RANGER ENGINEERING GROUP, INC.
13 Red Roof Lane Suite 203
Salem, NH 03079
Tel: 978-208-1762
www.rangereng.com

STORMWATER MANAGEMENT REPORT

Sellers Farm Road, MA 01821

ASSESSORS MAP 24 PARCEL 1E,1G,1K

March 4, 2022

Rev.July 11, 2022

Submitted to:

Town of Andover
Andover, MA 01821

Prepared for:

LRC Builders, LLC
475 Boston Road
Billerica, MA 01821

Prepared by:

Ranger Engineering Group, Inc.
13 Red Roof Lane Suite 203
Salem, NH 03079
978-208-1762

Benjamin C. Osgood, Jr PE
Director of Engineering

II. TABLE OF CONTENTS:

I Cover
II Table of Contents
III Introduction
IV Existing Conditions
V Proposed Conditions
VI Stormwater Design
VII Site Parameters
- Wetland Resource Areas
- Flood Zone Classification
- Estimated Habitat for Rare Wildlife and Rare Species
- Soil Classification
- Subsurface Investigation

VIII Drainage Analysis
- Methodology
- Existing Watershed
- Proposed Watershed

IX Summary of Peak Discharge Rates
X Stormwater Management Standards
- Stormwater Management Practices
- Conformance with Standards
- DEP Stormwater Checklist and Certification
- TSS Removal Calculation Worksheets

XI Pollution Prevention Plans
- Construction Period Erosion and Sedimentation Control Plan
- Long-Term Pollution Prevention
- Stormwater Management System Post-Development Inspection & Maintenance Log

Appendices
HydroCAD Calculations
Precipitation Frequency Table
Pond storage
Mounding Analysis

Maps
USGS Locus Map
SCS Soils Map
FEMA (FIRM)
CS 9201 Pre-Development Drainage Map
CS 9301 Post-Development Drainage Map

III. INTRODUCTION

In accordance with Massachusetts Stormwater Management Regulations and the Town of Andover Stormwater Management and Erosion Control Regulations, Ranger Engineering Group (Ranger) has prepared a comprehensive Stormwater Management Plan for submittal to the Town of Andover, MA planning board on behalf of LRC Builders, LLC (LRC) in support of an Application for a Modified Definitive Subdivision Plan with the planning board and Notice of Intent with the conservation commission for the construction of three (3) new dwellings on a new 382 foot road called Sellers Farm Road which ends in a cul-de-sac.

IV. EXISTING CONDITIONS

The project site consists of 3 existing lots on an undeveloped road which intersects Highland Road and was approved in 2006. Lot 1 is located on assessor's map 24 lot 1E and is 0.89 acres. Lot 2 is located on assessor's map 24 lot 1G and is 1,10 acres. Lot 3 is located on assessor's map 24 lot 1K and is 0.70 acres. Portions of the drainage area are on assessors Map 24 Lot 1F, 1J, and 1H. (see Ranger Dwg. CS0201). The site is currently undeveloped and consists of grassland, forest, and wetlands. The parcel is bordered by residential properties, with undeveloped forest across Highland Road and a large wetland area to the southeast. A small wetland located on the northeast side of the site drains into the larger wetland to the southeast.

Generally, the topography is sloped away from Highland Road towards the wetland to the southeast. Stormwater sheet flows over the site towards the wetlands. Soils on the site are generally sandy loam on the upper areas of the site and saturated hydric soils in the wetlands.

V. PROPOSED CONDITIONS

The Applicant proposes to construct a new 382 ft road ending in a cul-de-sac which will provide access to three new dwellings. Each dwelling has a garage and a bituminous concrete driveway. The new roadway will be 18' wide with asphalt berm constructed on each side. The cul-de sac will have a diameter of 96 feet. The dwellings will have water, electric, natural gas, and sewer service. The proposed utility services will be connected to the existing utility mains located in Highland Road.

A closed drainage system consisting of deep sump catch basins, manholes and piping will be constructed to collect stormwater runoff along Sellers Farm Road. Stormwater will be directed via the closed system and sheet flow over the site towards three open basin infiltration/detention ponds with sediment forebays. The treated stormwater is then discharged into the existing wetland.

VI. STORMWATER DESIGN

The proposed stormwater system will maintain the same drainage patterns as under the pre-development conditions. Increases to peak rates of flow will be mitigated onsite to minimize or eliminate impacts to downstream areas. Stormwater presently flows to the south and east into the surrounding wetland areas.

Closed Drainage Systems

The closed drainage system consists of deep sump catch basins with 4' deep sumps and HDPE piping. Each deep sump catch basin is capable of handling a minimum of one years' worth of sediment. The system conforms to the town of Andover and Massachusetts stormwater regulations.

Stormwater Treatment

Three (3) open infiltration/detention basins are proposed to mitigate peak runoff rates and volumes, promote groundwater recharge, and to provide for water quality. Pond 1 collects water from the proposed road, the entirety of lot 3, and the driveway and front lawn of lot 1. Pond 2 collects water from the driveway and front lawn of lot 2. Pond 3 collects the remaining stormwater water from lot 2. Each pond has a sediment forebay which is designed to treat stormwater of sediment and nutrient loading flowing off impervious areas. Each pond is also sized appropriately to remove the remaining nutrient load. The stormwater system is designed to contain and mitigate the 2-year, 10-year, 25-year, and 100-year storm events.

Stormwater Infiltration

The system has been sized to provide both water quality treatment and recharge to satisfy the requirements of both Mass DEP Stormwater Management Standards 3 and 4. Each pond has a raised outlet so a minimum of 1" of runoff from impervious surfaces is infiltrated.

VII. SITE PARAMETERS

Wetland Resource Areas
The site contains wetlands resource areas that have been flagged and located on the project plans.

Flood Zone Classification
According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Essex County, Massachusetts, Community Panel 25009C0238F, effective date July 3, 2012, the site and nearby properties are located within Zone X, which is defined as areas outside of the 500-year floodplains (see attached).

Estimated Habitat for Rare Wildlife and Rare Species
According to current *Massachusetts GIS Online Mapping Tool (Oliver),* the site is not designated as an area for estimated habitat for rare wildlife or rare species.

Soil Classification
According to the Soil Survey of Essex County, Massachusetts, prepared by the US Department of Agriculture, Soil Conservation Service, underlying soils located within the site consist primarily of Paxton Fine Sandy Loam and Woodbridge Fine Sandy Loam (see Soils Map). Paxton and Woodbridge soils, are classified within SCS Hydrologic Soil Group C.

Table 1
Hydrologic Soil Group Ratings

Map Unit Symbol	Map Unit Name	Rating
305C	Paxton Fine Sandy Loam 8-15% slope	C
311B	Woodbridge Fine Sandy Loam 0 -8%	C

The on-site soils consist of series, described by NRCS, as follows:

Paxton: The Paxton series consists of moderately well drained loamy soils formed in lodgment till and are shallow to bedrock. They are nearly level to moderately steep soils on hills, drumlins, till plains, and ground moraines. Slope ranges from 0 to 25 percent

Woodbridge: The Woodbridge series consists of moderately well drained loamy soils formed in lodgment till and are very deep to bedrock. They are nearly level to moderately steep soils on hills, drumlins, till plains, and ground moraines. Slope ranges from 0 to 25 percent.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.
Per the soil survey, the general characteristics of the four (4) hydrologic soil groups are as follows:

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

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

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

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

Subsurface Investigation

Test pits have been performed and are shown on CS0002 of the planset. Ground water was found between 17-48". Bedrock was found as approximately 32"-80" deep in areas. The soils were found to be consistent with a C soil type as indicated in the USGS soil survey report. Sufficient soils were found beneath the proposed detention/infiltration basin to allow for a conservative infiltration

VIII. DRAINAGE ANALYSIS

Methodology

The comparative hydrologic analysis of pre-development conditions to post-development conditions was performed using the Soil Conservation Service, Technical Release 20 (TR-20). The 2, 10, 25, and 100-year storm events were modeled for a 24-hour, Type III storm using HydroCAD version 8.5. HydroCAD calculations for pre-and post-development conditions are include in the Appendices.

The following rainfall amounts were utilized for each design storm event.

2-year Frequency Storm:	3.18 inches per 24-hours
10-year Frequency Storm:	5.04 inches per 24-hours
25-year Frequency Storm:	6.20 inches per 24 hours
100-year Frequency Storm:	7.99 inches per 24-hours

Existing Watershed

The existing site does not contain any drainage systems. Stormwater runoff infiltrates onsite and sheet flows offsite to the southeastern wetlands. The existing catchment areas and drainage runoff flow patterns associated with the site are illustrated on the attached Pre-Development Watershed Plan (Dwg. CS9201). The drainage patterns will be maintained under post-development conditions.

For the purposes of the hydrologic analyses, the existing site has been delineated as two existing catchment areas which flow to two design points. Design Point 1 is located in Highland Road and Design point 2 is located in the wetland to the south east of the site.

The following Catchments flow to design point 1 in the pre-development condition

Catchment E1

Catchment EX1 includes areas of the site which direct stormwater runoff primarily toward the existing road (Highland Road). The topography within the catchment is moderately sloped (approx. 4%-8%). The catchment has grassed lawn area and a small portion of abutting paved driveway.

Catchment E2

Catchment EX2 includes areas of the site which direct stormwater runoff primarily toward the wetland series A on the southeast side of the property (DP #2). The area includes undeveloped woods areas and grass lawn areas. Slopes are moderate (approx. 5%–20%). The topography within the proposed developed site is gently sloping (approx. 5%). A portion of EX2 flows into wetland series B which ultimately flows into Wetland series A.

Proposed Watershed

The proposed subdivision will include a closed drainage system which will collect and convey stormwater runoff into several detention basins. For the purposes of the analyses, the proposed site has been divided into eleven (11) sub-catchment areas. The proposed catchment areas are shown on the Post-Development Watershed Plan (Dwg. CS9301)

The following Catchments flow to Design Point 1in the post-development condition

Catchment P1A/P1B
Catchment P1A and P1B includes flow from the proposed Sellers Farm Road and grassed shoulder. Runoff from these catchments flow to deep sump catch basins CB1 and CB2 respectively.

Catchment P2
Includes flow from 171 Highland Road. It consists primarily of lawn with a small portion of paved bit. Conc. Driveway. Stormwater sheet flows offsite and matches the predevelopment drainage conditions.

Catchment P3
Is located on lot 3 and consists of lot 3 roof area (R3), landscaped lawn and paved driveway. Stormwater is collected in the curb constructed along the southern edge of lot 3 driveway and conveyed into one of pond 1's sediment forebays.

Catchment P4A/P4B
Consists of the lower section and cul-de-sac of Sellers Farm Road. In addition, P4B collects stormwater from lot 1 driveway and front lawn. The stormwater is directed towards CB3 and CB4 respectively and ultimately discharged into Pond 1.

Catchment P5
Consists of pond 2, a small portion of Lot 1's lawn, and Lot 1 roof area (R1). Pond 2 is discharged into wetland series B after treatment.

Catchment P6
P6 consists of Lot 1's back yard grassed lawn, woodland, and wetland series B. the majority of P6 is unaltered from the predevelopment conditions.

Catchment P7
Catchment P7 consists of lot 3's grassed lawn, roof area (R3) and pond 3. A small portion of the Lot3 driveway is directed into Pond 3. Pond 3 is discharged into wetland series A.

Catchment P8
Consists of pond 1 and the two forebays. It collects water from the closed drainage system. Treated stormwater is discharged into wetland series A.

Catchment P9
Consists of Wetland Series A, woodland, and a small portion of the rear lawn of lot 3. The majority of P9 is unaltered from the pre-development conditions.

IX. SUMMARY OF PEAK DISCHARGE RATES AND VOLUMES

The estimation of flow rates and volumes were calculated utilizing *HydroCad* stormwater modeling software. The methodology is SCS TR-20, Type III, 24-hour rainfalls (2, 10, 25, & 100-year frequency storm events). Supporting calculations are included in the Appendix.

FLOW RATE TABLES

Point of Analysis	Storm	Pre-Development Rate (CFS)	Post-Development Rate (CFS)
DP #1 (Flow to Highland Rd)	2-year	0.43	0.33
	10-year	1.00	0.75
	25-Year	1.39	1.03
	100-year	2.01	1.48

Point of Analysis	Storm	Pre-Development Rate (CFS)	Post-Development Rate (CFS)
DP #2 (Back Property Line)	2-year	2.90	2.36
	10-year	7.84	6.85
	25-Year	11.32	10.64
	100-year	16.97	16.38

X. STORMWATER MANAGEMENT STANDARDS

The project has been designed to meet the *Mass DEP Stormwater Management Standards* outlined in the *Wetlands Protection Act Regulations*. The design also complies with the standards of the *Town of Andover Stormwater Management and Erosion Control*.

STORMWATER MANAGEMENT PRACTICES

The majority of the stormwater runoff from the developed site is routed through a closed drainage system into detention basins at the low points of the site. All three ponds are equipped with sediment forebays to pretreat stormwater and handle sediment load from impervious areas. Each pond has been designed as an infiltration/detention basin. Discharge from pond 1 and 3 is conveyed through an Outlet control structure to control flows.

Detention basin 2 is an infiltration/detention basin. This basin is sized to provide infiltration and treatment of runoff. The pond has an overflow weir which directs flow to the wetland in the 10, 25, and 100 year storm event

Each pond is sized appropriately for water quality and will successfully remove the required amount of nutrients.

CONFORMANCE WITH STANDARDS

Standard 1: No New Untreated Discharges – Met
There will be no new untreated outfalls proposed as part of this project; the stormwater management system is designed to provide a minimal level of water quality treatment for all discharges.

Standard 2: Peak Rate Attenuation – Met
There will be an increase to the impervious area associated with the redevelopment of this site. Pre- and post-development watershed analyses of the drainage systems were performed for the 2, 10, 25 and 100-year storms. A summary of peak discharge rates for the pre and post development conditions is presented in section IX and the full Hydrocad printouts are included in the Appendix to this report. The results of the analysis indicate that post-development peak discharge rates will not increase from the pre-development peak discharge rates for the design point in the analysis.

Standard 3: Recharge Volume– Met
At a minimum, Standard 3 requires that the post-development site provides at least as much recharge volume as the existing conditions. There will be an increase to the impervious areas of 28,322 square feet in the post development condition which is broken down as follows:

Paved Area = 21,848 square feet
Roof Areas = 6,474 square feet

There is a groundwater recharge requirement associated with this project under the Massachusetts Stormwater management act. Based upon the Type C soil, 0.25” over the area of impervious surface must be infiltrated. Under the Andover Stormwater management act, the requirement for TSS removal are considered met when 1” of run off from impervious surfaces is infiltrated.

28,322 sf x (1”/12”) = **2,360 cubic feet**

To meet this requirement infiltration is provided by infiltration in the detention ponds.

Basin 1:
For the area flowing to detention basin 1 the total impervious pavement area is 19,523 square feet. The required infiltration for the area flowing to ponds 1 is calculated as follows:

19,523sf x (1”/12”) = **1,626 CF**

The total volume of infiltration available in detention basin 1 between elevation 260.0 and elevation 260.75 (outlet elevation) is 1822 cf

1,822 cubic feet >1,626 CF

Basin 2:
For the area flowing to detention basin 2 the total impervious pavement area is 5,449 square feet. The required infiltration for the area flowing to ponds 1 is calculated as follows:

5,449sf x (1”/12”) = **454 CF**

The total volume of infiltration available in detention basin 2 between elevation 262.5 and elevation 263.33 (outlet elevation) is 1100 cf

1560 cf provided > 454 cf required

Basin 3:
For the area flowing to detention basin 3 the total impervious pavement area is 3,350 square feet. The required infiltration for the area flowing to ponds 3 is calculated as follows:

3,350 sf x (1”/12”) = 279 **CF**

The total volume of infiltration available in detention pond 3 between elevation 262.75 and elevation 263.05 (outlet elevation) = 312 cf

312 cf provided > 279 cf required

The stormwater management act requires that no less than 65% of the impervious area flow to the infiltration systems for the project site. All impervious surfaces flow to infiltration system so an adjustment is not required.

72-Hour Drawdown Calculations

The drawdown time for the detention basin is determined with the following equation.

$$\text{Time (drawdown)} = \frac{\text{ReV}}{(\text{K}) \times \text{Area}}$$

Where, ReV = recharge Volume Provided
K = Saturated Hydraulic Conductivity (Rawls Rate for HSG B soils)
Area = Average Surface area of basin bottom

Three (3) soil samples were taken on site from Test Pit 6, 7 and 10 (see CS0201 and sieve analysis reports) and indicate that the underlying soil is a sandy loamy. The infiltration rate

associated with a loamy sand is 1.02 inches per hour and is the rate used in the drawdown calculations below.

Detention Basin 1
The volume of stormwater stored will infiltrate through the bottom of the detention basin in time

$$\text{Time (drawdown)} = \frac{1{,}822\text{cf}}{(1.02\text{"/hr})/12 \times 2125\text{ sf}} = 10\text{ hours}$$

Detention Basin 2
The volume of stormwater stored will infiltrate through the bottom of the detention basin in time

$$\text{Time (drawdown)} = \frac{511\text{cf}}{(1.02\text{"/hr})/12 \times 616\text{ sf}} = 9.75\text{ hours}$$

Detention Basin 3
The volume of stormwater stored will infiltrate through the bottom of the detention basin in time

$$\text{Time (drawdown)} = \frac{338\text{cf}}{(1.02\text{"/hr})/12 \times 541\text{ sf}} = 6.5\text{ hours}$$

Standard 4: Water Quality – Met
According to Andover Stormwater regulations, the project is subject to a 90% TSS Removal Rate and a 60% Phosphorus removal rate requirement. The requirement is also considered met when one inch of water over the impervious area is retained. Water quality will be provided in three separate treatment trains as detailed below.

Detention Basin 1-3

Water quality will be provided using deep sump catch basins, sediment forebays, and a infiltration/detention basin. The water quality volume treated within this system will be as follows: The volume subject to treatment is the same volume which was calculated for Standard 3 above

Basin 1
= **1,822 cubic feet provided > 1626 CF required**

Basin 2
= 1560 cubic feet provided > 454 CF required

Basin 3
= 312 cubic feet provided > 279 CF required

The detention basin water quality treatment train includes deep sump catch basins, which provide a 25% TSS removal rate, sediment forebay which provides 25% TSS removal and the dry detention/infiltration basin which provides 80% TSS removal rate. The total TSS removal rate for this treatment chain is 85% which meets standard 4 of the Massachusetts stormwater regulations of 80% TSS removal. Additionally, Andover Stormwater Management Act requires 60% Total Phosphorous removal. Infiltration/detention Basins equipped with Sediment forebays remove 60-80% Total Phosphorus which meets the requirements.

Revised Universal Soil Loss Equation (RUSLE)
Annual Sediment Load per Catch Basin w/ 4' deep sump

Sediment load (CF/yr) = Paved Area (Ac) * 750 LB/Ac-storm / 90LB/CF * 10 storms/yr
Volume of 4' deep sump catch basin = pi*r*r*h = 3.14 x 2ft x 2ft x 4 ft = 50.25 CF

CB1
Load = 0.034 ac * 750 * (1/90) * 10 = 2.83 cf/yr
CB2
Load = 0.034 ac * 750 * (1/90) * 10 = 2.83 cf/yr
CB3
Load = 0.12 ac * 750 * (1/90) * 10 = 10 cf/yr
CB4
Load = 0.16 ac * 750 * (1/90) * 10 = 13.3 cf/yr

Sediment Forebay Sizing
Required Volume = Impervious Area x (0.1"/12")

Pond 1:
Required Volume = 19,523 SF x (0.1"/12") = 162 CF
Provided Volume = 780 CF

Pond 2:
Required Volume = 5,449 SF x (0.1"/12") = 45 CF
Provided Volume = 76.25 CF

Pond 3:
Required Volume = 3,350 SF x (0.1"/12") = 28 CF
Provided Volume = 285 CF

Standard 5: LUHPPL's – Not applicable

Standard 6: Critical Areas _ Not Applicable

Standard 7: Redevelopment Projects Not Applicable

Standard 8: Erosion and Sediment Control – Met

Soil and erosion control shall be provided during construction by means of siltation fence, and/or compost filter tubes. Inlet protection will be installed on all drain inlets and a construction entrance will be used in areas where the pavement and building are being removed.

The Stormwater Pollution Prevention Plan (SWPPP) has been completed and included with this report. The Contractor will submit the SWPPP through the NPDES Notice system prior to any land disturbance.

Standard 9: Operation and Maintenance Plan – Met

The operation and maintenance plan for the post-construction BMP's on this project will be the responsibility of the Property Owner. The Operation and Maintenance Plan for the proposed drainage systems can be found in the Appendix.

Standard 10: Illicit Discharges – Met

There are no known or suspected illicit discharges to the proposed stormwater conveyance system.

In summary, this project meets Standards 1, 2,3, 4, 8, 9, and 10. Standards 5, 6, and 7 are not applicable to the project.

XI. POLLUTION PREVENTION PLANS

Construction Period Erosion and Sedimentation Control Plan:

The BMP's associated with the construction phase this project will be owned by the Applicant's Contractor, which will be responsible for inspection, operation and maintenance. A more detailed SWPPP – per NPDES Phase 2 requirements – is to be kept on site, along with inspection logs. All details and plans required are included in the Site Plan set attached herewith.

1. The contractor is to install and maintain drainage facilities as shown on site plan prepared by Ranger Engineering Group, Inc. (Ranger), dated March 04, 2022.

2. Prior to commencement of construction the contractor shall file a notice of intent under the EPA NPDES construction permit.

3. Any dewatering requires coverage under the NPDES construction site dewatering general permit.

4. The contractor must install erosion control measures as shown on the plans and in the details prior to starting any other work on the site. Erosion control must be installed at every inlet structure (existing and proposed) and maintained for the duration of the project.

5. Erosion controls as shown on plans shall be inspected, repaired and/or maintained by the contractor daily and within 12 hours of each storm event.

6. Sediment deposits shall be removed when they reach a depth of 1/4 to 1/2 the height of the silt fence or sediment sock.

7. Sediment shall be contained within the construction site, away from drainage structures. Sediment reaching the public way shall be removed by street sweeping and not by flushing.

8. Stabilize slopes steeper than 3:1 (horizontal to vertical) with seed, secured geotextile fabric, or rock rip-rap as required to prevent erosion during construction.

9. Clean out catch basins, drain manholes and storm drain pipes after completion of construction.

10. Loam and seed all disturbed areas. Permanent seeding shall occur in the spring from late march through may and in late summer or early fall between August and October.

11. Dust shall be controlled at the site with mechanical water spraying as necessary and during extended dry periods.

12. Upon establishment of permanent vegetation over disturbed areas, remove and dispose of hay wattles and stakes.

13. It is the responsibility of the contractor to maintain and supplement the specified sedimentation controls as necessary to prevent sedimentation of off-site areas and/or any regulated resource areas. Failure by the contractor to control erosion, pollution and/or siltation shall be cause for the owner to employ outside assistance or to use his

own means to provide the necessary corrective measure. The cost of such assistance plus project engineering costs will be the contractor's responsibility.

14. In addition to those locations shown on this plan and on the grading and drainage plans, erosion controls shall be installed at the following locations: toe of slope of embankment construction, toe of temporary earthwork stockpiles. Stockpile side slopes shall not exceed 2:1.

15. Erosion and sedimentation control shall be installed and maintained in compliance with Massachusetts stormwater policy.

LONG TERM POLUTION PREVENTION PLAN

It is the responsibility of the property owner to properly maintain the drainage systems and structures, including drain pipes. The current property owner will oversee long term maintenance of the stormwater system and will be responsible for compliance with the Long Term Pollution Prevention Plan upon completion of the construction.

Regular maintenance is to include the following:

1. **Cleaning of Debris from Stormwater Ponds**
   Trash and debris shall be removed from the stormwater ponds monthly.

2. **Mowing Interior of Stormwater Ponds**
   Grass slopes within and around stormwater ponds shall be mowed a minimum of twice per year to prevent the growth of woody vegetation

3. **Pavement Sweeping**
   Pavement surfaces shall be swept a minimum of twice per year, preferably just after snow melt and late in the fall.

4. **Catch Basin Sumps, Drain Manhole and Outlet Control Structures**
   Inspect quarterly for the evidence of structural damage, silt accumulation and improper function. Remove accumulated sediments and debris from catch basin sump when sump is more than 25% full, minimum annually just after snow melt.

5. **Drain Pipes**
   Inspect annually for the evidence of structural damage, silt accumulation and improper function. Clean pipes when sediment occupies more than 20% of pipe diameter.

6. **Sediment Forebays**
   Inspect quarterly for accumulation of silt and debris. Remove silt when deeper than 4”.

7. **Dry Detention / Infiltration Ponds**
   Inspect after every storm event for first few months of operation to ensure that the ponds are infiltrating properly. Thereafter inspect twice per year for evidence of structural damage, erosion, and sediment accumulation. Inspect outlet structure and rip rap protection for proper function and control of erosion. Mow the side slopes, remove trash, debris, and grass clippings a minimum of twice per year.

8. **Graded Slopes and Rip Rap outlets**
   Inspect every spring for erosion. Repair any erosion by placing rip-rap or loam and seed. Nurtured freshly seeded areas to ensure proper germination and establishment of turf.

Inspections shall be performed by a qualified person with knowledge of stormwater structures and conveyance systems A report of inspections shall be submitted to the Town of Billerica on an annual basis within 30 days of the end of each calendar year.

The requirement and responsibility for the inspection and maintenance of the stormwater system will continue to any subsequent owners of the property.

Current Property Owner who will be responsible for the operation, maintenance, and emergency repairs of the stormwater system.

LRC Builders, LLC
475 Boston Road
Billerica, MA 01821

Inspection Costs

The annual costs of implementing the required inspections and maintenance outlined in the long-term pollution prevention plan are expected to be as follows:

- Quarterly inspections $ 2,000
- Annual roadway sweeping $ 1,500
- Removal of silt from stormwater treatment systems $ 2,000
- Annual mowing of side slopes $ 500
- Annual catch basin cleaning $ 1,500

Public Safety

The stormwater management system is designed as a passive system and when maintained properly it should not pose any threat to public safety.

ANNUAL LONG TERM POLUTION PREVENTION PLAN
MAINTINANCE AND INSPECTION LOG

This inspection log shall be maintained on site and completed as required during the calendar year when stormwater system maintenance and inspection is performed. General Maintenance items such as mowing and removal of debris from stormwater systems can be completed by persons employed by the property owner. Inspections of stormwater systems and piping should be performed by a person with knowledge of stormwater systems and is qualified to perform such inspections.

Plan Year _____

Cleaning of Debris from Stormwater Ponds
Trash and debris shall be removed from the stormwater ponds on a monthly basis

MONTH	DATE	PERFORMED BY	COMMENTS
JANUARY			
FEBRUARY			
MARCH			
APRIL			
MAY			
JUNE			
JULY			
AUGUST			
SEPTEMBER			
OCTOBER			
NOVEMBER			
DECEMBER			

Mowing Interior of Stormwater Ponds
Grass slopes within and around stormwater ponds shall be mowed a minimum of twice per year to prevent the growth of woody vegetation

DATE	PERFORMED BY	COMMENTS

Pavement Sweeping
Pavement surfaces shall be swept a minimum of twice per year, preferably just after snow melt and late in the fall.

DATE	PERFORMED BY	COMMENTS

Catch Basin Sumps, Drain Manhole and Outlet Control Structures
Inspect quarterly for the evidence of structural damage, silt accumulation and improper function. Remove accumulated sediments and debris from catch basin sump when sump is more than 25% full, minimum annually just after snow melt.

.

INSPECTION DATE	PERFORMED BY	COMMENTS

Drain Pipes
Inspect annually for the evidence of structural damage, silt accumulation and improper function. Clean pipes when sediment occupies more than 20% of pipe diameter.

INSPECTION DATE	PERFORMED BY	COMMENTS

Sediment Forebays
Inspect quarterly for accumulation of silt and debris. Remove silt when deeper than 4".

INSPECTION DATE	PERFORMED BY	COMMENTS

Dry Detention / Infiltration Ponds
Inspect after every storm event for first few months of operation to ensure that the ponds are infiltrating properly. Thereafter inspect twice per year for evidence of structural damage, erosion, and sediment accumulation. Inspect outlet structure and rip rap protection for proper function and control of erosion. Mow the side slopes, remove trash, debris, and grass clippings a minimum of twice per year.

INSPECTION DATE	PERFORMED BY	COMMENTS

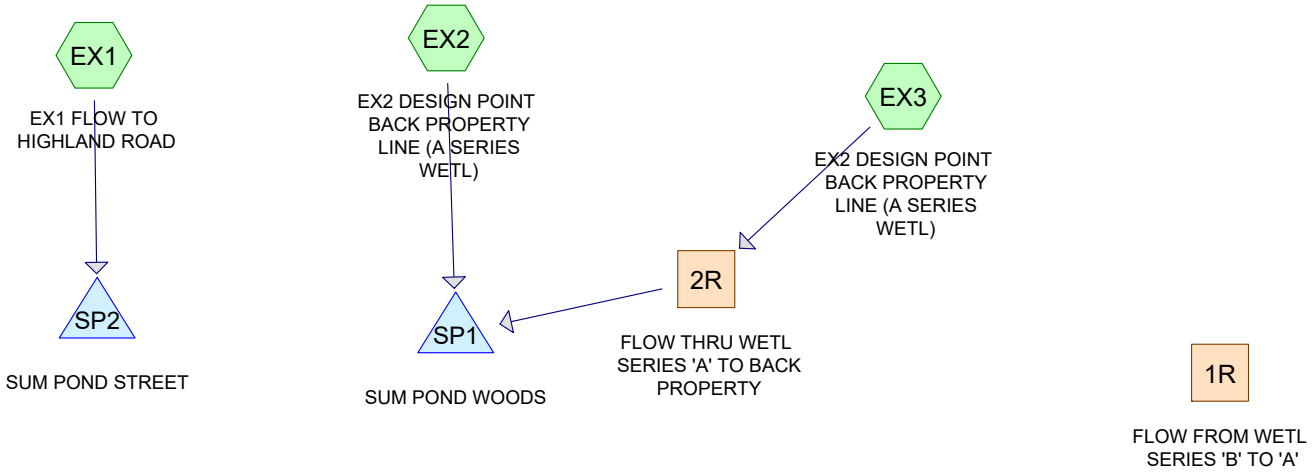
Graded Slopes and Rip Rap outlets
Inspect every spring for erosion. Repair any erosion by placing rip-rap or loam and seed. Nurtured freshly seeded areas to ensure proper germination and establishment of turf.

INSPECTION DATE	PERFORMED BY	COMMENTS

Corrective actions
In the area below describe any repairs made to the system during the current calendar year. Add additional sheets if necessary

APPENDICES

HYDROCAD CALCULATIONS



Subcat Reach Pond Link

Routing Diagram for SELLERS FARM PRE DEVELOPMENT
Prepared by {enter your company name here}, Printed 7/11/2022

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 year	Type III 24-hr		Default	24.00	1	3.18	2
2	10 year	Type III 24-hr		Default	24.00	1	5.04	2
3	25 year	Type III 24-hr		Default	24.00	1	6.20	2
4	100 Year	Type III 24-hr		Default	24.00	1	7.99	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
55,825	86	<50% Grass cover, Poor, HSG C (EX1, EX2, EX3)
1,415	98	Paved parking, HSG C (EX1)
1,000	98	Roofs, HSG C (EX3)
115,704	70	Woods, Good, HSG C (EX1, EX2, EX3)
6,667	77	Woods, Poor, HSG C (EX2)
17,466	79	Woods/grass comb., Good, HSG D (EX2, EX3)
198,077	**76**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
180,611	HSG C	EX1, EX2, EX3
17,466	HSG D	EX2, EX3
0	Other	
198,077		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	0	55,825	0	0	55,825	<50% Grass cover, Poor	
0	0	1,415	0	0	1,415	Paved parking	
0	0	1,000	0	0	1,000	Roofs	
0	0	115,704	0	0	115,704	Woods, Good	
0	0	6,667	0	0	6,667	Woods, Poor	
0	0	0	17,466	0	17,466	Woods/grass comb., Good	
0	**0**	**180,611**	**17,466**	**0**	**198,077**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1R	259.75	258.00	30.0	0.0583	0.035	0.0	12.0	0.0

PRE-DEVELOPMENT DRAINAGE

2 YEAR STORM

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX1: EX1 FLOW TO Runoff Area=14,525 sf 9.74% Impervious Runoff Depth>1.74"
Flow Length=205' Tc=5.0 min CN=85 Runoff=0.68 cfs 2,105 cf

Subcatchment EX2: EX2 DESIGN POINT Runoff Area=125,315 sf 0.00% Impervious Runoff Depth>1.13"
Flow Length=400' Tc=18.5 min CN=76 Runoff=2.56 cfs 11,833 cf

Subcatchment EX3: EX2 DESIGN POINT Runoff Area=58,237 sf 1.72% Impervious Runoff Depth>0.97"
Flow Length=335' Tc=14.9 min CN=73 Runoff=1.07 cfs 4,690 cf

Reach 1R: FLOW FROM WETL SERIES 'B' TO 'A' Avg. Flow Depth=0.00' Max Vel=0.00 fps
12.0" Round Pipe n=0.035 L=30.0' S=0.0583 '/' Capacity=3.20 cfs Outflow=0.00 cfs 0 cf

Reach 2R: FLOW THRU WETL SERIES Avg. Flow Depth=0.28' Max Vel=0.97 fps Inflow=1.07 cfs 4,690 cf
n=0.100 L=110.0' S=0.0309 '/' Capacity=3.00 cfs Outflow=1.05 cfs 4,680 cf

Pond SP1: SUM POND WOODS Inflow=3.60 cfs 16,513 cf
Primary=3.60 cfs 16,513 cf

Pond SP2: SUM POND STREET Inflow=0.68 cfs 2,105 cf
Primary=0.68 cfs 2,105 cf

Total Runoff Area = 198,077 sf Runoff Volume = 18,629 cf Average Runoff Depth = 1.13"
98.78% Pervious = 195,662 sf 1.22% Impervious = 2,415 sf

Summary for Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD

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

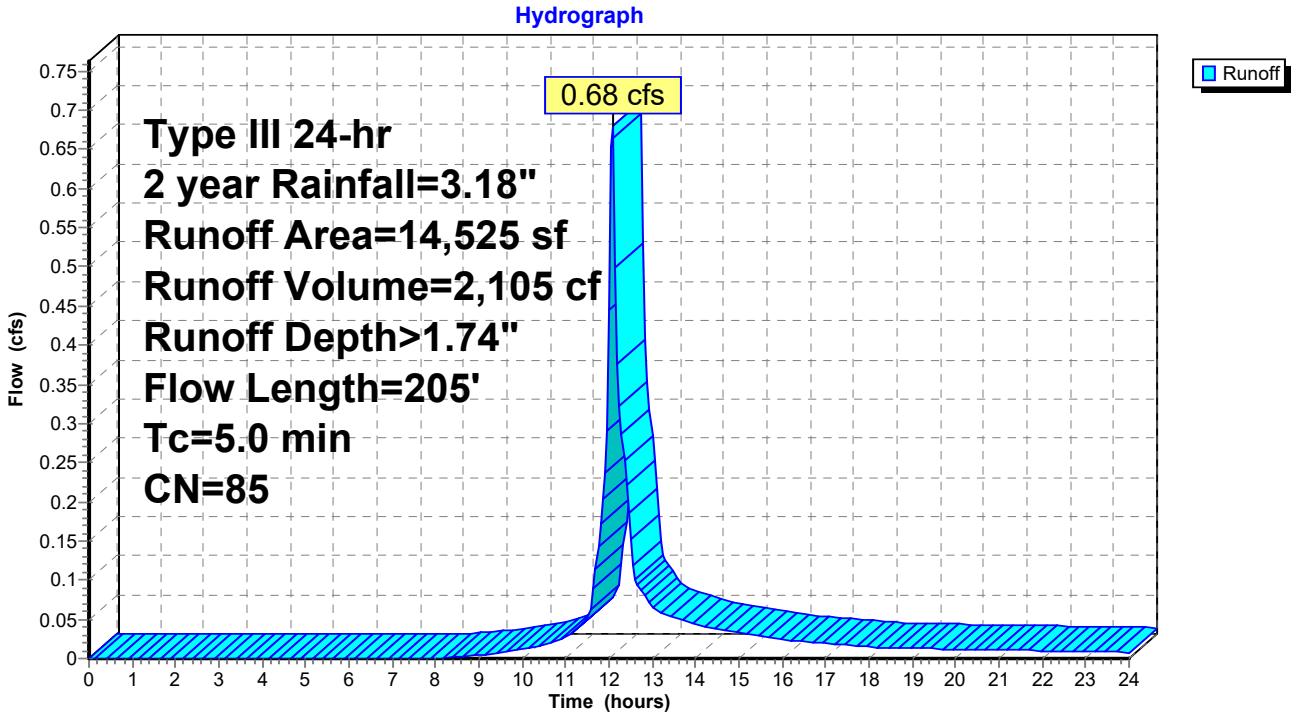
Runoff = 0.68 cfs @ 12.08 hrs, Volume= 2,105 cf, Depth> 1.74"
Routed to Pond SP2 : SUM POND STREET

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
10,810	86	<50% Grass cover, Poor, HSG C
2,300	70	Woods, Good, HSG C
14,525	85	Weighted Average
13,110		90.26% Pervious Area
1,415		9.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		**Sheet Flow, FLOW OVER GRASS** Grass: Short n= 0.150 P2= 3.12"
0.4	35	0.0420	1.43		**Shallow Concentrated Flow, FLOW OVER GRASS** Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		**Shallow Concentrated Flow, FLOW ALONG DRIVEWAY** Paved Kv= 20.3 fps
5.0	205	Total			

Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD



Summary for Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)

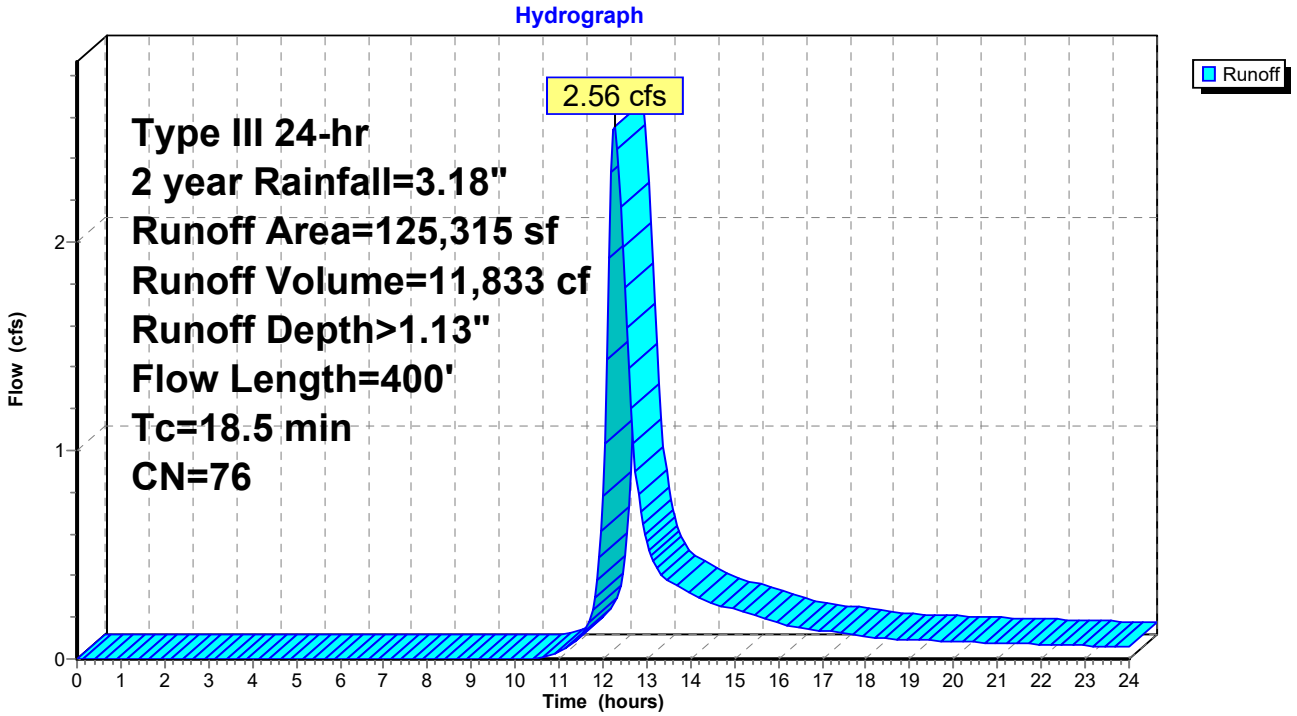
Runoff = 2.56 cfs @ 12.27 hrs, Volume= 11,833 cf, Depth> 1.13"
Routed to Pond SP1 : SUM POND WOODS

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
41,415	86	<50% Grass cover, Poor, HSG C
66,589	70	Woods, Good, HSG C
10,644	79	Woods/grass comb., Good, HSG D
6,667	77	Woods, Poor, HSG C
125,315	76	Weighted Average
125,315		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow, FLOW OVER GRASS** Woods: Light underbrush n= 0.400 P2= 3.12"
3.5	150	0.0200	0.71		**Shallow Concentrated Flow, FLOW IN WOODS** Woodland Kv= 5.0 fps
2.5	200	0.0700	1.32		**Shallow Concentrated Flow, FLOW IN WOODS** Woodland Kv= 5.0 fps
18.5	400	Total			

Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)



Summary for Subcatchment EX3: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)

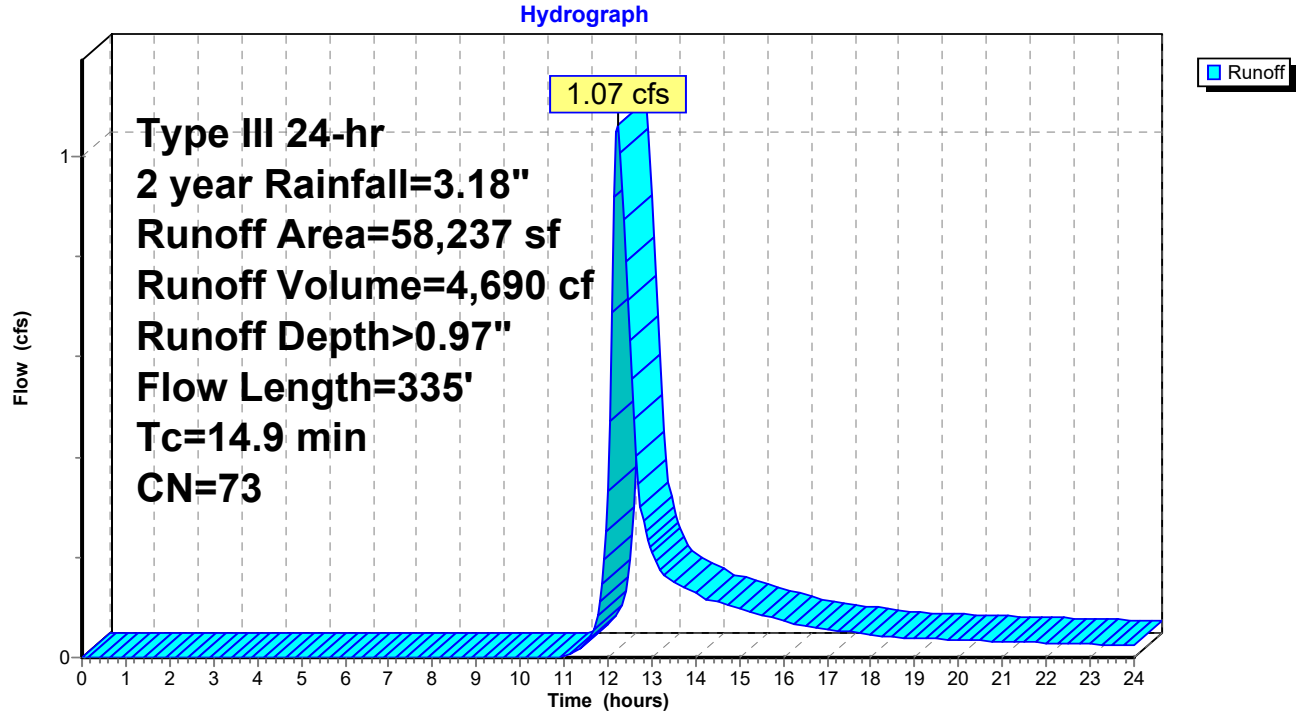
Runoff = 1.07 cfs @ 12.22 hrs, Volume= 4,690 cf, Depth> 0.97"
Routed to Reach 2R : FLOW THRU WETL SERIES 'A' TO BACK PROPERTY

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
3,600	86	<50% Grass cover, Poor, HSG C
46,815	70	Woods, Good, HSG C
6,822	79	Woods/grass comb., Good, HSG D
1,000	98	Roofs, HSG C
58,237	73	Weighted Average
57,237		98.28% Pervious Area
1,000		1.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0900	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
1.4	125	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.7	160	0.0250	0.40		**Shallow Concentrated Flow, FLOW THRU WETLAND B** Forest w/Heavy Litter Kv= 2.5 fps
14.9	335	Total			

Subcatchment EX3: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)

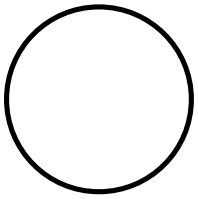


Summary for Reach 1R: FLOW FROM WETL SERIES 'B' TO 'A'

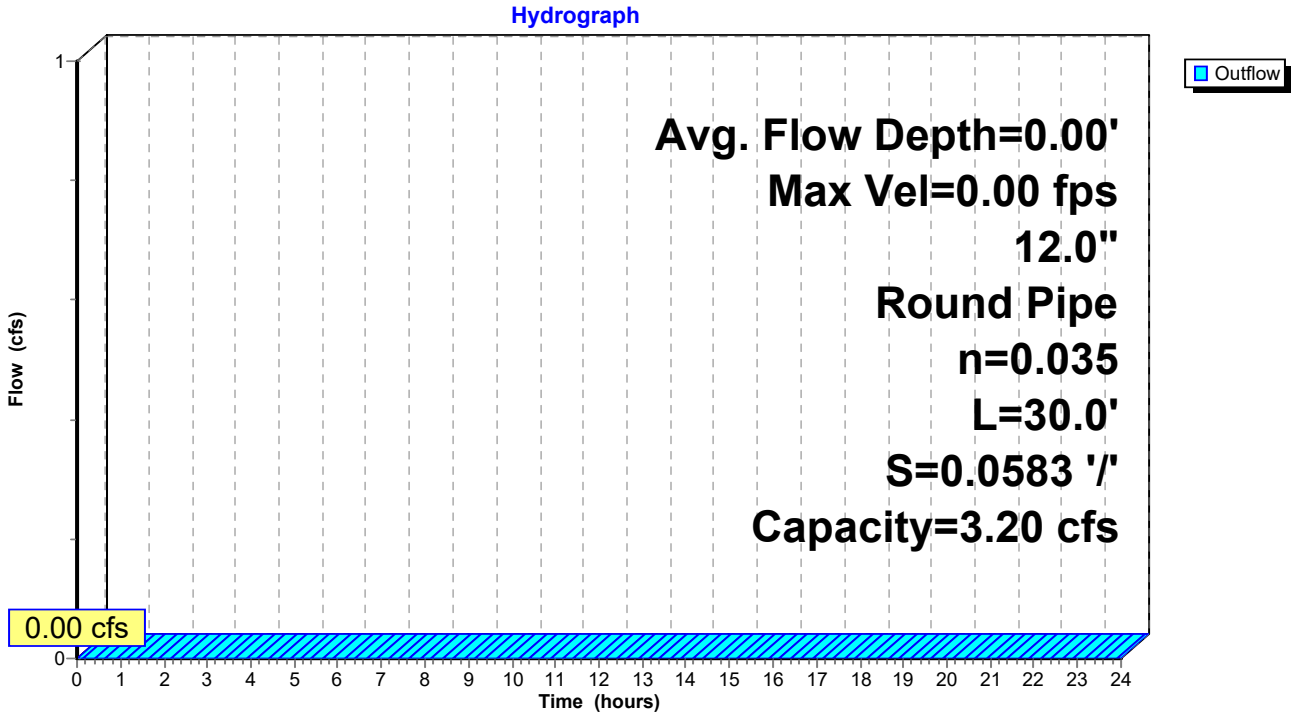
[43] Hint: Has no inflow (Outflow=Zero)

Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.20 cfs

12.0" Round Pipe
n= 0.035 Earth, dense weeds
Length= 30.0' Slope= 0.0583 '/'
Inlet Invert= 259.75', Outlet Invert= 258.00'



Reach 1R: FLOW FROM WETL SERIES 'B' TO 'A'



Summary for Reach 2R: FLOW THRU WETL SERIES 'A' TO BACK PROPERTY

Inflow Area = 58,237 sf, 1.72% Impervious, Inflow Depth > 0.97" for 2 year event
Inflow = 1.07 cfs @ 12.22 hrs, Volume= 4,690 cf
Outflow = 1.05 cfs @ 12.25 hrs, Volume= 4,680 cf, Atten= 1%, Lag= 1.7 min
Routed to Pond SP1 : SUM POND WOODS

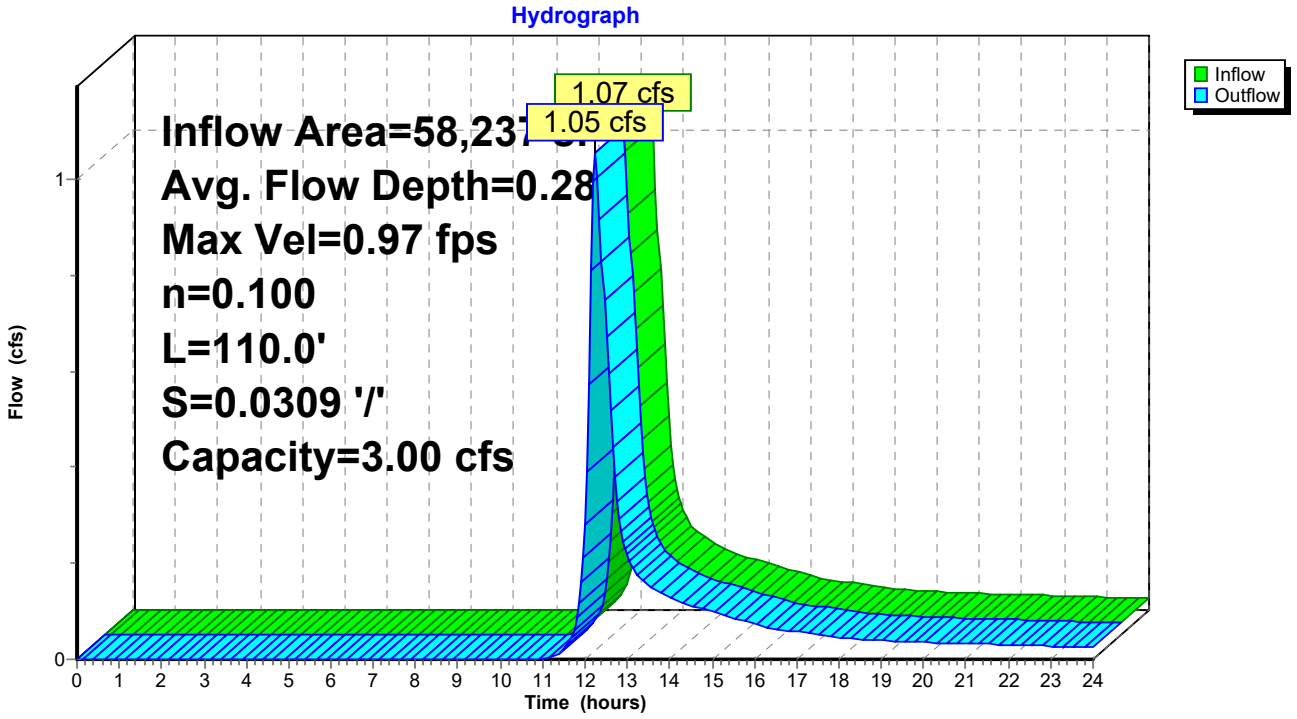
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.97 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.37 fps, Avg. Travel Time= 5.0 min

Peak Storage= 119 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.28' , Surface Width= 4.69'
Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 3.00 cfs

3.00' x 0.50' deep channel, n= 0.100 Earth, dense brush, high stage
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 110.0' Slope= 0.0309 '/'
Inlet Invert= 257.90', Outlet Invert= 254.50'

‡

Reach 2R: FLOW THRU WETL SERIES 'A' TO BACK PROPERTY



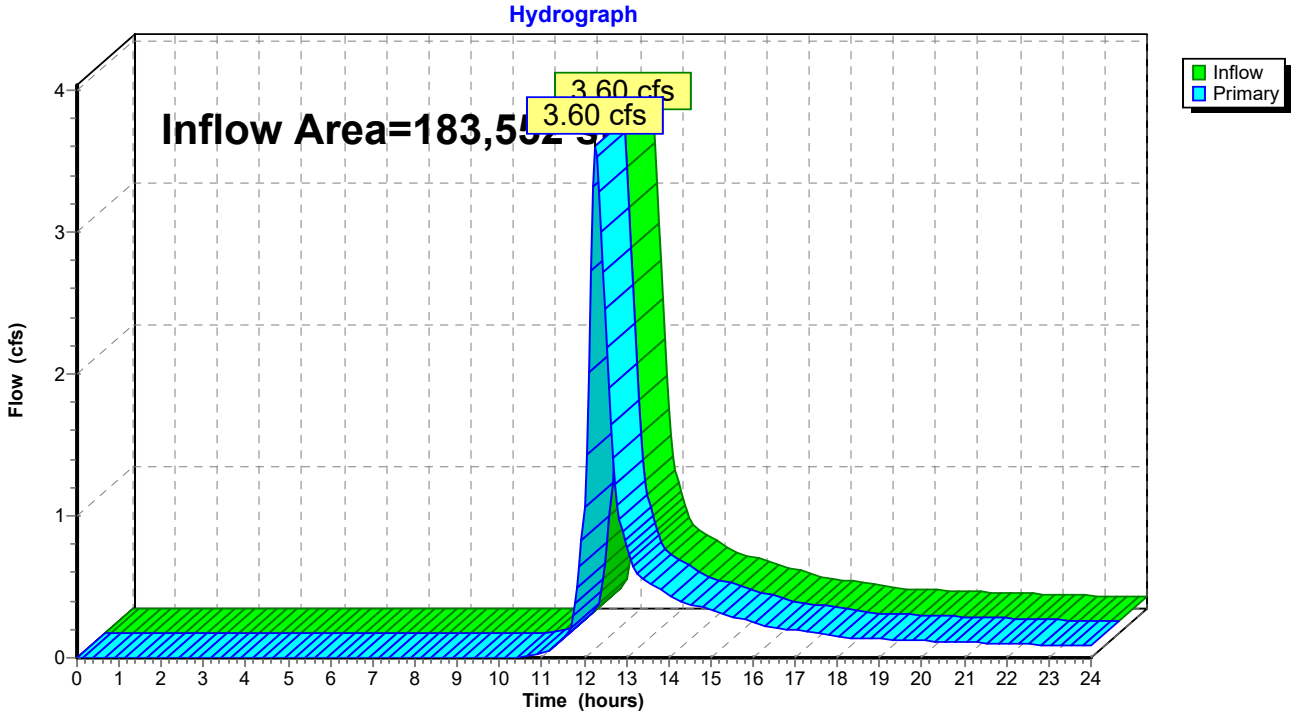
Summary for Pond SP1: SUM POND WOODS

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 183,552 sf, 0.54% Impervious, Inflow Depth > 1.08" for 2 year event
Inflow = 3.60 cfs @ 12.27 hrs, Volume= 16,513 cf
Primary = 3.60 cfs @ 12.27 hrs, Volume= 16,513 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: SUM POND WOODS



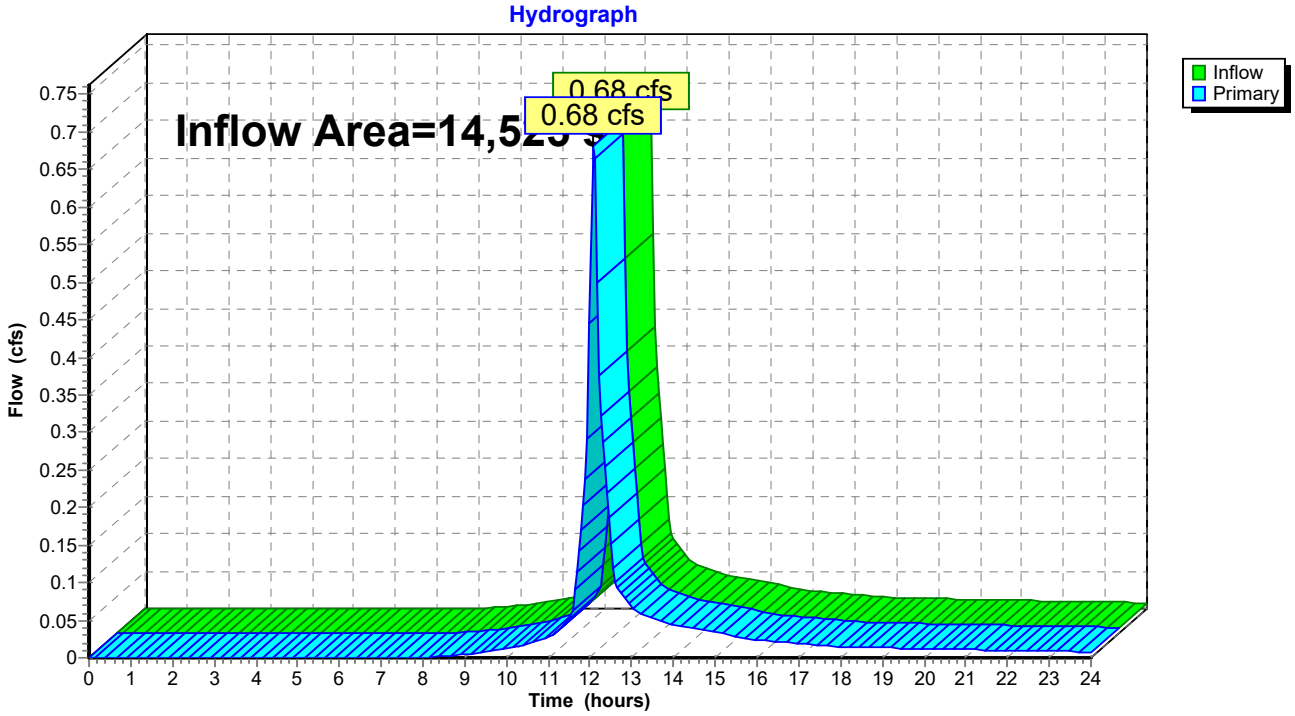
Summary for Pond SP2: SUM POND STREET

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14,525 sf, 9.74% Impervious, Inflow Depth > 1.74" for 2 year event
Inflow = 0.68 cfs @ 12.08 hrs, Volume= 2,105 cf
Primary = 0.68 cfs @ 12.08 hrs, Volume= 2,105 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET



PRE-DEVELOPMENT DRAINAGE

10 YEAR STORM

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX1: EX1 FLOW TO Runoff Area=14,525 sf 9.74% Impervious Runoff Depth>3.40"
Flow Length=205' Tc=5.0 min CN=85 Runoff=1.32 cfs 4,119 cf

Subcatchment EX2: EX2 DESIGN POINT Runoff Area=125,315 sf 0.00% Impervious Runoff Depth>2.56"
Flow Length=400' Tc=18.5 min CN=76 Runoff=6.00 cfs 26,724 cf

Subcatchment EX3: EX2 DESIGN POINT Runoff Area=58,237 sf 1.72% Impervious Runoff Depth>2.30"
Flow Length=335' Tc=14.9 min CN=73 Runoff=2.71 cfs 11,186 cf

Reach 1R: FLOW FROM WETL SERIES 'B' TO 'A' Avg. Flow Depth=0.00' Max Vel=0.00 fps
12.0" Round Pipe n=0.035 L=30.0' S=0.0583 '/' Capacity=3.20 cfs Outflow=0.00 cfs 0 cf

Reach 2R: FLOW THRU WETL SERIES Avg. Flow Depth=0.47' Max Vel=1.29 fps Inflow=2.71 cfs 11,186 cf
n=0.100 L=110.0' S=0.0309 '/' Capacity=3.00 cfs Outflow=2.68 cfs 11,170 cf

Pond SP1: SUM POND WOODS Inflow=8.66 cfs 37,894 cf
Primary=8.66 cfs 37,894 cf

Pond SP2: SUM POND STREET Inflow=1.32 cfs 4,119 cf
Primary=1.32 cfs 4,119 cf

Total Runoff Area = 198,077 sf Runoff Volume = 42,029 cf Average Runoff Depth = 2.55"
98.78% Pervious = 195,662 sf 1.22% Impervious = 2,415 sf

Summary for Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD

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

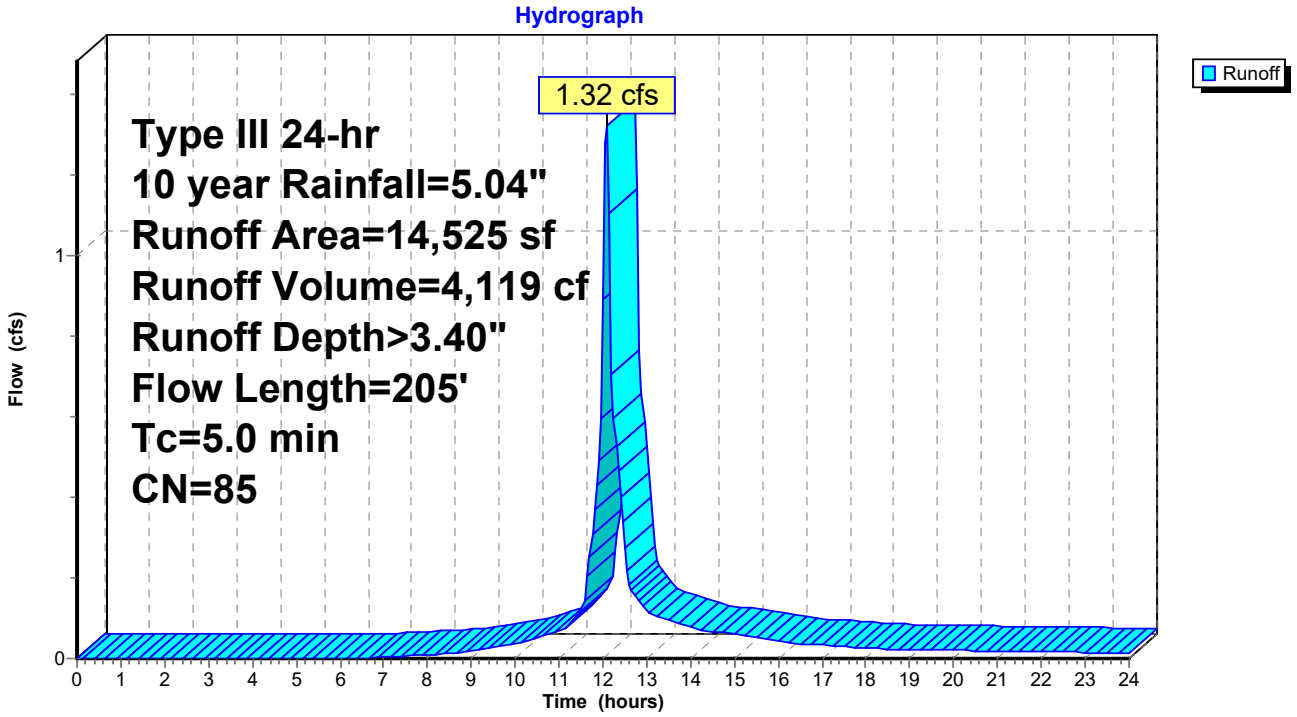
Runoff = 1.32 cfs @ 12.07 hrs, Volume= 4,119 cf, Depth> 3.40"
Routed to Pond SP2 : SUM POND STREET

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=5.04"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
10,810	86	<50% Grass cover, Poor, HSG C
2,300	70	Woods, Good, HSG C
14,525	85	Weighted Average
13,110		90.26% Pervious Area
1,415		9.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		**Sheet Flow, FLOW OVER GRASS** Grass: Short n= 0.150 P2= 3.12"
0.4	35	0.0420	1.43		**Shallow Concentrated Flow, FLOW OVER GRASS** Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		**Shallow Concentrated Flow, FLOW ALONG DRIVEWAY** Paved Kv= 20.3 fps
5.0	205	Total			

Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD



Summary for Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)

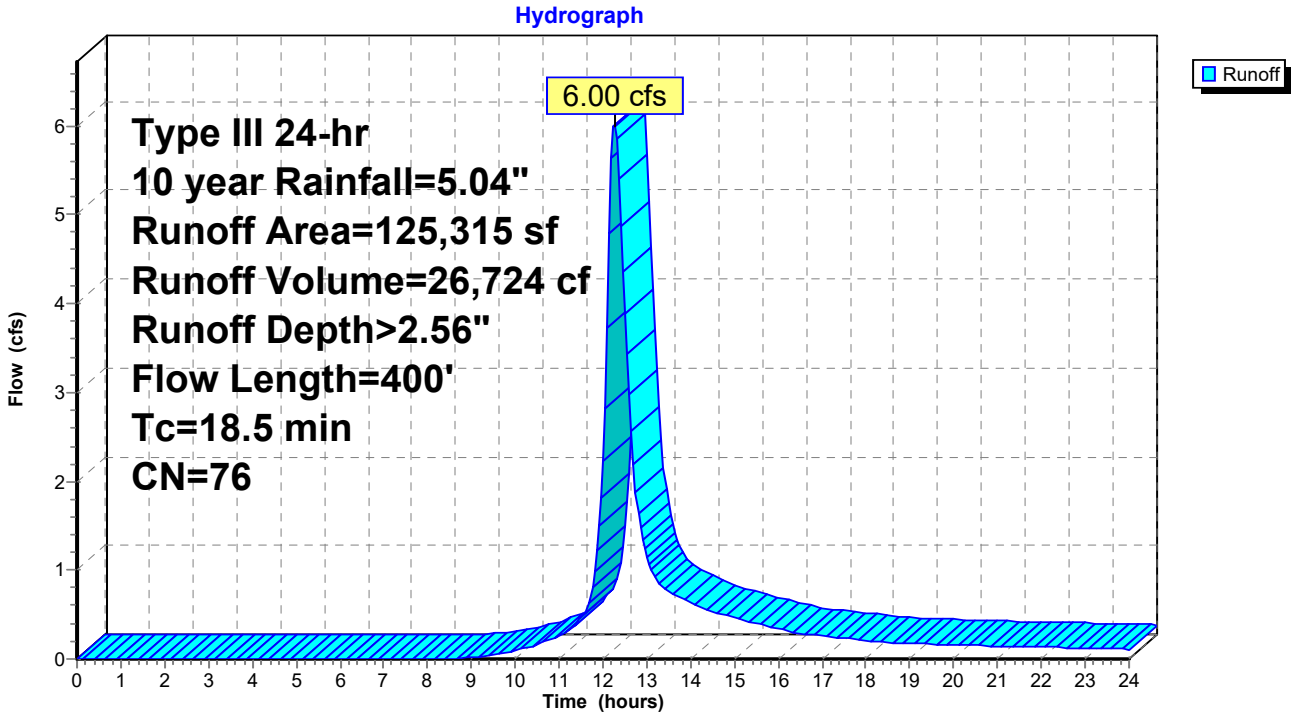
Runoff = 6.00 cfs @ 12.26 hrs, Volume= 26,724 cf, Depth> 2.56"
Routed to Pond SP1 : SUM POND WOODS

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=5.04"

Area (sf)	CN	Description
41,415	86	<50% Grass cover, Poor, HSG C
66,589	70	Woods, Good, HSG C
10,644	79	Woods/grass comb., Good, HSG D
6,667	77	Woods, Poor, HSG C
125,315	76	Weighted Average
125,315		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow, FLOW OVER GRASS** Woods: Light underbrush n= 0.400 P2= 3.12"
3.5	150	0.0200	0.71		**Shallow Concentrated Flow, FLOW IN WOODS** Woodland Kv= 5.0 fps
2.5	200	0.0700	1.32		**Shallow Concentrated Flow, FLOW IN WOODS** Woodland Kv= 5.0 fps
18.5	400	Total			

Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)



Summary for Subcatchment EX3: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)

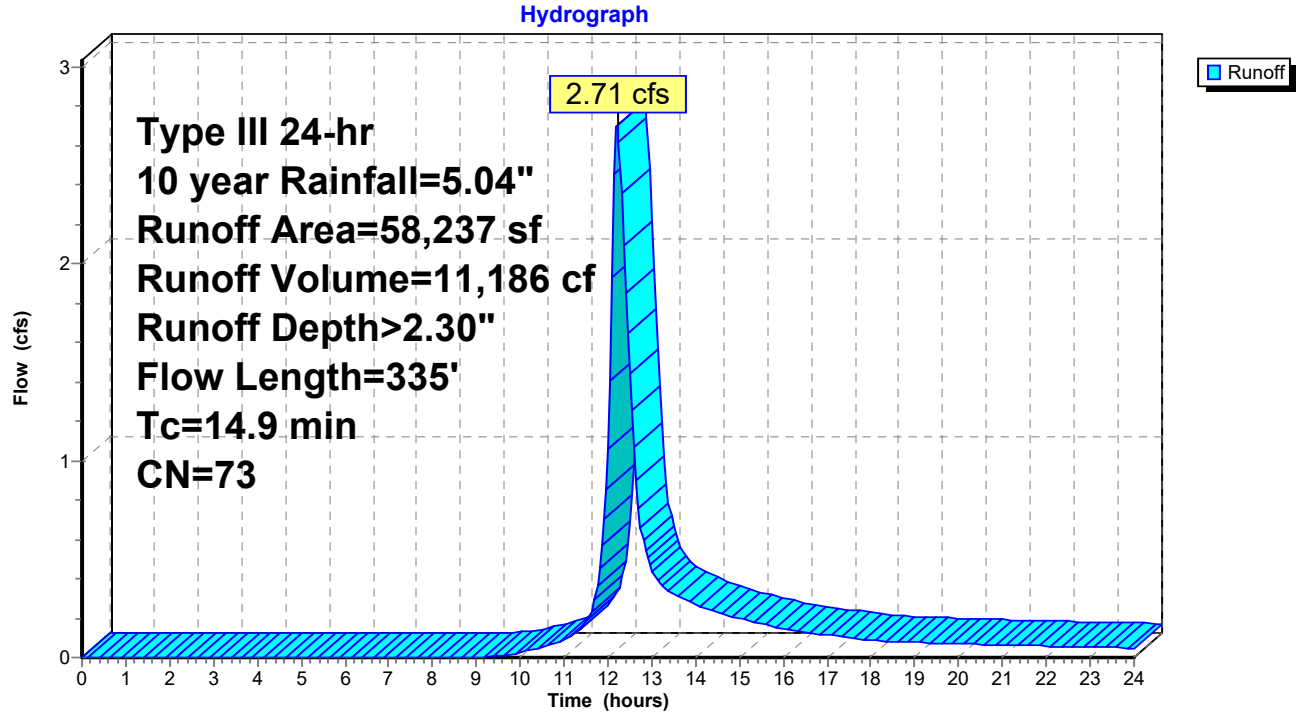
Runoff = 2.71 cfs @ 12.21 hrs, Volume= 11,186 cf, Depth> 2.30"
Routed to Reach 2R : FLOW THRU WETL SERIES 'A' TO BACK PROPERTY

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=5.04"

Area (sf)	CN	Description
3,600	86	<50% Grass cover, Poor, HSG C
46,815	70	Woods, Good, HSG C
6,822	79	Woods/grass comb., Good, HSG D
1,000	98	Roofs, HSG C
58,237	73	Weighted Average
57,237		98.28% Pervious Area
1,000		1.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0900	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
1.4	125	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.7	160	0.0250	0.40		**Shallow Concentrated Flow, FLOW THRU WETLAND B** Forest w/Heavy Litter Kv= 2.5 fps
14.9	335	Total			

Subcatchment EX3: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)

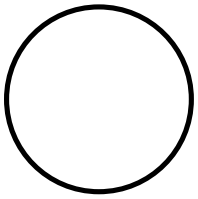


Summary for Reach 1R: FLOW FROM WETL SERIES 'B' TO 'A'

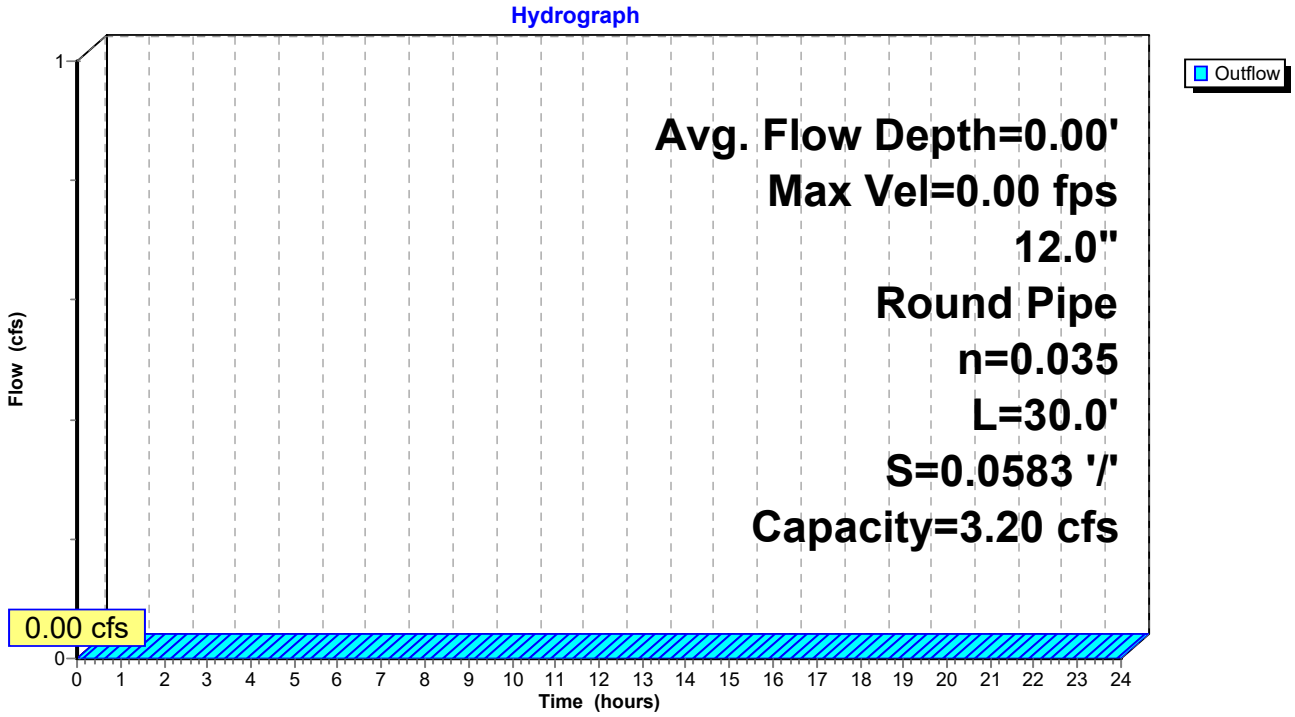
[43] Hint: Has no inflow (Outflow=Zero)

Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.20 cfs

12.0" Round Pipe
n= 0.035 Earth, dense weeds
Length= 30.0' Slope= 0.0583 '/'
Inlet Invert= 259.75', Outlet Invert= 258.00'



Reach 1R: FLOW FROM WETL SERIES 'B' TO 'A'



Summary for Reach 2R: FLOW THRU WETL SERIES 'A' TO BACK PROPERTY

Inflow Area = 58,237 sf, 1.72% Impervious, Inflow Depth > 2.30" for 10 year event
Inflow = 2.71 cfs @ 12.21 hrs, Volume= 11,186 cf
Outflow = 2.68 cfs @ 12.23 hrs, Volume= 11,170 cf, Atten= 1%, Lag= 1.1 min
Routed to Pond SP1 : SUM POND WOODS

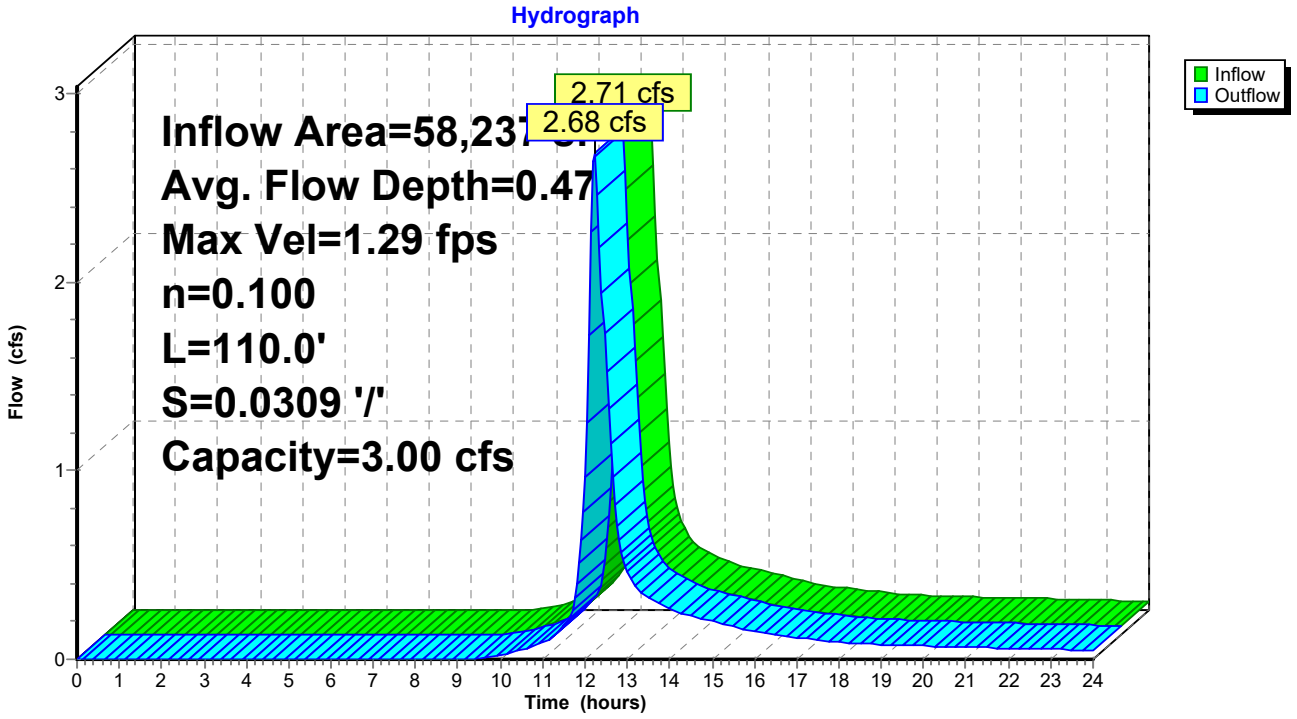
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.29 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.47 fps, Avg. Travel Time= 3.9 min

Peak Storage= 229 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.47' , Surface Width= 5.83'
Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 3.00 cfs

3.00' x 0.50' deep channel, n= 0.100 Earth, dense brush, high stage
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 110.0' Slope= 0.0309 '/'
Inlet Invert= 257.90', Outlet Invert= 254.50'

‡

Reach 2R: FLOW THRU WETL SERIES 'A' TO BACK PROPERTY



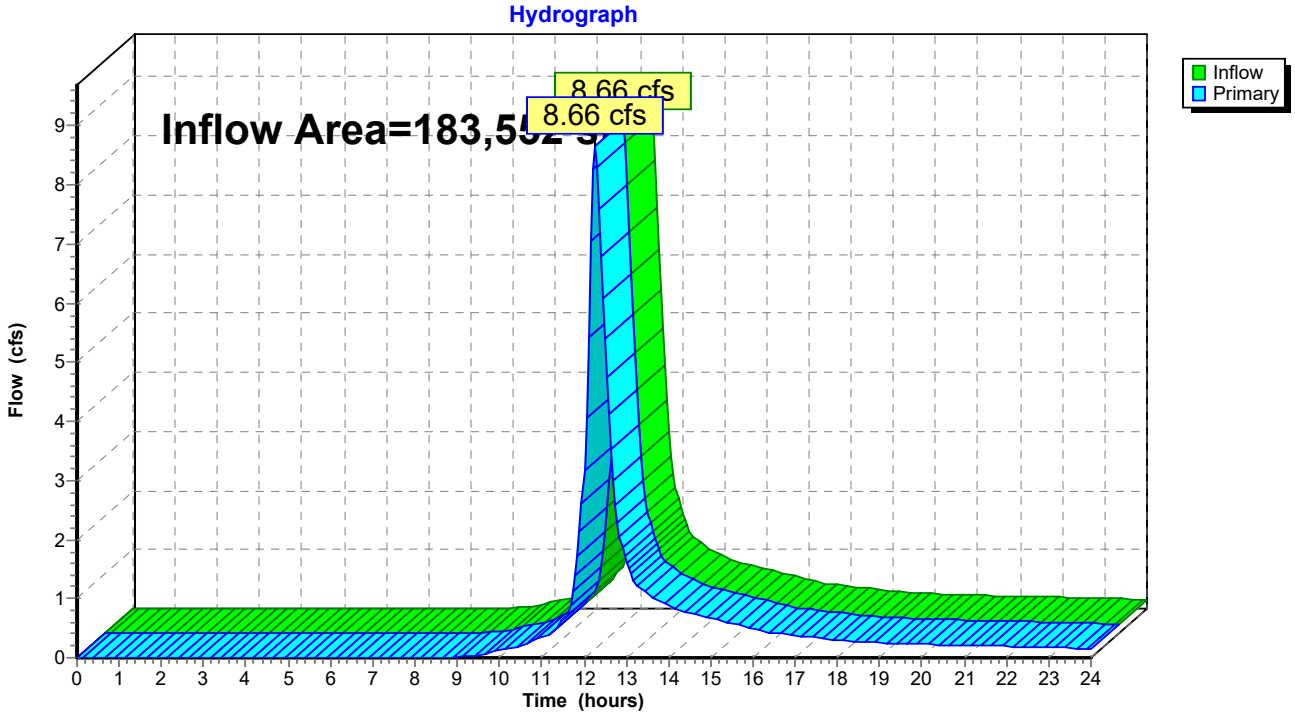
Summary for Pond SP1: SUM POND WOODS

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 183,552 sf, 0.54% Impervious, Inflow Depth > 2.48" for 10 year event
Inflow = 8.66 cfs @ 12.25 hrs, Volume= 37,894 cf
Primary = 8.66 cfs @ 12.25 hrs, Volume= 37,894 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: SUM POND WOODS



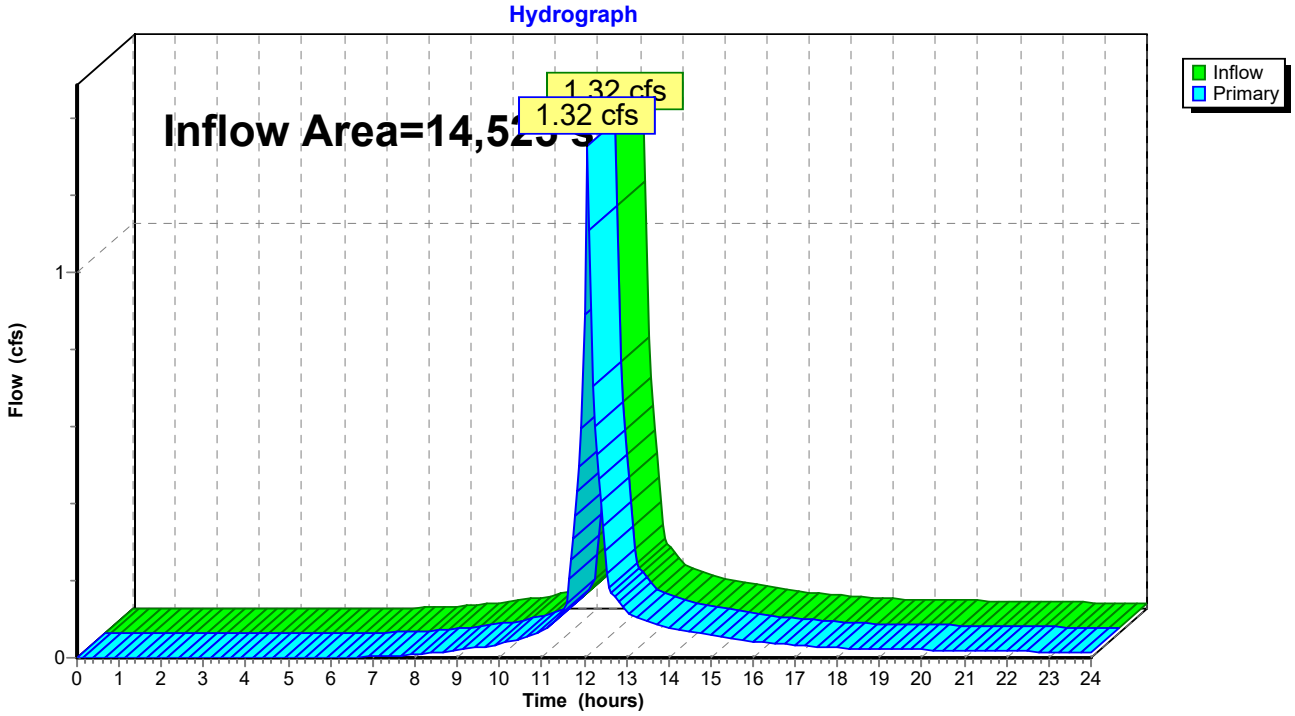
Summary for Pond SP2: SUM POND STREET

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14,525 sf, 9.74% Impervious, Inflow Depth > 3.40" for 10 year event
Inflow = 1.32 cfs @ 12.07 hrs, Volume= 4,119 cf
Primary = 1.32 cfs @ 12.07 hrs, Volume= 4,119 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET



PRE-DEVELOPMENT DRAINAGE

25 YEAR STORM

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX1: EX1 FLOW TO Runoff Area=14,525 sf 9.74% Impervious Runoff Depth>4.49"
Flow Length=205' Tc=5.0 min CN=85 Runoff=1.73 cfs 5,433 cf

Subcatchment EX2: EX2 DESIGN POINT Runoff Area=125,315 sf 0.00% Impervious Runoff Depth>3.54"
Flow Length=400' Tc=18.5 min CN=76 Runoff=8.32 cfs 36,979 cf

Subcatchment EX3: EX2 DESIGN POINT Runoff Area=58,237 sf 1.72% Impervious Runoff Depth>3.25"
Flow Length=335' Tc=14.9 min CN=73 Runoff=3.85 cfs 15,753 cf

Reach 1R: FLOW FROM WETL SERIES 'B' TO 'A' Avg. Flow Depth=0.00' Max Vel=0.00 fps
12.0" Round Pipe n=0.035 L=30.0' S=0.0583 '/' Capacity=3.20 cfs Outflow=0.00 cfs 0 cf

Reach 2R: FLOW THRU WETL SERIES Avg. Flow Depth=0.57' Max Vel=1.42 fps Inflow=3.85 cfs 15,753 cf
n=0.100 L=110.0' S=0.0309 '/' Capacity=3.00 cfs Outflow=3.81 cfs 15,735 cf

Pond SP1: SUM POND WOODS Inflow=12.09 cfs 52,714 cf
Primary=12.09 cfs 52,714 cf

Pond SP2: SUM POND STREET Inflow=1.73 cfs 5,433 cf
Primary=1.73 cfs 5,433 cf

Total Runoff Area = 198,077 sf Runoff Volume = 58,166 cf Average Runoff Depth = 3.52"
98.78% Pervious = 195,662 sf 1.22% Impervious = 2,415 sf

Summary for Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD

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

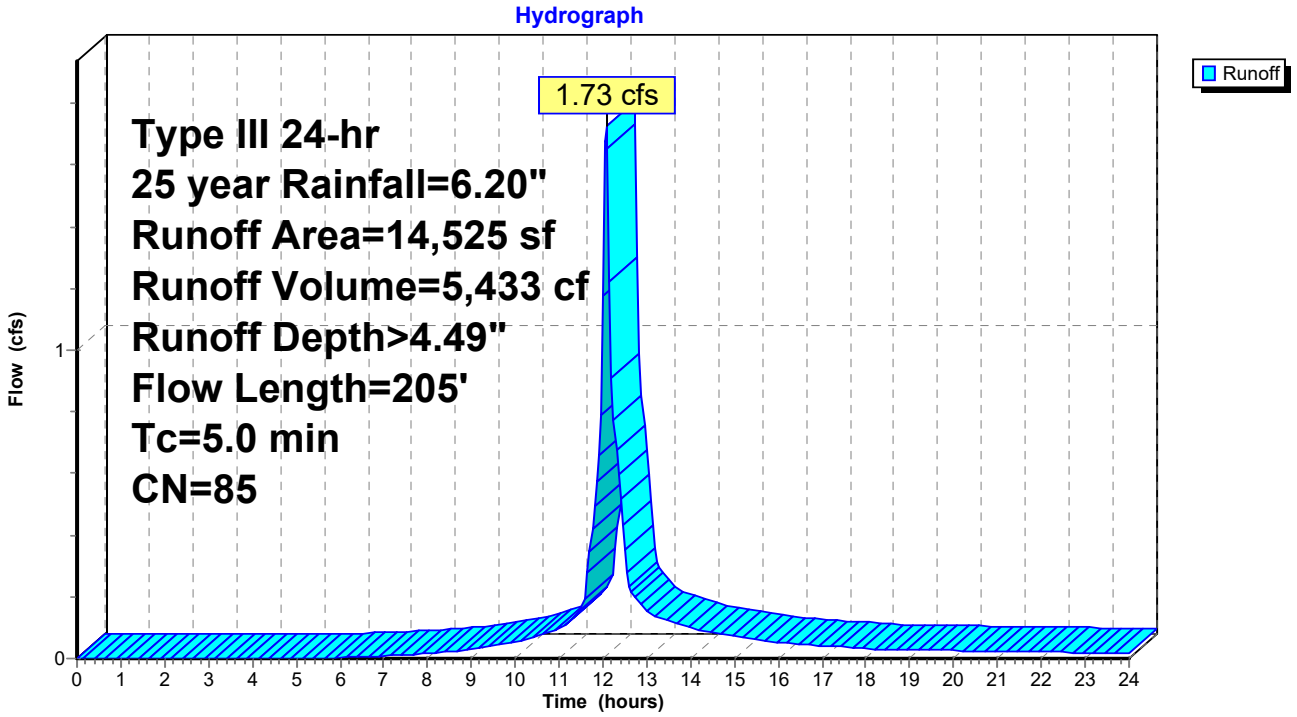
Runoff = 1.73 cfs @ 12.07 hrs, Volume= 5,433 cf, Depth> 4.49"
Routed to Pond SP2 : SUM POND STREET

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
10,810	86	<50% Grass cover, Poor, HSG C
2,300	70	Woods, Good, HSG C
14,525	85	Weighted Average
13,110		90.26% Pervious Area
1,415		9.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		**Sheet Flow, FLOW OVER GRASS** Grass: Short n= 0.150 P2= 3.12"
0.4	35	0.0420	1.43		**Shallow Concentrated Flow, FLOW OVER GRASS** Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		**Shallow Concentrated Flow, FLOW ALONG DRIVEWAY** Paved Kv= 20.3 fps
5.0	205	Total			

Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD



Summary for Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)

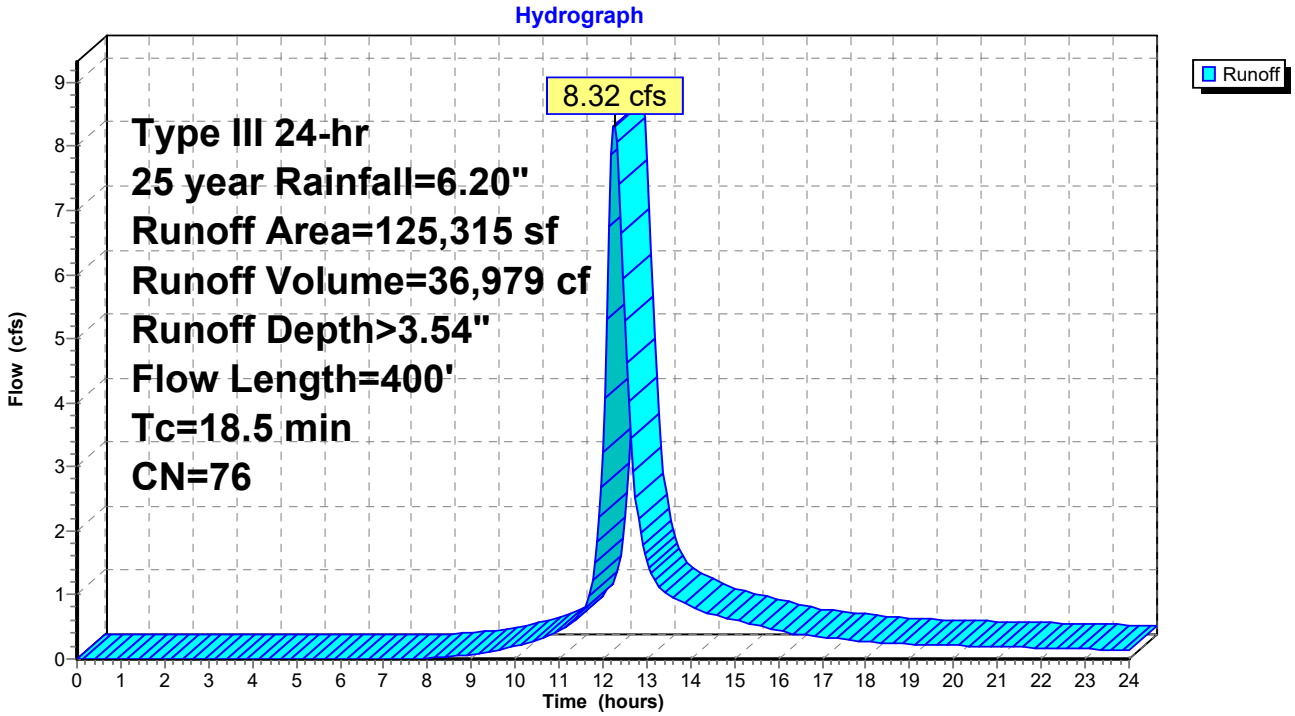
Runoff = 8.32 cfs @ 12.26 hrs, Volume= 36,979 cf, Depth> 3.54"
Routed to Pond SP1 : SUM POND WOODS

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
41,415	86	<50% Grass cover, Poor, HSG C
66,589	70	Woods, Good, HSG C
10,644	79	Woods/grass comb., Good, HSG D
6,667	77	Woods, Poor, HSG C
125,315	76	Weighted Average
125,315		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow, FLOW OVER GRASS** Woods: Light underbrush n= 0.400 P2= 3.12"
3.5	150	0.0200	0.71		**Shallow Concentrated Flow, FLOW IN WOODS** Woodland Kv= 5.0 fps
2.5	200	0.0700	1.32		**Shallow Concentrated Flow, FLOW IN WOODS** Woodland Kv= 5.0 fps
18.5	400	Total			

Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)



Summary for Subcatchment EX3: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)

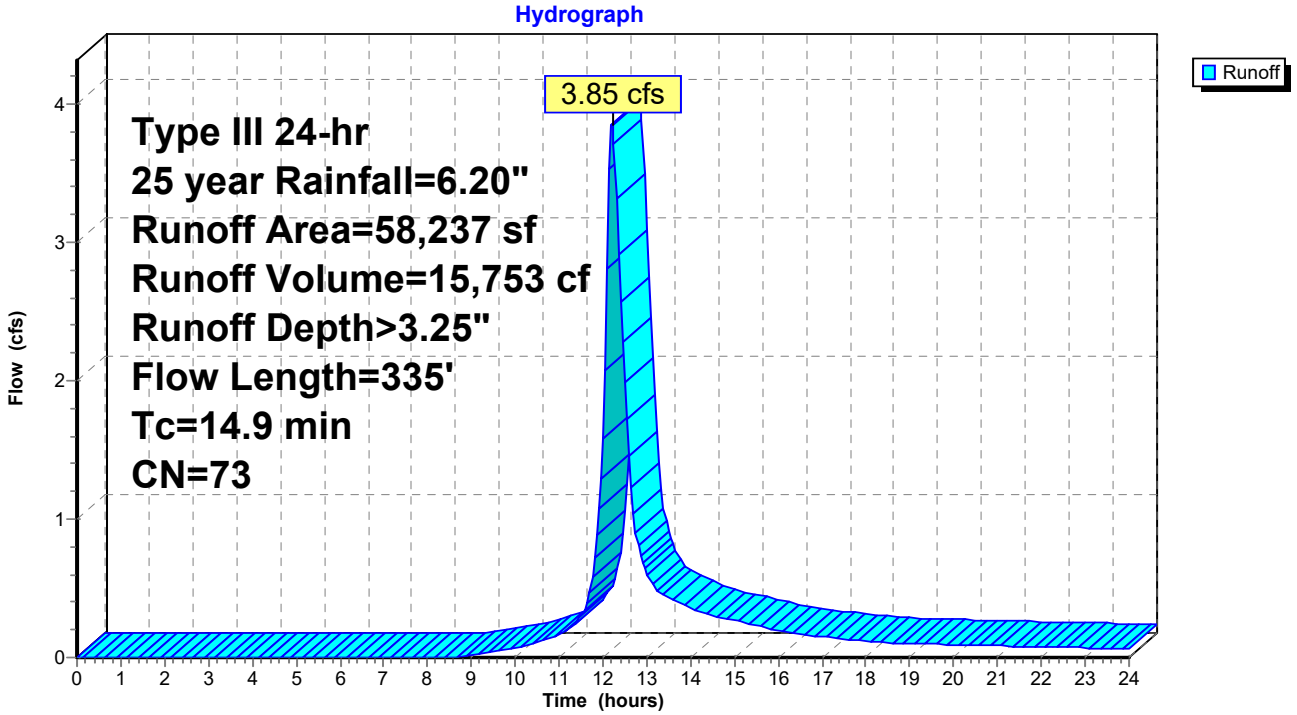
Runoff = 3.85 cfs @ 12.21 hrs, Volume= 15,753 cf, Depth> 3.25"
Routed to Reach 2R : FLOW THRU WETL SERIES 'A' TO BACK PROPERTY

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
3,600	86	<50% Grass cover, Poor, HSG C
46,815	70	Woods, Good, HSG C
6,822	79	Woods/grass comb., Good, HSG D
1,000	98	Roofs, HSG C
58,237	73	Weighted Average
57,237		98.28% Pervious Area
1,000		1.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0900	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
1.4	125	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.7	160	0.0250	0.40		**Shallow Concentrated Flow, FLOW THRU WETLAND B** Forest w/Heavy Litter Kv= 2.5 fps
14.9	335	Total			

Subcatchment EX3: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)

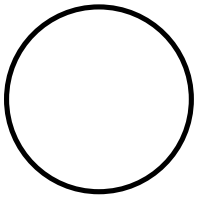


Summary for Reach 1R: FLOW FROM WETL SERIES 'B' TO 'A'

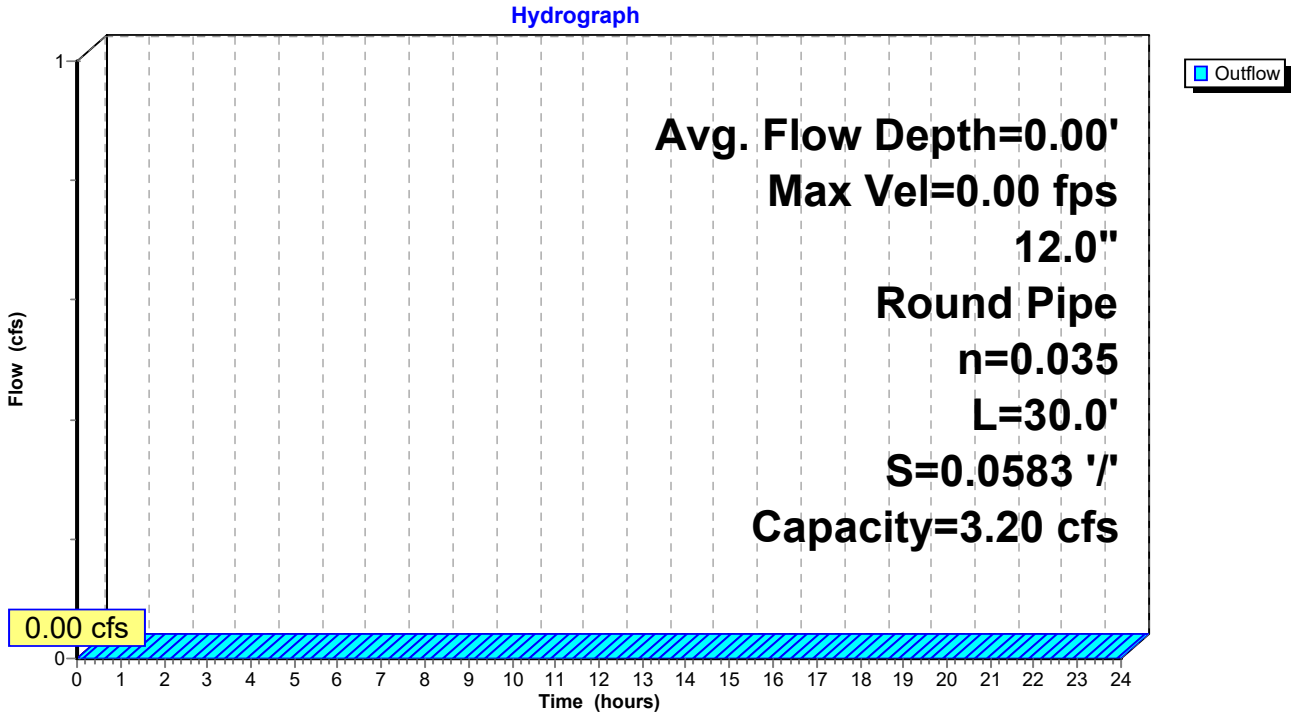
[43] Hint: Has no inflow (Outflow=Zero)

Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.20 cfs

12.0" Round Pipe
n= 0.035 Earth, dense weeds
Length= 30.0' Slope= 0.0583 '/'
Inlet Invert= 259.75', Outlet Invert= 258.00'



Reach 1R: FLOW FROM WETL SERIES 'B' TO 'A'



Summary for Reach 2R: FLOW THRU WETL SERIES 'A' TO BACK PROPERTY

[91] Warning: Storage range exceeded by 0.07'
[55] Hint: Peak inflow is 128% of Manning's capacity

Inflow Area = 58,237 sf, 1.72% Impervious, Inflow Depth > 3.25" for 25 year event
Inflow = 3.85 cfs @ 12.21 hrs, Volume= 15,753 cf
Outflow = 3.81 cfs @ 12.23 hrs, Volume= 15,735 cf, Atten= 1%, Lag= 1.0 min
Routed to Pond SP1 : SUM POND WOODS

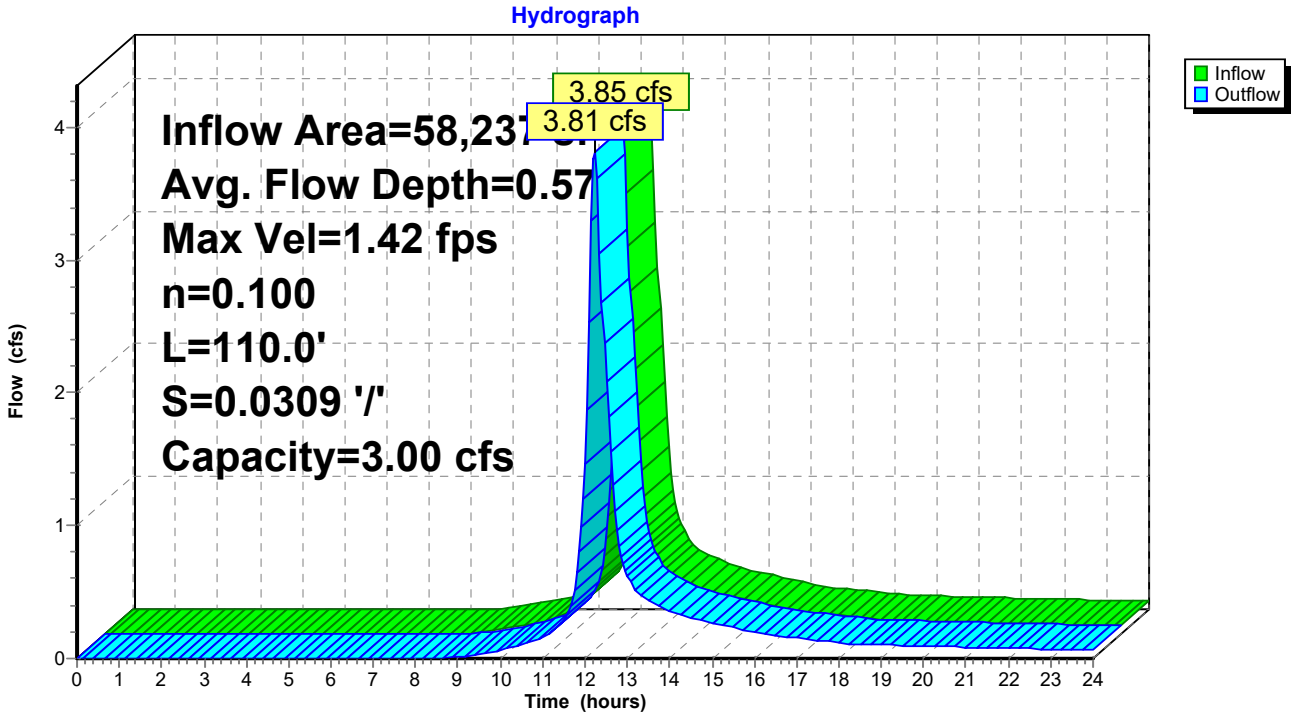
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.42 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.51 fps, Avg. Travel Time= 3.6 min

Peak Storage= 295 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.57' , Surface Width= 6.43'
Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 3.00 cfs

3.00' x 0.50' deep channel, n= 0.100 Earth, dense brush, high stage
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 110.0' Slope= 0.0309 '/'
Inlet Invert= 257.90', Outlet Invert= 254.50'

‡

Reach 2R: FLOW THRU WETL SERIES 'A' TO BACK PROPERTY



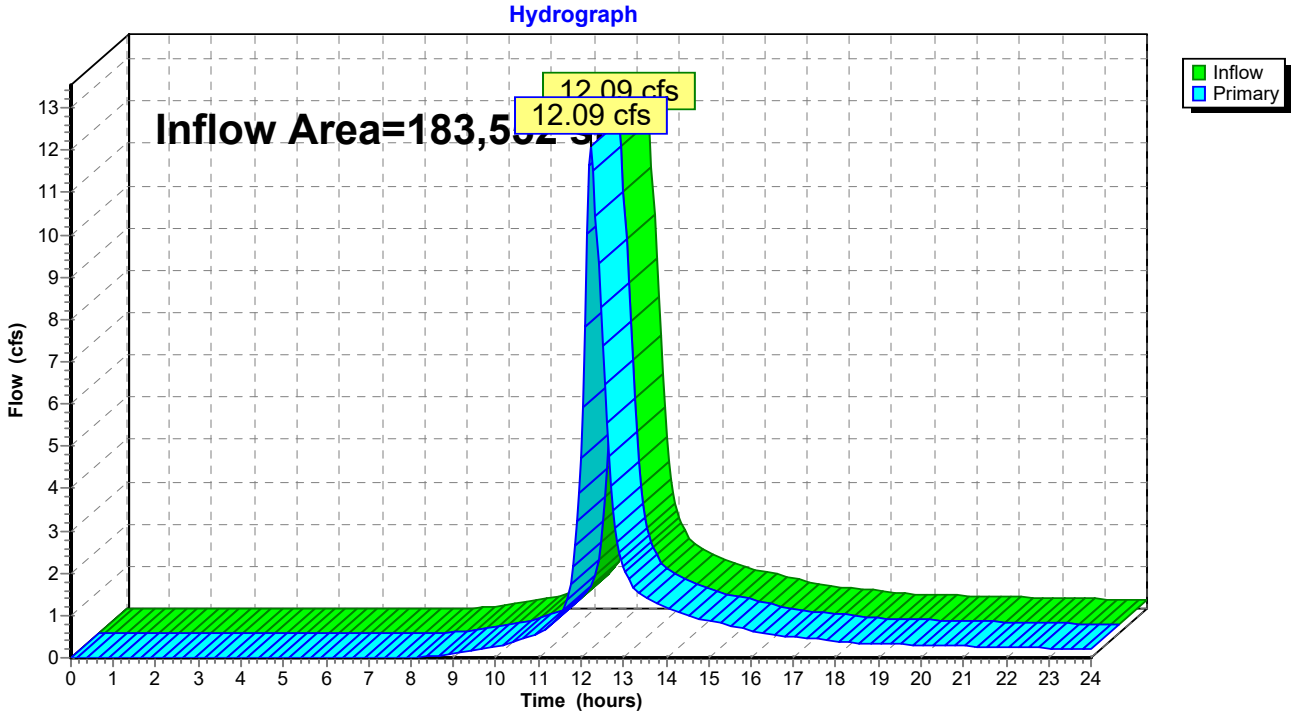
Summary for Pond SP1: SUM POND WOODS

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 183,552 sf, 0.54% Impervious, Inflow Depth > 3.45" for 25 year event
Inflow = 12.09 cfs @ 12.25 hrs, Volume= 52,714 cf
Primary = 12.09 cfs @ 12.25 hrs, Volume= 52,714 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: SUM POND WOODS



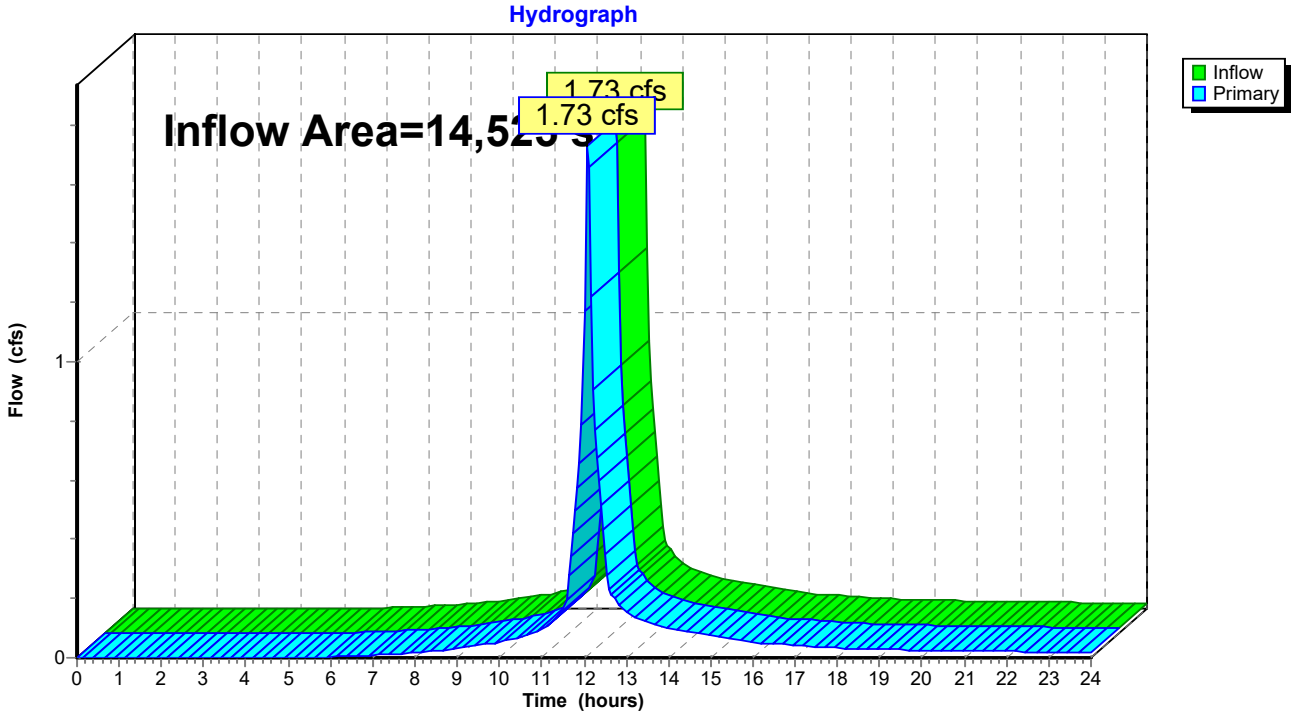
Summary for Pond SP2: SUM POND STREET

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 14,525 sf, 9.74% Impervious, Inflow Depth > 4.49" for 25 year event
Inflow = 1.73 cfs @ 12.07 hrs, Volume= 5,433 cf
Primary = 1.73 cfs @ 12.07 hrs, Volume= 5,433 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET



PRE-DEVELOPMENT DRAINAGE

100 YEAR STORM

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment EX1: EX1 FLOW TO Runoff Area=14,525 sf 9.74% Impervious Runoff Depth>6.20"
Flow Length=205' Tc=5.0 min CN=85 Runoff=2.35 cfs 7,505 cf

Subcatchment EX2: EX2 DESIGN POINT Runoff Area=125,315 sf 0.00% Impervious Runoff Depth>5.13"
Flow Length=400' Tc=18.5 min CN=76 Runoff=12.02 cfs 53,596 cf

Subcatchment EX3: EX2 DESIGN POINT Runoff Area=58,237 sf 1.72% Impervious Runoff Depth>4.79"
Flow Length=335' Tc=14.9 min CN=73 Runoff=5.68 cfs 23,239 cf

Reach 1R: FLOW FROM WETL SERIES 'B' TO 'A' Avg. Flow Depth=0.00' Max Vel=0.00 fps
12.0" Round Pipe n=0.035 L=30.0' S=0.0583 '/' Capacity=3.20 cfs Outflow=0.00 cfs 0 cf

Reach 2R: FLOW THRU WETL SERIES Avg. Flow Depth=0.74' Max Vel=1.54 fps Inflow=5.68 cfs 23,239 cf
n=0.100 L=110.0' S=0.0309 '/' Capacity=3.00 cfs Outflow=5.65 cfs 23,216 cf

Pond SP1: SUM POND WOODS Inflow=17.58 cfs 76,813 cf
Primary=17.58 cfs 76,813 cf

Pond SP2: SUM POND STREET Inflow=2.35 cfs 7,505 cf
Primary=2.35 cfs 7,505 cf

Total Runoff Area = 198,077 sf Runoff Volume = 84,340 cf Average Runoff Depth = 5.11"
98.78% Pervious = 195,662 sf 1.22% Impervious = 2,415 sf

Summary for Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD

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

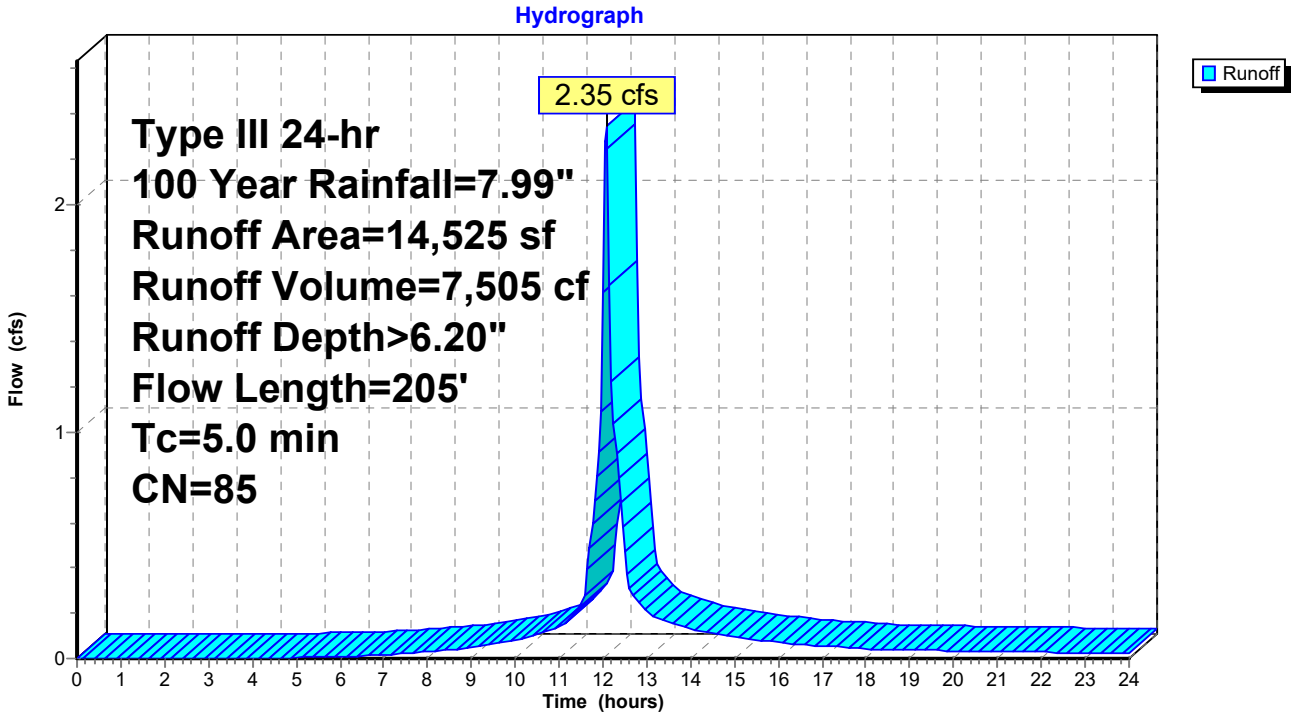
Runoff = 2.35 cfs @ 12.07 hrs, Volume= 7,505 cf, Depth> 6.20"
Routed to Pond SP2 : SUM POND STREET

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=7.99"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
10,810	86	<50% Grass cover, Poor, HSG C
2,300	70	Woods, Good, HSG C
14,525	85	Weighted Average
13,110		90.26% Pervious Area
1,415		9.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	50	0.0500	0.21		**Sheet Flow, FLOW OVER GRASS** Grass: Short n= 0.150 P2= 3.12"
0.4	35	0.0420	1.43		**Shallow Concentrated Flow, FLOW OVER GRASS** Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		**Shallow Concentrated Flow, FLOW ALONG DRIVEWAY** Paved Kv= 20.3 fps
5.0	205	Total			

Subcatchment EX1: EX1 FLOW TO HIGHLAND ROAD



Summary for Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)

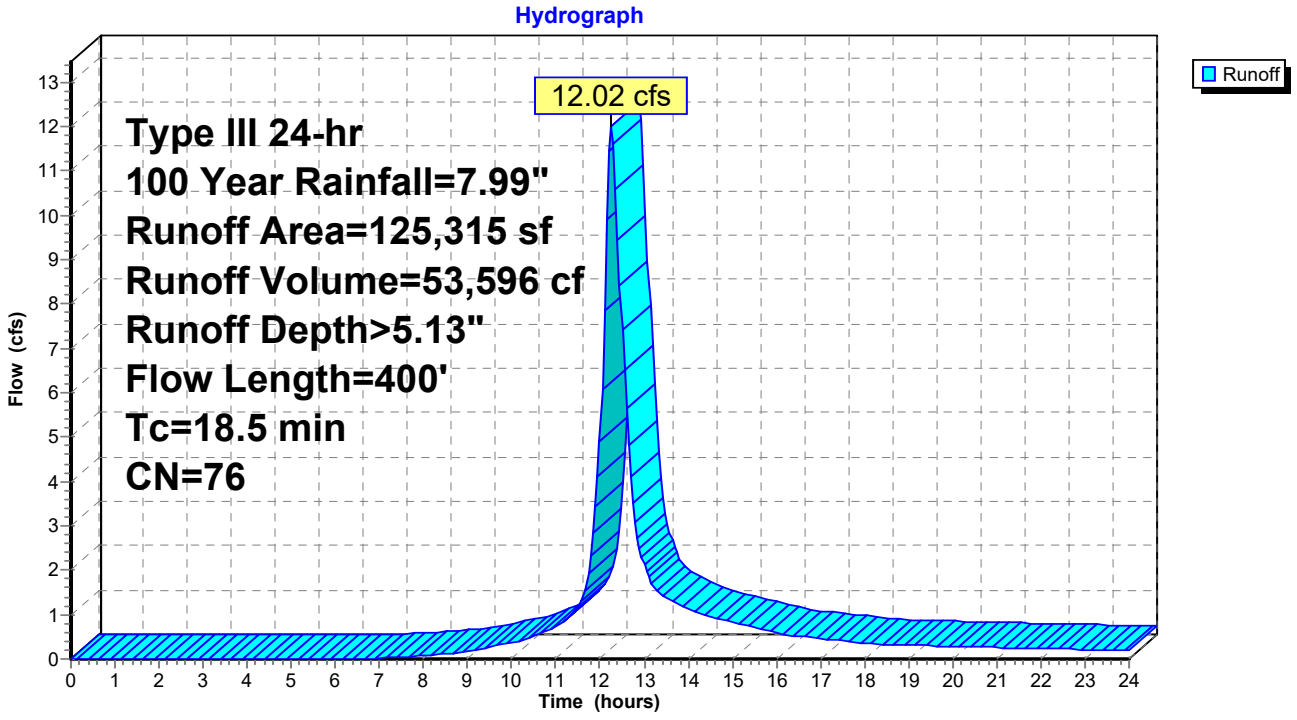
Runoff = 12.02 cfs @ 12.25 hrs, Volume= 53,596 cf, Depth> 5.13"
Routed to Pond SP1 : SUM POND WOODS

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=7.99"

Area (sf)	CN	Description
41,415	86	<50% Grass cover, Poor, HSG C
66,589	70	Woods, Good, HSG C
10,644	79	Woods/grass comb., Good, HSG D
6,667	77	Woods, Poor, HSG C
125,315	76	Weighted Average
125,315		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		**Sheet Flow, FLOW OVER GRASS** Woods: Light underbrush n= 0.400 P2= 3.12"
3.5	150	0.0200	0.71		**Shallow Concentrated Flow, FLOW IN WOODS** Woodland Kv= 5.0 fps
2.5	200	0.0700	1.32		**Shallow Concentrated Flow, FLOW IN WOODS** Woodland Kv= 5.0 fps
18.5	400	Total			

Subcatchment EX2: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)



Summary for Subcatchment EX3: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)

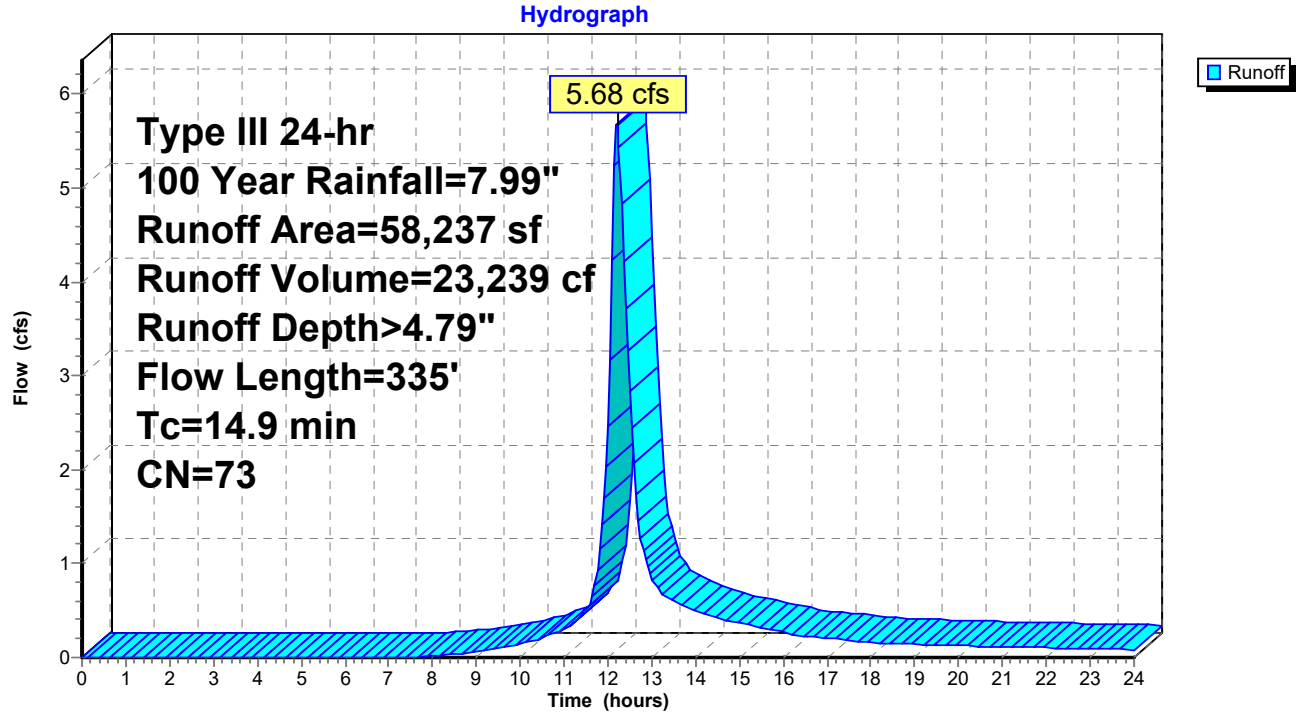
Runoff = 5.68 cfs @ 12.21 hrs, Volume= 23,239 cf, Depth> 4.79"
Routed to Reach 2R : FLOW THRU WETL SERIES 'A' TO BACK PROPERTY

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=7.99"

Area (sf)	CN	Description
3,600	86	<50% Grass cover, Poor, HSG C
46,815	70	Woods, Good, HSG C
6,822	79	Woods/grass comb., Good, HSG D
1,000	98	Roofs, HSG C
58,237	73	Weighted Average
57,237		98.28% Pervious Area
1,000		1.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0900	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.12"
1.4	125	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.7	160	0.0250	0.40		**Shallow Concentrated Flow, FLOW THRU WETLAND B** Forest w/Heavy Litter Kv= 2.5 fps
14.9	335	Total			

Subcatchment EX3: EX2 DESIGN POINT BACK PROPERTY LINE (A SERIES WETL)

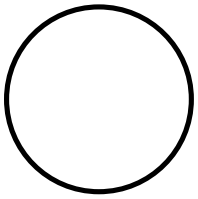


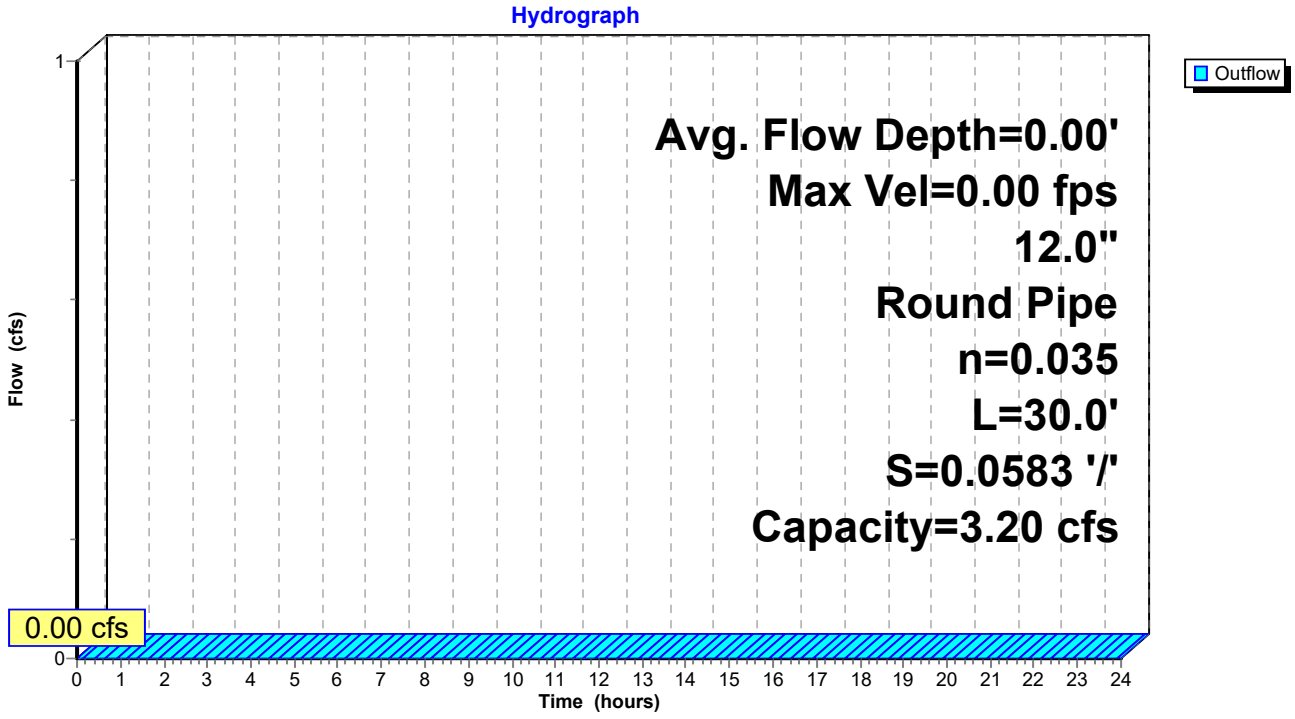
Summary for Reach 1R: FLOW FROM WETL SERIES 'B' TO 'A'

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

Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.20 cfs

12.0" Round Pipe
n= 0.035 Earth, dense weeds
Length= 30.0' Slope= 0.0583 '/'
Inlet Invert= 259.75', Outlet Invert= 258.00'





Summary for Reach 2R: FLOW THRU WETL SERIES 'A' TO BACK PROPERTY

[91] Warning: Storage range exceeded by 0.24'
[55] Hint: Peak inflow is 189% of Manning's capacity

Inflow Area = 58,237 sf, 1.72% Impervious, Inflow Depth > 4.79" for 100 Year event
Inflow = 5.68 cfs @ 12.21 hrs, Volume= 23,239 cf
Outflow = 5.65 cfs @ 12.22 hrs, Volume= 23,216 cf, Atten= 1%, Lag= 1.0 min
Routed to Pond SP1 : SUM POND WOODS

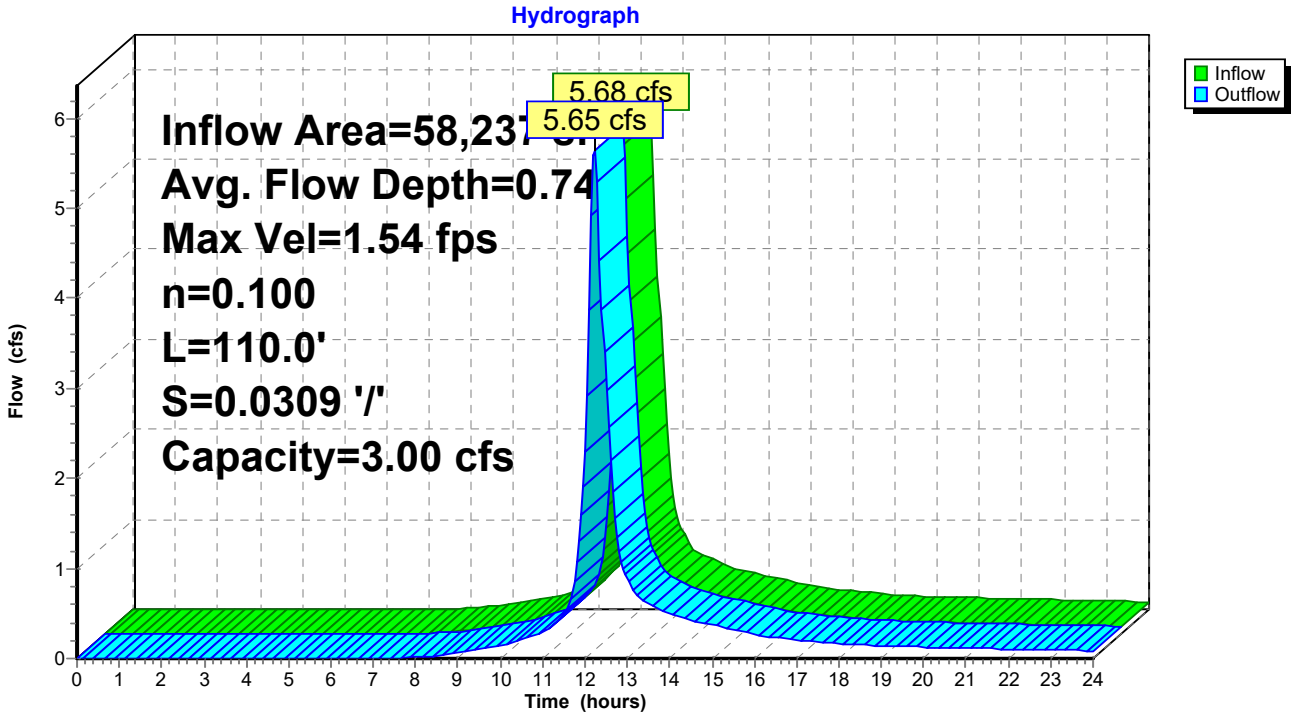
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.54 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 3.2 min

Peak Storage= 402 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.74' , Surface Width= 7.41'
Bank-Full Depth= 0.50' Flow Area= 2.3 sf, Capacity= 3.00 cfs

3.00' x 0.50' deep channel, n= 0.100 Earth, dense brush, high stage
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 110.0' Slope= 0.0309 '/'
Inlet Invert= 257.90', Outlet Invert= 254.50'

‡

Reach 2R: FLOW THRU WETL SERIES 'A' TO BACK PROPERTY



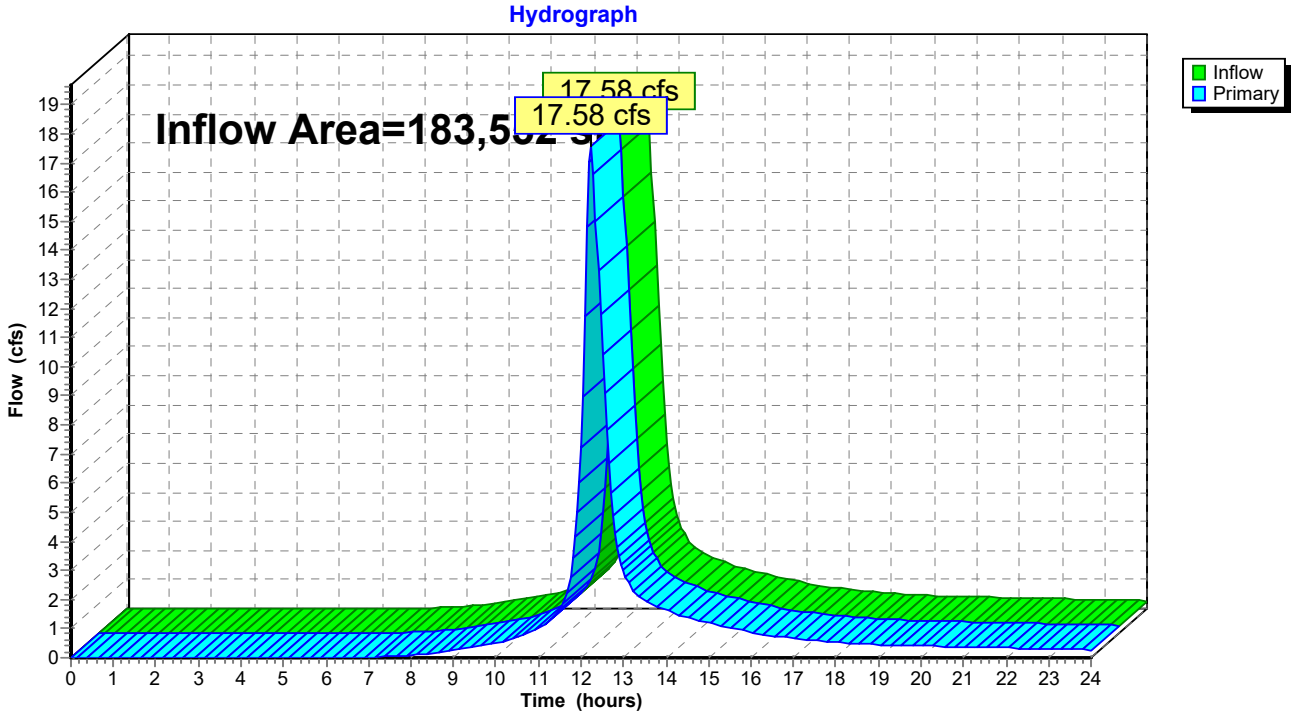
Summary for Pond SP1: SUM POND WOODS

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 183,552 sf, 0.54% Impervious, Inflow Depth > 5.02" for 100 Year event
Inflow = 17.58 cfs @ 12.24 hrs, Volume= 76,813 cf
Primary = 17.58 cfs @ 12.24 hrs, Volume= 76,813 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: SUM POND WOODS



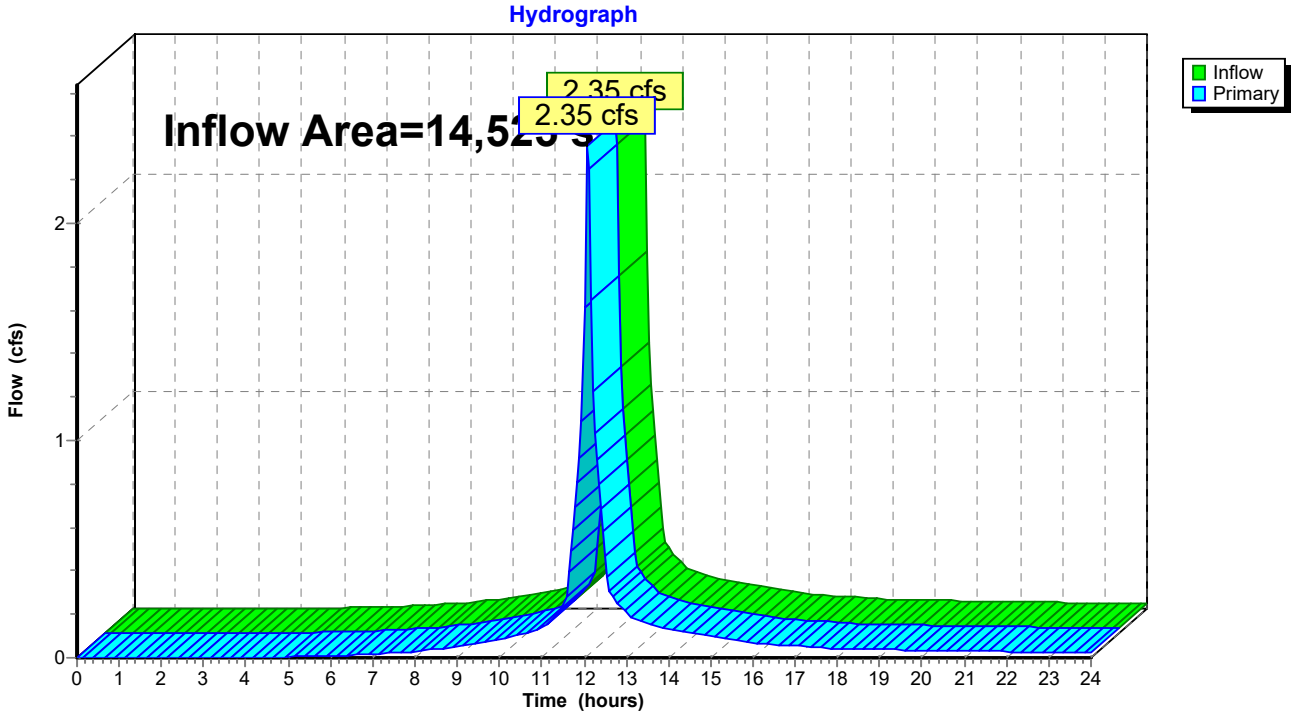
Summary for Pond SP2: SUM POND STREET

[40] Hint: Not Described (Outflow=Inflow)

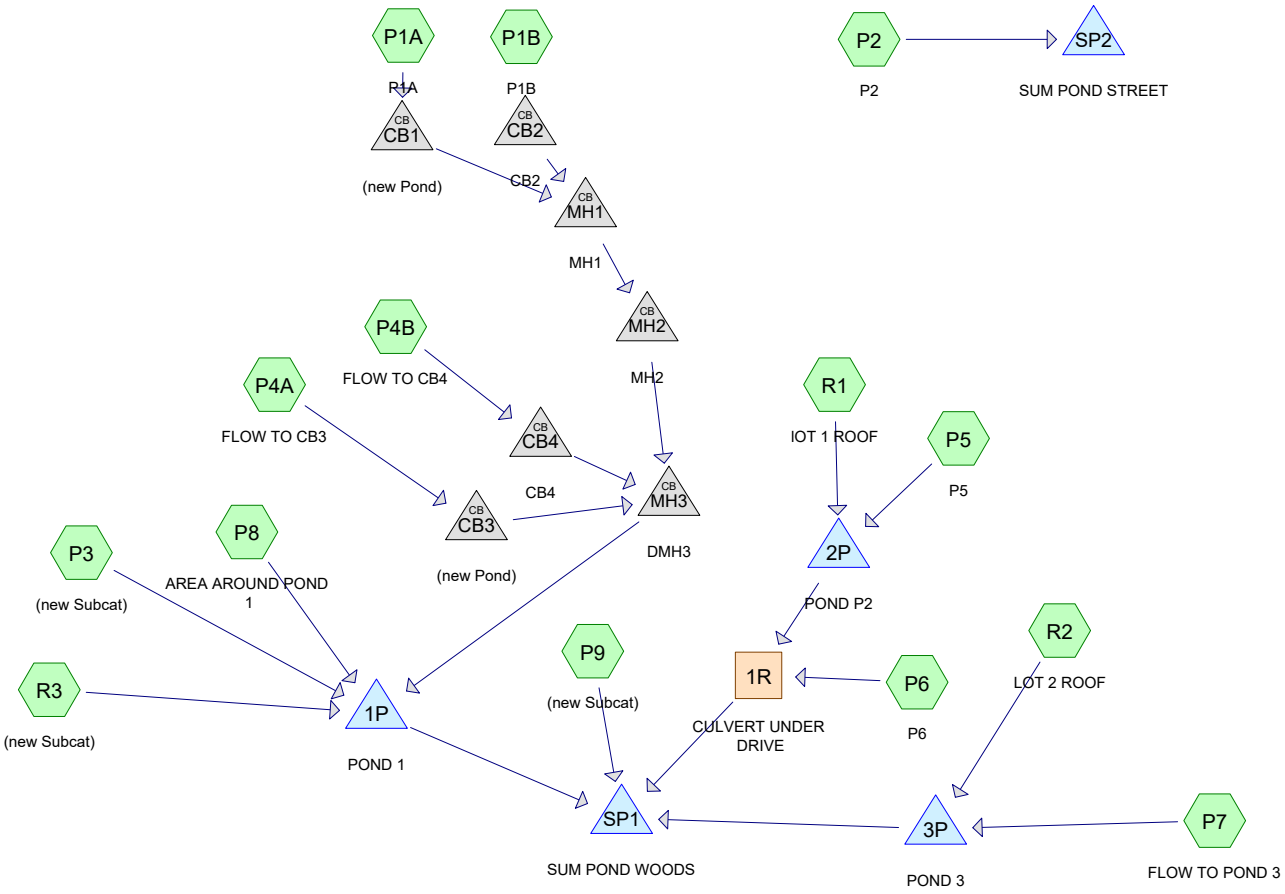
Inflow Area = 14,525 sf, 9.74% Impervious, Inflow Depth > 6.20" for 100 Year event
Inflow = 2.35 cfs @ 12.07 hrs, Volume= 7,505 cf
Primary = 2.35 cfs @ 12.07 hrs, Volume= 7,505 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET



POST-DEVELOPMENT DRAINAGE



Subcat Reach Pond Link

Routing Diagram for SELLERS FARM POST DEVELOPMENT
Prepared by {enter your company name here}, Printed 7/11/2022
HydroCAD® 10.10-7b s/n 02248 © 2022 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
92,478	86	<50% Grass cover, Poor, HSG C (P1A, P2, P3, P4B, P5, P6, P7, P8, P9)
23,263	98	Paved parking, HSG C (P1A, P1B, P2, P3, P4A, P4B, P5, P7)
7,474	98	Roofs, HSG C (P6, R1, R2, R3)
490	98	Unconnected pavement, HSG C (P3, P4B)
7,484	98	Water Surface, HSG C (P3, P5, P7, P8)
49,424	70	Woods, Good, HSG C (P6, P9)
17,464	79	Woods/grass comb., Good, HSG D (P6, P9)
198,077	**84**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
180,613	HSG C	P1A, P1B, P2, P3, P4A, P4B, P5, P6, P7, P8, P9, R1, R2, R3
17,464	HSG D	P6, P9
0	Other	
198,077		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	0	92,478	0	0	92,478	<50% Grass cover, Poor	
0	0	23,263	0	0	23,263	Paved parking	
0	0	7,474	0	0	7,474	Roofs	
0	0	490	0	0	490	Unconnected pavement	
0	0	7,484	0	0	7,484	Water Surface	
0	0	49,424	0	0	49,424	Woods, Good	
0	0	0	17,464	0	17,464	Woods/grass comb., Good	
0	**0**	**180,613**	**17,464**	**0**	**198,077**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1R	259.00	258.00	20.0	0.0500	0.012	0.0	12.0	0.0
2	1P	259.00	258.00	40.0	0.0250	0.012	0.0	12.0	0.0
3	3P	263.05	261.50	20.0	0.0775	0.013	0.0	12.0	0.0
4	CB1	261.90	261.80	10.0	0.0100	0.013	0.0	12.0	0.0
5	CB2	261.90	261.80	10.0	0.0100	0.013	0.0	12.0	0.0
6	CB3	260.50	260.00	10.0	0.0500	0.013	0.0	12.0	0.0
7	CB4	260.50	260.00	40.0	0.0125	0.013	0.0	12.0	0.0
8	MH1	261.70	260.60	215.0	0.0051	0.013	0.0	12.0	0.0
9	MH2	260.60	260.00	120.0	0.0050	0.013	0.0	12.0	0.0
10	MH3	259.75	259.00	30.0	0.0250	0.013	0.0	12.0	0.0

POST-DEVELOPMENT DRAINAGE

2 YEAR STORM

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P1A: P1A Runoff Area=3,286 sf 45.25% Impervious Runoff Depth>2.24"
Tc=6.0 min CN=91 Runoff=0.19 cfs 613 cf

Subcatchment P1B: P1B Runoff Area=1,506 sf 100.00% Impervious Runoff Depth>2.95"
Tc=6.0 min CN=98 Runoff=0.10 cfs 370 cf

Subcatchment P2: P2 Runoff Area=10,398 sf 13.61% Impervious Runoff Depth>1.98"
Flow Length=205' Tc=4.9 min CN=88 Runoff=0.56 cfs 1,714 cf

Subcatchment P3: (new Subcat) Runoff Area=11,734 sf 27.70% Impervious Runoff Depth>2.06"
Flow Length=250' Tc=6.2 min CN=89 Runoff=0.63 cfs 2,016 cf

Subcatchment P4A: FLOW TO CB3 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>2.95"
Tc=6.0 min CN=98 Runoff=0.37 cfs 1,296 cf

Subcatchment P4B: FLOW TO CB4 Runoff Area=11,827 sf 61.53% Impervious Runoff Depth>2.42"
Tc=6.0 min CN=93 Runoff=0.73 cfs 2,390 cf

Subcatchment P5: P5 Runoff Area=9,084 sf 51.11% Impervious Runoff Depth>2.33"
Tc=6.0 min CN=92 Runoff=0.54 cfs 1,764 cf

Subcatchment P6: P6 Runoff Area=56,672 sf 1.76% Impervious Runoff Depth>1.32"
Flow Length=335' Tc=14.9 min CN=79 Runoff=1.49 cfs 6,222 cf

Subcatchment P7: FLOW TO POND 3 Runoff Area=13,617 sf 17.96% Impervious Runoff Depth>1.97"
Flow Length=180' Tc=14.4 min CN=88 Runoff=0.55 cfs 2,240 cf

Subcatchment P8: AREA AROUND POND 1 Runoff Area=6,584 sf 59.75% Impervious Runoff Depth>2.42"
Tc=6.0 min CN=93 Runoff=0.41 cfs 1,330 cf

Subcatchment P9: (new Subcat) Runoff Area=61,615 sf 0.00% Impervious Runoff Depth>1.25"
Flow Length=500' Tc=19.1 min CN=78 Runoff=1.39 cfs 6,435 cf

Subcatchment R1: lOT 1 ROOF Runoff Area=1,966 sf 100.00% Impervious Runoff Depth>2.95"
Tc=6.0 min CN=98 Runoff=0.14 cfs 483 cf

Subcatchment R2: LOT 2 ROOF Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>2.95"
Tc=6.0 min CN=98 Runoff=0.16 cfs 553 cf

Subcatchment R3: (new Subcat) Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>2.95"
Tc=6.0 min CN=98 Runoff=0.16 cfs 553 cf

Reach 1R: CULVERT UNDER DRIVE Avg. Flow Depth=0.28' Max Vel=8.22 fps Inflow=1.49 cfs 6,222 cf
12.0" Round Pipe n=0.012 L=20.0' S=0.0500 '/' Capacity=8.63 cfs Outflow=1.49 cfs 6,222 cf

Pond 1P: POND 1 Peak Elev=261.35' Storage=3,599 cf Inflow=2.48 cfs 8,198 cf
Discarded=0.08 cfs 3,744 cf Primary=0.31 cfs 3,323 cf Outflow=0.38 cfs 7,066 cf

Pond 2P: POND P2 Peak Elev=263.03' Storage=964 cf Inflow=0.68 cfs 2,246 cf
Discarded=0.05 cfs 2,246 cf Primary=0.00 cfs 0 cf Outflow=0.05 cfs 2,246 cf

Pond 3P: POND 3 Peak Elev=263.54' Storage=1,023 cf Inflow=0.65 cfs 2,793 cf
Discarded=0.04 cfs 1,574 cf Primary=0.14 cfs 1,165 cf Outflow=0.18 cfs 2,739 cf

Pond CB1: (new Pond) Peak Elev=262.14' Inflow=0.19 cfs 613 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/' Outflow=0.19 cfs 613 cf

Pond CB2: CB2 Peak Elev=0.00'
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/' Primary=0.00 cfs 0 cf

Pond CB3: (new Pond) Peak Elev=261.35' Inflow=0.37 cfs 1,296 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0500 '/' Outflow=0.37 cfs 1,296 cf

Pond CB4: CB4 Peak Elev=261.35' Inflow=0.73 cfs 2,390 cf
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=0.73 cfs 2,390 cf

Pond MH1: MH1 Peak Elev=261.95' Inflow=0.19 cfs 613 cf
12.0" Round Culvert n=0.013 L=215.0' S=0.0051 '/' Outflow=0.19 cfs 613 cf

Pond MH2: MH2 Peak Elev=261.35' Inflow=0.19 cfs 613 cf
12.0" Round Culvert n=0.013 L=120.0' S=0.0050 '/' Outflow=0.19 cfs 613 cf

Pond MH3: DMH3 Peak Elev=261.35' Inflow=1.29 cfs 4,299 cf
12.0" Round Culvert n=0.013 L=30.0' S=0.0250 '/' Outflow=1.28 cfs 4,298 cf

Pond SP1: SUM POND WOODS Inflow=3.19 cfs 17,145 cf
Primary=3.19 cfs 17,145 cf

Pond SP2: SUM POND STREET Inflow=0.56 cfs 1,714 cf
Primary=0.56 cfs 1,714 cf

Total Runoff Area = 198,077 sf Runoff Volume = 27,979 cf Average Runoff Depth = 1.70"
80.46% Pervious = 159,366 sf 19.54% Impervious = 38,711 sf

Summary for Subcatchment P1A: P1A

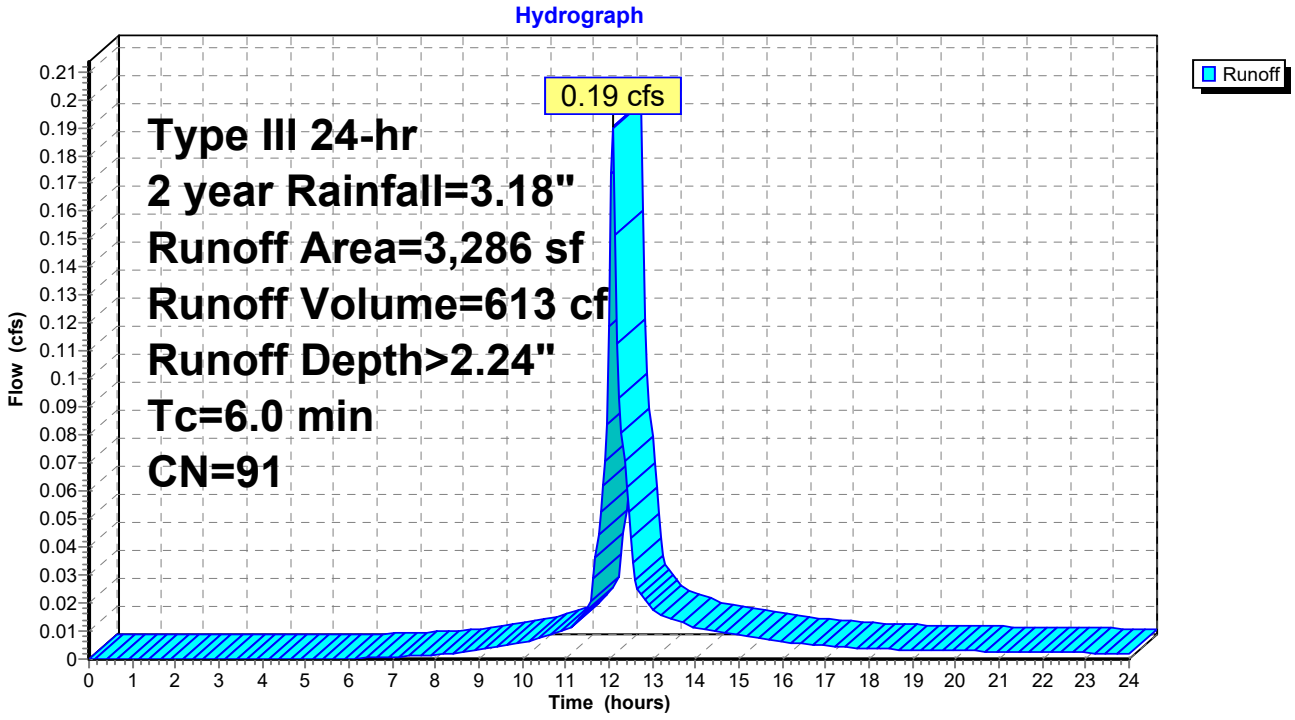
Runoff = 0.19 cfs @ 12.09 hrs, Volume= 613 cf, Depth> 2.24"
Routed to Pond CB1 : (new Pond)

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
1,799	86	<50% Grass cover, Poor, HSG C
1,487	98	Paved parking, HSG C
3,286	91	Weighted Average
1,799		54.75% Pervious Area
1,487		45.25% Impervious Area

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

Subcatchment P1A: P1A



Summary for Subcatchment P1B: P1B

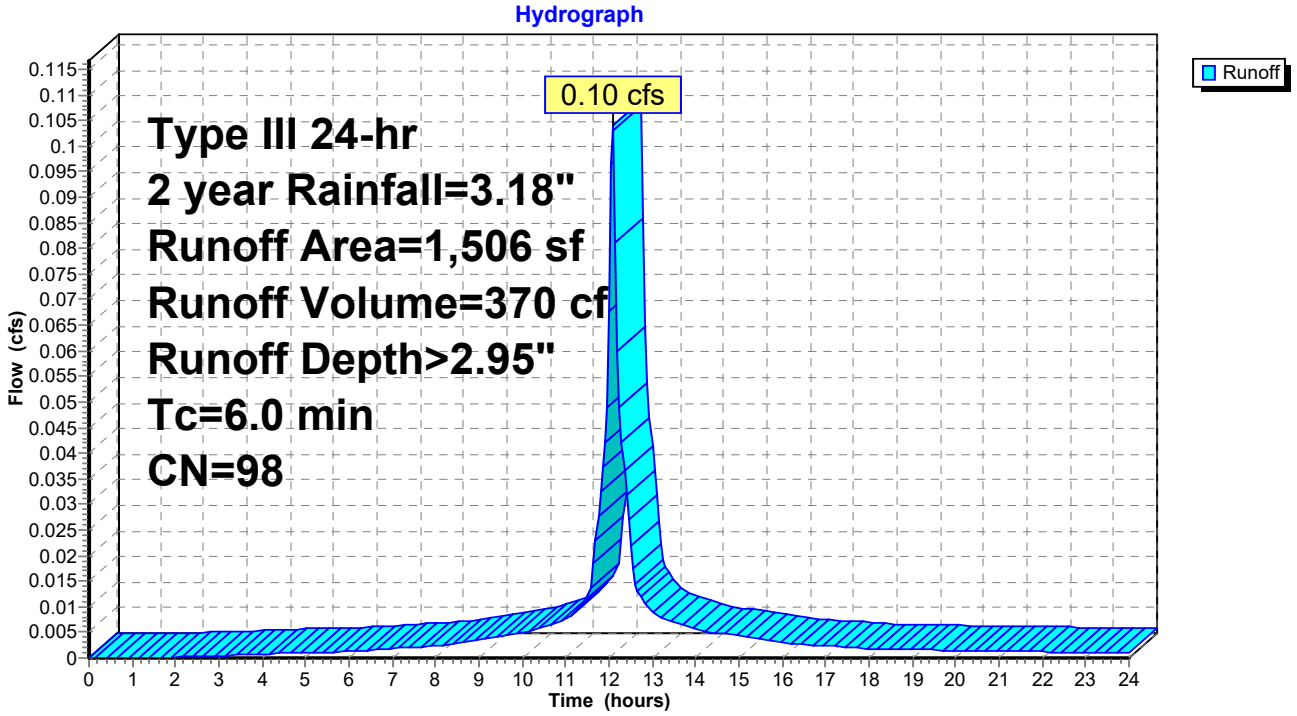
Runoff = 0.10 cfs @ 12.09 hrs, Volume= 370 cf, Depth> 2.95"

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
1,506	98	Paved parking, HSG C
1,506		100.00% Impervious Area

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

Subcatchment P1B: P1B



Summary for Subcatchment P2: P2

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

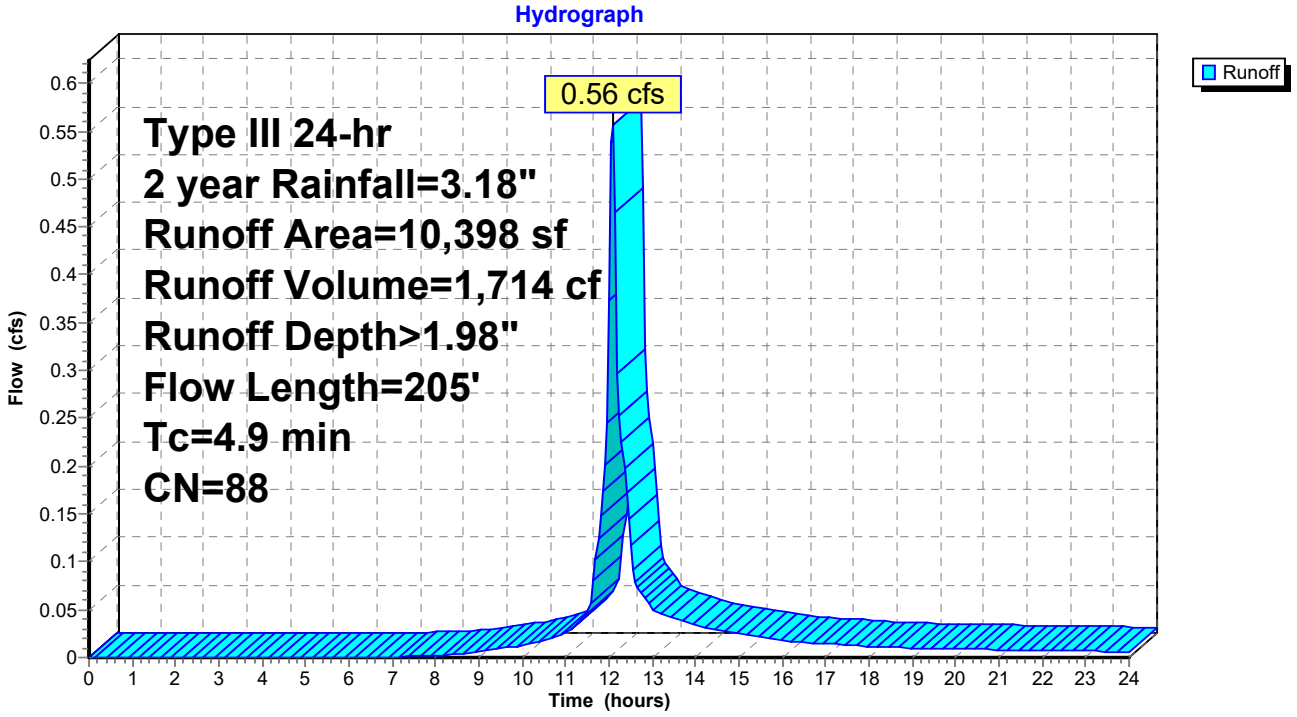
Runoff = 0.56 cfs @ 12.07 hrs, Volume= 1,714 cf, Depth> 1.98"
Routed to Pond SP2 : SUM POND STREET

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
8,983	86	<50% Grass cover, Poor, HSG C
10,398	88	Weighted Average
8,983		86.39% Pervious Area
1,415		13.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	50	0.0500	0.21		**Sheet Flow, flow over grass** Grass: Short n= 0.150 P2= 3.18"
0.4	35	0.0420	1.43		**Shallow Concentrated Flow, flow over grass** Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		**Shallow Concentrated Flow, flow along driveway** Paved Kv= 20.3 fps
4.9	205	Total			

Subcatchment P2: P2



Summary for Subcatchment P3: (new Subcat)

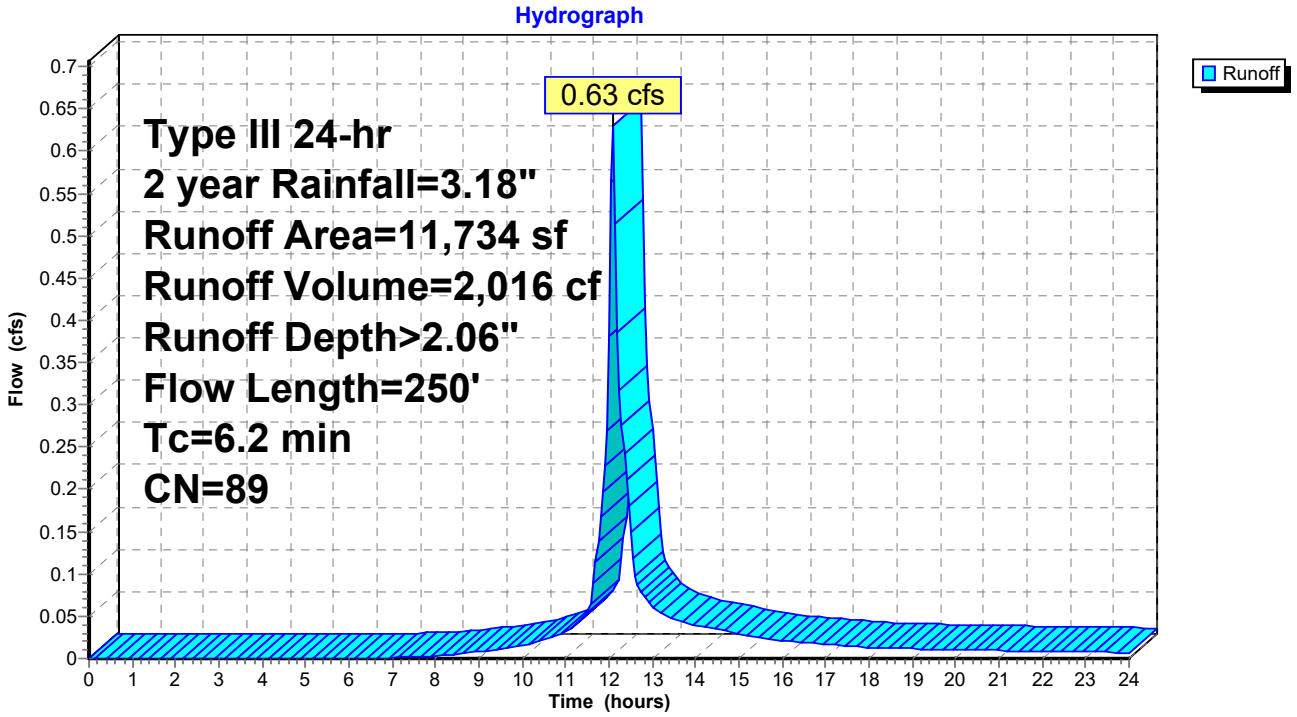
Runoff = 0.63 cfs @ 12.09 hrs, Volume= 2,016 cf, Depth> 2.06"
Routed to Pond 1P : POND 1

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
8,484	86	<50% Grass cover, Poor, HSG C
293	98	Unconnected pavement, HSG C
1,916	98	Paved parking, HSG C
1,041	98	Water Surface, HSG C
11,734	89	Weighted Average
8,484		72.30% Pervious Area
3,250		27.70% Impervious Area
293		9.02% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		**Sheet Flow, FLOW OVER GRASS** Grass: Short n= 0.150 P2= 3.18"
1.3	120	0.0500	1.57		**Shallow Concentrated Flow, FLOW OVER GRASS** Short Grass Pasture Kv= 7.0 fps
0.6	80	0.0125	2.27		**Shallow Concentrated Flow, FLOW OVER DRIVEWAY** Paved Kv= 20.3 fps
6.2	250	Total			

Subcatchment P3: (new Subcat)



Summary for Subcatchment P4A: FLOW TO CB3

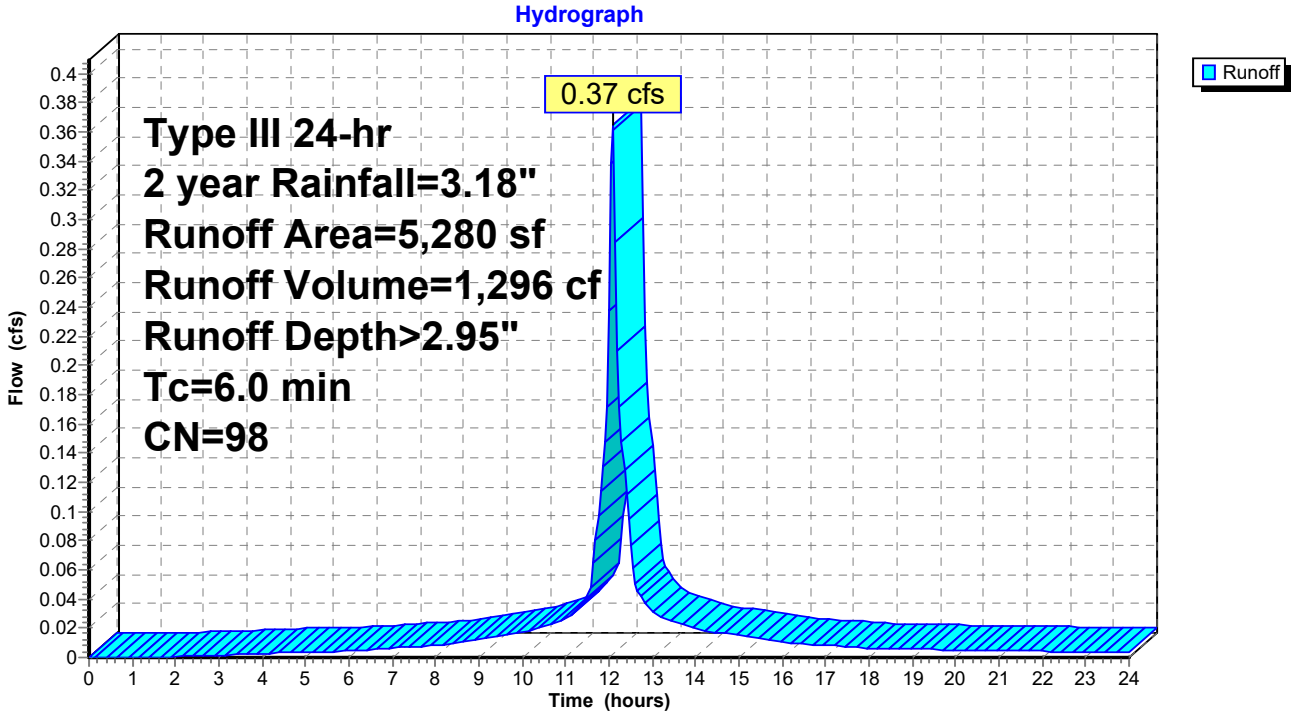
Runoff = 0.37 cfs @ 12.09 hrs, Volume= 1,296 cf, Depth> 2.95"
Routed to Pond CB3 : (new Pond)

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
5,280	98	Paved parking, HSG C
5,280		100.00% Impervious Area

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

Subcatchment P4A: FLOW TO CB3



Summary for Subcatchment P4B: FLOW TO CB4

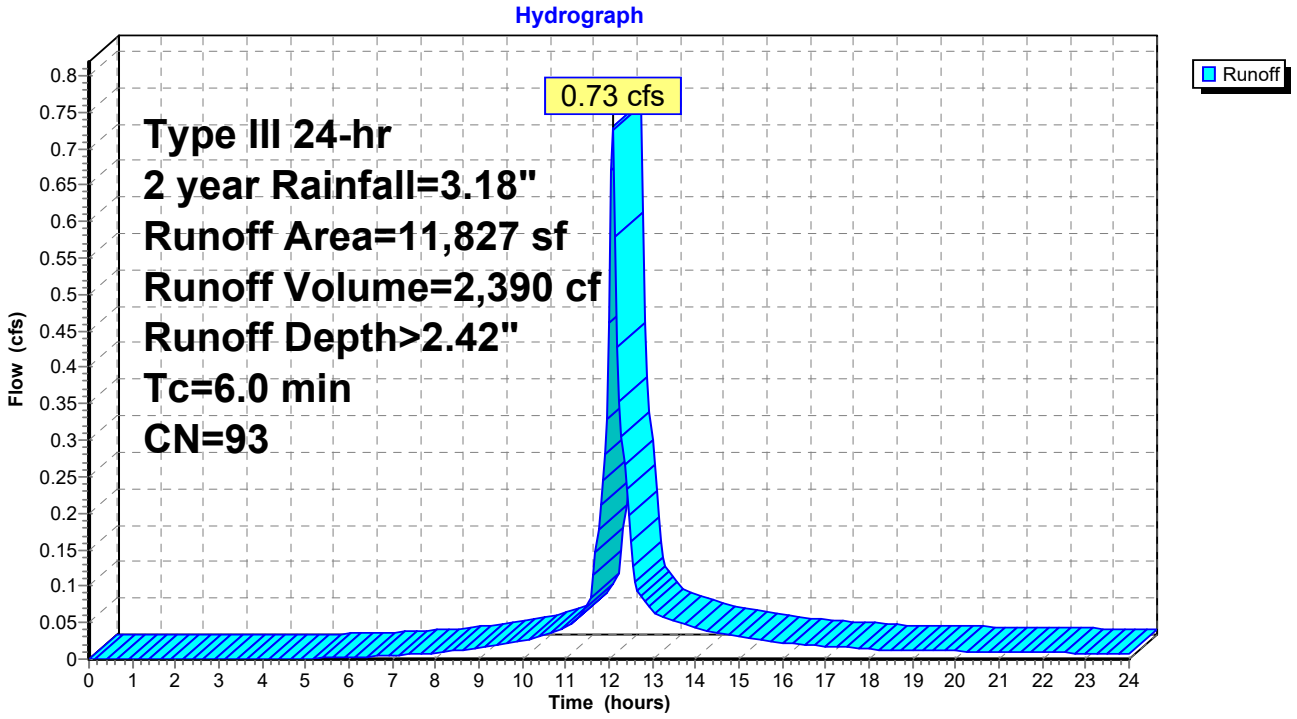
Runoff = 0.73 cfs @ 12.09 hrs, Volume= 2,390 cf, Depth> 2.42"
Routed to Pond CB4 : CB4

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
7,080	98	Paved parking, HSG C
4,550	86	<50% Grass cover, Poor, HSG C
197	98	Unconnected pavement, HSG C
11,827	93	Weighted Average
4,550		38.47% Pervious Area
7,277		61.53% Impervious Area
197		2.71% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW OVER PAVEMENT TO CB4**

Subcatchment P4B: FLOW TO CB4



Summary for Subcatchment P5: P5

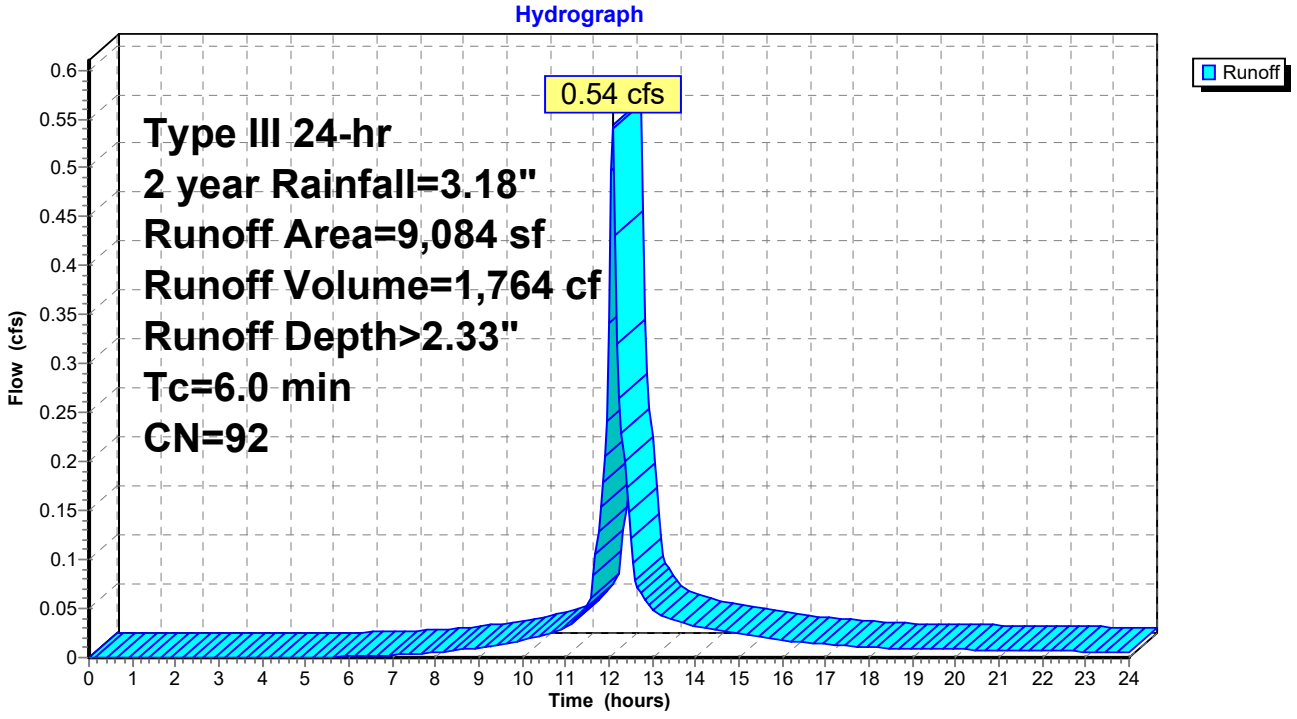
Runoff = 0.54 cfs @ 12.09 hrs, Volume= 1,764 cf, Depth> 2.33"
Routed to Pond 2P : POND P2

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
4,441	86	<50% Grass cover, Poor, HSG C
1,160	98	Water Surface, HSG C
3,483	98	Paved parking, HSG C
9,084	92	Weighted Average
4,441		48.89% Pervious Area
4,643		51.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW TO POND P2**

Subcatchment P5: P5



Summary for Subcatchment P6: P6

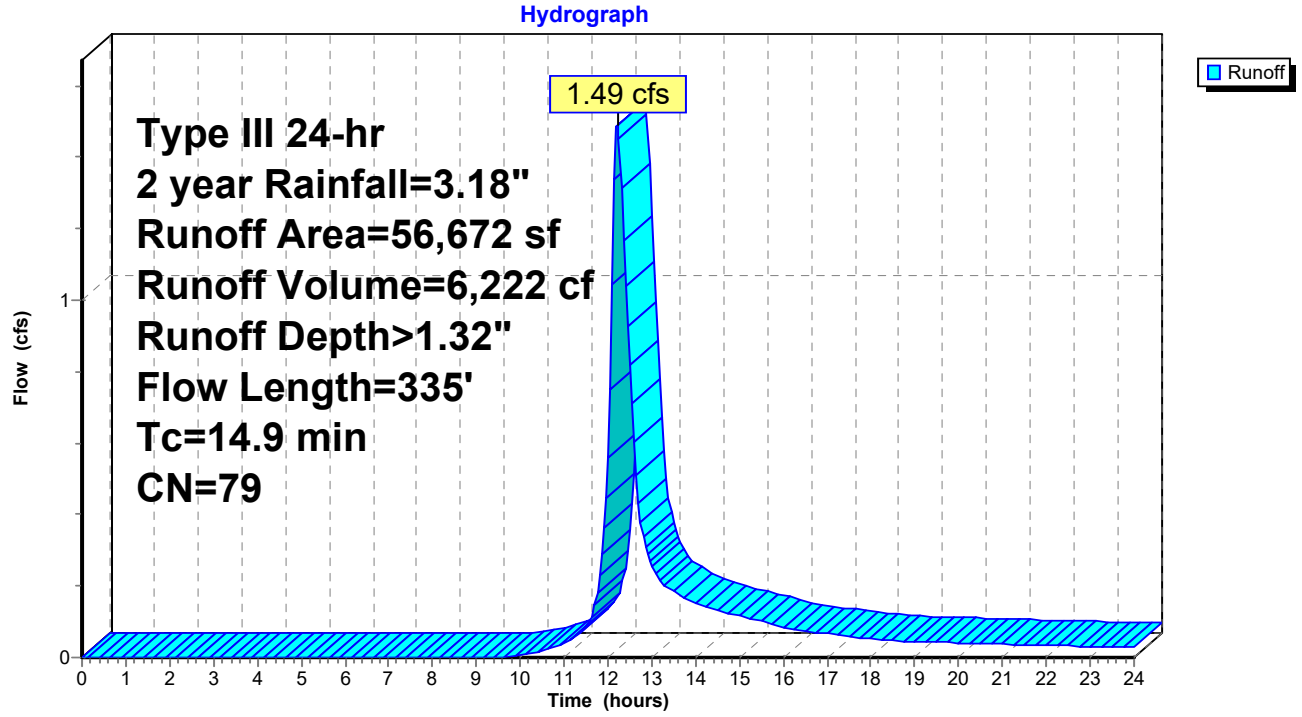
Runoff = 1.49 cfs @ 12.22 hrs, Volume= 6,222 cf, Depth> 1.32"
Routed to Reach 1R : CULVERT UNDER DRIVE

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
27,229	86	<50% Grass cover, Poor, HSG C
21,621	70	Woods, Good, HSG C
6,822	79	Woods/grass comb., Good, HSG D
1,000	98	Roofs, HSG C
56,672	79	Weighted Average
55,672		98.24% Pervious Area
1,000		1.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0900	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.18"
1.4	125	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.7	160	0.0250	0.40		**Shallow Concentrated Flow, FLOW THROUGH wetland** Forest w/Heavy Litter Kv= 2.5 fps
14.9	335	Total			

Subcatchment P6: P6



Summary for Subcatchment P7: FLOW TO POND 3

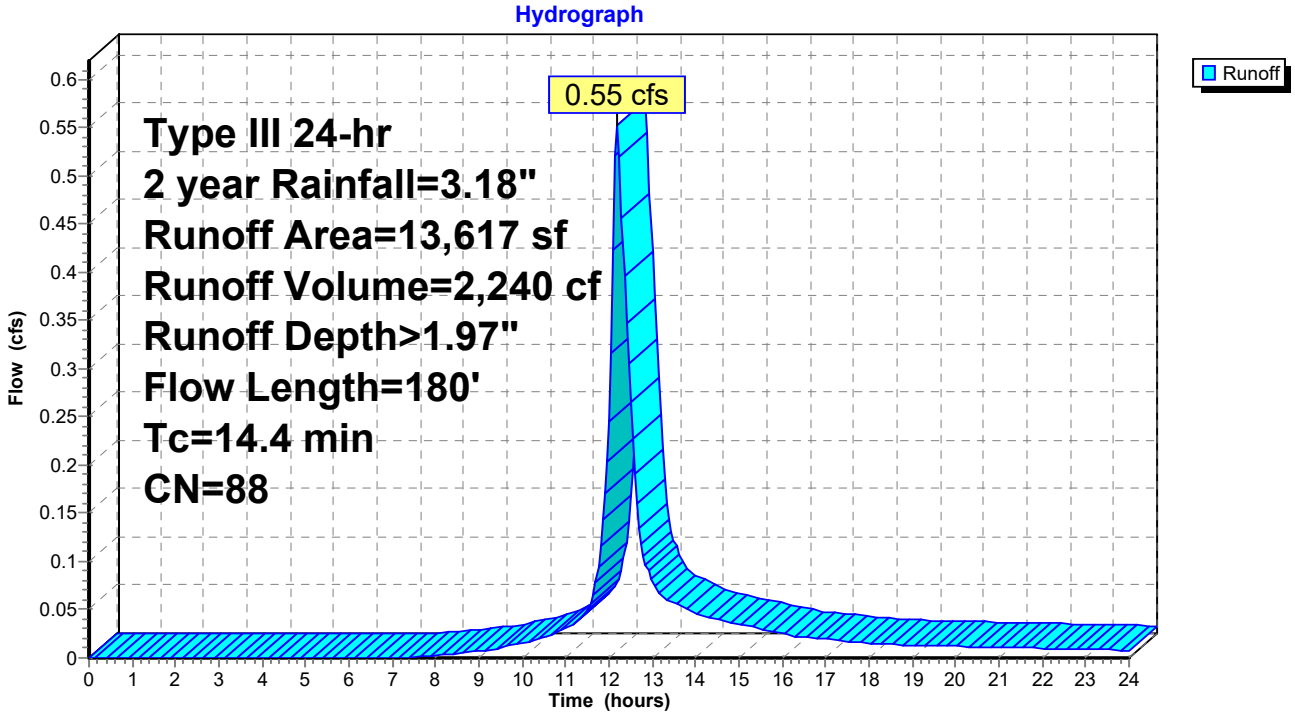
Runoff = 0.55 cfs @ 12.20 hrs, Volume= 2,240 cf, Depth> 1.97"
Routed to Pond 3P : POND 3

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
11,172	86	<50% Grass cover, Poor, HSG C
1,096	98	Paved parking, HSG C
1,349	98	Water Surface, HSG C
13,617	88	Weighted Average
11,172		82.04% Pervious Area
2,445		17.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, FLOW IN WOODS** Woods: Light underbrush n= 0.400 P2= 3.18"
2.0	130	0.0460	1.07		**Shallow Concentrated Flow, FLOW THROUGH WOODS** Woodland Kv= 5.0 fps
14.4	180	Total			

Subcatchment P7: FLOW TO POND 3



Summary for Subcatchment P8: AREA AROUND POND 1

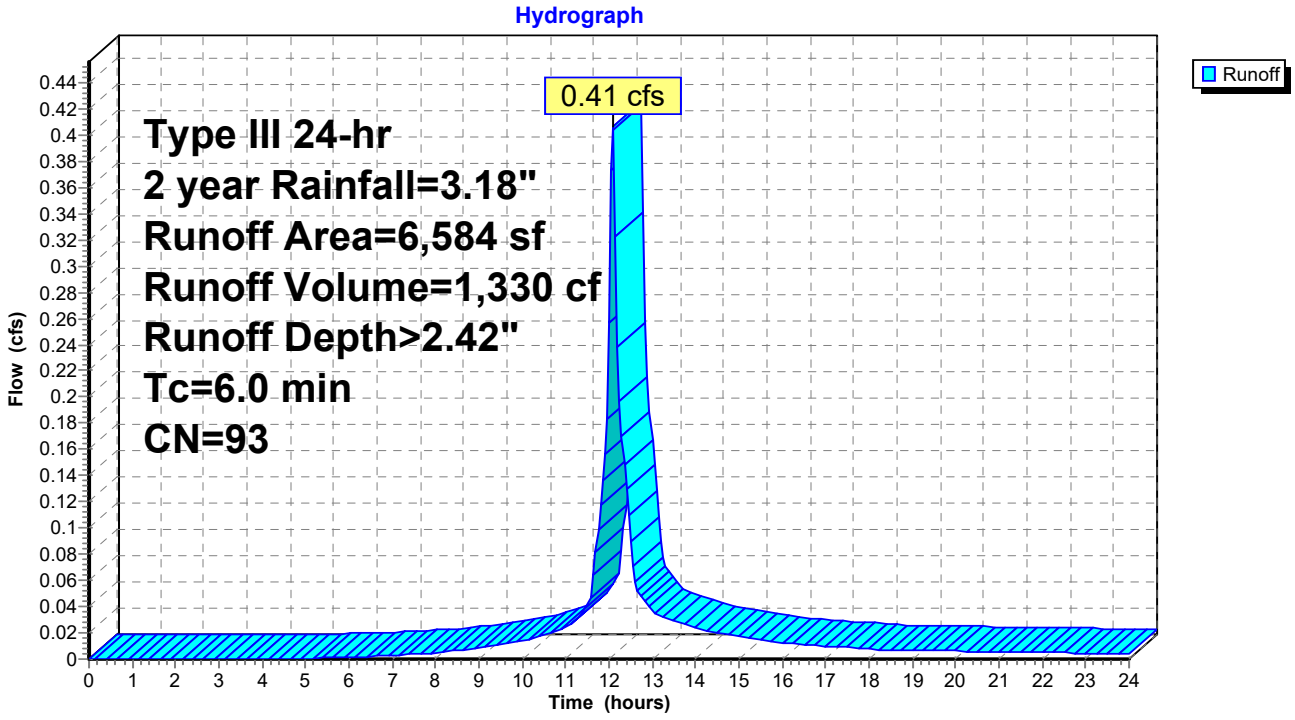
Runoff = 0.41 cfs @ 12.09 hrs, Volume= 1,330 cf, Depth> 2.42"
Routed to Pond 1P : POND 1

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
2,650	86	<50% Grass cover, Poor, HSG C
3,934	98	Water Surface, HSG C
6,584	93	Weighted Average
2,650		40.25% Pervious Area
3,934		59.75% Impervious Area

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

Subcatchment P8: AREA AROUND POND 1



Summary for Subcatchment P9: (new Subcat)

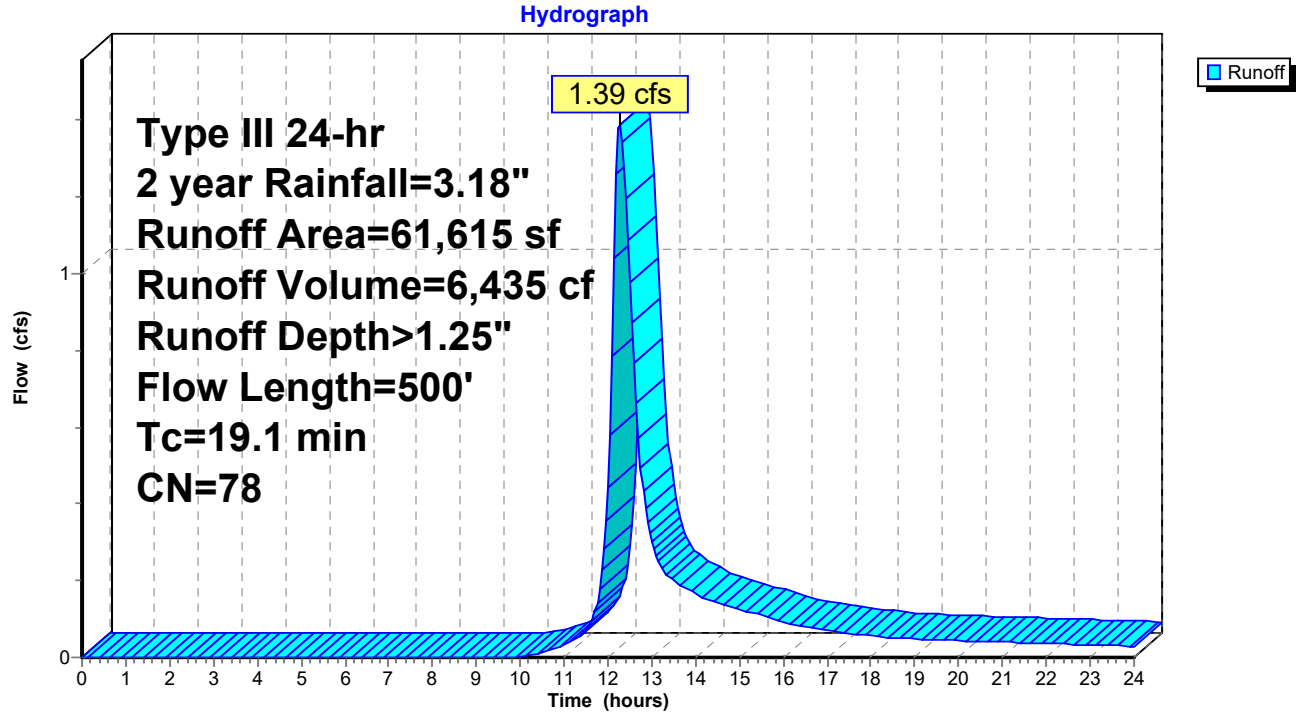
Runoff = 1.39 cfs @ 12.28 hrs, Volume= 6,435 cf, Depth> 1.25"
Routed to Pond SP1 : SUM POND WOODS

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
23,170	86	<50% Grass cover, Poor, HSG C
27,803	70	Woods, Good, HSG C
10,642	79	Woods/grass comb., Good, HSG D
61,615	78	Weighted Average
61,615		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, FLOW THROUGH WOODS** Woods: Light underbrush n= 0.400 P2= 3.18"
6.7	450	0.0500	1.12		**Shallow Concentrated Flow, FLOW THROUGH WOODS** Woodland Kv= 5.0 fps
19.1	500	Total			

Subcatchment P9: (new Subcat)



Summary for Subcatchment R1: IOT 1 ROOF

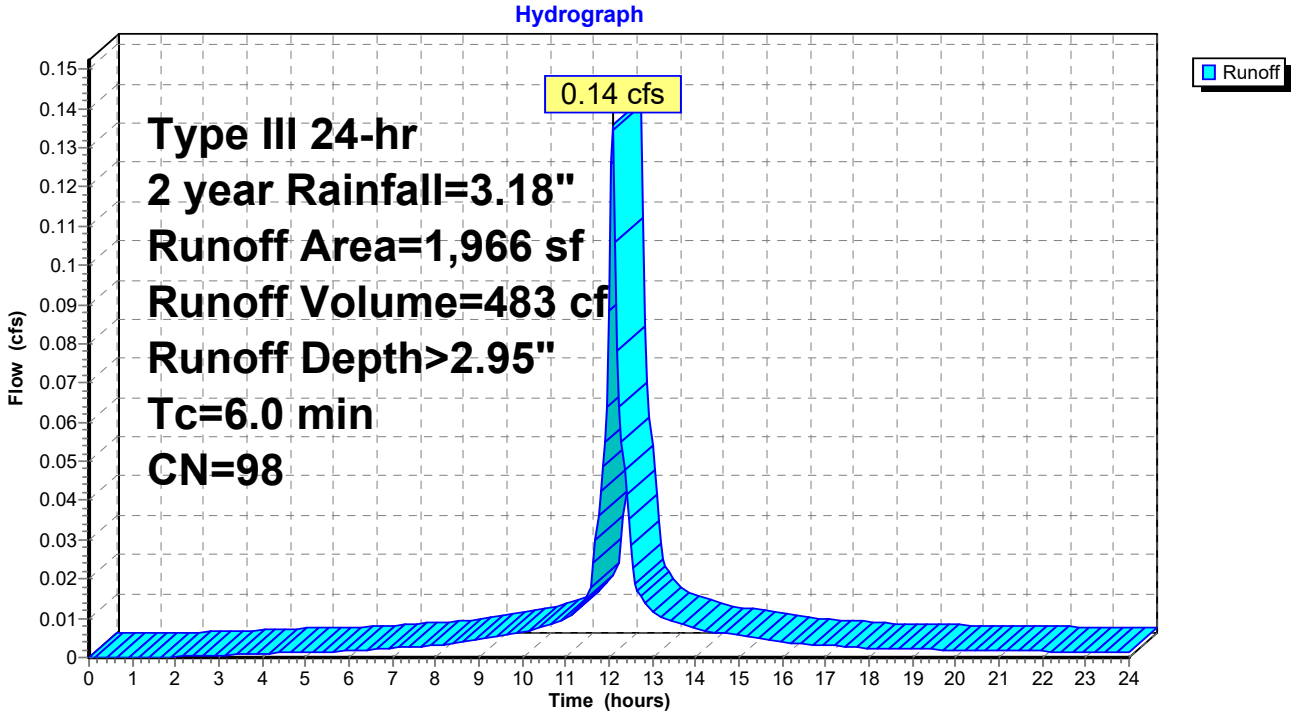
Runoff = 0.14 cfs @ 12.09 hrs, Volume= 483 cf, Depth> 2.95"
Routed to Pond 2P : POND P2

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
1,966	98	Roofs, HSG C
1,966		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW FROM ROOF TO POND**

Subcatchment R1: IOT 1 ROOF



Summary for Subcatchment R2: LOT 2 ROOF

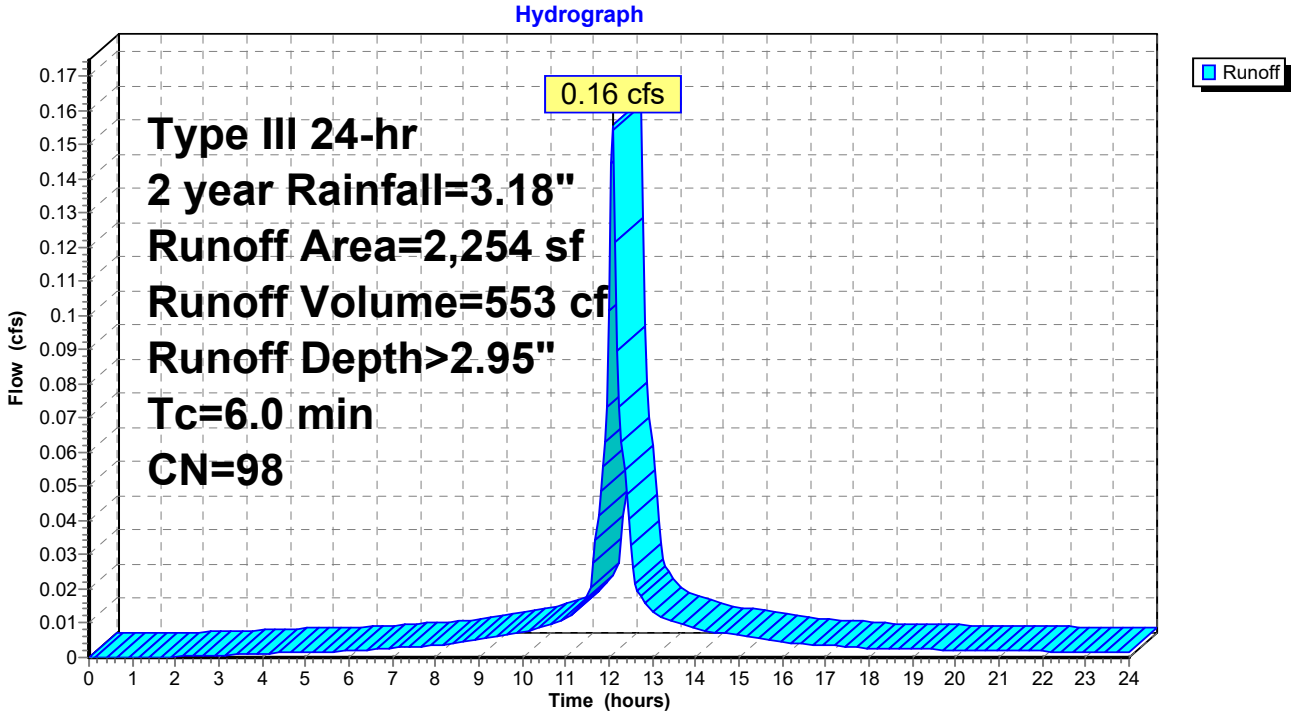
Runoff = 0.16 cfs @ 12.09 hrs, Volume= 553 cf, Depth> 2.95"
Routed to Pond 3P : POND 3

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW IN GUTTERS AND PIPES TO POND 3**

Subcatchment R2: LOT 2 ROOF



Summary for Subcatchment R3: (new Subcat)

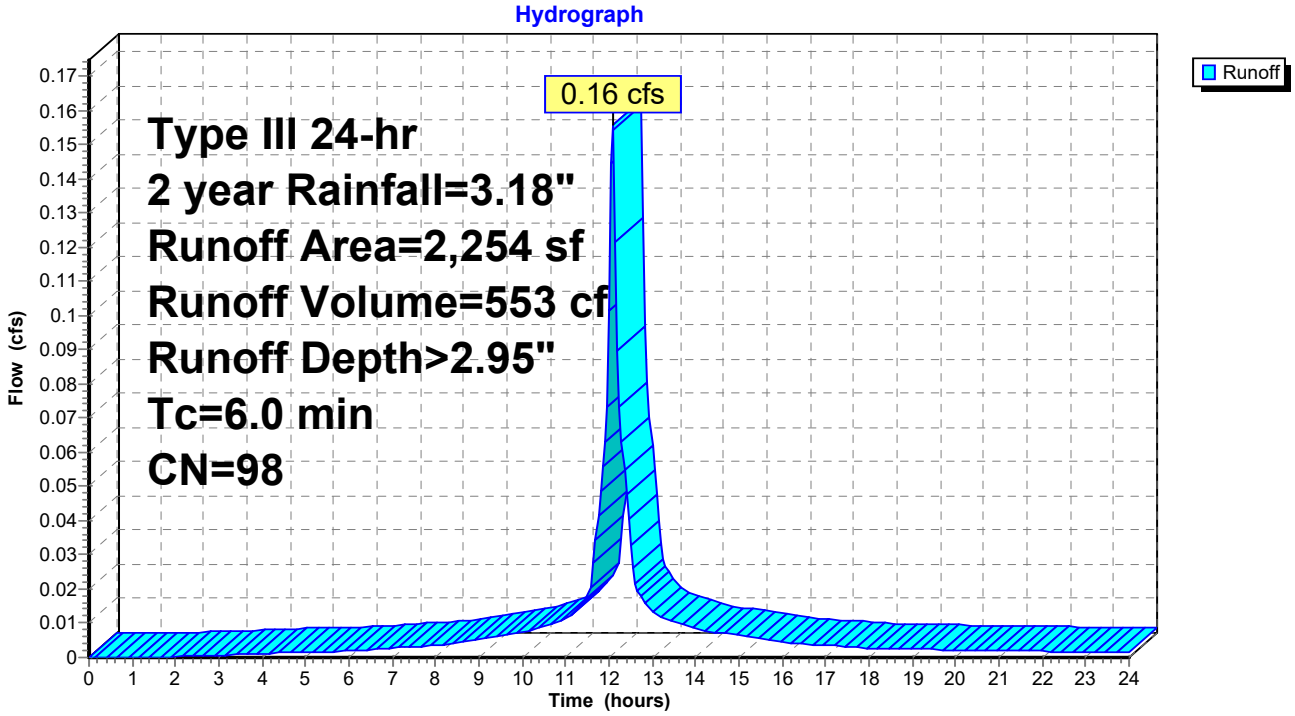
Runoff = 0.16 cfs @ 12.09 hrs, Volume= 553 cf, Depth> 2.95"
Routed to Pond 1P : POND 1

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 2 year Rainfall=3.18"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW THROUGH GUTTERS TO POND**

Subcatchment R3: (new Subcat)



Summary for Reach 1R: CULVERT UNDER DRIVE

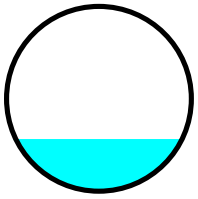
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 67,722 sf, 11.24% Impervious, Inflow Depth > 1.10" for 2 year event
Inflow = 1.49 cfs @ 12.22 hrs, Volume= 6,222 cf
Outflow = 1.49 cfs @ 12.22 hrs, Volume= 6,222 cf, Atten= 0%, Lag= 0.0 min
Routed to Pond SP1 : SUM POND WOODS

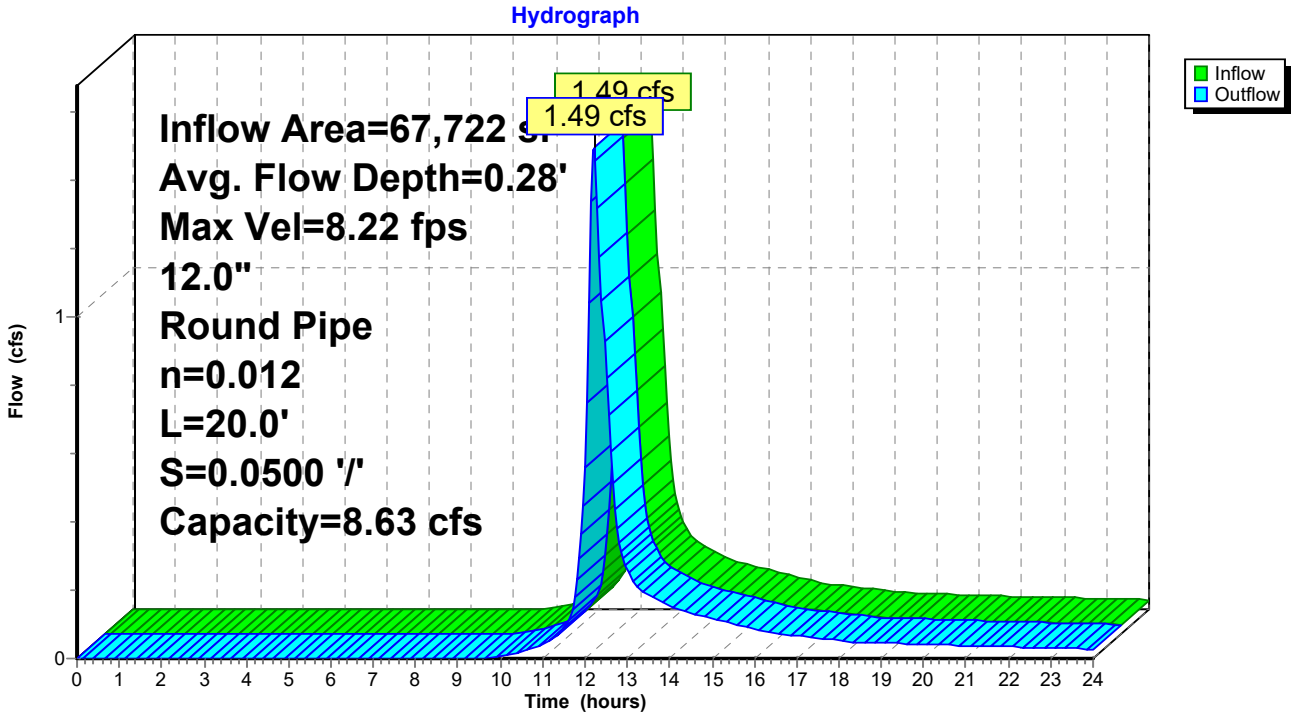
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.22 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 3.37 fps, Avg. Travel Time= 0.1 min

Peak Storage= 4 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.28' , Surface Width= 0.90'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.63 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 20.0' Slope= 0.0500 '/'
Inlet Invert= 259.00', Outlet Invert= 258.00'



Reach 1R: CULVERT UNDER DRIVE



Summary for Pond 1P: POND 1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=58)
[80] Warning: Exceeded Pond MH3 by 0.25' @ 0.00 hrs (0.20 cfs 2,112 cf)

Inflow Area = 40,965 sf, 57.32% Impervious, Inflow Depth > 2.40" for 2 year event
Inflow = 2.48 cfs @ 12.09 hrs, Volume= 8,198 cf
Outflow = 0.38 cfs @ 12.59 hrs, Volume= 7,066 cf, Atten= 85%, Lag= 30.0 min
Discarded = 0.08 cfs @ 12.59 hrs, Volume= 3,744 cf
Primary = 0.31 cfs @ 12.59 hrs, Volume= 3,323 cf
Routed to Pond SP1 : SUM POND WOODS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 261.35' @ 12.59 hrs Surf.Area= 3,236 sf Storage= 3,599 cf
Flood Elev= 263.00' Surf.Area= 4,790 sf Storage= 10,193 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 104.9 min (894.4 - 789.5)

Volume	Invert	Avail.Storage	Storage Description
#1	260.00'	10,193 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

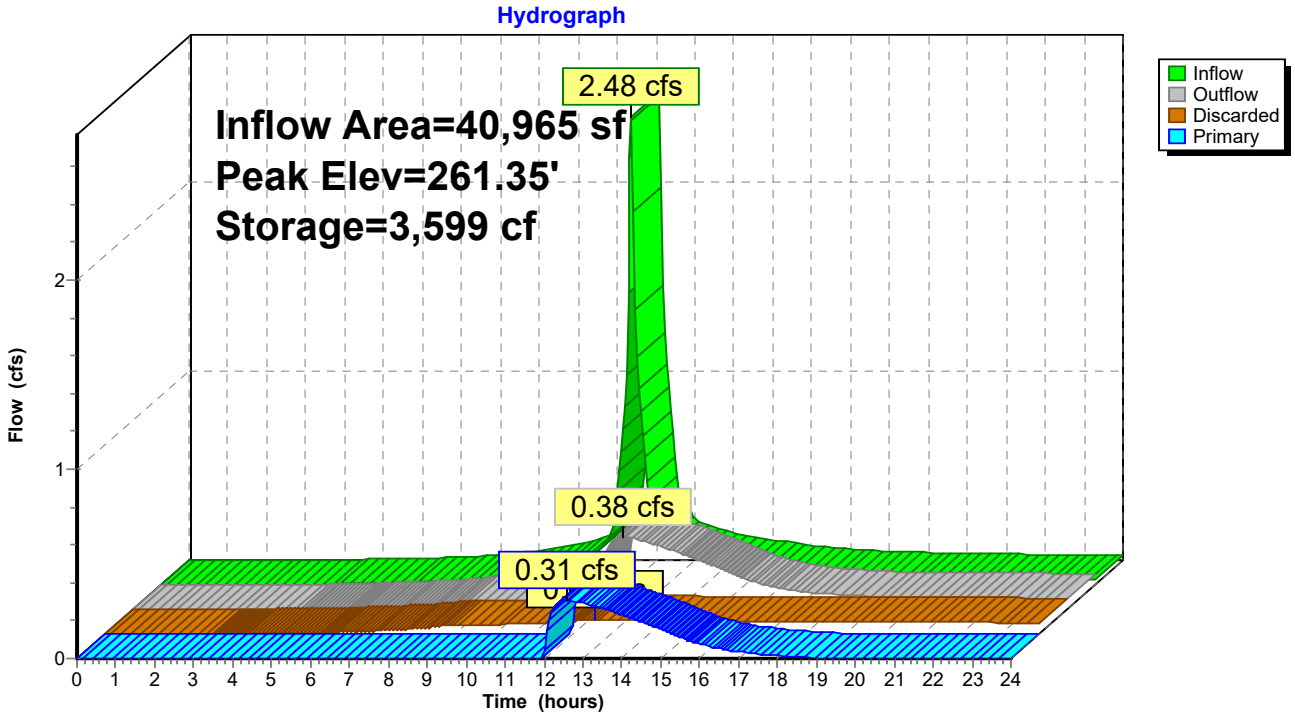
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
260.00	2,125	260.0	0	0	2,125
261.00	2,940	282.0	2,521	2,521	3,112
262.00	3,825	308.0	3,373	5,894	4,368
263.00	4,790	332.0	4,298	10,193	5,631

Device	Routing	Invert	Outlet Devices
#1	Primary	259.00'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.00' / 258.00' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	260.65'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	261.80'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Discarded	260.00'	**1.020 in/hr Exfiltration over Surface area**
#5	Primary	262.40'	**5.0' long x 8.0' 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) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Discarded OutFlow Max=0.08 cfs @ 12.59 hrs HW=261.35' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.31 cfs @ 12.59 hrs HW=261.35' TW=0.00' (Dynamic Tailwater)
├**1=Culvert** (Passes 0.31 cfs of 5.14 cfs potential flow)
│ ├**2=Orifice/Grate** (Orifice Controls 0.31 cfs @ 3.51 fps)
│ └**3=Orifice/Grate** (Controls 0.00 cfs)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: POND 1



Summary for Pond 2P: POND P2

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=2)

Inflow Area = 11,050 sf, 59.81% Impervious, Inflow Depth > 2.44" for 2 year event
Inflow = 0.68 cfs @ 12.09 hrs, Volume= 2,246 cf
Outflow = 0.05 cfs @ 13.59 hrs, Volume= 2,246 cf, Atten= 93%, Lag= 90.2 min
Discarded = 0.05 cfs @ 13.59 hrs, Volume= 2,246 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach 1R : CULVERT UNDER DRIVE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 263.03' @ 13.59 hrs Surf.Area= 1,972 sf Storage= 964 cf
Flood Elev= 263.50' Surf.Area= 2,275 sf Storage= 1,952 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 184.0 min (972.6 - 788.6)

Volume	Invert	Avail.Storage	Storage Description
#1	262.50'	1,952 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

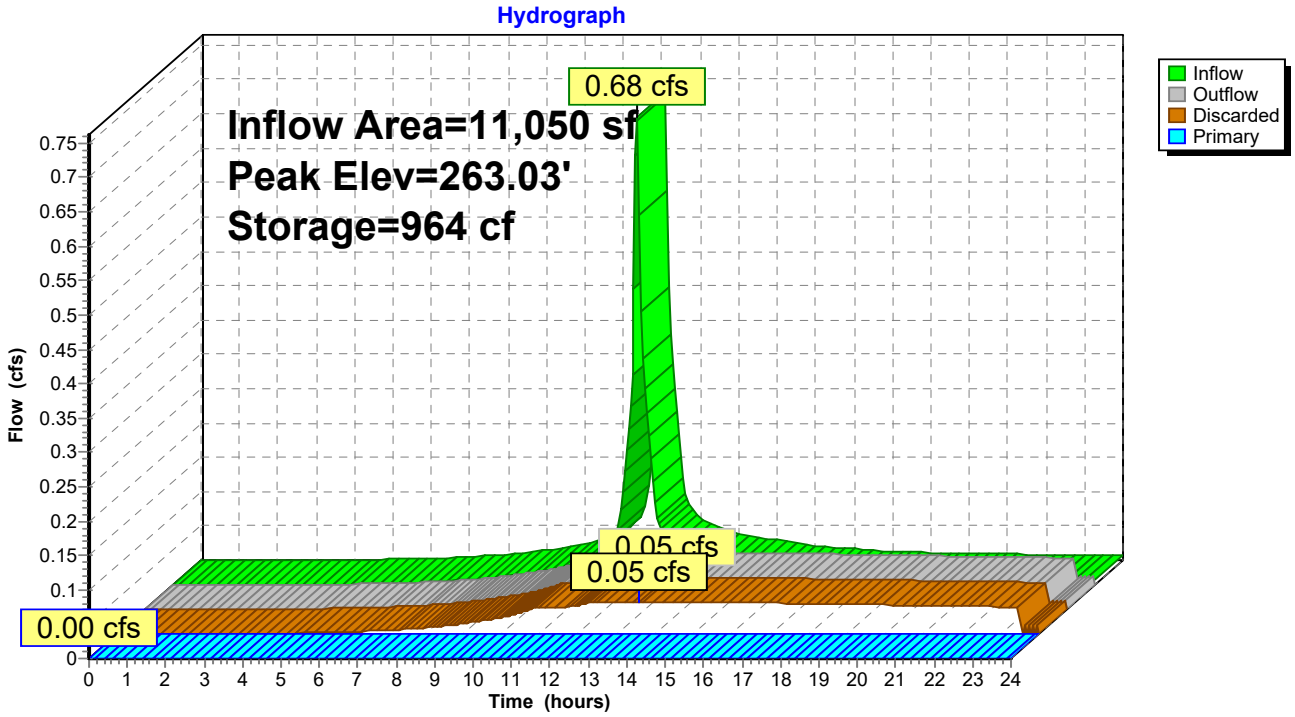
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
262.50	1,640	172.0	0	0	1,640
263.00	1,950	200.0	896	896	2,474
263.50	2,275	207.0	1,055	1,952	2,723

Device	Routing	Invert	Outlet Devices
#1	Discarded	262.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	263.20'	**3.0' 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

Discarded OutFlow Max=0.05 cfs @ 13.59 hrs HW=263.03' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=262.50' TW=259.00' (Dynamic Tailwater)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: POND P2



Summary for Pond 3P: POND 3

Inflow Area = 15,871 sf, 29.61% Impervious, Inflow Depth > 2.11" for 2 year event
Inflow = 0.65 cfs @ 12.18 hrs, Volume= 2,793 cf
Outflow = 0.18 cfs @ 12.65 hrs, Volume= 2,739 cf, Atten= 72%, Lag= 28.3 min
Discarded = 0.04 cfs @ 12.65 hrs, Volume= 1,574 cf
Primary = 0.14 cfs @ 12.65 hrs, Volume= 1,165 cf
Routed to Pond SP1 : SUM POND WOODS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 263.54' @ 12.65 hrs Surf.Area= 1,663 sf Storage= 1,023 cf
Flood Elev= 265.00' Surf.Area= 3,131 sf Storage= 4,528 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 92.7 min (901.3 - 808.6)

Volume	Invert	Avail.Storage	Storage Description
#1	262.75'	4,528 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

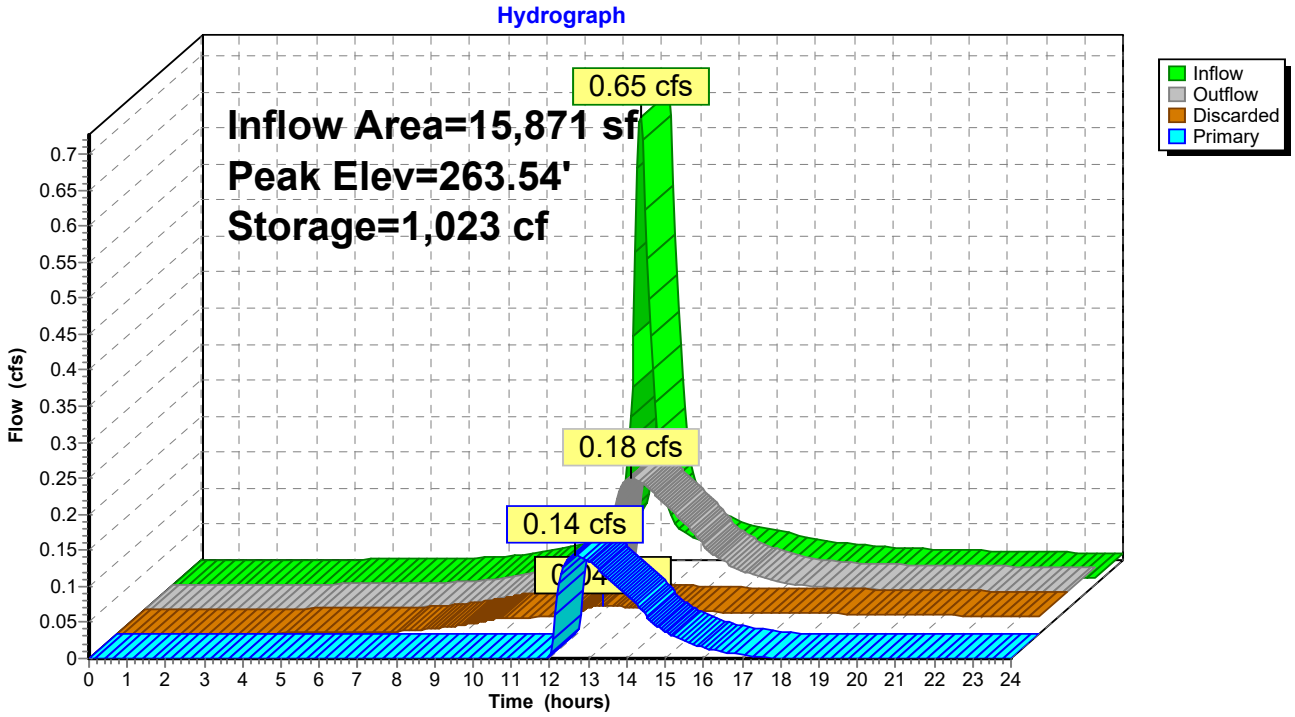
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
262.75	954	190.0	0	0	954
264.00	2,162	300.0	1,897	1,897	5,254
265.00	3,131	282.0	2,632	4,528	6,137

Device	Routing	Invert	Outlet Devices
#1	Primary	263.05'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 263.05' / 261.50' S= 0.0775 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	262.75'	**1.020 in/hr Exfiltration over Surface area**
#3	Device 1	263.90'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	263.05'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	264.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 12.65 hrs HW=263.54' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.14 cfs @ 12.65 hrs HW=263.54' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.14 cfs of 0.92 cfs potential flow)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  ├**4=Orifice/Grate** (Orifice Controls 0.14 cfs @ 2.92 fps)
  └**5=Orifice/Grate** (Controls 0.00 cfs)

Pond 3P: POND 3



Summary for Pond CB1: (new Pond)

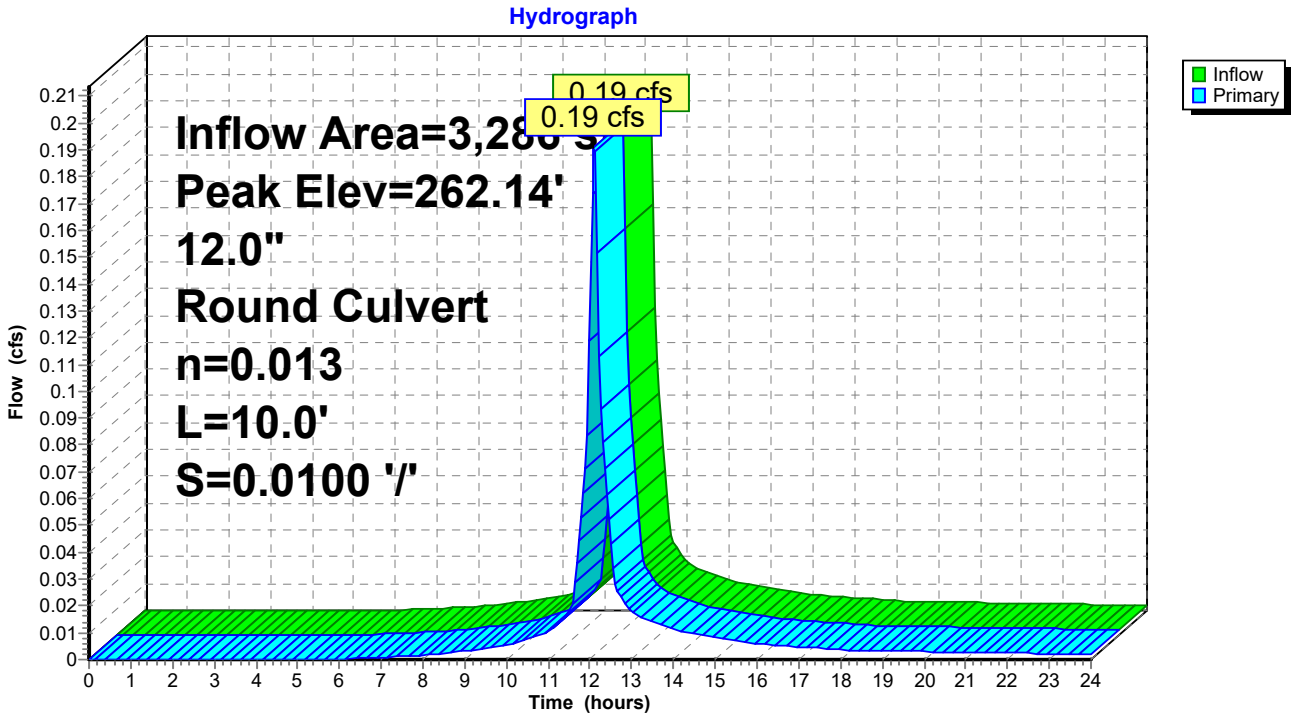
Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 2.24" for 2 year event
Inflow = 0.19 cfs @ 12.09 hrs, Volume= 613 cf
Outflow = 0.19 cfs @ 12.09 hrs, Volume= 613 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.19 cfs @ 12.09 hrs, Volume= 613 cf
Routed to Pond MH1 : MH1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.14' @ 12.09 hrs
Flood Elev= 264.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	261.90'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.19 cfs @ 12.09 hrs HW=262.13' TW=261.95' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.19 cfs @ 2.03 fps)

Pond CB1: (new Pond)



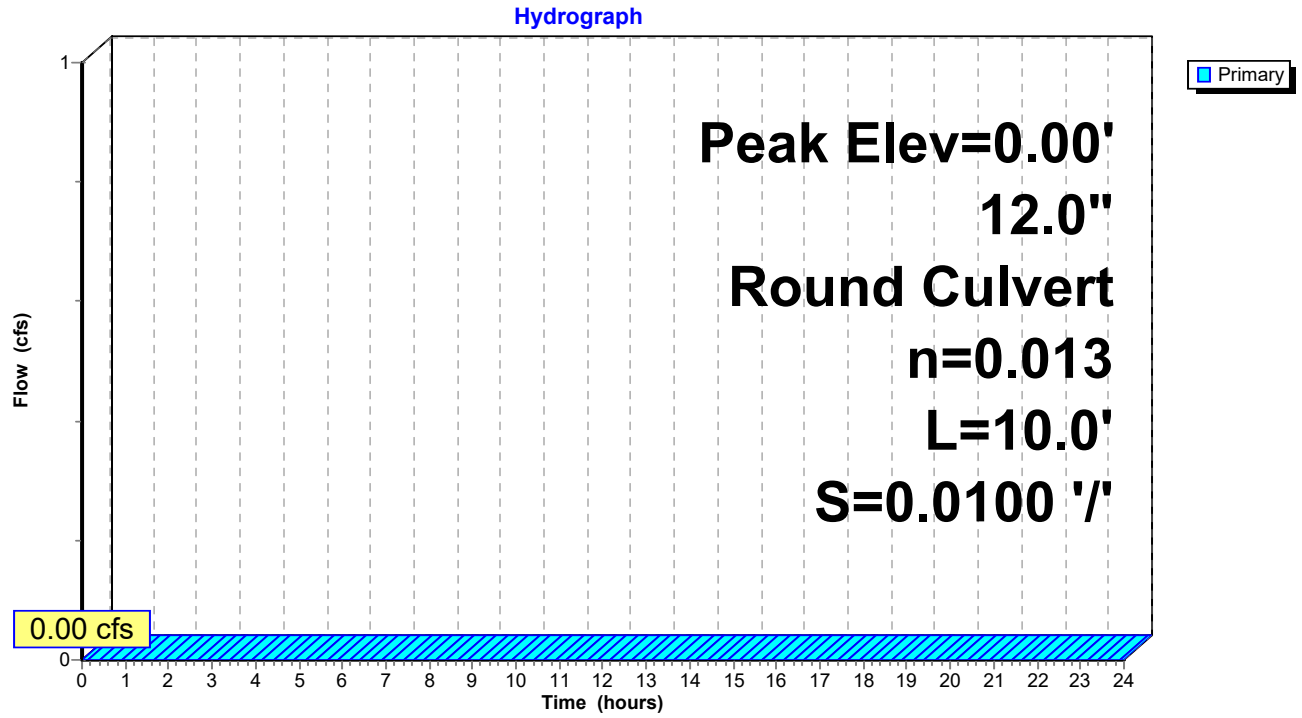
Summary for Pond CB2: CB2

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

Device	Routing	Invert	Outlet Devices
#1	Primary	261.90'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=261.70' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)

Pond CB2: CB2



Summary for Pond CB3: (new Pond)

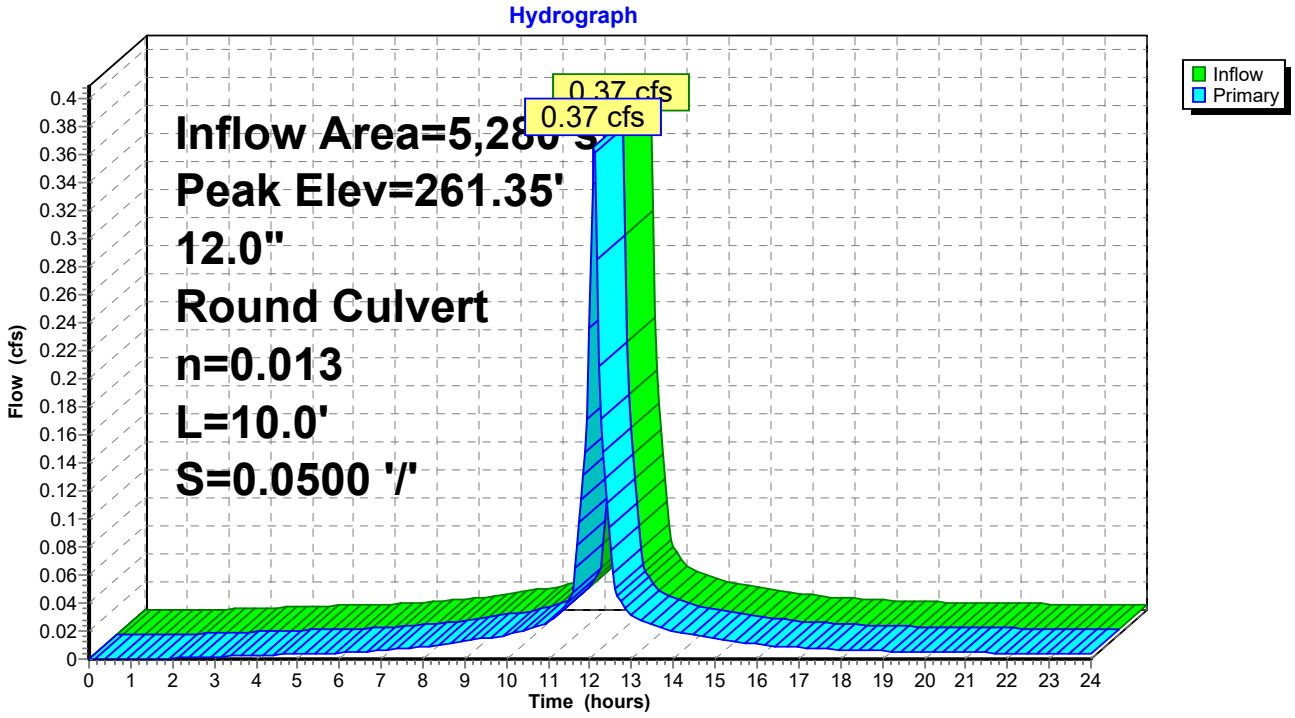
Inflow Area = 5,280 sf,100.00% Impervious, Inflow Depth > 2.95" for 2 year event
Inflow = 0.37 cfs @ 12.09 hrs, Volume= 1,296 cf
Outflow = 0.37 cfs @ 12.09 hrs, Volume= 1,296 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.37 cfs @ 12.09 hrs, Volume= 1,296 cf
Routed to Pond MH3 : DMH3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 261.35' @ 12.68 hrs
Flood Elev= 263.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.50'	**12.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.04 cfs @ 12.09 hrs HW=260.88' TW=260.88' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.04 cfs @ 0.22 fps)

Pond CB3: (new Pond)



Summary for Pond CB4: CB4

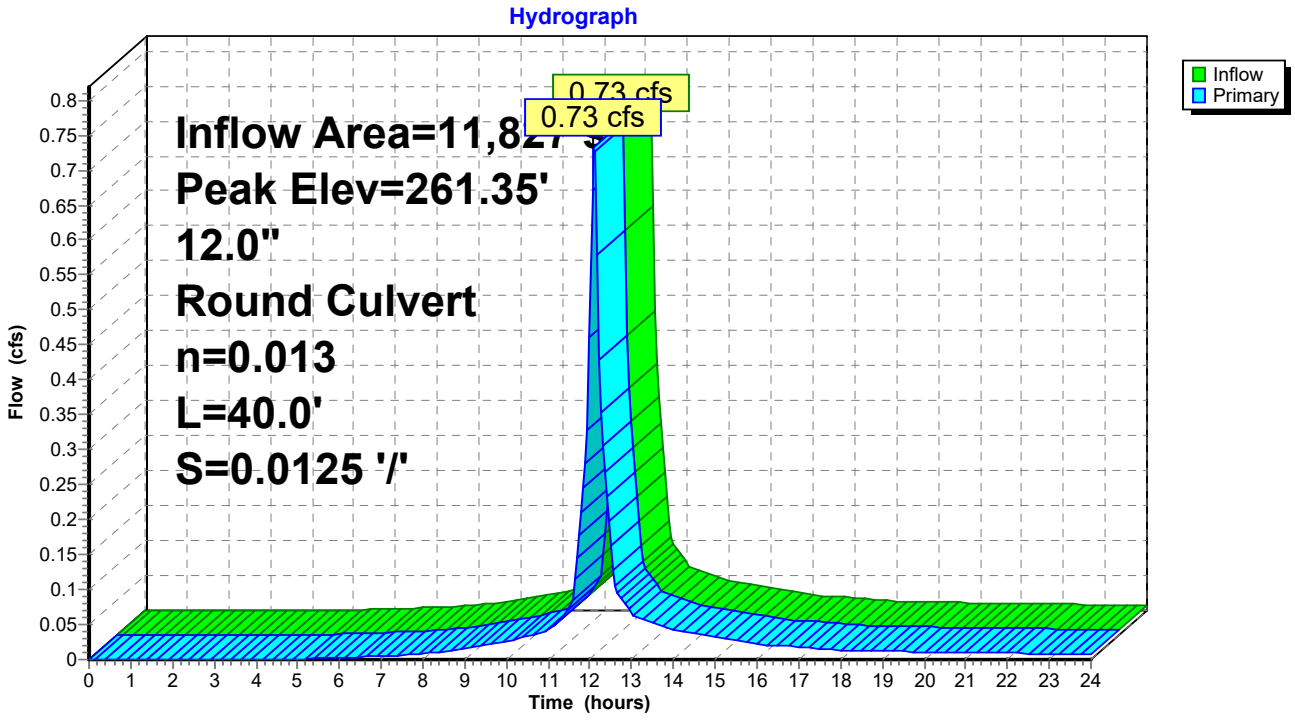
Inflow Area = 11,827 sf, 61.53% Impervious, Inflow Depth > 2.42" for 2 year event
Inflow = 0.73 cfs @ 12.09 hrs, Volume= 2,390 cf
Outflow = 0.73 cfs @ 12.09 hrs, Volume= 2,390 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.73 cfs @ 12.09 hrs, Volume= 2,390 cf
Routed to Pond MH3 : DMH3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 261.35' @ 12.68 hrs
Flood Elev= 263.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.50'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.54 cfs @ 12.09 hrs HW=261.04' TW=260.88' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.54 cfs @ 1.81 fps)

Pond CB4: CB4



Summary for Pond MH1: MH1

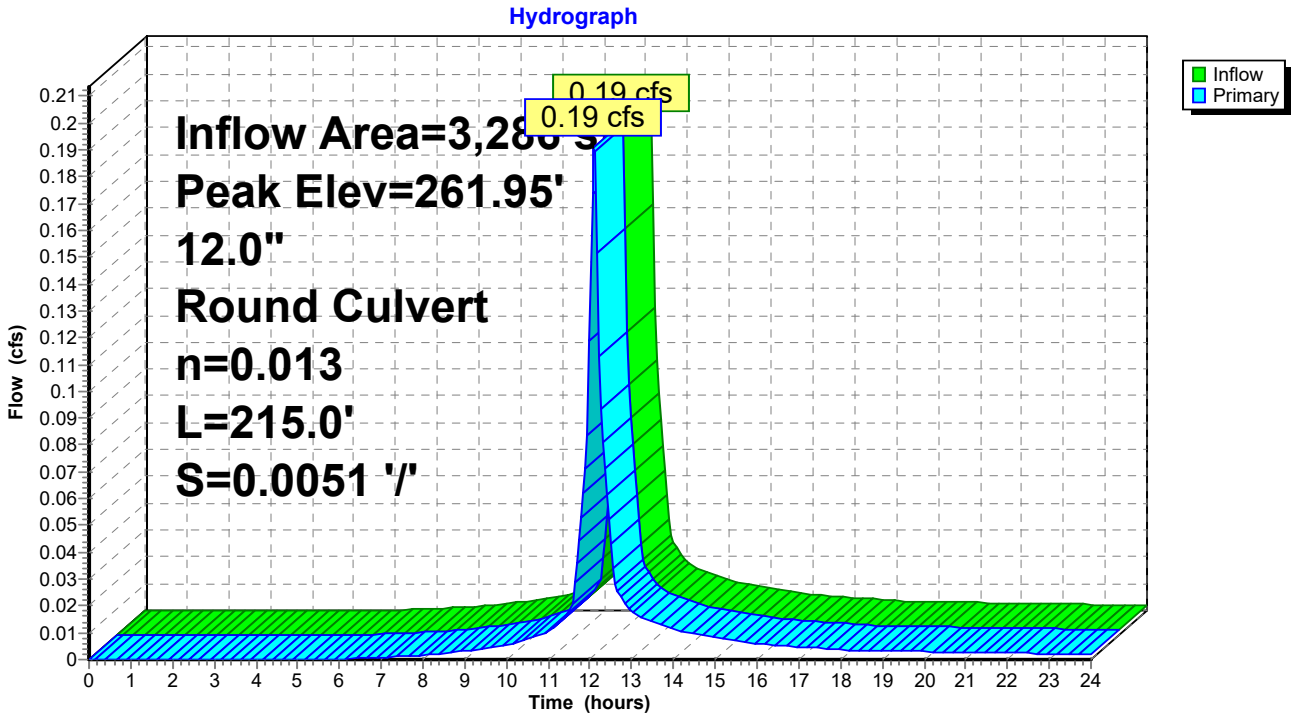
Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 2.24" for 2 year event
Inflow = 0.19 cfs @ 12.09 hrs, Volume= 613 cf
Outflow = 0.19 cfs @ 12.09 hrs, Volume= 613 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.19 cfs @ 12.09 hrs, Volume= 613 cf
Routed to Pond MH2 : MH2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 261.95' @ 12.09 hrs
Flood Elev= 265.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	261.70'	**12.0" Round Culvert** L= 215.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.70' / 260.60' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.18 cfs @ 12.09 hrs HW=261.95' TW=260.95' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.18 cfs @ 1.77 fps)

Pond MH1: MH1



Summary for Pond MH2: MH2

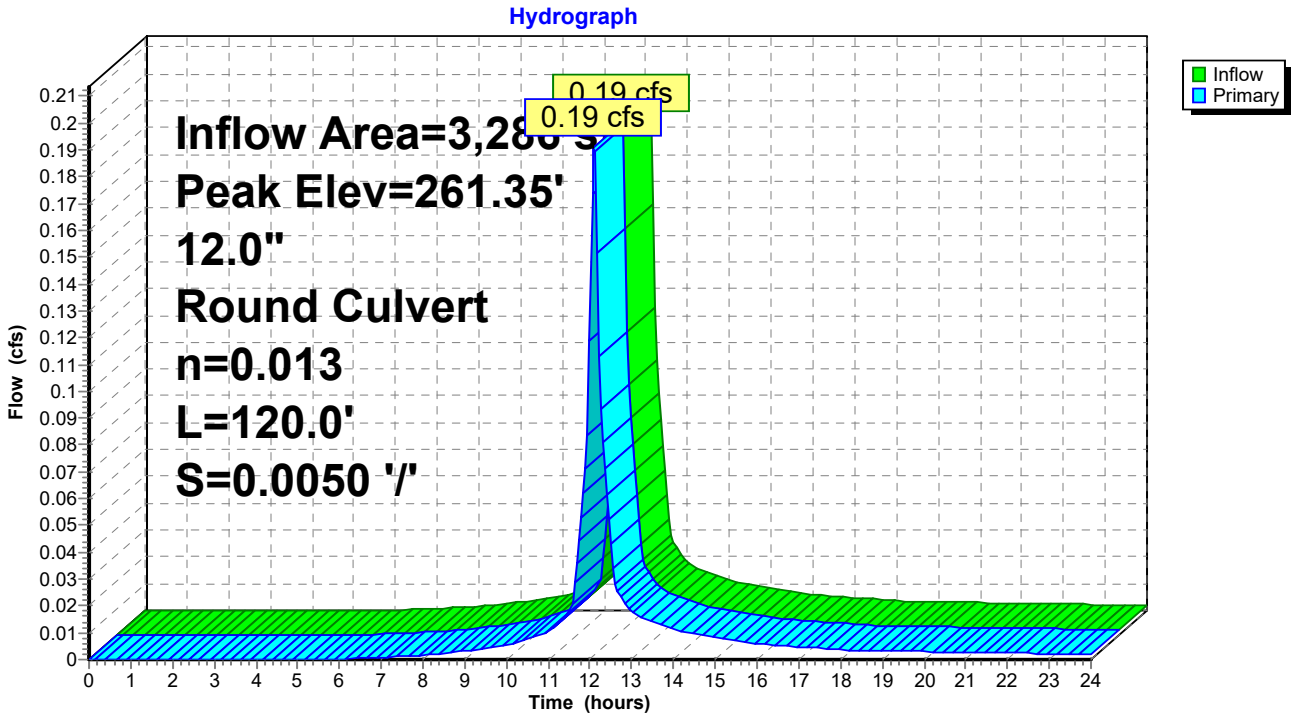
Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 2.24" for 2 year event
Inflow = 0.19 cfs @ 12.09 hrs, Volume= 613 cf
Outflow = 0.19 cfs @ 12.09 hrs, Volume= 613 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.19 cfs @ 12.09 hrs, Volume= 613 cf
Routed to Pond MH3 : DMH3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 261.35' @ 12.68 hrs
Flood Elev= 269.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.60'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.60' / 260.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.11 cfs @ 12.09 hrs HW=260.95' TW=260.88' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.11 cfs @ 0.68 fps)

Pond MH2: MH2



Summary for Pond MH3: DMH3

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=117)
[80] Warning: Exceeded Pond CB3 by 0.07' @ 12.20 hrs (0.54 cfs 856 cf)
[80] Warning: Exceeded Pond CB4 by 0.03' @ 12.25 hrs (0.35 cfs 475 cf)
[80] Warning: Exceeded Pond MH2 by 0.06' @ 12.25 hrs (0.26 cfs 375 cf)

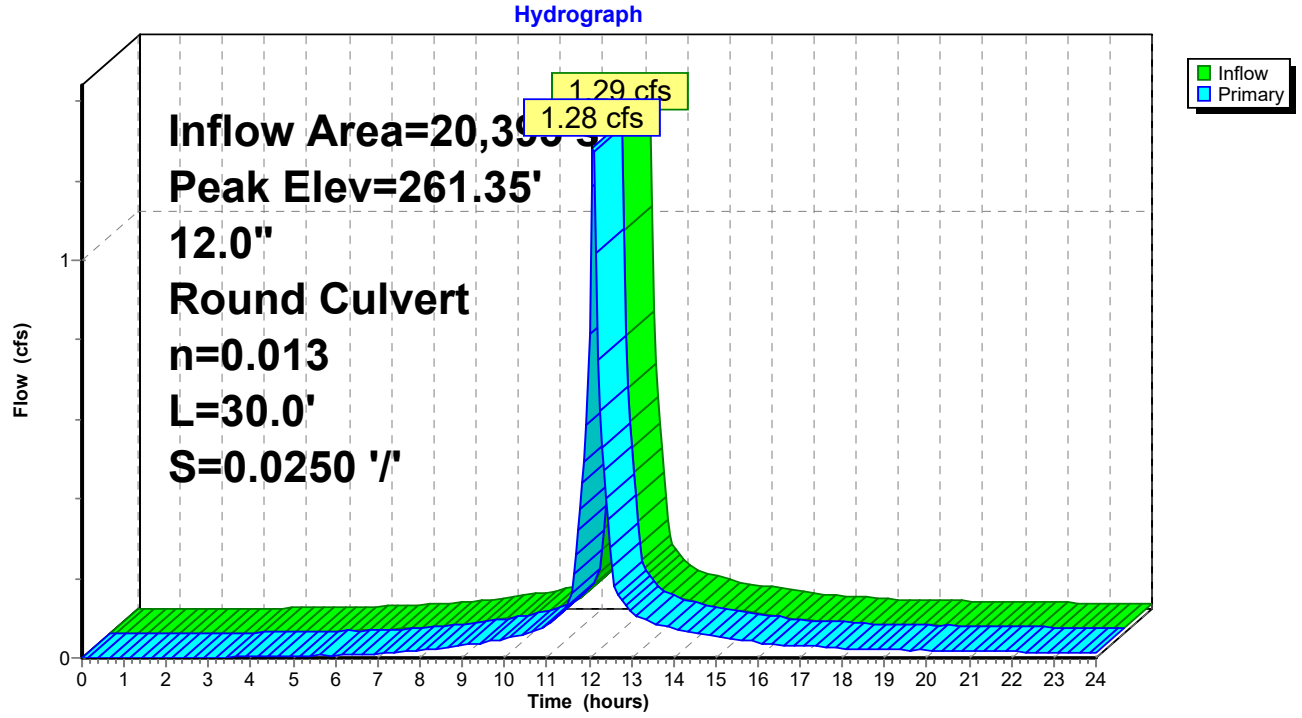
Inflow Area = 20,393 sf, 68.87% Impervious, Inflow Depth > 2.53" for 2 year event
Inflow = 1.29 cfs @ 12.09 hrs, Volume= 4,299 cf
Outflow = 1.28 cfs @ 12.09 hrs, Volume= 4,298 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.28 cfs @ 12.09 hrs, Volume= 4,298 cf
Routed to Pond 1P : POND 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 261.35' @ 12.64 hrs
Flood Elev= 263.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	259.75'	**12.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.75' / 259.00' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=260.88' TW=260.90' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond MH3: DMH3



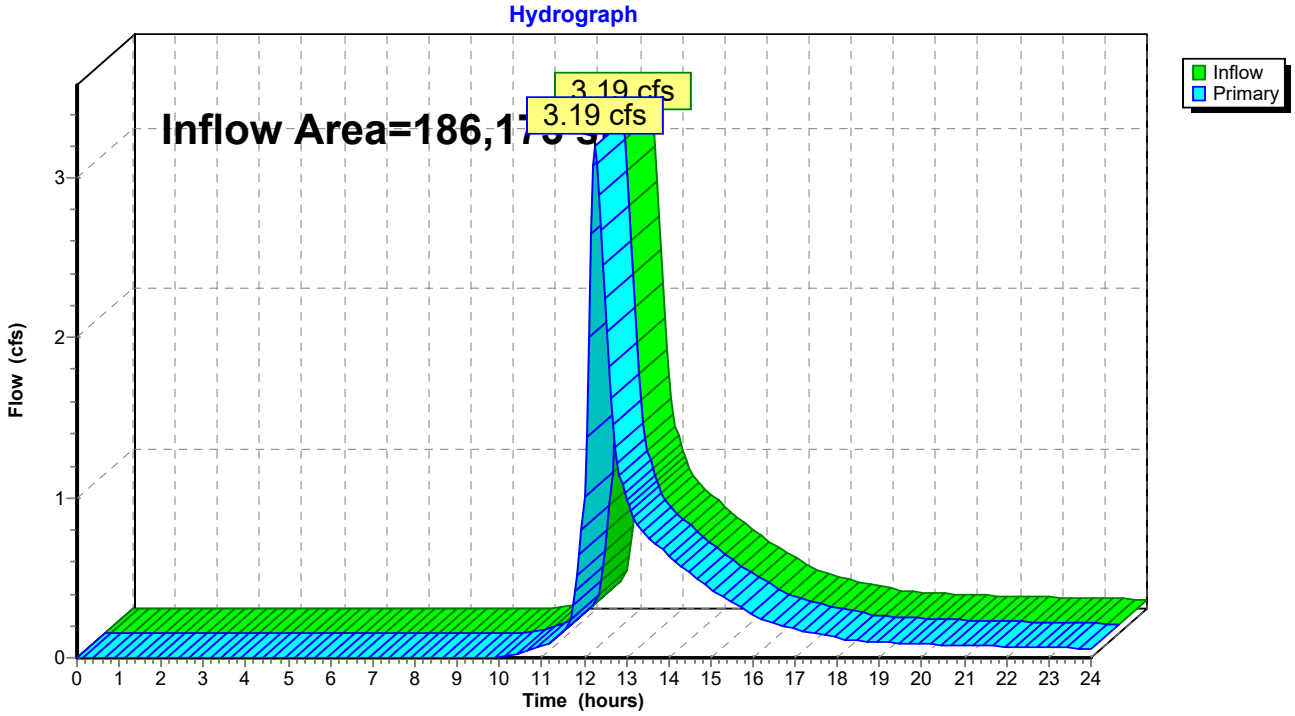
Summary for Pond SP1: SUM POND WOODS

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 186,173 sf, 19.22% Impervious, Inflow Depth > 1.11" for 2 year event
Inflow = 3.19 cfs @ 12.25 hrs, Volume= 17,145 cf
Primary = 3.19 cfs @ 12.25 hrs, Volume= 17,145 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: SUM POND WOODS



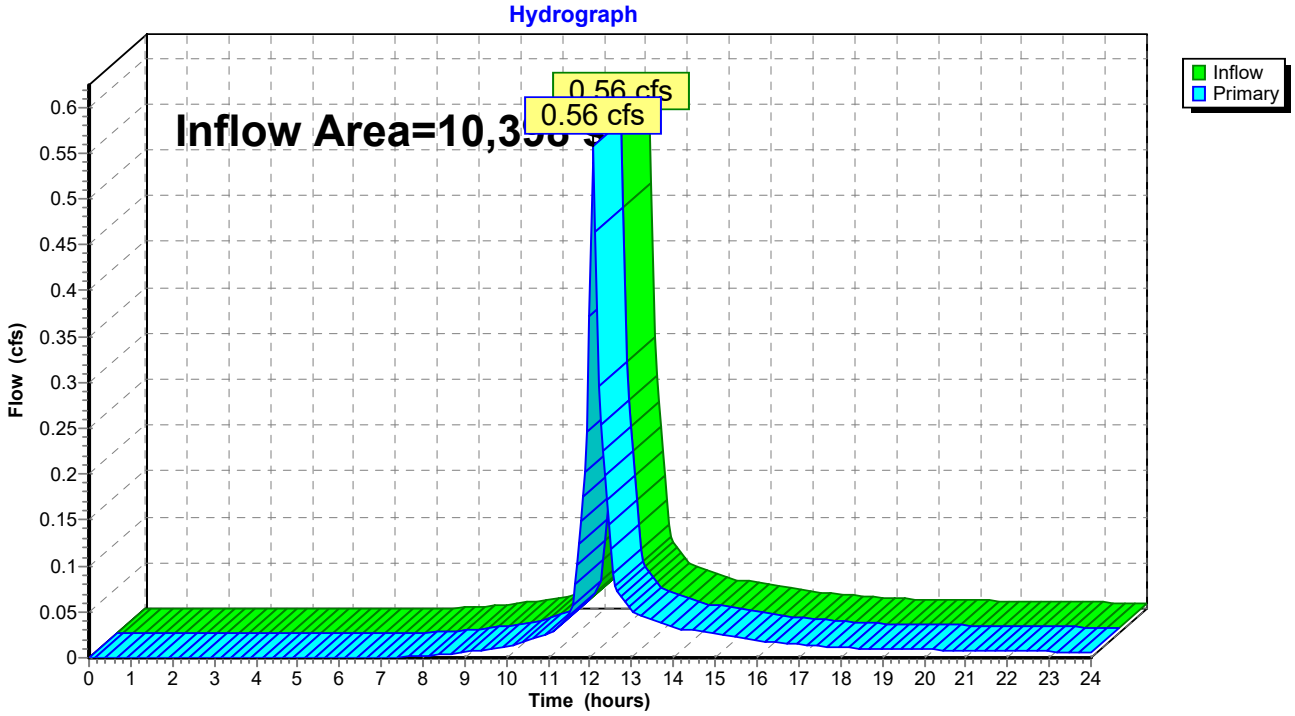
Summary for Pond SP2: SUM POND STREET

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 10,398 sf, 13.61% Impervious, Inflow Depth > 1.98" for 2 year event
Inflow = 0.56 cfs @ 12.07 hrs, Volume= 1,714 cf
Primary = 0.56 cfs @ 12.07 hrs, Volume= 1,714 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET



POST-DEVELOPMENT DRAINAGE

10 YEAR STORM

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P1A: P1A Runoff Area=3,286 sf 45.25% Impervious Runoff Depth>4.02"
Tc=6.0 min CN=91 Runoff=0.33 cfs 1,100 cf

Subcatchment P1B: P1B Runoff Area=1,506 sf 100.00% Impervious Runoff Depth>4.80"
Tc=6.0 min CN=98 Runoff=0.17 cfs 602 cf

Subcatchment P2: P2 Runoff Area=10,398 sf 13.61% Impervious Runoff Depth>3.70"
Flow Length=205' Tc=4.9 min CN=88 Runoff=1.02 cfs 3,210 cf

Subcatchment P3: (new Subcat) Runoff Area=11,734 sf 27.70% Impervious Runoff Depth>3.81"
Flow Length=250' Tc=6.2 min CN=89 Runoff=1.14 cfs 3,723 cf

Subcatchment P4A: FLOW TO CB3 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>4.80"
Tc=6.0 min CN=98 Runoff=0.58 cfs 2,112 cf

Subcatchment P4B: FLOW TO CB4 Runoff Area=11,827 sf 61.53% Impervious Runoff Depth>4.23"
Tc=6.0 min CN=93 Runoff=1.24 cfs 4,173 cf

Subcatchment P5: P5 Runoff Area=9,084 sf 51.11% Impervious Runoff Depth>4.13"
Tc=6.0 min CN=92 Runoff=0.94 cfs 3,123 cf

Subcatchment P6: P6 Runoff Area=56,672 sf 1.76% Impervious Runoff Depth>2.83"
Flow Length=335' Tc=14.9 min CN=79 Runoff=3.27 cfs 13,358 cf

Subcatchment P7: FLOW TO POND 3 Runoff Area=13,617 sf 17.96% Impervious Runoff Depth>3.70"
Flow Length=180' Tc=14.4 min CN=88 Runoff=1.02 cfs 4,197 cf

Subcatchment P8: AREA AROUND POND 1 Runoff Area=6,584 sf 59.75% Impervious Runoff Depth>4.23"
Tc=6.0 min CN=93 Runoff=0.69 cfs 2,323 cf

Subcatchment P9: (new Subcat) Runoff Area=61,615 sf 0.00% Impervious Runoff Depth>2.74"
Flow Length=500' Tc=19.1 min CN=78 Runoff=3.12 cfs 14,046 cf

Subcatchment R1: lOT 1 ROOF Runoff Area=1,966 sf 100.00% Impervious Runoff Depth>4.80"
Tc=6.0 min CN=98 Runoff=0.22 cfs 786 cf

Subcatchment R2: LOT 2 ROOF Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>4.80"
Tc=6.0 min CN=98 Runoff=0.25 cfs 902 cf

Subcatchment R3: (new Subcat) Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>4.80"
Tc=6.0 min CN=98 Runoff=0.25 cfs 902 cf

Reach 1R: CULVERT UNDER DRIVE Avg. Flow Depth=0.43' Max Vel=10.24 fps Inflow=3.30 cfs 14,081 cf
12.0" Round Pipe n=0.012 L=20.0' S=0.0500 '/' Capacity=8.63 cfs Outflow=3.30 cfs 14,081 cf

Pond 1P: POND 1 Peak Elev=262.00' Storage=5,893 cf Inflow=4.23 cfs 14,333 cf
Discarded=0.09 cfs 4,378 cf Primary=1.37 cfs 8,434 cf Outflow=1.46 cfs 12,811 cf

Pond 2P: POND P2 Peak Elev=263.31' Storage=1,536 cf Inflow=1.15 cfs 3,909 cf
Discarded=0.05 cfs 2,708 cf Primary=0.26 cfs 724 cf Outflow=0.31 cfs 3,431 cf

Pond 3P: POND 3 Peak Elev=264.05' Storage=2,009 cf Inflow=1.18 cfs 5,099 cf
Discarded=0.05 cfs 1,950 cf Primary=0.27 cfs 2,919 cf Outflow=0.32 cfs 4,868 cf

Pond CB1: (new Pond) Peak Elev=262.22' Inflow=0.33 cfs 1,100 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/' Outflow=0.33 cfs 1,100 cf

Pond CB2: CB2 Peak Elev=0.00'
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/' Primary=0.00 cfs 0 cf

Pond CB3: (new Pond) Peak Elev=262.03' Inflow=0.58 cfs 2,112 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0500 '/' Outflow=0.58 cfs 2,112 cf

Pond CB4: CB4 Peak Elev=262.04' Inflow=1.24 cfs 4,173 cf
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=1.24 cfs 4,173 cf

Pond MH1: MH1 Peak Elev=262.08' Inflow=0.33 cfs 1,100 cf
12.0" Round Culvert n=0.013 L=215.0' S=0.0051 '/' Outflow=0.33 cfs 1,100 cf

Pond MH2: MH2 Peak Elev=262.03' Inflow=0.33 cfs 1,100 cf
12.0" Round Culvert n=0.013 L=120.0' S=0.0050 '/' Outflow=0.33 cfs 1,100 cf

Pond MH3: DMH3 Peak Elev=262.03' Inflow=2.15 cfs 7,386 cf
12.0" Round Culvert n=0.013 L=30.0' S=0.0250 '/' Outflow=2.16 cfs 7,386 cf

Pond SP1: SUM POND WOODS Inflow=7.68 cfs 39,480 cf
Primary=7.68 cfs 39,480 cf

Pond SP2: SUM POND STREET Inflow=1.02 cfs 3,210 cf
Primary=1.02 cfs 3,210 cf

Total Runoff Area = 198,077 sf Runoff Volume = 54,558 cf Average Runoff Depth = 3.31"
80.46% Pervious = 159,366 sf 19.54% Impervious = 38,711 sf

Summary for Subcatchment P1A: P1A

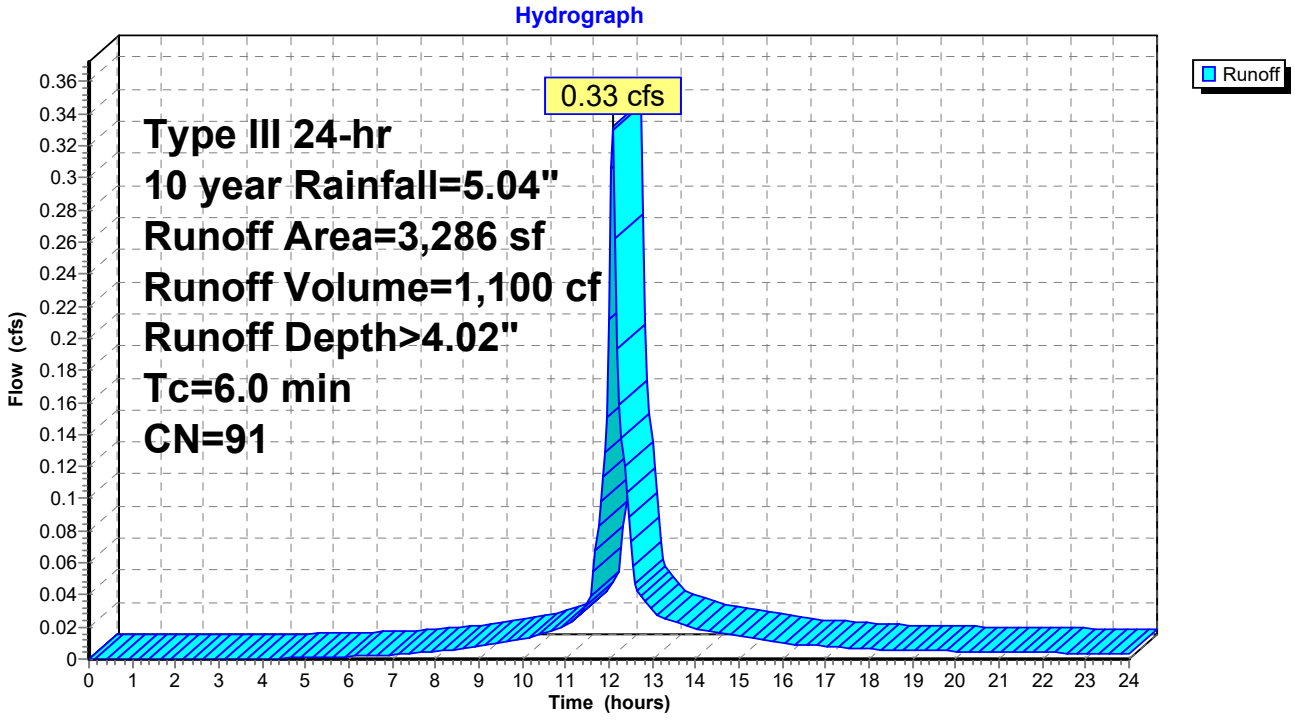
Runoff = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf, Depth> 4.02"
Routed to Pond CB1 : (new Pond)

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=5.04"

Area (sf)	CN	Description
1,799	86	<50% Grass cover, Poor, HSG C
1,487	98	Paved parking, HSG C
3,286	91	Weighted Average
1,799		54.75% Pervious Area
1,487		45.25% Impervious Area

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

Subcatchment P1A: P1A



Summary for Subcatchment P1B: P1B

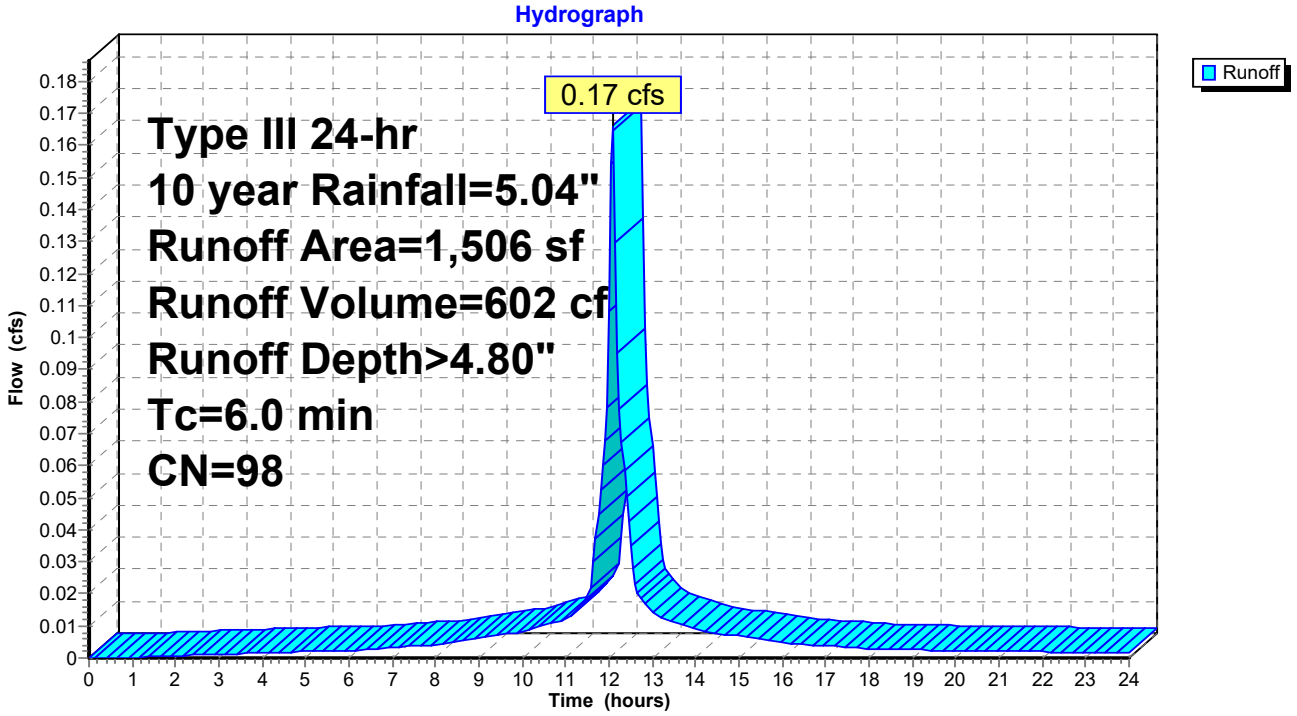
Runoff = 0.17 cfs @ 12.09 hrs, Volume= 602 cf, Depth> 4.80"

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=5.04"

Area (sf)	CN	Description
1,506	98	Paved parking, HSG C
1,506		100.00% Impervious Area

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

Subcatchment P1B: P1B



Summary for Subcatchment P2: P2

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

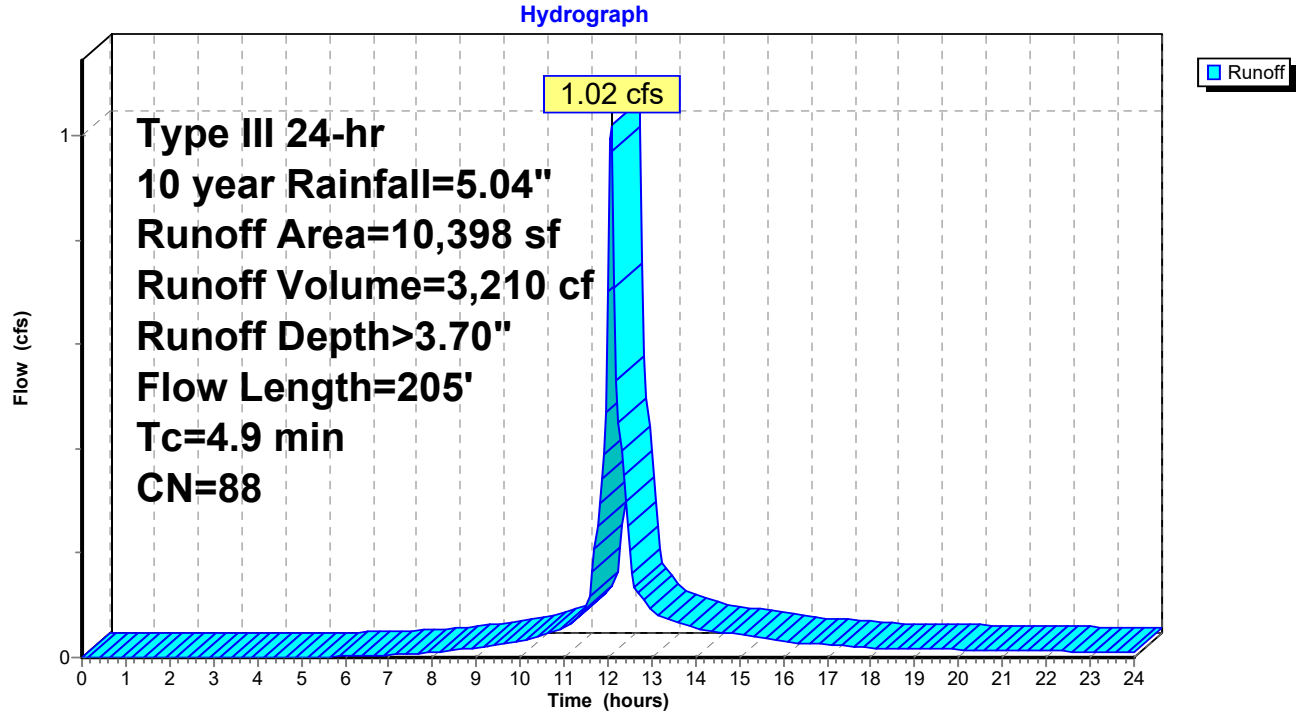
Runoff = 1.02 cfs @ 12.07 hrs, Volume= 3,210 cf, Depth> 3.70"
Routed to Pond SP2 : SUM POND STREET

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=5.04"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
8,983	86	<50% Grass cover, Poor, HSG C
10,398	88	Weighted Average
8,983		86.39% Pervious Area
1,415		13.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	50	0.0500	0.21		**Sheet Flow, flow over grass** Grass: Short n= 0.150 P2= 3.18"
0.4	35	0.0420	1.43		**Shallow Concentrated Flow, flow over grass** Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		**Shallow Concentrated Flow, flow along driveway** Paved Kv= 20.3 fps
4.9	205	Total			

Subcatchment P2: P2



Summary for Subcatchment P3: (new Subcat)

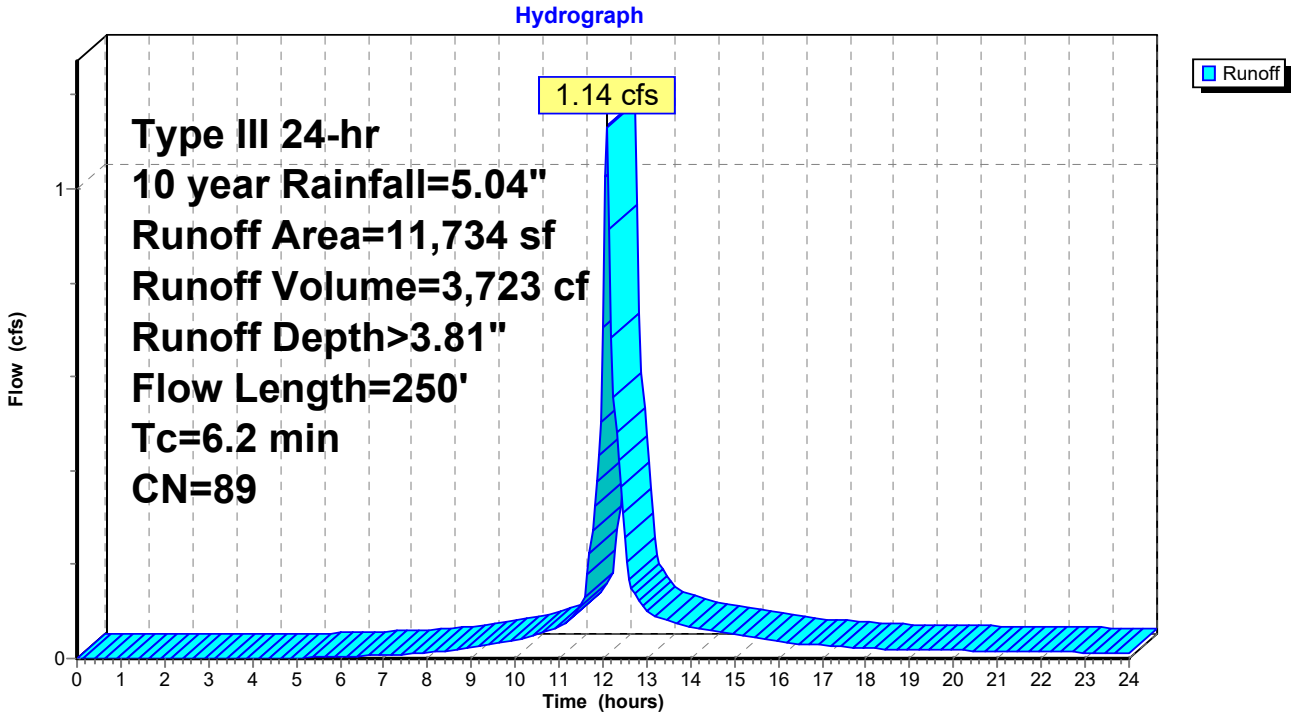
Runoff = 1.14 cfs @ 12.09 hrs, Volume= 3,723 cf, Depth> 3.81"
Routed to Pond 1P : POND 1

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=5.04"

Area (sf)	CN	Description
8,484	86	<50% Grass cover, Poor, HSG C
293	98	Unconnected pavement, HSG C
1,916	98	Paved parking, HSG C
1,041	98	Water Surface, HSG C
11,734	89	Weighted Average
8,484		72.30% Pervious Area
3,250		27.70% Impervious Area
293		9.02% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		**Sheet Flow, FLOW OVER GRASS** Grass: Short n= 0.150 P2= 3.18"
1.3	120	0.0500	1.57		**Shallow Concentrated Flow, FLOW OVER GRASS** Short Grass Pasture Kv= 7.0 fps
0.6	80	0.0125	2.27		**Shallow Concentrated Flow, FLOW OVER DRIVEWAY** Paved Kv= 20.3 fps
6.2	250	Total			

Subcatchment P3: (new Subcat)



Summary for Subcatchment P4A: FLOW TO CB3

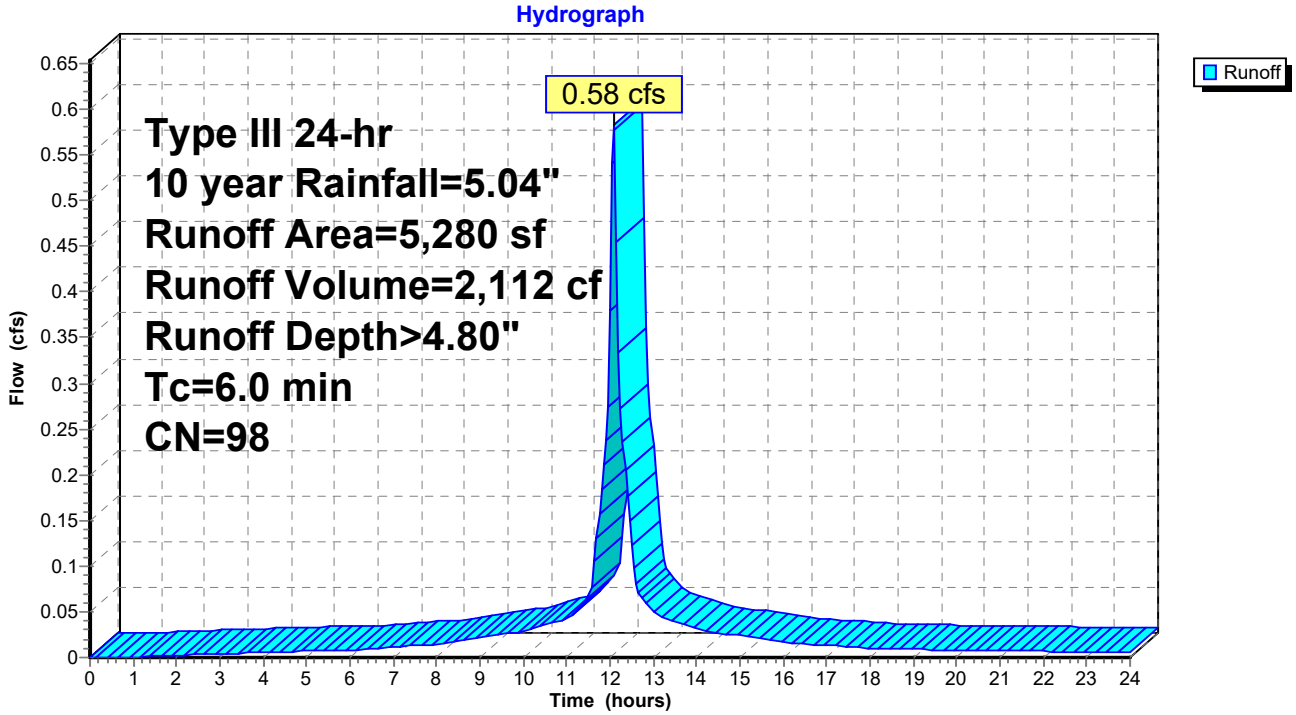
Runoff = 0.58 cfs @ 12.09 hrs, Volume= 2,112 cf, Depth> 4.80"
Routed to Pond CB3 : (new Pond)

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=5.04"

Area (sf)	CN	Description
5,280	98	Paved parking, HSG C
5,280		100.00% Impervious Area

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

Subcatchment P4A: FLOW TO CB3



Summary for Subcatchment P4B: FLOW TO CB4

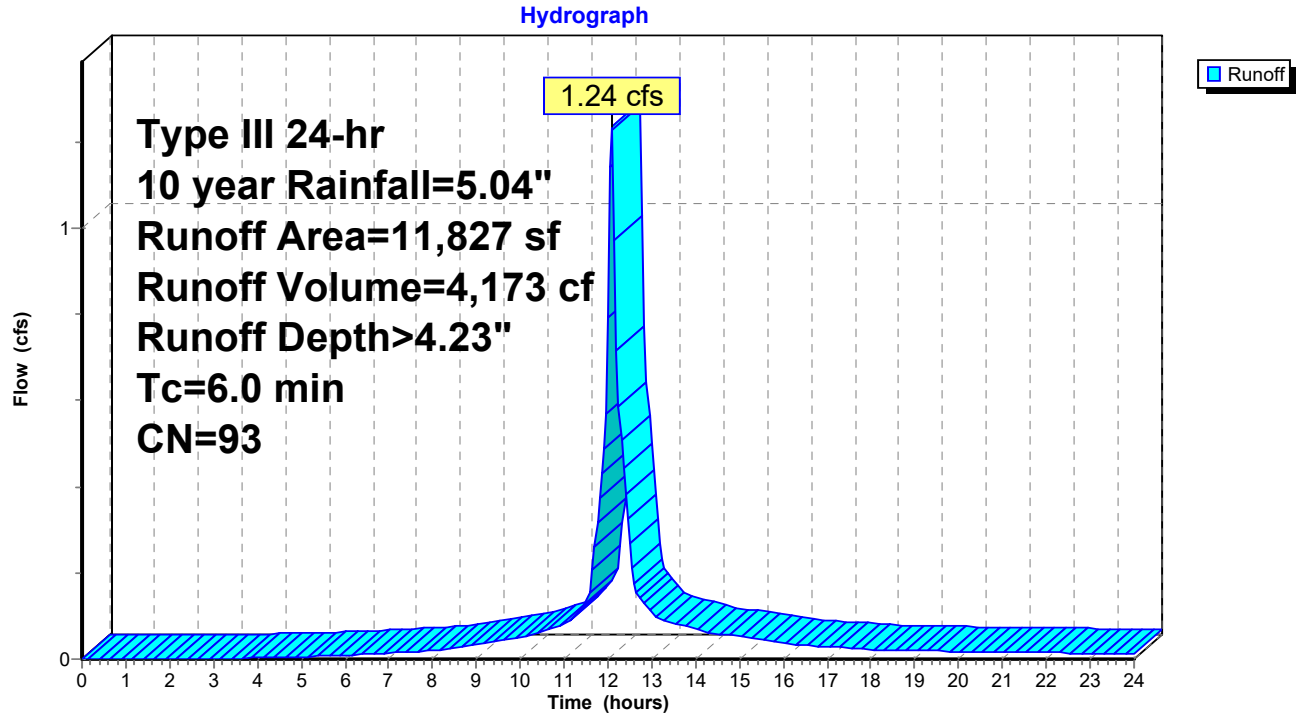
Runoff = 1.24 cfs @ 12.09 hrs, Volume= 4,173 cf, Depth> 4.23"
Routed to Pond CB4 : CB4

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=5.04"

Area (sf)	CN	Description
7,080	98	Paved parking, HSG C
4,550	86	<50% Grass cover, Poor, HSG C
197	98	Unconnected pavement, HSG C
11,827	93	Weighted Average
4,550		38.47% Pervious Area
7,277		61.53% Impervious Area
197		2.71% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW OVER PAVEMENT TO CB4**

Subcatchment P4B: FLOW TO CB4



Summary for Subcatchment P5: P5

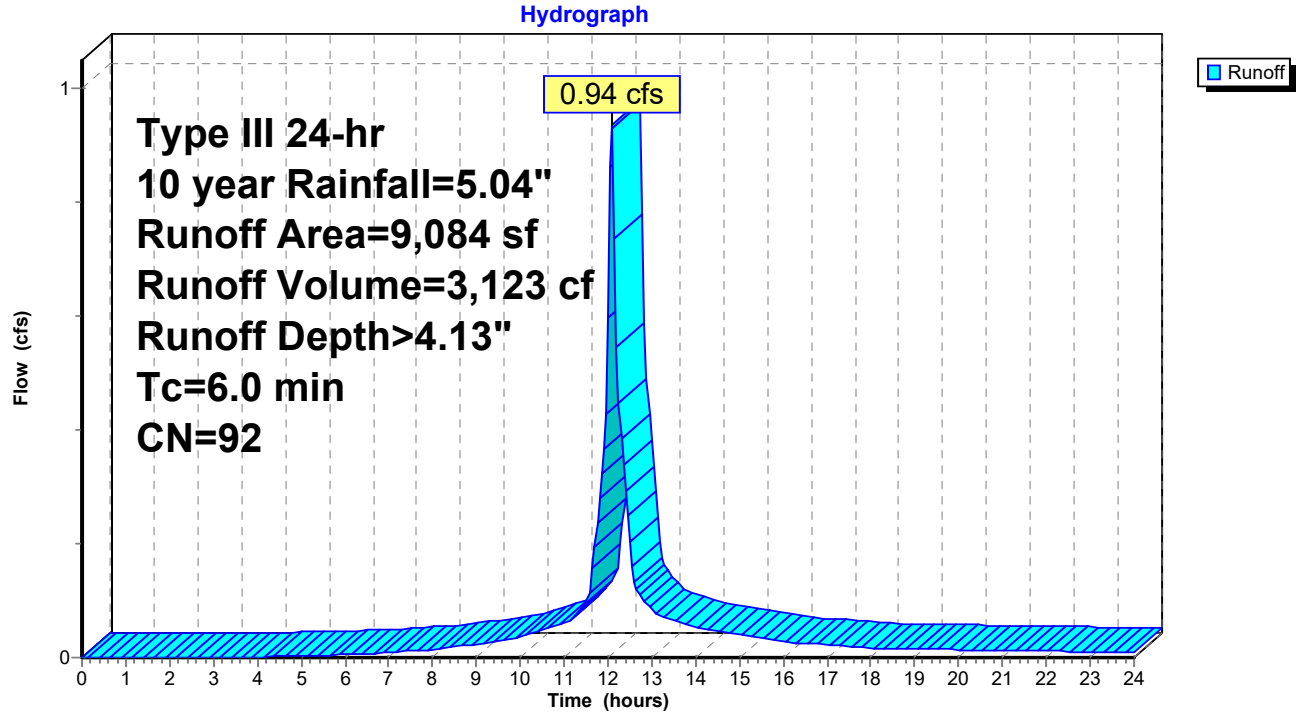
Runoff = 0.94 cfs @ 12.09 hrs, Volume= 3,123 cf, Depth> 4.13"
Routed to Pond 2P : POND P2

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=5.04"

Area (sf)	CN	Description
4,441	86	<50% Grass cover, Poor, HSG C
1,160	98	Water Surface, HSG C
3,483	98	Paved parking, HSG C
9,084	92	Weighted Average
4,441		48.89% Pervious Area
4,643		51.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW TO POND P2**

Subcatchment P5: P5



Summary for Subcatchment P6: P6

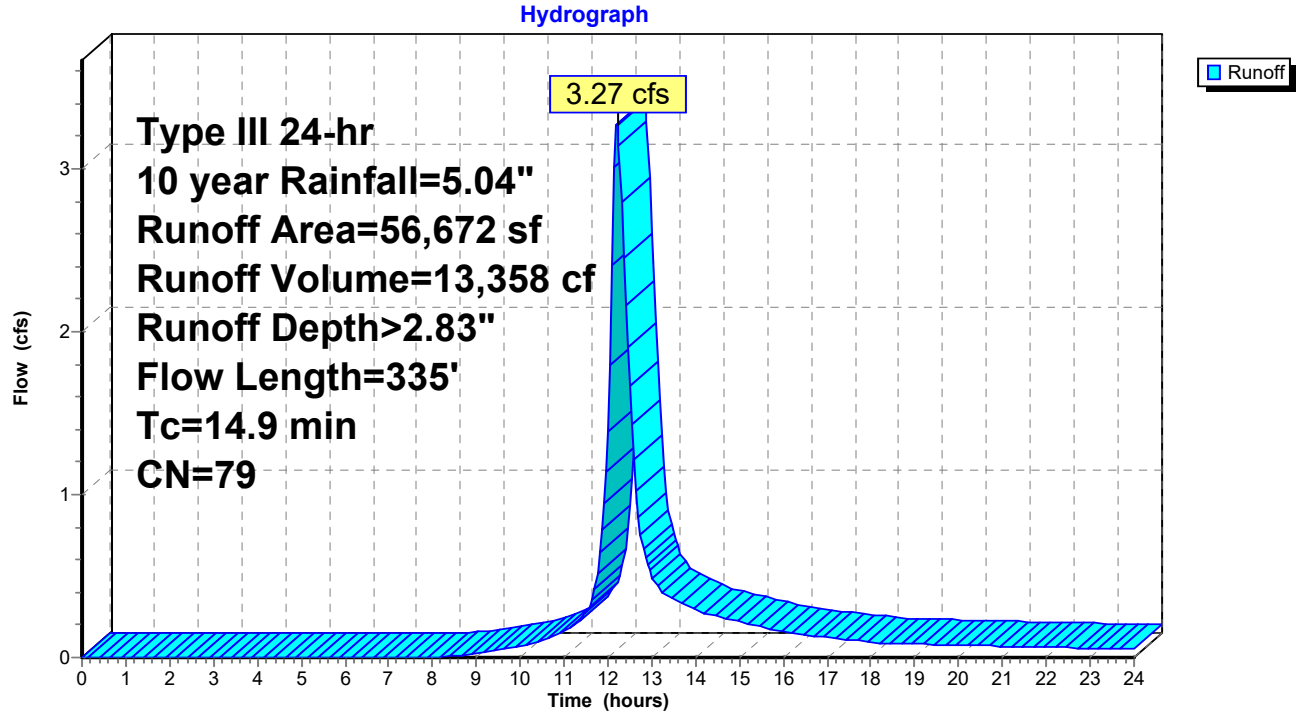
Runoff = 3.27 cfs @ 12.21 hrs, Volume= 13,358 cf, Depth> 2.83"
Routed to Reach 1R : CULVERT UNDER DRIVE

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=5.04"

Area (sf)	CN	Description
27,229	86	<50% Grass cover, Poor, HSG C
21,621	70	Woods, Good, HSG C
6,822	79	Woods/grass comb., Good, HSG D
1,000	98	Roofs, HSG C
56,672	79	Weighted Average
55,672		98.24% Pervious Area
1,000		1.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0900	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.18"
1.4	125	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.7	160	0.0250	0.40		**Shallow Concentrated Flow, FLOW THROUGH wetland** Forest w/Heavy Litter Kv= 2.5 fps
14.9	335	Total			

Subcatchment P6: P6



Summary for Subcatchment P7: FLOW TO POND 3

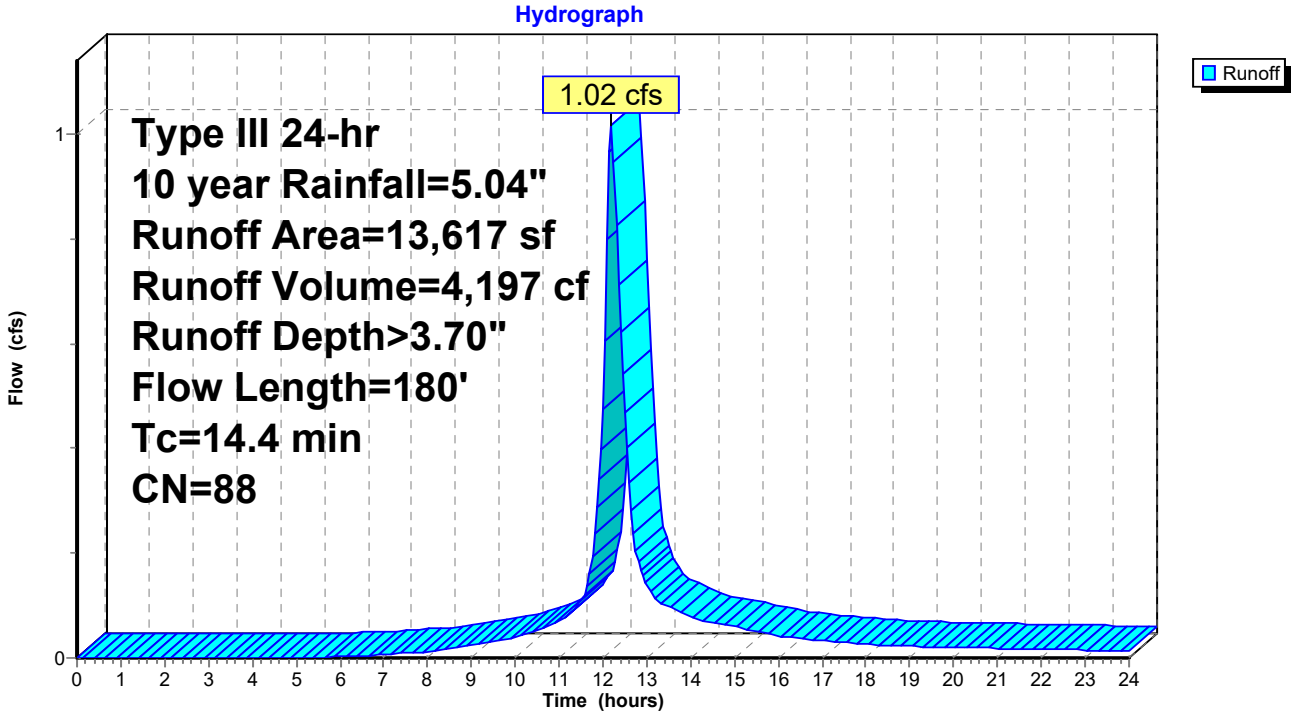
Runoff = 1.02 cfs @ 12.20 hrs, Volume= 4,197 cf, Depth> 3.70"
Routed to Pond 3P : POND 3

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=5.04"

Area (sf)	CN	Description
11,172	86	<50% Grass cover, Poor, HSG C
1,096	98	Paved parking, HSG C
1,349	98	Water Surface, HSG C
13,617	88	Weighted Average
11,172		82.04% Pervious Area
2,445		17.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, FLOW IN WOODS** Woods: Light underbrush n= 0.400 P2= 3.18"
2.0	130	0.0460	1.07		**Shallow Concentrated Flow, FLOW THROUGH WOODS** Woodland Kv= 5.0 fps
14.4	180	Total			

Subcatchment P7: FLOW TO POND 3



Summary for Subcatchment P8: AREA AROUND POND 1

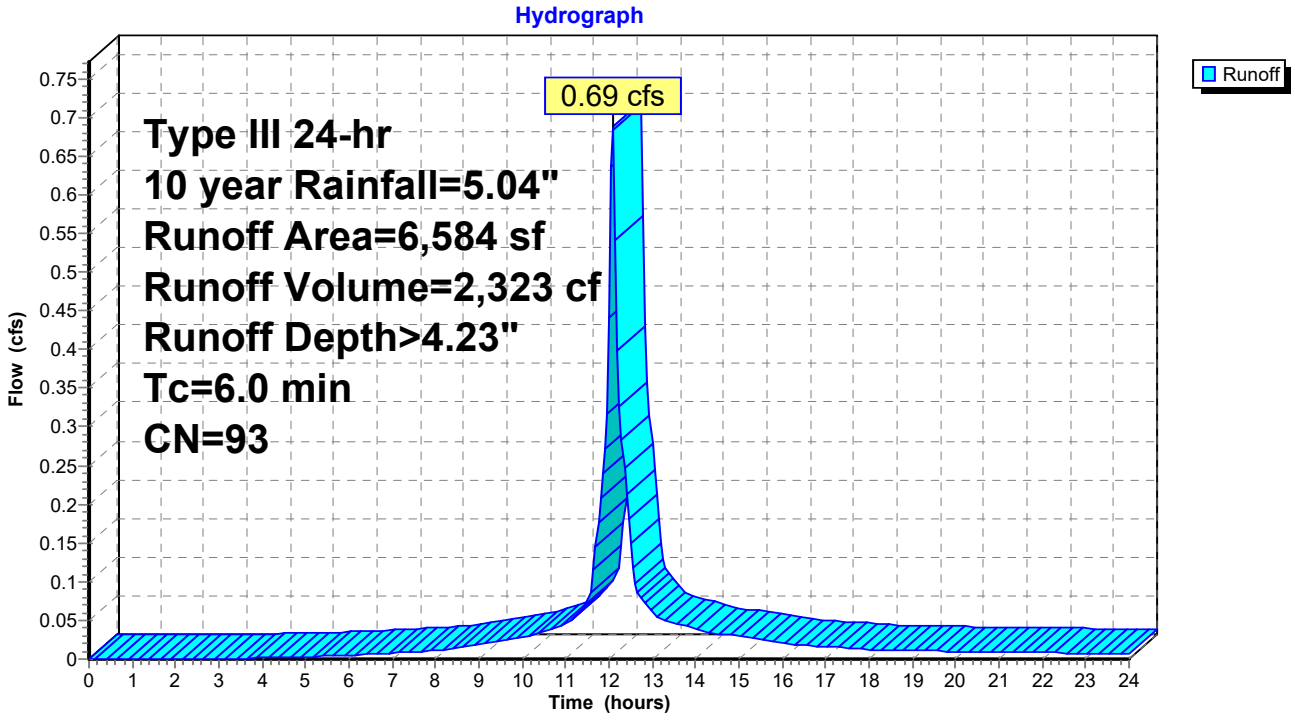
Runoff = 0.69 cfs @ 12.09 hrs, Volume= 2,323 cf, Depth> 4.23"
Routed to Pond 1P : POND 1

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=5.04"

Area (sf)	CN	Description
2,650	86	<50% Grass cover, Poor, HSG C
3,934	98	Water Surface, HSG C
6,584	93	Weighted Average
2,650		40.25% Pervious Area
3,934		59.75% Impervious Area

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

Subcatchment P8: AREA AROUND POND 1



Summary for Subcatchment P9: (new Subcat)

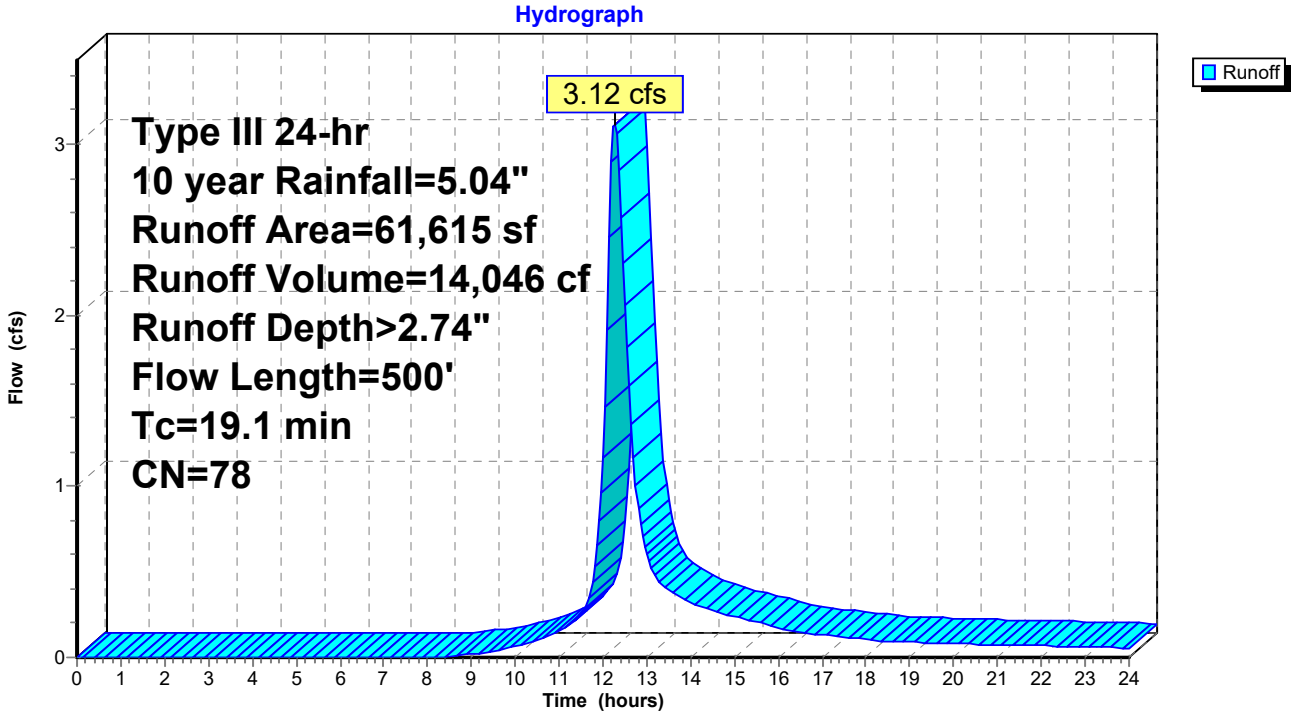
Runoff = 3.12 cfs @ 12.27 hrs, Volume= 14,046 cf, Depth> 2.74"
Routed to Pond SP1 : SUM POND WOODS

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=5.04"

Area (sf)	CN	Description
23,170	86	<50% Grass cover, Poor, HSG C
27,803	70	Woods, Good, HSG C
10,642	79	Woods/grass comb., Good, HSG D
61,615	78	Weighted Average
61,615		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, FLOW THROUGH WOODS** Woods: Light underbrush n= 0.400 P2= 3.18"
6.7	450	0.0500	1.12		**Shallow Concentrated Flow, FLOW THROUGH WOODS** Woodland Kv= 5.0 fps
19.1	500	Total			

Subcatchment P9: (new Subcat)



Summary for Subcatchment R1: IOT 1 ROOF

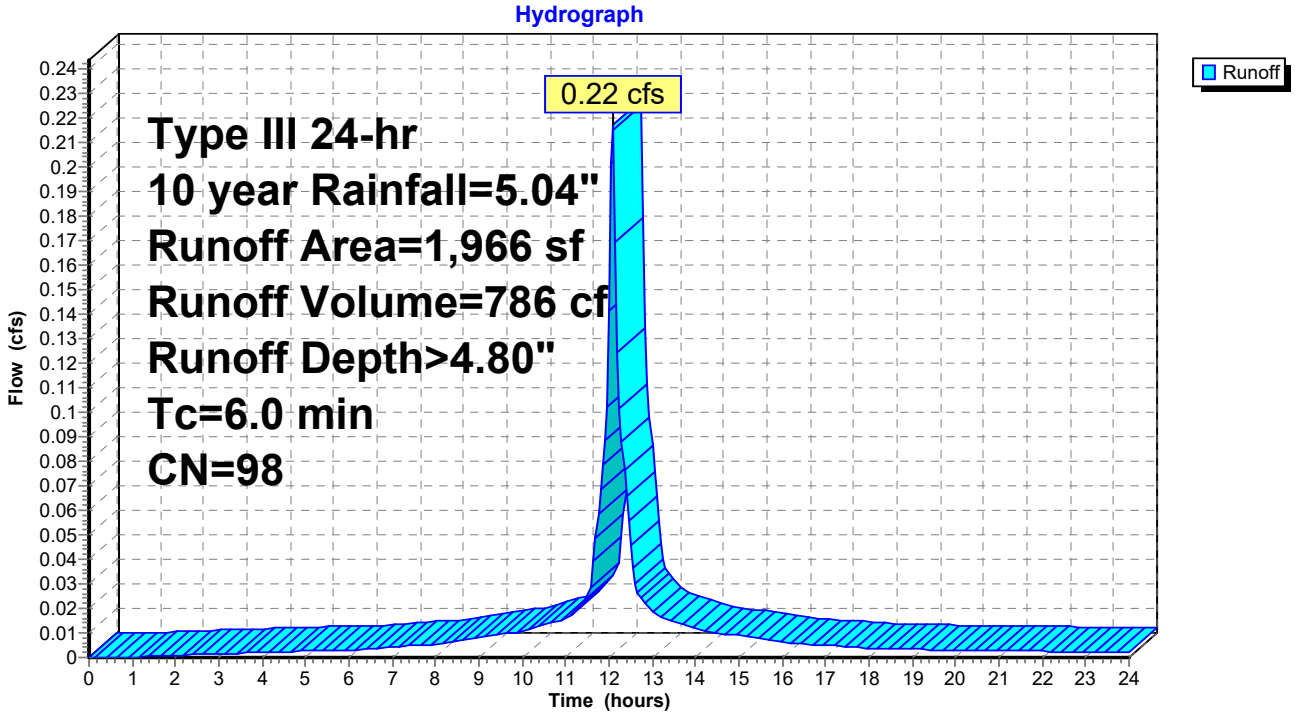
Runoff = 0.22 cfs @ 12.09 hrs, Volume= 786 cf, Depth> 4.80"
Routed to Pond 2P : POND P2

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=5.04"

Area (sf)	CN	Description
1,966	98	Roofs, HSG C
1,966		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW FROM ROOF TO POND**

Subcatchment R1: IOT 1 ROOF



Summary for Subcatchment R2: LOT 2 ROOF

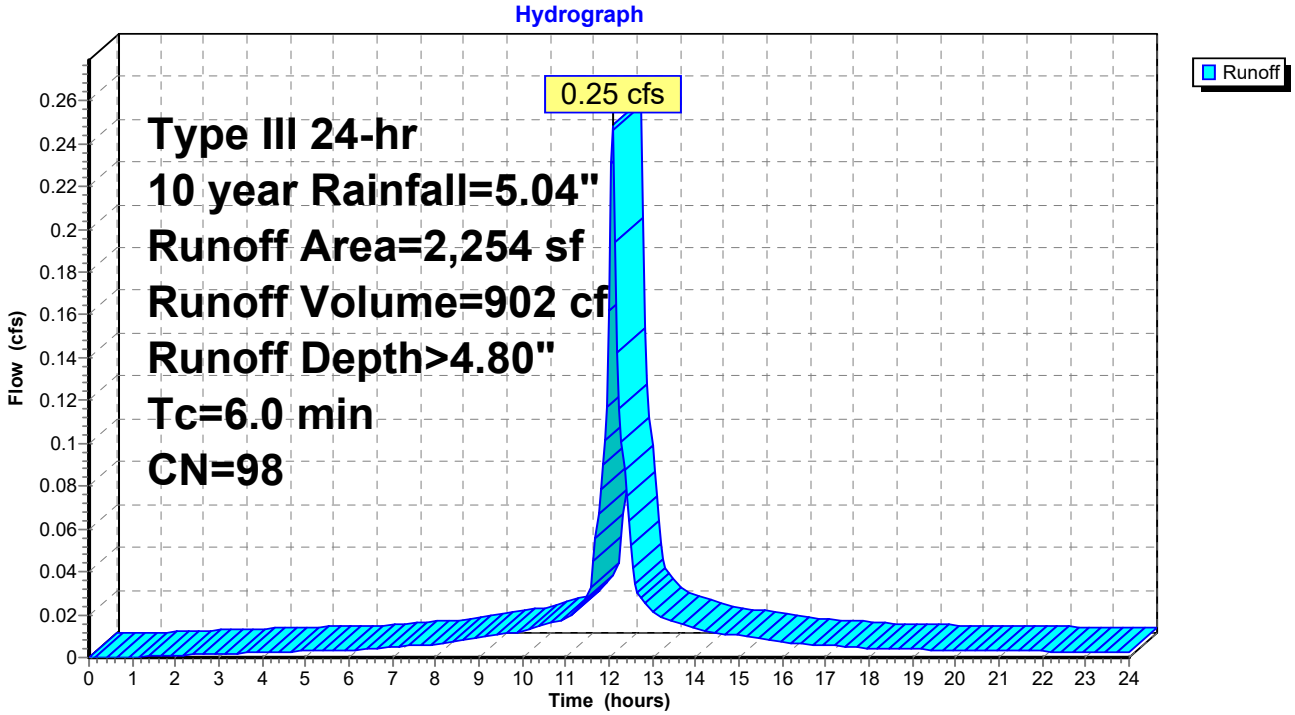
Runoff = 0.25 cfs @ 12.09 hrs, Volume= 902 cf, Depth> 4.80"
Routed to Pond 3P : POND 3

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=5.04"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW IN GUTTERS AND PIPES TO POND 3**

Subcatchment R2: LOT 2 ROOF



Summary for Subcatchment R3: (new Subcat)

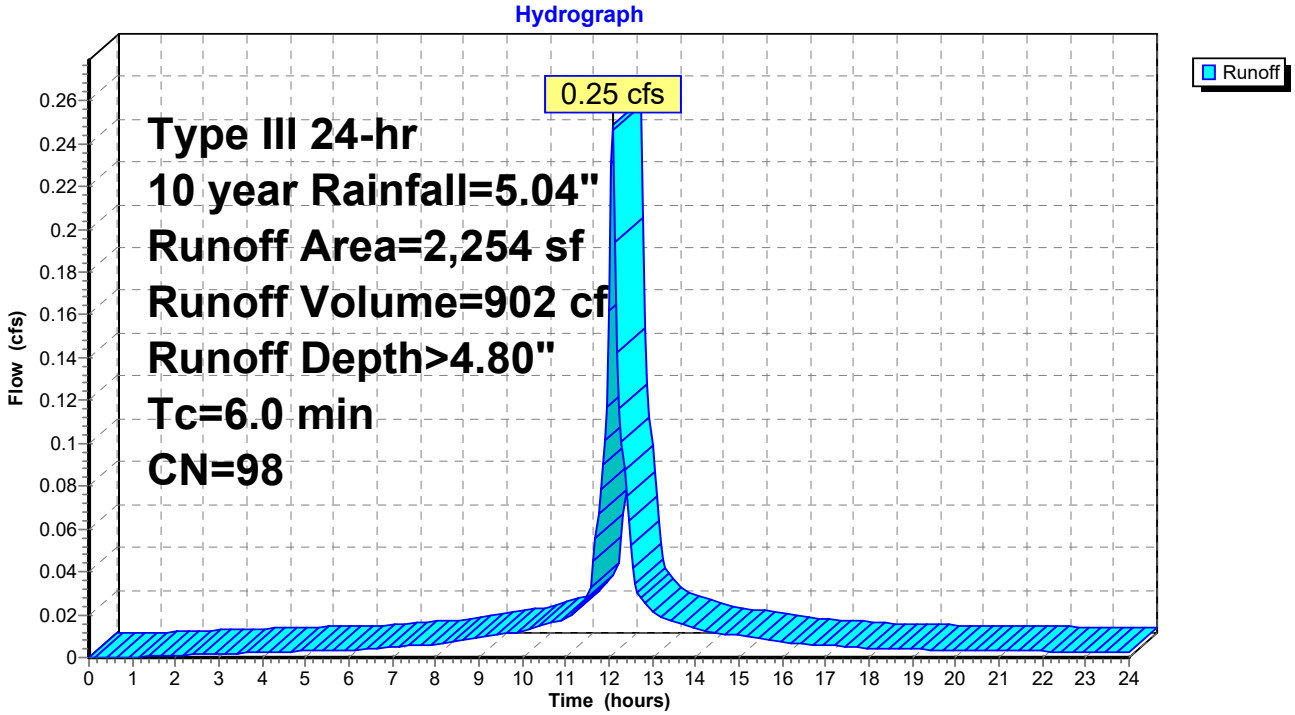
Runoff = 0.25 cfs @ 12.09 hrs, Volume= 902 cf, Depth> 4.80"
Routed to Pond 1P : POND 1

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=5.04"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW THROUGH GUTTERS TO POND**

Subcatchment R3: (new Subcat)



Summary for Reach 1R: CULVERT UNDER DRIVE

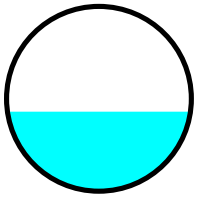
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 67,722 sf, 11.24% Impervious, Inflow Depth > 2.50" for 10 year event
Inflow = 3.30 cfs @ 12.22 hrs, Volume= 14,081 cf
Outflow = 3.30 cfs @ 12.22 hrs, Volume= 14,081 cf, Atten= 0%, Lag= 0.0 min
Routed to Pond SP1 : SUM POND WOODS

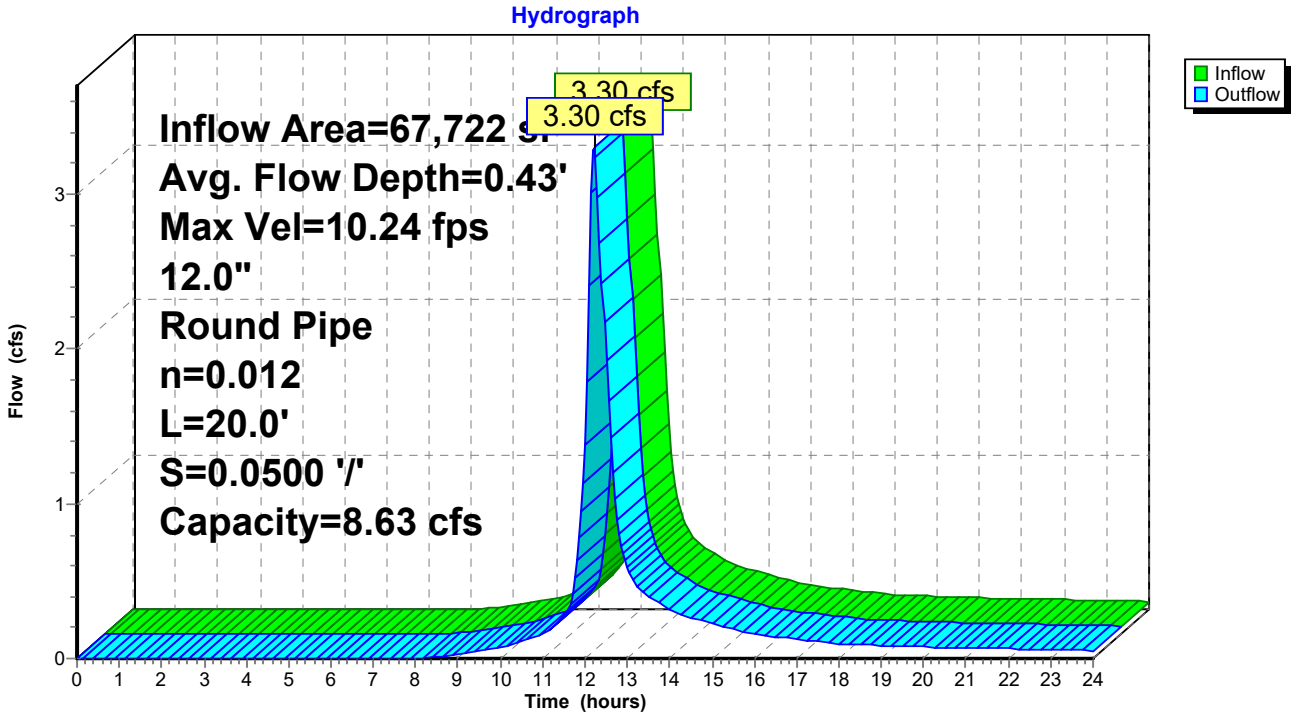
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 10.24 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.03 fps, Avg. Travel Time= 0.1 min

Peak Storage= 6 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.43' , Surface Width= 0.99'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.63 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 20.0' Slope= 0.0500 '/'
Inlet Invert= 259.00', Outlet Invert= 258.00'



Reach 1R: CULVERT UNDER DRIVE



Summary for Pond 1P: POND 1

[80] Warning: Exceeded Pond MH3 by 0.25' @ 0.00 hrs (0.20 cfs 2,561 cf)

Inflow Area = 40,965 sf, 57.32% Impervious, Inflow Depth > 4.20" for 10 year event
Inflow = 4.23 cfs @ 12.09 hrs, Volume= 14,333 cf
Outflow = 1.46 cfs @ 12.37 hrs, Volume= 12,811 cf, Atten= 65%, Lag= 16.8 min
Discarded = 0.09 cfs @ 12.37 hrs, Volume= 4,378 cf
Primary = 1.37 cfs @ 12.37 hrs, Volume= 8,434 cf
Routed to Pond SP1 : SUM POND WOODS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.00' @ 12.37 hrs Surf.Area= 3,825 sf Storage= 5,893 cf
Flood Elev= 263.00' Surf.Area= 4,790 sf Storage= 10,193 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 90.2 min (866.3 - 776.2)

Volume	Invert	Avail.Storage	Storage Description
#1	260.00'	10,193 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

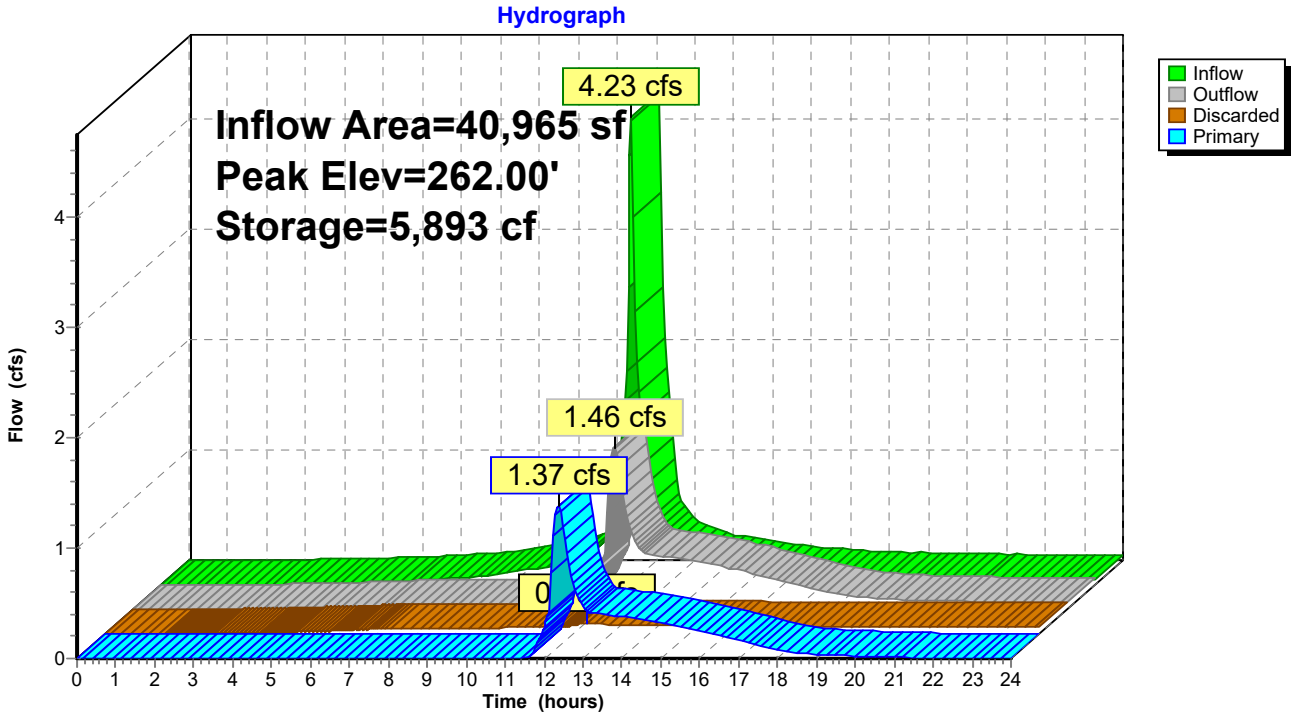
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
260.00	2,125	260.0	0	0	2,125
261.00	2,940	282.0	2,521	2,521	3,112
262.00	3,825	308.0	3,373	5,894	4,368
263.00	4,790	332.0	4,298	10,193	5,631

Device	Routing	Invert	Outlet Devices
#1	Primary	259.00'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.00' / 258.00' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	260.65'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	261.80'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Discarded	260.00'	**1.020 in/hr Exfiltration over Surface area**
#5	Primary	262.40'	**5.0' long x 8.0' 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) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Discarded OutFlow Max=0.09 cfs @ 12.37 hrs HW=262.00' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=1.36 cfs @ 12.37 hrs HW=262.00' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.36 cfs of 5.98 cfs potential flow)
  └**2=Orifice/Grate** (Orifice Controls 0.46 cfs @ 5.23 fps)
  └**3=Orifice/Grate** (Weir Controls 0.91 cfs @ 1.46 fps)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: POND 1



Summary for Pond 2P: POND P2

Inflow Area = 11,050 sf, 59.81% Impervious, Inflow Depth > 4.25" for 10 year event
Inflow = 1.15 cfs @ 12.09 hrs, Volume= 3,909 cf
Outflow = 0.31 cfs @ 12.44 hrs, Volume= 3,431 cf, Atten= 73%, Lag= 21.4 min
Discarded = 0.05 cfs @ 12.44 hrs, Volume= 2,708 cf
Primary = 0.26 cfs @ 12.44 hrs, Volume= 724 cf
Routed to Reach 1R : CULVERT UNDER DRIVE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 263.31' @ 12.44 hrs Surf.Area= 2,150 sf Storage= 1,536 cf
Flood Elev= 263.50' Surf.Area= 2,275 sf Storage= 1,952 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 134.3 min (909.4 - 775.1)

Volume	Invert	Avail.Storage	Storage Description
#1	262.50'	1,952 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

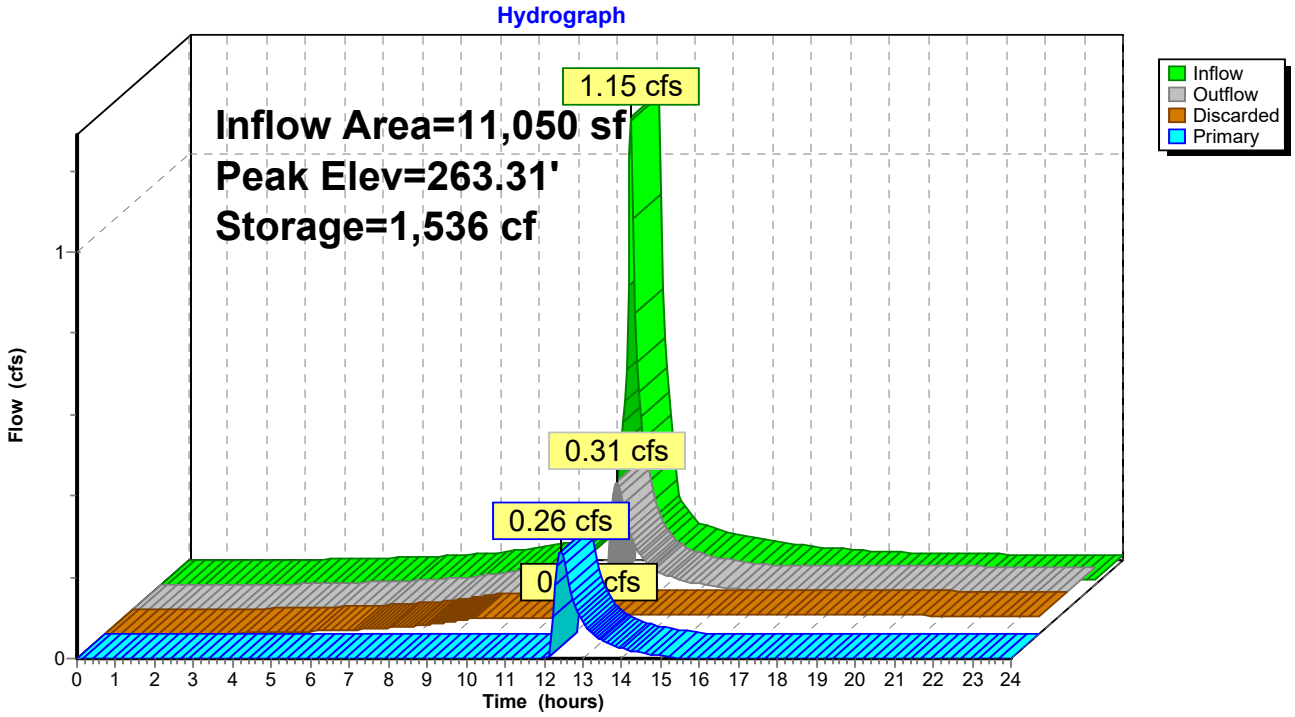
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
262.50	1,640	172.0	0	0	1,640
263.00	1,950	200.0	896	896	2,474
263.50	2,275	207.0	1,055	1,952	2,723

Device	Routing	Invert	Outlet Devices
#1	Discarded	262.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	263.20'	**3.0' 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

Discarded OutFlow Max=0.05 cfs @ 12.44 hrs HW=263.31' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.26 cfs @ 12.44 hrs HW=263.31' TW=259.34' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.26 cfs @ 0.78 fps)

Pond 2P: POND P2



Summary for Pond 3P: POND 3

Inflow Area = 15,871 sf, 29.61% Impervious, Inflow Depth > 3.86" for 10 year event
Inflow = 1.18 cfs @ 12.17 hrs, Volume= 5,099 cf
Outflow = 0.32 cfs @ 12.64 hrs, Volume= 4,868 cf, Atten= 72%, Lag= 28.0 min
Discarded = 0.05 cfs @ 12.64 hrs, Volume= 1,950 cf
Primary = 0.27 cfs @ 12.64 hrs, Volume= 2,919 cf
Routed to Pond SP1 : SUM POND WOODS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 264.05' @ 12.64 hrs Surf.Area= 2,208 sf Storage= 2,009 cf
Flood Elev= 265.00' Surf.Area= 3,131 sf Storage= 4,528 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 79.5 min (873.4 - 794.0)

Volume	Invert	Avail.Storage	Storage Description
#1	262.75'	4,528 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

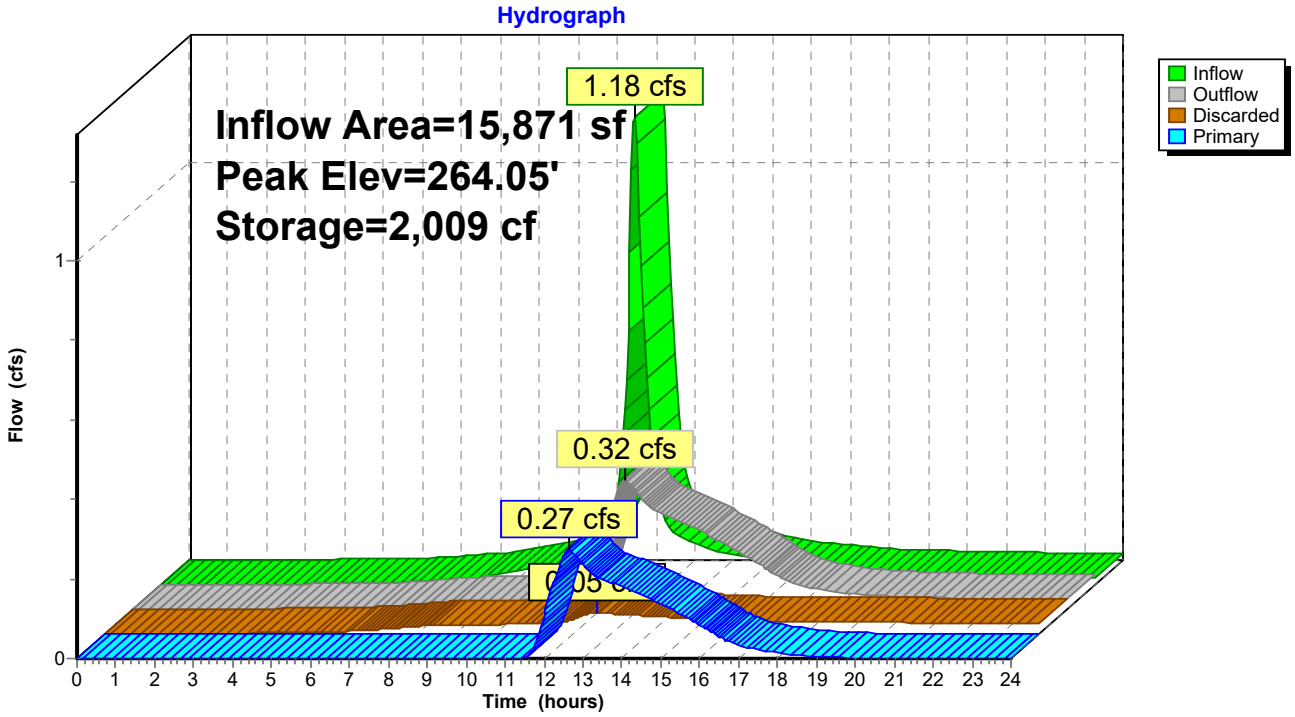
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
262.75	954	190.0	0	0	954
264.00	2,162	300.0	1,897	1,897	5,254
265.00	3,131	282.0	2,632	4,528	6,137

Device	Routing	Invert	Outlet Devices
#1	Primary	263.05'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 263.05' / 261.50' S= 0.0775 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	262.75'	**1.020 in/hr Exfiltration over Surface area**
#3	Device 1	263.90'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	263.05'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	264.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.05 cfs @ 12.64 hrs HW=264.05' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.27 cfs @ 12.64 hrs HW=264.05' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.27 cfs of 2.68 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 0.05 cfs @ 1.32 fps)
  ├**4=Orifice/Grate** (Orifice Controls 0.22 cfs @ 4.51 fps)
  └**5=Orifice/Grate** (Controls 0.00 cfs)

Pond 3P: POND 3



Summary for Pond CB1: (new Pond)

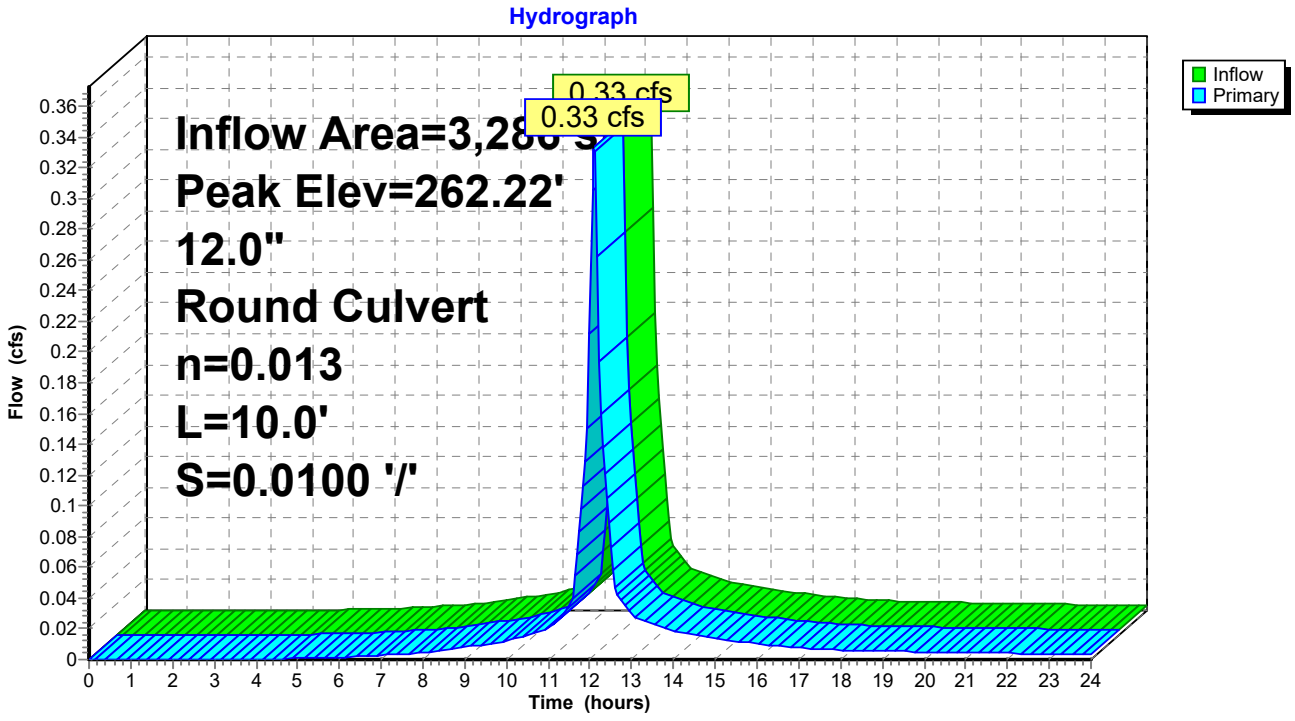
Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 4.02" for 10 year event
Inflow = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf
Outflow = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf
Routed to Pond MH1 : MH1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.22' @ 12.10 hrs
Flood Elev= 264.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	261.90'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.30 cfs @ 12.09 hrs HW=262.22' TW=262.06' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.30 cfs @ 2.12 fps)

Pond CB1: (new Pond)



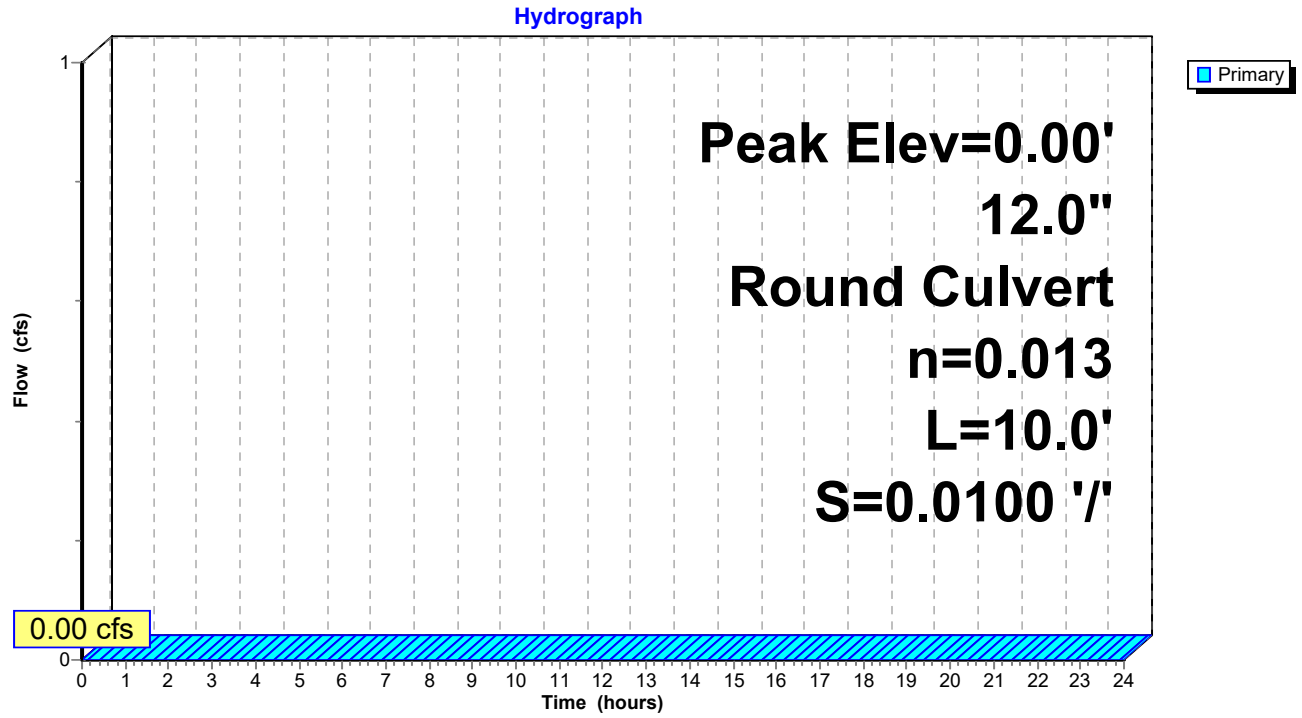
Summary for Pond CB2: CB2

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

Device	Routing	Invert	Outlet Devices
#1	Primary	261.90'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=261.70' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)

Pond CB2: CB2



Summary for Pond CB3: (new Pond)

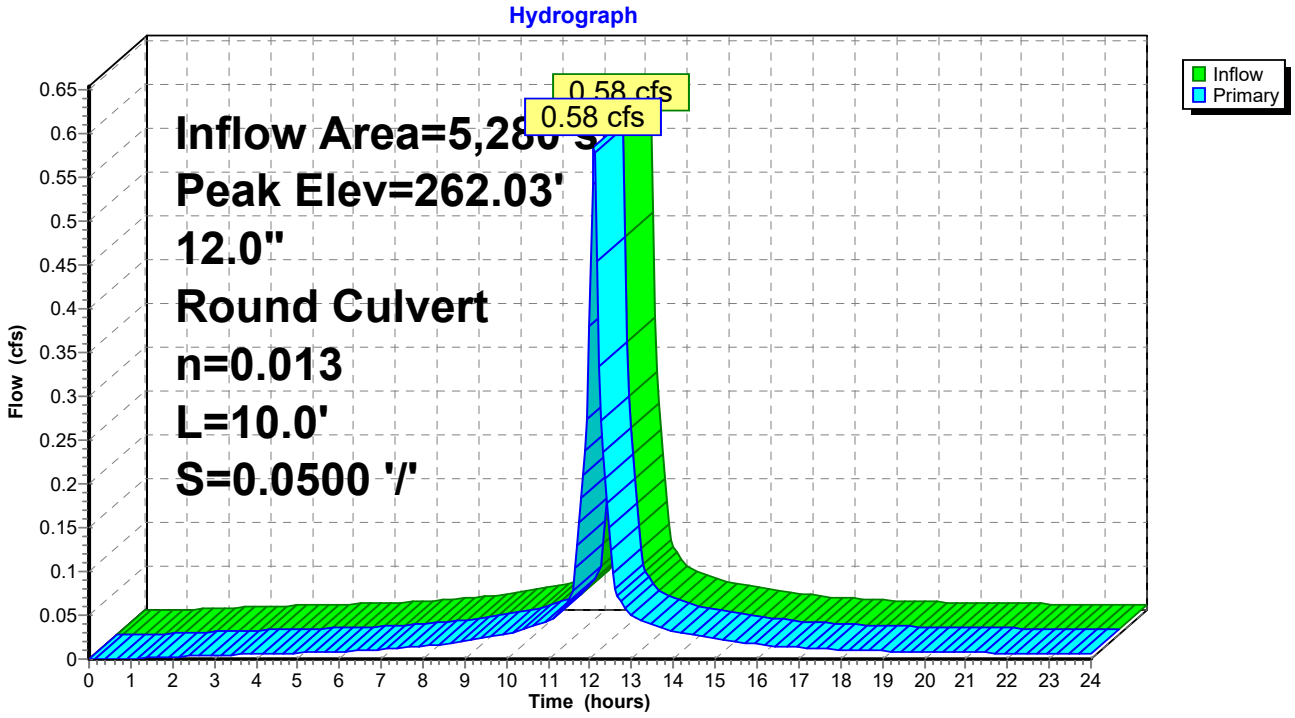
Inflow Area = 5,280 sf,100.00% Impervious, Inflow Depth > 4.80" for 10 year event
Inflow = 0.58 cfs @ 12.09 hrs, Volume= 2,112 cf
Outflow = 0.58 cfs @ 12.09 hrs, Volume= 2,112 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.58 cfs @ 12.09 hrs, Volume= 2,112 cf
Routed to Pond MH3 : DMH3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.03' @ 12.42 hrs
Flood Elev= 263.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.50'	**12.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=261.51' TW=261.70' (Dynamic Tailwater)
↳**1=Culvert** (Controls 0.00 cfs)

Pond CB3: (new Pond)



Summary for Pond CB4: CB4

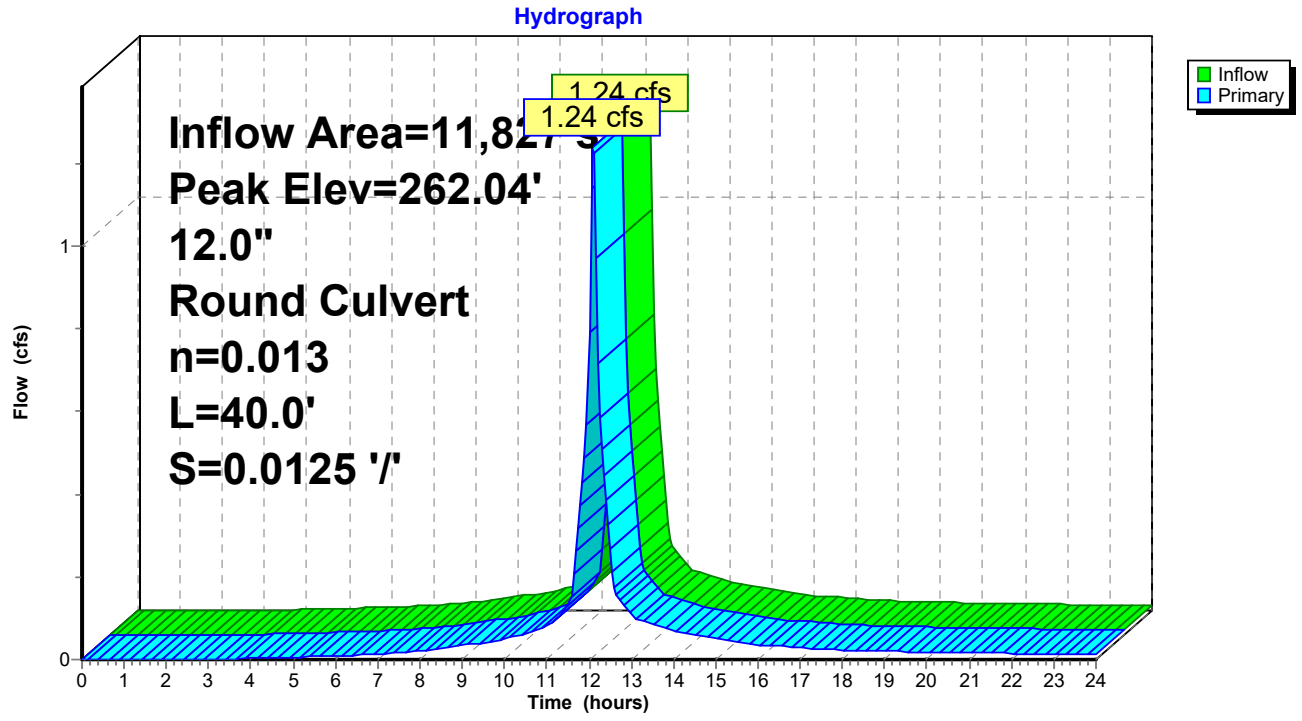
Inflow Area = 11,827 sf, 61.53% Impervious, Inflow Depth > 4.23" for 10 year event
Inflow = 1.24 cfs @ 12.09 hrs, Volume= 4,173 cf
Outflow = 1.24 cfs @ 12.09 hrs, Volume= 4,173 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.24 cfs @ 12.09 hrs, Volume= 4,173 cf
Routed to Pond MH3 : DMH3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.04' @ 12.42 hrs
Flood Elev= 263.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.50'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=261.61' TW=261.71' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond CB4: CB4



Summary for Pond MH1: MH1

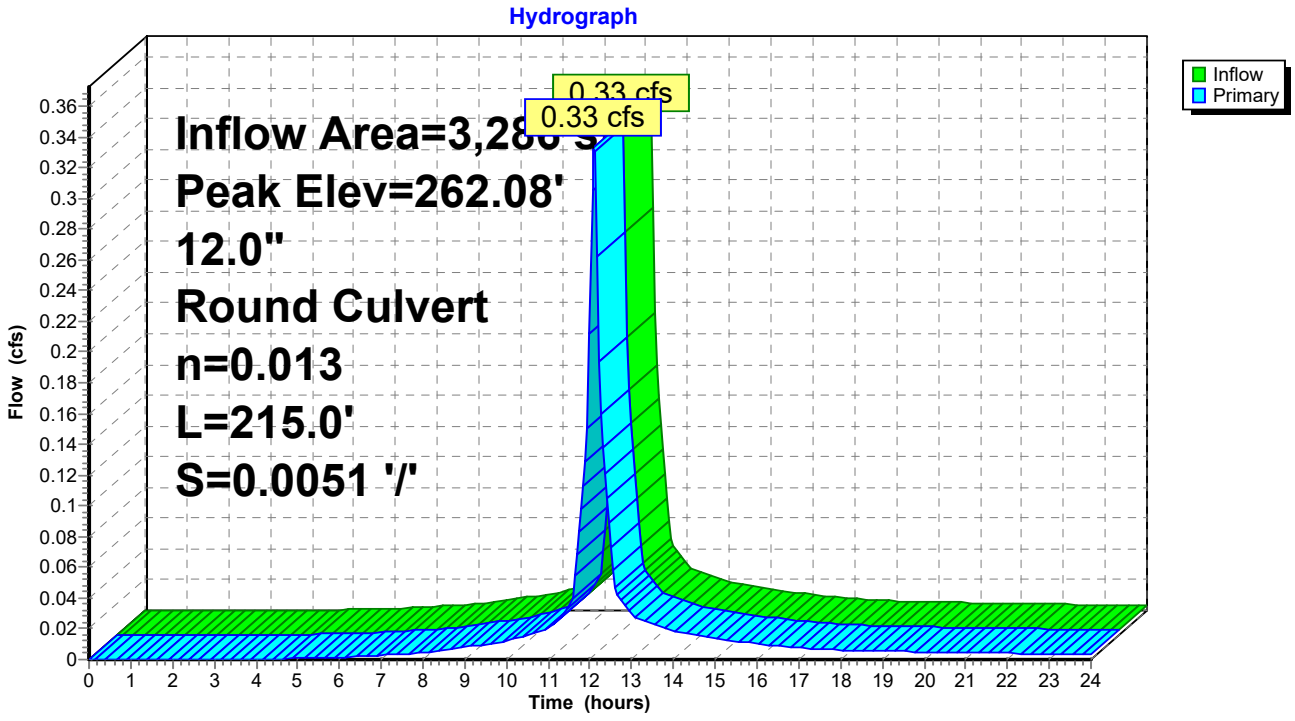
Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 4.02" for 10 year event
Inflow = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf
Outflow = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf
Routed to Pond MH2 : MH2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.08' @ 12.41 hrs
Flood Elev= 265.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	261.70'	**12.0" Round Culvert** L= 215.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.70' / 260.60' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.27 cfs @ 12.09 hrs HW=262.06' TW=261.51' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.27 cfs @ 1.59 fps)

Pond MH1: MH1



Summary for Pond MH2: MH2

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=99)

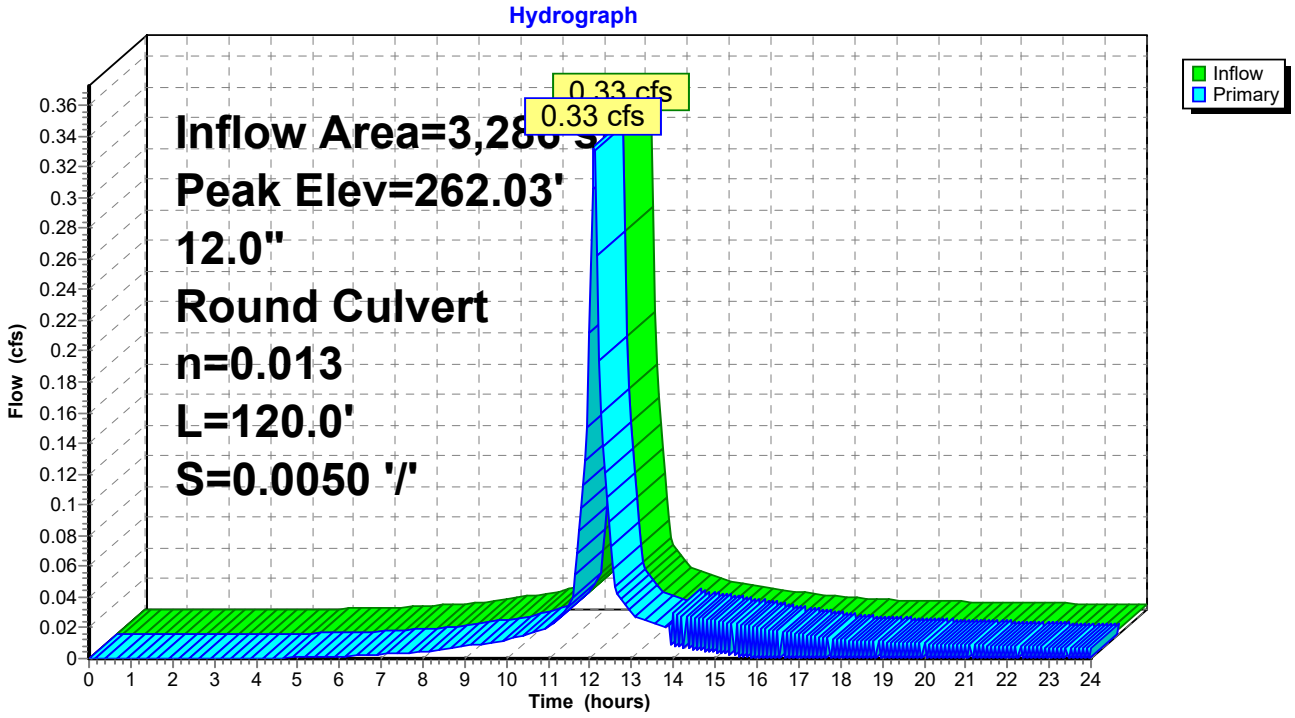
Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 4.02" for 10 year event
Inflow = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf
Outflow = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.33 cfs @ 12.09 hrs, Volume= 1,100 cf
Routed to Pond MH3 : DMH3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.03' @ 12.43 hrs
Flood Elev= 269.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.60'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.60' / 260.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=261.51' TW=261.71' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond MH2: MH2



Summary for Pond MH3: DMH3

[90] Warning: Qout>Qin may require smaller dt or Finer Routing
[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=40)
[80] Warning: Exceeded Pond CB3 by 0.22' @ 12.05 hrs (1.79 cfs 1,805 cf)
[80] Warning: Exceeded Pond CB4 by 0.11' @ 12.05 hrs (1.13 cfs 936 cf)
[80] Warning: Exceeded Pond MH2 by 0.58' @ 15.95 hrs (0.84 cfs 3,292 cf)

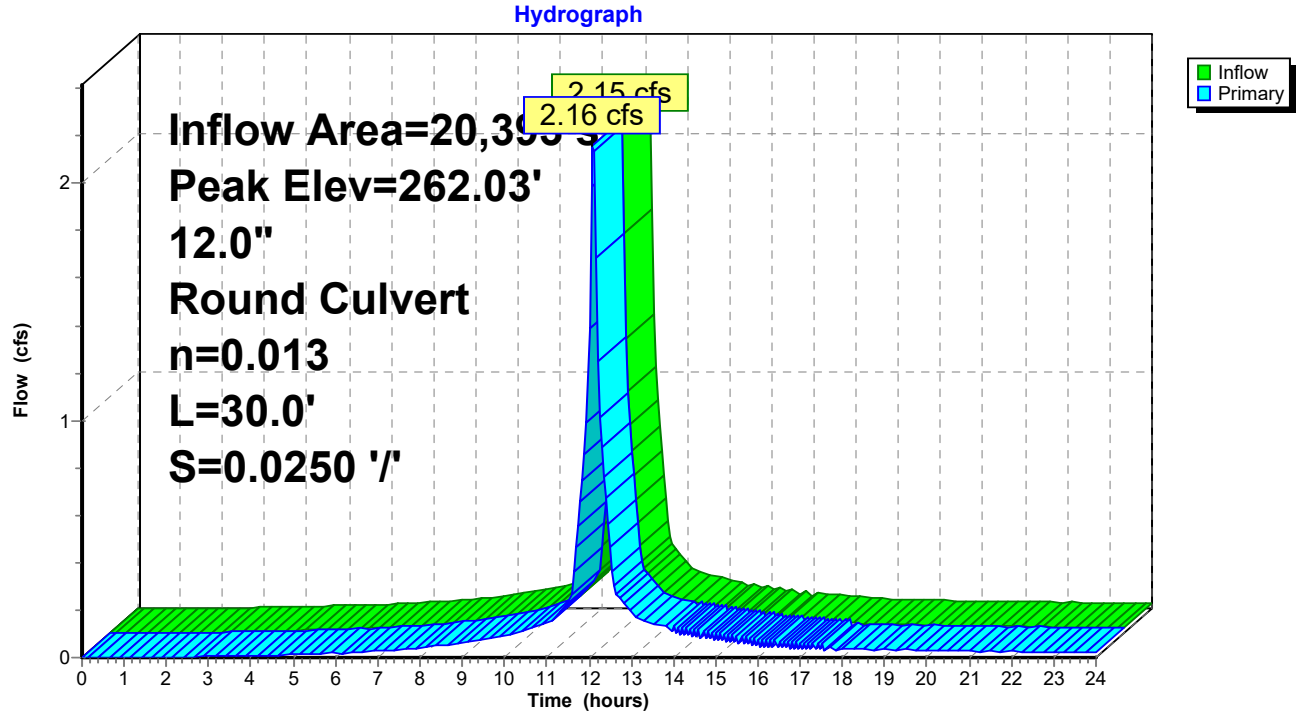
Inflow Area = 20,393 sf, 68.87% Impervious, Inflow Depth > 4.35" for 10 year event
Inflow = 2.15 cfs @ 12.09 hrs, Volume= 7,386 cf
Outflow = 2.16 cfs @ 12.09 hrs, Volume= 7,386 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.16 cfs @ 12.09 hrs, Volume= 7,386 cf
Routed to Pond 1P : POND 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.03' @ 12.38 hrs
Flood Elev= 263.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	259.75'	**12.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.75' / 259.00' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.34 cfs @ 12.09 hrs HW=261.71' TW=261.58' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.34 cfs @ 1.70 fps)

Pond MH3: DMH3



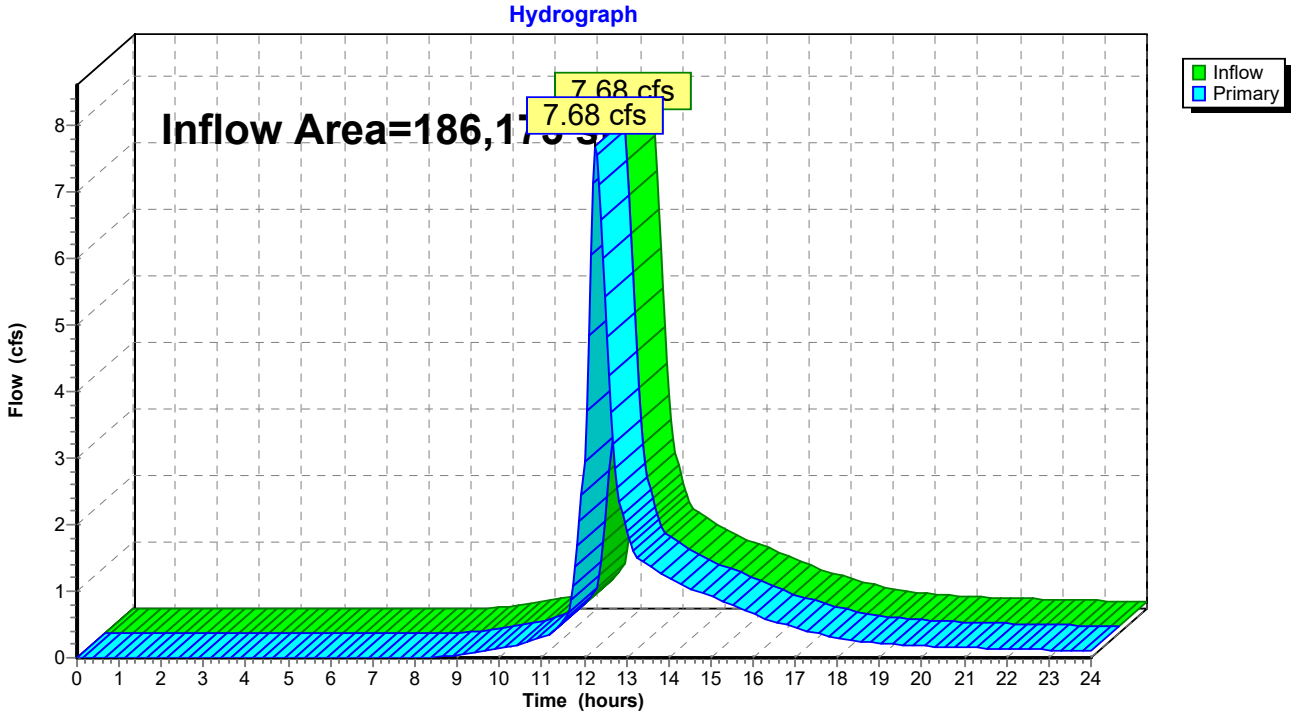
Summary for Pond SP1: SUM POND WOODS

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 186,173 sf, 19.22% Impervious, Inflow Depth > 2.54" for 10 year event
Inflow = 7.68 cfs @ 12.27 hrs, Volume= 39,480 cf
Primary = 7.68 cfs @ 12.27 hrs, Volume= 39,480 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: SUM POND WOODS



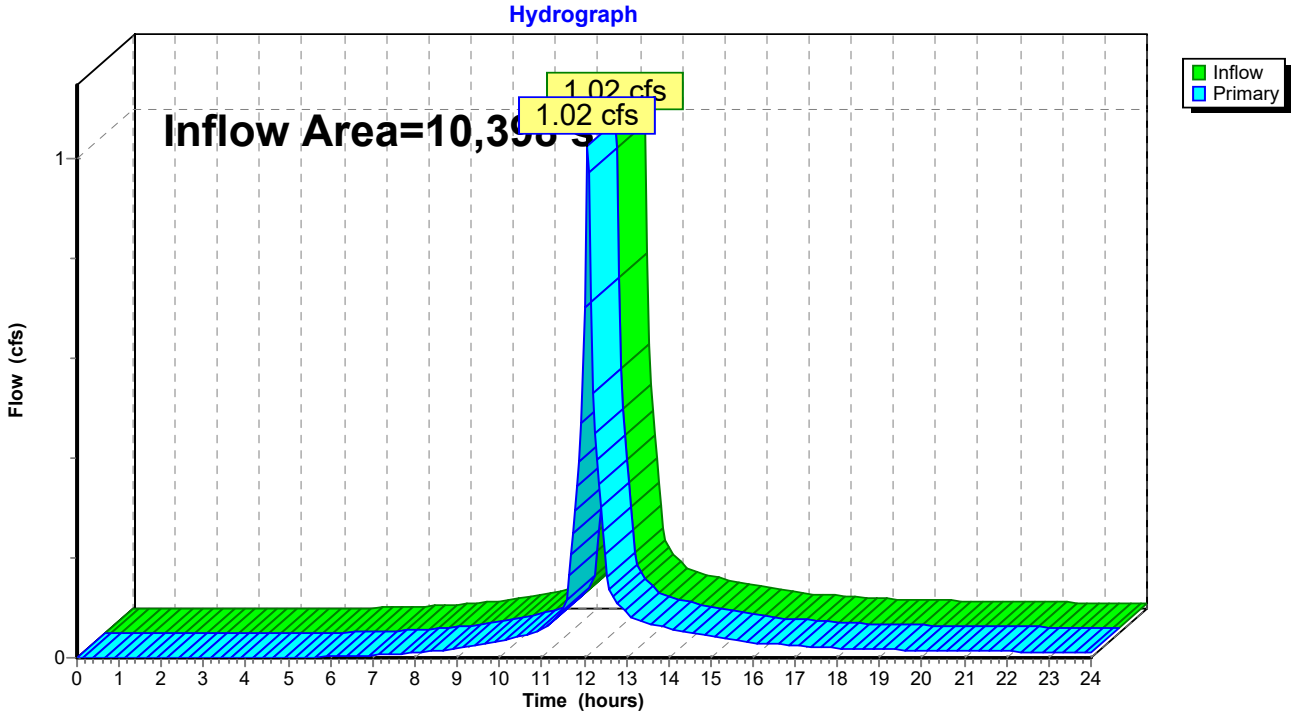
Summary for Pond SP2: SUM POND STREET

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 10,398 sf, 13.61% Impervious, Inflow Depth > 3.70" for 10 year event
Inflow = 1.02 cfs @ 12.07 hrs, Volume= 3,210 cf
Primary = 1.02 cfs @ 12.07 hrs, Volume= 3,210 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET



POST-DEVELOPMENT DRAINAGE

25 YEAR STORM

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P1A: P1A Runoff Area=3,286 sf 45.25% Impervious Runoff Depth>5.15"
Tc=6.0 min CN=91 Runoff=0.42 cfs 1,410 cf

Subcatchment P1B: P1B Runoff Area=1,506 sf 100.00% Impervious Runoff Depth>5.96"
Tc=6.0 min CN=98 Runoff=0.21 cfs 748 cf

Subcatchment P2: P2 Runoff Area=10,398 sf 13.61% Impervious Runoff Depth>4.82"
Flow Length=205' Tc=4.9 min CN=88 Runoff=1.31 cfs 4,173 cf

Subcatchment P3: (new Subcat) Runoff Area=11,734 sf 27.70% Impervious Runoff Depth>4.93"
Flow Length=250' Tc=6.2 min CN=89 Runoff=1.45 cfs 4,817 cf

Subcatchment P4A: FLOW TO CB3 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>5.96"
Tc=6.0 min CN=98 Runoff=0.72 cfs 2,622 cf

Subcatchment P4B: FLOW TO CB4 Runoff Area=11,827 sf 61.53% Impervious Runoff Depth>5.38"
Tc=6.0 min CN=93 Runoff=1.55 cfs 5,299 cf

Subcatchment P5: P5 Runoff Area=9,084 sf 51.11% Impervious Runoff Depth>5.26"
Tc=6.0 min CN=92 Runoff=1.18 cfs 3,984 cf

Subcatchment P6: P6 Runoff Area=56,672 sf 1.76% Impervious Runoff Depth>3.85"
Flow Length=335' Tc=14.9 min CN=79 Runoff=4.44 cfs 18,177 cf

Subcatchment P7: FLOW TO POND 3 Runoff Area=13,617 sf 17.96% Impervious Runoff Depth>4.81"
Flow Length=180' Tc=14.4 min CN=88 Runoff=1.31 cfs 5,456 cf

Subcatchment P8: AREA AROUND POND 1 Runoff Area=6,584 sf 59.75% Impervious Runoff Depth>5.38"
Tc=6.0 min CN=93 Runoff=0.86 cfs 2,950 cf

Subcatchment P9: (new Subcat) Runoff Area=61,615 sf 0.00% Impervious Runoff Depth>3.74"
Flow Length=500' Tc=19.1 min CN=78 Runoff=4.27 cfs 19,220 cf

Subcatchment R1: lOT 1 ROOF Runoff Area=1,966 sf 100.00% Impervious Runoff Depth>5.96"
Tc=6.0 min CN=98 Runoff=0.27 cfs 976 cf

Subcatchment R2: LOT 2 ROOF Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>5.96"
Tc=6.0 min CN=98 Runoff=0.31 cfs 1,119 cf

Subcatchment R3: (new Subcat) Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>5.96"
Tc=6.0 min CN=98 Runoff=0.31 cfs 1,119 cf

Reach 1R: CULVERT UNDER DRIVE Avg. Flow Depth=0.55' Max Vel=11.37 fps Inflow=4.99 cfs 19,676 cf
12.0" Round Pipe n=0.012 L=20.0' S=0.0500 '/' Capacity=8.63 cfs Outflow=4.99 cfs 19,675 cf

Pond 1P: POND 1 Peak Elev=262.16' Storage=6,522 cf Inflow=5.31 cfs 18,216 cf
Discarded=0.09 cfs 4,647 cf Primary=2.71 cfs 11,930 cf Outflow=2.81 cfs 16,578 cf

Pond 2P: POND P2 Peak Elev=263.39' Storage=1,711 cf Inflow=1.44 cfs 4,960 cf
Discarded=0.05 cfs 2,853 cf Primary=0.59 cfs 1,499 cf Outflow=0.65 cfs 4,352 cf

Pond 3P: POND 3 Peak Elev=264.26' Storage=2,499 cf Inflow=1.50 cfs 6,576 cf
Discarded=0.06 cfs 2,126 cf Primary=0.43 cfs 4,151 cf Outflow=0.49 cfs 6,277 cf

Pond CB1: (new Pond) Peak Elev=262.36' Inflow=0.42 cfs 1,410 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/' Outflow=0.42 cfs 1,410 cf

Pond CB2: CB2 Peak Elev=0.00'
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/' Primary=0.00 cfs 0 cf

Pond CB3: (new Pond) Peak Elev=262.30' Inflow=0.72 cfs 2,622 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0500 '/' Outflow=0.72 cfs 2,622 cf

Pond CB4: CB4 Peak Elev=262.38' Inflow=1.55 cfs 5,299 cf
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=1.55 cfs 5,299 cf

Pond MH1: MH1 Peak Elev=262.35' Inflow=0.42 cfs 1,410 cf
12.0" Round Culvert n=0.013 L=215.0' S=0.0051 '/' Outflow=0.42 cfs 1,410 cf

Pond MH2: MH2 Peak Elev=262.29' Inflow=0.42 cfs 1,410 cf
12.0" Round Culvert n=0.013 L=120.0' S=0.0050 '/' Outflow=0.42 cfs 1,410 cf

Pond MH3: DMH3 Peak Elev=262.28' Inflow=2.69 cfs 9,331 cf
12.0" Round Culvert n=0.013 L=30.0' S=0.0250 '/' Outflow=2.69 cfs 9,330 cf

Pond SP1: SUM POND WOODS Inflow=12.07 cfs 54,976 cf
Primary=12.07 cfs 54,976 cf

Pond SP2: SUM POND STREET Inflow=1.31 cfs 4,173 cf
Primary=1.31 cfs 4,173 cf

Total Runoff Area = 198,077 sf Runoff Volume = 72,069 cf Average Runoff Depth = 4.37"
80.46% Pervious = 159,366 sf 19.54% Impervious = 38,711 sf

Summary for Subcatchment P1A: P1A

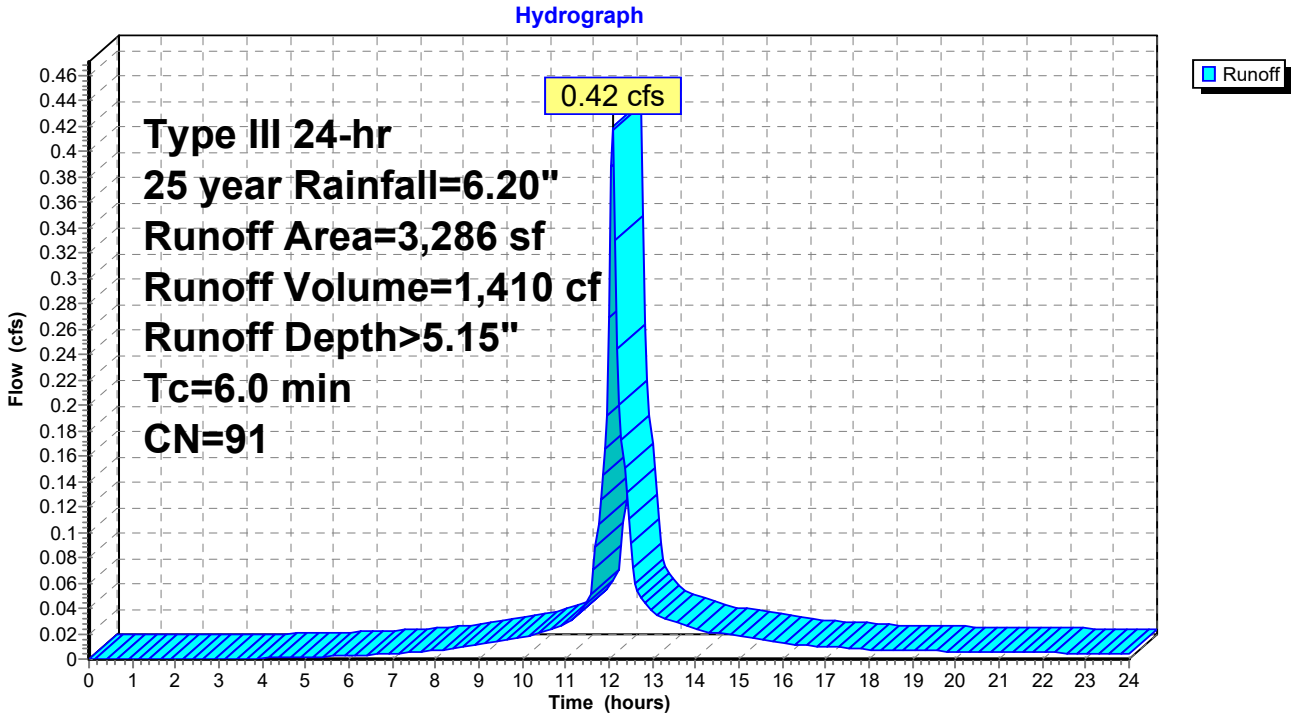
Runoff = 0.42 cfs @ 12.09 hrs, Volume= 1,410 cf, Depth> 5.15"
Routed to Pond CB1 : (new Pond)

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
1,799	86	<50% Grass cover, Poor, HSG C
1,487	98	Paved parking, HSG C
3,286	91	Weighted Average
1,799		54.75% Pervious Area
1,487		45.25% Impervious Area

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

Subcatchment P1A: P1A



Summary for Subcatchment P1B: P1B

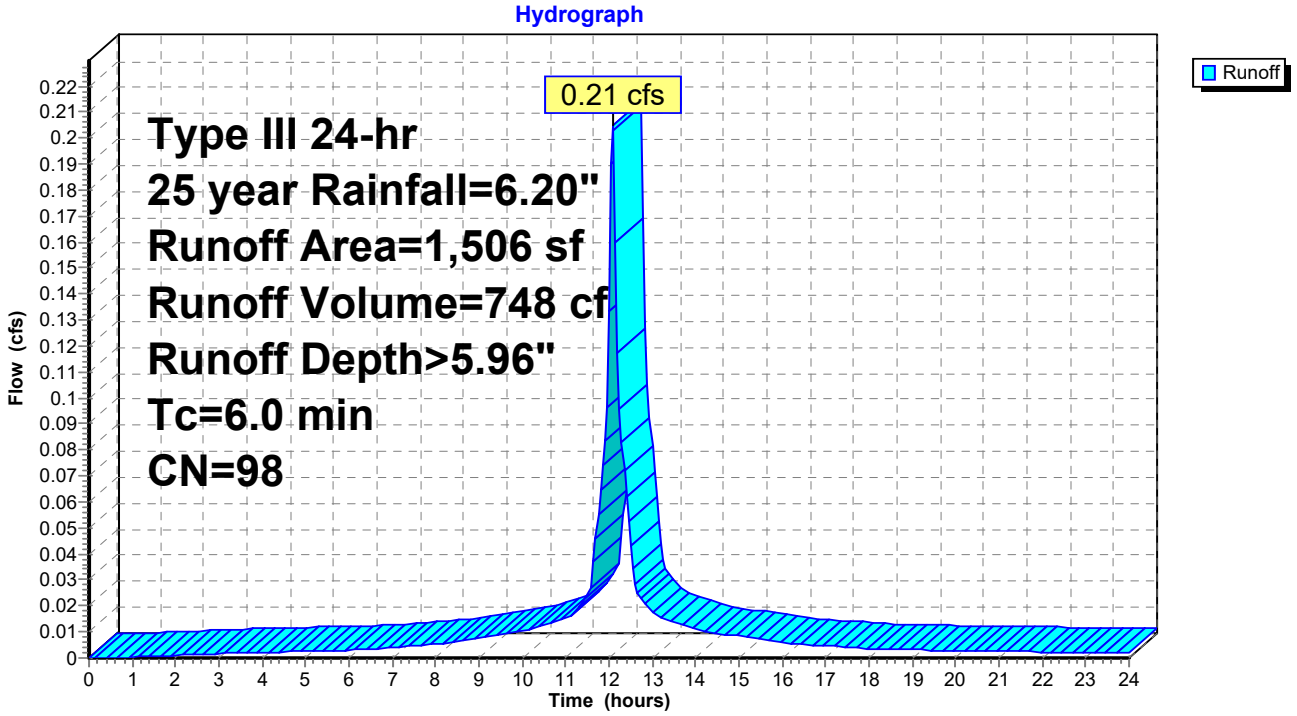
Runoff = 0.21 cfs @ 12.09 hrs, Volume= 748 cf, Depth> 5.96"

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
1,506	98	Paved parking, HSG C
1,506		100.00% Impervious Area

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

Subcatchment P1B: P1B



Summary for Subcatchment P2: P2

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

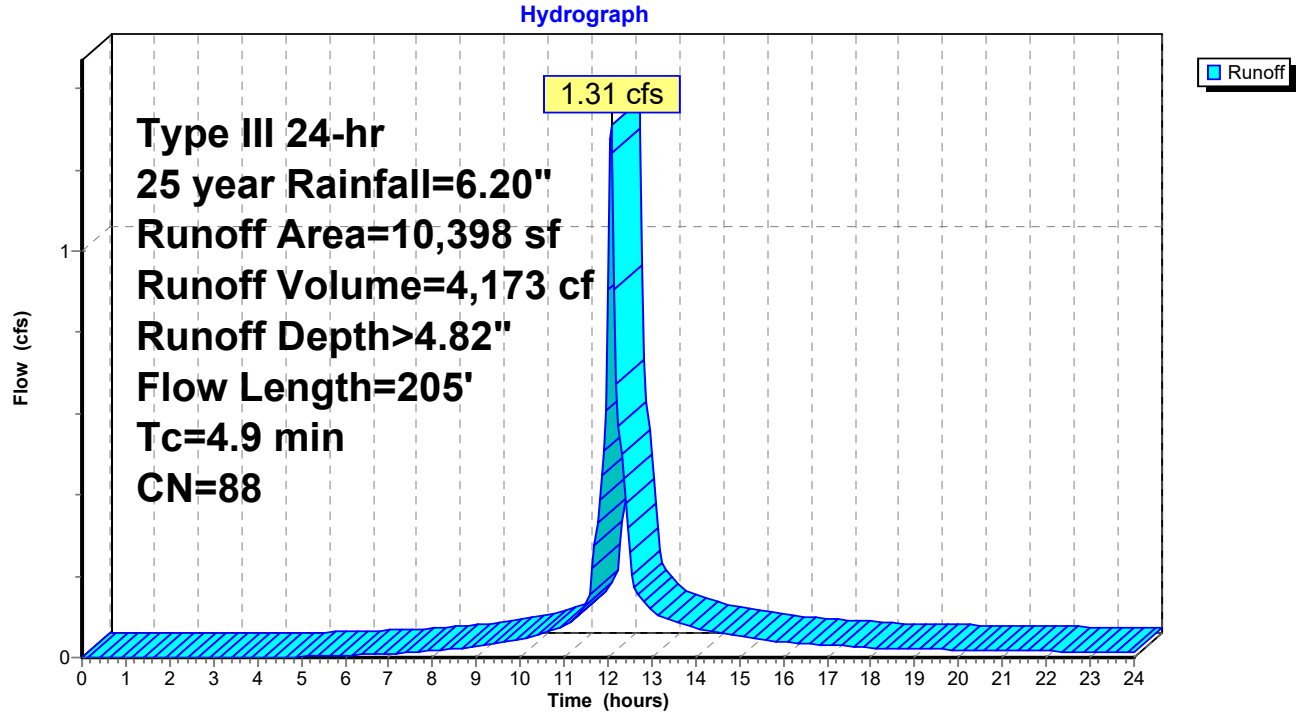
Runoff = 1.31 cfs @ 12.07 hrs, Volume= 4,173 cf, Depth> 4.82"
Routed to Pond SP2 : SUM POND STREET

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
8,983	86	<50% Grass cover, Poor, HSG C
10,398	88	Weighted Average
8,983		86.39% Pervious Area
1,415		13.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	50	0.0500	0.21		**Sheet Flow, flow over grass** Grass: Short n= 0.150 P2= 3.18"
0.4	35	0.0420	1.43		**Shallow Concentrated Flow, flow over grass** Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		**Shallow Concentrated Flow, flow along driveway** Paved Kv= 20.3 fps
4.9	205	Total			

Subcatchment P2: P2



Summary for Subcatchment P3: (new Subcat)

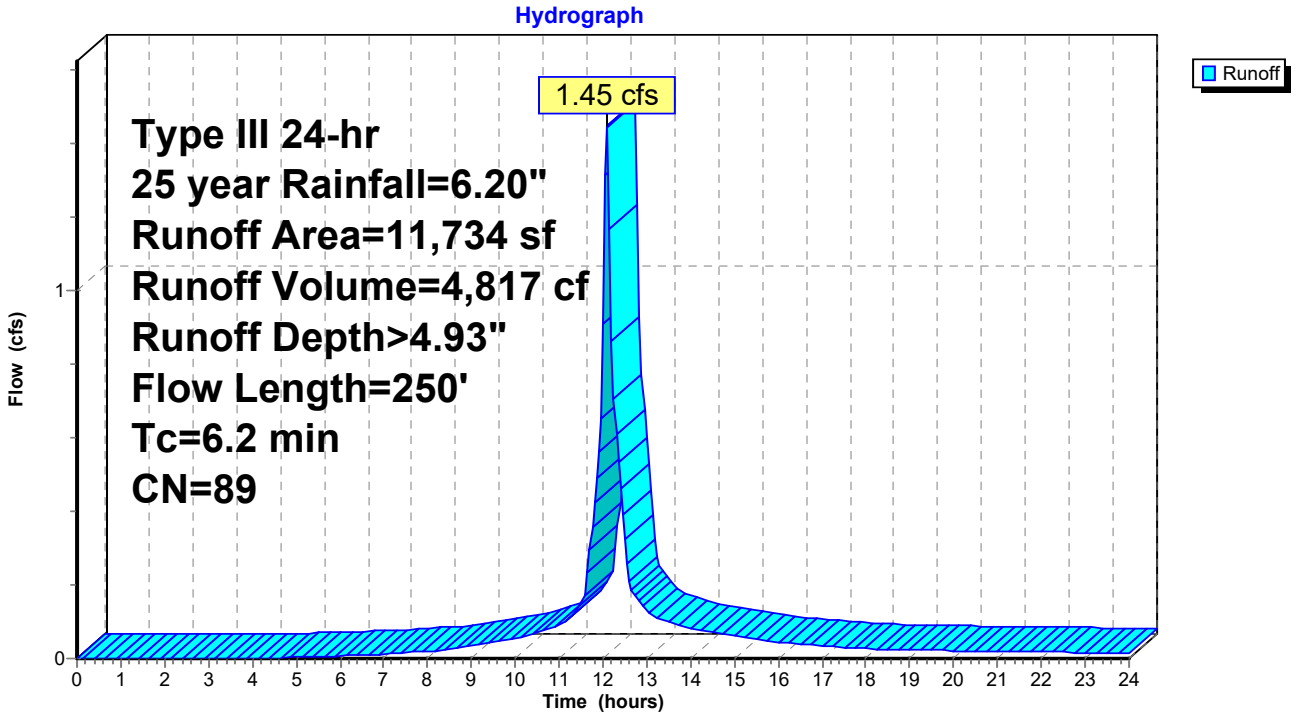
Runoff = 1.45 cfs @ 12.09 hrs, Volume= 4,817 cf, Depth> 4.93"
Routed to Pond 1P : POND 1

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
8,484	86	<50% Grass cover, Poor, HSG C
293	98	Unconnected pavement, HSG C
1,916	98	Paved parking, HSG C
1,041	98	Water Surface, HSG C
11,734	89	Weighted Average
8,484		72.30% Pervious Area
3,250		27.70% Impervious Area
293		9.02% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		**Sheet Flow, FLOW OVER GRASS** Grass: Short n= 0.150 P2= 3.18"
1.3	120	0.0500	1.57		**Shallow Concentrated Flow, FLOW OVER GRASS** Short Grass Pasture Kv= 7.0 fps
0.6	80	0.0125	2.27		**Shallow Concentrated Flow, FLOW OVER DRIVEWAY** Paved Kv= 20.3 fps
6.2	250	Total			

Subcatchment P3: (new Subcat)



Summary for Subcatchment P4A: FLOW TO CB3

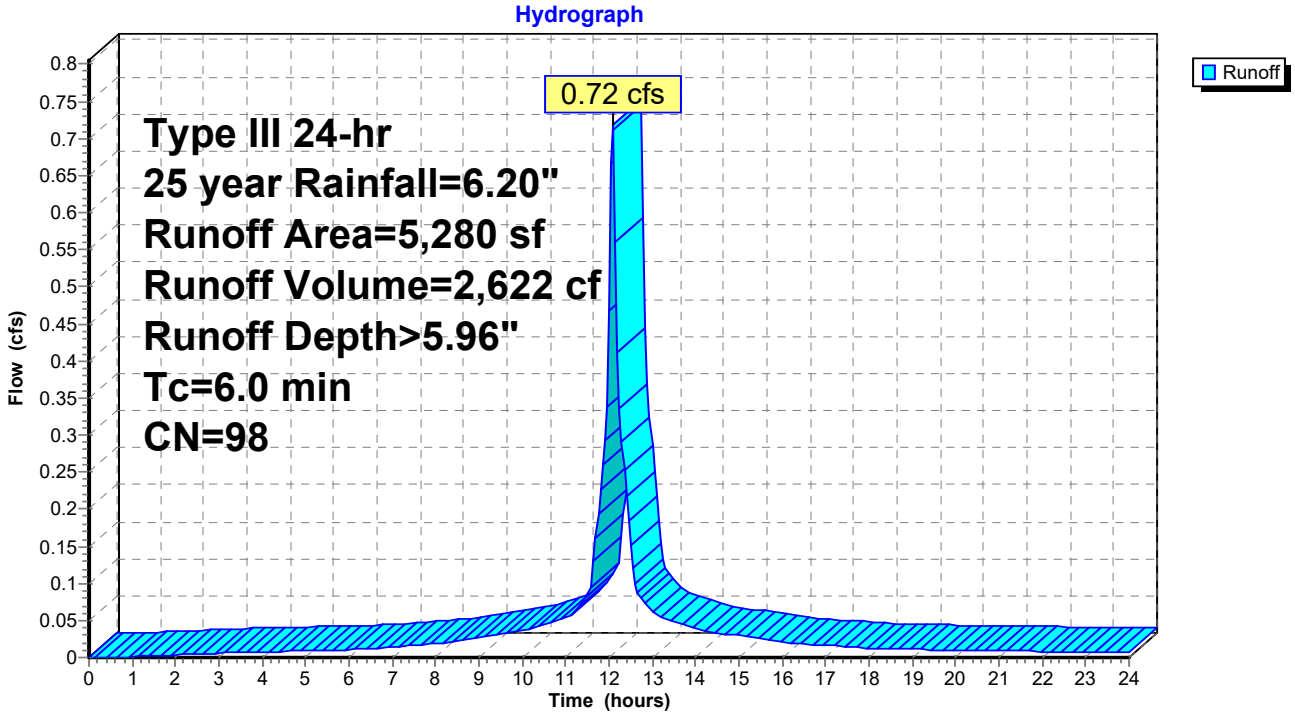
Runoff = 0.72 cfs @ 12.09 hrs, Volume= 2,622 cf, Depth> 5.96"
Routed to Pond CB3 : (new Pond)

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
5,280	98	Paved parking, HSG C
5,280		100.00% Impervious Area

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

Subcatchment P4A: FLOW TO CB3



Summary for Subcatchment P4B: FLOW TO CB4

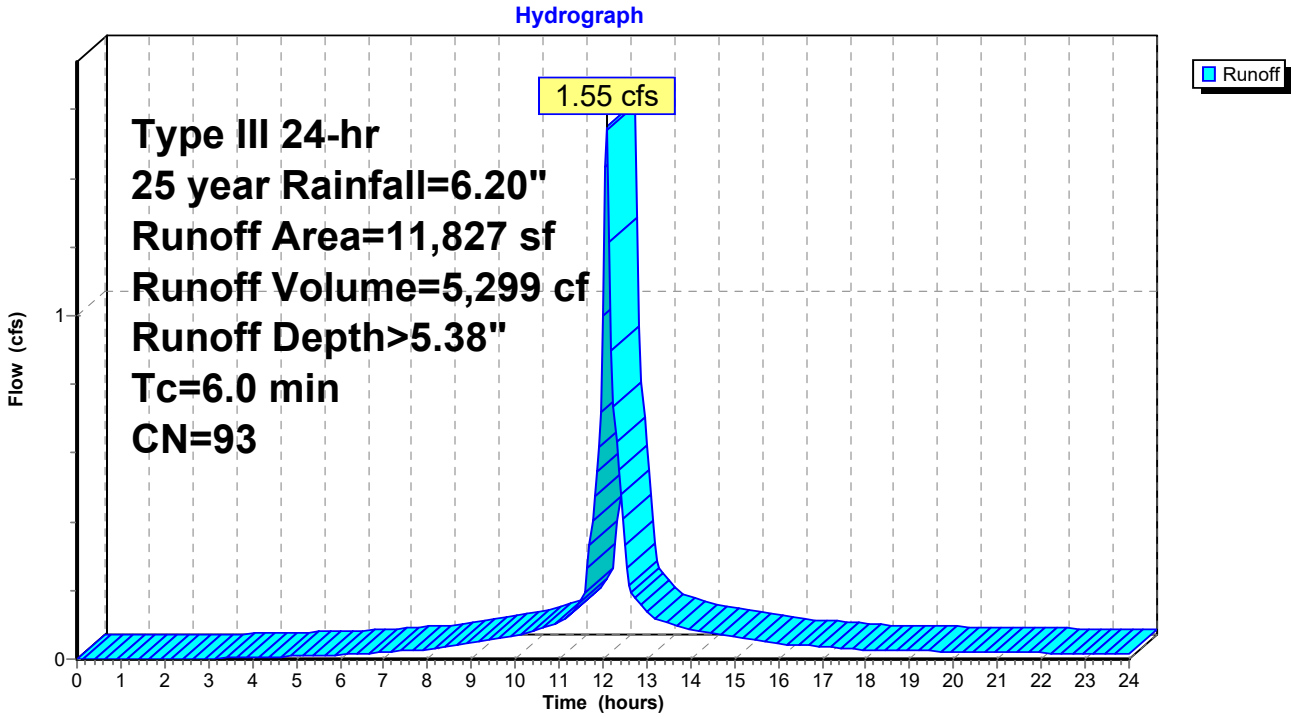
Runoff = 1.55 cfs @ 12.09 hrs, Volume= 5,299 cf, Depth> 5.38"
Routed to Pond CB4 : CB4

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
7,080	98	Paved parking, HSG C
4,550	86	<50% Grass cover, Poor, HSG C
197	98	Unconnected pavement, HSG C
11,827	93	Weighted Average
4,550		38.47% Pervious Area
7,277		61.53% Impervious Area
197		2.71% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW OVER PAVEMENT TO CB4**

Subcatchment P4B: FLOW TO CB4



Summary for Subcatchment P5: P5

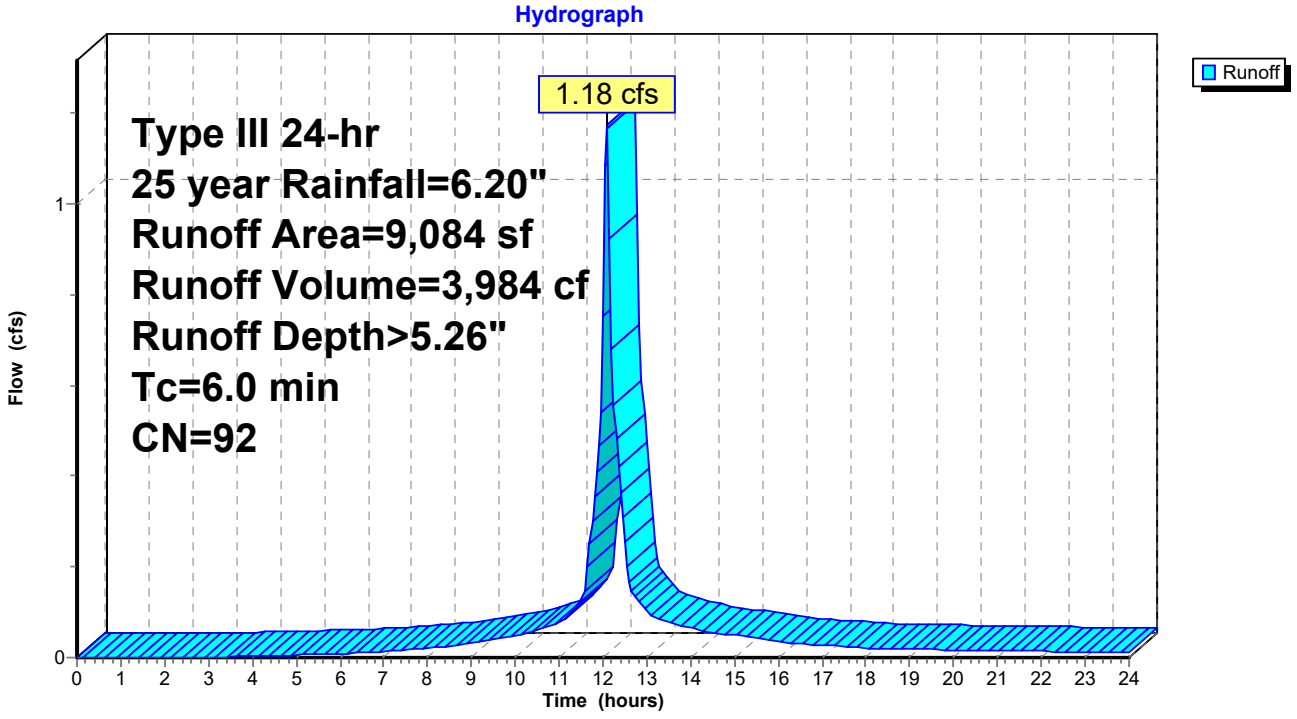
Runoff = 1.18 cfs @ 12.09 hrs, Volume= 3,984 cf, Depth> 5.26"
Routed to Pond 2P : POND P2

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
4,441	86	<50% Grass cover, Poor, HSG C
1,160	98	Water Surface, HSG C
3,483	98	Paved parking, HSG C
9,084	92	Weighted Average
4,441		48.89% Pervious Area
4,643		51.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW TO POND P2**

Subcatchment P5: P5



Summary for Subcatchment P6: P6

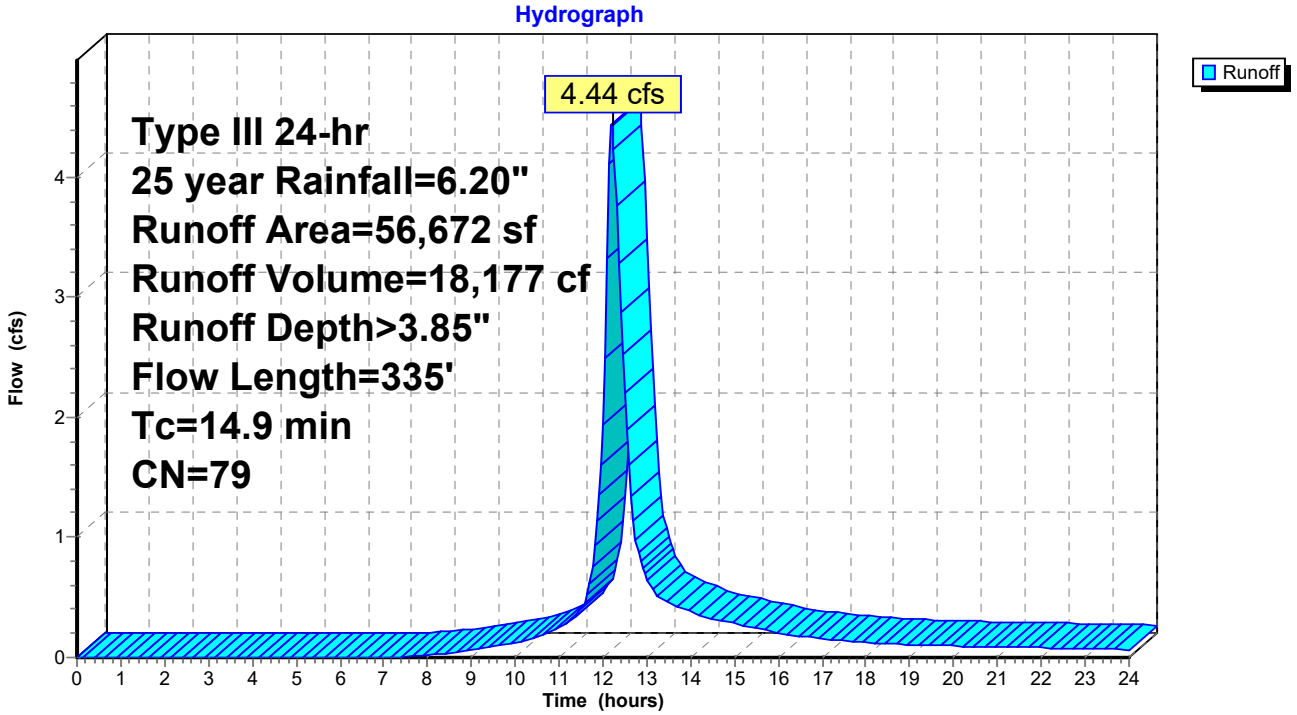
Runoff = 4.44 cfs @ 12.21 hrs, Volume= 18,177 cf, Depth> 3.85"
Routed to Reach 1R : CULVERT UNDER DRIVE

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
27,229	86	<50% Grass cover, Poor, HSG C
21,621	70	Woods, Good, HSG C
6,822	79	Woods/grass comb., Good, HSG D
1,000	98	Roofs, HSG C
56,672	79	Weighted Average
55,672		98.24% Pervious Area
1,000		1.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0900	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.18"
1.4	125	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.7	160	0.0250	0.40		**Shallow Concentrated Flow, FLOW THROUGH wetland** Forest w/Heavy Litter Kv= 2.5 fps
14.9	335	Total			

Subcatchment P6: P6



Summary for Subcatchment P7: FLOW TO POND 3

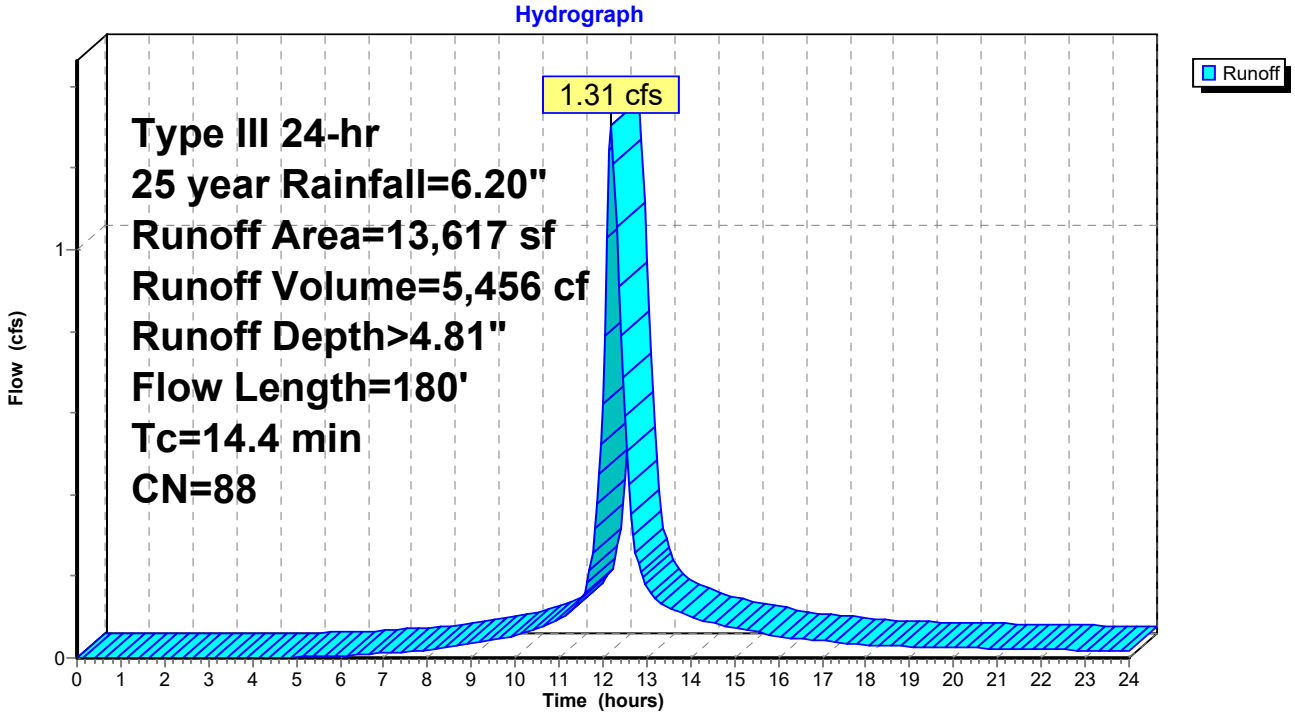
Runoff = 1.31 cfs @ 12.19 hrs, Volume= 5,456 cf, Depth> 4.81"
Routed to Pond 3P : POND 3

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
11,172	86	<50% Grass cover, Poor, HSG C
1,096	98	Paved parking, HSG C
1,349	98	Water Surface, HSG C
13,617	88	Weighted Average
11,172		82.04% Pervious Area
2,445		17.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, FLOW IN WOODS** Woods: Light underbrush n= 0.400 P2= 3.18"
2.0	130	0.0460	1.07		**Shallow Concentrated Flow, FLOW THROUGH WOODS** Woodland Kv= 5.0 fps
14.4	180	Total			

Subcatchment P7: FLOW TO POND 3



Summary for Subcatchment P8: AREA AROUND POND 1

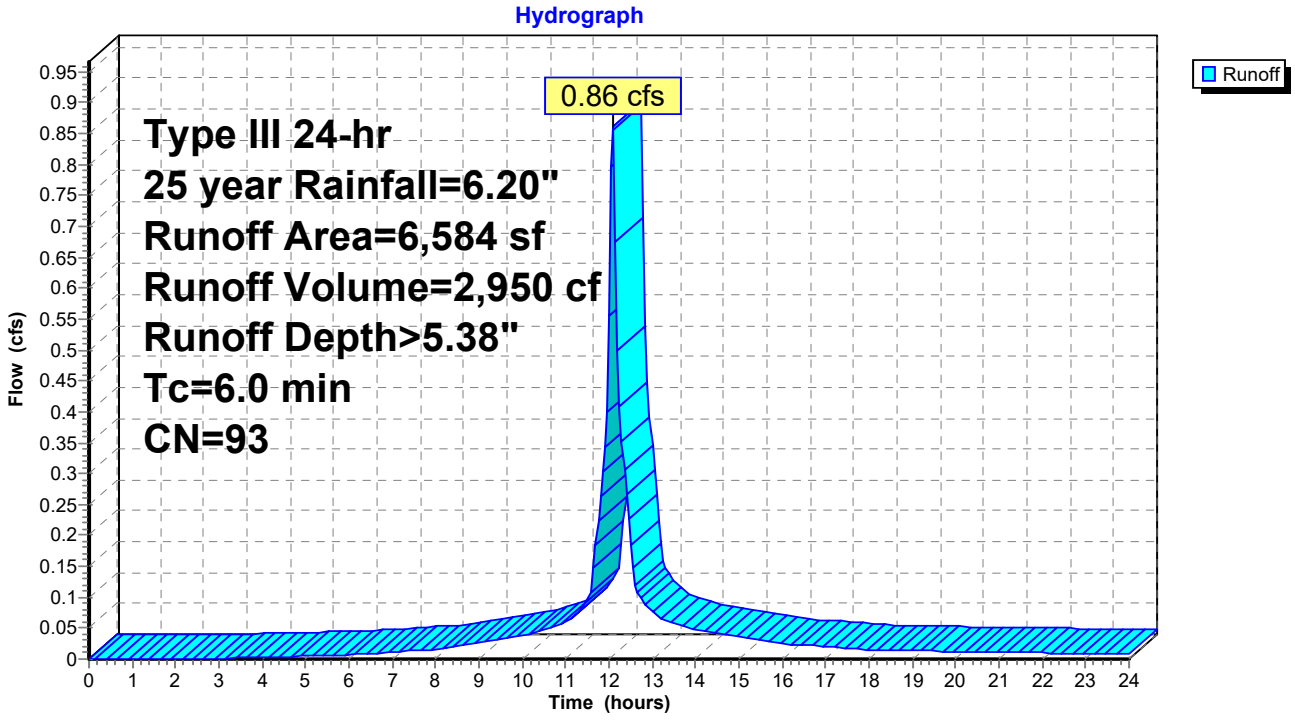
Runoff = 0.86 cfs @ 12.09 hrs, Volume= 2,950 cf, Depth> 5.38"
Routed to Pond 1P : POND 1

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
2,650	86	<50% Grass cover, Poor, HSG C
3,934	98	Water Surface, HSG C
6,584	93	Weighted Average
2,650		40.25% Pervious Area
3,934		59.75% Impervious Area

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

Subcatchment P8: AREA AROUND POND 1



Summary for Subcatchment P9: (new Subcat)

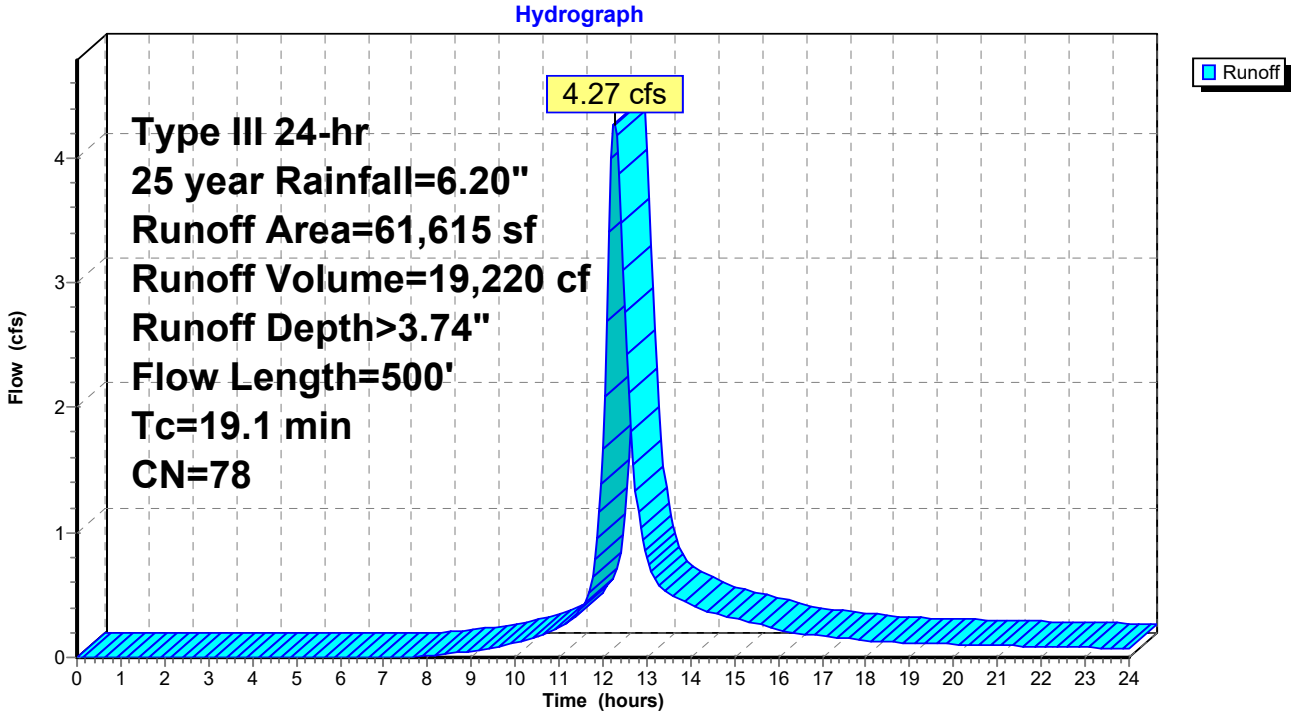
Runoff = 4.27 cfs @ 12.26 hrs, Volume= 19,220 cf, Depth> 3.74"
Routed to Pond SP1 : SUM POND WOODS

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
23,170	86	<50% Grass cover, Poor, HSG C
27,803	70	Woods, Good, HSG C
10,642	79	Woods/grass comb., Good, HSG D
61,615	78	Weighted Average
61,615		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, FLOW THROUGH WOODS** Woods: Light underbrush n= 0.400 P2= 3.18"
6.7	450	0.0500	1.12		**Shallow Concentrated Flow, FLOW THROUGH WOODS** Woodland Kv= 5.0 fps
19.1	500	Total			

Subcatchment P9: (new Subcat)



Summary for Subcatchment R1: IOT 1 ROOF

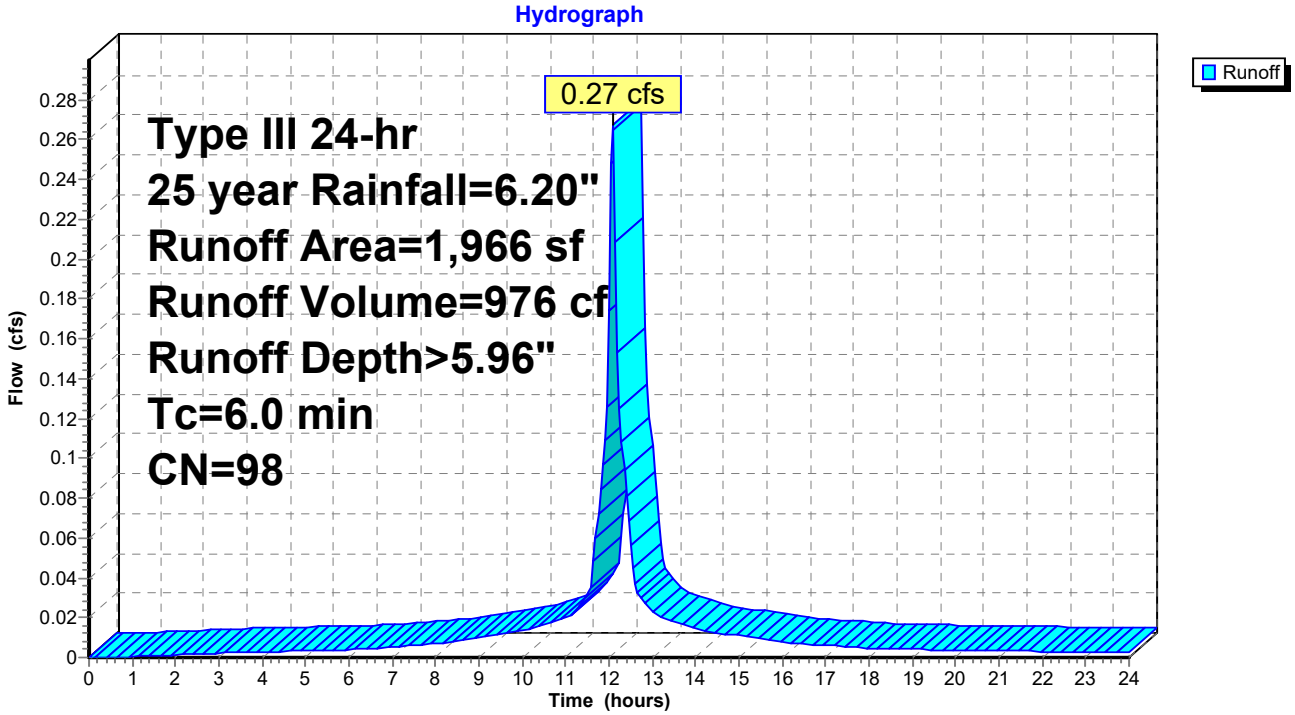
Runoff = 0.27 cfs @ 12.09 hrs, Volume= 976 cf, Depth> 5.96"
Routed to Pond 2P : POND P2

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
1,966	98	Roofs, HSG C
1,966		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW FROM ROOF TO POND**

Subcatchment R1: IOT 1 ROOF



Summary for Subcatchment R2: LOT 2 ROOF

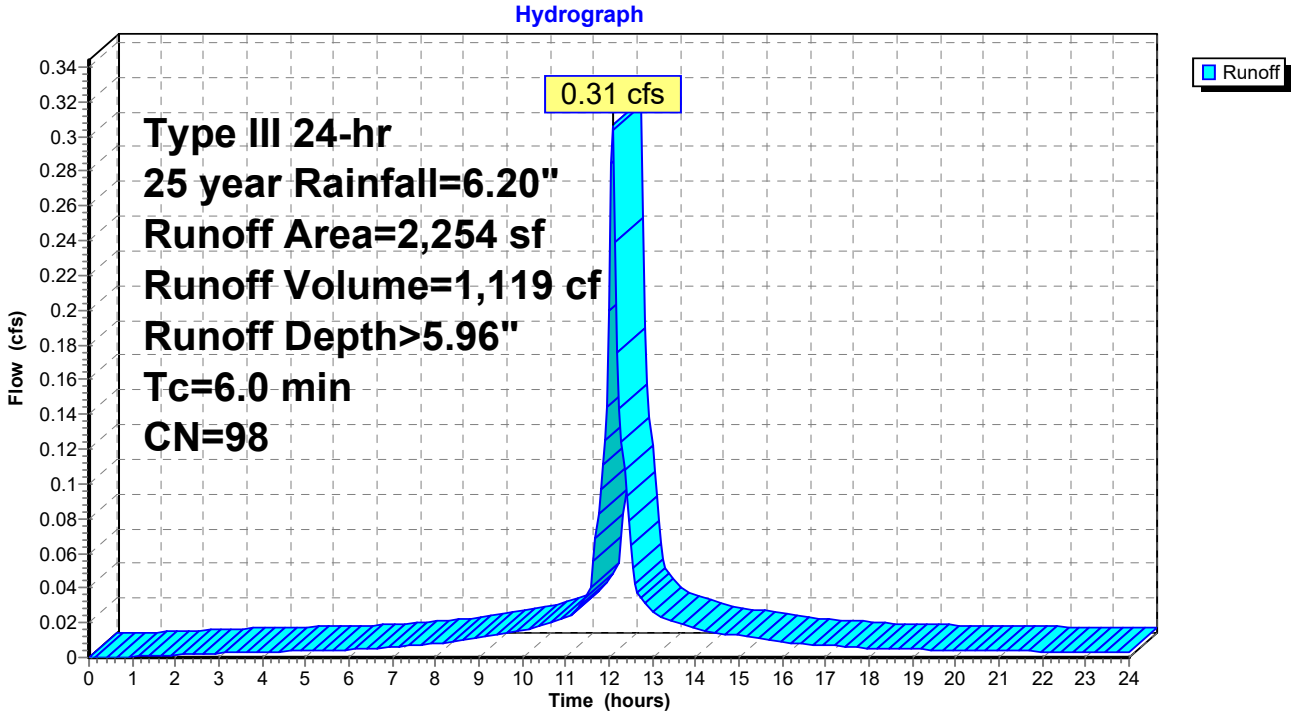
Runoff = 0.31 cfs @ 12.09 hrs, Volume= 1,119 cf, Depth> 5.96"
Routed to Pond 3P : POND 3

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW IN GUTTERS AND PIPES TO POND 3**

Subcatchment R2: LOT 2 ROOF



Summary for Subcatchment R3: (new Subcat)

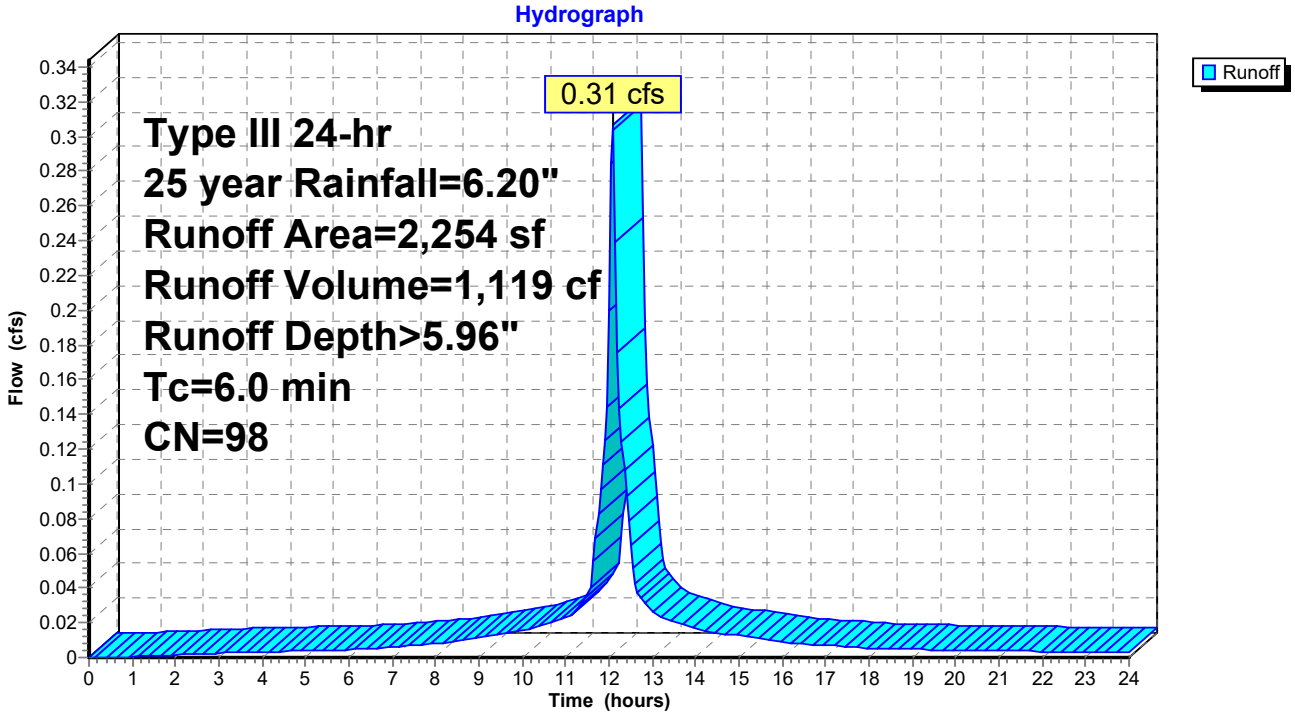
Runoff = 0.31 cfs @ 12.09 hrs, Volume= 1,119 cf, Depth> 5.96"
Routed to Pond 1P : POND 1

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 25 year Rainfall=6.20"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW THROUGH GUTTERS TO POND**

Subcatchment R3: (new Subcat)



Summary for Reach 1R: CULVERT UNDER DRIVE

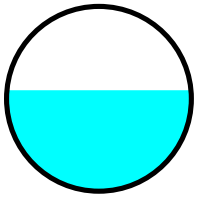
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 67,722 sf, 11.24% Impervious, Inflow Depth > 3.49" for 25 year event
Inflow = 4.99 cfs @ 12.21 hrs, Volume= 19,676 cf
Outflow = 4.99 cfs @ 12.21 hrs, Volume= 19,675 cf, Atten= 0%, Lag= 0.0 min
Routed to Pond SP1 : SUM POND WOODS

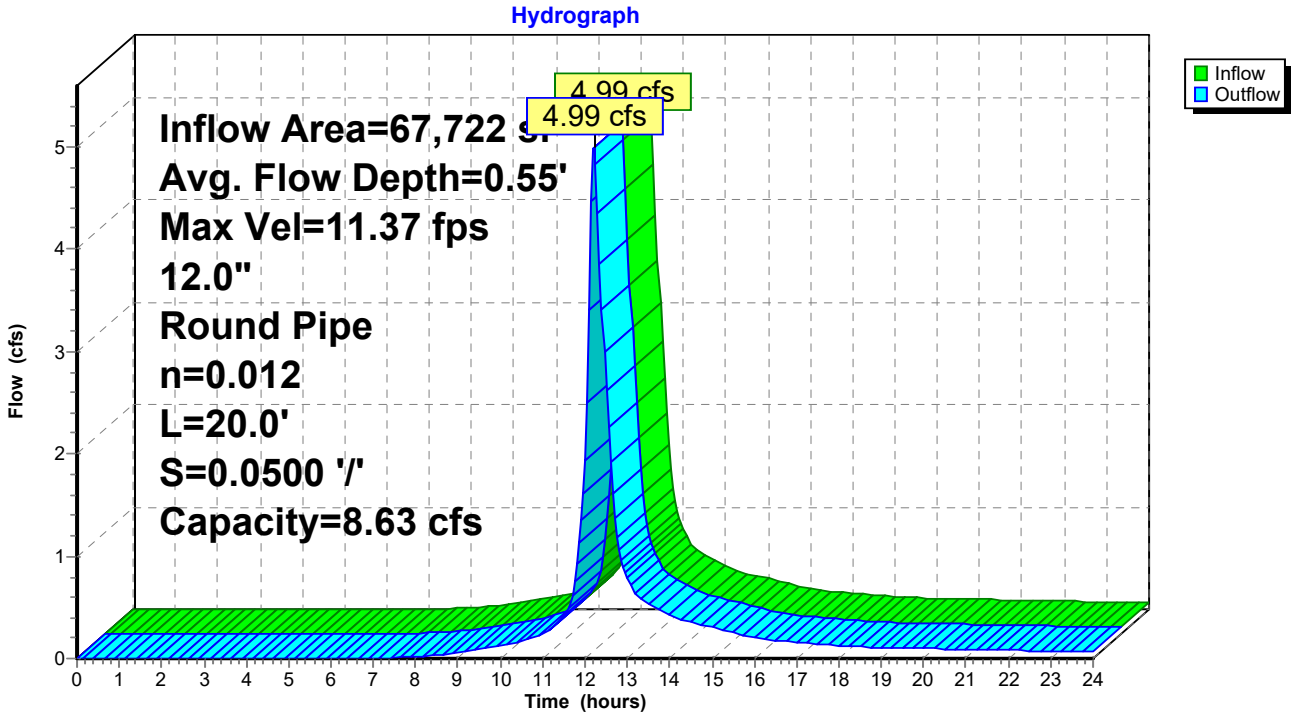
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.37 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.33 fps, Avg. Travel Time= 0.1 min

Peak Storage= 9 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.55' , Surface Width= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.63 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 20.0' Slope= 0.0500 '/'
Inlet Invert= 259.00', Outlet Invert= 258.00'



Reach 1R: CULVERT UNDER DRIVE



Summary for Pond 1P: POND 1

[80] Warning: Exceeded Pond MH3 by 0.25' @ 0.00 hrs (0.20 cfs 3,303 cf)

Inflow Area = 40,965 sf, 57.32% Impervious, Inflow Depth > 5.34" for 25 year event
Inflow = 5.31 cfs @ 12.09 hrs, Volume= 18,216 cf
Outflow = 2.81 cfs @ 12.23 hrs, Volume= 16,578 cf, Atten= 47%, Lag= 8.4 min
Discarded = 0.09 cfs @ 12.23 hrs, Volume= 4,647 cf
Primary = 2.71 cfs @ 12.23 hrs, Volume= 11,930 cf
Routed to Pond SP1 : SUM POND WOODS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.16' @ 12.23 hrs Surf.Area= 3,973 sf Storage= 6,522 cf
Flood Elev= 263.00' Surf.Area= 4,790 sf Storage= 10,193 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 79.8 min (850.4 - 770.6)

Volume	Invert	Avail.Storage	Storage Description
#1	260.00'	10,193 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

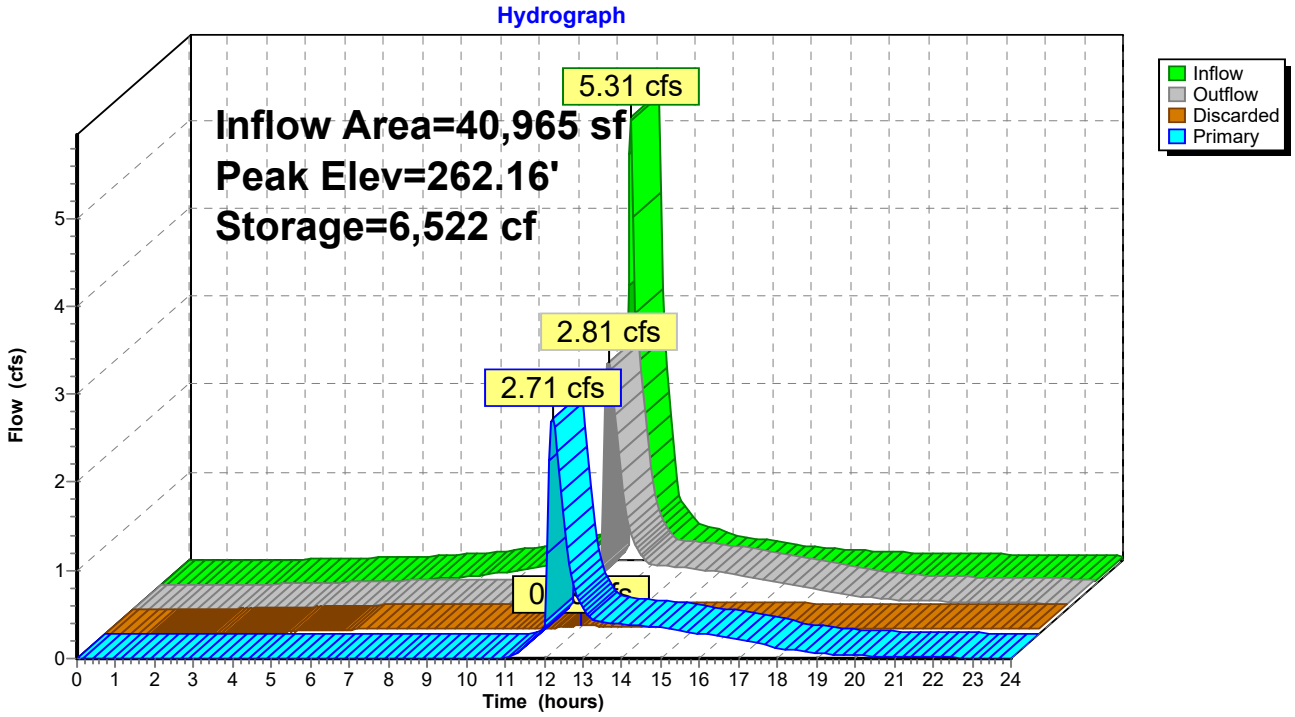
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
260.00	2,125	260.0	0	0	2,125
261.00	2,940	282.0	2,521	2,521	3,112
262.00	3,825	308.0	3,373	5,894	4,368
263.00	4,790	332.0	4,298	10,193	5,631

Device	Routing	Invert	Outlet Devices
#1	Primary	259.00'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.00' / 258.00' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	260.65'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	261.80'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Discarded	260.00'	**1.020 in/hr Exfiltration over Surface area**
#5	Primary	262.40'	**5.0' long x 8.0' 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) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Discarded OutFlow Max=0.09 cfs @ 12.23 hrs HW=262.16' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=2.69 cfs @ 12.23 hrs HW=262.16' TW=0.00' (Dynamic Tailwater)
├**1=Culvert** (Passes 2.69 cfs of 6.17 cfs potential flow)
│ ├**2=Orifice/Grate** (Orifice Controls 0.49 cfs @ 5.58 fps)
│ └**3=Orifice/Grate** (Weir Controls 2.21 cfs @ 1.96 fps)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: POND 1



Summary for Pond 2P: POND P2

Inflow Area = 11,050 sf, 59.81% Impervious, Inflow Depth > 5.39" for 25 year event
Inflow = 1.44 cfs @ 12.09 hrs, Volume= 4,960 cf
Outflow = 0.65 cfs @ 12.27 hrs, Volume= 4,352 cf, Atten= 55%, Lag= 11.2 min
Discarded = 0.05 cfs @ 12.27 hrs, Volume= 2,853 cf
Primary = 0.59 cfs @ 12.27 hrs, Volume= 1,499 cf
Routed to Reach 1R : CULVERT UNDER DRIVE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 263.39' @ 12.27 hrs Surf.Area= 2,203 sf Storage= 1,711 cf
Flood Elev= 263.50' Surf.Area= 2,275 sf Storage= 1,952 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 101.8 min (871.3 - 769.5)

Volume	Invert	Avail.Storage	Storage Description
#1	262.50'	1,952 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

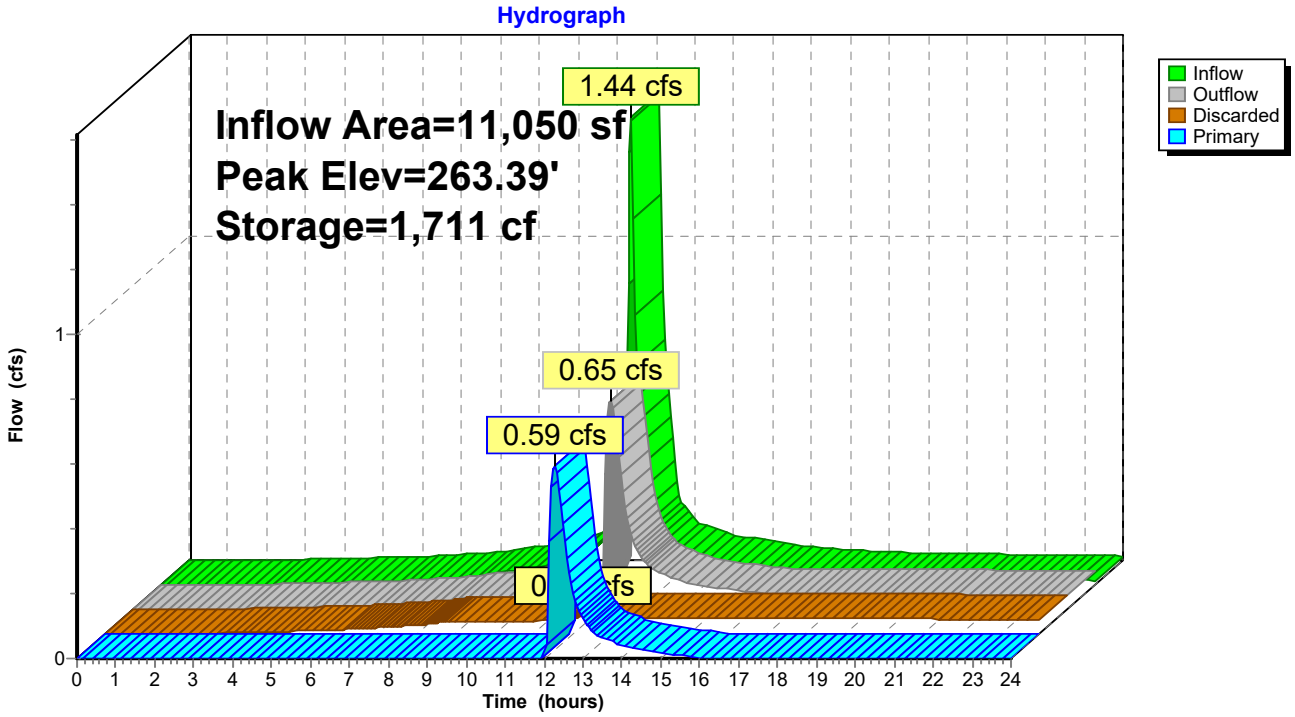
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
262.50	1,640	172.0	0	0	1,640
263.00	1,950	200.0	896	896	2,474
263.50	2,275	207.0	1,055	1,952	2,723

Device	Routing	Invert	Outlet Devices
#1	Discarded	262.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	263.20'	**3.0' 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

Discarded OutFlow Max=0.05 cfs @ 12.27 hrs HW=263.39' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.59 cfs @ 12.27 hrs HW=263.39' TW=259.52' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.59 cfs @ 1.02 fps)

Pond 2P: POND P2



Summary for Pond 3P: POND 3

Inflow Area = 15,871 sf, 29.61% Impervious, Inflow Depth > 4.97" for 25 year event
Inflow = 1.50 cfs @ 12.17 hrs, Volume= 6,576 cf
Outflow = 0.49 cfs @ 12.59 hrs, Volume= 6,277 cf, Atten= 67%, Lag= 24.9 min
Discarded = 0.06 cfs @ 12.59 hrs, Volume= 2,126 cf
Primary = 0.43 cfs @ 12.59 hrs, Volume= 4,151 cf
Routed to Pond SP1 : SUM POND WOODS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 264.26' @ 12.59 hrs Surf.Area= 2,401 sf Storage= 2,499 cf
Flood Elev= 265.00' Surf.Area= 3,131 sf Storage= 4,528 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 73.8 min (861.6 - 787.8)

Volume	Invert	Avail.Storage	Storage Description
#1	262.75'	4,528 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

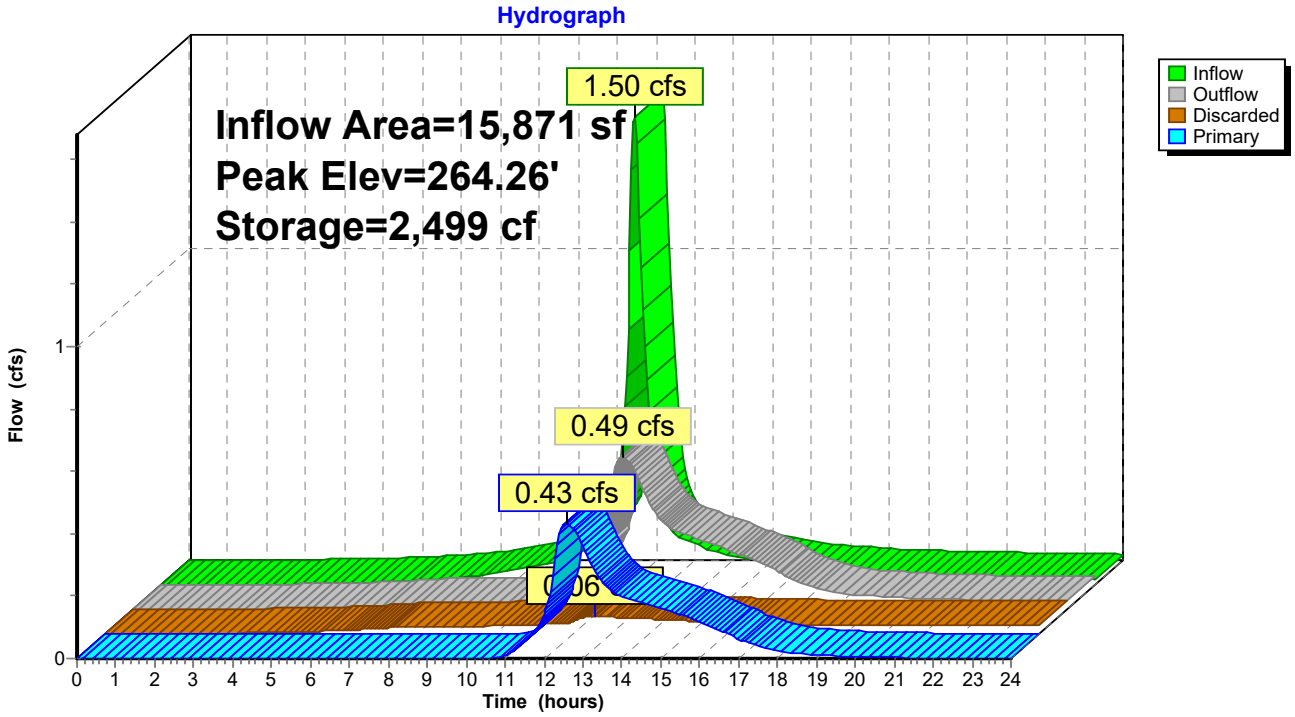
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
262.75	954	190.0	0	0	954
264.00	2,162	300.0	1,897	1,897	5,254
265.00	3,131	282.0	2,632	4,528	6,137

Device	Routing	Invert	Outlet Devices
#1	Primary	263.05'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 263.05' / 261.50' S= 0.0775 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	262.75'	**1.020 in/hr Exfiltration over Surface area**
#3	Device 1	263.90'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	263.05'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	264.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 12.59 hrs HW=264.26' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.43 cfs @ 12.59 hrs HW=264.26' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.43 cfs of 3.19 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 0.19 cfs @ 2.14 fps)
  ├**4=Orifice/Grate** (Orifice Controls 0.25 cfs @ 5.02 fps)
  └**5=Orifice/Grate** (Controls 0.00 cfs)

Pond 3P: POND 3



Summary for Pond CB1: (new Pond)

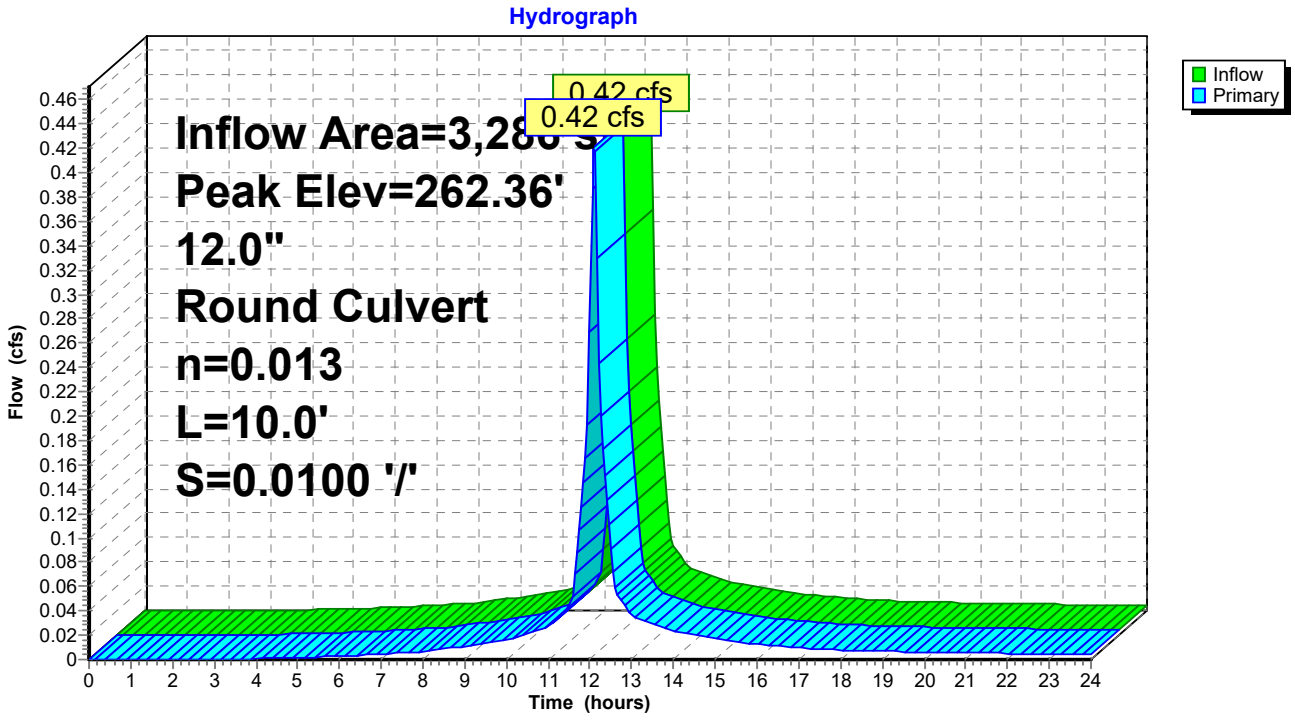
Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 5.15" for 25 year event
Inflow = 0.42 cfs @ 12.09 hrs, Volume= 1,410 cf
Outflow = 0.42 cfs @ 12.09 hrs, Volume= 1,410 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.42 cfs @ 12.09 hrs, Volume= 1,410 cf
Routed to Pond MH1 : MH1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.36' @ 12.27 hrs
Flood Elev= 264.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	261.90'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.34 cfs @ 12.09 hrs HW=262.27' TW=262.16' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.34 cfs @ 1.90 fps)

Pond CB1: (new Pond)



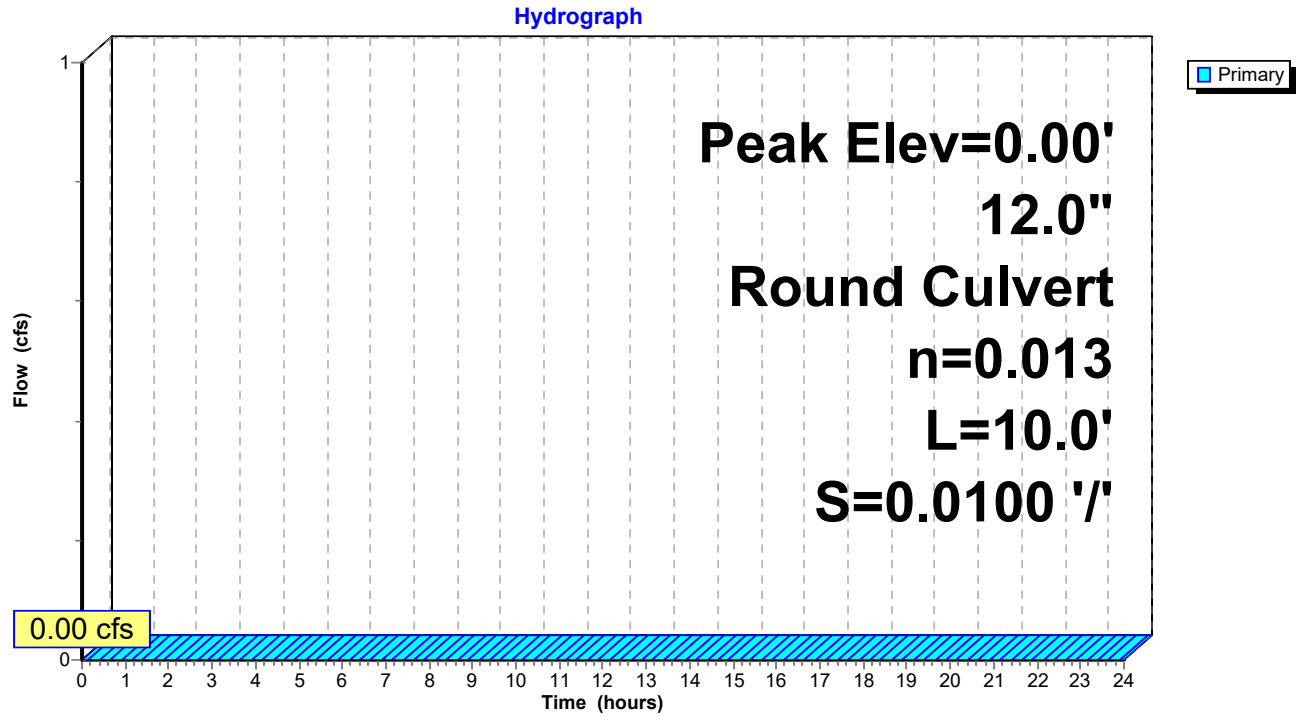
Summary for Pond CB2: CB2

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

Device	Routing	Invert	Outlet Devices
#1	Primary	261.90'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=261.70' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)

Pond CB2: CB2



Summary for Pond CB3: (new Pond)

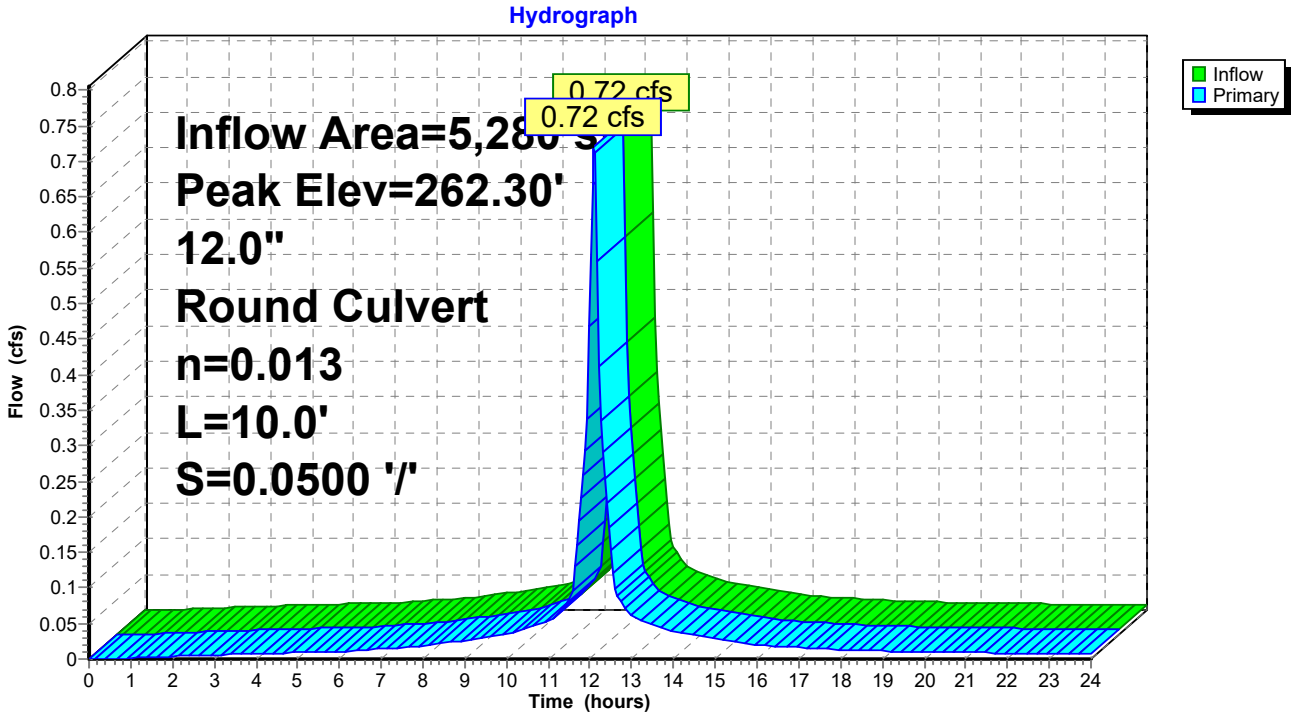
Inflow Area = 5,280 sf,100.00% Impervious, Inflow Depth > 5.96" for 25 year event
Inflow = 0.72 cfs @ 12.09 hrs, Volume= 2,622 cf
Outflow = 0.72 cfs @ 12.09 hrs, Volume= 2,622 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.72 cfs @ 12.09 hrs, Volume= 2,622 cf
Routed to Pond MH3 : DMH3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.30' @ 12.20 hrs
Flood Elev= 263.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.50'	**12.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=261.95' TW=262.20' (Dynamic Tailwater)
↳**1=Culvert** (Controls 0.00 cfs)

Pond CB3: (new Pond)



Summary for Pond CB4: CB4

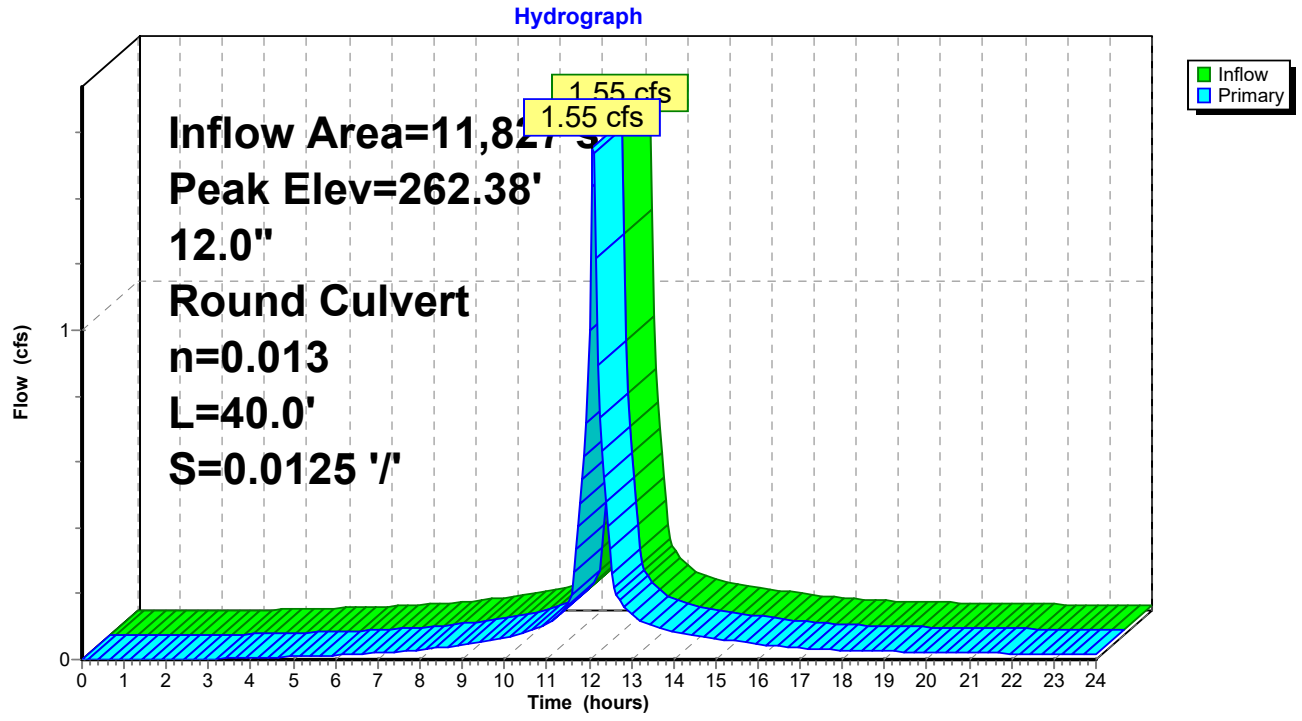
Inflow Area = 11,827 sf, 61.53% Impervious, Inflow Depth > 5.38" for 25 year event
Inflow = 1.55 cfs @ 12.09 hrs, Volume= 5,299 cf
Outflow = 1.55 cfs @ 12.09 hrs, Volume= 5,299 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.55 cfs @ 12.09 hrs, Volume= 5,299 cf
Routed to Pond MH3 : DMH3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.38' @ 12.17 hrs
Flood Elev= 263.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.50'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=262.08' TW=262.20' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond CB4: CB4



Summary for Pond MH1: MH1

[80] Warning: Exceeded Pond CB1 by 0.05' @ 12.20 hrs (0.29 cfs 53 cf)

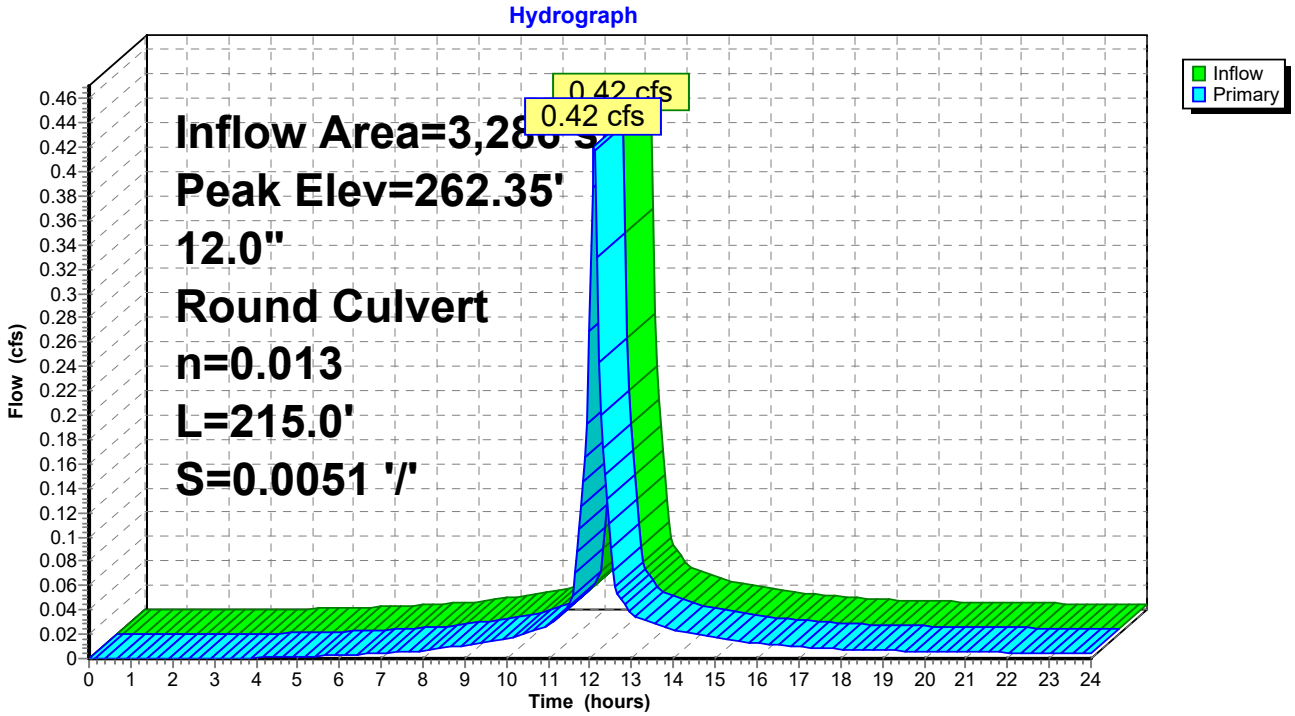
Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 5.15" for 25 year event
Inflow = 0.42 cfs @ 12.09 hrs, Volume= 1,410 cf
Outflow = 0.42 cfs @ 12.09 hrs, Volume= 1,410 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.42 cfs @ 12.09 hrs, Volume= 1,410 cf
Routed to Pond MH2 : MH2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.35' @ 12.22 hrs
Flood Elev= 265.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	261.70'	**12.0" Round Culvert** L= 215.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.70' / 260.60' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.26 cfs @ 12.09 hrs HW=262.16' TW=261.95' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.26 cfs @ 1.08 fps)

Pond MH1: MH1



Summary for Pond MH2: MH2

[80] Warning: Exceeded Pond MH1 by 0.05' @ 12.15 hrs (0.19 cfs 34 cf)

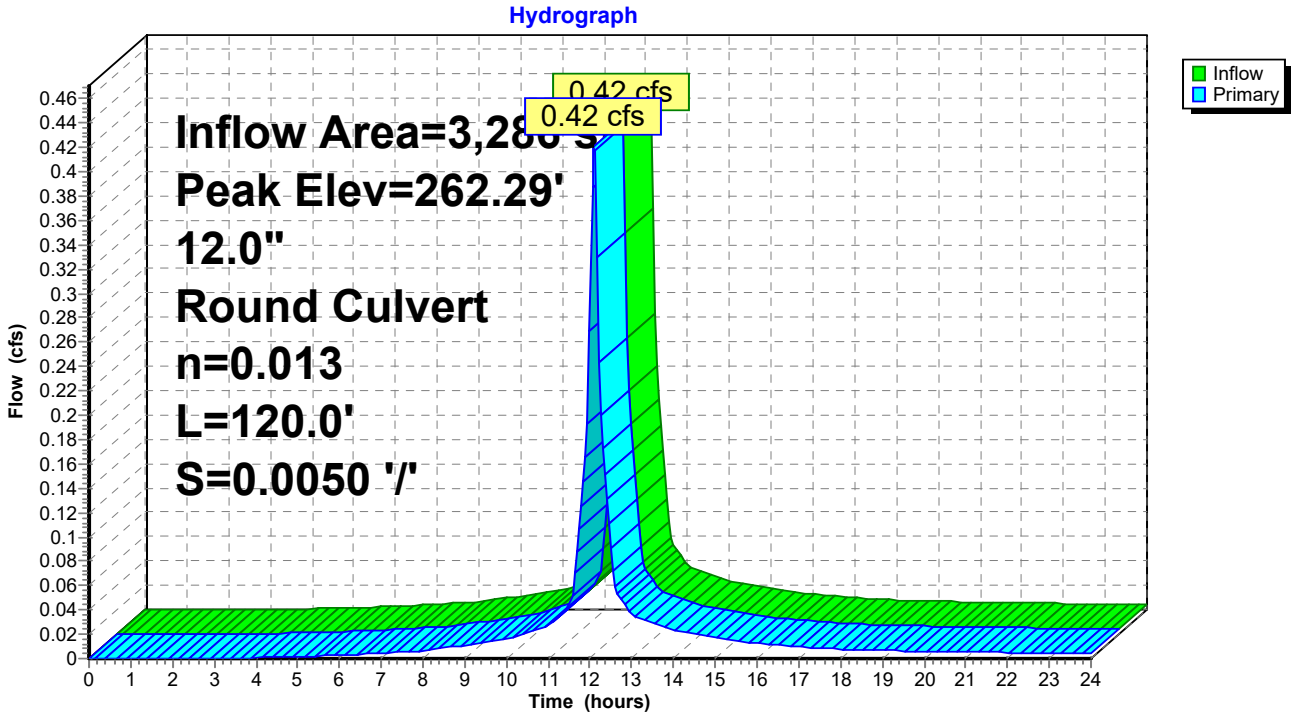
Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 5.15" for 25 year event
Inflow = 0.42 cfs @ 12.09 hrs, Volume= 1,410 cf
Outflow = 0.42 cfs @ 12.09 hrs, Volume= 1,410 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.42 cfs @ 12.09 hrs, Volume= 1,410 cf
Routed to Pond MH3 : DMH3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.29' @ 12.20 hrs
Flood Elev= 269.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.60'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.60' / 260.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=261.95' TW=262.20' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond MH2: MH2



Summary for Pond MH3: DMH3

[80] Warning: Exceeded Pond CB3 by 0.32' @ 12.05 hrs (2.15 cfs 1,977 cf)
[80] Warning: Exceeded Pond CB4 by 0.21' @ 12.05 hrs (1.74 cfs 1,032 cf)
[80] Warning: Exceeded Pond MH2 by 0.33' @ 12.05 hrs (1.59 cfs 1,119 cf)

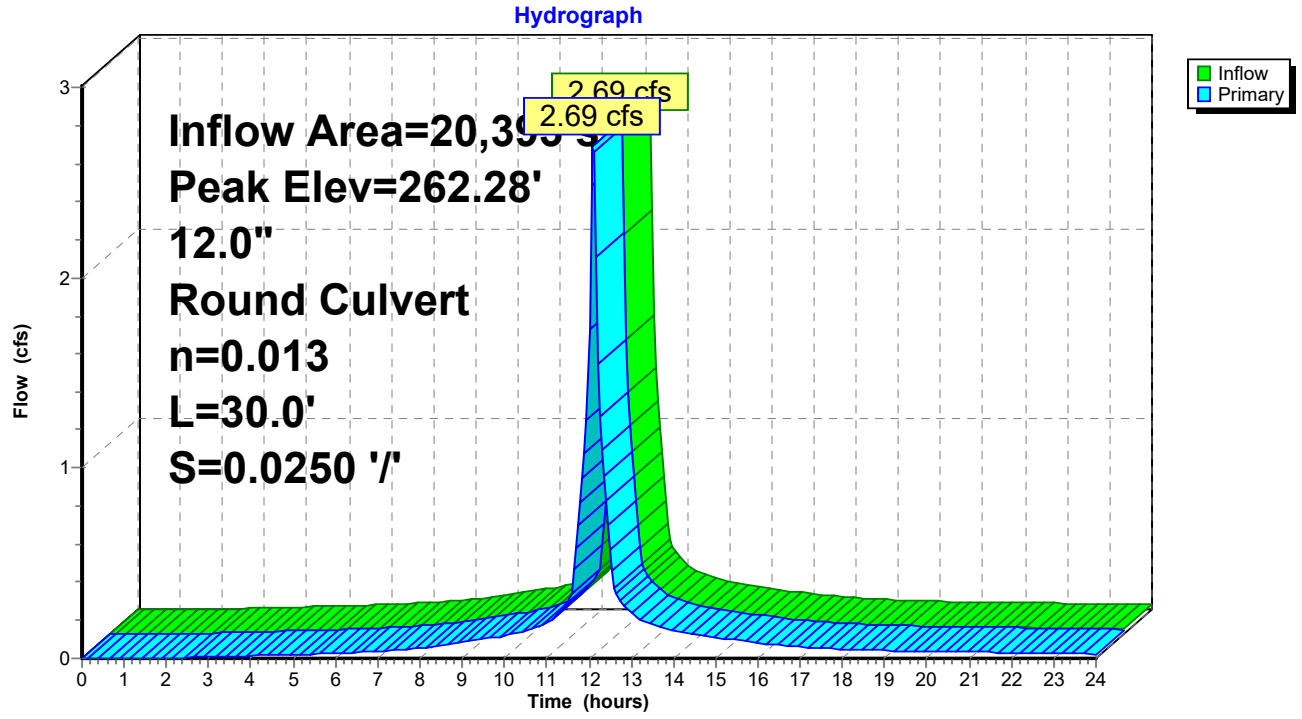
Inflow Area = 20,393 sf, 68.87% Impervious, Inflow Depth > 5.49" for 25 year event
Inflow = 2.69 cfs @ 12.09 hrs, Volume= 9,331 cf
Outflow = 2.69 cfs @ 12.09 hrs, Volume= 9,330 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.69 cfs @ 12.09 hrs, Volume= 9,330 cf
Routed to Pond 1P : POND 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.28' @ 12.15 hrs
Flood Elev= 263.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	259.75'	**12.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.75' / 259.00' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.00 cfs @ 12.09 hrs HW=262.20' TW=261.92' (Dynamic Tailwater)
1=Culvert (Inlet Controls 2.00 cfs @ 2.55 fps)

Pond MH3: DMH3



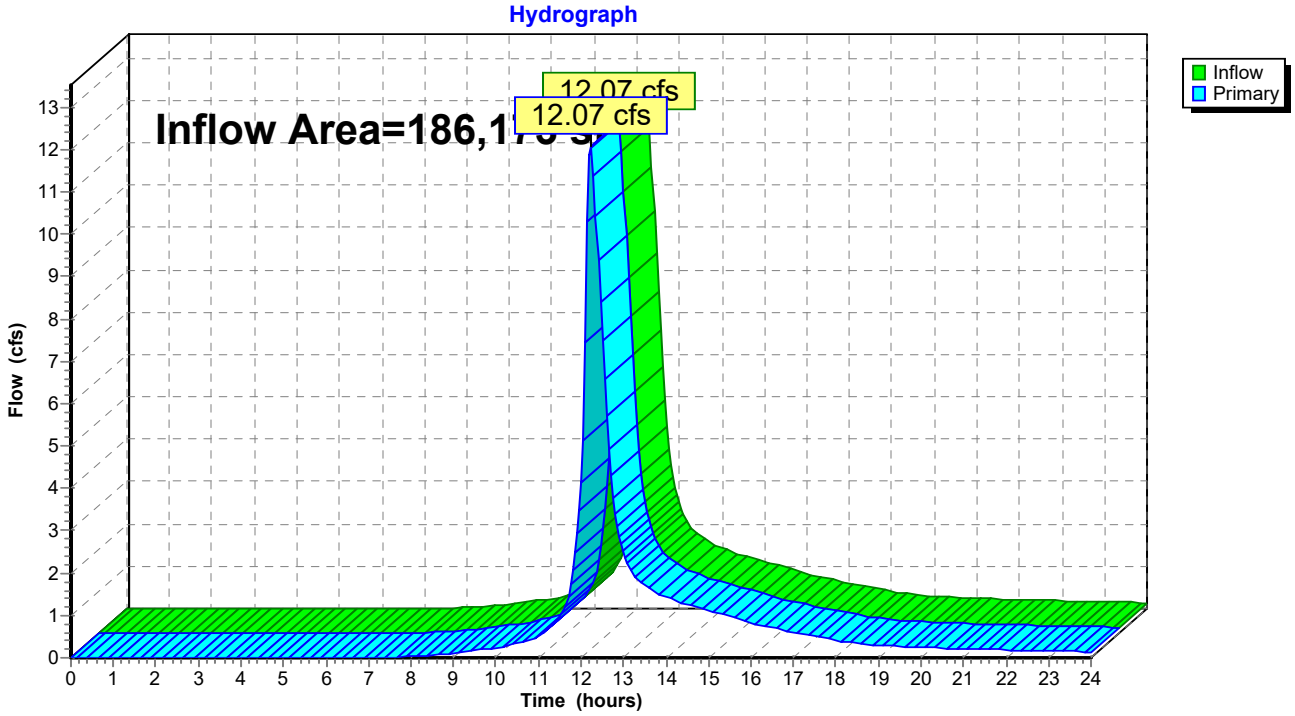
Summary for Pond SP1: SUM POND WOODS

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 186,173 sf, 19.22% Impervious, Inflow Depth > 3.54" for 25 year event
Inflow = 12.07 cfs @ 12.24 hrs, Volume= 54,976 cf
Primary = 12.07 cfs @ 12.24 hrs, Volume= 54,976 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: SUM POND WOODS



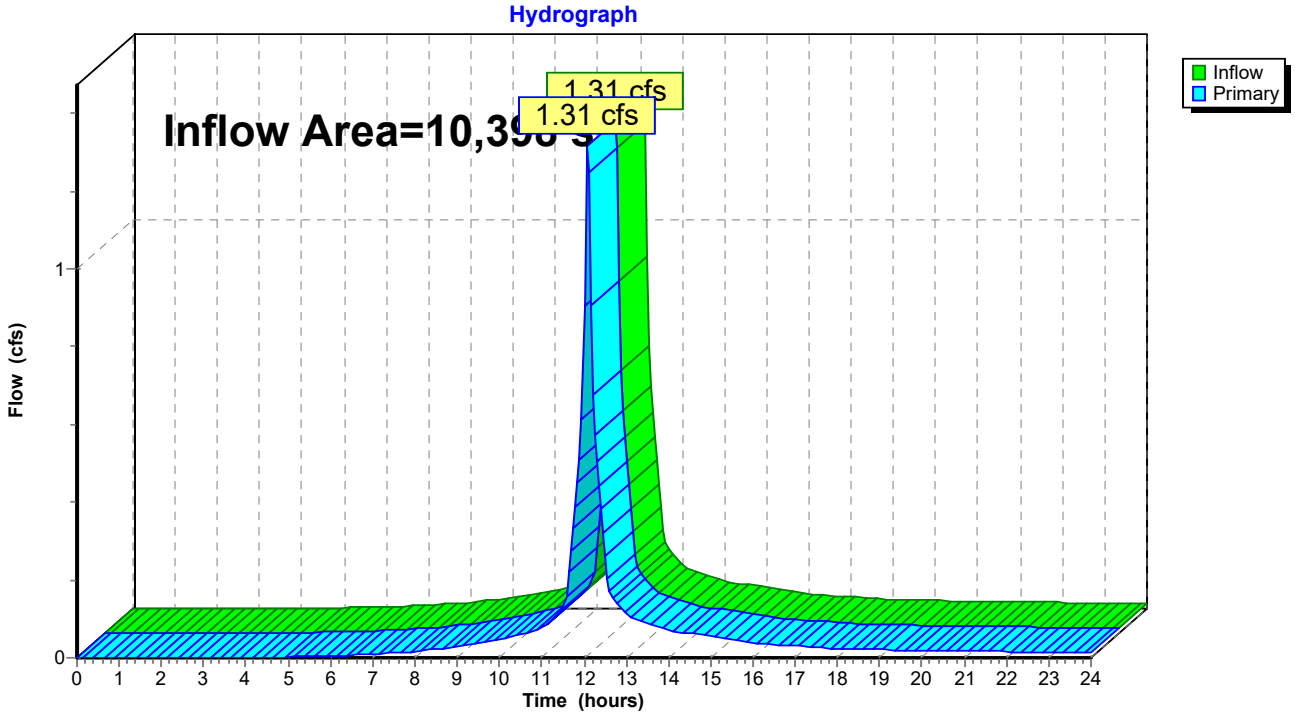
Summary for Pond SP2: SUM POND STREET

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 10,398 sf, 13.61% Impervious, Inflow Depth > 4.82" for 25 year event
Inflow = 1.31 cfs @ 12.07 hrs, Volume= 4,173 cf
Primary = 1.31 cfs @ 12.07 hrs, Volume= 4,173 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET



POST-DEVELOPMENT DRAINAGE

100 YEAR STORM

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P1A: P1A Runoff Area=3,286 sf 45.25% Impervious Runoff Depth>6.91"
Tc=6.0 min CN=91 Runoff=0.55 cfs 1,892 cf

Subcatchment P1B: P1B Runoff Area=1,506 sf 100.00% Impervious Runoff Depth>7.75"
Tc=6.0 min CN=98 Runoff=0.26 cfs 972 cf

Subcatchment P2: P2 Runoff Area=10,398 sf 13.61% Impervious Runoff Depth>6.56"
Flow Length=205' Tc=4.9 min CN=88 Runoff=1.76 cfs 5,680 cf

Subcatchment P3: (new Subcat) Runoff Area=11,734 sf 27.70% Impervious Runoff Depth>6.67"
Flow Length=250' Tc=6.2 min CN=89 Runoff=1.93 cfs 6,524 cf

Subcatchment P4A: FLOW TO CB3 Runoff Area=5,280 sf 100.00% Impervious Runoff Depth>7.75"
Tc=6.0 min CN=98 Runoff=0.93 cfs 3,408 cf

Subcatchment P4B: FLOW TO CB4 Runoff Area=11,827 sf 61.53% Impervious Runoff Depth>7.15"
Tc=6.0 min CN=93 Runoff=2.03 cfs 7,045 cf

Subcatchment P5: P5 Runoff Area=9,084 sf 51.11% Impervious Runoff Depth>7.03"
Tc=6.0 min CN=92 Runoff=1.55 cfs 5,321 cf

Subcatchment P6: P6 Runoff Area=56,672 sf 1.76% Impervious Runoff Depth>5.49"
Flow Length=335' Tc=14.9 min CN=79 Runoff=6.27 cfs 25,906 cf

Subcatchment P7: FLOW TO POND 3 Runoff Area=13,617 sf 17.96% Impervious Runoff Depth>6.55"
Flow Length=180' Tc=14.4 min CN=88 Runoff=1.75 cfs 7,427 cf

Subcatchment P8: AREA AROUND POND 1 Runoff Area=6,584 sf 59.75% Impervious Runoff Depth>7.15"
Tc=6.0 min CN=93 Runoff=1.13 cfs 3,922 cf

Subcatchment P9: (new Subcat) Runoff Area=61,615 sf 0.00% Impervious Runoff Depth>5.36"
Flow Length=500' Tc=19.1 min CN=78 Runoff=6.08 cfs 27,544 cf

Subcatchment R1: lOT 1 ROOF Runoff Area=1,966 sf 100.00% Impervious Runoff Depth>7.75"
Tc=6.0 min CN=98 Runoff=0.35 cfs 1,269 cf

Subcatchment R2: LOT 2 ROOF Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>7.75"
Tc=6.0 min CN=98 Runoff=0.40 cfs 1,455 cf

Subcatchment R3: (new Subcat) Runoff Area=2,254 sf 100.00% Impervious Runoff Depth>7.75"
Tc=6.0 min CN=98 Runoff=0.40 cfs 1,455 cf

Reach 1R: CULVERT UNDER DRIVE Avg. Flow Depth=0.72' Max Vel=12.37 fps Inflow=7.47 cfs 28,673 cf
12.0" Round Pipe n=0.012 L=20.0' S=0.0500 '/' Capacity=8.63 cfs Outflow=7.47 cfs 28,673 cf

Pond 1P: POND 1 Peak Elev=262.46' Storage=7,768 cf Inflow=6.97 cfs 24,246 cf
Discarded=0.10 cfs 5,000 cf Primary=3.81 cfs 17,489 cf Outflow=3.91 cfs 22,489 cf

Pond 2P: POND P2 Peak Elev=263.51' Storage=1,952 cf Inflow=1.89 cfs 6,590 cf
Discarded=0.05 cfs 3,046 cf Primary=1.28 cfs 2,767 cf Outflow=1.34 cfs 5,813 cf

Pond 3P: POND 3 Peak Elev=264.54' Storage=3,206 cf Inflow=2.01 cfs 8,882 cf
Discarded=0.06 cfs 2,355 cf Primary=0.80 cfs 6,171 cf Outflow=0.86 cfs 8,526 cf

Pond CB1: (new Pond) Peak Elev=263.03' Inflow=0.55 cfs 1,892 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/' Outflow=0.55 cfs 1,892 cf

Pond CB2: CB2 Peak Elev=0.00'
12.0" Round Culvert n=0.013 L=10.0' S=0.0100 '/' Primary=0.00 cfs 0 cf

Pond CB3: (new Pond) Peak Elev=263.02' Inflow=0.93 cfs 3,408 cf
12.0" Round Culvert n=0.013 L=10.0' S=0.0500 '/' Outflow=0.93 cfs 3,408 cf

Pond CB4: CB4 Peak Elev=263.16' Inflow=2.03 cfs 7,045 cf
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=2.03 cfs 7,045 cf

Pond MH1: MH1 Peak Elev=263.02' Inflow=0.55 cfs 1,892 cf
12.0" Round Culvert n=0.013 L=215.0' S=0.0051 '/' Outflow=0.55 cfs 1,892 cf

Pond MH2: MH2 Peak Elev=263.01' Inflow=0.55 cfs 1,892 cf
12.0" Round Culvert n=0.013 L=120.0' S=0.0050 '/' Outflow=0.55 cfs 1,892 cf

Pond MH3: DMH3 Peak Elev=262.98' Inflow=3.51 cfs 12,345 cf
12.0" Round Culvert n=0.013 L=30.0' S=0.0250 '/' Outflow=3.51 cfs 12,345 cf

Pond SP1: SUM POND WOODS Inflow=17.57 cfs 79,877 cf
Primary=17.57 cfs 79,877 cf

Pond SP2: SUM POND STREET Inflow=1.76 cfs 5,680 cf
Primary=1.76 cfs 5,680 cf

Total Runoff Area = 198,077 sf Runoff Volume = 99,820 cf Average Runoff Depth = 6.05"
80.46% Pervious = 159,366 sf 19.54% Impervious = 38,711 sf

Summary for Subcatchment P1A: P1A

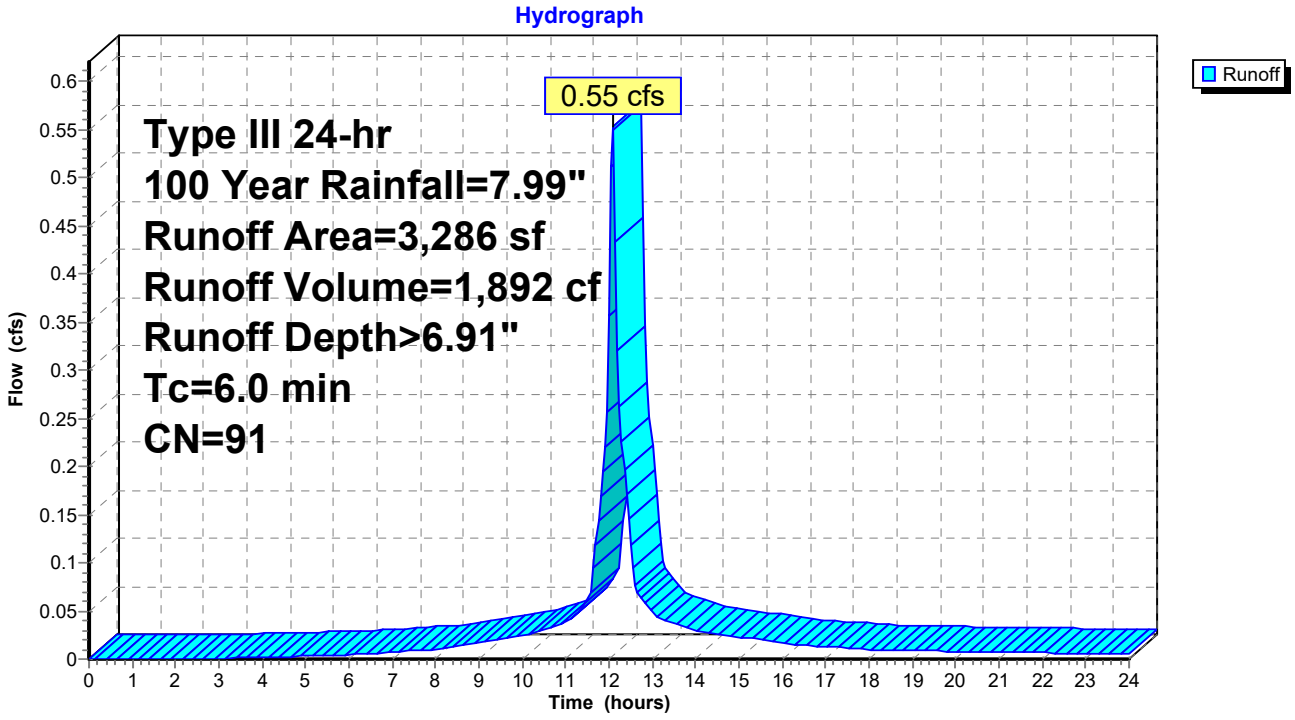
Runoff = 0.55 cfs @ 12.09 hrs, Volume= 1,892 cf, Depth> 6.91"
Routed to Pond CB1 : (new Pond)

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=7.99"

Area (sf)	CN	Description
1,799	86	<50% Grass cover, Poor, HSG C
1,487	98	Paved parking, HSG C
3,286	91	Weighted Average
1,799		54.75% Pervious Area
1,487		45.25% Impervious Area

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

Subcatchment P1A: P1A



Summary for Subcatchment P1B: P1B

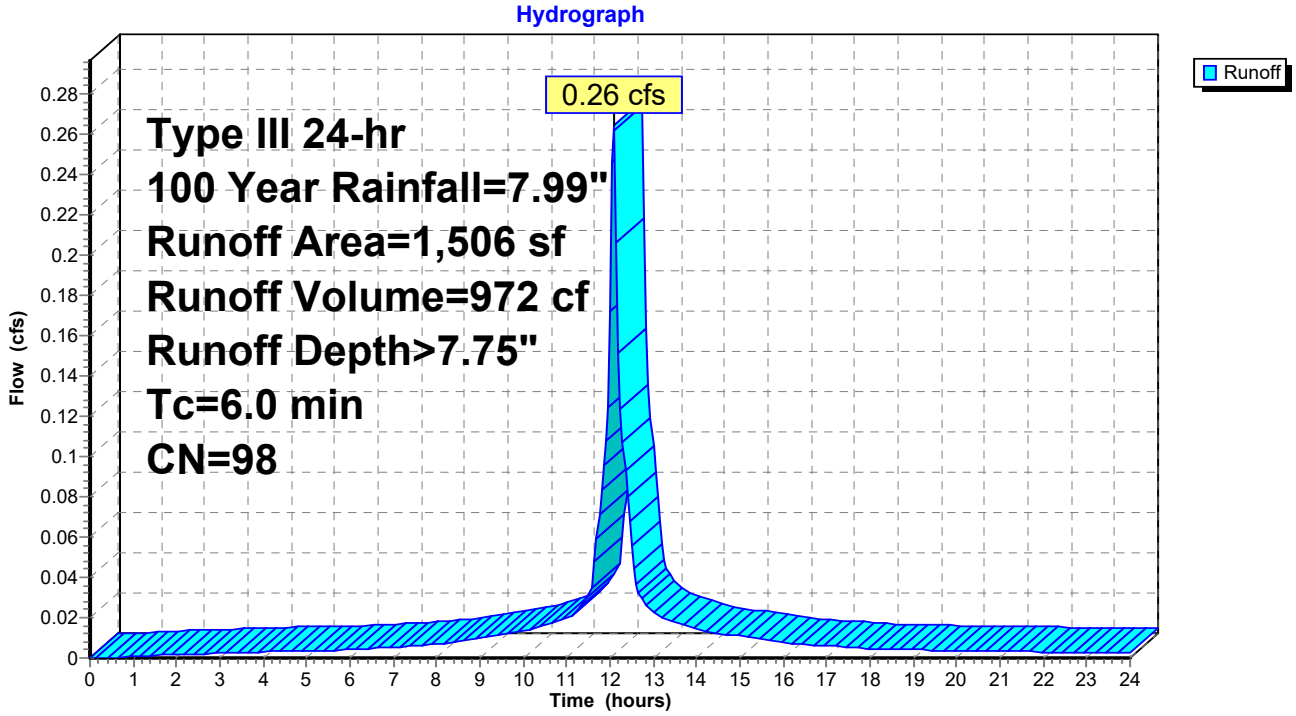
Runoff = 0.26 cfs @ 12.09 hrs, Volume= 972 cf, Depth> 7.75"

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=7.99"

Area (sf)	CN	Description
1,506	98	Paved parking, HSG C
1,506		100.00% Impervious Area

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

Subcatchment P1B: P1B



Summary for Subcatchment P2: P2

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

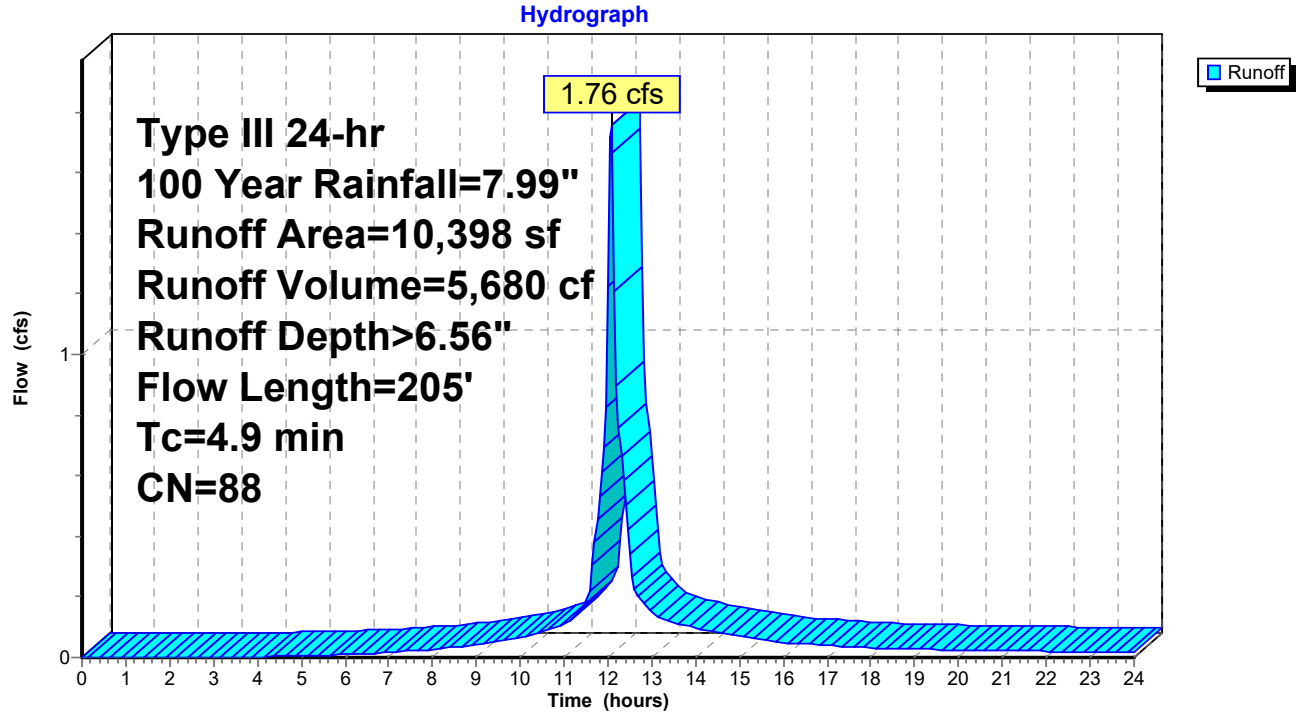
Runoff = 1.76 cfs @ 12.07 hrs, Volume= 5,680 cf, Depth> 6.56"
Routed to Pond SP2 : SUM POND STREET

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=7.99"

Area (sf)	CN	Description
1,415	98	Paved parking, HSG C
8,983	86	<50% Grass cover, Poor, HSG C
10,398	88	Weighted Average
8,983		86.39% Pervious Area
1,415		13.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.9	50	0.0500	0.21		**Sheet Flow, flow over grass** Grass: Short n= 0.150 P2= 3.18"
0.4	35	0.0420	1.43		**Shallow Concentrated Flow, flow over grass** Short Grass Pasture Kv= 7.0 fps
0.6	120	0.0300	3.52		**Shallow Concentrated Flow, flow along driveway** Paved Kv= 20.3 fps
4.9	205	Total			

Subcatchment P2: P2



Summary for Subcatchment P3: (new Subcat)

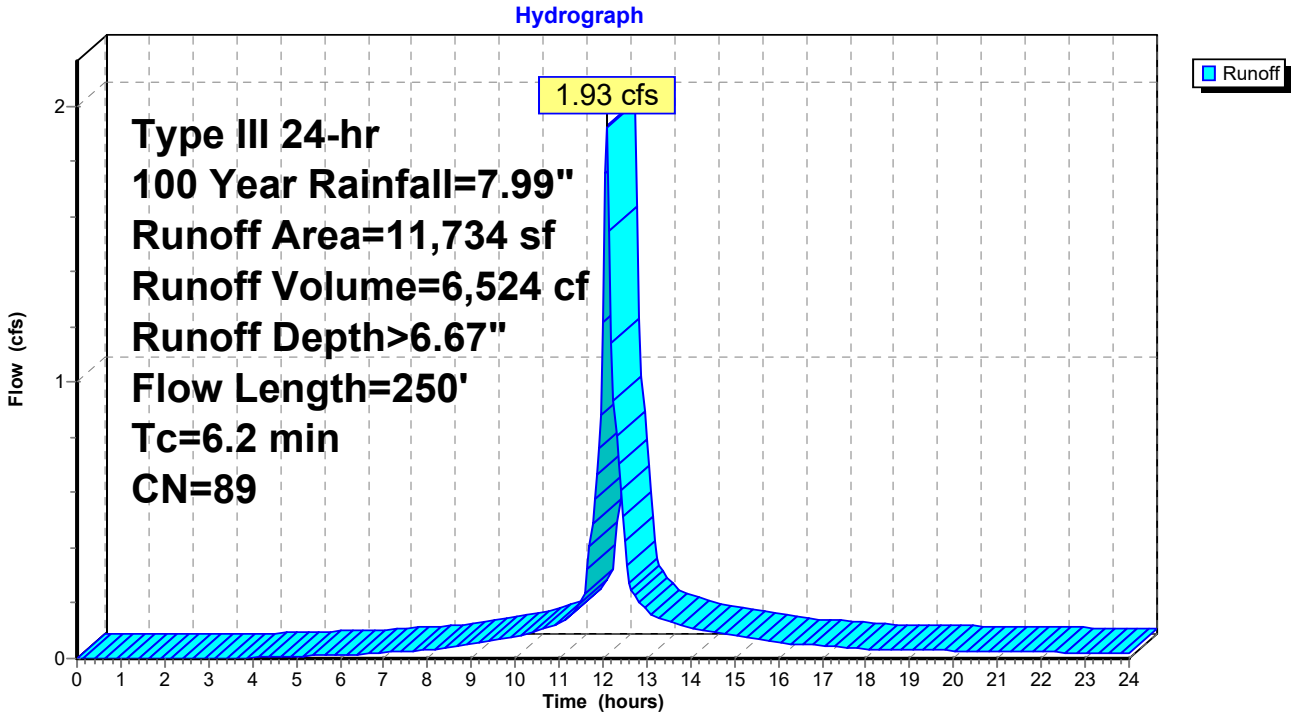
Runoff = 1.93 cfs @ 12.09 hrs, Volume= 6,524 cf, Depth> 6.67"
Routed to Pond 1P : POND 1

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=7.99"

Area (sf)	CN	Description
8,484	86	<50% Grass cover, Poor, HSG C
293	98	Unconnected pavement, HSG C
1,916	98	Paved parking, HSG C
1,041	98	Water Surface, HSG C
11,734	89	Weighted Average
8,484		72.30% Pervious Area
3,250		27.70% Impervious Area
293		9.02% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.19		**Sheet Flow, FLOW OVER GRASS** Grass: Short n= 0.150 P2= 3.18"
1.3	120	0.0500	1.57		**Shallow Concentrated Flow, FLOW OVER GRASS** Short Grass Pasture Kv= 7.0 fps
0.6	80	0.0125	2.27		**Shallow Concentrated Flow, FLOW OVER DRIVEWAY** Paved Kv= 20.3 fps
6.2	250	Total			

Subcatchment P3: (new Subcat)



Summary for Subcatchment P4A: FLOW TO CB3

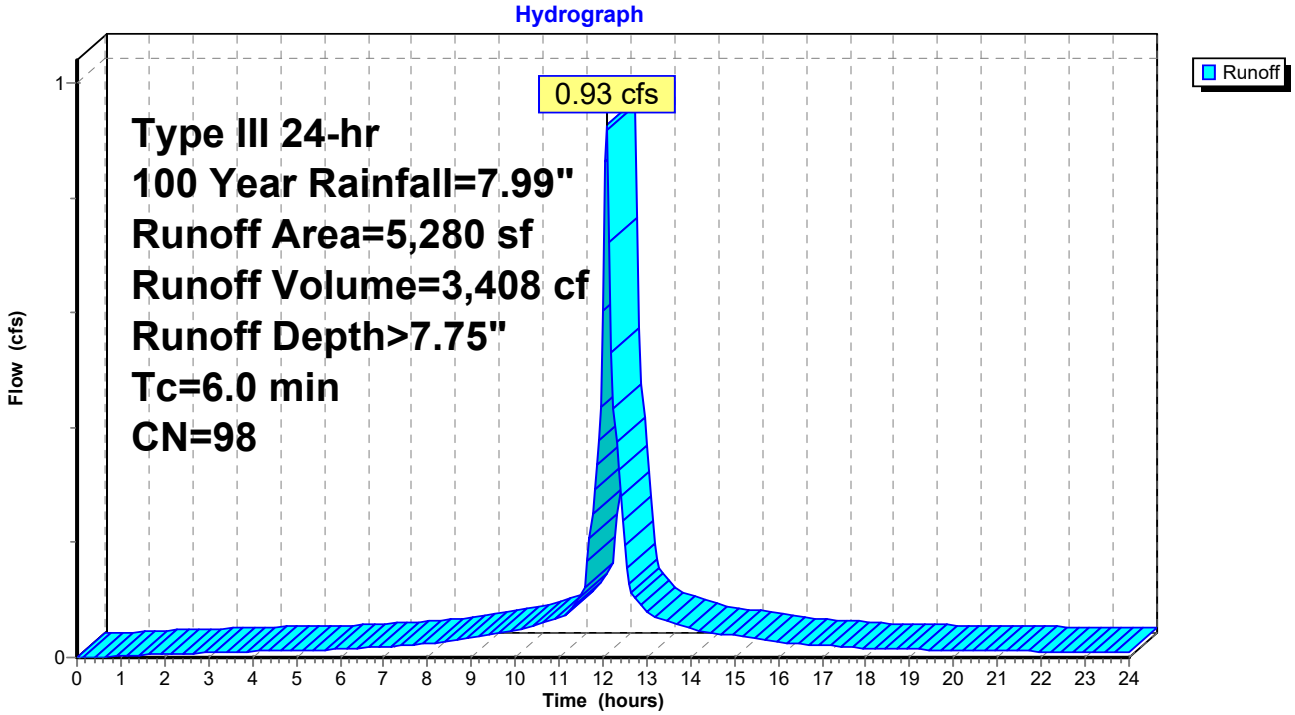
Runoff = 0.93 cfs @ 12.09 hrs, Volume= 3,408 cf, Depth> 7.75"
Routed to Pond CB3 : (new Pond)

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=7.99"

Area (sf)	CN	Description
5,280	98	Paved parking, HSG C
5,280		100.00% Impervious Area

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

Subcatchment P4A: FLOW TO CB3



Summary for Subcatchment P4B: FLOW TO CB4

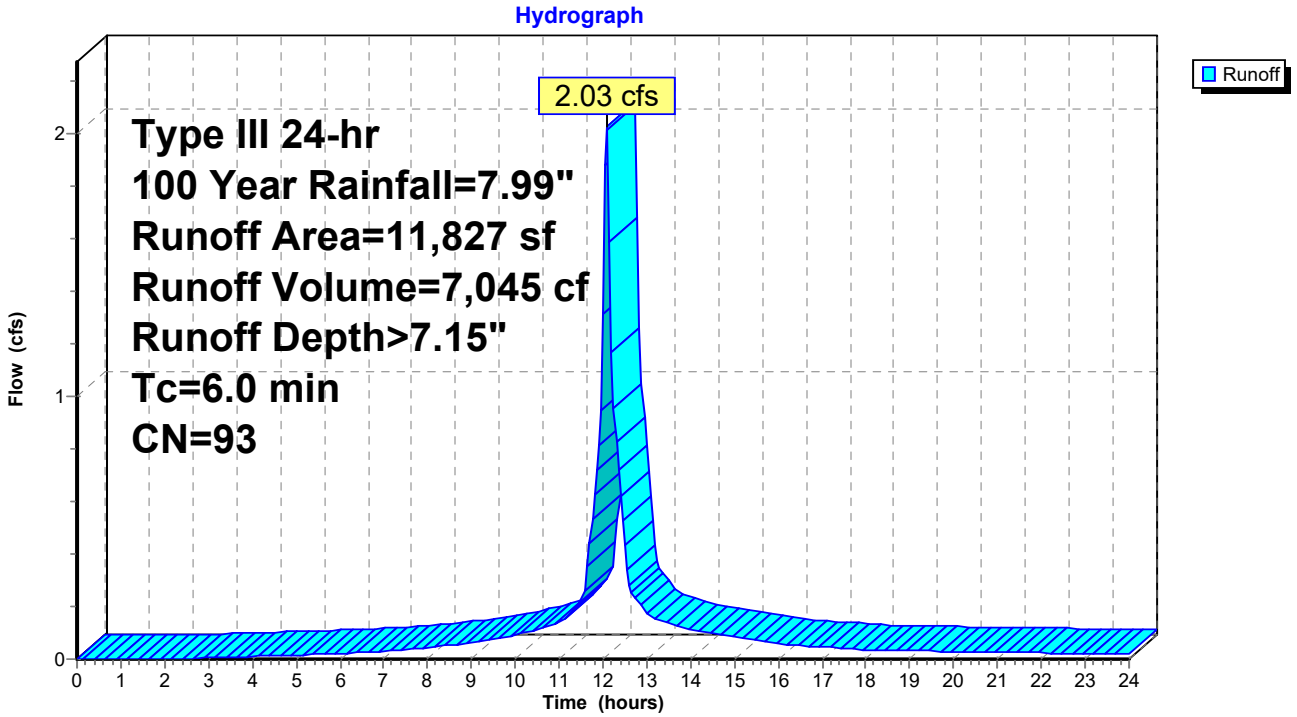
Runoff = 2.03 cfs @ 12.09 hrs, Volume= 7,045 cf, Depth> 7.15"
Routed to Pond CB4 : CB4

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=7.99"

Area (sf)	CN	Description
7,080	98	Paved parking, HSG C
4,550	86	<50% Grass cover, Poor, HSG C
197	98	Unconnected pavement, HSG C
11,827	93	Weighted Average
4,550		38.47% Pervious Area
7,277		61.53% Impervious Area
197		2.71% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW OVER PAVEMENT TO CB4**

Subcatchment P4B: FLOW TO CB4



Summary for Subcatchment P5: P5

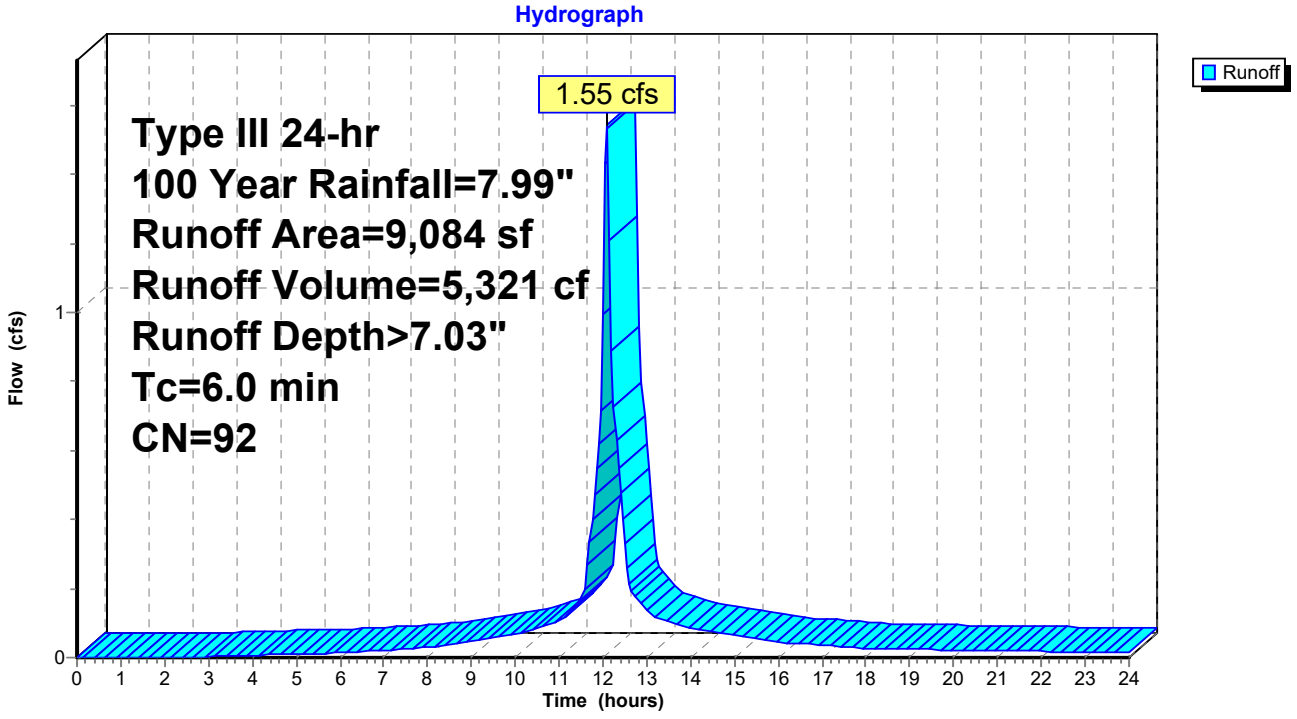
Runoff = 1.55 cfs @ 12.09 hrs, Volume= 5,321 cf, Depth> 7.03"
Routed to Pond 2P : POND P2

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=7.99"

Area (sf)	CN	Description
4,441	86	<50% Grass cover, Poor, HSG C
1,160	98	Water Surface, HSG C
3,483	98	Paved parking, HSG C
9,084	92	Weighted Average
4,441		48.89% Pervious Area
4,643		51.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW TO POND P2**

Subcatchment P5: P5



Summary for Subcatchment P6: P6

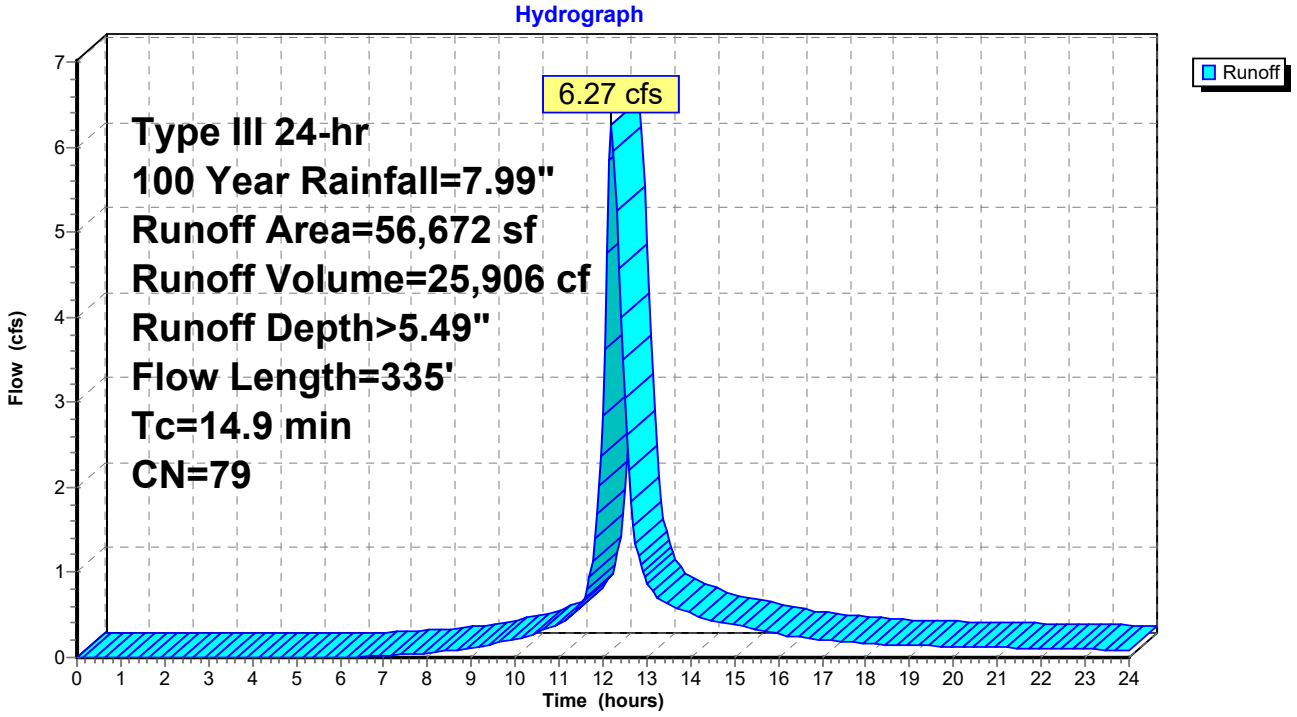
Runoff = 6.27 cfs @ 12.20 hrs, Volume= 25,906 cf, Depth> 5.49"
Routed to Reach 1R : CULVERT UNDER DRIVE

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=7.99"

Area (sf)	CN	Description
27,229	86	<50% Grass cover, Poor, HSG C
21,621	70	Woods, Good, HSG C
6,822	79	Woods/grass comb., Good, HSG D
1,000	98	Roofs, HSG C
56,672	79	Weighted Average
55,672		98.24% Pervious Area
1,000		1.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0900	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.18"
1.4	125	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.7	160	0.0250	0.40		**Shallow Concentrated Flow, FLOW THROUGH wetland** Forest w/Heavy Litter Kv= 2.5 fps
14.9	335	Total			

Subcatchment P6: P6



Summary for Subcatchment P7: FLOW TO POND 3

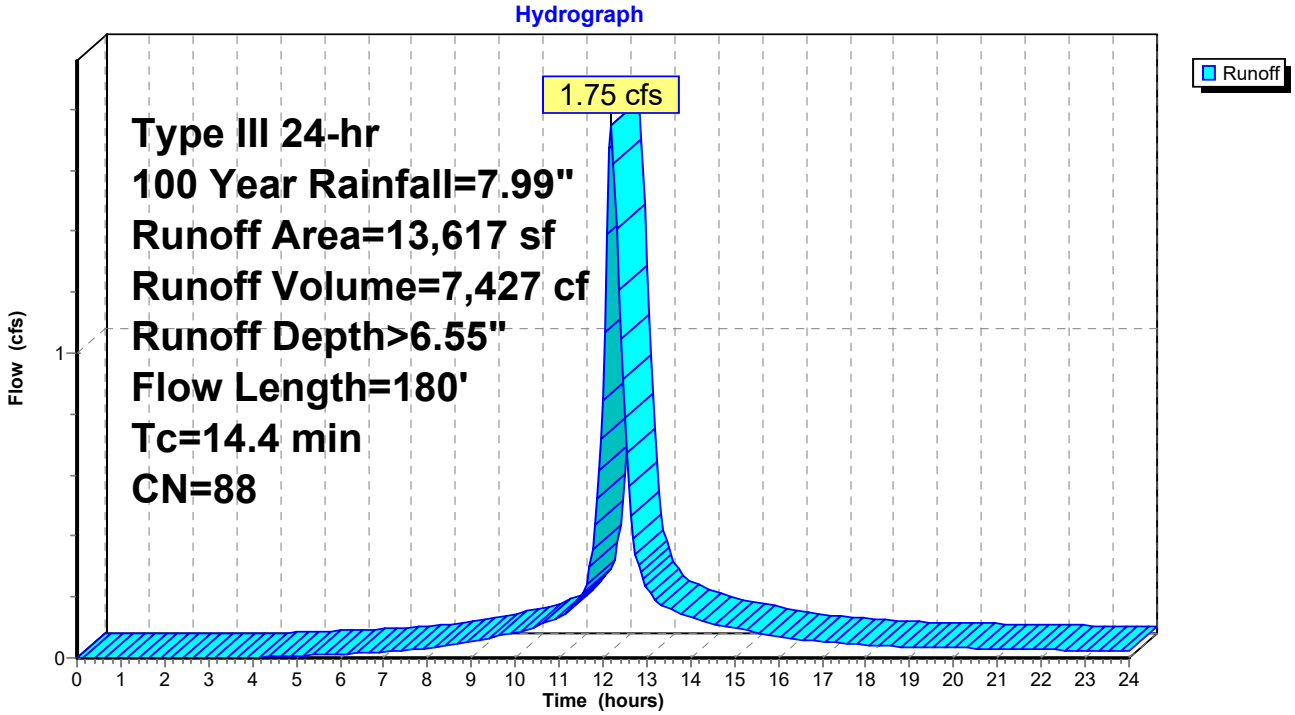
Runoff = 1.75 cfs @ 12.19 hrs, Volume= 7,427 cf, Depth> 6.55"
Routed to Pond 3P : POND 3

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=7.99"

Area (sf)	CN	Description
11,172	86	<50% Grass cover, Poor, HSG C
1,096	98	Paved parking, HSG C
1,349	98	Water Surface, HSG C
13,617	88	Weighted Average
11,172		82.04% Pervious Area
2,445		17.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, FLOW IN WOODS** Woods: Light underbrush n= 0.400 P2= 3.18"
2.0	130	0.0460	1.07		**Shallow Concentrated Flow, FLOW THROUGH WOODS** Woodland Kv= 5.0 fps
14.4	180	Total			

Subcatchment P7: FLOW TO POND 3



Summary for Subcatchment P8: AREA AROUND POND 1

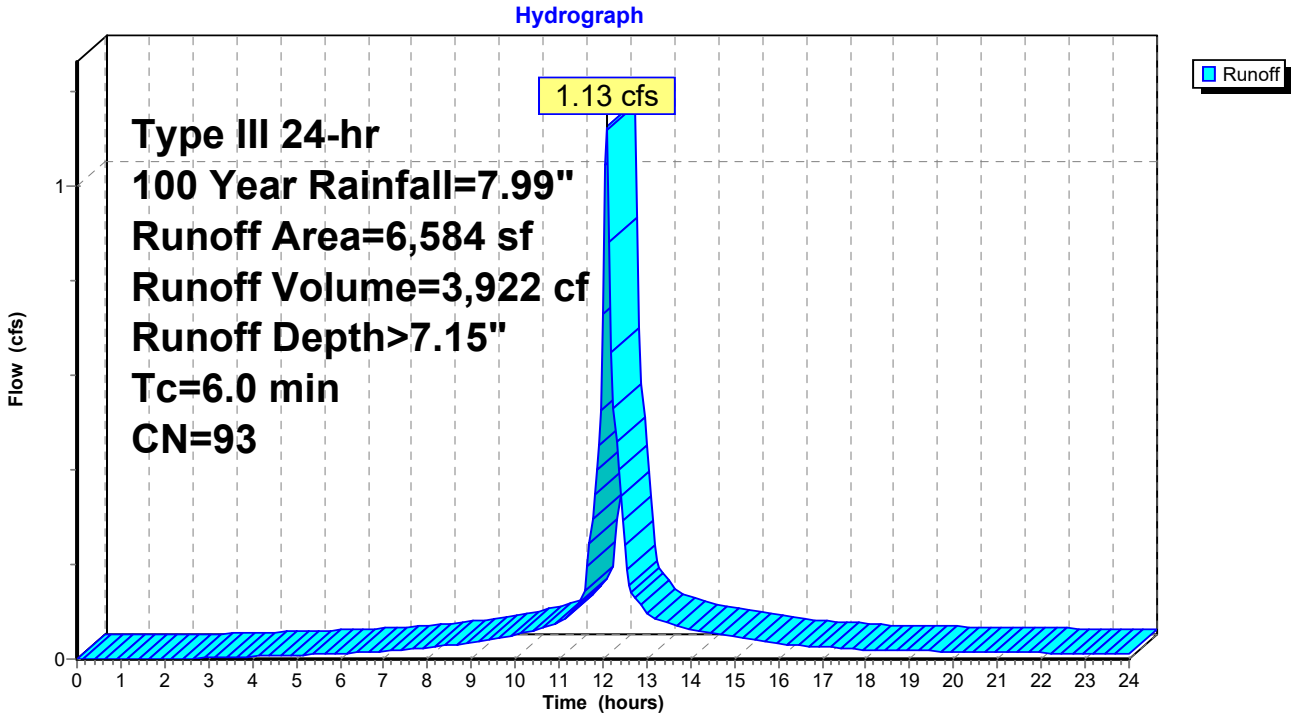
Runoff = 1.13 cfs @ 12.09 hrs, Volume= 3,922 cf, Depth> 7.15"
Routed to Pond 1P : POND 1

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=7.99"

Area (sf)	CN	Description
2,650	86	<50% Grass cover, Poor, HSG C
3,934	98	Water Surface, HSG C
6,584	93	Weighted Average
2,650		40.25% Pervious Area
3,934		59.75% Impervious Area

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

Subcatchment P8: AREA AROUND POND 1



Summary for Subcatchment P9: (new Subcat)

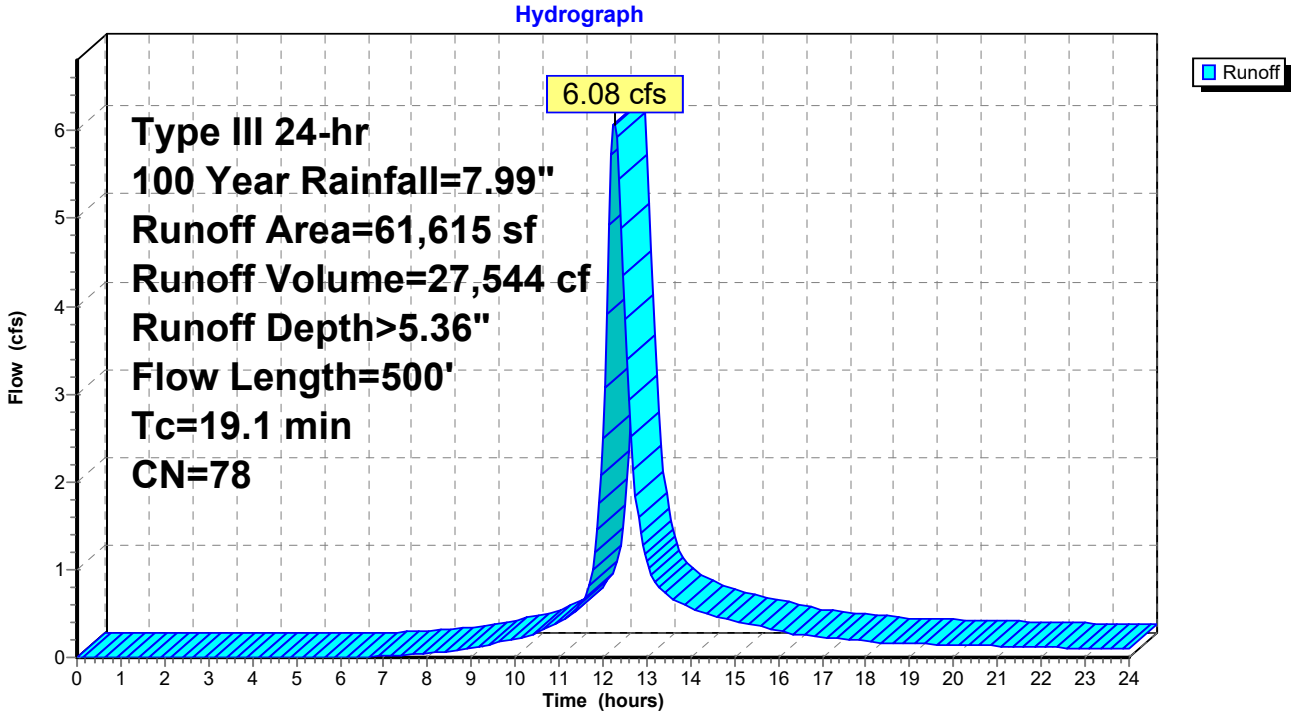
Runoff = 6.08 cfs @ 12.26 hrs, Volume= 27,544 cf, Depth> 5.36"
Routed to Pond SP1 : SUM POND WOODS

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=7.99"

Area (sf)	CN	Description
23,170	86	<50% Grass cover, Poor, HSG C
27,803	70	Woods, Good, HSG C
10,642	79	Woods/grass comb., Good, HSG D
61,615	78	Weighted Average
61,615		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, FLOW THROUGH WOODS** Woods: Light underbrush n= 0.400 P2= 3.18"
6.7	450	0.0500	1.12		**Shallow Concentrated Flow, FLOW THROUGH WOODS** Woodland Kv= 5.0 fps
19.1	500	Total			

Subcatchment P9: (new Subcat)



Summary for Subcatchment R1: IOT 1 ROOF

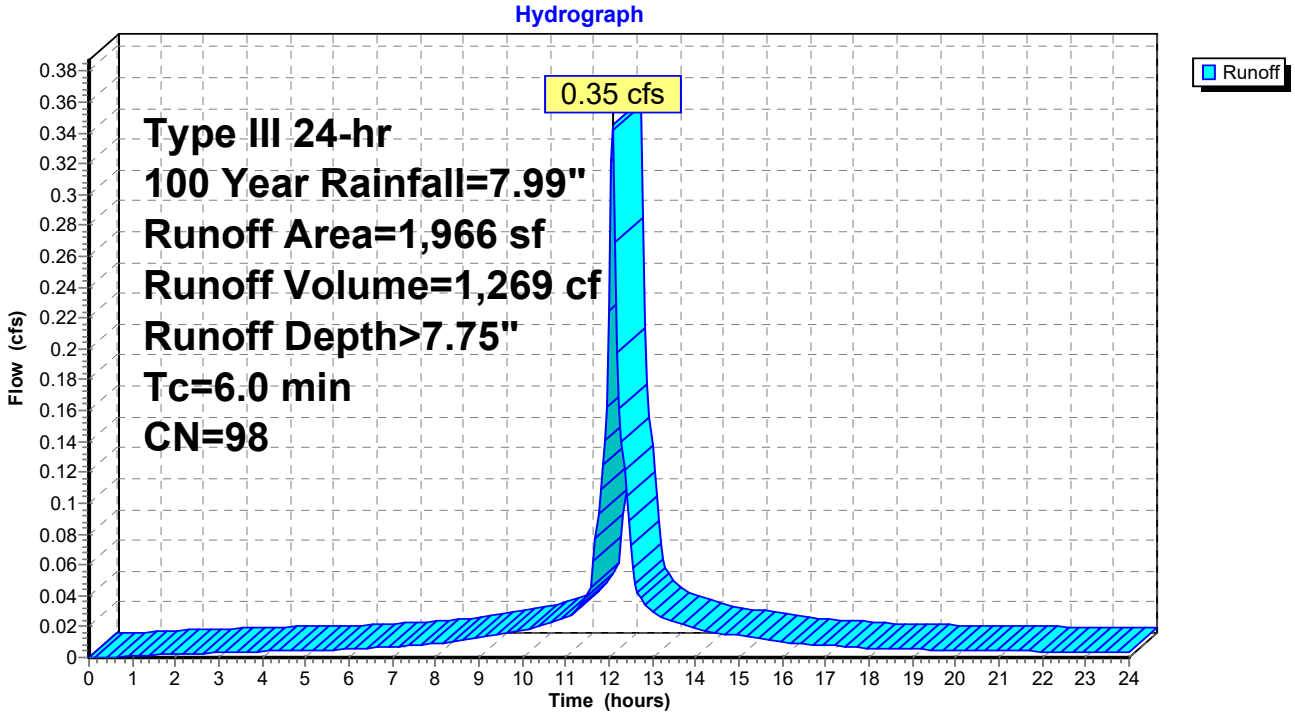
Runoff = 0.35 cfs @ 12.09 hrs, Volume= 1,269 cf, Depth> 7.75"
Routed to Pond 2P : POND P2

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=7.99"

Area (sf)	CN	Description
1,966	98	Roofs, HSG C
1,966		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW FROM ROOF TO POND**

Subcatchment R1: IOT 1 ROOF



Summary for Subcatchment R2: LOT 2 ROOF

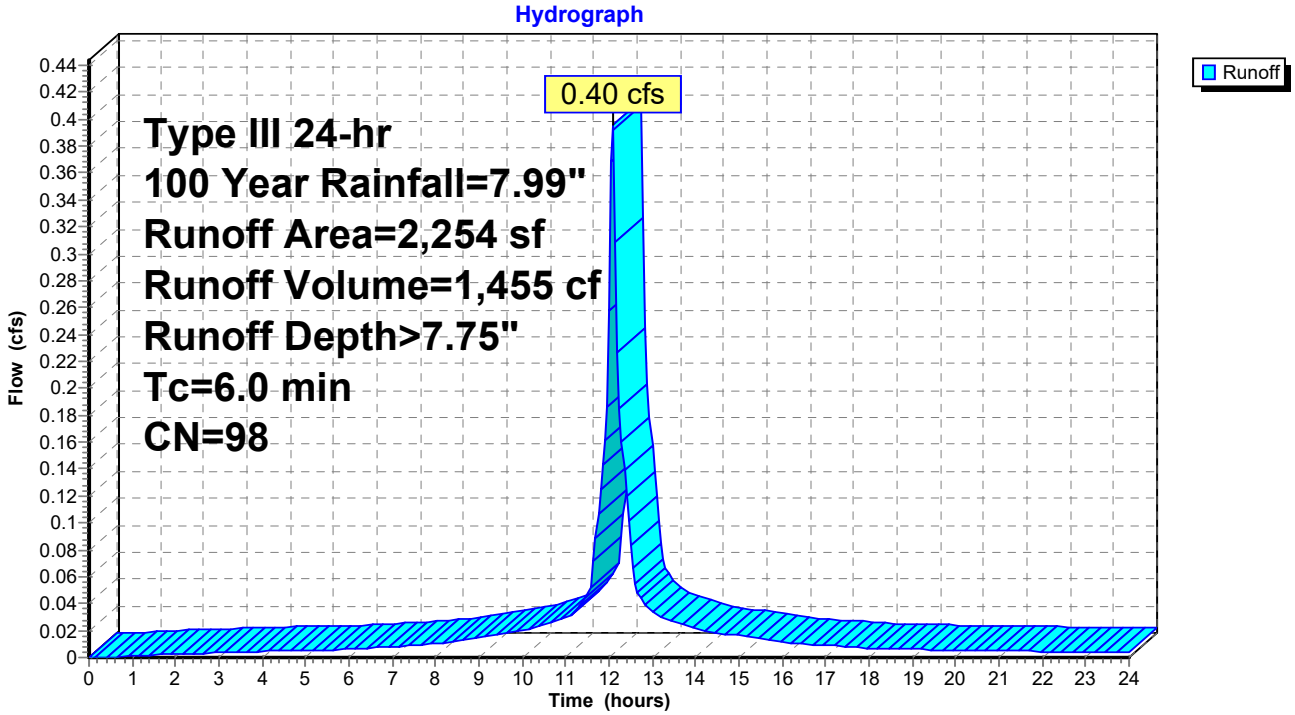
Runoff = 0.40 cfs @ 12.09 hrs, Volume= 1,455 cf, Depth> 7.75"
Routed to Pond 3P : POND 3

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=7.99"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW IN GUTTERS AND PIPES TO POND 3**

Subcatchment R2: LOT 2 ROOF



Summary for Subcatchment R3: (new Subcat)

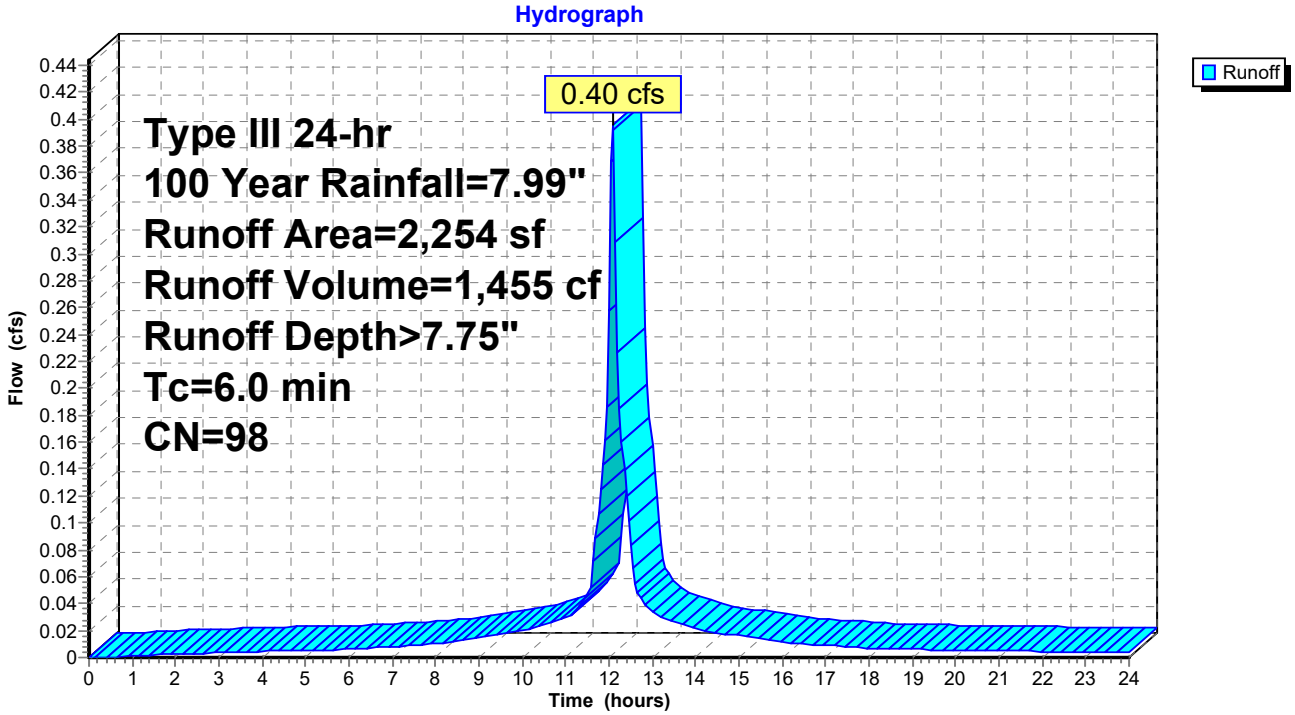
Runoff = 0.40 cfs @ 12.09 hrs, Volume= 1,455 cf, Depth> 7.75"
Routed to Pond 1P : POND 1

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=7.99"

Area (sf)	CN	Description
2,254	98	Roofs, HSG C
2,254		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, FLOW THROUGH GUTTERS TO POND**

Subcatchment R3: (new Subcat)



Summary for Reach 1R: CULVERT UNDER DRIVE

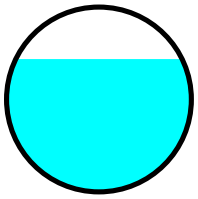
[52] Hint: Inlet/Outlet conditions not evaluated
[90] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 67,722 sf, 11.24% Impervious, Inflow Depth > 5.08" for 100 Year event
Inflow = 7.47 cfs @ 12.20 hrs, Volume= 28,673 cf
Outflow = 7.47 cfs @ 12.20 hrs, Volume= 28,673 cf, Atten= 0%, Lag= 0.0 min
Routed to Pond SP1 : SUM POND WOODS

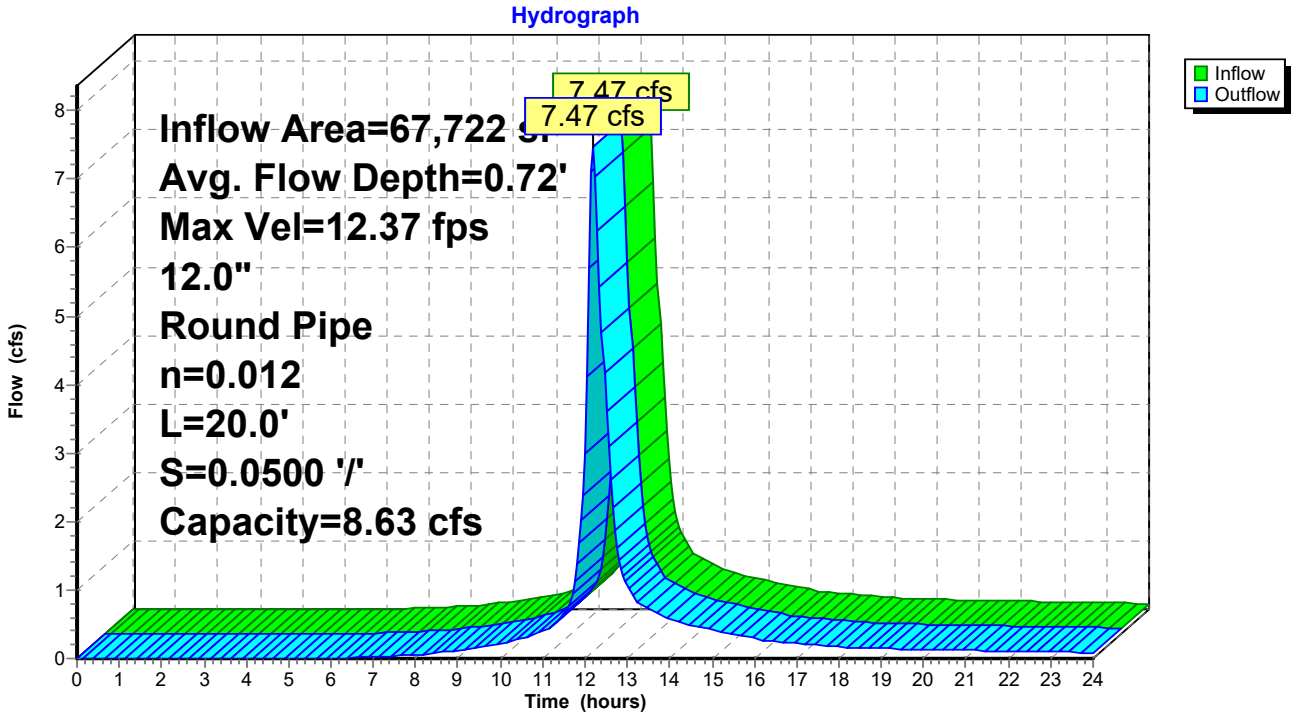
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 12.37 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 4.68 fps, Avg. Travel Time= 0.1 min

Peak Storage= 12 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.72' , Surface Width= 0.90'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 8.63 cfs

12.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 20.0' Slope= 0.0500 '/'
Inlet Invert= 259.00', Outlet Invert= 258.00'



Reach 1R: CULVERT UNDER DRIVE



Summary for Pond 1P: POND 1

[80] Warning: Exceeded Pond MH3 by 0.25' @ 0.00 hrs (0.20 cfs 4,208 cf)

Inflow Area = 40,965 sf, 57.32% Impervious, Inflow Depth > 7.10" for 100 Year event
Inflow = 6.97 cfs @ 12.09 hrs, Volume= 24,246 cf
Outflow = 3.91 cfs @ 12.22 hrs, Volume= 22,489 cf, Atten= 44%, Lag= 7.7 min
Discarded = 0.10 cfs @ 12.22 hrs, Volume= 5,000 cf
Primary = 3.81 cfs @ 12.22 hrs, Volume= 17,489 cf
Routed to Pond SP1 : SUM POND WOODS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.46' @ 12.22 hrs Surf.Area= 4,259 sf Storage= 7,768 cf
Flood Elev= 263.00' Surf.Area= 4,790 sf Storage= 10,193 cf

Plug-Flow detention time= 110.3 min calculated for 22,442 cf (93% of inflow)
Center-of-Mass det. time= 72.1 min (836.5 - 764.4)

Volume	Invert	Avail.Storage	Storage Description
#1	260.00'	10,193 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

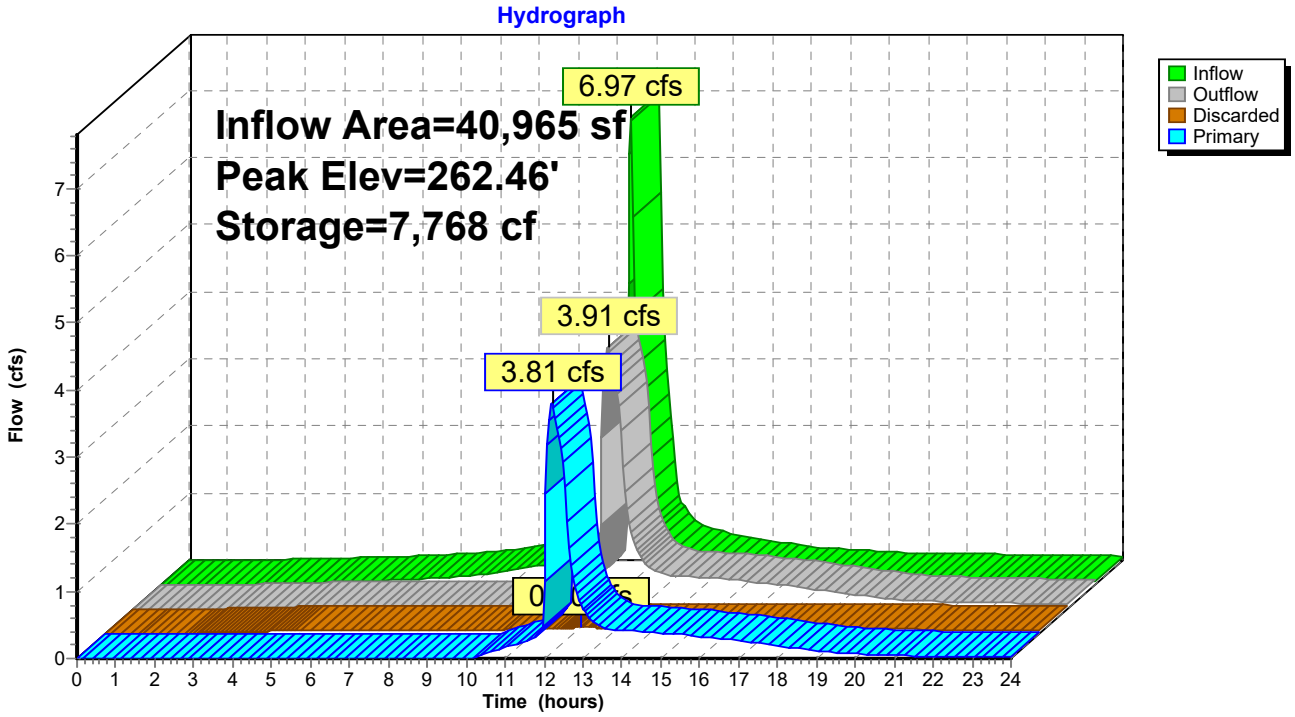
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
260.00	2,125	260.0	0	0	2,125
261.00	2,940	282.0	2,521	2,521	3,112
262.00	3,825	308.0	3,373	5,894	4,368
263.00	4,790	332.0	4,298	10,193	5,631

Device	Routing	Invert	Outlet Devices
#1	Primary	259.00'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.00' / 258.00' S= 0.0250 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Device 1	260.65'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	261.80'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Discarded	260.00'	**1.020 in/hr Exfiltration over Surface area**
#5	Primary	262.40'	**5.0' long x 8.0' 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) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Discarded OutFlow Max=0.10 cfs @ 12.22 hrs HW=262.46' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=3.78 cfs @ 12.22 hrs HW=262.46' TW=0.00' (Dynamic Tailwater)
├**1=Culvert** (Passes 3.61 cfs of 6.50 cfs potential flow)
│ ├**2=Orifice/Grate** (Orifice Controls 0.54 cfs @ 6.17 fps)
│ └**3=Orifice/Grate** (Orifice Controls 3.07 cfs @ 3.91 fps)
└**5=Broad-Crested Rectangular Weir** (Weir Controls 0.17 cfs @ 0.59 fps)

Pond 1P: POND 1



Summary for Pond 2P: POND P2

[93] Warning: Storage range exceeded by 0.01'
[58] Hint: Peaked 0.01' above defined flood level

Inflow Area = 11,050 sf, 59.81% Impervious, Inflow Depth > 7.16" for 100 Year event
Inflow = 1.89 cfs @ 12.09 hrs, Volume= 6,590 cf
Outflow = 1.34 cfs @ 12.17 hrs, Volume= 5,813 cf, Atten= 29%, Lag= 4.8 min
Discarded = 0.05 cfs @ 12.18 hrs, Volume= 3,046 cf
Primary = 1.28 cfs @ 12.17 hrs, Volume= 2,767 cf
Routed to Reach 1R : CULVERT UNDER DRIVE

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 263.51' @ 12.17 hrs Surf.Area= 2,275 sf Storage= 1,952 cf
Flood Elev= 263.50' Surf.Area= 2,275 sf Storage= 1,952 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 72.3 min (835.6 - 763.3)

Volume	Invert	Avail.Storage	Storage Description
#1	262.50'	1,952 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

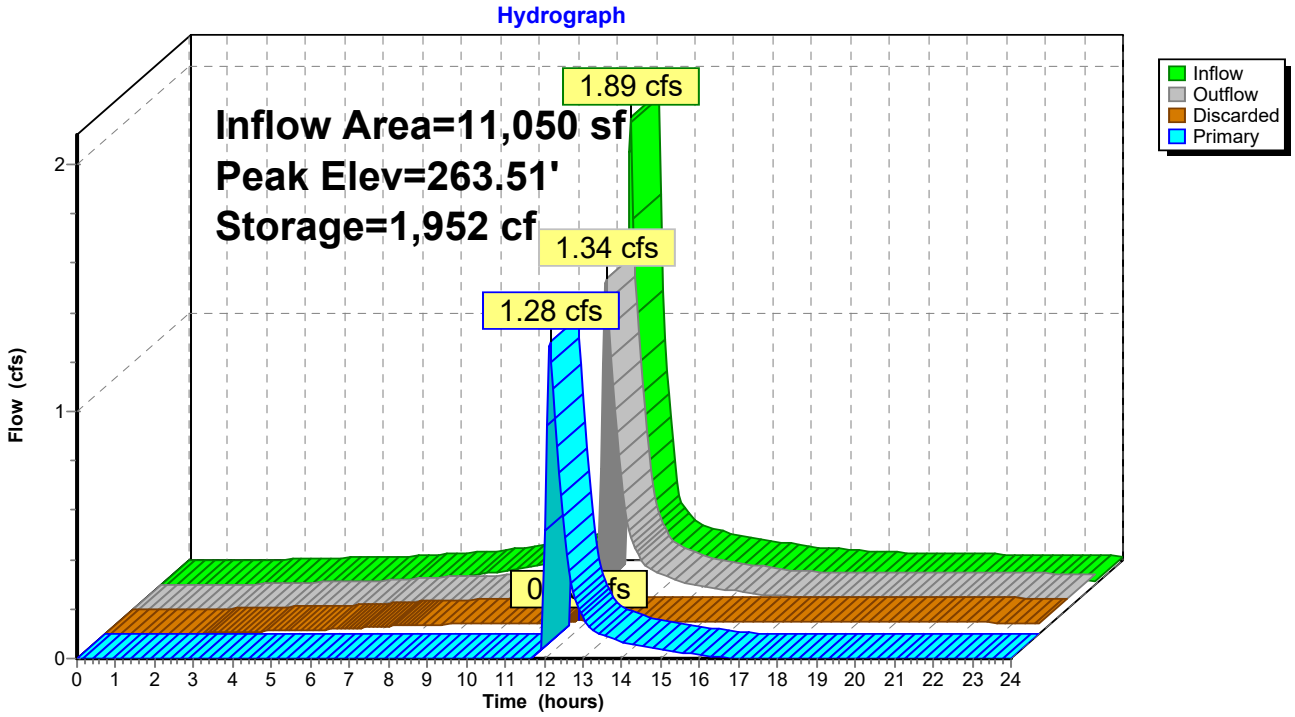
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
262.50	1,640	172.0	0	0	1,640
263.00	1,950	200.0	896	896	2,474
263.50	2,275	207.0	1,055	1,952	2,723

Device	Routing	Invert	Outlet Devices
#1	Discarded	262.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	263.20'	**3.0' 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

Discarded OutFlow Max=0.05 cfs @ 12.18 hrs HW=263.51' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=1.24 cfs @ 12.17 hrs HW=263.51' TW=259.70' (Dynamic Tailwater)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 1.24 cfs @ 1.35 fps)

Pond 2P: POND P2



Summary for Pond 3P: POND 3

Inflow Area = 15,871 sf, 29.61% Impervious, Inflow Depth > 6.72" for 100 Year event
Inflow = 2.01 cfs @ 12.17 hrs, Volume= 8,882 cf
Outflow = 0.86 cfs @ 12.51 hrs, Volume= 8,526 cf, Atten= 57%, Lag= 20.2 min
Discarded = 0.06 cfs @ 12.51 hrs, Volume= 2,355 cf
Primary = 0.80 cfs @ 12.51 hrs, Volume= 6,171 cf
Routed to Pond SP1 : SUM POND WOODS

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 264.54' @ 12.51 hrs Surf.Area= 2,666 sf Storage= 3,206 cf
Flood Elev= 265.00' Surf.Area= 3,131 sf Storage= 4,528 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 70.0 min (850.7 - 780.7)

Volume	Invert	Avail.Storage	Storage Description
#1	262.75'	4,528 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

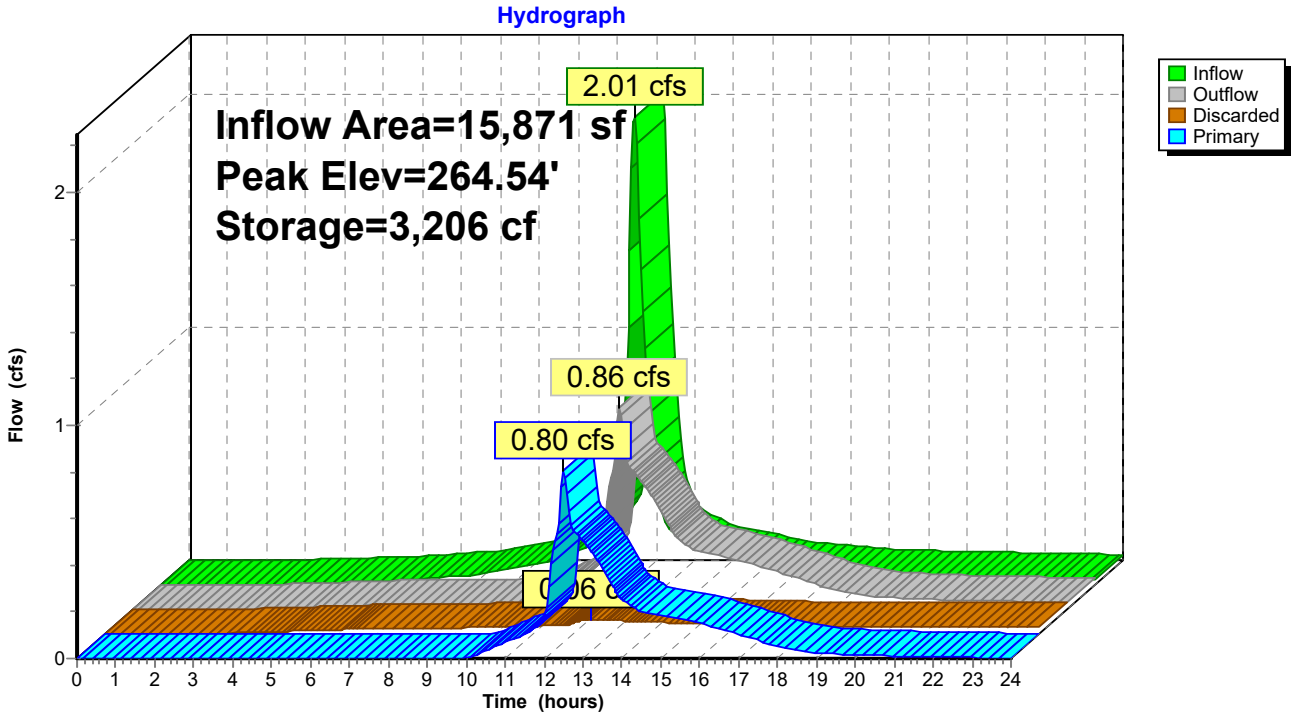
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
262.75	954	190.0	0	0	954
264.00	2,162	300.0	1,897	1,897	5,254
265.00	3,131	282.0	2,632	4,528	6,137

Device	Routing	Invert	Outlet Devices
#1	Primary	263.05'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 263.05' / 261.50' S= 0.0775 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Discarded	262.75'	**1.020 in/hr Exfiltration over Surface area**
#3	Device 1	263.90'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	263.05'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 1	264.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 12.51 hrs HW=264.54' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.79 cfs @ 12.51 hrs HW=264.54' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.79 cfs of 3.77 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 0.29 cfs @ 3.32 fps)
  ├**4=Orifice/Grate** (Orifice Controls 0.28 cfs @ 5.63 fps)
  └**5=Orifice/Grate** (Weir Controls 0.23 cfs @ 0.67 fps)

Pond 3P: POND 3



Summary for Pond CB1: (new Pond)

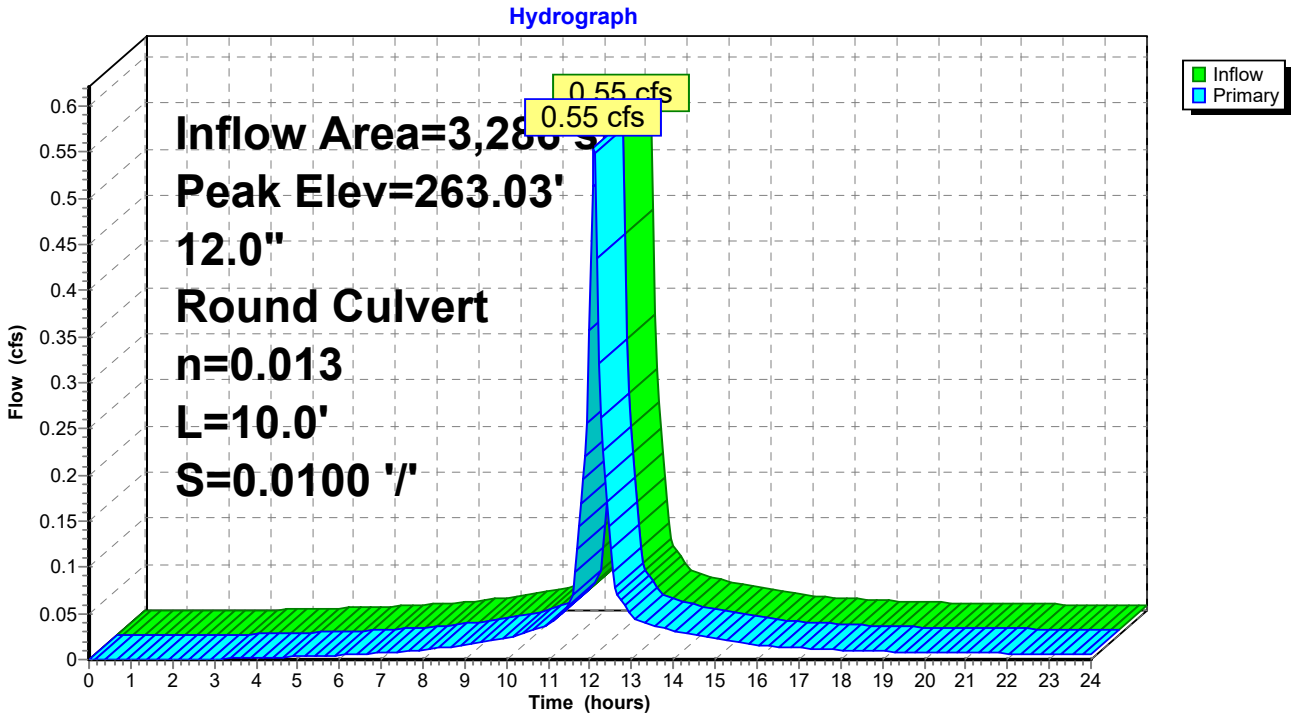
Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 6.91" for 100 Year event
Inflow = 0.55 cfs @ 12.09 hrs, Volume= 1,892 cf
Outflow = 0.55 cfs @ 12.09 hrs, Volume= 1,892 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.55 cfs @ 12.09 hrs, Volume= 1,892 cf
Routed to Pond MH1 : MH1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 263.03' @ 12.25 hrs
Flood Elev= 264.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	261.90'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=262.38' TW=262.38' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond CB1: (new Pond)



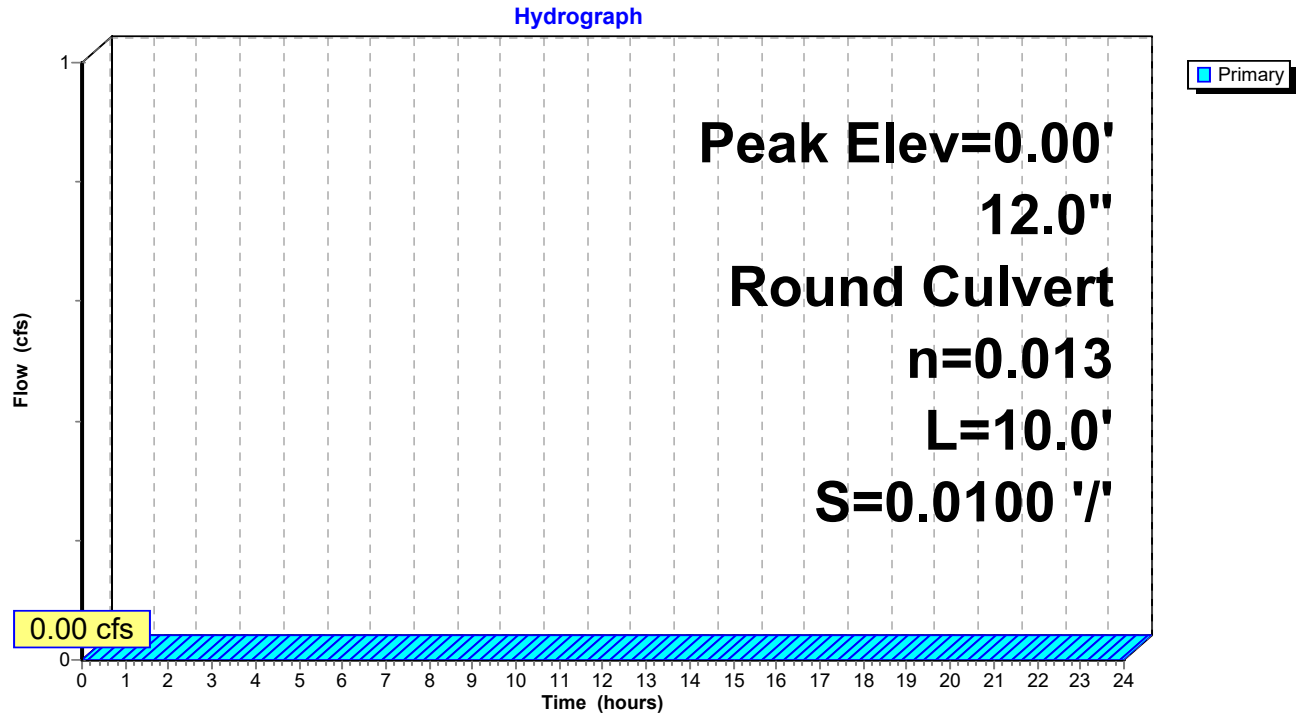
Summary for Pond CB2: CB2

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

Device	Routing	Invert	Outlet Devices
#1	Primary	261.90'	**12.0" Round Culvert** L= 10.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.90' / 261.80' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' TW=261.70' (Dynamic Tailwater)
└**1=Culvert** (Controls 0.00 cfs)

Pond CB2: CB2



Summary for Pond CB3: (new Pond)

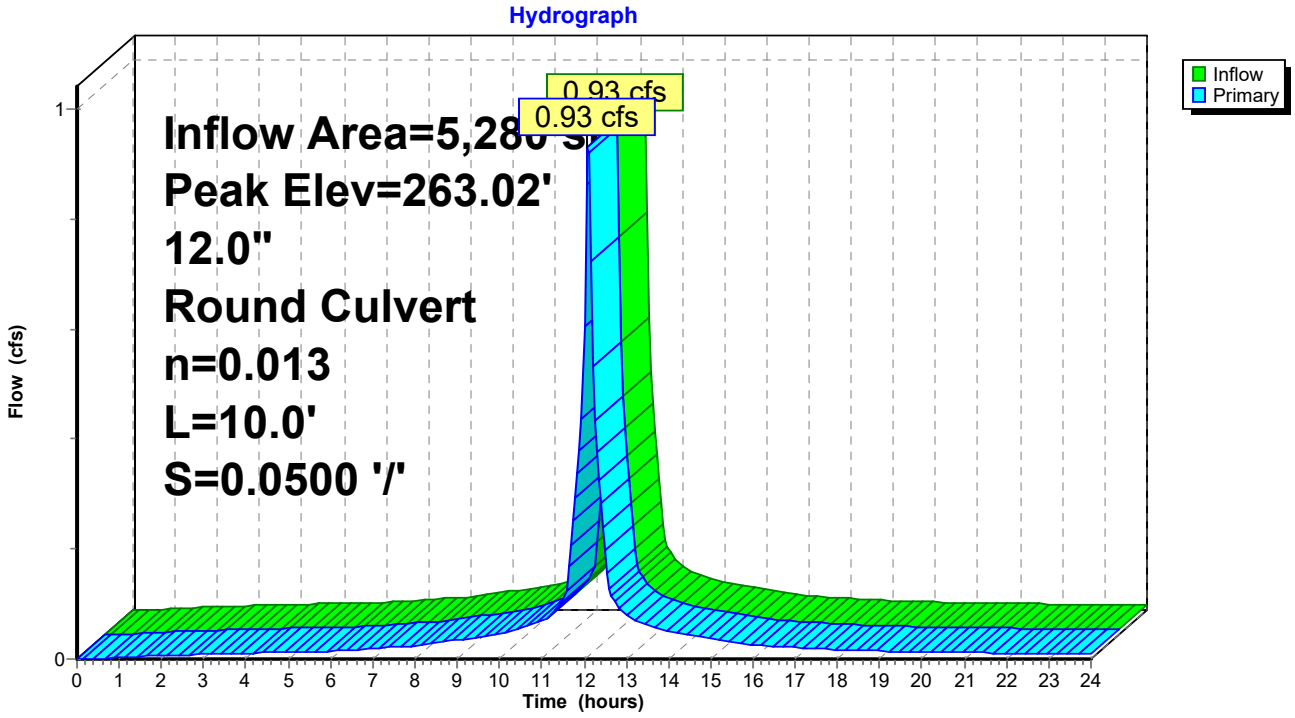
Inflow Area = 5,280 sf,100.00% Impervious, Inflow Depth > 7.75" for 100 Year event
Inflow = 0.93 cfs @ 12.09 hrs, Volume= 3,408 cf
Outflow = 0.93 cfs @ 12.09 hrs, Volume= 3,408 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.93 cfs @ 12.09 hrs, Volume= 3,408 cf
Routed to Pond MH3 : DMH3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 263.02' @ 12.15 hrs
Flood Elev= 263.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.50'	**12.0" Round Culvert** L= 10.0' Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=262.62' TW=262.90' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond CB3: (new Pond)



Summary for Pond CB4: CB4

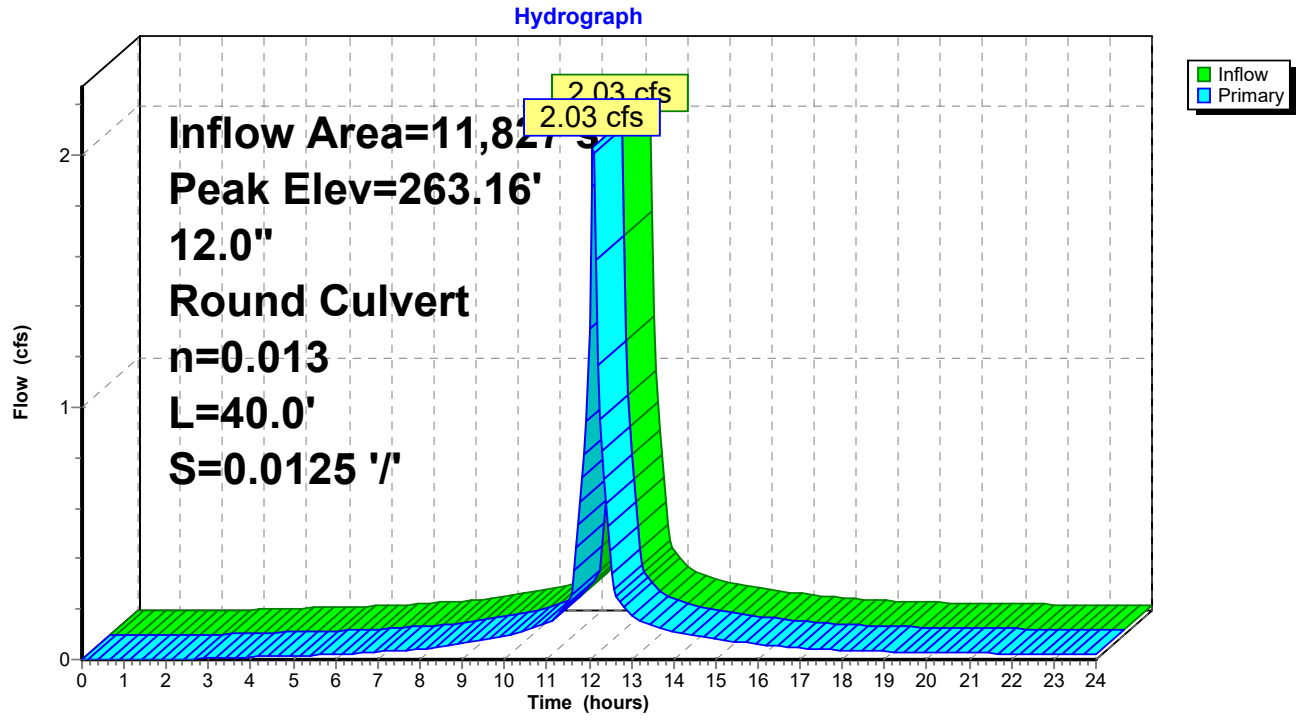
Inflow Area = 11,827 sf, 61.53% Impervious, Inflow Depth > 7.15" for 100 Year event
Inflow = 2.03 cfs @ 12.09 hrs, Volume= 7,045 cf
Outflow = 2.03 cfs @ 12.09 hrs, Volume= 7,045 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.03 cfs @ 12.09 hrs, Volume= 7,045 cf
Routed to Pond MH3 : DMH3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 263.16' @ 12.15 hrs
Flood Elev= 263.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.50'	**12.0" Round Culvert** L= 40.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.50' / 260.00' S= 0.0125 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=262.84' TW=262.91' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Pond CB4: CB4



Summary for Pond MH1: MH1

[80] Warning: Exceeded Pond CB1 by 0.32' @ 12.15 hrs (1.89 cfs 708 cf)

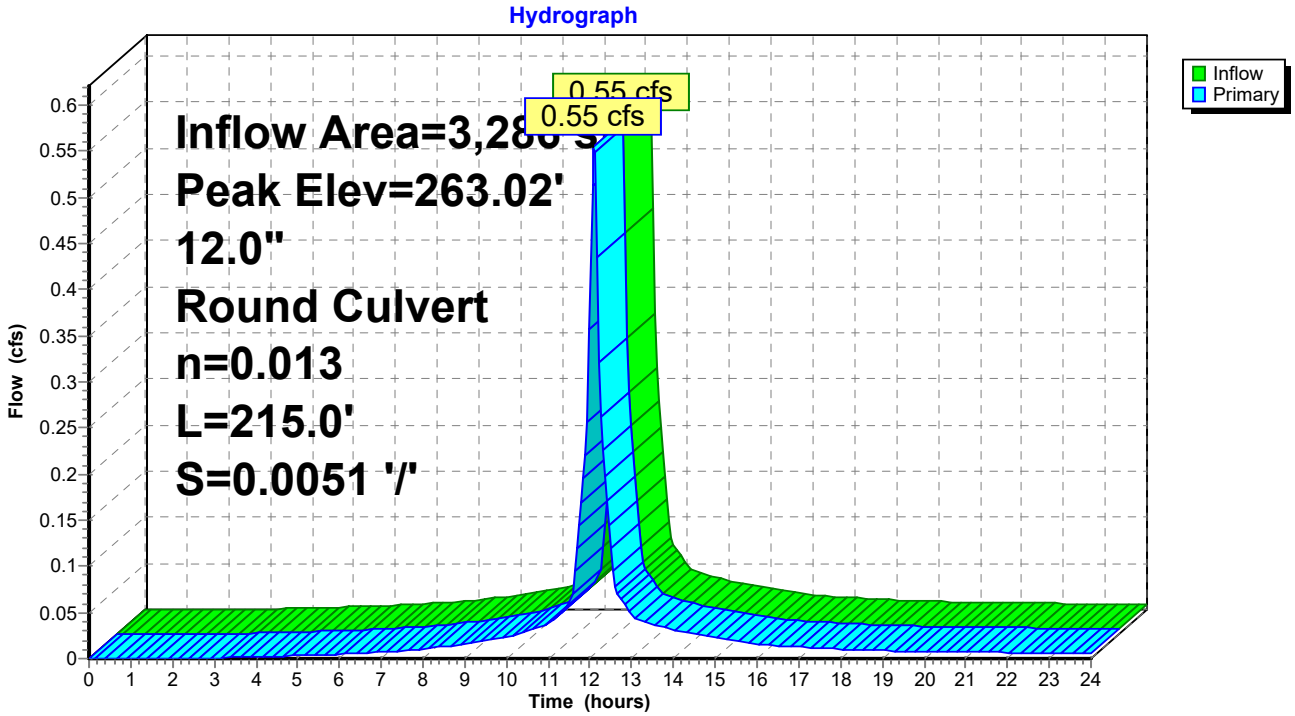
Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 6.91" for 100 Year event
Inflow = 0.55 cfs @ 12.09 hrs, Volume= 1,892 cf
Outflow = 0.55 cfs @ 12.09 hrs, Volume= 1,892 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.55 cfs @ 12.09 hrs, Volume= 1,892 cf
Routed to Pond MH2 : MH2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 263.02' @ 12.20 hrs
Flood Elev= 265.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	261.70'	**12.0" Round Culvert** L= 215.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 261.70' / 260.60' S= 0.0051 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=262.38' TW=262.61' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond MH1: MH1



Summary for Pond MH2: MH2

[80] Warning: Exceeded Pond MH1 by 0.33' @ 12.10 hrs (1.17 cfs 403 cf)

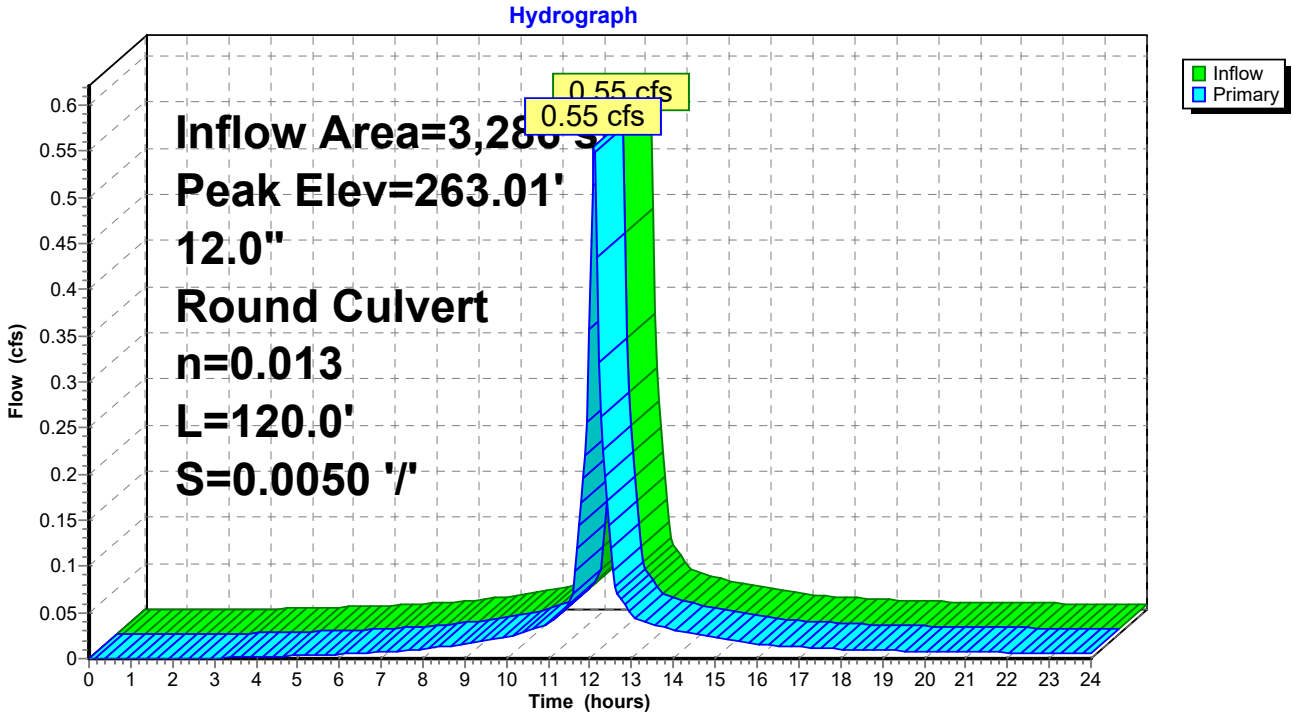
Inflow Area = 3,286 sf, 45.25% Impervious, Inflow Depth > 6.91" for 100 Year event
Inflow = 0.55 cfs @ 12.09 hrs, Volume= 1,892 cf
Outflow = 0.55 cfs @ 12.09 hrs, Volume= 1,892 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.55 cfs @ 12.09 hrs, Volume= 1,892 cf
Routed to Pond MH3 : DMH3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 263.01' @ 12.16 hrs
Flood Elev= 269.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	260.60'	**12.0" Round Culvert** L= 120.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.60' / 260.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.09 hrs HW=262.61' TW=262.91' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond MH2: MH2



Summary for Pond MH3: DMH3

[80] Warning: Exceeded Pond CB3 by 0.47' @ 12.05 hrs (2.59 cfs 3,311 cf)
[80] Warning: Exceeded Pond CB4 by 0.27' @ 12.05 hrs (1.98 cfs 1,797 cf)
[80] Warning: Exceeded Pond MH2 by 0.49' @ 12.05 hrs (1.91 cfs 1,932 cf)

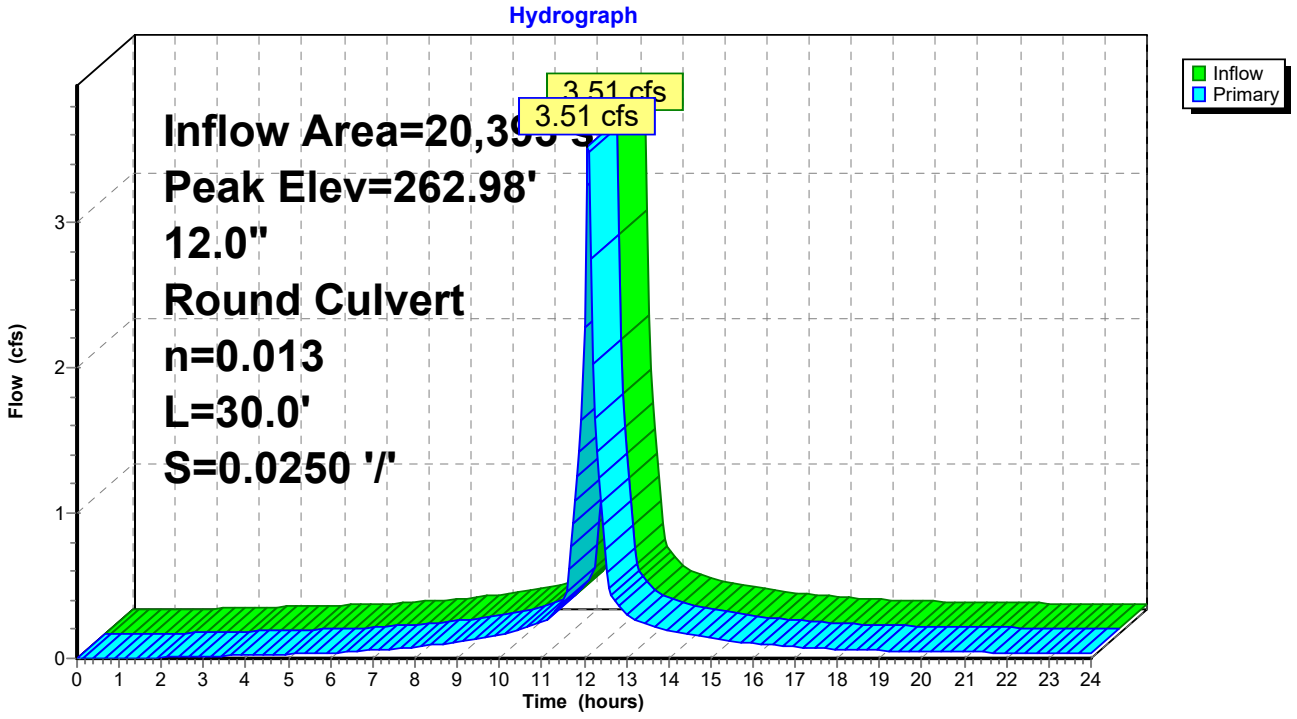
Inflow Area = 20,393 sf, 68.87% Impervious, Inflow Depth > 7.26" for 100 Year event
Inflow = 3.51 cfs @ 12.09 hrs, Volume= 12,345 cf
Outflow = 3.51 cfs @ 12.09 hrs, Volume= 12,345 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.51 cfs @ 12.09 hrs, Volume= 12,345 cf
Routed to Pond 1P : POND 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.98' @ 12.11 hrs
Flood Elev= 263.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	259.75'	**12.0" Round Culvert** L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 259.75' / 259.00' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.05 cfs @ 12.09 hrs HW=262.91' TW=262.26' (Dynamic Tailwater)
1=Culvert (Inlet Controls 3.05 cfs @ 3.88 fps)

Pond MH3: DMH3



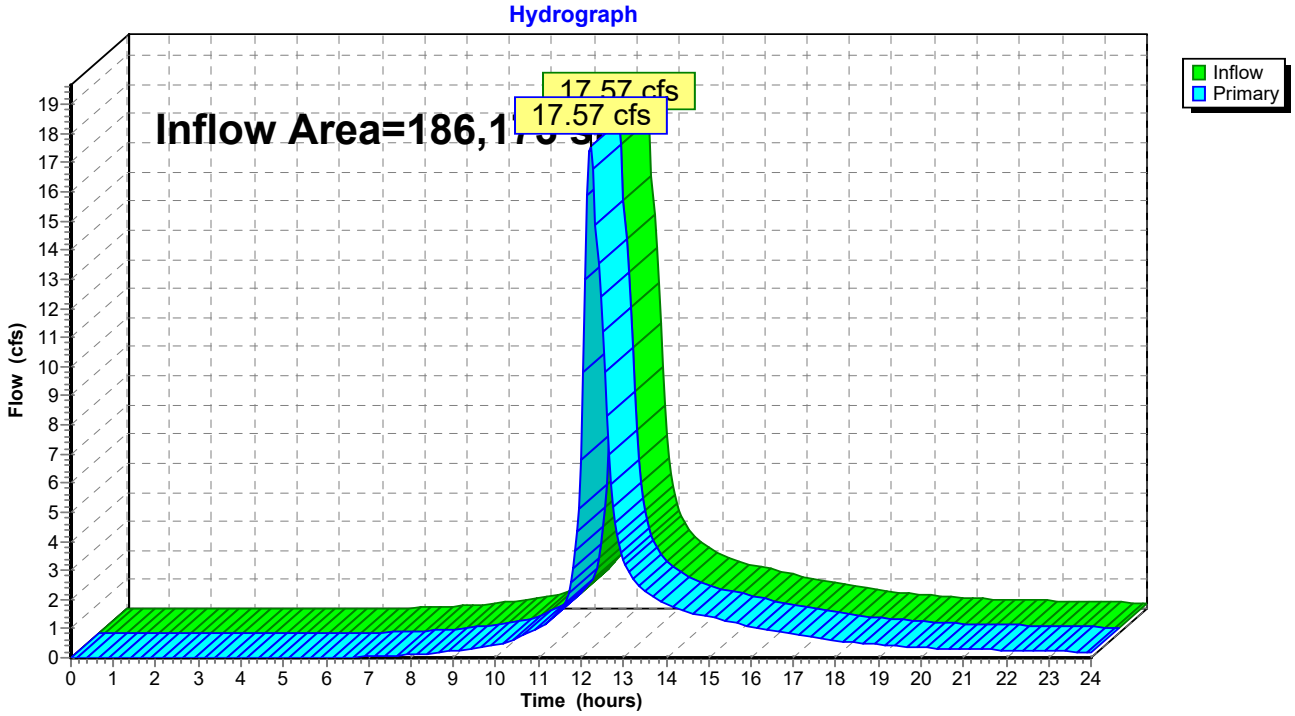
Summary for Pond SP1: SUM POND WOODS

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 186,173 sf, 19.22% Impervious, Inflow Depth > 5.15" for 100 Year event
Inflow = 17.57 cfs @ 12.22 hrs, Volume= 79,877 cf
Primary = 17.57 cfs @ 12.22 hrs, Volume= 79,877 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP1: SUM POND WOODS



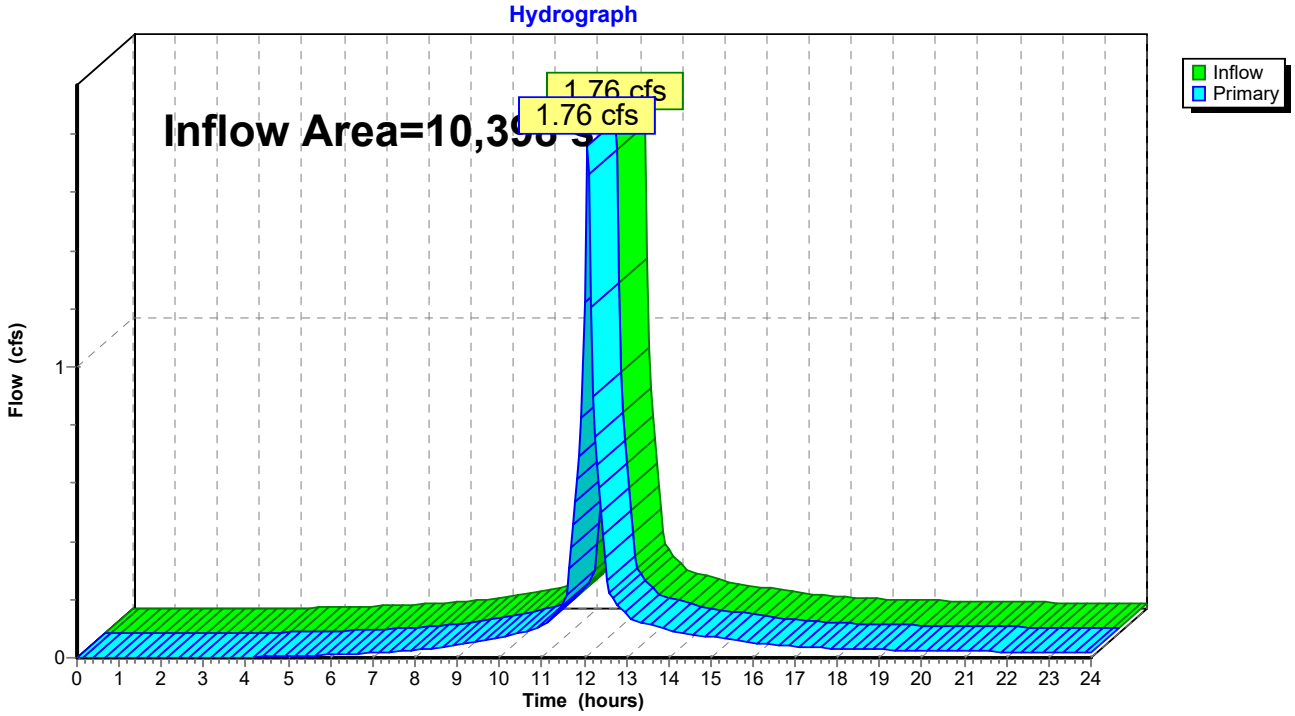
Summary for Pond SP2: SUM POND STREET

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 10,398 sf, 13.61% Impervious, Inflow Depth > 6.56" for 100 Year event
Inflow = 1.76 cfs @ 12.07 hrs, Volume= 5,680 cf
Primary = 1.76 cfs @ 12.07 hrs, Volume= 5,680 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond SP2: SUM POND STREET



USGS Precipitation Table
Pond Storage Charts
Pond Mounding Analysis

NOAA Atlas 14, Volume 10, Version 3
Location name: Andover, Massachusetts, USA*
Latitude: 42.6525°, Longitude: -71.1227°
Elevation: 258.69 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.311** (0.244-0.384)	**0.371** (0.291-0.460)	**0.470** (0.367-0.585)	**0.553** (0.429-0.690)	**0.666** (0.500-0.870)	**0.751** (0.553-1.00)	**0.840** (0.599-1.16)	**0.940** (0.634-1.33)	**1.08** (0.702-1.59)	**1.20** (0.760-1.80)
10-min	**0.440** (0.345-0.545)	**0.526** (0.412-0.652)	**0.666** (0.520-0.827)	**0.783** (0.608-0.979)	**0.943** (0.708-1.23)	**1.06** (0.782-1.42)	**1.19** (0.849-1.65)	**1.33** (0.899-1.89)	**1.53** (0.995-2.25)	**1.70** (1.08-2.55)
15-min	**0.518** (0.406-0.641)	**0.619** (0.485-0.767)	**0.784** (0.612-0.975)	**0.921** (0.715-1.15)	**1.11** (0.833-1.45)	**1.25** (0.921-1.67)	**1.40** (0.999-1.94)	**1.57** (1.06-2.22)	**1.81** (1.17-2.65)	**2.00** (1.27-3.00)
30-min	**0.712** (0.559-0.881)	**0.851** (0.667-1.05)	**1.08** (0.843-1.34)	**1.27** (0.984-1.59)	**1.53** (1.15-2.00)	**1.72** (1.27-2.30)	**1.93** (1.38-2.67)	**2.16** (1.46-3.06)	**2.49** (1.61-3.66)	**2.76** (1.75-4.14)
60-min	**0.906** (0.711-1.12)	**1.08** (0.849-1.34)	**1.37** (1.07-1.71)	**1.62** (1.25-2.02)	**1.95** (1.46-2.54)	**2.20** (1.61-2.93)	**2.46** (1.75-3.41)	**2.75** (1.86-3.90)	**3.17** (2.06-4.66)	**3.52** (2.23-5.28)
2-hr	**1.17** (0.923-1.43)	**1.41** (1.11-1.73)	**1.80** (1.41-2.22)	**2.12** (1.66-2.63)	**2.57** (1.95-3.34)	**2.90** (2.15-3.86)	**3.25** (2.35-4.52)	**3.68** (2.49-5.19)	**4.33** (2.82-6.32)	**4.88** (3.10-7.27)
3-hr	**1.35** (1.07-1.65)	**1.63** (1.30-2.00)	**2.09** (1.66-2.57)	**2.48** (1.95-3.06)	**3.00** (2.29-3.91)	**3.39** (2.54-4.52)	**3.82** (2.78-5.31)	**4.34** (2.94-6.10)	**5.14** (3.35-7.48)	**5.84** (3.71-8.66)
6-hr	**1.72** (1.38-2.10)	**2.10** (1.68-2.55)	**2.70** (2.16-3.30)	**3.21** (2.55-3.94)	**3.91** (3.00-5.05)	**4.42** (3.33-5.86)	**4.98** (3.65-6.90)	**5.68** (3.87-7.92)	**6.77** (4.42-9.78)	**7.71** (4.92-11.4)
12-hr	**2.17** (1.75-2.62)	**2.65** (2.14-3.20)	**3.44** (2.77-4.17)	**4.10** (3.27-5.00)	**5.00** (3.87-6.42)	**5.66** (4.29-7.46)	**6.39** (4.71-8.79)	**7.29** (4.99-10.1)	**8.69** (5.70-12.5)	**9.90** (6.34-14.5)
24-hr	**2.56** (2.09-3.08)	**3.18** (2.59-3.83)	**4.20** (3.41-5.06)	**5.04** (4.07-6.11)	**6.20** (4.84-7.93)	**7.05** (5.39-9.25)	**7.99** (5.95-11.0)	**9.17** (6.31-12.6)	**11.0** (7.26-15.7)	**12.7** (8.13-18.4)
2-day	**2.88** (2.37-3.43)	**3.65** (3.00-4.35)	**4.91** (4.02-5.88)	**5.95** (4.84-7.17)	**7.39** (5.82-9.42)	**8.44** (6.51-11.0)	**9.61** (7.23-13.2)	**11.1** (7.68-15.2)	**13.6** (8.98-19.3)	**15.8** (10.2-22.8)
3-day	**3.16** (2.61-3.75)	**3.98** (3.29-4.73)	**5.34** (4.39-6.36)	**6.46** (5.28-7.74)	**8.00** (6.33-10.2)	**9.12** (7.08-11.9)	**10.4** (7.85-14.2)	**12.0** (8.32-16.4)	**14.7** (9.74-20.8)	**17.1** (11.0-24.6)
4-day	**3.43** (2.85-4.06)	**4.28** (3.55-5.07)	**5.67** (4.68-6.74)	**6.83** (5.60-8.16)	**8.42** (6.68-10.7)	**9.57** (7.45-12.4)	**10.9** (8.24-14.8)	**12.6** (8.72-17.1)	**15.4** (10.2-21.6)	**17.8** (11.5-25.6)
7-day	**4.18** (3.49-4.92)	**5.06** (4.22-5.96)	**6.49** (5.40-7.68)	**7.69** (6.35-9.14)	**9.33** (7.45-11.7)	**10.5** (8.23-13.6)	**11.9** (9.02-16.0)	**13.6** (9.48-18.4)	**16.5** (11.0-23.0)	**19.0** (12.3-27.1)
10-day	**4.85** (4.08-5.69)	**5.75** (4.83-6.76)	**7.23** (6.04-8.52)	**8.46** (7.01-10.0)	**10.1** (8.12-12.7)	**11.4** (8.90-14.6)	**12.7** (9.67-17.1)	**14.5** (10.1-19.5)	**17.3** (11.5-24.1)	**19.8** (12.8-28.1)
20-day	**6.76** (5.73-7.88)	**7.76** (6.57-9.05)	**9.39** (7.91-11.0)	**10.7** (8.99-12.6)	**12.6** (10.1-15.5)	**14.0** (10.9-17.6)	**15.5** (11.7-20.2)	**17.2** (12.1-22.9)	**19.7** (13.2-27.2)	**21.8** (14.2-30.7)
30-day	**8.36** (7.13-9.70)	**9.44** (8.03-11.0)	**11.2** (9.48-13.0)	**12.6** (10.6-14.8)	**14.7** (11.8-17.9)	**16.2** (12.7-20.1)	**17.7** (13.3-22.8)	**19.4** (13.7-25.7)	**21.7** (14.6-29.8)	**23.5** (15.3-33.0)
45-day	**10.4** (8.92-12.0)	**11.6** (9.90-13.4)	**13.5** (11.5-15.6)	**15.0** (12.7-17.6)	**17.2** (13.9-20.8)	**18.9** (14.8-23.3)	**20.6** (15.4-26.1)	**22.2** (15.8-29.3)	**24.3** (16.4-33.2)	**25.8** (16.9-36.1)
60-day	**12.2** (10.5-14.0)	**13.4** (11.5-15.5)	**15.4** (13.2-17.8)	**17.1** (14.5-19.9)	**19.4** (15.7-23.3)	**21.1** (16.6-25.9)	**22.9** (17.1-28.9)	**24.5** (17.5-32.2)	**26.5** (18.0-36.1)	**27.9** (18.3-39.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

Stage-Area-Storage for Pond 1P: POND 1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
260.00	2,125	0
260.05	2,163	107
260.10	2,201	216
260.15	2,239	327
260.20	2,277	440
260.25	2,316	555
260.30	2,356	672
260.35	2,395	791
260.40	2,435	911
260.45	2,475	1,034
260.50	2,516	1,159
260.55	2,557	1,286
260.60	2,598	1,415
260.65	2,640	1,546
260.70	2,682	1,679
260.75	2,724	1,814
260.80	2,766	1,951
260.85	2,809	2,090
260.90	2,853	2,232
260.95	2,896	2,376
261.00	2,940	2,521
261.05	2,981	2,670
261.10	3,023	2,820
261.15	3,065	2,972
261.20	3,108	3,126
261.25	3,150	3,283
261.30	3,193	3,441
261.35	3,237	3,602
261.40	3,280	3,765
261.45	3,324	3,930
261.50	3,368	4,097
261.55	3,412	4,267
261.60	3,457	4,439
261.65	3,502	4,612
261.70	3,547	4,789
261.75	3,593	4,967
261.80	3,639	5,148
261.85	3,685	5,331
261.90	3,731	5,517
261.95	3,778	5,704
262.00	3,825	5,894
262.05	3,871	6,087
262.10	3,917	6,281
262.15	3,963	6,478
262.20	4,009	6,678
262.25	4,056	6,879
262.30	4,103	7,083
262.35	4,150	7,290
262.40	4,198	7,498
262.45	4,246	7,709
262.50	4,294	7,923
262.55	4,342	8,139
262.60	4,391	8,357
262.65	4,440	8,578
262.70	4,489	8,801
262.75	4,539	9,027
262.80	4,588	9,255
262.85	4,638	9,486
262.90	4,689	9,719
262.95	4,739	9,955
263.00	**4,790**	**10,193**

Stage-Area-Storage for Pond 2P: POND P2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
262.50	1,640	0
262.51	1,646	16
262.52	1,652	33
262.53	1,658	49
262.54	1,664	66
262.55	1,670	83
262.56	1,676	99
262.57	1,682	116
262.58	1,688	133
262.59	1,694	150
262.60	1,700	167
262.61	1,706	184
262.62	1,712	201
262.63	1,718	218
262.64	1,724	235
262.65	1,730	253
262.66	1,736	270
262.67	1,742	287
262.68	1,749	305
262.69	1,755	322
262.70	1,761	340
262.71	1,767	358
262.72	1,773	375
262.73	1,779	393
262.74	1,785	411
262.75	1,792	429
262.76	1,798	447
262.77	1,804	465
262.78	1,810	483
262.79	1,817	501
262.80	1,823	519
262.81	1,829	537
262.82	1,835	556
262.83	1,842	574
262.84	1,848	593
262.85	1,854	611
262.86	1,860	630
262.87	1,867	648
262.88	1,873	667
262.89	1,879	686
262.90	1,886	705
262.91	1,892	723
262.92	1,899	742
262.93	1,905	761
262.94	1,911	781
262.95	1,918	800
262.96	1,924	819
262.97	1,931	838
262.98	1,937	858
262.99	1,944	877
263.00	1,950	896
263.01	1,956	916
263.02	1,963	936
263.03	1,969	955
263.04	1,975	975
263.05	1,981	995
263.06	1,988	1,015
263.07	1,994	1,034
263.08	2,000	1,054
263.09	2,007	1,074
263.10	2,013	1,095
263.11	2,019	1,115
263.12	2,026	1,135
263.13	2,032	1,155
263.14	2,038	1,176
263.15	2,045	1,196
263.16	2,051	1,216
263.17	2,058	1,237
263.18	2,064	1,258
263.19	2,071	1,278
263.20	2,077	1,299
263.21	2,083	1,320
263.22	2,090	1,341
263.23	2,096	1,362
263.24	2,103	1,383
263.25	2,109	1,404
263.26	2,116	1,425
263.27	2,122	1,446
263.28	2,129	1,467
263.29	2,135	1,489
263.30	2,142	1,510
263.31	2,149	1,531
263.32	2,155	1,553
263.33	2,162	1,575
263.34	2,168	1,596
263.35	2,175	1,618
263.36	2,181	1,640
263.37	2,188	1,662
263.38	2,195	1,683
263.39	2,201	1,705
263.40	2,208	1,727
263.41	2,215	1,750
263.42	2,221	1,772
263.43	2,228	1,794
263.44	2,235	1,816
263.45	2,241	1,839
263.46	2,248	1,861
263.47	2,255	1,884
263.48	2,262	1,906
263.49	2,268	1,929
263.50	**2,275**	**1,952**

Stage-Area-Storage for Pond 3P: POND 3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
262.75	954	0
262.80	993	49
262.85	1,033	99
262.90	1,073	152
262.95	1,115	207
263.00	1,157	263
263.05	1,199	322
263.10	1,243	383
263.15	1,288	447
263.20	1,333	512
263.25	1,379	580
263.30	1,425	650
263.35	1,473	722
263.40	1,521	797
263.45	1,570	875
263.50	1,620	954
263.55	1,671	1,037
263.60	1,722	1,122
263.65	1,775	1,209
263.70	1,828	1,299
263.75	1,881	1,392
263.80	1,936	1,487
263.85	1,991	1,585
263.90	2,047	1,686
263.95	2,104	1,790
264.00	2,162	1,897
264.05	2,206	2,006
264.10	2,251	2,117
264.15	2,296	2,231
264.20	2,341	2,347
264.25	2,387	2,465
264.30	2,434	2,586
264.35	2,481	2,709
264.40	2,528	2,834
264.45	2,576	2,961
264.50	2,624	3,091
264.55	2,673	3,224
264.60	2,722	3,359
264.65	2,771	3,496
264.70	2,822	3,636
264.75	2,872	3,778
264.80	2,923	3,923
264.85	2,974	4,070
264.90	3,026	4,220
264.95	3,078	4,373
265.00	**3,131**	**4,528**

Pond 1

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs.The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changedotherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
2.0400	*R*	**Recharge (infiltration) rate (feet/day)**
0.160	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
20.40	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
50.000	x	**1/2 length of basin (x direction, in feet)**
10.000	y	**1/2 width of basin (y direction, in feet)**
0.410	t	**duration of infiltration period (days)**
10.000	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

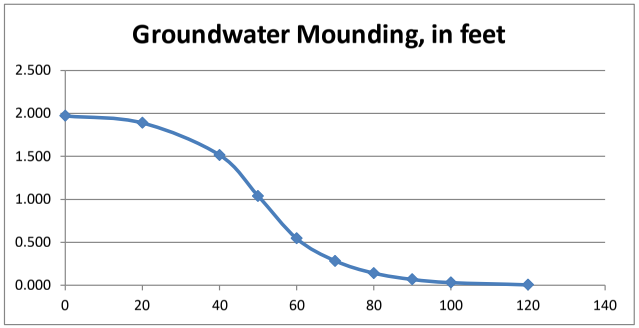
hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

11.973	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.973	Δh(max)	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.973	0
1.891	20
1.517	40
1.040	50
0.546	60
0.283	70
0.142	80
0.068	90
0.032	100
0.007	120

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Pond 2

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs.The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changedotherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
2.0400	*R*	**Recharge (infiltration) rate (feet/day)**
0.160	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
20.40	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
20.000	x	**1/2 length of basin (x direction, in feet)**
15.000	y	**1/2 width of basin (y direction, in feet)**
0.406	t	**duration of infiltration period (days)**
10.000	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

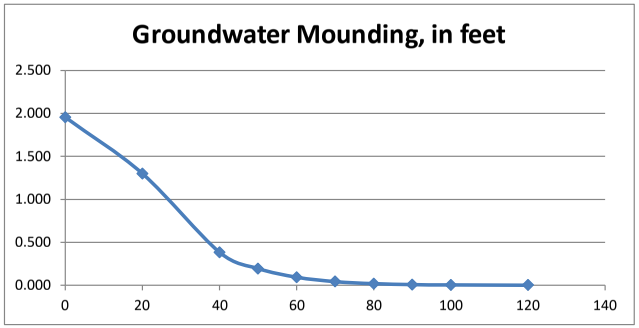
hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

11.956	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.956	Δh(max)	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.956	0
1.300	20
0.384	40
0.195	50
0.094	60
0.043	70
0.019	80
0.009	90
0.004	100
0.002	120

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Pond 3

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs.The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changedotherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
2.0400	*R*	**Recharge (infiltration) rate (feet/day)**
0.160	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
20.40	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
40.000	x	**1/2 length of basin (x direction, in feet)**
5.000	y	**1/2 width of basin (y direction, in feet)**
0.270	t	**duration of infiltration period (days)**
10.000	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

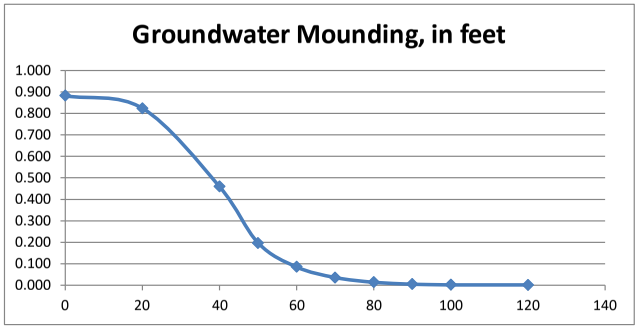
hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

10.883	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.883	Δh(max)	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.883	0
0.825	20
0.460	40
0.197	50
0.086	60
0.036	70
0.014	80
0.006	90
0.003	100
0.001	120

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

SOIL TESTS

Soil and Plant Nutrient Testing Laboratory
203 Paige Laboratory
161 Holdsworth Way
University of Massachusetts
Amherst, MA 01003
Phone: (413) 545-2311
e-mail: soiltest@umass.edu
website: soiltest.umass.edu

Particle Size Analysis - Comprehensive

Prepared For:

Benjamin Osgood
Ranger Engineering Group
13 Red Roof Lane, Suite 203
Salem, NH 03079

bosgood@rangereng.com
973-435-1324

Sample Information:
Sample ID: TP 10

Order Number: 58396
Lab Number: X220104-103
Received: 12/28/2021
Reported: 1/19/2022

USDA Size Fraction

Main Fractions	Size (mm)	Percent
Sand	0.05-2.0	77.6
Silt	0.002-0.05	16.6
Clay	<0.002	5.8

Sand Fractions	Size (mm)	Percent
Very Coarse	1.0-2.0	14.3
Coarse	0.5-1.0	15.4
Medium	0.25-0.5	16.8
Fine	0.10-0.25	19.5
Very Fine	0.05-0.10	11.6

Silt Fractions	Size (mm)	Percent
Coarse	0.02-0.05	7.7
Medium	0.005-0.02	7.6
Fine	0.002-0.005	1.3

Percent of Whole Sample Passing

Size (mm)	Sieve #	Whole Sample % of Sample Passing
2.00	#10	65.6
1.00	#18	56.3
0.50	#35	46.1
0.25	#60	35.1
0.10	#140	22.3
0.053	#270	14.7
0.02	20 um	9.6
0.005	5 um	4.6
0.002	2 um	3.8

USDA Textural Class: gravelly loamy coarse sand

Gravel Content: (%) 34.4

Soil and Plant Nutrient Testing Laboratory
203 Paige Laboratory
161 Holdsworth Way
University of Massachusetts
Amherst, MA 01003
Phone: (413) 545-2311
e-mail: soiltest@umass.edu
website: soiltest.umass.edu

Particle Size Analysis - Comprehensive

Prepared For:

Benjamin Osgood
Ranger Engineering Group
13 Red Roof Lane, Suite 203
Salem, NH 03079

bosgood@rangereng.com
973-435-1324

Sample Information:
Sample ID: TP 7

Order Number: 58396
Lab Number: X220104-102
Received: 12/28/2021
Reported: 1/19/2022

USDA Size Fraction

Main Fractions	Size (mm)	Percent
Sand	0.05-2.0	63.6
Silt	0.002-0.05	24.7
Clay	<0.002	11.7

Sand Fractions	Size (mm)	Percent
Very Coarse	1.0-2.0	8.3
Coarse	0.5-1.0	10.4
Medium	0.25-0.5	13.7
Fine	0.10-0.25	19.1
Very Fine	0.05-0.10	12.1

Silt Fractions	Size (mm)	Percent
Coarse	0.02-0.05	8.9
Medium	0.005-0.02	11.3
Fine	0.002-0.005	4.5

Percent of Whole Sample Passing

Size (mm)	Sieve #	Whole Sample % of Sample Passing
2.00	#10	69.3
1.00	#18	63.5
0.50	#35	56.3
0.25	#60	46.8
0.10	#140	33.6
0.053	#270	25.2
0.02	20 um	19.1
0.005	5 um	11.2
0.002	2 um	8.1

USDA Textural Class: sandy loam

Gravel Content: (%) 30.7

Soil and Plant Nutrient Testing Laboratory
203 Paige Laboratory
161 Holdsworth Way
University of Massachusetts
Amherst, MA 01003
Phone: (413) 545-2311
e-mail: soiltest@umass.edu
website: soiltest.umass.edu

Particle Size Analysis - Comprehensive

Prepared For:

Benjamin Osgood
Ranger Engineering Group
13 Red Roof Lane, Suite 203
Salem, NH 03079

bosgood@rangereng.com
973-435-1324

Sample Information:

Sample ID: TP 6

Order Number: 58396
Lab Number: X220104-101
Received: 12/28/2021
Reported: 1/19/2022

USDA Size Fraction

Main Fractions	Size (mm)	Percent
Sand	0.05-2.0	68.6
Silt	0.002-0.05	24.9
Clay	<0.002	6.5

Sand Fractions	Size (mm)	Percent
Very Coarse	1.0-2.0	9.9
Coarse	0.5-1.0	12.4
Medium	0.25-0.5	14.7
Fine	0.10-0.25	18.0
Very Fine	0.05-0.10	13.6

Silt Fractions	Size (mm)	Percent
Coarse	0.02-0.05	11.3
Medium	0.005-0.02	11.4
Fine	0.002-0.005	2.1

Percent of Whole Sample Passing

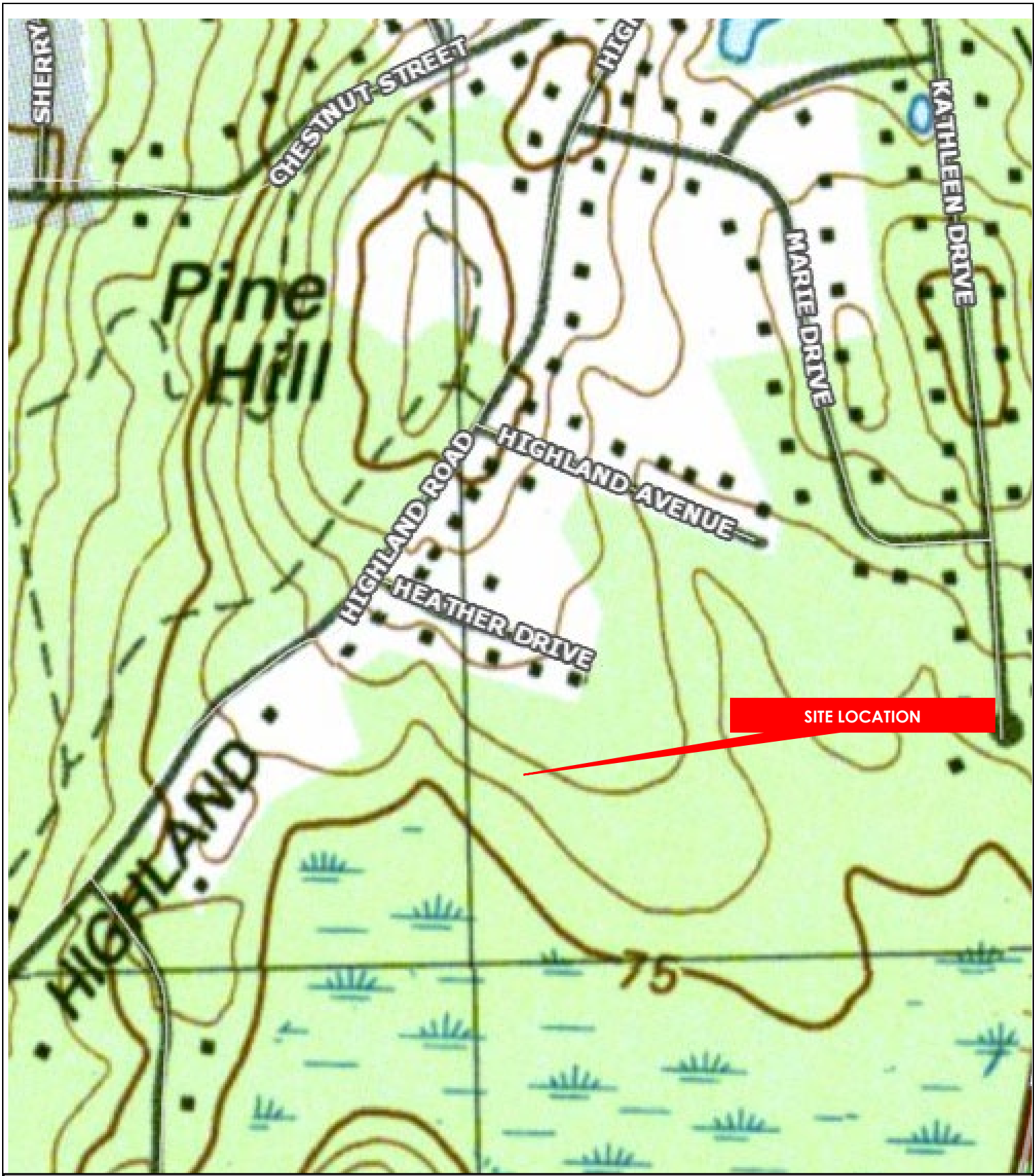
Size (mm)	Sieve #	Whole Sample % of Sample Passing
2.00	#10	62.5
1.00	#18	56.3
0.50	#35	48.6
0.25	#60	39.4
0.10	#140	28.1
0.053	#270	19.6
0.02	20 um	12.5
0.005	5 um	5.4
0.002	2 um	4.1

USDA Textural Class: gravelly sandy loam

Gravel Content: (%) 37.5

MAPS

USGS LOCUS
SCS SOILS
FEMA
CS 9201 PRE-DEVELOPMENT DRAINAGE
CS 9301 POST DEVELOPMENT DRAINAGE



Source: Office of Geographic and Environmental Information (MassGIS), Commonwealth of Massachusetts Executive Office of Environmental Affairs; USGS Topographic Quadrangle Images

USGS MAP
SELLERS FARM RD ANDOVER, MA
MAP 24 LOTS 1K, 1J, 1H, 1G, 1E, 1F

Soil Map—Essex County, Massachusetts, Northern Part

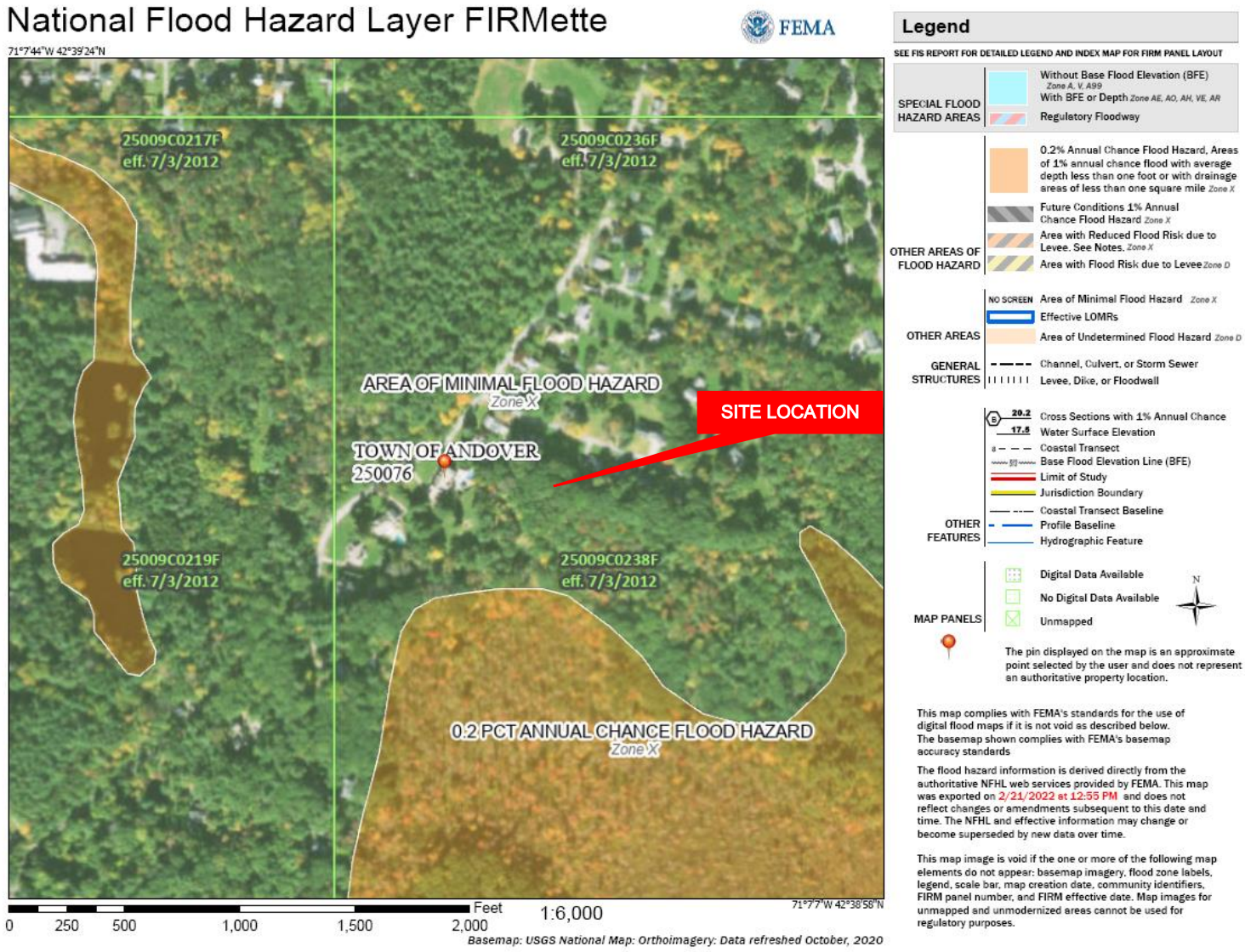
Map Scale: 1:2,900 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

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



Source: Official Website of the Department of Homeland Security FEMA

FEMA MAP
SELLERS FARM RD ANDOVER MA
MAP 24 LOTS 1K, 1J, 1H, 1G, 1E

PAXTON FINE SANDY LOAM

EX1

DP1

EX3

WOODBRIDGE FINE SANDY LOAM

PAXTON FINE SANDY LOAM

WOODBRIDGE FINE SANDY LOAM

PAXTON FINE SANDY LOAM

WOODBRIDGE FINE SANDY LOAM

DP2

PAXTON FINE SANDY LOAM

WOODBRIDGE FINE SANDY LOAM

EX2

WOODBRIDGE FINE SANDY LOAM

FREETOWN MUCK

L = 110'
S = 4.5%

LEGEND

DP	DESIGN POINT
EX#	SUB-CATCHMENT AREA
	SUB-CATCHMENT BOUNDARY
	TIME OF CONCENTRATION FLOW PATH

NORTH

0 30' 60'

MODIFIED DEFINITIVE SUBDIVISION
SELLERS FARM ROAD
ANDOVER, MASSACHUSETTS

PRE DEVELOPMENT DRAINAGE PLAN
PREPARED FOR

LRC BUILDERS LLC
475 BOSTON ROAD
BILLERICA, MASSACHUSETTS 01821

NO.	DATE	REVISIONS	BY

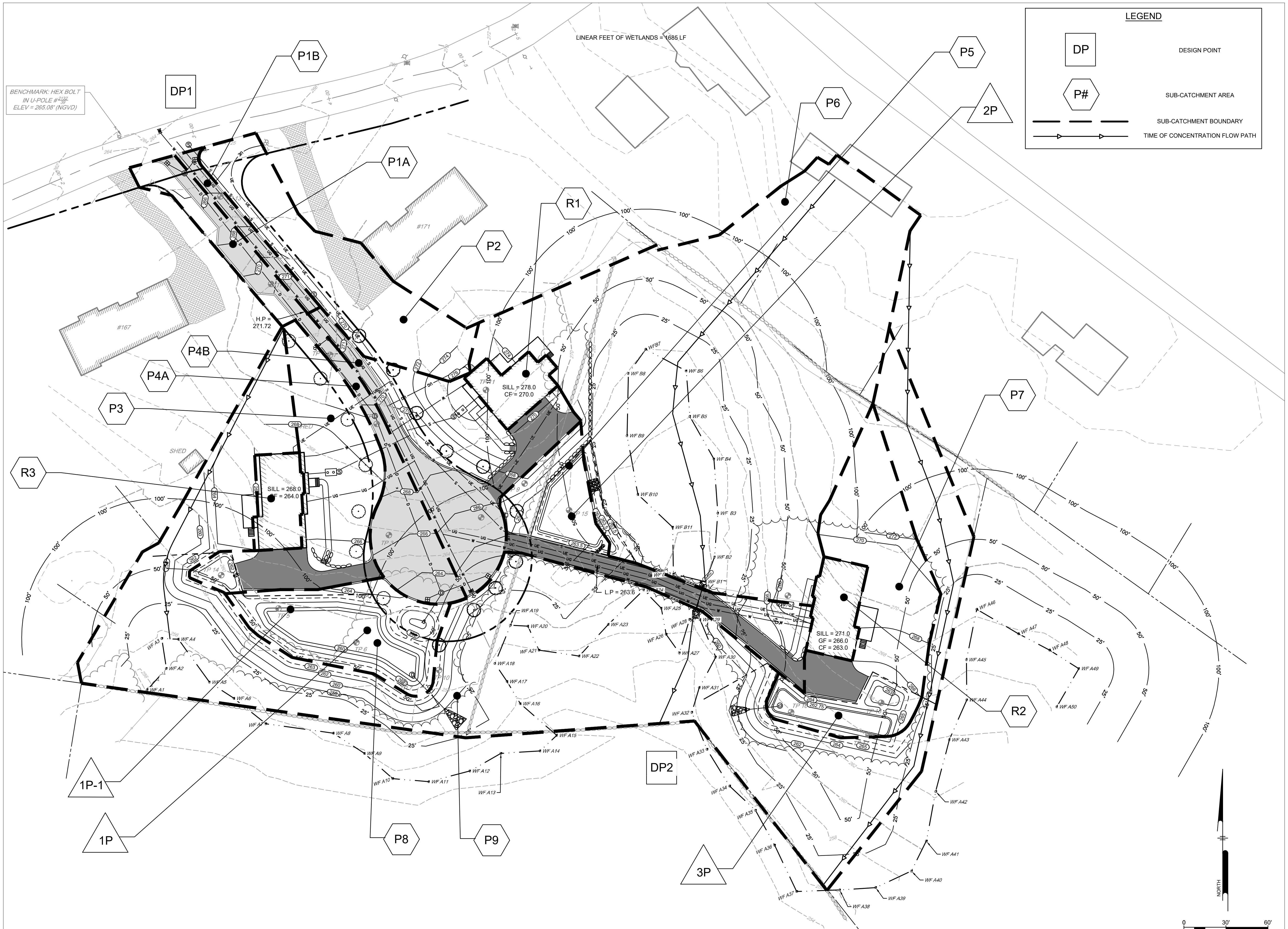
PROJECT	21-194
DATE	2021-11-23
DRAWING SCALE	1"= 40'
DRAWN BY	DJO
APPROVED BY	BCO

CS9201

SHEET 4 OF 9

PLOTTED: 7/11/2022 11:11 AM, BY: DaxPC PLOTSTYLE: TTE Env NCS - Half Size.stb PROJECT STATUS: ---

Z:\K\PROJECTS\LRC Builders LLC\21-194 SELLERS FARM RD, ANDOVER, MA\DESIGN\PUBLISH\OTHER PUBLISH SHEETS\CS9201.dwg



MODIFIED DEFINITIVE SUBDIVISION

SELLERS FARM ROAD
ANDOVER, MASSACHUSETTS

POST DEVELOPMENT DRAINAGE PLAN

PREPARED FOR

LRC BUILDERS LLC

475 BOSTON ROAD
BILLERICA, MASSACHUSETTS 01821

NO.	DATE	REVISIONS	BY

PROJECT	21-194
DATE	2021-11-23
DRAWING SCALE	1"= 40'
DRAWN BY	DJO
APPROVED BY	BCO

CS9301

SHEET 6 OF 9