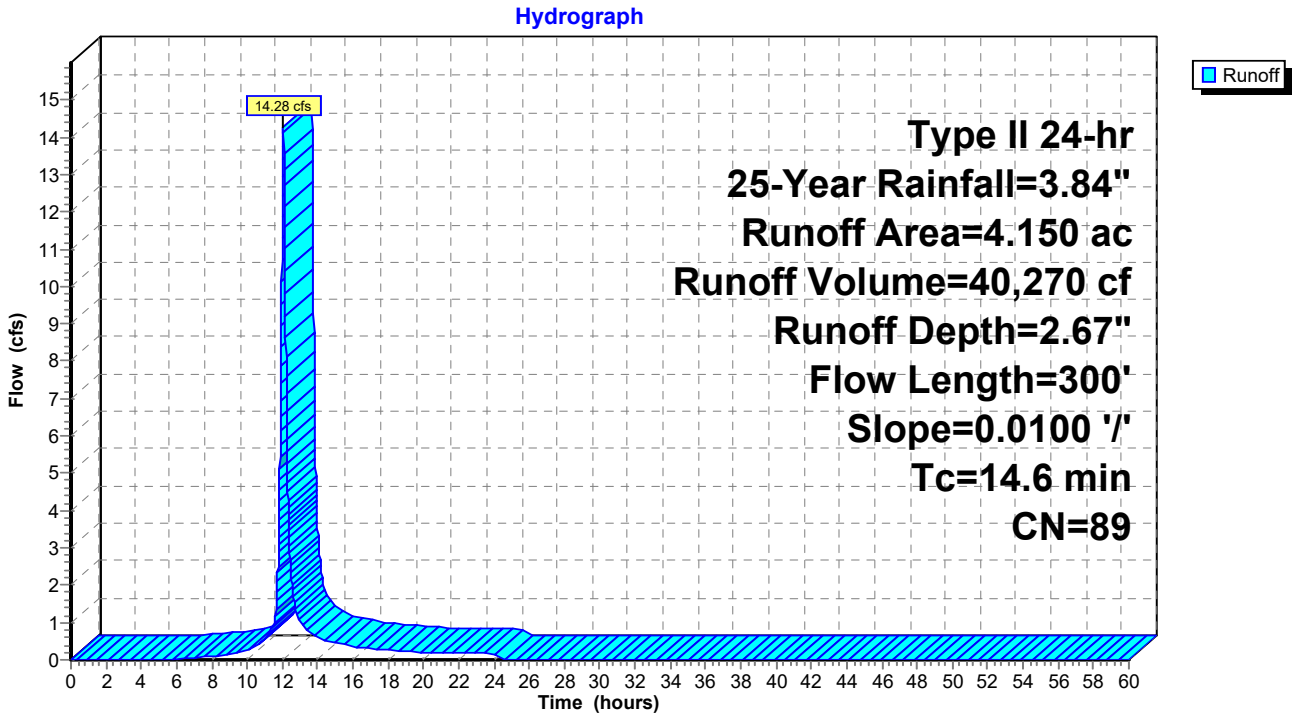
Runoff = 14.28 cfs @ 12.06 hrs, Volume= 40,270 cf, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-Year Rainfall=3.84"

Area (ac)	CN	Description
0.950	98	Paved parking, HSG D
1.000	96	Gravel surface, HSG D
0.250	84	50-75% Grass cover, Fair, HSG D
1.950	82	Woods/grass comb., Fair, HSG D
4.150	89	Weighted Average
3.200		77.11% Pervious Area
0.950		22.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	300	0.0100	0.34		**Sheet Flow, gravel** Fallow n= 0.050 P2= 2.50"

Subcatchment 3S: South



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: West Runoff Area=0.390 ac 0.00% Impervious Runoff Depth=3.90"
Flow Length=95' Slope=0.0190 '/' Tc=4.5 min CN=95 Runoff=2.53 cfs 5,528 cf

Subcatchment2S: East Runoff Area=0.630 ac 0.00% Impervious Runoff Depth=2.62"
Flow Length=90' Slope=0.0550 '/' Tc=14.9 min CN=82 Runoff=2.14 cfs 5,988 cf

Subcatchment3S: South Runoff Area=4.150 ac 22.89% Impervious Runoff Depth=3.28"
Flow Length=300' Slope=0.0100 '/' Tc=14.6 min CN=89 Runoff=17.35 cfs 49,354 cf

Total Runoff Area = 225,205 sf Runoff Volume = 60,871 cf Average Runoff Depth = 3.24"
81.62% Pervious = 183,823 sf 18.38% Impervious = 41,382 sf

Summary for Subcatchment 1S: West

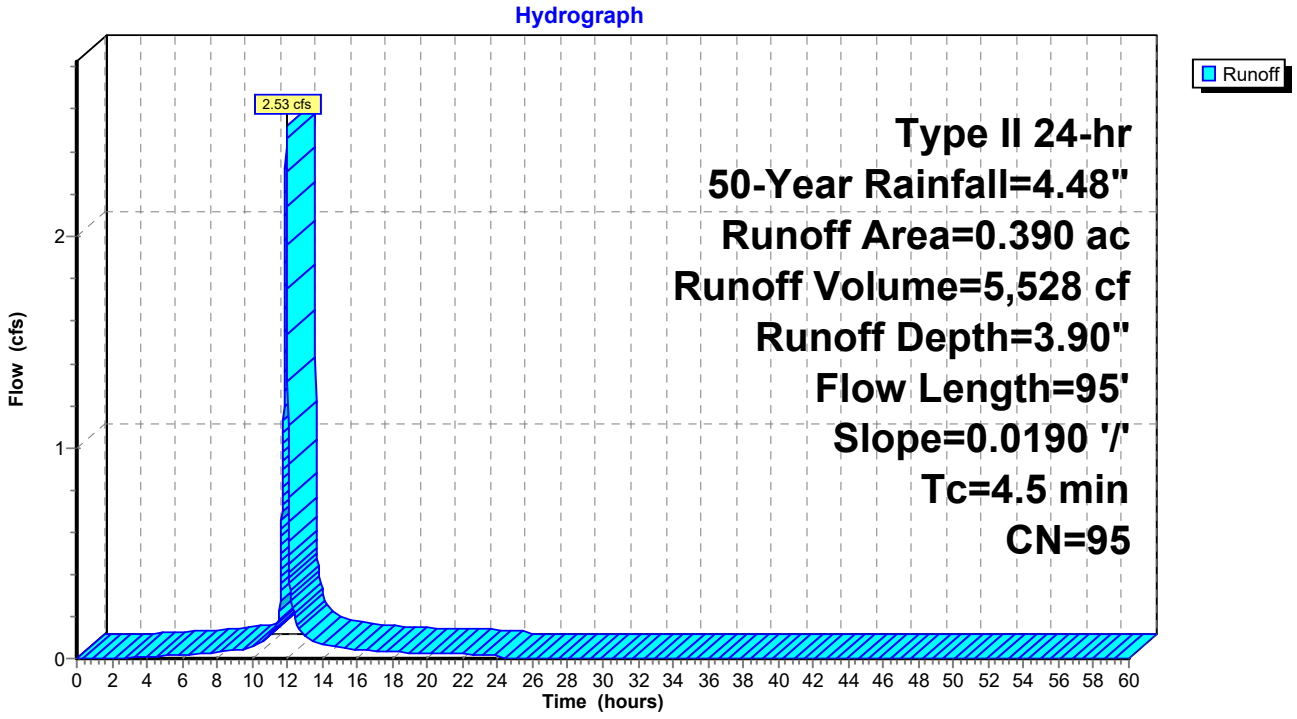
Runoff = 2.53 cfs @ 11.95 hrs, Volume= 5,528 cf, Depth= 3.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-Year Rainfall=4.48"

Area (ac)	CN	Description
0.350	96	Gravel surface, HSG D
0.040	84	50-75% Grass cover, Fair, HSG D
0.390	95	Weighted Average
0.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	95	0.0190	0.35		**Sheet Flow, gravel** Fallow n= 0.050 P2= 2.50"

Subcatchment 1S: West



Summary for Subcatchment 2S: East

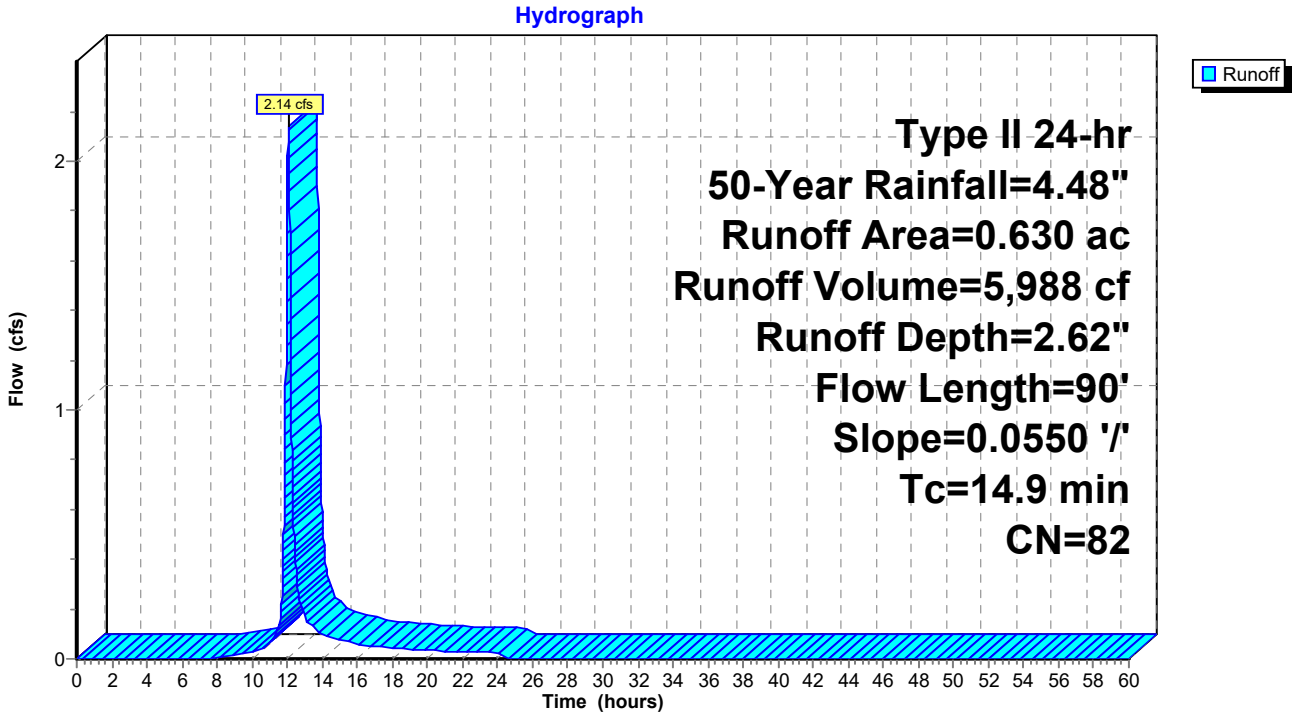
Runoff = 2.14 cfs @ 12.07 hrs, Volume= 5,988 cf, Depth= 2.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-Year Rainfall=4.48"

Area (ac)	CN	Description
0.630	82	Woods/grass comb., Fair, HSG D
0.630		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	90	0.0550	0.10		**Sheet Flow, woods/grass** Woods: Light underbrush n= 0.400 P2= 2.50"

Subcatchment 2S: East



Summary for Subcatchment 3S: South

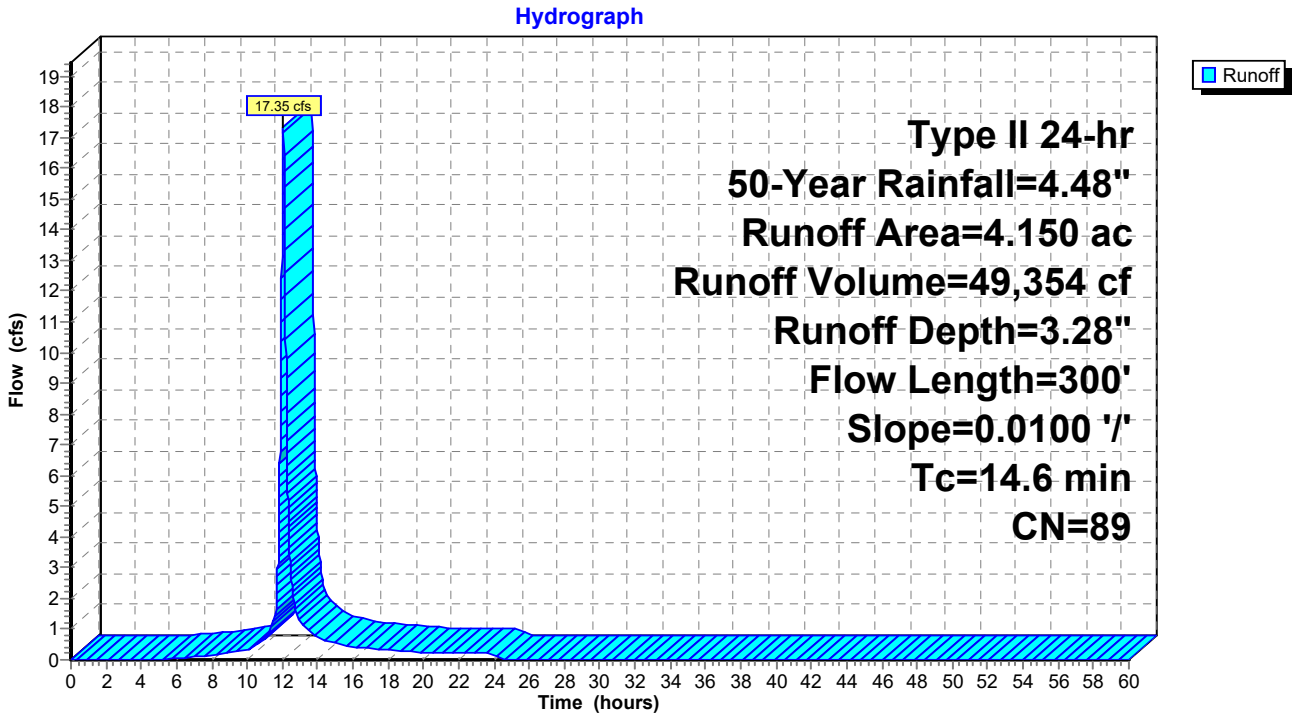
Runoff = 17.35 cfs @ 12.06 hrs, Volume= 49,354 cf, Depth= 3.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-Year Rainfall=4.48"

Area (ac)	CN	Description
0.950	98	Paved parking, HSG D
1.000	96	Gravel surface, HSG D
0.250	84	50-75% Grass cover, Fair, HSG D
1.950	82	Woods/grass comb., Fair, HSG D
4.150	89	Weighted Average
3.200		77.11% Pervious Area
0.950		22.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	300	0.0100	0.34		**Sheet Flow, gravel** Fallow n= 0.050 P2= 2.50"

Subcatchment 3S: South



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: West Runoff Area=0.390 ac 0.00% Impervious Runoff Depth=4.65"
Flow Length=95' Slope=0.0190 '/' Tc=4.5 min CN=95 Runoff=2.98 cfs 6,579 cf

Subcatchment2S: East Runoff Area=0.630 ac 0.00% Impervious Runoff Depth=3.29"
Flow Length=90' Slope=0.0550 '/' Tc=14.9 min CN=82 Runoff=2.68 cfs 7,514 cf

Subcatchment3S: South Runoff Area=4.150 ac 22.89% Impervious Runoff Depth=3.99"
Flow Length=300' Slope=0.0100 '/' Tc=14.6 min CN=89 Runoff=20.94 cfs 60,145 cf

Total Runoff Area = 225,205 sf Runoff Volume = 74,238 cf Average Runoff Depth = 3.96"
81.62% Pervious = 183,823 sf 18.38% Impervious = 41,382 sf

Summary for Subcatchment 1S: West

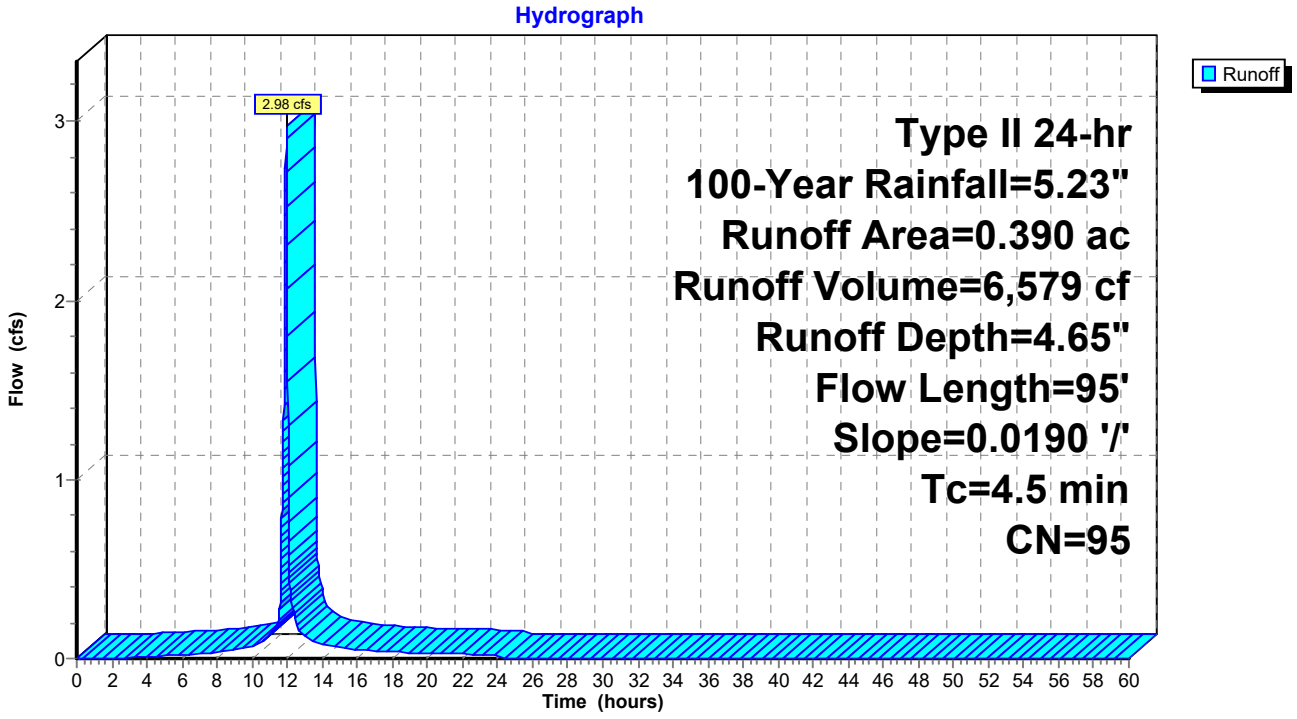
Runoff = 2.98 cfs @ 11.95 hrs, Volume= 6,579 cf, Depth= 4.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=5.23"

Area (ac)	CN	Description
0.350	96	Gravel surface, HSG D
0.040	84	50-75% Grass cover, Fair, HSG D
0.390	95	Weighted Average
0.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	95	0.0190	0.35		**Sheet Flow, gravel** Fallow n= 0.050 P2= 2.50"

Subcatchment 1S: West



Summary for Subcatchment 2S: East

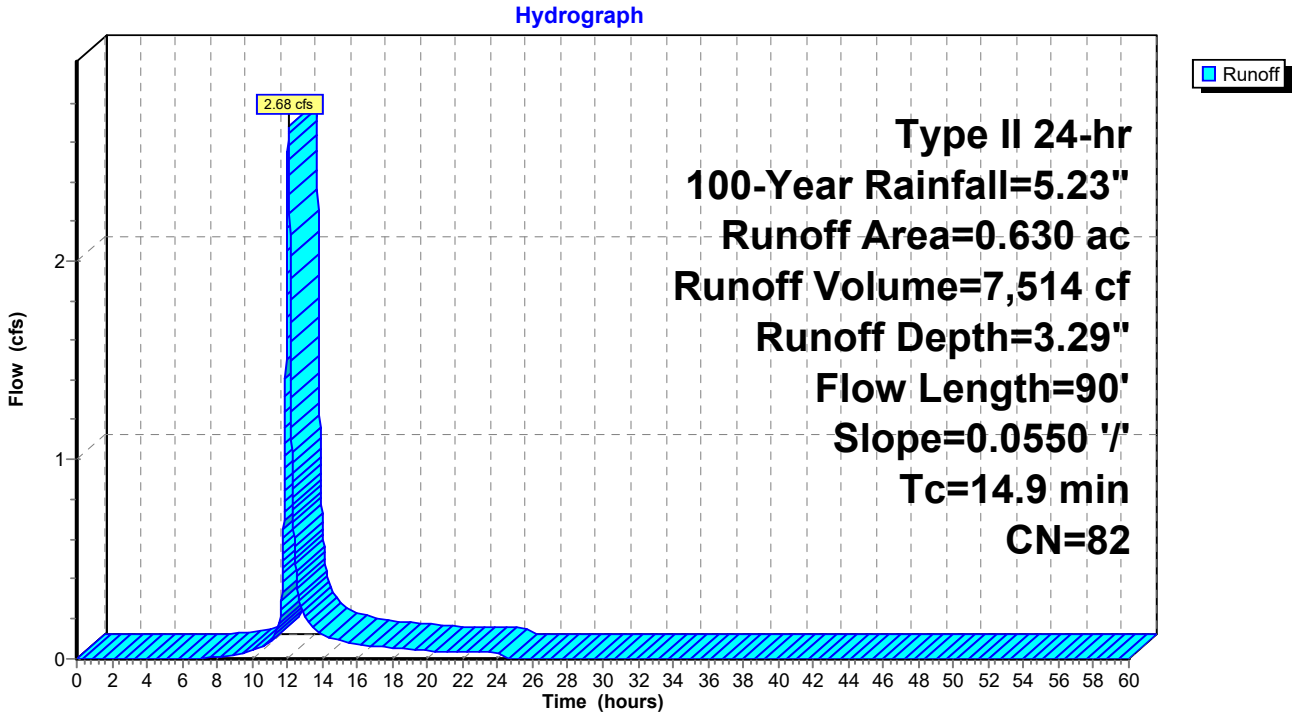
Runoff = 2.68 cfs @ 12.07 hrs, Volume= 7,514 cf, Depth= 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=5.23"

Area (ac)	CN	Description
0.630	82	Woods/grass comb., Fair, HSG D
0.630		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.9	90	0.0550	0.10		**Sheet Flow, woods/grass** Woods: Light underbrush n= 0.400 P2= 2.50"

Subcatchment 2S: East



Summary for Subcatchment 3S: South

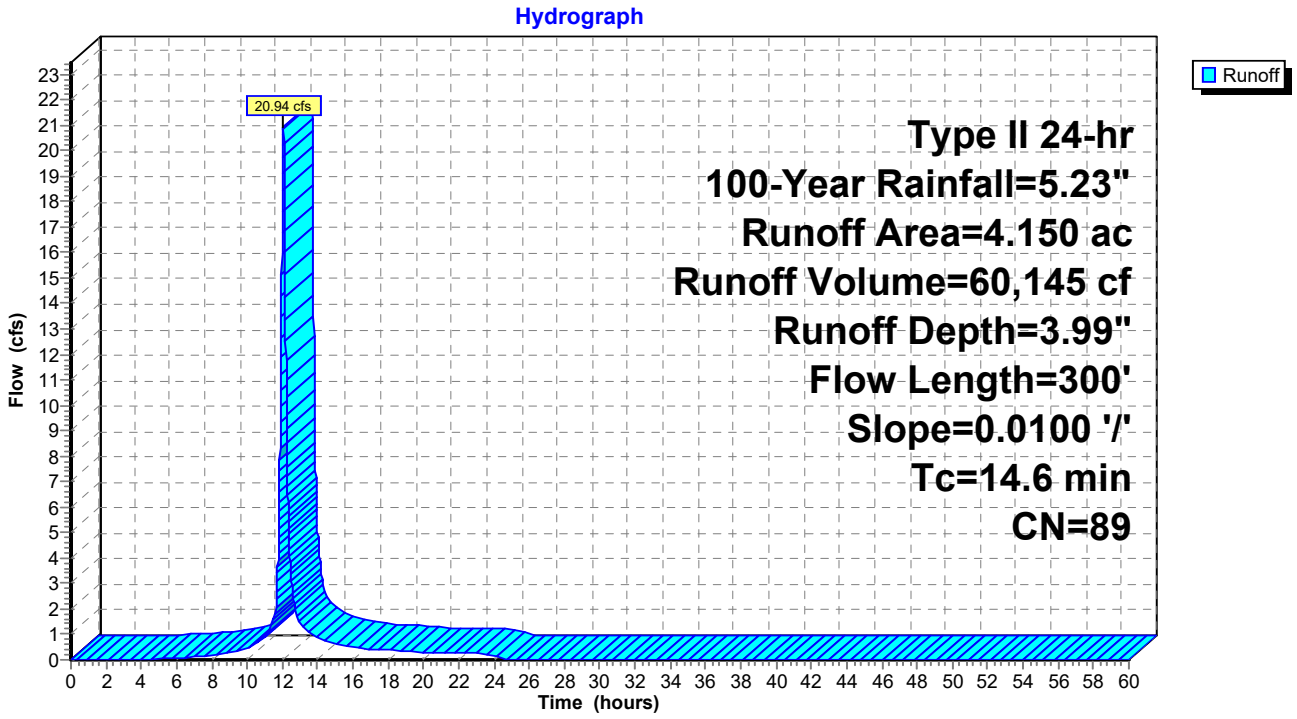
Runoff = 20.94 cfs @ 12.06 hrs, Volume= 60,145 cf, Depth= 3.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=5.23"

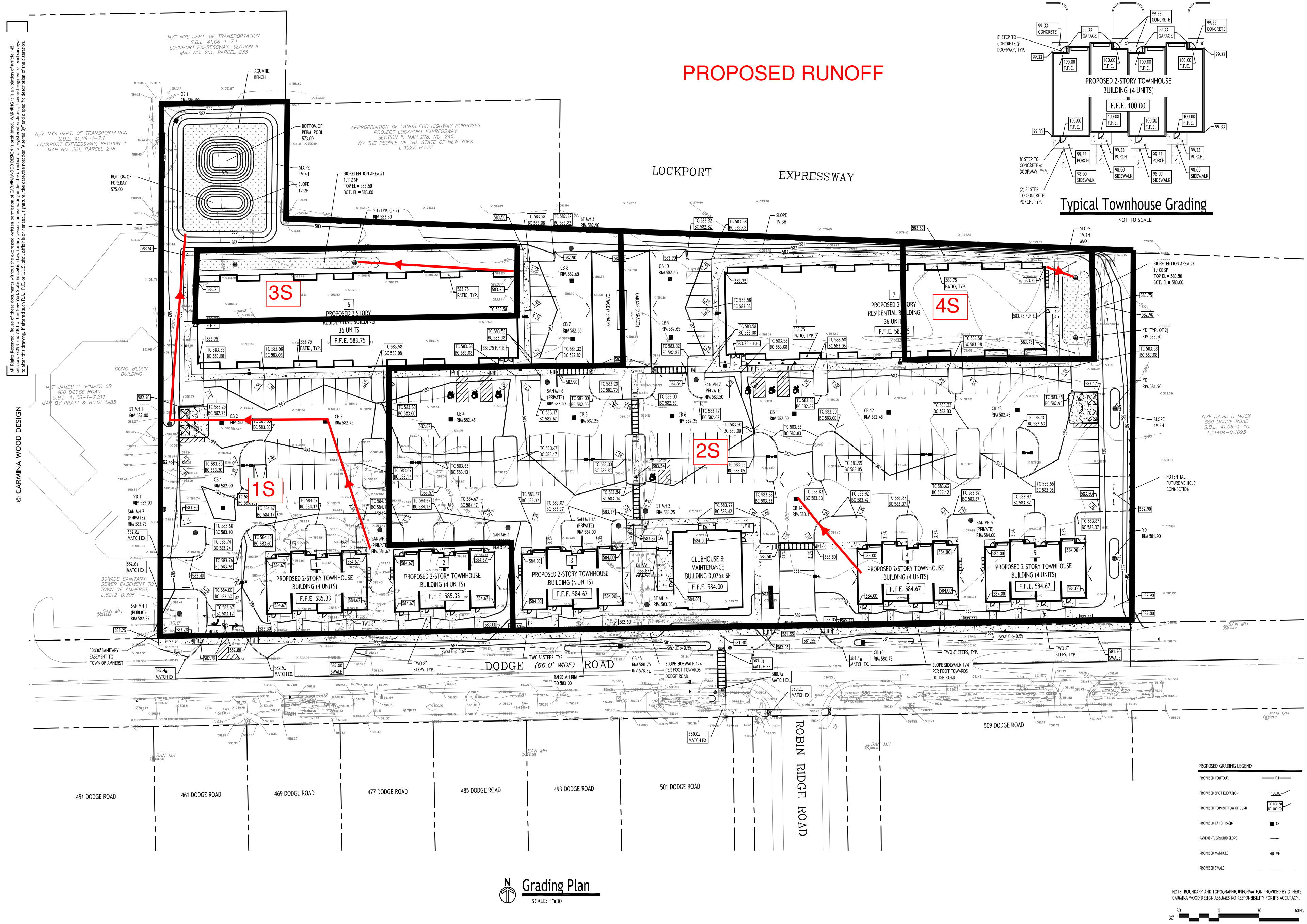
Area (ac)	CN	Description
0.950	98	Paved parking, HSG D
1.000	96	Gravel surface, HSG D
0.250	84	50-75% Grass cover, Fair, HSG D
1.950	82	Woods/grass comb., Fair, HSG D
4.150	89	Weighted Average
3.200		77.11% Pervious Area
0.950		22.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.6	300	0.0100	0.34		**Sheet Flow, gravel** Fallow n= 0.050 P2= 2.50"

Subcatchment 3S: South



Proposed Runoff



CARMINA WOOD DESIGN

80 Silo City Row, Suite 100
Buffalo, New York 14203
Phone: (716) 842-3165

111 Bain Street, Suite 332
Greensboro, North Carolina 27406
Phone: (336) 937-9009

Multi-Family Project

480 Dodge Road
Amherst, NY

REVISIONS:

No.	Description	Date
1	Rev. per Town comments	5/23/23
2	Rev. per Town & ECDPW comments	7/21/23
3	Rev. per Town comments	8/10/23
4	Rev. per Town comments	12/8/23
5	Rev. per Town comments	1/27/25

DRAWING NAME:
Grading Plan

Date: 3/20/23
Drawn By: P. Sheedy
Scale: As Noted

DRAWING NO.
C-200

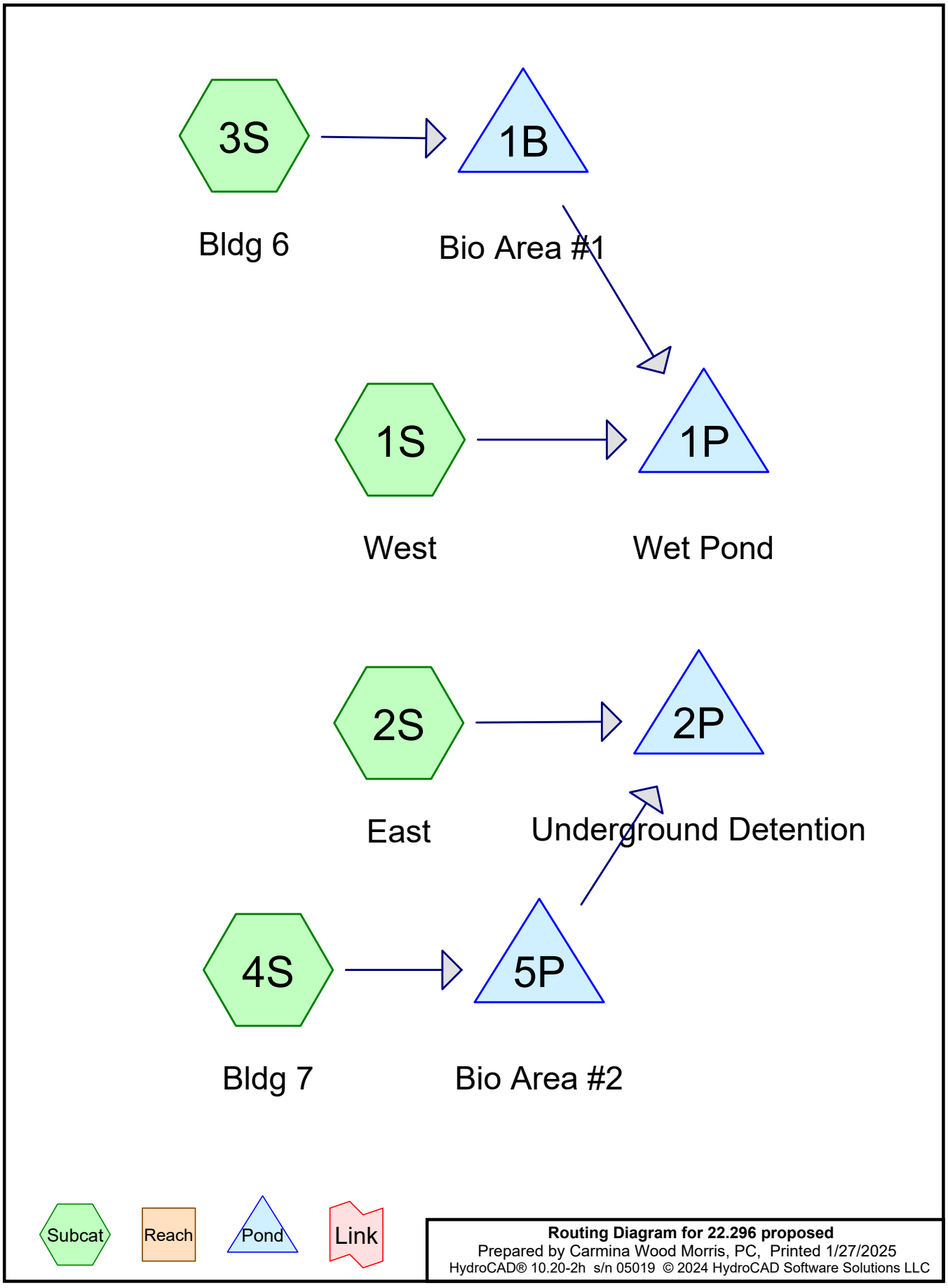
Project No: 22.296

Events for Pond 1P: Wet Pond

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1-Year	4.25	1.01	580.39	2,344
2-Year	5.31	1.17	580.52	3,145
5-Year	6.89	1.40	580.72	4,403
10-Year	8.34	1.61	580.92	5,751
25-Year	10.95	1.89	581.24	7,974
50-Year	13.12	2.12	581.54	10,111
100-Year	**15.61**	**2.35**	**581.88**	**12,683**

Events for Pond 2P: Underground Detention

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1-Year	3.85	1.64	579.54	3,629
2-Year	4.93	2.08	579.70	4,566
5-Year	6.58	2.53	579.96	6,084
10-Year	8.00	2.84	580.24	7,653
25-Year	10.15	3.45	580.69	10,042
50-Year	12.10	4.00	581.16	12,266
100-Year	**14.36**	**4.75**	**581.93**	**14,839**



Routing Diagram for 22.296 proposed
Prepared by Carmina Wood Morris, PC, Printed 1/27/2025

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	Type II 24-hr		Default	24.00	1	1.87	2
2	10-Year	Type II 24-hr		Default	24.00	1	3.14	2
3	25-Year	Type II 24-hr		Default	24.00	1	3.84	2
4	100-Year	Type II 24-hr		Default	24.00	1	5.23	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
73,616	80	>75% Grass cover, Good, HSG D (1S, 2S, 3S, 4S)
97,139	98	Paved parking, HSG D (1S, 2S, 3S, 4S)
54,450	98	Roofs, HSG D (1S, 2S, 3S, 4S)
225,205	**92**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
225,205	HSG D	1S, 2S, 3S, 4S
0	Other	
225,205		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	0	0	73,616	0	73,616	>75% Grass cover, Good	
0	0	0	97,139	0	97,139	Paved parking	
0	0	0	54,450	0	54,450	Roofs	
0	**0**	**0**	**225,205**	**0**	**225,205**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1S	0.00	0.00	335.0	0.0030	0.013	0.0	12.0	0.0
2	1B	580.50	580.28	22.0	0.0100	0.013	0.0	6.0	0.0
3	1P	579.50	579.40	20.0	0.0050	0.013	0.0	8.0	0.0
4	2P	578.67	578.30	100.0	0.0037	0.013	0.0	12.0	0.0
5	5P	580.50	579.95	70.0	0.0079	0.013	0.0	8.0	0.0

Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: West Runoff Area=2.000 ac 65.00% Impervious Runoff Depth=1.12"
Flow Length=440' Tc=3.9 min CN=92 Runoff=4.25 cfs 8,140 cf

Subcatchment2S: East Runoff Area=2.620 ac 69.85% Impervious Runoff Depth=1.20"
Flow Length=75' Tc=16.6 min CN=93 Runoff=3.84 cfs 11,374 cf

Subcatchment3S: Bldg 6 Runoff Area=0.300 ac 66.67% Impervious Runoff Depth=1.12"
Flow Length=100' Slope=0.0050 '/' Tc=19.3 min CN=92 Runoff=0.38 cfs 1,221 cf

Subcatchment4S: Bldg 7 Runoff Area=0.250 ac 60.00% Impervious Runoff Depth=1.05"
Flow Length=20' Slope=0.0060 '/' Tc=5.0 min CN=91 Runoff=0.48 cfs 954 cf

Pond 1B: Bio Area #1 Peak Elev=583.55' Storage=501 cf Inflow=0.38 cfs 1,221 cf
Outflow=0.17 cfs 1,221 cf

Pond 1P: Wet Pond Peak Elev=580.39' Storage=2,344 cf Inflow=4.25 cfs 9,361 cf
8.0" Round Culvert n=0.013 L=20.0' S=0.0050 '/' Outflow=1.01 cfs 9,361 cf

Pond 2P: Underground Detention Peak Elev=579.54' Storage=3,629 cf Inflow=3.85 cfs 12,328 cf
12.0" Round Culvert n=0.013 L=100.0' S=0.0037 '/' Outflow=1.64 cfs 12,293 cf

Pond 5P: Bio Area #2 Peak Elev=583.51' Storage=510 cf Inflow=0.48 cfs 954 cf
Outflow=0.03 cfs 954 cf

Total Runoff Area = 225,205 sf Runoff Volume = 21,689 cf Average Runoff Depth = 1.16"
32.69% Pervious = 73,616 sf 67.31% Impervious = 151,589 sf

Summary for Subcatchment 1S: West

[47] Hint: Peak is 218% of capacity of segment #2

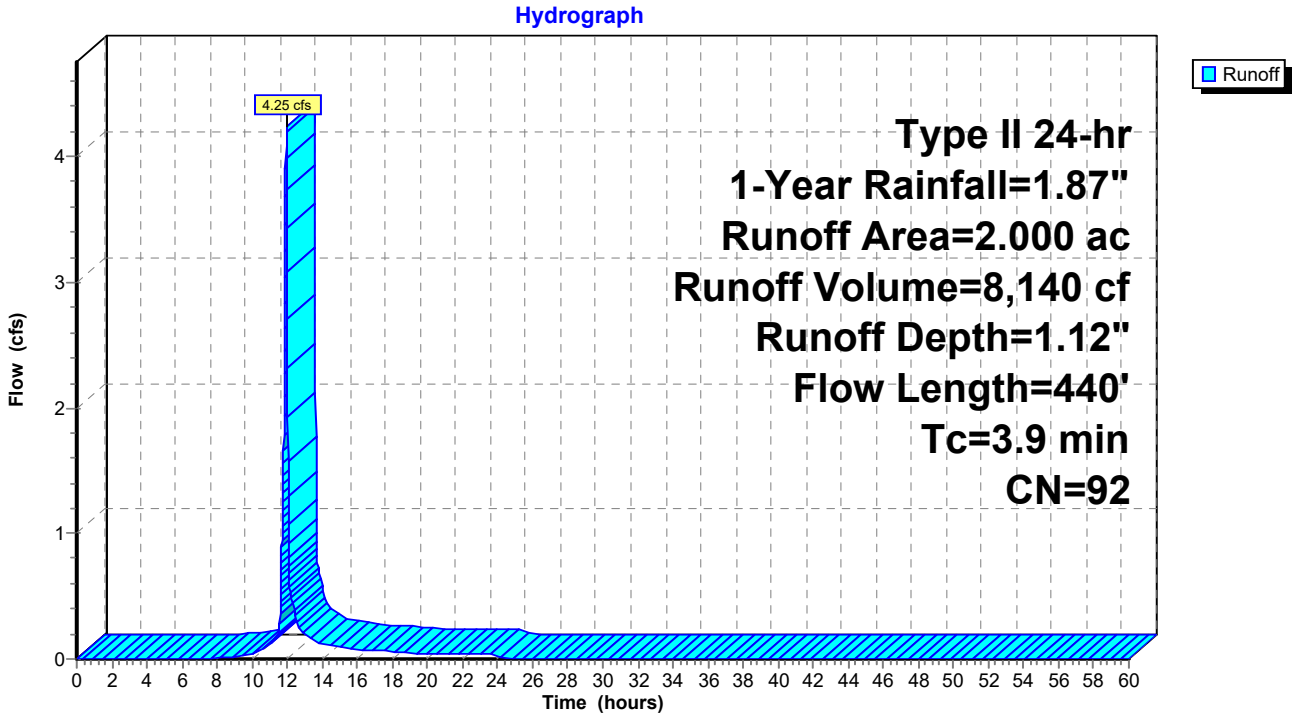
Runoff = 4.25 cfs @ 11.95 hrs, Volume= 8,140 cf, Depth= 1.12"
Routed to Pond 1P : Wet Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Year Rainfall=1.87"

Area (ac)	CN	Description
0.470	98	Roofs, HSG D
0.830	98	Paved parking, HSG D
0.700	80	>75% Grass cover, Good, HSG D
2.000	92	Weighted Average
0.700		35.00% Pervious Area
1.300		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	105	0.0120	1.00		**Sheet Flow, pavement** Smooth surfaces n= 0.011 P2= 2.50"
2.2	335	0.0030	2.48	1.95	**Pipe Channel, 12" pipe** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
3.9	440	Total			

Subcatchment 1S: West



Summary for Subcatchment 2S: East

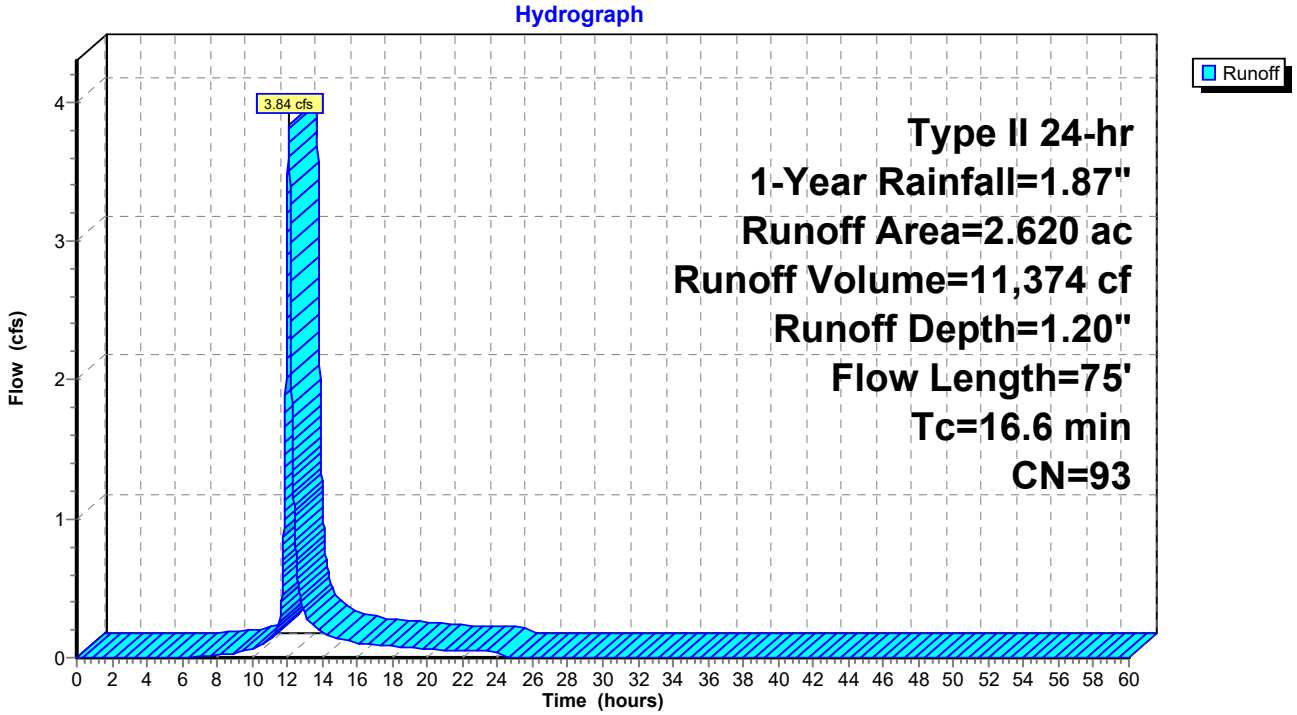
Runoff = 3.84 cfs @ 12.08 hrs, Volume= 11,374 cf, Depth= 1.20"
Routed to Pond 2P : Underground Detention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Year Rainfall=1.87"

Area (ac)	CN	Description
0.550	98	Roofs, HSG D
1.280	98	Paved parking, HSG D
0.790	80	>75% Grass cover, Good, HSG D
2.620	93	Weighted Average
0.790		30.15% Pervious Area
1.830		69.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	50	0.0020	0.05		**Sheet Flow, grass** Grass: Short n= 0.150 P2= 2.50"
0.6	25	0.0100	0.70		**Sheet Flow, pavement** Smooth surfaces n= 0.011 P2= 2.50"
16.6	75	Total			

Subcatchment 2S: East



Summary for Subcatchment 3S: Bldg 6

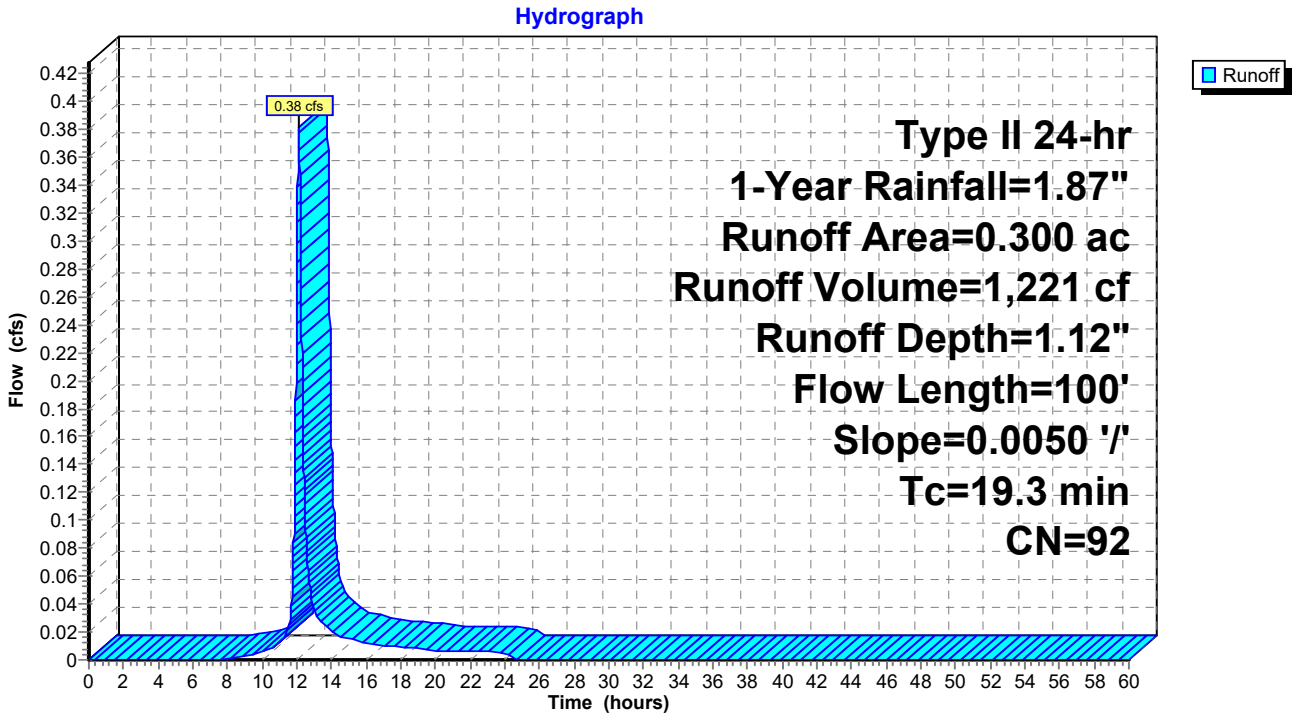
Runoff = 0.38 cfs @ 12.12 hrs, Volume= 1,221 cf, Depth= 1.12"
Routed to Pond 1B : Bio Area #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Year Rainfall=1.87"

Area (ac)	CN	Description
0.130	98	Roofs, HSG D
0.100	80	>75% Grass cover, Good, HSG D
0.070	98	Paved parking, HSG D
0.300	92	Weighted Average
0.100		33.33% Pervious Area
0.200		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.3	100	0.0050	0.09		**Sheet Flow, grass** Grass: Short n= 0.150 P2= 2.50"

Subcatchment 3S: Bldg 6



Summary for Subcatchment 4S: Bldg 7

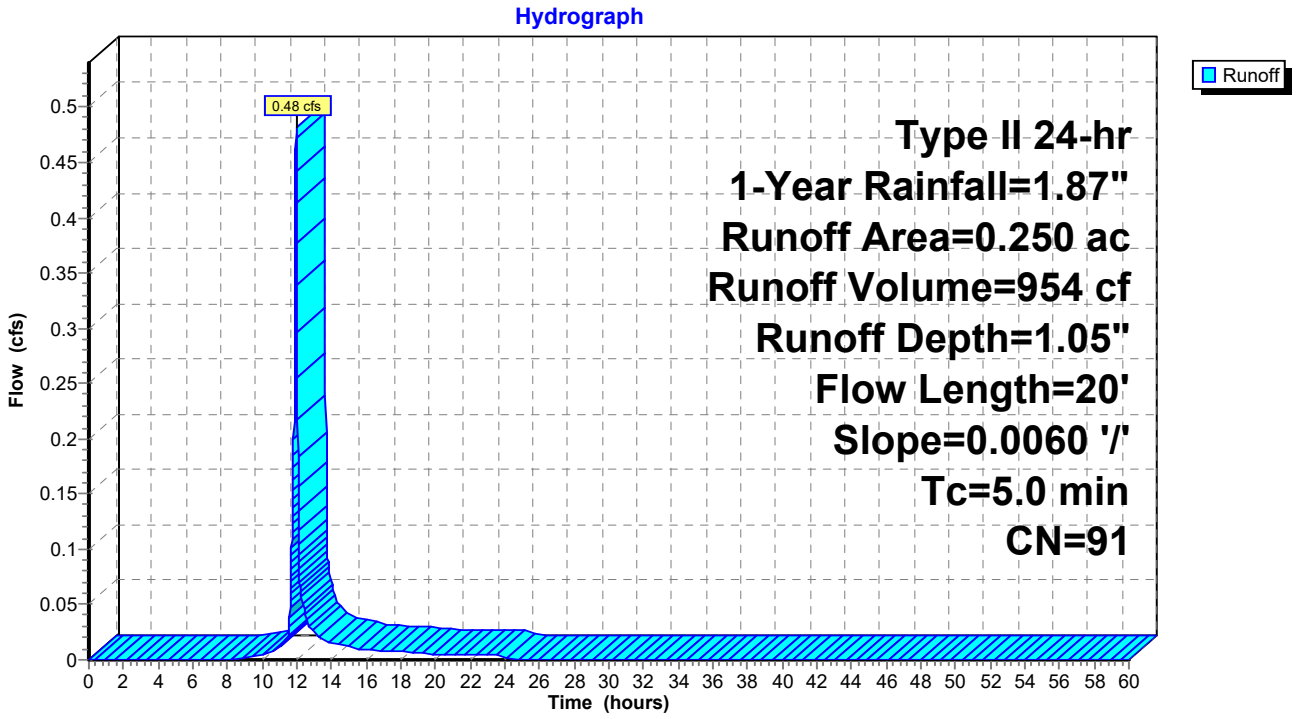
Runoff = 0.48 cfs @ 11.96 hrs, Volume= 954 cf, Depth= 1.05"
Routed to Pond 5P : Bio Area #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Year Rainfall=1.87"

Area (ac)	CN	Description
0.100	98	Roofs, HSG D
0.100	80	>75% Grass cover, Good, HSG D
0.050	98	Paved parking, HSG D
0.250	91	Weighted Average
0.100		40.00% Pervious Area
0.150		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	20	0.0060	0.07		**Sheet Flow, grass** Grass: Short n= 0.150 P2= 2.50"

Subcatchment 4S: Bldg 7



Summary for Pond 1B: Bio Area #1

Inflow Area = 13,068 sf, 66.67% Impervious, Inflow Depth = 1.12" for 1-Year event
Inflow = 0.38 cfs @ 12.12 hrs, Volume= 1,221 cf
Outflow = 0.17 cfs @ 12.34 hrs, Volume= 1,221 cf, Atten= 54%, Lag= 13.3 min
Primary = 0.17 cfs @ 12.34 hrs, Volume= 1,221 cf
Routed to Pond 1P : Wet Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 583.55' @ 12.34 hrs Surf.Area= 1,196 sf Storage= 501 cf

Plug-Flow detention time= 494.4 min calculated for 1,221 cf (100% of inflow)
Center-of-Mass det. time= 494.3 min (1,322.3 - 827.9)

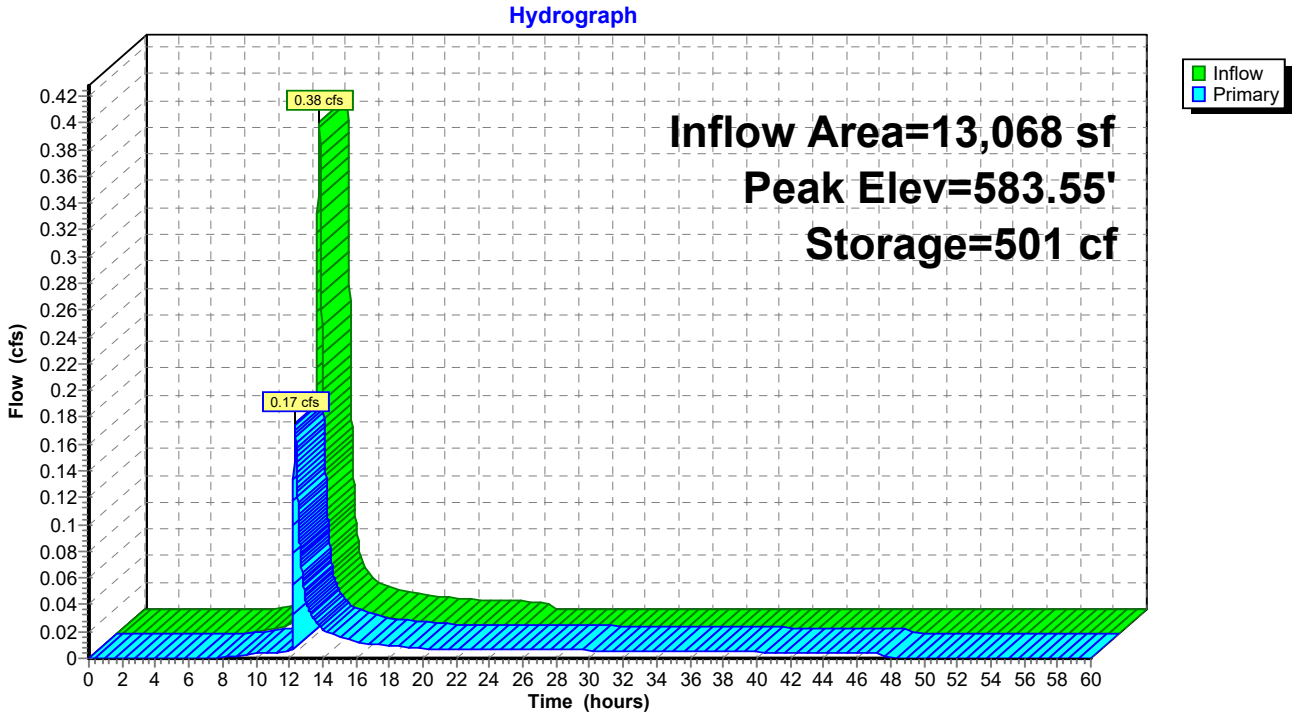
Volume	Invert	Avail.Storage	Storage Description
#1	583.00'	767 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
583.00	645	0	0
583.50	1,112	439	439
583.75	1,510	328	767

Device	Routing	Invert	Outlet Devices
#1	Primary	580.50'	**6.0" Round Culvert** L= 22.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.50' / 580.28' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Device 1	583.50'	**8.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	583.00'	**0.250 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 570.00'

Primary OutFlow Max=0.17 cfs @ 12.34 hrs HW=583.55' (Free Discharge)
└**1=Culvert** (Passes 0.17 cfs of 1.46 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.17 cfs @ 0.75 fps)
└**3=Exfiltration** (Controls 0.01 cfs)

Pond 1B: Bio Area #1



Summary for Pond 1P: Wet Pond

[44] Hint: Outlet device #1 is below defined storage
[79] Warning: Submerged Pond 1B Primary device # 1 OUTLET by 0.11'

Inflow Area = 100,188 sf, 65.22% Impervious, Inflow Depth = 1.12" for 1-Year event
Inflow = 4.25 cfs @ 11.95 hrs, Volume= 9,361 cf
Outflow = 1.01 cfs @ 12.06 hrs, Volume= 9,361 cf, Atten= 76%, Lag= 7.0 min
Primary = 1.01 cfs @ 12.06 hrs, Volume= 9,361 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 580.39' @ 12.06 hrs Surf.Area= 6,191 sf Storage= 2,344 cf

Plug-Flow detention time= 15.3 min calculated for 9,361 cf (100% of inflow)
Center-of-Mass det. time= 15.3 min (895.3 - 880.0)

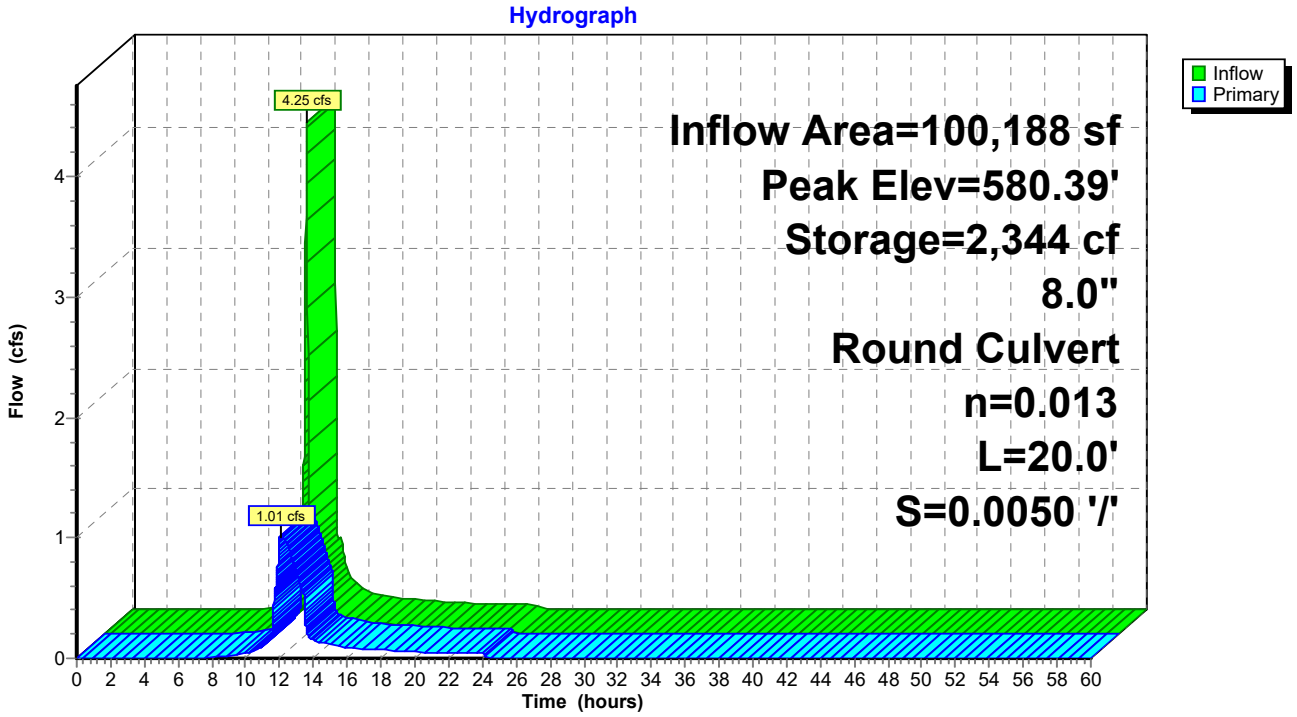
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	13,600 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	5,800	0	0
581.00	6,800	6,300	6,300
582.00	7,800	7,300	13,600

Device	Routing	Invert	Outlet Devices
#1	Primary	579.50'	**8.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 579.50' / 579.40' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.99 cfs @ 12.06 hrs HW=580.39' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 0.99 cfs @ 2.85 fps)

Pond 1P: Wet Pond



Summary for Pond 2P: Underground Detention

Inflow Area = 125,017 sf, 68.99% Impervious, Inflow Depth = 1.18" for 1-Year event
Inflow = 3.85 cfs @ 12.08 hrs, Volume= 12,328 cf
Outflow = 1.64 cfs @ 12.29 hrs, Volume= 12,293 cf, Atten= 57%, Lag= 12.5 min
Primary = 1.64 cfs @ 12.29 hrs, Volume= 12,293 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 579.54' @ 12.29 hrs Surf.Area= 7,226 sf Storage= 3,629 cf

Plug-Flow detention time= 76.0 min calculated for 12,290 cf (100% of inflow)
Center-of-Mass det. time= 70.8 min (944.0 - 873.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	578.67'	6,515 cf	**20.50'W x 352.50'L x 3.50'H Field A** 25,292 cf Overall - 9,004 cf Embedded = 16,287 cf x 40.0% Voids
#2A	579.17'	9,004 cf	**ADS_StormTech SC-740 +Cap** x 196 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 196 Chambers in 4 Rows
		15,519 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	578.67'	**12.0" Round Culvert** L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 578.67' / 578.30' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.64 cfs @ 12.29 hrs HW=579.54' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 1.64 cfs @ 3.04 fps)

Pond 2P: Underground Detention - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

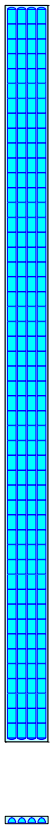
49 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 350.50' Row Length +12.0" End Stone x 2 = 352.50' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

196 Chambers x 45.9 cf = 9,004.2 cf Chamber Storage

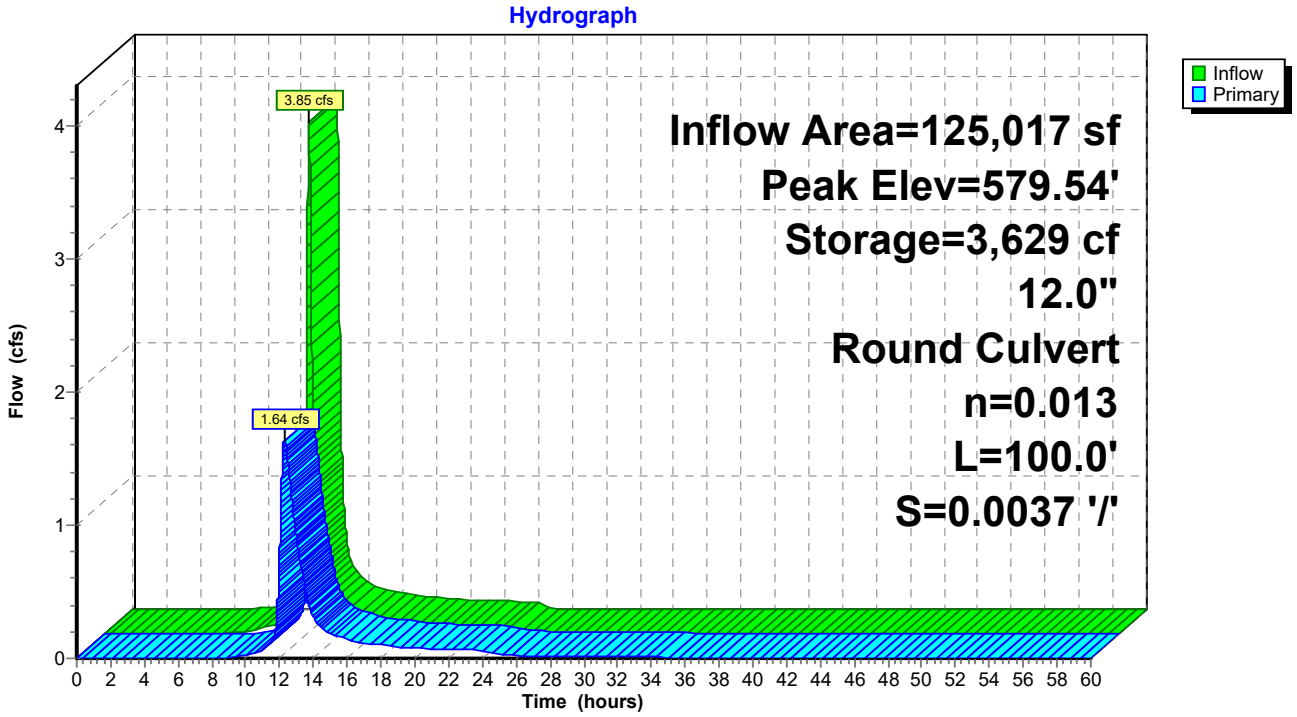
25,291.6 cf Field - 9,004.2 cf Chambers = 16,287.4 cf Stone x 40.0% Voids = 6,515.0 cf Stone Storage

Chamber Storage + Stone Storage = 15,519.2 cf = 0.356 af
Overall Storage Efficiency = 61.4%
Overall System Size = 352.50' x 20.50' x 3.50'

196 Chambers
936.7 cy Field
603.2 cy Stone



Pond 2P: Underground Detention



Summary for Pond 5P: Bio Area #2

Inflow Area = 10,890 sf, 60.00% Impervious, Inflow Depth = 1.05" for 1-Year event
Inflow = 0.48 cfs @ 11.96 hrs, Volume= 954 cf
Outflow = 0.03 cfs @ 12.66 hrs, Volume= 954 cf, Atten= 94%, Lag= 41.9 min
Primary = 0.03 cfs @ 12.66 hrs, Volume= 954 cf
Routed to Pond 2P : Underground Detention

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 583.51' @ 12.66 hrs Surf.Area= 1,135 sf Storage= 510 cf

Plug-Flow detention time= 693.3 min calculated for 954 cf (100% of inflow)
Center-of-Mass det. time= 693.2 min (1,513.4 - 820.2)

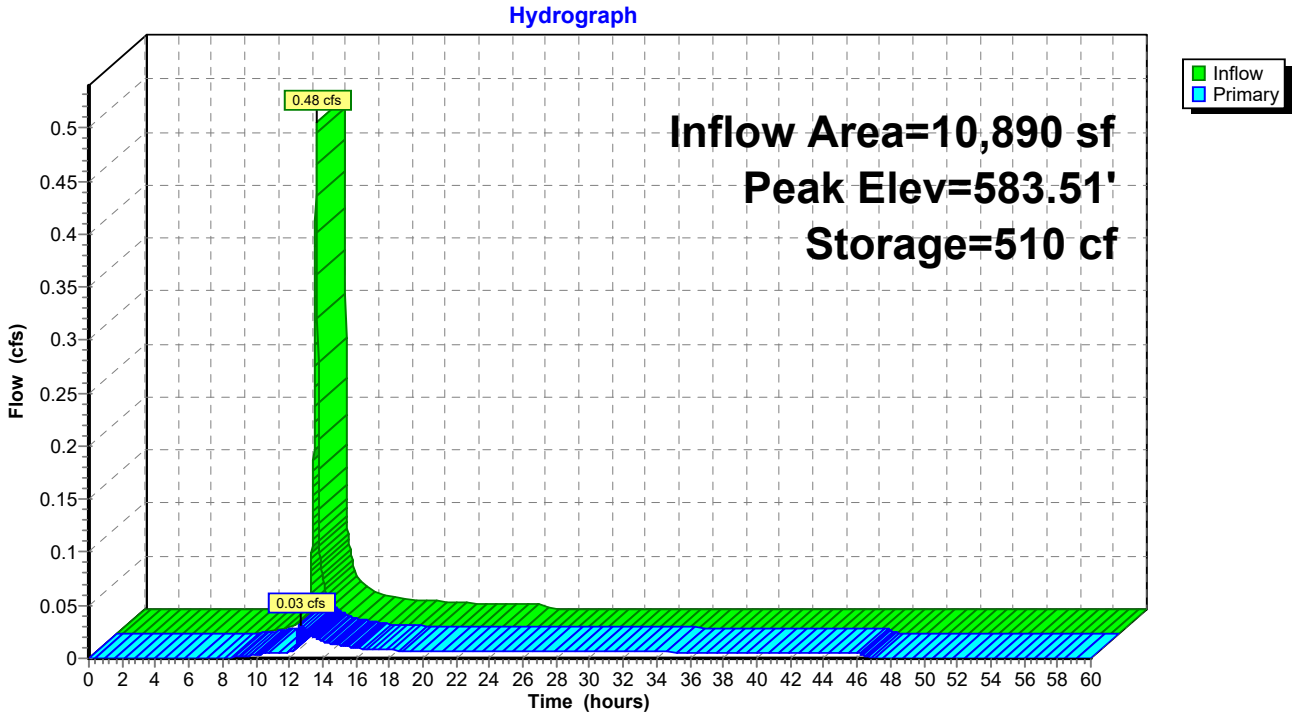
Volume	Invert	Avail.Storage	Storage Description
#1	583.00'	844 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
583.00	875	0	0
583.50	1,100	494	494
583.75	1,700	350	844

Device	Routing	Invert	Outlet Devices
#1	Primary	580.50'	**8.0" Round Culvert** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.50' / 579.95' S= 0.0079 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	583.50'	**8.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	583.00'	**0.250 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 570.00'

Primary OutFlow Max=0.03 cfs @ 12.66 hrs HW=583.51' (Free Discharge)
└**1=Culvert** (Passes 0.03 cfs of 2.08 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.02 cfs @ 0.39 fps)
└**3=Exfiltration** (Controls 0.01 cfs)

Pond 5P: Bio Area #2



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: West Runoff Area=2.000 ac 65.00% Impervious Runoff Depth=2.29"
Flow Length=440' Tc=3.9 min CN=92 Runoff=8.34 cfs 16,652 cf

Subcatchment2S: East Runoff Area=2.620 ac 69.85% Impervious Runoff Depth=2.39"
Flow Length=75' Tc=16.6 min CN=93 Runoff=7.47 cfs 22,713 cf

Subcatchment3S: Bldg 6 Runoff Area=0.300 ac 66.67% Impervious Runoff Depth=2.29"
Flow Length=100' Slope=0.0050 '/' Tc=19.3 min CN=92 Runoff=0.77 cfs 2,498 cf

Subcatchment4S: Bldg 7 Runoff Area=0.250 ac 60.00% Impervious Runoff Depth=2.20"
Flow Length=20' Slope=0.0060 '/' Tc=5.0 min CN=91 Runoff=0.97 cfs 1,998 cf

Pond 1B: Bio Area #1 Peak Elev=583.64' Storage=609 cf Inflow=0.77 cfs 2,498 cf
Outflow=0.72 cfs 2,498 cf

Pond 1P: Wet Pond Peak Elev=580.92' Storage=5,751 cf Inflow=8.34 cfs 19,150 cf
8.0" Round Culvert n=0.013 L=20.0' S=0.0050 '/' Outflow=1.61 cfs 19,150 cf

Pond 2P: Underground Detention Peak Elev=580.24' Storage=7,653 cf Inflow=8.00 cfs 24,711 cf
12.0" Round Culvert n=0.013 L=100.0' S=0.0037 '/' Outflow=2.84 cfs 24,672 cf

Pond 5P: Bio Area #2 Peak Elev=583.65' Storage=681 cf Inflow=0.97 cfs 1,998 cf
Outflow=0.78 cfs 1,998 cf

Total Runoff Area = 225,205 sf Runoff Volume = 43,861 cf Average Runoff Depth = 2.34"
32.69% Pervious = 73,616 sf 67.31% Impervious = 151,589 sf

Summary for Subcatchment 1S: West

[47] Hint: Peak is 427% of capacity of segment #2

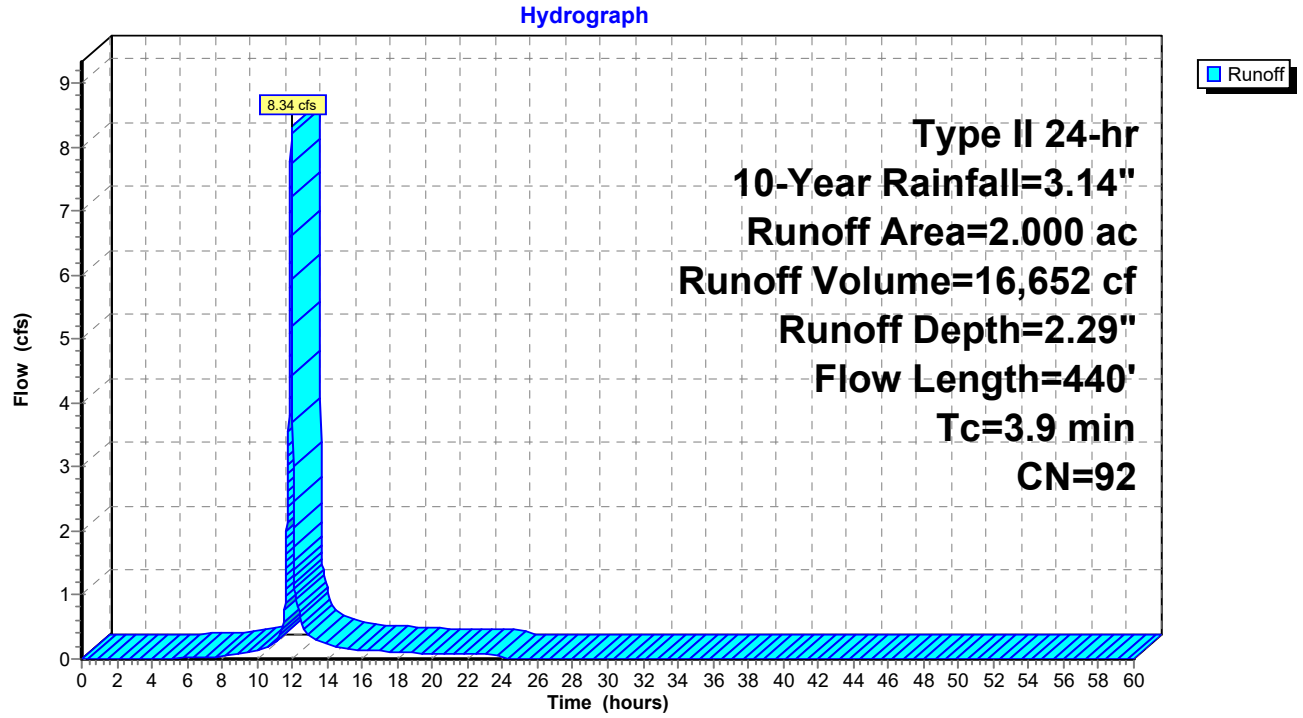
Runoff = 8.34 cfs @ 11.95 hrs, Volume= 16,652 cf, Depth= 2.29"
Routed to Pond 1P : Wet Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=3.14"

Area (ac)	CN	Description
0.470	98	Roofs, HSG D
0.830	98	Paved parking, HSG D
0.700	80	>75% Grass cover, Good, HSG D
2.000	92	Weighted Average
0.700		35.00% Pervious Area
1.300		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	105	0.0120	1.00		**Sheet Flow, pavement** Smooth surfaces n= 0.011 P2= 2.50"
2.2	335	0.0030	2.48	1.95	**Pipe Channel, 12" pipe** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
3.9	440	Total			

Subcatchment 1S: West



Summary for Subcatchment 2S: East

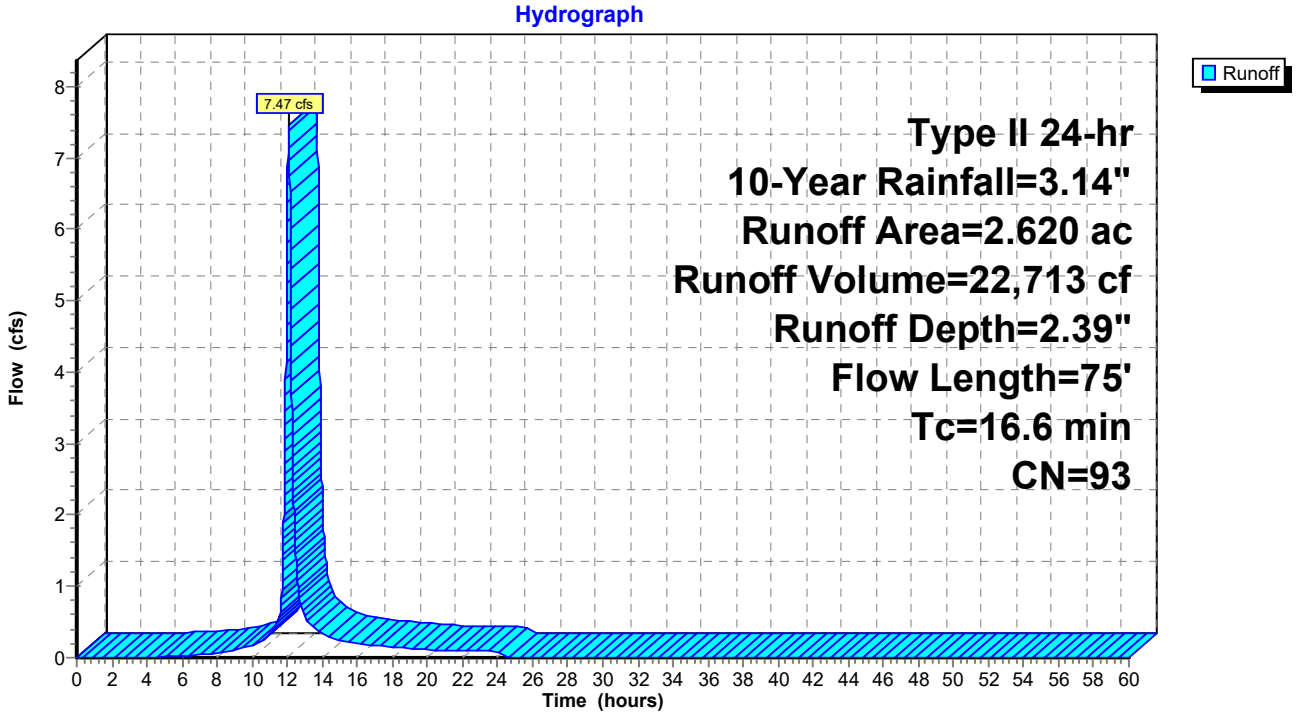
Runoff = 7.47 cfs @ 12.08 hrs, Volume= 22,713 cf, Depth= 2.39"
Routed to Pond 2P : Underground Detention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=3.14"

Area (ac)	CN	Description
0.550	98	Roofs, HSG D
1.280	98	Paved parking, HSG D
0.790	80	>75% Grass cover, Good, HSG D
2.620	93	Weighted Average
0.790		30.15% Pervious Area
1.830		69.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	50	0.0020	0.05		**Sheet Flow, grass** Grass: Short n= 0.150 P2= 2.50"
0.6	25	0.0100	0.70		**Sheet Flow, pavement** Smooth surfaces n= 0.011 P2= 2.50"
16.6	75	Total			

Subcatchment 2S: East



Summary for Subcatchment 3S: Bldg 6

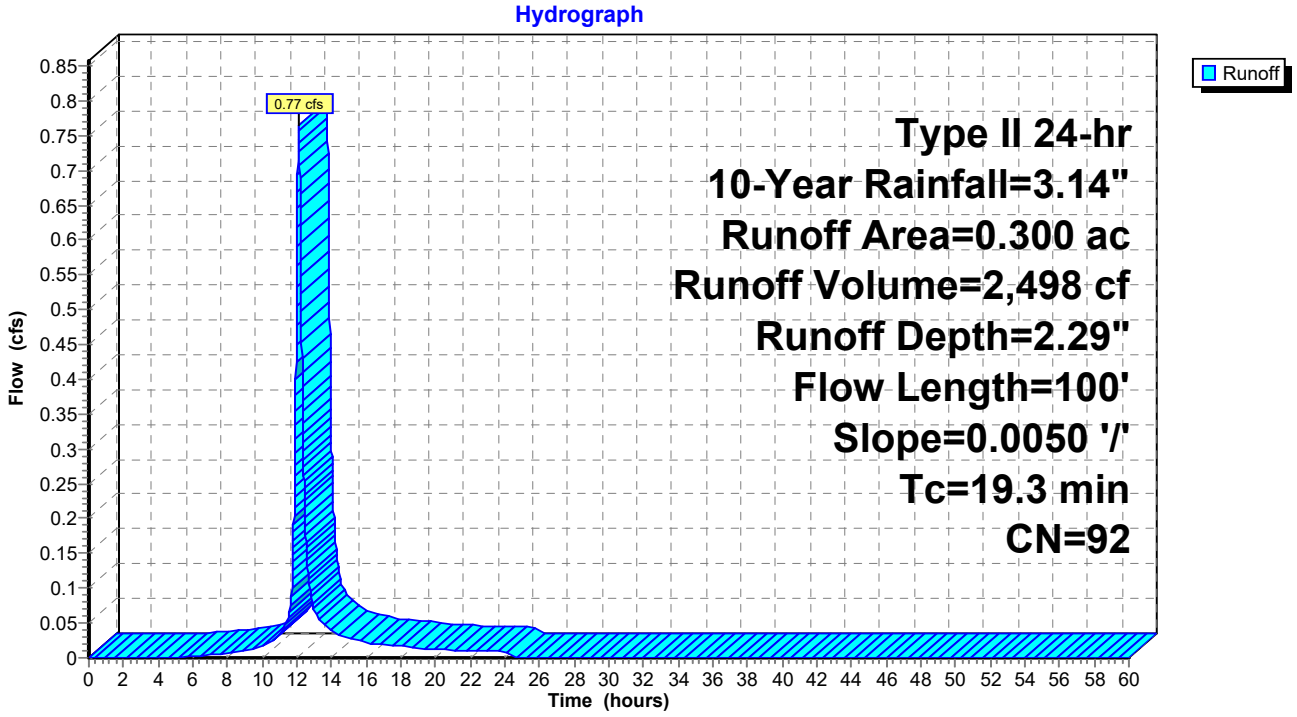
Runoff = 0.77 cfs @ 12.11 hrs, Volume= 2,498 cf, Depth= 2.29"
Routed to Pond 1B : Bio Area #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=3.14"

Area (ac)	CN	Description
0.130	98	Roofs, HSG D
0.100	80	>75% Grass cover, Good, HSG D
0.070	98	Paved parking, HSG D
0.300	92	Weighted Average
0.100		33.33% Pervious Area
0.200		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.3	100	0.0050	0.09		**Sheet Flow, grass** Grass: Short n= 0.150 P2= 2.50"

Subcatchment 3S: Bldg 6



Summary for Subcatchment 4S: Bldg 7

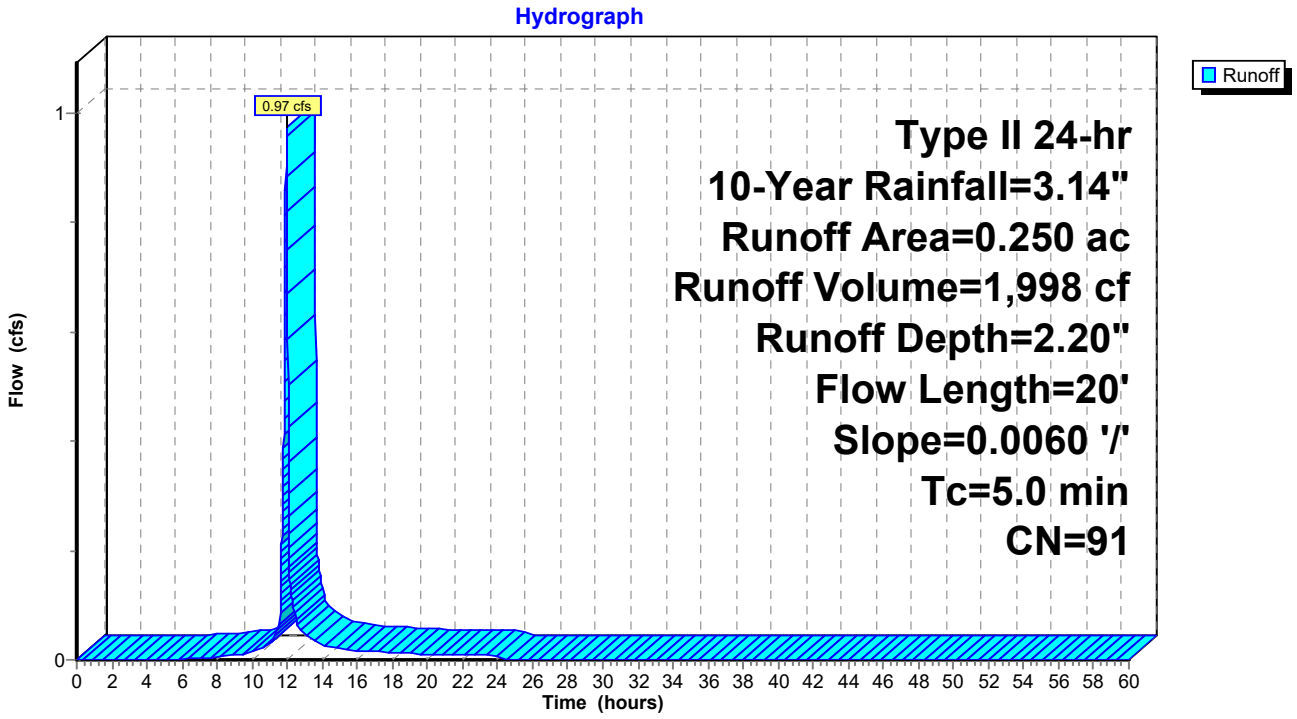
Runoff = 0.97 cfs @ 11.96 hrs, Volume= 1,998 cf, Depth= 2.20"
Routed to Pond 5P : Bio Area #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=3.14"

Area (ac)	CN	Description
0.100	98	Roofs, HSG D
0.100	80	>75% Grass cover, Good, HSG D
0.050	98	Paved parking, HSG D
0.250	91	Weighted Average
0.100		40.00% Pervious Area
0.150		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	20	0.0060	0.07		**Sheet Flow, grass** Grass: Short n= 0.150 P2= 2.50"

Subcatchment 4S: Bldg 7



Summary for Pond 1B: Bio Area #1

Inflow Area = 13,068 sf, 66.67% Impervious, Inflow Depth = 2.29" for 10-Year event
Inflow = 0.77 cfs @ 12.11 hrs, Volume= 2,498 cf
Outflow = 0.72 cfs @ 12.17 hrs, Volume= 2,498 cf, Atten= 6%, Lag= 3.1 min
Primary = 0.72 cfs @ 12.17 hrs, Volume= 2,498 cf
Routed to Pond 1P : Wet Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 583.64' @ 12.17 hrs Surf.Area= 1,333 sf Storage= 609 cf

Plug-Flow detention time= 258.8 min calculated for 2,498 cf (100% of inflow)
Center-of-Mass det. time= 258.8 min (1,066.4 - 807.6)

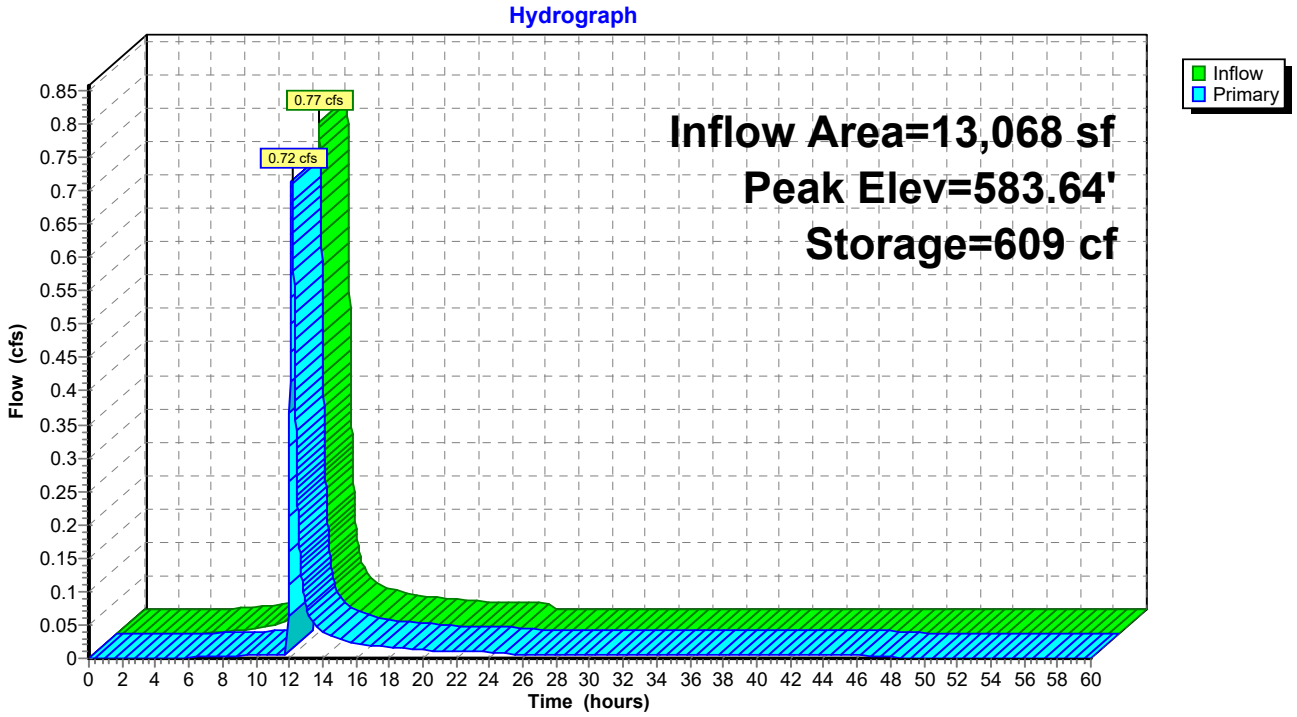
Volume	Invert	Avail.Storage	Storage Description
#1	583.00'	767 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
583.00	645	0	0
583.50	1,112	439	439
583.75	1,510	328	767

Device	Routing	Invert	Outlet Devices
#1	Primary	580.50'	**6.0" Round Culvert** L= 22.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.50' / 580.28' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Device 1	583.50'	**8.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	583.00'	**0.250 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 570.00'

Primary OutFlow Max=0.72 cfs @ 12.17 hrs HW=583.64' (Free Discharge)
└**1=Culvert** (Passes 0.72 cfs of 1.48 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.71 cfs @ 1.22 fps)
└**3=Exfiltration** (Controls 0.01 cfs)

Pond 1B: Bio Area #1



Summary for Pond 1P: Wet Pond

[44] Hint: Outlet device #1 is below defined storage
[79] Warning: Submerged Pond 1B Primary device # 1 INLET by 0.42'

Inflow Area = 100,188 sf, 65.22% Impervious, Inflow Depth = 2.29" for 10-Year event
Inflow = 8.34 cfs @ 11.95 hrs, Volume= 19,150 cf
Outflow = 1.61 cfs @ 12.22 hrs, Volume= 19,150 cf, Atten= 81%, Lag= 16.6 min
Primary = 1.61 cfs @ 12.22 hrs, Volume= 19,150 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 580.92' @ 12.22 hrs Surf.Area= 6,719 sf Storage= 5,751 cf

Plug-Flow detention time= 28.7 min calculated for 19,147 cf (100% of inflow)
Center-of-Mass det. time= 28.7 min (857.7 - 829.0)

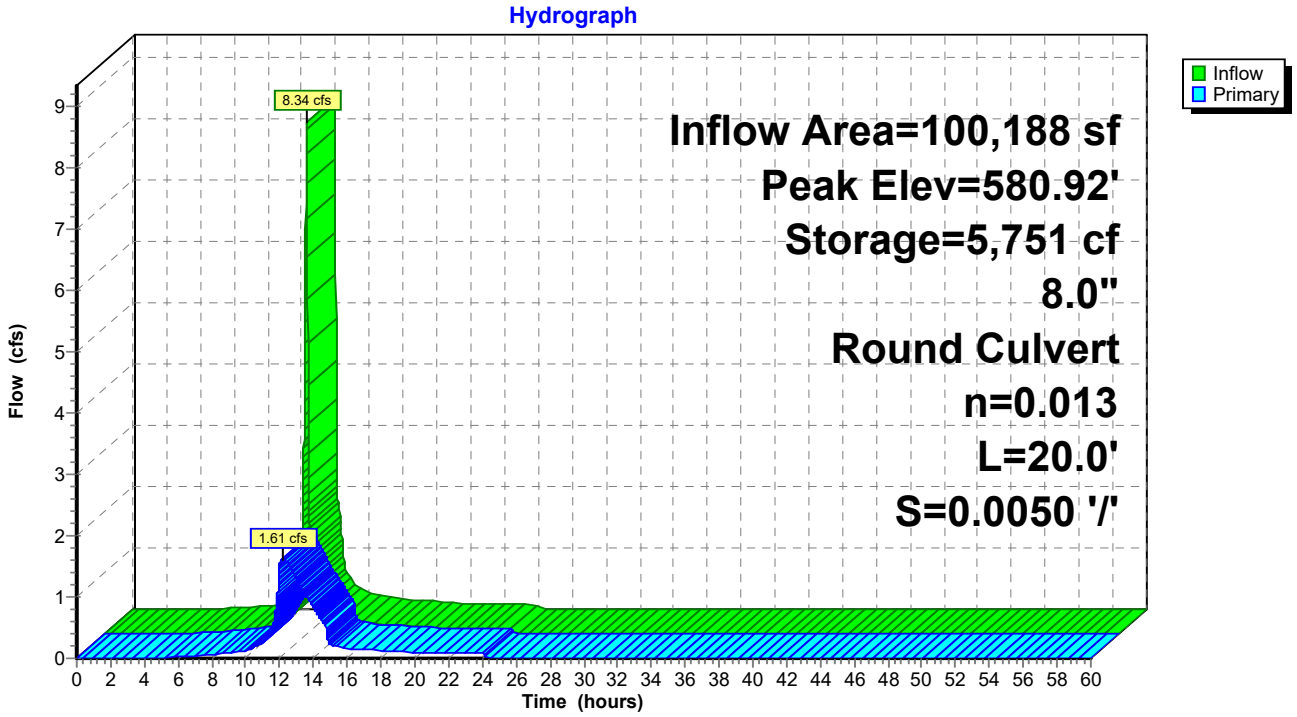
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	13,600 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	5,800	0	0
581.00	6,800	6,300	6,300
582.00	7,800	7,300	13,600

Device	Routing	Invert	Outlet Devices
#1	Primary	579.50'	**8.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 579.50' / 579.40' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=1.61 cfs @ 12.22 hrs HW=580.92' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 1.61 cfs @ 4.61 fps)

Pond 1P: Wet Pond



Summary for Pond 2P: Underground Detention

[79] Warning: Submerged Pond 5P Primary device # 1 OUTLET by 0.29'

Inflow Area = 125,017 sf, 68.99% Impervious, Inflow Depth = 2.37" for 10-Year event
Inflow = 8.00 cfs @ 12.08 hrs, Volume= 24,711 cf
Outflow = 2.84 cfs @ 12.32 hrs, Volume= 24,672 cf, Atten= 65%, Lag= 14.6 min
Primary = 2.84 cfs @ 12.32 hrs, Volume= 24,672 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 580.24' @ 12.32 hrs Surf.Area= 7,226 sf Storage= 7,653 cf

Plug-Flow detention time= 59.9 min calculated for 24,668 cf (100% of inflow)
Center-of-Mass det. time= 56.9 min (886.0 - 829.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	578.67'	6,515 cf	**20.50'W x 352.50'L x 3.50'H Field A** 25,292 cf Overall - 9,004 cf Embedded = 16,287 cf x 40.0% Voids
#2A	579.17'	9,004 cf	**ADS_StormTech SC-740 +Cap** x 196 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 196 Chambers in 4 Rows
		15,519 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	578.67'	**12.0" Round Culvert** L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 578.67' / 578.30' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.84 cfs @ 12.32 hrs HW=580.24' (Free Discharge)
1=Culvert (Barrel Controls 2.84 cfs @ 3.61 fps)

Pond 2P: Underground Detention - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

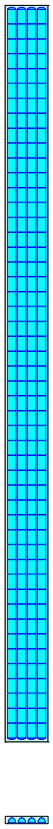
49 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 350.50' Row Length +12.0" End Stone x 2 = 352.50' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

196 Chambers x 45.9 cf = 9,004.2 cf Chamber Storage

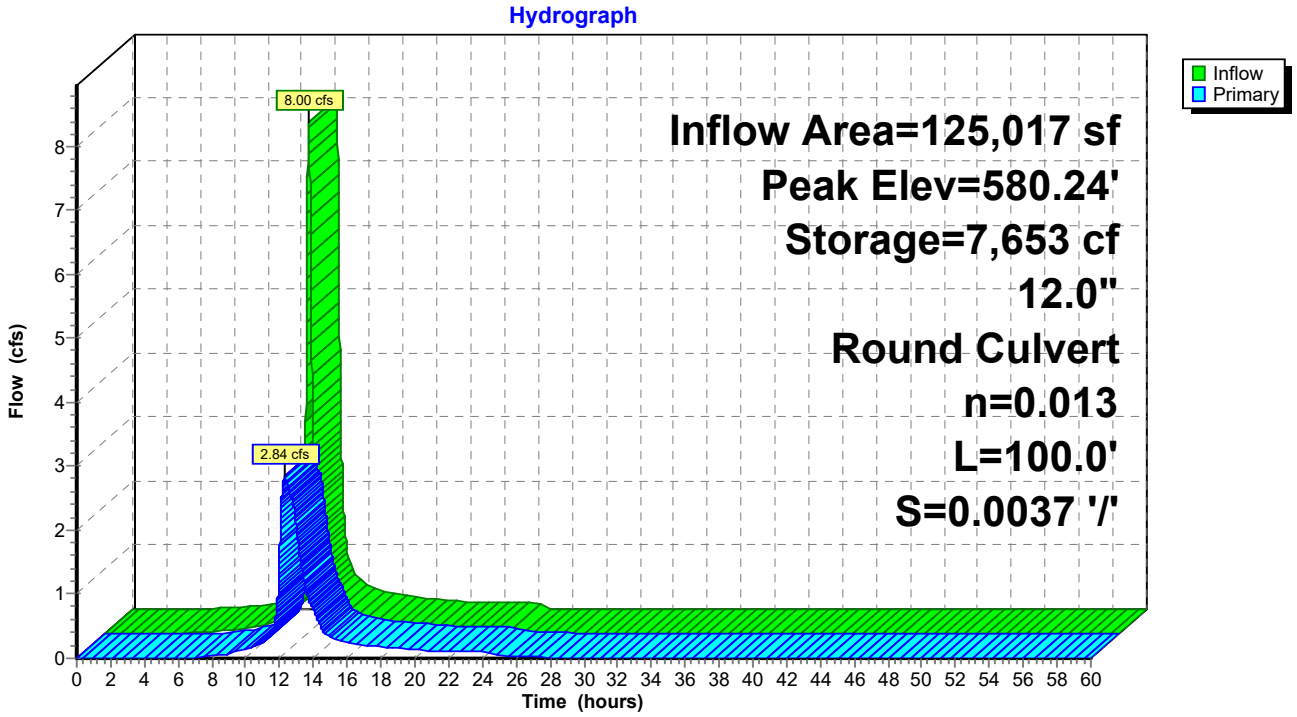
25,291.6 cf Field - 9,004.2 cf Chambers = 16,287.4 cf Stone x 40.0% Voids = 6,515.0 cf Stone Storage

Chamber Storage + Stone Storage = 15,519.2 cf = 0.356 af
Overall Storage Efficiency = 61.4%
Overall System Size = 352.50' x 20.50' x 3.50'

196 Chambers
936.7 cy Field
603.2 cy Stone



Pond 2P: Underground Detention



Summary for Pond 5P: Bio Area #2

Inflow Area = 10,890 sf, 60.00% Impervious, Inflow Depth = 2.20" for 10-Year event
Inflow = 0.97 cfs @ 11.96 hrs, Volume= 1,998 cf
Outflow = 0.78 cfs @ 12.01 hrs, Volume= 1,998 cf, Atten= 20%, Lag= 2.9 min
Primary = 0.78 cfs @ 12.01 hrs, Volume= 1,998 cf
Routed to Pond 2P : Underground Detention

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 583.65' @ 12.01 hrs Surf.Area= 1,452 sf Storage= 681 cf

Plug-Flow detention time= 361.7 min calculated for 1,998 cf (100% of inflow)
Center-of-Mass det. time= 361.6 min (1,160.8 - 799.2)

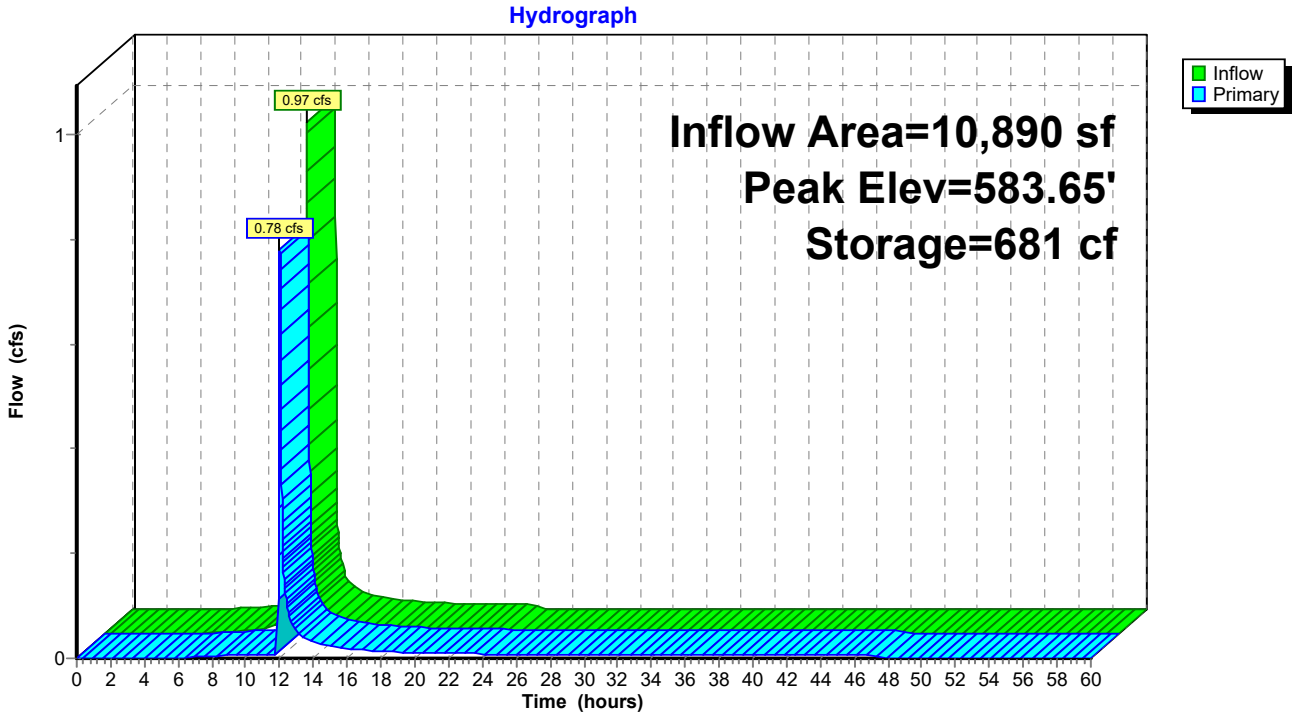
Volume	Invert	Avail.Storage	Storage Description
#1	583.00'	844 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
583.00	875	0	0
583.50	1,100	494	494
583.75	1,700	350	844

Device	Routing	Invert	Outlet Devices
#1	Primary	580.50'	**8.0" Round Culvert** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.50' / 579.95' S= 0.0079 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	583.50'	**8.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	583.00'	**0.250 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 570.00'

Primary OutFlow Max=0.78 cfs @ 12.01 hrs HW=583.65' (Free Discharge)
└**1=Culvert** (Passes 0.78 cfs of 2.12 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.77 cfs @ 1.25 fps)
└**3=Exfiltration** (Controls 0.01 cfs)

Pond 5P: Bio Area #2



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: West Runoff Area=2.000 ac 65.00% Impervious Runoff Depth=2.96"
Flow Length=440' Tc=3.9 min CN=92 Runoff=10.59 cfs 21,513 cf

Subcatchment2S: East Runoff Area=2.620 ac 69.85% Impervious Runoff Depth=3.06"
Flow Length=75' Tc=16.6 min CN=93 Runoff=9.46 cfs 29,143 cf

Subcatchment3S: Bldg 6 Runoff Area=0.300 ac 66.67% Impervious Runoff Depth=2.96"
Flow Length=100' Slope=0.0050 '/' Tc=19.3 min CN=92 Runoff=0.98 cfs 3,227 cf

Subcatchment4S: Bldg 7 Runoff Area=0.250 ac 60.00% Impervious Runoff Depth=2.86"
Flow Length=20' Slope=0.0060 '/' Tc=5.0 min CN=91 Runoff=1.25 cfs 2,599 cf

Pond 1B: Bio Area #1 Peak Elev=583.67' Storage=646 cf Inflow=0.98 cfs 3,227 cf
Outflow=0.93 cfs 3,227 cf

Pond 1P: Wet Pond Peak Elev=581.24' Storage=7,974 cf Inflow=10.95 cfs 24,740 cf
8.0" Round Culvert n=0.013 L=20.0' S=0.0050 '/' Outflow=1.89 cfs 24,740 cf

Pond 2P: Underground Detention Peak Elev=580.69' Storage=10,042 cf Inflow=10.15 cfs 31,743 cf
12.0" Round Culvert n=0.013 L=100.0' S=0.0037 '/' Outflow=3.45 cfs 31,703 cf

Pond 5P: Bio Area #2 Peak Elev=583.68' Storage=738 cf Inflow=1.25 cfs 2,599 cf
Outflow=1.10 cfs 2,599 cf

Total Runoff Area = 225,205 sf Runoff Volume = 56,483 cf Average Runoff Depth = 3.01"
32.69% Pervious = 73,616 sf 67.31% Impervious = 151,589 sf

Summary for Subcatchment 1S: West

[47] Hint: Peak is 543% of capacity of segment #2

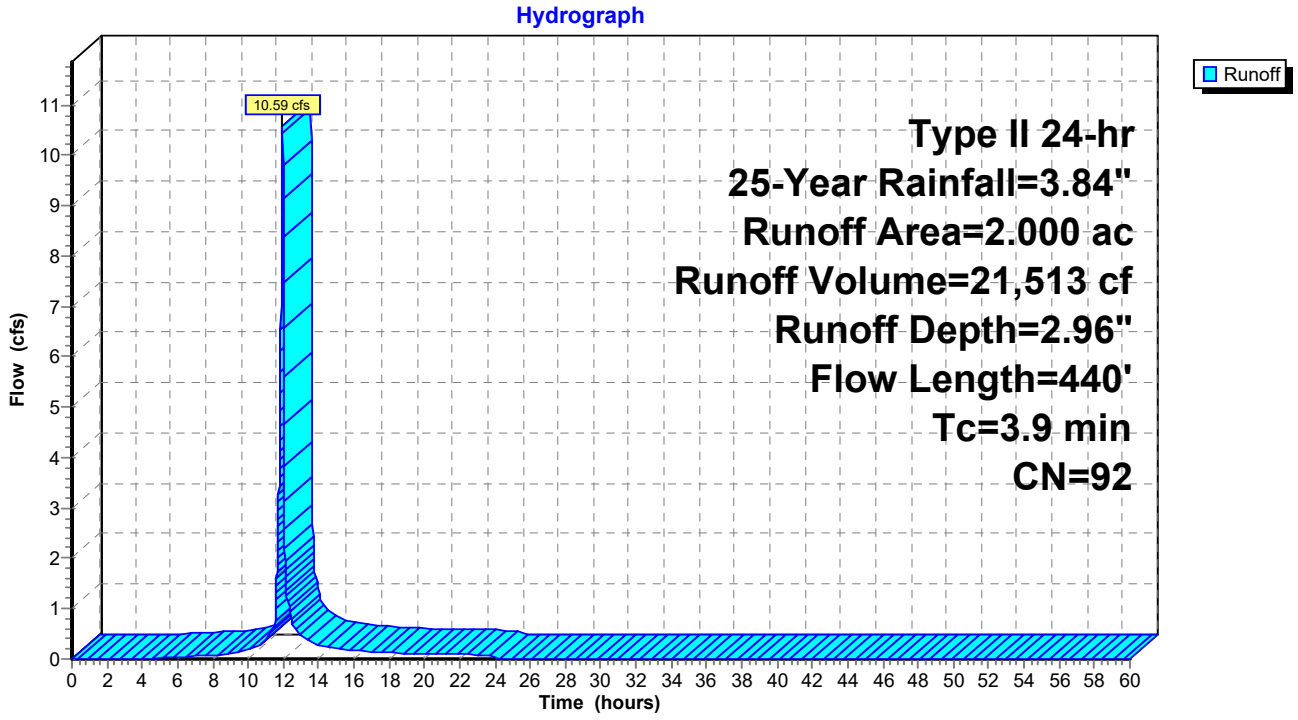
Runoff = 10.59 cfs @ 11.95 hrs, Volume= 21,513 cf, Depth= 2.96"
Routed to Pond 1P : Wet Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-Year Rainfall=3.84"

Area (ac)	CN	Description
0.470	98	Roofs, HSG D
0.830	98	Paved parking, HSG D
0.700	80	>75% Grass cover, Good, HSG D
2.000	92	Weighted Average
0.700		35.00% Pervious Area
1.300		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	105	0.0120	1.00		**Sheet Flow, pavement** Smooth surfaces n= 0.011 P2= 2.50"
2.2	335	0.0030	2.48	1.95	**Pipe Channel, 12" pipe** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
3.9	440	Total			

Subcatchment 1S: West



Summary for Subcatchment 2S: East

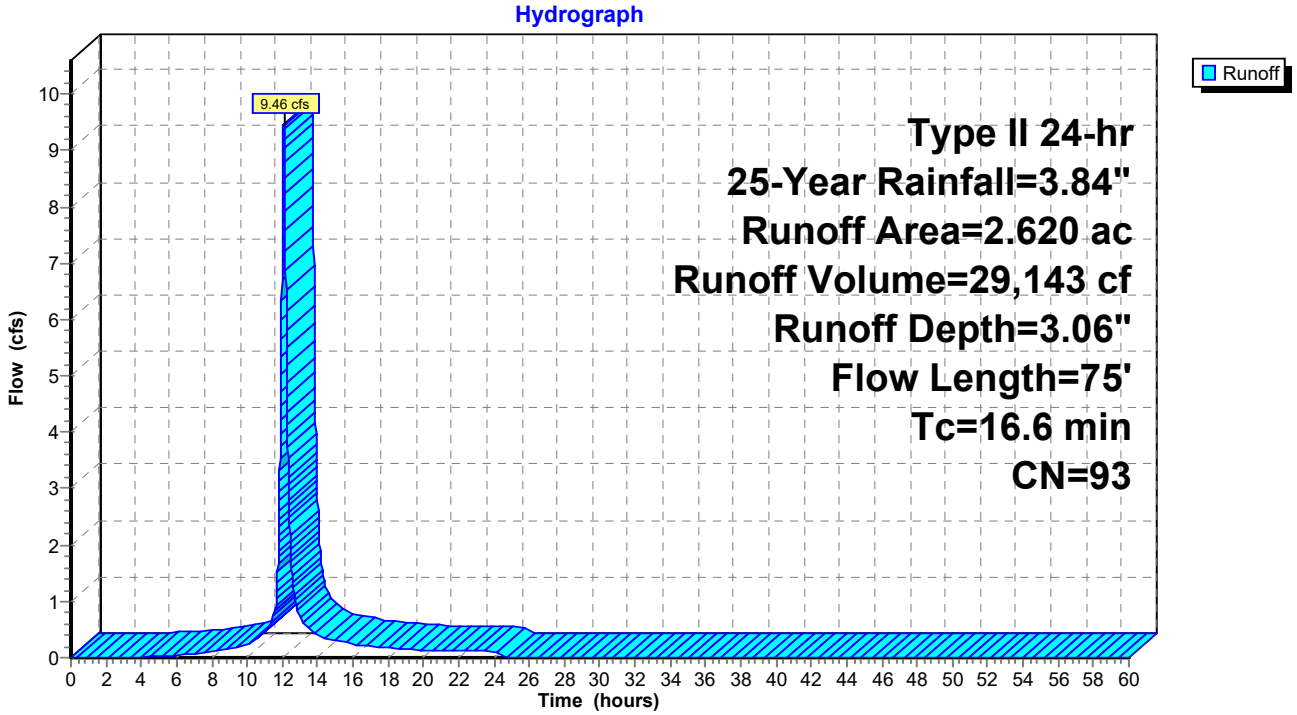
Runoff = 9.46 cfs @ 12.08 hrs, Volume= 29,143 cf, Depth= 3.06"
Routed to Pond 2P : Underground Detention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-Year Rainfall=3.84"

Area (ac)	CN	Description
0.550	98	Roofs, HSG D
1.280	98	Paved parking, HSG D
0.790	80	>75% Grass cover, Good, HSG D
2.620	93	Weighted Average
0.790		30.15% Pervious Area
1.830		69.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	50	0.0020	0.05		**Sheet Flow, grass** Grass: Short n= 0.150 P2= 2.50"
0.6	25	0.0100	0.70		**Sheet Flow, pavement** Smooth surfaces n= 0.011 P2= 2.50"
16.6	75	Total			

Subcatchment 2S: East



Summary for Subcatchment 3S: Bldg 6

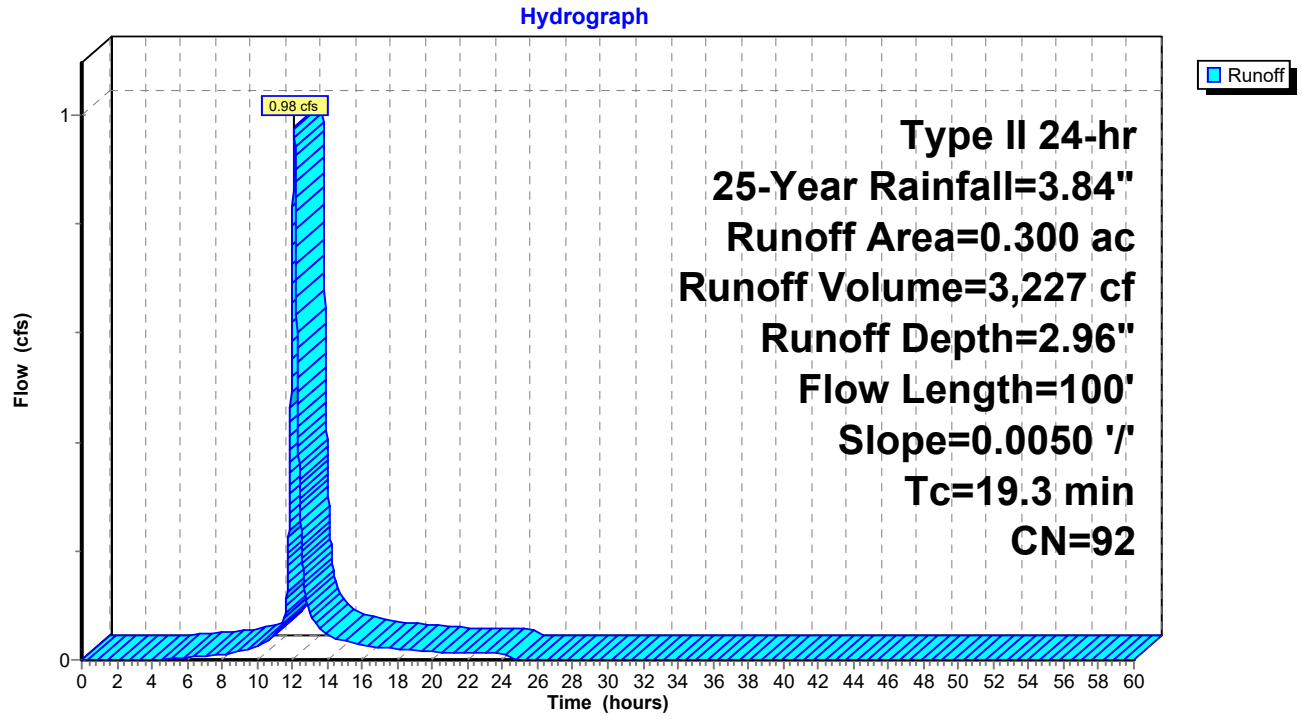
Runoff = 0.98 cfs @ 12.11 hrs, Volume= 3,227 cf, Depth= 2.96"
Routed to Pond 1B : Bio Area #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-Year Rainfall=3.84"

Area (ac)	CN	Description
0.130	98	Roofs, HSG D
0.100	80	>75% Grass cover, Good, HSG D
0.070	98	Paved parking, HSG D
0.300	92	Weighted Average
0.100		33.33% Pervious Area
0.200		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.3	100	0.0050	0.09		**Sheet Flow, grass** Grass: Short n= 0.150 P2= 2.50"

Subcatchment 3S: Bldg 6



Summary for Subcatchment 4S: Bldg 7

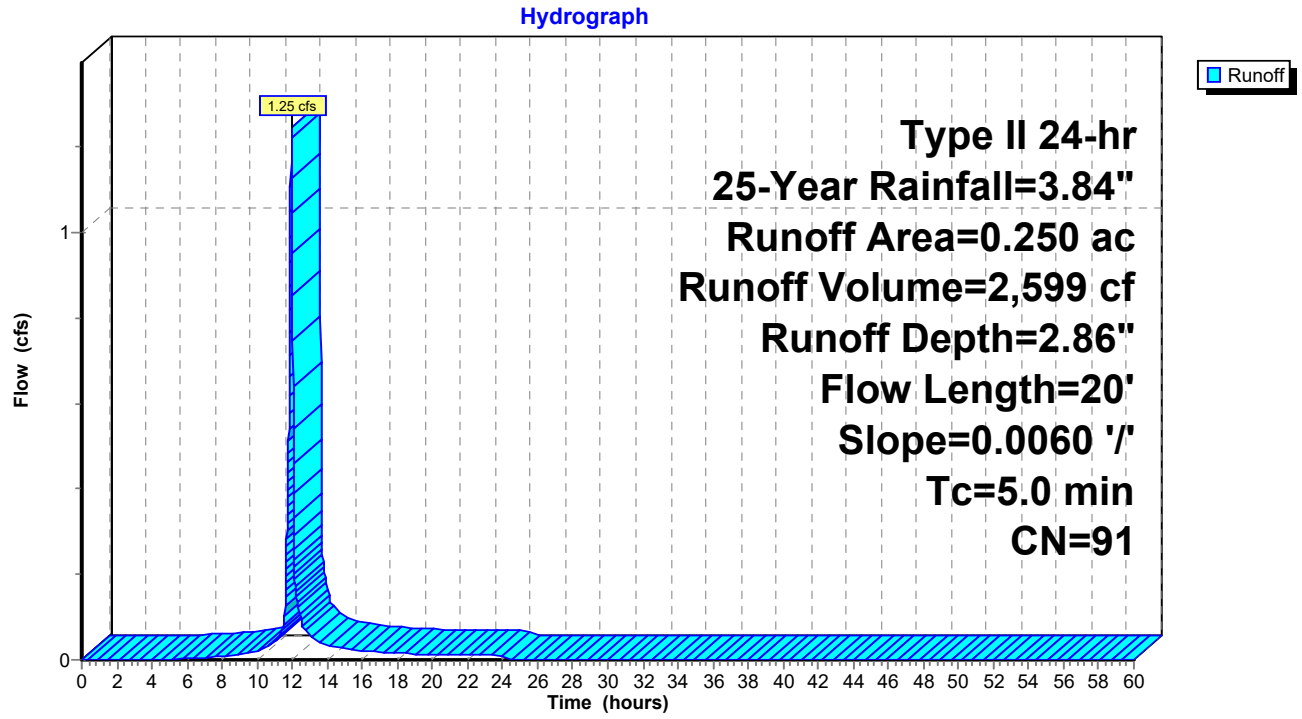
Runoff = 1.25 cfs @ 11.96 hrs, Volume= 2,599 cf, Depth= 2.86"
Routed to Pond 5P : Bio Area #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-Year Rainfall=3.84"

Area (ac)	CN	Description
0.100	98	Roofs, HSG D
0.100	80	>75% Grass cover, Good, HSG D
0.050	98	Paved parking, HSG D
0.250	91	Weighted Average
0.100		40.00% Pervious Area
0.150		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	20	0.0060	0.07		**Sheet Flow, grass** Grass: Short n= 0.150 P2= 2.50"

Subcatchment 4S: Bldg 7



Summary for Pond 1B: Bio Area #1

Inflow Area = 13,068 sf, 66.67% Impervious, Inflow Depth = 2.96" for 25-Year event
Inflow = 0.98 cfs @ 12.11 hrs, Volume= 3,227 cf
Outflow = 0.93 cfs @ 12.16 hrs, Volume= 3,227 cf, Atten= 5%, Lag= 2.6 min
Primary = 0.93 cfs @ 12.16 hrs, Volume= 3,227 cf
Routed to Pond 1P : Wet Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 583.67' @ 12.16 hrs Surf.Area= 1,376 sf Storage= 646 cf

Plug-Flow detention time= 206.8 min calculated for 3,227 cf (100% of inflow)
Center-of-Mass det. time= 206.7 min (1,007.2 - 800.5)

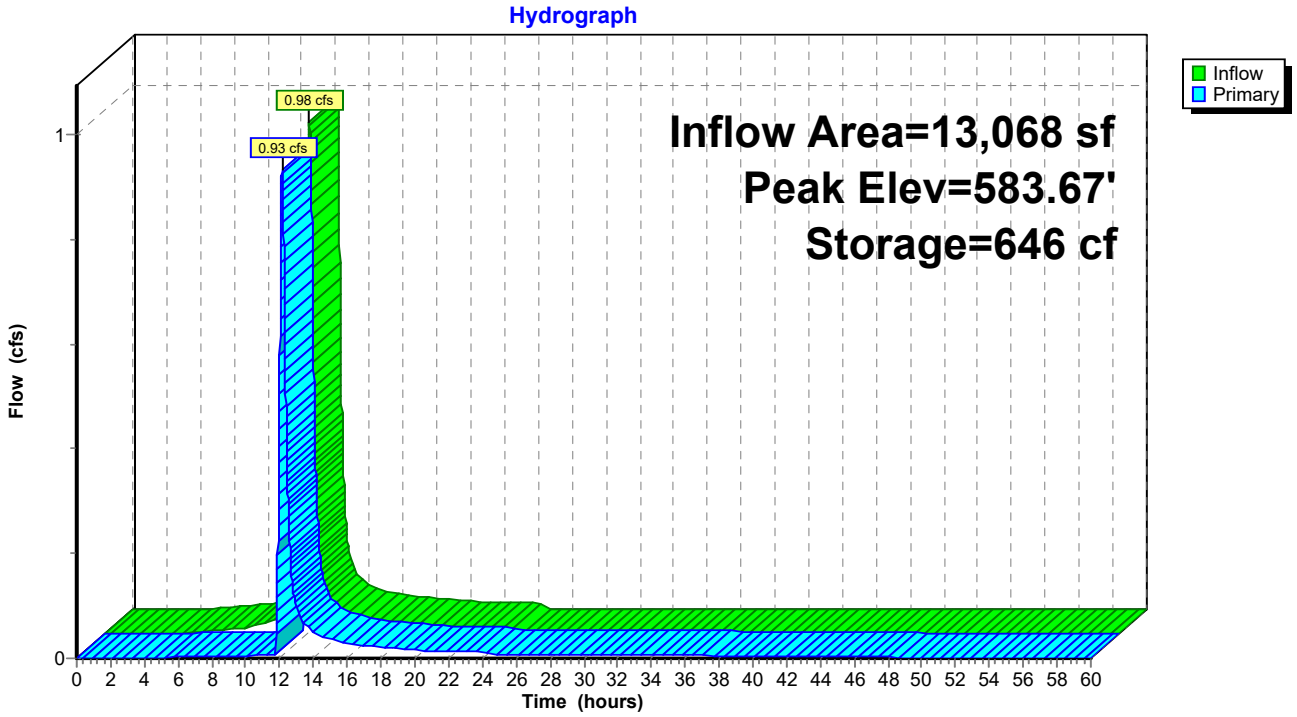
Volume	Invert	Avail.Storage	Storage Description
#1	583.00'	767 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
583.00	645	0	0
583.50	1,112	439	439
583.75	1,510	328	767

Device	Routing	Invert	Outlet Devices
#1	Primary	580.50'	**6.0" Round Culvert** L= 22.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.50' / 580.28' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Device 1	583.50'	**8.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	583.00'	**0.250 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 570.00'

Primary OutFlow Max=0.93 cfs @ 12.16 hrs HW=583.67' (Free Discharge)
└**1=Culvert** (Passes 0.93 cfs of 1.49 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 0.92 cfs @ 1.33 fps)
└**3=Exfiltration** (Controls 0.01 cfs)

Pond 1B: Bio Area #1



Summary for Pond 1P: Wet Pond

[44] Hint: Outlet device #1 is below defined storage
[79] Warning: Submerged Pond 1B Primary device # 1 INLET by 0.74'

Inflow Area = 100,188 sf, 65.22% Impervious, Inflow Depth = 2.96" for 25-Year event
Inflow = 10.95 cfs @ 11.95 hrs, Volume= 24,740 cf
Outflow = 1.89 cfs @ 12.26 hrs, Volume= 24,740 cf, Atten= 83%, Lag= 18.7 min
Primary = 1.89 cfs @ 12.26 hrs, Volume= 24,740 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 581.24' @ 12.26 hrs Surf.Area= 7,042 sf Storage= 7,974 cf

Plug-Flow detention time= 34.7 min calculated for 24,736 cf (100% of inflow)
Center-of-Mass det. time= 34.7 min (849.7 - 815.0)

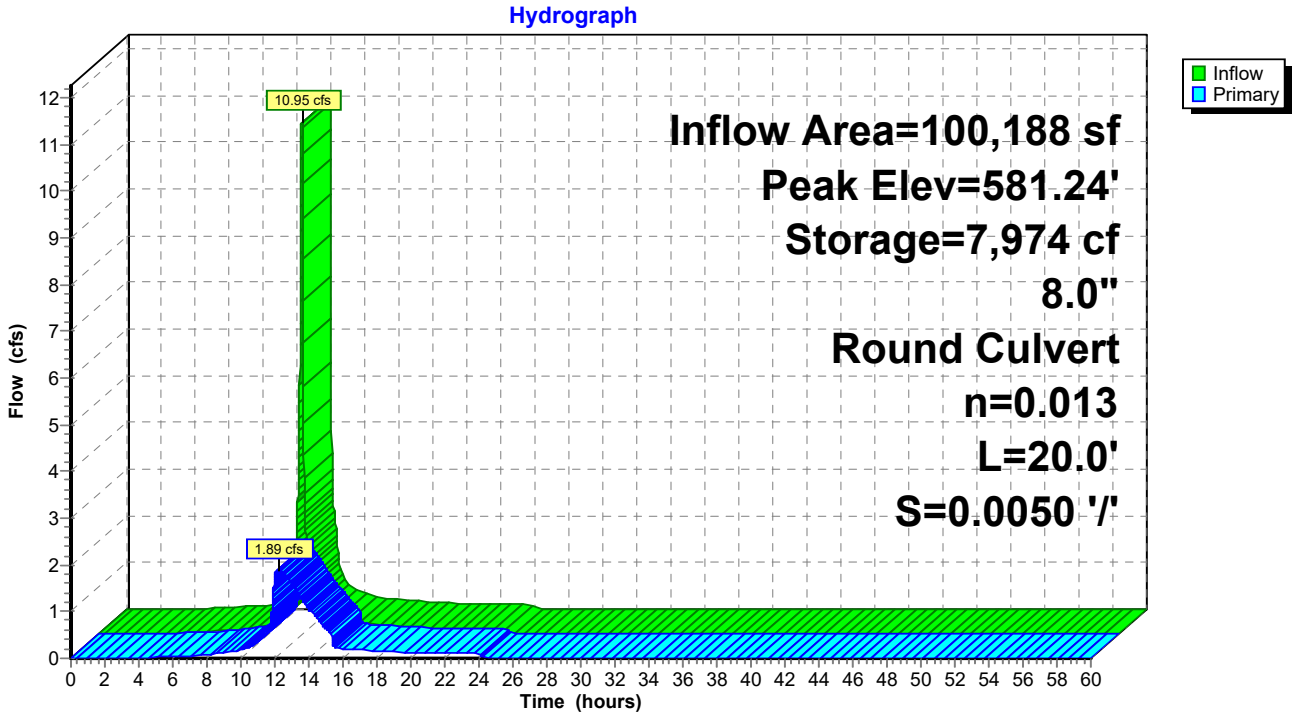
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	13,600 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	5,800	0	0
581.00	6,800	6,300	6,300
582.00	7,800	7,300	13,600

Device	Routing	Invert	Outlet Devices
#1	Primary	579.50'	**8.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 579.50' / 579.40' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=1.89 cfs @ 12.26 hrs HW=581.24' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 1.89 cfs @ 5.42 fps)

Pond 1P: Wet Pond



Summary for Pond 2P: Underground Detention

[79] Warning: Submerged Pond 5P Primary device # 1 INLET by 0.19'

Inflow Area = 125,017 sf, 68.99% Impervious, Inflow Depth = 3.05" for 25-Year event
Inflow = 10.15 cfs @ 12.07 hrs, Volume= 31,743 cf
Outflow = 3.45 cfs @ 12.32 hrs, Volume= 31,703 cf, Atten= 66%, Lag= 15.2 min
Primary = 3.45 cfs @ 12.32 hrs, Volume= 31,703 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 580.69' @ 12.32 hrs Surf.Area= 7,226 sf Storage= 10,042 cf

Plug-Flow detention time= 57.0 min calculated for 31,703 cf (100% of inflow)
Center-of-Mass det. time= 54.5 min (870.8 - 816.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	578.67'	6,515 cf	**20.50'W x 352.50'L x 3.50'H Field A** 25,292 cf Overall - 9,004 cf Embedded = 16,287 cf x 40.0% Voids
#2A	579.17'	9,004 cf	**ADS_StormTech SC-740 +Cap** x 196 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 196 Chambers in 4 Rows
		15,519 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	578.67'	**12.0" Round Culvert** L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 578.67' / 578.30' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.45 cfs @ 12.32 hrs HW=580.69' (Free Discharge)
1=Culvert (Barrel Controls 3.45 cfs @ 4.40 fps)

Pond 2P: Underground Detention - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

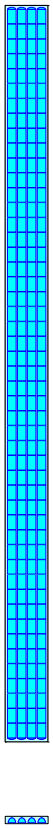
49 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 350.50' Row Length +12.0" End Stone x 2 = 352.50' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

196 Chambers x 45.9 cf = 9,004.2 cf Chamber Storage

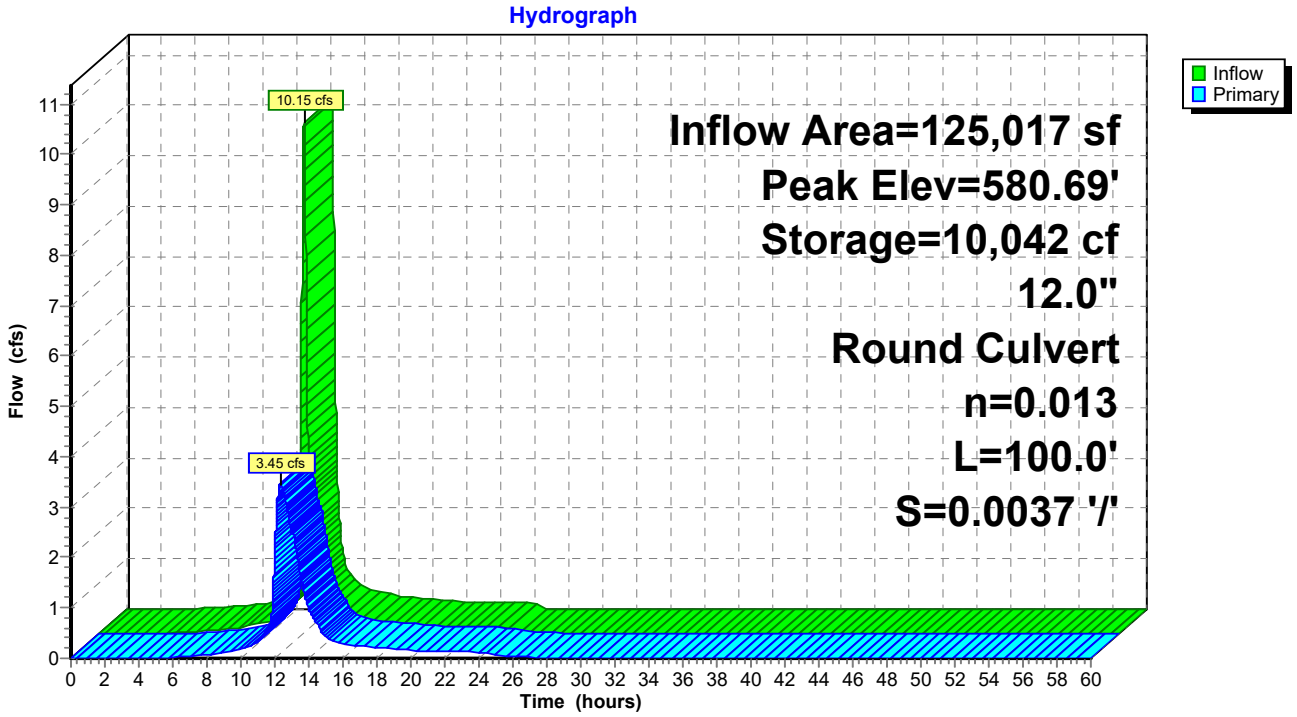
25,291.6 cf Field - 9,004.2 cf Chambers = 16,287.4 cf Stone x 40.0% Voids = 6,515.0 cf Stone Storage

Chamber Storage + Stone Storage = 15,519.2 cf = 0.356 af
Overall Storage Efficiency = 61.4%
Overall System Size = 352.50' x 20.50' x 3.50'

196 Chambers
936.7 cy Field
603.2 cy Stone



Pond 2P: Underground Detention



Summary for Pond 5P: Bio Area #2

Inflow Area = 10,890 sf, 60.00% Impervious, Inflow Depth = 2.86" for 25-Year event
Inflow = 1.25 cfs @ 11.96 hrs, Volume= 2,599 cf
Outflow = 1.10 cfs @ 11.99 hrs, Volume= 2,599 cf, Atten= 12%, Lag= 2.1 min
Primary = 1.10 cfs @ 11.99 hrs, Volume= 2,599 cf
Routed to Pond 2P : Underground Detention

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 583.68' @ 11.99 hrs Surf.Area= 1,543 sf Storage= 738 cf

Plug-Flow detention time= 283.8 min calculated for 2,599 cf (100% of inflow)
Center-of-Mass det. time= 284.0 min (1,075.7 - 791.7)

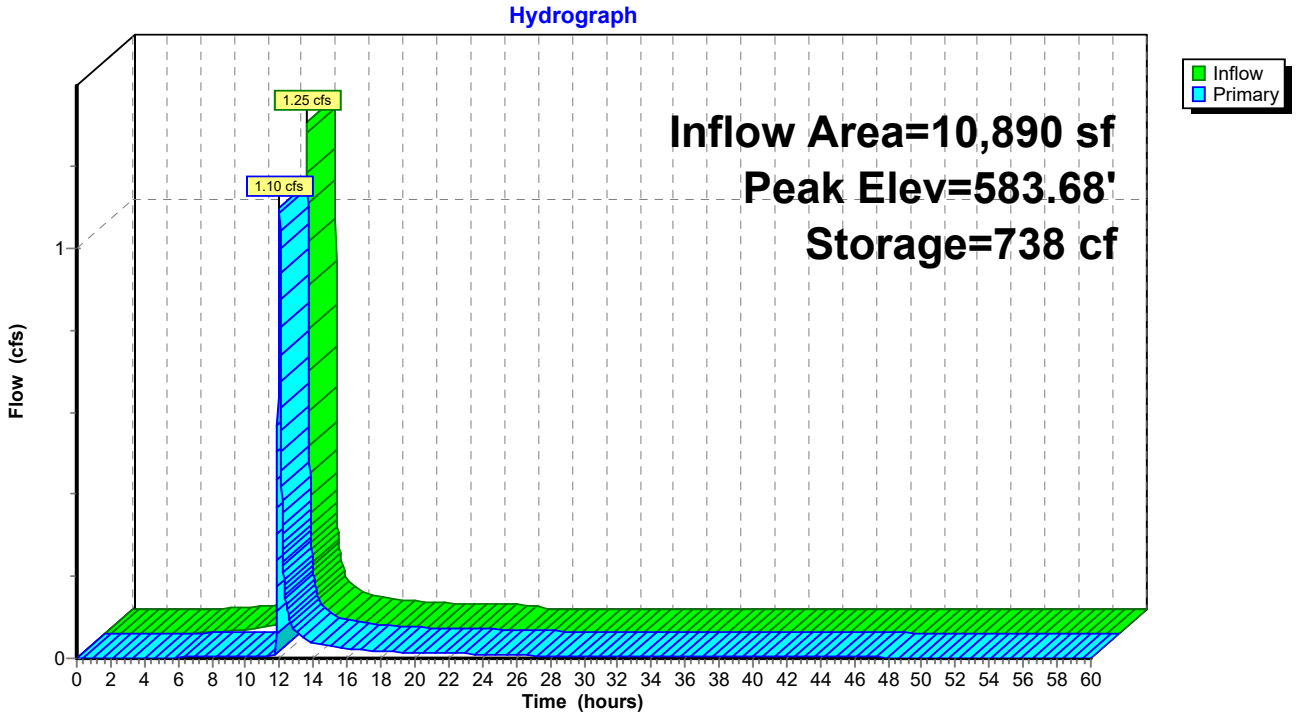
Volume	Invert	Avail.Storage	Storage Description
#1	583.00'	844 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
583.00	875	0	0
583.50	1,100	494	494
583.75	1,700	350	844

Device	Routing	Invert	Outlet Devices
#1	Primary	580.50'	**8.0" Round Culvert** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.50' / 579.95' S= 0.0079 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	583.50'	**8.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	583.00'	**0.250 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 570.00'

Primary OutFlow Max=1.09 cfs @ 11.99 hrs HW=583.68' (Free Discharge)
└**1=Culvert** (Passes 1.09 cfs of 2.14 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 1.09 cfs @ 1.40 fps)
└**3=Exfiltration** (Controls 0.01 cfs)

Pond 5P: Bio Area #2



Time span=0.00-60.00 hrs, dt=0.01 hrs, 6001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: West Runoff Area=2.000 ac 65.00% Impervious Runoff Depth=4.31"
Flow Length=440' Tc=3.9 min CN=92 Runoff=15.01 cfs 31,321 cf

Subcatchment2S: East Runoff Area=2.620 ac 69.85% Impervious Runoff Depth=4.42"
Flow Length=75' Tc=16.6 min CN=93 Runoff=13.39 cfs 42,074 cf

Subcatchment3S: Bldg 6 Runoff Area=0.300 ac 66.67% Impervious Runoff Depth=4.31"
Flow Length=100' Slope=0.0050 '/' Tc=19.3 min CN=92 Runoff=1.40 cfs 4,698 cf

Subcatchment4S: Bldg 7 Runoff Area=0.250 ac 60.00% Impervious Runoff Depth=4.21"
Flow Length=20' Slope=0.0060 '/' Tc=5.0 min CN=91 Runoff=1.78 cfs 3,817 cf

Pond 1B: Bio Area #1 Peak Elev=583.71' Storage=710 cf Inflow=1.40 cfs 4,698 cf
Outflow=1.34 cfs 4,698 cf

Pond 1P: Wet Pond Peak Elev=581.88' Storage=12,683 cf Inflow=15.61 cfs 36,019 cf
8.0" Round Culvert n=0.013 L=20.0' S=0.0050 '/' Outflow=2.35 cfs 36,019 cf

Pond 2P: Underground Detention Peak Elev=581.93' Storage=14,839 cf Inflow=14.36 cfs 45,891 cf
12.0" Round Culvert n=0.013 L=100.0' S=0.0037 '/' Outflow=4.75 cfs 45,851 cf

Pond 5P: Bio Area #2 Peak Elev=583.74' Storage=825 cf Inflow=1.78 cfs 3,817 cf
Outflow=1.61 cfs 3,817 cf

Total Runoff Area = 225,205 sf Runoff Volume = 81,909 cf Average Runoff Depth = 4.36"
32.69% Pervious = 73,616 sf 67.31% Impervious = 151,589 sf

Summary for Subcatchment 1S: West

[47] Hint: Peak is 769% of capacity of segment #2

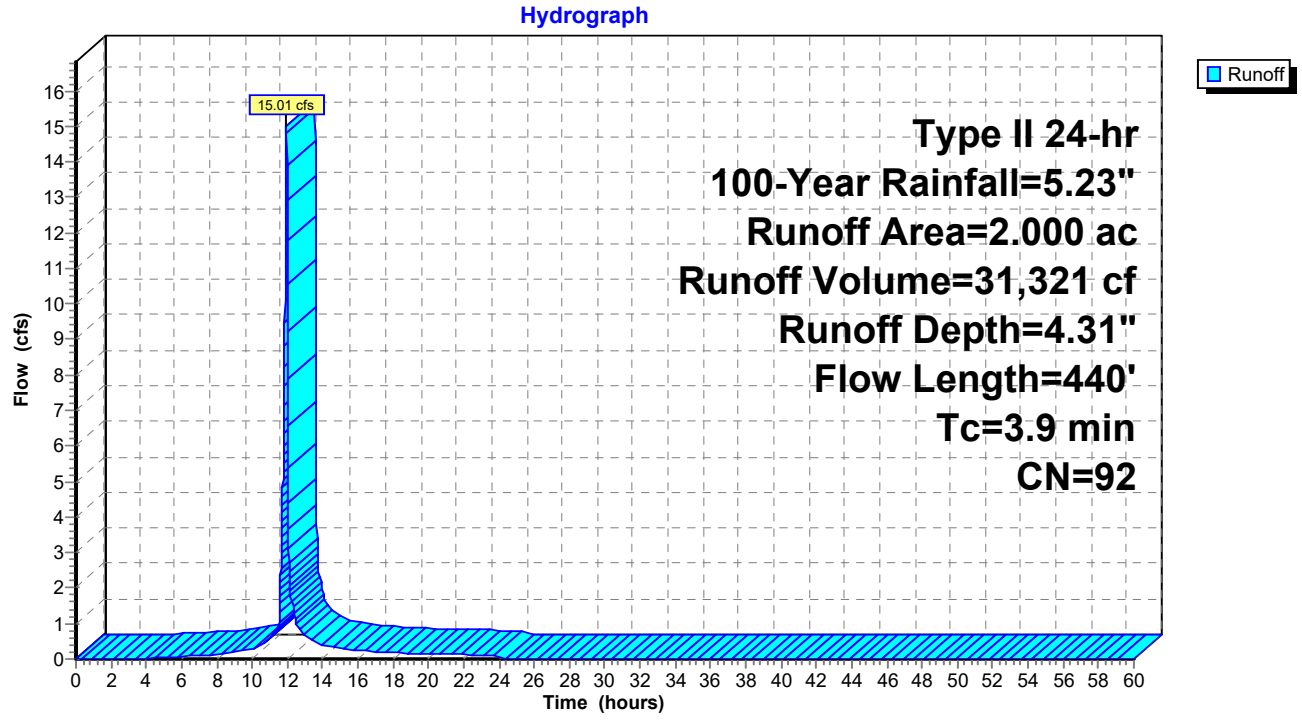
Runoff = 15.01 cfs @ 11.94 hrs, Volume= 31,321 cf, Depth= 4.31"
Routed to Pond 1P : Wet Pond

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=5.23"

Area (ac)	CN	Description
0.470	98	Roofs, HSG D
0.830	98	Paved parking, HSG D
0.700	80	>75% Grass cover, Good, HSG D
2.000	92	Weighted Average
0.700		35.00% Pervious Area
1.300		65.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	105	0.0120	1.00		**Sheet Flow, pavement** Smooth surfaces n= 0.011 P2= 2.50"
2.2	335	0.0030	2.48	1.95	**Pipe Channel, 12" pipe** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
3.9	440	Total			

Subcatchment 1S: West



Summary for Subcatchment 2S: East

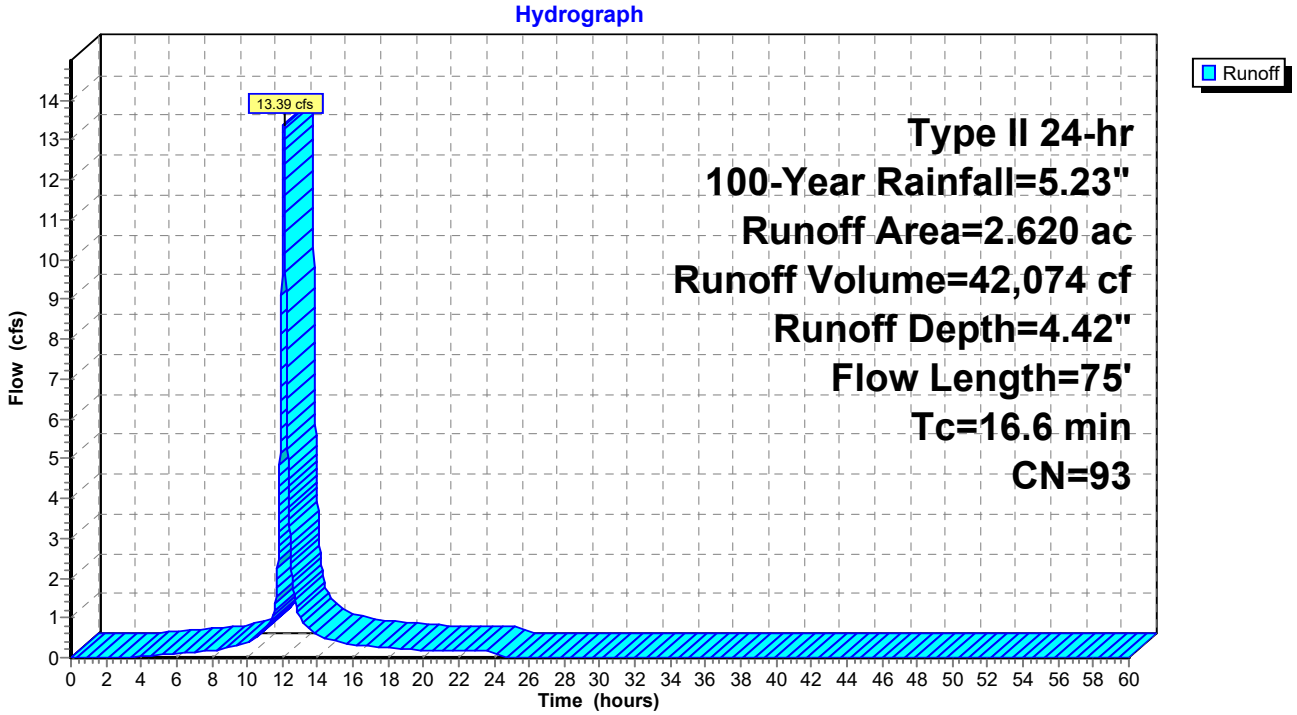
Runoff = 13.39 cfs @ 12.08 hrs, Volume= 42,074 cf, Depth= 4.42"
Routed to Pond 2P : Underground Detention

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=5.23"

Area (ac)	CN	Description
0.550	98	Roofs, HSG D
1.280	98	Paved parking, HSG D
0.790	80	>75% Grass cover, Good, HSG D
2.620	93	Weighted Average
0.790		30.15% Pervious Area
1.830		69.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	50	0.0020	0.05		**Sheet Flow, grass** Grass: Short n= 0.150 P2= 2.50"
0.6	25	0.0100	0.70		**Sheet Flow, pavement** Smooth surfaces n= 0.011 P2= 2.50"
16.6	75	Total			

Subcatchment 2S: East



Summary for Subcatchment 3S: Bldg 6

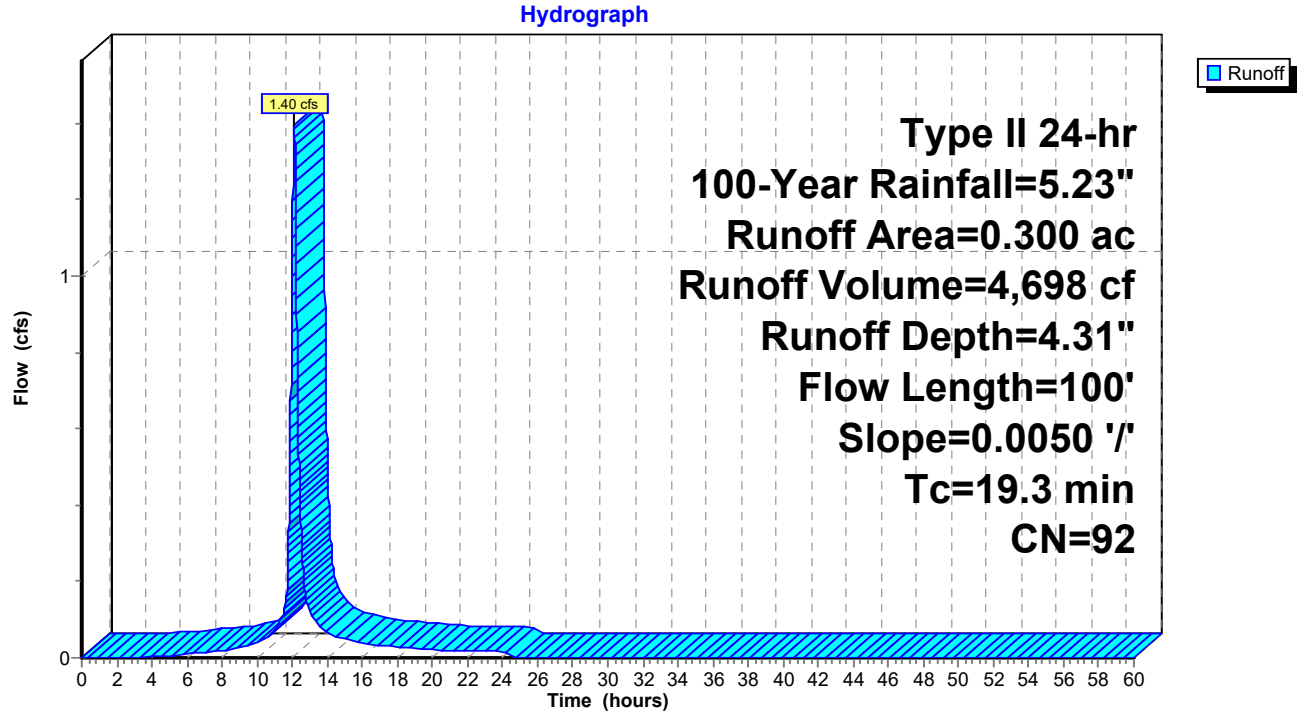
Runoff = 1.40 cfs @ 12.11 hrs, Volume= 4,698 cf, Depth= 4.31"
Routed to Pond 1B : Bio Area #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=5.23"

Area (ac)	CN	Description
0.130	98	Roofs, HSG D
0.100	80	>75% Grass cover, Good, HSG D
0.070	98	Paved parking, HSG D
0.300	92	Weighted Average
0.100		33.33% Pervious Area
0.200		66.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.3	100	0.0050	0.09		**Sheet Flow, grass** Grass: Short n= 0.150 P2= 2.50"

Subcatchment 3S: Bldg 6



Summary for Subcatchment 4S: Bldg 7

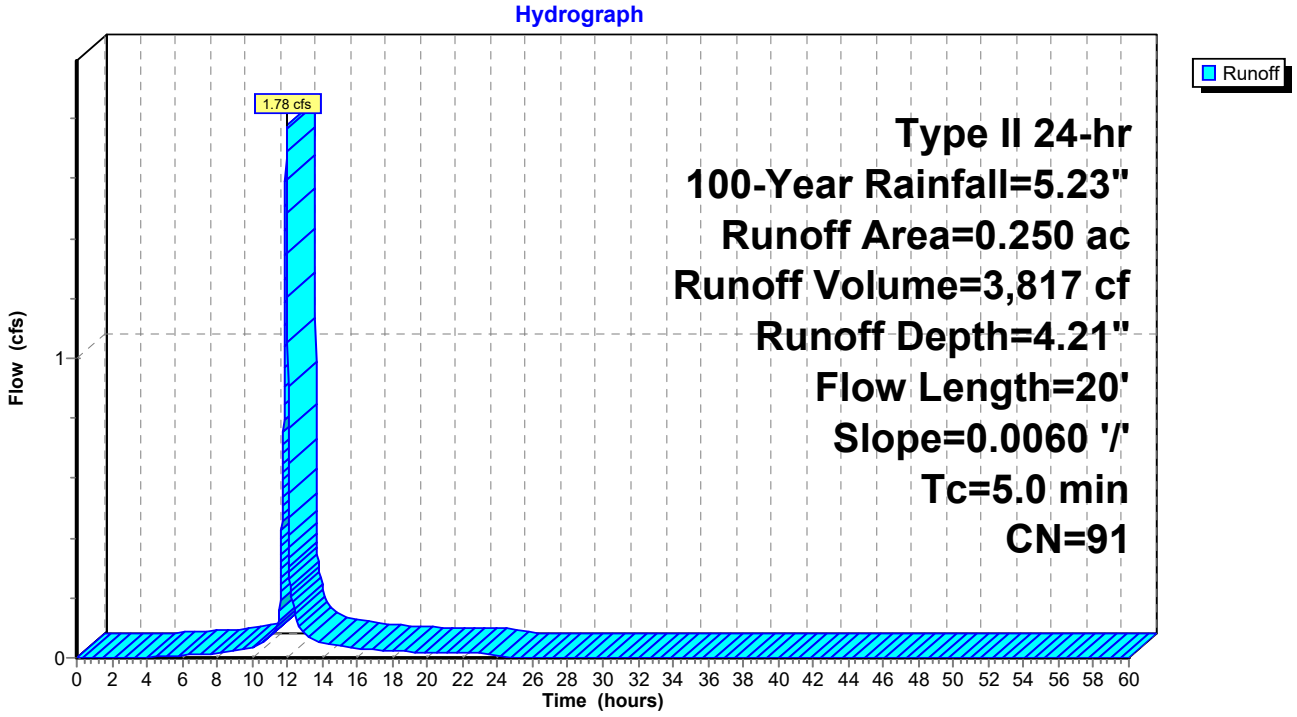
Runoff = 1.78 cfs @ 11.96 hrs, Volume= 3,817 cf, Depth= 4.21"
Routed to Pond 5P : Bio Area #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=5.23"

Area (ac)	CN	Description
0.100	98	Roofs, HSG D
0.100	80	>75% Grass cover, Good, HSG D
0.050	98	Paved parking, HSG D
0.250	91	Weighted Average
0.100		40.00% Pervious Area
0.150		60.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	20	0.0060	0.07		**Sheet Flow, grass** Grass: Short n= 0.150 P2= 2.50"

Subcatchment 4S: Bldg 7



Summary for Pond 1B: Bio Area #1

Inflow Area = 13,068 sf, 66.67% Impervious, Inflow Depth = 4.31" for 100-Year event
Inflow = 1.40 cfs @ 12.11 hrs, Volume= 4,698 cf
Outflow = 1.34 cfs @ 12.15 hrs, Volume= 4,698 cf, Atten= 4%, Lag= 2.4 min
Primary = 1.34 cfs @ 12.15 hrs, Volume= 4,698 cf
Routed to Pond 1P : Wet Pond

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 583.71' @ 12.15 hrs Surf.Area= 1,449 sf Storage= 710 cf

Plug-Flow detention time= 151.3 min calculated for 4,698 cf (100% of inflow)
Center-of-Mass det. time= 151.3 min (941.6 - 790.3)

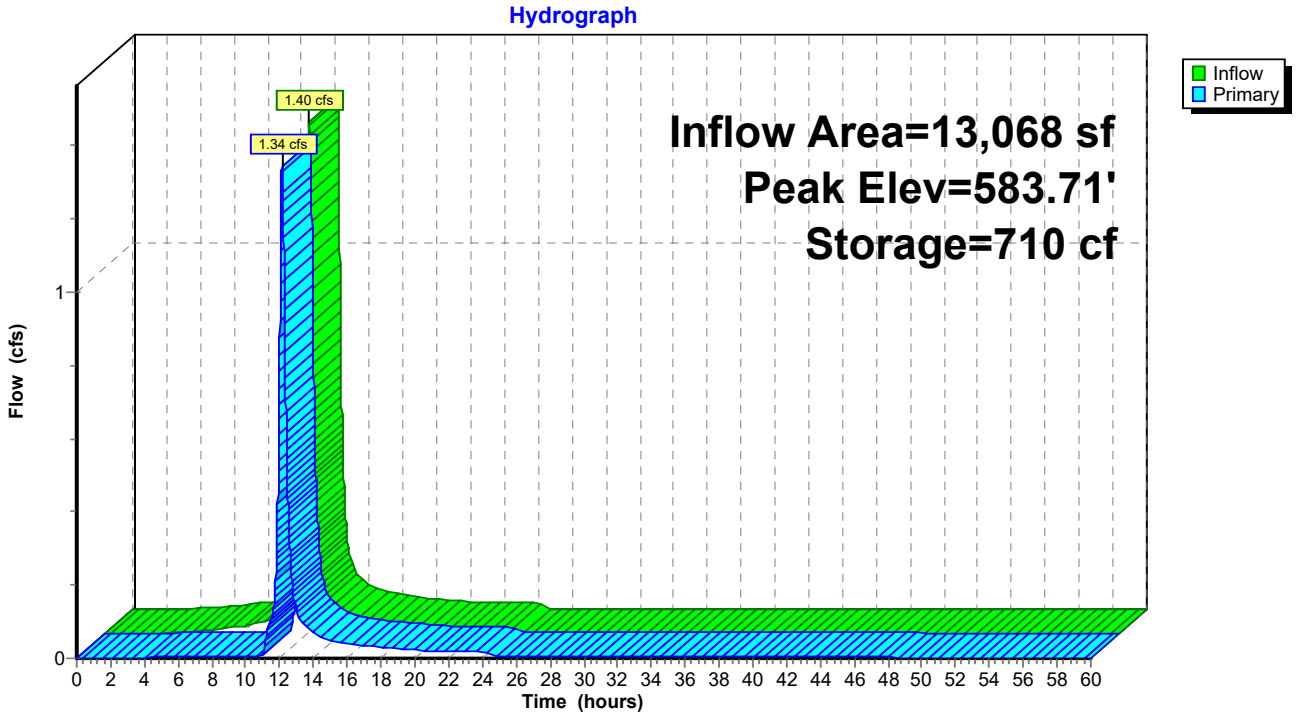
Volume	Invert	Avail.Storage	Storage Description
#1	583.00'	767 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
583.00	645	0	0
583.50	1,112	439	439
583.75	1,510	328	767

Device	Routing	Invert	Outlet Devices
#1	Primary	580.50'	**6.0" Round Culvert** L= 22.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.50' / 580.28' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Device 1	583.50'	**8.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	583.00'	**0.250 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 570.00'

Primary OutFlow Max=1.34 cfs @ 12.15 hrs HW=583.71' (Free Discharge)
└**1=Culvert** (Passes 1.34 cfs of 1.50 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 1.33 cfs @ 1.50 fps)
└**3=Exfiltration** (Controls 0.01 cfs)

Pond 1B: Bio Area #1



Summary for Pond 1P: Wet Pond

[44] Hint: Outlet device #1 is below defined storage
[79] Warning: Submerged Pond 1B Primary device # 1 INLET by 1.38'

Inflow Area = 100,188 sf, 65.22% Impervious, Inflow Depth = 4.31" for 100-Year event
Inflow = 15.61 cfs @ 11.95 hrs, Volume= 36,019 cf
Outflow = 2.35 cfs @ 12.31 hrs, Volume= 36,019 cf, Atten= 85%, Lag= 21.7 min
Primary = 2.35 cfs @ 12.31 hrs, Volume= 36,019 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 581.88' @ 12.31 hrs Surf.Area= 7,681 sf Storage= 12,683 cf

Plug-Flow detention time= 45.8 min calculated for 36,013 cf (100% of inflow)
Center-of-Mass det. time= 45.8 min (843.4 - 797.6)

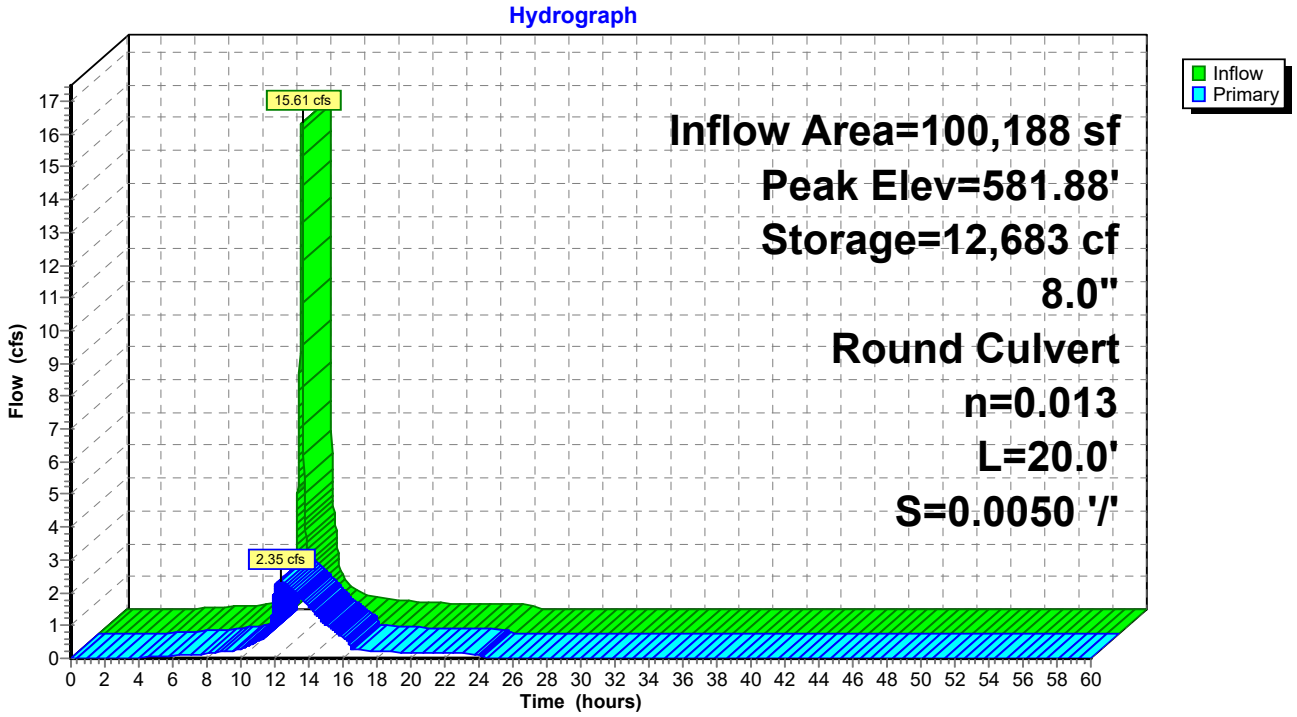
Volume	Invert	Avail.Storage	Storage Description
#1	580.00'	13,600 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
580.00	5,800	0	0
581.00	6,800	6,300	6,300
582.00	7,800	7,300	13,600

Device	Routing	Invert	Outlet Devices
#1	Primary	579.50'	**8.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 579.50' / 579.40' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=2.35 cfs @ 12.31 hrs HW=581.88' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 2.35 cfs @ 6.73 fps)

Pond 1P: Wet Pond



Summary for Pond 2P: Underground Detention

[79] Warning: Submerged Pond 5P Primary device # 1 INLET by 1.43'

Inflow Area = 125,017 sf, 68.99% Impervious, Inflow Depth = 4.40" for 100-Year event
Inflow = 14.36 cfs @ 12.07 hrs, Volume= 45,891 cf
Outflow = 4.75 cfs @ 12.33 hrs, Volume= 45,851 cf, Atten= 67%, Lag= 15.6 min
Primary = 4.75 cfs @ 12.33 hrs, Volume= 45,851 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 581.93' @ 12.33 hrs Surf.Area= 7,226 sf Storage= 14,839 cf

Plug-Flow detention time= 54.1 min calculated for 45,851 cf (100% of inflow)
Center-of-Mass det. time= 52.3 min (852.4 - 800.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	578.67'	6,515 cf	**20.50'W x 352.50'L x 3.50'H Field A** 25,292 cf Overall - 9,004 cf Embedded = 16,287 cf x 40.0% Voids
#2A	579.17'	9,004 cf	**ADS_StormTech SC-740 +Cap** x 196 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 196 Chambers in 4 Rows
		15,519 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	578.67'	**12.0" Round Culvert** L= 100.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 578.67' / 578.30' S= 0.0037 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=4.75 cfs @ 12.33 hrs HW=581.93' (Free Discharge)
1=Culvert (Barrel Controls 4.75 cfs @ 6.05 fps)

Pond 2P: Underground Detention - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-740 +Cap (ADS StormTech®SC-740 with cap length)
Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf
Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

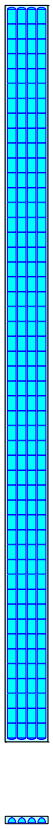
49 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 350.50' Row Length +12.0" End Stone x 2 = 352.50' Base Length
4 Rows x 51.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 20.50' Base Width
6.0" Stone Base + 30.0" Chamber Height + 6.0" Stone Cover = 3.50' Field Height

196 Chambers x 45.9 cf = 9,004.2 cf Chamber Storage

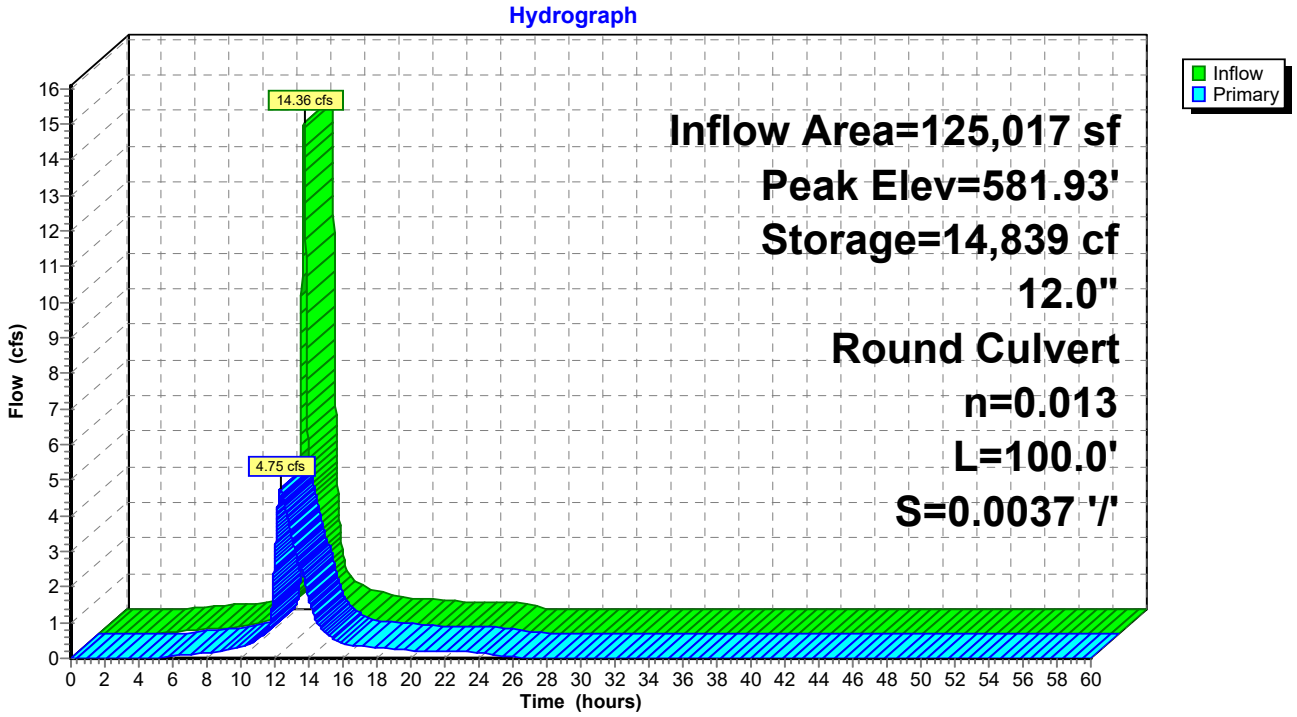
25,291.6 cf Field - 9,004.2 cf Chambers = 16,287.4 cf Stone x 40.0% Voids = 6,515.0 cf Stone Storage

Chamber Storage + Stone Storage = 15,519.2 cf = 0.356 af
Overall Storage Efficiency = 61.4%
Overall System Size = 352.50' x 20.50' x 3.50'

196 Chambers
936.7 cy Field
603.2 cy Stone



Pond 2P: Underground Detention



Summary for Pond 5P: Bio Area #2

Inflow Area = 10,890 sf, 60.00% Impervious, Inflow Depth = 4.21" for 100-Year event
Inflow = 1.78 cfs @ 11.96 hrs, Volume= 3,817 cf
Outflow = 1.61 cfs @ 11.99 hrs, Volume= 3,817 cf, Atten= 10%, Lag= 1.9 min
Primary = 1.61 cfs @ 11.99 hrs, Volume= 3,817 cf
Routed to Pond 2P : Underground Detention

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 583.74' @ 11.99 hrs Surf.Area= 1,673 sf Storage= 825 cf

Plug-Flow detention time= 202.8 min calculated for 3,816 cf (100% of inflow)
Center-of-Mass det. time= 203.0 min (984.2 - 781.1)

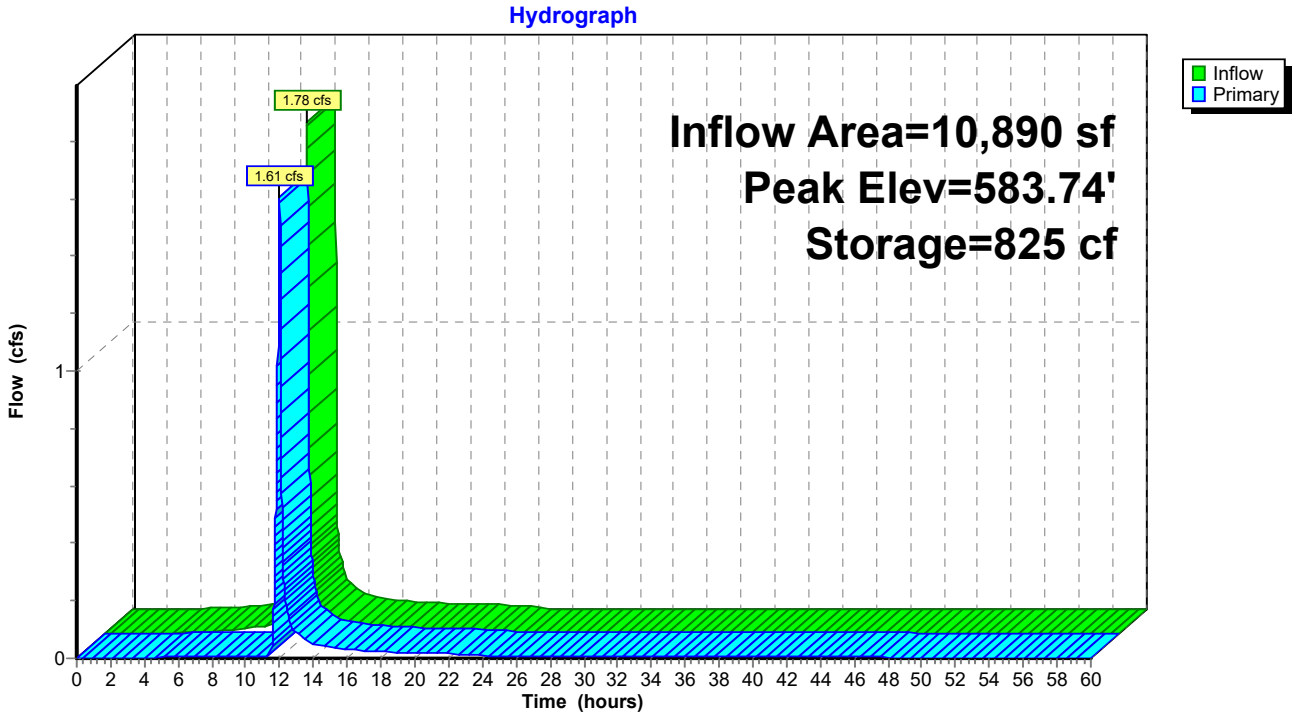
Volume	Invert	Avail.Storage	Storage Description
#1	583.00'	844 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
583.00	875	0	0
583.50	1,100	494	494
583.75	1,700	350	844

Device	Routing	Invert	Outlet Devices
#1	Primary	580.50'	**8.0" Round Culvert** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 580.50' / 579.95' S= 0.0079 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#2	Device 1	583.50'	**8.0" Horiz. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	583.00'	**0.250 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 570.00'

Primary OutFlow Max=1.61 cfs @ 11.99 hrs HW=583.74' (Free Discharge)
└**1=Culvert** (Passes 1.61 cfs of 2.16 cfs potential flow)
└**2=Orifice/Grate** (Weir Controls 1.60 cfs @ 1.60 fps)
└**3=Exfiltration** (Controls 0.01 cfs)

Pond 5P: Bio Area #2



Summary for Pond 3P: FOREBAY Water Quality in Detention Basin

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	575.00'	2,185 cf	**Detention Pond (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
575.00	220	0	0
576.00	360	290	290
577.00	530	445	735
578.00	720	625	1,360
579.00	930	825	2,185

Summary for Pond 4P: PERMANENT POOL Water Quality in Detention Basin

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	573.00'	4,155 cf	**Detention Pond (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
573.00	200	0	0
574.00	330	265	265
575.00	480	405	670
576.00	650	565	1,235
577.00	850	750	1,985
578.00	1,080	965	2,950
579.00	1,330	1,205	4,155

Green Infrastructure & Water Quality Calculations

Proposed Multi-Family Project - 480 Dodge Road
Town of Amherst, Erie County, New York

WATER QUALITY REQUIRED FOR PROPOSED DEVELOPMENT AREA Area, Acres = 5.17
(Note: Reference Chap. 9 NYSDEC Stormwater Design Manual)

"Redevelopment Activity", Acres = 2.30 "New development", Acres = 2.87
(existing, disturbed impervious area)

Total proposed impervious, Acres = 3.35 Adjusted impervious, Acres = 1.63
"New" impervious, Acres = 1.05 (25% redevelopment, 100% new development)

Water Quality Volume (WQv) WQv=(P*Rv*A)/12

Where: P=90% Rainfall Event Number P= 1
Rv= 0.05+0.009*(I) Rv= 0.33
IC=Impervious Cover, Acres IC= 1.63
I=Impervious Cover (%) I= 32
A=Runoff Area, Acres A= 5.17

WQv (ac-ft)= 0.143
WQv (cf)= 6,229

RRv PROVIDED FOR PROPOSED DEVELOPMENT AREA (See NYSDEC worksheets)

Min. RRv Req'd, cf = 1,124
Min. RRv Req'd, ac-ft = 0.026

	WQv, cf	RRv, cf
RRv, Bioretention Areas	115	1,128
WQv, Detention Pond	6,340	0
WQv, Treatment Unit	2,991	0
TOTAL, cf	9,446	1128
TOTAL, ac-ft	0.217	0.026

WQ & RR SUMMARY (ac-ft):

TOTAL WATER QUALITY PROVIDED FOR PROPOSED DEVELOPMENT AREA 0.243

IS WATER QUALITY VOLUME REQUIREMENT MET? Yes
(WQv provided equal to or greater than WQv required)

IS RUNOFF REDUCTION VOLUME REQUIREMENT MET? Yes
(RRv provided equal to or greater than Min. RRv required)

Version 1.7
Last Updated: 10/02/2015

Total Water Quality Volume Calculation
WQv(acre-feet) = [(P)(Rv)(A)] /12

Is this project subject to Chapter 10 of the NYS Design Manual (i.e. WQv is equal to post-development 1 year runoff volume)?.....	

Design Point:	1	
P=	1.00	*inch*

Breakdown of Subcatchments

Catchment Number	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Rv	WQv *(ft^3)*	Description
1	2.00	0.51	26%	0.28	2,029	
2	2.62	0.77	29%	0.31	2,991	
3	0.30	0.20	67%	0.65	708	
4	0.25	0.15	60%	0.59	535	
5						
6						
7						
8						
9						
10						
Subtotal (1-30)	5.17	1.63	32%	0.33	**6,264**	**Subtotal 1**
Total	5.17	1.63	32%	0.33	**6,264**	**Initial WQv**

Identify Runoff Reduction Techniques By Area

Technique	Total Contributing Area *(Acre)*	Contributing Impervious Area *(Acre)*	Notes
Conservation of Natural Areas	0.00	0.00	*minimum 10,000 sf*
Riparian Buffers	0.00	0.00	*maximum contributing length 75 feet to 150 feet*
Filter Strips	0.00	0.00	
Tree Planting	0.00	0.00	*Up to 100 sf directly connected impervious area may be subtracted per*
Total	**0.00**	**0.00**	

Recalculate WQv after application of Area Reduction Techniques

	Total Area *(Acres)*	Impervious Area *(Acres)*	Percent Impervious *%*	Runoff Coefficient Rv	WQv *(ft^3)*
"<<Initial WQv"	5.17	1.63	32%	0.33	6,264
Subtract Area	0.00	0.00			
WQv adjusted after Area Reductions	**5.17**	**1.63**	32%	0.33	6,264
Disconnection of Rooftops		0.00			
Adjusted WQv after Area Reduction and Rooftop Disconnect	5.17	1.63	32%	0.33	**6,264**
WQv reduced by Area Reduction techniques					0

Minimum RRv

Enter the Soils Data for the site		
Soil Group	Acres	S
A		55%
B		40%
C		30%
D	**5.17**	20%
Total Area	5.17	
Calculate the Minimum RRv		
S =	**0.20**	
Impervious =	1.63	*acre*
Precipitation	1	*in*
Rv	0.95	
Minimum RRv	**1,124**	***ft3***
	0.03	af

Bioretention Worksheet

(For use on HSG C or D Soils with underdrains)

Af=WQv*(df)/[k*(hf+df)(tf)]

Af	Required Surface Area (ft2)
WQv	Water Quality Volume (ft3)
df	Depth of the Soil Medium (feet)
hf	Average height of water above the planter bed
tf	Volume Through the Filter Media (days)

k — The hydraulic conductivity [ft/day], can be varied depending on the properties of the soil media. Some reported conductivity values are: ***Sand*** - 3.5 ft/day (City of Austin 1988); ***Peat*** - 2.0 ft/day (Galli 1990); ***Leaf Compost*** - 8.7 ft/day (Claytor and Schueler, 1996); ***Bioretention Soil*** (0.5 ft/day (Claytor &

Design Point:	**1**

Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
3	0.30	0.20	0.67	0.65	707.85	1.00	
Enter Impervious Area Reduced by Disconnection of Rooftops			67%	0.65	708	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						*ft^3*	

Soil Information			
Soil Group	D		
Soil Infiltration Rate	0.00	*in/hour*	*Okay*
Using Underdrains?	Yes	*Okay*	

Calculate the Minimum Filter Area				
		Value	Units	Notes
WQv		708	*ft^3*	
Enter Depth of Soil Media	*df*	1.5	*ft*	*2.5-4 ft*
Enter Hydraulic Conductivity	*k*	0.5	*ft/day*	
Enter Average Height of Ponding	*hf*	0.5	*ft*	*6 inches max.*
Enter Filter Time	*tf*	2	*days*	
Required Filter Area	***Af***	**531**	***ft^2***	

Determine Actual Bio-Retention Area			
Filter Width	8	*ft*	
Filter Length	139	*ft*	
Filter Area	1112	*ft^2*	
Actual Volume Provided	1483	*ft^3*	

Determine Runoff Reduction				
Is the Bioretention contributing flow to another practice?			Select Practice	
RRv	593			
RRv applied	**593**	***ft^3***	***This is 40% of the storage provided or WQv whichever is less.***	
Volume Treated	115	*ft^3*	*This is the portion of the WQv that is not reduced in the practice.*	
Volume Directed	0	*ft^3*	This volume is directed another practice	
Sizing √	OK		*Check to be sure Area provided ≥ Af*	

Bioretention Worksheet

(For use on HSG C or D Soils with underdrains)

Af=WQv*(df)/[k*(hf+df)(tf)]

Af	Required Surface Area (ft2)
WQv	Water Quality Volume (ft3)
df	Depth of the Soil Medium (feet)
hf	Average height of water above the planter bed
tf	Volume Through the Filter Media (days)

k — The hydraulic conductivity [ft/day], can be varied depending on the properties of the soil media. Some reported conductivity values are: ***Sand*** - 3.5 ft/day (City of Austin 1988); ***Peat*** - 2.0 ft/day (Galli 1990); ***Leaf Compost*** - 8.7 ft/day (Claytor and Schueler, 1996); ***Bioretention Soil*** (0.5 ft/day (Claytor &

Design Point:	**1**

Enter Site Data For Drainage Area to be Treated by Practice							
Catchment Number	**Total Area** *(Acres)*	**Impervious Area** *(Acres)*	**Percent Impervious** *%*	**Rv**	**WQv** *(ft^3)*	**Precipitation** *(in)*	**Description**
4	0.25	0.15	0.60	0.59	535.43	1.00	
Enter Impervious Area Reduced by Disconnection of Rooftops			60%	0.59	535	<<WQv after adjusting for Disconnected Rooftops	
Enter the portion of the WQv that is not reduced for all practices routed to this practice.						*ft^3*	

Soil Information			
Soil Group	D		
Soil Infiltration Rate	0.00	*in/hour*	*Okay*
Using Underdrains?	Yes	*Okay*	

Calculate the Minimum Filter Area				
		Value	Units	Notes
WQv		535	*ft^3*	
Enter Depth of Soil Media	*df*	1.5	*ft*	*2.5-4 ft*
Enter Hydraulic Conductivity	*k*	0.5	*ft/day*	
Enter Average Height of Ponding	*hf*	0.5	*ft*	*6 inches max.*
Enter Filter Time	*tf*	2	*days*	
Required Filter Area	***Af***	**402**	***ft^2***	

Determine Actual Bio-Retention Area			
Filter Width	20	*ft*	
Filter Length	55	*ft*	
Filter Area	1100	*ft^2*	
Actual Volume Provided	1467	*ft^3*	

Determine Runoff Reduction				
Is the Bioretention contributing flow to another practice?			Select Practice	
RRv	587			
RRv applied	**535**	***ft^3***	***This is 40% of the storage provided or WQv whichever is less.***	
Volume Treated	0	*ft^3*	*This is the portion of the WQv that is not reduced in the practice.*	
Volume Directed	0	*ft^3*	This volume is directed another practice	
Sizing √	OK		*Check to be sure Area provided ≥ Af*	