PRELIMINARY STORMWATER POLLUTION PREVENTION PLAN

For the:

Proposed Brandywine Estates – Phase 2
Henneberry Road
Town of Manlius

Prepared for:

HARRINGTON HOMES

Your Builder for Life

Harrington Homes, Inc
3848 Henneberry Road
Jamesville, NY 13078

Prepared by:

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Project No. 20-1906

September 2020

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EXECUTIVE SUMMARY

A. Purpose

The following Stormwater Pollution Prevention Plan (SWPPP) has been developed to control stormwater runoff and pollutants from a site during and after construction activities. The objective of this SWPPP is to comply with the NYSDEC SPDES Stormwater Permit from Construction Activities by planning and implementing standard design practices.

B. Project Description

The ±54 acre property is located on the west side of Henneberry Road in the Town of Manlius, Onondaga County, NY. This project consists of the subdivision and development of 34 single family homes. The development will also include necessary amenities such as public street(s), public/private utility extensions/connections, and applicable stormwater management facilities.

C. Stormwater Practices

Stormwater practices are categorized as either temporary construction measures or permanent operation measures. The temporary measures that will be used on this site for erosion and sediment control include (but are not limited to): stabilized construction entrance, silt fencing, and temporary sediment basins. The permanent stormwater practices to be installed are a series of vegetated swales, two bioretention areas, and four above ground grass-line detention basins which will provide water quality, runoff reduction, and storage for quantity control. All practices, both the temporary construction measures and the permanent operation measures, have been designed in accordance with the established standards.

D. Water Quality Treatment

The water quality volume treatment characteristics are summarized below. The entire water quality descriptions and calculations are further detailed in Section III.E and F.

Water Quality Volume	
Required WQv (ac-ft)	**Total Provided WQv (ac-ft)**
0.431	0.427

E. Runoff Reduction Volume (RRv)

The NYSDEC regulation requires all construction projects that disturb greater than one acre of land to provide runoff reduction through the implementation of green infrastructure practices. Runoff reduction volume for this project is achieved using vegetated swales and bioretention areas. This volume is summarized below and further detailed in Section III.D, E, and F.

Runoff Reduction Volume	
Required RRv (ac-ft)	**Total Provided RRv (ac-ft)**
0.051	0.143

F. Stormwater Quantity

The impacts to stormwater runoff quantity (i.e. peak flows) will be mitigated in the aboveground grass-lined detention basins throughout the site. The detention basins will be constructed with sufficient volume to store additional runoff from the site and discharge it in a controlled manner. The chart below summarizes the stormwater discharges from the site and is further detailed in Section III.G and H.

	Existing Peak Runoff Rate (cfs)			**Proposed Peak Runoff Rate (cfs)**		
Point of Study	Pt. 1B	Pt. 2	Pt. 3	Pt. 1B	Pt. 2	Pt. 3
10-Year Storm	69.99	7.68	9.35	28.86	1.33	5.84
100-Year Storm	163.03	18.46	22.06	101.76	3.01	12.42

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Section I. SCOPE

A. PURPOSE

Napierala Consulting, Professional Engineer, P.C., has prepared this Stormwater Pollution Prevention Plan (SWPPP) in compliance with the New York State Department of Environmental Conservation (NYSDEC) State Pollutant Discharge Elimination System (SPDES) Construction General Permit governing stormwater discharges during construction. The contractor's participation and adherence to this plan is mandatory. Non-compliance with the plan is subject to various remedies including, without limitation, monetary set-offs, withholding payments, reimbursement for costs, expenses (including reasonable attorney's fees), fines and civil penalties incurred and/or liquidated damages. This section provides a descriptive explanation of the Stormwater Pollution Prevention Plan and required contractor participation.

B. SPDES GENERAL PERMIT GP-0-20-001

Regulations enacted by the New York State Department of Environmental Conservation require permitting for the discharge of stormwater from construction activities on sites where an area of one acre or more of soil disturbance is proposed. To comply with these regulations, the developer of the site must request coverage under the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-20-001). In order to obtain coverage under the General Permit a Stormwater Pollution Prevention Plan (SWPPP) for the site must be prepared following the requirements of the New York State Stormwater Management Design Manual and the New York State Standards and Specifications for Erosion and Sediment Control.

The NOI, the SWPPP, and any amendments to the SWPPP, as well as any reports required by the SPDES General Permit for Stormwater Discharges from Construction Activity, must also be submitted concurrently to the local governing body and any other authorized agency having jurisdiction or regulatory control over the construction project.

C. RESPONSIBILITIES OF THE OWNER

The owner/operator shall identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP. The owner/operator shall identify the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP. The owner/operator shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. The owner/operator shall ensure that at least one trained contractor is on site on a daily basis when soil disturbance activities are being performed. The owner/operator shall have a qualified inspector conduct site inspections.

D. RESPONSIBILITIES OF THE CONTRACTOR

The contractor shall manage the discharge of stormwater from the site in accordance with the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity. The owner shall be responsible for conducting the stormwater management practices in accordance with the permit. The contractor shall be responsible for providing qualified inspectors to conduct the inspections required by the SWPPP. The contractor shall be responsible for any enforcement action taken or imposed by federal, state, or local agencies, including the cost of fines, construction delays, and remedial actions resulting from the contractor's failure to comply with the permit provisions. It shall be the responsibility of the contractor to make any changes to the SWPPP necessary when the contractor or any of his subcontractors elects to use borrow or fill or material storage sites, either contiguous to or remote from the construction

site, when such sites are used solely for this construction site. Such sites are considered to be part of the construction site covered by the permit and this SWPPP. Off-site borrow, fill, or material storage sites which are used for multiple construction projects are not subject to this requirement, unless specifically required by state or local jurisdictional entity regulations. The contractor should consider this requirement in negotiating with earthwork subcontractors, since the choice of an off-site borrow, fill, or material storage site may impact their duty to implement, make changes to, and perform inspections required by the SWPPP for the site.

The SWPPP shall provide forms for both the general contractor and subcontractor(s) identifying the company name, business address and telephone number along with the responsible person for the contractor and all subcontractors' who will implement the measures identified in the SWPPP. **The general contractor shall sign the "General Contractor's Certification" and all subcontractors shall sign the "Subcontractor's Certification",** verifying they have been instructed on how to comply with and fully understand the requirements of the NYSDEC and SWPPP. **This certification must be signed, by a fully qualified individual on behalf of each entity, prior to the beginning of any construction activities and shall be filed in the projects SWPPP.**

The SWPPP is meant to be a working document that shall be maintained at the site of the construction activities at all times throughout the project, shall be readily available upon request by the operator's personnel or NYSDEC or any other agency with regulatory authority over storm water issues, and shall be kept on-site until the site complies with the Final Stabilization section of this document. **A sign or other notice must be posted near the main entrance of the construction site which contains a completed NOI, the location of the SWPPP and the name and phone number of a contact person responsible for scheduling SWPPP viewing times, and any other state specific requirements.**

E. NOTICE OF INTENT

The operator has petitioned the NYSDEC for the stormwater discharges during construction at this site to be covered by the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity. A **Notice of Intent** (NOI) to be covered under this permit has been filed by the operator. The signatory on the NOI must sign all documents (i.e., inspection reports) associated with the SWPPP. If the signatory chooses not to sign all documents, he/she must designate a duly authorized representative to sign all relevant documents. This designation must be made in writing and be included in the SWPPP. The duly authorized representative may be either a named individual or any individual occupying a named position. Additionally, the written designation must be submitted to the NYSDEC.

F. STORMWATER INSPECTIONS

1. Inspection Procedures

Inspections of the erosion control practices are required every seven days by a qualified professional. All inspections will continue until the site complies with the final stabilization section of this document. **Weekly Inspections must be conducted by a "Qualified Professional". "Qualified Professional" means a person knowledgeable in the principles and practice of erosion and sediment controls, such as a licensed Professional Engineer (PE), Certified Professional in Erosion and Sediment Control (CPESC), or soil scientist.** Each inspection must be followed up by a report documenting the inspector's findings and request the required maintenance and/or repair for the erosion and sedimentation control measures. It is imperative that the contractor documents the inspection and maintenance of all erosion and sedimentation control measures as soon as possible after the inspection and/or maintenance have been completed. These records are used to prove that the required inspection and maintenance were performed. The records shall be placed in the SWPPP. In addition to inspection and maintenance reports, records should be kept of the construction activities that occur on the site. The operator shall post at the site, in a publicly-accessible location, a summary of the site inspection activities on a monthly basis.

2. Record Keeping

The operator shall also prepare a written summary of its status with respect to compliance with this

general permit at a minimum frequency of every three months during which coverage under the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity exists. The summary should address the status of achieving each component of the SWPPP. The reports shall be signed by the signatory of the NOI or a duly-authorized person and be retained at the construction site.

The contractor shall retain copies of the SWPPP, all reports and data for a minimum of five (5) years after the project. The following list identifies the required inspection and maintenance documentation that must be maintained by the contractor under this SWPPP.

- Inspection Report
- Stabilization Schedule
- Implementation Schedule
- Status Report

G. SWPPP MODIFICATIONS

The inspection report should also identify if any revisions to the SWPPP are warranted due to unexpected conditions. The SWPPP is meant to be a dynamic working guide that is to be kept current and amended whenever:

- The NYSDEC provides notification that the SWPPP does not comply with the minimum permit requirements.
- The design, construction, operation, or maintenance of the site changes in a way which significantly affects the potential for the discharge of pollutants or when the plan proves to be ineffective in eliminating or significantly minimizing pollutant discharges
- Within seven (7) calendar days of knowledge of a reportable release.

Any such changes to the SWPPP must be made in writing within seven (7) days of the date such modification or amendment is made. The contractor's failure to monitor or report deficiencies to the operator will result in the contractor being liable for fines and construction delays resulting from any federal, state, or local agency enforcement action.

H. FINAL STABILIZATION AND TERMINATION OF PERMIT COVERAGE

A site can be considered stabilized when all soil disturbing activities have been completed and a uniform perennial vegetative cover with a density of 80% over the unpaved areas and areas not covered by permanent structures has been established or equivalent permanent stabilization measures have been established and the facility no longer discharges stormwater associated with construction activities, and a **Notice of Termination** (NOT) form has been filed by the operator(s) with the NYSDEC. Prior to filing of the Notice of Termination, the operator shall have the qualified professional perform a final site inspection. The qualified professional shall certify that the site has undergone final stabilization using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fence) not needed for long-term erosion control have been removed. The filing of the NOT terminates coverage under the General Permit and terminates the contractor's responsibility to implement the SWPPP, but the requirements of the SWPPP, including periodic inspections, must be continued until the NOT is filed. Upon achieving this milestone, the contractor shall also submit "Final Stabilization Certification/Termination Checklist". Final payment and/or the release of any retainer will be withheld until all provisions of the SWPPP have been submitted, completed and accepted by the operator.

Section II. SITE DESCRIPTION

A. PROJECT NAME AND LOCATION

Harrington Home, Inc
Brandywine Estates, Phase 2
Henneberry Road
Town of Manlius
Onondaga County, New York

UTM Coordinates from NYSDEC Interactive Map: E: 417962; N: 4759972
NYSDEC Region 7

The ±54 acre property is located on the west side of Henneberry Road in the Town of Manlius, Onondaga County, NY. Figure 1 shows the project location on a street map and Figure 2 shows an aerial image of the proposed site in its existing condition.

B. OWNER/OPERATOR NAME AND ADDRESS

Harrington Homes, Inc
3848 Henneberry Road
Jamesville, NY 10378

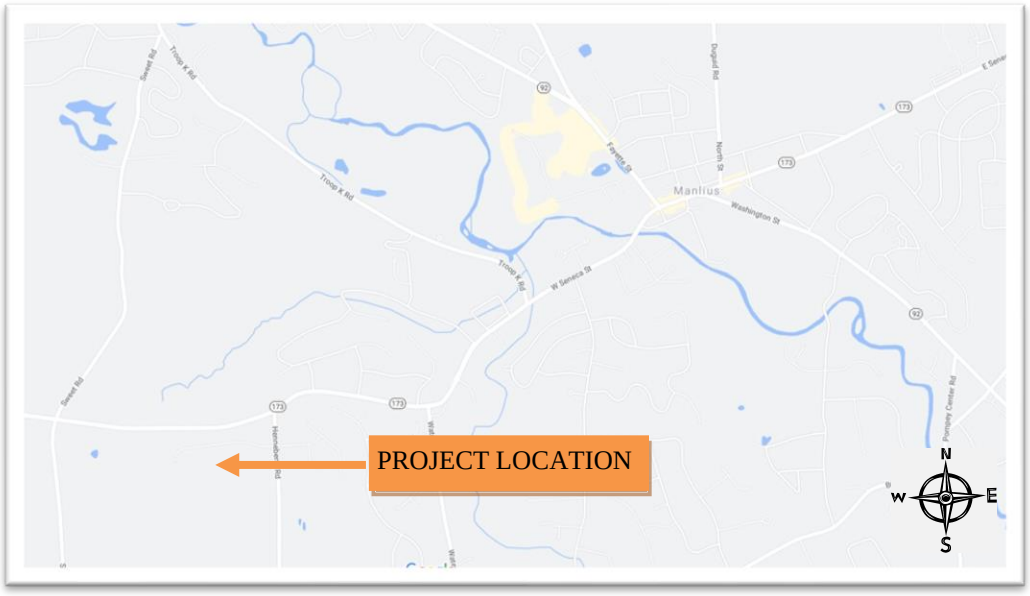


Figure 1: Site Location Map

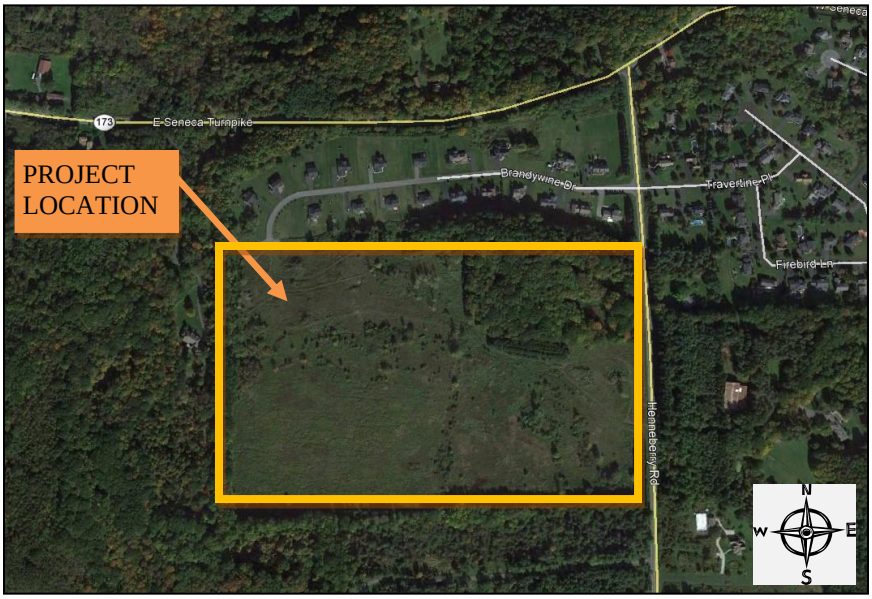


Figure 2: Proposed Site Aerial Image - Google Earth

C. PROJECT DESCRIPTION

The ±54 acre property is located on the west side of Henneberry Road in the Town of Manlius, Onondaga County, NY. This project consists of the subdivision and development of 34 single family homes. The development will also include necessary amenities such as public street(s), public/private utility extensions/connections, and applicable stormwater management facilities.

D. RECEIVING WATERS

Runoff from the site generally flows to the north toward Limestone Creek. This site is within a regulated MS4 (municipal separate storm sewer system). Figure 3 shows the project site location in relation to certain environmental boundaries using the NYSDEC Environmental Resource Mapper. The NYSDEC Environmental Resource Mapper shows that no regulated wetlands are within the vicinity of the project.

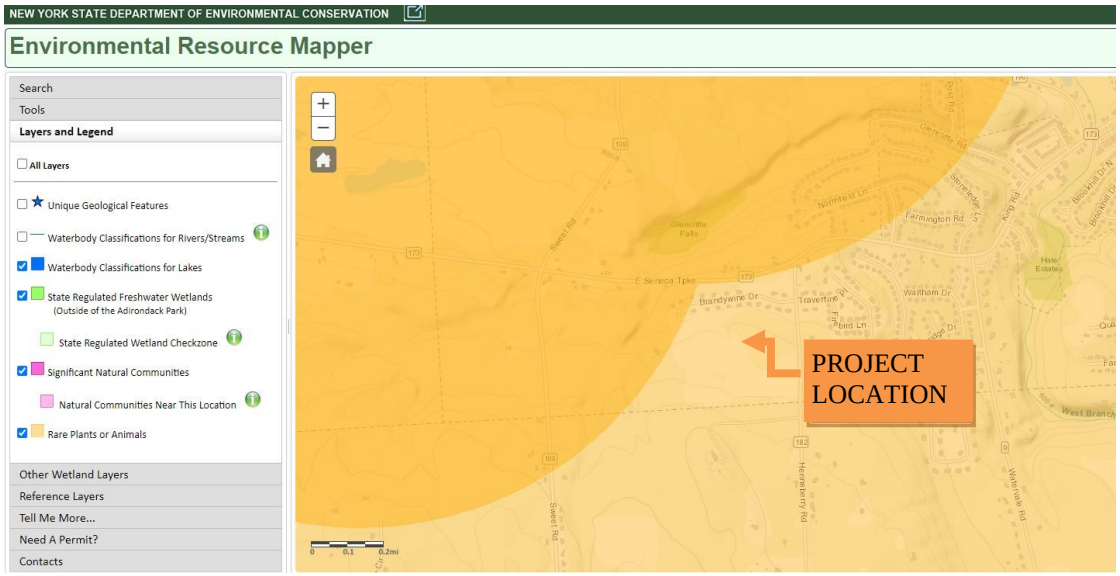


Figure 3: NYS DEC Environmental Resource Mapper

E. ENDANGERED OR THREATENED SPECIES

The NYS DEC Environmental Resource Mapper does not identify the site as containing any rare significant natural communities but is within the check zone for rare plants or animals. The site has been previously disturbed and therefore will not have an impact on plant or animal species but we have reached out to Natural Heritage for confirmation.

F. FEDERAL AND STATE HISTORIC PRESERVATION

The SPDES (State Pollutant Discharge Elimination System) GP-0-20-001 requires that the discharge from construction activities shall not influence properties listed as or eligible for listing on the State or National Register of Historic Places. Figure 4 shows the SHPO (State Historic Preservation) map which indicates the project is not within an archeological check zone.

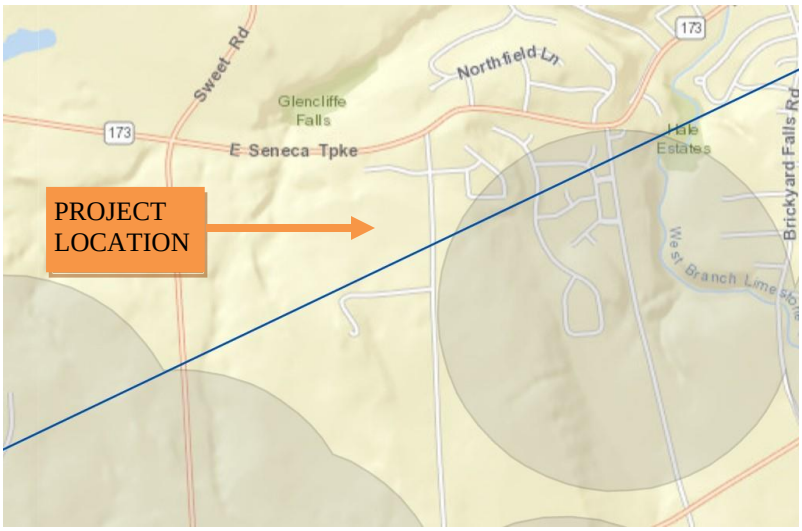


Figure 4: State Historic Preservation Office Map

G. FEMA

Based on local GIS mapping, there are no floodplain/floodway boundaries on this property, as shown on Figure 5 below. This is also confirmed on the site survey by Ianuzi and Romans Land Surveying, P.C., noting the project is in Zone X.

Figure 5: Onondaga County GIS Mapping

Section III. STORMWATER MANAGEMENT

A. METHODOLOGY

1. Hydrologic Conditions

The peak runoff rates for the site were calculated for the existing and proposed hydrologic conditions using HydroCAD software. The HydroCAD program uses the standard SCS TR-55 Curve Number Method for calculation of the time of concentration, composite curve number, and peak runoff rates for the drainage area(s) based on input by the user. The input data was taken from soil maps, detailed topographic and utility survey information, rainfall distribution maps, and aerial images. The required Water Quality Volume (WQ_v) was calculated in accordance with the New York State Stormwater Management Design Manual. The Channel Protection Volume (Cp_v) was calculated based on the release of the 1-year storm runoff volume over a 24-hour period. The hydrologic conditions are used to assess the impacts to the runoff characteristics and to design appropriate measures to mitigate these impacts. The NYS SPDES General Permit for Stormwater Discharges from Construction Activity requires that a stormwater mitigation system meet the following five design criteria.

a. Water Quality Volume: The system must capture and treat 90% of the average annual runoff volume.
b. Runoff Reduction Volume: The system must apply green infrastructure techniques and Stormwater Management Practices to replicate pre-development hydrology.
c. Provide 24-hour extended detention of the runoff from the one-year, 24-hour rainfall event.
d. Attenuation of the post-development 10-year, 24-hour peak discharge rate to predevelopment levels.
e. Attenuation of the post-development 100-year, 24-hour peak discharge rate to predevelopment levels.

2. Rainfall Information

The following table shows the rainfall values used in the design of the stormwater mitigation basin. These values are taken from rainfall distribution maps provided by the Northeast Regional Climate Center and the New York State Stormwater Management Design Manual, which can be seen on the following page. These values are applied to a Type II 24-hour rainfall distribution in the modeling of the watersheds using the HydroCAD program.

Table 1: Rainfall Information

Precipitation Event	Rainfall in inches
90% Rainfall (WQ_v)	1.0
1-Yr, 24-Hr (Cp_v)	2.04
10-Yr, 24-Hr (Q_p)	3.43
50-Yr, 24-Hr	4.94
100-Yr, 24-Hr (Q_f)	5.78

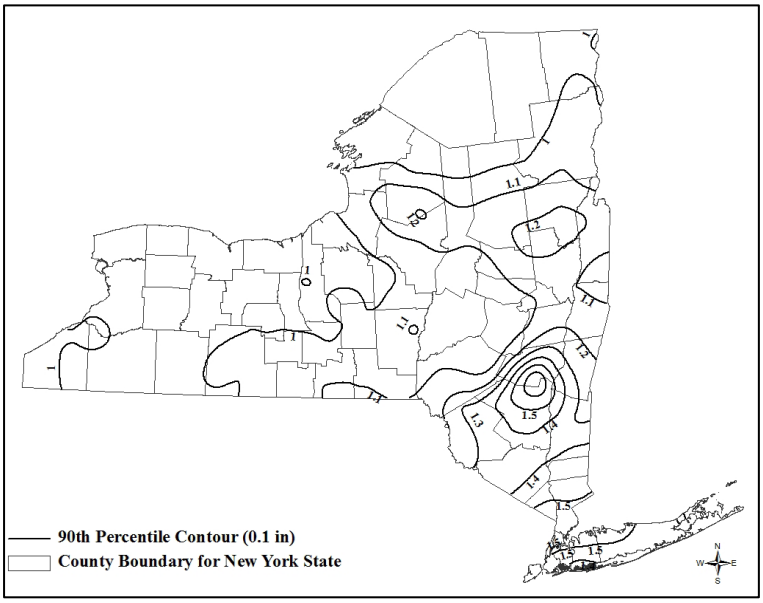


Figure 6: New York State 90% Rainfall Map

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	New York
Location	
Longitude	76.007 degrees West
Latitude	42.988 degrees North
Elevation	0 feet
Date/Time	Thu, 20 Aug 2020 10:25:27 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr
1yr	0.28	0.43	0.53	0.69	0.86	1.06	**1yr**	0.75	0.96	1.21	1.45	1.73	2.04	2.29
2yr	0.33	0.50	0.63	0.82	1.04	1.28	**2yr**	0.89	1.16	1.44	1.73	2.04	2.39	2.68
5yr	0.39	0.61	0.76	1.02	1.31	1.61	**5yr**	1.13	1.44	1.83	2.17	2.54	2.93	3.31
10yr	0.44	0.70	0.88	1.20	1.55	1.93	**10yr**	1.34	1.69	2.19	2.59	3.00	3.43	3.88
25yr	0.53	0.84	1.07	1.48	1.96	2.44	**25yr**	1.69	2.10	2.76	3.25	3.73	4.22	4.80
50yr	0.60	0.97	1.24	1.74	2.34	2.93	**50yr**	2.02	2.48	3.32	3.88	4.41	4.94	5.63
100yr	0.70	1.13	1.46	2.06	2.80	3.51	**100yr**	2.42	2.94	3.96	4.60	5.21	5.78	6.62
200yr	0.80	1.31	1.69	2.43	3.35	4.20	**200yr**	2.89	3.47	4.74	5.48	6.15	6.77	7.78
500yr	0.98	1.61	2.09	3.04	4.25	5.33	**500yr**	3.67	4.35	5.99	6.88	7.65	8.35	9.65

Figure 7: Northeast Regional Climate Center Design Storms

3. Soil Information

The majority of the soils within the project site area consist of Aurora silt loam and Angola-Darien silt loams which are classified as Hydrologic Soil Group D. This indicates that the site should have low transmissive soils if undeveloped. The NRCS Soil Survey Map is shown in Figure 8 below and the soil descriptions can be reviewed in Appendix C.

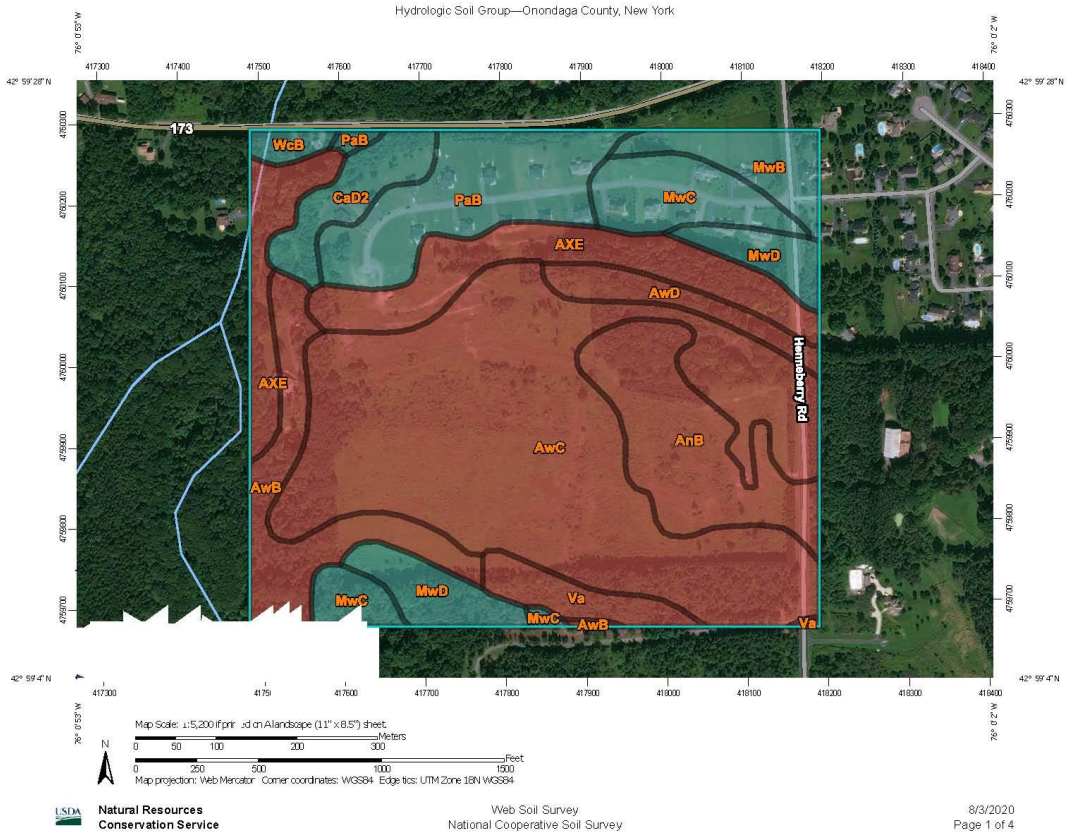


Figure 8: Project Site NRCS Soil Survey Map

B. EXISTING CONDITIONS

The existing project drainage area consists of approximately ±56 acres of mixed woods, brush, and grass area located on the west side of Henneberry Road and to the south of the Brandywine Road subdivision. The only impervious area in the existing drainage area is the hammerhead at the end of Brandywine Drive to the northwest. The entirety of the subject site slopes generally towards the north at grades varying between ±3% and 13%. The overall drainage area has three main points of study at which the peak runoff rates for pre and post-development conditions were analyzed. Point of Study 1 is split into two drainage areas: DA-1, which drains to Point 1A, and DA-2, which drains to Point 1B. These two points combine at a common drainage channel offsite to the west, and are therefore being treated as a common point of study in an effort to be more conservative. DA-3 and DA-4 drain to Point 2 and Point 3, respectively.

DA-1 includes a significant offsite wooded area to the south of the project site. This area sheet flows to the existing grass area on-site before being channelized in a drainage ditch that flows from east to west across the width of the project site. This ditch discharges to an offsite drainage ditch to the west of the subject site at Point 1A before combining with the discharge of Point 1B downstream of the project site.

Table 2: Existing Drainage Area 1 Curve Number Calculation

Area (ac)	CN	Description
12.250	77	Woods, Good, HSG D
28.140	80	>75% Grass cover, Good, HSG D
40.390	79	Weighted Average
40.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0600	0.10		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.39"
3.6	885	0.0650	4.10		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
2.2	1,127	0.0080	8.44	135.03	**Channel Flow, Swale** Area= 16.0 sf Perim= 8.0' r= 2.00' n= 0.025 Earth, clean & straight
21.8	2,112	Total			

DA-2 includes wooded, grass, and brush area that drain to the northeast to Point 1B. There is a series of existing drainage swales that channelize flow towards this point of study. This area is located to the north of the existing drainage ditch that cuts through the site and includes the hammerhead at the end of Brandywine Drive.

Table 3: Existing Drainage Area 2 Curve Number Calculation

Area (ac)	CN	Description
0.650	77	Woods, Good, HSG D
4.040	80	>75% Grass cover, Good, HSG D
0.070	98	Paved parking, HSG D
4.760	80	Weighted Average
4.690		98.53% Pervious Area
0.070		1.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0650	0.16		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.39"
0.5	144	0.0833	4.65		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
0.6	726	0.0440	21.93	307.08	**Channel Flow, Swale** Area= 14.0 sf Perim= 6.0' r= 2.33' n= 0.025 Earth, clean & straight
11.4	970	Total			

DA-3 consists of a significant portion of wooded area and grass area on the north side of the subject site. This portion drains to Point 2 which is a drainage structure locate within a drainage easement on the southern boundary of the existing Brandywine subdivision. Flow from this structure enters a conveyance system which drains towards the XXXX.

Table 4: Existing Drainage Area 3 Curve Number Calculation

Area (ac)	CN	Description
3.330	77	Woods, Good, HSG D
2.740	80	>75% Grass cover, Good, HSG D
6.070	78	Weighted Average
6.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	100	0.0400	0.13		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.39"
14.2	555	0.0170	0.65		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
1.5	281	0.0360	3.05		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
0.2	280	0.1210	20.51	205.13	**Channel Flow, Swale** Area= 10.0 sf Perim= 5.0' r= 2.00' n= 0.040 Earth, dense weeds
28.4	1,216	Total			

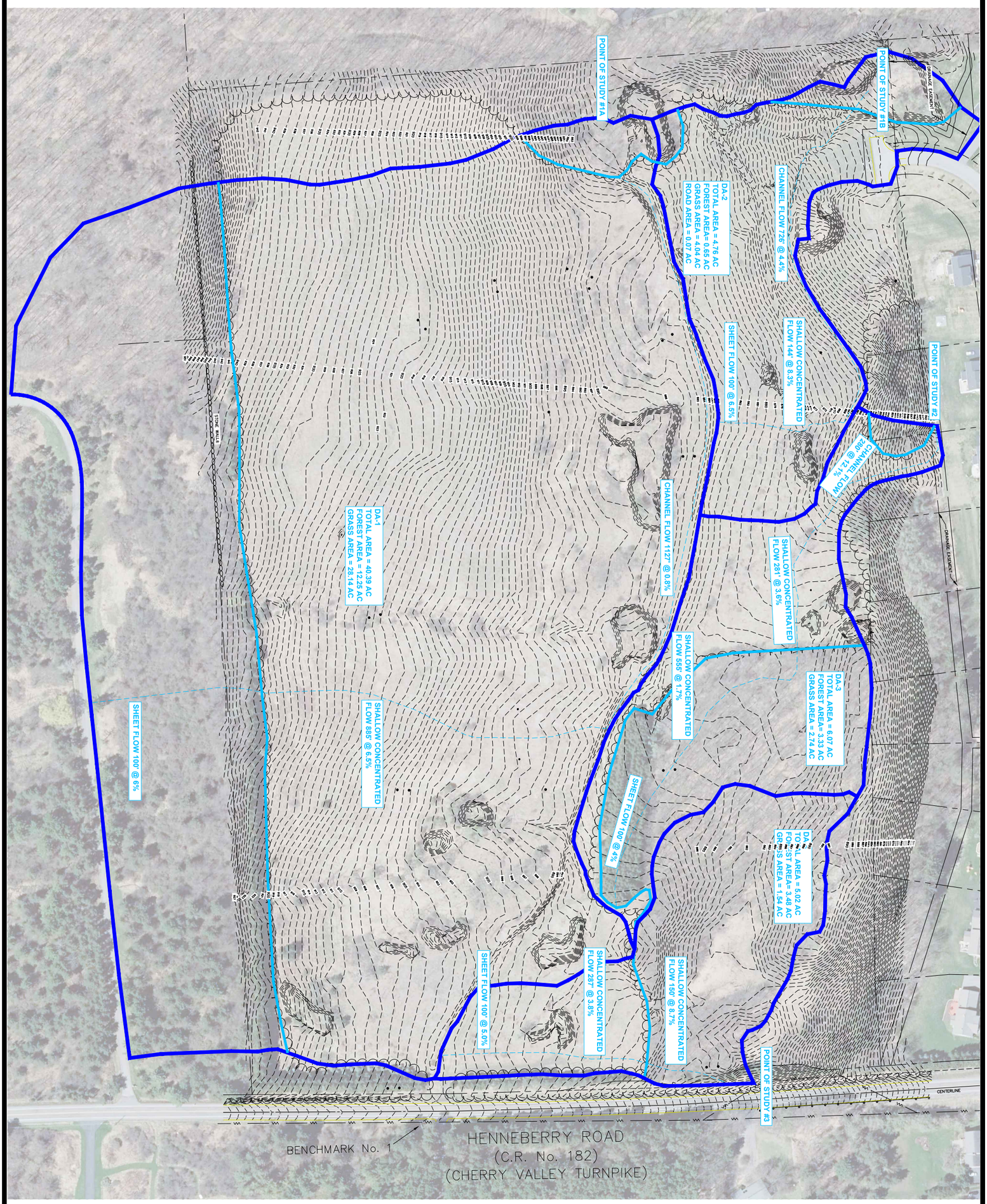
DA-4 includes the wooded and grassed area in the northeast portion of the subject site. This area drains to Point 3 and represents the tributary area to the drainage ditch within the right-of-way on the west side of Henneberry Road.

Table 5: Existing Drainage Area 4 Curve Number Calculation

Area (ac)	CN	Description
3.480	77	Woods, Good, HSG D
1.540	80	>75% Grass cover, Good, HSG D
5.020	78	Weighted Average
5.020		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.39"
1.5	287	0.0380	3.14		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
1.7	150	0.0870	1.47		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
14.6	537	Total			

The map on the following page summarizes the hydrology of the proposed condition watershed.



PLAN SEAL BY:
NEAL H. ZINSMEYER, JR., P.E.
NYS REGISTRATION # 087211

SHEET
EX

PROJECT NO.
20-1906

DATE
17 SEP 2020

SCALE
1" = 80'

PREPARED BY:
NAPIERALA CONSULTING
PROFESSIONAL ENGINEER, P.C.
SITE • DESIGN • ENGINEERING
110 FAYETTE STREET
MANLIUS, NEW YORK 13104
email: MNAP@NAPCON.COM
PH: (315) 682-5580 FAX: (315) 682-5544

NO.	REVISION/ISSUE	DATE

SHEET TITLE:
EXISTING
DRAINAGE AREA

PROJECT TITLE:
BRANDYWINE ESTATES PHASE 2
HENNEBERRY ROAD
TOWN OF MANLIUS ONONDAGA COUNTY, NY

PREPARED FOR:
HARRINGTON HOMES
3848 HENNEBERRY ROAD
JAMESVILLE, NY 13078

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C. PROPOSED CONDITIONS

This project consists of the construction of a 34-lot subdivision of single-family homes. The impervious area on each lot will consist of rooftop area, which will be properly disconnected via gutter discharge to grass buffer strips, and asphalt driveway area, which is assumed to be approximately 1,200 square-feet (about 0.03 acres) for each individual lot. The development will also include necessary amenities such as public street(s), public/private utility extensions/connections, and applicable stormwater management facilities. The stormwater mitigation area will collect and treat runoff in order to meet the objectives of the SPDES General Permit for Stormwater Discharges from Construction Activity and local regulations.

The stormwater management system includes several management practices to capture, treat and control the release of runoff from the site. Runoff from the impervious areas, both rooftop and asphalt, will be directed to practices to provide infiltration/runoff reduction, water quality treatment and water quantity storage. The following stormwater management practices will be constructed:

- Bioretention Areas: Bioretention filters are considered a standard stormwater management practice with runoff reduction capacity to decrease stormwater quantity and improve water quality (NYSDEC Stormwater Management Design Manual, p. 5-97)[1]. The filters collect runoff from rainfall events, temporarily store it, and filter it through the root structure of the plants and the planting soil media. Through the plants' uptake of runoff and the filtering through the soil media, the amount of runoff the site generates is reduced and the remaining runoff from these frequent, but less intense, rainfall events is treated to remove pollutants such as suspended solids and phosphorus. The runoff in excess of the water quality event (the 90th-percentile rain event) will discharge to the downstream detention basin.
- Vegetated Swale: Vegetated swales are open drainage channel systems lined with grass and designed to capture and divert stormwater runoff to a downstream point of collection or discharge. Vegetated swales temporarily store, infiltrate, and treat stormwater runoff from lower intensity storms while providing a path of conveyance for higher intensity storm events.
- Detention Basin: The detention basin will collect runoff from the more intense but less frequent rainfall events and temporarily store and released in a controlled manner such that the peak rates of runoff to the downstream design points will not be adversely impacted.

DA-A includes off-site wooded area and portions of the proposed development. This area is treated by a vegetated swale and is directly tributary to Detention Basin #1.

Table 6: Proposed Drainage Area A Curve Number Calculations

Area (ac)	CN	Description
0.270	98	Paved parking, HSG D
2.580	80	>75% Grass cover, Good, HSG D
1.540	77	Woods, Good, HSG D
0.280	98	Roofs, HSG D
4.670	81	Weighted Average
4.120		88.22% Pervious Area
0.550		11.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0600	0.10		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 2.39"
2.5	188	0.0650	1.27		**Shallow Concentrated Flow, SCF** Woodland Kv= 5.0 fps
0.8	202	0.0650	4.10		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	230	0.0200	16.17	32.33	**Channel Flow, GUTTER** Area= 2.0 sf Perim= 2.0' r= 1.00' n= 0.013 Asphalt, smooth
19.5	720	Total			

[1] The "biogeochemical process" in terms of stormwater management is the pathway by which water is recycled through plant material where the plant can consume it or return it to the atmosphere through evapotranspiration.

DA-B includes ±8 acres of off-site wooded area, and significant portions of the proposed development. This area is treated by Bioretention Area #1 and is directly tributary to Detention Basin #1.

Table 7: Proposed Drainage Area B Curve Number Calculations

Area (ac)	CN	Description
0.740	98	Paved parking, HSG D
7.140	80	>75% Grass cover, Good, HSG D
7.840	77	Woods, Good, HSG D
0.490	98	Roofs, HSG D
16.210	80	Weighted Average
14.980		92.41% Pervious Area
1.230		7.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0600	0.10		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 2.39"
4.8	370	0.0650	1.27		**Shallow Concentrated Flow, SCF** Woodland Kv= 5.0 fps
0.8	200	0.0650	4.10		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.3	290	0.0200	16.17	32.33	**Channel Flow, GUTTER** Area= 2.0 sf Perim= 2.0' r= 1.00' n= 0.013 Asphalt, smooth
21.9	960	Total			

DA-C includes portions of the proposed development within the middle of the proposed loop road. This area is treated by a vegetated swale and is directly tributary to Detention Basin #3.

Table 8: Proposed Drainage Area C Curve Number Calculations

Area (ac)	CN	Description
0.060	98	Paved parking, HSG D
3.200	80	>75% Grass cover, Good, HSG D
0.180	98	Roofs, HSG D
3.440	81	Weighted Average
3.200		93.02% Pervious Area
0.240		6.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0600	0.16		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
1.5	270	0.0370	3.10		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
12.1	370	Total			

DA-D includes portions of the proposed development on the inside and outside of the proposed loop road. This area is treated by a vegetated swale and is directly tributary to Detention Basin #3.

Table 9: Proposed Drainage Area D Curve Number Calculations

Area (ac)	CN	Description
0.310	98	Paved parking, HSG D
2.560	80	>75% Grass cover, Good, HSG D
0.170	98	Roofs, HSG D
3.040	83	Weighted Average
2.560		84.21% Pervious Area
0.480		15.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0700	0.17		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.5	140	0.0900	4.83		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.3	200	0.0200	9.55	76.42	**Channel Flow, swale flow** Area= 8.0 sf Perim= 8.0' r= 1.00' n= 0.022 Earth, clean & straight
10.8	440	Total			

DA-E includes portions of the proposed development to northwest of the proposed loop road. This area is treated by a vegetated swale before draining to Point 1B.

Table 10: Proposed Drainage Area E Curve Number Calculations

Area (ac)	CN	Description
0.030	98	Paved parking, HSG D
1.800	80	>75% Grass cover, Good, HSG D
0.070	98	Roofs, HSG D
1.900	81	Weighted Average
1.800		94.74% Pervious Area
0.100		5.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.3	85	0.0950	4.96		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
11.7	185	Total			

DA-F includes portions of the proposed development on the inside and outside of the proposed loop road. This area is treated by a vegetated swale and Bioretention #2 before draining to Detention Basin #2.

Table 11: Proposed Drainage Area F Curve Number Calculations

Area (ac)	CN	Description
0.090	98	Paved parking, HSG D
2.040	80	>75% Grass cover, Good, HSG D
0.140	98	Roofs, HSG D
2.270	82	Weighted Average
2.040		89.87% Pervious Area
0.230		10.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.7	150	0.0500	3.60		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
12.1	250	Total			

DA-G includes portions of the proposed development on the inside and outside of the proposed loop road. This area is treated by Bioretention #2 and is directly tributary to Detention Basin #2.

Table 12: Proposed Drainage Area G Curve Number Calculations

Area (ac)	CN	Description
1.050	98	Paved parking, HSG D
8.080	80	>75% Grass cover, Good, HSG D
0.490	98	Roofs, HSG D
9.620	83	Weighted Average
8.080		83.99% Pervious Area
1.540		16.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, sheet** Grass: Dense n= 0.240 P2= 2.39"
1.1	250	0.0550	3.78		**Shallow Concentrated Flow, shallow conc flow** Unpaved Kv= 16.1 fps
12.5	350	Total			

DA-H includes on-site wooded area and portions of the proposed development on the inside and outside of the proposed loop road. This area is treated by a vegetated swale before draining to Detention Basin #2.

Table 13: Proposed Drainage Area H Curve Number Calculations

Area (ac)	CN	Description
0.060	98	Paved parking, HSG D
2.100	80	>75% Grass cover, Good, HSG D
1.030	77	Woods, Good, HSG D
0.210	98	Roofs, HSG D
3.400	81	Weighted Average
3.130		92.06% Pervious Area
0.270		7.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0300	0.12		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.9	155	0.0300	2.79		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
14.9	255	Total			

DA-1 includes off-site wooded area and on-site grass area that is tributary to Point 1A.

Table 14: Proposed Drainage Area 1 Curve Number Calculations

Area (ac)	CN	Description
3.390	80	>75% Grass cover, Good, HSG D
2.850	77	Woods, Good, HSG D
0.030	98	Paved parking, HSG D
0.070	98	Roofs, HSG D
6.340	79	Weighted Average
6.240		98.42% Pervious Area
0.100		1.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0600	0.16		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
5.4	485	0.0900	1.50		**Shallow Concentrated Flow, SCF** Woodland Kv= 5.0 fps
1.8	517	0.0900	4.83		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	300	0.0860	27.67	442.73	**Channel Flow, SWALE** Area= 16.0 sf Perim= 8.0' r= 2.00' n= 0.025 Earth, clean & winding
18.0	1,402	Total			

DA-2 includes a portion of the development in the northwest portion of the subject site including the cul-de-sac at the end of Brandywine Drive. DA-2 is tributary to Point 1B.

Table 15: Proposed Drainage Area 2 Curve Number Calculations

Area (ac)	CN	Description
2.070	80	>75% Grass cover, Good, HSG D
0.660	77	Woods, Good, HSG D
0.220	98	Paved parking, HSG D
0.140	98	Roofs, HSG D
3.090	81	Weighted Average
2.730		88.35% Pervious Area
0.360		11.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0700	0.17		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.2	56	0.1300	5.80		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	367	0.0820	27.02	432.31	**Channel Flow, SWALE** Area= 16.0 sf Perim= 8.0' r= 2.00' n= 0.025 Earth, clean & winding
10.4	523	Total			

DA-3 includes a minor portion of wooded area and on-site grass area that is tributary to Point 2.

Table 16: Proposed Drainage Area 3 Curve Number Calculations

Area (ac)	CN	Description
0.390	80	>75% Grass cover, Good, HSG D
0.140	77	Woods, Good, HSG D
0.530	79	Weighted Average
0.530		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.1500	0.23		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.3	104	0.1300	5.80		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
7.7	204	Total			

DA-4 includes the northeastern-most portion of the development that drains to Point 3.

Table 17: Proposed Drainage Area 4 Curve Number Calculations

Area (ac)	CN	Description
2.020	80	>75% Grass cover, Good, HSG D
0.250	98	Paved parking, HSG D
0.140	98	Roofs, HSG D
2.410	83	Weighted Average
2.020		83.82% Pervious Area
0.390		16.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0450	0.14		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
1.5	307	0.0450	3.42		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	80	0.0200	6.42	5.04	**Pipe Channel, storm pipe** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
13.6	487	Total			

The map on the following page summarizes the hydrology of the proposed condition watershed.

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PLAN SEAL BY:
NEAL H. ZINSMEYER, JR., P.E.
NYS REGISTRATION # 087211

SHEET
PR

PROJECT NO.
20-1906

DATE
17 SEP 2020

SCALE
1" = 80'

PREPARED BY:
NAPIERALA CONSULTING
PROFESSIONAL ENGINEER, P.C.
SITE • DESIGN • ENGINEERING
110 FAYETTE STREET
MANLIUS, NEW YORK 13104
email: MNAP@NAPCON.COM
PH: (315) 682-5580 FAX: (315) 682-5544

NO.	REVISION/ISSUE	DATE

SHEET TITLE:
PROPOSED DRAINAGE AREA

PROJECT TITLE:
BRANDYWINE ESTATES PHASE 2
HENNEBERRY ROAD
TOWN OF MANLIUS
ONONDAGA COUNTY, NY

PREPARED FOR:
HARRINGTON HOMES
3848 HENNEBERRY ROAD
JAMESVILLE, NY 13078

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D. RUNOFF REDUCTION VOLUME (RRV)

The NYSDEC implemented regulations effective March 1, 2011 that requires all construction projects that disturb greater than one acre of land to provide runoff reduction through the implementation of green infrastructure practices. The goal of the runoff reduction volume criteria is to implement stormwater management practices and green infrastructure techniques to replicate pre-development hydrology. The NYS Stormwater Management Design Manual provides the acceptable green planning techniques and green infrastructure techniques to meet the runoff reduction volume criteria. The following narrative and calculations detail the implementation of the planning and infrastructure techniques on the site to achieve the minimum runoff reduction volume. The narrative follows the Design Manual, Chapter 5.

PLANNING

1. Plan to preserve, avoid, and minimize:

	Applicable	Not Applicable
a. Preserve undisturbed, natural buffer, and critical environmental areas.	☐	☒
b. Employ open space, conservation, and clustering site design techniques.	☒	☐
c. Avoid developing in environmentally sensitive areas: floodplain, steep slopes, habitat, ecosystems, bedrock, wetlands, shorelines, shallow groundwater, impervious soils and unstable soils.	☒	☐
d. Minimize impervious surfaces: building footprints, parking, roads, sidewalks, and driveways.	☒	☐
e. Minimize clearing and grading	☒	☐

Discussion:

a. The project does not have any critical environmental areas.

b. Open space is used in projects on tracts of land where the development can be concentrated in a portion of the site while maintaining large portions of undisturbed land. Open space design was taking into consideration when planning the subdivision of the property. Town code requires lot sizes to be a minimum of 40,000 square feet and this plan proposes lots between 43,000 sf and 100,000 sf.

c. The project does not have any critical environmental areas with the exception of steep slopes. Development in steep slopes will be minimized as much as possible and is limited to areas of the individual homes.

d. The NYS Stormwater Design Manual discusses building footprint reduction in terms of building multiple floors to achieve the same, or comparable, square footage as a single-floor footprint. The majority of these house are expected to be two-story homes to reduce the footprint and achieve more square foot area of the house.

e. The proposed grading plan for the project minimizes the amount of grading to the maximum extent practicable. Grade requirements for a functional site, including slopes to meet the buildable lots, were taken into account during the design phase. The off-grading was designed to catch up to the existing grade in the shortest distance possible (i.e., minimize off-grading) while still meeting acceptable standards for slope stabilization and erosion control.

Disconnection of Rooftop Runoff

All direct runoff from residential rooftop areas has been designed to be distributed to surrounding pervious areas to promote overland vegetative filtering and infiltration. As such, all rooftop impervious area is treated as pervious lawn area when calculating the required water quality volume and runoff reduction volume. The rooftop impervious area is not deducted when calculating the water quantity mitigation in the detention basins.

E. WATER QUALITY VOLUME (WQ_v) REQUIRED:

1. Calculate the required water quality volume for new impervious area within DA-1

$$\mathbf{WQ_v = \frac{PR_vA}{12}}$$

90-th Percentile Rainfall (P) = 1.0 inch

Drainage Area (A) = 44.55 acres

Impervious Area (A_I) = 3.22 acres

$$R_v = 0.05 + 0.9\left(\frac{A_I}{A}\right)$$

$$R_v = 0.05 + 0.9(0.0754)$$

$R_v = 0.115$

therefore:

$$WQ_v = \frac{1.0*0.115*44.55}{12}$$

Total WQ_v Required= 0.427 ac·ft (18,600 cf)

2. Minimum RR_v requirements

Calculate minimum required Runoff Reduction Volume (RR_v) for DA-1 using:

$$\mathbf{RR_v = \frac{P \cdot Rv \cdot S \cdot A_I}{12}}$$

A_I = total impervious area

S = 0.55 (A Soils), 0.40 (B Soils), 0.30 (C Soils), 0.20 (D Soils), or weighted HSG average in drainage area

$$RR_v = \frac{1.0(0.95)(0.20)(3.22)}{12}$$

Total Minimum RR_v required = 0.051 ac·ft (2,220 cf)

F. WATER QUALITY VOLUME (WQV) PROVIDED

Water quality treatment for the runoff from proposed impervious surfaces will be provided by a combination of vegetated swales and bioretention areas. Rooftop area is assumed to be properly disconnected from nearby impervious surfaces, and is therefore treated as pervious area in analysis.

Vegetated Swale Design #1 (DA-A)

The *Simplified Peak Flow Estimating Method* outlined in Appendix B.2 of the Stormwater Design Manual was used to calculate the peak rate of runoff during the water quality event.

$$CN = \frac{1000}{10 + 5P + 10Q - 10\sqrt{Q^2 + 1.25QP}}$$

Where,

CN = the computed runoff curve number

P = rainfall, in inches (use the 90% rainfall event for the Water Quality Storm, 1.0")

Q = runoff volume ($P*R_v$), in inches

Drainage Area Tributary to Practice = 4.67 acres

Impervious Areas (A_I) = 0.27 acres

$$R_v = 0.05 + 0.9\left(\frac{0.27\text{ ac}}{4.67\text{ ac}}\right) = 0.102$$

$\therefore$ CN = 81

Time of Concentration, t_c, is **19.5** minutes (minimum TR-55 value)

From Table 4-1 of TR-55, the initial abstraction, I_a, for a watershed is 0.469

$$\frac{I_a}{P} = \frac{0.469}{1.0} = 0.469$$

Using the I_a/P and the t_c, the unit peak discharge, q_u, is **350** csm/in (from Exhibit 4-II, TR-55)

The peak rate of runoff is then calculated using the following formula: $Q_p = q_u \times A \times WQ_v$

Where, Q_p = the peak discharge, in cfs

q_u = the unit peak discharge, in cfs/mi^2/inch

A = drainage area, in square miles (acres/640)

WQ_v = water quality volume, in watershed inches ($P*R_v$)

$$Q_p = 350\frac{\text{csm}}{\text{in}} \times \frac{4.67\text{ acres}}{\frac{640\text{ ac}}{\text{mi}^2}} \times (0.102) \times 1.0"$$

$$\mathbf{Q_p = 0.26\ cfs}$$

The required swale length must provide an average of <u>10 minutes</u> of retention time where:

base width = 4 ft

side slope = 3H:1V

slope = 0.02 ft/ft

depth = 0.25 ft

V = 0.28 fps (calculated using Hyroflow Express in AutoCAD)

$$\text{Required Length} = 0.28\frac{\text{ft}}{\text{sec}} \cdot 10\text{ min} \cdot \frac{60\text{ sec}}{\text{min}} = 168\text{ ft}$$

Length provided = 255 ft

$$\mathbf{WQ_v\ Provided\ in\ Swale} = \frac{1.0*0.102*4.67}{12} = \mathbf{0.040\ ac \cdot ft}\ (1{,}730\text{ cf})$$

The RR_v provided is calculated as follows:

Bioretention areas in C and D soils have a RRv factor of 0.2 * WQv.

$$RR_v = 0.2 * 0.040\text{ ac} \bullet \text{ft}$$

RR_v Provided in Swale = 0.008 ac·ft

Vegetated Swale Design #2 (DA-C)

The *Simplified Peak Flow Estimating Method* outlined in Appendix B.2 of the Stormwater Design Manual was used to calculate the peak rate of runoff during the water quality event.

$$CN = \frac{1000}{10 + 5P + 10Q - 10\sqrt{Q^2 + 1.25QP}}$$

Where,

CN = the computed runoff curve number

P = rainfall, in inches (use the 90% rainfall event for the Water Quality Storm, 1.0")

Q = runoff volume ($P*R_v$), in inches

Drainage Area Tributary to Practice = 3.44 acres

Impervious Areas (A_I) = 0.06 acres

$$R_v = 0.05 + 0.9\left(\frac{0.06\text{ ac}}{3.44\text{ ac}}\right) = 0.066$$

$\therefore$ CN = 81

Time of Concentration, t_c, is **12.1** minutes (minimum TR-55 value)

From Table 4-1 of TR-55, the initial abstraction, I_a, for a watershed is 0.469

$$\frac{I_a}{P} = \frac{0.532}{1.0} = 0.532$$

Using the I_a/P and the t_c, the unit peak discharge, q_u, is **325** csm/in (from Exhibit 4-II, TR-55)

The peak rate of runoff is then calculated using the following formula: $Q_p = q_u \times A \times WQ_v$

Where, Q_p = the peak discharge, in cfs

q_u = the unit peak discharge, in cfs/mi^2/inch

A = drainage area, in square miles (acres/640)

WQ_v = water quality volume, in watershed inches ($P*R_v$)

$$Q_p = 325\frac{\text{csm}}{\text{in}} \times \frac{3.44\text{ acres}}{\frac{640\text{ ac}}{\text{mi}^2}} \times (0.066) \times 1.0"$$

$$\mathbf{Q_p = 0.11\ cfs}$$

The required swale length must provide an average of 10 minutes of retention time where:

base width = 4 ft

side slope = 3H:1V

slope = 0.02 ft/ft

depth = 0.25 ft

V = 0.21 fps (calculated using Hyroflow Express in AutoCAD)

$$\text{Required Length} = 0.21\frac{\text{ft}}{\text{sec}} \cdot 10\text{ min} \cdot \frac{60\text{ sec}}{\text{min}} = 126\text{ ft}$$

Length provided = 290 ft

WQ_v Provided in Swale $= \frac{1.0*0.066*3.44}{12} =$ **0.019 ac · ft** (825 cf)

The RR_v provided is calculated as follows:

Bioretention areas in C and D soils have a RRv factor of 0.2 * WQv.

$RR_v = 0.2 * 0.019$ ac • ft

RR_v Provided in Swale = 0.004 ac·ft

Vegetated Swale Design #3 (DA-D)

The *Simplified Peak Flow Estimating Method* outlined in Appendix B.2 of the Stormwater Design Manual was used to calculate the peak rate of runoff during the water quality event.

$$CN = \frac{1000}{10 + 5P + 10Q - 10\sqrt{Q^2 + 1.25QP}}$$

Where,

CN = the computed runoff curve number

P = rainfall, in inches (use the 90% rainfall event for the Water Quality Storm, 1.0")

Q = runoff volume ($P*R_v$), in inches

Drainage Area Tributary to Practice = 3.04 acres

Impervious Areas (A_I) = 0.31 acres

$$R_v = 0.05 + 0.9\left(\frac{0.31 \text{ ac}}{3.04 \text{ ac}}\right) = 0.142$$

∴ CN = 84

Time of Concentration, t_c, is **12.2** minutes (minimum TR-55 value)

From Table 4-1 of TR-55, the initial abstraction, I_a, for a watershed is 0.41

$$\frac{I_a}{P} = \frac{0.41}{1.0} = 0.41$$

Using the I_a/P and the t_c, the unit peak discharge, q_u, is **500** csm/in (from Exhibit 4-II, TR-55)

The peak rate of runoff is then calculated using the following formula: $Q_p = q_u \times A \times WQ_v$

Where, Q_p = the peak discharge, in cfs

q_u = the unit peak discharge, in cfs/mi²/inch

A = drainage area, in square miles (acres/640)

WQ_v = water quality volume, in watershed inches ($P*R_v$)

$$Q_p = 500\frac{\text{csm}}{\text{in}} \times \frac{3.04 \text{ acres}}{\frac{640 \text{ ac}}{\text{mi}^2}} \times (0.142) \times 1.0"$$

$Q_p = 0.34$ cfs

The required swale length must provide an average of 10 minutes of retention time where:

base width = 4 ft

side slope = 3H:1V

slope = 0.02 ft/ft

depth = 0.25 ft

V = 0.33 fps (calculated using Hyroflow Express in AutoCAD)

$$\text{Required Length} = 0.33\frac{\text{ft}}{\text{sec}} \cdot 10 \text{ min} \cdot \frac{60 \text{ sec}}{\text{min}} = 198 \text{ ft}$$

Length provided = 210 ft

WQ_v Provided in Swale $= \frac{1.0*0.142*3.04}{12} =$ **0.036 ac · ft** (1,570 cf)

The RR_v provided is calculated as follows:

Bioretention areas in C and D soils have a RRv factor of 0.2 * WQv.

$RR_v = 0.2 * 0.036$ ac • ft

RR_v Provided in Swale = 0.007 ac·ft

Vegetated Swale Design #4 (DA-E)

The *Simplified Peak Flow Estimating Method* outlined in Appendix B.2 of the Stormwater Design Manual was used to calculate the peak rate of runoff during the water quality event.

$$CN = \frac{1000}{10 + 5P + 10Q - 10\sqrt{Q^2 + 1.25QP}}$$

Where,

CN = the computed runoff curve number

P = rainfall, in inches (use the 90% rainfall event for the Water Quality Storm, 1.0")

Q = runoff volume ($P*R_v$), in inches

Drainage Area Tributary to Practice = 1.9 acres

Impervious Areas (A_I) = 0.03 acres

$$R_v = 0.05 + 0.9\left(\frac{0.03 \text{ ac}}{1.9 \text{ ac}}\right) = 0.064$$

∴ CN = 79

Time of Concentration, t_c, is **15.5** minutes (minimum TR-55 value)

From Table 4-1 of TR-55, the initial abstraction, I_a, for a watershed is 0.469

$$\frac{I_a}{P} = \frac{0.532}{1.0} = 0.532$$

Using the I_a/P and the t_c, the unit peak discharge, q_u, is **300** csm/in (from Exhibit 4-II, TR-55)

The peak rate of runoff is then calculated using the following formula: $Q_p = q_u \times A \times WQ_v$

Where, Q_p = the peak discharge, in cfs

q_u = the unit peak discharge, in cfs/mi^2/inch

A = drainage area, in square miles (acres/640)

WQ_v = water quality volume, in watershed inches ($P*R_v$)

$$Q_p = 300\frac{csm}{in} \times \frac{1.9\ acres}{\frac{640\ ac}{mi^2}} \times (0.064) \times 1.0"$$

$$\mathbf{Q_p = 0.09\ cfs}$$

The required swale length must provide an average of 10 minutes of retention time where:

base width = 4 ft

side slope = 3H:1V

slope = 0.02 ft/ft

depth = 0.25 ft

V = 0.20 fps (calculated using Hyroflow Express in AutoCAD)

$$\text{Required Length} = 0.20\frac{ft}{sec} \cdot 10\ min \cdot \frac{60\ sec}{min} = 120\ ft$$

Length provided = 250 ft

$$\mathbf{WQ_v\ Provided\ in\ Swale} = \frac{1.0*0.064*1.9}{12} = \mathbf{0.010\ ac \cdot ft}\ (440\ cf)$$

The RR_v provided is calculated as follows:

Bioretention areas in C and D soils have a RRv factor of 0.2 * WQv.

$RR_v = 0.2 * 0.010\ ac \bullet ft$

RR_v Provided in Swale = 0.002 ac·ft

Vegetated Swale Design #5 (DA-F)

The *Simplified Peak Flow Estimating Method* outlined in Appendix B.2 of the Stormwater Design Manual was used to calculate the peak rate of runoff during the water quality event.

$$CN = \frac{1000}{10 + 5P + 10Q - 10\sqrt{Q^2 + 1.25QP}}$$

Where,

CN = the computed runoff curve number

P = rainfall, in inches (use the 90% rainfall event for the Water Quality Storm, 1.0")

Q = runoff volume ($P*R_v$), in inches

Drainage Area Tributary to Practice = 2.27 acres

Impervious Areas (A_I) = 0.09 acres

$$R_v = 0.05 + 0.9\left(\frac{0.09\ ac}{2.27\ ac}\right) = 0.086$$

$\therefore CN = 80$

Time of Concentration, t_c, is **11** minutes (minimum TR-55 value)

From Table 4-1 of TR-55, the initial abstraction, I_a, for a watershed is 0.469

$$\frac{I_a}{P} = \frac{0.50}{1.0} = 0.50$$

Using the I_a/P and the t_c, the unit peak discharge, q_u, is **375** csm/in (from Exhibit 4-II, TR-55)

The peak rate of runoff is then calculated using the following formula: $Q_p = q_u \times A \times WQ_v$

Where, Q_p = the peak discharge, in cfs

q_u = the unit peak discharge, in cfs/mi^2/inch

A = drainage area, in square miles (acres/640)

WQ_v = water quality volume, in watershed inches (P*R_v)

$$Q_p = 375\frac{\text{csm}}{\text{in}} \times \frac{2.27 \text{ acres}}{\frac{640 \text{ ac}}{\text{mi}^2}} \times (0.086) \times 1.0"$$

$$\mathbf{Q_p = 0.11 \text{ cfs}}$$

The required swale length must provide an average of 10 minutes of retention time where:

base width = 4 ft

side slope = 3H:1V

slope = 0.02 ft/ft

depth = 0.25 ft

V = 0.26 fps (calculated using Hyroflow Express in AutoCAD)

$$\text{Required Length} = 0.26\frac{\text{ft}}{\text{sec}} \cdot 10 \text{ min} \cdot \frac{60 \text{ sec}}{\text{min}} = 156 \text{ ft}$$

Length provided = 156 ft

$$\mathbf{WQ_v \text{ Provided in Swale}} = \frac{1.0*0.086*2.27}{12} = \mathbf{0.016 \text{ ac} \cdot \text{ft}} \text{ (710 cf)}$$

The RR_v provided is calculated as follows:

Bioretention areas in C and D soils have a RRv factor of 0.2 * WQv.

$RR_v = 0.2 * 0.016$ ac • ft

RR_v Provided in Swale = 0.003 ac·ft

Vegetated Swale Design #6 (DA-H)

The *Simplified Peak Flow Estimating Method* outlined in Appendix B.2 of the Stormwater Design Manual was used to calculate the peak rate of runoff during the water quality event.

$$CN = \frac{1000}{10 + 5P + 10Q - 10\sqrt{Q^2 + 1.25QP}}$$

Where,

CN = the computed runoff curve number

P = rainfall, in inches (use the 90% rainfall event for the Water Quality Storm, 1.0")

Q = runoff volume (P*R_v), in inches

Drainage Area Tributary to Practice = 3.96 acres

Impervious Areas (A_I) = 0.09 acres

$R_v = 0.05 + 0.9\left(\frac{0.09\text{ ac}}{3.96\text{ ac}}\right) = 0.070$

$\therefore CN = 79$

Time of Concentration, t_c, is **14.9** minutes (minimum TR-55 value)

From Table 4-1 of TR-55, the initial abstraction, I_a, for a watershed is 0.469

$\frac{I_a}{P} = \frac{0.532}{1.0} = 0.532$

Using the I_a/P and the t_c, the unit peak discharge, q_u, is **325** csm/in (from Exhibit 4-II, TR-55)

The peak rate of runoff is then calculated using the following formula: $Q_p = q_u \times A \times WQ_v$

Where, Q_p = the peak discharge, in cfs

q_u = the unit peak discharge, in cfs/mi^2/inch

A = drainage area, in square miles (acres/640)

WQ_v = water quality volume, in watershed inches ($P*R_v$)

$Q_p = 325\frac{\text{csm}}{\text{in}} \times \frac{3.96\text{ acres}}{\frac{640\text{ ac}}{\text{mi}^2}} \times (0.070) \times 1.0"$

$Q_p = 0.14$ cfs

The required swale length must provide an average of <u>10 minutes</u> of retention time where:

base width = 4 ft

side slope = 3H:1V

slope = 0.02 ft/ft

depth = 0.25 ft

V = 0.26 fps (calculated using Hyroflow Express in AutoCAD)

$\text{Required Length} = 0.26\frac{\text{ft}}{\text{sec}} \cdot 10\text{ min} \cdot \frac{60\text{ sec}}{\text{min}} = 156\text{ ft}$

Length provided = 500 ft

WQ_v Provided in Swale $= \frac{1.0*0.070*3.96}{12} =$ **0.023 ac · ft** (1,006 cf)

The RR_v provided is calculated as follows:

Bioretention areas in C and D soils have a RRv factor of 0.2 * WQv.

$RR_v = 0.2 * 0.023\text{ ac} \bullet \text{ft}$

RR_v Provided in Swale = 0.005 ac·ft

Bioretention Basin #1 (DA-B)

$$\mathbf{WQ_v = \frac{PR_vA}{12}}$$

90-th Percentile Rainfall (P) = 1.0 inch
Drainage Area (A) = 16.21 acres
Impervious Area (A_I) = 0.74 acres

Total Af provided = 6,250 sf

$$A_f = \frac{(WQ_v)(d_f)}{(k)(h_f + d_f)(t_f)}$$

Where,

A_f = Area of the filter (ft^2)
WQ_v = Water Quality Volume (ft^3)
d_f = depth of the bioretention soil media (2.5 feet as required in NYS Design Manual)
k = coefficient of permeability (0.5 ft/day per NYS Design Manual)
h_f = average height of water above the filter bed (0.25 ft)
t_f = design filter bed drain time (2 days per NYS Design Manual)

$$6{,}000\ ft^2 = \frac{(WQ_v)(2.5\ ft)}{\left(0.5\ \frac{ft}{day}\right)(0.25\ ft + 2.5\ ft)(2\ days)}$$

$$WQ_V = 0.151\ ac \cdot ft$$

∴ Total WQ_v provided = 0.151 ac-ft

The RR_v provided is calculated as follows:
Bioretention areas in C and D soils have a RRv factor of 0.4 * WQv.

$$RR_v = 0.4 * 0.151\ ac \bullet ft$$

RR_v provided = 0.060 ac·ft

Bioretention Basin #2 (DA-G)

$$\mathbf{WQ_v = \frac{PR_vA}{12}}$$

90-th Percentile Rainfall (P) = 1.0 inch
Drainage Area (A) = 16.21 acres
Impervious Area (A_I) = 0.74 acres

Total Af provided = 5,400 sf

$$A_f = \frac{(WQ_v)(d_f)}{(k)(h_f + d_f)(t_f)}$$

Where,

A_f = Area of the filter (ft^2)

WQ_v = Water Quality Volume (ft^3)
d_f = depth of the bioretention soil media (2.5 feet as required in NYS Design Manual)
k = coefficient of permeability (0.5 ft/day per NYS Design Manual)
h_f = average height of water above the filter bed (0.25 ft)
t_f = design filter bed drain time (2 days per NYS Design Manual)

$$5{,}400\ \text{ft}^2 = \frac{(WQ_v)(2.5\ \text{ft})}{\left(0.5\ \frac{\text{ft}}{\text{day}}\right)(0.25\ \text{ft} + 2.5\ \text{ft})(2\ \text{days})}$$

$$WQ_V = 0.136\ ac \cdot ft$$

∴ Total WQ_v provided = 0.136 ac-ft

The RR_v provided is calculated as follows:
Bioretention areas in C and D soils have a RRv factor of 0.4 * WQv.
$RR_v = 0.4 * 0.136\ \text{ac} \bullet \text{ft}$

RR_v provided = 0.054 ac·ft

Total RR_v provided = 0.008 + 0.004 + 0.007 + 0.002 + 0.003 + 0.005 + 0.060 + 0.054
= 0.143 ac·ft (0.051 ac-ft Required)

Total WQ_v provided = 0.040 + 0.019 + 0.036 + 0.010 + 0.016 + 0.023 + 0.151 + 0.136
= 0.431 ac·ft (0.427 ac-ft Required)

G. CHANNEL PROTECTION VOLUME (CP_V)

The proposed project must provide sufficient storage of the channel protection volume (CPv), which is accomplished by providing 24-hour extended detention of the one-year, 24-hour storm event, remained from runoff reduction. The NYS Stormwater Design Manual methodology for determining the storage volume was used (Appendix B.1) and is discussed below. Below is a summary of the calculations for DA-1.

Proposed Detention Basins 1, 2, &3

Tributary Area = 43.21 acres, CN = 81, & t_c = 22 minutes

I_a = 0.469, P = 1.0"

$$\frac{I_a}{P} = 0.469$$

Using I_a/P and T_c, q_u = 330 csm/in (TR-55, Exhibit 4-II)

Using q_u and T = 24 hr, q_o/q_i = 0.051 (Design Manual, Figure B.1)

Using formula 2.1.16 (Design Manual, Appendix B.1), calculate V_s/V_r

$$\frac{V_s}{V_r} = 0.61$$

Using formula 2.1.17 (Design Manual, Appendix B.1), calculate V_s

$$V_s = \frac{\left(\frac{V_s}{V_r}\right) Q_d A}{12}$$

$$V_s = (0.61)2.303 \text{ ac} \cdot \text{ft} \text{ (total tributary from HydroCAD)}$$

$$V_s = 1.40 \text{ ac} \cdot \text{ft} \text{ (60,984 cf)}$$

CPv required = CPv - RR_V Provided

CPv required = 60,984 ft^3 – 6,185 ft^3 = **54,799 ft^3 required**

CPv Provided in Bioretention #1 = 3,438 ft^3

CPv Provided in Bioretention #2 = 2,970 ft^3

CPv Provided in Detention #1 = 20,168 ft^3

CPv Provided in Detention #2 = 22,999 ft^3

CPv Provided in Detention #3 = 6,010 ft^3

Total* CPv =55,585 ft^3 *Provided

H. PEAK FLOW MITIGATION (Q_{p10} and Q_{p100})

The remaining two requirements of the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity are that the stormwater system cannot discharge runoff from the site during the 10-year and 100-year, 24-hour rainfall events at rates higher than the existing condition peak rates of runoff during the correlating rainfall events. To meet these requirements, the underground stormwater chamber system will act as a detention basin that capture the runoff, temporarily store it, and release the runoff in a controlled manner to the existing drainage ditch such that the proposed project will not adversely impact the downstream areas. The following tables summarize the HydroCAD results for the 10-year and 100-year rainfall events.

Table 18: Peak Flow Rates for 10-Year & 100-Year Rainfall Events

	Existing Peak Runoff Rate (cfs)			**Proposed Peak Runoff Rate (cfs)**		
Point of Study	Pt. 1B	Pt. 2	Pt. 3	Pt. 1B	Pt. 2	Pt. 3
10-Year Storm	69.99	7.68	9.35	28.86	1.33	5.84
100-Year Storm	163.03	18.46	22.06	101.76	3.01	12.42

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
888.00	373	0	0
889.00	3,768	2,071	2,071
890.00	11,124	7,446	9,517
891.00	12,590	11,857	21,374
892.00	14,113	13,352	34,725
893.00	15,691	14,902	49,627
894.00	17,327	16,509	66,136
895.00	19,019	18,173	84,309
896.00	20,768	19,894	104,203

Device	Routing	Invert	Outlet Devices
#1	Primary	887.90'	**30.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 887.90' / 886.90' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Device 1	888.00'	**5.0" Vert. Orifice1** C= 0.600
#3	Device 1	891.20'	**15.0" Vert. Orifice2** C= 0.600
#4	Device 1	894.90'	**30.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	896.00'	**25.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Figure 11: Proposed Detention Basin #1 Summary

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
863.00	335	0	0
864.00	3,479	1,907	1,907
865.00	5,953	4,716	6,623
866.00	7,741	6,847	13,470
867.00	9,739	8,740	22,210
868.00	11,941	10,840	33,050
869.00	14,156	13,049	46,099
870.00	16,371	15,264	61,362
871.00	18,599	17,485	78,847
872.00	20,845	19,722	98,569

Device	Routing	Invert	Outlet Devices
#1	Secondary	872.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	862.90'	**30.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 862.90' / 861.00' S= 0.0950 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#3	Device 2	863.00'	**5.0" Vert. Orifice1** C= 0.600
#4	Device 2	866.80'	**15.0" Vert. Orifice2** C= 0.600
#5	Device 2	870.00'	**30.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads

Figure 12: Proposed Detention Basin #2 Summary

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
900.00	2,381	0	0
901.00	3,197	2,789	2,789
902.00	7,737	5,467	8,256
903.00	9,288	8,513	16,769
904.00	10,896	10,092	26,861
905.00	12,560	11,728	38,589

Device	Routing	Invert	Outlet Devices
#1	Secondary	905.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	900.00'	**18.0" Round Culvert** L= 330.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 900.00' / 889.00' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	900.00'	**5.0" Vert. Orifice1** C= 0.600
#4	Device 2	901.90'	**10.0" Vert. Orifice2** C= 0.600
#5	Device 2	904.00'	**24.0" x 24.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads

Figure 13: Proposed Detention Basin #3 Summary

Section IV. CONTROLS

A. EROSION AND SEDIMENT CONTROLS

Prior to the commencement of construction, the operator will identify the contractor(s) and subcontractor(s) that will implement each erosion and sediment control measure identified in this SWPPP. All contractors and subcontractors identified in the SWPPP must sign a copy of the certification statement in Part III.E. of the NYS DEC SPDES General Permit for Stormwater Discharges from Construction Activities in accordance with Part V.H. of the SPDES General Permit.

1. Stabilization Practices (Permanent)
   Permanent stabilization practices for this site include:
   a. Land clearing activities shall be done only in areas where earthwork will be performed and shall progress as earthwork is needed.
   b. Permanent seeding and planting of all unpaved areas.

2. Stabilization Practices (Temporary) Temporary stabilization practices for this site include:
   a. Temporary seeding and planting of all unpaved areas when construction activity has ceased, or will cease, in an area for 14 days. Seeding mixtures and application rates are listed in the erosion and sediment control notes on the plans.
   b. Mulching exposed areas. Mulching rates are listed in the erosion and sediment control notes on the plan sheet C-15.
   c. Frequent watering to minimize wind erosion during construction.

3. Structural Practices (Permanent)Permanent structural practices for this site include:
   a. Bioretention Areas. Bioretention filters are considered a standard stormwater management practice with runoff reduction capacity to decrease stormwater quantity and improve water quality.
   b. Land grading. Land grading is the reshaping of the existing land surface in accordance with a plan as determined by the engineering survey and layout. The purpose of a land grading specification is to provide erosion control and vegetative establishment on areas where the existing land is to be reshaped according to the plan.

4. Structural Practices (Temporary)
   Temporary structural practices for this site include:
   a. Silt fence. Silt fence is a temporary barrier of geotextile fabric installed on the contours across from a slope used to intercept sediment laden runoff from small drainage areas of disturbed soil. The purpose of silt fence is to reduce runoff velocity and effect deposition of transported sediment load.
   b. Stabilized construction entrance/exit. A stabilized construction entrance/exit is a stabilized pad of aggregate underlain with geotextile located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk, or parking area. The purpose of the stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets
      1. Aggregate size: Use a matrix of one to four-inch stone, or reclaimed or recycled equivalent
      2. Thickness: Not less than six inches
      3. Width: 24-foot minimum
      4. Length: As required, but not less than 50 feet
      5. Geotextile: To be placed over the entire area to be covered with aggregate. Piping of surface water under entrance shall be provided as necessary.

c. Sediment trap. The detention basins will be used as a sediment trap during construction. The sediment basin will have a riprap outlet sediment trap in place of the emergency spillway. Upon completion of construction, the sediment basin will be cleaned of all sediment buildup and the basin shall be finalized per plans.
d. Concrete washout area. A temporary excavated or above ground lined constructed pit where concrete truck mixers and equipment can be washed after their loads have been discharged to prevent highly alkaline runoff from entering storm drainage systems or leaching into the soil.
    1. The washout facility is sized to contain solids, wash water and rainfall. The maximum size shall be eight feet by eight feet at the bottom and two feet deep. If excavated, then the side slopes shall be 2:1 (horizontal to vertical).
    2. The facility shall be located a minimum of 100 feet from drainage swales, storm drain inlets, wetlands, streams, and other surface waters. Surface waters shall be prevented from entering the structure except got the access road. Appropriate access shall be provided with a gravel access road sloped down to the structure. Signs shall be placed to direct drivers to the facility after their load is discharged.
    3. All washout facilities will be lined to prevent leaching of liquids into the ground. The liner shall be plastic sheeting with a minimum thickness of 10 mils with no holes or tears, and anchored beyond the top of the pit with an earthen berm, sand bags, stone, or other structural appurtenance except at the access point.

5. Sequence of Major Activities
The contractor will be responsible for implementing the above listed erosion and sediment control practices. The contractor may designate these tasks to certain subcontractors as is seen fit, but the ultimate responsibility for implementing these controls and ensuring their proper function remains with the contractor. The order of activities shall be as follows:

a. Conduct a preconstruction meeting with all involved parties
b. Delineate boundaries of disturbance as per the layout and grading plans
c. Construct construction entrance at the location shown on the erosion and sediment control plan
d. Install silt fence in locations shown on the layout and grading plans
e. Establish staging areas on the project site
f. Construct sediment trap(s) and overflow spillways for use during construction
g. Excavate detention basin and install overflow spillway
h. Remove topsoil, stockpile and stabilize
i. Rough grade site including swales and provide temporary stabilization when idle for more than 7 days
j. Building foundation excavation
k. Install underground stormwater management system
l. Compact gravel along driveways and parking areas
m. Utility installations.
n. Install concrete washout, complete concrete site work.
o. Complete final grading of the site
p. Restore all compacted soils in accordance with section 5.1.6 of the NYS Stormwater Design Manual
q. Provide final stabilization and landscaping of new area
r. Site Paving
s. Provide final stabilization of disturbed areas via seeding mulching.
t. Construct bioretention basins and outlet controls upon upstream stabilization
u. Remove all temporary stabilization control practices

Disturbed areas of the site where construction activity has ceased for more than seven (7) days shall be temporarily seeded and mulched. The Erosion & Sediment Control plan is shown in Appendix F.

B. INSPECTION AND MAINTENANCE REQUIREMENTS

Best management practices, both construction and operational, must be inspected and maintained on a routine basis to ensure continued compliance with the NYS SPDES General Permit for Stormwater Discharges from Construction Activity. The contractor is responsible for inspecting the erosion and sediment control practices, the operator/owner is responsible for providing a qualified professional, as defined in the SPDES General Permit, to perform the required weekly inspections of the construction site from the time earth-disturbing activities begin until final stabilization is achieved and the Notice of Termination is filed. The contractor will obtain copies of all local and state regulations that are applicable to stormwater management, erosion control, and pollution minimization at this job site and will comply fully with such regulations. The contractor will submit written evidence of such compliance if requested by the operator or any agent of a regulatory body. The contractor will comply with all conditions of the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity, including the conditions related to maintaining the SWPPP and evidence of compliance with the SWPPP at the job site and allowing regulatory personnel access to the job site and to records to determine compliance.

C. CONSTRUCTION MAINTENANCE/INSPECTION PROCEDURES

The operator shall maintain a record of all inspection reports in a site logbook. The logbook shall be maintained on site and be made available to the permitting authority upon request. Prior to the commencement of construction, the operator shall certify in the site logbook that the SWPPP, prepared in accordance with Part III.D. of the NYS DEC SPDES General Permit for Discharges from Construction Activities, meets all Federal, State and local erosion and sediment control requirements. The operator shall post at the site, in a publicly accessible location, a summary of the site inspection activities monthly. The following inspection and maintenance practices will be used to maintain erosion and sediment controls and stabilization measures.

1. Inspection and Maintenance Practices
    a. Inspections shall occur once every seven calendar days.
    b. At a minimum, the qualified inspector shall inspect all erosion and sediment control practices to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved final stabilization, all points of discharge to natural surface waterbodies located within or immediately adjacent to the property boundaries of the construction site, and all points of discharge from the construction site.
    c. The qualified inspector shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:
        i. Date and time of inspection;
        ii. Name and title of person(s) performing inspection;
        iii. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;
        iv. A description of the condition of the runoff at all points of discharge from the construction site. This shall include identification of any discharges of sediment from the construction site. Include discharges from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;
        v. A description of the condition of all natural surface water bodies located within, or immediately adjacent to, the property boundaries of the construction site which receive runoff from disturbed areas. This shall include identification of any discharges of sediment to the surface water body;
        vi. Identification of all erosion and sediment control practices that need repair or maintenance;
        vii. Identification of all erosion and sediment control practices that were not installed or are not functioning as designed and need to be reinstalled or replaced;
        viii. Description and sketch of areas that are disturbed at the time of the inspection and areas that have been stabilized (temporarily and/or final) since the last inspection;

ix. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;
x. Corrective action(s) that must be taken to install, repair, replace, or maintain erosion and sediment control practices; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s); and
xi. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The qualified inspector shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The qualified inspector shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The qualified inspector shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

d. Within one business day of the completion of an inspection, the qualified inspector shall notify the owner or operator and appropriate contractor or subcontractor of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.
e. All inspection reports shall be signed by the qualified inspector. The inspection reports shall be maintained on the site.
f. Erosion and Sediment Control Inspection/Maintenance
i. Silt Fence: Silt fence shall be inspected for depth of sediment, tears, etc., to see if the fabric is securely attached to the fence posts, and to see that the fence posts are securely in the ground. Built up sediment will be removed from silt fence when it has reached one-third the height of the fence.
ii. Stabilized Construction Entrance/Exit: The entrance shall be maintained in a condition which will prevent tracking of sediment onto public rights-of-way. This may require periodic top dressing with additional aggregate. All sediment spilled, dropped, or washed onto public rights-of-way must be removed immediately. When necessary, wheels must be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with aggregate, which drains into an approved sediment-trapping device. All sediment shall be prevented from entering storm drains, ditches, or water courses.
iii. Seeding: Temporary and permanent seeding and all other stabilization measures will be inspected for bare spots, washouts, and healthy growth.

2. Inspection and Maintenance Report Forms
- Once installation of any required or optional erosion control device or measure has been implemented, at least twice every seven calendar days a Qualified Professional shall inspect each practice. The inspector shall use the forms found in this SWPPP to inventory and report the condition of each measure to assist in maintaining the erosion and sediment control measures in good working order.
- These report forms shall become an integral part of the SWPPP and shall be made readily accessible to governmental inspection officials, the operator's engineer, and the operator for review upon request during visits to the project site. In addition, copies of the reports shall be provided to any of these persons upon requires, via mail or facsimile transmission. Inspection and maintenance report forms are to be maintained by the permittee for three years following the final stabilization of the site.
- The operator shall also prepare a written summary of its status with respect to compliance with the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity at a minimum frequency of every three months during which coverage under the SPDES General Permit exists. The summary should address the status of achieving each

component of the SWPPP. The reports shall be signed by the signatory of the NOI or a duly authorized person and be retained at the construction site.

1. Other Record Keeping Requirements

   The contractor shall keep the following records related to construction activities at the site:

   - Dates when major grading activities occur and the areas which were graded.
   - Dates and details concerning the installation of structural controls.
   - Dates when construction activities cease in an area.
   - Dates when an area is stabilized, either temporarily or permanently.
   - Dates of rainfall and the amount of rainfall.
   - Dates and descriptions of the character and amount of any spills of hazardous materials.
   - Records of reports filed with regulatory agencies if reportable quantities of hazardous materials are spilled.

D. OPERATION MAINTENANCE AND INSPECTION PROCEDURES

Long-term maintenance of the stormwater mitigation basins and swales will be the responsibility of the owner and/or the tenant. Maintenance and inspection check lists have been included in Appendix D.

1. Embankments and emergency spillways will be inspected annually and after major storm events. Items to be inspected include:
   a. Vegetation and ground cover is adequate to prevent erosion.
   b. No embankment erosion has occurred.
   c. No animal burrows into embankments.
   d. No unauthorized planting.
   e. No cracking, bulging or sliding of dam.
   f. Emergency spillway is in good condition, free of silt buildup and debris.
   g. No leaks or seepage is occurring on downstream face.
   h. All slope protection and riprap is intact and no failure has occurred.

2. Bioretention basins will be inspected monthly and after major storm events. Items to be inspected include:
   a. Debris and undesirable vegetative growth shall be removed.
   b. Sediment depth shall be noted. Sediment shall be removed prior to reaching 50% of the design depth.
   c. No visible pollution within basins.

3. Grass lined swales shall be inspected and maintained as follows:
   a. All channels are free of debris on monthly basis.
   b. No visible evidence of erosion.
   c. Mowing shall be performed as needed. Inspect to ensure minimum mowing depth has not been exceeded.
   d. Dewatering of swales between storms. Inspect monthly or as necessary.
   e. Inspect swales for sediment deposition annually and clean as necessary.

Section V. MATERIALS MANAGEMENT PLAN

A. MATERIALS COVERED

The following materials or substances are expected to be present onsite during construction:

Concrete/Additives/Wastes	Cleaning Solvents
Detergents	Petroleum Based Products
Paints/Solvents	Pesticides
Acids	Solid and Construction Wastes
Sanitary Wastes	Soil Stabilization Additives

B. MATERIAL MANAGEMENT PRACTICES

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff. The job site superintendent will be responsible for ensuring that these procedures are followed.

1. Good Housekeeping

The following good housekeeping practices will be followed onsite during the construction project.

a. An effort will be made to store only enough products required to do the job.
b. All materials stored onsite will be stored in a neat, orderly manner and, if possible, under a roof or in a containment area. At a minimum, all containers will be stored with their lids on when not in use. Drip pans shall be provided under all dispensers.
c. Products will be kept in their original containers with the original manufacturer's label in legible condition.
d. Substances will not be mixed with one another unless recommended by the manufacturer.
e. Whenever possible, all of a product will be used up before disposing of the container.
f. Manufacturer's recommendations for proper use and disposal will be followed.
g. The job site superintendent will be responsible for daily inspections to ensure proper use and disposal of materials.

2. Hazardous Products

These practices will be used to reduce the risks associated with hazardous materials. Material Safety Data Sheets (MSDS's) for each substance with hazardous properties that is used on the job site will be obtained and used for the proper management of potential wastes that may result from these products. An MSDS will be posted in the immediate area where such product is stored and/or used and another copy of each MSDS will be maintained in the SWPPP file at the job site construction trailer office. Each employee who must handle a substance with hazardous properties will be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product he/she is using, particularly regarding spill control techniques.

a. Products will be kept in original containers with the original labels in legible condition.
b. Original labels and material safety data sheets (MSDS's) will be procured and used for each material.
c. If surplus product must be disposed of, manufacturer's or local/state/federal recommended methods for proper disposal will be followed.

3. Hazardous Waste

All hazardous waste materials will be disposed of by the contractor in the manner specified by local, state, and/or federal regulations and by the manufacturer of such products. Site personnel will be instructed in these practices by the job site superintendent, who will also be responsible for seeing that these practices are followed.

4. Product Specific Practices
   The following product specific practices will be followed on the job site.

   a. Petroleum Products
      All onsite vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers, which are clearly labeled. Any petroleum storage tanks used onsite will have a dike or berm containment structure constructed around it to contain any spills, which may occur. Drip pans shall be provided for all dispensers. Any asphalt substances used onsite will be applied per the manufacturer's recommendations.

   b. Fertilizers
      Due to the onsite public water supply that will be constructed as part of this project, the use of fertilizers is not allowed without the written authorization of the operator. Authorization will be based on the specific product's possible contaminants and impacts to the groundwater.

   c. Paints, Paint Solvents, and Cleaning Solvents
      All containers will be tightly sealed and stored when not in use. Excess paint and solvents will not be discharged to the storm sewer system but will be properly disposed of per manufacturer's instructions or state and federal regulations.

5. Concrete Wastes
   Concrete trucks will be allowed to wash out or discharge surplus concrete or drum wash water on the site, but only in either (1) specifically designated area which has been prepared to prevent contact between the concrete and/or washout and stormwater which will be discharged from the site or (2) in locations where waste concrete can be poured into forms to make riprap or other useful concrete products.

   The hardened residue from the concrete washout areas will be disposed of in the same manner as other non-hazardous construction waste materials or may be broken up and used on site as deemed appropriate by the contractor. The job site superintendent will be responsible for seeing that these procedures are followed.

   All concrete washout areas will be in an area where the likelihood of the area contributing to storm water discharges is negligible. If required, additional BMPs must be implemented to prevent concrete wastes from contributing to storm water discharges.

6. Solid and Construction Wastes
   All waste materials will be collected and stored in a securely lidded metal dumpster rented from a local waste management company which must be a solid waste management company licensed to do business in New York State. The dumpster will comply with all local and state solid waste management regulations.

   All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied a minimum of twice per week or more often if necessary, and the trash will be hauled to a landfill approved by New York State. No construction waste materials will be buried on site. All personnel will be instructed regarding the correct procedures for waste disposal.

   All waste dumpsters and roll-off containers will be in an area where the likelihood of the containers contributing to storm water discharges is negligible. If required, additional BMPs must be implemented, such as sandbags around the base, to prevent wastes from contributing to storm water discharges.

7. Sanitary Wastes
   All sanitary waste will be collected from the portable units a minimum of three times per week by a licensed portable facility provider in complete compliance with local and state regulation.

   All sanitary waste units will be in an area where the likelihood of the unit contributing to storm water discharges is negligible. If required, additional BMPs must be implemented, such as sandbags around the base, to prevent wastes from contributing to storm water discharges.

Section VI. SPILL PREVENTION AND RESPONSE PROCEDURES

The contractor will train all personnel in the proper handling and cleanup of spilled materials. No spilled hazardous materials or hazardous wastes will be allowed to come in contact with storm water discharges. If such contact occurs, the storm water discharge will be contained on site until appropriate measures in compliance with state and federal regulations are taken to dispose of such contaminated storm water. It shall be the responsibility of the job site superintendent to properly train all personnel in spill prevention and clean up procedures.

In order to minimize the potential for a spill of hazardous materials to come into contact with storm water, the following steps will be implemented:

1. All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.
2. The minimum practical quantity of all such materials will be kept on the job site.
3. A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the storage site.
4. Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

In the event of a spill, the following procedures should be followed

1. All spills will be cleaned up immediately after discovery.
2. The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with the hazardous substances.
3. The project manager and the Engineer of Record will be notified immediately.

   Spills of toxic or hazardous materials will be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill. Spills of amounts that exceed Reportable Quantities of certain substances specifically mentioned in federal regulations (40 CFR 110, 40 CFR 117, and 40 CFR 302) must be immediately reported to the NYSDEC 24-Hour Spill Hotline at **1-800-457-7362.**

4. If the spill exceeds a Reportable Quantity, the SWPPP must be modified within seven (7) calendar days of knowledge of the discharge to provide a description of the release, the circumstances leading to the release, and the date of the release. The plans must identify measures to prevent the recurrence of such releases and to respond to such releases.

The job site superintendent will be the spill prevention and response coordinator. He will designate the individuals who will receive spill prevention and response training. These individuals will each become responsible for a particular phase of prevention and response. The names of these personnel will be posted in the material storage area and in the office trailer onsite.

Section VII. CONTROL OF NON-STORMWATER DISCHARGES

Certain types of discharges are allowable under the NYS-DEC SPDES General Permit for Stormwater Discharges from Construction Activity, and it is the intent of this SWPPP to allow such discharges. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come in contact with the water prior to or after its discharge. The control measures, which have been outlined previously in this SWPPP, will be strictly followed to ensure that no contamination of these non-stormwater discharges takes place. The following non-storm water discharges are allowed by the NYS-DEC and may occur at the job site:

1. Discharges from firefighting activities
2. Fire hydrant flushing
3. Waters to which cleansers or other components have not been added that are used to wash vehicles or control dust
4. Routine external building wash down which does not use detergents
5. Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used
6. Air conditioning condensate
7. Springs
8. Foundation or footing drains where flows are not contaminated with process materials such as solvents.

Section VIII. CERTIFICATION AND NOTIFICATION

The New York State Department of Environmental Conservation requires that the operator and the contractor make certifications of knowledge of the contents of this SWPPP and agreement to follow the SWPPP. The terms of the General Permit also require that each contractor sign the SWPPP plan, thereby making them co-permittees and acknowledging their responsibility for certain operational aspects of the plan. These certifications should be signed before the contractor begins activities and should be filed with the site's SWPPP at the jobsite.

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APPENDIX A: HYDRO CAD – EXISTING CONDITIONS

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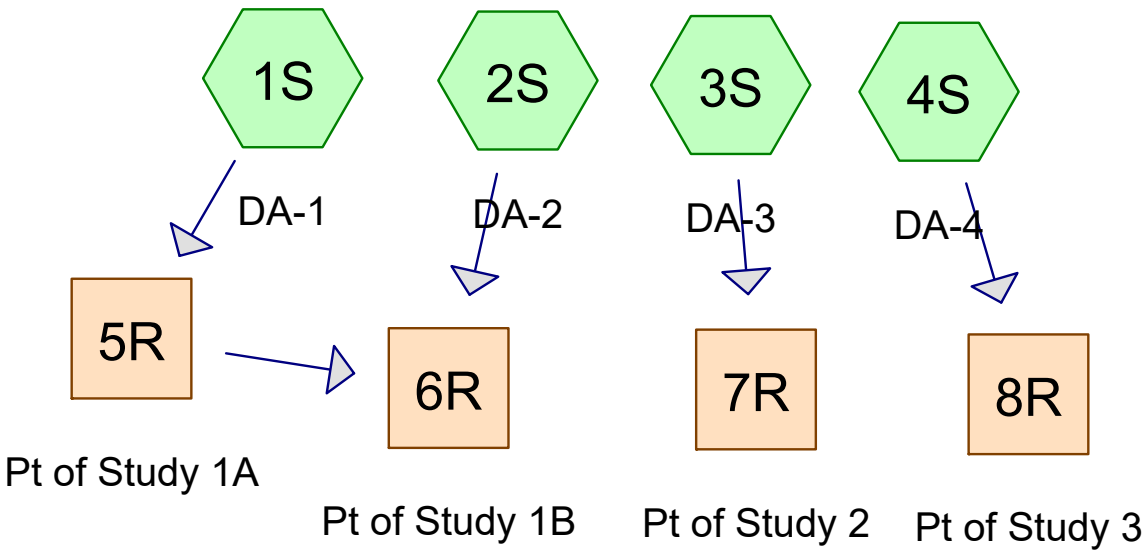


Subcat Reach Pond Link

Routing Diagram for Existing Drainage Areas
Prepared by Napierala Consulting, P.C., Printed 9/3/2020

Summary for Subcatchment 1S: DA-1

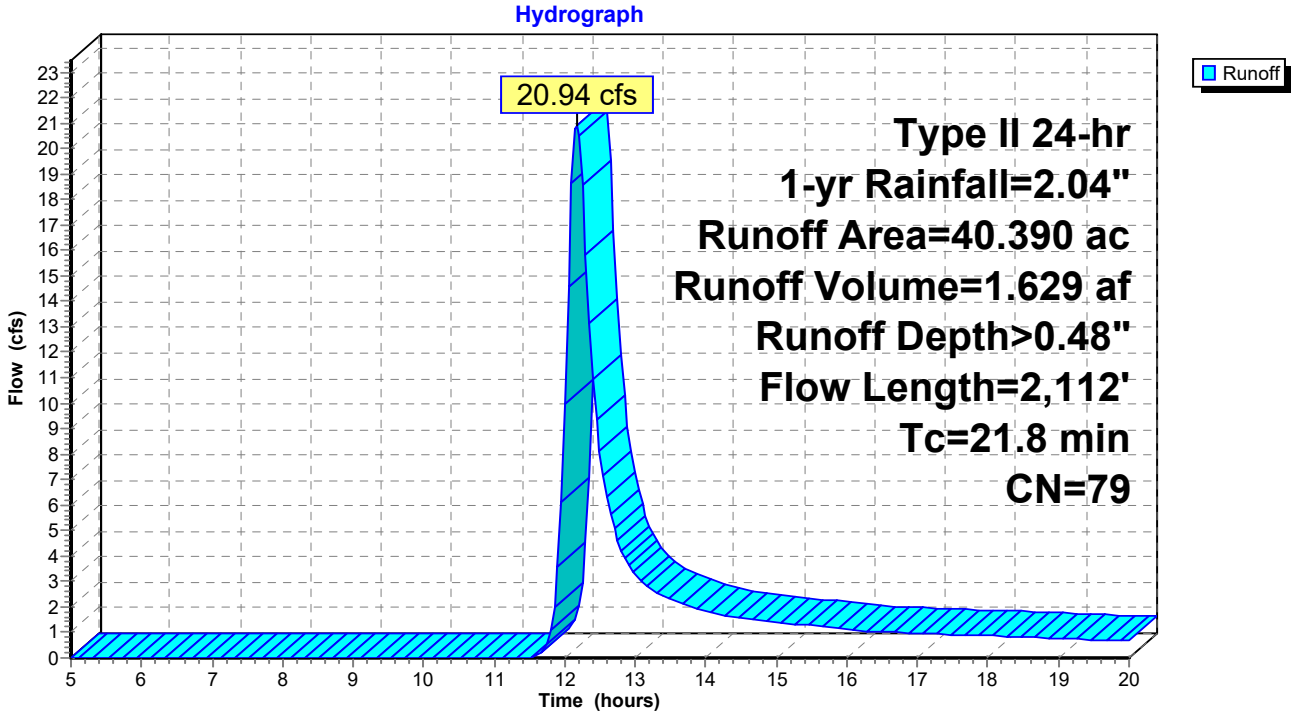
Runoff = 20.94 cfs @ 12.17 hrs, Volume= 1.629 af, Depth> 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
12.250	77	Woods, Good, HSG D
28.140	80	>75% Grass cover, Good, HSG D
40.390	79	Weighted Average
40.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0600	0.10		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.39"
3.6	885	0.0650	4.10		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
2.2	1,127	0.0080	8.44	135.03	**Channel Flow, Swale** Area= 16.0 sf Perim= 8.0' r= 2.00' n= 0.025 Earth, clean & straight
21.8	2,112	Total			

Subcatchment 1S: DA-1



Summary for Subcatchment 2S: DA-2

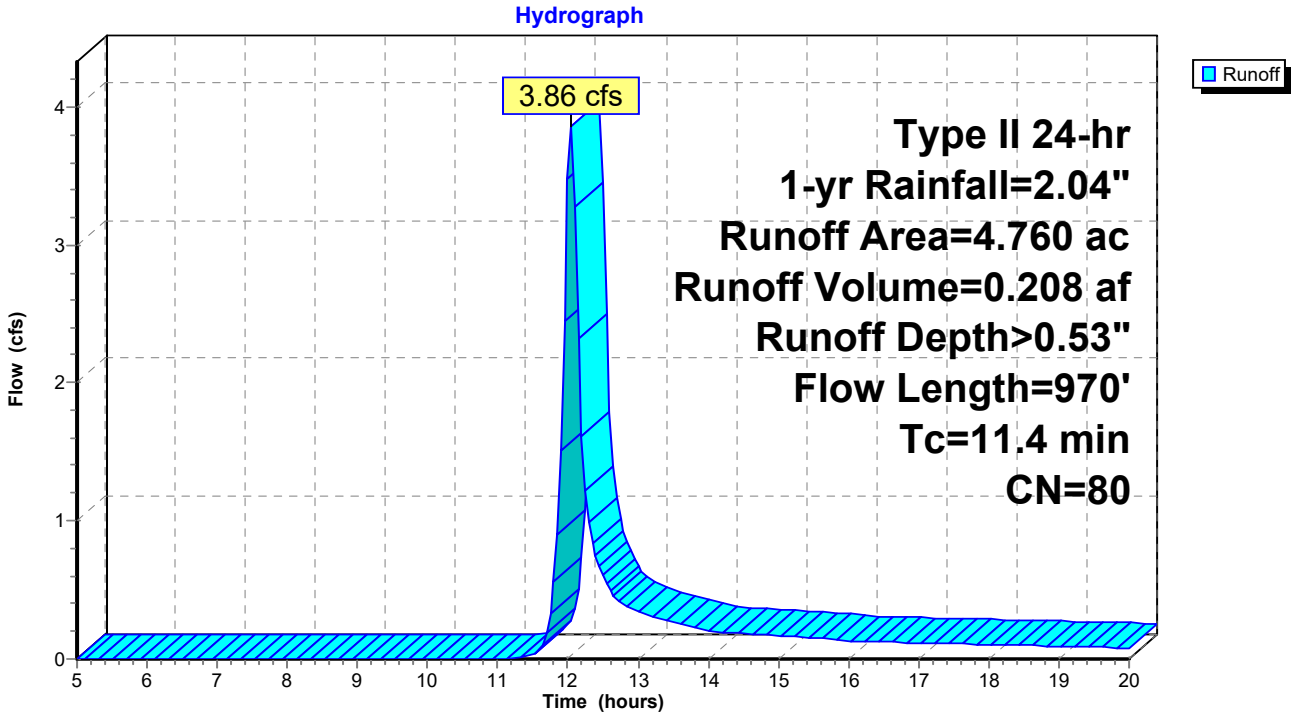
Runoff = 3.86 cfs @ 12.04 hrs, Volume= 0.208 af, Depth> 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
0.650	77	Woods, Good, HSG D
4.040	80	>75% Grass cover, Good, HSG D
0.070	98	Paved parking, HSG D
4.760	80	Weighted Average
4.690		98.53% Pervious Area
0.070		1.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0650	0.16		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.39"
0.5	144	0.0833	4.65		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
0.6	726	0.0440	21.93	307.08	**Channel Flow, Swale** Area= 14.0 sf Perim= 6.0' r= 2.33' n= 0.025 Earth, clean & straight
11.4	970	Total			

Subcatchment 2S: DA-2



Summary for Subcatchment 3S: DA-3

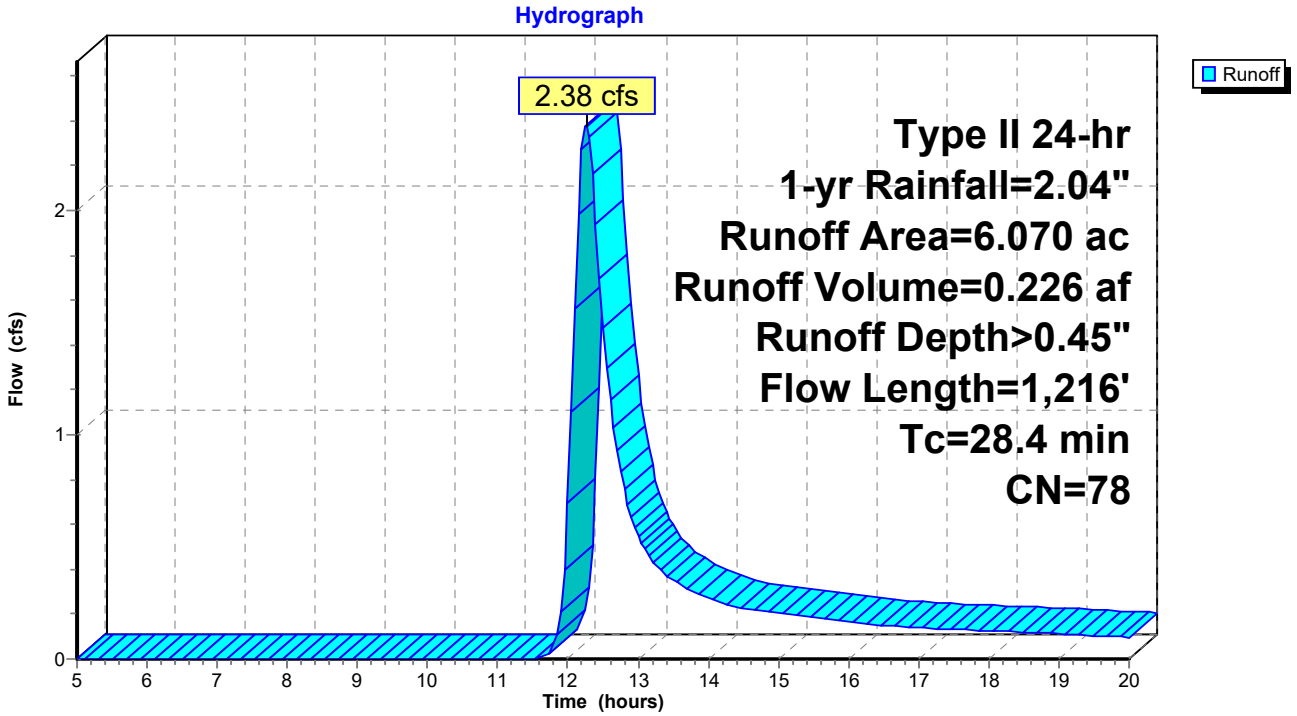
Runoff = 2.38 cfs @ 12.26 hrs, Volume= 0.226 af, Depth> 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
3.330	77	Woods, Good, HSG D
2.740	80	>75% Grass cover, Good, HSG D
6.070	78	Weighted Average
6.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	100	0.0400	0.13		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.39"
14.2	555	0.0170	0.65		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
1.5	281	0.0360	3.05		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
0.2	280	0.1210	20.51	205.13	**Channel Flow, Swale** Area= 10.0 sf Perim= 5.0' r= 2.00' n= 0.040 Earth, dense weeds
28.4	1,216	Total			

Subcatchment 3S: DA-3



Summary for Subcatchment 4S: DA-4

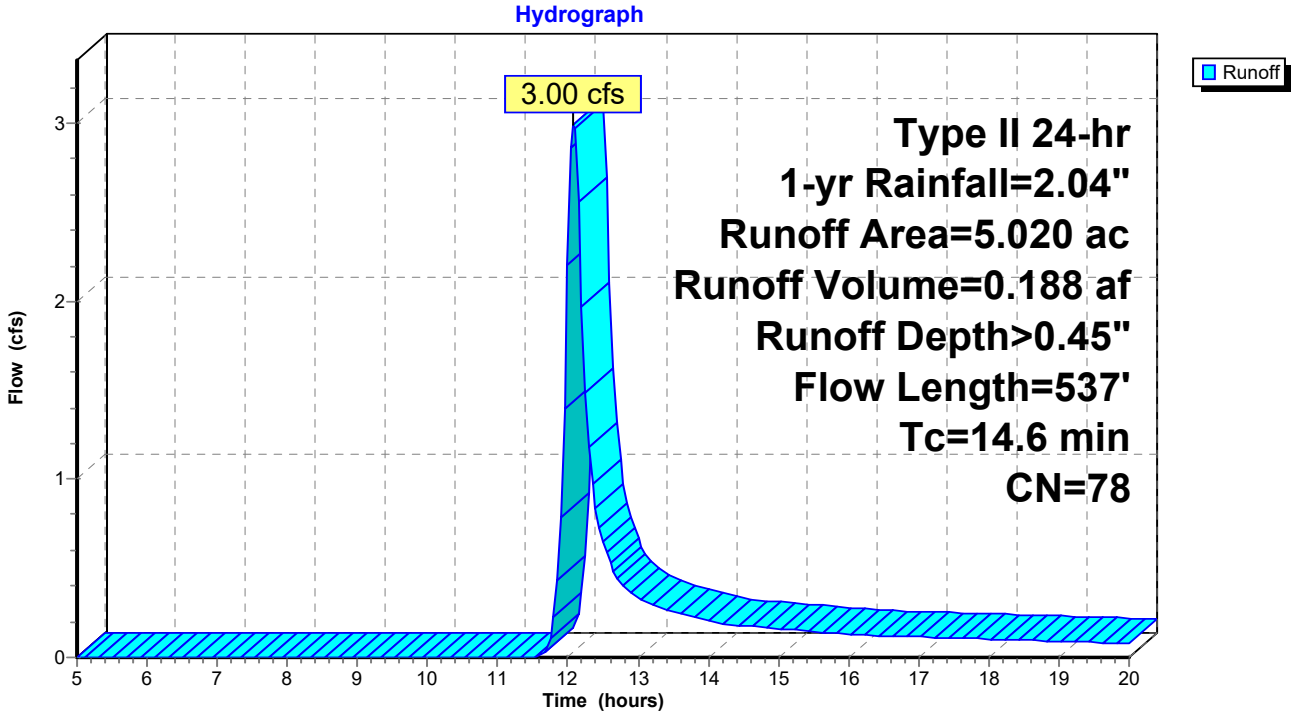
Runoff = 3.00 cfs @ 12.09 hrs, Volume= 0.188 af, Depth> 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
3.480	77	Woods, Good, HSG D
1.540	80	>75% Grass cover, Good, HSG D
5.020	78	Weighted Average
5.020		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.39"
1.5	287	0.0380	3.14		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
1.7	150	0.0870	1.47		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
14.6	537	Total			

Subcatchment 4S: DA-4

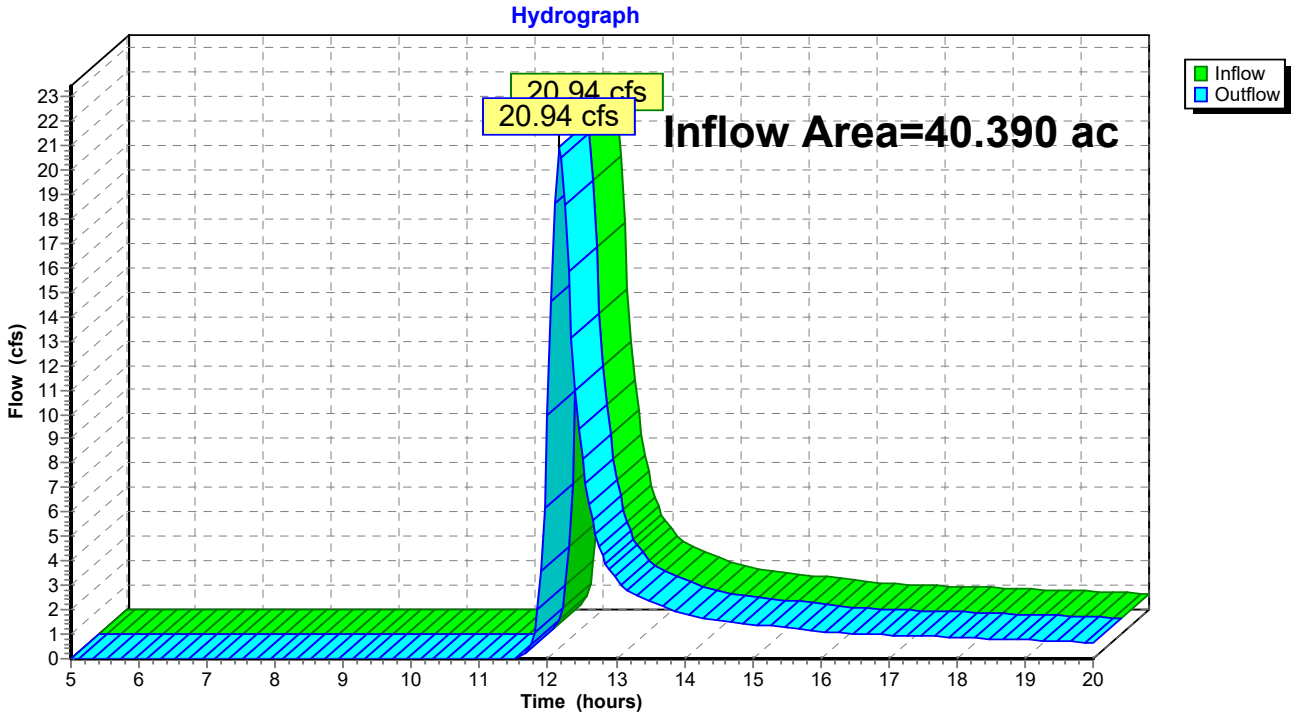


Summary for Reach 5R: Pt of Study 1A

Inflow Area = 40.390 ac, 0.00% Impervious, Inflow Depth > 0.48" for 1-yr event
Inflow = 20.94 cfs @ 12.17 hrs, Volume= 1.629 af
Outflow = 20.94 cfs @ 12.17 hrs, Volume= 1.629 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 5R: Pt of Study 1A

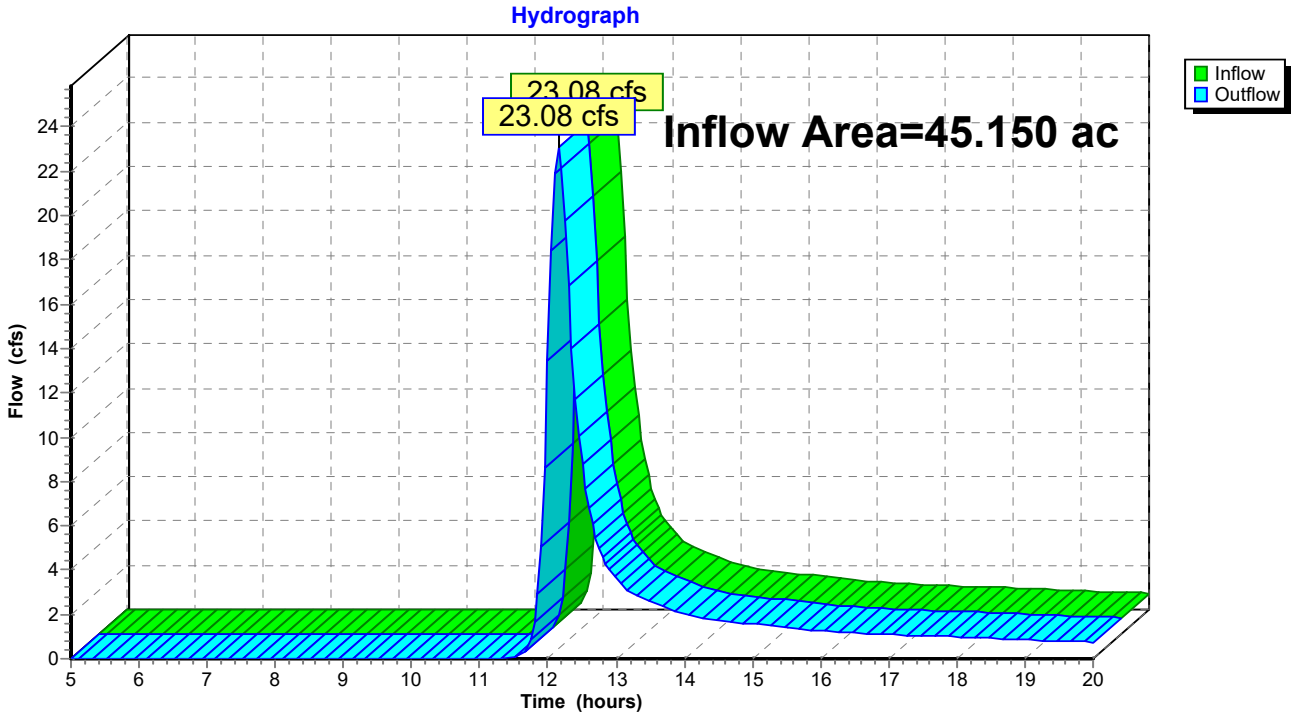


Summary for Reach 6R: Pt of Study 1B

Inflow Area = 45.150 ac, 0.16% Impervious, Inflow Depth > 0.49" for 1-yr event
Inflow = 23.08 cfs @ 12.15 hrs, Volume= 1.837 af
Outflow = 23.08 cfs @ 12.15 hrs, Volume= 1.837 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 6R: Pt of Study 1B

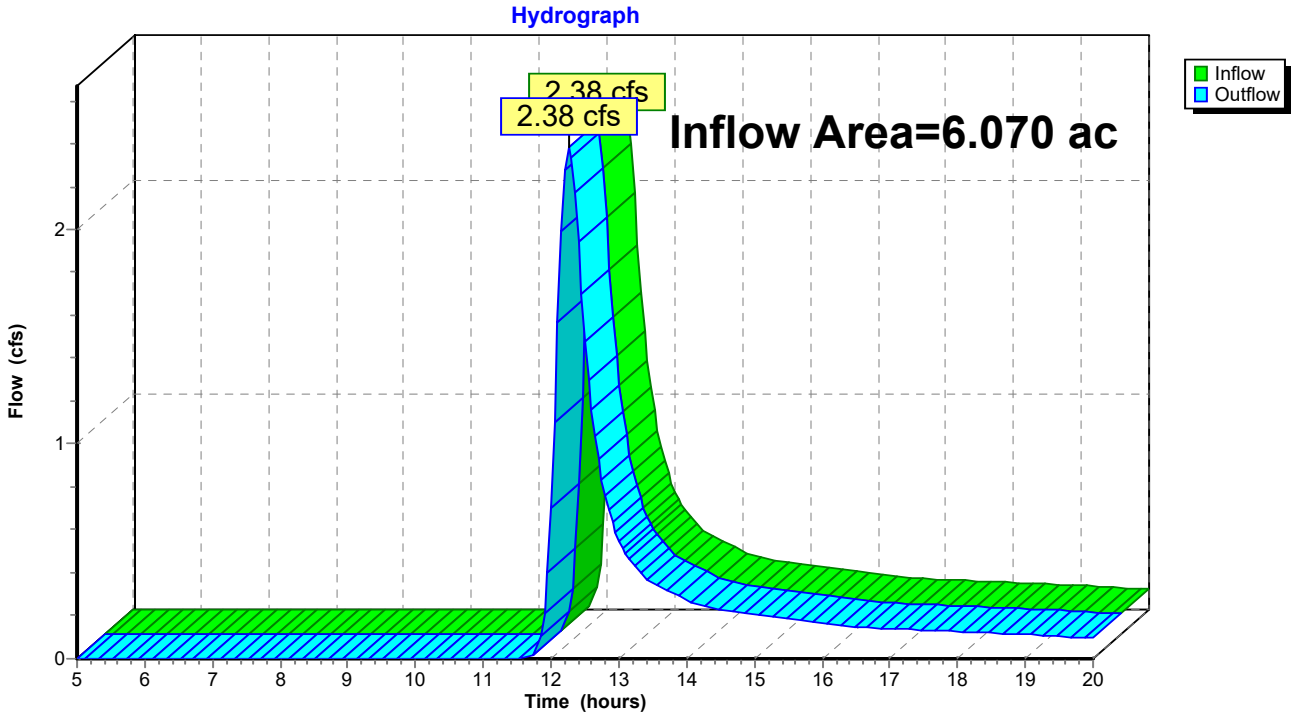


Summary for Reach 7R: Pt of Study 2

Inflow Area = 6.070 ac, 0.00% Impervious, Inflow Depth > 0.45" for 1-yr event
Inflow = 2.38 cfs @ 12.26 hrs, Volume= 0.226 af
Outflow = 2.38 cfs @ 12.26 hrs, Volume= 0.226 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 7R: Pt of Study 2

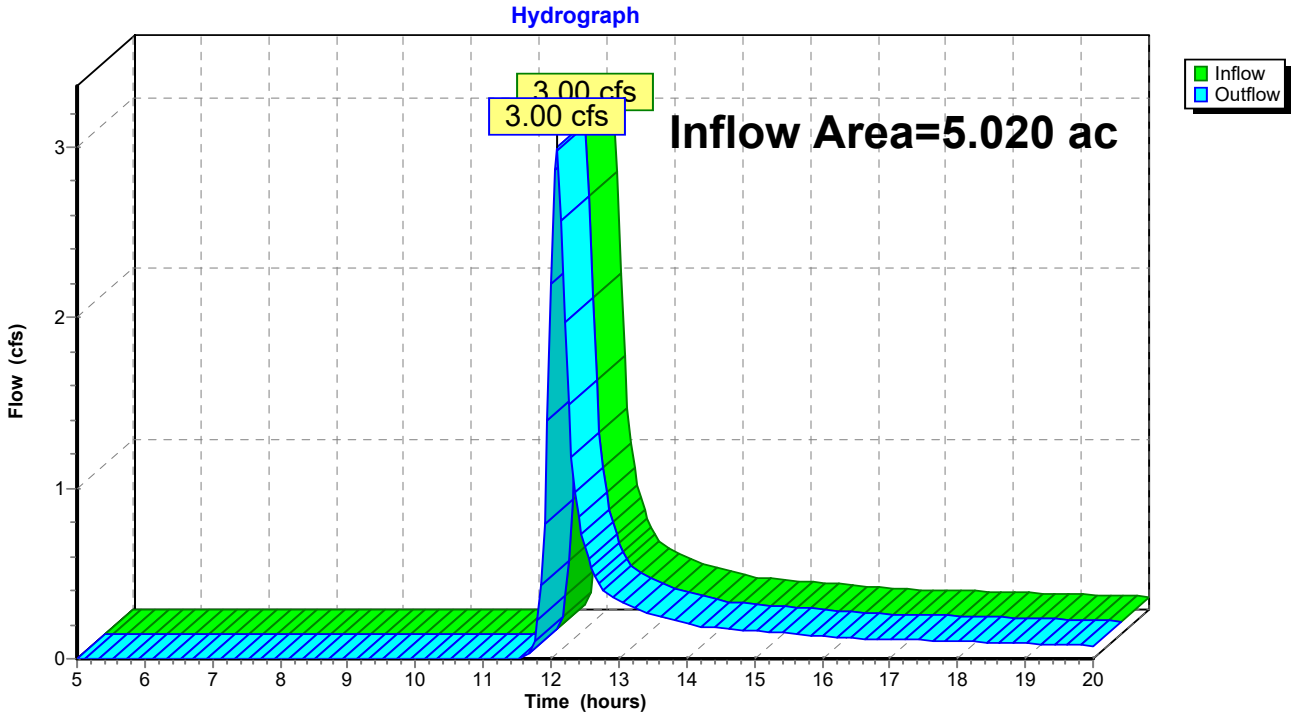


Summary for Reach 8R: Pt of Study 3

Inflow Area = 5.020 ac, 0.00% Impervious, Inflow Depth > 0.45" for 1-yr event
Inflow = 3.00 cfs @ 12.09 hrs, Volume= 0.188 af
Outflow = 3.00 cfs @ 12.09 hrs, Volume= 0.188 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 8R: Pt of Study 3



Summary for Subcatchment 1S: DA-1

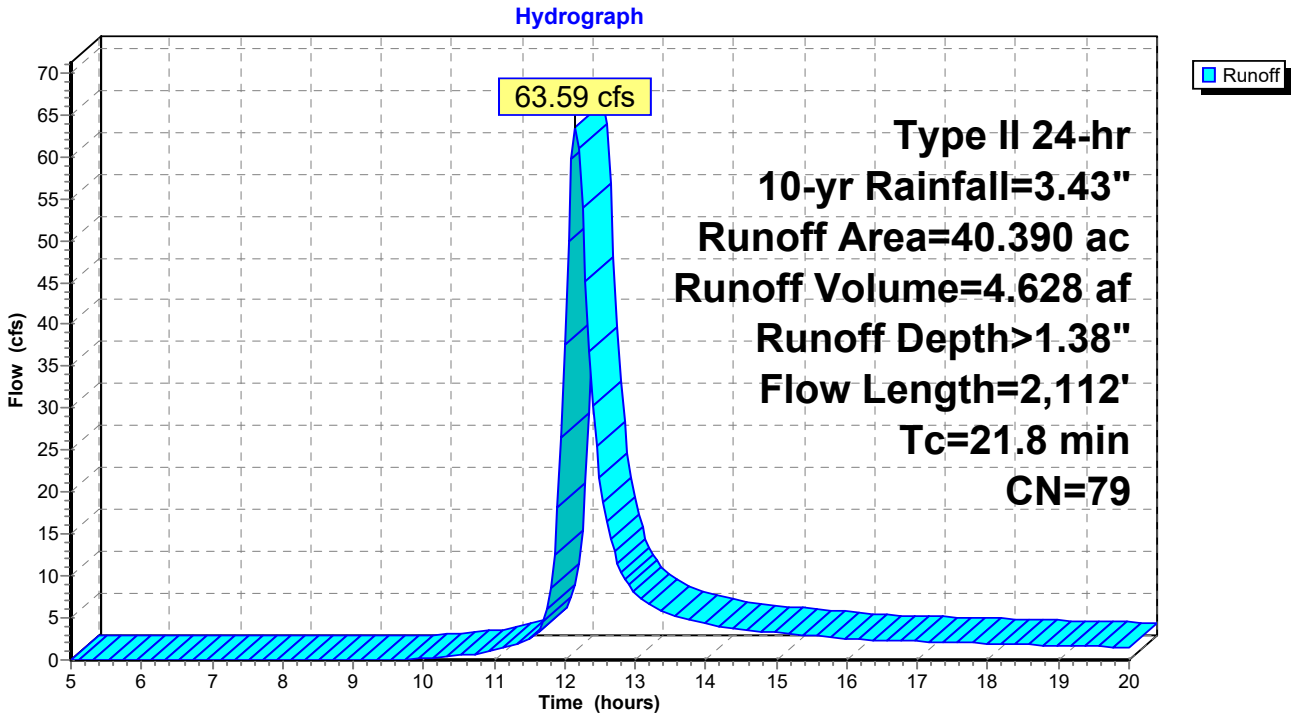
Runoff = 63.59 cfs @ 12.15 hrs, Volume= 4.628 af, Depth> 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
12.250	77	Woods, Good, HSG D
28.140	80	>75% Grass cover, Good, HSG D
40.390	79	Weighted Average
40.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0600	0.10		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.39"
3.6	885	0.0650	4.10		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
2.2	1,127	0.0080	8.44	135.03	**Channel Flow, Swale** Area= 16.0 sf Perim= 8.0' r= 2.00' n= 0.025 Earth, clean & straight
21.8	2,112	Total			

Subcatchment 1S: DA-1



Summary for Subcatchment 2S: DA-2

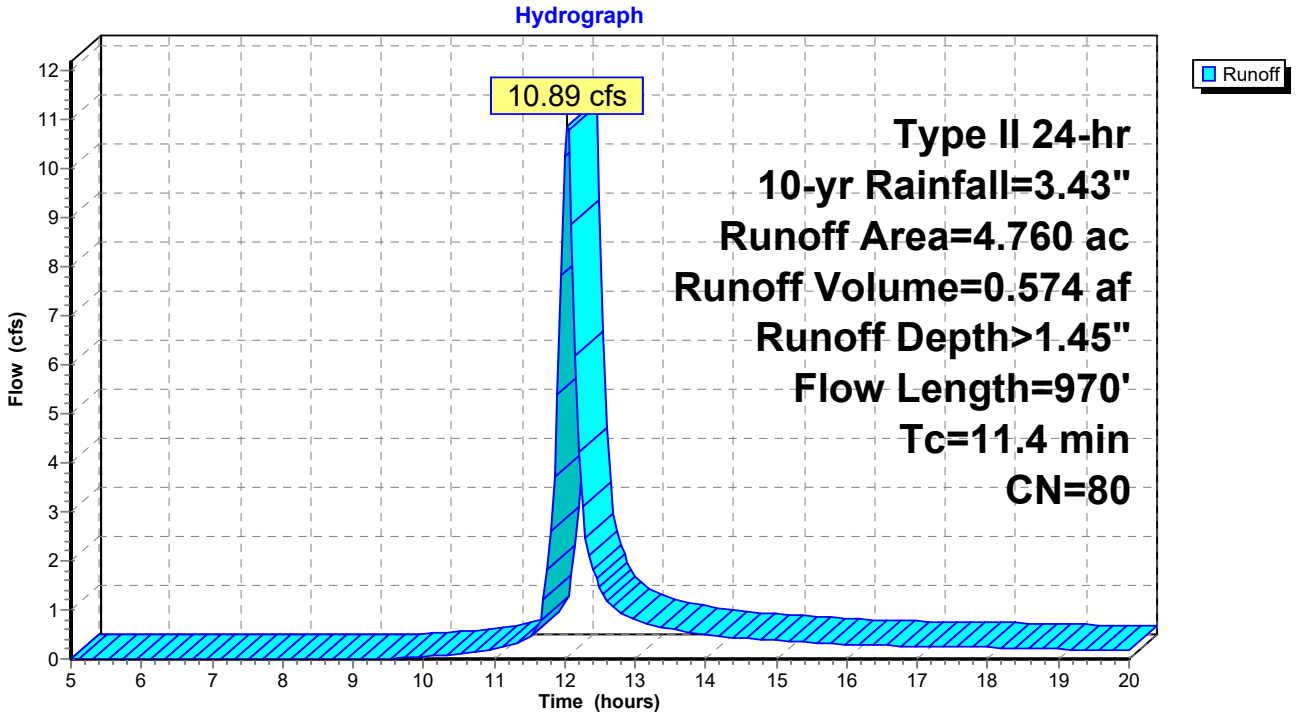
Runoff = 10.89 cfs @ 12.04 hrs, Volume= 0.574 af, Depth> 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
0.650	77	Woods, Good, HSG D
4.040	80	>75% Grass cover, Good, HSG D
0.070	98	Paved parking, HSG D
4.760	80	Weighted Average
4.690		98.53% Pervious Area
0.070		1.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0650	0.16		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.39"
0.5	144	0.0833	4.65		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
0.6	726	0.0440	21.93	307.08	**Channel Flow, Swale** Area= 14.0 sf Perim= 6.0' r= 2.33' n= 0.025 Earth, clean & straight
11.4	970	Total			

Subcatchment 2S: DA-2



Summary for Subcatchment 3S: DA-3

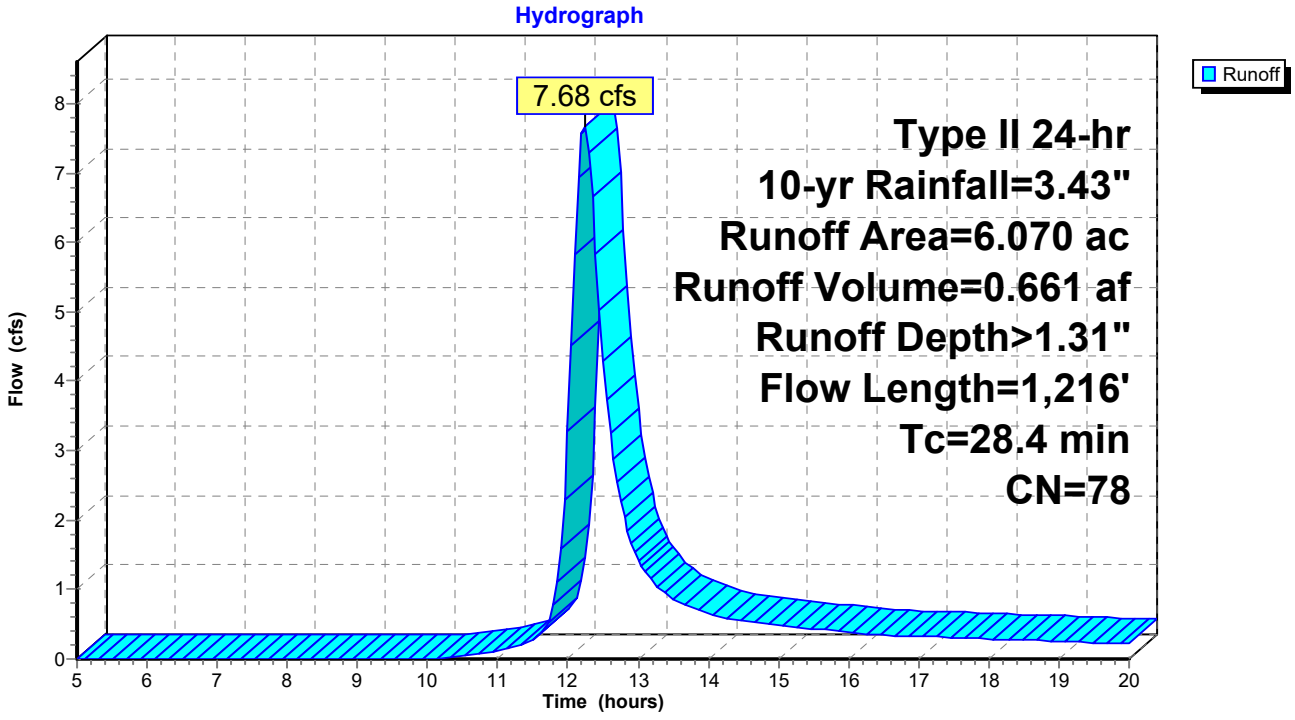
Runoff = 7.68 cfs @ 12.23 hrs, Volume= 0.661 af, Depth> 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
3.330	77	Woods, Good, HSG D
2.740	80	>75% Grass cover, Good, HSG D
6.070	78	Weighted Average
6.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	100	0.0400	0.13		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.39"
14.2	555	0.0170	0.65		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
1.5	281	0.0360	3.05		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
0.2	280	0.1210	20.51	205.13	**Channel Flow, Swale** Area= 10.0 sf Perim= 5.0' r= 2.00' n= 0.040 Earth, dense weeds
28.4	1,216	Total			

Subcatchment 3S: DA-3



Summary for Subcatchment 4S: DA-4

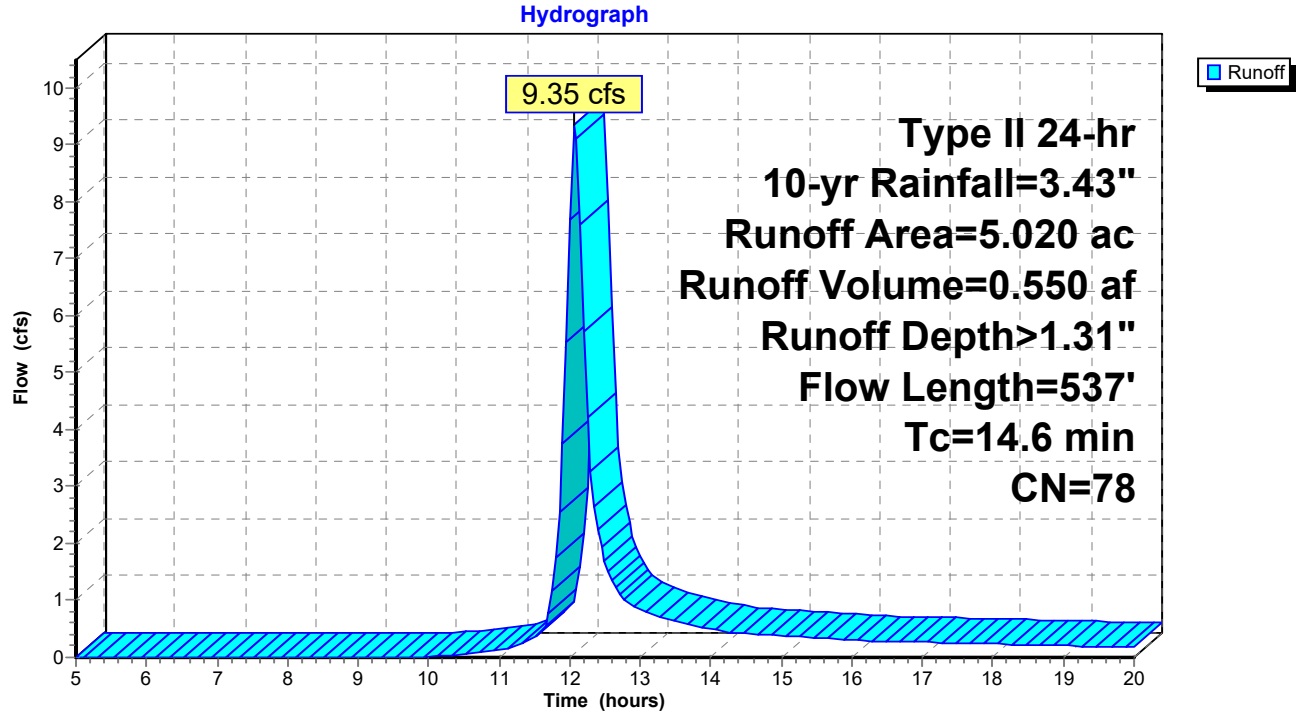
Runoff = 9.35 cfs @ 12.07 hrs, Volume= 0.550 af, Depth> 1.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
3.480	77	Woods, Good, HSG D
1.540	80	>75% Grass cover, Good, HSG D
5.020	78	Weighted Average
5.020		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.39"
1.5	287	0.0380	3.14		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
1.7	150	0.0870	1.47		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
14.6	537	Total			

Subcatchment 4S: DA-4

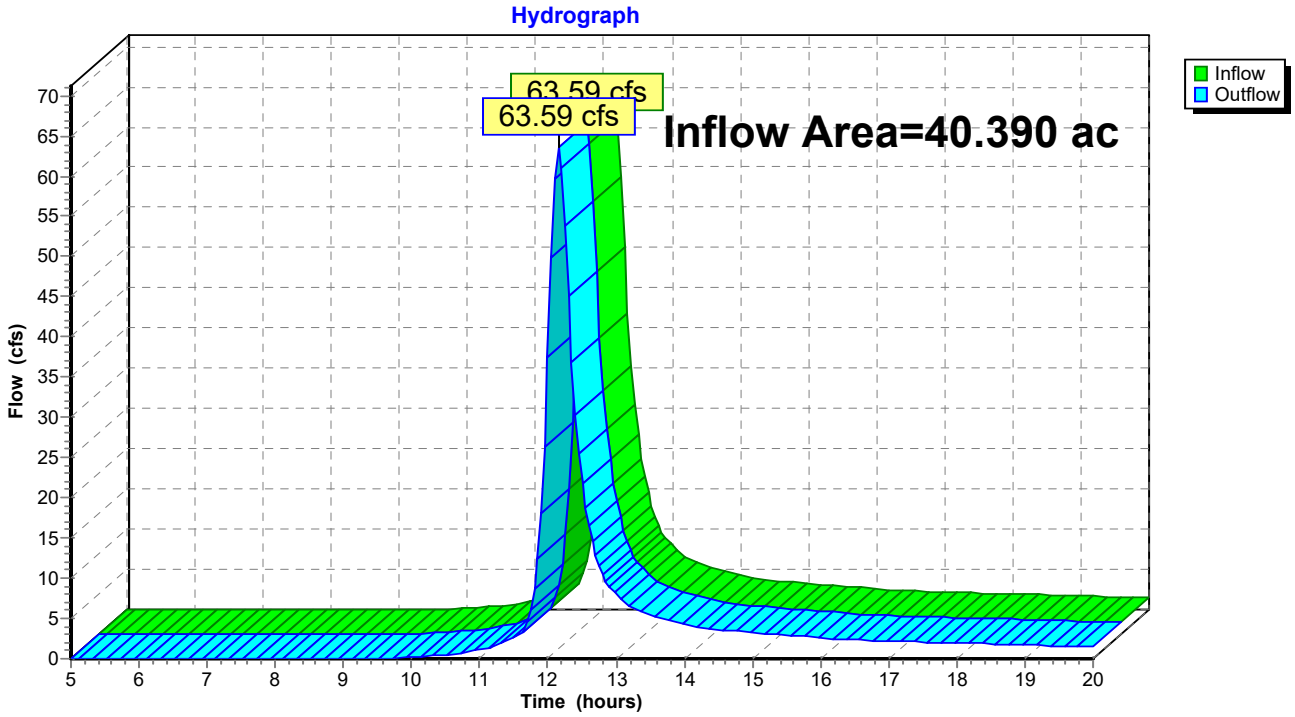


Summary for Reach 5R: Pt of Study 1A

Inflow Area = 40.390 ac, 0.00% Impervious, Inflow Depth > 1.38" for 10-yr event
Inflow = 63.59 cfs @ 12.15 hrs, Volume= 4.628 af
Outflow = 63.59 cfs @ 12.15 hrs, Volume= 4.628 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 5R: Pt of Study 1A

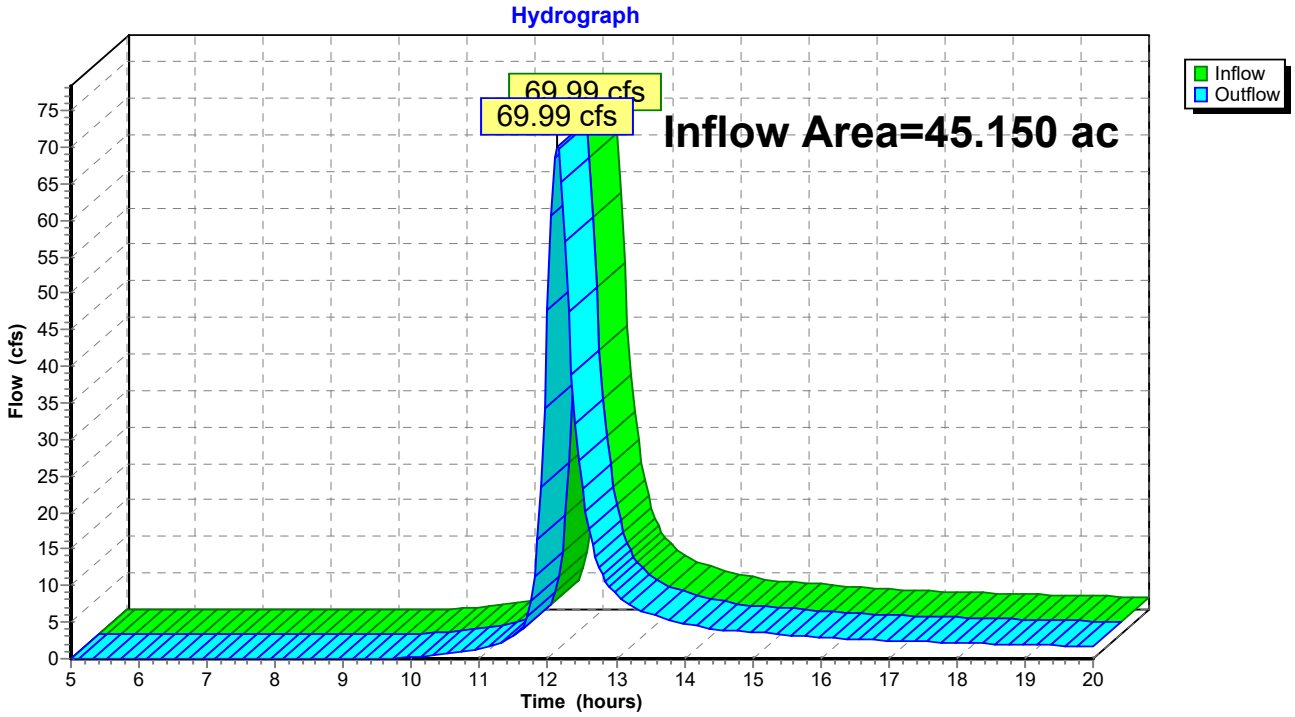


Summary for Reach 6R: Pt of Study 1B

Inflow Area = 45.150 ac, 0.16% Impervious, Inflow Depth > 1.38" for 10-yr event
Inflow = 69.99 cfs @ 12.14 hrs, Volume= 5.202 af
Outflow = 69.99 cfs @ 12.14 hrs, Volume= 5.202 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 6R: Pt of Study 1B

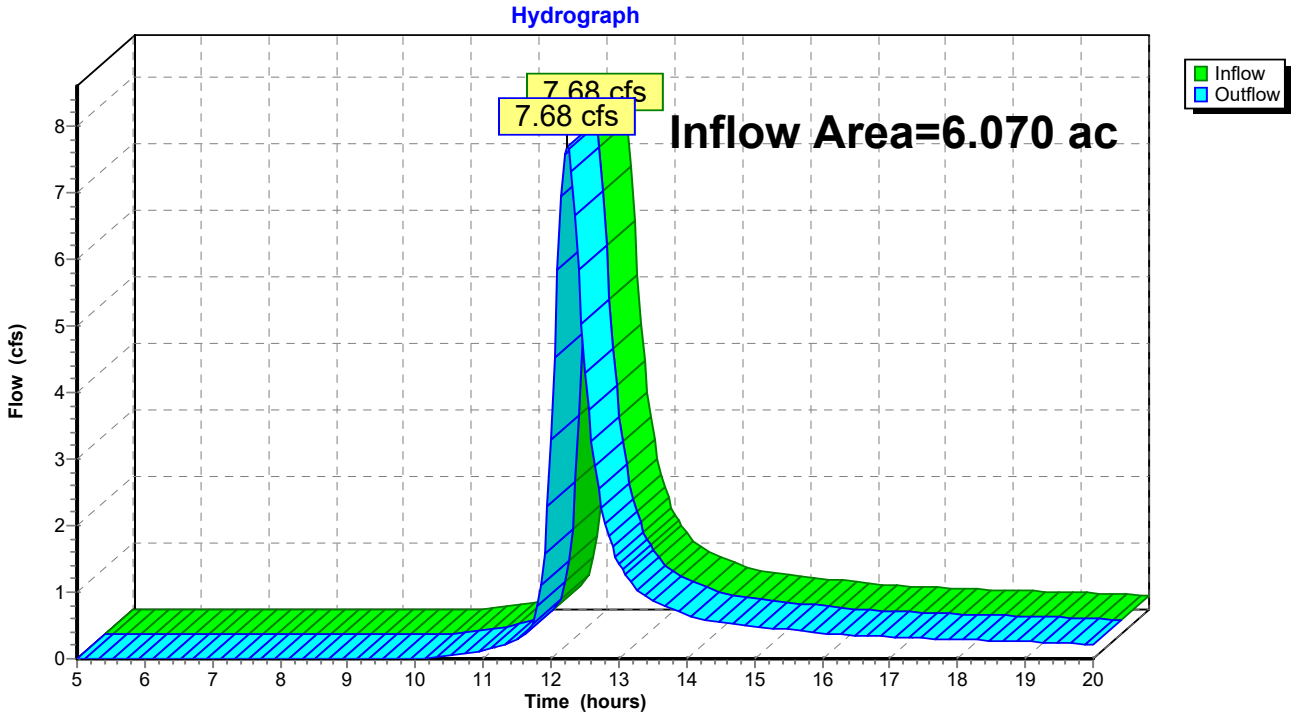


Summary for Reach 7R: Pt of Study 2

Inflow Area = 6.070 ac, 0.00% Impervious, Inflow Depth > 1.31" for 10-yr event
Inflow = 7.68 cfs @ 12.23 hrs, Volume= 0.661 af
Outflow = 7.68 cfs @ 12.23 hrs, Volume= 0.661 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 7R: Pt of Study 2

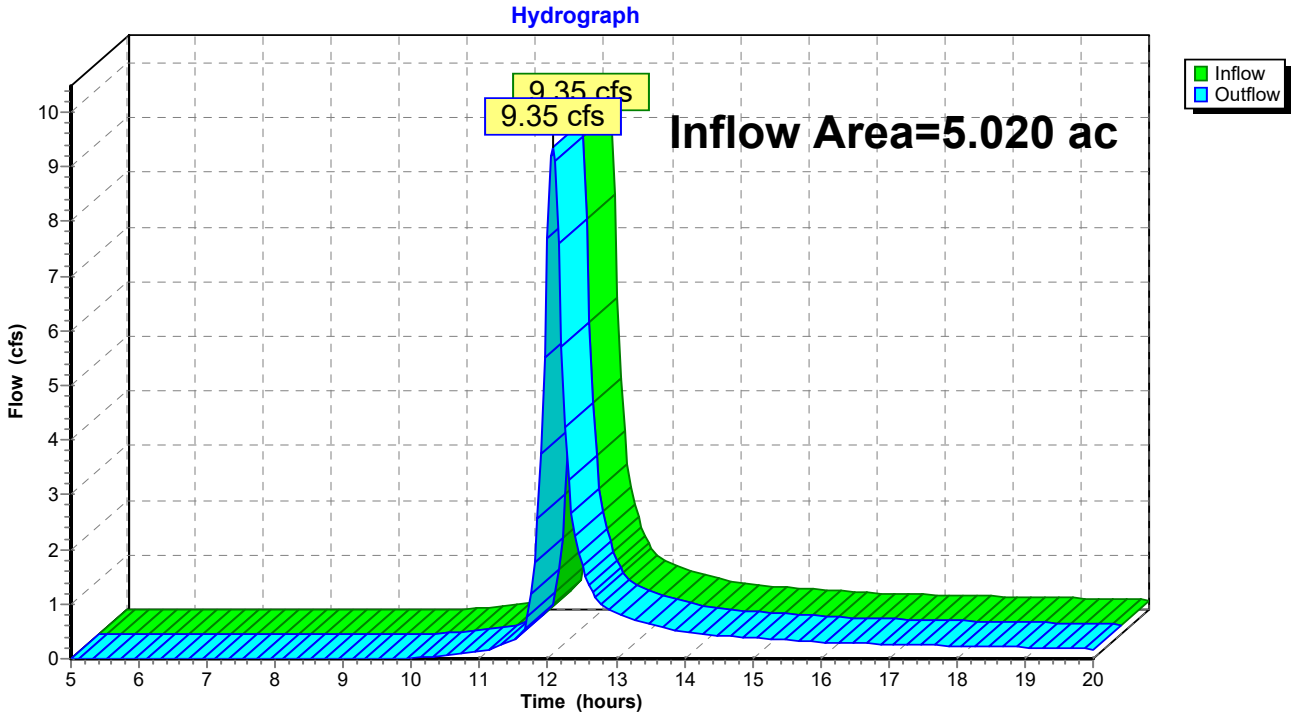


Summary for Reach 8R: Pt of Study 3

Inflow Area = 5.020 ac, 0.00% Impervious, Inflow Depth > 1.31" for 10-yr event
Inflow = 9.35 cfs @ 12.07 hrs, Volume= 0.550 af
Outflow = 9.35 cfs @ 12.07 hrs, Volume= 0.550 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 8R: Pt of Study 3



Summary for Subcatchment 1S: DA-1

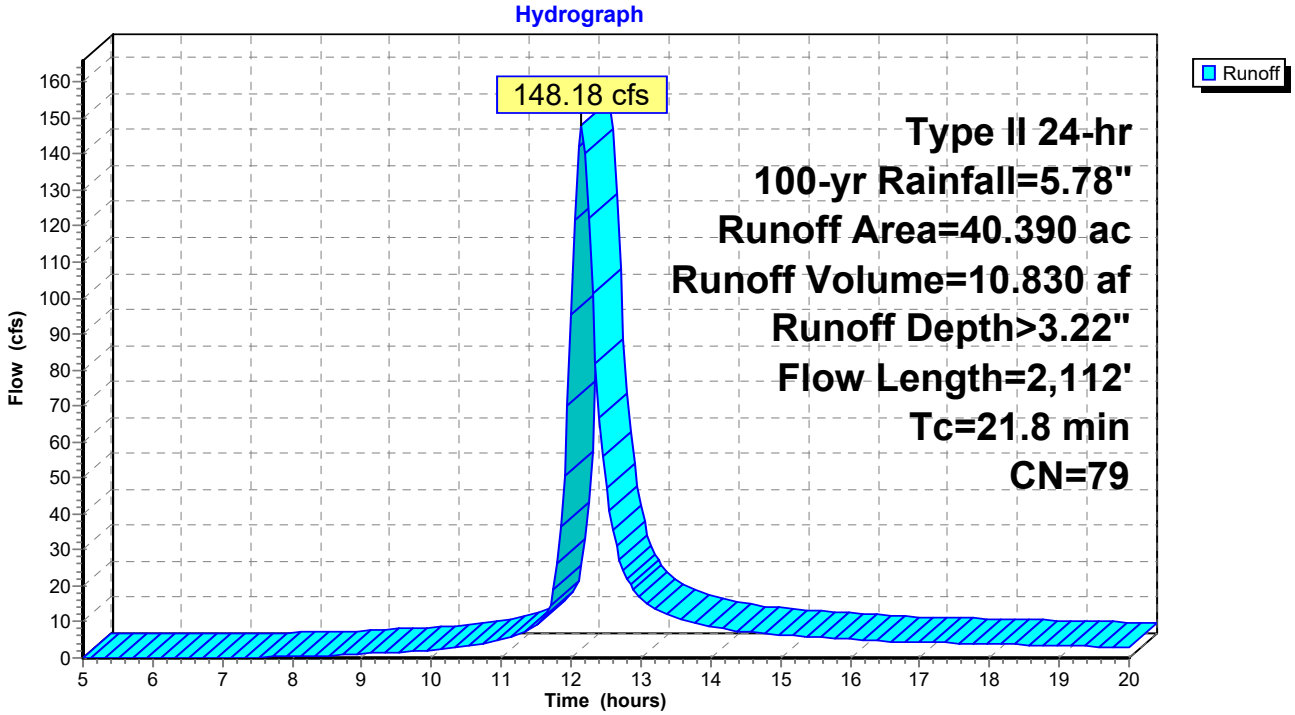
Runoff = 148.18 cfs @ 12.15 hrs, Volume= 10.830 af, Depth> 3.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
12.250	77	Woods, Good, HSG D
28.140	80	>75% Grass cover, Good, HSG D
40.390	79	Weighted Average
40.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0600	0.10		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.39"
3.6	885	0.0650	4.10		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
2.2	1,127	0.0080	8.44	135.03	**Channel Flow, Swale** Area= 16.0 sf Perim= 8.0' r= 2.00' n= 0.025 Earth, clean & straight
21.8	2,112	Total			

Subcatchment 1S: DA-1



Summary for Subcatchment 2S: DA-2

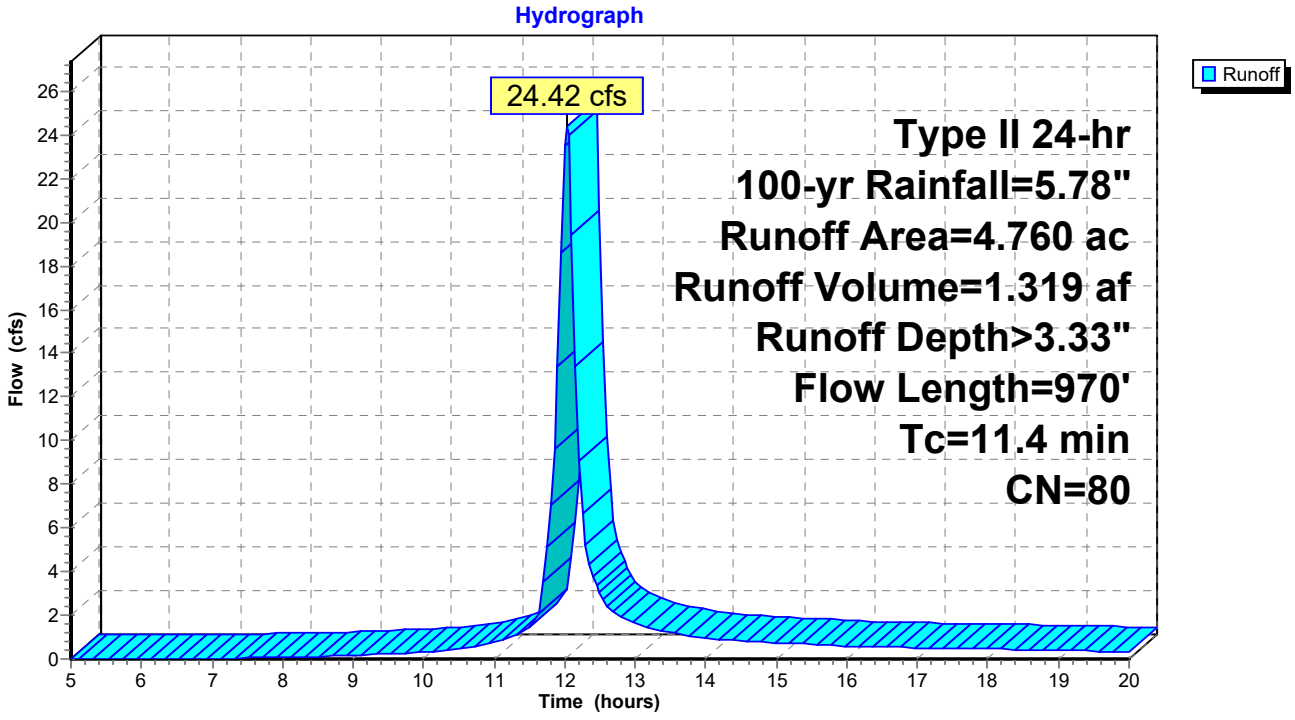
Runoff = 24.42 cfs @ 12.03 hrs, Volume= 1.319 af, Depth> 3.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
0.650	77	Woods, Good, HSG D
4.040	80	>75% Grass cover, Good, HSG D
0.070	98	Paved parking, HSG D
4.760	80	Weighted Average
4.690		98.53% Pervious Area
0.070		1.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0650	0.16		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.39"
0.5	144	0.0833	4.65		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
0.6	726	0.0440	21.93	307.08	**Channel Flow, Swale** Area= 14.0 sf Perim= 6.0' r= 2.33' n= 0.025 Earth, clean & straight
11.4	970	Total			

Subcatchment 2S: DA-2



Summary for Subcatchment 3S: DA-3

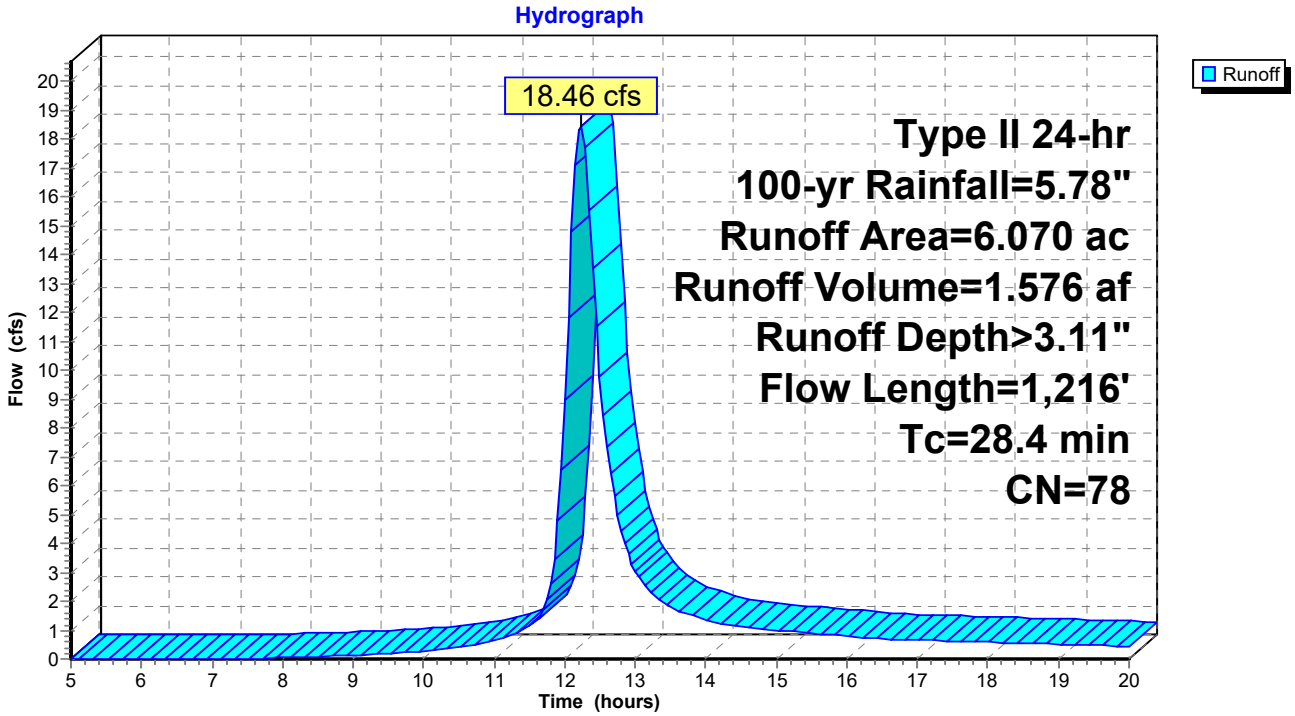
Runoff = 18.46 cfs @ 12.22 hrs, Volume= 1.576 af, Depth> 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
3.330	77	Woods, Good, HSG D
2.740	80	>75% Grass cover, Good, HSG D
6.070	78	Weighted Average
6.070		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	100	0.0400	0.13		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.39"
14.2	555	0.0170	0.65		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
1.5	281	0.0360	3.05		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
0.2	280	0.1210	20.51	205.13	**Channel Flow, Swale** Area= 10.0 sf Perim= 5.0' r= 2.00' n= 0.040 Earth, dense weeds
28.4	1,216	Total			

Subcatchment 3S: DA-3



Summary for Subcatchment 4S: DA-4

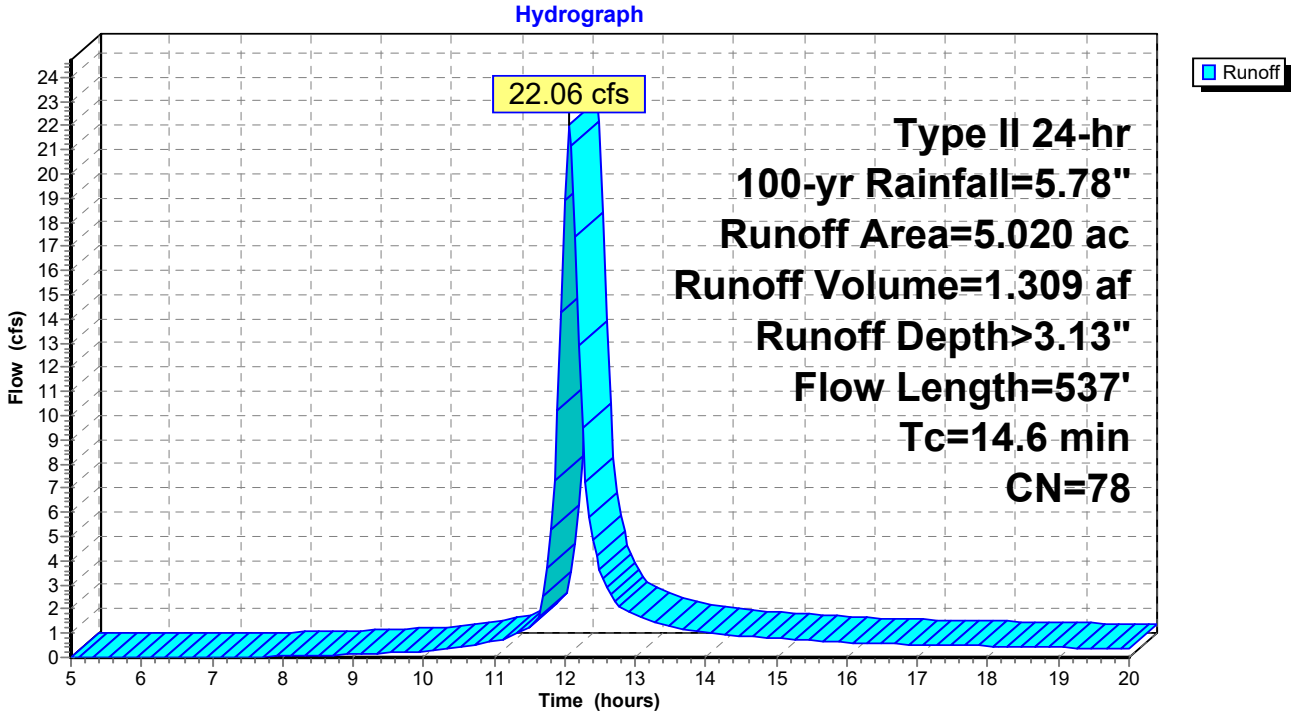
Runoff = 22.06 cfs @ 12.07 hrs, Volume= 1.309 af, Depth> 3.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
3.480	77	Woods, Good, HSG D
1.540	80	>75% Grass cover, Good, HSG D
5.020	78	Weighted Average
5.020		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.39"
1.5	287	0.0380	3.14		**Shallow Concentrated Flow, Shallow** Unpaved Kv= 16.1 fps
1.7	150	0.0870	1.47		**Shallow Concentrated Flow, Shallow** Woodland Kv= 5.0 fps
14.6	537	Total			

Subcatchment 4S: DA-4

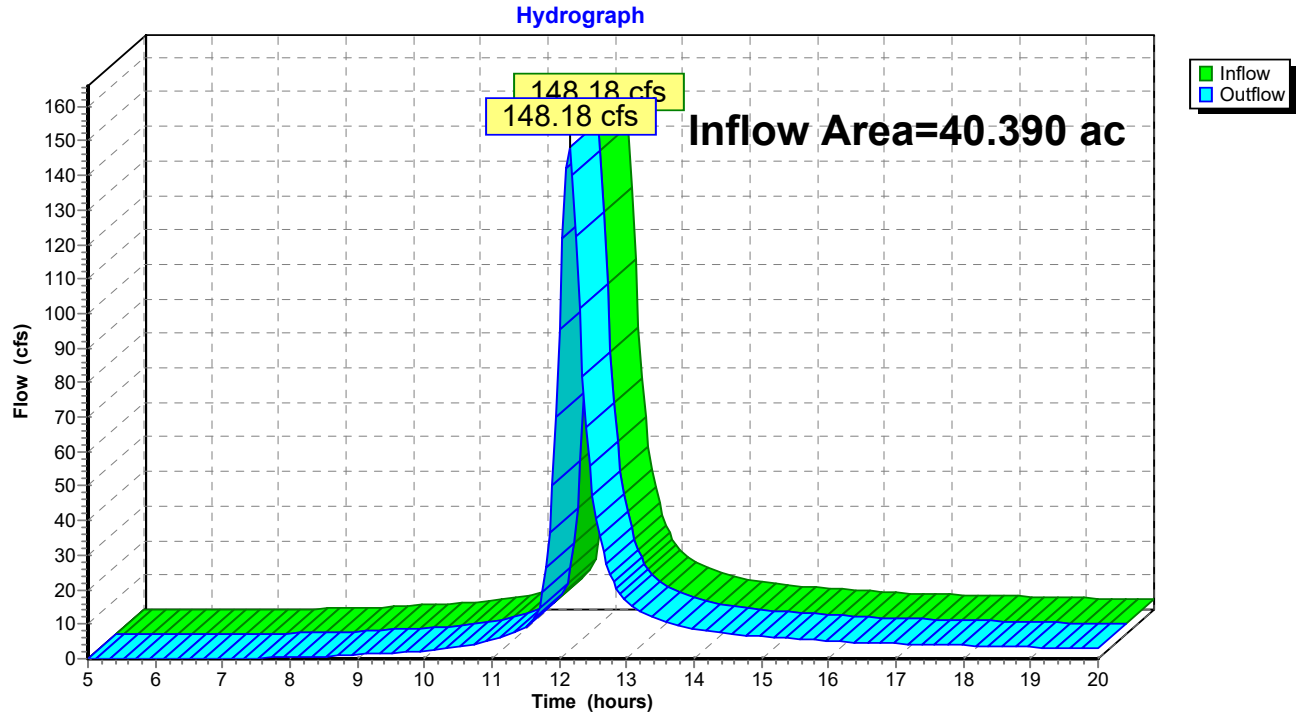


Summary for Reach 5R: Pt of Study 1A

Inflow Area = 40.390 ac, 0.00% Impervious, Inflow Depth > 3.22" for 100-yr event
Inflow = 148.18 cfs @ 12.15 hrs, Volume= 10.830 af
Outflow = 148.18 cfs @ 12.15 hrs, Volume= 10.830 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 5R: Pt of Study 1A

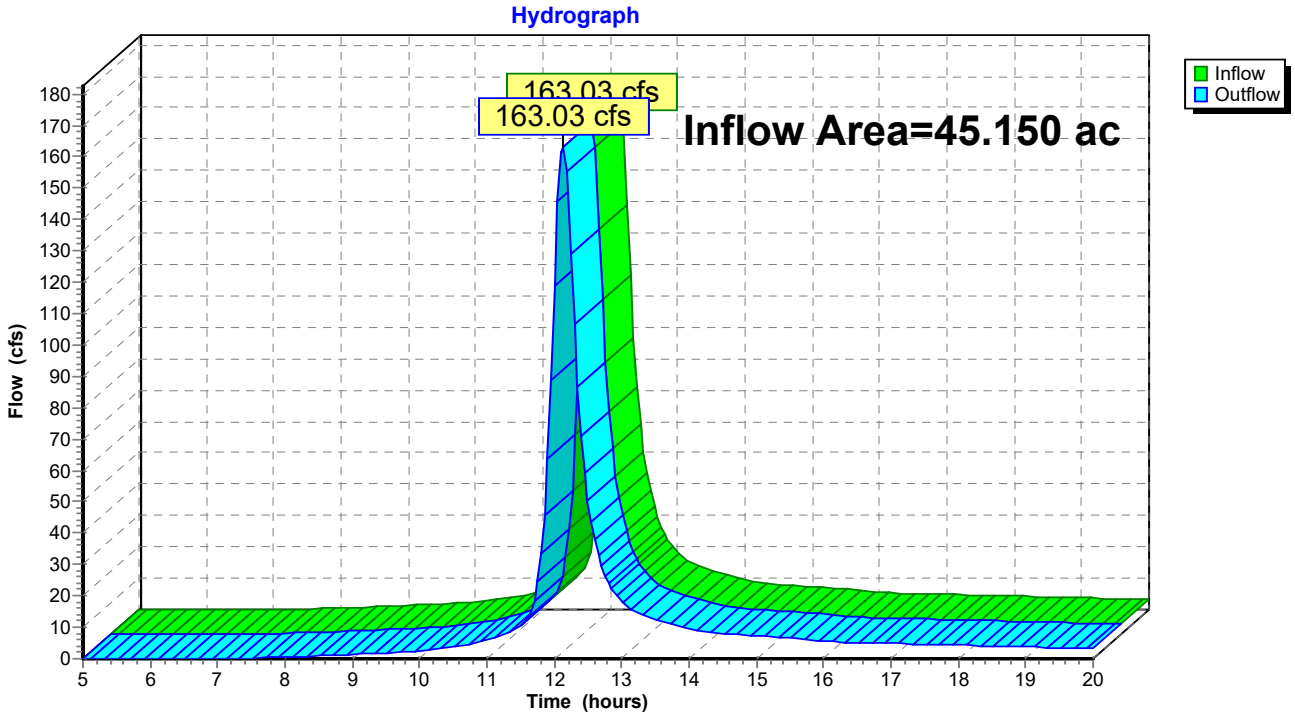


Summary for Reach 6R: Pt of Study 1B

Inflow Area = 45.150 ac, 0.16% Impervious, Inflow Depth > 3.23" for 100-yr event
Inflow = 163.03 cfs @ 12.13 hrs, Volume= 12.149 af
Outflow = 163.03 cfs @ 12.13 hrs, Volume= 12.149 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 6R: Pt of Study 1B

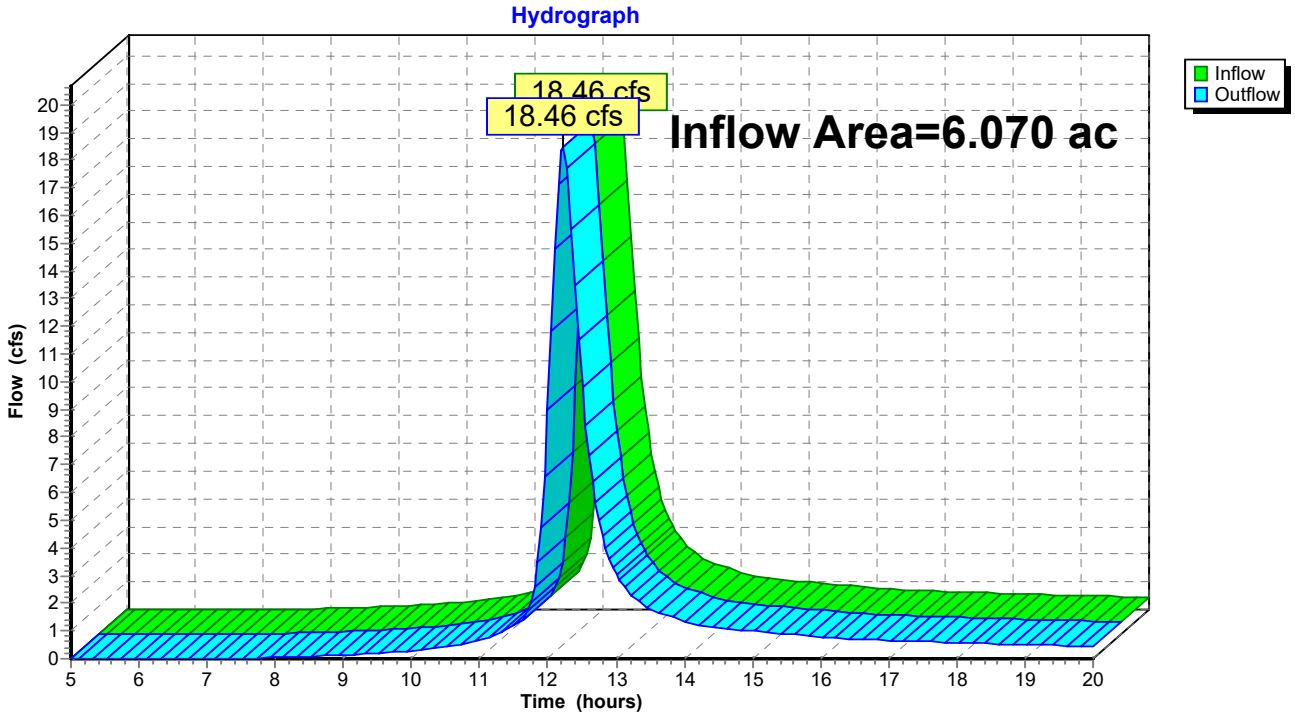


Summary for Reach 7R: Pt of Study 2

Inflow Area = 6.070 ac, 0.00% Impervious, Inflow Depth > 3.11" for 100-yr event
Inflow = 18.46 cfs @ 12.22 hrs, Volume= 1.576 af
Outflow = 18.46 cfs @ 12.22 hrs, Volume= 1.576 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 7R: Pt of Study 2

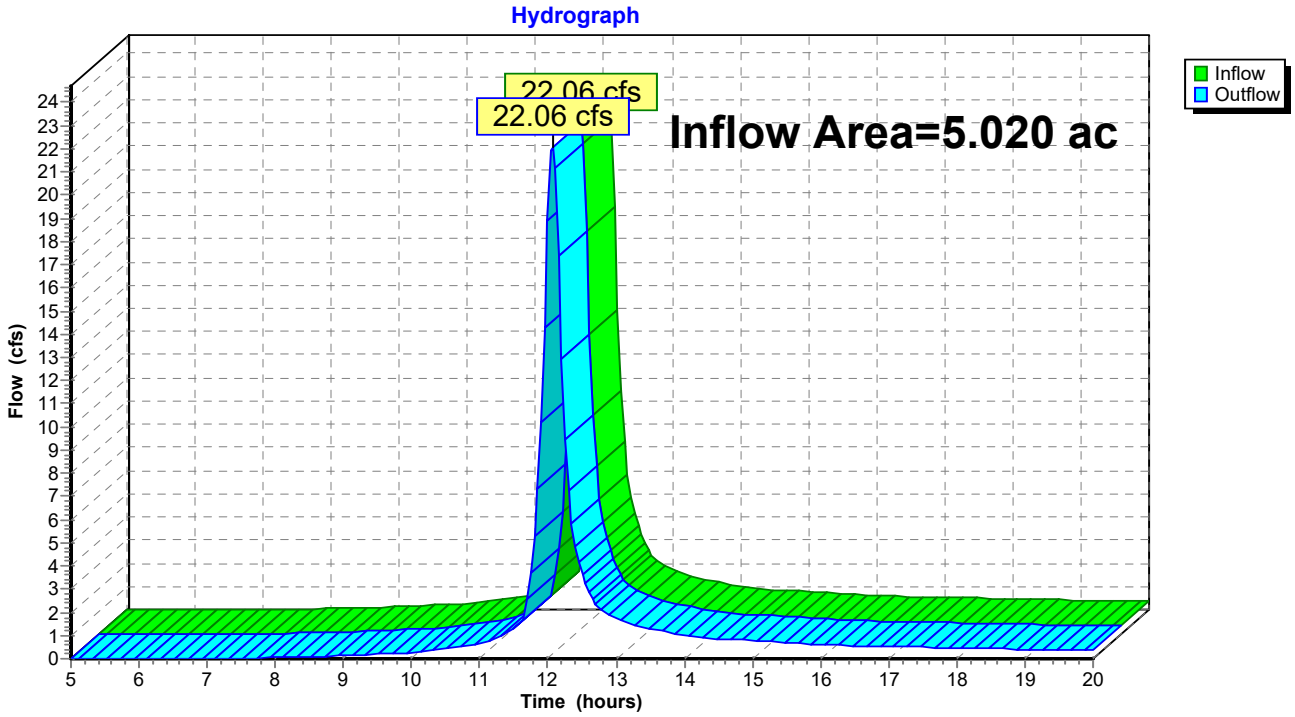


Summary for Reach 8R: Pt of Study 3

Inflow Area = 5.020 ac, 0.00% Impervious, Inflow Depth > 3.13" for 100-yr event
Inflow = 22.06 cfs @ 12.07 hrs, Volume= 1.309 af
Outflow = 22.06 cfs @ 12.07 hrs, Volume= 1.309 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Reach 8R: Pt of Study 3



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APPENDIX B: HYDRO CAD – PROPOSED CONDITIONS

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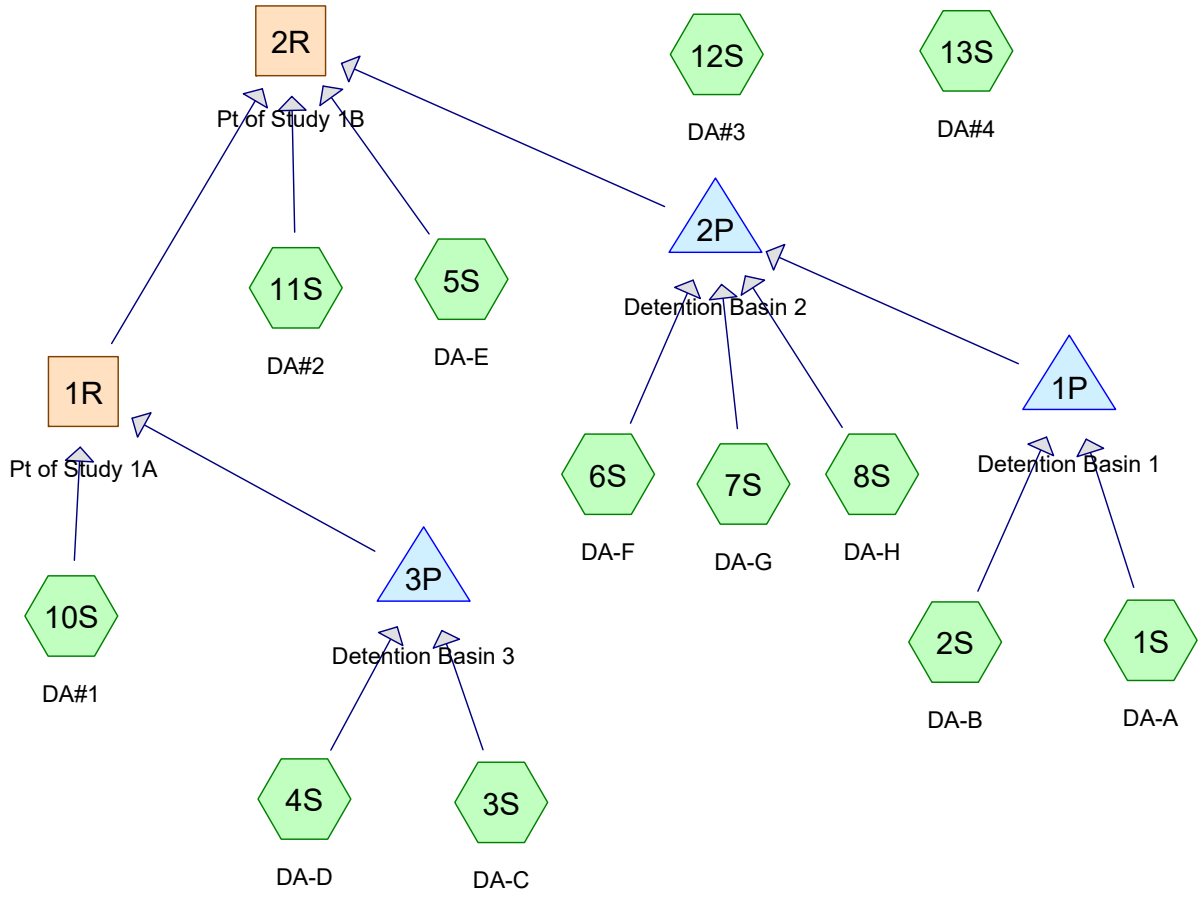


Subcat Reach Pond Link

Routing Diagram for Proposed Drainage Areas
Prepared by Napierala Consulting, P.C., Printed 9/10/2020

Summary for Subcatchment 1S: DA-A

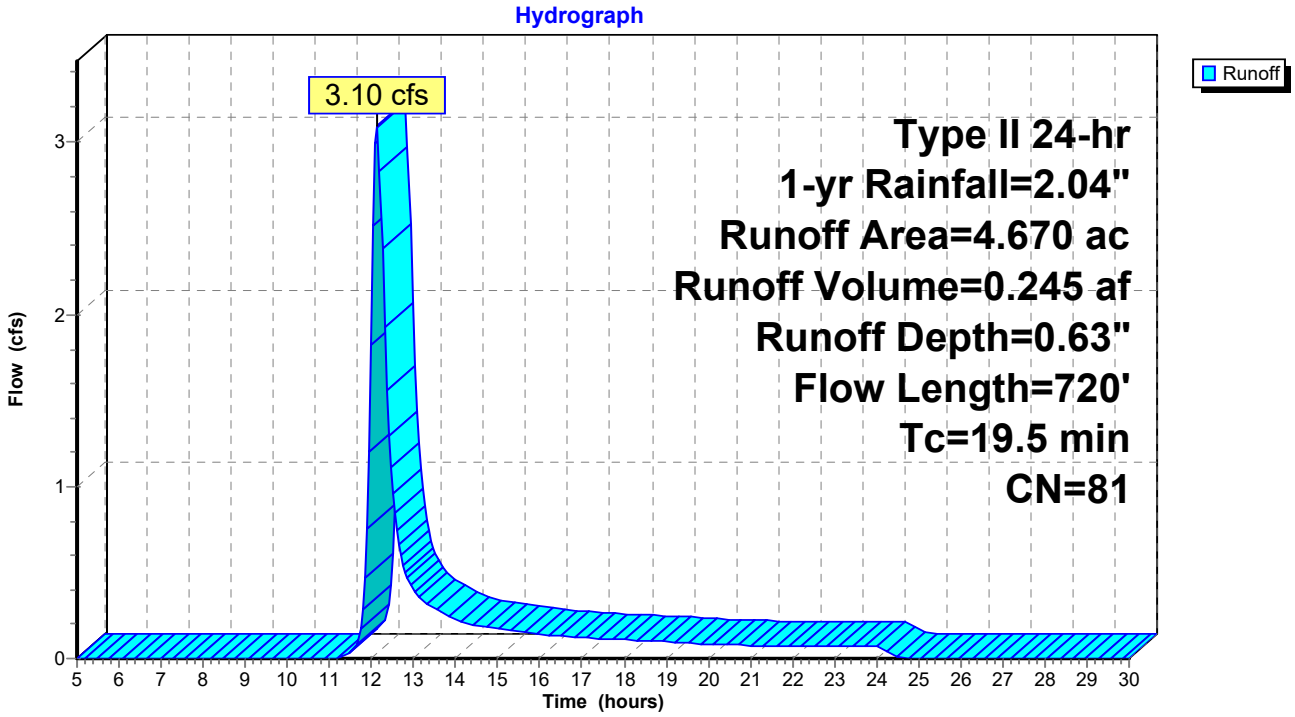
Runoff = 3.10 cfs @ 12.14 hrs, Volume= 0.245 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
0.270	98	Paved parking, HSG D
2.580	80	>75% Grass cover, Good, HSG D
1.540	77	Woods, Good, HSG D
0.280	98	Roofs, HSG D
4.670	81	Weighted Average
4.120		88.22% Pervious Area
0.550		11.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0600	0.10		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 2.39"
2.5	188	0.0650	1.27		**Shallow Concentrated Flow, SCF** Woodland Kv= 5.0 fps
0.8	202	0.0650	4.10		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	230	0.0200	16.17	32.33	**Channel Flow, GUTTER** Area= 2.0 sf Perim= 2.0' r= 1.00' n= 0.013 Asphalt, smooth
19.5	720	Total			

Subcatchment 1S: DA-A



Summary for Subcatchment 2S: DA-B

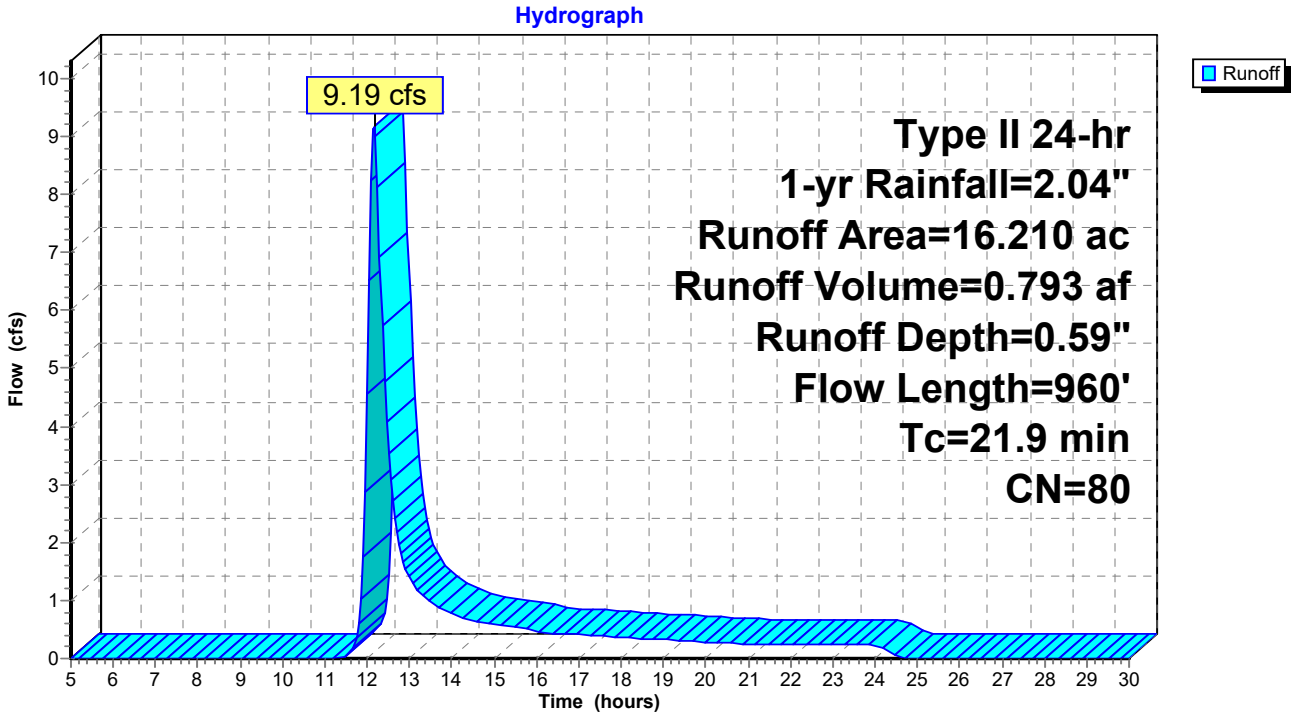
Runoff = 9.19 cfs @ 12.17 hrs, Volume= 0.793 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
0.740	98	Paved parking, HSG D
7.140	80	>75% Grass cover, Good, HSG D
7.840	77	Woods, Good, HSG D
0.490	98	Roofs, HSG D
16.210	80	Weighted Average
14.980		92.41% Pervious Area
1.230		7.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0600	0.10		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 2.39"
4.8	370	0.0650	1.27		**Shallow Concentrated Flow, SCF** Woodland Kv= 5.0 fps
0.8	200	0.0650	4.10		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.3	290	0.0200	16.17	32.33	**Channel Flow, GUTTER** Area= 2.0 sf Perim= 2.0' r= 1.00' n= 0.013 Asphalt, smooth
21.9	960	Total			

Subcatchment 2S: DA-B



Summary for Subcatchment 3S: DA-C

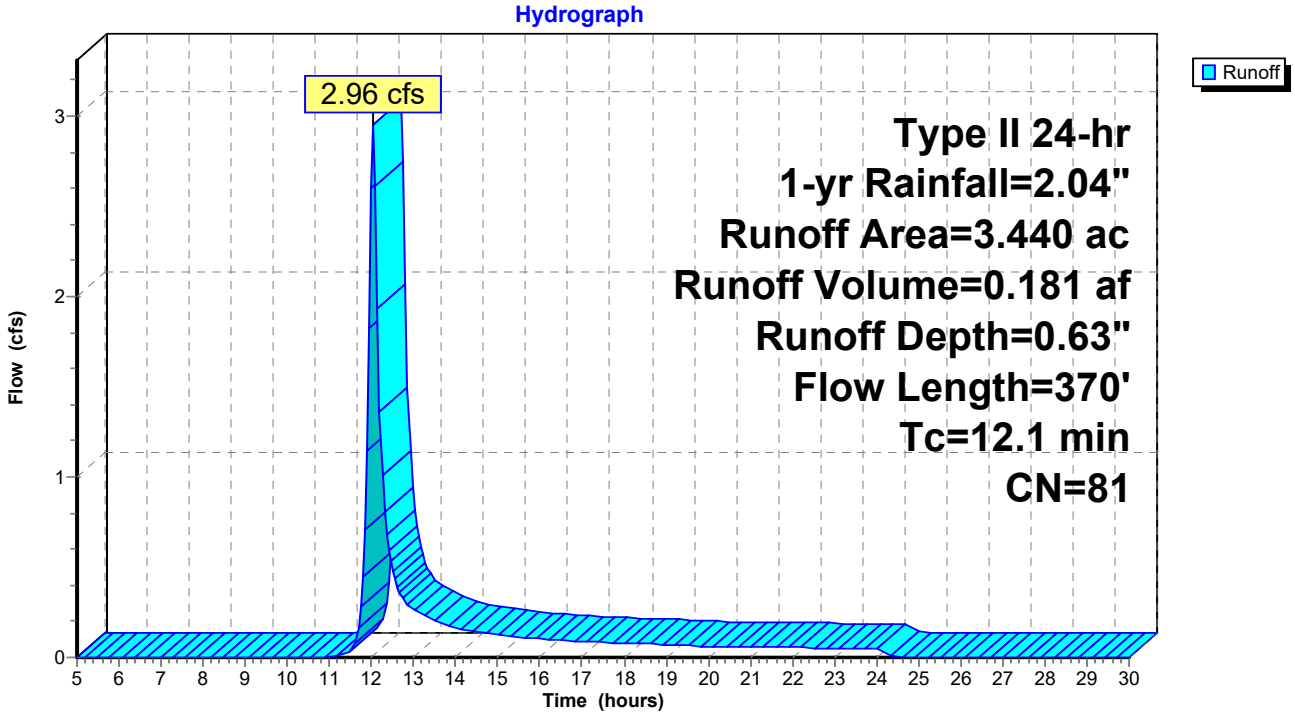
Runoff = 2.96 cfs @ 12.05 hrs, Volume= 0.181 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
0.060	98	Paved parking, HSG D
3.200	80	>75% Grass cover, Good, HSG D
0.180	98	Roofs, HSG D
3.440	81	Weighted Average
3.200		93.02% Pervious Area
0.240		6.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0600	0.16		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
1.5	270	0.0370	3.10		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
12.1	370	Total			

Subcatchment 3S: DA-C



Summary for Subcatchment 4S: DA-D

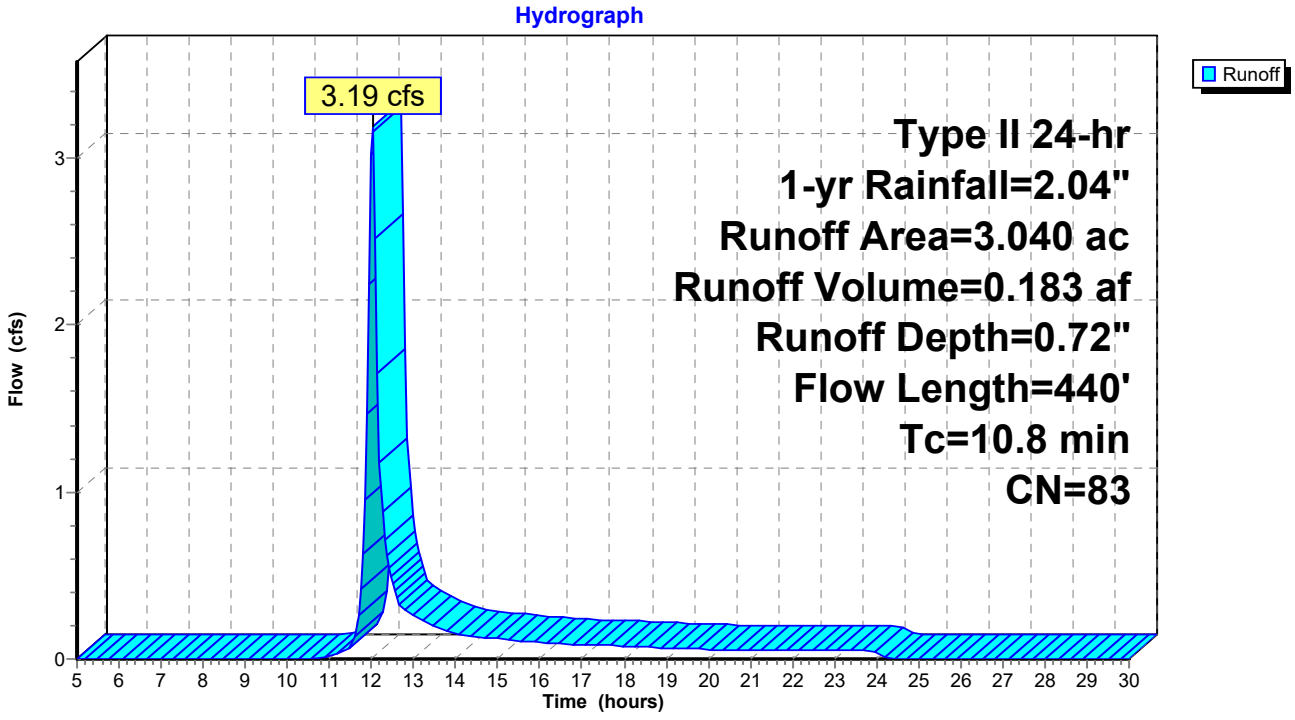
Runoff = 3.19 cfs @ 12.03 hrs, Volume= 0.183 af, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
0.310	98	Paved parking, HSG D
2.560	80	>75% Grass cover, Good, HSG D
0.170	98	Roofs, HSG D
3.040	83	Weighted Average
2.560		84.21% Pervious Area
0.480		15.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0700	0.17		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.5	140	0.0900	4.83		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.3	200	0.0200	9.55	76.42	**Channel Flow, swale flow** Area= 8.0 sf Perim= 8.0' r= 1.00' n= 0.022 Earth, clean & straight
10.8	440	Total			

Subcatchment 4S: DA-D



Summary for Subcatchment 5S: DA-E

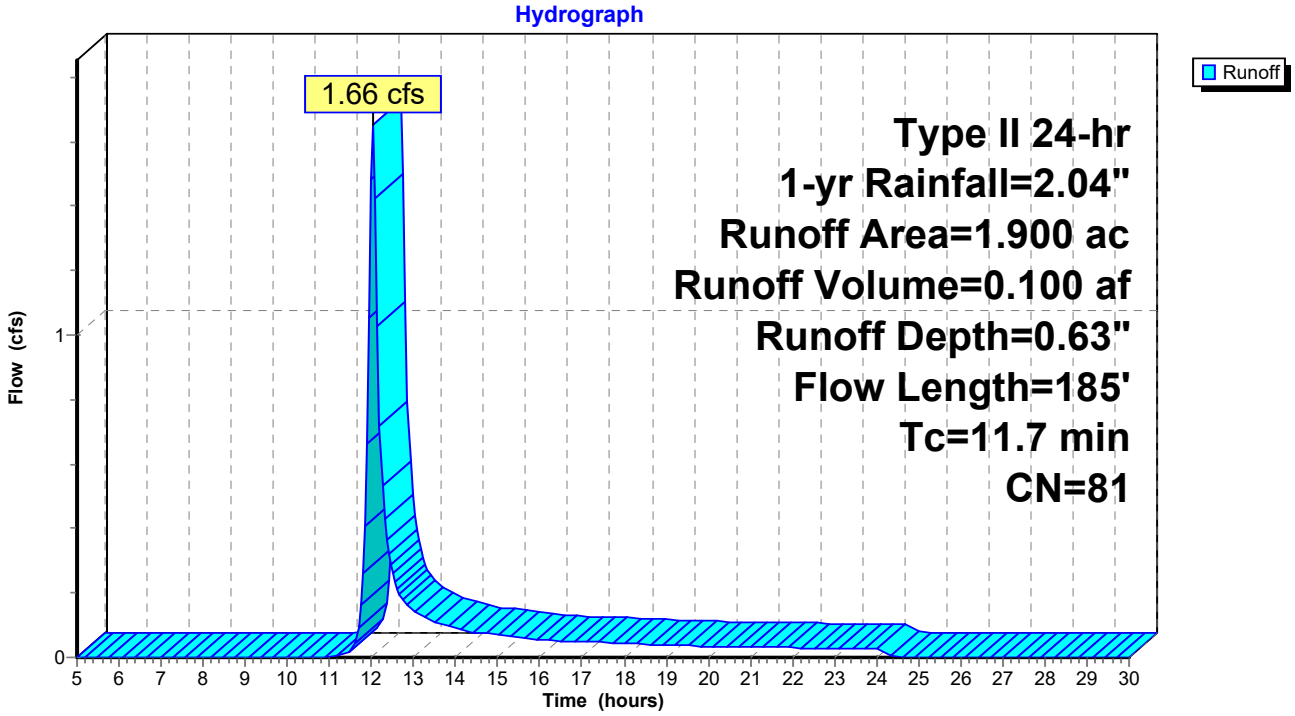
Runoff = 1.66 cfs @ 12.05 hrs, Volume= 0.100 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
0.030	98	Paved parking, HSG D
1.800	80	>75% Grass cover, Good, HSG D
0.070	98	Roofs, HSG D
1.900	81	Weighted Average
1.800		94.74% Pervious Area
0.100		5.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.3	85	0.0950	4.96		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
11.7	185	Total			

Subcatchment 5S: DA-E



Summary for Subcatchment 6S: DA-F

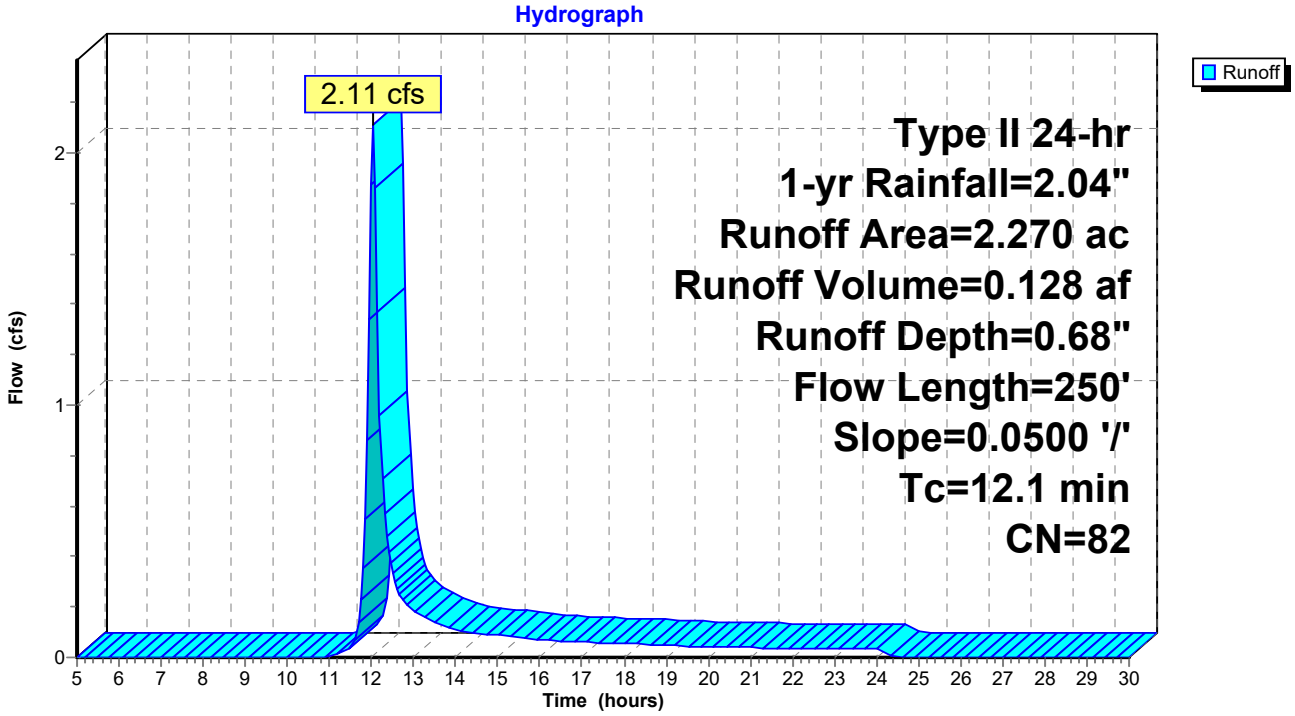
Runoff = 2.11 cfs @ 12.05 hrs, Volume= 0.128 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
0.090	98	Paved parking, HSG D
2.040	80	>75% Grass cover, Good, HSG D
0.140	98	Roofs, HSG D
2.270	82	Weighted Average
2.040		89.87% Pervious Area
0.230		10.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.7	150	0.0500	3.60		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
12.1	250	Total			

Subcatchment 6S: DA-F



Summary for Subcatchment 7S: DA-G

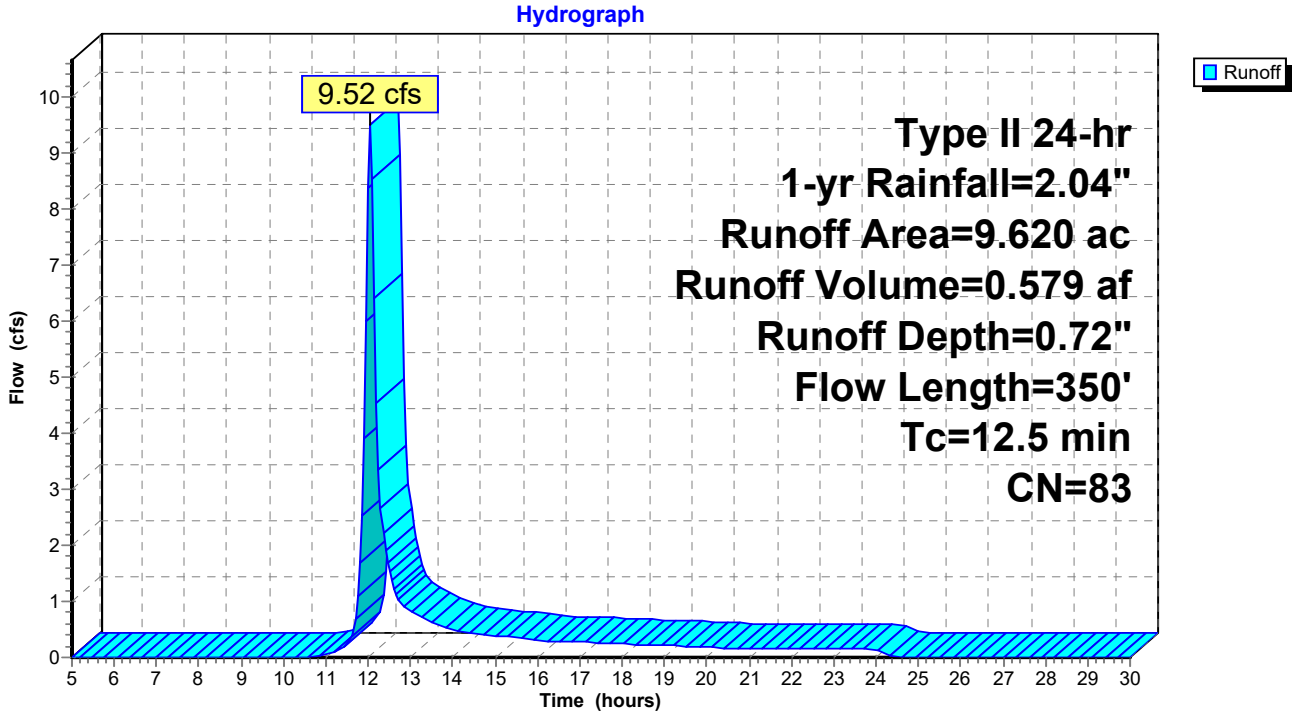
Runoff = 9.52 cfs @ 12.05 hrs, Volume= 0.579 af, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
1.050	98	Paved parking, HSG D
8.080	80	>75% Grass cover, Good, HSG D
0.490	98	Roofs, HSG D
9.620	83	Weighted Average
8.080		83.99% Pervious Area
1.540		16.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, sheet** Grass: Dense n= 0.240 P2= 2.39"
1.1	250	0.0550	3.78		**Shallow Concentrated Flow, shallow conc flow** Unpaved Kv= 16.1 fps
12.5	350	Total			

Subcatchment 7S: DA-G



Summary for Subcatchment 8S: DA-H

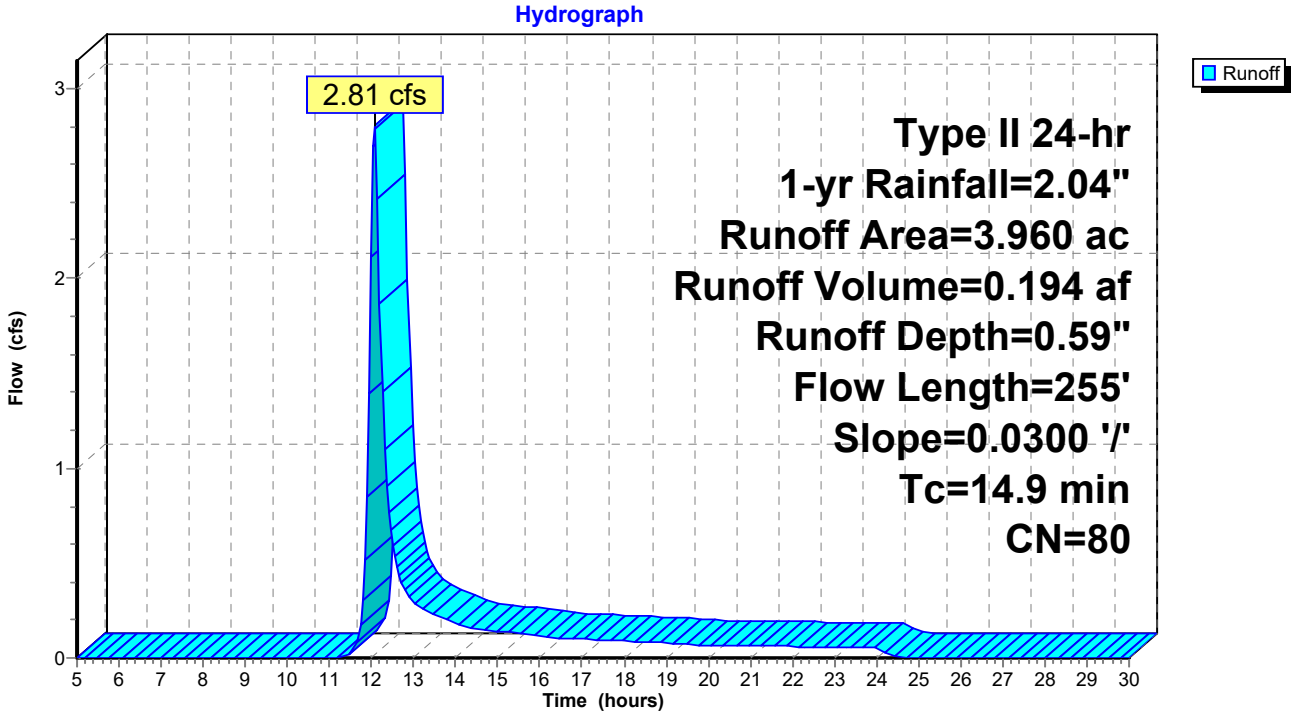
Runoff = 2.81 cfs @ 12.09 hrs, Volume= 0.194 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
0.090	98	Paved parking, HSG D
2.440	80	>75% Grass cover, Good, HSG D
1.220	77	Woods, Good, HSG D
0.210	98	Roofs, HSG D
3.960	80	Weighted Average
3.660		92.42% Pervious Area
0.300		7.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0300	0.12		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.9	155	0.0300	2.79		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
14.9	255	Total			

Subcatchment 8S: DA-H



Summary for Subcatchment 10S: DA#1

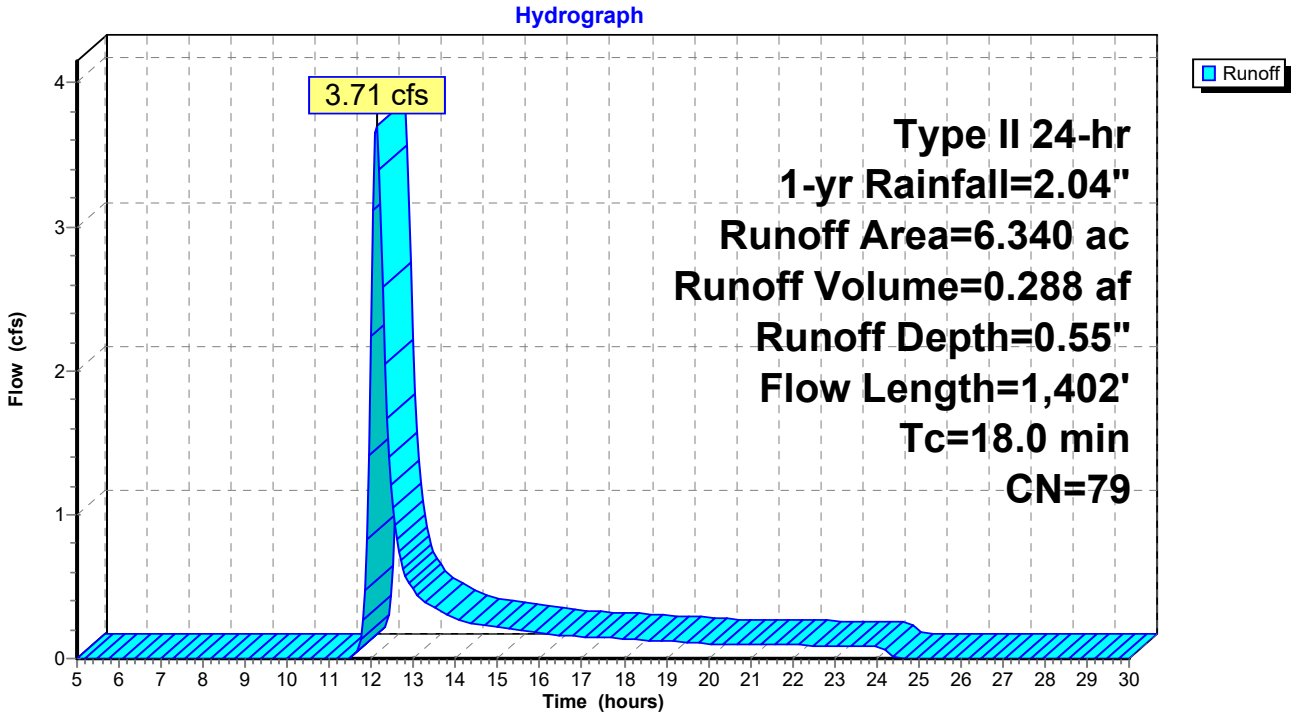
Runoff = 3.71 cfs @ 12.12 hrs, Volume= 0.288 af, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
3.390	80	>75% Grass cover, Good, HSG D
2.850	77	Woods, Good, HSG D
0.030	98	Paved parking, HSG D
0.070	98	Roofs, HSG D
6.340	79	Weighted Average
6.240		98.42% Pervious Area
0.100		1.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0600	0.16		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
5.4	485	0.0900	1.50		**Shallow Concentrated Flow, SCF** Woodland Kv= 5.0 fps
1.8	517	0.0900	4.83		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	300	0.0860	27.67	442.73	**Channel Flow, SWALE** Area= 16.0 sf Perim= 8.0' r= 2.00' n= 0.025 Earth, clean & winding
18.0	1,402	Total			

Subcatchment 10S: DA#1



Summary for Subcatchment 11S: DA#2

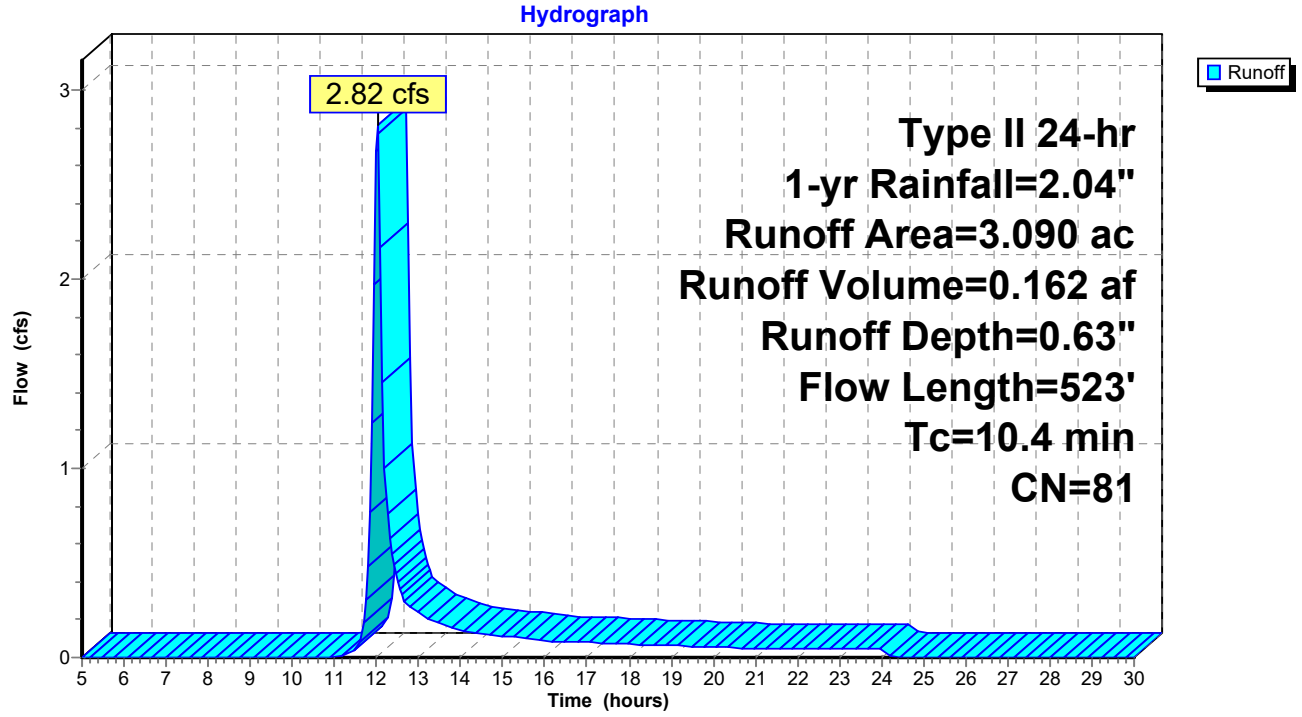
Runoff = 2.82 cfs @ 12.03 hrs, Volume= 0.162 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
2.070	80	>75% Grass cover, Good, HSG D
0.660	77	Woods, Good, HSG D
0.220	98	Paved parking, HSG D
0.140	98	Roofs, HSG D
3.090	81	Weighted Average
2.730		88.35% Pervious Area
0.360		11.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0700	0.17		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.2	56	0.1300	5.80		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	367	0.0820	27.02	432.31	**Channel Flow, SWALE** Area= 16.0 sf Perim= 8.0' r= 2.00' n= 0.025 Earth, clean & winding
10.4	523	Total			

Subcatchment 11S: DA#2



Summary for Subcatchment 12S: DA#3

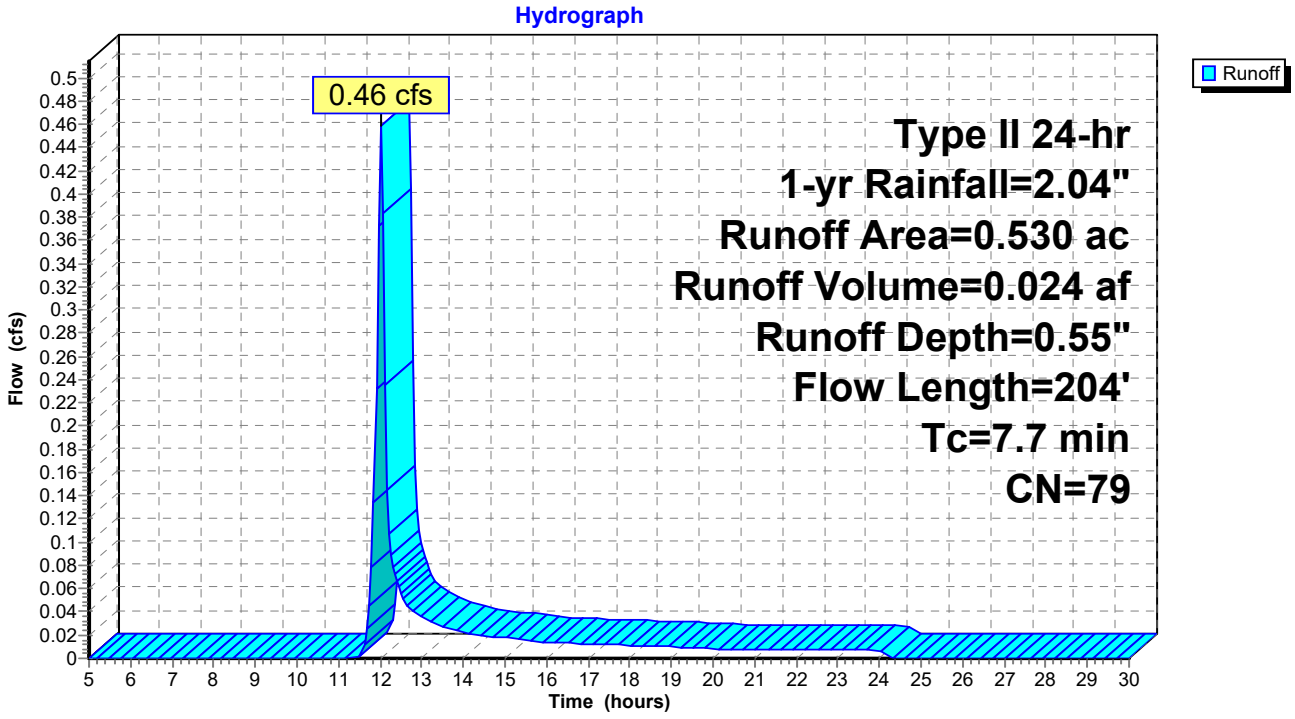
Runoff = 0.46 cfs @ 12.00 hrs, Volume= 0.024 af, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
0.390	80	>75% Grass cover, Good, HSG D
0.140	77	Woods, Good, HSG D
0.530	79	Weighted Average
0.530		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.1500	0.23		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.3	104	0.1300	5.80		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
7.7	204	Total			

Subcatchment 12S: DA#3



Summary for Subcatchment 13S: DA#4

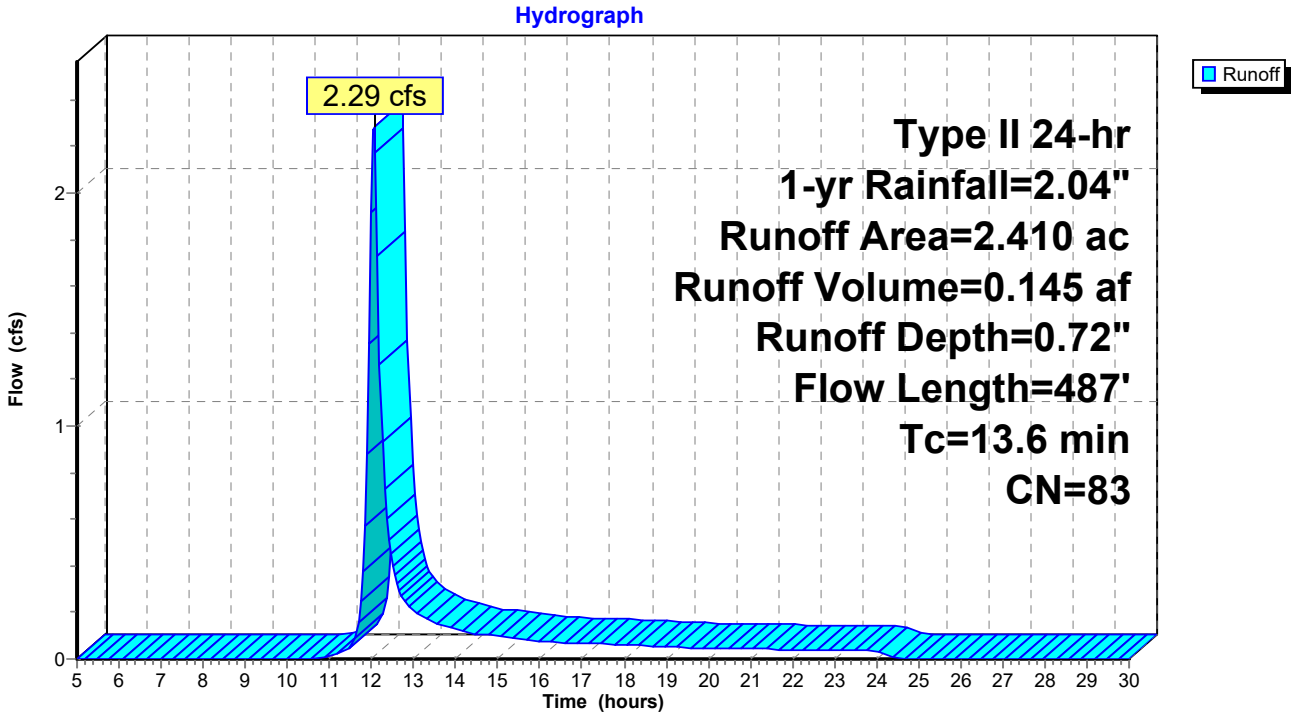
Runoff = 2.29 cfs @ 12.06 hrs, Volume= 0.145 af, Depth= 0.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 1-yr Rainfall=2.04"

Area (ac)	CN	Description
2.020	80	>75% Grass cover, Good, HSG D
0.250	98	Paved parking, HSG D
0.140	98	Roofs, HSG D
2.410	83	Weighted Average
2.020		83.82% Pervious Area
0.390		16.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0450	0.14		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
1.5	307	0.0450	3.42		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	80	0.0200	6.42	5.04	**Pipe Channel, storm pipe** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
13.6	487	Total			

Subcatchment 13S: DA#4

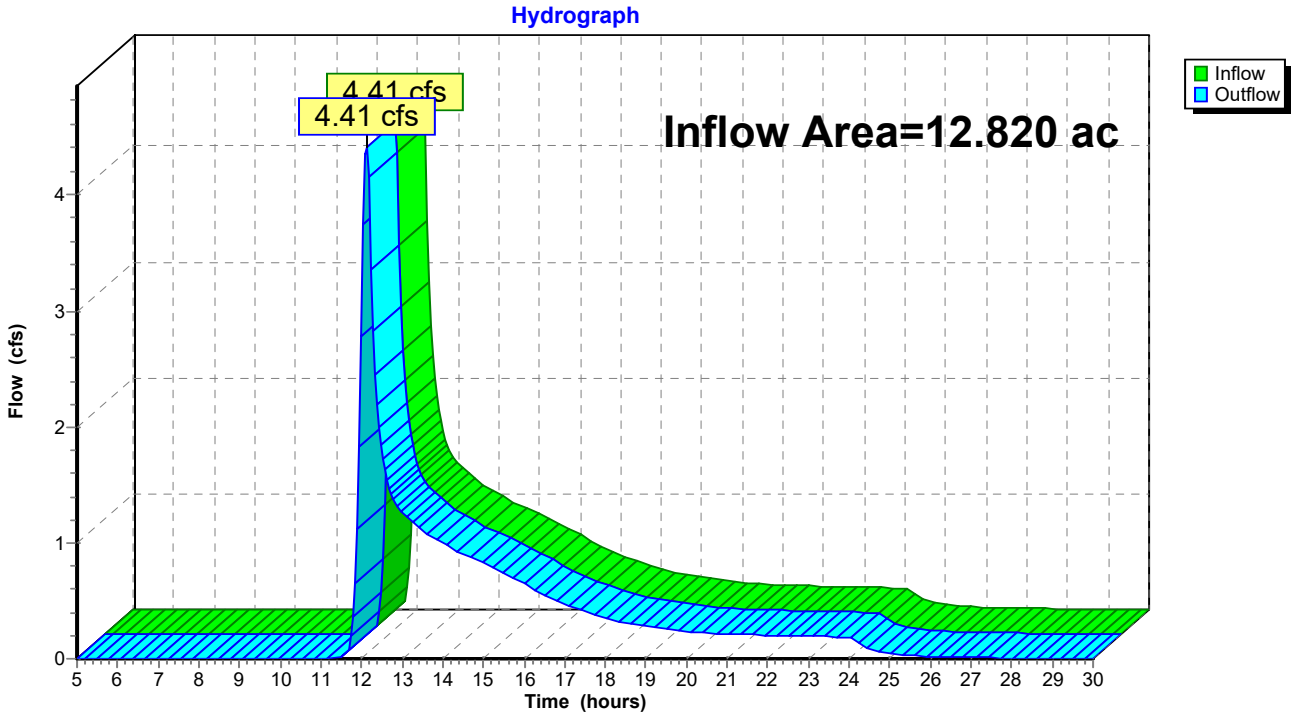


Summary for Reach 1R: Pt of Study 1A

Inflow Area = 12.820 ac, 6.40% Impervious, Inflow Depth > 0.61" for 1-yr event
Inflow = 4.41 cfs @ 12.13 hrs, Volume= 0.650 af
Outflow = 4.41 cfs @ 12.13 hrs, Volume= 0.650 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Reach 1R: Pt of Study 1A

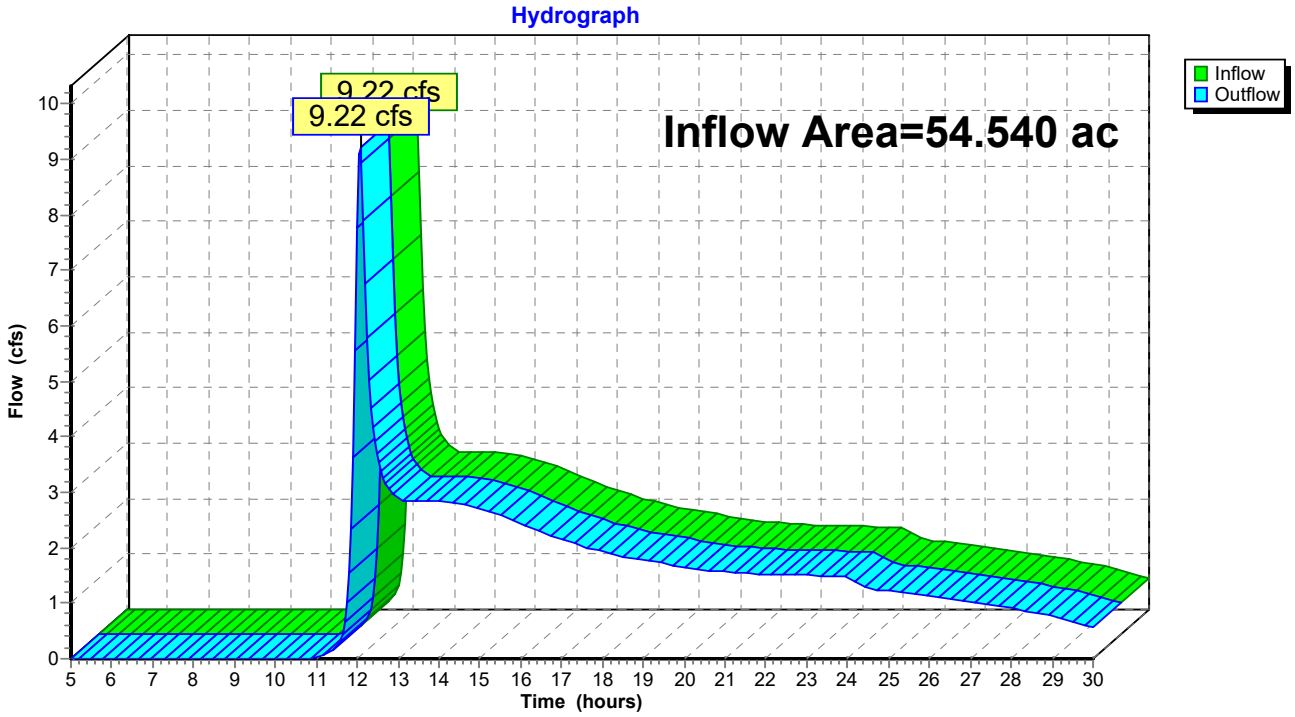


Summary for Reach 2R: Pt of Study 1B

Inflow Area = 54.540 ac, 9.41% Impervious, Inflow Depth > 0.62" for 1-yr event
Inflow = 9.22 cfs @ 12.07 hrs, Volume= 2.811 af
Outflow = 9.22 cfs @ 12.07 hrs, Volume= 2.811 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Reach 2R: Pt of Study 1B



Summary for Pond 1P: Detention Basin 1

Inflow Area = 20.880 ac, 8.52% Impervious, Inflow Depth = 0.60" for 1-yr event
Inflow = 12.24 cfs @ 12.16 hrs, Volume= 1.038 af
Outflow = 1.08 cfs @ 13.84 hrs, Volume= 1.038 af, Atten= 91%, Lag= 100.9 min
Primary = 1.08 cfs @ 13.84 hrs, Volume= 1.038 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 890.90' @ 13.84 hrs Surf.Area= 12,449 sf Storage= 20,168 cf

Plug-Flow detention time= 217.0 min calculated for 1.038 af (100% of inflow)
Center-of-Mass det. time= 216.9 min (1,096.1 - 879.3)

Volume	Invert	Avail.Storage	Storage Description
#1	888.00'	104,203 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

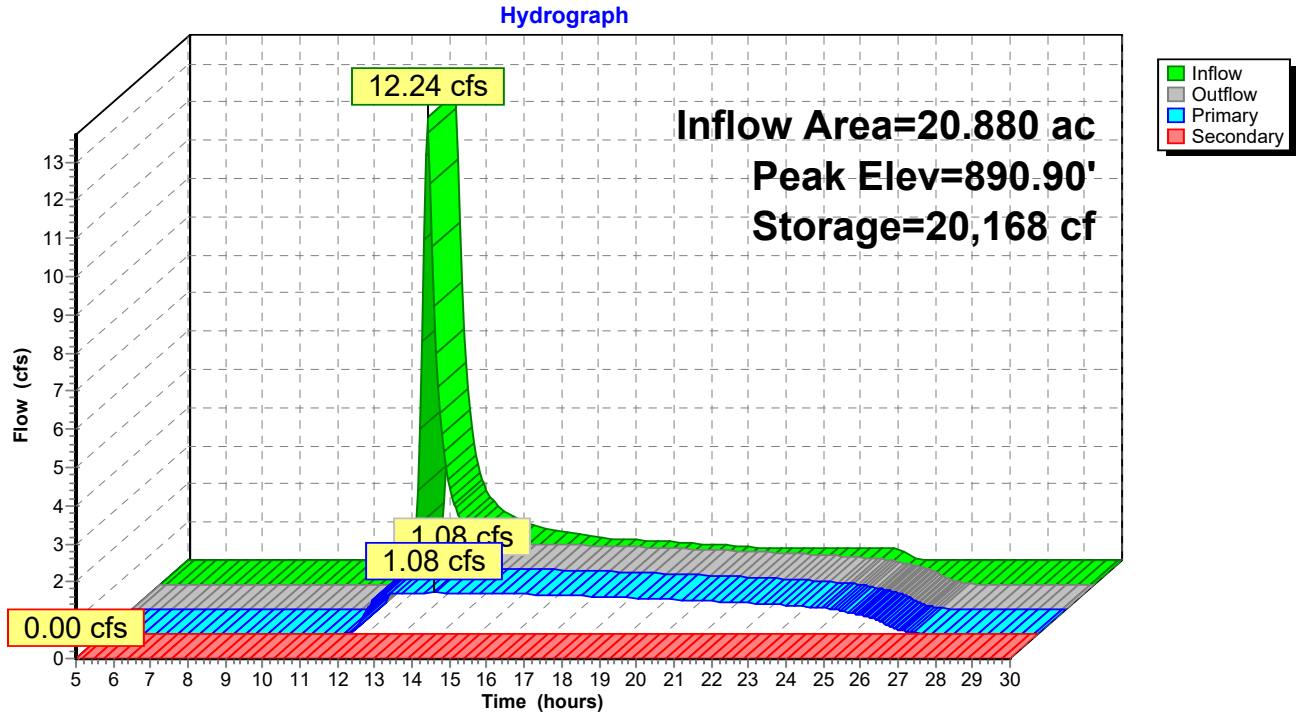
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
888.00	373	0	0
889.00	3,768	2,071	2,071
890.00	11,124	7,446	9,517
891.00	12,590	11,857	21,374
892.00	14,113	13,352	34,725
893.00	15,691	14,902	49,627
894.00	17,327	16,509	66,136
895.00	19,019	18,173	84,309
896.00	20,768	19,894	104,203

Device	Routing	Invert	Outlet Devices
#1	Primary	887.90'	**30.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 887.90' / 886.90' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Device 1	888.00'	**5.0" Vert. Orifice1** C= 0.600
#3	Device 1	891.20'	**15.0" Vert. Orifice2** C= 0.600
#4	Device 1	894.90'	**30.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	896.00'	**25.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.08 cfs @ 13.84 hrs HW=890.90' (Free Discharge)
└**1=Culvert** (Passes 1.08 cfs of 24.71 cfs potential flow)
  ├**2=Orifice1** (Orifice Controls 1.08 cfs @ 7.91 fps)
  ├**3=Orifice2** (Controls 0.00 cfs)
  └**4=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=888.00' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Detention Basin 1



Summary for Pond 2P: Detention Basin 2

Inflow Area = 36.730 ac, 10.48% Impervious, Inflow Depth = 0.63" for 1-yr event
Inflow = 15.04 cfs @ 12.06 hrs, Volume= 1.939 af
Outflow = 1.70 cfs @ 14.90 hrs, Volume= 1.899 af, Atten= 89%, Lag= 170.5 min
Primary = 1.70 cfs @ 14.90 hrs, Volume= 1.899 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 867.09' @ 14.90 hrs Surf.Area= 9,939 sf Storage= 23,105 cf

Plug-Flow detention time= 225.1 min calculated for 1.899 af (98% of inflow)
Center-of-Mass det. time= 213.5 min (1,201.4 - 987.8)

Volume	Invert	Avail.Storage	Storage Description
#1	863.00'	98,569 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

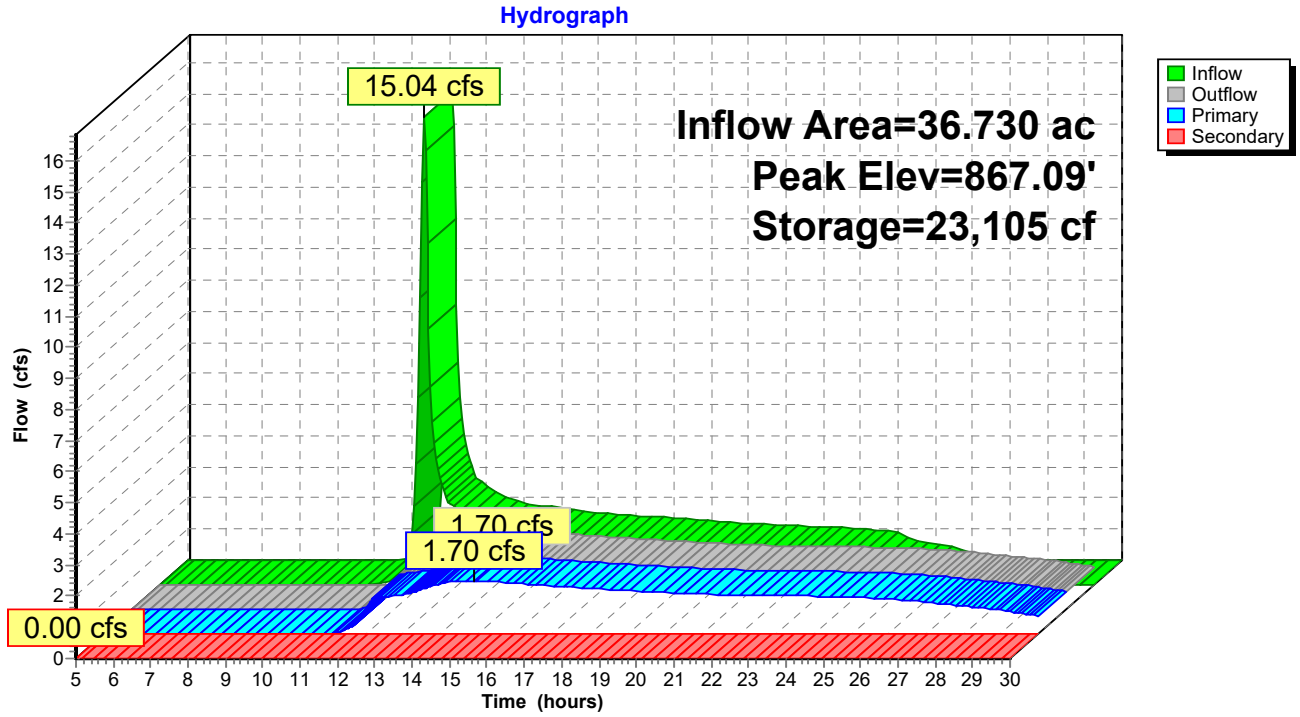
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
863.00	335	0	0
864.00	3,479	1,907	1,907
865.00	5,953	4,716	6,623
866.00	7,741	6,847	13,470
867.00	9,739	8,740	22,210
868.00	11,941	10,840	33,050
869.00	14,156	13,049	46,099
870.00	16,371	15,264	61,362
871.00	18,599	17,485	78,847
872.00	20,845	19,722	98,569

Device	Routing	Invert	Outlet Devices
#1	Secondary	872.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	862.90'	**30.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 862.90' / 861.00' S= 0.0950 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#3	Device 2	863.00'	**5.0" Vert. Orifice1** C= 0.600
#4	Device 2	866.80'	**15.0" Vert. Orifice2** C= 0.600
#5	Device 2	870.00'	**30.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.69 cfs @ 14.90 hrs HW=867.09' (Free Discharge)
└**2=Culvert** (Passes 1.69 cfs of 32.00 cfs potential flow)
  ├**3=Orifice1** (Orifice Controls 1.29 cfs @ 9.49 fps)
  ├**4=Orifice2** (Orifice Controls 0.40 cfs @ 1.84 fps)
  └**5=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=863.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Detention Basin 2



Summary for Pond 3P: Detention Basin 3

Inflow Area = 6.480 ac, 11.11% Impervious, Inflow Depth = 0.67" for 1-yr event
Inflow = 6.12 cfs @ 12.04 hrs, Volume= 0.364 af
Outflow = 0.80 cfs @ 12.58 hrs, Volume= 0.362 af, Atten= 87%, Lag= 32.0 min
Primary = 0.80 cfs @ 12.58 hrs, Volume= 0.362 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 901.68' @ 12.58 hrs Surf.Area= 6,282 sf Storage= 6,010 cf

Plug-Flow detention time= 90.6 min calculated for 0.362 af (100% of inflow)
Center-of-Mass det. time= 87.9 min (950.4 - 862.5)

Volume	Invert	Avail.Storage	Storage Description
#1	900.00'	38,589 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

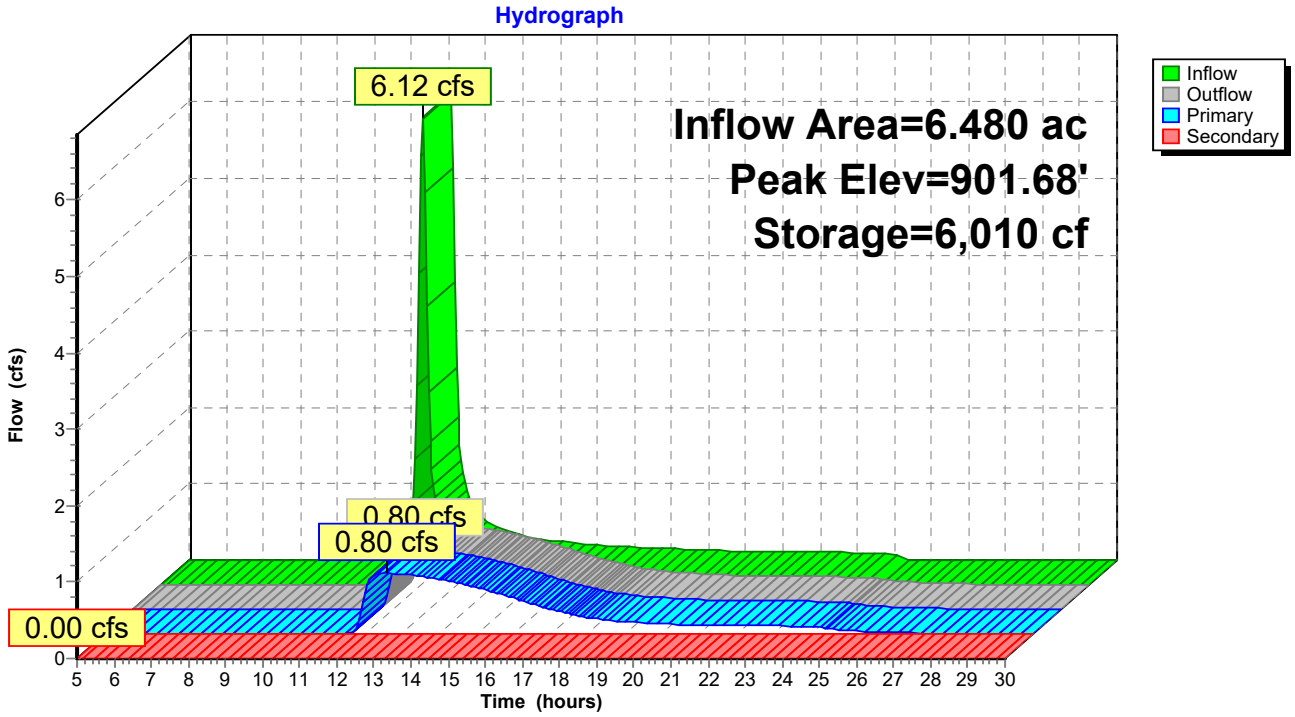
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
900.00	2,381	0	0
901.00	3,197	2,789	2,789
902.00	7,737	5,467	8,256
903.00	9,288	8,513	16,769
904.00	10,896	10,092	26,861
905.00	12,560	11,728	38,589

Device	Routing	Invert	Outlet Devices
#1	Secondary	905.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	900.00'	**18.0" Round Culvert** L= 330.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 900.00' / 889.00' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	900.00'	**5.0" Vert. Orifice1** C= 0.600
#4	Device 2	901.90'	**10.0" Vert. Orifice2** C= 0.600
#5	Device 2	904.00'	**24.0" x 24.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.80 cfs @ 12.58 hrs HW=901.68' (Free Discharge)
└**2=Culvert** (Passes 0.80 cfs of 6.48 cfs potential flow)
  ├**3=Orifice1** (Orifice Controls 0.80 cfs @ 5.84 fps)
  ├**4=Orifice2** (Controls 0.00 cfs)
  └**5=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=900.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Detention Basin 3



Summary for Subcatchment 1S: DA-A

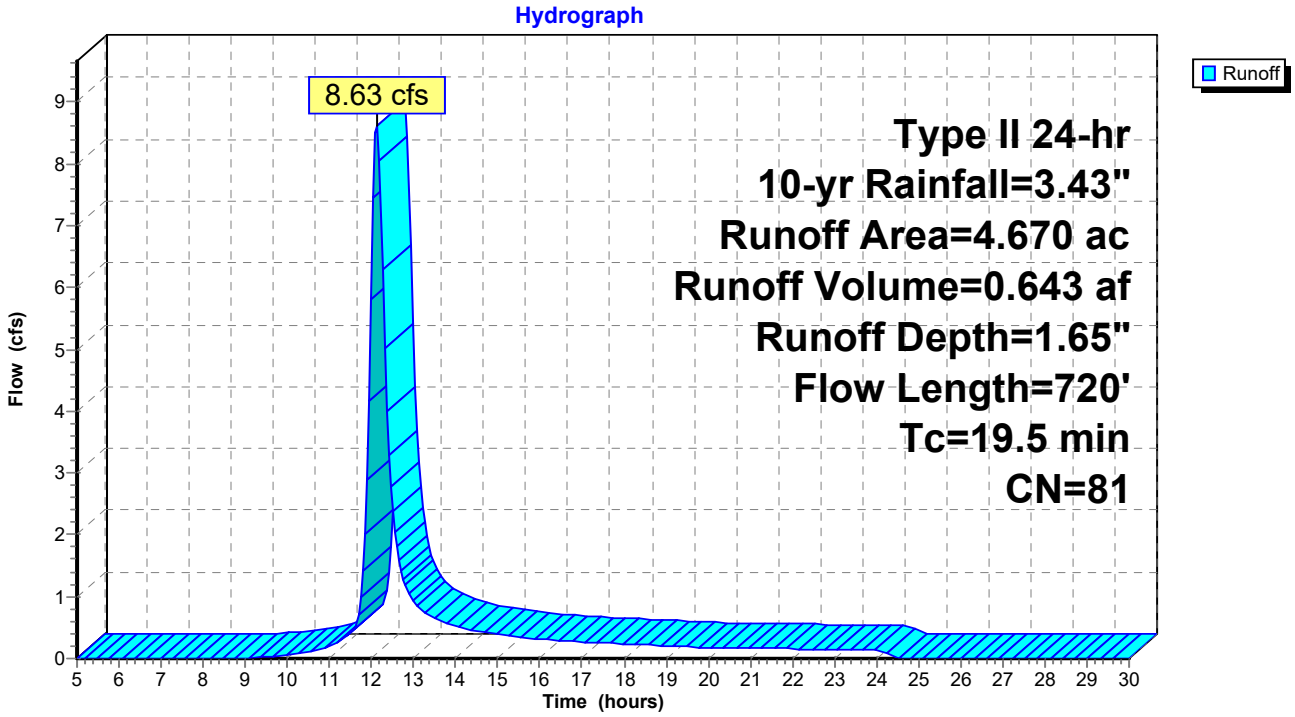
Runoff = 8.63 cfs @ 12.12 hrs, Volume= 0.643 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
0.270	98	Paved parking, HSG D
2.580	80	>75% Grass cover, Good, HSG D
1.540	77	Woods, Good, HSG D
0.280	98	Roofs, HSG D
4.670	81	Weighted Average
4.120		88.22% Pervious Area
0.550		11.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0600	0.10		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 2.39"
2.5	188	0.0650	1.27		**Shallow Concentrated Flow, SCF** Woodland Kv= 5.0 fps
0.8	202	0.0650	4.10		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	230	0.0200	16.17	32.33	**Channel Flow, GUTTER** Area= 2.0 sf Perim= 2.0' r= 1.00' n= 0.013 Asphalt, smooth
19.5	720	Total			

Subcatchment 1S: DA-A



Summary for Subcatchment 2S: DA-B

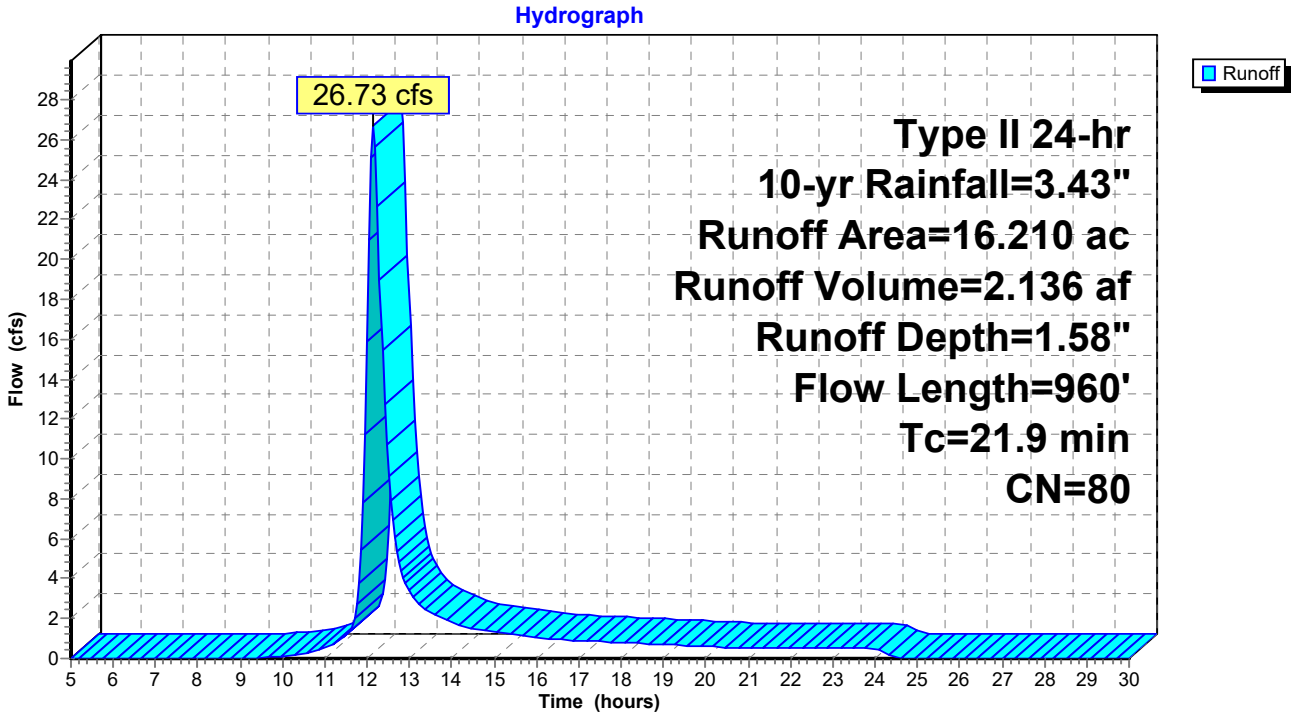
Runoff = 26.73 cfs @ 12.15 hrs, Volume= 2.136 af, Depth= 1.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
0.740	98	Paved parking, HSG D
7.140	80	>75% Grass cover, Good, HSG D
7.840	77	Woods, Good, HSG D
0.490	98	Roofs, HSG D
16.210	80	Weighted Average
14.980		92.41% Pervious Area
1.230		7.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0600	0.10		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 2.39"
4.8	370	0.0650	1.27		**Shallow Concentrated Flow, SCF** Woodland Kv= 5.0 fps
0.8	200	0.0650	4.10		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.3	290	0.0200	16.17	32.33	**Channel Flow, GUTTER** Area= 2.0 sf Perim= 2.0' r= 1.00' n= 0.013 Asphalt, smooth
21.9	960	Total			

Subcatchment 2S: DA-B



Summary for Subcatchment 3S: DA-C

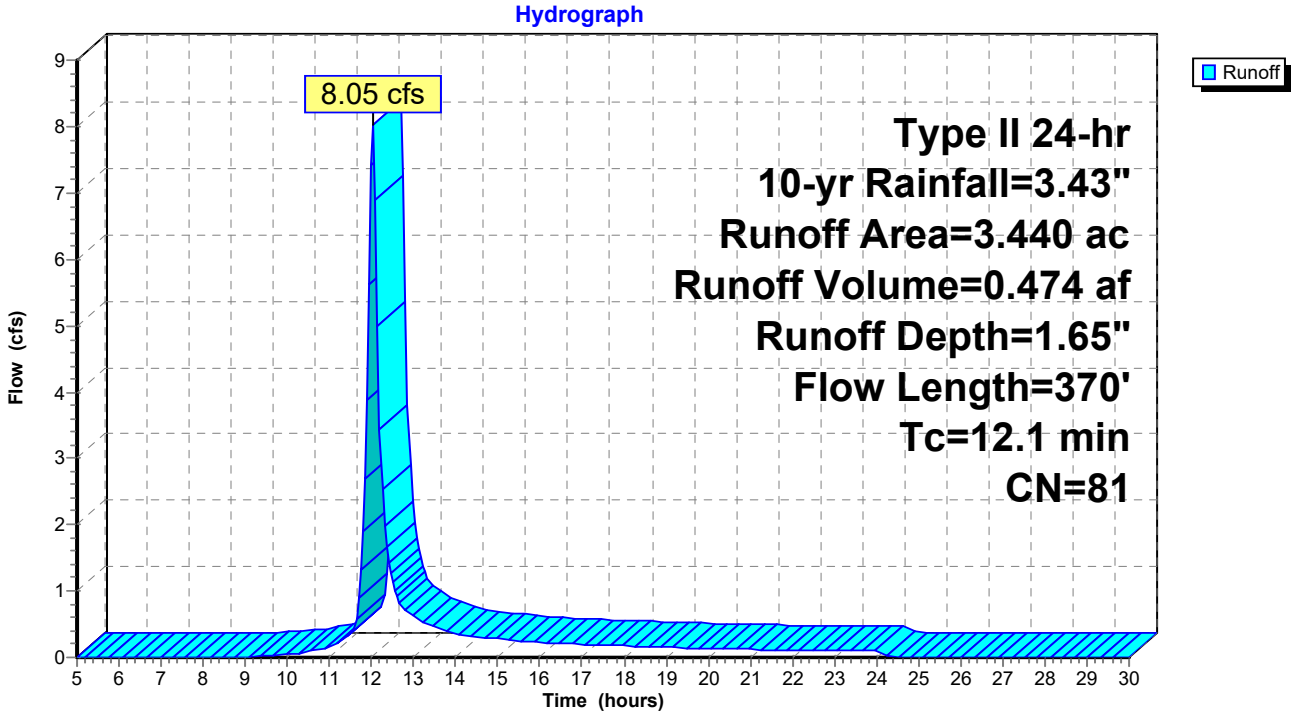
Runoff = 8.05 cfs @ 12.04 hrs, Volume= 0.474 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
0.060	98	Paved parking, HSG D
3.200	80	>75% Grass cover, Good, HSG D
0.180	98	Roofs, HSG D
3.440	81	Weighted Average
3.200		93.02% Pervious Area
0.240		6.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0600	0.16		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
1.5	270	0.0370	3.10		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
12.1	370	Total			

Subcatchment 3S: DA-C



Summary for Subcatchment 4S: DA-D

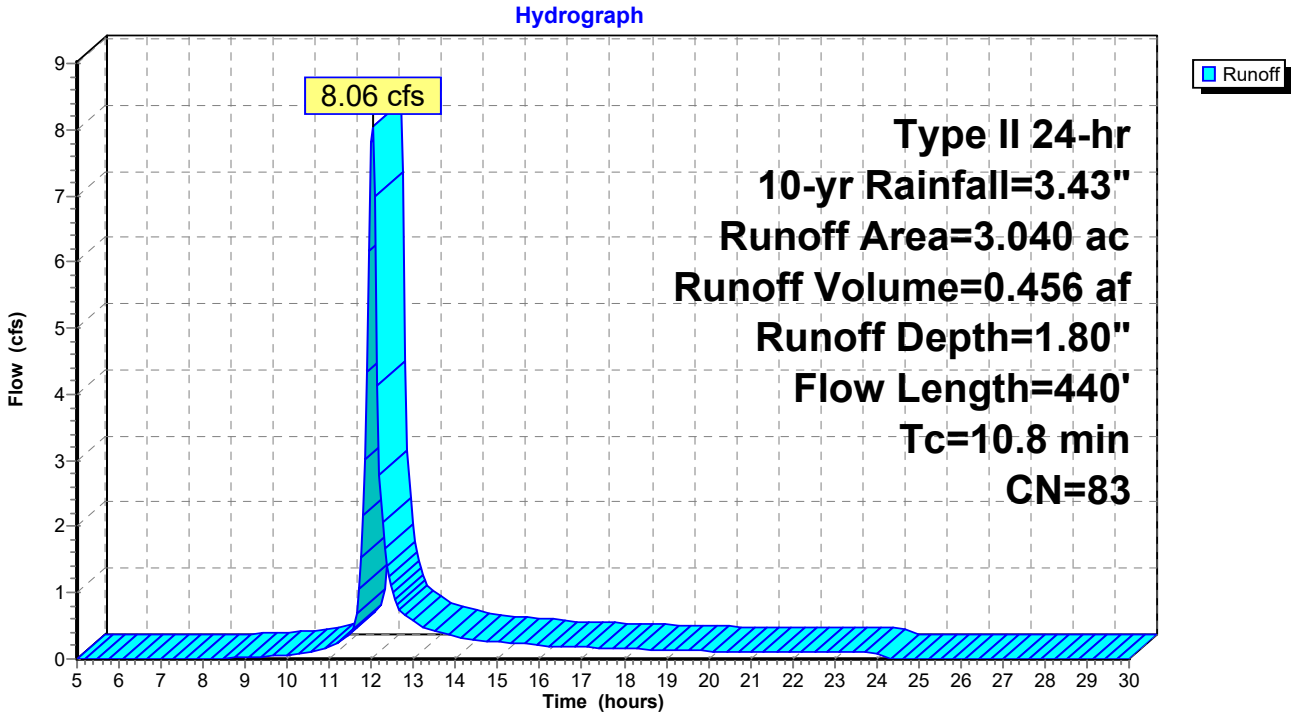
Runoff = 8.06 cfs @ 12.03 hrs, Volume= 0.456 af, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
0.310	98	Paved parking, HSG D
2.560	80	>75% Grass cover, Good, HSG D
0.170	98	Roofs, HSG D
3.040	83	Weighted Average
2.560		84.21% Pervious Area
0.480		15.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0700	0.17		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.5	140	0.0900	4.83		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.3	200	0.0200	9.55	76.42	**Channel Flow, swale flow** Area= 8.0 sf Perim= 8.0' r= 1.00' n= 0.022 Earth, clean & straight
10.8	440	Total			

Subcatchment 4S: DA-D



Summary for Subcatchment 5S: DA-E

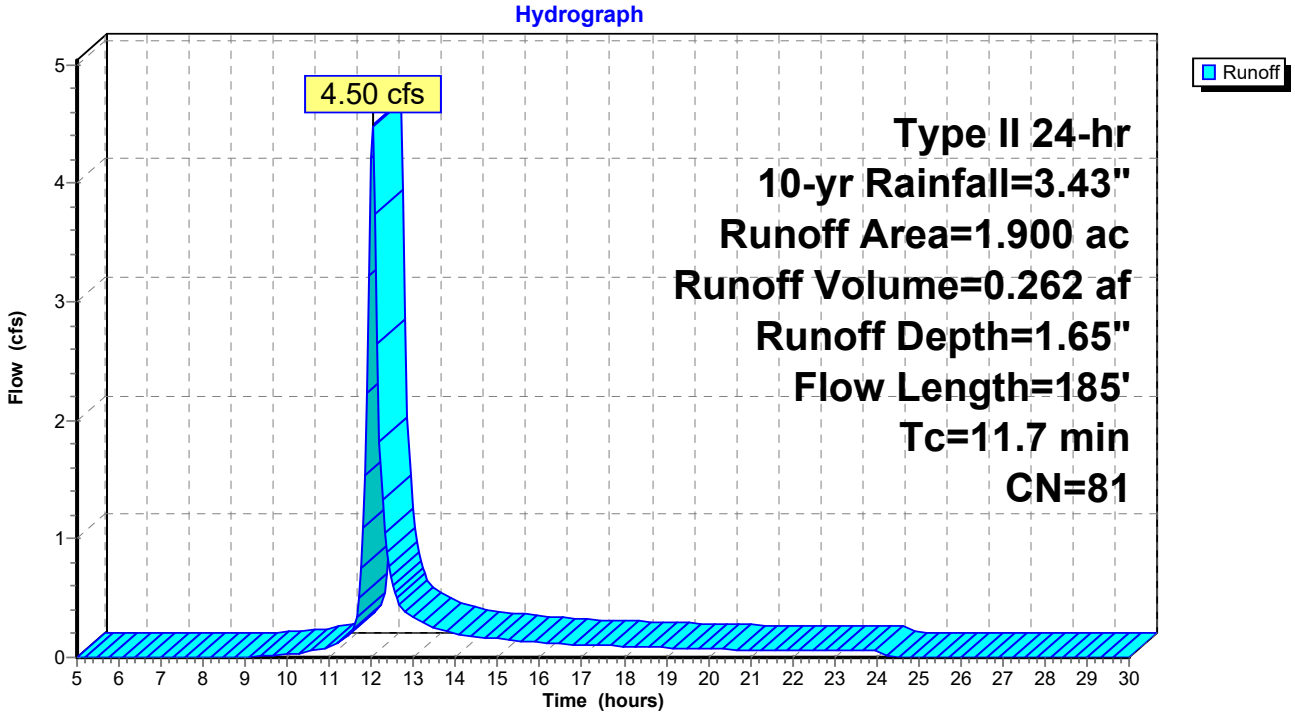
Runoff = 4.50 cfs @ 12.04 hrs, Volume= 0.262 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
0.030	98	Paved parking, HSG D
1.800	80	>75% Grass cover, Good, HSG D
0.070	98	Roofs, HSG D
1.900	81	Weighted Average
1.800		94.74% Pervious Area
0.100		5.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.3	85	0.0950	4.96		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
11.7	185	Total			

Subcatchment 5S: DA-E



Summary for Subcatchment 6S: DA-F

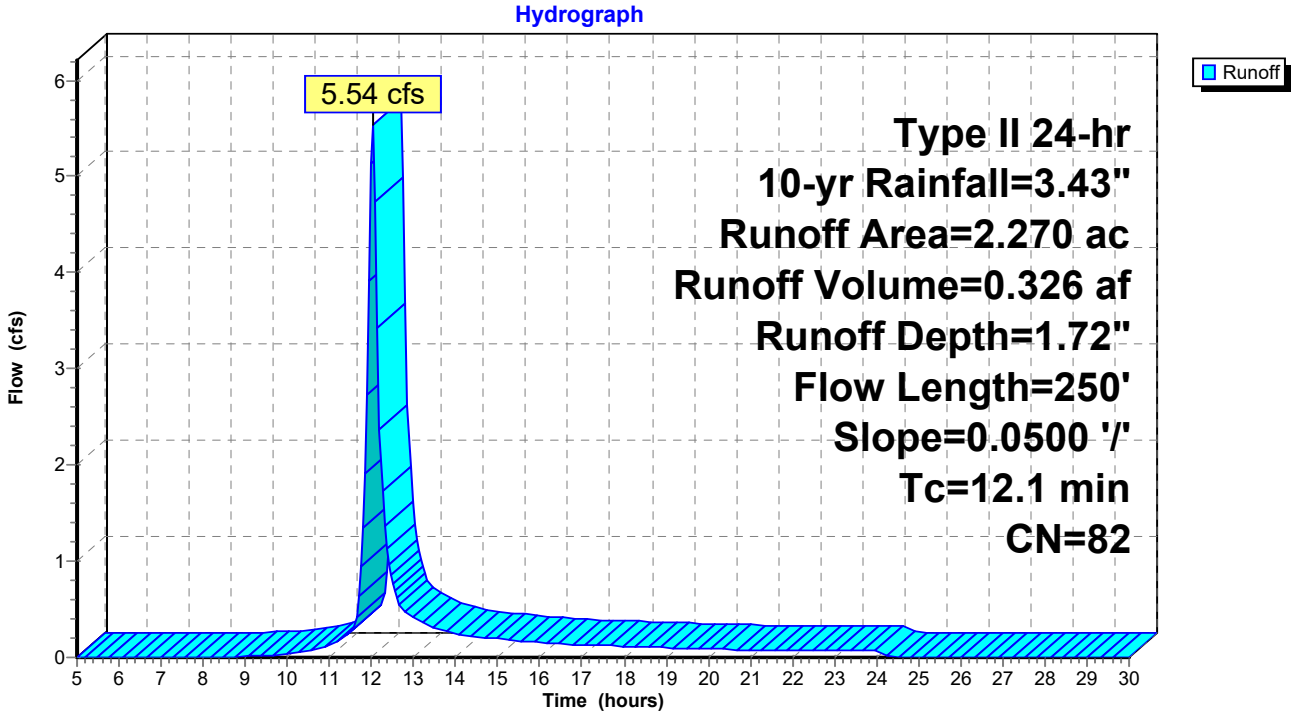
Runoff = 5.54 cfs @ 12.04 hrs, Volume= 0.326 af, Depth= 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
0.090	98	Paved parking, HSG D
2.040	80	>75% Grass cover, Good, HSG D
0.140	98	Roofs, HSG D
2.270	82	Weighted Average
2.040		89.87% Pervious Area
0.230		10.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.7	150	0.0500	3.60		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
12.1	250	Total			

Subcatchment 6S: DA-F



Summary for Subcatchment 7S: DA-G

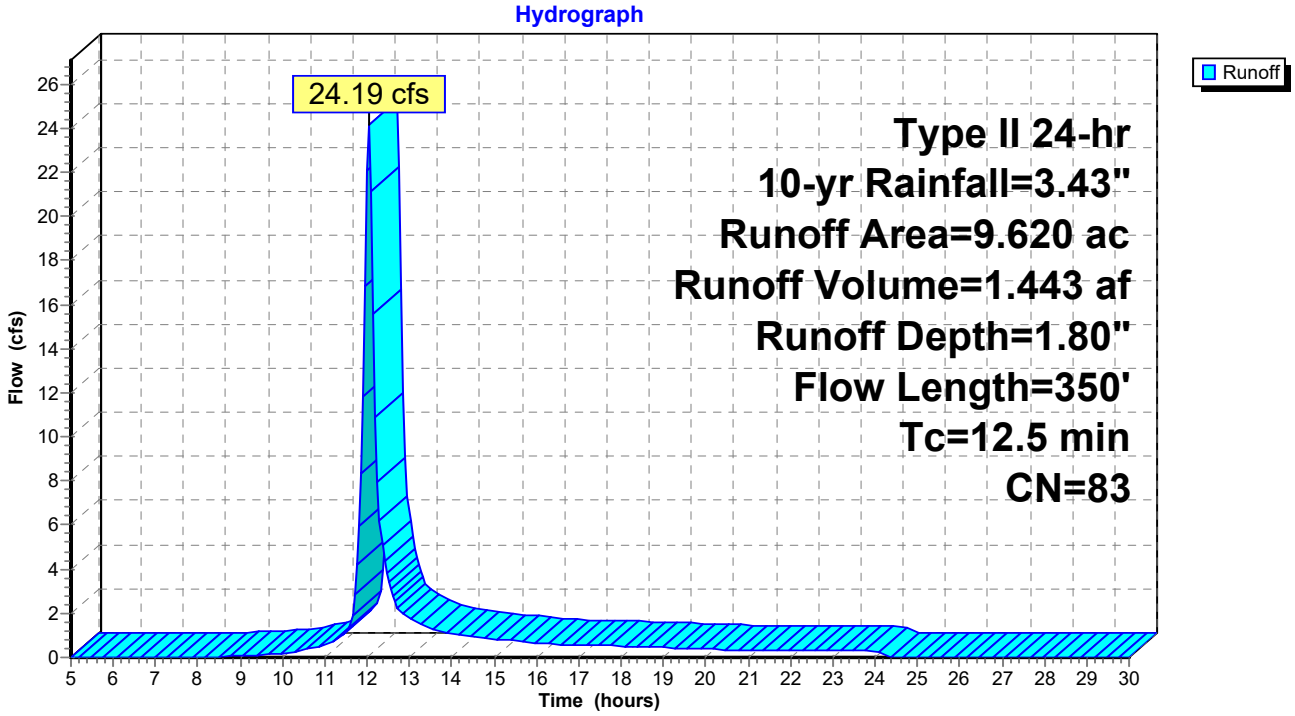
Runoff = 24.19 cfs @ 12.05 hrs, Volume= 1.443 af, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
1.050	98	Paved parking, HSG D
8.080	80	>75% Grass cover, Good, HSG D
0.490	98	Roofs, HSG D
9.620	83	Weighted Average
8.080		83.99% Pervious Area
1.540		16.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, sheet** Grass: Dense n= 0.240 P2= 2.39"
1.1	250	0.0550	3.78		**Shallow Concentrated Flow, shallow conc flow** Unpaved Kv= 16.1 fps
12.5	350	Total			

Subcatchment 7S: DA-G



Summary for Subcatchment 8S: DA-H

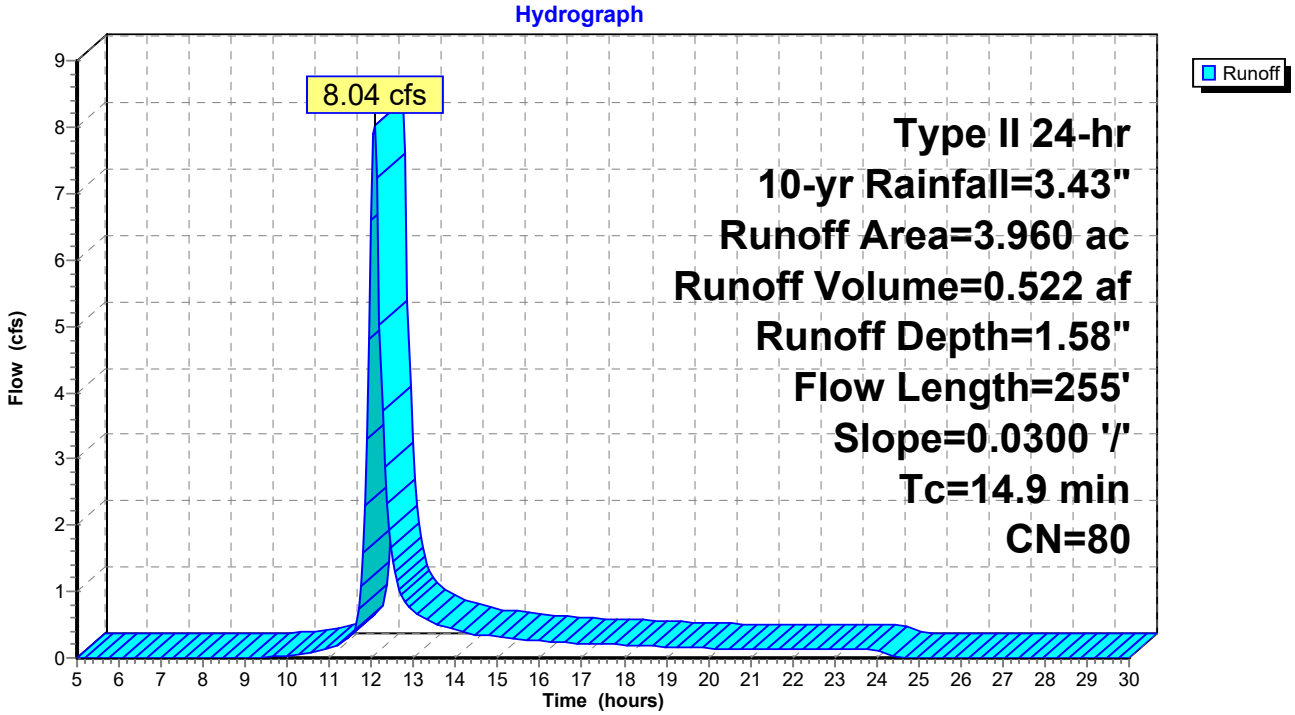
Runoff = 8.04 cfs @ 12.07 hrs, Volume= 0.522 af, Depth= 1.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
0.090	98	Paved parking, HSG D
2.440	80	>75% Grass cover, Good, HSG D
1.220	77	Woods, Good, HSG D
0.210	98	Roofs, HSG D
3.960	80	Weighted Average
3.660		92.42% Pervious Area
0.300		7.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0300	0.12		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.9	155	0.0300	2.79		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
14.9	255	Total			

Subcatchment 8S: DA-H



Summary for Subcatchment 10S: DA#1

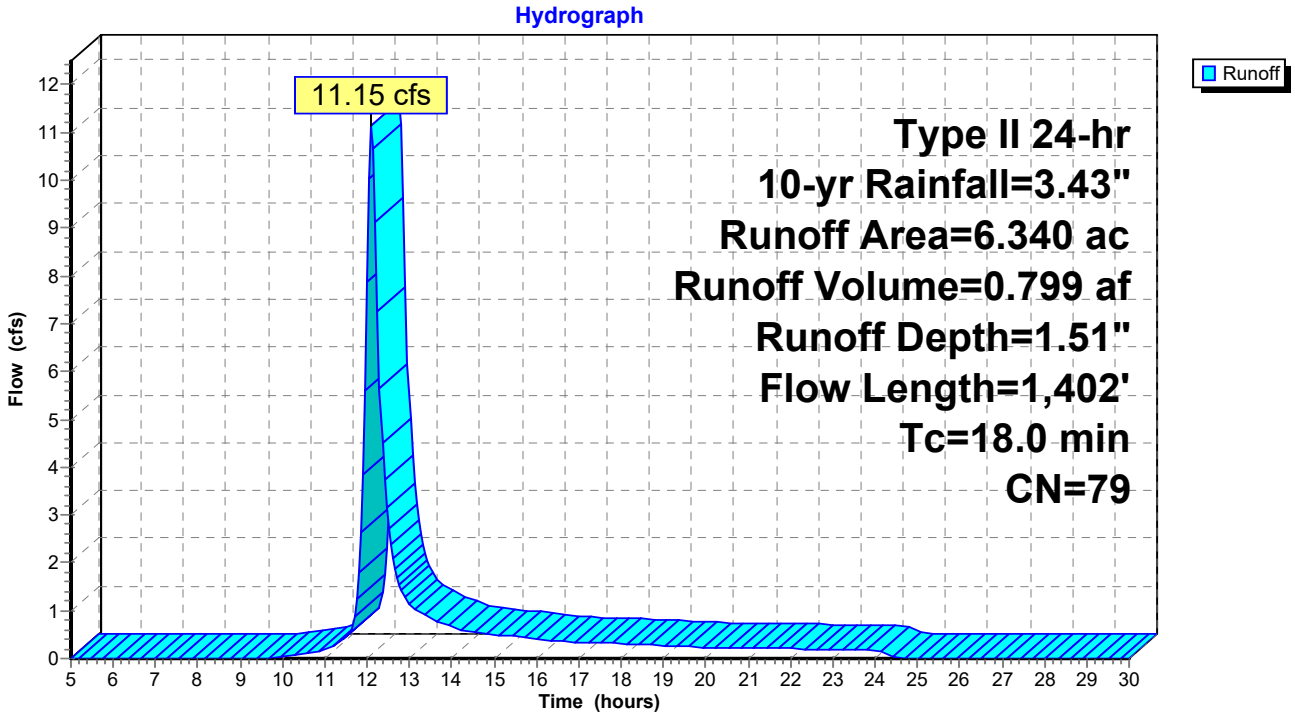
Runoff = 11.15 cfs @ 12.11 hrs, Volume= 0.799 af, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
3.390	80	>75% Grass cover, Good, HSG D
2.850	77	Woods, Good, HSG D
0.030	98	Paved parking, HSG D
0.070	98	Roofs, HSG D
6.340	79	Weighted Average
6.240		98.42% Pervious Area
0.100		1.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0600	0.16		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
5.4	485	0.0900	1.50		**Shallow Concentrated Flow, SCF** Woodland Kv= 5.0 fps
1.8	517	0.0900	4.83		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	300	0.0860	27.67	442.73	**Channel Flow, SWALE** Area= 16.0 sf Perim= 8.0' r= 2.00' n= 0.025 Earth, clean & winding
18.0	1,402	Total			

Subcatchment 10S: DA#1



Summary for Subcatchment 11S: DA#2

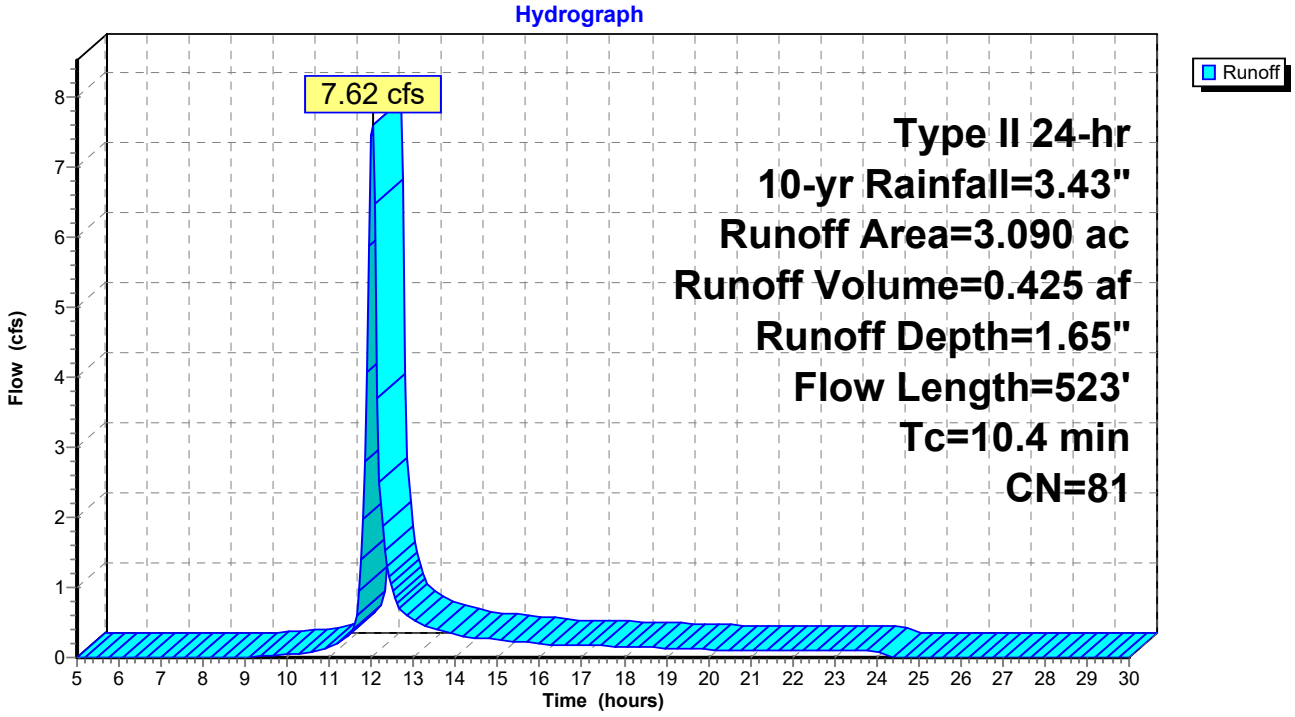
Runoff = 7.62 cfs @ 12.02 hrs, Volume= 0.425 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
2.070	80	>75% Grass cover, Good, HSG D
0.660	77	Woods, Good, HSG D
0.220	98	Paved parking, HSG D
0.140	98	Roofs, HSG D
3.090	81	Weighted Average
2.730		88.35% Pervious Area
0.360		11.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0700	0.17		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.2	56	0.1300	5.80		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	367	0.0820	27.02	432.31	**Channel Flow, SWALE** Area= 16.0 sf Perim= 8.0' r= 2.00' n= 0.025 Earth, clean & winding
10.4	523	Total			

Subcatchment 11S: DA#2



Summary for Subcatchment 12S: DA#3

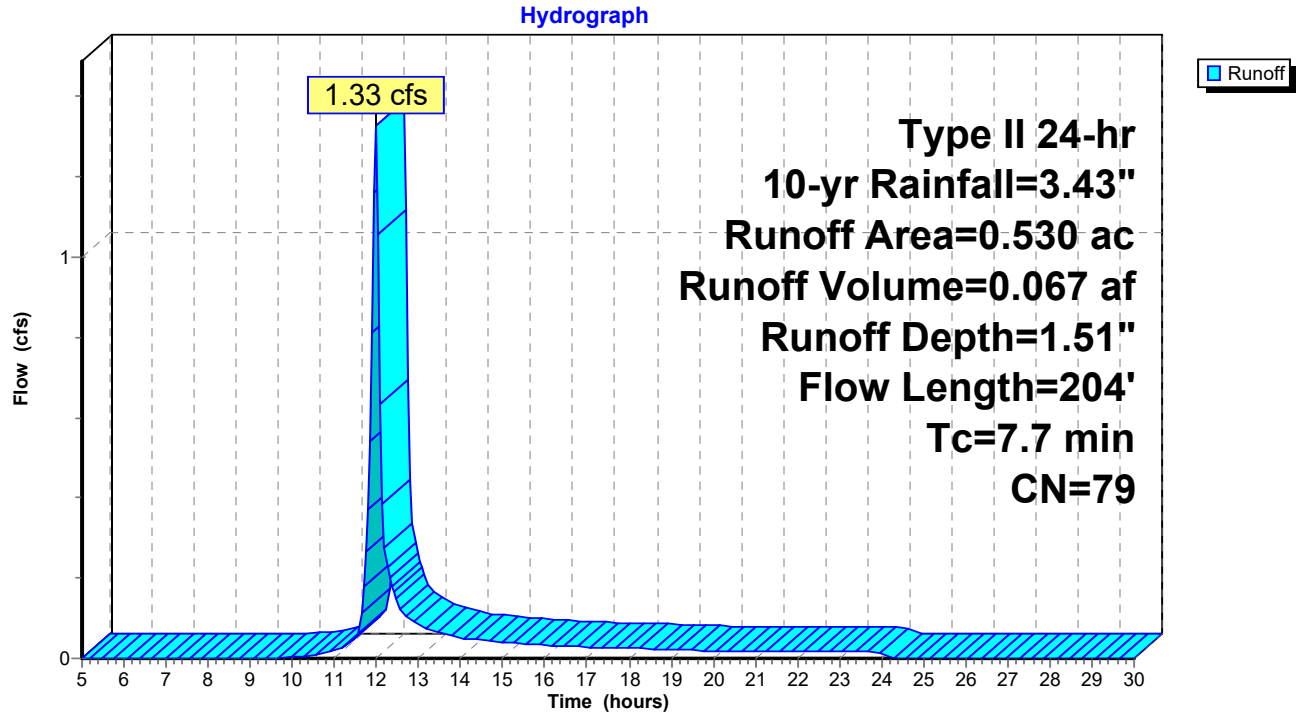
Runoff = 1.33 cfs @ 11.99 hrs, Volume= 0.067 af, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
0.390	80	>75% Grass cover, Good, HSG D
0.140	77	Woods, Good, HSG D
0.530	79	Weighted Average
0.530		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.1500	0.23		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.3	104	0.1300	5.80		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
7.7	204	Total			

Subcatchment 12S: DA#3



Summary for Subcatchment 13S: DA#4

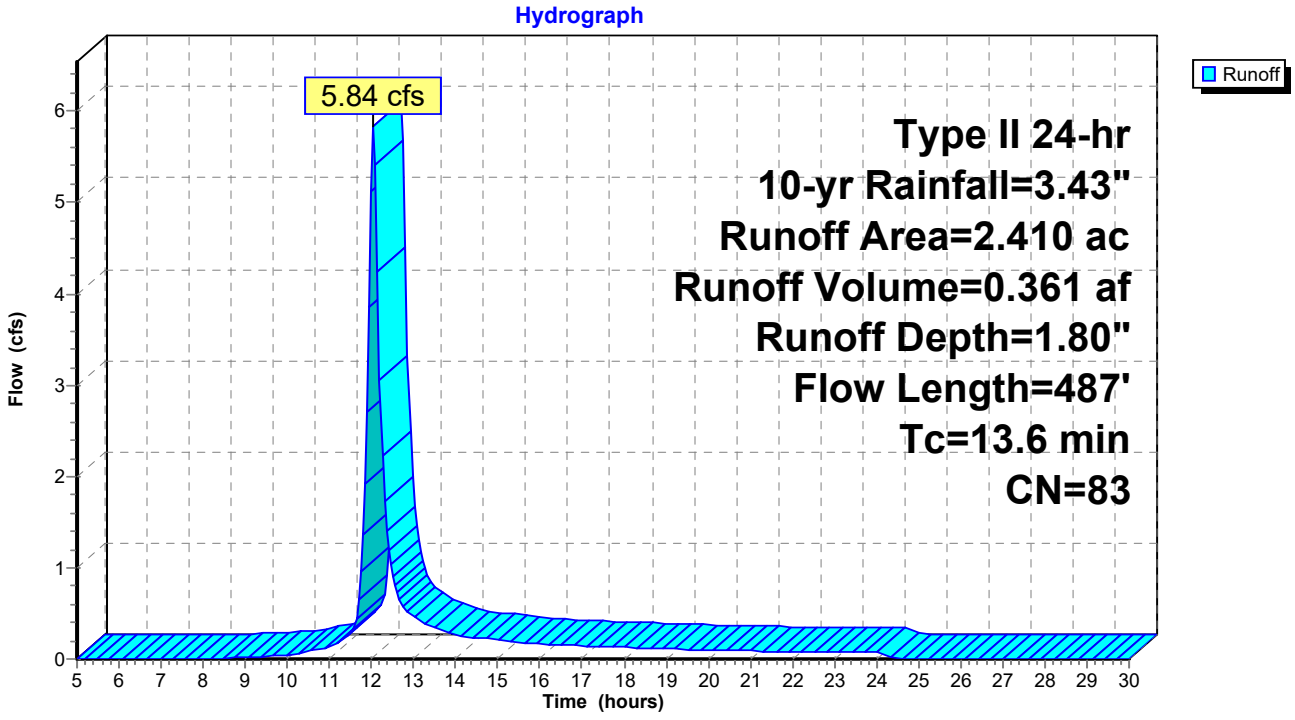
Runoff = 5.84 cfs @ 12.06 hrs, Volume= 0.361 af, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 10-yr Rainfall=3.43"

Area (ac)	CN	Description
2.020	80	>75% Grass cover, Good, HSG D
0.250	98	Paved parking, HSG D
0.140	98	Roofs, HSG D
2.410	83	Weighted Average
2.020		83.82% Pervious Area
0.390		16.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0450	0.14		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
1.5	307	0.0450	3.42		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	80	0.0200	6.42	5.04	**Pipe Channel, storm pipe** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
13.6	487	Total			

Subcatchment 13S: DA#4

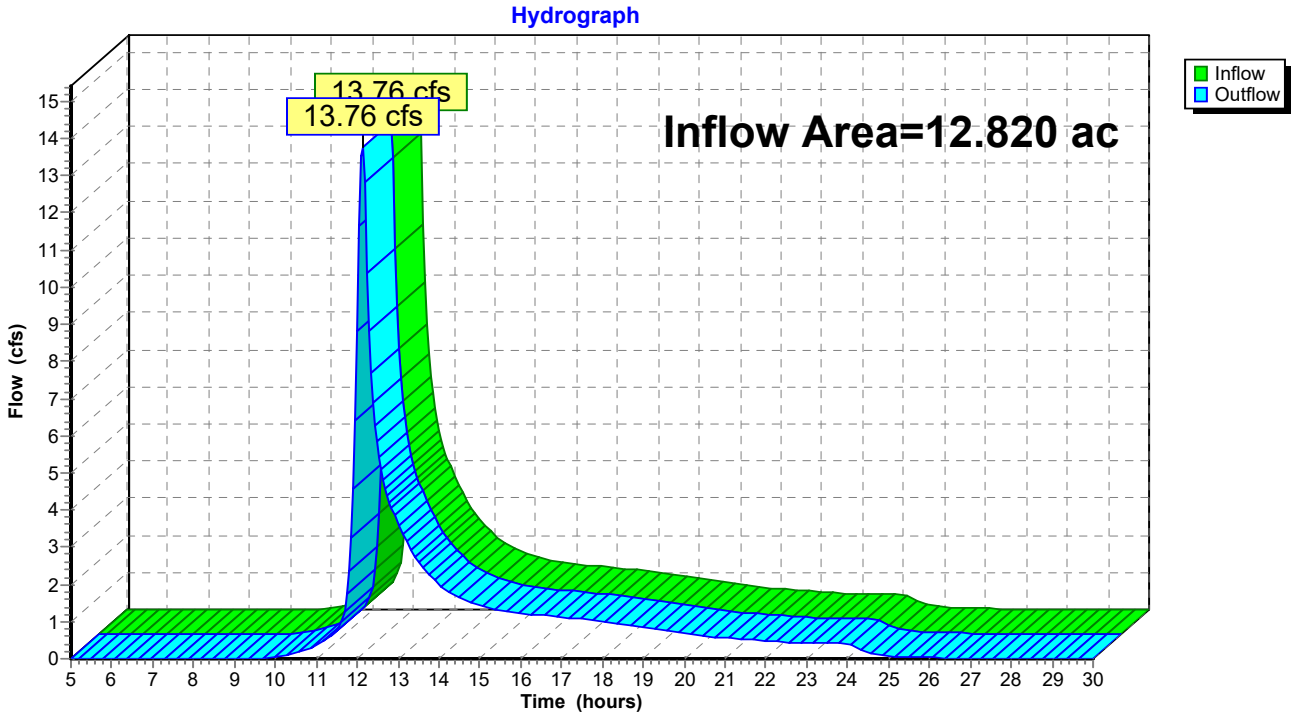


Summary for Reach 1R: Pt of Study 1A

Inflow Area = 12.820 ac, 6.40% Impervious, Inflow Depth > 1.62" for 10-yr event
Inflow = 13.76 cfs @ 12.12 hrs, Volume= 1.726 af
Outflow = 13.76 cfs @ 12.12 hrs, Volume= 1.726 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Reach 1R: Pt of Study 1A

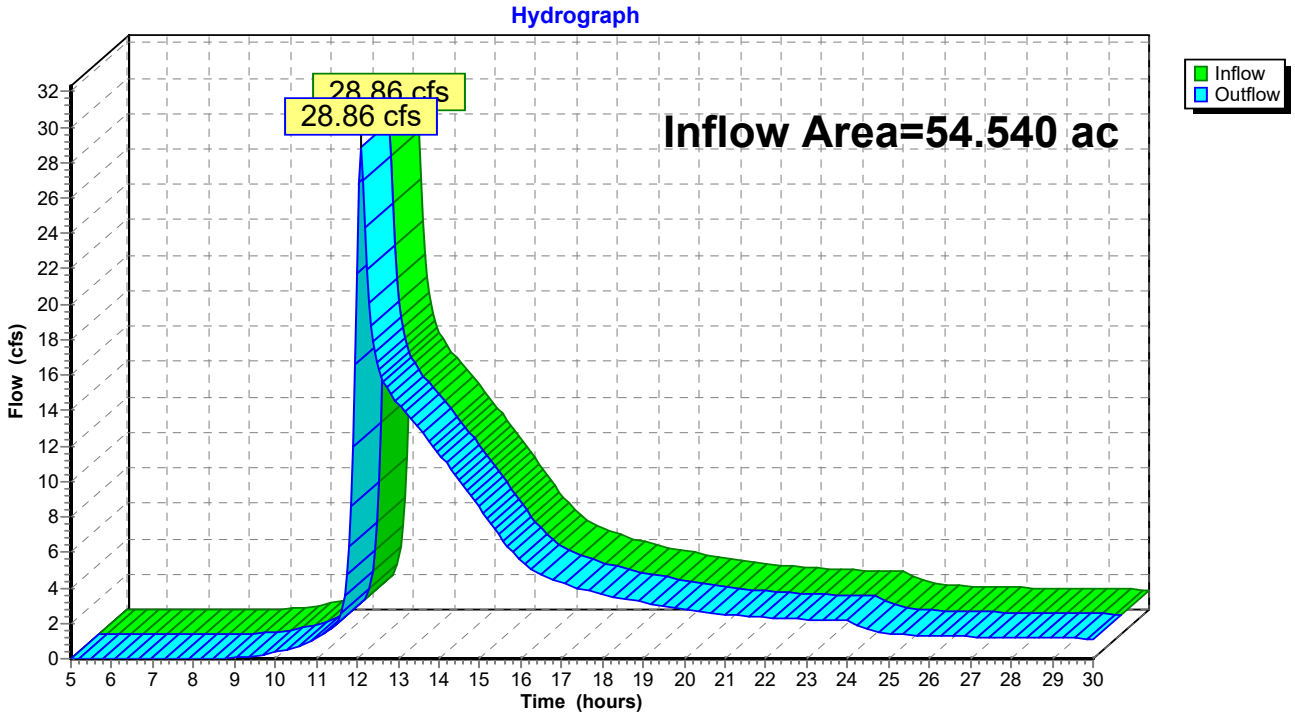


Summary for Reach 2R: Pt of Study 1B

Inflow Area = 54.540 ac, 9.41% Impervious, Inflow Depth > 1.57" for 10-yr event
Inflow = 28.86 cfs @ 12.10 hrs, Volume= 7.139 af
Outflow = 28.86 cfs @ 12.10 hrs, Volume= 7.139 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Reach 2R: Pt of Study 1B



Summary for Pond 1P: Detention Basin 1

Inflow Area = 20.880 ac, 8.52% Impervious, Inflow Depth = 1.60" for 10-yr event
Inflow = 35.22 cfs @ 12.15 hrs, Volume= 2.779 af
Outflow = 7.84 cfs @ 12.64 hrs, Volume= 2.755 af, Atten= 78%, Lag= 29.8 min
Primary = 7.84 cfs @ 12.64 hrs, Volume= 2.755 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 893.00' @ 12.64 hrs Surf.Area= 15,687 sf Storage= 49,591 cf

Plug-Flow detention time= 194.2 min calculated for 2.755 af (99% of inflow)
Center-of-Mass det. time= 189.2 min (1,038.7 - 849.5)

Volume	Invert	Avail.Storage	Storage Description
#1	888.00'	104,203 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

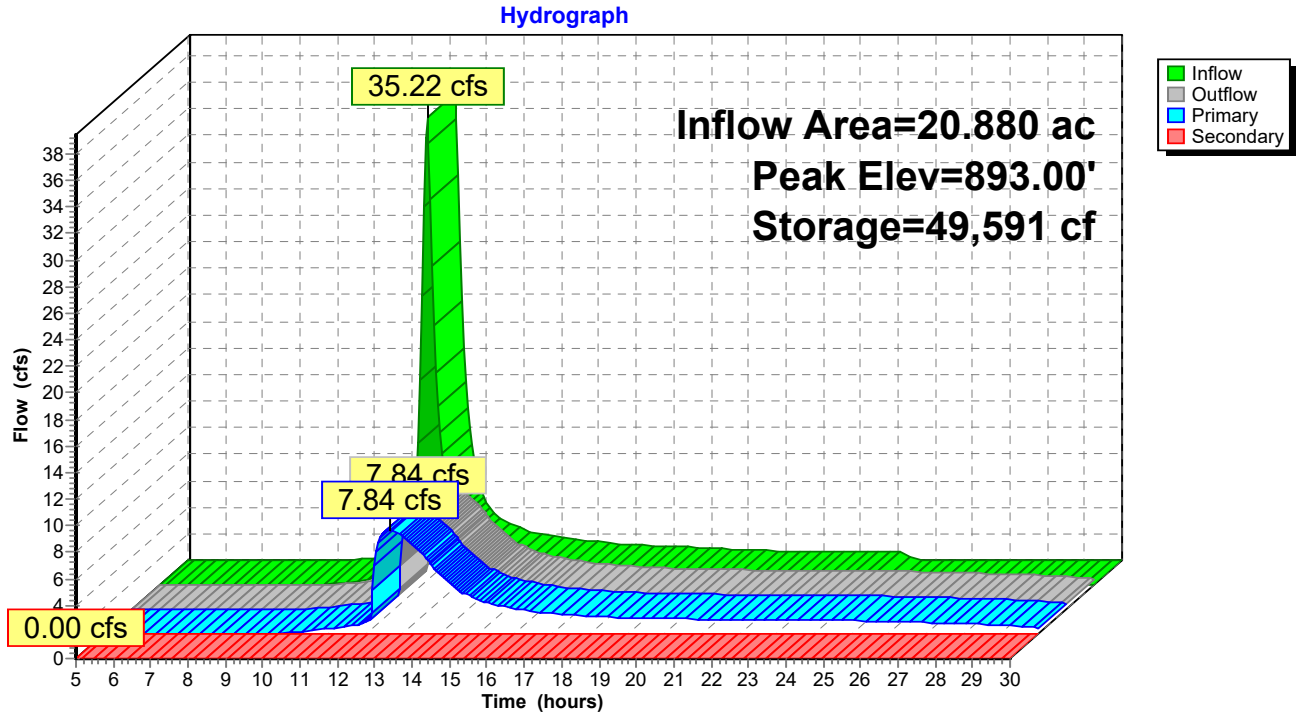
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
888.00	373	0	0
889.00	3,768	2,071	2,071
890.00	11,124	7,446	9,517
891.00	12,590	11,857	21,374
892.00	14,113	13,352	34,725
893.00	15,691	14,902	49,627
894.00	17,327	16,509	66,136
895.00	19,019	18,173	84,309
896.00	20,768	19,894	104,203

Device	Routing	Invert	Outlet Devices
#1	Primary	887.90'	**30.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 887.90' / 886.90' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Device 1	888.00'	**5.0" Vert. Orifice1** C= 0.600
#3	Device 1	891.20'	**15.0" Vert. Orifice2** C= 0.600
#4	Device 1	894.90'	**30.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	896.00'	**25.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=7.83 cfs @ 12.64 hrs HW=893.00' (Free Discharge)
└─**1=Culvert** (Passes 7.83 cfs of 36.60 cfs potential flow)
  ├─**2=Orifice1** (Orifice Controls 1.44 cfs @ 10.54 fps)
  ├─**3=Orifice2** (Orifice Controls 6.40 cfs @ 5.21 fps)
  └─**4=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=888.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Detention Basin 1



Summary for Pond 2P: Detention Basin 2

Inflow Area = 36.730 ac, 10.48% Impervious, Inflow Depth > 1.65" for 10-yr event
Inflow = 38.60 cfs @ 12.05 hrs, Volume= 5.046 af
Outflow = 9.89 cfs @ 13.09 hrs, Volume= 4.726 af, Atten= 74%, Lag= 62.1 min
Primary = 9.89 cfs @ 13.09 hrs, Volume= 4.726 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 869.38' @ 13.09 hrs Surf.Area= 14,995 sf Storage= 51,620 cf

Plug-Flow detention time= 128.9 min calculated for 4.717 af (93% of inflow)
Center-of-Mass det. time= 82.3 min (1,028.8 - 946.5)

Volume	Invert	Avail.Storage	Storage Description
#1	863.00'	98,569 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

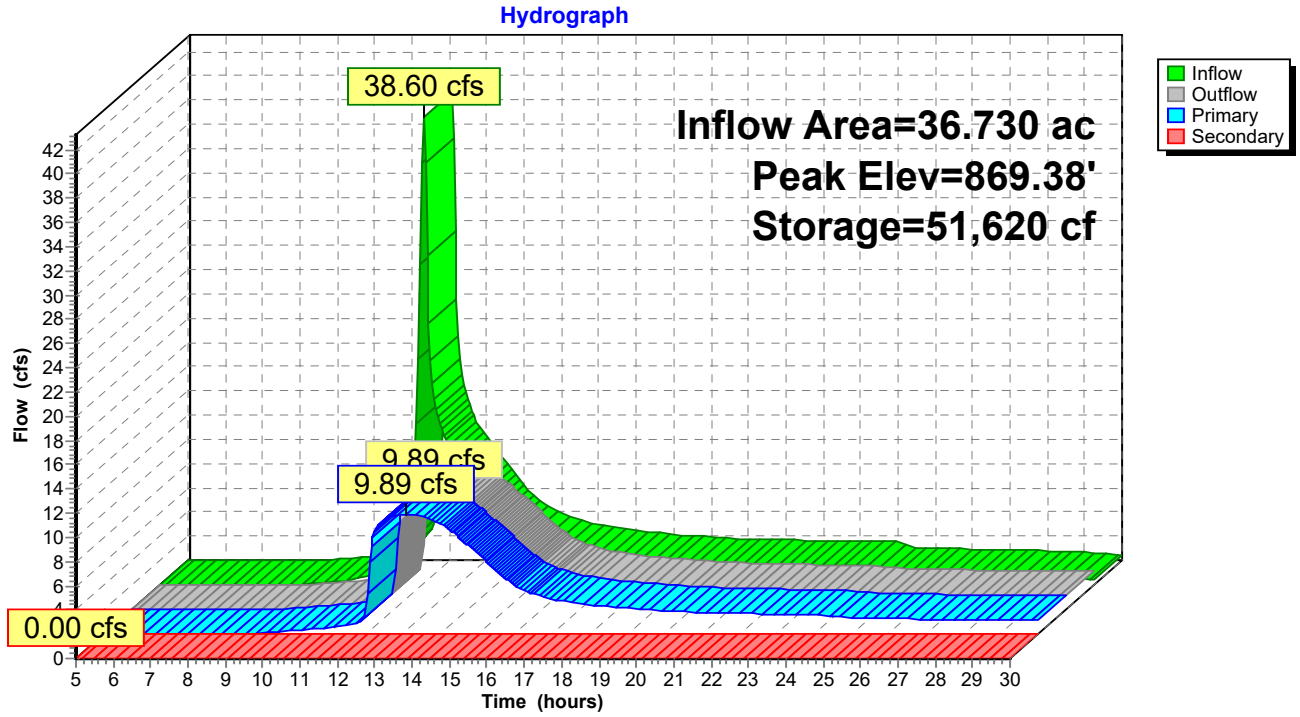
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
863.00	335	0	0
864.00	3,479	1,907	1,907
865.00	5,953	4,716	6,623
866.00	7,741	6,847	13,470
867.00	9,739	8,740	22,210
868.00	11,941	10,840	33,050
869.00	14,156	13,049	46,099
870.00	16,371	15,264	61,362
871.00	18,599	17,485	78,847
872.00	20,845	19,722	98,569

Device	Routing	Invert	Outlet Devices
#1	Secondary	872.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	862.90'	**30.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 862.90' / 861.00' S= 0.0950 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#3	Device 2	863.00'	**5.0" Vert. Orifice1** C= 0.600
#4	Device 2	866.80'	**15.0" Vert. Orifice2** C= 0.600
#5	Device 2	870.00'	**30.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=9.89 cfs @ 13.09 hrs HW=869.38' (Free Discharge)
└**2=Culvert** (Passes 9.89 cfs of 42.67 cfs potential flow)
  ├**3=Orifice1** (Orifice Controls 1.63 cfs @ 11.96 fps)
  ├**4=Orifice2** (Orifice Controls 8.26 cfs @ 6.73 fps)
  └**5=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=863.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Detention Basin 2



Summary for Pond 3P: Detention Basin 3

Inflow Area = 6.480 ac, 11.11% Impervious, Inflow Depth = 1.72" for 10-yr event
Inflow = 16.06 cfs @ 12.03 hrs, Volume= 0.930 af
Outflow = 3.16 cfs @ 12.35 hrs, Volume= 0.928 af, Atten= 80%, Lag= 18.6 min
Primary = 3.16 cfs @ 12.35 hrs, Volume= 0.928 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 902.94' @ 12.35 hrs Surf.Area= 9,197 sf Storage= 16,224 cf

Plug-Flow detention time= 100.3 min calculated for 0.926 af (100% of inflow)
Center-of-Mass det. time= 99.4 min (934.3 - 834.8)

Volume	Invert	Avail.Storage	Storage Description
#1	900.00'	38,589 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

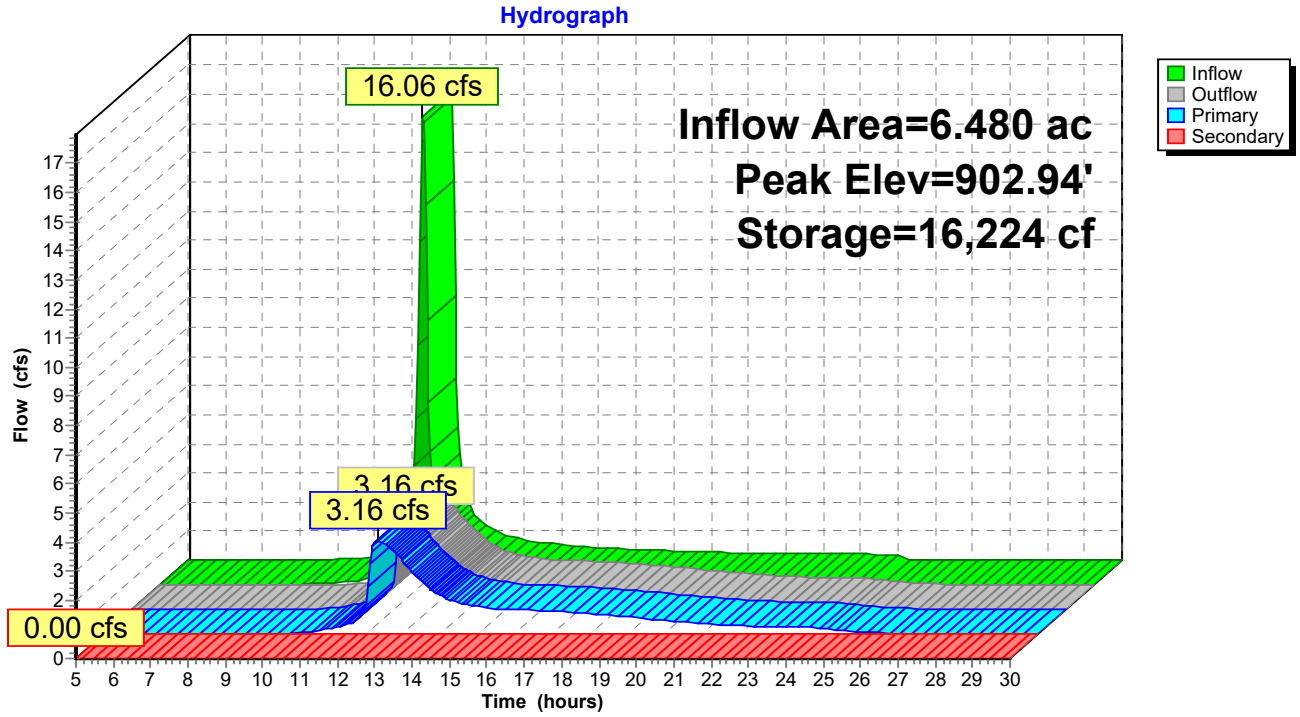
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
900.00	2,381	0	0
901.00	3,197	2,789	2,789
902.00	7,737	5,467	8,256
903.00	9,288	8,513	16,769
904.00	10,896	10,092	26,861
905.00	12,560	11,728	38,589

Device	Routing	Invert	Outlet Devices
#1	Secondary	905.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	900.00'	**18.0" Round Culvert** L= 330.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 900.00' / 889.00' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	900.00'	**5.0" Vert. Orifice1** C= 0.600
#4	Device 2	901.90'	**10.0" Vert. Orifice2** C= 0.600
#5	Device 2	904.00'	**24.0" x 24.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.16 cfs @ 12.35 hrs HW=902.94' (Free Discharge)
└**2=Culvert** (Passes 3.16 cfs of 9.94 cfs potential flow)
  ├**3=Orifice1** (Orifice Controls 1.09 cfs @ 7.96 fps)
  ├**4=Orifice2** (Orifice Controls 2.07 cfs @ 3.80 fps)
  └**5=Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=900.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Detention Basin 3



Summary for Subcatchment 1S: DA-A

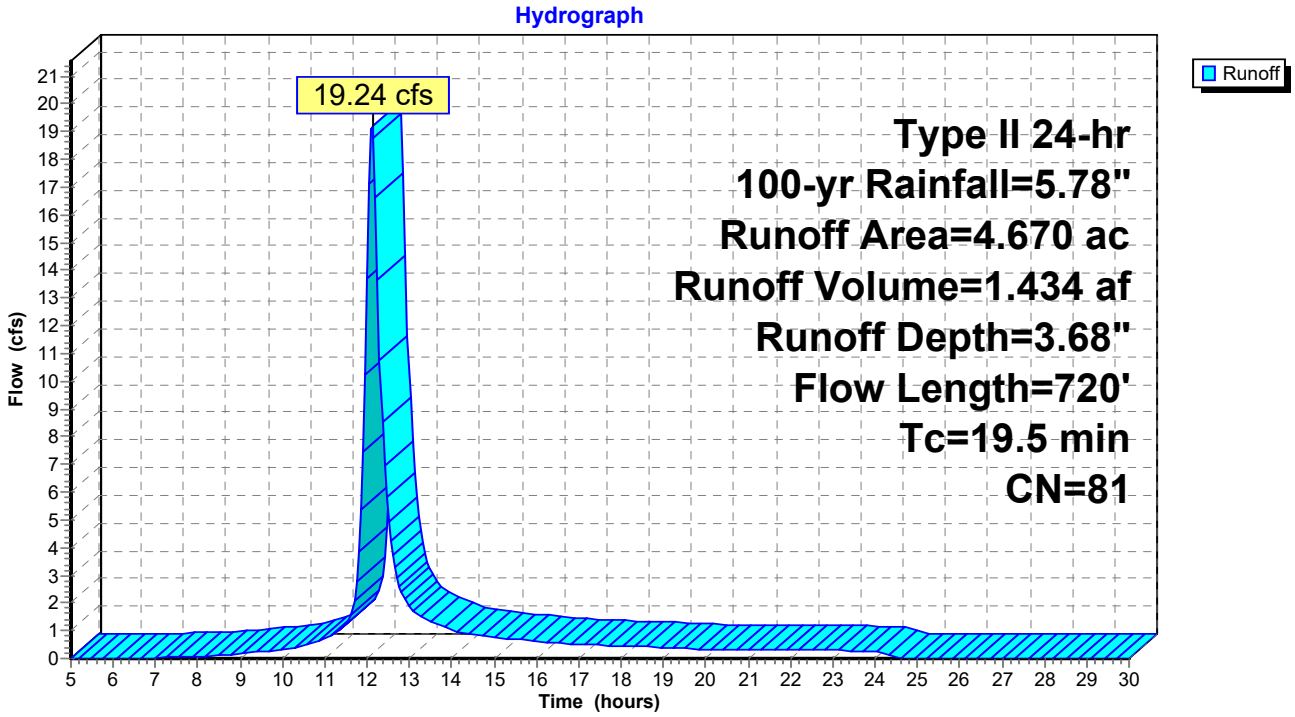
Runoff = 19.24 cfs @ 12.12 hrs, Volume= 1.434 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
0.270	98	Paved parking, HSG D
2.580	80	>75% Grass cover, Good, HSG D
1.540	77	Woods, Good, HSG D
0.280	98	Roofs, HSG D
4.670	81	Weighted Average
4.120		88.22% Pervious Area
0.550		11.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0600	0.10		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 2.39"
2.5	188	0.0650	1.27		**Shallow Concentrated Flow, SCF** Woodland Kv= 5.0 fps
0.8	202	0.0650	4.10		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	230	0.0200	16.17	32.33	**Channel Flow, GUTTER** Area= 2.0 sf Perim= 2.0' r= 1.00' n= 0.013 Asphalt, smooth
19.5	720	Total			

Subcatchment 1S: DA-A



Summary for Subcatchment 2S: DA-B

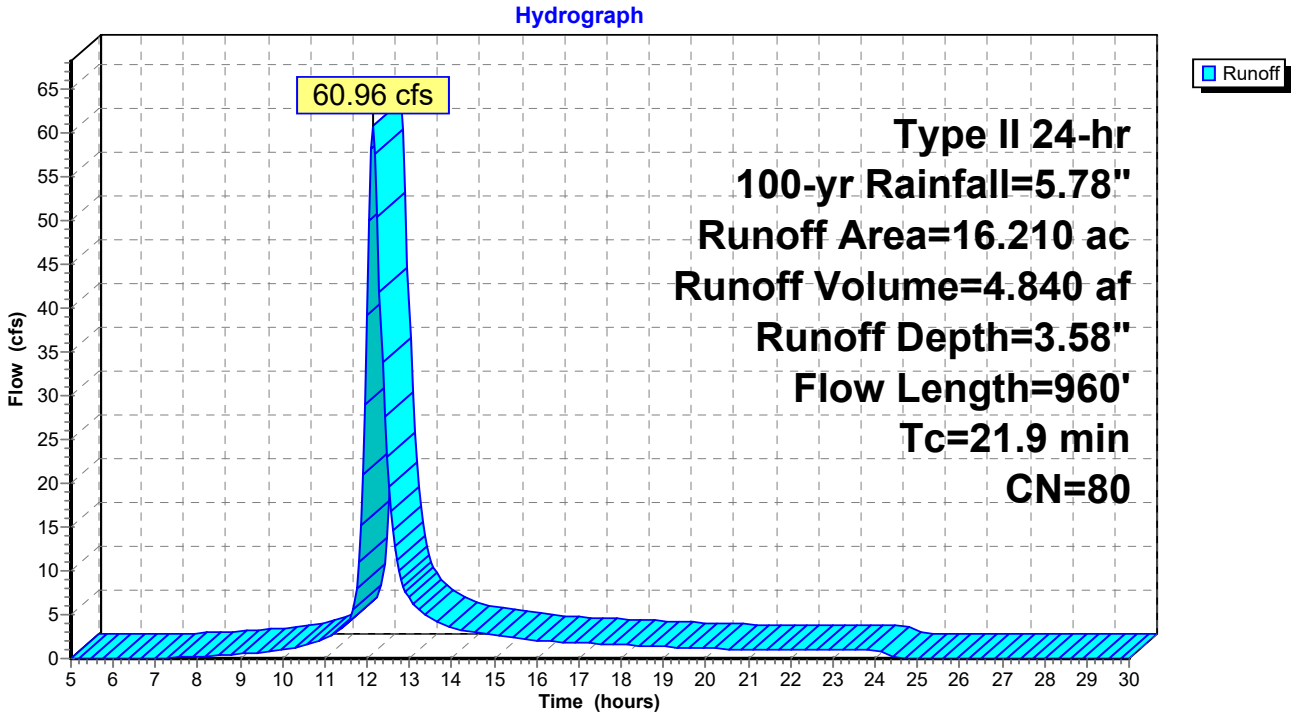
Runoff = 60.96 cfs @ 12.15 hrs, Volume= 4.840 af, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
0.740	98	Paved parking, HSG D
7.140	80	>75% Grass cover, Good, HSG D
7.840	77	Woods, Good, HSG D
0.490	98	Roofs, HSG D
16.210	80	Weighted Average
14.980		92.41% Pervious Area
1.230		7.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.0600	0.10		**Sheet Flow, SHEET FLOW** Woods: Light underbrush n= 0.400 P2= 2.39"
4.8	370	0.0650	1.27		**Shallow Concentrated Flow, SCF** Woodland Kv= 5.0 fps
0.8	200	0.0650	4.10		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.3	290	0.0200	16.17	32.33	**Channel Flow, GUTTER** Area= 2.0 sf Perim= 2.0' r= 1.00' n= 0.013 Asphalt, smooth
21.9	960	Total			

Subcatchment 2S: DA-B



Summary for Subcatchment 3S: DA-C

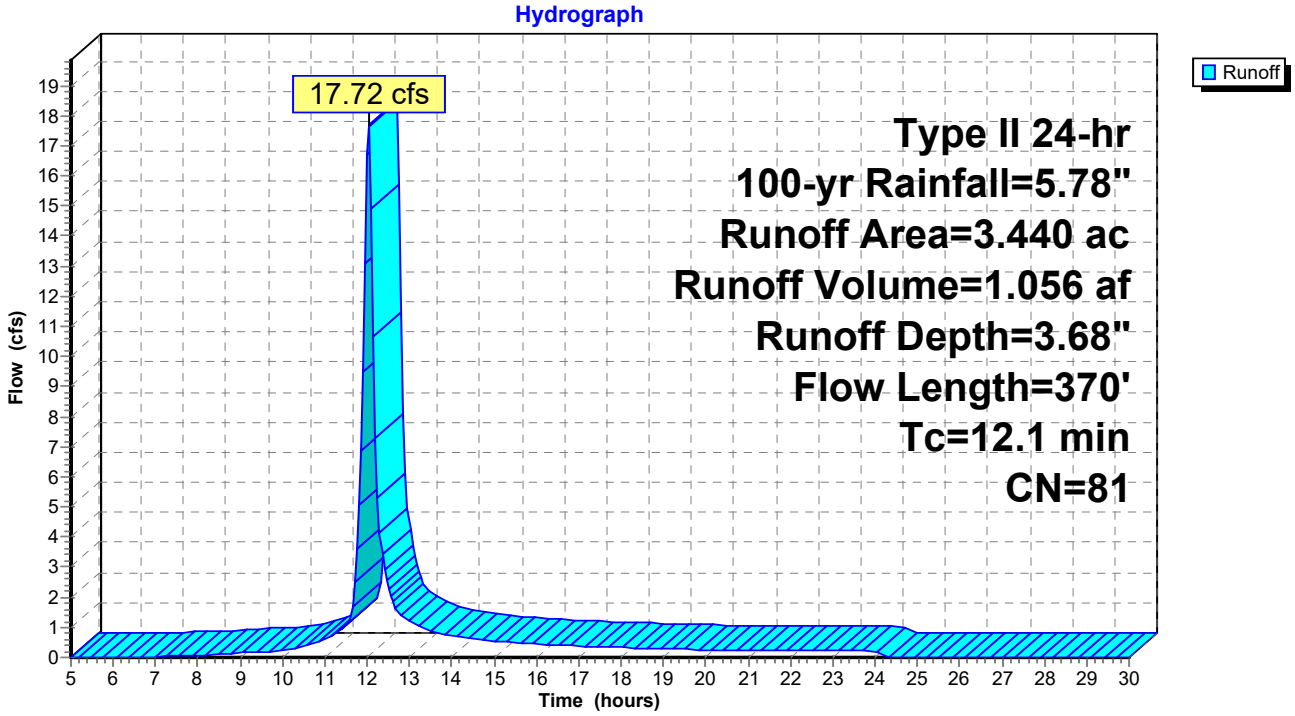
Runoff = 17.72 cfs @ 12.04 hrs, Volume= 1.056 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
0.060	98	Paved parking, HSG D
3.200	80	>75% Grass cover, Good, HSG D
0.180	98	Roofs, HSG D
3.440	81	Weighted Average
3.200		93.02% Pervious Area
0.240		6.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0600	0.16		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
1.5	270	0.0370	3.10		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
12.1	370	Total			

Subcatchment 3S: DA-C



Summary for Subcatchment 4S: DA-D

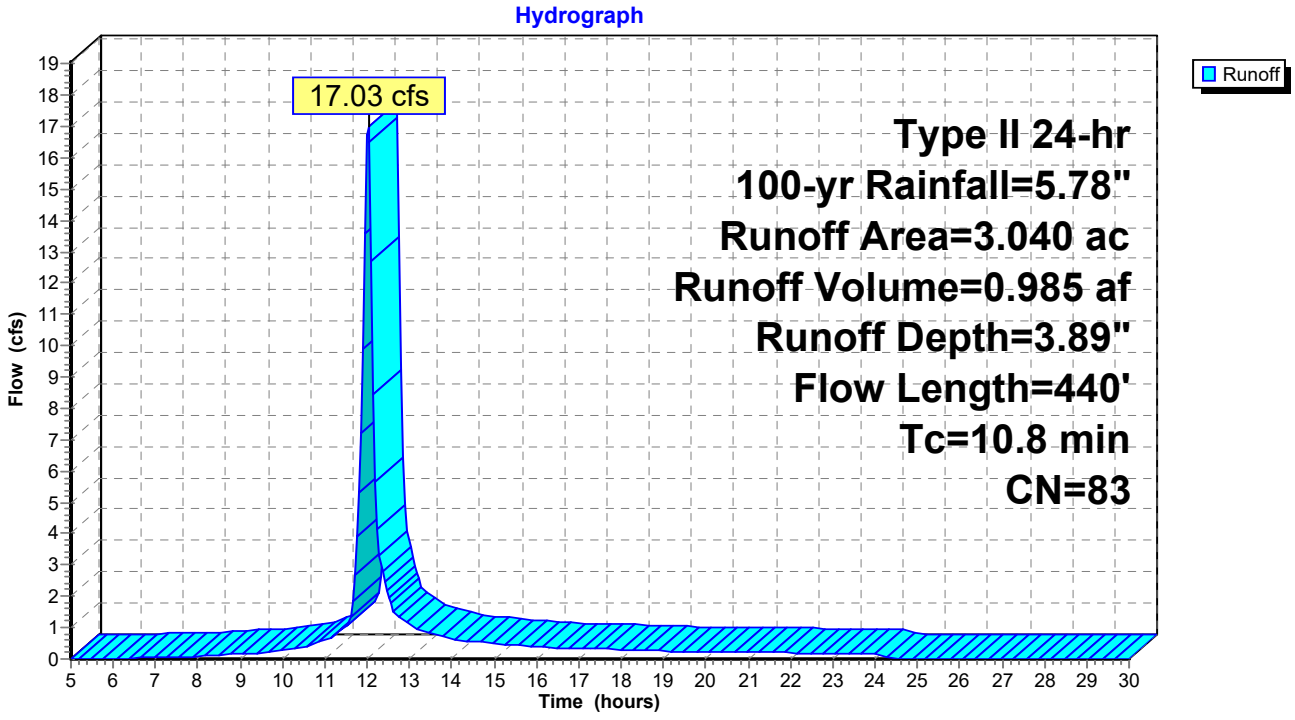
Runoff = 17.03 cfs @ 12.02 hrs, Volume= 0.985 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
0.310	98	Paved parking, HSG D
2.560	80	>75% Grass cover, Good, HSG D
0.170	98	Roofs, HSG D
3.040	83	Weighted Average
2.560		84.21% Pervious Area
0.480		15.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0700	0.17		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.5	140	0.0900	4.83		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.3	200	0.0200	9.55	76.42	**Channel Flow, swale flow** Area= 8.0 sf Perim= 8.0' r= 1.00' n= 0.022 Earth, clean & straight
10.8	440	Total			

Subcatchment 4S: DA-D



Summary for Subcatchment 5S: DA-E

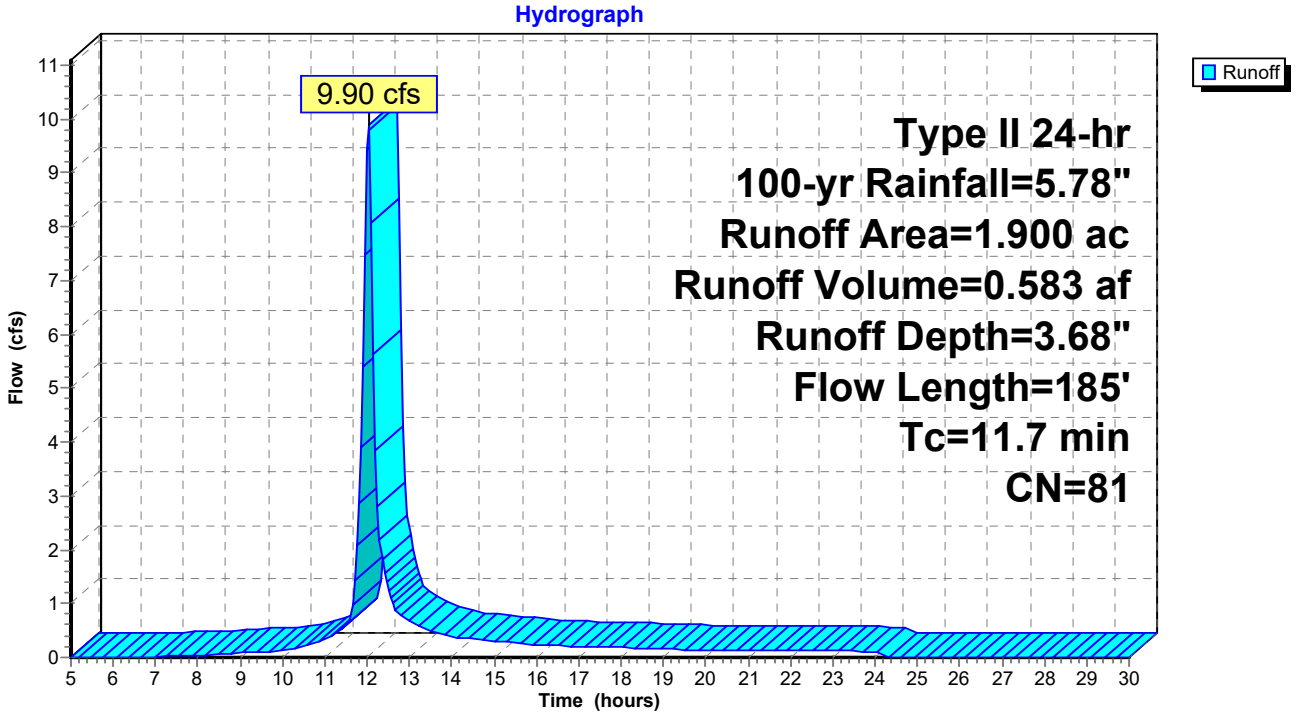
Runoff = 9.90 cfs @ 12.03 hrs, Volume= 0.583 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
0.030	98	Paved parking, HSG D
1.800	80	>75% Grass cover, Good, HSG D
0.070	98	Roofs, HSG D
1.900	81	Weighted Average
1.800		94.74% Pervious Area
0.100		5.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.3	85	0.0950	4.96		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
11.7	185	Total			

Subcatchment 5S: DA-E



Summary for Subcatchment 6S: DA-F

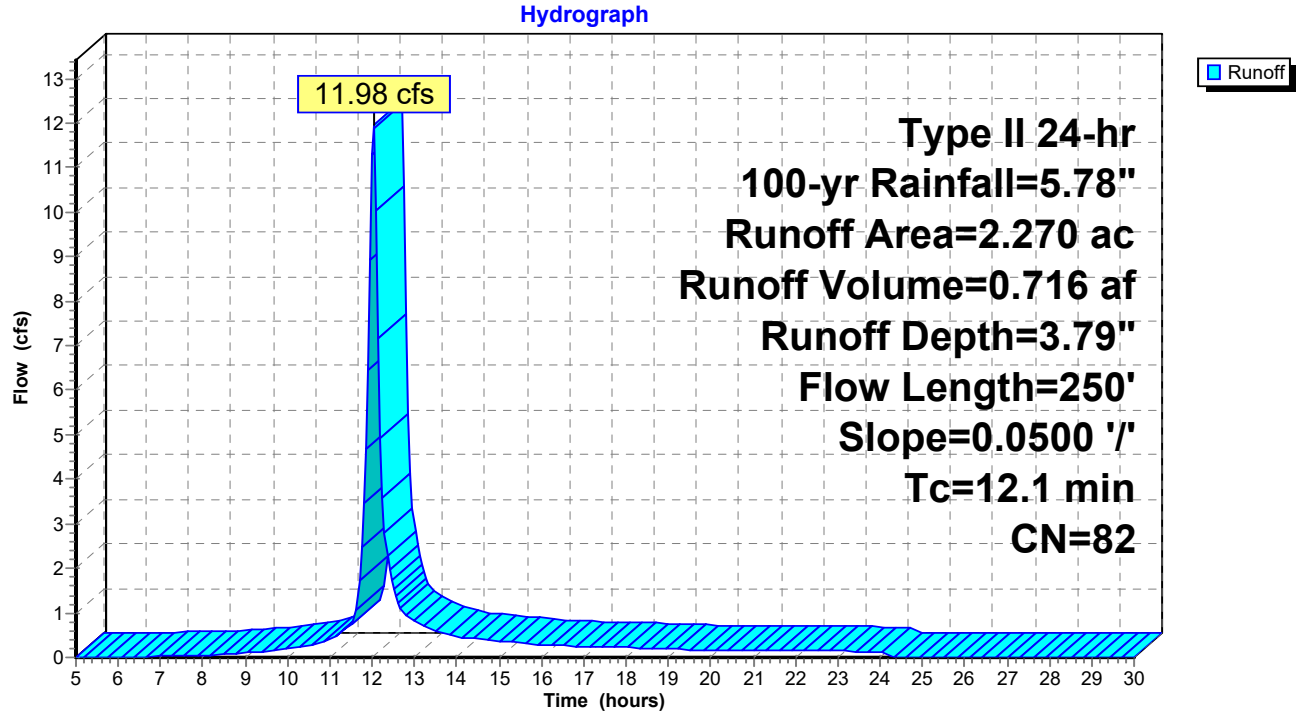
Runoff = 11.98 cfs @ 12.04 hrs, Volume= 0.716 af, Depth= 3.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
0.090	98	Paved parking, HSG D
2.040	80	>75% Grass cover, Good, HSG D
0.140	98	Roofs, HSG D
2.270	82	Weighted Average
2.040		89.87% Pervious Area
0.230		10.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.7	150	0.0500	3.60		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
12.1	250	Total			

Subcatchment 6S: DA-F



Summary for Subcatchment 7S: DA-G

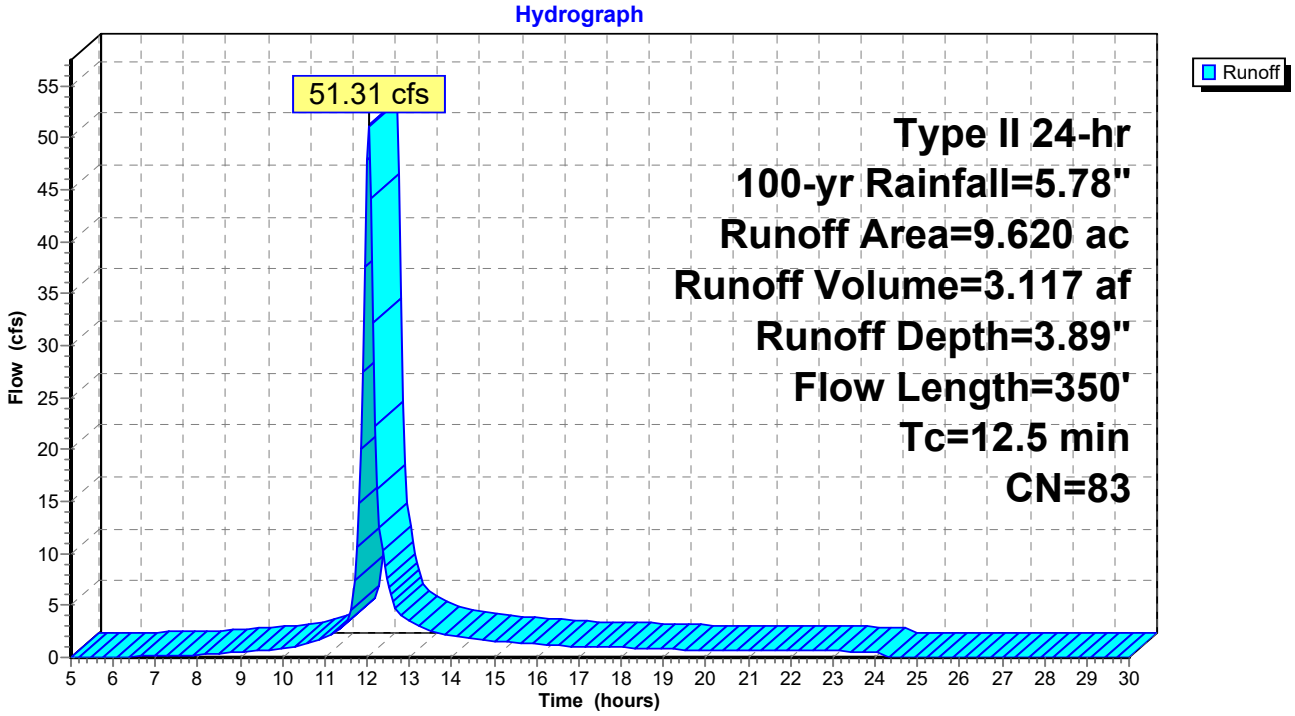
Runoff = 51.31 cfs @ 12.04 hrs, Volume= 3.117 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
1.050	98	Paved parking, HSG D
8.080	80	>75% Grass cover, Good, HSG D
0.490	98	Roofs, HSG D
9.620	83	Weighted Average
8.080		83.99% Pervious Area
1.540		16.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0500	0.15		**Sheet Flow, sheet** Grass: Dense n= 0.240 P2= 2.39"
1.1	250	0.0550	3.78		**Shallow Concentrated Flow, shallow conc flow** Unpaved Kv= 16.1 fps
12.5	350	Total			

Subcatchment 7S: DA-G



Summary for Subcatchment 8S: DA-H

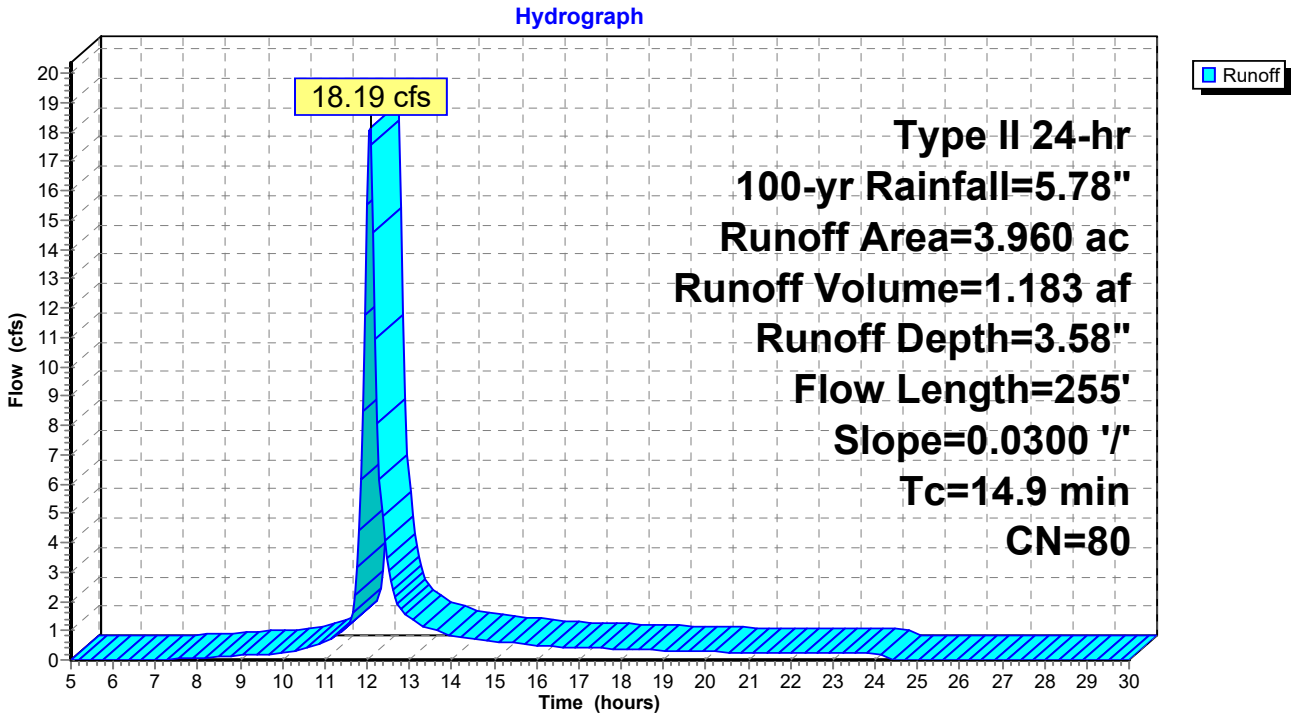
Runoff = 18.19 cfs @ 12.07 hrs, Volume= 1.183 af, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
0.090	98	Paved parking, HSG D
2.440	80	>75% Grass cover, Good, HSG D
1.220	77	Woods, Good, HSG D
0.210	98	Roofs, HSG D
3.960	80	Weighted Average
3.660		92.42% Pervious Area
0.300		7.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0300	0.12		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.9	155	0.0300	2.79		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
14.9	255	Total			

Subcatchment 8S: DA-H



Summary for Subcatchment 10S: DA#1

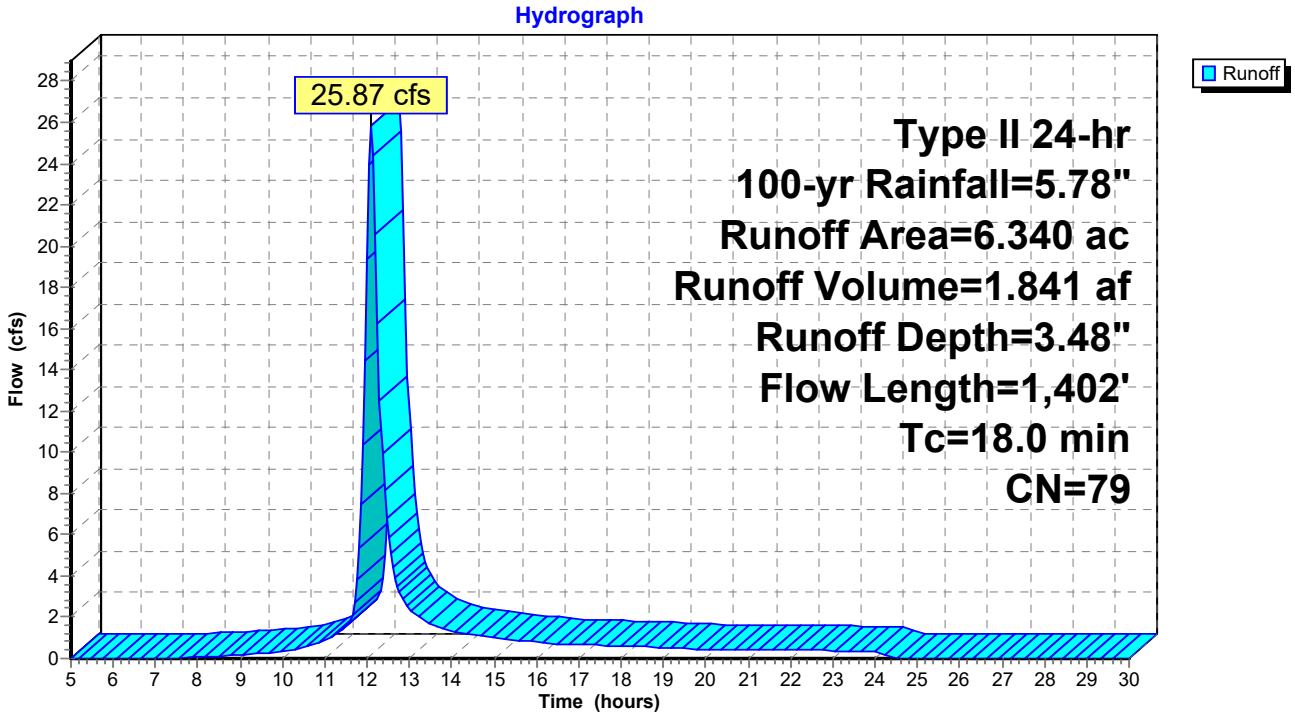
Runoff = 25.87 cfs @ 12.10 hrs, Volume= 1.841 af, Depth= 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
3.390	80	>75% Grass cover, Good, HSG D
2.850	77	Woods, Good, HSG D
0.030	98	Paved parking, HSG D
0.070	98	Roofs, HSG D
6.340	79	Weighted Average
6.240		98.42% Pervious Area
0.100		1.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0600	0.16		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
5.4	485	0.0900	1.50		**Shallow Concentrated Flow, SCF** Woodland Kv= 5.0 fps
1.8	517	0.0900	4.83		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	300	0.0860	27.67	442.73	**Channel Flow, SWALE** Area= 16.0 sf Perim= 8.0' r= 2.00' n= 0.025 Earth, clean & winding
18.0	1,402	Total			

Subcatchment 10S: DA#1



Summary for Subcatchment 11S: DA#2

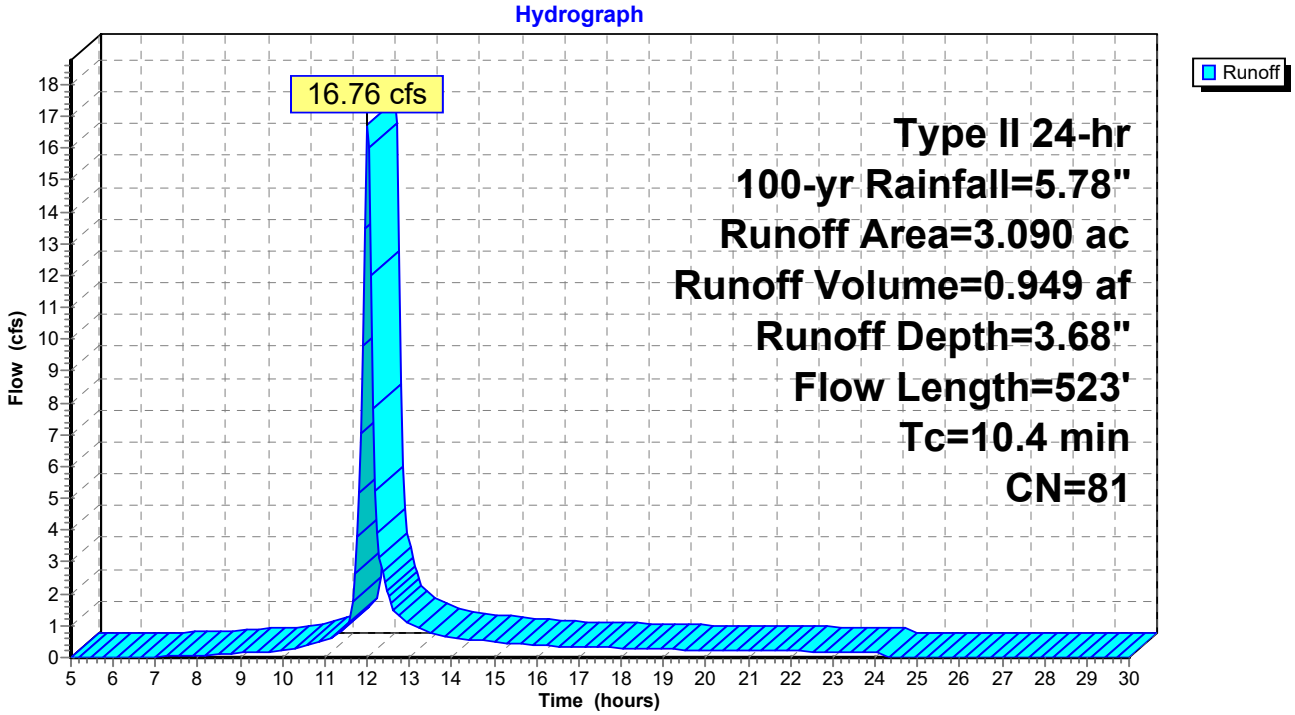
Runoff = 16.76 cfs @ 12.02 hrs, Volume= 0.949 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
2.070	80	>75% Grass cover, Good, HSG D
0.660	77	Woods, Good, HSG D
0.220	98	Paved parking, HSG D
0.140	98	Roofs, HSG D
3.090	81	Weighted Average
2.730		88.35% Pervious Area
0.360		11.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	100	0.0700	0.17		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.2	56	0.1300	5.80		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	367	0.0820	27.02	432.31	**Channel Flow, SWALE** Area= 16.0 sf Perim= 8.0' r= 2.00' n= 0.025 Earth, clean & winding
10.4	523	Total			

Subcatchment 11S: DA#2



Summary for Subcatchment 12S: DA#3

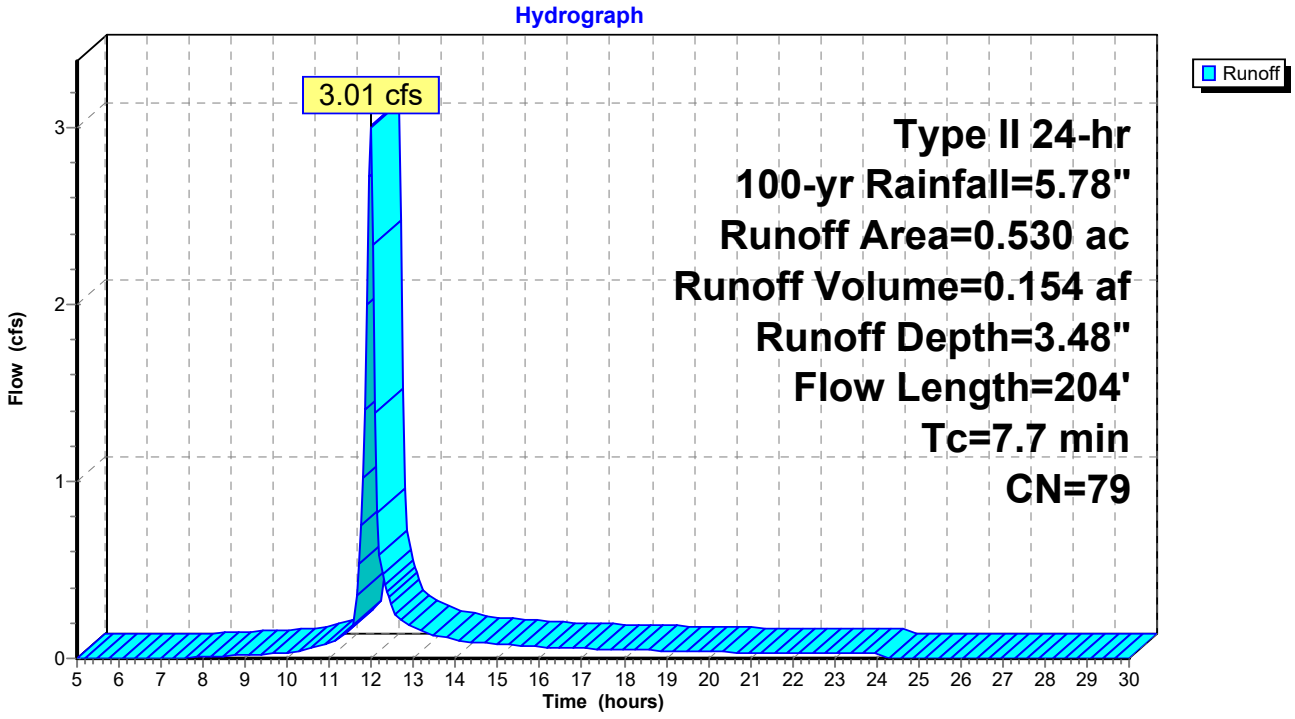
Runoff = 3.01 cfs @ 11.99 hrs, Volume= 0.154 af, Depth= 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
0.390	80	>75% Grass cover, Good, HSG D
0.140	77	Woods, Good, HSG D
0.530	79	Weighted Average
0.530		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.1500	0.23		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
0.3	104	0.1300	5.80		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
7.7	204	Total			

Subcatchment 12S: DA#3



Summary for Subcatchment 13S: DA#4

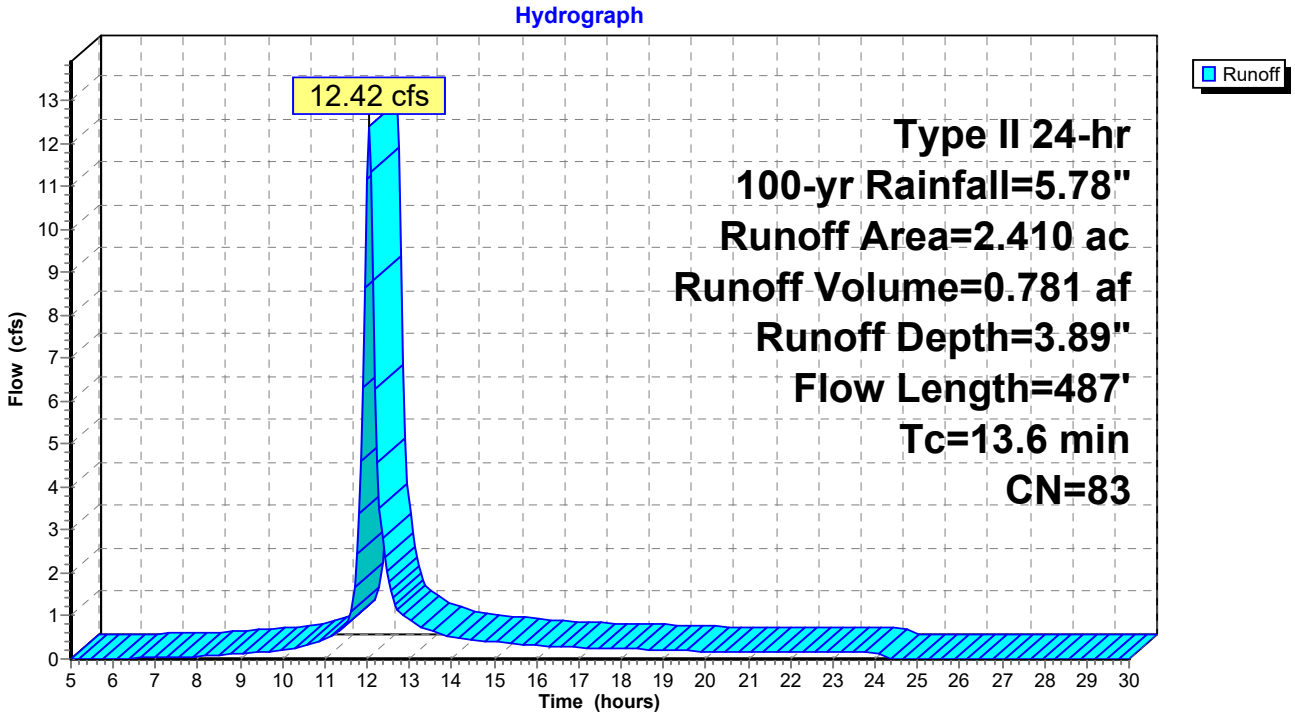
Runoff = 12.42 cfs @ 12.05 hrs, Volume= 0.781 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Type II 24-hr 100-yr Rainfall=5.78"

Area (ac)	CN	Description
2.020	80	>75% Grass cover, Good, HSG D
0.250	98	Paved parking, HSG D
0.140	98	Roofs, HSG D
2.410	83	Weighted Average
2.020		83.82% Pervious Area
0.390		16.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0450	0.14		**Sheet Flow, SHEET FLOW** Grass: Dense n= 0.240 P2= 2.39"
1.5	307	0.0450	3.42		**Shallow Concentrated Flow, SCF** Unpaved Kv= 16.1 fps
0.2	80	0.0200	6.42	5.04	**Pipe Channel, storm pipe** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
13.6	487	Total			

Subcatchment 13S: DA#4

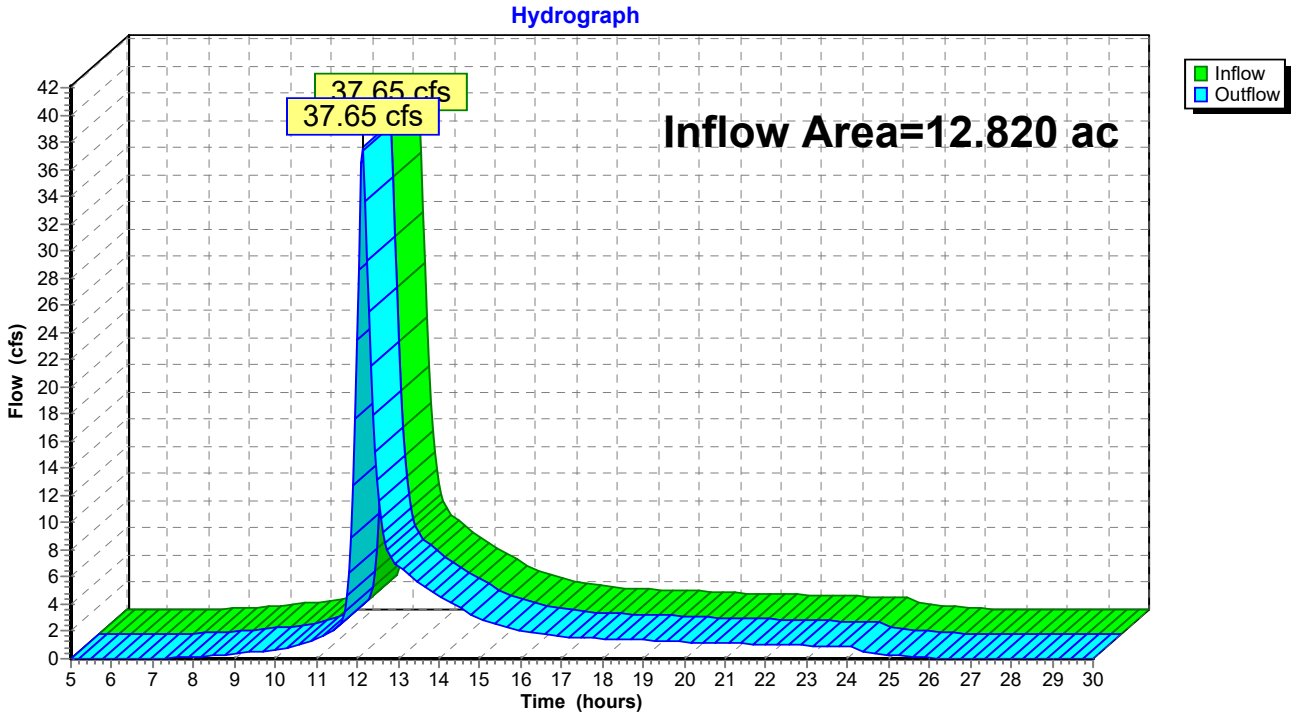


Summary for Reach 1R: Pt of Study 1A

Inflow Area = 12.820 ac, 6.40% Impervious, Inflow Depth > 3.63" for 100-yr event
Inflow = 37.65 cfs @ 12.13 hrs, Volume= 3.879 af
Outflow = 37.65 cfs @ 12.13 hrs, Volume= 3.879 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Reach 1R: Pt of Study 1A

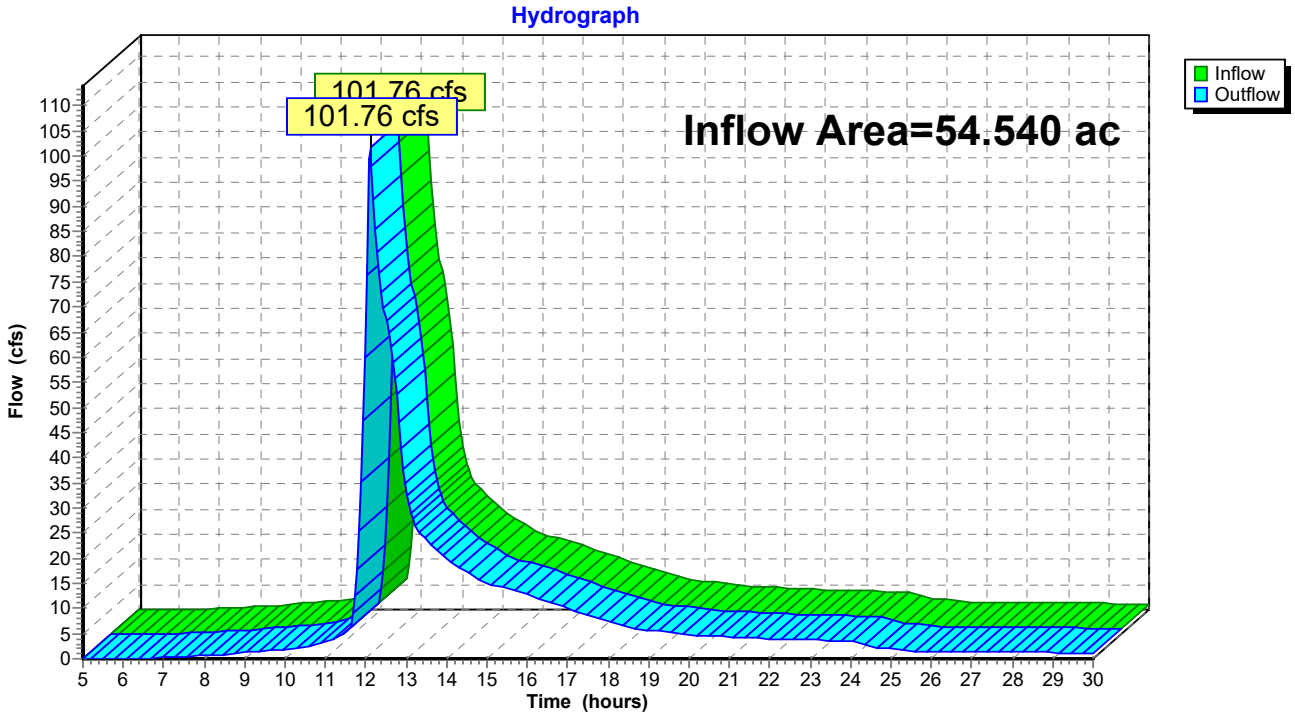


Summary for Reach 2R: Pt of Study 1B

Inflow Area = 54.540 ac, 9.41% Impervious, Inflow Depth > 3.56" for 100-yr event
Inflow = 101.76 cfs @ 12.12 hrs, Volume= 16.174 af
Outflow = 101.76 cfs @ 12.12 hrs, Volume= 16.174 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs

Reach 2R: Pt of Study 1B



Summary for Pond 1P: Detention Basin 1

Inflow Area = 20.880 ac, 8.52% Impervious, Inflow Depth = 3.61" for 100-yr event
Inflow = 79.89 cfs @ 12.14 hrs, Volume= 6.274 af
Outflow = 41.08 cfs @ 12.37 hrs, Volume= 6.140 af, Atten= 49%, Lag= 13.6 min
Primary = 41.08 cfs @ 12.37 hrs, Volume= 6.140 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 895.80' @ 12.37 hrs Surf.Area= 20,411 sf Storage= 100,002 cf

Plug-Flow detention time= 127.9 min calculated for 6.127 af (98% of inflow)
Center-of-Mass det. time= 115.5 min (941.7 - 826.2)

Volume	Invert	Avail.Storage	Storage Description
#1	888.00'	104,203 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

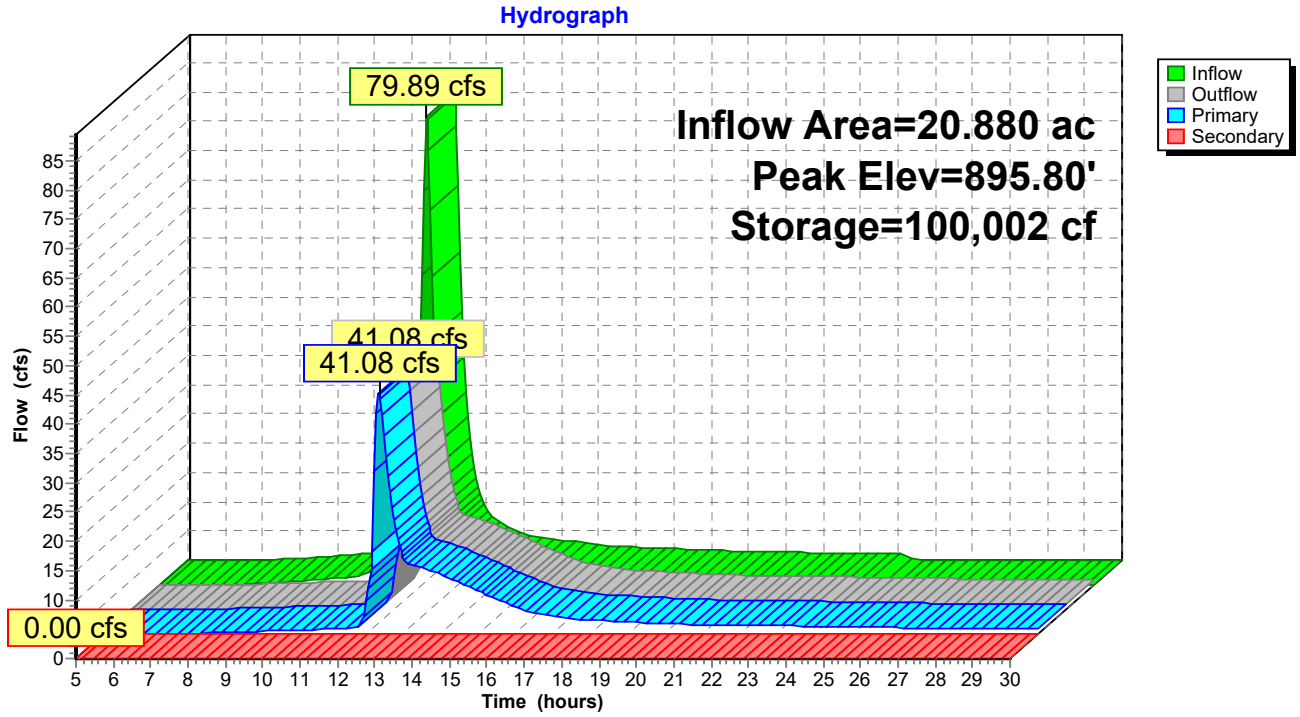
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
888.00	373	0	0
889.00	3,768	2,071	2,071
890.00	11,124	7,446	9,517
891.00	12,590	11,857	21,374
892.00	14,113	13,352	34,725
893.00	15,691	14,902	49,627
894.00	17,327	16,509	66,136
895.00	19,019	18,173	84,309
896.00	20,768	19,894	104,203

Device	Routing	Invert	Outlet Devices
#1	Primary	887.90'	**30.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 887.90' / 886.90' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#2	Device 1	888.00'	**5.0" Vert. Orifice1** C= 0.600
#3	Device 1	891.20'	**15.0" Vert. Orifice2** C= 0.600
#4	Device 1	894.90'	**30.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	896.00'	**25.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=40.85 cfs @ 12.37 hrs HW=895.79' (Free Discharge)
└**1=Culvert** (Passes 40.85 cfs of 48.07 cfs potential flow)
  ├**2=Orifice1** (Orifice Controls 1.81 cfs @ 13.25 fps)
  ├**3=Orifice2** (Orifice Controls 11.76 cfs @ 9.58 fps)
  └**4=Grate** (Weir Controls 27.28 cfs @ 3.08 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=888.00' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Detention Basin 1



Summary for Pond 2P: Detention Basin 2

Inflow Area = 36.730 ac, 10.48% Impervious, Inflow Depth > 3.64" for 100-yr event
Inflow = 88.94 cfs @ 12.05 hrs, Volume= 11.155 af
Outflow = 50.98 cfs @ 12.44 hrs, Volume= 10.763 af, Atten= 43%, Lag= 23.4 min
Primary = 50.98 cfs @ 12.44 hrs, Volume= 10.763 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 871.61' @ 12.44 hrs Surf.Area= 19,979 sf Storage= 90,701 cf

Plug-Flow detention time= 79.9 min calculated for 10.763 af (96% of inflow)
Center-of-Mass det. time= 52.2 min (936.2 - 884.0)

Volume	Invert	Avail.Storage	Storage Description
#1	863.00'	98,569 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

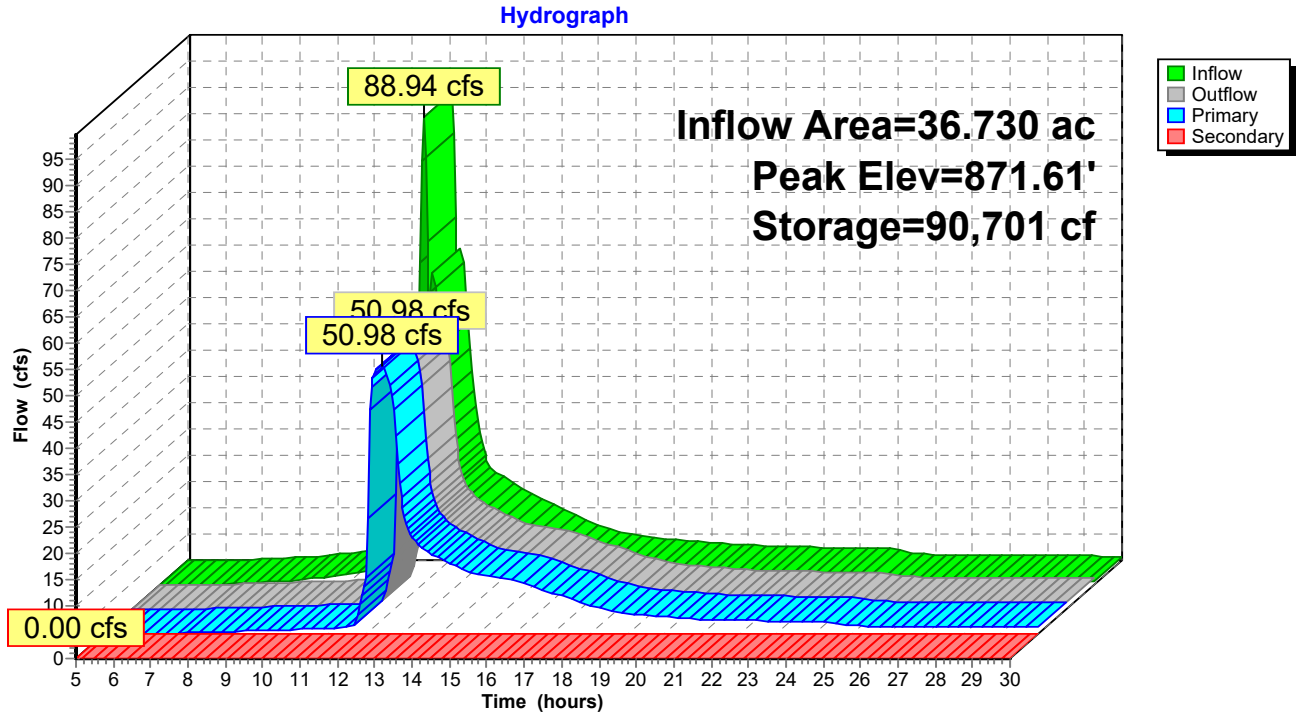
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
863.00	335	0	0
864.00	3,479	1,907	1,907
865.00	5,953	4,716	6,623
866.00	7,741	6,847	13,470
867.00	9,739	8,740	22,210
868.00	11,941	10,840	33,050
869.00	14,156	13,049	46,099
870.00	16,371	15,264	61,362
871.00	18,599	17,485	78,847
872.00	20,845	19,722	98,569

Device	Routing	Invert	Outlet Devices
#1	Secondary	872.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	862.90'	**30.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 862.90' / 861.00' S= 0.0950 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 4.91 sf
#3	Device 2	863.00'	**5.0" Vert. Orifice1** C= 0.600
#4	Device 2	866.80'	**15.0" Vert. Orifice2** C= 0.600
#5	Device 2	870.00'	**30.0" x 30.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=50.97 cfs @ 12.44 hrs HW=871.61' (Free Discharge)
└**2=Culvert** (Inlet Controls 50.97 cfs @ 10.38 fps)
  ├**3=Orifice1** (Passes < 1.90 cfs potential flow)
  ├**4=Orifice2** (Passes < 12.09 cfs potential flow)
  └**5=Grate** (Passes < 38.20 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=863.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Detention Basin 2



Summary for Pond 3P: Detention Basin 3

Inflow Area = 6.480 ac, 11.11% Impervious, Inflow Depth = 3.78" for 100-yr event
Inflow = 34.67 cfs @ 12.03 hrs, Volume= 2.041 af
Outflow = 13.14 cfs @ 12.21 hrs, Volume= 2.038 af, Atten= 62%, Lag= 10.5 min
Primary = 13.14 cfs @ 12.21 hrs, Volume= 2.038 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 904.58' @ 12.21 hrs Surf.Area= 11,859 sf Storage= 33,447 cf

Plug-Flow detention time= 89.6 min calculated for 2.038 af (100% of inflow)
Center-of-Mass det. time= 88.8 min (901.3 - 812.5)

Volume	Invert	Avail.Storage	Storage Description
#1	900.00'	38,589 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

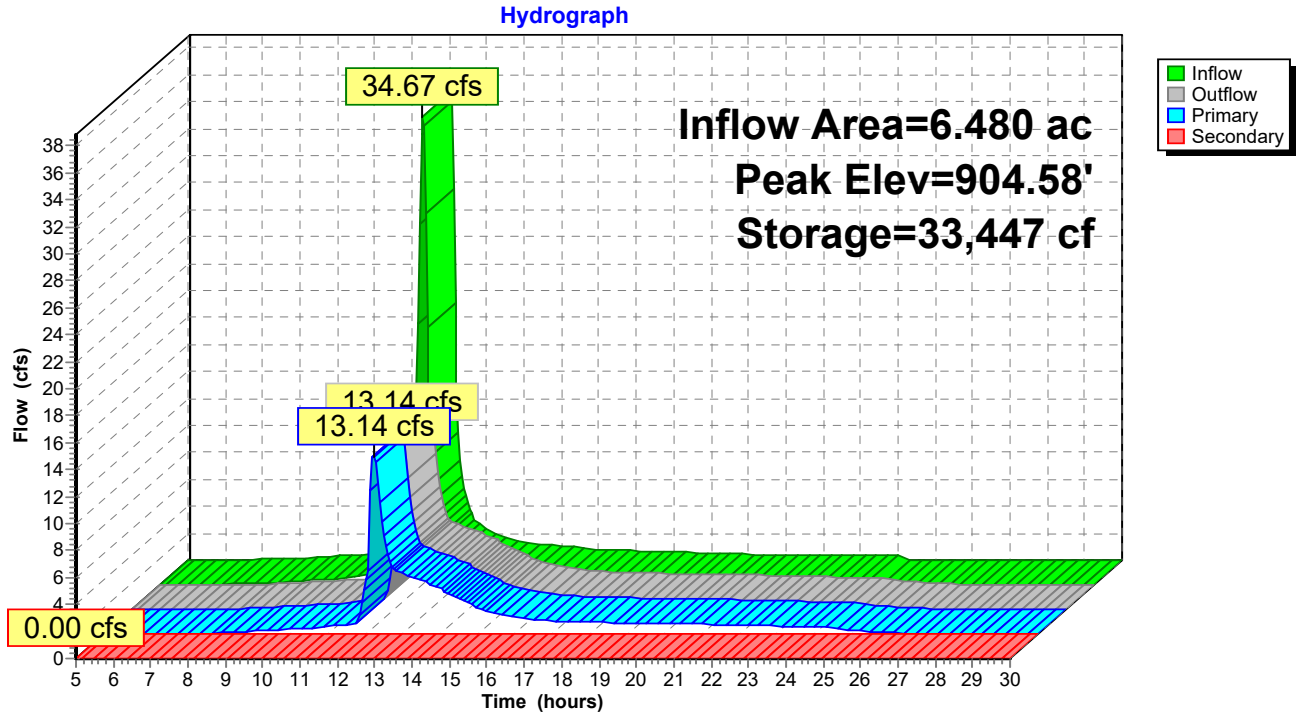
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
900.00	2,381	0	0
901.00	3,197	2,789	2,789
902.00	7,737	5,467	8,256
903.00	9,288	8,513	16,769
904.00	10,896	10,092	26,861
905.00	12,560	11,728	38,589

Device	Routing	Invert	Outlet Devices
#1	Secondary	905.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Primary	900.00'	**18.0" Round Culvert** L= 330.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 900.00' / 889.00' S= 0.0333 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#3	Device 2	900.00'	**5.0" Vert. Orifice1** C= 0.600
#4	Device 2	901.90'	**10.0" Vert. Orifice2** C= 0.600
#5	Device 2	904.00'	**24.0" x 24.0" Horiz. Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=13.14 cfs @ 12.21 hrs HW=904.58' (Free Discharge)
└**2=Culvert** (Inlet Controls 13.14 cfs @ 7.43 fps)
  ├**3=Orifice1** (Passes < 1.37 cfs potential flow)
  ├**4=Orifice2** (Passes < 3.95 cfs potential flow)
  └**5=Grate** (Passes < 11.42 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=900.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Detention Basin 3



APPENDIX C: SOIL DESCRIPTIONS

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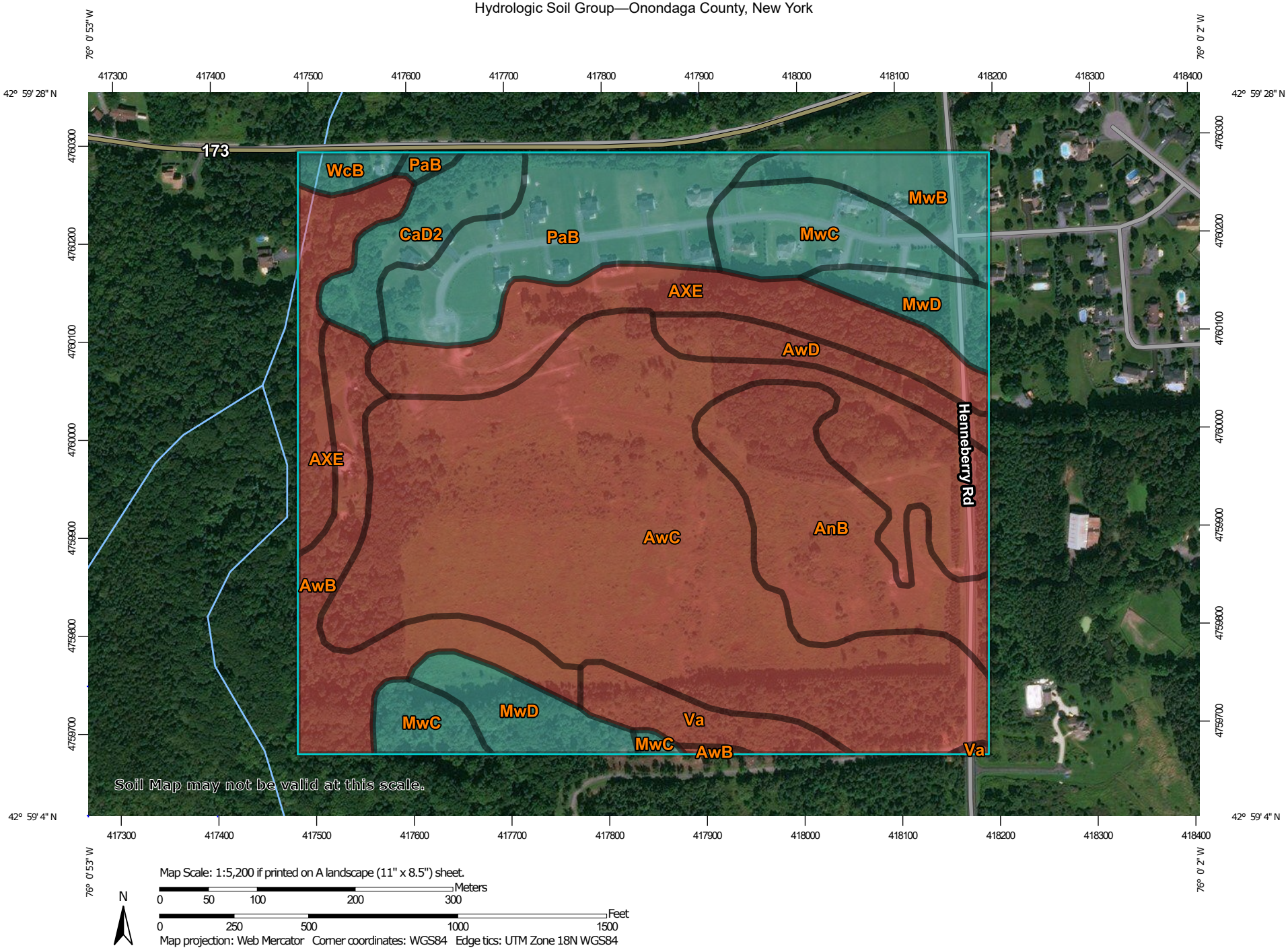
76° 0' 53" W
76° 0' 2" W
42° 59' 28" N
42° 59' 4" N
417300
417400
417500
417600
417700
417800
417900
418000
418100
418200
418300
418400
4760300
4760200
4760100
4760000
4759900
4759800
4759700
173
WcB
PaB
CaD2
PaB
MwB
MwC
AXE
MwD
AwD
Henneberry Rd
AXE
AwC
AnB
AwB
MwC
MwD
Va
MwC
AwB
Va
Soil Map may not be valid at this scale.
Map Scale: 1:5,200 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 50 100 200 300
Feet
0 250 500 1000 1500
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Onondaga County, New York
Survey Area Data: Version 15, Jun 11, 2020

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

Date(s) aerial images were photographed: Jun 18, 2011—Oct 10, 2016

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
AnB	Angola-Darien silt loams, 0 to 6 percent slopes	D	10.0	9.3%
AwB	Aurora silt loam, 0 to 6 percent slopes	D	7.7	7.1%
AwC	Aurora silt loam, 6 to 12 percent slopes	D	41.7	38.7%
AwD	Aurora silt loam, 12 to 18 percent slopes	D	2.9	2.7%
AXE	Aurora-Farmington-Rock outcrop association, steep	D	12.5	11.6%
CaD2	Camillus silt loam, 12 to 18 percent slopes eroded	C	3.7	3.4%
MwB	Mohawk silt loam, 2 to 8 percent slopes	C	3.7	3.4%
MwC	Mohawk silt loam, 8 to 15 percent slopes	C	6.6	6.1%
MwD	Mohawk silt loam, 15 to 25 percent slopes	C	5.3	4.9%
PaB	Palatine shaly silt loam, 2 to 6 percent slopes	C	9.9	9.2%
Va	Varick silt loam	D	2.9	2.6%
WcB	Wassaic silt loam, 0 to 8 percent slopes	C	0.9	0.9%
Totals for Area of Interest			**107.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX D: BIORETENTION BASIN CONSTRUCTION AND MAINTENANCE

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NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Bioretention Stormwater Management Practices Level 1 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other _____	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

BR Drainage Area

Look for areas that are uphill from the Bioretention cell.

Problem (Check if Present)	**Follow-Up Actions**
 ☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and mulch areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other:

BR Drainage Area

Look for areas that are uphill from the Bioretention cell.

Problem (Check if Present)	Follow-Up Actions
	☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths.
 ☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
 ☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

BR Inlets

Stand in the Bioretention cell itself and look for all the places where water flows in. Often there will be multiple points of inflow to the practice.

Problem (Check if Present)	Follow-Up Actions
 ☐ Inlets collect grit and debris or grass/weeds. Some water may not be getting into the Bioretention cell. The objective is to have a clear pathway for water to flow into the cell.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or openings). Parking lots generate fine grit that will accumulate at these spots. ☐ Pull out clumps of growing grass or weeds and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the Bioretention cell. ☐ Dispose of all material properly where it will not re-enter the Bioretention cell. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the Bioretention cell.
 ☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion is present, or there is bare dirt that is washing into the Bioretention cell.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying erosion-control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Erosion is occurring at most of the inlets, and it looks like there is too much water that is concentrating at these points. The inlet design may have to be modified.

BR Ponding Area

Examine the entire Bioretention surface and side slopes

Problem (Check if Present)	Follow-Up Actions
 ☐ Mulch (if used) needs to be replaced or replenished. The mulch layer had decomposed or is less than 1-inch thick.	☐ Add new mulch to a total depth (including any existing mulch that is left) of 2 to 3 inches. The mulch should be shredded hardwood mulch that is less likely to float away during rainstorms. ☐ Avoid adding too much mulch so that inlets are obstructed or certain areas become higher than the rest of the Bioretention surface. ☐ Other:
 ☐ Minor areas of sediment, grit, trash, or other debris are accumulating on the bottom.	☐ Use a shovel to scoop out minor areas of sediment or grit, especially in the spring after winter sanding materials may wash in and accumulate. Dispose of the material where it cannot re-enter the Bioretention cell . ☐ If removing the material creates a hole or low area, fill with soil mix that matches original mix and cover with mulch so that the Bioretention surface area is as flat as possible. ☐ Remove trash, vegetative debris, and other undesirable materials. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment has accumulated more than 2-inches deep and covers 25% or more of the Bioretention surface. ☐ Kick-Out to Level 2 Inspection: The Bioretention cell is too densely vegetated to assess sediment accumulation or ponding; see BR-4, Vegetation.

BR Ponding Area

Examine the entire Bioretention surface and side slopes

Problem (Check if Present)	Follow-Up Actions
 ☐ There is erosion in the bottom or on the side slopes. Water seems to be carving out rills as it flows across the Bioretention surface or on the slopes, or sinkholes are forming in certain areas. ☐ Source: Stormwater Maintenance, LLC.	☐ Try filling the eroded areas with clean topsoil or sand, and cover with mulch. ☐ If the problem recurs, you may have to use stone (e.g., river cobble) to fill in problem areas. ☐ If the erosion is on a side slope, fill with clay that can be compacted and seed and mulch the area. ☐ Other: ☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3-inches deep and seems to be an issue with how water enters and moves through the Bioretention cell. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water, but a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.
 ☐ The bottom of the Bioretention cell is not flat, and the water pools at one end, along an edge, or in certain pockets. The whole bottom is not uniformly covered with water. See design plan to verify that bioretention surface is intended to be flat. Check during or immediately after a rainstorm.	☐ If the problem is minor (just small, isolated areas are not covered with water), try raking the surface OR adding mulch to low spots to create a more level surface. You may need to remove and replace plantings in order to properly even off the surface. ☐ Check the surface with a string and bubble level to get the surface as flat as possible. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Ponding water is isolated to less than half of the Bioretention surface area, and there seem to be elevation differences of more than a couple of inches across the surface.

BR Ponding Area

Examine the entire Bioretention surface and side slopes

Problem (Check if Present)	Follow-Up Actions
 ☐ Water stands on the surface more than 72 hours after a rainstorm and /or wetland-type vegetation is present. The Bioretention cell does not appear to be draining properly.	☐ Kick-Out to Level 2 Inspection: This is generally a serious problem, and it will be necessary to activate a Level 2 Inspection.

BR Vegetation

Examine all Bioretention cell vegetation.

Problem (Check if Present)	Follow-Up Actions
 ☐ Vegetation requires regular maintenance—pulling weeds, removing dead and diseased plants, replacing mulch around plants, adding plants to fill in areas that are not well vegetated, etc.	☐ If you can identify which plants are weeds or not intended to be part of the planting plan, eliminate these, preferably by hand pulling. ☐ If weeds are widespread, check with the local stormwater authority and/or Extension Office about proper use of herbicides for areas connected with the flow of water. ☐ Even vegetation that is intended to be present can become large, overgrown, and/or crowd out surrounding plants. Prune and thin accordingly. ☐ If weeds or invasive plants have overtaken the whole Bioretention cell , bush-hog the entire area before seedheads form in the spring. It will be necessary to remove the root mat manually or with appropriate herbicides, as noted above. ☐ Re-plant with species that are aesthetically pleasing and seem to be doing well in the Bioretention cell. ☐ Other: ☐ Kick-Out to Level 2 Inspection: You are unsure of the original planting design, or the vegetation maintenance task is beyond your capabilities of time, expertise, or resources. If you are unsure of the health of the vegetation (e.g. salt damage, invasives, which plants are undesirable) or the appropriate season to conduct vegetation management, consult a landscape professional before undertaking any cutting, pruning, mowing, or brush hogging.

BR Vegetation

Examine all Bioretention cell vegetation.

Problem (Check if Present)	Follow-Up Actions
 ☐ Vegetation is too thin, is not healthy, and there are many spots that are not well vegetated.	☐ The original plants are likely not suited for the actual conditions within the Bioretention cell . If you are knowledgeable about plants, select and plant more appropriate vegetation (preferably native plants) so that almost the entire surface area will be covered by the end of the second growing season. ☐ Other: ☐ Kick-Out to Level 2 Inspection: For all but small practices (e.g., rain gardens), this task will likely require a landscape design professional or horticulturalist.

BR Outlets

Examine outlets that release water out of the Bioretention cell.

Problem (Check if Present)	Follow-Up Actions
☐ Erosion at outlet	☐ Add stone to reduce the impact from the water flowing out of the outlet pipe or weir during storms. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Rills have formed and erosion problem becomes more severe.
 ☐ Outlet obstructed with mulch, sediment, debris, trash, etc.	☐ Remove the debris and dispose of it where it cannot re-enter the Bioretention cell . ☐ Other: ☐ Kick-Out to Level 2 Inspection: Outlet is completely clogged or obstructed; there is too much material to remove by hand or with simple hand tools.

Additional Notes:

Inspector:_____ Date: _____

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

"I hereby certify that the follow-up/corrective actions identified in the inspection performed on _____ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected."

Inspector/Operator: _____ Date: _____

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Bioretention Stormwater Management Practices Level 2 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other _____	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

Level 2 Inspection: BIORETENTION NOTE: Key Source for this Information *(CSN, 2013)*	
Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
☐ Condition 1: Small pockets of standing water Use a soil probe or auger to examine the soil profile. If isolated areas have accumulated grit, fines, or vegetative debris or have bad soil media, try scraping off top 3 inches of media and replacing with clean material. Also check to see that surface is level and water is not ponding selectively in certain areas. ☐ Condition 2: Standing water is widespread or covers entire surface Requires diagnosis and resolution of problem: • Clogged underdrain? • Filter fabric between soil media and underdrain stone? • Need to install underdrain if not present? • Too much sediment/grit washing in from drainage area? • Too much ponding depth? • Improper soil media?	• Soil media is clogged and problem is not evident from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or is associated with the original design of the practice. ☐ Level 3 inspection necessary
Observed Condition: Vegetation is sparse or out of control	
☐ Condition 1: Original design planting plan seems good but has not been maintained, so there are many invasives and/or dead plants Will require some horticultural experience to restore vegetation to intended condition by weeding, pruning, removing plants, and adding new plants. ☐ Condition 2: Original design planting plan is unknown or cannot be actualized A landscape architect or horticulturalist will be needed to redo the planting plan. Will likely require analysis of soil pH, moisture, organic content, sun/shade, and other conditions to make sure plants match conditions. Plan should include invasive plant management and maintenance plan to include mulching, watering, disease intervention, periodic thinning/pruning, etc.	• Vegetation deviates significantly from original planting plan; Bioretention has been neglected and suffered from deferred maintenance. • Owner/responsible party does not know how to maintain the practice. ☐ Level 3 inspection necessary
Observed Condition: Bioretention does not conform to original design plan in surface area or storage	
☐ Condition 1: Level 2 Inspection reveals that practice is too small based on design dimension, does not have adequate storage (e.g., ponding depth) based on the plan, and/or does not treat the drainage area runoff as indicated on the plan Small areas of deviation can be corrected by the property owner or responsible party, but it is likely that a Qualified Professional will have to revisit the design and attempt a redesign that meets original objectives or that can be resubmitted to the municipality for approval.	• More than a 25% departure from the approved plan in surface area, storage, or drainage area; sometimes less than this threshold at the discretion of the Level 2 inspector. ☐ Level 3 inspection necessary

Level 2 Inspection: BIORETENTION
NOTE: Key Source for this Information *(CSN, 2013)*

Recommended Repairs	Triggers for Level 3 Inspection
Observed Condition: Severe erosion of filter bed, inlets, or around outlets	
☐ Condition 1: Erosion at inlets The lining (e.g., grass, matting, stone, rock) may not be adequate for the actual flow velocities coming through the inlets. First line of defense is to try a more non-erosive lining and/or to extend the lining further down to where inlet slopes meet the Bioretention surface. If problem persists, analysis by a Qualified Professional is warranted. ☐ Condition 2: Erosion of Bioretention filter bed This is often caused by "preferential flow paths" through and along the Bioretention surface. The source of flow should be analyzed and methods employed to dissipate energy and disperse the flow (e.g., check dams, rock splash pads). ☐ Condition 3: Erosion on side slopes Again, the issue is likely linked with unanticipated flow paths down the side slopes (probably overland flow that concentrates as it hits the edge of the slope). For small or isolated areas, try filling, compacting, and re-establishing healthy ground cover vegetation. If the problem is more widespread, further analysis is required to determine how to redirect the flow.	• Erosion (rills, gullies) is more than 12 inches deep at inlets or the filter bed or more than 3 inches deep on side slopes. • If the issue is not caused by moving water but some sort of subsurface defect. This may manifest as a sinkhole or linear depression and be associated with problems with the underdrain stone or pipe or underlying soil. ☐ Level 3 inspection necessary
Observed Condition: Significant sediment accumulation, indicating an uncontrolled source of sediment	
☐ Condition 1: Isolated areas of sediment accumulation, generally less than 3-inches deep Sediment source may be from a one-time or isolated event. Remove accumulated sediment and top 2 to 3 inches of Bioretention soil media; replace with clean material. Check drainage area for any ongoing sources of sediment. ☐ Condition 2: Majority of the surface is caked with "hard pan" (thin layer of clogging material) or accumulated sediment that is 3-inches deep or more This can be caused by an improper construction sequence (drainage area not fully stabilized prior to installation of Bioretention soil media) or another chronic source of sediment in the drainage area. Augering several holes down through the media can indicate how severe the problem is; often the damage is confined to the first several inches of soil media. Removing and replacing this top layer (or to the depth where sediment incursion is seen in auger holes) can be adequate, as long as the problem does not recur.	• More than 2 inches of accumulated sediment cover 25% or more of the Bioretention surface area. • "Hard pan" of thin, crusty layer covers majority of Bioretention surface area and seems to be impeding flow of water down through the soil media. • New sources of sediment seem to be accumulating with each significant rainfall event. ☐ Level 3 inspection necessary

Notes:

Inspector:_____ Date: _____

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Certified Completion of Follow-Up Actions:

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Inspector/Operator: _____ Date: _____

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Pond and Wetland Stormwater Management Practices Level 1 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other _____	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

PW Drainage Area

Look for areas that are uphill from the pond.

Problem (Check if Present)	**Follow-Up Actions**
☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to establish vegetation. ☐ Fill in eroded areas with soil, compact, seed and mulch with straw to establish vegetation. ☐ Other:

☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Kick-Out to Level 2 Inspection: If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ If large areas of soil have been eroded or larger channels are forming, this may require rerouting of flow paths or use of an erosion-control seed mat or blanket to reestablish acceptable ground cover or anchor sod where it is practical.
 ☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Remove excessive vegetation or woody debris that can block drainage systems. ☐ Other:
 ☐ Open containers of oil, grease, paint, or other substances exposed to rain in the drainage area	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

Pond Inlets

Look for all areas where water flows into the pond during storms. Note that there may be multiple points of inflow and types of structures (e.g., pipes, open ditches, etc.).

Problem (Check if Present)	Follow-Up Actions
 ☐ Inlets are buried, covered or filled with silt, debris, or trash, or blocked by excessive vegetation.	☐ If the problem can be remedied with hand tools and done in a safe manner, remove vegetation, trash, woody debris, etc. from blocking inlet structures. ☐ Other: ☐ Kick-Out to Level 2 or 3 Inspection: If the amount of material is too large to handle OR there are ANY safety concerns about working in standing water, soft sediment, etc., the work will likely have to be performed by a qualified contractor.

Pond Inlets

Look for all areas where water flows into the pond during storms. Note that there may be multiple points of inflow and types of structures (e.g., pipes, open ditches, etc.).

Problem (Check if Present)		Follow-Up Actions
	☐ Inlets are buried, covered or filled with silt, debris, or trash, or blocked by excessive vegetation.	☐ Kick-Out to Level 2 or 3 Inspection: If the amount of material is too large to handle OR there are ANY safety concerns about working in standing water, soft sediment, etc., the work will likely have to be performed by a qualified contractor.
	☐ Inlets are broken, and, with pieces of pipe or concrete falling into the pond, there is erosion around the inlet, there is open space under the pipe, or there is erosion where the inlet meets the pond	☐ Kick-Out to Level 2 Inspection: These types of structural or erosion problems are more serious and will require a qualified contractor to repair.

PW Pond Area and Embankments

Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Problem (Check if Present)		Follow-Up Actions
	☐ The pretreatment area(s) or forebay(s) are filled with sediment, trash, vegetation, or other debris.	☐ If the problem can be remedied with hand tools and done in a safe manner, use a flat shovel or other equipment to remove small amounts of sediment. ☐ Remove trash and excessive vegetation from forebays if this can be done in a safe manner. ☐ Other:

PW Pond Area and Embankments

Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Problem (Check if Present)		Follow-Up Actions
	☐ The pretreatment area(s) or forebay(s) are filled with sediment, trash, vegetation, or other debris.	☐ Kick-Out to Level 2 Inspection: Large amounts of sediment or debris will have to be removed by a qualified contractor. ANY condition that poses a safety concern for working in standing water or soft sediments should be referred to a Level 2 Inspection or qualified contractor.
	☐ The pond area itself has accumulated sediment, trash, debris, or excessive vegetation that is choking the flow of the water, OR the pond area is covered with algae or aquatic plants.	☐ Level 1 includes handling only small amounts of material that can be removed by hand, or with rakes or other hand tools. Do not attempt any repair that poses a safety issue. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Most cases will call for a Level 2 Inspection and/or a qualified contractor. ☐ You are not sure what type and amount of vegetation is supposed to be in the pond. ☐ The algae or aquatic plants should be identified so that proper control techniques can be applied.
	☐ The side slopes of the pond are unstable, eroding, and have areas of bare dirt.	☐ If there are only minor areas, try filling in small rills or gullies with topsoil, compacting, and seeding and mulching all bare dirt areas with an appropriate seed. Alternatively, try using herbaceous plugs to get vegetation established in tricky areas, such as steep slopes. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Erosion and many bare dirt areas on steep side slopes will require a Level 2 Inspection and repair by a qualified contractor.

PW Pond Area and Embankments

Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Problem (Check if Present)		Follow-Up Actions
 	☐ The riser structure is clogged with trash, debris, sediment, vegetation, etc., OR is open, unlocked, or has a steep drop and poses a safety concern. The pond level may have dropped below its "normal" level.	☐ If you can safely access the riser on foot or with a small boat, clear minor amounts of debris and remove it from the pond area for safe disposal. ☐ Other: ☐ Kick-Out to Level 2 Inspection: The riser cannot be accessed safely, the amount of debris is substantial, or the riser seems to be completely clogged and the water level has risen too high. ☐ There are safety issues with the riser and concern about access to pipes, drops, or any other life safety concern. ☐ The riser is leaning, broken, settling or slumping, corroded, eroded or any other structural problem.
	☐ The dam/embankment is slumping, sinking, settling, eroding, or has medium or large trees growing on it.	☐ If there are small isolated areas, try to fix them by adding clean material (clay and topsoil) and seeding and mulching. ☐ Periodically mow embankments to enable inspection of the banks and to minimize establishment of woody vegetation. ☐ Remove any woody vegetation that has already established on embankments. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Most of these situations will require a Level 2 Inspection or evaluation and repair by a qualified contractor. Seepage through the dam or problems with the pipe through the dam can be a serious issue that should be addressed to avoid possible dam failure.

PW Pond Area and Embankments

Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Problem (Check if Present)		Follow-Up Actions
	☐ The emergency spillway or outfall (if it exists) has ☐ Erosion, settlement, or loss of material. Rock-lined spillways have excessive debris or vegetation.	☐ Clear light debris and vegetation. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Displacement of rock lining, excessive vegetation and erosion/settlement may warrant review and decision by Level 2 Inspector to check against original plan. ☐ Any uncertainty about the integrity of the emergency spillway should be referred to a Level 2 Inspector. ☐ Erosion or settlement such that design has been compromised should be reviewed by an engineer.

PW Pond Outlet

Examine the outlet of the pipe on the downstream side of the dam/embankment where it empties into a stream, channel, or drainage system.

Problem (Check if Present)	Follow-Up Actions
 ☐ The pond outlet is clogged with sediment, trash, debris, vegetation, or is eroding, caving in, slumping, or falling apart.	☐ If there is a minor blockage, remove the debris or vegetation to allow free flow of water. ☐ Remove any accumulated trash at the outlet. ☐ Outlet: ☐ Kick-Out to Level 2 Inspection: ☐ If the area at the outlet cannot be easily accessed or if the blockage is substantial, a Level 2 Inspection is warranted. ☐ Erosion at and downstream of the outfall should be evaluated by a qualified professional. ☐ Any structural problems, such as broken pipes, structures falling into the stream, or holes or tunnels around the outfall pipe, should be evaluated by a Level 2 Inspector and will require repair by a qualified contractor. ☐ The pool of water at the outlet pipe is discolored, has an odor, or has excessive algae or vegetative growth.

Additional Notes:

Inspector:_____ Date: _____

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Inspector/Operator: _____ Date: _____

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Pond and Wetland Stormwater Management Practices Level 2 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other _____	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

Level 2 Inspection: PONDS and WETLANDS

Recommended Repairs and Required Skills	Triggers for Level 3 Inspection
Observed Condition: Bare Soil or Erosion in the Drainage Area	
☐ Condition 1: Extensive problem spots, but no channels or rills forming Reseed problem areas. If problem persists or grass does not take, consider hiring a landscape contractor. ☐ Condition 2: Problem is extensive, and rills/channels are beginning to form May be necessary to divert or redirect water that is causing the erosion problem. If it appears that simple regrading—such as installing a berm or leveling a low spot–will fix the problem, make repairs and ensure that the problem is repaired after the next storm.	• Large rills or gullies are forming in the drainage area. • An attempt to regrade the drainage area has been unsuccessful. • Fixing the problem would require major regrading (i.e., redirecting more than a 100-square-foot area. • It is not clear why the problem is occurring. ☐ Level 3 inspection necessary
Observed Condition: Manholes or Inlet Pipe Buried or Covered with Vegetation	
☐ Condition 1: Nearest manhole and inlet pipe not found Consult as-built drawings to get to closest suspected location and use metal detector to search for metal manhole cover. If unsuccessful, identify nearest drain inlets and approximate pipe direction to locate next manhole. ☐ Condition 2: Manhole located and inspected Never enter a manhole, except by following confined-space entry protocols. If outlet pipe is not visible or greater than 25% full of sediment/debris or trash, it will typically require a qualified contractor to flush, clean and clear blockages. ☐ Condition 3: Inlet pipe not found at pond Clear vegetation and brush that may be covering the inlet pipe. Buried inlet pipes may be found through use of a metal probe. ☐ Condition 4: Inlet pipe buried in sediment or blocked by vegetation Once located, the pipe path can be cleared of vegetation with brush hook or other brush tools. Light digging may clear sediment from the end of the pipe.	• To locate buried manholes and lost storm lines, it is sometimes necessary to hire a pipeline inspection contractor with televising equipment or ground-penetrating radar and enter at the closest upstream access point. • Locating a buried inlet pipe may require wading in the edge of the pond and using a metal probe and brush axe to find and expose the pipe. • If other than light digging is necessary to remove accumulated sediment, a contractor with heavy equipment may be required. ☐ Level 3 inspection necessary

Level 2 Inspection: PONDS and WETLANDS

Recommended Repairs and Required Skills	Triggers for Level 3 Inspection
Observed Condition: Pipe or Headwall Settlement, Erosion, Corrosion or Failure	
☐ Condition 1: Pipe or headwall settlement or failure Severe sinkholes, settlement or corrosion should be kicked out to Level 3 Inspection. ☐ Condition 2: Flow not confined to pipe and visible outside pipe wall With flashlight, observe the inside of the pipe and note its condition. Take photographs. Look for sinkholes developing that indicate pipe failure beneath the surface. Kick out to Level 3 inspection.	• Where blockages are visible, a decision is needed on whether to clear them or leave in place. If a third of the pipe is full of sediment, it should be removed by a contractor with pipe-cleaning equipment. • Corrosion of inlet pipes that allows flow around the pipe exterior is a structural concern because it can lead to settlement, sinkholes and undermining pond embankment. Evidence of this type of failure may require specialized pipe-inspection equipment and investigation by an engineer. ☐ Level 3 inspection necessary
Observed Condition: Pond Conditions	
☐ Condition 1: Pond pre-treatment zone is full of sediment or not constructed as shown on as-built drawings. ☐ Condition 2: Excessive buildup of sediment or overgrowth If the pre-treatment area or pond pool is overgrown or filled with sediment so that the original design is compromised, corrective measures are required. If plants have died, then replanting is necessary. If none of the original design exists due to alteration or sediment, kick out to Level 3 inspection.	• It may require inspection by an engineer to determine next steps for clearing, replanting or reconstruction. • Erosion or settlement such that design has been compromised should be reviewed by an engineer. Recurring erosion may require redesign and/or regrading to direct flow away from eroding area. • If sediment has filled more than 50% of the pond's capacity, dredging is likely needed and should be evaluated by a qualified contractor. • Removal or control of excessive algae or aquatic plants can be assessed by a qualified pond maintenance company. ☐ Level 3 inspection necessary

Notes:

Inspector:_____ Date: _____

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NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Swale Stormwater Management Practices Level 1 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
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Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other _____	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

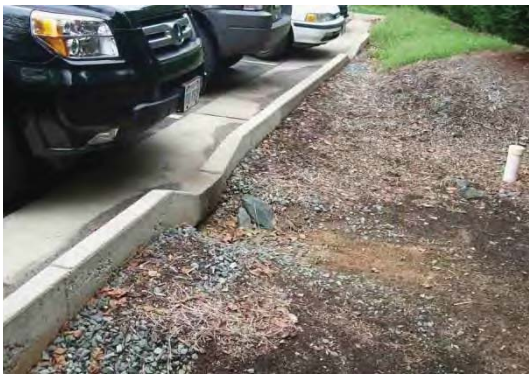
SW Drainage Area

Look at areas that are uphill from the swale.

Problem (Check if Present)	Follow-Up Actions
 ☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and mulch or sod areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and add seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths
 ☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
 ☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous.
☐ Grass dying at edge of road	☐ Seed and mulch; add topsoil or compost if needed. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Grass on edge of pavement continues to die off for unknown reasons. Swale edge may need to be replaced with other materials (e.g., stone diaphragm).

SW Inlets

Stand in the swale and look for all the places where water flows in.

Problem (Check if Present)	Follow-Up Actions
☐ Inlets or the swale edge are collecting grit, grass clippings, or debris or have grass/weeds growing. Some water may not be getting into the swale. The objective is to have a clear pathway for water to flow into the swale.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or opening). Parking lots will generate fine grit that will accumulate at these spots. ☐ Pull out clumps of growing grass or weeds, and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets or along the edge of the swale where water is supposed to enter. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the swale. ☐ Dispose of all material properly in an area where it will not re-enter the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the swale.
 ☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion are present, or there is bare dirt that is washing into the swale.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying an erosion control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
	☐ Level 2 Inspection: Erosion is occurring at most of the inlets or along much of the swale edge. The inlet design may have to be modified.

SW Surface Area

Examine the entire swale surface and side slopes.

Problem (Check if Present)	Follow-Up Actions
☐ Minor areas of sediment, grit, trash, or other debris are accumulating in the swale.	☐ Use a shovel to scoop out minor areas of sediment or grit, especially in the spring after winter sanding materials may wash in and accumulate. Dispose of the material where it cannot re-enter the swale. ☐ If removing the material creates a hole or low area, fill with good topsoil and add seed and straw to re-vegetate. ☐ Remove trash, vegetative debris, and other undesirable materials. ☐ If the swale is densely vegetated, it may be difficult to do the maintenance; check for excessive ponding or other issues described in this section to see if the accumulated material is causing a problem. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Sediment has accumulated more than 3 inches deep and covers 25% or more of the swale surface. ☐ The source of sediment is unknown or cannot be controlled with simple measures.
 ☐ There is erosion in the bottom or on the side slopes. Water seems to be carving out rills as it flows through the swale or on the slopes.	☐ Try filling the eroded areas with clean topsoil, and then seed and mulch to establish vegetation. ☐ If the problem recurs, you may have to use some type of matting, stone (e.g., river cobble), or other material to fill in eroded areas. ☐ If the erosion is on a side slope, fill with soil and cover with erosion-control matting or at least straw mulch after re-seeding. ☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3 inches deep and seems to be an issue with how water enters and moves through the swale. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water, but a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.
☐ Water does not flow evenly down the length of the swale, but ponds in certain areas for long periods of time (e.g., 72 hours after a storm). The swale does not seem to have “positive drainage.” Check during or immediately after a rain storm.	☐ If the problem is minor (just small, isolated areas), try using a metal rake or other tools to create a more even flow path; remove excessive vegetative growth, sediment, or other debris that may be blocking the flow. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Water ponds in more than 25% of the swale for three days or more after a storm. The issue may be with the underlying soil or the grade of the swale. ☐ Water ponds behind check dams for three days or more after a storm. Check dams may be clogged or not functioning properly.

SW Surface Area

Examine the entire swale surface and side slopes.

Problem (Check if Present)	Follow-Up Actions
 ☐ Check dams (if present): water is flowing around the edges of check dams, creating erosion or sinkholes on the uphill or downhill side, or the check dams are breaking apart or breaching .	☐ If the problem is isolated to just a few check dams, try simple repairs. ☐ It is very important for the center of each check dam (where most of the water flows) to be lower (by at least several inches) than the edges of the check dams where they meet the side slopes. Also, the check dams should be keyed into side slopes so water does not flow between the check dam and side slope. ☐ Use a level to check the right check-dam configuration, as noted above. Repair by moving around stone, filling and compacting soil, or adding new material so that water will be directed to the center of the check dam instead of the edges. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Many check dams are impacted and/or the problem seems to be a design issue with height, spacing, shape, or materials used to construct them.

SW Vegetation

Assess the swale vegetation.

Problem (Check if Present)	Follow-Up Actions
 ☐ Vegetation is too overgrown to access swale for maintenance activities	☐ Mow or bush-hog the path. ☐ Other:

SW Vegetation

Assess the swale vegetation.

Problem (Check if Present)	Follow-Up Actions
 ☐ Vegetation requires regular maintenance: pulling weeds, removing dead and diseased plants, adding plants to fill in areas that are not well vegetated, etc.	☐ If you can identify which plants are weeds or not intended to be part of the planting plan, eliminate these, preferably by hand pulling. ☐ If weeds are widespread, check with the local stormwater authority and/or Extension Office about proper use of herbicides for areas connected with the flow of water. ☐ Even vegetation that is intended to be present can become large, overgrown, block flow, and/or crowd out surrounding plants. Prune and thin accordingly. ☐ If weeds or invasive plants have overtaken the whole swale, bush-hog the entire area before seed heads form in the spring. It will be necessary to remove the root mat manually or with appropriate herbicides, as noted above. ☐ Replant with species that are aesthetically pleasing and seem to be doing well in the swale. ☐ Other: ☐ Kick-Out to Level 2 Inspection: You are unsure of the original planting design or the vegetation maintenance task is beyond your capabilities of time, expertise, or resources. If you are unsure of the health of the vegetation (e.g. salt damage, invasives, which plants are undesirable) or the appropriate season to conduct vegetation management, consult a landscape professional before undertaking any cutting, pruning, mowing, or brush hogging.
☐ Vegetation is too thin, is not healthy, and there are many spots that are not well vegetated.	☐ The original plants are likely not suited for the actual conditions within the swale. If you are knowledgeable about plants, select and plant more appropriate vegetation (preferably native plants) so that almost the entire surface area will be covered by the end of the second growing season. ☐ Other: ☐ Kick-Out to Level 2 Inspection: For all but small practices (e.g., in residential yards), this task will likely require a landscape design professional or horticulturalist.

SW Outlets

Examine outlets that release water out of the swale.

Problem (Check if Present)	Follow-Up Actions
☐ Outlet is obstructed with mulch, sediment, debris, trash, etc.	☐ Remove the debris and dispose of it where it cannot re-enter the swale. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Outlet is completely clogged or obstructed; there is too much material to remove by hand or with simple hand tools.

Additional Notes:

Inspector:_____ Date: _____

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Inspector/Operator: _____ Date: _____

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Swale Stormwater Management Practices Level 2 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
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Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other _____	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

Level 2 Inspection: SWALE	
Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
☐ Condition 1: Small pockets of standing water Use a soil probe or auger to examine the soil profile. If isolated areas have accumulated grit, fines, or vegetative debris or have compacted soil, try scraping off top 3 to 6 inches of soil and replacing with clean material. Also check to see that surface is level and water is not ponding selectively in certain areas. ☐ Condition 2: Standing water is widespread or covers entire surface Requires diagnosis and resolution of problem: • Bad or compacted soil • Filter fabric on the swale bottom • Too much sediment/grit washing in from drainage area? • Too much ponding depth? • Longitudinal slope is too flat?	• Soil is overly compacted or clogged and problem is not evident from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or is associated with the original design of the practice (e.g., not enough slope down through the swale). ☐ Level 3 inspection necessary
Observed Condition: Vegetation is predominantly weeds and invasive species	
For a small area, weed and dig up invasive plants. Replant with natives or plants from original planting plan. If longer than 100 feet, develop a new planting plan and have it professionally reviewed.	• Vegetation deviates significantly from original planting plan; swale has been neglected and suffered from deferred maintenance. • Owner/responsible party does not know how to maintain the practice. • For large area, hire a professional to develop a grading plan and develop a planting plan. ☐ Level 3 inspection necessary

Notes:

Inspector:_____ Date: _____

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

> "I hereby certify that the follow-up/corrective actions identified in the inspection performed on _____ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected."

Inspector/Operator: _____ Date: _____

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APPENDIX E: SWPPP FORMS
Notice of Intent
Notice of Termination
Contractor Forms

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0644089821

NOTICE OF INTENT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NYR ☐☐☐☐☐☐
(for DEC use only)

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-0-20-001

All sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required.

-IMPORTANT-

RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)

Owner/Operator Contact Person Last Name (NOT CONSULTANT)

Owner/Operator Contact Person First Name

Owner/Operator Mailing Address

City

State ☐☐ Zip ☐☐☐☐☐ - ☐☐☐☐

Phone (Owner/Operator) ☐☐☐ - ☐☐☐ - ☐☐☐☐ Fax (Owner/Operator) ☐☐☐ - ☐☐☐ - ☐☐☐☐

Email (Owner/Operator)

FED TAX ID ☐☐ - ☐☐☐☐☐☐☐ (not required for individuals)

Project Site Information

Project/Site Name

Street Address (NOT P.O. BOX)

Side of Street

○ **North** ○ **South** ○ **East** ○ **West**

City/Town/Village (THAT ISSUES BUILDING PERMIT)

State N Y Zip - County DEC Region

Name of Nearest Cross Street

Distance to Nearest Cross Street (Feet)

Project In Relation to Cross Street

○ **North** ○ **South** ○ **East** ○ **West**

Tax Map Numbers
Section-Block-Parcel

Tax Map Numbers

1. Provide the Geographic Coordinates for the project site in NYTM Units. To do this you **must** go to the NYSDEC Stormwater Interactive Map on the DEC website at:

www.dec.ny.gov/imsmaps/stormwater/viewer.htm

Zoom into your Project Location such that you can accurately click on the centroid of your site. Once you have located your project site, go to the tool boxes on the top and choose "i"(identify). Then click on the center of your site and a new window containing the X, Y coordinates in UTM will pop up. Transcribe these coordinates into the boxes below. For problems with the interactive map use the help function.

X Coordinates (Easting)

Y Coordinates (Northing) 4

2. What is the nature of this construction project?

○ **New Construction**

○ **Redevelopment with increase in impervious area**

○ **Redevelopment with no increase in impervious area**

3. Select the predominant land use for both pre and post development conditions.
SELECT ONLY ONE CHOICE FOR EACH

Pre-Development Existing Land Use

- ○ FOREST
- ○ PASTURE/OPEN LAND
- ○ CULTIVATED LAND
- ○ SINGLE FAMILY HOME
- ○ SINGLE FAMILY SUBDIVISION
- ○ TOWN HOME RESIDENTIAL
- ○ MULTIFAMILY RESIDENTIAL
- ○ INSTITUTIONAL/SCHOOL
- ○ INDUSTRIAL
- ○ COMMERCIAL
- ○ ROAD/HIGHWAY
- ○ RECREATIONAL/SPORTS FIELD
- ○ BIKE PATH/TRAIL
- ○ LINEAR UTILITY
- ○ PARKING LOT
- ○ OTHER

Post-Development Future Land Use

- ○ SINGLE FAMILY HOME
- ○ SINGLE FAMILY SUBDIVISION — Number of Lots
- ○ TOWN HOME RESIDENTIAL
- ○ MULTIFAMILY RESIDENTIAL
- ○ INSTITUTIONAL/SCHOOL
- ○ INDUSTRIAL
- ○ COMMERCIAL
- ○ MUNICIPAL
- ○ ROAD/HIGHWAY
- ○ RECREATIONAL/SPORTS FIELD
- ○ BIKE PATH/TRAIL
- ○ LINEAR UTILITY (water, sewer, gas, etc.)
- ○ PARKING LOT
- ○ CLEARING/GRADING ONLY
- ○ DEMOLITION, NO REDEVELOPMENT
- ○ WELL DRILLING ACTIVITY *(Oil, Gas, etc.)
- ○ OTHER

***Note**: for gas well drilling, non-high volume hydraulic fractured wells only

4. In accordance with the larger common plan of development or sale, enter the total project site area; the total area to be disturbed; existing impervious area to be disturbed (for redevelopment activities); and the future impervious area constructed within the disturbed area. (Round to the nearest tenth of an acre.)

Total Site Area	**Total Area To Be Disturbed**	**Existing Impervious Area To Be Disturbed**	**Future Impervious Area Within Disturbed Area**
.	.	.	.

5. Do you plan to disturb more than 5 acres of soil at any one time? ○ **Yes** ○ **No**

6. Indicate the percentage of each Hydrologic Soil Group(HSG) at the site.

A	**B**	**C**	**D**
%	%	%	%

7. Is this a phased project? ○ **Yes** ○ **No**

8. Enter the planned start and end dates of the disturbance activities.

Start Date / / – **End Date** / /

9. Identify the nearest surface waterbody(ies) to which construction site runoff will discharge.

Name

9a. Type of waterbody identified in Question 9?

- ○ Wetland / State Jurisdiction On Site (Answer 9b)
- ○ Wetland / State Jurisdiction Off Site
- ○ Wetland / Federal Jurisdiction On Site (Answer 9b)
- ○ Wetland / Federal Jurisdiction Off Site
- ○ Stream / Creek On Site
- ○ Stream / Creek Off Site
- ○ River On Site
- ○ River Off Site
- ○ Lake On Site
- ○ Lake Off Site
- ○ Other Type On Site
- ○ Other Type Off Site

9b. How was the wetland identified?

- ○ Regulatory Map
- ○ Delineated by Consultant
- ○ Delineated by Army Corps of Engineers
- ○ Other (identify)

10. Has the surface waterbody(ies) in question 9 been identified as a 303(d) segment in Appendix E of GP-0-20-001? ○ **Yes** ○ **No**

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-20-001? ○ **Yes** ○ **No**

12. Is the project located in one of the watershed areas associated with AA and AA-S classified waters? ○ **Yes** ○ **No**
If no, skip question 13.

13. Does this construction activity disturb land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey? ○ **Yes** ○ **No**
If Yes, what is the acreage to be disturbed?

.

14. Will the project disturb soils within a State regulated wetland or the protected 100 foot adjacent area? ○ **Yes** ○ **No**

15. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)? ○ **Yes** ○ **No** ○ **Unknown**

16. What is the name of the municipality/entity that owns the separate storm sewer system?

17. Does any runoff from the site enter a sewer classified as a Combined Sewer? ○ **Yes** ○ **No** ○ **Unknown**

18. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law? ○ **Yes** ○ **No**

19. Is this property owned by a state authority, state agency, federal government or local government? ○ **Yes** ○ **No**

20. Is this a remediation project being done under a Department approved work plan? (i.e. CERCLA, RCRA, Voluntary Cleanup Agreement, etc.) ○ **Yes** ○ **No**

21. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book)? ○ **Yes** ○ **No**

22. Does this construction activity require the development of a SWPPP that includes the post-construction stormwater management practice component (i.e. Runoff Reduction, Water Quality and Quantity Control practices/techniques)? ○ **Yes** ○ **No**
If No, skip questions 23 and 27-39.

23. Has the post-construction stormwater management practice component of the SWPPP been developed in conformance with the current NYS Stormwater Management Design Manual? ○ **Yes** ○ **No**

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

- ○ **Professional Engineer (P.E.)**
- ○ **Soil and Water Conservation District (SWCD)**
- ○ **Registered Landscape Architect (R.L.A)**
- ○ **Certified Professional in Erosion and Sediment Control (CPESC)**
- ○ **Owner/Operator**
- ○ **Other**

SWPPP Preparer

Contact Name (Last, Space, First)

Mailing Address

City

State Zip -

Phone - -

Fax - -

Email

SWPPP Preparer Certification

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-20-001. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First Name **MI**

Last Name

Signature

Date / /

25. Has a construction sequence schedule for the planned management practices been prepared? ○ **Yes** ○ **No**

26. Select **all** of the erosion and sediment control practices that will be employed on the project site:

Temporary Structural

- ○ **Check Dams**
- ○ **Construction Road Stabilization**
- ○ **Dust Control**
- ○ **Earth Dike**
- ○ **Level Spreader**
- ○ **Perimeter Dike/Swale**
- ○ **Pipe Slope Drain**
- ○ **Portable Sediment Tank**
- ○ **Rock Dam**
- ○ **Sediment Basin**
- ○ **Sediment Traps**
- ○ **Silt Fence**
- ○ **Stabilized Construction Entrance**
- ○ **Storm Drain Inlet Protection**
- ○ **Straw/Hay Bale Dike**
- ○ **Temporary Access Waterway Crossing**
- ○ **Temporary Stormdrain Diversion**
- ○ **Temporary Swale**
- ○ **Turbidity Curtain**
- ○ **Water bars**

Biotechnical

- ○ **Brush Matting**
- ○ **Wattling**

Vegetative Measures

- ○ **Brush Matting**
- ○ **Dune Stabilization**
- ○ **Grassed Waterway**
- ○ **Mulching**
- ○ **Protecting Vegetation**
- ○ **Recreation Area Improvement**
- ○ **Seeding**
- ○ **Sodding**
- ○ **Straw/Hay Bale Dike**
- ○ **Streambank Protection**
- ○ **Temporary Swale**
- ○ **Topsoiling**
- ○ **Vegetating Waterways**

Permanent Structural

- ○ **Debris Basin**
- ○ **Diversion**
- ○ **Grade Stabilization Structure**
- ○ **Land Grading**
- ○ **Lined Waterway (Rock)**
- ○ **Paved Channel (Concrete)**
- ○ **Paved Flume**
- ○ **Retaining Wall**
- ○ **Riprap Slope Protection**
- ○ **Rock Outlet Protection**
- ○ **Streambank Protection**

Other

Post-construction Stormwater Management Practice (SMP) Requirements

Important: Completion of Questions 27-39 is not required if response to Question 22 is No.

27. Identify all site planning practices that were used to prepare the final site plan/layout for the project.

- ○ **Preservation of Undisturbed Areas**
- ○ **Preservation of Buffers**
- ○ **Reduction of Clearing and Grading**
- ○ **Locating Development in Less Sensitive Areas**
- ○ **Roadway Reduction**
- ○ **Sidewalk Reduction**
- ○ **Driveway Reduction**
- ○ **Cul-de-sac Reduction**
- ○ **Building Footprint Reduction**
- ○ **Parking Reduction**

27a. Indicate which of the following soil restoration criteria was used to address the requirements in Section 5.1.6("Soil Restoration") of the Design Manual (2010 version).

- ○ All disturbed areas will be restored in accordance with the Soil Restoration requirements in Table 5.3 of the Design Manual (see page 5-22).
- ○ Compacted areas were considered as impervious cover when calculating the **WQv Required**, and the compacted areas were assigned a post-construction Hydrologic Soil Group (HSG) designation that is one level less permeable than existing conditions for the hydrology analysis.

28. Provide the total Water Quality Volume (WQv) required for this project (based on final site plan/layout).

Total WQv Required

			.				**acre-feet**

29. Identify the RR techniques (Area Reduction), RR techniques(Volume Reduction) and Standard SMPs with RRv Capacity in Table 1 (See Page 9) that were used to reduce the Total WQv Required(#28).

Also, provide in Table 1 the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

Note: Redevelopment projects shall use Tables 1 and 2 to identify the SMPs used to treat and/or reduce the WQv required. If runoff reduction techniques will not be used to reduce the required WQv, skip to question 33a after identifying the SMPs.

Table 1 - Runoff Reduction (RR) Techniques and Standard Stormwater Management Practices (SMPs)

	Total Contributing Area (acres)		Total Contributing Impervious Area (acres)
RR Techniques (Area Reduction)			
○ Conservation of Natural Areas (RR-1)		and/or	
○ Sheetflow to Riparian Buffers/Filters Strips (RR-2)		and/or	
○ Tree Planting/Tree Pit (RR-3)		and/or	
○ Disconnection of Rooftop Runoff (RR-4)		and/or	
RR Techniques (Volume Reduction)			
○ Vegetated Swale (RR-5)			
○ Rain Garden (RR-6)			
○ Stormwater Planter (RR-7)			
○ Rain Barrel/Cistern (RR-8)			
○ Porous Pavement (RR-9)			
○ Green Roof (RR-10)			
Standard SMPs with RRv Capacity			
○ Infiltration Trench (I-1)			
○ Infiltration Basin (I-2)			
○ Dry Well (I-3)			
○ Underground Infiltration System (I-4)			
○ Bioretention (F-5)			
○ Dry Swale (O-1)			
Standard SMPs			
○ Micropool Extended Detention (P-1)			
○ Wet Pond (P-2)			
○ Wet Extended Detention (P-3)			
○ Multiple Pond System (P-4)			
○ Pocket Pond (P-5)			
○ Surface Sand Filter (F-1)			
○ Underground Sand Filter (F-2)			
○ Perimeter Sand Filter (F-3)			
○ Organic Filter (F-4)			
○ Shallow Wetland (W-1)			
○ Extended Detention Wetland (W-2)			
○ Pond/Wetland System (W-3)			
○ Pocket Wetland (W-4)			
○ Wet Swale (O-2)			

Table 2 - Alternative SMPs (DO NOT INCLUDE PRACTICES BEING USED FOR PRETREATMENT ONLY)

Alternative SMP	Total Contributing Impervious Area(acres)
○ **Hydrodynamic**	
○ **Wet Vault**	
○ **Media Filter**	
○ **Other**	

Provide the name and manufacturer of the Alternative SMPs (i.e. proprietary practice(s)) being used for WQv treatment.

Name

Manufacturer

Note: Redevelopment projects which do not use RR techniques, shall use questions 28, 29, 33 and 33a to provide SMPs used, total WQv required and total WQv provided for the project.

30. Indicate the Total RRv provided by the RR techniques (Area/Volume Reduction) and Standard SMPs with RRv capacity identified in question 29.

Total RRv provided

. **acre-feet**

31. Is the Total RRv provided (#30) greater than or equal to the total WQv required (#28).

○ **Yes** ○ **No**

If Yes, go to question 36.
If No, go to question 32.

32. Provide the Minimum RRv required based on HSG.
[Minimum RRv Required = (P)(0.95)(Ai)/12, Ai=(S)(Aic)]

Minimum RRv Required

. **acre-feet**

32a. Is the Total RRv provided (#30) greater than or equal to the Minimum RRv Required (#32)?

○ **Yes** ○ **No**

If Yes, go to question 33.
Note: Use the space provided in question #39 to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). A detailed evaluation of the specific site limitations and justification for not reducing 100% of the WQv required (#28) must also be included in the SWPPP.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

33. Identify the Standard SMPs in Table 1 and, if applicable, the Alternative SMPs in Table 2 that were used to treat the remaining total WQv(=Total WQv Required in 28 - Total RRv Provided in 30).

Also, provide in Table 1 and 2 the total impervious area that contributes runoff to each practice selected.

Note: Use Tables 1 and 2 to identify the SMPs used on Redevelopment projects.

33a. Indicate the Total WQv provided (i.e. WQv treated) by the SMPs identified in question #33 and Standard SMPs with RRv Capacity identified in question 29.

WQv Provided

			.			
			.			**acre-feet**

Note: For the standard SMPs with RRv capacity, the WQv provided by each practice = the WQv calculated using the contributing drainage area to the practice - RRv provided by the practice. (See Table 3.5 in Design Manual)

34. Provide the sum of the Total RRv provided (#30) and the WQv provided (#33a).

			.			
			.			

35. Is the sum of the RRv provided (#30) and the WQv provided (#33a) greater than or equal to the total WQv required (#28)? ○ **Yes** ○ **No**

If Yes, go to question 36.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

36. Provide the total Channel Protection Storage Volume (CPv) required and provided or select waiver (36a), if applicable.

CPv Required

			.			
			.			**acre-feet**

CPv Provided

			.			
			.			**acre-feet**

36a. The need to provide channel protection has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.

○ Reduction of the total CPv is achieved on site through runoff reduction techniques or infiltration systems.

37. Provide the Overbank Flood (Qp) and Extreme Flood (Qf) control criteria or select waiver (37a), if applicable.

Total Overbank Flood Control Criteria (Qp)

Pre-Development

			.			
			.			**CFS**

Post-development

			.			
			.			**CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development

			.			
			.			**CFS**

Post-development

			.			
			.			**CFS**

37a. The need to meet the Qp and Qf criteria has been waived because:

- ○ Site discharges directly to tidal waters or a fifth order or larger stream.
- ○ Downstream analysis reveals that the Qp and Qf controls are not required

38. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed? ○ **Yes** ○ **No**

If Yes, Identify the entity responsible for the long term Operation and Maintenance

39. Use this space to summarize the specific site limitations and justification for not reducing 100% of WQv required(#28). (See question 32a) This space can also be used for other pertinent project information.

40. Identify other DEC permits, existing and new, that are required for this project/facility.

- ○ Air Pollution Control
- ○ Coastal Erosion
- ○ Hazardous Waste
- ○ Long Island Wells
- ○ Mined Land Reclamation
- ○ Solid Waste
- ○ Navigable Waters Protection / Article 15
- ○ Water Quality Certificate
- ○ Dam Safety
- ○ Water Supply
- ○ Freshwater Wetlands/Article 24
- ○ Tidal Wetlands
- ○ Wild, Scenic and Recreational Rivers
- ○ Stream Bed or Bank Protection / Article 15
- ○ Endangered or Threatened Species(Incidental Take Permit)
- ○ Individual SPDES
- ○ SPDES Multi-Sector GP [N][Y][R][ ][ ][ ][ ][ ][ ]
- ○ Other [ ]
- ○ None

41. Does this project require a US Army Corps of Engineers Wetland Permit? ○ **Yes** ○ **No**
If Yes, Indicate Size of Impact. [ ][ ][ ][ ][ ].[ ]

42. Is this project subject to the requirements of a regulated, traditional land use control MS4? ○ **Yes** ○ **No**
(If No, skip question 43)

43. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI? ○ **Yes** ○ **No**

44. If this NOI is being submitted for the purpose of continuing or transferring coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned. [N][Y][R][ ][ ][ ][ ][ ][ ]

Owner/Operator Certification

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Print First Name **MI**

Print Last Name

Owner/Operator Signature

Date / /

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

NYS Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

MS4 Stormwater Pollution Prevention Plan (SWPPP) Acceptance Form

for

Construction Activities Seeking Authorization Under SPDES General Permit

*(NOTE: Attach Completed Form to Notice Of Intent and Submit to Address Above)

I. Project Owner/Operator Information
1. Owner/Operator Name:
2. Contact Person:
3. Street Address:
4. City/State/Zip:
II. Project Site Information
5. Project/Site Name:
6. Street Address:
7. City/State/Zip:
III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance Information
8. SWPPP Reviewed by:
9. Title/Position:
10. Date Final SWPPP Reviewed and Accepted:
IV. Regulated MS4 Information
11. Name of MS4:
12. MS4 SPDES Permit Identification Number: NYR20A
13. Contact Person:
14. Street Address:
15. City/State/Zip:
16. Telephone Number:

MS4 SWPPP Acceptance Form - continued

V. Certification Statement - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative

I hereby certify that the final Stormwater Pollution Prevention Plan (SWPPP) for the construction project identified in question 5 has been reviewed and meets the substantive requirements in the SPDES General Permit For Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s). Note: The MS4, through the acceptance of the SWPPP, assumes no responsibility for the accuracy and adequacy of the design included in the SWPPP. In addition, review and acceptance of the SWPPP by the MS4 does not relieve the owner/operator or their SWPPP preparer of responsibility or liability for errors or omissions in the plan.

Printed Name:

Title/Position:

Signature:

Date:

VI. Additional Information

(NYS DEC - MS4 SWPPP Acceptance Form - January 2015)

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505
(NOTE: Submit completed form to address above)

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity

Please indicate your permit identification number: NYR ___ ___ ___ ___ ___ ___

I. Owner or Operator Information

1. Owner/Operator Name:

2. Street Address:

3. City/State/Zip:

4. Contact Person: | 4a.Telephone:

4b. Contact Person E-Mail:

II. Project Site Information

5. Project/Site Name:

6. Street Address:

7. City/Zip:

8. County:

III. Reason for Termination

9a. □ All disturbed areas have achieved final stabilization in accordance with the general permit and SWPPP. ***Date final stabilization completed** (month/year): _____

9b. □ Permit coverage has been transferred to new owner/operator. Indicate new owner/operator's permit identification number: NYR ___ ___ ___ ___ ___ ___
(Note: Permit coverage can not be terminated by owner identified in I.1. above until new owner/operator obtains coverage under the general permit)

9c. □ Other (Explain on Page 2)

IV. Final Site Information:

10a. Did this construction activity require the development of a SWPPP that includes post-construction stormwater management practices? □ yes □ no (If no, go to question 10f.)

10b. Have all post-construction stormwater management practices included in the final SWPPP been constructed? □ yes □ no (If no, explain on Page 2)

10c. Identify the entity responsible for long-term operation and maintenance of practice(s)?

_____

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

10d. Has the entity responsible for long-term operation and maintenance been given a copy of the operation and maintenance plan required by the general permit? □ yes □ no

10e. Indicate the method used to ensure long-term operation and maintenance of the post-construction stormwater management practice(s):

□ Post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain practice(s) have been deeded to the municipality.

□ Executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s).

□ For post-construction stormwater management practices that are privately owned, a mechanism is in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the owner or operator's deed of record.

□ For post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university or hospital), government agency or authority, or public utility; policy and procedures are in place that ensures operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

10f. Provide the total area of impervious surface (i.e. roof, pavement, concrete, gravel, etc.) constructed within the disturbance area? _____ (acres)

11. Is this project subject to the requirements of a regulated, traditional land use control MS4? □ yes □ no

(If Yes, complete section VI - "MS4 Acceptance" statement

V. Additional Information/Explanation:

(Use this section to answer questions 9c. and 10b., if applicable)

VI. MS4 Acceptance - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative (Note: Not required when 9b. is checked -transfer of coverage)

I have determined that it is acceptable for the owner or operator of the construction project identified in question 5 to submit the Notice of Termination at this time.

Printed Name:	
Title/Position:	
Signature:	Date:

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

VII. Qualified Inspector Certification - Final Stabilization:

I hereby certify that all disturbed areas have achieved final stabilization as defined in the current version of the general permit, and that all temporary, structural erosion and sediment control measures have been removed. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:	
Title/Position:	
Signature:	Date:

VIII. Qualified Inspector Certification - Post-construction Stormwater Management Practice(s):

I hereby certify that all post-construction stormwater management practices have been constructed in conformance with the SWPPP. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:	
Title/Position:	
Signature:	Date:

IX. Owner or Operator Certification

I hereby certify that this document was prepared by me or under my direction or supervision. My determination, based upon my inquiry of the person(s) who managed the construction activity, or those persons directly responsible for gathering the information, is that the information provided in this document is true, accurate and complete. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:	
Title/Position:	
Signature:	Date:

(NYS DEC Notice of Termination - January 2015)

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