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PRINCIPAL

Hidden Cove Development

Proposed 137 Unit Residential Development
And Off-Site Road improvements to North Water Street

Village of Ossining
Westchester County, New York

STORMWATER POLLUTION PREVENTION PLAN

Prepared for:

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Prepared by:
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I Paul Berté, PE certifies that this Stormwater Pollution Prevention Plan has been prepared in accordance with NYSDEC rules and regulations and in accordance with the Village of Ossining Code.

Table of Contents

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WESTCHESTER COUNTY, NEW YORK

STORMWATER POLLUTION PREVENTION PLAN

1. <u>General</u>

    a. **Introduction**

This Stormwater Pollution Prevention Plan has been prepared pursuant to the Phase II regulations under General Permit (GP -0-15-002) as required by the New York State Department of Environmental Conservation (NYSDEC).

The proposal is for the construction of Hidden Cove, a new 6 story multi-family building, hereafter referred to as the Project located on Section 89.14, Block, 1, Lot 11. Additionally, the Project includes the reconstruction of North Water Street from Snowden Avenue to the site parcel (hereinafter referred to as Off-Site Improvements), situated in the Village of Ossining, Westchester County, New York. Hidden Cove will consist of 137 apartments within 6 floors over an interior parking garage having 150 spaces supplemented by 46 surface parking spaces located in front of the building. The Off-Site Improvements include the reconstruction of North Water Street to include a 24' roadway, 4' sidewalk, curbs and retaining walls within a 30' right-of-way over easements on adjacent parcels.

The site discharges directly to the Hudson River which is a 7th order stream/tidal water and thus attenuation is not required for the CpV- Channel Protection Volume (1 year storm), the Qp- Overbank Flood Control (10 year storm) or Qf- Extreme Flood Control (100 year storm). Attenuation is required for the WQv- Water Quality / RRv- Runoff Reduction volume and is calculated in accordance with the NYSDEC Stormwater Design Manual.

Attenuation of the WQv will be managed with various practices, including green techniques such as green roofs on top of the proposed building, porous pavement within the exterior parking lots, and hydrodynamic separators to address the runoff from the reconstructed portion of North Water Street. All practices have been designed in accordance with the New York State Stormwater Management Design Manual (SWMDM). The parcel is not located within the East of Hudson Watershed (EOH).

b. Stormwater Management Objectives

A primary stormwater management objective of this project is to control runoff and pollutants during construction. This is done by providing temporary erosion and sediment control measures for the project that are in conformance with the "New York State Standards and Specifications for Erosion and Sediment Control" and General Permit GP -0-15-002.

A second stormwater management objective is to provide permanent measures to control the stormwater runoff quality and quantity after construction is complete. This objective is achieved by using Standard Stormwater Practices that are listed in chapter 5.0 and table 7.1 of the SWMDM.

c. Existing Site Description

The site is located on North Water Street in the Village of Ossining, New York on the former site of the Brandeth Pill Building. The existing building was in a state of disrepair and was deemed unsafe after the flood in November 2012. The building was demolished in 2014 upon approval of a demolition permit.

The site consists of slopes varying from 0-15% to slopes exceeding 25% and is comprised mainly of rock with very little overburden in soil areas. A brook runs through the site from the eastern property line to the eastern side of the existing Mill Building. The brook was integral to the existing building and provided hydrodynamic power for the factory. Within the project area, the brook was channeled within man made open and closed culverts. The brook ultimately discharges to the Hudson River via an open defined channel under the MTA railroad.

Currently the stormwater runoff from the site is collected in drainage inlets and diverted to Hudson River.

For the purpose of this report, the site has been broken up into distinct drainage areas which discharge to two (2) distinct discharge points, this is shown on the pre-development and post-development drainage maps. These points have been selected based on the topography available on the survey. The design points were chosen since they were the lowest points along the respective flow routes of each drainage area and hence, are the points where the stormwater runoff leaves the project area. Based on the USGS maps the receiving water is the Hudson River and the stormwater interactive map provided on the NYSDEC website illustrates that the site is in a TMDL watershed (MS4) but does not contain and is not adjacent to any 303d listed streams.

The stormwater runoff from the site is conveyed via overland flow to the discharge points illustrated on the Pre-Development Map.

d. Project Description

Construction will consist of new (6) story residential building with 137 apartment units. For purposes of comparing the pre and post cover types, this analysis takes into account the former Mill Building, even though it has been demolished. The site construction also includes surface parking areas and an underground parking structure. There will also be the construction of a new roadway and stormwater management facilities. The total land disturbance associated with this construction is approximately 5.40 acres.

i. Soils

The soils in the project area are mapped as follows;

Map Unit Symbol	Map Unit Name	Hydrologic Soil Group	Acres in AOI	Percent of AOI
CrC	Charlton-Chatfield Complex, rolling, very rocky	B	0.3	0.6%
ChE	Charlton Loam, 25 to 35% slopes	B	0.7	1.4%
CsD	Chatfield-Hollis-Rock complex, hilly, very rocky	B	18.1	34.6%
HrF	Hollis-rock outcrop complex, very steep	D	4.5	8.7%
LcB	Leicester loam, 3 to 8% slopes, stony	C	2.0	3.9%
RhE	Riverhead loam, 25 to 50% slopes	B	0.7	1.3%
Ub	Udorthents, smoothed	A	0.7	1.3%
Uc	Udorthents, wet substratum	A	5.5	10.5%
Uf	Urban land	A	5.8	11.1%
W	Water	-	14.0	26.7%
	Total		27.3	100.00

ii. Grading and Drainage

The grading and drainage plan has been designed to capture and treat the stormwater runoff from the new and existing impervious surfaces and disturbed areas at each improvement location. The stormwater runoff generated by the new impervious areas for DA 1 has been further divided into drainage areas based on whether they are roof gardens, porous pavement or roofs. Refer to the drainage map to view each new area. The stormwater drainage systems have been designed to treat the Water Quality Volume (WQv). The drainage will be collected by way of curbs, walls or flow routing. It will then be directed to the various treatment methods mentioned previously. The stormwater runoff for the roof gardens and the porous pavement will flow into the ground by way of infiltration. The stormwater runoff that collects on the building roof will be directed to a hydrodynamic separator for treatment. The stormwater runoff generated by the new impervious areas for the access road water street will be collected by way of curbs and directed to catch basins and then directed to hydrodynamic separators.

Storm water runoff rates for the water quality volume will be attenuated such that the project areas will not represent a negative impact or degradation in water quality to the Hudson River. The stormwater design was modeled utilizing computer software "HydroCAD 10.0" The design assumptions are provided in the appendix of this report

e. Stormwater Conveyance

Presently the stormwater from the site flows overland through woodland cover or paved asphalt to each of two design points. The site discharges directly to the Hudson river which is classified as a seventh order stream and does not require channel protection volume, overbank flood control and extreme flood.

Design point 1 analyzes the disturbed areas within the project property. This includes the building, parking lot and a small portion of the roadway water street. The runoff to design point 1 will be treated by hydrodynamic separators, roof gardens, porous pavement and infiltration trenches.

The Infiltration Trench has been designed to fully infiltrate the 1 year storm event. Runoff is directed to the two aforementioned catchbasins where it flows through an 8" PVC pipe. The flow is then directed to a total of 175' of perforated 8" PVC pipe, where it will then be evenly dispersed (slope of 0.002%) to infiltrate into the infiltration trench media as designed. The media consists of a top layer of ¾" crushed stone which surrounds the 8" perforated PVC pipe, followed by a 2" layer of pea gravel, a 2.5' layer of 1.5-2.5" diameter crushed stone and at the bottom a 9" layer of sand. In the event of a large storm event, greater than what the system was designed for, the excess runoff will flow through a 12" HDPE overflow pipe into the existing watercourse.

The rainwater that falls onto the building roof (Subcatchment WR) is collected and directed to Hydrodynamic separator AS-9. The water is treated and discharged to the existing water course.

Design point 2 analyzes all areas that are related with the Offsite Road Improvements. The road is proposed to be redefined to provide proper access to the multi family building. The road is currently undefined allowing traffic to freely move on and off the adjacent properties without using a controlled access. The new road will be redefined with curbs, a sidewalk, and curb cuts to the project site and adjoining properties. Water quality treatment is proposed by means of a hydrodynamic separator. Runoff is collected by inlets along the roadway and directed to a single hydrodynamic separator to treat the water quality flow rate prior to being discharged into the Hudson River. The hydrodynamic separator has been sized utilizing the peak flow rates from the HydroCAD model.

This project includes 2 alternative roadway locations. Both layouts include roadway from Snowden Avenue to the project site. One layout shows the improved road through the Conga property generally within the existing traveled way within the center of the property. The other layout shows this portion of the road within the Conga property shifted 25' to the west along the MTA railroad property. The stormwater management design is the same for both options as the cover types and impervious areas for both alternatives is the same. All existing drainage paths are maintained in both layouts.

f. Stormwater Management Planning

i. Site Planning

- Maps identifying all natural resources (Wetlands, Water, Topography, etc.) and drainage patterns have been included in the Drainage Plans.
- All natural resources have been preserved to the greatest extent possible.
- Natural drainage design points were maintained.
- The area of disturbance was kept as small as possible in order to maximize the retention of woodland cover and minimize the amount of undisturbed soils.
- Erodible soils and mass grading were avoided.
- Proposed impervious surfaces were kept to a minimum in order to reduce the amount of runoff and maintain as much natural areas as possible.
- Runoff was minimized and the pre-construction hydrology was either maintained or reduced wherever possible (see tables 1-9 for detailed

analysis).

ii. Determine Water Quality Treatment Volume (WQv)

- The onsite WQv was equated utilizing the 90% rainfall. Calculations can be seen in appendix B. While it was not necessary to attenuate the 10yr (Qp) and the Qf (100)yr), it was done anyway due to the design of the parking garage and parapet wall heights. The areas that were treated by the green roofs are contained by a parapet wall that is a least 30" high and well above the 100 yr storm high water elevation. In effect the high parapet wall attenuates by default.
- The offsite WQv was equated utilizing the 90% rainfall number. Calculations can be seen in Appendix B.

iii. Runoff Reduction by Applying Green Infrastructure Techniques and Standard SMPs with RRv Capacity (e.g. infiltration practices, detention pipes, sand filter and infiltration trench).

- The standard SMPs with RRv capacity listed in Tables 3.4 & 3.5 of the SWMDM were used to reduce the required WQv. These include Infiltration Practices (Infiltration trenches & porous pavement). The practices have been designed as localized systems that are to be installed at each runoff source. The calculations for RRv are included in Appendix B. The onsite WQv has been reduced by 100% in all affected areas as specified in SWMDM.
- There are no runoff reduction techniques proposed for the offsite portion of the project. The new roadway is proposed to only be treated by means of hydrodynamic separators.

iv. Apply Standard Stormwater Management Practices to Address Remaining Water Quality Volume

- The onsite RRv requirement has been met or exceeded in all cases. Refer to Appendix B for RRv calculations and Post-Development Drainage Analysis.
- Hydrodynamic separators are proposed to treat all runoff from water street prior to being discharged into the Hudson river. The two units have been sized utilizing the HydroCAD peak flow numbers to properly treat the water quality flow rate.

v. Apply Volume and Peak Rate Control Practices if Still Needed to Meet Requirements

- The Channel Protection Volume (Cp_v), Overbank Flood Control (Qp) and Extreme Flood Control (Qf) are not required for this project.

g. Parties Responsible for Long Term Maintenance

The improved Road and all drainage improvements will be initially maintained by:

Plateau Associates, L.L.C. c/o Peter Stolatis
427 Bedford Road

Pleasantville, NY 10570

At such time that adjacent parcel owners improve their properties, they may be required to share in the maintenance obligations.

2. Stormwater Management Methodology

The Pre and Post-Construction Drainage Divide Maps are included in Appendix B of this report. The time of concentration, coverage types, and hydrograph/stormwater calculations for the pre and post-construction conditions as provided in the stormwater routings are also provided for in Appendix B.

Storm water quality and quantity computations are based upon the following publications.

- Soil Conservation Service (SCS) - TR-20.
- Urban Hydrology for Small Watersheds - TR-55.
- NYSDEC 'New York State Stormwater Management Design Manual', January 2015 edition.
- Controlling Urban Runoff: A practical Manual for Planning and Designing Urban BMP'S, by the Metropolitan Washington Council of Governments.
- Computer software "HydroCAD® 10.0"has been utilized for the stormwater analysis. This program is on USDA Soil Conservation Service (SCS) Technical Release 55 (TR 55).

3. Pre-Development and Post-Development Peak Flow Summary

Table 1. Stormwater Practices:

Practice	SMP Type	SWMDM Designation	Justification (page)
Roof Garden	Filtering Practice	F – 3	6-49
Infiltration Trench	Infiltration Practice	I - 1	6-32
Porous Pavement	Infiltration Practice	I - 2	5-105
HydroDynamic Separator	Filtering Practice	Alternative Practice	9-7

Table 2. Summary of Flows DP-1

DP - 1				
Design Storm (yr)	**Pre-Development Peak Runoff (cfs)**	**Post-Development Peak Runoff (cfs)**	**Pre-Development Peak Volume (af)**	**Post-Development Peak Volume (af)**
1	1.96	3.52	0.230	0.410
10	9.12	9.09	0.863	1.079
100	25.04	21.82	2.312	2.572

Table 3. Summary of Flows DP-2

DP - 2				
Design Storm (yr)	**Pre-Development Peak Runoff (cfs)**	**Post-Development Peak Runoff (cfs)**	**Pre-Development Peak Volume (af)**	**Post-Development Peak Volume (af)**
1	4.22	5.08	0.385	0.345
10	9.02	10.89	0.883	0.757
100	17.64	21.21	1.822	1.515

Summary of Hydrodynamic Separators

Aqua Swirl				
Model	**1 Year Storm Peak Fow (cfs)**	**Water Quality Max Treatment Flow (cfs)**	**100 Year Storm Peak Flow (cfs)**	**Maximum Flow Rating (cfs)**
AS-6	0.35	2.11	4.71	6.3
AS-9	2.23	4.73	7.55	14.2
AS-10	2.32	5.84	10.73	17.5

a. Results of WQV, RRV and CPV Calculations

Table 7. RRv, WQv and Cpv requirements (ONSITE)

Technique	WQv Provided (ac-ft)	RRv Provided (ac-ft)
Infiltration Trench	1834	1834
Green Roof	2327	2327
Hydrodynamic Separator	8653	0
Porous Pavement	8266	8266
Total	**21080**	**12427**
Required	**3737**	**3737**

Table 7. RRv, WQv and Cpv requirements (OFFSITE)

Technique	WQv Provided (ac-ft)	RRv Provided (ac-ft)
Hydrodynamic Separator	6909	0
Total	**6909**	**0**
Required	**2128**	**2128**

b. Water Quality Volume

Stormwater quality and quantity have been analyzed in accordance with the guidelines set forth in the New York State General Permit for Storm Water Discharge, GP--0-15-002. The water quality volume for stormwater practices have been computed utilizing the NYSDEC equation $WQ_V = P \times R_v \times A/12$. Water Quality volume and invert elevations of the low flow orifices, where applicable, have been included in the Appendix. The calculations for WQv were done using the 90% rainfall number and are in Appendix B. The SWMDM states on page 4-8, 4-10, and 4-12 that Cpv, Qp and Qf are not required because the site discharges directly to a fifth order or larger stream. All storm events (1-yr, 10-yr, and 100-yr) were analyzed using HydroCAD 10.0.

The Infiltration Trenches, Roof Gardens and porous pavement have been designed to fully infiltrate the 1-year 24 hour runoff volume in accordance with Chapter 10 of the SWMDM.

4. Construction and Maintenance Description

a. Erosion and Sediment Control Plan

i. Temporary Structural Measures:

The temporary soil erosion and sediment control devices include protective earthmoving procedures and grading practices, vegetated cover, silt fencing, stabilized construction entrance, dust control, construction road stabilization, silt traps, inlet protections and sediment basins. The methodology of the plan is to control erosion & sedimentation, and to re-establish vegetation as soon as possible. These temporary controls will be installed prior to commencement of earthmoving activities where possible.

All proposed erosion and sediment controls and details as well as the stormwater management facilities are shown on various plans prepared by Petruccelli Engineering. All proposed soil erosion and sediment control practices are designed in accordance with the following publications:

- New York State Guidelines for Urban Erosion and Sediment Control, latest edition
- New York State General Permit for Stormwater Discharges, GP -0-15-002
- “Reducing the Impacts of Stormwater Runoff from New Development”, as published by the New York State Department of Environmental Conservation (NYSDEC), second edition, April 1993.

ii. Permanent Structural Measures:

Rock outlet protections will be installed at the inflow of the proposed infiltration trenches. All other temporary devices such as silt fencing, hay bales and diversions will be removed during the course of construction.

iii. Pollution Prevention Measures and Materials Storage/Disposal:

The construction materials and vehicles expected to be present during construction include but are not limited to drainage pipe, pre-cast concrete drainage structures, earth moving equipment, concrete trucks, asphalt trucks, pavement marking machinery, and worker vehicles.

All construction related debris will be collected and removed from the area on a regular basis. Concrete wash out areas will be provided where necessary and existing and or excess asphalt material will be removed from the site and disposed of in the proper manner.

Sediment spoils will be disposed in an approved off-site location along with temporary erosion control devices.

b. Narrative Report

The primary goal of the soil erosion and sediment control measures is to reduce soil erosion from areas stripped of vegetation during and after construction, and to prevent discharge of silt offsite. Erosion control barriers shall be placed around exposed areas during construction. The barriers shall consist of silt fence. Temporary sediment basins or traps will be used at stormwater collection points to allow sediment removal prior to releasing the stormwater offsite.

Any areas stripped of vegetation during construction will be left bare for the shortest time possible. Any topsoil removed during construction will be temporarily stockpiled for future use in grading and landscaping. A stockpile location has been provided on the Erosion Control Plan and shall be contained within a silt fence barrier.

Temporary vegetation will be established to protect exposed soil areas during construction. If growing conditions are not suitable for the temporary vegetation, mulch will be used. Materials that may be used for mulching include; straw, hay, salt hay, wood fiber, synthetic soil stabilizers, mulch netting, and sod. A permanent vegetative cover will be established upon completion of construction of those areas that have been brought to finished grade and to remain undisturbed.

A temporary stabilized construction entrance comprised of three inches clean stone will be constructed at the entrances to the site. The purpose of a stabilized entrance is to remove soil from the construction vehicle tires prior to exiting the site and traveling on the existing roadways. During construction, inlet protection will be installed at each storm sewer inlet to minimize the conveyance of silt and sediment through the storm sewer system.

c. Maintenance Requirements

1. The owner shall erect or post signage displaying the project sponsor and 24 hour contact information of the person responsible for the implementation of GP-0-15-002.
2. The current owner of the parcel will be responsible for the maintenance and long term operation of their respective stormwater management practices.
3. When the properties are developed Plateau Associates will remain in control of all subsequent drainage facilities. It will be their responsibility to deal with the long term maintenance of the stormwater management practices.
4. Copies of each type of practice, along with the design specifications are included in the Appendixes.
5. Maintenance requirements, maintenance logs and maintenance frequencies are included in Appendix D

d. Stormwater Management Facilities Maintenance Program

The following maintenance program is proposed in order to maintain the proper function of all drainage and erosion and sediment control facilities:

- Inspect Infiltration Trenches and if necessary remove invasive woody vegetation that may have grown on the ground cover to prevent it from becoming established (Infiltration Trench #1).
- During the construction of the project, the site erosion and sediment control measures as well as outlet structures will be inspected by the project superintendent once a week and/or immediately following a rainstorm. Any repairs required shall be performed in a timely manner. All sediment removal and/or repairs will be followed immediately by re-vegetation.
- The Green Roofs (Roof Gardens) shall be watered twice a month and fertilizing and weeding shall be performed for the first two years after construction to allow the plants to become established.
- Roof drains in the Green Roofs shall be cleared when the soil substrate, vegetation, debris or liter clog the drain inlets.
- The Green Roofs shall be inspected monthly for a period of two years and yearly after that to look for leaks, plant establishment and any structural concerns that may develop.
- The Green Roof maintenance, after the first year shall consist of two visits per year for weeding of invasive species and safety and membrane inspections.
- Porous pavement shall be inspected monthly to ensure that the area is clear of debris.
    - Shall be inspected monthly and after each rainfall greater than 0.5” to ensure that it dewatered properly.
    - Shall be inspected monthly to ensure that the area is clear of sediments.
    - Shall be vacuum swept to keep the surface free of sediments 3 to 4 times a year.
    - Shall be inspected annually to inspect for deterioration and spalling.
- Aqua Swirl Hydrodynamic Separators
    - Refer to Appendix D for detailed operation & maintenance instructions
- Infiltration Trenches
    - Refer to Appendix D for detailed maintenance checklists.
- Clean catch basins and other drainage structures from silt regularly, but not less than twice a year.
- Restore and re-seed any eroded areas and gullies as soon as possible.

e. Requirements of Part IV of the General Permit -0-15-002

- “The Owner/Operator must ensure that all erosion control practices and all post-construction stormwater management practices identified [in this] SWPPP are maintained in effective operating condition at all times.”
- “The terms of the [GP -0-15-002 permit] shall not be construed to prohibit the State of New York from exercising any authority pursuant to the ECL, common law or federal law, or prohibit New York State from taking any measures, whether civil or criminal, to prevent violations of the laws of the State of New York, or protect the public health and safety and/or environment”.
- Refer to Part IV of GP--0-15-002 for a more detailed list of requirements. Part IV is attached to Appendix E.

f. Construction Sequencing

Phase 1

1. Surveyor to stake out limit of disturbance and install construction fencing to delineate project area. Surveyor to stake out proposed centerline of No. Water Street.
2. Install sediment control practices including but not limited to perimeter barriers, stone construction entrance. Install pollution prevention practices including portable toilets located away from drainage paths, trash dumpsters, maintain spill kits on site. No fuel for construction equipment is anticipated to be stored on site. Engineer may direct the contractor to install additional best management practices throughout construction, as required.
3. Clear and remove trees as shown on the Plans, remove stumps and install tree protection. Chipped organic material shall be stockpiled to utilize as a temporary erosion control on disturbed areas. Dispose organics and deleterious materials off site.
4. Verify location of existing sewer line at proposed culvert crossing. Relocate sewer and install siphoned sewer main under new culvert.
5. Install 8' x 4' reinforced concrete box culvert from discharge location west of the site to the headwall upstream. Maintain the existing stream drainage path until such time as the diversion structure is ready to be installed. Install a clean water diversion to install the structure at the head of the new box culvert. Restore stream channel to direct runoff into the new culvert. Demolish the existing brick culvert.
6. Excavate the easterly property corner within the building footprint to bottom of footing elevation and stockpile cut material in location shown on the plan.
7. Relocate existing sewer along the southwest corner of the building within new sewer easement.
8. Construct new 137 Unit Residential building.
9. Install all new utility services including hydrants.

Phase 2

1. Begin improvements to North Water Street:

2. Maintain one lane of traffic at all times, minimum 12' lane width, provide flagmen to direct thru traffic.

3. Station 1+00 to 5+00 (north bound)

   a. Install new drainage structures from CB-7 to CB-1.

   b. Relocate/Install existing utilities.

   c. Remove existing pavement within the easterly half of the right of way.

   d. Install fill section to pavement subgrade elevation in accordance with the details.

   e. Install fill section east of Right of Way within the Conga parcel to maintain access to the buildings east of the road.

4. Station 5+00 to 8+50 (North Bound)

   a. Install new drainage structures from CB-7 to CB-10.

   b. Relocate/Install existing utilities.

   c. Remove existing pavement within the easterly right of way.

   d. Excavate and install footing and retaining wall along easterly right of way.

   e. Install fill section to pavement subgrade elevation in accordance with the details.

5. Station 1+00 to 5+00 (South Bound)

   a. Remove existing pavement within the westerly half of the right of way.

   b. Excavate and install footing and retaining wall along easterly right of way.

   c. Install fill section to pavement subgrade elevation in accordance with the details.

6. Station 5+00 to 8+50 (South Bound)

   a. Remove existing pavement within the westerly half of the right of way.

   b. Excavate and install footing and retaining wall along westerly right of way.

   c. Install fill section east of Right of Way within the Conga parcel to maintain access to the buildings west of the road.

<u>Phase 3</u>

1. Construct new roadway from station 11+50 to station 16+00, including all utilities as shown the plan. Redirect thru traffic to new roadway.

<u>Phase 4</u>

1. Install concrete barrier and 8' high chain link fence along the easterly edge of the existing traveled way from station 8+50 to sta 11+50. Maintain 1 lane of traffic at all times.

2. Begin cut excavation from Station 8+50 to sta 11+50. Excavation of rock shall be from points north, stockpile material in locations shown on the plan.
3. Construct new road section from station 8+50 to station 11+50.
4. Construct new water line around 89 North Water Street
5. Restore 2 lane traffic.

g. **Conclusions**

The incorporation of the Best Management Practices will significantly reduce the pollutant loadings in the post-construction condition by capturing and treating the runoff from the new and existing impervious surfaces and disturbed areas to the greatest extent possible, this plan meets the requirements of the NYSDEC for Water Quality and Quantity, providing minimal impact to downstream waters.

APPENDIX A

- *SOIL INFORMATION*

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Westchester County, New York

May 7, 2018

Soil Map

Map Scale: 1:2,840 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 40, 80, 160, 240

Feet: 0, 100, 200, 400, 600

N

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 Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Westchester County, New York
Survey Area Data: Version 13, Oct 8, 2017

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

Date(s) aerial images were photographed: Jul 21, 2014—Aug 27, 2014

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CsD	Chatfield-Charlton complex, 15 to 35 percent slopes, very rocky	0.0	0.7%
HrF	Hollis-Rock outcrop complex, 35 to 60 percent slopes	1.5	34.3%
RhE	Riverhead loam, 25 to 50 percent slopes	0.3	6.7%
Uc	Udorthents, wet substratum	1.0	23.9%
Uf	Urban land	1.5	34.3%
Totals for Area of Interest		**4.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Westchester County, New York

CsD—Chatfield-Charlton complex, 15 to 35 percent slopes, very rocky

Map Unit Setting

National map unit symbol: 2w69k
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Chatfield, very stony, and similar soils: 45 percent
Charlton, very stony, and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chatfield, Very Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 2 inches: fine sandy loam
Bw - 2 to 30 inches: gravelly fine sandy loam
2R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 15 to 35 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 20 to 41 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Charlton, Very Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 15 to 35 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Leicester, very stony

Percent of map unit: 6 percent
Landform: Depressions, ground moraines, drainageways, hills
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: Yes

Rock outcrop

Percent of map unit: 5 percent
Landform: Ridges, hills
Hydric soil rating: No

Hollis, very stony

Percent of map unit: 5 percent
Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit

Landform position (three-dimensional): Side slope, nose slope, crest
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Sutton, very stony

Percent of map unit: 4 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

HrF—Hollis-Rock outcrop complex, 35 to 60 percent slopes

Map Unit Setting

National map unit symbol: 2w69q
Elevation: 0 to 1,540 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hollis, very stony, and similar soils: 60 percent
Rock outcrop: 20 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis, Very Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 7 inches: gravelly fine sandy loam
Bw - 7 to 16 inches: gravelly fine sandy loam
2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 35 to 60 percent
Percent of area covered with surface fragments: 1.6 percent

Depth to restrictive feature: 8 to 23 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Rock Outcrop

Setting
Landform: Ridges, hills
Parent material: Igneous and metamorphic rock

Typical profile
R - 0 to 79 inches: bedrock

Properties and qualities
Slope: 35 to 60 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Chatfield, very stony
Percent of map unit: 10 percent
Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Charlton, very stony
Percent of map unit: 5 percent
Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex

Hydric soil rating: No

Leicester, very stony

Percent of map unit: 4 percent
Landform: Drainageways, hills, depressions, ground moraines
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear, concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sutton, very stony

Percent of map unit: 1 percent
Landform: Ground moraines, hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

RhE—Riverhead loam, 25 to 50 percent slopes

Map Unit Setting

National map unit symbol: bd9k
Mean annual precipitation: 46 to 50 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 115 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Riverhead and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Riverhead

Setting

Landform: Deltas, terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits overlying stratified sand and gravel

Typical profile

H1 - 0 to 6 inches: loam
H2 - 6 to 25 inches: sandy loam
H3 - 25 to 30 inches: loamy sand
H4 - 30 to 60 inches: loamy sand

Properties and qualities

Slope: 25 to 50 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Pompton

Percent of map unit: 5 percent
Hydric soil rating: No

Charlton

Percent of map unit: 4 percent
Hydric soil rating: No

Hinckley

Percent of map unit: 3 percent
Hydric soil rating: No

Knickerbocker

Percent of map unit: 3 percent
Hydric soil rating: No

Uc—Udorthents, wet substratum

Map Unit Setting

National map unit symbol: bd7g
Elevation: 50 to 2,400 feet
Mean annual precipitation: 46 to 50 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 115 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, wet substratum, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Wet Substratum

Typical profile

H1 - 0 to 4 inches: gravelly loam
H2 - 4 to 72 inches: very gravelly loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 4.6 inches)

Minor Components

Udorthents

Percent of map unit: 5 percent
Hydric soil rating: No

Urban land

Percent of map unit: 5 percent
Hydric soil rating: Unranked

Fredon

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

Paxton

Percent of map unit: 2 percent
Hydric soil rating: No

Ipswich

Percent of map unit: 2 percent
Landform: Tidal marshes
Hydric soil rating: Yes

Raynham

Percent of map unit: 2 percent
Hydric soil rating: Yes

Hinckley

Percent of map unit: 2 percent
Hydric soil rating: No

Uf—Urban land

Map Unit Setting

National map unit symbol: bd7j
Elevation: 50 to 2,400 feet
Mean annual precipitation: 46 to 50 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 115 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Minor Components

Udorthents

Percent of map unit: 5 percent
Hydric soil rating: No

Riverhead

Percent of map unit: 2 percent
Hydric soil rating: No

Udorthents, wet substratum

Percent of map unit: 2 percent
Hydric soil rating: No

Unadilla

Percent of map unit: 2 percent
Hydric soil rating: No

Chatfield

Percent of map unit: 2 percent
Hydric soil rating: No

Sutton

Percent of map unit: 2 percent
Hydric soil rating: No

APPENDIX B

- *STORMWATER MANAGEMENT REPORT*

  - *RUNOFF REDUCTION VOLUME CALCULATIONS*
  - *PRE-DEVELOPMENT DRAINAGE DIVIDE MAP AND ROUTINGS*
  - *POST-DEVELOPMENT DRAINAGE DIVIDE MAP AND ROUTINGS*

PETRUCCELLI ENGINEERING
PAUL BERTÉ, P.E.
PRINCIPAL

Project **HIDDEN COVE ON THE HUDSON OSSINING NEW YORK**

Revised

WATER QUALITY COMPUTATIONS, WQv (ONSITE AREA)

A = Total Site Area (Limit of Disturbance)				=	2.878 ac	=	125,361 s.f.				
Ai = Impervious Area at Post Development Condition				=	1.105 ac	=	48,151 s.f.	Total area reconstruced within existing limits			
I = percent Impervious Area =				[(	Ai	)(	100	)]/(	A	)=	
I = percent Impervious Area =				[(	1.105 ac	)(	100	)]/(	2.878 ac	)=	38 %
Rv = Volumetric Runoff Coeff. =				(	se	+[(	0.009	)(	38.41	)]=	
Rv = Volumetric Runoff Coeff. =				(	0.05	+[(	0.009	)(	38.41	)]=	0.396
P = Precipitation Depth =											1.5 in.
WQv = Water Quality Volume =	[(	P	)(	Rv	)(	A	)]/	12			
WQv (required)	[(	1.5 in.	)(	0.396	)(	2.878 ac	)]/	12	= 0.142 ac.ft	=	6,200 cf
WQv									= 0.142 ac.ft	=	6,200 cf
25% WQv (required per re-development)									= 0.036 ac.ft	=	**1,550 cf**
A = Total Site Area (Limit of Disturbance)				=	1.015 ac	=	44,215 s.f.				
Ai = Impervious Area at Post Development Condition				=	0.390 ac	=	16,983 s.f.	Expanded Impervious Cover			
I = percent Impervious Area =				[(	Ai	)(	100	)]/(	A	)=	
I = percent Impervious Area =				[(	0.390 ac	)(	100	)]/(	1.015 ac	)=	38 %
Rv = Volumetric Runoff Coeff. =				(	se	+[(	0.009	)(	:quired W(	)]=	
Rv = Volumetric Runoff Coeff. =				(	0.05	+[(	0.009	)(	38.41	)]=	0.396
P = Precipitation Depth =											1.5 in.
WQv = Water Quality Volume =	[(	P	)(	Rv	)(	A	)]/	12			
WQv (required)	[(	1.5 in.	)(	0.396	)(	1.015 ac	)]/	12	= 0.050 ac.ft	=	2,187 cf
WQv									= 0.050 ac.ft	=	2,187 cf

Total WQv 90% Rainfall Event	=	0.086 ac.ft	=	3,737 cf
Required WQv	=	0.086 ac.ft	=	**3,737 cf**
Infiltration Trench	=	0.042 ac.ft		1,834 cf
Green Roof	=	0.053 ac.ft		2,327 cf
Hydrodynamic Seperator	=	0.199 ac.ft		8,653 cf
Porous Pavement	=	0.190 ac.ft		8,266 cf
Total WQv (Provided)	=	**0.484 ac.ft**	=	**21,080 cf**

Note: See HydroCAD for storm routings

600 North Broadway Suite 215 White Plains, NY 10603 914.948.3629

PETRUCCELLI ENGINEERING

PAUL BERTÉ, P.E.
PRINCIPAL

Project
HIDDEN COVE ON THE HUDSON
OSSINING NEW YORK

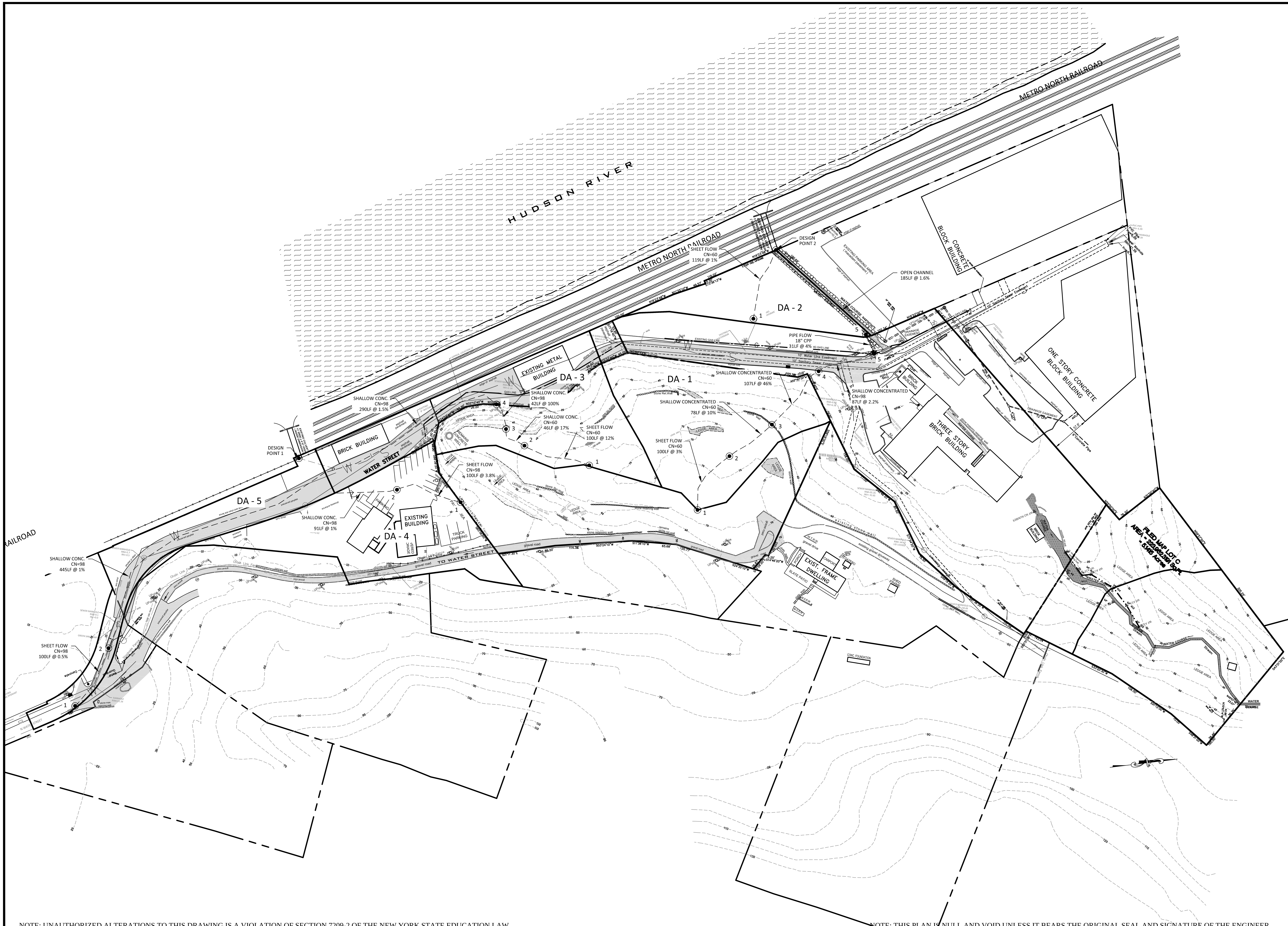
Revised

WATER QUALITY COMPUTATIONS, WQv (OFFSITE AREA)

A = Total Site Area (Limit of Disturbance)		=	1.472 ac	=	64,110 s.f.						
Ai = Impervious Area at Post Development Condition		=	1.089 ac	=	47,417 s.f.	Total area reconstruced within existing limits					
I = percent Impervious Area =		[(	Ai	)(	100	)]/(	A	)=			
I = percent Impervious Area =		[(	1.089 ac	)(	100	)]/(	1.472 ac	)=	74 %		
Rv = Volumetric Runoff Coeff. =		(	se	+[(	0.009	)(	73.96	)]=			
Rv = Volumetric Runoff Coeff. =		(	0.05	+[(	0.009	)(	73.96	)]=	0.716		
P = Precipitation Depth =									1.5 in.		
WQv = Water Quality Volume =	[(P	)(	Rv	)(	A	)]/	12				
WQv (required)	[(1.5 in.	)(	0.716	)(	1.472 ac	)]/	12	=	0.132 ac.ft	=	5,735 cf
WQv								=	0.132 ac.ft	=	5,735 cf
25% WQv (required per re-development)								=	0.033 ac.ft	=	**1,434 cf**

A = Total Site Area (Limit of Disturbance)		=	0.178 ac	=	7,760 s.f.						
Ai = Impervious Area at Post Development Condition		=	0.132 ac	=	5,740 s.f.	Expanded Impervious Cover					
I = percent Impervious Area =		[(	Ai	)(	100	)]/(	A	)=			
I = percent Impervious Area =		[(	0.132 ac	)(	100	)]/(	0.178 ac	)=	74 %		
Rv = Volumetric Runoff Coeff. =		(	se	+[(	0.009	)(	:quired W(	)]=			
Rv = Volumetric Runoff Coeff. =		(	0.05	+[(	0.009	)(	73.97	)]=	0.716		
P = Precipitation Depth =									1.5 in.		
WQv = Water Quality Volume =	[(P	)(	Rv	)(	A	)]/	12				
WQv (required)	[(1.5 in.	)(	0.716	)(	0.178 ac	)]/	12	=	0.016 ac.ft	=	0,694 cf
WQv								=	0.016 ac.ft	=	0,694 cf

	Total WQv 90% Rainfall Event	=	0.049 ac.ft	=	2,128 cf
	Required WQv	=	0.049 ac.ft	=	**2,128 cf**
Note: See HydroCAD for storm routings	Hydrodynamic Separator Flow Treatment	=	0.159 ac.ft		6,909 cf
	Total WQv (Provided)	=	**0.159 ac.ft**	=	**6,909 cf**



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DATE	09-10-12
SCALE	1"=60'
DRAWN BY:	KMM
CHK'D BY:	R.C.P.

REVISIONS

PETRUCCELLI ENGINEERING

392 COLUMBUS AVENUE
VALHALLA, NEW YORK 10595
9 1 4 • 9 4 8 • 3 6 2 9

RUDOLPH C. PETRUCCELLI, P.E.

DRAINAGE AREAS (EXISTING)

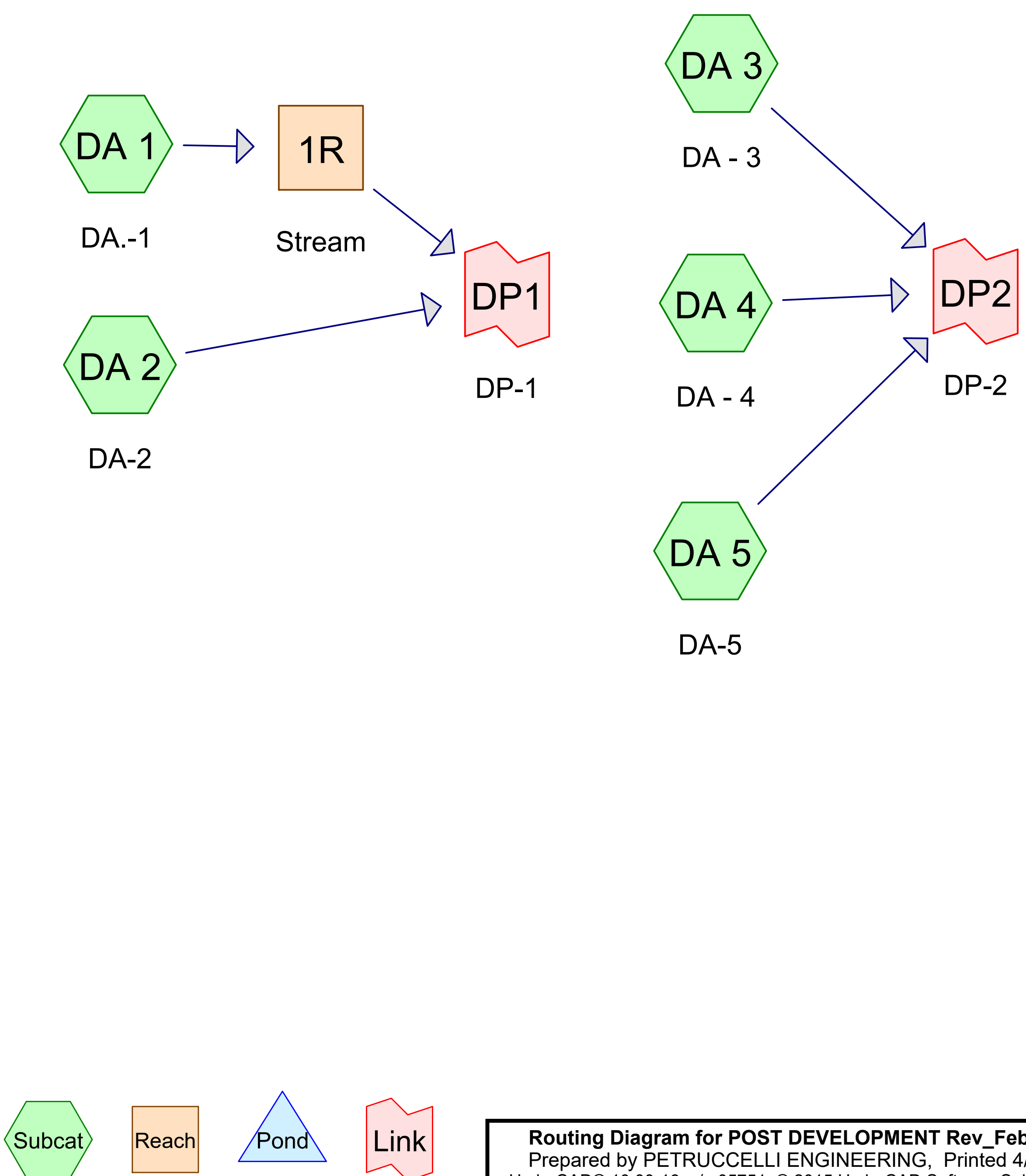
FOR

HIDDEN COVE ON THE HUDSON

36 NORTH WATER STREET

VILLAGE OF OSSINING NEW YORK

SHEET NO. 1 / 2



Routing Diagram for POST DEVELOPMENT Rev_Feb 28 2017
Prepared by PETRUCCELLI ENGINEERING, Printed 4/7/2018
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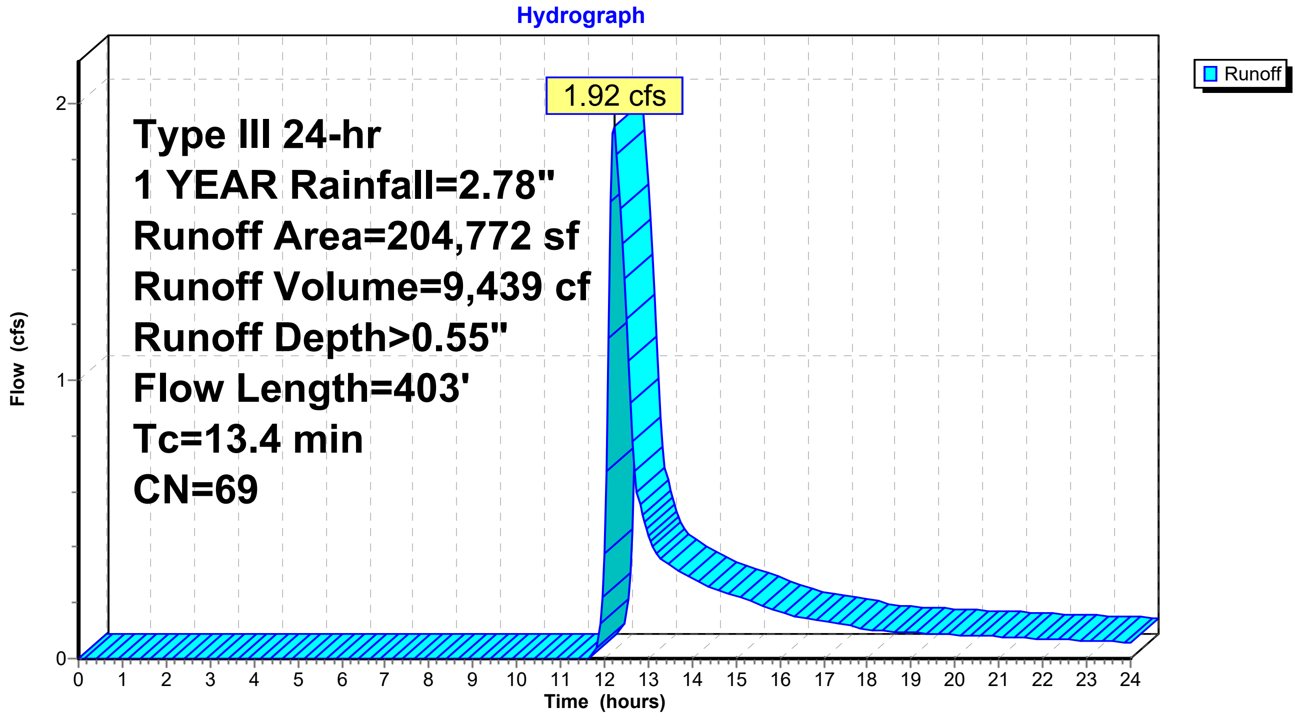
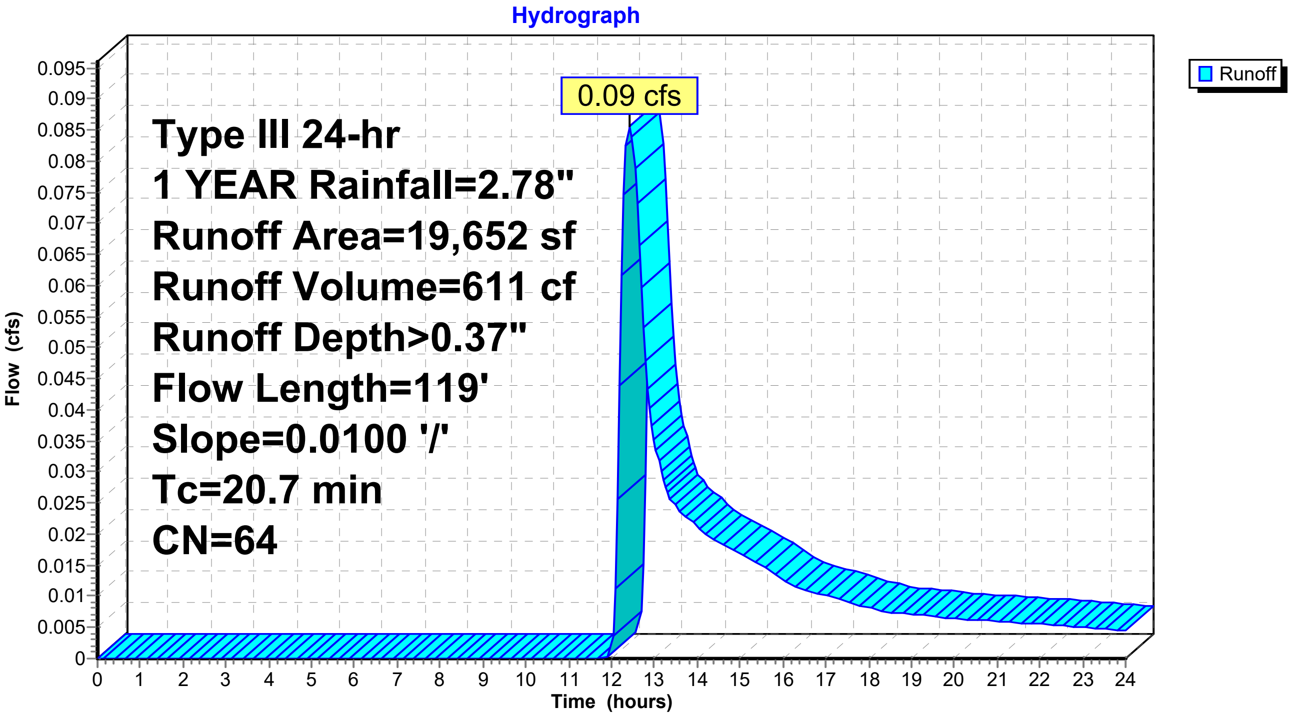
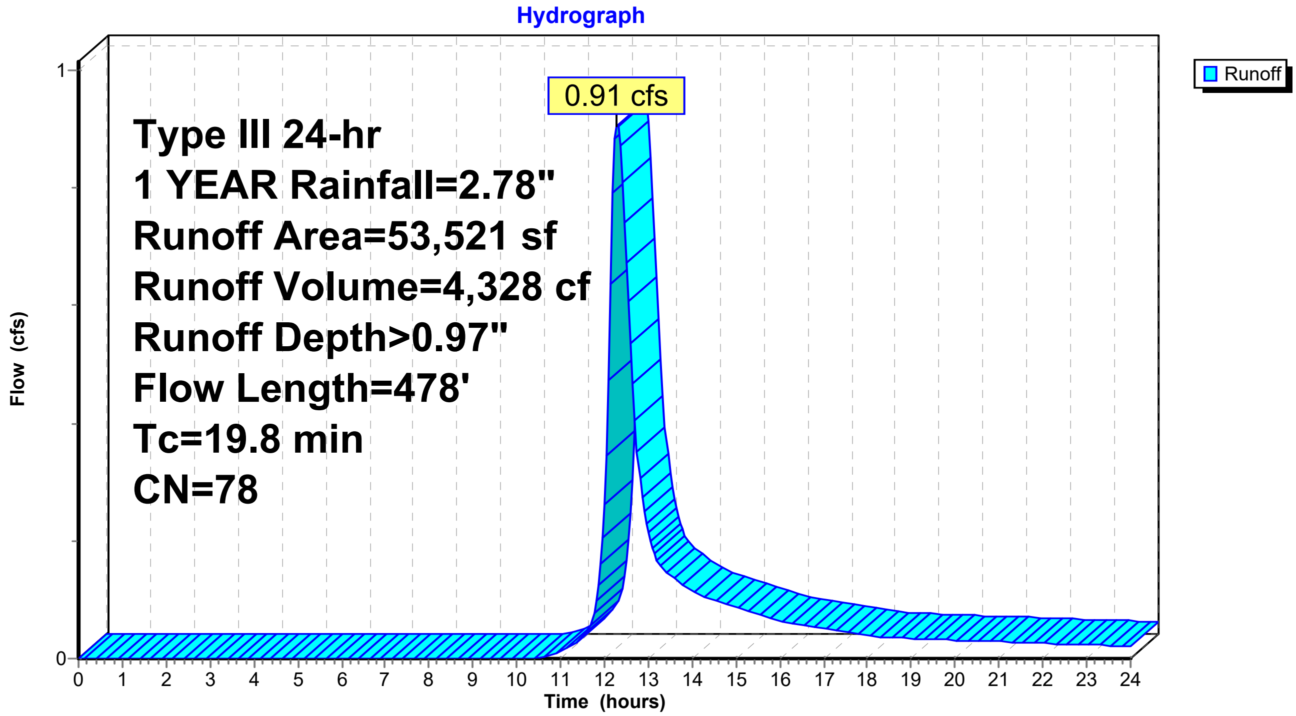
Subcatchment DA 1: DA.-1



Subcatchment DA 2: DA-2



Subcatchment DA 3: DA - 3



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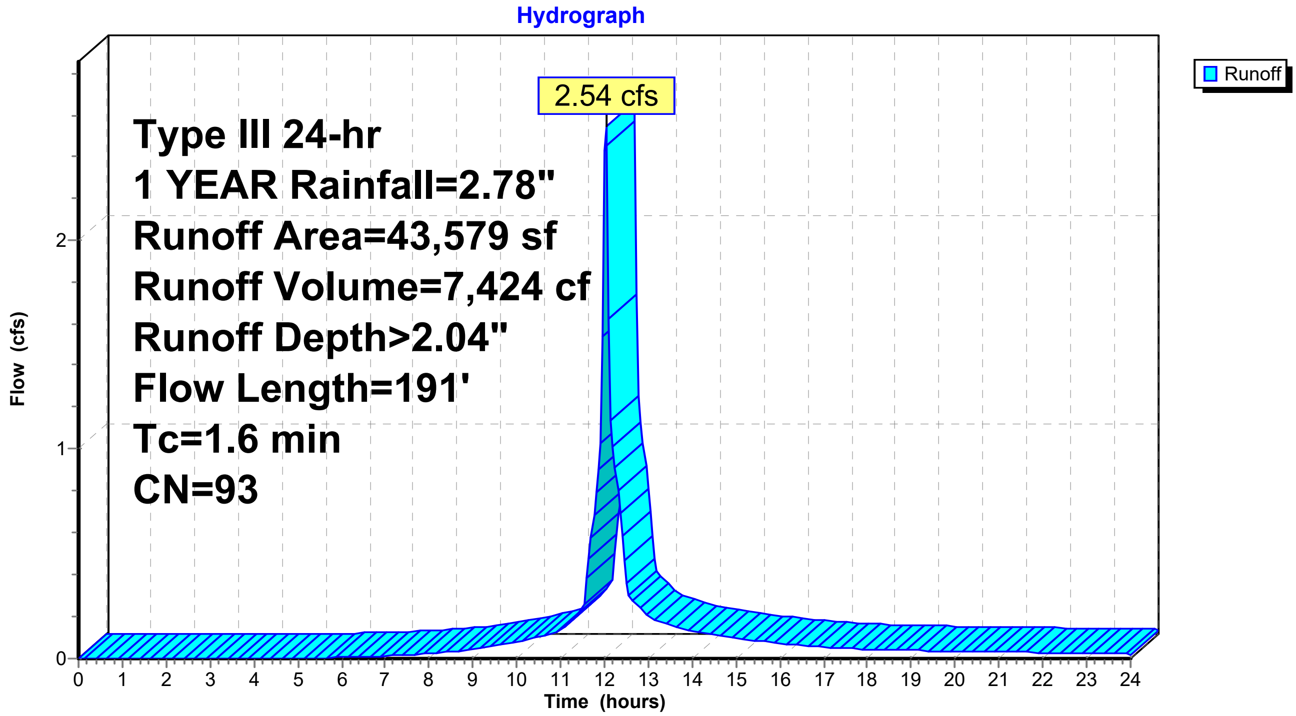
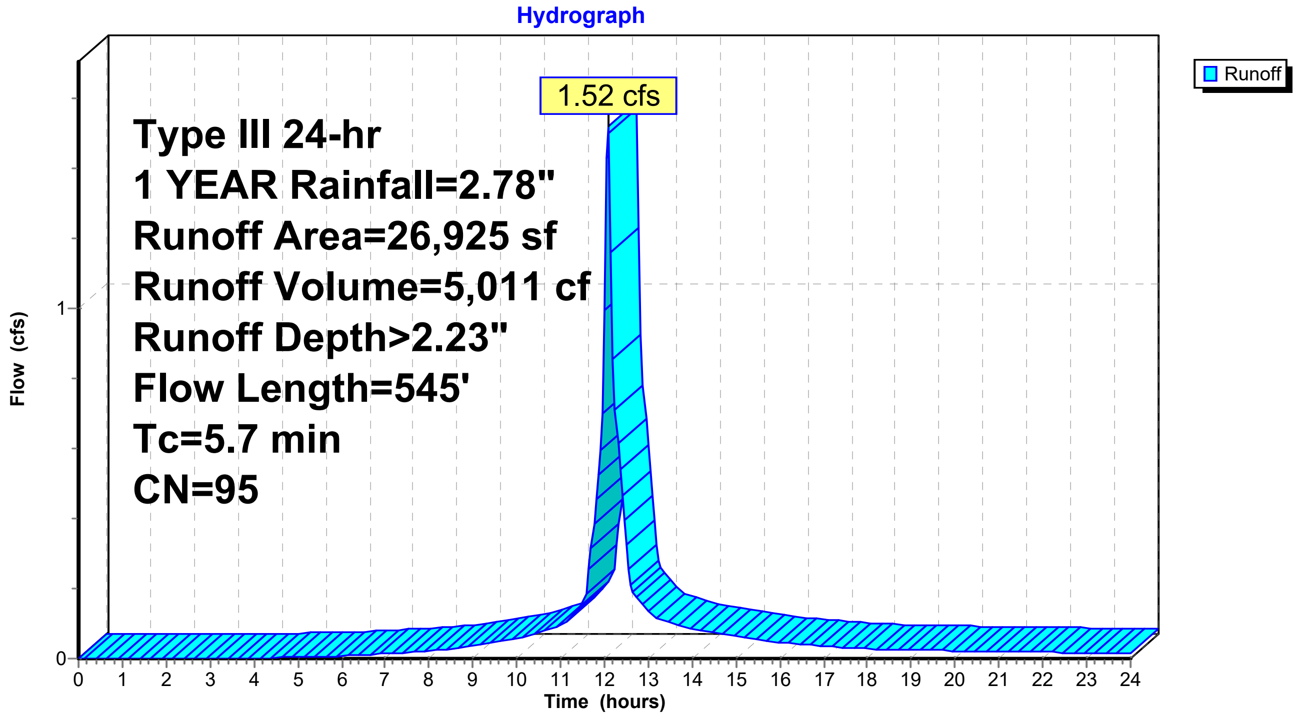
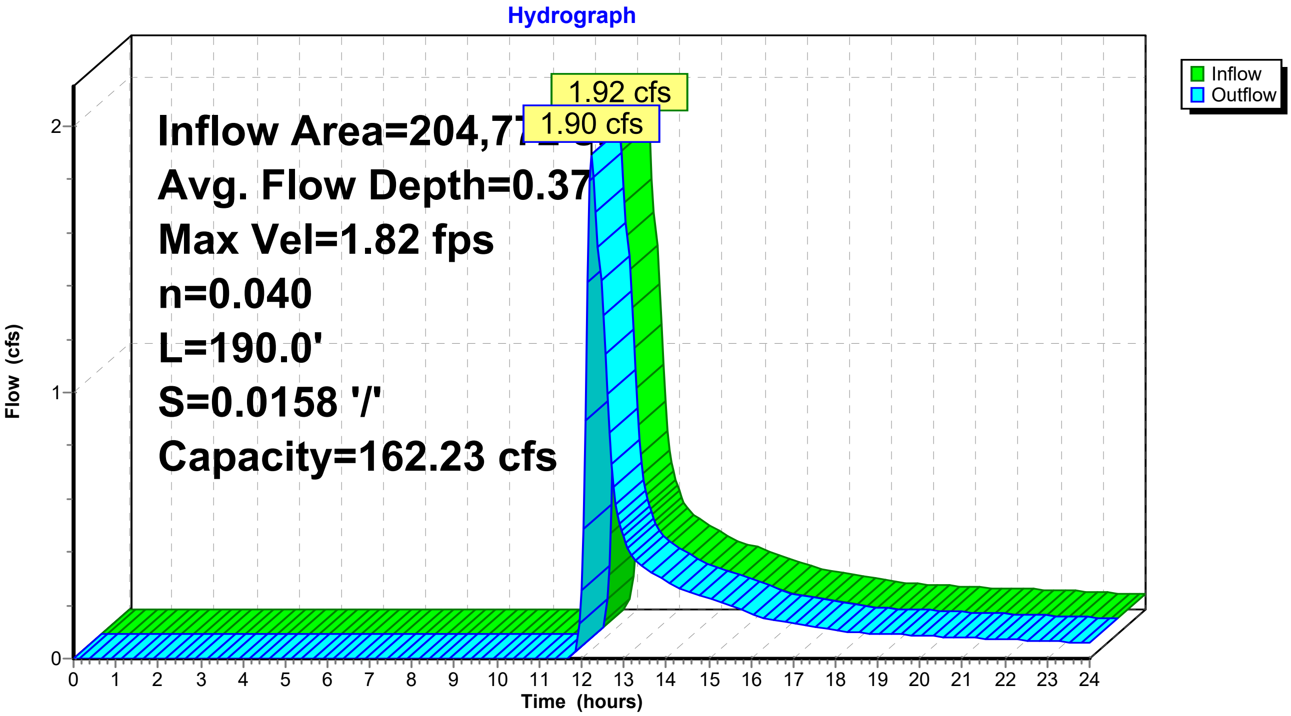


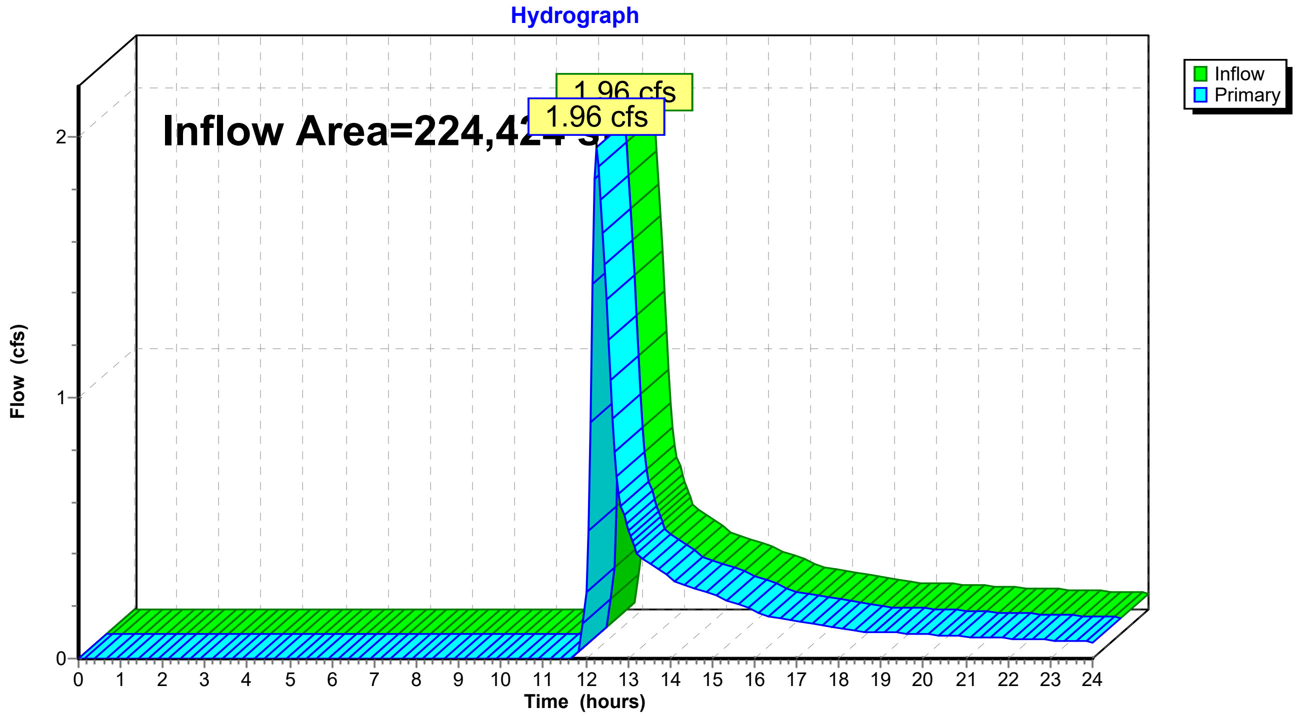
Subcatchment DA 5: DA-5



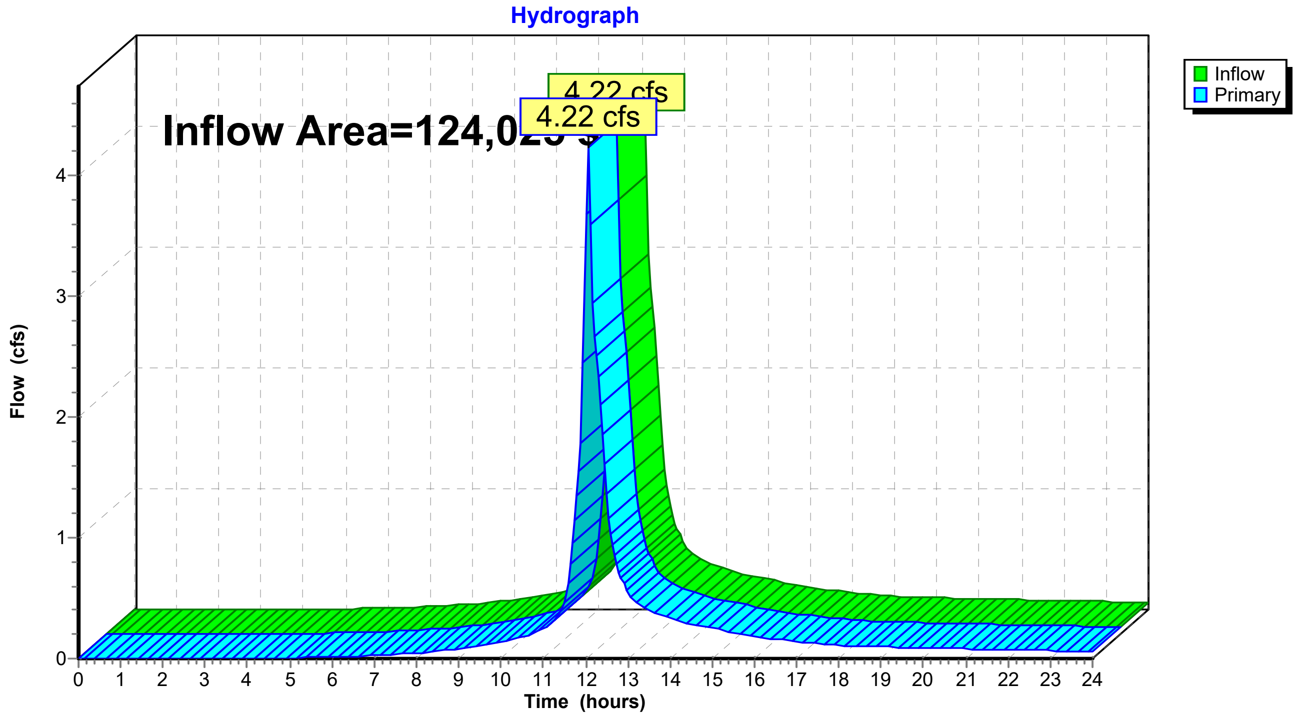
Reach 1R: Stream



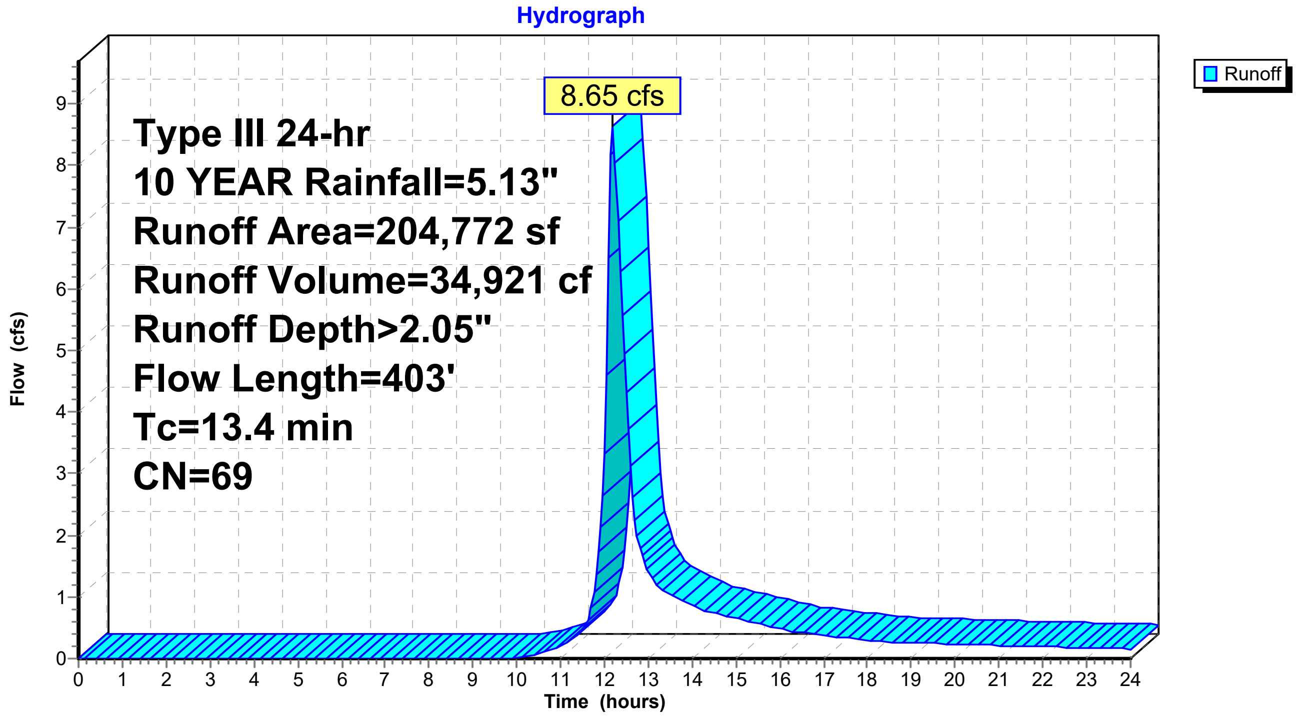
Link DP1: DP-1


Hydrograph
Inflow
Primary
1.96 cfs
1.96 cfs
Inflow Area=224,4
Flow (cfs)
0
1
2
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (hours)

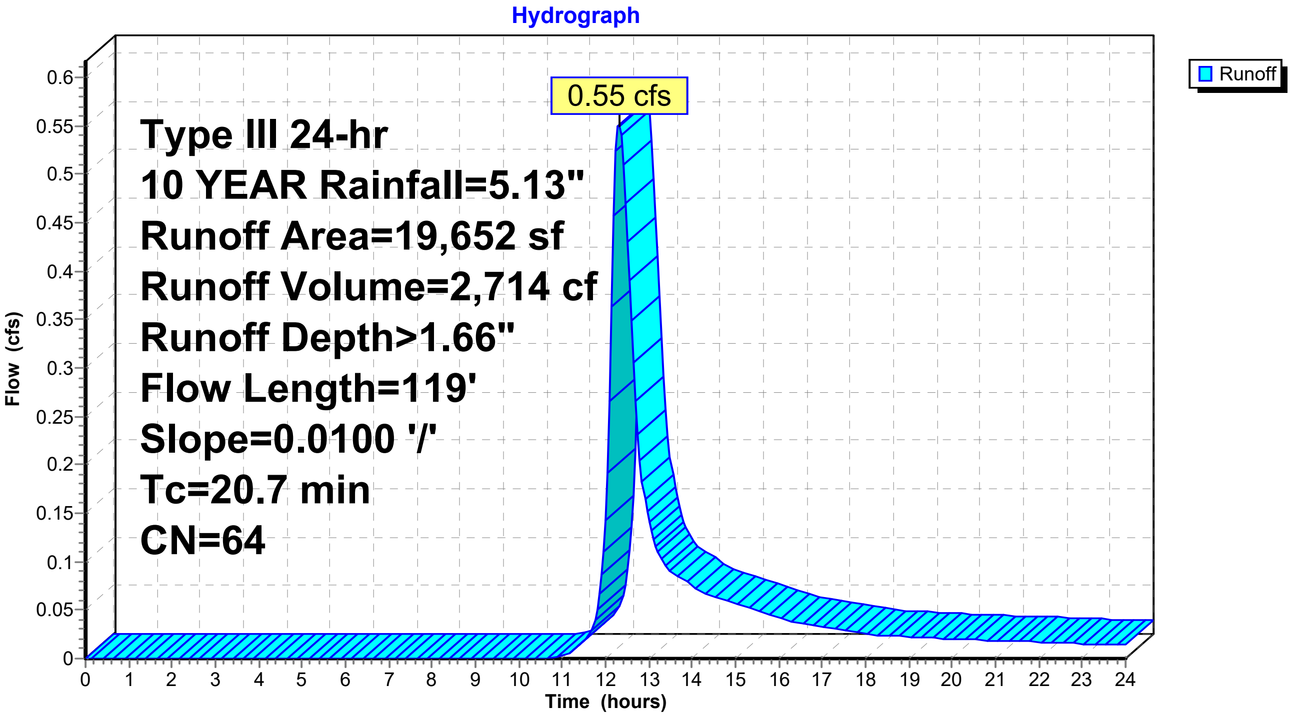
Link DP2: DP-2


Hydrograph
4.22 cfs
4.22 cfs
Inflow Area=124,02
Inflow
Primary
Flow (cfs)
0
1
2
3
4
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Time (hours)

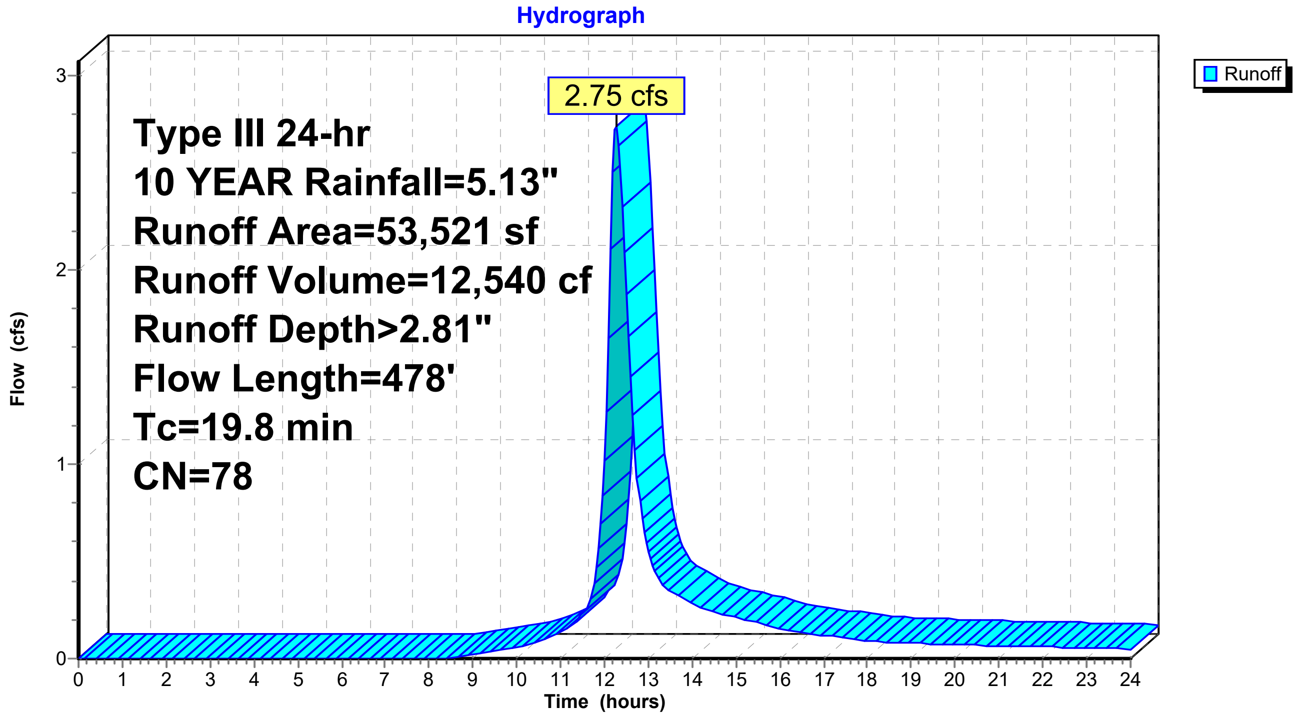
Subcatchment DA 1: DA.-1



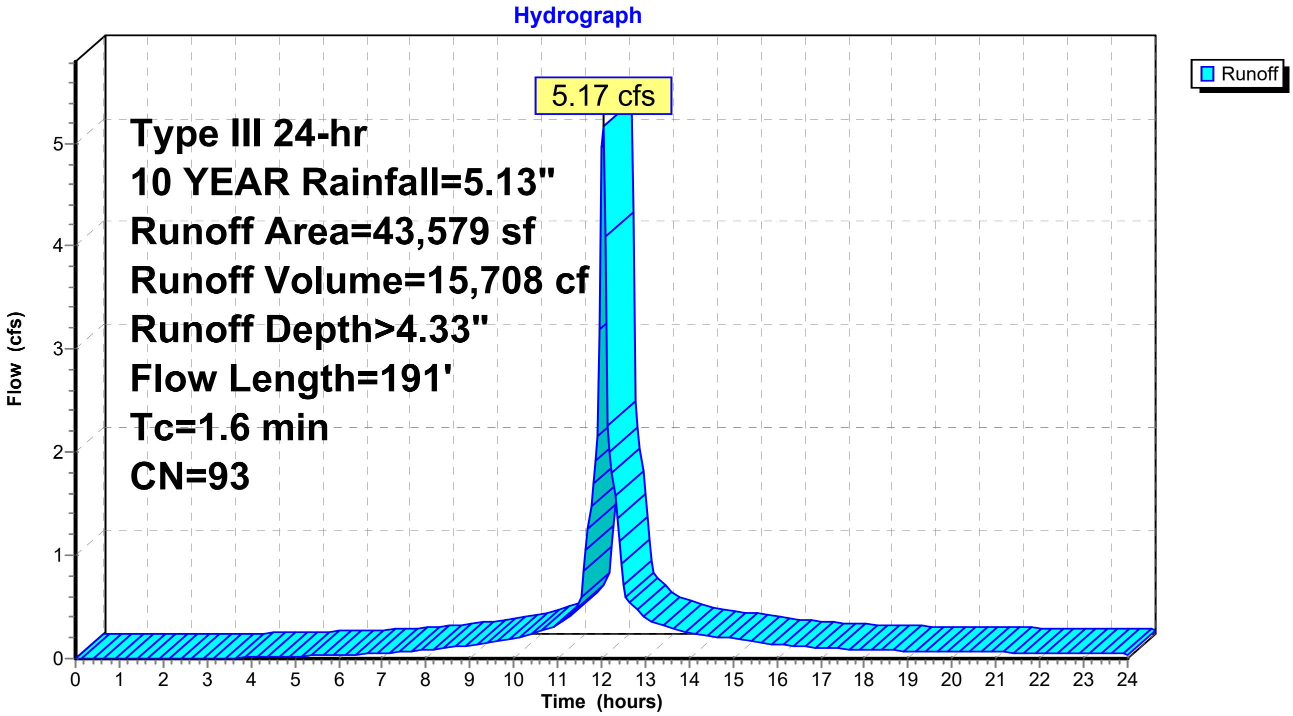
Subcatchment DA 2: DA-2



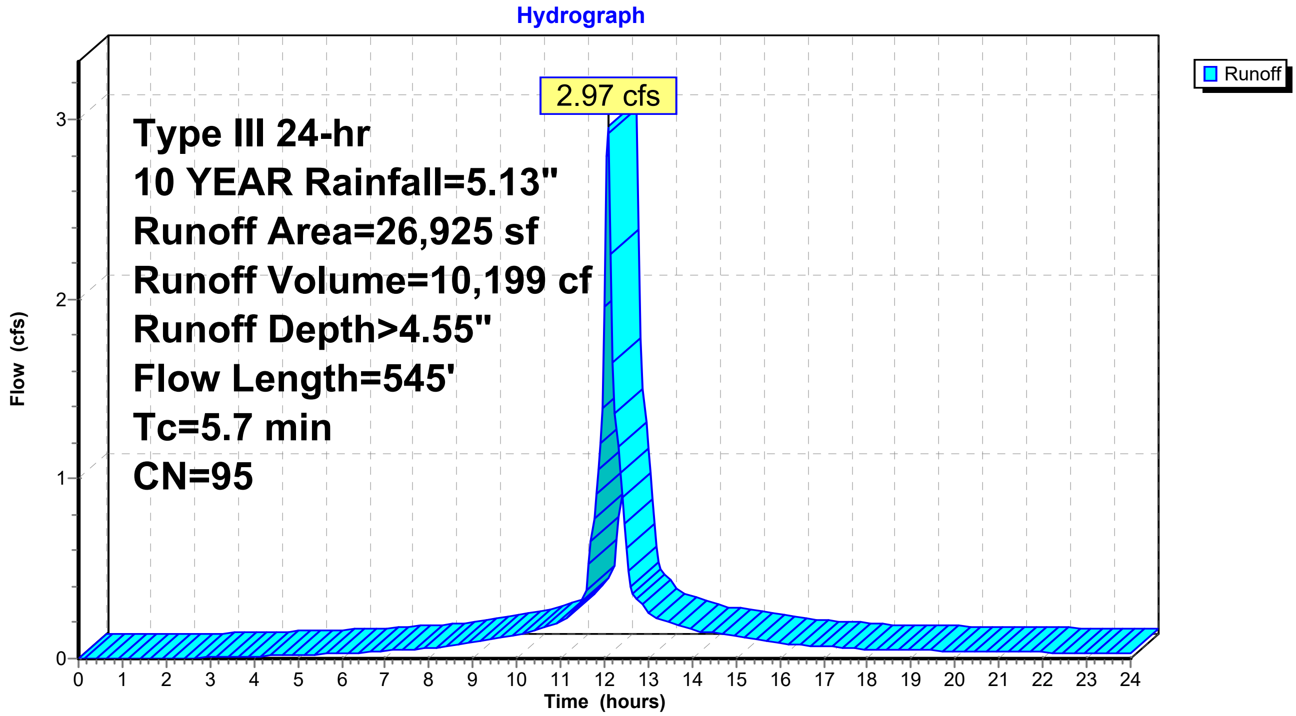
Subcatchment DA 3: DA - 3



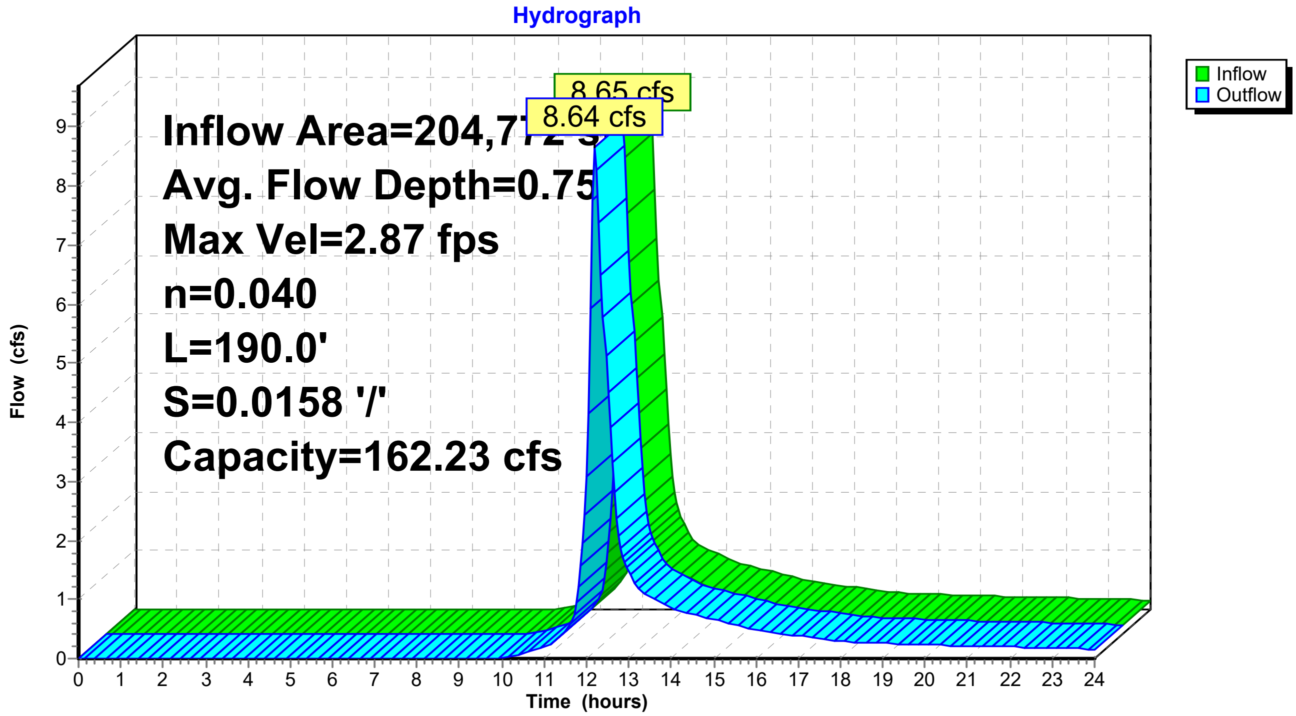
Subcatchment DA 4: DA - 4



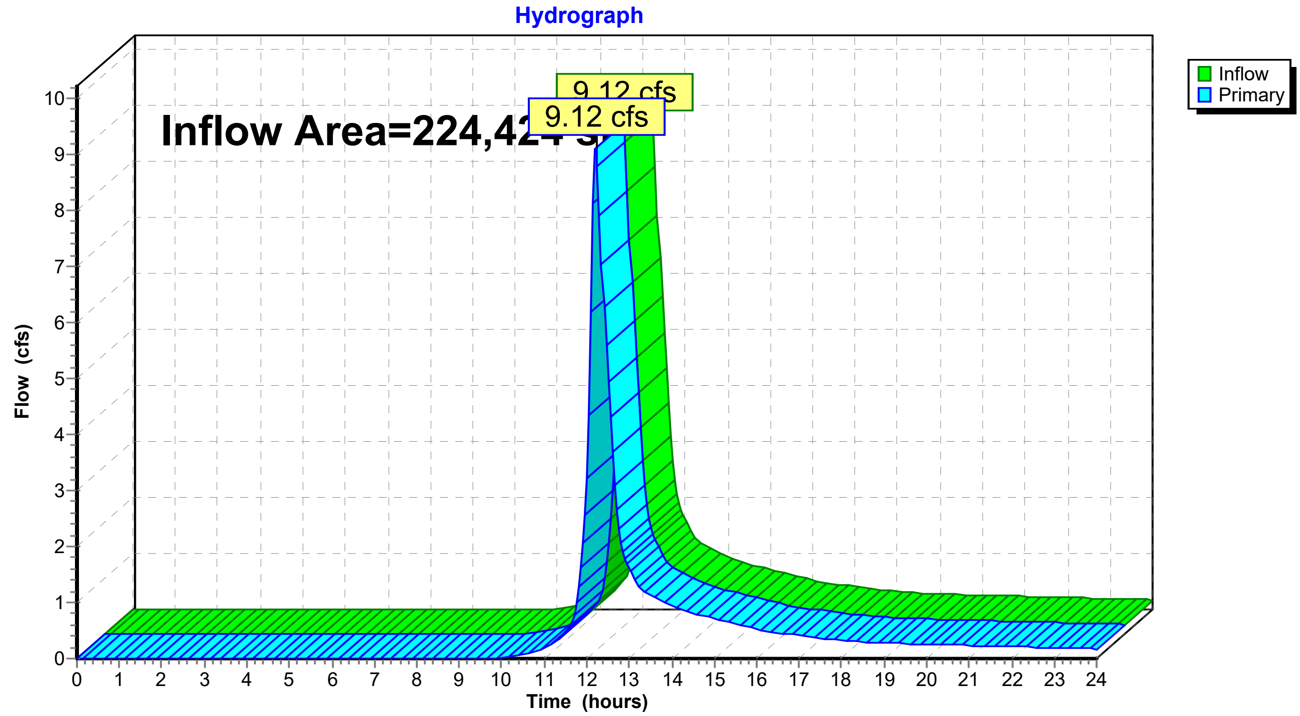
Subcatchment DA 5: DA-5



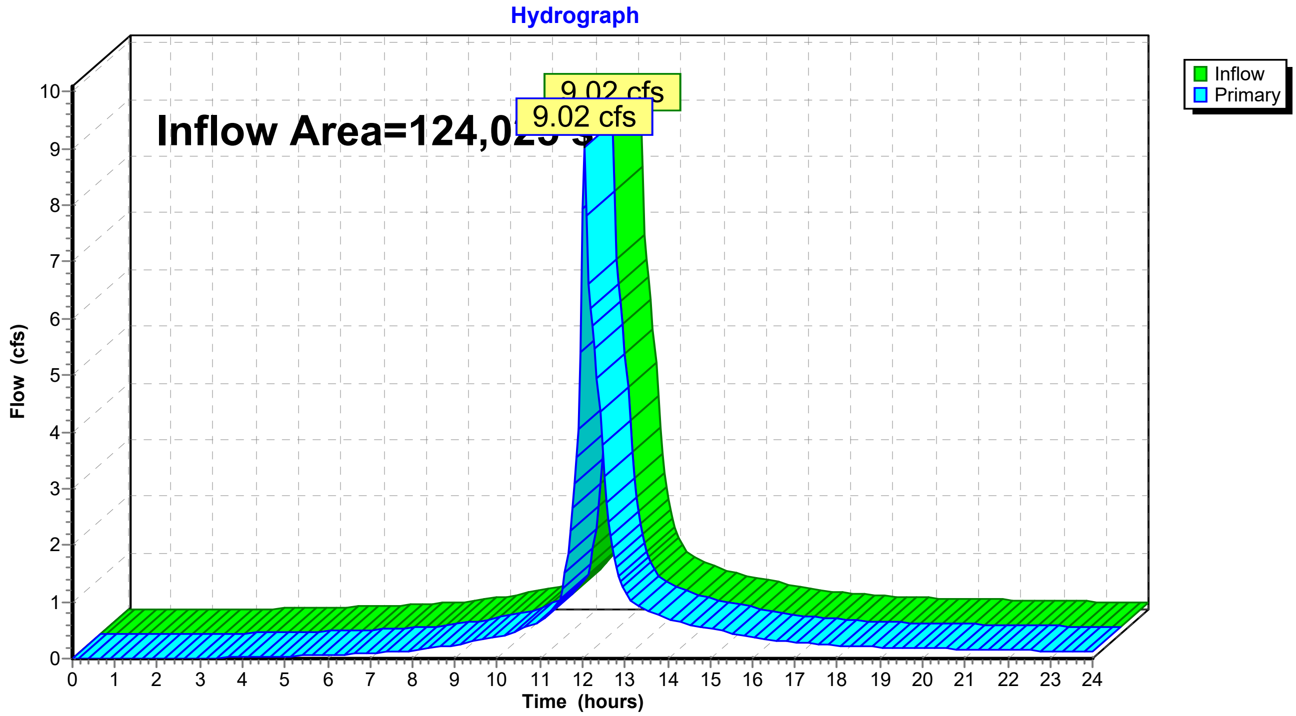
Reach 1R: Stream



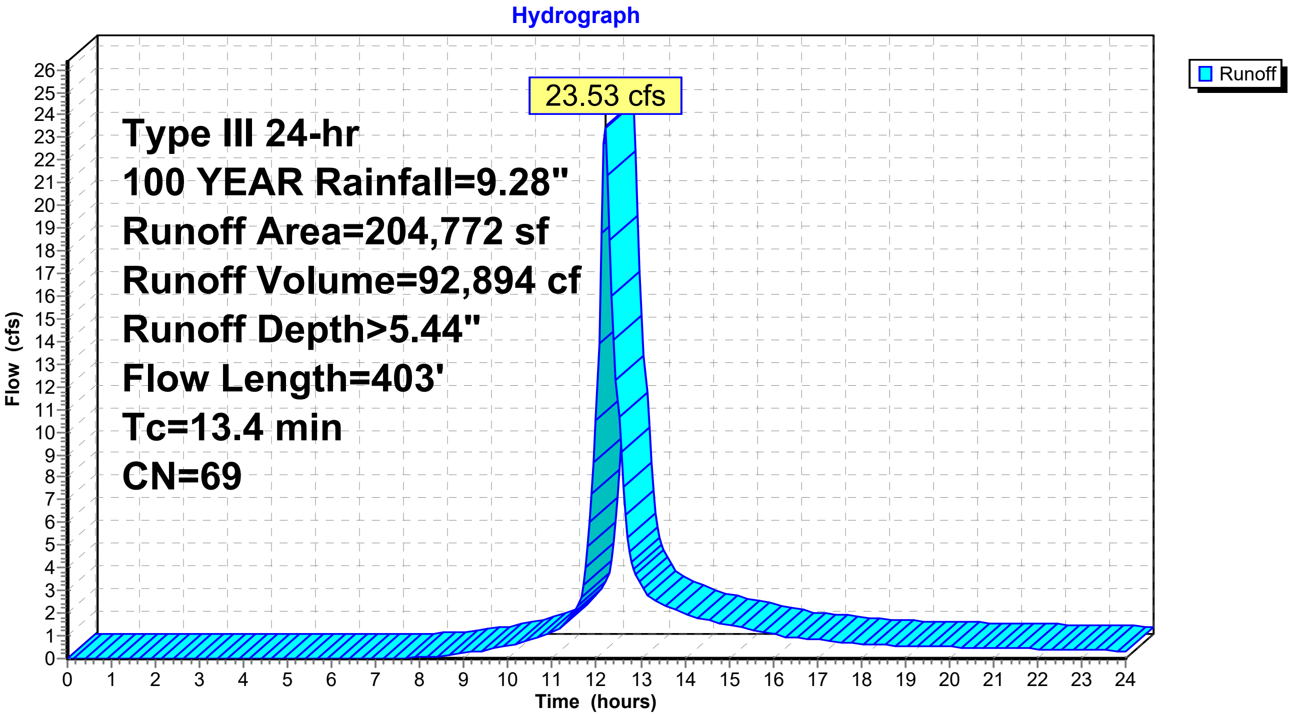
Link DP1: DP-1


Hydrograph
Inflow
Primary
9.12 cfs
9.12 cfs
Inflow Area=224,42
Flow (cfs)
0
1
2
3
4
5
6
7
8
9
10
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Time (hours)

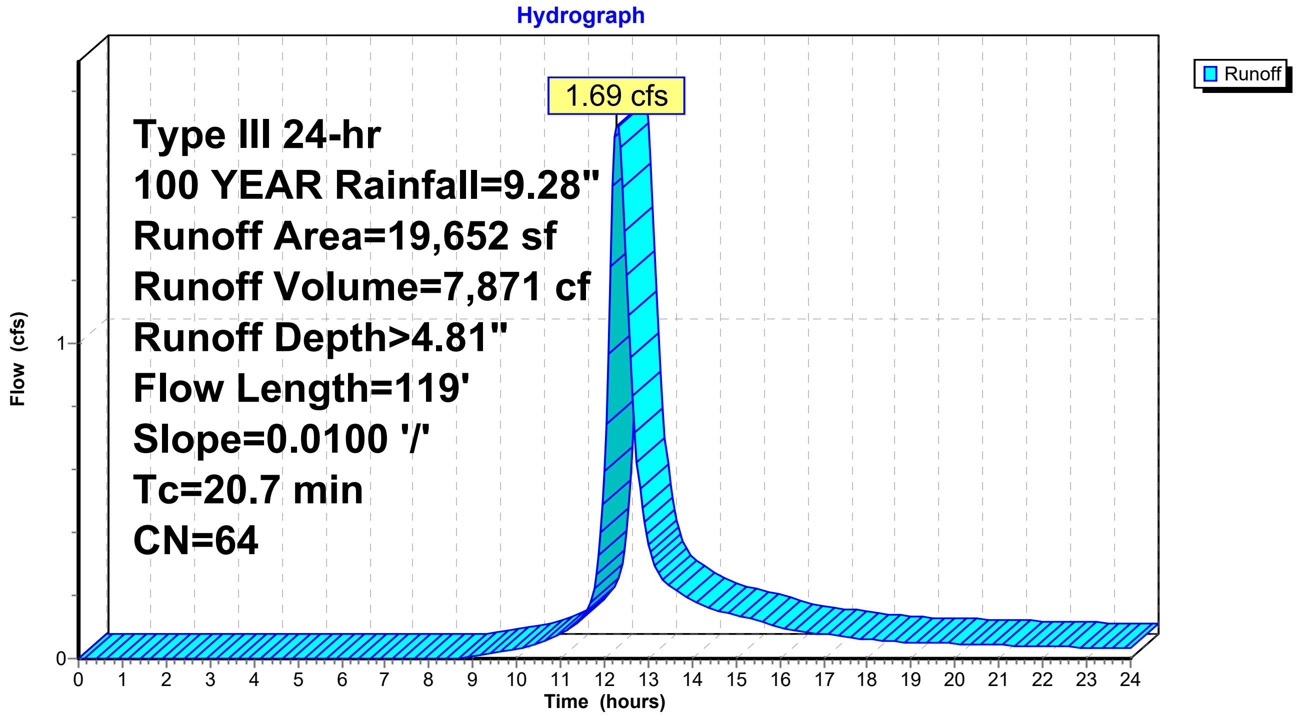
Link DP2: DP-2


Hydrograph
Inflow
Primary
9.02 cfs
9.02 cfs
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24

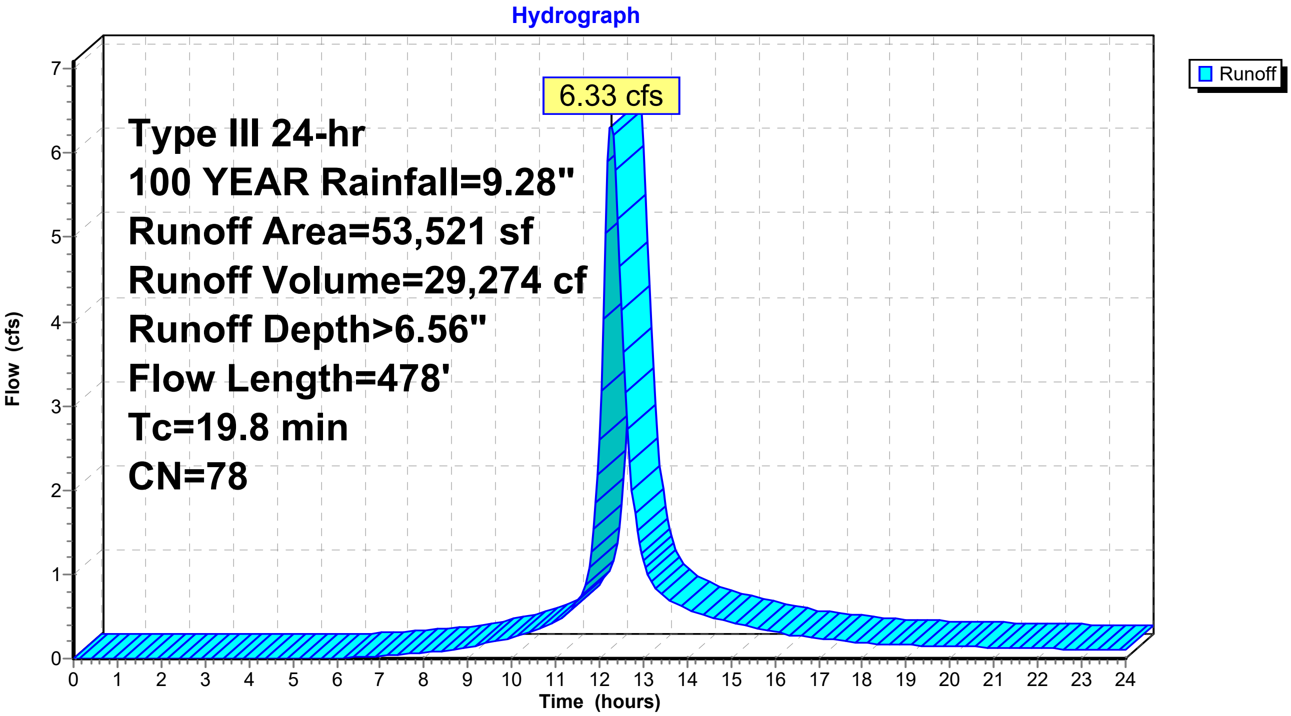
Subcatchment DA 1: DA.-1



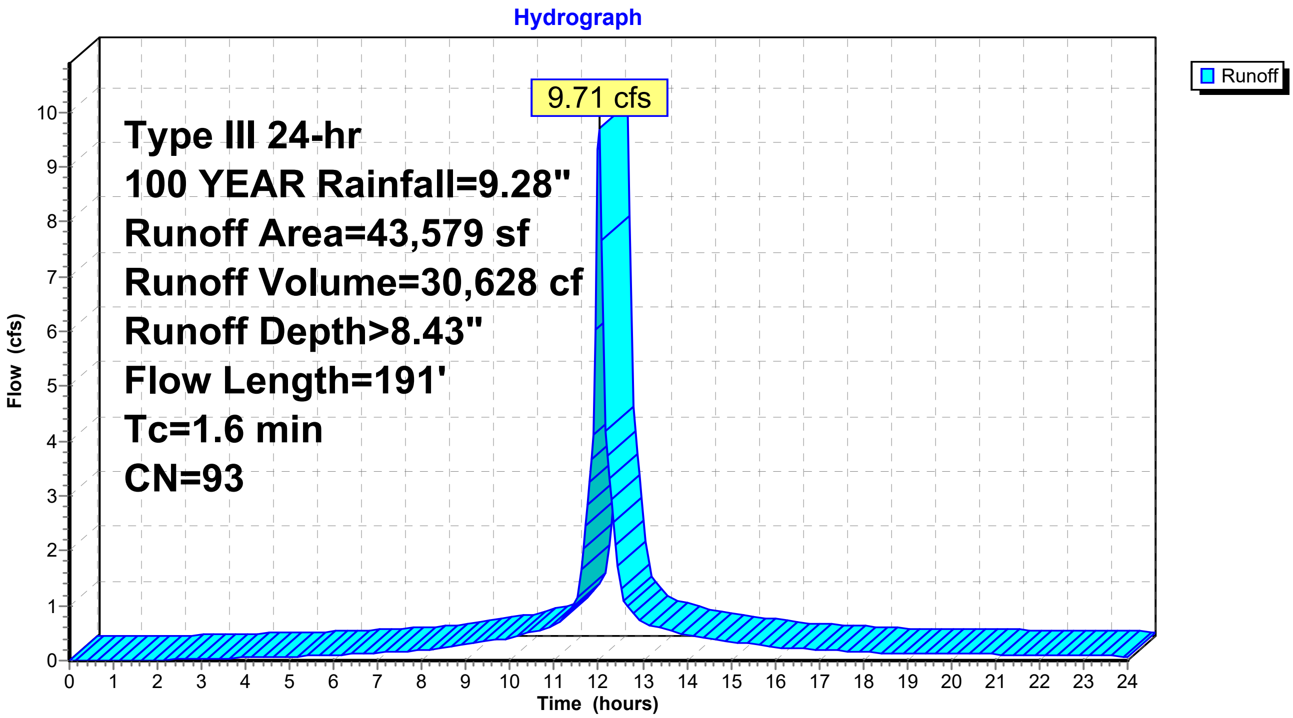
Subcatchment DA 2: DA-2



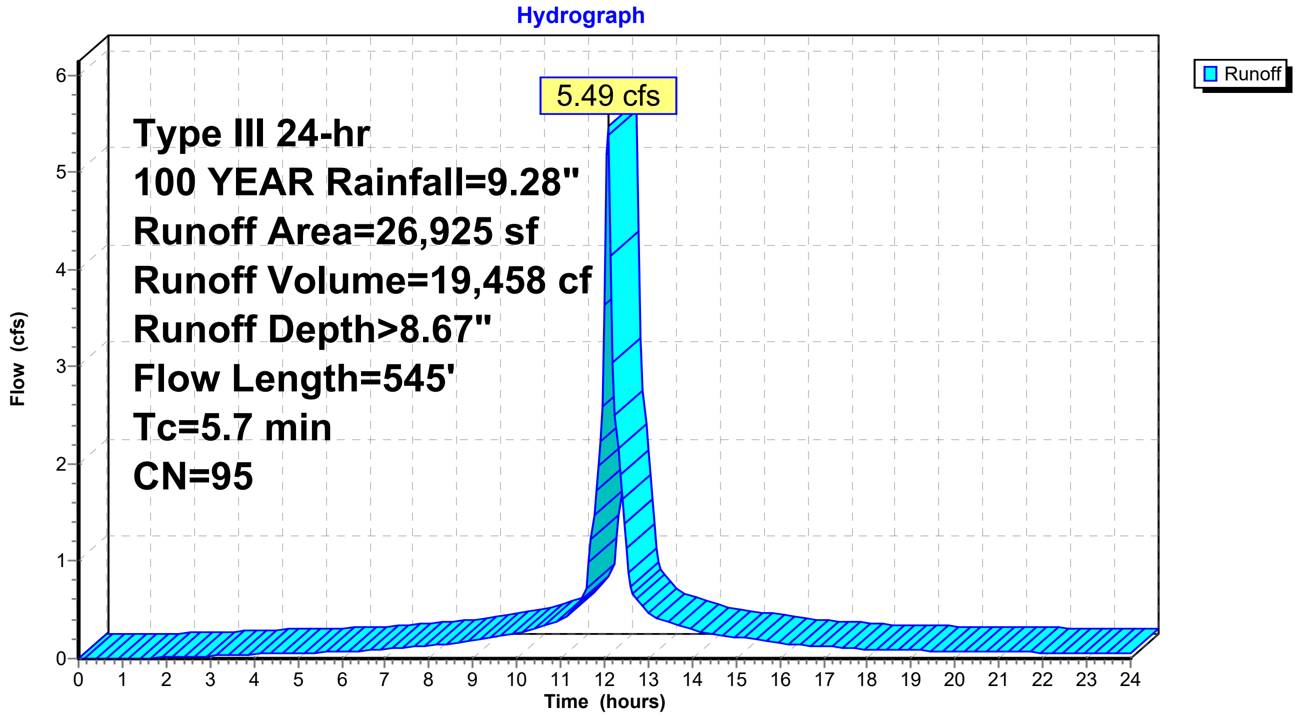
Subcatchment DA 3: DA - 3



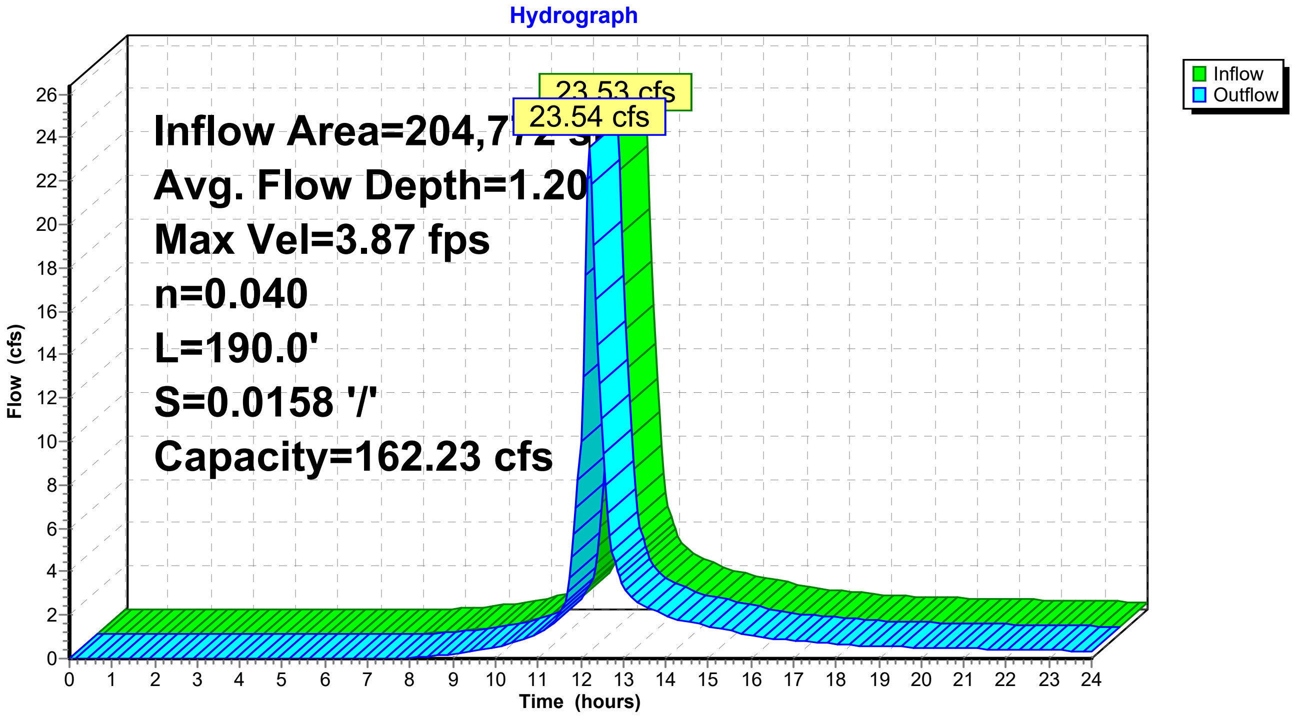
Subcatchment DA 4: DA - 4



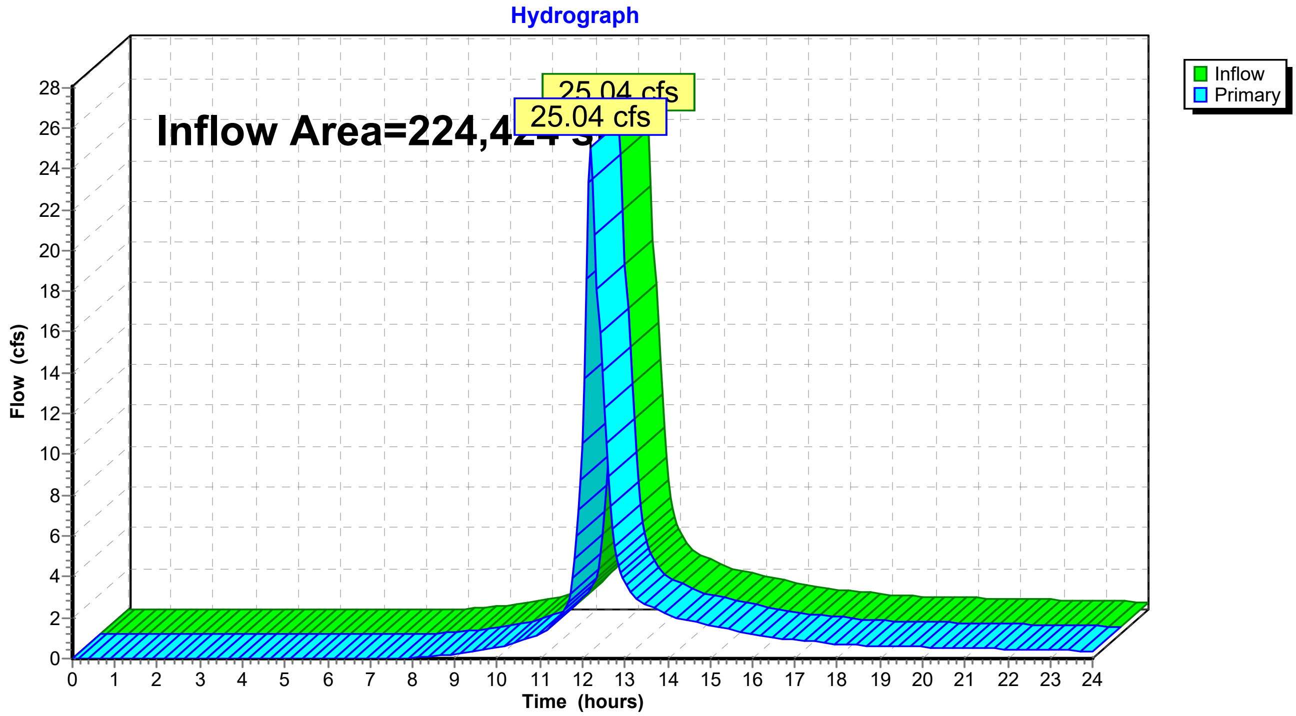
Subcatchment DA 5: DA-5



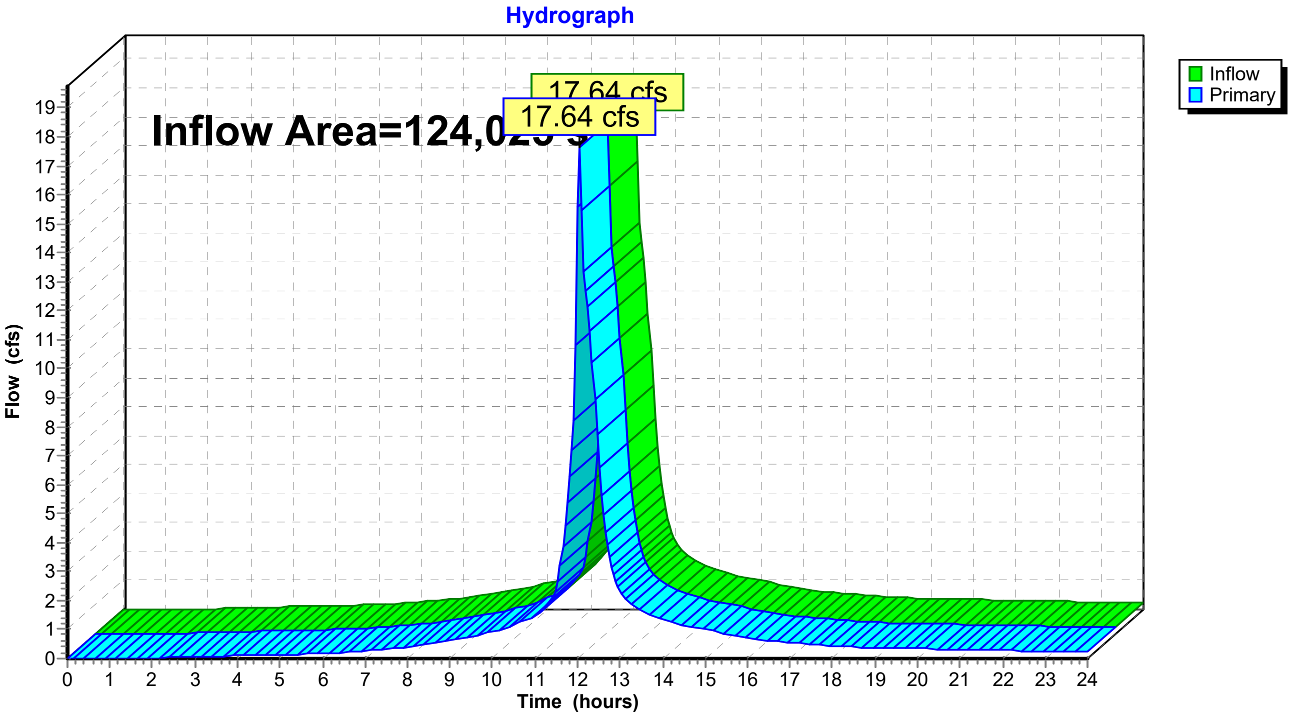
Reach 1R: Stream



Link DP1: DP-1


Hydrograph
Inflow
Primary
25.04 cfs
25.04 cfs
Inflow Area=224,4
Flow (cfs)
Time (hours)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Link DP2: DP-2


Hydrograph
Inflow
Primary
17.64 cfs
17.64 cfs
Inflow Area=124,0
Flow (cfs)
Time (hours)
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1
2
3
4
5
6
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9
10
11
12
13
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15
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17
18
19
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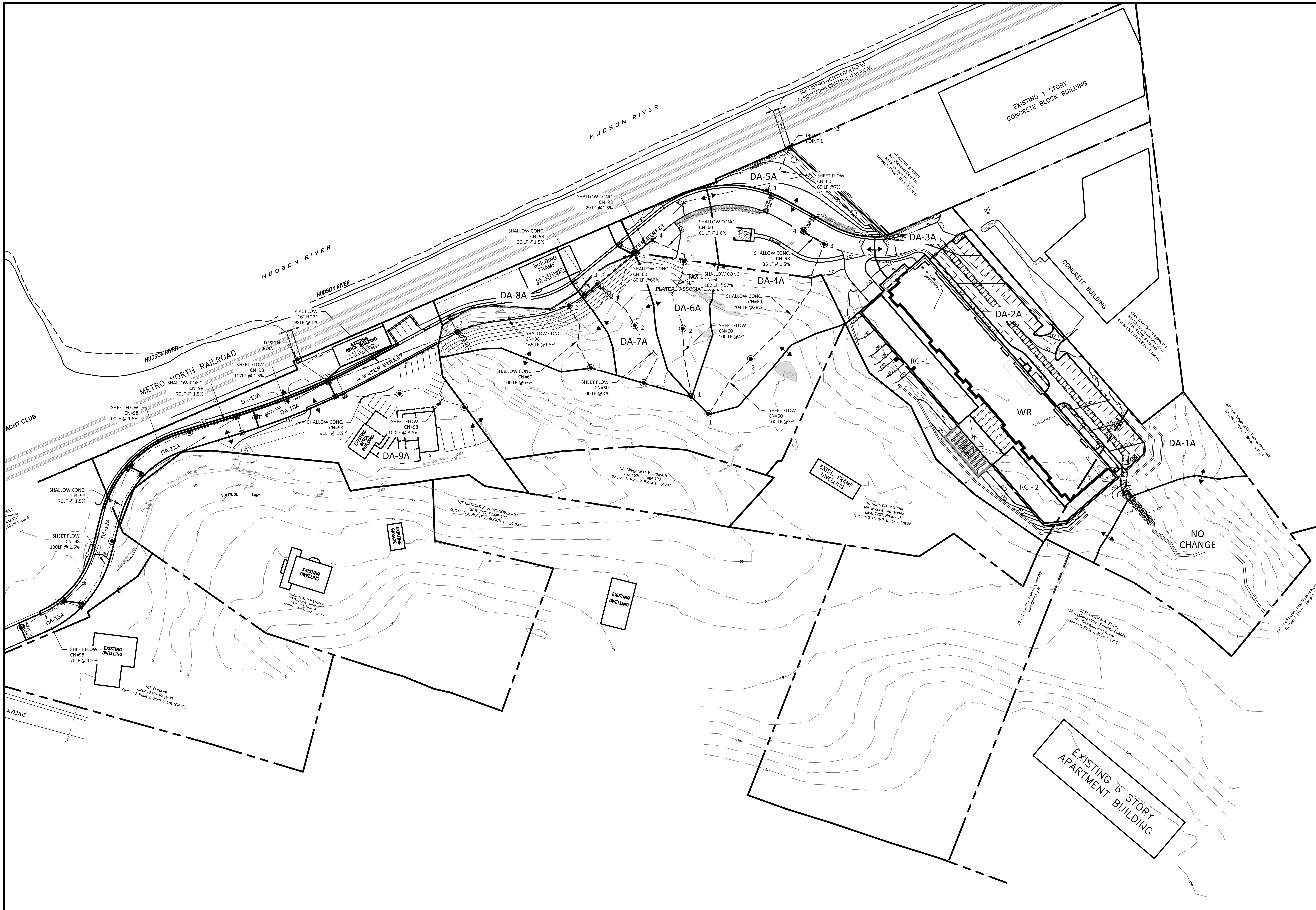
22
23
24



JOB NO.	2001
DATE:	02.28.17
SCALE:	AS NOTED
DRAWN BY:	KMM
CHECKED BY:	P.B.

REVISIONS

PETRUCCELLI ENGINEERING
600 NORTH BROADWAY
WHITE PLAINS, N.Y. 10603
9 1 4 . 9 4 8 . 3 6 2 9
PAUL BERTE, P.E.

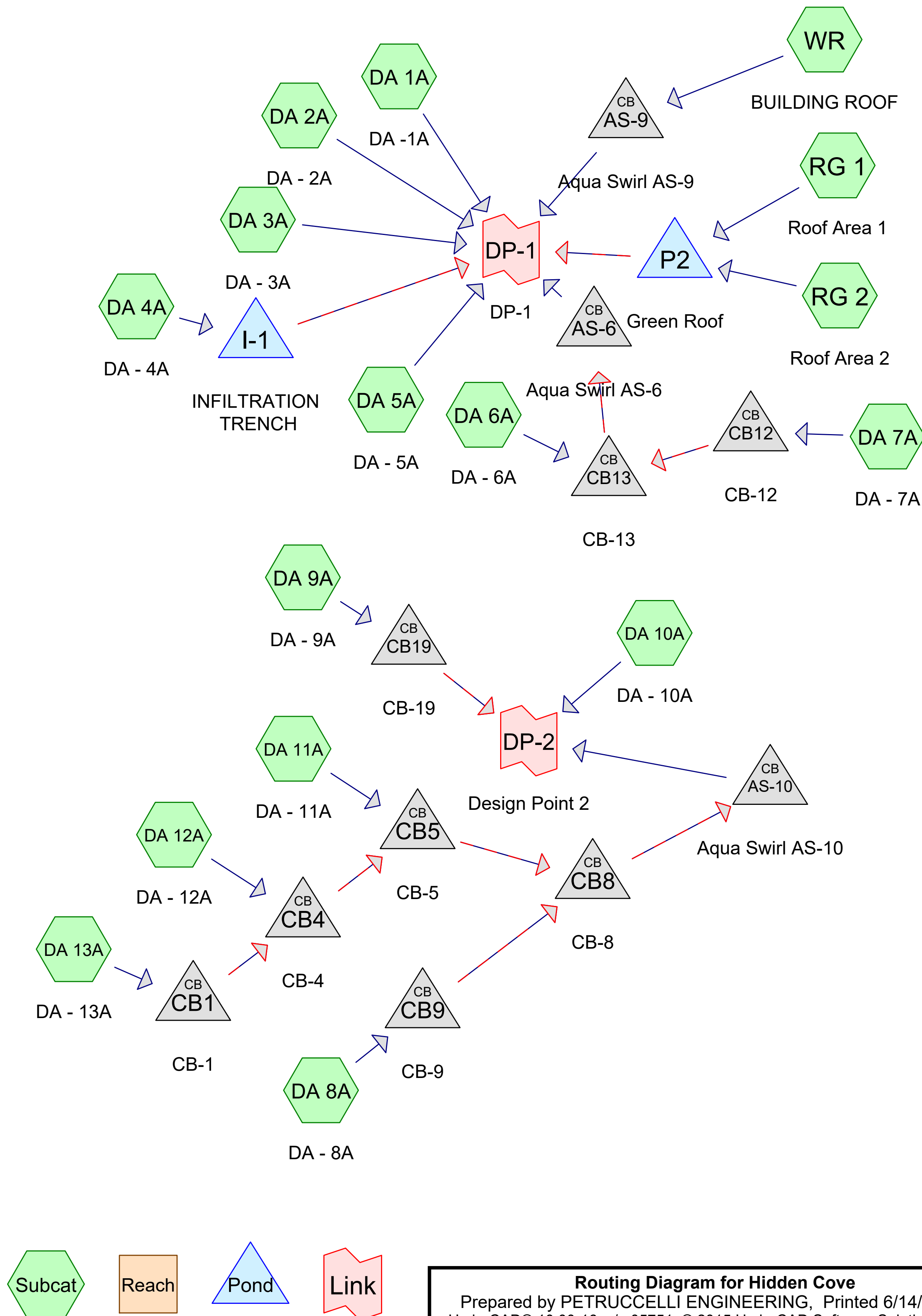
POST-DEVELOPMENT MAP

HIDDEN COVE ON THE HUDSON

36 NORTH WATER STREET

VILLAGE OF OSSINING NEW YORK

SHEET NO.



Routing Diagram for Hidden Cove
Prepared by PETRUCCELLI ENGINEERING, Printed 6/14/2018
HydroCAD® 10.00-16 s/n 05751 © 2015 HydroCAD Software Solutions LLC

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	AS-10	1.00	0.00	46.0	0.0217	0.010	18.0	0.0	0.0
2	AS-6	1.00	0.00	46.0	0.0217	0.010	18.0	0.0	0.0
3	AS-9	6.00	2.00	35.0	0.1143	0.010	16.0	0.0	0.0
4	CB1	9.10	4.69	443.0	0.0100	0.010	16.0	0.0	0.0
5	CB12	6.05	5.10	93.0	0.0102	0.010	15.0	0.0	0.0
6	CB13	5.00	1.95	235.0	0.0130	0.010	15.0	0.0	0.0
7	CB19	3.50	3.20	32.0	0.0094	0.010	18.0	0.0	0.0
8	CB4	4.55	2.99	156.0	0.0100	0.010	16.0	0.0	0.0
9	CB5	2.89	1.66	128.0	0.0096	0.010	16.0	0.0	0.0
10	CB8	1.56	1.46	10.0	0.0100	0.010	18.0	0.0	0.0
11	CB9	3.54	3.35	198.0	0.0010	0.010	16.0	0.0	0.0
12	I-1	8.00	1.50	60.0	0.1083	0.013	12.0	0.0	0.0

Summary for Subcatchment DA 10A: DA - 10A

[49] Hint: Tc<2dt may require smaller dt

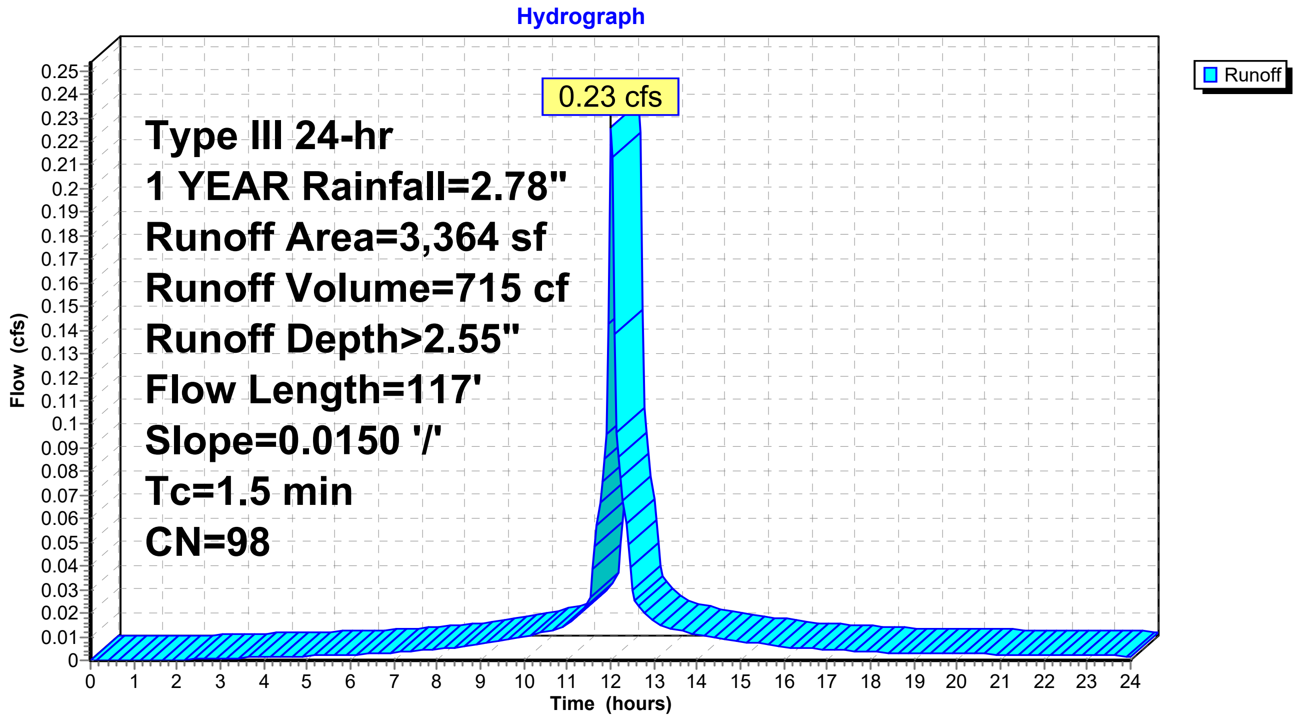
Runoff = 0.23 cfs @ 12.02 hrs, Volume= 715 cf, Depth> 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

Area (sf)	CN	Description
0	61	>75% Grass cover, Good, HSG B
3,364	98	Paved parking, HSG B
3,364	98	Weighted Average
3,364		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	117	0.0150	1.32		**Sheet Flow, 1 to 2** Smooth surfaces n= 0.011 P2= 3.50"

Subcatchment DA 10A: DA - 10A



Summary for Subcatchment DA 11A: DA - 11A

[49] Hint: Tc<2dt may require smaller dt

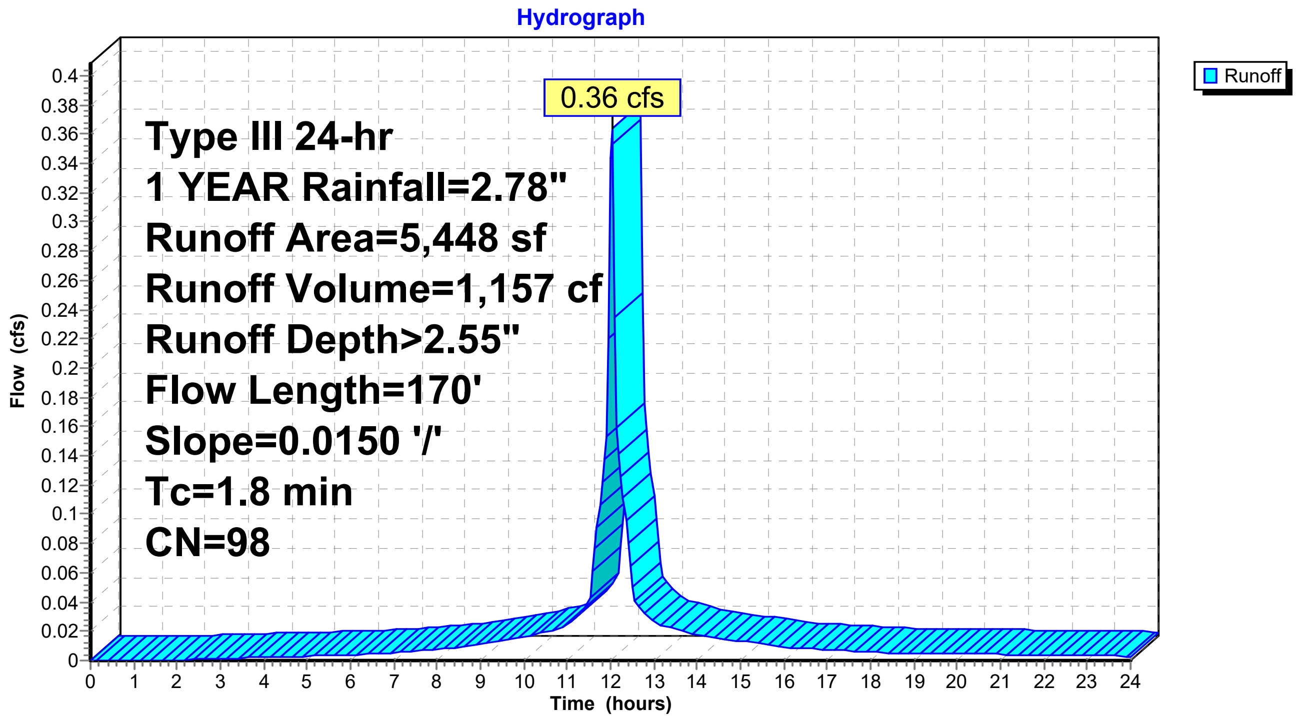
Runoff = 0.36 cfs @ 12.03 hrs, Volume= 1,157 cf, Depth> 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

Area (sf)	CN	Description
0	61	>75% Grass cover, Good, HSG B
5,448	98	Paved parking, HSG B
5,448	98	Weighted Average
5,448		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.28		**Sheet Flow, 1 to 2** Smooth surfaces n= 0.011 P2= 3.50"
0.5	70	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	170	Total			

Subcatchment DA 11A: DA - 11A



Summary for Subcatchment DA 12A: DA - 12A

[49] Hint: Tc<2dt may require smaller dt

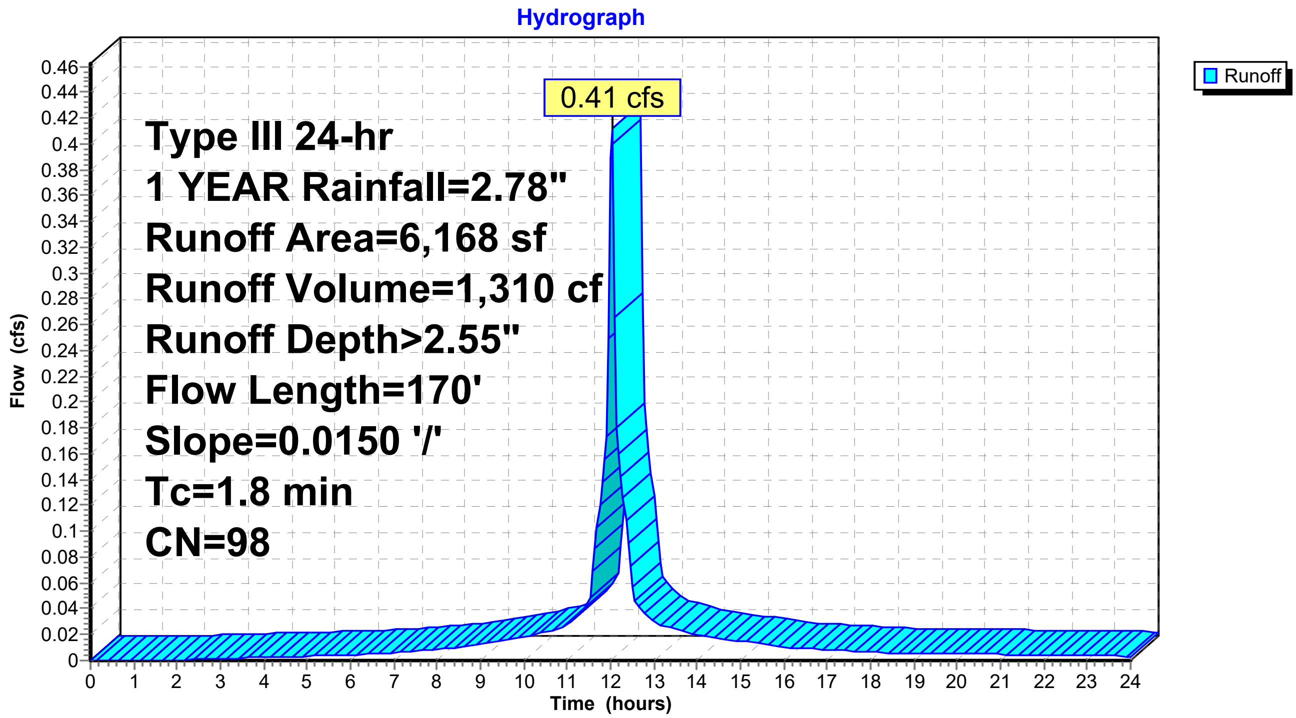
Runoff = 0.41 cfs @ 12.03 hrs, Volume= 1,310 cf, Depth> 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

Area (sf)	CN	Description
0	61	>75% Grass cover, Good, HSG B
6,168	98	Paved parking, HSG B
6,168	98	Weighted Average
6,168		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.28		**Sheet Flow, 1 to 2** Smooth surfaces n= 0.011 P2= 3.50"
0.5	70	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	170	Total			

Subcatchment DA 12A: DA - 12A



Summary for Subcatchment DA 13A: DA - 13A

[49] Hint: Tc<2dt may require smaller dt

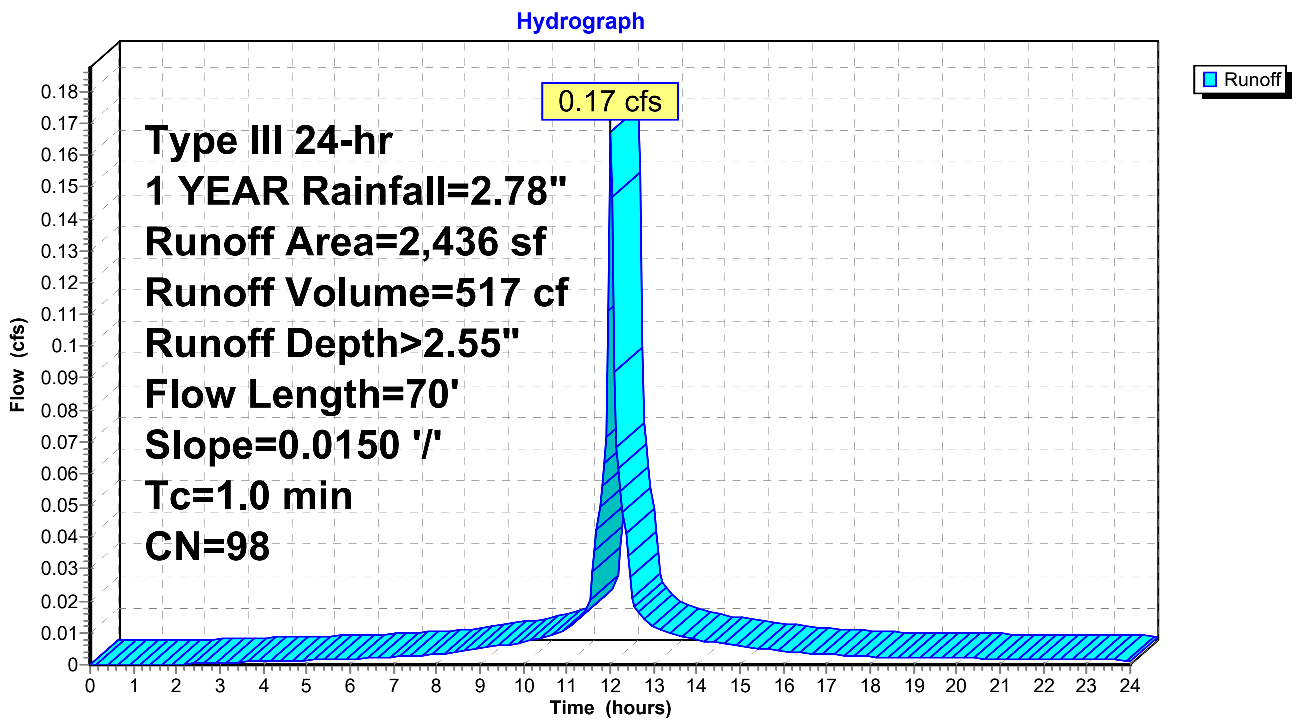
Runoff = 0.17 cfs @ 12.01 hrs, Volume= 517 cf, Depth> 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

Area (sf)	CN	Description
0	61	>75% Grass cover, Good, HSG B
2,436	98	Paved parking, HSG B
2,436	98	Weighted Average
2,436		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	70	0.0150	1.19		**Sheet Flow, 1 to 2** Smooth surfaces n= 0.011 P2= 3.50"

Subcatchment DA 13A: DA - 13A



Summary for Subcatchment DA 1A: DA -1A

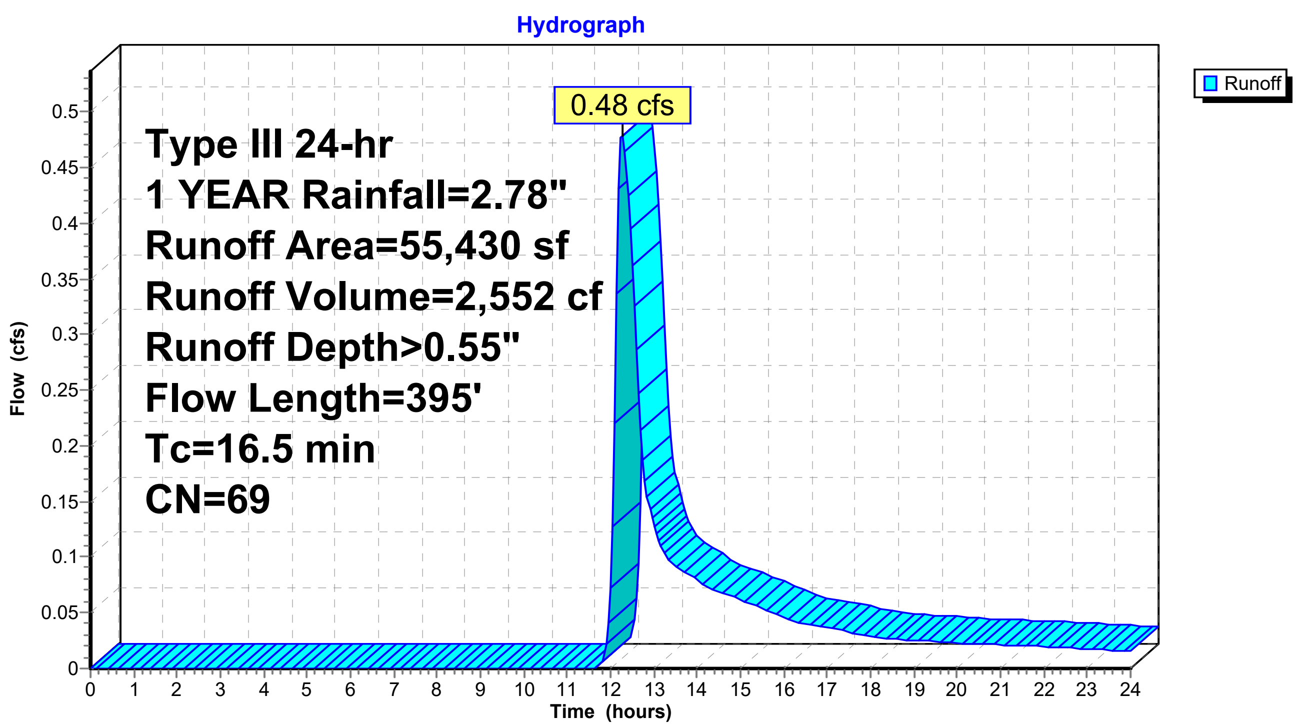
Runoff = 0.48 cfs @ 12.28 hrs, Volume= 2,552 cf, Depth> 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

	Area (sf)	CN	Description
	43,680	61	>75% Grass cover, Good, HSG B
*	11,750	98	
	55,430	69	Weighted Average
	43,680		78.80% Pervious Area
	11,750		21.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	190	0.0520	0.20		**Sheet Flow, 1 to 2**
					Grass: Dense n= 0.240 P2= 3.50"
0.4	119	0.4400	4.64		**Shallow Concentrated Flow, 2 to 3**
					Short Grass Pasture Kv= 7.0 fps
0.5	86	0.0230	3.08		**Shallow Concentrated Flow, 3 to End**
					Paved Kv= 20.3 fps
16.5	395	Total			

Subcatchment DA 1A: DA -1A



Summary for Subcatchment DA 2A: DA - 2A

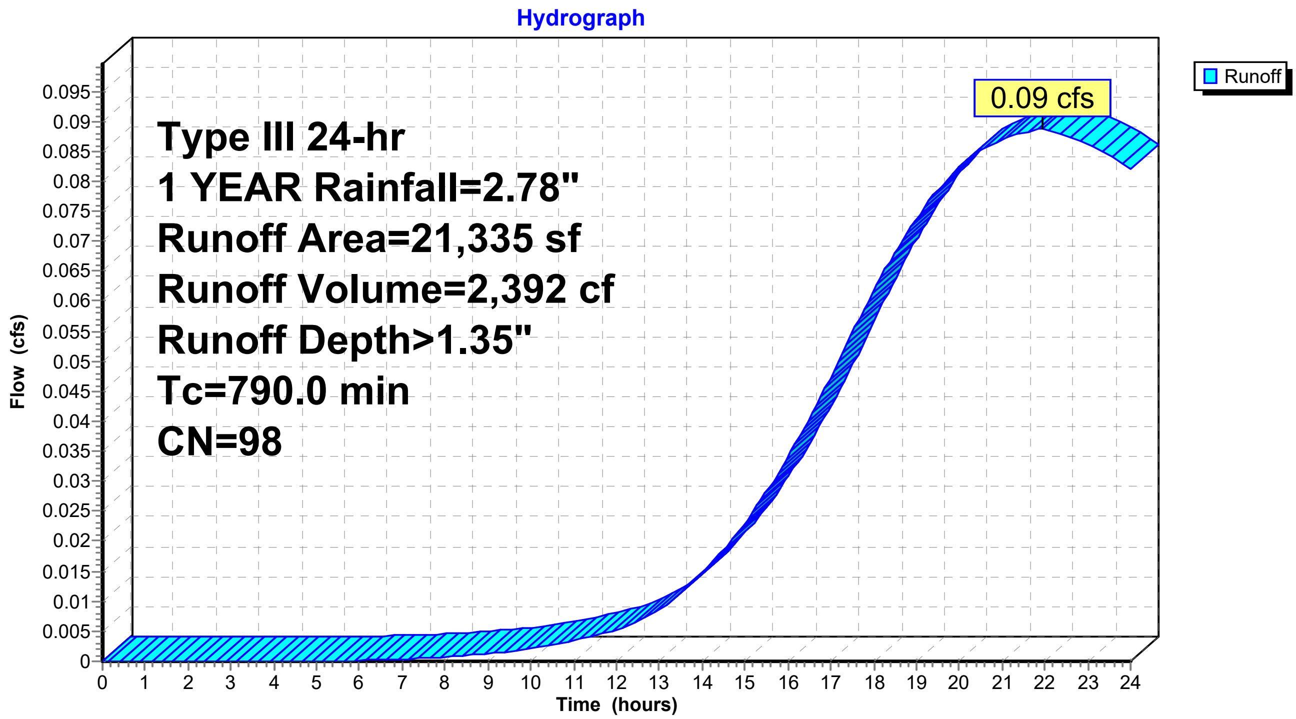
Runoff = 0.09 cfs @ 21.94 hrs, Volume= 2,392 cf, Depth> 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

Area (sf)	CN	Description
21,335	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
21,335	98	Weighted Average
21,335		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
790.0					**Direct Entry, Porous Pavment**

Subcatchment DA 2A: DA - 2A



Summary for Subcatchment DA 3A: DA - 3A

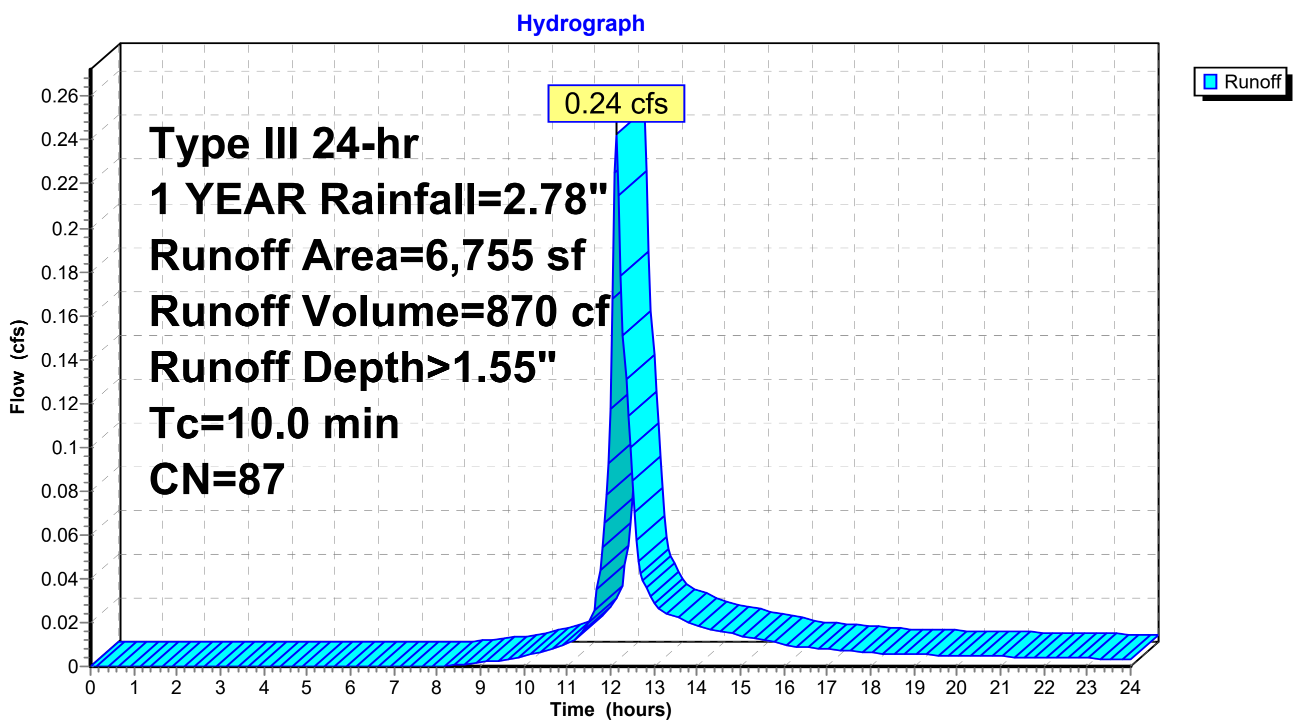
Runoff = 0.24 cfs @ 12.14 hrs, Volume= 870 cf, Depth> 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

Area (sf)	CN	Description
4,820	98	Unconnected roofs, HSG B
1,935	61	>75% Grass cover, Good, HSG B
6,755	87	Weighted Average
1,935		28.65% Pervious Area
4,820		71.35% Impervious Area
4,820		100.00% Unconnected

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

Subcatchment DA 3A: DA - 3A



Summary for Subcatchment DA 4A: DA - 4A

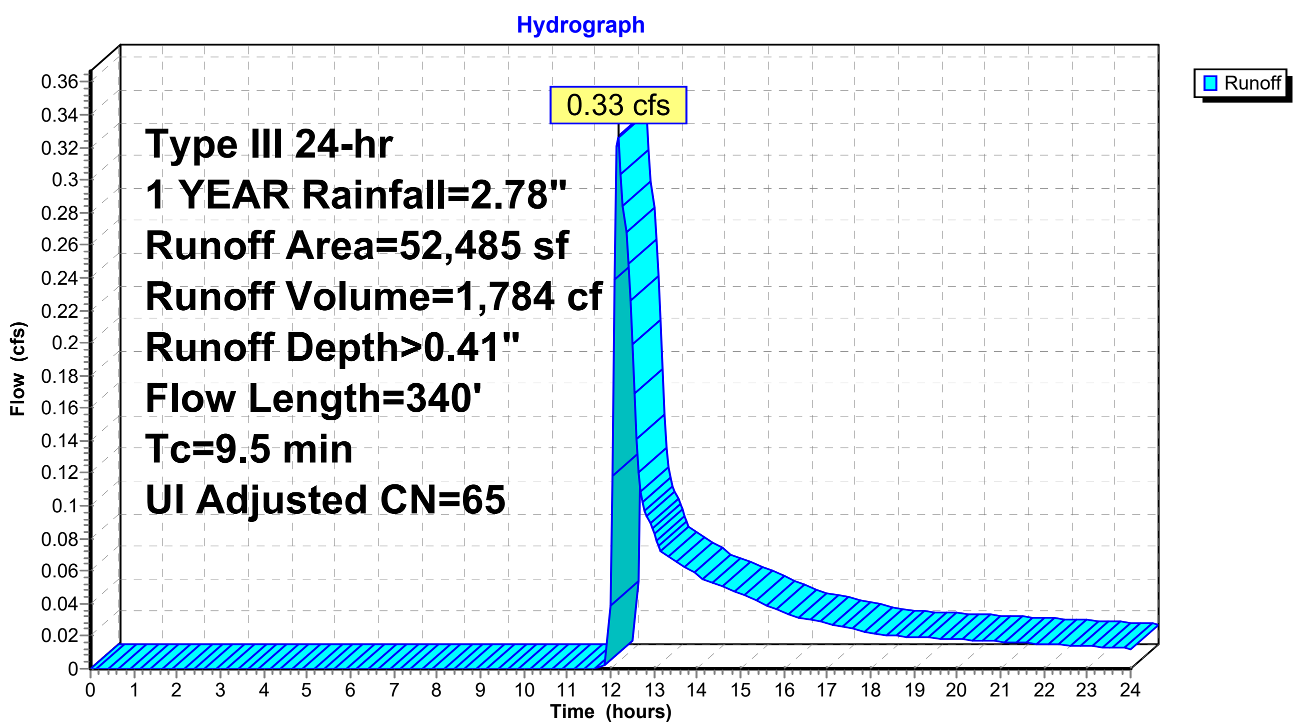
Runoff = 0.33 cfs @ 12.18 hrs, Volume= 1,784 cf, Depth> 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

Area (sf)	CN	Adj	Description
10,719	98		Unconnected roofs, HSG B
41,766	61		>75% Grass cover, Good, HSG B
52,485	69	65	Weighted Average, UI Adjusted
41,766			79.58% Pervious Area
10,719			20.42% Impervious Area
10,719			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0300	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
1.3	204	0.2800	2.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	36	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.5	340	Total			

Subcatchment DA 4A: DA - 4A



Summary for Subcatchment DA 5A: DA - 5A

[49] Hint: Tc<2dt may require smaller dt

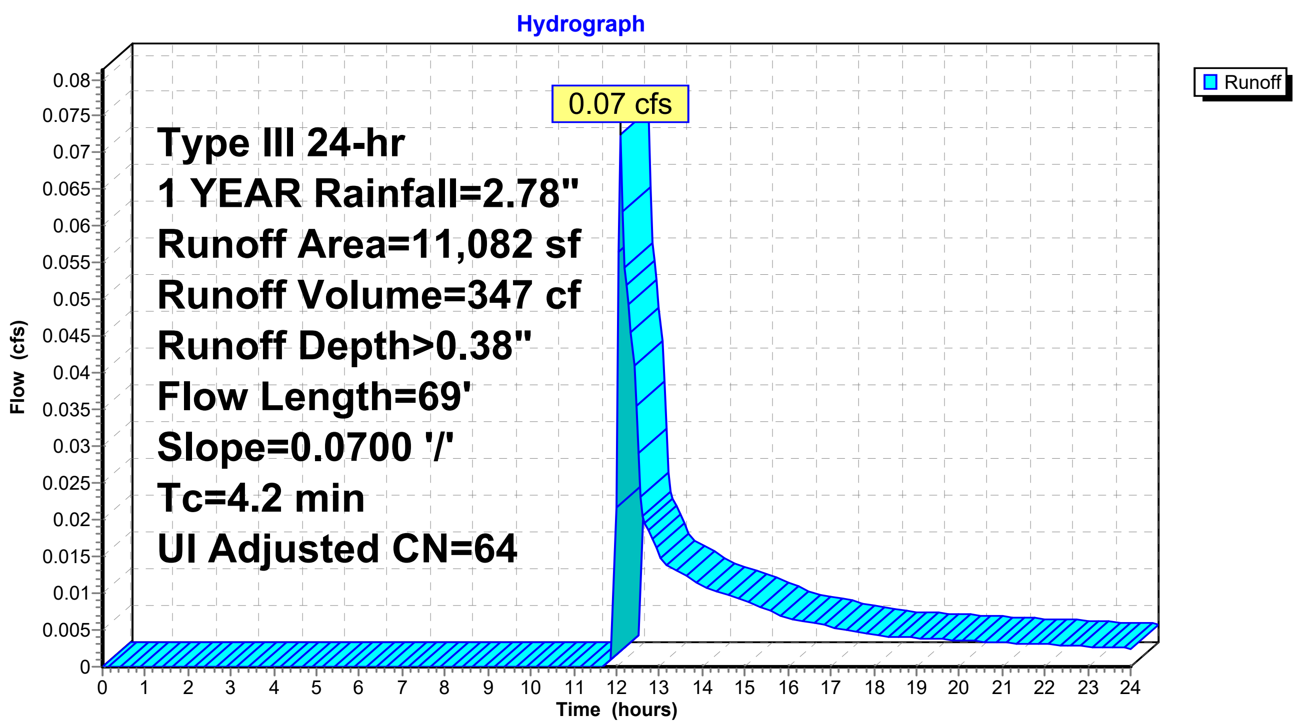
Runoff = 0.07 cfs @ 12.11 hrs, Volume= 347 cf, Depth> 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

Area (sf)	CN	Adj	Description
1,530	98		Unconnected roofs, HSG B
9,552	61		>75% Grass cover, Good, HSG B
11,082	66	64	Weighted Average, UI Adjusted
9,552			86.19% Pervious Area
1,530			13.81% Impervious Area
1,530			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	69	0.0700	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"

Subcatchment DA 5A: DA - 5A



Summary for Subcatchment DA 6A: DA - 6A

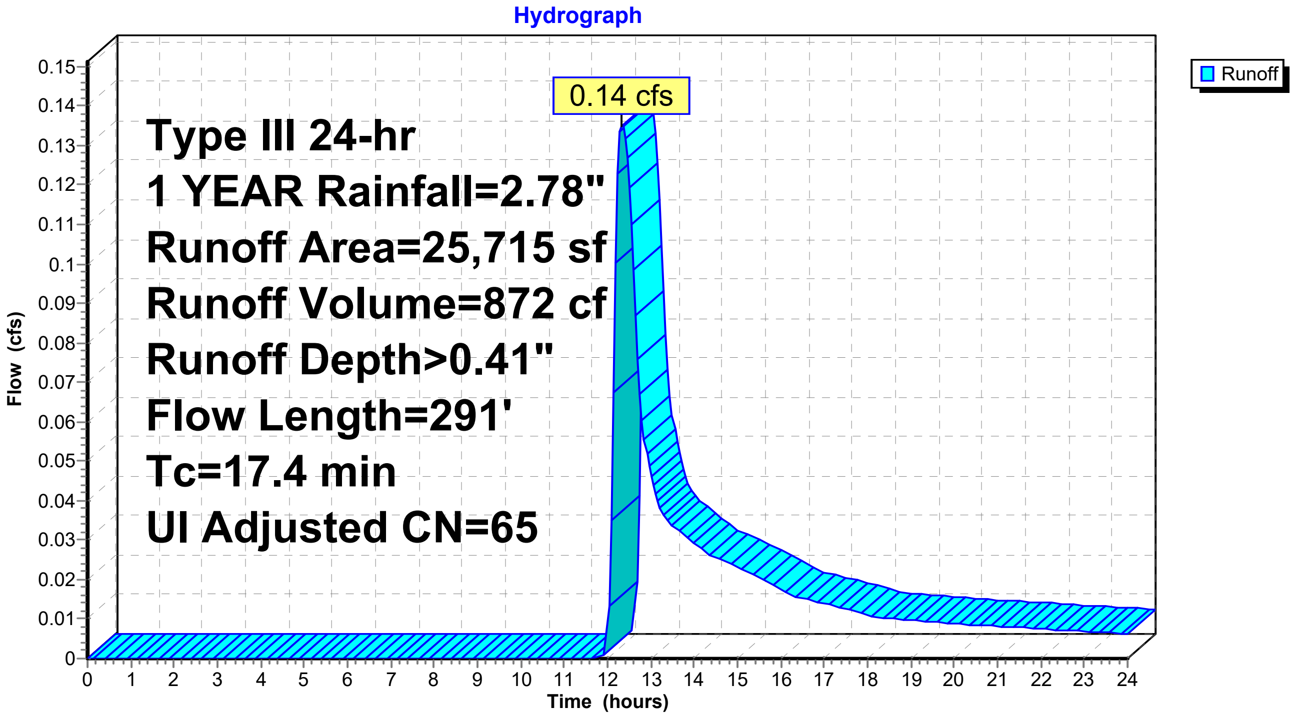
Runoff = 0.14 cfs @ 12.34 hrs, Volume= 872 cf, Depth> 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

Area (sf)	CN	Adj	Description
5,765	98		Unconnected roofs, HSG B
19,950	61		>75% Grass cover, Good, HSG B
25,715	69	65	Weighted Average, UI Adjusted
19,950			77.58% Pervious Area
5,765			22.42% Impervious Area
5,765			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	100	0.0400	0.11		**Sheet Flow,**
					Woods: Light underbrush n= 0.400 P2= 3.50"
0.5	102	0.5700	3.77		**Shallow Concentrated Flow,**
					Woodland Kv= 5.0 fps
1.1	60	0.0160	0.89		**Shallow Concentrated Flow,**
					Short Grass Pasture Kv= 7.0 fps
0.2	29	0.0150	2.49		**Shallow Concentrated Flow,**
					Paved Kv= 20.3 fps
17.4	291	Total			

Subcatchment DA 6A: DA - 6A



Summary for Subcatchment DA 7A: DA - 7A

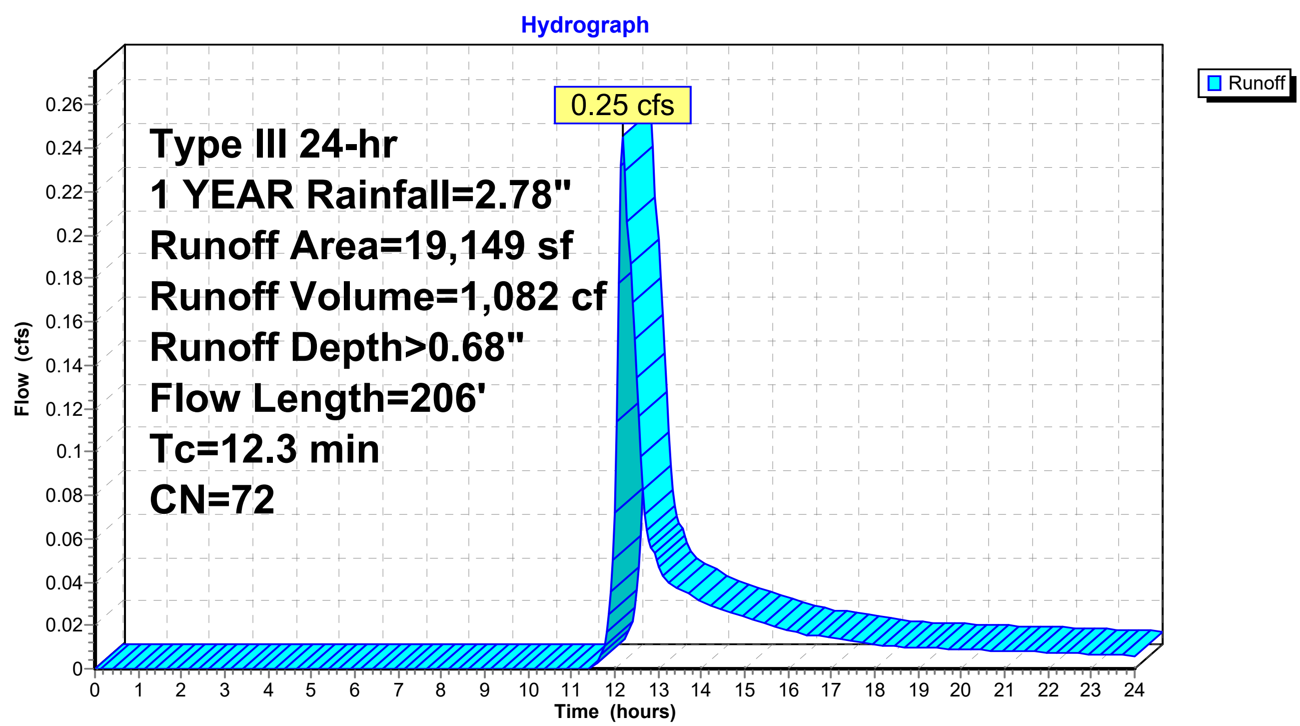
Runoff = 0.25 cfs @ 12.20 hrs, Volume= 1,082 cf, Depth> 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

Area (sf)	CN	Description
5,897	98	Unconnected roofs, HSG B
13,252	61	>75% Grass cover, Good, HSG B
19,149	72	Weighted Average
13,252		69.20% Pervious Area
5,897		30.80% Impervious Area
5,897		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	100	0.0800	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	80	0.6600	4.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	26	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.3	206	Total			

Subcatchment DA 7A: DA - 7A



Summary for Subcatchment DA 8A: DA - 8A

[49] Hint: Tc<2dt may require smaller dt

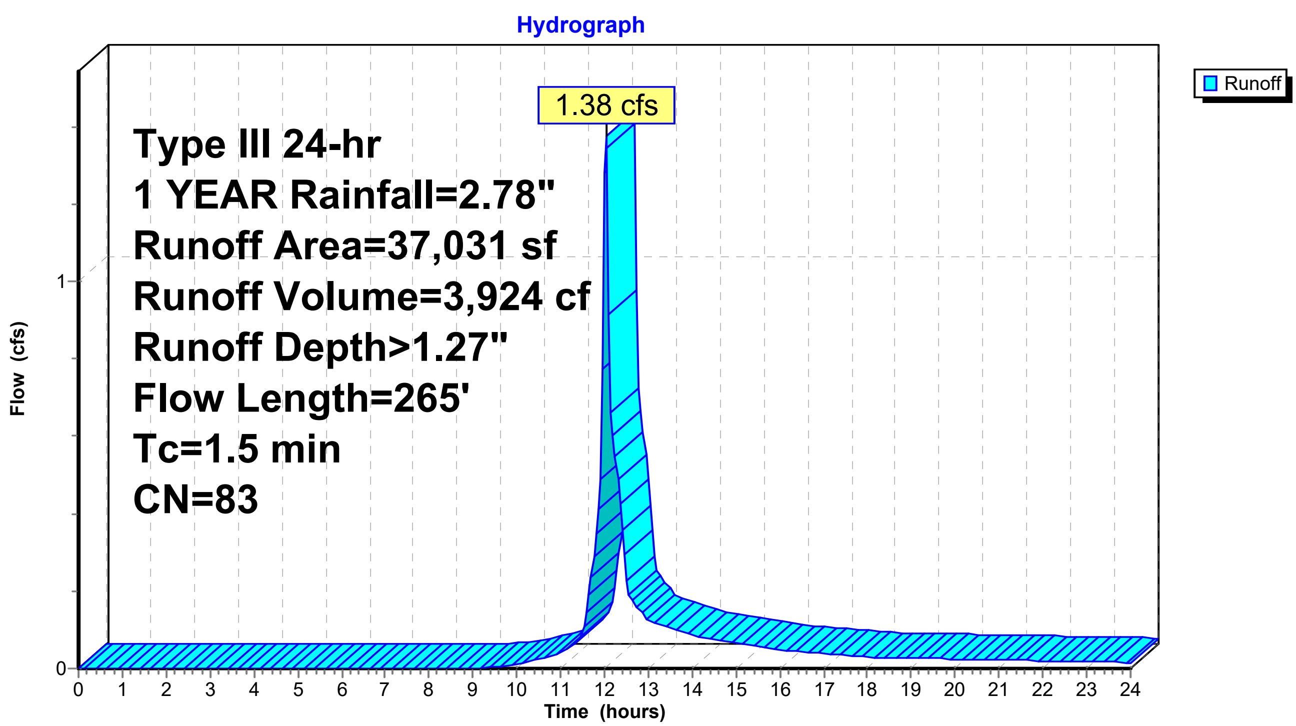
Runoff = 1.38 cfs @ 12.03 hrs, Volume= 3,924 cf, Depth> 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

	Area (sf)	CN	Description
	14,803	61	>75% Grass cover, Good, HSG B
*	22,228	98	Paved
	37,031	83	Weighted Average
	14,803		39.97% Pervious Area
	22,228		60.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	100	0.6300	3.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	165	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	265	Total			

Subcatchment DA 8A: DA - 8A



Summary for Subcatchment DA 9A: DA - 9A

[49] Hint: Tc<2dt may require smaller dt

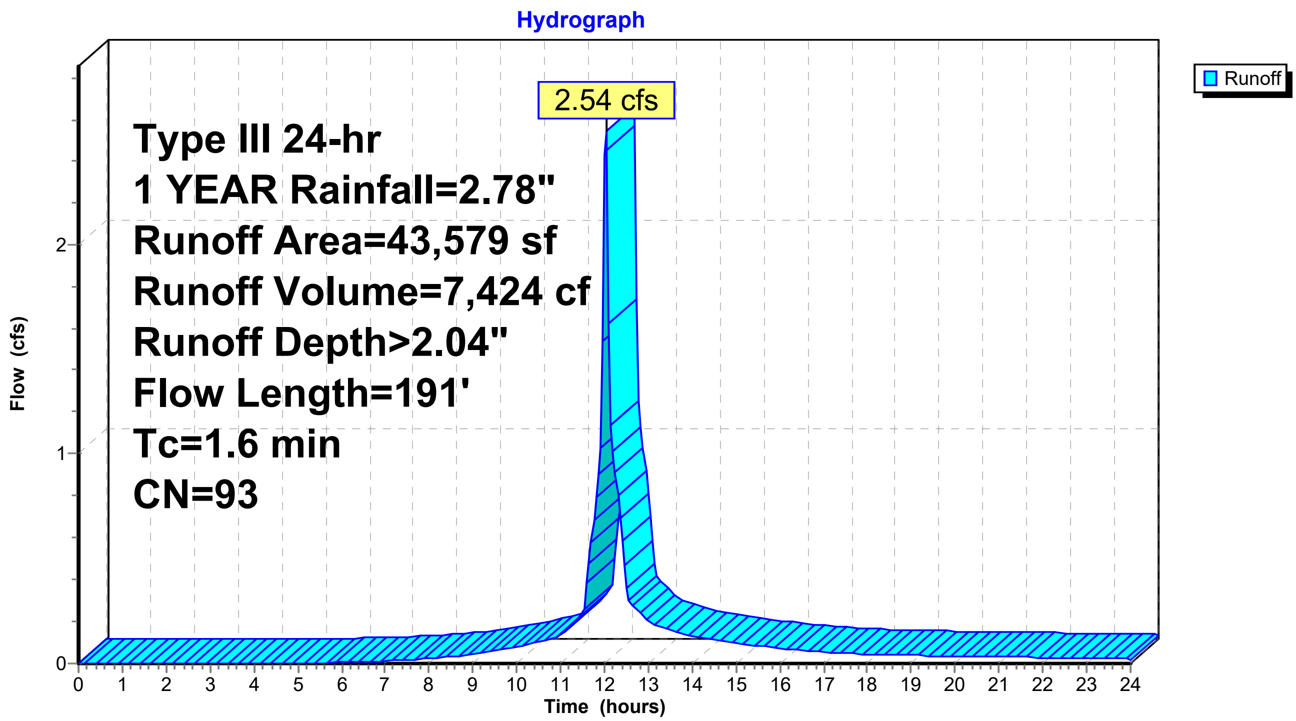
Runoff = 2.54 cfs @ 12.03 hrs, Volume= 7,424 cf, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

Area (sf)	CN	Description
5,822	61	>75% Grass cover, Good, HSG B
37,757	98	Paved parking, HSG B
43,579	93	Weighted Average
5,822		13.36% Pervious Area
37,757		86.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0380	1.86		**Sheet Flow, 1 to 2**
					Smooth surfaces n= 0.011 P2= 3.50"
0.7	91	0.0100	2.03		**Shallow Concentrated Flow, 2 to end**
					Paved Kv= 20.3 fps
1.6	191	Total			

Subcatchment DA 9A: DA - 9A



Summary for Subcatchment RG 1: Roof Area 1

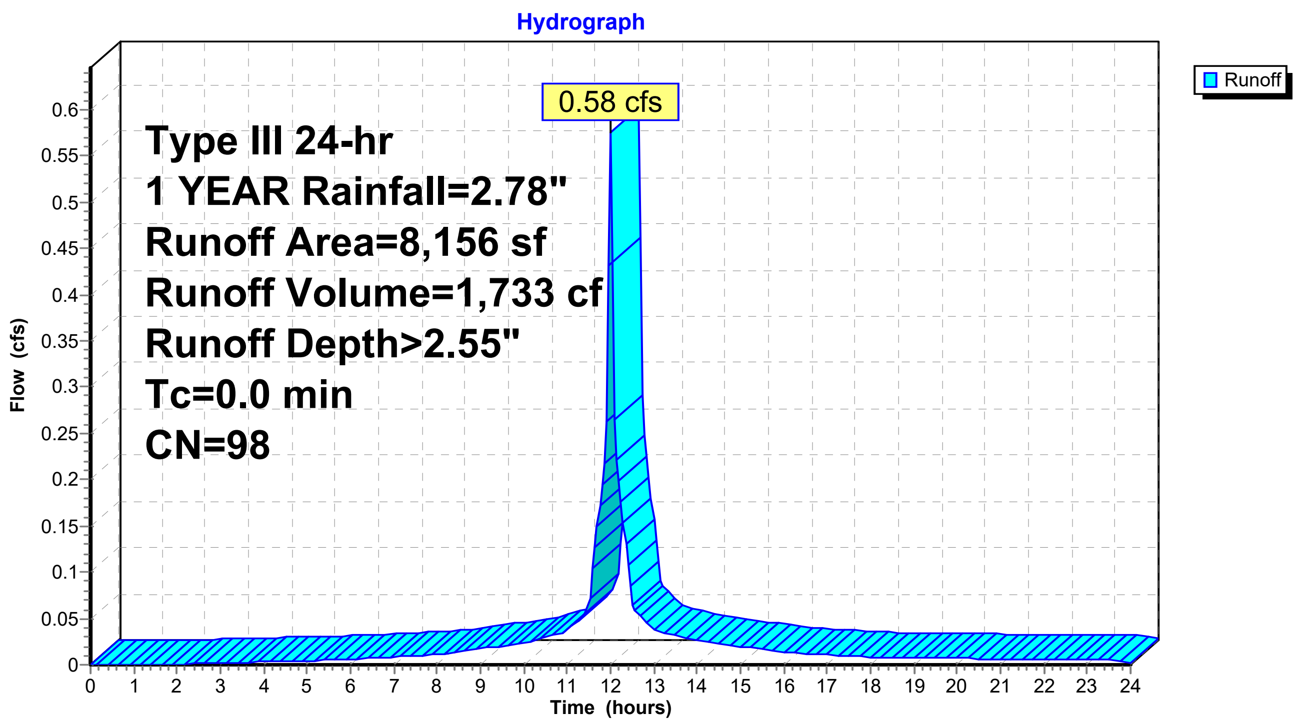
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.58 cfs @ 12.00 hrs, Volume= 1,733 cf, Depth> 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

Area (sf)	CN	Description
8,156	98	Unconnected pavement, HSG B
8,156		100.00% Impervious Area
8,156		100.00% Unconnected

Subcatchment RG 1: Roof Area 1



Summary for Subcatchment RG 2: Roof Area 2

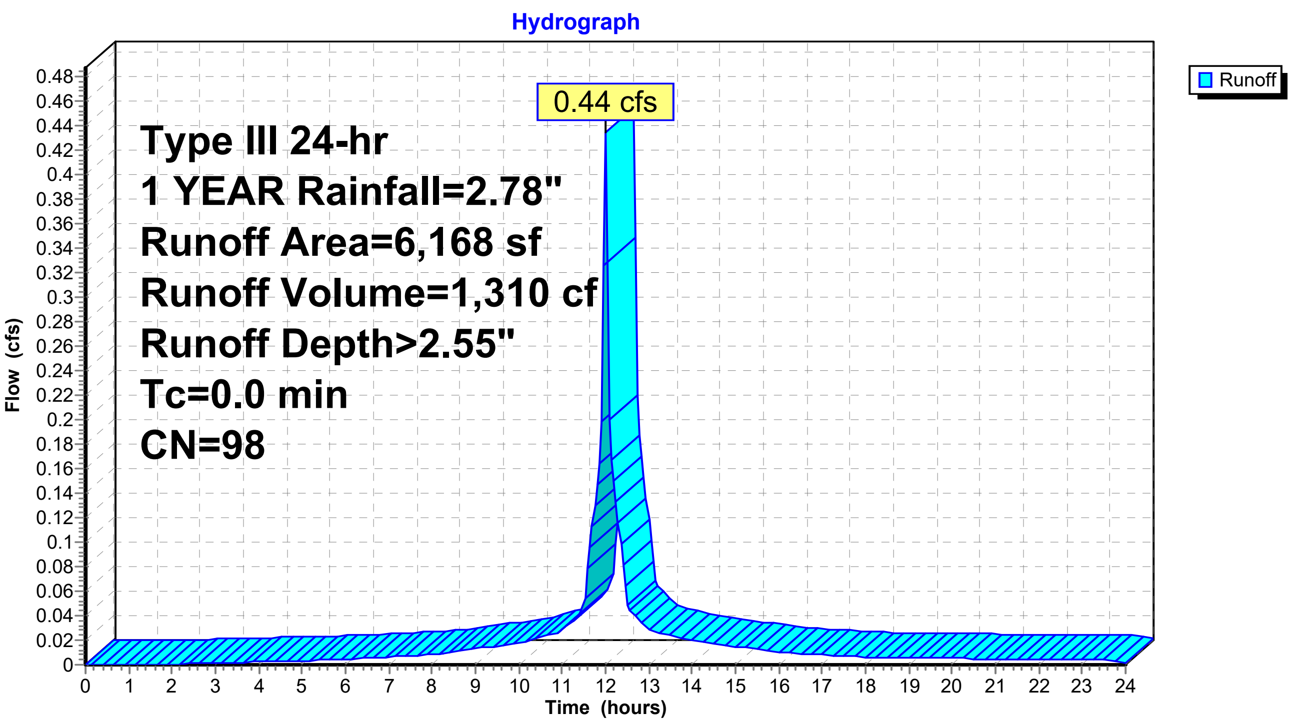
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.44 cfs @ 12.00 hrs, Volume= 1,310 cf, Depth> 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

Area (sf)	CN	Description
6,168	98	Unconnected pavement, HSG B
6,168		100.00% Impervious Area
6,168		100.00% Unconnected

Subcatchment RG 2: Roof Area 2



Summary for Subcatchment WR: BUILDING ROOF

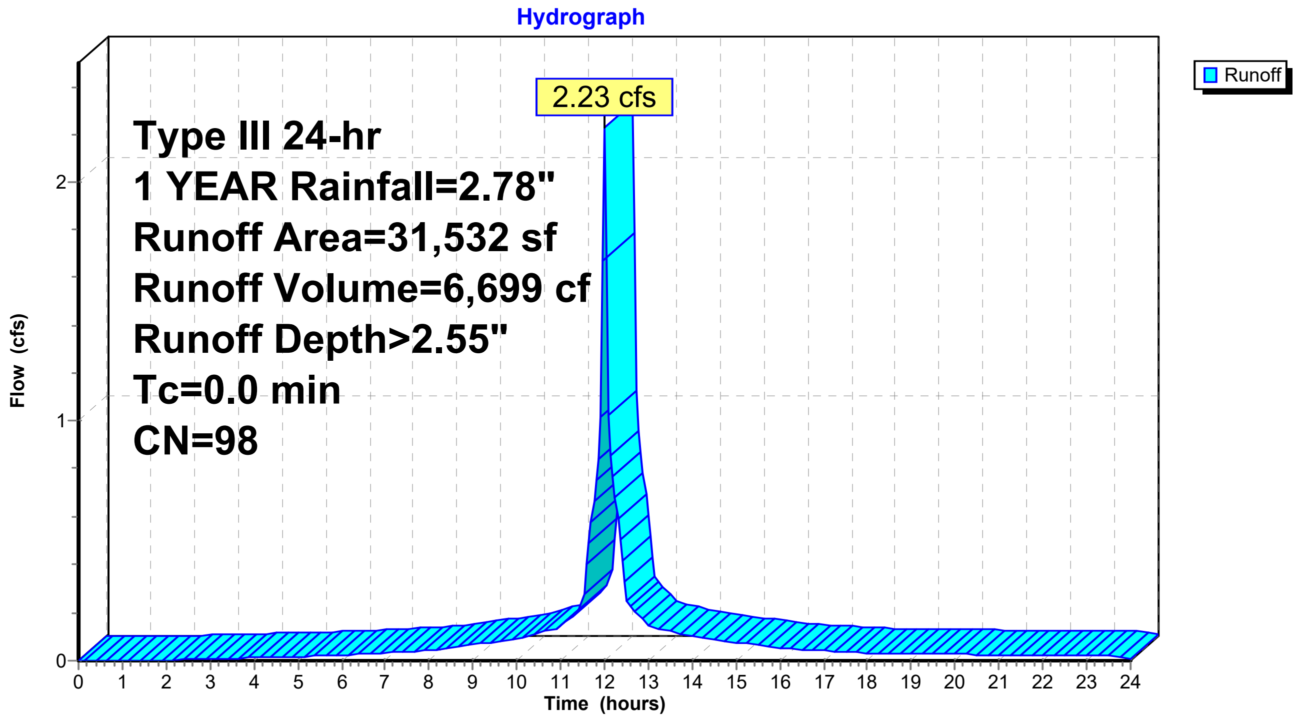
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 2.23 cfs @ 12.00 hrs, Volume= 6,699 cf, Depth> 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

Area (sf)	CN	Description
31,532	98	Unconnected pavement, HSG B
31,532		100.00% Impervious Area
31,532		100.00% Unconnected

Subcatchment WR: BUILDING ROOF



Summary for Pond AS-10: Aqua Swirl AS-10

[57] Hint: Peaked at 1.80' (Flood elevation advised)

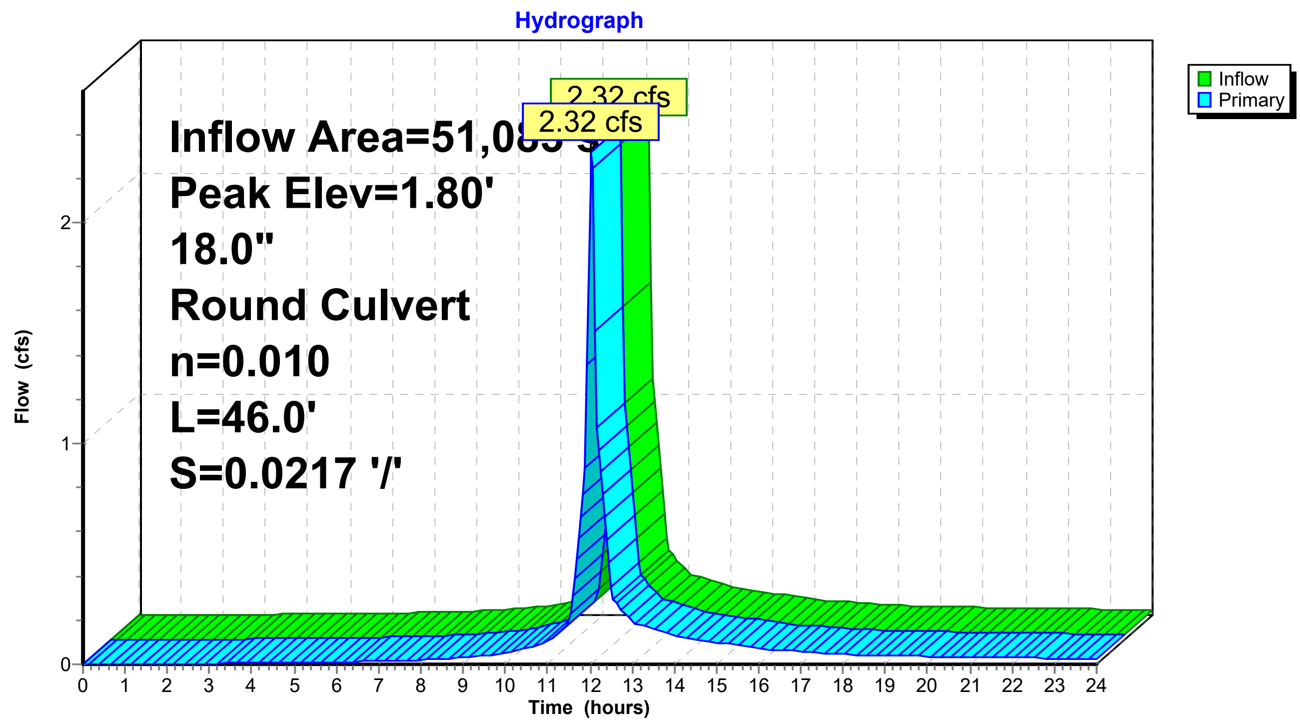
Inflow Area =	51,083 sf, 71.02% Impervious,	Inflow Depth > 1.62"	for 1 YEAR event
Inflow =	2.32 cfs @ 12.03 hrs,	Volume=	6,909 cf
Outflow =	2.32 cfs @ 12.03 hrs,	Volume=	6,909 cf, Atten= 0%, Lag= 0.0 min
Primary =	2.32 cfs @ 12.03 hrs,	Volume=	6,909 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1.80' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1.00'	**18.0" Round Culvert** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1.00' / 0.00' S= 0.0217 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=2.22 cfs @ 12.03 hrs HW=1.78' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.22 cfs @ 2.38 fps)

Pond AS-10: Aqua Swirl AS-10



Summary for Pond AS-6: Aqua Swirl AS-6

[57] Hint: Peaked at 1.29' (Flood elevation advised)

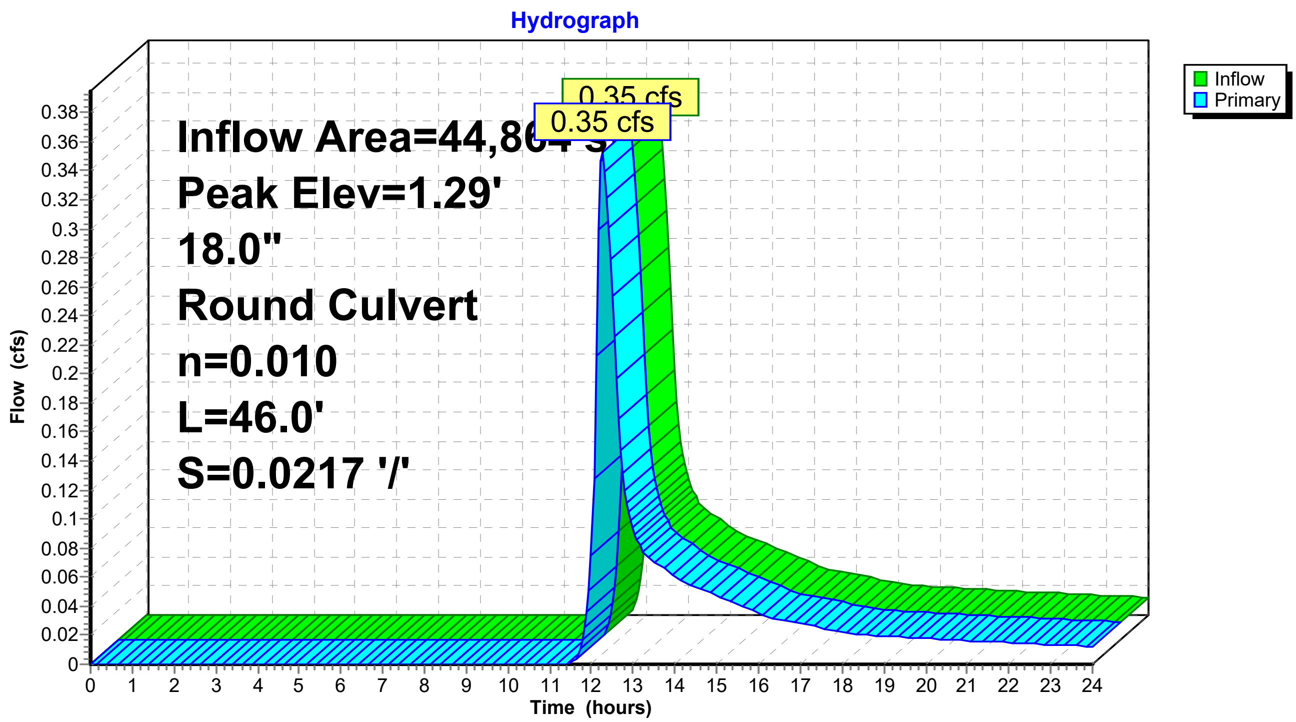
Inflow Area =	44,864 sf, 25.99% Impervious, Inflow Depth > 0.52"	for 1 YEAR event
Inflow =	0.35 cfs @ 12.24 hrs, Volume=	1,954 cf
Outflow =	0.35 cfs @ 12.24 hrs, Volume=	1,954 cf, Atten= 0%, Lag= 0.0 min
Primary =	0.35 cfs @ 12.24 hrs, Volume=	1,954 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1.29' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1.00'	**18.0" Round Culvert** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1.00' / 0.00' S= 0.0217 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.35 cfs @ 12.24 hrs HW=1.29' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.35 cfs @ 1.45 fps)

Pond AS-6: Aqua Swirl AS-6



Summary for Pond AS-9: Aqua Swirl AS-9

[57] Hint: Peaked at 6.83' (Flood elevation advised)

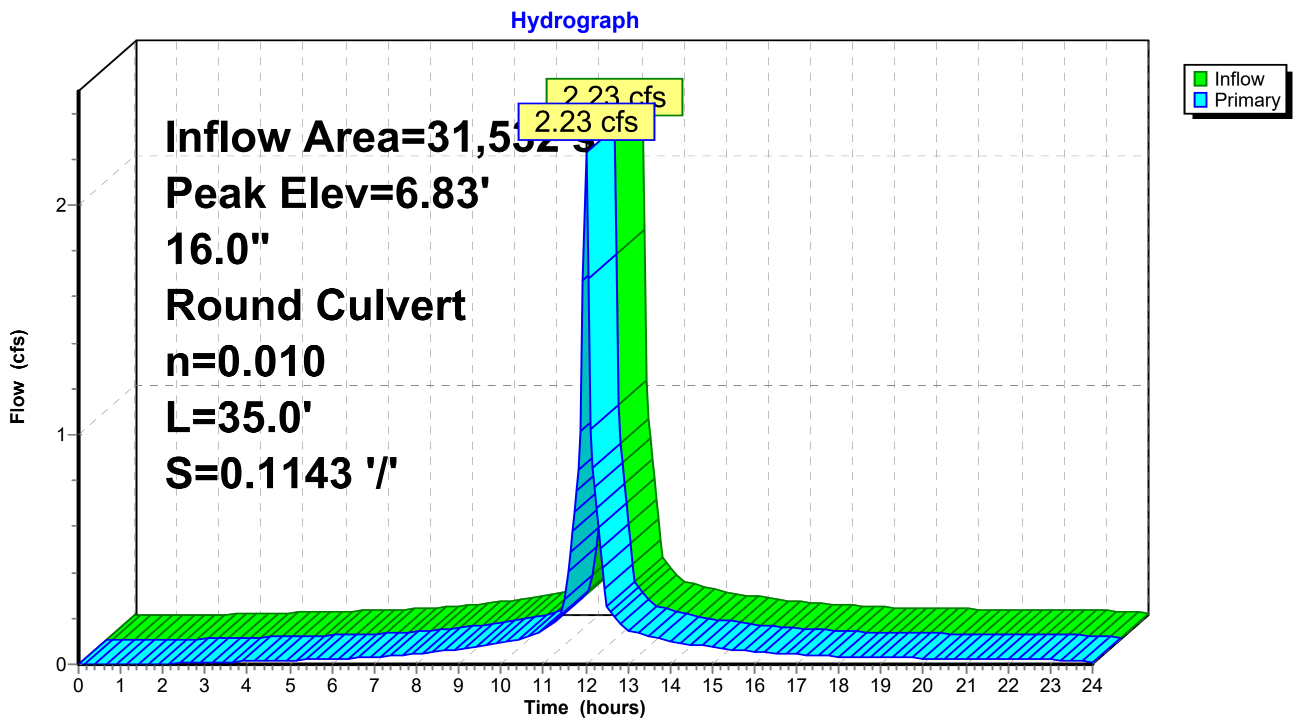
Inflow Area =	31,532 sf,100.00% Impervious,	Inflow Depth > 2.55"	for 1 YEAR event
Inflow =	2.23 cfs @ 12.00 hrs,	Volume=	6,699 cf
Outflow =	2.23 cfs @ 12.00 hrs,	Volume=	6,699 cf, Atten= 0%, Lag= 0.0 min
Primary =	2.23 cfs @ 12.00 hrs,	Volume=	6,699 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 6.83' @ 12.00 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	6.00'	**16.0" Round Culvert** L= 35.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 6.00' / 2.00' S= 0.1143 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.40 sf

Primary OutFlow Max=2.22 cfs @ 12.00 hrs HW=6.83' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 2.22 cfs @ 2.44 fps)

Pond AS-9: Aqua Swirl AS-9



Summary for Pond CB1: CB-1

[57] Hint: Peaked at 9.31' (Flood elevation advised)

Inflow Area = 2,436 sf,100.00% Impervious, Inflow Depth > 2.55" for 1 YEAR event
Inflow = 0.17 cfs @ 12.01 hrs, Volume= 517 cf
Outflow = 0.17 cfs @ 12.01 hrs, Volume= 517 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.17 cfs @ 12.01 hrs, Volume= 517 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

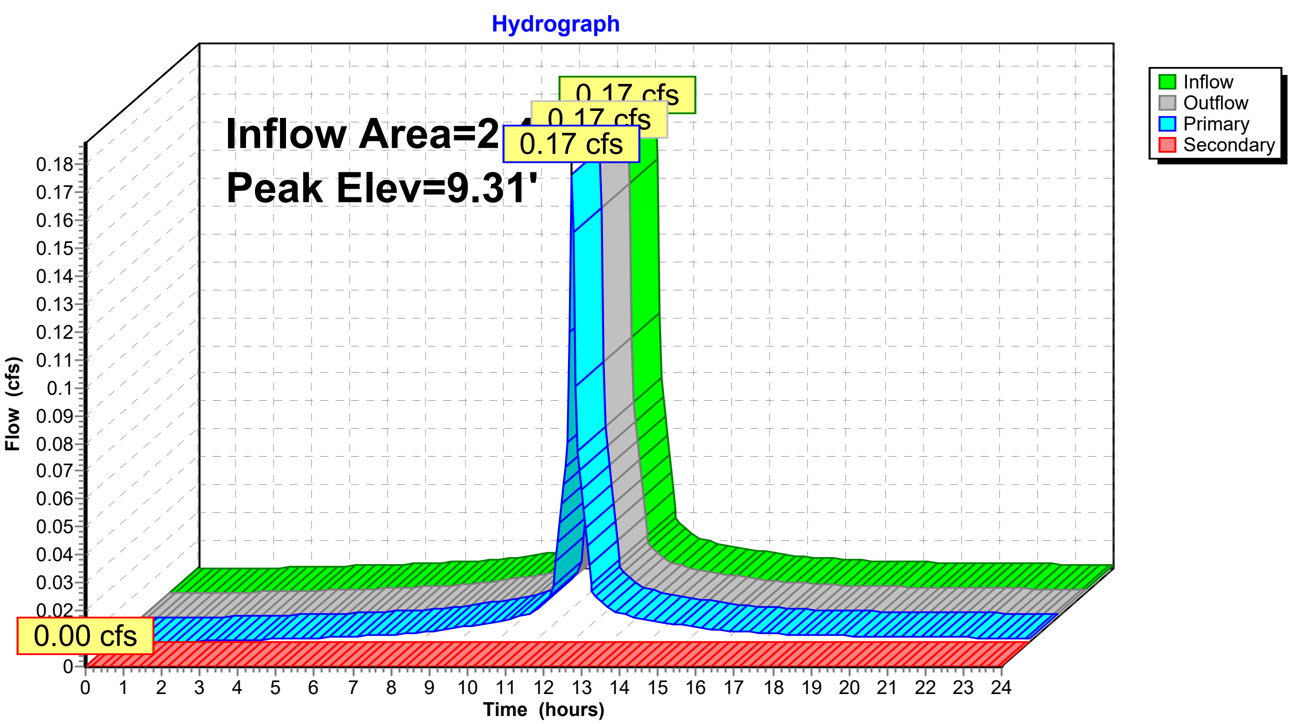
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 9.31' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	9.10'	**16.0" Round Culvert** L= 443.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.10' / 4.69' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.40 sf
#2	Secondary	11.90'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.16 cfs @ 12.01 hrs HW=9.30' TW=4.93' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.16 cfs @ 1.21 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=9.10' TW=4.55' (Dynamic Tailwater)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond CB1: CB-1



Summary for Pond CB12: CB-12

[57] Hint: Peaked at 6.31' (Flood elevation advised)

Inflow Area =	19,149 sf, 30.80% Impervious,	Inflow Depth > 0.68"	for 1 YEAR event
Inflow =	0.25 cfs @ 12.20 hrs, Volume=	1,082 cf	
Outflow =	0.25 cfs @ 12.20 hrs, Volume=	1,082 cf, Atten= 0%, Lag= 0.0 min	
Primary =	0.25 cfs @ 12.20 hrs, Volume=	1,082 cf	
Secondary =	0.00 cfs @ 0.00 hrs, Volume=	0 cf	

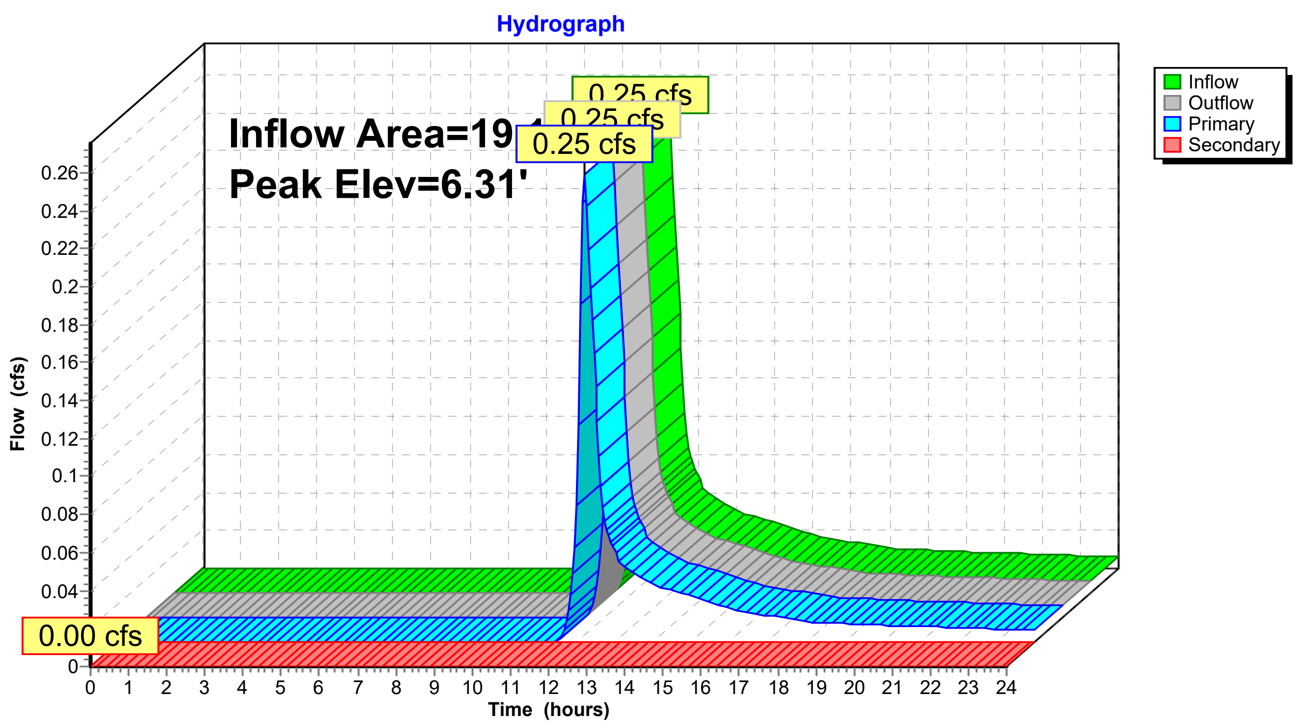
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 6.31' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	6.05'	**15.0" Round Culvert** L= 93.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 6.05' / 5.10' S= 0.0102 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf
#2	Secondary	9.65'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.25 cfs @ 12.20 hrs HW=6.31' TW=5.31' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.25 cfs @ 1.36 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6.05' TW=5.00' (Dynamic Tailwater)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond CB12: CB-12



Summary for Pond CB13: CB-13

[57] Hint: Peaked at 5.31' (Flood elevation advised)

Inflow Area =	44,864 sf, 25.99% Impervious,	Inflow Depth > 0.52"	for 1 YEAR event
Inflow =	0.35 cfs @ 12.24 hrs, Volume=	1,954 cf	
Outflow =	0.35 cfs @ 12.24 hrs, Volume=	1,954 cf, Atten= 0%, Lag= 0.0 min	
Primary =	0.35 cfs @ 12.24 hrs, Volume=	1,954 cf	
Secondary =	0.00 cfs @ 0.00 hrs, Volume=	0 cf	

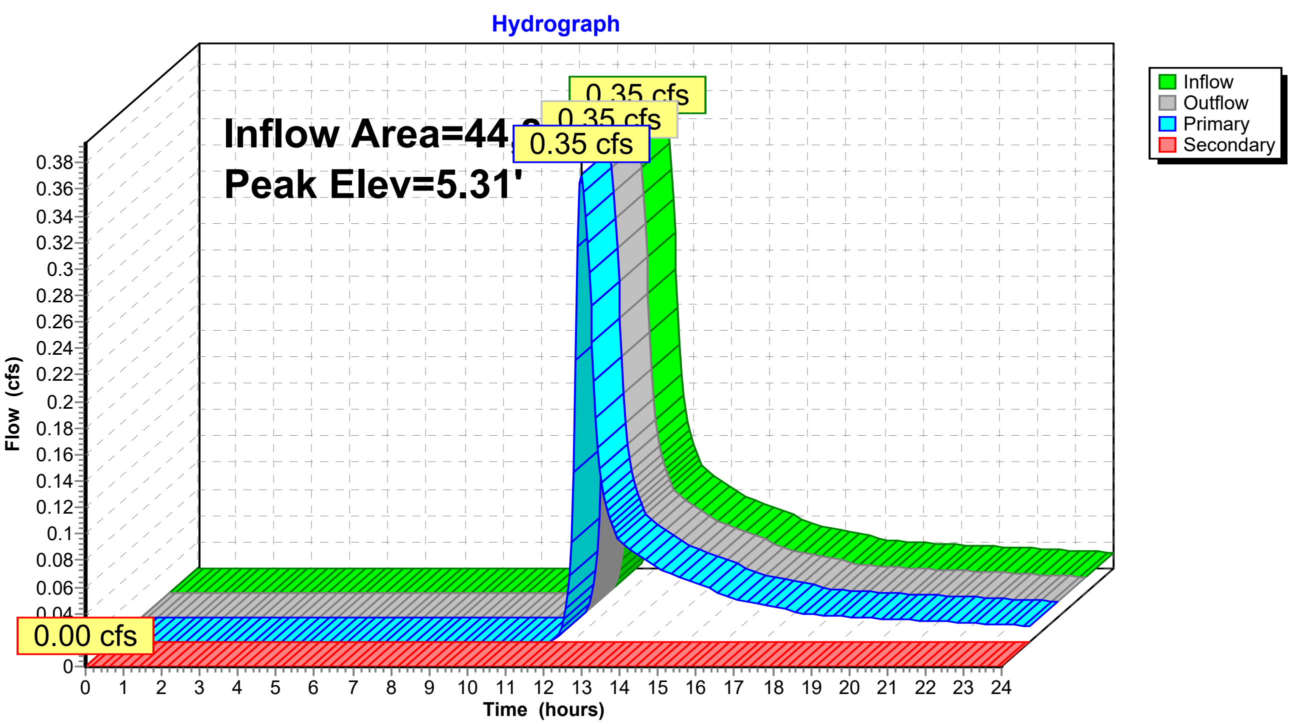
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 5.31' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5.00'	**15.0" Round Culvert** L= 235.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 5.00' / 1.95' S= 0.0130 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf
#2	Secondary	8.53'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.35 cfs @ 12.24 hrs HW=5.31' TW=1.29' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.35 cfs @ 1.49 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=5.00' TW=1.00' (Dynamic Tailwater)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond CB13: CB-13



Summary for Pond CB19: CB-19

[57] Hint: Peaked at 4.35' (Flood elevation advised)

Inflow Area =	43,579 sf, 86.64% Impervious,	Inflow Depth > 2.04"	for 1 YEAR event
Inflow =	2.54 cfs @ 12.03 hrs, Volume=	7,424 cf	
Outflow =	2.54 cfs @ 12.03 hrs, Volume=	7,424 cf, Atten= 0%, Lag= 0.0 min	
Primary =	2.54 cfs @ 12.03 hrs, Volume=	7,424 cf	
Secondary =	0.00 cfs @ 0.00 hrs, Volume=	0 cf	

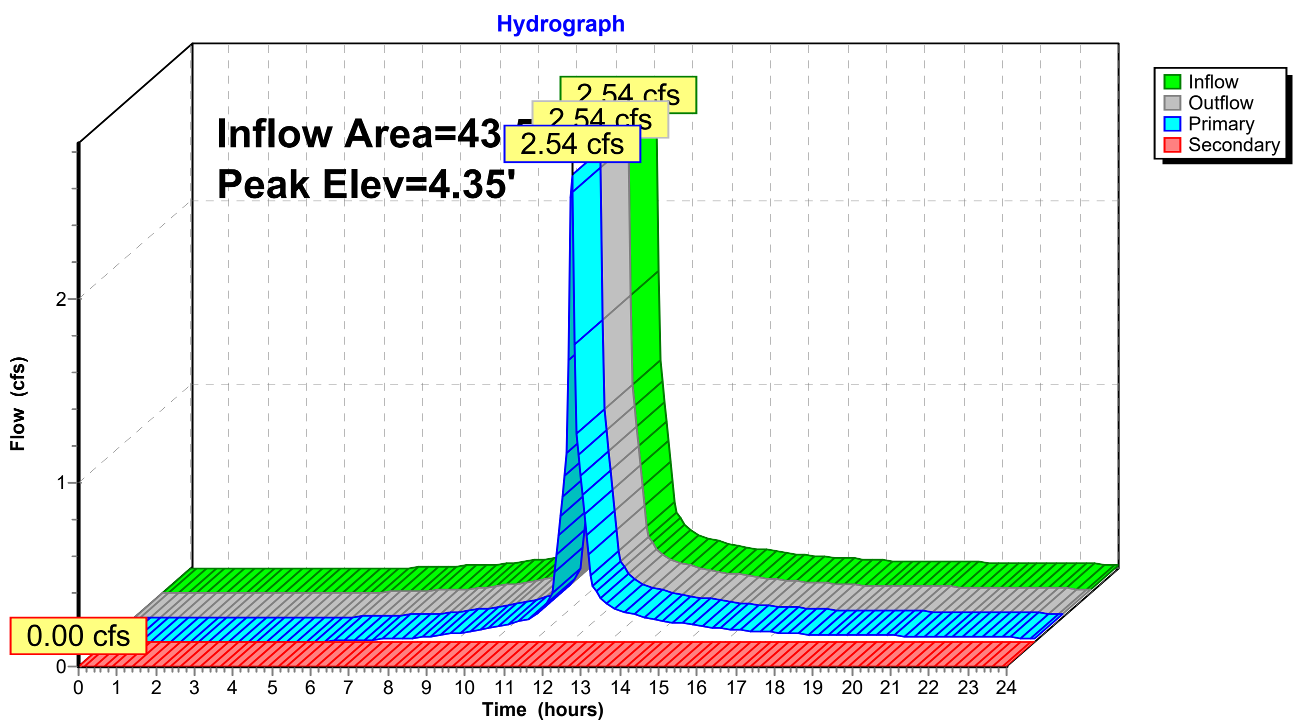
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 4.35' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	3.50'	**18.0" Round Culvert** L= 32.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 3.50' / 3.20' S= 0.0094 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#2	Secondary	5.50'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.44 cfs @ 12.03 hrs HW=4.33' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 2.44 cfs @ 2.44 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.50' TW=0.00' (Dynamic Tailwater)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond CB19: CB-19



Summary for Pond CB4: CB-4

[57] Hint: Peaked at 4.94' (Flood elevation advised)

Inflow Area = 8,604 sf,100.00% Impervious, Inflow Depth > 2.55" for 1 YEAR event
Inflow = 0.58 cfs @ 12.02 hrs, Volume= 1,828 cf
Outflow = 0.58 cfs @ 12.02 hrs, Volume= 1,828 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.58 cfs @ 12.02 hrs, Volume= 1,828 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

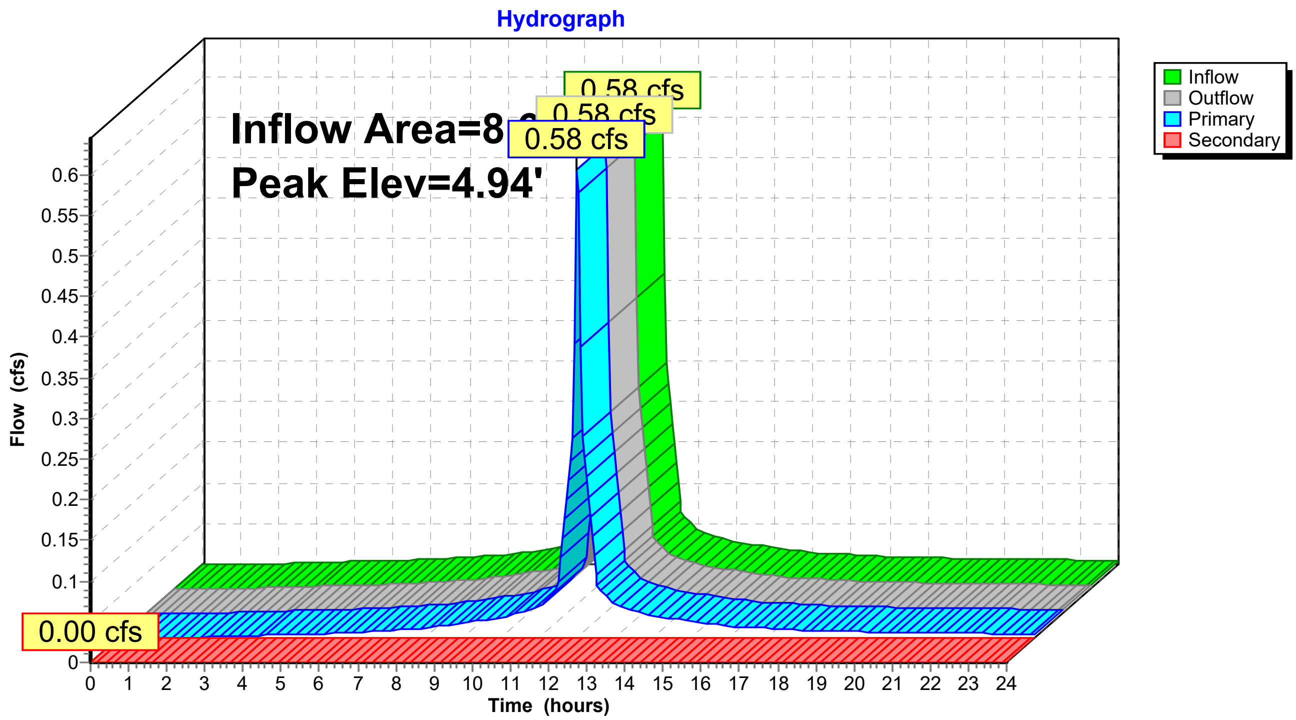
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 4.94' @ 12.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	4.55'	**16.0" Round Culvert** L= 156.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 4.55' / 2.99' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.40 sf
#2	Secondary	8.52'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.55 cfs @ 12.02 hrs HW=4.93' TW=3.39' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.55 cfs @ 1.66 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=4.55' TW=2.89' (Dynamic Tailwater)
2=Orifice/Grate (Controls 0.00 cfs)

Pond CB4: CB-4



Summary for Pond CB5: CB-5

[57] Hint: Peaked at 3.40' (Flood elevation advised)

Inflow Area = 14,052 sf,100.00% Impervious, Inflow Depth > 2.55" for 1 YEAR event
Inflow = 0.94 cfs @ 12.03 hrs, Volume= 2,985 cf
Outflow = 0.94 cfs @ 12.03 hrs, Volume= 2,985 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.94 cfs @ 12.03 hrs, Volume= 2,985 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

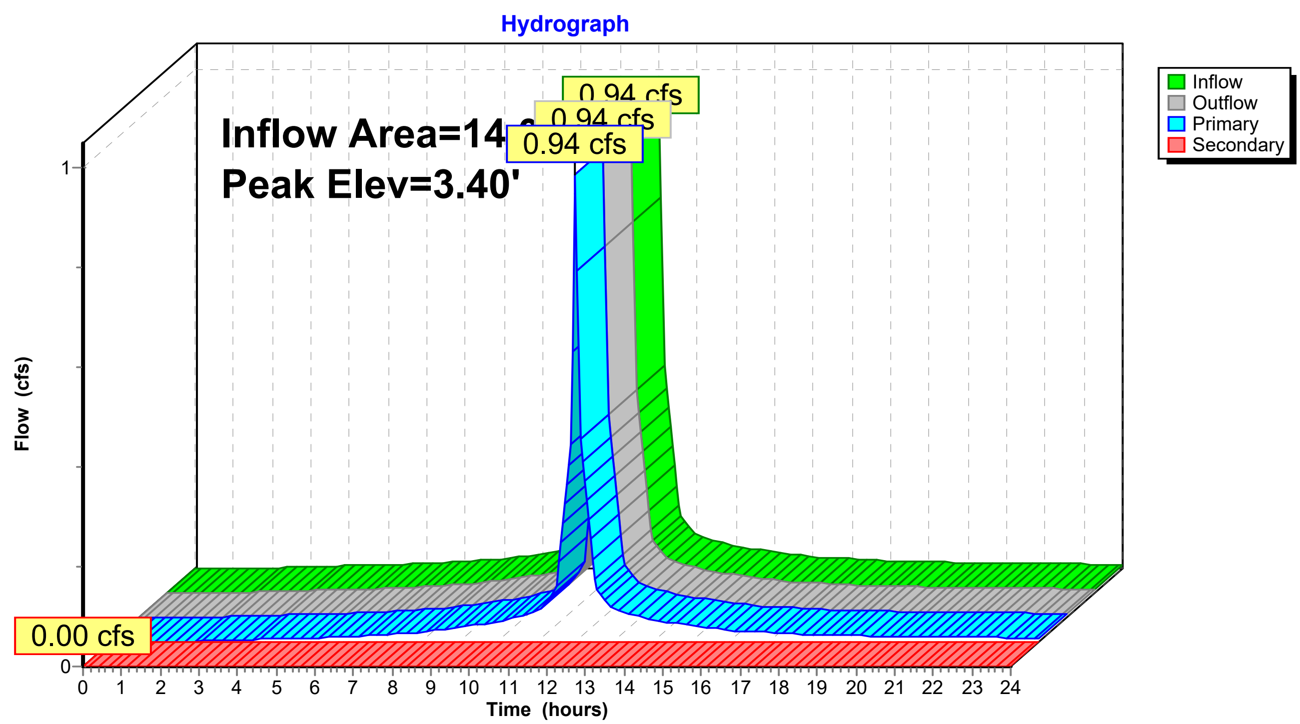
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 3.40' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	2.89'	**16.0" Round Culvert** L= 128.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2.89' / 1.66' S= 0.0096 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.40 sf
#2	Secondary	8.34'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.90 cfs @ 12.03 hrs HW=3.39' TW=2.40' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.90 cfs @ 1.89 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.89' TW=1.56' (Dynamic Tailwater)
2=Orifice/Grate (Controls 0.00 cfs)

Pond CB5: CB-5



Summary for Pond CB8: CB-8

[57] Hint: Peaked at 2.42' (Flood elevation advised)

Inflow Area =	51,083 sf, 71.02% Impervious,	Inflow Depth > 1.62"	for 1 YEAR event
Inflow =	2.32 cfs @ 12.03 hrs, Volume=	6,909 cf	
Outflow =	2.32 cfs @ 12.03 hrs, Volume=	6,909 cf, Atten= 0%, Lag= 0.0 min	
Primary =	2.32 cfs @ 12.03 hrs, Volume=	6,909 cf	
Secondary =	0.00 cfs @ 0.00 hrs, Volume=	0 cf	

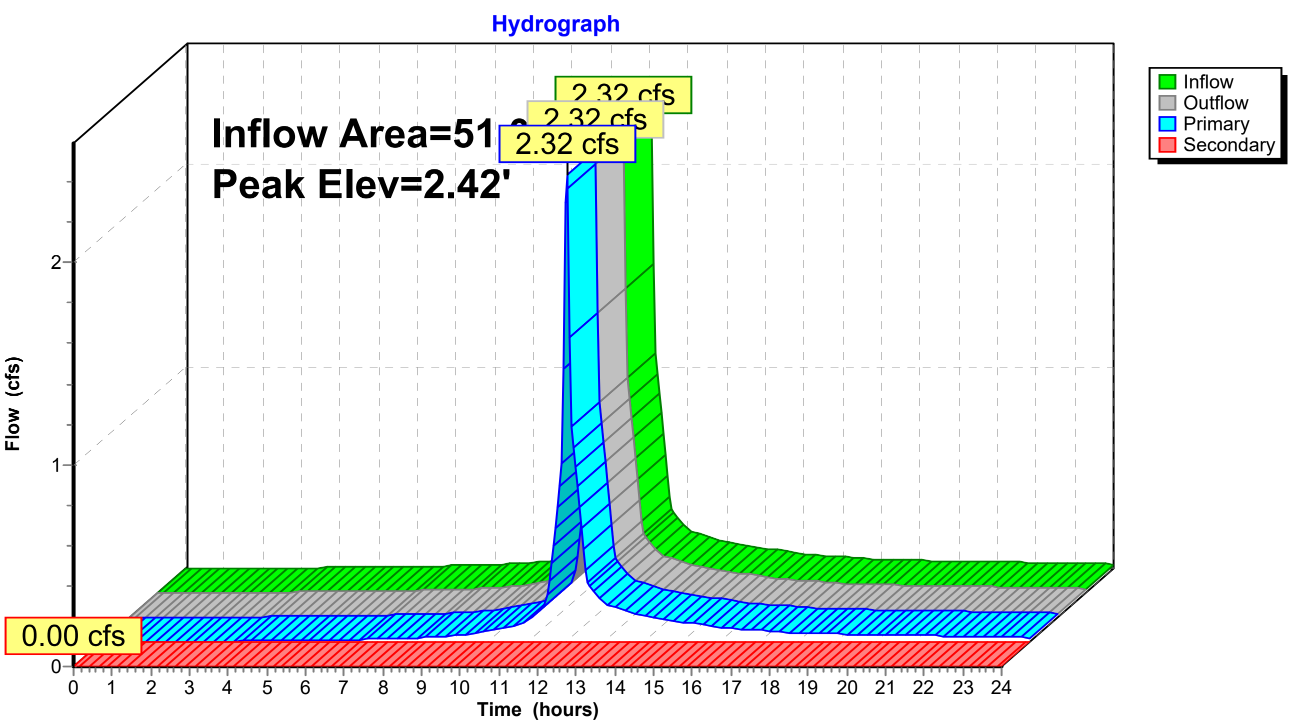
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2.42' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1.56'	**18.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1.56' / 1.46' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#2	Secondary	8.34'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.22 cfs @ 12.03 hrs HW=2.40' TW=1.78' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 2.22 cfs @ 3.14 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1.56' TW=1.00' (Dynamic Tailwater)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond CB8: CB-8



Summary for Pond CB9: CB-9

[57] Hint: Peaked at 4.33' (Flood elevation advised)

Inflow Area = 37,031 sf, 60.03% Impervious, Inflow Depth > 1.27" for 1 YEAR event
Inflow = 1.38 cfs @ 12.03 hrs, Volume= 3,924 cf
Outflow = 1.38 cfs @ 12.03 hrs, Volume= 3,924 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.38 cfs @ 12.03 hrs, Volume= 3,924 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

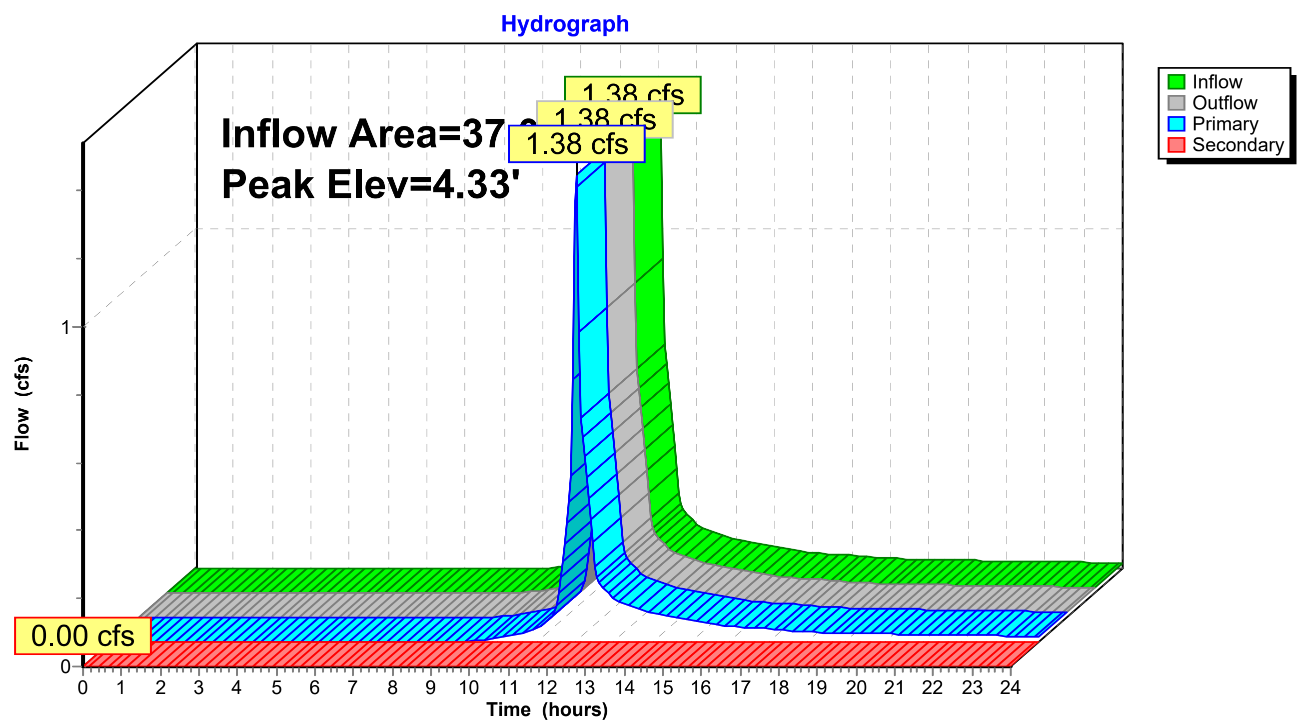
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 4.33' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	3.54'	**16.0" Round Culvert** L= 198.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 3.54' / 3.35' S= 0.0010 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.40 sf
#2	Secondary	8.36'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.32 cfs @ 12.03 hrs HW=4.31' TW=2.40' (Dynamic Tailwater)
1=Culvert (Barrel Controls 1.32 cfs @ 2.28 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.54' TW=1.56' (Dynamic Tailwater)
2=Orifice/Grate (Controls 0.00 cfs)

Pond CB9: CB-9



Summary for Pond I-1: INFILTRATION TRENCH

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=86)

Inflow Area = 52,485 sf, 20.42% Impervious, Inflow Depth > 0.41" for 1 YEAR event
Inflow = 0.33 cfs @ 12.18 hrs, Volume= 1,784 cf
Outflow = 0.10 cfs @ 12.15 hrs, Volume= 1,786 cf, Atten= 70%, Lag= 0.0 min
Discarded = 0.10 cfs @ 12.15 hrs, Volume= 1,786 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 6.44' @ 12.80 hrs Surf.Area= 1,400 sf Storage= 309 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 19.6 min (932.1 - 912.5)

Volume	Invert	Avail.Storage	Storage Description
#1	9.25'	112 cf	**8.00'W x 175.00'L x 0.20'H Prismatoid (Pea Gravel Layer)**
			280 cf Overall x 40.0% Voids
#2	6.75'	1,225 cf	**8.00'W x 175.00'L x 2.50'H Prismatoid (Gravel Layer)**
			3,500 cf Overall x 35.0% Voids
#3	6.00'	525 cf	**8.00'W x 175.00'L x 0.75'H Prismatoid (Sand Layer)**
			1,050 cf Overall x 50.0% Voids
		1,862 cf	Total Available Storage

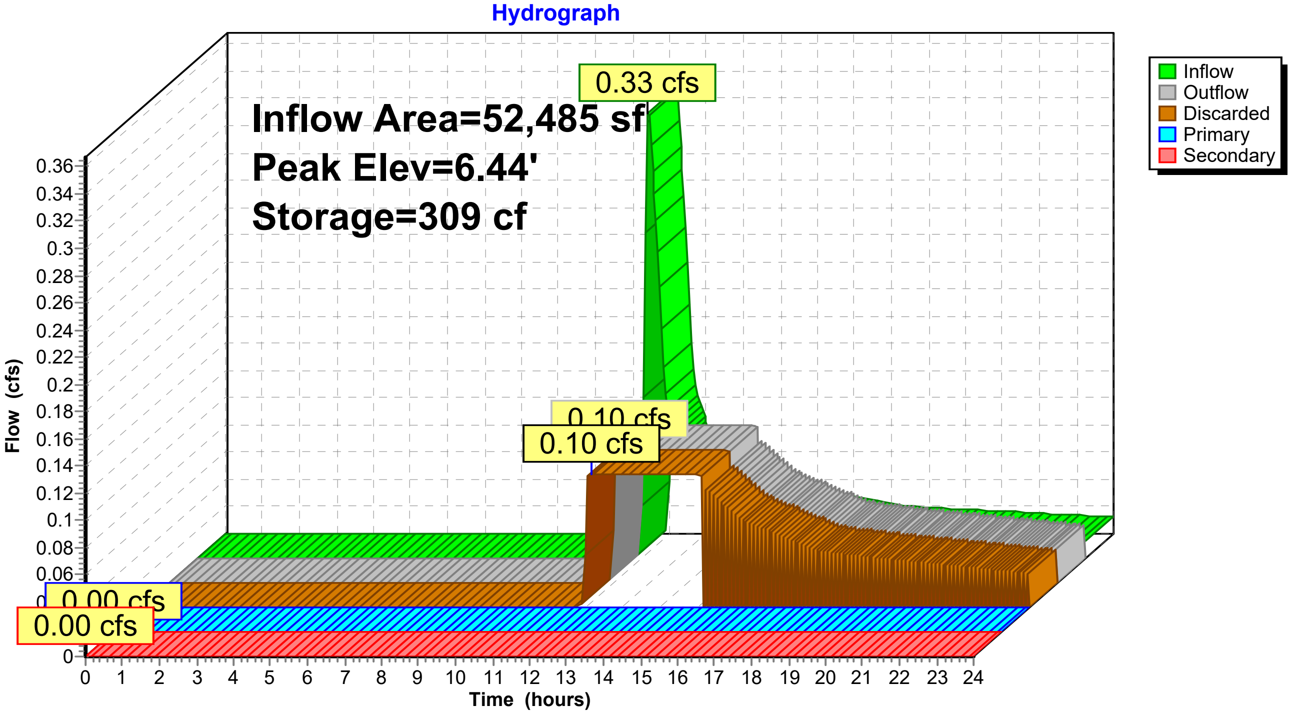
Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**3.000 in/hr Exfiltration over Surface area**
#2	Primary	8.00'	**12.0" Round Culvert X 2.00** L= 60.0' CMP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 8.00' / 1.50' S= 0.1083 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Secondary	9.25'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.10 cfs @ 12.15 hrs HW=6.07' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6.00' TW=0.00' (Dynamic Tailwater)
↑**2=Culvert** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6.00' TW=0.00' (Dynamic Tailwater)
↑**3=Orifice/Grate** (Controls 0.00 cfs)

Pond I-1: INFILTRATION TRENCH



Summary for Pond P2: Green Roof

Inflow Area = 14,324 sf,100.00% Impervious, Inflow Depth > 2.55" for 1 YEAR event
Inflow = 1.01 cfs @ 12.00 hrs, Volume= 3,043 cf
Outflow = 0.78 cfs @ 12.05 hrs, Volume= 3,043 cf, Atten= 23%, Lag= 3.1 min
Primary = 0.78 cfs @ 12.05 hrs, Volume= 3,043 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 23.46' @ 12.05 hrs Surf.Area= 11,176 sf Storage= 140 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.9 min (754.8 - 753.9)

Volume	Invert	Avail.Storage	Storage Description
#1	23.40'	53,287 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

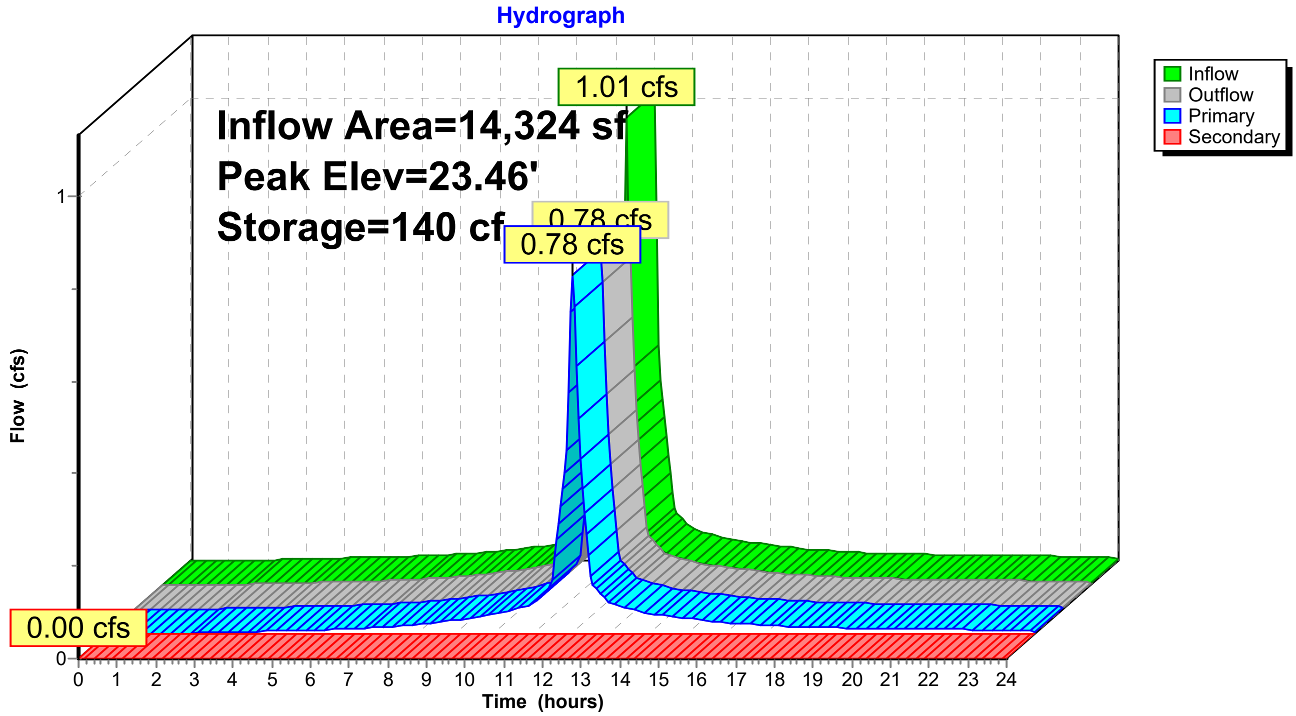
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.40	100	0.0	0	0
23.48	14,324	40.0	231	231
23.50	14,324	20.0	57	288
24.50	14,324	20.0	2,865	3,153
28.00	14,324	100.0	50,134	53,287

Device	Routing	Invert	Outlet Devices
#1	Primary	23.40'	**3.000 in/hr Exfiltration over Surface area**
#2	Secondary	24.54'	**6.0" Horiz. Orifice/Grate (Overflow) X 2.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.77 cfs @ 12.05 hrs HW=23.46' TW=0.00' (Dynamic Tailwater)
└─**1=Exfiltration** (Exfiltration Controls 0.77 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=23.40' TW=0.00' (Dynamic Tailwater)
└─**2=Orifice/Grate (Overflow)** (Controls 0.00 cfs)

Pond P2: Green Roof

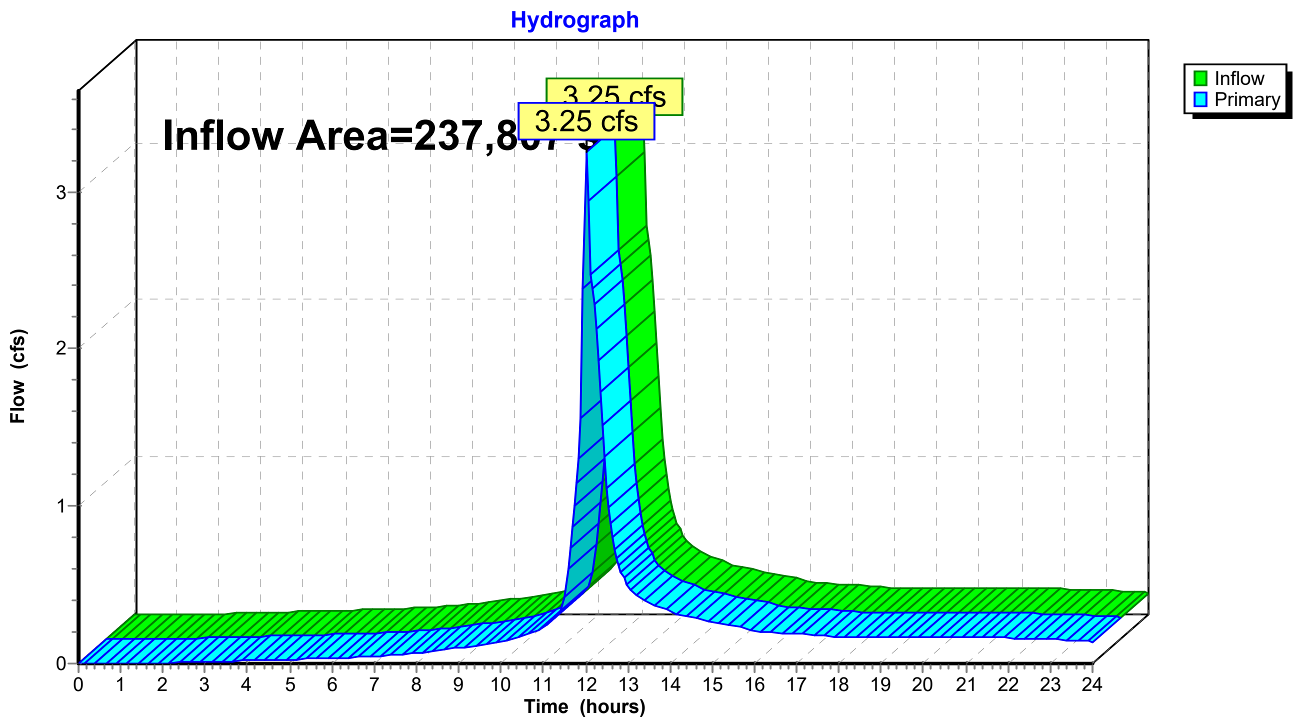


Summary for Link DP-1: DP-1

Inflow Area =	237,807 sf, 45.28% Impervious, Inflow Depth > 0.90"	for 1 YEAR event
Inflow =	3.25 cfs @ 12.01 hrs, Volume=	17,857 cf
Primary =	3.25 cfs @ 12.01 hrs, Volume=	17,857 cf, Atten= 0%, Lag= 0.0 min

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

Link DP-1: DP-1

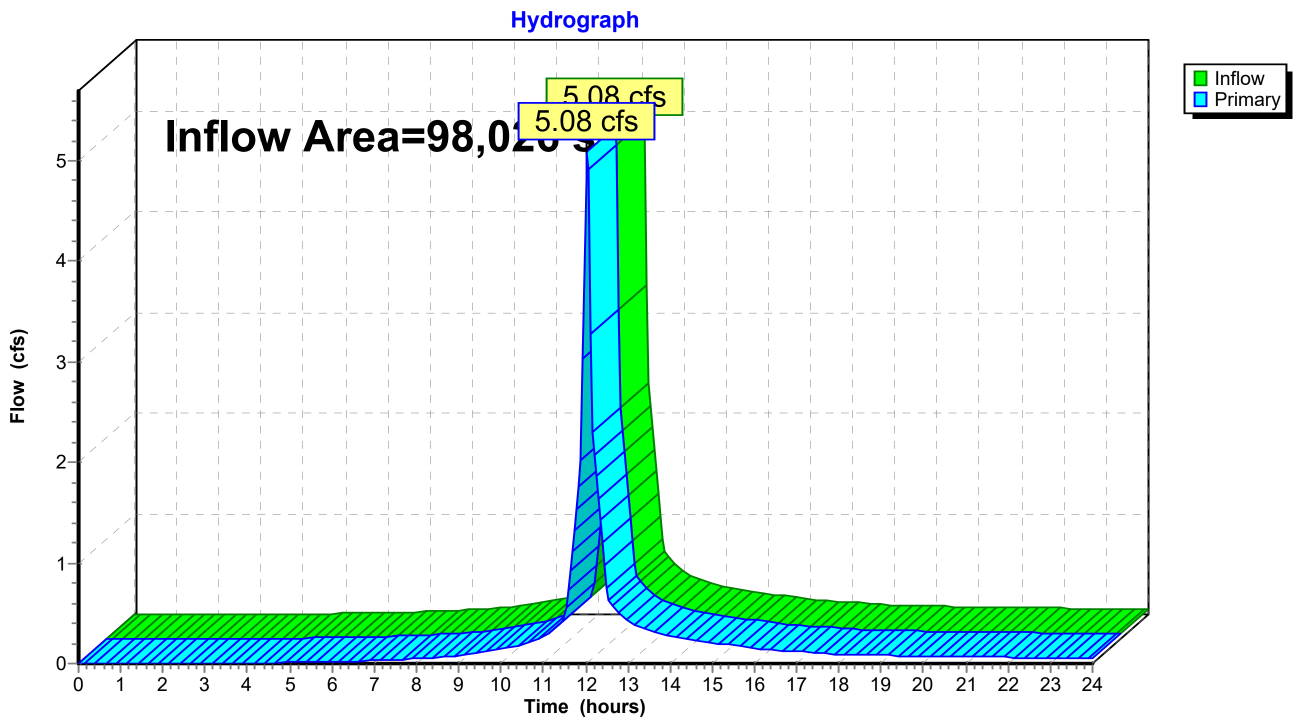


Summary for Link DP-2: Design Point 2

Inflow Area = 98,026 sf, 78.96% Impervious, Inflow Depth > 1.84" for 1 YEAR event
Inflow = 5.08 cfs @ 12.03 hrs, Volume= 15,047 cf
Primary = 5.08 cfs @ 12.03 hrs, Volume= 15,047 cf, Atten= 0%, Lag= 0.0 min

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

Link DP-2: Design Point 2



Summary for Subcatchment DA 10A: DA - 10A

[49] Hint: Tc<2dt may require smaller dt

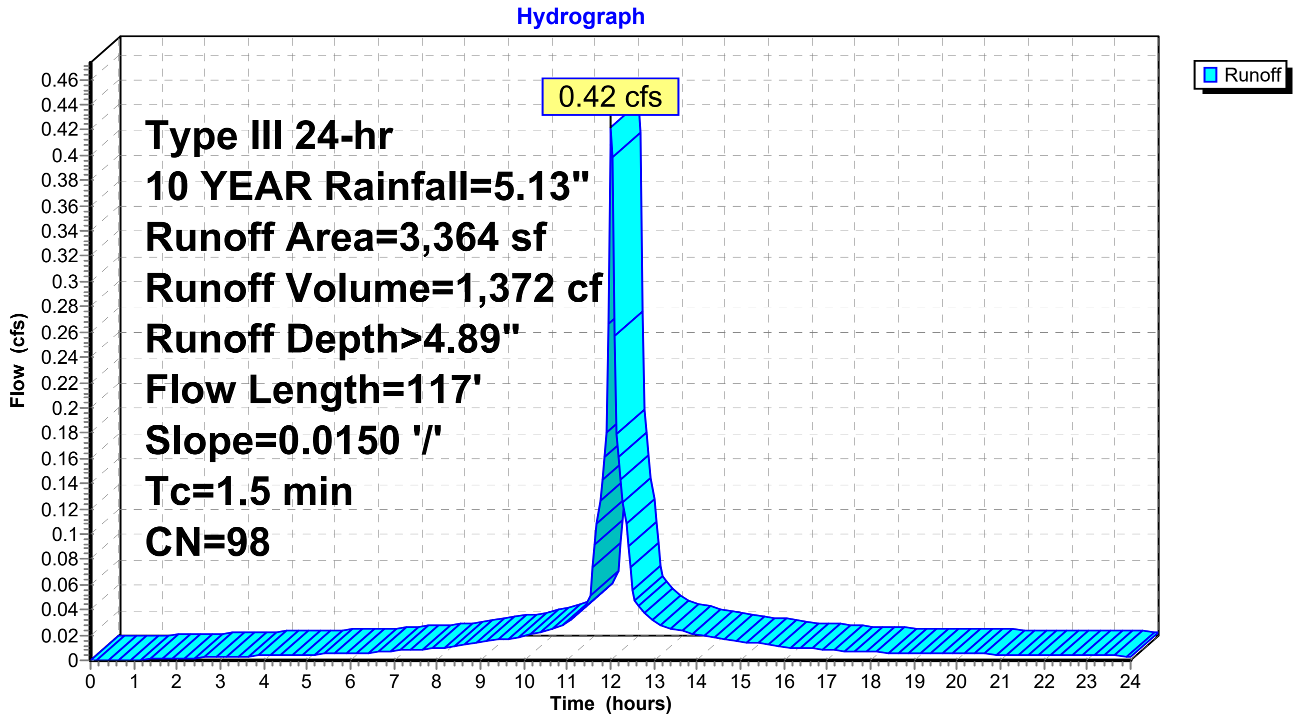
Runoff = 0.42 cfs @ 12.02 hrs, Volume= 1,372 cf, Depth> 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

Area (sf)	CN	Description
0	61	>75% Grass cover, Good, HSG B
3,364	98	Paved parking, HSG B
3,364	98	Weighted Average
3,364		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	117	0.0150	1.32		**Sheet Flow, 1 to 2** Smooth surfaces n= 0.011 P2= 3.50"

Subcatchment DA 10A: DA - 10A



Summary for Subcatchment DA 11A: DA - 11A

[49] Hint: Tc<2dt may require smaller dt

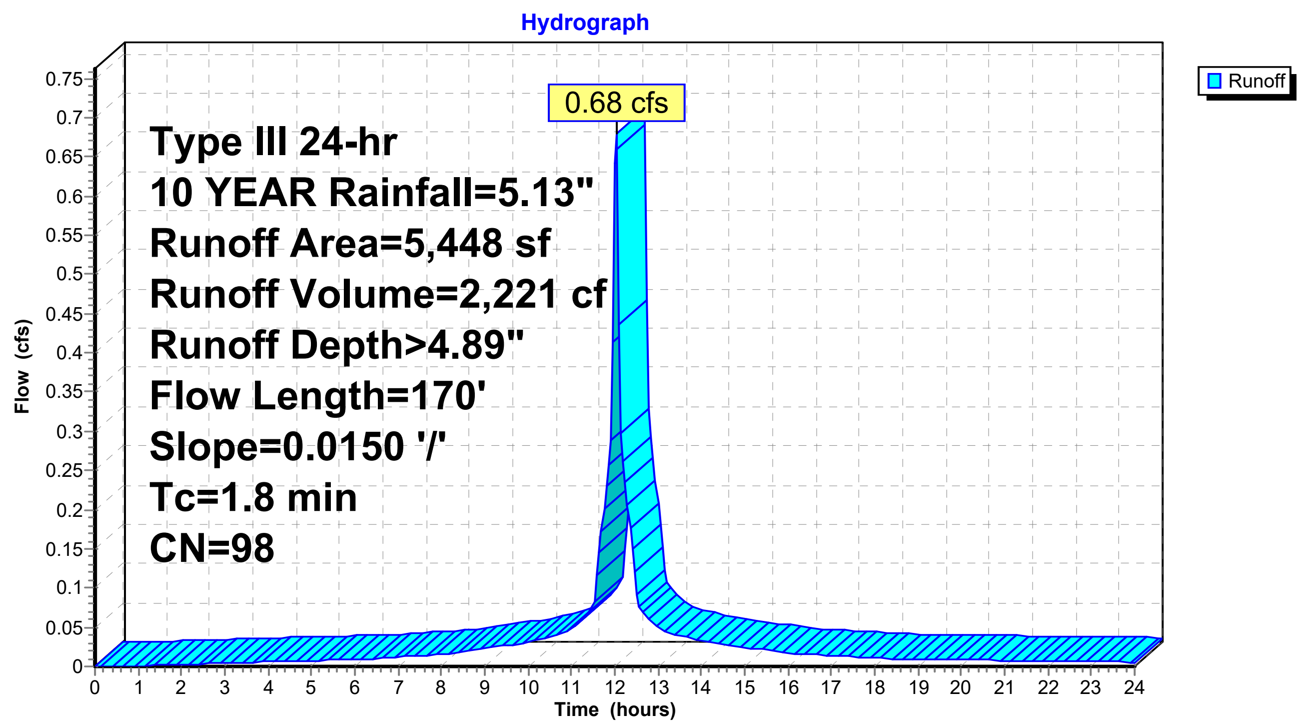
Runoff = 0.68 cfs @ 12.03 hrs, Volume= 2,221 cf, Depth> 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

Area (sf)	CN	Description
0	61	>75% Grass cover, Good, HSG B
5,448	98	Paved parking, HSG B
5,448	98	Weighted Average
5,448		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.28		**Sheet Flow, 1 to 2** Smooth surfaces n= 0.011 P2= 3.50"
0.5	70	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	170	Total			

Subcatchment DA 11A: DA - 11A



Summary for Subcatchment DA 12A: DA - 12A

[49] Hint: Tc<2dt may require smaller dt

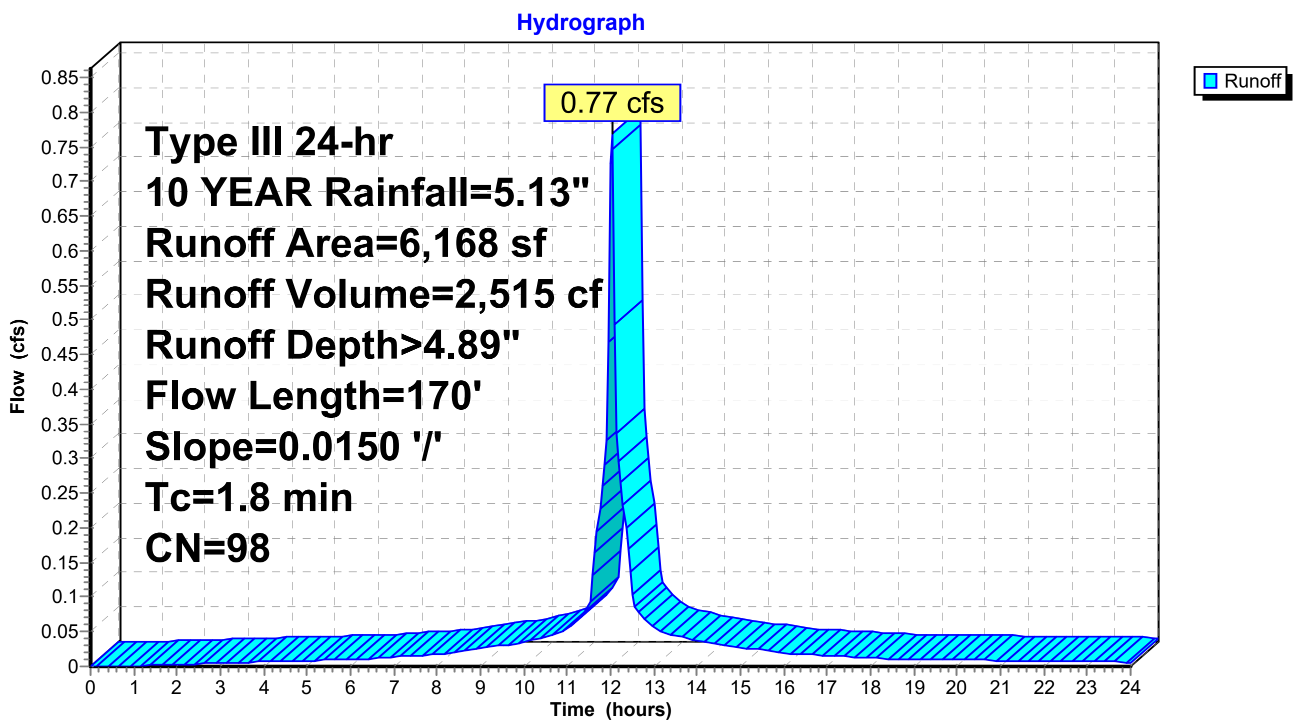
Runoff = 0.77 cfs @ 12.03 hrs, Volume= 2,515 cf, Depth> 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

Area (sf)	CN	Description
0	61	>75% Grass cover, Good, HSG B
6,168	98	Paved parking, HSG B
6,168	98	Weighted Average
6,168		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.28		**Sheet Flow, 1 to 2** Smooth surfaces n= 0.011 P2= 3.50"
0.5	70	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	170	Total			

Subcatchment DA 12A: DA - 12A



Summary for Subcatchment DA 13A: DA - 13A

[49] Hint: Tc<2dt may require smaller dt

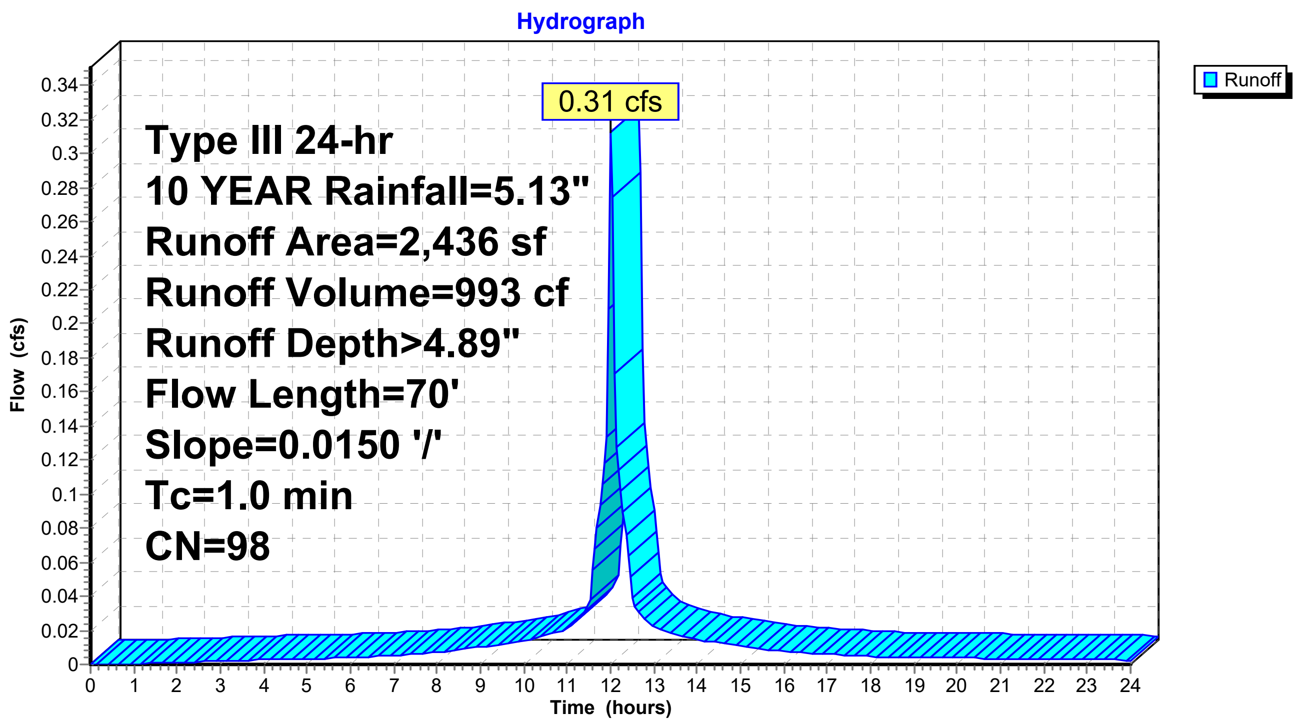
Runoff = 0.31 cfs @ 12.01 hrs, Volume= 993 cf, Depth> 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

Area (sf)	CN	Description
0	61	>75% Grass cover, Good, HSG B
2,436	98	Paved parking, HSG B
2,436	98	Weighted Average
2,436		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	70	0.0150	1.19		**Sheet Flow, 1 to 2** Smooth surfaces n= 0.011 P2= 3.50"

Subcatchment DA 13A: DA - 13A



Summary for Subcatchment DA 1A: DA -1A

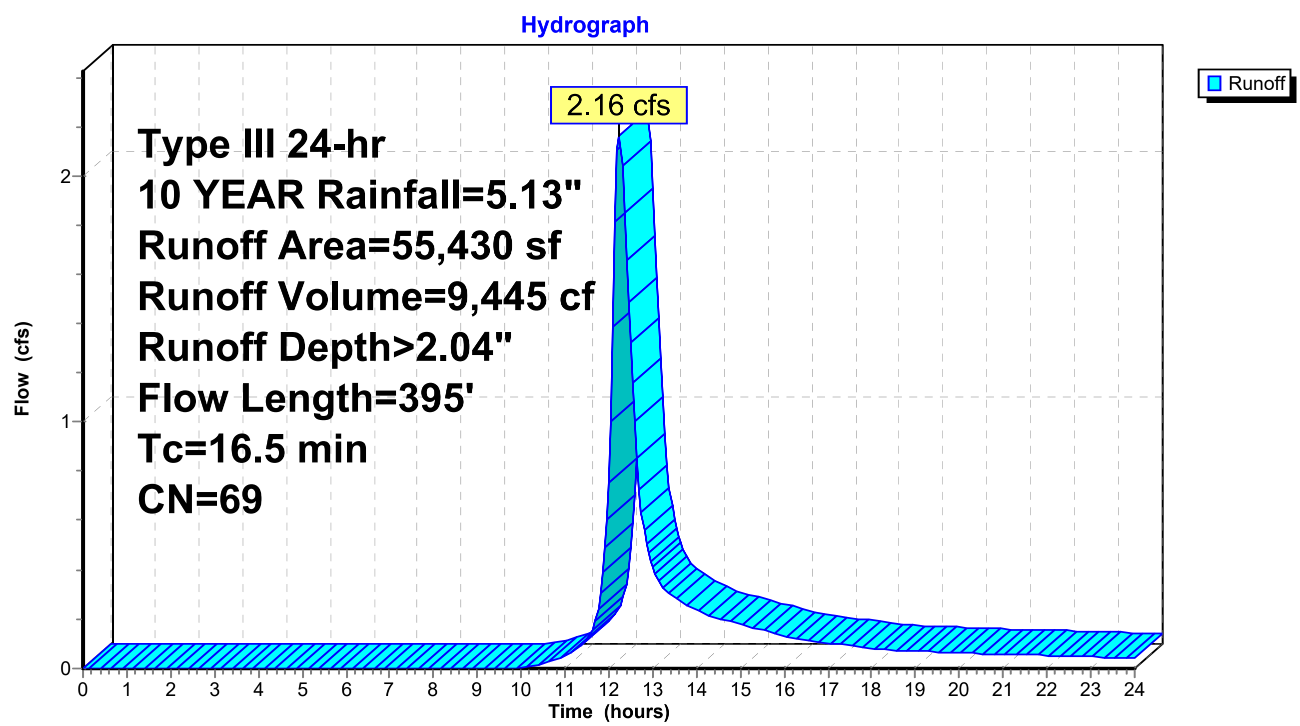
Runoff = 2.16 cfs @ 12.24 hrs, Volume= 9,445 cf, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

	Area (sf)	CN	Description
	43,680	61	>75% Grass cover, Good, HSG B
*	11,750	98	
	55,430	69	Weighted Average
	43,680		78.80% Pervious Area
	11,750		21.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	190	0.0520	0.20		**Sheet Flow, 1 to 2**
					Grass: Dense n= 0.240 P2= 3.50"
0.4	119	0.4400	4.64		**Shallow Concentrated Flow, 2 to 3**
					Short Grass Pasture Kv= 7.0 fps
0.5	86	0.0230	3.08		**Shallow Concentrated Flow, 3 to End**
					Paved Kv= 20.3 fps
16.5	395	Total			

Subcatchment DA 1A: DA -1A



Summary for Subcatchment DA 2A: DA - 2A

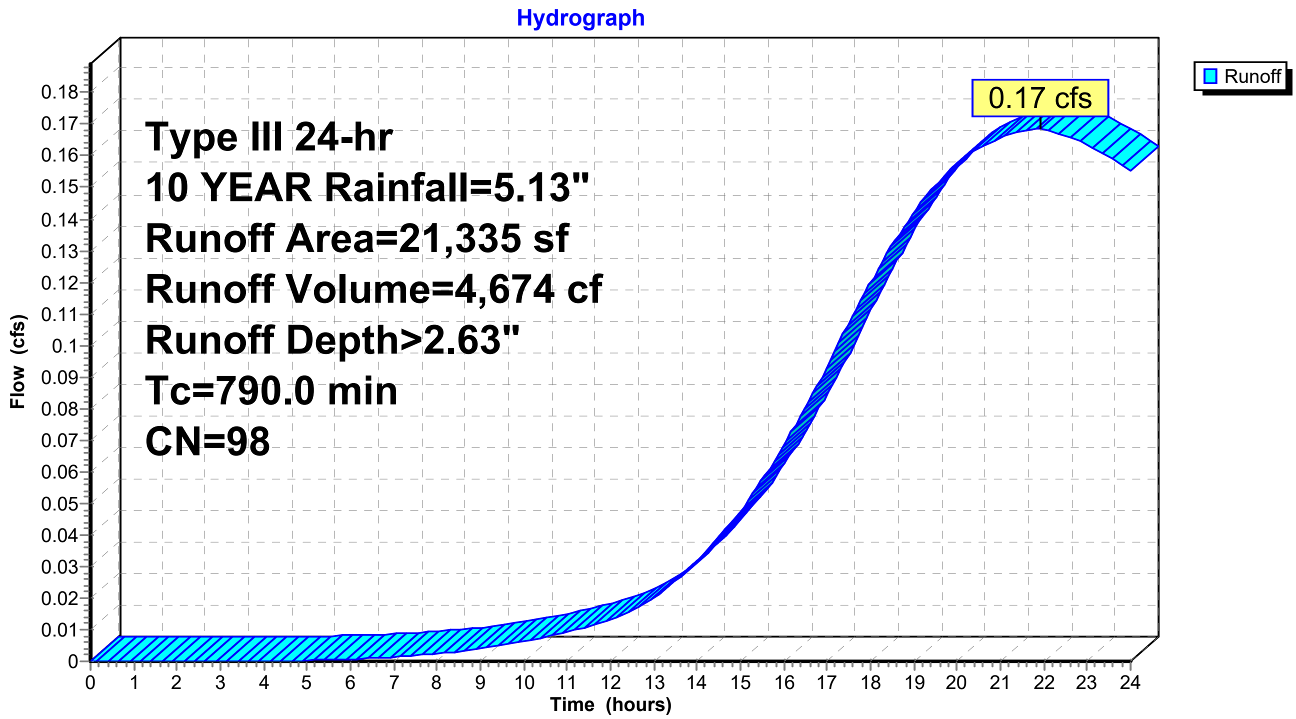
Runoff = 0.17 cfs @ 21.94 hrs, Volume= 4,674 cf, Depth> 2.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

Area (sf)	CN	Description
21,335	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
21,335	98	Weighted Average
21,335		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
790.0					**Direct Entry, Porous Pavment**

Subcatchment DA 2A: DA - 2A



Summary for Subcatchment DA 3A: DA - 3A

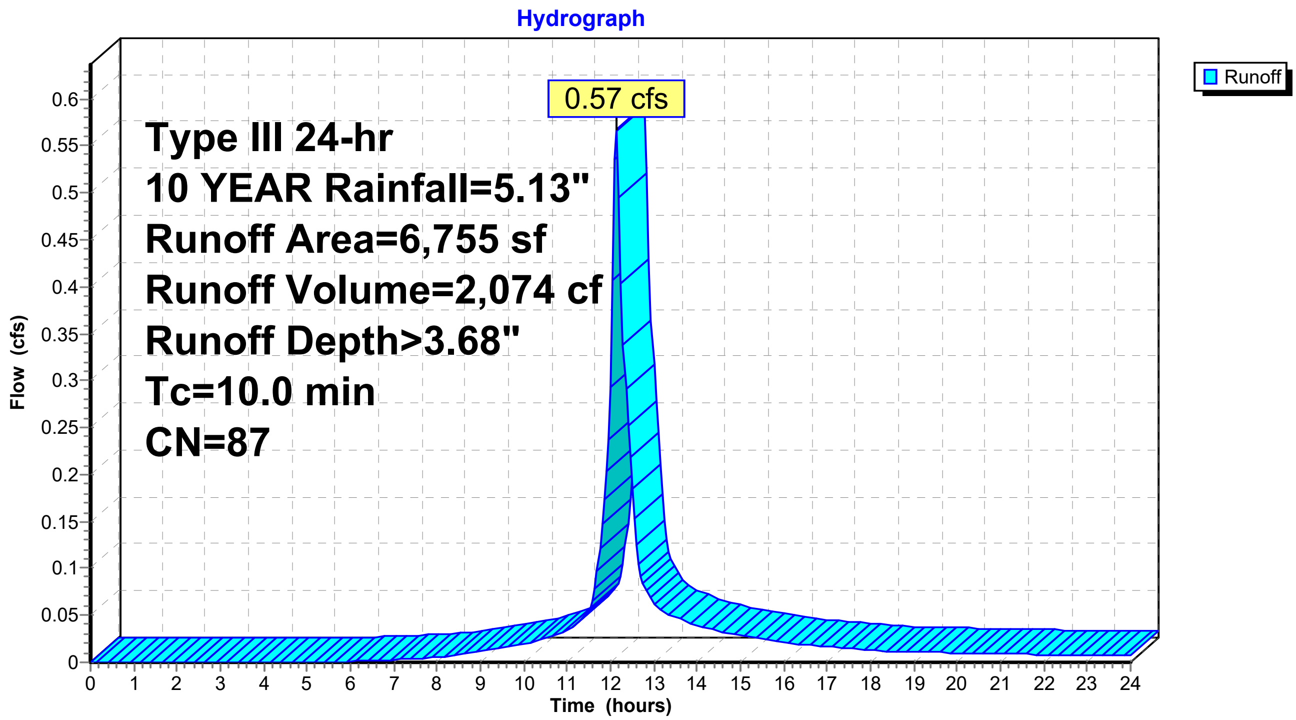
Runoff = 0.57 cfs @ 12.14 hrs, Volume= 2,074 cf, Depth> 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

Area (sf)	CN	Description
4,820	98	Unconnected roofs, HSG B
1,935	61	>75% Grass cover, Good, HSG B
6,755	87	Weighted Average
1,935		28.65% Pervious Area
4,820		71.35% Impervious Area
4,820		100.00% Unconnected

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

Subcatchment DA 3A: DA - 3A



Summary for Subcatchment DA 4A: DA - 4A

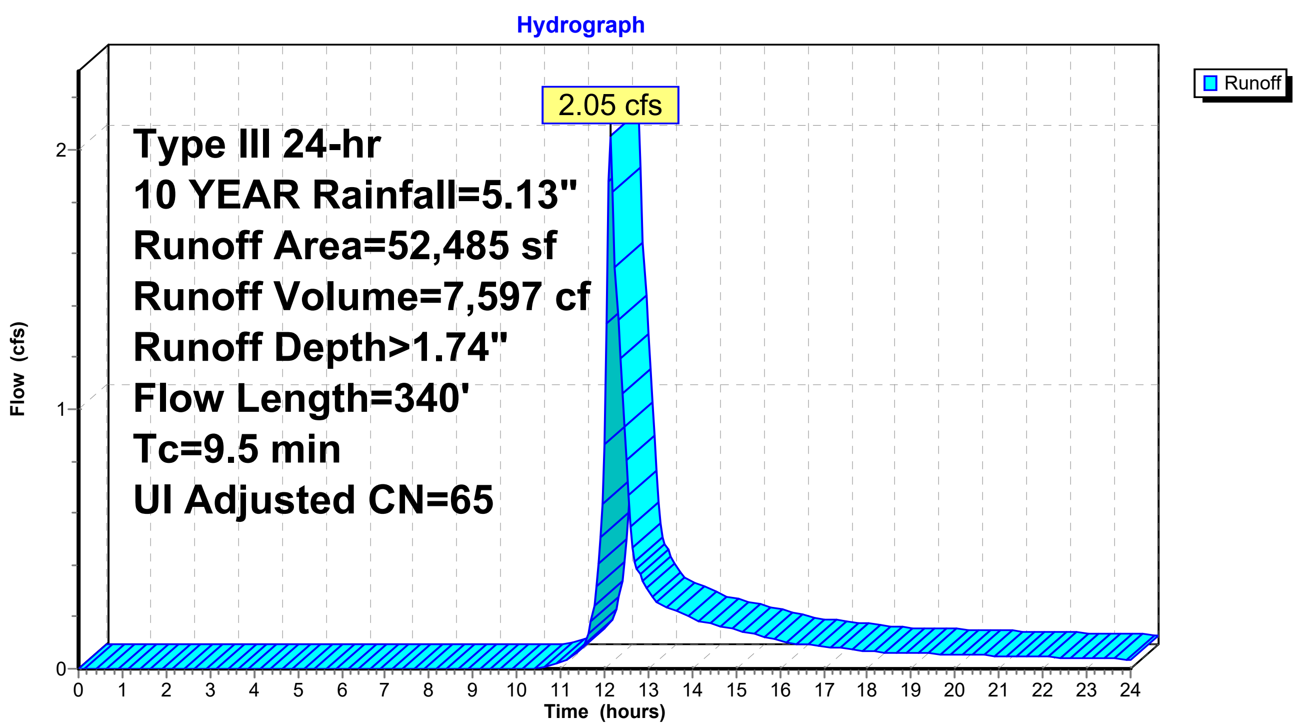
Runoff = 2.05 cfs @ 12.15 hrs, Volume= 7,597 cf, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

Area (sf)	CN	Adj	Description
10,719	98		Unconnected roofs, HSG B
41,766	61		>75% Grass cover, Good, HSG B
52,485	69	65	Weighted Average, UI Adjusted
41,766			79.58% Pervious Area
10,719			20.42% Impervious Area
10,719			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0300	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
1.3	204	0.2800	2.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	36	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.5	340	Total			

Subcatchment DA 4A: DA - 4A



Summary for Subcatchment DA 5A: DA - 5A

[49] Hint: Tc<2dt may require smaller dt

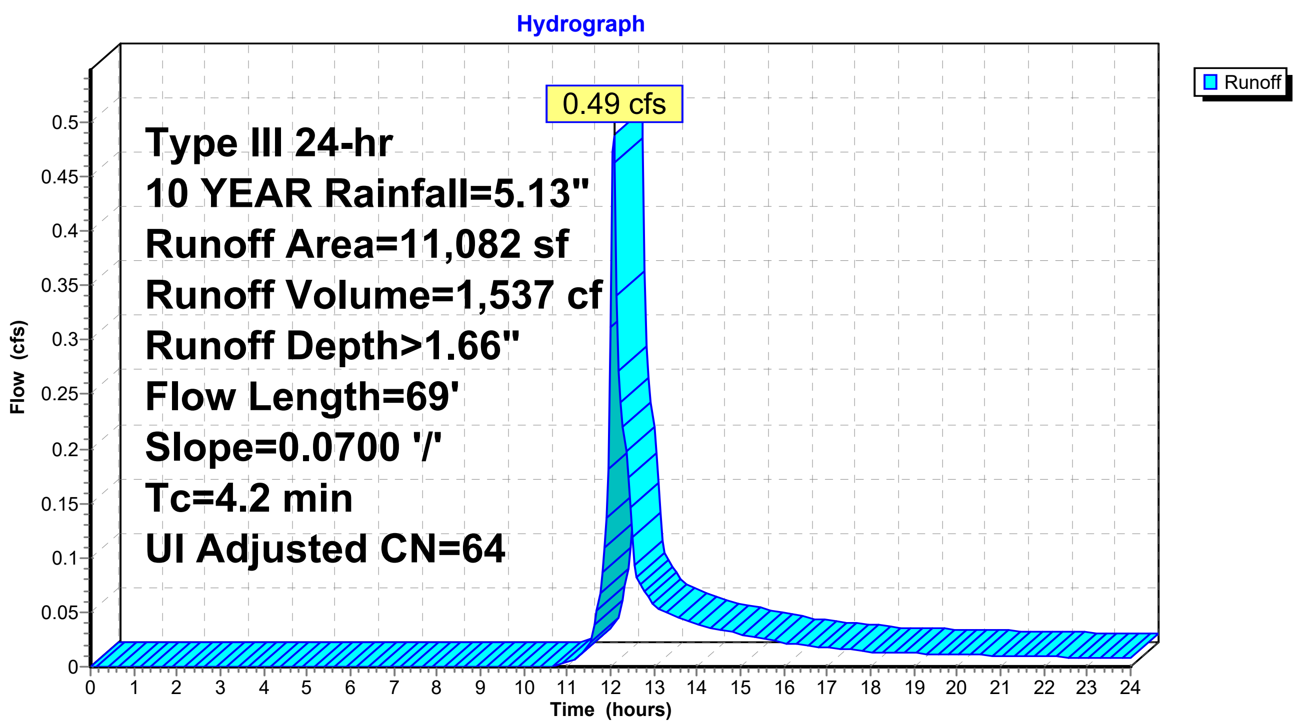
Runoff = 0.49 cfs @ 12.07 hrs, Volume= 1,537 cf, Depth> 1.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

Area (sf)	CN	Adj	Description
1,530	98		Unconnected roofs, HSG B
9,552	61		>75% Grass cover, Good, HSG B
11,082	66	64	Weighted Average, UI Adjusted
9,552			86.19% Pervious Area
1,530			13.81% Impervious Area
1,530			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	69	0.0700	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"

Subcatchment DA 5A: DA - 5A



Summary for Subcatchment DA 6A: DA - 6A

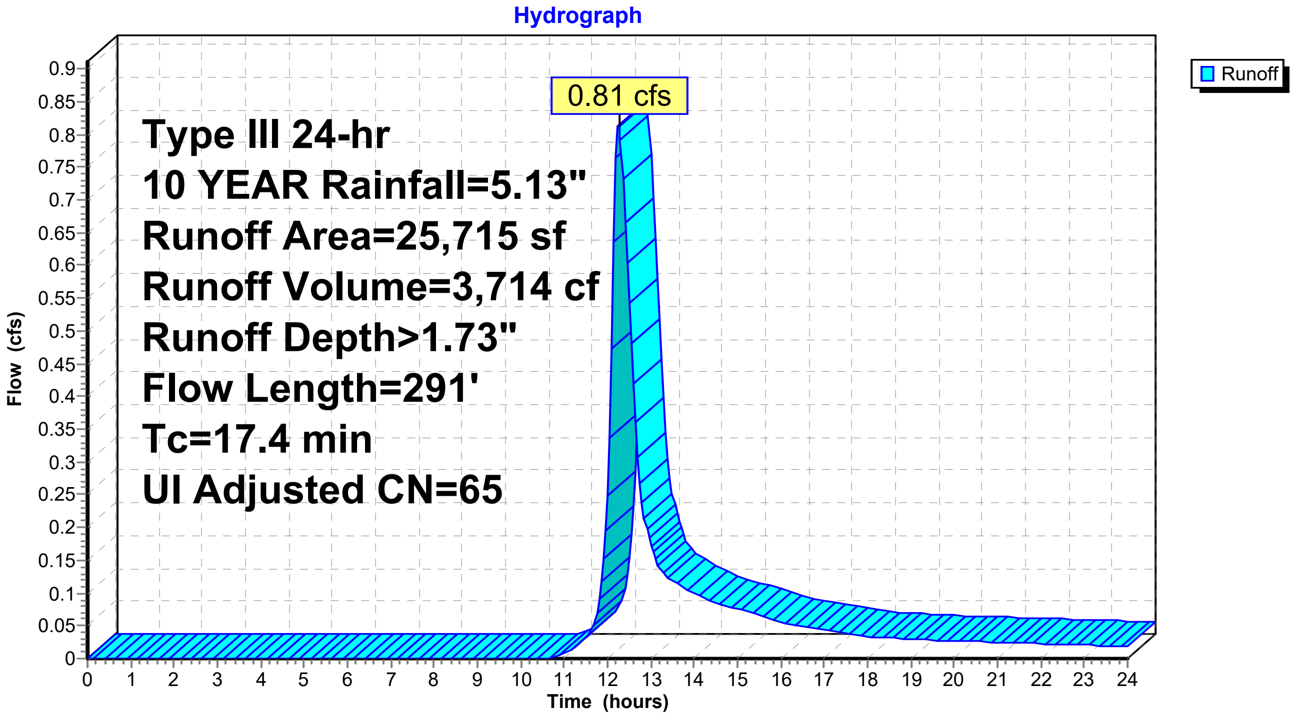
Runoff = 0.81 cfs @ 12.26 hrs, Volume= 3,714 cf, Depth> 1.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

Area (sf)	CN	Adj	Description
5,765	98		Unconnected roofs, HSG B
19,950	61		>75% Grass cover, Good, HSG B
25,715	69	65	Weighted Average, UI Adjusted
19,950			77.58% Pervious Area
5,765			22.42% Impervious Area
5,765			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	100	0.0400	0.11		**Sheet Flow,**
					Woods: Light underbrush n= 0.400 P2= 3.50"
0.5	102	0.5700	3.77		**Shallow Concentrated Flow,**
					Woodland Kv= 5.0 fps
1.1	60	0.0160	0.89		**Shallow Concentrated Flow,**
					Short Grass Pasture Kv= 7.0 fps
0.2	29	0.0150	2.49		**Shallow Concentrated Flow,**
					Paved Kv= 20.3 fps
17.4	291	Total			

Subcatchment DA 6A: DA - 6A



Summary for Subcatchment DA 7A: DA - 7A

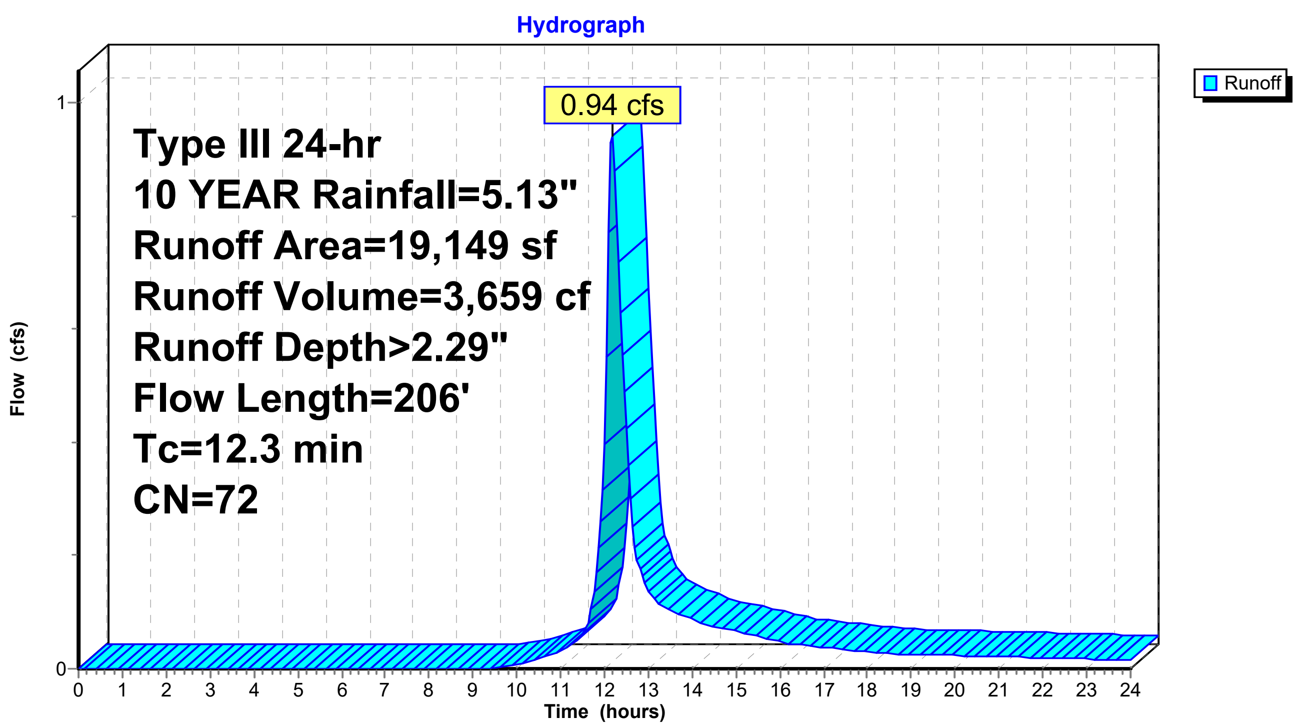
Runoff = 0.94 cfs @ 12.18 hrs, Volume= 3,659 cf, Depth> 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

Area (sf)	CN	Description
5,897	98	Unconnected roofs, HSG B
13,252	61	>75% Grass cover, Good, HSG B
19,149	72	Weighted Average
13,252		69.20% Pervious Area
5,897		30.80% Impervious Area
5,897		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	100	0.0800	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	80	0.6600	4.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	26	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.3	206	Total			

Subcatchment DA 7A: DA - 7A



Summary for Subcatchment DA 8A: DA - 8A

[49] Hint: Tc<2dt may require smaller dt

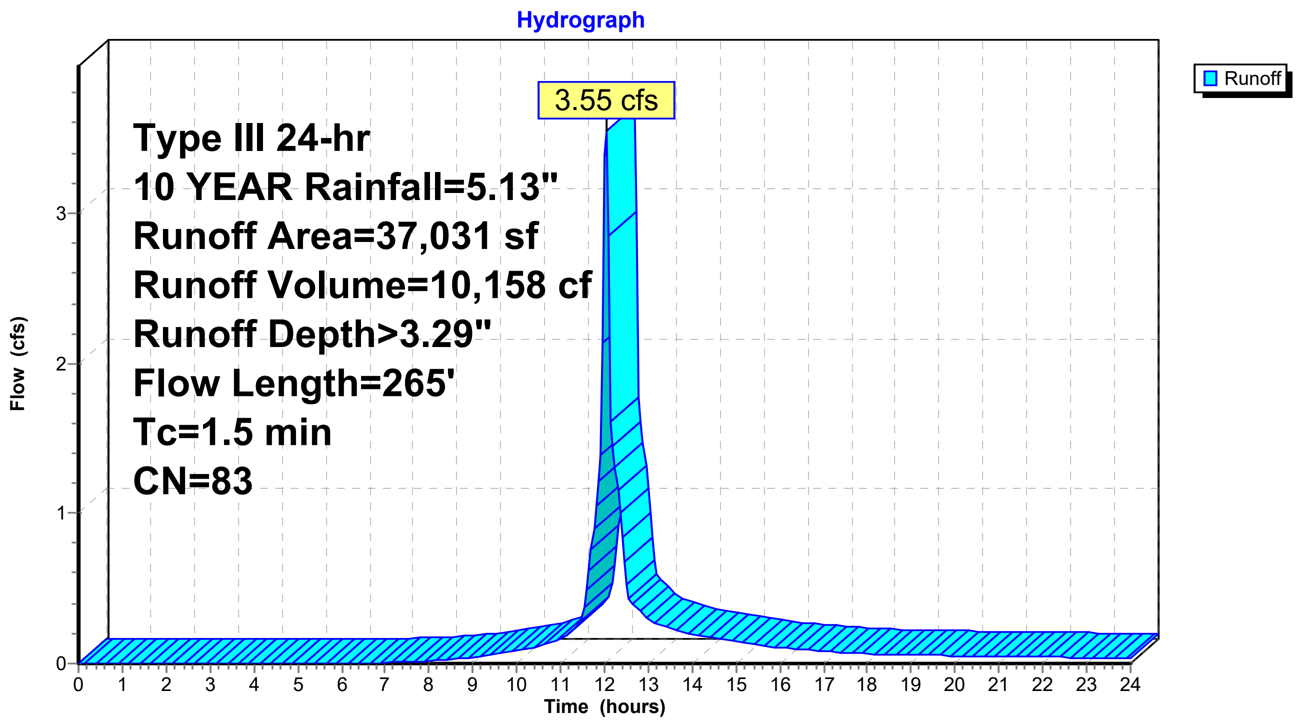
Runoff = 3.55 cfs @ 12.03 hrs, Volume= 10,158 cf, Depth> 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

	Area (sf)	CN	Description
	14,803	61	>75% Grass cover, Good, HSG B
*	22,228	98	Paved
	37,031	83	Weighted Average
	14,803		39.97% Pervious Area
	22,228		60.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	100	0.6300	3.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	165	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	265	Total			

Subcatchment DA 8A: DA - 8A



Summary for Subcatchment DA 9A: DA - 9A

[49] Hint: Tc<2dt may require smaller dt

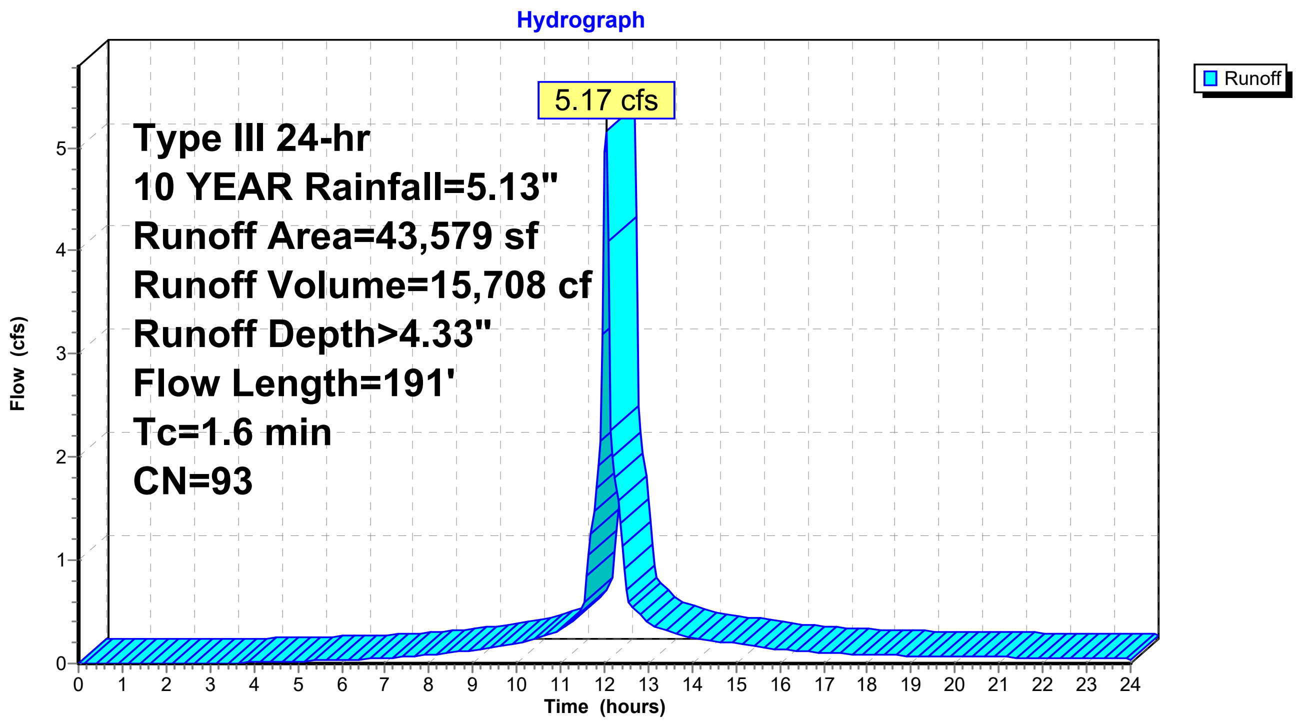
Runoff = 5.17 cfs @ 12.02 hrs, Volume= 15,708 cf, Depth> 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

Area (sf)	CN	Description
5,822	61	>75% Grass cover, Good, HSG B
37,757	98	Paved parking, HSG B
43,579	93	Weighted Average
5,822		13.36% Pervious Area
37,757		86.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0380	1.86		**Sheet Flow, 1 to 2**
					Smooth surfaces n= 0.011 P2= 3.50"
0.7	91	0.0100	2.03		**Shallow Concentrated Flow, 2 to end**
					Paved Kv= 20.3 fps
1.6	191	Total			

Subcatchment DA 9A: DA - 9A



Summary for Subcatchment RG 1: Roof Area 1

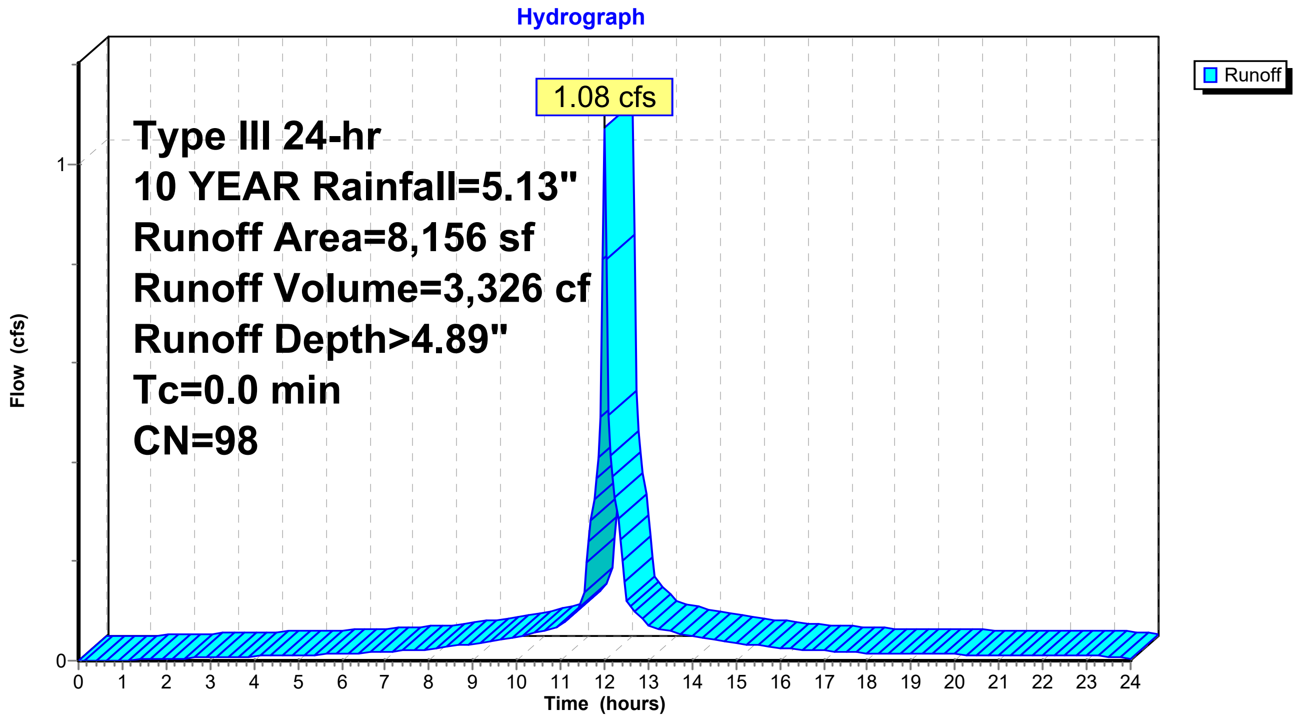
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.08 cfs @ 12.00 hrs, Volume= 3,326 cf, Depth> 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

Area (sf)	CN	Description
8,156	98	Unconnected pavement, HSG B
8,156		100.00% Impervious Area
8,156		100.00% Unconnected

Subcatchment RG 1: Roof Area 1



Summary for Subcatchment RG 2: Roof Area 2

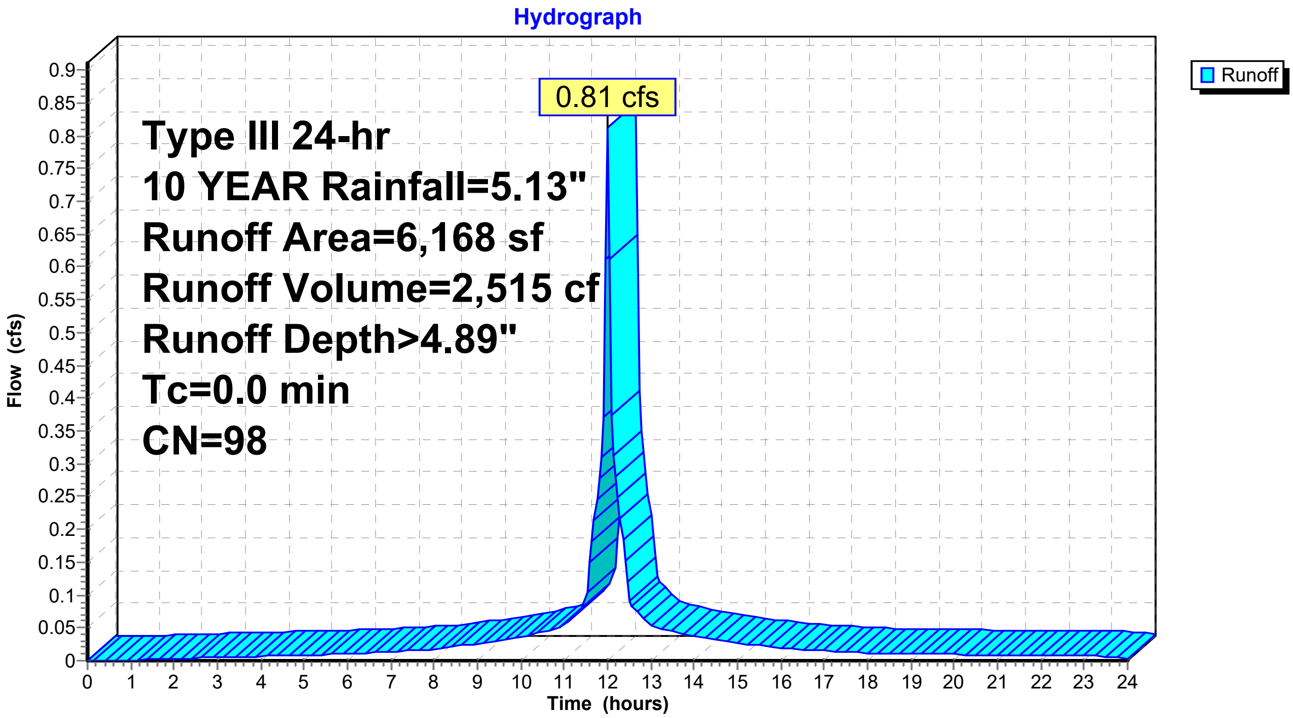
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 0.81 cfs @ 12.00 hrs, Volume= 2,515 cf, Depth> 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

Area (sf)	CN	Description
6,168	98	Unconnected pavement, HSG B
6,168		100.00% Impervious Area
6,168		100.00% Unconnected

Subcatchment RG 2: Roof Area 2



Summary for Subcatchment WR: BUILDING ROOF

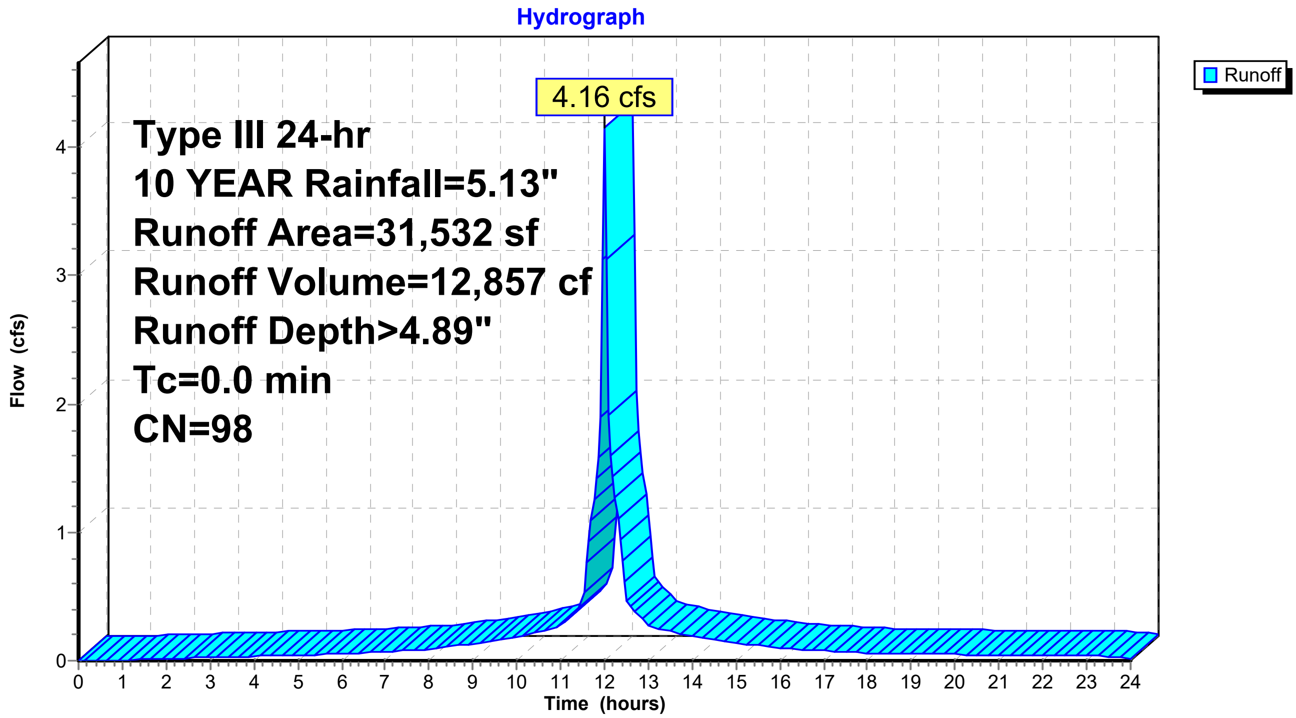
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 4.16 cfs @ 12.00 hrs, Volume= 12,857 cf, Depth> 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

Area (sf)	CN	Description
31,532	98	Unconnected pavement, HSG B
31,532		100.00% Impervious Area
31,532		100.00% Unconnected

Subcatchment WR: BUILDING ROOF



Summary for Pond AS-10: Aqua Swirl AS-10

[57] Hint: Peaked at 2.36' (Flood elevation advised)

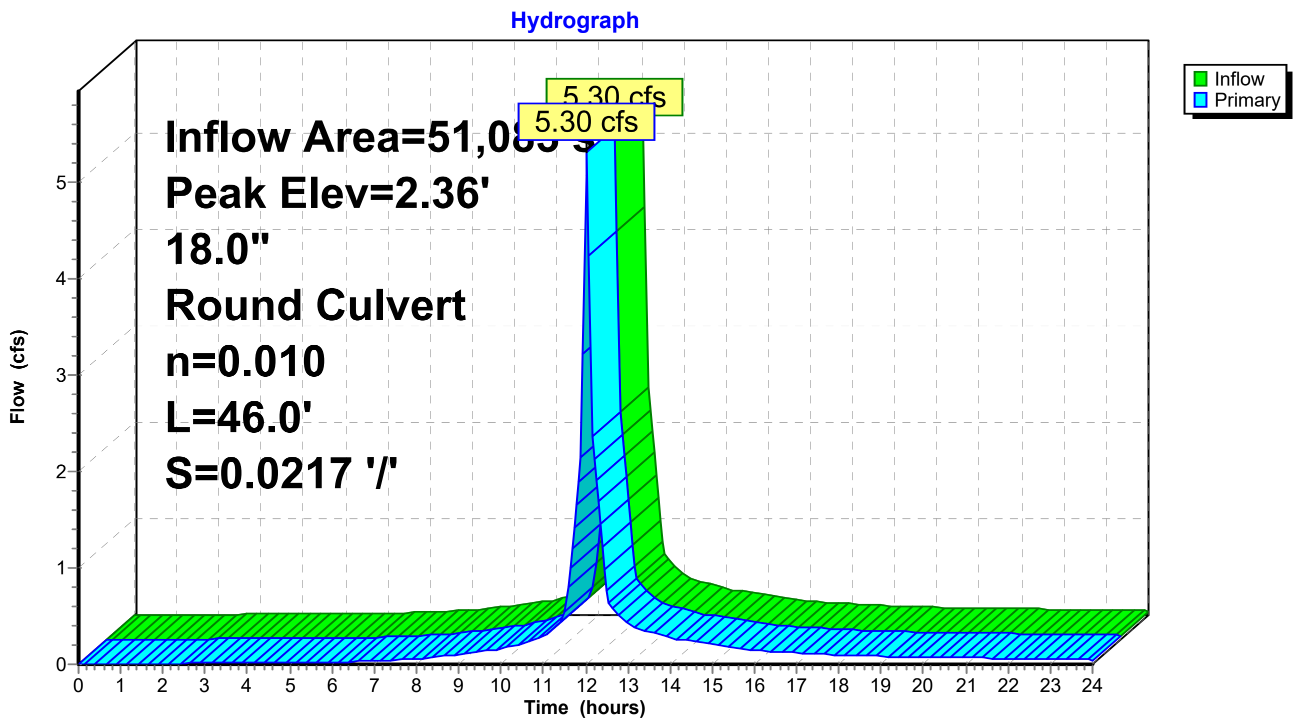
Inflow Area = 51,083 sf, 71.02% Impervious, Inflow Depth > 3.73" for 10 YEAR event
Inflow = 5.30 cfs @ 12.03 hrs, Volume= 15,888 cf
Outflow = 5.30 cfs @ 12.03 hrs, Volume= 15,888 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.30 cfs @ 12.03 hrs, Volume= 15,888 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2.36' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1.00'	**18.0" Round Culvert** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1.00' / 0.00' S= 0.0217 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=5.08 cfs @ 12.03 hrs HW=2.32' TW=0.00' (Dynamic Tailwater)
1=Culvert (Inlet Controls 5.08 cfs @ 3.09 fps)

Pond AS-10: Aqua Swirl AS-10



Summary for Pond AS-6: Aqua Swirl AS-6

[57] Hint: Peaked at 1.67' (Flood elevation advised)

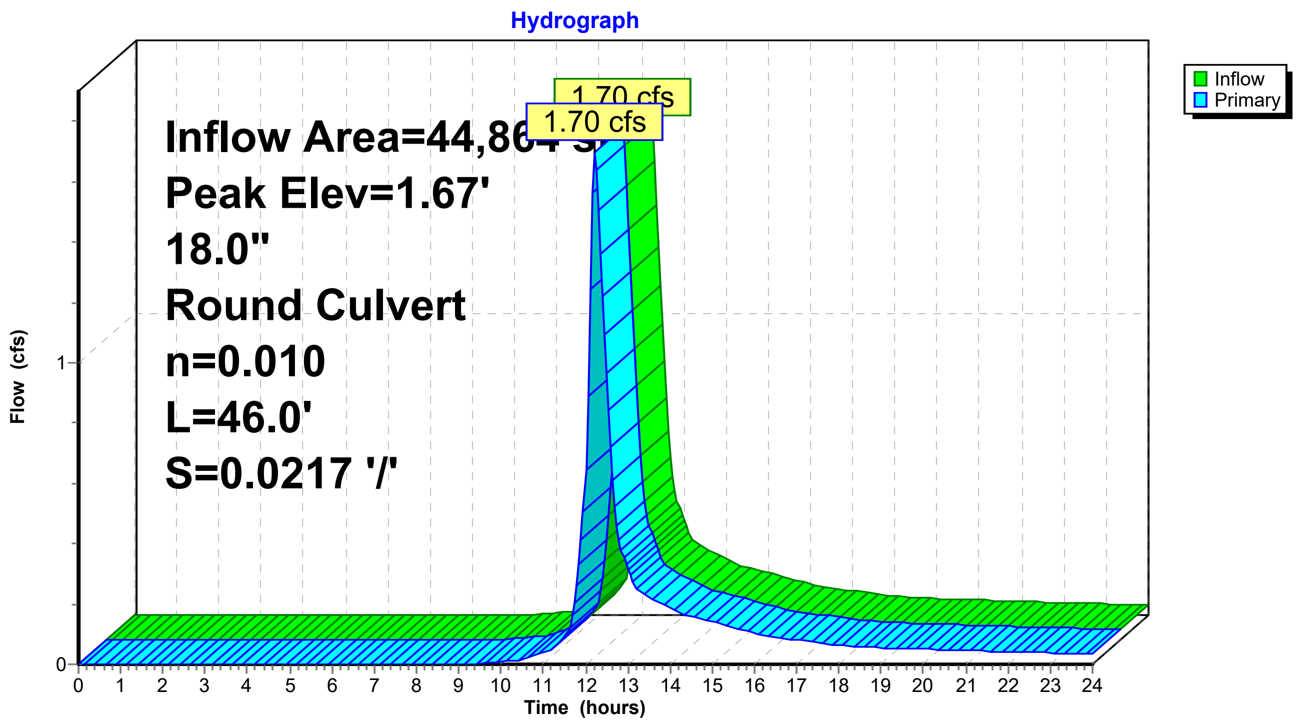
Inflow Area = 44,864 sf, 25.99% Impervious, Inflow Depth > 1.97" for 10 YEAR event
Inflow = 1.70 cfs @ 12.21 hrs, Volume= 7,373 cf
Outflow = 1.70 cfs @ 12.21 hrs, Volume= 7,373 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.70 cfs @ 12.21 hrs, Volume= 7,373 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 1.67' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1.00'	**18.0" Round Culvert** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1.00' / 0.00' S= 0.0217 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=1.68 cfs @ 12.21 hrs HW=1.67' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 1.68 cfs @ 2.20 fps)

Pond AS-6: Aqua Swirl AS-6



Summary for Pond AS-9: Aqua Swirl AS-9

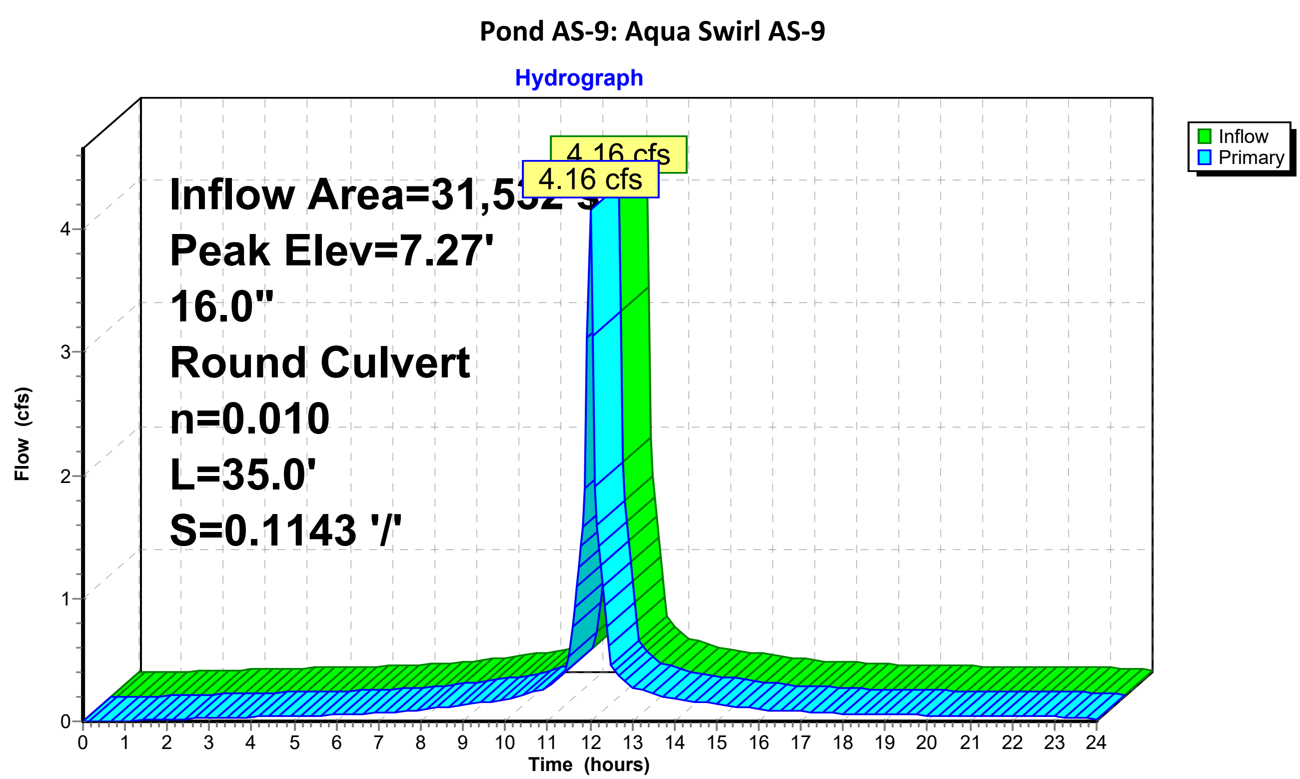
[57] Hint: Peaked at 7.27' (Flood elevation advised)

Inflow Area = 31,532 sf,100.00% Impervious, Inflow Depth > 4.89" for 10 YEAR event
Inflow = 4.16 cfs @ 12.00 hrs, Volume= 12,857 cf
Outflow = 4.16 cfs @ 12.00 hrs, Volume= 12,857 cf, Atten= 0%, Lag= 0.0 min
Primary = 4.16 cfs @ 12.00 hrs, Volume= 12,857 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 7.27' @ 12.00 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	6.00'	**16.0" Round Culvert** L= 35.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 6.00' / 2.00' S= 0.1143 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.40 sf

Primary OutFlow Max=4.16 cfs @ 12.00 hrs HW=7.27' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 4.16 cfs @ 3.03 fps)



Summary for Pond CB1: CB-1

[57] Hint: Peaked at 9.39' (Flood elevation advised)

Inflow Area = 2,436 sf,100.00% Impervious, Inflow Depth > 4.89" for 10 YEAR event
Inflow = 0.31 cfs @ 12.01 hrs, Volume= 993 cf
Outflow = 0.31 cfs @ 12.01 hrs, Volume= 993 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.31 cfs @ 12.01 hrs, Volume= 993 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

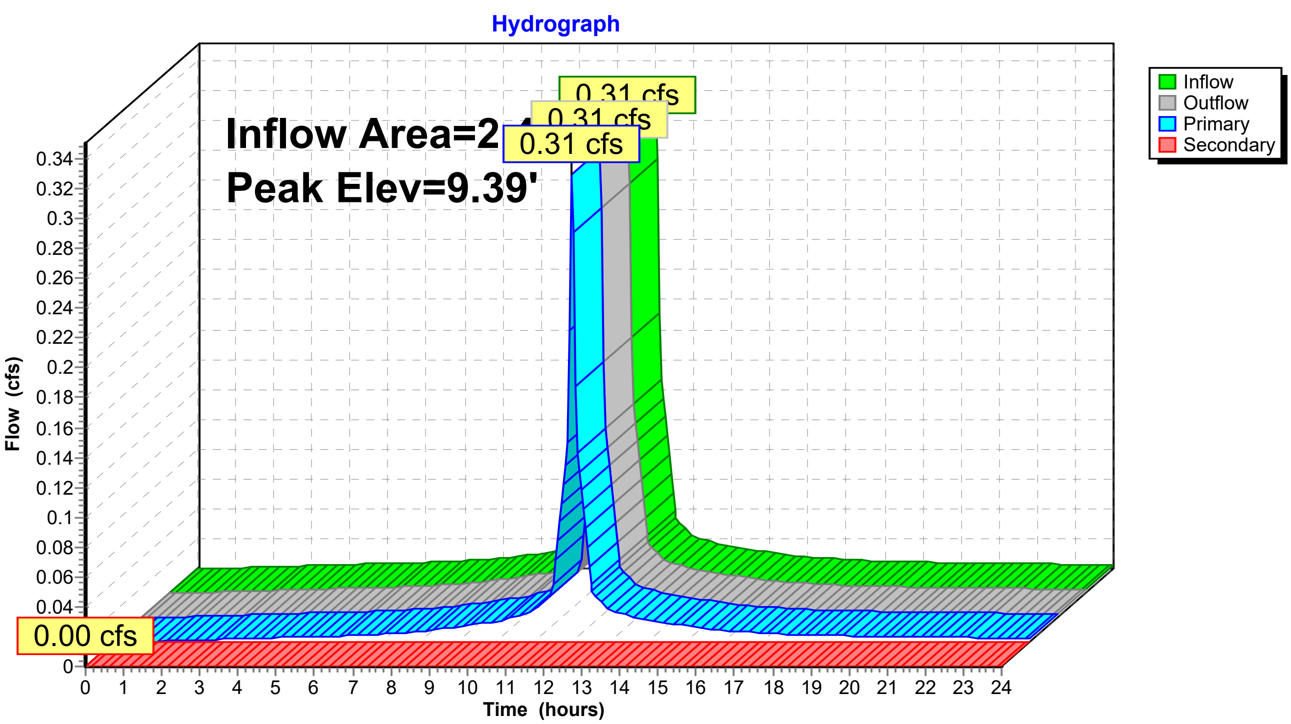
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 9.39' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	9.10'	**16.0" Round Culvert** L= 443.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.10' / 4.69' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.40 sf
#2	Secondary	11.90'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.30 cfs @ 12.01 hrs HW=9.38' TW=5.09' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.30 cfs @ 1.42 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=9.10' TW=4.55' (Dynamic Tailwater)
2=Orifice/Grate (Controls 0.00 cfs)

Pond CB1: CB-1



Summary for Pond CB12: CB-12

[57] Hint: Peaked at 6.57' (Flood elevation advised)

Inflow Area =	19,149 sf,	30.80% Impervious,	Inflow Depth > 2.29"	for 10 YEAR event
Inflow =	0.94 cfs @	12.18 hrs, Volume=	3,659 cf	
Outflow =	0.94 cfs @	12.18 hrs, Volume=	3,659 cf, Atten= 0%, Lag= 0.0 min	
Primary =	0.94 cfs @	12.18 hrs, Volume=	3,659 cf	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0 cf	

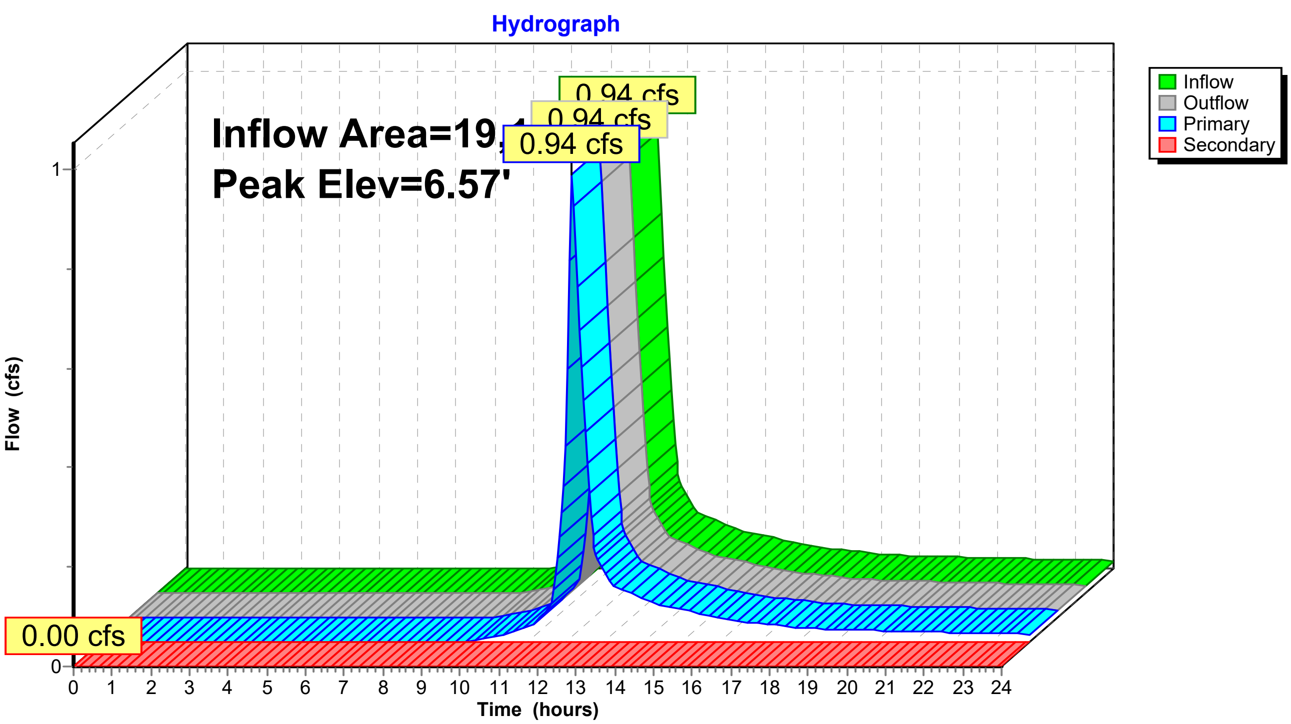
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 6.57' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	6.05'	**15.0" Round Culvert** L= 93.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 6.05' / 5.10' S= 0.0102 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf
#2	Secondary	9.65'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.93 cfs @ 12.18 hrs HW=6.57' TW=5.71' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.93 cfs @ 1.93 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6.05' TW=5.00' (Dynamic Tailwater)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond CB12: CB-12



Summary for Pond CB13: CB-13

[57] Hint: Peaked at 5.73' (Flood elevation advised)

Inflow Area =	44,864 sf, 25.99% Impervious,	Inflow Depth > 1.97"	for 10 YEAR event
Inflow =	1.70 cfs @ 12.21 hrs,	Volume= 7,373 cf	
Outflow =	1.70 cfs @ 12.21 hrs,	Volume= 7,373 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.70 cfs @ 12.21 hrs,	Volume= 7,373 cf	
Secondary =	0.00 cfs @ 0.00 hrs,	Volume= 0 cf	

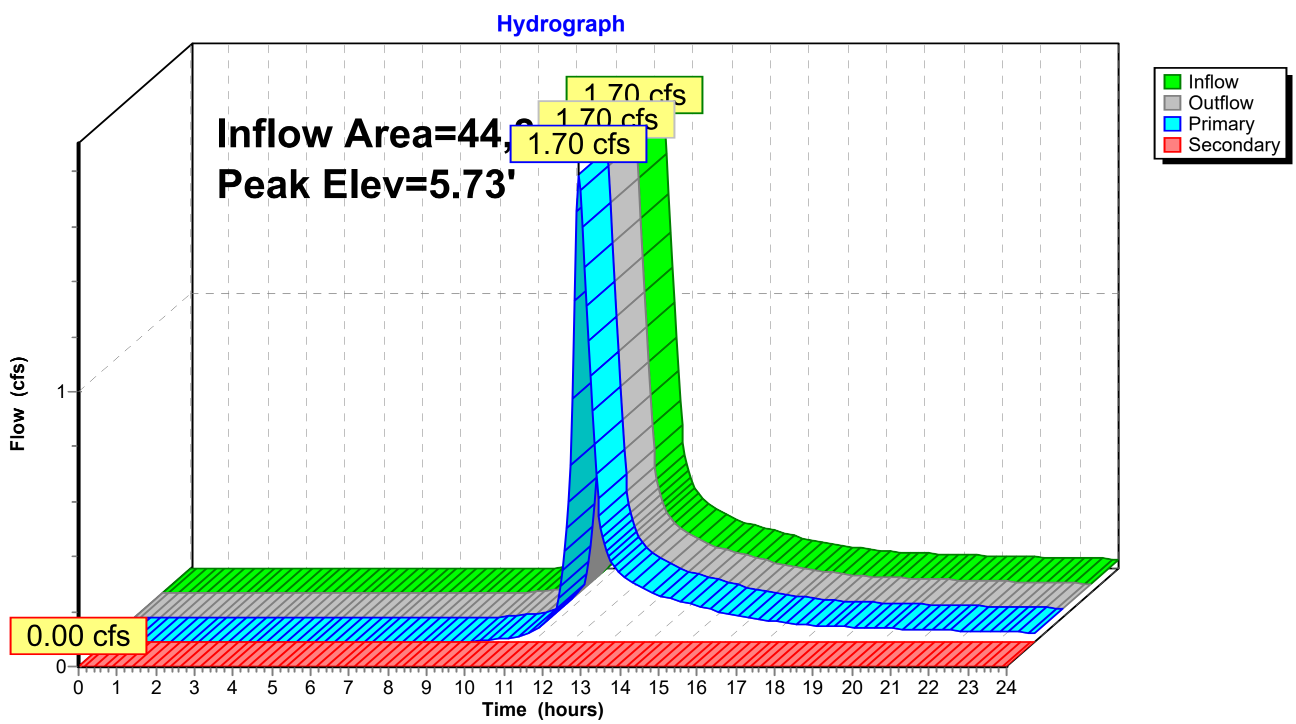
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 5.73' @ 12.21 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5.00'	**15.0" Round Culvert** L= 235.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 5.00' / 1.95' S= 0.0130 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf
#2	Secondary	8.53'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.68 cfs @ 12.21 hrs HW=5.72' TW=1.67' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 1.68 cfs @ 2.29 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=5.00' TW=1.00' (Dynamic Tailwater)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond CB13: CB-13



Summary for Pond CB19: CB-19

[57] Hint: Peaked at 4.83' (Flood elevation advised)

Inflow Area =	43,579 sf,	86.64% Impervious,	Inflow Depth > 4.33"	for 10 YEAR event
Inflow =	5.17 cfs @	12.02 hrs, Volume=	15,708 cf	
Outflow =	5.17 cfs @	12.02 hrs, Volume=	15,708 cf,	Atten= 0%, Lag= 0.0 min
Primary =	5.17 cfs @	12.02 hrs, Volume=	15,708 cf	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0 cf	

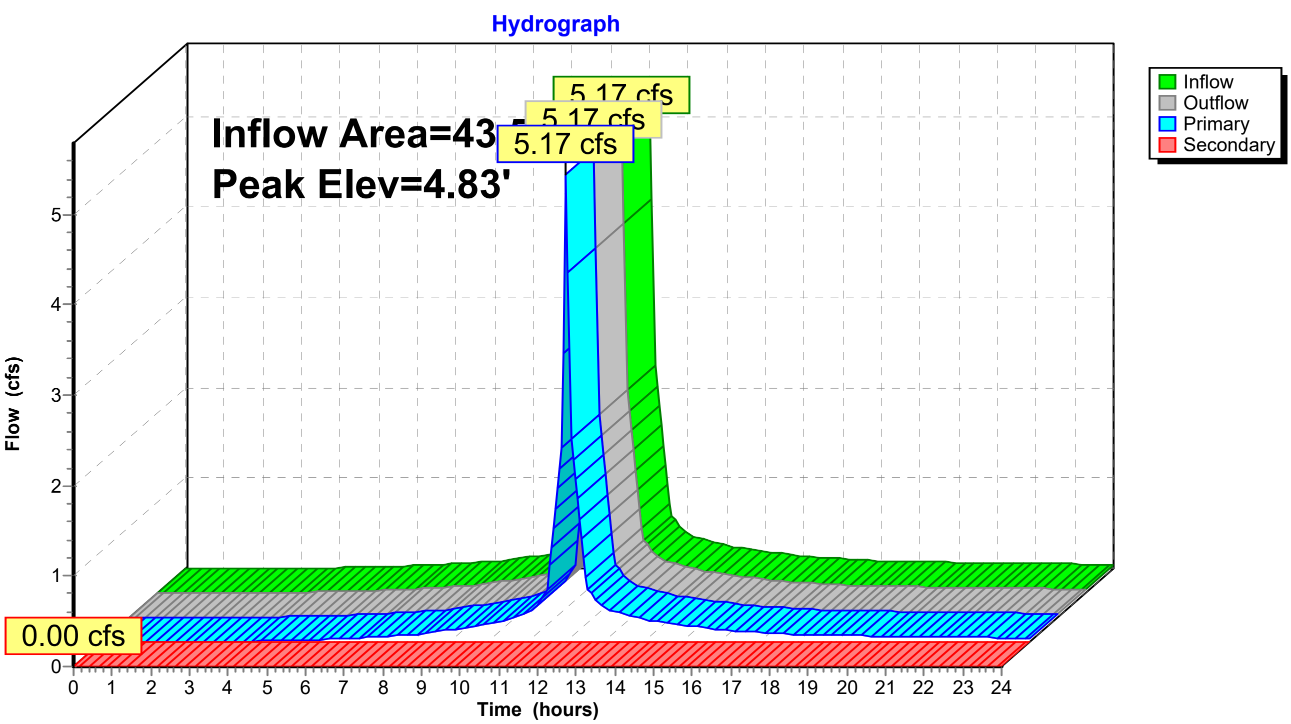
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 4.83' @ 12.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	3.50'	**18.0" Round Culvert** L= 32.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 3.50' / 3.20' S= 0.0094 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#2	Secondary	5.50'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.95 cfs @ 12.02 hrs HW=4.79' TW=0.00' (Dynamic Tailwater)
↑
└**1=Culvert** (Inlet Controls 4.95 cfs @ 3.06 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.50' TW=0.00' (Dynamic Tailwater)
↑
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond CB19: CB-19



Summary for Pond CB4: CB-4

[57] Hint: Peaked at 5.10' (Flood elevation advised)

Inflow Area =	8,604 sf,100.00% Impervious,	Inflow Depth > 4.89"	for 10 YEAR event	
Inflow =	1.07 cfs @	12.02 hrs, Volume=	3,508 cf	
Outflow =	1.07 cfs @	12.02 hrs, Volume=	3,508 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.07 cfs @	12.02 hrs, Volume=	3,508 cf	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0 cf	

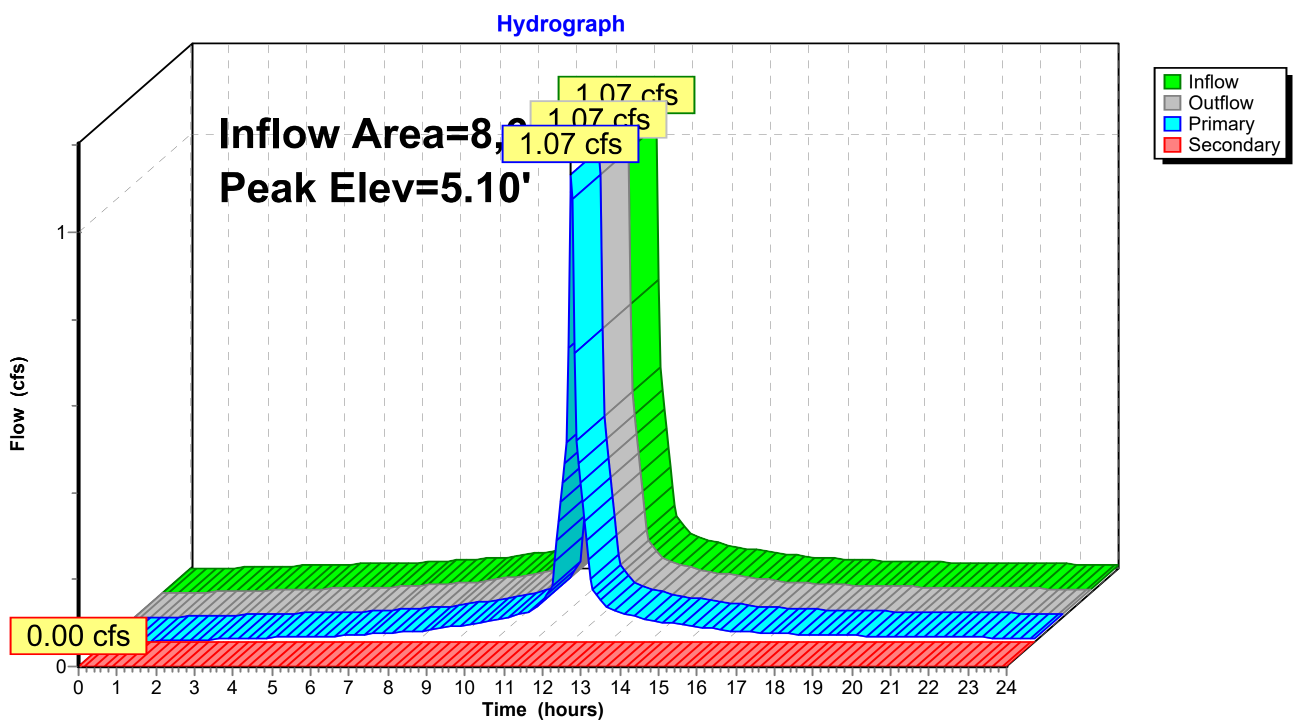
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 5.10' @ 12.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	4.55'	**16.0" Round Culvert** L= 156.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 4.55' / 2.99' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.40 sf
#2	Secondary	8.52'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.03 cfs @ 12.02 hrs HW=5.08' TW=3.59' (Dynamic Tailwater)
1=Culvert (Inlet Controls 1.03 cfs @ 1.97 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=4.55' TW=2.89' (Dynamic Tailwater)
2=Orifice/Grate (Controls 0.00 cfs)

Pond CB4: CB-4



Summary for Pond CB5: CB-5

[57] Hint: Peaked at 3.61' (Flood elevation advised)

Inflow Area =	14,052 sf,100.00% Impervious,	Inflow Depth > 4.89"	for 10 YEAR event	
Inflow =	1.75 cfs @	12.03 hrs, Volume=	5,729 cf	
Outflow =	1.75 cfs @	12.03 hrs, Volume=	5,729 cf,	Atten= 0%, Lag= 0.0 min
Primary =	1.75 cfs @	12.03 hrs, Volume=	5,729 cf	
Secondary =	0.00 cfs @	0.00 hrs, Volume=	0 cf	

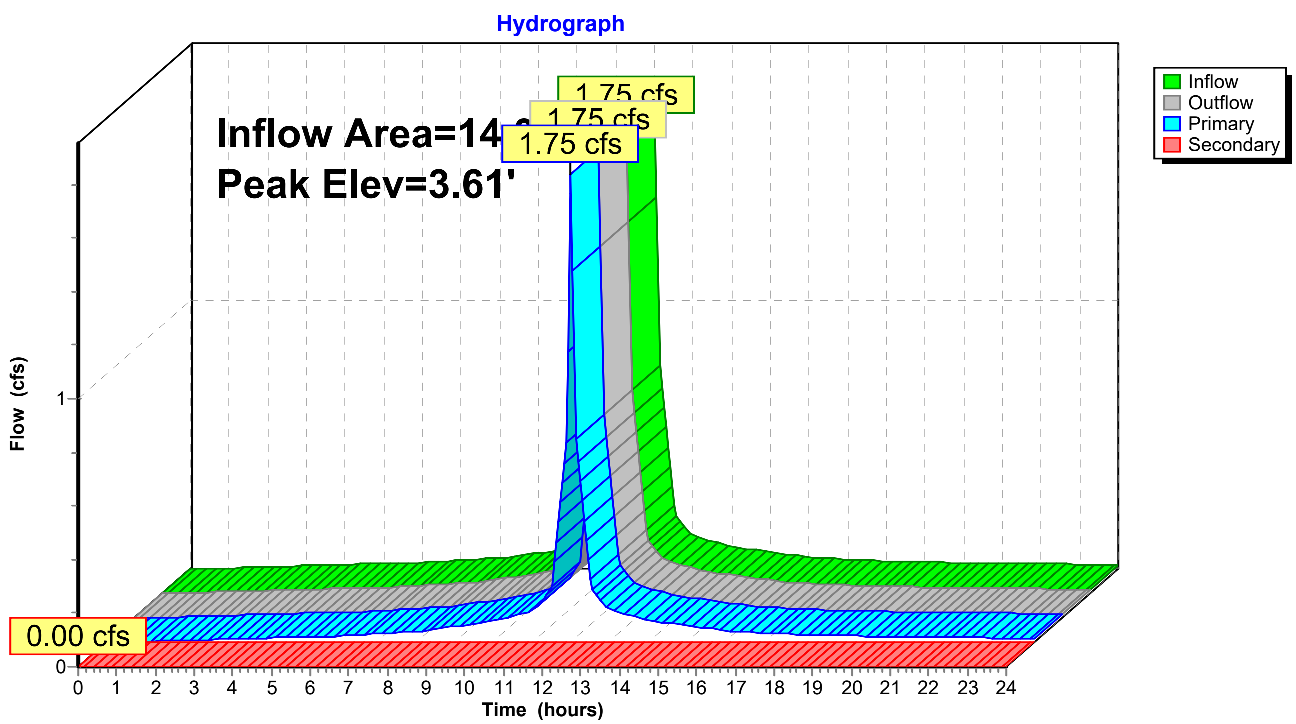
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 3.61' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	2.89'	**16.0" Round Culvert** L= 128.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2.89' / 1.66' S= 0.0096 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.40 sf
#2	Secondary	8.34'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.66 cfs @ 12.03 hrs HW=3.59' TW=2.97' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 1.66 cfs @ 3.22 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.89' TW=1.56' (Dynamic Tailwater)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond CB5: CB-5



Summary for Pond CB8: CB-8

[57] Hint: Peaked at 3.00' (Flood elevation advised)

Inflow Area =	51,083 sf, 71.02% Impervious,	Inflow Depth > 3.73"	for 10 YEAR event
Inflow =	5.30 cfs @ 12.03 hrs,	Volume= 15,888 cf	
Outflow =	5.30 cfs @ 12.03 hrs,	Volume= 15,888 cf,	Atten= 0%, Lag= 0.0 min
Primary =	5.30 cfs @ 12.03 hrs,	Volume= 15,888 cf	
Secondary =	0.00 cfs @ 0.00 hrs,	Volume= 0 cf	

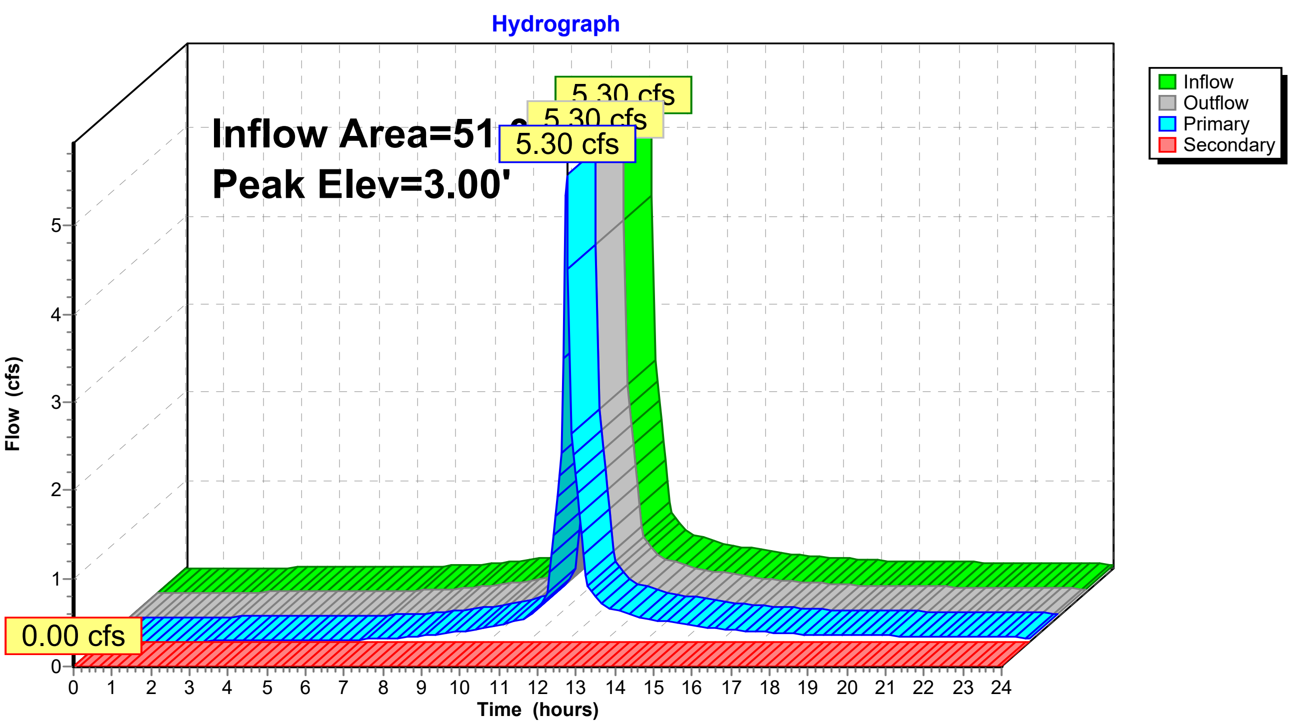
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 3.00' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1.56'	**18.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1.56' / 1.46' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#2	Secondary	8.34'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.08 cfs @ 12.03 hrs HW=2.97' TW=2.32' (Dynamic Tailwater)
1=Culvert (Barrel Controls 5.08 cfs @ 3.83 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1.56' TW=1.00' (Dynamic Tailwater)
2=Orifice/Grate (Controls 0.00 cfs)

Pond CB8: CB-8



Summary for Pond CB9: CB-9

[57] Hint: Peaked at 4.94' (Flood elevation advised)

Inflow Area =	37,031 sf, 60.03% Impervious,	Inflow Depth > 3.29"	for 10 YEAR event
Inflow =	3.55 cfs @ 12.03 hrs,	Volume=	10,158 cf
Outflow =	3.55 cfs @ 12.03 hrs,	Volume=	10,158 cf, Atten= 0%, Lag= 0.0 min
Primary =	3.55 cfs @ 12.03 hrs,	Volume=	10,158 cf
Secondary =	0.00 cfs @ 0.00 hrs,	Volume=	0 cf

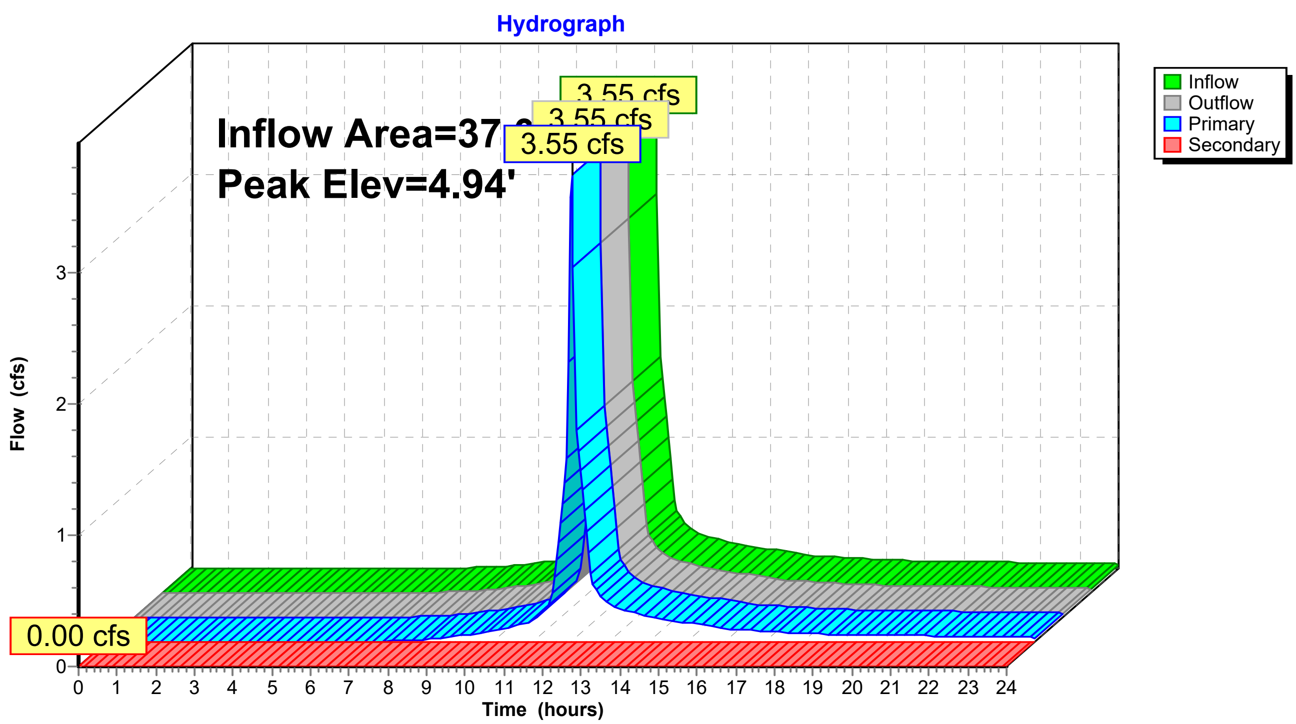
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 4.94' @ 12.03 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	3.54'	**16.0" Round Culvert** L= 198.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 3.54' / 3.35' S= 0.0010 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.40 sf
#2	Secondary	8.36'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.40 cfs @ 12.03 hrs HW=4.90' TW=2.97' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 3.40 cfs @ 2.98 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.54' TW=1.56' (Dynamic Tailwater)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond CB9: CB-9



Summary for Pond I-1: INFILTRATION TRENCH

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=26)

Inflow Area = 52,485 sf, 20.42% Impervious, Inflow Depth > 1.74" for 10 YEAR event
Inflow = 2.05 cfs @ 12.15 hrs, Volume= 7,597 cf
Outflow = 1.68 cfs @ 12.26 hrs, Volume= 7,598 cf, Atten= 18%, Lag= 6.6 min
Discarded = 0.19 cfs @ 12.05 hrs, Volume= 5,608 cf
Primary = 1.48 cfs @ 12.26 hrs, Volume= 1,990 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 8.50' @ 12.26 hrs Surf.Area= 2,800 sf Storage= 1,382 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 50.4 min (911.7 - 861.3)

Volume	Invert	Avail.Storage	Storage Description
#1	9.25'	112 cf	**8.00'W x 175.00'L x 0.20'H Prismatoid (Pea Gravel Layer)**
			280 cf Overall x 40.0% Voids
#2	6.75'	1,225 cf	**8.00'W x 175.00'L x 2.50'H Prismatoid (Gravel Layer)**
			3,500 cf Overall x 35.0% Voids
#3	6.00'	525 cf	**8.00'W x 175.00'L x 0.75'H Prismatoid (Sand Layer)**
			1,050 cf Overall x 50.0% Voids
		1,862 cf	Total Available Storage

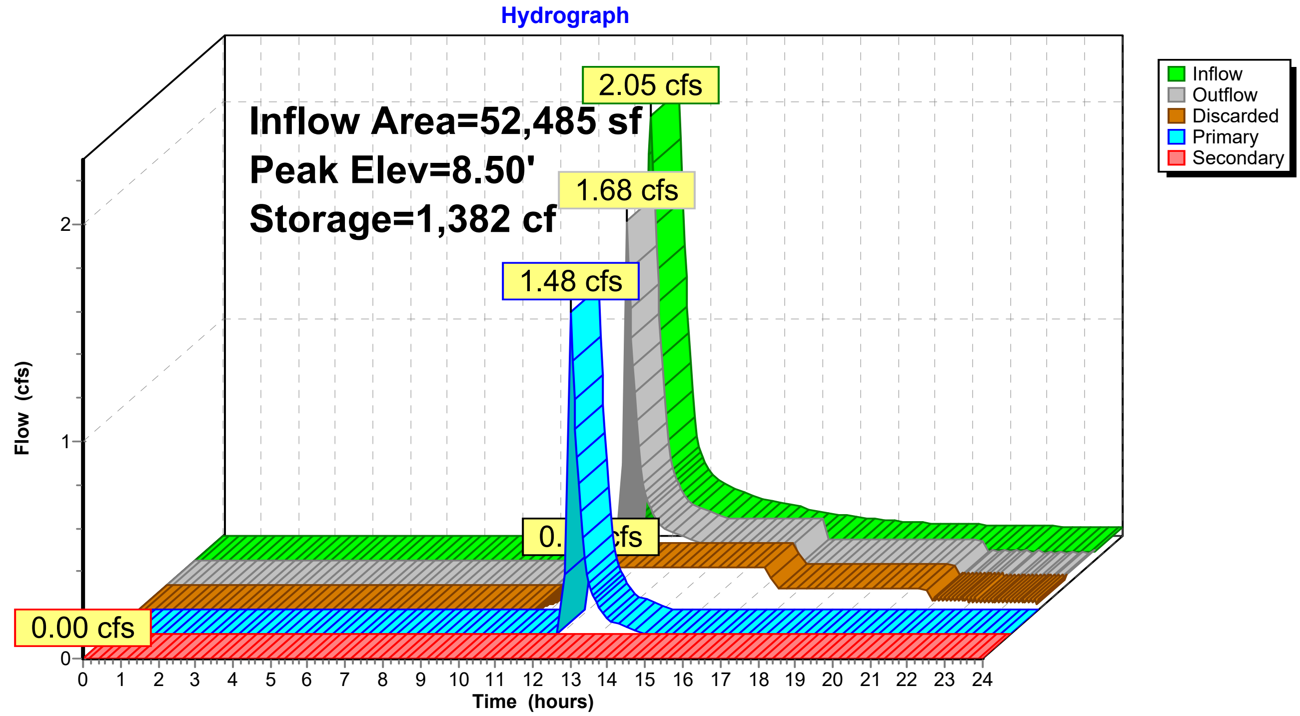
Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**3.000 in/hr Exfiltration over Surface area**
#2	Primary	8.00'	**12.0" Round Culvert X 2.00** L= 60.0' CMP, projecting, no headwall, Ke= 0.900
			Inlet / Outlet Invert= 8.00' / 1.50' S= 0.1083 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Secondary	9.25'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.19 cfs @ 12.05 hrs HW=6.81' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=1.45 cfs @ 12.26 hrs HW=8.49' TW=0.00' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 1.45 cfs @ 1.88 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6.00' TW=0.00' (Dynamic Tailwater)
└─**3=Orifice/Grate** (Controls 0.00 cfs)

Pond I-1: INFILTRATION TRENCH



Summary for Pond P2: Green Roof

Inflow Area = 14,324 sf,100.00% Impervious, Inflow Depth > 4.89" for 10 YEAR event
Inflow = 1.89 cfs @ 12.00 hrs, Volume= 5,841 cf
Outflow = 0.99 cfs @ 12.00 hrs, Volume= 5,841 cf, Atten= 47%, Lag= 0.0 min
Primary = 0.99 cfs @ 12.00 hrs, Volume= 5,841 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 23.56' @ 12.10 hrs Surf.Area= 14,324 sf Storage= 453 cf

Plug-Flow detention time= 1.9 min calculated for 5,828 cf (100% of inflow)
Center-of-Mass det. time= 1.9 min (743.9 - 742.0)

Volume	Invert	Avail.Storage	Storage Description
#1	23.40'	53,287 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

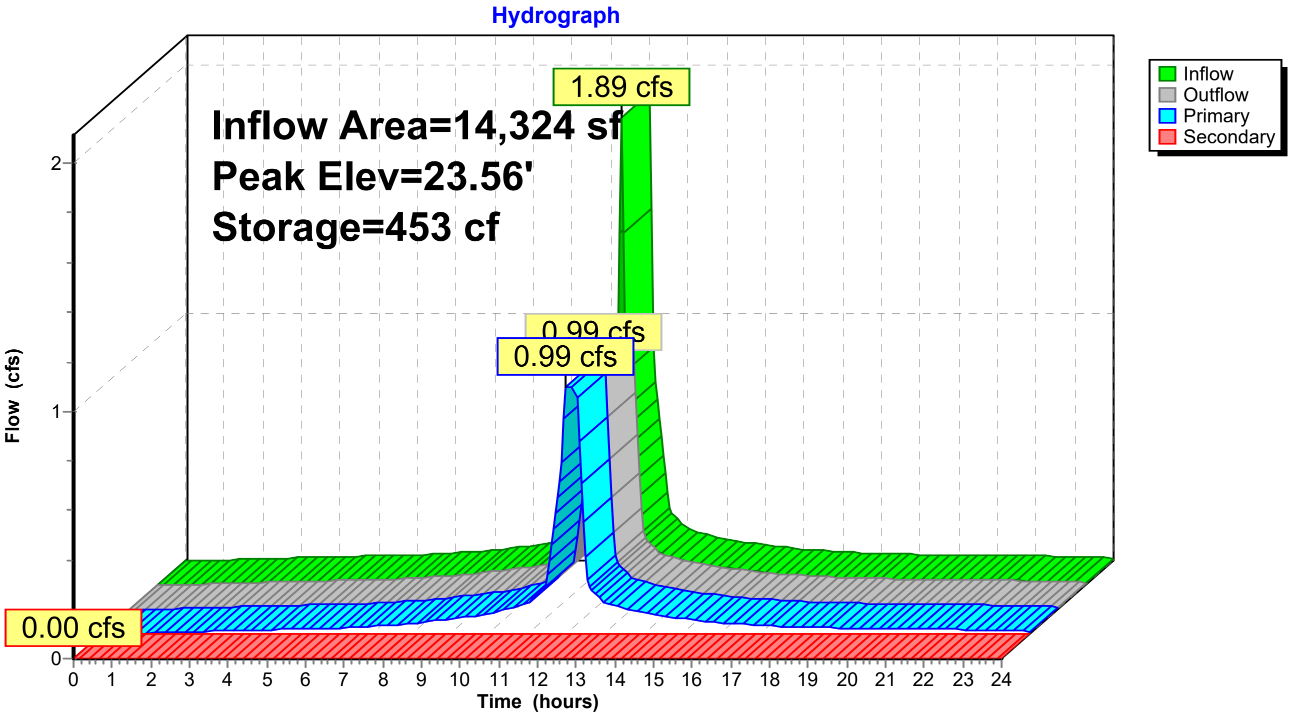
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.40	100	0.0	0	0
23.48	14,324	40.0	231	231
23.50	14,324	20.0	57	288
24.50	14,324	20.0	2,865	3,153
28.00	14,324	100.0	50,134	53,287

Device	Routing	Invert	Outlet Devices
#1	Primary	23.40'	**3.000 in/hr Exfiltration over Surface area**
#2	Secondary	24.54'	**6.0" Horiz. Orifice/Grate (Overflow) X 2.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.99 cfs @ 12.00 hrs HW=23.51' TW=0.00' (Dynamic Tailwater)
↑**1=Exfiltration** (Exfiltration Controls 0.99 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=23.40' TW=0.00' (Dynamic Tailwater)
↑**2=Orifice/Grate (Overflow)** (Controls 0.00 cfs)

Pond P2: Green Roof

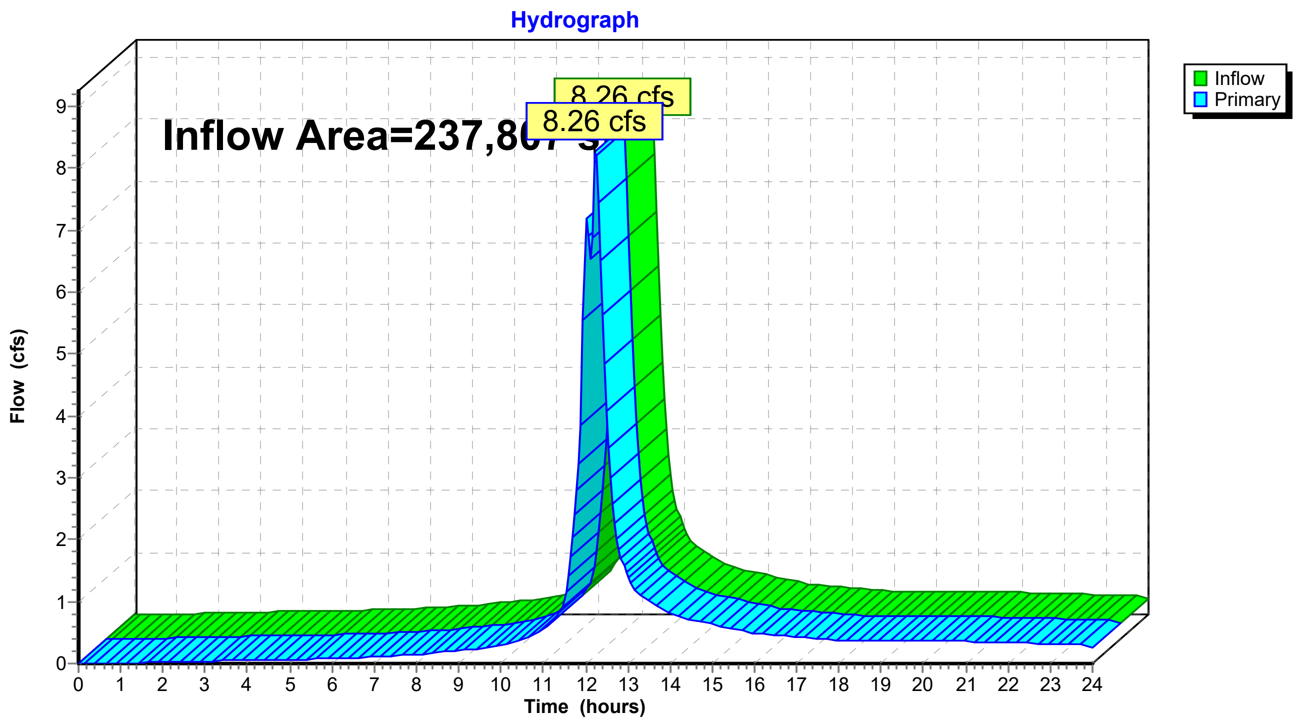


Summary for Link DP-1: DP-1

Inflow Area =	237,807 sf, 45.28% Impervious,	Inflow Depth > 2.31"	for 10 YEAR event
Inflow =	8.26 cfs @ 12.23 hrs, Volume=	45,792 cf	
Primary =	8.26 cfs @ 12.23 hrs, Volume=	45,792 cf, Atten= 0%, Lag= 0.0 min	

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

Link DP-1: DP-1

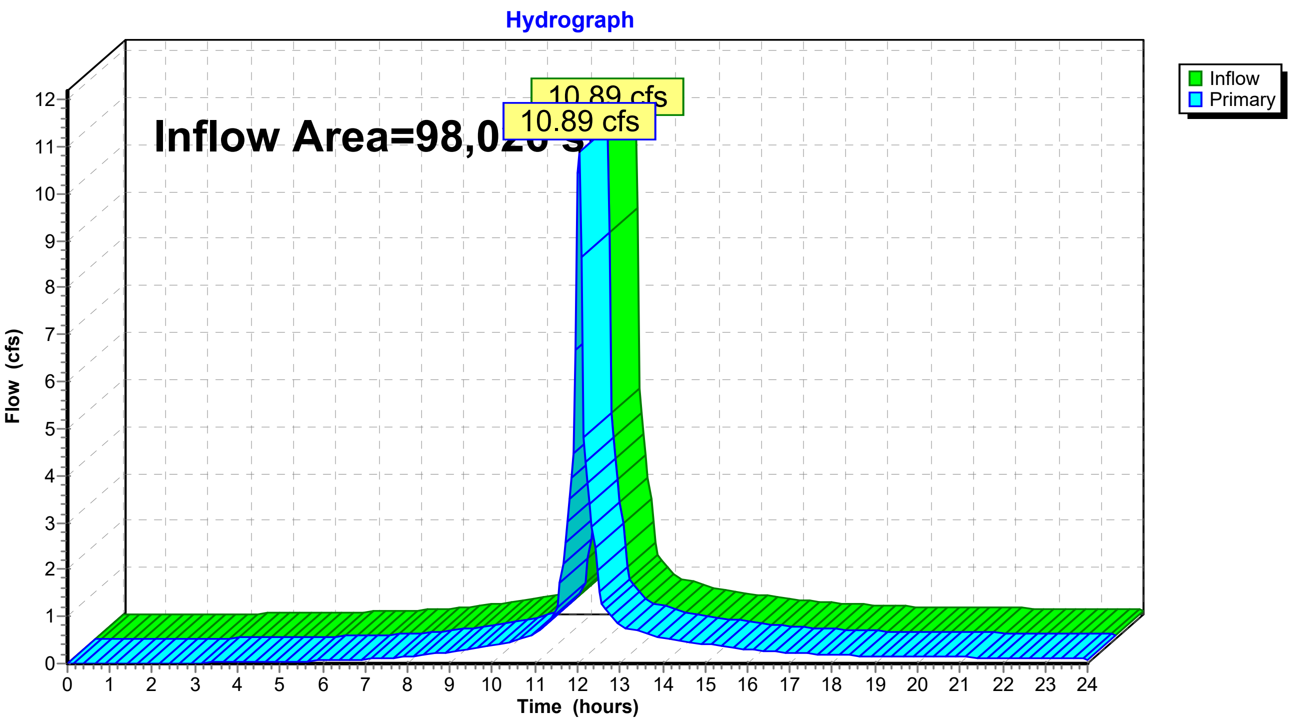


Summary for Link DP-2: Design Point 2

Inflow Area = 98,026 sf, 78.96% Impervious, Inflow Depth > 4.04" for 10 YEAR event
Inflow = 10.89 cfs @ 12.03 hrs, Volume= 32,967 cf
Primary = 10.89 cfs @ 12.03 hrs, Volume= 32,967 cf, Atten= 0%, Lag= 0.0 min

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

Link DP-2: Design Point 2



Summary for Subcatchment DA 10A: DA - 10A

[49] Hint: Tc<2dt may require smaller dt

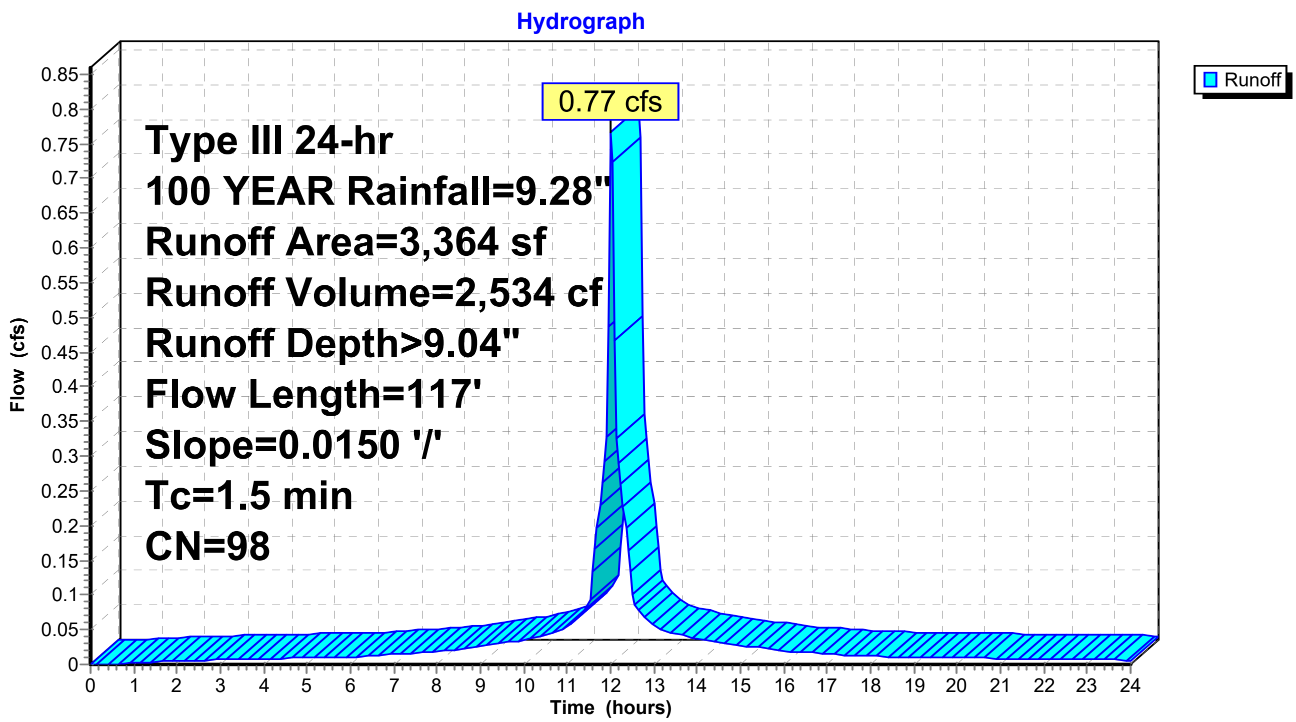
Runoff = 0.77 cfs @ 12.02 hrs, Volume= 2,534 cf, Depth> 9.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

Area (sf)	CN	Description
0	61	>75% Grass cover, Good, HSG B
3,364	98	Paved parking, HSG B
3,364	98	Weighted Average
3,364		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	117	0.0150	1.32		**Sheet Flow, 1 to 2** Smooth surfaces n= 0.011 P2= 3.50"

Subcatchment DA 10A: DA - 10A



Summary for Subcatchment DA 11A: DA - 11A

[49] Hint: Tc<2dt may require smaller dt

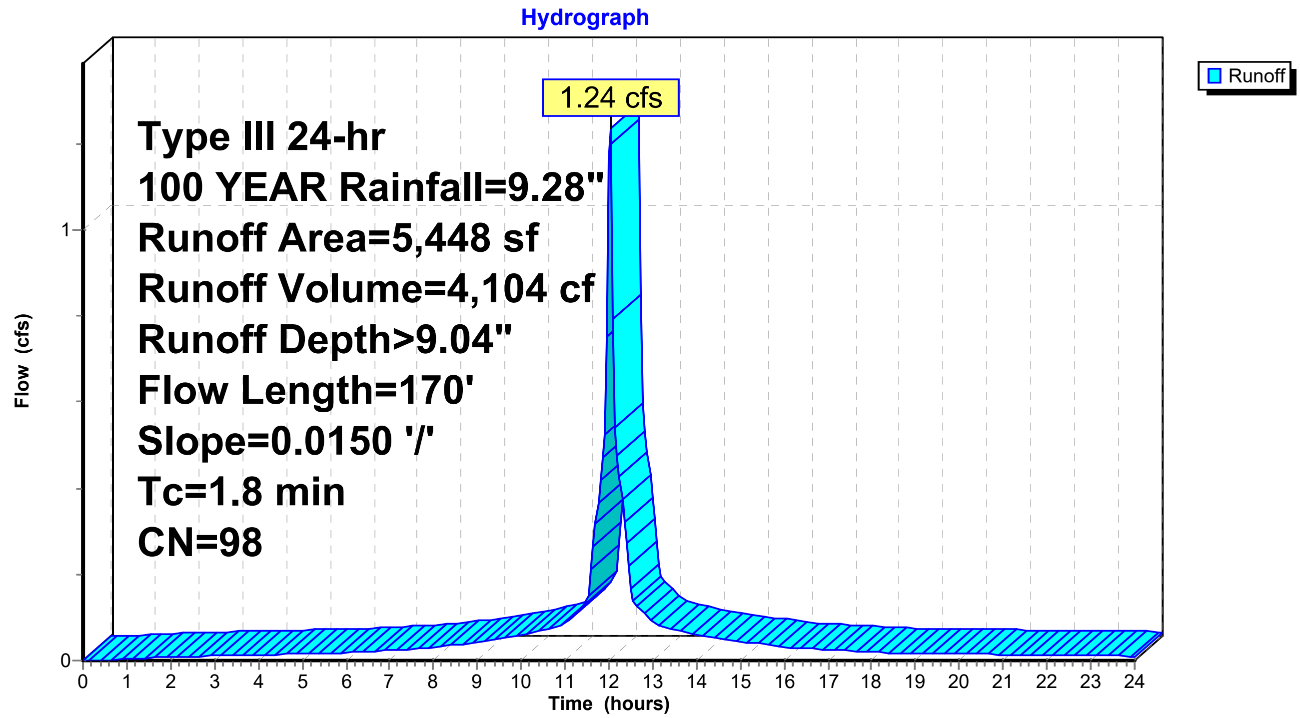
Runoff = 1.24 cfs @ 12.03 hrs, Volume= 4,104 cf, Depth> 9.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

Area (sf)	CN	Description
0	61	>75% Grass cover, Good, HSG B
5,448	98	Paved parking, HSG B
5,448	98	Weighted Average
5,448		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.28		**Sheet Flow, 1 to 2** Smooth surfaces n= 0.011 P2= 3.50"
0.5	70	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.8	170	Total			

Subcatchment DA 11A: DA - 11A



Summary for Subcatchment DA 12A: DA - 12A

[49] Hint: Tc<2dt may require smaller dt

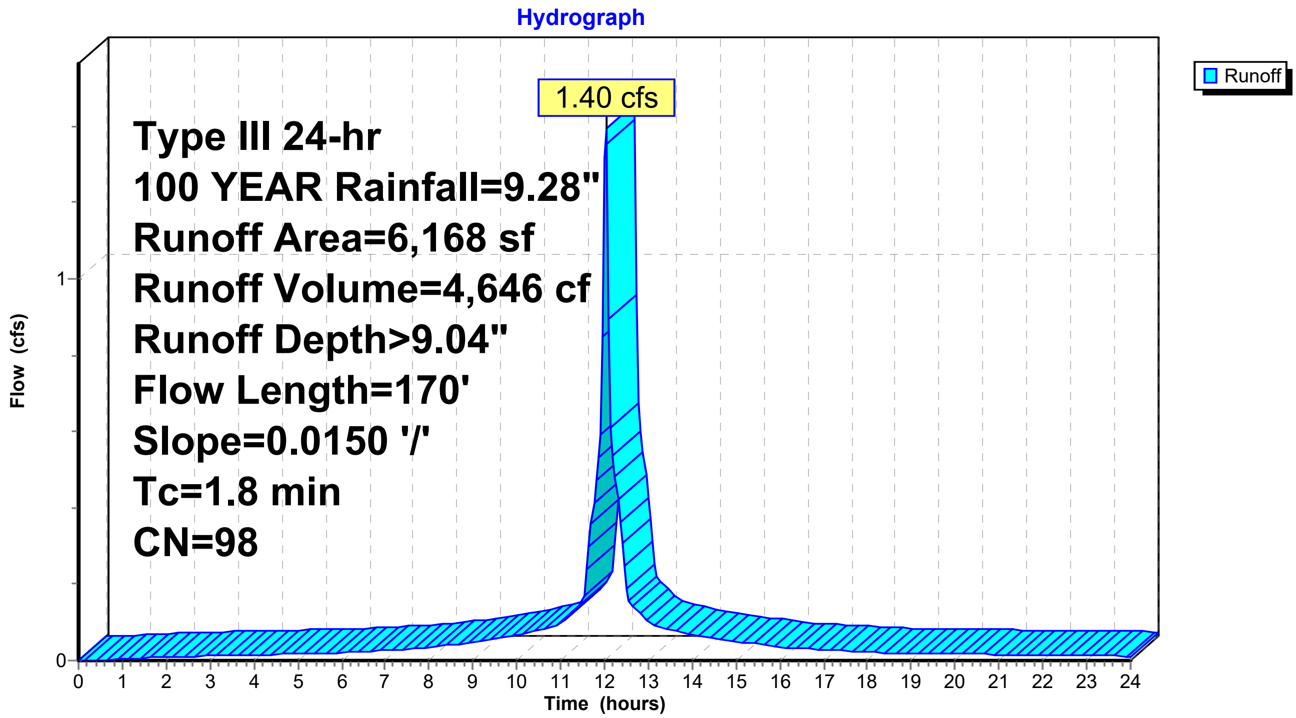
Runoff = 1.40 cfs @ 12.03 hrs, Volume= 4,646 cf, Depth> 9.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

Area (sf)	CN	Description
0	61	>75% Grass cover, Good, HSG B
6,168	98	Paved parking, HSG B
6,168	98	Weighted Average
6,168		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.3	100	0.0150	1.28		**Sheet Flow, 1 to 2**
					Smooth surfaces n= 0.011 P2= 3.50"
0.5	70	0.0150	2.49		**Shallow Concentrated Flow,**
					Paved Kv= 20.3 fps
1.8	170	Total			

Subcatchment DA 12A: DA - 12A



Summary for Subcatchment DA 13A: DA - 13A

[49] Hint: Tc<2dt may require smaller dt

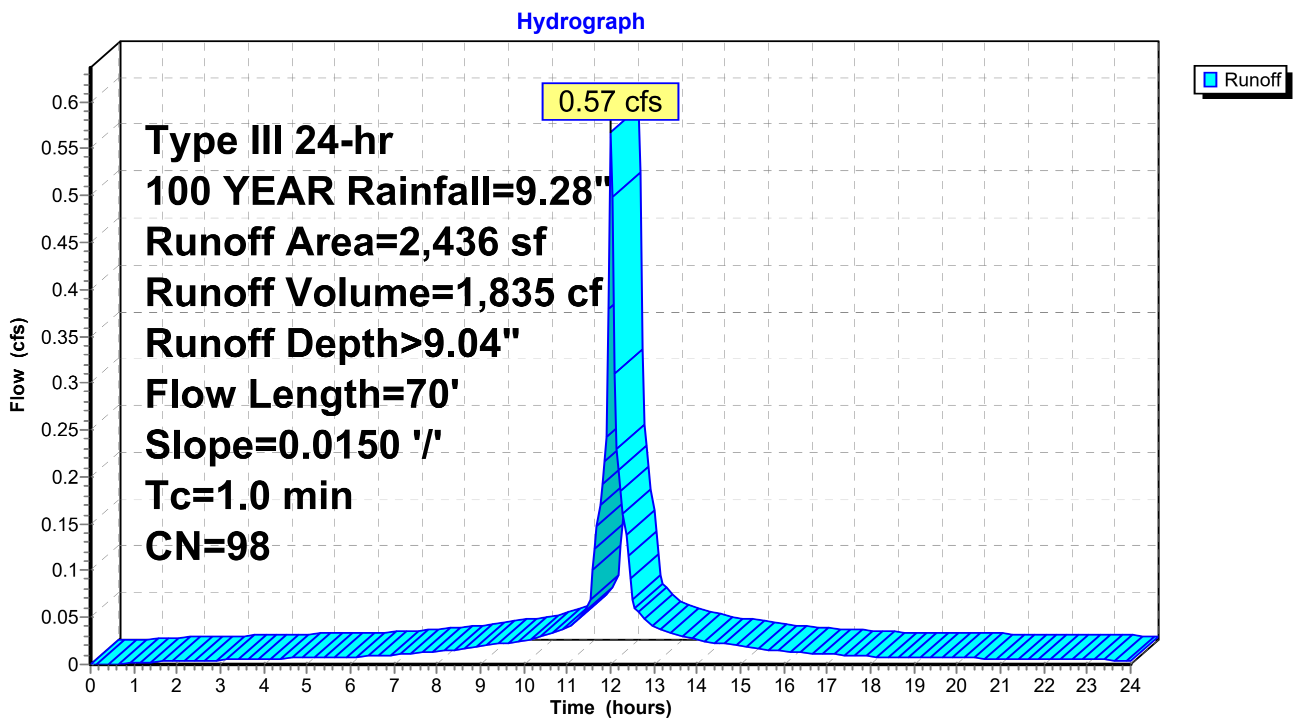
Runoff = 0.57 cfs @ 12.01 hrs, Volume= 1,835 cf, Depth> 9.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

Area (sf)	CN	Description
0	61	>75% Grass cover, Good, HSG B
2,436	98	Paved parking, HSG B
2,436	98	Weighted Average
2,436		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	70	0.0150	1.19		**Sheet Flow, 1 to 2** Smooth surfaces n= 0.011 P2= 3.50"

Subcatchment DA 13A: DA - 13A



Summary for Subcatchment DA 1A: DA -1A

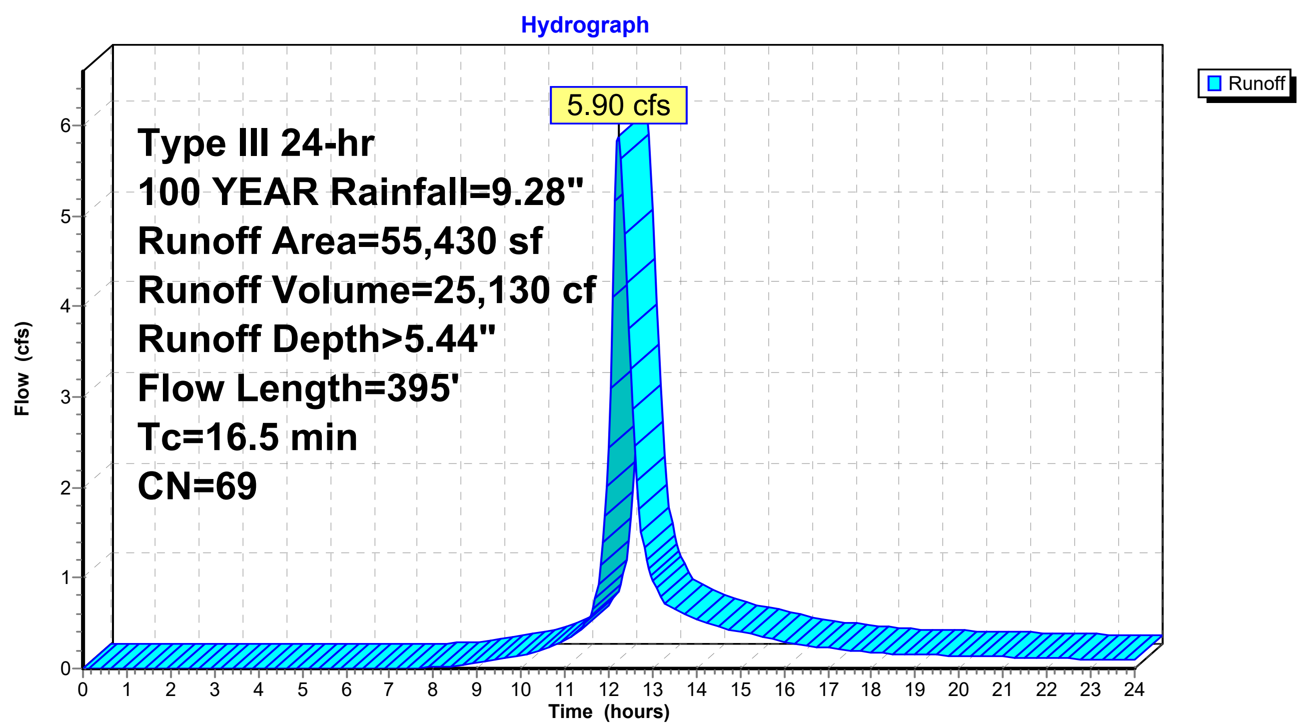
Runoff = 5.90 cfs @ 12.23 hrs, Volume= 25,130 cf, Depth> 5.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

	Area (sf)	CN	Description
	43,680	61	>75% Grass cover, Good, HSG B
*	11,750	98	
	55,430	69	Weighted Average
	43,680		78.80% Pervious Area
	11,750		21.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	190	0.0520	0.20		**Sheet Flow, 1 to 2**
					Grass: Dense n= 0.240 P2= 3.50"
0.4	119	0.4400	4.64		**Shallow Concentrated Flow, 2 to 3**
					Short Grass Pasture Kv= 7.0 fps
0.5	86	0.0230	3.08		**Shallow Concentrated Flow, 3 to End**
					Paved Kv= 20.3 fps
16.5	395	Total			

Subcatchment DA 1A: DA -1A



Summary for Subcatchment DA 2A: DA - 2A

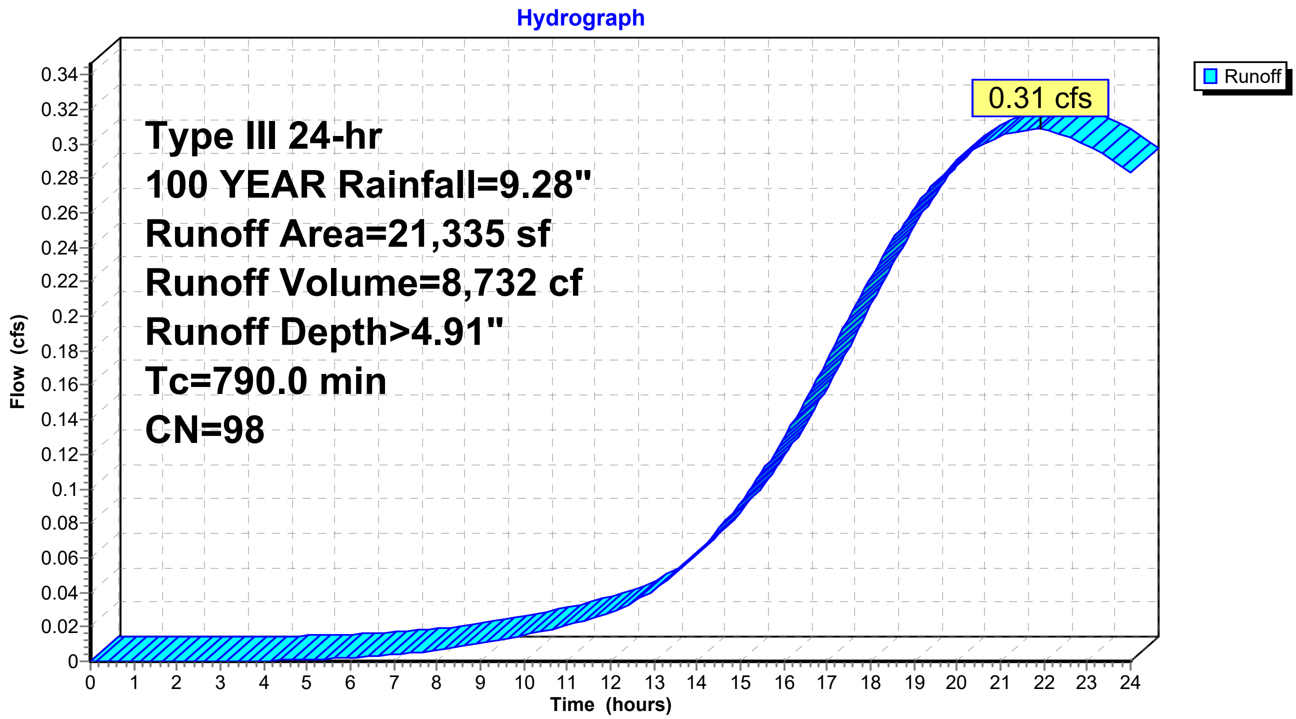
Runoff = 0.31 cfs @ 21.94 hrs, Volume= 8,732 cf, Depth> 4.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

Area (sf)	CN	Description
21,335	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
21,335	98	Weighted Average
21,335		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
790.0					**Direct Entry, Porous Pavment**

Subcatchment DA 2A: DA - 2A



Summary for Subcatchment DA 3A: DA - 3A

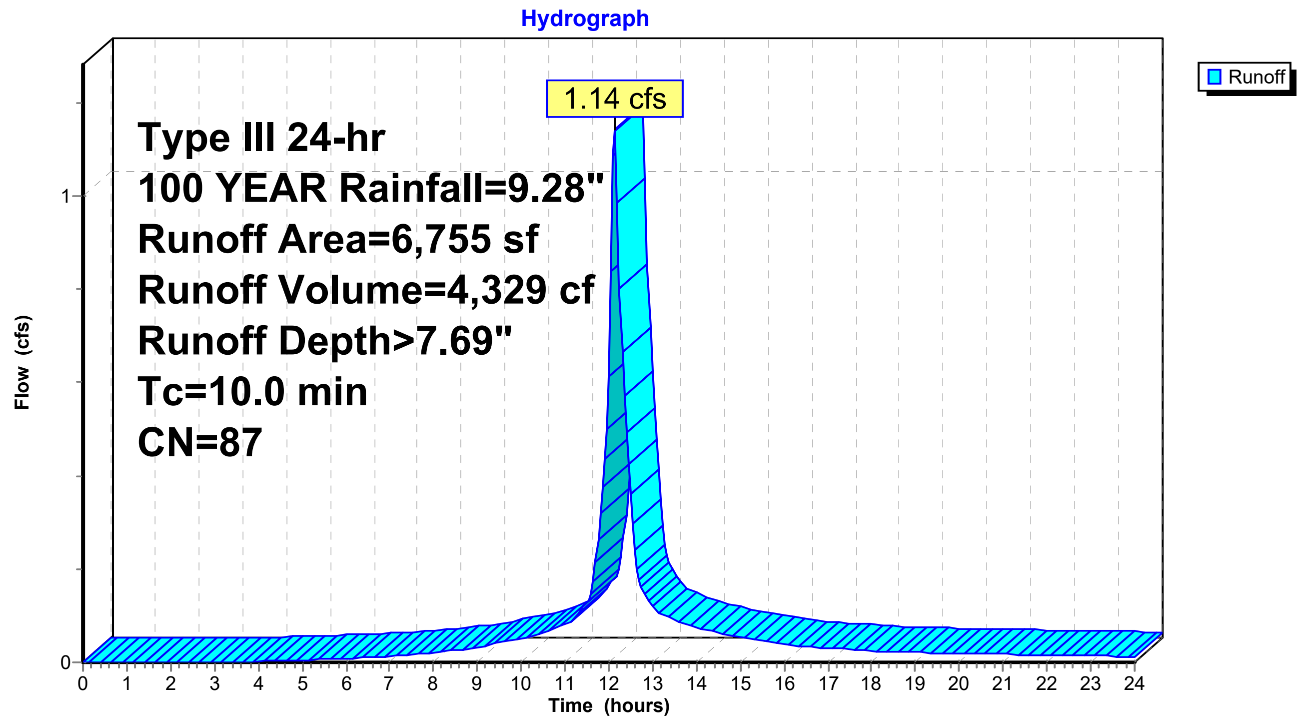
Runoff = 1.14 cfs @ 12.14 hrs, Volume= 4,329 cf, Depth> 7.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

Area (sf)	CN	Description
4,820	98	Unconnected roofs, HSG B
1,935	61	>75% Grass cover, Good, HSG B
6,755	87	Weighted Average
1,935		28.65% Pervious Area
4,820		71.35% Impervious Area
4,820		100.00% Unconnected

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

Subcatchment DA 3A: DA - 3A



Summary for Subcatchment DA 4A: DA - 4A

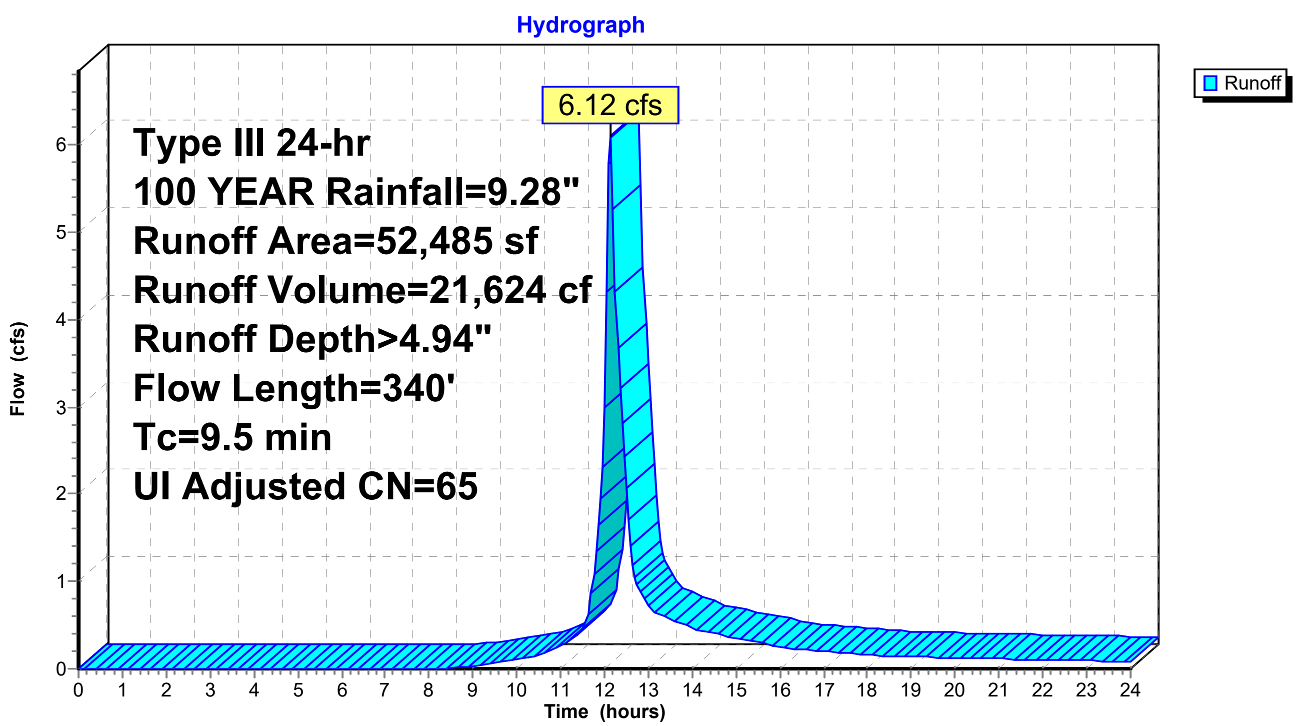
Runoff = 6.12 cfs @ 12.14 hrs, Volume= 21,624 cf, Depth> 4.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

Area (sf)	CN	Adj	Description
10,719	98		Unconnected roofs, HSG B
41,766	61		>75% Grass cover, Good, HSG B
52,485	69	65	Weighted Average, UI Adjusted
41,766			79.58% Pervious Area
10,719			20.42% Impervious Area
10,719			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0300	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
1.3	204	0.2800	2.65		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	36	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.5	340	Total			

Subcatchment DA 4A: DA - 4A



Summary for Subcatchment DA 5A: DA - 5A

[49] Hint: Tc<2dt may require smaller dt

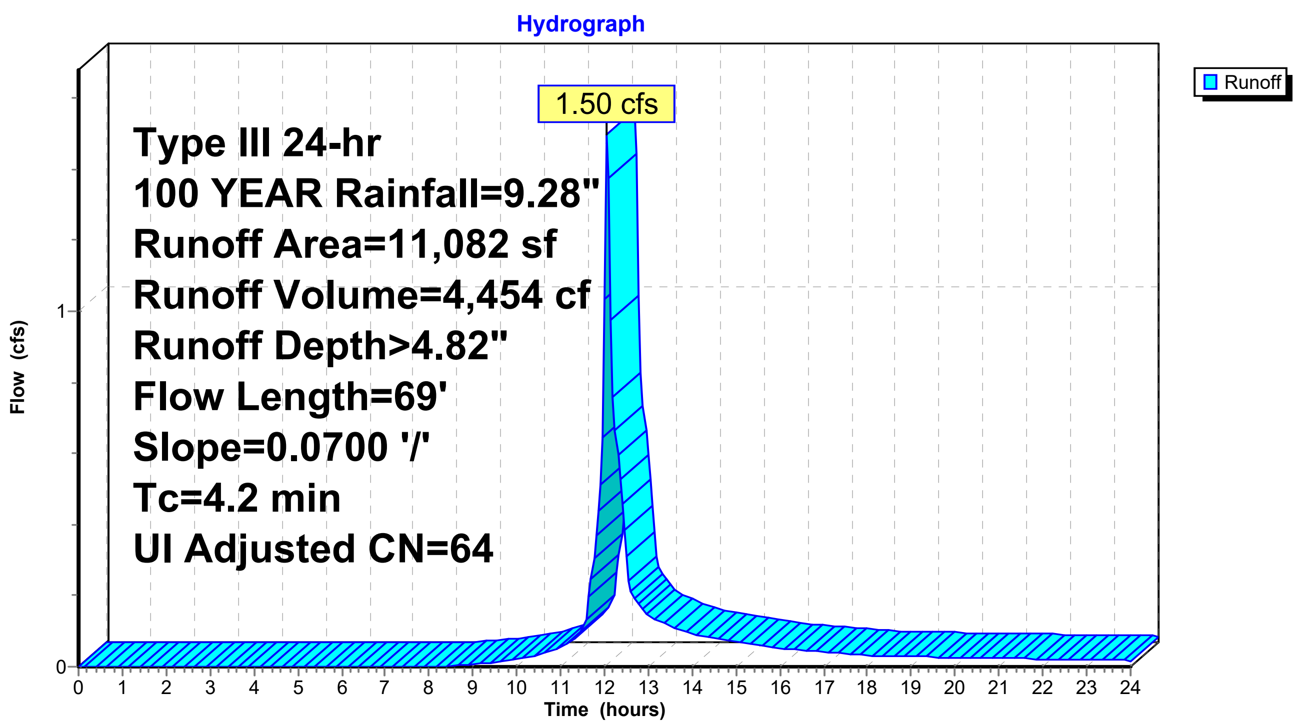
Runoff = 1.50 cfs @ 12.07 hrs, Volume= 4,454 cf, Depth> 4.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

Area (sf)	CN	Adj	Description
1,530	98		Unconnected roofs, HSG B
9,552	61		>75% Grass cover, Good, HSG B
11,082	66	64	Weighted Average, UI Adjusted
9,552			86.19% Pervious Area
1,530			13.81% Impervious Area
1,530			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	69	0.0700	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"

Subcatchment DA 5A: DA - 5A



Summary for Subcatchment DA 6A: DA - 6A

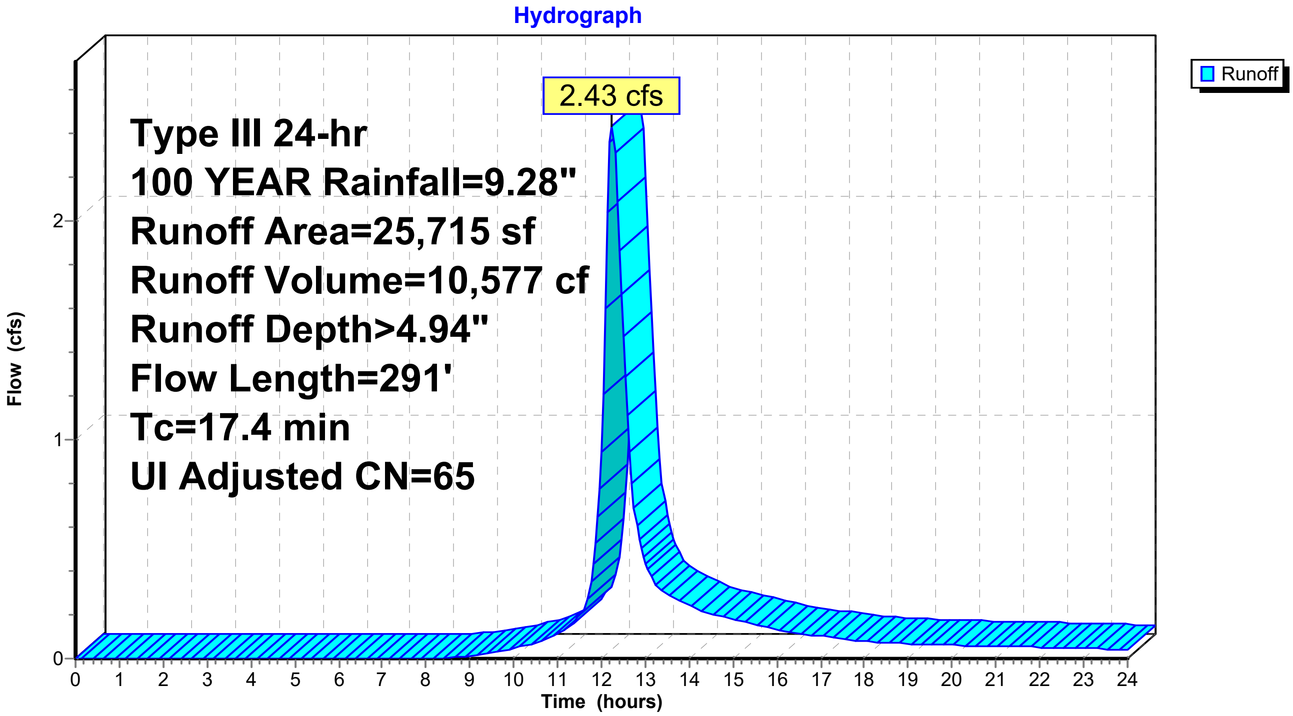
Runoff = 2.43 cfs @ 12.24 hrs, Volume= 10,577 cf, Depth> 4.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

Area (sf)	CN	Adj	Description
5,765	98		Unconnected roofs, HSG B
19,950	61		>75% Grass cover, Good, HSG B
25,715	69	65	Weighted Average, UI Adjusted
19,950			77.58% Pervious Area
5,765			22.42% Impervious Area
5,765			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	100	0.0400	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.5	102	0.5700	3.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	60	0.0160	0.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	29	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
17.4	291	Total			

Subcatchment DA 6A: DA - 6A



Summary for Subcatchment DA 7A: DA - 7A

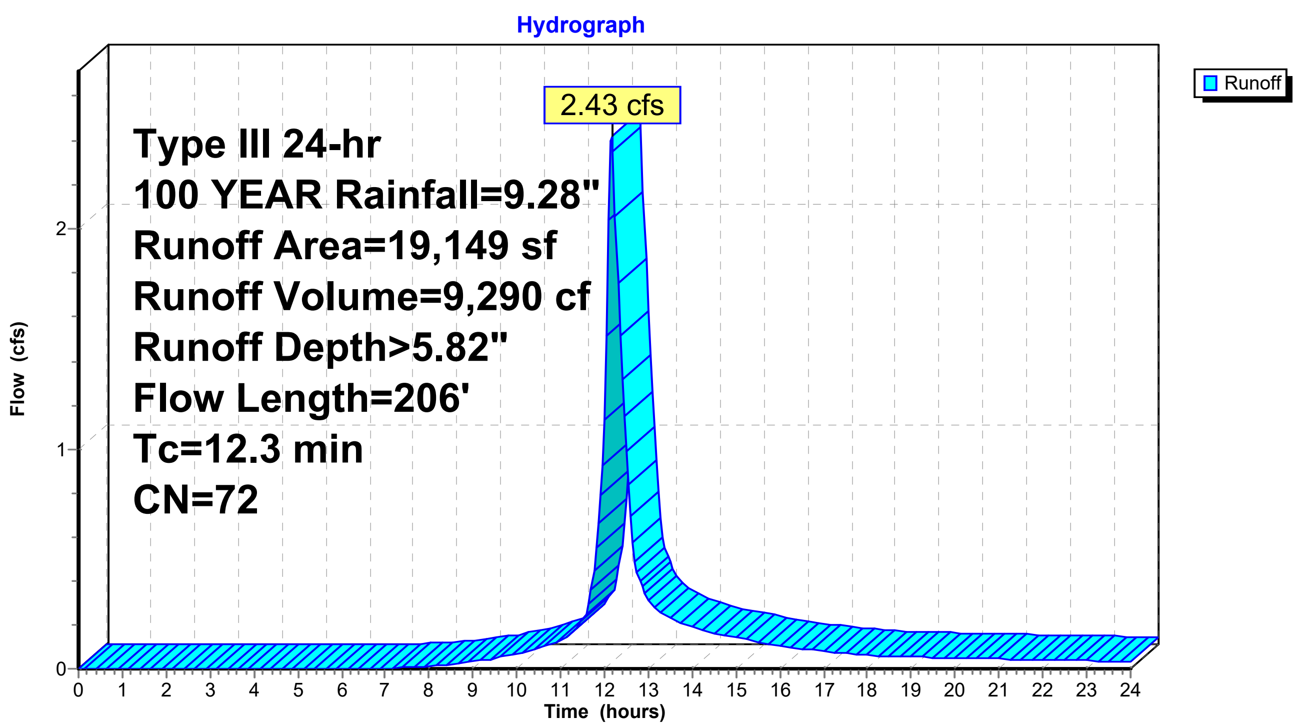
Runoff = 2.43 cfs @ 12.17 hrs, Volume= 9,290 cf, Depth> 5.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

Area (sf)	CN	Description
5,897	98	Unconnected roofs, HSG B
13,252	61	>75% Grass cover, Good, HSG B
19,149	72	Weighted Average
13,252		69.20% Pervious Area
5,897		30.80% Impervious Area
5,897		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	100	0.0800	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.3	80	0.6600	4.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.2	26	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
12.3	206	Total			

Subcatchment DA 7A: DA - 7A



Summary for Subcatchment DA 8A: DA - 8A

[49] Hint: Tc<2dt may require smaller dt

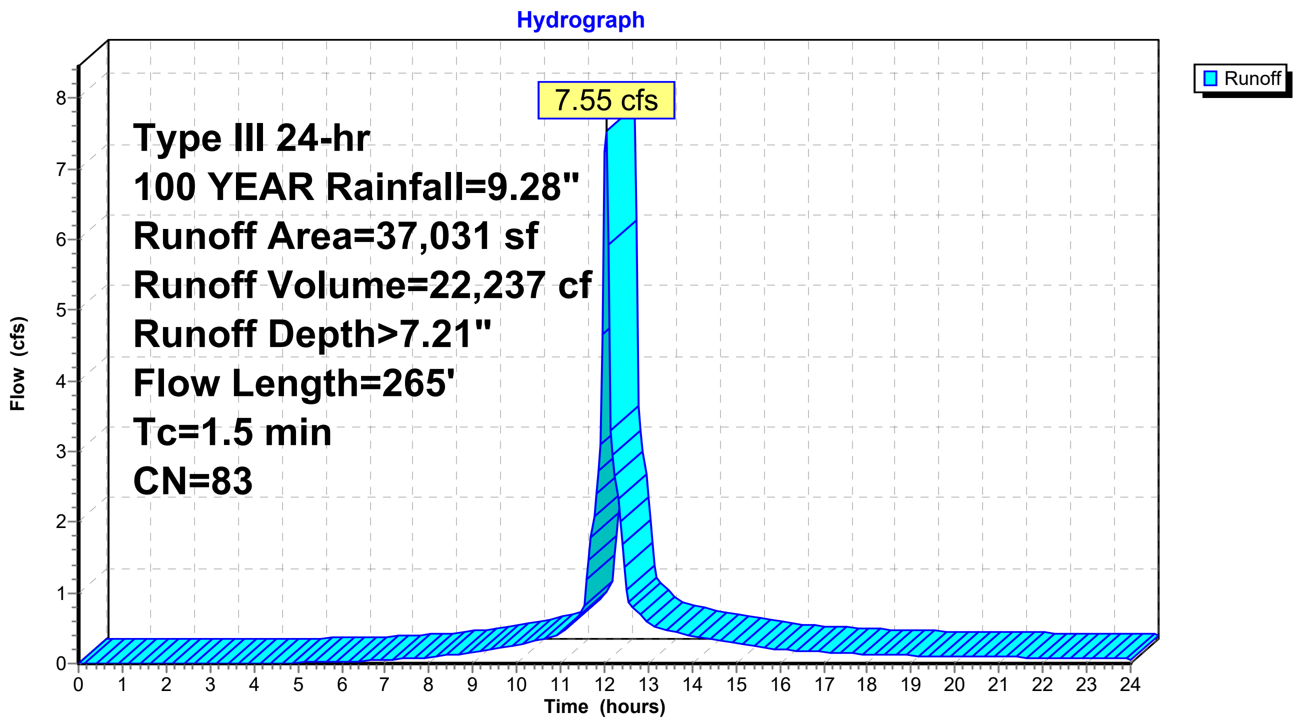
Runoff = 7.55 cfs @ 12.02 hrs, Volume= 22,237 cf, Depth> 7.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

	Area (sf)	CN	Description
	14,803	61	>75% Grass cover, Good, HSG B
*	22,228	98	Paved
	37,031	83	Weighted Average
	14,803		39.97% Pervious Area
	22,228		60.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	100	0.6300	3.97		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	165	0.0150	2.49		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	265	Total			

Subcatchment DA 8A: DA - 8A



Summary for Subcatchment DA 9A: DA - 9A

[49] Hint: Tc<2dt may require smaller dt

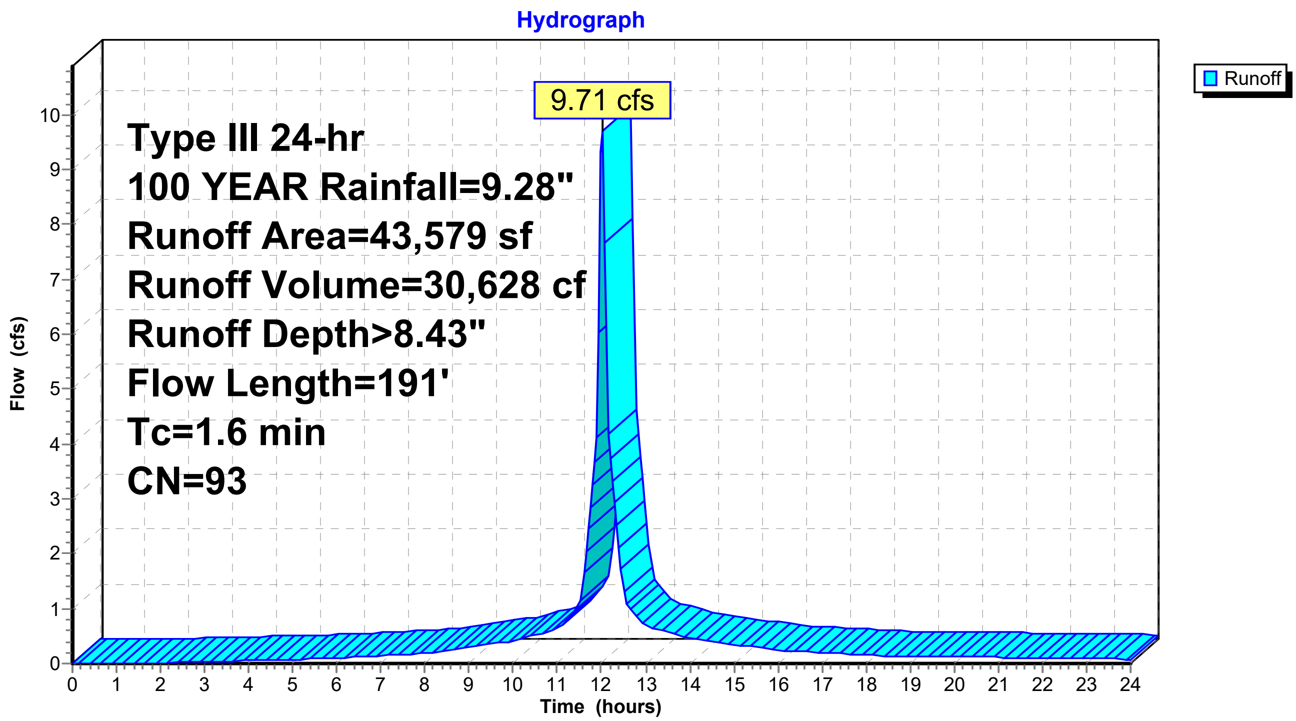
Runoff = 9.71 cfs @ 12.02 hrs, Volume= 30,628 cf, Depth> 8.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

Area (sf)	CN	Description
5,822	61	>75% Grass cover, Good, HSG B
37,757	98	Paved parking, HSG B
43,579	93	Weighted Average
5,822		13.36% Pervious Area
37,757		86.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0380	1.86		**Sheet Flow, 1 to 2**
					Smooth surfaces n= 0.011 P2= 3.50"
0.7	91	0.0100	2.03		**Shallow Concentrated Flow, 2 to end**
					Paved Kv= 20.3 fps
1.6	191	Total			

Subcatchment DA 9A: DA - 9A



Summary for Subcatchment RG 1: Roof Area 1

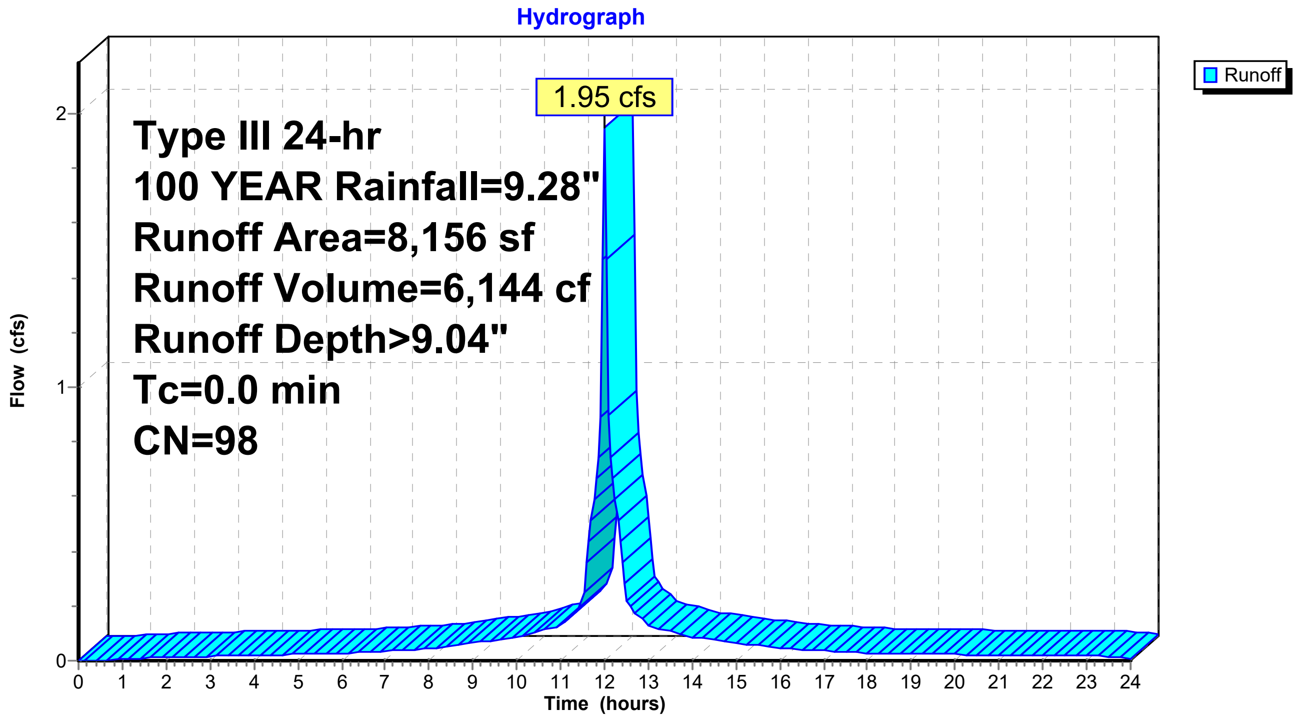
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.95 cfs @ 12.00 hrs, Volume= 6,144 cf, Depth> 9.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

Area (sf)	CN	Description
8,156	98	Unconnected pavement, HSG B
8,156		100.00% Impervious Area
8,156		100.00% Unconnected

Subcatchment RG 1: Roof Area 1



Summary for Subcatchment RG 2: Roof Area 2

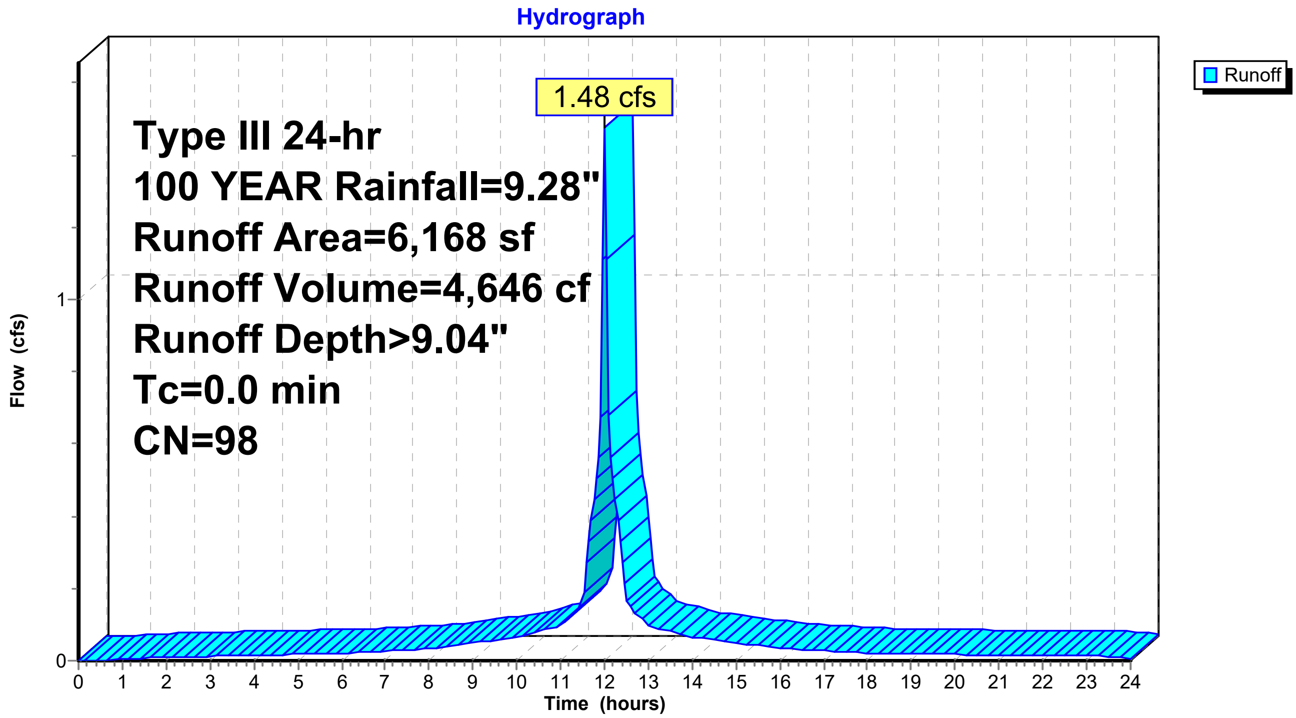
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 1.48 cfs @ 12.00 hrs, Volume= 4,646 cf, Depth> 9.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

Area (sf)	CN	Description
6,168	98	Unconnected pavement, HSG B
6,168		100.00% Impervious Area
6,168		100.00% Unconnected

Subcatchment RG 2: Roof Area 2



Summary for Subcatchment WR: BUILDING ROOF

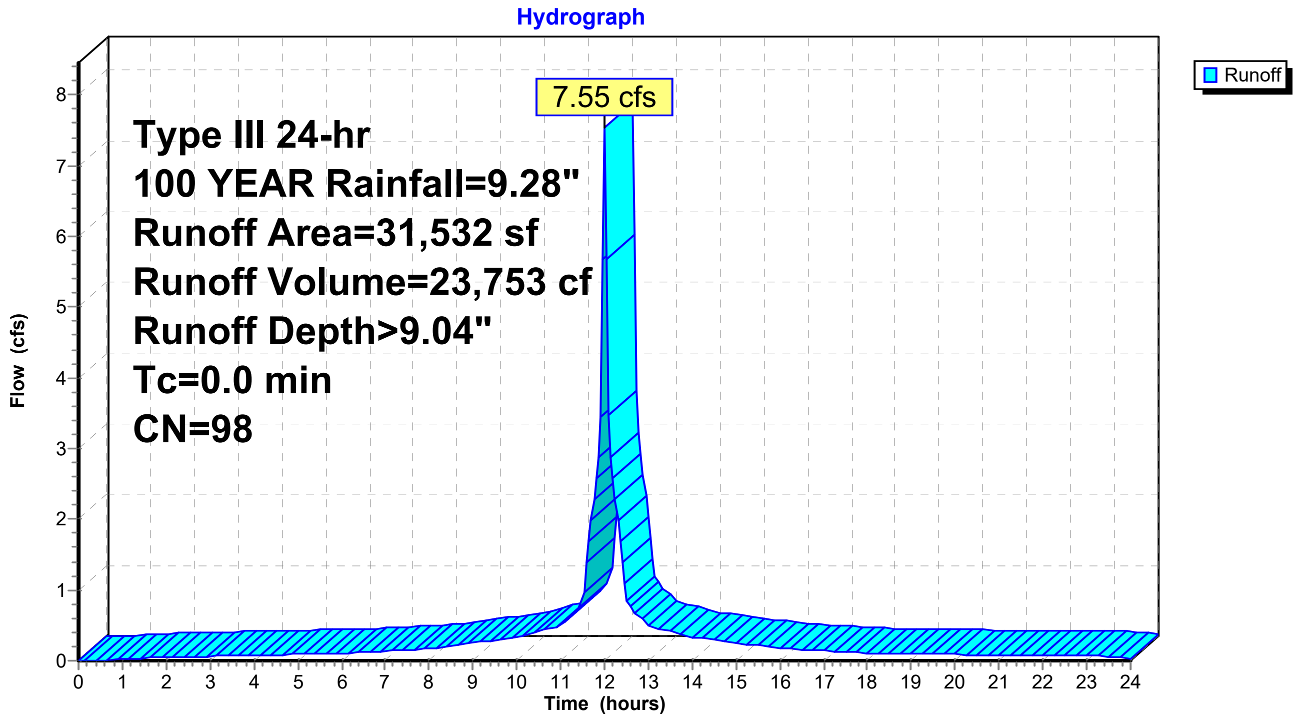
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 7.55 cfs @ 12.00 hrs, Volume= 23,753 cf, Depth> 9.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

Area (sf)	CN	Description
31,532	98	Unconnected pavement, HSG B
31,532		100.00% Impervious Area
31,532		100.00% Unconnected

Subcatchment WR: BUILDING ROOF



Summary for Pond AS-10: Aqua Swirl AS-10

[57] Hint: Peaked at 4.26' (Flood elevation advised)

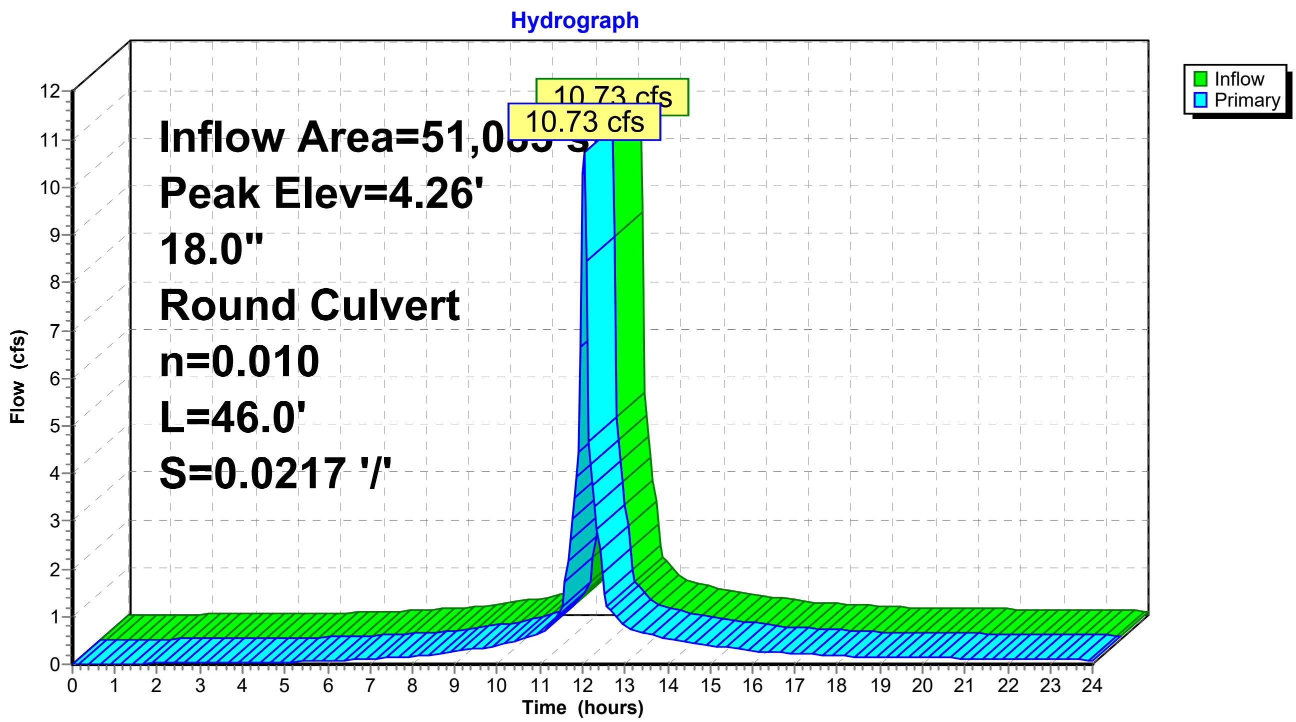
Inflow Area = 51,083 sf, 71.02% Impervious, Inflow Depth > 7.71" for 100 YEAR event
Inflow = 10.73 cfs @ 12.02 hrs, Volume= 32,822 cf
Outflow = 10.73 cfs @ 12.02 hrs, Volume= 32,822 cf, Atten= 0%, Lag= 0.0 min
Primary = 10.73 cfs @ 12.02 hrs, Volume= 32,822 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 4.26' @ 12.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1.00'	**18.0" Round Culvert** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1.00' / 0.00' S= 0.0217 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=10.26 cfs @ 12.02 hrs HW=4.08' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 10.26 cfs @ 5.81 fps)

Pond AS-10: Aqua Swirl AS-10



Summary for Pond AS-6: Aqua Swirl AS-6

[57] Hint: Peaked at 2.25' (Flood elevation advised)

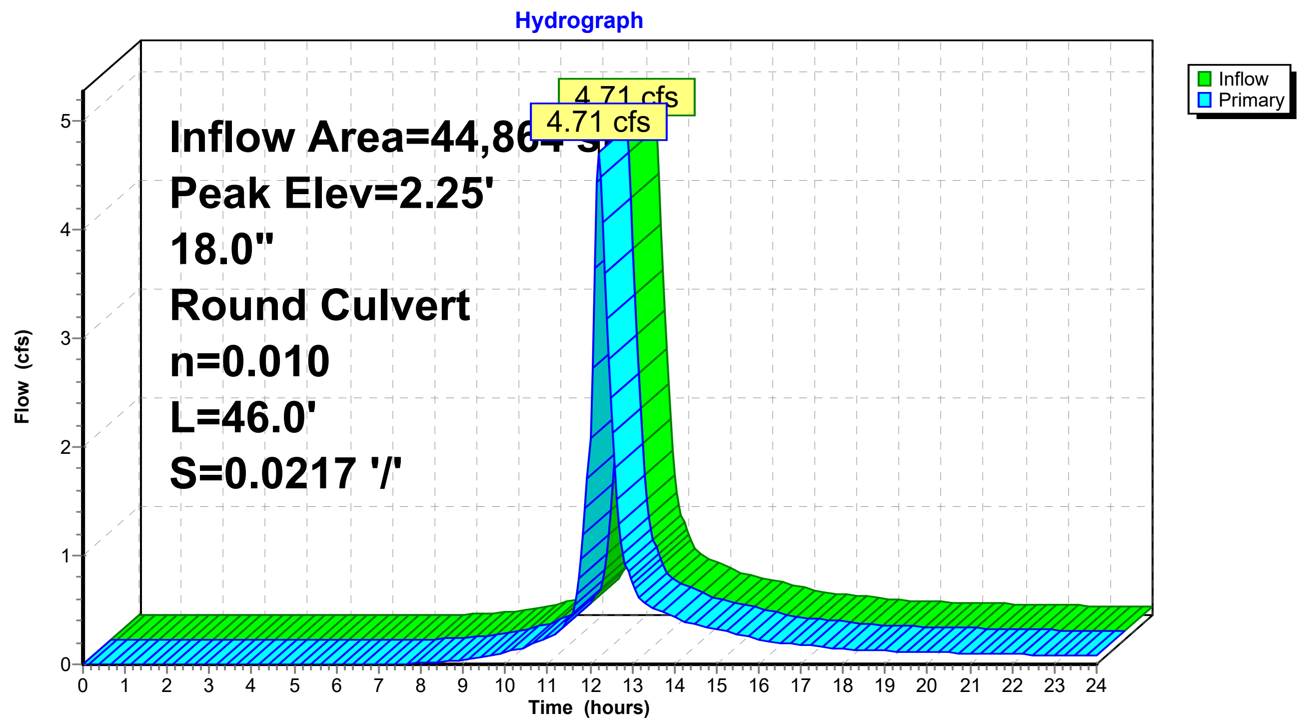
Inflow Area =	44,864 sf, 25.99% Impervious,	Inflow Depth > 5.31"	for 100 YEAR event
Inflow =	4.71 cfs @ 12.20 hrs,	Volume= 19,867 cf	
Outflow =	4.71 cfs @ 12.20 hrs,	Volume= 19,867 cf,	Atten= 0%, Lag= 0.0 min
Primary =	4.71 cfs @ 12.20 hrs,	Volume= 19,867 cf	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 2.25' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1.00'	**18.0" Round Culvert** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1.00' / 0.00' S= 0.0217 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=4.70 cfs @ 12.20 hrs HW=2.24' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 4.70 cfs @ 3.00 fps)

Pond AS-6: Aqua Swirl AS-6



Summary for Pond AS-9: Aqua Swirl AS-9

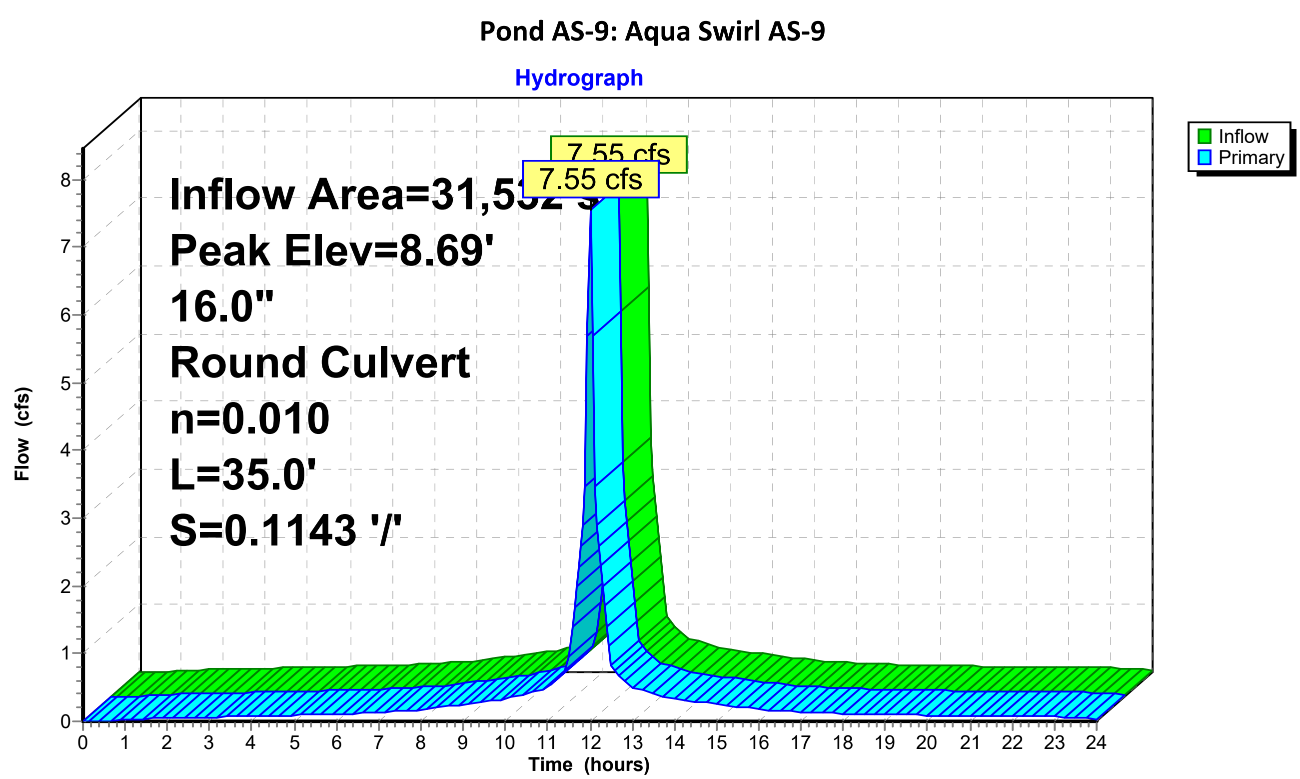
[57] Hint: Peaked at 8.69' (Flood elevation advised)

Inflow Area = 31,532 sf,100.00% Impervious, Inflow Depth > 9.04" for 100 YEAR event
Inflow = 7.55 cfs @ 12.00 hrs, Volume= 23,753 cf
Outflow = 7.55 cfs @ 12.00 hrs, Volume= 23,753 cf, Atten= 0%, Lag= 0.0 min
Primary = 7.55 cfs @ 12.00 hrs, Volume= 23,753 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 8.69' @ 12.00 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	6.00'	**16.0" Round Culvert** L= 35.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 6.00' / 2.00' S= 0.1143 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.40 sf

Primary OutFlow Max=7.55 cfs @ 12.00 hrs HW=8.69' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 7.55 cfs @ 5.41 fps)



Summary for Pond CB1: CB-1

[57] Hint: Peaked at 9.49' (Flood elevation advised)

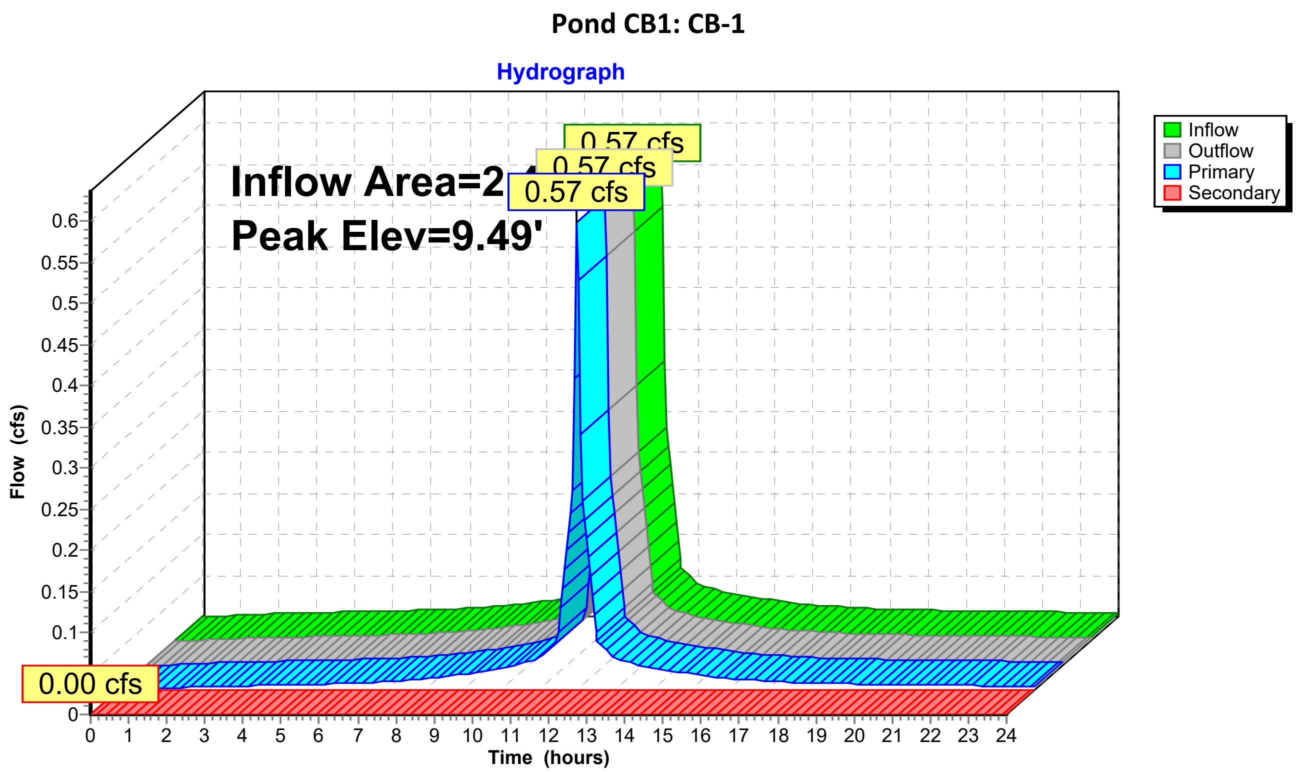
Inflow Area = 2,436 sf,100.00% Impervious, Inflow Depth > 9.04" for 100 YEAR event
Inflow = 0.57 cfs @ 12.01 hrs, Volume= 1,835 cf
Outflow = 0.57 cfs @ 12.01 hrs, Volume= 1,835 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.57 cfs @ 12.01 hrs, Volume= 1,835 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 9.49' @ 12.01 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	9.10'	**16.0" Round Culvert** L= 443.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 9.10' / 4.69' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.40 sf
#2	Secondary	11.90'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.55 cfs @ 12.01 hrs HW=9.48' TW=5.30' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.55 cfs @ 1.66 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=9.10' TW=4.55' (Dynamic Tailwater)
2=Orifice/Grate (Controls 0.00 cfs)



Summary for Pond CB12: CB-12

[57] Hint: Peaked at 7.03' (Flood elevation advised)

Inflow Area = 19,149 sf, 30.80% Impervious, Inflow Depth > 5.82" for 100 YEAR event
Inflow = 2.43 cfs @ 12.17 hrs, Volume= 9,290 cf
Outflow = 2.43 cfs @ 12.17 hrs, Volume= 9,290 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.43 cfs @ 12.17 hrs, Volume= 9,290 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

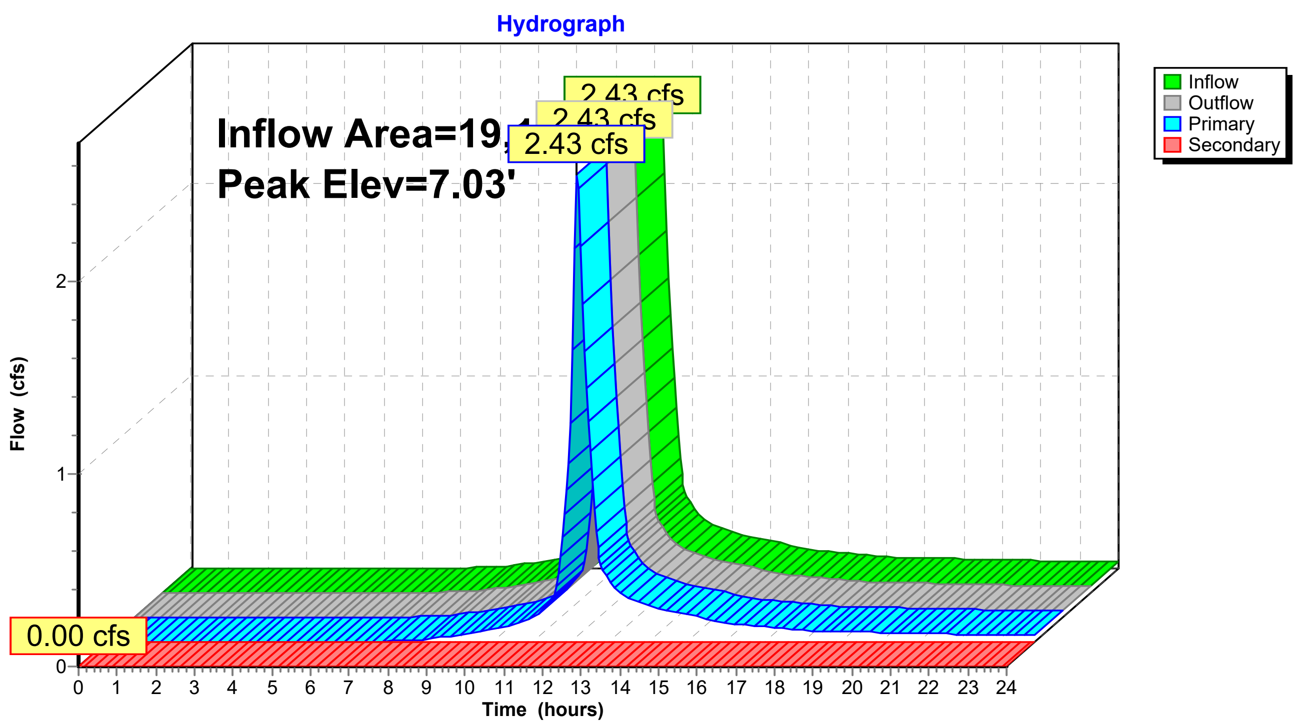
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 7.03' @ 12.23 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	6.05'	**15.0" Round Culvert** L= 93.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 6.05' / 5.10' S= 0.0102 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf
#2	Secondary	9.65'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.01 cfs @ 12.17 hrs HW=6.97' TW=6.57' (Dynamic Tailwater)
1=Culvert (Outlet Controls 2.01 cfs @ 2.89 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6.05' TW=5.00' (Dynamic Tailwater)
2=Orifice/Grate (Controls 0.00 cfs)

Pond CB12: CB-12



Summary for Pond CB13: CB-13

[57] Hint: Peaked at 6.64' (Flood elevation advised)

Inflow Area =	44,864 sf, 25.99% Impervious,	Inflow Depth > 5.31"	for 100 YEAR event
Inflow =	4.71 cfs @ 12.20 hrs,	Volume= 19,867 cf	
Outflow =	4.71 cfs @ 12.20 hrs,	Volume= 19,867 cf,	Atten= 0%, Lag= 0.0 min
Primary =	4.71 cfs @ 12.20 hrs,	Volume= 19,867 cf	
Secondary =	0.00 cfs @ 0.00 hrs,	Volume= 0 cf	

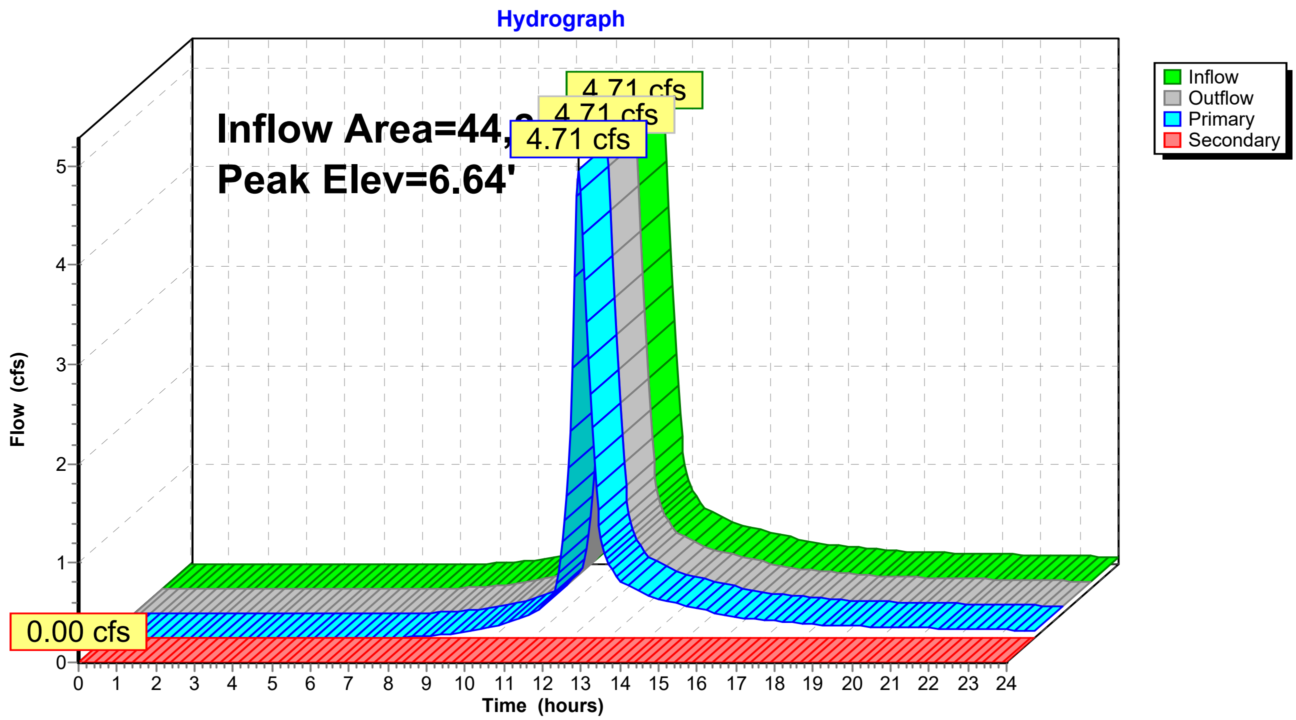
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 6.64' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	5.00'	**15.0" Round Culvert** L= 235.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 5.00' / 1.95' S= 0.0130 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf
#2	Secondary	8.53'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.70 cfs @ 12.20 hrs HW=6.64' TW=2.24' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 4.70 cfs @ 3.83 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=5.00' TW=1.00' (Dynamic Tailwater)
└─**2=Orifice/Grate** (Controls 0.00 cfs)

Pond CB13: CB-13



Summary for Pond CB19: CB-19

[57] Hint: Peaked at 5.69' (Flood elevation advised)

Inflow Area =	43,579 sf,	86.64% Impervious,	Inflow Depth > 8.43"	for 100 YEAR event
Inflow =	9.71 cfs @	12.02 hrs, Volume=	30,628 cf	
Outflow =	9.71 cfs @	12.02 hrs, Volume=	30,628 cf,	Atten= 0%, Lag= 0.0 min
Primary =	8.10 cfs @	12.02 hrs, Volume=	30,116 cf	
Secondary =	1.61 cfs @	12.02 hrs, Volume=	512 cf	

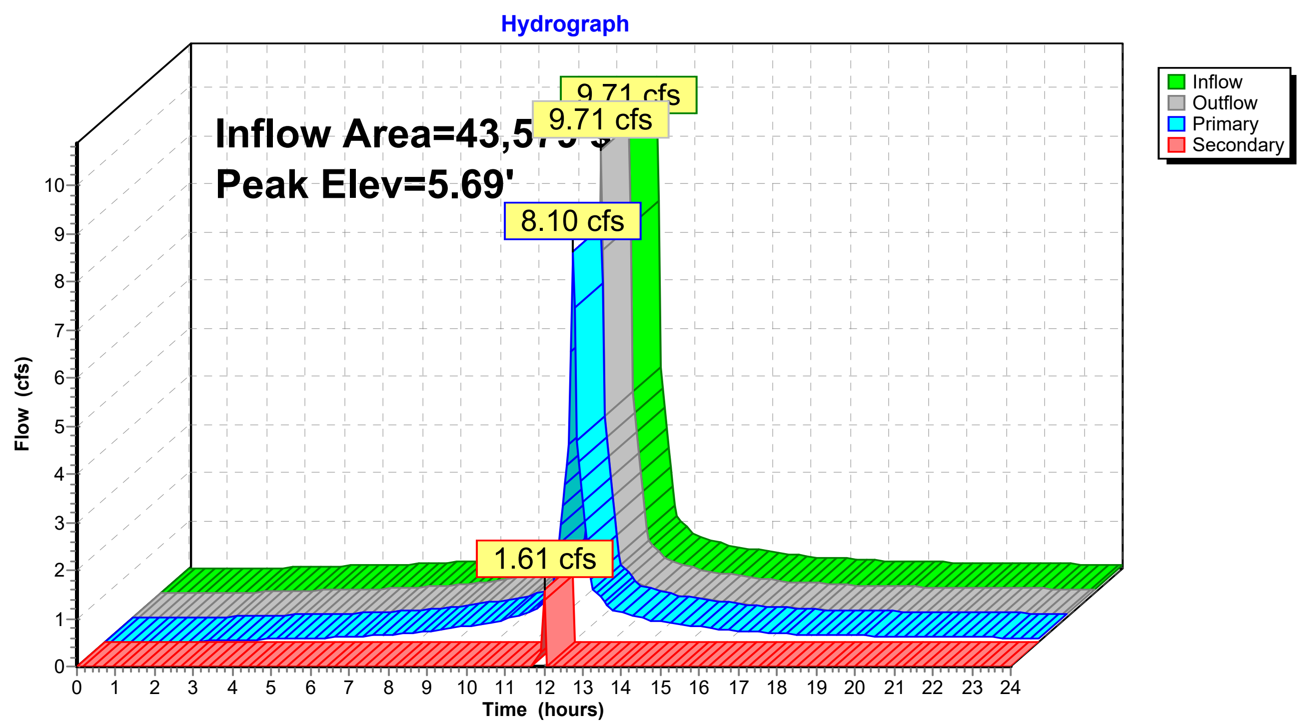
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 5.69' @ 12.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	3.50'	**18.0" Round Culvert** L= 32.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 3.50' / 3.20' S= 0.0094 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#2	Secondary	5.50'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.87 cfs @ 12.02 hrs HW=5.62' TW=0.00' (Dynamic Tailwater)
1=Culvert (Inlet Controls 7.87 cfs @ 4.46 fps)

Secondary OutFlow Max=1.42 cfs @ 12.02 hrs HW=5.62' TW=0.00' (Dynamic Tailwater)
2=Orifice/Grate (Weir Controls 1.42 cfs @ 1.15 fps)

Pond CB19: CB-19



Summary for Pond CB4: CB-4

[57] Hint: Peaked at 6.59' (Flood elevation advised)

Inflow Area = 8,604 sf,100.00% Impervious, Inflow Depth > 9.04" for 100 YEAR event
Inflow = 1.95 cfs @ 12.02 hrs, Volume= 6,481 cf
Outflow = 1.95 cfs @ 12.02 hrs, Volume= 6,481 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.95 cfs @ 12.02 hrs, Volume= 6,481 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

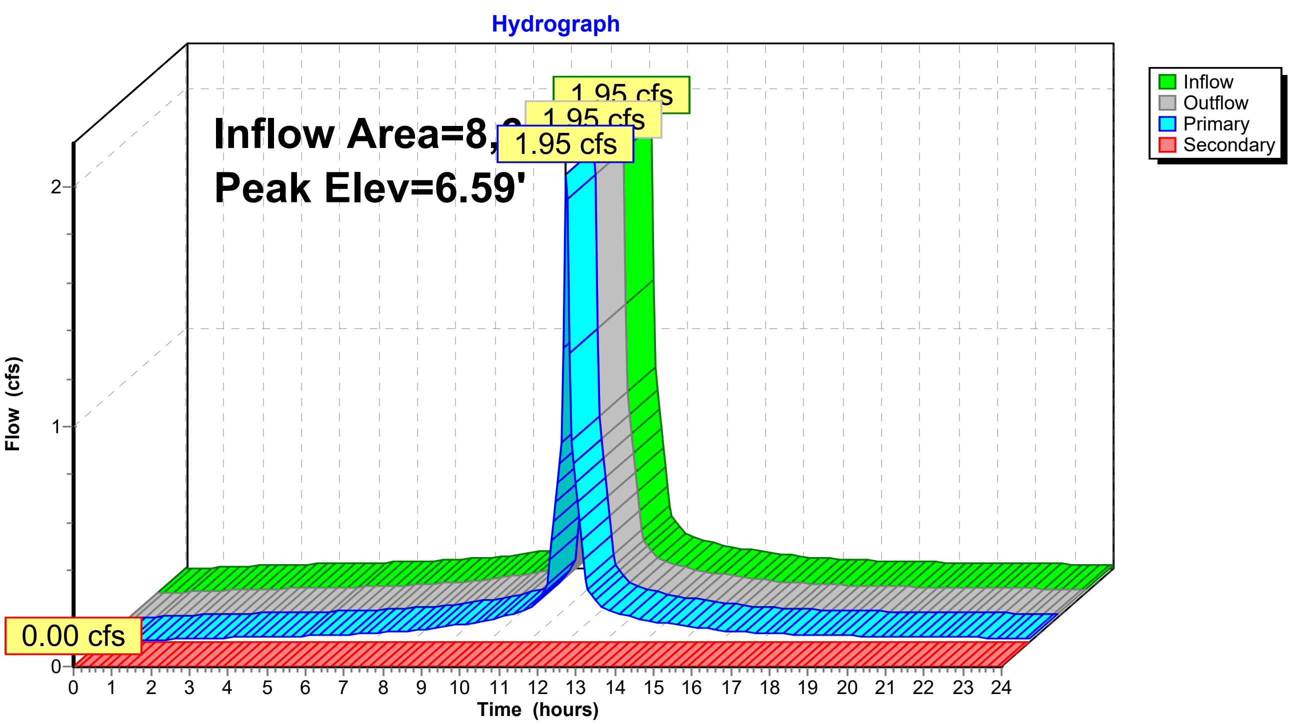
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 6.59' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	4.55'	**16.0" Round Culvert** L= 156.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 4.55' / 2.99' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.40 sf
#2	Secondary	8.52'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.80 cfs @ 12.02 hrs HW=5.30' TW=4.61' (Dynamic Tailwater)
1=Culvert (Outlet Controls 1.80 cfs @ 3.24 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=4.55' TW=2.89' (Dynamic Tailwater)
2=Orifice/Grate (Controls 0.00 cfs)

Pond CB4: CB-4



Summary for Pond CB5: CB-5

[57] Hint: Peaked at 6.56' (Flood elevation advised)
[80] Warning: Exceeded Pond CB4 by 1.02' @ 12.10 hrs (5.36 cfs 1,129 cf)

Inflow Area =	14,052 sf,100.00% Impervious,	Inflow Depth > 9.04"	for 100 YEAR event
Inflow =	3.18 cfs @ 12.03 hrs,	Volume= 10,585 cf	
Outflow =	3.18 cfs @ 12.03 hrs,	Volume= 10,585 cf,	Atten= 0%, Lag= 0.0 min
Primary =	3.18 cfs @ 12.03 hrs,	Volume= 10,585 cf	
Secondary =	0.00 cfs @ 0.00 hrs,	Volume= 0 cf	

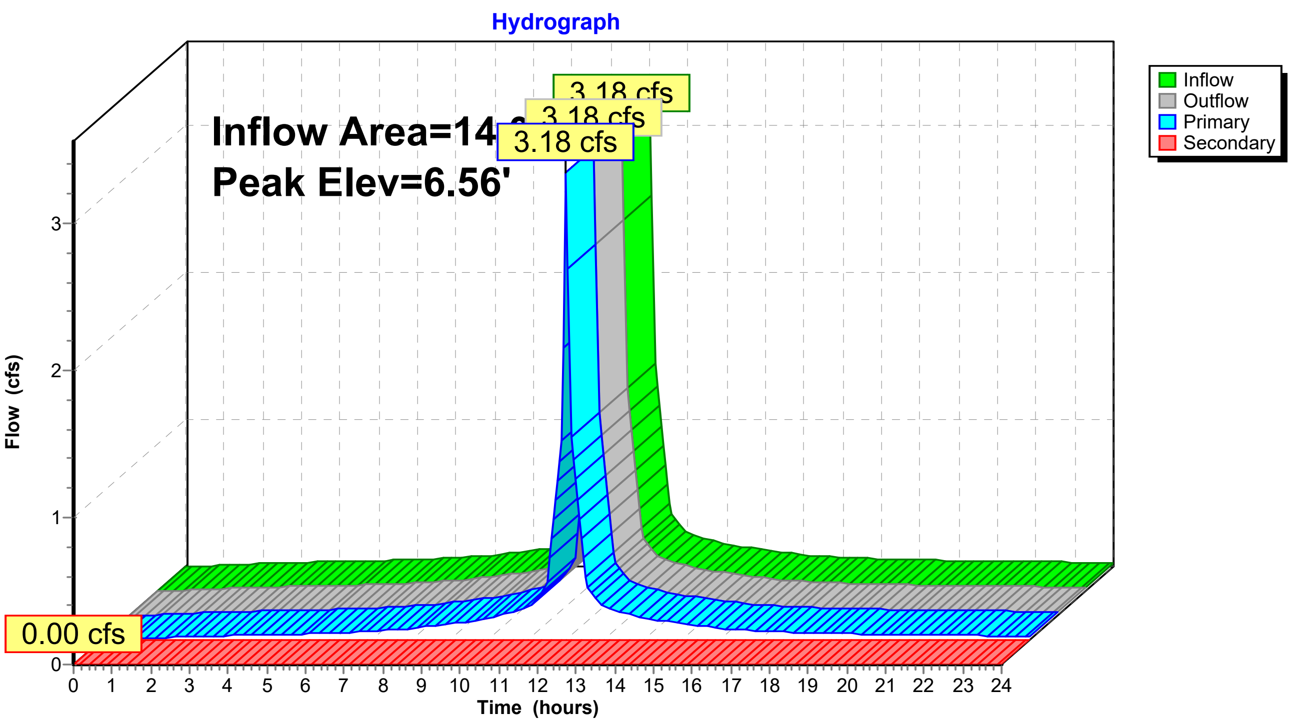
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 6.56' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	2.89'	**16.0" Round Culvert** L= 128.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 2.89' / 1.66' S= 0.0096 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.40 sf
#2	Secondary	8.34'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.00 cfs @ 12.03 hrs HW=4.67' TW=5.75' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=2.89' TW=1.56' (Dynamic Tailwater)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond CB5: CB-5



Summary for Pond CB8: CB-8

[57] Hint: Peaked at 6.42' (Flood elevation advised)
[80] Warning: Exceeded Pond CB5 by 1.14' @ 12.00 hrs (5.66 cfs 1,980 cf)

Inflow Area =	51,083 sf, 71.02% Impervious,	Inflow Depth > 7.71"	for 100 YEAR event
Inflow =	10.73 cfs @ 12.02 hrs,	Volume= 32,822 cf	
Outflow =	10.73 cfs @ 12.02 hrs,	Volume= 32,822 cf,	Atten= 0%, Lag= 0.0 min
Primary =	10.73 cfs @ 12.02 hrs,	Volume= 32,822 cf	
Secondary =	0.00 cfs @ 0.00 hrs,	Volume= 0 cf	

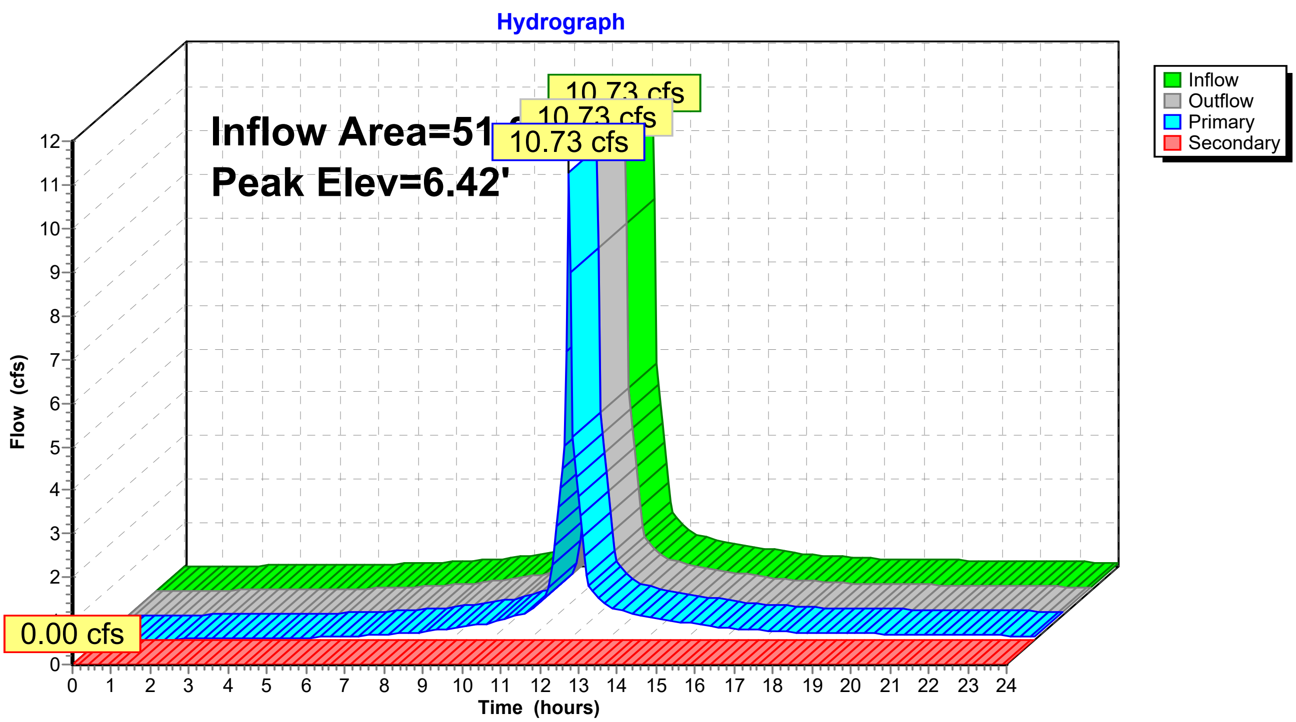
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 6.42' @ 12.05 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1.56'	**18.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1.56' / 1.46' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#2	Secondary	8.34'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=8.59 cfs @ 12.02 hrs HW=5.72' TW=4.08' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 8.59 cfs @ 4.86 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1.56' TW=1.00' (Dynamic Tailwater)
└**2=Orifice/Grate** (Controls 0.00 cfs)

Pond CB8: CB-8



Summary for Pond CB9: CB-9

[57] Hint: Peaked at 7.33' (Flood elevation advised)

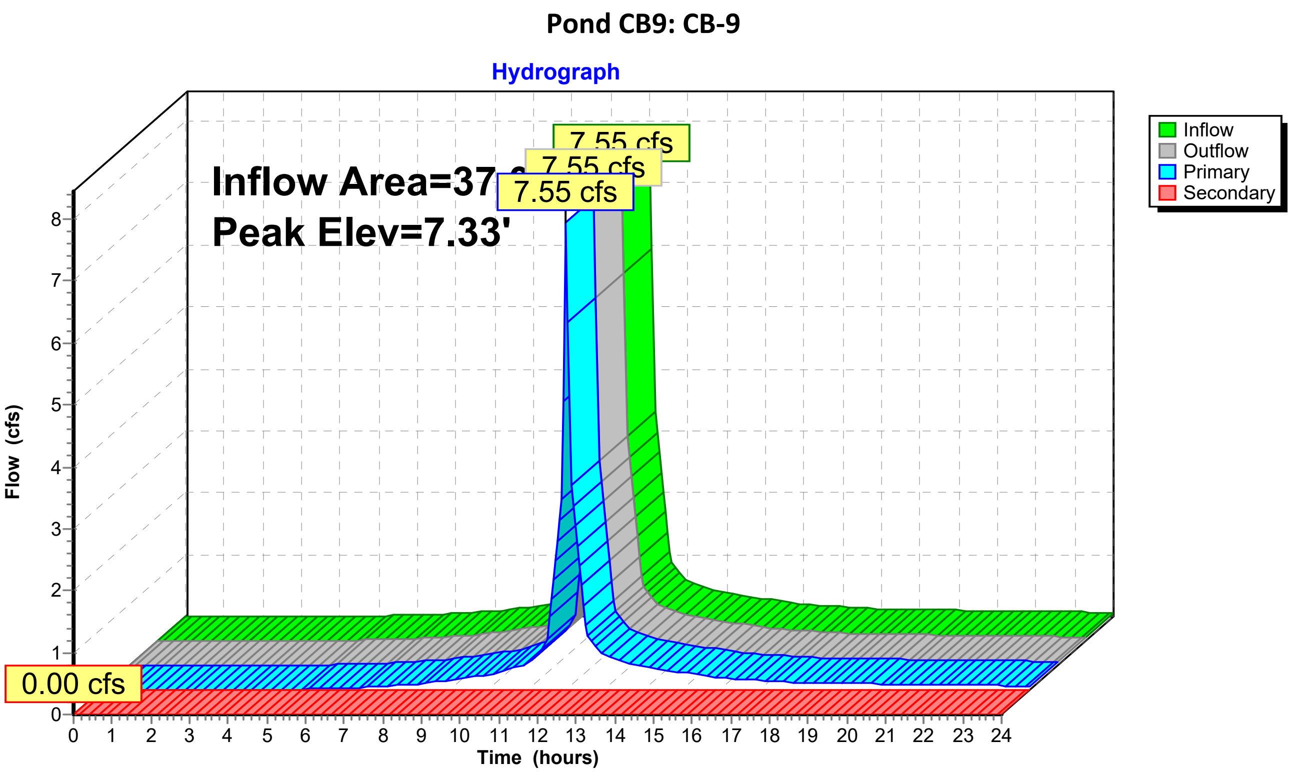
Inflow Area = 37,031 sf, 60.03% Impervious, Inflow Depth > 7.21" for 100 YEAR event
Inflow = 7.55 cfs @ 12.02 hrs, Volume= 22,237 cf
Outflow = 7.55 cfs @ 12.02 hrs, Volume= 22,237 cf, Atten= 0%, Lag= 0.0 min
Primary = 7.55 cfs @ 12.02 hrs, Volume= 22,237 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 7.33' @ 12.08 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	3.54'	**16.0" Round Culvert** L= 198.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 3.54' / 3.35' S= 0.0010 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.40 sf
#2	Secondary	8.36'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.30 cfs @ 12.02 hrs HW=6.71' TW=5.71' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 5.30 cfs @ 3.80 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=3.54' TW=1.56' (Dynamic Tailwater)
└**2=Orifice/Grate** (Controls 0.00 cfs)



Summary for Pond I-1: INFILTRATION TRENCH

Inflow Area = 52,485 sf, 20.42% Impervious, Inflow Depth > 4.94" for 100 YEAR event
Inflow = 6.12 cfs @ 12.14 hrs, Volume= 21,624 cf
Outflow = 6.01 cfs @ 12.16 hrs, Volume= 21,140 cf, Atten= 2%, Lag= 1.4 min
Discarded = 0.30 cfs @ 12.18 hrs, Volume= 8,517 cf
Primary = 5.38 cfs @ 12.17 hrs, Volume= 12,549 cf
Secondary = 0.34 cfs @ 12.15 hrs, Volume= 73 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 9.31' @ 12.17 hrs Surf.Area= 4,200 sf Storage= 1,784 cf

Plug-Flow detention time= 33.7 min calculated for 21,140 cf (98% of inflow)
Center-of-Mass det. time= 20.8 min (851.4 - 830.6)

Volume	Invert	Avail.Storage	Storage Description
#1	9.25'	112 cf	**8.00'W x 175.00'L x 0.20'H Prismatoid (Pea Gravel Layer)** 280 cf Overall x 40.0% Voids
#2	6.75'	1,225 cf	**8.00'W x 175.00'L x 2.50'H Prismatoid (Gravel Layer)** 3,500 cf Overall x 35.0% Voids
#3	6.00'	525 cf	**8.00'W x 175.00'L x 0.75'H Prismatoid (Sand Layer)** 1,050 cf Overall x 50.0% Voids
		1,862 cf	Total Available Storage

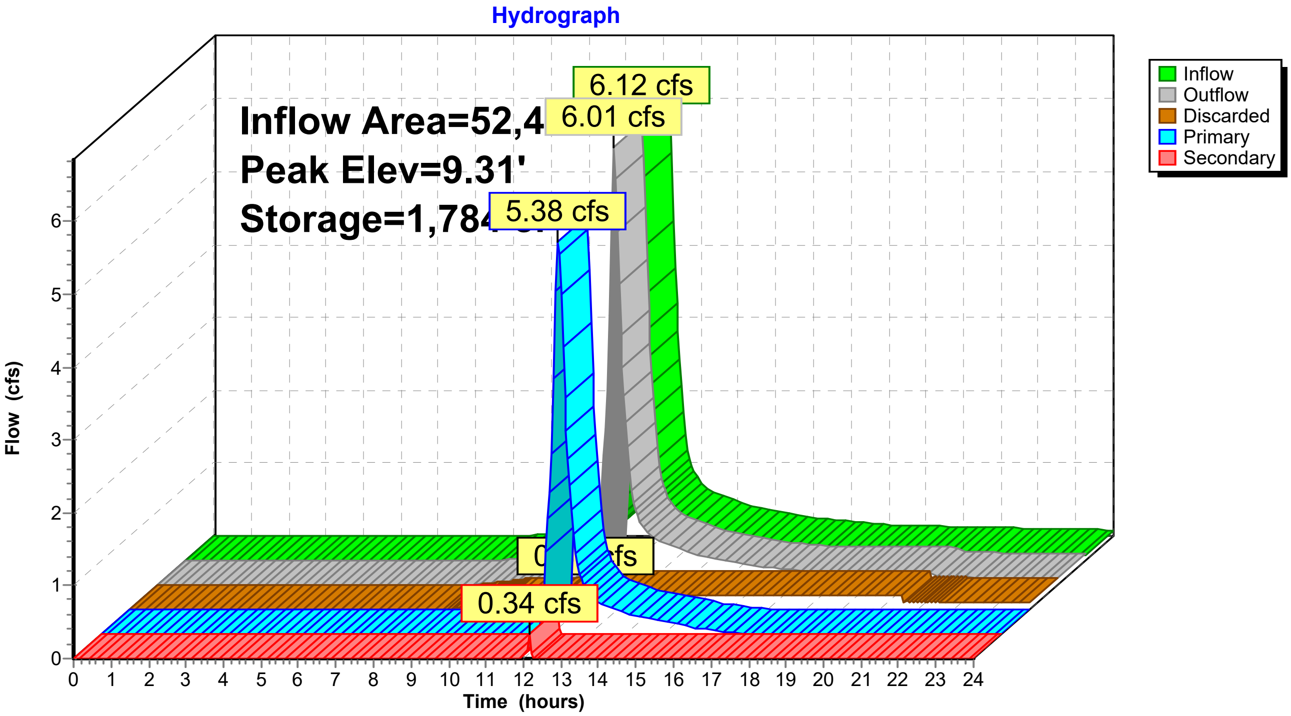
Device	Routing	Invert	Outlet Devices
#1	Discarded	6.00'	**3.000 in/hr Exfiltration over Surface area**
#2	Primary	8.00'	**12.0" Round Culvert X 2.00** L= 60.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 8.00' / 1.50' S= 0.1083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Secondary	9.25'	**24.0" x 36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.29 cfs @ 12.18 hrs HW=9.28' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=5.30 cfs @ 12.17 hrs HW=9.29' TW=0.00' (Dynamic Tailwater)
└**2=Culvert** (Inlet Controls 5.30 cfs @ 3.37 fps)

Secondary OutFlow Max=0.32 cfs @ 12.15 hrs HW=9.30' TW=0.00' (Dynamic Tailwater)
└**3=Orifice/Grate** (Weir Controls 0.32 cfs @ 0.70 fps)

Pond I-1: INFILTRATION TRENCH



Summary for Pond P2: Green Roof

Inflow Area = 14,324 sf,100.00% Impervious, Inflow Depth > 9.04" for 100 YEAR event
Inflow = 3.43 cfs @ 12.00 hrs, Volume= 10,790 cf
Outflow = 0.99 cfs @ 11.85 hrs, Volume= 10,790 cf, Atten= 71%, Lag= 0.0 min
Primary = 0.99 cfs @ 11.85 hrs, Volume= 10,790 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 23.95' @ 12.27 hrs Surf.Area= 14,324 sf Storage= 1,590 cf

Plug-Flow detention time= 7.0 min calculated for 10,768 cf (100% of inflow)
Center-of-Mass det. time= 7.0 min (740.8 - 733.9)

Volume	Invert	Avail.Storage	Storage Description
#1	23.40'	53,287 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

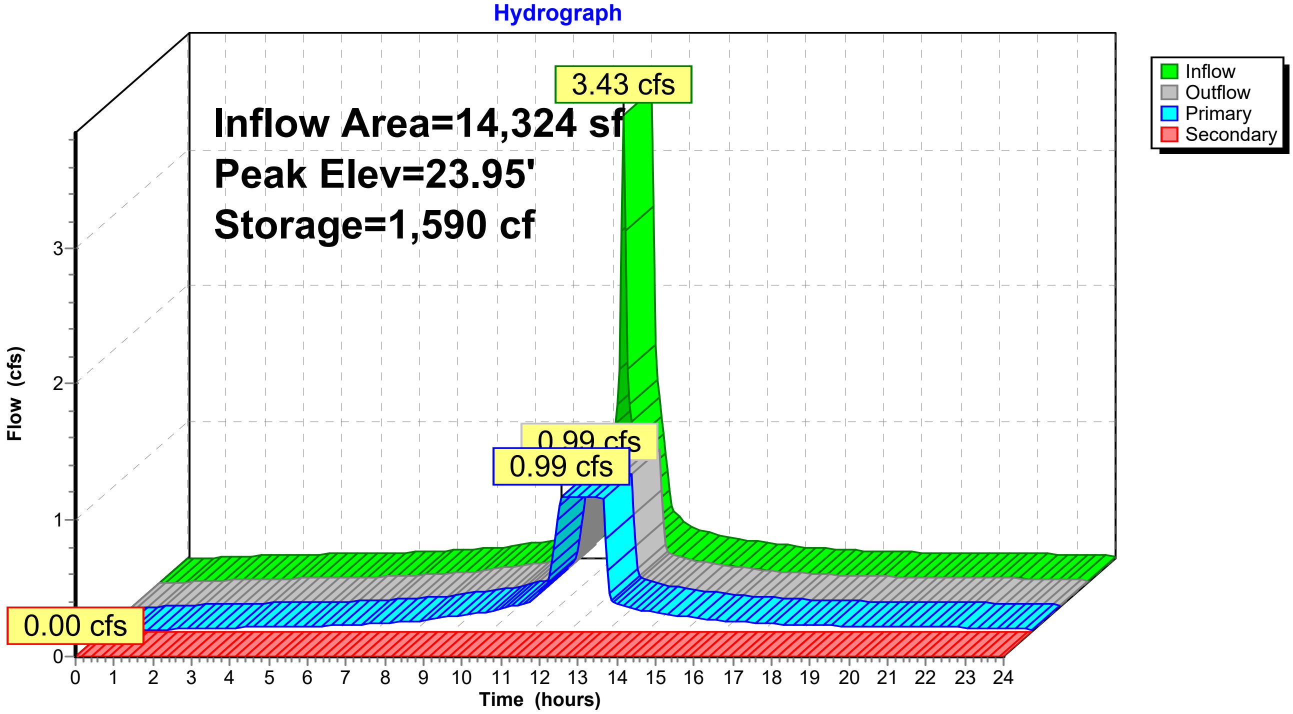
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
23.40	100	0.0	0	0
23.48	14,324	40.0	231	231
23.50	14,324	20.0	57	288
24.50	14,324	20.0	2,865	3,153
28.00	14,324	100.0	50,134	53,287

Device	Routing	Invert	Outlet Devices
#1	Primary	23.40'	**3.000 in/hr Exfiltration over Surface area**
#2	Secondary	24.54'	**6.0" Horiz. Orifice/Grate (Overflow) X 2.00** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.99 cfs @ 11.85 hrs HW=23.49' TW=0.00' (Dynamic Tailwater)
└─**1=Exfiltration** (Exfiltration Controls 0.99 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=23.40' TW=0.00' (Dynamic Tailwater)
└─**2=Orifice/Grate (Overflow)** (Controls 0.00 cfs)

Pond P2: Green Roof

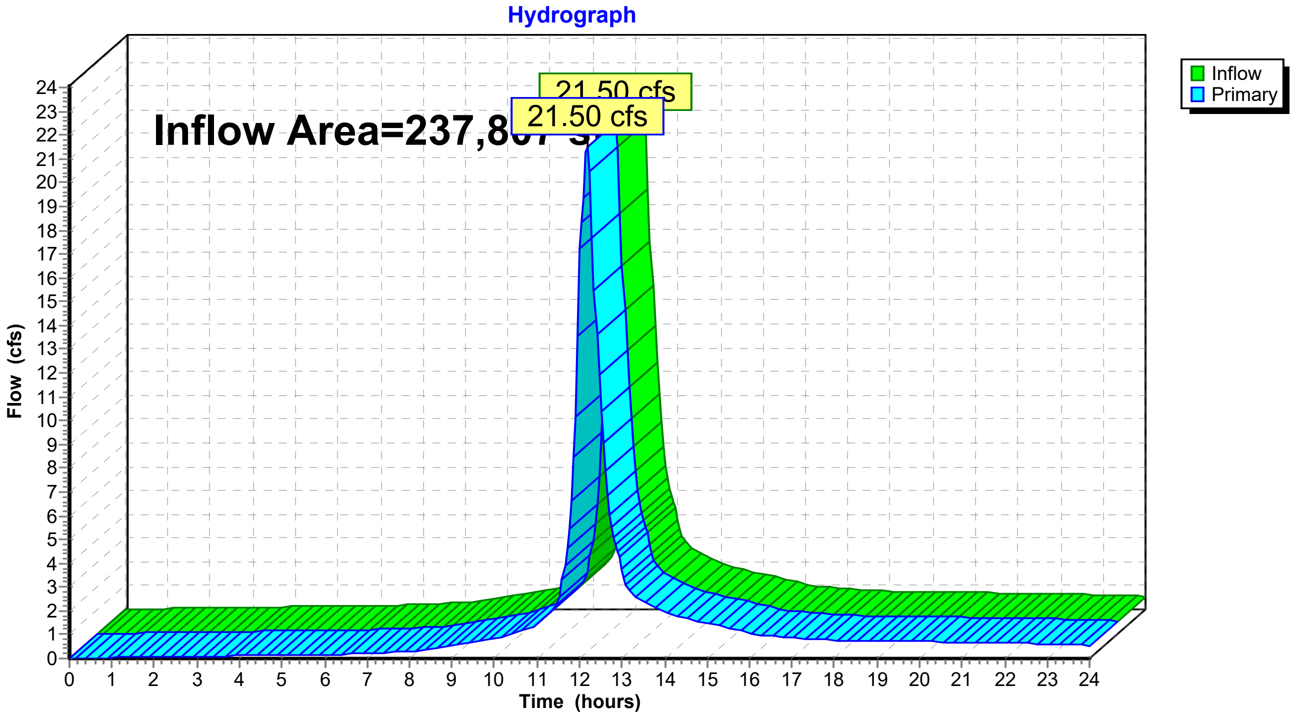


Summary for Link DP-1: DP-1

Inflow Area = 237,807 sf, 45.28% Impervious, Inflow Depth > 5.53" for 100 YEAR event
Inflow = 21.50 cfs @ 12.17 hrs, Volume= 109,678 cf
Primary = 21.50 cfs @ 12.17 hrs, Volume= 109,678 cf, Atten= 0%, Lag= 0.0 min

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

Link DP-1: DP-1

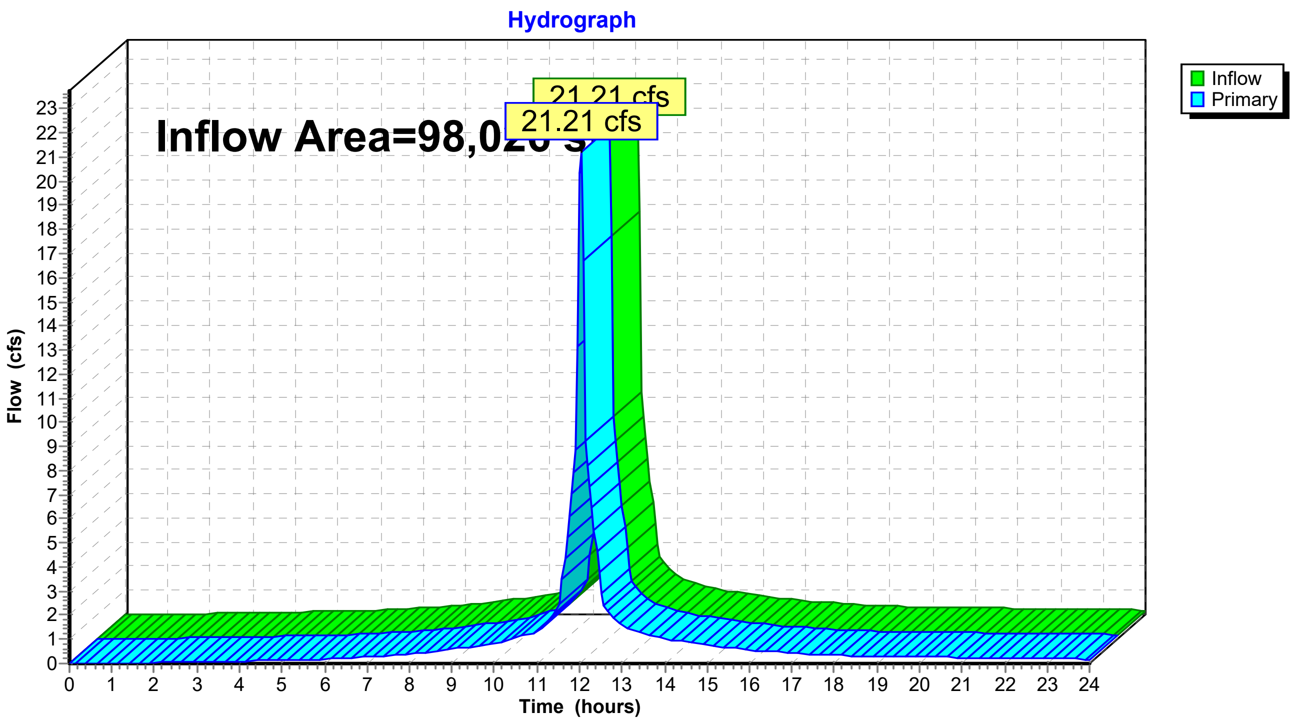


Summary for Link DP-2: Design Point 2

Inflow Area = 98,026 sf, 78.96% Impervious, Inflow Depth > 8.08" for 100 YEAR event
Inflow = 21.21 cfs @ 12.02 hrs, Volume= 65,984 cf
Primary = 21.21 cfs @ 12.02 hrs, Volume= 65,984 cf, Atten= 0%, Lag= 0.0 min

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

Link DP-2: Design Point 2



APPENDIX C

- *MISCELLANEOUS INFORMATION*

  - *Owner Certification Statement*
  - *Operator Certification Statement*

PLATEAU ASSOCIATES

VILLAGE OF OSSINING

WESTCHESTER COUNTY, NEW YORK

OPERATOR CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to sections 210.45 of the Penal Law.

Operator

Signature

Print Name

Title

Date

Address

Telephone Number

CONTRACTOR'S CERTIFICATION

"I hereby certify that I understand and agree to comply with the terms and conditions of the SPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. 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. "

SIGNED: ______________________ DATE: ______________________

NAME:

FIRM: ______________________

ADDRESS: ______________________

____

PHONE: ______________________

SITE: ______________________

SPPP IMPLEMENTER'S NAME ______________________

SPPP IMPLEMENTER'S TITLE ______________________

CONTRACTOR'S SCOPE ______________________

TRAINED CONTRACTOR'S NAME ______________________

TRAINED CONTRACTOR'S TITLE ______________________

*The SPPP Implementer must be a trained contractor responsible for SPPP implementation, an employee of the firm who has received training in accordance with SPEDES GP-0-10-001.

APPENDIX D

- CONSTRUCTION SITE LOG BOOK AND CHECKLISTS
- CONSTRUCTION SPECIFICATIONS FOR INFILTRATION PRACTICES
- INFILTRATION TRENCH CONSTRUCTION INSPECTION CHECKLIST
- INFILTRATION TRENCH OPERATION, MAINTENANCE AND MANAGEMENT INSPECTION CHECKLIST
- GRASS PAVE TECHNICAL SPECIFICATIONS
- RAINTROL SPECIFICATIONS

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM FOR CONSTRUCTION ACTIVITIES

CONSTRUCTION SITE LOG BOOK

Table of Contents

Properly completing forms such as those contained in Appendix H meet the inspection requirement of NYS-DEC SPDES GP for Construction Activities. Completed forms shall be kept on site at all times and made available to authorities upon request.

I. PRE-CONSTRUCTION MEETING DOCUMENTS

Project Name ______________________________

Permit No. ______________________________ **Date of Authorization** ______________

Name of Operator ______________________________

Prime Contractor ______________________________

a. Preamble to Site Assessment and Inspections

The Following Information To Be Read By All Person's Involved in The Construction of Stormwater Related Activities:

The Operator agrees to have a qualified professional[1] conduct an assessment of the site prior to the commencement of construction[2] and certify in this inspection report that the appropriate erosion and sediment controls described in the SWPPP have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction.

Prior to the commencement of construction, the Operator shall certify in this site logbook that the SWPPP has been prepared in accordance with the State's standards and meets all Federal, State and local erosion and sediment control requirements.

When construction starts, site inspections shall be conducted by the qualified professional at least every 7 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater (Construction Duration Inspections). The Operator shall maintain a record of all inspection reports in this site logbook. The site logbook shall be maintained on site and be made available to the permitting authorities upon request. The Operator shall post at the site, in a publicly accessible location, a summary of the site inspection activities on a monthly basis (Monthly Summary Report).

The operator shall also prepare a written summary of compliance with this general permit at a minimum frequency of every three months (Operator's Compliance Response Form), while coverage exists. The summary should address the status of achieving each component of the SWPPP.

Prior to filing the Notice of Termination or the end of permit term, the Operator shall have a qualified professional perform a final site inspection. The qualified professional shall certify that the site has undergone final stabilization[3] using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fencing) not needed for long-term erosion control have been removed. In addition, the Operator must identify and certify that all permanent structures described in the SWPPP have been constructed and provide the owner(s) with an operation and maintenance plan that ensures the structure(s) continuously functions as designed.

1 "Qualified Professional means a person knowledgeable in the principles and practice of erosion and sediment controls, such as a Certified Professional in Erosion and Sediment Control (CPESC), soil scientist, licensed engineer or someone working under the direction and supervision of a licensed engineer (person must have experience in the principles and practices of erosion and sediment control).

2 "Commencement of construction" means the initial removal of vegetation and disturbance of soils associated with clearing, grading or excavating activities or other construction activities.

3 "Final stabilization" means that all soil-disturbing activities at the site have been completed and a uniform, perennial vegetative cover with a density of eighty (80) percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.

b. Operators Certification

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. Further, I hereby certify that the SWPPP meets all Federal, State, and local erosion and sediment control requirements. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law.

Name (please print): ______________________________

Title ______________________________ **Date:** ____________

Address: ______________________________

Phone: ____________ **Email:** ______________________________

Signature: ______________________________

c. Qualified Professional's Credentials & Certification

"I hereby certify that I meet the criteria set forth in the General Permit to conduct site inspections for this project and that the appropriate erosion and sediment controls described in the SWPPP and as described in the following Pre-construction Site Assessment Checklist have been adequately installed or implemented, ensuring the overall preparedness of this site for the commencement of construction."

Name (please print): ______________________________

Title ______________________________ **Date:** ____________

Address: ______________________________

Phone: ____________ **Email:** ______________________________

Signature: ______________________________

d. Pre-construction Site Assessment Checklist
(NOTE: Provide comments below as necessary)

1. Notice of Intent, SWPPP, and Contractors Certification:
Yes No NA
[ ] [ ] [ ] Has a Notice of Intent been filed with the NYS Department of Conservation?
[ ] [ ] [ ] Is the SWPPP on-site? Where?____________________________
[ ] [ ] [ ] Is the Plan current? What is the latest revision date?_____________
[ ] [ ] [ ] Is a copy of the NOI (with brief description) onsite? Where?______________
[ ] [ ] [ ] Have all contractors involved with stormwater related activities signed a contractor's certification?

2. Resource Protection
Yes No NA
[ ] [ ] [ ] Are construction limits clearly flagged or fenced?
[ ] [ ] [ ] Important trees and associated rooting zones, on-site septic system absorption fields, existing vegetated areas suitable for filter strips, especially in perimeter areas, have been flagged for protection.
[ ] [ ] [ ] Creek crossings installed prior to land-disturbing activity, including clearing and blasting.

3. Surface Water Protection
Yes No NA
[ ] [ ] [ ] Clean stormwater runoff has been diverted from areas to be disturbed.
[ ] [ ] [ ] Bodies of water located either on site or in the vicinity of the site have been identified and protected.
[ ] [ ] [ ] Appropriate practices to protect on-site or downstream surface water are installed.
[ ] [ ] [ ] Are clearing and grading operations divided into areas <5 acres?

4. Stabilized Construction Entrance
Yes No NA
[ ] [ ] [ ] A temporary construction entrance to capture mud and debris from construction vehicles before they enter the public highway has been installed.
[ ] [ ] [ ] Other access areas (entrances, construction routes, equipment parking areas) are stabilized immediately as work takes place with gravel or other cover.
[ ] [ ] [ ] Sediment tracked onto public streets is removed or cleaned on a regular basis.

5. Perimeter Sediment Controls
Yes No NA
[ ] [ ] [ ] Silt fence material and installation comply with the standard drawing and specifications.
[ ] [ ] [ ] Silt fences are installed at appropriate spacing intervals
[ ] [ ] [ ] Sediment/detention basin was installed as first land disturbing activity.
[ ] [ ] [ ] Sediment traps and barriers are installed.

6. Pollution Prevention for Waste and Hazardous Materials
Yes No NA
[ ] [ ] [ ] The Operator or designated representative has been assigned to implement the spill prevention avoidance and response plan.
[ ] [ ] [ ] The plan is contained in the SWPPP on page ______
[ ] [ ] [ ] Appropriate materials to control spills are onsite. Where? __________________

II. CONSTRUCTION DURATION INSPECTIONS

a. Directions:
Inspection Forms will be filled out during the entire construction phase of the project.
Required Elements:

(1) On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;

(2) Indicate on a site map all areas of the site that have undergone temporary or permanent stabilization;

(3) Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;

(4) Inspect all sediment control practices and record the approximate degree of sediment accumulation as a percentage of sediment storage volume (for example, 10 percent, 20 percent, 50 percent);

(5) Inspect all erosion and sediment control practices and record all maintenance requirements such as verifying the integrity of barrier or diversion systems (earthen berms or silt fencing) and containment systems (sediment basins and sediment traps). Identify any evidence of rill or gully erosion occurring on slopes and any loss of stabilizing vegetation or seeding/mulching. Document any excessive deposition of sediment or ponding water along barrier or diversion systems. Record the depth of sediment within containment structures, any erosion near outlet and overflow structures, and verify the ability of rock filters around perforated riser pipes to pass water; and

(6) Immediately report to the Operator any deficiencies that are identified with the implementation of the SWPPP.

SITE PLAN/SKETCH

______________________________ ______________________________

Inspector (print name) **Date of Inspection**

______________________________ ______________________________

Qualified Professional (print name) **Qualified Professional Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

Maintaining Water Quality

Yes No NA
[ ] [ ] [ ] Is there an increase in turbidity causing a substantial visible contrast to natural conditions?
[ ] [ ] [ ] Is there residue from oil and floating substances, visible oil film, or globules or grease?
[ ] [ ] [ ] All disturbance is within the limits of the approved plans.
[ ] [ ] [ ] Have receiving lake/bay, stream, and/or wetland been impacted by silt from project?

Housekeeping

1. General Site Conditions
Yes No NA
[ ] [ ] [ ] Is construction site litter and debris appropriately managed?
[ ] [ ] [ ] Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
[ ] [ ] [ ] Is construction impacting the adjacent property?
[ ] [ ] [ ] Is dust adequately controlled?

2. Temporary Stream Crossing
Yes No NA
[ ] [ ] [ ] Maximum diameter pipes necessary to span creek without dredging are installed.
[ ] [ ] [ ] Installed non-woven geotextile fabric beneath approaches.
[ ] [ ] [ ] Is fill composed of aggregate (no earth or soil)?
[ ] [ ] [ ] Rock on approaches is clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

Runoff Control Practices

1. Excavation Dewatering
Yes No NA
[ ] [ ] [ ] Upstream and downstream berms (sandbags, inflatable dams, etc.) are installed per plan.
[ ] [ ] [ ] Clean water from upstream pool is being pumped to the downstream pool.
[ ] [ ] [ ] Sediment laden water from work area is being discharged to a silt-trapping device.
[ ] [ ] [ ] Constructed upstream berm with one-foot minimum freeboard.

2. Level Spreader
Yes No NA
[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
[ ] [ ] [ ] Flow sheets out of level spreader without erosion on downstream edge.

3. Interceptor Dikes and Swales
Yes No NA
[ ] [ ] [ ] Installed per plan with minimum side slopes 2H:1V or flatter.
[ ] [ ] [ ] Stabilized by geotextile fabric, seed, or mulch with no erosion occurring.
[ ] [ ] [ ] Sediment-laden runoff directed to sediment trapping structure

Runoff Control Practices (continued)

4. Stone Check Dam
Yes No NA
[ ] [ ] [ ] Is channel stable? (flow is not eroding soil underneath or around the structure).
[ ] [ ] [ ] Check is in good condition (rocks in place and no permanent pools behind the structure).
[ ] [ ] [ ] Has accumulated sediment been removed?.

5. Rock Outlet Protection
Yes No NA
[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Installed concurrently with pipe installation.

Soil Stabilization

1. Topsoil and Spoil Stockpiles
Yes No NA
[ ] [ ] [ ] Stockpiles are stabilized with vegetation and/or mulch.
[ ] [ ] [ ] Sediment control is installed at the toe of the slope.

2. Revegetation
Yes No NA
[ ] [ ] [ ] Temporary seedings and mulch have been applied to idle areas.
[ ] [ ] [ ] 4 inches minimum of topsoil has been applied under permanent seedings

Sediment Control Practices

1. Stabilized Construction Entrance
Yes No NA
[ ] [ ] [ ] Stone is clean enough to effectively remove mud from vehicles.
[ ] [ ] [ ] Installed per standards and specifications?
[ ] [ ] [ ] Does all traffic use the stabilized entrance to enter and leave site?
[ ] [ ] [ ] Is adequate drainage provided to prevent ponding at entrance?

2. Silt Fence
Yes No NA
[ ] [ ] [ ] Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
[ ] [ ] [ ] Joints constructed by wrapping the two ends together for continuous support.
[ ] [ ] [ ] Fabric buried 6 inches minimum.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
Sediment accumulation is ___% of design capacity.

Sediment Control Practices (continued)

3. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated practices)
Yes No NA
[ ] [ ] [ ] Installed concrete blocks lengthwise so open ends face outward, not upward.
[ ] [ ] [ ] Placed wire screen between No. 3 crushed stone and concrete blocks.
[ ] [ ] [ ] Drainage area is 1acre or less.
[ ] [ ] [ ] Excavated area is 900 cubic feet.
[ ] [ ] [ ] Excavated side slopes should be 2:1.
[ ] [ ] [ ] 2" x 4" frame is constructed and structurally sound.
[ ] [ ] [ ] Posts 3-foot maximum spacing between posts.
[ ] [ ] [ ] Fabric is embedded 1 to 1.5 feet below ground and secured to frame/posts with staples at max 8-inch spacing.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
Sediment accumulation ___% of design capacity.

4. Temporary Sediment Trap
Yes No NA
[ ] [ ] [ ] Outlet structure is constructed per the approved plan or drawing.
[ ] [ ] [ ] Geotextile fabric has been placed beneath rock fill.
Sediment accumulation is ___% of design capacity.

5. Temporary Sediment Basin
Yes No NA
[ ] [ ] [ ] Basin and outlet structure constructed per the approved plan.
[ ] [ ] [ ] Basin side slopes are stabilized with seed/mulch.
[ ] [ ] [ ] Drainage structure flushed and basin surface restored upon removal of sediment basin facility.
Sediment accumulation is ___% of design capacity.

Note: Not all erosion and sediment control practices are included in this listing. Add additional pages to this list as required by site specific design.
Construction inspection checklists for post-development stormwater management practices can be found in Appendix F of the New York Stormwater Management Design Manual.

b. Modifications to the SWPPP (To be completed as described below)

The Operator shall amend the SWPPP whenever:

1. There is a significant change in design, construction, operation, or maintenance which may have a significant effect on the potential for the discharge of pollutants to the waters of the United States and which has not otherwise been addressed in the SWPPP; or
2. The SWPPP proves to be ineffective in:
   a. Eliminating or significantly minimizing pollutants from sources identified in the SWPPP and as required by this permit; or
   b. Achieving the general objectives of controlling pollutants in stormwater discharges from permitted construction activity; and
3. Additionally, the SWPPP shall be amended to identify any new contractor or subcontractor that will implement any measure of the SWPPP.

Modification & Reason:

C.2 Construction Specifications for Infiltration Practices

Infiltration Trench General Notes and Specifications

The infiltration trench systems may not receive run-off until the entire contributing drainage area to the infiltration system has received final stabilization.

1. Heavy equipment and traffic shall be restricted from traveling over the infiltration trench to minimize compaction of the soil.

2. Excavate the infiltration trench to the design dimensions. Excavated materials shall be placed away from the trench sides to enhance trench wall stability. Large tree roots must be trimmed flush with the trench sides in order to prevent fabric puncturing or tearing of the filter fabric during subsequent installation procedures. The side walls of the trench shall be roughened where sheared and sealed by heavy equipment.

3. A Class “C” geotextile or better shall interface between the trench side walls and between the stone reservoir and gravel filter layers. A partial list of non-woven filter fabrics that meet the Class “C” criteria is contained below. Any alternative filter fabric must be approved by the local municipality prior to installation.

   Mirafi 180-N
   Amoco 4552
   WEBTEC N70
   GEOLON N70
   Carthage FX-80S

   The width of the geotextile must include sufficient material to conform to trench perimeter irregularities and for a 6-inch minimum top overlap. The filter fabric shall be tucked under the sand layer on the bottom of the infiltration trench for a distance of 6 to 12 inches. Stones or other anchoring objects should be placed on the fabric at the edge of the trench to keep the trench open during windy periods. When overlaps are required between rolls, the uphill roll should lap a minimum of 2 feet over the downhill roll in order to provide a shingled effect.

4. A 6 inch sand layer may be placed on the bottom of the infiltration trench in lieu of filter fabric, and shall be compacted using plate compactors. The sand for the infiltration trench shall be washed and meet AASHTO Std. M-43, Size No. 9 or No. 10. Any alternative sand gradation must be approved by the Engineer or the local municipality.

5. The stone aggregate should be placed in lifts and compacted using plate compactors. A maximum loose lift thickness of 12 inches is recommended. Gravel filling (rounded bank run gravel is preferred) for the infiltration trench shall be washed and meet one of the following: AASHTO Std. M-43; Size No. 2 or No. 3.

6. Following the stone aggregate placement, the filter fabric shall be folded over the stone aggregate to form a 6-inch minimum longitudinal lap. The desired fill soil or stone aggregate shall be placed over the lap at sufficient intervals to maintain the lap during subsequent backfilling.

7. Care shall be exercised to prevent natural or fill soils from intermixing with the stone aggregate. All contaminated stone aggregate shall be removed and replaced with uncontaminated stone aggregate.

8. Voids can be created between the fabric and the excavation sides and shall be avoided. Removing boulders or other obstacles from the trench walls is one source of such voids, therefore, natural soils should be placed in these voids at the most convenient time during construction to ensure fabric conformity to the excavation sides.

9. Vertically excavated walls may be difficult to maintain in areas where soil moisture is high or where soft cohesive or cohesionless soils are predominate. These conditions may require laying back of the side slopes to maintain stability.

10. PVC distribution pipes shall be Schedule 40 and meet ASTM Std. D 1784. All fittings and perforations (1/2 inch in diameter) shall meet ASTM Std. D 2729. A perforated pipe shall be provided only within the infiltration trench and shall terminate 1 foot short of the infiltration trench wall. The end of the PVC pipe shall be capped.

11. Corrugated metal distribution pipes shall conform to AASHTO Std. M-36, and shall be aluminized in accordance with AASHTO Std. M-274. Coat aluminized pipe in contact with concrete with an inert compound capable of effecting isolation of the deleterious effect of the aluminum on the concrete. Perforated distribution pipe shall be provided only within the infiltration trench and shall terminate 1 foot short of the infiltration trench wall. An aluminized metal plate shall be welded to the end of the pipe.

12. The observation well is to consist of 6-inch diameter PVC Schedule 40 pipe (ASTM Std. D 1784) with a cap set 6 inches above ground level and is to be located near the longitudinal center of the infiltration trench. Preferably the observation well will not be located in vehicular traffic areas. The pipe shall have a plastic collar with ribs to prevent rotation when removing cap. The screw top lid shall be a “Panella” type cleanout with a locking mechanism or special bolt to discourage vandalism. A perforated (1/2 inch in diameter) PVC Schedule 40 pipe shall be provided and placed vertically within the gravel portion of the infiltration trench and a cap provided at the bottom of the pipe. The bottom of the cap shall rest on the infiltration trench bottom.

13. If a distribution structure with a wet well is used, a 4-inch PVC drain pipe shall be provided at opposite ends of the infiltration trench distribution structure. Two (2) cubic feet of porous backfill meeting AASHTO Std. M-43 Size No. 57 shall be provided at each drain.

14. If a distribution structure is used, the manhole cover shall be bolted to the frame.

NOTE: PVC pipe with a wall thickness classification of SDR-35 meeting ASTM standard D3034 is an acceptable substitution for PVC Schedule 40 pipe.

Infiltration Basins Notes and Specifications

1. The sequence of various phases of basin construction shall be coordinated with the overall project construction schedule. A program should schedule rough excavation of the basin (to not less than 2’ from final grade) with the rough grading phase of the project to permit use of the material as fill in earthwork areas. The partially excavated basin, however, **cannot** serve as a sedimentation basin.

   Specifications for basin construction should state: (1) the earliest point in progress when storm drainage may be directed to the basin, and (2) the means by which this delay in use is to be accomplished. Due to the wide variety of conditions encountered among projects, each should be separately evaluated in order to postpone use as long as is reasonably possible.

2. Initial basin excavation should be carried to within 2 feet of the final elevation of the basin floor. Final excavation to the finished grade should be deferred until all disturbed areas on the watershed have been stabilized or protected. The final phase excavation should remove all accumulated sediment. Relatively light tracked equipment is recommended for this operation to avoid compaction of the basin floor. After the final grading is completed, the basin should retain a highly porous surface texture.

3. Infiltration basins may be lined with a 6- to 12-inch layer of filter material such as coarse sand (AASHTO Std. M-43, Sizes 9 or 10) to help prevent the buildup of impervious deposits on the soil surface. The filter layer can be replaced or cleaned when it becomes clogged. When a 6-inch layer of coarse organic material is specified for discing (such as hulls, leaves, stems, etc.) or spading into the basin floor to increase the permeability of the soils, the basin floor should be soaked or inundated for a brief period, then allowed to dry subsequent to this operation. This induces the organic material to decay rapidly, loosening the upper soil layer.

4. Establishing dense vegetation on the basin side slopes and floor is recommended. A dense vegetative stand will not only prevent erosion and sloughing, but will also provide a natural means of maintaining relatively high infiltration rates. Erosion protection of inflow points to the basin shall also be provided.

5. Selection of suitable vegetative materials for the side slope and all other areas to be stabilized with vegetation and application of required lime, fertilizer, etc. shall be done in accordance with the NRCS Standards and Specifications or your local Standards and Specifications for Soil Erosion and Sediment Control.

6. Grasses of the fescue family are recommended for seeding primarily due to their adaptability to dry sandy soils, drought resistance, hardiness, and ability to withstand brief inundations. The use of fescues will also permit long intervals between mowings. This is important due to the relatively steep slopes which make mowing difficult. Mowing twice a year, once in June and again in September, is generally satisfactory.

Infiltration Trench Construction Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
1. Pre-Construction		
Pre-construction meeting		
Runoff diverted		
Soil permeability tested		
Groundwater / bedrock sufficient at depth		
2. Excavation		
Size and location		
Side slopes stable		
Excavation does not compact subsoils		
3. Filter Fabric Placement		
Fabric specifications		
Placed on bottom, sides, and top		

CONSTRUCTION SEQUENCE	SATISFACTORY / UNSATISFACTORY	COMMENTS
4. Aggregate Material		
Size as specified		
Clean / washed material		
Placed properly		
5. Observation Well		
Pipe size		
Removable cap / footplate		
Initial depth =______feet		
6. Final Inspection		
Pretreatment facility in place		
Contributing watershed stabilized prior to flow diversion		
Outlet		

Comments:

III. Monthly Summary of Site Inspection Activities

Name of Permitted Facility:	Today's Date:	Reporting Month:
Location:	Permit Identification #:	
Name and Telephone Number of Site Inspector:		

Date of Inspection	Regular / Rainfall based Inspection	Name of Inspector	Items of Concern

Owner/Operator Certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that false statements made herein are punishable as a class A misdemeanor pursuant to Section 210.45 of the Penal Law."

Signature of Permittee or Duly Authorized Representative

Name of Permittee or Duly Authorized Representative   Date

Duly authorized representatives must have written authorization, submitted to DEC, to sign any permit documents.

Actions to be Taken:

Infiltration Trench Operation, Maintenance, and Management Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

Maintenance Item	Satisfactory / Unsatisfactory	Comments
1. Debris Cleanout (Monthly)		
Trench surface clear of debris		
Inflow pipes clear of debris		
Overflow spillway clear of debris		
Inlet area clear of debris		
2. Sediment Traps or Forebays (Annual)		
Obviously trapping sediment		
Greater than 50% of storage volume remaining		
3. Dewatering (Monthly)		
Trench dewaters between storms		
4. Sediment Cleanout of Trench (Annual)		
No evidence of sedimentation in trench		
Sediment accumulation doesn't yet require cleanout		
5. Inlets (Annual)		

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
Good condition		
No evidence of erosion		
6. Outlet/Overflow Spillway (Annual)		
Good condition, no need for repair		
No evidence of erosion		
7. Aggregate Repairs (Annual)		
Surface of aggregate clean		
Top layer of stone does not need replacement		
Trench does not need rehabilitation		

Comments:

Actions to be Taken:

Previous Raintrol Technical Data Index Next

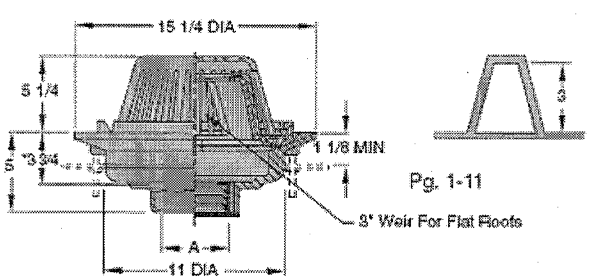
RAINTROL® SPECIFICATIONS

The RAINTROL® drain is offered in two basic designs. The three inch high weir is principally for flat roofs. Though this may be used on sloped roofs, the limited factor is the build up which can not exceed 3". The second design is the six inch weir which can be used on all roofs up to and including a sloped roof with a 6" rise. The flow rates for all RAINTROL® drains are shown on Table 2.

NOTE: The roof drains are supplied in increments of weir openings. They are shipped from the factory with the correct weir openings in accordance with the specifications.

However, should some requirements or conditions change, the drain can be adjusted. Vandal proof fasteners prevent unauthorized tampering with the setting.

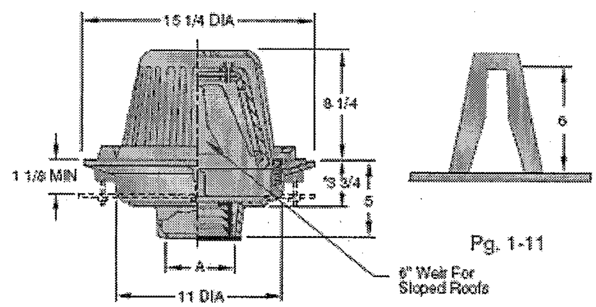
Included in this section are tables of data for a number of localities. For locations not listed, use values for similar or nearby locations. For specific conditions which require more information, contact Jay R. Smith Mfg. Co., Montgomery, Alabama.



FLAT ROOF TYPE

Fig. 1083 ....BOTTOM OUTLET
Fig. 1088 ....SIDE OUTLET

*This Dimension to Internal Stop of Speedi-Set Gasket



SLOPED ROOF TYPE

Fig. 1085 ....BOTTOM OUTLET
Fig. 1089 ....SIDE OUTLET

DRAIN SYSTEMS

The engineer should lay out the roof drain system consistent with the structural design strength of the roof. Normally for a flat roof with a 30 lb. sq. ft. design load, the water depth or build-up would be limited to 3". This will keep the load down to approximately 15 lbs. per square foot. For sloped roofs, the allowed water depth can be greater, but only to the point where the stresses will be within the design limitations. This will be up to the discretion of the engineer.

The roof drainage design can be based

DESIGN CONSIDERATIONS

When designing the roof drain system, the engineer must remember that the roof is being utilized as a temporary reservoir to retain some water. Flashing and water proofing should be high enough to prevent any leakage. The engineer must also provide adequate strength for structural safety. In addition, the following considerations should be observed:

These are not absolute requirements, but are suggestions to be considered. The final design is at the discretion of the design engineer and should be consistent with the roof requirements.

a. On all roofs, use minimum of two drains, if possible.
b. On larger roofs, use a greater number of drains as dictated by design layout.
c. Limit roof area to 25,000 sq. ft. per weir opening.

on a number of factors. The prime consideration could be economy, using minimum leaders and storm sewers. The allowable roof load or build-up could limit the design. Or possibly, drain down time could be the limiting design criteria. In any case, knowing the maximum flow rates, which are controlled, the engineer can properly size leaders and storm sewers economically consistent with his selected design criteria.

d. Recommended maximum distance from roof edge to drain is 50 ft. (flat roofs).
e. Recommended maximum distance from end of valley to drain is 50 ft. (sloped roofs).
f. Recommended maximum distance between drains is 200 ft. g. Provide adequate flashing at parapets, openings, walls, joints, etc.
h. Limit parapet walls or provide overflow scuppers. These should be located at the anticipated maximum water depth (build-up). If located in a higher position which could result in a greater flow rate, piping must be sized accordingly.
i. Consider wind effect in locating the drains, and the number of drains.
j. Possible roof deflection due to load. This could create low spots and adversely affect drainage and/or structural safety.

Previous Raintrol Technical Data Index Next

Aqua-Swirl®
Stormwater Treatment System

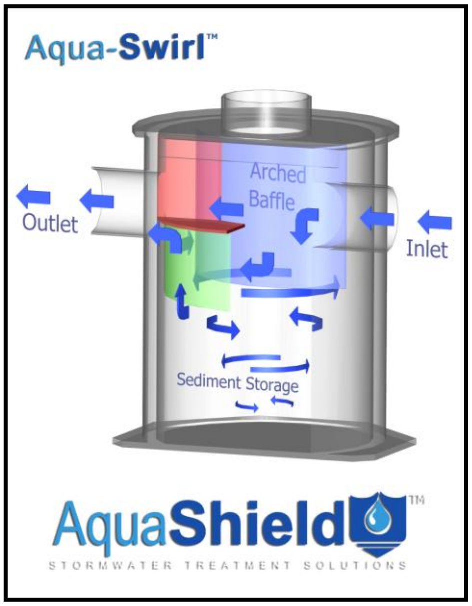
Inspection and Maintenance Manual

AquaShield™, Inc.
2733 Kanasita Drive
Suite 111
Chattanooga, TN 37343
Toll free (888) 344-9044
Phone: (423) 870-8888
Fax: (423) 826-2112
Email: info@aquashieldinc.com
www.aquashieldinc.com

November 2016

Aqua-Swirl® Stormwater Treatment System

The Aqua-Swirl® Stormwater Treatment System (Aqua-Swirl®) is a vortex-type hydrodynamic separator designed and supplied by AquaShield™, Inc. (AquaShield™). Aqua-Swirl® technology removes pollutants including suspended solids, debris, floatables and free-floating oil from stormwater runoff. Both treatment and storage are accomplished in the single swirl chamber without the use of multiple or hidden, blind access chambers.



Aqua-Swirl® Stormwater Treatment System

Floatable debris in the Aqua-Swirl®

System Operation

The treatment operation begins when stormwater enters the Aqua-Swirl® through a tangential inlet pipe that produces a circular (or vortex) flow pattern that causes contaminates to settle to the base of the unit. Since stormwater flow is intermittent by nature, the Aqua-Swirl® retains water between storm events providing both dynamic and quiescent settling of solids. The dynamic settling occurs during each storm event while the quiescent settling takes place between successive storms. A combination of gravitational and hydrodynamic drag forces encourages the solids to drop out of the flow and migrate to the center of the chamber where velocities are the lowest.

The treated flow then exits the Aqua-Swirl® behind the arched outer baffle. The top of the baffle is sealed across the treatment channel, thereby eliminating floatable pollutants from escaping the system. A vent pipe is extended up the riser to expose the backside of the baffle to atmospheric conditions, preventing a siphon from forming at the bottom of the baffle.

Custom Applications

The Aqua-Swirl® system can be modified to fit a variety of purposes in the field, and the angles for inlet and outlet lines can be modified to fit most applications. The photo below demonstrates the flexibility of Aqua-Swirl® installations using a “twin” configuration in order to double the water quality treatment capacity. Two Aqua-Swirl® units were placed side by side in order to treat a high volume of water while occupying a small amount of space.

Custom designed AS-9 Twin Aqua-Swirl®

Retrofit Applications

The Aqua-Swirl® system is designed so that it can easily be used for retrofit applications. With the invert of the inlet and outlet pipe at the same elevation, the Aqua-Swirl® can easily be connected directly to the existing storm conveyance drainage system. Furthermore, because of the lightweight nature and small footprint of the Aqua-Swirl®, existing infrastructure utilities (i.e., wires, poles, trees) would be unaffected by installation.

Aqua-Swirl® System Maintenance

The long term performance of any stormwater treatment structure, including manufactured or land based systems, depends on a consistent maintenance plan. Inspection and maintenance functions are simple and easy for the Aqua-Swirl® allowing all inspections to be performed from the surface.

It is important that a routine inspection and maintenance program be established for each unit based on: (a) the volume or load of the contaminants of concern, (b) the frequency of releases of contaminants at the facility or location, and (c) the nature of the area being drained.

In order to ensure that our systems are being maintained properly, AquaShield™ offers a maintenance solution to all of our customers. We will arrange to have maintenance performed.

Aqua-Swirl® manhole cover

Inspection

The Aqua-Swirl® can be inspected from the surface, eliminating the need to enter the system to determine when cleanout should be performed. In most cases, AquaShield™ recommends a quarterly inspection for the first year of operation to develop an appropriate schedule of maintenance. Based on experience of the system's first year in operation, we recommend that the inspection schedule be revised to reflect the site-specific conditions encountered. Typically, the inspection schedule for subsequent years is reduced to semi-annual inspection.

Maintenance

The Aqua-Swirl® has been designed to minimize and simplify the inspection and maintenance process. The single chamber system can be inspected and maintained entirely from the surface thereby eliminating the need for confined space entry. Furthermore, the entire structure (specifically, the floor) is accessible for visual inspection from the surface. There are no areas of the structure that are blocked from visual inspection or periodic cleaning. Inspection of any free-floating oil and floatable debris can be directly observed and maintained through the manhole access provided directly over the swirl chamber.

Aqua-Swirl® Inspection Procedure

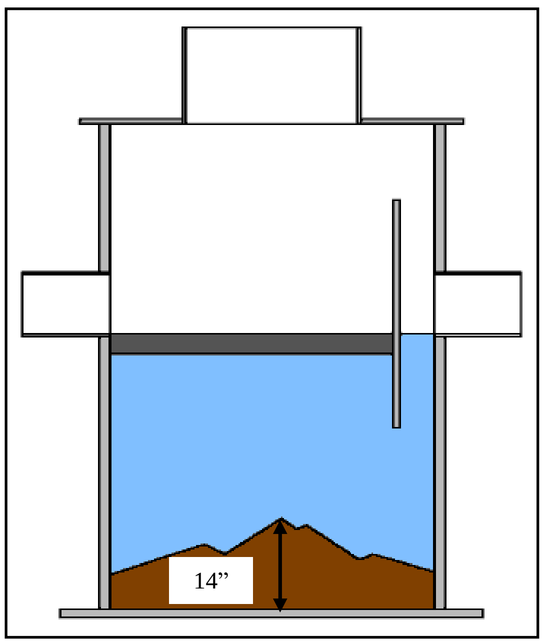
To inspect the Aqua-Swirl®, a hook is typically needed to remove the manhole cover. AquaShield™ provides a customized manhole cover with our distinctive logo to make it easy for maintenance crews to locate the system in the field. We also provide a permanent metal information plate affixed inside the access riser which provides our contact information, the Aqua-Swirl® model size, and serial number.

The only tools needed to inspect the Aqua-Swirl® system are a flashlight and a measuring device such as a stadia rod or pole. Given the easy and direct accessibility provided, floating oil and debris can be observed directly from the surface. Sediment depths can easily be determined by lowering a measuring device to the top of the sediment pile and to the surface of the water.

It should be noted that in order to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the *top* of the sediment pile. Keep in mind that the finer sediment at the top of the pile may offer less resistance to the measuring device than the larger particles which typically occur deeper within the sediment pile.

The Aqua-Swirl® design allows for the sediment to accumulate in a semi-conical fashion as illustrated below. That is, the depth to sediment as measured below the water surface may be less in the center of the swirl chamber; and likewise, may be greater at the edges of the swirl chamber.

Sediment inspection using a stadia rod



Maximum recommended sediment depth prior to cleanout
is 14 inches for all Aqua-Swirl® models

Aqua-Swirl® Cleanout Procedure

Cleaning the Aqua-Swirl® is simple and quick. Free-floating oil and floatable debris can be observed and removed directly through the 30-inch service access riser provided. A vacuum truck is typically used to remove the accumulated sediment and debris. An advantage of the Aqua-Swirl® design is that the entire sediment storage area can be reached with a vacuum hose from the surface reaching all the sides. Since there are no multiple or limited (blind) access chambers in the Aqua-Swirl®, there are no restrictions to impede on-site maintenance tasks.

Disposal of Recovered Materials

AquaShield™ recommends that all maintenance activities be performed in accordance with appropriate health and safety practices for the tasks and equipment being used. AquaShield™ also recommends that all materials removed from the Aqua-Swirl® and any external structures (e.g, bypass features) be handled and disposed in full accordance with any applicable local and state requirements.

Vacuum (vactor) truck quickly cleans the single open access swirl chamber

Aqua-Swirl® Inspection and Maintenance Work Sheets on following pages

Aqua-Swirl® Inspection and Maintenance Manual
Work Sheets

SITE and OWNER INFORMATION

Site Name: ____

Site Location: ____

Date: ______________________ Time: ________________

Inspector Name: ____

Inspector Company: ______________________ Phone #: ______________

Owner Name: ____

Owner Address: ____

Owner Phone #: ________________ Emergency Phone #: ________________

INSPECTIONS

I. Floatable Debris and Oil

1. Remove manhole lid to expose liquid surface of the Aqua-Swirl®.
2. Remove floatable debris with basket or net if any present.
3. If oil is present, measure its depth. Clean liquids from system if one half (½) inch or more oil is present.

   Note: Water in Aqua-Swirl® can appear black and similar to oil due to the dark body of the surrounding structure. Oil may appear darker than water in the system and is usually accompanied by oil stained debris (e.g. Styrofoam, etc.). The depth of oil can be measured with an oil/water interface probe, a stadia rod with water finding paste, a coliwasa, or collect a representative sample with a jar attached to a rod.

II. Sediment Accumulation

1. Lower measuring device (e.g. stadia rod) into swirl chamber through service access provided until top of sediment pile is reached.
2. Record distance to top of sediment pile from top of standing water: ____________ inches.
3. Maximum recommended sediment depth prior to cleanout is 14 inches for all models. Consult system shop drawing for treatment chamber depth as measured from the inlet pipe invert to base of the unit.

III. Diversion Structures (External Bypass Features)

If a diversion (external bypass) configuration is present, it should be inspected as follows:

1. Inspect weir or other bypass feature for structural decay or damage. Weirs are more susceptible to damage than off-set piping and should be checked to confirm that they are not crumbling (concrete or brick) or decaying (steel).
2. Inspect diversion structure and bypass piping for signs of structural damage or blockage from debris or sediment accumulation.
3. When feasible, measure elevations on diversion weir or piping to ensure it is consistent with site plan designs.
4. Inspect downstream (convergence) structure(s) for sign of blockage or structural failure as noted above.

CLEANING

Schedule cleaning with local vactor company or AquaShield™ to remove sediment, oil and other floatable pollutants. The captured material generally does not require special treatment or handling for disposal. Site-specific conditions or the presence of known contaminants may necessitate that appropriate actions be taken to clean and dispose of materials captured and retained by the Aqua-Swirl®. All cleaning activities should be performed in accordance with property health and safety procedures.

AquaShield™ always recommends that all materials removed from the Aqua-Swirl® during the maintenance process be handled and disposed in accordance with local and state environmental or other regulatory requirements.

MAINTENANCE SCHEDULE

I. During Construction

Inspect the Aqua-Swirl® every three (3) months and clean the system as needed. The Aqua-Swirl® should be inspected and cleaned at the end of construction regardless of whether it has reached its maintenance trigger.

II. First Year Post-Construction

Inspect the Aqua-Swirl® every three (3) months and clean the system as needed.

Inspect and clean the system once annually regardless of whether it has reached its sediment or floatable pollutant storage capacity.

III. Second and Subsequent Years Post-Construction

If the Aqua-Swirl® did not reach full sediment or floatable pollutant capacity in the First Year Post-Construction period, the system can be inspected and cleaned once annually.

If the Aqua-Swirl® reached full sediment or floatable pollutant capacity in less than 12 months in the First Year Post-Construction period, the system should be inspected once every six (6) months and cleaned as needed. The Aqua-Swirl® should be cleaned annually regardless of whether it reaches its sediment or floatable pollutant capacity.

IV. Bypass Structures

Bypass structures should be inspected whenever the Aqua-Swirl® is inspected. Maintenance should be performed on bypass structures as needed.

MAINTENANCE COMPANY INFORMATION

Company Name: ____

Street Address: ____

City: ______________________ State/Prov.:________ Zip/Postal Code: __________

Contact: ______________________________ Title: ___________________

Office Phone: ______________________ Cell Phone: _____________________

ACTIVITY LOG

Date of Cleaning: __________________ (Next inspection should be 3 months from this data for first year).

Time of Cleaning: Start: __________________ End: __________________

Date of Next Inspection: ______________

Floatable debris present: Yes No

Notes: ____

____

____

Oil present: Yes No Oil depth (inches): ______________________

Measurement method and notes: ______________________________

____

____

STRUCTURAL CONDITIONS and OBSERVATIONS

Structural damage: Yes No Where: ___________________________________

Structural wear: Yes No Where: ___________________________________

Odors present: Yes No Describe: ___________________________________

Clogging: Yes No Describe: ___________________________________

Other Observations: ___________________________________

____

____

NOTES

Additional Comments and/or Actions To Be Taken	Time Frame

ATTACHMENTS

- Attach site plan showing Aqua-Swirl® location.
- Attach detail drawing showing Aqua-Swirl® dimensions and model number.
- If a diversion configuration is used, attach details showing basic design and elevations (where feasible).

Aqua-Swirl®

TABULAR MAINTENANCE SCHEDULE

Date Construction Started: ______________________________

Date Construction Ended: ______________________________

During Construction

	Month											
Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Inspect and Clean as needed			X			X			X			X
Inspect Bypass and maintain as needed			X			X			X			X
Clean System*												X*

* The Aqua-Swirl® should be cleaned **once a year** regardless of whether it has reached full pollutant storage capacity. In addition, the system should be cleaned at the **end of construction** regardless of whether it has reach full pollutant storage capacity.

First Year Post-Construction

	Month											
Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Inspect and Clean as needed			X			X			X			X
Inspect Bypass and maintain as needed			X			X			X			X
Clean System*												X*

* The Aqua-Swirl® should be cleaned **once a year** regardless of whether it has reached full pollutant storage capacity.

Second and Subsequent Years Post-Construction

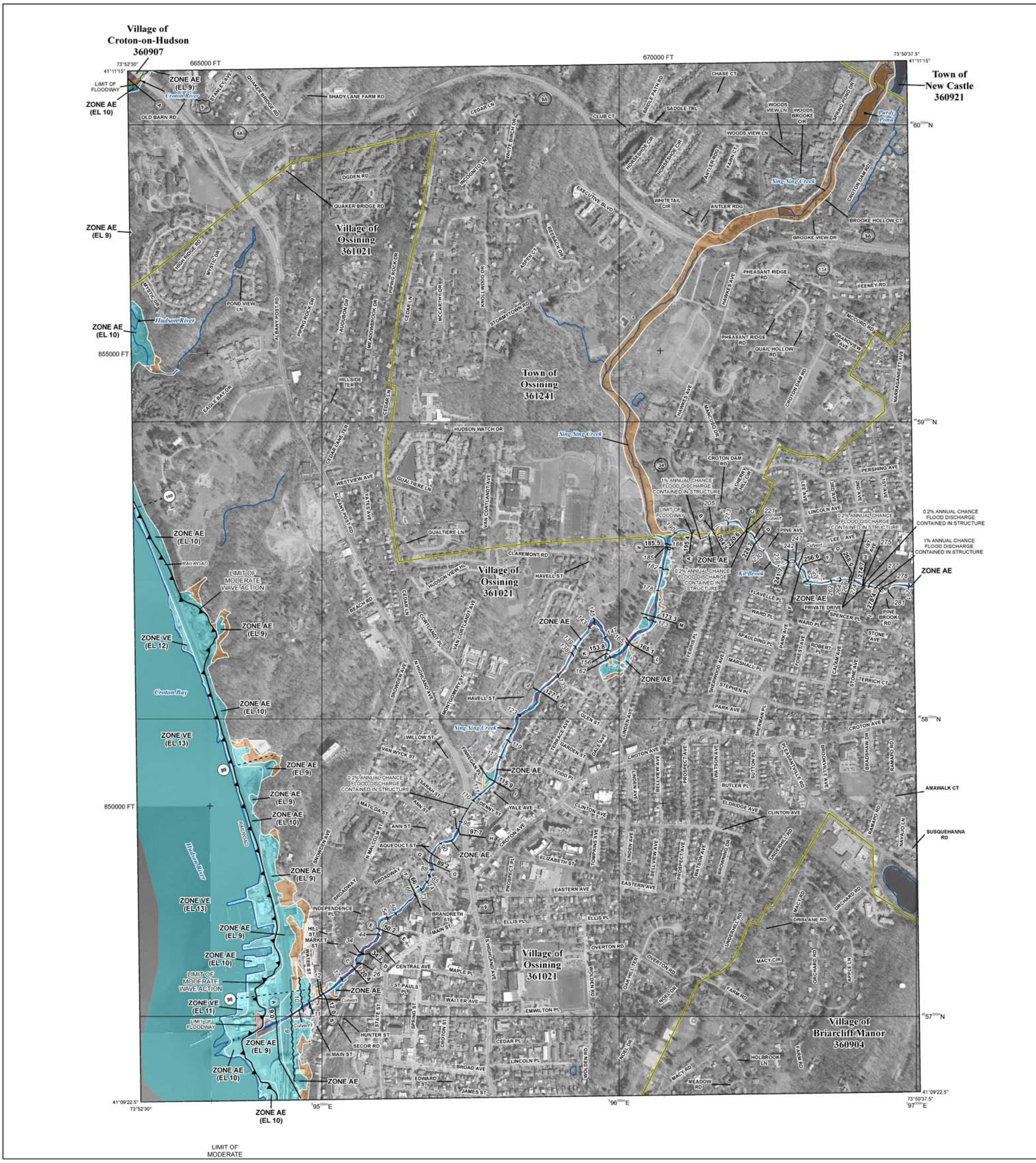
	Month											
Activity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Inspect and Clean as needed												X*
Inspect Bypass, maintain as needed												X*
Clean System*												X*

* If the Aqua-Swirl® did **not** reach full sediment or floatable pollutant capacity in the First Year Post-Construction period, the system can be inspected and cleaned once annually.

If the Aqua-Swirl® **reached** full sediment or floatable pollutant capacity in less than 12 months in the First Year Post-Construction period, the system should be inspected once every six (6) months or more frequently if past history warrants, and cleaned as needed. The Aqua-Swirl® should be cleaned annually regardless of whether it reaches its full sediment or floatable pollutant capacity.

APPENDIX E

- FEMA FLOOD MAP



FLOOD HAZARD INFORMATION

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

THE INFORMATION DEPICTED ON THIS MAP AND SUPPORTING DOCUMENTATION ARE ALSO AVAILABLE IN DIGITAL FORMAT AT

HTTP://MSC.FEMA.GOV

SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) *Zone A, V, A99*
	With BFE or Depth *Zone AE, AO, AH, VE, AR*
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% Annual Chance Flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	Area with Reduced Flood Risk due to Levee See Notes *Zone X*
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard *Zone X*
	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
	E 18.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation (BFE)
	8 Coastal Transect
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
	513 Base Flood Elevation Line (BFE)
OTHER FEATURES	Limit of Study
	Jurisdiction Boundary

NOTES TO USERS

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

For community and countywide map dates refer to the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

Base map information shown on this FIRM was provided in digital format by New York State Cyber and Critical Infrastructure. This information was derived from digital orthophotography at a 0.5 foot ground resolution from imagery flown in April 2013.

LIMIT OF MODERATE WAVE ACTION: Zone AE has been divided by a Limit of Moderate Wave Action (LiMWA). The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LiMWA (or between the shoreline and the LiMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

Limit of Moderate Wave Action (LiMWA)

SCALE

N

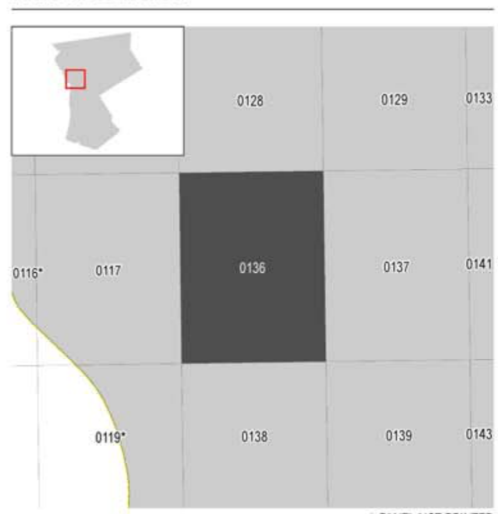
Map Projection:
Universal Transverse Mercator Zone 18N; North American Datum 1983; GRS_1980 Spheroid; North American Vertical Datum of 1988

1 inch = 500 feet 1:6,000

0 500 1,000 2,000 Feet

0 130 260 520 Meters

PANEL LOCATOR



* PANEL NOT PRINTED

FEMA

National Flood Insurance Program

NATIONAL FLOOD INSURANCE PROGRAM
FLOOD INSURANCE RATE MAP

WESTCHESTER COUNTY, NEW YORK
All Jurisdictions

PANEL 136 OF 426

FEMA

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
BRIARCLIFF MANOR, VILLAGE OF	360904	0136	G
CROTON ON HUDSON, VILLAGE OF	360907	0136	G
NEW CASTLE, TOWN OF	360921	0136	G
OSSINING, TOWN OF	361241	0136	G
OSSINING, VILLAGE OF	361021	0136	G

PRELIMINARY
DECEMBER 8, 2014

VERSION NUMBER
2.2.2.1

MAP NUMBER
36119C0136G

MAP REVISED

APPENDIX F

- *CULVERT STORMWATER CAPACITY ANALYSIS*

PETRUCCELLI ENGINEERING
RUDOLPH C. PETRUCCELLI, P.E.
PAUL BERTÉ, P.E.

HIDDEN COVE ON THE HUDSON
Village of Ossining

STORMWATER CAPACITY ANALYSIS

Prepared by:
Petruccelli Engineering
600 North Broadway
Suite 215
White Plains, NY 10603

November 20, 2012
Revised
July 2, 2013
February 28, 2017
May 3, 2018
June 18, 2018

Stormwater Management

Proposed re-routing of the existing stream flow

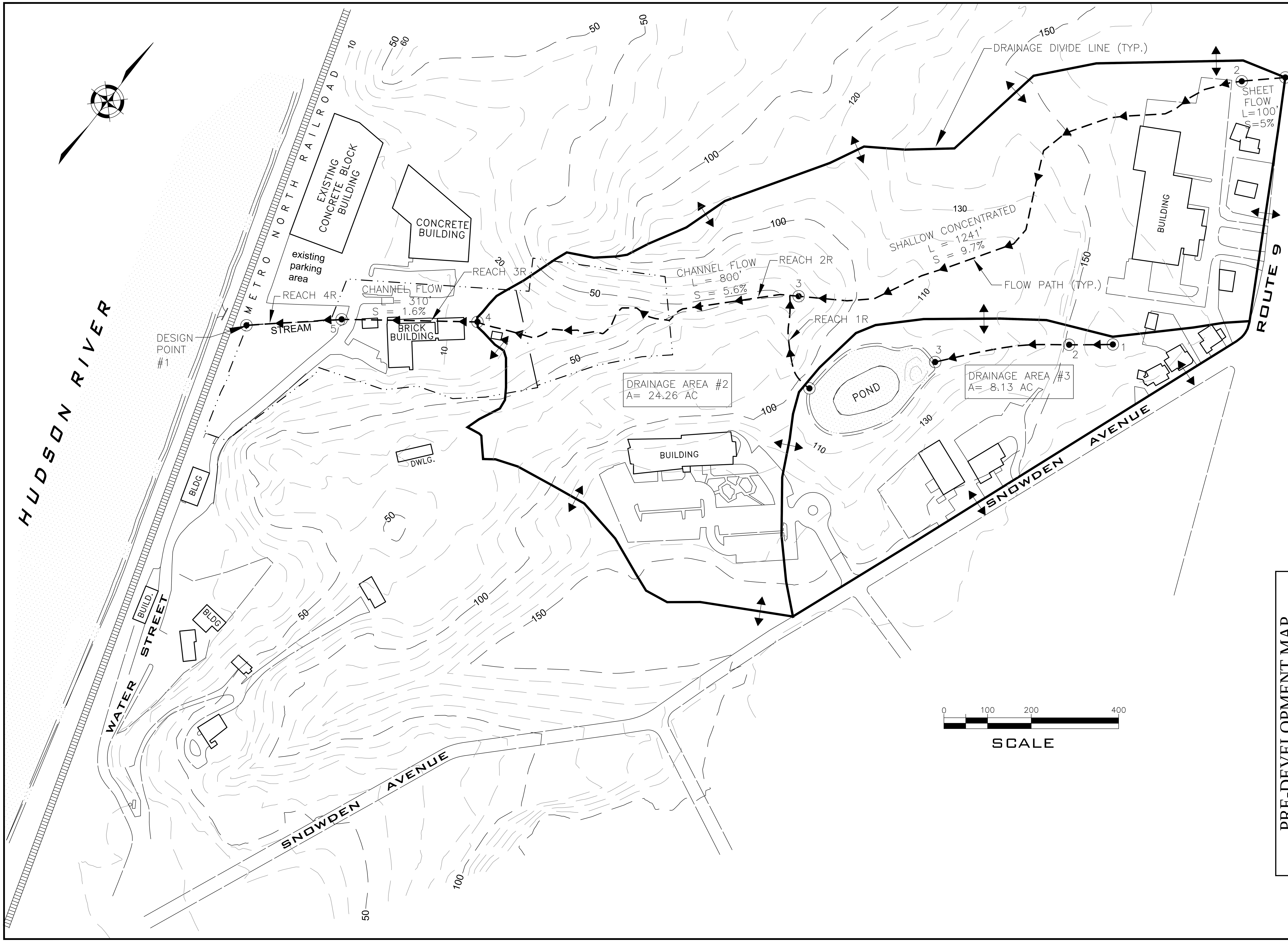
The existing stream that currently channel flows through the site takes in an approximate drainage area of 26.6 acres with a peek storage for a 100-year storm event of 11,240 c.f. The open channel drains the corresponding watershed area from Route 9 to the Hudson River. Runoff from the sub-basin is routed downstream until it reaches an existing brick culvert at the existing Mill Building. This culvert continues underneath the Mill Building and Water Street eventually discharging to an approximately 220’ long open water course. The channel continues west before joining an existing drainage culvert (Design Point #1) crossing under the Metro-North tracks and then discharges into the Hudson River.

During demolition of the Mill Building, the brick culvert will remain in place and be maintained. Upon completion of the building demolition, a new reinforced concrete box culvert will be installed alongside the existing one and then tied into the stream at each end. When the new concrete box culvert is installed, the stream between the access road and the railroad will be cleaned of all debris and removed off the site. The existing brick culvert will collect stormwater for a time and be phased out as construction proceeds. Upon completion of the new box culvert, the brick culvert will be demolished and replaced with compacted earth.

The project development requires the re-routing of the existing stream underneath the proposed parking lot for the 6-story building through a new series of 8’ wide x 4’ deep precast box culverts.
The new box culvert includes a drainage structure with a weir inlet designed to transport the stream with flows during most conditions while allowing to control the peak stormwater elevations at the east side of the building. The enclosed box culvert will consist of a series of rectangular sections that will extend for the entire length of the proposed building and new improvement areas before discharging at a point on the stream.

Storm water Management Facilities Maintenance Program

- Precast concrete box culverts provide many years of service with the minimum amount of maintenance. The authority who is maintaining the building and property will have personnel to conduct periodic up-keeping of the condition of the box culverts to remove any drift and debris as needed.



REVISIONS
07.02.13
02.28.17

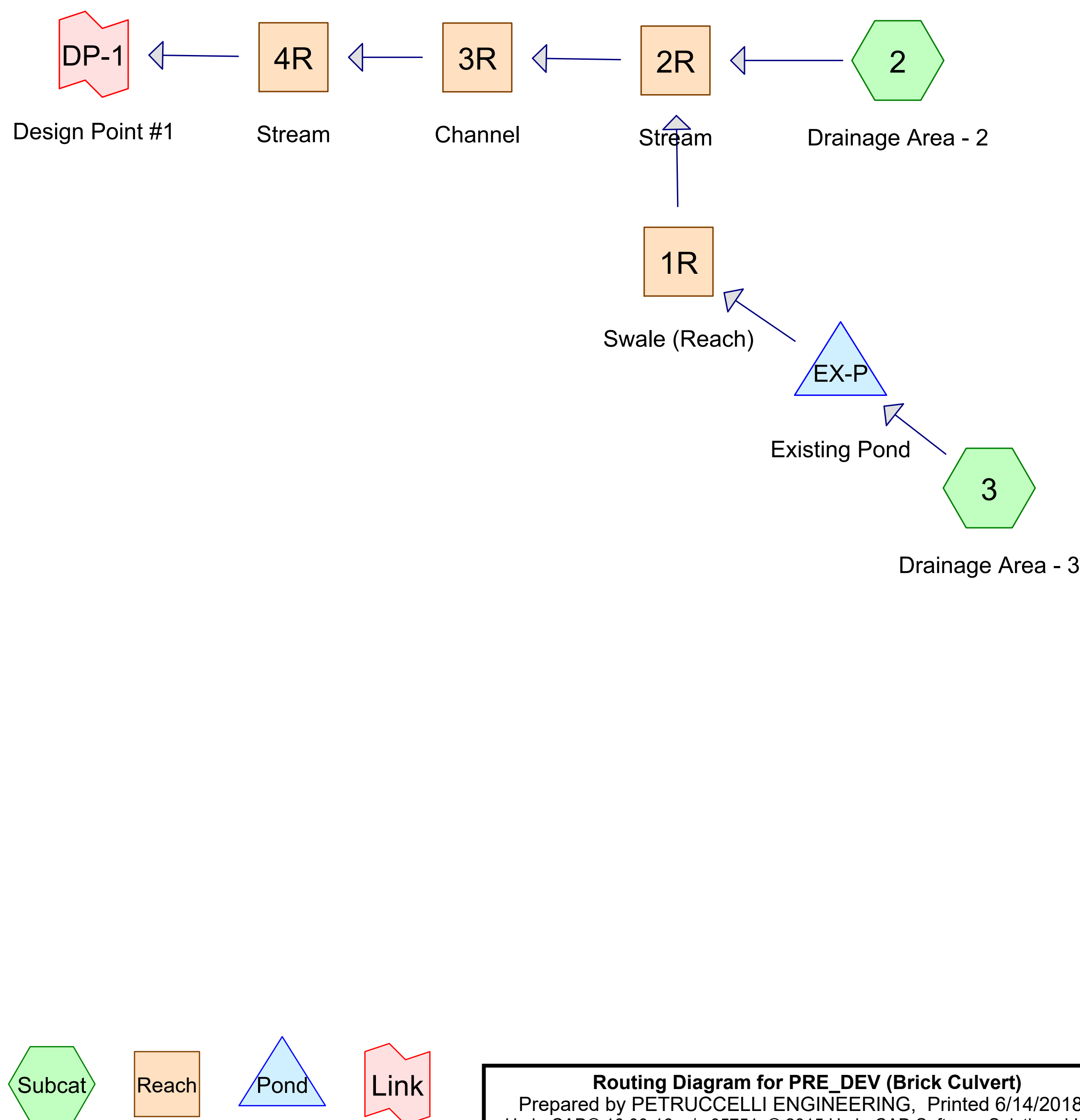
JOB NO. 2001
DATE: 11.20.12
SCALE: AS NOTED
DRAWN BY: KMM
CHECKED BY: P.B.

PETRUCCELLI ENGINEERING
600 NORTH BROADWAY
WHITE PLAINS, N.Y. 10603
9 1 4 . 9 4 8 . 3 6 2 9
PAUL BERTE, P.E.

PRE-DEVELOPMENT MAP
STORMWATER CAPACITY ANAYALSIS

HIDDEN COVE ON THE HUDSON
36 NORTH WATER STREET
VILLAGE OF OSSINING
NEW YORK

SHEET NO.
1 / 2



Routing Diagram for PRE_DEV (Brick Culvert)
Prepared by PETRUCCELLI ENGINEERING, Printed 6/14/2018

Summary for Subcatchment 2: Drainage Area - 2

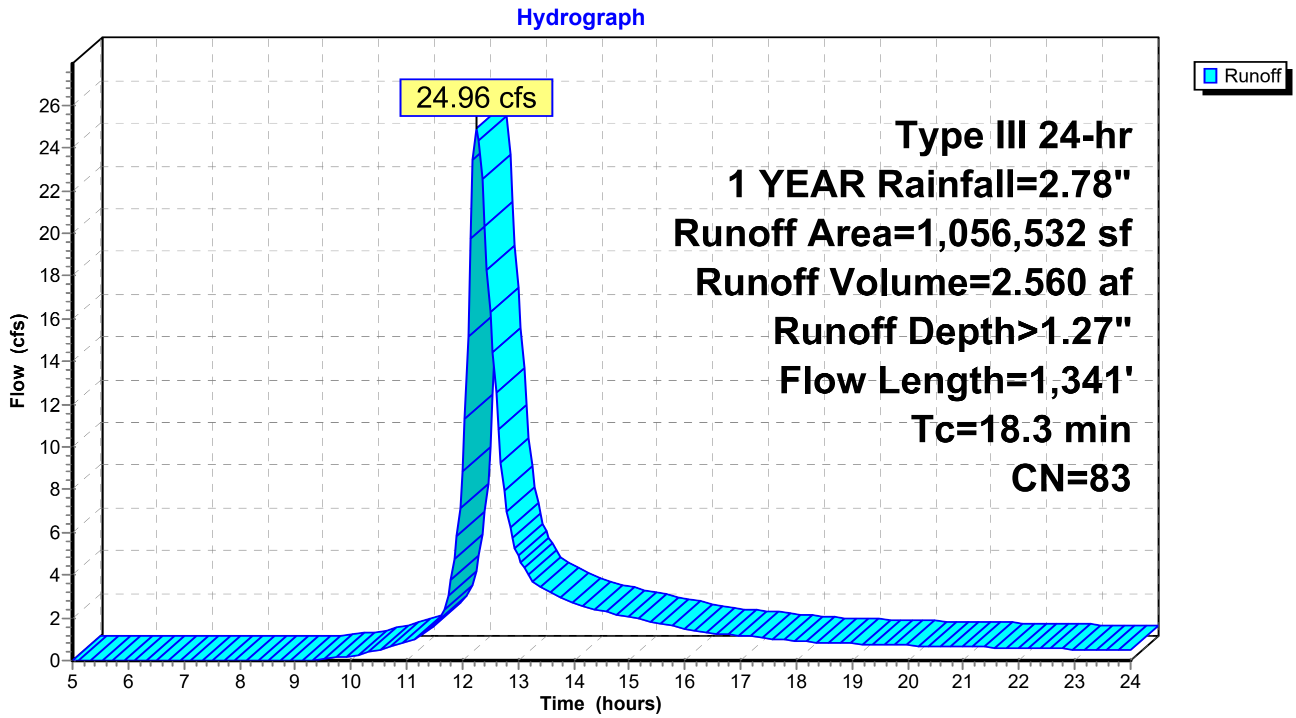
Runoff = 24.96 cfs @ 12.26 hrs, Volume= 2.560 af, Depth> 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

	Area (sf)	CN	Description
*	195,831	98	Paved parking & roofs
*	6,925	98	Water Course
	853,776	79	Woods, Fair, HSG D
	1,056,532	83	Weighted Average
	853,776		80.81% Pervious Area
	202,756		19.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0500	0.12		**Sheet Flow, 1 to 2**
					Woods: Light underbrush n= 0.400 P2= 3.50"
4.1	1,241	0.0970	5.01		**Shallow Concentrated Flow, 2 to 3**
					Unpaved Kv= 16.1 fps
18.3	1,341	Total			

Subcatchment 2: Drainage Area - 2



Summary for Subcatchment 3: Drainage Area - 3

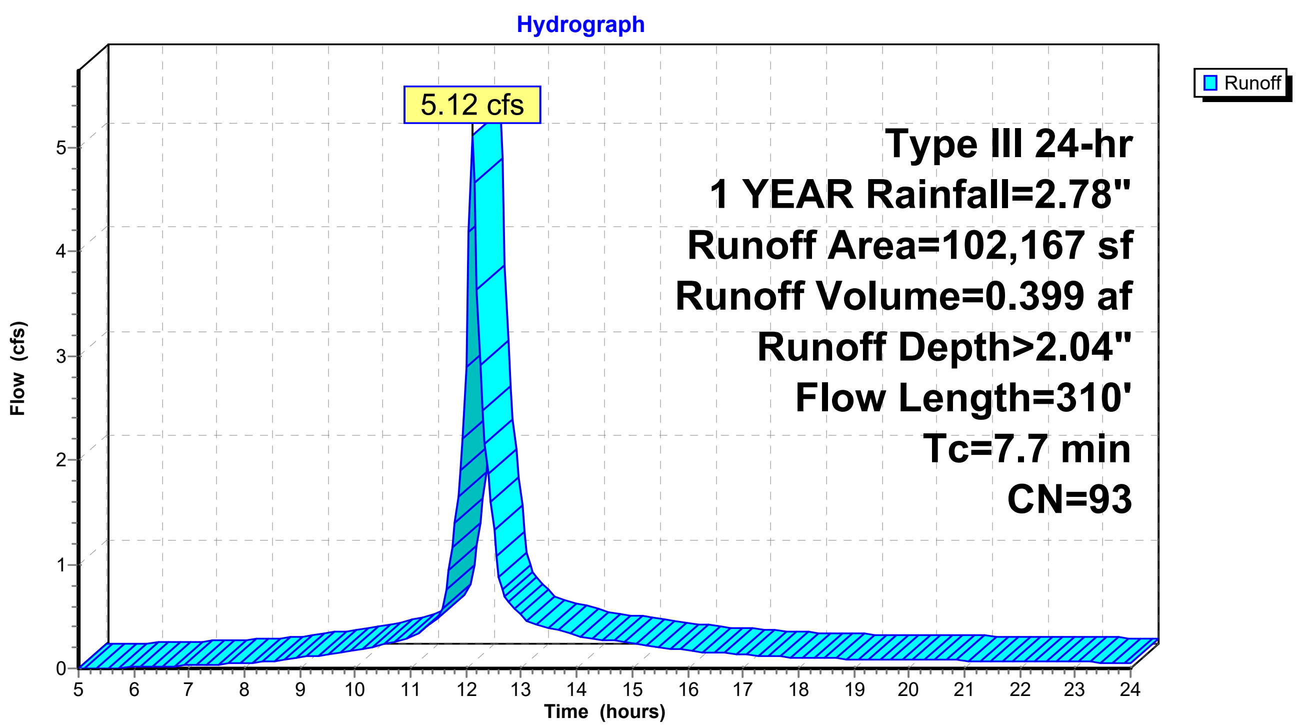
Runoff = 5.12 cfs @ 12.11 hrs, Volume= 0.399 af, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

	Area (sf)	CN	Description
*	74,229	98	Paved roads w/ curbs & sewers
	27,938	79	Woods, Fair, HSG D
	102,167	93	Weighted Average
	27,938		27.35% Pervious Area
	74,229		72.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	100	0.3000	0.24		**Sheet Flow, 1 to 2**
					Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	210	0.0950	4.96		**Shallow Concentrated Flow, 2 to 3**
					Unpaved Kv= 16.1 fps
7.7	310	Total			

Subcatchment 3: Drainage Area - 3



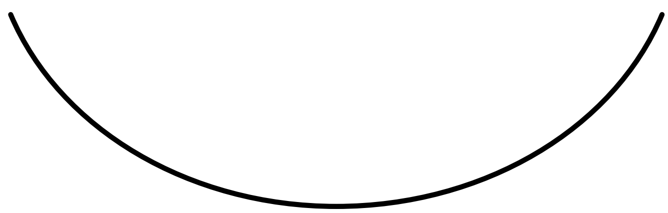
Summary for Reach 1R: Swale (Reach)

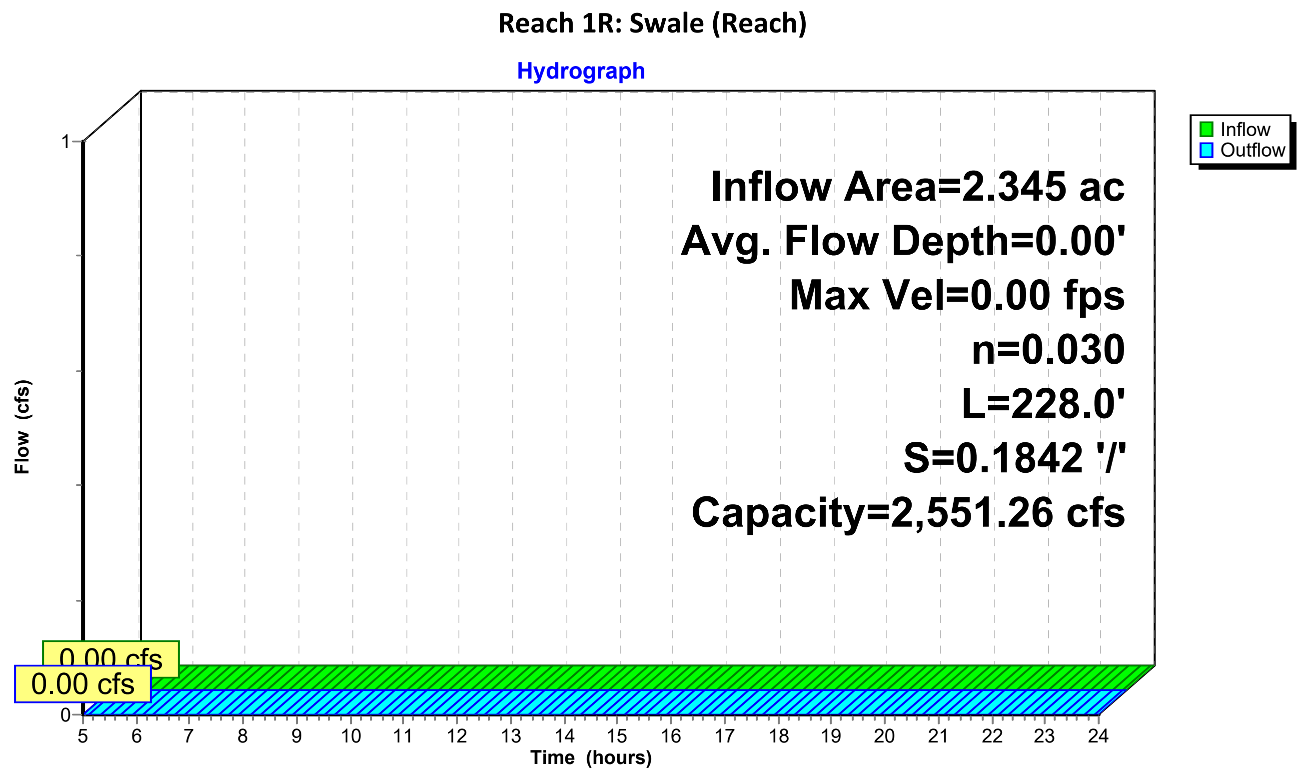
Inflow Area = 2.345 ac, 72.65% Impervious, Inflow Depth = 0.00" for 1 YEAR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 5.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.00' Flow Area= 60.0 sf, Capacity= 2,551.26 cfs

18.00' x 5.00' deep Parabolic Channel, n= 0.030 Stream, clean & straight
Length= 228.0' Slope= 0.1842 '/'
Inlet Invert= 95.00', Outlet Invert= 53.00'





Summary for Reach 2R: Stream

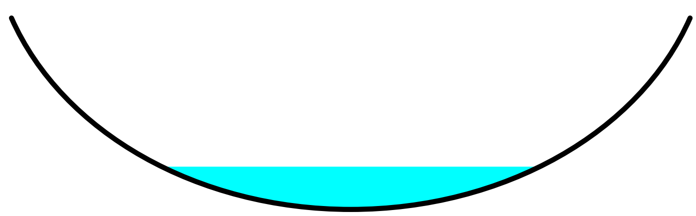
[62] Hint: Exceeded Reach 1R OUTLET depth by 0.89' @ 12.30 hrs

Inflow Area = 26.600 ac, 23.90% Impervious, Inflow Depth > 1.16" for 1 YEAR event
Inflow = 24.96 cfs @ 12.26 hrs, Volume= 2.560 af
Outflow = 24.63 cfs @ 12.29 hrs, Volume= 2.555 af, Atten= 1%, Lag= 1.8 min

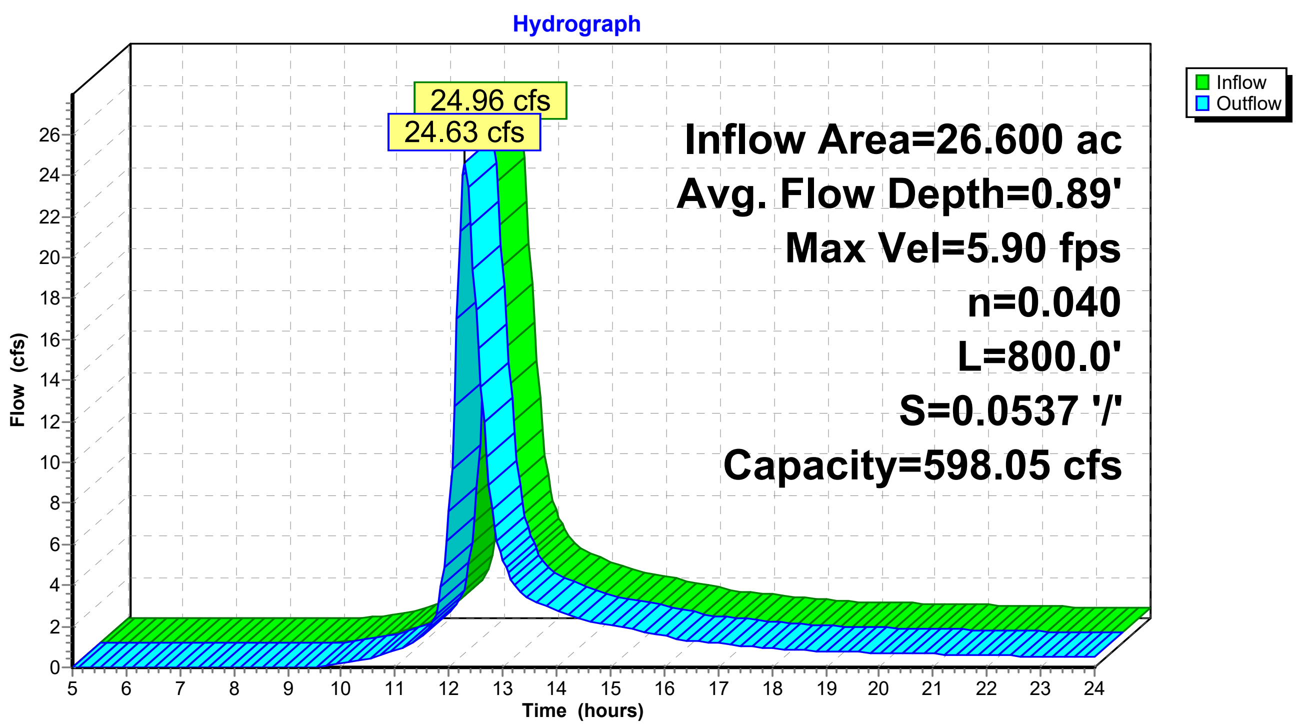
Routing by Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.90 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 2.39 fps, Avg. Travel Time= 5.6 min

Peak Storage= 3,337 cf @ 12.29 hrs
Average Depth at Peak Storage= 0.89'
Bank-Full Depth= 4.00' Flow Area= 40.0 sf, Capacity= 598.05 cfs

15.00' x 4.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 800.0' Slope= 0.0537 '/'
Inlet Invert= 53.00', Outlet Invert= 10.00'



Reach 2R: Stream



Summary for Reach 3R: Channel

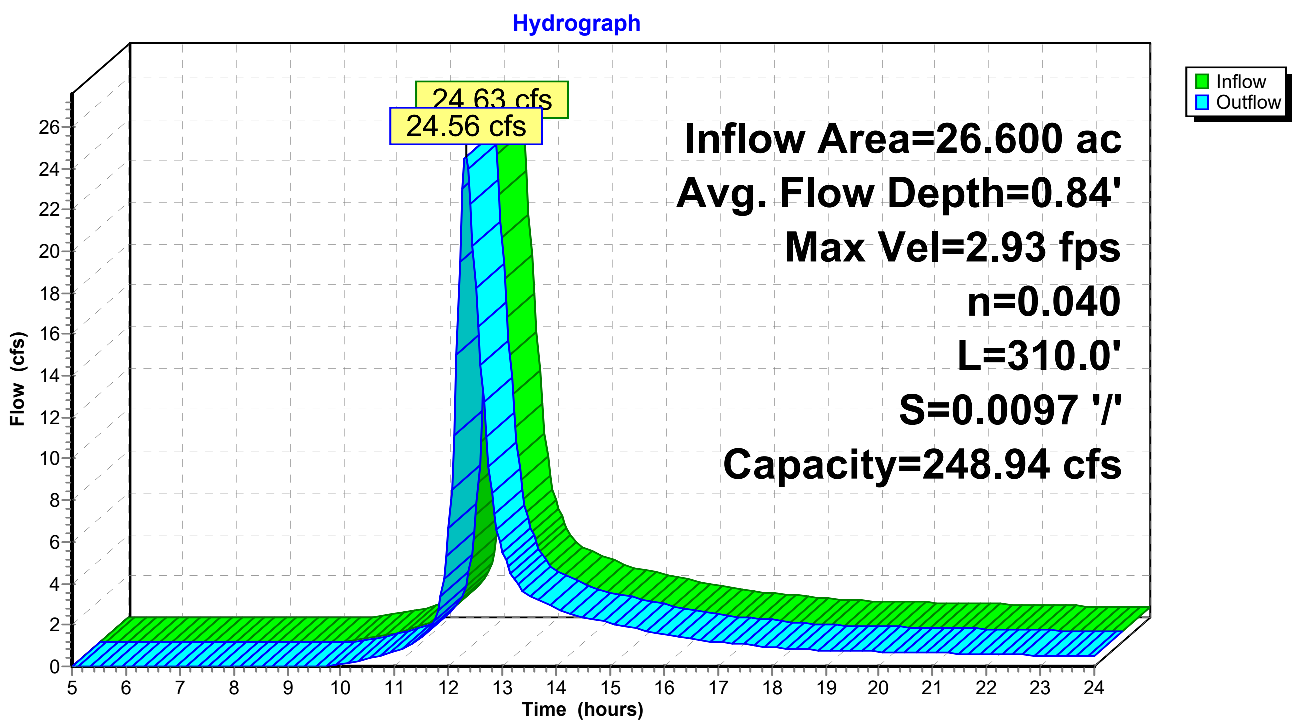
Inflow Area = 26.600 ac, 23.90% Impervious, Inflow Depth > 1.15" for 1 YEAR event
Inflow = 24.63 cfs @ 12.29 hrs, Volume= 2.555 af
Outflow = 24.56 cfs @ 12.31 hrs, Volume= 2.550 af, Atten= 0%, Lag= 1.2 min

Routing by Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.93 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 5.3 min

Peak Storage= 2,598 cf @ 12.31 hrs
Average Depth at Peak Storage= 0.84'
Bank-Full Depth= 4.00' Flow Area= 40.0 sf, Capacity= 248.94 cfs

10.00' x 4.00' deep channel, n= 0.040 Winding stream, pools & shoals
Length= 310.0' Slope= 0.0097 '/'
Inlet Invert= 6.00', Outlet Invert= 3.00'

Reach 3R: Channel



Summary for Reach 4R: Stream

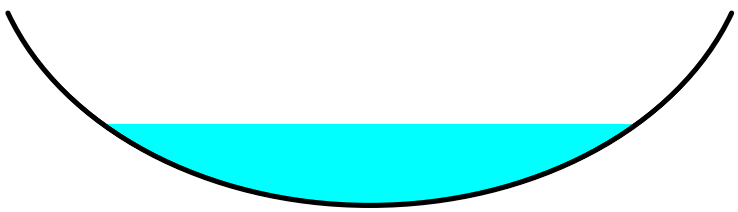
[62] Hint: Exceeded Reach 3R OUTLET depth by 0.44' @ 12.40 hrs

Inflow Area = 26.600 ac, 23.90% Impervious, Inflow Depth > 1.15" for 1 YEAR event
Inflow = 24.56 cfs @ 12.31 hrs, Volume= 2.550 af
Outflow = 24.53 cfs @ 12.32 hrs, Volume= 2.548 af, Atten= 0%, Lag= 0.7 min

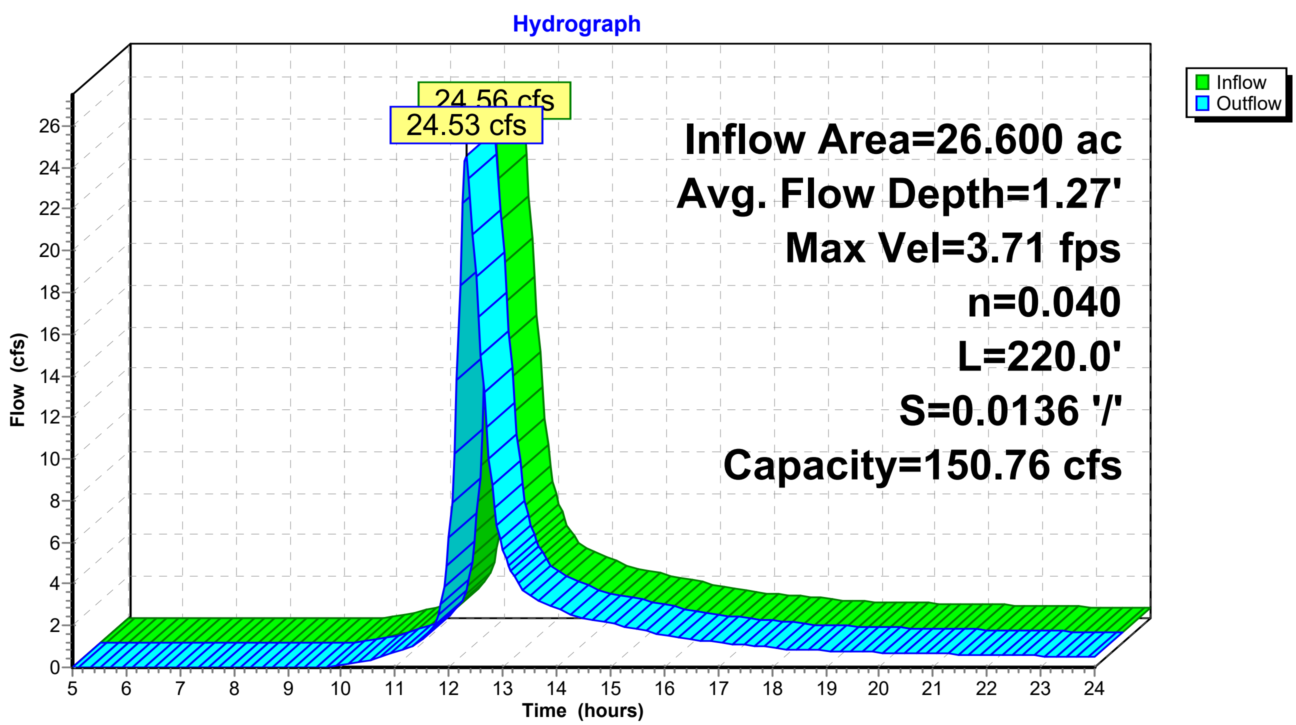
Routing by Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.71 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.51 fps, Avg. Travel Time= 2.4 min

Peak Storage= 1,452 cf @ 12.32 hrs
Average Depth at Peak Storage= 1.27'
Bank-Full Depth= 3.00' Flow Area= 24.0 sf, Capacity= 150.76 cfs

12.00' x 3.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 220.0' Slope= 0.0136 '/'
Inlet Invert= 3.00', Outlet Invert= 0.00'



Reach 4R: Stream



Summary for Pond EX-P: Existing Pond

Inflow Area = 2.345 ac, 72.65% Impervious, Inflow Depth > 2.04" for 1 YEAR event
Inflow = 5.12 cfs @ 12.11 hrs, Volume= 0.399 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 87.37' @ 24.00 hrs Surf.Area= 6,986 sf Storage= 17,382 cf

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

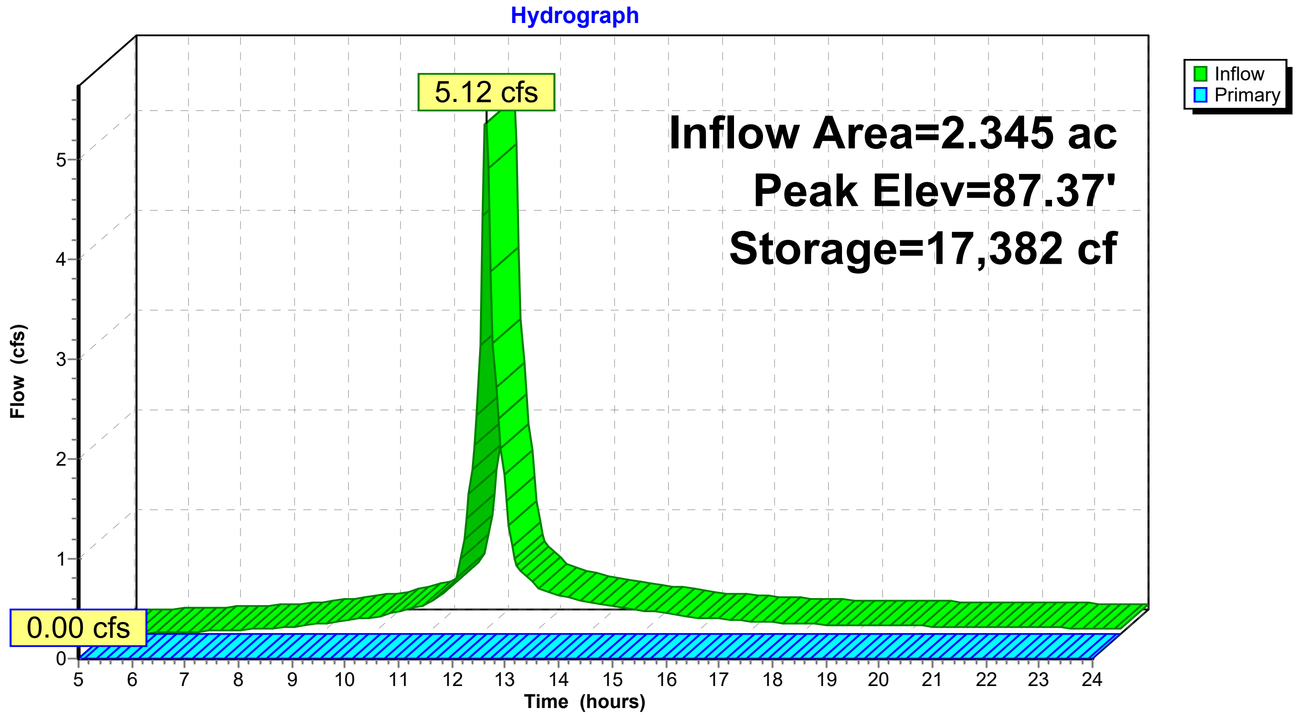
Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	277,808 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
85.00	635	0	0
90.00	14,042	36,693	36,693
100.00	34,181	241,115	277,808

Device	Routing	Invert	Outlet Devices
#1	Primary	95.00'	**65.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=85.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond EX-P: Existing Pond

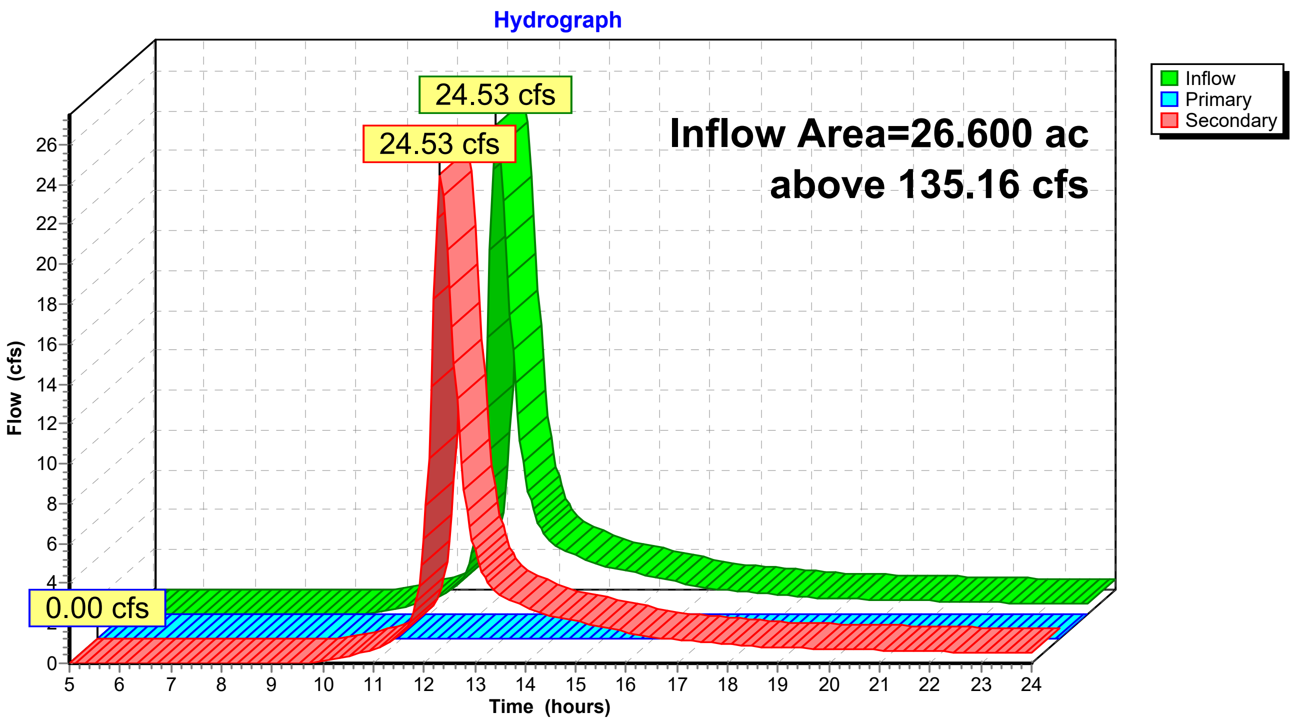


Summary for Link DP-1: Design Point #1

Inflow Area = 26.600 ac, 23.90% Impervious, Inflow Depth > 1.15" for 1 YEAR event
Inflow = 24.53 cfs @ 12.32 hrs, Volume= 2.548 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Secondary = 24.53 cfs @ 12.32 hrs, Volume= 2.548 af

Primary outflow = Inflow above 135.16 cfs, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs

Link DP-1: Design Point #1



Summary for Subcatchment 2: Drainage Area - 2

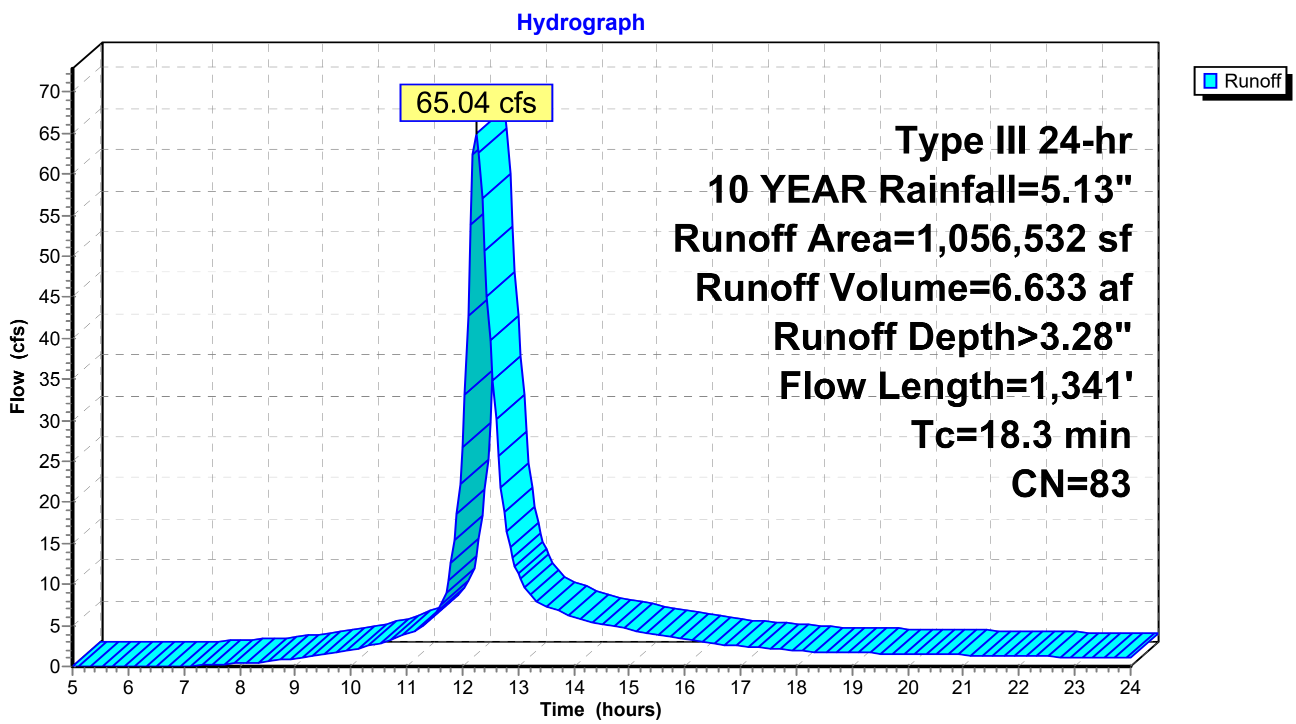
Runoff = 65.04 cfs @ 12.25 hrs, Volume= 6.633 af, Depth> 3.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

	Area (sf)	CN	Description
*	195,831	98	Paved parking & roofs
*	6,925	98	Water Course
	853,776	79	Woods, Fair, HSG D
	1,056,532	83	Weighted Average
	853,776		80.81% Pervious Area
	202,756		19.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0500	0.12		**Sheet Flow, 1 to 2**
					Woods: Light underbrush n= 0.400 P2= 3.50"
4.1	1,241	0.0970	5.01		**Shallow Concentrated Flow, 2 to 3**
					Unpaved Kv= 16.1 fps
18.3	1,341	Total			

Subcatchment 2: Drainage Area - 2



Summary for Subcatchment 3: Drainage Area - 3

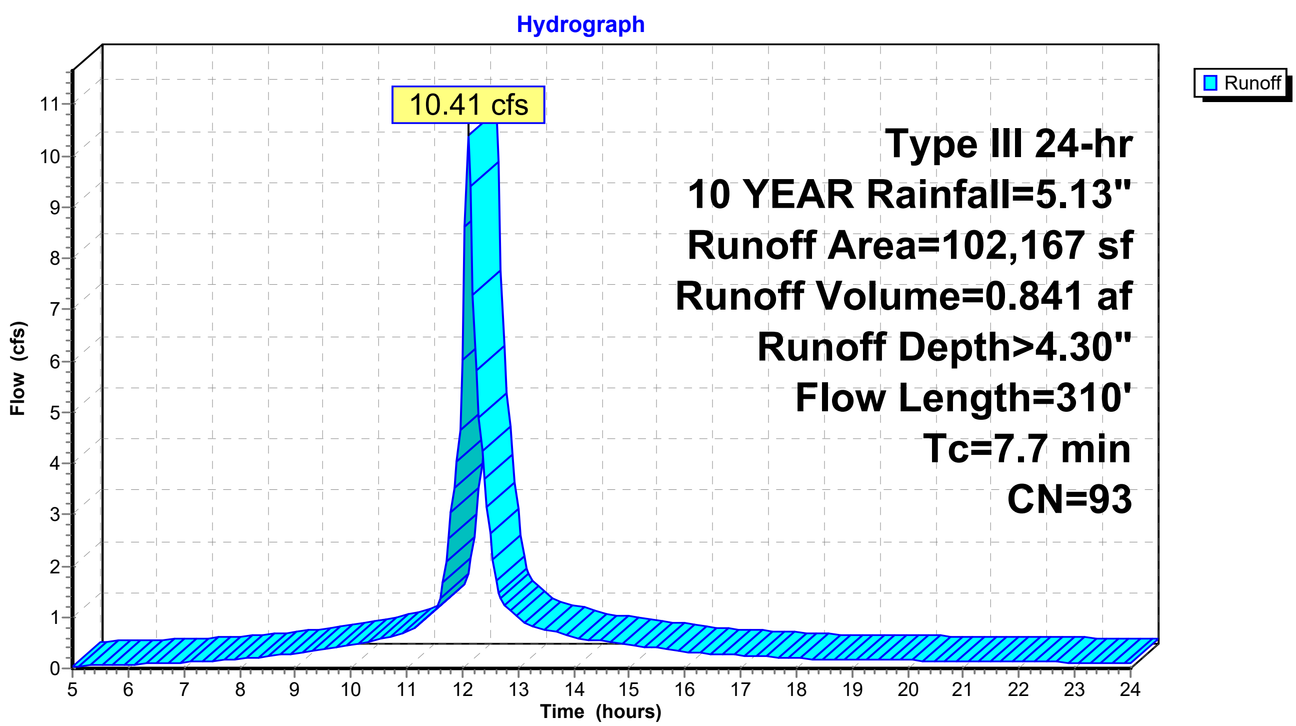
Runoff = 10.41 cfs @ 12.11 hrs, Volume= 0.841 af, Depth> 4.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

	Area (sf)	CN	Description
*	74,229	98	Paved roads w/ curbs & sewers
	27,938	79	Woods, Fair, HSG D
	102,167	93	Weighted Average
	27,938		27.35% Pervious Area
	74,229		72.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	100	0.3000	0.24		**Sheet Flow, 1 to 2**
					Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	210	0.0950	4.96		**Shallow Concentrated Flow, 2 to 3**
					Unpaved Kv= 16.1 fps
7.7	310	Total			

Subcatchment 3: Drainage Area - 3



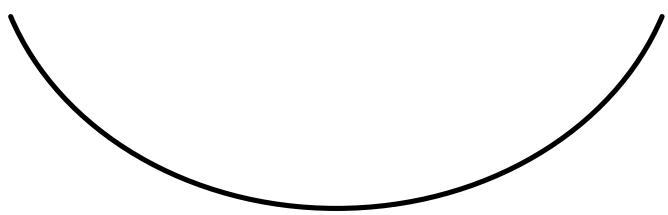
Summary for Reach 1R: Swale (Reach)

Inflow Area = 2.345 ac, 72.65% Impervious, Inflow Depth = 0.00" for 10 YEAR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

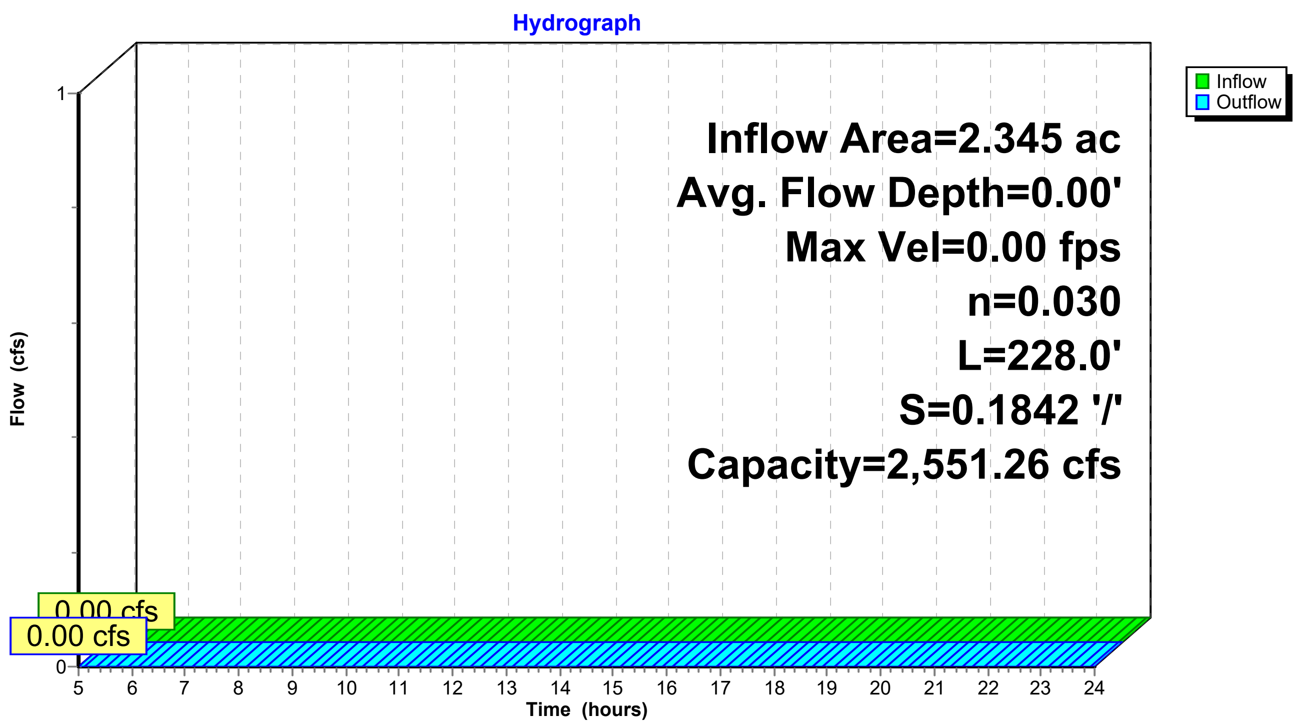
Routing by Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 5.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.00' Flow Area= 60.0 sf, Capacity= 2,551.26 cfs

18.00' x 5.00' deep Parabolic Channel, n= 0.030 Stream, clean & straight
Length= 228.0' Slope= 0.1842 '/'
Inlet Invert= 95.00', Outlet Invert= 53.00'



Reach 1R: Swale (Reach)



Summary for Reach 2R: Stream

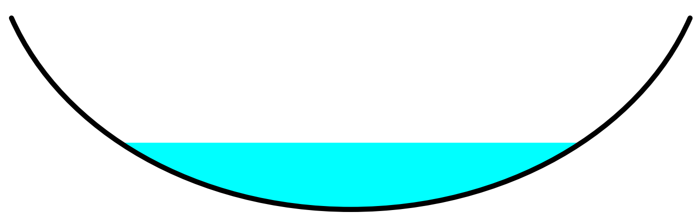
[62] Hint: Exceeded Reach 1R OUTLET depth by 1.39' @ 12.25 hrs

Inflow Area = 26.600 ac, 23.90% Impervious, Inflow Depth > 2.99" for 10 YEAR event
Inflow = 65.04 cfs @ 12.25 hrs, Volume= 6.633 af
Outflow = 64.70 cfs @ 12.27 hrs, Volume= 6.624 af, Atten= 1%, Lag= 1.2 min

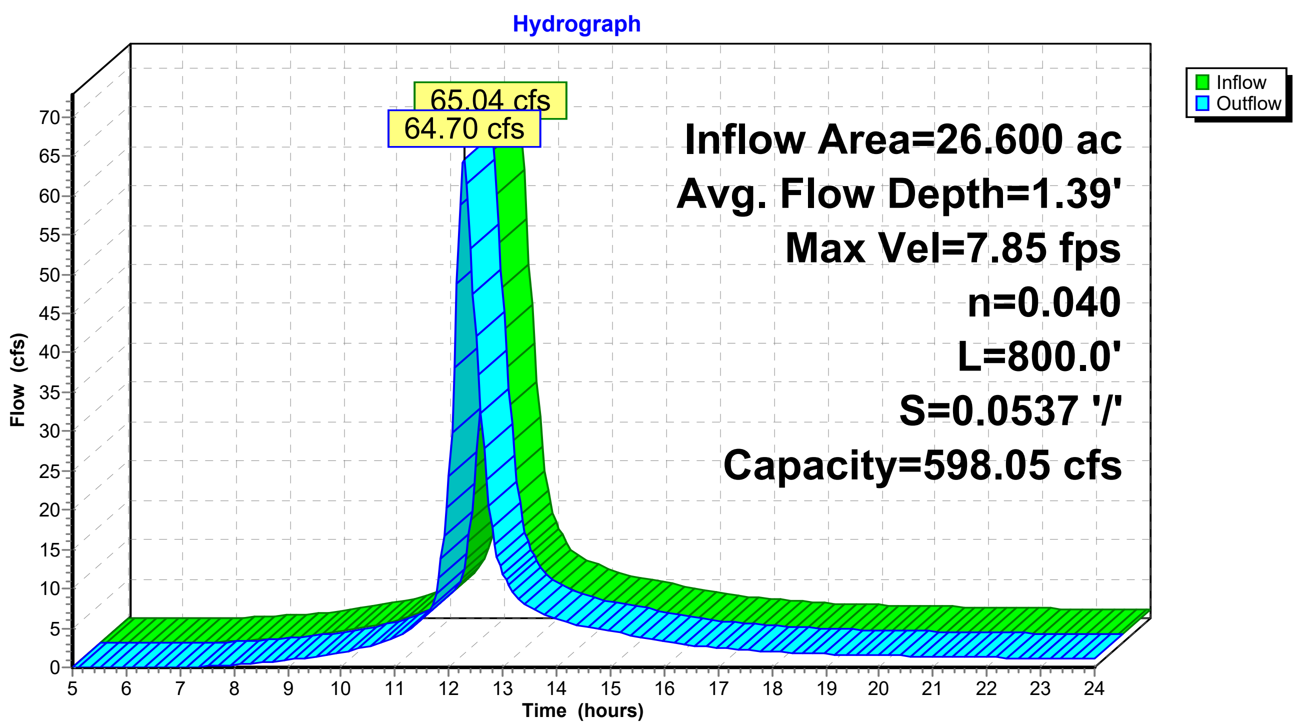
Routing by Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.85 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 2.97 fps, Avg. Travel Time= 4.5 min

Peak Storage= 6,575 cf @ 12.27 hrs
Average Depth at Peak Storage= 1.39'
Bank-Full Depth= 4.00' Flow Area= 40.0 sf, Capacity= 598.05 cfs

15.00' x 4.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 800.0' Slope= 0.0537 '/'
Inlet Invert= 53.00', Outlet Invert= 10.00'



Reach 2R: Stream



Summary for Reach 3R: Channel

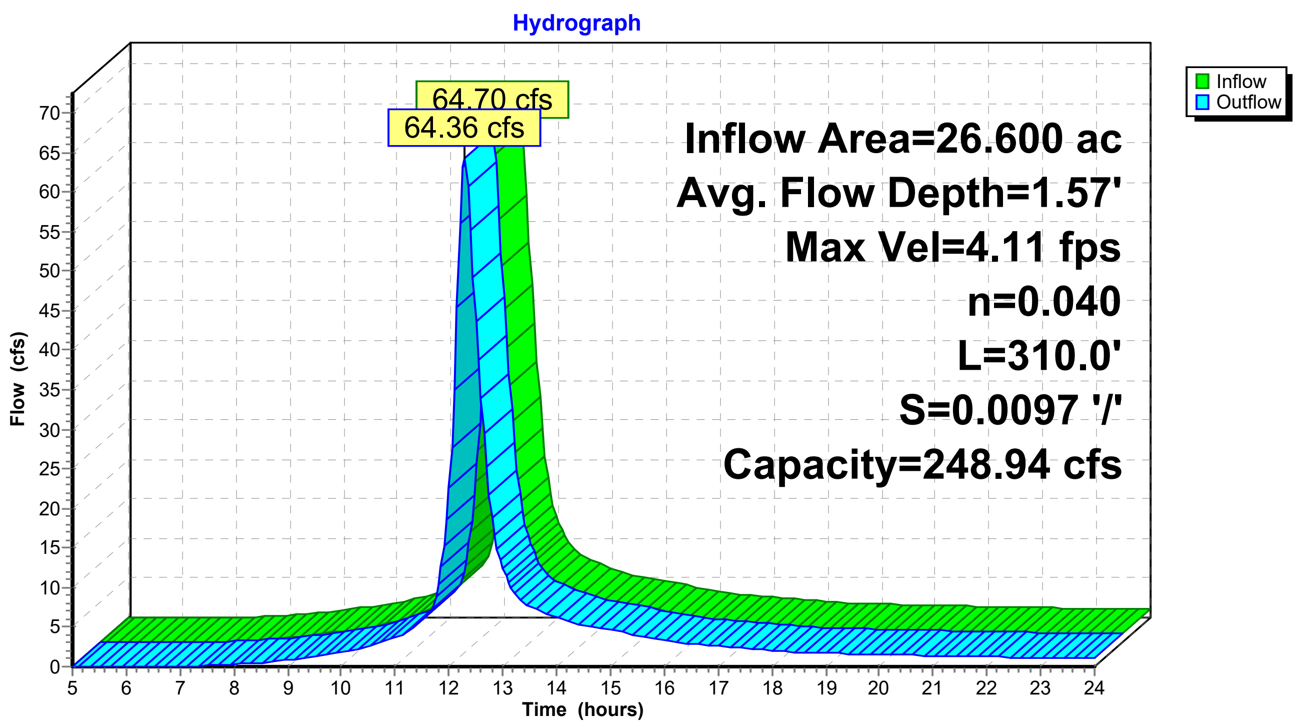
Inflow Area = 26.600 ac, 23.90% Impervious, Inflow Depth > 2.99" for 10 YEAR event
Inflow = 64.70 cfs @ 12.27 hrs, Volume= 6.624 af
Outflow = 64.36 cfs @ 12.29 hrs, Volume= 6.616 af, Atten= 1%, Lag= 1.0 min

Routing by Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.11 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 1.27 fps, Avg. Travel Time= 4.1 min

Peak Storage= 4,855 cf @ 12.29 hrs
Average Depth at Peak Storage= 1.57'
Bank-Full Depth= 4.00' Flow Area= 40.0 sf, Capacity= 248.94 cfs

10.00' x 4.00' deep channel, n= 0.040 Winding stream, pools & shoals
Length= 310.0' Slope= 0.0097 '/'
Inlet Invert= 6.00', Outlet Invert= 3.00'

Reach 3R: Channel



Summary for Reach 4R: Stream

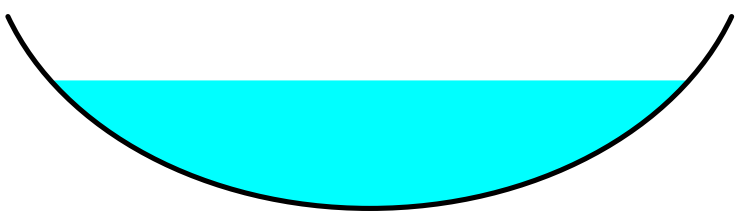
[88] Warning: Qout>Qin may require smaller dt or Finer Routing
[62] Hint: Exceeded Reach 3R OUTLET depth by 0.47' @ 12.50 hrs

Inflow Area = 26.600 ac, 23.90% Impervious, Inflow Depth > 2.98" for 10 YEAR event
Inflow = 64.36 cfs @ 12.29 hrs, Volume= 6.616 af
Outflow = 64.37 cfs @ 12.30 hrs, Volume= 6.612 af, Atten= 0%, Lag= 0.6 min

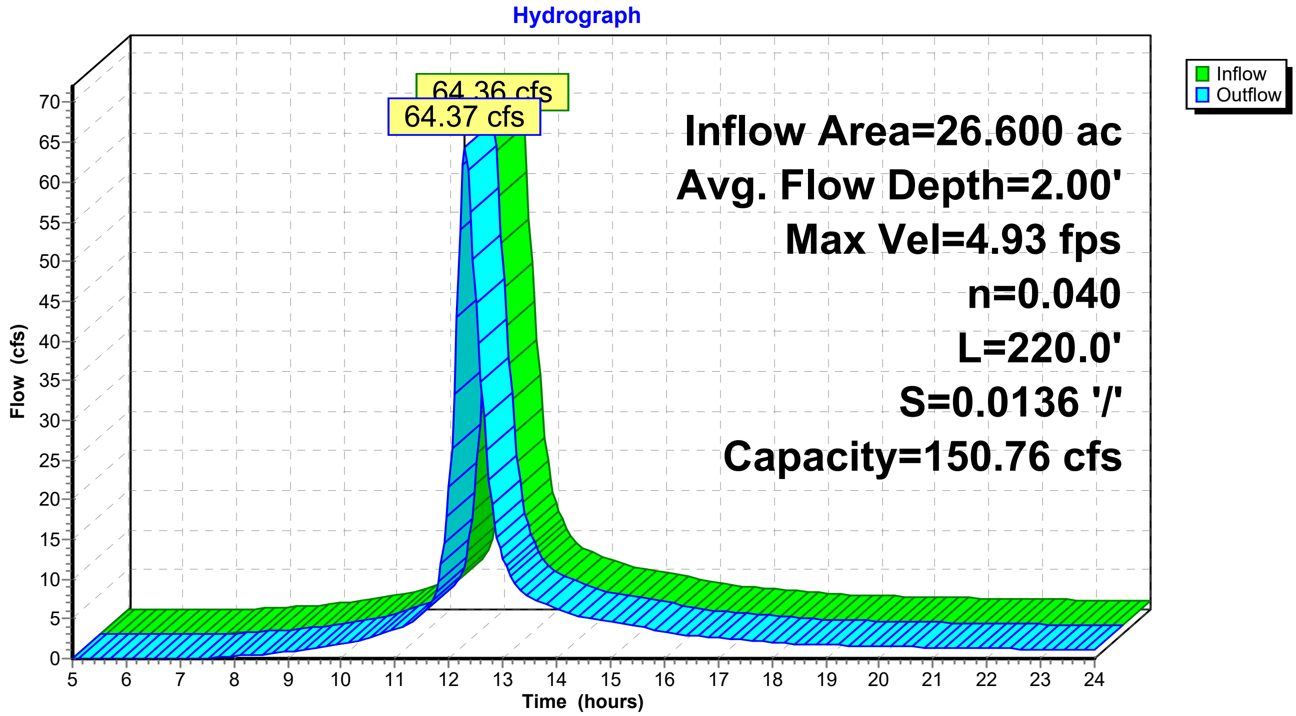
Routing by Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.93 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.87 fps, Avg. Travel Time= 2.0 min

Peak Storage= 2,875 cf @ 12.30 hrs
Average Depth at Peak Storage= 2.00'
Bank-Full Depth= 3.00' Flow Area= 24.0 sf, Capacity= 150.76 cfs

12.00' x 3.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 220.0' Slope= 0.0136 '/'
Inlet Invert= 3.00', Outlet Invert= 0.00'



Reach 4R: Stream



Summary for Pond EX-P: Existing Pond

[82] Warning: Early inflow requires earlier time span

Inflow Area = 2.345 ac, 72.65% Impervious, Inflow Depth > 4.30" for 10 YEAR event
Inflow = 10.41 cfs @ 12.11 hrs, Volume= 0.841 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 89.99' @ 24.00 hrs Surf.Area= 14,016 sf Storage= 36,621 cf

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

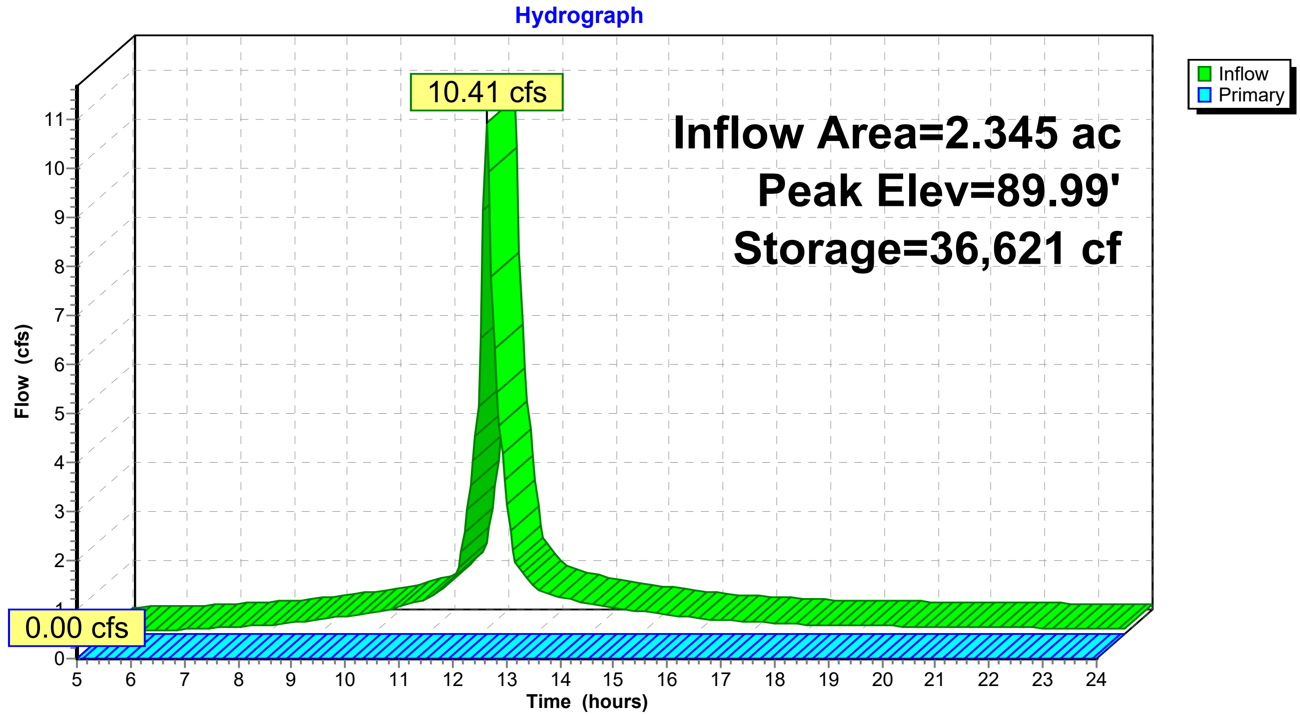
Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	277,808 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
85.00	635	0	0
90.00	14,042	36,693	36,693
100.00	34,181	241,115	277,808

Device	Routing	Invert	Outlet Devices
#1	Primary	95.00'	**65.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=85.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond EX-P: Existing Pond

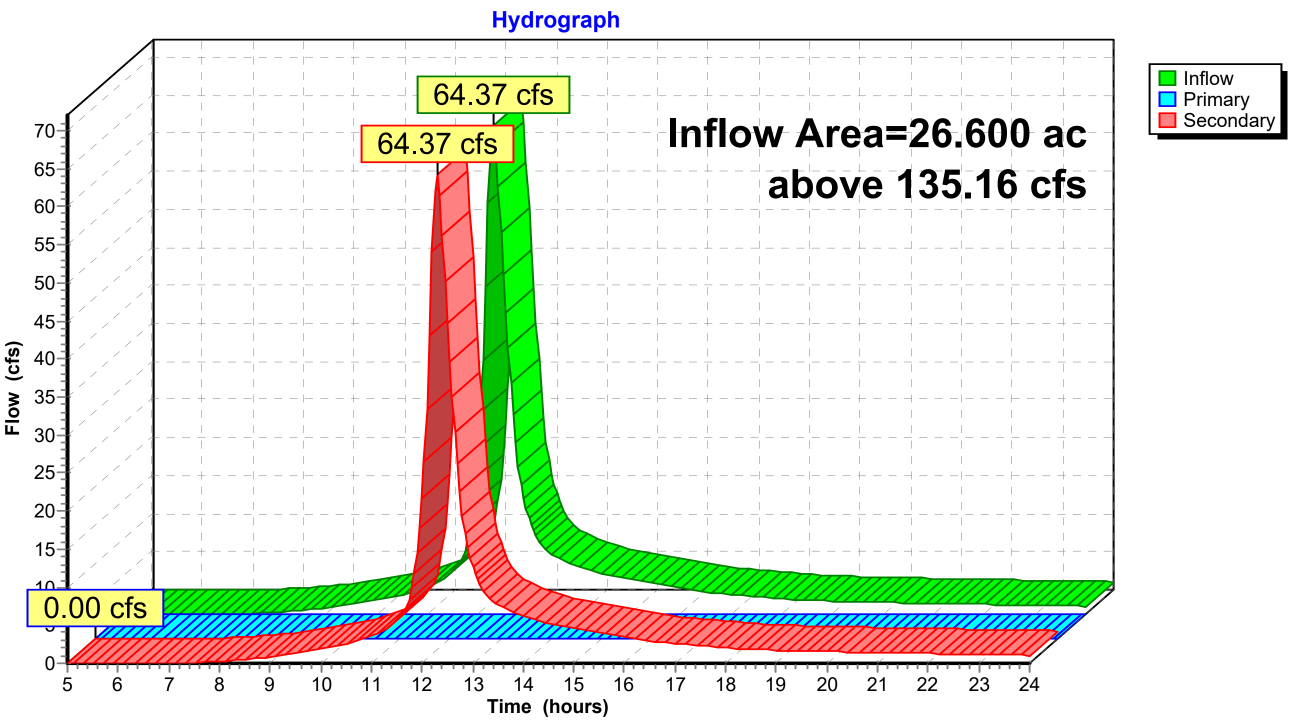


Summary for Link DP-1: Design Point #1

Inflow Area = 26.600 ac, 23.90% Impervious, Inflow Depth > 2.98" for 10 YEAR event
Inflow = 64.37 cfs @ 12.30 hrs, Volume= 6.612 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Secondary = 64.37 cfs @ 12.30 hrs, Volume= 6.612 af

Primary outflow = Inflow above 135.16 cfs, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs

Link DP-1: Design Point #1



Summary for Subcatchment 2: Drainage Area - 2

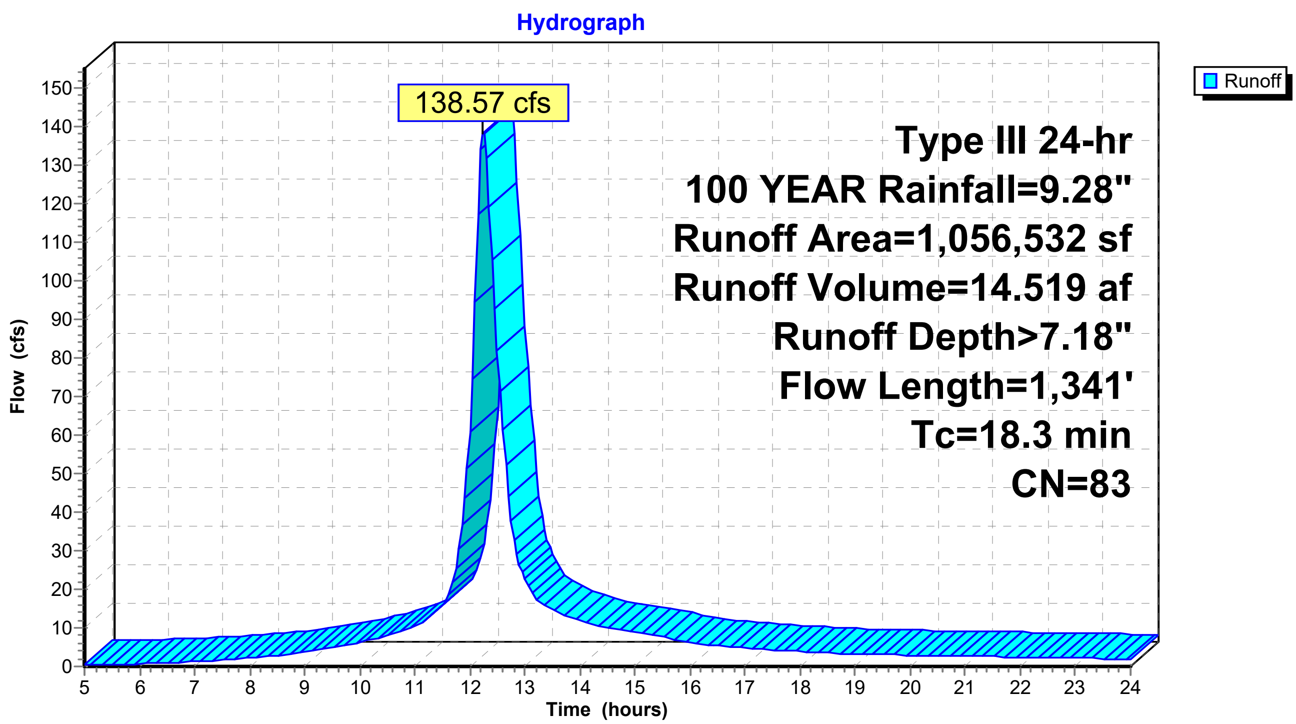
Runoff = 138.57 cfs @ 12.25 hrs, Volume= 14.519 af, Depth> 7.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

	Area (sf)	CN	Description
*	195,831	98	Paved parking & roofs
*	6,925	98	Water Course
	853,776	79	Woods, Fair, HSG D
	1,056,532	83	Weighted Average
	853,776		80.81% Pervious Area
	202,756		19.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0500	0.12		**Sheet Flow, 1 to 2**
					Woods: Light underbrush n= 0.400 P2= 3.50"
4.1	1,241	0.0970	5.01		**Shallow Concentrated Flow, 2 to 3**
					Unpaved Kv= 16.1 fps
18.3	1,341	Total			

Subcatchment 2: Drainage Area - 2



Summary for Subcatchment 3: Drainage Area - 3

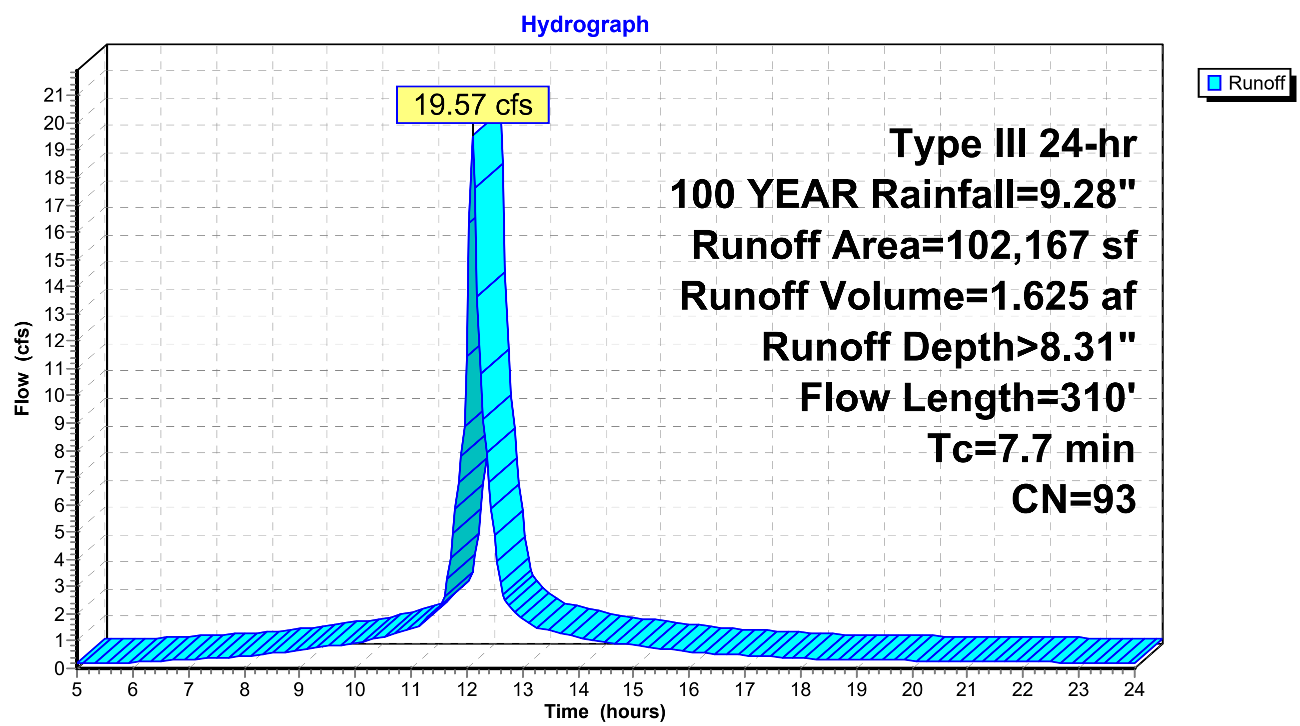
Runoff = 19.57 cfs @ 12.11 hrs, Volume= 1.625 af, Depth> 8.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

	Area (sf)	CN	Description
*	74,229	98	Paved roads w/ curbs & sewers
	27,938	79	Woods, Fair, HSG D
	102,167	93	Weighted Average
	27,938		27.35% Pervious Area
	74,229		72.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	100	0.3000	0.24		**Sheet Flow, 1 to 2**
					Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	210	0.0950	4.96		**Shallow Concentrated Flow, 2 to 3**
					Unpaved Kv= 16.1 fps
7.7	310	Total			

Subcatchment 3: Drainage Area - 3



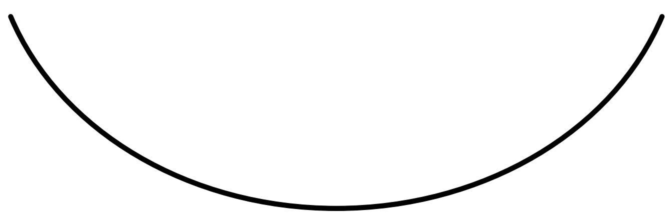
Summary for Reach 1R: Swale (Reach)

Inflow Area = 2.345 ac, 72.65% Impervious, Inflow Depth = 0.00" for 100 YEAR event
Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

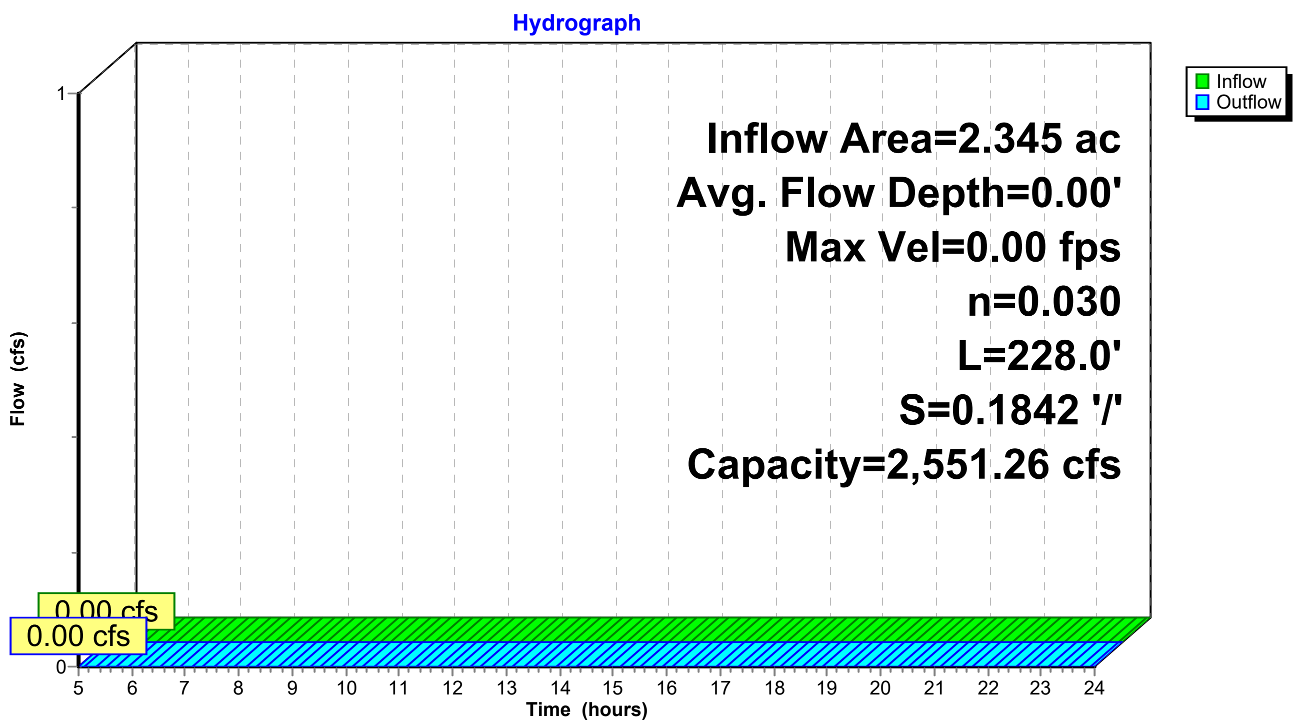
Routing by Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 5.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.00' Flow Area= 60.0 sf, Capacity= 2,551.26 cfs

18.00' x 5.00' deep Parabolic Channel, n= 0.030 Stream, clean & straight
Length= 228.0' Slope= 0.1842 '/'
Inlet Invert= 95.00', Outlet Invert= 53.00'



Reach 1R: Swale (Reach)



Summary for Reach 2R: Stream

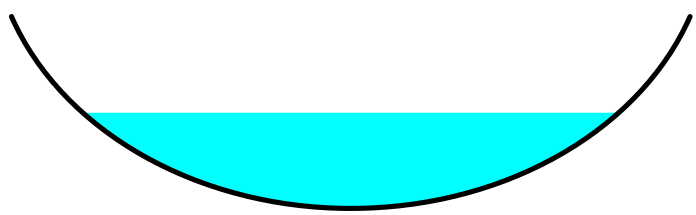
[82] Warning: Early inflow requires earlier time span
[62] Hint: Exceeded Reach 1R OUTLET depth by 1.99' @ 12.25 hrs

Inflow Area = 26.600 ac, 23.90% Impervious, Inflow Depth > 6.55" for 100 YEAR event
Inflow = 138.57 cfs @ 12.25 hrs, Volume= 14.519 af
Outflow = 138.20 cfs @ 12.26 hrs, Volume= 14.506 af, Atten= 0%, Lag= 1.0 min

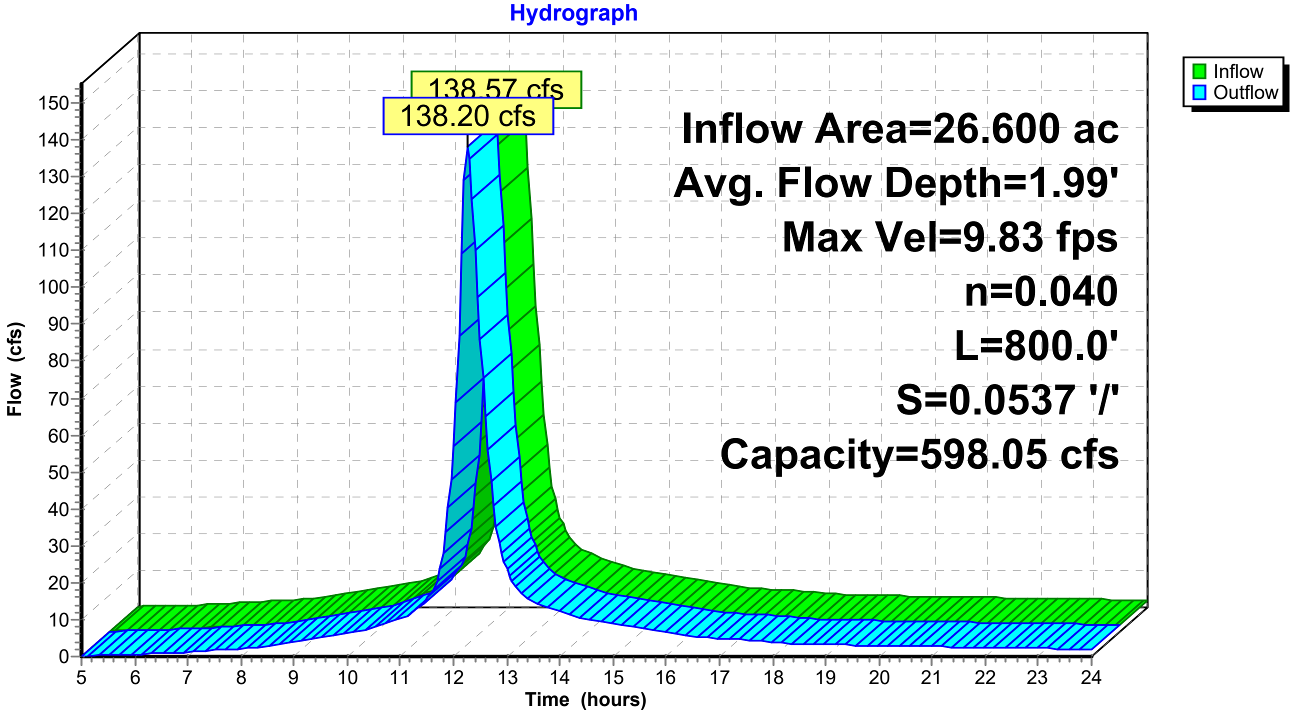
Routing by Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 9.83 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 3.69 fps, Avg. Travel Time= 3.6 min

Peak Storage= 11,240 cf @ 12.26 hrs
Average Depth at Peak Storage= 1.99'
Bank-Full Depth= 4.00' Flow Area= 40.0 sf, Capacity= 598.05 cfs

15.00' x 4.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 800.0' Slope= 0.0537 '/'
Inlet Invert= 53.00', Outlet Invert= 10.00'



Reach 2R: Stream



Summary for Reach 3R: Channel

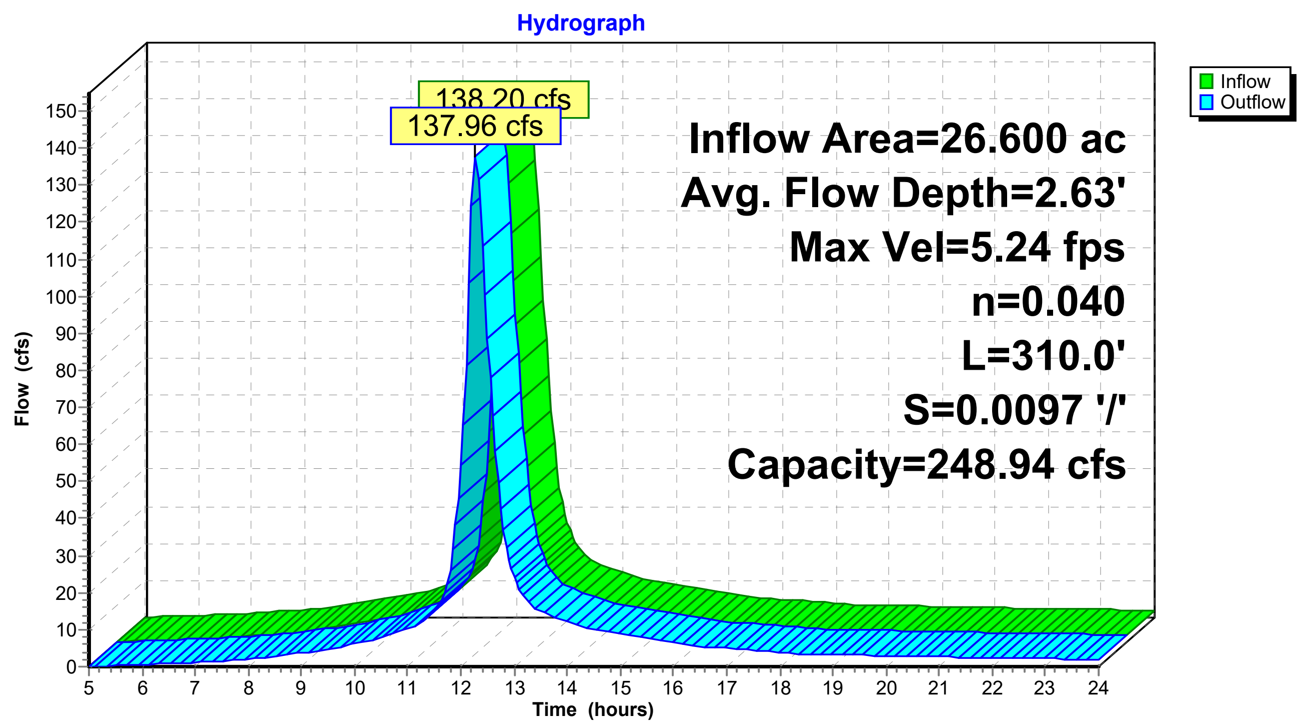
Inflow Area = 26.600 ac, 23.90% Impervious, Inflow Depth > 6.54" for 100 YEAR event
Inflow = 138.20 cfs @ 12.26 hrs, Volume= 14.506 af
Outflow = 137.96 cfs @ 12.27 hrs, Volume= 14.493 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.24 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.65 fps, Avg. Travel Time= 3.1 min

Peak Storage= 8,145 cf @ 12.27 hrs
Average Depth at Peak Storage= 2.63'
Bank-Full Depth= 4.00' Flow Area= 40.0 sf, Capacity= 248.94 cfs

10.00' x 4.00' deep channel, n= 0.040 Winding stream, pools & shoals
Length= 310.0' Slope= 0.0097 '/'
Inlet Invert= 6.00', Outlet Invert= 3.00'

Reach 3R: Channel



Summary for Reach 4R: Stream

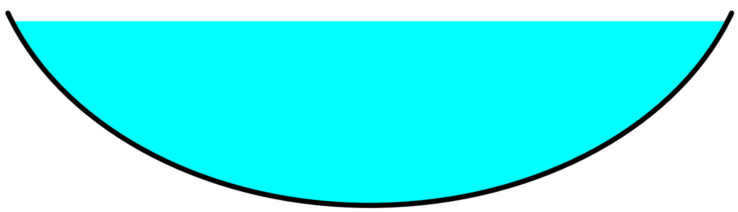
[62] Hint: Exceeded Reach 3R OUTLET depth by 0.48' @ 12.75 hrs

Inflow Area = 26.600 ac, 23.90% Impervious, Inflow Depth > 6.54" for 100 YEAR event
Inflow = 137.96 cfs @ 12.27 hrs, Volume= 14.493 af
Outflow = 137.50 cfs @ 12.28 hrs, Volume= 14.488 af, Atten= 0%, Lag= 0.5 min

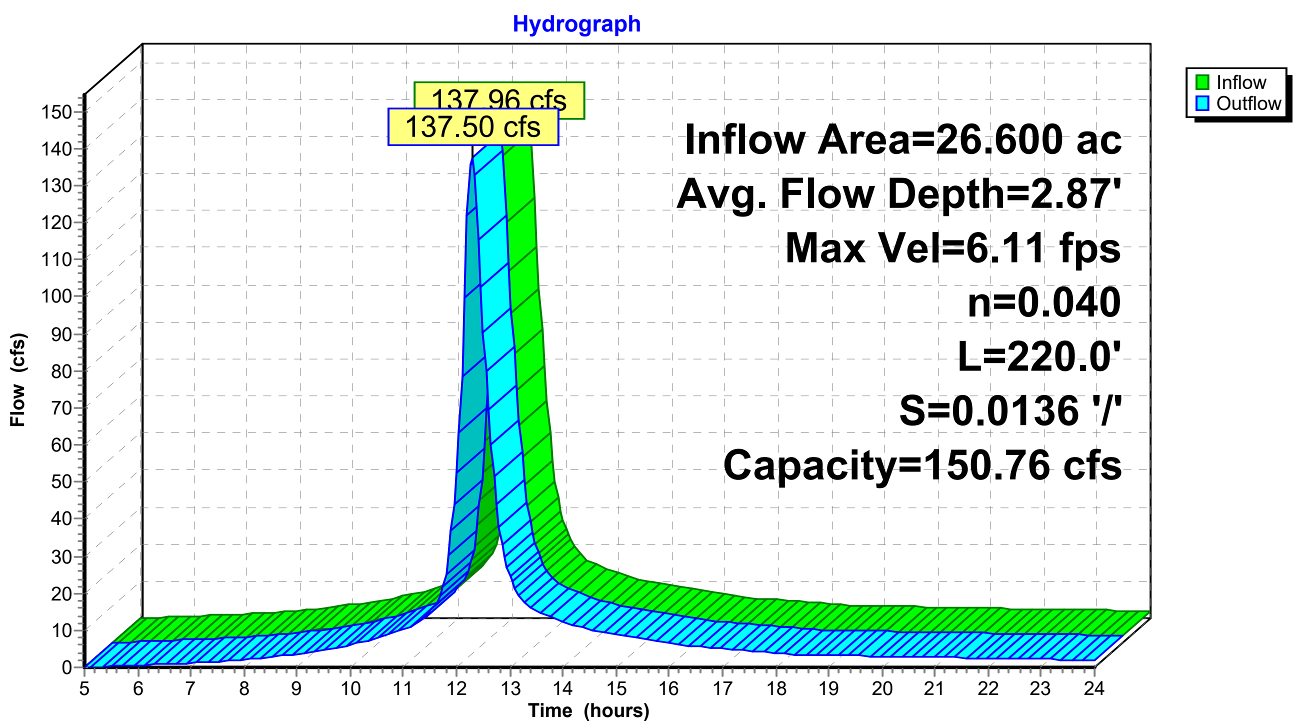
Routing by Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.11 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.32 fps, Avg. Travel Time= 1.6 min

Peak Storage= 4,943 cf @ 12.28 hrs
Average Depth at Peak Storage= 2.87'
Bank-Full Depth= 3.00' Flow Area= 24.0 sf, Capacity= 150.76 cfs

12.00' x 3.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 220.0' Slope= 0.0136 '/'
Inlet Invert= 3.00', Outlet Invert= 0.00'



Reach 4R: Stream



Summary for Pond EX-P: Existing Pond

[82] Warning: Early inflow requires earlier time span

Inflow Area = 2.345 ac, 72.65% Impervious, Inflow Depth > 8.31" for 100 YEAR event
Inflow = 19.57 cfs @ 12.11 hrs, Volume= 1.625 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 91.41' @ 24.00 hrs Surf.Area= 16,887 sf Storage= 70,749 cf

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

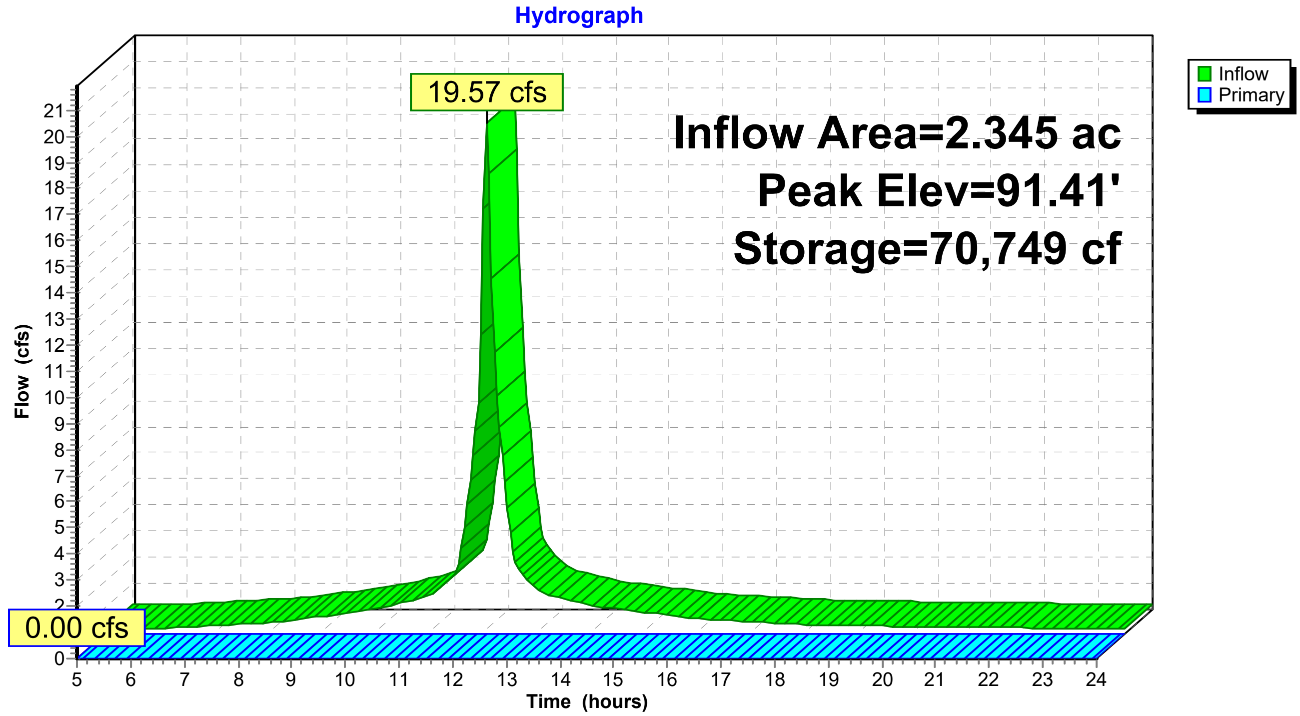
Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	277,808 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
85.00	635	0	0
90.00	14,042	36,693	36,693
100.00	34,181	241,115	277,808

Device	Routing	Invert	Outlet Devices
#1	Primary	95.00'	**65.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=85.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond EX-P: Existing Pond

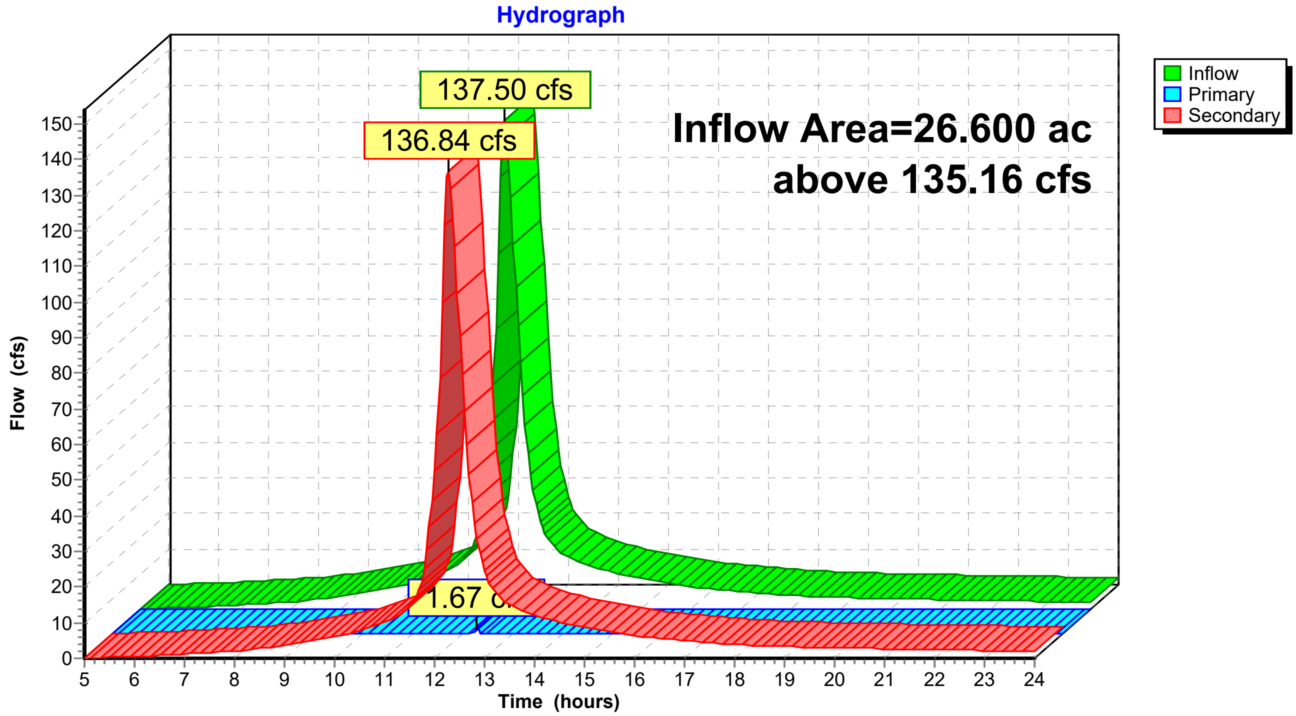


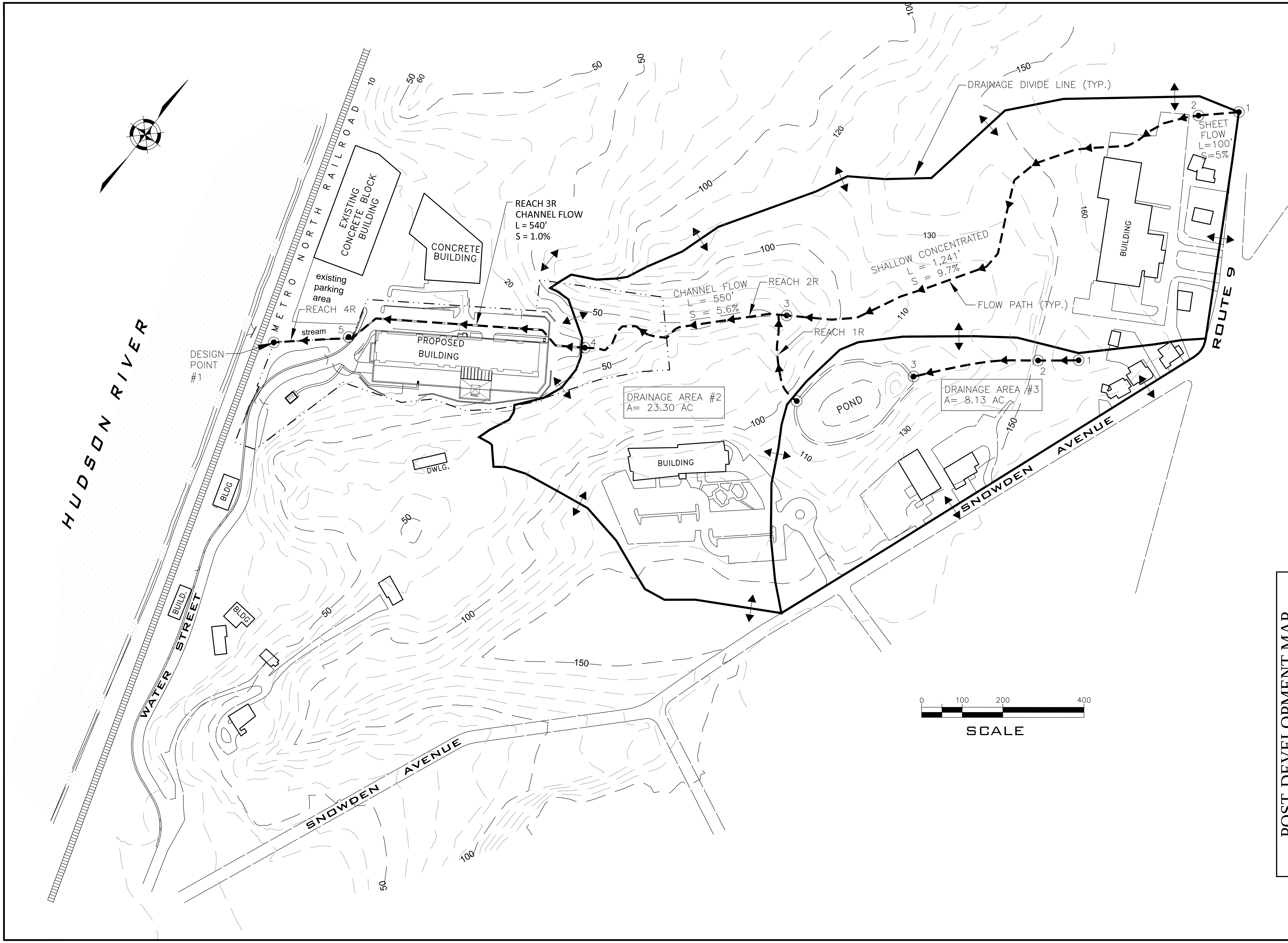
Summary for Link DP-1: Design Point #1

Inflow Area = 26.600 ac, 23.90% Impervious, Inflow Depth > 6.54" for 100 YEAR event
Inflow = 137.50 cfs @ 12.28 hrs, Volume= 14.488 af
Primary = 1.67 cfs @ 12.30 hrs, Volume= 0.009 af, Atten= 99%, Lag= 0.9 min
Secondary = 136.84 cfs @ 12.28 hrs, Volume= 14.479 af

Primary outflow = Inflow above 135.16 cfs, Time Span= 5.00-24.00 hrs, dt= 0.05 hrs

Link DP-1: Design Point #1





POST-DEVELOPMENT MAP
STORMWATER CAPACITY ANALYSIS

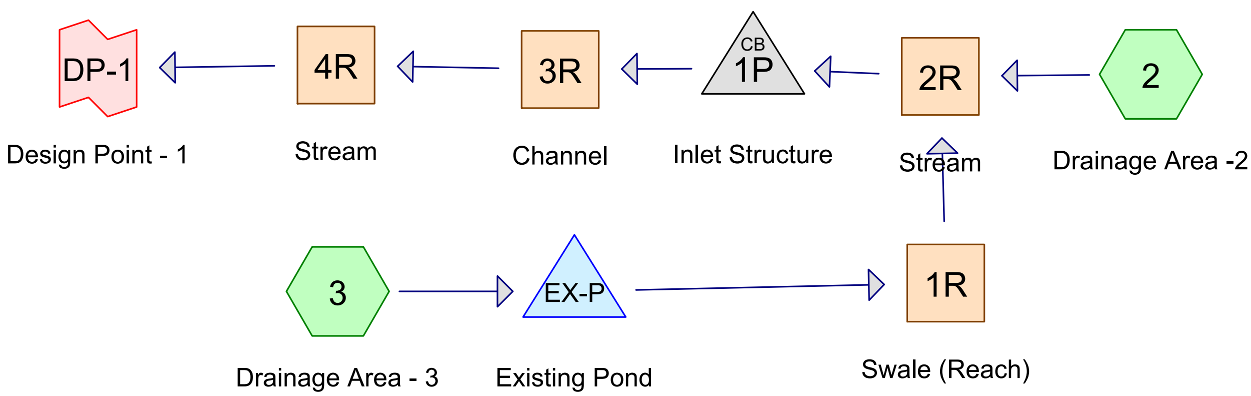
HIDDEN COVE ON THE HUDSON
36 NORTH WATER STREET
VILLAGE OF OSSINING NEW YORK

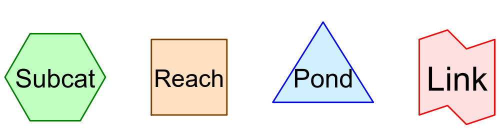
PETRUCCELLI ENGINEERING
600 NORTH BROADWAY
WHITE PLAINS, N.Y. 10603
9 1 4 . 9 4 8 . 3 6 2 9
PAUL BERTE, P.E.

REVISIONS
07.03.13
02.28.17
05.02.18

JOB NO.	2001
DATE:	02.28.17
SCALE:	AS NOTED
DRAWN BY:	KMM
CHECKED BY:	P.B.

SHEET NO.
2/2





Routing Diagram for POST_DEV (8'x4' Concrete Box Culvert)
Prepared by PETRUCCELLI ENGINEERING, Printed 6/14/2018

Summary for Subcatchment 2: Drainage Area -2

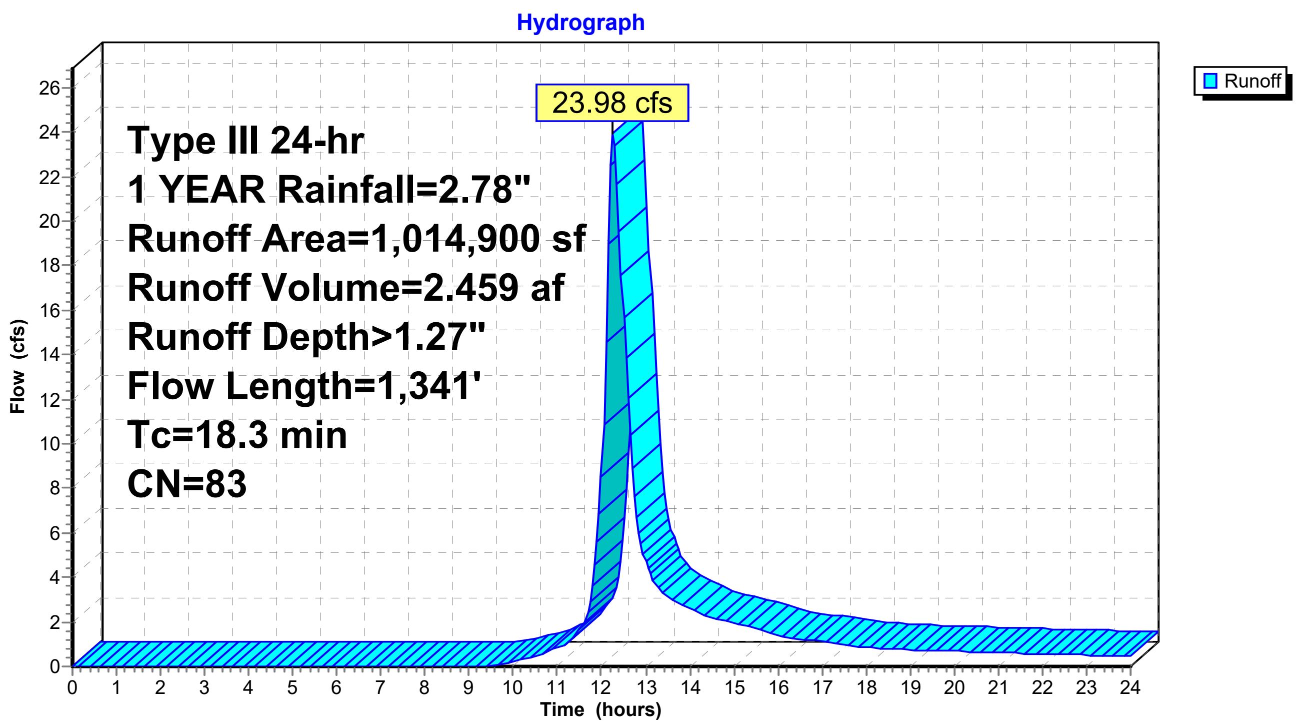
Runoff = 23.98 cfs @ 12.26 hrs, Volume= 2.459 af, Depth> 1.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

	Area (sf)	CN	Description
*	195,831	98	Paved parking & roofs
*	6,925	98	Water Course
	812,144	79	Woods, Fair, HSG D
	1,014,900	83	Weighted Average
	812,144		80.02% Pervious Area
	202,756		19.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0500	0.12		**Sheet Flow, 1 to 2**
					Woods: Light underbrush n= 0.400 P2= 3.50"
4.1	1,241	0.0970	5.01		**Shallow Concentrated Flow, 2 to 3**
					Unpaved Kv= 16.1 fps
18.3	1,341	Total			

Subcatchment 2: Drainage Area -2



Summary for Subcatchment 3: Drainage Area - 3

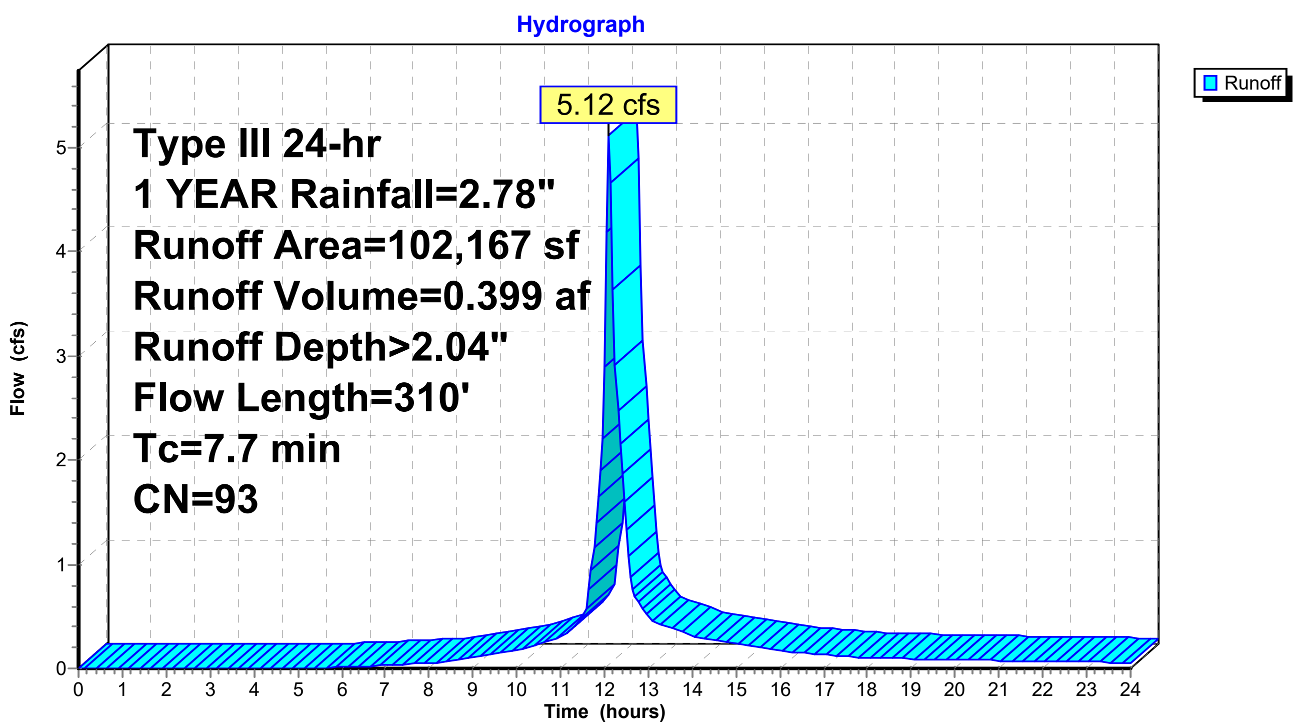
Runoff = 5.12 cfs @ 12.11 hrs, Volume= 0.399 af, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 YEAR Rainfall=2.78"

	Area (sf)	CN	Description
*	74,229	98	Paved roads w/curbs & sewers
	27,938	79	Woods, Fair, HSG D
	102,167	93	Weighted Average
	27,938		27.35% Pervious Area
	74,229		72.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	100	0.3000	0.24		**Sheet Flow, 1 to 2**
					Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	210	0.0950	4.96		**Shallow Concentrated Flow, 2 to 3**
					Unpaved Kv= 16.1 fps
7.7	310	Total			

Subcatchment 3: Drainage Area - 3



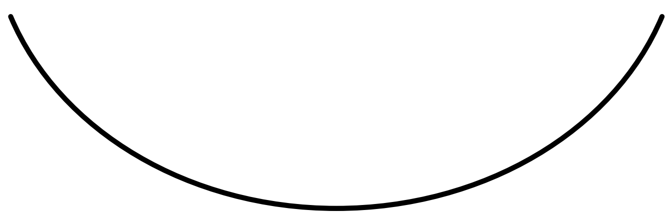
Summary for Reach 1R: Swale (Reach)

Inflow Area = 2.345 ac, 72.65% Impervious, Inflow Depth = 0.00" for 1 YEAR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

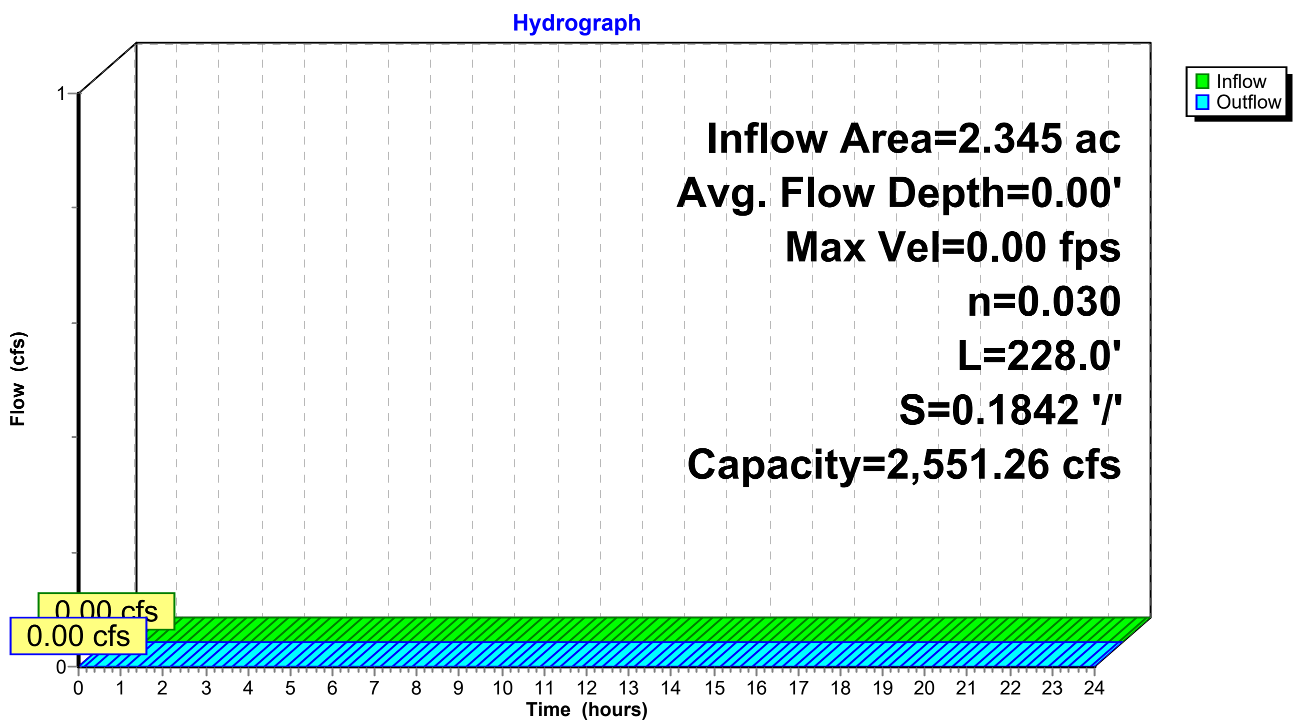
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.00' Flow Area= 60.0 sf, Capacity= 2,551.26 cfs

18.00' x 5.00' deep Parabolic Channel, n= 0.030 Stream, clean & straight
Length= 228.0' Slope= 0.1842 '/'
Inlet Invert= 95.00', Outlet Invert= 53.00'



Reach 1R: Swale (Reach)



Summary for Reach 2R: Stream

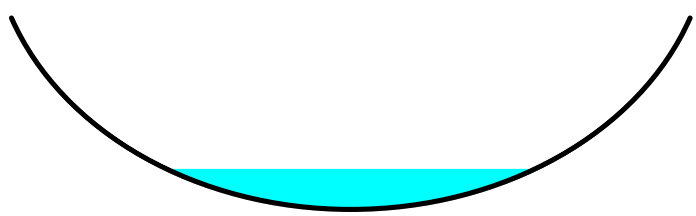
[62] Hint: Exceeded Reach 1R OUTLET depth by 0.84' @ 12.30 hrs

Inflow Area = 25.644 ac, 24.80% Impervious, Inflow Depth > 1.15" for 1 YEAR event
Inflow = 23.98 cfs @ 12.26 hrs, Volume= 2.459 af
Outflow = 23.80 cfs @ 12.28 hrs, Volume= 2.456 af, Atten= 1%, Lag= 1.1 min

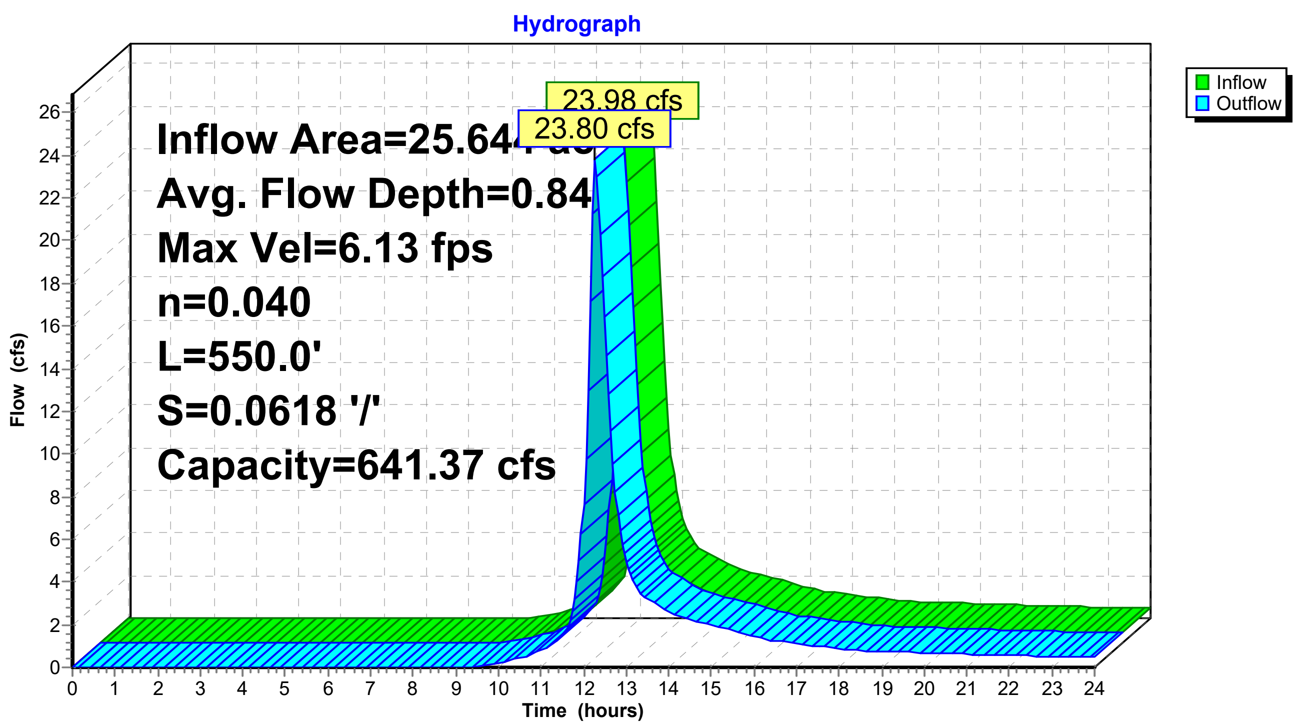
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.13 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 2.49 fps, Avg. Travel Time= 3.7 min

Peak Storage= 2,133 cf @ 12.28 hrs
Average Depth at Peak Storage= 0.84'
Bank-Full Depth= 4.00' Flow Area= 40.0 sf, Capacity= 641.37 cfs

15.00' x 4.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 550.0' Slope= 0.0618 '/'
Inlet Invert= 53.00', Outlet Invert= 19.00'



Reach 2R: Stream



Summary for Reach 3R: Channel

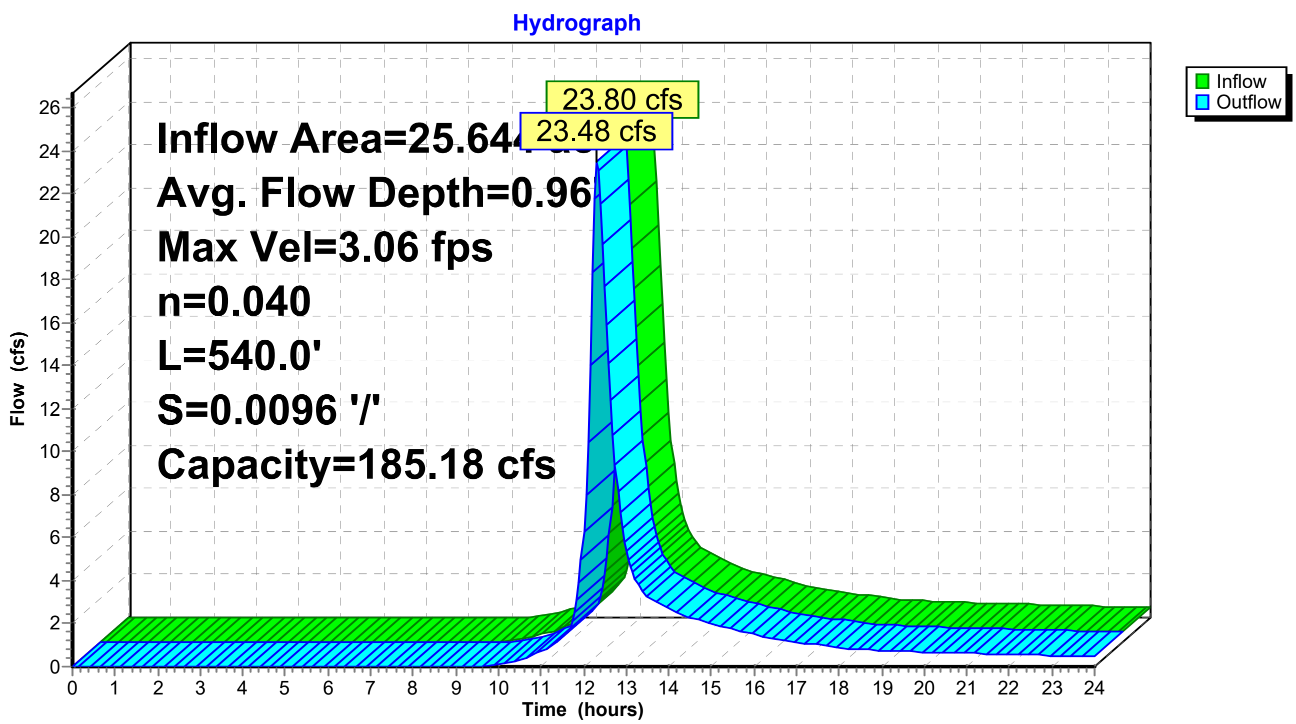
Inflow Area = 25.644 ac, 24.80% Impervious, Inflow Depth > 1.15" for 1 YEAR event
Inflow = 23.80 cfs @ 12.28 hrs, Volume= 2.456 af
Outflow = 23.48 cfs @ 12.32 hrs, Volume= 2.448 af, Atten= 1%, Lag= 2.2 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.06 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 1.03 fps, Avg. Travel Time= 8.7 min

Peak Storage= 4,133 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.96'
Bank-Full Depth= 4.00' Flow Area= 32.0 sf, Capacity= 185.18 cfs

8.00' x 4.00' deep channel, n= 0.040 Winding stream, pools & shoals
Length= 540.0' Slope= 0.0096 '/'
Inlet Invert= 7.50', Outlet Invert= 2.30'

Reach 3R: Channel



Summary for Reach 4R: Stream

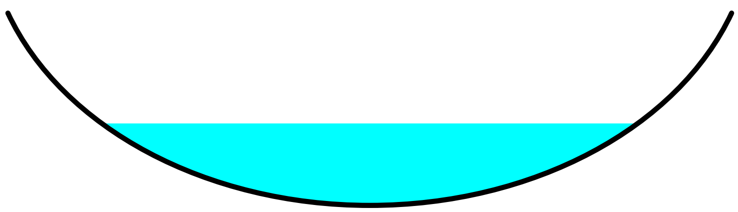
[62] Hint: Exceeded Reach 3R OUTLET depth by 0.34' @ 12.45 hrs

Inflow Area = 25.644 ac, 24.80% Impervious, Inflow Depth > 1.15" for 1 YEAR event
Inflow = 23.48 cfs @ 12.32 hrs, Volume= 2.448 af
Outflow = 23.37 cfs @ 12.33 hrs, Volume= 2.446 af, Atten= 0%, Lag= 0.6 min

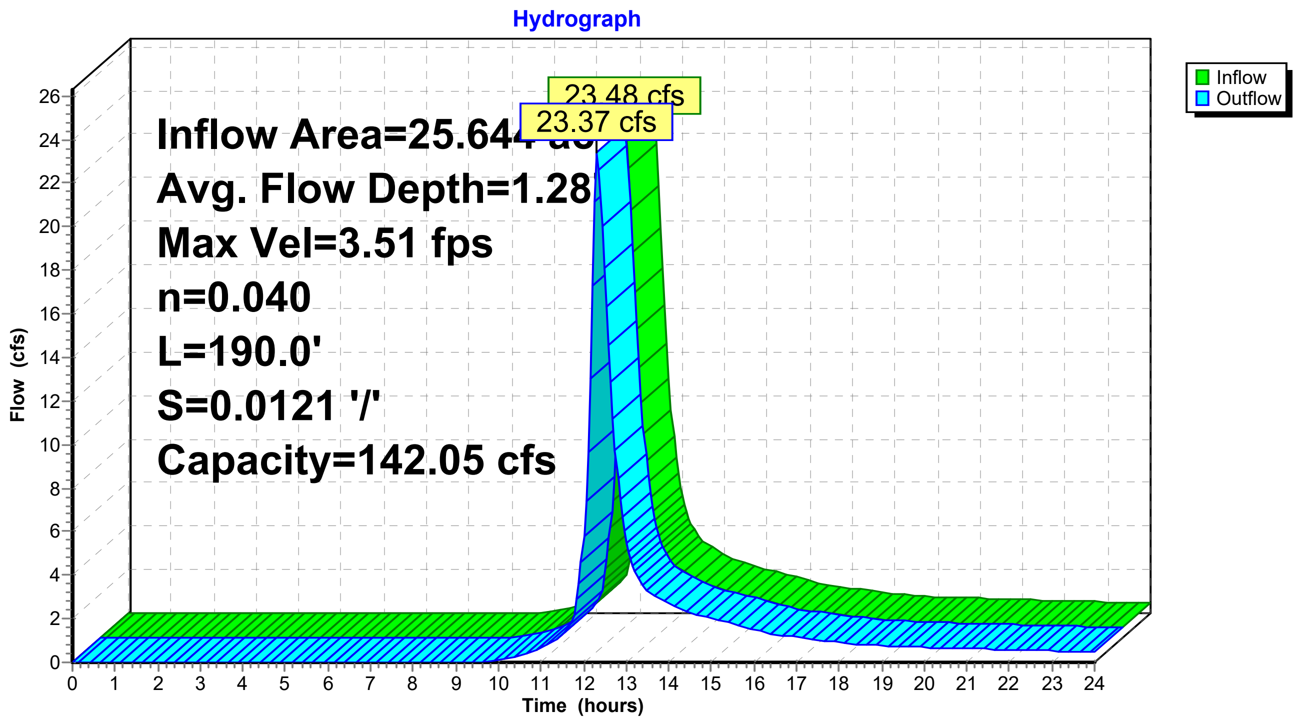
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.51 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.43 fps, Avg. Travel Time= 2.2 min

Peak Storage= 1,264 cf @ 12.33 hrs
Average Depth at Peak Storage= 1.28'
Bank-Full Depth= 3.00' Flow Area= 24.0 sf, Capacity= 142.05 cfs

12.00' x 3.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 190.0' Slope= 0.0121 '/'
Inlet Invert= 2.30', Outlet Invert= 0.00'



Reach 4R: Stream



Summary for Pond 1P: Inlet Structure

[57] Hint: Peaked at 19.95' (Flood elevation advised)
[62] Hint: Exceeded Reach 2R OUTLET depth by 0.11' @ 12.30 hrs

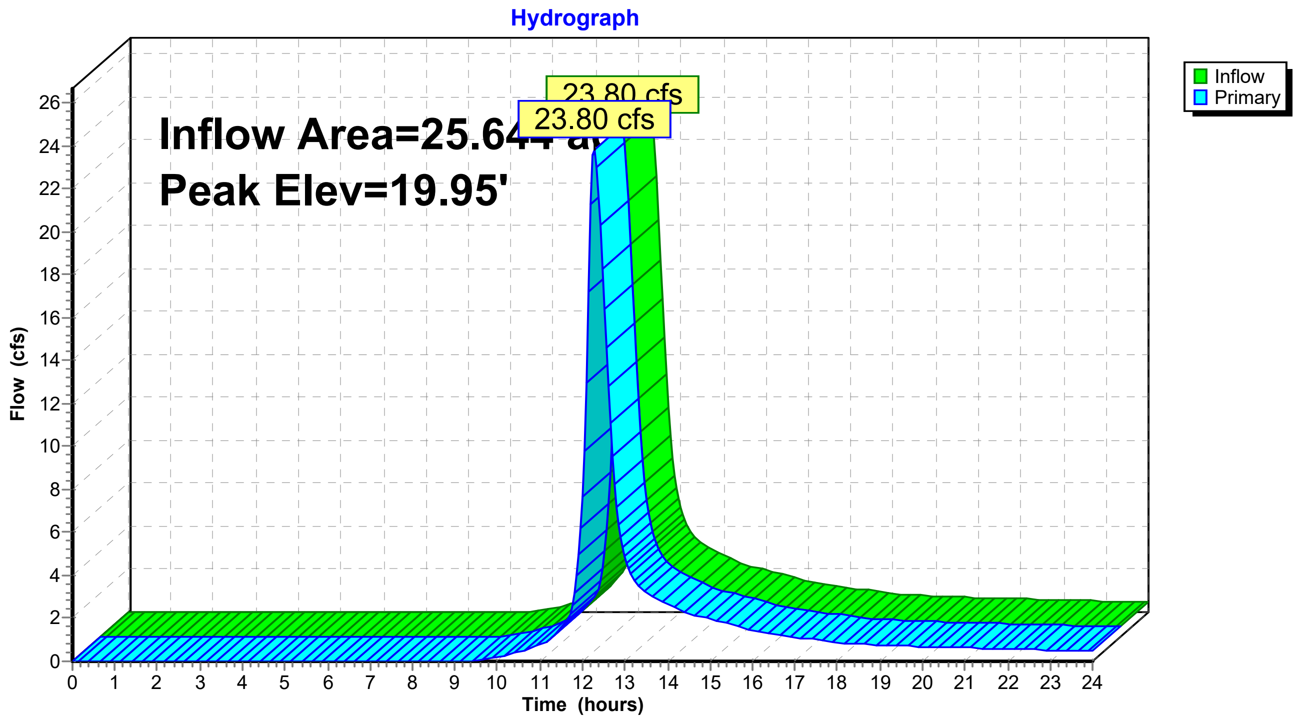
Inflow Area = 25.644 ac, 24.80% Impervious, Inflow Depth > 1.15" for 1 YEAR event
Inflow = 23.80 cfs @ 12.28 hrs, Volume= 2.456 af
Outflow = 23.80 cfs @ 12.28 hrs, Volume= 2.456 af, Atten= 0%, Lag= 0.0 min
Primary = 23.80 cfs @ 12.28 hrs, Volume= 2.456 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 19.95' @ 12.28 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	19.00'	**96.0" W x 48.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=23.62 cfs @ 12.28 hrs HW=19.95' (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 23.62 cfs @ 3.12 fps)

Pond 1P: Inlet Structure



Summary for Pond EX-P: Existing Pond

Inflow Area = 2.345 ac, 72.65% Impervious, Inflow Depth > 2.04" for 1 YEAR event
Inflow = 5.12 cfs @ 12.11 hrs, Volume= 0.399 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 87.37' @ 24.00 hrs Surf.Area= 3,811 sf Storage= 17,382 cf

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

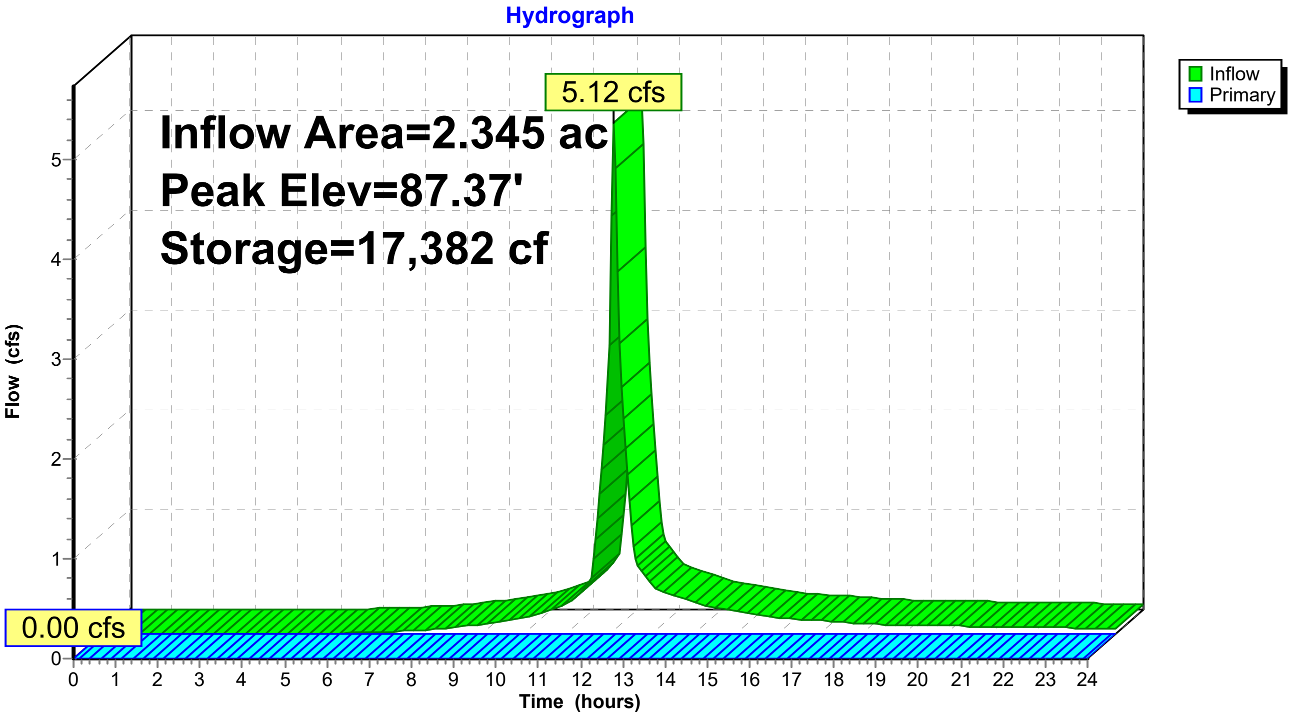
Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	193,943 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
85.00	635	0	0
95.00	14,042	73,385	73,385
100.00	34,181	120,558	193,943

Device	Routing	Invert	Outlet Devices
#1	Primary	95.00'	**65.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=85.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond EX-P: Existing Pond

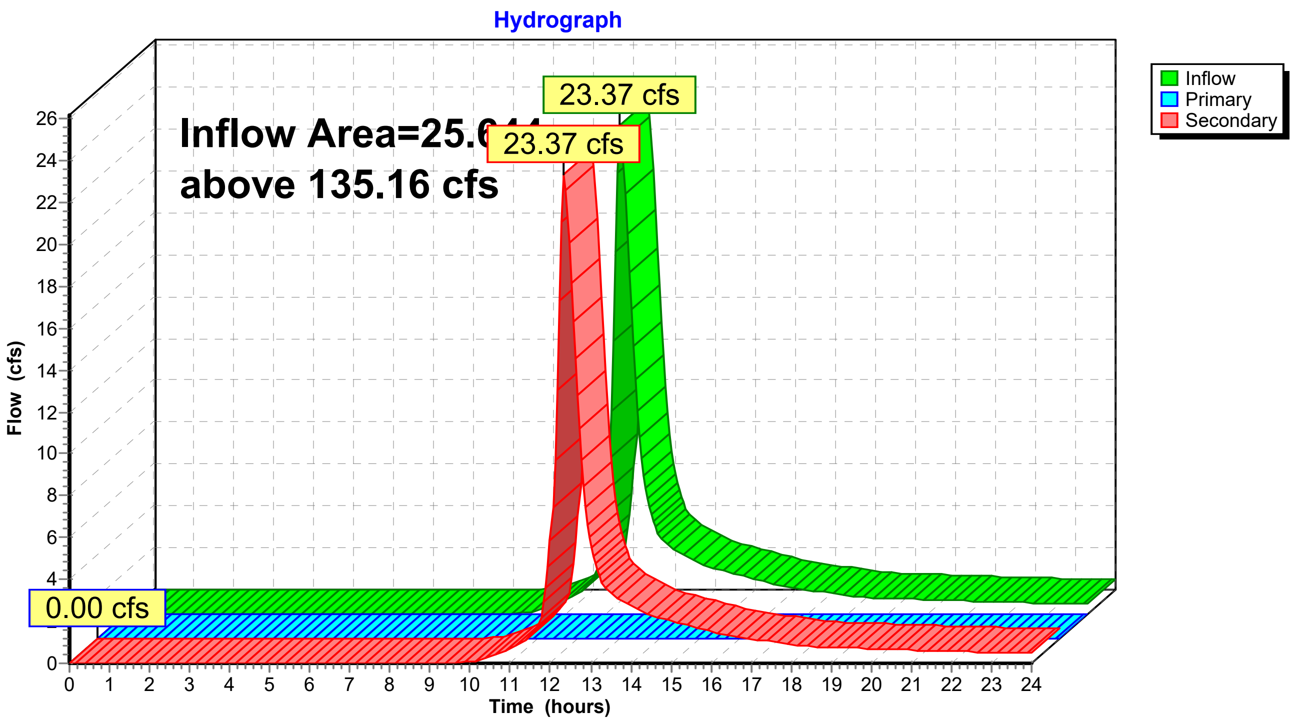


Summary for Link DP-1: Design Point - 1

Inflow Area =	25.644 ac,	24.80% Impervious,	Inflow Depth > 1.14"	for 1 YEAR event
Inflow =	23.37 cfs @	12.33 hrs, Volume=	2.446 af	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af, Atten= 100%, Lag= 0.0 min	
Secondary =	23.37 cfs @	12.33 hrs, Volume=	2.446 af	

Primary outflow = Inflow above 135.16 cfs, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-1: Design Point - 1



Summary for Subcatchment 2: Drainage Area -2

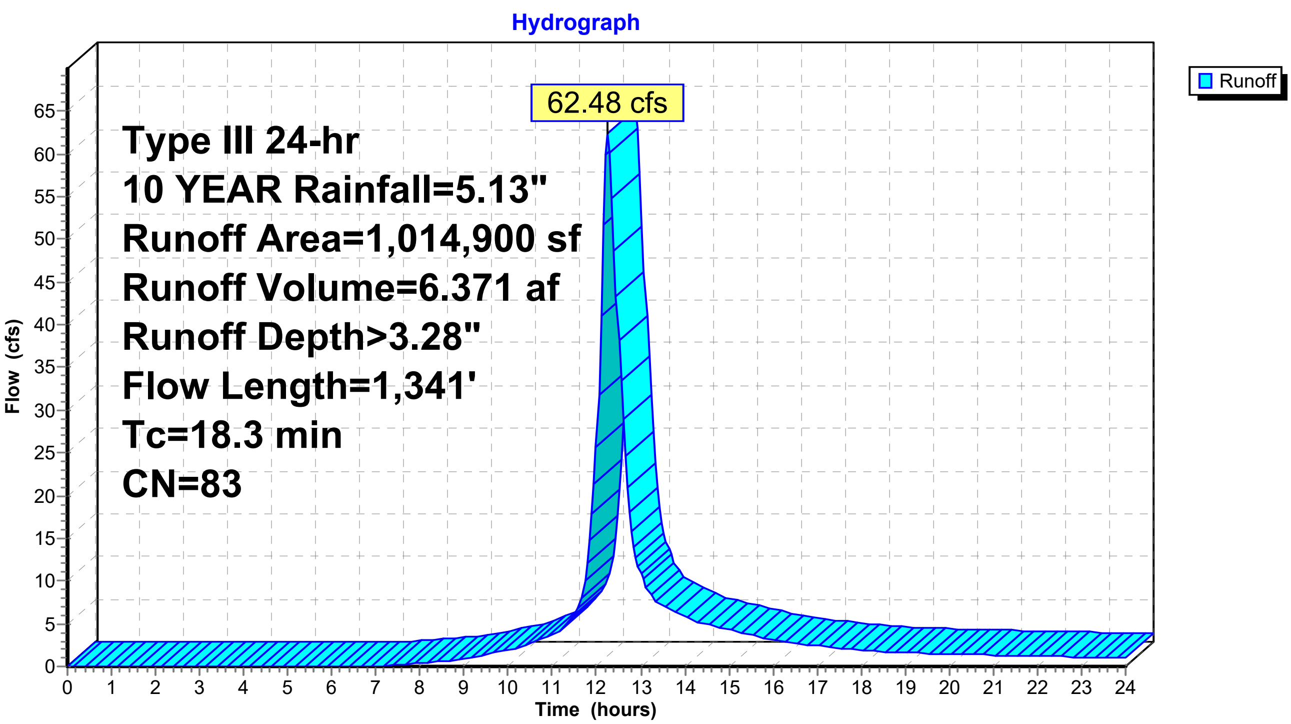
Runoff = 62.48 cfs @ 12.25 hrs, Volume= 6.371 af, Depth> 3.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

	Area (sf)	CN	Description
*	195,831	98	Paved parking & roofs
*	6,925	98	Water Course
	812,144	79	Woods, Fair, HSG D
	1,014,900	83	Weighted Average
	812,144		80.02% Pervious Area
	202,756		19.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0500	0.12		**Sheet Flow, 1 to 2**
					Woods: Light underbrush n= 0.400 P2= 3.50"
4.1	1,241	0.0970	5.01		**Shallow Concentrated Flow, 2 to 3**
					Unpaved Kv= 16.1 fps
18.3	1,341	Total			

Subcatchment 2: Drainage Area -2



Summary for Subcatchment 3: Drainage Area - 3

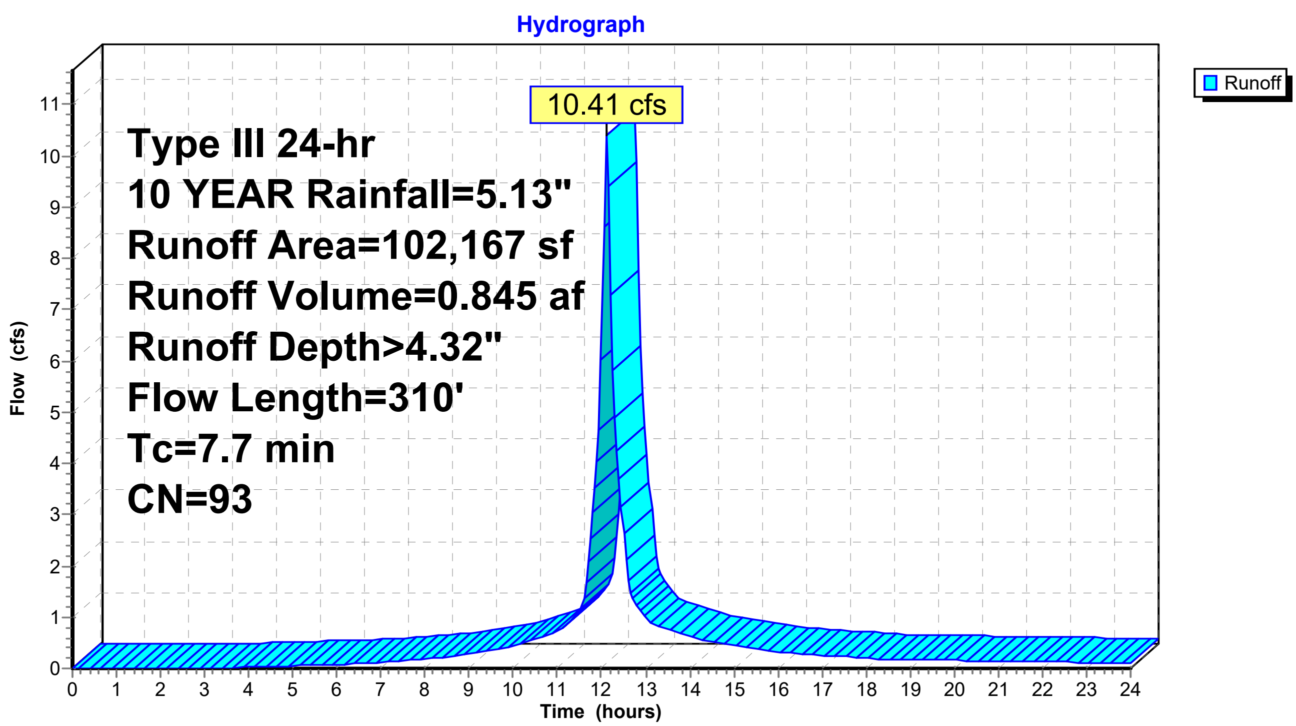
Runoff = 10.41 cfs @ 12.11 hrs, Volume= 0.845 af, Depth> 4.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 YEAR Rainfall=5.13"

	Area (sf)	CN	Description
*	74,229	98	Paved roads w/curbs & sewers
	27,938	79	Woods, Fair, HSG D
	102,167	93	Weighted Average
	27,938		27.35% Pervious Area
	74,229		72.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	100	0.3000	0.24		**Sheet Flow, 1 to 2**
					Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	210	0.0950	4.96		**Shallow Concentrated Flow, 2 to 3**
					Unpaved Kv= 16.1 fps
7.7	310	Total			

Subcatchment 3: Drainage Area - 3



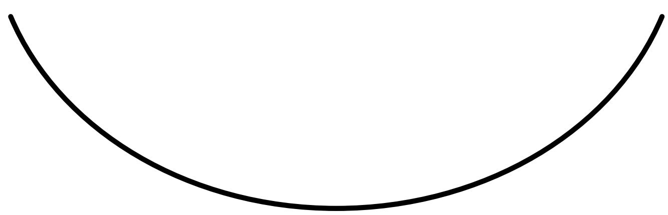
Summary for Reach 1R: Swale (Reach)

Inflow Area = 2.345 ac, 72.65% Impervious, Inflow Depth = 0.00" for 10 YEAR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

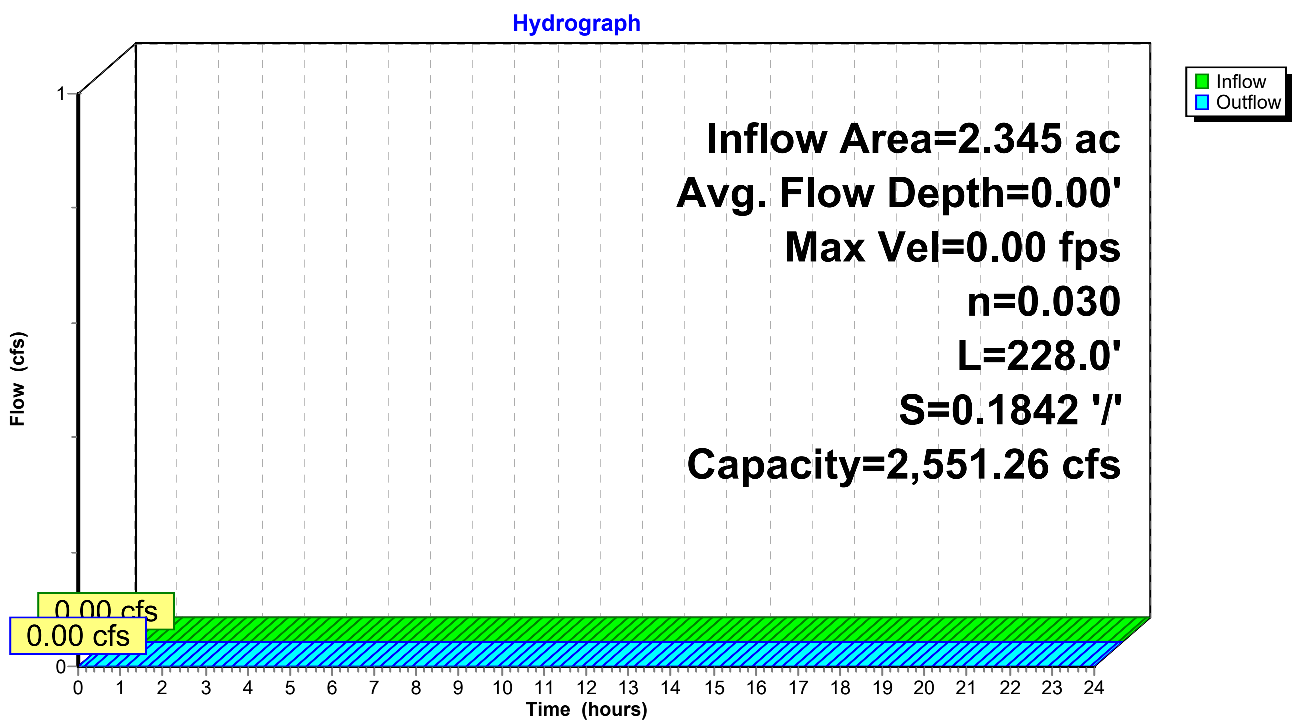
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.00' Flow Area= 60.0 sf, Capacity= 2,551.26 cfs

18.00' x 5.00' deep Parabolic Channel, n= 0.030 Stream, clean & straight
Length= 228.0' Slope= 0.1842 '/'
Inlet Invert= 95.00', Outlet Invert= 53.00'



Reach 1R: Swale (Reach)



Summary for Reach 2R: Stream

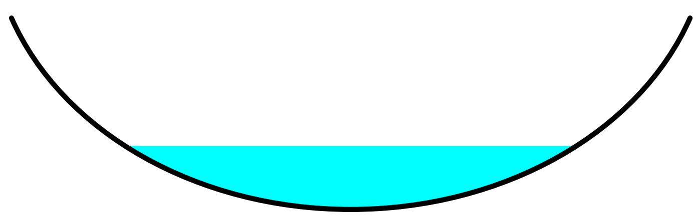
[62] Hint: Exceeded Reach 1R OUTLET depth by 1.32' @ 12.25 hrs

Inflow Area = 25.644 ac, 24.80% Impervious, Inflow Depth > 2.98" for 10 YEAR event
Inflow = 62.48 cfs @ 12.25 hrs, Volume= 6.371 af
Outflow = 62.39 cfs @ 12.26 hrs, Volume= 6.366 af, Atten= 0%, Lag= 0.8 min

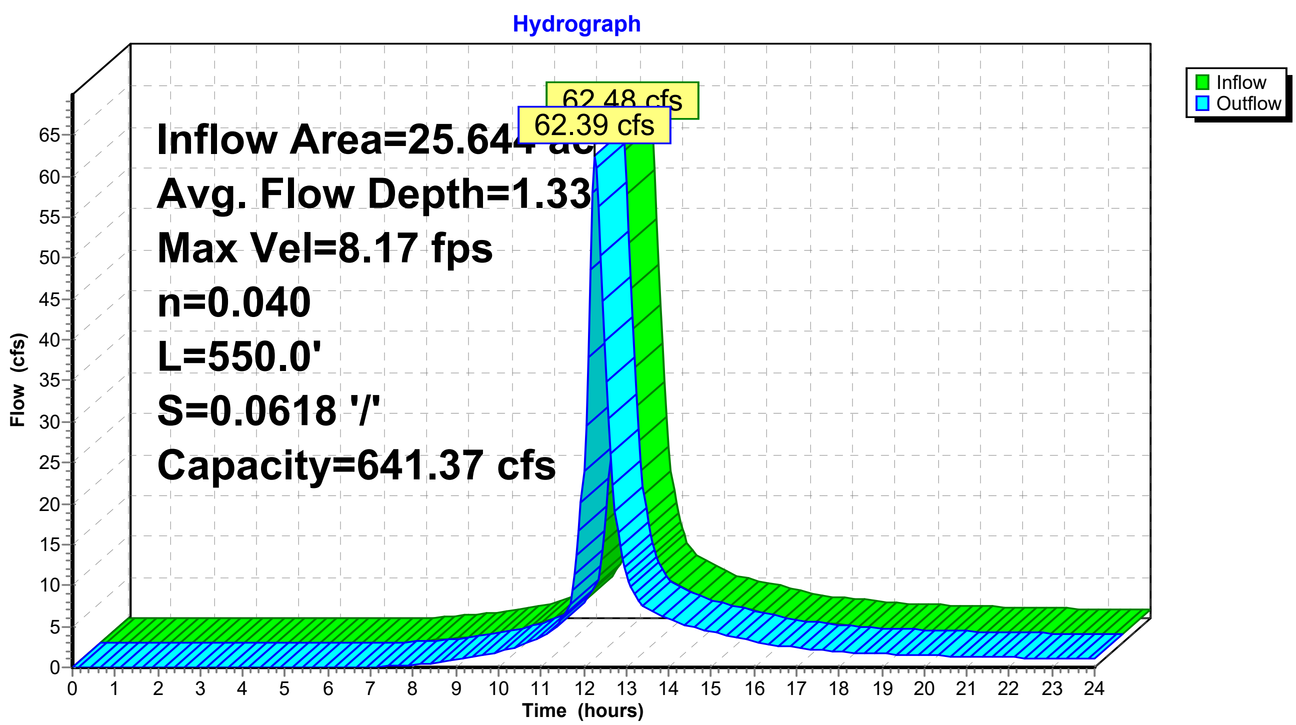
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.17 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 3.08 fps, Avg. Travel Time= 3.0 min

Peak Storage= 4,194 cf @ 12.26 hrs
Average Depth at Peak Storage= 1.33'
Bank-Full Depth= 4.00' Flow Area= 40.0 sf, Capacity= 641.37 cfs

15.00' x 4.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 550.0' Slope= 0.0618 '/'
Inlet Invert= 53.00', Outlet Invert= 19.00'



Reach 2R: Stream



Summary for Reach 3R: Channel

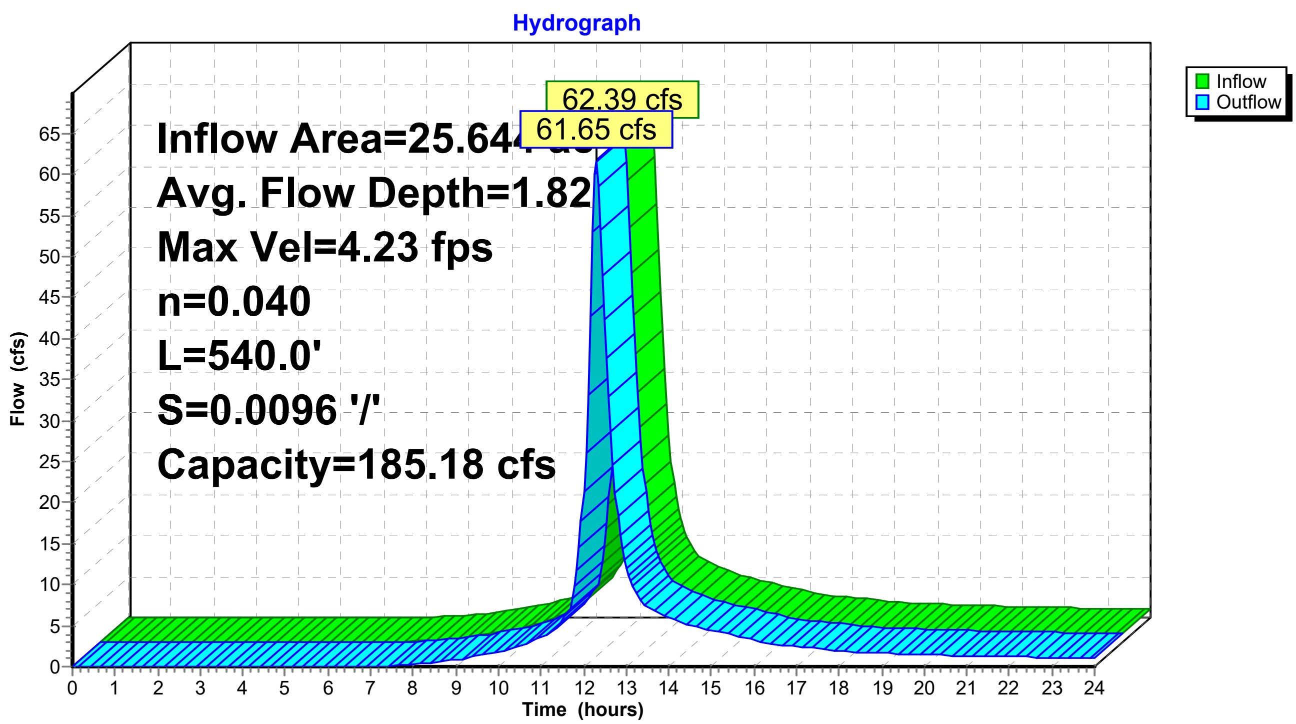
Inflow Area = 25.644 ac, 24.80% Impervious, Inflow Depth > 2.98" for 10 YEAR event
Inflow = 62.39 cfs @ 12.26 hrs, Volume= 6.366 af
Outflow = 61.65 cfs @ 12.29 hrs, Volume= 6.353 af, Atten= 1%, Lag= 1.7 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.23 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 1.35 fps, Avg. Travel Time= 6.7 min

Peak Storage= 7,865 cf @ 12.29 hrs
Average Depth at Peak Storage= 1.82'
Bank-Full Depth= 4.00' Flow Area= 32.0 sf, Capacity= 185.18 cfs

8.00' x 4.00' deep channel, n= 0.040 Winding stream, pools & shoals
Length= 540.0' Slope= 0.0096 '/'
Inlet Invert= 7.50', Outlet Invert= 2.30'

Reach 3R: Channel



Summary for Reach 4R: Stream

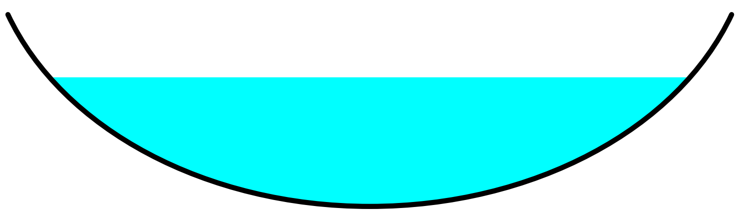
[88] Warning: Qout>Qin may require smaller dt or Finer Routing
[62] Hint: Exceeded Reach 3R OUTLET depth by 0.34' @ 12.75 hrs

Inflow Area = 25.644 ac, 24.80% Impervious, Inflow Depth > 2.97" for 10 YEAR event
Inflow = 61.65 cfs @ 12.29 hrs, Volume= 6.353 af
Outflow = 61.67 cfs @ 12.30 hrs, Volume= 6.350 af, Atten= 0%, Lag= 0.5 min

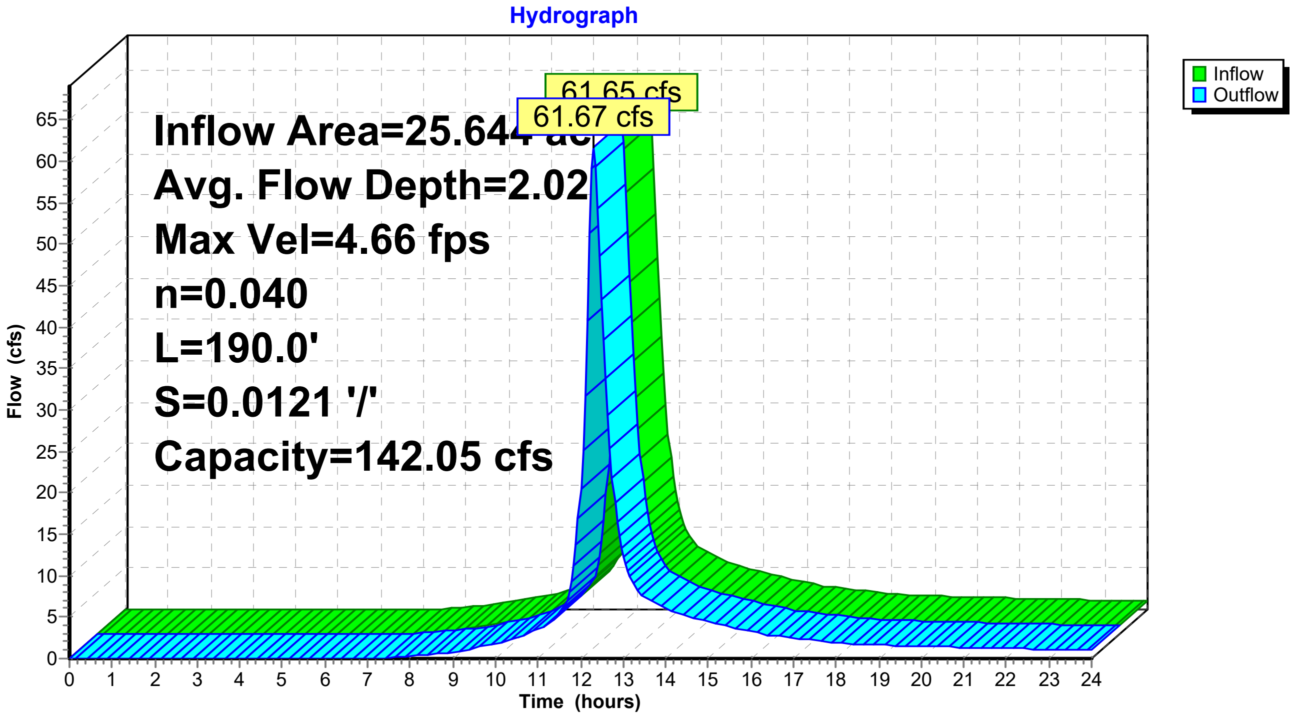
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.66 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.77 fps, Avg. Travel Time= 1.8 min

Peak Storage= 2,512 cf @ 12.30 hrs
Average Depth at Peak Storage= 2.02'
Bank-Full Depth= 3.00' Flow Area= 24.0 sf, Capacity= 142.05 cfs

12.00' x 3.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 190.0' Slope= 0.0121 '/'
Inlet Invert= 2.30', Outlet Invert= 0.00'



Reach 4R: Stream



Summary for Pond 1P: Inlet Structure

[57] Hint: Peaked at 20.81' (Flood elevation advised)
[62] Hint: Exceeded Reach 2R OUTLET depth by 0.48' @ 12.25 hrs

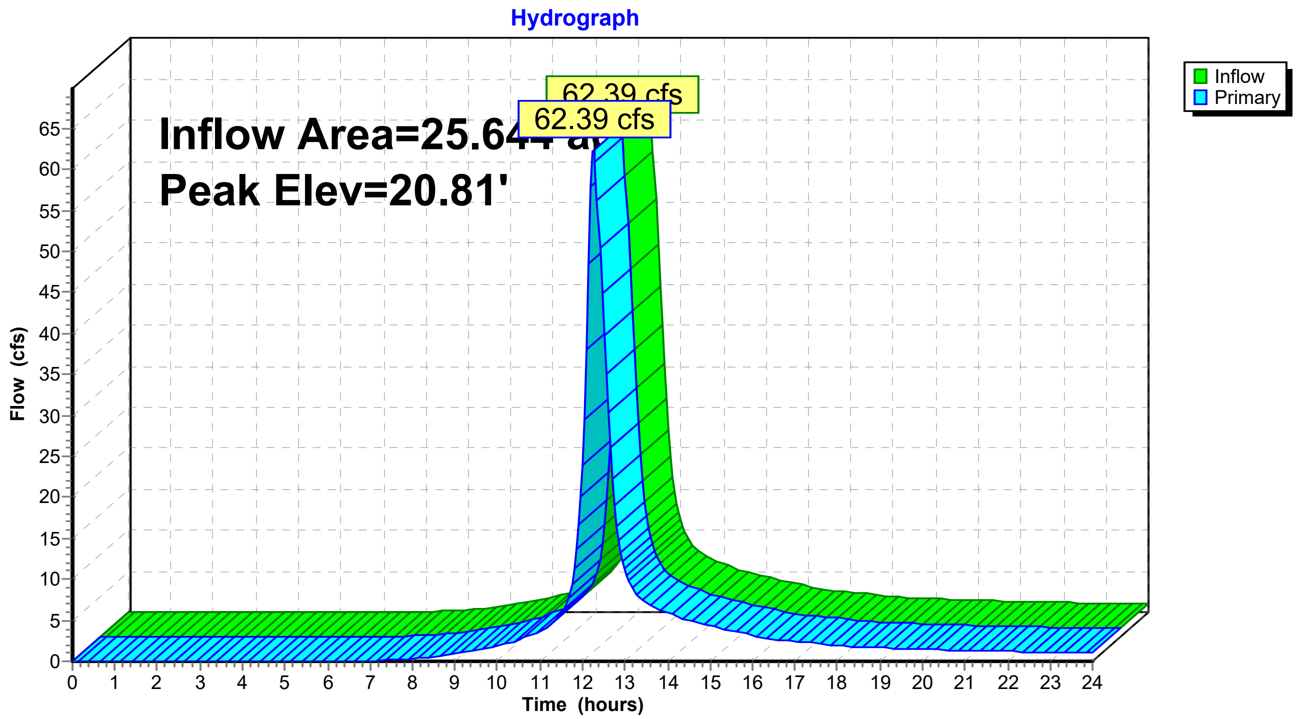
Inflow Area = 25.644 ac, 24.80% Impervious, Inflow Depth > 2.98" for 10 YEAR event
Inflow = 62.39 cfs @ 12.26 hrs, Volume= 6.366 af
Outflow = 62.39 cfs @ 12.26 hrs, Volume= 6.366 af, Atten= 0%, Lag= 0.0 min
Primary = 62.39 cfs @ 12.26 hrs, Volume= 6.366 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 20.81' @ 12.26 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	19.00'	**96.0" W x 48.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=61.84 cfs @ 12.26 hrs HW=20.80' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 61.84 cfs @ 4.30 fps)

Pond 1P: Inlet Structure



Summary for Pond EX-P: Existing Pond

Inflow Area = 2.345 ac, 72.65% Impervious, Inflow Depth > 4.32" for 10 YEAR event
Inflow = 10.41 cfs @ 12.11 hrs, Volume= 0.845 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 90.01' @ 24.00 hrs Surf.Area= 7,355 sf Storage= 36,784 cf

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

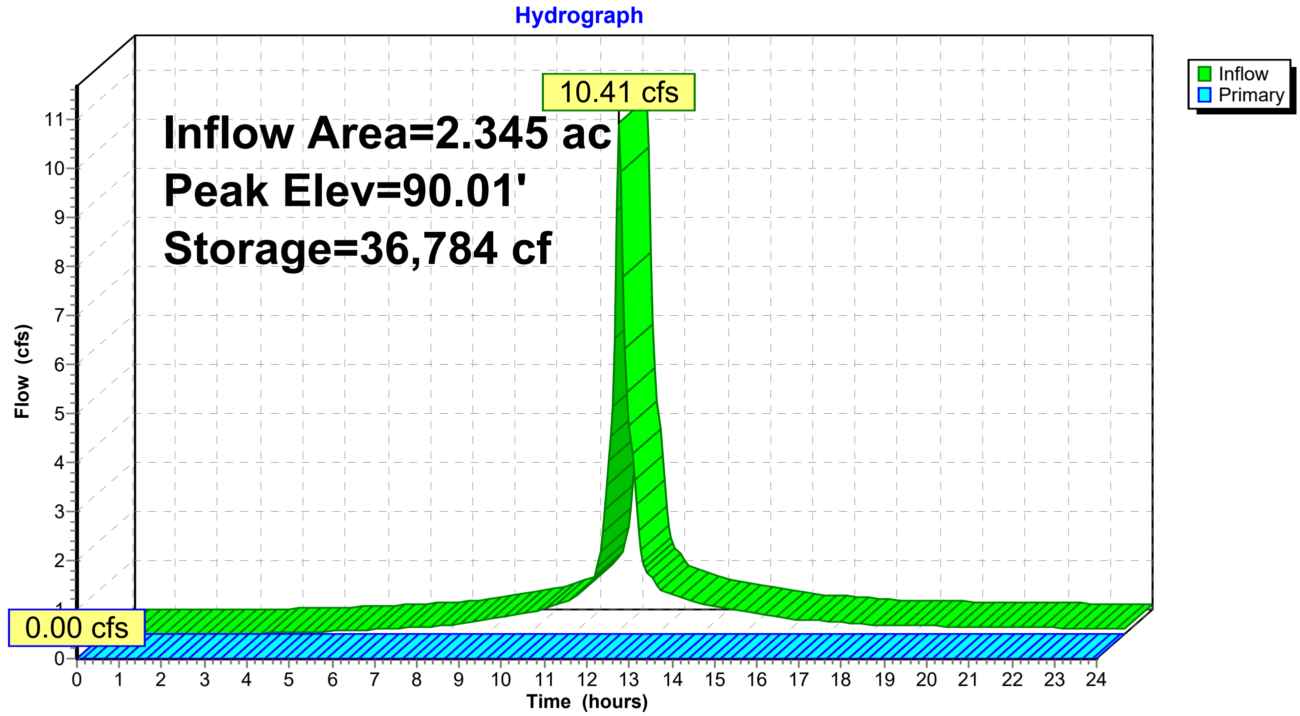
Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	193,943 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
85.00	635	0	0
95.00	14,042	73,385	73,385
100.00	34,181	120,558	193,943

Device	Routing	Invert	Outlet Devices
#1	Primary	95.00'	**65.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=85.00' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond EX-P: Existing Pond

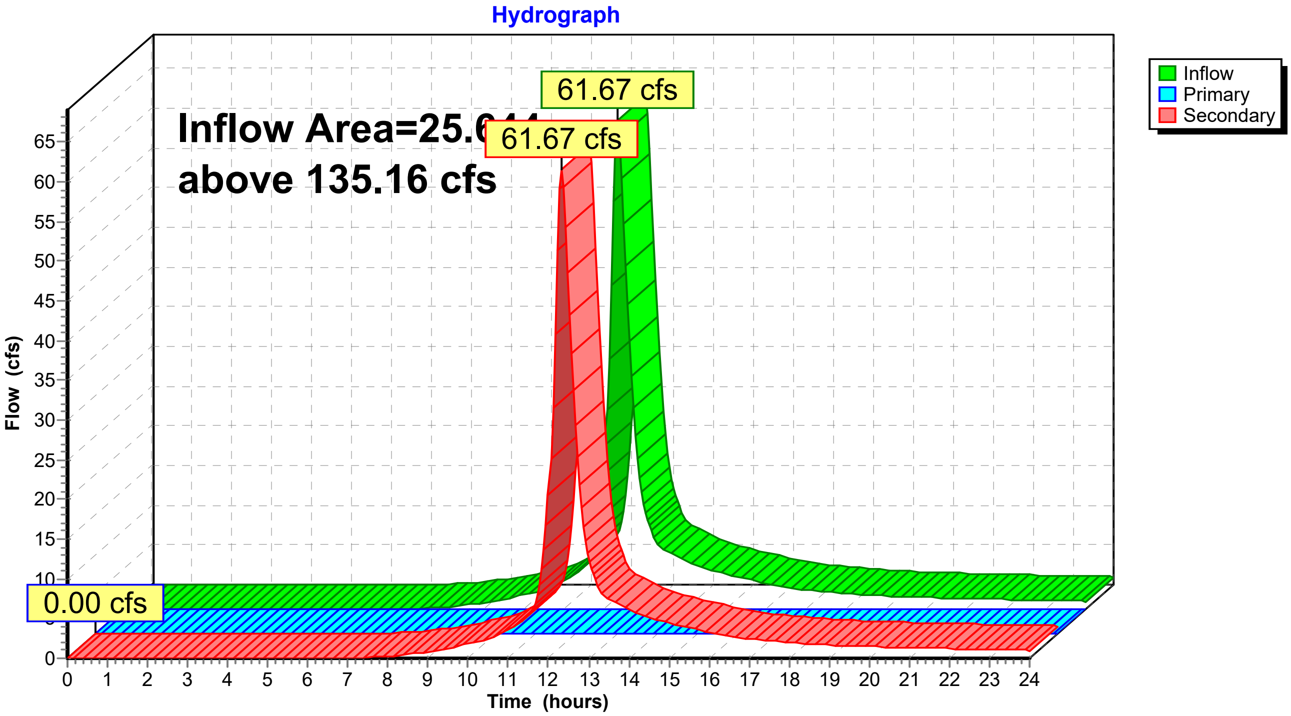


Summary for Link DP-1: Design Point - 1

Inflow Area = 25.644 ac, 24.80% Impervious, Inflow Depth > 2.97" for 10 YEAR event
Inflow = 61.67 cfs @ 12.30 hrs, Volume= 6.350 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Secondary = 61.67 cfs @ 12.30 hrs, Volume= 6.350 af

Primary outflow = Inflow above 135.16 cfs, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-1: Design Point - 1



Summary for Subcatchment 2: Drainage Area -2

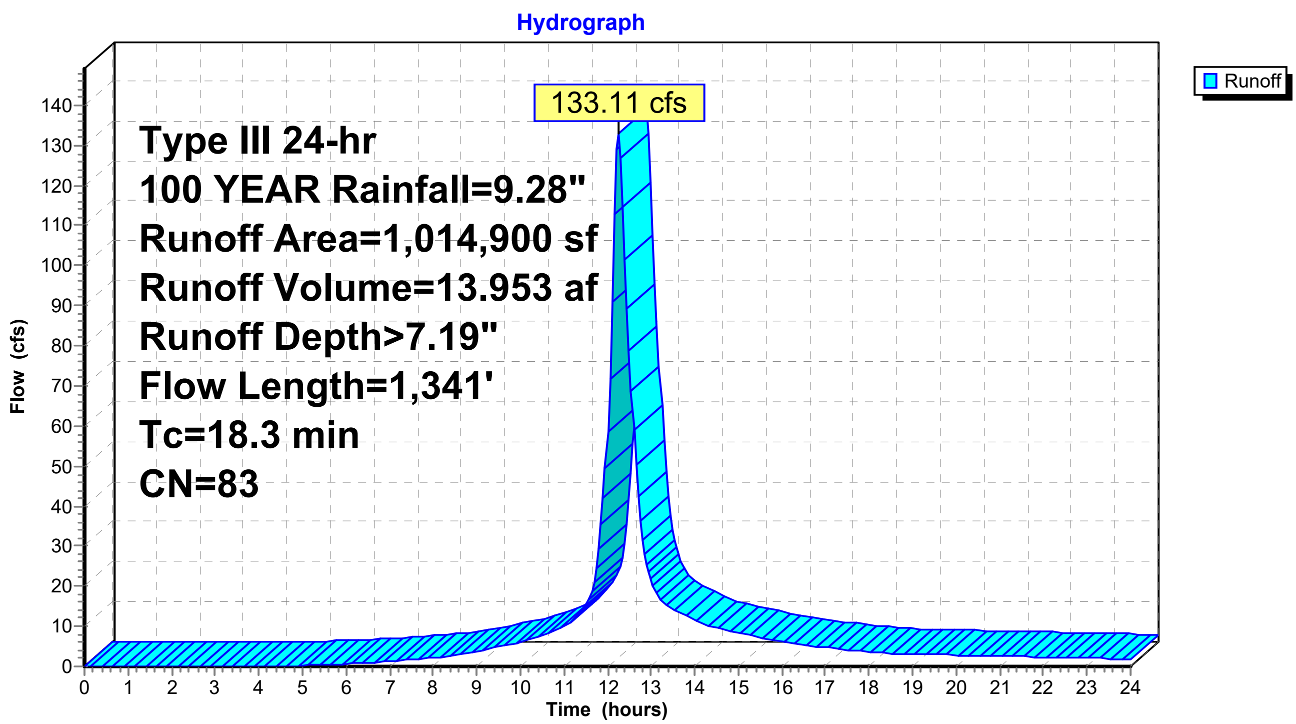
Runoff = 133.11 cfs @ 12.25 hrs, Volume= 13.953 af, Depth> 7.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

	Area (sf)	CN	Description
*	195,831	98	Paved parking & roofs
*	6,925	98	Water Course
	812,144	79	Woods, Fair, HSG D
	1,014,900	83	Weighted Average
	812,144		80.02% Pervious Area
	202,756		19.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.0500	0.12		**Sheet Flow, 1 to 2** Woods: Light underbrush n= 0.400 P2= 3.50"
4.1	1,241	0.0970	5.01		**Shallow Concentrated Flow, 2 to 3** Unpaved Kv= 16.1 fps
18.3	1,341	Total			

Subcatchment 2: Drainage Area -2



Summary for Subcatchment 3: Drainage Area - 3

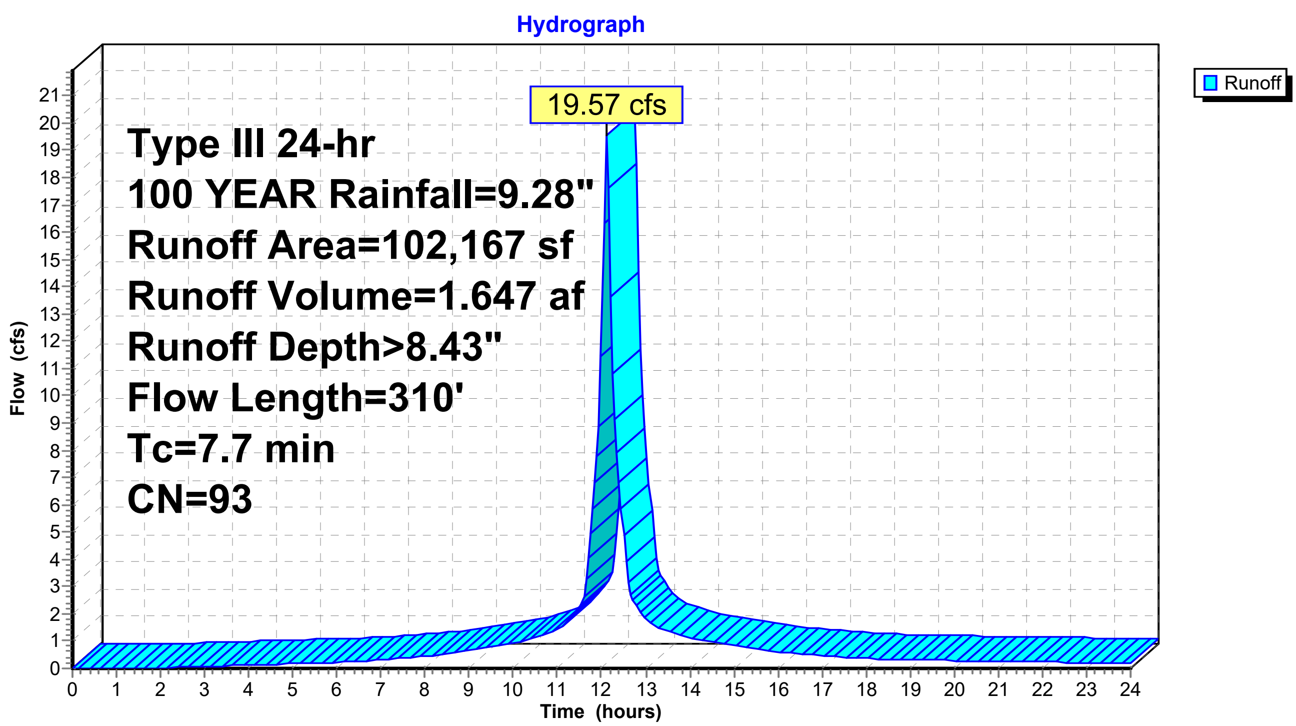
Runoff = 19.57 cfs @ 12.11 hrs, Volume= 1.647 af, Depth> 8.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 YEAR Rainfall=9.28"

	Area (sf)	CN	Description
*	74,229	98	Paved roads w/curbs & sewers
	27,938	79	Woods, Fair, HSG D
	102,167	93	Weighted Average
	27,938		27.35% Pervious Area
	74,229		72.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	100	0.3000	0.24		**Sheet Flow, 1 to 2** Woods: Light underbrush n= 0.400 P2= 3.50"
0.7	210	0.0950	4.96		**Shallow Concentrated Flow, 2 to 3** Unpaved Kv= 16.1 fps
7.7	310	Total			

Subcatchment 3: Drainage Area - 3



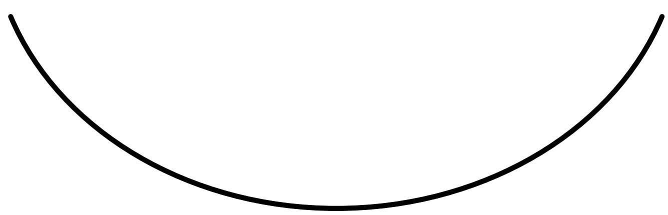
Summary for Reach 1R: Swale (Reach)

Inflow Area = 2.345 ac, 72.65% Impervious, Inflow Depth = 0.00" for 100 YEAR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

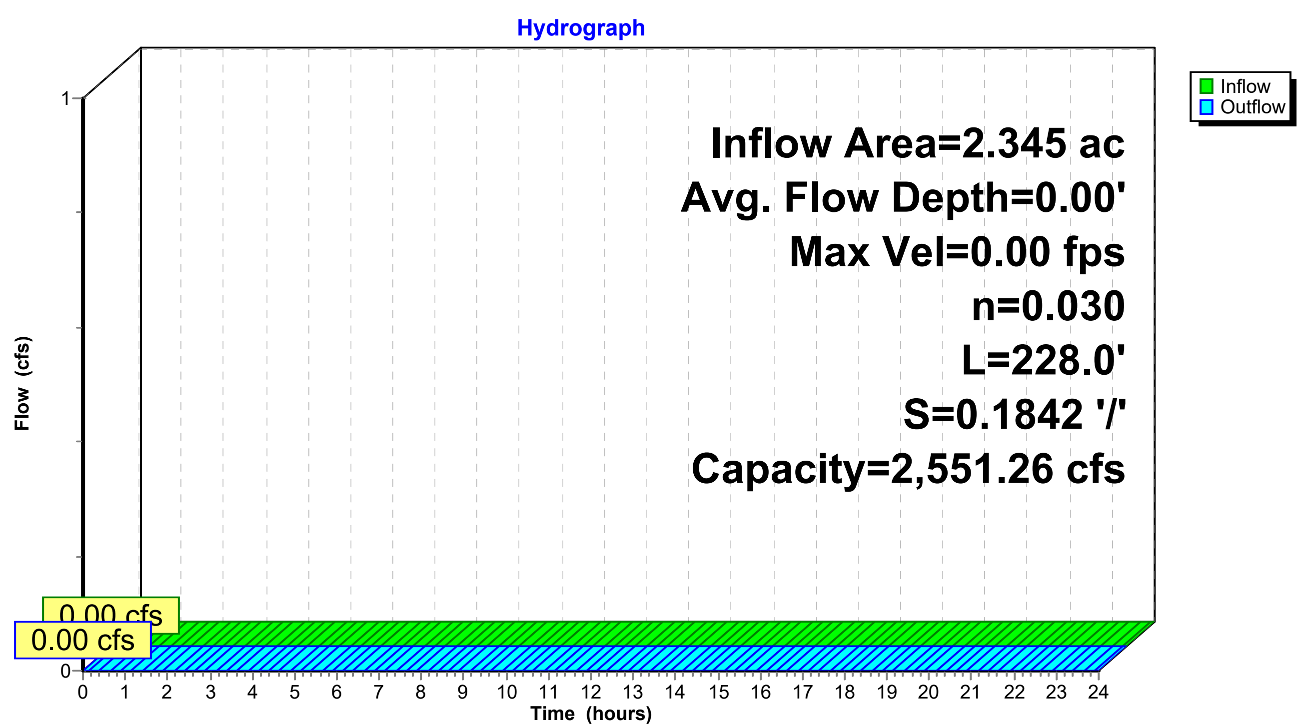
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 5.00' Flow Area= 60.0 sf, Capacity= 2,551.26 cfs

18.00' x 5.00' deep Parabolic Channel, n= 0.030 Stream, clean & straight
Length= 228.0' Slope= 0.1842 '/'
Inlet Invert= 95.00', Outlet Invert= 53.00'



Reach 1R: Swale (Reach)



Summary for Reach 2R: Stream

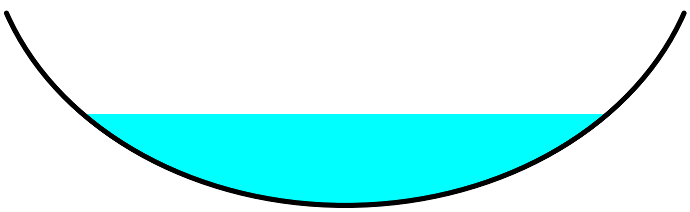
[62] Hint: Exceeded Reach 1R OUTLET depth by 1.89' @ 12.25 hrs

Inflow Area = 25.644 ac, 24.80% Impervious, Inflow Depth > 6.53" for 100 YEAR event
Inflow = 133.11 cfs @ 12.25 hrs, Volume= 13.953 af
Outflow = 133.05 cfs @ 12.26 hrs, Volume= 13.945 af, Atten= 0%, Lag= 0.7 min

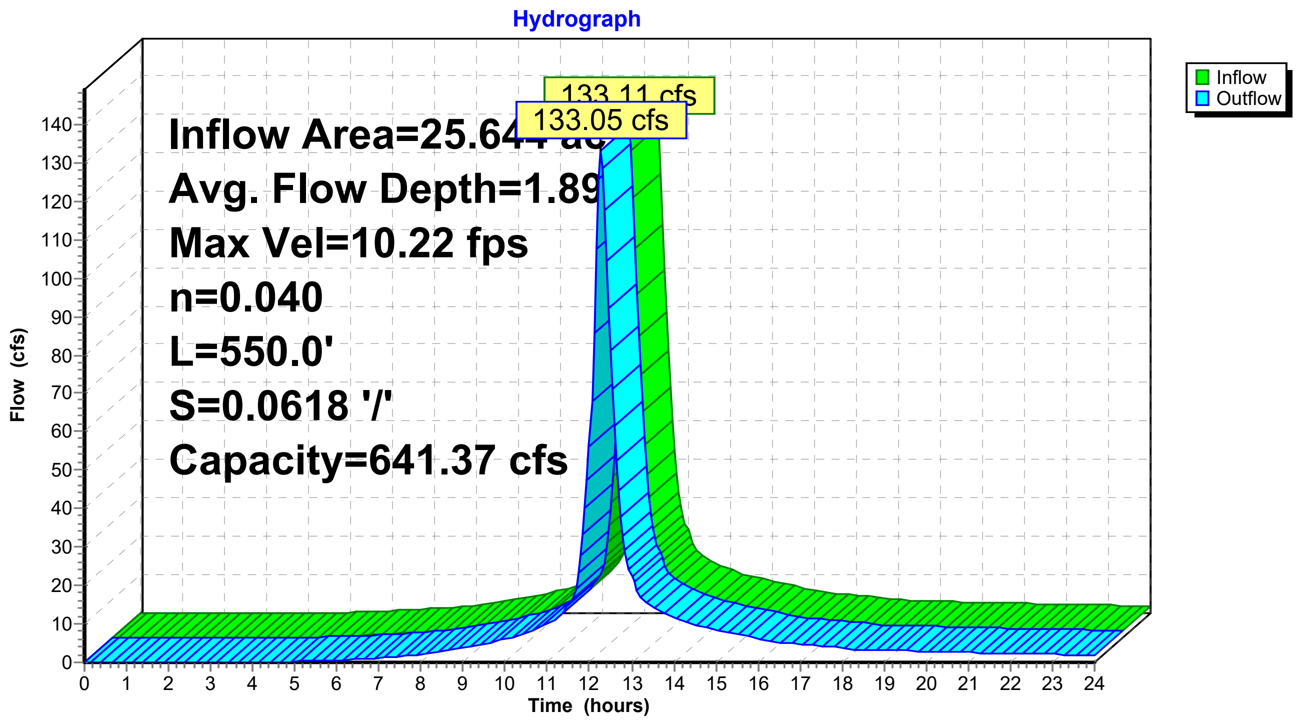
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.22 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 3.72 fps, Avg. Travel Time= 2.5 min

Peak Storage= 7,158 cf @ 12.26 hrs
Average Depth at Peak Storage= 1.89'
Bank-Full Depth= 4.00' Flow Area= 40.0 sf, Capacity= 641.37 cfs

15.00' x 4.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 550.0' Slope= 0.0618 '/'
Inlet Invert= 53.00', Outlet Invert= 19.00'



Reach 2R: Stream



Summary for Reach 3R: Channel

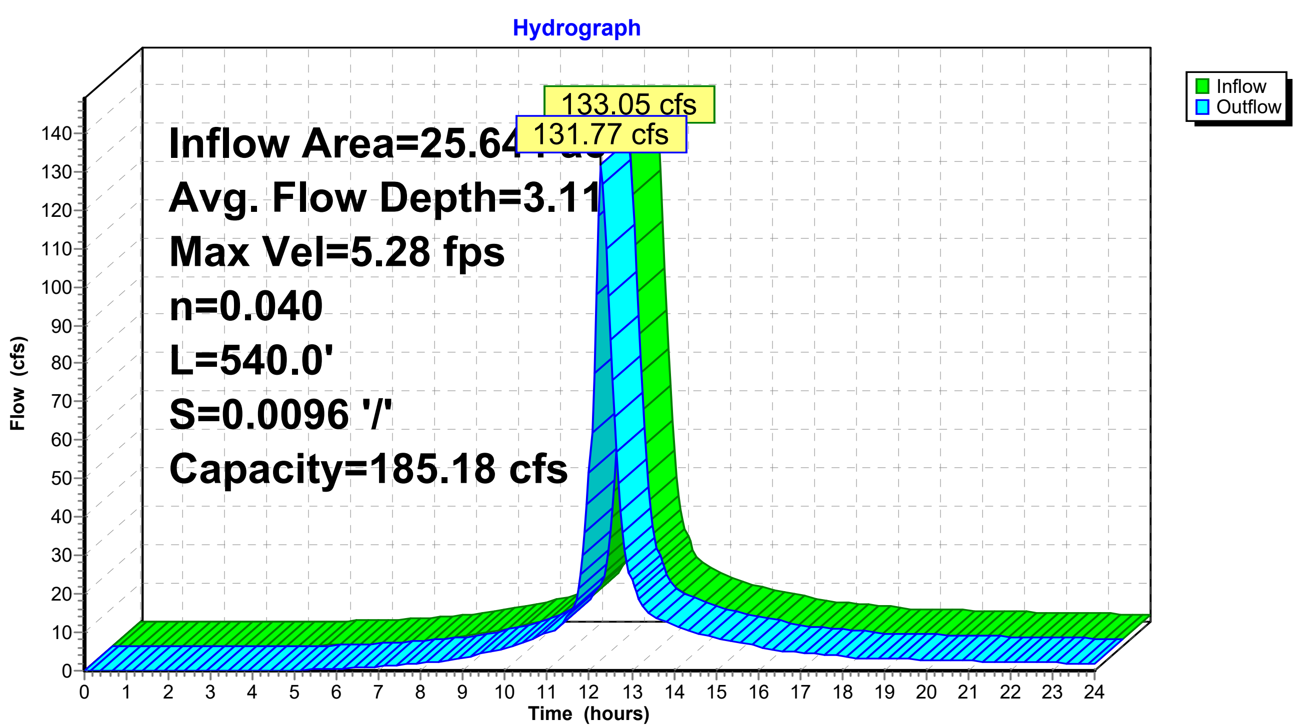
Inflow Area = 25.644 ac, 24.80% Impervious, Inflow Depth > 6.53" for 100 YEAR event
Inflow = 133.05 cfs @ 12.26 hrs, Volume= 13.945 af
Outflow = 131.77 cfs @ 12.28 hrs, Volume= 13.925 af, Atten= 1%, Lag= 1.3 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.28 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 1.70 fps, Avg. Travel Time= 5.3 min

Peak Storage= 13,441 cf @ 12.28 hrs
Average Depth at Peak Storage= 3.11'
Bank-Full Depth= 4.00' Flow Area= 32.0 sf, Capacity= 185.18 cfs

8.00' x 4.00' deep channel, n= 0.040 Winding stream, pools & shoals
Length= 540.0' Slope= 0.0096 '/'
Inlet Invert= 7.50', Outlet Invert= 2.30'

Reach 3R: Channel



Summary for Reach 4R: Stream

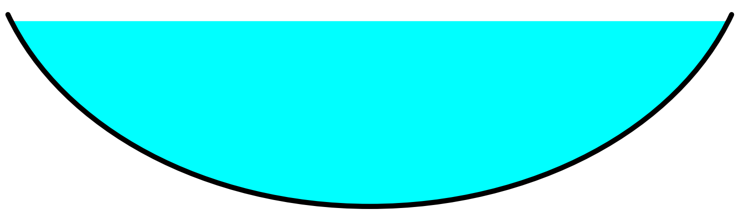
[88] Warning: Qout>Qin may require smaller dt or Finer Routing
[62] Hint: Exceeded Reach 3R OUTLET depth by 0.33' @ 13.05 hrs

Inflow Area = 25.644 ac, 24.80% Impervious, Inflow Depth > 6.52" for 100 YEAR event
Inflow = 131.77 cfs @ 12.28 hrs, Volume= 13.925 af
Outflow = 131.78 cfs @ 12.29 hrs, Volume= 13.920 af, Atten= 0%, Lag= 0.5 min

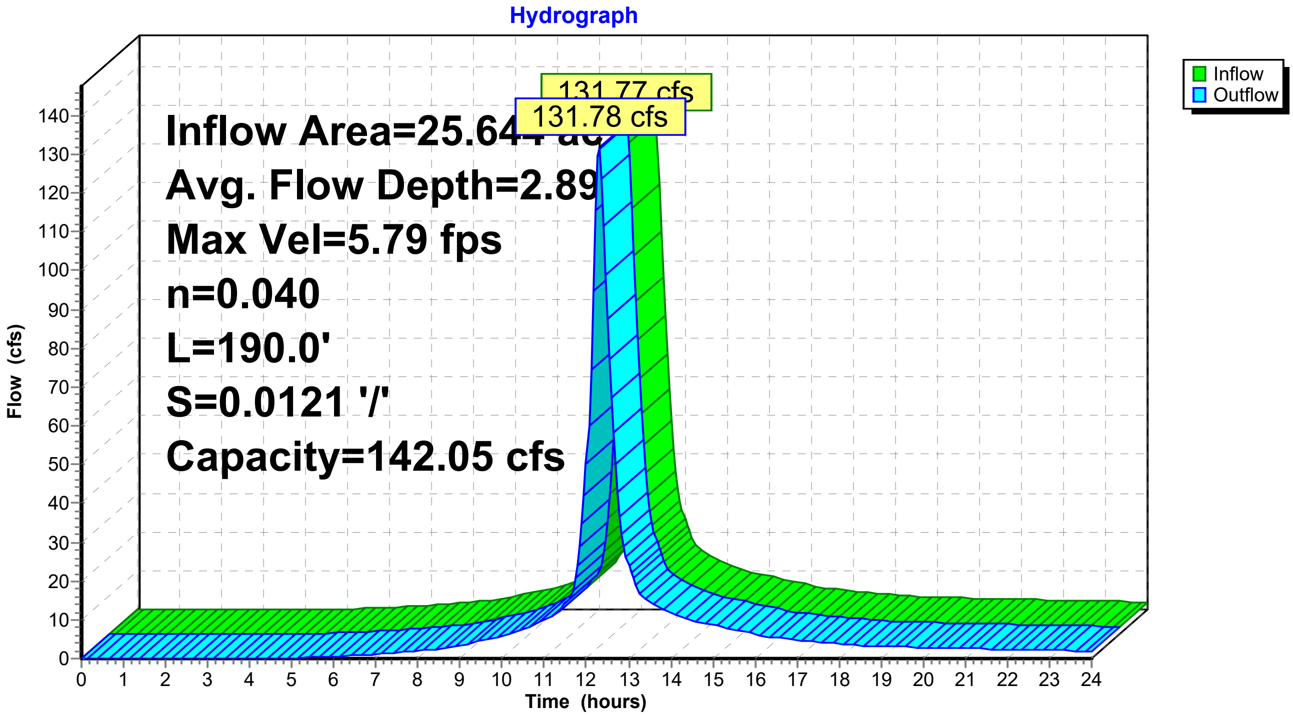
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.79 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.14 fps, Avg. Travel Time= 1.5 min

Peak Storage= 4,321 cf @ 12.29 hrs
Average Depth at Peak Storage= 2.89'
Bank-Full Depth= 3.00' Flow Area= 24.0 sf, Capacity= 142.05 cfs

12.00' x 3.00' deep Parabolic Channel, n= 0.040 Winding stream, pools & shoals
Length= 190.0' Slope= 0.0121 '/'
Inlet Invert= 2.30', Outlet Invert= 0.00'



Reach 4R: Stream



Summary for Pond 1P: Inlet Structure

[57] Hint: Peaked at 21.99' (Flood elevation advised)
[62] Hint: Exceeded Reach 2R OUTLET depth by 1.10' @ 12.25 hrs

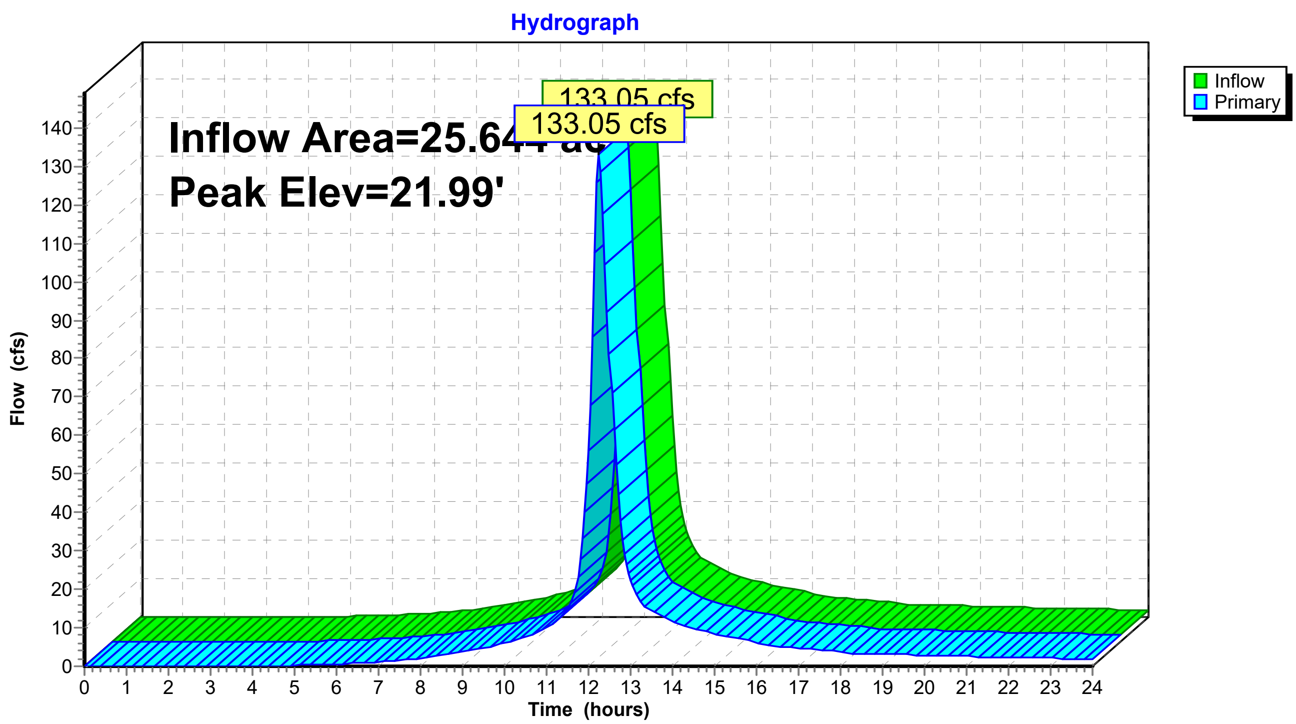
Inflow Area = 25.644 ac, 24.80% Impervious, Inflow Depth > 6.53" for 100 YEAR event
Inflow = 133.05 cfs @ 12.26 hrs, Volume= 13.945 af
Outflow = 133.05 cfs @ 12.26 hrs, Volume= 13.945 af, Atten= 0%, Lag= 0.0 min
Primary = 133.05 cfs @ 12.26 hrs, Volume= 13.945 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 21.99' @ 12.26 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	19.00'	**96.0" W x 48.0" H Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=132.44 cfs @ 12.26 hrs HW=21.98' (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 132.44 cfs @ 5.55 fps)

Pond 1P: Inlet Structure



Summary for Pond EX-P: Existing Pond

Inflow Area = 2.345 ac, 72.65% Impervious, Inflow Depth > 8.43" for 100 YEAR event
Inflow = 19.57 cfs @ 12.11 hrs, Volume= 1.647 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 94.77' @ 24.00 hrs Surf.Area= 13,739 sf Storage= 71,727 cf

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

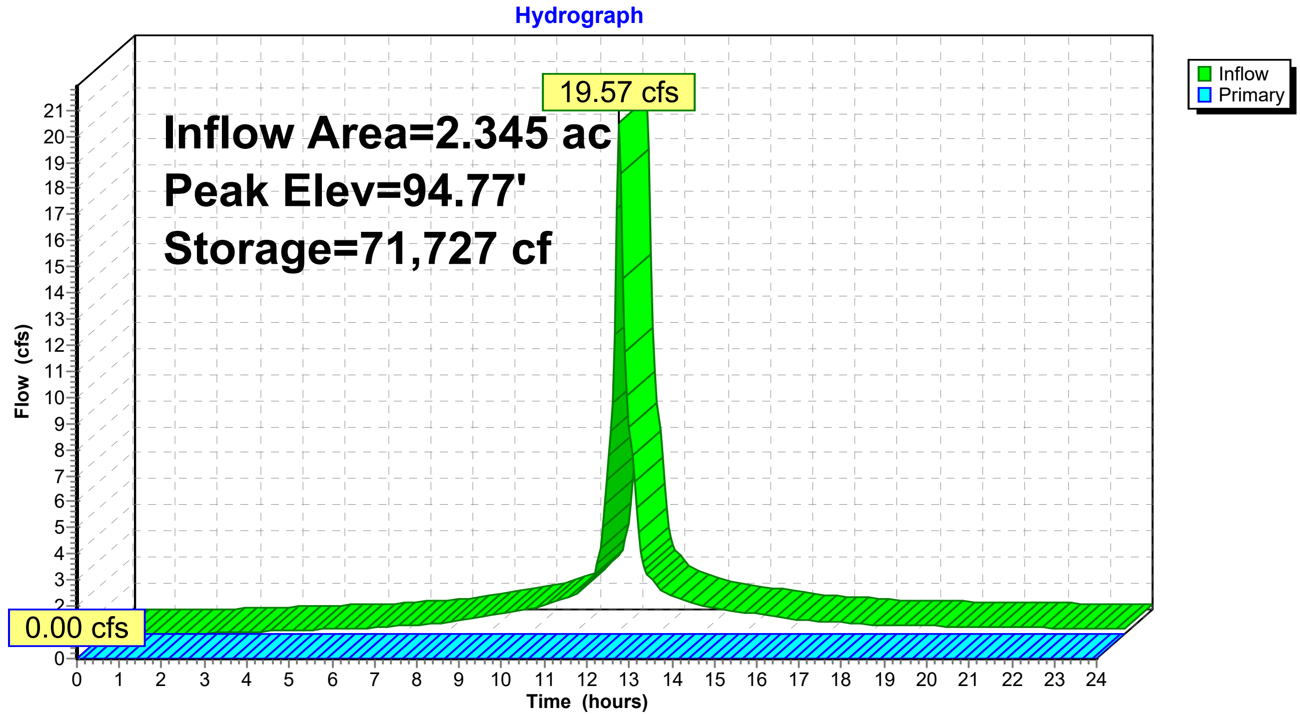
Volume	Invert	Avail.Storage	Storage Description
#1	85.00'	193,943 cf	**Custom Stage Data (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
85.00	635	0	0
95.00	14,042	73,385	73,385
100.00	34,181	120,558	193,943

Device	Routing	Invert	Outlet Devices
#1	Primary	95.00'	**65.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=85.00' (Free Discharge)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond EX-P: Existing Pond

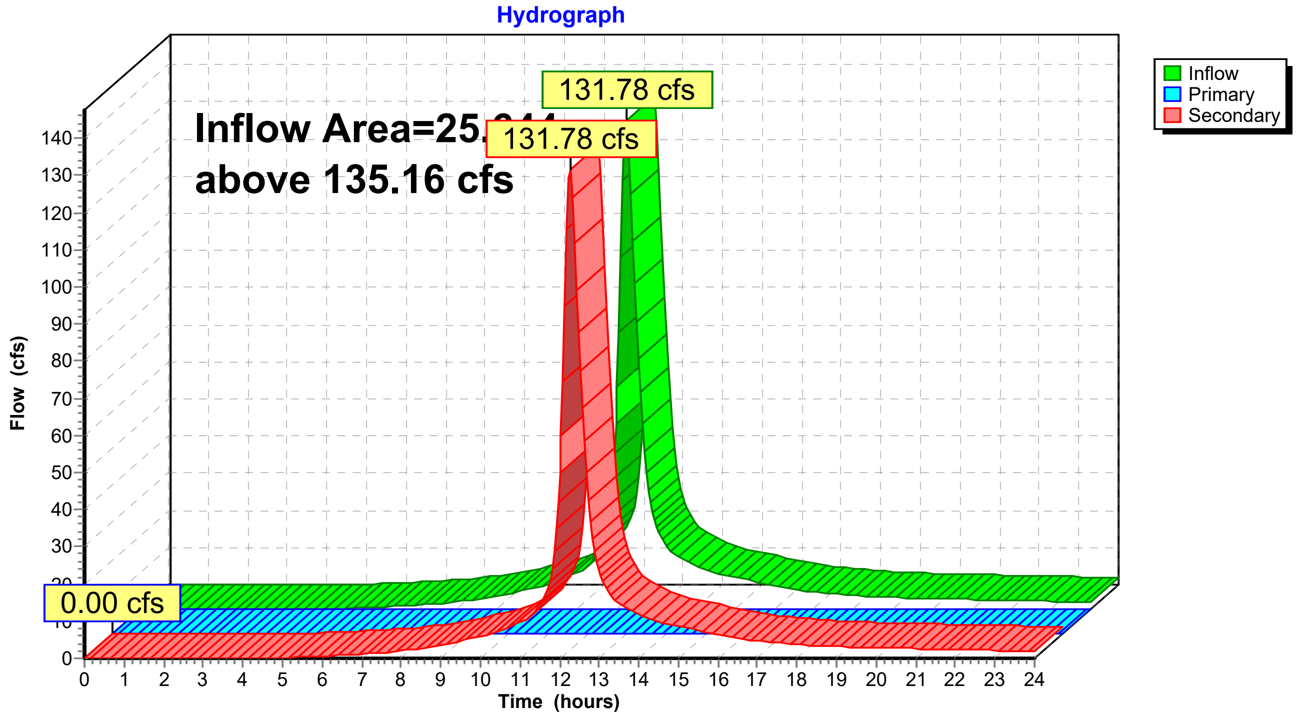


Summary for Link DP-1: Design Point - 1

Inflow Area = 25.644 ac, 24.80% Impervious, Inflow Depth > 6.51" for 100 YEAR event
Inflow = 131.78 cfs @ 12.29 hrs, Volume= 13.920 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Secondary = 131.78 cfs @ 12.29 hrs, Volume= 13.920 af

Primary outflow = Inflow above 135.16 cfs, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Link DP-1: Design Point - 1



APPENDIX G

- AQUA SWIRL CERTIFICATION

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Nonpoint Pollution Control
Division of Water Quality
401-02B
Post Office Box 420
Trenton, New Jersey 08625-0420
609-633-7021 Fax: 609-777-0432
http://www.state.nj.us/dep/dwq/bnpc_home.htm

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

December 1, 2016

Mark B. Miller, Research Scientist
AquaShield^{TM}, Inc.
2733 Kanasita Drive, Suite 111
Chattanooga, Tennessee 37343

Re: MTD Lab Certification
Aqua-Swirl® Stormwater Treatment System by AquaShield^{TM}, Inc.

TSS Removal Rate 50%

Dear Mr. Miller:

The Stormwater Management rules under N.J.A.C. 7:8-5.5(b) and 5.7 (c) allow the use of manufactured treatment devices (MTDs) for compliance with the design and performance standards at N.J.A.C. 7:8-5 if the pollutant removal rates have been verified by the New Jersey Corporation for Advanced Technology (NJCAT) and have been certified by the New Jersey Department of Environmental Protection (NJDEP). AquaShield^{TM}, Inc. has requested an MTD Laboratory Certification for the Aqua-Swirl® Stormwater Treatment System, which is a vortex hydrodynamic separator.

The verification is subject to the "Procedure for Obtaining Verification of a Stormwater Manufactured Treatment Device from New Jersey Corporation for Advance Technology" dated January 25, 2013. The applicable protocol is the "New Jersey Laboratory Testing Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device" dated January 25, 2013.

NJCAT verification documents submitted to the NJDEP indicate that the requirements of the aforementioned protocol have been met or exceeded. The NJCAT letter also included a recommended certification TSS removal rate and the required maintenance plan. The NJCAT Verification Report with the Verification Appendix (dated November 2016) for this device is published online at http://www.njcat.org/verification-process/technology-verification-database.html.

The NJDEP certifies the use of the Aqua-Swirl® Stormwater Treatment System by AquaShield^{TM}, Inc. at a TSS removal rate of 50% when designed, operated, and maintained in accordance with the information provided in the Verification Appendix and the following conditions:

1. The maximum treatment flow rate (MTFR) for the manufactured treatment device (MTD) is calculated using the New Jersey Water Quality Design Storm (1.25 inches in 2 hrs) in N.J.A.C. 7:8-5.5.

2. The Aqua-Swirl® stormwater treatment device shall be installed using the same configuration reviewed by NJCAT and shall be sized in accordance with the criteria specified in item 6 below.

3. This Aqua-Swirl® stormwater treatment device cannot be used in series with another MTD or a media filter (such as a sand filter) to achieve an enhanced removal rate for total suspended solids (TSS) removal under N.J.A.C. 7:8-5.5.

4. Additional design criteria for MTDs can be found in Chapter 9.6 of the New Jersey Stormwater Best Management Practices (NJ Stormwater BMP) Manual which can be found on-line at www.njstormwater.org.

5. The maintenance plan for a site using this device shall incorporate, at a minimum, the maintenance requirements for the Aqua-Swirl® stormwater treatment device. A copy of the maintenance plan is attached to this certification. However, it is recommended to review the maintenance website at http://www.aquashieldinc.com/uploads/1/3/6/1/13618853/aqua-swirl_i_m_manual_11-16.pdf for any changes to the maintenance requirements.

6. Sizing Requirements:

   The example below demonstrates the sizing procedure for the Aqua-Swirl®:

   Example: A 0.25-acre impervious site is to be treated to 50% TSS removal using an Aqua-Swirl®. The impervious site runoff (Q) based on the New Jersey Water Quality Design Storm was determined to be 0.79 cfs.

   <u>Maximum Treatment Flow Rate (MTFR) Evaluation:</u>

   The site runoff (Q) was based on the following:
   time of concentration = 10 minutes
   i=3.2 in/hr (page 5-8, Fig. 5-3 of the NJ Stormwater BMP Manual)
   c=0.99 (runoff coefficient for impervious)
   Q=ciA=0.99x3.2x0.25=0.79 cfs

   Given the site runoff is 0.79 cfs and based on Table A-1 below, the Aqua-Swirl® Model AS-4 with an MTFR of 1.18 cfs would be the smallest model approved that could be used for this site that could remove 50% of the TSS from the impervious area without exceeding the MTFR.

   The sizing table corresponding to the available system models is noted below. Additional specifications regarding each model can be found in the Verification Appendix under Table A-2.

Table A-1 MTFRs and Required Sediment Removal Intervals for Aqua-Swirl® Models

Model	Manhole Diameter (ft)	NJDEP 50% TSS Maximum Treatment Flow Rate (cfs)	Treatment Area (ft^2)	Hydraulic Loading Rate (gpm/ft^2)	50% Maximum Sediment Storage Volume (ft^3)	Required Sediment Removal Interval (months)
AS-2	2.5	0.36	4.9	33.4	2.86	56
AS-3	3.5	0.71	9.6	33.4	5.60	56
AS-4	4.5	1.18	15.9	33.4	9.28	56
AS-5	5	1.46	19.6	33.4	11.43	56
AS-6	6	2.11	28.3	33.4	16.51	56
AS-7	7	2.87	38.5	33.4	22.46	56
AS-8	8	3.74	50.3	33.4	29.34	56
AS-9	9	4.73	63.6	33.4	37.10	56
AS-10	10	5.84	78.5	33.4	45.79	56
AS-11	11	7.07	95.0	33.4	55.42	56
AS-12	12	8.42	113.1	33.4	65.98	56
AS-13	13	9.87	132.7	33.4	77.41	56

A detailed maintenance plan is mandatory for any project with a Stormwater BMP subject to the Stormwater Management Rules, N.J.A.C. 7:8. The plan must include all of the items identified in the Stormwater Management Rules, N.J.A.C. 7:8-5.8. Such items include, but are not limited to, the list of inspection and maintenance equipment and tools, specific corrective and preventative maintenance tasks, indication of problems in the system, and training of maintenance personnel. Additional information can be found in Chapter 8: Maintenance and Retrofit of Stormwater Management Measures.

If you have any questions regarding the above information, please contact Mr. Shashi Nayak of my office at (609) 633-7021.

Sincerely,

James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

Attachment: Maintenance Plan

cc: Chron File
Richard Magee, NJCAT
Vince Mazzei, NJDEP - DLUR
Ravi Patraju, NJDEP - BES
Gabriel Mahon, NJDEP - BNPC
Shashi Nayak, NJDEP - BNPC

APPENDIX H

- NOTICE OF INTENT

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-0-15-002

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)
PLATEAU ASSOCIATES L.L.C

Owner/Operator Contact Person Last Name (NOT CONSULTANT)
STOLATIS

Owner/Operator Contact Person First Name
NICHOLAS

Owner/Operator Mailing Address
427 BEDFORD ROAD SUIT 100

City
PLEASANTVILLE

State
NY

Zip
10570 -

Phone (Owner/Operator)
914 - 356 - 7000

Fax (Owner/Operator)
- -

Email (Owner/Operator)
nick@427bedfordroad.com

FED TAX ID
- (not required for individuals)

6401089828

Project Site Information

Project/Site Name
HIDDEN COVE ON THE HUDSON

Street Address (NOT P.O. BOX)
36 NORTH WATER STREET

Side of Street
○ **North** ○ **South** ● **East** ○ **West**

City/Town/Village (THAT ISSUES BUILDING PERMIT)
OSSINING

State	Zip	County	DEC Region
NY	10562 -	WESTCHESTER	

Name of Nearest Cross Street
SOLITUDE LANE

Distance to Nearest Cross Street (Feet)
1200

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)
594872	4557778

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
6.8 6.8	1.6 1.6	1.1 1.1	1.5 1.5

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 %	1 %	%	34 %

24% Udorthents (HSG=N/A)
34% Urban Land (HSG=N/A)

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

Hudson River

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-0-15-002? ○ **Yes** ● **No**

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-15-002? ○ **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
Petrucelli Engineering

Contact Name (Last, Space, First)
Azim Aliriza

Mailing Address
600 North Broadway Suite 215

City
White Plains

State Zip
NY 10603 -

Phone
9149486229

Fax
- -

Email
office@petrucelli-eng.com

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-0-15-002. 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
Paul

MI

Last Name
Berte

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

.086.086 **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.

7738089822

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

RR Techniques (Area Reduction)	Total Contributing Area (acres)		Total Contributing Impervious Area(acres)
○ 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)	Total Contributing Impervious Area(acres)
○ Vegetated Swale (RR-5)	.
○ Rain Garden (RR-6)	.
○ Stormwater Planter (RR-7)	.
○ Rain Barrel/Cistern (RR-8)	.
● Porous Pavement (RR-9)	.19 . 19
● Green Roof (RR-10)	.053 . 053
Standard SMPs with RRv Capacity	
● Infiltration Trench (I-1)	.046 . 046
○ Infiltration Basin (I-2)	.
○ Dry Well (I-3)	.
○ Underground Infiltration System (I-4)	.
○ Bioretention (F-5)	.
○ Dry Swale (O-1)	.

Standard SMPs	Total Contributing Impervious Area(acres)
○ 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	1.11.1
○ 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: AS-6, AS-8

Manufacturer: AQUASHEILD

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

.289.289 **acre-feet**

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

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

● **Yes** ○ **No**

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 NYR
- ○ 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. NYR

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

/ /