



**Transcontinental Gas Pipe Line Company, LLC**

**Section 3-2 PCSM Plan for Effort Loop**

**Regional Energy Access Expansion Project – Effort Loop**

**MLV-505LD86**

**April 2021**  
*(Revised March 2022)*

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SECTION 3.2.1  
EFFORT LOOP NARRATIVE



## **1. Project Description**

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. is proposing the Regional Energy Access Expansion Project – Effort Loop. Effort Loop consists of installing approximately 13.8 miles of 42-inch diameter pipeline collocated with Transco's Leidy Line System from MP 43.72 to MP 57.50 in Monroe County, PA. Transco will be installing a Mainline Valve (MLV) near the Effort Loop Pipeline as a means to isolate gas flows along sections of a pipeline.

Effort Loop is proposed as part of the overall Regional Energy Access Expansion Project (Project). Effort Loop is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 829,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6. Transco's Zone 6 includes the portion of the Transco system in Pennsylvania, New York, New Jersey, and Maryland.

The Effort Loop right-of-way (ROW) will be restored to original conditions. This Post Construction Stormwater Management (PCSM) plan has been developed for and is only applicable to the MLV-505LD86 site. The PCSM Plan shall be designed and implemented to be consistent with the PCSM Plan under 25 Pa. Code § 102.8 (relating to PCSM requirements). The work and disturbed areas are located within Transco property, existing easements or legally obtained workspace. The limit of disturbance (LOD) for the MLV-505LD86 site will be approximately 9.60 acres. Subject to FERC's certification and receipt of the necessary permits and authorizations, Transco anticipates construction of the Project would commence in second quarter 2023 to meet a target in-service date of fourth quarter 2024.

## **2. Topographic Features of the Area**

Project Location Maps for the MLV-505LD86 site are included in Attachment 1 The map shows the topographical features of the general site vicinity and is based on the USGS 7.5 Minute topographical mapping of the Blakeslee, Pocono Pines, Brodheadsville, and Saylorsburg, Pennsylvania quadrangles.

### 3. Receiving Surface Waters

The following table (Table 1) lists each watershed located in the MLV-505LD86 Project Area, its Chapter 93 Water Quality Standards, and Pennsylvania Fish and Boat Commission classifications. A Wetland and Watercourse Delineation Report is included in Attachment A of the ESCP permit application.

| Table 1 – Receiving Waters                   |                |              |                     |
|----------------------------------------------|----------------|--------------|---------------------|
| Watershed Name                               | Designated Use | Existing Use | PFBC Classification |
| <b>MLV-505LD86</b>                           |                |              |                     |
| Sugar Hollow Creek                           | CWF, MF        | HQ-CWF, MF   | Class A Wild Trout  |
| CWF: Cold Water Fishes, MF: Migratory Fishes |                |              |                     |

An evaluation of potential hydrologic impacts to wetlands was undertaken at the MLV-505LD86. There are no significant changes in the pre and post construction drainage area associated with the PCSM facilities. There are no wetlands immediately downslope of the proposed PCSM facility that would result in a change to the hydrologic conditions of the area that would result in a significant impact to wetland hydrology. The pre and post site hydrology will flow into an existing roadside ditch along Sugar Hollow Road then be covered via existing cross pipe into an existing wetland/riparian complex associated with Sugar Hollow Creek. No significant change to the assumed wetland on the east side of Sugar Hollow Road is proposed due to that wetland's hydrology being tied to the high groundwater associated with Sugar Hollow Creek.

### 4. Types, Depth, Slope, Locations & Limitation of the Soils and Geologic Formations

The soil associations on site were identified by soil map units as mapped in the Web Soil Survey website (<https://websoilsurvey.sc.egov.usda.gov/>) by the United States Dept. of Agriculture (USDA), Natural Resources Conservation Service (NRCS). There are 6 soil mapping units located within the LOD for the MLV-505LD86 site, see Table 2 below.

| Table 2 – Soils mapping units within the LOD |                                                         |
|----------------------------------------------|---------------------------------------------------------|
| Soil Mapping Unit                            | Soil Series                                             |
| <b>MLV-505LD86</b>                           |                                                         |
| KvB                                          | Klinesville channery silt loam, 3 to 8 percent slopes   |
| KvD                                          | Klinesville channery silt loam, 15 to 25 percent slopes |
| LkB                                          | Leck kill channery silt loam, 2 to 8 percent slopes     |
| LkC                                          | Leck kill channery silt loam, 8 to 15 percent slopes    |
| LkD                                          | Leck kill channery silt loam, 15 to 25 percent slopes   |

|     |                                      |
|-----|--------------------------------------|
| WKE | Weikert and Klinesville soils, steep |
|-----|--------------------------------------|

Detailed descriptions and mapping of soil mapping units are provided in the Attachment 2. Soil use limitations (outlined in Table 3) were reviewed in relation to the MLV-505LD86 site and resolutions were identified in Section 4.1.

| Table 3 – Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401) |                       |               |                             |          |                 |          |                                                       |                           |                                |                  |        |                        |              |                |                    |         |         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|-----------------------------|----------|-----------------|----------|-------------------------------------------------------|---------------------------|--------------------------------|------------------|--------|------------------------|--------------|----------------|--------------------|---------|---------|
| SOIL NAME                                                                                                                                                                                                   | SOIL WITH SLOPE CLASS | CUTBANKS CAVE | CORROSIVE TO CONCRETE\STEEL | DROUGHTY | EASILY ERODIBLE | FLOODING | DEPTH TO SATURATED ZONE/<br>SEASONAL HIGH WATER TABLE | HYDRIC/ HYDRIC INCLUSIONS | LOW STRENGTH / LANDSLIDE PRONE | SLOW PERCOLATION | PIPING | POOR SOURCE OF TOPSOIL | FROST ACTION | SHRINK - SWELL | POTENTIAL SINKHOLE | PONDING | WETNESS |
| Klinesville                                                                                                                                                                                                 | KvB, KvD              | X             | C/S                         | X        | X               |          |                                                       | X                         |                                | X                |        | X                      | X            |                |                    |         |         |
| Leck Kill                                                                                                                                                                                                   | LkB, LkC, LkD         | X             | C                           |          |                 |          |                                                       |                           | X                              | X                | X      | X                      | X            |                |                    |         | X       |
| Weikert                                                                                                                                                                                                     | WKE                   | X             | C/S                         | X        |                 |          |                                                       | X                         | X                              | X                | X      | X                      | X            |                |                    |         |         |

#### 4.1. Resolution of Soil Limitations

Transco proposes the following resolutions to compensate for soil limitations summarized in Table 3 above:

1. To offset the caving of cutbanks, trenching operations will be conducted in accordance with the OSHA Technical Manual for Trenching.
2. Preventative coatings shall be used to prevent corrosion of concrete and/ or steel.
3. When bedrock is encountered it will be removed by mechanical methods or blasting. Blasting operations will conform with local, state, and federal regulations.
4. Precautions will be taken to prevent slope failure when working within low strength soils by flattening cut / fill slopes, not overloading, maintaining lateral support, and preventing saturation of soils. Low strength soils will not be used for roadway construction.

5. Excavation in soils prone to flooding, slow percolation, ponding, wetness, located in a seasonal high water table, or which are hydric, will likely encounter water. Compensation will involve dewatering with appropriate means such as pump water filter bags, sediment traps, etc.
6. Soils that have the potential to swell, shrink, or heave due to frost action may cause damage to roadways or pads. Where foundations are critical, compensation may require removal and replacement of soils with suitable material.
7. In circumstances where soils appear to be a poor source of topsoil, droughty or prone to wetness, soil testing will be performed to determine the appropriate applications of soil amendments to promote growth. Soils onsite that are fair sources of topsoil, will be identified, stripped and stockpiled for use during restoration.
8. In order to minimize erosion of soils that are easily erodible, compensation may involve providing a protective lining, to apply seed, mulch, erosion control blankets (either in rolls or hydraulically applied), tracking slopes, upstream diversions, waterbars, etc. to minimize soil erosion.

#### **4.2. Geologic Formations**

Transco retained Civil & Environmental Consultants, Inc. (CEC) of Pittsburgh, PA to perform a geohazard assessment, the following is provided from their 2020 report. Transco utilized United States Geological Survey (USGS), Geologic Map of Pennsylvania - Map 1, dated 1980 (online), to evaluate geologic hazards on the Project. The desktop analysis completed for the Project by CEC revealed that the Effort Loop Pipeline does not cross known, mapped, or inferred faults. No mines or Karst formations were identified in the site vicinity. However, the analysis outlined that Effort Loop Pipeline lies within a zone of moderate to high landslide incidence and susceptibility.

Due to the moderate to high landslide incidence and susceptibility, a Geological Hazard Assessment and Mitigation Plan was completed by CEC and is submitted with this application (Attachment B). The Geological Hazard Assessment and Mitigation Plan identifies appropriate best management practices to avoid and mitigate for conditions encountered during construction.

## **5. Characterizations of Earth Disturbance Activities, Including Past, Present, and Proposed Land Uses**

Transco will be installing MLV-505LD86 near the Effort Loop Pipeline as a means to isolate gas flows. Pig launchers/receivers, valves and other ancillary facilities will be located at this MLV facility. The work and disturbed areas are located within Transco property, existing easements, or legally obtained workspace where the past, present, and proposed land use is primarily an existing pipeline ROW. Disturbed areas within the temporary workspaces will be restored to the original contours. Using data taken from Google Earth and Multi-Resolution Land Characteristics (MRLC) Consortium website (<https://www.mrlc.gov/viewer/>), it appears that a major portion of the Effort Loop MLV was existing and maintained gas pipeline right-of-way for the past 20 years and will continue to be an existing and maintained gas pipeline right-of-way once the Project is complete. Along the edges of the ROW land use is primarily forested. Based on the surrounding land characteristics, land use prior to ROW construction within the past 50 years would likely have been either forested land or meadow. A gravel pad and access road will be constructed at the Effort Loop MLV-505LD86 site. The contractor will construct stormwater Best Management Practices (BMPs) to mitigate the increase in volume and peak rates associated with construction. The proposed BMPs are designed to evaporate and infiltrate the net increase in volume between the pre- and post-development 2-year rain events. Refer to the Stormwater BMP Sizing Calculations in Attachment 4 for additional information.

## **6. Post Construction Stormwater Management Best Management Practices, Installation Sequence and PCSM Critical Stages**

Increase in stormwater runoff during and after construction shall be controlled by sequencing the operations and using a selection of BMPs. BMP design calculations and drawings are provided in Attachment 4 and PCSM Plan set.

### **6.1. MLV-505LD86**

The MLV-505LD86 site will utilize several PCSM BMPs to control stormwater runoff, attenuate peak flow rate and volume, and provide infiltration. Excess stormwater runoff will be directed to the berms, basin and subsurface beds, via a series of channels, for infiltration and controlled discharge. BMP design calculations and drawings are provided in Attachment 4 and PCSM Plan set. For these calculations, Test Pit 202, Test Pit 203, Test Pit 204, Test Pit 206, Test Pit 207, Test Pit 208 and Test Pit 209 were selected and used for design criteria. See Attachment 3 for the specific infiltration data. Many of these test pits exhibited infiltration rates exceeding 10" per hour. Therefore, each BMP will be constructed with a 24" layer of soil amendment

underlayment to mitigate excessive dewatering times and to provide additional water quality. A summary of the PCSM BMP design criteria is below.

*MLV-505LD86: Test Pit Data*

| Test Pits                                 |            |            |            |            |            |
|-------------------------------------------|------------|------------|------------|------------|------------|
|                                           | TP 206     | TP 207     | TP 204     | TP 202     | TP 203     |
| Existing Ground Elevation (ft)            | 964.23     | 964.51     | 913.93     | 926.17     | 924.38     |
| Elevation of Confining Layer (ft)         | None Found | None Found | None Found | None Found | None Found |
| Depth to Confining Layer (in)             | >52"       | >52"       | >46"       | >36"       | >47"       |
| Lowest Observed Infiltration Rate (in/hr) | >18        | >18        | 12.38      | 11.63      | >18        |

*MLV-505LD86: Design Criteria*

| PCSM BMP                                      |                                       |                                          |                                            |                                            |                                      |
|-----------------------------------------------|---------------------------------------|------------------------------------------|--------------------------------------------|--------------------------------------------|--------------------------------------|
|                                               | Infiltration Berm 1<br>(TP 206 & 207) | Infiltration Berm 2<br>(TP 206 & TP 207) | Subsurface Infiltration Bed #1<br>(TP 204) | Subsurface Infiltration Bed #2<br>(TP 204) | Infiltration Basin<br>(TP 202 & 203) |
| Minimum Final Grade (ft)                      | 969                                   | 963                                      | 912                                        | 912                                        | 924.5                                |
| Interpreted Elevation of Confining Layer (ft) | <965.7                                | <960.2                                   | NA                                         | NA                                         | <920.5                               |
| Provided Separation (in)                      | >27 (No Confining Layer Found)        | >33 (No Confining Layer Found)           | >24 (No Confining Layer Found)             | >24 (No Confining Layer Found)             | >48 (No Confining Layer Found)       |
| Infiltration Rate Used (in/hr)                | 3                                     | 3                                        | 3                                          | 3                                          | 3                                    |

### **BMP Installation Sequence**

The PCSM BMPs should be installed in a manner designed to:

1. Protect BMP areas associated with infiltration from compaction prior to and during installation.
2. Maintain proper Erosion and Sediment Control Measures during construction.
3. As areas are completed, seed and mulch in accordance with the section below.

4. Do not remove Erosion and Sediment Control Measures until site is fully stabilized.
5. Install BMPs as follows:

Infiltration Berms\*

- a. Complete site grading and stabilize within the limit of disturbance except where the infiltration berms will be constructed. Make every effort to minimize berm footprint and necessary zone of disturbance (including both removal of exiting vegetation and disturbance of empty soil).
- b. Maintain Compost Filter Sock Sediment Trap #13 until infiltration berms are completed.
- c. Infiltration berm construction should begin with the construction of Berm #2 and proceed in an upgradient manner to Berm #1.
- d. Lightly scarify the soil in the area of the proposed berm before placement of berm fill. Decompact subgrade as necessary to a depth of 2' if subgrade has been overcompacted.
- e. Utilize suitable fill material to make up the major portion of the berm. Soil should be added in 8-inch lifts and compacted after each addition according to design specifications. The slope and shape of the berm should be graded out as soil is added.
- f. Protect the surface ponding area at the base of the berm from compaction. If compaction of this area does occur, scarify the soil to a depth of at least 8 inches.
- g. Install soil amendment according to detail.
- h. Complete final grading of the berm after the top layer of soil is added. Tamp soil down lightly and smooth sides of the berm. The crest and base of the berm should be at level grade.
- i. Plant berm with turf, meadow plants, shrubs or trees, as desired.
- j. Mulch planted and disturbed areas with compost mulch to prevent erosion while plants become established.

- k. Following berm construction, remove Compost Filter Sock Sediment Trap #13 and establish PCSM Channel C-4 into the berm area.

#### Infiltration Basin

- a. Protect infiltration basin area from compaction prior to installation.
- b. Dewater sediment trap as necessary using pump water filter bags. Filter bags will be within the drainage area of existing perimeter compost filter sock.
- c. Remove sediment accumulated within the basin during its use as a sediment trap.
- d. Convert temporary sediment trap outlet control structure to the permanent outlet structure for the infiltration basin. Plug perforations using shrink-proof, water-proof sealant.
- e. Install soil amendment according to detail.
- f. Do not remove inlet protection or other erosion and sediment control measures until site is fully stabilized.

#### Subsurface Infiltration Bed\*

- a. Protect infiltration bed area from compaction prior to installation.
- b. Excavate infiltration beds and install soil amendment according to the detail.
- c. Install upstream and downstream control structures, cleanouts, perforated piping, and all other necessary stormwater structures.
- d. Install geotextile in accordance with the manufacturer's standards and recommendations.
- e. Clean-washed, uniformly graded aggregate should be placed in the bed in maximum 8-inch lifts. Lightly compact each layer, keeping construction equipment off the bed bottom as much as possible.

#### Channels/culverts\*

- a. Construct PCSM Channels C-5 and C-6 as shown in the plan.
- b. Stabilize the channels with specified channel linings.
- c. Install culverts as shown on the plan.



6. Sediment that enters BMPs during construction is to be removed within 24 hours.
7. Seed and stabilize remaining topsoil as per Seeding and Mulching section below.
8. Follow long term operation and maintenance guidelines discussed below.

*\*Portions of the BMP installation sequence denoted with an asterisk (\*) above are critical stages as discussed on this sheet.*

### **PCSM Critical Stages**

Critical points requiring visits by the licensed professional or delegate are as follows:

1. Prior to construction to ensure the areas of the infiltration berms, infiltration basin and subsurface infiltration beds have been properly secured with fencing or other methods to prevent compaction of the infiltration areas.
2. For the final grading of the access road, ensuring it is constructed according to the plan details for proper conveyance of runoff.
3. Following final grading and stabilization of the channels in order to confirm they have been constructed according to the plan details for proper collection and conveyance of runoff. Periodic assessments will need to be made to ensure accumulated sediment have been cleaned out, so the channels maintain the necessary design volumes.
4. At the start of construction of the infiltration berms, infiltration basin and subsurface infiltration beds to ascertain the infiltration areas have not been compacted.
5. During the layout and excavation of the outlet control structures for the infiltration basin and beds, the professional or delegate will ensure sizing, materials specifications, and construction procedures are followed to enable proper storage in the basin.
6. Following final grading and seeding of the infiltration berms, infiltration basin and subsurface infiltration beds in order to confirm they have been constructed according to the plan details for proper collection, infiltration, and conveyance of runoff. Periodic assessment will need to be made to ensure that accumulated sediment have been cleaned out so the BMPs maintain the necessary design volumes.
7. For final inspection of constructed channels, culverts, infiltration berms, infiltration basin and subsurface infiltration beds.
8. At the establishment of hard surface stabilization or 70% vegetation covers to allow removal of E&S controls.

## 7. Net Change in Volume and Rate of Runoff

An analysis of pre- and post-development stormwater runoff was performed for the proposed MLV site associated with the Effort Loop Pipeline. The installation of the valve and associated access road will increase the volume of stormwater runoff between the pre and post development 2 year rain event due to the increase in the type and size of the impervious area. The increase in impervious area will increase the pre to post development peak runoff for the 1-, 2-, 10-, 25-, 50-, and 100-year storm events. Design calculations using HydroCAD software are included in Attachment 4. Refer to the Post-Construction Stormwater Management (PCSM) Plan drawings for additional information.

### 7.1. MLV-505LD86

*Pre- and Post-Construction Stormwater Volume for 2-yr Rainfall event*

| Pre-construction (cf) | Post-construction before BMPs (cf) | Post-construction after BMPs (cf) | Net (cf) |
|-----------------------|------------------------------------|-----------------------------------|----------|
| 14,876                | 17,783                             | 12,329                            | -2,547   |

*DA-1: Pre-Construction Peak Discharge Rates (cfs)*

| 1-year | 2-year | 10-year | 25-year | 50-year | 100-year |
|--------|--------|---------|---------|---------|----------|
| 0.00   | 0.01   | 0.15    | 0.83    | 2.00    | 3.90     |

*DA-1: Post-Construction Peak Discharge Rates (cfs)*

| 1-year | 2-year | 10-year | 25-year | 50-year | 100-year |
|--------|--------|---------|---------|---------|----------|
| 0.02   | 0.07   | 1.36    | 3.57    | 6.23    | 10.01    |

*DA-1: Post-Construction w/ BMPs Peak Discharge Rates (cfs)*

| 1-year | 2-year | 10-year | 25-year | 50-year | 100-year |
|--------|--------|---------|---------|---------|----------|
| 0.00   | 0.00   | 0.13    | 0.64    | 1.54    | 3.58     |

*DA-1: Difference between Pre-Construction and Post-Construction w/ BMPs*

|                | 1-year | 2-year | 10-year | 25-year | 50-year | 100-year |
|----------------|--------|--------|---------|---------|---------|----------|
| NET Difference | -0.00  | -0.01  | -0.02   | -0.19   | -0.46   | -0.32    |

*DA-2: Pre-Construction Peak Discharge Rates(cfs)*

| 1-year | 2-year | 10-year | 25-year | 50-year | 100-year |
|--------|--------|---------|---------|---------|----------|
| 0.38   | 0.93   | 3.22    | 5.40    | 7.61    | 10.45    |

*DA-2: Post-Construction Peak Discharge Rates (cfs)*

| 1-year | 2-year | 10-year | 25-year | 50-year | 100-year |
|--------|--------|---------|---------|---------|----------|
| 1.06   | 1.76   | 4.01    | 5.91    | 7.75    | 10.03    |

*DA-2: Post-Construction w/ BMPs Peak Discharge Rates (cfs)*

| 1-year | 2-year | 10-year | 25-year | 50-year | 100-year |
|--------|--------|---------|---------|---------|----------|
| 0.27   | 0.39   | 1.80    | 4.28    | 5.94    | 7.82     |

DA-2: Difference between Pre-Construction and Post-Construction w/ BMPs

|                | 1-year | 2-year | 10-year | 25-year | 50-year | 100-year |
|----------------|--------|--------|---------|---------|---------|----------|
| NET Difference | -0.11  | -0.54  | -1.42   | -1.12   | -1.67   | -2.63    |

DA-3: Pre-Construction Peak Discharge Rates(cfs)

| 1-year | 2-year | 10-year | 25-year | 50-year | 100-year |
|--------|--------|---------|---------|---------|----------|
| 0.00   | 0.00   | 0.05    | 0.33    | 1.25    | 3.12     |

DA-3: Post-Construction Peak Discharge Rates (cfs)

| 1-year | 2-year | 10-year | 25-year | 50-year | 100-year |
|--------|--------|---------|---------|---------|----------|
| 0.00   | 0.00   | 0.05    | 0.33    | 1.25    | 3.12     |

## 8. Temporary and Permanent Stabilization

Appropriate seed mixtures for temporary and permanent stabilization are outlined on the notes sheet of the plan drawings.

### 8.1. Permanent Stabilization

Upon final completion of an earth disturbance activity or stage or phase of an activity, the site shall immediately have topsoil restored, replaced, or amended, seeded, mulched or otherwise permanently stabilized and protected from accelerated erosion and sedimentation. E&S BMPs shall be implemented and maintained until the permanent stabilization is completed. Once permanent stabilization has been established, the temporary E&S BMPs shall be removed. Areas disturbed in the act of removing temporary E&S BMPs shall be permanently stabilized upon completion of the temporary E&S BMP removal activity. For an earth disturbance activity or stage or phase of an activity to be considered permanently stabilized, the disturbed areas shall be covered with one of the following:

- A minimum uniform 70% perennial vegetative cover, with a density capable of resisting accelerated erosion and sedimentation.
- An acceptable BMP which permanently minimizes accelerated erosion and sedimentation.
- When erosion and sedimentation controls are to be removed in agricultural non-sensitive areas (streams/wetlands), agricultural landowners shall maintain agricultural BMPs per PaDEP regulations.

## **8.2. Temporary Stabilization**

Upon temporary cessation of an earth disturbance activity or stage or phase of an activity where a cessation of earth disturbance activities will exceed 4 days (including agricultural areas), the site shall be immediately seeded, mulched, or otherwise protected from accelerated erosion and sedimentation pending future earth disturbance activities. For an earth disturbance activity or stage or phase of an activity to be considered temporarily stabilized, the disturbed areas shall be covered with one of the following:

- A minimum uniform coverage of mulch and seed, with a density capable of resisting accelerated erosion and sedimentation.
- An acceptable BMP which temporarily minimizes accelerated erosion and sedimentation.

## **8.3. Stabilization During Non-Growing Season**

When utility construction must be done and is completed during a non-growing season, interim stabilization BMPs must be implemented and adequately maintained. The application of straw mulch at the rate of 3.0 tons per acre is required. The BMPs should be inspected weekly (unless snow covered) and after each runoff event to identify areas that become bare. Temporary erosion and sediment pollution controls must be maintained.

## **9. Long Term Operation and Maintenance Schedule**

PCSM BMPs should be properly maintained to ensure their effectiveness. Transcontinental Gas Pipe Line Company, LLC will be responsible for the long-term operation and maintenance of the PCSM BMPs proposed at MLV-505LD86. Sheet flow conditions and infiltration must be sustained throughout the life of the BMP. BMPs should be inspected for clogging from sediment or debris, damage by foot or vehicular traffic, and flow channelization. Inspections should be made on a quarterly basis for the first two years following installation, and then twice per year thereafter. Inspections should also be made after every storm event greater than 1 inch during the establishment period.

Channel linings should be inspected for signs of erosion or dislodging, as applicable. Channels should be inspected for debris, overgrown vegetation, and other blockages. Channels should be cleaned whenever total channel depth is reduced by 25% at location. Vegetated areas will be inspected weekly and after runoff events until permanent vegetation is achieved. Once the vegetation is established, inspections of health, diversity, and density should be performed at

least twice per year, during both the growing and non-growing season. Vegetative cover should be sustained at 85% and reestablished if damage greater than 50% is observed. Damaged BMPs will be repaired as soon as possible upon discovery. Repairs will be made to restore to BMPs to the original design condition.

Operation and maintenance guidelines should be provided to facility owners and tenants. Sediment and debris should be routinely removed upon observation. If erosion is observed, measures should be taken to improve the dispersion method to address the source of erosion. Sediment should be removed when the BMP is thoroughly dry. Trash and debris removed from the site should be deposited only at suitable disposal/recycling sites and must comply with applicable local, state, and federal waste regulations. Grass cover should be mowed with low ground pressure equipment annually to control noxious weeds. Mowing should be done only when the soil is dry in order to prevent tracking damage to vegetation, soil compaction, and flow concentrations. If vegetative cover is not fully established within the designated time, it should be replaced with an alternative species. Unwanted or invasive growth should be removed on an annual basis.

Vegetated areas will be inspected weekly and after runoff events until permanent vegetation is achieved. Once the vegetation is established, inspections of health, diversity, and density should be performed at least twice per year, during both the growing and non-growing season. Vegetative cover should be sustained at 85% and reestablished if damage greater than 50% is observed. Damaged BMPs will be repaired as soon as possible upon discovery. Repairs will be made to restore damaged BMPs to the original design condition.

Maintenance activities on the infiltration berms, infiltration beds and basin should be done twice annually and within 72 hours after every major storm event (> 1-inch rainfall depth). Erosion problems, damage to vegetation, sediment and debris accumulation, uniformity of in cross-section and pools of standing water should be inspected.

Transcontinental Gas Pipe Line Company, LLC will be responsible for the long term operation and maintenance of the post-construction stormwater management facilities proposed at the site.

## **10. Recycling and Disposal of Materials**

The restoration of the pipeline right-of-way will require the removal of the temporary materials. The temporary materials include, but may not be limited to, stone surfaces and

associated geotextiles. The contractors are required to dispose of the materials at suitable disposal or recycling sites and in compliance with local, state and federal regulations.

Contractors are required to inventory and manage their construction site materials. The goal is to be aware of the materials on-site, ensure they are properly maintained, used, and disposed of, and to make sure the materials are not exposed to stormwater. The following materials or substances are expected to be present on-site during construction (Note: this list is not an all-inclusive list and the materials management plan can be modified to address additional materials used on-site):

- Acids
- Detergents
- Fertilizers (nitrogen/phosphorus)
- Hydroseeding mixtures
- Petroleum based products
- Sanitary wastes
- Soil stabilization additives
- Solder
- Solvents

These materials must be stored as appropriate and shall not contact storm or non-stormwater discharges. Contractor shall provide a weatherproof container to store chemicals or erodible substances that must be kept on the site. Contractor is responsible for reading, maintaining, and making employees and subcontractors aware of Safety Data Sheets (SDSs).

## **11. Thermal Impacts**

Due to the overall nature of the Project, thermal impacts to surface waters are not anticipated. The pipeline installation activities will primarily take place within an existing cleared and maintained pipeline right-of-way. There will be no increase in stormwater discharge. The primary means to address thermal impacts on this Project is to limit the size and duration of exposed earth. Revegetation procedures and the Sequence of Construction outline disturbed areas being immediately revegetated.

Stormwater runoff associated with the installation of the MLV will be routed through the stormwater BMPs designed to retain and infiltrate the first surge of water from the site. The first surge of water will be the warmest water for the duration of the storm event and will quickly cool as the storm event progresses. The BMPs are designed to capture and infiltrate this warmest surge of stormwater. Based on routing calculations, stormwater is not discharged from the BMPs

for the first 12 hours during a 100-year/24-hour storm event. The retention period is longer for less intense storms. Therefore, as a result of these measures, no significant thermal impact to the receiving waters is anticipated.

## **12. Antidegradation Requirements**

Transco evaluated the feasibility of non-discharge alternatives that would be located outside of exceptional value (EV) or high-quality (HQ) watersheds. Hydraulic models were analyzed from an efficiency and effectiveness point of view to confirm and minimize the necessary pipeline lengths and diameters to meet the Project purpose and need. The hydraulic model determined the sizing of the MLV-505LD86 site on the Effort Loop Pipeline. In order for the Project to meet the required purpose and need, siting the Effort Loop Pipeline outside of EV and HQ watersheds, is not feasible.

Therefore, Transco determined that there are no cost-effective and environmental sound viable non-discharge alternatives for the project. Transco has minimized project impacts to EV and HQ watersheds through the use of co-location with existing pipelines and protecting riparian buffers within the project workspace. Earth disturbance will be minimized to the extent practical and will be phased or sequenced to only disturbed portions that are necessary for the specific scope of work. Wherever possible, the LOD was decreased to avoid disturbing additional ground and will be kept to the minimum width and depth necessary to safely complete construction activities.

Anti-Degradation Best Available Combination of Technologies (ABACT) standards have been proposed for the MLV-505LD86 site because there are no viable non-discharge alternatives. The Erosion and Sediment Control Plan prepared for the Project outlines a more stringent design and E&S BMPs that meet ABACT standards.

The MLV-505LD86 site will result in increased discharge of stormwater to surface waters which will be mitigated by the implementation of post-construction stormwater management (PCSM) BMPs. Proposed PCSM BMPs are designed with stormwater volume reduction and water quality treatment maximized to the extent practicable within the site constraints to maintain and protect existing water quality and existing and designated uses.

## **13. Riparian Buffers**

Temporary workspace associated with MLV-505LD86 is partially located within the forested riparian buffer of Sugar Hollow Creek. After completing construction activities, the area

will be restored to a herbaceous state, as the forested portion of the riparian buffer will not be replanted. This area is located within the line-of-sight for the valve setting permanent access road that joins Sugar Hollow Road, a state road, and must remain non-forested to maintain line-of-sight for PA Department of Transportation requirements to abate a substantial threat to public health or safety.

#### **14. Offsite Discharge Analysis**

The stormwater BMPs being constructed at the MLV-505LD86 site are in areas that will discharge stormwater to offsite non-surface water. These areas have been analyzed to reduce the likelihood that these discharges will be erosive to adjacent property owners. The analysis has been performed in accordance with PADEP Document 3150-FS-DEP4124, "Off-Site Discharges of Stormwaters to Areas That Are Not Surface Waters". The full analysis is presented in Attachment 6 – Offsite Discharge Report. A summary of the findings is presented below.

##### **14.1. MLV-505LD86**

The MLV-505LD86 Yard site utilizes two infiltration berms, an infiltration basin and two subsurface infiltration beds. A series of PCSM channels along the access road will direct stormwater to discharge locations on both the north and south sides of the access road. On the south side of the access road, stormwater from the PCSM channels enters Infiltration Berm 1, flows into Infiltration Berm 2 and discharges to a wooded area near the southeastern part of the MLV-505LD86 site. The remainder of PCSM channels direct stormwater water into two subsurface infiltration beds south of the access road and an infiltration basin that is north of the access road. The Infiltration Basin has an outlet that discharges into an 24" diameter pipe which directs stormwater to the Sugar Hollow Road ditch. Infiltration Bed #1 and Infiltration Bed #2 discharge below the access road and flow into the Sugar Hollow Road ditch. Stormwater from the Sugar Hollow Road ditch leaves the site via an 18" Sugar Hollow Road PennDOT culvert.

The infiltration berms discharge water as sheet flow which travels along a vegetative flow path, eventually entering Sugar Hollow Creek. The area downstream of the outfall is over 90% vegetated. In the E&S and PCSM Narrative, site calculations are provided that show the Pre- and Post-Construction runoff flow rates and volume. These calculations show a reduction in the post-construction discharge rates and volumes. Calculations indicated that the discharge velocity at the proposed Infiltration Berm 2 is 1.31 fps for the 25 year, 24-hour storm event. Since the outlet velocity is below 2.5 fps, downstream erosion will be minimal, if not negligible.



The infiltration basin discharges stormwater to a basin riser pipe outlet. Infiltration Bed #1 has a 4" outlet pipe and Infiltration Bed #2 has a 6" outlet pipe which discharge upgradient of the Sugar Hollow Road ditch. The stormwater from these BMPs is discharged as sheet flow and travels along a vegetative flow path until it enters a Sugar Hollow Roadside ditch near the site entrance and then a PennDOT culvert south of the Limits of Disturbance. The area downstream of the outfall is over 90% vegetated. In the E&S and PCSM Narrative, site calculations are provided that show the Pre- and Post-Construction runoff flow rates and volume. These calculations show a reduction in the post-construction discharge rates and volumes. Calculations indicated that the discharge velocity at the proposed Infiltration Basin outlet is 0.0 feet per second for the for the 25 year, 24-hour storm event. The discharge velocity from subsurface Infiltration Bed #1 is 1.61 feet per second and the discharge velocity from Infiltration Bed #2 is 1.88 feet per second for the 25 year, 24-hour storm event. Since the outlet velocity is below 2.5 fps, downstream erosion will be minimal, if not negligible.

#### **15. Non-Structural and Structural Water Quality BMP Description**

Limit of disturbance will be minimized to the maximum extent possible by disturbing only those areas necessary to complete the proposed earthwork and BMP installations.

Sensitive features such as wetlands will be protected to the maximum extent possible. These areas will be clearly delineated in the field and protected prior to construction activities taking place. Existing vegetation is not to be removed from the protected area and the areas shall not be subject to grading or movement of existing soils. Protected areas that have been disturbed/compacted during construction will be restored using soil amendment and restoration.

Disturbed areas that are not proposed to be impervious will be revegetated as per the seeding and mulching notes provided in PCSM plan notes. Disturbed areas that are not proposed to be impervious will be revegetated as per the seeding and mulching notes provided in PCSM plan notes. Wherever possible, existing natural drainage patterns will be utilized to divert flow to the proposed BMPs.

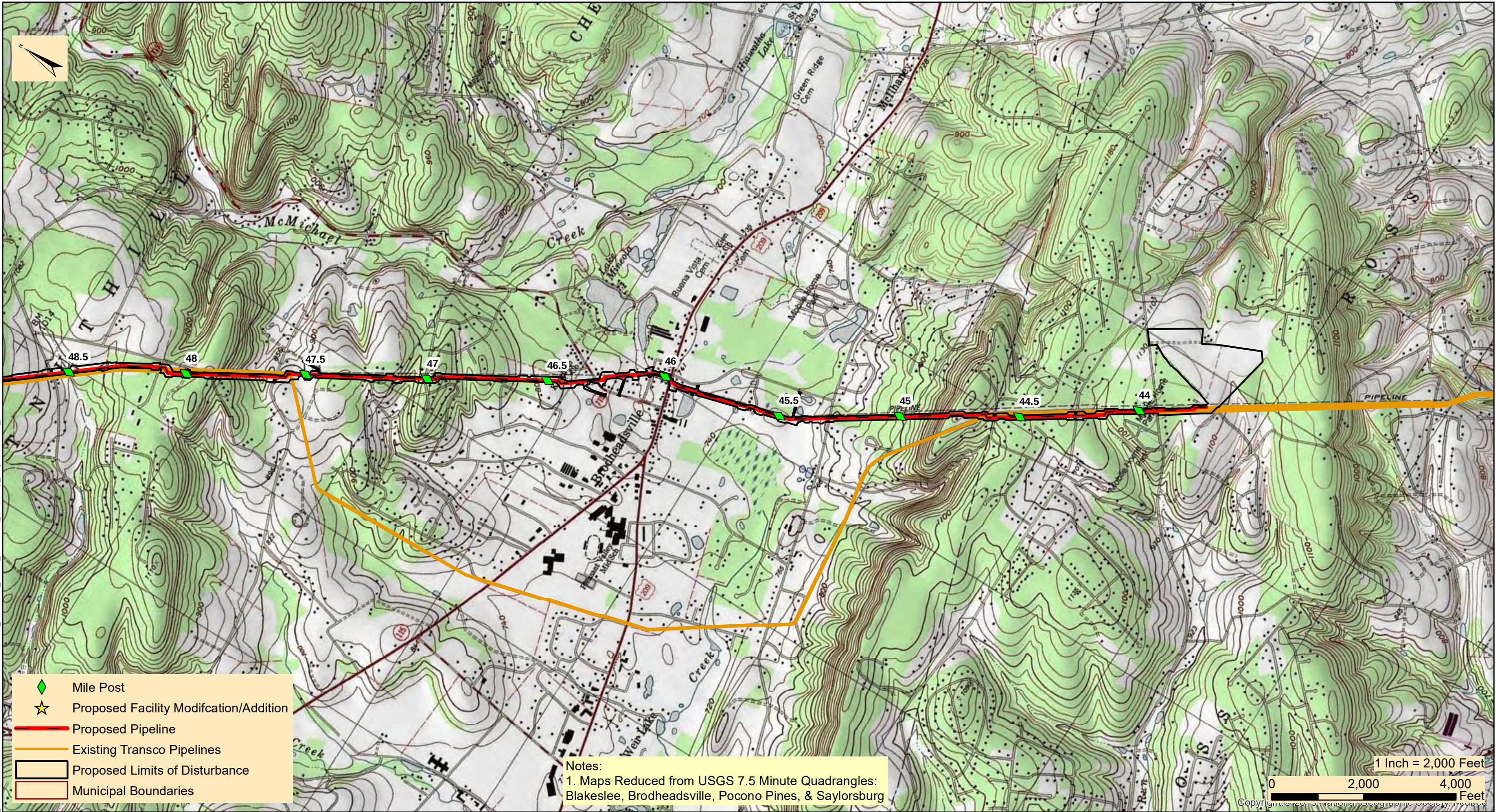
#### **16. The PCSM Plan Shall be Prepared by a Person Trained and Experienced in PCSM Methods and Techniques**

These plans and narrative were prepared by Patrick Wozinski, PE (BAI Group, LLC) of State College, PA in accordance with the Pennsylvania Department of Environmental Protection Stormwater BMP Manual, December 2006. Plan preparer's resume is provided in Attachment C of the ESCP permit package.

ATTACHMENT 1  
PROJECT LOCATION MAPS



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**TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC**  
**REGIONAL ENERGY ACCESS EXPANSION PROJECT**  
**PROPOSED 42" LEIDY D EFFORT LOOP**

**PROJECT LOCATION MAP**

CHESTNUT HILL & ROSS TOWNSHIP

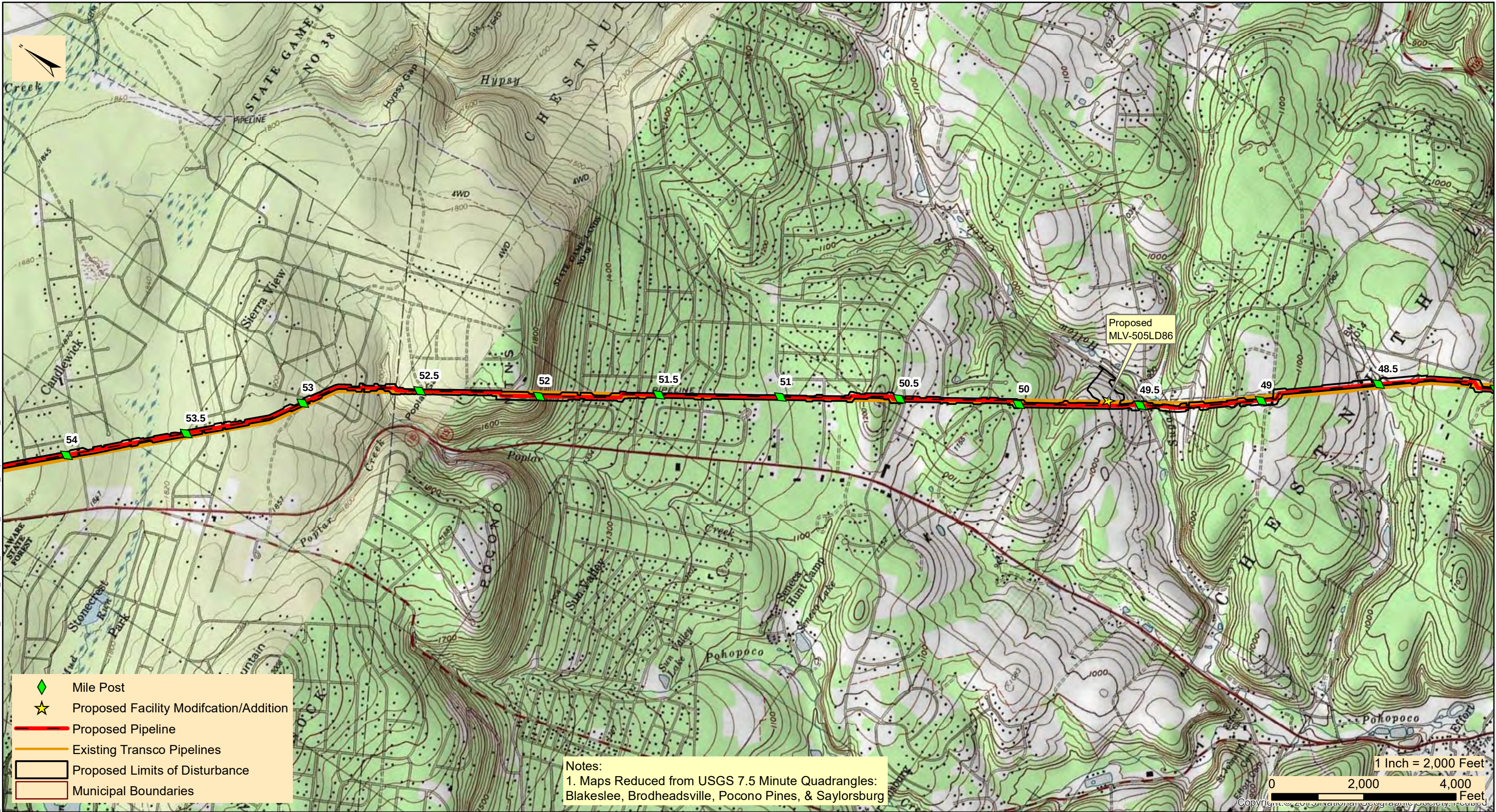
MONROE COUNTY

PENNSYLVANIA

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| Date:          | 2/10/2022 |
| Drawn By:      | FTN       |
| Figure Number: | EL-1      |



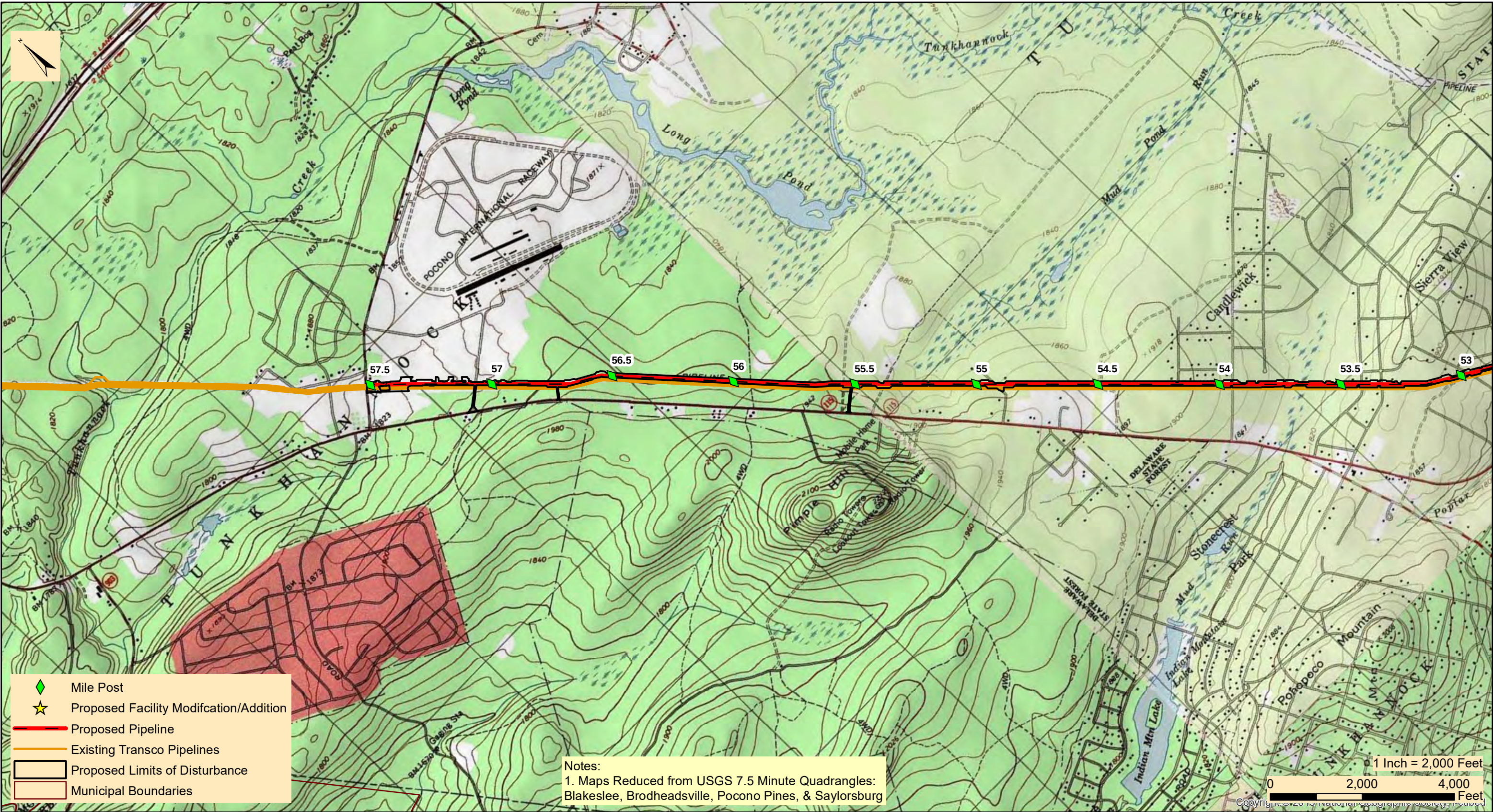
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|  |                                                                                                                                                                                 |              |                        |
|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------|
|  | <b>TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC</b><br><b>REGIONAL ENERGY ACCESS EXPANSION PROJECT</b><br><b>PROPOSED 42" LEIDY D EFFORT LOOP</b><br><b>PROJECT LOCATION MAP</b> |              | Date:<br>2/10/2022     |
|  | CHESTNUT HILL & TUNKHANNOCK TOWNSHIP                                                                                                                                            |              | Drawn By:<br>FTN       |
|  | MONROE COUNTY                                                                                                                                                                   |              | Figure Number:<br>EL-2 |
|  |                                                                                                                                                                                 | PENNSYLVANIA |                        |



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**TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC**  
**REGIONAL ENERGY ACCESS EXPANSION PROJECT**  
**PROPOSED 42" LEIDY D EFFORT LOOP**

**PROJECT LOCATION MAP**

TUNKHANNOCK TOWNSHIP

MONROE COUNTY

PENNSYLVANIA

|                |           |
|----------------|-----------|
| Date:          | 2/10/2022 |
| Drawn By:      | FTN       |
| Figure Number: | EL-3      |



ATTACHMENT 2  
SOILS MAP AND REPORT



United States  
Department of  
Agriculture

**NRCS**

Natural  
Resources  
Conservation  
Service

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

# Custom Soil Resource Report for **Monroe County, Pennsylvania**

**LOD**



February 18, 2021

# Preface

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Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist ([http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2\\_053951](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951)).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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# How Soil Surveys Are Made

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Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil



scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

## Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

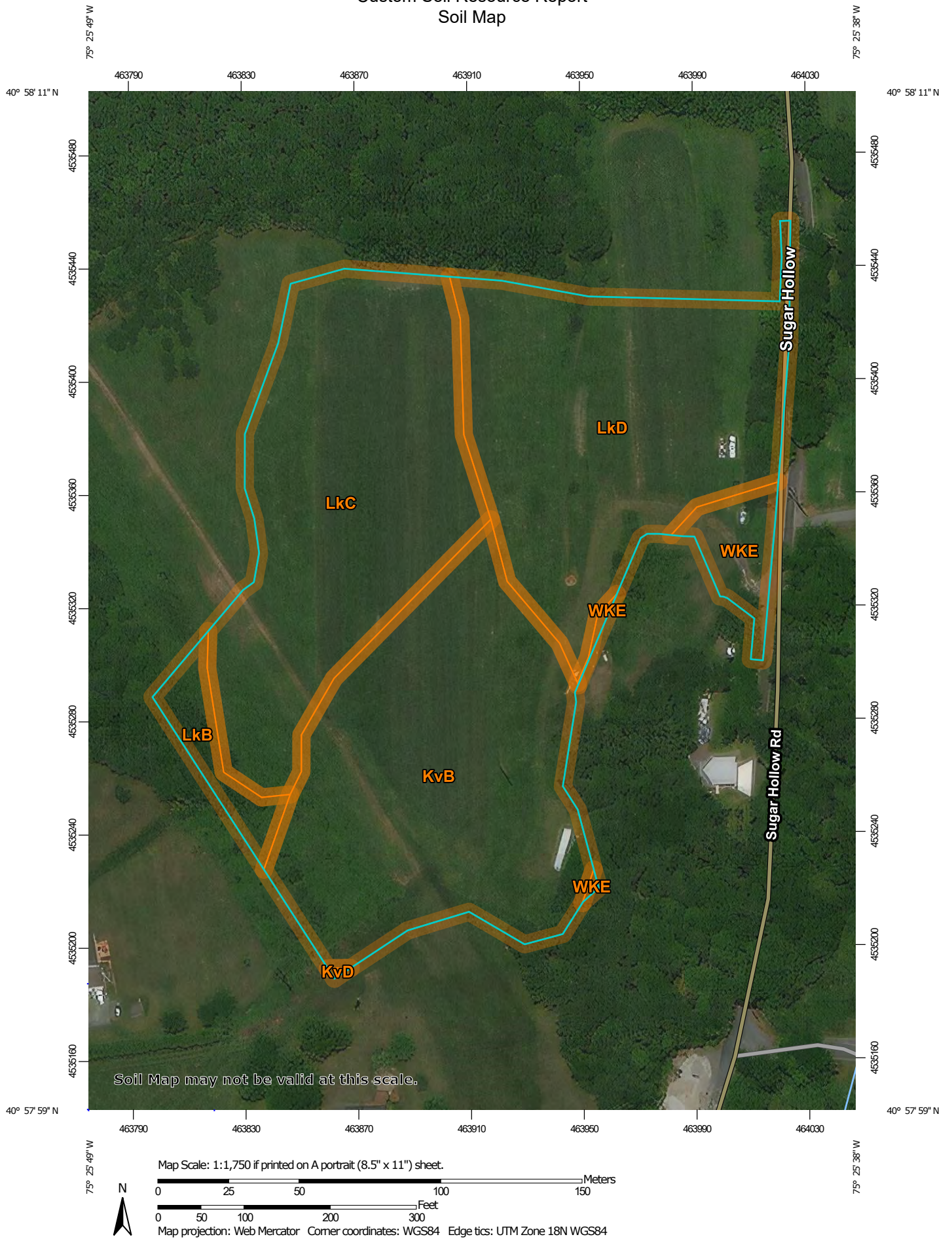
# Soil Map

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The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.



# Custom Soil Resource Report Soil Map



# Custom Soil Resource Report

## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features

 Blowout

 Borrow Pit

 Clay Spot

 Closed Depression

 Gravel Pit

 Gravelly Spot

 Landfill

 Lava Flow

 Marsh or swamp

 Mine or Quarry

 Miscellaneous Water

 Perennial Water

 Rock Outcrop

 Saline Spot

 Sandy Spot

 Severely Eroded Spot

 Sinkhole

 Slide or Slip

 Sodic Spot

 Spoil Area

 Stony Spot

 Very Stony Spot

 Wet Spot

 Other

 Special Line Features

### Water Features

 Streams and Canals

### Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Monroe County, Pennsylvania  
Survey Area Data: Version 15, Jun 5, 2020

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

Date(s) aerial images were photographed: Sep 20, 2010—Aug 28, 2016

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

## Map Unit Legend

| Map Unit Symbol                    | Map Unit Name                                           | Acres in AOI | Percent of AOI |
|------------------------------------|---------------------------------------------------------|--------------|----------------|
| KvB                                | Klinesville channery silt loam, 3 to 8 percent slopes   | 2.9          | 32.6%          |
| KvD                                | Klinesville channery silt loam, 15 to 25 percent slopes | 0.0          | 0.0%           |
| LkB                                | Leck kill channery silt loam, 2 to 8 percent slopes     | 0.3          | 3.0%           |
| LkC                                | Leck kill channery silt loam, 8 to 15 percent slopes    | 2.8          | 31.3%          |
| LkD                                | Leck kill channery silt loam, 15 to 25 percent slopes   | 2.6          | 29.8%          |
| WKE                                | Weikert and Klinesville soils, steep                    | 0.3          | 3.3%           |
| <b>Totals for Area of Interest</b> |                                                         | <b>8.8</b>   | <b>100.0%</b>  |

## Map Unit Descriptions

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

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

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

was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

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

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

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

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

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

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

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



## Monroe County, Pennsylvania

### KvB—Klinesville channery silt loam, 3 to 8 percent slopes

#### Map Unit Setting

*National map unit symbol:* 9ybb

*Elevation:* 300 to 1,300 feet

*Mean annual precipitation:* 36 to 50 inches

*Mean annual air temperature:* 46 to 57 degrees F

*Frost-free period:* 130 to 200 days

*Farmland classification:* Farmland of statewide importance

#### Map Unit Composition

*Klinesville, frost churned, and similar soils:* 100 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

#### Description of Klinesville, Frost Churned

##### Setting

*Landform:* Ridges, valleys

*Landform position (two-dimensional):* Backslope, shoulder

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Parent material:* Residuum weathered from siltstone

##### Typical profile

*H1 - 0 to 6 inches:* very channery silt loam

*H2 - 6 to 15 inches:* very channery silt loam

*H3 - 15 to 40 inches:* channers

*R - 40 to 44 inches:* unweathered bedrock

##### Properties and qualities

*Slope:* 3 to 8 percent

*Depth to restrictive feature:* 10 to 20 inches to lithic bedrock; 20 to 60 inches to lithic bedrock

*Drainage class:* Somewhat excessively drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water capacity:* Very low (about 1.3 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 3e

*Hydrologic Soil Group:* D

*Hydric soil rating:* No

## **KvD—Klinesville channery silt loam, 15 to 25 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* 9ybd  
*Elevation:* 300 to 1,300 feet  
*Mean annual precipitation:* 36 to 50 inches  
*Mean annual air temperature:* 46 to 57 degrees F  
*Frost-free period:* 130 to 200 days  
*Farmland classification:* Not prime farmland

### **Map Unit Composition**

*Klinesville, frost churned, and similar soils:* 100 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Klinesville, Frost Churned**

#### **Setting**

*Landform:* Valleys, ridges  
*Landform position (two-dimensional):* Backslope, shoulder  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Parent material:* Residuum weathered from siltstone

#### **Typical profile**

*H1 - 0 to 6 inches:* very channery silt loam  
*H2 - 6 to 15 inches:* very channery silt loam  
*H3 - 15 to 40 inches:* channers  
*R - 40 to 44 inches:* unweathered bedrock

#### **Properties and qualities**

*Slope:* 15 to 25 percent  
*Depth to restrictive feature:* 10 to 20 inches to lithic bedrock; 20 to 60 inches to lithic bedrock  
*Drainage class:* Somewhat excessively drained  
*Runoff class:* Medium  
*Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water capacity:* Very low (about 1.3 inches)

#### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 6e  
*Hydrologic Soil Group:* D  
*Hydric soil rating:* No

## **LkB—Leck kill channery silt loam, 2 to 8 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* 9ybq  
*Elevation:* 500 to 1,500 feet  
*Mean annual precipitation:* 38 to 46 inches  
*Mean annual air temperature:* 45 to 54 degrees F  
*Frost-free period:* 140 to 170 days  
*Farmland classification:* All areas are prime farmland

### **Map Unit Composition**

*Leck kill and similar soils:* 100 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Leck Kill**

#### **Setting**

*Landform:* Mountains  
*Landform position (two-dimensional):* Backslope  
*Landform position (three-dimensional):* Mountainflank  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Parent material:* Reddish residuum derived from sedimentary rock

#### **Typical profile**

*H1 - 0 to 10 inches:* channery silt loam  
*H2 - 10 to 27 inches:* channery silty clay loam  
*H3 - 27 to 48 inches:* very channery silt loam  
*R - 48 to 52 inches:* unweathered bedrock

#### **Properties and qualities**

*Slope:* 3 to 8 percent  
*Depth to restrictive feature:* 40 to 60 inches to lithic bedrock  
*Drainage class:* Well drained  
*Runoff class:* Low  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high  
(0.60 to 6.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water capacity:* Low (about 5.2 inches)

#### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 2e  
*Hydrologic Soil Group:* A  
*Hydric soil rating:* No

## **LkC—Leck kill channery silt loam, 8 to 15 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* 9ybr

*Elevation:* 500 to 1,500 feet

*Mean annual precipitation:* 38 to 46 inches

*Mean annual air temperature:* 45 to 54 degrees F

*Frost-free period:* 140 to 170 days

*Farmland classification:* Farmland of statewide importance

### **Map Unit Composition**

*Leck kill and similar soils:* 100 percent

*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Leck Kill**

#### **Setting**

*Landform:* Mountains

*Landform position (two-dimensional):* Backslope

*Landform position (three-dimensional):* Mountainflank

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Parent material:* Reddish residuum derived from sedimentary rock

#### **Typical profile**

*H1 - 0 to 10 inches:* channery silt loam

*H2 - 10 to 27 inches:* channery silty clay loam

*H3 - 27 to 48 inches:* very channery silt loam

*R - 48 to 52 inches:* unweathered bedrock

#### **Properties and qualities**

*Slope:* 8 to 15 percent

*Depth to restrictive feature:* 40 to 60 inches to lithic bedrock

*Drainage class:* Well drained

*Runoff class:* Low

*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high  
(0.60 to 6.00 in/hr)

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water capacity:* Low (about 5.2 inches)

#### **Interpretive groups**

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 3e

*Hydrologic Soil Group:* A

*Hydric soil rating:* No



## **LkD—Leck kill channery silt loam, 15 to 25 percent slopes**

### **Map Unit Setting**

*National map unit symbol:* 9ybs  
*Elevation:* 300 to 2,800 feet  
*Mean annual precipitation:* 34 to 50 inches  
*Mean annual air temperature:* 45 to 57 degrees F  
*Frost-free period:* 120 to 200 days  
*Farmland classification:* Not prime farmland

### **Map Unit Composition**

*Leck kill and similar soils:* 80 percent  
*Minor components:* 20 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### **Description of Leck Kill**

#### **Setting**

*Landform:* Hillslopes  
*Landform position (two-dimensional):* Summit  
*Landform position (three-dimensional):* Interfluve  
*Down-slope shape:* Linear, convex  
*Across-slope shape:* Convex, linear  
*Parent material:* Residuum weathered from shale and siltstone

#### **Typical profile**

*H1 - 0 to 10 inches:* channery silt loam  
*H2 - 10 to 43 inches:* channery silt loam  
*H3 - 43 to 58 inches:* very channery silt loam  
*R - 58 to 62 inches:* unweathered bedrock

#### **Properties and qualities**

*Slope:* 15 to 25 percent  
*Depth to restrictive feature:* 40 to 80 inches to lithic bedrock  
*Drainage class:* Well drained  
*Runoff class:* Medium  
*Capacity of the most limiting layer to transmit water (Ksat):* Moderately high to high  
(0.60 to 6.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water capacity:* Moderate (about 7.1 inches)

#### **Interpretive groups**

*Land capability classification (irrigated):* None specified  
*Land capability classification (nonirrigated):* 4e  
*Hydrologic Soil Group:* A  
*Hydric soil rating:* No

### Minor Components

#### Calvin

*Percent of map unit:* 10 percent  
*Hydric soil rating:* No

#### Klinesville

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

#### Meckesville

*Percent of map unit:* 5 percent  
*Landform:* Mountain valleys  
*Landform position (two-dimensional):* Footslope  
*Landform position (three-dimensional):* Lower third of mountain flank  
*Down-slope shape:* Concave  
*Across-slope shape:* Linear  
*Hydric soil rating:* No

## WKE—Weikert and Klinesville soils, steep

### Map Unit Setting

*National map unit symbol:* 9yd7  
*Elevation:* 300 to 2,800 feet  
*Mean annual precipitation:* 34 to 50 inches  
*Mean annual air temperature:* 45 to 57 degrees F  
*Frost-free period:* 120 to 200 days  
*Farmland classification:* Not prime farmland

### Map Unit Composition

*Weikert and similar soils:* 50 percent  
*Klinesville, frost churned, and similar soils:* 30 percent  
*Minor components:* 20 percent  
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Weikert

#### Setting

*Landform:* Hills  
*Landform position (two-dimensional):* Backslope, shoulder  
*Landform position (three-dimensional):* Side slope, crest  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Parent material:* Residuum weathered from shale and siltstone

#### Typical profile

*H1 - 0 to 6 inches:* very channery silt loam  
*H2 - 6 to 15 inches:* very channery silt loam  
*H3 - 15 to 45 inches:* channers  
*R - 45 to 49 inches:* unweathered bedrock

**Properties and qualities**

*Slope:* 25 to 80 percent  
*Depth to restrictive feature:* 10 to 20 inches to lithic bedrock; 40 to 60 inches to lithic bedrock  
*Drainage class:* Somewhat excessively drained  
*Runoff class:* Medium  
*Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water capacity:* Very low (about 1.2 inches)

**Interpretive groups**

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

**Description of Klinesville, Frost Churned**

**Setting**

*Landform:* Ridges, valleys  
*Landform position (two-dimensional):* Backslope, shoulder  
*Landform position (three-dimensional):* Side slope  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Parent material:* Residuum weathered from siltstone

**Typical profile**

*H1 - 0 to 6 inches:* very channery silt loam  
*H2 - 6 to 15 inches:* very channery silt loam  
*H3 - 15 to 45 inches:* channers  
*R - 45 to 49 inches:* unweathered bedrock

**Properties and qualities**

*Slope:* 25 to 80 percent  
*Depth to restrictive feature:* 10 to 20 inches to lithic bedrock; 20 to 60 inches to lithic bedrock  
*Drainage class:* Somewhat excessively drained  
*Runoff class:* Medium  
*Capacity of the most limiting layer to transmit water (Ksat):* High (2.00 to 6.00 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Available water capacity:* Very low (about 1.2 inches)

**Interpretive groups**

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

## Minor Components

### Hartleton

*Percent of map unit:* 8 percent

*Landform:* — error in exists on —

*Landform position (two-dimensional):* Shoulder, backslope

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear, concave

*Across-slope shape:* Linear, concave

*Hydric soil rating:* No

### Leck kill

*Percent of map unit:* 8 percent

*Landform:* Mountains

*Landform position (two-dimensional):* Backslope

*Landform position (three-dimensional):* Mountainflank

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Hydric soil rating:* No

### Meckesville

*Percent of map unit:* 4 percent

*Landform:* Mountain valleys

*Landform position (two-dimensional):* Footslope

*Landform position (three-dimensional):* Lower third of mountainflank

*Down-slope shape:* Concave

*Across-slope shape:* Linear

*Hydric soil rating:* No



# **Soil Information for All Uses**

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## **Soil Reports**

The Soil Reports section includes various formatted tabular and narrative reports (tables) containing data for each selected soil map unit and each component of each unit. No aggregation of data has occurred as is done in reports in the Soil Properties and Qualities and Suitabilities and Limitations sections.

The reports contain soil interpretive information as well as basic soil properties and qualities. A description of each report (table) is included.

## **AOI Inventory**

This folder contains a collection of tabular reports that present a variety of soil information. Included are various map unit description reports, special soil interpretation reports, and data summary reports.

## **Map Unit Description (Brief, Generated)**

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, provide information on the composition of map units and properties of their components.

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

The Map Unit Description (Brief, Generated) report displays a generated description of the major soils that occur in a map unit. Descriptions of non-soil (miscellaneous areas) and minor map unit components are not included. This description is generated from the underlying soil attribute data.

Additional information about the map units described in this report is available in other Soil Data Mart reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the Soil Data Mart reports define some of the properties included in the map unit descriptions.

## **Report—Map Unit Description (Brief, Generated)**

### **Monroe County, Pennsylvania**

**Map Unit:** KvB—Klinesville channery silt loam, 3 to 8 percent slopes

**Component:** Klinesville, frost churned (100%)

The Klinesville, frost churned component makes up 100 percent of the map unit. Slopes are 3 to 8 percent. This component is on ridges, valleys. The parent material consists of residuum weathered from siltstone. Depth to a root restrictive layer, bedrock, lithic, is 20 to 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

**Map Unit:** KvD—Klinesville channery silt loam, 15 to 25 percent slopes

**Component:** Klinesville, frost churned (100%)

The Klinesville, frost churned component makes up 100 percent of the map unit. Slopes are 15 to 25 percent. This component is on ridges, valleys. The parent material consists of residuum weathered from siltstone. Depth to a root restrictive layer, bedrock, lithic, is 20 to 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. Nonirrigated land capability classification is 6e. This soil does not meet hydric criteria.

**Map Unit:** LkB—Leck kill channery silt loam, 2 to 8 percent slopes

**Component:** Leck Kill (100%)

The Leck Kill component makes up 100 percent of the map unit. Slopes are 3 to 8 percent. This component is on mountainslopes mountains. The parent material consists of reddish residuum derived from sedimentary rock. Depth to a root restrictive layer, bedrock, lithic, is 40 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available

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water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 2e. This soil does not meet hydric criteria.

**Map Unit:** LkC—Leck kill channery silt loam, 8 to 15 percent slopes

**Component:** Leck Kill (100%)

The Leck Kill component makes up 100 percent of the map unit. Slopes are 8 to 15 percent. This component is on mountainslopes mountains. The parent material consists of reddish residuum derived from sedimentary rock. Depth to a root restrictive layer, bedrock, lithic, is 40 to 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 3 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

**Map Unit:** LkD—Leck kill channery silt loam, 15 to 25 percent slopes

**Component:** Leck Kill (80%)

The Leck Kill component makes up 80 percent of the map unit. Slopes are 15 to 25 percent. This component is on shale hillslopes. The parent material consists of residuum weathered from shale and siltstone. Depth to a root restrictive layer, bedrock, lithic, is 40 to 80 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches (or restricted depth) is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 4e. This soil does not meet hydric criteria.

**Component:** Calvin (10%)

Generated brief soil descriptions are created for major soil components. The Calvin soil is a minor component.

**Component:** Klinesville (5%)

Generated brief soil descriptions are created for major soil components. The Klinesville soil is a minor component.

**Component:** Meckesville (5%)

Generated brief soil descriptions are created for major soil components. The Meckesville soil is a minor component.

**Map Unit:** WKE—Weikert and Klinesville soils, steep

**Component:** Weikert (50%)

The Weikert component makes up 50 percent of the map unit. Slopes are 25 to 80 percent. This component is on hills. The parent material consists of residuum weathered from shale and siltstone. Depth to a root restrictive layer, bedrock, lithic, is 40 to 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

**Component:** Klinesville, frost churned (30%)

The Klinesville, frost churned component makes up 30 percent of the map unit. Slopes are 25 to 80 percent. This component is on ridges, valleys. The parent material consists of residuum weathered from siltstone. Depth to a root restrictive layer, bedrock, lithic, is 20 to 60 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches (or restricted depth) is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7e. This soil does not meet hydric criteria.

**Component:** Hartleton (8%)

Generated brief soil descriptions are created for major soil components. The Hartleton soil is a minor component.

**Component:** Leck Kill (8%)

Generated brief soil descriptions are created for major soil components. The Leck Kill soil is a minor component.

**Component:** Meckesville (4%)

Generated brief soil descriptions are created for major soil components. The Meckesville soil is a minor component.

## Water Features

This folder contains tabular reports that present soil hydrology information. The reports (tables) include all selected map units and components for each map unit.



Water Features include ponding frequency, flooding frequency, and depth to water table.

## Hydrologic Soil Group and Surface Runoff

This table gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

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

The four hydrologic soil groups are:

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

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

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

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

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

*Surface runoff* refers to the loss of water from an area by flow over the land surface. Surface runoff classes are based on slope, climate, and vegetative cover. The concept indicates relative runoff for very specific conditions. It is assumed that the surface of the soil is bare and that the retention of surface water resulting from irregularities in the ground surface is minimal. The classes are negligible, very low, low, medium, high, and very high.

## Report—Hydrologic Soil Group and Surface Runoff

Absence of an entry indicates that the data were not estimated. The dash indicates no documented presence.

| Hydrologic Soil Group and Surface Runoff—Monroe County, Pennsylvania |                  |                |                       |
|----------------------------------------------------------------------|------------------|----------------|-----------------------|
| Map symbol and soil name                                             | Pct. of map unit | Surface Runoff | Hydrologic Soil Group |
|                                                                      |                  |                |                       |

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| Hydrologic Soil Group and Surface Runoff—Monroe County, Pennsylvania |                  |                |                       |
|----------------------------------------------------------------------|------------------|----------------|-----------------------|
| Map symbol and soil name                                             | Pct. of map unit | Surface Runoff | Hydrologic Soil Group |
| KvB—Klinesville channery silt loam, 3 to 8 percent slopes            |                  |                |                       |
| Klinesville, frost churned                                           | 100              | Low            | D                     |
| KvD—Klinesville channery silt loam, 15 to 25 percent slopes          |                  |                |                       |
| Klinesville, frost churned                                           | 100              | Medium         | D                     |
| LkB—Leck kill channery silt loam, 2 to 8 percent slopes              |                  |                |                       |
| Leck kill                                                            | 100              | Low            | A                     |
| LkC—Leck kill channery silt loam, 8 to 15 percent slopes             |                  |                |                       |
| Leck kill                                                            | 100              | Low            | A                     |
| LkD—Leck kill channery silt loam, 15 to 25 percent slopes            |                  |                |                       |
| Leck kill                                                            | 80               | Medium         | A                     |
| WKE—Weikert and Klinesville soils, steep                             |                  |                |                       |
| Weikert                                                              | 50               | Medium         | D                     |
| Klinesville, frost churned                                           | 30               | Medium         | D                     |

# References

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- American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.
- American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.
- Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.
- Federal Register. July 13, 1994. Changes in hydric soils of the United States.
- Federal Register. September 18, 2002. Hydric soils of the United States.
- Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.
- National Research Council. 1995. Wetlands: Characteristics and boundaries.
- Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_054262](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262)
- Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053577](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577)
- Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053580](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580)
- Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.
- United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.
- United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2\\_053374](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374)
- United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. <http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084>

## Custom Soil Resource Report

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2\\_054242](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242)

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. [http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2\\_053624](http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624)

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. [http://www.nrcs.usda.gov/Internet/FSE\\_DOCUMENTS/nrcs142p2\\_052290.pdf](http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf)

ATTACHMENT 3  
INFILTRATION TEST REPORT





March 4, 2022

**TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC.  
A SUBSIDIARY OF THE WILLIAMS COMPANIES, INC.  
REGIONAL ENERGY ACCESS EXPANSION PROJECT  
MLV-505LD86 MAINLINE VALVE PROJECT**

**SITE EVALUATION AND SOIL INFILTRATION TEST REPORT**

**1.0 SITE SOILS**

Based upon mapping provided by the United States Department of Agriculture's Natural Resources Conservation Service (USDA NRCS) Web Soil Survey<sup>1</sup>, the project areas under consideration for infiltration best management practices (BMP) are underlain by the following soil series: Klinesville channery silt loam, 3 to 8 percent slopes (KvB), Klinesville channery silt loam, 8 to 15 percent slopes (KvC), Leck kill channery silt loam, 2 to 8 percent slopes (LkB), Leck kill channery silt loam, 8 to 15 percent slopes (LkC), Leck kill channery silt loam, 15 to 25 percent slopes (LkD), and Weikert and Klinesville soils, steep (WKE).

Klinesville silt loam, 3 to 8 percent slopes (KvB) soils consist of gently sloping, somewhat excessively drained soils found in valley backslopes and shoulders. The parent material is residuum weathered from siltstone. Bedrock is typically found at approximately 40 to 44 inches below ground surface (bgs). Depth to the water table generally found below 80 inches bgs and the available water capacity of KvB soils is very low.

Klinesville silt loam, 8 to 15 percent slopes (KvC) soils consist of gently sloping, somewhat excessively drained soils found in valley backslopes and shoulders. The parent material is residuum weathered from siltstone. Bedrock is typically found at approximately 40 to 44 inches bgs. Depth to the water table generally found below 80 inches and the available water capacity of KvC soils is very low.

Klinesville silt loam, 15 to 25 percent slopes (KvD) soils consist of gently sloping, somewhat excessively drained soils found in valley backslopes and shoulders. The parent material is residuum weathered from siltstone. Bedrock is typically found at approximately 40 to 44 inches bgs. Depth to the water table generally found below 80 inches and the available water capacity of KvD soils is very low.

Leck kill silt loam, 2 to 8 percent slopes (LkB) soils consist of gently sloping, well drained soils found in mountain backslopes. The parent material is reddish residuum derived from sedimentary rock. Bedrock is typically found at approximately 48 to 52 inches bgs. Depth to the water table generally found below 80 bgs and the available water capacity of LkC soils is low.

Leck kill silt loam, 8 to 15 percent slopes (LkC) soils consist of gently sloping, well drained soils found in mountain backslopes. The parent material is reddish residuum derived from sedimentary rock. Bedrock is typically found at approximately 48 to 52 inches bgs. Depth to the water table generally found below 80 inches and the available water capacity of LkC soils is low.

<sup>1</sup> <http://websoilsurvey.nrcs.usda.gov/app/>

Leck kill silt loam, 15 to 25 percent slopes (LkD) soils consist of gently sloping, well drained soils found in hillslope summits. The parent material is residuum weathered from siltstone and shale. Bedrock is typically found at approximately 58 to 62 inches bgs. Depth to the water table generally found below 80 inches bgs and the available water capacity of LkD soils is moderate.

The soil infiltration testing described in this report focused on KvB, KvC, KvD, LkB, LvC and LkD soils. These soils are anticipated as being the primary soils in the areas of possible BMPs.

## **2.0 FIELD INVESTIGATION AND TESTING METHODOLOGY**

BAI completed a total of 9 test pits and 18 double-ring infiltrometer tests, two infiltration tests per test pit. Locations were selected to be representative of the main soil series in the areas of potential infiltration BMPs. Figure 1 presents the locations of test pits and corresponding double-ring infiltrometer tests.

Nine test pits (TP 201 through TP 209) were opened using an excavator for soil characterization down to 48 inches bgs on November 16 and 17, 2020. Infiltration tests were also performed in test pits at 48 bgs deep to evaluate infiltration rates of shallow soils in the study area. The infiltration tests used double-ring infiltrometer (DRI) tests.

The DRI tests consisted of PVC rings. The PVC DRI had a nine-inch diameter outer ring (OR) and a six-inch diameter inner ring (IR) set two inches deep into the bottom of each test pit (approximately 48 inches bgs).

DRI tests were used to determine infiltration rates of shallow soils at various locations across the site. DRI testing was initiated by completing a one-hour pre-soak, which involved adding two inches of head to both the OR and IR. By noting the drop in head in each infiltrometer at 30-minute increments during the pre-soak, BAI determined whether a 10 or 30-minute testing interval for the infiltration tests would be used for DRI testing as per the Pennsylvania Stormwater Best Management Practices Manual (Document ID 363-0300-002) Appendix C.

Following the pre-soak, the test pits were refilled to a two-inch head level in both the IR and OR. Drop in head was measured from a fixed reference point in the IR every 10 or 30 minutes for the infiltration tests. The IR and OR were refilled following each reading. Results for DRI tests are discussed in Section 3.0.

## **3.0 FINDINGS AND CONCLUSIONS**

Based upon examination of each test pit, soils beneath the Site consist of brown (7.5YR 4/4) firm, heavy silt to a depth of at 12 inches bgs. At approximately 10 to 12 inches bgs, a brown (5YR 4/4) firm lean silt to lean clay. TP 203 and TP 206 through TP 209 encountered weathered and fractured bedrock beginning at 7 to 40 inches bgs.

No limiting zones were identified. As mentioned above, several test pits encountered fractured and weathered bedrock but not competent to be considered a limiting zone according to the Document ID 363-0300-002. The layer of lean silt to lean clay between 10 to 12 inches bgs was not observed to have redox features. Therefore it was not interpreted as being a limiting zone

and does not appear to impede the infiltration of stormwater. The following table summarizes the limiting zone investigation in each test pit.

| Limiting Zone Investigation Results |                    |                                |                  |                 |                  |
|-------------------------------------|--------------------|--------------------------------|------------------|-----------------|------------------|
| Test Pit                            | Elevation (MSL ft) | Seasonal High Water Table (in) | Water Table (in) | Bedrock (in)    | Total Depth (in) |
| TP 201                              | 925.74             | Not encountered                | Not encountered  | Not encountered | 48               |
| TP 202                              | 926.171            | Not encountered                | Not encountered  | Not encountered | 36               |
| TP 203                              | 924.379            | Not encountered                | Not encountered  | Not encountered | 47               |
| TP 204                              | 913.932            | Not encountered                | Not encountered  | Not encountered | 46               |
| TP 205                              | 914.136            | Not encountered                | Not encountered  | Not encountered | 48               |
| TP 206                              | 964.231            | Not encountered                | Not encountered  | Not encountered | 52               |
| TP 207                              | 964.509            | Not encountered                | Not encountered  | Not encountered | 52               |
| TP 208                              | 972.936            | Not encountered                | Not encountered  | Not encountered | 54               |
| TP 209                              | 972.785            | Not encountered                | Not encountered  | Not encountered | 49               |

DRI testing was completed within the same soil series in the locations of the potential BMP locations, however only the infiltration rates for TP 202, 203, 204, 206 and 207 were utilized. The following table summarizes the DRI readings for each test pit used for the proposed BMPs. Based on field observations, the infiltration testing was completed at an appropriate location in the soil profile and is representative to the BMP's infiltration elevation.

| Infiltration Testing Results |                   |                   |                        |                 |                 |                 |                 |                            |
|------------------------------|-------------------|-------------------|------------------------|-----------------|-----------------|-----------------|-----------------|----------------------------|
| Test pit                     | Infiltration Test | Testing Elevation | Reading Interval (min) | Reading 1 (in.) | Reading 2 (in.) | Reading 3 (in.) | Reading 4 (in.) | Infiltration Rate (in./hr) |
| TP 202*                      | IT 202A           | 923.34'           | 10                     | >3              | >3              | >3              | >3              | >18                        |
|                              | IT 202B           | 923.34'           | 10                     | 2.00            | 2.00            | 2.00            | 1.75            | 11.63                      |
| TP 203*                      | IT 203A           | 920.63'           | 10                     | >3              | >3              | >3              | >3              | >18                        |
|                              | IT 203B           | 920.63'           | 10                     | >3              | >3              | >3              | >3              | >18                        |
| TP 204**                     | IT 204A           | 910.26'           | 10                     | 2.25            | 2.00            | 2.00            | 2.00            | 12.38                      |
|                              | IT 204B           | 910.26'           | 10                     | >3              | >3              | >3              | >3              | >18                        |
| TP 206***                    | IT 206A           | 960.06'           | 10                     | >3              | >3              | >3              | >3              | >18                        |
|                              | IT 206B           | 960.06'           | 10                     | >3              | >3              | >3              | >3              | >18                        |
| TP 207                       | IT 207A           | 960.34'           | 10                     | >3              | >3              | >3              | >3              | >18                        |
|                              | IT 207B           | 960.34'           | 10                     | >3              | >3              | >3              | >3              | >18                        |

\* Bottom Elevation of Proposed BMP (Infiltration Basin 1) = 924.50'

\*\*Bottom Elevation of Proposed BMP (Infiltration Bed 1 and 2) = 912.00'

\*\*\*Bottom Elevation of Proposed BMP (Infiltration Berm 1) = 969.00'

\*\*\*\* Bottom Elevation of Proposed BMP (Infiltration Berm 2) = 963.00'

### TP 202

The infiltration rate for IT 202A was more than 18 iph with an average rate of more than 3 inches over the last four 10-minute infiltration readings. Infiltration test IT 202B had an infiltration rate of 11.63 iph with an average of 1.937 inches over the last four 10-minute infiltration readings.

***TP 203***

The infiltration rate for IT 203A more than 18 iph with an average rate of more than 3 inches over the last four 10-minute infiltration readings. Infiltration test IT 203B had an infiltration rate of more than 18 iph with an average rate of more than 3 inches over the last four 10-minute infiltration readings.

***TP 204***

The infiltration rate for IT 204A was 12.38 iph with an average rate of 2.063 inches over the last four 10-minute infiltration readings. Infiltration test IT 204B had more than 18 iph with an average rate of more than 3 inches over the last four 10-minute infiltration readings.

***TP 206***

The infiltration rate for IT 206A was more than 18 iph with an average rate of more than 3 inches over the last four 10-minute infiltration readings. Infiltration test IT 206B had an infiltration rate more than 18 iph with an average rate of more than 3 inches over the last four 10-minute infiltration readings.

***TP 207***

The infiltration rate for IT 207A was more than 18 iph with an average rate of more than 3 inches over the last four 10-minute infiltration readings. Infiltration test IT 207B had an infiltration rate of more than 18 iph with an average rate of more than 3 inches over the last four 10-minute infiltration readings.

**4.0 REFERENCES**

Pennsylvania Department of Environmental Protection. "Pennsylvania Stormwater Best Management Practices Manual" Document No. 363-0300-02, December 2006.

"Web Soil Survey - Home." Web Soil Survey - Home. United States Department of Agriculture, 6 Dec. 2013. Web. 23 December 2020. <<http://websoilsurvey.nrcs.usda.gov/app/>>.





**PLAN NOTE**

EACH INFILTRATION TEST LOCATION INDICATED WILL HAVE TWO INFILTRATION TESTS PERFORMED AT EACH DEPTH SELECTED BASED ON THE TST PIT OBSERVATIONS OF LIMITING ZONES AND/OR DEPTH OF THE BASE OF THE ANTICIPATED PCSM BMP AS RECOMMENDED IN APPENDIX C OF PADEP'S BMP MANUAL.

LEGEND

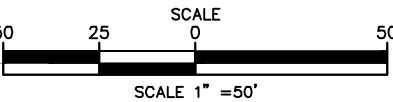
|  |                                            |  |                                         |
|--|--------------------------------------------|--|-----------------------------------------|
|  | TRENCH PLUG                                |  | EXISTING UTILITY POLE / TOWER           |
|  | DIVERSION CHANNEL                          |  | EXISTING VALVE                          |
|  | CLEAN WATER CROSSING                       |  | EXISTING CULVERT                        |
|  | PROPOSED PIPELINE                          |  | EXISTING ELECTRIC LINE                  |
|  | LIMITS OF DISTURBANCE                      |  | EXISTING UNDERGROUND ELECTRIC LINE      |
|  | APPROX. ENVIRONMENTAL STUDY LIMITS         |  | EXISTING GAS LINE                       |
|  | DELINEATED WETLAND                         |  | EXISTING WATER LINE                     |
|  | DELINEATED WATERWAY / STREAM (TOP OF BANK) |  | EXISTING SANITARY LINE                  |
|  | STREAM FLOW DIRECTION                      |  | EXISTING STORM SEWER                    |
|  | RIPIARIAN BUFFER                           |  | EXISTING TELEPHONE LINE                 |
|  | 50'/FEMA FLOODWAY                          |  | EXISTING FIBER OPTIC LINE               |
|  | FEMA 100-YEAR FLOODPLAIN                   |  | EXISTING UNDERGROUND CABLE LINE         |
|  | SOIL BOUNDARY / TYPE                       |  | EXISTING STORM INLET                    |
|  | EXISTING TREE LINE / TREE/SHRUB            |  | EXISTING SANITARY MANHOLE               |
|  | PROPERTY LINE                              |  | EXISTING COMMUNICATION/ELECTRIC MANHOLE |
|  | EXISTING FENCE                             |  | EXISTING FIRE HYDRANT                   |
|  | PROPOSED FENCE                             |  | EXISTING POWER POLE                     |
|  | EXISTING LEIDY / TGPL PIPELINES            |  | TEST PIT NOT USED FOR BMP DESIGN        |
|  | EXISTING FOREIGN PIPELINES                 |  | INFILTRATION TEST USED FOR BMP DESIGN   |

SOIL LEGEND

|     |                                                       |
|-----|-------------------------------------------------------|
| LMB | LECK KILL CHANNERY SILT LOAM, 2 TO 8 PERCENT SLOPES   |
| LKC | LECK KILL CHANNERY SILT LOAM, 8 TO 15 PERCENT SLOPES  |
| KVB | KUNESVILLE CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES  |
| KVC | KUNESVILLE CHANNERY SILT LOAM, 8 TO 15 PERCENT SLOPES |
| WKE | WEIKERT AND KUNESVILLE SOILS, STEEP                   |

EXISTING CONDITION NOTES/SOURCES

- EXISTING ROADWAYS, CONTOURS, PROPERTY LINE, TREE LINE, ETC. ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN MARCH 2019 AND 2020.
- PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
- PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
- STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WHM CONSULTING FROM MARCH 2020 TO OCTOBER 2020.
- DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD86, ELEVATION MSL, DERIVED FROM GPS OBSERVATION.



|                          |                |     |                                               |  |          |      |      |                                                    |                |                 |                 |                                                                                       |
|--------------------------|----------------|-----|-----------------------------------------------|--|----------|------|------|----------------------------------------------------|----------------|-----------------|-----------------|---------------------------------------------------------------------------------------|
| PATRICK A. WOZNICK, P.E. |                |     | REVISIONS                                     |  |          |      |      | TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC        |                |                 |                 |  |
| NO.                      | DATE           | BY  | DESCRIPTION                                   |  | W.O. NO. | CHK. | APP. | REGIONAL ENERGY ACCESS PROJECT -                   |                |                 |                 |                                                                                       |
|                          |                |     |                                               |  |          |      |      | MLV-505LD86 MAINLINE VALVE YARD                    |                |                 |                 |                                                                                       |
| 1                        | 03/01/22       | RWS | RESPONSE TO PADEP TECHNICAL DEFICIENCY LETTER |  |          |      |      | SOIL TEST PIT LOCATIONS                            |                |                 |                 |                                                                                       |
|                          |                |     |                                               |  |          |      |      | EXISTING CONDITIONS PLAN                           |                |                 |                 |                                                                                       |
|                          |                |     |                                               |  |          |      |      | CHESTNUTHILL TOWNSHIP, MONROE COUNTY, PENNSYLVANIA |                |                 |                 |                                                                                       |
|                          |                |     |                                               |  |          |      |      |                                                    |                |                 |                 |                                                                                       |
|                          |                |     |                                               |  |          |      |      | DRAWN BY: RHM                                      | DATE: 03/31/21 | ISSUED FOR BID: | SCALE: 1" = 50' |                                                                                       |
|                          |                |     |                                               |  |          |      |      |                                                    |                |                 |                 |                                                                                       |
| APPROVED BY: PW          | DATE: 03/31/21 |     |                                               |  |          |      |      | DRAWING NUMBER: 26-1000-70-28-D                    | SHEET 1        |                 |                 |                                                                                       |
|                          |                |     |                                               |  |          |      |      |                                                    |                | WO: 1222837     | RID: 108        |                                                                                       |

PENNSYLVANIA PROFESSIONAL ENGINEER



ATTACHMENT 4  
PCSM PLAN BMP DESIGN WORKSHEETS  
AND CALCULATIONS

## **TABLE OF CONTENTS**

### **Attachment 4**

- 4.1 CN Table – MLV-505LD86
- 4.2 Stormwater BMP Manual Appendix D Worksheets – MLV-505LD86
- 4.3 BMP HydroCAD Reports – MLV-505LD86
- 4.4 Channel Design Worksheets – MLV-505LD86
- 4.5 Channel HydroCAD Reports – MLV-505LD86
- 4.6 Riprap Apron Worksheet – MLV-505LD86
- 4.7 BMP Erosion Control Blanket Reports – MLV-505LD86
- 4.8 Channel Erosion Control Blanket Reports – MLV-505LD86

ATTACHMENT 4.1  
CN TABLE –  
MLV-505LD86



**Table 2-2a** Runoff curve numbers for urban areas <sup>1/</sup>

| Cover description                                                                                                                         |                                               | Curve numbers for hydrologic soil group |    |    |    |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------|----|----|----|
| Cover type and hydrologic condition                                                                                                       | Average percent impervious area <sup>2/</sup> | A                                       | B  | C  | D  |
| <i>Fully developed urban areas (vegetation established)</i>                                                                               |                                               |                                         |    |    |    |
| Open space (lawns, parks, golf courses, cemeteries, etc.) <sup>3/</sup> :                                                                 |                                               |                                         |    |    |    |
| Poor condition (grass cover < 50%) .....                                                                                                  |                                               | 68                                      | 79 | 86 | 89 |
| Fair condition (grass cover 50% to 75%) .....                                                                                             |                                               | 49                                      | 69 | 79 | 84 |
| Good condition (grass cover > 75%) .....                                                                                                  |                                               | 39                                      | 61 | 74 | 80 |
| Impervious areas:                                                                                                                         |                                               |                                         |    |    |    |
| Paved parking lots, roofs, driveways, etc.<br>(excluding right-of-way) .....                                                              |                                               | 98                                      | 98 | 98 | 98 |
| Streets and roads:                                                                                                                        |                                               |                                         |    |    |    |
| Paved; curbs and storm sewers (excluding<br>right-of-way) .....                                                                           |                                               | 98                                      | 98 | 98 | 98 |
| Paved; open ditches (including right-of-way) .....                                                                                        |                                               | 83                                      | 89 | 92 | 93 |
| Gravel (including right-of-way) .....                                                                                                     |                                               | 76                                      | 85 | 89 | 91 |
| Dirt (including right-of-way) .....                                                                                                       |                                               | 72                                      | 82 | 87 | 89 |
| Western desert urban areas:                                                                                                               |                                               |                                         |    |    |    |
| Natural desert landscaping (pervious areas only) <sup>4/</sup> .....                                                                      |                                               | 63                                      | 77 | 85 | 88 |
| Artificial desert landscaping (impervious weedbarrier,<br>desert shrub with 1- to 2-inch sand or gravel mulch<br>and basin borders) ..... |                                               | 96                                      | 96 | 96 | 96 |
| Urban districts:                                                                                                                          |                                               |                                         |    |    |    |
| Commercial and business .....                                                                                                             | 85                                            | 89                                      | 92 | 94 | 95 |
| Industrial .....                                                                                                                          | 72                                            | 81                                      | 88 | 91 | 93 |
| Residential districts by average lot size:                                                                                                |                                               |                                         |    |    |    |
| 1/8 acre or less (town houses) .....                                                                                                      | 65                                            | 77                                      | 85 | 90 | 92 |
| 1/4 acre .....                                                                                                                            | 38                                            | 61                                      | 75 | 83 | 87 |
| 1/3 acre .....                                                                                                                            | 30                                            | 57                                      | 72 | 81 | 86 |
| 1/2 acre .....                                                                                                                            | 25                                            | 54                                      | 70 | 80 | 85 |
| 1 acre .....                                                                                                                              | 20                                            | 51                                      | 68 | 79 | 84 |
| 2 acres .....                                                                                                                             | 12                                            | 46                                      | 65 | 77 | 82 |
| <i>Developing urban areas</i>                                                                                                             |                                               |                                         |    |    |    |
| Newly graded areas<br>(pervious areas only, no vegetation) <sup>5/</sup> .....                                                            |                                               |                                         |    |    |    |
|                                                                                                                                           |                                               | 77                                      | 86 | 91 | 94 |
| Idle lands (CN's are determined using cover types<br>similar to those in table 2-2c).                                                     |                                               |                                         |    |    |    |

<sup>1/</sup> Average runoff condition, and  $I_a = 0.2S$ .<sup>2/</sup> The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.<sup>3/</sup> CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.<sup>4/</sup> Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.<sup>5/</sup> Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

**Table 2-2b** Runoff curve numbers for cultivated agricultural lands <sup>1/</sup>

| Cover description                                    |                            |                                    | Curve numbers for hydrologic soil group |    |    |    |
|------------------------------------------------------|----------------------------|------------------------------------|-----------------------------------------|----|----|----|
| Cover type                                           | Treatment <sup>2/</sup>    | Hydrologic condition <sup>3/</sup> | A                                       | B  | C  | D  |
| Fallow                                               | Bare soil                  | —                                  | 77                                      | 86 | 91 | 94 |
|                                                      | Crop residue cover (CR)    | Poor                               | 76                                      | 85 | 90 | 93 |
|                                                      |                            | Good                               | 74                                      | 83 | 88 | 90 |
| Row crops                                            | Straight row (SR)          | Poor                               | 72                                      | 81 | 88 | 91 |
|                                                      |                            | Good                               | 67                                      | 78 | 85 | 89 |
|                                                      | SR + CR                    | Poor                               | 71                                      | 80 | 87 | 90 |
|                                                      |                            | Good                               | 64                                      | 75 | 82 | 85 |
|                                                      | Contoured (C)              | Poor                               | 70                                      | 79 | 84 | 88 |
|                                                      |                            | Good                               | 65                                      | 75 | 82 | 86 |
|                                                      | C + CR                     | Poor                               | 69                                      | 78 | 83 | 87 |
|                                                      |                            | Good                               | 64                                      | 74 | 81 | 85 |
|                                                      | Contoured & terraced (C&T) | Poor                               | 66                                      | 74 | 80 | 82 |
|                                                      |                            | Good                               | 62                                      | 71 | 78 | 81 |
|                                                      | C&T+ CR                    | Poor                               | 65                                      | 73 | 79 | 81 |
|                                                      |                            | Good                               | 61                                      | 70 | 77 | 80 |
| Small grain                                          | SR                         | Poor                               | 65                                      | 76 | 84 | 88 |
|                                                      |                            | Good                               | 63                                      | 75 | 83 | 87 |
|                                                      | SR + CR                    | Poor                               | 64                                      | 75 | 83 | 86 |
|                                                      |                            | Good                               | 60                                      | 72 | 80 | 84 |
|                                                      | C                          | Poor                               | 63                                      | 74 | 82 | 85 |
|                                                      |                            | Good                               | 61                                      | 73 | 81 | 84 |
|                                                      | C + CR                     | Poor                               | 62                                      | 73 | 81 | 84 |
|                                                      |                            | Good                               | 60                                      | 72 | 80 | 83 |
|                                                      | C&T                        | Poor                               | 61                                      | 72 | 79 | 82 |
|                                                      |                            | Good                               | 59                                      | 70 | 78 | 81 |
| Close-seeded or broadcast legumes or rotation meadow | C&T+ CR                    | Poor                               | 60                                      | 71 | 78 | 81 |
|                                                      |                            | Good                               | 58                                      | 69 | 77 | 80 |
|                                                      | SR                         | Poor                               | 66                                      | 77 | 85 | 89 |
|                                                      |                            | Good                               | 58                                      | 72 | 81 | 85 |
|                                                      | C                          | Poor                               | 64                                      | 75 | 83 | 85 |
|                                                      |                            | Good                               | 55                                      | 69 | 78 | 83 |
|                                                      | C&T                        | Poor                               | 63                                      | 73 | 80 | 83 |
|                                                      |                            | Good                               | 51                                      | 67 | 76 | 80 |

<sup>1</sup> Average runoff condition, and  $I_a=0.2S$ <sup>2</sup> Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.<sup>3</sup> Hydraulic condition is based on combination factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes, (d) percent of residue cover on the land surface (good  $\geq 20\%$ ), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

**Table 2-2c** Runoff curve numbers for other agricultural lands <sup>1/</sup>

| Cover description                                                            |                      | Curve numbers for hydrologic soil group |    |    |    |
|------------------------------------------------------------------------------|----------------------|-----------------------------------------|----|----|----|
| Cover type                                                                   | Hydrologic condition | A                                       | B  | C  | D  |
| Pasture, grassland, or range—continuous forage for grazing. <sup>2/</sup>    | Poor                 | 68                                      | 79 | 86 | 89 |
|                                                                              | Fair                 | 49                                      | 69 | 79 | 84 |
|                                                                              | Good                 | 39                                      | 61 | 74 | 80 |
| Meadow—continuous grass, protected from grazing and generally mowed for hay. | —                    | 30                                      | 58 | 71 | 78 |
| Brush—brush-weed-grass mixture with brush the major element. <sup>3/</sup>   | Poor                 | 48                                      | 67 | 77 | 83 |
|                                                                              | Fair                 | 35                                      | 56 | 70 | 77 |
|                                                                              | Good                 | 30 <sup>4/</sup>                        | 48 | 65 | 73 |
| Woods—grass combination (orchard or tree farm). <sup>5/</sup>                | Poor                 | 57                                      | 73 | 82 | 86 |
|                                                                              | Fair                 | 43                                      | 65 | 76 | 82 |
|                                                                              | Good                 | 32                                      | 58 | 72 | 79 |
| Woods. <sup>6/</sup>                                                         | Poor                 | 45                                      | 66 | 77 | 83 |
|                                                                              | Fair                 | 36                                      | 60 | 73 | 79 |
|                                                                              | Good                 | 30 <sup>4/</sup>                        | 55 | 70 | 77 |
| Farmsteads—buildings, lanes, driveways, and surrounding lots.                | —                    | 59                                      | 74 | 82 | 86 |

<sup>1</sup> Average runoff condition, and  $I_a = 0.2S$ .<sup>2</sup> *Poor*: <50% ground cover or heavily grazed with no mulch.*Fair*: 50 to 75% ground cover and not heavily grazed.*Good*: > 75% ground cover and lightly or only occasionally grazed.<sup>3</sup> *Poor*: <50% ground cover.*Fair*: 50 to 75% ground cover.*Good*: >75% ground cover.<sup>4</sup> Actual curve number is less than 30; use  $CN = 30$  for runoff computations.<sup>5</sup>  $CN$ 's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the  $CN$ 's for woods and pasture.<sup>6</sup> *Poor*: Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.*Fair*: Woods are grazed but not burned, and some forest litter covers the soil.*Good*: Woods are protected from grazing, and litter and brush adequately cover the soil.



**Table 2-2d** Runoff curve numbers for arid and semiarid rangelands <sup>1/</sup>

| Cover description.....                                                                                                       |                                    | Curve numbers for hydrologic soil group ..... |    |    |    |
|------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------------------|----|----|----|
| Cover type                                                                                                                   | Hydrologic condition <sup>2/</sup> | A <sup>3/</sup>                               | B  | C  | D  |
| Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.                                     | Poor                               |                                               | 80 | 87 | 93 |
|                                                                                                                              | Fair                               |                                               | 71 | 81 | 89 |
|                                                                                                                              | Good                               |                                               | 62 | 74 | 85 |
| Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.               | Poor                               |                                               | 66 | 74 | 79 |
|                                                                                                                              | Fair                               |                                               | 48 | 57 | 63 |
|                                                                                                                              | Good                               |                                               | 30 | 41 | 48 |
| Pinyon-juniper—pinyon, juniper, or both; grass understory.                                                                   | Poor                               |                                               | 75 | 85 | 89 |
|                                                                                                                              | Fair                               |                                               | 58 | 73 | 80 |
|                                                                                                                              | Good                               |                                               | 41 | 61 | 71 |
| Sagebrush with grass understory.                                                                                             | Poor                               |                                               | 67 | 80 | 85 |
|                                                                                                                              | Fair                               |                                               | 51 | 63 | 70 |
|                                                                                                                              | Good                               |                                               | 35 | 47 | 55 |
| Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus. | Poor                               | 63                                            | 77 | 85 | 88 |
|                                                                                                                              | Fair                               | 55                                            | 72 | 81 | 86 |
|                                                                                                                              | Good                               | 49                                            | 68 | 79 | 84 |

<sup>1</sup> Average runoff condition, and  $I_a$ , = 0.2S. For range in humid regions, use table 2-2c.

<sup>2</sup> Poor: <30% ground cover (litter, grass, and brush overstory).

Fair: 30 to 70% ground cover.

Good: > 70% ground cover.

<sup>3</sup> Curve numbers for group A have been developed only for desert shrub.

ATTACHMENT 4.2  
STORMWATER BMP MANUAL  
APPENDIX D WORKSHEET –  
MLV-505LD86

## General Information

Instructions General Volume Rate Quality

Project Name: Williams REAE - MLV-505LD86

Application Type: Individual E&S Application

County: Monroe

Municipality: Chestnuthill Township

Project Type: New Utilities

☒ New Project ☐ Minor / Major Amendment

Area: 9.60 acres  
(In Watershed)

Total Earth Disturbance: 9.60 acres  
(In Watershed)

No. of Post-Construction Discharge Points: 3

Start DP Numbering at: 001

| Discharge Point (DP) No. | Drainage Area (DA) (acres) | Earth Disturbance in DA (acres) | Existing Impervious in DA (acres) | Proposed Impervious in DA (acres) | Receiving Waters                | Ch. 93 Class | Structural BMP(s) |
|--------------------------|----------------------------|---------------------------------|-----------------------------------|-----------------------------------|---------------------------------|--------------|-------------------|
| 001                      | 3.77                       | 3.77                            | 0.11                              | 0.15                              | Discharge to Non-Surface Waters | CWF, MF      | Yes               |
| 002                      | 1.56                       | 1.56                            | 0.00                              | 0.25                              | Discharge to Non-Surface Waters | CWF, MF      | Yes               |
| 003                      | 3.43                       | 3.43                            | 0.00                              | 0.00                              | Discharge to Non-Surface Waters | CWF, MF      | No                |
| Undetained Areas         | 0.84                       | 0.84                            | 0.00                              | 0.01                              | Discharge to Non-Surface Waters | CWF          |                   |
| <b>Totals:</b>           | <b>9.60</b>                | <b>9.60</b>                     | <b>0.11</b>                       | <b>0.422</b>                      |                                 |              |                   |



# Volume Management

Project: Williams REAE - MLV-505LD86

Instructions General **Volume** Rate Quality

2-Year / 24-Hour Storm Event (NOAA Atlas 14):  inches Alternative 2-Year / 24-Hour Storm Even  inches

Alternative Source:

**Pre-Construction Conditions:** No. Rows:  ☐ Exempt from Meadow in Good Condition ☒ Automatically Calculate CN, Ia, Runoff and Volume

| Land Cover                                                                   | Area (acres) | Soil Group | CN | Ia (in) | Q Runoff (in) | Runoff Volume (cf) |
|------------------------------------------------------------------------------|--------------|------------|----|---------|---------------|--------------------|
| Impervious as Meadow                                                         | 0.02         | A          | 30 | 4.667   | 0.00          | 0                  |
| Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW) | 0.09         | A          | 98 | 0.041   | 3.03          | 989                |
| Forested (Good Condition)                                                    | 0.70         | A          | 30 | 4.667   | 0.00          | 0                  |
| Forested (Good Condition)                                                    | 0.11         | D          | 77 | 0.597   | 1.25          | 515                |
| Pervious as Meadow                                                           | 5.87         | A          | 30 | 4.667   | 0.00          | 0                  |
| Pervious as Meadow                                                           | 2.80         | D          | 78 | 0.564   | 1.32          | 13,372             |

**TOTAL (ACRES):** 9.59

**TOTAL (CF):** 14,876

**Post-Construction Conditions:** No. Rows:

| Land Cover                                                                   | Area (acres) | Soil Group | CN | Ia (in) | Q Runoff (in) | Runoff Volume (cf) |
|------------------------------------------------------------------------------|--------------|------------|----|---------|---------------|--------------------|
| Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW) | 0.42         | A          | 98 | 0.041   | 3.03          | 4,637              |
| Woods (Good Condition)                                                       | 0.66         | A          | 30 | 4.667   | 0.00          | 0                  |
| Woods (Good Condition)                                                       | 0.11         | D          | 77 | 0.597   | 1.25          | 515                |

|                                                                             |      |   |    |       |      |        |
|-----------------------------------------------------------------------------|------|---|----|-------|------|--------|
| Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay | 5.75 | A | 30 | 4.667 | 0.00 | 0      |
| Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay | 2.64 | D | 78 | 0.564 | 1.32 | 12,631 |

**TOTAL (ACRES): 9.59**

**TOTAL (CF): 17,783**

**ET CHANGE IN VOLUME TO MANAGE (CF): 2,907**

**Non-Structural BMP Volume Credits:**

☐ Tree Planting Credit

☐ Other (attach calculations):

**Structural BMP Volume Credits:**

No. Structural BMPs:

5

Start BMP Numbering at:

1

| DP No. | BMP No. | BMP Name                              | MRC? | Discharge    | Incremental BMP DA (acres) | Volume Routed to BMP (CF) | Infiltration / Vegetated Area (SF) | Infiltration Rate (in/hr) | Infiltration Period (hrs) | Vegetated? | Media Depth (ft) | Storage Volume (CF) | Infiltration Credit (CF) | ET Credit (CF) |
|--------|---------|---------------------------------------|------|--------------|----------------------------|---------------------------|------------------------------------|---------------------------|---------------------------|------------|------------------|---------------------|--------------------------|----------------|
| 001    | 1       | Infiltration Basin                    | -    | Off-Site     | 3.53                       | 1,275                     | 4,785                              | 3.00                      | 8                         | No         | 0.5              | 20                  | 1,275                    |                |
| 001    | 2       | Infiltration Bed                      | -    | Off-Site     | 0.20                       | 538                       | 800                                | 3.00                      | 10                        | No         | 2.7              | 100                 | 538                      |                |
| 001    | 3       | Infiltration Bed                      | -    | Off-Site     | 0.04                       | 457                       | 575                                | 3.00                      | 5                         | No         | 1.5              | 113                 | 457                      |                |
| 002    | 4       | Infiltration Berm & Retentive Grading | -    | to BMP No. 5 | 1.46                       | 4,045                     | 1,979                              | 3.00                      | 6                         | No         | 1.0              | 1,525               | 2,672                    |                |
| 002    | 5       | Infiltration Berm & Retentive Grading | -    | Off-Site     | 0.11                       | 512                       | 1,407                              | 3.00                      | 6                         | No         | 1.0              | 164                 | 512                      |                |

**Totals: 5,454**

**INFILTRATION & ET CREDITS (CF): 5,454**

**NET CHANGE IN VOLUME TO MANAGE (CF): 2,907**

**TOTAL CREDITS (CF): 5,454**

**VOLUME REQUIREMENT SATISFIED**

## Rate Control

Project: Williams REAE - MLV-505LD86

- [Instructions](#)
[General](#)
[Volume](#)
[Rate](#)
[Quality](#)

### Precipitation Amounts:

|                                         |             |
|-----------------------------------------|-------------|
| NOAA 2-Year 24-Hour Storm Event (in):   | <b>3.26</b> |
| NOAA 10-Year 24-Hour Storm Event (in):  | <b>4.74</b> |
| NOAA 50-Year 24-Hour Storm Event (in):  | <b>6.87</b> |
| NOAA 100-Year 24-Hour Storm Event (in): | <b>8.09</b> |

|                                                |  |
|------------------------------------------------|--|
| Alternative 2-Year 24-Hour Storm Event (in):   |  |
| Alternative 10-Year 24-Hour Storm Event (in):  |  |
| Alternative 50-Year 24-Hour Storm Event (in):  |  |
| Alternative 100-Year 24-Hour Storm Event (in): |  |

☒ **Report Summary of Peak Rates Only**

Attach model input and output data or other calculations to support the rates reported below.

| <i>Peak Discharge Rates (cfs)</i> |                  |                   |              |
|-----------------------------------|------------------|-------------------|--------------|
|                                   | Pre-Construction | Post-Construction | Net Change   |
| 2-Year Storm:                     | <b>0.93</b>      | <b>0.39</b>       | <b>-0.54</b> |
| 10-Year Storm:                    | <b>3.31</b>      | <b>1.88</b>       | <b>-1.43</b> |
| 50-Year Storm:                    | <b>10.85</b>     | <b>7.94</b>       | <b>-2.91</b> |
| 100-Year Storm:                   | <b>17.43</b>     | <b>12.23</b>      | <b>-5.20</b> |

*Rate Control Satisfied*

*Rate Control Satisfied*

*Rate Control Satisfied*

*Rate Control Satisfied*



# Water Quality

Project: Williams REAE - MLV-505LD86

PRINT

Instructions

General

Volume

Rate

Quality

## Pre-Construction Pollutant Loads:

| Land Cover (from Volume Worksheet)                                           | Land Cover for Water Quality  | Area (acres) | Soil Group | Runoff Volume (cf) | Pollutant Conc. (mg/L) |      |      | Pollutant Loads (lbs) |      |      |
|------------------------------------------------------------------------------|-------------------------------|--------------|------------|--------------------|------------------------|------|------|-----------------------|------|------|
|                                                                              |                               |              |            |                    | TSS                    | TP   | TN   | TSS                   | TP   | TN   |
| Impervious as Meadow                                                         | Grassland/Herbaceous          | 0.02         | A          | 0                  | 48.8                   | 0.22 | 2.30 | 0.00                  | 0.00 | 0.00 |
| Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW) | Residential                   | 0.09         | A          | 989                | 65.0                   | 0.29 | 2.05 | 4.01                  | 0.02 | 0.13 |
| Forested (Good Condition)                                                    | Deciduous Forest/Evergreen    | 0.70         | A          | 0                  | 45.0                   | 0.13 | 1.05 | 0.00                  | 0.00 | 0.00 |
| Forested (Good Condition)                                                    | Deciduous Forest/Mixed Forest | 0.11         | D          | 515                | 45.0                   | 0.13 | 1.05 | 1.45                  | 0.00 | 0.03 |
| Pervious as Meadow                                                           | Grassland/Herbaceous          | 5.87         | A          | 0                  | 48.8                   | 0.22 | 2.30 | 0.00                  | 0.00 | 0.00 |
| Pervious as Meadow                                                           | Grassland/Herbaceous          | 2.80         | D          | 13,372             | 48.8                   | 0.22 | 2.30 | 40.75                 | 0.18 | 1.92 |

**TOTAL (ACRES): 9.59**

**TOTALS: 46.21 0.21 2.08**

## Post-Construction Pollutant Loads (without BMPs):

| Land Cover (from Volume Worksheet) | Land Cover for Water Quality | Area (acres) | Soil Group | Runoff Volume (cf) | Pollutant Conc. (mg/L) |    |    | Pollutant Loads (lbs) |    |    |
|------------------------------------|------------------------------|--------------|------------|--------------------|------------------------|----|----|-----------------------|----|----|
|                                    |                              |              |            |                    | TSS                    | TP | TN | TSS                   | TP | TN |

|                                                                              |                                                |      |   |        |      |      |      |       |      |      |
|------------------------------------------------------------------------------|------------------------------------------------|------|---|--------|------|------|------|-------|------|------|
| Impervious Areas: Paved Parking Lots, Roofs, Driveways, Etc. (Excluding ROW) | Residential                                    | 0.42 | A | 4,637  | 65.0 | 0.29 | 2.05 | 18.82 | 0.08 | 0.59 |
| Woods (Good Condition)                                                       | Deciduous Forest/Evergreen Forest/Mixed Forest | 0.66 | A | 0      | 45.0 | 0.13 | 1.05 | 0.00  | 0.00 | 0.00 |
| Woods (Good Condition)                                                       | Deciduous Forest/Evergreen Forest/Mixed Forest | 0.11 | D | 515    | 45.0 | 0.13 | 1.05 | 1.45  | 0.00 | 0.03 |
| Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay  | Grassland/Herbaceous                           | 5.75 | A | 0      | 48.8 | 0.22 | 2.30 | 0.00  | 0.00 | 0.00 |
| Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay  | Grassland/Herbaceous                           | 2.64 | D | 12,631 | 48.8 | 0.22 | 2.30 | 38.49 | 0.17 | 1.81 |

**TOTAL (ACRES): 9.59**

**TOTALS: 58.76 0.26 2.44**

**POLLUTANT LOAD REDUCTION REQUIREMENTS (LBS):**

|              |             |             |
|--------------|-------------|-------------|
| <b>12.55</b> | <b>0.06</b> | <b>0.36</b> |
|--------------|-------------|-------------|

☒ **Characterize Undetained Areas (for Untreated Stormwater)**

No. Rows:

2

| Land Cover                                                                  | Area (acres) | Soil Group | CN | Ia (in) | Q Runoff (in) | Runoff Volume (cf) |
|-----------------------------------------------------------------------------|--------------|------------|----|---------|---------------|--------------------|
| Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay | 3.59         | A          | 30 | 4.667   | 0.00          | 0                  |
| Meadow-Continuous Grass, Protected from Grazing and Generally Mowed for Hay | 0.78         | D          | 78 | 0.564   | 1.32          | 3,730              |

#### Non-Structural BMP Water Quality Credits:

☐ Pervious Undetained Area Credit

☐ Other (attach calculations)

#### Structural BMP Water Quality Credits:

☒ Use default BMP Outflows and Median BMP Outflow Concentrations

| BMP ID | BMP | BMP Name | CN | BMP DA | Vol. Routed to | Inf. & ET | Capture & Buffer | Outflow | Outflow Conc. (mg/L) | Pollutant Loads (lbs) |
|--------|-----|----------|----|--------|----------------|-----------|------------------|---------|----------------------|-----------------------|
|--------|-----|----------|----|--------|----------------|-----------|------------------|---------|----------------------|-----------------------|

| BMP No. | No. | BMP Name                              | MF | DA (acres) | Routes to BMP (CF) | Credits (CF) | Buffer Credits (CF) | (CF)  | TSS   | TP   | TN   | TSS  | TP   | TN   |
|---------|-----|---------------------------------------|----|------------|--------------------|--------------|---------------------|-------|-------|------|------|------|------|------|
| 001     | 1   | Infiltration Basin                    | -  | 3.53       | 1,275              | 1,275        |                     | 0     | 10.00 | 0.24 | 1.04 | 0.00 | 0.00 | 0.00 |
| 001     | 2   | Infiltration Bed                      | -  | 0.20       | 538                | 538          |                     | 0     | 24.30 | 0.19 | 1.19 | 0.00 | 0.00 | 0.00 |
| 001     | 3   | Infiltration Bed                      | -  | 0.04       | 457                | 457          |                     | 0     | 24.30 | 0.19 | 1.19 | 0.00 | 0.00 | 0.00 |
| 002     | 4   | Infiltration Berm & Retentive Grading | -  | 1.46       | 4,045              | 2,672        |                     | 1,373 | -     | -    | -    | -    | -    | -    |
| 002     | 5   | Infiltration Berm & Retentive Grading | -  | 0.11       | 512                | 512          |                     | 0     | 24.00 | 0.20 | 0.85 | 0.00 | 0.00 | 0.00 |

**POLLUTANT LOADS FROM STRUCTURAL BMP (TREATED) OUTFLOWS (LBS):**

**POLLUTANT LOADS FROM UNTREATED STORMWATER (LBS):**

**NON-STRUCTURAL BMP WATER QUALITY CREDITS (LBS):**

**NET POLLUTANT LOADS FROM SITE, POST-CONSTRUCTION (LBS):**

**POLLUTANT LOADS FROM SITE, PRE-CONSTRUCTION (LBS):**

| TSS   | TP   | TN   |
|-------|------|------|
| 0.00  | 0.00 | 0.00 |
| 11.37 | 0.05 | 0.54 |
|       |      |      |
| 11.37 | 0.05 | 0.54 |
| 46.21 | 0.21 | 2.08 |

**WATER QUALITY REQUIREMENT SATISFIED**

### CERTIFICATION

I certify under penalty of law and subject to the penalties of 18 Pa.C.S. § 4904 (relating to unsworn falsification to authorities) that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I further certify that the structure, function, and calculations contained in this spreadsheet have not been modified in comparison to the spreadsheet DEP has posted to its website or, if modifications were made, an explanation of the modifications made is attached to this spreadsheet.

**Pat Wozinski**

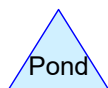
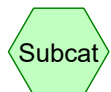
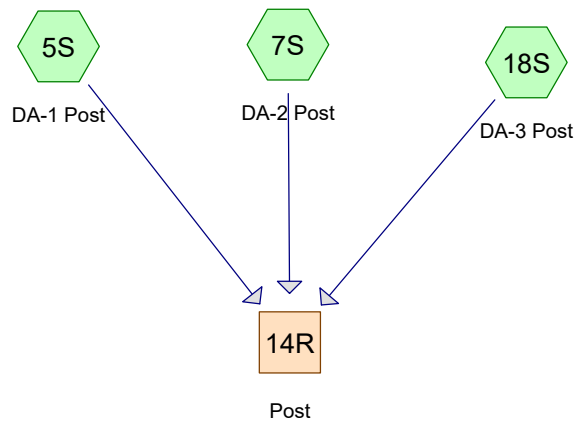
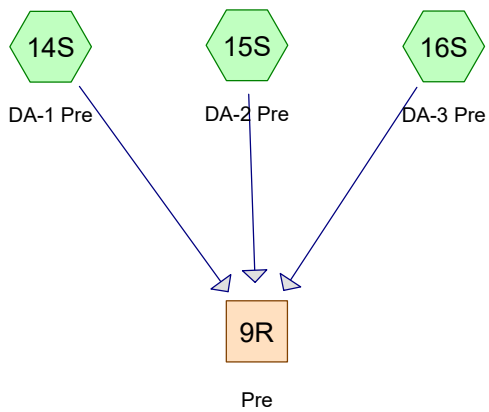
Spreadsheet User Name

**3/1/2022**

Date

ATTACHMENT 4.3  
BMP HYDROCAD REPORTS –  
MLV-505LD86





**Area Listing (all nodes)**

| Area<br>(sq-ft)  | CN        | Description<br>(subcatchment-numbers)                  |
|------------------|-----------|--------------------------------------------------------|
| 1,020            | 30        | 20% Impervious as Meadow (14S)                         |
| 4,082            | 98        | Existing Impervious (14S)                              |
| 18,360           | 98        | Impervious (5S, 7S)                                    |
| 609,902          | 30        | Meadow, non-grazed, HSG A (5S, 7S, 14S, 15S, 16S, 18S) |
| 266,691          | 78        | Meadow, non-grazed, HSG D (5S, 7S, 14S, 15S, 16S, 18S) |
| 114,247          | 30        | Woods, Good, HSG A (5S, 7S, 14S, 15S, 16S, 18S)        |
| 60,124           | 77        | Woods, Good, HSG D (5S, 14S, 15S, 16S, 18S)            |
| <b>1,074,426</b> | <b>46</b> | <b>TOTAL AREA</b>                                      |

**Soil Listing (all nodes)**

| Area<br>(sq-ft)  | Soil<br>Group | Subcatchment<br>Numbers    |
|------------------|---------------|----------------------------|
| 724,149          | HSG A         | 5S, 7S, 14S, 15S, 16S, 18S |
| 0                | HSG B         |                            |
| 0                | HSG C         |                            |
| 326,815          | HSG D         | 5S, 7S, 14S, 15S, 16S, 18S |
| 23,462           | Other         | 5S, 7S, 14S                |
| <b>1,074,426</b> |               | <b>TOTAL AREA</b>          |

**MLV 505LD86\_Pre&post**

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Page 4

**Ground Covers (all nodes)**

| HSG-A<br>(sq-ft) | HSG-B<br>(sq-ft) | HSG-C<br>(sq-ft) | HSG-D<br>(sq-ft) | Other<br>(sq-ft) | Total<br>(sq-ft) | Ground<br>Cover             |
|------------------|------------------|------------------|------------------|------------------|------------------|-----------------------------|
| 0                | 0                | 0                | 0                | 1,020            | 1,020            | 20% Impervious<br>as Meadow |
| 0                | 0                | 0                | 0                | 4,082            | 4,082            | Existing<br>Impervious      |
| 0                | 0                | 0                | 0                | 18,360           | 18,360           | Impervious                  |
| 609,902          | 0                | 0                | 266,691          | 0                | 876,593          | Meadow,<br>non-grazed       |
| 114,247          | 0                | 0                | 60,124           | 0                | 174,371          | Woods, Good                 |
| <b>724,149</b>   | <b>0</b>         | <b>0</b>         | <b>326,815</b>   | <b>23,462</b>    | <b>1,074,426</b> | <b>TOTAL AREA</b>           |



**MLV 505LD86\_Pre&post***Type II 24-hr 1-yr Rainfall=2.72"*

Prepared by Microsoft

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment5S: DA-1 Post**

Runoff Area=246,601 sf 2.96% Impervious Runoff Depth>0.03"  
Flow Length=1,381' Tc=25.6 min CN=48 Runoff=0.02 cfs 531 cf

**Subcatchment7S: DA-2 Post**

Runoff Area=75,708 sf 14.62% Impervious Runoff Depth>0.56"  
Flow Length=592' Tc=15.3 min CN=70 Runoff=1.06 cfs 3,540 cf

**Subcatchment14S: DA-1 Pre**

Runoff Area=174,425 sf 2.34% Impervious Runoff Depth=0.00"  
Flow Length=1,316' Tc=25.5 min CN=41 Runoff=0.00 cfs 0 cf

**Subcatchment15S: DA-2 Pre**

Runoff Area=149,107 sf 0.00% Impervious Runoff Depth>0.26"  
Flow Length=1,216' Tc=28.9 min CN=61 Runoff=0.38 cfs 3,242 cf

**Subcatchment16S: DA-3 Pre**

Runoff Area=213,681 sf 0.00% Impervious Runoff Depth=0.00"  
Flow Length=1,087' Tc=22.2 min CN=37 Runoff=0.00 cfs 0 cf

**Subcatchment18S: DA-3 Post**

Runoff Area=214,904 sf 0.00% Impervious Runoff Depth=0.00"  
Flow Length=1,087' Tc=22.4 min CN=37 Runoff=0.00 cfs 0 cf

**Reach 9R: Pre**

Inflow=0.38 cfs 3,242 cf  
Outflow=0.38 cfs 3,242 cf

**Reach 14R: Post**

Inflow=1.06 cfs 4,071 cf  
Outflow=1.06 cfs 4,071 cf

**Total Runoff Area = 1,074,426 sf Runoff Volume = 7,313 cf Average Runoff Depth = 0.08"**  
**97.91% Pervious = 1,051,984 sf 2.09% Impervious = 22,442 sf**

**Summary for Subcatchment 5S: DA-1 Post**

Runoff = 0.02 cfs @ 18.38 hrs, Volume= 531 cf, Depth> 0.03"

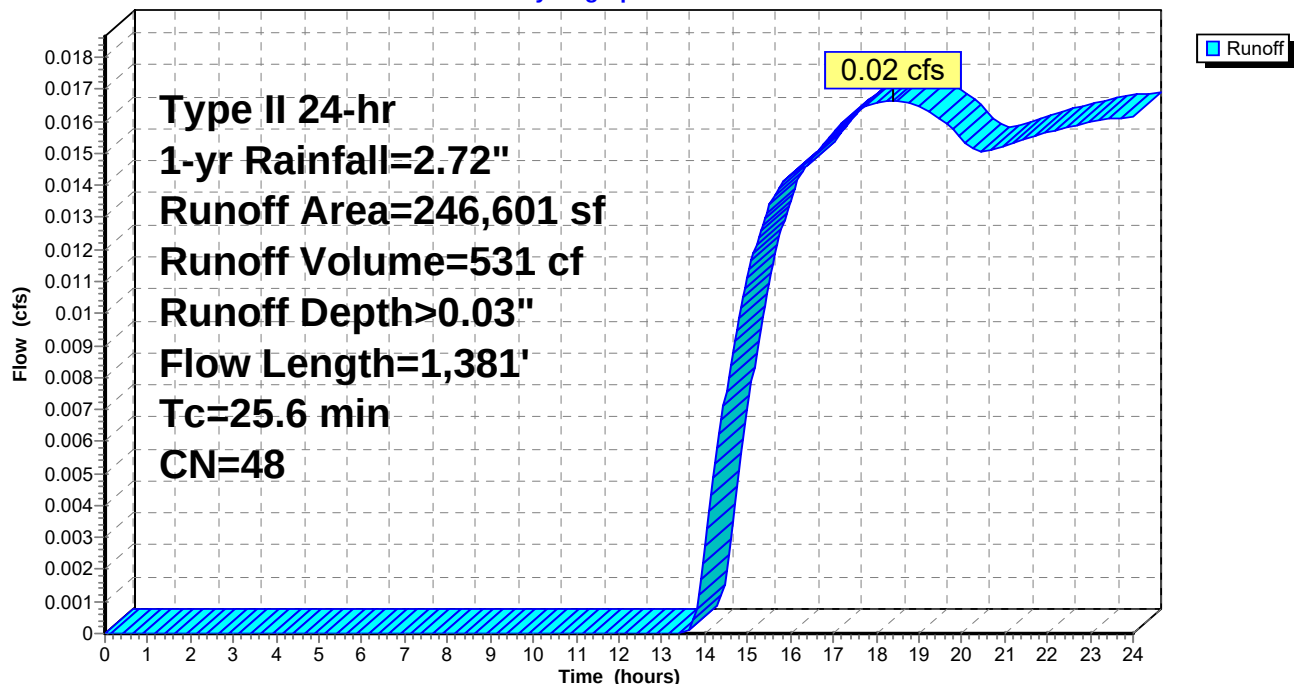
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 42,139    | 30 | Woods, Good, HSG A        |
| 13,920    | 77 | Woods, Good, HSG D        |
| 112,687   | 30 | Meadow, non-grazed, HSG A |
| 70,562    | 78 | Meadow, non-grazed, HSG D |
| * 7,293   | 98 | Impervious                |
| 246,601   | 48 | Weighted Average          |
| 239,308   |    | 97.04% Pervious Area      |
| 7,293     |    | 2.96% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 15.4     | 100           | 0.0450        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.5      | 463           | 0.1160        | 1.70              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 5.7      | 818           | 0.1160        | 2.38              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 25.6     | 1,381         | Total         |                   |                |                                                                      |

**Subcatchment 5S: DA-1 Post**

Hydrograph



**Summary for Subcatchment 7S: DA-2 Post**

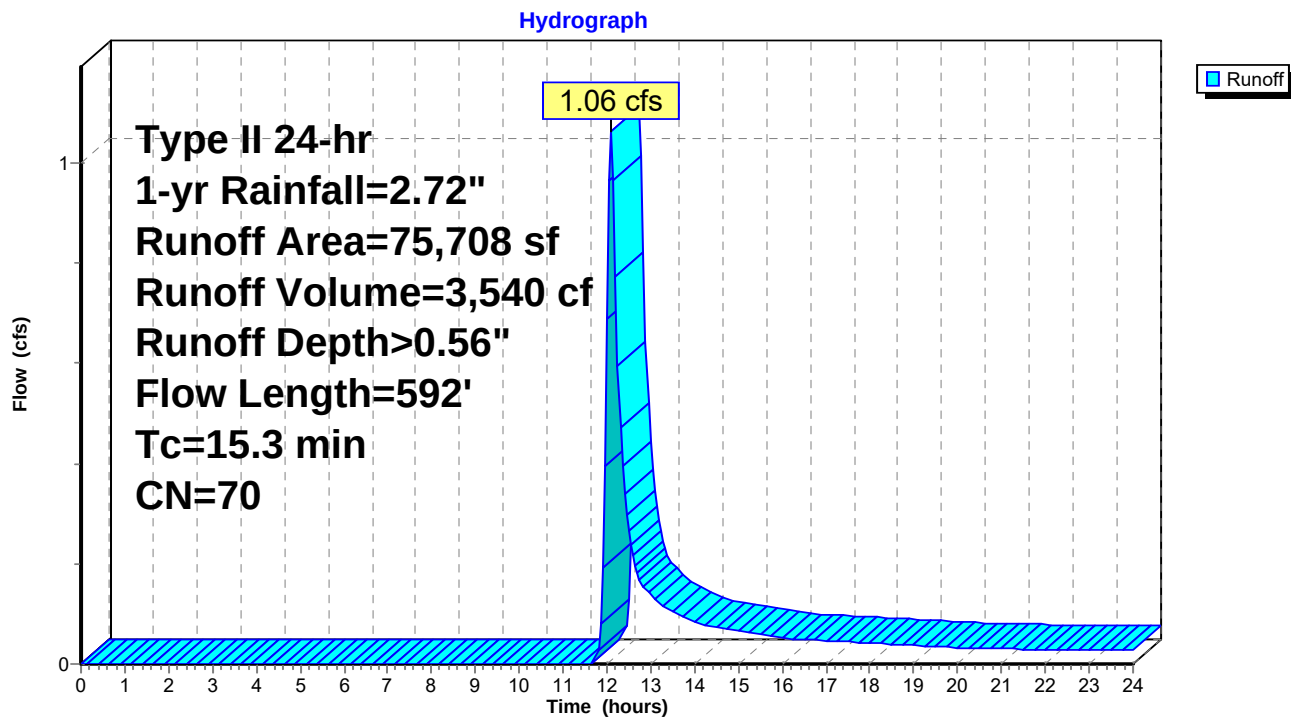
Runoff = 1.06 cfs @ 12.10 hrs, Volume= 3,540 cf, Depth> 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 4,976     | 30 | Woods, Good, HSG A        |
| 12,609    | 30 | Meadow, non-grazed, HSG A |
| 47,056    | 78 | Meadow, non-grazed, HSG D |
| * 11,067  | 98 | Impervious                |
| 75,708    | 70 | Weighted Average          |
| 64,641    |    | 85.38% Pervious Area      |
| 11,067    |    | 14.62% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 11.7     | 100           | 0.0900        | 0.14              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 0.3      | 130           | 0.1150        | 6.88              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps              |
| 3.3      | 362           | 0.0663        | 1.80              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 15.3     | 592           | Total         |                   |                |                                                                      |

**Subcatchment 7S: DA-2 Post**

**Summary for Subcatchment 14S: DA-1 Pre**

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 1-yr Rainfall=2.72"

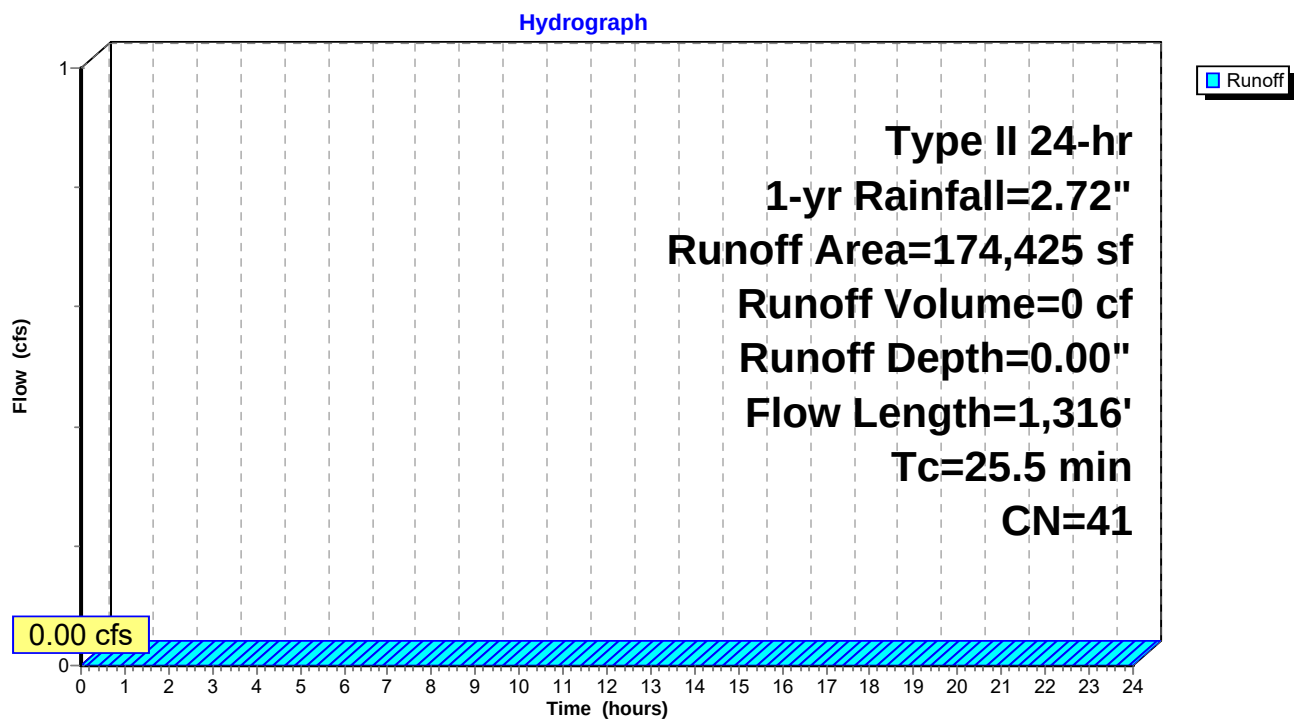
| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 25,013    | 30 | Woods, Good, HSG A        |
| 6,124     | 77 | Woods, Good, HSG D        |
| 108,615   | 30 | Meadow, non-grazed, HSG A |
| 29,571    | 78 | Meadow, non-grazed, HSG D |
| * 4,082   | 98 | Existing Impervious       |
| * 1,020   | 30 | 20% Impervious as Meadow  |
| 174,425   | 41 | Weighted Average          |
| 170,343   |    | 97.66% Pervious Area      |
| 4,082     |    | 2.34% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 3.7      | 398           | 0.1256        | 1.77              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 5.7      | 818           | 0.1160        | 2.38              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 25.5     | 1,316         | Total         |                   |                |                                                                      |



## Subcatchment 14S: DA-1 Pre



**Summary for Subcatchment 15S: DA-2 Pre**

Runoff = 0.38 cfs @ 12.35 hrs, Volume= 3,242 cf, Depth> 0.26"

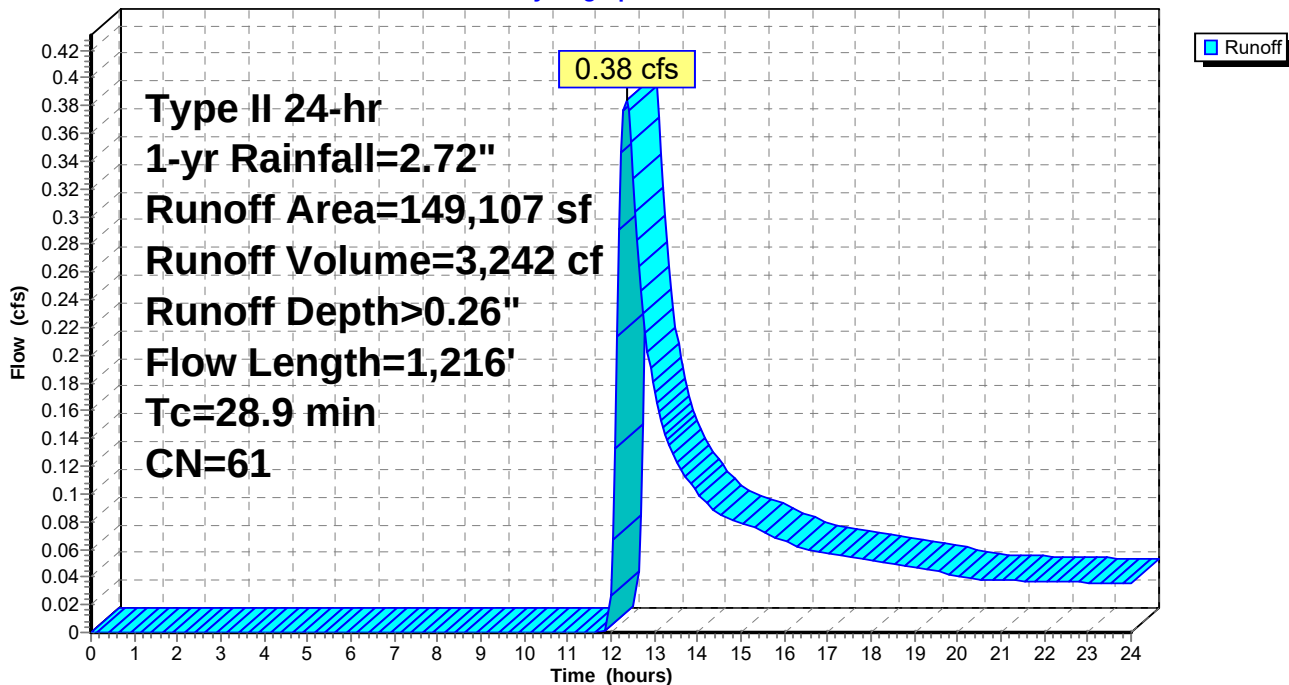
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 24,746    | 30 | Woods, Good, HSG A        |
| 7,798     | 77 | Woods, Good, HSG D        |
| 28,513    | 30 | Meadow, non-grazed, HSG A |
| 88,050    | 78 | Meadow, non-grazed, HSG D |
| 149,107   | 61 | Weighted Average          |
| 149,107   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 18.1     | 100           | 0.0300        | 0.09              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 6.7      | 639           | 0.1001        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.1      | 477           | 0.0755        | 1.92              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 28.9     | 1,216         | Total         |                   |                |                                                                      |

**Subcatchment 15S: DA-2 Pre**

Hydrograph



**Summary for Subcatchment 16S: DA-3 Pre**

[45] Hint: Runoff=Zero

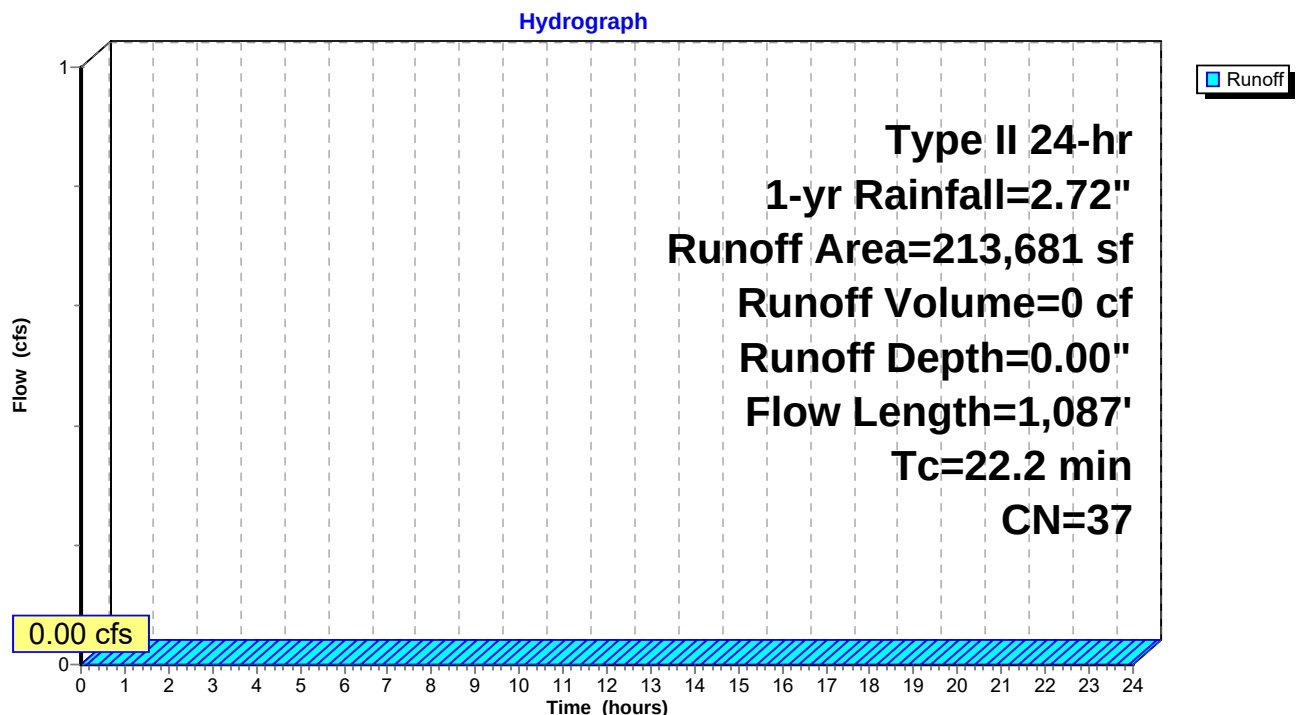
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 8,118     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,696   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 213,681   | 37 | Weighted Average          |
| 213,681   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0921        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.0      | 846           | 0.1123        | 2.35              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.2     | 1,087         | Total         |                   |                |                                                                      |

**Subcatchment 16S: DA-3 Pre**

**Summary for Subcatchment 18S: DA-3 Post**

[45] Hint: Runoff=Zero

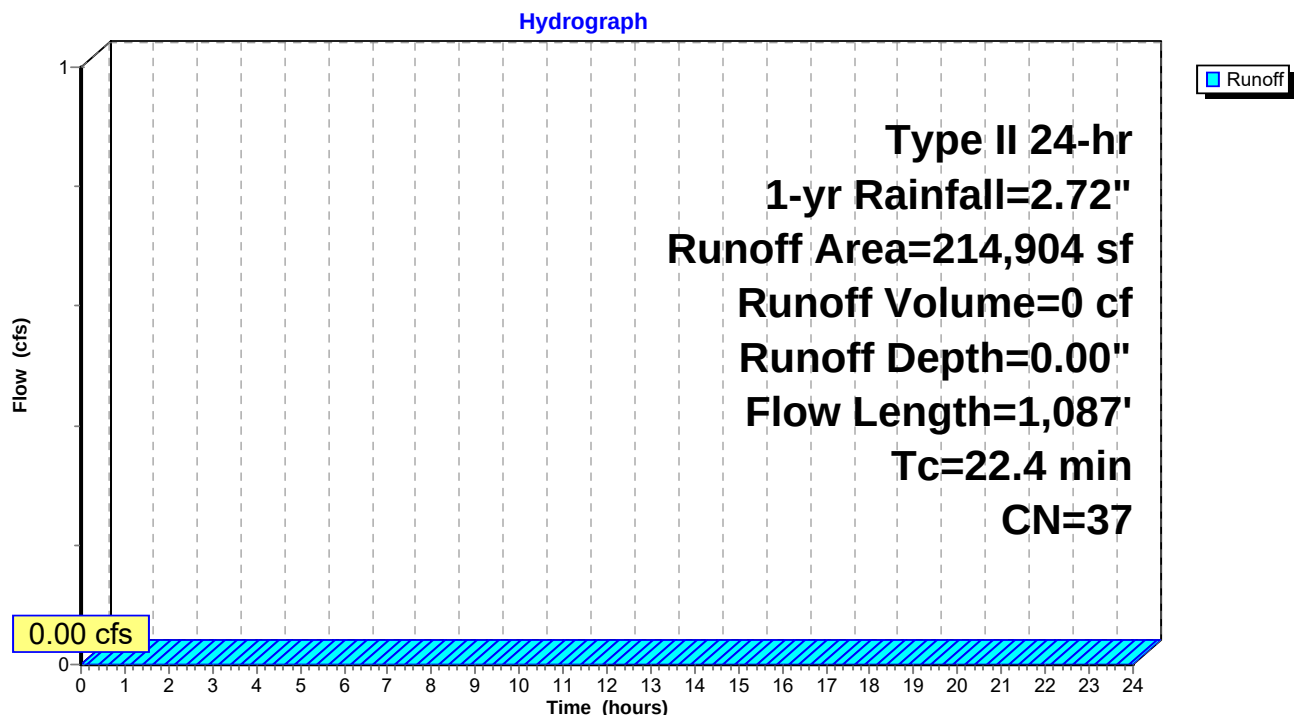
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,255     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,782   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 214,904   | 37 | Weighted Average          |
| 214,904   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0920        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.2      | 846           | 0.1060        | 2.28              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.4     | 1,087         | Total         |                   |                |                                                                      |

**Subcatchment 18S: DA-3 Post**

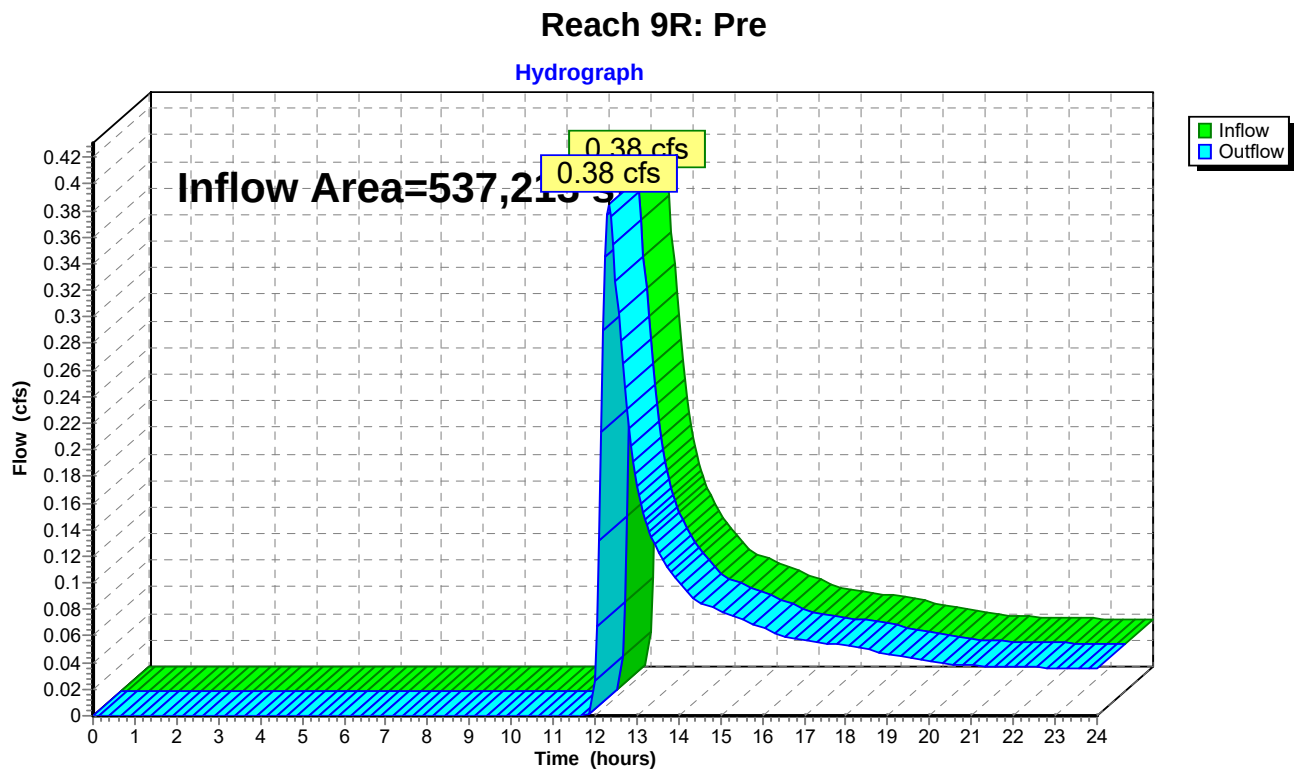


**Summary for Reach 9R: Pre**

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

Inflow Area = 537,213 sf, 0.76% Impervious, Inflow Depth > 0.07" for 1-yr event  
Inflow = 0.38 cfs @ 12.35 hrs, Volume= 3,242 cf  
Outflow = 0.38 cfs @ 12.35 hrs, Volume= 3,242 cf, Atten= 0%, Lag= 0.0 min

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

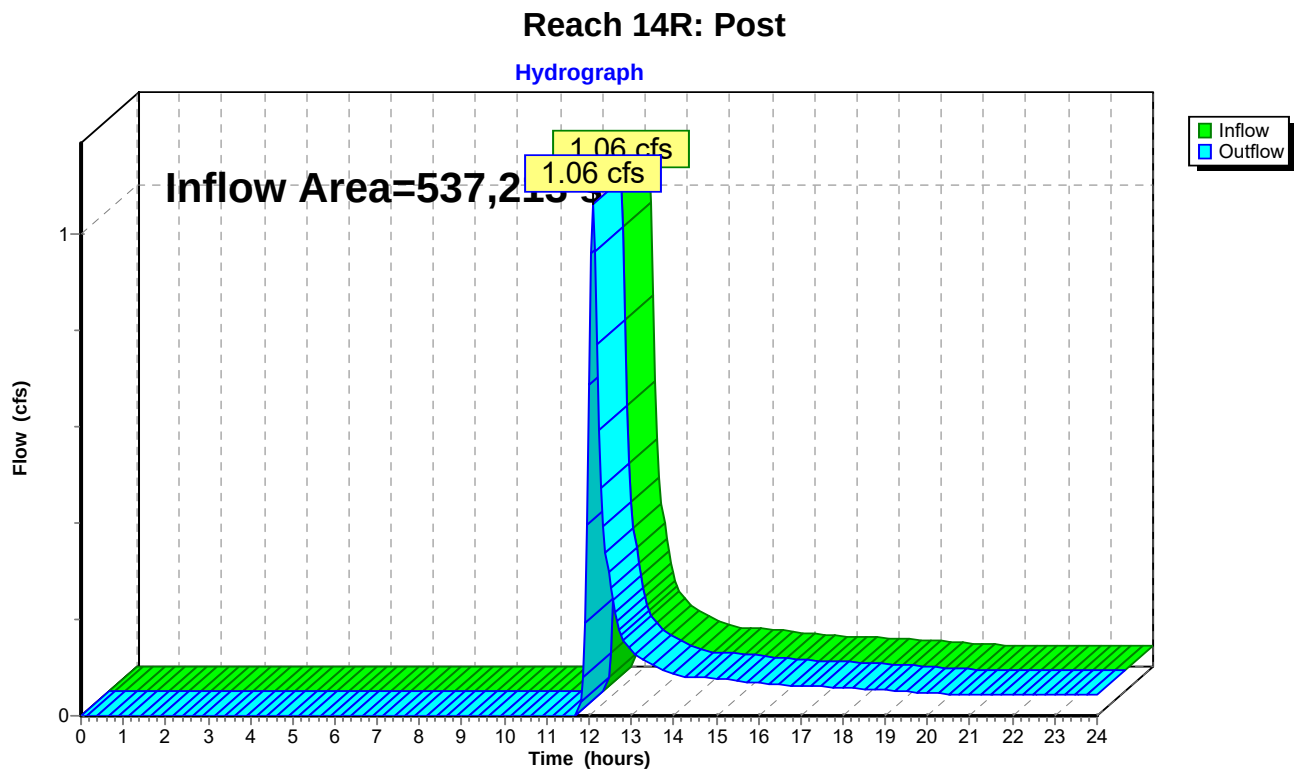


**Summary for Reach 14R: Post**

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

Inflow Area = 537,213 sf, 3.42% Impervious, Inflow Depth > 0.09" for 1-yr event  
Inflow = 1.06 cfs @ 12.10 hrs, Volume= 4,071 cf  
Outflow = 1.06 cfs @ 12.10 hrs, Volume= 4,071 cf, Atten= 0%, Lag= 0.0 min

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



**MLV 505LD86\_Pre&post**

Prepared by Microsoft

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*Type II 24-hr 2-yr Rainfall=3.26"*

Printed 3/1/2022

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment5S: DA-1 Post**

Runoff Area=246,601 sf 2.96% Impervious Runoff Depth>0.10"  
Flow Length=1,381' Tc=25.6 min CN=48 Runoff=0.07 cfs 2,012 cf

**Subcatchment7S: DA-2 Post**

Runoff Area=75,708 sf 14.62% Impervious Runoff Depth>0.86"  
Flow Length=592' Tc=15.3 min CN=70 Runoff=1.76 cfs 5,418 cf

**Subcatchment14S: DA-1 Pre**

Runoff Area=174,425 sf 2.34% Impervious Runoff Depth>0.01"  
Flow Length=1,316' Tc=25.5 min CN=41 Runoff=0.01 cfs 134 cf

**Subcatchment15S: DA-2 Pre**

Runoff Area=149,107 sf 0.00% Impervious Runoff Depth>0.46"  
Flow Length=1,216' Tc=28.9 min CN=61 Runoff=0.93 cfs 5,745 cf

**Subcatchment16S: DA-3 Pre**

Runoff Area=213,681 sf 0.00% Impervious Runoff Depth=0.00"  
Flow Length=1,087' Tc=22.2 min CN=37 Runoff=0.00 cfs 0 cf

**Subcatchment18S: DA-3 Post**

Runoff Area=214,904 sf 0.00% Impervious Runoff Depth=0.00"  
Flow Length=1,087' Tc=22.4 min CN=37 Runoff=0.00 cfs 0 cf

**Reach 9R: Pre**

Inflow=0.93 cfs 5,879 cf  
Outflow=0.93 cfs 5,879 cf

**Reach 14R: Post**

Inflow=1.76 cfs 7,429 cf  
Outflow=1.76 cfs 7,429 cf

**Total Runoff Area = 1,074,426 sf Runoff Volume = 13,309 cf Average Runoff Depth = 0.15"**  
**97.91% Pervious = 1,051,984 sf 2.09% Impervious = 22,442 sf**

**Summary for Subcatchment 5S: DA-1 Post**

Runoff = 0.07 cfs @ 13.25 hrs, Volume= 2,012 cf, Depth> 0.10"

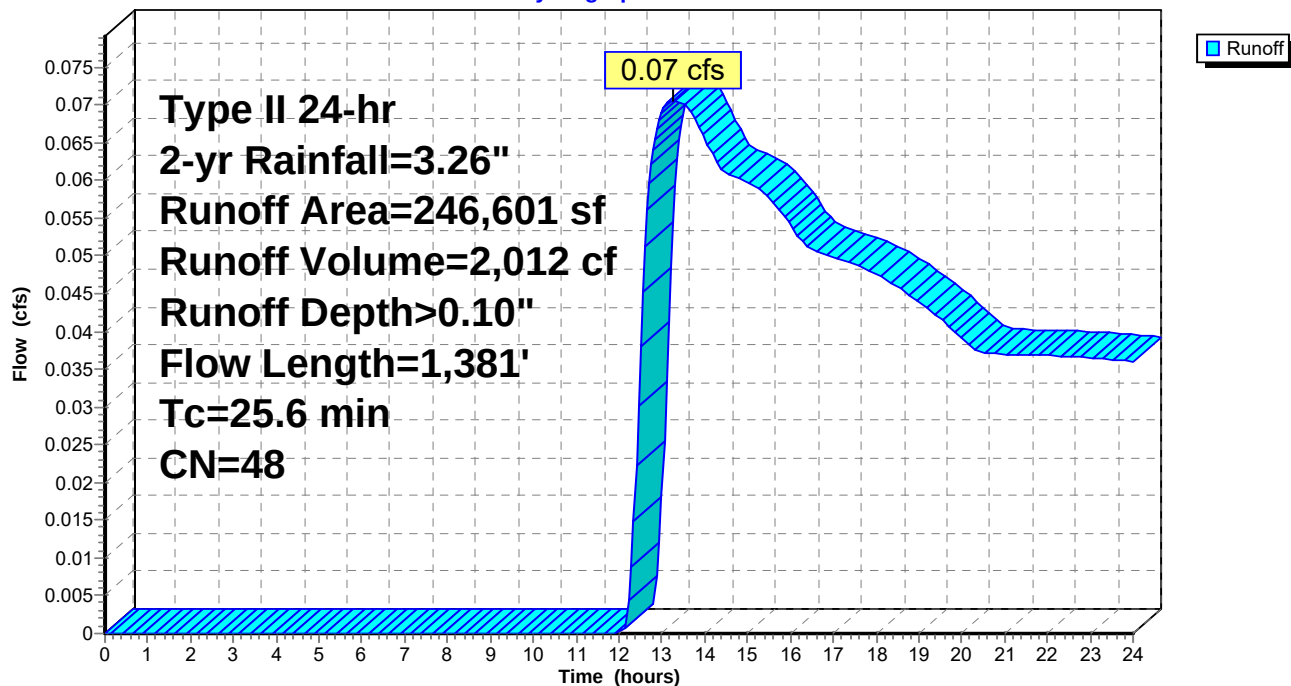
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 42,139    | 30 | Woods, Good, HSG A        |
| 13,920    | 77 | Woods, Good, HSG D        |
| 112,687   | 30 | Meadow, non-grazed, HSG A |
| 70,562    | 78 | Meadow, non-grazed, HSG D |
| * 7,293   | 98 | Impervious                |
| 246,601   | 48 | Weighted Average          |
| 239,308   |    | 97.04% Pervious Area      |
| 7,293     |    | 2.96% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 15.4     | 100           | 0.0450        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.5      | 463           | 0.1160        | 1.70              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 5.7      | 818           | 0.1160        | 2.38              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 25.6     | 1,381         | Total         |                   |                |                                                                      |

**Subcatchment 5S: DA-1 Post**

Hydrograph





**Summary for Subcatchment 7S: DA-2 Post**

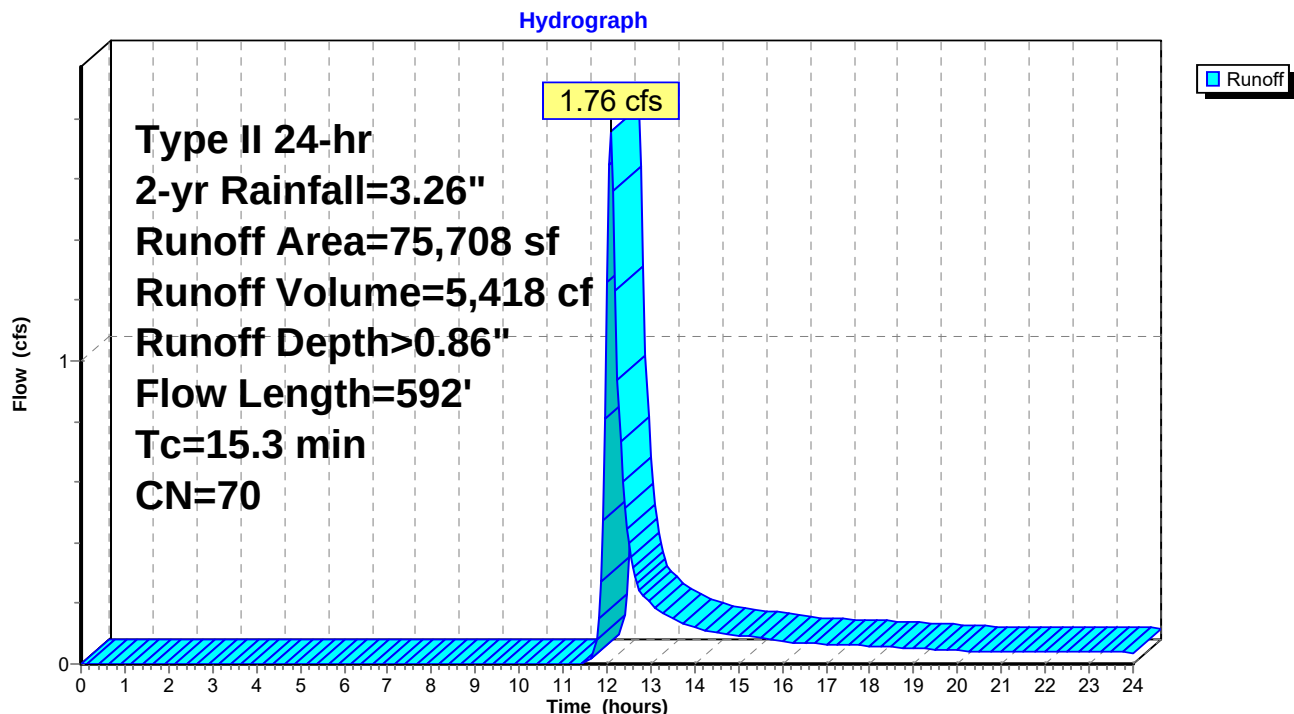
Runoff = 1.76 cfs @ 12.09 hrs, Volume= 5,418 cf, Depth> 0.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 4,976     | 30 | Woods, Good, HSG A        |
| 12,609    | 30 | Meadow, non-grazed, HSG A |
| 47,056    | 78 | Meadow, non-grazed, HSG D |
| * 11,067  | 98 | Impervious                |
| 75,708    | 70 | Weighted Average          |
| 64,641    |    | 85.38% Pervious Area      |
| 11,067    |    | 14.62% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 11.7     | 100           | 0.0900        | 0.14              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 0.3      | 130           | 0.1150        | 6.88              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps              |
| 3.3      | 362           | 0.0663        | 1.80              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 15.3     | 592           | Total         |                   |                |                                                                      |

**Subcatchment 7S: DA-2 Post**

**Summary for Subcatchment 14S: DA-1 Pre**

[73] Warning: Peak may fall outside time span

Runoff = 0.01 cfs @ 24.00 hrs, Volume= 134 cf, Depth> 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-yr Rainfall=3.26"

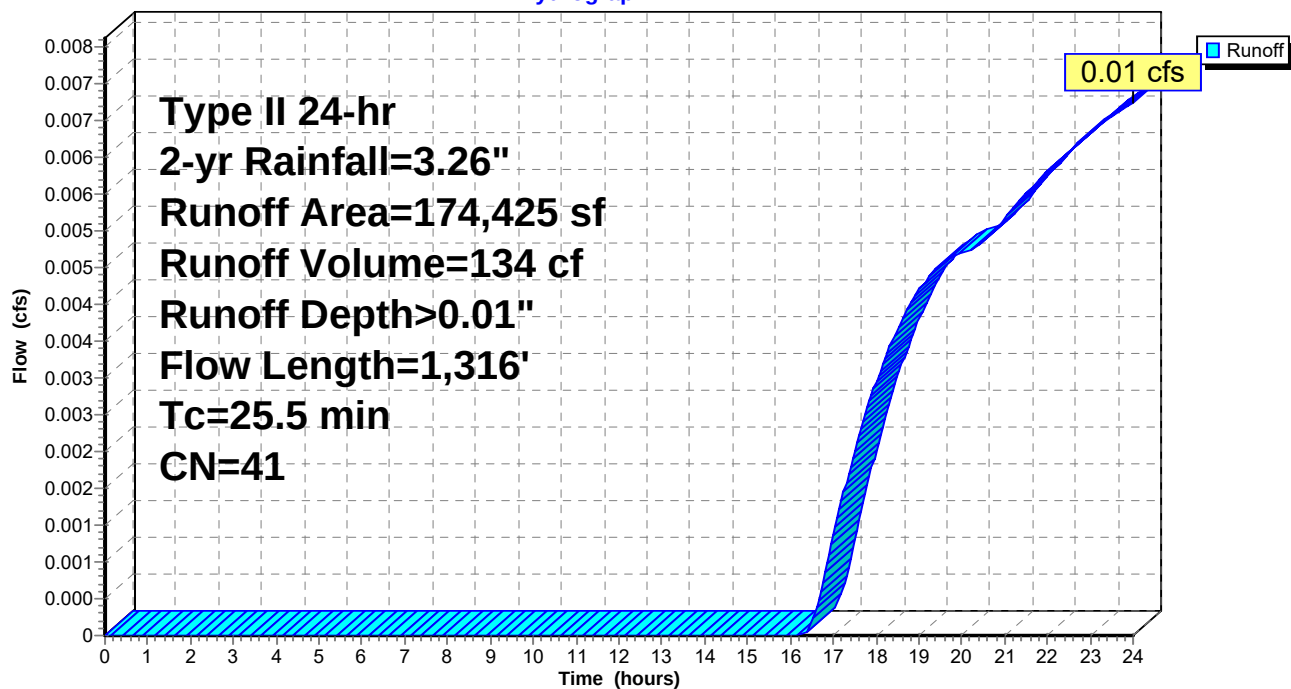
| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 25,013    | 30 | Woods, Good, HSG A        |
| 6,124     | 77 | Woods, Good, HSG D        |
| 108,615   | 30 | Meadow, non-grazed, HSG A |
| 29,571    | 78 | Meadow, non-grazed, HSG D |
| * 4,082   | 98 | Existing Impervious       |
| * 1,020   | 30 | 20% Impervious as Meadow  |
| 174,425   | 41 | Weighted Average          |
| 170,343   |    | 97.66% Pervious Area      |
| 4,082     |    | 2.34% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 3.7      | 398           | 0.1256        | 1.77              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 5.7      | 818           | 0.1160        | 2.38              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 25.5     | 1,316         | Total         |                   |                |                                                                      |

## Subcatchment 14S: DA-1 Pre

Hydrograph



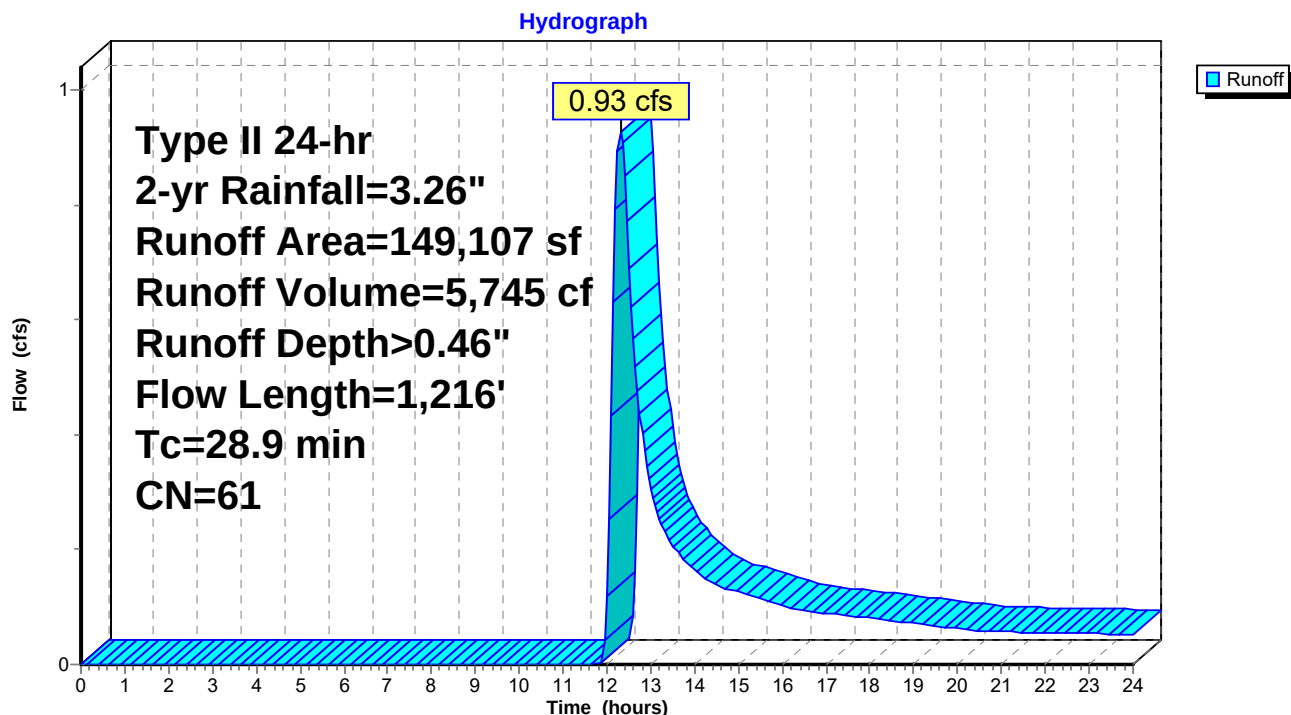
**Summary for Subcatchment 15S: DA-2 Pre**

Runoff = 0.93 cfs @ 12.31 hrs, Volume= 5,745 cf, Depth> 0.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 24,746    | 30 | Woods, Good, HSG A        |
| 7,798     | 77 | Woods, Good, HSG D        |
| 28,513    | 30 | Meadow, non-grazed, HSG A |
| 88,050    | 78 | Meadow, non-grazed, HSG D |
| 149,107   | 61 | Weighted Average          |
| 149,107   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 18.1     | 100           | 0.0300        | 0.09              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 6.7      | 639           | 0.1001        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.1      | 477           | 0.0755        | 1.92              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 28.9     | 1,216         | Total         |                   |                |                                                                      |

**Subcatchment 15S: DA-2 Pre**



**Summary for Subcatchment 16S: DA-3 Pre**

[45] Hint: Runoff=Zero

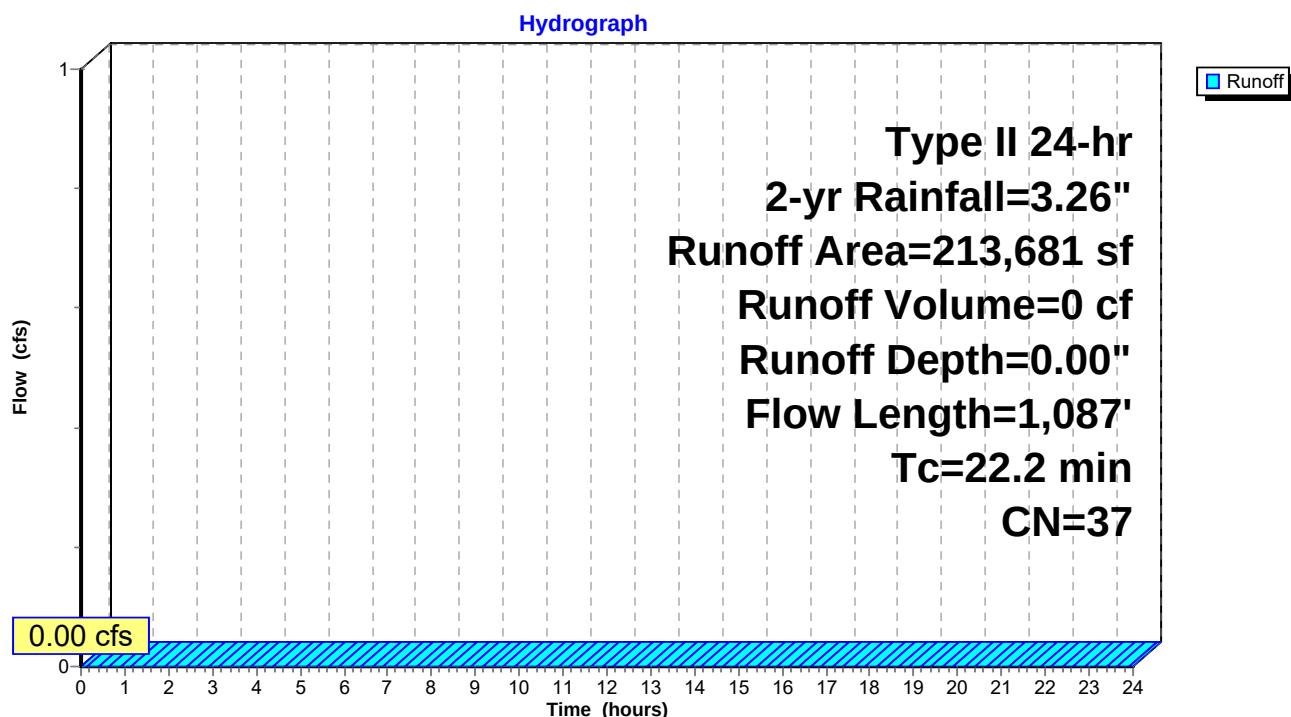
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 8,118     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,696   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 213,681   | 37 | Weighted Average          |
| 213,681   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0921        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.0      | 846           | 0.1123        | 2.35              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.2     | 1,087         | Total         |                   |                |                                                                      |

**Subcatchment 16S: DA-3 Pre**

**Summary for Subcatchment 18S: DA-3 Post**

[45] Hint: Runoff=Zero

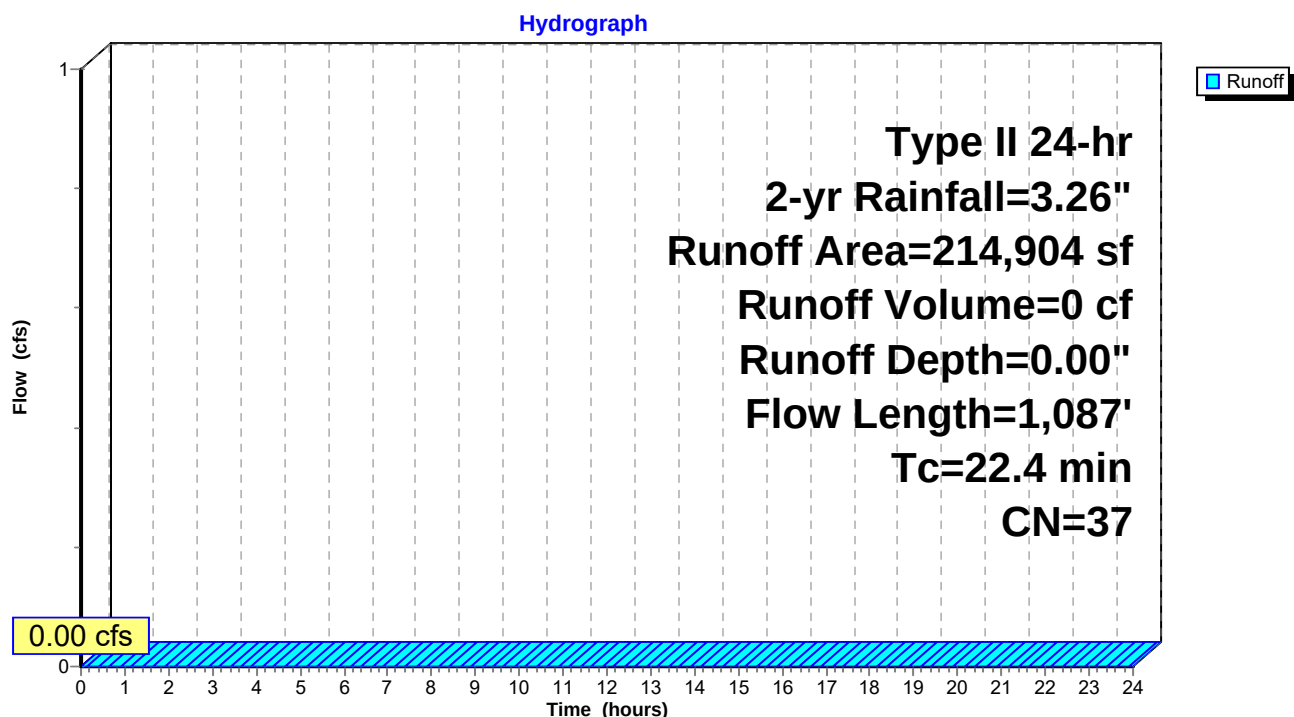
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,255     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,782   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 214,904   | 37 | Weighted Average          |
| 214,904   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0920        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.2      | 846           | 0.1060        | 2.28              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.4     | 1,087         | Total         |                   |                |                                                                      |

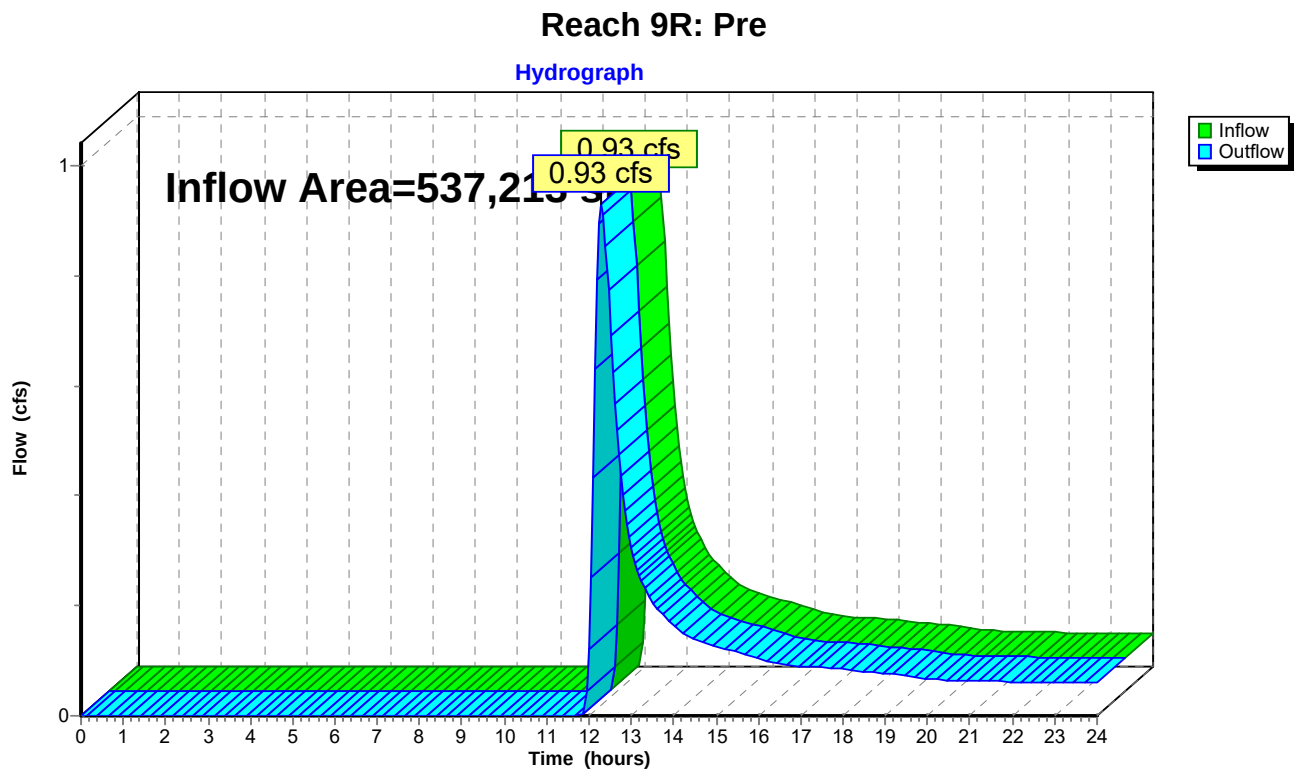
**Subcatchment 18S: DA-3 Post**

**Summary for Reach 9R: Pre**

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

Inflow Area = 537,213 sf, 0.76% Impervious, Inflow Depth > 0.13" for 2-yr event  
Inflow = 0.93 cfs @ 12.31 hrs, Volume= 5,879 cf  
Outflow = 0.93 cfs @ 12.31 hrs, Volume= 5,879 cf, Atten= 0%, Lag= 0.0 min

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

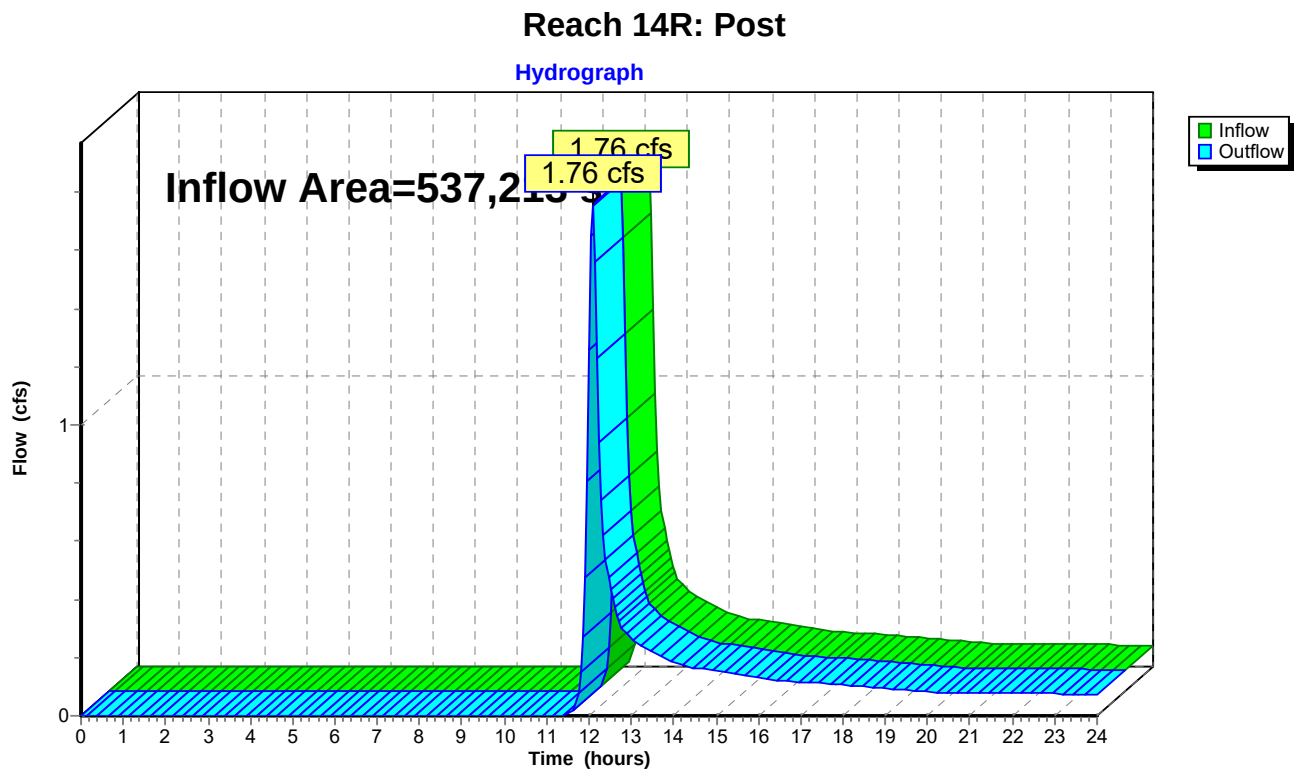


**Summary for Reach 14R: Post**

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

Inflow Area = 537,213 sf, 3.42% Impervious, Inflow Depth > 0.17" for 2-yr event  
Inflow = 1.76 cfs @ 12.09 hrs, Volume= 7,429 cf  
Outflow = 1.76 cfs @ 12.09 hrs, Volume= 7,429 cf, Atten= 0%, Lag= 0.0 min

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





**MLV 505LD86\_Pre&post**

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*Type II 24-hr 10-yr Rainfall=4.74"*

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment5S: DA-1 Post**

Runoff Area=246,601 sf 2.96% Impervious Runoff Depth>0.49"  
Flow Length=1,381' Tc=25.6 min CN=48 Runoff=1.36 cfs 10,012 cf

**Subcatchment7S: DA-2 Post**

Runoff Area=75,708 sf 14.62% Impervious Runoff Depth>1.84"  
Flow Length=592' Tc=15.3 min CN=70 Runoff=4.01 cfs 11,594 cf

**Subcatchment14S: DA-1 Pre**

Runoff Area=174,425 sf 2.34% Impervious Runoff Depth>0.21"  
Flow Length=1,316' Tc=25.5 min CN=41 Runoff=0.15 cfs 3,040 cf

**Subcatchment15S: DA-2 Pre**

Runoff Area=149,107 sf 0.00% Impervious Runoff Depth>1.20"  
Flow Length=1,216' Tc=28.9 min CN=61 Runoff=3.22 cfs 14,946 cf

**Subcatchment16S: DA-3 Pre**

Runoff Area=213,681 sf 0.00% Impervious Runoff Depth>0.09"  
Flow Length=1,087' Tc=22.2 min CN=37 Runoff=0.05 cfs 1,686 cf

**Subcatchment18S: DA-3 Post**

Runoff Area=214,904 sf 0.00% Impervious Runoff Depth>0.09"  
Flow Length=1,087' Tc=22.4 min CN=37 Runoff=0.05 cfs 1,695 cf

**Reach 9R: Pre**

Inflow=3.31 cfs 19,672 cf  
Outflow=3.31 cfs 19,672 cf

**Reach 14R: Post**

Inflow=4.63 cfs 23,300 cf  
Outflow=4.63 cfs 23,300 cf

**Total Runoff Area = 1,074,426 sf Runoff Volume = 42,973 cf Average Runoff Depth = 0.48"**  
**97.91% Pervious = 1,051,984 sf 2.09% Impervious = 22,442 sf**

**MLV 505LD86\_Pre&post**

Prepared by Microsoft

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Type II 24-hr 10-yr Rainfall=4.74"

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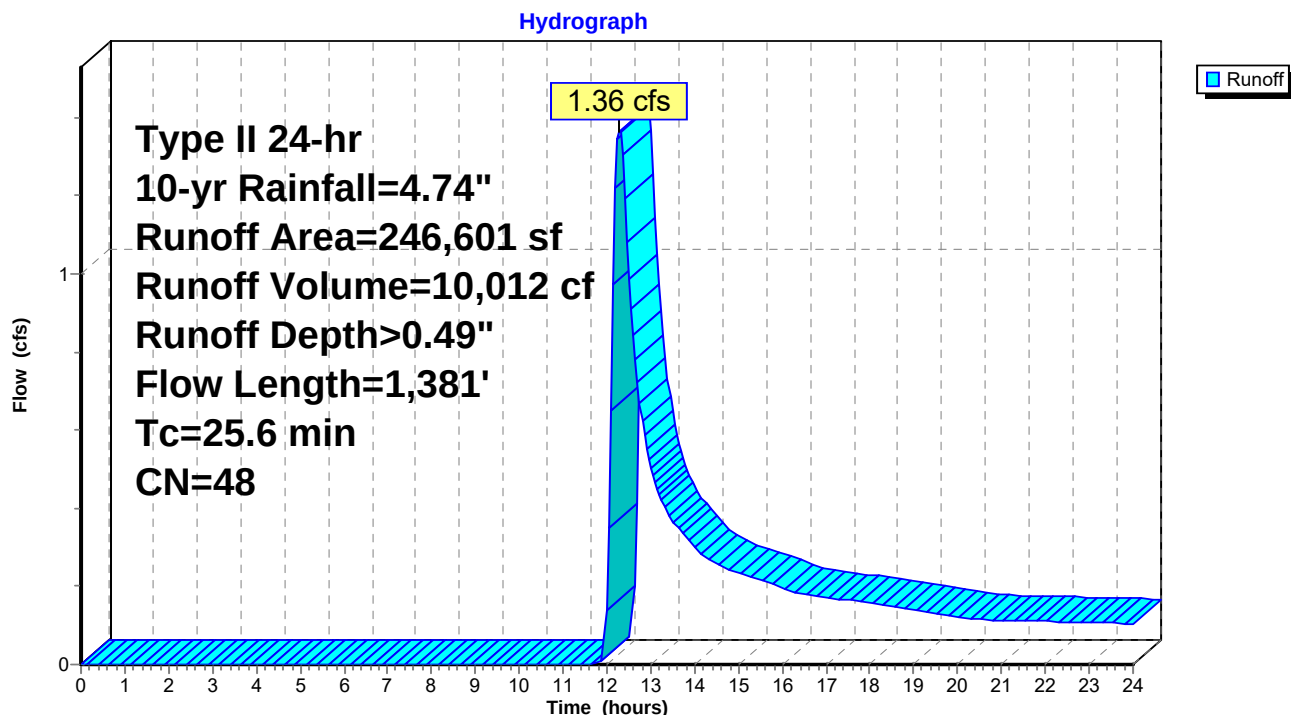
**Summary for Subcatchment 5S: DA-1 Post**

Runoff = 1.36 cfs @ 12.29 hrs, Volume= 10,012 cf, Depth&gt; 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 42,139    | 30 | Woods, Good, HSG A        |
| 13,920    | 77 | Woods, Good, HSG D        |
| 112,687   | 30 | Meadow, non-grazed, HSG A |
| 70,562    | 78 | Meadow, non-grazed, HSG D |
| * 7,293   | 98 | Impervious                |
| 246,601   | 48 | Weighted Average          |
| 239,308   |    | 97.04% Pervious Area      |
| 7,293     |    | 2.96% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 15.4     | 100           | 0.0450        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.5      | 463           | 0.1160        | 1.70              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 5.7      | 818           | 0.1160        | 2.38              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 25.6     | 1,381         | Total         |                   |                |                                                                      |

**Subcatchment 5S: DA-1 Post**

**Summary for Subcatchment 7S: DA-2 Post**

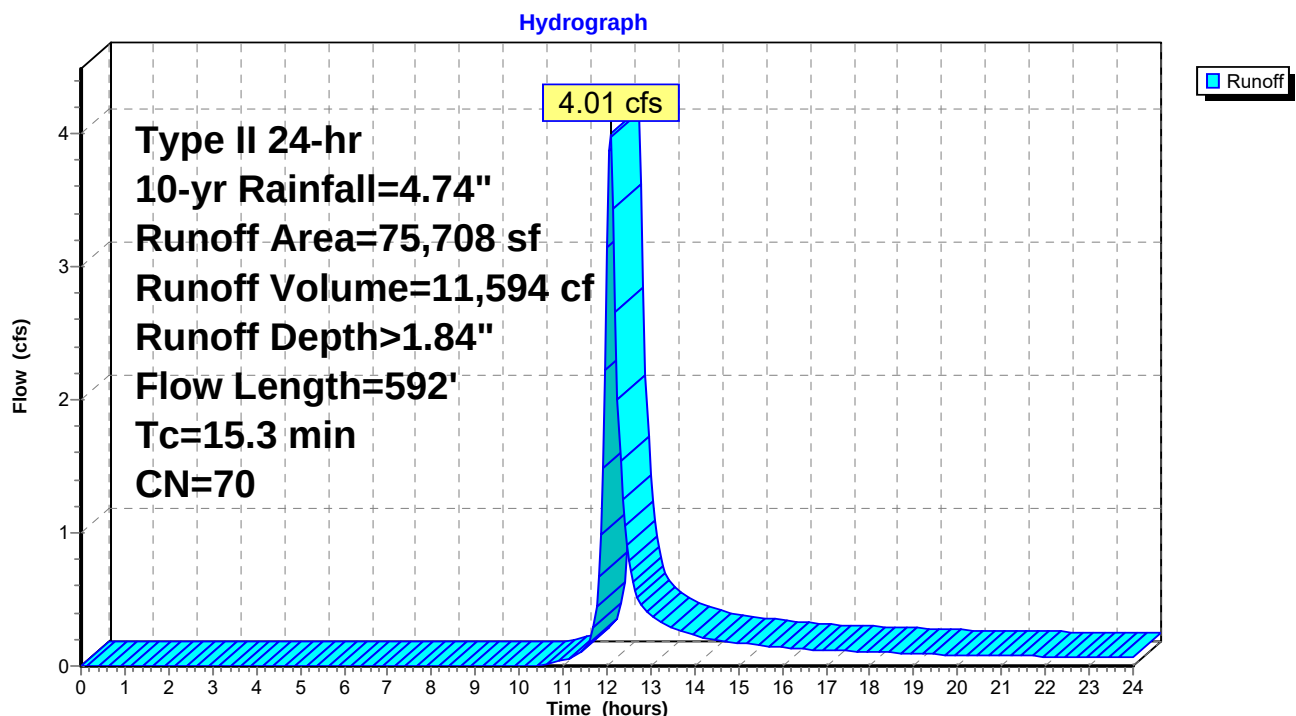
Runoff = 4.01 cfs @ 12.08 hrs, Volume= 11,594 cf, Depth> 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 4,976     | 30 | Woods, Good, HSG A        |
| 12,609    | 30 | Meadow, non-grazed, HSG A |
| 47,056    | 78 | Meadow, non-grazed, HSG D |
| * 11,067  | 98 | Impervious                |
| 75,708    | 70 | Weighted Average          |
| 64,641    |    | 85.38% Pervious Area      |
| 11,067    |    | 14.62% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 11.7     | 100           | 0.0900        | 0.14              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 0.3      | 130           | 0.1150        | 6.88              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps              |
| 3.3      | 362           | 0.0663        | 1.80              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 15.3     | 592           | Total         |                   |                |                                                                      |

**Subcatchment 7S: DA-2 Post**

**Summary for Subcatchment 14S: DA-1 Pre**

Runoff = 0.15 cfs @ 12.62 hrs, Volume= 3,040 cf, Depth> 0.21"

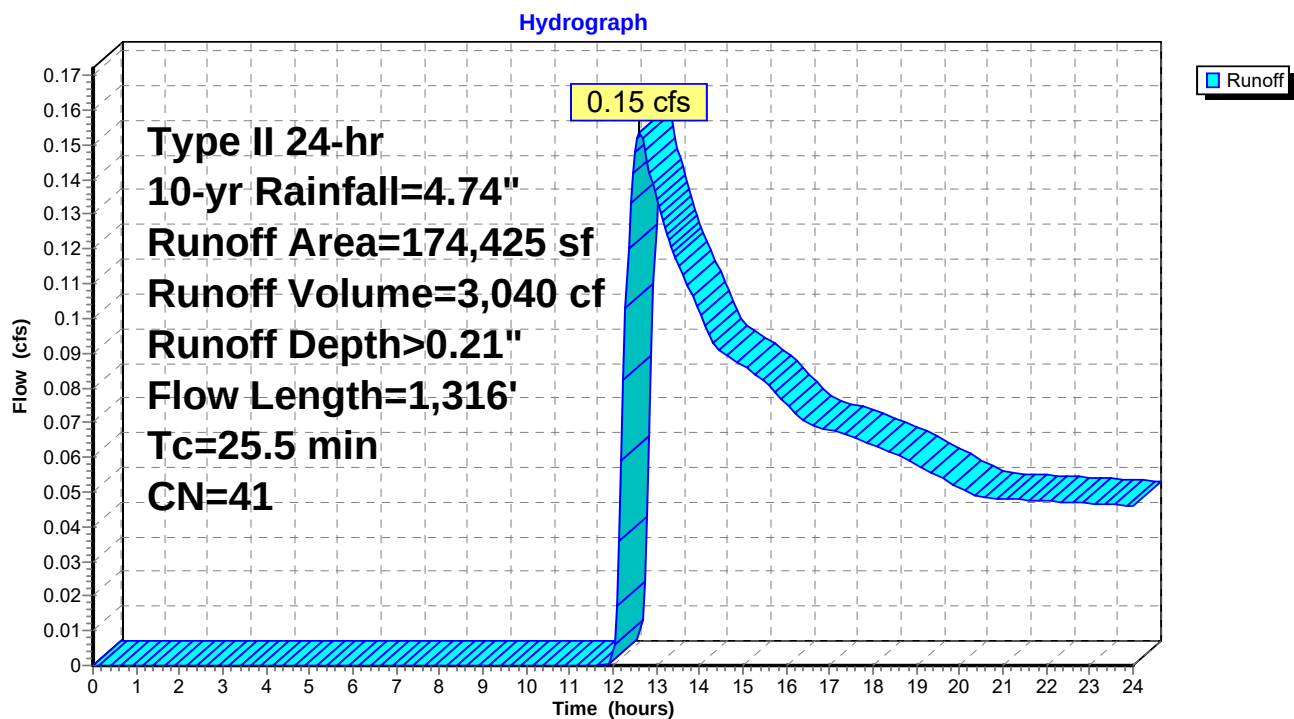
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 25,013    | 30 | Woods, Good, HSG A        |
| 6,124     | 77 | Woods, Good, HSG D        |
| 108,615   | 30 | Meadow, non-grazed, HSG A |
| 29,571    | 78 | Meadow, non-grazed, HSG D |
| * 4,082   | 98 | Existing Impervious       |
| * 1,020   | 30 | 20% Impervious as Meadow  |
| 174,425   | 41 | Weighted Average          |
| 170,343   |    | 97.66% Pervious Area      |
| 4,082     |    | 2.34% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 3.7      | 398           | 0.1256        | 1.77              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 5.7      | 818           | 0.1160        | 2.38              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 25.5     | 1,316         | Total         |                   |                |                                                                      |

## Subcatchment 14S: DA-1 Pre





**Summary for Subcatchment 15S: DA-2 Pre**

Runoff = 3.22 cfs @ 12.26 hrs, Volume= 14,946 cf, Depth> 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10-yr Rainfall=4.74"

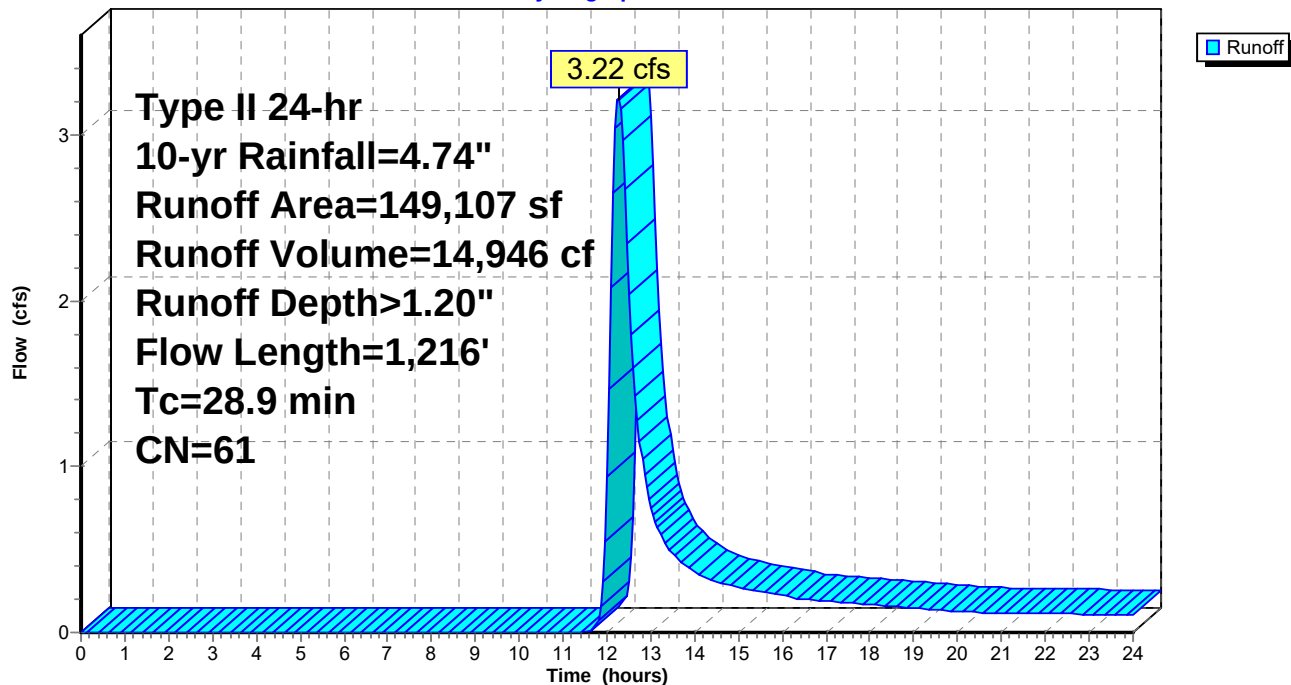
| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 24,746    | 30 | Woods, Good, HSG A        |
| 7,798     | 77 | Woods, Good, HSG D        |
| 28,513    | 30 | Meadow, non-grazed, HSG A |
| 88,050    | 78 | Meadow, non-grazed, HSG D |
| 149,107   | 61 | Weighted Average          |
| 149,107   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 18.1     | 100           | 0.0300        | 0.09              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 6.7      | 639           | 0.1001        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.1      | 477           | 0.0755        | 1.92              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 28.9     | 1,216         | Total         |                   |                |                                                                      |

**Subcatchment 15S: DA-2 Pre**

Hydrograph



**Summary for Subcatchment 16S: DA-3 Pre**

Runoff = 0.05 cfs @ 15.20 hrs, Volume= 1,686 cf, Depth> 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10-yr Rainfall=4.74"

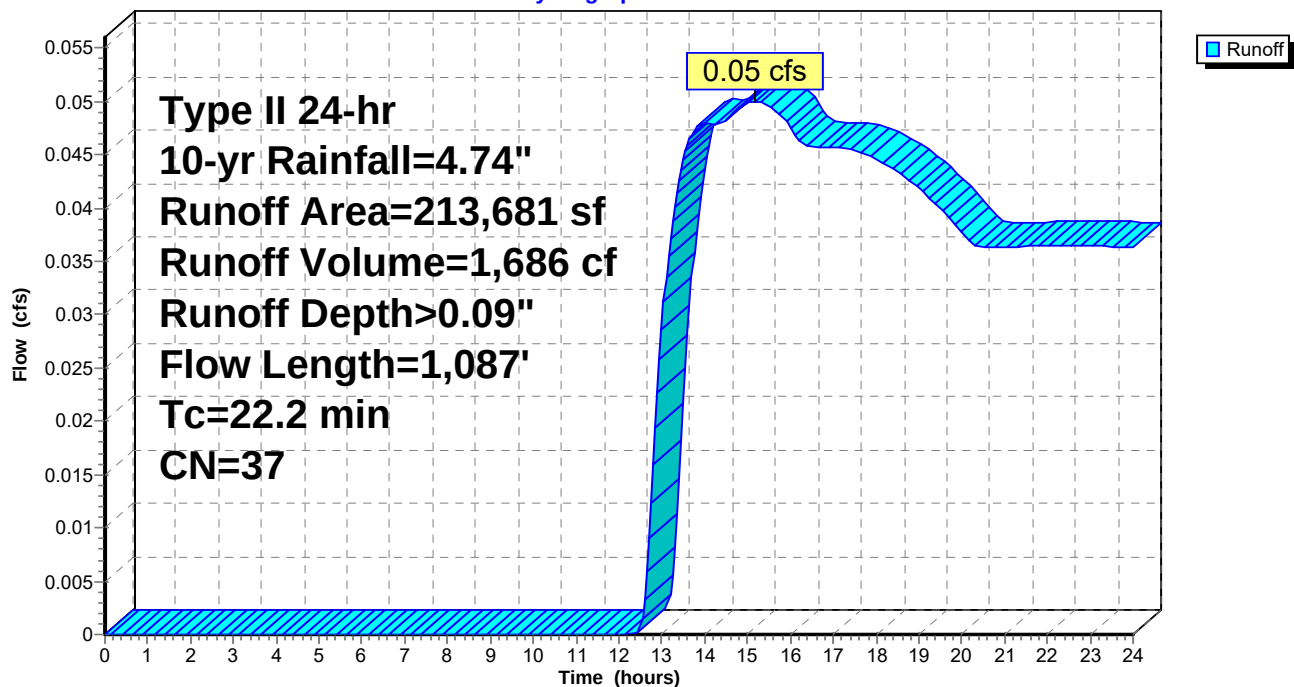
| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 8,118     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,696   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 213,681   | 37 | Weighted Average          |
| 213,681   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0921        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.0      | 846           | 0.1123        | 2.35              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.2     | 1,087         | Total         |                   |                |                                                                      |

**Subcatchment 16S: DA-3 Pre**

Hydrograph



**Summary for Subcatchment 18S: DA-3 Post**

Runoff = 0.05 cfs @ 15.20 hrs, Volume= 1,695 cf, Depth> 0.09"

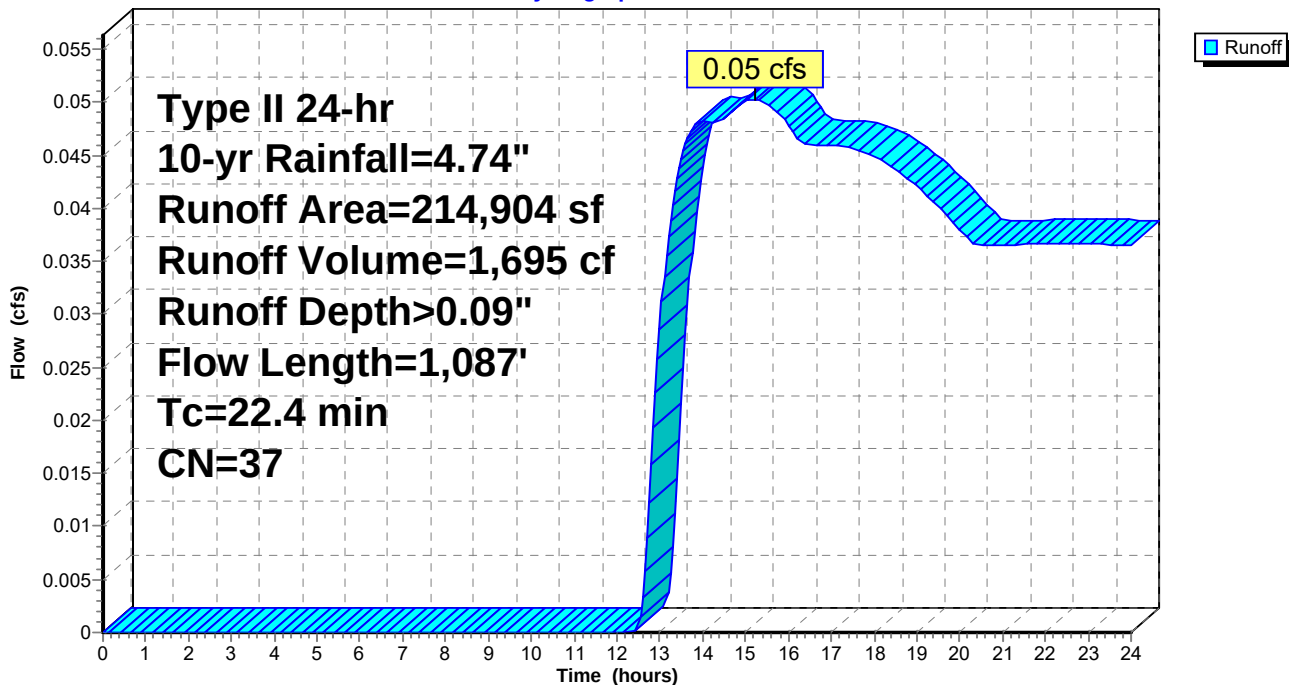
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,255     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,782   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 214,904   | 37 | Weighted Average          |
| 214,904   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0920        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.2      | 846           | 0.1060        | 2.28              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.4     | 1,087         | Total         |                   |                |                                                                      |

**Subcatchment 18S: DA-3 Post**

Hydrograph

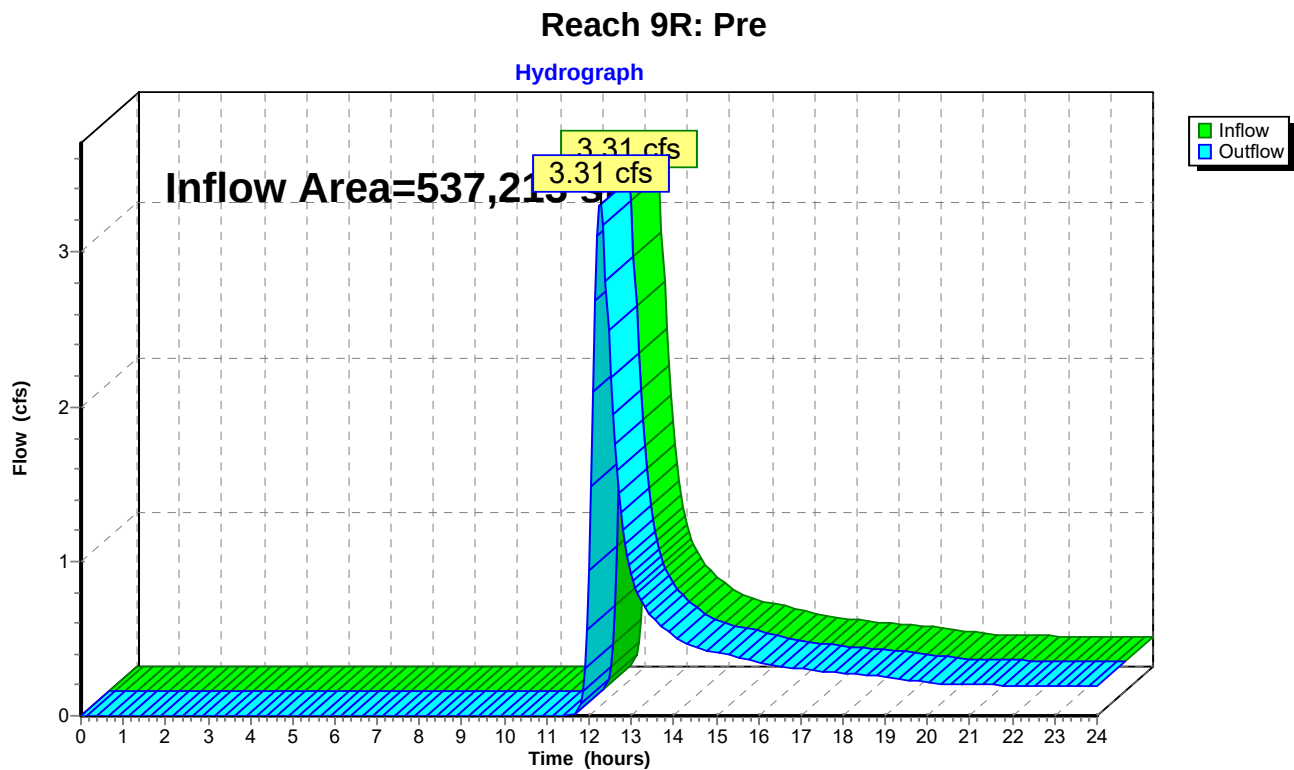


**Summary for Reach 9R: Pre**

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

Inflow Area = 537,213 sf, 0.76% Impervious, Inflow Depth > 0.44" for 10-yr event  
Inflow = 3.31 cfs @ 12.27 hrs, Volume= 19,672 cf  
Outflow = 3.31 cfs @ 12.27 hrs, Volume= 19,672 cf, Atten= 0%, Lag= 0.0 min

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

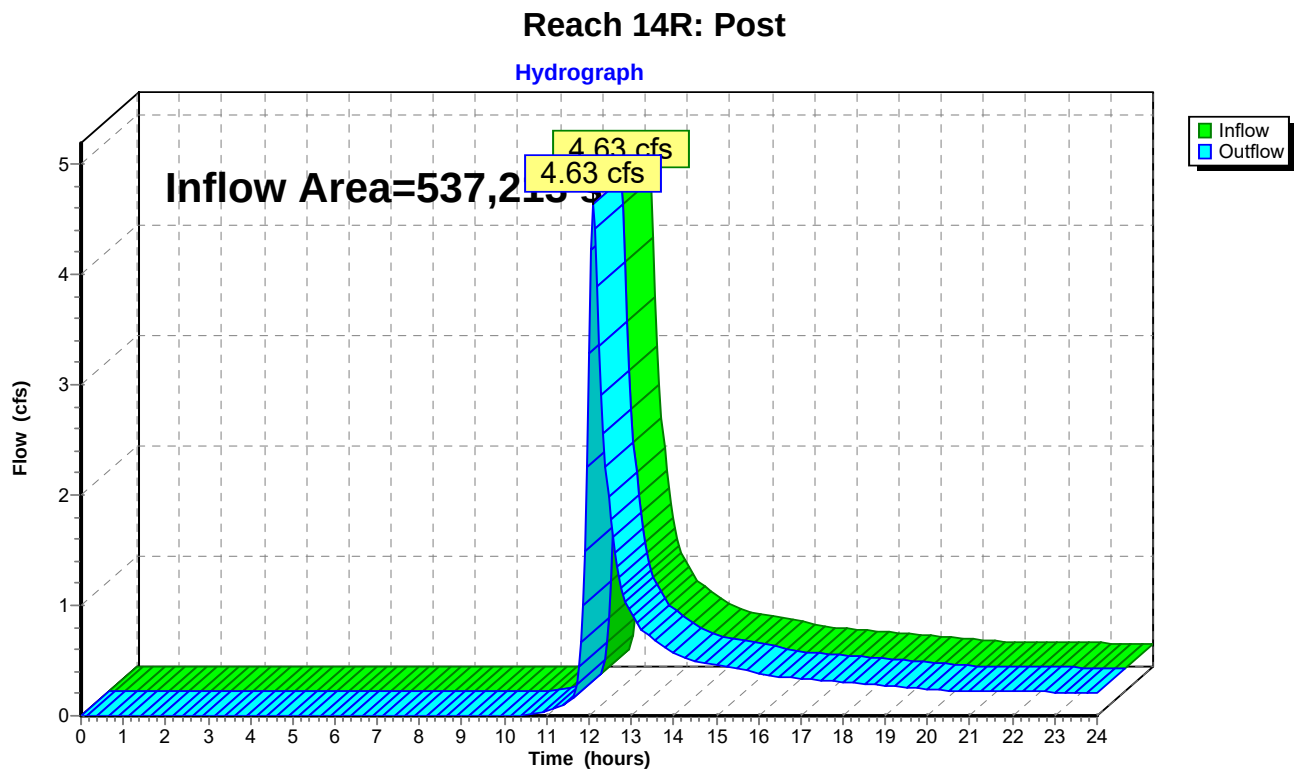


**Summary for Reach 14R: Post**

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

Inflow Area = 537,213 sf, 3.42% Impervious, Inflow Depth > 0.52" for 10-yr event  
Inflow = 4.63 cfs @ 12.11 hrs, Volume= 23,300 cf  
Outflow = 4.63 cfs @ 12.11 hrs, Volume= 23,300 cf, Atten= 0%, Lag= 0.0 min

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





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*Type II 24-hr 25-yr Rainfall=5.85"*

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment5S: DA-1 Post**

Runoff Area=246,601 sf 2.96% Impervious Runoff Depth>0.92"  
Flow Length=1,381' Tc=25.6 min CN=48 Runoff=3.57 cfs 18,987 cf

**Subcatchment7S: DA-2 Post**

Runoff Area=75,708 sf 14.62% Impervious Runoff Depth>2.68"  
Flow Length=592' Tc=15.3 min CN=70 Runoff=5.91 cfs 16,882 cf

**Subcatchment14S: DA-1 Pre**

Runoff Area=174,425 sf 2.34% Impervious Runoff Depth>0.50"  
Flow Length=1,316' Tc=25.5 min CN=41 Runoff=0.83 cfs 7,286 cf

**Subcatchment15S: DA-2 Pre**

Runoff Area=149,107 sf 0.00% Impervious Runoff Depth>1.89"  
Flow Length=1,216' Tc=28.9 min CN=61 Runoff=5.40 cfs 23,456 cf

**Subcatchment16S: DA-3 Pre**

Runoff Area=213,681 sf 0.00% Impervious Runoff Depth>0.30"  
Flow Length=1,087' Tc=22.2 min CN=37 Runoff=0.33 cfs 5,379 cf

**Subcatchment18S: DA-3 Post**

Runoff Area=214,904 sf 0.00% Impervious Runoff Depth>0.30"  
Flow Length=1,087' Tc=22.4 min CN=37 Runoff=0.33 cfs 5,409 cf

**Reach 9R: Pre**

Inflow=6.50 cfs 36,121 cf  
Outflow=6.50 cfs 36,121 cf

**Reach 14R: Post**

Inflow=8.26 cfs 41,278 cf  
Outflow=8.26 cfs 41,278 cf

**Total Runoff Area = 1,074,426 sf Runoff Volume = 77,399 cf Average Runoff Depth = 0.86"**  
**97.91% Pervious = 1,051,984 sf 2.09% Impervious = 22,442 sf**

**Summary for Subcatchment 5S: DA-1 Post**

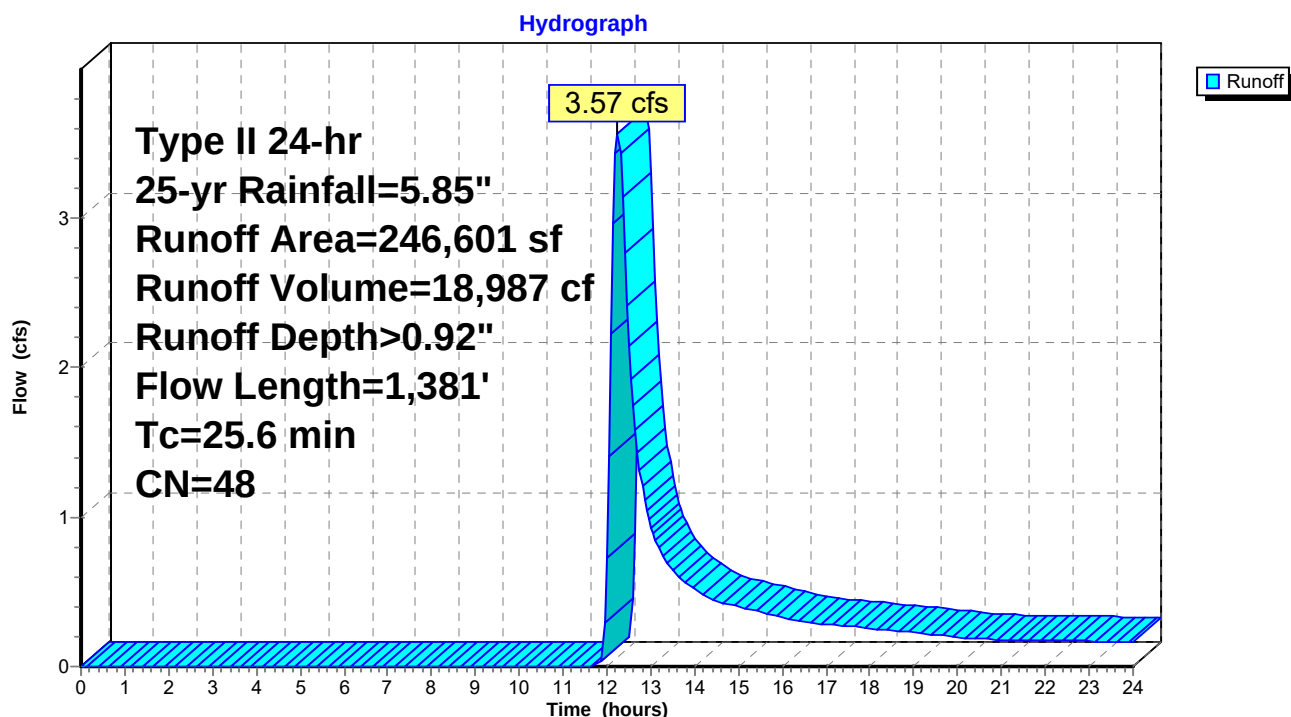
Runoff = 3.57 cfs @ 12.25 hrs, Volume= 18,987 cf, Depth> 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 42,139    | 30 | Woods, Good, HSG A        |
| 13,920    | 77 | Woods, Good, HSG D        |
| 112,687   | 30 | Meadow, non-grazed, HSG A |
| 70,562    | 78 | Meadow, non-grazed, HSG D |
| * 7,293   | 98 | Impervious                |
| 246,601   | 48 | Weighted Average          |
| 239,308   |    | 97.04% Pervious Area      |
| 7,293     |    | 2.96% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 15.4     | 100           | 0.0450        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.5      | 463           | 0.1160        | 1.70              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 5.7      | 818           | 0.1160        | 2.38              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 25.6     | 1,381         | Total         |                   |                |                                                                      |

**Subcatchment 5S: DA-1 Post**

**Summary for Subcatchment 7S: DA-2 Post**

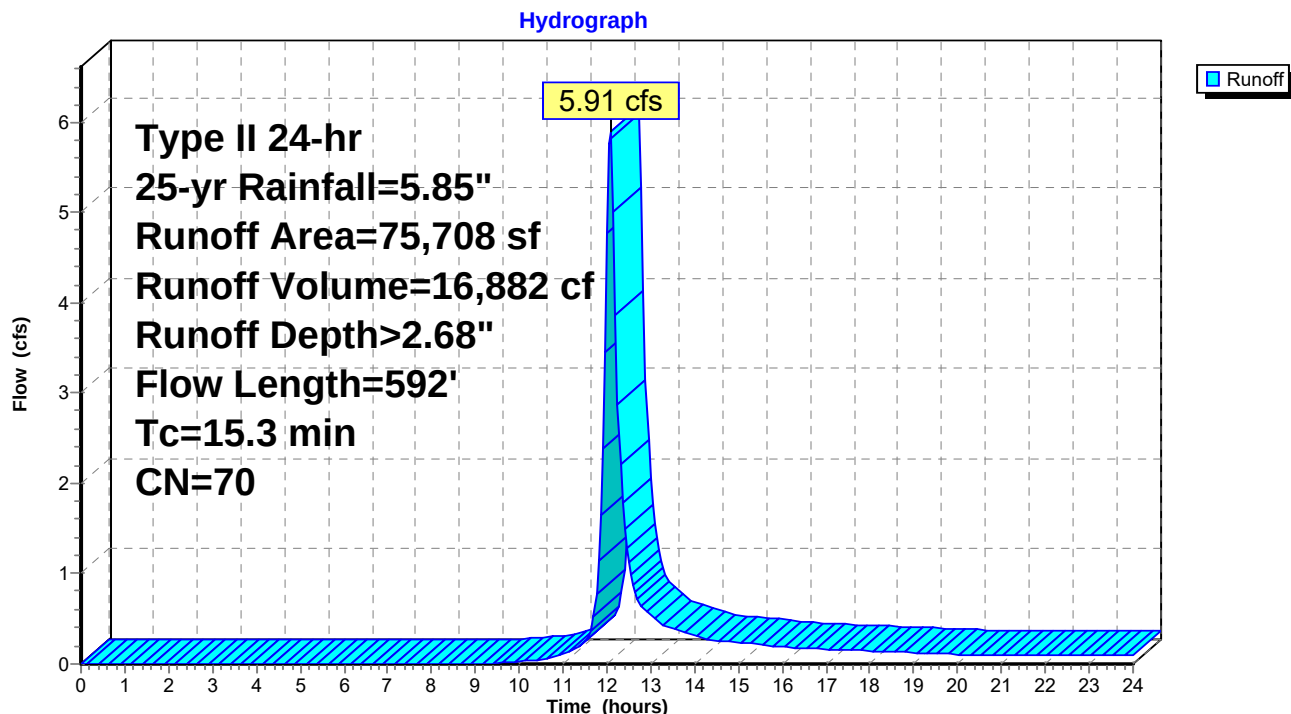
Runoff = 5.91 cfs @ 12.08 hrs, Volume= 16,882 cf, Depth> 2.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 4,976     | 30 | Woods, Good, HSG A        |
| 12,609    | 30 | Meadow, non-grazed, HSG A |
| 47,056    | 78 | Meadow, non-grazed, HSG D |
| * 11,067  | 98 | Impervious                |
| 75,708    | 70 | Weighted Average          |
| 64,641    |    | 85.38% Pervious Area      |
| 11,067    |    | 14.62% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 11.7     | 100           | 0.0900        | 0.14              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 0.3      | 130           | 0.1150        | 6.88              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps              |
| 3.3      | 362           | 0.0663        | 1.80              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 15.3     | 592           | Total         |                   |                |                                                                      |

**Subcatchment 7S: DA-2 Post**

**Summary for Subcatchment 14S: DA-1 Pre**

Runoff = 0.83 cfs @ 12.31 hrs, Volume= 7,286 cf, Depth> 0.50"

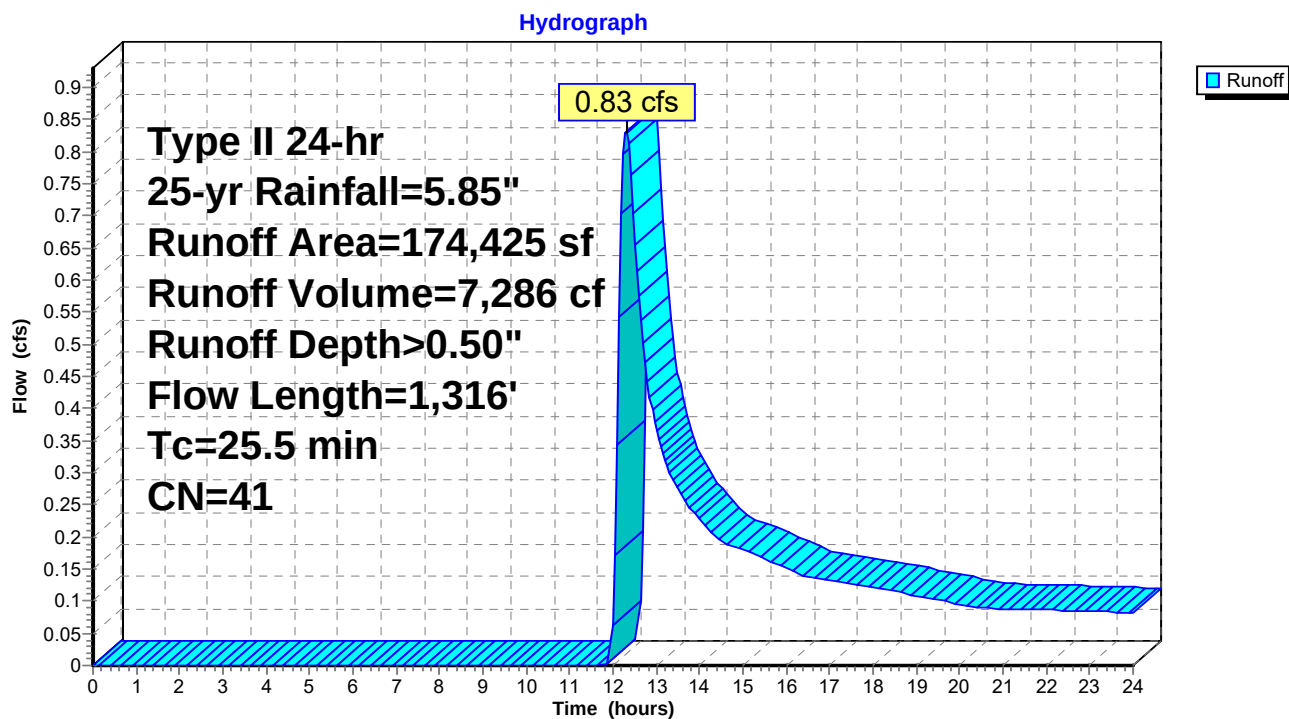
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 25,013    | 30 | Woods, Good, HSG A        |
| 6,124     | 77 | Woods, Good, HSG D        |
| 108,615   | 30 | Meadow, non-grazed, HSG A |
| 29,571    | 78 | Meadow, non-grazed, HSG D |
| * 4,082   | 98 | Existing Impervious       |
| * 1,020   | 30 | 20% Impervious as Meadow  |
| 174,425   | 41 | Weighted Average          |
| 170,343   |    | 97.66% Pervious Area      |
| 4,082     |    | 2.34% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 3.7      | 398           | 0.1256        | 1.77              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 5.7      | 818           | 0.1160        | 2.38              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 25.5     | 1,316         | Total         |                   |                |                                                                      |

## Subcatchment 14S: DA-1 Pre





**Summary for Subcatchment 15S: DA-2 Pre**

Runoff = 5.40 cfs @ 12.25 hrs, Volume= 23,456 cf, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 25-yr Rainfall=5.85"

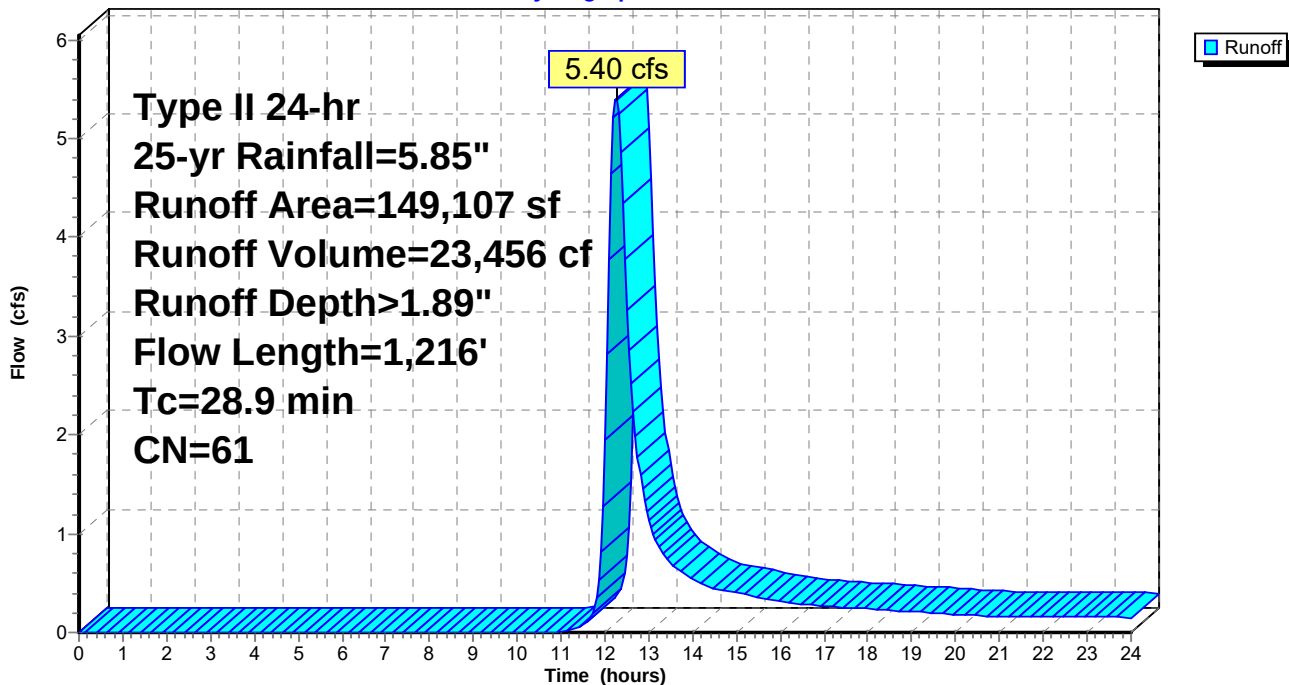
| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 24,746    | 30 | Woods, Good, HSG A        |
| 7,798     | 77 | Woods, Good, HSG D        |
| 28,513    | 30 | Meadow, non-grazed, HSG A |
| 88,050    | 78 | Meadow, non-grazed, HSG D |
| 149,107   | 61 | Weighted Average          |
| 149,107   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 18.1     | 100           | 0.0300        | 0.09              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 6.7      | 639           | 0.1001        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.1      | 477           | 0.0755        | 1.92              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 28.9     | 1,216         | Total         |                   |                |                                                                      |

**Subcatchment 15S: DA-2 Pre**

Hydrograph



**Summary for Subcatchment 16S: DA-3 Pre**

Runoff = 0.33 cfs @ 12.43 hrs, Volume= 5,379 cf, Depth> 0.30"

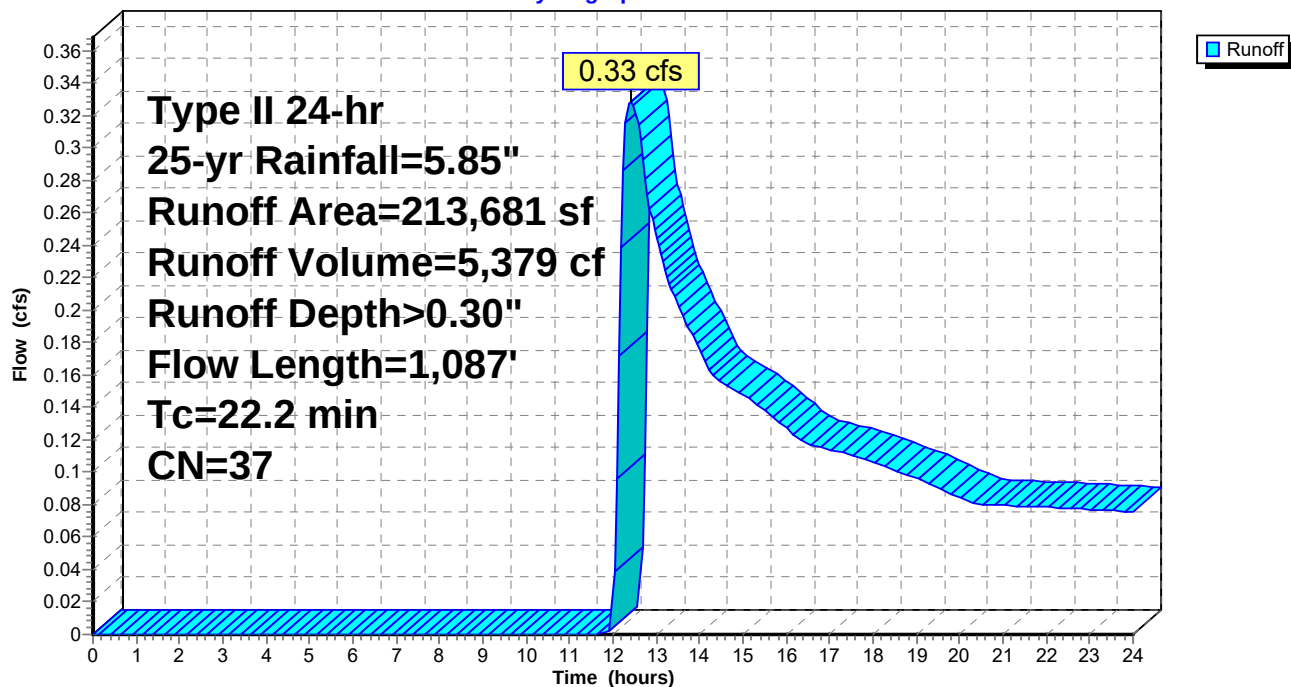
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 8,118     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,696   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 213,681   | 37 | Weighted Average          |
| 213,681   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0921        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.0      | 846           | 0.1123        | 2.35              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.2     | 1,087         | Total         |                   |                |                                                                      |

**Subcatchment 16S: DA-3 Pre**

Hydrograph



**Summary for Subcatchment 18S: DA-3 Post**

Runoff = 0.33 cfs @ 12.42 hrs, Volume= 5,409 cf, Depth> 0.30"

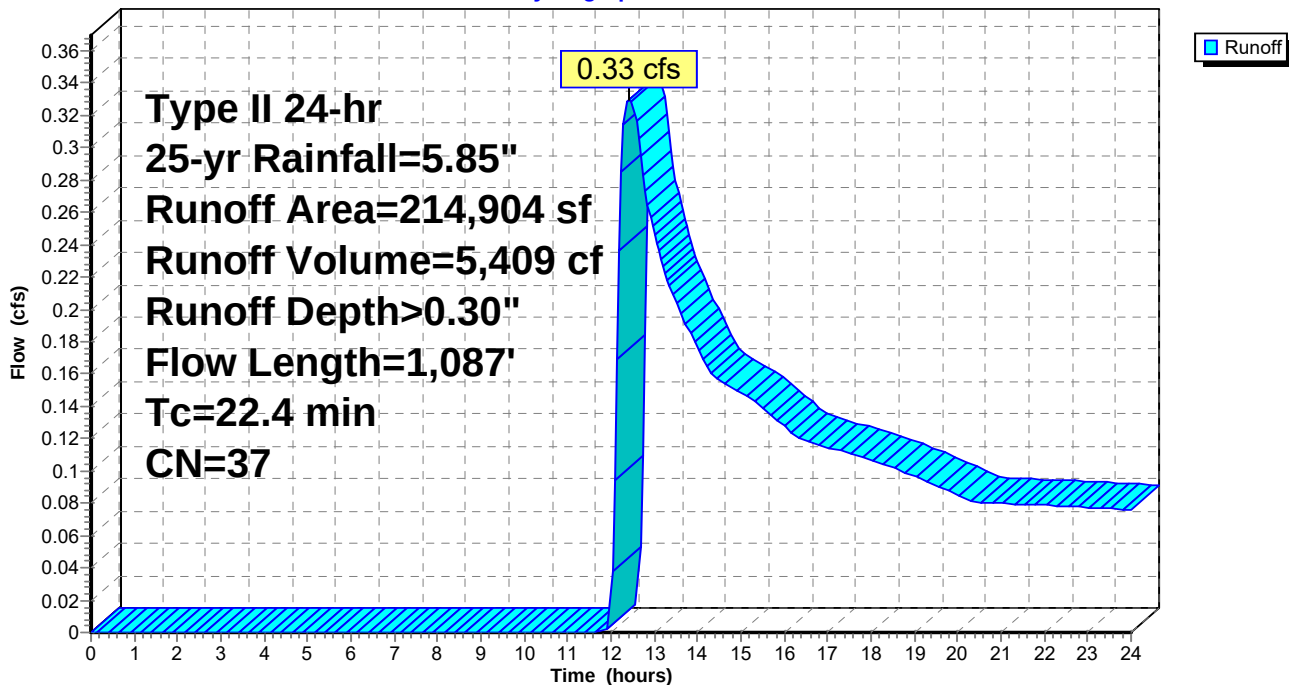
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,255     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,782   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 214,904   | 37 | Weighted Average          |
| 214,904   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0920        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.2      | 846           | 0.1060        | 2.28              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.4     | 1,087         | Total         |                   |                |                                                                      |

**Subcatchment 18S: DA-3 Post**

Hydrograph

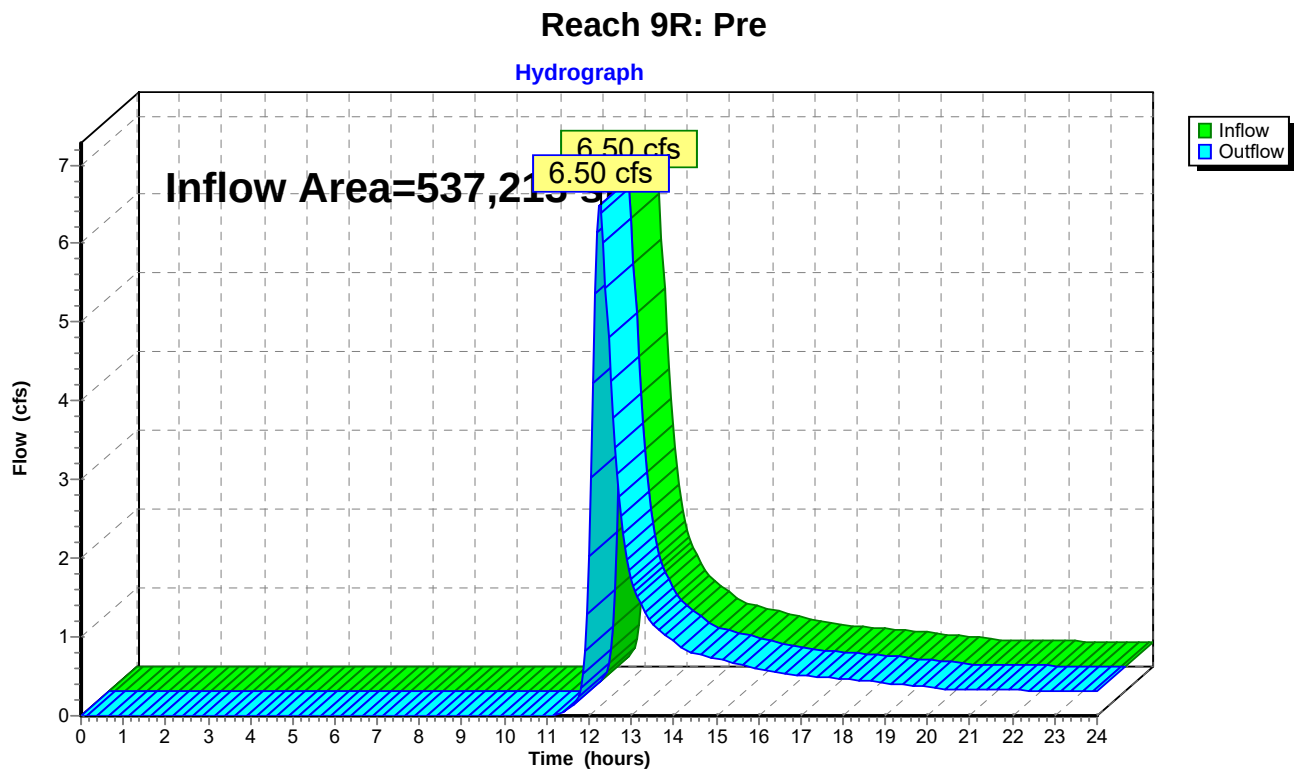


**Summary for Reach 9R: Pre**

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

Inflow Area = 537,213 sf, 0.76% Impervious, Inflow Depth > 0.81" for 25-yr event  
Inflow = 6.50 cfs @ 12.26 hrs, Volume= 36,121 cf  
Outflow = 6.50 cfs @ 12.26 hrs, Volume= 36,121 cf, Atten= 0%, Lag= 0.0 min

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

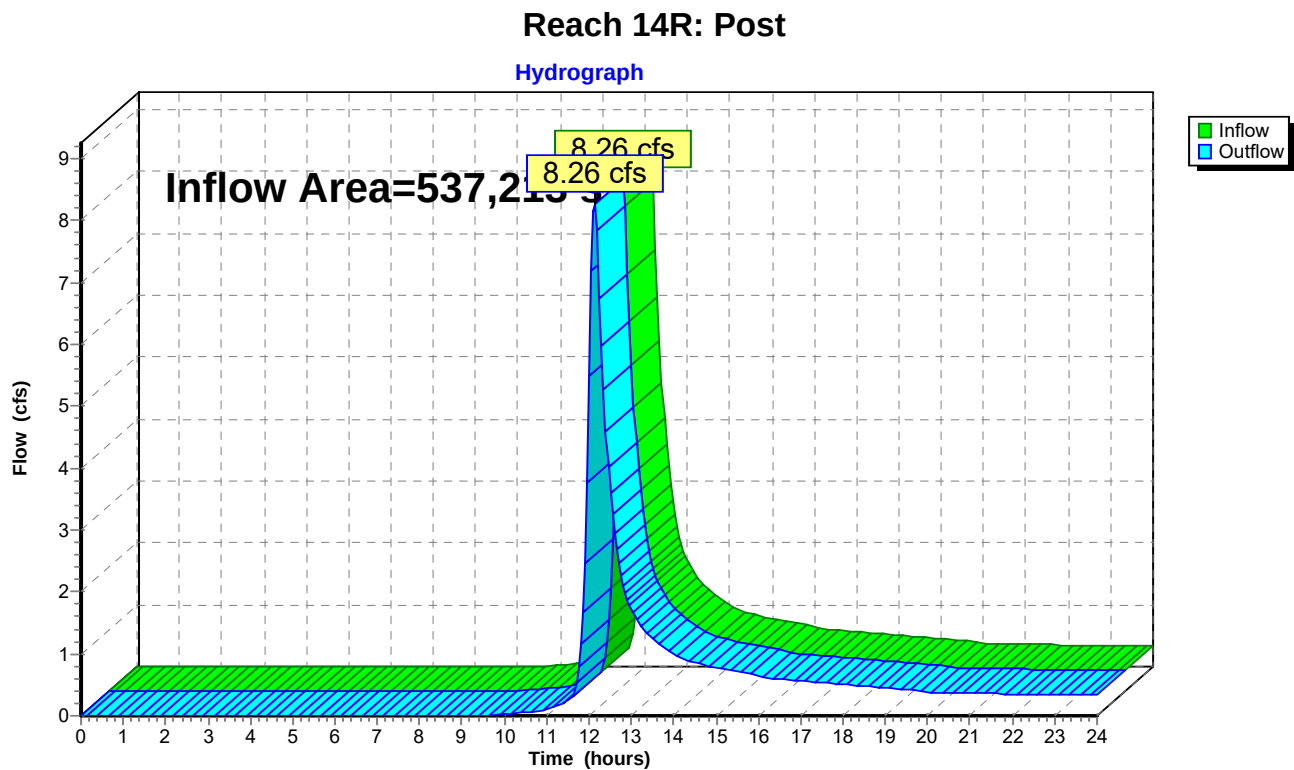


**Summary for Reach 14R: Post**

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

Inflow Area = 537,213 sf, 3.42% Impervious, Inflow Depth > 0.92" for 25-yr event  
Inflow = 8.26 cfs @ 12.12 hrs, Volume= 41,278 cf  
Outflow = 8.26 cfs @ 12.12 hrs, Volume= 41,278 cf, Atten= 0%, Lag= 0.0 min

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





**MLV 505LD86\_Pre&post**

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*Type II 24-hr 50-yr Rainfall=6.87"*

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment5S: DA-1 Post**

Runoff Area=246,601 sf 2.96% Impervious Runoff Depth>1.41"  
Flow Length=1,381' Tc=25.6 min CN=48 Runoff=6.23 cfs 28,961 cf

**Subcatchment7S: DA-2 Post**

Runoff Area=75,708 sf 14.62% Impervious Runoff Depth>3.50"  
Flow Length=592' Tc=15.3 min CN=70 Runoff=7.75 cfs 22,065 cf

**Subcatchment14S: DA-1 Pre**

Runoff Area=174,425 sf 2.34% Impervious Runoff Depth>0.86"  
Flow Length=1,316' Tc=25.5 min CN=41 Runoff=2.00 cfs 12,443 cf

**Subcatchment15S: DA-2 Pre**

Runoff Area=149,107 sf 0.00% Impervious Runoff Depth>2.59"  
Flow Length=1,216' Tc=28.9 min CN=61 Runoff=7.61 cfs 32,126 cf

**Subcatchment16S: DA-3 Pre**

Runoff Area=213,681 sf 0.00% Impervious Runoff Depth>0.58"  
Flow Length=1,087' Tc=22.2 min CN=37 Runoff=1.25 cfs 10,297 cf

**Subcatchment18S: DA-3 Post**

Runoff Area=214,904 sf 0.00% Impervious Runoff Depth>0.58"  
Flow Length=1,087' Tc=22.4 min CN=37 Runoff=1.25 cfs 10,355 cf

**Reach 9R: Pre**

Inflow=10.85 cfs 54,867 cf  
Outflow=10.85 cfs 54,867 cf

**Reach 14R: Post**

Inflow=13.03 cfs 61,381 cf  
Outflow=13.03 cfs 61,381 cf

**Total Runoff Area = 1,074,426 sf Runoff Volume = 116,248 cf Average Runoff Depth = 1.30"**  
**97.91% Pervious = 1,051,984 sf 2.09% Impervious = 22,442 sf**

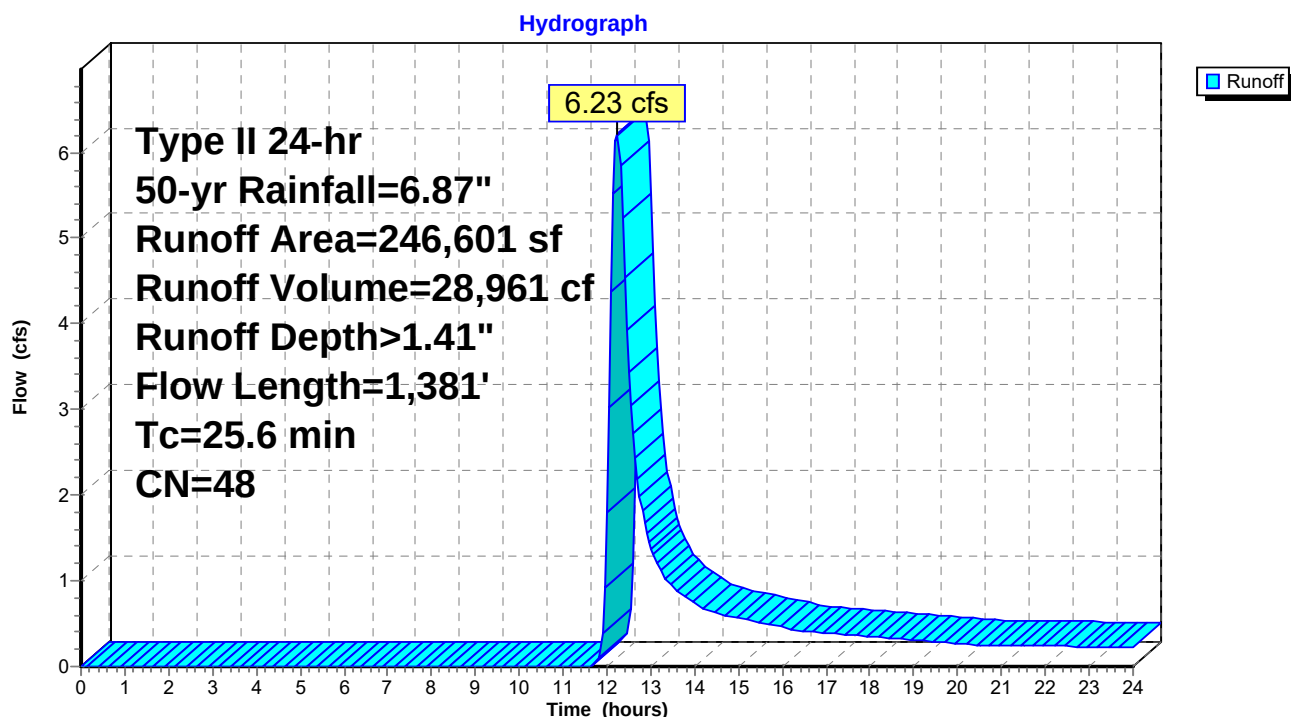
**Summary for Subcatchment 5S: DA-1 Post**

Runoff = 6.23 cfs @ 12.23 hrs, Volume= 28,961 cf, Depth> 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 42,139    | 30 | Woods, Good, HSG A        |
| 13,920    | 77 | Woods, Good, HSG D        |
| 112,687   | 30 | Meadow, non-grazed, HSG A |
| 70,562    | 78 | Meadow, non-grazed, HSG D |
| * 7,293   | 98 | Impervious                |
| 246,601   | 48 | Weighted Average          |
| 239,308   |    | 97.04% Pervious Area      |
| 7,293     |    | 2.96% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 15.4     | 100           | 0.0450        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.5      | 463           | 0.1160        | 1.70              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 5.7      | 818           | 0.1160        | 2.38              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 25.6     | 1,381         | Total         |                   |                |                                                                      |

**Subcatchment 5S: DA-1 Post**

**MLV 505LD86\_Pre&post**

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Type II 24-hr 50-yr Rainfall=6.87"

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**Summary for Subcatchment 7S: DA-2 Post**

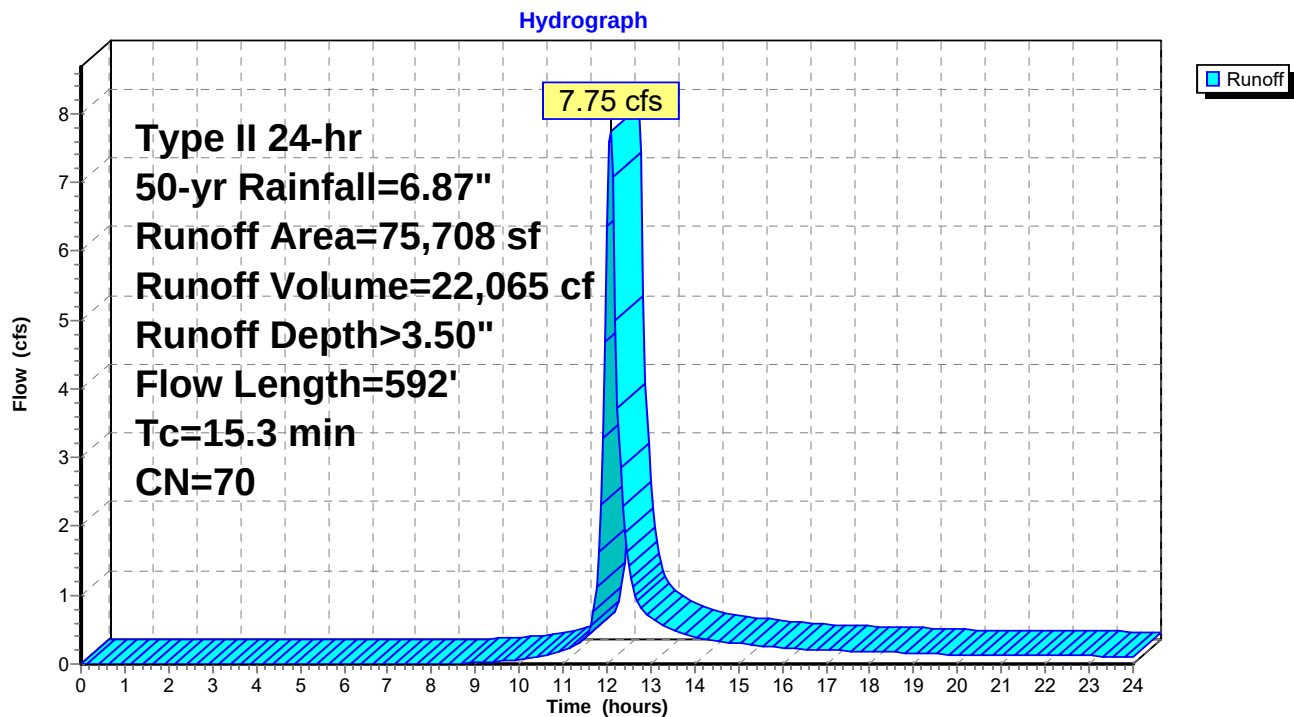
Runoff = 7.75 cfs @ 12.08 hrs, Volume= 22,065 cf, Depth&gt; 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 4,976     | 30 | Woods, Good, HSG A        |
| 12,609    | 30 | Meadow, non-grazed, HSG A |
| 47,056    | 78 | Meadow, non-grazed, HSG D |
| * 11,067  | 98 | Impervious                |
| 75,708    | 70 | Weighted Average          |
| 64,641    |    | 85.38% Pervious Area      |
| 11,067    |    | 14.62% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 11.7     | 100           | 0.0900        | 0.14              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 0.3      | 130           | 0.1150        | 6.88              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps              |
| 3.3      | 362           | 0.0663        | 1.80              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 15.3     | 592           | Total         |                   |                |                                                                      |

**Subcatchment 7S: DA-2 Post**

**Summary for Subcatchment 14S: DA-1 Pre**

Runoff = 2.00 cfs @ 12.27 hrs, Volume= 12,443 cf, Depth> 0.86"

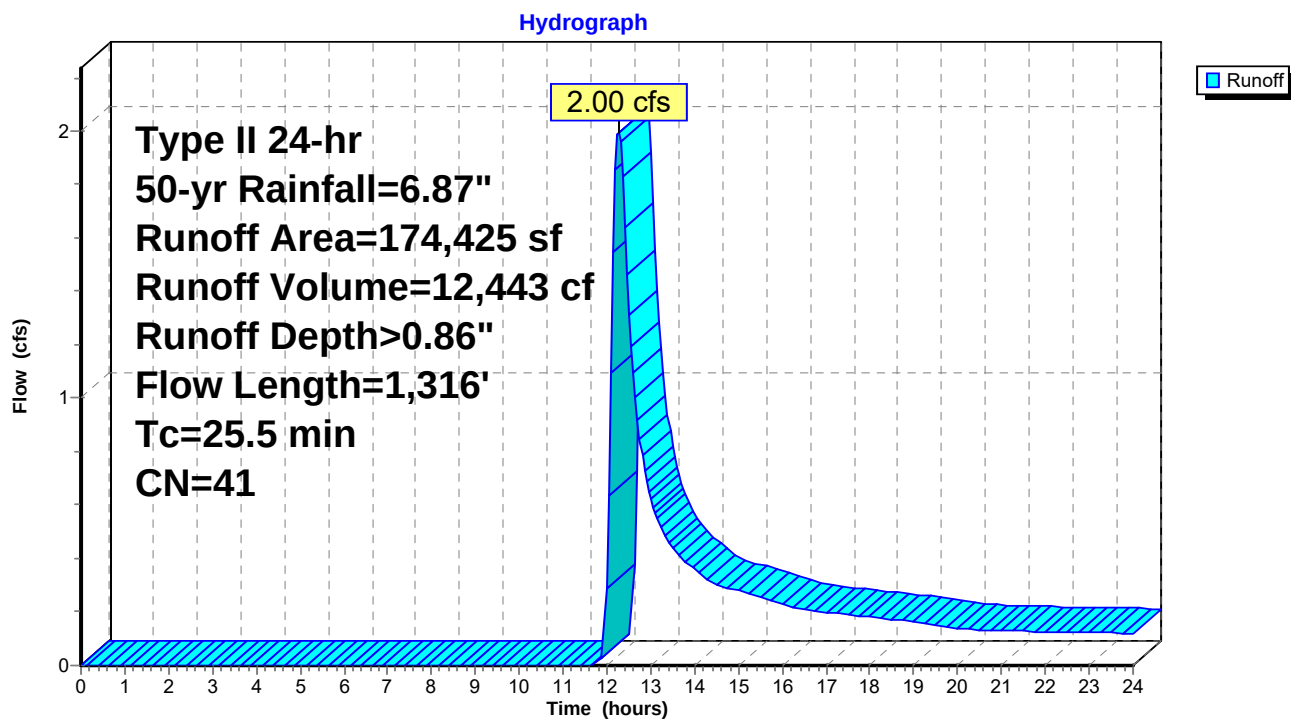
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 25,013    | 30 | Woods, Good, HSG A        |
| 6,124     | 77 | Woods, Good, HSG D        |
| 108,615   | 30 | Meadow, non-grazed, HSG A |
| 29,571    | 78 | Meadow, non-grazed, HSG D |
| * 4,082   | 98 | Existing Impervious       |
| * 1,020   | 30 | 20% Impervious as Meadow  |
| 174,425   | 41 | Weighted Average          |
| 170,343   |    | 97.66% Pervious Area      |
| 4,082     |    | 2.34% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 3.7      | 398           | 0.1256        | 1.77              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 5.7      | 818           | 0.1160        | 2.38              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 25.5     | 1,316         | Total         |                   |                |                                                                      |

## Subcatchment 14S: DA-1 Pre





**Summary for Subcatchment 15S: DA-2 Pre**

Runoff = 7.61 cfs @ 12.25 hrs, Volume= 32,126 cf, Depth> 2.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 50-yr Rainfall=6.87"

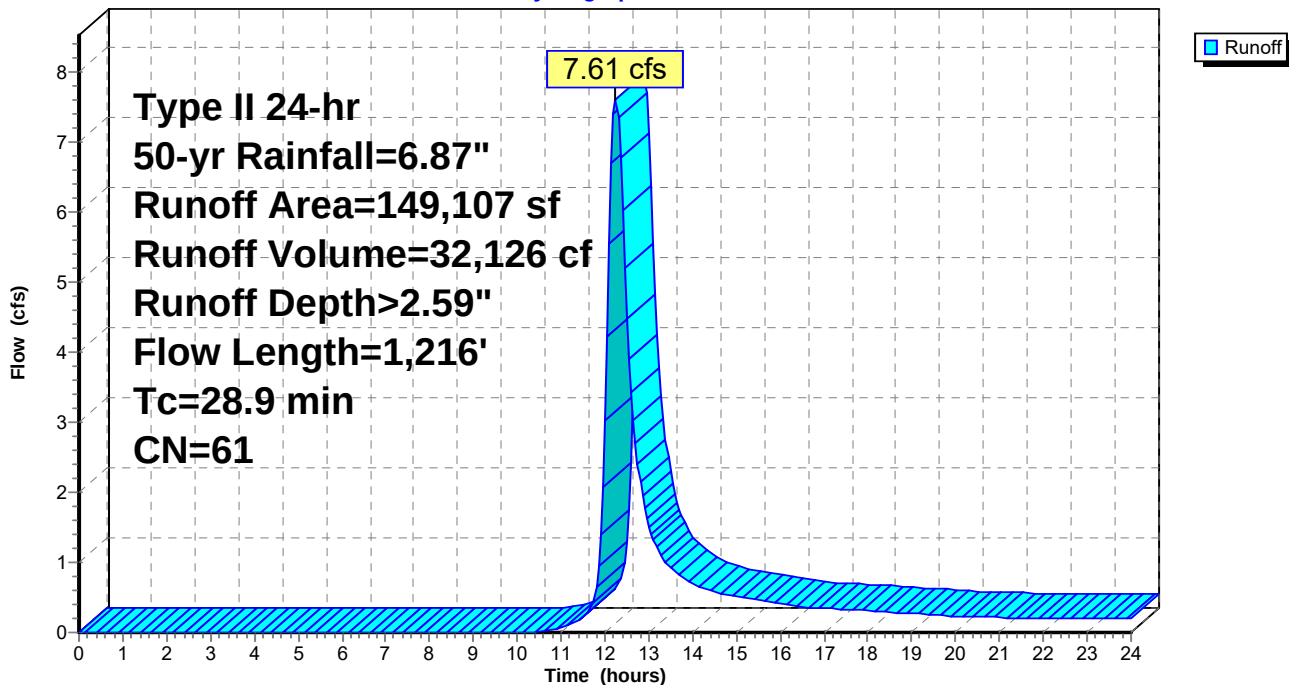
| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 24,746    | 30 | Woods, Good, HSG A        |
| 7,798     | 77 | Woods, Good, HSG D        |
| 28,513    | 30 | Meadow, non-grazed, HSG A |
| 88,050    | 78 | Meadow, non-grazed, HSG D |
| 149,107   | 61 | Weighted Average          |
| 149,107   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 18.1     | 100           | 0.0300        | 0.09              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 6.7      | 639           | 0.1001        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.1      | 477           | 0.0755        | 1.92              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 28.9     | 1,216         | Total         |                   |                |                                                                      |

**Subcatchment 15S: DA-2 Pre**

Hydrograph



**Summary for Subcatchment 16S: DA-3 Pre**

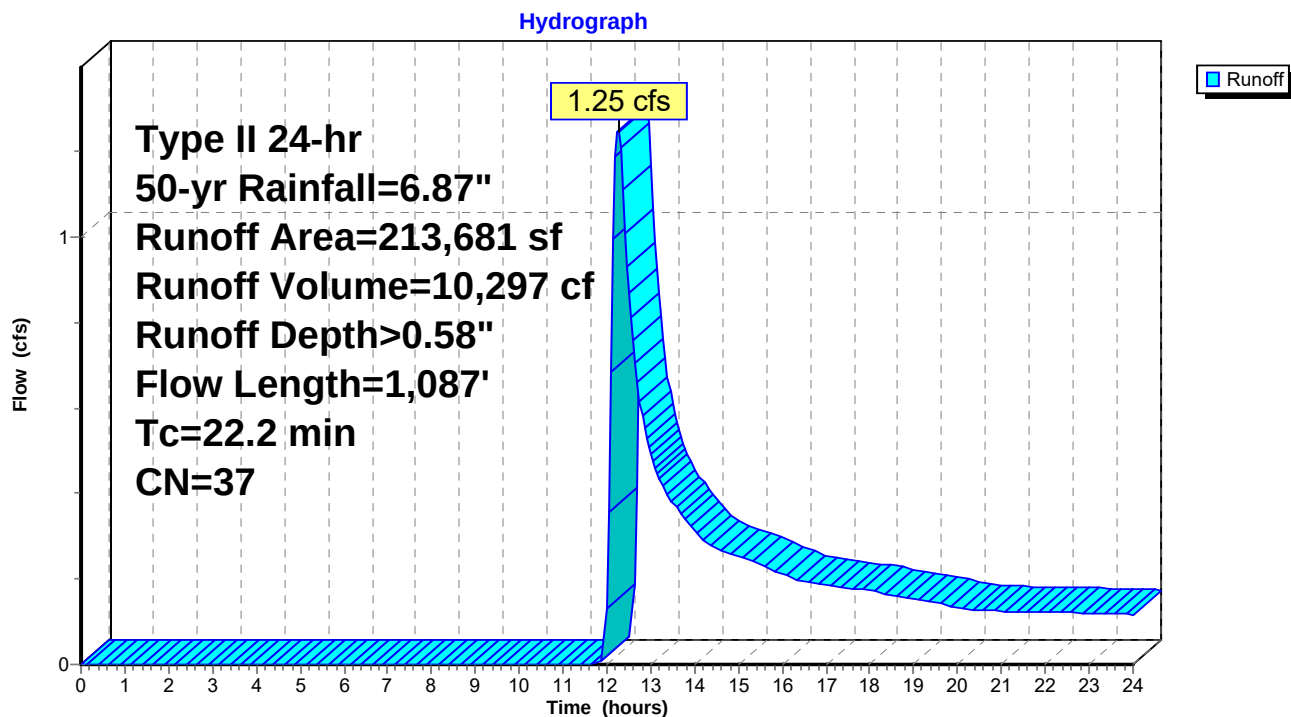
Runoff = 1.25 cfs @ 12.26 hrs, Volume= 10,297 cf, Depth> 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 8,118     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,696   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 213,681   | 37 | Weighted Average          |
| 213,681   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0921        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.0      | 846           | 0.1123        | 2.35              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.2     | 1,087         | Total         |                   |                |                                                                      |

**Subcatchment 16S: DA-3 Pre**

**Summary for Subcatchment 18S: DA-3 Post**

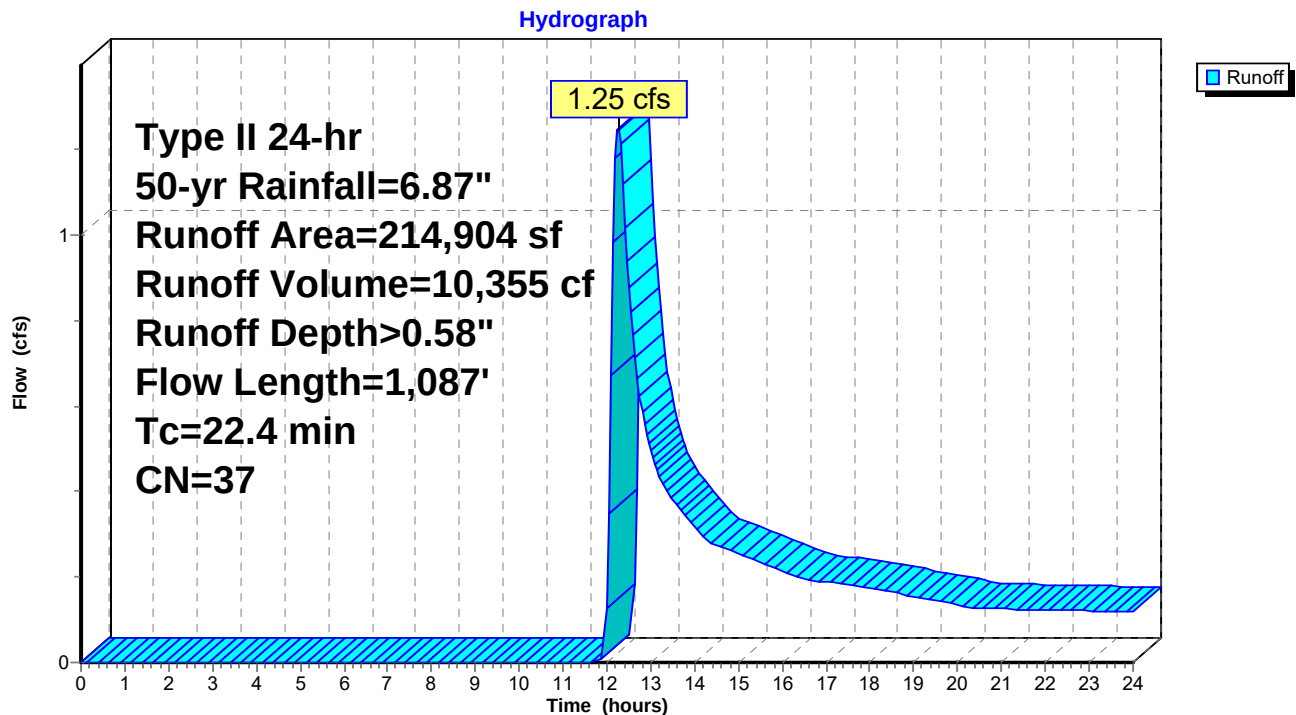
Runoff = 1.25 cfs @ 12.26 hrs, Volume= 10,355 cf, Depth> 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,255     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,782   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 214,904   | 37 | Weighted Average          |
| 214,904   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0920        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.2      | 846           | 0.1060        | 2.28              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.4     | 1,087         | Total         |                   |                |                                                                      |

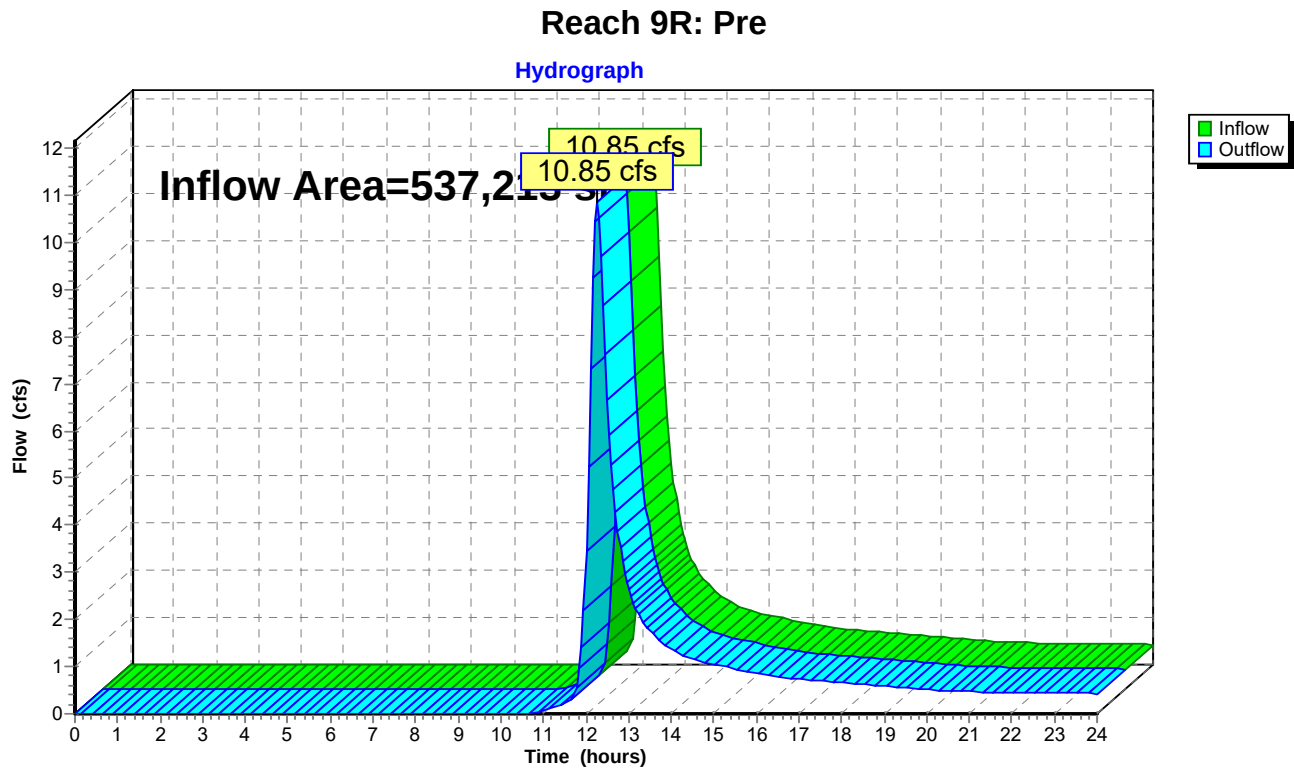
**Subcatchment 18S: DA-3 Post**

**Summary for Reach 9R: Pre**

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

Inflow Area = 537,213 sf, 0.76% Impervious, Inflow Depth > 1.23" for 50-yr event  
Inflow = 10.85 cfs @ 12.25 hrs, Volume= 54,867 cf  
Outflow = 10.85 cfs @ 12.25 hrs, Volume= 54,867 cf, Atten= 0%, Lag= 0.0 min

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

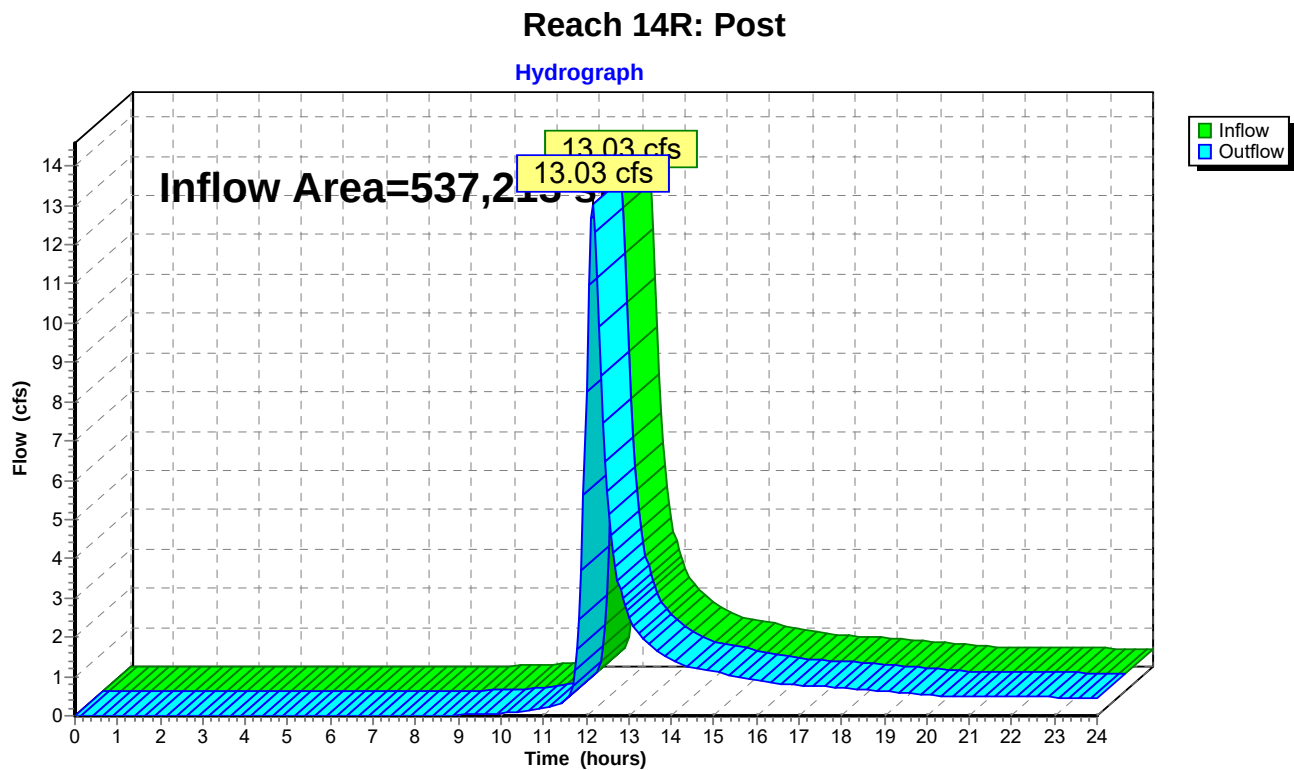


**Summary for Reach 14R: Post**

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

Inflow Area = 537,213 sf, 3.42% Impervious, Inflow Depth > 1.37" for 50-yr event  
Inflow = 13.03 cfs @ 12.14 hrs, Volume= 61,381 cf  
Outflow = 13.03 cfs @ 12.14 hrs, Volume= 61,381 cf, Atten= 0%, Lag= 0.0 min

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





**MLV 505LD86\_Pre&post***Type II 24-hr 100-yr Rainfall=8.09"*

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment5S: DA-1 Post**

Runoff Area=246,601 sf 2.96% Impervious Runoff Depth>2.07"  
Flow Length=1,381' Tc=25.6 min CN=48 Runoff=10.01 cfs 42,631 cf

**Subcatchment7S: DA-2 Post**

Runoff Area=75,708 sf 14.62% Impervious Runoff Depth>4.53"  
Flow Length=592' Tc=15.3 min CN=70 Runoff=10.03 cfs 28,551 cf

**Subcatchment14S: DA-1 Pre**

Runoff Area=174,425 sf 2.34% Impervious Runoff Depth>1.37"  
Flow Length=1,316' Tc=25.5 min CN=41 Runoff=3.90 cfs 19,921 cf

**Subcatchment15S: DA-2 Pre**

Runoff Area=149,107 sf 0.00% Impervious Runoff Depth>3.48"  
Flow Length=1,216' Tc=28.9 min CN=61 Runoff=10.45 cfs 43,296 cf

**Subcatchment16S: DA-3 Pre**

Runoff Area=213,681 sf 0.00% Impervious Runoff Depth>1.00"  
Flow Length=1,087' Tc=22.2 min CN=37 Runoff=3.12 cfs 17,803 cf

**Subcatchment18S: DA-3 Post**

Runoff Area=214,904 sf 0.00% Impervious Runoff Depth>1.00"  
Flow Length=1,087' Tc=22.4 min CN=37 Runoff=3.12 cfs 17,903 cf

**Reach 9R: Pre**

Inflow=17.43 cfs 81,020 cf  
Outflow=17.43 cfs 81,020 cf

**Reach 14R: Post**

Inflow=20.31 cfs 89,085 cf  
Outflow=20.31 cfs 89,085 cf

**Total Runoff Area = 1,074,426 sf Runoff Volume = 170,105 cf Average Runoff Depth = 1.90"**  
**97.91% Pervious = 1,051,984 sf 2.09% Impervious = 22,442 sf**

**Summary for Subcatchment 5S: DA-1 Post**

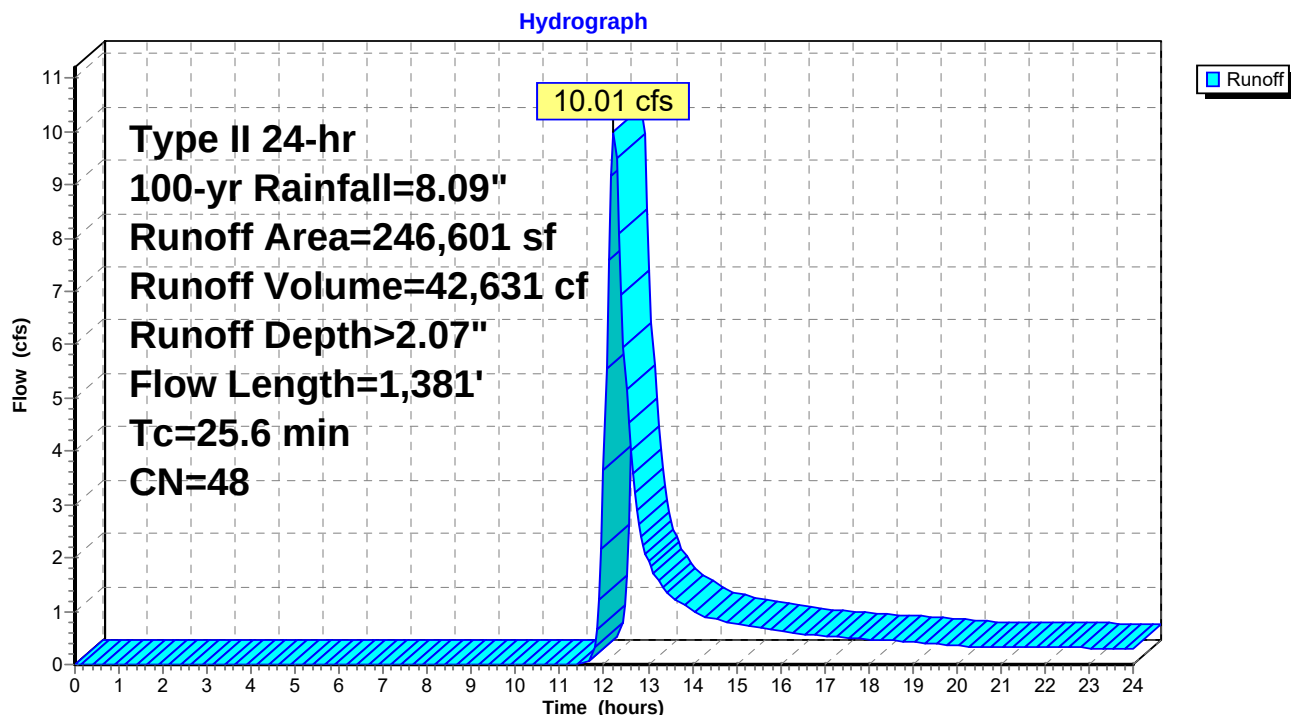
Runoff = 10.01 cfs @ 12.22 hrs, Volume= 42,631 cf, Depth> 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 42,139    | 30 | Woods, Good, HSG A        |
| 13,920    | 77 | Woods, Good, HSG D        |
| 112,687   | 30 | Meadow, non-grazed, HSG A |
| 70,562    | 78 | Meadow, non-grazed, HSG D |
| * 7,293   | 98 | Impervious                |
| 246,601   | 48 | Weighted Average          |
| 239,308   |    | 97.04% Pervious Area      |
| 7,293     |    | 2.96% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 15.4     | 100           | 0.0450        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.5      | 463           | 0.1160        | 1.70              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 5.7      | 818           | 0.1160        | 2.38              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 25.6     | 1,381         | Total         |                   |                |                                                                      |

**Subcatchment 5S: DA-1 Post**

**Summary for Subcatchment 7S: DA-2 Post**

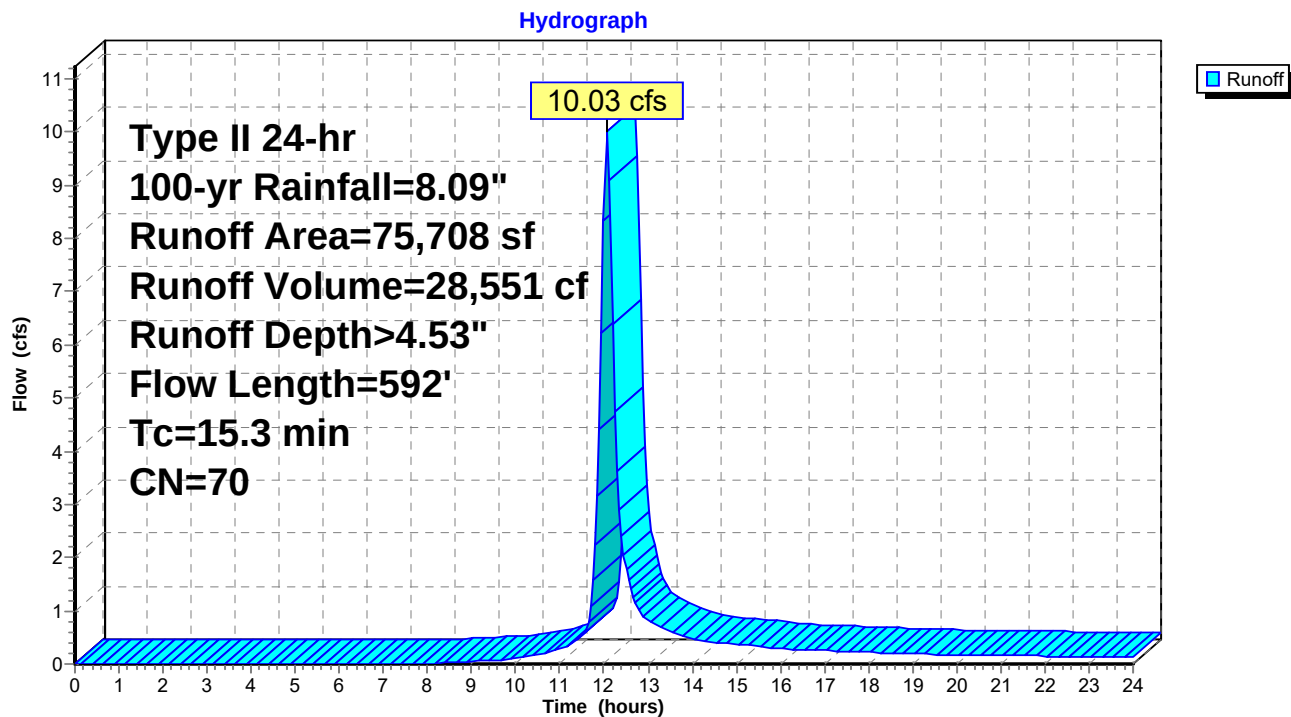
Runoff = 10.03 cfs @ 12.07 hrs, Volume= 28,551 cf, Depth> 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 4,976     | 30 | Woods, Good, HSG A        |
| 12,609    | 30 | Meadow, non-grazed, HSG A |
| 47,056    | 78 | Meadow, non-grazed, HSG D |
| * 11,067  | 98 | Impervious                |
| 75,708    | 70 | Weighted Average          |
| 64,641    |    | 85.38% Pervious Area      |
| 11,067    |    | 14.62% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 11.7     | 100           | 0.0900        | 0.14              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 0.3      | 130           | 0.1150        | 6.88              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps              |
| 3.3      | 362           | 0.0663        | 1.80              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 15.3     | 592           | Total         |                   |                |                                                                      |

**Subcatchment 7S: DA-2 Post**

**Summary for Subcatchment 14S: DA-1 Pre**

Runoff = 3.90 cfs @ 12.24 hrs, Volume= 19,921 cf, Depth> 1.37"

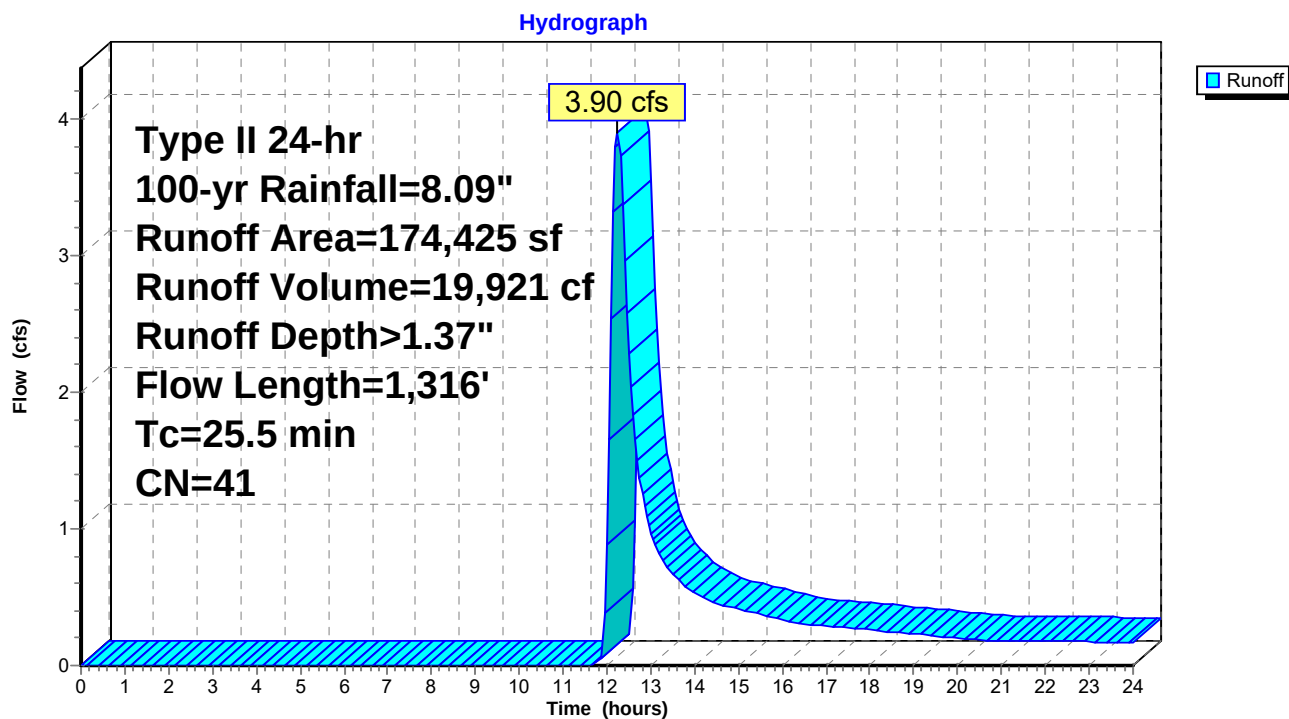
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 25,013    | 30 | Woods, Good, HSG A        |
| 6,124     | 77 | Woods, Good, HSG D        |
| 108,615   | 30 | Meadow, non-grazed, HSG A |
| 29,571    | 78 | Meadow, non-grazed, HSG D |
| * 4,082   | 98 | Existing Impervious       |
| * 1,020   | 30 | 20% Impervious as Meadow  |
| 174,425   | 41 | Weighted Average          |
| 170,343   |    | 97.66% Pervious Area      |
| 4,082     |    | 2.34% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 3.7      | 398           | 0.1256        | 1.77              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 5.7      | 818           | 0.1160        | 2.38              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 25.5     | 1,316         | Total         |                   |                |                                                                      |

## Subcatchment 14S: DA-1 Pre





**Summary for Subcatchment 15S: DA-2 Pre**

Runoff = 10.45 cfs @ 12.24 hrs, Volume= 43,296 cf, Depth> 3.48"

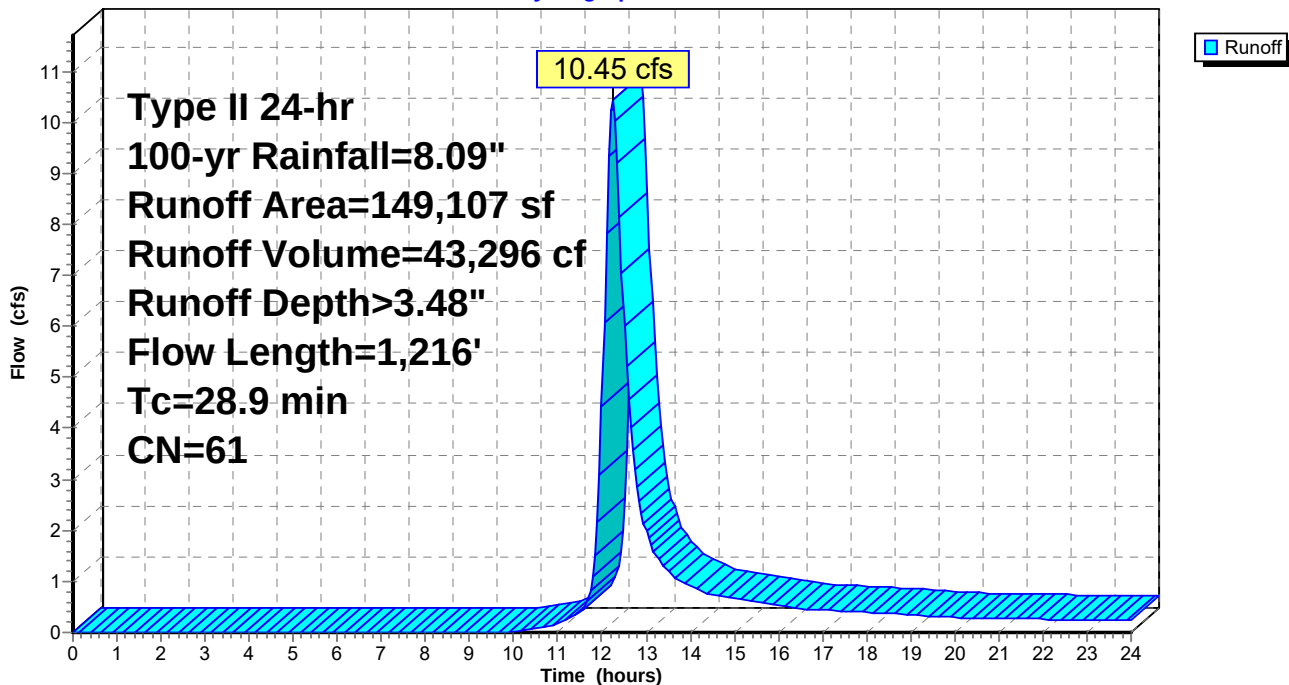
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 24,746    | 30 | Woods, Good, HSG A        |
| 7,798     | 77 | Woods, Good, HSG D        |
| 28,513    | 30 | Meadow, non-grazed, HSG A |
| 88,050    | 78 | Meadow, non-grazed, HSG D |
| 149,107   | 61 | Weighted Average          |
| 149,107   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 18.1     | 100           | 0.0300        | 0.09              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 6.7      | 639           | 0.1001        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.1      | 477           | 0.0755        | 1.92              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 28.9     | 1,216         | Total         |                   |                |                                                                      |

**Subcatchment 15S: DA-2 Pre**

Hydrograph



**Summary for Subcatchment 16S: DA-3 Pre**

Runoff = 3.12 cfs @ 12.22 hrs, Volume= 17,803 cf, Depth> 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-yr Rainfall=8.09"

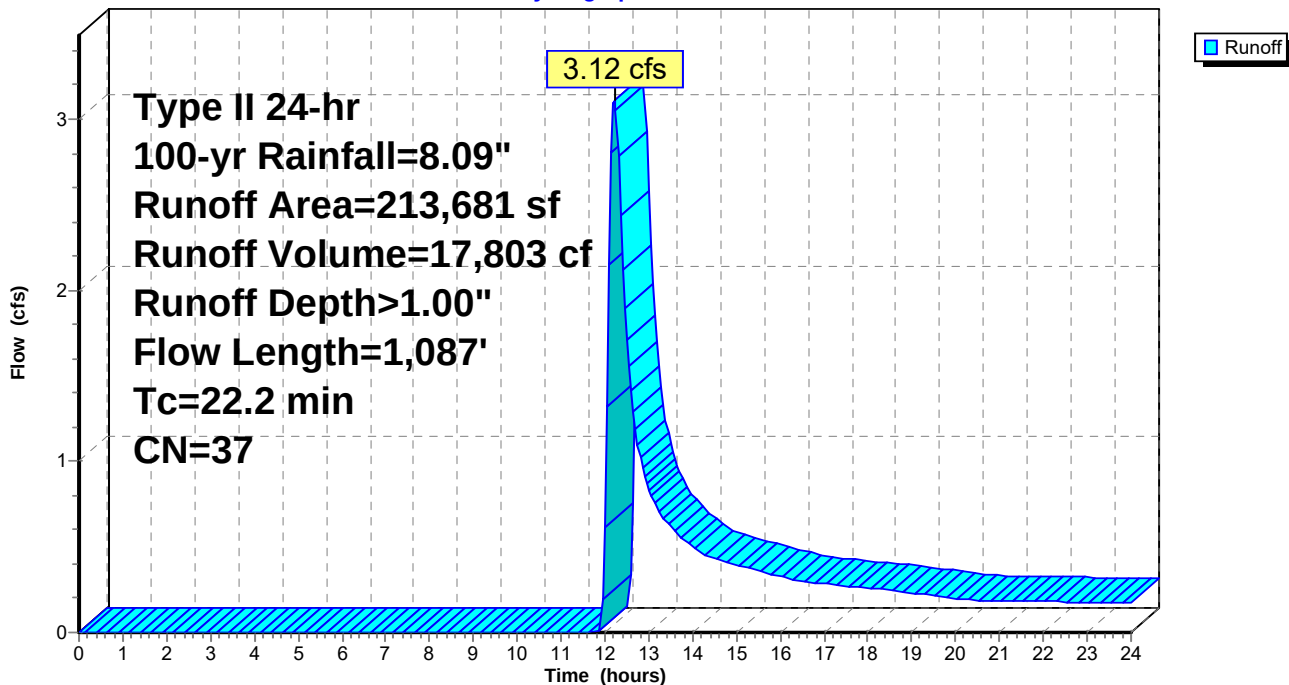
| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 8,118     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,696   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 213,681   | 37 | Weighted Average          |
| 213,681   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0921        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.0      | 846           | 0.1123        | 2.35              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.2     | 1,087         | Total         |                   |                |                                                                      |

**Subcatchment 16S: DA-3 Pre**

Hydrograph



**Summary for Subcatchment 18S: DA-3 Post**

Runoff = 3.12 cfs @ 12.22 hrs, Volume= 17,903 cf, Depth> 1.00"

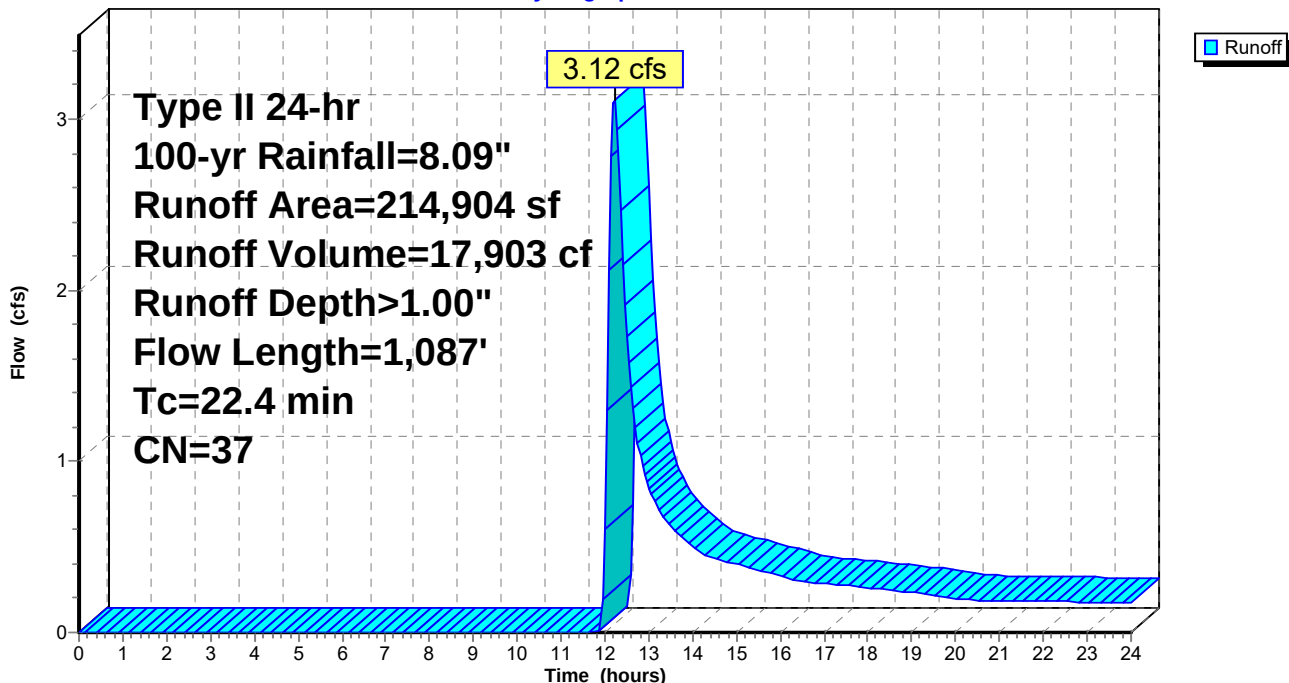
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,255     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,782   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 214,904   | 37 | Weighted Average          |
| 214,904   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0920        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.2      | 846           | 0.1060        | 2.28              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.4     | 1,087         | Total         |                   |                |                                                                      |

**Subcatchment 18S: DA-3 Post**

Hydrograph

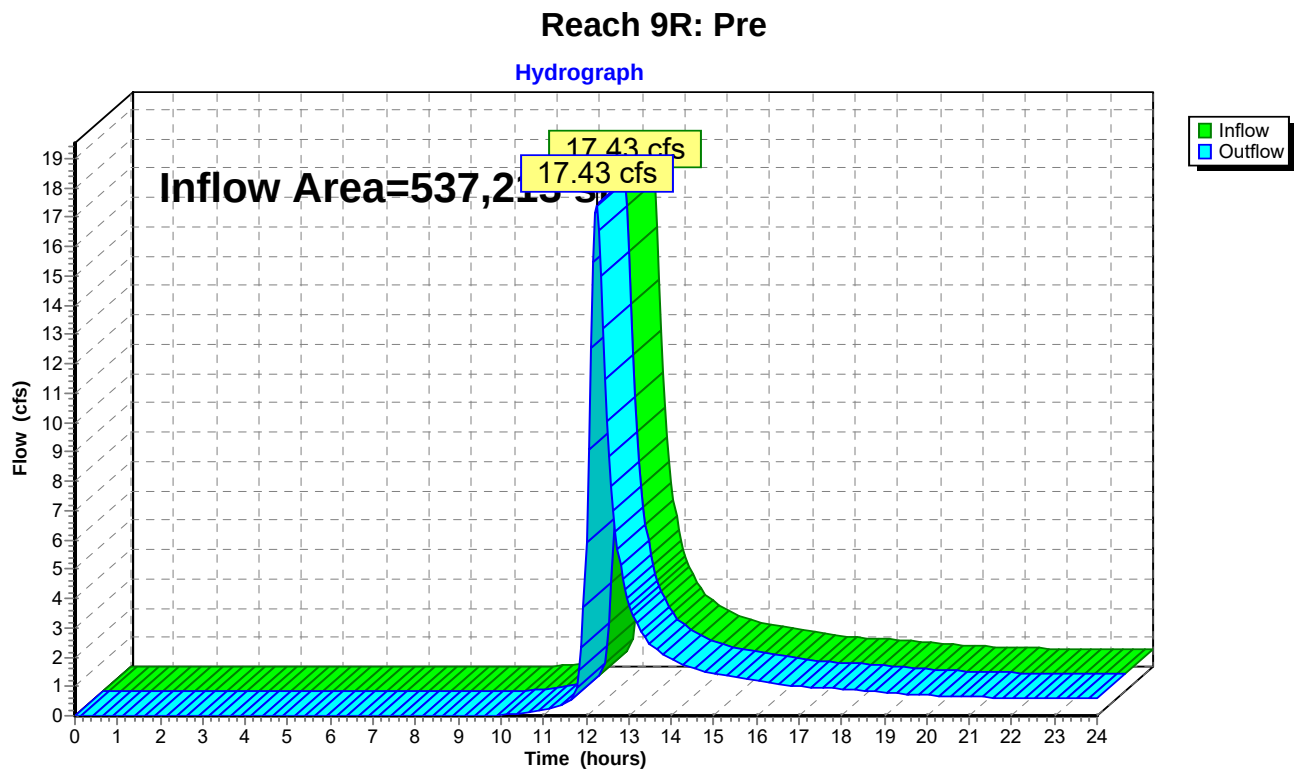


**Summary for Reach 9R: Pre**

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

Inflow Area = 537,213 sf, 0.76% Impervious, Inflow Depth > 1.81" for 100-yr event  
Inflow = 17.43 cfs @ 12.24 hrs, Volume= 81,020 cf  
Outflow = 17.43 cfs @ 12.24 hrs, Volume= 81,020 cf, Atten= 0%, Lag= 0.0 min

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

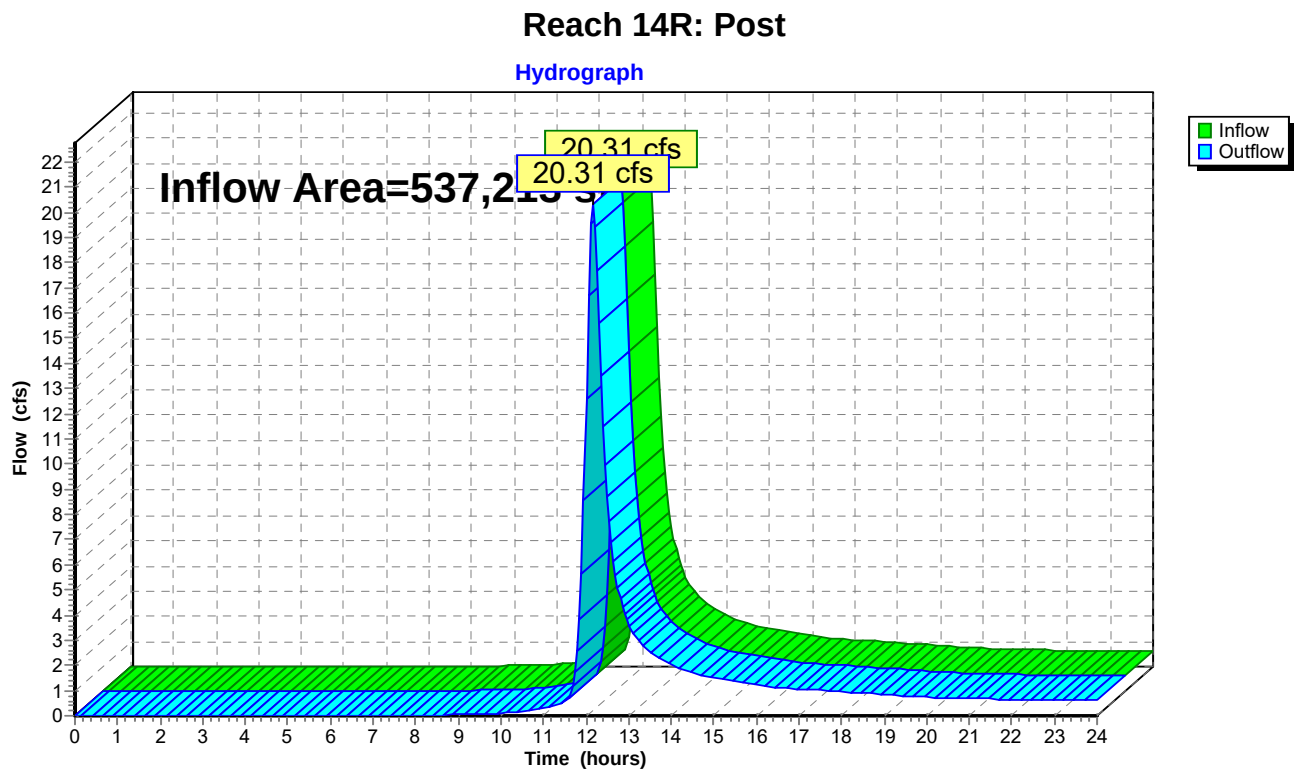


**Summary for Reach 14R: Post**

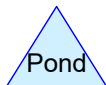
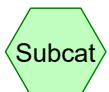
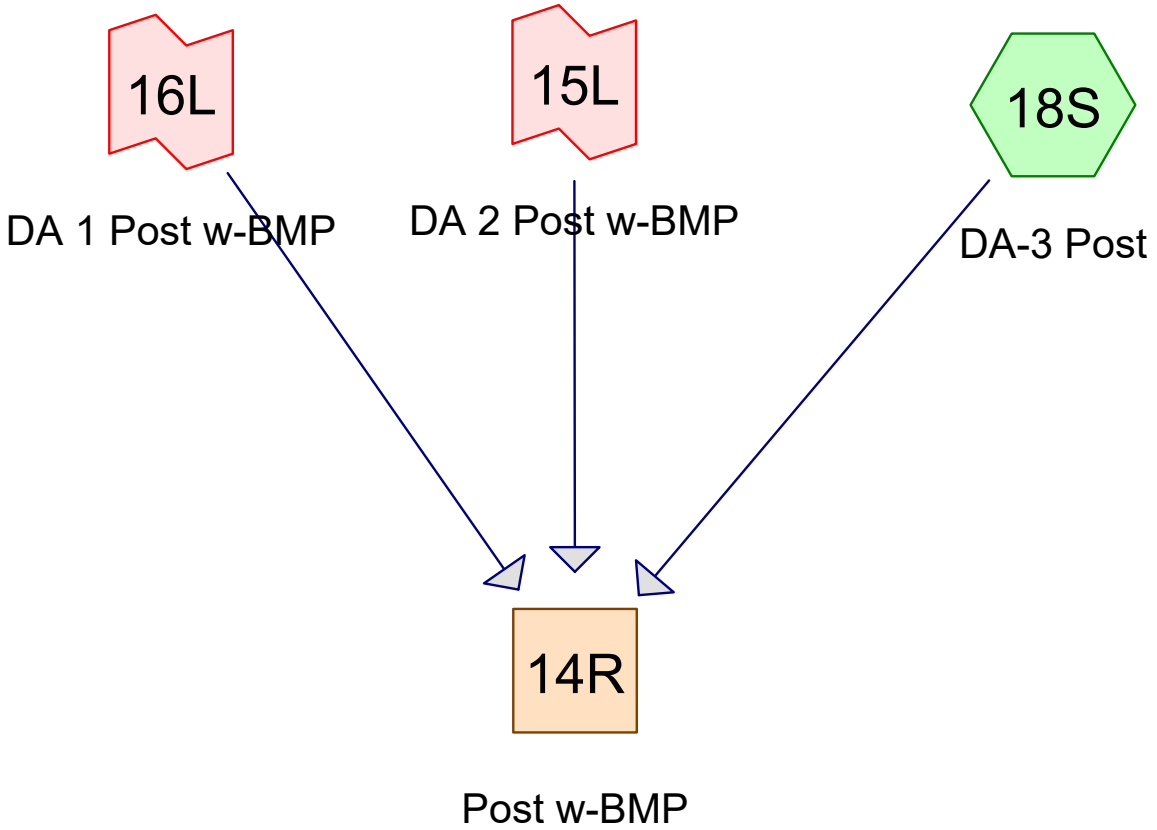
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 537,213 sf, 3.42% Impervious, Inflow Depth > 1.99" for 100-yr event  
Inflow = 20.31 cfs @ 12.15 hrs, Volume= 89,085 cf  
Outflow = 20.31 cfs @ 12.15 hrs, Volume= 89,085 cf, Atten= 0%, Lag= 0.0 min

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







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## Area Listing (selected nodes)

| Area<br>(sq-ft) | CN        | Description<br>(subcatchment-numbers) |
|-----------------|-----------|---------------------------------------|
| 173,782         | 30        | Meadow, non-grazed, HSG A (18S)       |
| 15,726          | 78        | Meadow, non-grazed, HSG D (18S)       |
| 9,255           | 30        | Woods, Good, HSG A (18S)              |
| 16,141          | 77        | Woods, Good, HSG D (18S)              |
| <b>214,904</b>  | <b>37</b> | <b>TOTAL AREA</b>                     |

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**Soil Listing (selected nodes)**

| Area<br>(sq-ft) | Soil<br>Group | Subcatchment<br>Numbers |
|-----------------|---------------|-------------------------|
| 183,037         | HSG A         | 18S                     |
| 0               | HSG B         |                         |
| 0               | HSG C         |                         |
| 31,867          | HSG D         | 18S                     |
| 0               | Other         |                         |
| <b>214,904</b>  |               | <b>TOTAL AREA</b>       |

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**Ground Covers (selected nodes)**

| HSG-A<br>(sq-ft) | HSG-B<br>(sq-ft) | HSG-C<br>(sq-ft) | HSG-D<br>(sq-ft) | Other<br>(sq-ft) | Total<br>(sq-ft) | Ground<br>Cover       | Subcat<br>Number |
|------------------|------------------|------------------|------------------|------------------|------------------|-----------------------|------------------|
| 173,782          | 0                | 0                | 15,726           | 0                | 189,508          | Meadow,<br>non-grazed |                  |
| 9,255            | 0                | 0                | 16,141           | 0                | 25,396           | Woods, Good           |                  |
| <b>183,037</b>   | <b>0</b>         | <b>0</b>         | <b>31,867</b>    | <b>0</b>         | <b>214,904</b>   | <b>TOTAL AREA</b>     |                  |

**MLV 505LD86\_Post w-BMP***Type II 24-hr 1-yr Rainfall=2.72"*

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment18S: DA-3 Post**

Runoff Area=214,904 sf 0.00% Impervious Runoff Depth=0.00"  
Flow Length=1,087' Tc=22.4 min CN=37 Runoff=0.00 cfs 0 cf

**Reach 14R: Post w-BMP**

Inflow=0.27 cfs 509 cf  
Outflow=0.27 cfs 509 cf

**Link** 1-yr Outflow Imported from MLV 505LD86\_PostwBMP DA2- REV 2~Reach 11.hce Inflow=0.27 cfs 509 cf  
Area= 75,800 sf 14.60% Imperv. Primary=0.27 cfs 509 cf

**Link** 1-yr Outflow Imported from MLV 505LD86\_PostwBMP DA1- REV 2~Reach 10.hce Inflow=0.00 cfs 0 cf  
Area= 246,600 sf 2.96% Imperv. Primary=0.00 cfs 0 cf

**Total Runoff Area = 214,904 sf Runoff Volume = 0 cf Average Runoff Depth = 0.00"**  
**100.00% Pervious = 214,904 sf 0.00% Impervious = 0 sf**

**Summary for Subcatchment 18S: DA-3 Post**

[45] Hint: Runoff=Zero

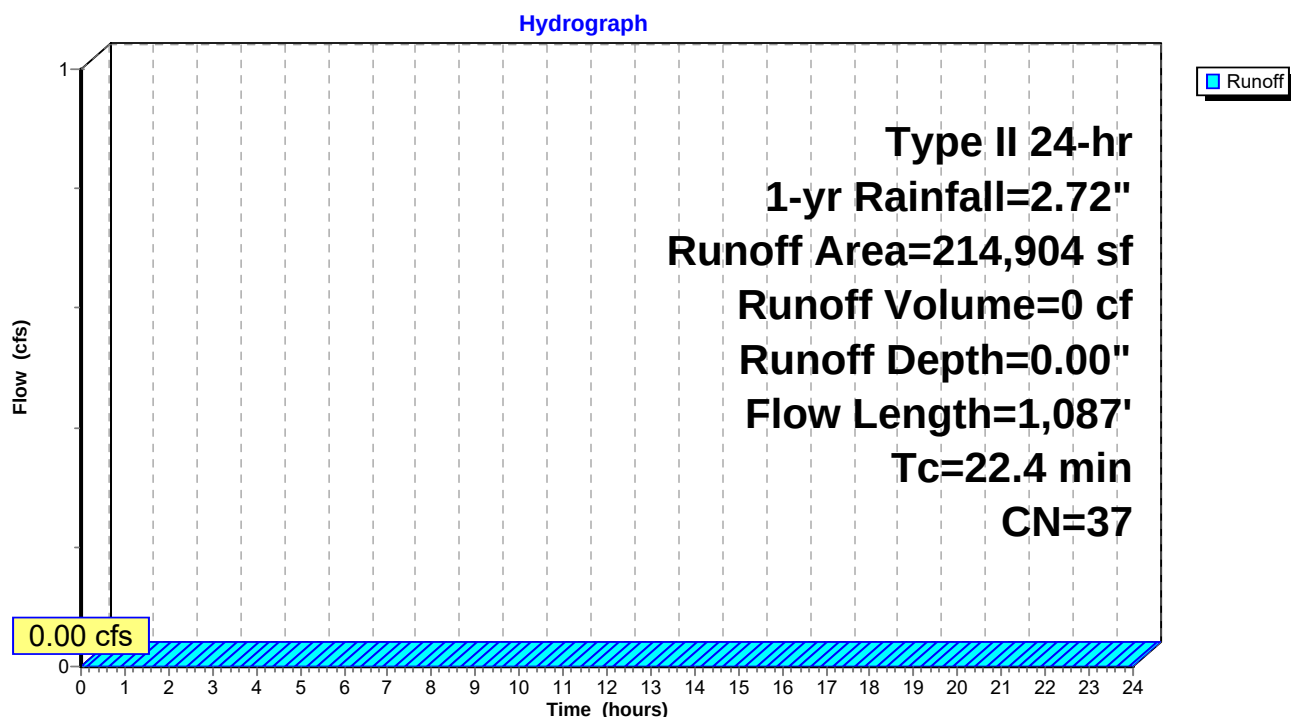
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,255     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,782   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 214,904   | 37 | Weighted Average          |
| 214,904   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0920        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.2      | 846           | 0.1060        | 2.28              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.4     | 1,087         | Total         |                   |                |                                                                      |

**Subcatchment 18S: DA-3 Post**

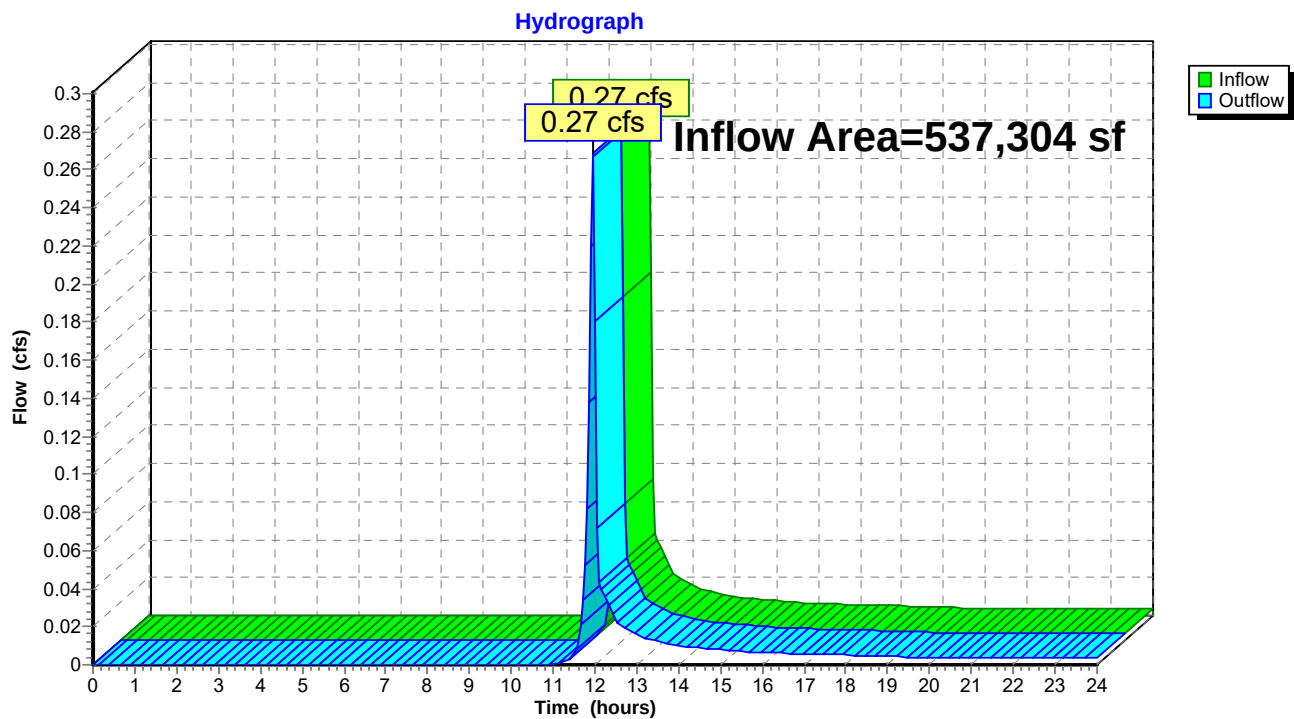


**Summary for Reach 14R: Post w-BMP**

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

Inflow Area = 537,304 sf, 3.42% Impervious, Inflow Depth > 0.01" for 1-yr event  
Inflow = 0.27 cfs @ 11.94 hrs, Volume= 509 cf  
Outflow = 0.27 cfs @ 11.94 hrs, Volume= 509 cf, Atten= 0%, Lag= 0.0 min

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

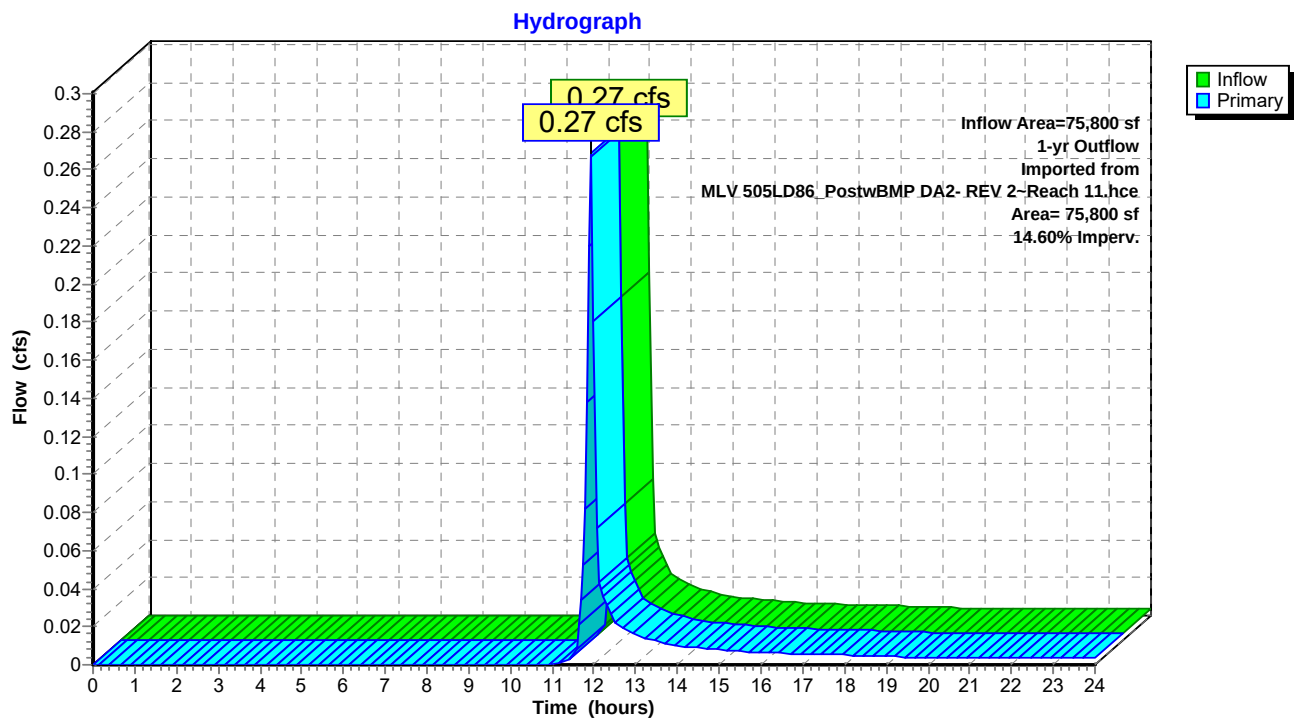
**Reach 14R: Post w-BMP**

**Summary for Link 15L: DA 2 Post w-BMP**

Inflow Area = 75,800 sf, 14.60% Impervious, Inflow Depth > 0.08" for 1-yr event  
Inflow = 0.27 cfs @ 11.94 hrs, Volume= 509 cf  
Primary = 0.27 cfs @ 11.94 hrs, Volume= 509 cf, Atten= 0%, Lag= 0.0 min

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

1-yr Outflow Imported from MLV 505LD86\_PostwBMP DA2- REV 2~Reach 11.hce

**Link 15L: DA 2 Post w-BMP**

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Type II 24-hr 1-yr Rainfall=2.72"

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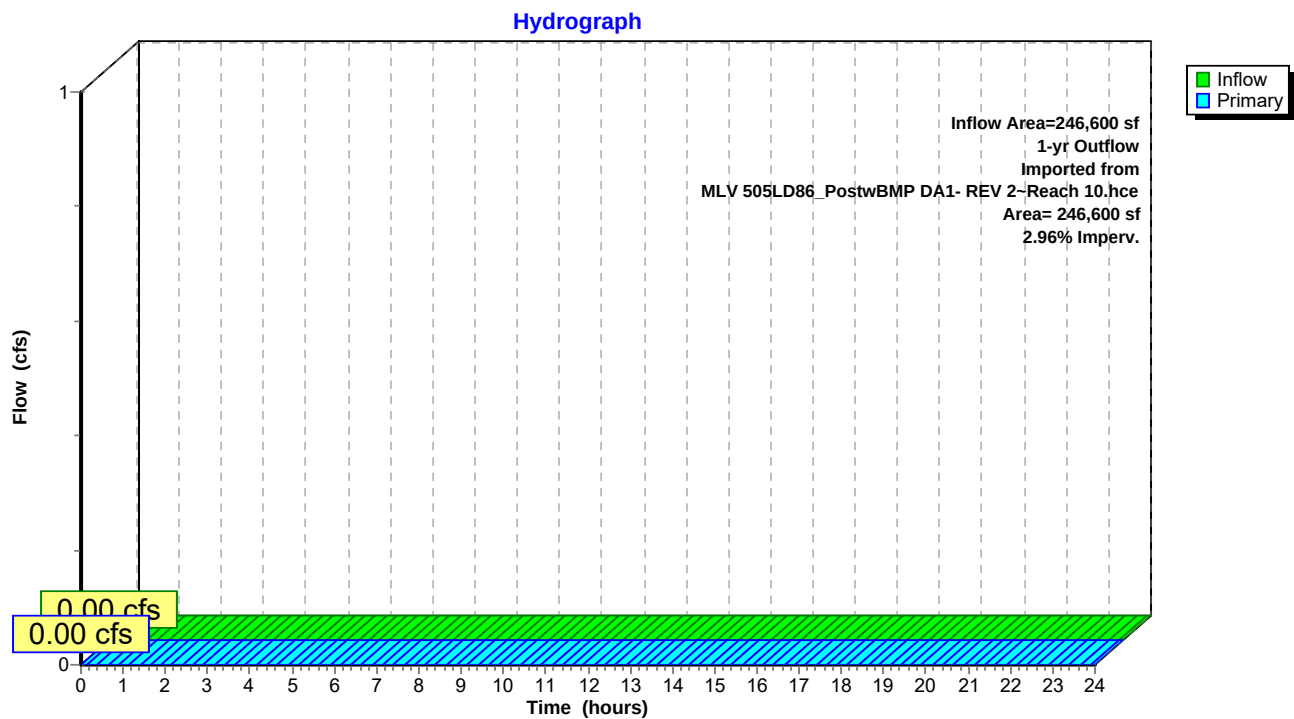
## Summary for Link 16L: DA 1 Post w-BMP

Inflow Area = 246,600 sf, 2.96% Impervious, Inflow Depth = 0.00" for 1-yr event  
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

1-yr Outflow Imported from MLV 505LD86\_PostwBMP DA1- REV 2~Reach 10.hce

## Link 16L: DA 1 Post w-BMP



**MLV 505LD86\_Post w-BMP***Type II 24-hr 2-yr Rainfall=3.26"*

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment18S: DA-3 Post**

Runoff Area=214,904 sf 0.00% Impervious Runoff Depth=0.00"  
Flow Length=1,087' Tc=22.4 min CN=37 Runoff=0.00 cfs 0 cf

**Reach 14R: Post w-BMP**

Inflow=0.39 cfs 745 cf  
Outflow=0.39 cfs 745 cf

**Link** 2-yr Outflow Imported from MLV 505LD86\_PostwBMP DA2- REV 2~Reach 11.hce Inflow=0.39 cfs 731 cf  
Area= 75,800 sf 14.60% Imperv. Primary=0.39 cfs 731 cf

**Link** 2-yr Outflow Imported from MLV 505LD86\_PostwBMP DA1- REV 2~Reach 10.hce Inflow=0.00 cfs 14 cf  
Area= 246,600 sf 2.96% Imperv. Primary=0.00 cfs 14 cf

**Total Runoff Area = 214,904 sf Runoff Volume = 0 cf Average Runoff Depth = 0.00"**  
**100.00% Pervious = 214,904 sf 0.00% Impervious = 0 sf**

**Summary for Subcatchment 18S: DA-3 Post**

[45] Hint: Runoff=Zero

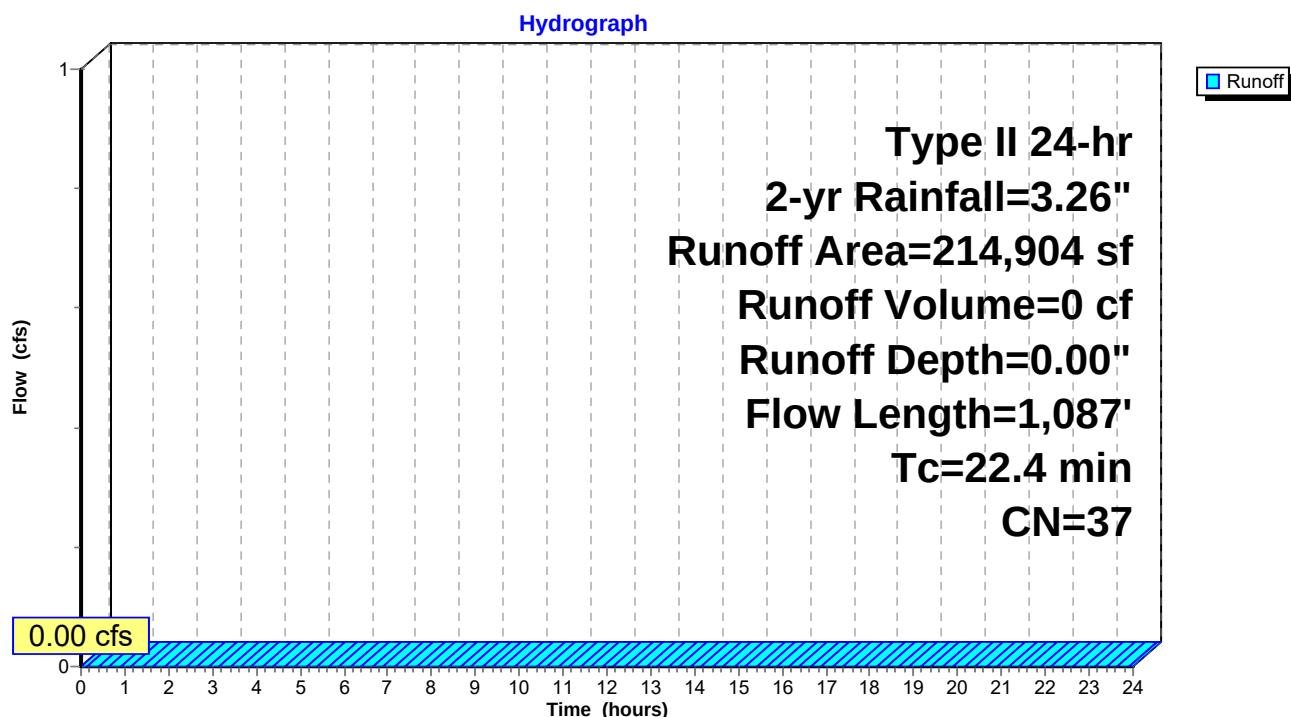
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,255     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,782   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 214,904   | 37 | Weighted Average          |
| 214,904   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0920        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.2      | 846           | 0.1060        | 2.28              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.4     | 1,087         | Total         |                   |                |                                                                      |

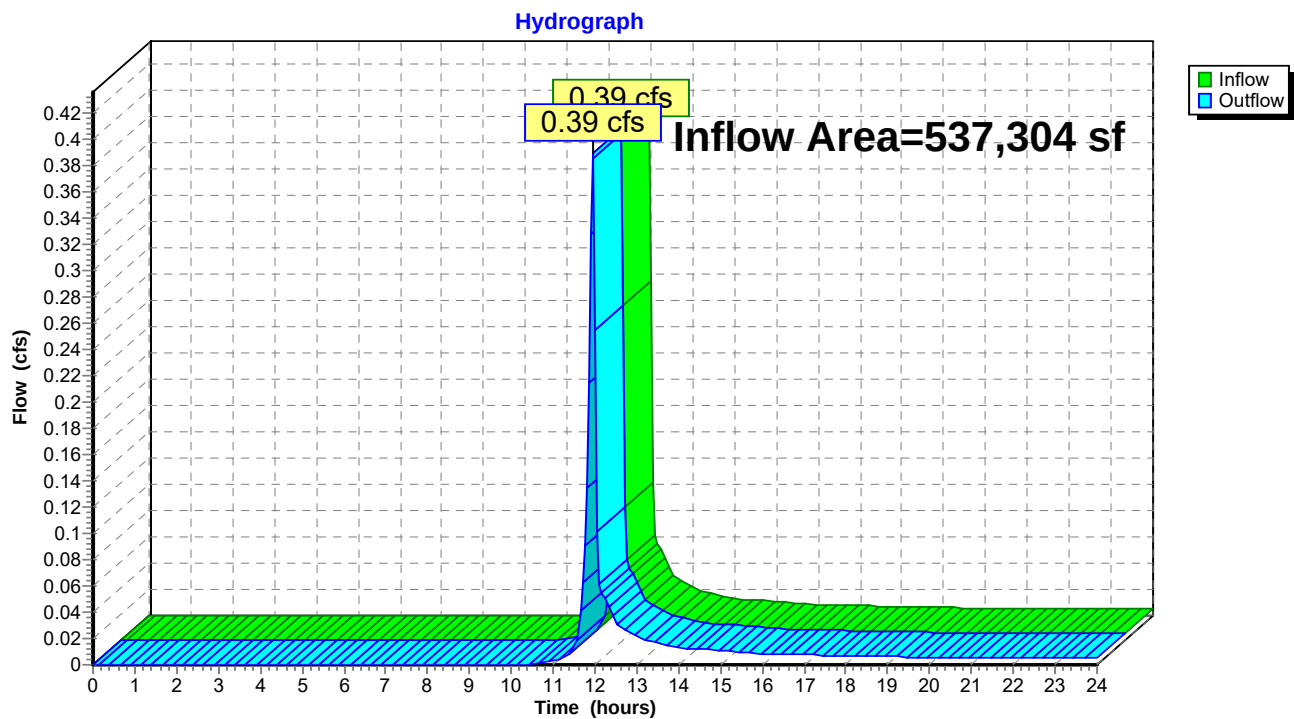
**Subcatchment 18S: DA-3 Post**

**Summary for Reach 14R: Post w-BMP**

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

Inflow Area = 537,304 sf, 3.42% Impervious, Inflow Depth > 0.02" for 2-yr event  
Inflow = 0.39 cfs @ 11.94 hrs, Volume= 745 cf  
Outflow = 0.39 cfs @ 11.94 hrs, Volume= 745 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 14R: Post w-BMP**

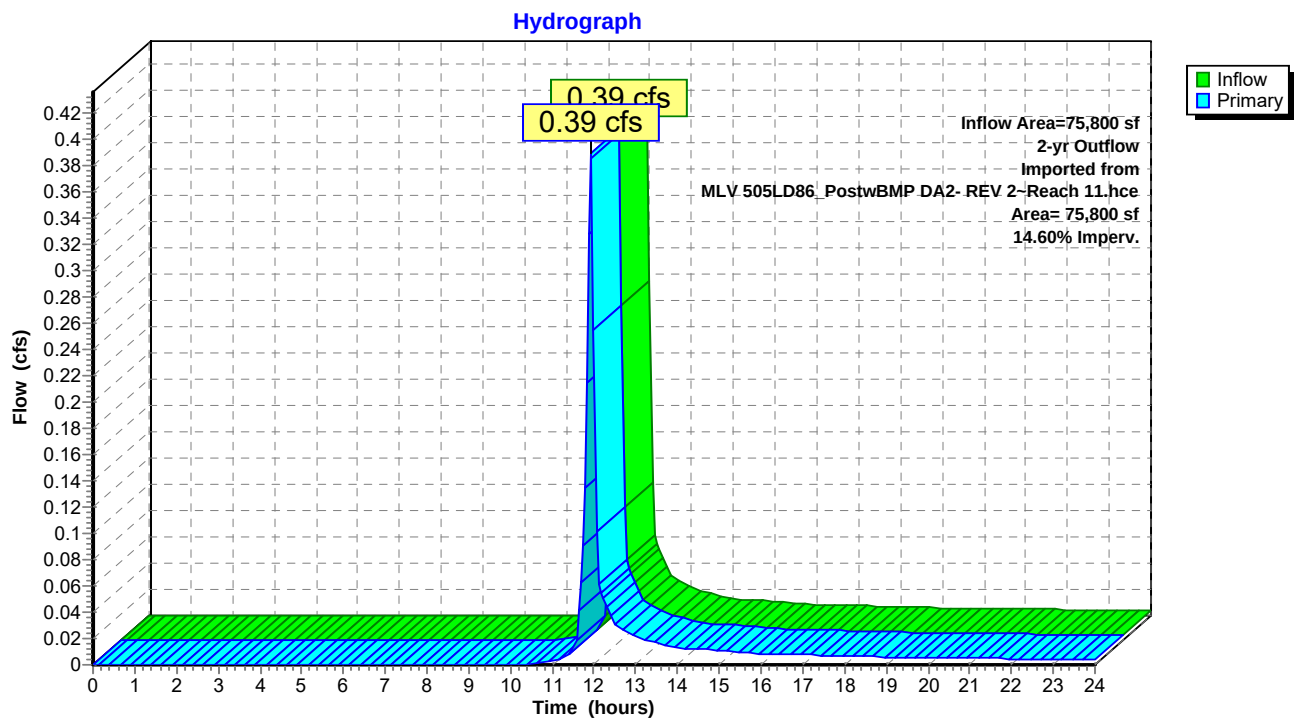


**Summary for Link 15L: DA 2 Post w-BMP**

Inflow Area = 75,800 sf, 14.60% Impervious, Inflow Depth > 0.12" for 2-yr event  
Inflow = 0.39 cfs @ 11.94 hrs, Volume= 731 cf  
Primary = 0.39 cfs @ 11.94 hrs, Volume= 731 cf, Atten= 0%, Lag= 0.0 min

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

2-yr Outflow Imported from MLV 505LD86\_PostwBMP DA2- REV 2~Reach 11.hce

**Link 15L: DA 2 Post w-BMP**

## MLV 505LD86\_Post w-BMP

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Type II 24-hr 2-yr Rainfall=3.26"

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### Summary for Link 16L: DA 1 Post w-BMP

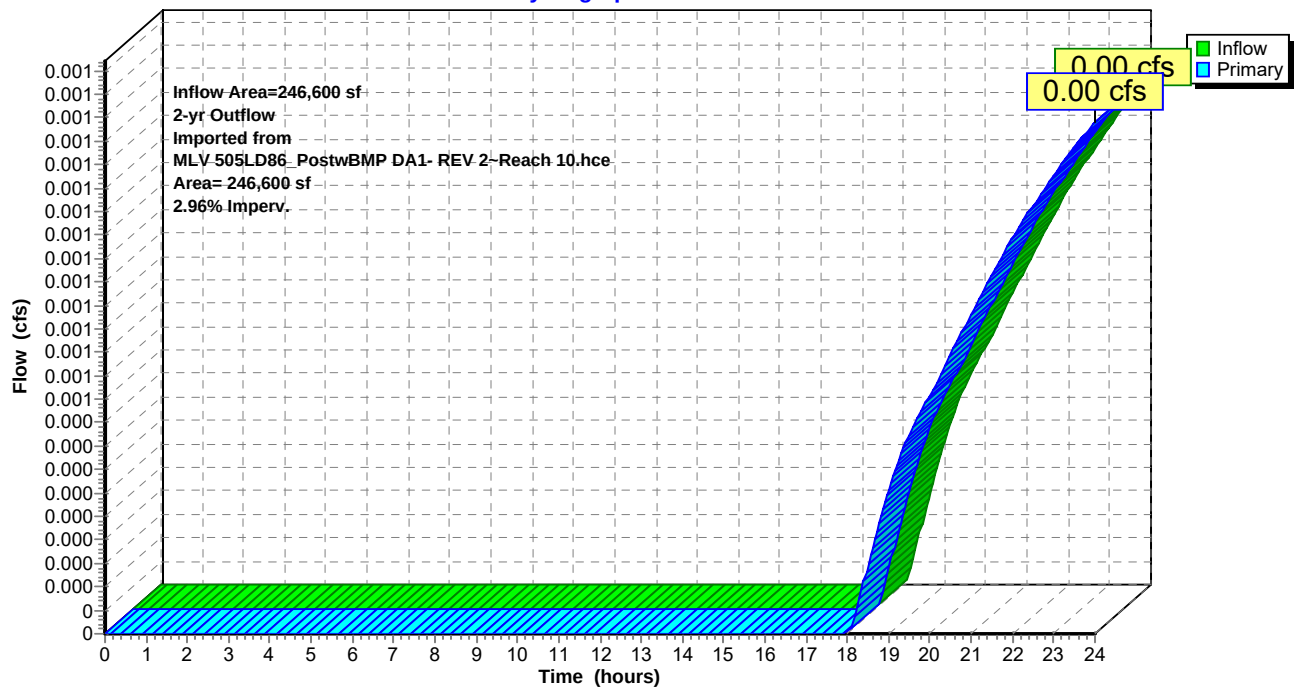
Inflow Area = 246,600 sf, 2.96% Impervious, Inflow Depth > 0.00" for 2-yr event  
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 14 cf  
Primary = 0.00 cfs @ 24.00 hrs, Volume= 14 cf, Atten= 0%, Lag= 0.0 min

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

2-yr Outflow Imported from MLV 505LD86\_PostwBMP DA1- REV 2~Reach 10.hce

### Link 16L: DA 1 Post w-BMP

#### Hydrograph



**MLV 505LD86\_Post w-BMP***Type II 24-hr 10-yr Rainfall=4.74"*

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment18S: DA-3 Post**

Runoff Area=214,904 sf 0.00% Impervious Runoff Depth>0.09"  
Flow Length=1,087' Tc=22.4 min CN=37 Runoff=0.05 cfs 1,695 cf

**Reach 14R: Post w-BMP**

Inflow=1.88 cfs 5,614 cf  
Outflow=1.88 cfs 5,614 cf

**Link** 10-yr Outflow Imported from MLV 505LD86\_PostwBMP DA2- REV 2~Reach 11.hce Inflow=1.80 cfs 3,216 cf  
Area= 75,800 sf 14.60% Imperv. Primary=1.80 cfs 3,216 cf

**Link** 10-yr Outflow Imported from MLV 505LD86\_PostwBMP DA1- REV 2~Reach 10.hce Inflow=0.13 cfs 703 cf  
Area= 246,600 sf 2.96% Imperv. Primary=0.13 cfs 703 cf

**Total Runoff Area = 214,904 sf Runoff Volume = 1,695 cf Average Runoff Depth = 0.09"**  
**100.00% Pervious = 214,904 sf 0.00% Impervious = 0 sf**

**Summary for Subcatchment 18S: DA-3 Post**

Runoff = 0.05 cfs @ 15.20 hrs, Volume= 1,695 cf, Depth> 0.09"

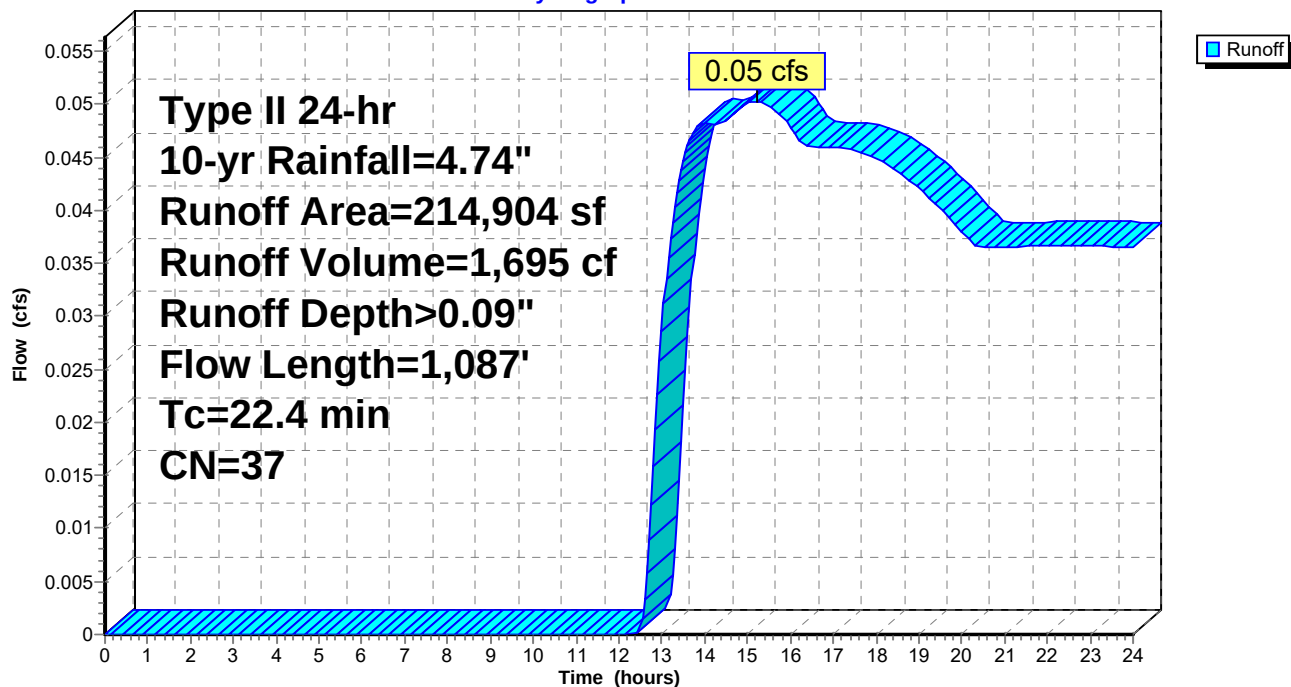
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,255     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,782   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 214,904   | 37 | Weighted Average          |
| 214,904   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0920        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.2      | 846           | 0.1060        | 2.28              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.4     | 1,087         | Total         |                   |                |                                                                      |

**Subcatchment 18S: DA-3 Post**

Hydrograph

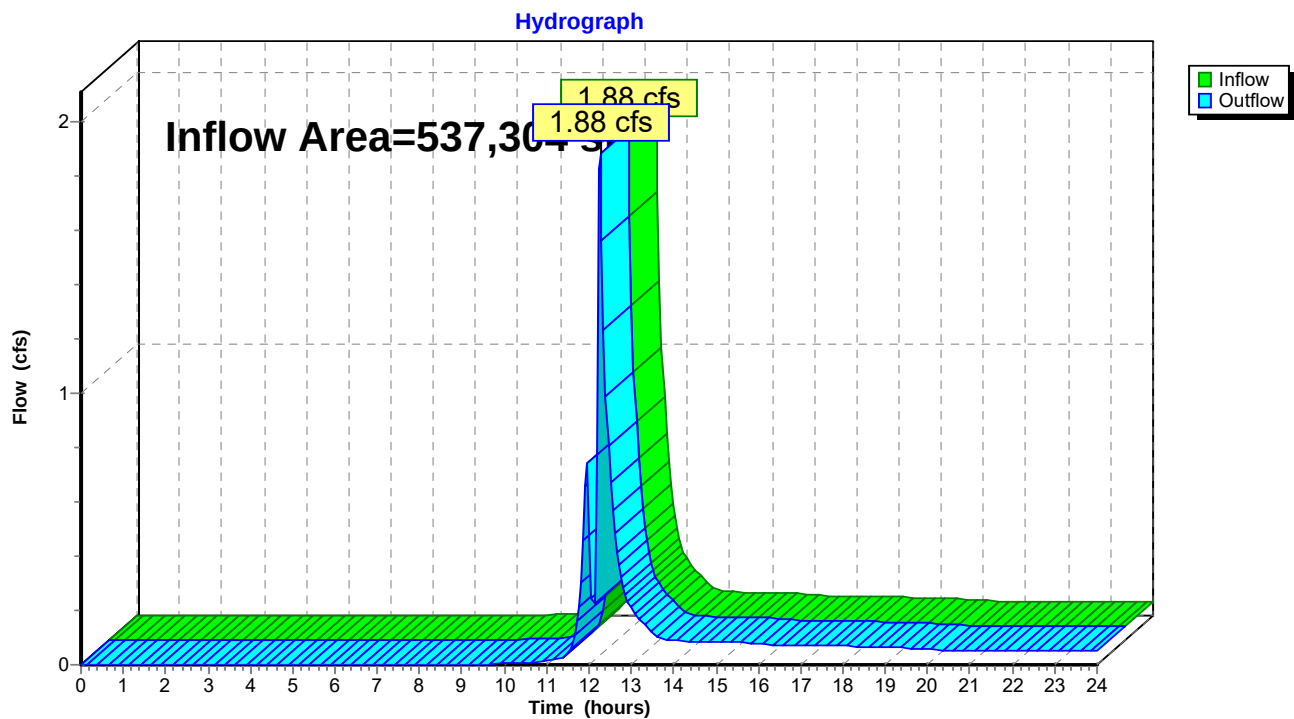


**Summary for Reach 14R: Post w-BMP**

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

Inflow Area = 537,304 sf, 3.42% Impervious, Inflow Depth > 0.13" for 10-yr event  
Inflow = 1.88 cfs @ 12.27 hrs, Volume= 5,614 cf  
Outflow = 1.88 cfs @ 12.27 hrs, Volume= 5,614 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 14R: Post w-BMP**

## MLV 505LD86\_Post w-BMP

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Type II 24-hr 10-yr Rainfall=4.74"

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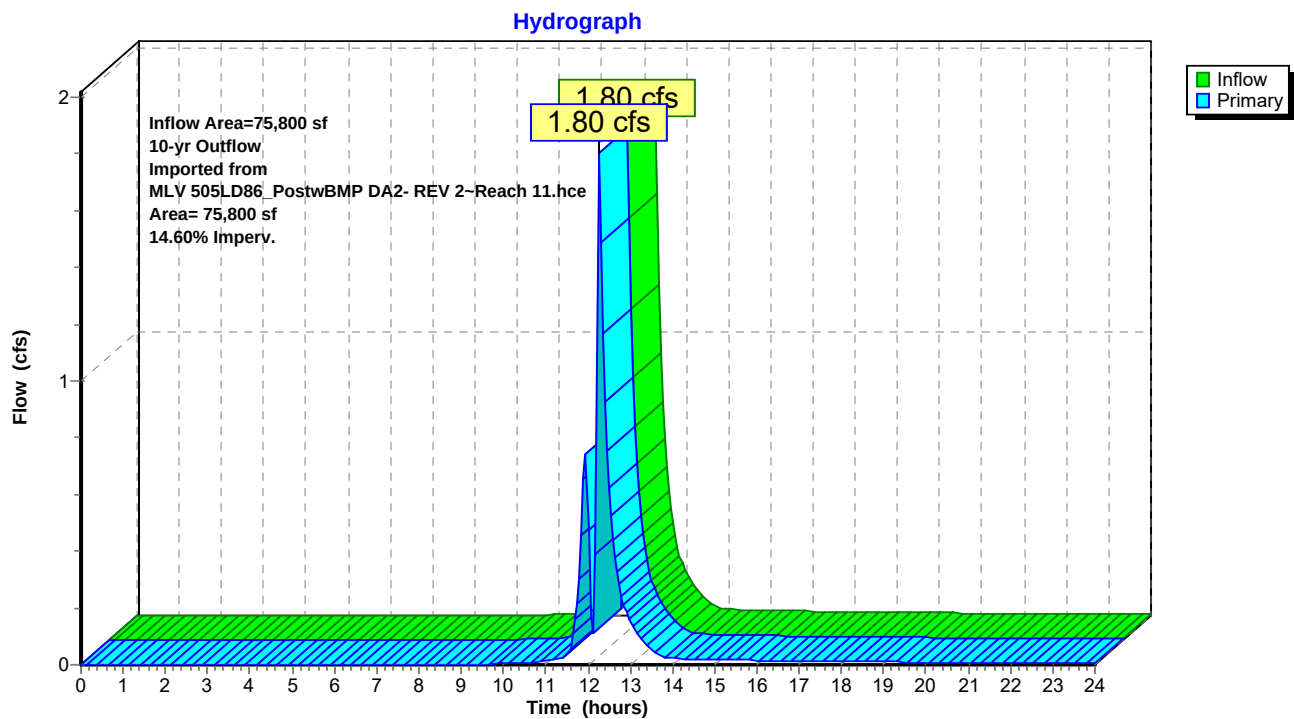
### Summary for Link 15L: DA 2 Post w-BMP

Inflow Area = 75,800 sf, 14.60% Impervious, Inflow Depth > 0.51" for 10-yr event  
Inflow = 1.80 cfs @ 12.27 hrs, Volume= 3,216 cf  
Primary = 1.80 cfs @ 12.27 hrs, Volume= 3,216 cf, Atten= 0%, Lag= 0.0 min

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

10-yr Outflow Imported from MLV 505LD86\_PostwBMP DA2- REV 2~Reach 11.hce

### Link 15L: DA 2 Post w-BMP





## MLV 505LD86\_Post w-BMP

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Type II 24-hr 10-yr Rainfall=4.74"

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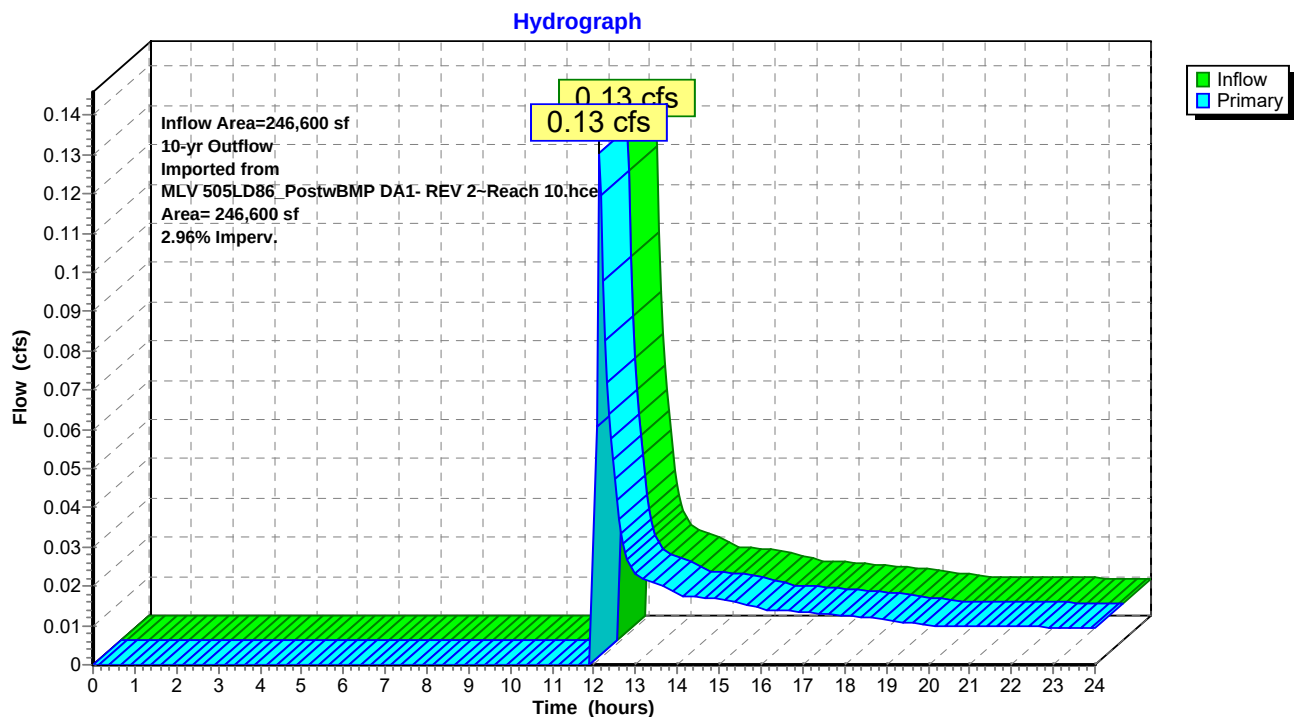
### Summary for Link 16L: DA 1 Post w-BMP

Inflow Area = 246,600 sf, 2.96% Impervious, Inflow Depth > 0.03" for 10-yr event  
Inflow = 0.13 cfs @ 12.12 hrs, Volume= 703 cf  
Primary = 0.13 cfs @ 12.12 hrs, Volume= 703 cf, Atten= 0%, Lag= 0.0 min

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

10-yr Outflow Imported from MLV 505LD86\_PostwBMP DA1- REV 2~Reach 10.hce

### Link 16L: DA 1 Post w-BMP



**MLV 505LD86\_Post w-BMP***Type II 24-hr 25-yr Rainfall=5.85"*

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment18S: DA-3 Post**

Runoff Area=214,904 sf 0.00% Impervious Runoff Depth>0.30"  
Flow Length=1,087' Tc=22.4 min CN=37 Runoff=0.33 cfs 5,409 cf

**Reach 14R: Post w-BMP**

Inflow=4.95 cfs 14,346 cf  
Outflow=4.95 cfs 14,346 cf

**Link** 25-yr Outflow Imported from MLV 505LD86\_PostwBMP DA2- REV 2~Reach 11.hce Inflow=4.28 cfs 6,920 cf  
Area= 75,800 sf 14.60% Imperv. Primary=4.28 cfs 6,920 cf

**Link** 25-yr Outflow Imported from MLV 505LD86\_PostwBMP DA1- REV 2~Reach 10.hce Inflow=0.64 cfs 2,018 cf  
Area= 246,600 sf 2.96% Imperv. Primary=0.64 cfs 2,018 cf

**Total Runoff Area = 214,904 sf Runoff Volume = 5,409 cf Average Runoff Depth = 0.30"**  
**100.00% Pervious = 214,904 sf 0.00% Impervious = 0 sf**

**Summary for Subcatchment 18S: DA-3 Post**

Runoff = 0.33 cfs @ 12.42 hrs, Volume= 5,409 cf, Depth> 0.30"

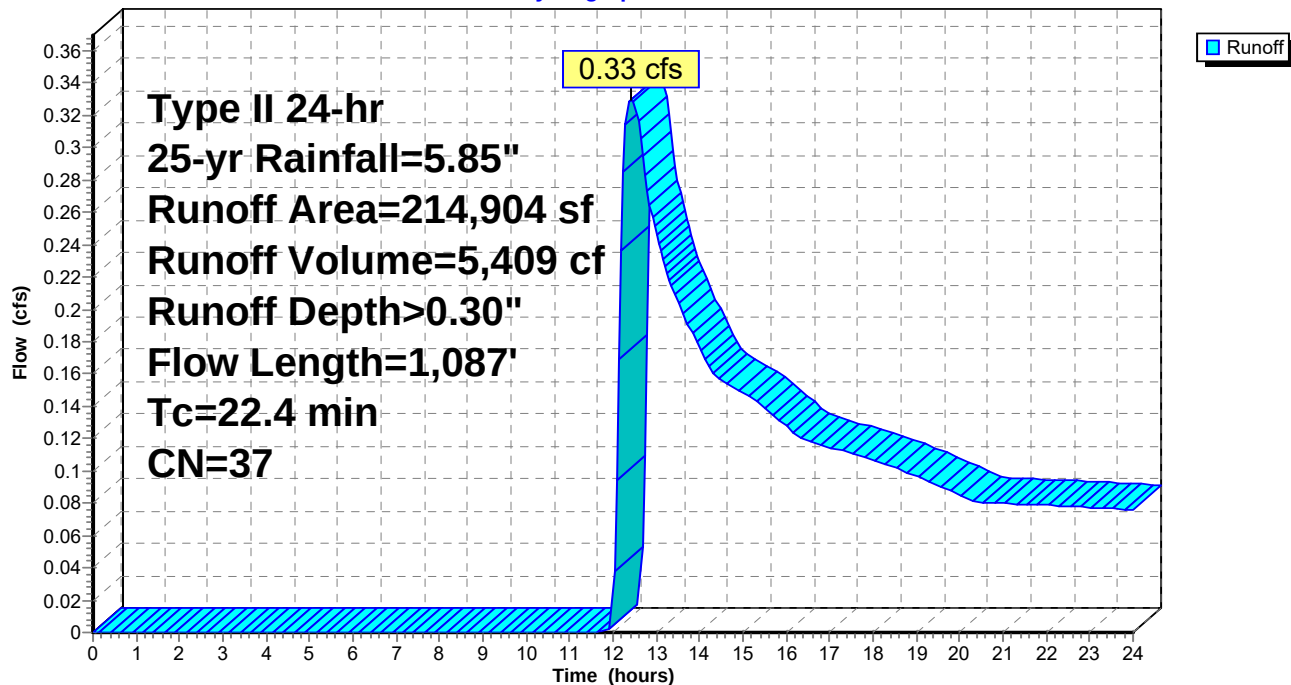
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,255     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,782   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 214,904   | 37 | Weighted Average          |
| 214,904   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0920        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.2      | 846           | 0.1060        | 2.28              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.4     | 1,087         | Total         |                   |                |                                                                      |

**Subcatchment 18S: DA-3 Post**

Hydrograph

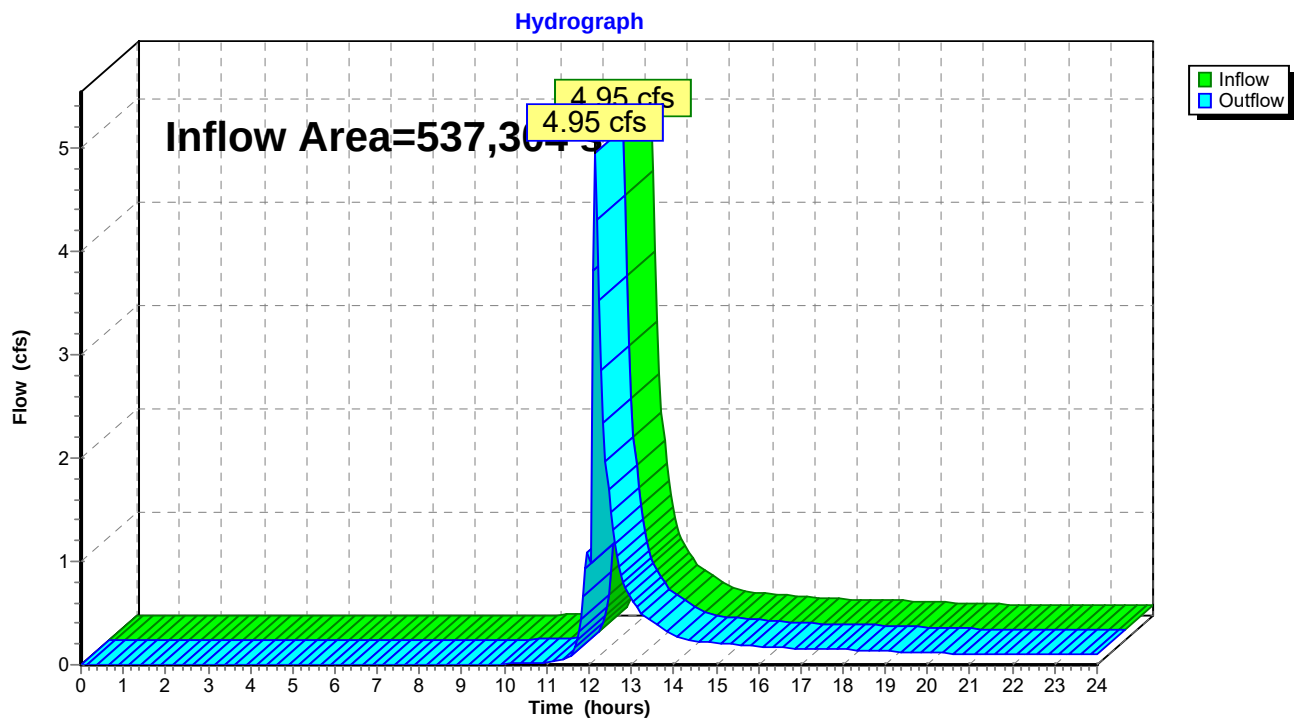


**Summary for Reach 14R: Post w-BMP**

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

Inflow Area = 537,304 sf, 3.42% Impervious, Inflow Depth > 0.32" for 25-yr event  
Inflow = 4.95 cfs @ 12.16 hrs, Volume= 14,346 cf  
Outflow = 4.95 cfs @ 12.16 hrs, Volume= 14,346 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 14R: Post w-BMP**

## MLV 505LD86\_Post w-BMP

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Type II 24-hr 25-yr Rainfall=5.85"

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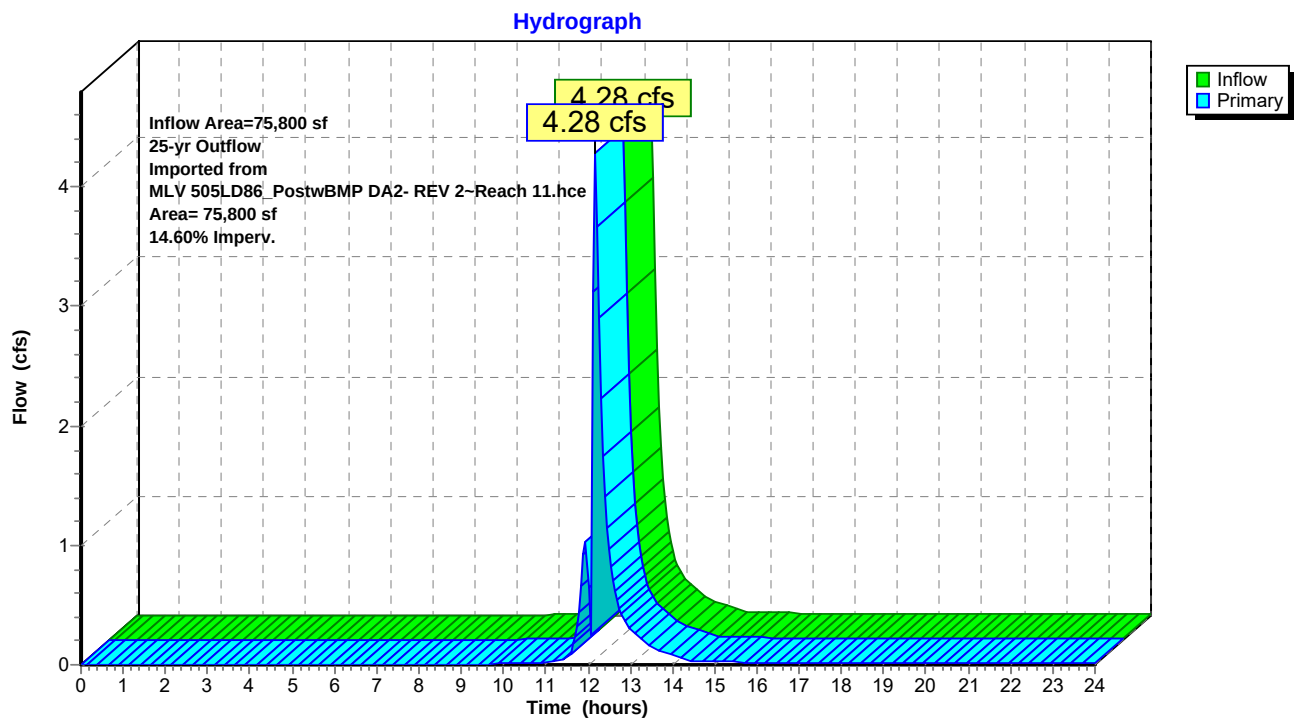
### Summary for Link 15L: DA 2 Post w-BMP

Inflow Area = 75,800 sf, 14.60% Impervious, Inflow Depth > 1.10" for 25-yr event  
Inflow = 4.28 cfs @ 12.16 hrs, Volume= 6,920 cf  
Primary = 4.28 cfs @ 12.16 hrs, Volume= 6,920 cf, Atten= 0%, Lag= 0.0 min

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

25-yr Outflow Imported from MLV 505LD86\_PostwBMP DA2- REV 2~Reach 11.hce

### Link 15L: DA 2 Post w-BMP



## MLV 505LD86\_Post w-BMP

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Type II 24-hr 25-yr Rainfall=5.85"

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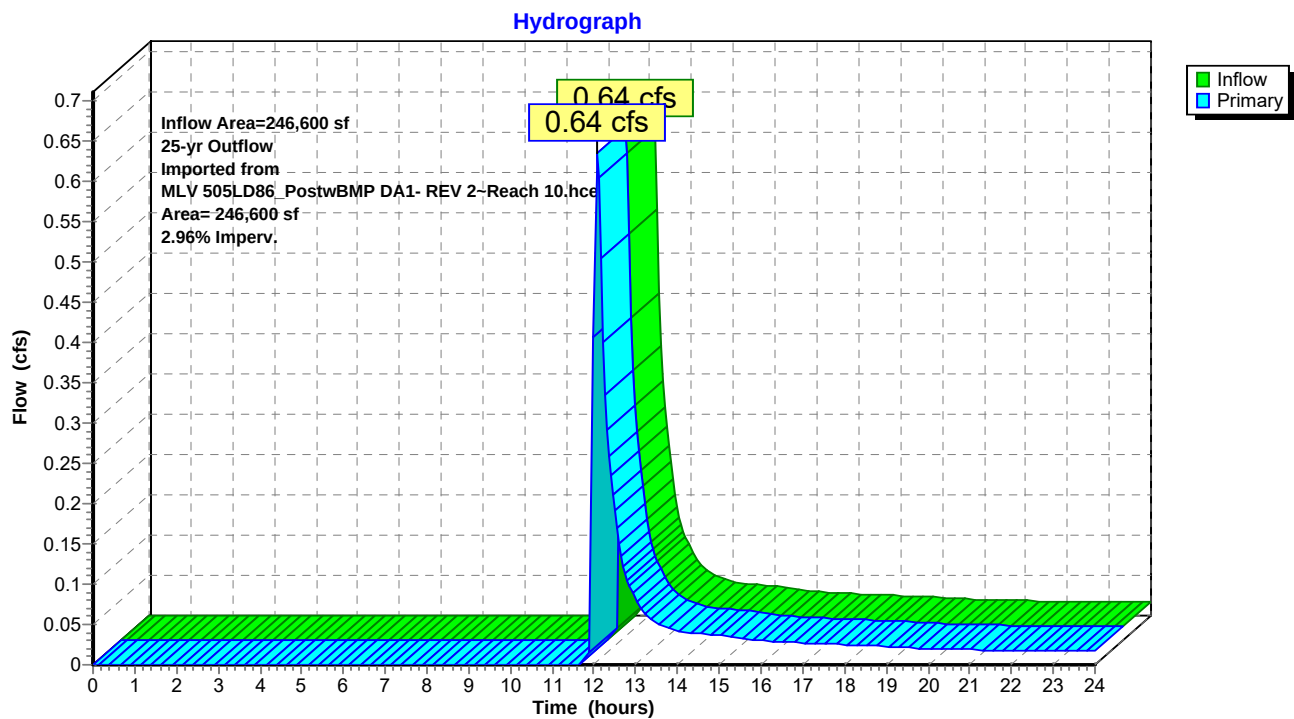
### Summary for Link 16L: DA 1 Post w-BMP

Inflow Area = 246,600 sf, 2.96% Impervious, Inflow Depth > 0.10" for 25-yr event  
Inflow = 0.64 cfs @ 12.07 hrs, Volume= 2,018 cf  
Primary = 0.64 cfs @ 12.07 hrs, Volume= 2,018 cf, Atten= 0%, Lag= 0.0 min

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

25-yr Outflow Imported from MLV 505LD86\_PostwBMP DA1- REV 2~Reach 10.hce

### Link 16L: DA 1 Post w-BMP





**MLV 505LD86\_Post w-BMP***Type II 24-hr 50-yr Rainfall=6.87"*

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment18S: DA-3 Post**

Runoff Area=214,904 sf 0.00% Impervious Runoff Depth>0.58"  
Flow Length=1,087' Tc=22.4 min CN=37 Runoff=1.25 cfs 10,355 cf

**Reach 14R: Post w-BMP**

Inflow=7.94 cfs 26,537 cf  
Outflow=7.94 cfs 26,537 cf

**Link** 10-yr Outflow Imported from MLV 505LD86\_PostwBMP DA2- REV 2~Reach 11.hce Inflow=5.94 cfs 10,726 cf  
Area= 75,800 sf 14.60% Imperv. Primary=5.94 cfs 10,726 cf

**Link** 50-yr Outflow Imported from MLV 505LD86\_PostwBMP DA1- REV 2~Reach 10.hce Inflow=1.54 cfs 5,456 cf  
Area= 246,600 sf 2.96% Imperv. Primary=1.54 cfs 5,456 cf

**Total Runoff Area = 214,904 sf Runoff Volume = 10,355 cf Average Runoff Depth = 0.58"**  
**100.00% Pervious = 214,904 sf 0.00% Impervious = 0 sf**

**MLV 505LD86\_Post w-BMP**

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Type II 24-hr 50-yr Rainfall=6.87"

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**Summary for Subcatchment 18S: DA-3 Post**

Runoff = 1.25 cfs @ 12.26 hrs, Volume= 10,355 cf, Depth&gt; 0.58"

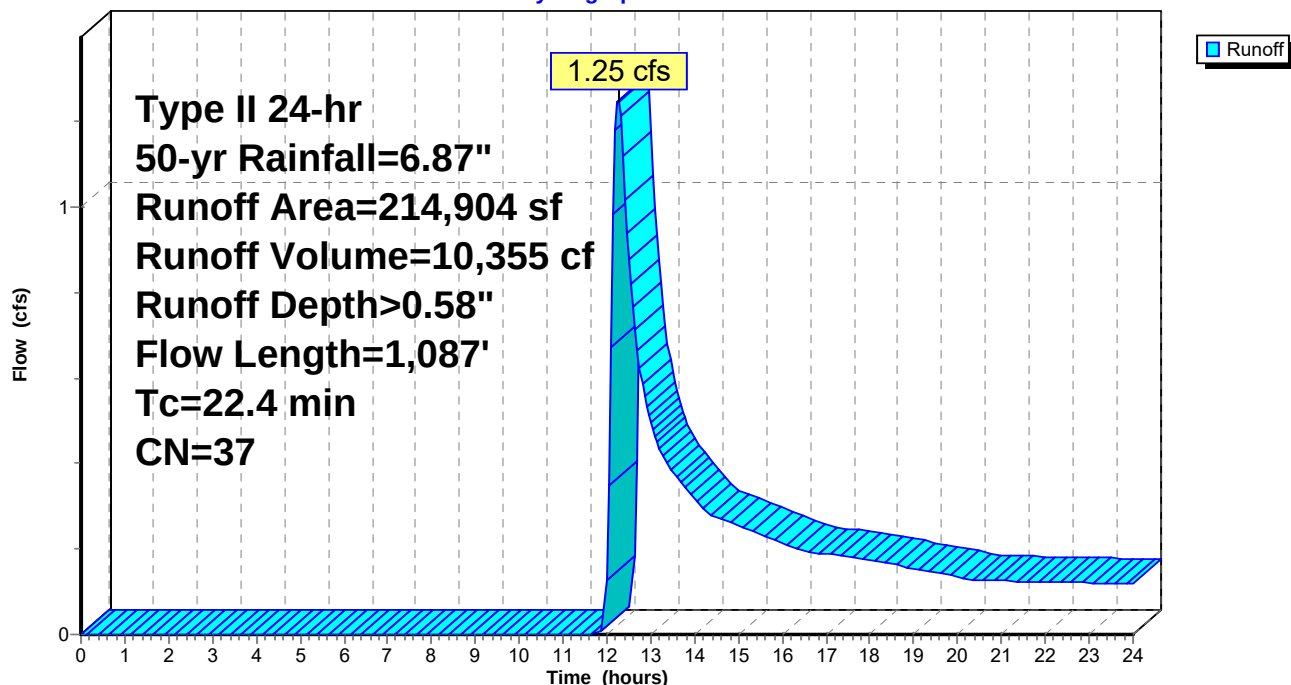
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,255     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,782   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 214,904   | 37 | Weighted Average          |
| 214,904   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0920        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.2      | 846           | 0.1060        | 2.28              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.4     | 1,087         | Total         |                   |                |                                                                      |

**Subcatchment 18S: DA-3 Post**

Hydrograph

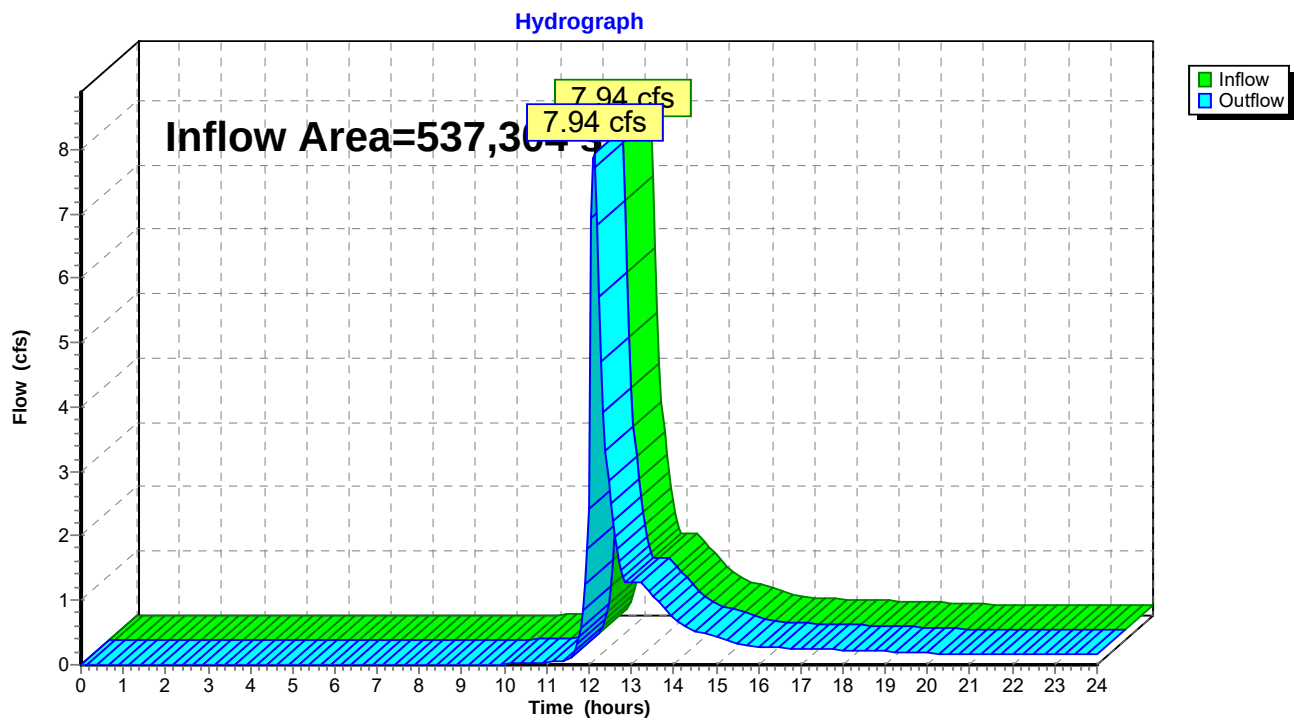


**Summary for Reach 14R: Post w-BMP**

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

Inflow Area = 537,304 sf, 3.42% Impervious, Inflow Depth > 0.59" for 50-yr event  
Inflow = 7.94 cfs @ 12.12 hrs, Volume= 26,537 cf  
Outflow = 7.94 cfs @ 12.12 hrs, Volume= 26,537 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 14R: Post w-BMP**

## MLV 505LD86\_Post w-BMP

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Type II 24-hr 50-yr Rainfall=6.87"

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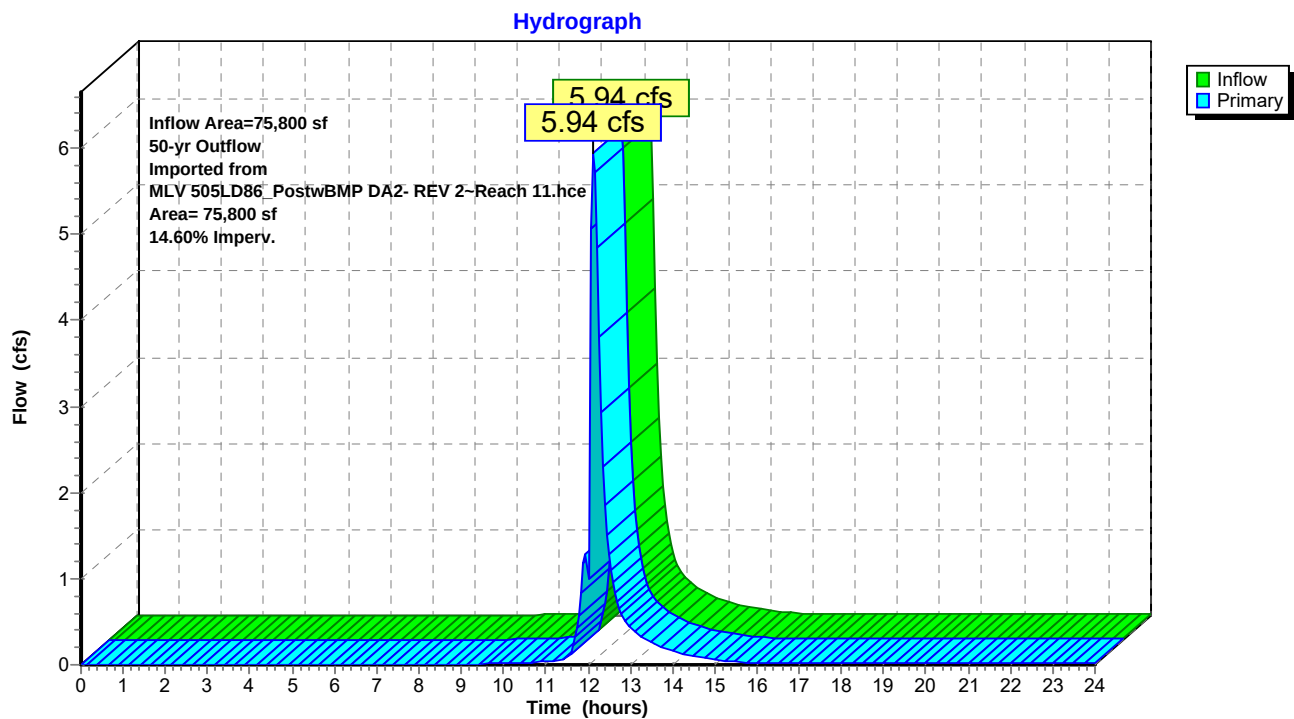
### Summary for Link 15L: DA 2 Post w-BMP

Inflow Area = 75,800 sf, 14.60% Impervious, Inflow Depth > 1.70" for 50-yr event  
Inflow = 5.94 cfs @ 12.12 hrs, Volume= 10,726 cf  
Primary = 5.94 cfs @ 12.12 hrs, Volume= 10,726 cf, Atten= 0%, Lag= 0.0 min

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

50-yr Outflow Imported from MLV 505LD86\_PostwBMP DA2- REV 2~Reach 11.hce

### Link 15L: DA 2 Post w-BMP



## MLV 505LD86\_Post w-BMP

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Type II 24-hr 50-yr Rainfall=6.87"

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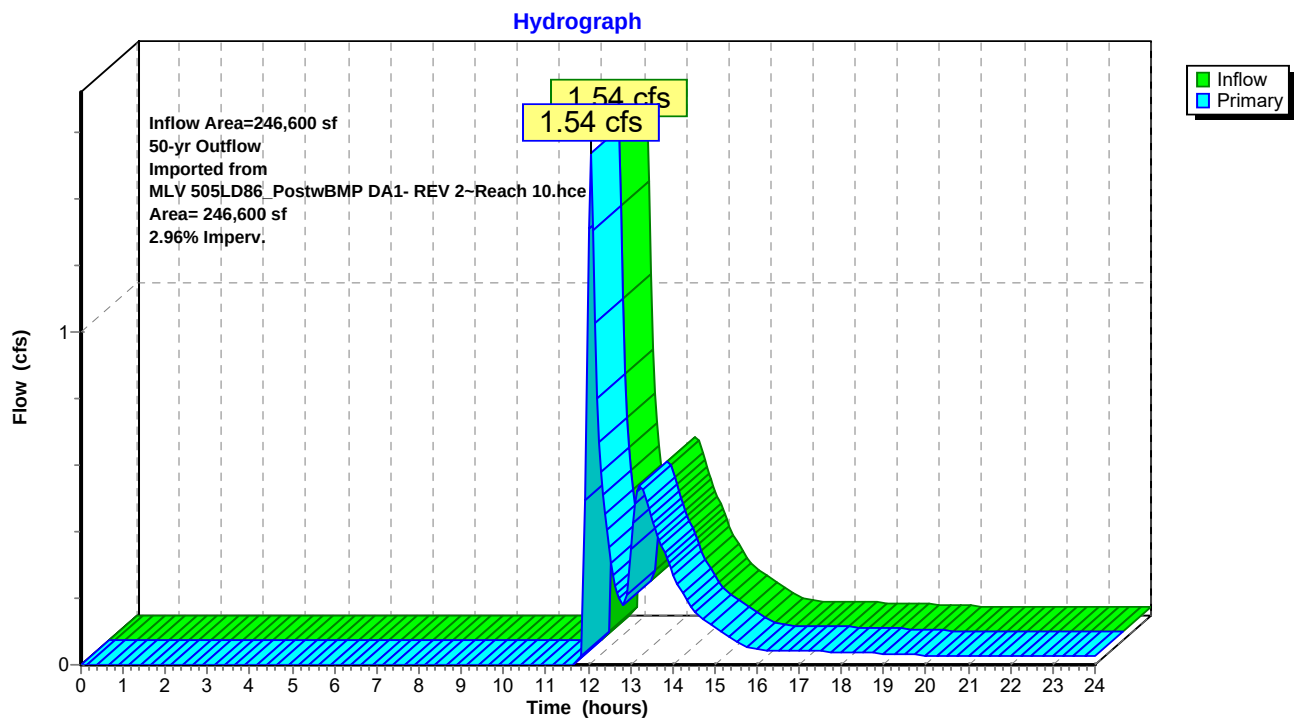
### Summary for Link 16L: DA 1 Post w-BMP

Inflow Area = 246,600 sf, 2.96% Impervious, Inflow Depth > 0.27" for 50-yr event  
Inflow = 1.54 cfs @ 12.05 hrs, Volume= 5,456 cf  
Primary = 1.54 cfs @ 12.05 hrs, Volume= 5,456 cf, Atten= 0%, Lag= 0.0 min

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

50-yr Outflow Imported from MLV 505LD86\_PostwBMP DA1- REV 2~Reach 10.hce

### Link 16L: DA 1 Post w-BMP



**MLV 505LD86\_Post w-BMP***Type II 24-hr 100-yr Rainfall=8.09"*

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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 Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment18S: DA-3 Post**

Runoff Area=214,904 sf 0.00% Impervious Runoff Depth>1.00"  
Flow Length=1,087' Tc=22.4 min CN=37 Runoff=3.12 cfs 17,903 cf

**Reach 14R: Post w-BMP**

Inflow=12.23 cfs 49,639 cf  
Outflow=12.23 cfs 49,639 cf

**Link** 100-yr Outflow Imported from MLV 505LD86\_PostwBMP DA2- REV 2~Reach 11.hce Inflow=7.82 cfs 16,030 cf  
Area= 75,800 sf 14.60% Imperv. Primary=7.82 cfs 16,030 cf

**Link** 100-yr Outflow Imported from MLV 505LD86\_PostwBMP DA1- REV 2~Reach 10.hce Inflow=3.58 cfs 15,706 cf  
Area= 246,600 sf 2.96% Imperv. Primary=3.58 cfs 15,706 cf

**Total Runoff Area = 214,904 sf Runoff Volume = 17,903 cf Average Runoff Depth = 1.00"**  
**100.00% Pervious = 214,904 sf 0.00% Impervious = 0 sf**



**MLV 505LD86\_Post w-BMP**

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Type II 24-hr 100-yr Rainfall=8.09"

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**Summary for Subcatchment 18S: DA-3 Post**

Runoff = 3.12 cfs @ 12.22 hrs, Volume= 17,903 cf, Depth&gt; 1.00"

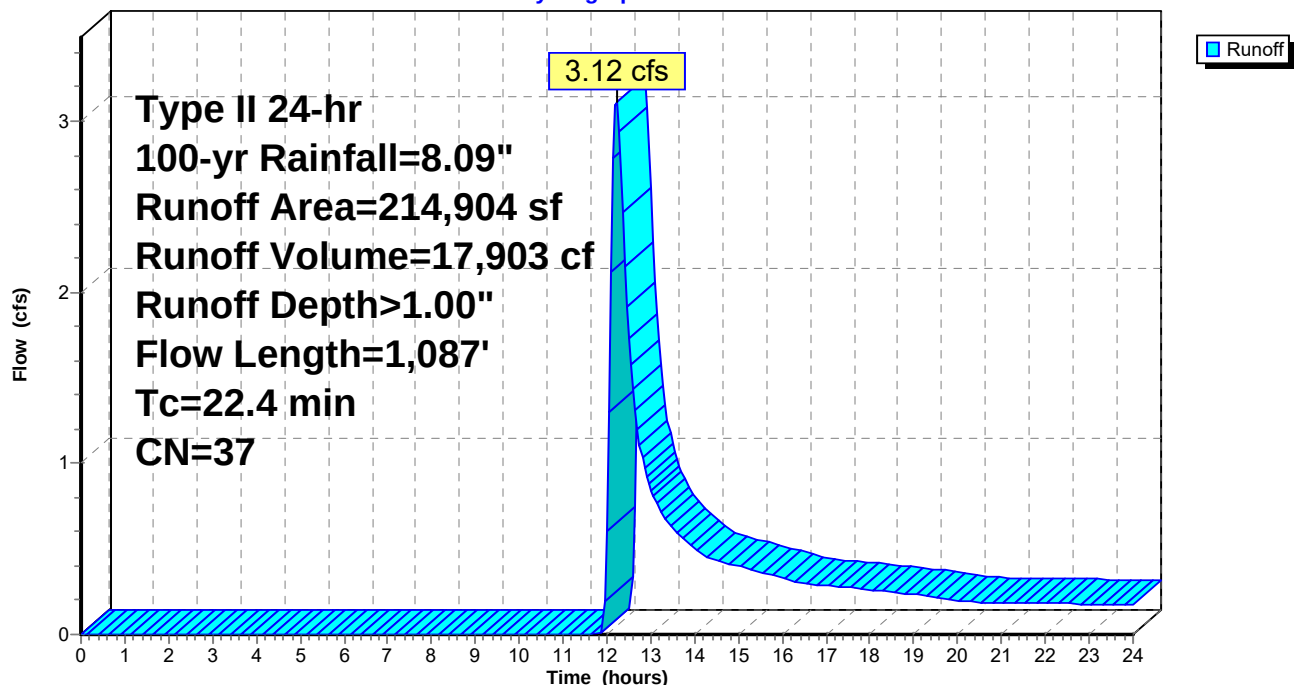
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,255     | 30 | Woods, Good, HSG A        |
| 16,141    | 77 | Woods, Good, HSG D        |
| 173,782   | 30 | Meadow, non-grazed, HSG A |
| 15,726    | 78 | Meadow, non-grazed, HSG D |
| 214,904   | 37 | Weighted Average          |
| 214,904   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 14.7     | 100           | 0.0500        | 0.11              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 1.5      | 141           | 0.0920        | 1.52              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 6.2      | 846           | 0.1060        | 2.28              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 22.4     | 1,087         | Total         |                   |                |                                                                      |

**Subcatchment 18S: DA-3 Post**

Hydrograph

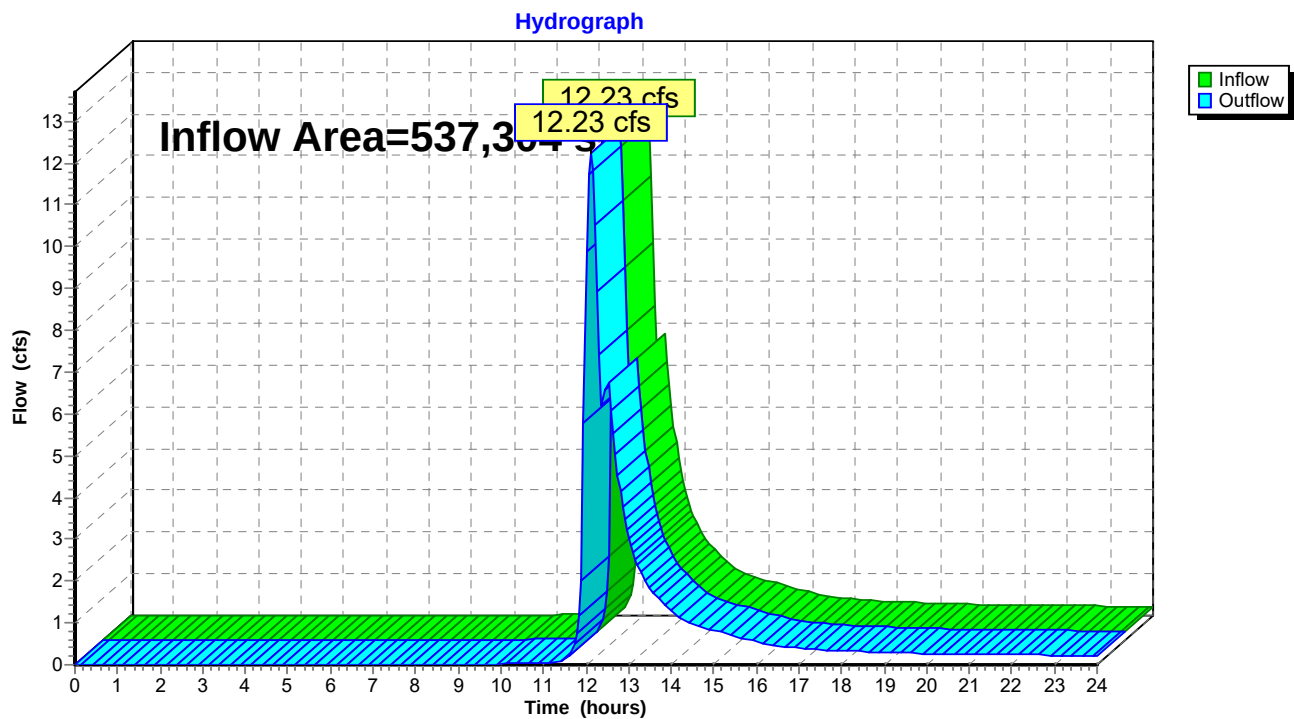


**Summary for Reach 14R: Post w-BMP**

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

Inflow Area = 537,304 sf, 3.42% Impervious, Inflow Depth > 1.11" for 100-yr event  
Inflow = 12.23 cfs @ 12.10 hrs, Volume= 49,639 cf  
Outflow = 12.23 cfs @ 12.10 hrs, Volume= 49,639 cf, Atten= 0%, Lag= 0.0 min

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

**Reach 14R: Post w-BMP**

## MLV 505LD86\_Post w-BMP

Prepared by Microsoft

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Type II 24-hr 100-yr Rainfall=8.09"

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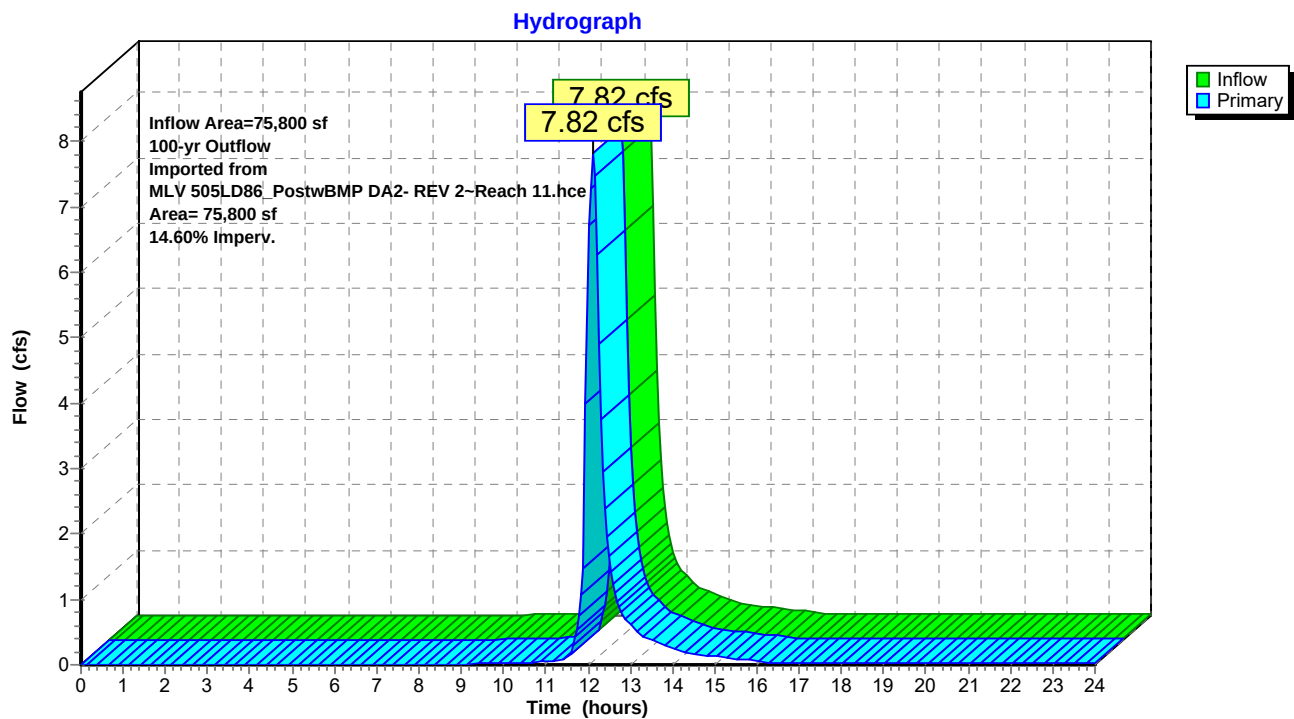
### Summary for Link 15L: DA 2 Post w-BMP

Inflow Area = 75,800 sf, 14.60% Impervious, Inflow Depth > 2.54" for 100-yr event  
Inflow = 7.82 cfs @ 12.11 hrs, Volume= 16,030 cf  
Primary = 7.82 cfs @ 12.11 hrs, Volume= 16,030 cf, Atten= 0%, Lag= 0.0 min

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

100-yr Outflow Imported from MLV 505LD86\_PostwBMP DA2- REV 2~Reach 11.hce

### Link 15L: DA 2 Post w-BMP



## MLV 505LD86\_Post w-BMP

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Type II 24-hr 100-yr Rainfall=8.09"

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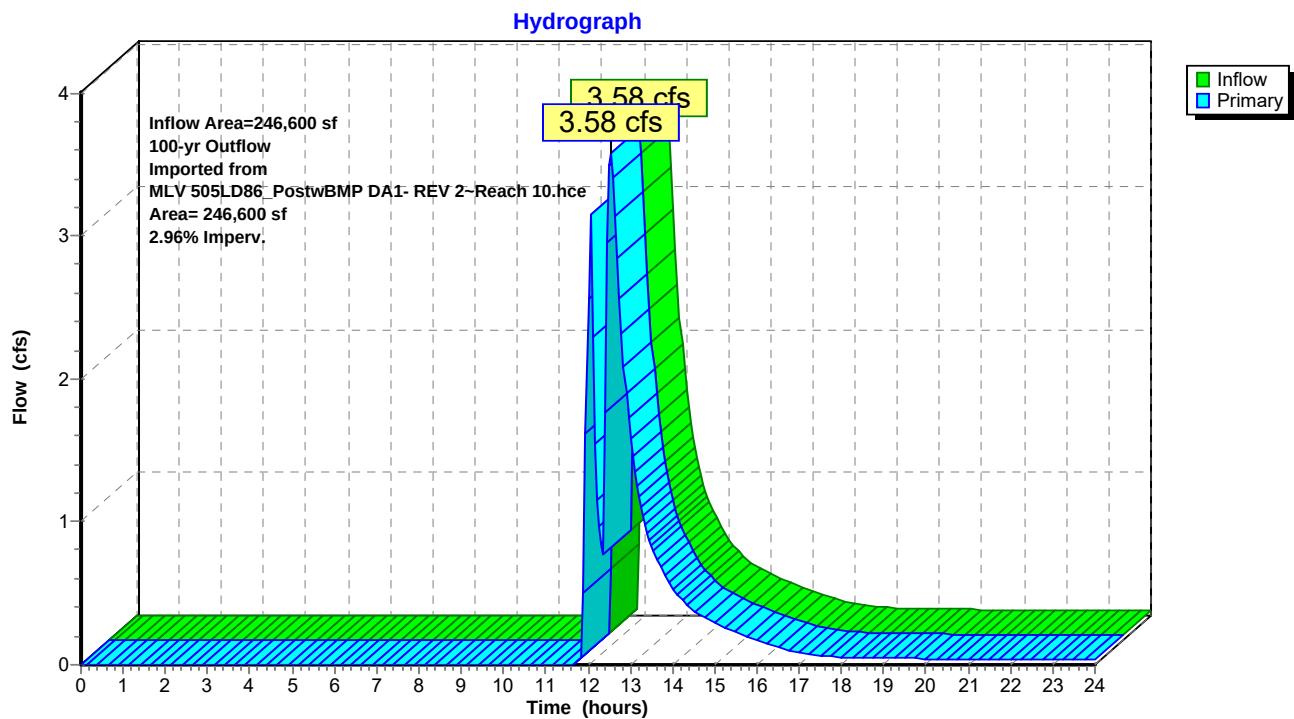
### Summary for Link 16L: DA 1 Post w-BMP

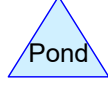
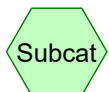
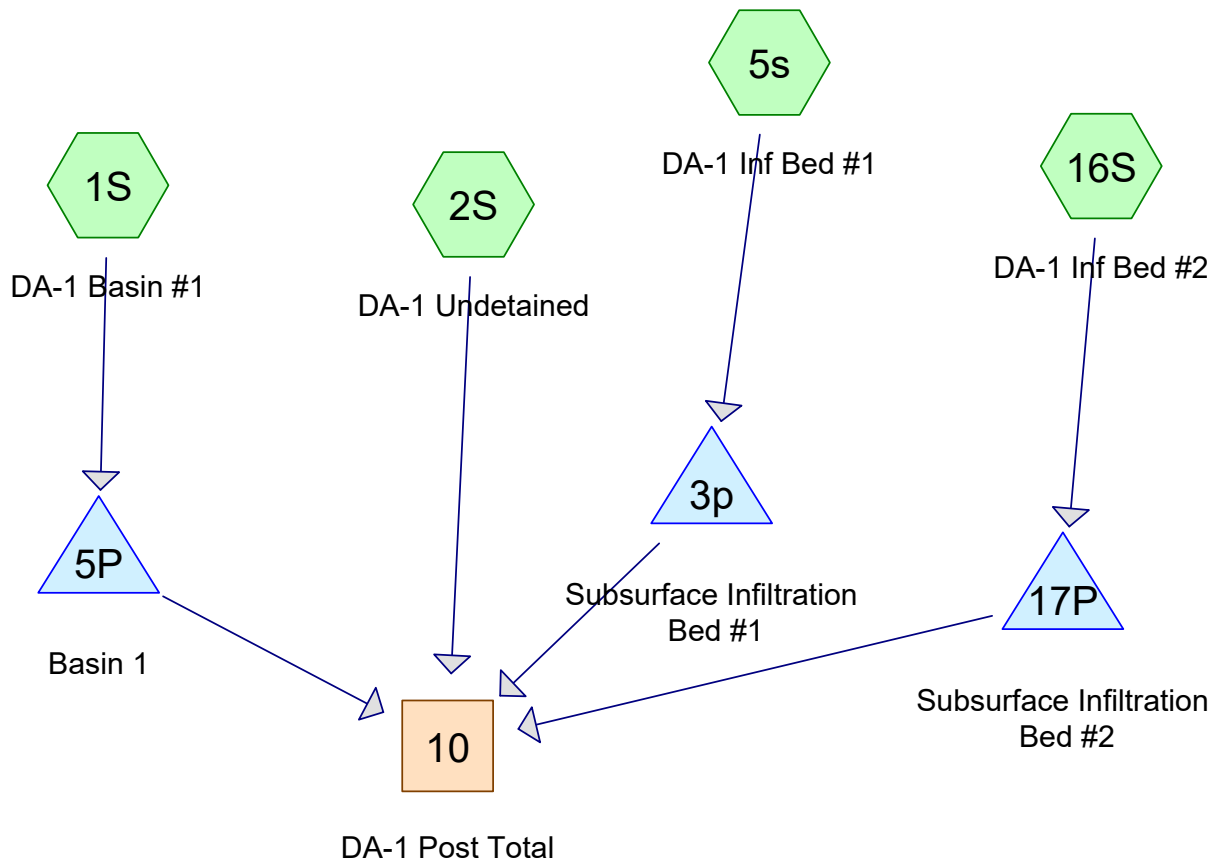
Inflow Area = 246,600 sf, 2.96% Impervious, Inflow Depth > 0.76" for 100-yr event  
Inflow = 3.58 cfs @ 12.54 hrs, Volume= 15,706 cf  
Primary = 3.58 cfs @ 12.54 hrs, Volume= 15,706 cf, Atten= 0%, Lag= 0.0 min

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

100-yr Outflow Imported from MLV 505LD86\_PostwBMP DA1- REV 2~Reach 10.hce

### Link 16L: DA 1 Post w-BMP





**MLV 505LD86\_PostwBMP DA1- REV 2**

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**Area Listing (all nodes)**

| Area<br>(sq-ft) | CN        | Description<br>(subcatchment-numbers)       |
|-----------------|-----------|---------------------------------------------|
| 7,293           | 98        | Impervious (1S, 2S, 5s, 16S)                |
| 117,845         | 30        | Meadow, non-grazed, HSG A (1S, 2S, 5s, 16S) |
| 65,478          | 78        | Meadow, non-grazed, HSG D (1S, 2S, 5s, 16S) |
| 42,062          | 30        | Woods, Good, HSG A (1S, 2S)                 |
| 13,922          | 77        | Woods, Good, HSG D (1S, 2S, 16S)            |
| <b>246,600</b>  | <b>47</b> | <b>TOTAL AREA</b>                           |



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**Soil Listing (all nodes)**

| Area<br>(sq-ft) | Soil<br>Group | Subcatchment<br>Numbers |
|-----------------|---------------|-------------------------|
| 159,907         | HSG A         | 1S, 2S, 5s, 16S         |
| 0               | HSG B         |                         |
| 0               | HSG C         |                         |
| 79,400          | HSG D         | 1S, 2S, 5s, 16S         |
| 7,293           | Other         | 1S, 2S, 5s, 16S         |
| <b>246,600</b>  |               | <b>TOTAL AREA</b>       |

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**Ground Covers (all nodes)**

| HSG-A<br>(sq-ft) | HSG-B<br>(sq-ft) | HSG-C<br>(sq-ft) | HSG-D<br>(sq-ft) | Other<br>(sq-ft) | Total<br>(sq-ft) | Ground<br>Cover       | Subcat<br>Number |
|------------------|------------------|------------------|------------------|------------------|------------------|-----------------------|------------------|
| 0                | 0                | 0                | 0                | 7,293            | 7,293            | Impervious            |                  |
| 117,845          | 0                | 0                | 65,478           | 0                | 183,323          | Meadow,<br>non-grazed |                  |
| 42,062           | 0                | 0                | 13,922           | 0                | 55,984           | Woods, Good           |                  |
| <b>159,907</b>   | <b>0</b>         | <b>0</b>         | <b>79,400</b>    | <b>7,293</b>     | <b>246,600</b>   | <b>TOTAL AREA</b>     |                  |

**MLV 505LD86\_PostwBMP DA1- REV 2**

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**Pipe Listing (all nodes)**

| Line# | Node<br>Number | In-Invert<br>(feet) | Out-Invert<br>(feet) | Length<br>(feet) | Slope<br>(ft/ft) | n     | Diam/Width<br>(inches) | Height<br>(inches) | Inside-Fill<br>(inches) |
|-------|----------------|---------------------|----------------------|------------------|------------------|-------|------------------------|--------------------|-------------------------|
| 1     | 3p             | 913.50              | 912.50               | 10.0             | 0.1000           | 0.024 | 4.0                    | 0.0                | 0.0                     |
| 2     | 5P             | 924.50              | 918.00               | 50.0             | 0.1300           | 0.012 | 18.0                   | 0.0                | 0.0                     |
| 3     | 17P            | 912.80              | 912.00               | 12.0             | 0.0667           | 0.012 | 6.0                    | 0.0                | 0.0                     |

**MLV 505LD86\_PostwBMP DA1- REV 2***Type II 24-hr 1-yr Rainfall=2.72"*

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Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DA-1 Basin #1** Runoff Area=191,207 sf 2.18% Impervious Runoff Depth>0.02"  
Flow Length=1,332' Tc=26.4 min CN=47 Runoff=0.01 cfs 279 cf

**Subcatchment2S: DA-1 Undetained** Runoff Area=39,431 sf 1.50% Impervious Runoff Depth=0.00"  
Flow Length=547' Tc=10.1 min CN=40 Runoff=0.00 cfs 0 cf

**Subcatchment5s: DA-1 Inf Bed #1** Runoff Area=10,278 sf 21.06% Impervious Runoff Depth>0.38"  
Flow Length=154' Slope=0.1500 '/' Tc=6.6 min CN=65 Runoff=0.12 cfs 328 cf

**Subcatchment16S: DA-1 Inf Bed #2** Runoff Area=5,684 sf 6.60% Impervious Runoff Depth>0.65"  
Flow Length=154' Slope=0.1500 '/' Tc=6.6 min CN=72 Runoff=0.14 cfs 306 cf

**Reach 10: DA-1 Post Total** Inflow=0.00 cfs 0 cf  
Outflow=0.00 cfs 0 cf

**Pond 3p: Subsurface Infiltration Bed #1** Peak Elev=912.09' Storage=32 cf Inflow=0.12 cfs 328 cf  
Discarded=0.06 cfs 328 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 328 cf

**Pond 5P: Basin 1** Peak Elev=924.50' Storage=5 cf Inflow=0.01 cfs 279 cf  
Discarded=0.01 cfs 274 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 274 cf

**Pond 17P: Subsurface Infiltration Bed #2** Peak Elev=912.21' Storage=54 cf Inflow=0.14 cfs 306 cf  
Discarded=0.04 cfs 306 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 306 cf

**Total Runoff Area = 246,600 sf Runoff Volume = 913 cf Average Runoff Depth = 0.04"**  
**97.04% Pervious = 239,307 sf 2.96% Impervious = 7,293 sf**

**Summary for Subcatchment 1S: DA-1 Basin #1**

[73] Warning: Peak may fall outside time span

Runoff = 0.01 cfs @ 24.00 hrs, Volume= 279 cf, Depth&gt; 0.02"

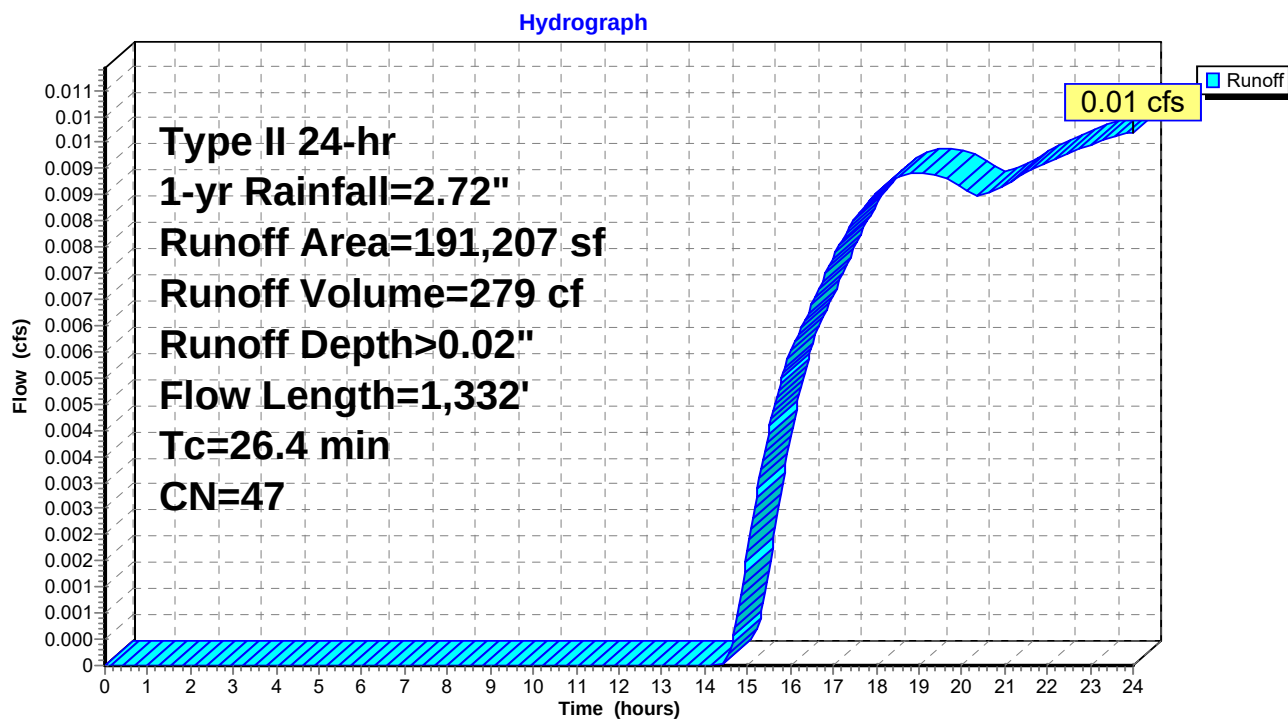
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 31,537    | 30 | Woods, Good, HSG A        |
| 12,873    | 77 | Woods, Good, HSG D        |
| 92,642    | 30 | Meadow, non-grazed, HSG A |
| 49,992    | 78 | Meadow, non-grazed, HSG D |
| * 4,163   | 98 | Impervious                |
| 191,207   | 47 | Weighted Average          |
| 187,044   |    | 97.82% Pervious Area      |
| 4,163     |    | 2.18% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.9      | 463           | 0.1000        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.4      | 554           | 0.0900        | 2.10              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 1.0      | 215           | 0.0630        | 3.64              | 5.10           | <b>Channel Flow,</b><br>Area= 1.4 sf Perim= 4.1' r= 0.34' n= 0.050   |
| 26.4     | 1,332         | Total         |                   |                |                                                                      |

## Subcatchment 1S: DA-1 Basin #1





**Summary for Subcatchment 2S: DA-1 Undetained**

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

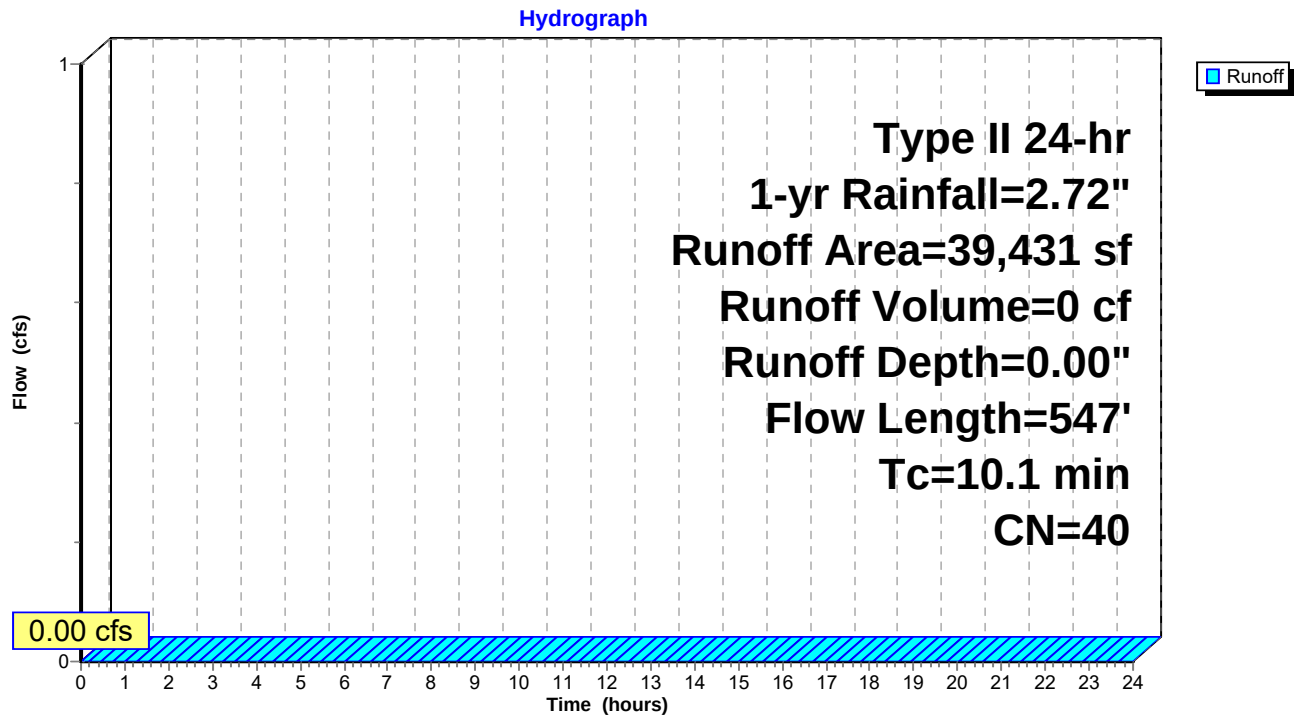
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 10,525    | 30 | Woods, Good, HSG A        |
| 1,020     | 77 | Woods, Good, HSG D        |
| 20,698    | 30 | Meadow, non-grazed, HSG A |
| 6,598     | 78 | Meadow, non-grazed, HSG D |
| * 590     | 98 | Impervious                |
| 39,431    | 40 | Weighted Average          |
| 38,841    |    | 98.50% Pervious Area      |
| 590       |    | 1.50% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------|
| 7.4      | 100           | 0.1000        | 0.22              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.26"                      |
| 1.0      | 147           | 0.1200        | 2.42              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps       |
| 1.7      | 300           | 0.0200        | 2.89              | 4.33           | <b>Channel Flow, Channel</b><br>Area= 1.5 sf Perim= 4.5' r= 0.33' n= 0.035 |
| 10.1     | 547           | Total         |                   |                |                                                                            |

## Subcatchment 2S: DA-1 Undetained



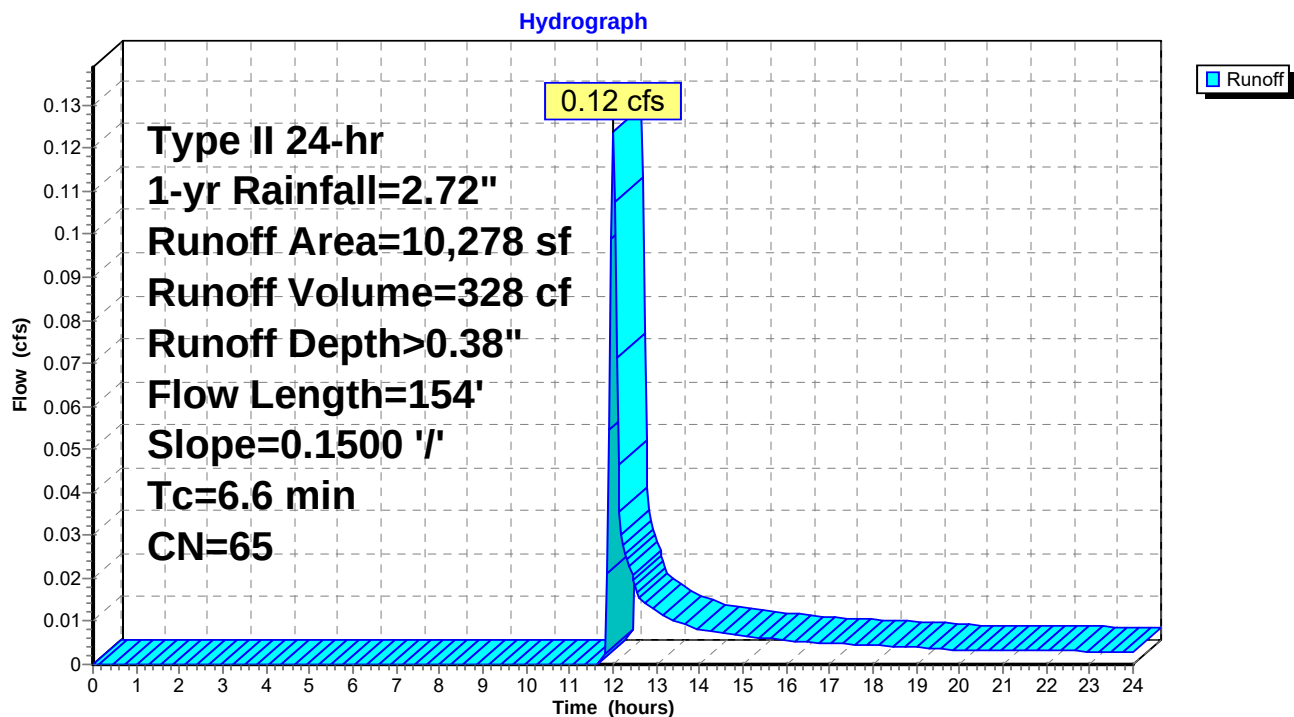
**Summary for Subcatchment 5s: DA-1 Inf Bed #1**

Runoff = 0.12 cfs @ 12.00 hrs, Volume= 328 cf, Depth> 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,580     | 30 | Meadow, non-grazed, HSG A |
| 4,533     | 78 | Meadow, non-grazed, HSG D |
| * 2,165   | 98 | Impervious                |
| 10,278    | 65 | Weighted Average          |
| 8,113     |    | 78.94% Pervious Area      |
| 2,165     |    | 21.06% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 6.3      | 100           | 0.1500        | 0.26              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.26"                |
| 0.3      | 54            | 0.1500        | 2.71              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 6.6      | 154           | Total         |                   |                |                                                                      |

**Subcatchment 5s: DA-1 Inf Bed #1**

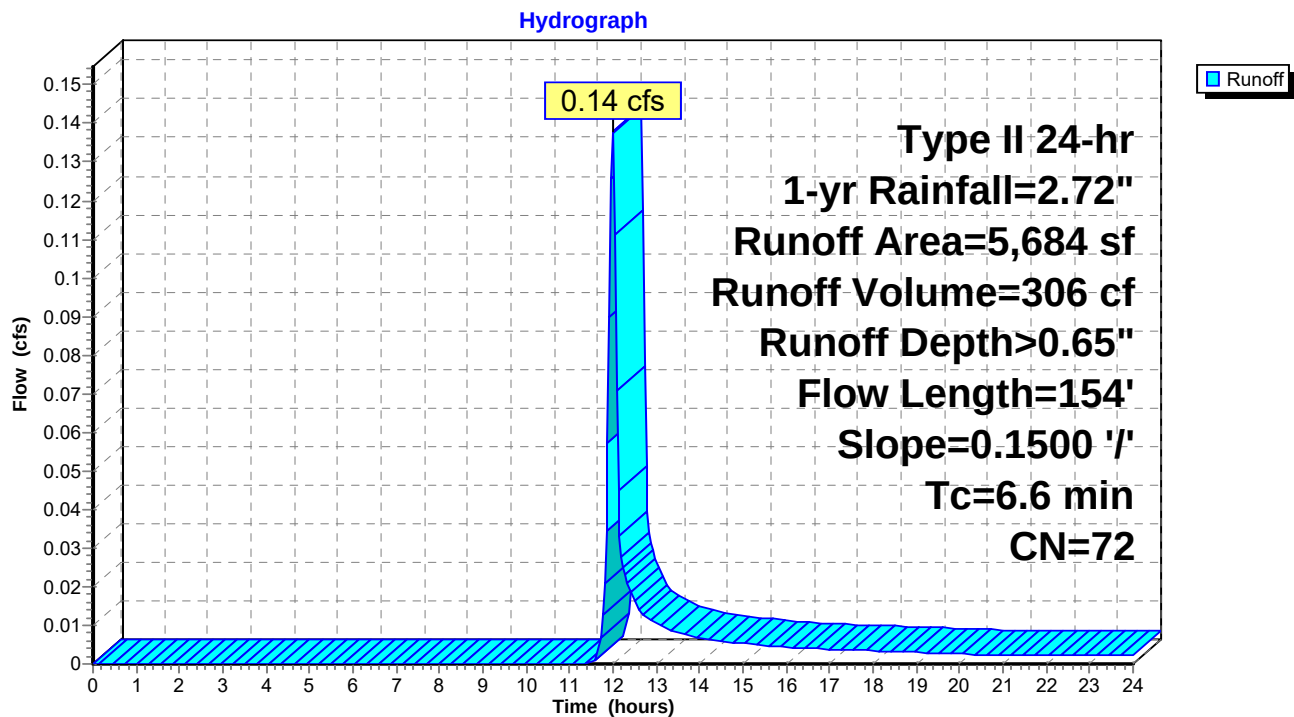
**Summary for Subcatchment 16S: DA-1 Inf Bed #2**

Runoff = 0.14 cfs @ 11.99 hrs, Volume= 306 cf, Depth> 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 29        | 77 | Woods, Good, HSG D        |
| 925       | 30 | Meadow, non-grazed, HSG A |
| 4,355     | 78 | Meadow, non-grazed, HSG D |
| * 375     | 98 | Impervious                |
| 5,684     | 72 | Weighted Average          |
| 5,309     |    | 93.40% Pervious Area      |
| 375       |    | 6.60% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 6.3      | 100           | 0.1500        | 0.26              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.26"                |
| 0.3      | 54            | 0.1500        | 2.71              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 6.6      | 154           | Total         |                   |                |                                                                      |

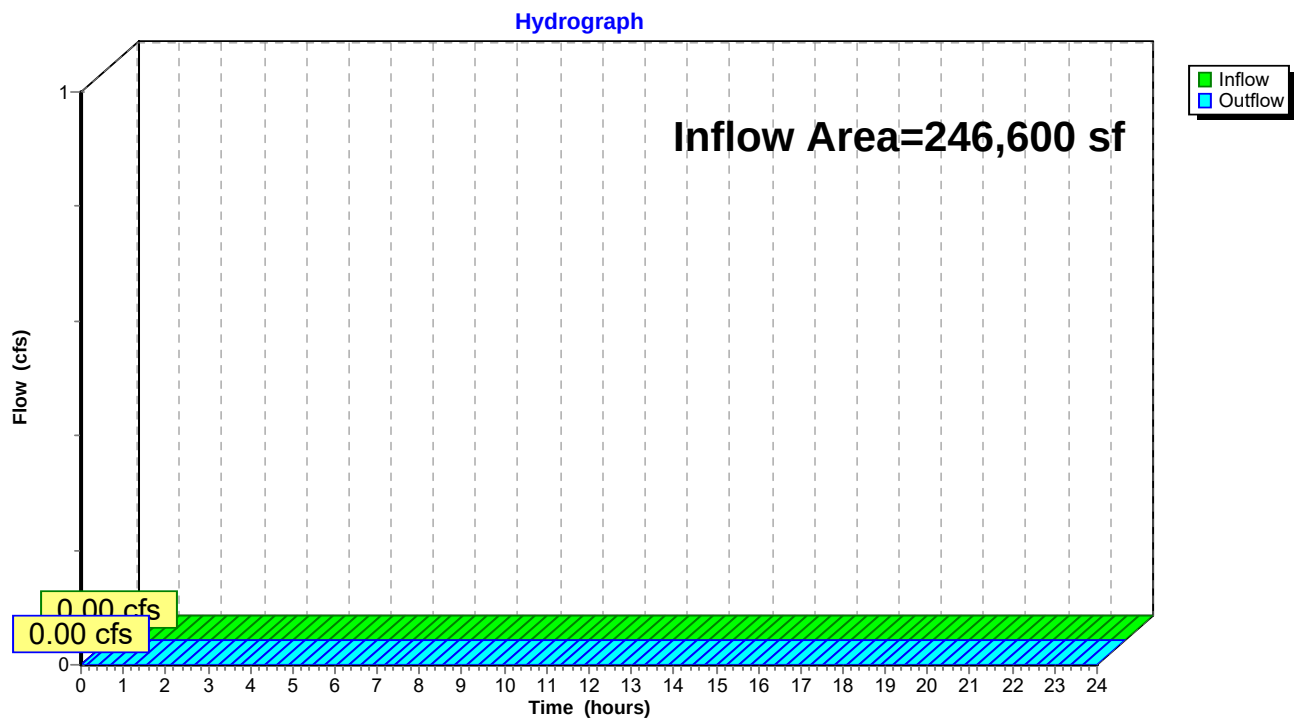
**Subcatchment 16S: DA-1 Inf Bed #2**

**Summary for Reach 10: DA-1 Post Total**

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

Inflow Area = 246,600 sf, 2.96% Impervious, Inflow Depth = 0.00" for 1-yr event  
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs

**Reach 10: DA-1 Post Total**

**Summary for Pond 3p: Subsurface Infiltration Bed #1**

Inflow Area = 10,278 sf, 21.06% Impervious, Inflow Depth > 0.38" for 1-yr event  
 Inflow = 0.12 cfs @ 12.00 hrs, Volume= 328 cf  
 Outflow = 0.06 cfs @ 12.11 hrs, Volume= 328 cf, Atten= 55%, Lag= 6.2 min  
 Discarded = 0.06 cfs @ 12.11 hrs, Volume= 328 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 912.09' @ 12.11 hrs Surf.Area= 800 sf Storage= 32 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 2.7 min ( 913.9 - 911.2 )

| Volume | Invert  | Avail.Storage | Storage Description                                                                                                       |
|--------|---------|---------------|---------------------------------------------------------------------------------------------------------------------------|
| #1     | 912.00' | 795 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>2,200 cf Overall - 212 cf Embedded = 1,988 cf x 40.0% Voids |
| #2     | 912.00' | 212 cf        | <b>18.0" Round Pipe Storage</b> x 3 Inside #1<br>L= 40.0'                                                                 |
|        |         | 1,007 cf      | Total Available Storage                                                                                                   |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 912.00              | 800                  | 0                         | 0                         |
| 913.00              | 800                  | 800                       | 800                       |
| 914.00              | 800                  | 800                       | 1,600                     |
| 914.75              | 800                  | 600                       | 2,200                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                           |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 914.50' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32 |
| #2     | Primary   | 913.50' | <b>4.0" Round Culvert</b><br>L= 10.0' CMP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 913.50' / 912.50' S= 0.1000 ' / Cc= 0.900<br>n= 0.024, Flow Area= 0.09 sf                                                           |
| #3     | Discarded | 912.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = -4.00'                                                                                                                                      |

**Discarded OutFlow** Max=0.06 cfs @ 12.11 hrs HW=912.09' (Free Discharge)

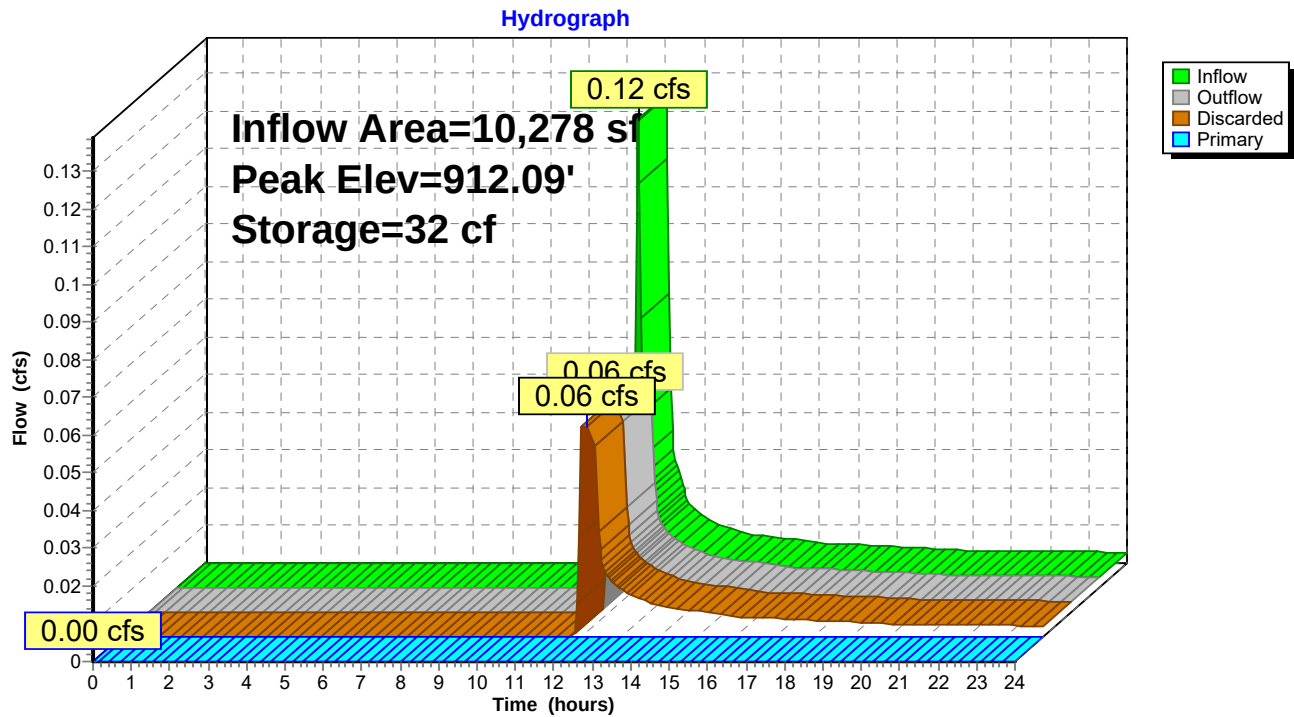
↑ **3=Exfiltration** ( Controls 0.06 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=912.00' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

↑ **2=Culvert** ( Controls 0.00 cfs)

## Pond 3p: Subsurface Infiltration Bed #1





**Summary for Pond 5P: Basin 1**

Inflow Area = 191,207 sf, 2.18% Impervious, Inflow Depth > 0.02" for 1-yr event  
 Inflow = 0.01 cfs @ 24.00 hrs, Volume= 279 cf  
 Outflow = 0.01 cfs @ 24.00 hrs, Volume= 274 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.01 cfs @ 24.00 hrs, Volume= 274 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
 Peak Elev= 924.50' @ 24.00 hrs Surf.Area= 2,840 sf Storage= 5 cf

Plug-Flow detention time= 8.2 min calculated for 274 cf (98% of inflow)  
 Center-of-Mass det. time= 3.8 min ( 1,199.0 - 1,195.2 )

| Volume              | Invert               | Avail.Storage             | Storage Description                                        |
|---------------------|----------------------|---------------------------|------------------------------------------------------------|
| #1                  | 924.50'              | 15,897 cf                 | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet)                                  |
| 924.50              | 2,838                | 0                         | 0                                                          |
| 925.00              | 3,298                | 1,534                     | 1,534                                                      |
| 926.00              | 4,260                | 3,779                     | 5,313                                                      |
| 927.00              | 5,278                | 4,769                     | 10,082                                                     |
| 928.00              | 6,352                | 5,815                     | 15,897                                                     |

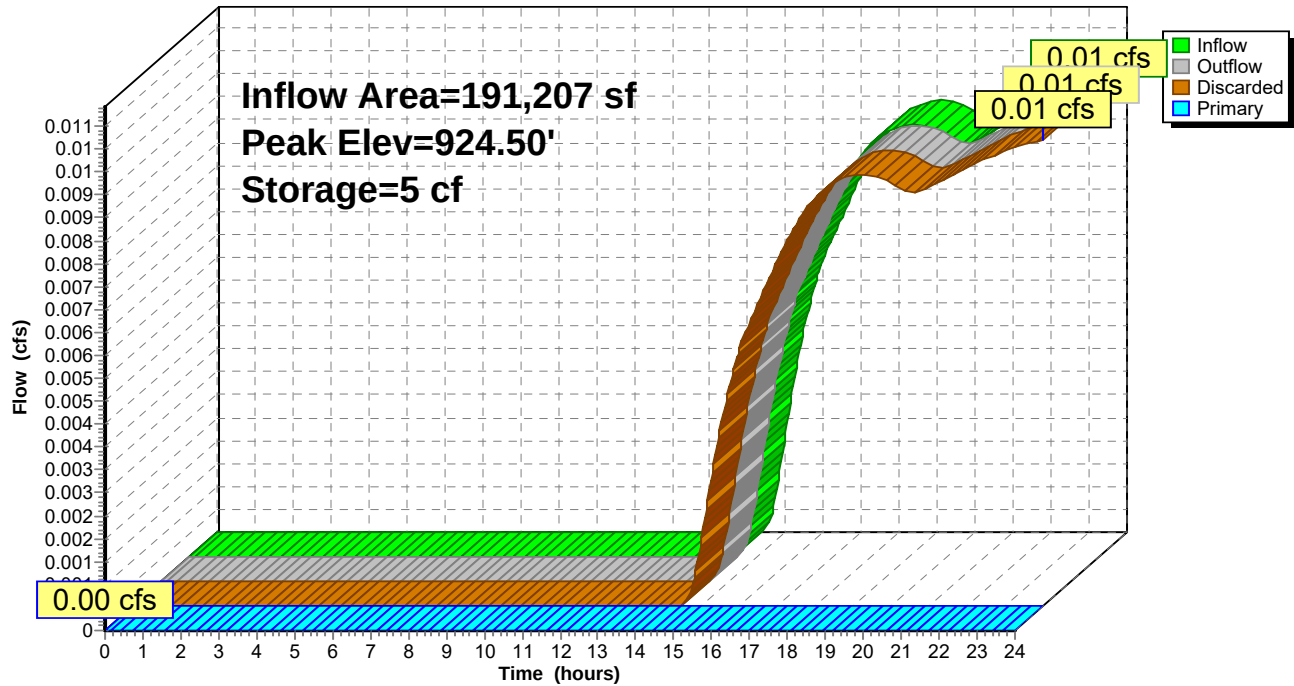
| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 927.00' | <b>20.0' long x 4.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66<br>2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32 |
| #2     | Device 4  | 926.50' | <b>24.0" Horiz. Orifice/Grate C= 0.600</b><br>Limited to weir flow at low heads                                                                                                                                                                                                   |
| #3     | Discarded | 924.50' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 916.00'                                                                                                                                                                              |
| #4     | Primary   | 924.50' | <b>18.0" Round Culvert</b><br>L= 50.0' Box, headwall w/3 rounded edges, Ke= 0.200<br>Inlet / Outlet Invert= 924.50' / 918.00' S= 0.1300 ' /' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf                                                             |

**Discarded OutFlow** Max=0.20 cfs @ 24.00 hrs HW=924.50' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.20 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=924.50' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **4=Culvert** ( Controls 0.00 cfs)  
 ↳ **2=Orifice/Grate** ( Controls 0.00 cfs)

## Pond 5P: Basin 1

## Hydrograph



**Summary for Pond 17P: Subsurface Infiltration Bed #2**

Inflow Area = 5,684 sf, 6.60% Impervious, Inflow Depth > 0.65" for 1-yr event  
 Inflow = 0.14 cfs @ 11.99 hrs, Volume= 306 cf  
 Outflow = 0.04 cfs @ 12.14 hrs, Volume= 306 cf, Atten= 71%, Lag= 8.8 min  
 Discarded = 0.04 cfs @ 12.14 hrs, Volume= 306 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 912.21' @ 12.14 hrs Surf.Area= 575 sf Storage= 54 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 6.2 min ( 883.5 - 877.2 )

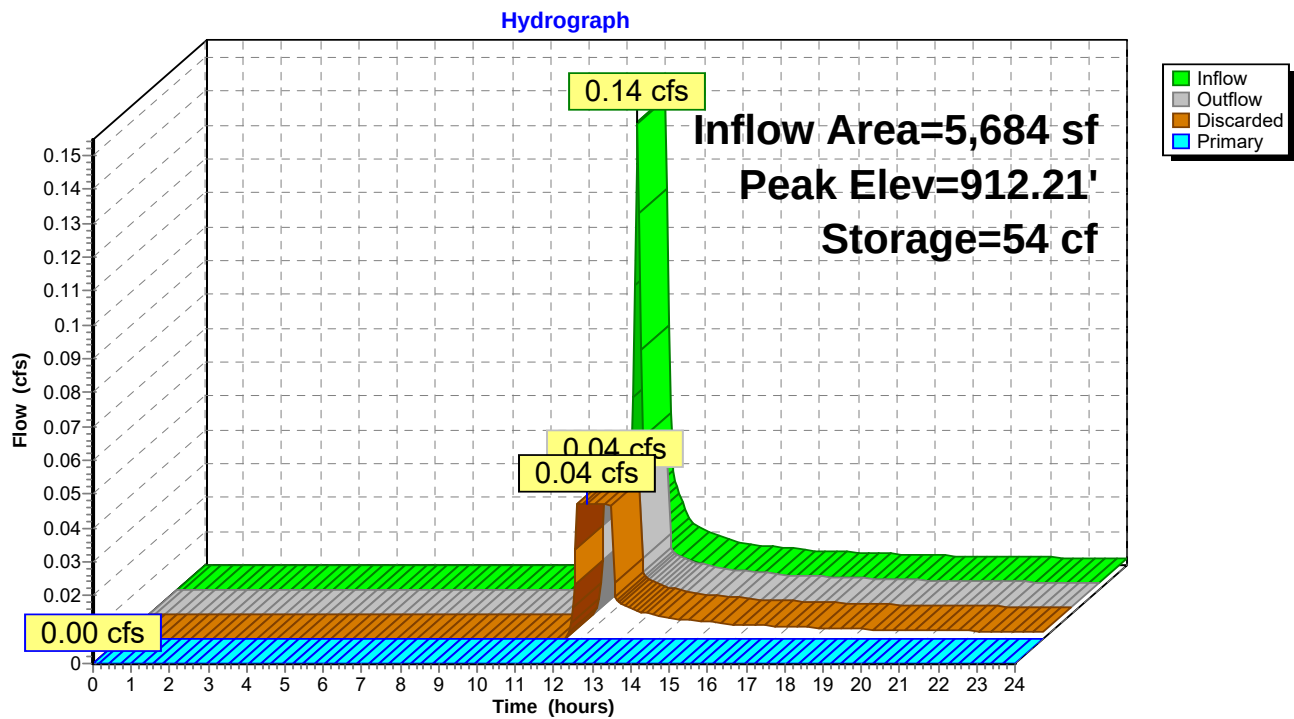
| Volume | Invert  | Avail.Storage | Storage Description                                                                                                  |
|--------|---------|---------------|----------------------------------------------------------------------------------------------------------------------|
| #1     | 912.00' | 314 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>863 cf Overall - 79 cf Embedded = 784 cf x 40.0% Voids |
| #2     | 912.00' | 79 cf         | <b>12.0" Round Pipe Storage</b> x 4 Inside #1<br>L= 25.0'                                                            |
|        |         | 392 cf        | Total Available Storage                                                                                              |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 912.00              | 575                  | 0                         | 0                         |
| 913.00              | 575                  | 575                       | 575                       |
| 913.50              | 575                  | 288                       | 863                       |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                           |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 913.30' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32 |
| #2     | Primary   | 912.80' | <b>6.0" Round Culvert</b><br>L= 12.0' CMP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 912.80' / 912.00' S= 0.0667 '/' Cc= 0.900<br>n= 0.012, Flow Area= 0.20 sf                                                        |
| #3     | Discarded | 912.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = -4.00'                                                                                                                                      |

**Discarded OutFlow** Max=0.04 cfs @ 12.14 hrs HW=912.20' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.04 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=912.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Culvert** ( Controls 0.00 cfs)

**Pond 17P: Subsurface Infiltration Bed #2**

**MLV 505LD86\_PostwBMP DA1- REV 2***Type II 24-hr 2-yr Rainfall=3.26"*

Prepared by {enter your company name here}

Printed 3/2/2022

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Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DA-1 Basin #1**

Runoff Area=191,207 sf 2.18% Impervious Runoff Depth>0.08"  
Flow Length=1,332' Tc=26.4 min CN=47 Runoff=0.04 cfs 1,275 cf

**Subcatchment2S: DA-1 Undetained**

Runoff Area=39,431 sf 1.50% Impervious Runoff Depth>0.00"  
Flow Length=547' Tc=10.1 min CN=40 Runoff=0.00 cfs 14 cf

**Subcatchment5s: DA-1 Inf Bed #1**

Runoff Area=10,278 sf 21.06% Impervious Runoff Depth>0.63"  
Flow Length=154' Slope=0.1500 '/' Tc=6.6 min CN=65 Runoff=0.23 cfs 538 cf

**Subcatchment16S: DA-1 Inf Bed #2**

Runoff Area=5,684 sf 6.60% Impervious Runoff Depth>0.97"  
Flow Length=154' Slope=0.1500 '/' Tc=6.6 min CN=72 Runoff=0.21 cfs 457 cf

**Reach 10: DA-1 Post Total**

Inflow=0.00 cfs 14 cf  
Outflow=0.00 cfs 14 cf

**Pond 3p: Subsurface Infiltration Bed #1**

Peak Elev=912.27' Storage=100 cf Inflow=0.23 cfs 538 cf  
Discarded=0.06 cfs 537 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 537 cf

**Pond 5P: Basin 1**

Peak Elev=924.51' Storage=20 cf Inflow=0.04 cfs 1,275 cf  
Discarded=0.04 cfs 1,262 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 1,262 cf

**Pond 17P: Subsurface Infiltration Bed #2**

Peak Elev=912.41' Storage=113 cf Inflow=0.21 cfs 457 cf  
Discarded=0.04 cfs 457 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 457 cf

**Total Runoff Area = 246,600 sf Runoff Volume = 2,284 cf Average Runoff Depth = 0.11"**  
**97.04% Pervious = 239,307 sf 2.96% Impervious = 7,293 sf**

**Summary for Subcatchment 1S: DA-1 Basin #1**

Runoff = 0.04 cfs @ 13.71 hrs, Volume= 1,275 cf, Depth> 0.08"

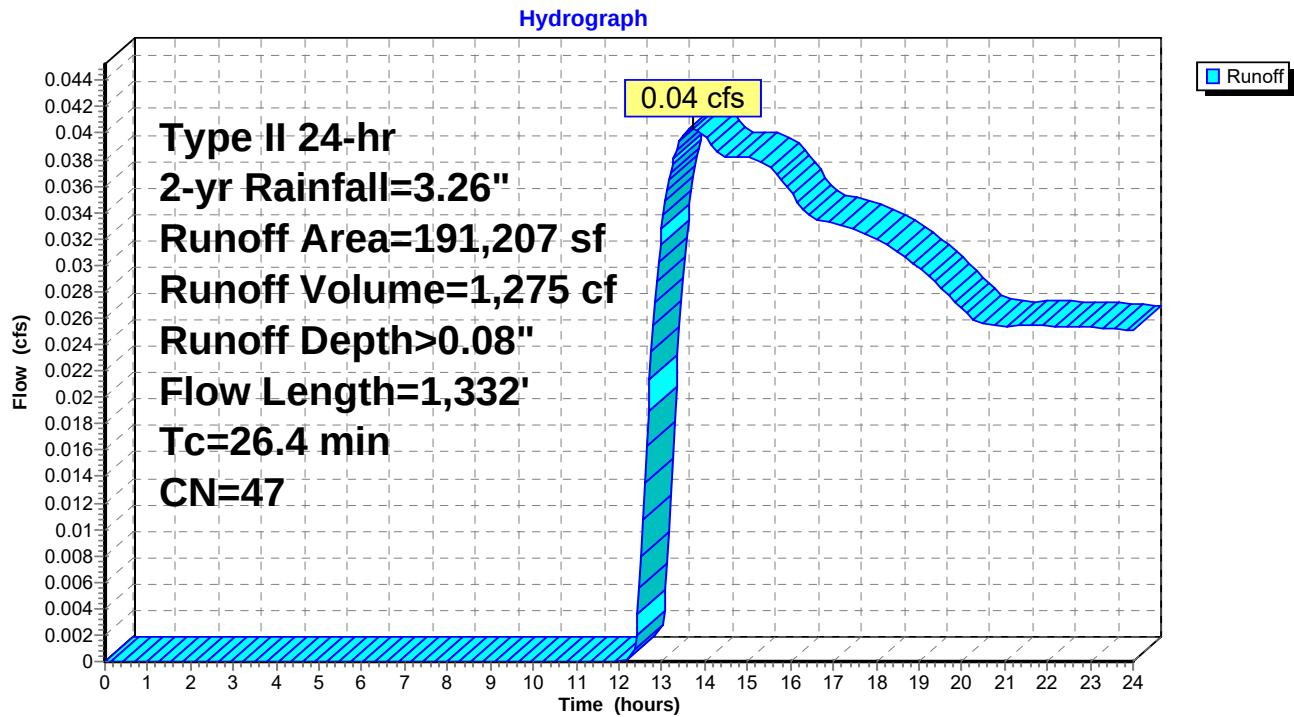
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 31,537    | 30 | Woods, Good, HSG A        |
| 12,873    | 77 | Woods, Good, HSG D        |
| 92,642    | 30 | Meadow, non-grazed, HSG A |
| 49,992    | 78 | Meadow, non-grazed, HSG D |
| * 4,163   | 98 | Impervious                |
| 191,207   | 47 | Weighted Average          |
| 187,044   |    | 97.82% Pervious Area      |
| 4,163     |    | 2.18% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.9      | 463           | 0.1000        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.4      | 554           | 0.0900        | 2.10              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 1.0      | 215           | 0.0630        | 3.64              | 5.10           | <b>Channel Flow,</b><br>Area= 1.4 sf Perim= 4.1' r= 0.34' n= 0.050   |
| 26.4     | 1,332         | Total         |                   |                |                                                                      |

## Subcatchment 1S: DA-1 Basin #1





**Summary for Subcatchment 2S: DA-1 Undetained**

[73] Warning: Peak may fall outside time span

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 14 cf, Depth&gt; 0.00"

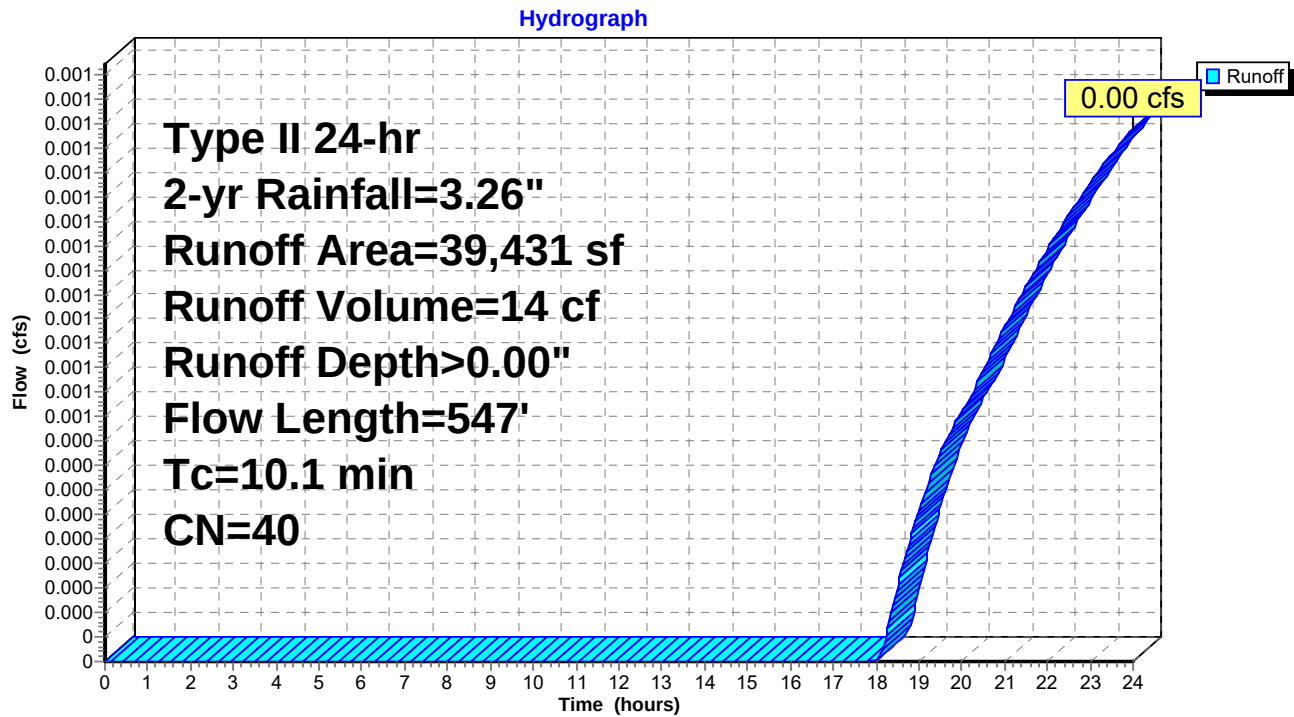
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 10,525    | 30 | Woods, Good, HSG A        |
| 1,020     | 77 | Woods, Good, HSG D        |
| 20,698    | 30 | Meadow, non-grazed, HSG A |
| 6,598     | 78 | Meadow, non-grazed, HSG D |
| * 590     | 98 | Impervious                |
| 39,431    | 40 | Weighted Average          |
| 38,841    |    | 98.50% Pervious Area      |
| 590       |    | 1.50% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------|
| 7.4      | 100           | 0.1000        | 0.22              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.26"                      |
| 1.0      | 147           | 0.1200        | 2.42              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps       |
| 1.7      | 300           | 0.0200        | 2.89              | 4.33           | <b>Channel Flow, Channel</b><br>Area= 1.5 sf Perim= 4.5' r= 0.33' n= 0.035 |
| 10.1     | 547           | Total         |                   |                |                                                                            |

## Subcatchment 2S: DA-1 Undetained



**Summary for Subcatchment 5s: DA-1 Inf Bed #1**

Runoff = 0.23 cfs @ 12.00 hrs, Volume= 538 cf, Depth> 0.63"

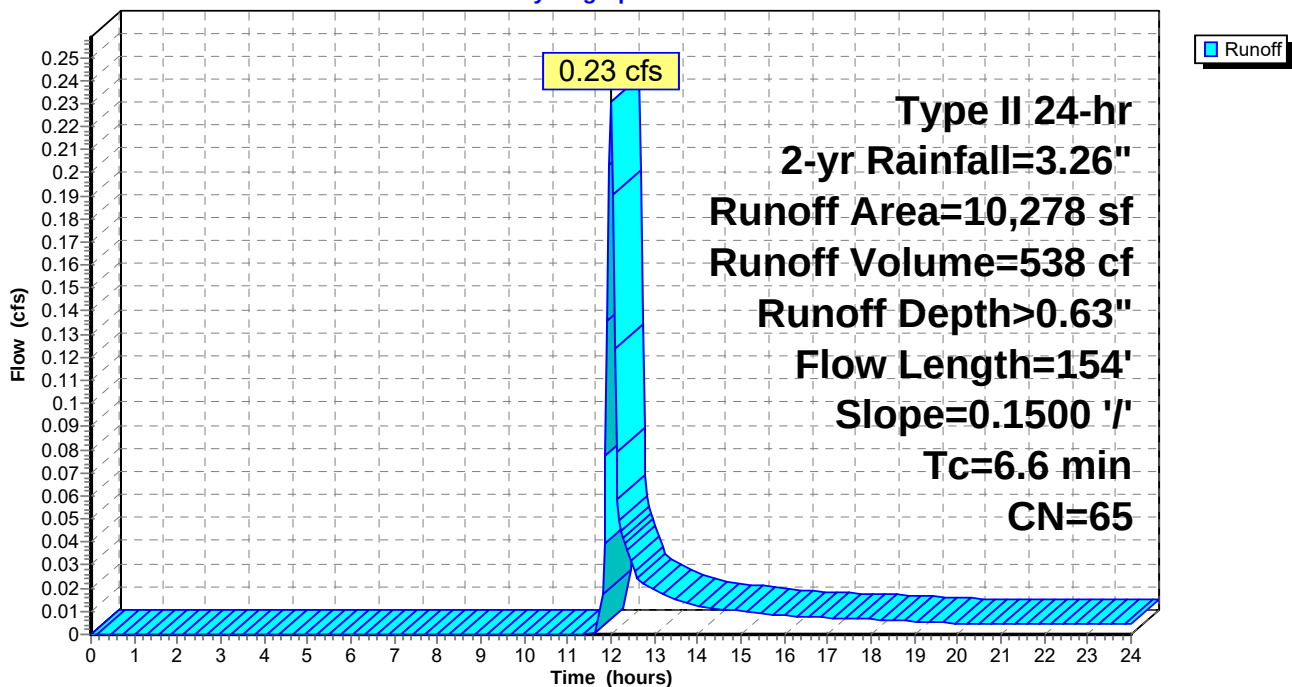
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,580     | 30 | Meadow, non-grazed, HSG A |
| 4,533     | 78 | Meadow, non-grazed, HSG D |
| * 2,165   | 98 | Impervious                |
| 10,278    | 65 | Weighted Average          |
| 8,113     |    | 78.94% Pervious Area      |
| 2,165     |    | 21.06% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                   |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------------------------|
| 6.3      | 100           | 0.1500        | 0.26              |                | Sheet Flow,<br>Grass: Dense n= 0.240 P2= 3.26"                |
| 0.3      | 54            | 0.1500        | 2.71              |                | Shallow Concentrated Flow,<br>Short Grass Pasture Kv= 7.0 fps |
| 6.6      | 154           | Total         |                   |                |                                                               |

**Subcatchment 5s: DA-1 Inf Bed #1**

Hydrograph



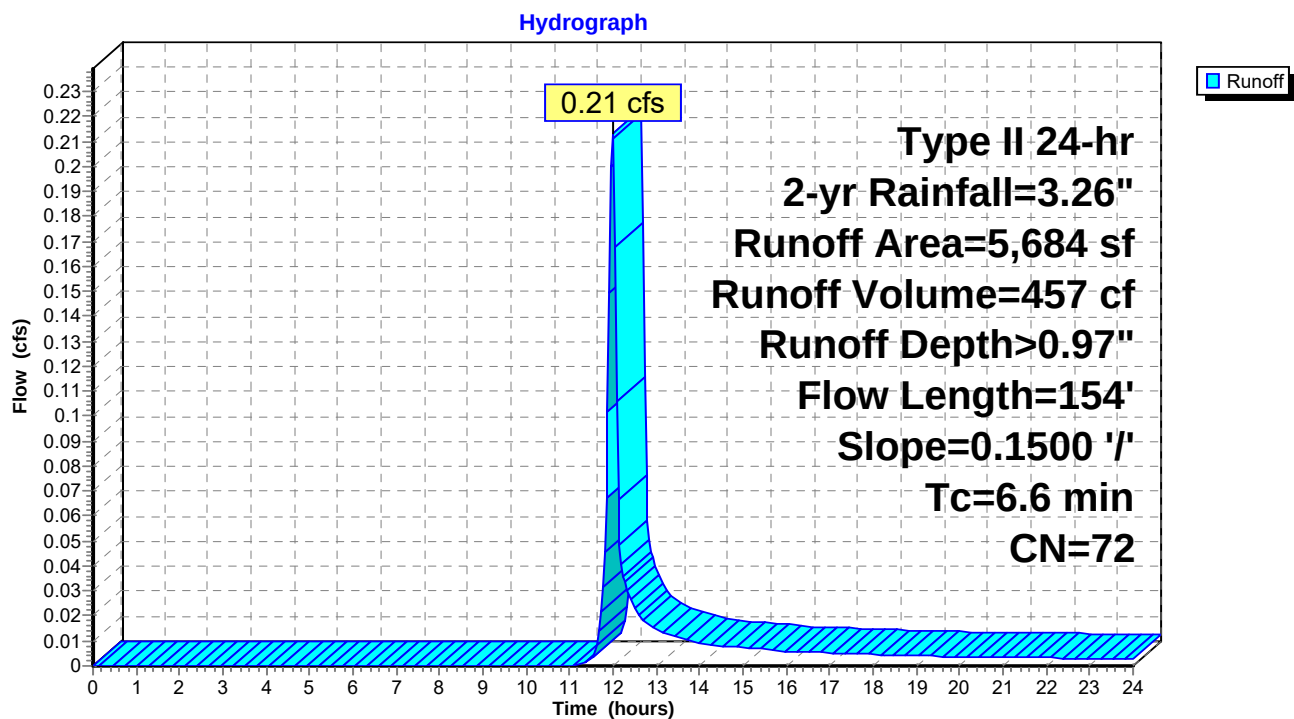
**Summary for Subcatchment 16S: DA-1 Inf Bed #2**

Runoff = 0.21 cfs @ 11.99 hrs, Volume= 457 cf, Depth> 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 29        | 77 | Woods, Good, HSG D        |
| 925       | 30 | Meadow, non-grazed, HSG A |
| 4,355     | 78 | Meadow, non-grazed, HSG D |
| * 375     | 98 | Impervious                |
| 5,684     | 72 | Weighted Average          |
| 5,309     |    | 93.40% Pervious Area      |
| 375       |    | 6.60% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                   |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------------------------|
| 6.3      | 100           | 0.1500        | 0.26              |                | Sheet Flow,<br>Grass: Dense n= 0.240 P2= 3.26"                |
| 0.3      | 54            | 0.1500        | 2.71              |                | Shallow Concentrated Flow,<br>Short Grass Pasture Kv= 7.0 fps |
| 6.6      | 154           | Total         |                   |                |                                                               |

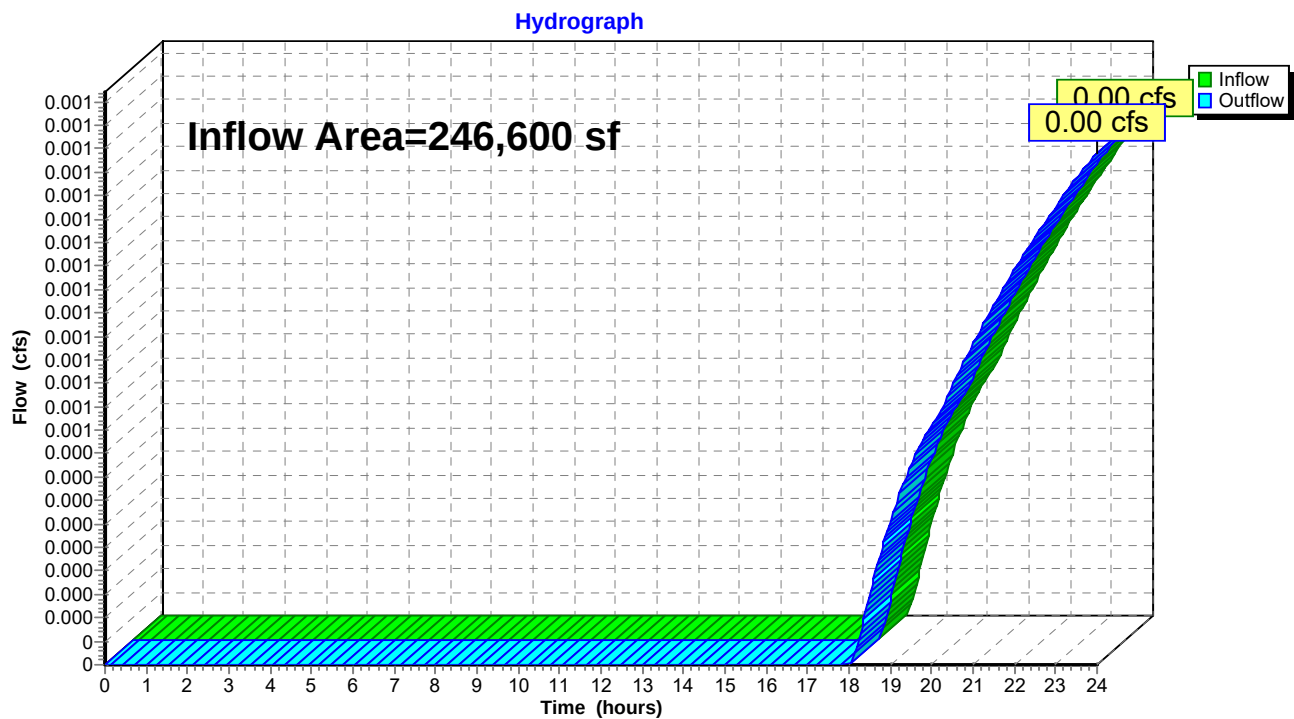
**Subcatchment 16S: DA-1 Inf Bed #2**

**Summary for Reach 10: DA-1 Post Total**

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

Inflow Area = 246,600 sf, 2.96% Impervious, Inflow Depth > 0.00" for 2-yr event  
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 14 cf  
Outflow = 0.00 cfs @ 24.00 hrs, Volume= 14 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs

**Reach 10: DA-1 Post Total**

**Summary for Pond 3p: Subsurface Infiltration Bed #1**

Inflow Area = 10,278 sf, 21.06% Impervious, Inflow Depth > 0.63" for 2-yr event  
 Inflow = 0.23 cfs @ 12.00 hrs, Volume= 538 cf  
 Outflow = 0.06 cfs @ 12.18 hrs, Volume= 537 cf, Atten= 76%, Lag= 10.8 min  
 Discarded = 0.06 cfs @ 12.18 hrs, Volume= 537 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 912.27' @ 12.18 hrs Surf.Area= 800 sf Storage= 100 cf

Plug-Flow detention time= 10.5 min calculated for 536 cf (100% of inflow)  
 Center-of-Mass det. time= 9.4 min ( 899.8 - 890.3 )

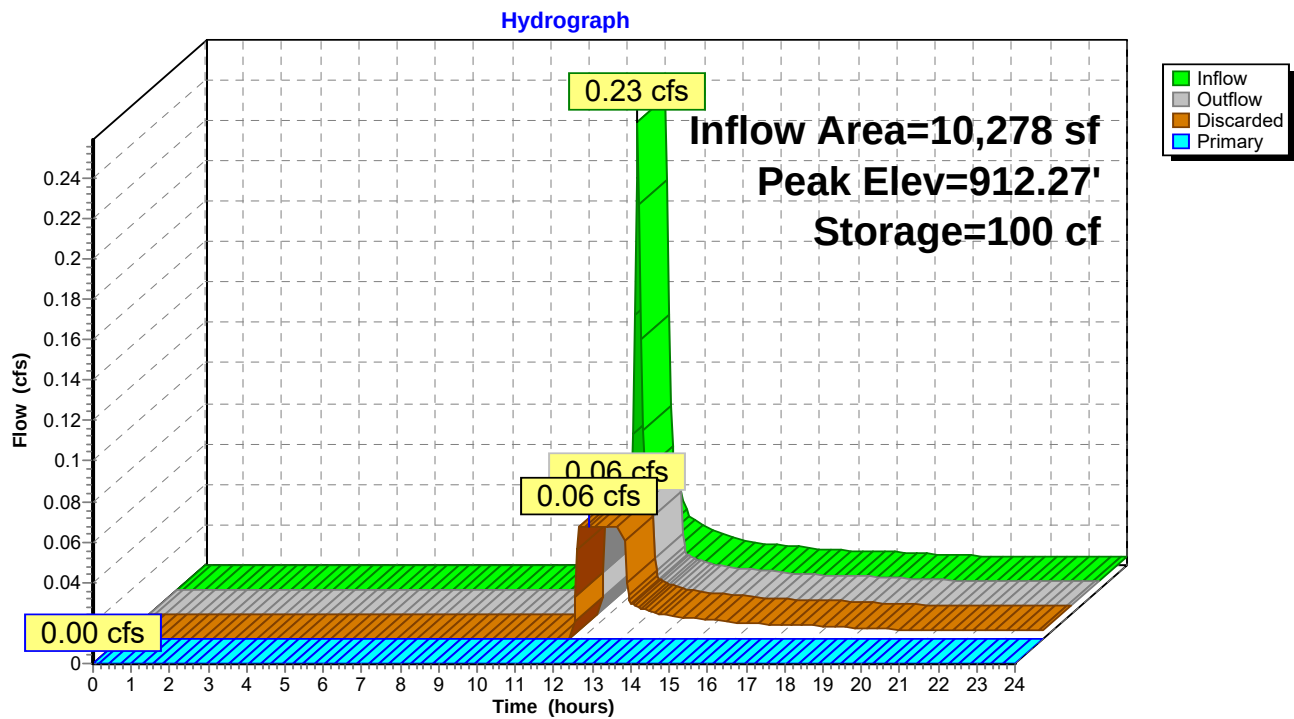
| Volume | Invert  | Avail.Storage | Storage Description                                                                                                       |
|--------|---------|---------------|---------------------------------------------------------------------------------------------------------------------------|
| #1     | 912.00' | 795 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>2,200 cf Overall - 212 cf Embedded = 1,988 cf x 40.0% Voids |
| #2     | 912.00' | 212 cf        | <b>18.0" Round Pipe Storage</b> x 3 Inside #1<br>L= 40.0'                                                                 |
|        |         | 1,007 cf      | Total Available Storage                                                                                                   |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 912.00              | 800                  | 0                         | 0                         |
| 913.00              | 800                  | 800                       | 800                       |
| 914.00              | 800                  | 800                       | 1,600                     |
| 914.75              | 800                  | 600                       | 2,200                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                           |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 914.50' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32 |
| #2     | Primary   | 913.50' | <b>4.0" Round Culvert</b><br>L= 10.0' CMP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 913.50' / 912.50' S= 0.1000 ' / Cc= 0.900<br>n= 0.024, Flow Area= 0.09 sf                                                           |
| #3     | Discarded | 912.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = -4.00'                                                                                                                                      |

**Discarded OutFlow** Max=0.06 cfs @ 12.18 hrs HW=912.27' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.06 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=912.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Culvert** ( Controls 0.00 cfs)

**Pond 3p: Subsurface Infiltration Bed #1**



**Summary for Pond 5P: Basin 1**

Inflow Area = 191,207 sf, 2.18% Impervious, Inflow Depth > 0.08" for 2-yr event  
 Inflow = 0.04 cfs @ 13.71 hrs, Volume= 1,275 cf  
 Outflow = 0.04 cfs @ 13.89 hrs, Volume= 1,262 cf, Atten= 1%, Lag= 10.4 min  
 Discarded = 0.04 cfs @ 13.89 hrs, Volume= 1,262 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
 Peak Elev= 924.51' @ 13.89 hrs Surf.Area= 2,844 sf Storage= 20 cf

Plug-Flow detention time= 8.3 min calculated for 1,260 cf (99% of inflow)  
 Center-of-Mass det. time= 4.6 min ( 1,074.0 - 1,069.4 )

| Volume              | Invert               | Avail.Storage             | Storage Description                                        |
|---------------------|----------------------|---------------------------|------------------------------------------------------------|
| #1                  | 924.50'              | 15,897 cf                 | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet)                                  |
| 924.50              | 2,838                | 0                         | 0                                                          |
| 925.00              | 3,298                | 1,534                     | 1,534                                                      |
| 926.00              | 4,260                | 3,779                     | 5,313                                                      |
| 927.00              | 5,278                | 4,769                     | 10,082                                                     |
| 928.00              | 6,352                | 5,815                     | 15,897                                                     |

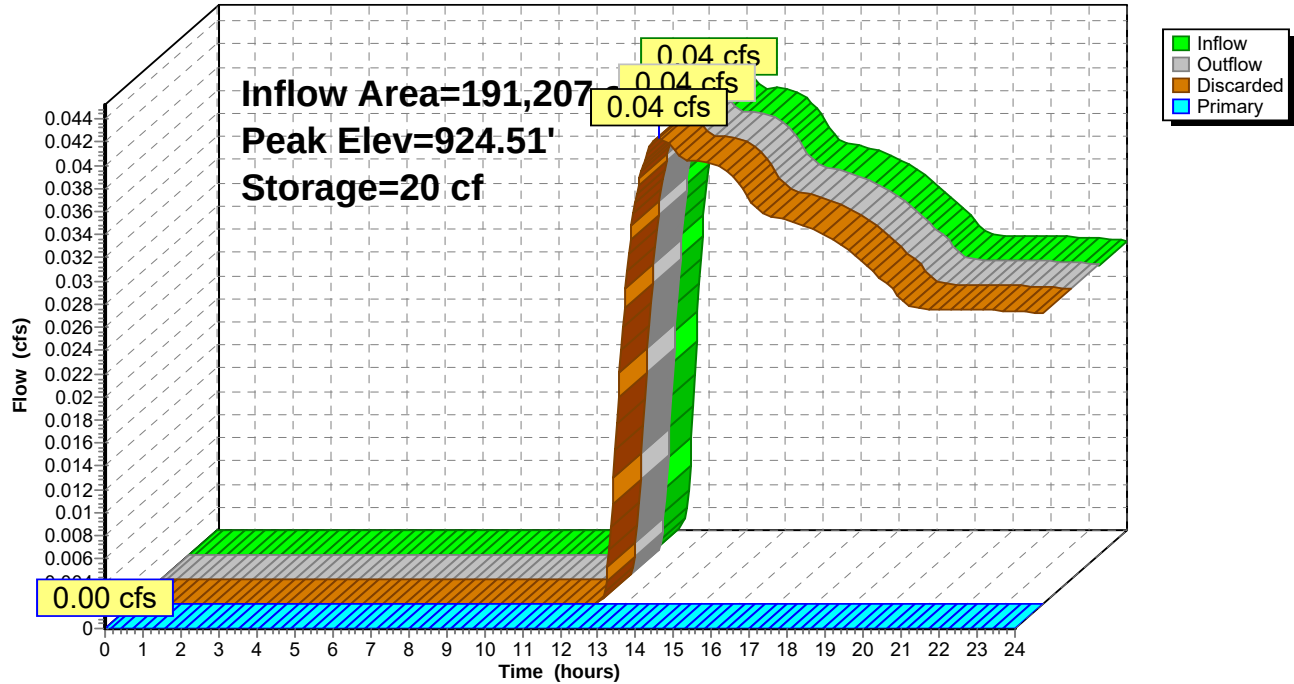
| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 927.00' | <b>20.0' long x 4.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66<br>2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32 |
| #2     | Device 4  | 926.50' | <b>24.0" Horiz. Orifice/Grate C= 0.600</b><br>Limited to weir flow at low heads                                                                                                                                                                                                   |
| #3     | Discarded | 924.50' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 916.00'                                                                                                                                                                              |
| #4     | Primary   | 924.50' | <b>18.0" Round Culvert</b><br>L= 50.0' Box, headwall w/3 rounded edges, Ke= 0.200<br>Inlet / Outlet Invert= 924.50' / 918.00' S= 0.1300 '/ Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf                                                               |

**Discarded OutFlow** Max=0.20 cfs @ 13.89 hrs HW=924.51' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.20 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=924.50' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **4=Culvert** ( Controls 0.00 cfs)  
 ↳ **2=Orifice/Grate** ( Controls 0.00 cfs)

## Pond 5P: Basin 1

## Hydrograph



**Summary for Pond 17P: Subsurface Infiltration Bed #2**

Inflow Area = 5,684 sf, 6.60% Impervious, Inflow Depth > 0.97" for 2-yr event  
 Inflow = 0.21 cfs @ 11.99 hrs, Volume= 457 cf  
 Outflow = 0.04 cfs @ 12.21 hrs, Volume= 457 cf, Atten= 81%, Lag= 13.3 min  
 Discarded = 0.04 cfs @ 12.21 hrs, Volume= 457 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 912.41' @ 12.21 hrs Surf.Area= 575 sf Storage= 113 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 16.1 min ( 879.7 - 863.7 )

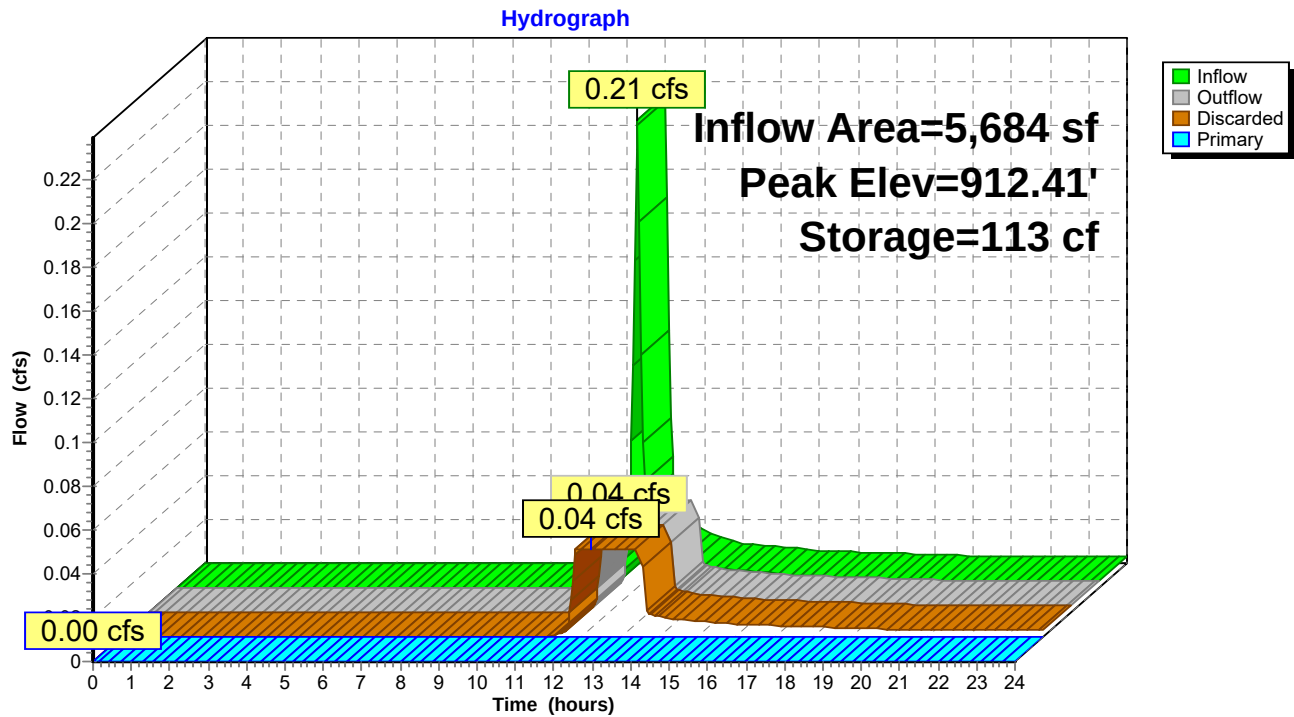
| Volume | Invert  | Avail.Storage | Storage Description                                                                                                  |
|--------|---------|---------------|----------------------------------------------------------------------------------------------------------------------|
| #1     | 912.00' | 314 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>863 cf Overall - 79 cf Embedded = 784 cf x 40.0% Voids |
| #2     | 912.00' | 79 cf         | <b>12.0" Round Pipe Storage</b> x 4 Inside #1<br>L= 25.0'                                                            |
|        |         | 392 cf        | Total Available Storage                                                                                              |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 912.00              | 575                  | 0                         | 0                         |
| 913.00              | 575                  | 575                       | 575                       |
| 913.50              | 575                  | 288                       | 863                       |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                           |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 913.30' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32 |
| #2     | Primary   | 912.80' | <b>6.0" Round Culvert</b><br>L= 12.0' CMP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 912.80' / 912.00' S= 0.0667 '/' Cc= 0.900<br>n= 0.012, Flow Area= 0.20 sf                                                        |
| #3     | Discarded | 912.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = -4.00'                                                                                                                                      |

**Discarded OutFlow** Max=0.04 cfs @ 12.21 hrs HW=912.41' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.04 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=912.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Culvert** ( Controls 0.00 cfs)

**Pond 17P: Subsurface Infiltration Bed #2**

**MLV 505LD86\_PostwBMP DA1- REV 2***Type II 24-hr 10-yr Rainfall=4.74"*

Prepared by {enter your company name here}

Printed 3/2/2022

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Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DA-1 Basin #1**

Runoff Area=191,207 sf 2.18% Impervious Runoff Depth>0.44"  
Flow Length=1,332' Tc=26.4 min CN=47 Runoff=0.86 cfs 7,042 cf

**Subcatchment2S: DA-1 Undetained**

Runoff Area=39,431 sf 1.50% Impervious Runoff Depth>0.18"  
Flow Length=547' Tc=10.1 min CN=40 Runoff=0.03 cfs 590 cf

**Subcatchment5s: DA-1 Inf Bed #1**

Runoff Area=10,278 sf 21.06% Impervious Runoff Depth>1.48"  
Flow Length=154' Slope=0.1500 '/' Tc=6.6 min CN=65 Runoff=0.60 cfs 1,268 cf

**Subcatchment16S: DA-1 Inf Bed #2**

Runoff Area=5,684 sf 6.60% Impervious Runoff Depth>2.00"  
Flow Length=154' Slope=0.1500 '/' Tc=6.6 min CN=72 Runoff=0.45 cfs 946 cf

**Reach 10: DA-1 Post Total**

Inflow=0.13 cfs 704 cf  
Outflow=0.13 cfs 704 cf

**Pond 3p: Subsurface Infiltration Bed #1**

Peak Elev=913.07' Storage=440 cf Inflow=0.60 cfs 1,268 cf  
Discarded=0.06 cfs 1,267 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 1,267 cf

**Pond 5P: Basin 1**

Peak Elev=924.96' Storage=1,414 cf Inflow=0.86 cfs 7,042 cf  
Discarded=0.24 cfs 7,003 cf Primary=0.00 cfs 0 cf Outflow=0.24 cfs 7,003 cf

**Pond 17P: Subsurface Infiltration Bed #2**

Peak Elev=913.03' Storage=285 cf Inflow=0.45 cfs 946 cf  
Discarded=0.04 cfs 831 cf Primary=0.12 cfs 114 cf Outflow=0.16 cfs 945 cf

**Total Runoff Area = 246,600 sf Runoff Volume = 9,845 cf Average Runoff Depth = 0.48"**  
**97.04% Pervious = 239,307 sf 2.96% Impervious = 7,293 sf**

**Summary for Subcatchment 1S: DA-1 Basin #1**

Runoff = 0.86 cfs @ 12.31 hrs, Volume= 7,042 cf, Depth> 0.44"

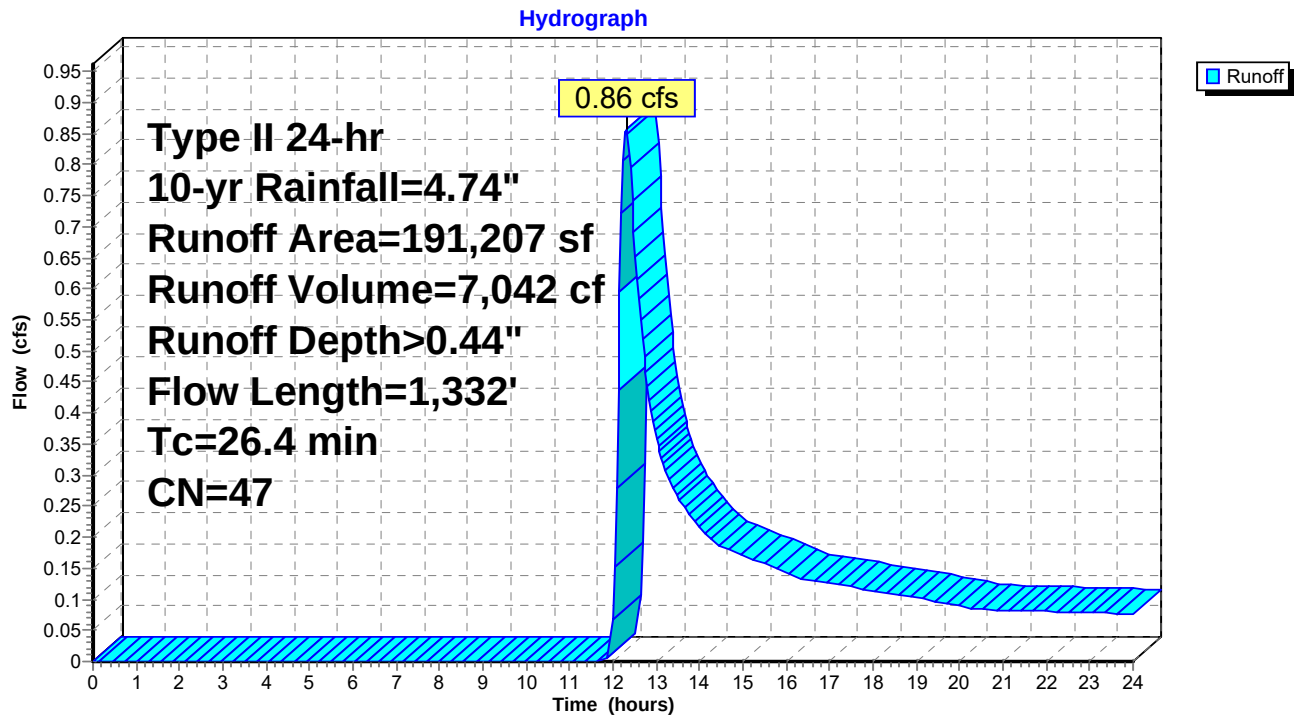
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 31,537    | 30 | Woods, Good, HSG A        |
| 12,873    | 77 | Woods, Good, HSG D        |
| 92,642    | 30 | Meadow, non-grazed, HSG A |
| 49,992    | 78 | Meadow, non-grazed, HSG D |
| * 4,163   | 98 | Impervious                |
| 191,207   | 47 | Weighted Average          |
| 187,044   |    | 97.82% Pervious Area      |
| 4,163     |    | 2.18% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.9      | 463           | 0.1000        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.4      | 554           | 0.0900        | 2.10              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 1.0      | 215           | 0.0630        | 3.64              | 5.10           | <b>Channel Flow,</b><br>Area= 1.4 sf Perim= 4.1' r= 0.34' n= 0.050   |
| 26.4     | 1,332         | Total         |                   |                |                                                                      |

## Subcatchment 1S: DA-1 Basin #1





**Summary for Subcatchment 2S: DA-1 Undetained**

Runoff = 0.03 cfs @ 12.45 hrs, Volume= 590 cf, Depth> 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 10-yr Rainfall=4.74"

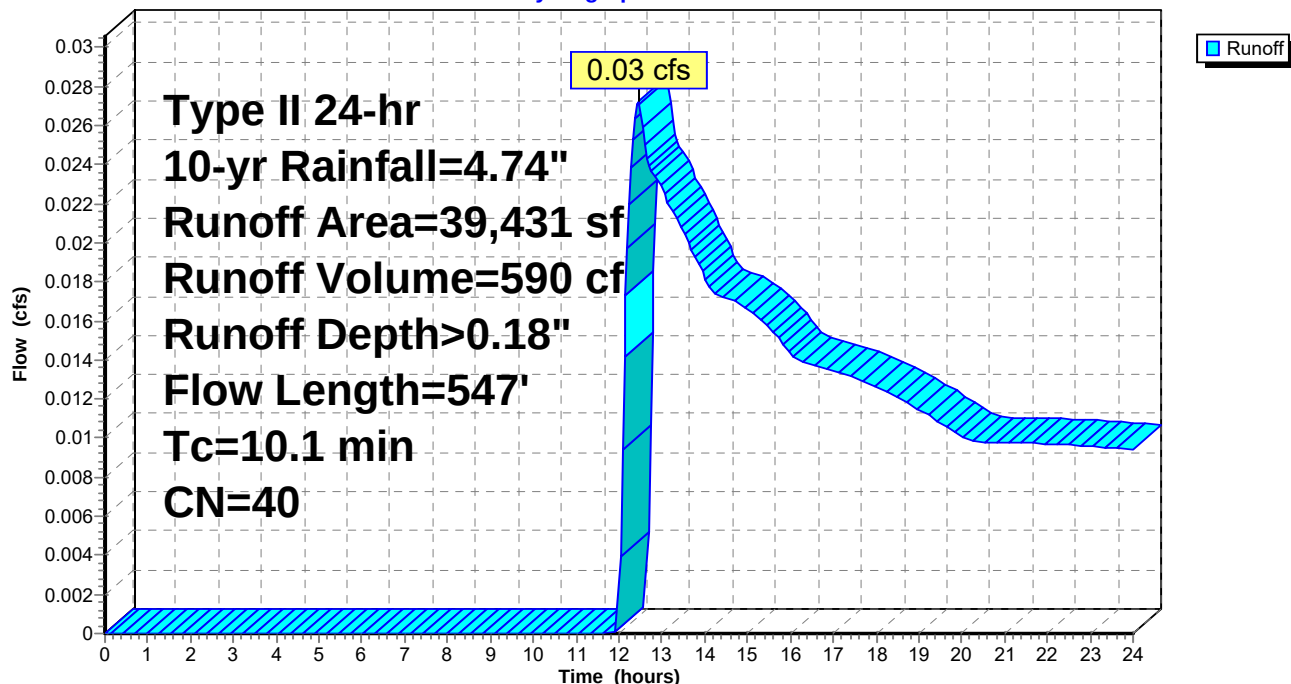
| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 10,525    | 30 | Woods, Good, HSG A        |
| 1,020     | 77 | Woods, Good, HSG D        |
| 20,698    | 30 | Meadow, non-grazed, HSG A |
| 6,598     | 78 | Meadow, non-grazed, HSG D |
| * 590     | 98 | Impervious                |
| 39,431    | 40 | Weighted Average          |
| 38,841    |    | 98.50% Pervious Area      |
| 590       |    | 1.50% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------|
| 7.4      | 100           | 0.1000        | 0.22              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.26"                      |
| 1.0      | 147           | 0.1200        | 2.42              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps       |
| 1.7      | 300           | 0.0200        | 2.89              | 4.33           | <b>Channel Flow, Channel</b><br>Area= 1.5 sf Perim= 4.5' r= 0.33' n= 0.035 |
| 10.1     | 547           | Total         |                   |                |                                                                            |

**Subcatchment 2S: DA-1 Undetained**

Hydrograph



**MLV 505LD86\_PostwBMP DA1- REV 2**

Prepared by {enter your company name here}

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Type II 24-hr 10-yr Rainfall=4.74"

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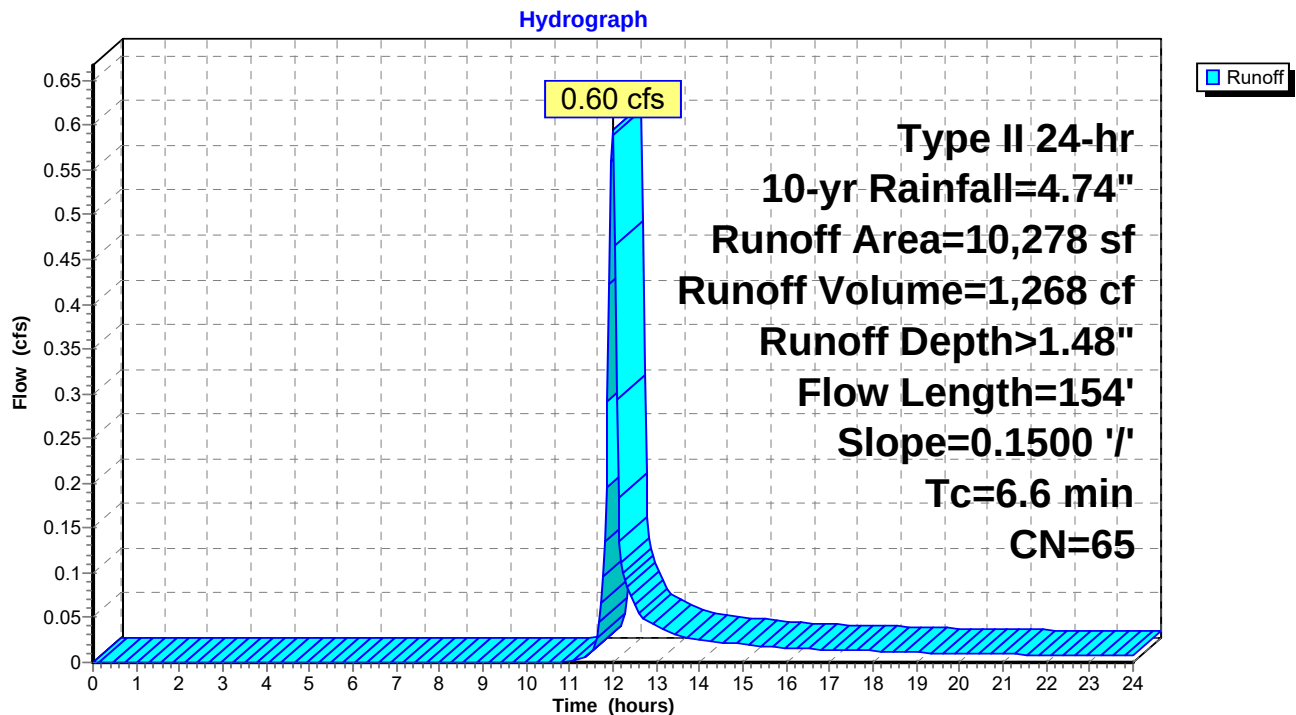
**Summary for Subcatchment 5s: DA-1 Inf Bed #1**

Runoff = 0.60 cfs @ 11.99 hrs, Volume= 1,268 cf, Depth&gt; 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,580     | 30 | Meadow, non-grazed, HSG A |
| 4,533     | 78 | Meadow, non-grazed, HSG D |
| * 2,165   | 98 | Impervious                |
| 10,278    | 65 | Weighted Average          |
| 8,113     |    | 78.94% Pervious Area      |
| 2,165     |    | 21.06% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 6.3      | 100           | 0.1500        | 0.26              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.26"                |
| 0.3      | 54            | 0.1500        | 2.71              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 6.6      | 154           | Total         |                   |                |                                                                      |

**Subcatchment 5s: DA-1 Inf Bed #1**

**Summary for Subcatchment 16S: DA-1 Inf Bed #2**

Runoff = 0.45 cfs @ 11.98 hrs, Volume= 946 cf, Depth> 2.00"

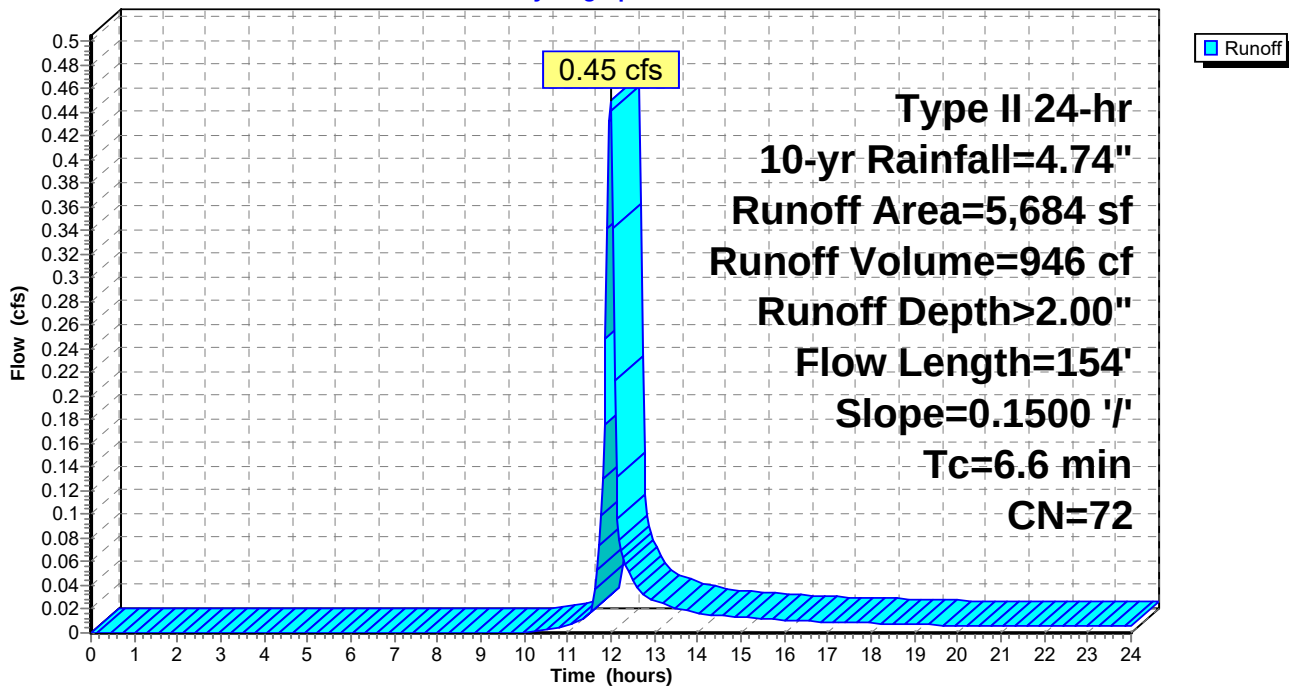
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 29        | 77 | Woods, Good, HSG D        |
| 925       | 30 | Meadow, non-grazed, HSG A |
| 4,355     | 78 | Meadow, non-grazed, HSG D |
| * 375     | 98 | Impervious                |
| 5,684     | 72 | Weighted Average          |
| 5,309     |    | 93.40% Pervious Area      |
| 375       |    | 6.60% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                   |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------------------------|
| 6.3      | 100           | 0.1500        | 0.26              |                | Sheet Flow,<br>Grass: Dense n= 0.240 P2= 3.26"                |
| 0.3      | 54            | 0.1500        | 2.71              |                | Shallow Concentrated Flow,<br>Short Grass Pasture Kv= 7.0 fps |
| 6.6      | 154           | Total         |                   |                |                                                               |

**Subcatchment 16S: DA-1 Inf Bed #2**

Hydrograph

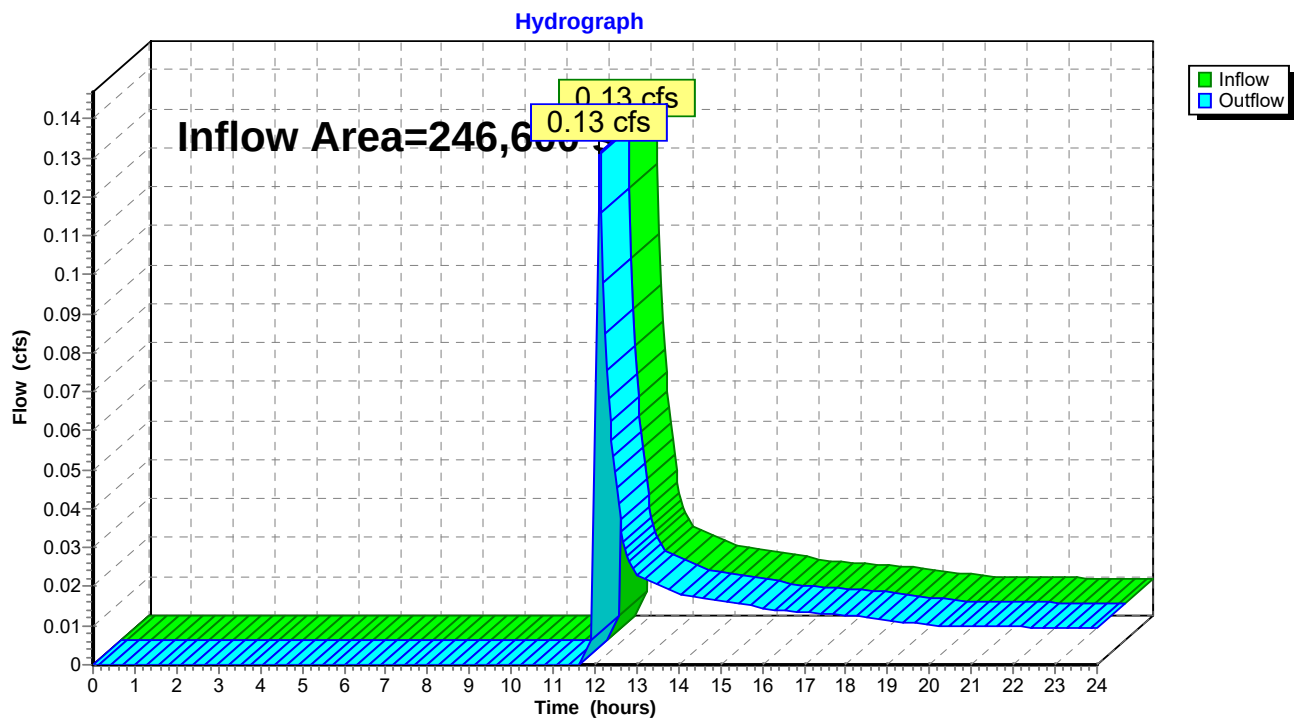


**Summary for Reach 10: DA-1 Post Total**

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

Inflow Area = 246,600 sf, 2.96% Impervious, Inflow Depth > 0.03" for 10-yr event  
Inflow = 0.13 cfs @ 12.12 hrs, Volume= 704 cf  
Outflow = 0.13 cfs @ 12.12 hrs, Volume= 704 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs

**Reach 10: DA-1 Post Total**

**Summary for Pond 3p: Subsurface Infiltration Bed #1**

Inflow Area = 10,278 sf, 21.06% Impervious, Inflow Depth > 1.48" for 10-yr event  
 Inflow = 0.60 cfs @ 11.99 hrs, Volume= 1,268 cf  
 Outflow = 0.06 cfs @ 12.58 hrs, Volume= 1,267 cf, Atten= 91%, Lag= 35.3 min  
 Discarded = 0.06 cfs @ 12.58 hrs, Volume= 1,267 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 913.07' @ 12.58 hrs Surf.Area= 800 sf Storage= 440 cf

Plug-Flow detention time= 61.7 min calculated for 1,264 cf (100% of inflow)  
 Center-of-Mass det. time= 61.0 min ( 921.4 - 860.4 )

| Volume | Invert  | Avail.Storage | Storage Description                                                                                                       |
|--------|---------|---------------|---------------------------------------------------------------------------------------------------------------------------|
| #1     | 912.00' | 795 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>2,200 cf Overall - 212 cf Embedded = 1,988 cf x 40.0% Voids |
| #2     | 912.00' | 212 cf        | <b>18.0" Round Pipe Storage</b> x 3 Inside #1<br>L= 40.0'                                                                 |
|        |         | 1,007 cf      | Total Available Storage                                                                                                   |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 912.00              | 800                  | 0                         | 0                         |
| 913.00              | 800                  | 800                       | 800                       |
| 914.00              | 800                  | 800                       | 1,600                     |
| 914.75              | 800                  | 600                       | 2,200                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                           |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 914.50' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32 |
| #2     | Primary   | 913.50' | <b>4.0" Round Culvert</b><br>L= 10.0' CMP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 913.50' / 912.50' S= 0.1000 ' / Cc= 0.900<br>n= 0.024, Flow Area= 0.09 sf                                                           |
| #3     | Discarded | 912.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = -4.00'                                                                                                                                      |

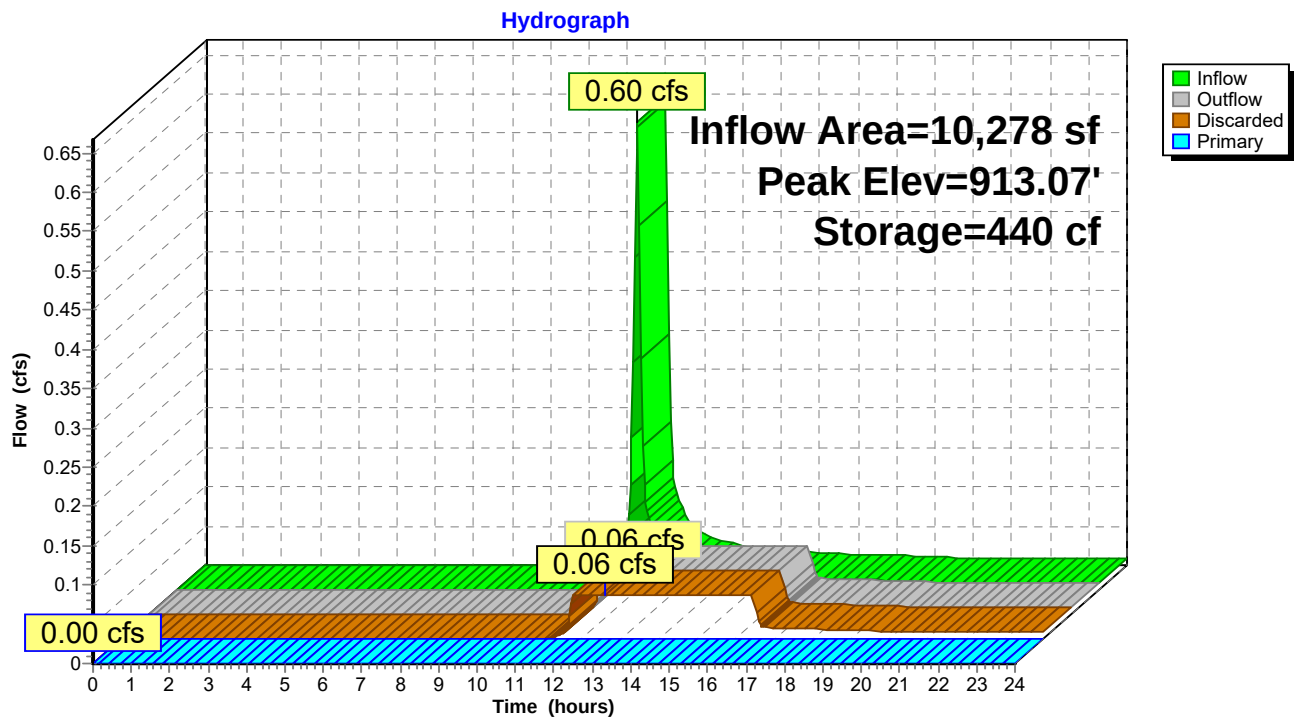
**Discarded OutFlow** Max=0.06 cfs @ 12.58 hrs HW=913.07' (Free Discharge)

↑ **3=Exfiltration** ( Controls 0.06 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=912.00' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

↑ **2=Culvert** ( Controls 0.00 cfs)

**Pond 3p: Subsurface Infiltration Bed #1**

**Summary for Pond 5P: Basin 1**

Inflow Area = 191,207 sf, 2.18% Impervious, Inflow Depth > 0.44" for 10-yr event  
 Inflow = 0.86 cfs @ 12.31 hrs, Volume= 7,042 cf  
 Outflow = 0.24 cfs @ 13.75 hrs, Volume= 7,003 cf, Atten= 72%, Lag= 86.5 min  
 Discarded = 0.24 cfs @ 13.75 hrs, Volume= 7,003 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
 Peak Elev= 924.96' @ 13.75 hrs Surf.Area= 3,264 sf Storage= 1,414 cf

Plug-Flow detention time= 53.3 min calculated for 6,992 cf (99% of inflow)  
 Center-of-Mass det. time= 50.5 min ( 1,003.5 - 953.0 )

| Volume              | Invert               | Avail.Storage             | Storage Description                                        |
|---------------------|----------------------|---------------------------|------------------------------------------------------------|
| #1                  | 924.50'              | 15,897 cf                 | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet)                                  |
| 924.50              | 2,838                | 0                         | 0                                                          |
| 925.00              | 3,298                | 1,534                     | 1,534                                                      |
| 926.00              | 4,260                | 3,779                     | 5,313                                                      |
| 927.00              | 5,278                | 4,769                     | 10,082                                                     |
| 928.00              | 6,352                | 5,815                     | 15,897                                                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 927.00' | <b>20.0' long x 4.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66<br>2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32 |
| #2     | Device 4  | 926.50' | <b>24.0" Horiz. Orifice/Grate C= 0.600</b><br>Limited to weir flow at low heads                                                                                                                                                                                                   |
| #3     | Discarded | 924.50' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 916.00'                                                                                                                                                                              |
| #4     | Primary   | 924.50' | <b>18.0" Round Culvert</b><br>L= 50.0' Box, headwall w/3 rounded edges, Ke= 0.200<br>Inlet / Outlet Invert= 924.50' / 918.00' S= 0.1300 '/ Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf                                                               |

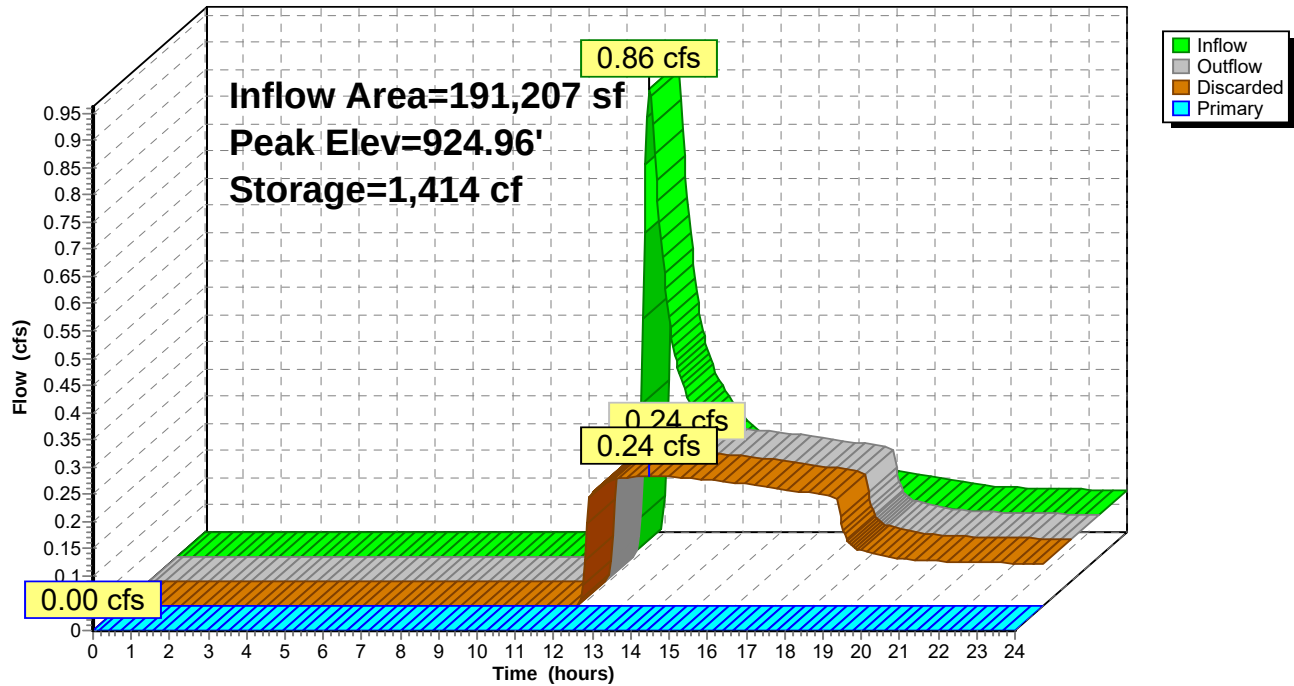
**Discarded OutFlow** Max=0.24 cfs @ 13.75 hrs HW=924.96' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.24 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=924.50' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **4=Culvert** ( Controls 0.00 cfs)  
 ↳ **2=Orifice/Grate** ( Controls 0.00 cfs)



## Pond 5P: Basin 1

## Hydrograph



**Summary for Pond 17P: Subsurface Infiltration Bed #2**

Inflow Area = 5,684 sf, 6.60% Impervious, Inflow Depth > 2.00" for 10-yr event  
 Inflow = 0.45 cfs @ 11.98 hrs, Volume= 946 cf  
 Outflow = 0.16 cfs @ 12.11 hrs, Volume= 945 cf, Atten= 65%, Lag= 7.8 min  
 Discarded = 0.04 cfs @ 12.11 hrs, Volume= 831 cf  
 Primary = 0.12 cfs @ 12.11 hrs, Volume= 114 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 913.03' @ 12.11 hrs Surf.Area= 575 sf Storage= 285 cf

Plug-Flow detention time= 38.9 min calculated for 944 cf (100% of inflow)  
 Center-of-Mass det. time= 38.5 min ( 880.1 - 841.6 )

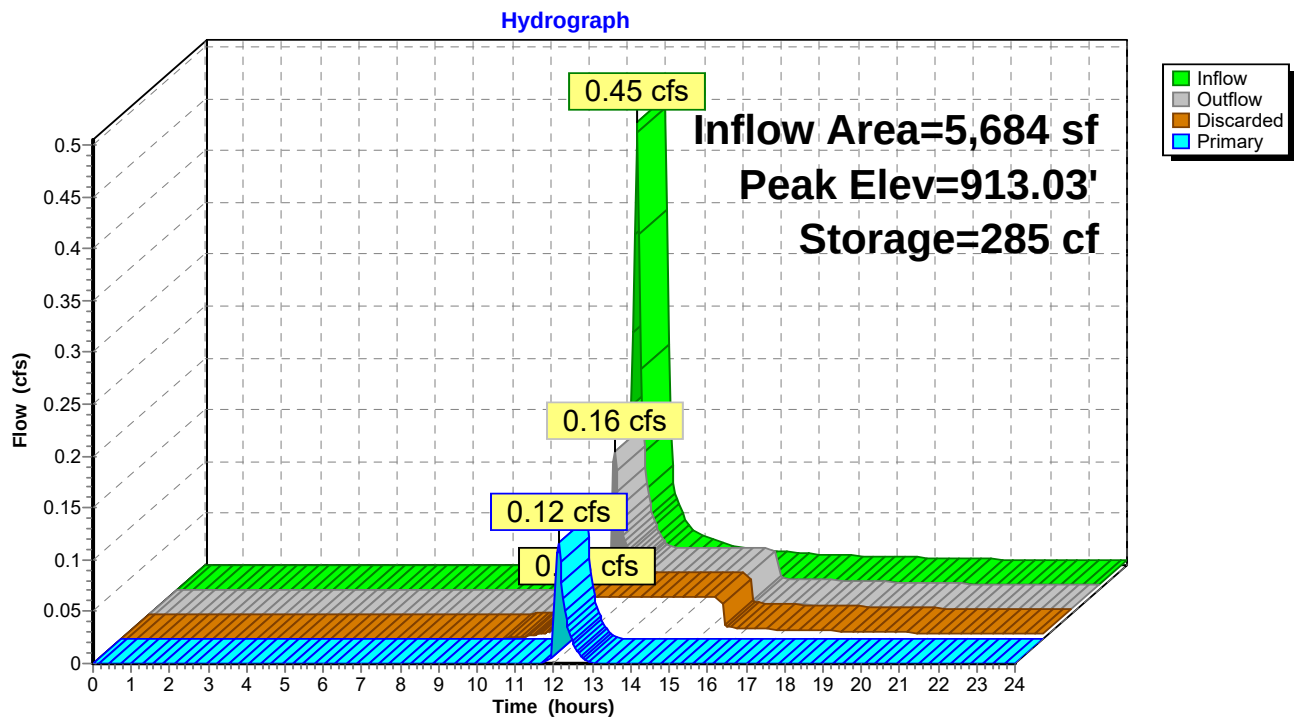
| Volume | Invert  | Avail.Storage | Storage Description                                                                                                  |
|--------|---------|---------------|----------------------------------------------------------------------------------------------------------------------|
| #1     | 912.00' | 314 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>863 cf Overall - 79 cf Embedded = 784 cf x 40.0% Voids |
| #2     | 912.00' | 79 cf         | <b>12.0" Round Pipe Storage</b> x 4 Inside #1<br>L= 25.0'                                                            |
|        |         | 392 cf        | Total Available Storage                                                                                              |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 912.00              | 575                  | 0                         | 0                         |
| 913.00              | 575                  | 575                       | 575                       |
| 913.50              | 575                  | 288                       | 863                       |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                           |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 913.30' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32 |
| #2     | Primary   | 912.80' | <b>6.0" Round Culvert</b><br>L= 12.0' CMP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 912.80' / 912.00' S= 0.0667 '/' Cc= 0.900<br>n= 0.012, Flow Area= 0.20 sf                                                        |
| #3     | Discarded | 912.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = -4.00'                                                                                                                                      |

**Discarded OutFlow** Max=0.04 cfs @ 12.11 hrs HW=913.03' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.04 cfs)

**Primary OutFlow** Max=0.12 cfs @ 12.11 hrs HW=913.03' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Culvert** (Inlet Controls 0.12 cfs @ 1.29 fps)

**Pond 17P: Subsurface Infiltration Bed #2**

**MLV 505LD86\_PostwBMP DA1- REV 2***Type II 24-hr 25-yr Rainfall=5.85"*

Prepared by {enter your company name here}

Printed 3/2/2022

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Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DA-1 Basin #1** Runoff Area=191,207 sf 2.18% Impervious Runoff Depth>0.86"  
Flow Length=1,332' Tc=26.4 min CN=47 Runoff=2.40 cfs 13,675 cf

**Subcatchment2S: DA-1 Undetained** Runoff Area=39,431 sf 1.50% Impervious Runoff Depth>0.45"  
Flow Length=547' Tc=10.1 min CN=40 Runoff=0.26 cfs 1,487 cf

**Subcatchment5s: DA-1 Inf Bed #1** Runoff Area=10,278 sf 21.06% Impervious Runoff Depth>2.24"  
Flow Length=154' Slope=0.1500 '/' Tc=6.6 min CN=65 Runoff=0.91 cfs 1,918 cf

**Subcatchment16S: DA-1 Inf Bed #2** Runoff Area=5,684 sf 6.60% Impervious Runoff Depth>2.87"  
Flow Length=154' Slope=0.1500 '/' Tc=6.6 min CN=72 Runoff=0.65 cfs 1,358 cf

**Reach 10: DA-1 Post Total** Inflow=0.63 cfs 2,016 cf  
Outflow=0.63 cfs 2,016 cf

**Pond 3p: Subsurface Infiltration Bed #1** Peak Elev=913.73' Storage=680 cf Inflow=0.91 cfs 1,918 cf  
Discarded=0.06 cfs 1,730 cf Primary=0.10 cfs 186 cf Outflow=0.16 cfs 1,916 cf

**Pond 5P: Basin 1** Peak Elev=925.89' Storage=4,836 cf Inflow=2.40 cfs 13,675 cf  
Discarded=0.33 cfs 12,514 cf Primary=0.00 cfs 0 cf Outflow=0.33 cfs 12,514 cf

**Pond 17P: Subsurface Infiltration Bed #2** Peak Elev=913.31' Storage=348 cf Inflow=0.65 cfs 1,358 cf  
Discarded=0.04 cfs 1,013 cf Primary=0.38 cfs 343 cf Outflow=0.42 cfs 1,356 cf

**Total Runoff Area = 246,600 sf Runoff Volume = 18,437 cf Average Runoff Depth = 0.90"**  
**97.04% Pervious = 239,307 sf 2.96% Impervious = 7,293 sf**

**Summary for Subcatchment 1S: DA-1 Basin #1**

Runoff = 2.40 cfs @ 12.27 hrs, Volume= 13,675 cf, Depth> 0.86"

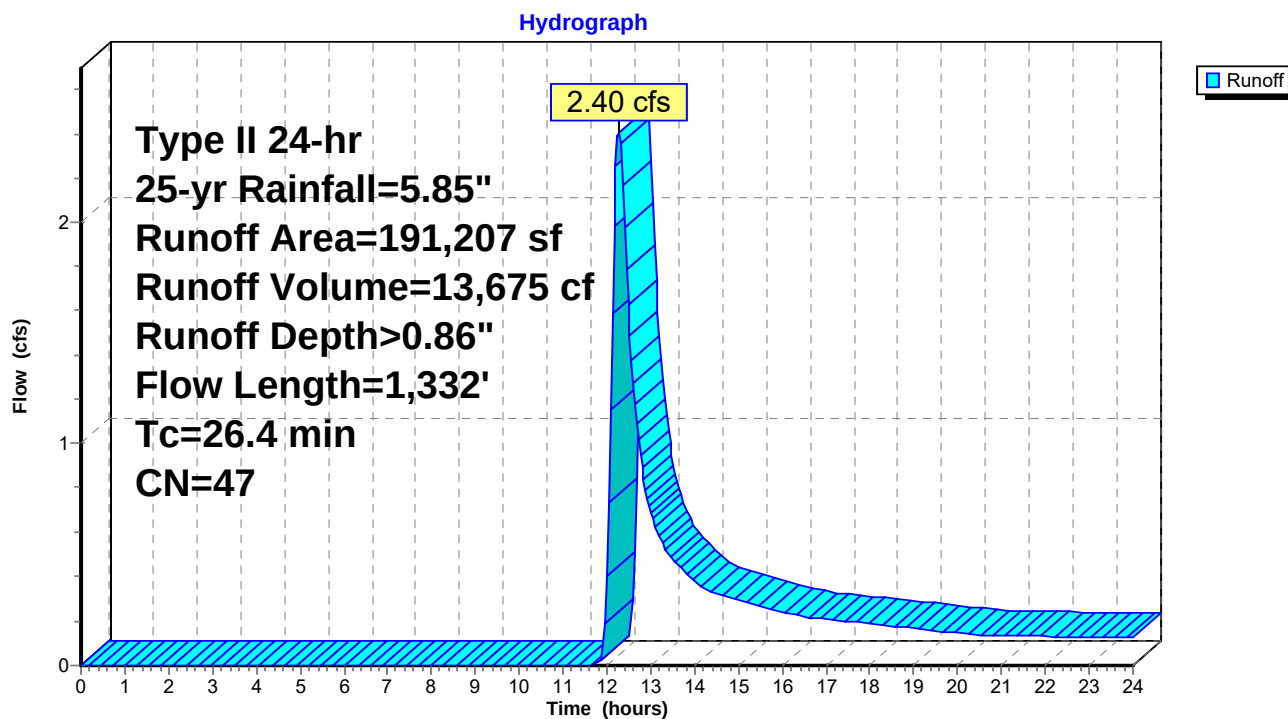
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 31,537    | 30 | Woods, Good, HSG A        |
| 12,873    | 77 | Woods, Good, HSG D        |
| 92,642    | 30 | Meadow, non-grazed, HSG A |
| 49,992    | 78 | Meadow, non-grazed, HSG D |
| * 4,163   | 98 | Impervious                |
| 191,207   | 47 | Weighted Average          |
| 187,044   |    | 97.82% Pervious Area      |
| 4,163     |    | 2.18% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.9      | 463           | 0.1000        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.4      | 554           | 0.0900        | 2.10              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 1.0      | 215           | 0.0630        | 3.64              | 5.10           | <b>Channel Flow,</b><br>Area= 1.4 sf Perim= 4.1' r= 0.34' n= 0.050   |
| 26.4     | 1,332         | Total         |                   |                |                                                                      |

## Subcatchment 1S: DA-1 Basin #1



**Summary for Subcatchment 2S: DA-1 Undetained**

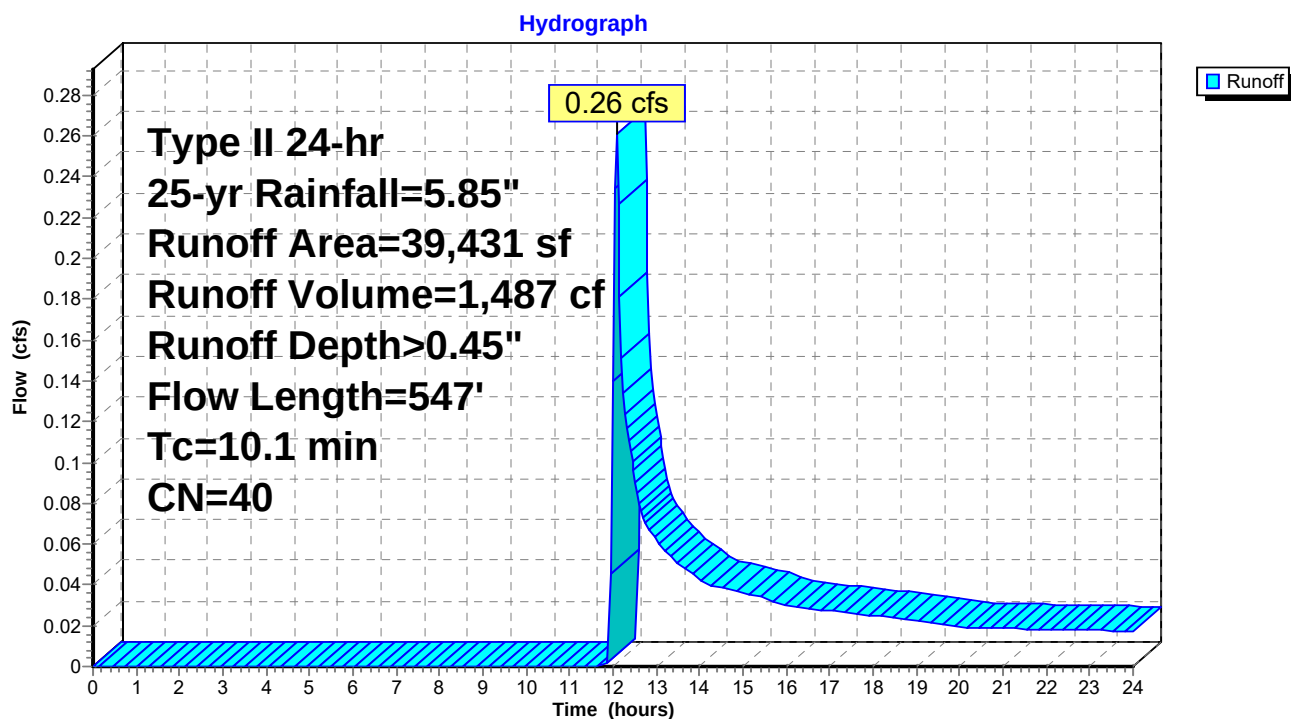
Runoff = 0.26 cfs @ 12.08 hrs, Volume= 1,487 cf, Depth> 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 10,525    | 30 | Woods, Good, HSG A        |
| 1,020     | 77 | Woods, Good, HSG D        |
| 20,698    | 30 | Meadow, non-grazed, HSG A |
| 6,598     | 78 | Meadow, non-grazed, HSG D |
| * 590     | 98 | Impervious                |
| 39,431    | 40 | Weighted Average          |
| 38,841    |    | 98.50% Pervious Area      |
| 590       |    | 1.50% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------|
| 7.4      | 100           | 0.1000        | 0.22              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.26"                      |
| 1.0      | 147           | 0.1200        | 2.42              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps       |
| 1.7      | 300           | 0.0200        | 2.89              | 4.33           | <b>Channel Flow, Channel</b><br>Area= 1.5 sf Perim= 4.5' r= 0.33' n= 0.035 |
| 10.1     | 547           | Total         |                   |                |                                                                            |

**Subcatchment 2S: DA-1 Undetained**



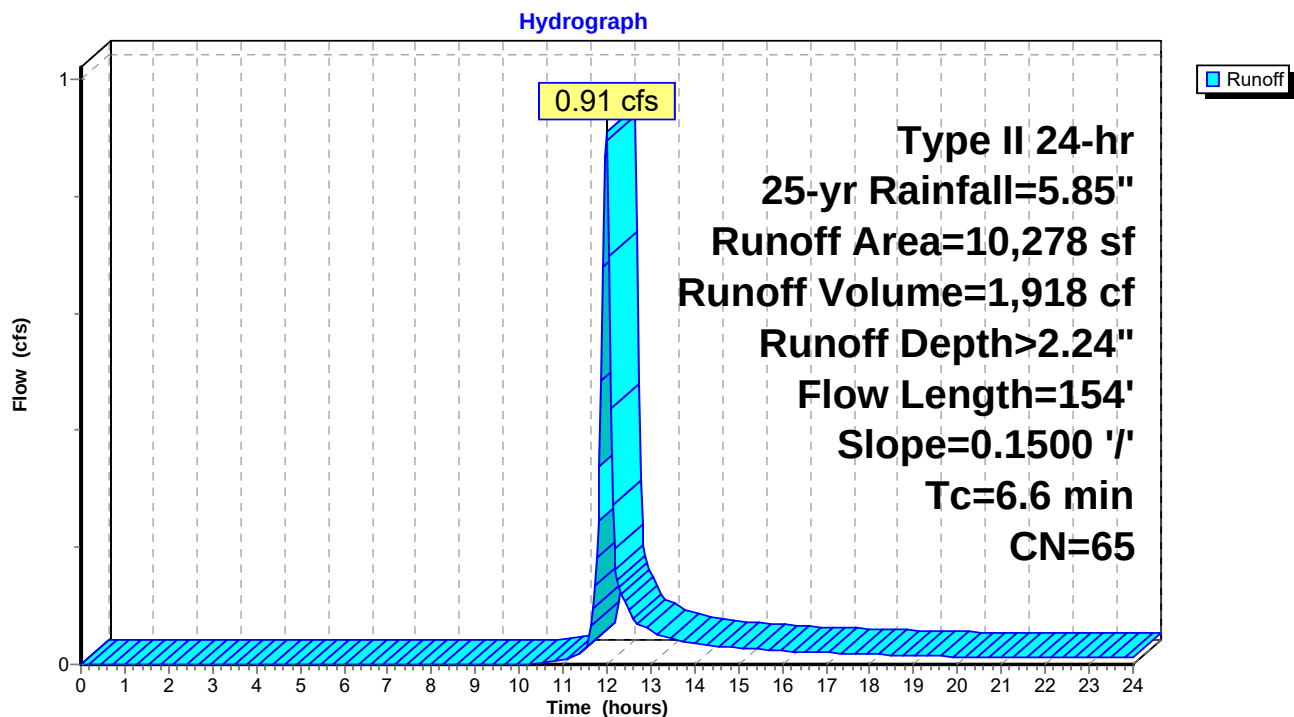
**Summary for Subcatchment 5s: DA-1 Inf Bed #1**

Runoff = 0.91 cfs @ 11.98 hrs, Volume= 1,918 cf, Depth> 2.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,580     | 30 | Meadow, non-grazed, HSG A |
| 4,533     | 78 | Meadow, non-grazed, HSG D |
| * 2,165   | 98 | Impervious                |
| 10,278    | 65 | Weighted Average          |
| 8,113     |    | 78.94% Pervious Area      |
| 2,165     |    | 21.06% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 6.3      | 100           | 0.1500        | 0.26              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.26"                |
| 0.3      | 54            | 0.1500        | 2.71              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 6.6      | 154           | Total         |                   |                |                                                                      |

**Subcatchment 5s: DA-1 Inf Bed #1**

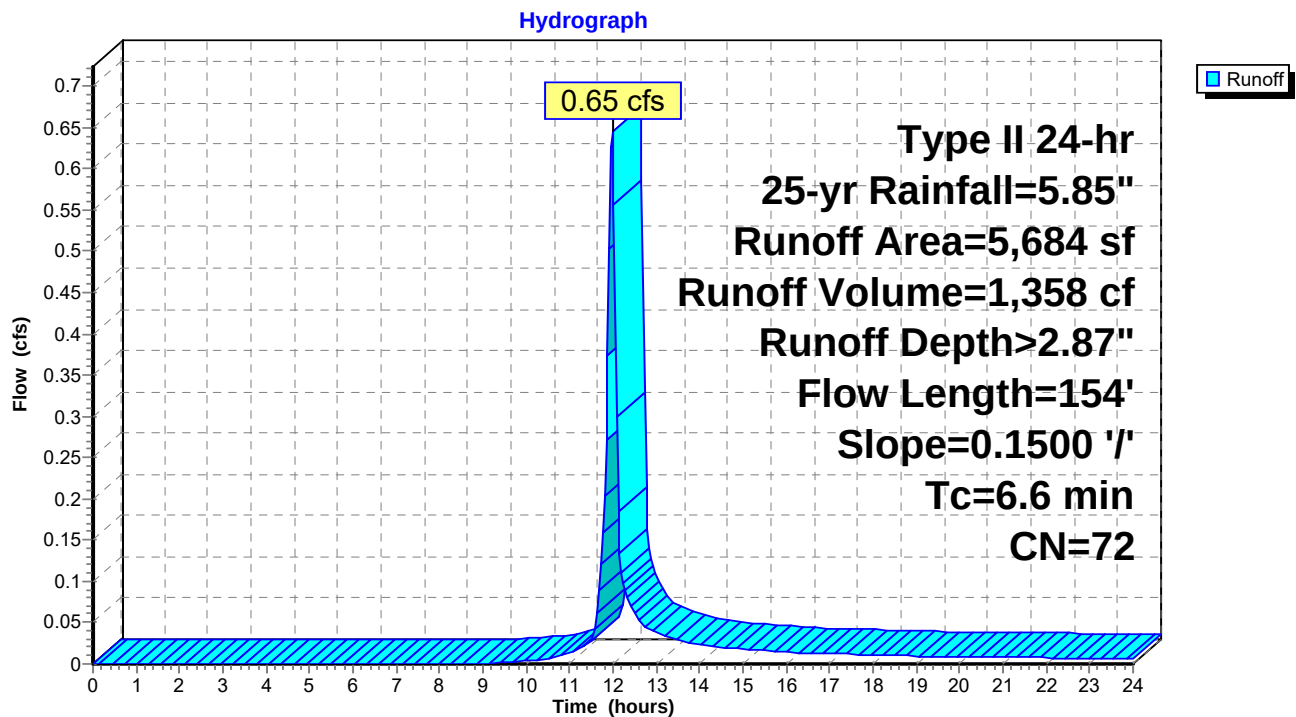
**Summary for Subcatchment 16S: DA-1 Inf Bed #2**

Runoff = 0.65 cfs @ 11.98 hrs, Volume= 1,358 cf, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 29        | 77 | Woods, Good, HSG D        |
| 925       | 30 | Meadow, non-grazed, HSG A |
| 4,355     | 78 | Meadow, non-grazed, HSG D |
| * 375     | 98 | Impervious                |
| 5,684     | 72 | Weighted Average          |
| 5,309     |    | 93.40% Pervious Area      |
| 375       |    | 6.60% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 6.3      | 100           | 0.1500        | 0.26              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.26"                |
| 0.3      | 54            | 0.1500        | 2.71              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 6.6      | 154           | Total         |                   |                |                                                                      |

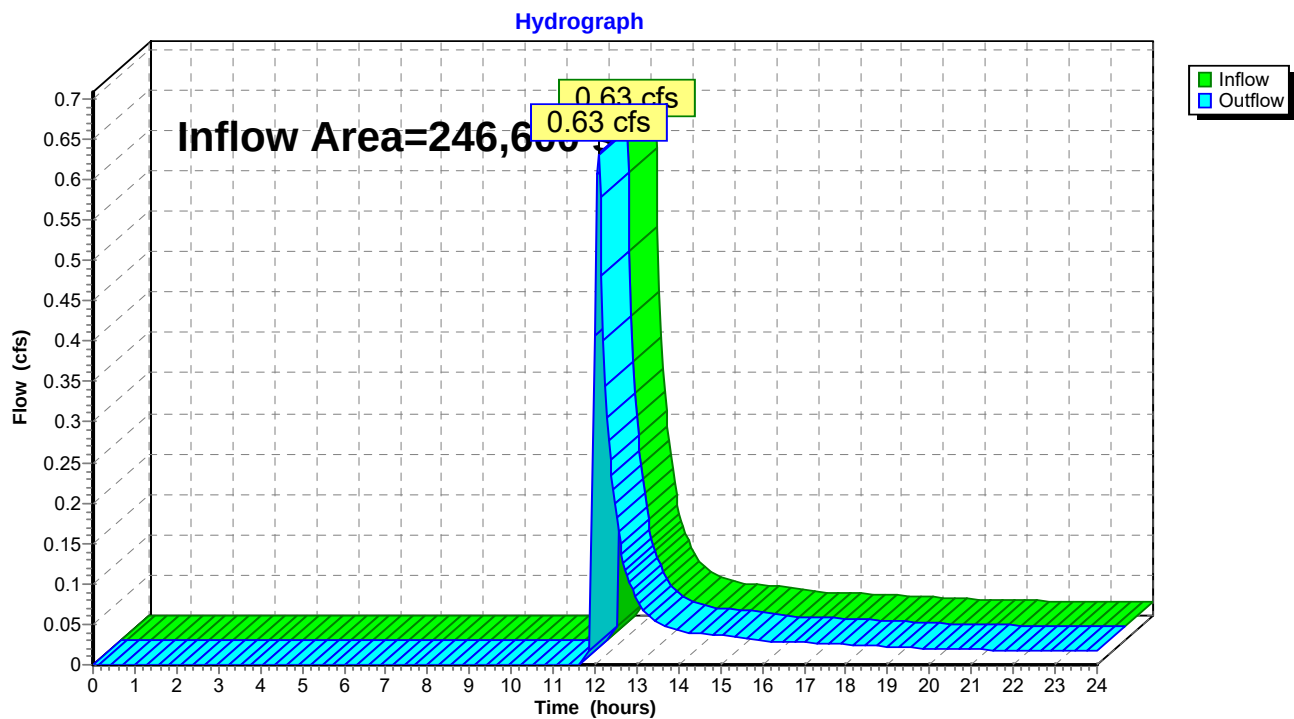
**Subcatchment 16S: DA-1 Inf Bed #2**

**Summary for Reach 10: DA-1 Post Total**

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

Inflow Area = 246,600 sf, 2.96% Impervious, Inflow Depth > 0.10" for 25-yr event  
Inflow = 0.63 cfs @ 12.07 hrs, Volume= 2,016 cf  
Outflow = 0.63 cfs @ 12.07 hrs, Volume= 2,016 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs

**Reach 10: DA-1 Post Total**

**Summary for Pond 3p: Subsurface Infiltration Bed #1**

Inflow Area = 10,278 sf, 21.06% Impervious, Inflow Depth > 2.24" for 25-yr event  
 Inflow = 0.91 cfs @ 11.98 hrs, Volume= 1,918 cf  
 Outflow = 0.16 cfs @ 12.22 hrs, Volume= 1,916 cf, Atten= 83%, Lag= 13.9 min  
 Discarded = 0.06 cfs @ 12.22 hrs, Volume= 1,730 cf  
 Primary = 0.10 cfs @ 12.22 hrs, Volume= 186 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 913.73' @ 12.22 hrs Surf.Area= 800 sf Storage= 680 cf

Plug-Flow detention time= 90.1 min calculated for 1,913 cf (100% of inflow)

Center-of-Mass det. time= 89.4 min ( 937.2 - 847.8 )

| Volume | Invert  | Avail.Storage | Storage Description                                                                                                       |
|--------|---------|---------------|---------------------------------------------------------------------------------------------------------------------------|
| #1     | 912.00' | 795 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>2,200 cf Overall - 212 cf Embedded = 1,988 cf x 40.0% Voids |
| #2     | 912.00' | 212 cf        | <b>18.0" Round Pipe Storage</b> x 3 Inside #1<br>L= 40.0'                                                                 |
|        |         | 1,007 cf      | Total Available Storage                                                                                                   |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 912.00              | 800                  | 0                         | 0                         |
| 913.00              | 800                  | 800                       | 800                       |
| 914.00              | 800                  | 800                       | 1,600                     |
| 914.75              | 800                  | 600                       | 2,200                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                           |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 914.50' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32 |
| #2     | Primary   | 913.50' | <b>4.0" Round Culvert</b><br>L= 10.0' CMP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 913.50' / 912.50' S= 0.1000 ' / Cc= 0.900<br>n= 0.024, Flow Area= 0.09 sf                                                           |
| #3     | Discarded | 912.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = -4.00'                                                                                                                                      |

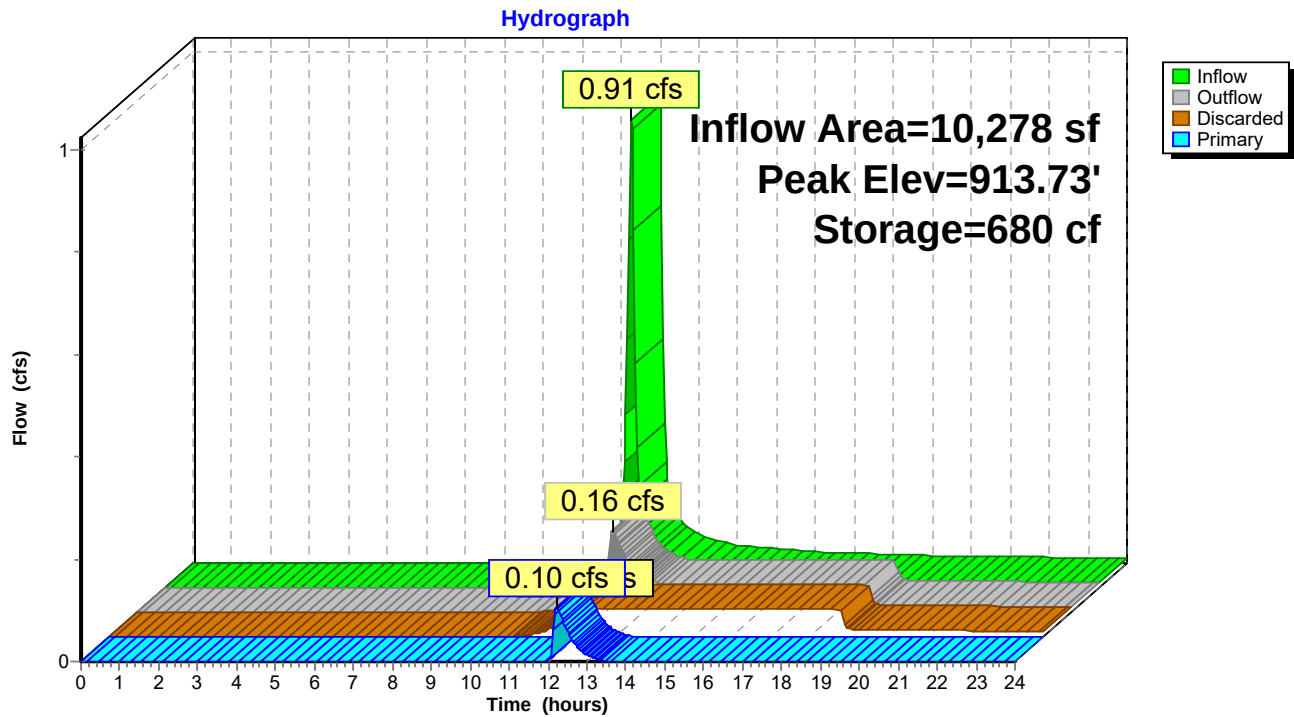
**Discarded OutFlow** Max=0.06 cfs @ 12.22 hrs HW=913.72' (Free Discharge)

↑ **3=Exfiltration** ( Controls 0.06 cfs)

**Primary OutFlow** Max=0.10 cfs @ 12.22 hrs HW=913.72' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

↑ **2=Culvert** (Inlet Controls 0.10 cfs @ 1.61 fps)

**Pond 3p: Subsurface Infiltration Bed #1**

**Summary for Pond 5P: Basin 1**

Inflow Area = 191,207 sf, 2.18% Impervious, Inflow Depth > 0.86" for 25-yr event  
 Inflow = 2.40 cfs @ 12.27 hrs, Volume= 13,675 cf  
 Outflow = 0.33 cfs @ 14.42 hrs, Volume= 12,514 cf, Atten= 86%, Lag= 129.2 min  
 Discarded = 0.33 cfs @ 14.42 hrs, Volume= 12,514 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
 Peak Elev= 925.89' @ 14.42 hrs Surf.Area= 4,151 sf Storage= 4,836 cf

Plug-Flow detention time= 185.0 min calculated for 12,514 cf (92% of inflow)  
 Center-of-Mass det. time= 143.8 min ( 1,064.8 - 920.9 )

| Volume              | Invert               | Avail.Storage             | Storage Description                                        |
|---------------------|----------------------|---------------------------|------------------------------------------------------------|
| #1                  | 924.50'              | 15,897 cf                 | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet)                                  |
| 924.50              | 2,838                | 0                         | 0                                                          |
| 925.00              | 3,298                | 1,534                     | 1,534                                                      |
| 926.00              | 4,260                | 3,779                     | 5,313                                                      |
| 927.00              | 5,278                | 4,769                     | 10,082                                                     |
| 928.00              | 6,352                | 5,815                     | 15,897                                                     |

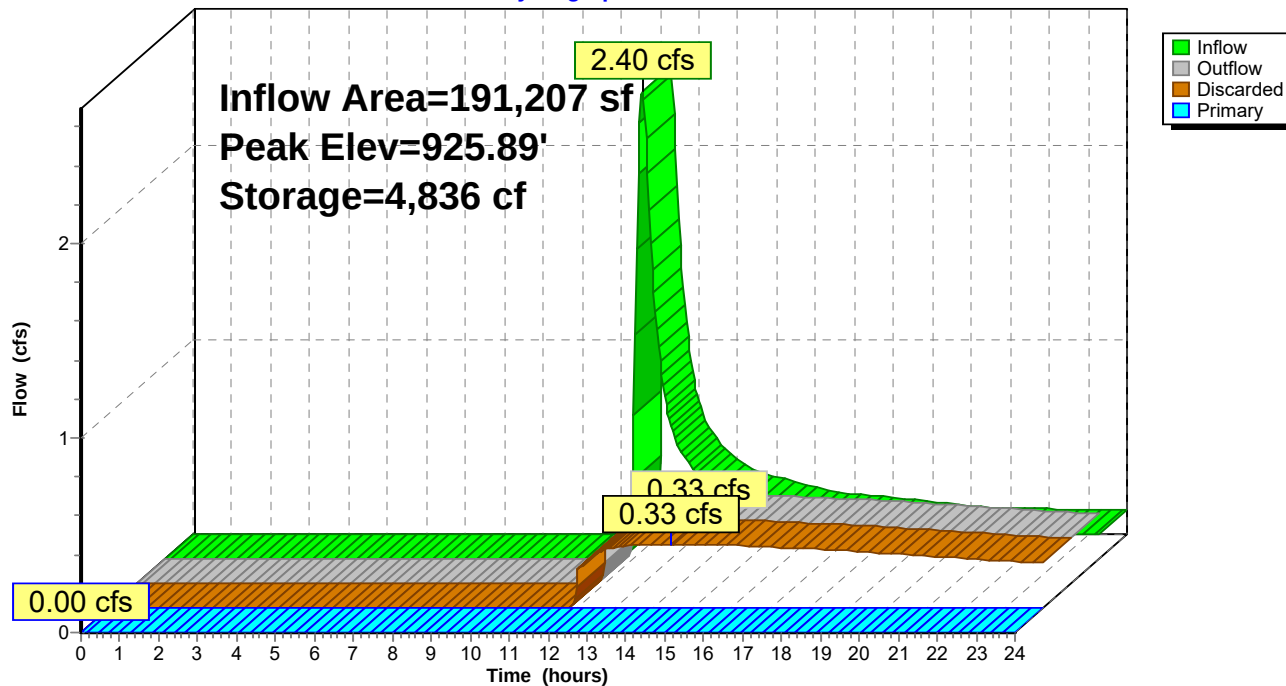
| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 927.00' | <b>20.0' long x 4.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66<br>2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32 |
| #2     | Device 4  | 926.50' | <b>24.0" Horiz. Orifice/Grate C= 0.600</b><br>Limited to weir flow at low heads                                                                                                                                                                                                   |
| #3     | Discarded | 924.50' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 916.00'                                                                                                                                                                              |
| #4     | Primary   | 924.50' | <b>18.0" Round Culvert</b><br>L= 50.0' Box, headwall w/3 rounded edges, Ke= 0.200<br>Inlet / Outlet Invert= 924.50' / 918.00' S= 0.1300 '/' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf                                                              |

**Discarded OutFlow** Max=0.33 cfs @ 14.42 hrs HW=925.89' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.33 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=924.50' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **4=Culvert** ( Controls 0.00 cfs)  
 ↳ **2=Orifice/Grate** ( Controls 0.00 cfs)

## Pond 5P: Basin 1

## Hydrograph





**Summary for Pond 17P: Subsurface Infiltration Bed #2**

Inflow Area = 5,684 sf, 6.60% Impervious, Inflow Depth > 2.87" for 25-yr event  
 Inflow = 0.65 cfs @ 11.98 hrs, Volume= 1,358 cf  
 Outflow = 0.42 cfs @ 12.06 hrs, Volume= 1,356 cf, Atten= 35%, Lag= 4.6 min  
 Discarded = 0.04 cfs @ 12.06 hrs, Volume= 1,013 cf  
 Primary = 0.38 cfs @ 12.06 hrs, Volume= 343 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 913.31' @ 12.06 hrs Surf.Area= 575 sf Storage= 348 cf

Plug-Flow detention time= 35.3 min calculated for 1,354 cf (100% of inflow)

Center-of-Mass det. time= 34.6 min ( 865.8 - 831.2 )

| Volume | Invert  | Avail.Storage | Storage Description                                                                                                  |
|--------|---------|---------------|----------------------------------------------------------------------------------------------------------------------|
| #1     | 912.00' | 314 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>863 cf Overall - 79 cf Embedded = 784 cf x 40.0% Voids |
| #2     | 912.00' | 79 cf         | <b>12.0" Round Pipe Storage</b> x 4 Inside #1<br>L= 25.0'                                                            |
|        |         | 392 cf        | Total Available Storage                                                                                              |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 912.00              | 575                  | 0                         | 0                         |
| 913.00              | 575                  | 575                       | 575                       |
| 913.50              | 575                  | 288                       | 863                       |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                           |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 913.30' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32 |
| #2     | Primary   | 912.80' | <b>6.0" Round Culvert</b><br>L= 12.0' CMP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 912.80' / 912.00' S= 0.0667 '/' Cc= 0.900<br>n= 0.012, Flow Area= 0.20 sf                                                        |
| #3     | Discarded | 912.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = -4.00'                                                                                                                                      |

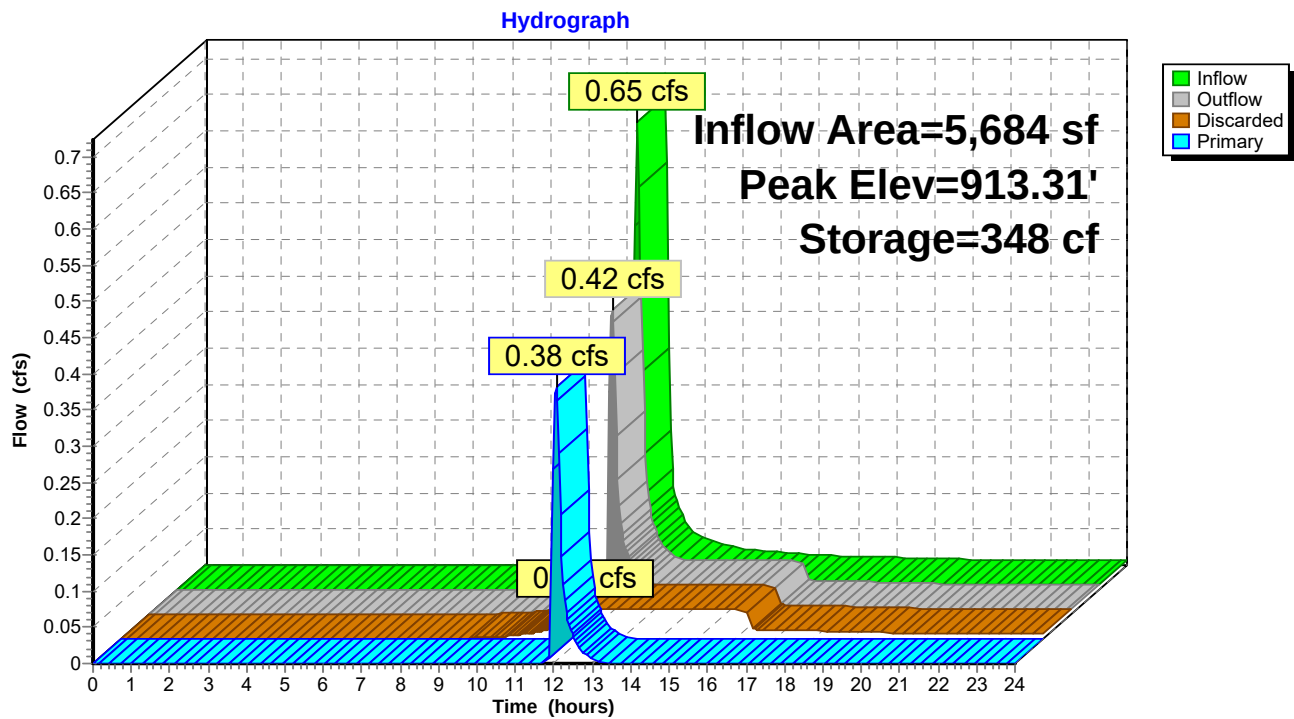
**Discarded OutFlow** Max=0.04 cfs @ 12.06 hrs HW=913.29' (Free Discharge)

↑ **3=Exfiltration** ( Controls 0.04 cfs)

**Primary OutFlow** Max=0.37 cfs @ 12.06 hrs HW=913.29' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

↑ **2=Culvert** (Inlet Controls 0.37 cfs @ 1.88 fps)

**Pond 17P: Subsurface Infiltration Bed #2**

**MLV 505LD86\_PostwBMP DA1- REV 2***Type II 24-hr 50-yr Rainfall=6.87"*

Prepared by {enter your company name here}

Printed 3/2/2022

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Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DA-1 Basin #1** Runoff Area=191,207 sf 2.18% Impervious Runoff Depth>1.33"  
Flow Length=1,332' Tc=26.4 min CN=47 Runoff=4.33 cfs 21,118 cf

**Subcatchment2S: DA-1 Undetained** Runoff Area=39,431 sf 1.50% Impervious Runoff Depth>0.79"  
Flow Length=547' Tc=10.1 min CN=40 Runoff=0.71 cfs 2,596 cf

**Subcatchment5s: DA-1 Inf Bed #1** Runoff Area=10,278 sf 21.06% Impervious Runoff Depth>3.00"  
Flow Length=154' Slope=0.1500 '/' Tc=6.6 min CN=65 Runoff=1.22 cfs 2,567 cf

**Subcatchment16S: DA-1 Inf Bed #2** Runoff Area=5,684 sf 6.60% Impervious Runoff Depth>3.71"  
Flow Length=154' Slope=0.1500 '/' Tc=6.6 min CN=72 Runoff=0.83 cfs 1,759 cf

**Reach 10: DA-1 Post Total** Inflow=1.58 cfs 5,444 cf  
Outflow=1.58 cfs 5,444 cf

**Pond 3p: Subsurface Infiltration Bed #1** Peak Elev=914.24' Storage=845 cf Inflow=1.22 cfs 2,567 cf  
Discarded=0.06 cfs 1,979 cf Primary=0.32 cfs 584 cf Outflow=0.37 cfs 2,563 cf

**Pond 5P: Basin 1** Peak Elev=926.57' Storage=7,927 cf Inflow=4.33 cfs 21,118 cf  
Discarded=0.40 cfs 15,629 cf Primary=0.42 cfs 1,682 cf Outflow=0.82 cfs 17,311 cf

**Pond 17P: Subsurface Infiltration Bed #2** Peak Elev=913.41' Storage=371 cf Inflow=0.83 cfs 1,759 cf  
Discarded=0.04 cfs 1,178 cf Primary=0.76 cfs 582 cf Outflow=0.80 cfs 1,760 cf

**Total Runoff Area = 246,600 sf Runoff Volume = 28,040 cf Average Runoff Depth = 1.36"**  
**97.04% Pervious = 239,307 sf 2.96% Impervious = 7,293 sf**

**Summary for Subcatchment 1S: DA-1 Basin #1**

Runoff = 4.33 cfs @ 12.25 hrs, Volume= 21,118 cf, Depth> 1.33"

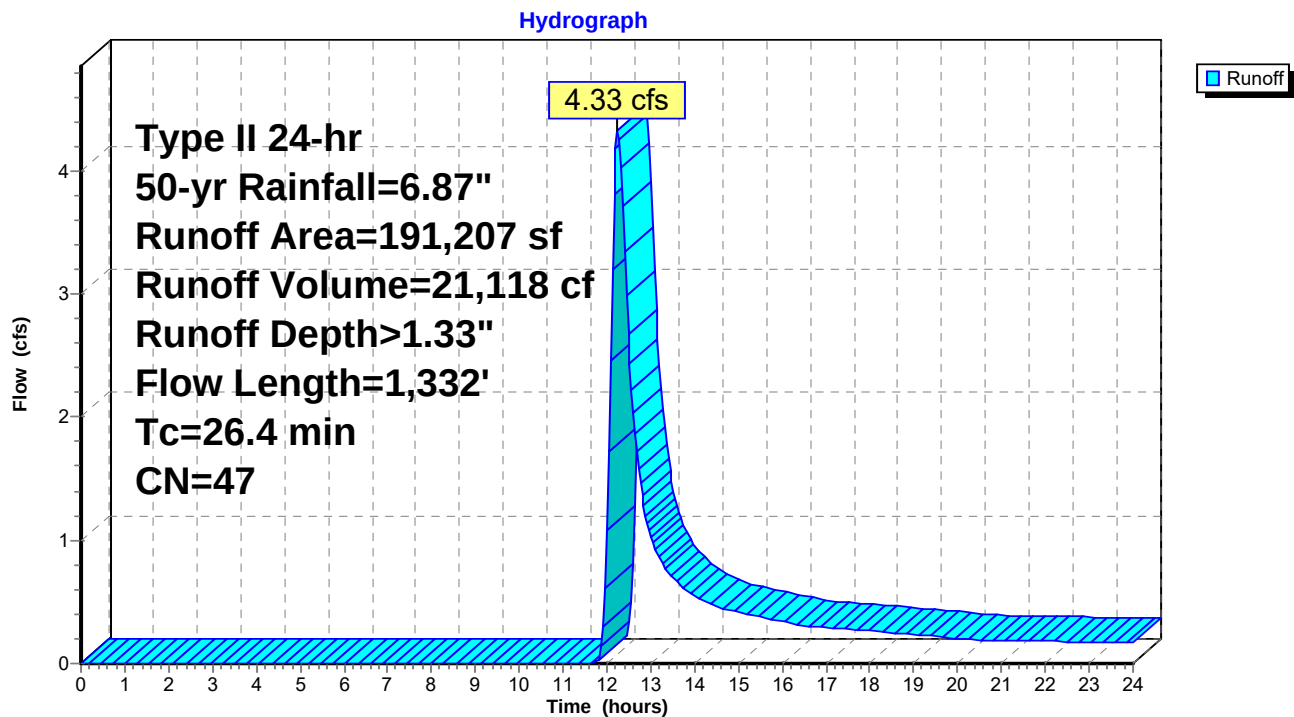
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 31,537    | 30 | Woods, Good, HSG A        |
| 12,873    | 77 | Woods, Good, HSG D        |
| 92,642    | 30 | Meadow, non-grazed, HSG A |
| 49,992    | 78 | Meadow, non-grazed, HSG D |
| * 4,163   | 98 | Impervious                |
| 191,207   | 47 | Weighted Average          |
| 187,044   |    | 97.82% Pervious Area      |
| 4,163     |    | 2.18% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.9      | 463           | 0.1000        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.4      | 554           | 0.0900        | 2.10              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 1.0      | 215           | 0.0630        | 3.64              | 5.10           | <b>Channel Flow,</b><br>Area= 1.4 sf Perim= 4.1' r= 0.34' n= 0.050   |
| 26.4     | 1,332         | Total         |                   |                |                                                                      |

## Subcatchment 1S: DA-1 Basin #1



**Summary for Subcatchment 2S: DA-1 Undetained**

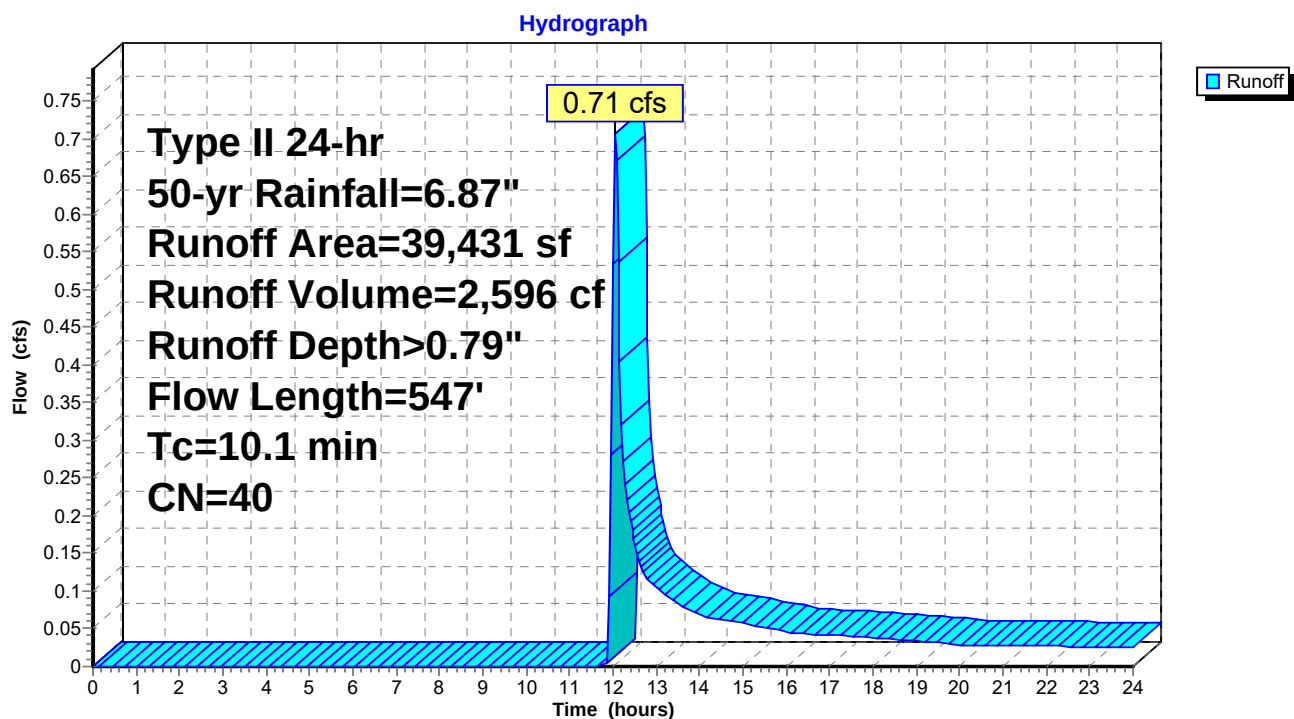
Runoff = 0.71 cfs @ 12.06 hrs, Volume= 2,596 cf, Depth> 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 10,525    | 30 | Woods, Good, HSG A        |
| 1,020     | 77 | Woods, Good, HSG D        |
| 20,698    | 30 | Meadow, non-grazed, HSG A |
| 6,598     | 78 | Meadow, non-grazed, HSG D |
| * 590     | 98 | Impervious                |
| 39,431    | 40 | Weighted Average          |
| 38,841    |    | 98.50% Pervious Area      |
| 590       |    | 1.50% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------|
| 7.4      | 100           | 0.1000        | 0.22              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.26"                      |
| 1.0      | 147           | 0.1200        | 2.42              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps       |
| 1.7      | 300           | 0.0200        | 2.89              | 4.33           | <b>Channel Flow, Channel</b><br>Area= 1.5 sf Perim= 4.5' r= 0.33' n= 0.035 |
| 10.1     | 547           | Total         |                   |                |                                                                            |

**Subcatchment 2S: DA-1 Undetained**

**MLV 505LD86\_PostwBMP DA1- REV 2**

Prepared by {enter your company name here}

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Type II 24-hr 50-yr Rainfall=6.87"

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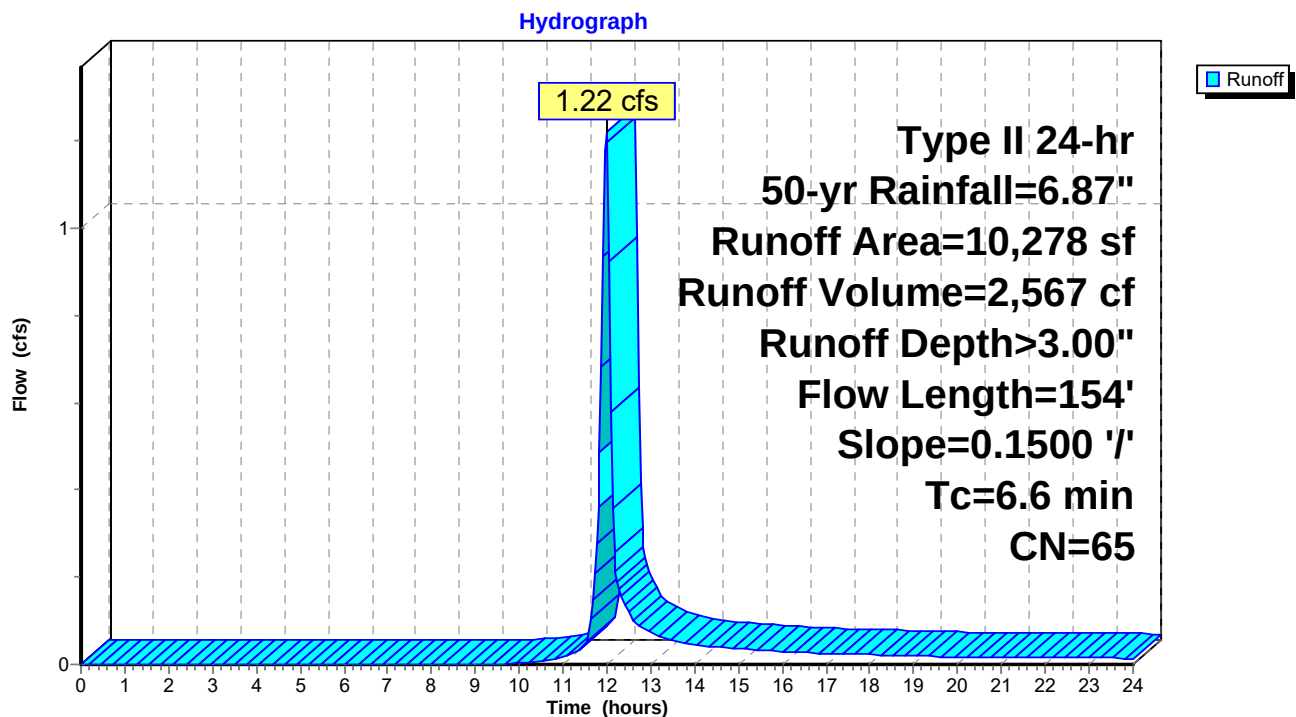
**Summary for Subcatchment 5s: DA-1 Inf Bed #1**

Runoff = 1.22 cfs @ 11.98 hrs, Volume= 2,567 cf, Depth&gt; 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,580     | 30 | Meadow, non-grazed, HSG A |
| 4,533     | 78 | Meadow, non-grazed, HSG D |
| * 2,165   | 98 | Impervious                |
| 10,278    | 65 | Weighted Average          |
| 8,113     |    | 78.94% Pervious Area      |
| 2,165     |    | 21.06% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 6.3      | 100           | 0.1500        | 0.26              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.26"                |
| 0.3      | 54            | 0.1500        | 2.71              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 6.6      | 154           | Total         |                   |                |                                                                      |

**Subcatchment 5s: DA-1 Inf Bed #1**



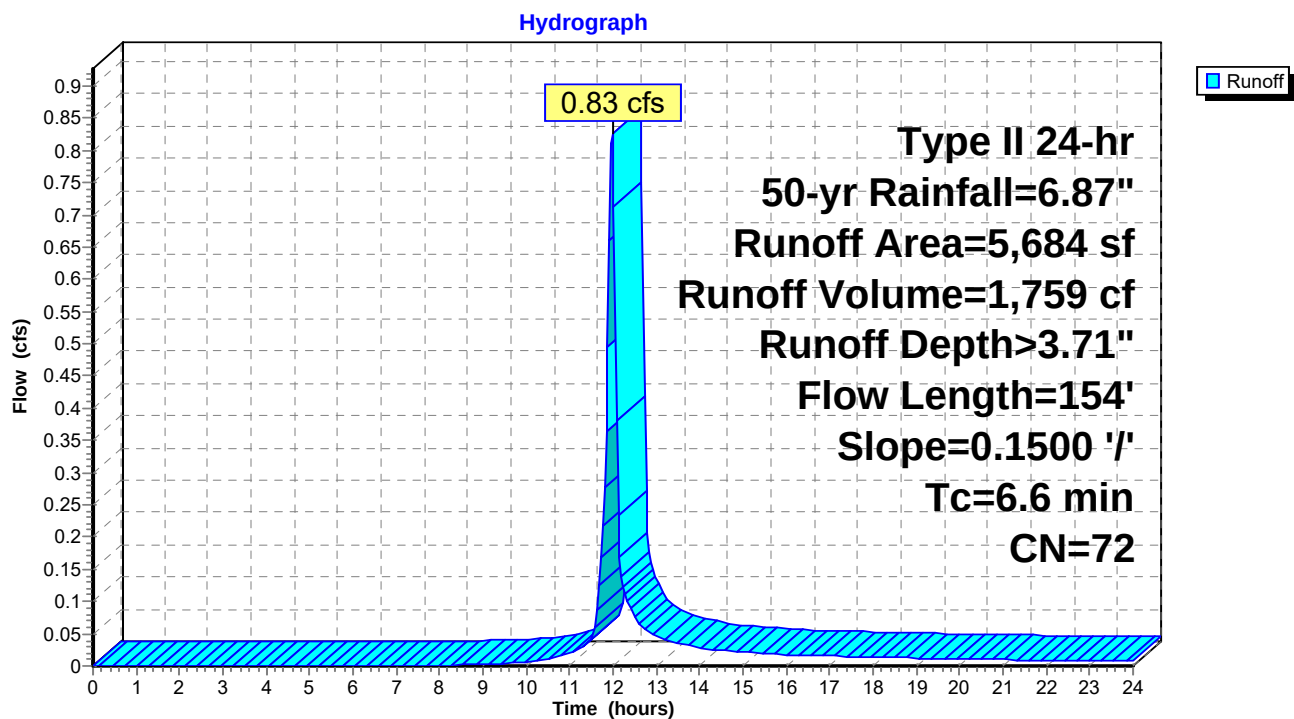
**Summary for Subcatchment 16S: DA-1 Inf Bed #2**

Runoff = 0.83 cfs @ 11.98 hrs, Volume= 1,759 cf, Depth> 3.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 29        | 77 | Woods, Good, HSG D        |
| 925       | 30 | Meadow, non-grazed, HSG A |
| 4,355     | 78 | Meadow, non-grazed, HSG D |
| * 375     | 98 | Impervious                |
| 5,684     | 72 | Weighted Average          |
| 5,309     |    | 93.40% Pervious Area      |
| 375       |    | 6.60% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 6.3      | 100           | 0.1500        | 0.26              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.26"                |
| 0.3      | 54            | 0.1500        | 2.71              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 6.6      | 154           | Total         |                   |                |                                                                      |

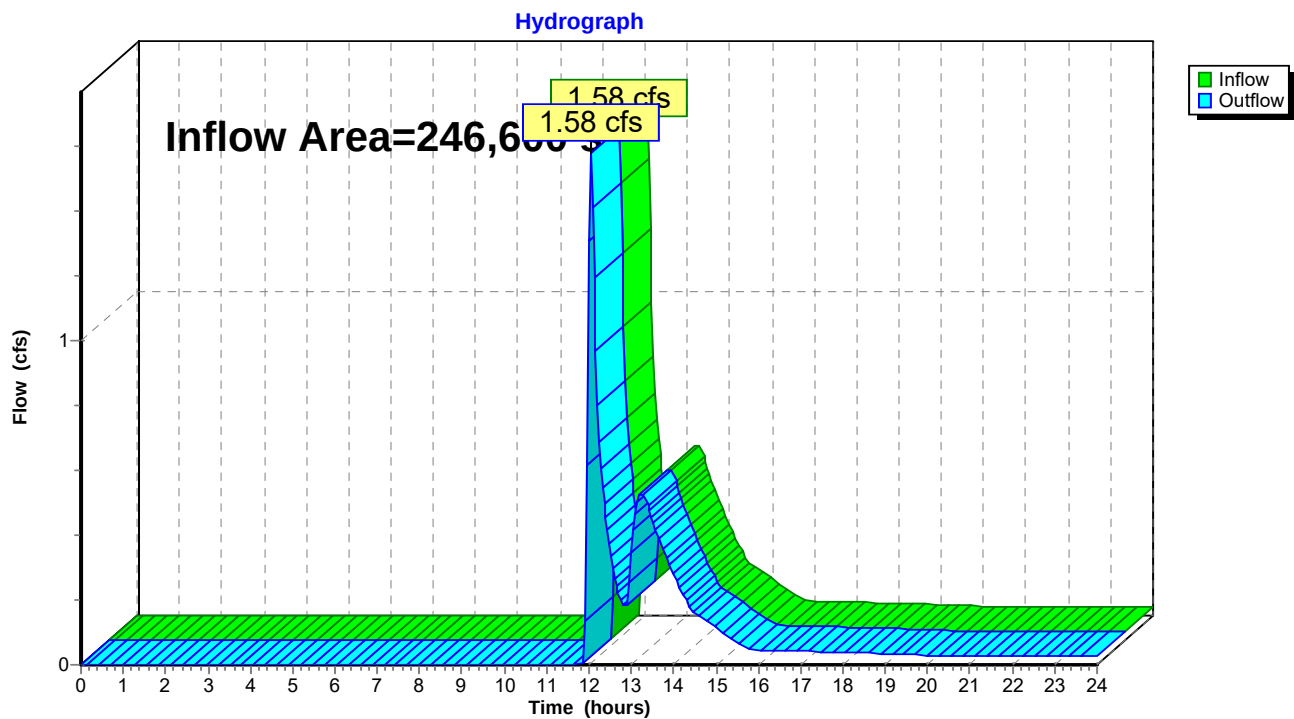
**Subcatchment 16S: DA-1 Inf Bed #2**

**Summary for Reach 10: DA-1 Post Total**

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

Inflow Area = 246,600 sf, 2.96% Impervious, Inflow Depth > 0.26" for 50-yr event  
Inflow = 1.58 cfs @ 12.04 hrs, Volume= 5,444 cf  
Outflow = 1.58 cfs @ 12.04 hrs, Volume= 5,444 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs

**Reach 10: DA-1 Post Total**

**Summary for Pond 3p: Subsurface Infiltration Bed #1**

Inflow Area = 10,278 sf, 21.06% Impervious, Inflow Depth > 3.00" for 50-yr event  
 Inflow = 1.22 cfs @ 11.98 hrs, Volume= 2,567 cf  
 Outflow = 0.37 cfs @ 12.12 hrs, Volume= 2,563 cf, Atten= 69%, Lag= 8.5 min  
 Discarded = 0.06 cfs @ 12.12 hrs, Volume= 1,979 cf  
 Primary = 0.32 cfs @ 12.12 hrs, Volume= 584 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2

Peak Elev= 914.24' @ 12.12 hrs Surf.Area= 800 sf Storage= 845 cf

Plug-Flow detention time= 82.4 min calculated for 2,559 cf (100% of inflow)

Center-of-Mass det. time= 81.4 min ( 920.6 - 839.2 )

| Volume | Invert  | Avail.Storage | Storage Description                                                                                                       |
|--------|---------|---------------|---------------------------------------------------------------------------------------------------------------------------|
| #1     | 912.00' | 795 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>2,200 cf Overall - 212 cf Embedded = 1,988 cf x 40.0% Voids |
| #2     | 912.00' | 212 cf        | <b>18.0" Round Pipe Storage</b> x 3 Inside #1<br>L= 40.0'                                                                 |
|        |         | 1,007 cf      | Total Available Storage                                                                                                   |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 912.00              | 800                  | 0                         | 0                         |
| 913.00              | 800                  | 800                       | 800                       |
| 914.00              | 800                  | 800                       | 1,600                     |
| 914.75              | 800                  | 600                       | 2,200                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                           |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 914.50' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32 |
| #2     | Primary   | 913.50' | <b>4.0" Round Culvert</b><br>L= 10.0' CMP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 913.50' / 912.50' S= 0.1000 ' / Cc= 0.900<br>n= 0.024, Flow Area= 0.09 sf                                                           |
| #3     | Discarded | 912.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = -4.00'                                                                                                                                      |

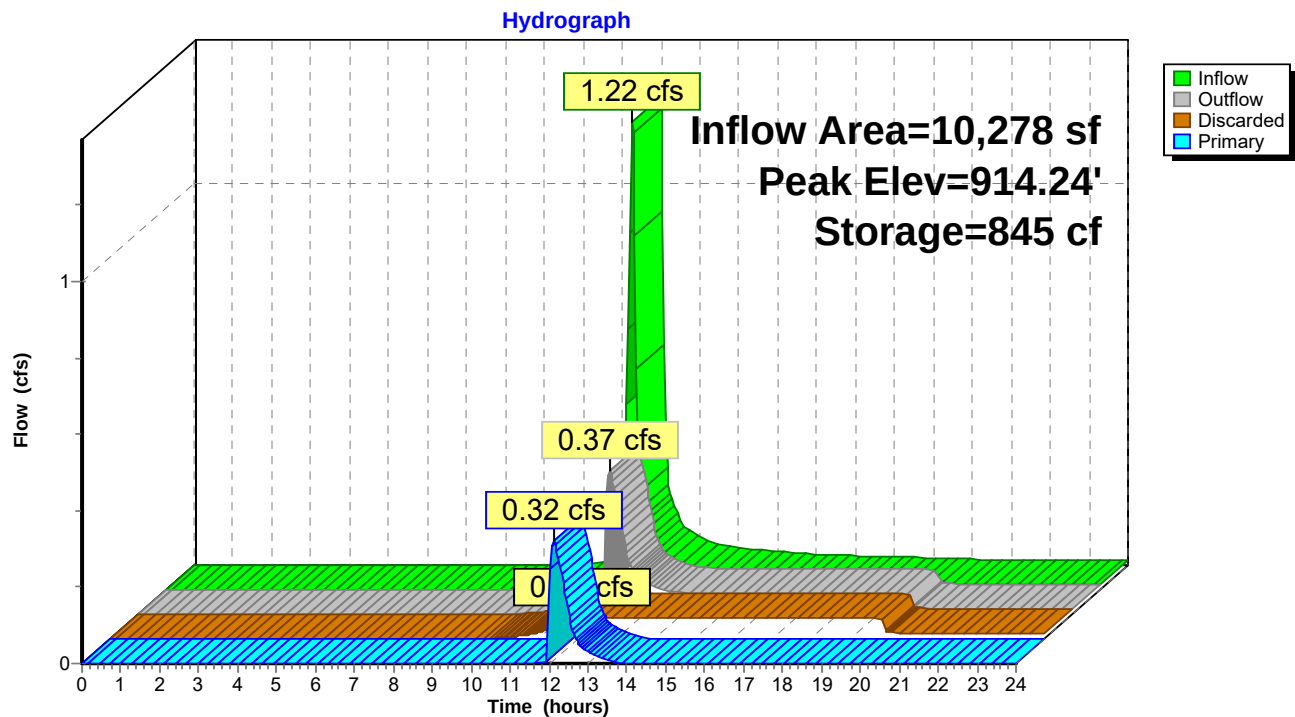
**Discarded OutFlow** Max=0.06 cfs @ 12.12 hrs HW=914.24' (Free Discharge)

↑ **3=Exfiltration** ( Controls 0.06 cfs)

**Primary OutFlow** Max=0.32 cfs @ 12.12 hrs HW=914.24' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

↑ **2=Culvert** (Inlet Controls 0.32 cfs @ 3.65 fps)

**Pond 3p: Subsurface Infiltration Bed #1**

**Summary for Pond 5P: Basin 1**

Inflow Area = 191,207 sf, 2.18% Impervious, Inflow Depth > 1.33" for 50-yr event  
 Inflow = 4.33 cfs @ 12.25 hrs, Volume= 21,118 cf  
 Outflow = 0.82 cfs @ 13.25 hrs, Volume= 17,311 cf, Atten= 81%, Lag= 60.2 min  
 Discarded = 0.40 cfs @ 13.25 hrs, Volume= 15,629 cf  
 Primary = 0.42 cfs @ 13.25 hrs, Volume= 1,682 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
 Peak Elev= 926.57' @ 13.25 hrs Surf.Area= 4,844 sf Storage= 7,927 cf

Plug-Flow detention time= 220.7 min calculated for 17,282 cf (82% of inflow)  
 Center-of-Mass det. time= 141.1 min ( 1,044.4 - 903.3 )

| Volume              | Invert               | Avail.Storage             | Storage Description                                        |
|---------------------|----------------------|---------------------------|------------------------------------------------------------|
| #1                  | 924.50'              | 15,897 cf                 | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet)                                  |
| 924.50              | 2,838                | 0                         | 0                                                          |
| 925.00              | 3,298                | 1,534                     | 1,534                                                      |
| 926.00              | 4,260                | 3,779                     | 5,313                                                      |
| 927.00              | 5,278                | 4,769                     | 10,082                                                     |
| 928.00              | 6,352                | 5,815                     | 15,897                                                     |

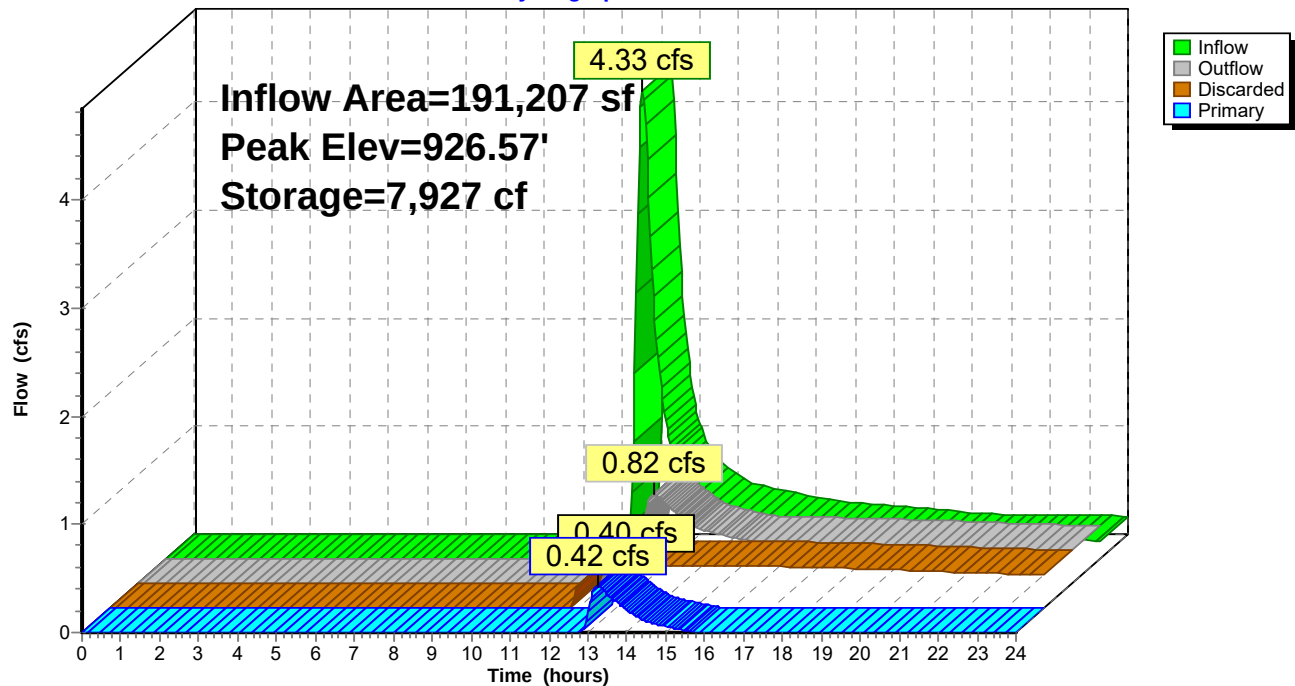
| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 927.00' | <b>20.0' long x 4.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66<br>2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32 |
| #2     | Device 4  | 926.50' | <b>24.0" Horiz. Orifice/Grate C= 0.600</b><br>Limited to weir flow at low heads                                                                                                                                                                                                   |
| #3     | Discarded | 924.50' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 916.00'                                                                                                                                                                              |
| #4     | Primary   | 924.50' | <b>18.0" Round Culvert</b><br>L= 50.0' Box, headwall w/3 rounded edges, Ke= 0.200<br>Inlet / Outlet Invert= 924.50' / 918.00' S= 0.1300 ' /' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf                                                             |

**Discarded OutFlow** Max=0.40 cfs @ 13.25 hrs HW=926.57' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.40 cfs)

**Primary OutFlow** Max=0.41 cfs @ 13.25 hrs HW=926.57' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **4=Culvert** (Passes 0.41 cfs of 12.24 cfs potential flow)  
 ↳ **2=Orifice/Grate** (Weir Controls 0.41 cfs @ 0.89 fps)

## Pond 5P: Basin 1

Hydrograph



**Summary for Pond 17P: Subsurface Infiltration Bed #2**

Inflow Area = 5,684 sf, 6.60% Impervious, Inflow Depth > 3.71" for 50-yr event  
 Inflow = 0.83 cfs @ 11.98 hrs, Volume= 1,759 cf  
 Outflow = 0.80 cfs @ 12.01 hrs, Volume= 1,760 cf, Atten= 4%, Lag= 2.0 min  
 Discarded = 0.04 cfs @ 12.02 hrs, Volume= 1,178 cf  
 Primary = 0.76 cfs @ 12.01 hrs, Volume= 582 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 913.41' @ 12.02 hrs Surf.Area= 575 sf Storage= 371 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 31.9 min ( 855.7 - 823.8 )

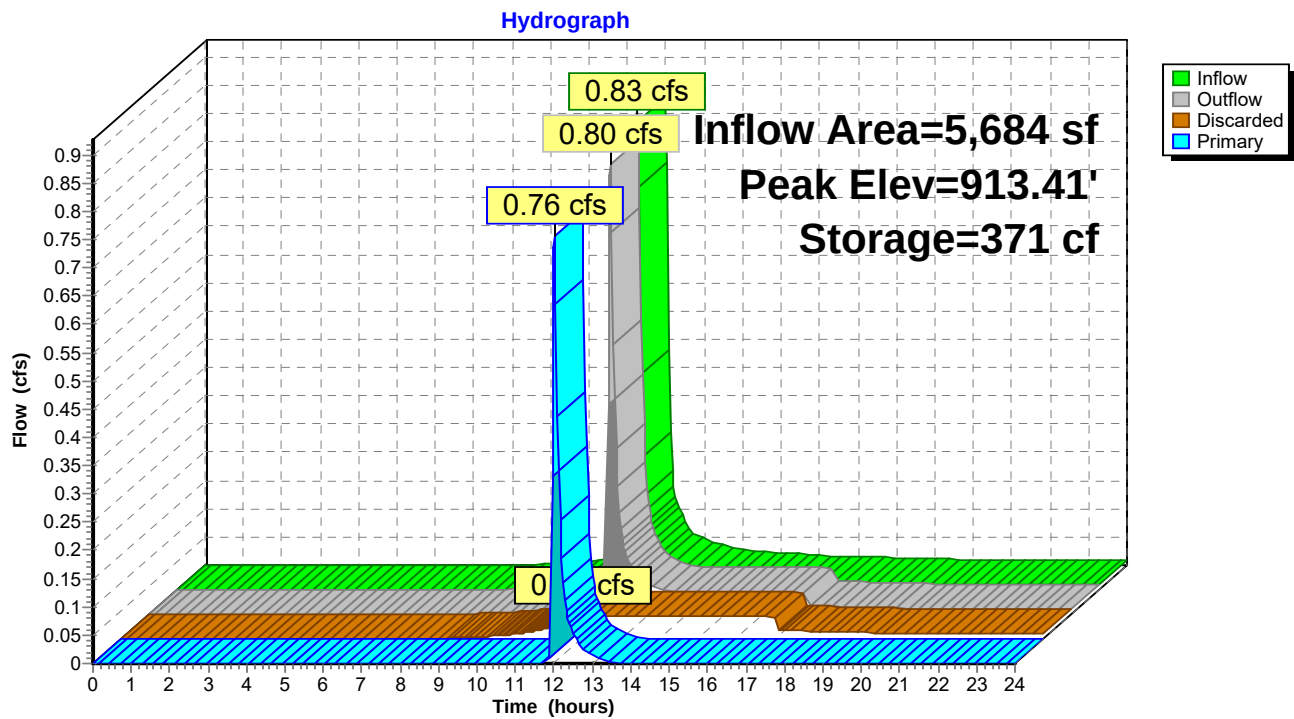
| Volume | Invert  | Avail.Storage | Storage Description                                                                                                  |
|--------|---------|---------------|----------------------------------------------------------------------------------------------------------------------|
| #1     | 912.00' | 314 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>863 cf Overall - 79 cf Embedded = 784 cf x 40.0% Voids |
| #2     | 912.00' | 79 cf         | <b>12.0" Round Pipe Storage</b> x 4 Inside #1<br>L= 25.0'                                                            |
|        |         | 392 cf        | Total Available Storage                                                                                              |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 912.00              | 575                  | 0                         | 0                         |
| 913.00              | 575                  | 575                       | 575                       |
| 913.50              | 575                  | 288                       | 863                       |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                           |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 913.30' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32 |
| #2     | Primary   | 912.80' | <b>6.0" Round Culvert</b><br>L= 12.0' CMP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 912.80' / 912.00' S= 0.0667 '/' Cc= 0.900<br>n= 0.012, Flow Area= 0.20 sf                                                        |
| #3     | Discarded | 912.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = -4.00'                                                                                                                                      |

**Discarded OutFlow** Max=0.04 cfs @ 12.02 hrs HW=913.39' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.04 cfs)

**Primary OutFlow** Max=0.70 cfs @ 12.01 hrs HW=913.39' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 0.27 cfs @ 0.76 fps)  
 ↳ **2=Culvert** (Inlet Controls 0.43 cfs @ 2.21 fps)

**Pond 17P: Subsurface Infiltration Bed #2**



**MLV 505LD86\_PostwBMP DA1- REV 2**

Type II 24-hr 100-yr Rainfall=8.09"

Prepared by {enter your company name here}

Printed 3/2/2022

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Time span=0.00-24.00 hrs, dt=0.04 hrs, 601 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DA-1 Basin #1** Runoff Area=191,207 sf 2.18% Impervious Runoff Depth>1.97"  
Flow Length=1,332' Tc=26.4 min CN=47 Runoff=7.09 cfs 31,387 cf

**Subcatchment2S: DA-1 Undetained** Runoff Area=39,431 sf 1.50% Impervious Runoff Depth>1.28"  
Flow Length=547' Tc=10.1 min CN=40 Runoff=1.42 cfs 4,220 cf

**Subcatchment5s: DA-1 Inf Bed #1** Runoff Area=10,278 sf 21.06% Impervious Runoff Depth>3.96"  
Flow Length=154' Slope=0.1500 '/' Tc=6.6 min CN=65 Runoff=1.61 cfs 3,393 cf

**Subcatchment16S: DA-1 Inf Bed #2** Runoff Area=5,684 sf 6.60% Impervious Runoff Depth>4.77"  
Flow Length=154' Slope=0.1500 '/' Tc=6.6 min CN=72 Runoff=1.05 cfs 2,258 cf

**Reach 10: DA-1 Post Total** Inflow=3.61 cfs 15,704 cf  
Outflow=3.61 cfs 15,704 cf

**Pond 3p: Subsurface Infiltration Bed #1** Peak Elev=914.69' Storage=989 cf Inflow=1.61 cfs 3,393 cf  
Discarded=0.06 cfs 2,266 cf Primary=1.12 cfs 1,135 cf Outflow=1.18 cfs 3,401 cf

**Pond 5P: Basin 1** Peak Elev=926.78' Storage=8,959 cf Inflow=7.09 cfs 31,387 cf  
Discarded=0.42 cfs 16,583 cf Primary=3.09 cfs 9,458 cf Outflow=3.51 cfs 26,041 cf

**Pond 17P: Subsurface Infiltration Bed #2** Peak Elev=913.44' Storage=378 cf Inflow=1.05 cfs 2,258 cf  
Discarded=0.04 cfs 1,363 cf Primary=1.00 cfs 891 cf Outflow=1.04 cfs 2,254 cf

**Total Runoff Area = 246,600 sf Runoff Volume = 41,258 cf Average Runoff Depth = 2.01"**  
**97.04% Pervious = 239,307 sf 2.96% Impervious = 7,293 sf**

**Summary for Subcatchment 1S: DA-1 Basin #1**

Runoff = 7.09 cfs @ 12.23 hrs, Volume= 31,387 cf, Depth> 1.97"

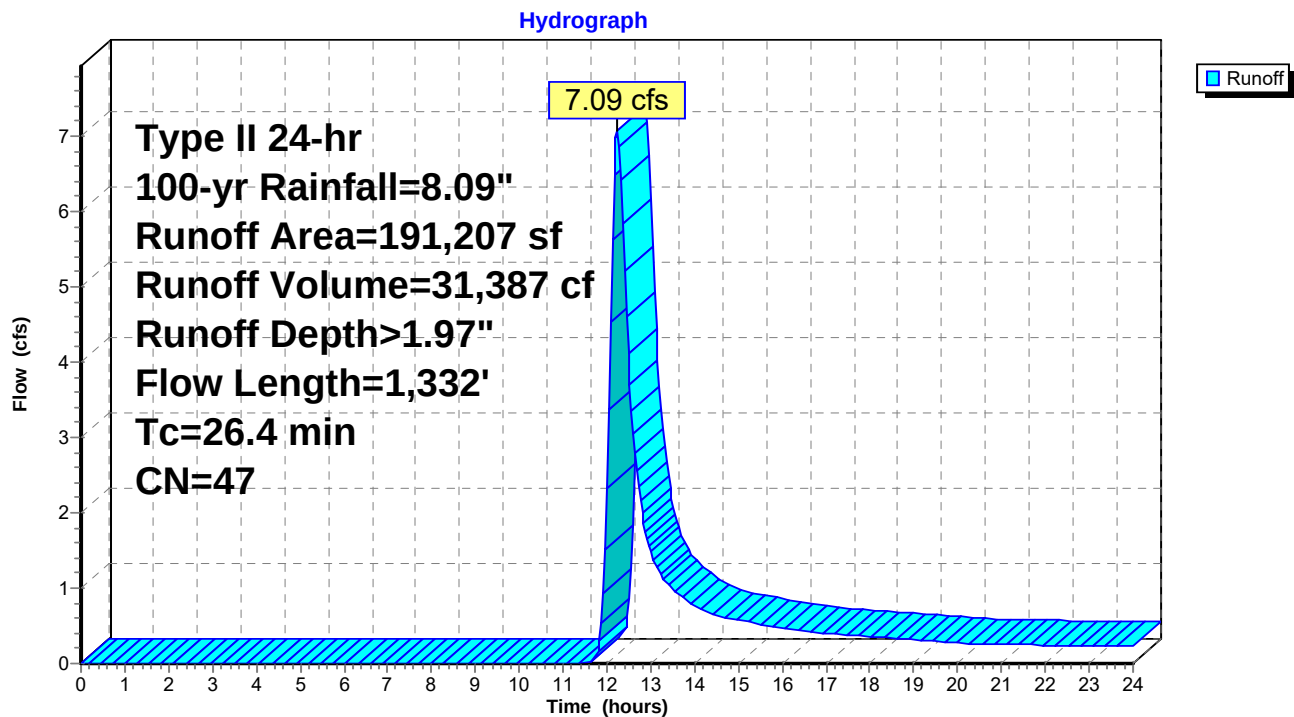
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 31,537    | 30 | Woods, Good, HSG A        |
| 12,873    | 77 | Woods, Good, HSG D        |
| 92,642    | 30 | Meadow, non-grazed, HSG A |
| 49,992    | 78 | Meadow, non-grazed, HSG D |
| * 4,163   | 98 | Impervious                |
| 191,207   | 47 | Weighted Average          |
| 187,044   |    | 97.82% Pervious Area      |
| 4,163     |    | 2.18% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.9      | 463           | 0.1000        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.4      | 554           | 0.0900        | 2.10              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 1.0      | 215           | 0.0630        | 3.64              | 5.10           | <b>Channel Flow,</b><br>Area= 1.4 sf Perim= 4.1' r= 0.34' n= 0.050   |
| 26.4     | 1,332         | Total         |                   |                |                                                                      |

## Subcatchment 1S: DA-1 Basin #1



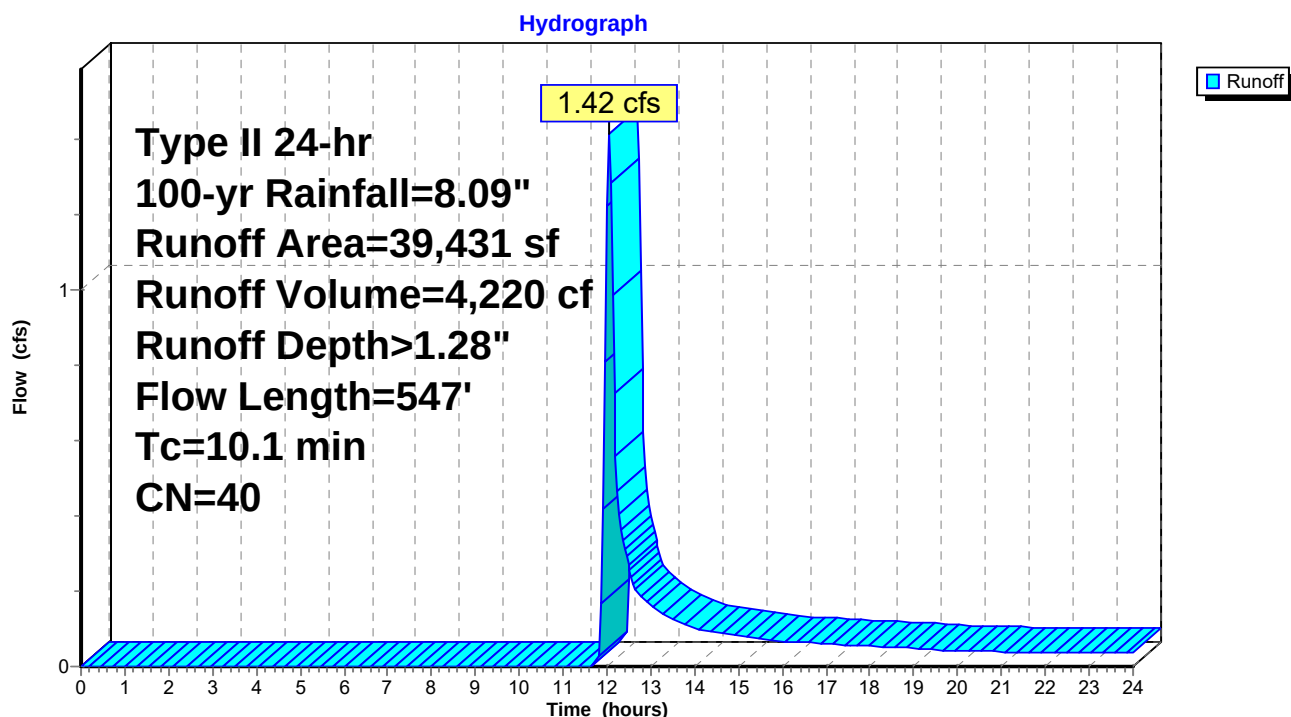
**Summary for Subcatchment 2S: DA-1 Undetained**

Runoff = 1.42 cfs @ 12.04 hrs, Volume= 4,220 cf, Depth> 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 10,525    | 30 | Woods, Good, HSG A        |
| 1,020     | 77 | Woods, Good, HSG D        |
| 20,698    | 30 | Meadow, non-grazed, HSG A |
| 6,598     | 78 | Meadow, non-grazed, HSG D |
| * 590     | 98 | Impervious                |
| 39,431    | 40 | Weighted Average          |
| 38,841    |    | 98.50% Pervious Area      |
| 590       |    | 1.50% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                                |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------------|
| 7.4      | 100           | 0.1000        | 0.22              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.26"                      |
| 1.0      | 147           | 0.1200        | 2.42              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps       |
| 1.7      | 300           | 0.0200        | 2.89              | 4.33           | <b>Channel Flow, Channel</b><br>Area= 1.5 sf Perim= 4.5' r= 0.33' n= 0.035 |
| 10.1     | 547           | Total         |                   |                |                                                                            |

**Subcatchment 2S: DA-1 Undetained**

**MLV 505LD86\_PostwBMP DA1- REV 2**

Prepared by {enter your company name here}

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Type II 24-hr 100-yr Rainfall=8.09"

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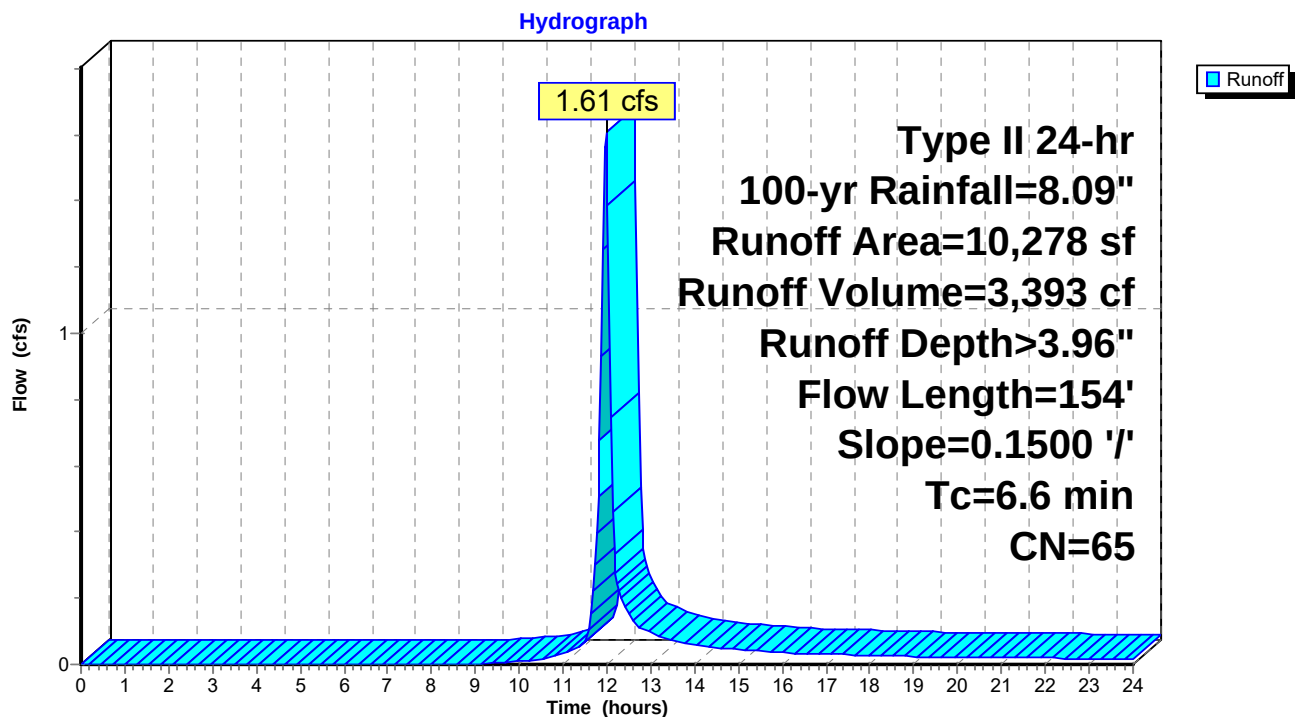
**Summary for Subcatchment 5s: DA-1 Inf Bed #1**

Runoff = 1.61 cfs @ 11.98 hrs, Volume= 3,393 cf, Depth&gt; 3.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,580     | 30 | Meadow, non-grazed, HSG A |
| 4,533     | 78 | Meadow, non-grazed, HSG D |
| * 2,165   | 98 | Impervious                |
| 10,278    | 65 | Weighted Average          |
| 8,113     |    | 78.94% Pervious Area      |
| 2,165     |    | 21.06% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 6.3      | 100           | 0.1500        | 0.26              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.26"                |
| 0.3      | 54            | 0.1500        | 2.71              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 6.6      | 154           | Total         |                   |                |                                                                      |

**Subcatchment 5s: DA-1 Inf Bed #1**

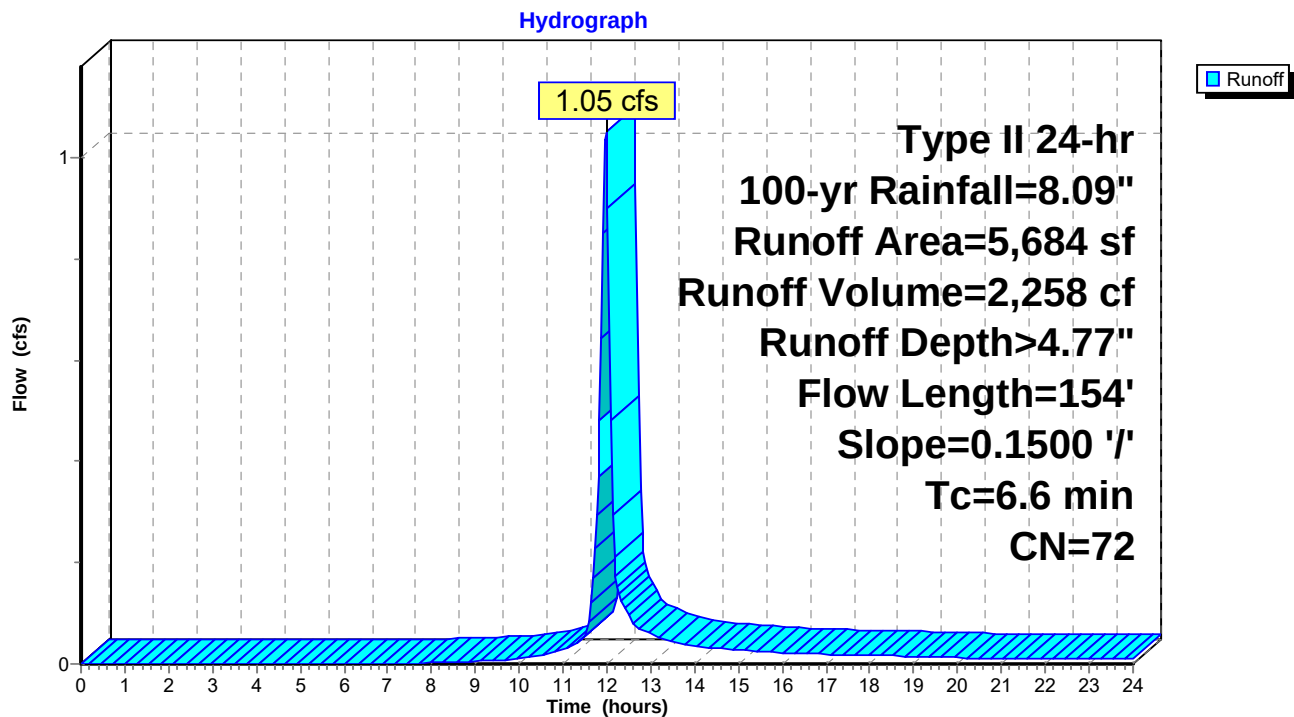
**Summary for Subcatchment 16S: DA-1 Inf Bed #2**

Runoff = 1.05 cfs @ 11.98 hrs, Volume= 2,258 cf, Depth> 4.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 29        | 77 | Woods, Good, HSG D        |
| 925       | 30 | Meadow, non-grazed, HSG A |
| 4,355     | 78 | Meadow, non-grazed, HSG D |
| * 375     | 98 | Impervious                |
| 5,684     | 72 | Weighted Average          |
| 5,309     |    | 93.40% Pervious Area      |
| 375       |    | 6.60% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 6.3      | 100           | 0.1500        | 0.26              |                | <b>Sheet Flow,</b><br>Grass: Dense n= 0.240 P2= 3.26"                |
| 0.3      | 54            | 0.1500        | 2.71              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 6.6      | 154           | Total         |                   |                |                                                                      |

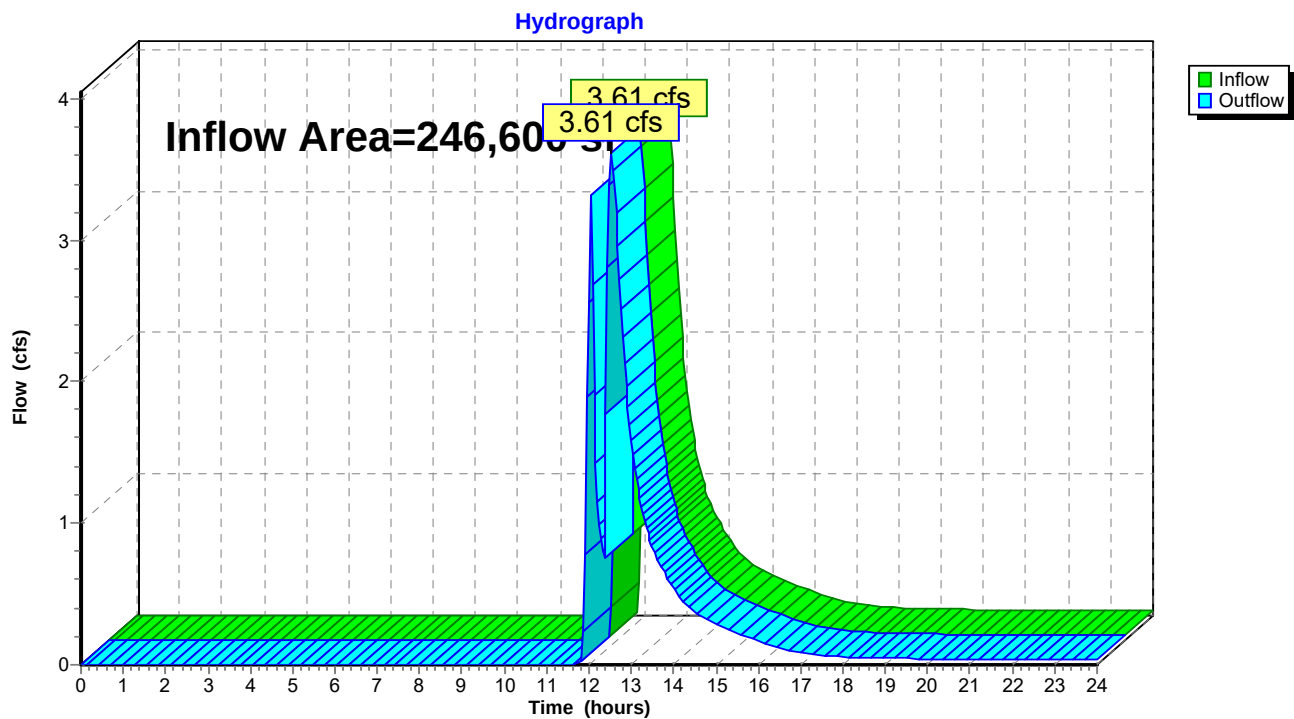
**Subcatchment 16S: DA-1 Inf Bed #2**

**Summary for Reach 10: DA-1 Post Total**

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

Inflow Area = 246,600 sf, 2.96% Impervious, Inflow Depth > 0.76" for 100-yr event  
Inflow = 3.61 cfs @ 12.53 hrs, Volume= 15,704 cf  
Outflow = 3.61 cfs @ 12.53 hrs, Volume= 15,704 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs

**Reach 10: DA-1 Post Total**

**Summary for Pond 3p: Subsurface Infiltration Bed #1**

Inflow Area = 10,278 sf, 21.06% Impervious, Inflow Depth > 3.96" for 100-yr event  
 Inflow = 1.61 cfs @ 11.98 hrs, Volume= 3,393 cf  
 Outflow = 1.18 cfs @ 12.05 hrs, Volume= 3,401 cf, Atten= 27%, Lag= 4.2 min  
 Discarded = 0.06 cfs @ 12.06 hrs, Volume= 2,266 cf  
 Primary = 1.12 cfs @ 12.05 hrs, Volume= 1,135 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 914.69' @ 12.06 hrs Surf.Area= 800 sf Storage= 989 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 74.2 min ( 905.5 - 831.2 )

| Volume | Invert  | Avail.Storage | Storage Description                                                                                                       |
|--------|---------|---------------|---------------------------------------------------------------------------------------------------------------------------|
| #1     | 912.00' | 795 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>2,200 cf Overall - 212 cf Embedded = 1,988 cf x 40.0% Voids |
| #2     | 912.00' | 212 cf        | <b>18.0" Round Pipe Storage</b> x 3 Inside #1<br>L= 40.0'                                                                 |
|        |         | 1,007 cf      | Total Available Storage                                                                                                   |

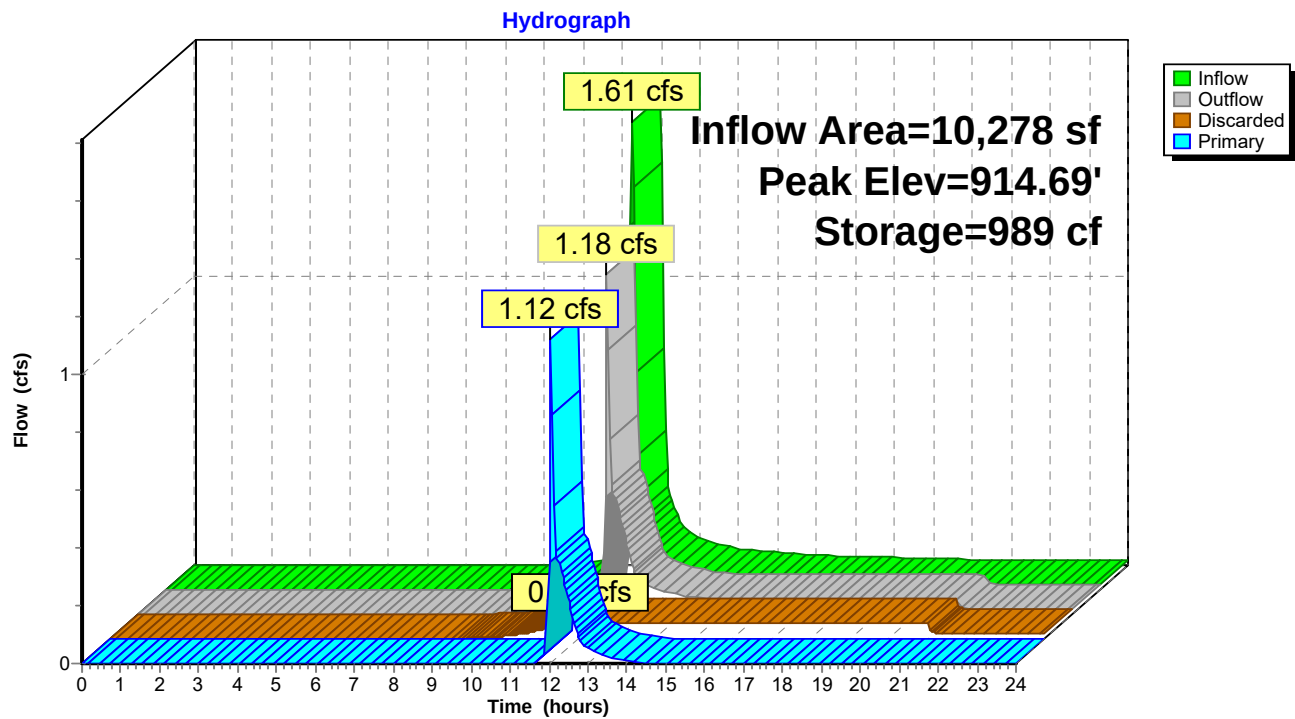
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 912.00              | 800                  | 0                         | 0                         |
| 913.00              | 800                  | 800                       | 800                       |
| 914.00              | 800                  | 800                       | 1,600                     |
| 914.75              | 800                  | 600                       | 2,200                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                           |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 914.50' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32 |
| #2     | Primary   | 913.50' | <b>4.0" Round Culvert</b><br>L= 10.0' CMP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 913.50' / 912.50' S= 0.1000 ' / Cc= 0.900<br>n= 0.024, Flow Area= 0.09 sf                                                           |
| #3     | Discarded | 912.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = -4.00'                                                                                                                                      |

**Discarded OutFlow** Max=0.06 cfs @ 12.06 hrs HW=914.65' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.06 cfs)

**Primary OutFlow** Max=1.02 cfs @ 12.05 hrs HW=914.66' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 0.64 cfs @ 1.01 fps)  
 ↳ **2=Culvert** (Barrel Controls 0.38 cfs @ 4.38 fps)



**Pond 3p: Subsurface Infiltration Bed #1**

**Summary for Pond 5P: Basin 1**

Inflow Area = 191,207 sf, 2.18% Impervious, Inflow Depth > 1.97" for 100-yr event  
 Inflow = 7.09 cfs @ 12.23 hrs, Volume= 31,387 cf  
 Outflow = 3.51 cfs @ 12.54 hrs, Volume= 26,041 cf, Atten= 50%, Lag= 18.7 min  
 Discarded = 0.42 cfs @ 12.54 hrs, Volume= 16,583 cf  
 Primary = 3.09 cfs @ 12.54 hrs, Volume= 9,458 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs  
 Peak Elev= 926.78' @ 12.54 hrs Surf.Area= 5,057 sf Storage= 8,959 cf

Plug-Flow detention time= 159.3 min calculated for 26,041 cf (83% of inflow)  
 Center-of-Mass det. time= 83.2 min ( 972.3 - 889.1 )

| Volume              | Invert               | Avail.Storage             | Storage Description                                        |
|---------------------|----------------------|---------------------------|------------------------------------------------------------|
| #1                  | 924.50'              | 15,897 cf                 | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet)                                  |
| 924.50              | 2,838                | 0                         | 0                                                          |
| 925.00              | 3,298                | 1,534                     | 1,534                                                      |
| 926.00              | 4,260                | 3,779                     | 5,313                                                      |
| 927.00              | 5,278                | 4,769                     | 10,082                                                     |
| 928.00              | 6,352                | 5,815                     | 15,897                                                     |

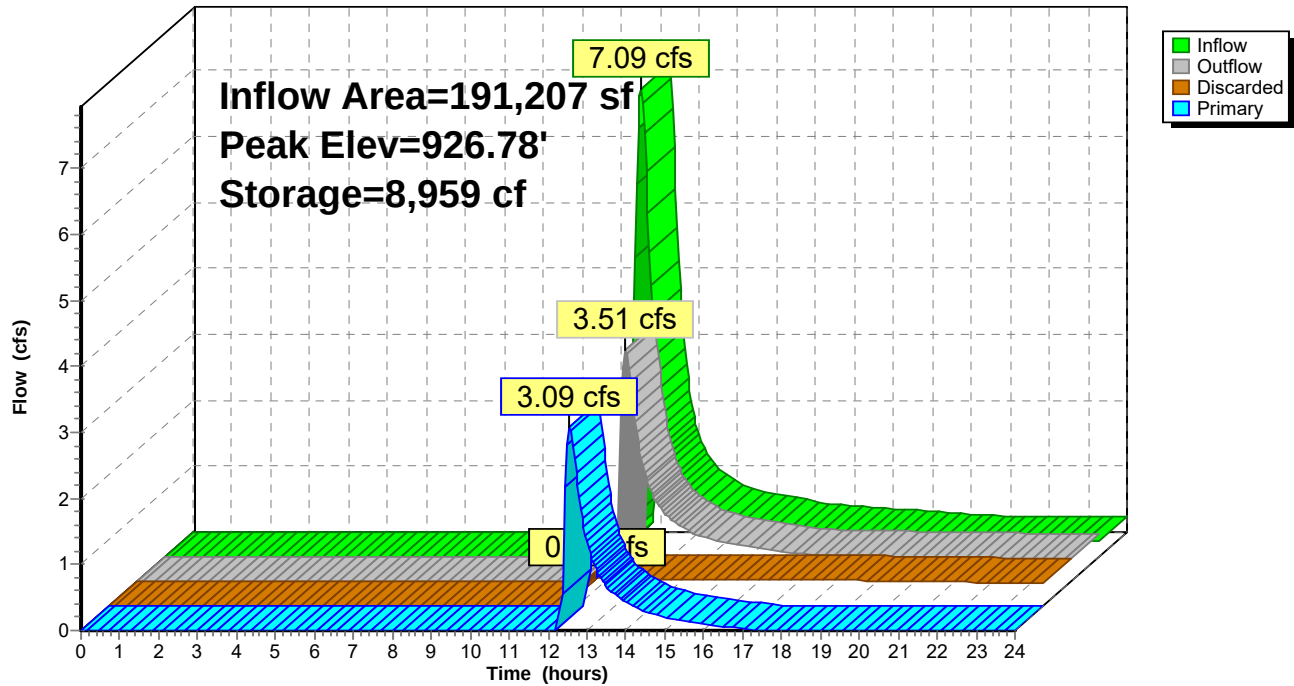
| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 927.00' | <b>20.0' long x 4.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66<br>2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32 |
| #2     | Device 4  | 926.50' | <b>24.0" Horiz. Orifice/Grate C= 0.600</b><br>Limited to weir flow at low heads                                                                                                                                                                                                   |
| #3     | Discarded | 924.50' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 916.00'                                                                                                                                                                              |
| #4     | Primary   | 924.50' | <b>18.0" Round Culvert</b><br>L= 50.0' Box, headwall w/3 rounded edges, Ke= 0.200<br>Inlet / Outlet Invert= 924.50' / 918.00' S= 0.1300 '/' Cc= 0.900<br>n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf                                                              |

**Discarded OutFlow** Max=0.42 cfs @ 12.54 hrs HW=926.78' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.42 cfs)

**Primary OutFlow** Max=3.07 cfs @ 12.54 hrs HW=926.78' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **4=Culvert** (Passes 3.07 cfs of 13.16 cfs potential flow)  
 ↳ **2=Orifice/Grate** (Weir Controls 3.07 cfs @ 1.74 fps)

**Pond 5P: Basin 1**

Hydrograph



**Summary for Pond 17P: Subsurface Infiltration Bed #2**

Inflow Area = 5,684 sf, 6.60% Impervious, Inflow Depth > 4.77" for 100-yr event  
 Inflow = 1.05 cfs @ 11.98 hrs, Volume= 2,258 cf  
 Outflow = 1.04 cfs @ 11.99 hrs, Volume= 2,254 cf, Atten= 2%, Lag= 0.7 min  
 Discarded = 0.04 cfs @ 11.99 hrs, Volume= 1,363 cf  
 Primary = 1.00 cfs @ 11.99 hrs, Volume= 891 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.04 hrs / 2  
 Peak Elev= 913.44' @ 11.99 hrs Surf.Area= 575 sf Storage= 378 cf

Plug-Flow detention time= 31.1 min calculated for 2,254 cf (100% of inflow)  
 Center-of-Mass det. time= 30.1 min ( 846.8 - 816.7 )

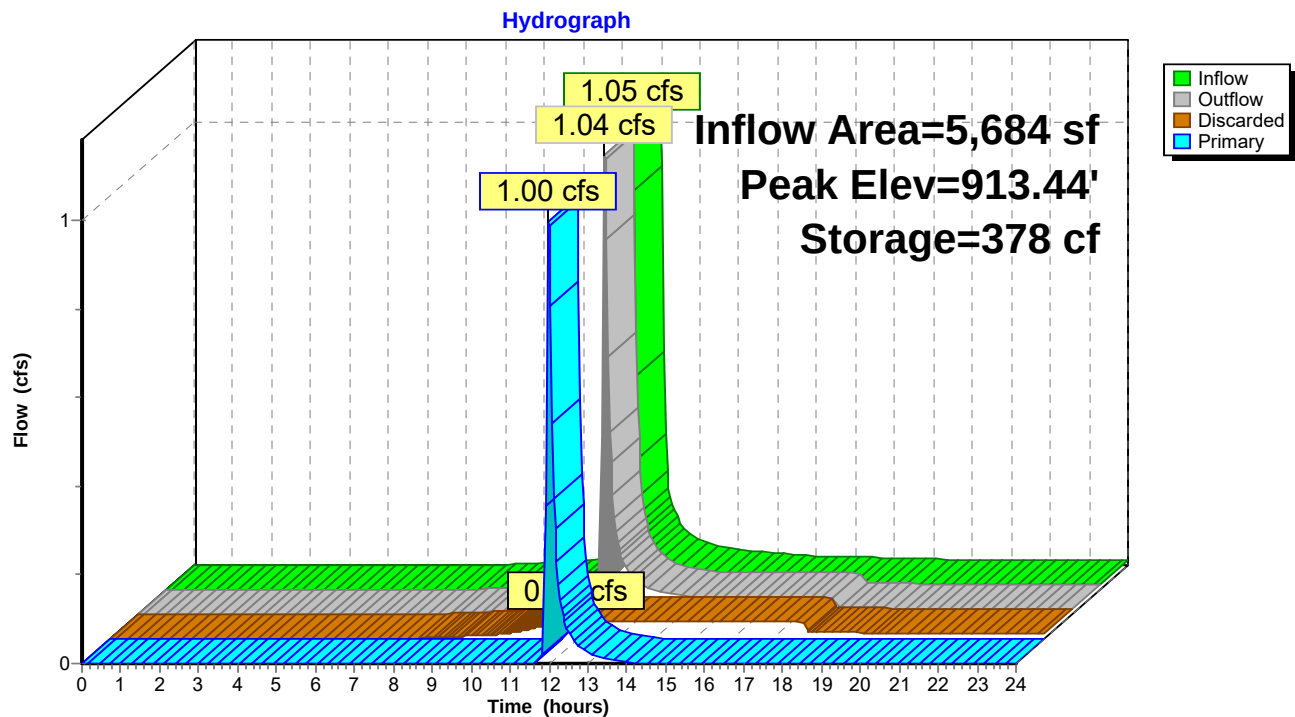
| Volume | Invert  | Avail.Storage | Storage Description                                                                                                  |
|--------|---------|---------------|----------------------------------------------------------------------------------------------------------------------|
| #1     | 912.00' | 314 cf        | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)<br>863 cf Overall - 79 cf Embedded = 784 cf x 40.0% Voids |
| #2     | 912.00' | 79 cf         | <b>12.0" Round Pipe Storage</b> x 4 Inside #1<br>L= 25.0'                                                            |
|        |         | 392 cf        | Total Available Storage                                                                                              |

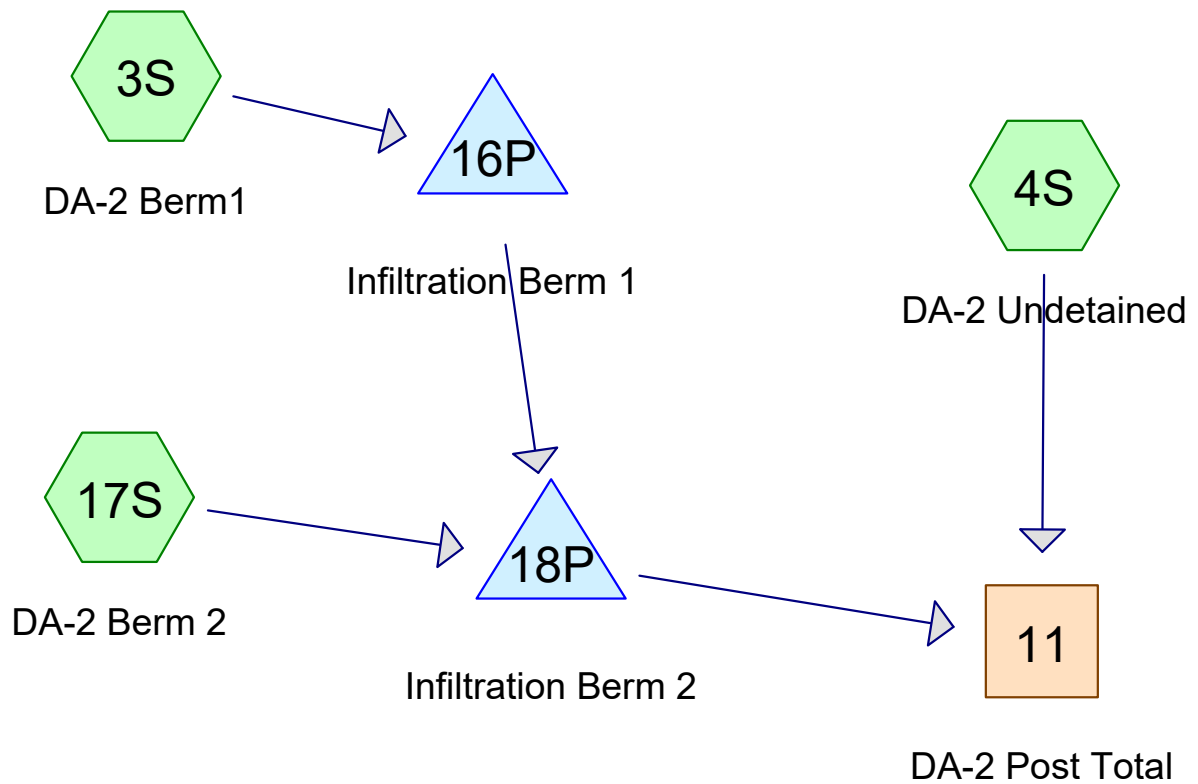
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 912.00              | 575                  | 0                         | 0                         |
| 913.00              | 575                  | 575                       | 575                       |
| 913.50              | 575                  | 288                       | 863                       |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                           |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 913.30' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32 |
| #2     | Primary   | 912.80' | <b>6.0" Round Culvert</b><br>L= 12.0' CMP, projecting, no headwall, Ke= 0.900<br>Inlet / Outlet Invert= 912.80' / 912.00' S= 0.0667 '/' Cc= 0.900<br>n= 0.012, Flow Area= 0.20 sf                                                        |
| #3     | Discarded | 912.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = -4.00'                                                                                                                                      |

**Discarded OutFlow** Max=0.04 cfs @ 11.99 hrs HW=913.44' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.04 cfs)

**Primary OutFlow** Max=0.97 cfs @ 11.99 hrs HW=913.44' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 0.51 cfs @ 0.94 fps)  
 ↳ **2=Culvert** (Inlet Controls 0.46 cfs @ 2.36 fps)

**Pond 17P: Subsurface Infiltration Bed #2**



**MLV 505LD86\_PostwBMP DA2- REV 2**

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**Area Listing (all nodes)**

| Area<br>(sq-ft) | CN        | Description<br>(subcatchment-numbers)   |
|-----------------|-----------|-----------------------------------------|
| 11,069          | 98        | Imperviuos (3S)                         |
| 12,601          | 30        | Meadow, non-grazed, HSG A (3S, 4S)      |
| 47,169          | 78        | Meadow, non-grazed, HSG D (3S, 4S, 17S) |
| 4,961           | 30        | Woods, Good, HSG A (3S)                 |
| <b>75,800</b>   | <b>70</b> | <b>TOTAL AREA</b>                       |

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**Soil Listing (all nodes)**

| Area<br>(sq-ft) | Soil<br>Group | Subcatchment<br>Numbers |
|-----------------|---------------|-------------------------|
| 17,562          | HSG A         | 3S, 4S                  |
| 0               | HSG B         |                         |
| 0               | HSG C         |                         |
| 47,169          | HSG D         | 3S, 4S, 17S             |
| 11,069          | Other         | 3S                      |
| <b>75,800</b>   |               | <b>TOTAL AREA</b>       |



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**Ground Covers (all nodes)**

| HSG-A<br>(sq-ft) | HSG-B<br>(sq-ft) | HSG-C<br>(sq-ft) | HSG-D<br>(sq-ft) | Other<br>(sq-ft) | Total<br>(sq-ft) | Ground<br>Cover       | Subcat<br>Number |
|------------------|------------------|------------------|------------------|------------------|------------------|-----------------------|------------------|
| 0                | 0                | 0                | 0                | 11,069           | 11,069           | Imperviuos            |                  |
| 12,601           | 0                | 0                | 47,169           | 0                | 59,770           | Meadow,<br>non-grazed |                  |
| 4,961            | 0                | 0                | 0                | 0                | 4,961            | Woods, Good           |                  |
| <b>17,562</b>    | <b>0</b>         | <b>0</b>         | <b>47,169</b>    | <b>11,069</b>    | <b>75,800</b>    | <b>TOTAL AREA</b>     |                  |

**MLV 505LD86\_PostwBMP DA2- REV 2***Type II 24-hr 1-yr Rainfall=2.72"*

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Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment3S: DA-2 Berm1**

Runoff Area=63,791 sf 17.35% Impervious Runoff Depth>0.48"  
Flow Length=526' Tc=15.7 min CN=68 Runoff=0.72 cfs 2,577 cf

**Subcatchment4S: DA-2 Undetained**

Runoff Area=7,345 sf 0.00% Impervious Runoff Depth>0.83"  
Flow Length=221' Tc=3.0 min CN=76 Runoff=0.28 cfs 508 cf

**Subcatchment17S: DA-2 Berm 2**

Runoff Area=4,664 sf 0.00% Impervious Runoff Depth>0.93"  
Flow Length=40' Slope=0.1500 '/' Tc=3.0 min CN=78 Runoff=0.20 cfs 363 cf

**Reach 11: DA-2 Post Total**

Inflow=0.28 cfs 508 cf  
Outflow=0.28 cfs 508 cf

**Pond 16P: Infiltration Berm 1**

Peak Elev=969.94' Storage=824 cf Inflow=0.72 cfs 2,577 cf  
Discarded=0.09 cfs 2,571 cf Primary=0.00 cfs 0 cf Outflow=0.09 cfs 2,571 cf

**Pond 18P: Infiltration Berm 2**

Peak Elev=963.25' Storage=103 cf Inflow=0.20 cfs 363 cf  
Discarded=0.03 cfs 362 cf Primary=0.00 cfs 0 cf Outflow=0.03 cfs 362 cf

**Total Runoff Area = 75,800 sf Runoff Volume = 3,448 cf Average Runoff Depth = 0.55"**  
**85.40% Pervious = 64,731 sf 14.60% Impervious = 11,069 sf**

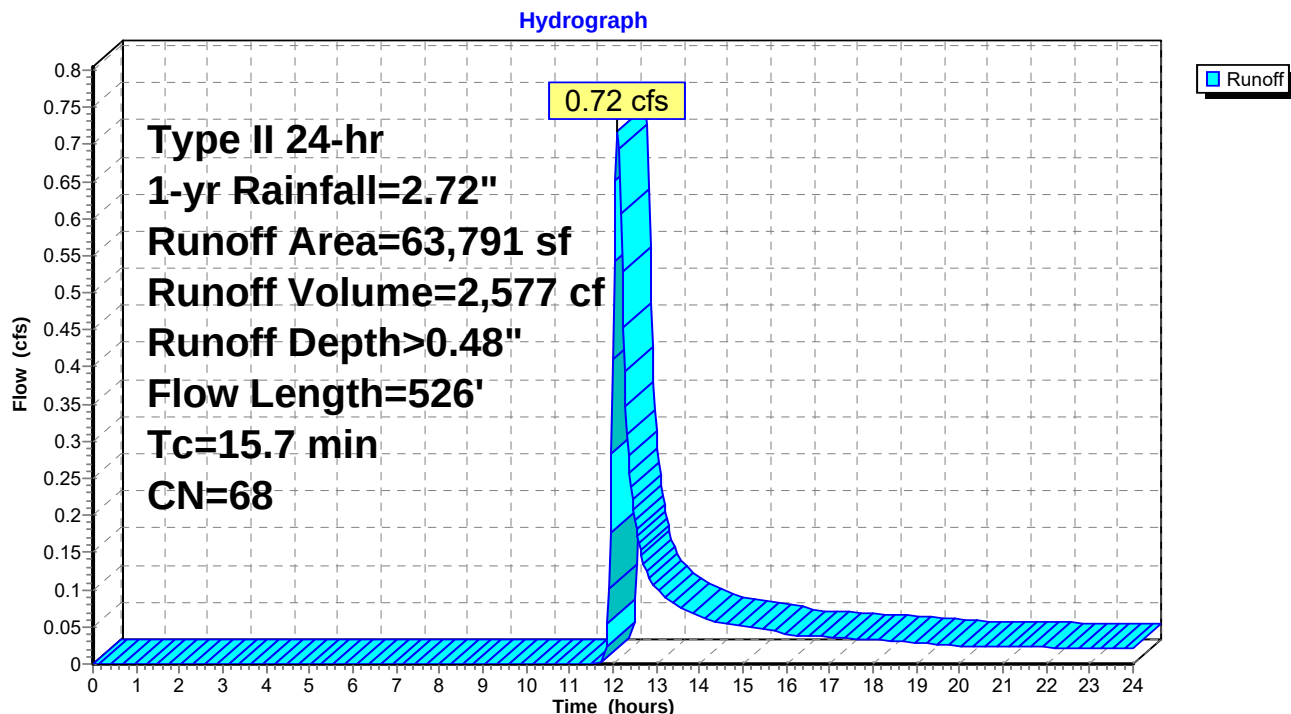
**Summary for Subcatchment 3S: DA-2 Berm1**

Runoff = 0.72 cfs @ 12.11 hrs, Volume= 2,577 cf, Depth> 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs  
Type II 24-hr 1-yr Rainfall=2.72"

|   | Area (sf) | CN | Description               |
|---|-----------|----|---------------------------|
| * | 11,069    | 98 | Imperviuos                |
|   | 4,961     | 30 | Woods, Good, HSG A        |
|   | 12,328    | 30 | Meadow, non-grazed, HSG A |
|   | 35,433    | 78 | Meadow, non-grazed, HSG D |
|   | 63,791    | 68 | Weighted Average          |
|   | 52,722    |    | 82.65% Pervious Area      |
|   | 11,069    |    | 17.35% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 12.2     | 100           | 0.0800        | 0.14              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 0.4      | 130           | 0.0885        | 6.04              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps              |
| 3.1      | 296           | 0.0507        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 15.7     | 526           | Total         |                   |                |                                                                      |

**Subcatchment 3S: DA-2 Berm1**

**Summary for Subcatchment 4S: DA-2 Undetained**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

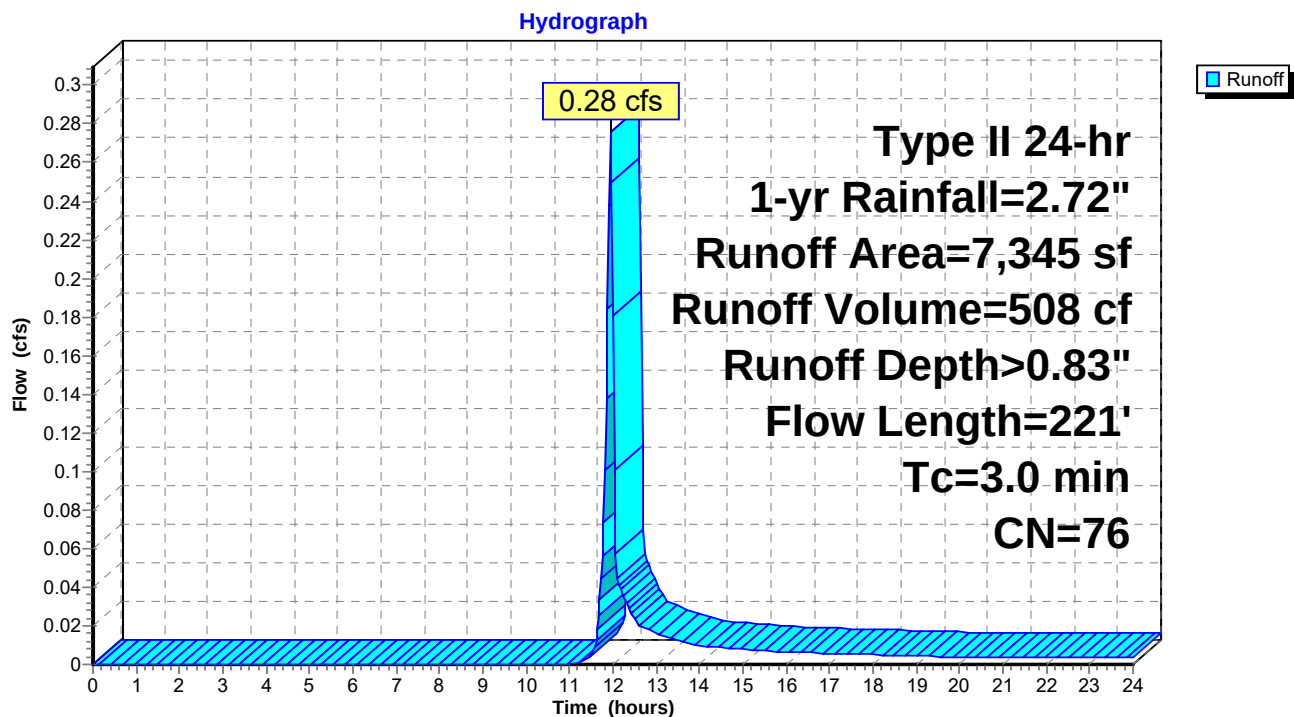
Runoff = 0.28 cfs @ 11.94 hrs, Volume= 508 cf, Depth&gt; 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs,  $dt=0.03$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 273       | 30 | Meadow, non-grazed, HSG A |
| 7,072     | 78 | Meadow, non-grazed, HSG D |
| 7,345     | 76 | Weighted Average          |
| 7,345     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                        |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------|
| 1.8      | 31            | 0.1290        | 0.29              |                | Sheet Flow,<br>Grass: Short n= 0.150 P2= 3.26"     |
| 1.2      | 190           | 0.2580        | 2.54              |                | Shallow Concentrated Flow,<br>Woodland Kv= 5.0 fps |
| 3.0      | 221           | Total         |                   |                |                                                    |

**Subcatchment 4S: DA-2 Undetained**

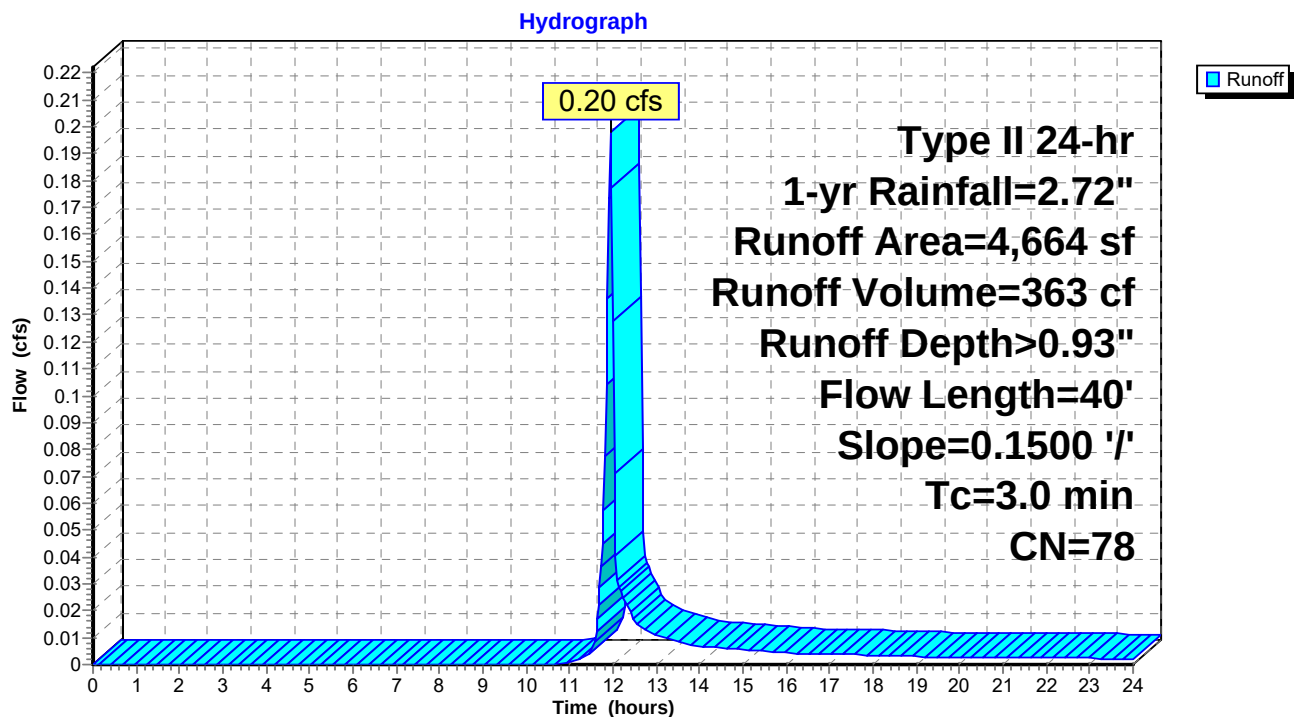
**Summary for Subcatchment 17S: DA-2 Berm 2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.20 cfs @ 11.94 hrs, Volume= 363 cf, Depth&gt; 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs,  $dt=0.03$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 4,664     | 78 | Meadow, non-grazed, HSG D |
| 4,664     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                    |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------|
| 3.0      | 40            | 0.1500        | 0.22              |                | Sheet Flow,<br>Grass: Dense n= 0.240 P2= 3.26" |

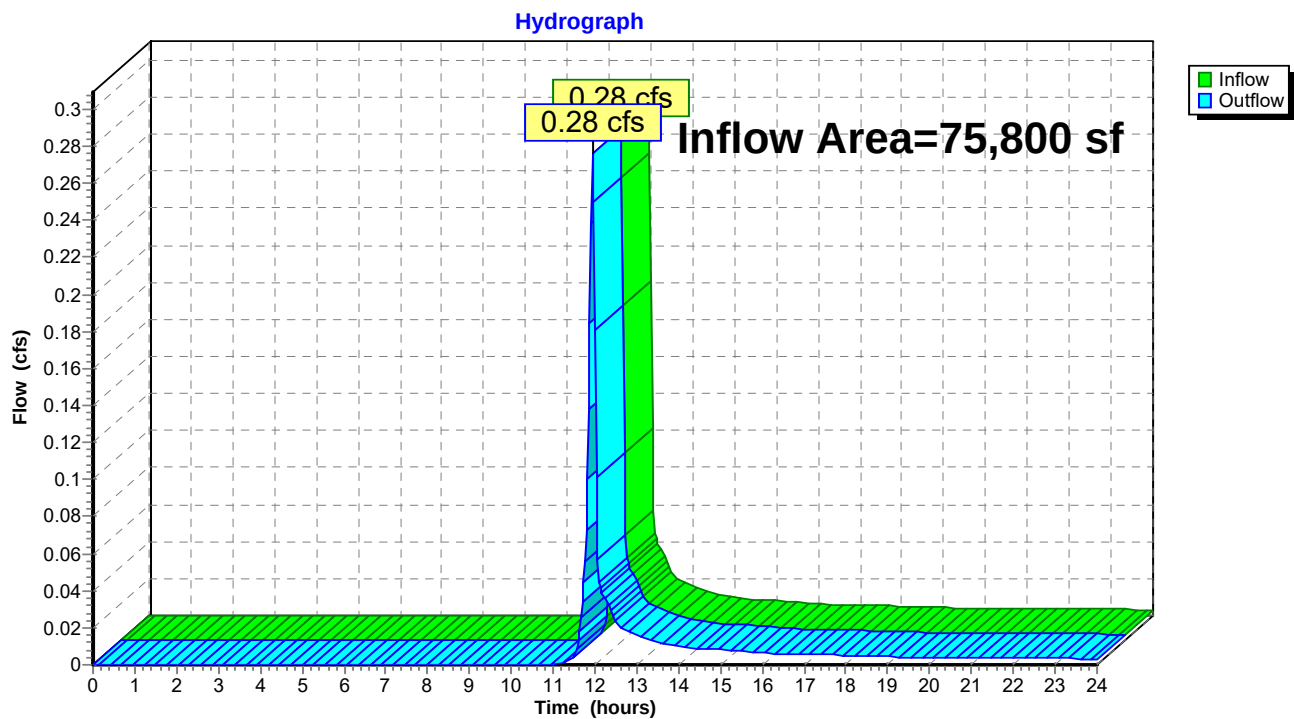
**Subcatchment 17S: DA-2 Berm 2**

**Summary for Reach 11: DA-2 Post Total**

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

Inflow Area = 75,800 sf, 14.60% Impervious, Inflow Depth > 0.08" for 1-yr event  
Inflow = 0.28 cfs @ 11.94 hrs, Volume= 508 cf  
Outflow = 0.28 cfs @ 11.94 hrs, Volume= 508 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs

**Reach 11: DA-2 Post Total**

**Summary for Pond 16P: Infiltration Berm 1**

Inflow Area = 63,791 sf, 17.35% Impervious, Inflow Depth > 0.48" for 1-yr event  
 Inflow = 0.72 cfs @ 12.11 hrs, Volume= 2,577 cf  
 Outflow = 0.09 cfs @ 13.18 hrs, Volume= 2,571 cf, Atten= 87%, Lag= 64.2 min  
 Discarded = 0.09 cfs @ 13.18 hrs, Volume= 2,571 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 2  
 Peak Elev= 969.94' @ 13.18 hrs Surf.Area= 1,250 sf Storage= 824 cf

Plug-Flow detention time= 97.1 min calculated for 2,571 cf (100% of inflow)  
 Center-of-Mass det. time= 95.9 min ( 997.1 - 901.2 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 969.00' | 2,871 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

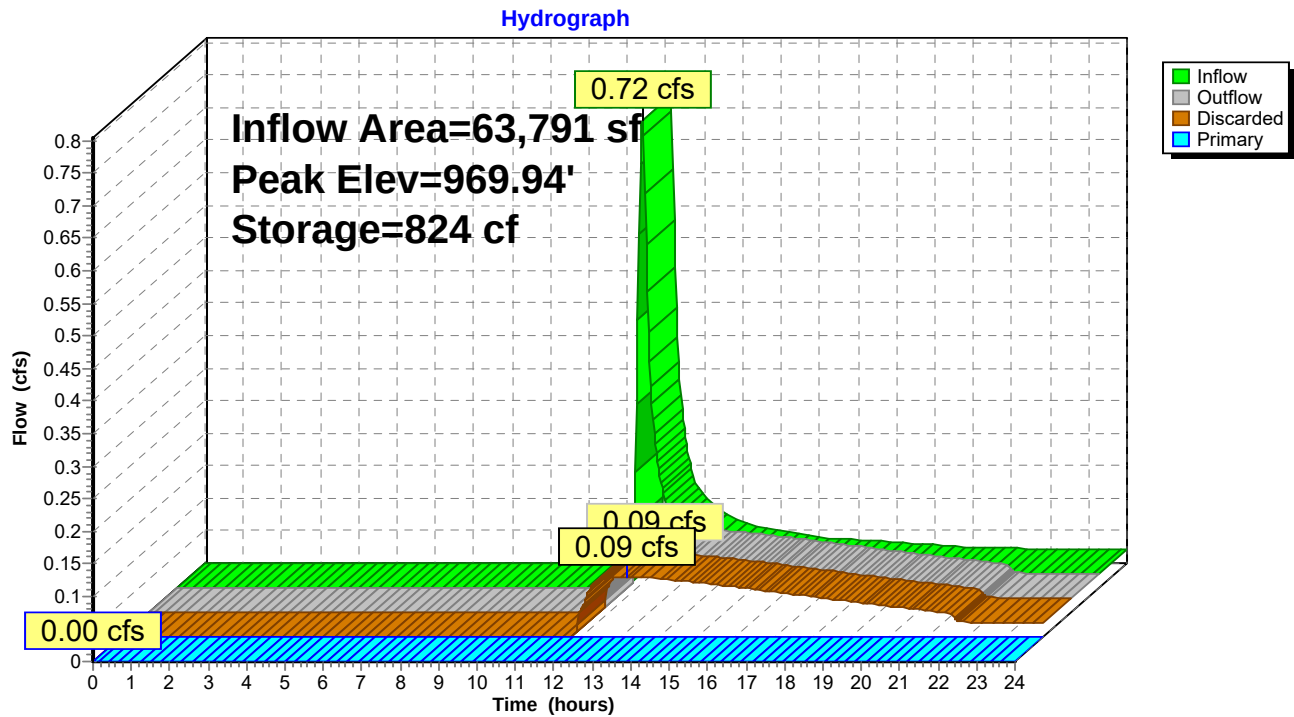
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 969.00              | 511                  | 0                         | 0                         |
| 970.00              | 1,300                | 906                       | 906                       |
| 971.00              | 2,579                | 1,940                     | 2,845                     |
| 971.01              | 2,579                | 26                        | 2,871                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                     |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 971.00' | <b>128.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65<br>2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88 |
| #2     | Primary   | 970.50' | <b>5.0' long x 2.0' breadth Broad-Crested Rectangular Weir X 3.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32                                    |
| #3     | Discarded | 969.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 958.00'                                                                                                                                                                               |

**Discarded OutFlow** Max=0.09 cfs @ 13.18 hrs HW=969.94' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.09 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=969.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Pond 16P: Infiltration Berm 1





**Summary for Pond 18P: Infiltration Berm 2**

Inflow Area = 68,455 sf, 16.17% Impervious, Inflow Depth > 0.06" for 1-yr event  
 Inflow = 0.20 cfs @ 11.94 hrs, Volume= 363 cf  
 Outflow = 0.03 cfs @ 12.08 hrs, Volume= 362 cf, Atten= 83%, Lag= 8.6 min  
 Discarded = 0.03 cfs @ 12.08 hrs, Volume= 362 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 2  
 Peak Elev= 963.25' @ 12.08 hrs Surf.Area= 469 sf Storage= 103 cf

Plug-Flow detention time= 21.3 min calculated for 362 cf (100% of inflow)  
 Center-of-Mass det. time= 20.2 min ( 872.2 - 852.0 )

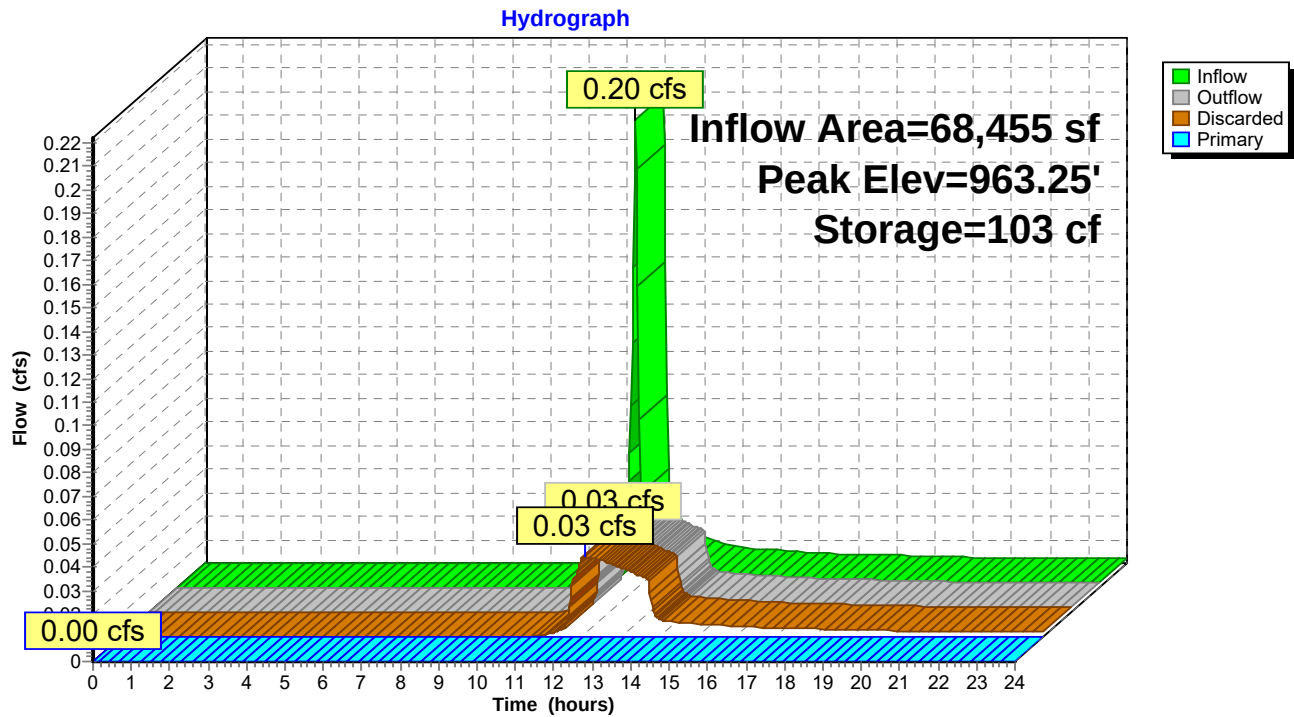
| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 963.00' | 1,736 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 963.00              | 340                  | 0                         | 0                         |
| 964.00              | 848                  | 594                       | 594                       |
| 965.00              | 1,407                | 1,128                     | 1,722                     |
| 965.01              | 1,407                | 14                        | 1,736                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 965.00' | <b>74.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65<br>2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88 |
| #2     | Primary   | 964.50' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir X 3.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32                                   |
| #3     | Discarded | 963.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 958.00'                                                                                                                                                                              |

**Discarded OutFlow** Max=0.03 cfs @ 12.08 hrs HW=963.25' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.03 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=963.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

**Pond 18P: Infiltration Berm 2**

**MLV 505LD86\_PostwBMP DA2- REV 2***Type II 24-hr 2-yr Rainfall=3.26"*

Prepared by {enter your company name here}

Printed 2/28/2022

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Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment3S: DA-2 Berm1**

Runoff Area=63,791 sf 17.35% Impervious Runoff Depth>0.76"  
Flow Length=526' Tc=15.7 min CN=68 Runoff=1.26 cfs 4,045 cf

**Subcatchment4S: DA-2 Undetained**

Runoff Area=7,345 sf 0.00% Impervious Runoff Depth>1.19"  
Flow Length=221' Tc=3.0 min CN=76 Runoff=0.40 cfs 730 cf

**Subcatchment17S: DA-2 Berm 2**

Runoff Area=4,664 sf 0.00% Impervious Runoff Depth>1.32"  
Flow Length=40' Slope=0.1500 ' / ' Tc=3.0 min CN=78 Runoff=0.28 cfs 512 cf

**Reach 11: DA-2 Post Total**

Inflow=0.40 cfs 730 cf  
Outflow=0.40 cfs 730 cf

**Pond 16P: Infiltration Berm 1**

Peak Elev=970.40' Storage=1,525 cf Inflow=1.26 cfs 4,045 cf  
Discarded=0.14 cfs 3,948 cf Primary=0.00 cfs 0 cf Outflow=0.14 cfs 3,948 cf

**Pond 18P: Infiltration Berm 2**

Peak Elev=963.38' Storage=164 cf Inflow=0.28 cfs 512 cf  
Discarded=0.04 cfs 511 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 511 cf

**Total Runoff Area = 75,800 sf Runoff Volume = 5,287 cf Average Runoff Depth = 0.84"**  
**85.40% Pervious = 64,731 sf 14.60% Impervious = 11,069 sf**

**Summary for Subcatchment 3S: DA-2 Berm1**

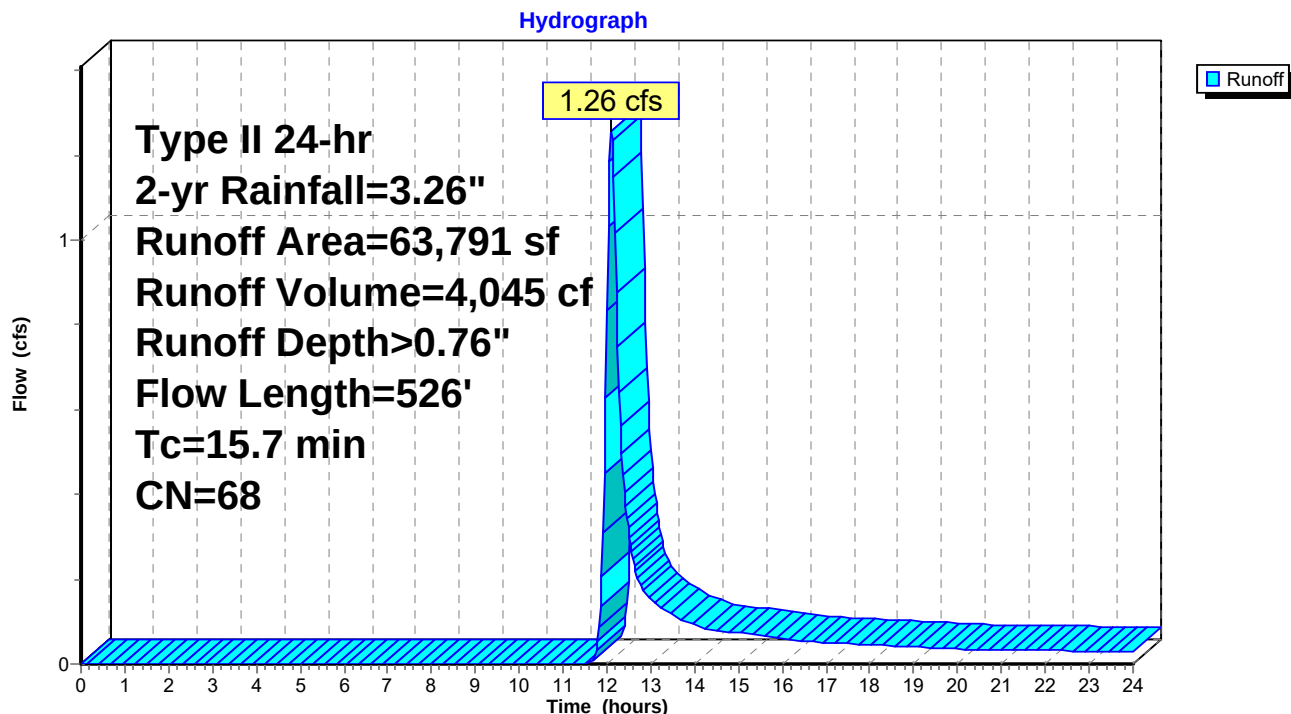
Runoff = 1.26 cfs @ 12.10 hrs, Volume= 4,045 cf, Depth> 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs  
Type II 24-hr 2-yr Rainfall=3.26"

|   | Area (sf) | CN | Description               |
|---|-----------|----|---------------------------|
| * | 11,069    | 98 | Impervious                |
|   | 4,961     | 30 | Woods, Good, HSG A        |
|   | 12,328    | 30 | Meadow, non-grazed, HSG A |
|   | 35,433    | 78 | Meadow, non-grazed, HSG D |
|   | 63,791    | 68 | Weighted Average          |
|   | 52,722    |    | 82.65% Pervious Area      |
|   | 11,069    |    | 17.35% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 12.2     | 100           | 0.0800        | 0.14              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 0.4      | 130           | 0.0885        | 6.04              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps              |
| 3.1      | 296           | 0.0507        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 15.7     | 526           | Total         |                   |                |                                                                      |

**Subcatchment 3S: DA-2 Berm1**

**Summary for Subcatchment 4S: DA-2 Undetained**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

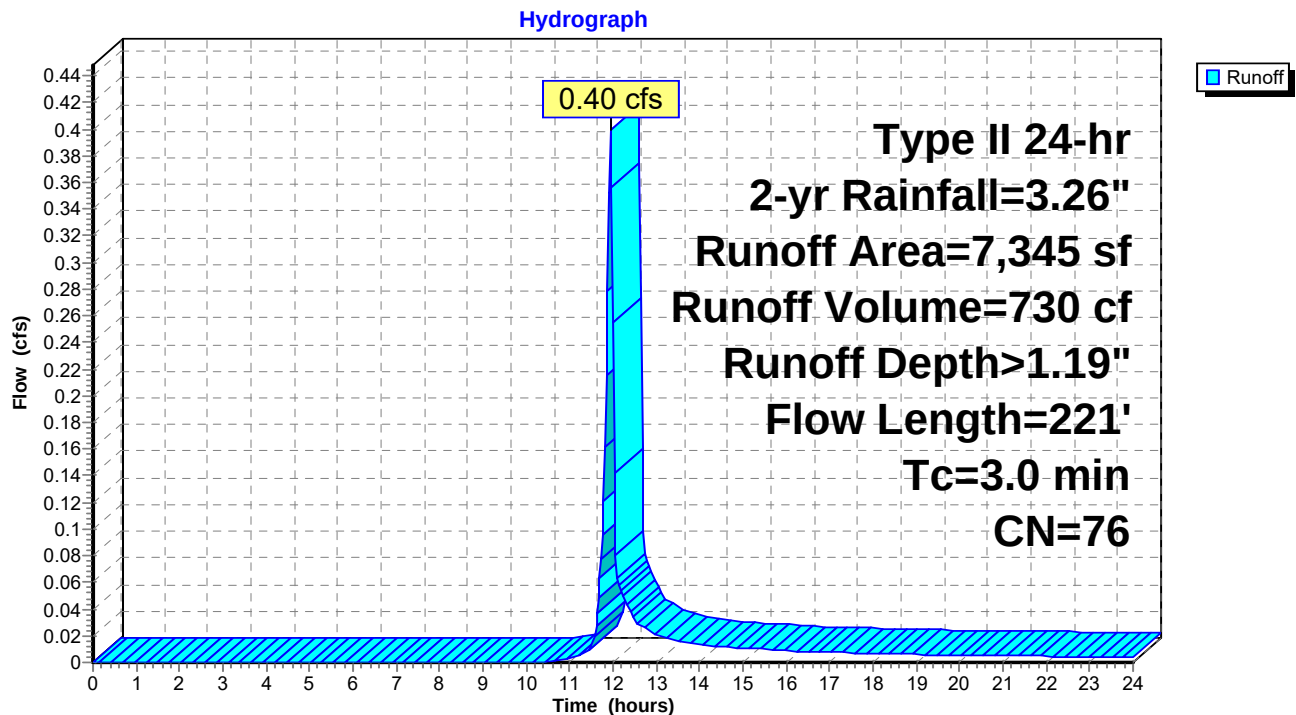
Runoff = 0.40 cfs @ 11.94 hrs, Volume= 730 cf, Depth&gt; 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs,  $dt=0.03$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 273       | 30 | Meadow, non-grazed, HSG A |
| 7,072     | 78 | Meadow, non-grazed, HSG D |
| 7,345     | 76 | Weighted Average          |
| 7,345     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                        |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------|
| 1.8      | 31            | 0.1290        | 0.29              |                | Sheet Flow,<br>Grass: Short n= 0.150 P2= 3.26"     |
| 1.2      | 190           | 0.2580        | 2.54              |                | Shallow Concentrated Flow,<br>Woodland Kv= 5.0 fps |
| 3.0      | 221           | Total         |                   |                |                                                    |

**Subcatchment 4S: DA-2 Undetained**

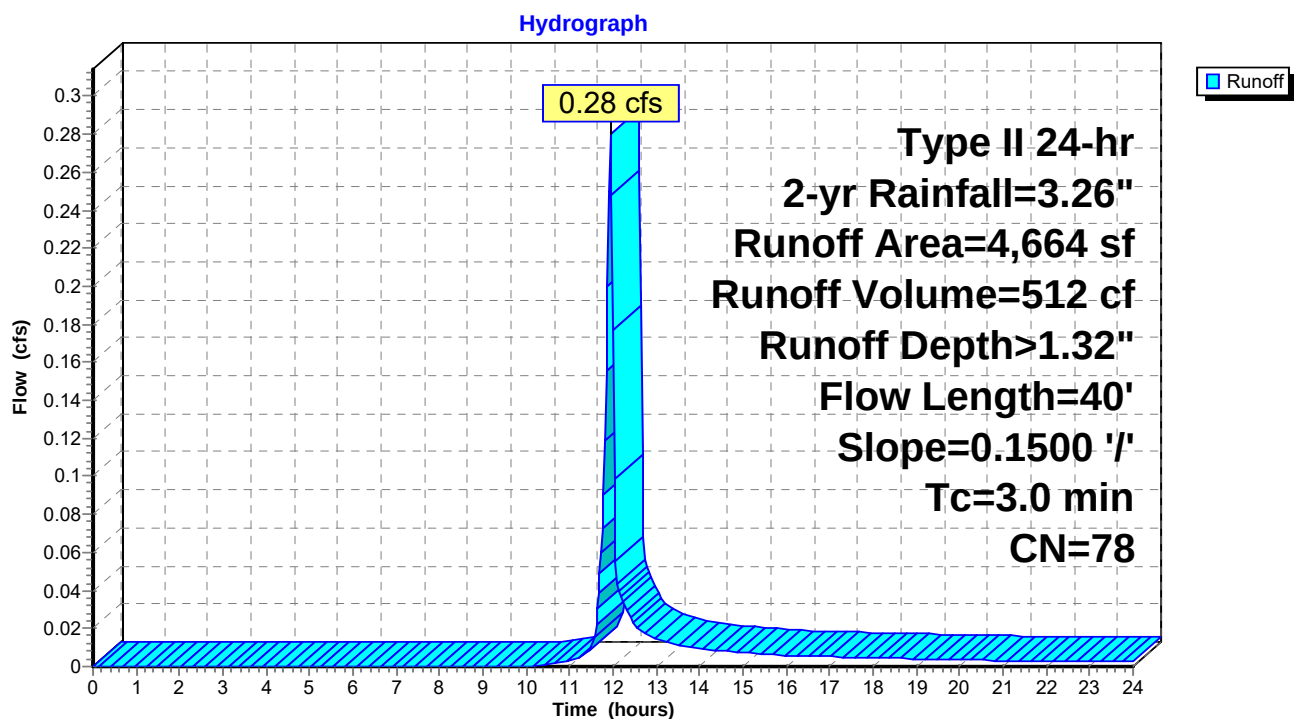
**Summary for Subcatchment 17S: DA-2 Berm 2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.28 cfs @ 11.94 hrs, Volume= 512 cf, Depth&gt; 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs,  $dt=0.03$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 4,664     | 78 | Meadow, non-grazed, HSG D |
| 4,664     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                    |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------|
| 3.0      | 40            | 0.1500        | 0.22              |                | Sheet Flow,<br>Grass: Dense n= 0.240 P2= 3.26" |

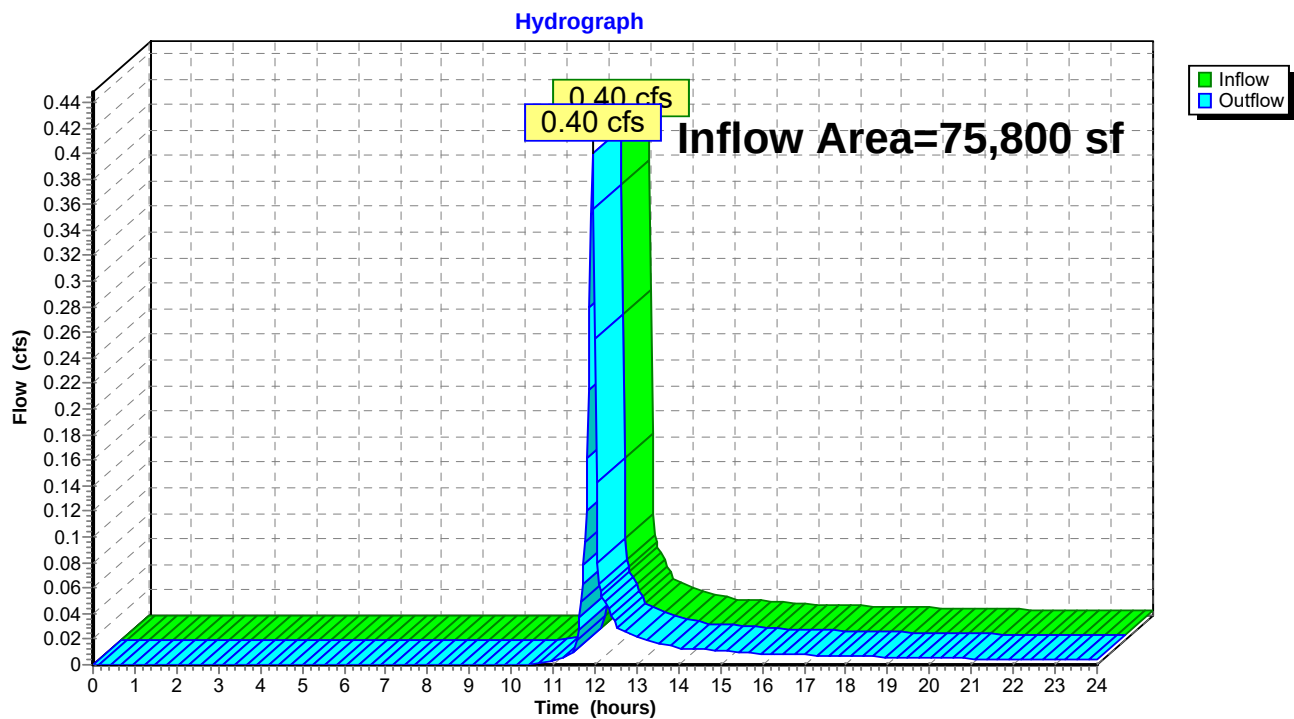
**Subcatchment 17S: DA-2 Berm 2**

**Summary for Reach 11: DA-2 Post Total**

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

Inflow Area = 75,800 sf, 14.60% Impervious, Inflow Depth > 0.12" for 2-yr event  
Inflow = 0.40 cfs @ 11.94 hrs, Volume= 730 cf  
Outflow = 0.40 cfs @ 11.94 hrs, Volume= 730 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs

**Reach 11: DA-2 Post Total**

**Summary for Pond 16P: Infiltration Berm 1**

Inflow Area = 63,791 sf, 17.35% Impervious, Inflow Depth > 0.76" for 2-yr event  
 Inflow = 1.26 cfs @ 12.10 hrs, Volume= 4,045 cf  
 Outflow = 0.14 cfs @ 13.19 hrs, Volume= 3,948 cf, Atten= 89%, Lag= 65.4 min  
 Discarded = 0.14 cfs @ 13.19 hrs, Volume= 3,948 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 2  
 Peak Elev= 970.40' @ 13.19 hrs Surf.Area= 1,810 sf Storage= 1,525 cf

Plug-Flow detention time= 143.8 min calculated for 3,943 cf (97% of inflow)  
 Center-of-Mass det. time= 130.7 min ( 1,015.0 - 884.3 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 969.00' | 2,871 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 969.00              | 511                  | 0                         | 0                         |
| 970.00              | 1,300                | 906                       | 906                       |
| 971.00              | 2,579                | 1,940                     | 2,845                     |
| 971.01              | 2,579                | 26                        | 2,871                     |

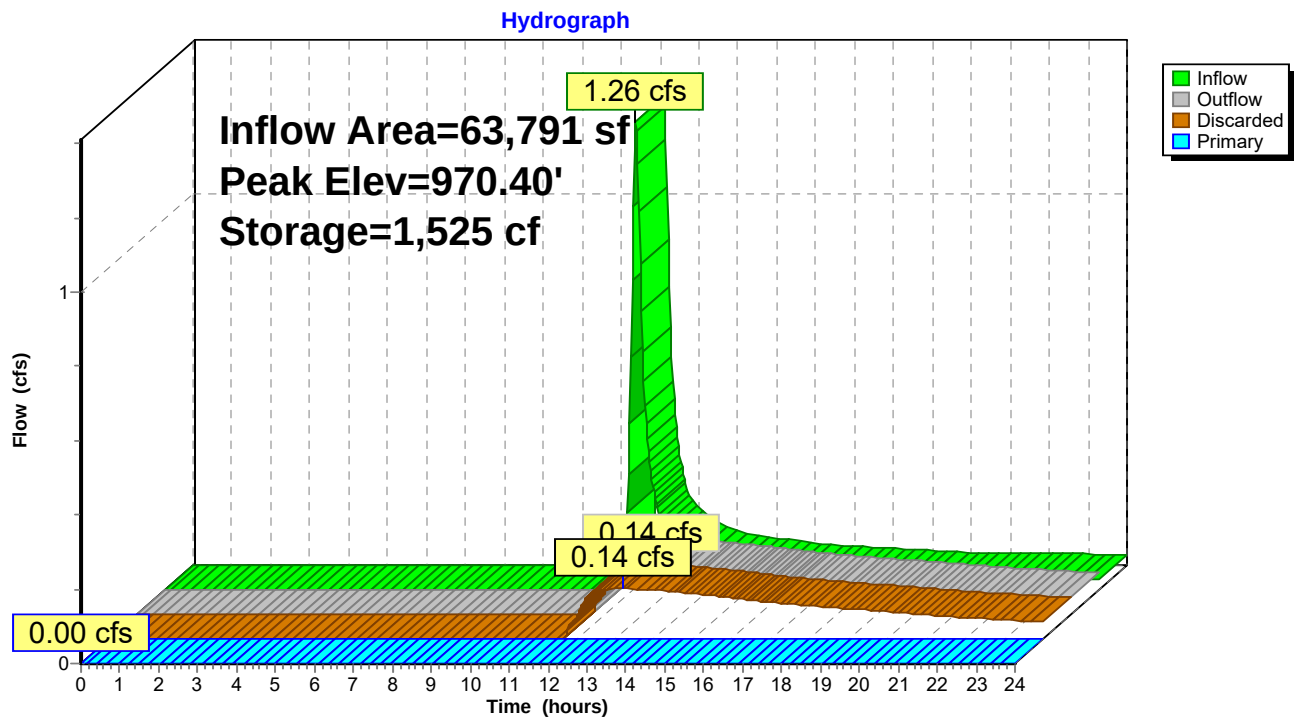
| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                     |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 971.00' | <b>128.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65<br>2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88 |
| #2     | Primary   | 970.50' | <b>5.0' long x 2.0' breadth Broad-Crested Rectangular Weir X 3.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32                                    |
| #3     | Discarded | 969.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 958.00'                                                                                                                                                                               |

**Discarded OutFlow** Max=0.14 cfs @ 13.19 hrs HW=970.40' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.14 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=969.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)



## Pond 16P: Infiltration Berm 1



**Summary for Pond 18P: Infiltration Berm 2**

Inflow Area = 68,455 sf, 16.17% Impervious, Inflow Depth > 0.09" for 2-yr event  
 Inflow = 0.28 cfs @ 11.94 hrs, Volume= 512 cf  
 Outflow = 0.04 cfs @ 12.13 hrs, Volume= 511 cf, Atten= 86%, Lag= 11.4 min  
 Discarded = 0.04 cfs @ 12.13 hrs, Volume= 511 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 2  
 Peak Elev= 963.38' @ 12.13 hrs Surf.Area= 531 sf Storage= 164 cf

Plug-Flow detention time= 32.2 min calculated for 511 cf (100% of inflow)  
 Center-of-Mass det. time= 31.2 min ( 872.9 - 841.7 )

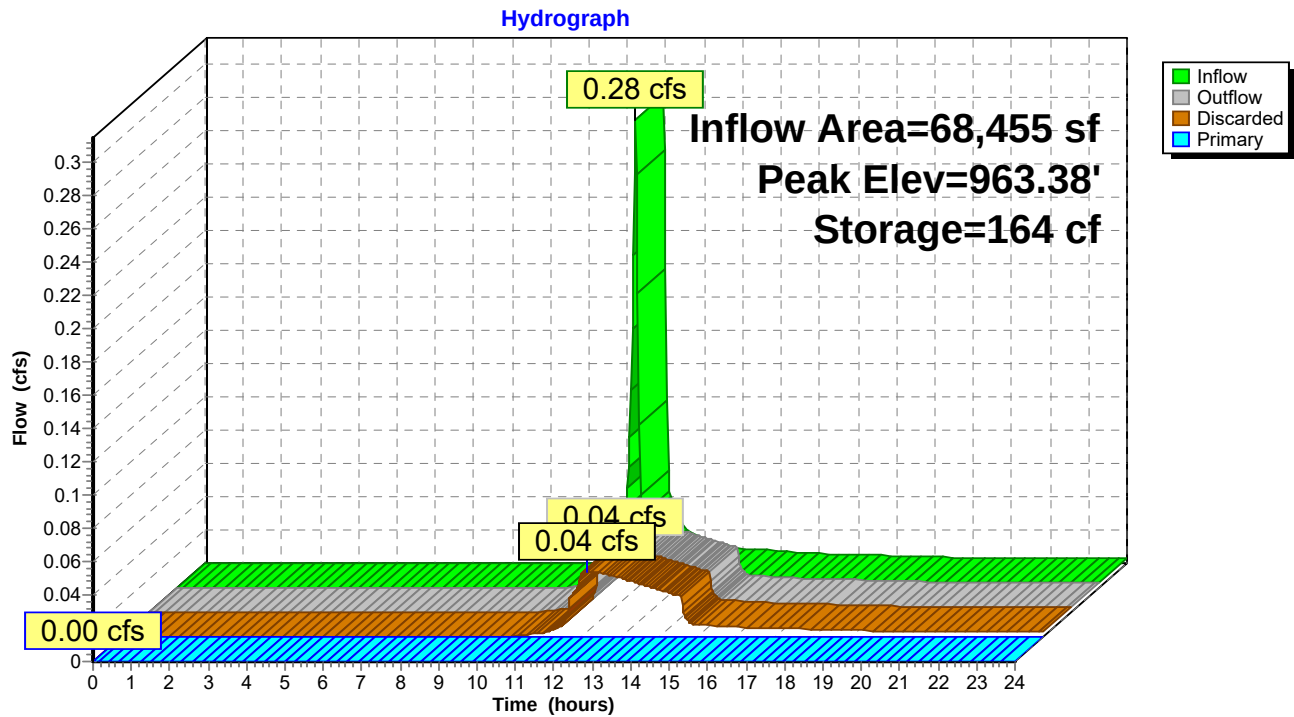
| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 963.00' | 1,736 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 963.00              | 340                  | 0                         | 0                         |
| 964.00              | 848                  | 594                       | 594                       |
| 965.00              | 1,407                | 1,128                     | 1,722                     |
| 965.01              | 1,407                | 14                        | 1,736                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 965.00' | <b>74.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65<br>2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88 |
| #2     | Primary   | 964.50' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir X 3.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32                                   |
| #3     | Discarded | 963.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 958.00'                                                                                                                                                                              |

**Discarded OutFlow** Max=0.04 cfs @ 12.13 hrs HW=963.38' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.04 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=963.00' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

**Pond 18P: Infiltration Berm 2**

**MLV 505LD86\_PostwBMP DA2- REV 2***Type II 24-hr 10-yr Rainfall=4.74"*

Prepared by {enter your company name here}

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Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment3S: DA-2 Berm1**

Runoff Area=63,791 sf 17.35% Impervious Runoff Depth>1.69"  
Flow Length=526' Tc=15.7 min CN=68 Runoff=3.06 cfs 8,976 cf

**Subcatchment4S: DA-2 Undetained**

Runoff Area=7,345 sf 0.00% Impervious Runoff Depth>2.32"  
Flow Length=221' Tc=3.0 min CN=76 Runoff=0.77 cfs 1,421 cf

**Subcatchment17S: DA-2 Berm 2**

Runoff Area=4,664 sf 0.00% Impervious Runoff Depth>2.49"  
Flow Length=40' Slope=0.1500 '/' Tc=3.0 min CN=78 Runoff=0.52 cfs 968 cf

**Reach 11: DA-2 Post Total**

Inflow=1.84 cfs 3,207 cf  
Outflow=1.84 cfs 3,207 cf

**Pond 16P: Infiltration Berm 1**

Peak Elev=970.66' Storage=2,043 cf Inflow=3.06 cfs 8,976 cf  
Discarded=0.16 cfs 5,408 cf Primary=2.45 cfs 2,973 cf Outflow=2.61 cfs 8,382 cf

**Pond 18P: Infiltration Berm 2**

Peak Elev=964.65' Storage=1,263 cf Inflow=2.51 cfs 3,941 cf  
Discarded=0.10 cfs 2,163 cf Primary=1.75 cfs 1,786 cf Outflow=1.85 cfs 3,949 cf

**Total Runoff Area = 75,800 sf Runoff Volume = 11,365 cf Average Runoff Depth = 1.80"**  
**85.40% Pervious = 64,731 sf 14.60% Impervious = 11,069 sf**

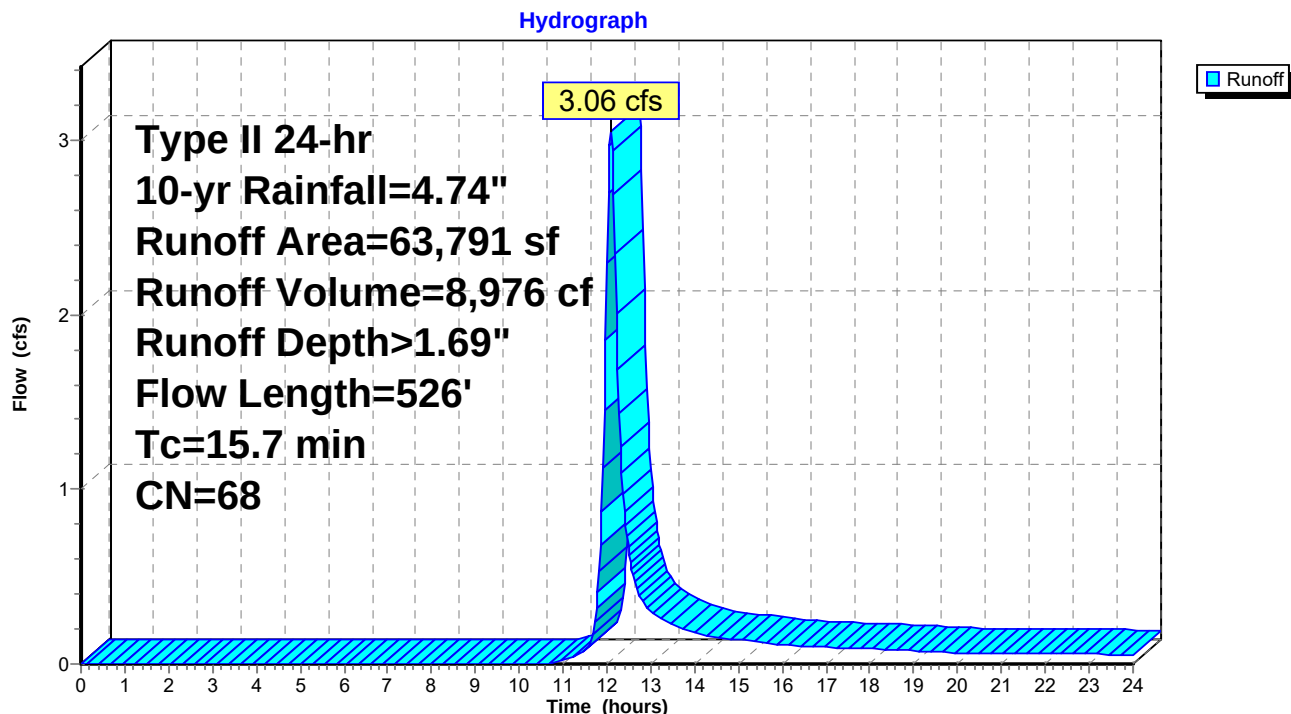
**Summary for Subcatchment 3S: DA-2 Berm1**

Runoff = 3.06 cfs @ 12.09 hrs, Volume= 8,976 cf, Depth> 1.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs  
Type II 24-hr 10-yr Rainfall=4.74"

|   | Area (sf) | CN | Description               |
|---|-----------|----|---------------------------|
| * | 11,069    | 98 | Impervious                |
|   | 4,961     | 30 | Woods, Good, HSG A        |
|   | 12,328    | 30 | Meadow, non-grazed, HSG A |
|   | 35,433    | 78 | Meadow, non-grazed, HSG D |
|   | 63,791    | 68 | Weighted Average          |
|   | 52,722    |    | 82.65% Pervious Area      |
|   | 11,069    |    | 17.35% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 12.2     | 100           | 0.0800        | 0.14              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 0.4      | 130           | 0.0885        | 6.04              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps              |
| 3.1      | 296           | 0.0507        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 15.7     | 526           | Total         |                   |                |                                                                      |

**Subcatchment 3S: DA-2 Berm1**

**Summary for Subcatchment 4S: DA-2 Undetained**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

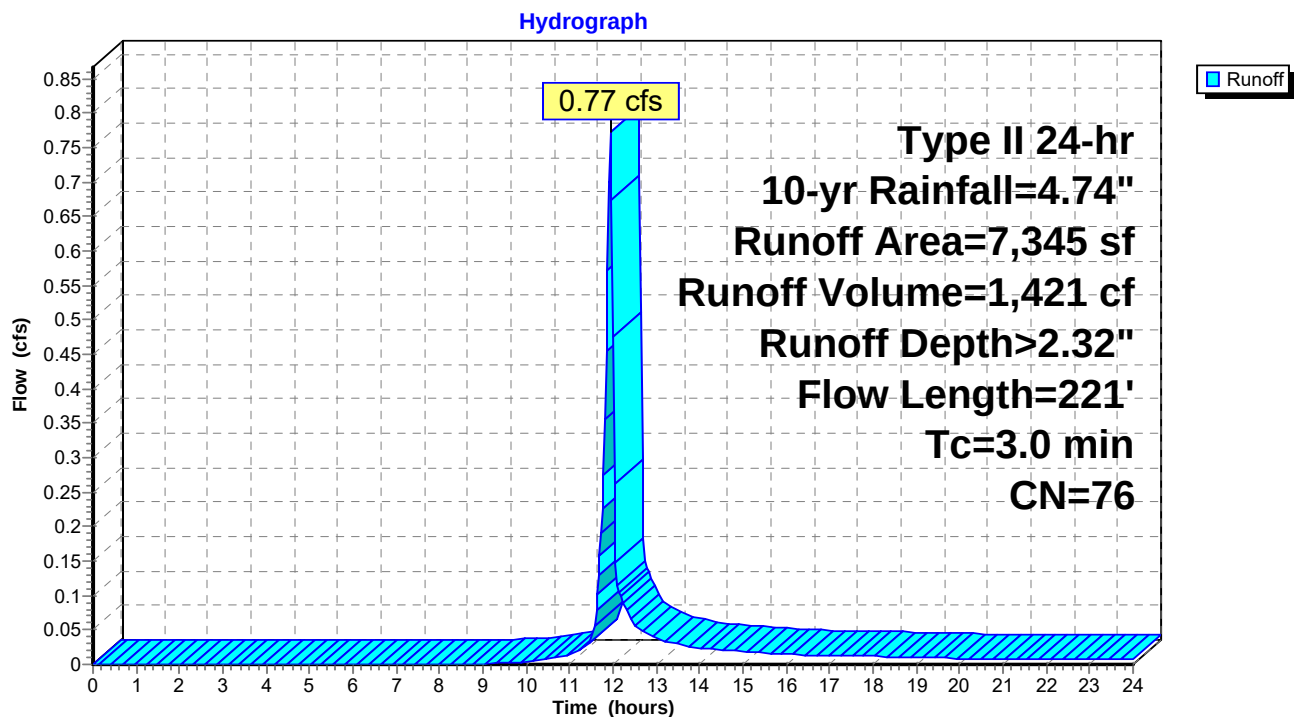
Runoff = 0.77 cfs @ 11.94 hrs, Volume= 1,421 cf, Depth&gt; 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs,  $dt=0.03$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 273       | 30 | Meadow, non-grazed, HSG A |
| 7,072     | 78 | Meadow, non-grazed, HSG D |
| 7,345     | 76 | Weighted Average          |
| 7,345     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                          |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------|
| 1.8      | 31            | 0.1290        | 0.29              |                | Sheet Flow,<br>Grass: Short $n=0.150$ $P2=3.26"$     |
| 1.2      | 190           | 0.2580        | 2.54              |                | Shallow Concentrated Flow,<br>Woodland $K_v=5.0$ fps |
| 3.0      | 221           | Total         |                   |                |                                                      |

**Subcatchment 4S: DA-2 Undetained**

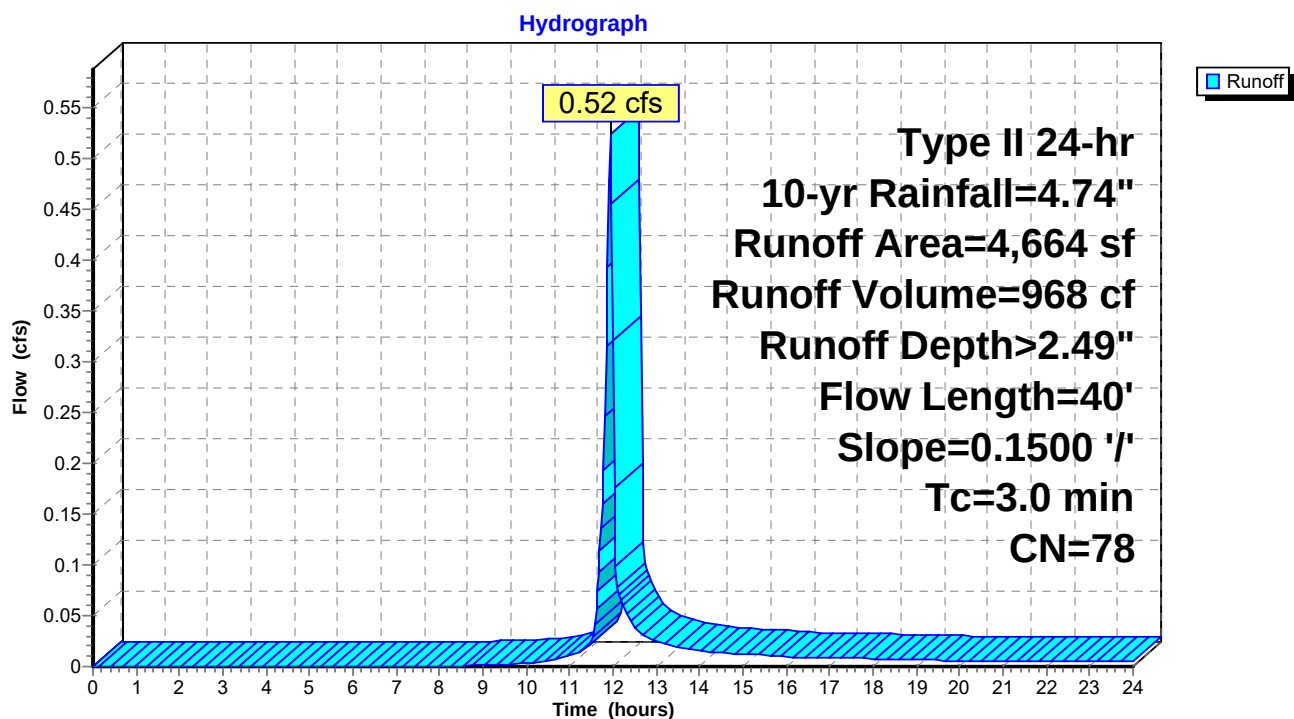
**Summary for Subcatchment 17S: DA-2 Berm 2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.52 cfs @ 11.94 hrs, Volume= 968 cf, Depth&gt; 2.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs,  $dt=0.03$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 4,664     | 78 | Meadow, non-grazed, HSG D |
| 4,664     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                    |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------|
| 3.0      | 40            | 0.1500        | 0.22              |                | Sheet Flow,<br>Grass: Dense n= 0.240 P2= 3.26" |

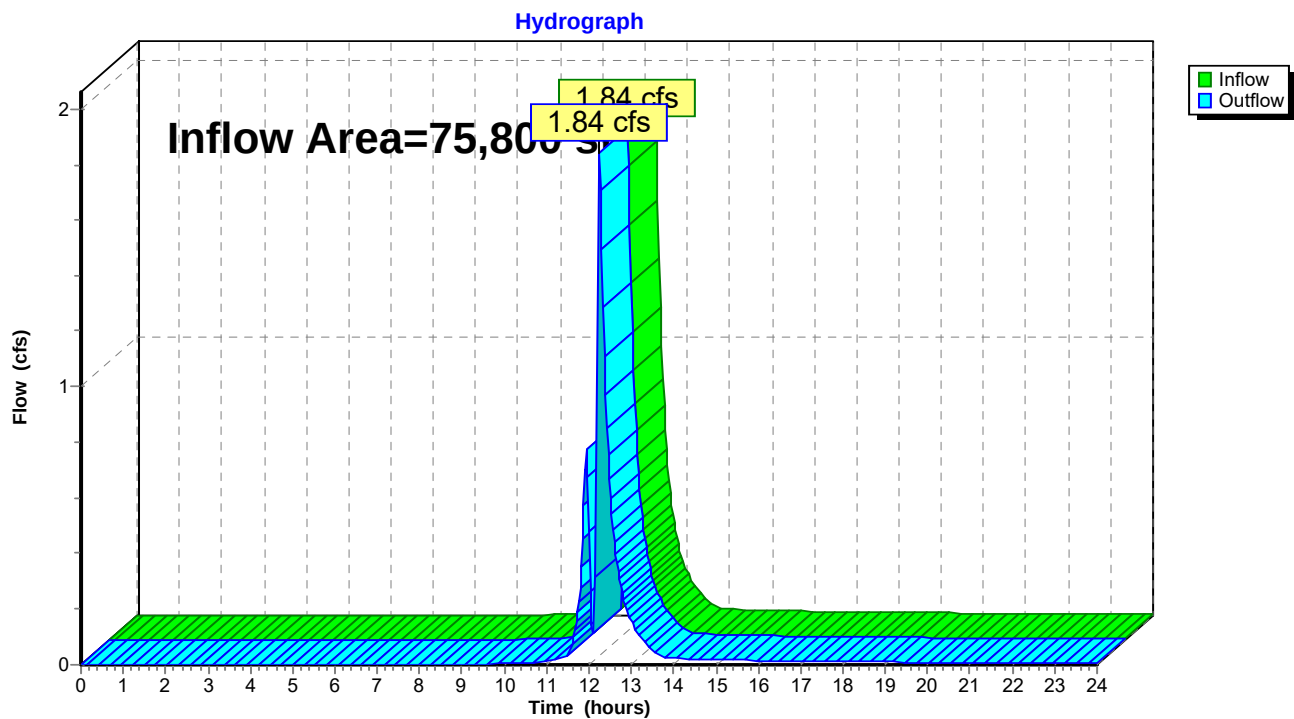
**Subcatchment 17S: DA-2 Berm 2**

**Summary for Reach 11: DA-2 Post Total**

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

Inflow Area = 75,800 sf, 14.60% Impervious, Inflow Depth > 0.51" for 10-yr event  
Inflow = 1.84 cfs @ 12.25 hrs, Volume= 3,207 cf  
Outflow = 1.84 cfs @ 12.25 hrs, Volume= 3,207 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs

**Reach 11: DA-2 Post Total**



**Summary for Pond 16P: Infiltration Berm 1**

Inflow Area = 63,791 sf, 17.35% Impervious, Inflow Depth > 1.69" for 10-yr event  
 Inflow = 3.06 cfs @ 12.09 hrs, Volume= 8,976 cf  
 Outflow = 2.61 cfs @ 12.16 hrs, Volume= 8,382 cf, Atten= 15%, Lag= 4.5 min  
 Discarded = 0.16 cfs @ 12.16 hrs, Volume= 5,408 cf  
 Primary = 2.45 cfs @ 12.16 hrs, Volume= 2,973 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 2  
 Peak Elev= 970.66' @ 12.16 hrs Surf.Area= 2,144 sf Storage= 2,043 cf

Plug-Flow detention time= 107.3 min calculated for 8,371 cf (93% of inflow)  
 Center-of-Mass det. time= 72.4 min ( 931.1 - 858.7 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 969.00' | 2,871 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

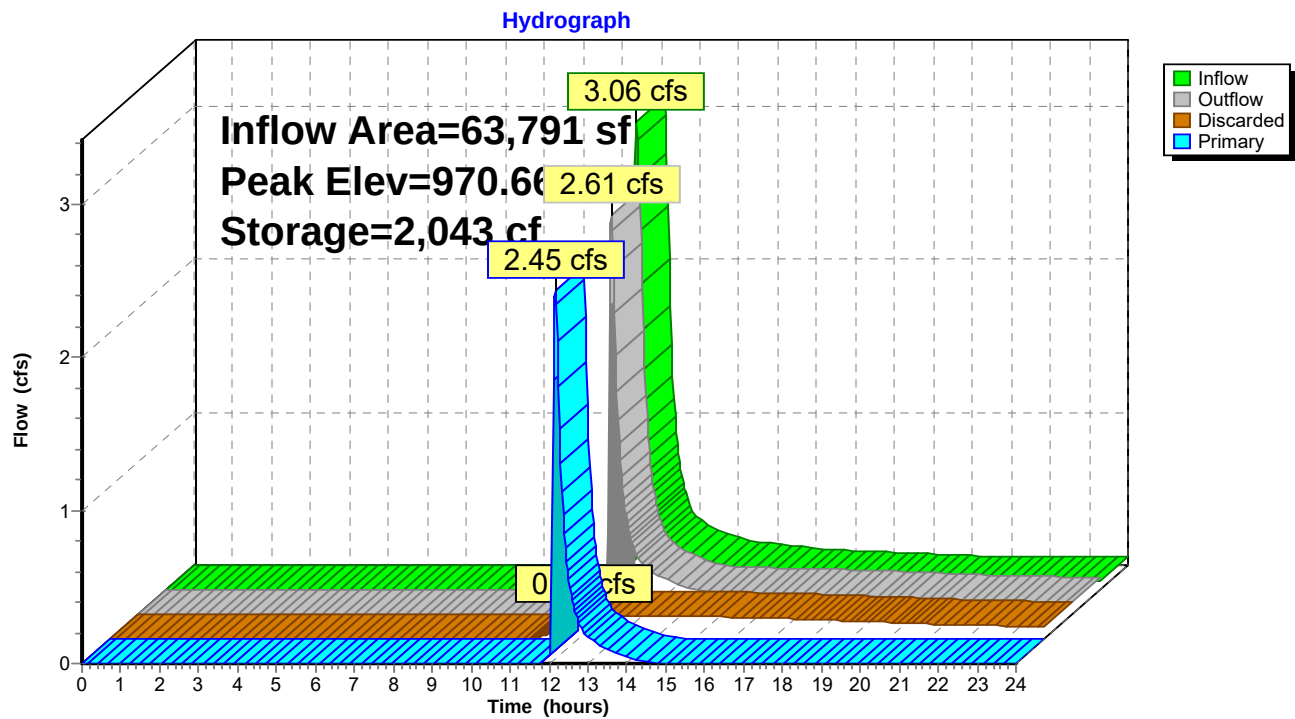
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 969.00              | 511                  | 0                         | 0                         |
| 970.00              | 1,300                | 906                       | 906                       |
| 971.00              | 2,579                | 1,940                     | 2,845                     |
| 971.01              | 2,579                | 26                        | 2,871                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                     |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 971.00' | <b>128.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65<br>2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88 |
| #2     | Primary   | 970.50' | <b>5.0' long x 2.0' breadth Broad-Crested Rectangular Weir X 3.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32                                    |
| #3     | Discarded | 969.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 958.00'                                                                                                                                                                               |

**Discarded OutFlow** Max=0.16 cfs @ 12.16 hrs HW=970.66' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.16 cfs)

**Primary OutFlow** Max=2.37 cfs @ 12.16 hrs HW=970.66' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Broad-Crested Rectangular Weir** (Weir Controls 2.37 cfs @ 1.01 fps)

## Pond 16P: Infiltration Berm 1



**Summary for Pond 18P: Infiltration Berm 2**

Inflow Area = 68,455 sf, 16.17% Impervious, Inflow Depth > 0.69" for 10-yr event  
 Inflow = 2.51 cfs @ 12.16 hrs, Volume= 3,941 cf  
 Outflow = 1.85 cfs @ 12.25 hrs, Volume= 3,949 cf, Atten= 26%, Lag= 5.4 min  
 Discarded = 0.10 cfs @ 12.25 hrs, Volume= 2,163 cf  
 Primary = 1.75 cfs @ 12.25 hrs, Volume= 1,786 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 2  
 Peak Elev= 964.65' @ 12.25 hrs Surf.Area= 1,211 sf Storage= 1,263 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 77.2 min ( 845.3 - 768.2 )

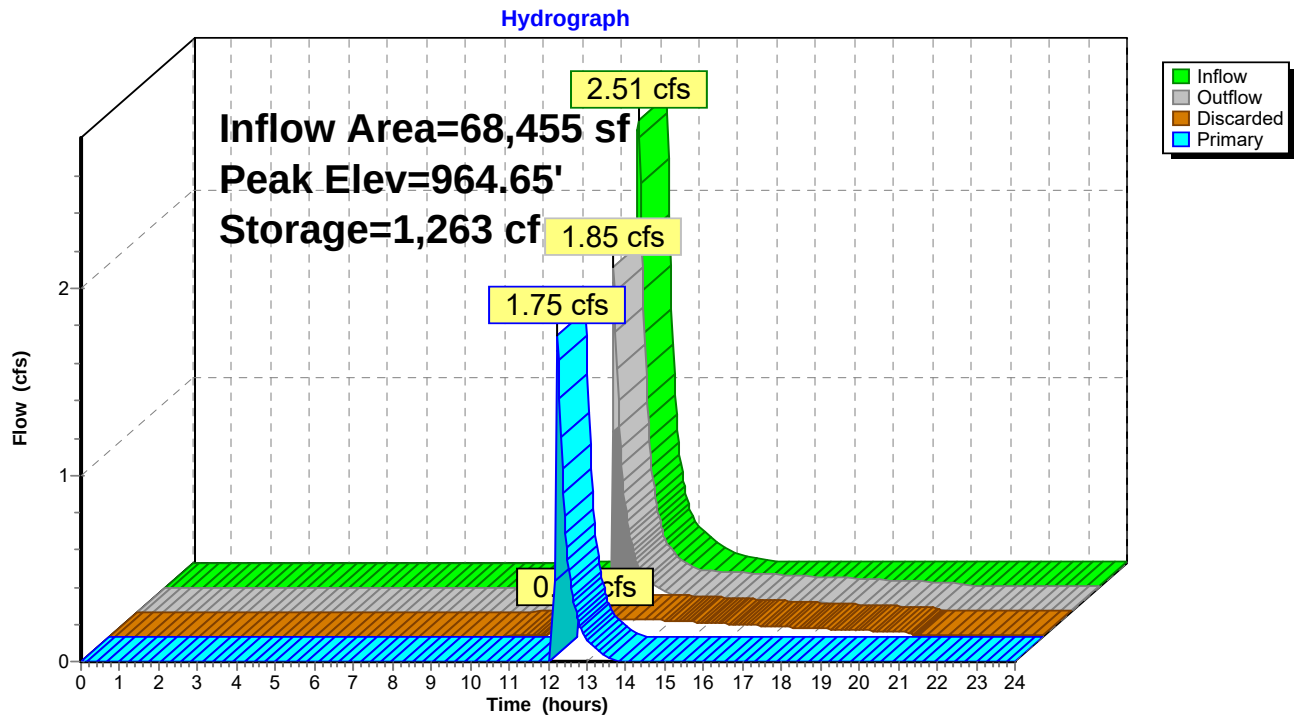
| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 963.00' | 1,736 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 963.00              | 340                  | 0                         | 0                         |
| 964.00              | 848                  | 594                       | 594                       |
| 965.00              | 1,407                | 1,128                     | 1,722                     |
| 965.01              | 1,407                | 14                        | 1,736                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 965.00' | <b>74.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65<br>2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88 |
| #2     | Primary   | 964.50' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir X 3.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32                                   |
| #3     | Discarded | 963.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 958.00'                                                                                                                                                                              |

**Discarded OutFlow** Max=0.10 cfs @ 12.25 hrs HW=964.64' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.10 cfs)

**Primary OutFlow** Max=1.65 cfs @ 12.25 hrs HW=964.64' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Broad-Crested Rectangular Weir** (Weir Controls 1.65 cfs @ 0.96 fps)

**Pond 18P: Infiltration Berm 2**

**MLV 505LD86\_PostwBMP DA2- REV 2***Type II 24-hr 25-yr Rainfall=5.85"*

Prepared by {enter your company name here}

Printed 2/28/2022

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Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment3S: DA-2 Berm1**

Runoff Area=63,791 sf 17.35% Impervious Runoff Depth>2.50"  
Flow Length=526' Tc=15.7 min CN=68 Runoff=4.60 cfs 13,263 cf

**Subcatchment4S: DA-2 Undetained**

Runoff Area=7,345 sf 0.00% Impervious Runoff Depth>3.25"  
Flow Length=221' Tc=3.0 min CN=76 Runoff=1.07 cfs 1,989 cf

**Subcatchment17S: DA-2 Berm 2**

Runoff Area=4,664 sf 0.00% Impervious Runoff Depth>3.44"  
Flow Length=40' Slope=0.1500 '/' Tc=3.0 min CN=78 Runoff=0.72 cfs 1,339 cf

**Reach 11: DA-2 Post Total**

Inflow=4.27 cfs 6,929 cf  
Outflow=4.27 cfs 6,929 cf

**Pond 16P: Infiltration Berm 1**

Peak Elev=970.73' Storage=2,201 cf Inflow=4.60 cfs 13,263 cf  
Discarded=0.17 cfs 6,079 cf Primary=4.30 cfs 6,249 cf Outflow=4.47 cfs 12,329 cf

**Pond 18P: Infiltration Berm 2**

Peak Elev=964.76' Storage=1,403 cf Inflow=4.39 cfs 7,588 cf  
Discarded=0.11 cfs 2,660 cf Primary=4.14 cfs 4,941 cf Outflow=4.24 cfs 7,600 cf

**Total Runoff Area = 75,800 sf Runoff Volume = 16,591 cf Average Runoff Depth = 2.63"**  
**85.40% Pervious = 64,731 sf 14.60% Impervious = 11,069 sf**

**Summary for Subcatchment 3S: DA-2 Berm1**

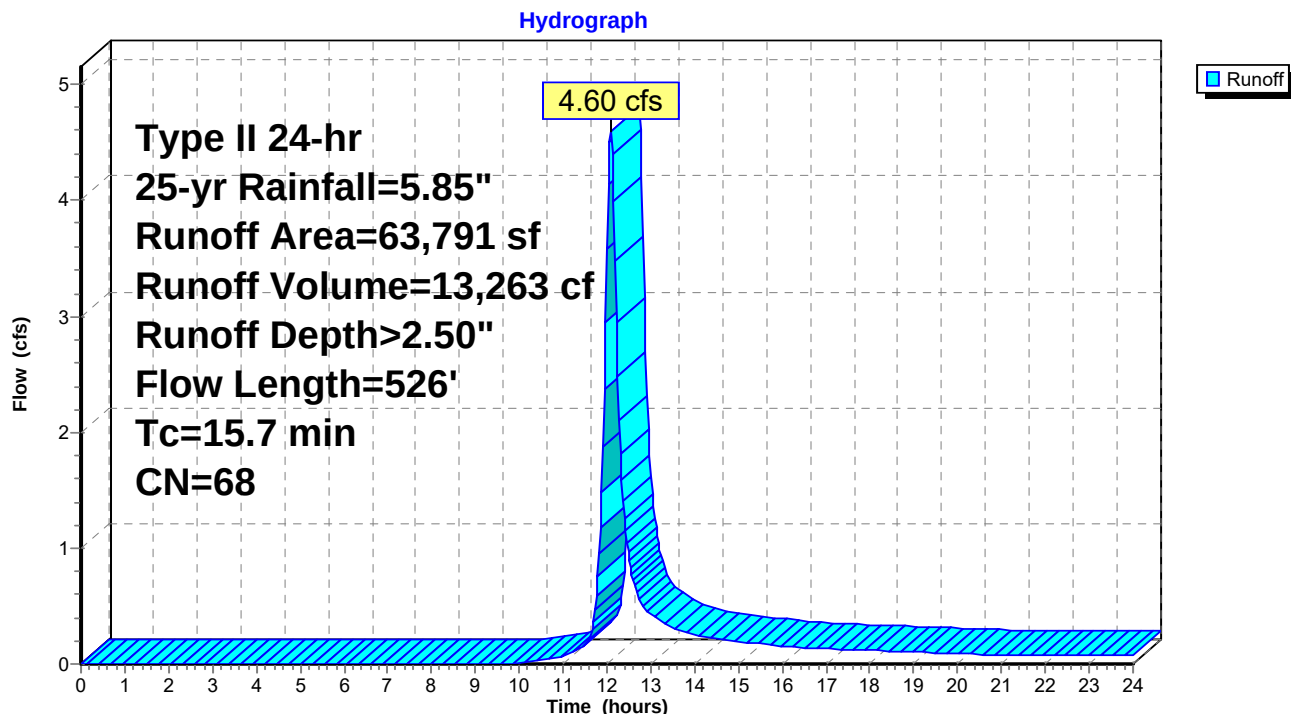
Runoff = 4.60 cfs @ 12.08 hrs, Volume= 13,263 cf, Depth> 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs  
Type II 24-hr 25-yr Rainfall=5.85"

|   | Area (sf) | CN | Description               |
|---|-----------|----|---------------------------|
| * | 11,069    | 98 | Impervious                |
|   | 4,961     | 30 | Woods, Good, HSG A        |
|   | 12,328    | 30 | Meadow, non-grazed, HSG A |
|   | 35,433    | 78 | Meadow, non-grazed, HSG D |
|   | 63,791    | 68 | Weighted Average          |
|   | 52,722    |    | 82.65% Pervious Area      |
|   | 11,069    |    | 17.35% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 12.2     | 100           | 0.0800        | 0.14              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 0.4      | 130           | 0.0885        | 6.04              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps              |
| 3.1      | 296           | 0.0507        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 15.7     | 526           | Total         |                   |                |                                                                      |

**Subcatchment 3S: DA-2 Berm1**

**Summary for Subcatchment 4S: DA-2 Undetained**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

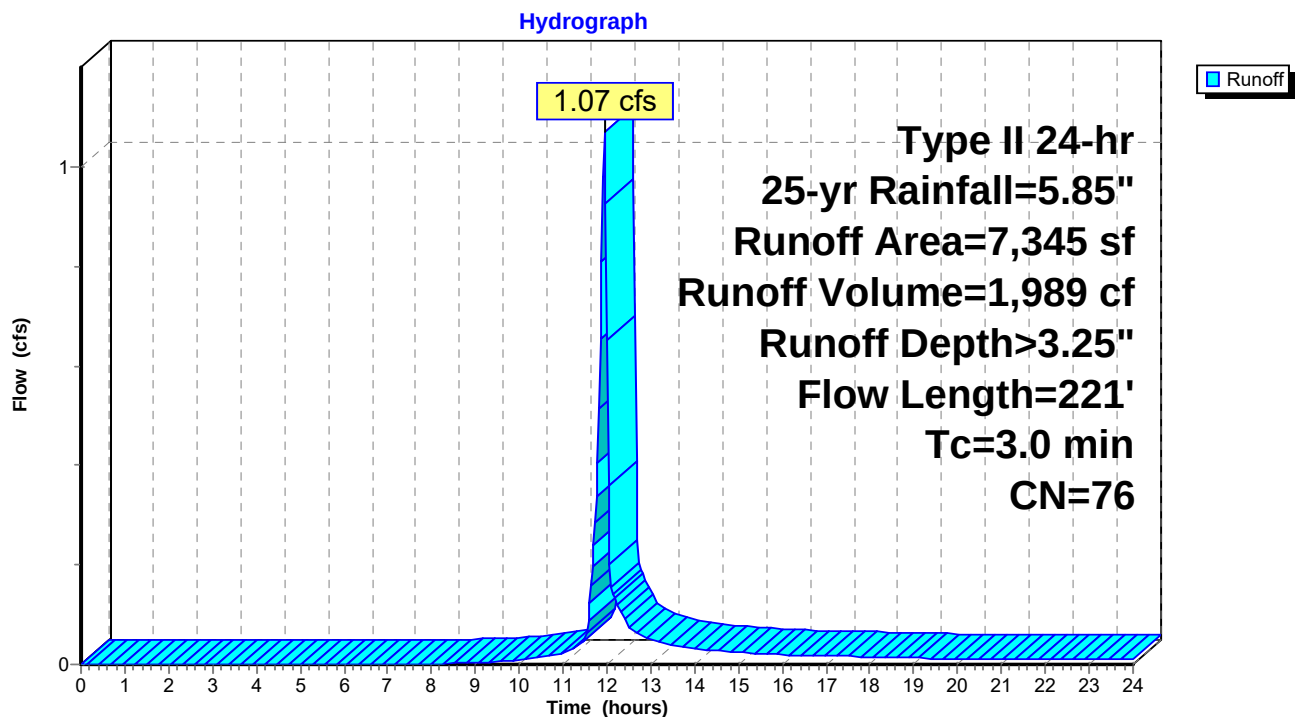
Runoff = 1.07 cfs @ 11.94 hrs, Volume= 1,989 cf, Depth&gt; 3.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs,  $dt=0.03$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 273       | 30 | Meadow, non-grazed, HSG A |
| 7,072     | 78 | Meadow, non-grazed, HSG D |
| 7,345     | 76 | Weighted Average          |
| 7,345     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                        |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------|
| 1.8      | 31            | 0.1290        | 0.29              |                | Sheet Flow,<br>Grass: Short n= 0.150 P2= 3.26"     |
| 1.2      | 190           | 0.2580        | 2.54              |                | Shallow Concentrated Flow,<br>Woodland Kv= 5.0 fps |
| 3.0      | 221           | Total         |                   |                |                                                    |

**Subcatchment 4S: DA-2 Undetained**

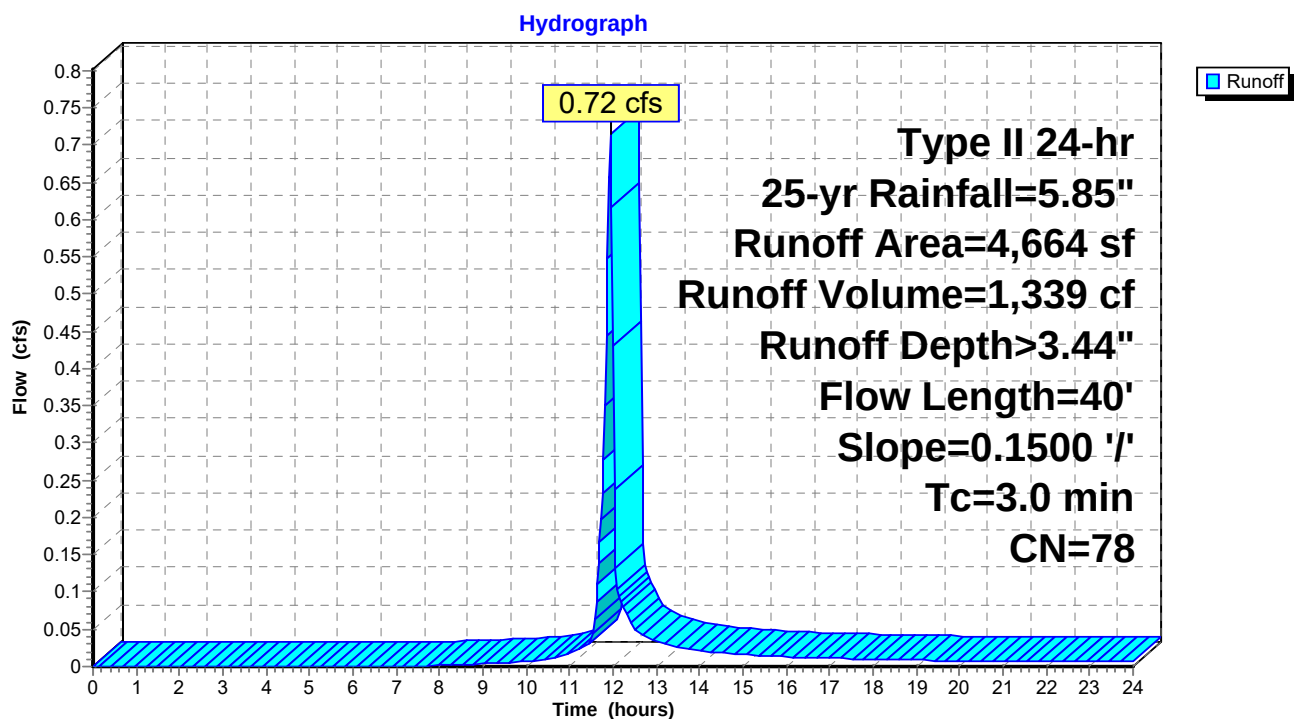
**Summary for Subcatchment 17S: DA-2 Berm 2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.72 cfs @ 11.94 hrs, Volume= 1,339 cf, Depth&gt; 3.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs,  $dt=0.03$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 4,664     | 78 | Meadow, non-grazed, HSG D |
| 4,664     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                    |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------|
| 3.0      | 40            | 0.1500        | 0.22              |                | Sheet Flow,<br>Grass: Dense n= 0.240 P2= 3.26" |

**Subcatchment 17S: DA-2 Berm 2**

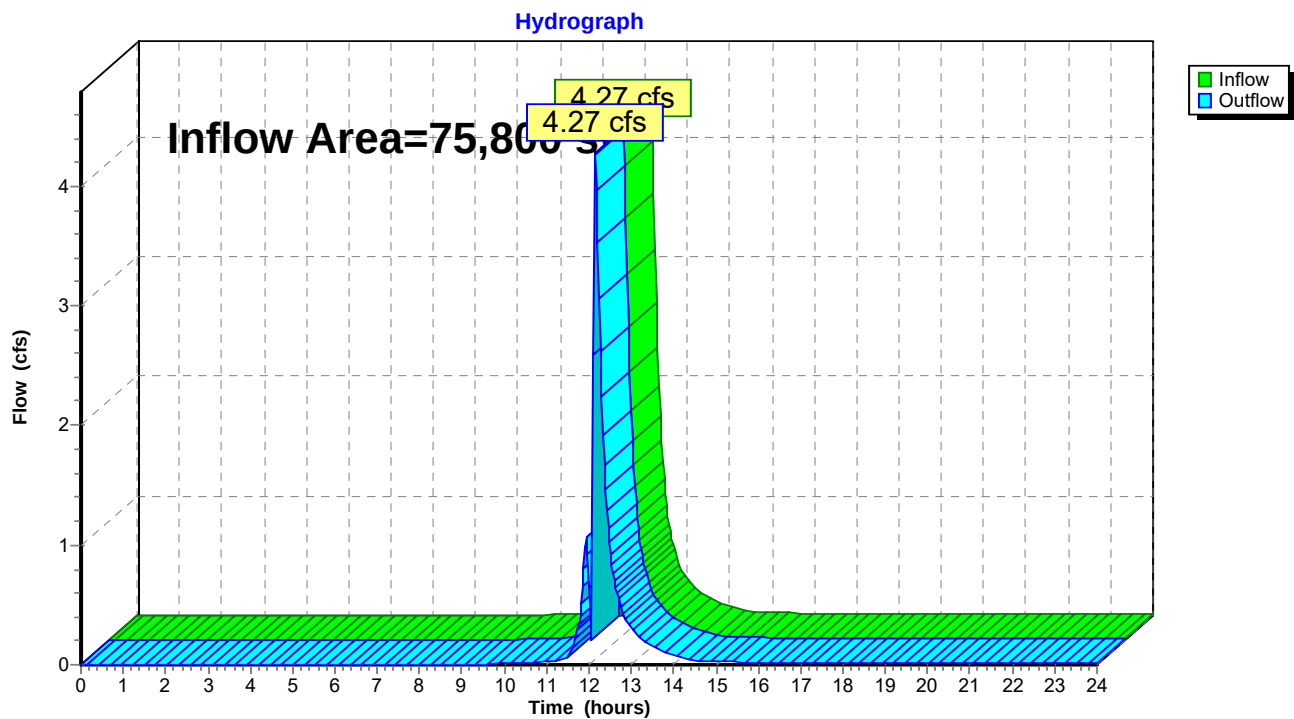


**Summary for Reach 11: DA-2 Post Total**

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

Inflow Area = 75,800 sf, 14.60% Impervious, Inflow Depth > 1.10" for 25-yr event  
Inflow = 4.27 cfs @ 12.14 hrs, Volume= 6,929 cf  
Outflow = 4.27 cfs @ 12.14 hrs, Volume= 6,929 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs

**Reach 11: DA-2 Post Total**

**Summary for Pond 16P: Infiltration Berm 1**

Inflow Area = 63,791 sf, 17.35% Impervious, Inflow Depth > 2.50" for 25-yr event  
 Inflow = 4.60 cfs @ 12.08 hrs, Volume= 13,263 cf  
 Outflow = 4.47 cfs @ 12.11 hrs, Volume= 12,329 cf, Atten= 3%, Lag= 1.7 min  
 Discarded = 0.17 cfs @ 12.11 hrs, Volume= 6,079 cf  
 Primary = 4.30 cfs @ 12.11 hrs, Volume= 6,249 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 2  
 Peak Elev= 970.73' @ 12.11 hrs Surf.Area= 2,237 sf Storage= 2,201 cf

Plug-Flow detention time= 82.7 min calculated for 12,313 cf (93% of inflow)  
 Center-of-Mass det. time= 45.6 min ( 892.9 - 847.3 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 969.00' | 2,871 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

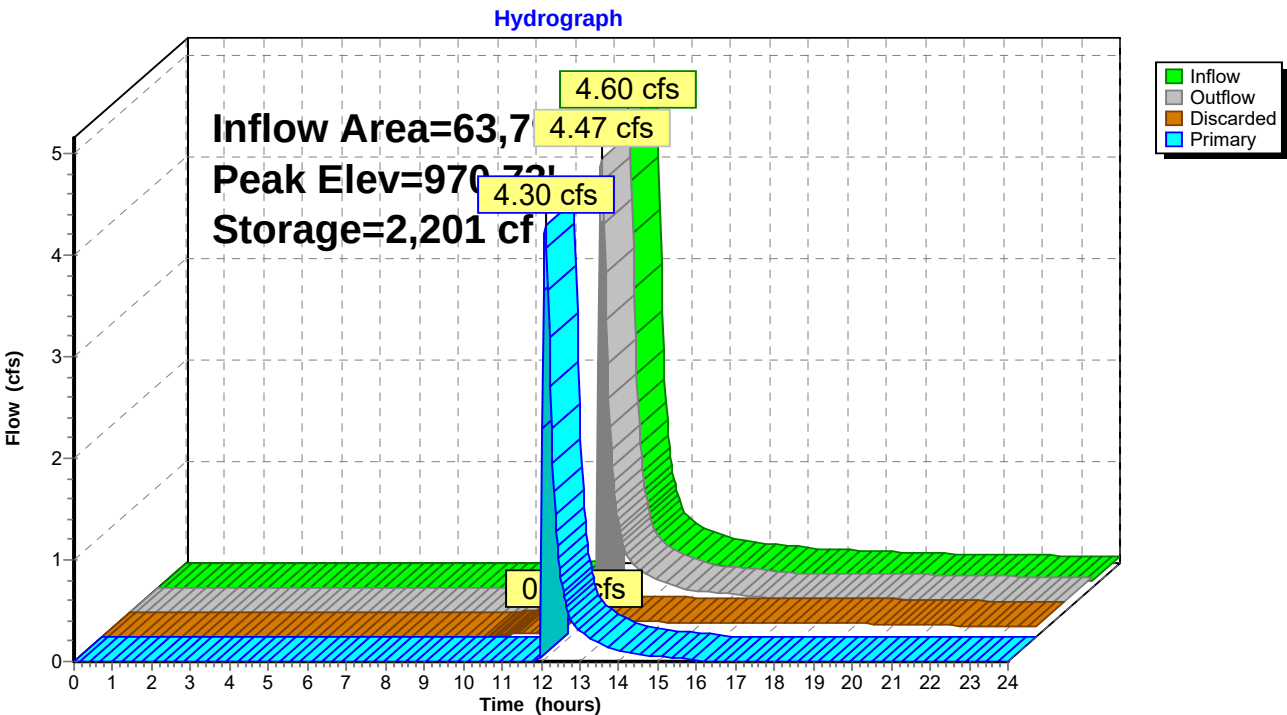
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 969.00              | 511                  | 0                         | 0                         |
| 970.00              | 1,300                | 906                       | 906                       |
| 971.00              | 2,579                | 1,940                     | 2,845                     |
| 971.01              | 2,579                | 26                        | 2,871                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                     |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 971.00' | <b>128.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65<br>2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88 |
| #2     | Primary   | 970.50' | <b>5.0' long x 2.0' breadth Broad-Crested Rectangular Weir X 3.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32                                    |
| #3     | Discarded | 969.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 958.00'                                                                                                                                                                               |

**Discarded OutFlow** Max=0.17 cfs @ 12.11 hrs HW=970.73' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.17 cfs)

**Primary OutFlow** Max=4.27 cfs @ 12.11 hrs HW=970.73' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Broad-Crested Rectangular Weir** (Weir Controls 4.27 cfs @ 1.23 fps)

Pond 16P: Infiltration Berm 1



**Summary for Pond 18P: Infiltration Berm 2**

Inflow Area = 68,455 sf, 16.17% Impervious, Inflow Depth > 1.33" for 25-yr event  
 Inflow = 4.39 cfs @ 12.11 hrs, Volume= 7,588 cf  
 Outflow = 4.24 cfs @ 12.14 hrs, Volume= 7,600 cf, Atten= 3%, Lag= 1.8 min  
 Discarded = 0.11 cfs @ 12.14 hrs, Volume= 2,660 cf  
 Primary = 4.14 cfs @ 12.14 hrs, Volume= 4,941 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 2  
 Peak Elev= 964.76' @ 12.14 hrs Surf.Area= 1,274 sf Storage= 1,403 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 52.2 min ( 816.5 - 764.3 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 963.00' | 1,736 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

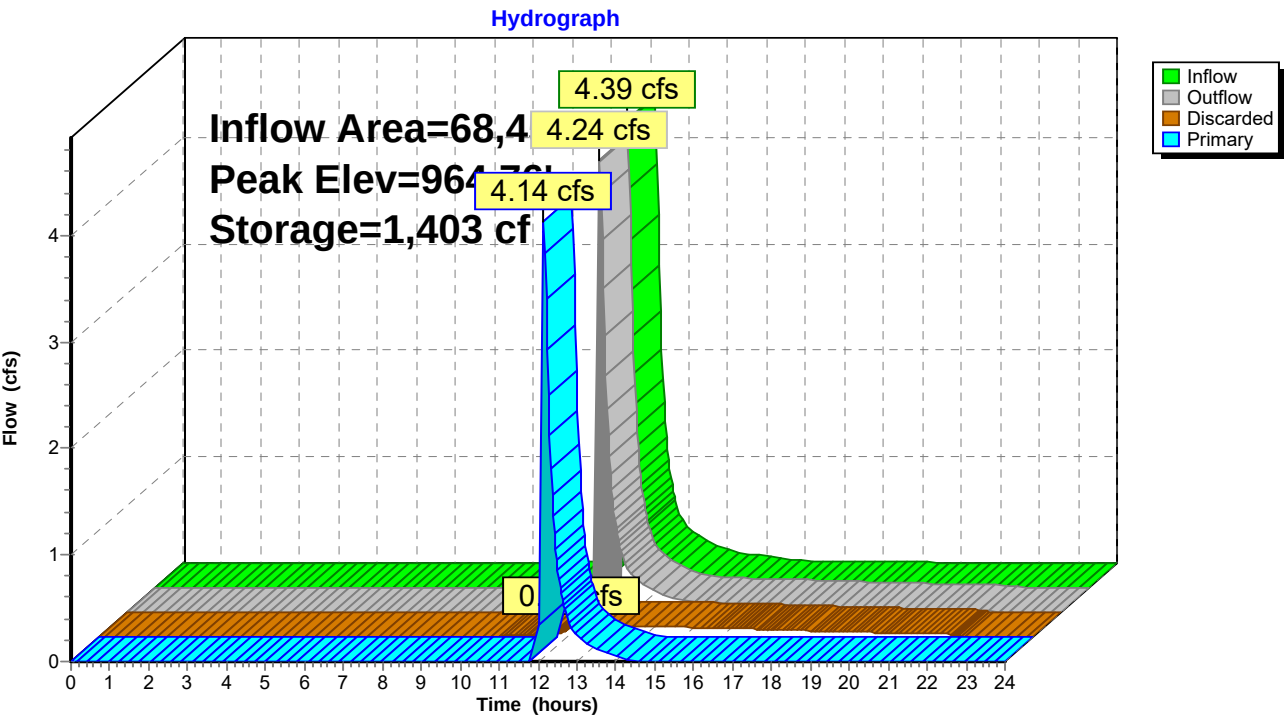
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 963.00              | 340                  | 0                         | 0                         |
| 964.00              | 848                  | 594                       | 594                       |
| 965.00              | 1,407                | 1,128                     | 1,722                     |
| 965.01              | 1,407                | 14                        | 1,736                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 965.00' | <b>74.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65<br>2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88 |
| #2     | Primary   | 964.50' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir X 3.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32                                   |
| #3     | Discarded | 963.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 958.00'                                                                                                                                                                              |

**Discarded OutFlow** Max=0.11 cfs @ 12.14 hrs HW=964.76' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.11 cfs)

**Primary OutFlow** Max=4.10 cfs @ 12.14 hrs HW=964.76' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Broad-Crested Rectangular Weir** (Weir Controls 4.10 cfs @ 1.31 fps)

Pond 18P: Infiltration Berm 2



**MLV 505LD86\_PostwBMP DA2- REV 2***Type II 24-hr 50-yr Rainfall=6.87"*

Prepared by {enter your company name here}

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Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment3S: DA-2 Berm1**

Runoff Area=63,791 sf 17.35% Impervious Runoff Depth>3.29"  
Flow Length=526' Tc=15.7 min CN=68 Runoff=6.11 cfs 17,497 cf

**Subcatchment4S: DA-2 Undetained**

Runoff Area=7,345 sf 0.00% Impervious Runoff Depth>4.14"  
Flow Length=221' Tc=3.0 min CN=76 Runoff=1.35 cfs 2,534 cf

**Subcatchment17S: DA-2 Berm 2**

Runoff Area=4,664 sf 0.00% Impervious Runoff Depth>4.35"  
Flow Length=40' Slope=0.1500 '/' Tc=3.0 min CN=78 Runoff=0.89 cfs 1,693 cf

**Reach 11: DA-2 Post Total**

Inflow=5.96 cfs 10,836 cf  
Outflow=5.96 cfs 10,836 cf

**Pond 16P: Infiltration Berm 1**

Peak Elev=970.78' Storage=2,317 cf Inflow=6.11 cfs 17,497 cf  
Discarded=0.17 cfs 6,556 cf Primary=5.83 cfs 9,749 cf Outflow=6.00 cfs 16,305 cf

**Pond 18P: Infiltration Berm 2**

Peak Elev=964.83' Storage=1,485 cf Inflow=5.95 cfs 11,441 cf  
Discarded=0.11 cfs 3,114 cf Primary=5.78 cfs 8,302 cf Outflow=5.89 cfs 11,415 cf

**Total Runoff Area = 75,800 sf Runoff Volume = 21,723 cf Average Runoff Depth = 3.44"**  
**85.40% Pervious = 64,731 sf 14.60% Impervious = 11,069 sf**

**Summary for Subcatchment 3S: DA-2 Berm1**

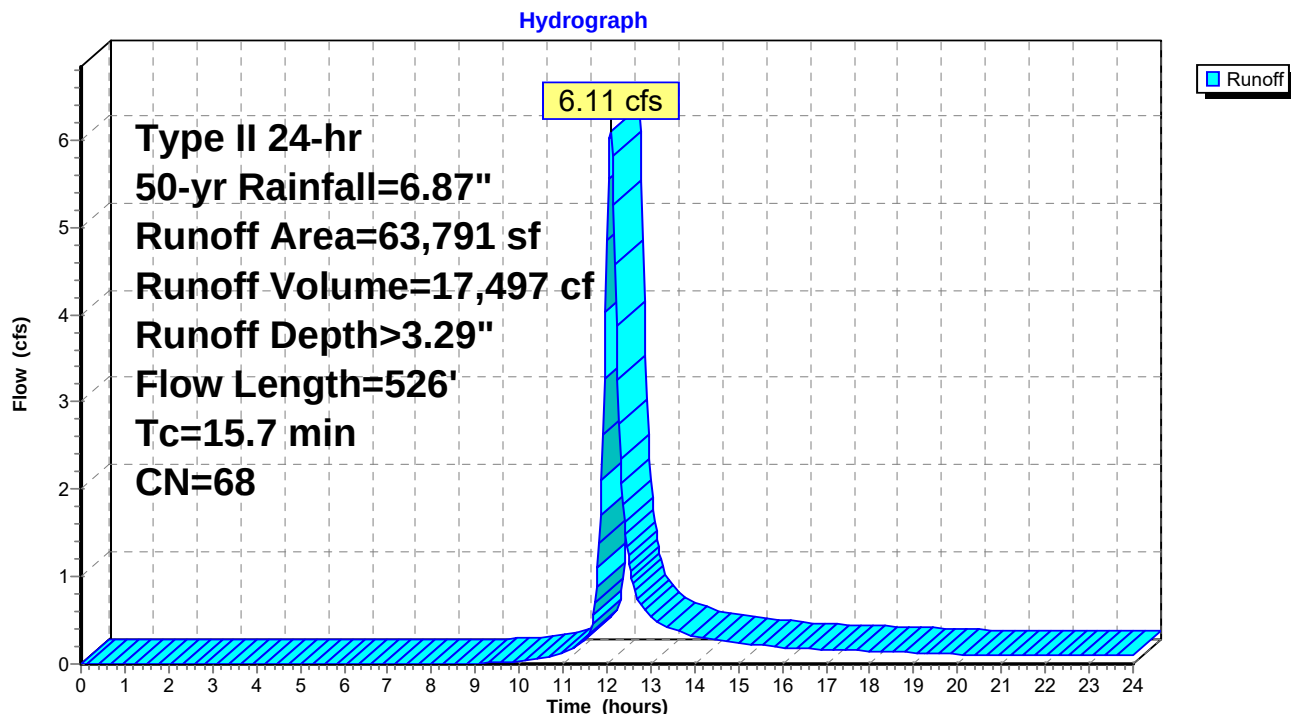
Runoff = 6.11 cfs @ 12.08 hrs, Volume= 17,497 cf, Depth> 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs  
Type II 24-hr 50-yr Rainfall=6.87"

|   | Area (sf) | CN | Description               |
|---|-----------|----|---------------------------|
| * | 11,069    | 98 | Imperviuos                |
|   | 4,961     | 30 | Woods, Good, HSG A        |
|   | 12,328    | 30 | Meadow, non-grazed, HSG A |
|   | 35,433    | 78 | Meadow, non-grazed, HSG D |
|   | 63,791    | 68 | Weighted Average          |
|   | 52,722    |    | 82.65% Pervious Area      |
|   | 11,069    |    | 17.35% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 12.2     | 100           | 0.0800        | 0.14              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 0.4      | 130           | 0.0885        | 6.04              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps              |
| 3.1      | 296           | 0.0507        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 15.7     | 526           | Total         |                   |                |                                                                      |

**Subcatchment 3S: DA-2 Berm1**

**Summary for Subcatchment 4S: DA-2 Undetained**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

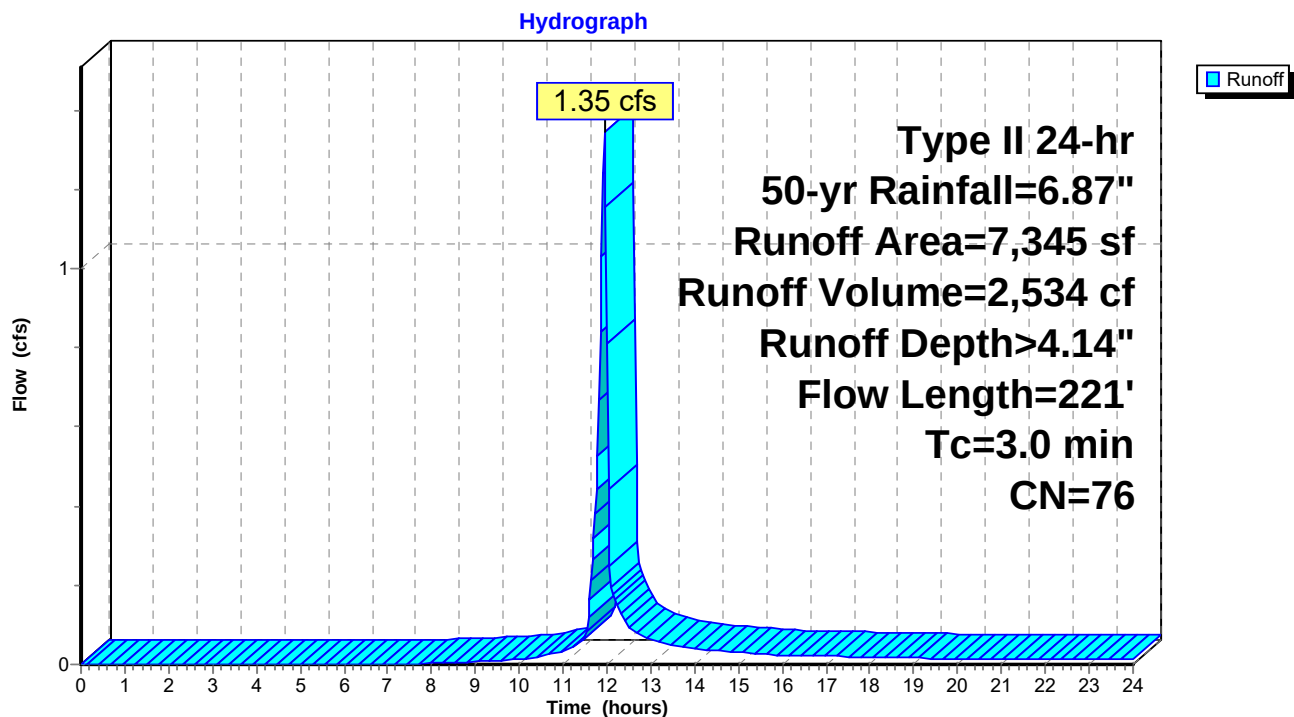
Runoff = 1.35 cfs @ 11.94 hrs, Volume= 2,534 cf, Depth&gt; 4.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs,  $dt=0.03$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 273       | 30 | Meadow, non-grazed, HSG A |
| 7,072     | 78 | Meadow, non-grazed, HSG D |
| 7,345     | 76 | Weighted Average          |
| 7,345     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                          |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------------|
| 1.8      | 31            | 0.1290        | 0.29              |                | Sheet Flow,<br>Grass: Short $n=0.150$ $P2=3.26"$     |
| 1.2      | 190           | 0.2580        | 2.54              |                | Shallow Concentrated Flow,<br>Woodland $K_v=5.0$ fps |
| 3.0      | 221           | Total         |                   |                |                                                      |

**Subcatchment 4S: DA-2 Undetained**



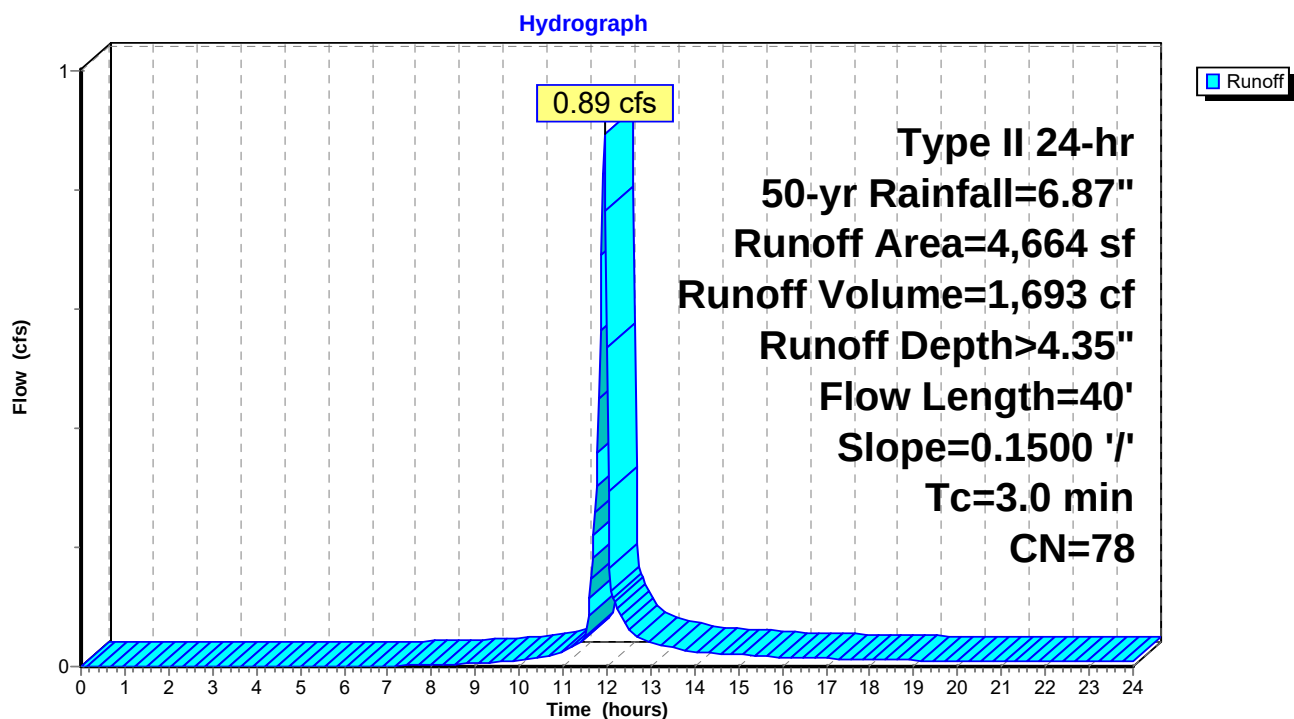
**Summary for Subcatchment 17S: DA-2 Berm 2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.89 cfs @ 11.94 hrs, Volume= 1,693 cf, Depth&gt; 4.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs,  $dt=0.03$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 4,664     | 78 | Meadow, non-grazed, HSG D |
| 4,664     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                    |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------|
| 3.0      | 40            | 0.1500        | 0.22              |                | Sheet Flow,<br>Grass: Dense n= 0.240 P2= 3.26" |

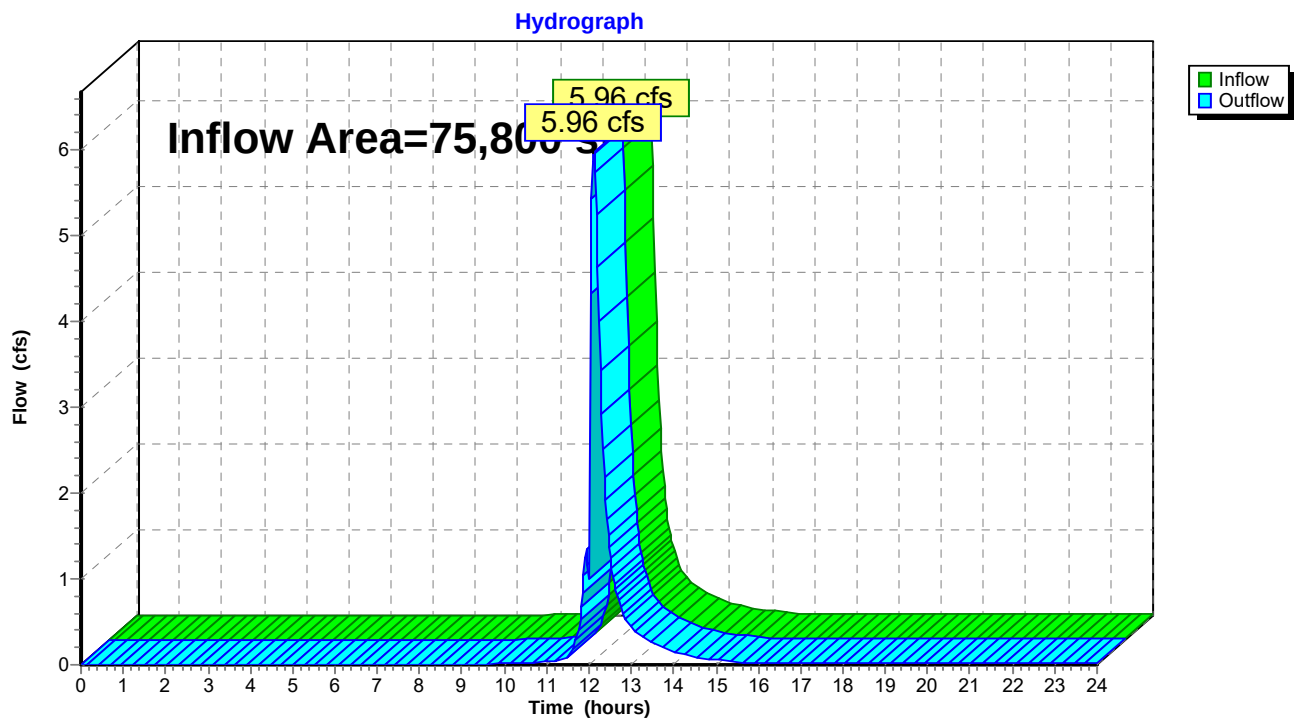
**Subcatchment 17S: DA-2 Berm 2**

**Summary for Reach 11: DA-2 Post Total**

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

Inflow Area = 75,800 sf, 14.60% Impervious, Inflow Depth > 1.72" for 50-yr event  
Inflow = 5.96 cfs @ 12.11 hrs, Volume= 10,836 cf  
Outflow = 5.96 cfs @ 12.11 hrs, Volume= 10,836 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs

**Reach 11: DA-2 Post Total**

**Summary for Pond 16P: Infiltration Berm 1**

Inflow Area = 63,791 sf, 17.35% Impervious, Inflow Depth > 3.29" for 50-yr event  
 Inflow = 6.11 cfs @ 12.08 hrs, Volume= 17,497 cf  
 Outflow = 6.00 cfs @ 12.10 hrs, Volume= 16,305 cf, Atten= 2%, Lag= 1.2 min  
 Discarded = 0.17 cfs @ 12.10 hrs, Volume= 6,556 cf  
 Primary = 5.83 cfs @ 12.10 hrs, Volume= 9,749 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 2  
 Peak Elev= 970.78' @ 12.10 hrs Surf.Area= 2,302 sf Storage= 2,317 cf

Plug-Flow detention time= 67.1 min calculated for 16,305 cf (93% of inflow)  
 Center-of-Mass det. time= 30.8 min ( 870.2 - 839.4 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 969.00' | 2,871 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

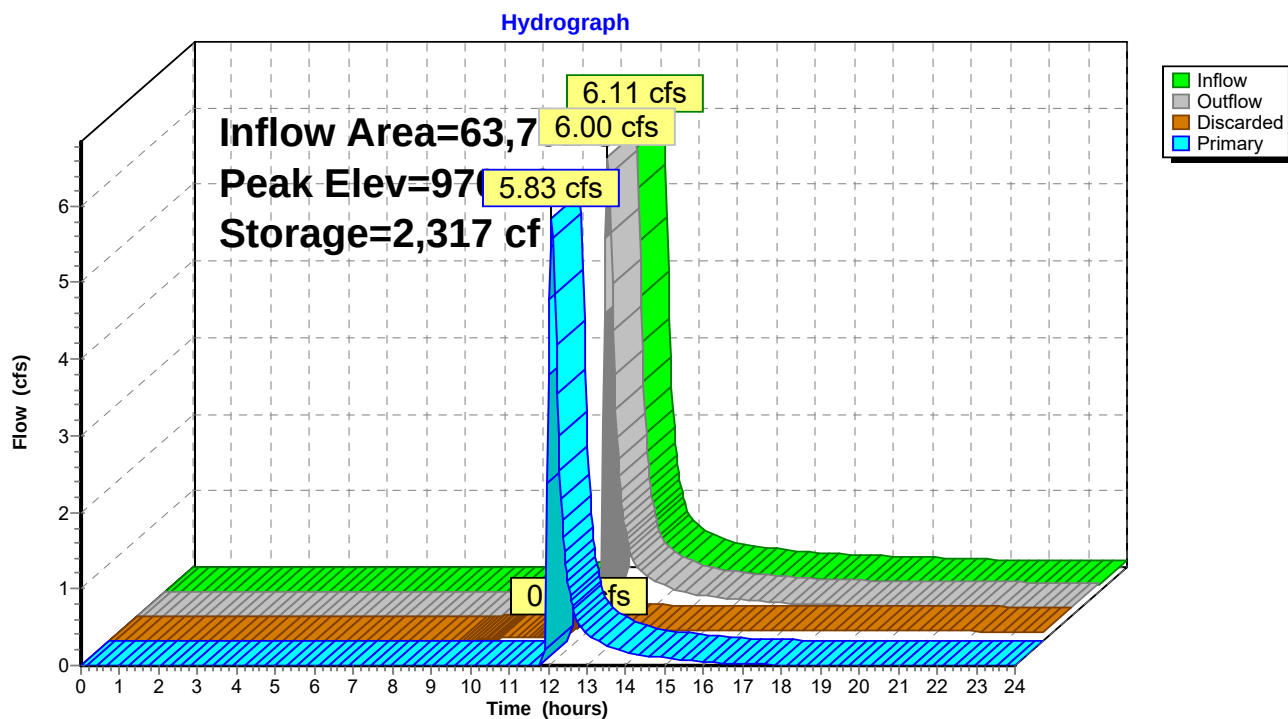
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 969.00              | 511                  | 0                         | 0                         |
| 970.00              | 1,300                | 906                       | 906                       |
| 971.00              | 2,579                | 1,940                     | 2,845                     |
| 971.01              | 2,579                | 26                        | 2,871                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                     |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 971.00' | <b>128.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65<br>2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88 |
| #2     | Primary   | 970.50' | <b>5.0' long x 2.0' breadth Broad-Crested Rectangular Weir X 3.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32                                    |
| #3     | Discarded | 969.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 958.00'                                                                                                                                                                               |

**Discarded OutFlow** Max=0.17 cfs @ 12.10 hrs HW=970.78' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.17 cfs)

**Primary OutFlow** Max=5.78 cfs @ 12.10 hrs HW=970.78' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Broad-Crested Rectangular Weir** (Weir Controls 5.78 cfs @ 1.36 fps)

## Pond 16P: Infiltration Berm 1



**Summary for Pond 18P: Infiltration Berm 2**

Inflow Area = 68,455 sf, 16.17% Impervious, Inflow Depth > 2.01" for 50-yr event  
 Inflow = 5.95 cfs @ 12.10 hrs, Volume= 11,441 cf  
 Outflow = 5.89 cfs @ 12.12 hrs, Volume= 11,415 cf, Atten= 1%, Lag= 0.8 min  
 Discarded = 0.11 cfs @ 12.12 hrs, Volume= 3,114 cf  
 Primary = 5.78 cfs @ 12.12 hrs, Volume= 8,302 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 2  
 Peak Elev= 964.83' @ 12.12 hrs Surf.Area= 1,310 sf Storage= 1,485 cf

Plug-Flow detention time= 43.9 min calculated for 11,401 cf (100% of inflow)  
 Center-of-Mass det. time= 42.5 min ( 808.2 - 765.8 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 963.00' | 1,736 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

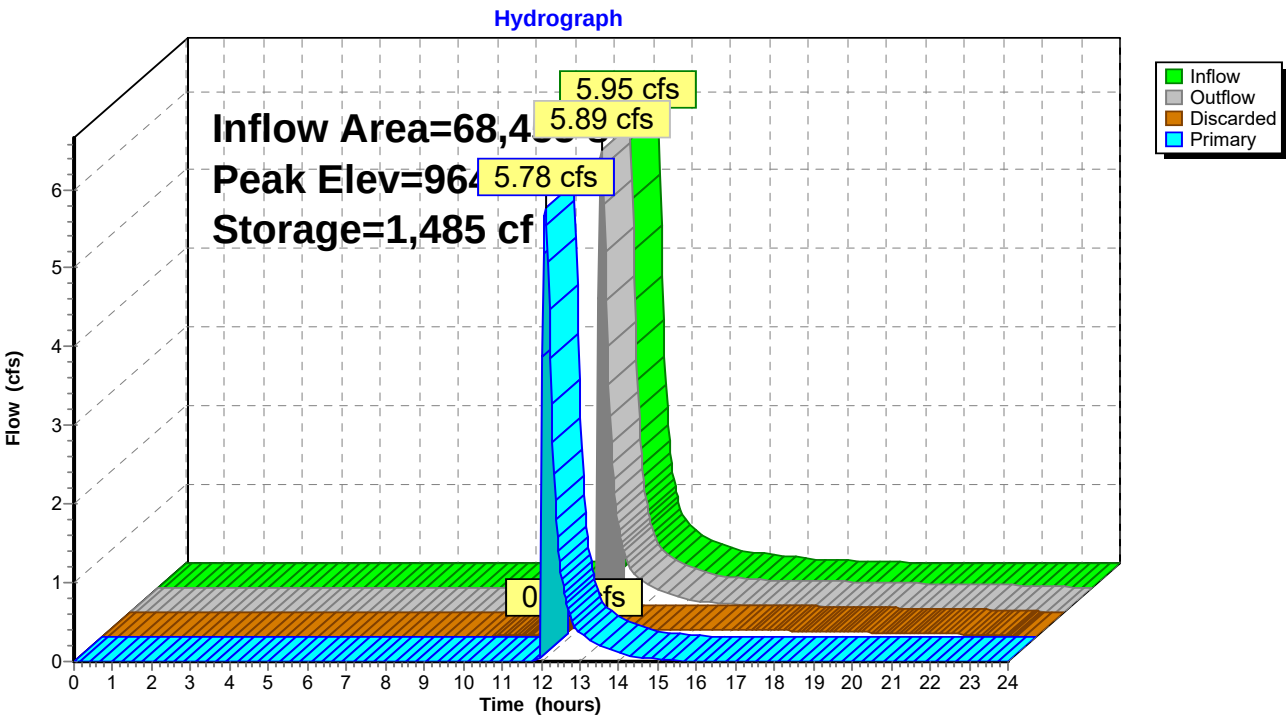
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 963.00              | 340                  | 0                         | 0                         |
| 964.00              | 848                  | 594                       | 594                       |
| 965.00              | 1,407                | 1,128                     | 1,722                     |
| 965.01              | 1,407                | 14                        | 1,736                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 965.00' | <b>74.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65<br>2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88 |
| #2     | Primary   | 964.50' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir X 3.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32                                   |
| #3     | Discarded | 963.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 958.00'                                                                                                                                                                              |

**Discarded OutFlow** Max=0.11 cfs @ 12.12 hrs HW=964.83' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.11 cfs)

**Primary OutFlow** Max=5.75 cfs @ 12.12 hrs HW=964.83' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Broad-Crested Rectangular Weir** (Weir Controls 5.75 cfs @ 1.47 fps)

Pond 18P: Infiltration Berm 2



**MLV 505LD86\_PostwBMP DA2- REV 2***Type II 24-hr 100-yr Rainfall=8.09"*

Prepared by {enter your company name here}

Printed 2/28/2022

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Time span=0.00-24.00 hrs, dt=0.03 hrs, 801 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment3S: DA-2 Berm1**

Runoff Area=63,791 sf 17.35% Impervious Runoff Depth>4.29"  
Flow Length=526' Tc=15.7 min CN=68 Runoff=7.98 cfs 22,826 cf

**Subcatchment4S: DA-2 Undetained**

Runoff Area=7,345 sf 0.00% Impervious Runoff Depth>5.24"  
Flow Length=221' Tc=3.0 min CN=76 Runoff=1.69 cfs 3,206 cf

**Subcatchment17S: DA-2 Berm 2**

Runoff Area=4,664 sf 0.00% Impervious Runoff Depth>5.47"  
Flow Length=40' Slope=0.1500 '/' Tc=3.0 min CN=78 Runoff=1.11 cfs 2,127 cf

**Reach 11: DA-2 Post Total**

Inflow=7.87 cfs 16,045 cf  
Outflow=7.87 cfs 16,045 cf

**Pond 16P: Infiltration Berm 1**

Peak Elev=970.84' Storage=2,447 cf Inflow=7.98 cfs 22,826 cf  
Discarded=0.18 cfs 6,981 cf Primary=7.68 cfs 14,382 cf Outflow=7.86 cfs 21,363 cf

**Pond 18P: Infiltration Berm 2**

Peak Elev=964.89' Storage=1,571 cf Inflow=7.83 cfs 16,508 cf  
Discarded=0.11 cfs 3,604 cf Primary=7.65 cfs 12,840 cf Outflow=7.76 cfs 16,443 cf

**Total Runoff Area = 75,800 sf Runoff Volume = 28,158 cf Average Runoff Depth = 4.46"**  
**85.40% Pervious = 64,731 sf 14.60% Impervious = 11,069 sf**

**Summary for Subcatchment 3S: DA-2 Berm1**

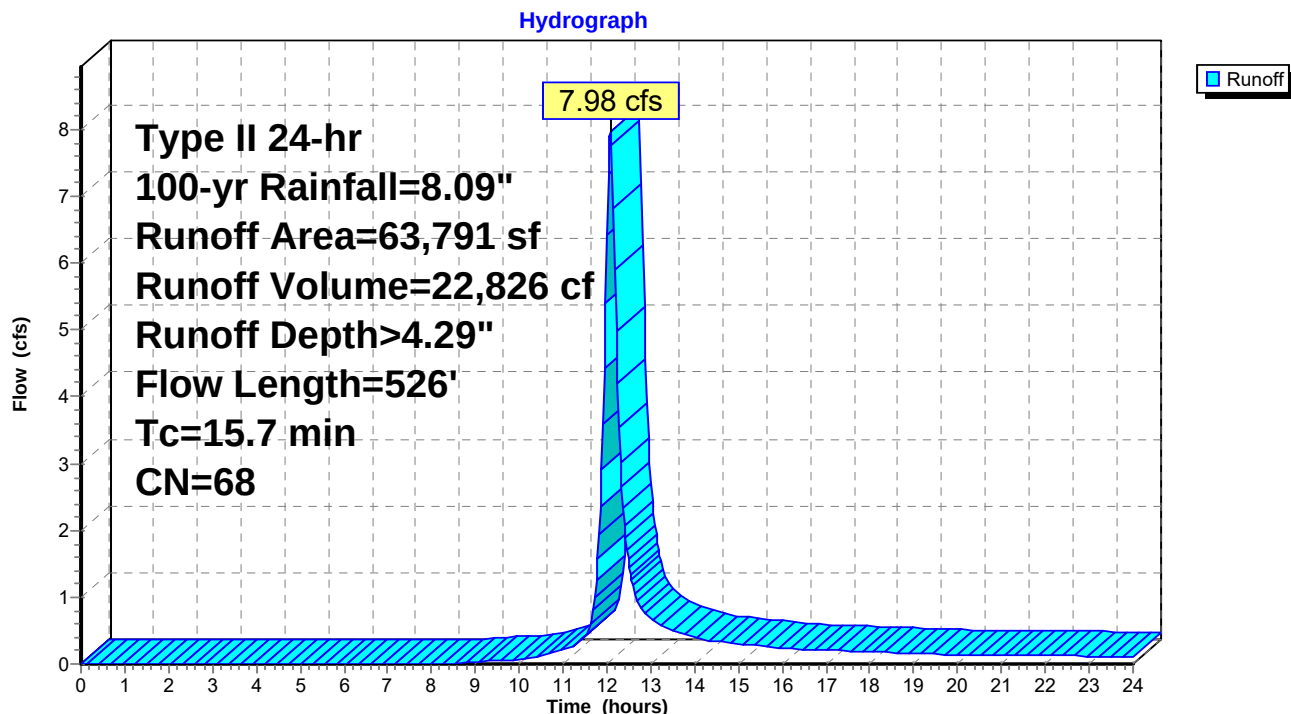
Runoff = 7.98 cfs @ 12.08 hrs, Volume= 22,826 cf, Depth> 4.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs  
Type II 24-hr 100-yr Rainfall=8.09"

|   | Area (sf) | CN | Description               |
|---|-----------|----|---------------------------|
| * | 11,069    | 98 | Imperviuos                |
|   | 4,961     | 30 | Woods, Good, HSG A        |
|   | 12,328    | 30 | Meadow, non-grazed, HSG A |
|   | 35,433    | 78 | Meadow, non-grazed, HSG D |
|   | 63,791    | 68 | Weighted Average          |
|   | 52,722    |    | 82.65% Pervious Area      |
|   | 11,069    |    | 17.35% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 12.2     | 100           | 0.0800        | 0.14              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 0.4      | 130           | 0.0885        | 6.04              |                | <b>Shallow Concentrated Flow,</b><br>Paved Kv= 20.3 fps              |
| 3.1      | 296           | 0.0507        | 1.58              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 15.7     | 526           | Total         |                   |                |                                                                      |

**Subcatchment 3S: DA-2 Berm1**



**Summary for Subcatchment 4S: DA-2 Undetained**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

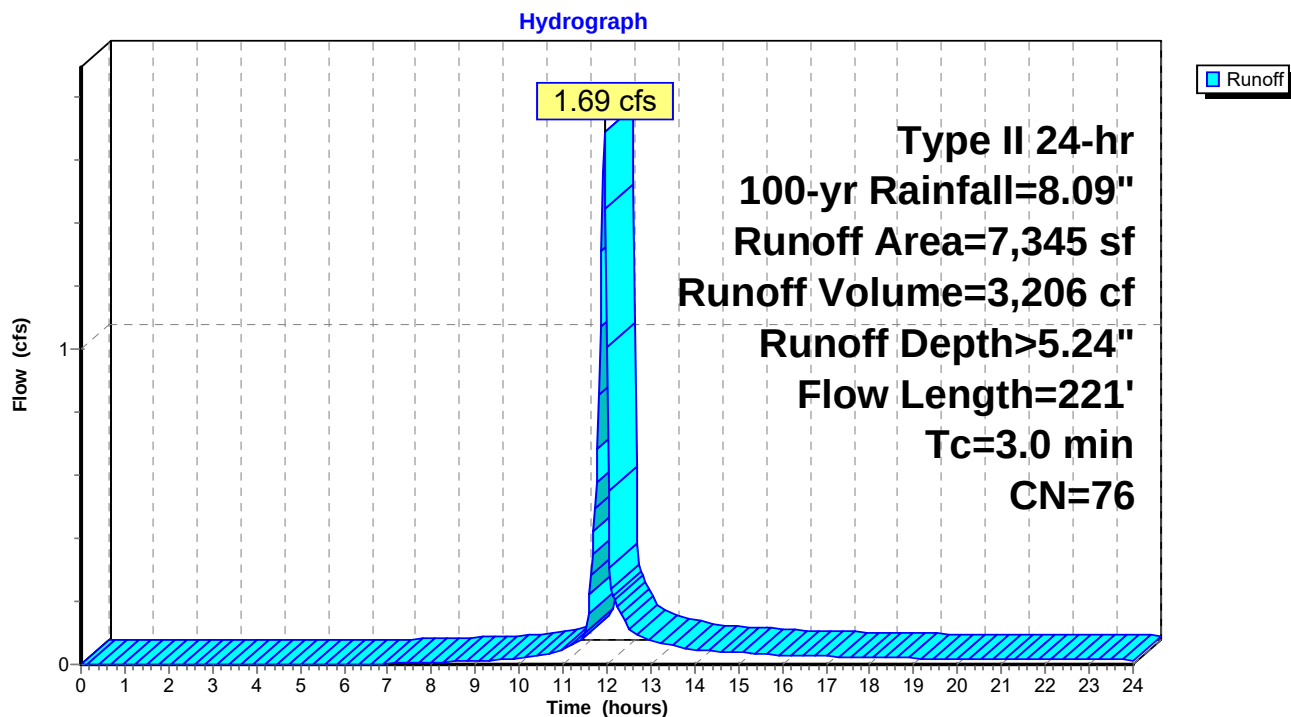
Runoff = 1.69 cfs @ 11.94 hrs, Volume= 3,206 cf, Depth&gt; 5.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs,  $dt=0.03$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 273       | 30 | Meadow, non-grazed, HSG A |
| 7,072     | 78 | Meadow, non-grazed, HSG D |
| 7,345     | 76 | Weighted Average          |
| 7,345     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                        |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------|
| 1.8      | 31            | 0.1290        | 0.29              |                | Sheet Flow,<br>Grass: Short n= 0.150 P2= 3.26"     |
| 1.2      | 190           | 0.2580        | 2.54              |                | Shallow Concentrated Flow,<br>Woodland Kv= 5.0 fps |
| 3.0      | 221           | Total         |                   |                |                                                    |

**Subcatchment 4S: DA-2 Undetained**

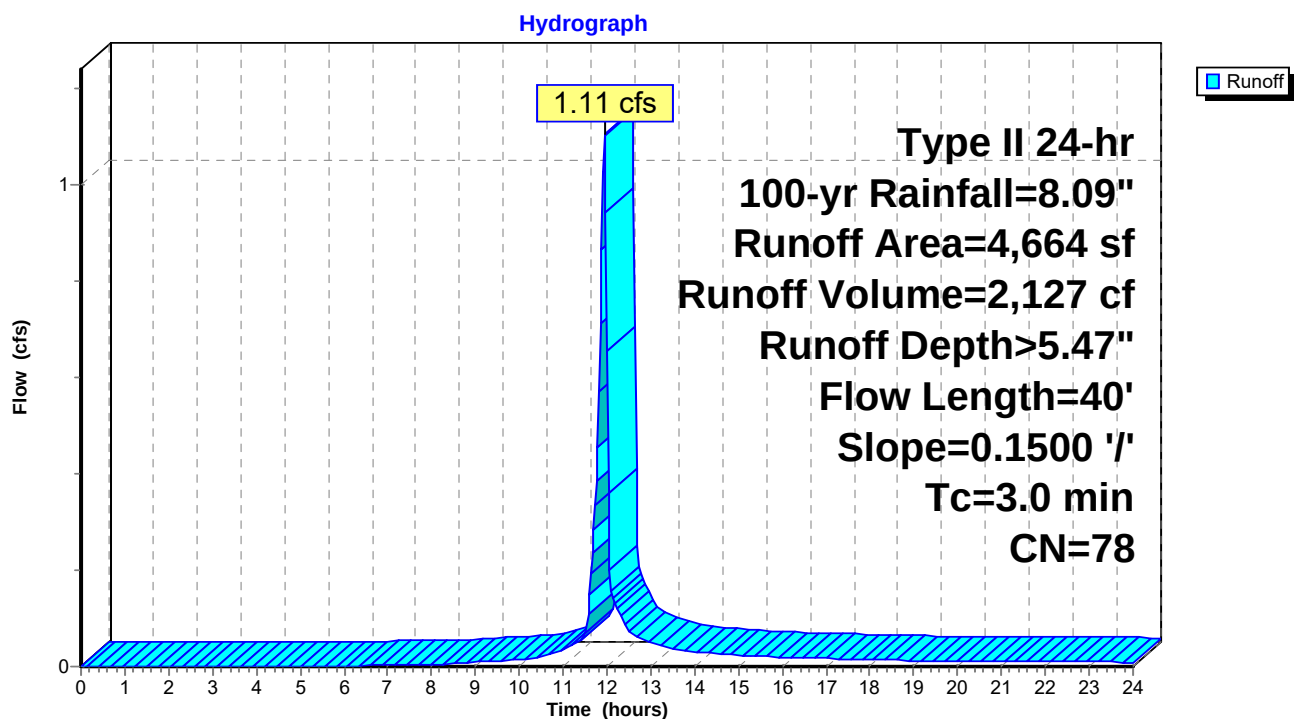
**Summary for Subcatchment 17S: DA-2 Berm 2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.11 cfs @ 11.93 hrs, Volume= 2,127 cf, Depth&gt; 5.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs,  $dt=0.03$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 4,664     | 78 | Meadow, non-grazed, HSG D |
| 4,664     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                    |
|----------|---------------|---------------|-------------------|----------------|------------------------------------------------|
| 3.0      | 40            | 0.1500        | 0.22              |                | Sheet Flow,<br>Grass: Dense n= 0.240 P2= 3.26" |

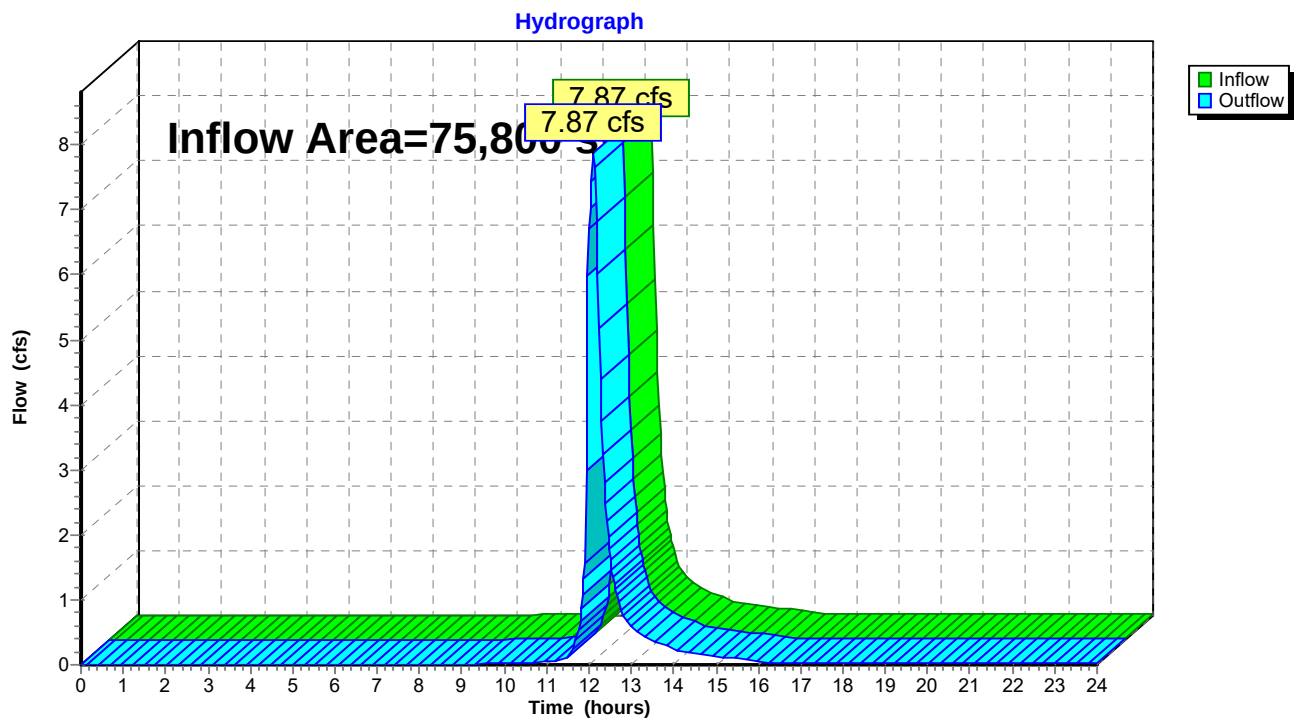
**Subcatchment 17S: DA-2 Berm 2**

**Summary for Reach 11: DA-2 Post Total**

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

Inflow Area = 75,800 sf, 14.60% Impervious, Inflow Depth > 2.54" for 100-yr event  
Inflow = 7.87 cfs @ 12.11 hrs, Volume= 16,045 cf  
Outflow = 7.87 cfs @ 12.11 hrs, Volume= 16,045 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs

**Reach 11: DA-2 Post Total**

**Summary for Pond 16P: Infiltration Berm 1**

Inflow Area = 63,791 sf, 17.35% Impervious, Inflow Depth > 4.29" for 100-yr event  
 Inflow = 7.98 cfs @ 12.08 hrs, Volume= 22,826 cf  
 Outflow = 7.86 cfs @ 12.10 hrs, Volume= 21,363 cf, Atten= 2%, Lag= 1.1 min  
 Discarded = 0.18 cfs @ 12.10 hrs, Volume= 6,981 cf  
 Primary = 7.68 cfs @ 12.10 hrs, Volume= 14,382 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 2  
 Peak Elev= 970.84' @ 12.10 hrs Surf.Area= 2,373 sf Storage= 2,447 cf

Plug-Flow detention time= 54.0 min calculated for 21,336 cf (93% of inflow)  
 Center-of-Mass det. time= 19.6 min ( 851.5 - 831.9 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 969.00' | 2,871 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

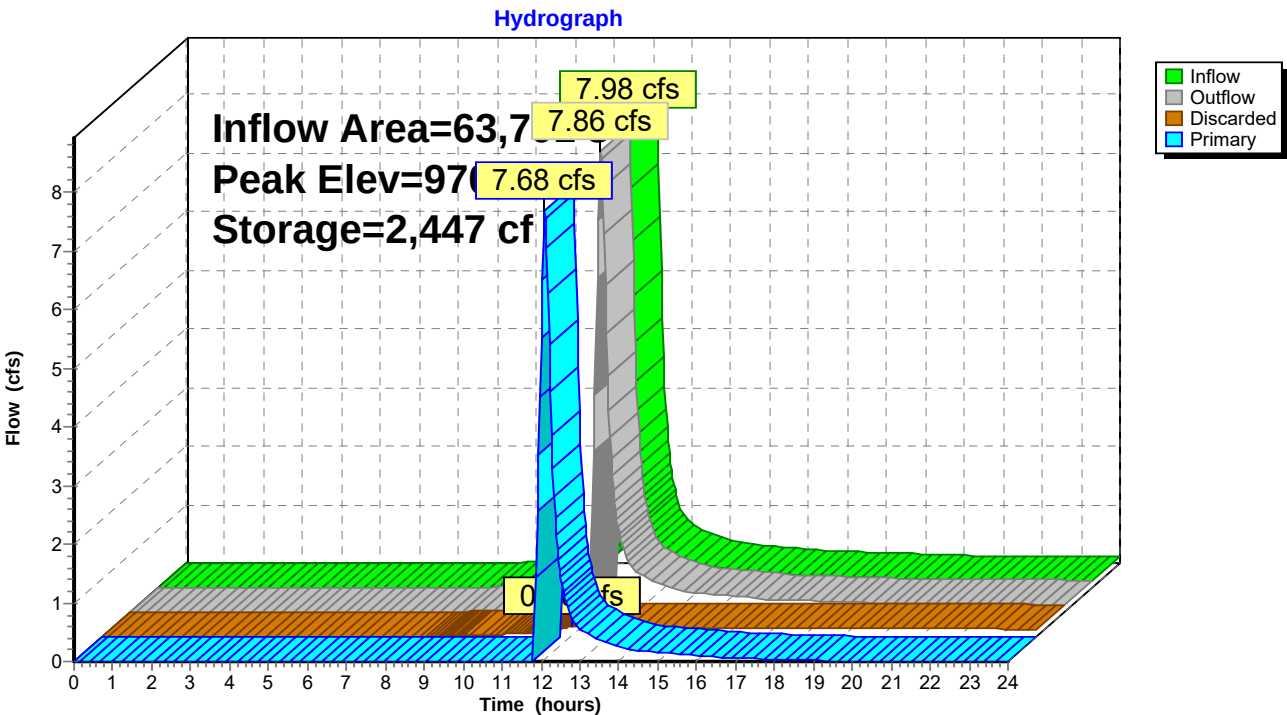
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 969.00              | 511                  | 0                         | 0                         |
| 970.00              | 1,300                | 906                       | 906                       |
| 971.00              | 2,579                | 1,940                     | 2,845                     |
| 971.01              | 2,579                | 26                        | 2,871                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                     |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 971.00' | <b>128.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65<br>2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88 |
| #2     | Primary   | 970.50' | <b>5.0' long x 2.0' breadth Broad-Crested Rectangular Weir X 3.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32                                    |
| #3     | Discarded | 969.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 958.00'                                                                                                                                                                               |

**Discarded OutFlow** Max=0.18 cfs @ 12.10 hrs HW=970.84' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.18 cfs)

**Primary OutFlow** Max=7.63 cfs @ 12.10 hrs HW=970.84' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Broad-Crested Rectangular Weir** (Weir Controls 7.63 cfs @ 1.50 fps)

Pond 16P: Infiltration Berm 1



**Summary for Pond 18P: Infiltration Berm 2**

Inflow Area = 68,455 sf, 16.17% Impervious, Inflow Depth > 2.89" for 100-yr event  
 Inflow = 7.83 cfs @ 12.10 hrs, Volume= 16,508 cf  
 Outflow = 7.76 cfs @ 12.11 hrs, Volume= 16,443 cf, Atten= 1%, Lag= 0.7 min  
 Discarded = 0.11 cfs @ 12.11 hrs, Volume= 3,604 cf  
 Primary = 7.65 cfs @ 12.11 hrs, Volume= 12,840 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.03 hrs / 2  
 Peak Elev= 964.89' @ 12.11 hrs Surf.Area= 1,346 sf Storage= 1,571 cf

Plug-Flow detention time= 35.7 min calculated for 16,443 cf (100% of inflow)  
 Center-of-Mass det. time= 33.3 min ( 803.0 - 769.7 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 963.00' | 1,736 cf      | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

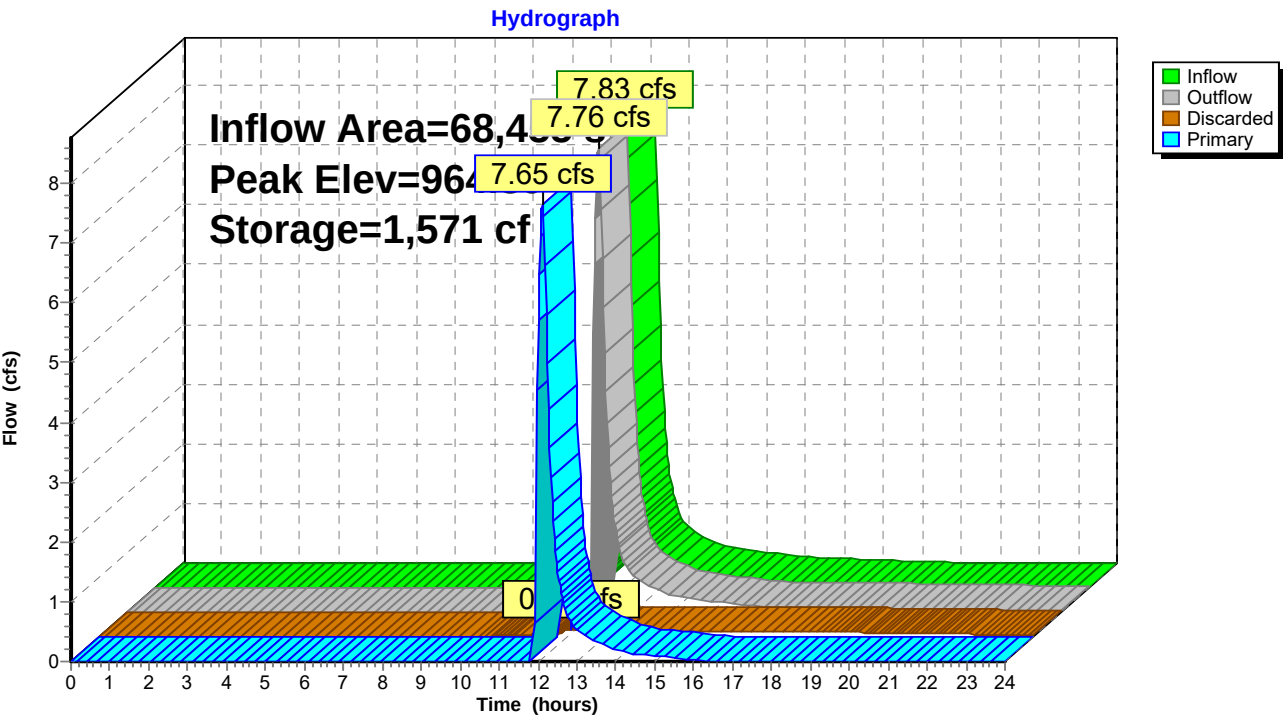
| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 963.00              | 340                  | 0                         | 0                         |
| 964.00              | 848                  | 594                       | 594                       |
| 965.00              | 1,407                | 1,128                     | 1,722                     |
| 965.01              | 1,407                | 14                        | 1,736                     |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                                                                                                                    |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 965.00' | <b>74.0' long x 5.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50 4.00 4.50 5.00 5.50<br>Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65<br>2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88 |
| #2     | Primary   | 964.50' | <b>4.0' long x 2.0' breadth Broad-Crested Rectangular Weir X 3.00</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00<br>2.50 3.00 3.50<br>Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88<br>2.85 3.07 3.20 3.32                                   |
| #3     | Discarded | 963.00' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 958.00'                                                                                                                                                                              |

**Discarded OutFlow** Max=0.11 cfs @ 12.11 hrs HW=964.89' (Free Discharge)  
 ↳ **3=Exfiltration** ( Controls 0.11 cfs)

**Primary OutFlow** Max=7.60 cfs @ 12.11 hrs HW=964.89' (Free Discharge)  
 ↳ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)  
 ↳ **2=Broad-Crested Rectangular Weir** (Weir Controls 7.60 cfs @ 1.63 fps)

Pond 18P: Infiltration Berm 2



ATTACHMENT 4.4  
CHANNEL DESIGN WORKSHEETS –  
MLV-505LD86



# STANDARD E&S WORKSHEET # 9

## Time of Concentration

PROJECT NAME: Williams REAE – MLV-505LD86

LOCATION: Monroe County, PA

PREPARED BY: CD

DATE: 02/27/2022

CHECKED BY: PW

DATE: 02/27/2022

### TIME OF CONCENTRATION:

| PATH NUMBER   | T <sub>c</sub><br>(min) | METHOD |
|---------------|-------------------------|--------|
| SH - DC - 001 | 5                       | Direct |
| SH - CC - 002 | 5                       | Direct |
| SH - CC - 003 | 5                       | Direct |
| SH - CC - 004 | 5                       | Direct |
| SH - CC - 005 | 5                       | Direct |
| SH - CC - 006 | 5                       | Direct |
| SH - CC - 007 | 5                       | Direct |
| SH - CC - 008 | 5                       | Direct |
| SH - CC - 009 | 5                       | Direct |
| SH - CC - 010 | 5                       | Direct |

$$T_{c \text{ (sheet flow)}} = \left[ \frac{2.48(n)}{3.6} \right]^{0.4673}$$

**n** **Type of Cover**  
 0.02 smooth pavement  
 0.1 bare parched soil  
 0.3 poor grass cover  
 0.4 average grass cover  
 0.8 dense grass cover  
 (L = 150' maximum)

### CHANNEL DIMENSIONS:

| PATH NUMBER   | BOTTOM WIDTH (ft) | LEFT SIDE SLOPE (H:V) | RIGHT SIDE SLOPE (H:V) | TOTAL DEPTH (ft) | TOP WIDTH (ft) |
|---------------|-------------------|-----------------------|------------------------|------------------|----------------|
| SH - DC - 001 | 2                 | 2                     | 2                      | 1                | 6              |
| SH - CC - 002 | 2                 | 2                     | 2                      | 0.75             | 5              |
| SH - CC - 003 | 2                 | 2                     | 2                      | 1                | 6              |
| SH - CC - 004 | 4                 | 2                     | 2                      | 0.75             | 7              |
| SH - CC - 005 | 2                 | 2                     | 2                      | 1                | 6              |
| SH - CC - 006 | 3                 | 2                     | 2                      | 1                | 7              |
| SH - CC - 007 | 1                 | 2                     | 2                      | 1                | 5              |
| SH - CC - 008 | 2                 | 2                     | 2                      | 1                | 6              |
| SH - CC - 009 | 1                 | 2                     | 2                      | 0.75             | 4              |
| SH - CC - 010 | 1                 | 2                     | 2                      | 0.75             | 4              |

# STANDARD E&S WORKSHEET # 11

## Channel Design Data

PROJECT NAME: Williams REAE – MLV-505LD86

LOCATION: Monroe County, PA

PREPARED BY: CD

DATE: 02/21/2022

CHECKED BY: PW

DATE: 02/21/2022

| CHANNEL OR CHANNEL SECTION                                                 | SH-DC-001 |             |  |  |
|----------------------------------------------------------------------------|-----------|-------------|--|--|
| TEMPORARY OR PERMANENT? (T OR P)                                           | T         | P           |  |  |
| DESIGN STORM (2, 5, OR 10 YR)                                              | 10        | 10          |  |  |
| ACRES (AC)                                                                 | 3.68      | 3.68        |  |  |
| MULTIPLIER (1.6, 2.25, or 2.75) <sup>1</sup>                               | N/A       | N/A         |  |  |
| Q <sub>r</sub> (REQUIRED CAPACITY) (CFS)                                   | 0.11      | 0.11        |  |  |
| Q (CALCULATED AT FLOW DEPTH d) (CFS)                                       | 0.34      | 0.22        |  |  |
| PROTECTIVE LINING <sup>2</sup>                                             | SC150BN   | ECM w/ VEG. |  |  |
| n (MANNING'S COEFFICIENT) <sup>2</sup>                                     | 0.050     | 0.080       |  |  |
| V <sub>a</sub> (ALLOWABLE VELOCITY) (FPS)                                  | 8.0       | 15.0        |  |  |
| V (CALCULATED AT FLOW DEPTH d) (FPS)                                       | 0.9       | 0.6         |  |  |
| T <sub>a</sub> (MAX ALLOWABLE SHEAR STRESS) (LB/FT <sup>2</sup> )          | 2.1       | 8.0         |  |  |
| T <sub>d</sub> (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT <sup>2</sup> ) | 0.1       | 0.1         |  |  |
| CHANNEL BOTTOM WIDTH (FT)                                                  | 1         | 1           |  |  |
| CHANNEL SIDE SLOPES (H:V)                                                  | 2         | 2           |  |  |
| D (TOTAL DEPTH) (FT)                                                       | 0.75      | 0.75        |  |  |
| CHANNEL TOP WIDTH @ D (FT)                                                 | 4         | 4           |  |  |
| d (CALCULATED FLOW DEPTH) (FT)                                             | 0.25      | 0.25        |  |  |
| CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)                                      | 2         | 2           |  |  |
| BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)                                  | 4.0       | 4.0         |  |  |
| d <sub>50</sub> STONE SIZE (IN)                                            | -         | -           |  |  |
| A (CROSS-SECTIONAL AREA) (SQ. FT.)                                         | 0.375     | 0.375       |  |  |
| R (HYDRAULIC RADIUS) (FT)                                                  | 0.177     | 0.177       |  |  |
| S (BED SLOPE) <sup>3</sup> (FT/FT)                                         | 0.010     | 0.010       |  |  |
| S <sub>c</sub> (CRITICAL SLOPE) (FT/FT)                                    | 0.069     | 0.176       |  |  |
| .7S <sub>c</sub> (FT/FT)                                                   | 0.048     | 0.123       |  |  |
| 1.3S <sub>c</sub> (FT/FT)                                                  | 0.089     | 0.228       |  |  |
| STABLE FLOW? (Y/N)                                                         | Y         | Y           |  |  |
| FREEBOARD BASED ON UNSTABLE FLOW (FT)                                      | -         | -           |  |  |
| FREEBOARD BASED ON STABLE FLOW (FT)                                        | 0.5       | 0.5         |  |  |
| MINIMUM REQUIRED FREEBOARD <sup>4</sup> (FT)                               | 0.5       | 0.5         |  |  |
| DESIGN METHOD FOR PROTECTIVE LINING <sup>5</sup>                           | V         | V           |  |  |
| PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)                               |           |             |  |  |

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

# STANDARD E&S WORKSHEET # 11

## Channel Design Data

PROJECT NAME: Williams REAE – MLV-505LD86

LOCATION: Monroe County, PA

PREPARED BY: BM

DATE: 02/21/2022

CHECKED BY: PW

DATE: 02/21/2022

| CHANNEL OR CHANNEL SECTION                                                                       | SH-CC-002 |             | SH-CC-003 |             |
|--------------------------------------------------------------------------------------------------|-----------|-------------|-----------|-------------|
| TEMPORARY OR PERMANENT? (T OR P)                                                                 | T         | P           | T         | P           |
| DESIGN STORM (2, 5, OR 10 YR)                                                                    | 10        | 10          | 10        | 10          |
| ACRES (AC)                                                                                       | 0.09      | 0.09        | 0.57      | 0.57        |
| MULTIPLIER (1.6, 2.25, or 2.75) <sup>1</sup>                                                     | N/A       | N/A         | N/A       | N/A         |
| Q <sub>r</sub> (REQUIRED CAPACITY) (CFS)                                                         | 0.42      | 0.42        | 1.58      | 1.58        |
| Q (CALCULATED AT FLOW DEPTH d) (CFS)                                                             | 0.77      | 0.64        | 2.08      | 1.65        |
| PROTECTIVE LINING <sup>2</sup>                                                                   | SC150BN   | ECM w/ veg. | SC150BN   | ECM w/ veg. |
| n (MANNING'S COEFFICIENT) <sup>2</sup>                                                           | 0.050     | 0.055       | 0.050     | 0.063       |
| V <sub>a</sub> (ALLOWABLE VELOCITY) (FPS)                                                        | 8.0       | 15.0        | 8.0       | 15.0        |
| V (CALCULATED AT FLOW DEPTH d) (FPS)                                                             | 1.7       | 1.5         | 2.4       | 1.9         |
| T <sub>a</sub> (MAX ALLOWABLE SHEAR STRESS) (LB/FT <sup>2</sup> )                                | 2.1       | 8.0         | 2.1       | 8.0         |
| T <sub>d</sub> (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT <sup>2</sup> )                       | 0.5       | 0.4         | 0.8       | 0.8         |
| CHANNEL BOTTOM WIDTH (FT)                                                                        | 2         | 2           | 2         | 2           |
| CHANNEL SIDE SLOPES (H:V)                                                                        | 2         | 2           | 2         | 2           |
| D (TOTAL DEPTH) (FT)                                                                             | 0.75      | 0.75        | 1.0       | 1.0         |
| CHANNEL TOP WIDTH @ D (FT)                                                                       | 5         | 5           | 6         | 6           |
| d (CALCULATED FLOW DEPTH) (FT)                                                                   | 0.19      | 0.18        | 0.33      | 0.33        |
| CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)                                                            | 2.76      | 2.72        | 4.64      | 4.64        |
| BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)                                                        | 10.53     | 11.11       | 25.00     | 25.00       |
| d <sub>50</sub> STONE SIZE (IN)                                                                  | -         | -           | -         | -           |
| A (CROSS-SECTIONAL AREA) (SQ. FT.)                                                               | 0.452     | 0.425       | 0.878     | 0.878       |
| R (HYDRAULIC RADIUS) (FT)                                                                        | 0.159     | 0.151       | 0.253     | 0.253       |
| S (BED SLOPE) <sup>3</sup> (FT/FT)                                                               | 0.038     | 0.038       | 0.040     | 0.040       |
| S <sub>c</sub> (CRITICAL SLOPE) (FT/FT)                                                          | 0.069     | 0.085       | 0.060     | 0.097       |
| .7S <sub>c</sub> (FT/FT)                                                                         | 0.049     | 0.060       | 0.042     | 0.068       |
| 1.3S <sub>c</sub> (FT/FT)                                                                        | 0.090     | 0.111       | 0.078     | 0.126       |
| STABLE FLOW? (Y/N)                                                                               | Y         | Y           | Y         | Y           |
| FREEBOARD BASED ON UNSTABLE FLOW (FT)                                                            | -         | -           | -         | -           |
| FREEBOARD BASED ON STABLE FLOW (FT)                                                              | 0.56      | 0.57        | 0.67      | 0.67        |
| MINIMUM REQUIRED FREEBOARD <sup>4</sup> (FT)                                                     | 0.5       | 0.5         | 0.5       | 0.5         |
| DESIGN METHOD FOR PROTECTIVE LINING <sup>5</sup><br>PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S) | V         | V           | V         | V           |

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

| CHANNEL OR CHANNEL SECTION                                                                       | SH-CC-004 |             | SH-CC-005 |             |
|--------------------------------------------------------------------------------------------------|-----------|-------------|-----------|-------------|
| TEMPORARY OR PERMANENT? (T OR P)                                                                 | T         | P           | T         | P           |
| DESIGN STORM (2, 5, OR 10 YR)                                                                    | 10        | 10          | 10        | 10          |
| ACRES (AC)                                                                                       | 0.62      | 0.62        | 1.46      | 1.46        |
| MULTIPLIER (1.6, 2.25, or 2.75) <sup>1</sup>                                                     | N/A       | N/A         | N/A       | N/A         |
| Q <sub>r</sub> (REQUIRED CAPACITY) (CFS)                                                         | 1.78      | 1.78        | 3.82      | 3.82        |
| Q (CALCULATED AT FLOW DEPTH d) (CFS)                                                             | 1.89      | 1.89        | 4.03      | 3.99        |
| PROTECTIVE LINING <sup>2</sup>                                                                   | SC150BN   | ECM w/ veg. | SC150BN   | ECM w/ veg. |
| n (MANNING'S COEFFICIENT) <sup>2</sup>                                                           | 0.050     | 0.050       | 0.050     | 0.045       |
| V <sub>a</sub> (ALLOWABLE VELOCITY) (FPS)                                                        | 8.0       | 15.0        | 8.0       | 15.0        |
| V (CALCULATED AT FLOW DEPTH d) (FPS)                                                             | 2.7       | 2.7         | 3.6       | 3.8         |
| T <sub>a</sub> (MAX ALLOWABLE SHEAR STRESS) (LB/FT <sup>2</sup> )                                | 2.1       | 8.0         | 2.1       | 8.0         |
| T <sub>d</sub> (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT <sup>2</sup> )                       | 1.1       | 1.1         | 1.7       | 1.6         |
| CHANNEL BOTTOM WIDTH (FT)                                                                        | 4         | 4           | 3         | 3           |
| CHANNEL SIDE SLOPES (H:V)                                                                        | 2         | 2           | 2         | 2           |
| D (TOTAL DEPTH) (FT)                                                                             | 0.75      | 0.75        | 1.0       | 1.0         |
| CHANNEL TOP WIDTH @ D (FT)                                                                       | 7         | 7           | 7         | 7           |
| d (CALCULATED FLOW DEPTH) (FT)                                                                   | 0.16      | 0.16        | 0.31      | 0.29        |
| CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)                                                            | 4.64      | 4.64        | 4.24      | 4.16        |
| BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)                                                        | 25.0      | 25.0        | 9.68      | 10.34       |
| d <sub>50</sub> STONE SIZE (IN)                                                                  | -         | -           | -         | -           |
| A (CROSS-SECTIONAL AREA) (SQ. FT.)                                                               | 0.691     | 0.691       | 1.122     | 1.038       |
| R (HYDRAULIC RADIUS) (FT)                                                                        | 0.147     | 0.147       | 0.256     | 0.242       |
| S (BED SLOPE) <sup>3</sup> (FT/FT)                                                               | 0.110     | 0.110       | 0.090     | 0.090       |
| S <sub>c</sub> (CRITICAL SLOPE) (FT/FT)                                                          | 0.070     | 0.070       | 0.059     | 0.049       |
| .7S <sub>c</sub> (FT/FT)                                                                         | 0.049     | 0.049       | 0.042     | 0.034       |
| 1.3S <sub>c</sub> (FT/FT)                                                                        | 0.091     | 0.091       | 0.077     | 0.064       |
| STABLE FLOW? (Y/N)                                                                               | Y         | Y           | Y         | Y           |
| FREEBOARD BASED ON UNSTABLE FLOW (FT)                                                            | -         | -           | -         | -           |
| FREEBOARD BASED ON STABLE FLOW (FT)                                                              | 0.59      | 0.59        | 0.69      | 0.71        |
| MINIMUM REQUIRED FREEBOARD <sup>4</sup> (FT)                                                     | 0.5       | 0.5         | 0.5       | 0.5         |
| DESIGN METHOD FOR PROTECTIVE LINING <sup>5</sup><br>PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S) | V         | V           | V         | V           |

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.
6. Shear stress calculations for rip-rap channels assume a 40% void ratio in the riprap on the channel bottoms (not the side slopes) in accordance with Chapter 6 of the E&S Manual.

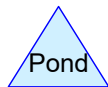
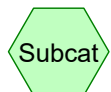
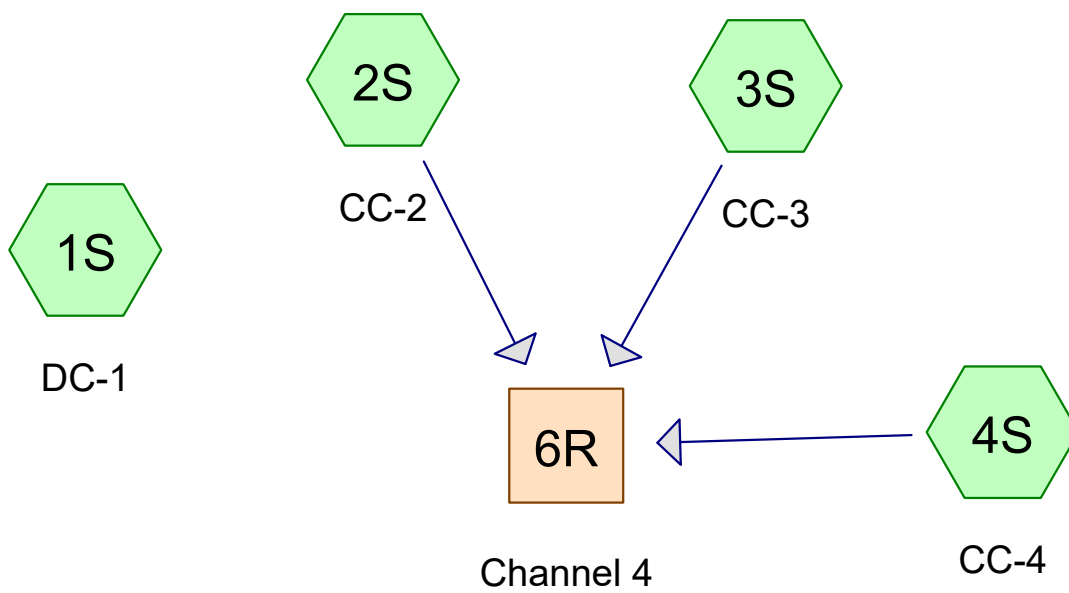
| CHANNEL OR CHANNEL SECTION                                                                       | SH-CC-006  | SH-CC-007  | SH-CC-008 |            |
|--------------------------------------------------------------------------------------------------|------------|------------|-----------|------------|
| TEMPORARY OR PERMANENT? (T OR P)                                                                 | P          | P          | T         | P          |
| DESIGN STORM (2, 5, OR 10 YR)                                                                    | 10         | 10         | 10        | 10         |
| ACRES (AC)                                                                                       | 1.81       | 1.93       | 1.98      | 1.98       |
| MULTIPLIER (1.6, 2.25, or 2.75) <sup>1</sup>                                                     | N/A        | N/A        | N/A       | N/A        |
| Q <sub>r</sub> (REQUIRED CAPACITY) (CFS)                                                         | 4.12       | 5.06       | 4.60      | 4.60       |
| Q (CALCULATED AT FLOW DEPTH d) (CFS)                                                             | 4.2        | 6.3        | 5.58      | 5.10       |
| PROTECTIVE LINING <sup>2</sup>                                                                   | R-4 Riprap | R-4 Riprap | SC150BN   | ECM w veg. |
| n (MANNING'S COEFFICIENT) <sup>2</sup>                                                           | 0.070      | 0.64       | 0.050     | 0.045      |
| V <sub>a</sub> (ALLOWABLE VELOCITY) (FPS)                                                        | 9.0        | 9.0        | 8.0       | 15.0       |
| V (CALCULATED AT FLOW DEPTH d) (FPS)                                                             | 3.5        | 4.2        | 3.7       | 3.9        |
| T <sub>a</sub> (MAX ALLOWABLE SHEAR STRESS) (LB/FT <sup>2</sup> )                                | 2.0        | 2.0        | 2.1       | 8.0        |
| T <sub>d</sub> (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT <sup>2</sup> )                       | 0.0        | 1.1        | 2.0       | 1.8        |
| CHANNEL BOTTOM WIDTH (FT)                                                                        | 2          | 2          | 2         | 2          |
| CHANNEL SIDE SLOPES (H:V)                                                                        | 2          | 2          | 2         | 2          |
| D (TOTAL DEPTH) (FT)                                                                             | 1.0        | 1.0        | 1.0       | 1.0        |
| CHANNEL TOP WIDTH @ D (FT)                                                                       | 6          | 6          | 6         | 6          |
| d (CALCULATED FLOW DEPTH) (FT)                                                                   | 0.42       | 0.50       | 0.50      | 0.45       |
| CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)                                                            | 3.68       | 4.00       | 4.00      | 3.80       |
| BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)                                                        | 4.76       | 4.00       | 4.00      | 4.44       |
| d <sub>50</sub> STONE SIZE (IN)                                                                  | 6          | 6          | -         | -          |
| A (CROSS-SECTIONAL AREA) (SQ. FT.)                                                               | 1.193      | 1.500      | 1.500     | 1.305      |
| R (HYDRAULIC RADIUS) (FT)                                                                        | 0.308      | 0.354      | 0.354     | 0.325      |
| S (BED SLOPE) <sup>3</sup> (FT/FT)                                                               | 0.130      | 0.130      | 0.063     | 0.063      |
| S <sub>c</sub> (CRITICAL SLOPE) (FT/FT)                                                          | 0.111      | 0.088      | 0.054     | 0.045      |
| .7S <sub>c</sub> (FT/FT)                                                                         | 0.078      | 0.062      | 0.038     | 0.032      |
| 1.3S <sub>c</sub> (FT/FT)                                                                        | 0.14       | 0.11       | 0.071     | 0.059      |
| STABLE FLOW? (Y/N)                                                                               | N          | Y          | N         | Y          |
| FREEBOARD BASED ON UNSTABLE FLOW (FT)                                                            | 0.58       | -          | 0.5       | -          |
| FREEBOARD BASED ON STABLE FLOW (FT)                                                              | -          | 0.5        | -         | 0.55       |
| MINIMUM REQUIRED FREEBOARD <sup>4</sup> (FT)                                                     | 0.5        | 0.5        | 0.5       | 0.5        |
| DESIGN METHOD FOR PROTECTIVE LINING <sup>5</sup><br>PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S) | V          | V          | V         | V          |

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.
6. Shear stress calculations for rip-rap channels assume a 40% void ratio in the riprap on the channel bottoms (not the side slopes) in accordance with Chapter 6 of the E&S Manual.

| CHANNEL OR CHANNEL SECTION                                                                       | SH-CC-009 |            | SH-CC-010 |            |
|--------------------------------------------------------------------------------------------------|-----------|------------|-----------|------------|
| TEMPORARY OR PERMANENT? (T OR P)                                                                 | T         | P          | T         | P          |
| DESIGN STORM (2, 5, OR 10 YR)                                                                    | 10        | 10         | 10        | 10         |
| ACRES (AC)                                                                                       | 0.06      | 0.06       | 0.12      | 0.12       |
| MULTIPLIER (1.6, 2.25, or 2.75) <sup>1</sup>                                                     | N/A       | N/A        | N/A       | N/A        |
| Q <sub>r</sub> (REQUIRED CAPACITY) (CFS)                                                         | 0.22      | 0.22       | 0.5       | 0.5        |
| Q (CALCULATED AT FLOW DEPTH d) (CFS)                                                             | 0.25      | 0.23       | 0.89      | 0.81       |
| PROTECTIVE LINING <sup>2</sup>                                                                   | SC150BN   | ECM w veg. | SC150BN   | ECM w veg. |
| n (MANNING'S COEFFICIENT) <sup>2</sup>                                                           | 0.050     | 0.055      | 0.050     | 0.055      |
| V <sub>a</sub> (ALLOWABLE VELOCITY) (FPS)                                                        | 8.0       | 15.0       | 8.0       | 15.0       |
| V (CALCULATED AT FLOW DEPTH d) (FPS)                                                             | 2.1       | 1.9        | 3.2       | 2.9        |
| T <sub>a</sub> (MAX ALLOWABLE SHEAR STRESS) (LB/FT <sup>2</sup> )                                | 2.1       | 8.0        | 2.1       | 8.0        |
| T <sub>d</sub> (CALC'D SHEAR STRESS AT FLOW DEPTH d) (LB/FT <sup>2</sup> )                       | 0.9       | 0.9        | 1.8       | 1.8        |
| CHANNEL BOTTOM WIDTH (FT)                                                                        | 1         | 1          | 1         | 1          |
| CHANNEL SIDE SLOPES (H:V)                                                                        | 2         | 2          | 2         | 2          |
| D (TOTAL DEPTH) (FT)                                                                             | 0.75      | 0.75       | 0.75      | 0.75       |
| CHANNEL TOP WIDTH @ D (FT)                                                                       | 4         | 4          | 4         | 4          |
| d (CALCULATED FLOW DEPTH) (FT)                                                                   | 0.1       | 0.1        | 0.2       | 0.2        |
| CHANNEL TOP WIDTH @ FLOW DEPTH d (FT)                                                            | 1.4       | 1.4        | 1.8       | 1.8        |
| BOTTOM WIDTH: FLOW DEPTH RATIO (12:1 MAX)                                                        | 10        | 10         | 5         | 5          |
| d <sub>50</sub> STONE SIZE (IN)                                                                  | -         | -          | -         | -          |
| A (CROSS-SECTIONAL AREA) (SQ. FT.)                                                               | 0.120     | 0.120      | 0.280     | 0.280      |
| R (HYDRAULIC RADIUS) (FT)                                                                        | 0.083     | 0.083      | 0.148     | 0.148      |
| S (BED SLOPE) <sup>3</sup> (FT/FT)                                                               | 0.139     | 0.139      | 0.148     | 0.148      |
| S <sub>c</sub> (CRITICAL SLOPE) (FT/FT)                                                          | 0.086     | 0.104      | 0.072     | 0.088      |
| .7S <sub>c</sub> (FT/FT)                                                                         | 0.060     | 0.073      | 0.051     | 0.061      |
| 1.3S <sub>c</sub> (FT/FT)                                                                        | 0.112     | 0.136      | 0.094     | 0.114      |
| STABLE FLOW? (Y/N)                                                                               | Y         | Y          | Y         | Y          |
| FREEBOARD BASED ON UNSTABLE FLOW (FT)                                                            | -         | -          | -         | -          |
| FREEBOARD BASED ON STABLE FLOW (FT)                                                              | 0.65      | 0.65       | 0.55      | 0.55       |
| MINIMUM REQUIRED FREEBOARD <sup>4</sup> (FT)                                                     | 0.5       | 0.5        | 0.5       | 0.5        |
| DESIGN METHOD FOR PROTECTIVE LINING <sup>5</sup><br>PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S) | V         | V          | V         | V          |

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.
6. Shear stress calculations for rip-rap channels assume a 40% void ratio in the riprap on the channel bottoms (not the side slopes) in accordance with Chapter 6 of the E&S Manual.

ATTACHMENT 4.5  
CHANNEL HYDROCAD REPORTS –  
MLV-505LD86





**MLV 505LD86\_Channels 1-4 REV 2**

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**Area Listing (all nodes)**

| Area<br>(sq-ft) | CN        | Description<br>(subcatchment-numbers)      |
|-----------------|-----------|--------------------------------------------|
| 104,226         | 30        | Meadow, non-grazed, HSG A (1S, 3S)         |
| 13,199          | 78        | Meadow, non-grazed, HSG D (1S, 2S, 3S, 4S) |
| 5,051           | 98        | Paved parking, HSG A (3S)                  |
| 1,251           | 98        | Paved parking, HSG D (2S, 3S)              |
| 30,585          | 30        | Woods, Good, HSG A (1S)                    |
| 32,717          | 77        | Woods, Good, HSG D (1S)                    |
| <b>187,029</b>  | <b>44</b> | <b>TOTAL AREA</b>                          |

**MLV 505LD86\_Channels 1-4 REV 2**

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**Soil Listing (all nodes)**

| Area<br>(sq-ft) | Soil<br>Group | Subcatchment<br>Numbers |
|-----------------|---------------|-------------------------|
| 139,862         | HSG A         | 1S, 3S                  |
| 0               | HSG B         |                         |
| 0               | HSG C         |                         |
| 47,167          | HSG D         | 1S, 2S, 3S, 4S          |
| 0               | Other         |                         |
| <b>187,029</b>  |               | <b>TOTAL AREA</b>       |

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**Ground Covers (all nodes)**

| HSG-A<br>(sq-ft) | HSG-B<br>(sq-ft) | HSG-C<br>(sq-ft) | HSG-D<br>(sq-ft) | Other<br>(sq-ft) | Total<br>(sq-ft) | Ground<br>Cover       | Subcat<br>Number |
|------------------|------------------|------------------|------------------|------------------|------------------|-----------------------|------------------|
| 104,226          | 0                | 0                | 13,199           | 0                | 117,425          | Meadow,<br>non-grazed |                  |
| 5,051            | 0                | 0                | 1,251            | 0                | 6,302            | Paved parking         |                  |
| 30,585           | 0                | 0                | 32,717           | 0                | 63,302           | Woods, Good           |                  |
| <b>139,862</b>   | <b>0</b>         | <b>0</b>         | <b>47,167</b>    | <b>0</b>         | <b>187,029</b>   | <b>TOTAL AREA</b>     |                  |

**MLV 505LD86\_Channels 1-4 REV 2***Type II 24-hr 1-yr Rainfall=2.72"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DC-1**Runoff Area=160,162 sf 0.00% Impervious Runoff Depth=0.00"  
Tc=5.0 min CN=40 Runoff=0.00 cfs 0 cf**Subcatchment2S: CC-2**Runoff Area=3,973 sf 3.80% Impervious Runoff Depth=0.99"  
Tc=5.0 min CN=79 Runoff=0.16 cfs 327 cf**Subcatchment3S: CC-3**Runoff Area=20,862 sf 29.48% Impervious Runoff Depth=0.32"  
Tc=5.0 min CN=63 Runoff=0.20 cfs 560 cf**Subcatchment4S: CC-4**Runoff Area=2,032 sf 0.00% Impervious Runoff Depth=0.93"  
Tc=5.0 min CN=78 Runoff=0.08 cfs 158 cf**Reach 6R: Channel 4**Avg. Flow Depth=0.21' Max Vel=1.84 fps Inflow=0.43 cfs 1,045 cf  
n=0.067 L=63.0' S=0.0800 '/' Capacity=3.42 cfs Outflow=0.42 cfs 1,045 cf**Total Runoff Area = 187,029 sf Runoff Volume = 1,045 cf Average Runoff Depth = 0.07"**  
**96.63% Pervious = 180,727 sf 3.37% Impervious = 6,302 sf**

**MLV 505LD86\_Channels 1-4 REV 2**

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Type II 24-hr 1-yr Rainfall=2.72"

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**Summary for Subcatchment 1S: DC-1**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

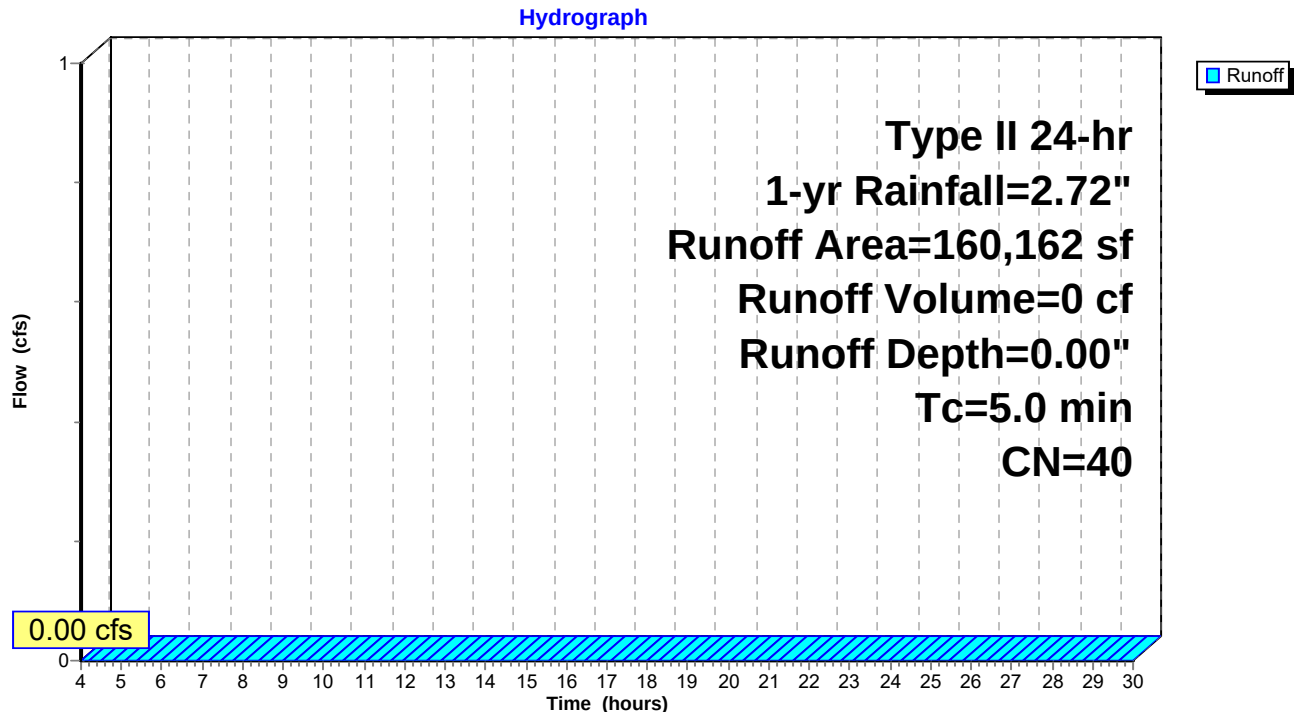
[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 30,585    | 30 | Woods, Good, HSG A        |
| 32,717    | 77 | Woods, Good, HSG D        |
| 94,974    | 30 | Meadow, non-grazed, HSG A |
| 1,886     | 78 | Meadow, non-grazed, HSG D |
| 160,162   | 40 | Weighted Average          |
| 160,162   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 1S: DC-1**

**MLV 505LD86\_Channels 1-4 REV 2**

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Type II 24-hr 1-yr Rainfall=2.72"

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**Summary for Subcatchment 2S: CC-2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.16 cfs @ 11.96 hrs, Volume= 327 cf, Depth= 0.99"

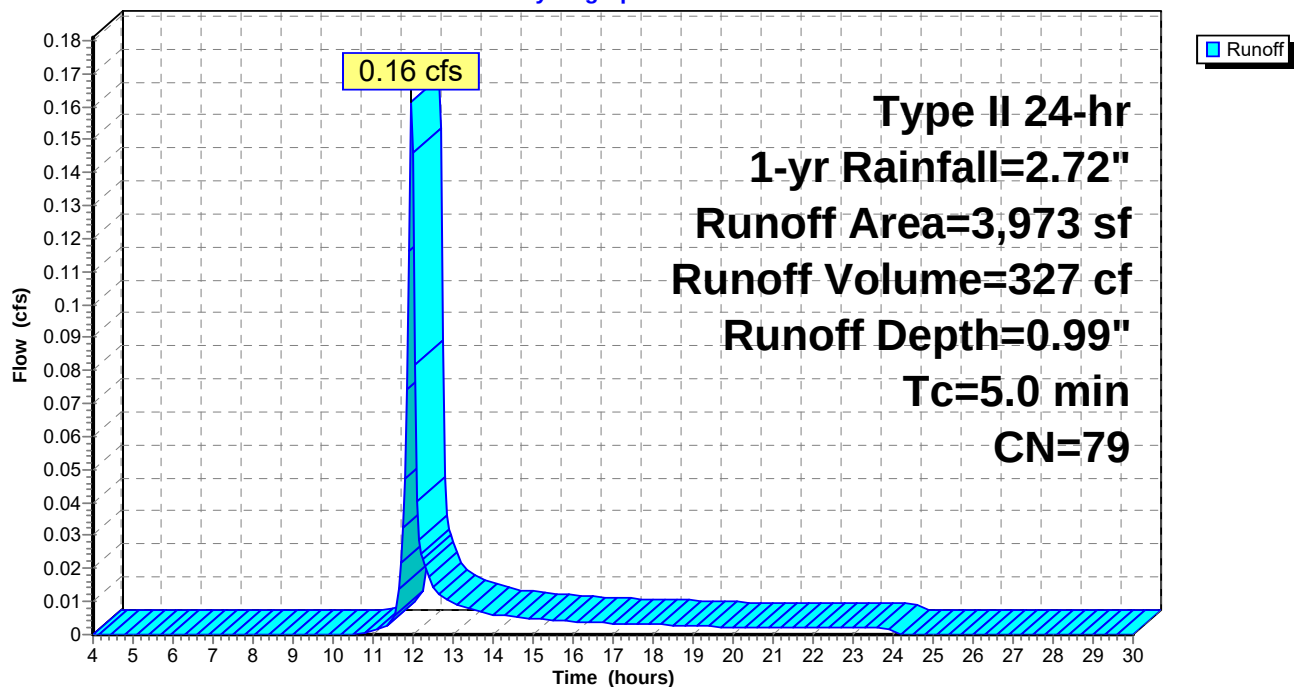
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,822     | 78 | Meadow, non-grazed, HSG D |
| 151       | 98 | Paved parking, HSG D      |
| 3,973     | 79 | Weighted Average          |
| 3,822     |    | 96.20% Pervious Area      |
| 151       |    | 3.80% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 2S: CC-2**

Hydrograph



**MLV 505LD86\_Channels 1-4 REV 2**

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Type II 24-hr 1-yr Rainfall=2.72"

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**Summary for Subcatchment 3S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.20 cfs @ 11.99 hrs, Volume= 560 cf, Depth= 0.32"

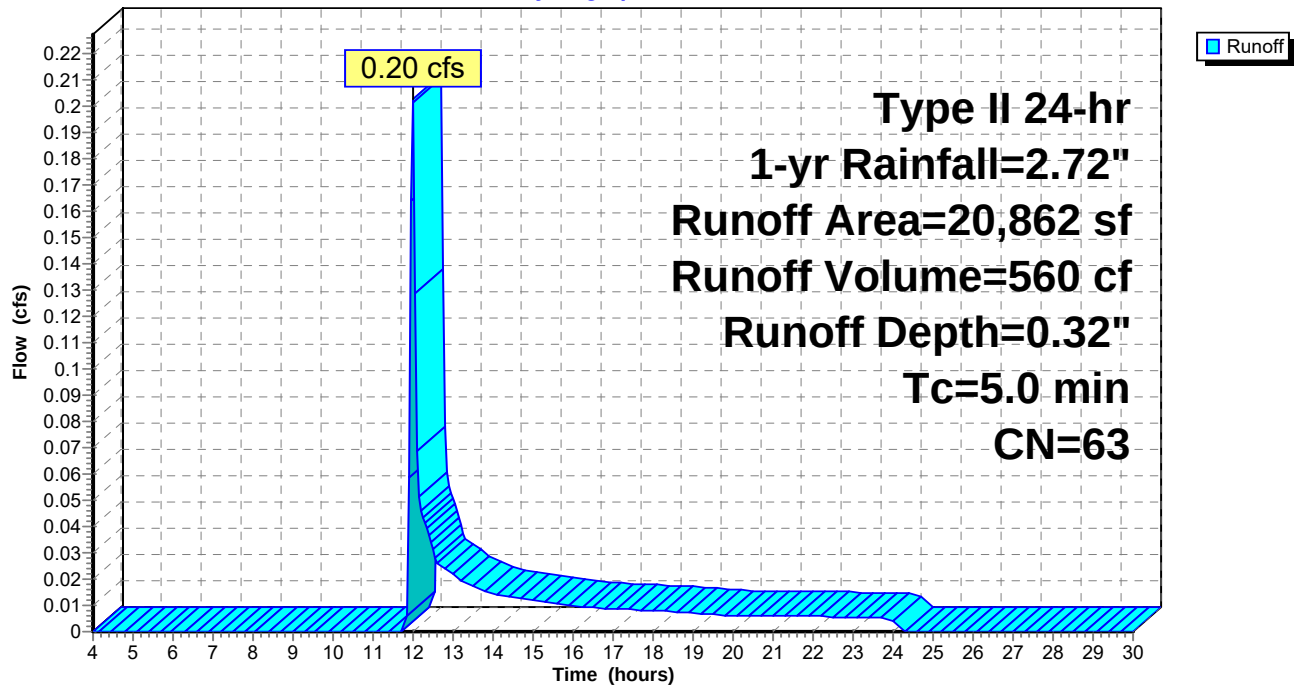
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 5,459     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 1,100     | 98 | Paved parking, HSG D      |
| 20,862    | 63 | Weighted Average          |
| 14,711    |    | 70.52% Pervious Area      |
| 6,151     |    | 29.48% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 3S: CC-3**

Hydrograph



**MLV 505LD86\_Channels 1-4 REV 2**

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Type II 24-hr 1-yr Rainfall=2.72"

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**Summary for Subcatchment 4S: CC-4**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.08 cfs @ 11.96 hrs, Volume= 158 cf, Depth= 0.93"

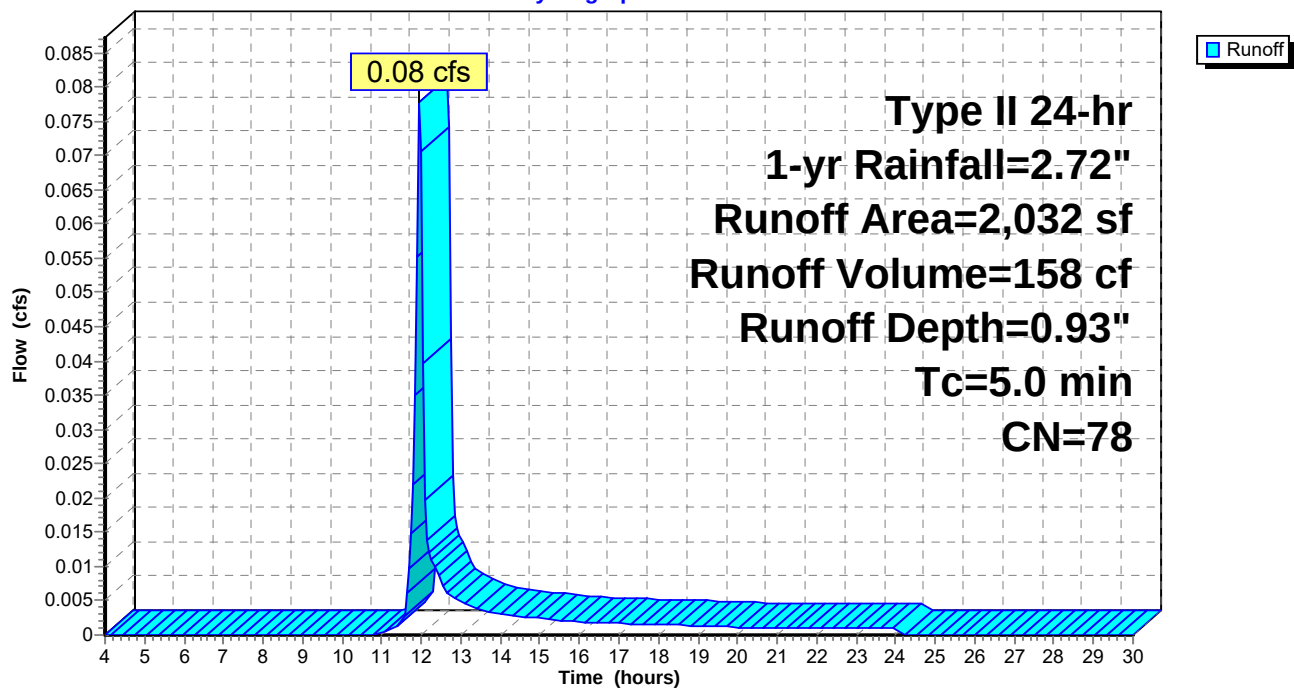
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,032     | 78 | Meadow, non-grazed, HSG D |
| 2,032     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 4S: CC-4**

Hydrograph





**Summary for Reach 6R: Channel 4**

Inflow Area = 26,867 sf, 23.46% Impervious, Inflow Depth = 0.47" for 1-yr event  
 Inflow = 0.43 cfs @ 11.98 hrs, Volume= 1,045 cf  
 Outflow = 0.42 cfs @ 12.00 hrs, Volume= 1,045 cf, Atten= 3%, Lag= 0.9 min

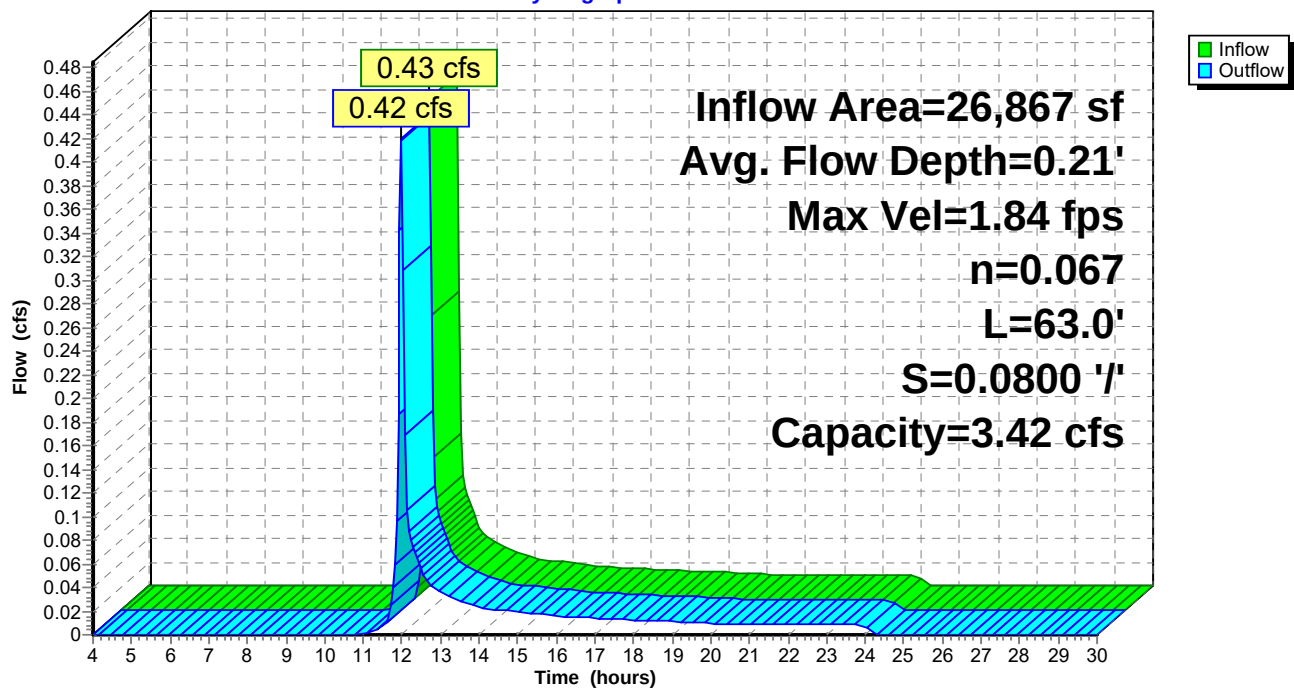
Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
 Max. Velocity= 1.84 fps, Min. Travel Time= 0.6 min  
 Avg. Velocity= 0.54 fps, Avg. Travel Time= 1.9 min

Peak Storage= 15 cf @ 11.99 hrs  
 Average Depth at Peak Storage= 0.21'  
 Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 3.42 cfs

1.00' x 0.75' deep channel, n= 0.067  
 Side Slope Z-value= 0.5 '/' Top Width= 1.75'  
 Length= 63.0' Slope= 0.0800 '/'  
 Inlet Invert= 977.00', Outlet Invert= 971.96'

**Reach 6R: Channel 4**

Hydrograph



**MLV 505LD86\_Channels 1-4 REV 2***Type II 24-hr 2-yr Rainfall=3.26"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DC-1**Runoff Area=160,162 sf 0.00% Impervious Runoff Depth=0.00"  
Tc=5.0 min CN=40 Runoff=0.00 cfs 59 cf**Subcatchment2S: CC-2**Runoff Area=3,973 sf 3.80% Impervious Runoff Depth=1.38"  
Tc=5.0 min CN=79 Runoff=0.23 cfs 458 cf**Subcatchment3S: CC-3**Runoff Area=20,862 sf 29.48% Impervious Runoff Depth=0.55"  
Tc=5.0 min CN=63 Runoff=0.41 cfs 950 cf**Subcatchment4S: CC-4**Runoff Area=2,032 sf 0.00% Impervious Runoff Depth=1.32"  
Tc=5.0 min CN=78 Runoff=0.11 cfs 223 cf**Reach 6R: Channel 4**Avg. Flow Depth=0.30' Max Vel=2.16 fps Inflow=0.74 cfs 1,631 cf  
n=0.067 L=63.0' S=0.0800 '/' Capacity=3.42 cfs Outflow=0.72 cfs 1,631 cf**Total Runoff Area = 187,029 sf Runoff Volume = 1,690 cf Average Runoff Depth = 0.11"**  
**96.63% Pervious = 180,727 sf 3.37% Impervious = 6,302 sf**

**Summary for Subcatchment 1S: DC-1**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 59 cf, Depth= 0.00"

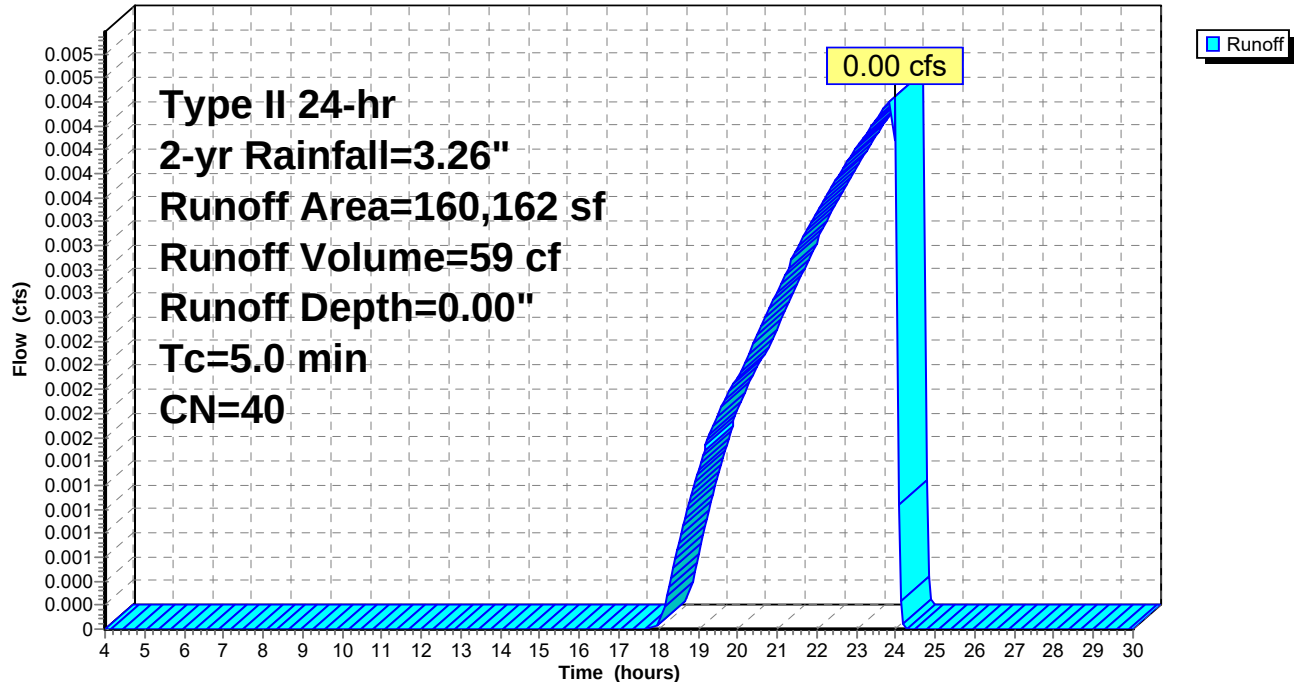
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 30,585    | 30 | Woods, Good, HSG A        |
| 32,717    | 77 | Woods, Good, HSG D        |
| 94,974    | 30 | Meadow, non-grazed, HSG A |
| 1,886     | 78 | Meadow, non-grazed, HSG D |
| 160,162   | 40 | Weighted Average          |
| 160,162   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 1S: DC-1**

Hydrograph



**MLV 505LD86\_Channels 1-4 REV 2**

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Type II 24-hr 2-yr Rainfall=3.26"

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**Summary for Subcatchment 2S: CC-2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.23 cfs @ 11.96 hrs, Volume= 458 cf, Depth= 1.38"

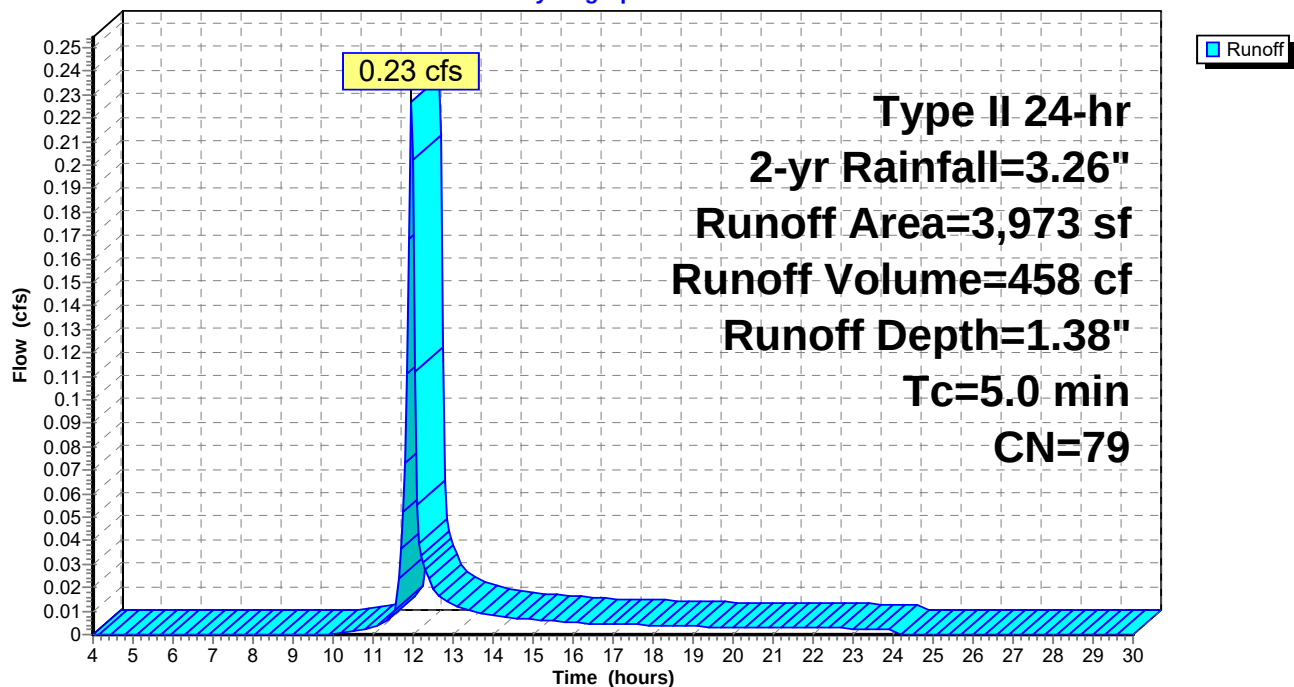
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,822     | 78 | Meadow, non-grazed, HSG D |
| 151       | 98 | Paved parking, HSG D      |
| 3,973     | 79 | Weighted Average          |
| 3,822     |    | 96.20% Pervious Area      |
| 151       |    | 3.80% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 2S: CC-2**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.26"

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**Summary for Subcatchment 3S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.41 cfs @ 11.98 hrs, Volume= 950 cf, Depth= 0.55"

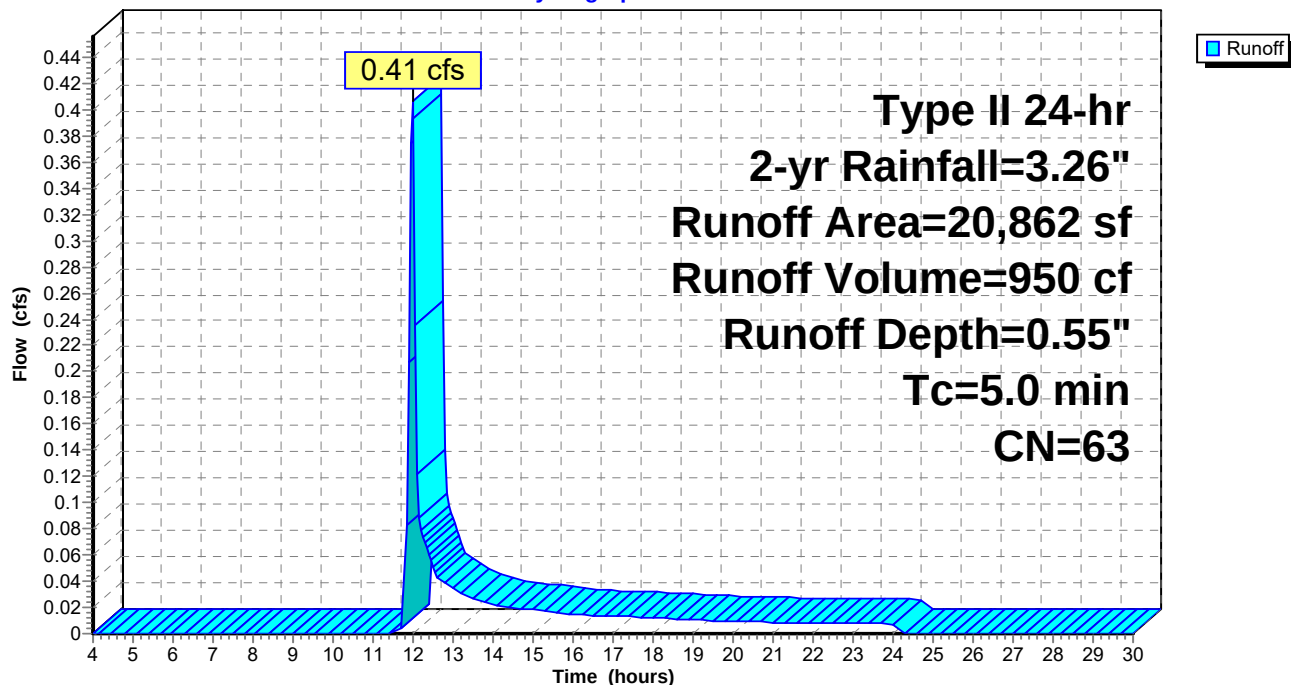
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 5,459     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 1,100     | 98 | Paved parking, HSG D      |
| 20,862    | 63 | Weighted Average          |
| 14,711    |    | 70.52% Pervious Area      |
| 6,151     |    | 29.48% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 3S: CC-3**

Hydrograph



**Summary for Subcatchment 4S: CC-4**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.11 cfs @ 11.96 hrs, Volume= 223 cf, Depth= 1.32"

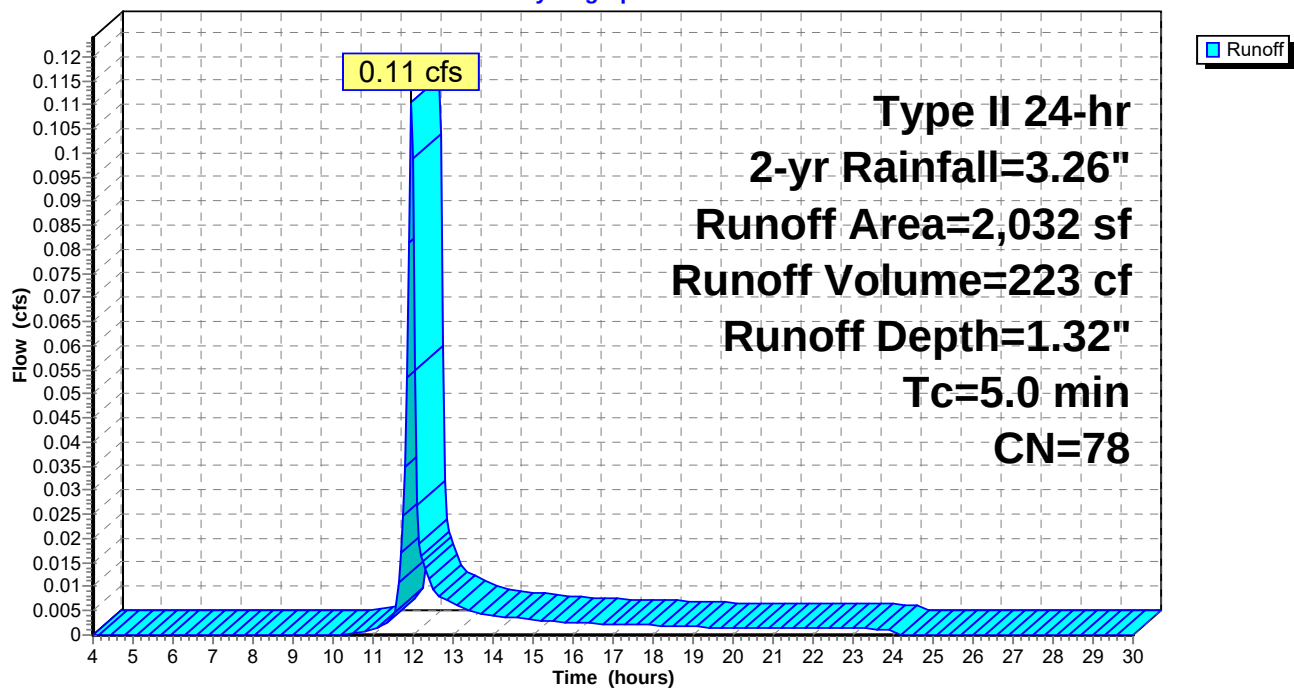
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,032     | 78 | Meadow, non-grazed, HSG D |
| 2,032     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 4S: CC-4**

Hydrograph



### Summary for Reach 6R: Channel 4

Inflow Area = 26,867 sf, 23.46% Impervious, Inflow Depth = 0.73" for 2-yr event  
 Inflow = 0.74 cfs @ 11.97 hrs, Volume= 1,631 cf  
 Outflow = 0.72 cfs @ 11.99 hrs, Volume= 1,631 cf, Atten= 2%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
 Max. Velocity= 2.16 fps, Min. Travel Time= 0.5 min  
 Avg. Velocity= 0.61 fps, Avg. Travel Time= 1.7 min

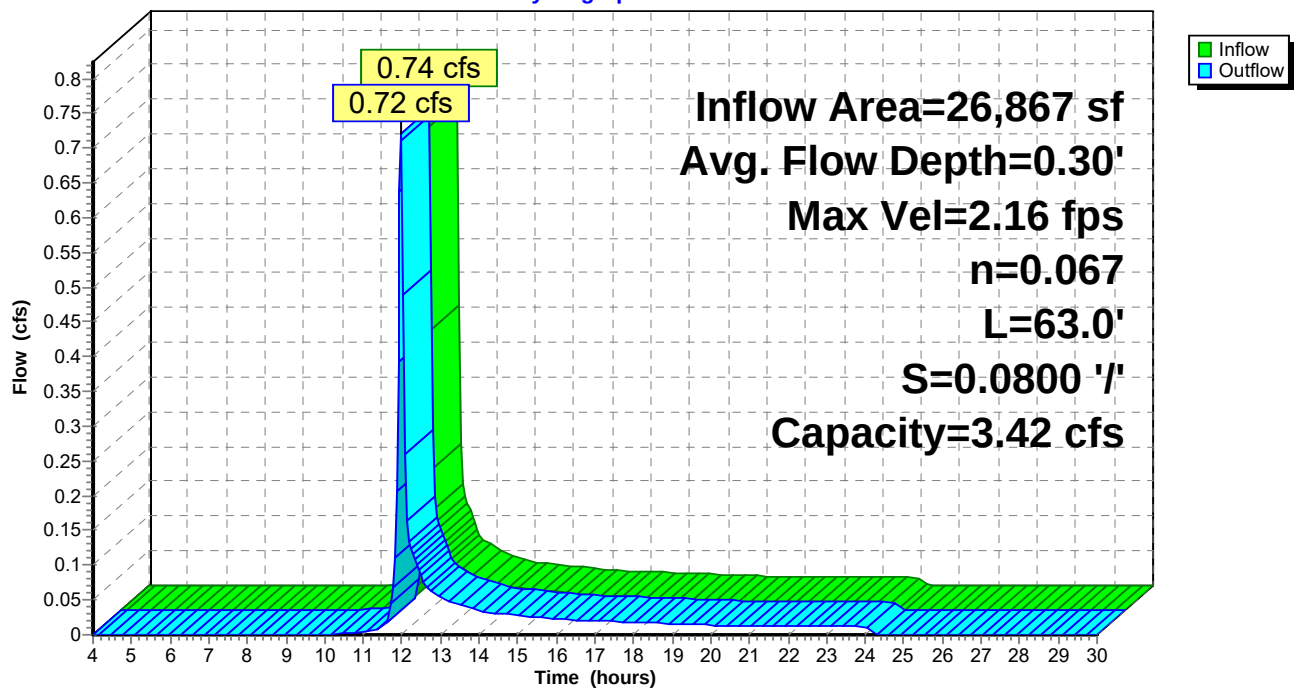
Peak Storage= 21 cf @ 11.98 hrs  
 Average Depth at Peak Storage= 0.30'  
 Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 3.42 cfs

1.00' x 0.75' deep channel, n= 0.067  
 Side Slope Z-value= 0.5 '/' Top Width= 1.75'  
 Length= 63.0' Slope= 0.0800 '/'  
 Inlet Invert= 977.00', Outlet Invert= 971.96'



### Reach 6R: Channel 4

Hydrograph



**MLV 505LD86\_Channels 1-4 REV 2***Type II 24-hr 10-yr Rainfall=4.74"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DC-1** Runoff Area=160,162 sf 0.00% Impervious Runoff Depth=0.18"  
Tc=5.0 min CN=40 Runoff=0.11 cfs 2,414 cf

**Subcatchment2S: CC-2** Runoff Area=3,973 sf 3.80% Impervious Runoff Depth=2.58"  
Tc=5.0 min CN=79 Runoff=0.42 cfs 854 cf

**Subcatchment3S: CC-3** Runoff Area=20,862 sf 29.48% Impervious Runoff Depth=1.35"  
Tc=5.0 min CN=63 Runoff=1.13 cfs 2,341 cf

**Subcatchment4S: CC-4** Runoff Area=2,032 sf 0.00% Impervious Runoff Depth=2.49"  
Tc=5.0 min CN=78 Runoff=0.21 cfs 422 cf

**Reach 6R: Channel 4** Avg. Flow Depth=0.50' Max Vel=2.76 fps Inflow=1.76 cfs 3,617 cf  
n=0.067 L=63.0' S=0.0800 '/' Capacity=3.42 cfs Outflow=1.72 cfs 3,617 cf

**Total Runoff Area = 187,029 sf Runoff Volume = 6,031 cf Average Runoff Depth = 0.39"**  
**96.63% Pervious = 180,727 sf 3.37% Impervious = 6,302 sf**



**Summary for Subcatchment 1S: DC-1**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.11 cfs @ 12.36 hrs, Volume= 2,414 cf, Depth= 0.18"

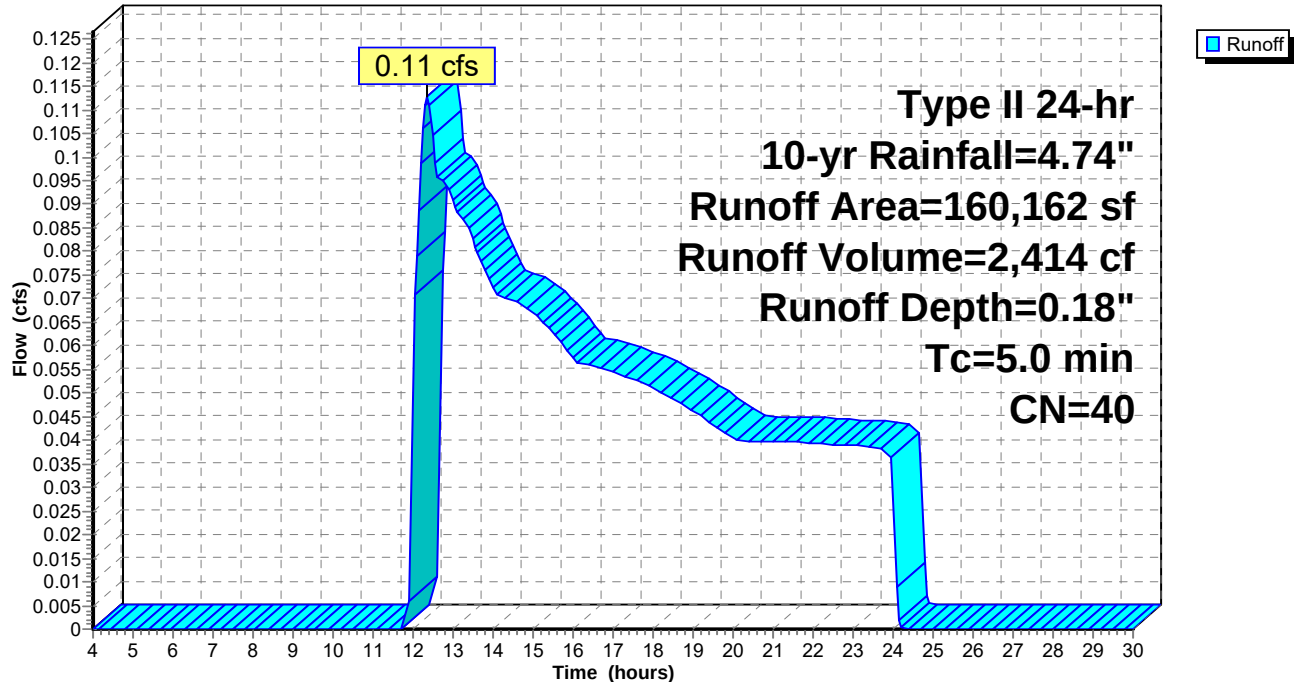
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 30,585    | 30 | Woods, Good, HSG A        |
| 32,717    | 77 | Woods, Good, HSG D        |
| 94,974    | 30 | Meadow, non-grazed, HSG A |
| 1,886     | 78 | Meadow, non-grazed, HSG D |
| 160,162   | 40 | Weighted Average          |
| 160,162   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 1S: DC-1**

Hydrograph



**MLV 505LD86\_Channels 1-4 REV 2**

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Type II 24-hr 10-yr Rainfall=4.74"

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**Summary for Subcatchment 2S: CC-2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.42 cfs @ 11.96 hrs, Volume= 854 cf, Depth= 2.58"

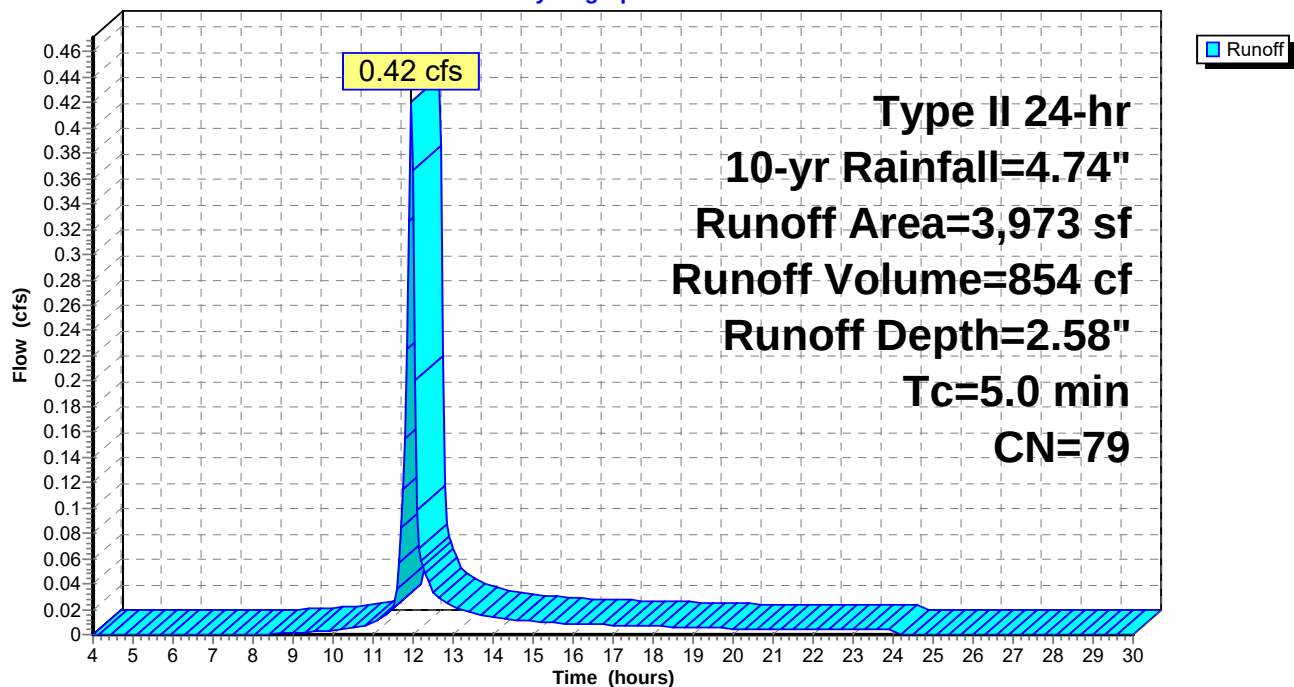
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,822     | 78 | Meadow, non-grazed, HSG D |
| 151       | 98 | Paved parking, HSG D      |
| 3,973     | 79 | Weighted Average          |
| 3,822     |    | 96.20% Pervious Area      |
| 151       |    | 3.80% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 2S: CC-2**

Hydrograph



**MLV 505LD86\_Channels 1-4 REV 2**

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Type II 24-hr 10-yr Rainfall=4.74"

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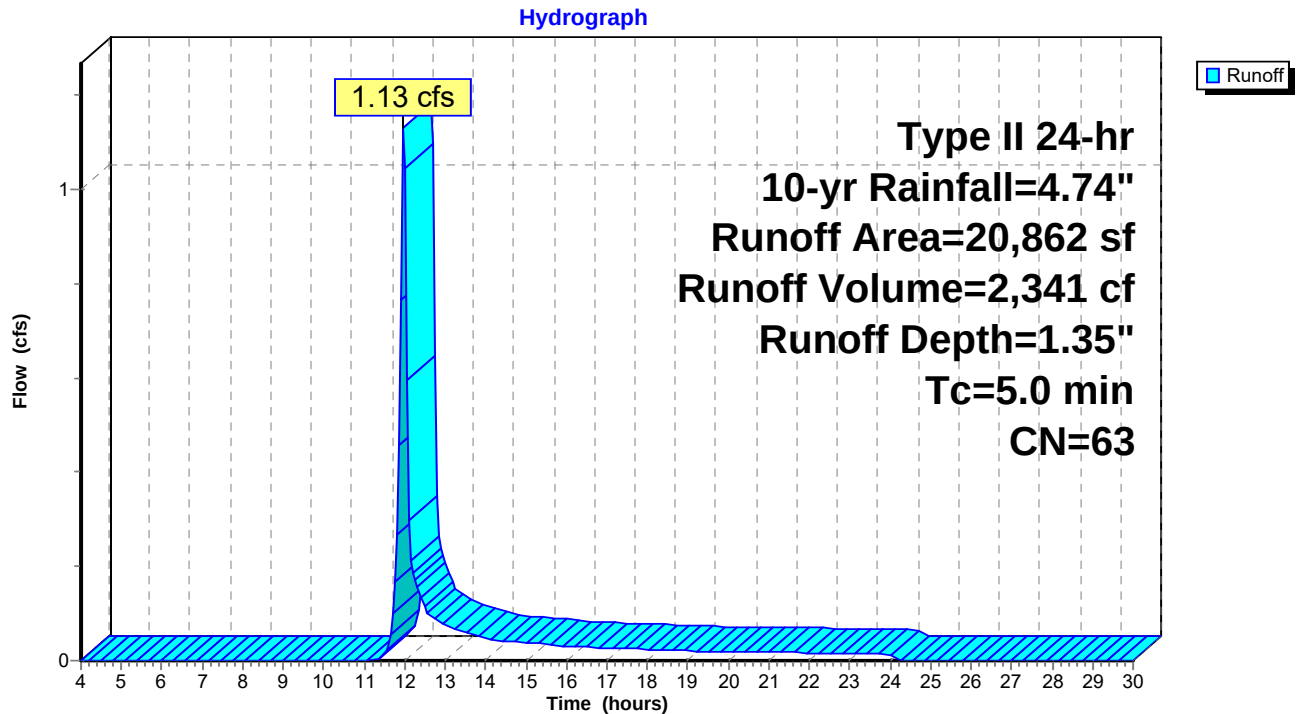
**Summary for Subcatchment 3S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.13 cfs @ 11.97 hrs, Volume= 2,341 cf, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 5,459     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 1,100     | 98 | Paved parking, HSG D      |
| 20,862    | 63 | Weighted Average          |
| 14,711    |    | 70.52% Pervious Area      |
| 6,151     |    | 29.48% Impervious Area    |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 3S: CC-3**

**MLV 505LD86\_Channels 1-4 REV 2**

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Type II 24-hr 10-yr Rainfall=4.74"

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**Summary for Subcatchment 4S: CC-4**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.21 cfs @ 11.96 hrs, Volume= 422 cf, Depth= 2.49"

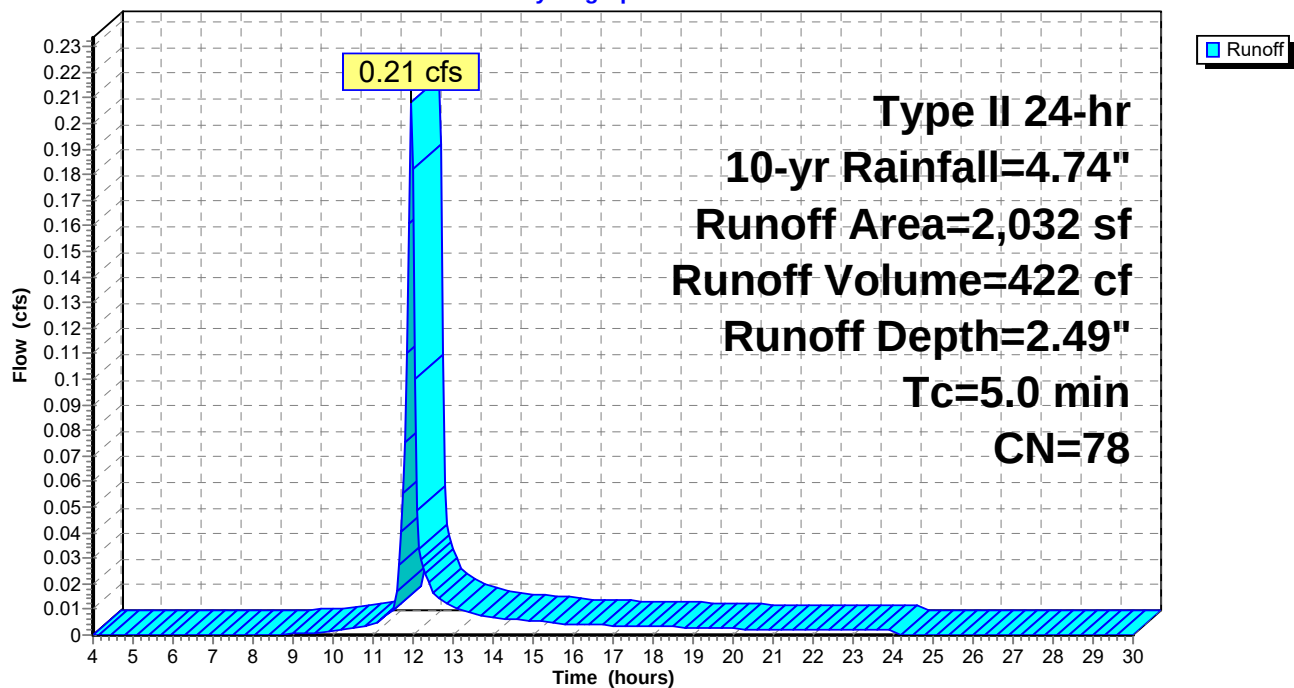
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,032     | 78 | Meadow, non-grazed, HSG D |
| 2,032     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 4S: CC-4**

Hydrograph



## MLV 505LD86\_Channels 1-4 REV 2

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Type II 24-hr 10-yr Rainfall=4.74"

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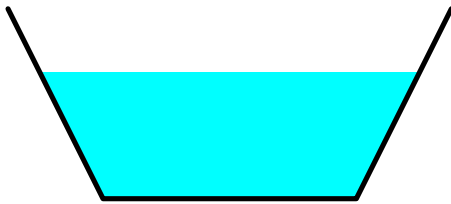
### Summary for Reach 6R: Channel 4

Inflow Area = 26,867 sf, 23.46% Impervious, Inflow Depth = 1.62" for 10-yr event  
Inflow = 1.76 cfs @ 11.96 hrs, Volume= 3,617 cf  
Outflow = 1.72 cfs @ 11.98 hrs, Volume= 3,617 cf, Atten= 2%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
Max. Velocity= 2.76 fps, Min. Travel Time= 0.4 min  
Avg. Velocity= 0.73 fps, Avg. Travel Time= 1.4 min

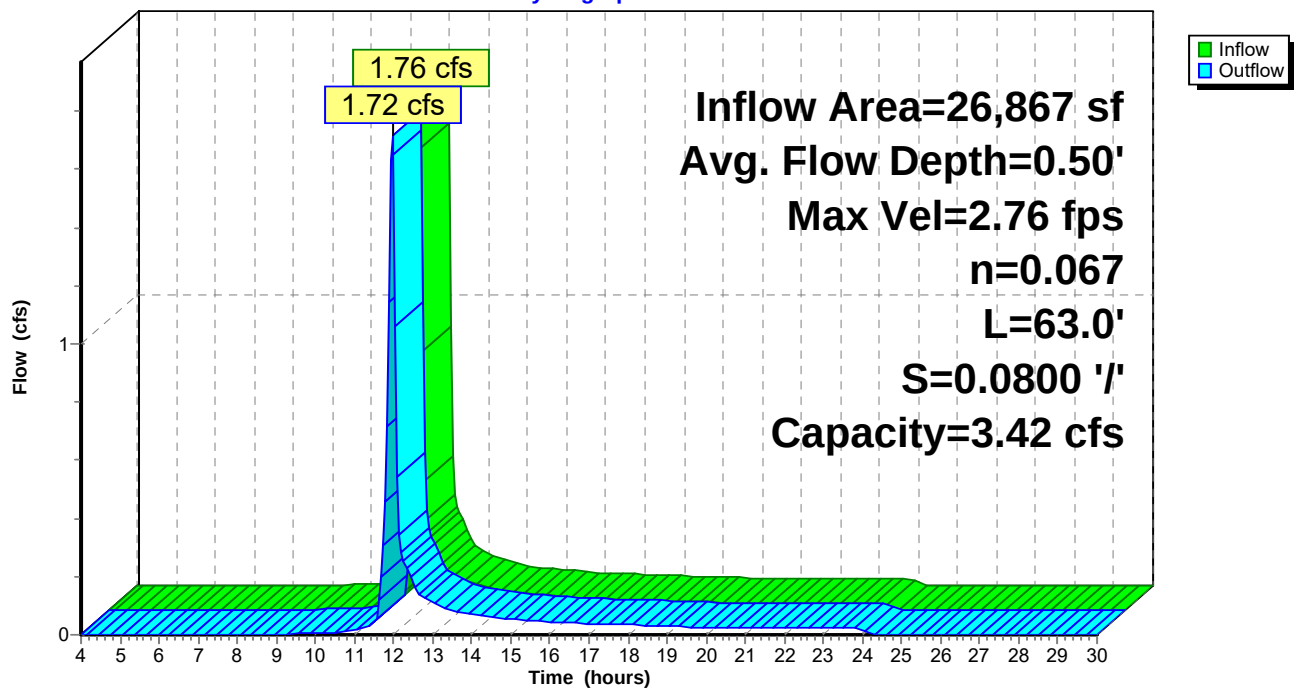
Peak Storage= 39 cf @ 11.97 hrs  
Average Depth at Peak Storage= 0.50'  
Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 3.42 cfs

1.00' x 0.75' deep channel, n= 0.067  
Side Slope Z-value= 0.5 '/' Top Width= 1.75'  
Length= 63.0' Slope= 0.0800 '/'  
Inlet Invert= 977.00', Outlet Invert= 971.96'



### Reach 6R: Channel 4

Hydrograph



**MLV 505LD86\_Channels 1-4 REV 2***Type II 24-hr 25-yr Rainfall=5.85"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DC-1**Runoff Area=160,162 sf 0.00% Impervious Runoff Depth=0.46"  
Tc=5.0 min CN=40 Runoff=1.49 cfs 6,073 cf**Subcatchment2S: CC-2**Runoff Area=3,973 sf 3.80% Impervious Runoff Depth=3.55"  
Tc=5.0 min CN=79 Runoff=0.57 cfs 1,174 cf**Subcatchment3S: CC-3**Runoff Area=20,862 sf 29.48% Impervious Runoff Depth=2.07"  
Tc=5.0 min CN=63 Runoff=1.78 cfs 3,603 cf**Subcatchment4S: CC-4**Runoff Area=2,032 sf 0.00% Impervious Runoff Depth=3.45"  
Tc=5.0 min CN=78 Runoff=0.29 cfs 584 cf**Reach 6R: Channel 4**Avg. Flow Depth=0.64' Max Vel=3.08 fps Inflow=2.63 cfs 5,360 cf  
n=0.067 L=63.0' S=0.0800 '/' Capacity=3.42 cfs Outflow=2.55 cfs 5,360 cf**Total Runoff Area = 187,029 sf Runoff Volume = 11,434 cf Average Runoff Depth = 0.73"**  
**96.63% Pervious = 180,727 sf 3.37% Impervious = 6,302 sf**

**MLV 505LD86\_Channels 1-4 REV 2**

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Type II 24-hr 25-yr Rainfall=5.85"

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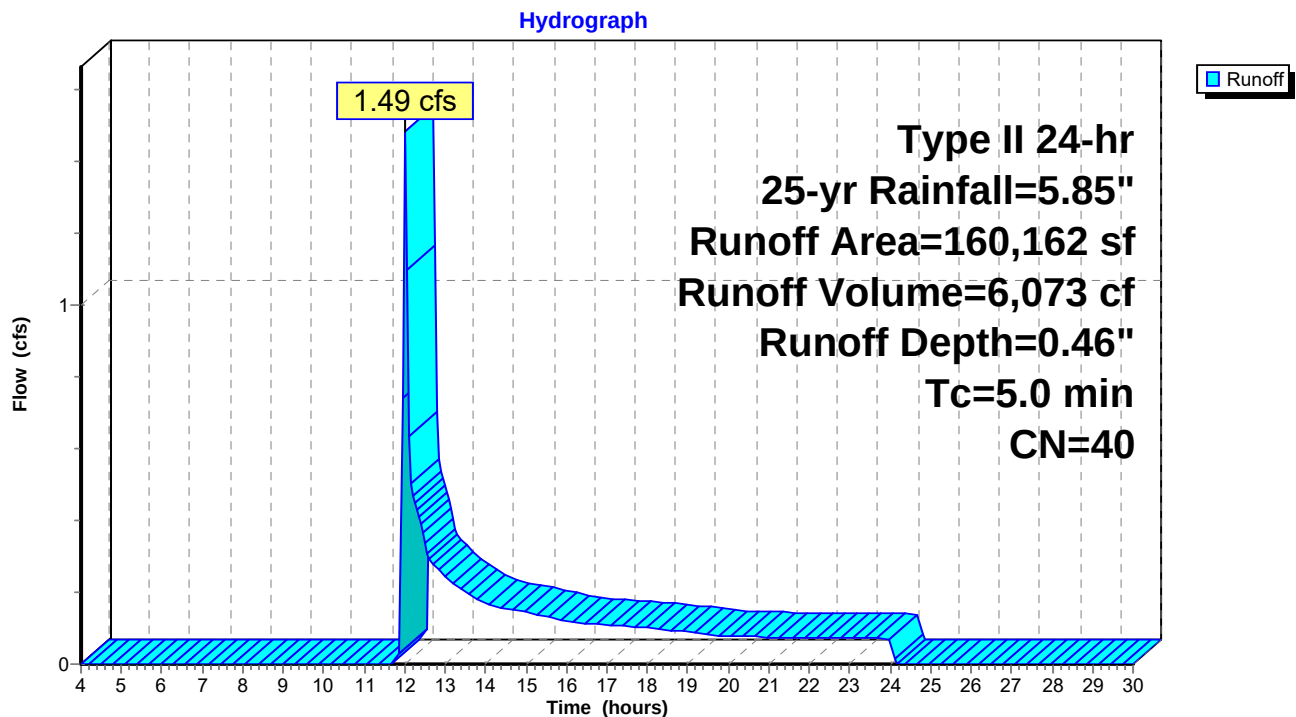
**Summary for Subcatchment 1S: DC-1**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.49 cfs @ 12.01 hrs, Volume= 6,073 cf, Depth= 0.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 30,585    | 30 | Woods, Good, HSG A        |
| 32,717    | 77 | Woods, Good, HSG D        |
| 94,974    | 30 | Meadow, non-grazed, HSG A |
| 1,886     | 78 | Meadow, non-grazed, HSG D |
| 160,162   | 40 | Weighted Average          |
| 160,162   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 1S: DC-1**

**MLV 505LD86\_Channels 1-4 REV 2**

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Type II 24-hr 25-yr Rainfall=5.85"

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**Summary for Subcatchment 2S: CC-2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.57 cfs @ 11.96 hrs, Volume= 1,174 cf, Depth= 3.55"

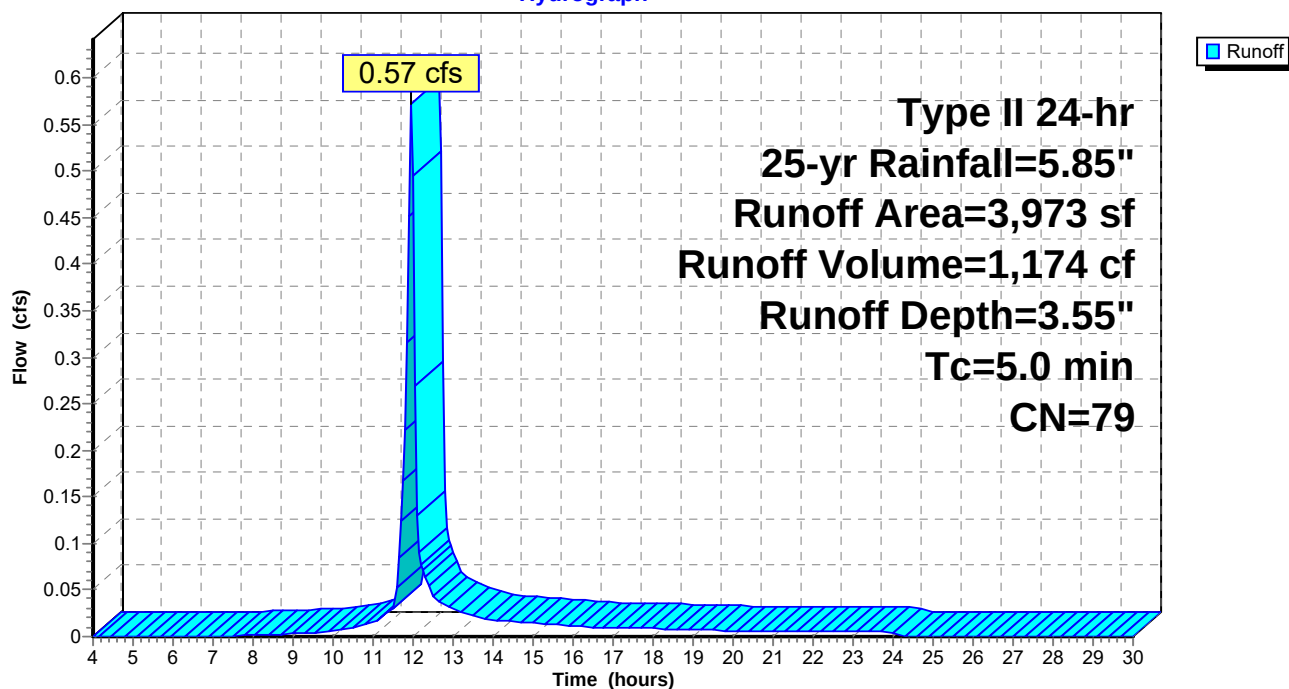
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,822     | 78 | Meadow, non-grazed, HSG D |
| 151       | 98 | Paved parking, HSG D      |
| 3,973     | 79 | Weighted Average          |
| 3,822     |    | 96.20% Pervious Area      |
| 151       |    | 3.80% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 2S: CC-2**

Hydrograph





**MLV 505LD86\_Channels 1-4 REV 2**

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Type II 24-hr 25-yr Rainfall=5.85"

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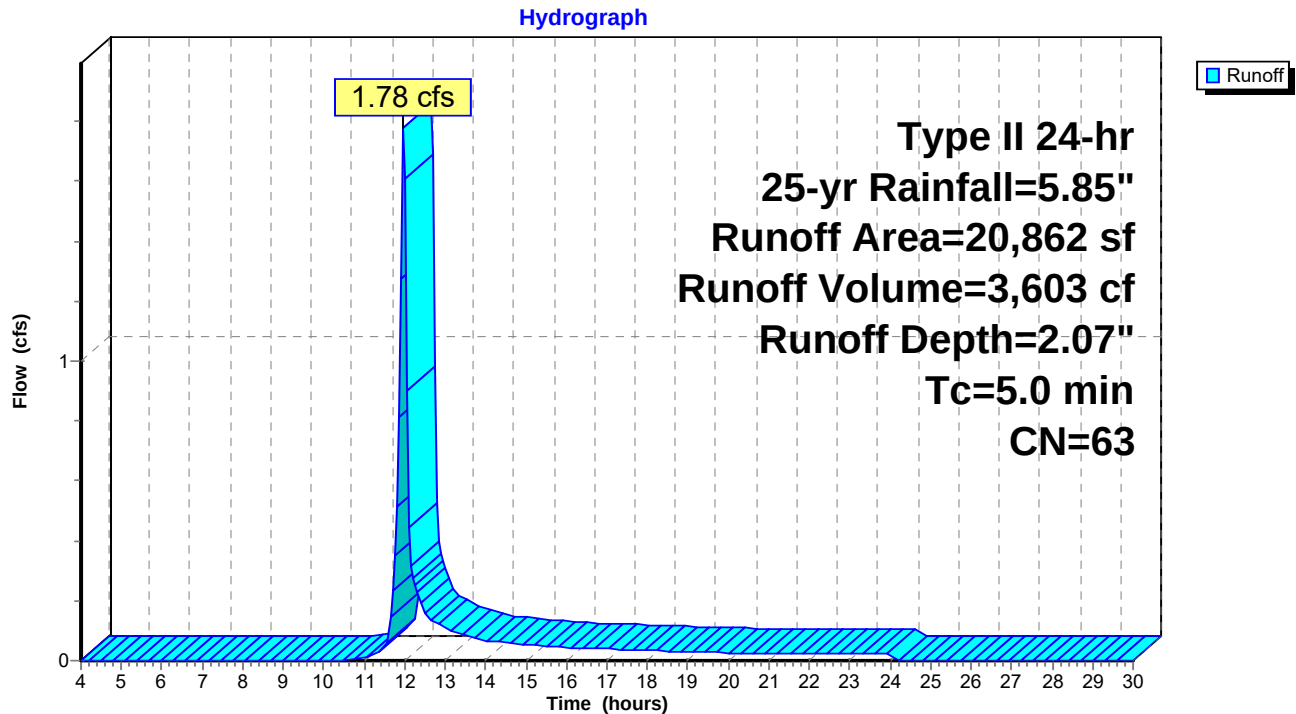
**Summary for Subcatchment 3S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.78 cfs @ 11.96 hrs, Volume= 3,603 cf, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 5,459     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 1,100     | 98 | Paved parking, HSG D      |
| 20,862    | 63 | Weighted Average          |
| 14,711    |    | 70.52% Pervious Area      |
| 6,151     |    | 29.48% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 3S: CC-3**

**Summary for Subcatchment 4S: CC-4**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.29 cfs @ 11.96 hrs, Volume= 584 cf, Depth= 3.45"

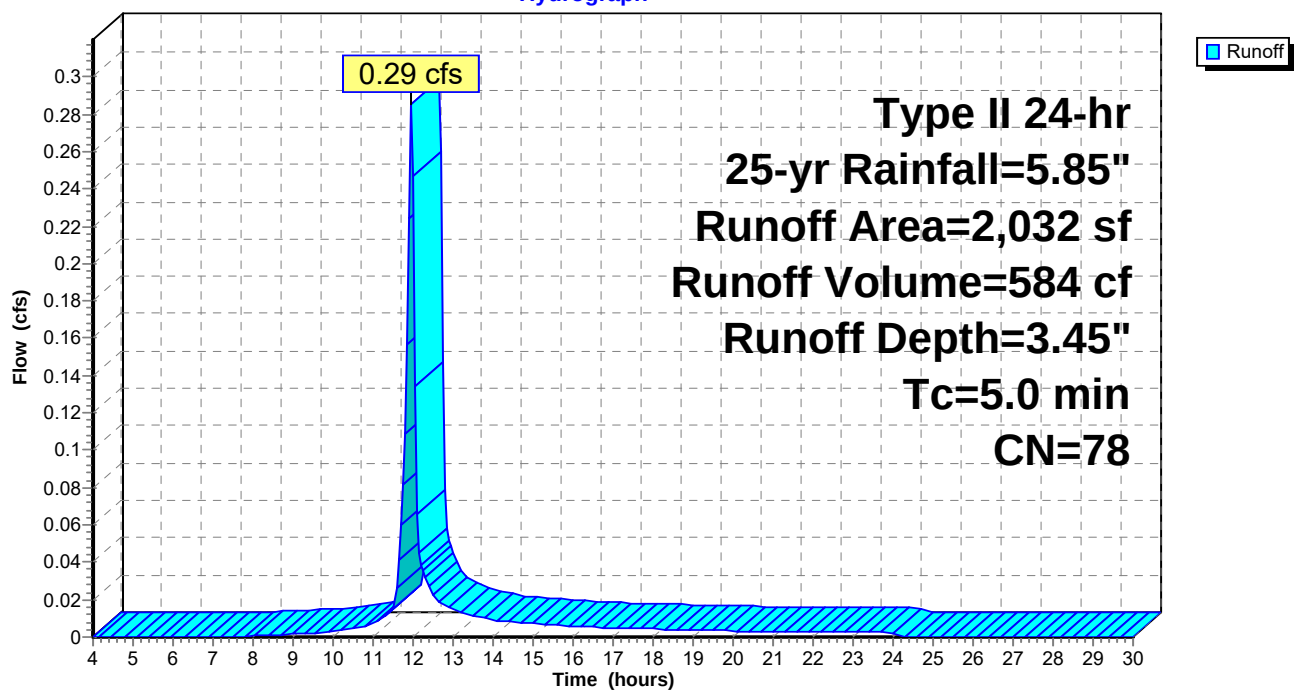
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,032     | 78 | Meadow, non-grazed, HSG D |
| 2,032     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 4S: CC-4**

Hydrograph



## MLV 505LD86\_Channels 1-4 REV 2

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Type II 24-hr 25-yr Rainfall=5.85"

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### Summary for Reach 6R: Channel 4

Inflow Area = 26,867 sf, 23.46% Impervious, Inflow Depth = 2.39" for 25-yr event  
Inflow = 2.63 cfs @ 11.96 hrs, Volume= 5,360 cf  
Outflow = 2.55 cfs @ 11.97 hrs, Volume= 5,360 cf, Atten= 3%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
Max. Velocity= 3.08 fps, Min. Travel Time= 0.3 min  
Avg. Velocity= 0.81 fps, Avg. Travel Time= 1.3 min

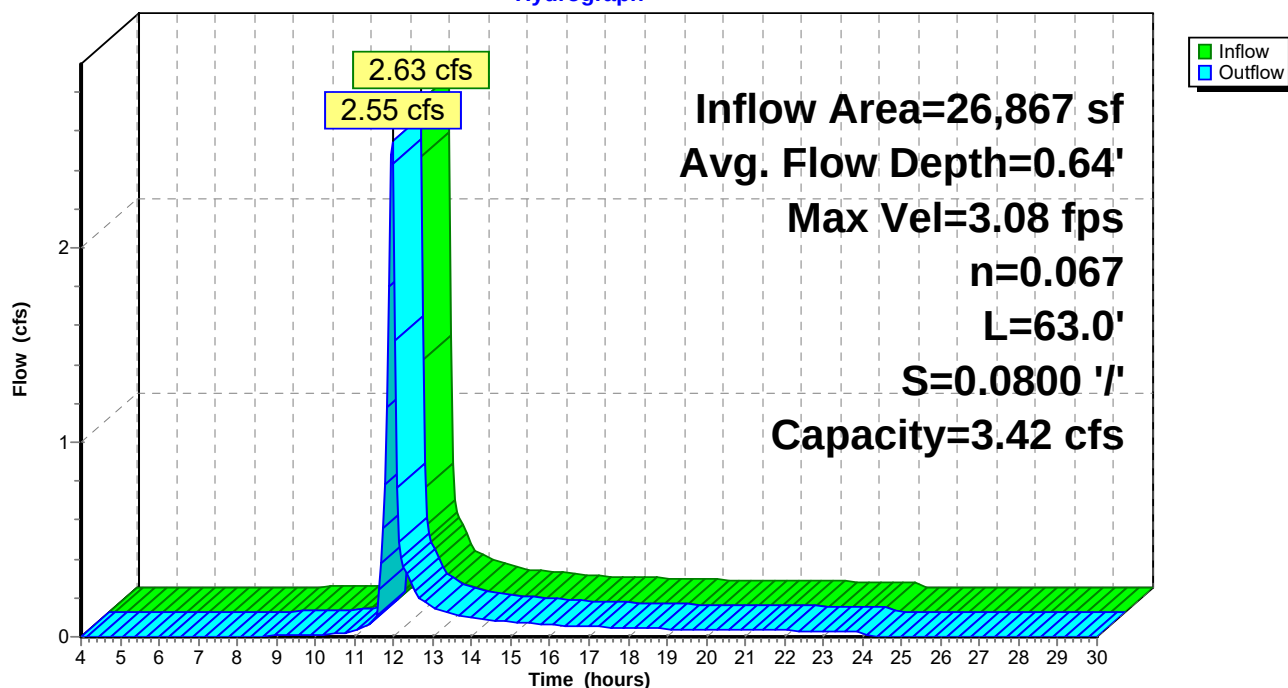
Peak Storage= 53 cf @ 11.97 hrs  
Average Depth at Peak Storage= 0.64'  
Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 3.42 cfs

1.00' x 0.75' deep channel, n= 0.067  
Side Slope Z-value= 0.5 '/' Top Width= 1.75'  
Length= 63.0' Slope= 0.0800 '/'  
Inlet Invert= 977.00', Outlet Invert= 971.96'



### Reach 6R: Channel 4

Hydrograph



**MLV 505LD86\_Channels 1-4 REV 2***Type II 24-hr 50-yr Rainfall=6.87"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DC-1** Runoff Area=160,162 sf 0.00% Impervious Runoff Depth=0.79"  
Tc=5.0 min CN=40 Runoff=3.78 cfs 10,593 cf

**Subcatchment2S: CC-2** Runoff Area=3,973 sf 3.80% Impervious Runoff Depth=4.47"  
Tc=5.0 min CN=79 Runoff=0.71 cfs 1,478 cf

**Subcatchment3S: CC-3** Runoff Area=20,862 sf 29.48% Impervious Runoff Depth=2.80"  
Tc=5.0 min CN=63 Runoff=2.42 cfs 4,875 cf

**Subcatchment4S: CC-4** Runoff Area=2,032 sf 0.00% Impervious Runoff Depth=4.36"  
Tc=5.0 min CN=78 Runoff=0.36 cfs 738 cf

**Reach 6R: Channel 4** Avg. Flow Depth=0.75' Max Vel=3.32 fps Inflow=3.49 cfs 7,091 cf  
n=0.067 L=63.0' S=0.0800 '/' Capacity=3.42 cfs Outflow=3.39 cfs 7,091 cf

**Total Runoff Area = 187,029 sf Runoff Volume = 17,684 cf Average Runoff Depth = 1.13"**  
**96.63% Pervious = 180,727 sf 3.37% Impervious = 6,302 sf**

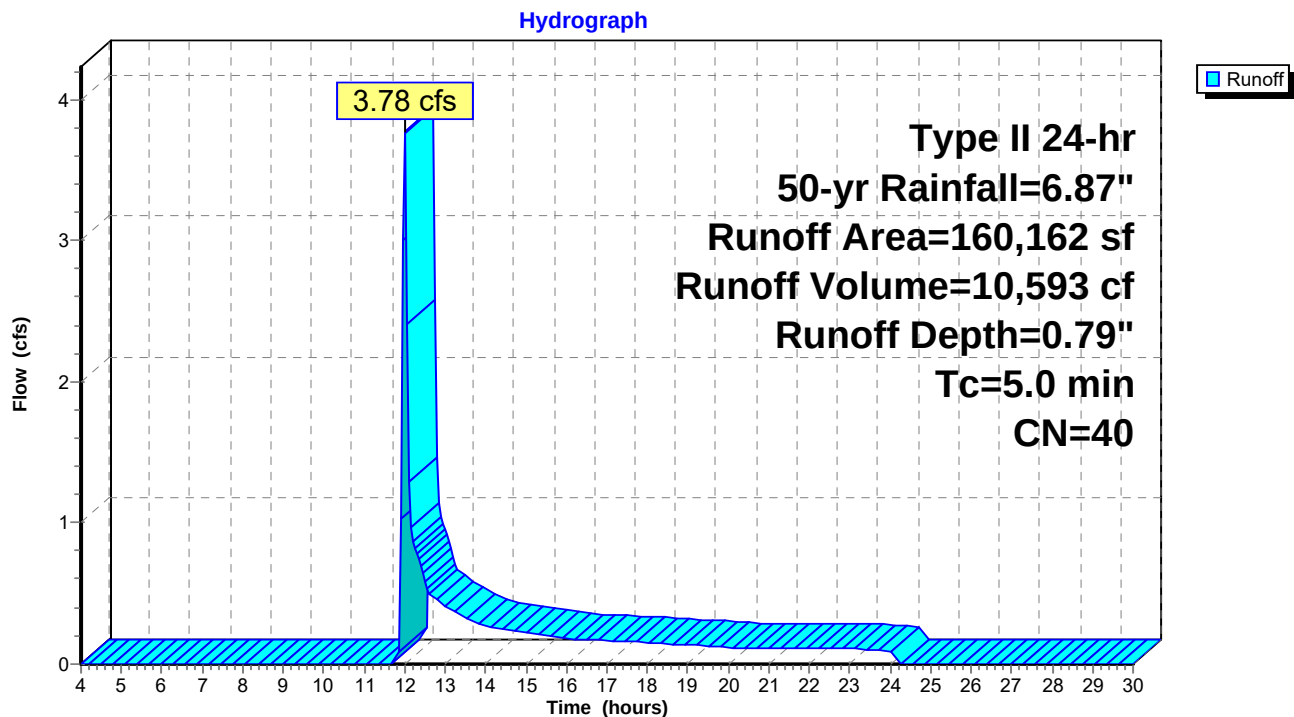
**Summary for Subcatchment 1S: DC-1**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 3.78 cfs @ 11.99 hrs, Volume= 10,593 cf, Depth= 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 30,585    | 30 | Woods, Good, HSG A        |
| 32,717    | 77 | Woods, Good, HSG D        |
| 94,974    | 30 | Meadow, non-grazed, HSG A |
| 1,886     | 78 | Meadow, non-grazed, HSG D |
| 160,162   | 40 | Weighted Average          |
| 160,162   |    | 100.00% Pervious Area     |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 1S: DC-1**

**MLV 505LD86\_Channels 1-4 REV 2**

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Type II 24-hr 50-yr Rainfall=6.87"

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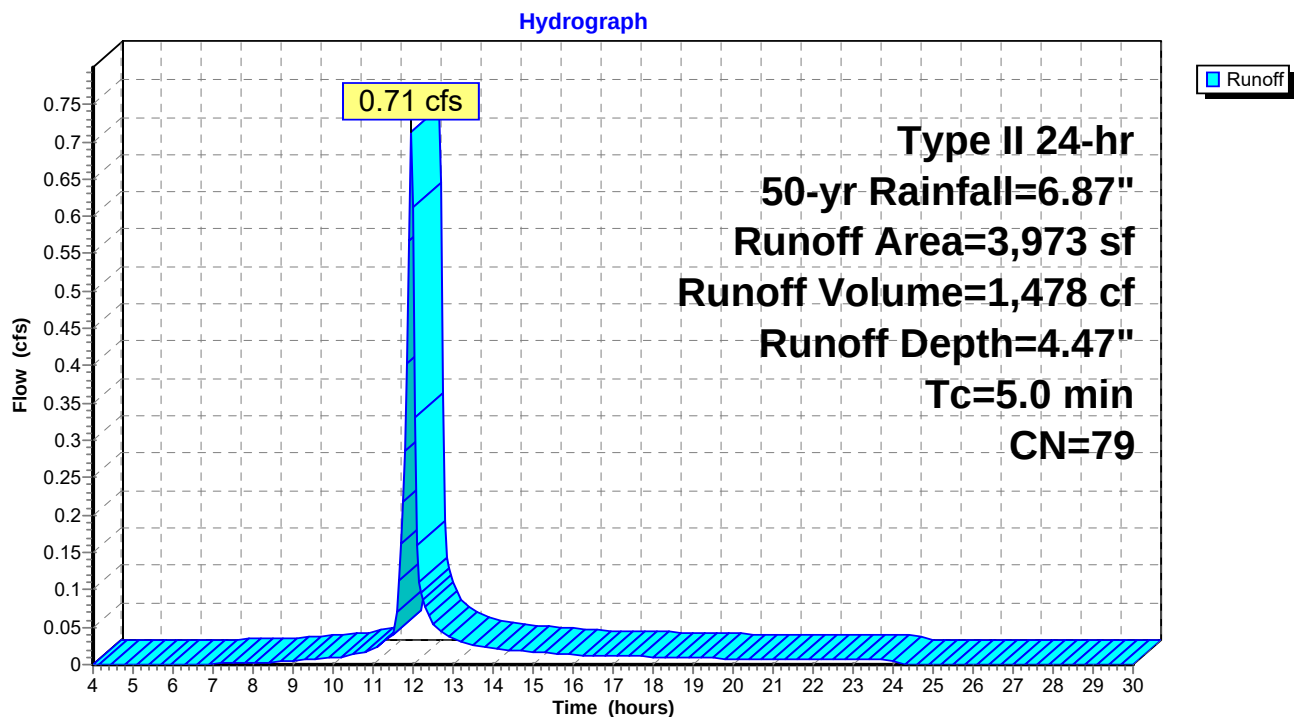
**Summary for Subcatchment 2S: CC-2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.71 cfs @ 11.95 hrs, Volume= 1,478 cf, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,822     | 78 | Meadow, non-grazed, HSG D |
| 151       | 98 | Paved parking, HSG D      |
| 3,973     | 79 | Weighted Average          |
| 3,822     |    | 96.20% Pervious Area      |
| 151       |    | 3.80% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 2S: CC-2**

**MLV 505LD86\_Channels 1-4 REV 2**

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Type II 24-hr 50-yr Rainfall=6.87"

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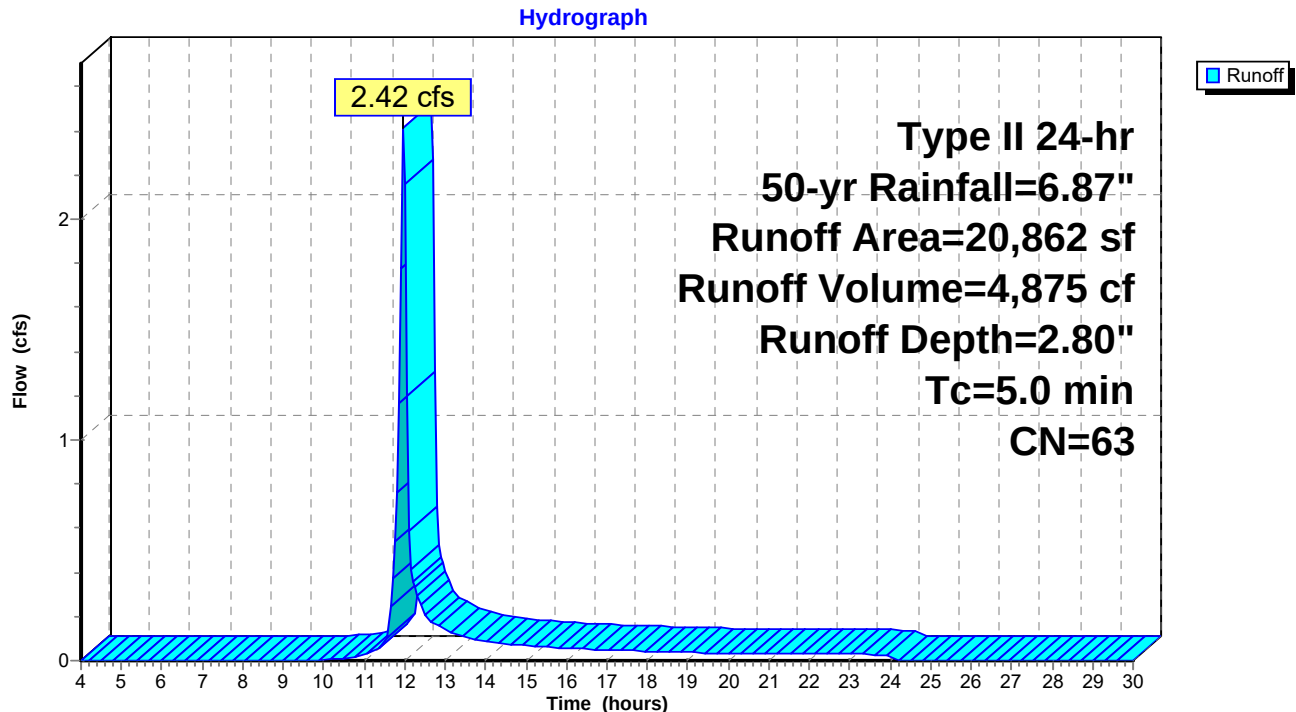
**Summary for Subcatchment 3S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 2.42 cfs @ 11.96 hrs, Volume= 4,875 cf, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 5,459     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 1,100     | 98 | Paved parking, HSG D      |
| 20,862    | 63 | Weighted Average          |
| 14,711    |    | 70.52% Pervious Area      |
| 6,151     |    | 29.48% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 3S: CC-3**

**Summary for Subcatchment 4S: CC-4**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.36 cfs @ 11.95 hrs, Volume= 738 cf, Depth= 4.36"

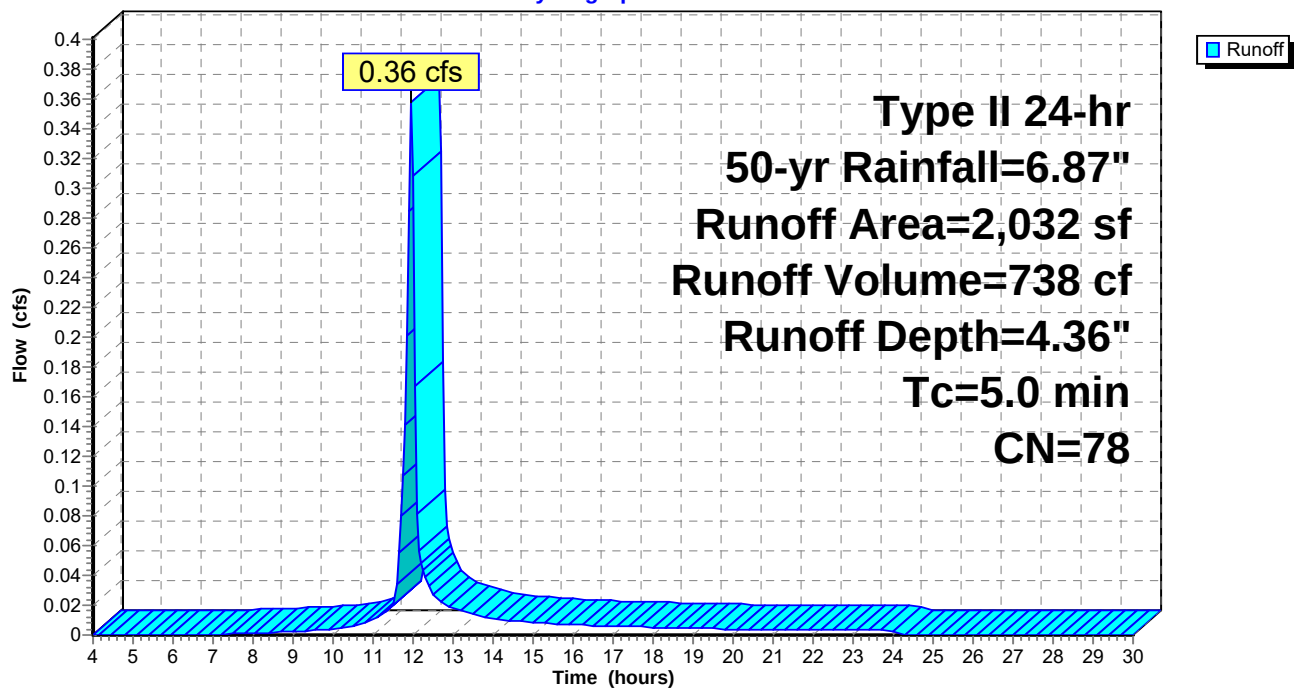
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,032     | 78 | Meadow, non-grazed, HSG D |
| 2,032     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 4S: CC-4**

Hydrograph





## MLV 505LD86\_Channels 1-4 REV 2

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Type II 24-hr 50-yr Rainfall=6.87"

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### Summary for Reach 6R: Channel 4

[55] Hint: Peak inflow is 102% of Manning's capacity

Inflow Area = 26,867 sf, 23.46% Impervious, Inflow Depth = 3.17" for 50-yr event  
Inflow = 3.49 cfs @ 11.96 hrs, Volume= 7,091 cf  
Outflow = 3.39 cfs @ 11.97 hrs, Volume= 7,091 cf, Atten= 3%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.32 fps, Min. Travel Time= 0.3 min

Avg. Velocity = 0.87 fps, Avg. Travel Time= 1.2 min

Peak Storage= 65 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.75'

Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 3.42 cfs

1.00' x 0.75' deep channel, n= 0.067

Side Slope Z-value= 0.5 '/' Top Width= 1.75'

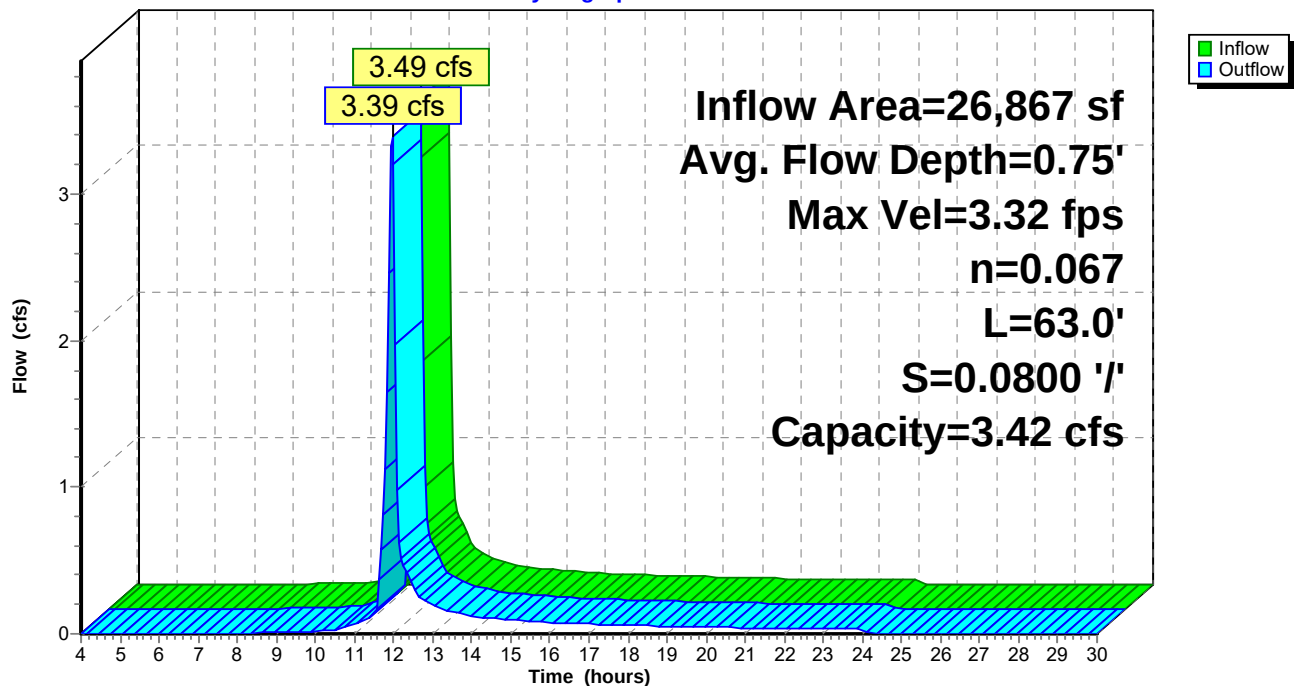
Length= 63.0' Slope= 0.0800 '/'

Inlet Invert= 977.00', Outlet Invert= 971.96'



### Reach 6R: Channel 4

Hydrograph



**MLV 505LD86\_Channels 1-4 REV 2***Type II 24-hr 100-yr Rainfall=8.09"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DC-1**Runoff Area=160,162 sf 0.00% Impervious Runoff Depth=1.29"  
Tc=5.0 min CN=40 Runoff=7.24 cfs 17,212 cf**Subcatchment2S: CC-2**Runoff Area=3,973 sf 3.80% Impervious Runoff Depth=5.59"  
Tc=5.0 min CN=79 Runoff=0.88 cfs 1,851 cf**Subcatchment3S: CC-3**Runoff Area=20,862 sf 29.48% Impervious Runoff Depth=3.74"  
Tc=5.0 min CN=63 Runoff=3.23 cfs 6,501 cf**Subcatchment4S: CC-4**Runoff Area=2,032 sf 0.00% Impervious Runoff Depth=5.47"  
Tc=5.0 min CN=78 Runoff=0.44 cfs 927 cf**Reach 6R: Channel 4**Avg. Flow Depth=0.89' Max Vel=3.53 fps Inflow=4.55 cfs 9,279 cf  
n=0.067 L=63.0' S=0.0800 '/' Capacity=3.42 cfs Outflow=4.43 cfs 9,279 cf**Total Runoff Area = 187,029 sf Runoff Volume = 26,492 cf Average Runoff Depth = 1.70"**  
**96.63% Pervious = 180,727 sf 3.37% Impervious = 6,302 sf**

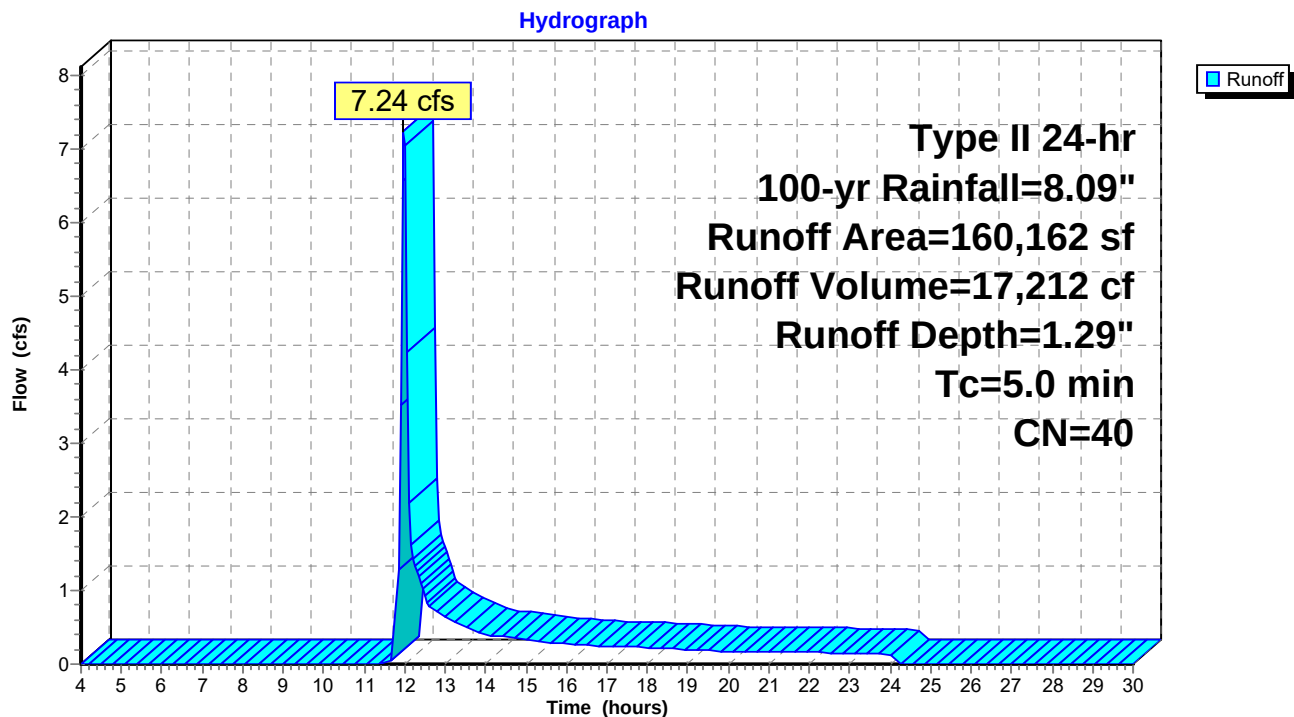
**Summary for Subcatchment 1S: DC-1**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 7.24 cfs @ 11.98 hrs, Volume= 17,212 cf, Depth= 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 30,585    | 30 | Woods, Good, HSG A        |
| 32,717    | 77 | Woods, Good, HSG D        |
| 94,974    | 30 | Meadow, non-grazed, HSG A |
| 1,886     | 78 | Meadow, non-grazed, HSG D |
| 160,162   | 40 | Weighted Average          |
| 160,162   |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 1S: DC-1**

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Type II 24-hr 100-yr Rainfall=8.09"

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**Summary for Subcatchment 2S: CC-2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.88 cfs @ 11.95 hrs, Volume= 1,851 cf, Depth= 5.59"

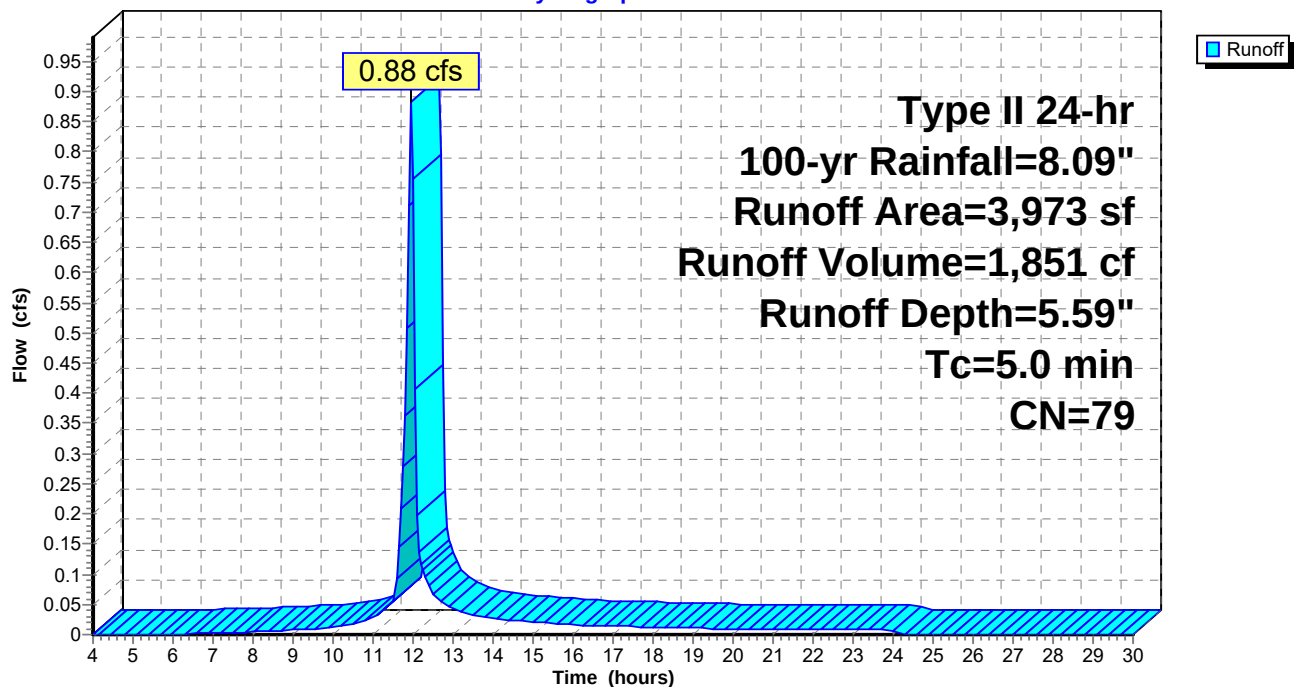
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,822     | 78 | Meadow, non-grazed, HSG D |
| 151       | 98 | Paved parking, HSG D      |
| 3,973     | 79 | Weighted Average          |
| 3,822     |    | 96.20% Pervious Area      |
| 151       |    | 3.80% Impervious Area     |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 2S: CC-2**

Hydrograph



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Type II 24-hr 100-yr Rainfall=8.09"

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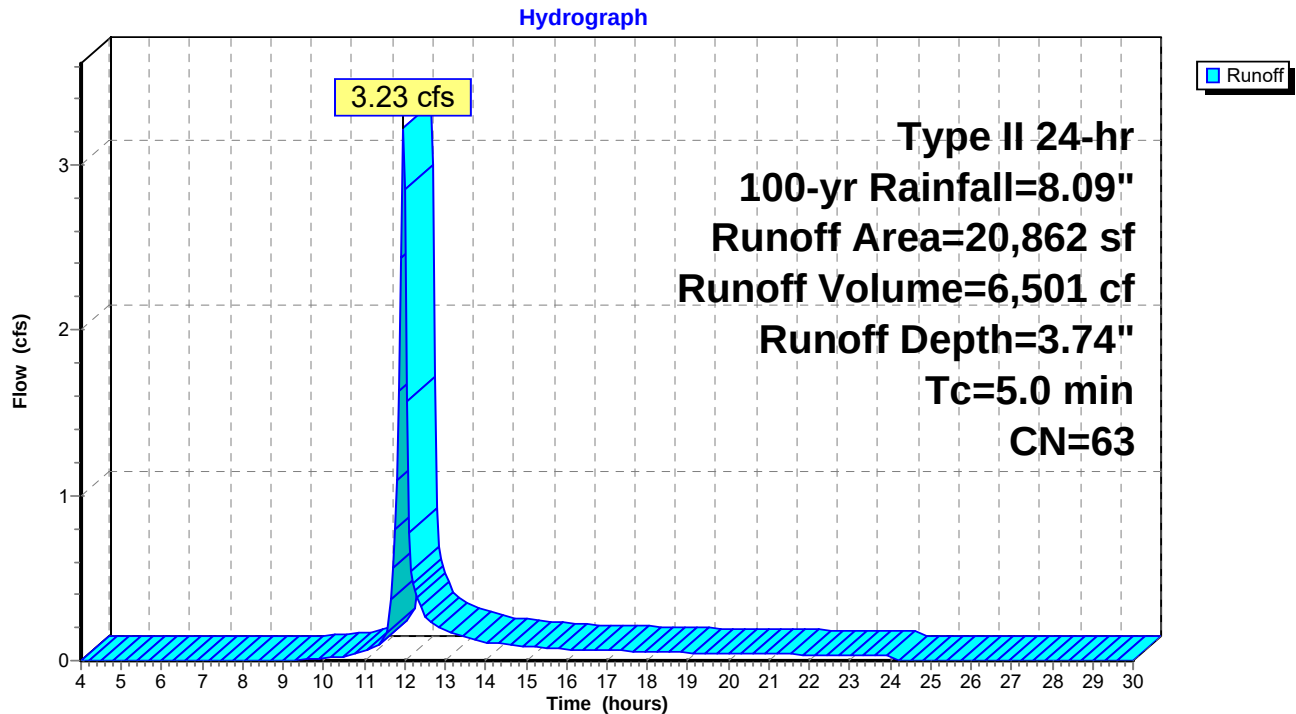
**Summary for Subcatchment 3S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 3.23 cfs @ 11.96 hrs, Volume= 6,501 cf, Depth= 3.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 5,459     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 1,100     | 98 | Paved parking, HSG D      |
| 20,862    | 63 | Weighted Average          |
| 14,711    |    | 70.52% Pervious Area      |
| 6,151     |    | 29.48% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 3S: CC-3**

**Summary for Subcatchment 4S: CC-4**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.44 cfs @ 11.95 hrs, Volume= 927 cf, Depth= 5.47"

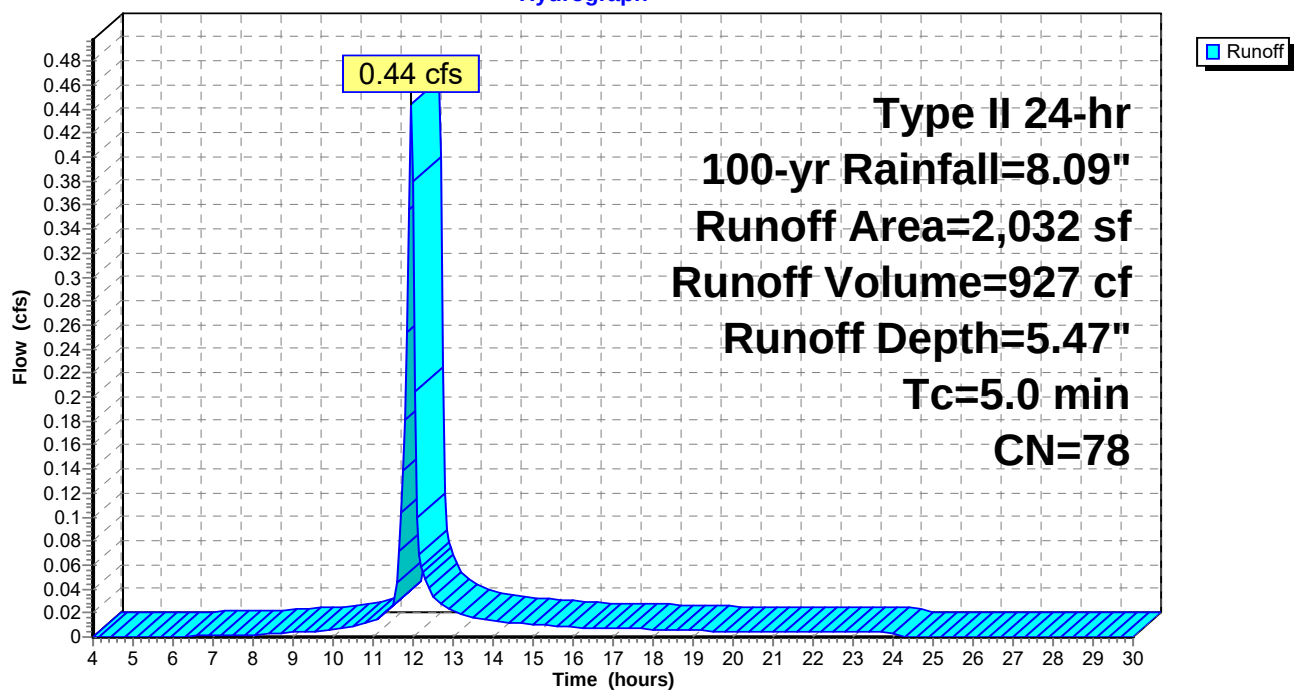
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,032     | 78 | Meadow, non-grazed, HSG D |
| 2,032     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 4S: CC-4**

Hydrograph



**Summary for Reach 6R: Channel 4**

[91] Warning: Storage range exceeded by 0.14'

[55] Hint: Peak inflow is 133% of Manning's capacity

Inflow Area = 26,867 sf, 23.46% Impervious, Inflow Depth = 4.14" for 100-yr event  
Inflow = 4.55 cfs @ 11.96 hrs, Volume= 9,279 cf  
Outflow = 4.43 cfs @ 11.97 hrs, Volume= 9,279 cf, Atten= 3%, Lag= 0.5 min

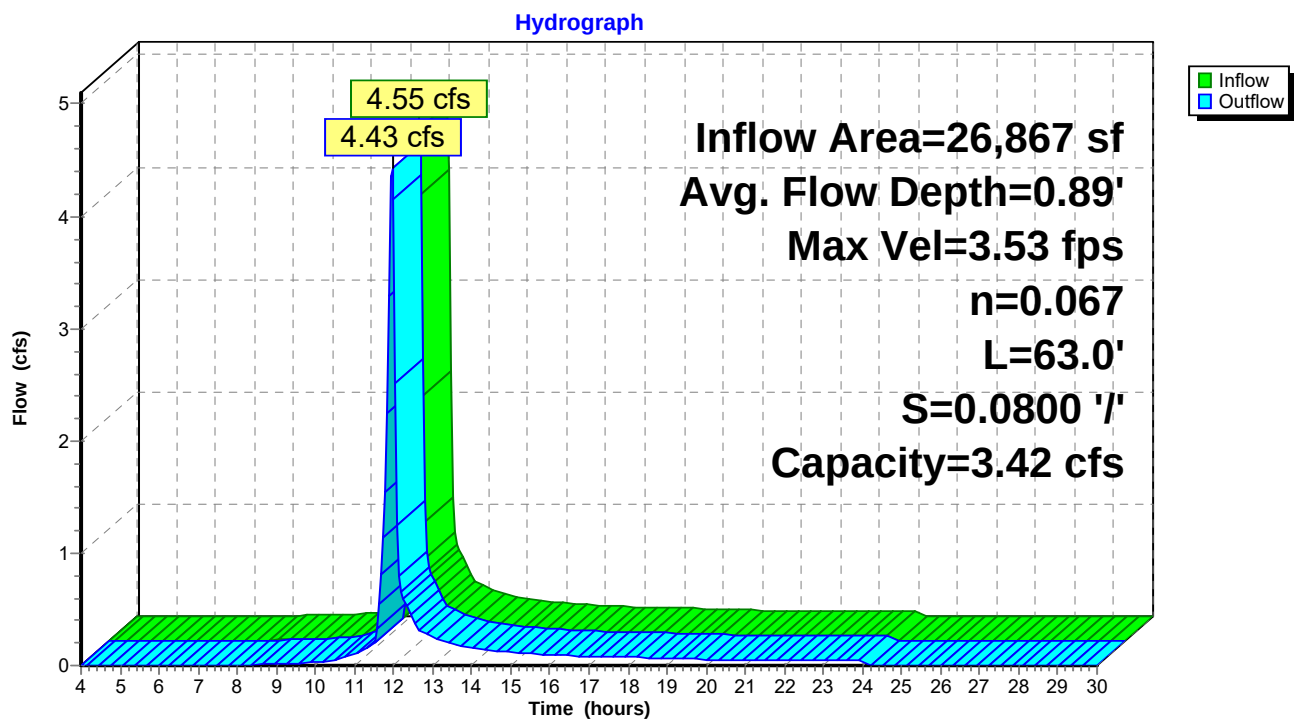
Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
Max. Velocity= 3.53 fps, Min. Travel Time= 0.3 min  
Avg. Velocity= 0.93 fps, Avg. Travel Time= 1.1 min

Peak Storage= 80 cf @ 11.96 hrs  
Average Depth at Peak Storage= 0.89'  
Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 3.42 cfs

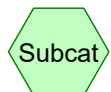
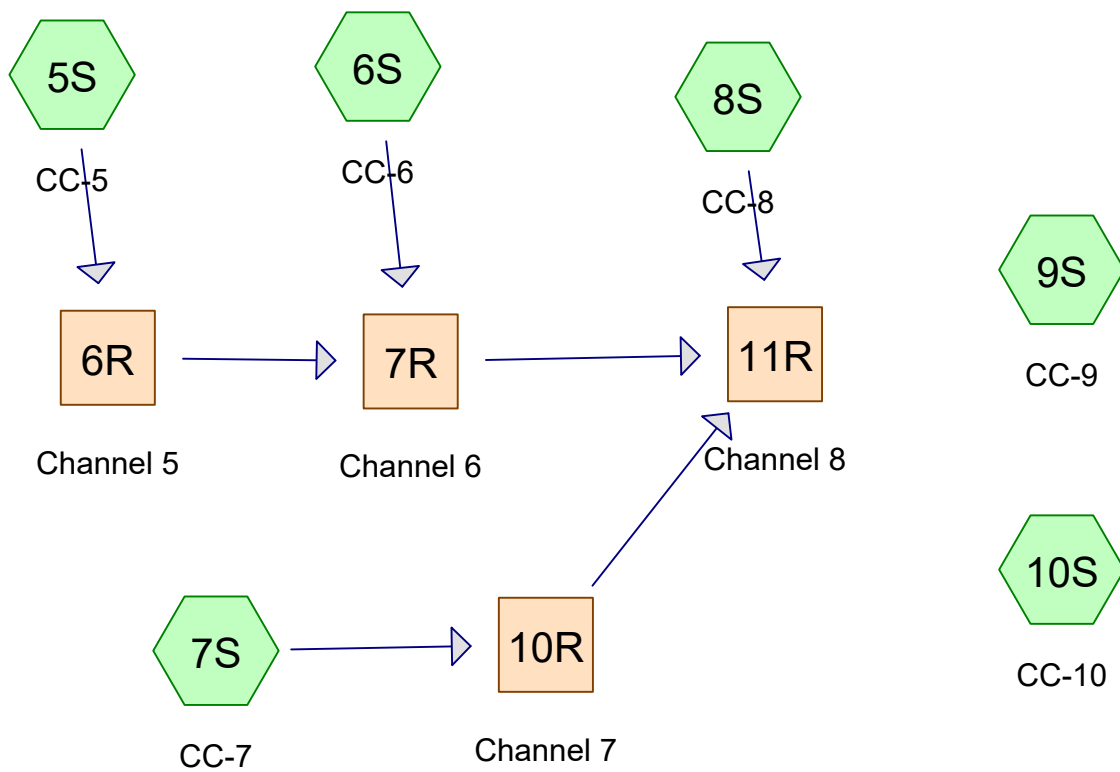
1.00' x 0.75' deep channel, n= 0.067  
Side Slope Z-value= 0.5 '/' Top Width= 1.75'  
Length= 63.0' Slope= 0.0800 '/'  
Inlet Invert= 977.00', Outlet Invert= 971.96'



## Reach 6R: Channel 4



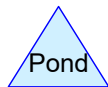




Subcat



Reach



Pond



Link

**Routing Diagram for MLV 505LD86, Channels 5-10 REV 2**  
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**Area Listing (all nodes)**

| Area<br>(sq-ft) | CN        | Description<br>(subcatchment-numbers)               |
|-----------------|-----------|-----------------------------------------------------|
| 31,356          | 30        | Meadow, non-grazed, HSG A (5S, 6S, 7S, 8S, 9S, 10S) |
| 48,216          | 78        | Meadow, non-grazed, HSG D (5S, 6S, 7S, 9S, 10S)     |
| 6,772           | 98        | Paved parking, HSG A (5S, 6S, 7S, 9S, 10S)          |
| 4,611           | 98        | Paved parking, HSG D (5S, 6S, 7S, 10S)              |
| 783             | 98        | Water Surface, HSG D (9S)                           |
| <b>91,738</b>   | <b>64</b> | <b>TOTAL AREA</b>                                   |

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**Soil Listing (all nodes)**

| Area<br>(sq-ft) | Soil<br>Group | Subcatchment<br>Numbers |
|-----------------|---------------|-------------------------|
| 38,128          | HSG A         | 5S, 6S, 7S, 8S, 9S, 10S |
| 0               | HSG B         |                         |
| 0               | HSG C         |                         |
| 53,610          | HSG D         | 5S, 6S, 7S, 9S, 10S     |
| 0               | Other         |                         |
| <b>91,738</b>   |               | <b>TOTAL AREA</b>       |

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**Ground Covers (all nodes)**

| HSG-A<br>(sq-ft) | HSG-B<br>(sq-ft) | HSG-C<br>(sq-ft) | HSG-D<br>(sq-ft) | Other<br>(sq-ft) | Total<br>(sq-ft) | Ground<br>Cover       | Subcat<br>Number |
|------------------|------------------|------------------|------------------|------------------|------------------|-----------------------|------------------|
| 31,356           | 0                | 0                | 48,216           | 0                | 79,572           | Meadow,<br>non-grazed |                  |
| 6,772            | 0                | 0                | 4,611            | 0                | 11,383           | Paved parking         |                  |
| 0                | 0                | 0                | 783              | 0                | 783              | Water Surface         |                  |
| <b>38,128</b>    | <b>0</b>         | <b>0</b>         | <b>53,610</b>    | <b>0</b>         | <b>91,738</b>    | <b>TOTAL AREA</b>     |                  |

**MLV 505LD86\_Channels 5-10 REV 2***Type II 24-hr 1-yr Rainfall=2.72"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                               |                                                                                                                                              |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment5S: CC-5</b>   | Runoff Area=63,362 sf 7.29% Impervious Runoff Depth=0.38"<br>Tc=5.0 min CN=65 Runoff=0.81 cfs 2,028 cf                                       |
| <b>Subcatchment6S: CC-6</b>   | Runoff Area=15,485 sf 11.48% Impervious Runoff Depth=0.15"<br>Tc=5.0 min CN=56 Runoff=0.02 cfs 189 cf                                        |
| <b>Subcatchment7S: CC-7</b>   | Runoff Area=5,181 sf 57.98% Impervious Runoff Depth=1.04"<br>Tc=5.0 min CN=80 Runoff=0.22 cfs 451 cf                                         |
| <b>Subcatchment8S: CC-8</b>   | Runoff Area=2,336 sf 0.00% Impervious Runoff Depth=0.00"<br>Tc=5.0 min CN=30 Runoff=0.00 cfs 0 cf                                            |
| <b>Subcatchment9S: CC-9</b>   | Runoff Area=2,509 sf 56.44% Impervious Runoff Depth=0.74"<br>Tc=5.0 min CN=74 Runoff=0.07 cfs 154 cf                                         |
| <b>Subcatchment10S: CC-10</b> | Runoff Area=2,865 sf 47.23% Impervious Runoff Depth=0.83"<br>Tc=5.0 min CN=76 Runoff=0.10 cfs 198 cf                                         |
| <b>Reach 6R: Channel 5</b>    | Avg. Flow Depth=0.26' Max Vel=2.69 fps Inflow=0.81 cfs 2,028 cf<br>n=0.050 L=257.0' S=0.0780 '/' Capacity=7.46 cfs Outflow=0.72 cfs 2,028 cf |
| <b>Reach 7R: Channel 6</b>    | Avg. Flow Depth=0.22' Max Vel=2.99 fps Inflow=0.74 cfs 2,217 cf<br>n=0.054 L=127.0' S=0.1300 '/' Capacity=8.91 cfs Outflow=0.71 cfs 2,217 cf |
| <b>Reach 10R: Channel 7</b>   | Avg. Flow Depth=0.11' Max Vel=1.69 fps Inflow=0.22 cfs 451 cf<br>n=0.055 L=395.0' S=0.0910 '/' Capacity=7.32 cfs Outflow=0.19 cfs 451 cf     |
| <b>Reach 11R: Channel 8</b>   | Avg. Flow Depth=0.28' Max Vel=2.79 fps Inflow=0.90 cfs 2,668 cf<br>n=0.045 L=88.0' S=0.0630 '/' Capacity=4.52 cfs Outflow=0.87 cfs 2,668 cf  |

**Total Runoff Area = 91,738 sf Runoff Volume = 3,021 cf Average Runoff Depth = 0.40"**  
**86.74% Pervious = 79,572 sf 13.26% Impervious = 12,166 sf**

**MLV 505LD86\_Channels 5-10 REV 2**

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Type II 24-hr 1-yr Rainfall=2.72"

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**Summary for Subcatchment 5S: CC-5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.81 cfs @ 11.99 hrs, Volume= 2,028 cf, Depth= 0.38"

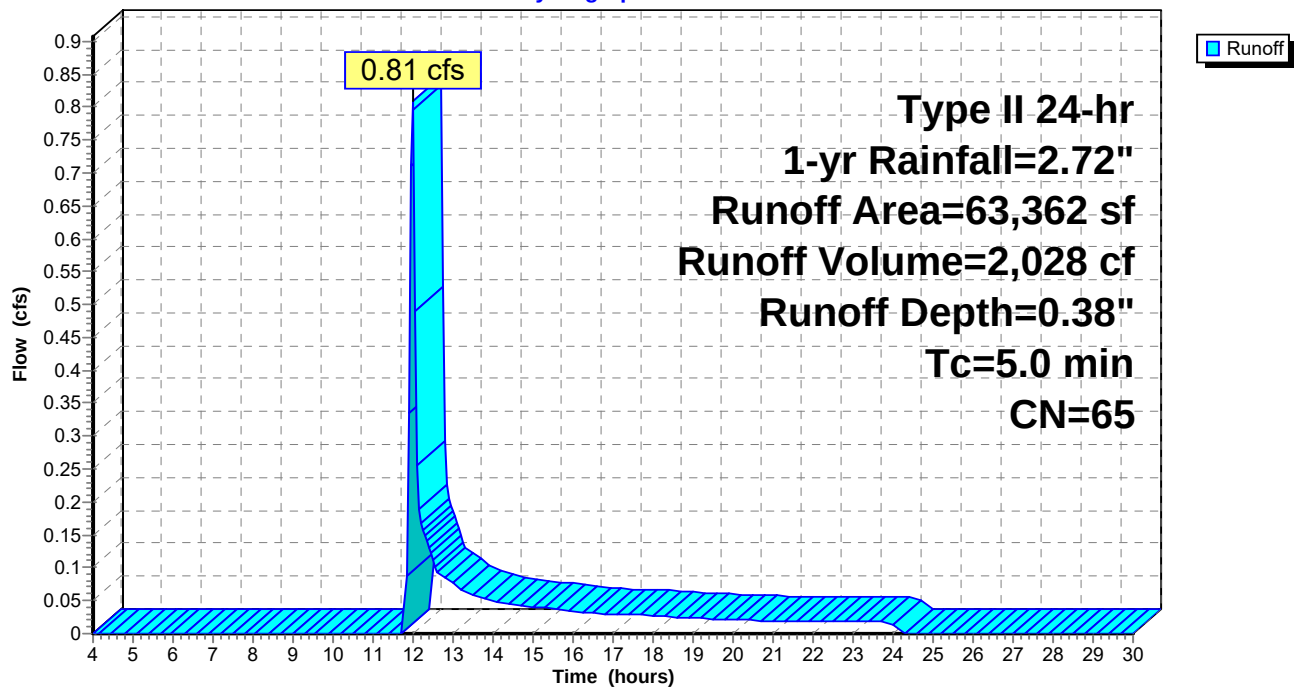
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 18,807    | 30 | Meadow, non-grazed, HSG A |
| 39,939    | 78 | Meadow, non-grazed, HSG D |
| 2,138     | 98 | Paved parking, HSG A      |
| 2,478     | 98 | Paved parking, HSG D      |
| 63,362    | 65 | Weighted Average          |
| 58,746    |    | 92.71% Pervious Area      |
| 4,616     |    | 7.29% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 5S: CC-5**

Hydrograph



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**Summary for Subcatchment 6S: CC-6**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.02 cfs @ 12.03 hrs, Volume= 189 cf, Depth= 0.15"

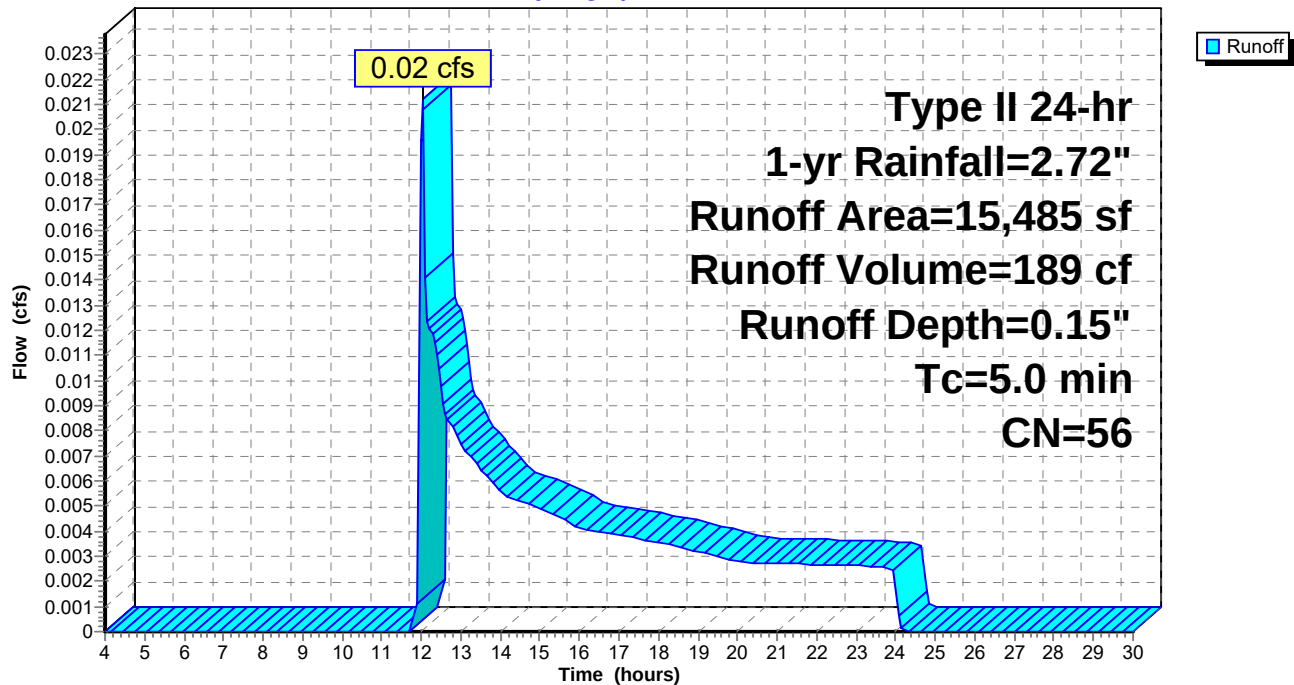
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 7,682     | 30 | Meadow, non-grazed, HSG A |
| 6,026     | 78 | Meadow, non-grazed, HSG D |
| 1,255     | 98 | Paved parking, HSG A      |
| 522       | 98 | Paved parking, HSG D      |
| 15,485    | 56 | Weighted Average          |
| 13,708    |    | 88.52% Pervious Area      |
| 1,777     |    | 11.48% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 6S: CC-6**

Hydrograph



**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.22 cfs @ 11.96 hrs, Volume= 451 cf, Depth= 1.04"

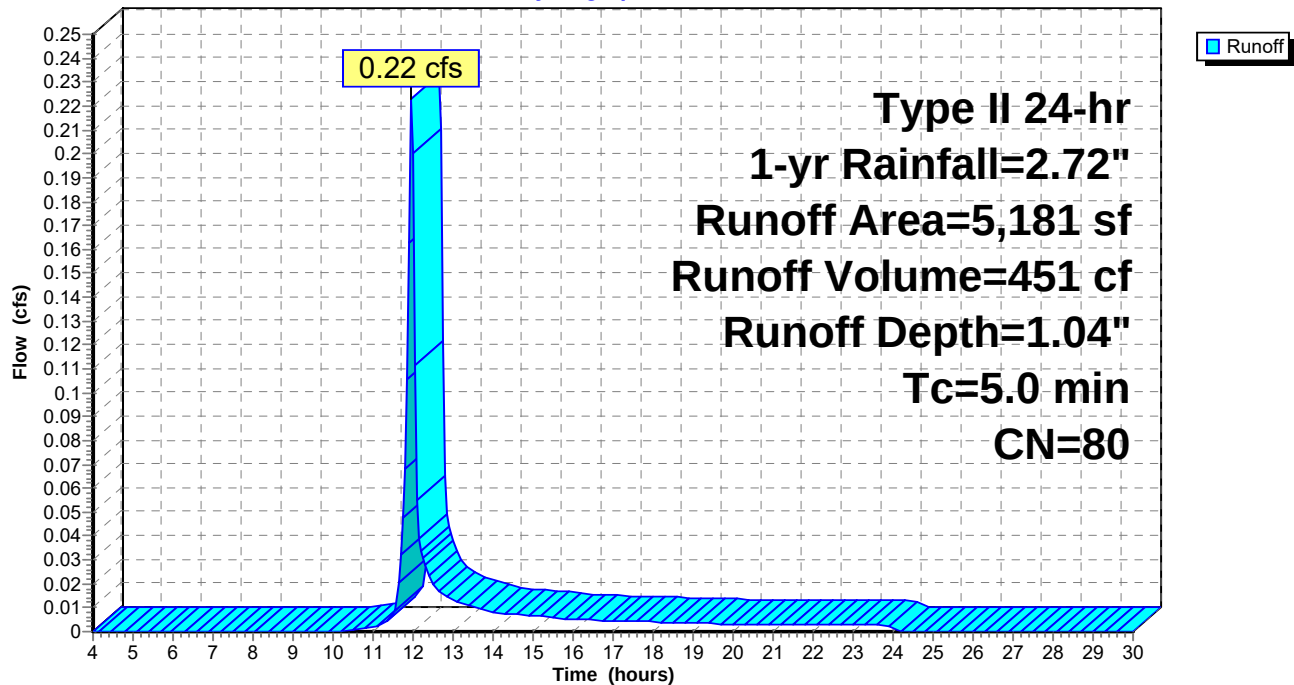
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,049     | 30 | Meadow, non-grazed, HSG A |
| 1,128     | 78 | Meadow, non-grazed, HSG D |
| 2,071     | 98 | Paved parking, HSG A      |
| 933       | 98 | Paved parking, HSG D      |
| 5,181     | 80 | Weighted Average          |
| 2,177     |    | 42.02% Pervious Area      |
| 3,004     |    | 57.98% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

Hydrograph





**Summary for Subcatchment 8S: CC-8**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

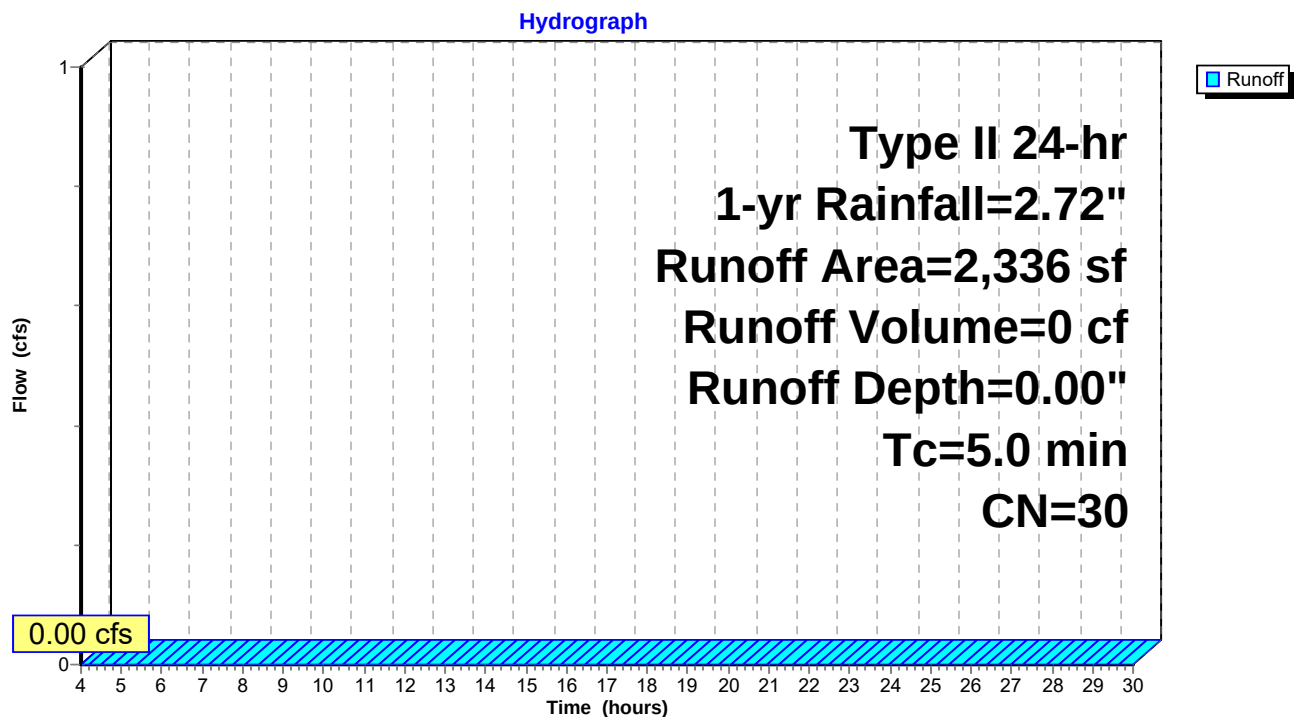
[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,336     | 30 | Meadow, non-grazed, HSG A |
| 2,336     |    | 100.00% Pervious Area     |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 8S: CC-8**

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Type II 24-hr 1-yr Rainfall=2.72"

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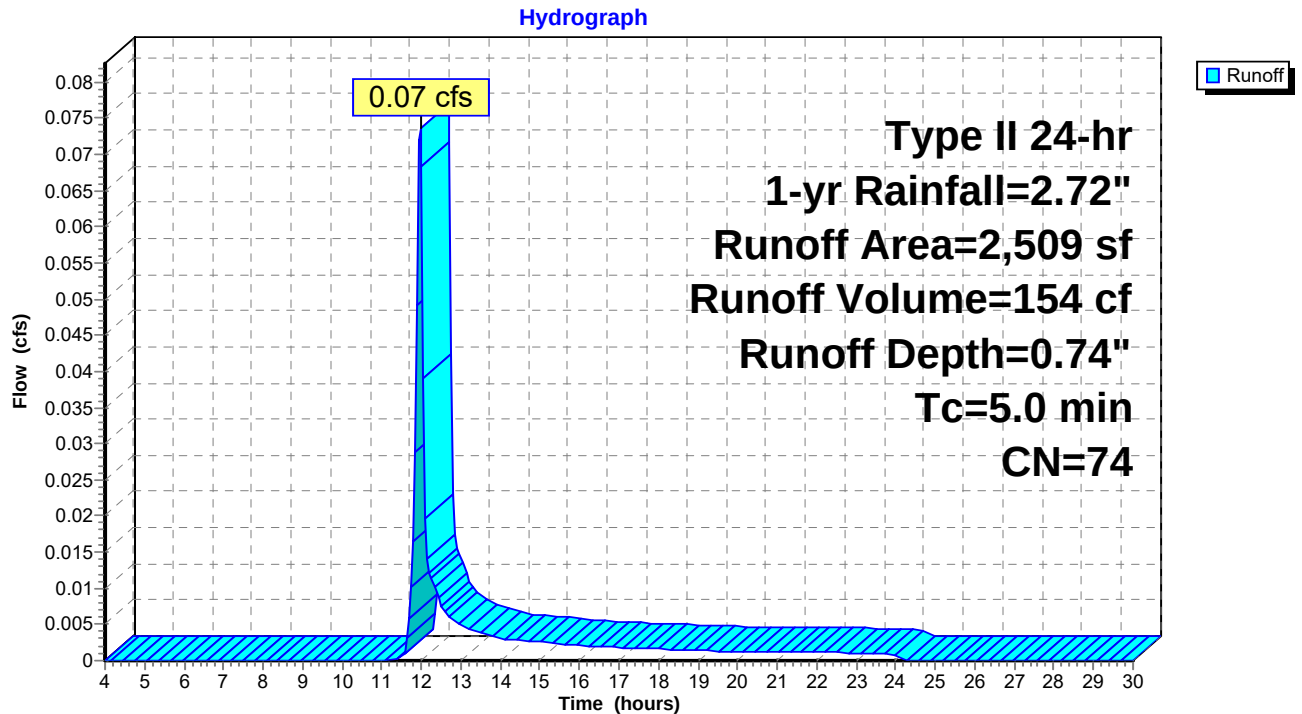
**Summary for Subcatchment 9S: CC-9**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.07 cfs @ 11.97 hrs, Volume= 154 cf, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 815       | 30 | Meadow, non-grazed, HSG A |
| 278       | 78 | Meadow, non-grazed, HSG D |
| 633       | 98 | Paved parking, HSG A      |
| 783       | 98 | Water Surface, HSG D      |
| 2,509     | 74 | Weighted Average          |
| 1,093     |    | 43.56% Pervious Area      |
| 1,416     |    | 56.44% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 9S: CC-9**

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Type II 24-hr 1-yr Rainfall=2.72"

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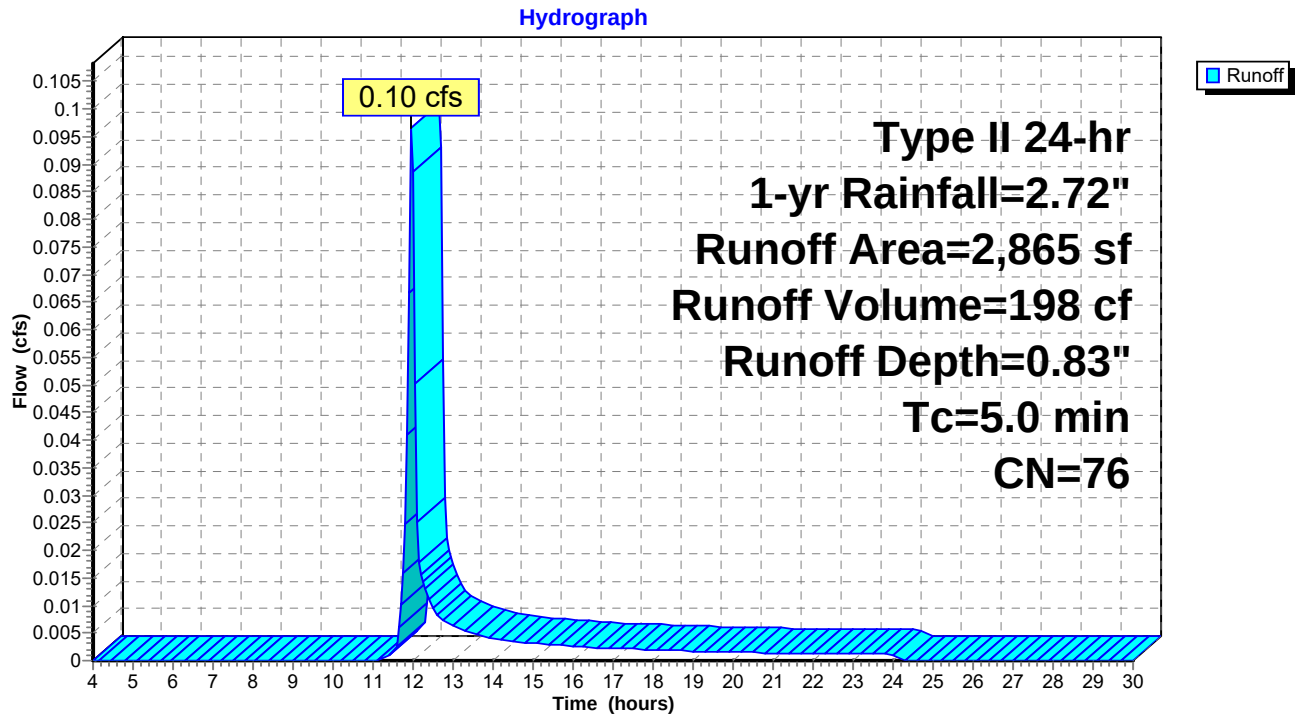
**Summary for Subcatchment 10S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.10 cfs @ 11.97 hrs, Volume= 198 cf, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 667       | 30 | Meadow, non-grazed, HSG A |
| 845       | 78 | Meadow, non-grazed, HSG D |
| 675       | 98 | Paved parking, HSG A      |
| 678       | 98 | Paved parking, HSG D      |
| 2,865     | 76 | Weighted Average          |
| 1,512     |    | 52.77% Pervious Area      |
| 1,353     |    | 47.23% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 10S: CC-10**

**Summary for Reach 6R: Channel 5**

[65] Warning: Inlet elevation not specified

Inflow Area = 63,362 sf, 7.29% Impervious, Inflow Depth = 0.38" for 1-yr event  
 Inflow = 0.81 cfs @ 11.99 hrs, Volume= 2,028 cf  
 Outflow = 0.72 cfs @ 12.04 hrs, Volume= 2,028 cf, Atten= 11%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.69 fps, Min. Travel Time= 1.6 min

Avg. Velocity = 0.87 fps, Avg. Travel Time= 4.9 min

Peak Storage= 75 cf @ 12.01 hrs

Average Depth at Peak Storage= 0.26'

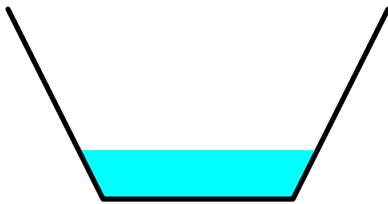
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 7.46 cfs

1.00' x 1.00' deep channel, n= 0.050

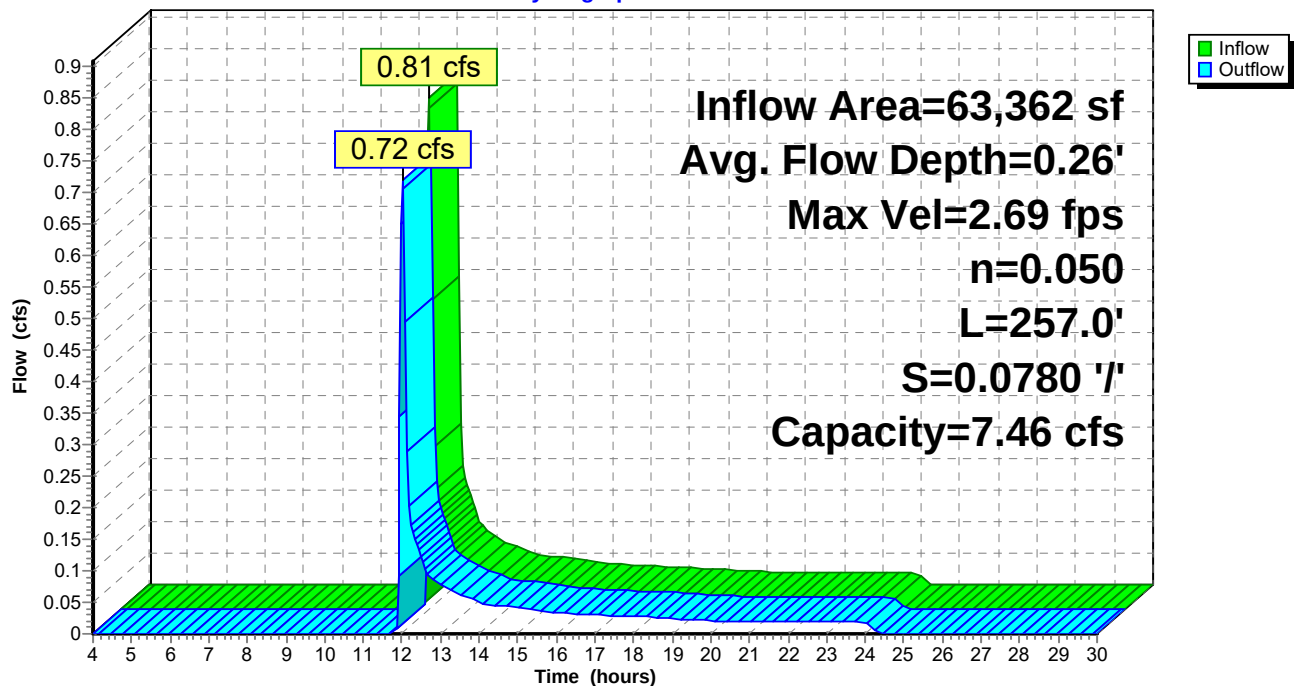
Side Slope Z-value= 0.5 '/' Top Width= 2.00'

Length= 257.0' Slope= 0.0780 '/'

Inlet Invert= 0.00', Outlet Invert= -20.05'

**Reach 6R: Channel 5**

Hydrograph



**Summary for Reach 7R: Channel 6**

[65] Warning: Inlet elevation not specified

Inflow Area = 78,847 sf, 8.11% Impervious, Inflow Depth = 0.34" for 1-yr event  
 Inflow = 0.74 cfs @ 12.04 hrs, Volume= 2,217 cf  
 Outflow = 0.71 cfs @ 12.06 hrs, Volume= 2,217 cf, Atten= 4%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.99 fps, Min. Travel Time= 0.7 min

Avg. Velocity= 1.01 fps, Avg. Travel Time= 2.1 min

Peak Storage= 31 cf @ 12.05 hrs

Average Depth at Peak Storage= 0.22'

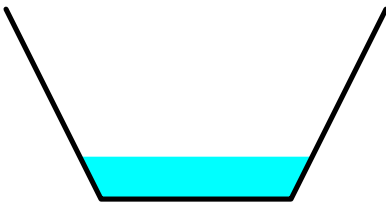
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 8.91 cfs

1.00' x 1.00' deep channel, n= 0.054

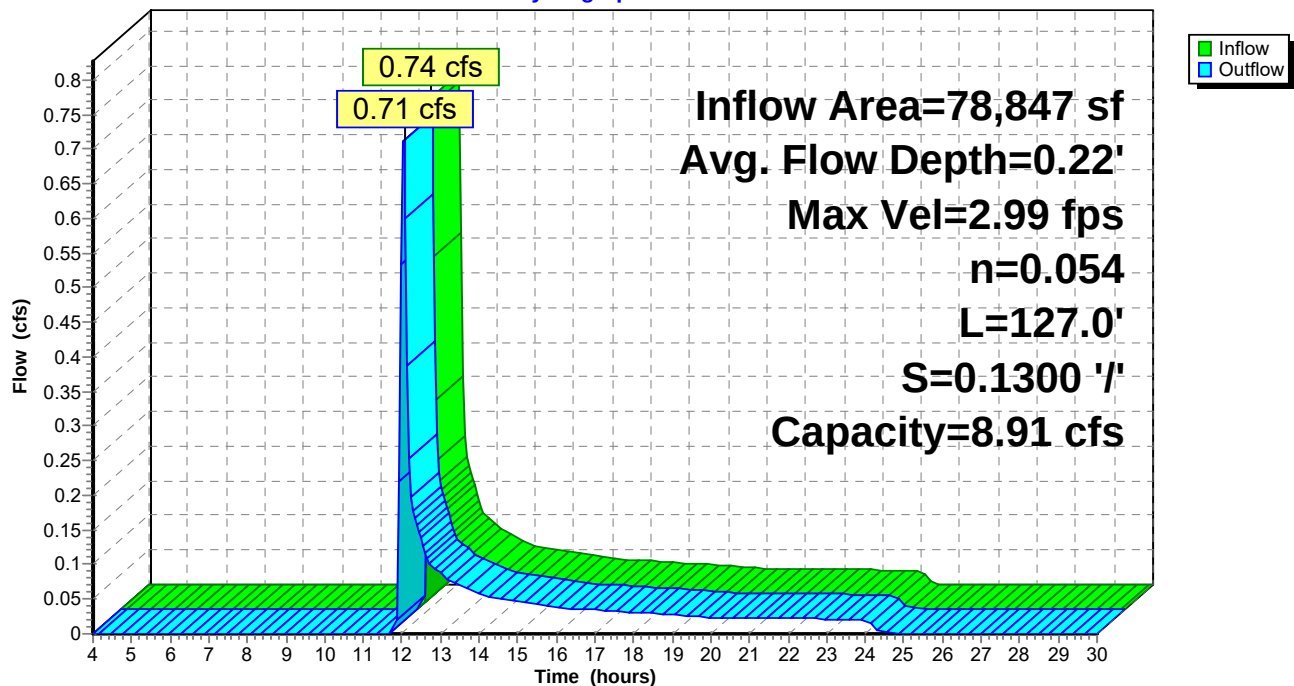
Side Slope Z-value= 0.5 '/' Top Width= 2.00'

Length= 127.0' Slope= 0.1300 '/'

Inlet Invert= 0.00', Outlet Invert= -16.51'

**Reach 7R: Channel 6**

Hydrograph



**Summary for Reach 10R: Channel 7**

[65] Warning: Inlet elevation not specified

Inflow Area = 5,181 sf, 57.98% Impervious, Inflow Depth = 1.04" for 1-yr event  
 Inflow = 0.22 cfs @ 11.96 hrs, Volume= 451 cf  
 Outflow = 0.19 cfs @ 12.06 hrs, Volume= 451 cf, Atten= 15%, Lag= 6.1 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.69 fps, Min. Travel Time= 3.9 min

Avg. Velocity= 0.46 fps, Avg. Travel Time= 14.3 min

Peak Storage= 46 cf @ 12.00 hrs

Average Depth at Peak Storage= 0.11'

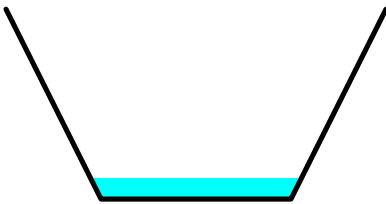
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 7.32 cfs

1.00' x 1.00' deep channel, n= 0.055

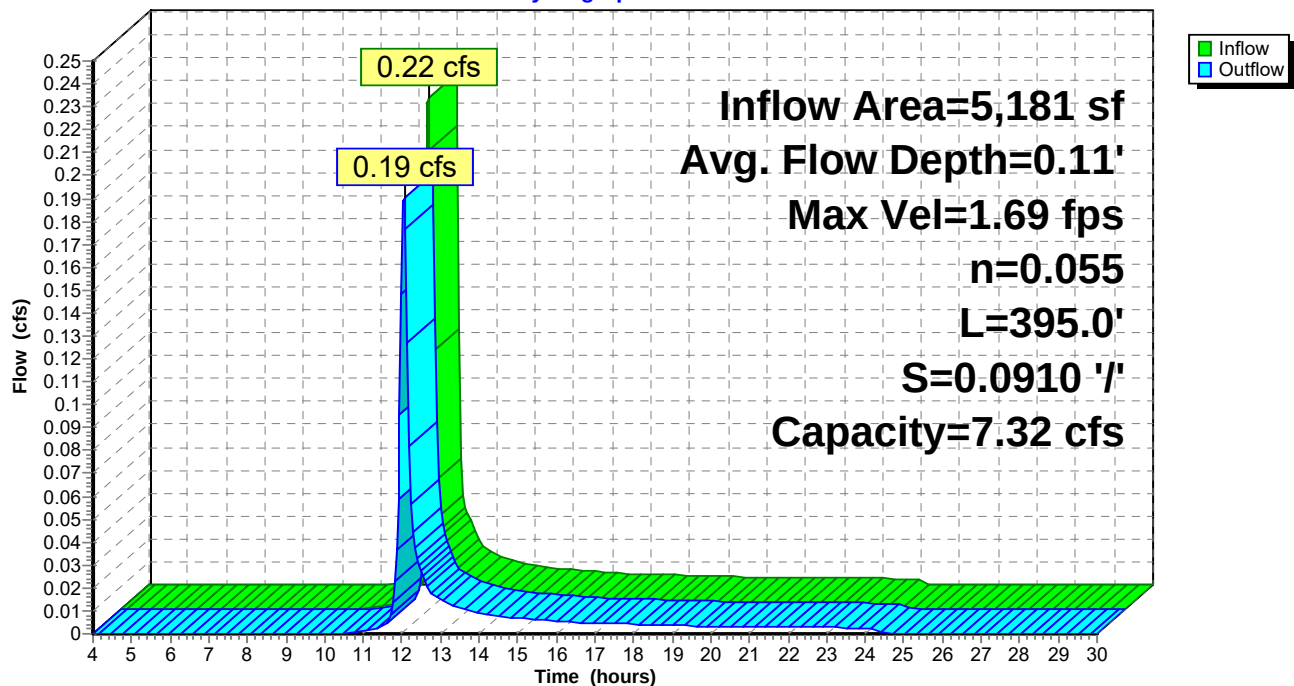
Side Slope Z-value= 0.5 '/' Top Width= 2.00'

Length= 395.0' Slope= 0.0910 '/'

Inlet Invert= 0.00', Outlet Invert= -35.95'

**Reach 10R: Channel 7**

Hydrograph



**Summary for Reach 11R: Channel 8**

[65] Warning: Inlet elevation not specified

Inflow Area = 86,364 sf, 10.88% Impervious, Inflow Depth = 0.37" for 1-yr event  
 Inflow = 0.90 cfs @ 12.06 hrs, Volume= 2,668 cf  
 Outflow = 0.87 cfs @ 12.07 hrs, Volume= 2,668 cf, Atten= 4%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.79 fps, Min. Travel Time= 0.5 min

Avg. Velocity = 0.87 fps, Avg. Travel Time= 1.7 min

Peak Storage= 28 cf @ 12.06 hrs

Average Depth at Peak Storage= 0.28'

Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 4.52 cfs

1.00' x 0.75' deep channel, n= 0.045

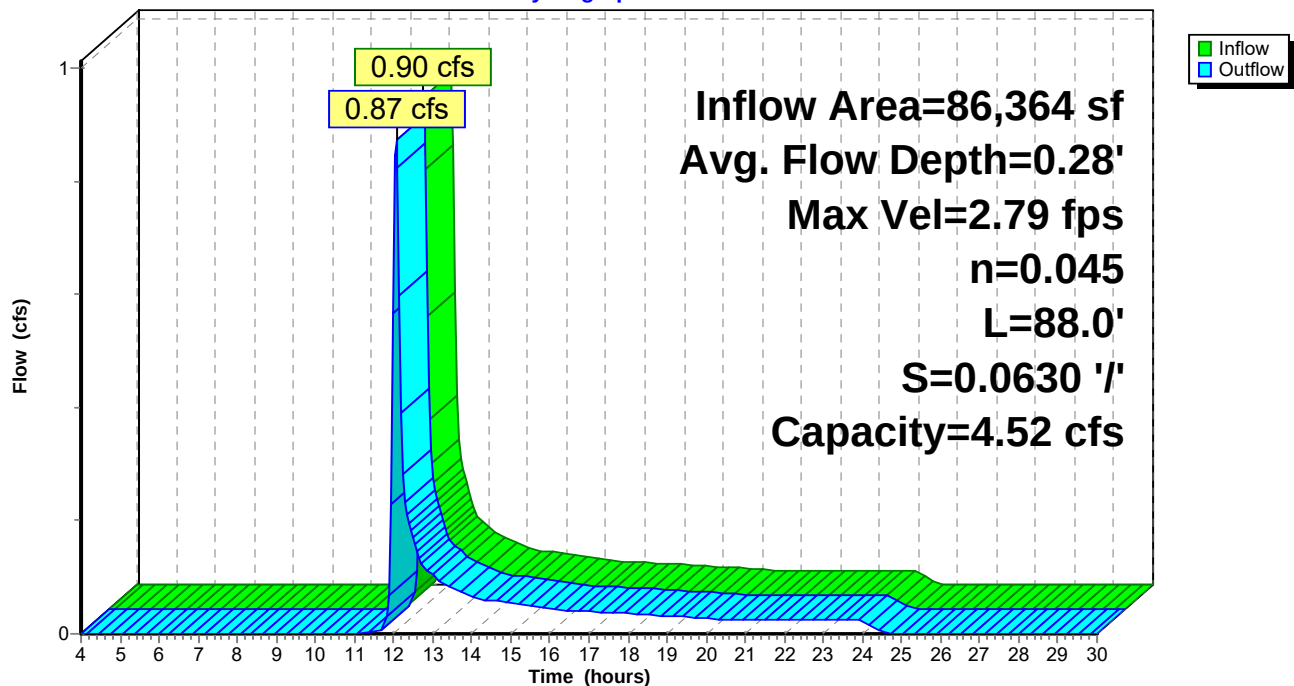
Side Slope Z-value= 0.5 '/' Top Width= 1.75'

Length= 88.0' Slope= 0.0630 '/'

Inlet Invert= 0.00', Outlet Invert= -5.54'

**Reach 11R: Channel 8**

Hydrograph



**MLV 505LD86\_Channels 5-10 REV 2***Type II 24-hr 2-yr Rainfall=3.26"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                               |                                                                                                                                              |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment5S: CC-5</b>   | Runoff Area=63,362 sf 7.29% Impervious Runoff Depth=0.63"<br>Tc=5.0 min CN=65 Runoff=1.49 cfs 3,325 cf                                       |
| <b>Subcatchment6S: CC-6</b>   | Runoff Area=15,485 sf 11.48% Impervious Runoff Depth=0.30"<br>Tc=5.0 min CN=56 Runoff=0.11 cfs 385 cf                                        |
| <b>Subcatchment7S: CC-7</b>   | Runoff Area=5,181 sf 57.98% Impervious Runoff Depth=1.45"<br>Tc=5.0 min CN=80 Runoff=0.31 cfs 625 cf                                         |
| <b>Subcatchment8S: CC-8</b>   | Runoff Area=2,336 sf 0.00% Impervious Runoff Depth=0.00"<br>Tc=5.0 min CN=30 Runoff=0.00 cfs 0 cf                                            |
| <b>Subcatchment9S: CC-9</b>   | Runoff Area=2,509 sf 56.44% Impervious Runoff Depth=1.08"<br>Tc=5.0 min CN=74 Runoff=0.11 cfs 225 cf                                         |
| <b>Subcatchment10S: CC-10</b> | Runoff Area=2,865 sf 47.23% Impervious Runoff Depth=1.19"<br>Tc=5.0 min CN=76 Runoff=0.14 cfs 285 cf                                         |
| <b>Reach 6R: Channel 5</b>    | Avg. Flow Depth=0.38' Max Vel=3.24 fps Inflow=1.49 cfs 3,325 cf<br>n=0.050 L=257.0' S=0.0780 '/' Capacity=7.46 cfs Outflow=1.37 cfs 3,325 cf |
| <b>Reach 7R: Channel 6</b>    | Avg. Flow Depth=0.34' Max Vel=3.65 fps Inflow=1.48 cfs 3,711 cf<br>n=0.054 L=127.0' S=0.1300 '/' Capacity=8.91 cfs Outflow=1.41 cfs 3,711 cf |
| <b>Reach 10R: Channel 7</b>   | Avg. Flow Depth=0.14' Max Vel=1.90 fps Inflow=0.31 cfs 625 cf<br>n=0.055 L=395.0' S=0.0910 '/' Capacity=7.32 cfs Outflow=0.28 cfs 625 cf     |
| <b>Reach 11R: Channel 8</b>   | Avg. Flow Depth=0.41' Max Vel=3.37 fps Inflow=1.68 cfs 4,336 cf<br>n=0.045 L=88.0' S=0.0630 '/' Capacity=4.52 cfs Outflow=1.65 cfs 4,336 cf  |

**Total Runoff Area = 91,738 sf Runoff Volume = 4,846 cf Average Runoff Depth = 0.63"**  
**86.74% Pervious = 79,572 sf 13.26% Impervious = 12,166 sf**



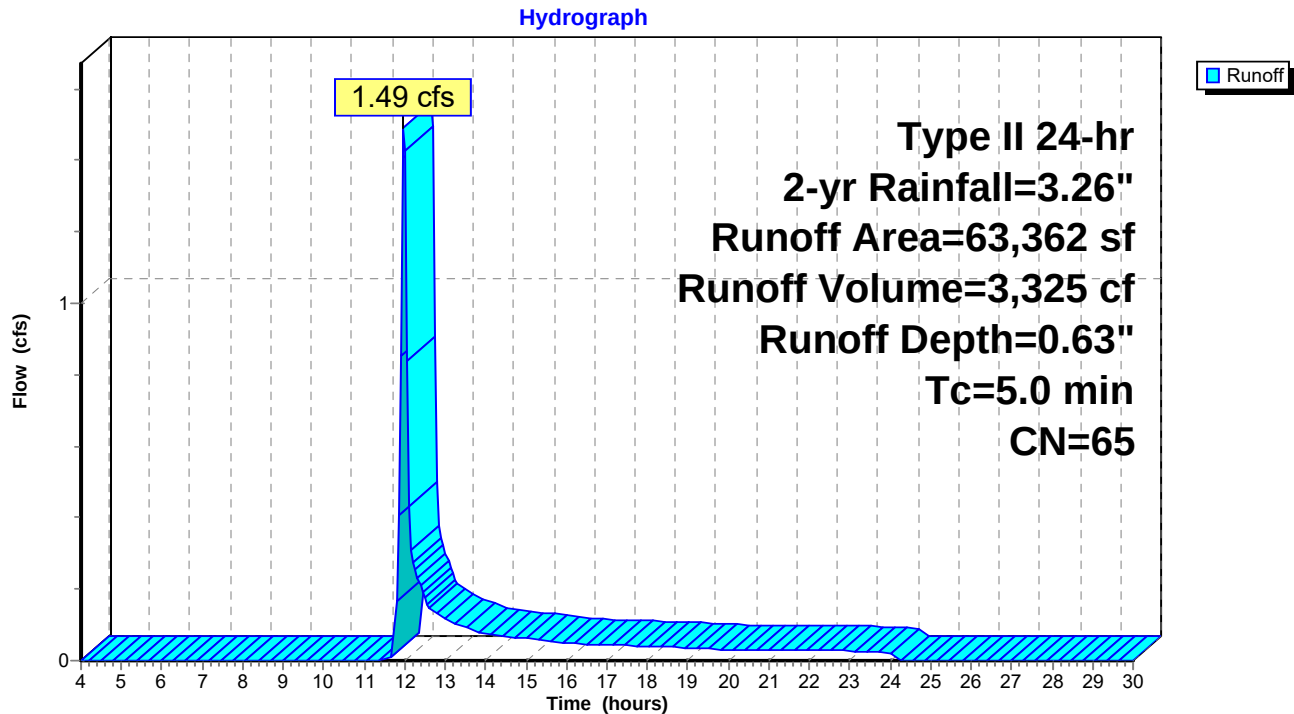
**Summary for Subcatchment 5S: CC-5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.49 cfs @ 11.98 hrs, Volume= 3,325 cf, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 18,807    | 30 | Meadow, non-grazed, HSG A |
| 39,939    | 78 | Meadow, non-grazed, HSG D |
| 2,138     | 98 | Paved parking, HSG A      |
| 2,478     | 98 | Paved parking, HSG D      |
| 63,362    | 65 | Weighted Average          |
| 58,746    |    | 92.71% Pervious Area      |
| 4,616     |    | 7.29% Impervious Area     |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 5S: CC-5**

**Summary for Subcatchment 6S: CC-6**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.11 cfs @ 12.00 hrs, Volume= 385 cf, Depth= 0.30"

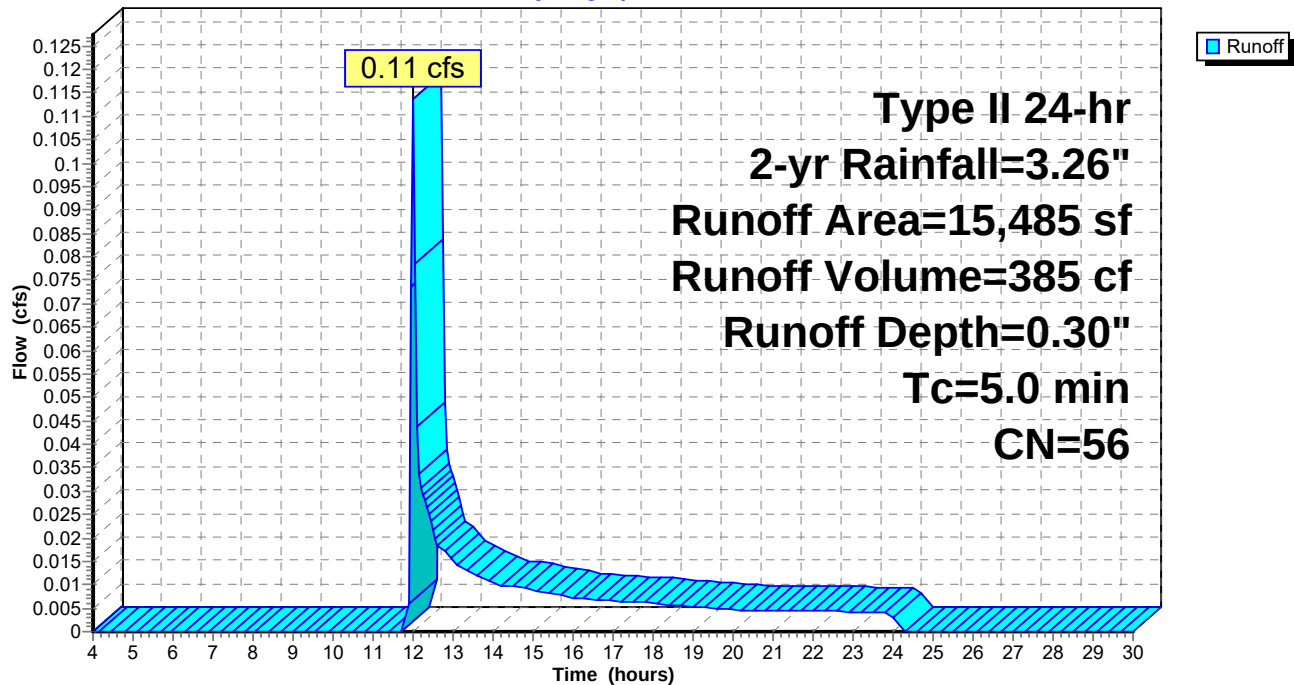
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 7,682     | 30 | Meadow, non-grazed, HSG A |
| 6,026     | 78 | Meadow, non-grazed, HSG D |
| 1,255     | 98 | Paved parking, HSG A      |
| 522       | 98 | Paved parking, HSG D      |
| 15,485    | 56 | Weighted Average          |
| 13,708    |    | 88.52% Pervious Area      |
| 1,777     |    | 11.48% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 6S: CC-6**

Hydrograph



**MLV 505LD86\_Channels 5-10 REV 2**

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Type II 24-hr 2-yr Rainfall=3.26"

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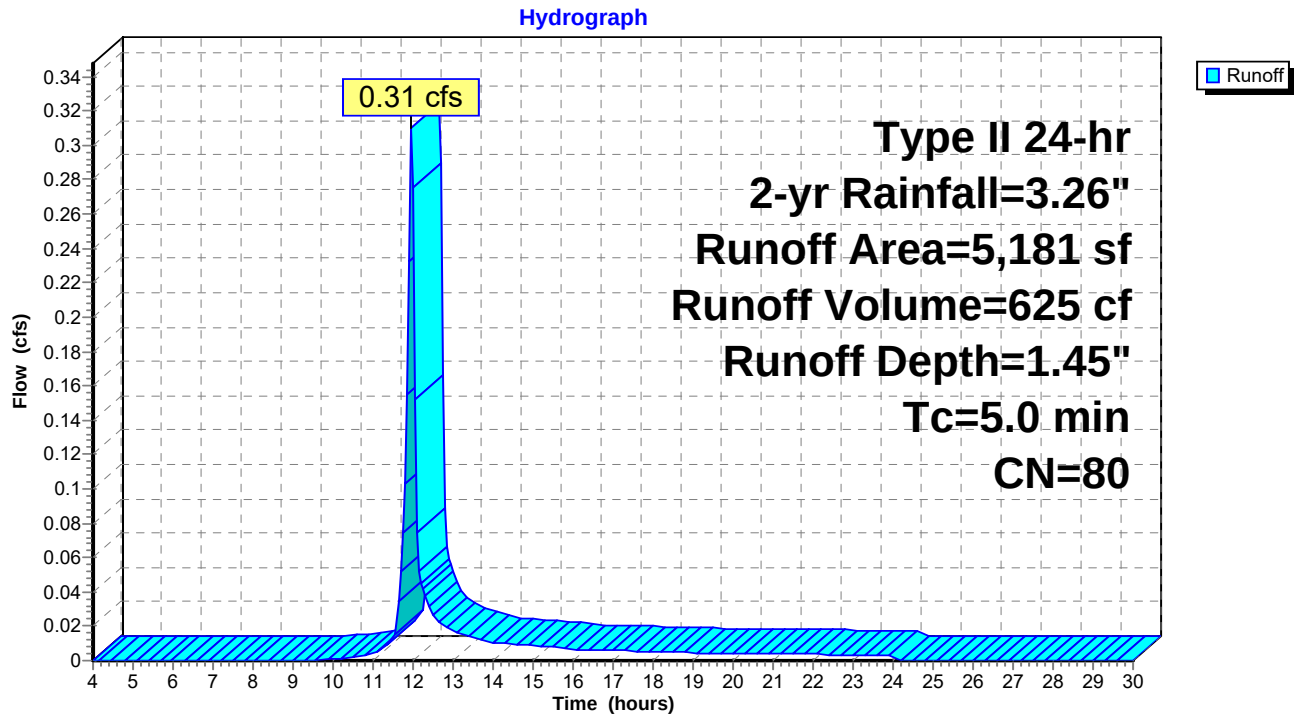
**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.31 cfs @ 11.96 hrs, Volume= 625 cf, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,049     | 30 | Meadow, non-grazed, HSG A |
| 1,128     | 78 | Meadow, non-grazed, HSG D |
| 2,071     | 98 | Paved parking, HSG A      |
| 933       | 98 | Paved parking, HSG D      |
| 5,181     | 80 | Weighted Average          |
| 2,177     |    | 42.02% Pervious Area      |
| 3,004     |    | 57.98% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

**Summary for Subcatchment 8S: CC-8**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

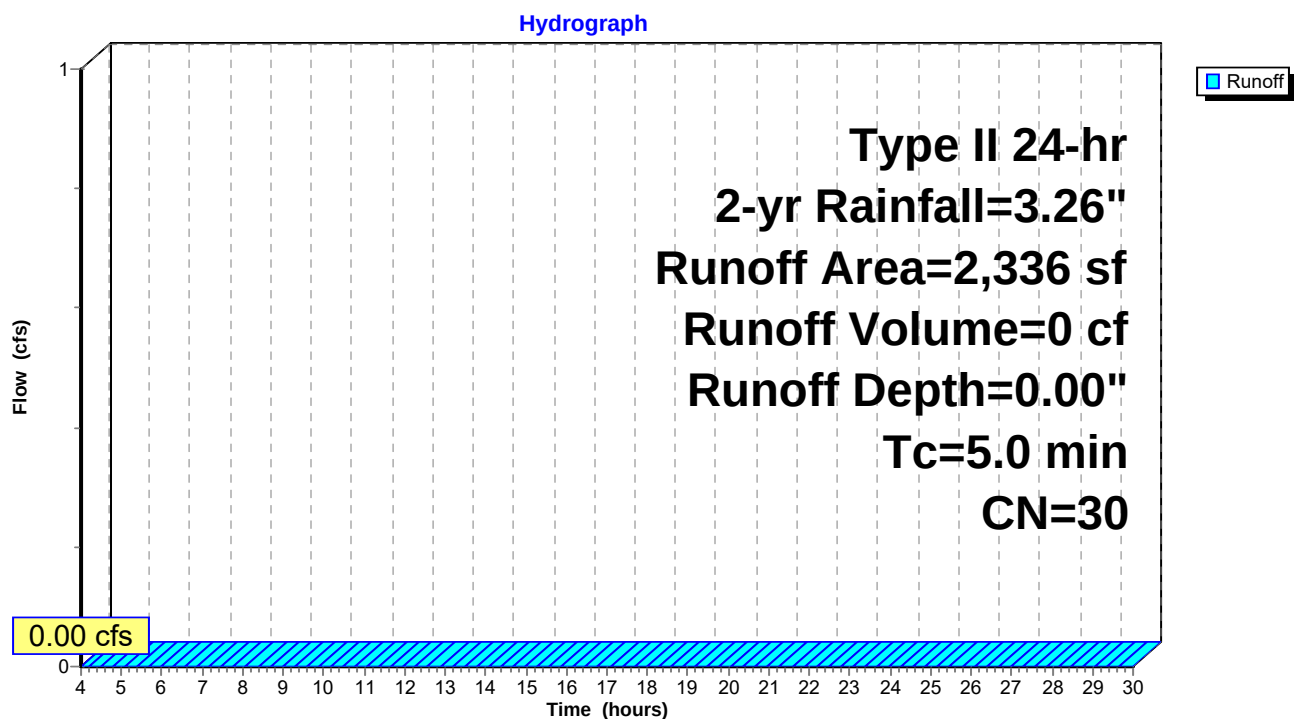
[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,336     | 30 | Meadow, non-grazed, HSG A |
| 2,336     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 8S: CC-8**

**MLV 505LD86\_Channels 5-10 REV 2**

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Type II 24-hr 2-yr Rainfall=3.26"

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**Summary for Subcatchment 9S: CC-9**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.11 cfs @ 11.96 hrs, Volume= 225 cf, Depth= 1.08"

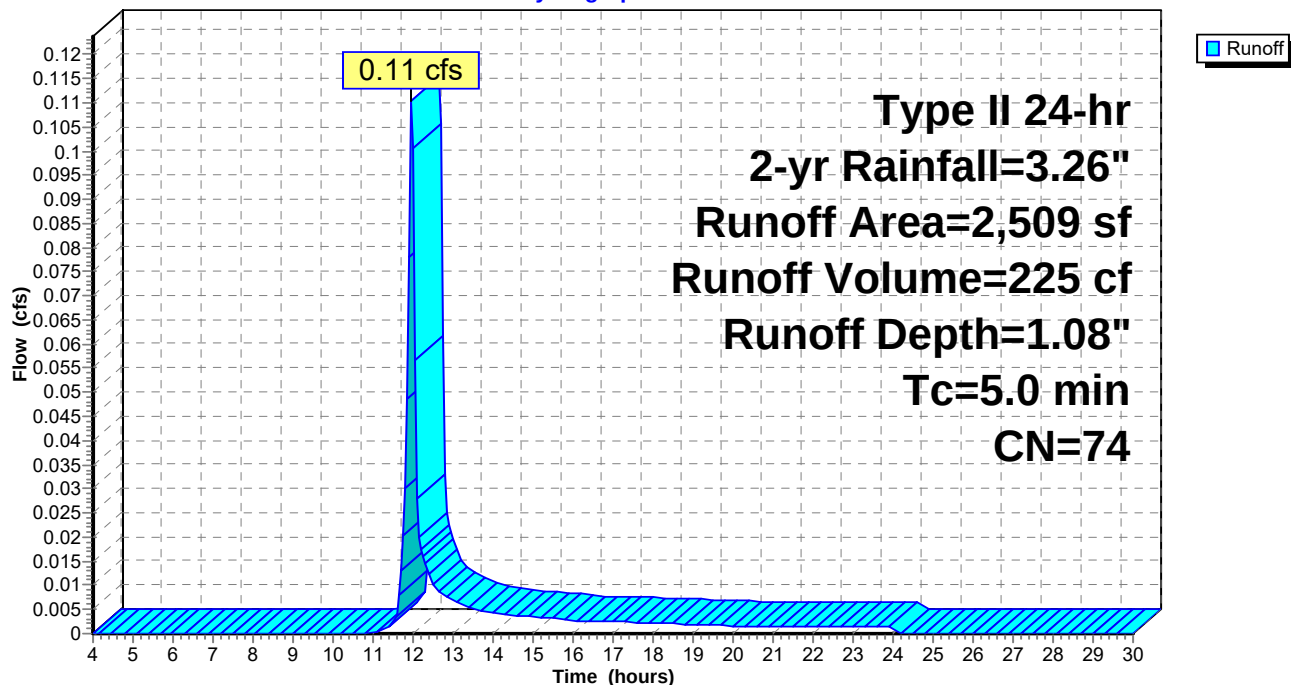
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 815       | 30 | Meadow, non-grazed, HSG A |
| 278       | 78 | Meadow, non-grazed, HSG D |
| 633       | 98 | Paved parking, HSG A      |
| 783       | 98 | Water Surface, HSG D      |
| 2,509     | 74 | Weighted Average          |
| 1,093     |    | 43.56% Pervious Area      |
| 1,416     |    | 56.44% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 9S: CC-9**

Hydrograph



**MLV 505LD86\_Channels 5-10 REV 2**

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Type II 24-hr 2-yr Rainfall=3.26"

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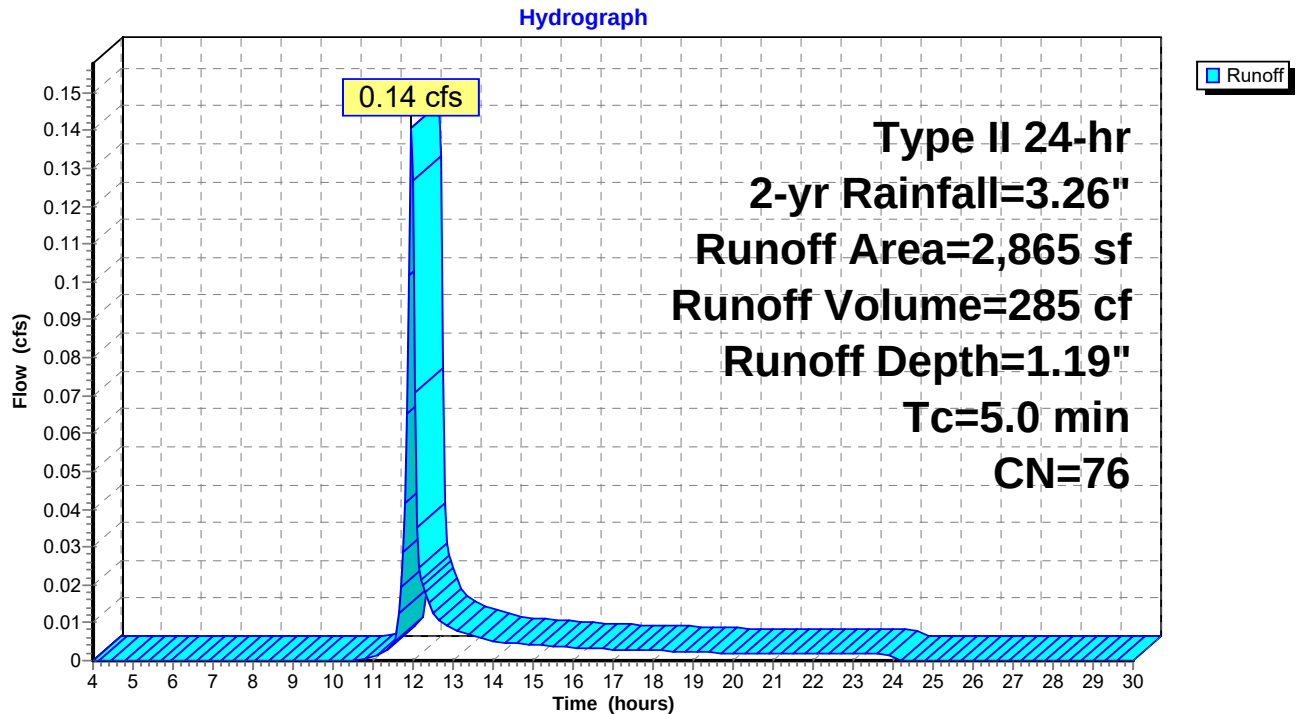
**Summary for Subcatchment 10S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.14 cfs @ 11.96 hrs, Volume= 285 cf, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 667       | 30 | Meadow, non-grazed, HSG A |
| 845       | 78 | Meadow, non-grazed, HSG D |
| 675       | 98 | Paved parking, HSG A      |
| 678       | 98 | Paved parking, HSG D      |
| 2,865     | 76 | Weighted Average          |
| 1,512     |    | 52.77% Pervious Area      |
| 1,353     |    | 47.23% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 10S: CC-10**

**Summary for Reach 6R: Channel 5**

[65] Warning: Inlet elevation not specified

Inflow Area = 63,362 sf, 7.29% Impervious, Inflow Depth = 0.63" for 2-yr event  
 Inflow = 1.49 cfs @ 11.98 hrs, Volume= 3,325 cf  
 Outflow = 1.37 cfs @ 12.01 hrs, Volume= 3,325 cf, Atten= 8%, Lag= 2.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.24 fps, Min. Travel Time= 1.3 min

Avg. Velocity= 1.01 fps, Avg. Travel Time= 4.3 min

Peak Storage= 116 cf @ 11.99 hrs

Average Depth at Peak Storage= 0.38'

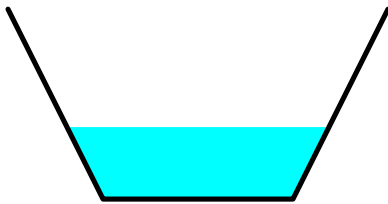
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 7.46 cfs

1.00' x 1.00' deep channel, n= 0.050

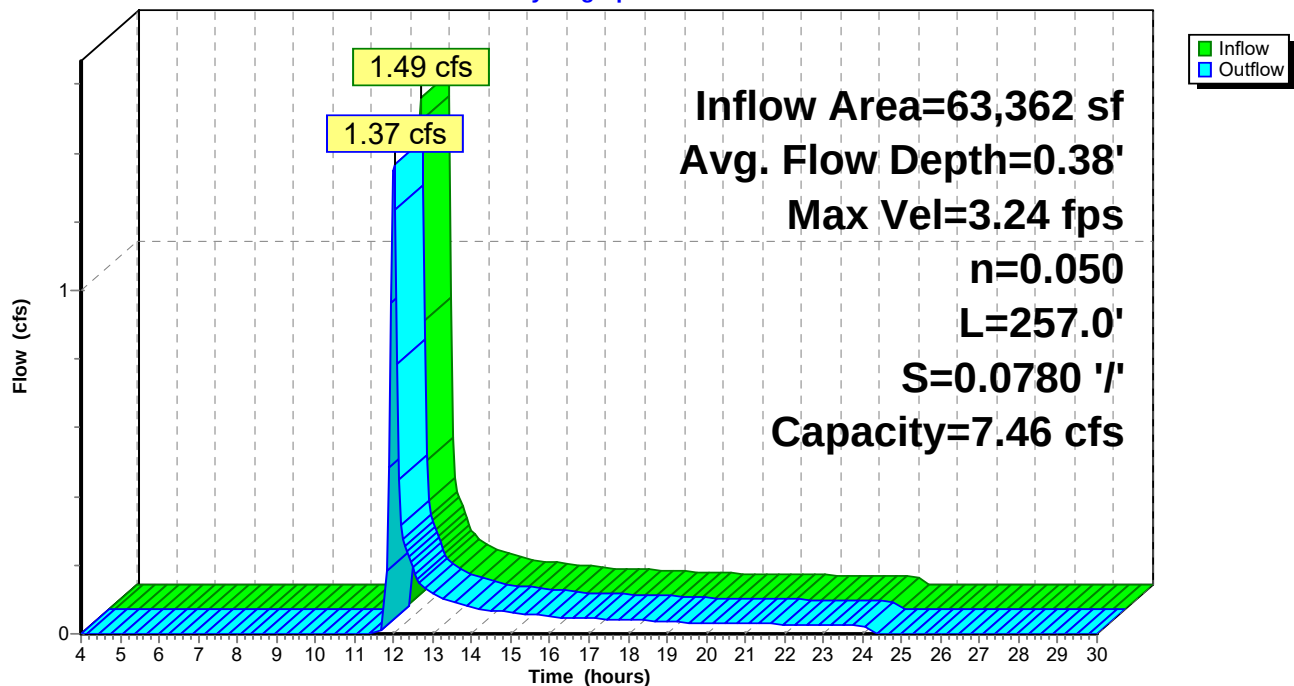
Side Slope Z-value= 0.5 '/' Top Width= 2.00'

Length= 257.0' Slope= 0.0780 '/'

Inlet Invert= 0.00', Outlet Invert= -20.05'

**Reach 6R: Channel 5**

Hydrograph



**Summary for Reach 7R: Channel 6**

[65] Warning: Inlet elevation not specified

Inflow Area = 78,847 sf, 8.11% Impervious, Inflow Depth = 0.56" for 2-yr event  
 Inflow = 1.48 cfs @ 12.01 hrs, Volume= 3,711 cf  
 Outflow = 1.41 cfs @ 12.03 hrs, Volume= 3,711 cf, Atten= 5%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.65 fps, Min. Travel Time= 0.6 min

Avg. Velocity= 1.18 fps, Avg. Travel Time= 1.8 min

Peak Storage= 51 cf @ 12.02 hrs

Average Depth at Peak Storage= 0.34'

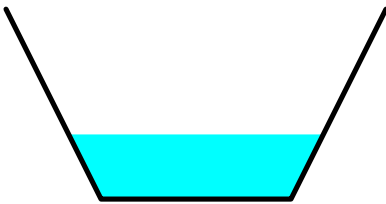
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 8.91 cfs

1.00' x 1.00' deep channel, n= 0.054

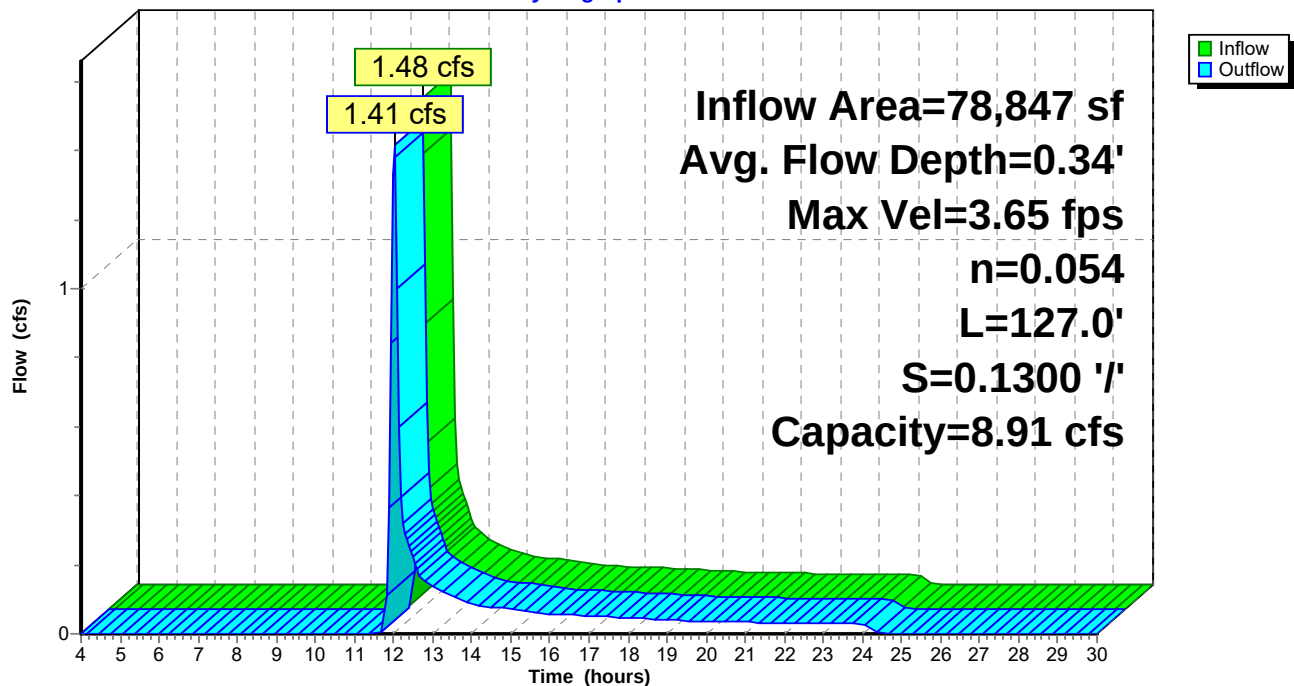
Side Slope Z-value= 0.5 '/' Top Width= 2.00'

Length= 127.0' Slope= 0.1300 '/'

Inlet Invert= 0.00', Outlet Invert= -16.51'

**Reach 7R: Channel 6**

Hydrograph





**Summary for Reach 10R: Channel 7**

[65] Warning: Inlet elevation not specified

Inflow Area = 5,181 sf, 57.98% Impervious, Inflow Depth = 1.45" for 2-yr event  
 Inflow = 0.31 cfs @ 11.96 hrs, Volume= 625 cf  
 Outflow = 0.28 cfs @ 12.05 hrs, Volume= 625 cf, Atten= 11%, Lag= 5.5 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.90 fps, Min. Travel Time= 3.5 min

Avg. Velocity= 0.49 fps, Avg. Travel Time= 13.4 min

Peak Storage= 58 cf @ 12.00 hrs

Average Depth at Peak Storage= 0.14'

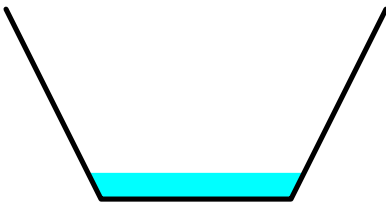
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 7.32 cfs

1.00' x 1.00' deep channel, n= 0.055

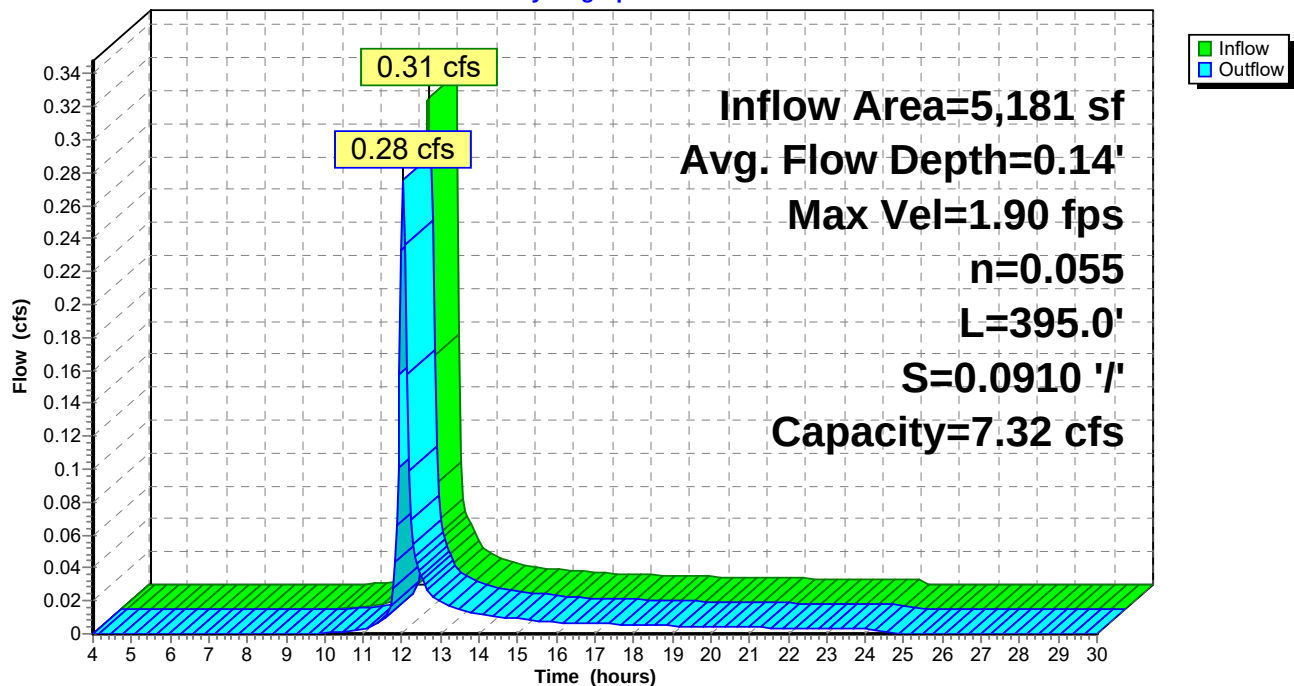
Side Slope Z-value= 0.5 '/' Top Width= 2.00'

Length= 395.0' Slope= 0.0910 '/'

Inlet Invert= 0.00', Outlet Invert= -35.95'

**Reach 10R: Channel 7**

Hydrograph



**Summary for Reach 11R: Channel 8**

[65] Warning: Inlet elevation not specified

Inflow Area = 86,364 sf, 10.88% Impervious, Inflow Depth = 0.60" for 2-yr event  
 Inflow = 1.68 cfs @ 12.03 hrs, Volume= 4,336 cf  
 Outflow = 1.65 cfs @ 12.05 hrs, Volume= 4,336 cf, Atten= 2%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.37 fps, Min. Travel Time= 0.4 min

Avg. Velocity = 0.98 fps, Avg. Travel Time= 1.5 min

Peak Storage= 44 cf @ 12.04 hrs

Average Depth at Peak Storage= 0.41'

Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 4.52 cfs

1.00' x 0.75' deep channel, n= 0.045

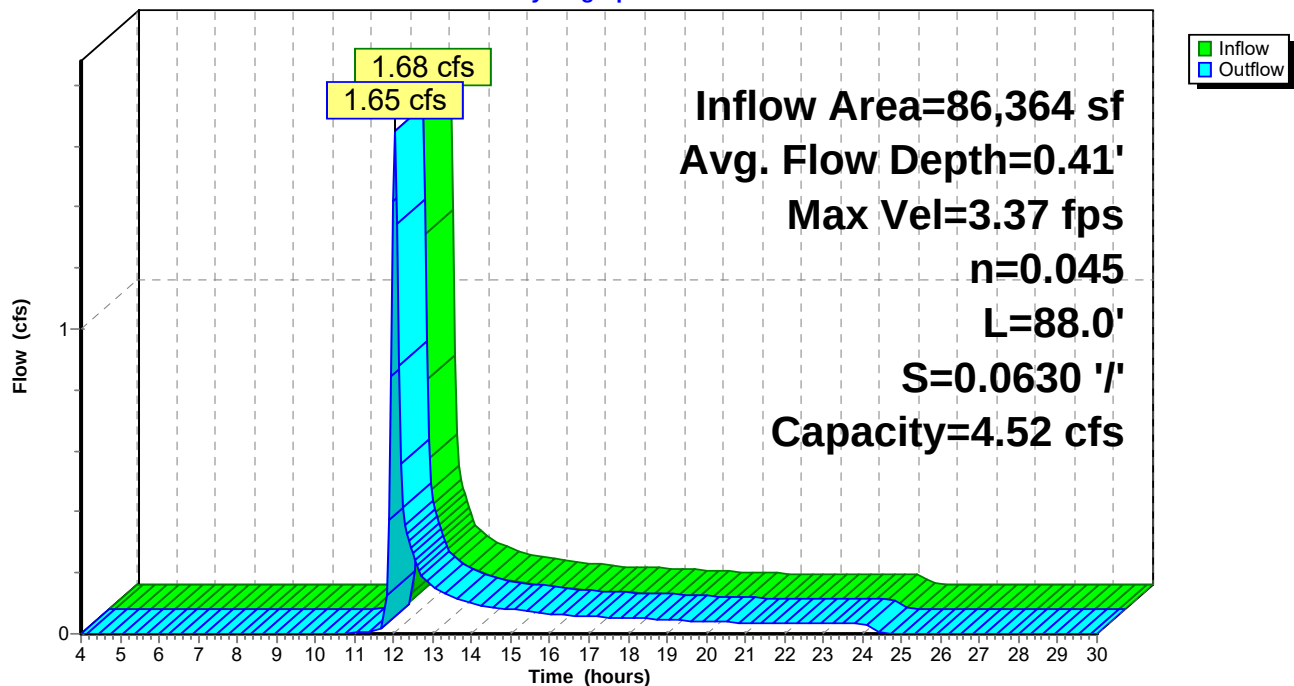
Side Slope Z-value= 0.5 '/' Top Width= 1.75'

Length= 88.0' Slope= 0.0630 '/'

Inlet Invert= 0.00', Outlet Invert= -5.54'

**Reach 11R: Channel 8**

Hydrograph



**MLV 505LD86\_Channels 5-10 REV 2***Type II 24-hr 10-yr Rainfall=4.74"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                               |                                                                                                                                               |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment5S: CC-5</b>   | Runoff Area=63,362 sf 7.29% Impervious Runoff Depth=1.48"<br>Tc=5.0 min CN=65 Runoff=3.82 cfs 7,831 cf                                        |
| <b>Subcatchment6S: CC-6</b>   | Runoff Area=15,485 sf 11.48% Impervious Runoff Depth=0.91"<br>Tc=5.0 min CN=56 Runoff=0.53 cfs 1,175 cf                                       |
| <b>Subcatchment7S: CC-7</b>   | Runoff Area=5,181 sf 57.98% Impervious Runoff Depth=2.67"<br>Tc=5.0 min CN=80 Runoff=0.57 cfs 1,152 cf                                        |
| <b>Subcatchment8S: CC-8</b>   | Runoff Area=2,336 sf 0.00% Impervious Runoff Depth=0.00"<br>Tc=5.0 min CN=30 Runoff=0.00 cfs 0 cf                                             |
| <b>Subcatchment9S: CC-9</b>   | Runoff Area=2,509 sf 56.44% Impervious Runoff Depth=2.16"<br>Tc=5.0 min CN=74 Runoff=0.22 cfs 451 cf                                          |
| <b>Subcatchment10S: CC-10</b> | Runoff Area=2,865 sf 47.23% Impervious Runoff Depth=2.32"<br>Tc=5.0 min CN=76 Runoff=0.27 cfs 555 cf                                          |
| <b>Reach 6R: Channel 5</b>    | Avg. Flow Depth=0.67' Max Vel=4.17 fps Inflow=3.82 cfs 7,831 cf<br>n=0.050 L=257.0' S=0.0780 '/' Capacity=7.46 cfs Outflow=3.61 cfs 7,831 cf  |
| <b>Reach 7R: Channel 6</b>    | Avg. Flow Depth=0.64' Max Vel=4.89 fps Inflow=4.12 cfs 9,006 cf<br>n=0.054 L=127.0' S=0.1300 '/' Capacity=8.91 cfs Outflow=4.02 cfs 9,006 cf  |
| <b>Reach 10R: Channel 7</b>   | Avg. Flow Depth=0.20' Max Vel=2.34 fps Inflow=0.57 cfs 1,152 cf<br>n=0.055 L=395.0' S=0.0910 '/' Capacity=7.32 cfs Outflow=0.52 cfs 1,152 cf  |
| <b>Reach 11R: Channel 8</b>   | Avg. Flow Depth=0.75' Max Vel=4.37 fps Inflow=4.50 cfs 10,157 cf<br>n=0.045 L=88.0' S=0.0630 '/' Capacity=4.52 cfs Outflow=4.40 cfs 10,157 cf |

**Total Runoff Area = 91,738 sf Runoff Volume = 11,163 cf Average Runoff Depth = 1.46"**  
**86.74% Pervious = 79,572 sf 13.26% Impervious = 12,166 sf**

**MLV 505LD86\_Channels 5-10 REV 2**

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Type II 24-hr 10-yr Rainfall=4.74"

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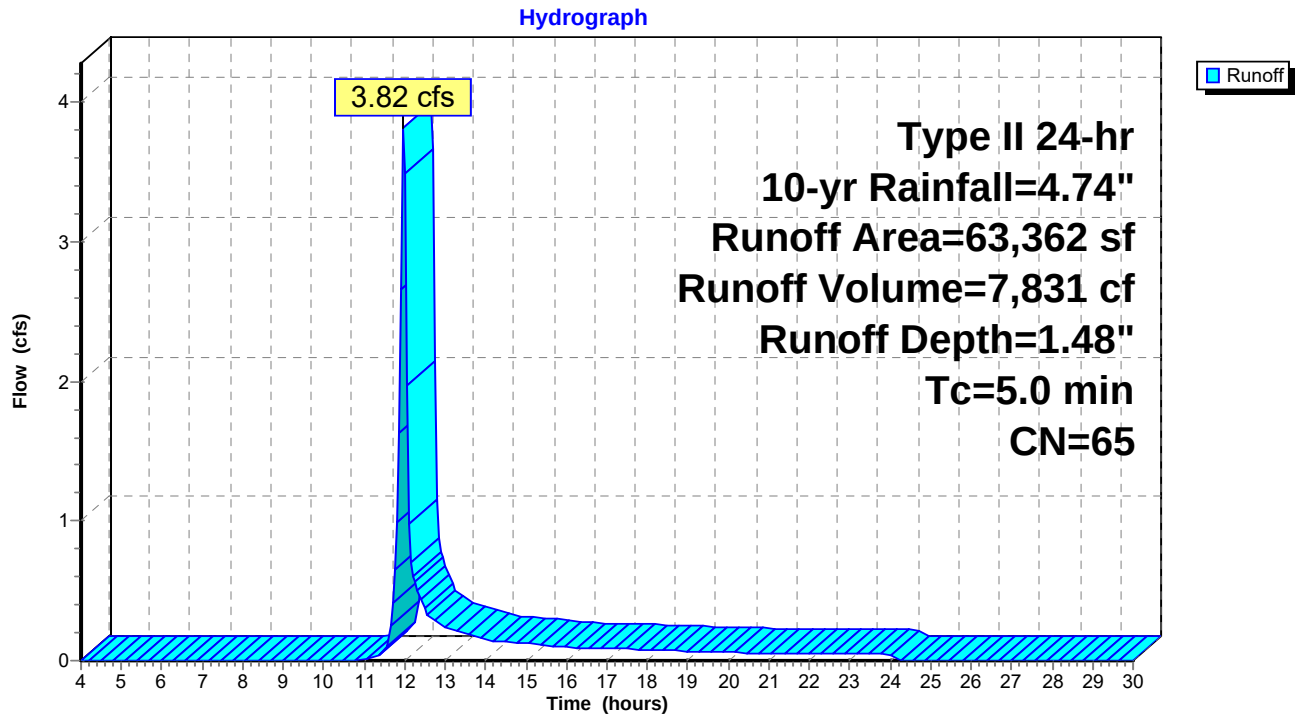
**Summary for Subcatchment 5S: CC-5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 3.82 cfs @ 11.97 hrs, Volume= 7,831 cf, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 18,807    | 30 | Meadow, non-grazed, HSG A |
| 39,939    | 78 | Meadow, non-grazed, HSG D |
| 2,138     | 98 | Paved parking, HSG A      |
| 2,478     | 98 | Paved parking, HSG D      |
| 63,362    | 65 | Weighted Average          |
| 58,746    |    | 92.71% Pervious Area      |
| 4,616     |    | 7.29% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 5S: CC-5**

**MLV 505LD86\_Channels 5-10 REV 2**

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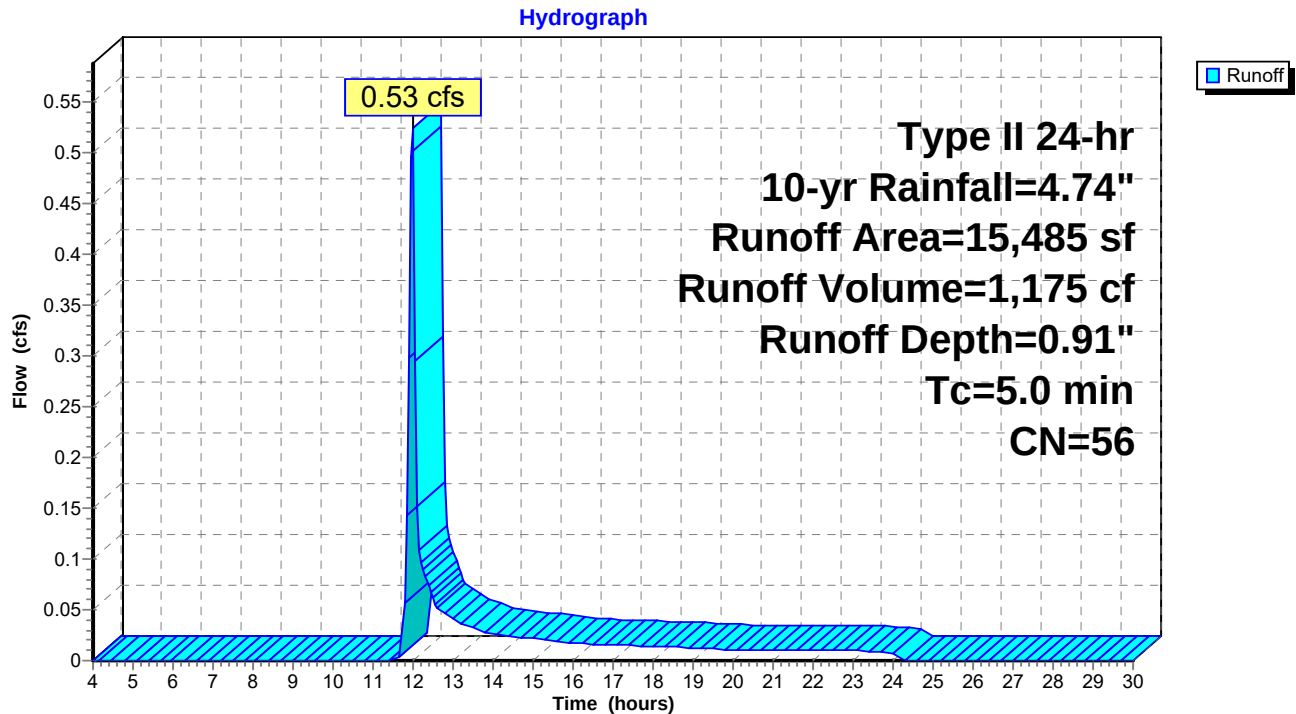
**Summary for Subcatchment 6S: CC-6**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.53 cfs @ 11.98 hrs, Volume= 1,175 cf, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 7,682     | 30 | Meadow, non-grazed, HSG A |
| 6,026     | 78 | Meadow, non-grazed, HSG D |
| 1,255     | 98 | Paved parking, HSG A      |
| 522       | 98 | Paved parking, HSG D      |
| 15,485    | 56 | Weighted Average          |
| 13,708    |    | 88.52% Pervious Area      |
| 1,777     |    | 11.48% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 6S: CC-6**

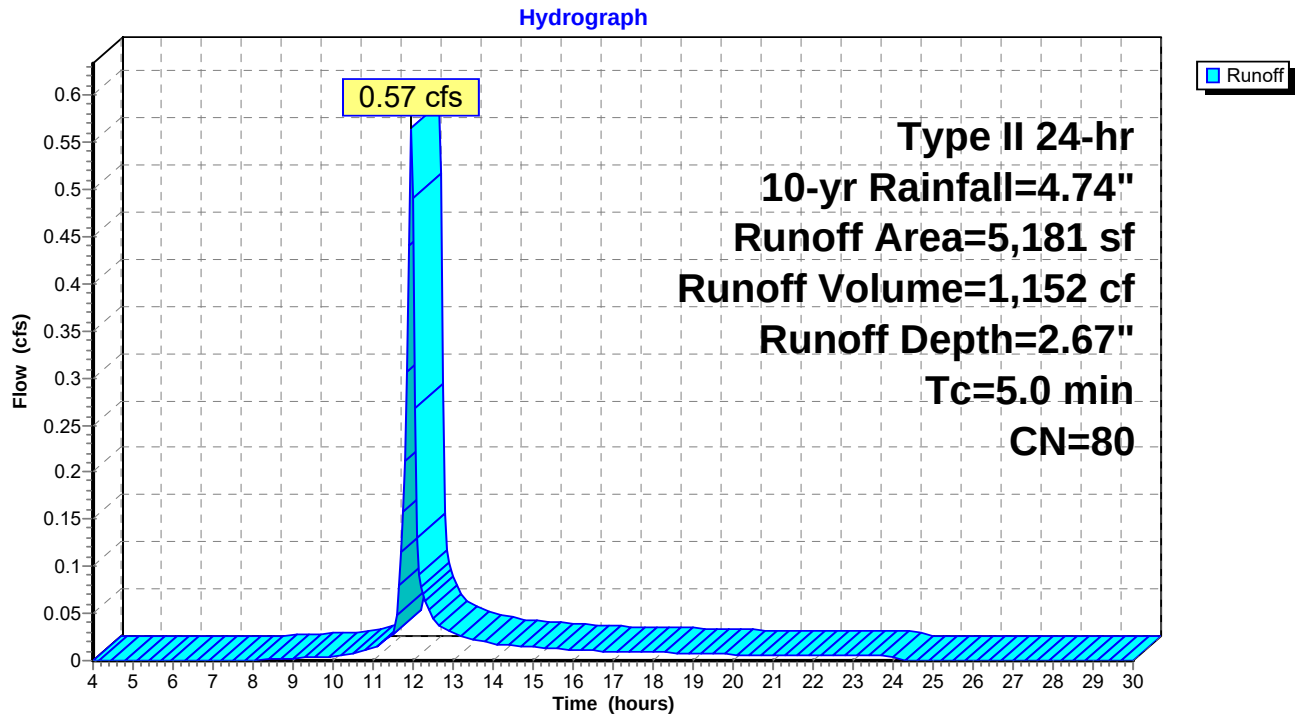
**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.57 cfs @ 11.96 hrs, Volume= 1,152 cf, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,049     | 30 | Meadow, non-grazed, HSG A |
| 1,128     | 78 | Meadow, non-grazed, HSG D |
| 2,071     | 98 | Paved parking, HSG A      |
| 933       | 98 | Paved parking, HSG D      |
| 5,181     | 80 | Weighted Average          |
| 2,177     |    | 42.02% Pervious Area      |
| 3,004     |    | 57.98% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

**Summary for Subcatchment 8S: CC-8**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.00 cfs @ 23.98 hrs, Volume= 0 cf, Depth= 0.00"

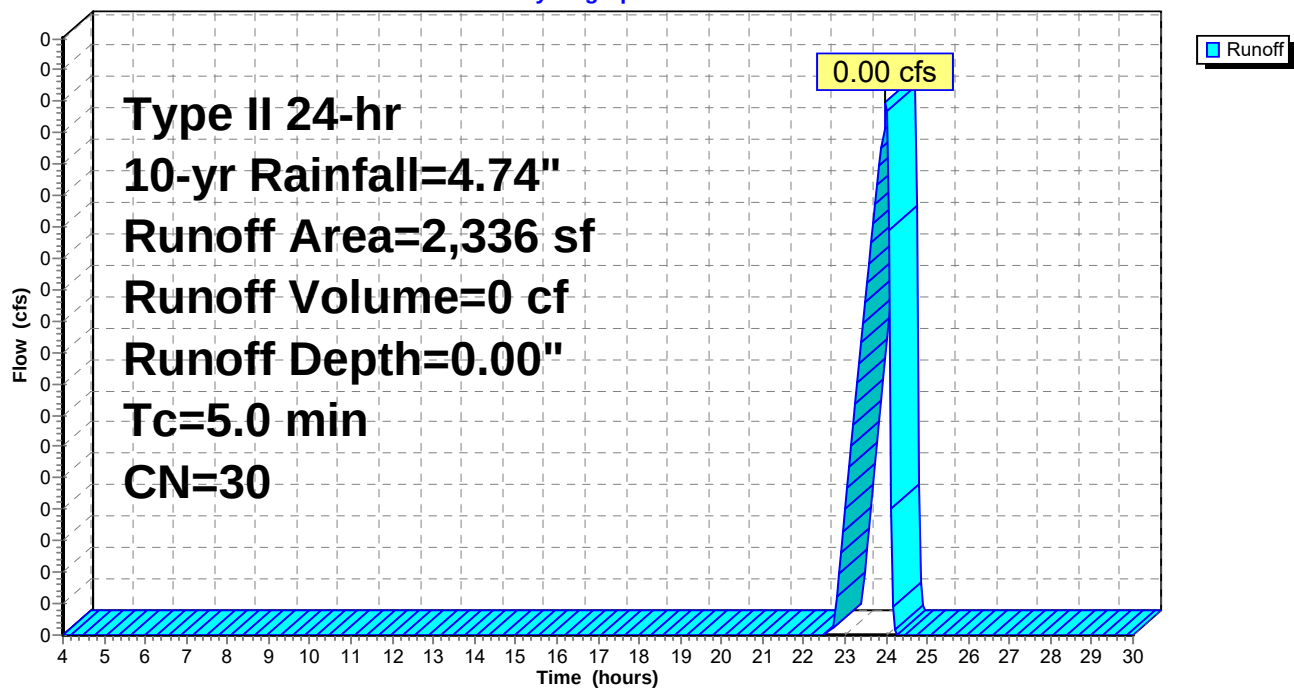
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,336     | 30 | Meadow, non-grazed, HSG A |
| 2,336     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 8S: CC-8**

Hydrograph



**Summary for Subcatchment 9S: CC-9**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.22 cfs @ 11.96 hrs, Volume= 451 cf, Depth= 2.16"

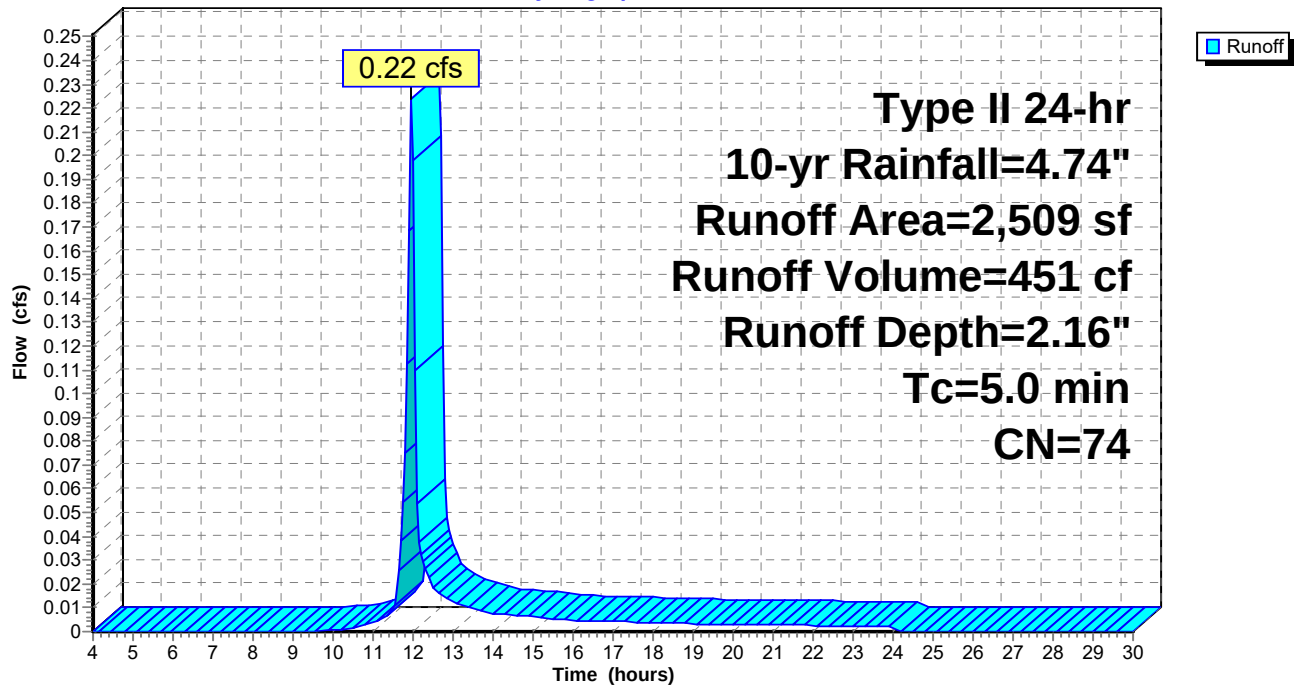
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 815       | 30 | Meadow, non-grazed, HSG A |
| 278       | 78 | Meadow, non-grazed, HSG D |
| 633       | 98 | Paved parking, HSG A      |
| 783       | 98 | Water Surface, HSG D      |
| 2,509     | 74 | Weighted Average          |
| 1,093     |    | 43.56% Pervious Area      |
| 1,416     |    | 56.44% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 9S: CC-9**

Hydrograph





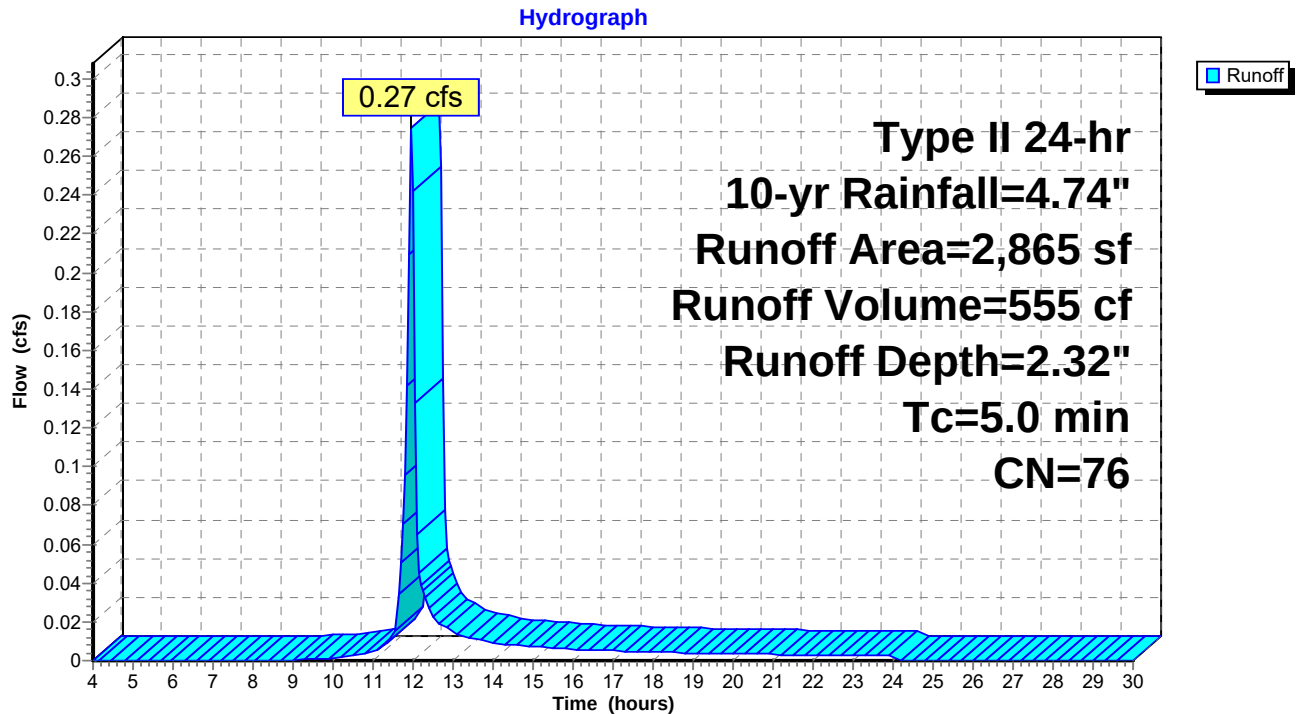
**Summary for Subcatchment 10S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.27 cfs @ 11.96 hrs, Volume= 555 cf, Depth= 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 667       | 30 | Meadow, non-grazed, HSG A |
| 845       | 78 | Meadow, non-grazed, HSG D |
| 675       | 98 | Paved parking, HSG A      |
| 678       | 98 | Paved parking, HSG D      |
| 2,865     | 76 | Weighted Average          |
| 1,512     |    | 52.77% Pervious Area      |
| 1,353     |    | 47.23% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 10S: CC-10**

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Type II 24-hr 10-yr Rainfall=4.74"

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### Summary for Reach 6R: Channel 5

[65] Warning: Inlet elevation not specified

Inflow Area = 63,362 sf, 7.29% Impervious, Inflow Depth = 1.48" for 10-yr event  
Inflow = 3.82 cfs @ 11.97 hrs, Volume= 7,831 cf  
Outflow = 3.61 cfs @ 12.00 hrs, Volume= 7,831 cf, Atten= 6%, Lag= 1.8 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.17 fps, Min. Travel Time= 1.0 min

Avg. Velocity= 1.28 fps, Avg. Travel Time= 3.4 min

Peak Storage= 231 cf @ 11.98 hrs

Average Depth at Peak Storage= 0.67'

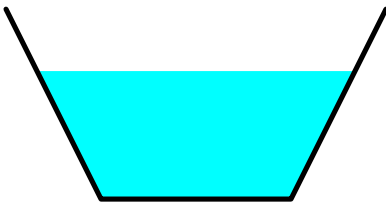
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 7.46 cfs

1.00' x 1.00' deep channel, n= 0.050

Side Slope Z-value= 0.5 '/' Top Width= 2.00'

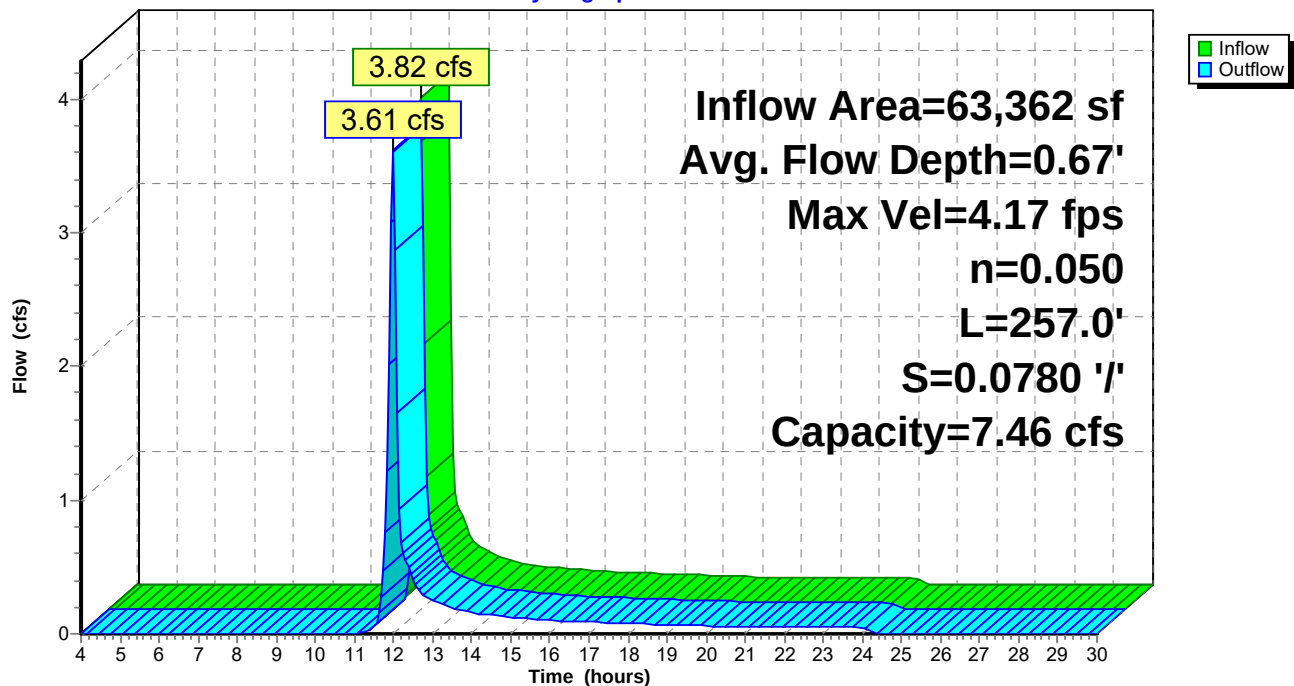
Length= 257.0' Slope= 0.0780 '/'

Inlet Invert= 0.00', Outlet Invert= -20.05'



### Reach 6R: Channel 5

Hydrograph



**Summary for Reach 7R: Channel 6**

[65] Warning: Inlet elevation not specified

Inflow Area = 78,847 sf, 8.11% Impervious, Inflow Depth = 1.37" for 10-yr event  
 Inflow = 4.12 cfs @ 11.99 hrs, Volume= 9,006 cf  
 Outflow = 4.02 cfs @ 12.00 hrs, Volume= 9,006 cf, Atten= 3%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.89 fps, Min. Travel Time= 0.4 min

Avg. Velocity= 1.51 fps, Avg. Travel Time= 1.4 min

Peak Storage= 107 cf @ 12.00 hrs

Average Depth at Peak Storage= 0.64'

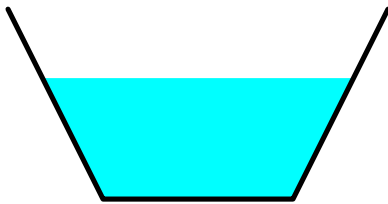
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 8.91 cfs

1.00' x 1.00' deep channel, n= 0.054

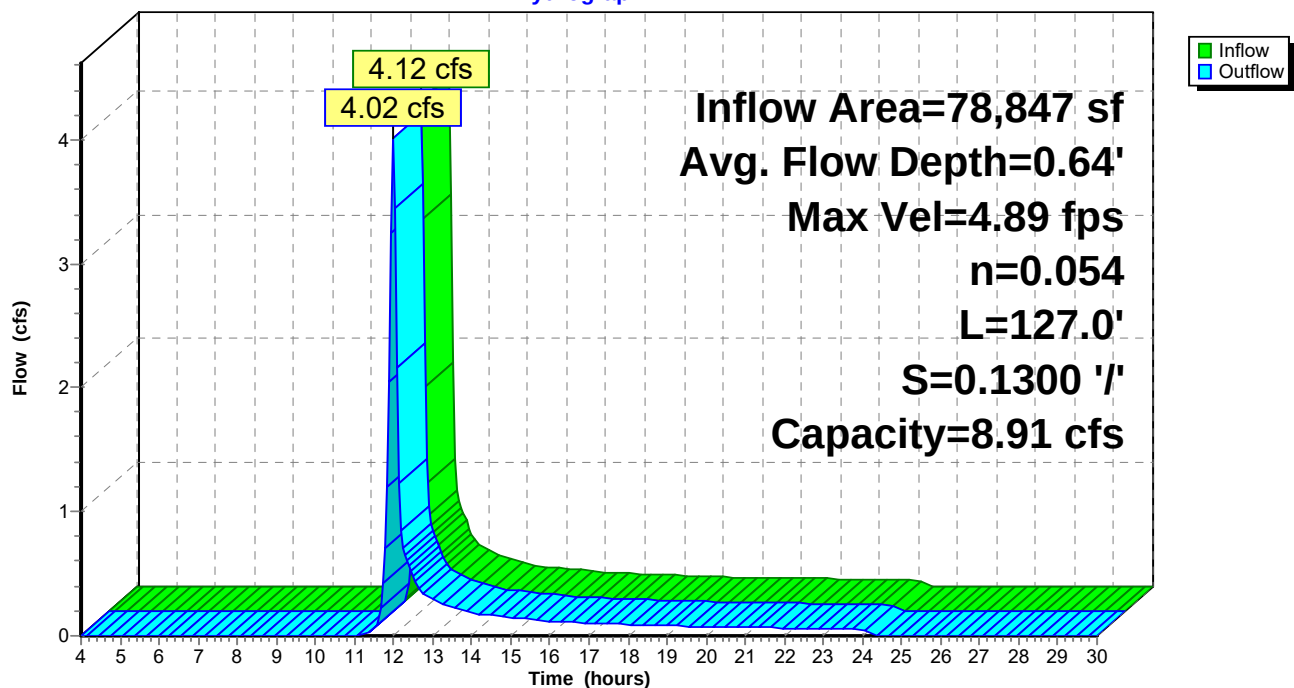
Side Slope Z-value= 0.5 '/' Top Width= 2.00'

Length= 127.0' Slope= 0.1300 '/'

Inlet Invert= 0.00', Outlet Invert= -16.51'

**Reach 7R: Channel 6**

Hydrograph



## MLV 505LD86\_Channels 5-10 REV 2

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### Summary for Reach 10R: Channel 7

[65] Warning: Inlet elevation not specified

Inflow Area = 5,181 sf, 57.98% Impervious, Inflow Depth = 2.67" for 10-yr event  
Inflow = 0.57 cfs @ 11.96 hrs, Volume= 1,152 cf  
Outflow = 0.52 cfs @ 12.04 hrs, Volume= 1,152 cf, Atten= 8%, Lag= 4.7 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.34 fps, Min. Travel Time= 2.8 min

Avg. Velocity= 0.57 fps, Avg. Travel Time= 11.5 min

Peak Storage= 89 cf @ 11.99 hrs

Average Depth at Peak Storage= 0.20'

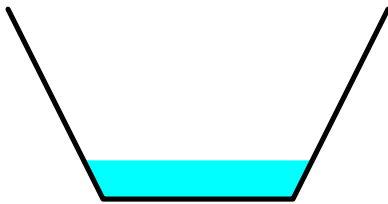
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 7.32 cfs

1.00' x 1.00' deep channel, n= 0.055

Side Slope Z-value= 0.5 '/' Top Width= 2.00'

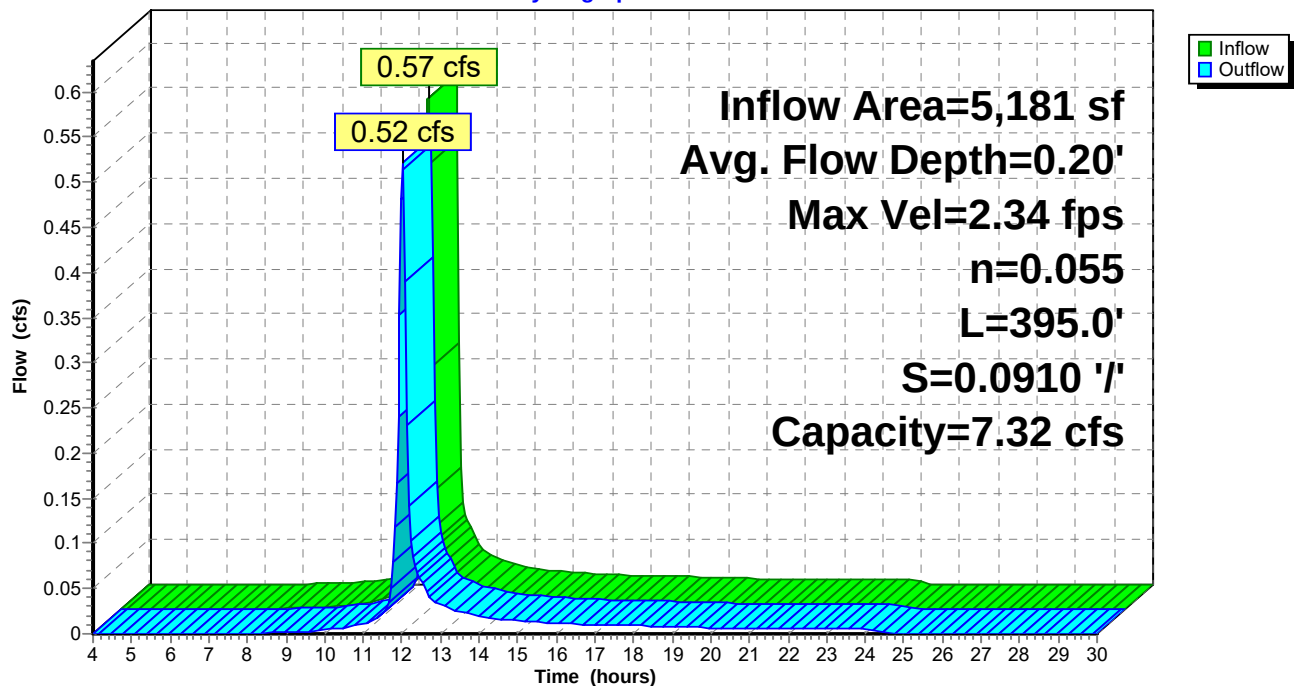
Length= 395.0' Slope= 0.0910 '/'

Inlet Invert= 0.00', Outlet Invert= -35.95'



### Reach 10R: Channel 7

Hydrograph



## MLV 505LD86\_Channels 5-10 REV 2

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Type II 24-hr 10-yr Rainfall=4.74"

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### Summary for Reach 11R: Channel 8

[65] Warning: Inlet elevation not specified

Inflow Area = 86,364 sf, 10.88% Impervious, Inflow Depth = 1.41" for 10-yr event  
Inflow = 4.50 cfs @ 12.01 hrs, Volume= 10,157 cf  
Outflow = 4.40 cfs @ 12.02 hrs, Volume= 10,157 cf, Atten= 2%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.37 fps, Min. Travel Time= 0.3 min

Avg. Velocity= 1.18 fps, Avg. Travel Time= 1.2 min

Peak Storage= 90 cf @ 12.01 hrs

Average Depth at Peak Storage= 0.75'

Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 4.52 cfs

1.00' x 0.75' deep channel, n= 0.045

Side Slope Z-value= 0.5 ' / ' Top Width= 1.75'

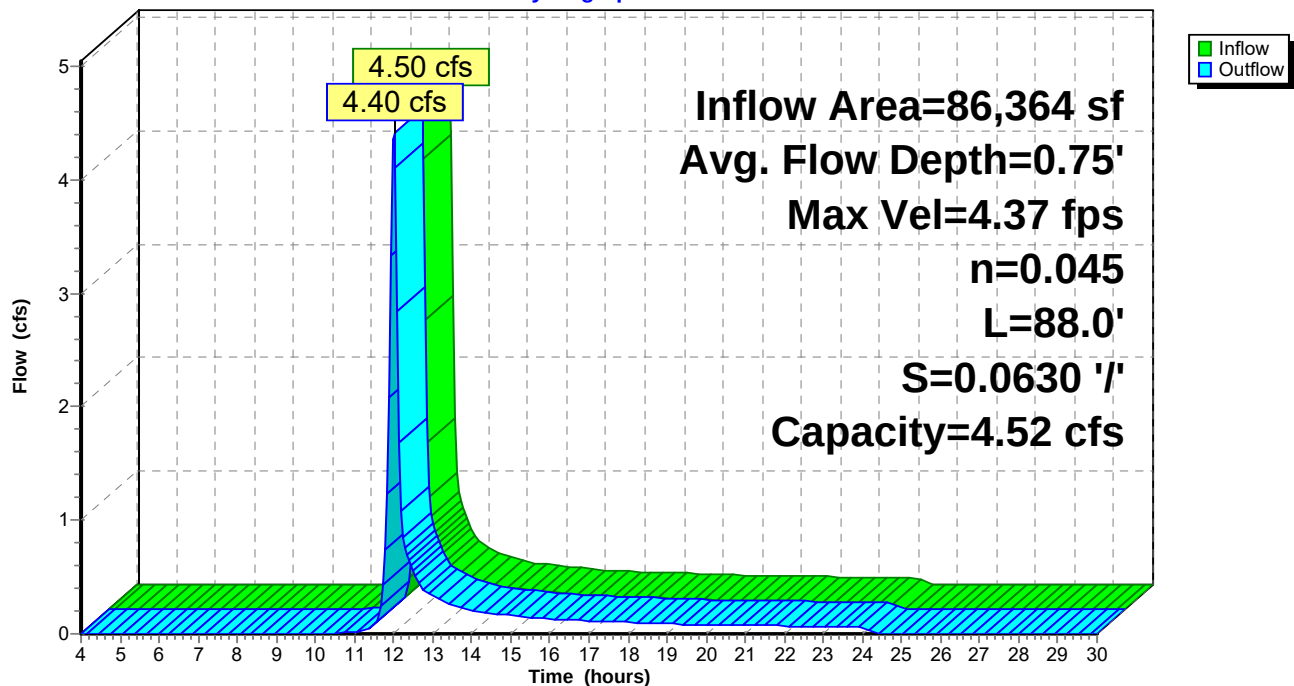
Length= 88.0' Slope= 0.0630 ' / '

Inlet Invert= 0.00', Outlet Invert= -5.54'



### Reach 11R: Channel 8

Hydrograph



**MLV 505LD86\_Channels 5-10 REV 2***Type II 24-hr 25-yr Rainfall=5.85"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                               |                                                                                                                                                |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment5S: CC-5</b>   | Runoff Area=63,362 sf 7.29% Impervious Runoff Depth=2.24"<br>Tc=5.0 min CN=65 Runoff=5.87 cfs 11,843 cf                                        |
| <b>Subcatchment6S: CC-6</b>   | Runoff Area=15,485 sf 11.48% Impervious Runoff Depth=1.51"<br>Tc=5.0 min CN=56 Runoff=0.93 cfs 1,947 cf                                        |
| <b>Subcatchment7S: CC-7</b>   | Runoff Area=5,181 sf 57.98% Impervious Runoff Depth=3.65"<br>Tc=5.0 min CN=80 Runoff=0.77 cfs 1,574 cf                                         |
| <b>Subcatchment8S: CC-8</b>   | Runoff Area=2,336 sf 0.00% Impervious Runoff Depth=0.06"<br>Tc=5.0 min CN=30 Runoff=0.00 cfs 11 cf                                             |
| <b>Subcatchment9S: CC-9</b>   | Runoff Area=2,509 sf 56.44% Impervious Runoff Depth=3.06"<br>Tc=5.0 min CN=74 Runoff=0.32 cfs 640 cf                                           |
| <b>Subcatchment10S: CC-10</b> | Runoff Area=2,865 sf 47.23% Impervious Runoff Depth=3.25"<br>Tc=5.0 min CN=76 Runoff=0.38 cfs 776 cf                                           |
| <b>Reach 6R: Channel 5</b>    | Avg. Flow Depth=0.87' Max Vel=4.63 fps Inflow=5.87 cfs 11,843 cf<br>n=0.050 L=257.0' S=0.0780 '/' Capacity=7.46 cfs Outflow=5.57 cfs 11,843 cf |
| <b>Reach 7R: Channel 6</b>    | Avg. Flow Depth=0.83' Max Vel=5.48 fps Inflow=6.47 cfs 13,789 cf<br>n=0.054 L=127.0' S=0.1300 '/' Capacity=8.91 cfs Outflow=6.34 cfs 13,789 cf |
| <b>Reach 10R: Channel 7</b>   | Avg. Flow Depth=0.25' Max Vel=2.57 fps Inflow=0.77 cfs 1,574 cf<br>n=0.055 L=395.0' S=0.0910 '/' Capacity=7.32 cfs Outflow=0.70 cfs 1,574 cf   |
| <b>Reach 11R: Channel 8</b>   | Avg. Flow Depth=0.99' Max Vel=4.81 fps Inflow=7.01 cfs 15,375 cf<br>n=0.045 L=88.0' S=0.0630 '/' Capacity=4.52 cfs Outflow=6.87 cfs 15,375 cf  |

**Total Runoff Area = 91,738 sf Runoff Volume = 16,790 cf Average Runoff Depth = 2.20"**  
**86.74% Pervious = 79,572 sf 13.26% Impervious = 12,166 sf**

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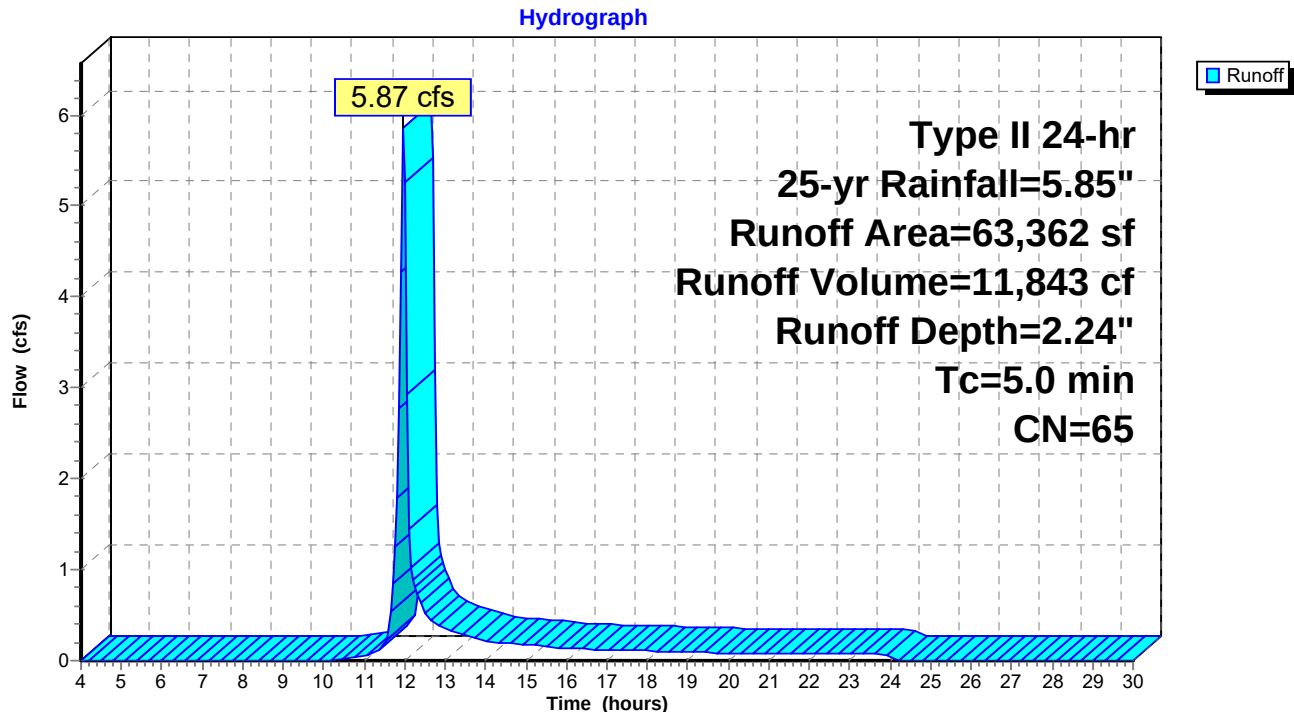
**Summary for Subcatchment 5S: CC-5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 5.87 cfs @ 11.96 hrs, Volume= 11,843 cf, Depth= 2.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 18,807    | 30 | Meadow, non-grazed, HSG A |
| 39,939    | 78 | Meadow, non-grazed, HSG D |
| 2,138     | 98 | Paved parking, HSG A      |
| 2,478     | 98 | Paved parking, HSG D      |
| 63,362    | 65 | Weighted Average          |
| 58,746    |    | 92.71% Pervious Area      |
| 4,616     |    | 7.29% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 5S: CC-5**

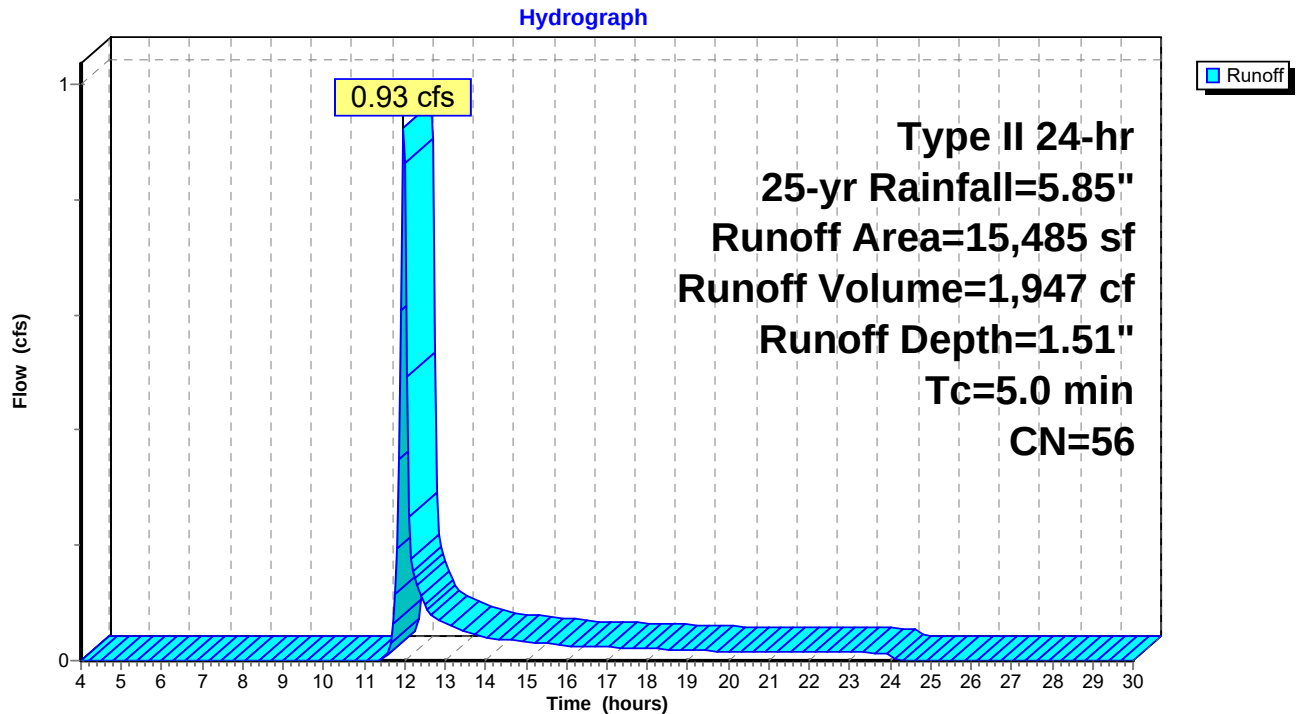
**Summary for Subcatchment 6S: CC-6**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.93 cfs @ 11.97 hrs, Volume= 1,947 cf, Depth= 1.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 7,682     | 30 | Meadow, non-grazed, HSG A |
| 6,026     | 78 | Meadow, non-grazed, HSG D |
| 1,255     | 98 | Paved parking, HSG A      |
| 522       | 98 | Paved parking, HSG D      |
| 15,485    | 56 | Weighted Average          |
| 13,708    |    | 88.52% Pervious Area      |
| 1,777     |    | 11.48% Impervious Area    |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 6S: CC-6**



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**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.77 cfs @ 11.96 hrs, Volume= 1,574 cf, Depth= 3.65"

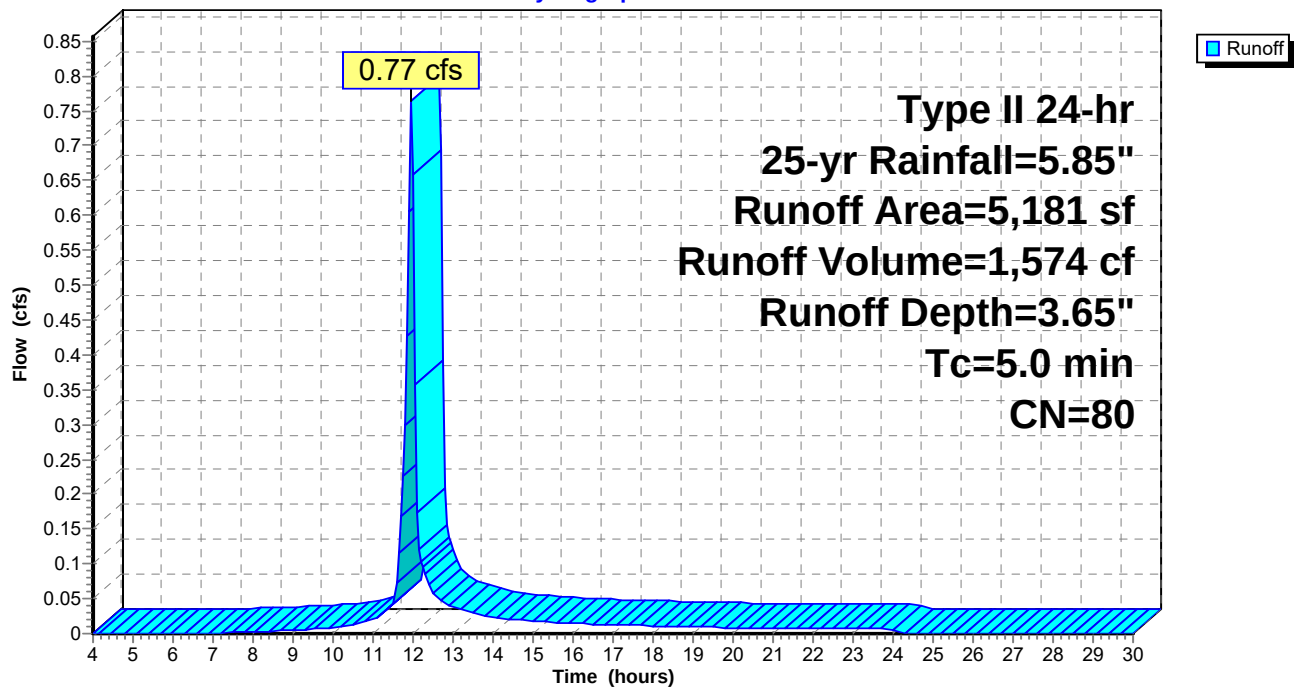
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,049     | 30 | Meadow, non-grazed, HSG A |
| 1,128     | 78 | Meadow, non-grazed, HSG D |
| 2,071     | 98 | Paved parking, HSG A      |
| 933       | 98 | Paved parking, HSG D      |
| 5,181     | 80 | Weighted Average          |
| 2,177     |    | 42.02% Pervious Area      |
| 3,004     |    | 57.98% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

Hydrograph



### Summary for Subcatchment 8S: CC-8

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

Runoff = 0.00 cfs @ 18.07 hrs, Volume= 11 cf, Depth= 0.06"

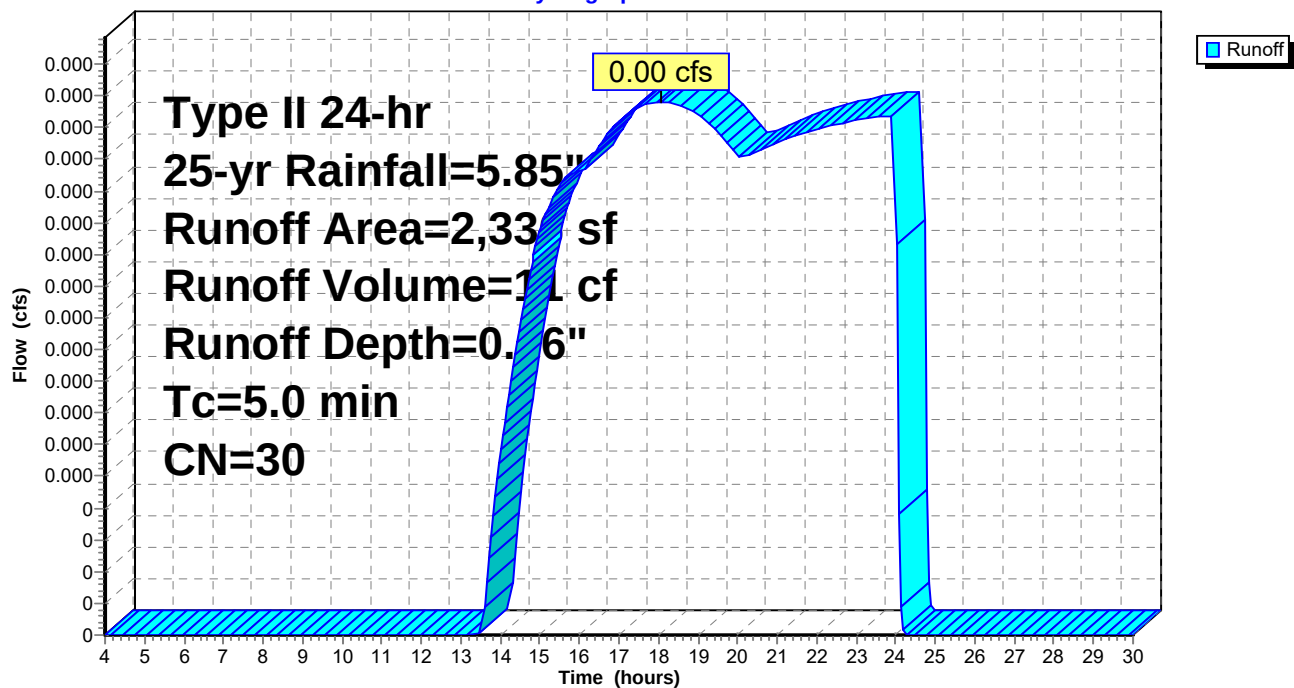
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,336     | 30 | Meadow, non-grazed, HSG A |
| 2,336     |    | 100.00% Pervious Area     |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|-------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0         |                  |                  |                      |                   | Direct Entry, Assumed |

## Subcatchment 8S: CC-8

## Hydrograph



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Type II 24-hr 25-yr Rainfall=5.85"

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**Summary for Subcatchment 9S: CC-9**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.32 cfs @ 11.96 hrs, Volume= 640 cf, Depth= 3.06"

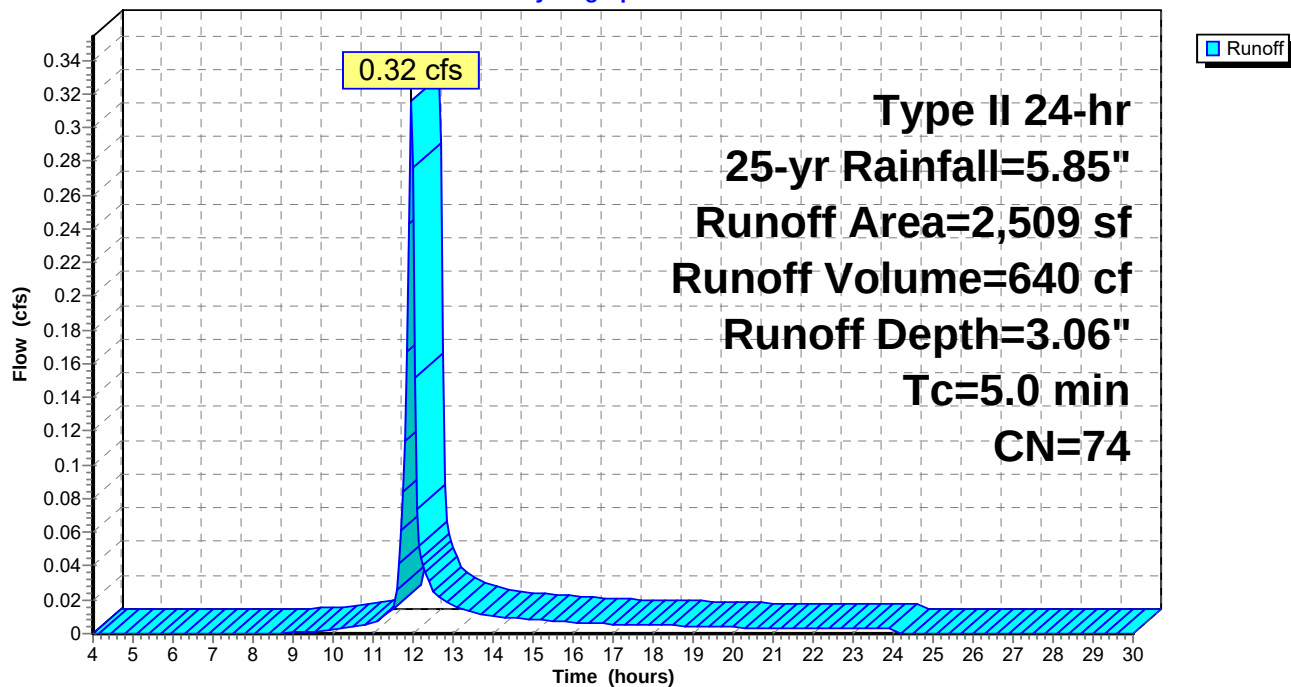
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 815       | 30 | Meadow, non-grazed, HSG A |
| 278       | 78 | Meadow, non-grazed, HSG D |
| 633       | 98 | Paved parking, HSG A      |
| 783       | 98 | Water Surface, HSG D      |
| 2,509     | 74 | Weighted Average          |
| 1,093     |    | 43.56% Pervious Area      |
| 1,416     |    | 56.44% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 9S: CC-9**

Hydrograph



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Type II 24-hr 25-yr Rainfall=5.85"

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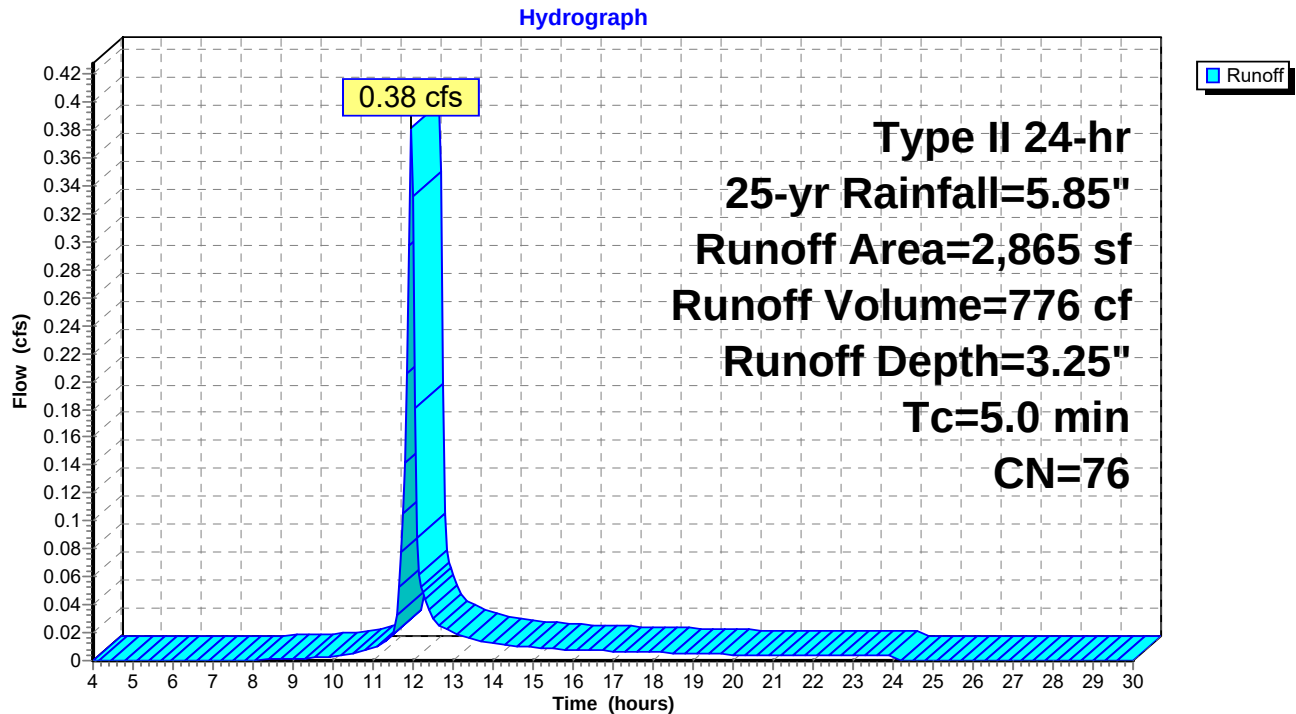
**Summary for Subcatchment 10S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.38 cfs @ 11.96 hrs, Volume= 776 cf, Depth= 3.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 667       | 30 | Meadow, non-grazed, HSG A |
| 845       | 78 | Meadow, non-grazed, HSG D |
| 675       | 98 | Paved parking, HSG A      |
| 678       | 98 | Paved parking, HSG D      |
| 2,865     | 76 | Weighted Average          |
| 1,512     |    | 52.77% Pervious Area      |
| 1,353     |    | 47.23% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 10S: CC-10**

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Type II 24-hr 25-yr Rainfall=5.85"

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### Summary for Reach 6R: Channel 5

[65] Warning: Inlet elevation not specified

Inflow Area = 63,362 sf, 7.29% Impervious, Inflow Depth = 2.24" for 25-yr event  
Inflow = 5.87 cfs @ 11.96 hrs, Volume= 11,843 cf  
Outflow = 5.57 cfs @ 11.99 hrs, Volume= 11,843 cf, Atten= 5%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.63 fps, Min. Travel Time= 0.9 min

Avg. Velocity= 1.42 fps, Avg. Travel Time= 3.0 min

Peak Storage= 318 cf @ 11.98 hrs

Average Depth at Peak Storage= 0.87'

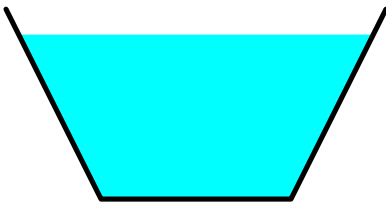
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 7.46 cfs

1.00' x 1.00' deep channel, n= 0.050

Side Slope Z-value= 0.5 '/' Top Width= 2.00'

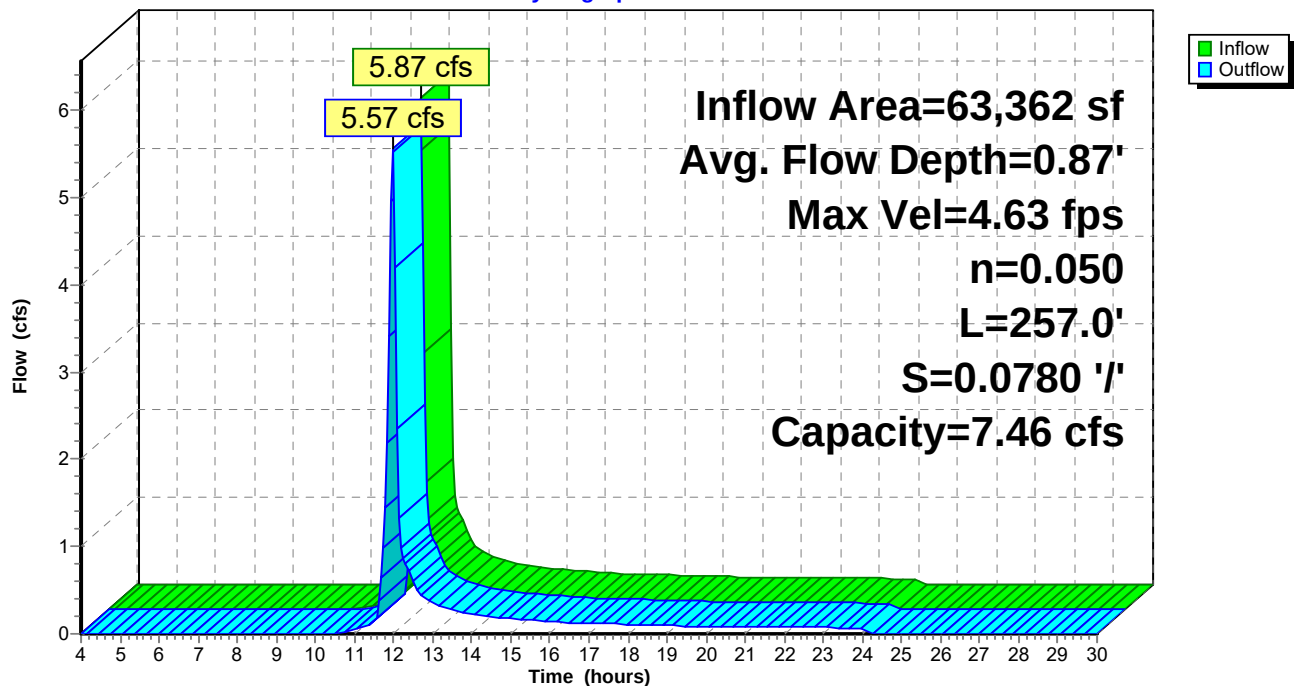
Length= 257.0' Slope= 0.0780 '/'

Inlet Invert= 0.00', Outlet Invert= -20.05'



### Reach 6R: Channel 5

Hydrograph



## MLV 505LD86\_Channels 5-10 REV 2

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Type II 24-hr 25-yr Rainfall=5.85"

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### Summary for Reach 7R: Channel 6

[65] Warning: Inlet elevation not specified

Inflow Area = 78,847 sf, 8.11% Impervious, Inflow Depth = 2.10" for 25-yr event  
Inflow = 6.47 cfs @ 11.99 hrs, Volume= 13,789 cf  
Outflow = 6.34 cfs @ 12.00 hrs, Volume= 13,789 cf, Atten= 2%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.48 fps, Min. Travel Time= 0.4 min

Avg. Velocity= 1.68 fps, Avg. Travel Time= 1.3 min

Peak Storage= 149 cf @ 11.99 hrs

Average Depth at Peak Storage= 0.83'

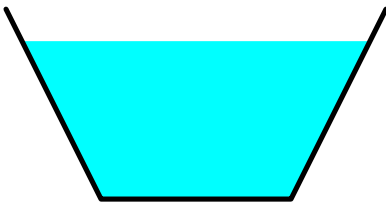
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 8.91 cfs

1.00' x 1.00' deep channel, n= 0.054

Side Slope Z-value= 0.5 '/' Top Width= 2.00'

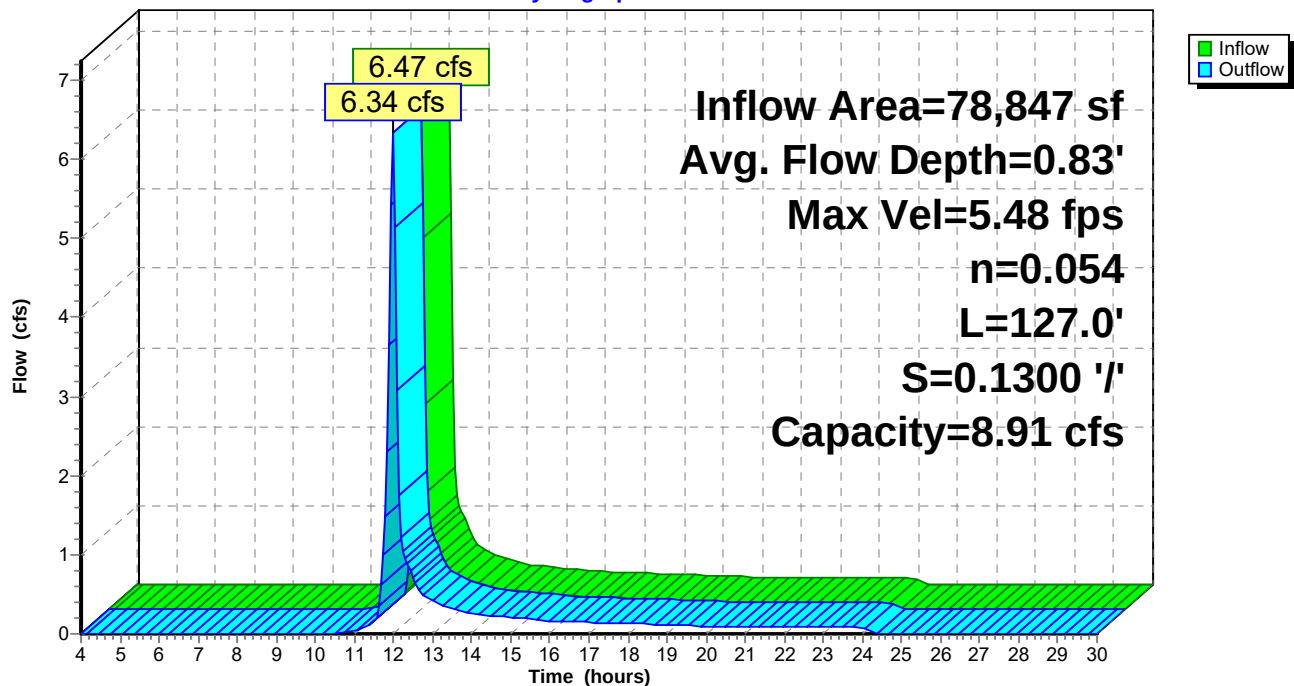
Length= 127.0' Slope= 0.1300 '/'

Inlet Invert= 0.00', Outlet Invert= -16.51'



### Reach 7R: Channel 6

Hydrograph



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Type II 24-hr 25-yr Rainfall=5.85"

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### Summary for Reach 10R: Channel 7

[65] Warning: Inlet elevation not specified

Inflow Area = 5,181 sf, 57.98% Impervious, Inflow Depth = 3.65" for 25-yr event  
Inflow = 0.77 cfs @ 11.96 hrs, Volume= 1,574 cf  
Outflow = 0.70 cfs @ 12.03 hrs, Volume= 1,574 cf, Atten= 8%, Lag= 4.4 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.57 fps, Min. Travel Time= 2.6 min

Avg. Velocity= 0.62 fps, Avg. Travel Time= 10.6 min

Peak Storage= 110 cf @ 11.98 hrs

Average Depth at Peak Storage= 0.25'

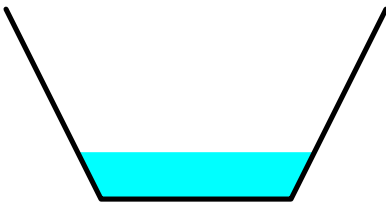
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 7.32 cfs

1.00' x 1.00' deep channel, n= 0.055

Side Slope Z-value= 0.5 '/' Top Width= 2.00'

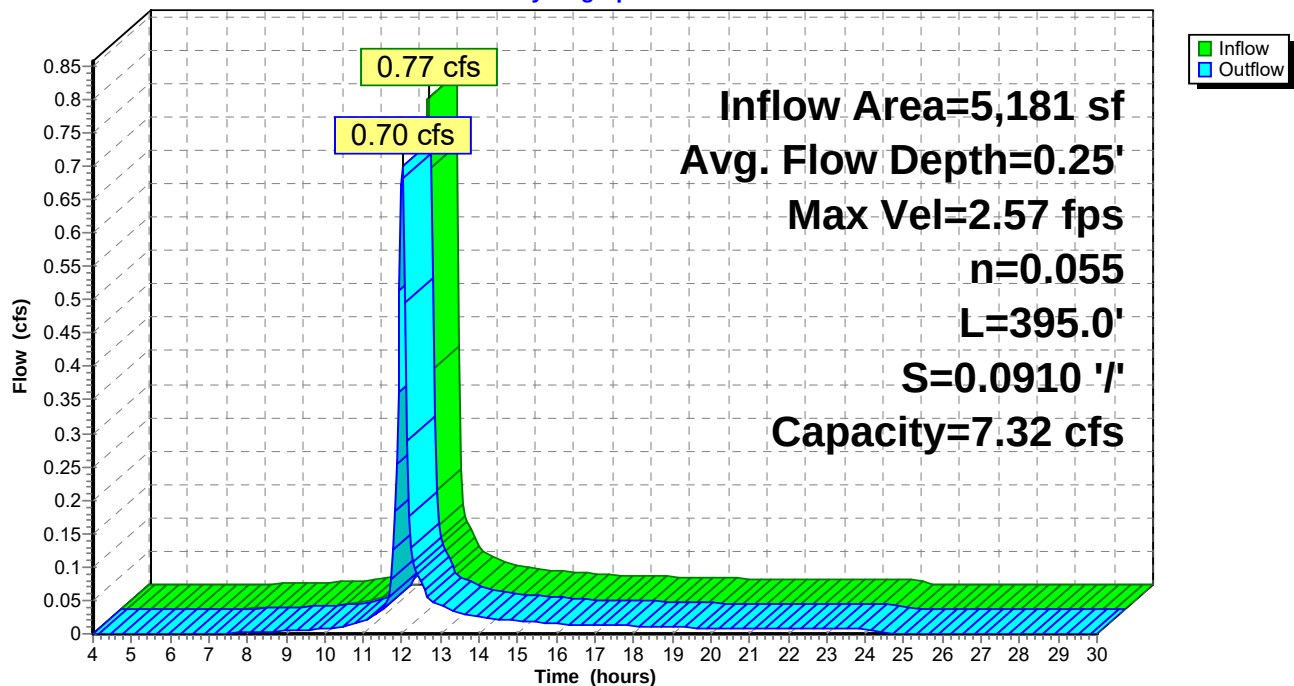
Length= 395.0' Slope= 0.0910 '/'

Inlet Invert= 0.00', Outlet Invert= -35.95'



### Reach 10R: Channel 7

Hydrograph



**Summary for Reach 11R: Channel 8**

[65] Warning: Inlet elevation not specified

[91] Warning: Storage range exceeded by 0.24'

[55] Hint: Peak inflow is 155% of Manning's capacity

Inflow Area = 86,364 sf, 10.88% Impervious, Inflow Depth = 2.14" for 25-yr event  
Inflow = 7.01 cfs @ 12.00 hrs, Volume= 15,375 cf  
Outflow = 6.87 cfs @ 12.01 hrs, Volume= 15,375 cf, Atten= 2%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.81 fps, Min. Travel Time= 0.3 min

Avg. Velocity= 1.30 fps, Avg. Travel Time= 1.1 min

Peak Storage= 128 cf @ 12.00 hrs

Average Depth at Peak Storage= 0.99'

Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 4.52 cfs

1.00' x 0.75' deep channel, n= 0.045

Side Slope Z-value= 0.5 '/' Top Width= 1.75'

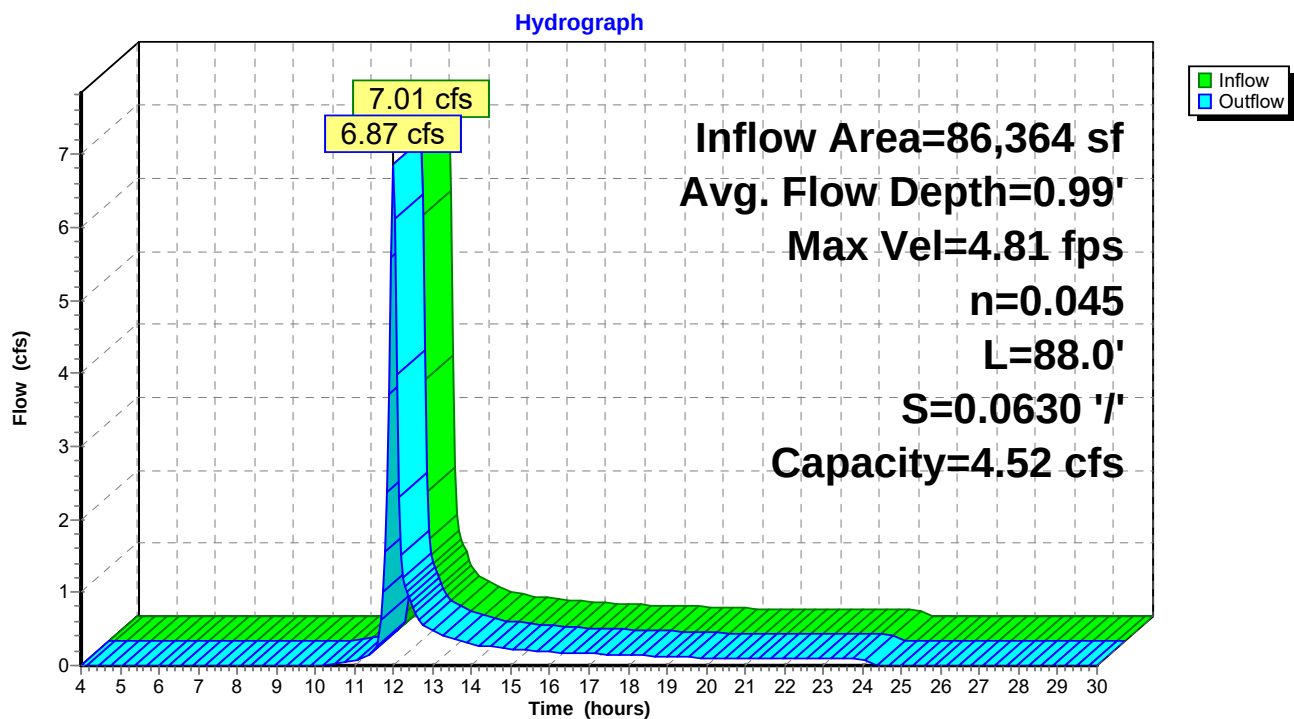
Length= 88.0' Slope= 0.0630 '/'

Inlet Invert= 0.00', Outlet Invert= -5.54'





## Reach 11R: Channel 8



**MLV 505LD86\_Channels 5-10 REV 2***Type II 24-hr 50-yr Rainfall=6.87"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                               |                                                                                                                                               |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment5S: CC-5</b>   | Runoff Area=63,362 sf 7.29% Impervious Runoff Depth=3.00"<br>Tc=5.0 min CN=65 Runoff=7.87 cfs 15,853 cf                                       |
| <b>Subcatchment6S: CC-6</b>   | Runoff Area=15,485 sf 11.48% Impervious Runoff Depth=2.13"<br>Tc=5.0 min CN=56 Runoff=1.34 cfs 2,754 cf                                       |
| <b>Subcatchment7S: CC-7</b>   | Runoff Area=5,181 sf 57.98% Impervious Runoff Depth=4.57"<br>Tc=5.0 min CN=80 Runoff=0.95 cfs 1,975 cf                                        |
| <b>Subcatchment8S: CC-8</b>   | Runoff Area=2,336 sf 0.00% Impervious Runoff Depth=0.19"<br>Tc=5.0 min CN=30 Runoff=0.00 cfs 37 cf                                            |
| <b>Subcatchment9S: CC-9</b>   | Runoff Area=2,509 sf 56.44% Impervious Runoff Depth=3.93"<br>Tc=5.0 min CN=74 Runoff=0.40 cfs 821 cf                                          |
| <b>Subcatchment10S: CC-10</b> | Runoff Area=2,865 sf 47.23% Impervious Runoff Depth=4.14"<br>Tc=5.0 min CN=76 Runoff=0.48 cfs 989 cf                                          |
| <b>Reach 6R: Channel 5</b>    | Avg. Flow Depth=1.02' Max Vel=4.96 fps Inflow=7.87 cfs 15,853 cf<br>n=0.050 L=257.0' S=0.0780 '/ Capacity=7.46 cfs Outflow=7.49 cfs 15,853 cf |
| <b>Reach 7R: Channel 6</b>    | Avg. Flow Depth=0.99' Max Vel=5.91 fps Inflow=8.80 cfs 18,607 cf<br>n=0.054 L=127.0' S=0.1300 '/ Capacity=8.91 cfs Outflow=8.65 cfs 18,607 cf |
| <b>Reach 10R: Channel 7</b>   | Avg. Flow Depth=0.28' Max Vel=2.75 fps Inflow=0.95 cfs 1,975 cf<br>n=0.055 L=395.0' S=0.0910 '/ Capacity=7.32 cfs Outflow=0.86 cfs 1,975 cf   |
| <b>Reach 11R: Channel 8</b>   | Avg. Flow Depth=1.23' Max Vel=5.05 fps Inflow=9.48 cfs 20,619 cf<br>n=0.045 L=88.0' S=0.0630 '/ Capacity=4.52 cfs Outflow=9.32 cfs 20,619 cf  |

**Total Runoff Area = 91,738 sf Runoff Volume = 22,429 cf Average Runoff Depth = 2.93"**  
**86.74% Pervious = 79,572 sf 13.26% Impervious = 12,166 sf**

**MLV 505LD86\_Channels 5-10 REV 2**

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Type II 24-hr 50-yr Rainfall=6.87"

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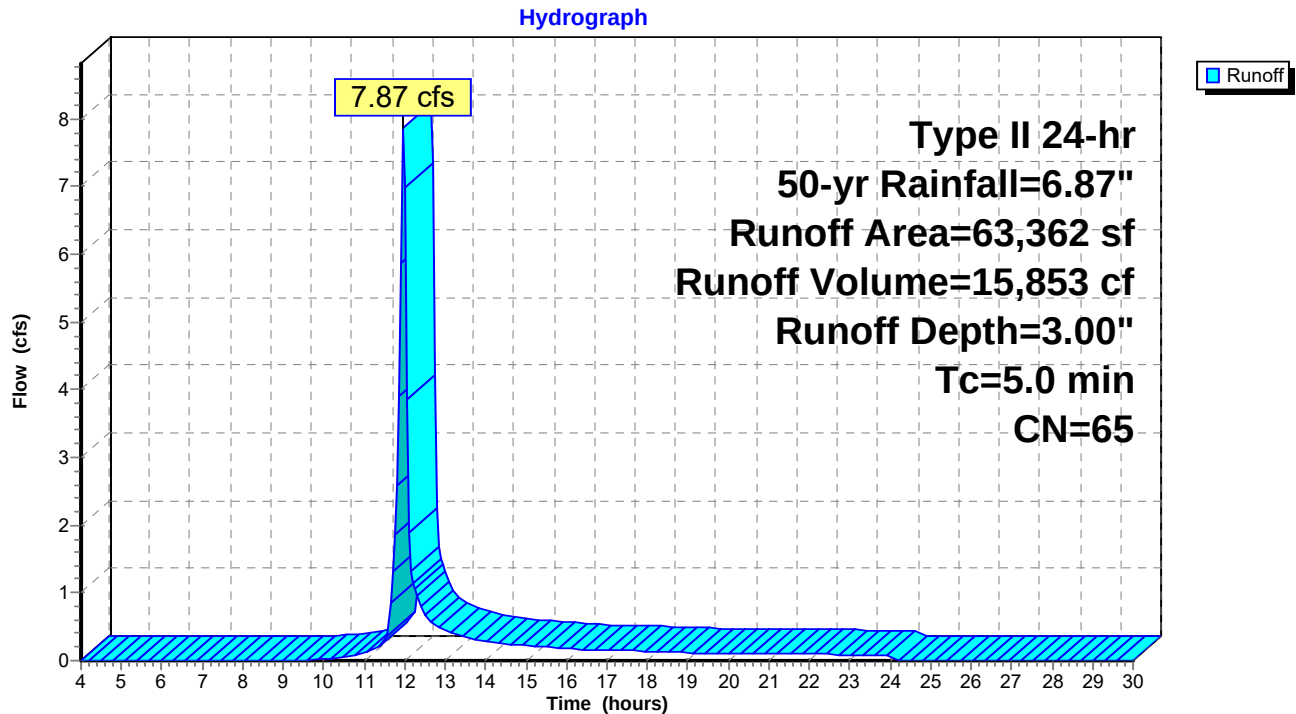
**Summary for Subcatchment 5S: CC-5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 7.87 cfs @ 11.96 hrs, Volume= 15,853 cf, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 18,807    | 30 | Meadow, non-grazed, HSG A |
| 39,939    | 78 | Meadow, non-grazed, HSG D |
| 2,138     | 98 | Paved parking, HSG A      |
| 2,478     | 98 | Paved parking, HSG D      |
| 63,362    | 65 | Weighted Average          |
| 58,746    |    | 92.71% Pervious Area      |
| 4,616     |    | 7.29% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 5S: CC-5**

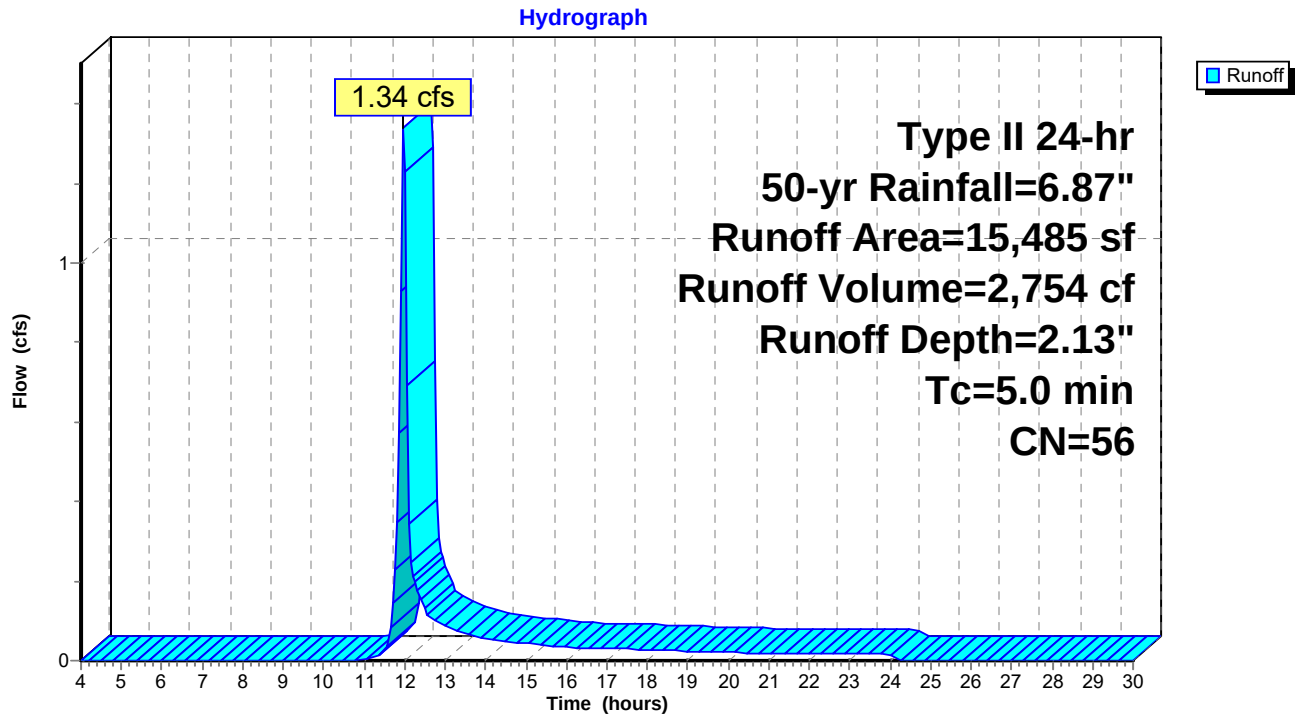
**Summary for Subcatchment 6S: CC-6**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.34 cfs @ 11.97 hrs, Volume= 2,754 cf, Depth= 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 7,682     | 30 | Meadow, non-grazed, HSG A |
| 6,026     | 78 | Meadow, non-grazed, HSG D |
| 1,255     | 98 | Paved parking, HSG A      |
| 522       | 98 | Paved parking, HSG D      |
| 15,485    | 56 | Weighted Average          |
| 13,708    |    | 88.52% Pervious Area      |
| 1,777     |    | 11.48% Impervious Area    |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 6S: CC-6**

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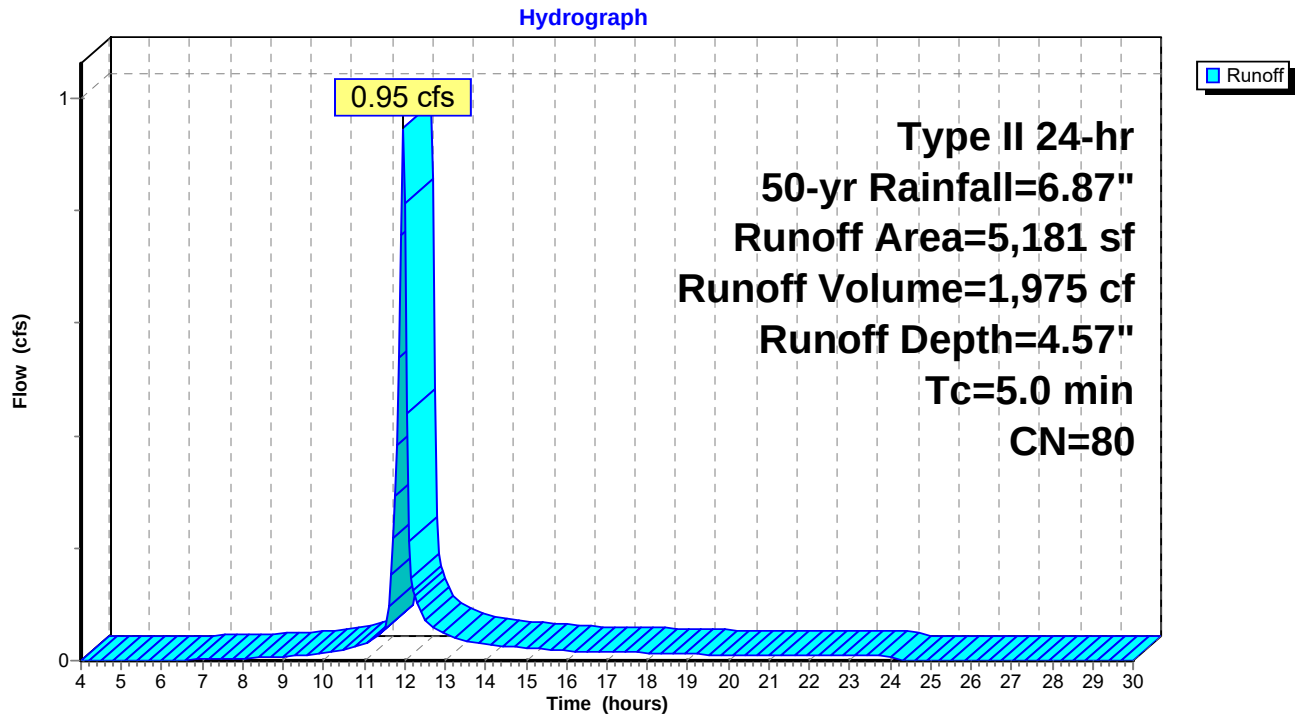
**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.95 cfs @ 11.95 hrs, Volume= 1,975 cf, Depth= 4.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,049     | 30 | Meadow, non-grazed, HSG A |
| 1,128     | 78 | Meadow, non-grazed, HSG D |
| 2,071     | 98 | Paved parking, HSG A      |
| 933       | 98 | Paved parking, HSG D      |
| 5,181     | 80 | Weighted Average          |
| 2,177     |    | 42.02% Pervious Area      |
| 3,004     |    | 57.98% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

## Summary for Subcatchment 8S: CC-8

[49] Hint:  $T_c < 2dt$  may require smaller  $dt$

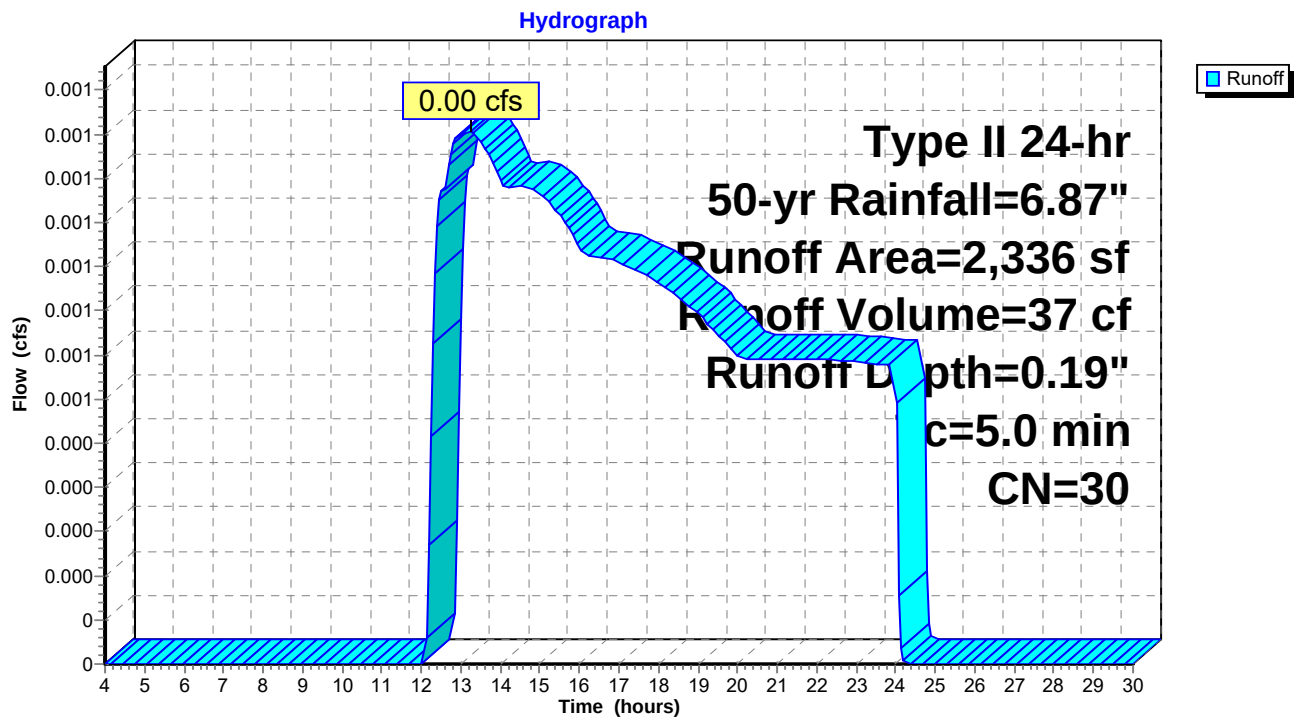
Runoff = 0.00 cfs @ 13.28 hrs, Volume= 37 cf, Depth= 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,336     | 30 | Meadow, non-grazed, HSG A |
| 2,336     |    | 100.00% Pervious Area     |

| Tc<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|-------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0         |                  |                  |                      |                   | Direct Entry, Assumed |

### Subcatchment 8S: CC-8



**Summary for Subcatchment 9S: CC-9**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.40 cfs @ 11.96 hrs, Volume= 821 cf, Depth= 3.93"

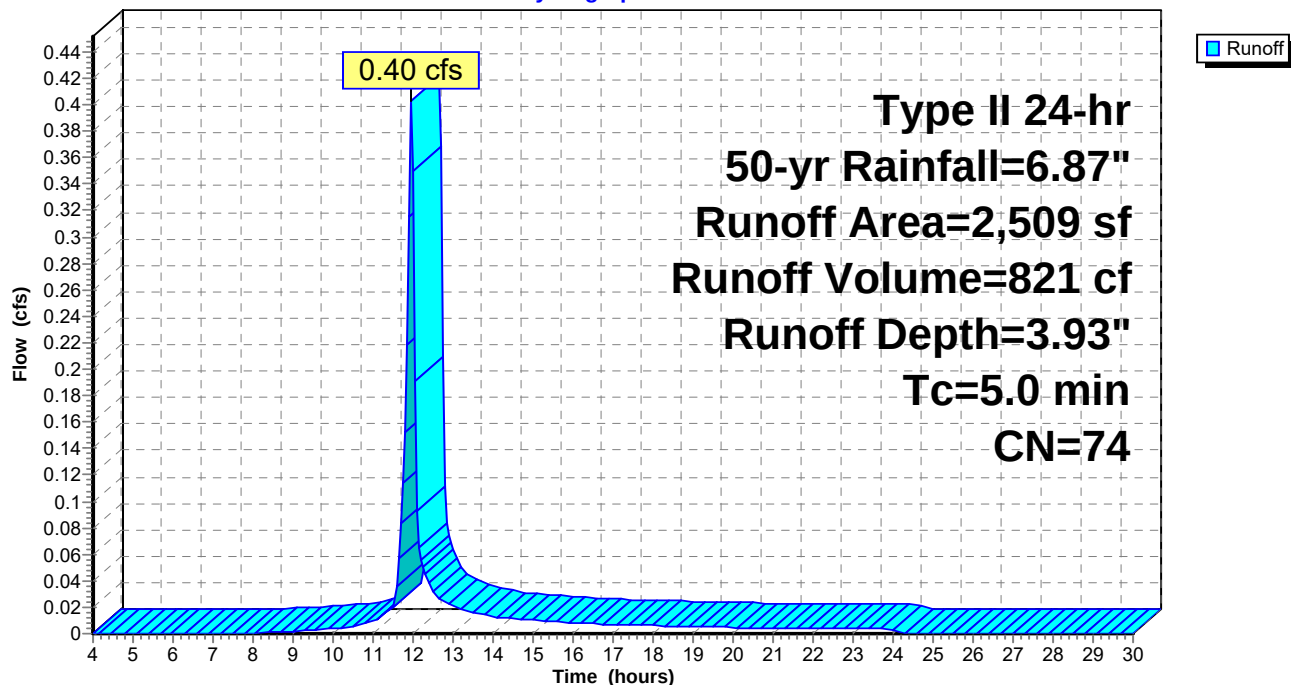
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 815       | 30 | Meadow, non-grazed, HSG A |
| 278       | 78 | Meadow, non-grazed, HSG D |
| 633       | 98 | Paved parking, HSG A      |
| 783       | 98 | Water Surface, HSG D      |
| 2,509     | 74 | Weighted Average          |
| 1,093     |    | 43.56% Pervious Area      |
| 1,416     |    | 56.44% Impervious Area    |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 9S: CC-9**

Hydrograph



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Type II 24-hr 50-yr Rainfall=6.87"

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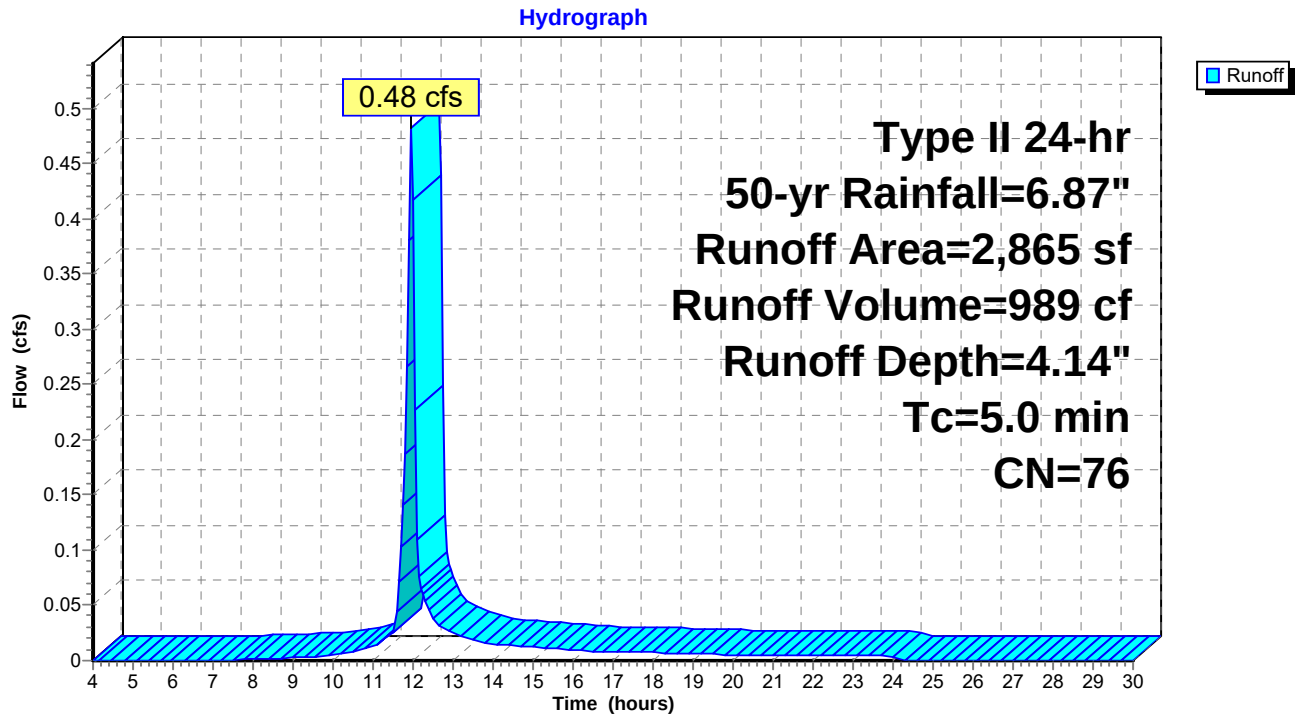
**Summary for Subcatchment 10S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.48 cfs @ 11.96 hrs, Volume= 989 cf, Depth= 4.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 667       | 30 | Meadow, non-grazed, HSG A |
| 845       | 78 | Meadow, non-grazed, HSG D |
| 675       | 98 | Paved parking, HSG A      |
| 678       | 98 | Paved parking, HSG D      |
| 2,865     | 76 | Weighted Average          |
| 1,512     |    | 52.77% Pervious Area      |
| 1,353     |    | 47.23% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 10S: CC-10**



**Summary for Reach 6R: Channel 5**

[65] Warning: Inlet elevation not specified

[91] Warning: Storage range exceeded by 0.02'

[55] Hint: Peak inflow is 106% of Manning's capacity

Inflow Area = 63,362 sf, 7.29% Impervious, Inflow Depth = 3.00" for 50-yr event  
Inflow = 7.87 cfs @ 11.96 hrs, Volume= 15,853 cf  
Outflow = 7.49 cfs @ 11.99 hrs, Volume= 15,853 cf, Atten= 5%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.96 fps, Min. Travel Time= 0.9 min

Avg. Velocity= 1.52 fps, Avg. Travel Time= 2.8 min

Peak Storage= 394 cf @ 11.97 hrs

Average Depth at Peak Storage= 1.02'

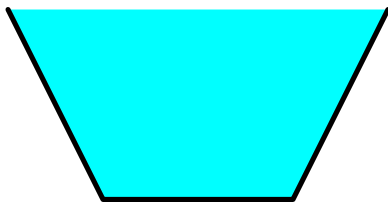
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 7.46 cfs

1.00' x 1.00' deep channel, n= 0.050

Side Slope Z-value= 0.5 '/' Top Width= 2.00'

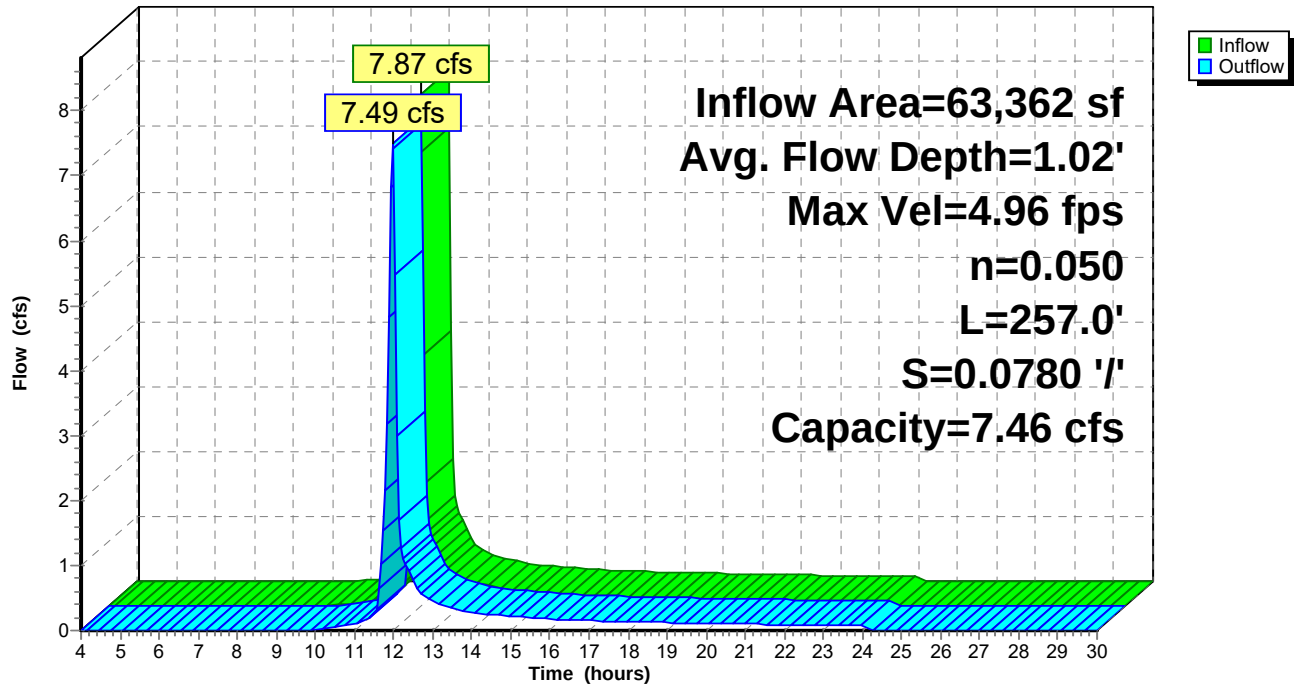
Length= 257.0' Slope= 0.0780 '/'

Inlet Invert= 0.00', Outlet Invert= -20.05'



## Reach 6R: Channel 5

Hydrograph



**Summary for Reach 7R: Channel 6**

[65] Warning: Inlet elevation not specified

Inflow Area = 78,847 sf, 8.11% Impervious, Inflow Depth = 2.83" for 50-yr event  
 Inflow = 8.80 cfs @ 11.98 hrs, Volume= 18,607 cf  
 Outflow = 8.65 cfs @ 11.99 hrs, Volume= 18,607 cf, Atten= 2%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.91 fps, Min. Travel Time= 0.4 min

Avg. Velocity= 1.81 fps, Avg. Travel Time= 1.2 min

Peak Storage= 189 cf @ 11.99 hrs

Average Depth at Peak Storage= 0.99'

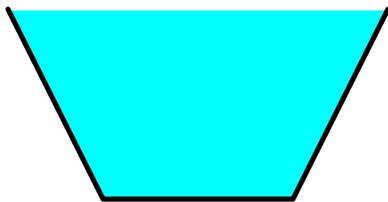
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 8.91 cfs

1.00' x 1.00' deep channel, n= 0.054

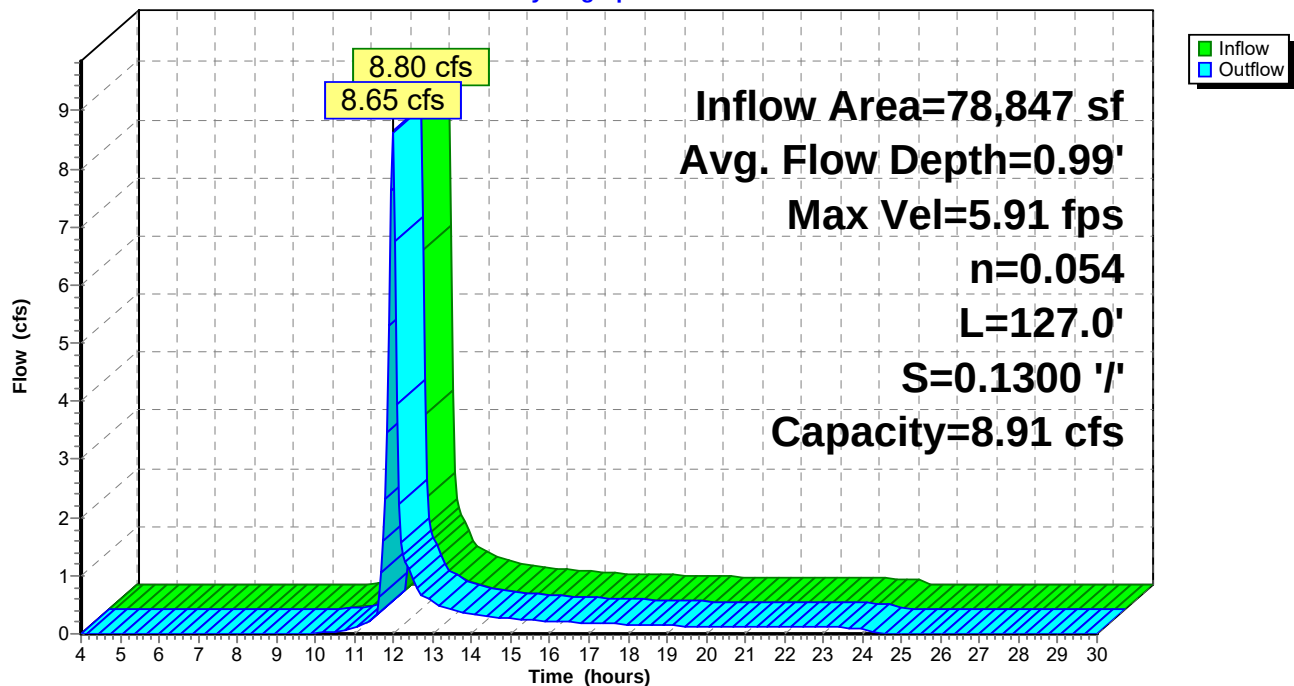
Side Slope Z-value= 0.5 '/' Top Width= 2.00'

Length= 127.0' Slope= 0.1300 '/'

Inlet Invert= 0.00', Outlet Invert= -16.51'

**Reach 7R: Channel 6**

Hydrograph



## MLV 505LD86\_Channels 5-10 REV 2

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Type II 24-hr 50-yr Rainfall=6.87"

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### Summary for Reach 10R: Channel 7

[65] Warning: Inlet elevation not specified

Inflow Area = 5,181 sf, 57.98% Impervious, Inflow Depth = 4.57" for 50-yr event  
Inflow = 0.95 cfs @ 11.95 hrs, Volume= 1,975 cf  
Outflow = 0.86 cfs @ 12.02 hrs, Volume= 1,975 cf, Atten= 9%, Lag= 4.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.75 fps, Min. Travel Time= 2.4 min

Avg. Velocity= 0.66 fps, Avg. Travel Time= 10.0 min

Peak Storage= 128 cf @ 11.98 hrs

Average Depth at Peak Storage= 0.28'

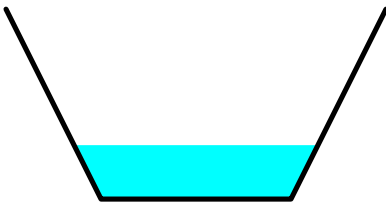
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 7.32 cfs

1.00' x 1.00' deep channel, n= 0.055

Side Slope Z-value= 0.5 '/' Top Width= 2.00'

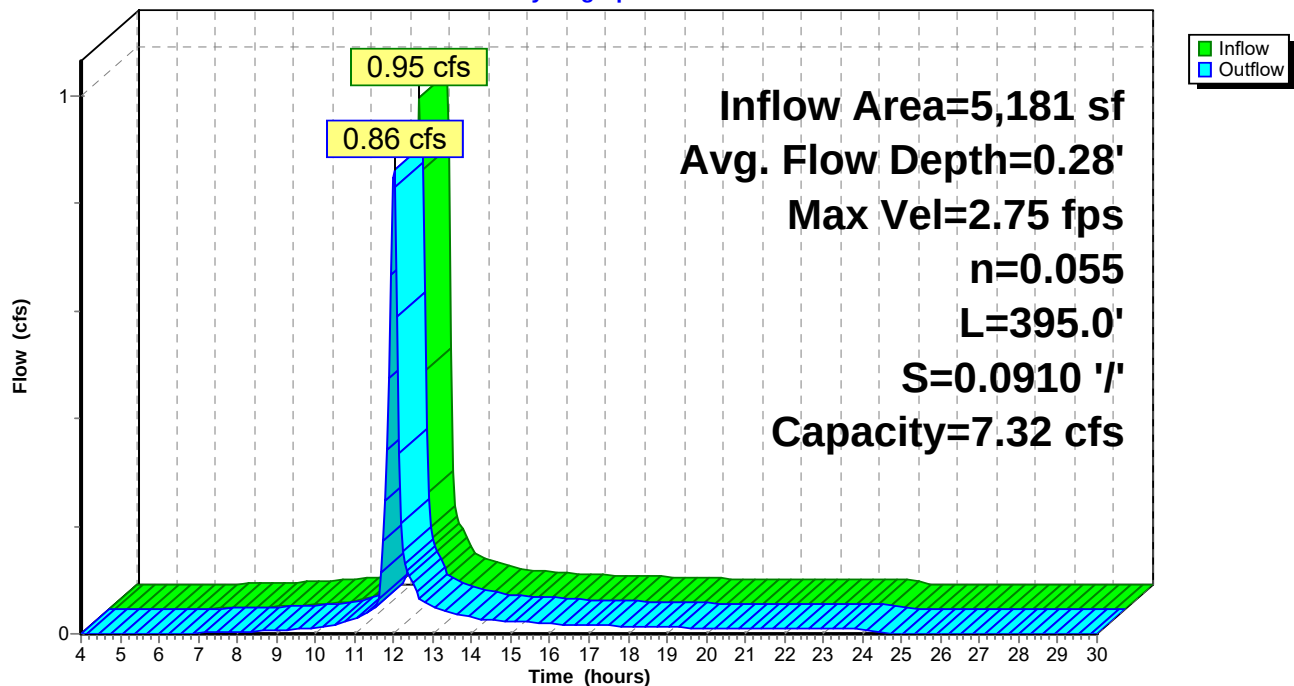
Length= 395.0' Slope= 0.0910 '/'

Inlet Invert= 0.00', Outlet Invert= -35.95'



### Reach 10R: Channel 7

Hydrograph



**Summary for Reach 11R: Channel 8**

[65] Warning: Inlet elevation not specified

[91] Warning: Storage range exceeded by 0.48'

[55] Hint: Peak inflow is 210% of Manning's capacity

Inflow Area = 86,364 sf, 10.88% Impervious, Inflow Depth = 2.86" for 50-yr event  
Inflow = 9.48 cfs @ 11.99 hrs, Volume= 20,619 cf  
Outflow = 9.32 cfs @ 12.00 hrs, Volume= 20,619 cf, Atten= 2%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.05 fps, Min. Travel Time= 0.3 min

Avg. Velocity= 1.40 fps, Avg. Travel Time= 1.1 min

Peak Storage= 165 cf @ 12.00 hrs

Average Depth at Peak Storage= 1.23'

Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 4.52 cfs

1.00' x 0.75' deep channel, n= 0.045

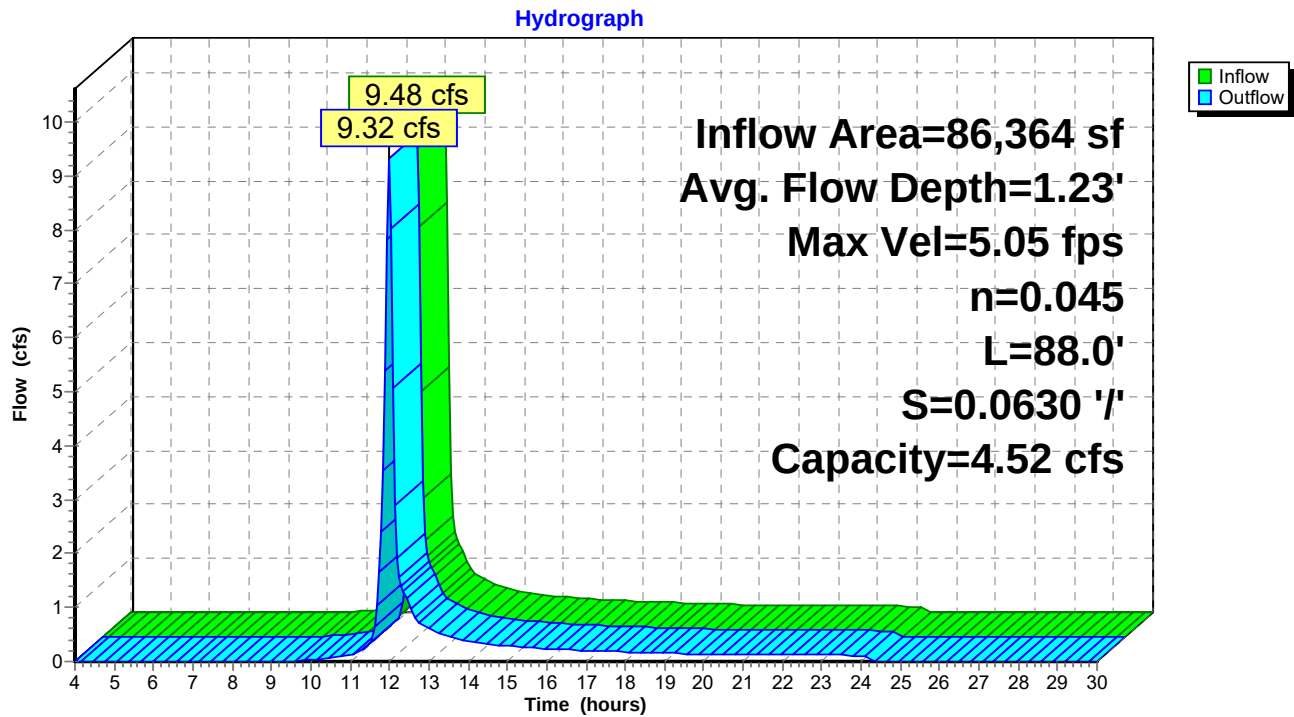
Side Slope Z-value= 0.5 '/' Top Width= 1.75'

Length= 88.0' Slope= 0.0630 '/'

Inlet Invert= 0.00', Outlet Invert= -5.54'



## Reach 11R: Channel 8



**MLV 505LD86\_Channels 5-10 REV 2**

Type II 24-hr 100-yr Rainfall=8.09"

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                               |                                                                                                                                                 |
|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment5S: CC-5</b>   | Runoff Area=63,362 sf 7.29% Impervious Runoff Depth=3.97"<br>Tc=5.0 min CN=65 Runoff=10.38 cfs 20,947 cf                                        |
| <b>Subcatchment6S: CC-6</b>   | Runoff Area=15,485 sf 11.48% Impervious Runoff Depth=2.96"<br>Tc=5.0 min CN=56 Runoff=1.88 cfs 3,814 cf                                         |
| <b>Subcatchment7S: CC-7</b>   | Runoff Area=5,181 sf 57.98% Impervious Runoff Depth=5.71"<br>Tc=5.0 min CN=80 Runoff=1.17 cfs 2,465 cf                                          |
| <b>Subcatchment8S: CC-8</b>   | Runoff Area=2,336 sf 0.00% Impervious Runoff Depth=0.44"<br>Tc=5.0 min CN=30 Runoff=0.01 cfs 85 cf                                              |
| <b>Subcatchment9S: CC-9</b>   | Runoff Area=2,509 sf 56.44% Impervious Runoff Depth=5.01"<br>Tc=5.0 min CN=74 Runoff=0.51 cfs 1,047 cf                                          |
| <b>Subcatchment10S: CC-10</b> | Runoff Area=2,865 sf 47.23% Impervious Runoff Depth=5.24"<br>Tc=5.0 min CN=76 Runoff=0.60 cfs 1,251 cf                                          |
| <b>Reach 6R: Channel 5</b>    | Avg. Flow Depth=1.20' Max Vel=5.28 fps Inflow=10.38 cfs 20,947 cf<br>n=0.050 L=257.0' S=0.0780 '/ Capacity=7.46 cfs Outflow=9.90 cfs 20,947 cf  |
| <b>Reach 7R: Channel 6</b>    | Avg. Flow Depth=1.18' Max Vel=6.29 fps Inflow=11.73 cfs 24,761 cf<br>n=0.054 L=127.0' S=0.1300 '/ Capacity=8.91 cfs Outflow=11.55 cfs 24,761 cf |
| <b>Reach 10R: Channel 7</b>   | Avg. Flow Depth=0.32' Max Vel=2.93 fps Inflow=1.17 cfs 2,465 cf<br>n=0.055 L=395.0' S=0.0910 '/ Capacity=7.32 cfs Outflow=1.07 cfs 2,465 cf     |
| <b>Reach 11R: Channel 8</b>   | Avg. Flow Depth=1.54' Max Vel=5.23 fps Inflow=12.59 cfs 27,312 cf<br>n=0.045 L=88.0' S=0.0630 '/ Capacity=4.52 cfs Outflow=12.40 cfs 27,312 cf  |

**Total Runoff Area = 91,738 sf Runoff Volume = 29,609 cf Average Runoff Depth = 3.87"**  
**86.74% Pervious = 79,572 sf 13.26% Impervious = 12,166 sf**

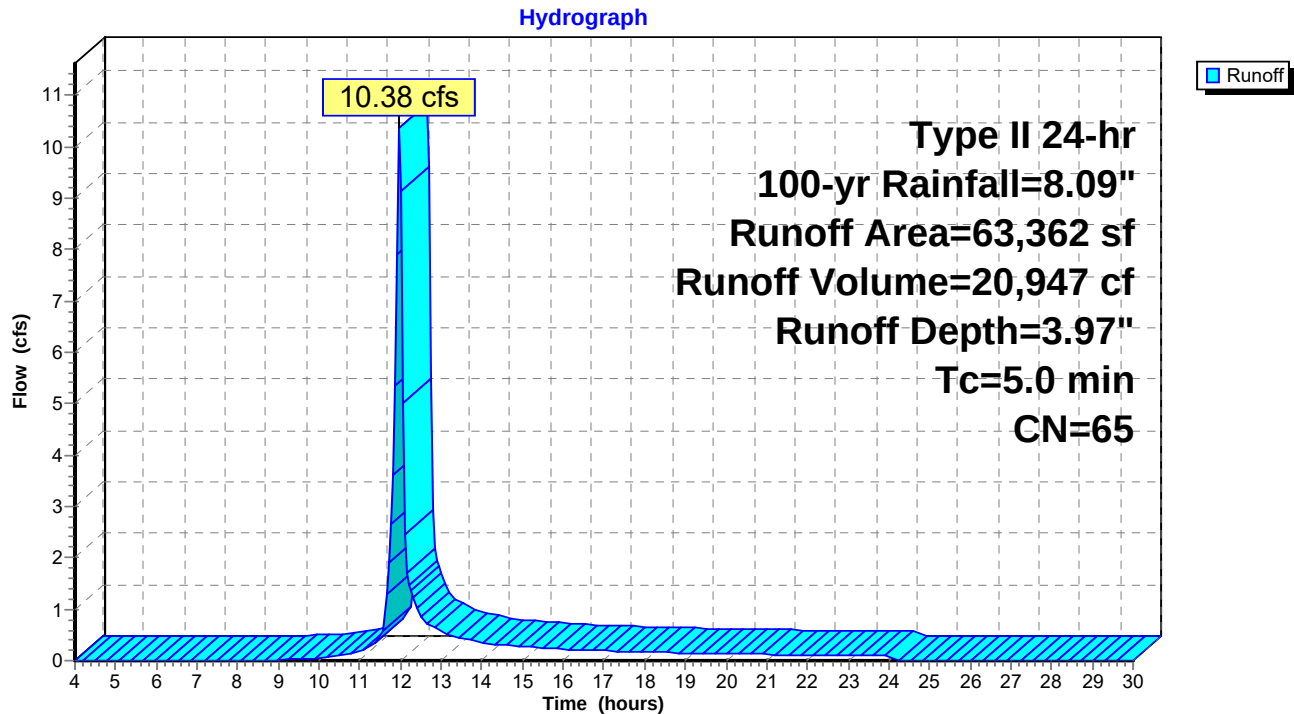
**Summary for Subcatchment 5S: CC-5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 10.38 cfs @ 11.96 hrs, Volume= 20,947 cf, Depth= 3.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 18,807    | 30 | Meadow, non-grazed, HSG A |
| 39,939    | 78 | Meadow, non-grazed, HSG D |
| 2,138     | 98 | Paved parking, HSG A      |
| 2,478     | 98 | Paved parking, HSG D      |
| 63,362    | 65 | Weighted Average          |
| 58,746    |    | 92.71% Pervious Area      |
| 4,616     |    | 7.29% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 5S: CC-5**



**MLV 505LD86\_Channels 5-10 REV 2**

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Type II 24-hr 100-yr Rainfall=8.09"

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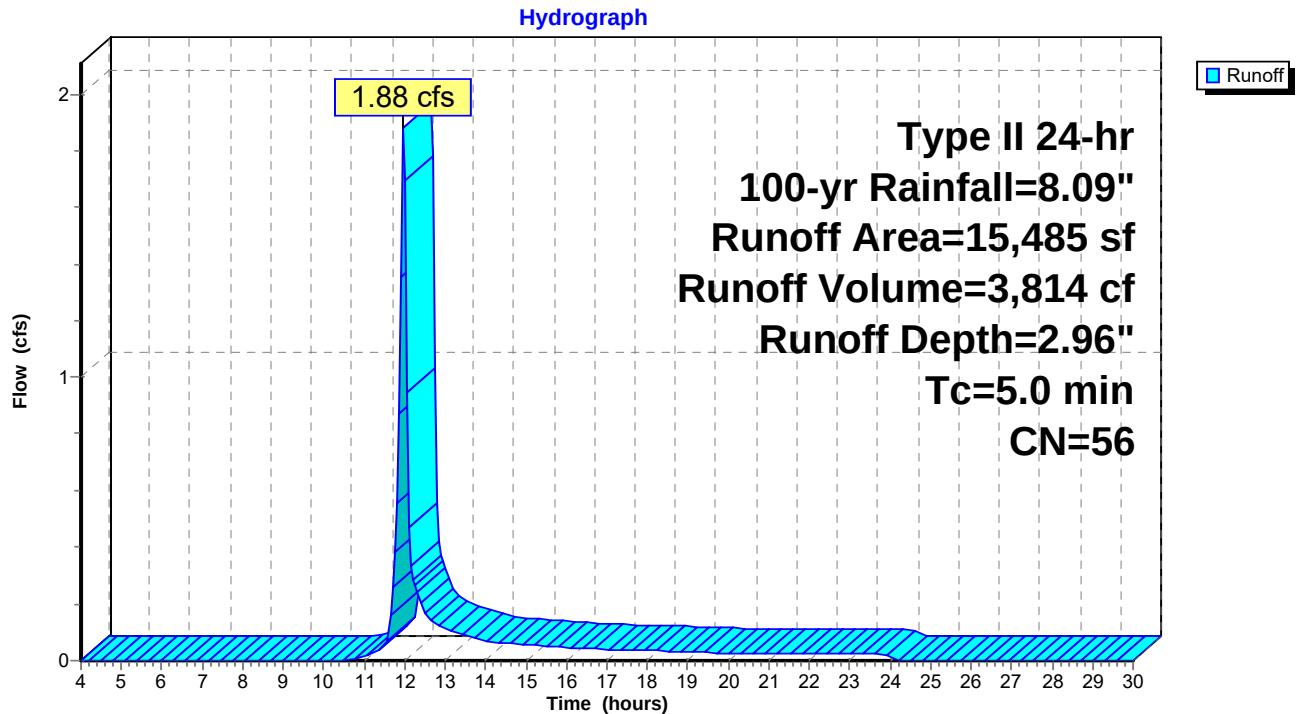
**Summary for Subcatchment 6S: CC-6**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.88 cfs @ 11.96 hrs, Volume= 3,814 cf, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 7,682     | 30 | Meadow, non-grazed, HSG A |
| 6,026     | 78 | Meadow, non-grazed, HSG D |
| 1,255     | 98 | Paved parking, HSG A      |
| 522       | 98 | Paved parking, HSG D      |
| 15,485    | 56 | Weighted Average          |
| 13,708    |    | 88.52% Pervious Area      |
| 1,777     |    | 11.48% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 6S: CC-6**

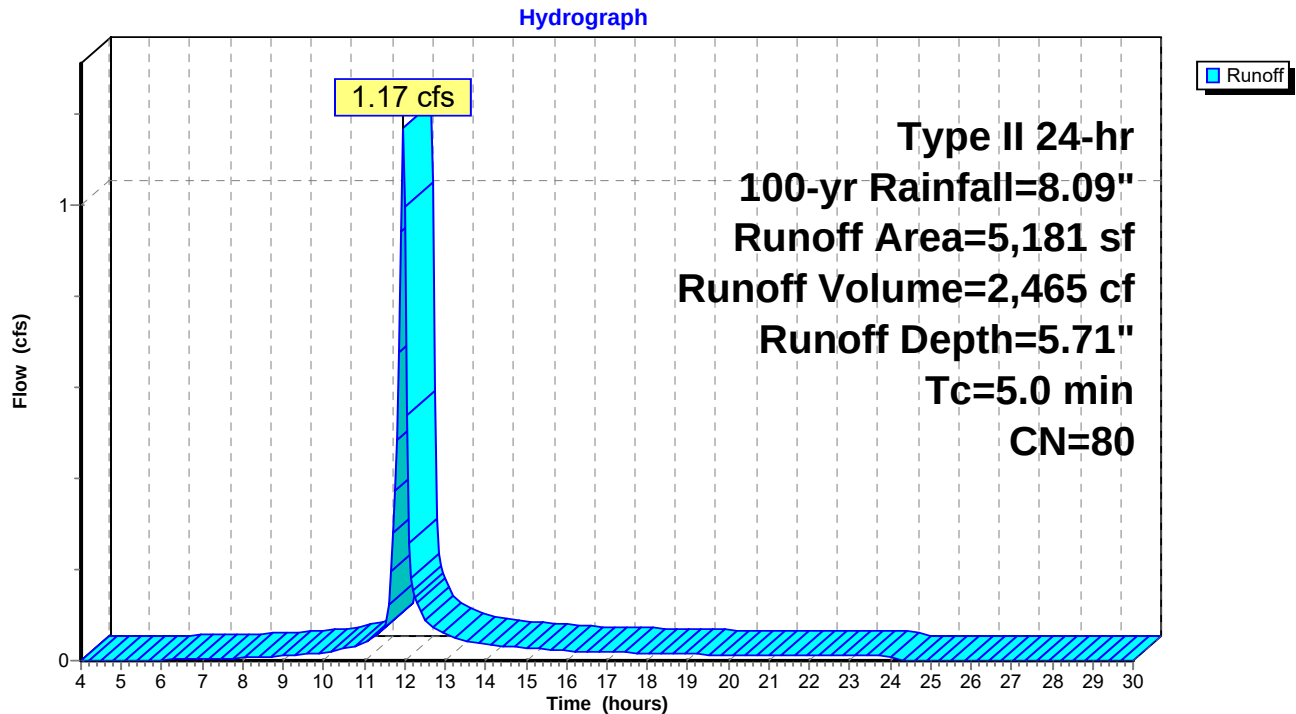
**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.17 cfs @ 11.95 hrs, Volume= 2,465 cf, Depth= 5.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,049     | 30 | Meadow, non-grazed, HSG A |
| 1,128     | 78 | Meadow, non-grazed, HSG D |
| 2,071     | 98 | Paved parking, HSG A      |
| 933       | 98 | Paved parking, HSG D      |
| 5,181     | 80 | Weighted Average          |
| 2,177     |    | 42.02% Pervious Area      |
| 3,004     |    | 57.98% Impervious Area    |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

**Summary for Subcatchment 8S: CC-8**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.01 cfs @ 12.03 hrs, Volume= 85 cf, Depth= 0.44"

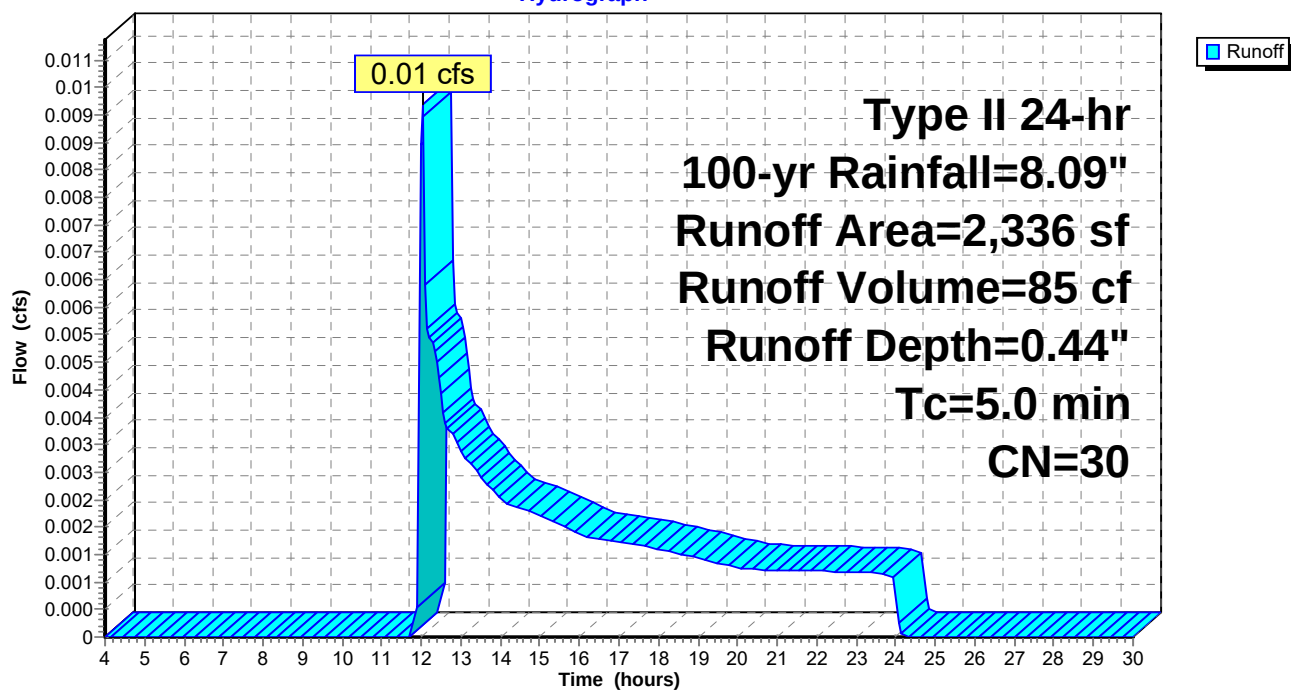
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,336     | 30 | Meadow, non-grazed, HSG A |
| 2,336     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 8S: CC-8**

Hydrograph



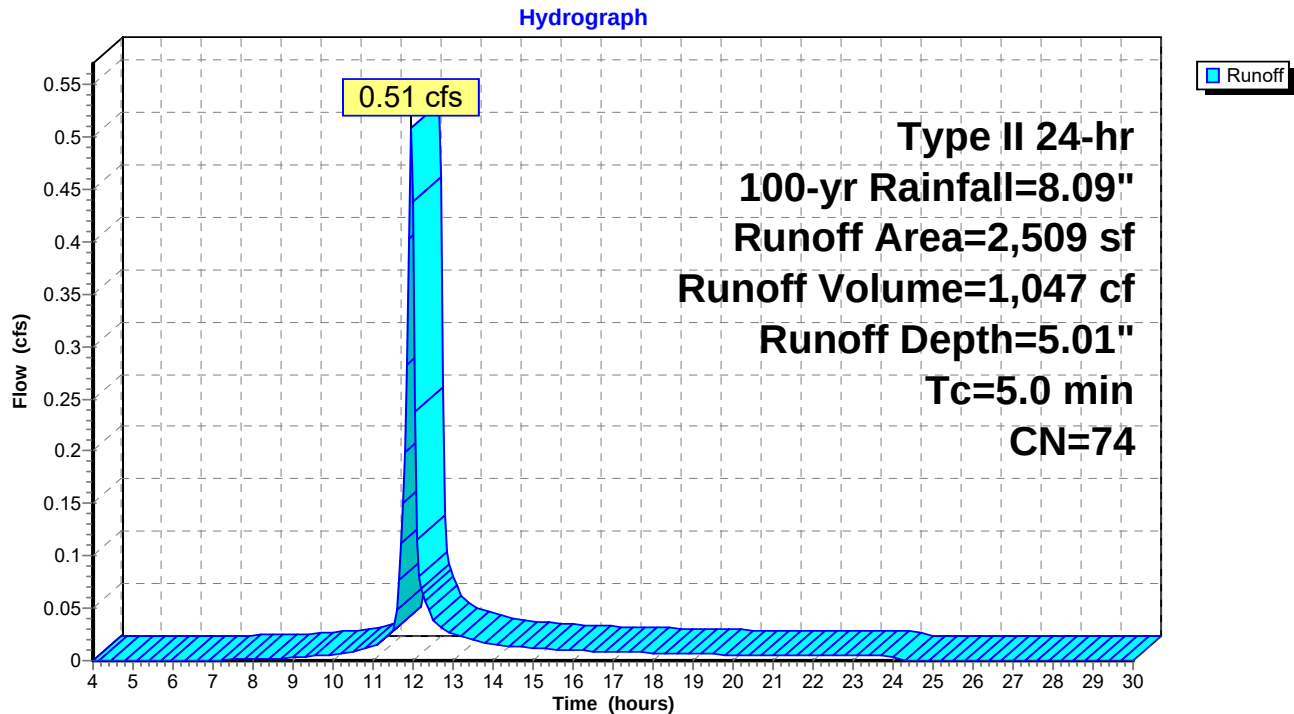
**Summary for Subcatchment 9S: CC-9**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.51 cfs @ 11.96 hrs, Volume= 1,047 cf, Depth= 5.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 815       | 30 | Meadow, non-grazed, HSG A |
| 278       | 78 | Meadow, non-grazed, HSG D |
| 633       | 98 | Paved parking, HSG A      |
| 783       | 98 | Water Surface, HSG D      |
| 2,509     | 74 | Weighted Average          |
| 1,093     |    | 43.56% Pervious Area      |
| 1,416     |    | 56.44% Impervious Area    |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 9S: CC-9**

**Summary for Subcatchment 10S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.60 cfs @ 11.95 hrs, Volume= 1,251 cf, Depth= 5.24"

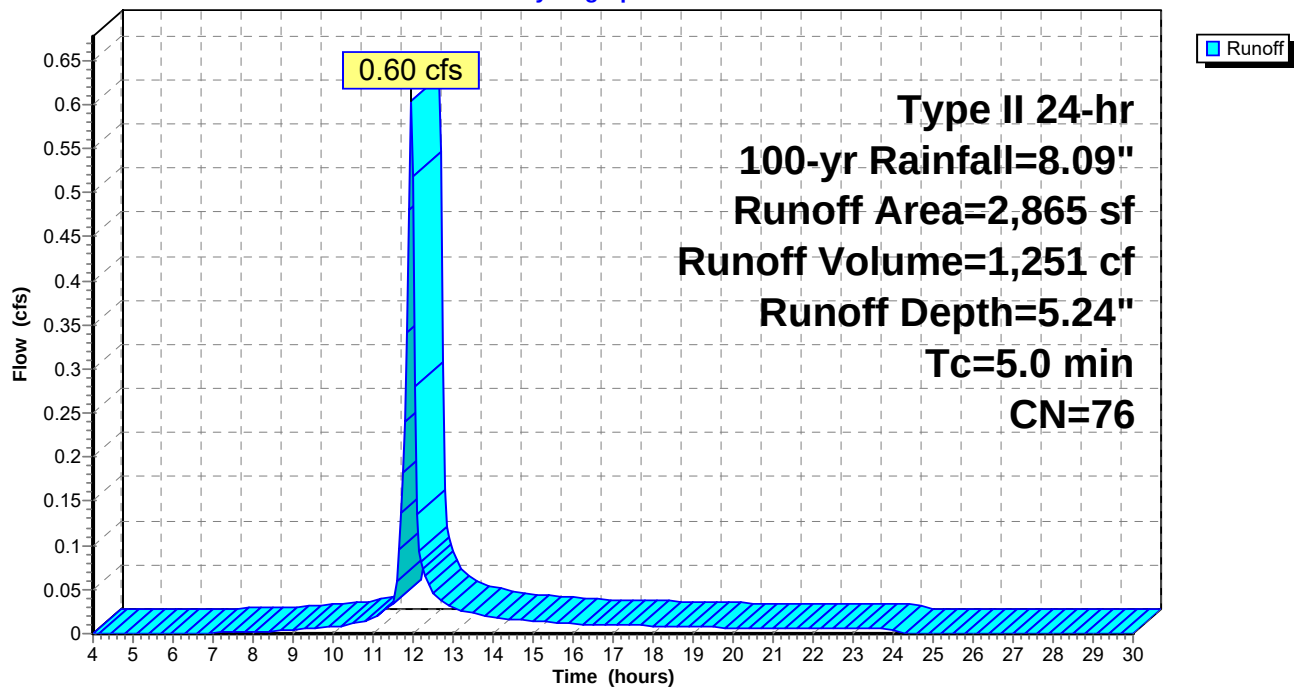
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 667       | 30 | Meadow, non-grazed, HSG A |
| 845       | 78 | Meadow, non-grazed, HSG D |
| 675       | 98 | Paved parking, HSG A      |
| 678       | 98 | Paved parking, HSG D      |
| 2,865     | 76 | Weighted Average          |
| 1,512     |    | 52.77% Pervious Area      |
| 1,353     |    | 47.23% Impervious Area    |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 10S: CC-10**

Hydrograph



**Summary for Reach 6R: Channel 5**

[65] Warning: Inlet elevation not specified

[91] Warning: Storage range exceeded by 0.20'

[55] Hint: Peak inflow is 139% of Manning's capacity

Inflow Area = 63,362 sf, 7.29% Impervious, Inflow Depth = 3.97" for 100-yr event  
Inflow = 10.38 cfs @ 11.96 hrs, Volume= 20,947 cf  
Outflow = 9.90 cfs @ 11.98 hrs, Volume= 20,947 cf, Atten= 5%, Lag= 1.5 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.28 fps, Min. Travel Time= 0.8 min

Avg. Velocity= 1.63 fps, Avg. Travel Time= 2.6 min

Peak Storage= 489 cf @ 11.97 hrs

Average Depth at Peak Storage= 1.20'

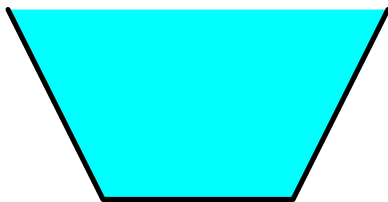
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 7.46 cfs

1.00' x 1.00' deep channel, n= 0.050

Side Slope Z-value= 0.5 '/' Top Width= 2.00'

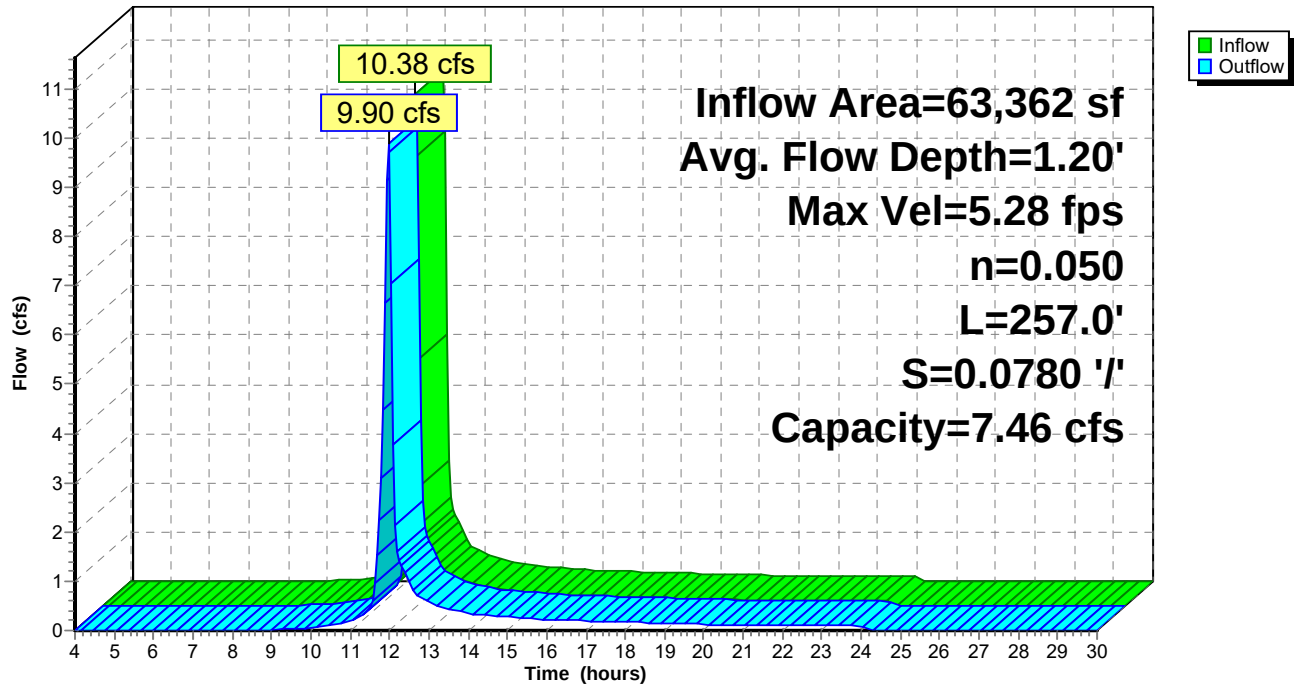
Length= 257.0' Slope= 0.0780 '/'

Inlet Invert= 0.00', Outlet Invert= -20.05'



## Reach 6R: Channel 5

Hydrograph



**Summary for Reach 7R: Channel 6**

[65] Warning: Inlet elevation not specified

[91] Warning: Storage range exceeded by 0.18'

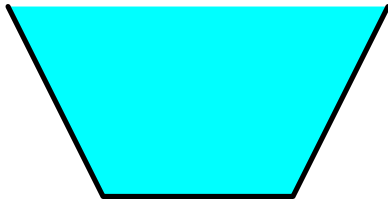
[55] Hint: Peak inflow is 132% of Manning's capacity

Inflow Area = 78,847 sf, 8.11% Impervious, Inflow Depth = 3.77" for 100-yr event  
Inflow = 11.73 cfs @ 11.98 hrs, Volume= 24,761 cf  
Outflow = 11.55 cfs @ 11.99 hrs, Volume= 24,761 cf, Atten= 2%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
Max. Velocity= 6.29 fps, Min. Travel Time= 0.3 min  
Avg. Velocity= 1.93 fps, Avg. Travel Time= 1.1 min

Peak Storage= 236 cf @ 11.99 hrs  
Average Depth at Peak Storage= 1.18'  
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 8.91 cfs

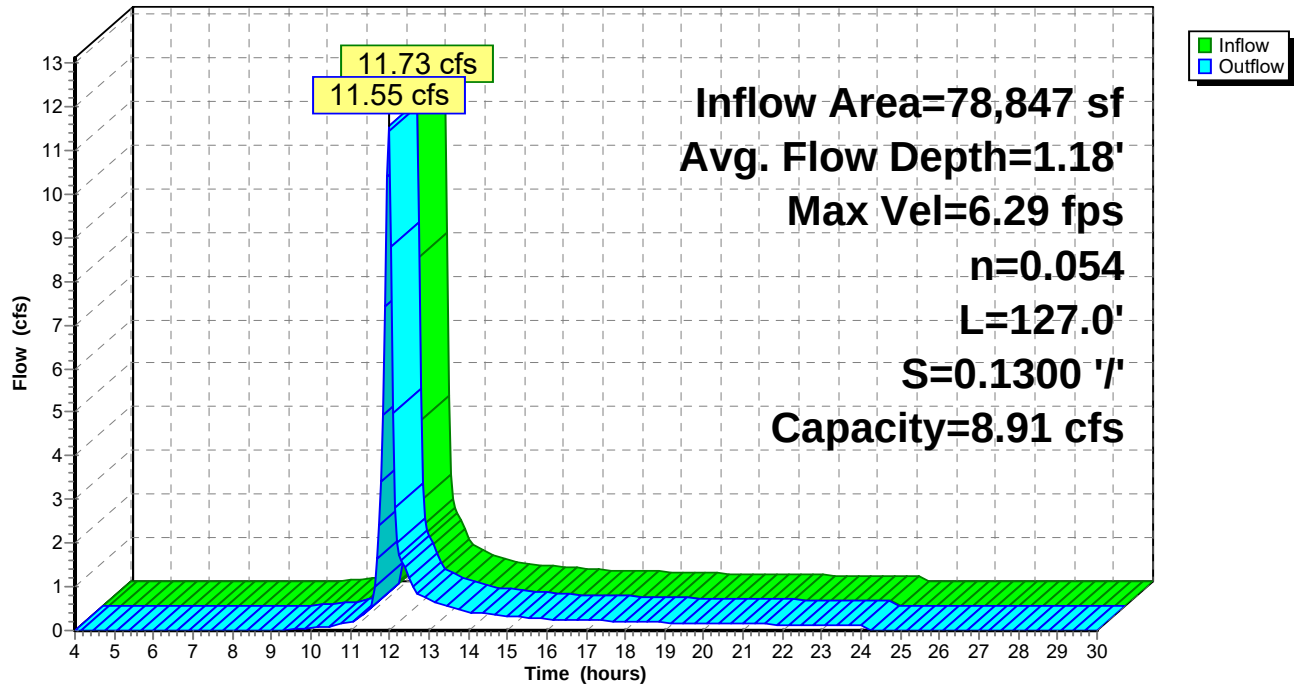
1.00' x 1.00' deep channel, n= 0.054  
Side Slope Z-value= 0.5 '/' Top Width= 2.00'  
Length= 127.0' Slope= 0.1300 '/'  
Inlet Invert= 0.00', Outlet Invert= -16.51'





## Reach 7R: Channel 6

Hydrograph



**Summary for Reach 10R: Channel 7**

[65] Warning: Inlet elevation not specified

Inflow Area = 5,181 sf, 57.98% Impervious, Inflow Depth = 5.71" for 100-yr event  
 Inflow = 1.17 cfs @ 11.95 hrs, Volume= 2,465 cf  
 Outflow = 1.07 cfs @ 12.02 hrs, Volume= 2,465 cf, Atten= 9%, Lag= 3.7 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.93 fps, Min. Travel Time= 2.2 min

Avg. Velocity = 0.70 fps, Avg. Travel Time= 9.5 min

Peak Storage= 148 cf @ 11.98 hrs

Average Depth at Peak Storage= 0.32'

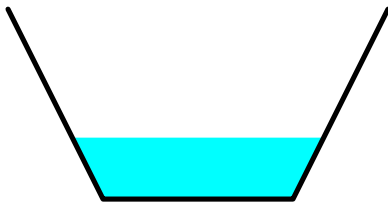
Bank-Full Depth= 1.00' Flow Area= 1.5 sf, Capacity= 7.32 cfs

1.00' x 1.00' deep channel, n= 0.055

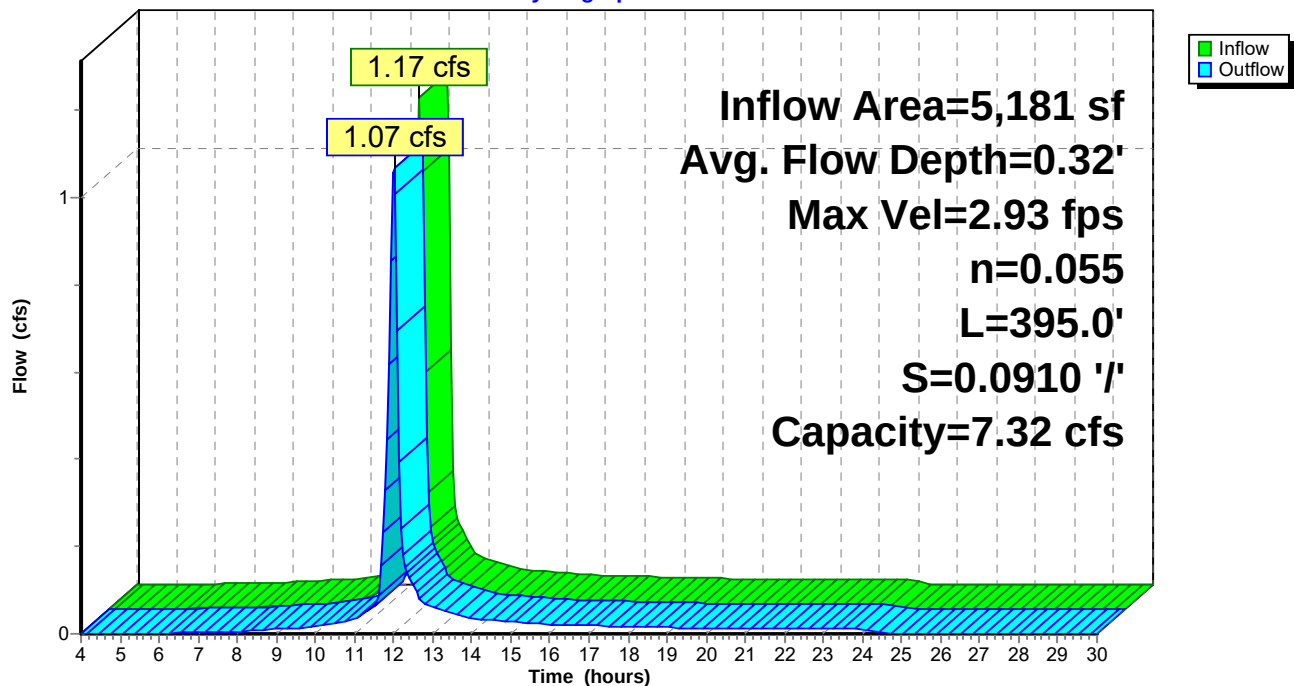
Side Slope Z-value= 0.5 '/' Top Width= 2.00'

Length= 395.0' Slope= 0.0910 '/'

Inlet Invert= 0.00', Outlet Invert= -35.95'

**Reach 10R: Channel 7**

Hydrograph



**Summary for Reach 11R: Channel 8**

[65] Warning: Inlet elevation not specified

[91] Warning: Storage range exceeded by 0.79'

[55] Hint: Peak inflow is 278% of Manning's capacity

Inflow Area = 86,364 sf, 10.88% Impervious, Inflow Depth = 3.79" for 100-yr event  
Inflow = 12.59 cfs @ 11.99 hrs, Volume= 27,312 cf  
Outflow = 12.40 cfs @ 12.00 hrs, Volume= 27,312 cf, Atten= 2%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.23 fps, Min. Travel Time= 0.3 min

Avg. Velocity= 1.51 fps, Avg. Travel Time= 1.0 min

Peak Storage= 211 cf @ 11.99 hrs

Average Depth at Peak Storage= 1.54'

Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 4.52 cfs

1.00' x 0.75' deep channel, n= 0.045

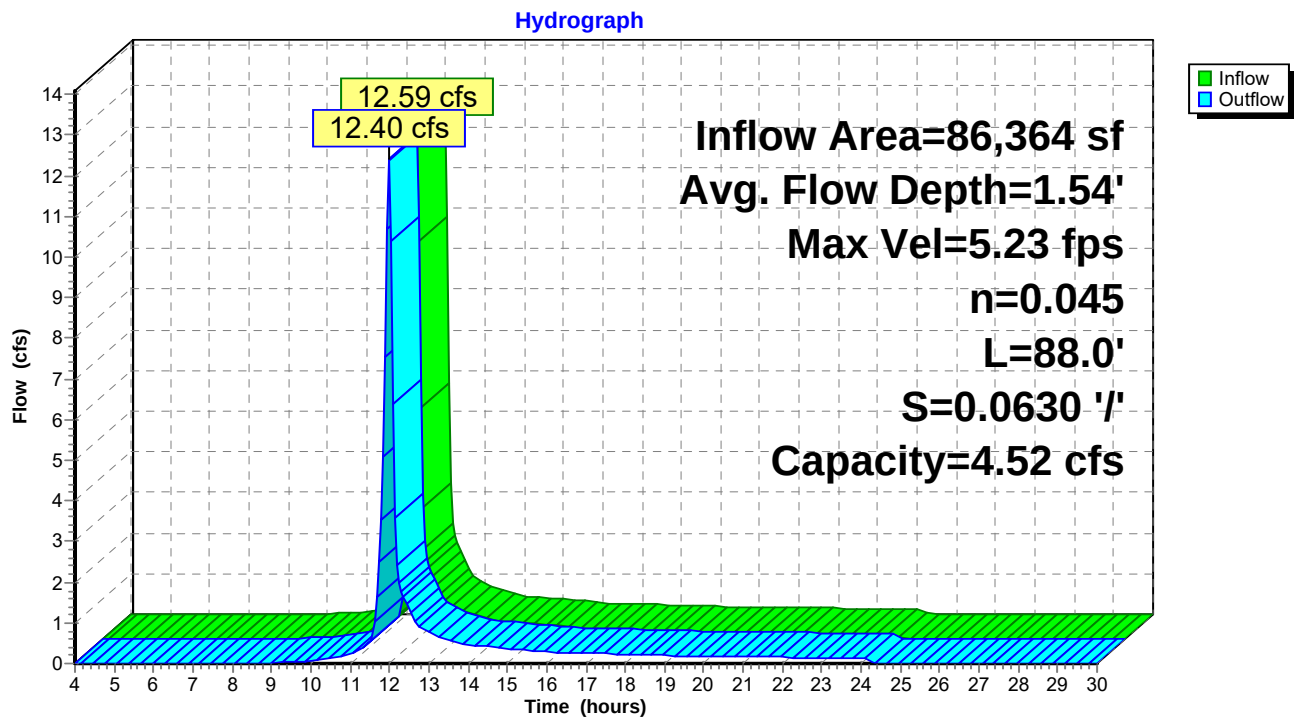
Side Slope Z-value= 0.5 '/' Top Width= 1.75'

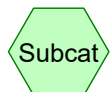
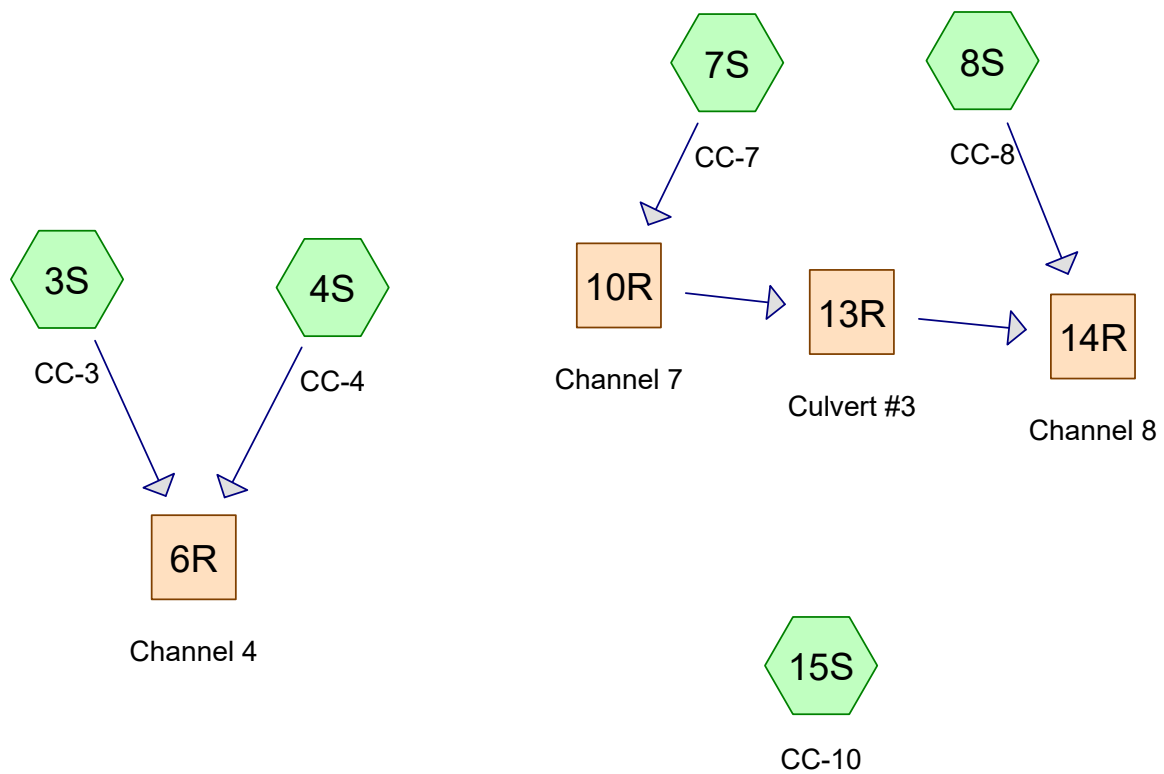
Length= 88.0' Slope= 0.0630 '/'

Inlet Invert= 0.00', Outlet Invert= -5.54'



## Reach 11R: Channel 8

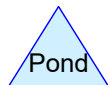




Subcat



Reach



Pond



Link

**Routing Diagram for MLV 505LD86\_Channels REV 2 Phase 1**  
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**MLV 505LD86\_Channels REV 2 Phase 1**

Prepared by {enter your company name here}

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Page 2

**Area Listing (all nodes)**

| Area<br>(sq-ft) | CN        | Description<br>(subcatchment-numbers)       |
|-----------------|-----------|---------------------------------------------|
| 39,721          | 30        | Meadow, non-grazed, HSG A (3S, 7S, 8S, 15S) |
| 57,397          | 78        | Meadow, non-grazed, HSG D (3S, 4S, 7S, 15S) |
| 12,302          | 98        | Paved parking, HSG A (3S, 7S, 15S)          |
| 9,065           | 98        | Paved parking, HSG D (3S, 7S, 15S)          |
| <b>118,485</b>  | <b>66</b> | <b>TOTAL AREA</b>                           |

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**Soil Listing (all nodes)**

| Area<br>(sq-ft) | Soil<br>Group | Subcatchment<br>Numbers |
|-----------------|---------------|-------------------------|
| 52,023          | HSG A         | 3S, 7S, 8S, 15S         |
| 0               | HSG B         |                         |
| 0               | HSG C         |                         |
| 66,462          | HSG D         | 3S, 4S, 7S, 15S         |
| 0               | Other         |                         |
| <b>118,485</b>  |               | <b>TOTAL AREA</b>       |

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**Ground Covers (all nodes)**

| HSG-A<br>(sq-ft) | HSG-B<br>(sq-ft) | HSG-C<br>(sq-ft) | HSG-D<br>(sq-ft) | Other<br>(sq-ft) | Total<br>(sq-ft) | Ground<br>Cover       | Subcat<br>Number |
|------------------|------------------|------------------|------------------|------------------|------------------|-----------------------|------------------|
| 39,721           | 0                | 0                | 57,397           | 0                | 97,118           | Meadow,<br>non-grazed |                  |
| 12,302           | 0                | 0                | 9,065            | 0                | 21,367           | Paved parking         |                  |
| <b>52,023</b>    | <b>0</b>         | <b>0</b>         | <b>66,462</b>    | <b>0</b>         | <b>118,485</b>   | <b>TOTAL AREA</b>     |                  |



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**Pipe Listing (all nodes)**

| Line# | Node<br>Number | In-Invert<br>(feet) | Out-Invert<br>(feet) | Length<br>(feet) | Slope<br>(ft/ft) | n     | Diam/Width<br>(inches) | Height<br>(inches) | Inside-Fill<br>(inches) |
|-------|----------------|---------------------|----------------------|------------------|------------------|-------|------------------------|--------------------|-------------------------|
| 1     | 13R            | 927.00              | 926.50               | 26.0             | 0.0192           | 0.012 | 12.0                   | 0.0                | 0.0                     |

**MLV 505LD86\_Channels REV 2 Phase 1***Type II 24-hr 1-yr Rainfall=2.72"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                               |                                                                                                                                                              |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment3S: CC-3</b>   | Runoff Area=24,835 sf 29.80% Impervious Runoff Depth=0.42"<br>Tc=5.0 min CN=66 Runoff=0.36 cfs 864 cf                                                        |
| <b>Subcatchment4S: CC-4</b>   | Runoff Area=2,032 sf 0.00% Impervious Runoff Depth=0.93"<br>Tc=5.0 min CN=78 Runoff=0.08 cfs 158 cf                                                          |
| <b>Subcatchment7S: CC-7</b>   | Runoff Area=83,908 sf 13.34% Impervious Runoff Depth=0.38"<br>Tc=5.0 min CN=65 Runoff=1.07 cfs 2,686 cf                                                      |
| <b>Subcatchment8S: CC-8</b>   | Runoff Area=2,336 sf 0.00% Impervious Runoff Depth=0.00"<br>Tc=5.0 min CN=30 Runoff=0.00 cfs 0 cf                                                            |
| <b>Subcatchment15S: CC-10</b> | Runoff Area=5,374 sf 51.53% Impervious Runoff Depth=0.78"<br>Tc=5.0 min CN=75 Runoff=0.17 cfs 351 cf                                                         |
| <b>Reach 6R: Channel 4</b>    | Avg. Flow Depth=0.21' Max Vel=1.84 fps Inflow=0.43 cfs 1,022 cf<br>n=0.067 L=63.0' S=0.0800 '/' Capacity=3.42 cfs Outflow=0.42 cfs 1,022 cf                  |
| <b>Reach 10R: Channel 7</b>   | Avg. Flow Depth=0.12' Max Vel=1.82 fps Inflow=1.07 cfs 2,686 cf<br>n=0.055 L=395.0' S=0.0910 '/' Capacity=38.86 cfs Outflow=0.86 cfs 2,686 cf                |
| <b>Reach 13R: Culvert #3</b>  | Avg. Flow Depth=0.27' Max Vel=4.99 fps Inflow=0.86 cfs 2,686 cf<br>12.0" Round Pipe n=0.012 L=26.0' S=0.0192 '/' Capacity=5.35 cfs Outflow=0.86 cfs 2,686 cf |
| <b>Reach 14R: Channel 8</b>   | Avg. Flow Depth=0.18' Max Vel=2.09 fps Inflow=0.86 cfs 2,686 cf<br>n=0.050 L=88.0' S=0.0630 '/' Capacity=21.64 cfs Outflow=0.83 cfs 2,686 cf                 |

**Total Runoff Area = 118,485 sf Runoff Volume = 4,059 cf Average Runoff Depth = 0.41"**  
**81.97% Pervious = 97,118 sf 18.03% Impervious = 21,367 sf**

**MLV 505LD86\_Channels REV 2 Phase 1**

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Type II 24-hr 1-yr Rainfall=2.72"

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**Summary for Subcatchment 3S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.36 cfs @ 11.98 hrs, Volume= 864 cf, Depth= 0.42"

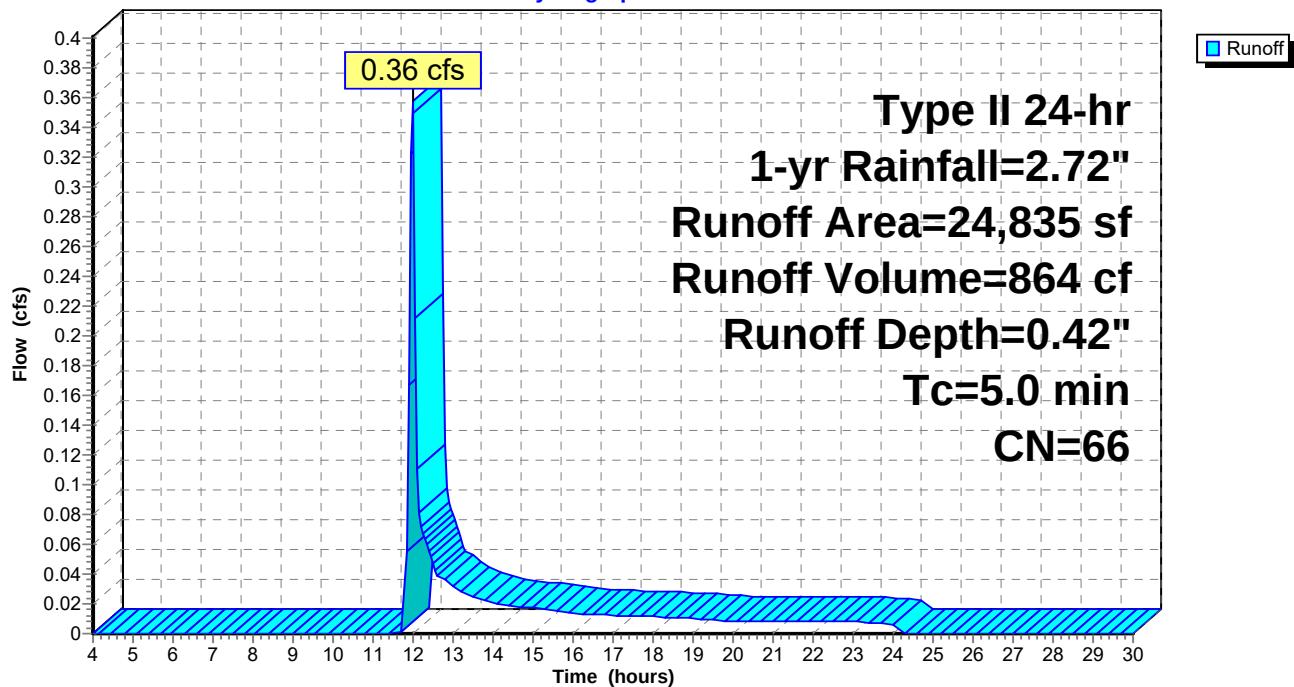
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 8,181     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 2,351     | 98 | Paved parking, HSG D      |
| 24,835    | 66 | Weighted Average          |
| 17,433    |    | 70.20% Pervious Area      |
| 7,402     |    | 29.80% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 3S: CC-3**

Hydrograph



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Type II 24-hr 1-yr Rainfall=2.72"

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**Summary for Subcatchment 4S: CC-4**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.08 cfs @ 11.96 hrs, Volume= 158 cf, Depth= 0.93"

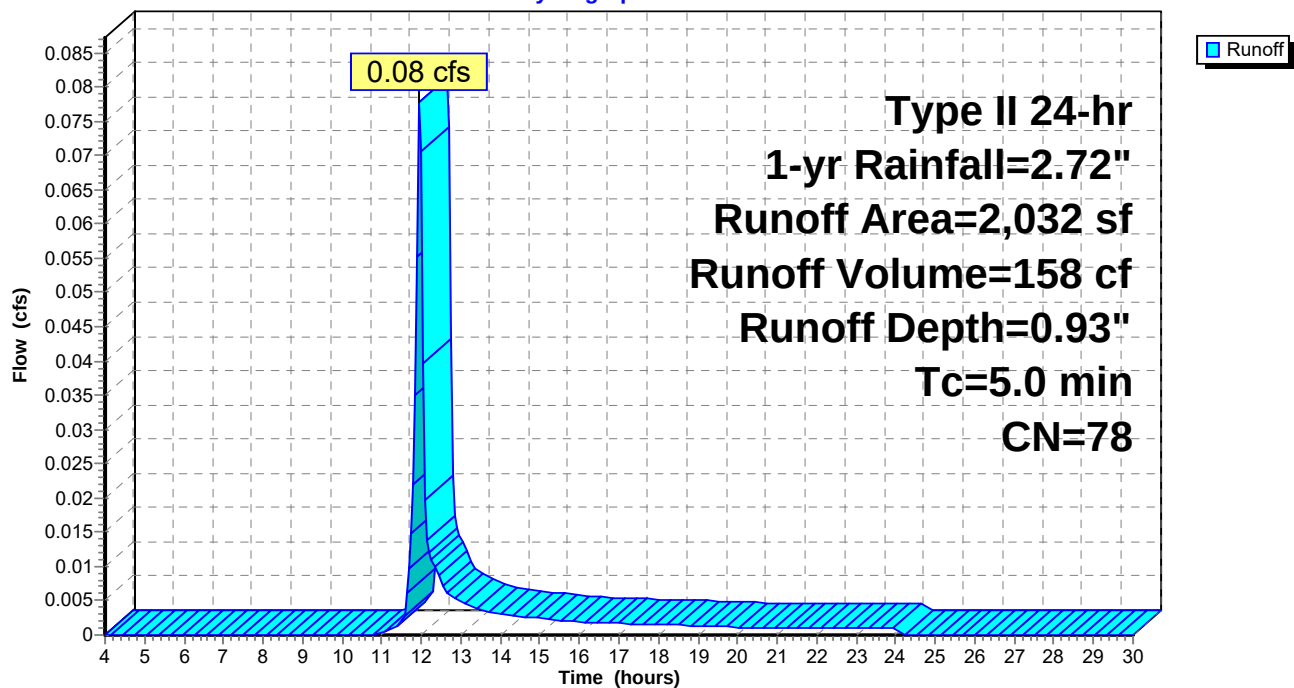
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,032     | 78 | Meadow, non-grazed, HSG D |
| 2,032     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 4S: CC-4**

Hydrograph



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Type II 24-hr 1-yr Rainfall=2.72"

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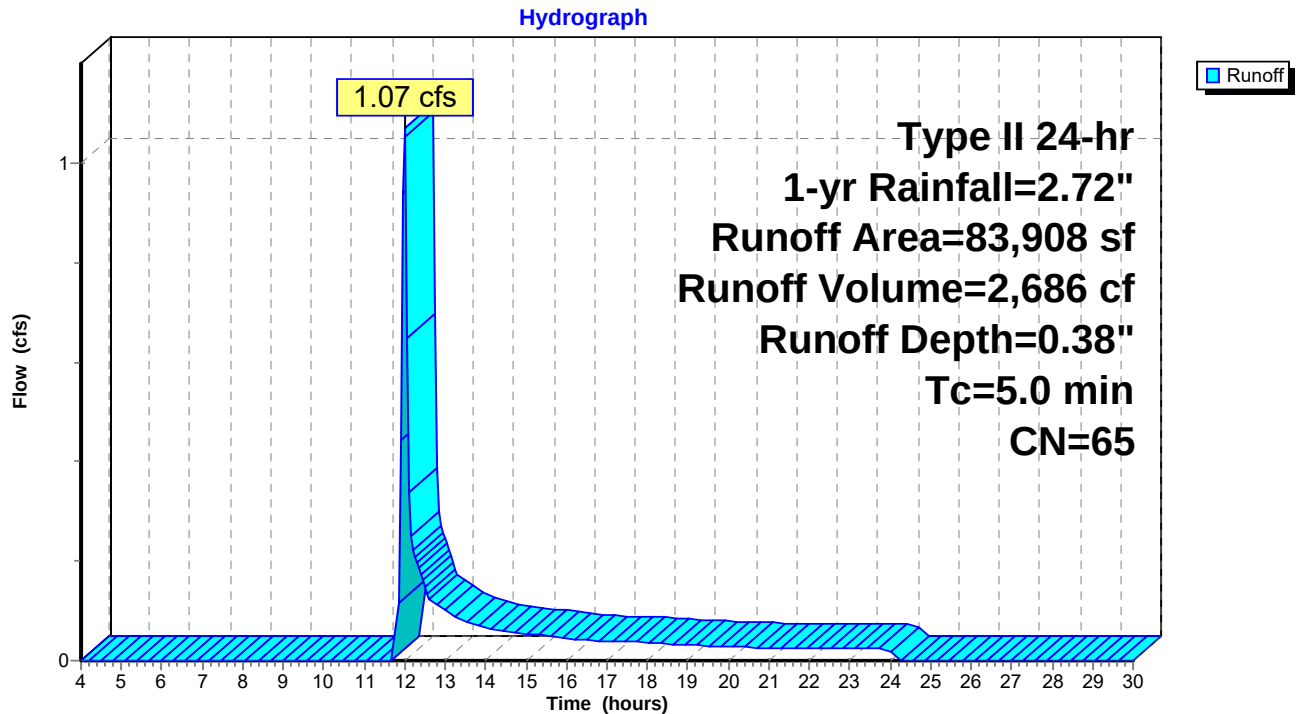
**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.07 cfs @ 11.99 hrs, Volume= 2,686 cf, Depth= 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 26,651    | 30 | Meadow, non-grazed, HSG A |
| 46,061    | 78 | Meadow, non-grazed, HSG D |
| 5,943     | 98 | Paved parking, HSG A      |
| 5,253     | 98 | Paved parking, HSG D      |
| 83,908    | 65 | Weighted Average          |
| 72,712    |    | 86.66% Pervious Area      |
| 11,196    |    | 13.34% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

**Summary for Subcatchment 8S: CC-8**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

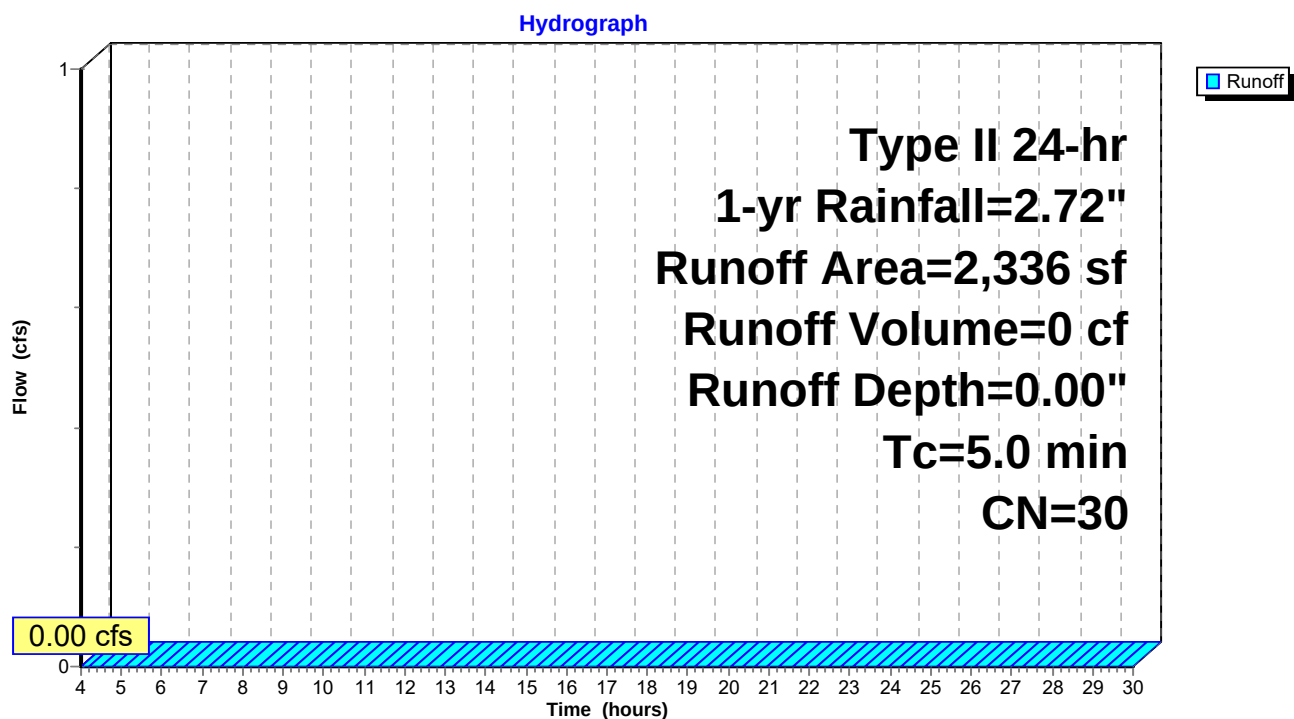
[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,336     | 30 | Meadow, non-grazed, HSG A |
| 2,336     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 8S: CC-8**

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Type II 24-hr 1-yr Rainfall=2.72"

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**Summary for Subcatchment 15S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.17 cfs @ 11.97 hrs, Volume= 351 cf, Depth= 0.78"

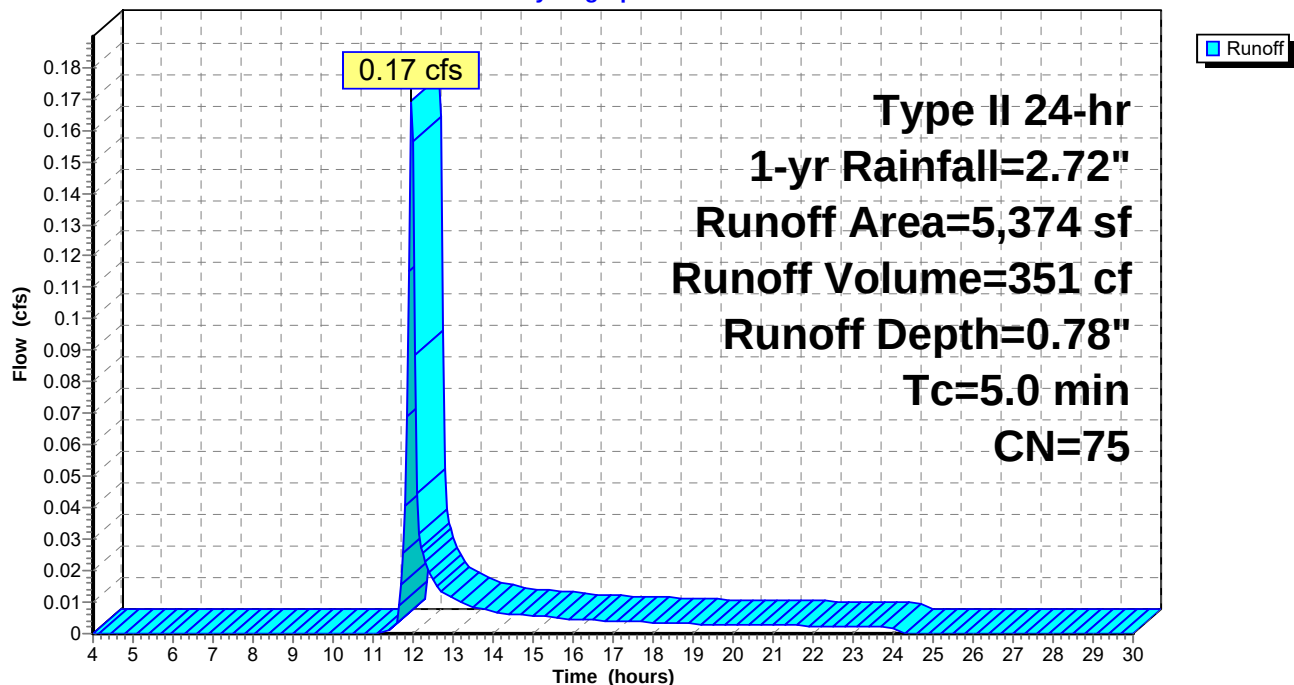
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,482     | 30 | Meadow, non-grazed, HSG A |
| 1,123     | 78 | Meadow, non-grazed, HSG D |
| 1,308     | 98 | Paved parking, HSG A      |
| 1,461     | 98 | Paved parking, HSG D      |
| 5,374     | 75 | Weighted Average          |
| 2,605     |    | 48.47% Pervious Area      |
| 2,769     |    | 51.53% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 15S: CC-10**

Hydrograph



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Type II 24-hr 1-yr Rainfall=2.72"

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## Summary for Reach 6R: Channel 4

Inflow Area = 26,867 sf, 27.55% Impervious, Inflow Depth = 0.46" for 1-yr event  
Inflow = 0.43 cfs @ 11.98 hrs, Volume= 1,022 cf  
Outflow = 0.42 cfs @ 12.00 hrs, Volume= 1,022 cf, Atten= 3%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
Max. Velocity= 1.84 fps, Min. Travel Time= 0.6 min  
Avg. Velocity= 0.54 fps, Avg. Travel Time= 1.9 min

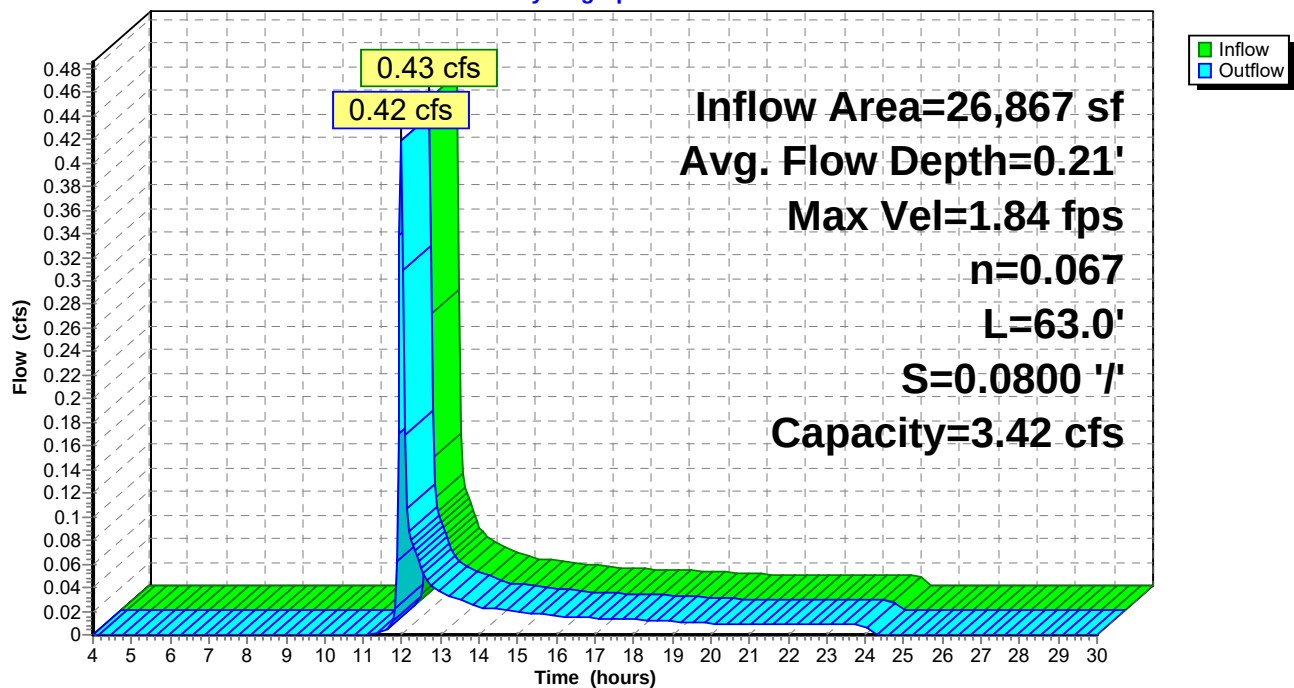
Peak Storage= 15 cf @ 11.99 hrs  
Average Depth at Peak Storage= 0.21'  
Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 3.42 cfs

1.00' x 0.75' deep channel, n= 0.067  
Side Slope Z-value= 0.5 '/' Top Width= 1.75'  
Length= 63.0' Slope= 0.0800 '/'  
Inlet Invert= 977.00', Outlet Invert= 971.96'



## Reach 6R: Channel 4

Hydrograph





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Type II 24-hr 1-yr Rainfall=2.72"

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## Summary for Reach 10R: Channel 7

[65] Warning: Inlet elevation not specified

Inflow Area = 83,908 sf, 13.34% Impervious, Inflow Depth = 0.38" for 1-yr event  
Inflow = 1.07 cfs @ 11.99 hrs, Volume= 2,686 cf  
Outflow = 0.86 cfs @ 12.09 hrs, Volume= 2,686 cf, Atten= 20%, Lag= 6.1 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 1.82 fps, Min. Travel Time= 3.6 min

Avg. Velocity= 0.58 fps, Avg. Travel Time= 11.4 min

Peak Storage= 194 cf @ 12.02 hrs

Average Depth at Peak Storage= 0.12'

Bank-Full Depth= 1.00' Flow Area= 6.0 sf, Capacity= 38.86 cfs

4.00' x 1.00' deep channel, n= 0.055

Side Slope Z-value= 2.0 '/' Top Width= 8.00'

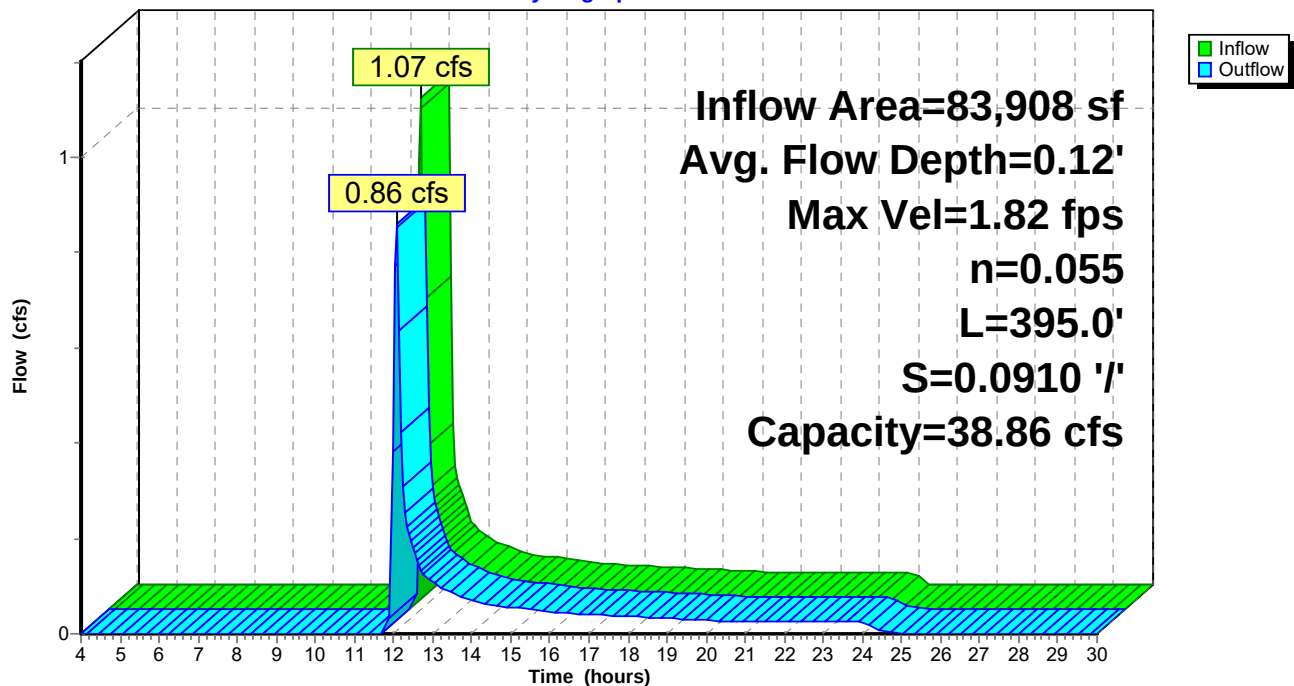
Length= 395.0' Slope= 0.0910 '/'

Inlet Invert= 0.00', Outlet Invert= -35.95'



## Reach 10R: Channel 7

### Hydrograph



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Type II 24-hr 1-yr Rainfall=2.72"

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## Summary for Reach 13R: Culvert #3

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 83,908 sf, 13.34% Impervious, Inflow Depth = 0.38" for 1-yr event  
Inflow = 0.86 cfs @ 12.09 hrs, Volume= 2,686 cf  
Outflow = 0.86 cfs @ 12.09 hrs, Volume= 2,686 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.99 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 1.94 fps, Avg. Travel Time= 0.2 min

Peak Storage= 4 cf @ 12.09 hrs

Average Depth at Peak Storage= 0.27'

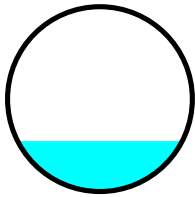
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.35 cfs

12.0" Round Pipe

n= 0.012

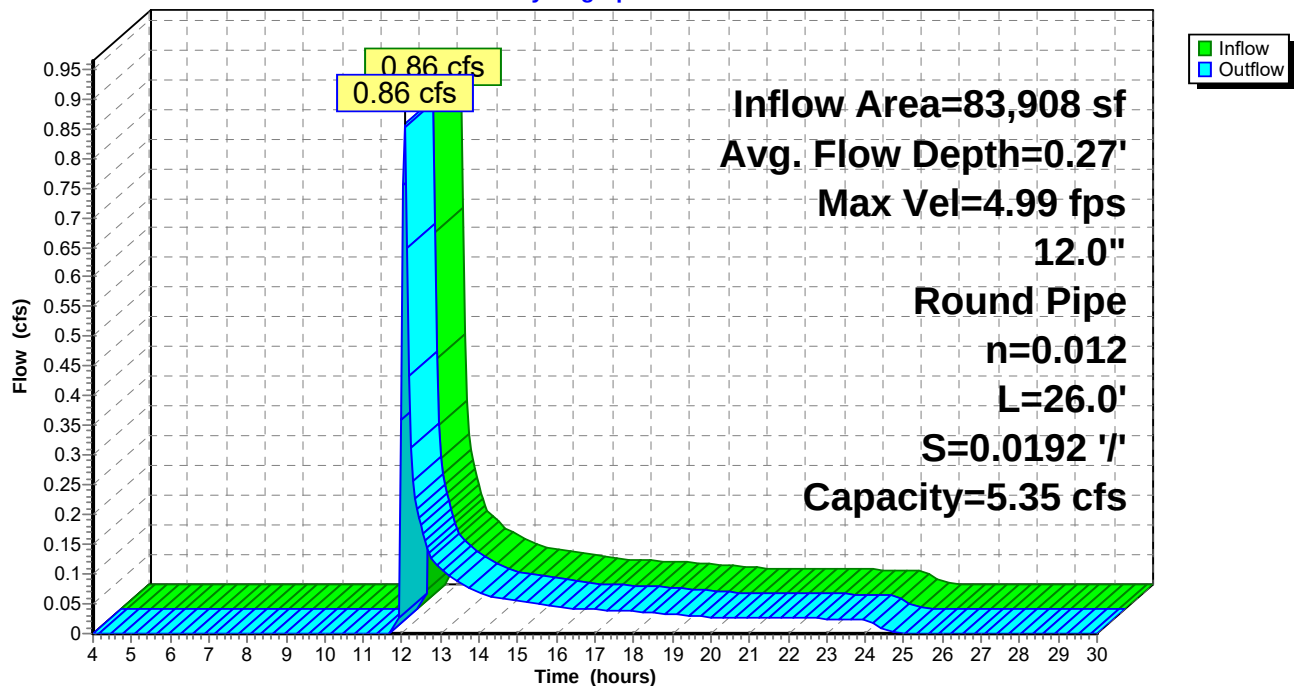
Length= 26.0' Slope= 0.0192 '/'

Inlet Invert= 927.00', Outlet Invert= 926.50'



## Reach 13R: Culvert #3

### Hydrograph



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## Summary for Reach 14R: Channel 8

[65] Warning: Inlet elevation not specified

Inflow Area = 86,244 sf, 12.98% Impervious, Inflow Depth = 0.37" for 1-yr event  
Inflow = 0.86 cfs @ 12.09 hrs, Volume= 2,686 cf  
Outflow = 0.83 cfs @ 12.11 hrs, Volume= 2,686 cf, Atten= 3%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.09 fps, Min. Travel Time= 0.7 min

Avg. Velocity= 0.68 fps, Avg. Travel Time= 2.2 min

Peak Storage= 36 cf @ 12.10 hrs

Average Depth at Peak Storage= 0.18'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 21.64 cfs

2.00' x 1.00' deep channel, n= 0.050

Side Slope Z-value= 2.0 '/' Top Width= 6.00'

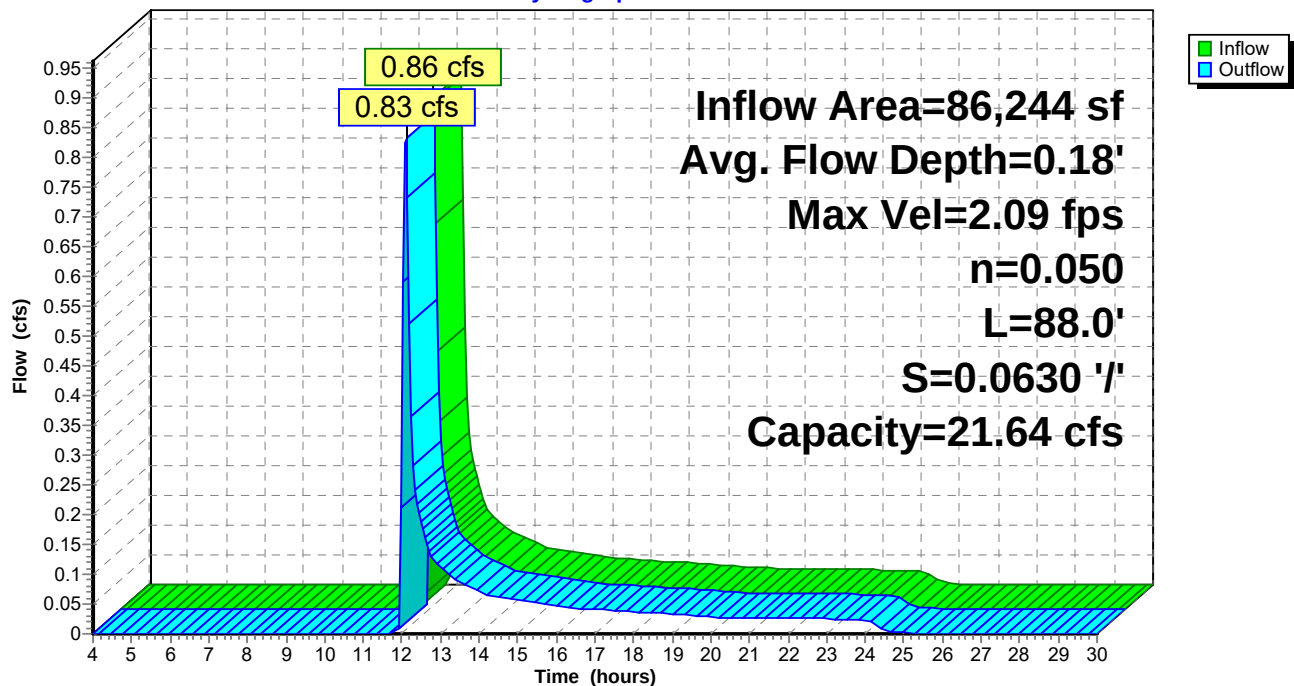
Length= 88.0' Slope= 0.0630 '/'

Inlet Invert= 0.00', Outlet Invert= -5.54'



## Reach 14R: Channel 8

### Hydrograph



**MLV 505LD86\_Channels REV 2 Phase 1***Type II 24-hr 2-yr Rainfall=3.26"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                               |                                                                                                                                                              |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment3S: CC-3</b>   | Runoff Area=24,835 sf 29.80% Impervious Runoff Depth=0.67"<br>Tc=5.0 min CN=66 Runoff=0.63 cfs 1,394 cf                                                      |
| <b>Subcatchment4S: CC-4</b>   | Runoff Area=2,032 sf 0.00% Impervious Runoff Depth=1.32"<br>Tc=5.0 min CN=78 Runoff=0.11 cfs 223 cf                                                          |
| <b>Subcatchment7S: CC-7</b>   | Runoff Area=83,908 sf 13.34% Impervious Runoff Depth=0.63"<br>Tc=5.0 min CN=65 Runoff=1.97 cfs 4,403 cf                                                      |
| <b>Subcatchment8S: CC-8</b>   | Runoff Area=2,336 sf 0.00% Impervious Runoff Depth=0.00"<br>Tc=5.0 min CN=30 Runoff=0.00 cfs 0 cf                                                            |
| <b>Subcatchment15S: CC-10</b> | Runoff Area=5,374 sf 51.53% Impervious Runoff Depth=1.13"<br>Tc=5.0 min CN=75 Runoff=0.25 cfs 508 cf                                                         |
| <b>Reach 6R: Channel 4</b>    | Avg. Flow Depth=0.30' Max Vel=2.16 fps Inflow=0.74 cfs 1,617 cf<br>n=0.067 L=63.0' S=0.0800 '/' Capacity=3.42 cfs Outflow=0.73 cfs 1,617 cf                  |
| <b>Reach 10R: Channel 7</b>   | Avg. Flow Depth=0.17' Max Vel=2.39 fps Inflow=1.97 cfs 4,403 cf<br>n=0.055 L=395.0' S=0.0910 '/' Capacity=38.86 cfs Outflow=1.79 cfs 4,403 cf                |
| <b>Reach 13R: Culvert #3</b>  | Avg. Flow Depth=0.40' Max Vel=6.14 fps Inflow=1.79 cfs 4,403 cf<br>12.0" Round Pipe n=0.012 L=26.0' S=0.0192 '/' Capacity=5.35 cfs Outflow=1.78 cfs 4,403 cf |
| <b>Reach 14R: Channel 8</b>   | Avg. Flow Depth=0.27' Max Vel=2.63 fps Inflow=1.78 cfs 4,403 cf<br>n=0.050 L=88.0' S=0.0630 '/' Capacity=21.64 cfs Outflow=1.71 cfs 4,403 cf                 |

**Total Runoff Area = 118,485 sf Runoff Volume = 6,529 cf Average Runoff Depth = 0.66"**  
**81.97% Pervious = 97,118 sf 18.03% Impervious = 21,367 sf**

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**Summary for Subcatchment 3S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.63 cfs @ 11.97 hrs, Volume= 1,394 cf, Depth= 0.67"

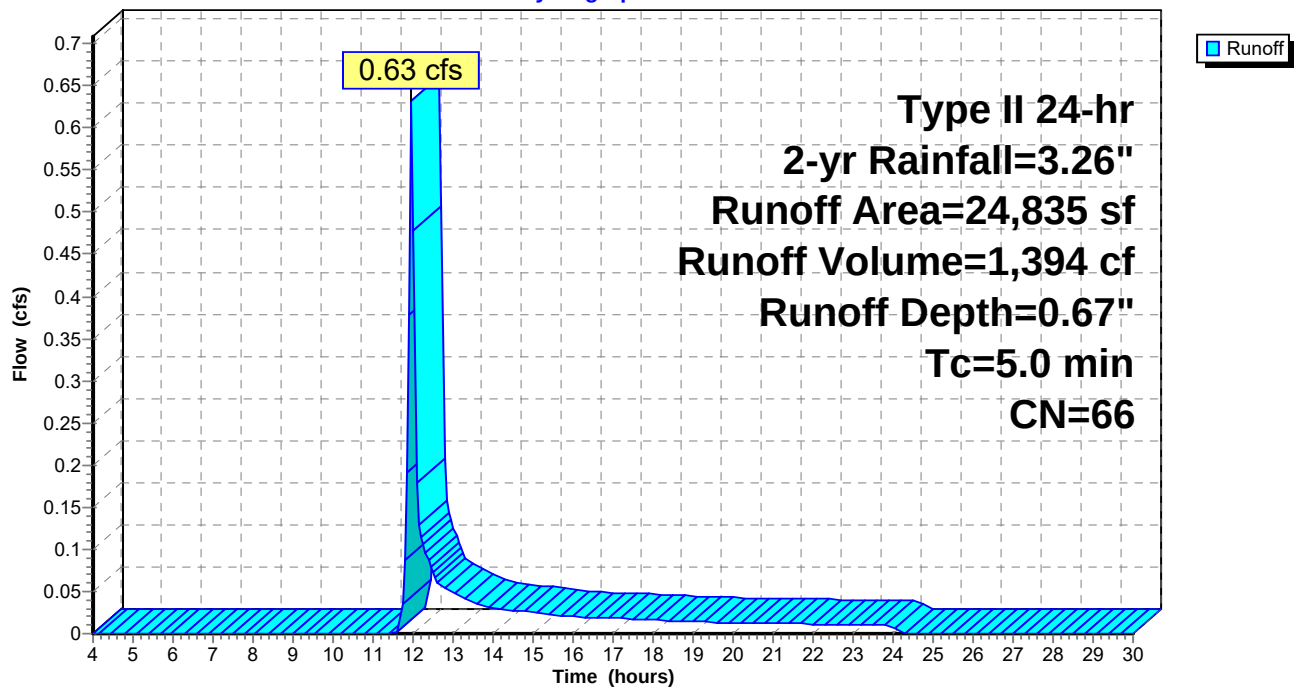
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 8,181     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 2,351     | 98 | Paved parking, HSG D      |
| 24,835    | 66 | Weighted Average          |
| 17,433    |    | 70.20% Pervious Area      |
| 7,402     |    | 29.80% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 3S: CC-3**

Hydrograph



**Summary for Subcatchment 4S: CC-4**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.11 cfs @ 11.96 hrs, Volume= 223 cf, Depth= 1.32"

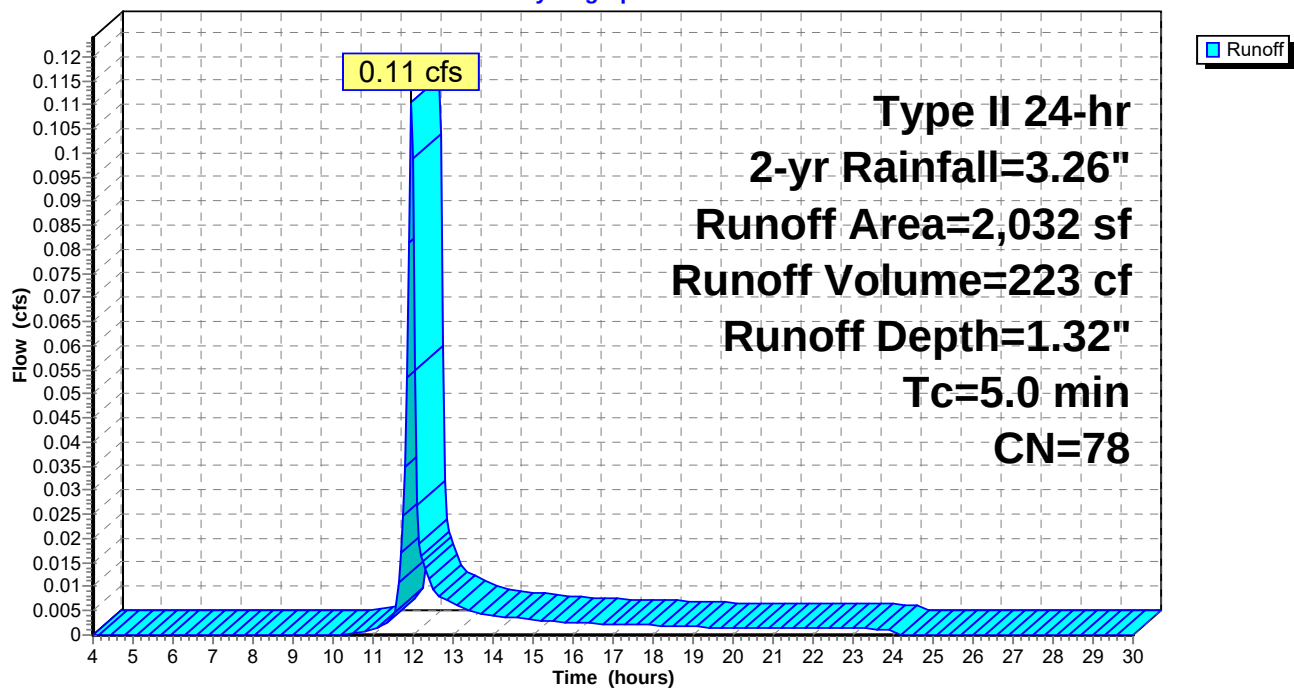
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,032     | 78 | Meadow, non-grazed, HSG D |
| 2,032     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 4S: CC-4**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.26"

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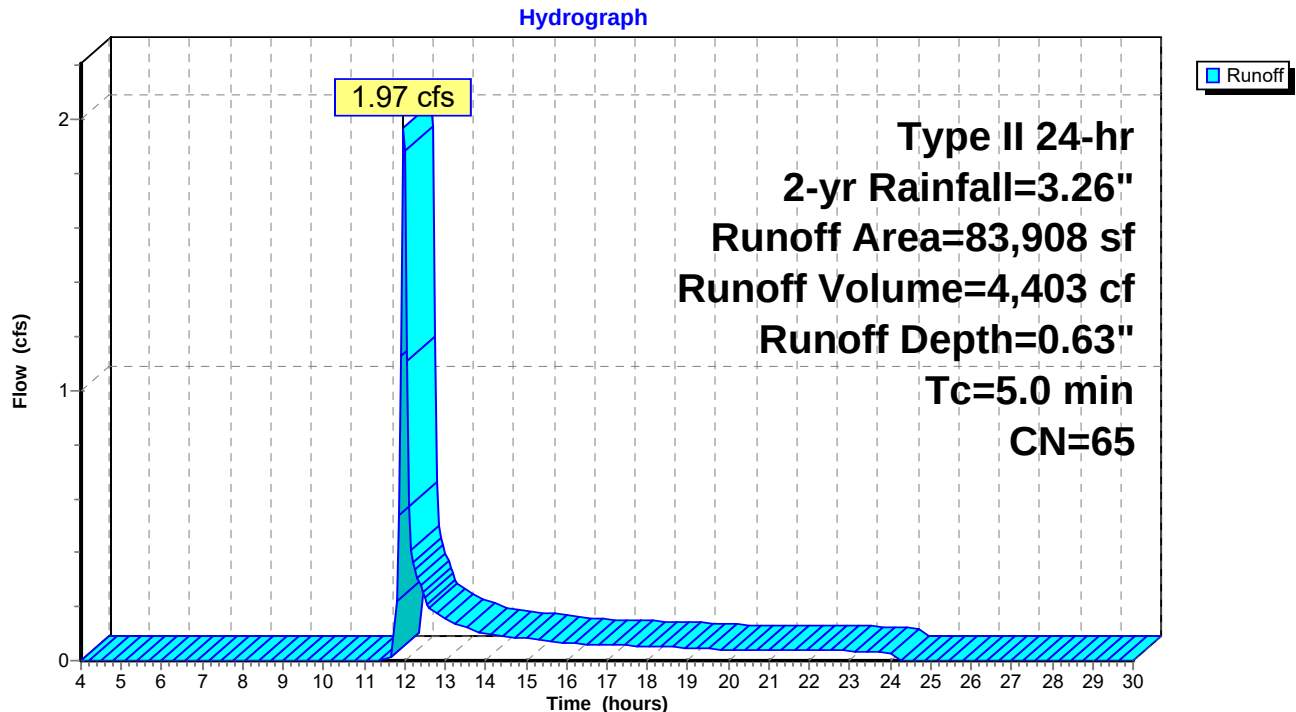
**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.97 cfs @ 11.98 hrs, Volume= 4,403 cf, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 26,651    | 30 | Meadow, non-grazed, HSG A |
| 46,061    | 78 | Meadow, non-grazed, HSG D |
| 5,943     | 98 | Paved parking, HSG A      |
| 5,253     | 98 | Paved parking, HSG D      |
| 83,908    | 65 | Weighted Average          |
| 72,712    |    | 86.66% Pervious Area      |
| 11,196    |    | 13.34% Impervious Area    |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

**Summary for Subcatchment 8S: CC-8**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

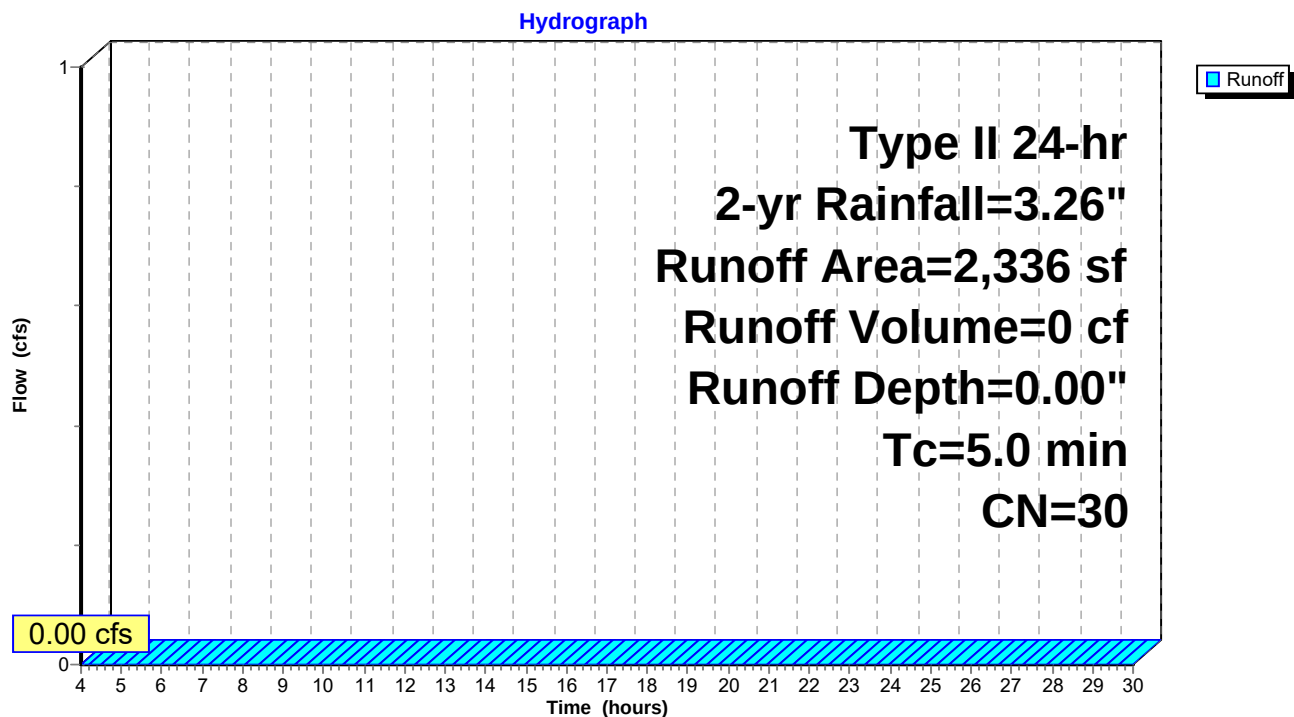
[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,336     | 30 | Meadow, non-grazed, HSG A |
| 2,336     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 8S: CC-8**



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**Summary for Subcatchment 15S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.25 cfs @ 11.96 hrs, Volume= 508 cf, Depth= 1.13"

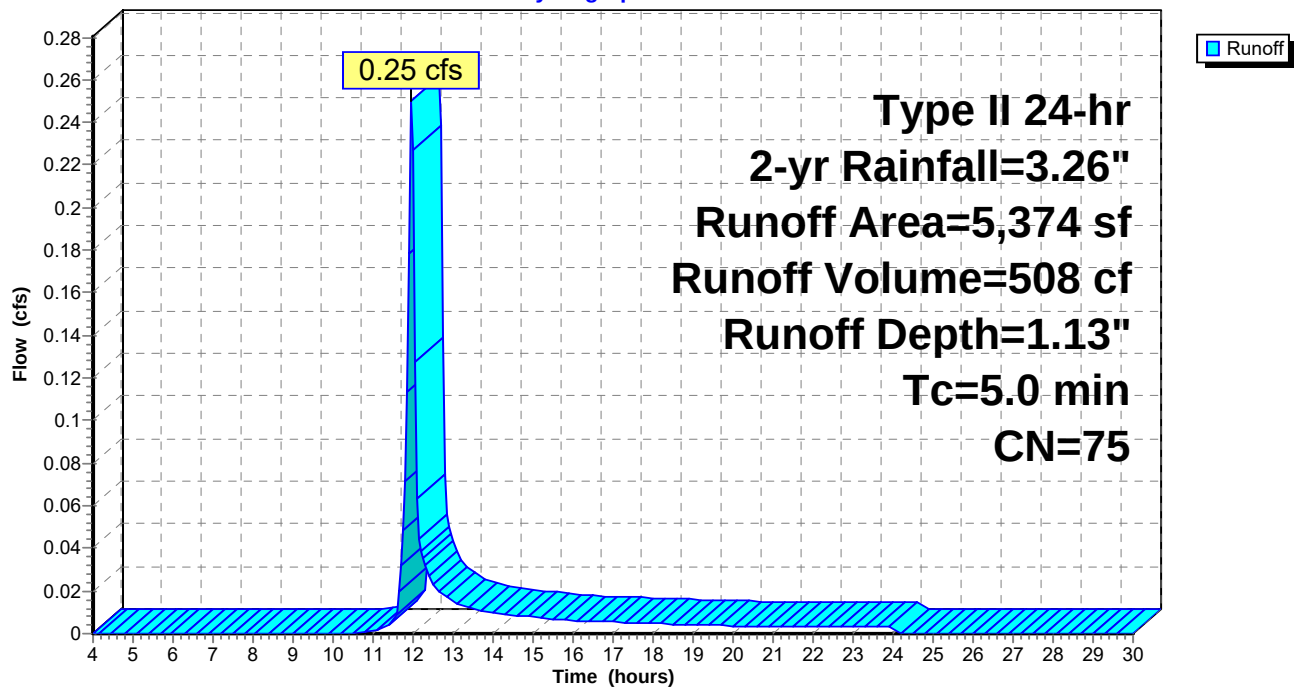
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,482     | 30 | Meadow, non-grazed, HSG A |
| 1,123     | 78 | Meadow, non-grazed, HSG D |
| 1,308     | 98 | Paved parking, HSG A      |
| 1,461     | 98 | Paved parking, HSG D      |
| 5,374     | 75 | Weighted Average          |
| 2,605     |    | 48.47% Pervious Area      |
| 2,769     |    | 51.53% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 15S: CC-10**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.26"

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## Summary for Reach 6R: Channel 4

Inflow Area = 26,867 sf, 27.55% Impervious, Inflow Depth = 0.72" for 2-yr event  
Inflow = 0.74 cfs @ 11.97 hrs, Volume= 1,617 cf  
Outflow = 0.73 cfs @ 11.99 hrs, Volume= 1,617 cf, Atten= 2%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
Max. Velocity= 2.16 fps, Min. Travel Time= 0.5 min  
Avg. Velocity= 0.61 fps, Avg. Travel Time= 1.7 min

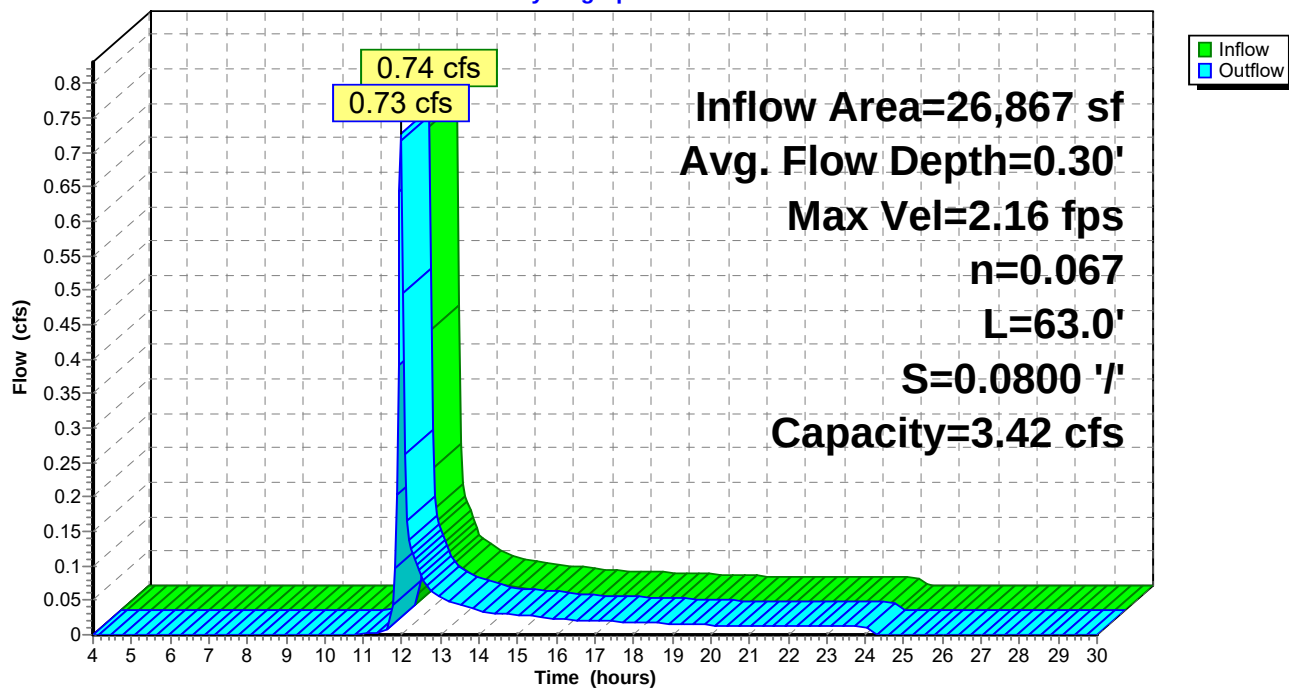
Peak Storage= 22 cf @ 11.98 hrs  
Average Depth at Peak Storage= 0.30'  
Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 3.42 cfs

1.00' x 0.75' deep channel, n= 0.067  
Side Slope Z-value= 0.5 '/' Top Width= 1.75'  
Length= 63.0' Slope= 0.0800 '/'  
Inlet Invert= 977.00', Outlet Invert= 971.96'



## Reach 6R: Channel 4

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.26"

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## Summary for Reach 10R: Channel 7

[65] Warning: Inlet elevation not specified

Inflow Area = 83,908 sf, 13.34% Impervious, Inflow Depth = 0.63" for 2-yr event  
Inflow = 1.97 cfs @ 11.98 hrs, Volume= 4,403 cf  
Outflow = 1.79 cfs @ 12.05 hrs, Volume= 4,403 cf, Atten= 9%, Lag= 4.6 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.39 fps, Min. Travel Time= 2.8 min

Avg. Velocity= 0.66 fps, Avg. Travel Time= 9.9 min

Peak Storage= 301 cf @ 12.01 hrs

Average Depth at Peak Storage= 0.17'

Bank-Full Depth= 1.00' Flow Area= 6.0 sf, Capacity= 38.86 cfs

4.00' x 1.00' deep channel, n= 0.055

Side Slope Z-value= 2.0 '/' Top Width= 8.00'

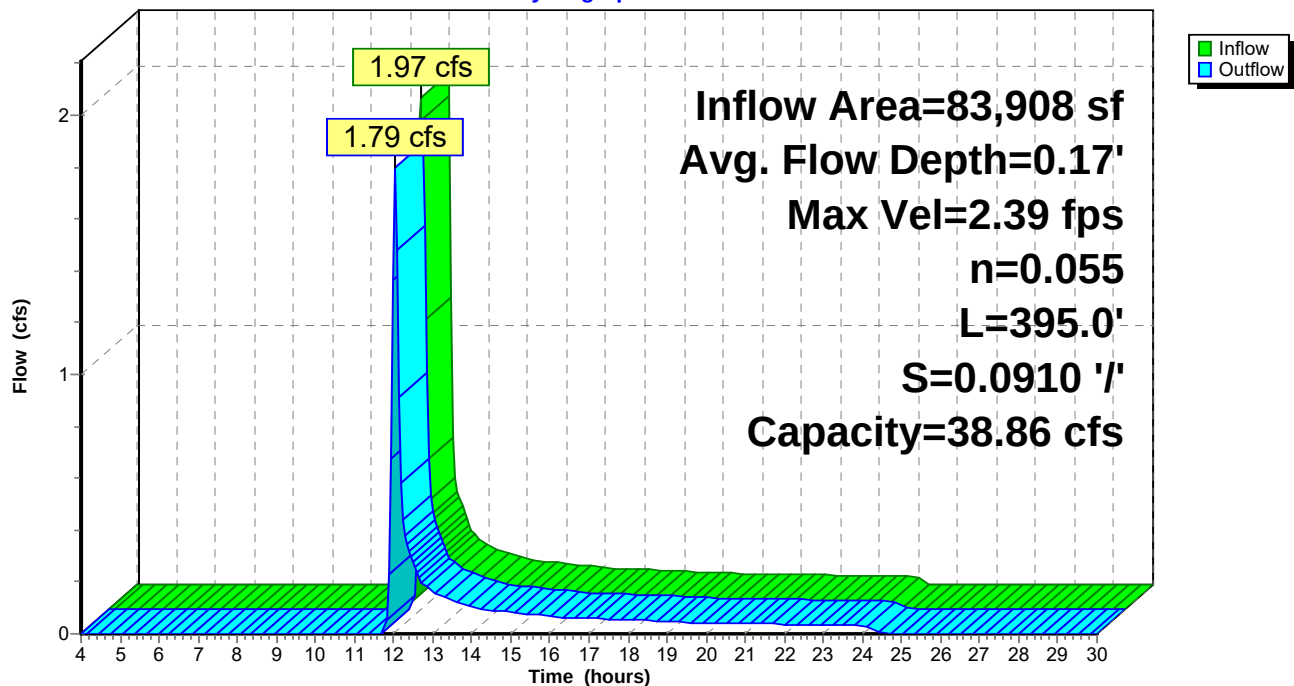
Length= 395.0' Slope= 0.0910 '/'

Inlet Invert= 0.00', Outlet Invert= -35.95'



## Reach 10R: Channel 7

Hydrograph



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## Summary for Reach 13R: Culvert #3

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 83,908 sf, 13.34% Impervious, Inflow Depth = 0.63" for 2-yr event  
Inflow = 1.79 cfs @ 12.05 hrs, Volume= 4,403 cf  
Outflow = 1.78 cfs @ 12.06 hrs, Volume= 4,403 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.14 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 2.18 fps, Avg. Travel Time= 0.2 min

Peak Storage= 8 cf @ 12.05 hrs

Average Depth at Peak Storage= 0.40'

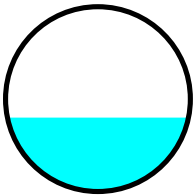
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.35 cfs

12.0" Round Pipe

n= 0.012

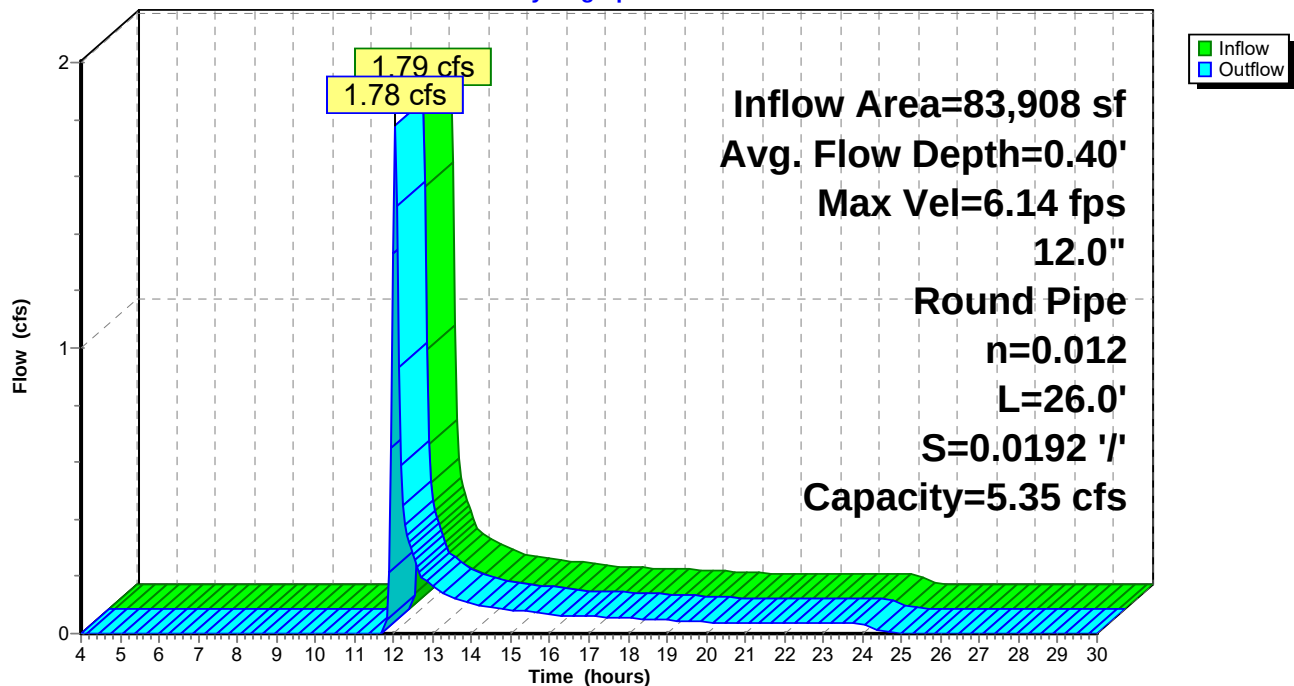
Length= 26.0' Slope= 0.0192 '/'

Inlet Invert= 927.00', Outlet Invert= 926.50'



## Reach 13R: Culvert #3

Hydrograph



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## Summary for Reach 14R: Channel 8

[65] Warning: Inlet elevation not specified

Inflow Area = 86,244 sf, 12.98% Impervious, Inflow Depth = 0.61" for 2-yr event  
Inflow = 1.78 cfs @ 12.06 hrs, Volume= 4,403 cf  
Outflow = 1.71 cfs @ 12.07 hrs, Volume= 4,403 cf, Atten= 4%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.63 fps, Min. Travel Time= 0.6 min

Avg. Velocity = 0.78 fps, Avg. Travel Time= 1.9 min

Peak Storage= 59 cf @ 12.06 hrs

Average Depth at Peak Storage= 0.27'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 21.64 cfs

2.00' x 1.00' deep channel, n= 0.050

Side Slope Z-value= 2.0 '/' Top Width= 6.00'

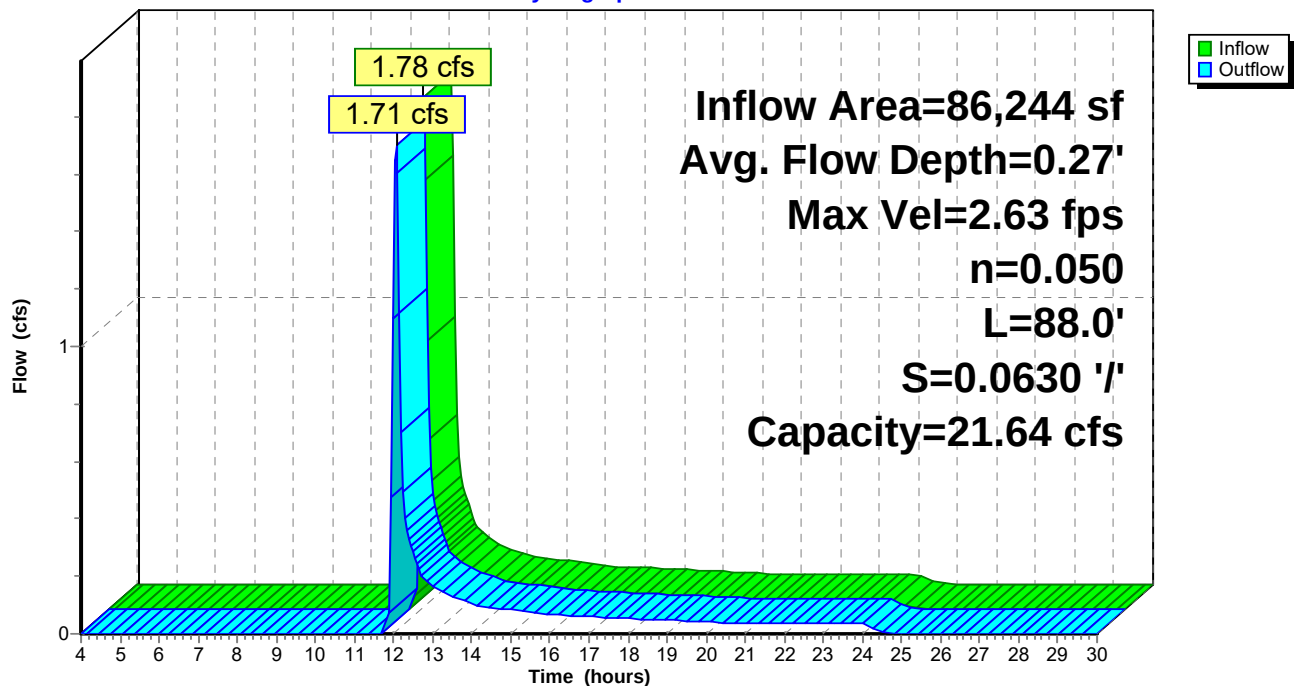
Length= 88.0' Slope= 0.0630 '/'

Inlet Invert= 0.00', Outlet Invert= -5.54'



## Reach 14R: Channel 8

Hydrograph



**MLV 505LD86\_Channels REV 2 Phase 1***Type II 24-hr 10-yr Rainfall=4.74"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                               |                                                                                                                                                               |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment3S: CC-3</b>   | Runoff Area=24,835 sf 29.80% Impervious Runoff Depth=1.55"<br>Tc=5.0 min CN=66 Runoff=1.58 cfs 3,214 cf                                                       |
| <b>Subcatchment4S: CC-4</b>   | Runoff Area=2,032 sf 0.00% Impervious Runoff Depth=2.49"<br>Tc=5.0 min CN=78 Runoff=0.21 cfs 422 cf                                                           |
| <b>Subcatchment7S: CC-7</b>   | Runoff Area=83,908 sf 13.34% Impervious Runoff Depth=1.48"<br>Tc=5.0 min CN=65 Runoff=5.06 cfs 10,370 cf                                                      |
| <b>Subcatchment8S: CC-8</b>   | Runoff Area=2,336 sf 0.00% Impervious Runoff Depth=0.00"<br>Tc=5.0 min CN=30 Runoff=0.00 cfs 0 cf                                                             |
| <b>Subcatchment15S: CC-10</b> | Runoff Area=5,374 sf 51.53% Impervious Runoff Depth=2.24"<br>Tc=5.0 min CN=75 Runoff=0.50 cfs 1,003 cf                                                        |
| <b>Reach 6R: Channel 4</b>    | Avg. Flow Depth=0.51' Max Vel=2.77 fps Inflow=1.78 cfs 3,636 cf<br>n=0.067 L=63.0' S=0.0800 '/ Capacity=3.42 cfs Outflow=1.74 cfs 3,636 cf                    |
| <b>Reach 10R: Channel 7</b>   | Avg. Flow Depth=0.31' Max Vel=3.37 fps Inflow=5.06 cfs 10,370 cf<br>n=0.055 L=395.0' S=0.0910 '/ Capacity=38.86 cfs Outflow=4.60 cfs 10,370 cf                |
| <b>Reach 13R: Culvert #3</b>  | Avg. Flow Depth=0.71' Max Vel=7.63 fps Inflow=4.60 cfs 10,370 cf<br>12.0" Round Pipe n=0.012 L=26.0' S=0.0192 '/ Capacity=5.35 cfs Outflow=4.58 cfs 10,370 cf |
| <b>Reach 14R: Channel 8</b>   | Avg. Flow Depth=0.45' Max Vel=3.50 fps Inflow=4.58 cfs 10,370 cf<br>n=0.050 L=88.0' S=0.0630 '/ Capacity=21.64 cfs Outflow=4.51 cfs 10,370 cf                 |

**Total Runoff Area = 118,485 sf Runoff Volume = 15,009 cf Average Runoff Depth = 1.52"**  
**81.97% Pervious = 97,118 sf 18.03% Impervious = 21,367 sf**

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Type II 24-hr 10-yr Rainfall=4.74"

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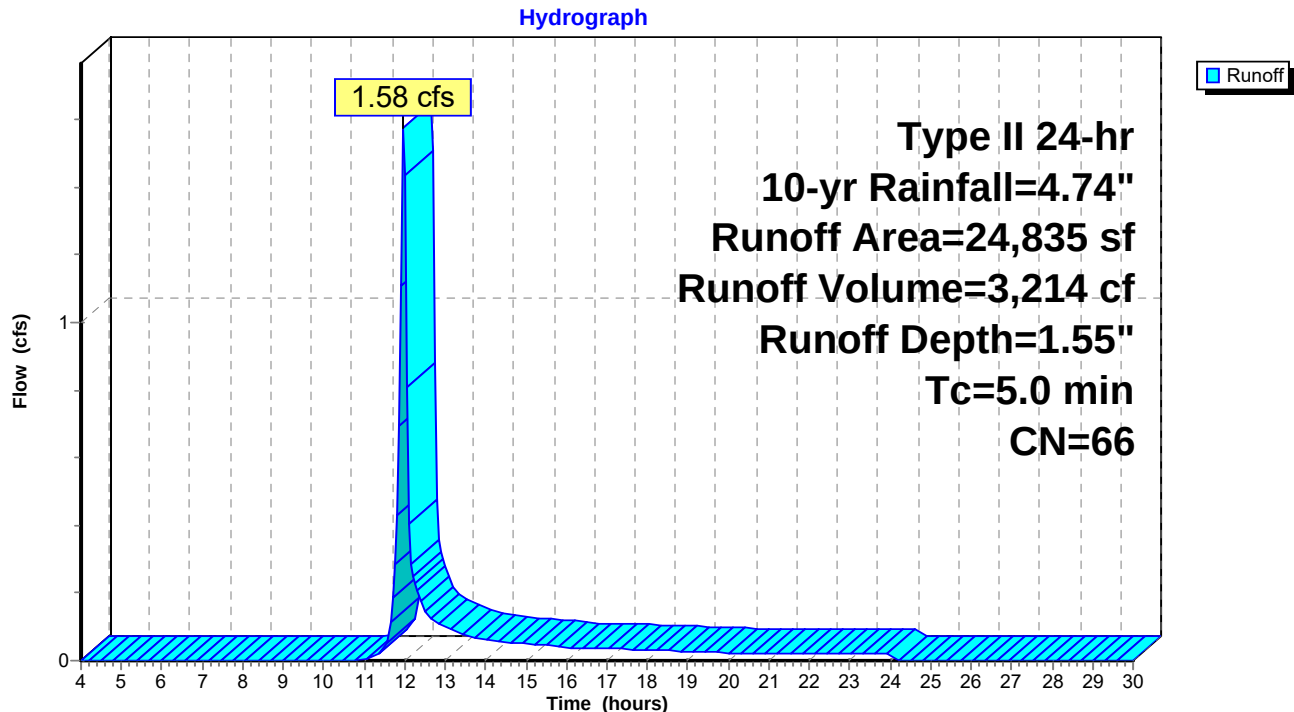
**Summary for Subcatchment 3S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.58 cfs @ 11.96 hrs, Volume= 3,214 cf, Depth= 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 8,181     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 2,351     | 98 | Paved parking, HSG D      |
| 24,835    | 66 | Weighted Average          |
| 17,433    |    | 70.20% Pervious Area      |
| 7,402     |    | 29.80% Impervious Area    |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 3S: CC-3**

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**Summary for Subcatchment 4S: CC-4**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.21 cfs @ 11.96 hrs, Volume= 422 cf, Depth= 2.49"

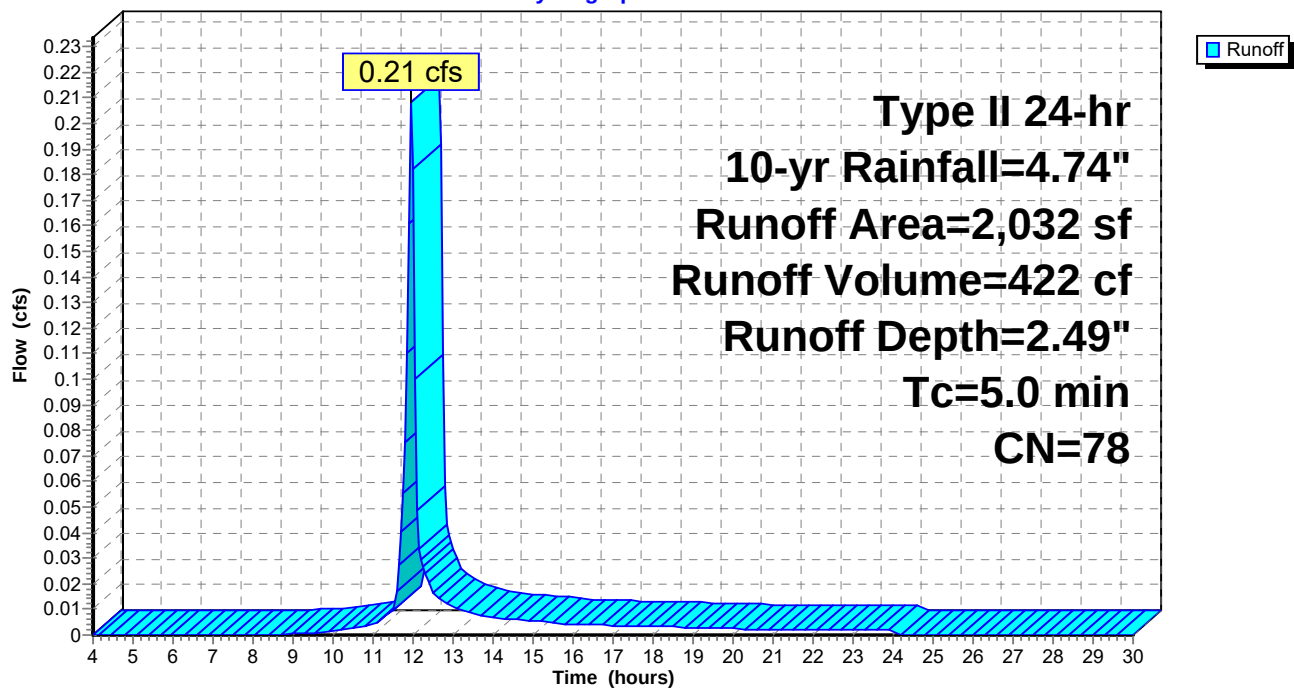
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,032     | 78 | Meadow, non-grazed, HSG D |
| 2,032     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 4S: CC-4**

Hydrograph





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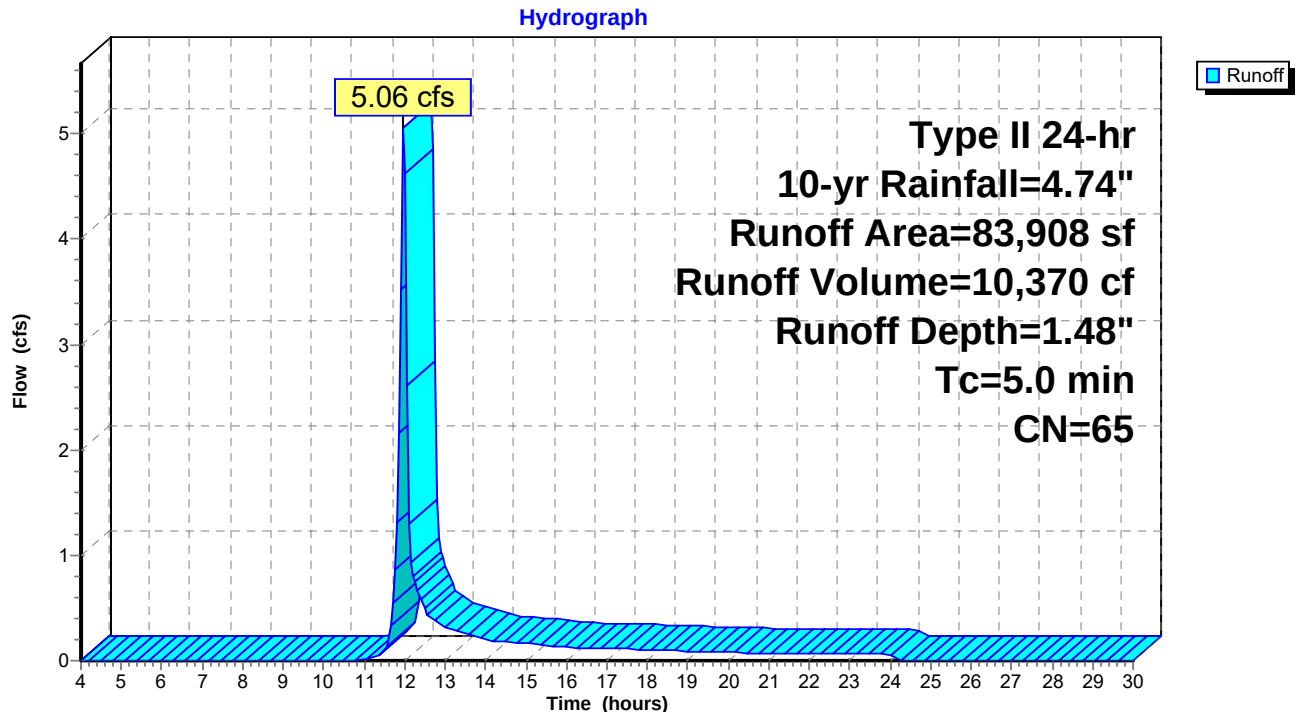
**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 5.06 cfs @ 11.97 hrs, Volume= 10,370 cf, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 26,651    | 30 | Meadow, non-grazed, HSG A |
| 46,061    | 78 | Meadow, non-grazed, HSG D |
| 5,943     | 98 | Paved parking, HSG A      |
| 5,253     | 98 | Paved parking, HSG D      |
| 83,908    | 65 | Weighted Average          |
| 72,712    |    | 86.66% Pervious Area      |
| 11,196    |    | 13.34% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

**Summary for Subcatchment 8S: CC-8**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.00 cfs @ 23.98 hrs, Volume= 0 cf, Depth= 0.00"

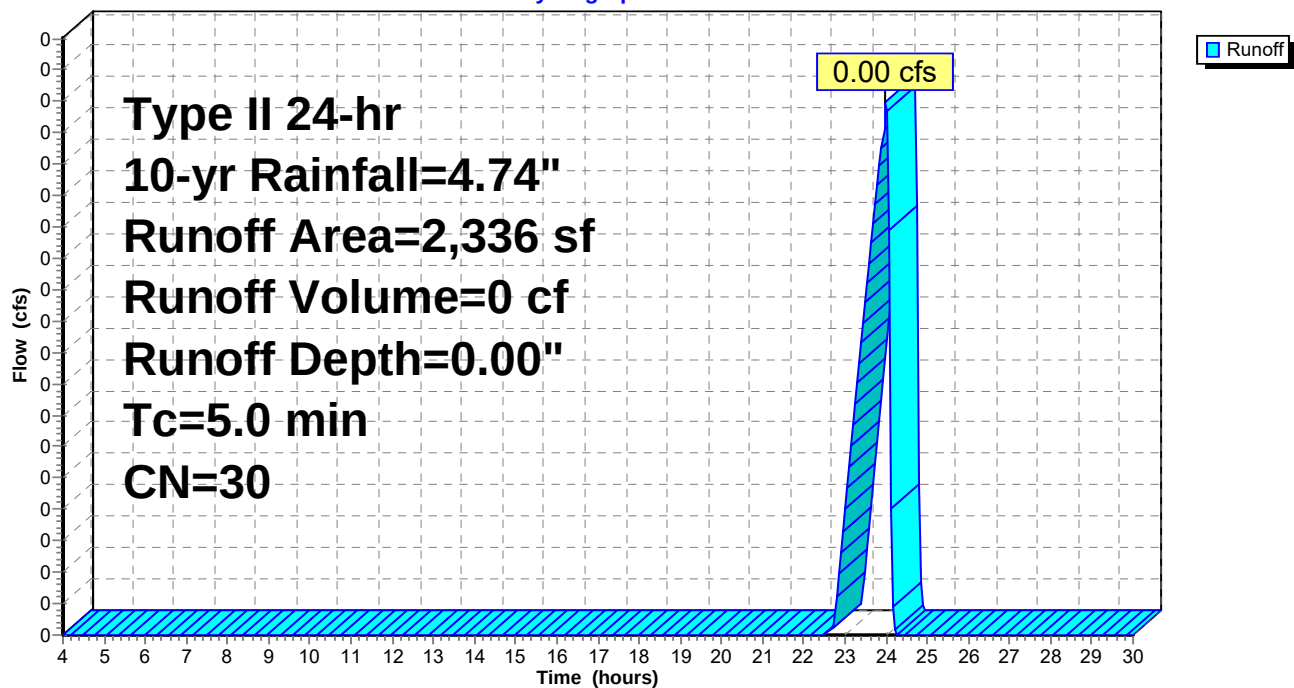
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,336     | 30 | Meadow, non-grazed, HSG A |
| 2,336     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 8S: CC-8**

Hydrograph



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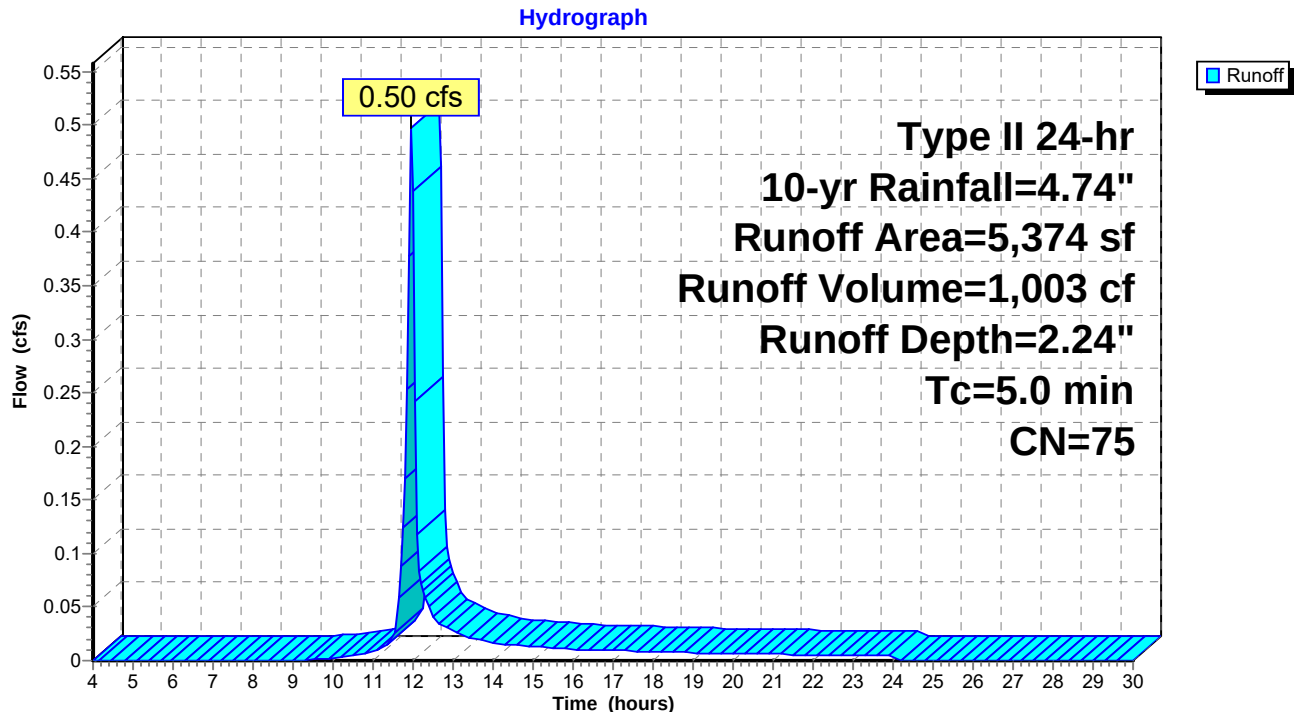
**Summary for Subcatchment 15S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.50 cfs @ 11.96 hrs, Volume= 1,003 cf, Depth= 2.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,482     | 30 | Meadow, non-grazed, HSG A |
| 1,123     | 78 | Meadow, non-grazed, HSG D |
| 1,308     | 98 | Paved parking, HSG A      |
| 1,461     | 98 | Paved parking, HSG D      |
| 5,374     | 75 | Weighted Average          |
| 2,605     |    | 48.47% Pervious Area      |
| 2,769     |    | 51.53% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 15S: CC-10**

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Type II 24-hr 10-yr Rainfall=4.74"

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## Summary for Reach 6R: Channel 4

Inflow Area = 26,867 sf, 27.55% Impervious, Inflow Depth = 1.62" for 10-yr event  
Inflow = 1.78 cfs @ 11.96 hrs, Volume= 3,636 cf  
Outflow = 1.74 cfs @ 11.98 hrs, Volume= 3,636 cf, Atten= 2%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
Max. Velocity= 2.77 fps, Min. Travel Time= 0.4 min  
Avg. Velocity= 0.74 fps, Avg. Travel Time= 1.4 min

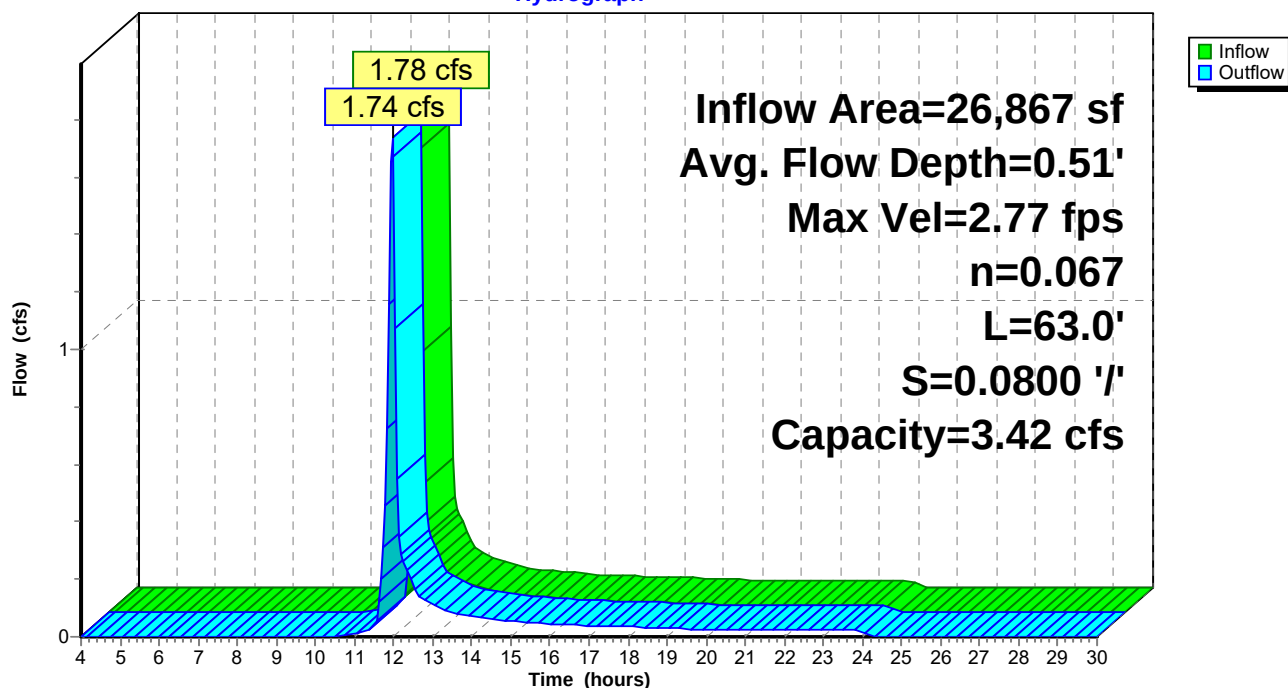
Peak Storage= 40 cf @ 11.97 hrs  
Average Depth at Peak Storage= 0.51'  
Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 3.42 cfs

1.00' x 0.75' deep channel, n= 0.067  
Side Slope Z-value= 0.5 '/' Top Width= 1.75'  
Length= 63.0' Slope= 0.0800 '/'  
Inlet Invert= 977.00', Outlet Invert= 971.96'



## Reach 6R: Channel 4

Hydrograph



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Type II 24-hr 10-yr Rainfall=4.74"

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## Summary for Reach 10R: Channel 7

[65] Warning: Inlet elevation not specified

Inflow Area = 83,908 sf, 13.34% Impervious, Inflow Depth = 1.48" for 10-yr event  
Inflow = 5.06 cfs @ 11.97 hrs, Volume= 10,370 cf  
Outflow = 4.60 cfs @ 12.02 hrs, Volume= 10,370 cf, Atten= 9%, Lag= 3.4 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.37 fps, Min. Travel Time= 2.0 min

Avg. Velocity= 0.85 fps, Avg. Travel Time= 7.8 min

Peak Storage= 570 cf @ 11.99 hrs

Average Depth at Peak Storage= 0.31'

Bank-Full Depth= 1.00' Flow Area= 6.0 sf, Capacity= 38.86 cfs

4.00' x 1.00' deep channel, n= 0.055

Side Slope Z-value= 2.0 '/' Top Width= 8.00'

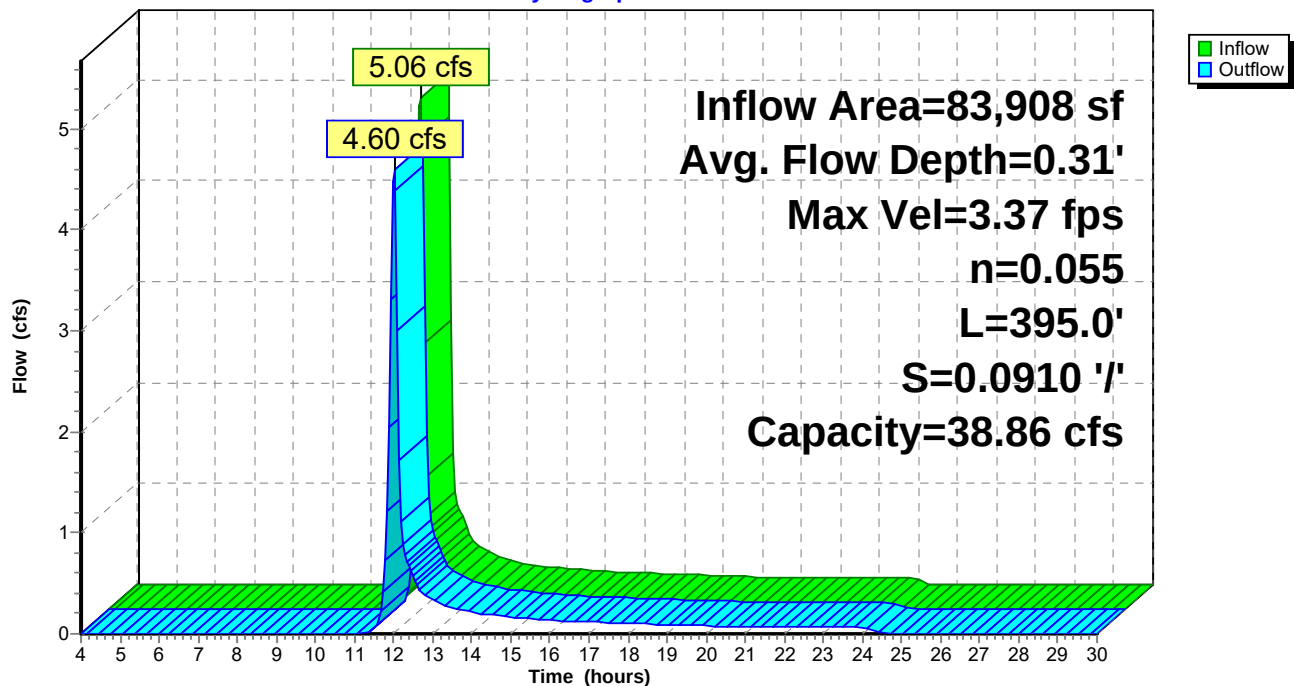
Length= 395.0' Slope= 0.0910 '/'

Inlet Invert= 0.00', Outlet Invert= -35.95'



## Reach 10R: Channel 7

Hydrograph



## MLV 505LD86\_Channels REV 2 Phase 1

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Type II 24-hr 10-yr Rainfall=4.74"

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### Summary for Reach 13R: Culvert #3

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 83,908 sf, 13.34% Impervious, Inflow Depth = 1.48" for 10-yr event  
Inflow = 4.60 cfs @ 12.02 hrs, Volume= 10,370 cf  
Outflow = 4.58 cfs @ 12.02 hrs, Volume= 10,370 cf, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 7.63 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 2.64 fps, Avg. Travel Time= 0.2 min

Peak Storage= 16 cf @ 12.02 hrs

Average Depth at Peak Storage= 0.71'

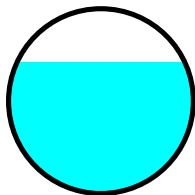
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.35 cfs

12.0" Round Pipe

n= 0.012

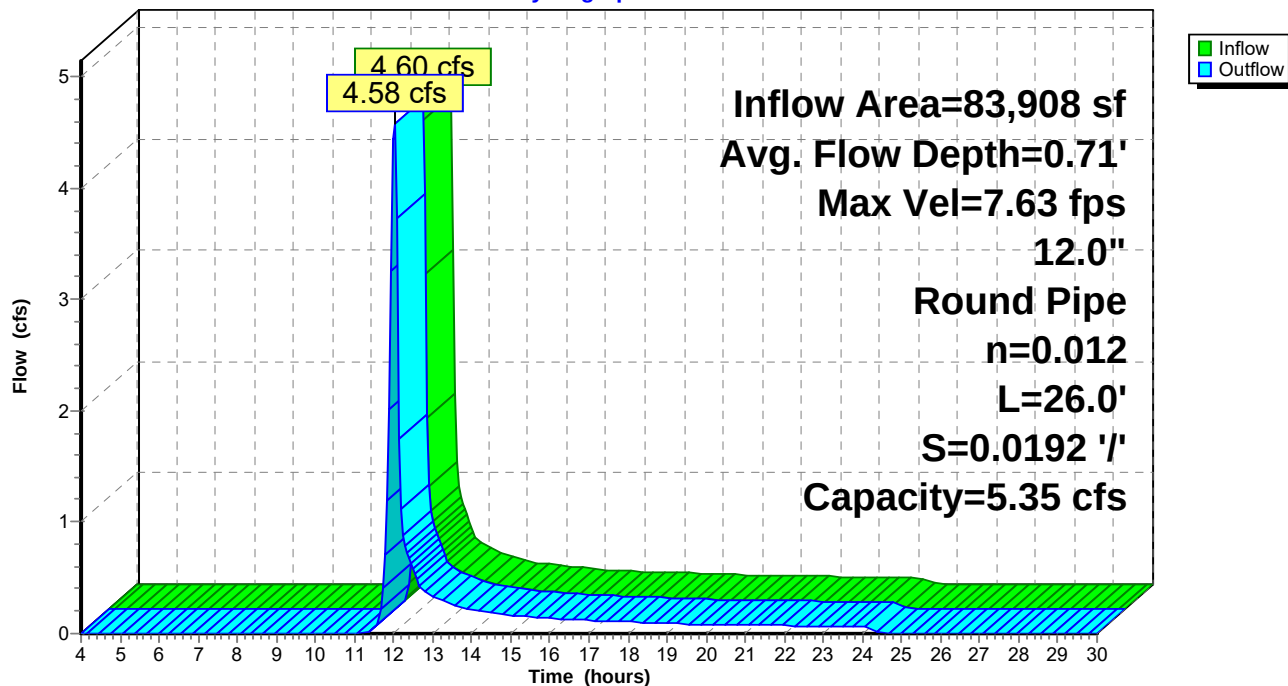
Length= 26.0' Slope= 0.0192 '/'

Inlet Invert= 927.00', Outlet Invert= 926.50'



### Reach 13R: Culvert #3

Hydrograph



# MLV 505LD86\_Channels REV 2 Phase 1

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Type II 24-hr 10-yr Rainfall=4.74"

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## Summary for Reach 14R: Channel 8

[65] Warning: Inlet elevation not specified

Inflow Area = 86,244 sf, 12.98% Impervious, Inflow Depth = 1.44" for 10-yr event  
Inflow = 4.58 cfs @ 12.02 hrs, Volume= 10,370 cf  
Outflow = 4.51 cfs @ 12.04 hrs, Volume= 10,370 cf, Atten= 1%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.50 fps, Min. Travel Time= 0.4 min

Avg. Velocity = 0.99 fps, Avg. Travel Time= 1.5 min

Peak Storage= 115 cf @ 12.03 hrs

Average Depth at Peak Storage= 0.45'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 21.64 cfs

2.00' x 1.00' deep channel, n= 0.050

Side Slope Z-value= 2.0 '/' Top Width= 6.00'

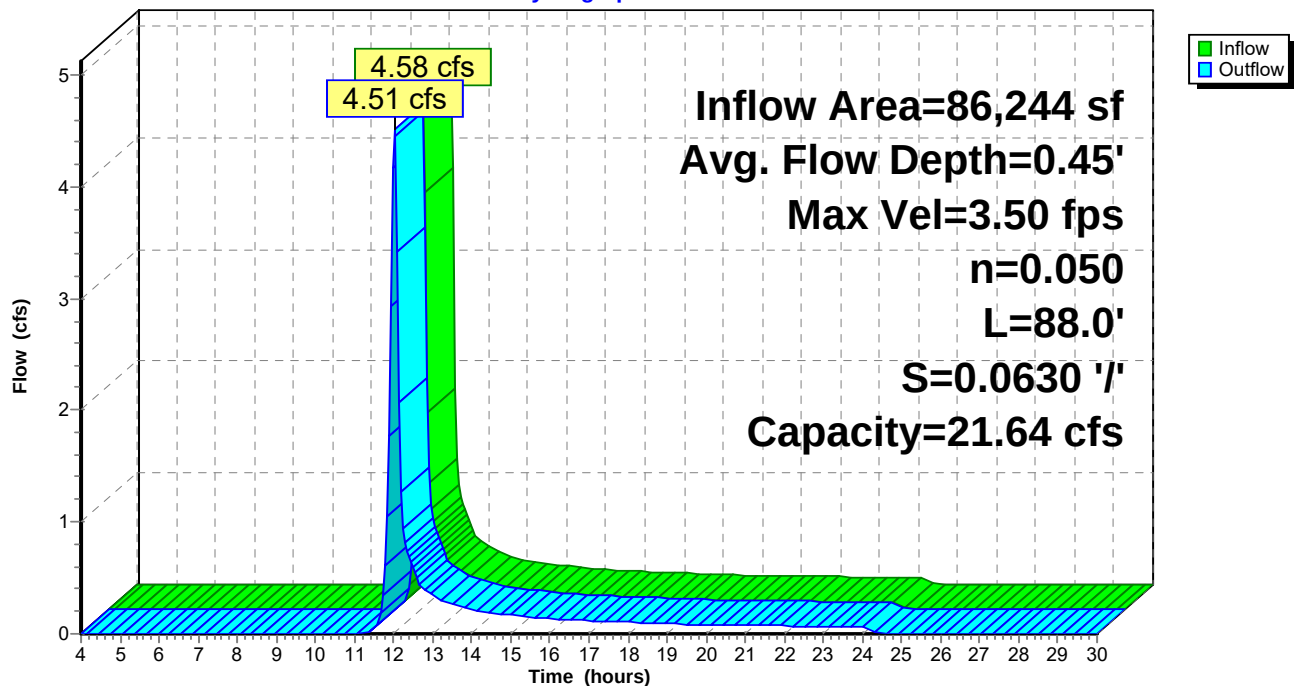
Length= 88.0' Slope= 0.0630 '/'

Inlet Invert= 0.00', Outlet Invert= -5.54'



## Reach 14R: Channel 8

Hydrograph



**MLV 505LD86\_Channels REV 2 Phase 1***Type II 24-hr 25-yr Rainfall=5.85"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                                                                                                                                                                  |                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment3S: CC-3</b>                                                                                                                                      | Runoff Area=24,835 sf 29.80% Impervious Runoff Depth=2.33"<br>Tc=5.0 min CN=66 Runoff=2.39 cfs 4,821 cf                                                       |
| <b>Subcatchment4S: CC-4</b>                                                                                                                                      | Runoff Area=2,032 sf 0.00% Impervious Runoff Depth=3.45"<br>Tc=5.0 min CN=78 Runoff=0.29 cfs 584 cf                                                           |
| <b>Subcatchment7S: CC-7</b>                                                                                                                                      | Runoff Area=83,908 sf 13.34% Impervious Runoff Depth=2.24"<br>Tc=5.0 min CN=65 Runoff=7.77 cfs 15,683 cf                                                      |
| <b>Subcatchment8S: CC-8</b>                                                                                                                                      | Runoff Area=2,336 sf 0.00% Impervious Runoff Depth=0.06"<br>Tc=5.0 min CN=30 Runoff=0.00 cfs 11 cf                                                            |
| <b>Subcatchment15S: CC-10</b>                                                                                                                                    | Runoff Area=5,374 sf 51.53% Impervious Runoff Depth=3.15"<br>Tc=5.0 min CN=75 Runoff=0.70 cfs 1,413 cf                                                        |
| <b>Reach 6R: Channel 4</b>                                                                                                                                       | Avg. Flow Depth=0.64' Max Vel=3.10 fps Inflow=2.68 cfs 5,405 cf<br>n=0.067 L=63.0' S=0.0800 '/ Capacity=3.42 cfs Outflow=2.59 cfs 5,405 cf                    |
| <b>Reach 10R: Channel 7</b>                                                                                                                                      | Avg. Flow Depth=0.40' Max Vel=3.89 fps Inflow=7.77 cfs 15,683 cf<br>n=0.055 L=395.0' S=0.0910 '/ Capacity=38.86 cfs Outflow=7.13 cfs 15,683 cf                |
| <b>Reach 13R: Culvert #3</b>                                                                                                                                     | Avg. Flow Depth=1.00' Max Vel=7.72 fps Inflow=7.13 cfs 15,683 cf<br>12.0" Round Pipe n=0.012 L=26.0' S=0.0192 '/ Capacity=5.35 cfs Outflow=5.75 cfs 15,683 cf |
| <b>Reach 14R: Channel 8</b>                                                                                                                                      | Avg. Flow Depth=0.50' Max Vel=3.72 fps Inflow=5.75 cfs 15,694 cf<br>n=0.050 L=88.0' S=0.0630 '/ Capacity=21.64 cfs Outflow=5.51 cfs 15,694 cf                 |
| <b>Total Runoff Area = 118,485 sf Runoff Volume = 22,512 cf Average Runoff Depth = 2.28"</b><br><b>81.97% Pervious = 97,118 sf 18.03% Impervious = 21,367 sf</b> |                                                                                                                                                               |



**MLV 505LD86\_Channels REV 2 Phase 1**

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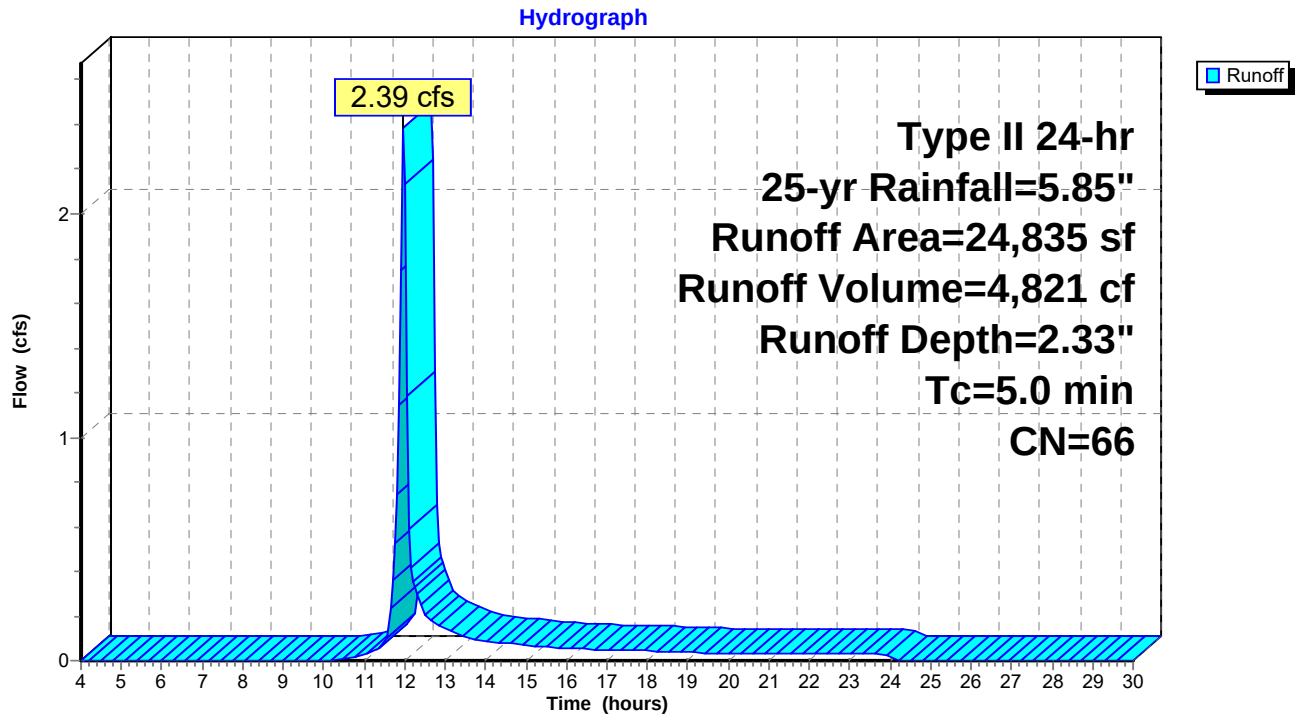
**Summary for Subcatchment 3S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 2.39 cfs @ 11.96 hrs, Volume= 4,821 cf, Depth= 2.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 8,181     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 2,351     | 98 | Paved parking, HSG D      |
| 24,835    | 66 | Weighted Average          |
| 17,433    |    | 70.20% Pervious Area      |
| 7,402     |    | 29.80% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 3S: CC-3**

**Summary for Subcatchment 4S: CC-4**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.29 cfs @ 11.96 hrs, Volume= 584 cf, Depth= 3.45"

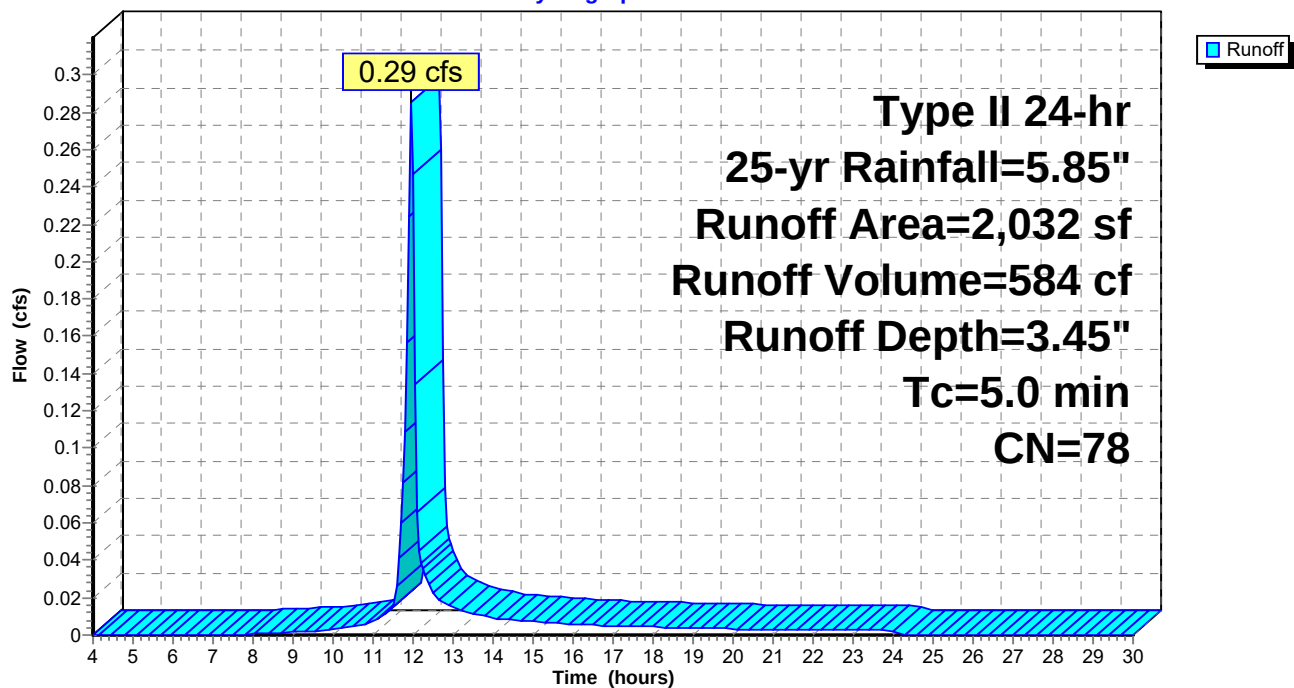
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,032     | 78 | Meadow, non-grazed, HSG D |
| 2,032     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 4S: CC-4**

Hydrograph



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Type II 24-hr 25-yr Rainfall=5.85"

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**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 7.77 cfs @ 11.96 hrs, Volume= 15,683 cf, Depth= 2.24"

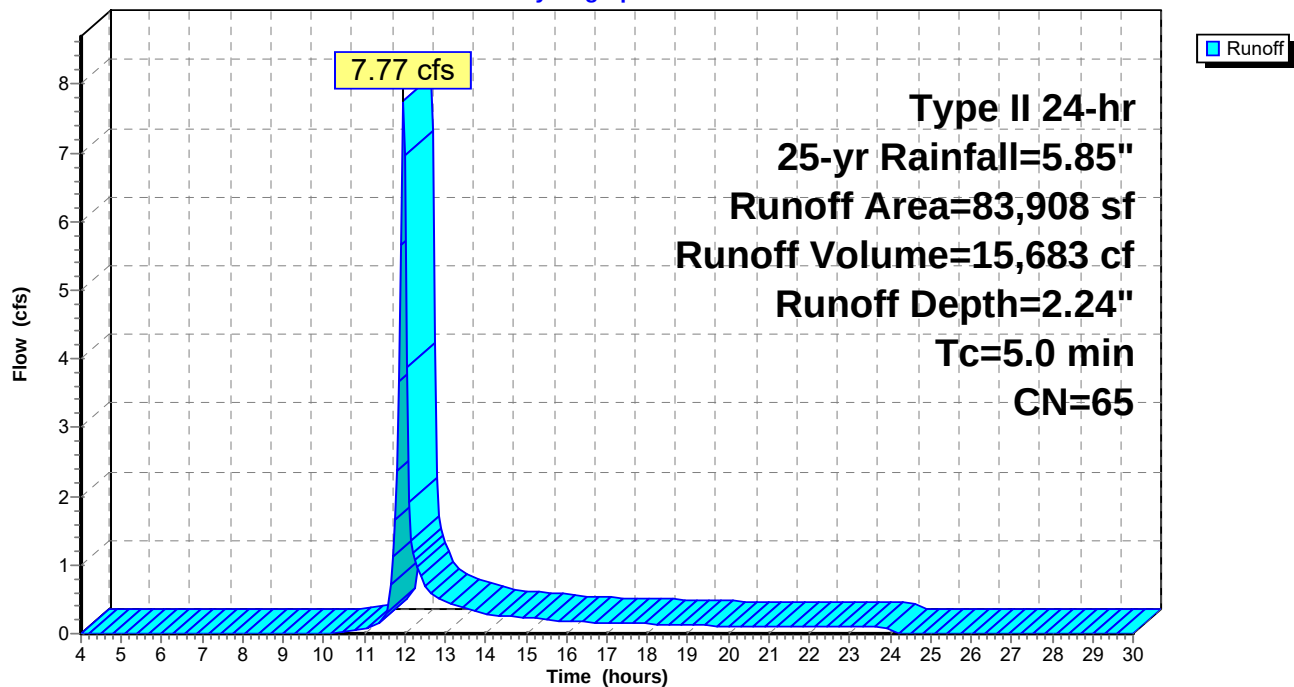
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

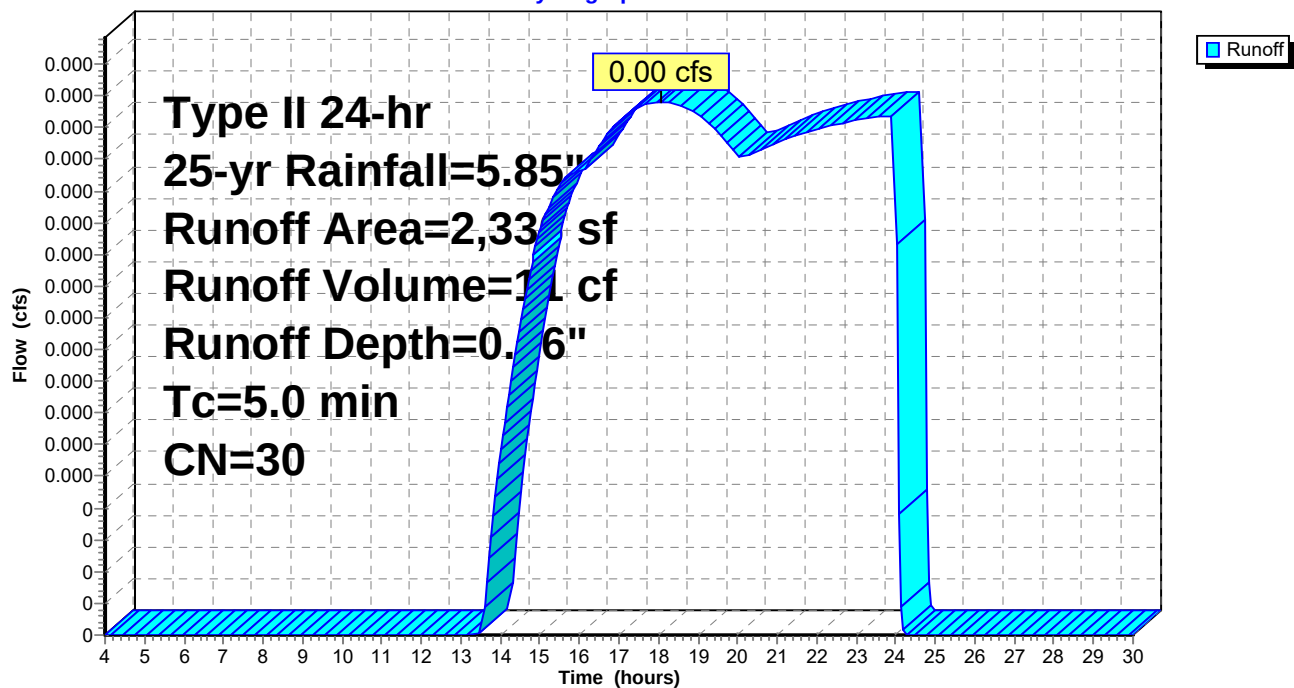
| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 26,651    | 30 | Meadow, non-grazed, HSG A |
| 46,061    | 78 | Meadow, non-grazed, HSG D |
| 5,943     | 98 | Paved parking, HSG A      |
| 5,253     | 98 | Paved parking, HSG D      |
| 83,908    | 65 | Weighted Average          |
| 72,712    |    | 86.66% Pervious Area      |
| 11,196    |    | 13.34% Impervious Area    |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

Hydrograph





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Type II 24-hr 25-yr Rainfall=5.85"

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**Summary for Subcatchment 15S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.70 cfs @ 11.96 hrs, Volume= 1,413 cf, Depth= 3.15"

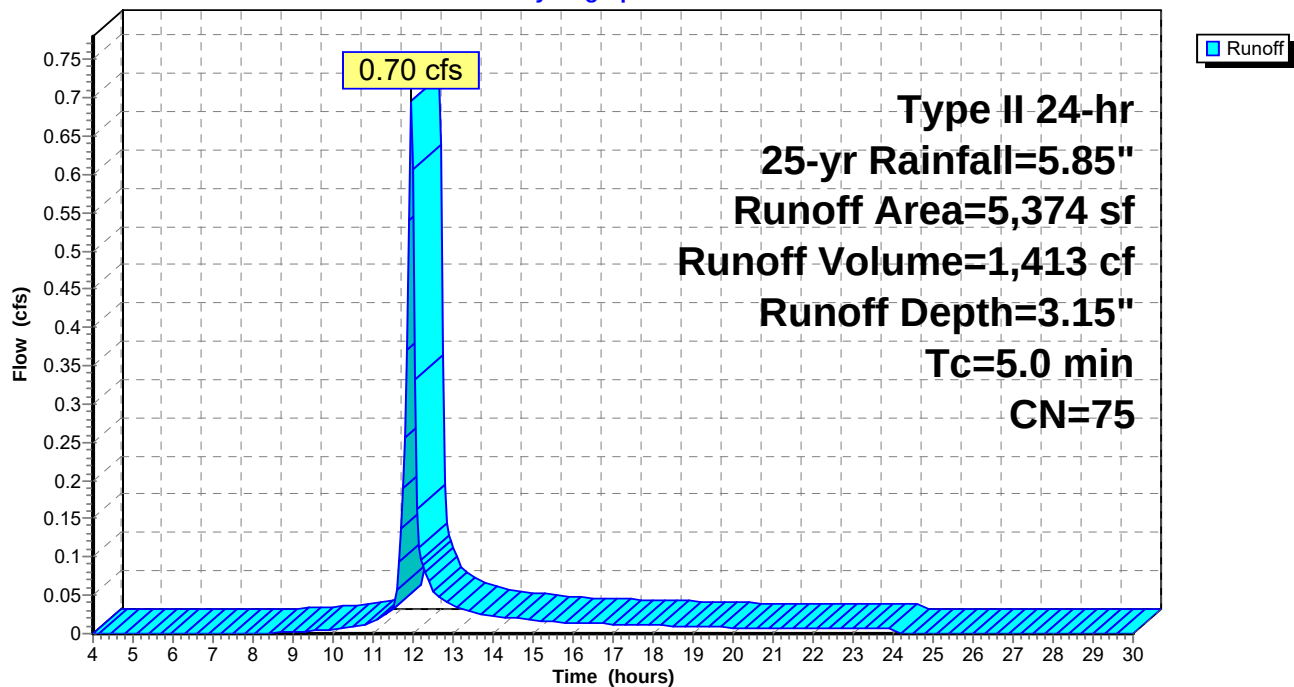
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,482     | 30 | Meadow, non-grazed, HSG A |
| 1,123     | 78 | Meadow, non-grazed, HSG D |
| 1,308     | 98 | Paved parking, HSG A      |
| 1,461     | 98 | Paved parking, HSG D      |
| 5,374     | 75 | Weighted Average          |
| 2,605     |    | 48.47% Pervious Area      |
| 2,769     |    | 51.53% Impervious Area    |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 15S: CC-10**

Hydrograph



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Type II 24-hr 25-yr Rainfall=5.85"

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## Summary for Reach 6R: Channel 4

Inflow Area = 26,867 sf, 27.55% Impervious, Inflow Depth = 2.41" for 25-yr event  
Inflow = 2.68 cfs @ 11.96 hrs, Volume= 5,405 cf  
Outflow = 2.59 cfs @ 11.97 hrs, Volume= 5,405 cf, Atten= 3%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
Max. Velocity= 3.10 fps, Min. Travel Time= 0.3 min  
Avg. Velocity= 0.81 fps, Avg. Travel Time= 1.3 min

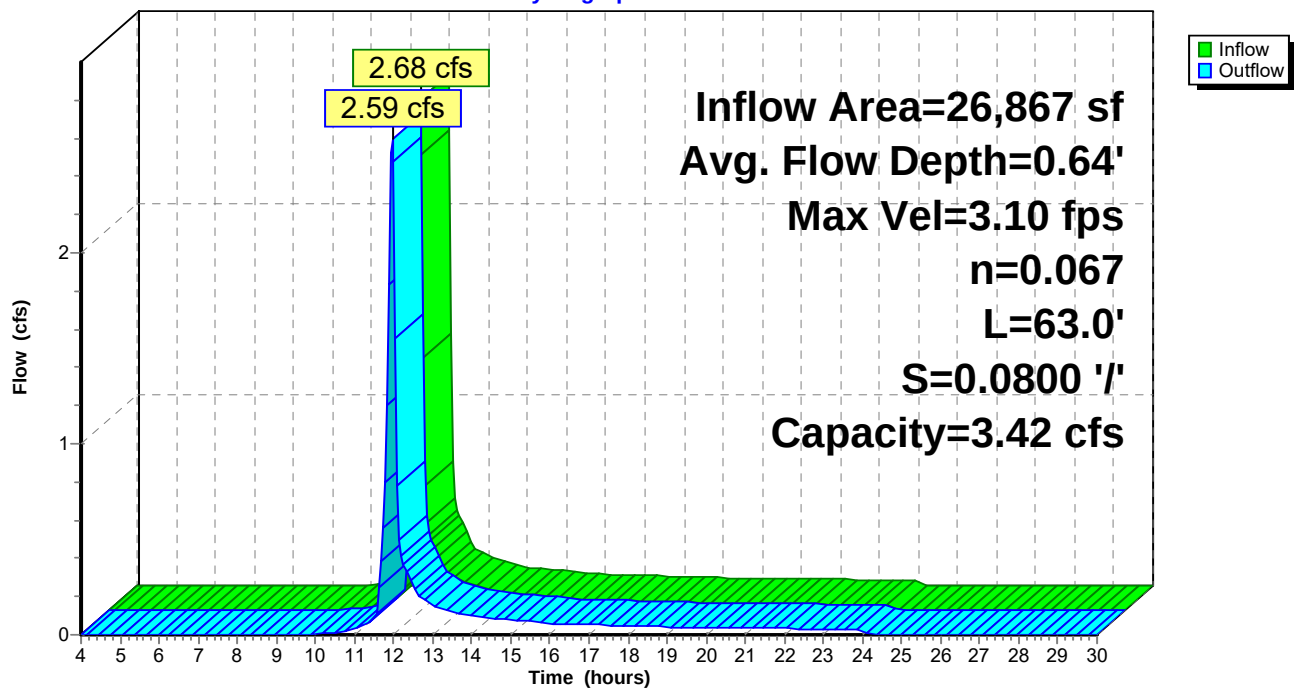
Peak Storage= 54 cf @ 11.97 hrs  
Average Depth at Peak Storage= 0.64'  
Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 3.42 cfs

1.00' x 0.75' deep channel, n= 0.067  
Side Slope Z-value= 0.5 '/' Top Width= 1.75'  
Length= 63.0' Slope= 0.0800 '/'  
Inlet Invert= 977.00', Outlet Invert= 971.96'



## Reach 6R: Channel 4

Hydrograph



# MLV 505LD86\_Channels REV 2 Phase 1

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Type II 24-hr 25-yr Rainfall=5.85"

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## Summary for Reach 10R: Channel 7

[65] Warning: Inlet elevation not specified

Inflow Area = 83,908 sf, 13.34% Impervious, Inflow Depth = 2.24" for 25-yr event  
Inflow = 7.77 cfs @ 11.96 hrs, Volume= 15,683 cf  
Outflow = 7.13 cfs @ 12.01 hrs, Volume= 15,683 cf, Atten= 8%, Lag= 2.8 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.89 fps, Min. Travel Time= 1.7 min

Avg. Velocity= 0.95 fps, Avg. Travel Time= 7.0 min

Peak Storage= 761 cf @ 11.98 hrs

Average Depth at Peak Storage= 0.40'

Bank-Full Depth= 1.00' Flow Area= 6.0 sf, Capacity= 38.86 cfs

4.00' x 1.00' deep channel, n= 0.055

Side Slope Z-value= 2.0 '/' Top Width= 8.00'

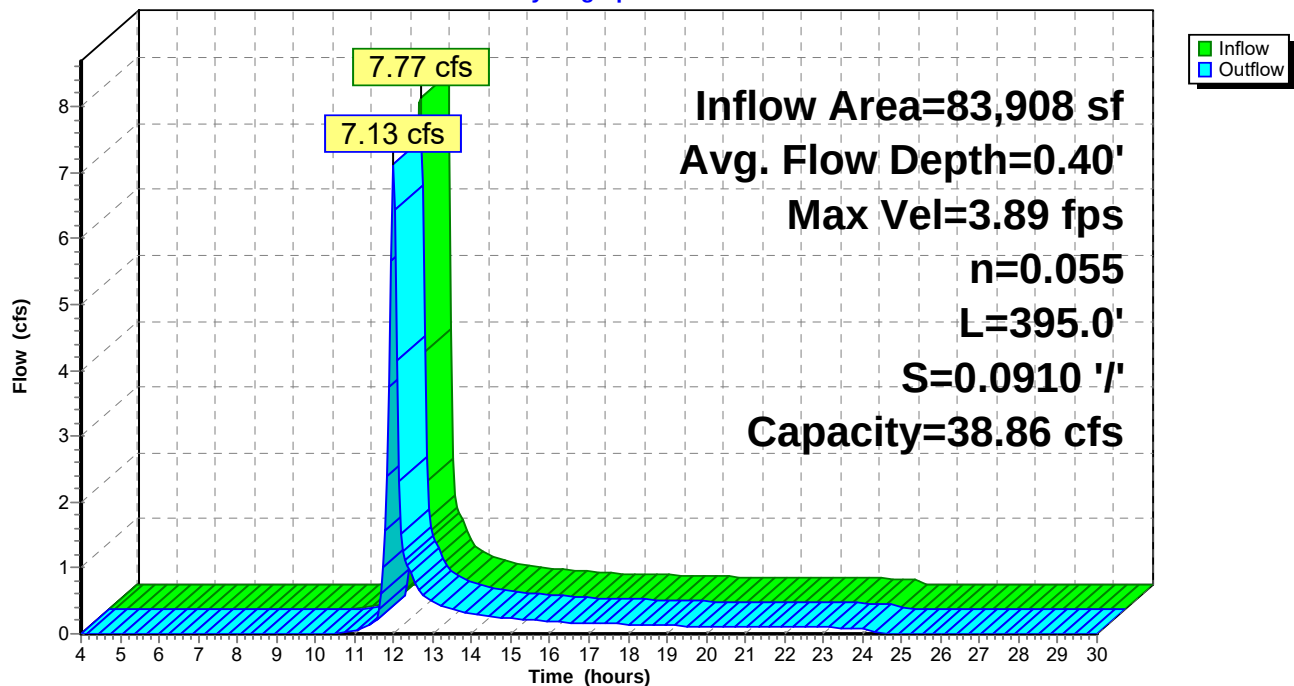
Length= 395.0' Slope= 0.0910 '/'

Inlet Invert= 0.00', Outlet Invert= -35.95'



## Reach 10R: Channel 7

### Hydrograph



### Summary for Reach 13R: Culvert #3

[52] Hint: Inlet/Outlet conditions not evaluated

[55] Hint: Peak inflow is 133% of Manning's capacity

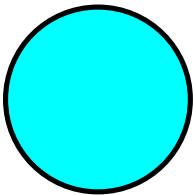
[76] Warning: Detained 510 cf (Pond w/culvert advised)

Inflow Area = 83,908 sf, 13.34% Impervious, Inflow Depth = 2.24" for 25-yr event  
Inflow = 7.13 cfs @ 12.01 hrs, Volume= 15,683 cf  
Outflow = 5.75 cfs @ 11.97 hrs, Volume= 15,683 cf, Atten= 19%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
Max. Velocity= 7.72 fps, Min. Travel Time= 0.1 min  
Avg. Velocity= 2.88 fps, Avg. Travel Time= 0.2 min

Peak Storage= 20 cf @ 12.00 hrs  
Average Depth at Peak Storage= 1.00'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.35 cfs

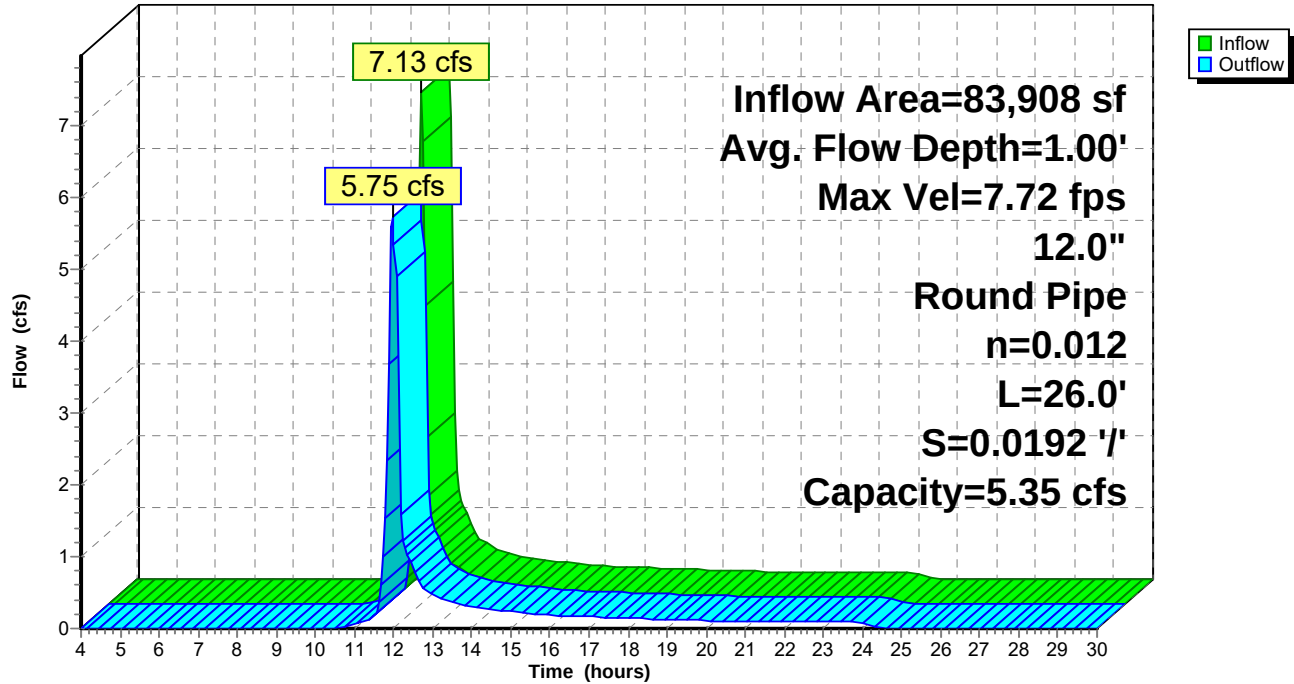
12.0" Round Pipe  
n= 0.012  
Length= 26.0' Slope= 0.0192 '/'  
Inlet Invert= 927.00', Outlet Invert= 926.50'





## Reach 13R: Culvert #3

Hydrograph



**Summary for Reach 14R: Channel 8**

[65] Warning: Inlet elevation not specified

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=1)

Inflow Area = 86,244 sf, 12.98% Impervious, Inflow Depth = 2.18" for 25-yr event  
Inflow = 5.75 cfs @ 11.97 hrs, Volume= 15,694 cf  
Outflow = 5.51 cfs @ 12.00 hrs, Volume= 15,694 cf, Atten= 4%, Lag= 1.8 min

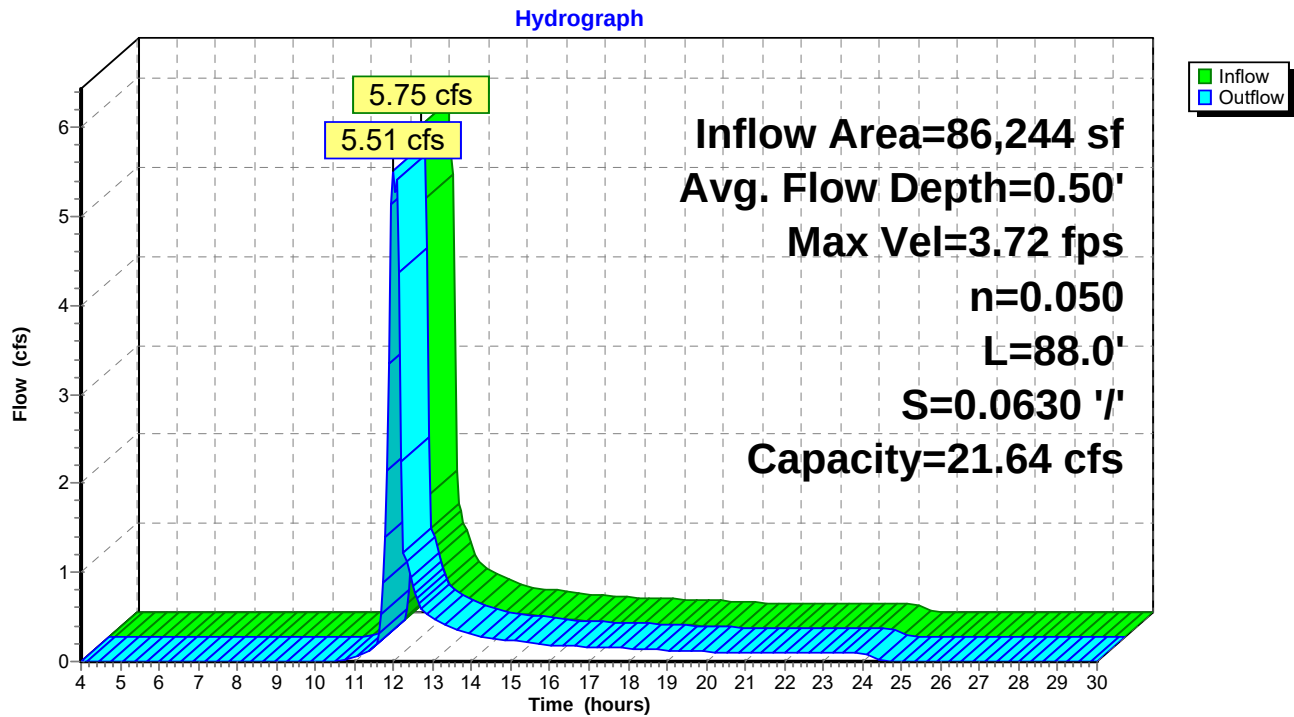
Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
Max. Velocity= 3.72 fps, Min. Travel Time= 0.4 min  
Avg. Velocity = 1.11 fps, Avg. Travel Time= 1.3 min

Peak Storage= 131 cf @ 12.00 hrs  
Average Depth at Peak Storage= 0.50'  
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 21.64 cfs

2.00' x 1.00' deep channel, n= 0.050  
Side Slope Z-value= 2.0 '/' Top Width= 6.00'  
Length= 88.0' Slope= 0.0630 '/'  
Inlet Invert= 0.00', Outlet Invert= -5.54'



## Reach 14R: Channel 8



**MLV 505LD86\_Channels REV 2 Phase 1***Type II 24-hr 50-yr Rainfall=6.87"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                               |                                                                                                                                                               |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment3S: CC-3</b>   | Runoff Area=24,835 sf 29.80% Impervious Runoff Depth=3.10"<br>Tc=5.0 min CN=66 Runoff=3.19 cfs 6,421 cf                                                       |
| <b>Subcatchment4S: CC-4</b>   | Runoff Area=2,032 sf 0.00% Impervious Runoff Depth=4.36"<br>Tc=5.0 min CN=78 Runoff=0.36 cfs 738 cf                                                           |
| <b>Subcatchment7S: CC-7</b>   | Runoff Area=83,908 sf 13.34% Impervious Runoff Depth=3.00"<br>Tc=5.0 min CN=65 Runoff=10.43 cfs 20,994 cf                                                     |
| <b>Subcatchment8S: CC-8</b>   | Runoff Area=2,336 sf 0.00% Impervious Runoff Depth=0.19"<br>Tc=5.0 min CN=30 Runoff=0.00 cfs 37 cf                                                            |
| <b>Subcatchment15S: CC-10</b> | Runoff Area=5,374 sf 51.53% Impervious Runoff Depth=4.04"<br>Tc=5.0 min CN=75 Runoff=0.88 cfs 1,807 cf                                                        |
| <b>Reach 6R: Channel 4</b>    | Avg. Flow Depth=0.76' Max Vel=3.33 fps Inflow=3.55 cfs 7,159 cf<br>n=0.067 L=63.0' S=0.0800 '/ Capacity=3.42 cfs Outflow=3.45 cfs 7,159 cf                    |
| <b>Reach 10R: Channel 7</b>   | Avg. Flow Depth=0.48' Max Vel=4.27 fps Inflow=10.43 cfs 20,994 cf<br>n=0.055 L=395.0' S=0.0910 '/ Capacity=38.86 cfs Outflow=9.65 cfs 20,994 cf               |
| <b>Reach 13R: Culvert #3</b>  | Avg. Flow Depth=1.00' Max Vel=7.76 fps Inflow=9.65 cfs 20,994 cf<br>12.0" Round Pipe n=0.012 L=26.0' S=0.0192 '/ Capacity=5.35 cfs Outflow=5.54 cfs 20,994 cf |
| <b>Reach 14R: Channel 8</b>   | Avg. Flow Depth=0.50' Max Vel=3.72 fps Inflow=5.54 cfs 21,031 cf<br>n=0.050 L=88.0' S=0.0630 '/ Capacity=21.64 cfs Outflow=5.50 cfs 21,031 cf                 |

**Total Runoff Area = 118,485 sf Runoff Volume = 29,997 cf Average Runoff Depth = 3.04"**  
**81.97% Pervious = 97,118 sf 18.03% Impervious = 21,367 sf**

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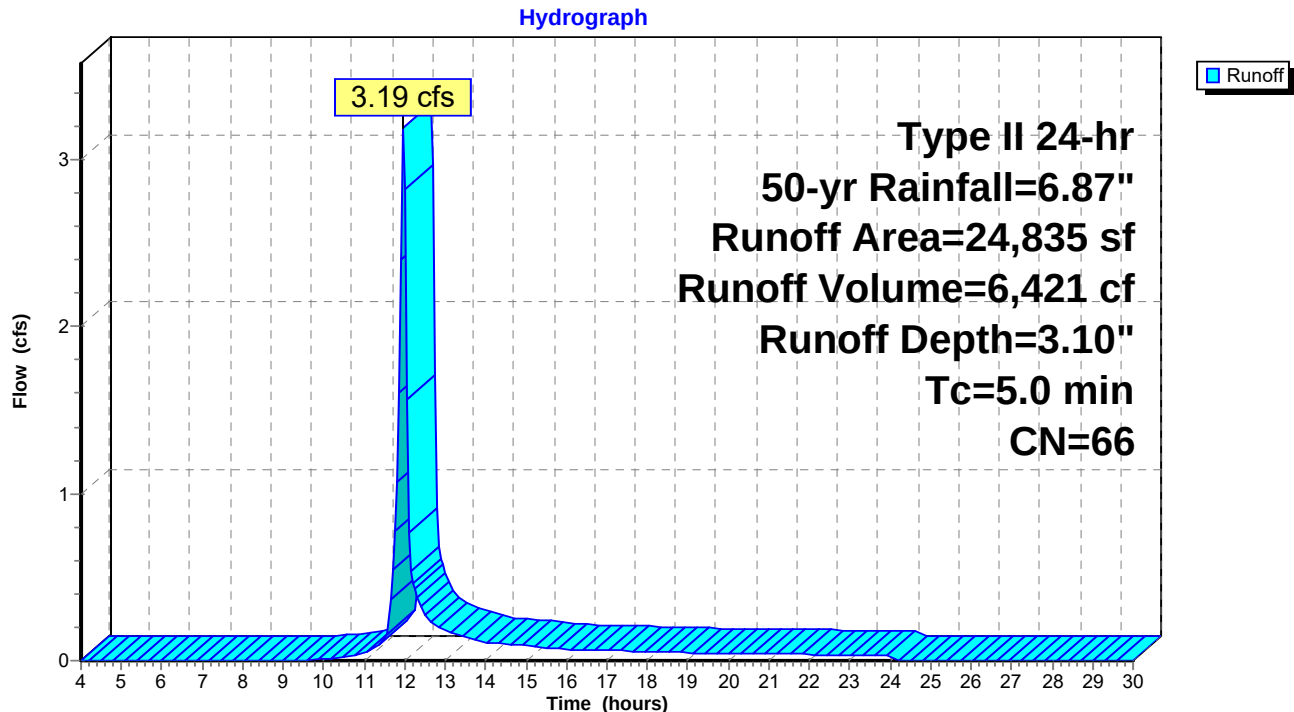
**Summary for Subcatchment 3S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 3.19 cfs @ 11.96 hrs, Volume= 6,421 cf, Depth= 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 8,181     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 2,351     | 98 | Paved parking, HSG D      |
| 24,835    | 66 | Weighted Average          |
| 17,433    |    | 70.20% Pervious Area      |
| 7,402     |    | 29.80% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 3S: CC-3**

**Summary for Subcatchment 4S: CC-4**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.36 cfs @ 11.95 hrs, Volume= 738 cf, Depth= 4.36"

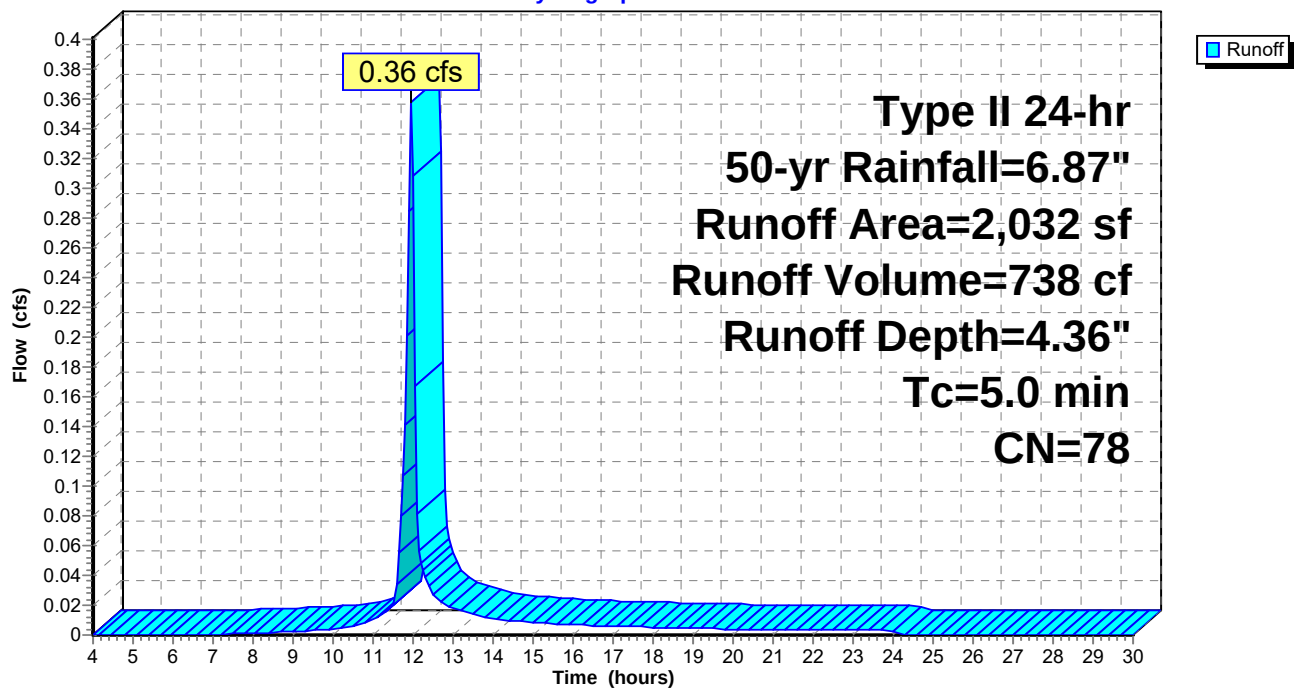
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,032     | 78 | Meadow, non-grazed, HSG D |
| 2,032     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 4S: CC-4**

Hydrograph



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Type II 24-hr 50-yr Rainfall=6.87"

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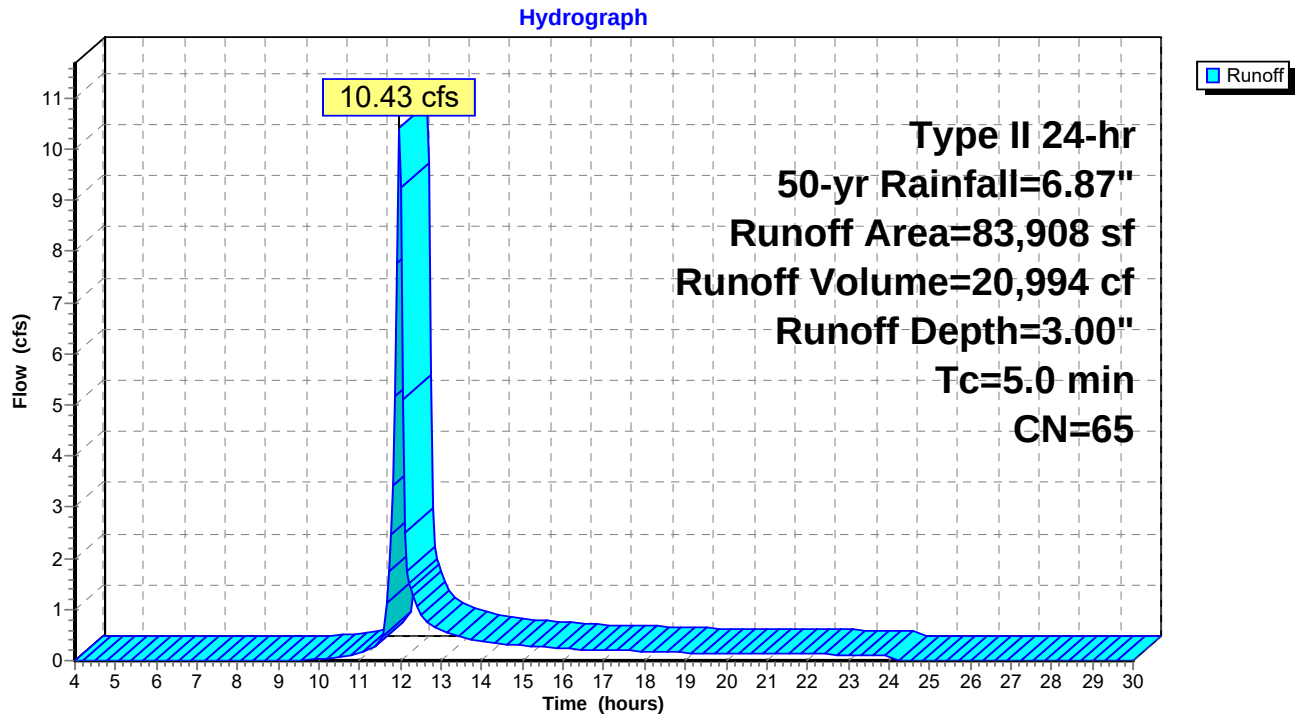
**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 10.43 cfs @ 11.96 hrs, Volume= 20,994 cf, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 26,651    | 30 | Meadow, non-grazed, HSG A |
| 46,061    | 78 | Meadow, non-grazed, HSG D |
| 5,943     | 98 | Paved parking, HSG A      |
| 5,253     | 98 | Paved parking, HSG D      |
| 83,908    | 65 | Weighted Average          |
| 72,712    |    | 86.66% Pervious Area      |
| 11,196    |    | 13.34% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

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Type II 24-hr 50-yr Rainfall=6.87"

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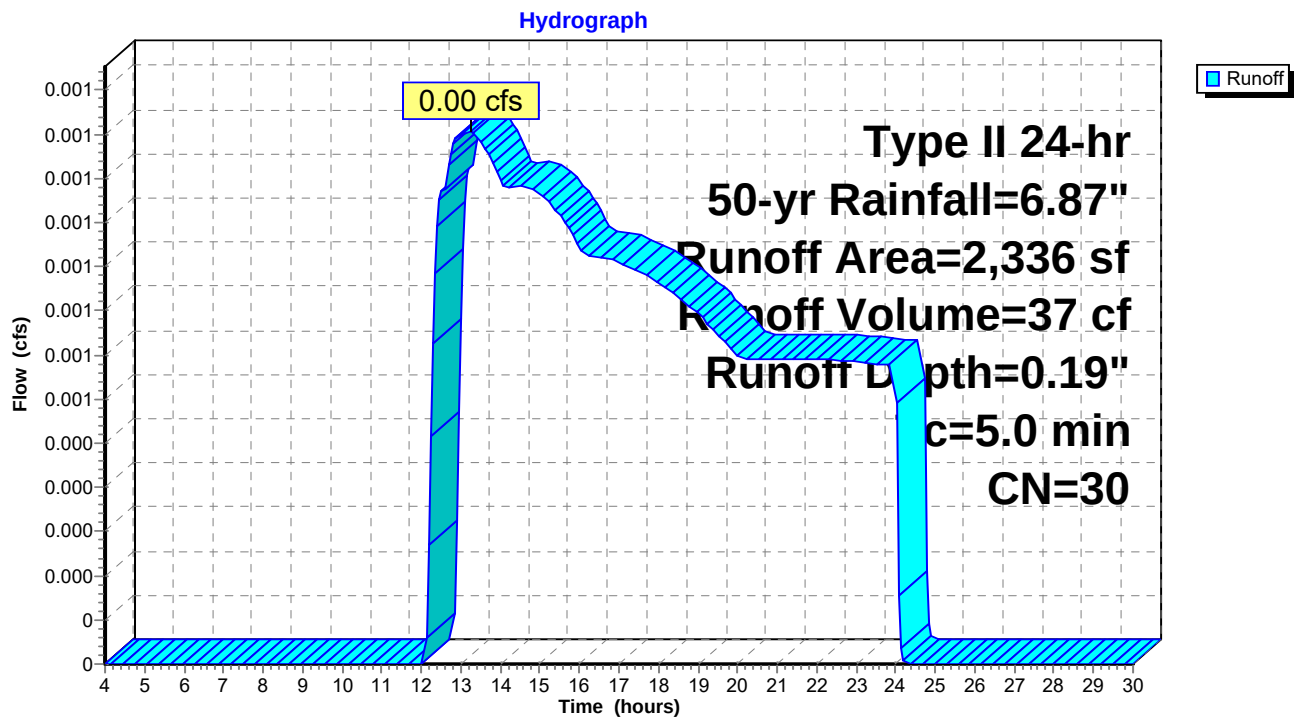
**Summary for Subcatchment 8S: CC-8**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.00 cfs @ 13.28 hrs, Volume= 37 cf, Depth= 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,336     | 30 | Meadow, non-grazed, HSG A |
| 2,336     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 8S: CC-8**



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Type II 24-hr 50-yr Rainfall=6.87"

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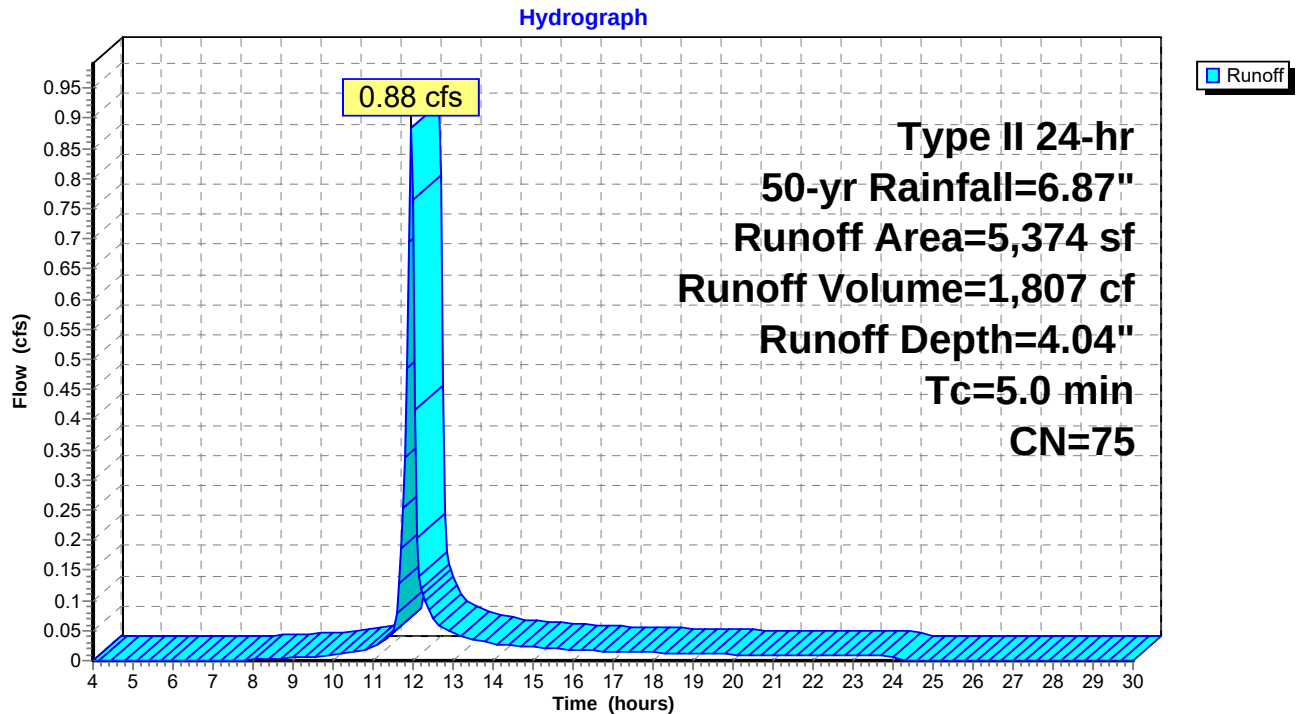
**Summary for Subcatchment 15S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.88 cfs @ 11.96 hrs, Volume= 1,807 cf, Depth= 4.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,482     | 30 | Meadow, non-grazed, HSG A |
| 1,123     | 78 | Meadow, non-grazed, HSG D |
| 1,308     | 98 | Paved parking, HSG A      |
| 1,461     | 98 | Paved parking, HSG D      |
| 5,374     | 75 | Weighted Average          |
| 2,605     |    | 48.47% Pervious Area      |
| 2,769     |    | 51.53% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 15S: CC-10**

**Summary for Reach 6R: Channel 4**

[91] Warning: Storage range exceeded by 0.01'

[55] Hint: Peak inflow is 104% of Manning's capacity

Inflow Area = 26,867 sf, 27.55% Impervious, Inflow Depth = 3.20" for 50-yr event  
Inflow = 3.55 cfs @ 11.96 hrs, Volume= 7,159 cf  
Outflow = 3.45 cfs @ 11.97 hrs, Volume= 7,159 cf, Atten= 3%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
Max. Velocity= 3.33 fps, Min. Travel Time= 0.3 min  
Avg. Velocity= 0.87 fps, Avg. Travel Time= 1.2 min

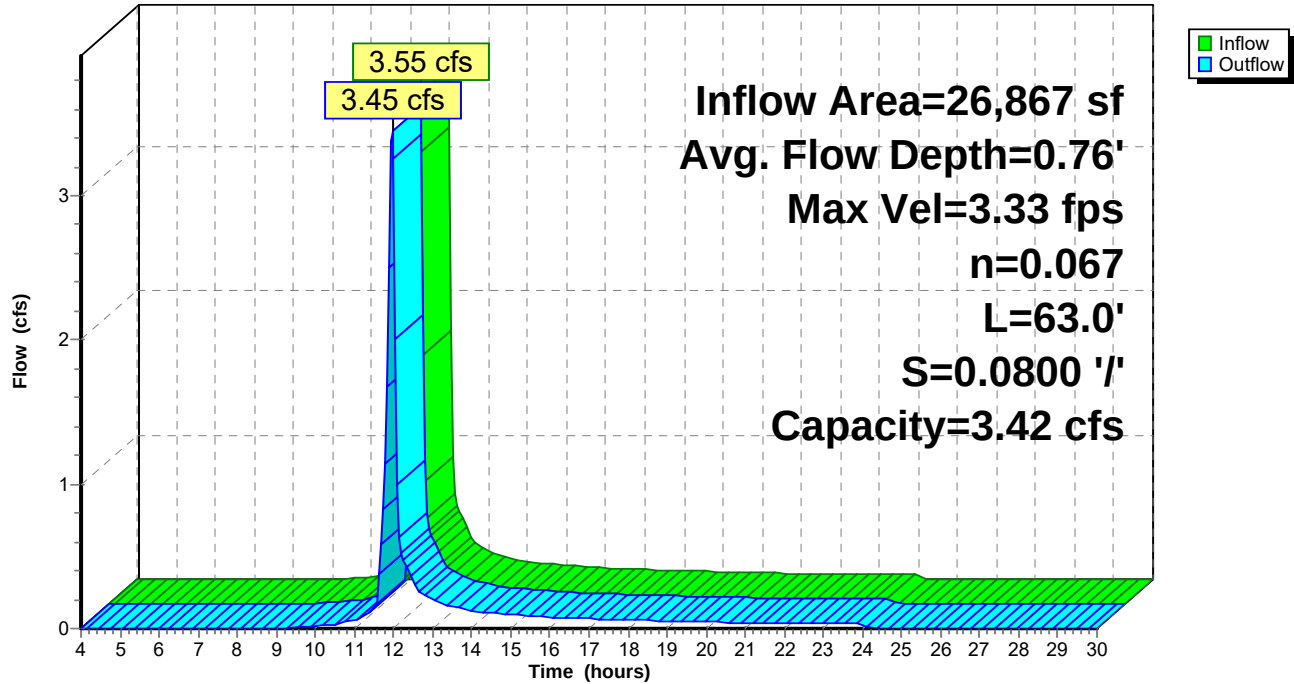
Peak Storage= 66 cf @ 11.96 hrs  
Average Depth at Peak Storage= 0.76'  
Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 3.42 cfs

1.00' x 0.75' deep channel, n= 0.067  
Side Slope Z-value= 0.5 '/' Top Width= 1.75'  
Length= 63.0' Slope= 0.0800 '/'  
Inlet Invert= 977.00', Outlet Invert= 971.96'



Reach 6R: Channel 4

Hydrograph



# MLV 505LD86\_Channels REV 2 Phase 1

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Type II 24-hr 50-yr Rainfall=6.87"

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## Summary for Reach 10R: Channel 7

[65] Warning: Inlet elevation not specified

Inflow Area = 83,908 sf, 13.34% Impervious, Inflow Depth = 3.00" for 50-yr event  
Inflow = 10.43 cfs @ 11.96 hrs, Volume= 20,994 cf  
Outflow = 9.65 cfs @ 12.00 hrs, Volume= 20,994 cf, Atten= 7%, Lag= 2.6 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.27 fps, Min. Travel Time= 1.5 min

Avg. Velocity= 1.02 fps, Avg. Travel Time= 6.4 min

Peak Storage= 930 cf @ 11.98 hrs

Average Depth at Peak Storage= 0.48'

Bank-Full Depth= 1.00' Flow Area= 6.0 sf, Capacity= 38.86 cfs

4.00' x 1.00' deep channel, n= 0.055

Side Slope Z-value= 2.0 '/' Top Width= 8.00'

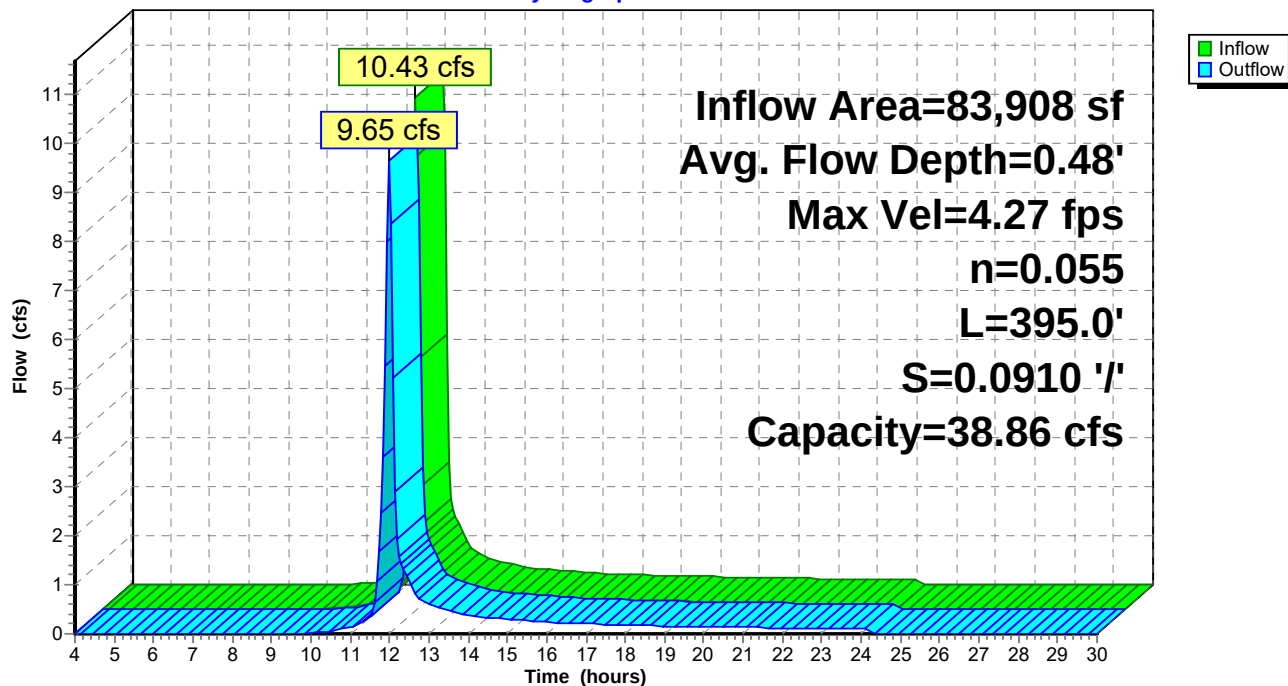
Length= 395.0' Slope= 0.0910 '/'

Inlet Invert= 0.00', Outlet Invert= -35.95'



## Reach 10R: Channel 7

Hydrograph



**Summary for Reach 13R: Culvert #3**

[52] Hint: Inlet/Outlet conditions not evaluated

[55] Hint: Peak inflow is 180% of Manning's capacity

[76] Warning: Detained 1,796 cf (Pond w/culvert advised)

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=7)

Inflow Area = 83,908 sf, 13.34% Impervious, Inflow Depth = 3.00" for 50-yr event

Inflow = 9.65 cfs @ 12.00 hrs, Volume= 20,994 cf

Outflow = 5.54 cfs @ 12.25 hrs, Volume= 20,994 cf, Atten= 43%, Lag= 14.8 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 7.76 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 3.05 fps, Avg. Travel Time= 0.1 min

Peak Storage= 20 cf @ 11.95 hrs

Average Depth at Peak Storage= 1.00'

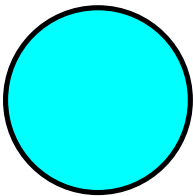
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.35 cfs

12.0" Round Pipe

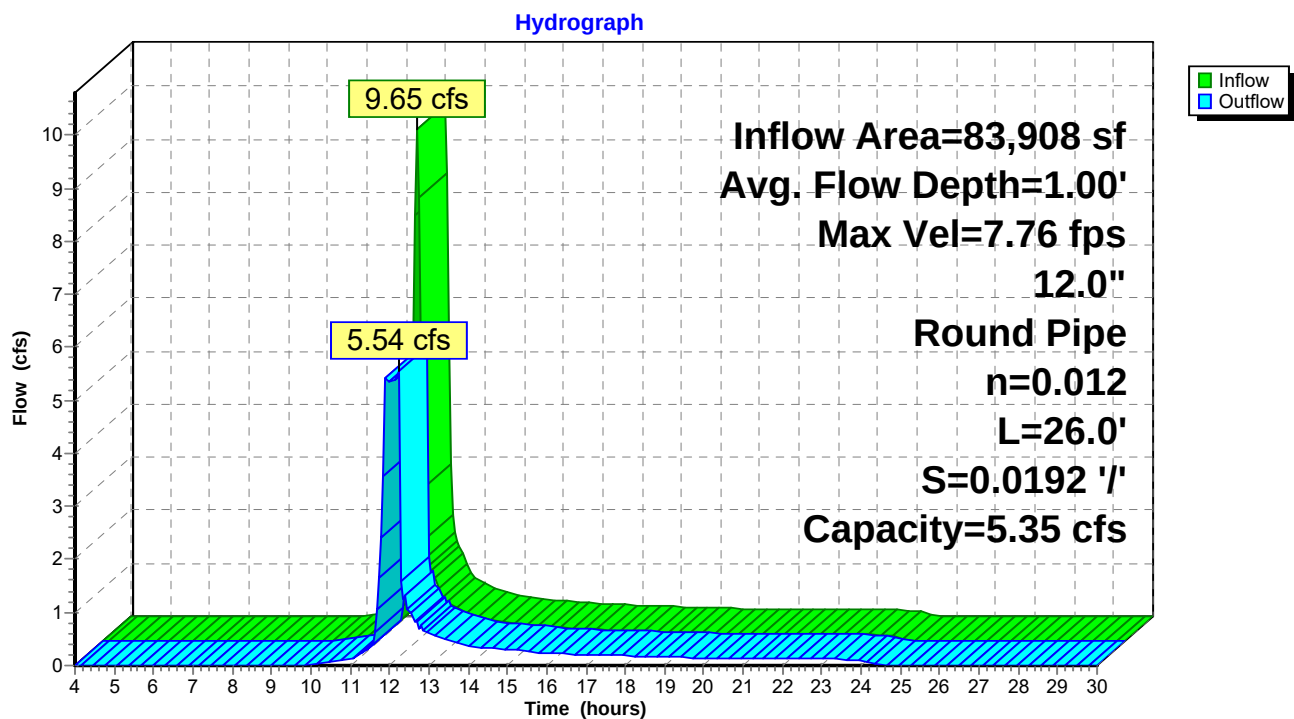
n= 0.012

Length= 26.0' Slope= 0.0192 '/'

Inlet Invert= 927.00', Outlet Invert= 926.50'



## Reach 13R: Culvert #3



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Type II 24-hr 50-yr Rainfall=6.87"

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### Summary for Reach 14R: Channel 8

[65] Warning: Inlet elevation not specified

Inflow Area = 86,244 sf, 12.98% Impervious, Inflow Depth = 2.93" for 50-yr event  
Inflow = 5.54 cfs @ 12.25 hrs, Volume= 21,031 cf  
Outflow = 5.50 cfs @ 12.25 hrs, Volume= 21,031 cf, Atten= 1%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.72 fps, Min. Travel Time= 0.4 min

Avg. Velocity= 1.19 fps, Avg. Travel Time= 1.2 min

Peak Storage= 131 cf @ 12.25 hrs

Average Depth at Peak Storage= 0.50'

Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 21.64 cfs

2.00' x 1.00' deep channel, n= 0.050

Side Slope Z-value= 2.0 '/' Top Width= 6.00'

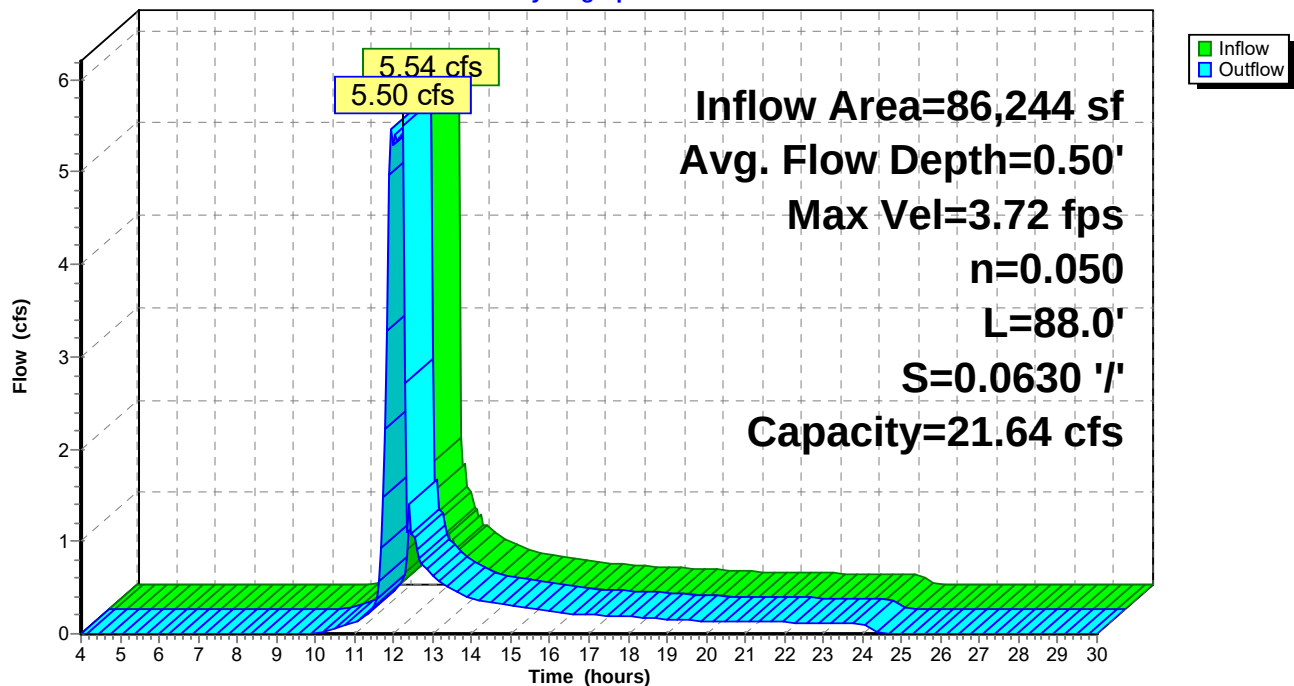
Length= 88.0' Slope= 0.0630 '/'

Inlet Invert= 0.00', Outlet Invert= -5.54'



### Reach 14R: Channel 8

Hydrograph



**MLV 505LD86\_Channels REV 2 Phase 1**

Type II 24-hr 100-yr Rainfall=8.09"

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment3S: CC-3** Runoff Area=24,835 sf 29.80% Impervious Runoff Depth=4.08"  
Tc=5.0 min CN=66 Runoff=4.18 cfs 8,447 cf

**Subcatchment4S: CC-4** Runoff Area=2,032 sf 0.00% Impervious Runoff Depth=5.47"  
Tc=5.0 min CN=78 Runoff=0.44 cfs 927 cf

**Subcatchment7S: CC-7** Runoff Area=83,908 sf 13.34% Impervious Runoff Depth=3.97"  
Tc=5.0 min CN=65 Runoff=13.75 cfs 27,739 cf

**Subcatchment8S: CC-8** Runoff Area=2,336 sf 0.00% Impervious Runoff Depth=0.44"  
Tc=5.0 min CN=30 Runoff=0.01 cfs 85 cf

**Subcatchment15S: CC-10** Runoff Area=5,374 sf 51.53% Impervious Runoff Depth=5.12"  
Tc=5.0 min CN=75 Runoff=1.11 cfs 2,294 cf

**Reach 6R: Channel 4** Avg. Flow Depth=0.90' Max Vel=3.54 fps Inflow=4.63 cfs 9,374 cf  
n=0.067 L=63.0' S=0.0800 '/' Capacity=3.42 cfs Outflow=4.50 cfs 9,374 cf

**Reach 10R: Channel 7** Avg. Flow Depth=0.56' Max Vel=4.65 fps Inflow=13.75 cfs 27,739 cf  
n=0.055 L=395.0' S=0.0910 '/' Capacity=38.86 cfs Outflow=12.80 cfs 27,739 cf

**Reach 13R: Culvert #3** Avg. Flow Depth=1.00' Max Vel=7.76 fps Inflow=12.80 cfs 27,739 cf  
12.0" Round Pipe n=0.012 L=26.0' S=0.0192 '/' Capacity=5.35 cfs Outflow=5.35 cfs 27,739 cf

**Reach 14R: Channel 8** Avg. Flow Depth=0.49' Max Vel=3.70 fps Inflow=5.36 cfs 27,825 cf  
n=0.050 L=88.0' S=0.0630 '/' Capacity=21.64 cfs Outflow=5.39 cfs 27,825 cf

**Total Runoff Area = 118,485 sf Runoff Volume = 39,493 cf Average Runoff Depth = 4.00"**  
**81.97% Pervious = 97,118 sf 18.03% Impervious = 21,367 sf**



**MLV 505LD86\_Channels REV 2 Phase 1**

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Type II 24-hr 100-yr Rainfall=8.09"

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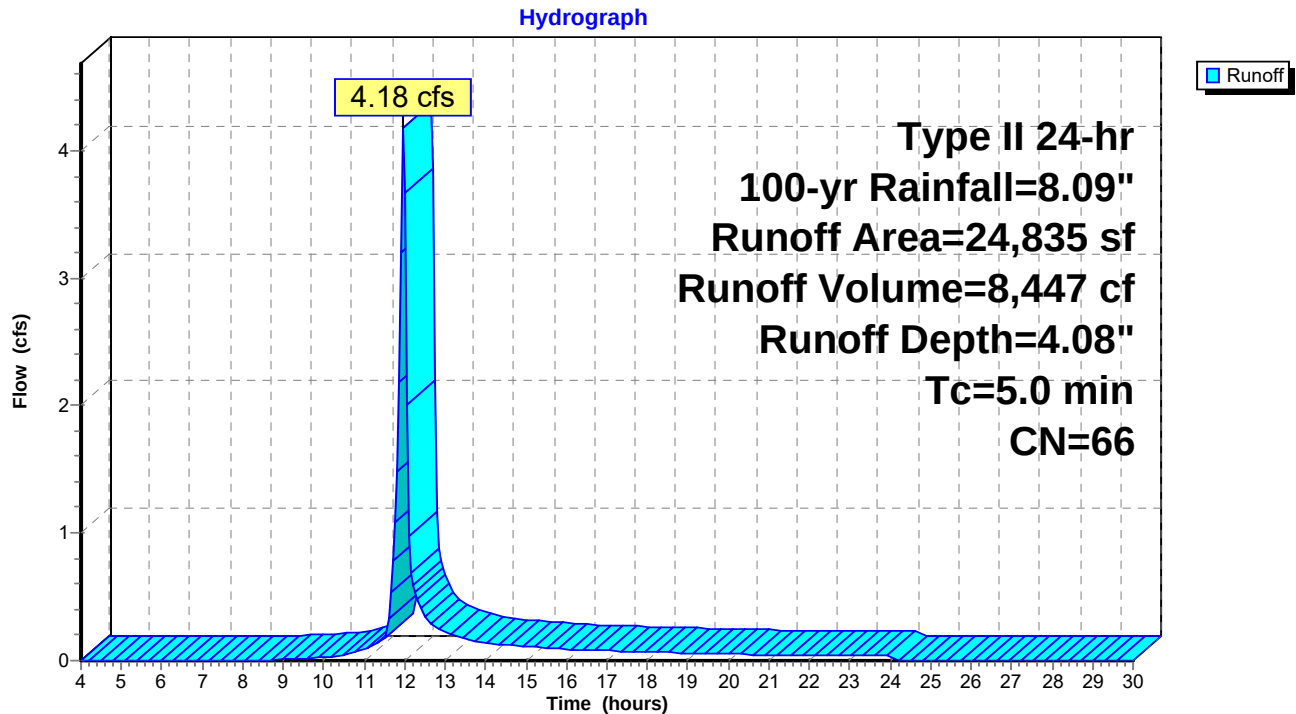
**Summary for Subcatchment 3S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 4.18 cfs @ 11.96 hrs, Volume= 8,447 cf, Depth= 4.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 8,181     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 2,351     | 98 | Paved parking, HSG D      |
| 24,835    | 66 | Weighted Average          |
| 17,433    |    | 70.20% Pervious Area      |
| 7,402     |    | 29.80% Impervious Area    |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 3S: CC-3**

**Summary for Subcatchment 4S: CC-4**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.44 cfs @ 11.95 hrs, Volume= 927 cf, Depth= 5.47"

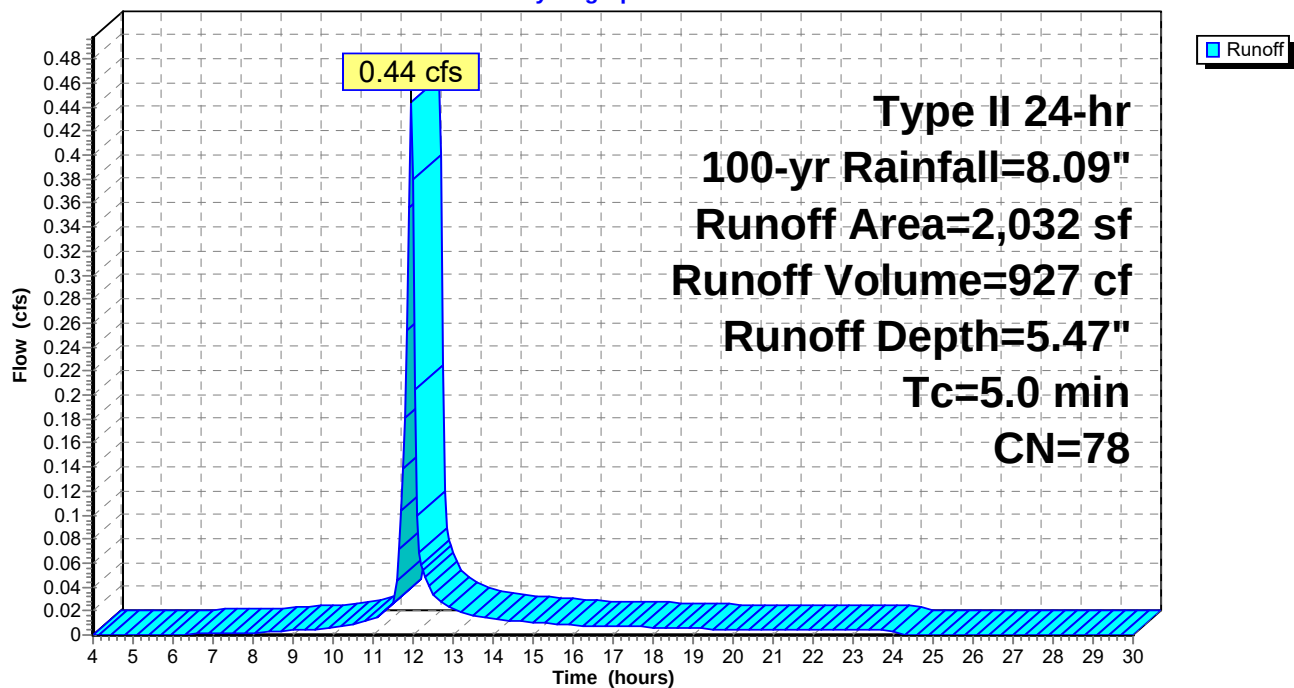
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,032     | 78 | Meadow, non-grazed, HSG D |
| 2,032     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 4S: CC-4**

Hydrograph



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Type II 24-hr 100-yr Rainfall=8.09"

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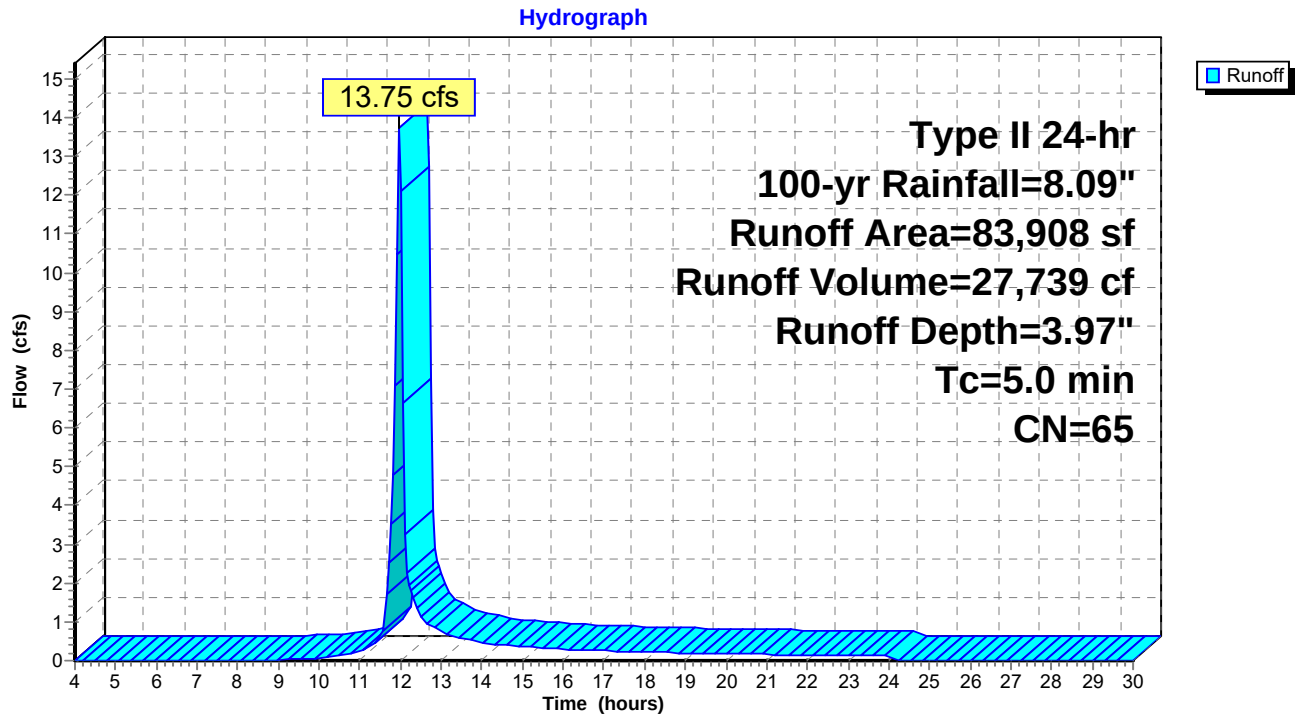
**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 13.75 cfs @ 11.96 hrs, Volume= 27,739 cf, Depth= 3.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 26,651    | 30 | Meadow, non-grazed, HSG A |
| 46,061    | 78 | Meadow, non-grazed, HSG D |
| 5,943     | 98 | Paved parking, HSG A      |
| 5,253     | 98 | Paved parking, HSG D      |
| 83,908    | 65 | Weighted Average          |
| 72,712    |    | 86.66% Pervious Area      |
| 11,196    |    | 13.34% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

**Summary for Subcatchment 8S: CC-8**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.01 cfs @ 12.03 hrs, Volume= 85 cf, Depth= 0.44"

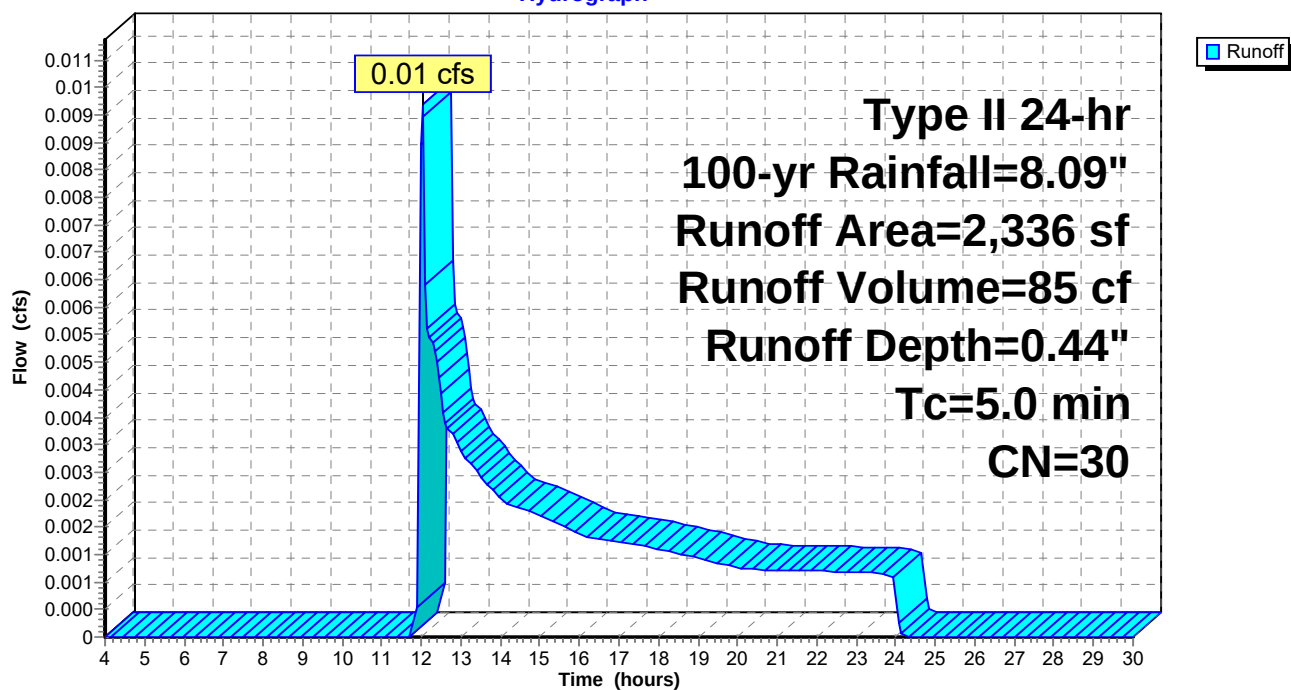
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 2,336     | 30 | Meadow, non-grazed, HSG A |
| 2,336     |    | 100.00% Pervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 8S: CC-8**

Hydrograph



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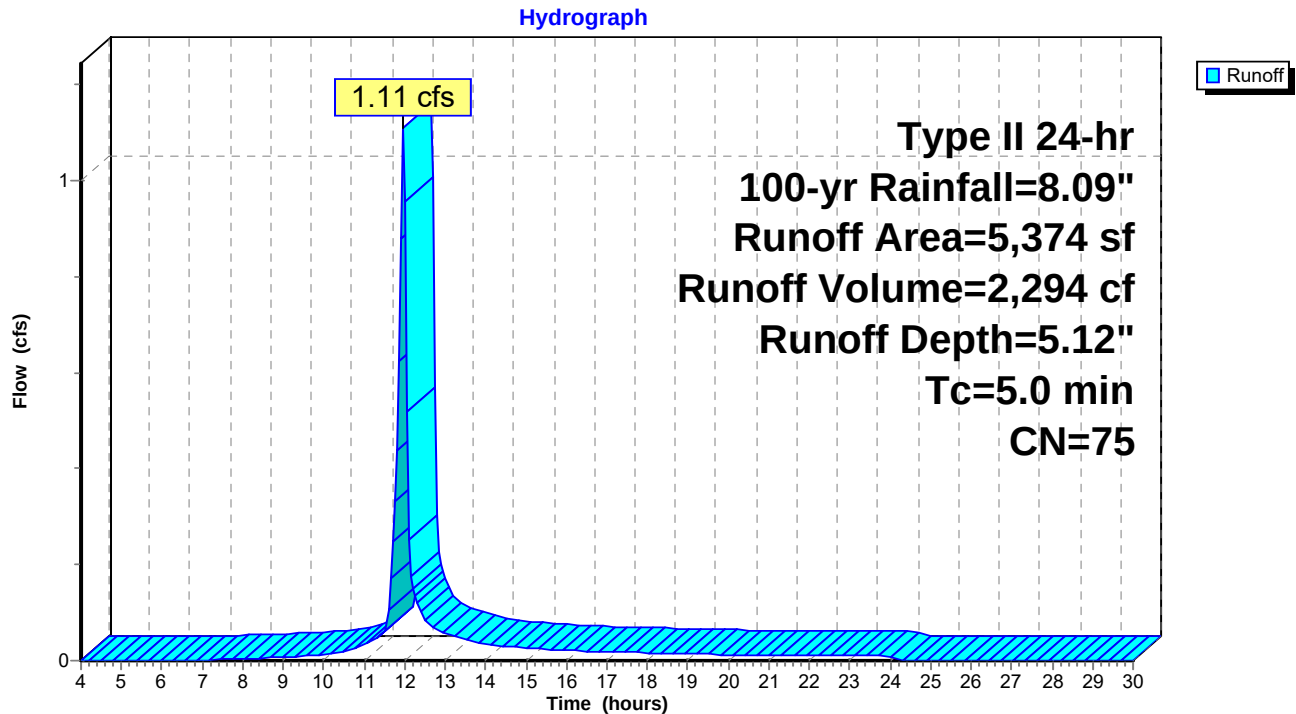
**Summary for Subcatchment 15S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.11 cfs @ 11.95 hrs, Volume= 2,294 cf, Depth= 5.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,482     | 30 | Meadow, non-grazed, HSG A |
| 1,123     | 78 | Meadow, non-grazed, HSG D |
| 1,308     | 98 | Paved parking, HSG A      |
| 1,461     | 98 | Paved parking, HSG D      |
| 5,374     | 75 | Weighted Average          |
| 2,605     |    | 48.47% Pervious Area      |
| 2,769     |    | 51.53% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 15S: CC-10**

**Summary for Reach 6R: Channel 4**

[91] Warning: Storage range exceeded by 0.15'

[55] Hint: Peak inflow is 135% of Manning's capacity

Inflow Area = 26,867 sf, 27.55% Impervious, Inflow Depth = 4.19" for 100-yr event  
Inflow = 4.63 cfs @ 11.96 hrs, Volume= 9,374 cf  
Outflow = 4.50 cfs @ 11.97 hrs, Volume= 9,374 cf, Atten= 3%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
Max. Velocity= 3.54 fps, Min. Travel Time= 0.3 min  
Avg. Velocity= 0.93 fps, Avg. Travel Time= 1.1 min

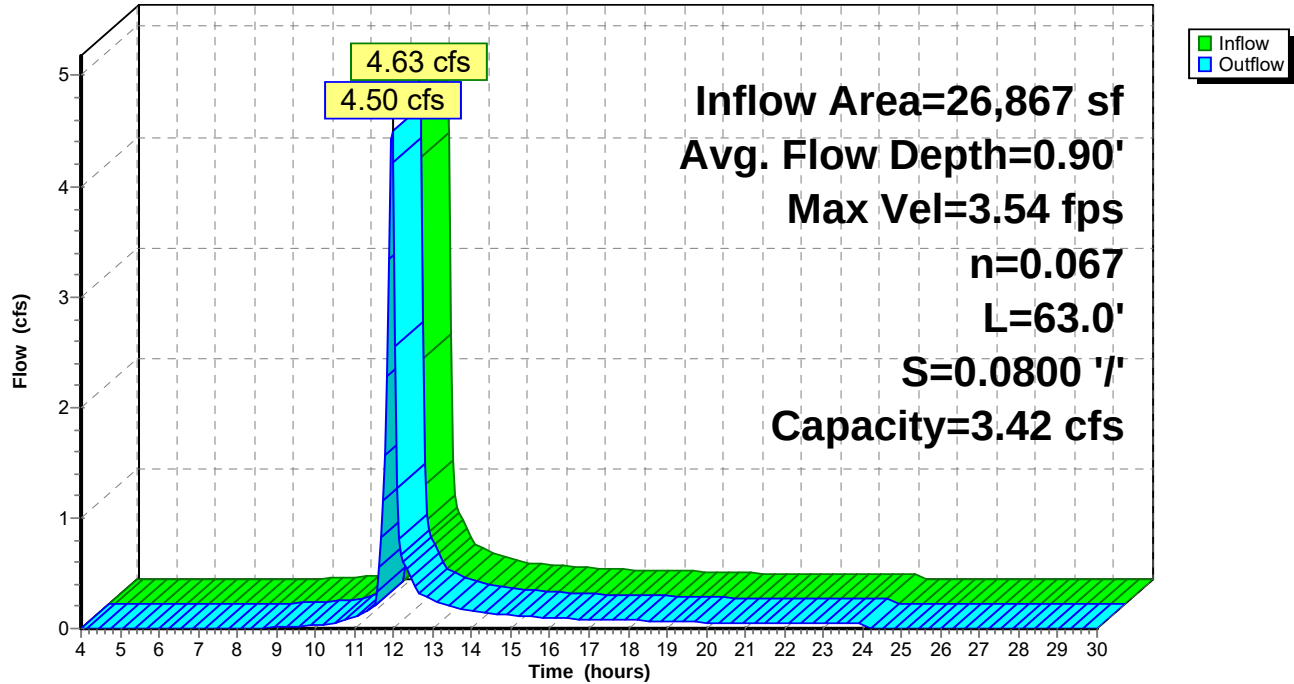
Peak Storage= 81 cf @ 11.96 hrs  
Average Depth at Peak Storage= 0.90'  
Bank-Full Depth= 0.75' Flow Area= 1.0 sf, Capacity= 3.42 cfs

1.00' x 0.75' deep channel, n= 0.067  
Side Slope Z-value= 0.5 '/' Top Width= 1.75'  
Length= 63.0' Slope= 0.0800 '/'  
Inlet Invert= 977.00', Outlet Invert= 971.96'



## Reach 6R: Channel 4

Hydrograph



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Type II 24-hr 100-yr Rainfall=8.09"

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## Summary for Reach 10R: Channel 7

[65] Warning: Inlet elevation not specified

Inflow Area = 83,908 sf, 13.34% Impervious, Inflow Depth = 3.97" for 100-yr event  
Inflow = 13.75 cfs @ 11.96 hrs, Volume= 27,739 cf  
Outflow = 12.80 cfs @ 12.00 hrs, Volume= 27,739 cf, Atten= 7%, Lag= 2.4 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.65 fps, Min. Travel Time= 1.4 min

Avg. Velocity= 1.10 fps, Avg. Travel Time= 6.0 min

Peak Storage= 1,124 cf @ 11.98 hrs

Average Depth at Peak Storage= 0.56'

Bank-Full Depth= 1.00' Flow Area= 6.0 sf, Capacity= 38.86 cfs

4.00' x 1.00' deep channel, n= 0.055

Side Slope Z-value= 2.0 '/' Top Width= 8.00'

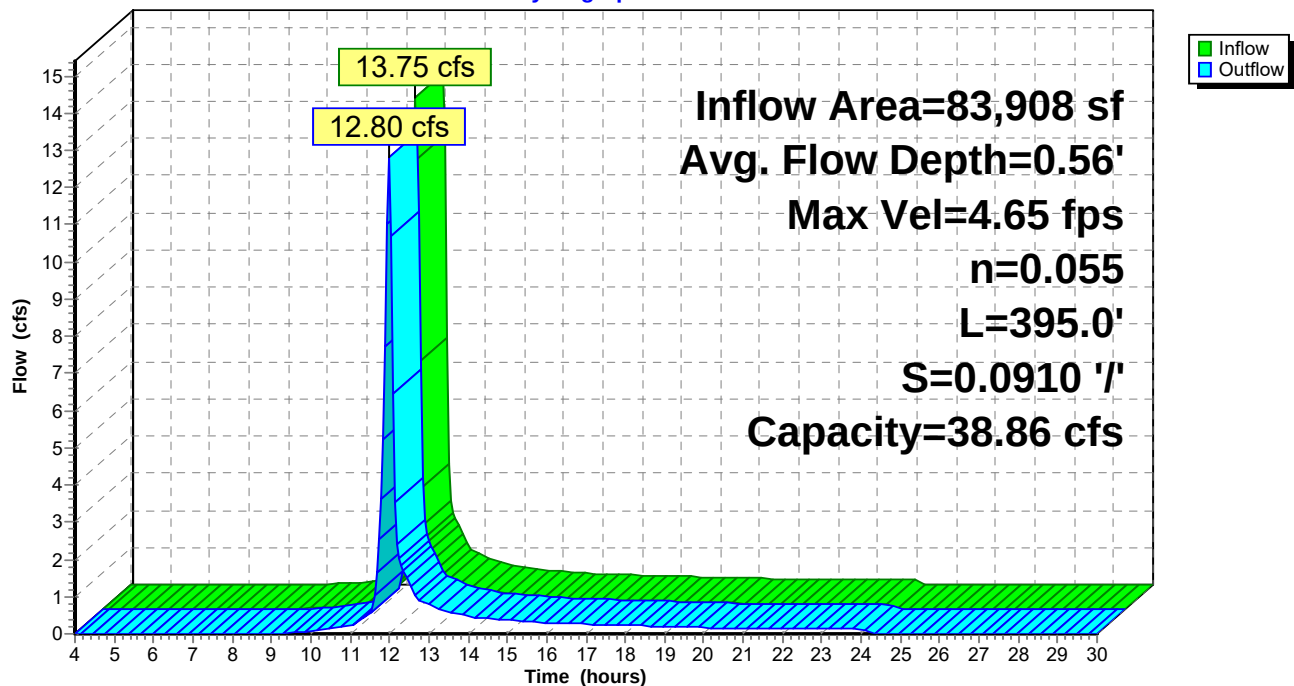
Length= 395.0' Slope= 0.0910 '/'

Inlet Invert= 0.00', Outlet Invert= -35.95'



## Reach 10R: Channel 7

Hydrograph





**Summary for Reach 13R: Culvert #3**

[52] Hint: Inlet/Outlet conditions not evaluated

[55] Hint: Peak inflow is 239% of Manning's capacity

[76] Warning: Detained 3,946 cf (Pond w/culvert advised)

Inflow Area = 83,908 sf, 13.34% Impervious, Inflow Depth = 3.97" for 100-yr event

Inflow = 12.80 cfs @ 12.00 hrs, Volume= 27,739 cf

Outflow = 5.35 cfs @ 11.95 hrs, Volume= 27,739 cf, Atten= 58%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 7.76 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 3.23 fps, Avg. Travel Time= 0.1 min

Peak Storage= 20 cf @ 11.90 hrs

Average Depth at Peak Storage= 1.00'

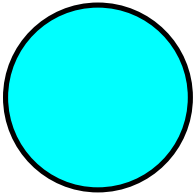
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.35 cfs

12.0" Round Pipe

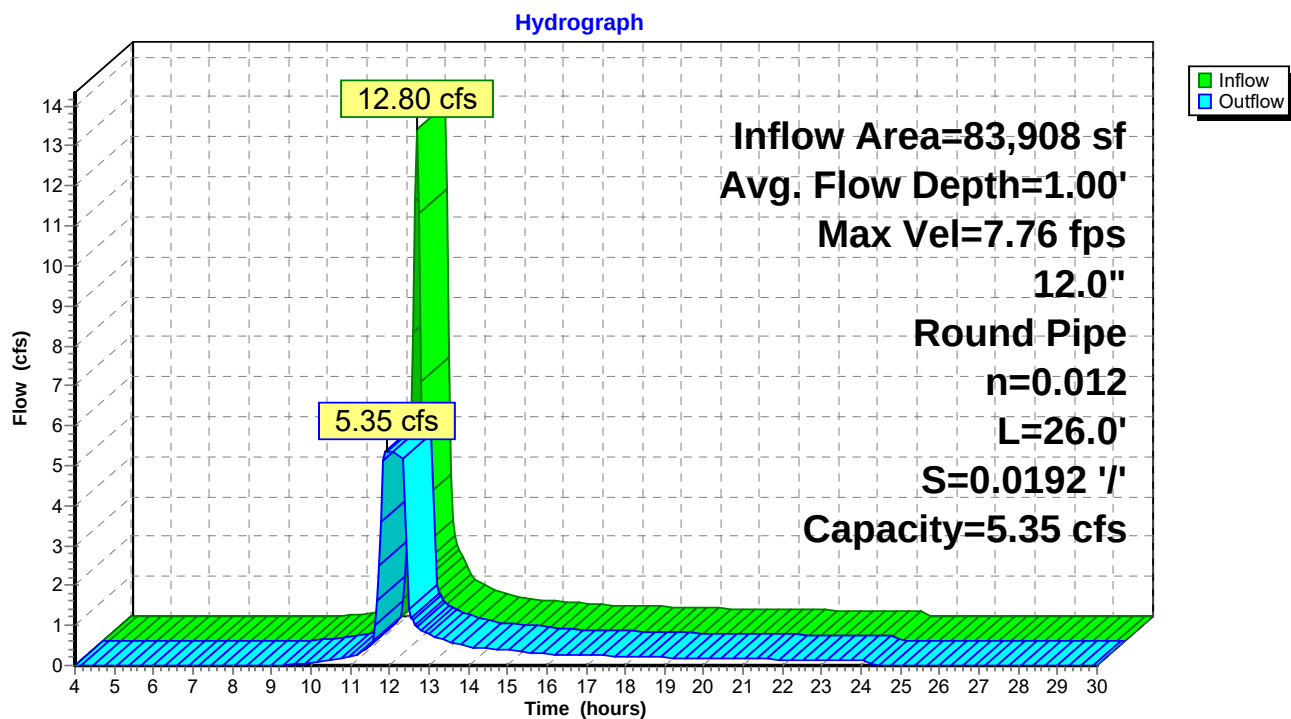
n= 0.012

Length= 26.0' Slope= 0.0192 '/'

Inlet Invert= 927.00', Outlet Invert= 926.50'



## Reach 13R: Culvert #3



**Summary for Reach 14R: Channel 8**

[65] Warning: Inlet elevation not specified

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

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

Inflow Area = 86,244 sf, 12.98% Impervious, Inflow Depth = 3.87" for 100-yr event  
Inflow = 5.36 cfs @ 12.03 hrs, Volume= 27,825 cf  
Outflow = 5.39 cfs @ 12.01 hrs, Volume= 27,825 cf, Atten= 0%, Lag= 0.0 min

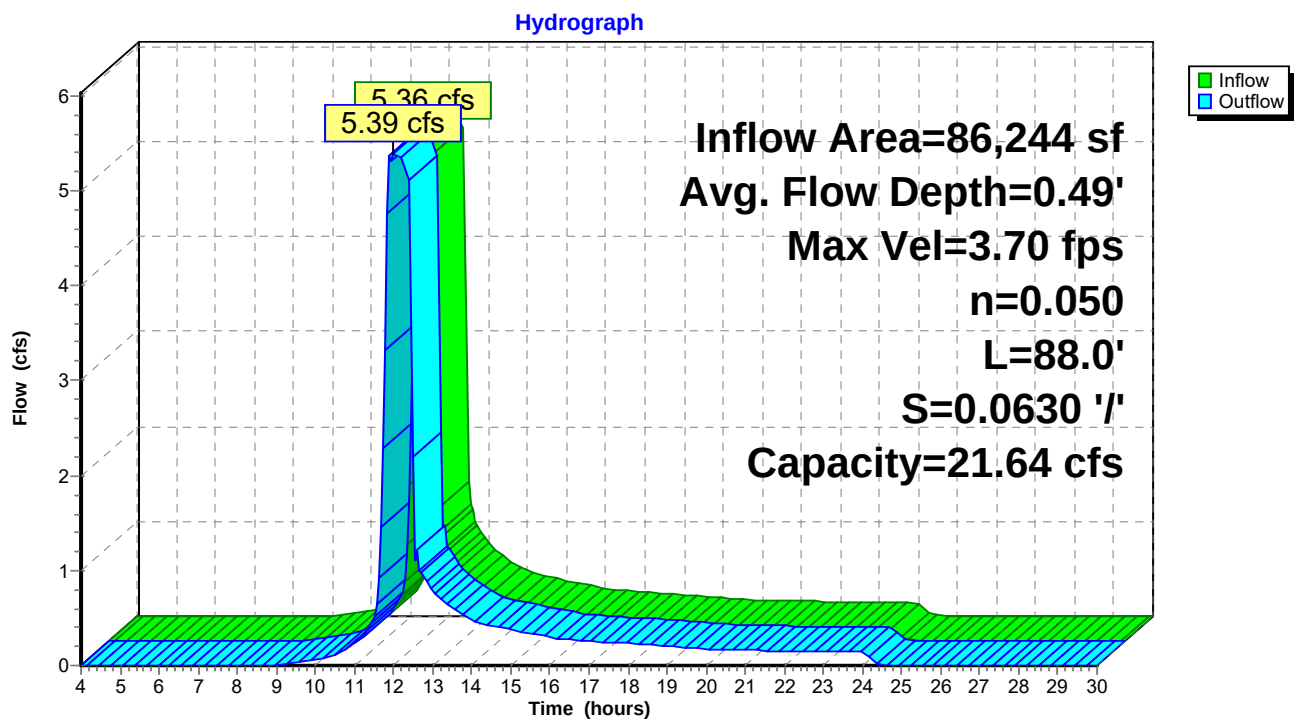
Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs  
Max. Velocity= 3.70 fps, Min. Travel Time= 0.4 min  
Avg. Velocity = 1.29 fps, Avg. Travel Time= 1.1 min

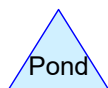
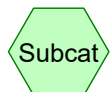
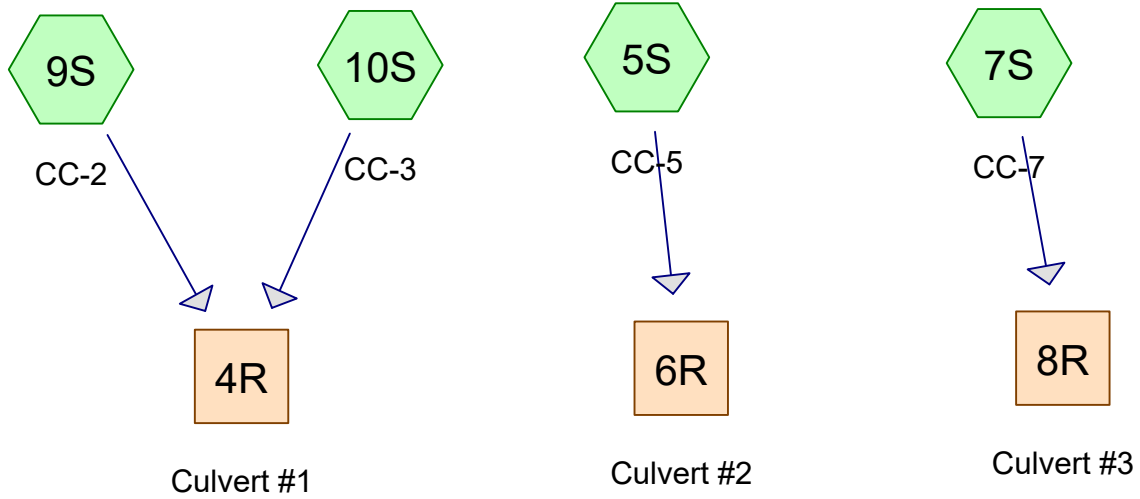
Peak Storage= 129 cf @ 11.90 hrs  
Average Depth at Peak Storage= 0.49'  
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 21.64 cfs

2.00' x 1.00' deep channel, n= 0.050  
Side Slope Z-value= 2.0 '/' Top Width= 6.00'  
Length= 88.0' Slope= 0.0630 '/'  
Inlet Invert= 0.00', Outlet Invert= -5.54'



## Reach 14R: Channel 8





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**Area Listing (all nodes)**

| Area<br>(sq-ft) | CN        | Description<br>(subcatchment-numbers)       |
|-----------------|-----------|---------------------------------------------|
| 29,108          | 30        | Meadow, non-grazed, HSG A (5S, 7S, 10S)     |
| 50,348          | 78        | Meadow, non-grazed, HSG D (5S, 7S, 9S, 10S) |
| 9,260           | 98        | Paved parking, HSG A (5S, 7S, 10S)          |
| 4,662           | 98        | Paved parking, HSG D (5S, 7S, 9S, 10S)      |
| <b>93,378</b>   | <b>66</b> | <b>TOTAL AREA</b>                           |

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**Soil Listing (all nodes)**

| Area<br>(sq-ft) | Soil<br>Group | Subcatchment<br>Numbers |
|-----------------|---------------|-------------------------|
| 38,368          | HSG A         | 5S, 7S, 10S             |
| 0               | HSG B         |                         |
| 0               | HSG C         |                         |
| 55,010          | HSG D         | 5S, 7S, 9S, 10S         |
| 0               | Other         |                         |
| <b>93,378</b>   |               | <b>TOTAL AREA</b>       |

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**Ground Covers (all nodes)**

| HSG-A<br>(sq-ft) | HSG-B<br>(sq-ft) | HSG-C<br>(sq-ft) | HSG-D<br>(sq-ft) | Other<br>(sq-ft) | Total<br>(sq-ft) | Ground<br>Cover       | Subcat<br>Number |
|------------------|------------------|------------------|------------------|------------------|------------------|-----------------------|------------------|
| 29,108           | 0                | 0                | 50,348           | 0                | 79,456           | Meadow,<br>non-grazed |                  |
| 9,260            | 0                | 0                | 4,662            | 0                | 13,922           | Paved parking         |                  |
| <b>38,368</b>    | <b>0</b>         | <b>0</b>         | <b>55,010</b>    | <b>0</b>         | <b>93,378</b>    | <b>TOTAL AREA</b>     |                  |



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**Pipe Listing (all nodes)**

| Line# | Node<br>Number | In-Invert<br>(feet) | Out-Invert<br>(feet) | Length<br>(feet) | Slope<br>(ft/ft) | n     | Diam/Width<br>(inches) | Height<br>(inches) | Inside-Fill<br>(inches) |
|-------|----------------|---------------------|----------------------|------------------|------------------|-------|------------------------|--------------------|-------------------------|
| 1     | 4R             | 972.00              | 971.50               | 28.7             | 0.0174           | 0.012 | 12.0                   | 0.0                | 0.0                     |
| 2     | 6R             | 951.50              | 951.00               | 50.0             | 0.0100           | 0.012 | 18.0                   | 0.0                | 0.0                     |
| 3     | 8R             | 927.00              | 926.50               | 26.0             | 0.0192           | 0.012 | 12.0                   | 0.0                | 0.0                     |

**MLV 505LD86\_Culvert 1-3\_rev2***Type II 24-hr 1-yr Rainfall=2.72"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                                                                                                                                                                |                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment5S: CC-5</b>                                                                                                                                    | Runoff Area=63,362 sf 7.29% Impervious Runoff Depth=0.38"<br>Tc=5.0 min CN=65 Runoff=0.81 cfs 2,028 cf                                                        |
| <b>Subcatchment7S: CC-7</b>                                                                                                                                    | Runoff Area=5,181 sf 57.98% Impervious Runoff Depth=1.04"<br>Tc=5.0 min CN=80 Runoff=0.22 cfs 451 cf                                                          |
| <b>Subcatchment9S: CC-2</b>                                                                                                                                    | Runoff Area=3,973 sf 3.80% Impervious Runoff Depth=0.99"<br>Tc=5.0 min CN=79 Runoff=0.16 cfs 327 cf                                                           |
| <b>Subcatchment10S: CC-3</b>                                                                                                                                   | Runoff Area=20,862 sf 29.48% Impervious Runoff Depth=0.32"<br>Tc=5.0 min CN=63 Runoff=0.20 cfs 560 cf                                                         |
| <b>Reach 4R: Culvert #1</b>                                                                                                                                    | Avg. Flow Depth=0.18' Max Vel=3.72 fps Inflow=0.36 cfs 887 cf<br>12.0" Round Pipe n=0.012 L=28.7' S=0.0174 '/' Capacity=5.09 cfs Outflow=0.35 cfs 887 cf      |
| <b>Reach 6R: Culvert #2</b>                                                                                                                                    | Avg. Flow Depth=0.27' Max Vel=3.72 fps Inflow=0.81 cfs 2,028 cf<br>18.0" Round Pipe n=0.012 L=50.0' S=0.0100 '/' Capacity=11.38 cfs Outflow=0.80 cfs 2,028 cf |
| <b>Reach 8R: Culvert #3</b>                                                                                                                                    | Avg. Flow Depth=0.14' Max Vel=3.35 fps Inflow=0.22 cfs 451 cf<br>12.0" Round Pipe n=0.012 L=26.0' S=0.0192 '/' Capacity=5.35 cfs Outflow=0.22 cfs 451 cf      |
| <b>Total Runoff Area = 93,378 sf Runoff Volume = 3,366 cf Average Runoff Depth = 0.43"</b><br><b>85.09% Pervious = 79,456 sf 14.91% Impervious = 13,922 sf</b> |                                                                                                                                                               |

**MLV 505LD86\_Culvert 1-3\_rev2**

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Type II 24-hr 1-yr Rainfall=2.72"

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**Summary for Subcatchment 5S: CC-5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.81 cfs @ 11.99 hrs, Volume= 2,028 cf, Depth= 0.38"

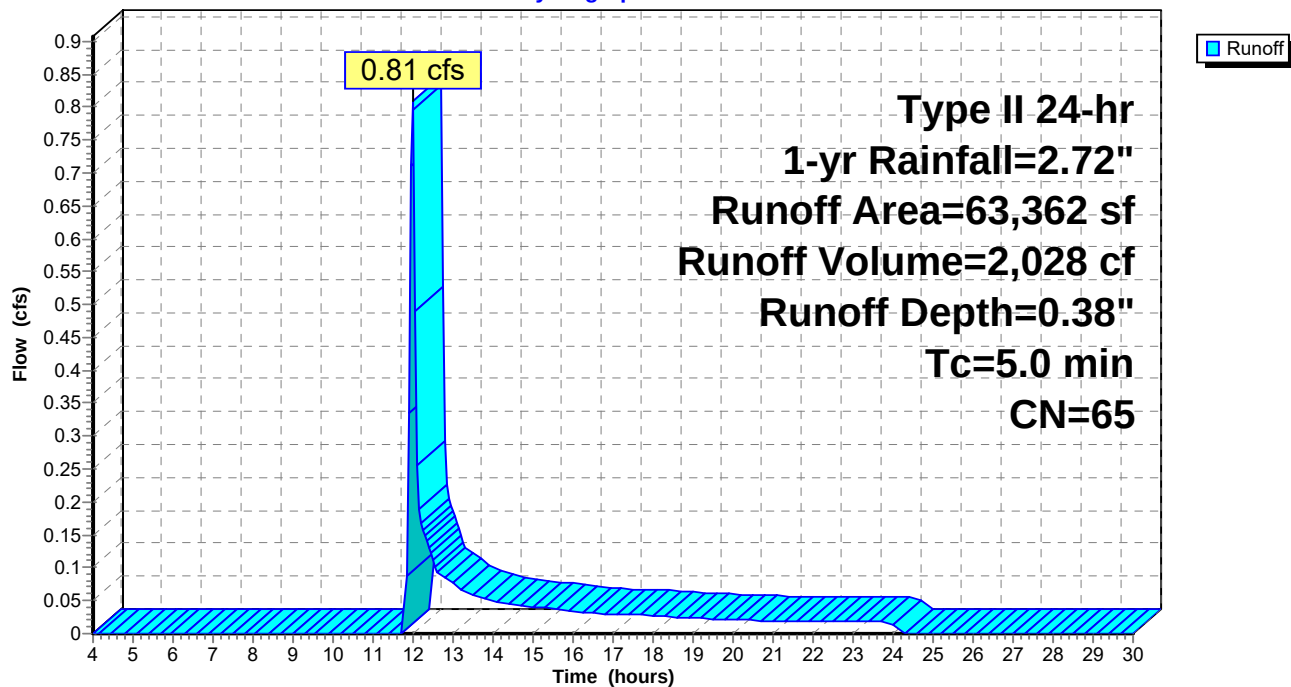
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 18,807    | 30 | Meadow, non-grazed, HSG A |
| 39,939    | 78 | Meadow, non-grazed, HSG D |
| 2,138     | 98 | Paved parking, HSG A      |
| 2,478     | 98 | Paved parking, HSG D      |
| 63,362    | 65 | Weighted Average          |
| 58,746    |    | 92.71% Pervious Area      |
| 4,616     |    | 7.29% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 5S: CC-5**

Hydrograph



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Type II 24-hr 1-yr Rainfall=2.72"

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**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.22 cfs @ 11.96 hrs, Volume= 451 cf, Depth= 1.04"

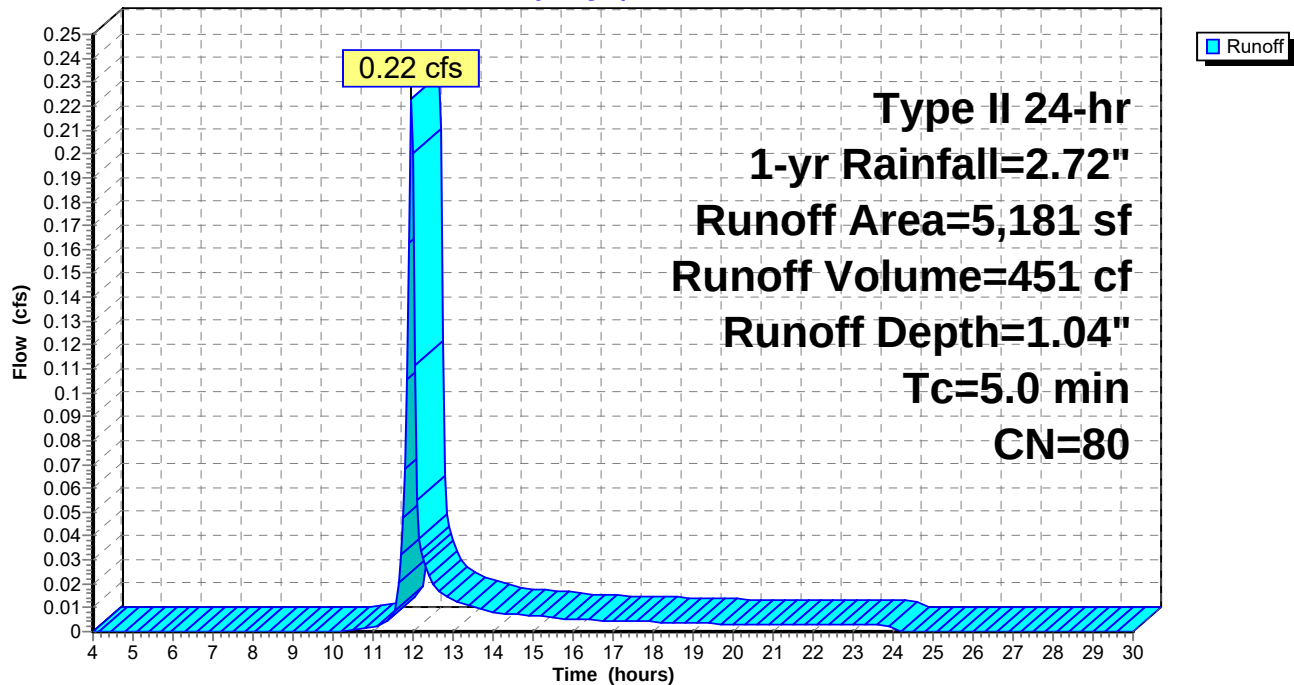
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,049     | 30 | Meadow, non-grazed, HSG A |
| 1,128     | 78 | Meadow, non-grazed, HSG D |
| 2,071     | 98 | Paved parking, HSG A      |
| 933       | 98 | Paved parking, HSG D      |
| 5,181     | 80 | Weighted Average          |
| 2,177     |    | 42.02% Pervious Area      |
| 3,004     |    | 57.98% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

Hydrograph



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Type II 24-hr 1-yr Rainfall=2.72"

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**Summary for Subcatchment 9S: CC-2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.16 cfs @ 11.96 hrs, Volume= 327 cf, Depth= 0.99"

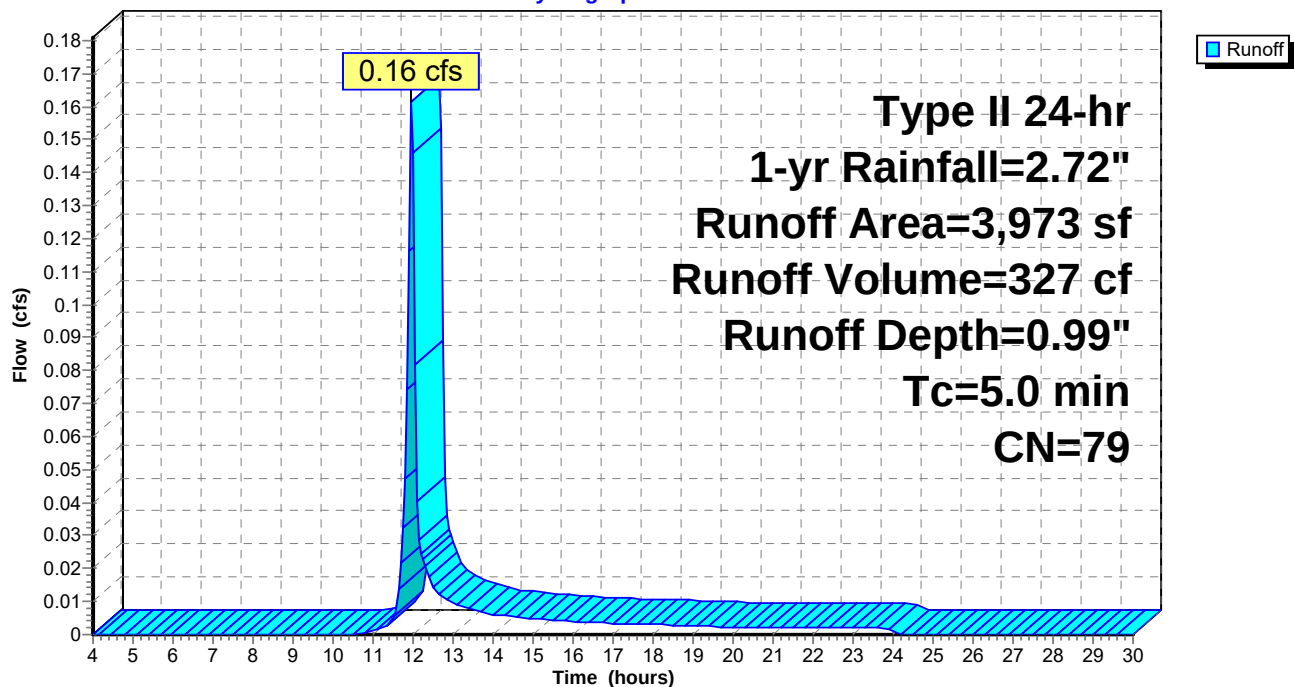
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,822     | 78 | Meadow, non-grazed, HSG D |
| 151       | 98 | Paved parking, HSG D      |
| 3,973     | 79 | Weighted Average          |
| 3,822     |    | 96.20% Pervious Area      |
| 151       |    | 3.80% Impervious Area     |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 9S: CC-2**

Hydrograph



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Type II 24-hr 1-yr Rainfall=2.72"

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**Summary for Subcatchment 10S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.20 cfs @ 11.99 hrs, Volume= 560 cf, Depth= 0.32"

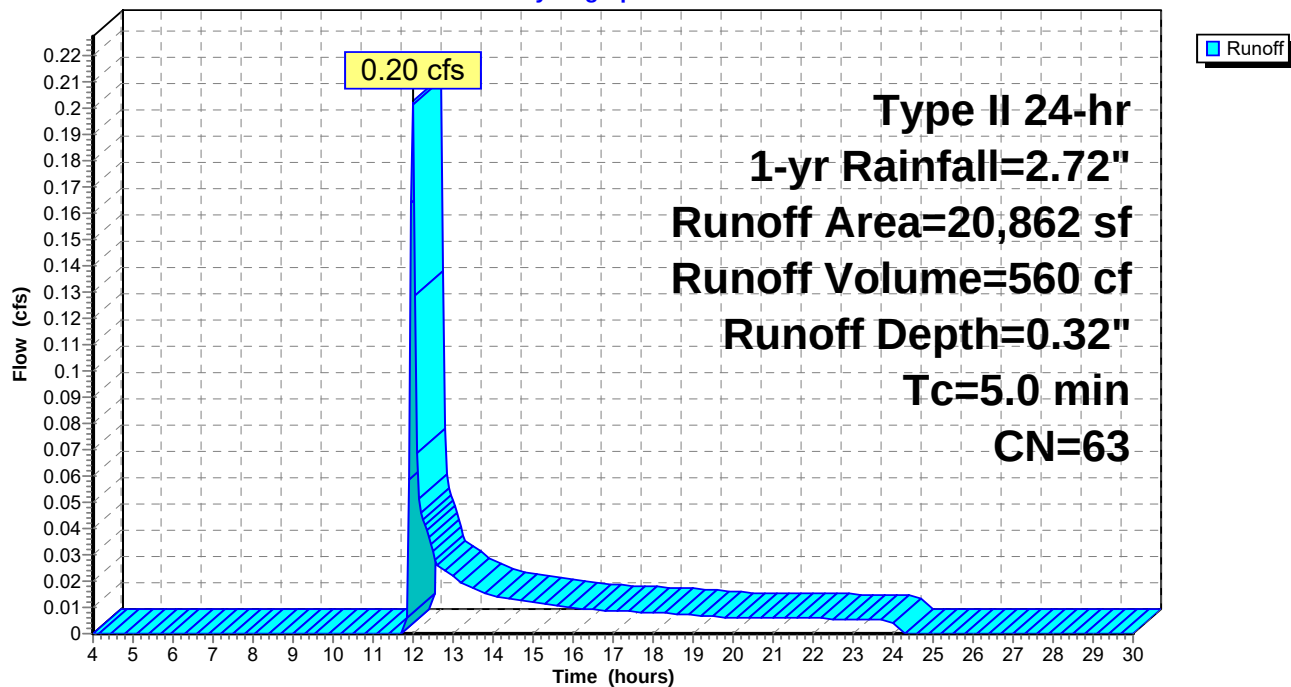
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 5,459     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 1,100     | 98 | Paved parking, HSG D      |
| 20,862    | 63 | Weighted Average          |
| 14,711    |    | 70.52% Pervious Area      |
| 6,151     |    | 29.48% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 10S: CC-3**

Hydrograph



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Type II 24-hr 1-yr Rainfall=2.72"

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## Summary for Reach 4R: Culvert #1

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 24,835 sf, 25.38% Impervious, Inflow Depth = 0.43" for 1-yr event  
Inflow = 0.36 cfs @ 11.98 hrs, Volume= 887 cf  
Outflow = 0.35 cfs @ 11.99 hrs, Volume= 887 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.72 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 1.36 fps, Avg. Travel Time= 0.4 min

Peak Storage= 3 cf @ 11.98 hrs

Average Depth at Peak Storage= 0.18'

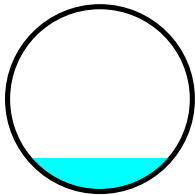
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.09 cfs

12.0" Round Pipe

n= 0.012

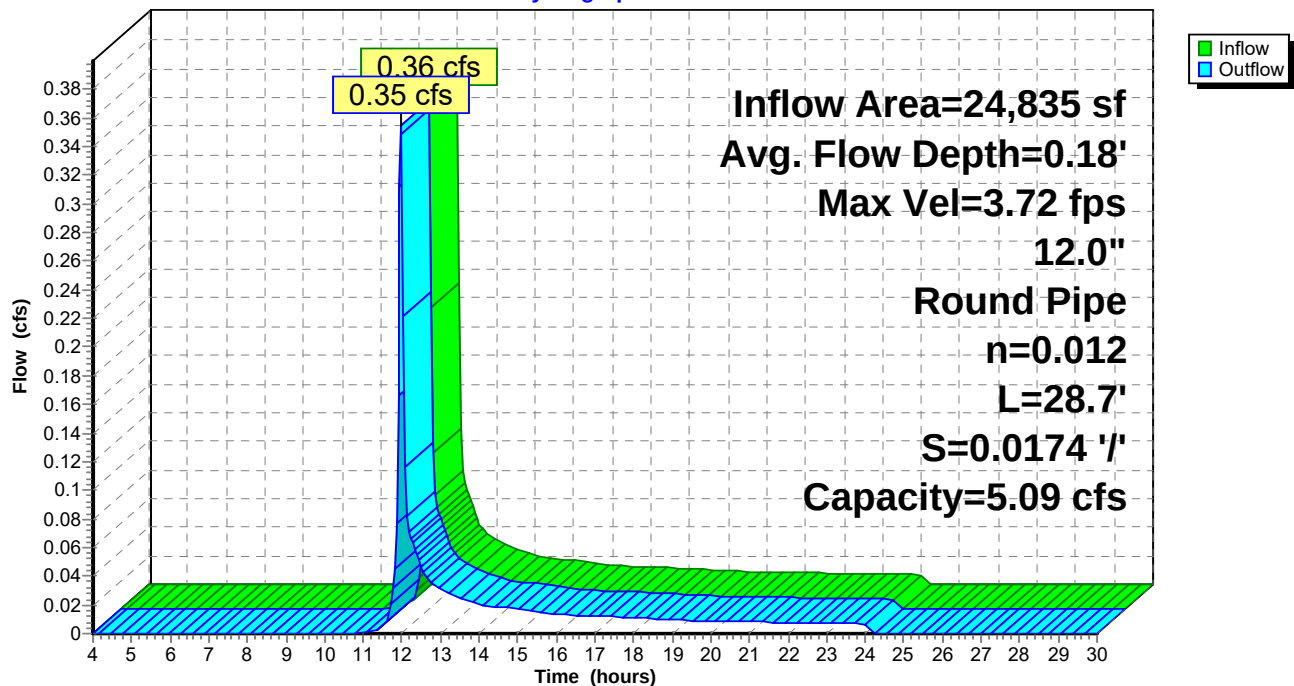
Length= 28.7' Slope= 0.0174 '/'

Inlet Invert= 972.00', Outlet Invert= 971.50'



## Reach 4R: Culvert #1

### Hydrograph



## MLV 505LD86\_Culvert 1-3\_rev2

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Type II 24-hr 1-yr Rainfall=2.72"

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### Summary for Reach 6R: Culvert #2

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 63,362 sf, 7.29% Impervious, Inflow Depth = 0.38" for 1-yr event  
Inflow = 0.81 cfs @ 11.99 hrs, Volume= 2,028 cf  
Outflow = 0.80 cfs @ 11.99 hrs, Volume= 2,028 cf, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.72 fps, Min. Travel Time= 0.2 min

Avg. Velocity= 1.43 fps, Avg. Travel Time= 0.6 min

Peak Storage= 11 cf @ 11.99 hrs

Average Depth at Peak Storage= 0.27'

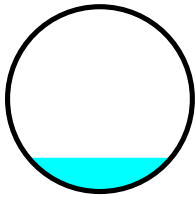
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.38 cfs

18.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

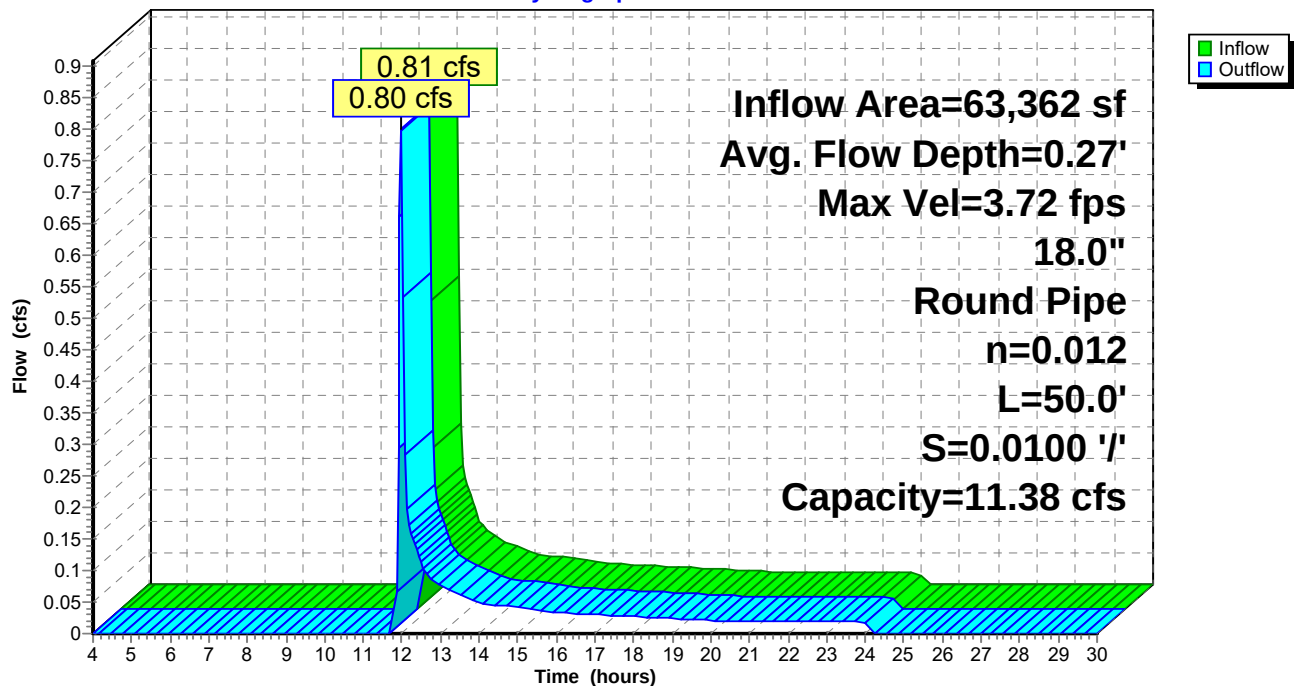
Length= 50.0' Slope= 0.0100 '/'

Inlet Invert= 951.50', Outlet Invert= 951.00'



### Reach 6R: Culvert #2

#### Hydrograph





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Type II 24-hr 1-yr Rainfall=2.72"

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### Summary for Reach 8R: Culvert #3

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 5,181 sf, 57.98% Impervious, Inflow Depth = 1.04" for 1-yr event  
Inflow = 0.22 cfs @ 11.96 hrs, Volume= 451 cf  
Outflow = 0.22 cfs @ 11.97 hrs, Volume= 451 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.35 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 1.10 fps, Avg. Travel Time= 0.4 min

Peak Storage= 2 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.14'

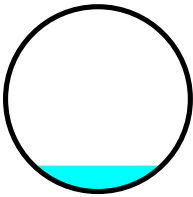
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.35 cfs

12.0" Round Pipe

n= 0.012

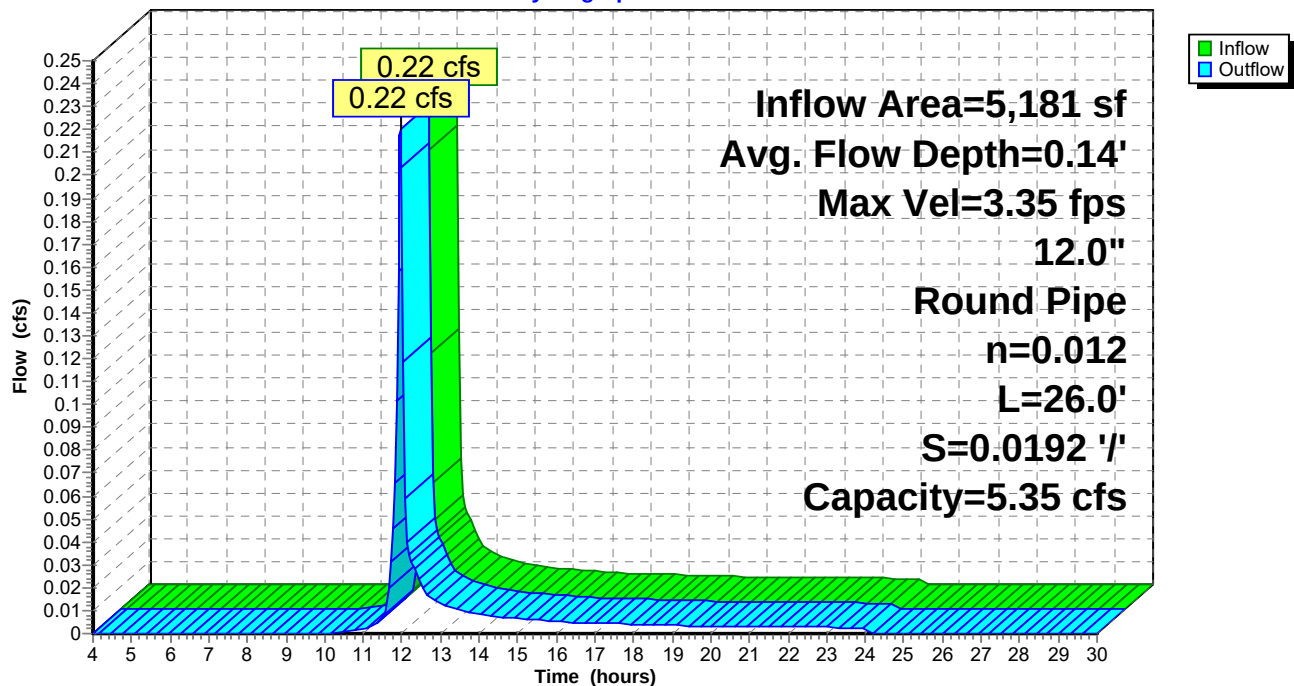
Length= 26.0' Slope= 0.0192 '/'

Inlet Invert= 927.00', Outlet Invert= 926.50'



### Reach 8R: Culvert #3

#### Hydrograph



**MLV 505LD86\_Culvert 1-3\_rev2***Type II 24-hr 2-yr Rainfall=3.26"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                                                                                                                                                                |                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment5S: CC-5</b>                                                                                                                                    | Runoff Area=63,362 sf 7.29% Impervious Runoff Depth=0.63"<br>Tc=5.0 min CN=65 Runoff=1.49 cfs 3,325 cf                                                        |
| <b>Subcatchment7S: CC-7</b>                                                                                                                                    | Runoff Area=5,181 sf 57.98% Impervious Runoff Depth=1.45"<br>Tc=5.0 min CN=80 Runoff=0.31 cfs 625 cf                                                          |
| <b>Subcatchment9S: CC-2</b>                                                                                                                                    | Runoff Area=3,973 sf 3.80% Impervious Runoff Depth=1.38"<br>Tc=5.0 min CN=79 Runoff=0.23 cfs 458 cf                                                           |
| <b>Subcatchment10S: CC-3</b>                                                                                                                                   | Runoff Area=20,862 sf 29.48% Impervious Runoff Depth=0.55"<br>Tc=5.0 min CN=63 Runoff=0.41 cfs 950 cf                                                         |
| <b>Reach 4R: Culvert #1</b>                                                                                                                                    | Avg. Flow Depth=0.24' Max Vel=4.35 fps Inflow=0.63 cfs 1,408 cf<br>12.0" Round Pipe n=0.012 L=28.7' S=0.0174 '/' Capacity=5.09 cfs Outflow=0.63 cfs 1,408 cf  |
| <b>Reach 6R: Culvert #2</b>                                                                                                                                    | Avg. Flow Depth=0.37' Max Vel=4.41 fps Inflow=1.49 cfs 3,325 cf<br>18.0" Round Pipe n=0.012 L=50.0' S=0.0100 '/' Capacity=11.38 cfs Outflow=1.48 cfs 3,325 cf |
| <b>Reach 8R: Culvert #3</b>                                                                                                                                    | Avg. Flow Depth=0.16' Max Vel=3.70 fps Inflow=0.31 cfs 625 cf<br>12.0" Round Pipe n=0.012 L=26.0' S=0.0192 '/' Capacity=5.35 cfs Outflow=0.31 cfs 625 cf      |
| <b>Total Runoff Area = 93,378 sf Runoff Volume = 5,358 cf Average Runoff Depth = 0.69"</b><br><b>85.09% Pervious = 79,456 sf 14.91% Impervious = 13,922 sf</b> |                                                                                                                                                               |

**MLV 505LD86\_Culvert 1-3\_rev2**

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Type II 24-hr 2-yr Rainfall=3.26"

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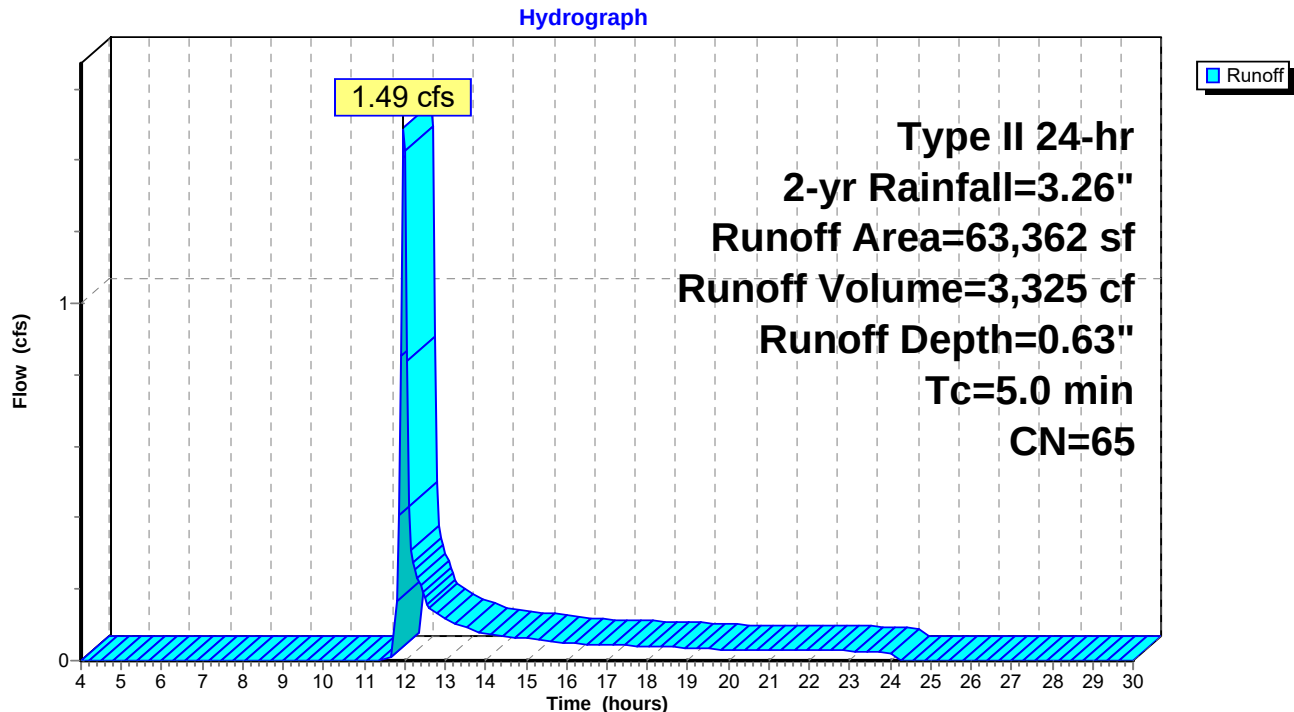
**Summary for Subcatchment 5S: CC-5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.49 cfs @ 11.98 hrs, Volume= 3,325 cf, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 18,807    | 30 | Meadow, non-grazed, HSG A |
| 39,939    | 78 | Meadow, non-grazed, HSG D |
| 2,138     | 98 | Paved parking, HSG A      |
| 2,478     | 98 | Paved parking, HSG D      |
| 63,362    | 65 | Weighted Average          |
| 58,746    |    | 92.71% Pervious Area      |
| 4,616     |    | 7.29% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 5S: CC-5**

**MLV 505LD86\_Culvert 1-3\_rev2**

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Type II 24-hr 2-yr Rainfall=3.26"

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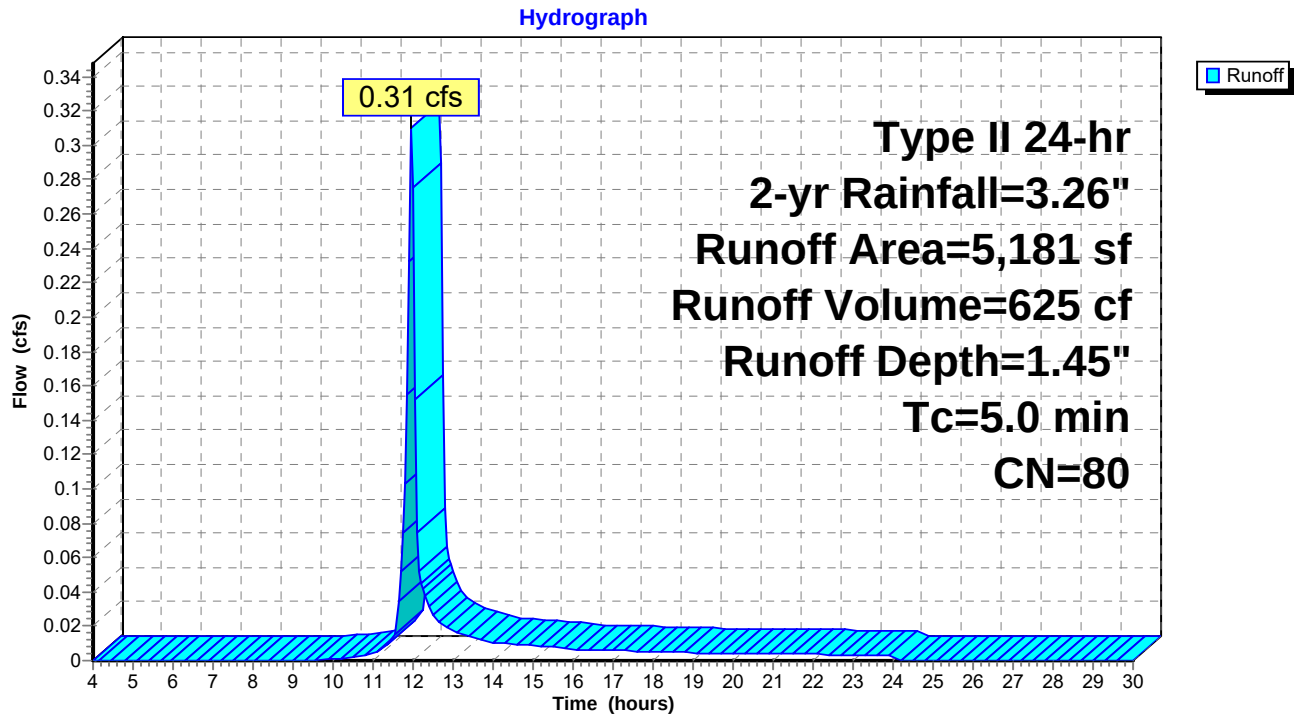
**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.31 cfs @ 11.96 hrs, Volume= 625 cf, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,049     | 30 | Meadow, non-grazed, HSG A |
| 1,128     | 78 | Meadow, non-grazed, HSG D |
| 2,071     | 98 | Paved parking, HSG A      |
| 933       | 98 | Paved parking, HSG D      |
| 5,181     | 80 | Weighted Average          |
| 2,177     |    | 42.02% Pervious Area      |
| 3,004     |    | 57.98% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

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Type II 24-hr 2-yr Rainfall=3.26"

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**Summary for Subcatchment 9S: CC-2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.23 cfs @ 11.96 hrs, Volume= 458 cf, Depth= 1.38"

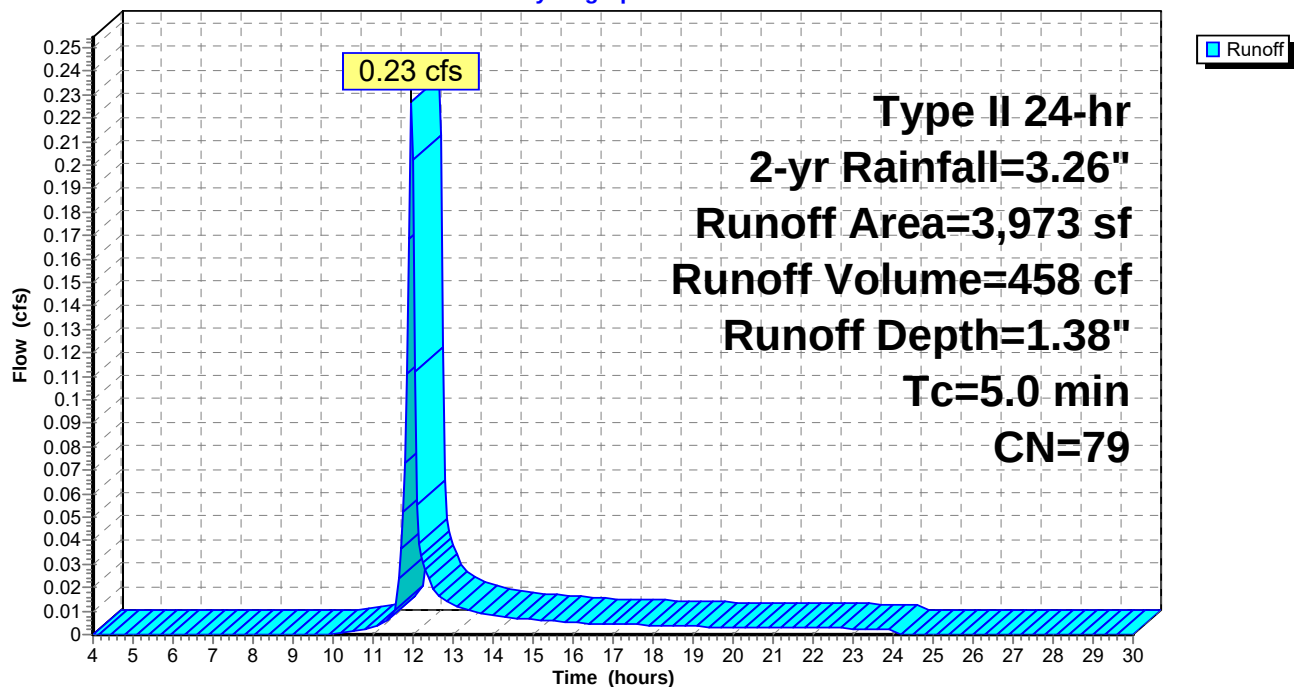
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,822     | 78 | Meadow, non-grazed, HSG D |
| 151       | 98 | Paved parking, HSG D      |
| 3,973     | 79 | Weighted Average          |
| 3,822     |    | 96.20% Pervious Area      |
| 151       |    | 3.80% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 9S: CC-2**

Hydrograph



**MLV 505LD86\_Culvert 1-3\_rev2**

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Type II 24-hr 2-yr Rainfall=3.26"

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**Summary for Subcatchment 10S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.41 cfs @ 11.98 hrs, Volume= 950 cf, Depth= 0.55"

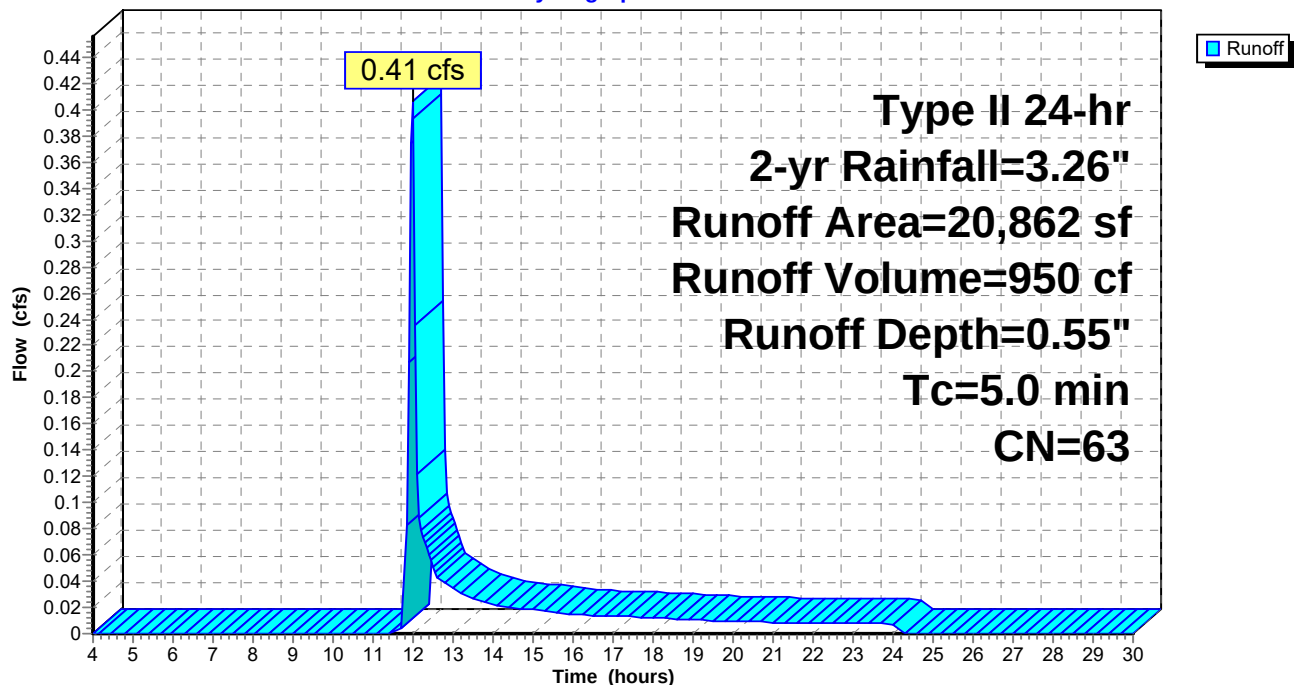
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 5,459     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 1,100     | 98 | Paved parking, HSG D      |
| 20,862    | 63 | Weighted Average          |
| 14,711    |    | 70.52% Pervious Area      |
| 6,151     |    | 29.48% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 10S: CC-3**

Hydrograph



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Type II 24-hr 2-yr Rainfall=3.26"

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## Summary for Reach 4R: Culvert #1

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 24,835 sf, 25.38% Impervious, Inflow Depth = 0.68" for 2-yr event  
Inflow = 0.63 cfs @ 11.97 hrs, Volume= 1,408 cf  
Outflow = 0.63 cfs @ 11.98 hrs, Volume= 1,408 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.35 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 1.49 fps, Avg. Travel Time= 0.3 min

Peak Storage= 4 cf @ 11.98 hrs

Average Depth at Peak Storage= 0.24'

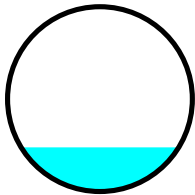
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.09 cfs

12.0" Round Pipe

n= 0.012

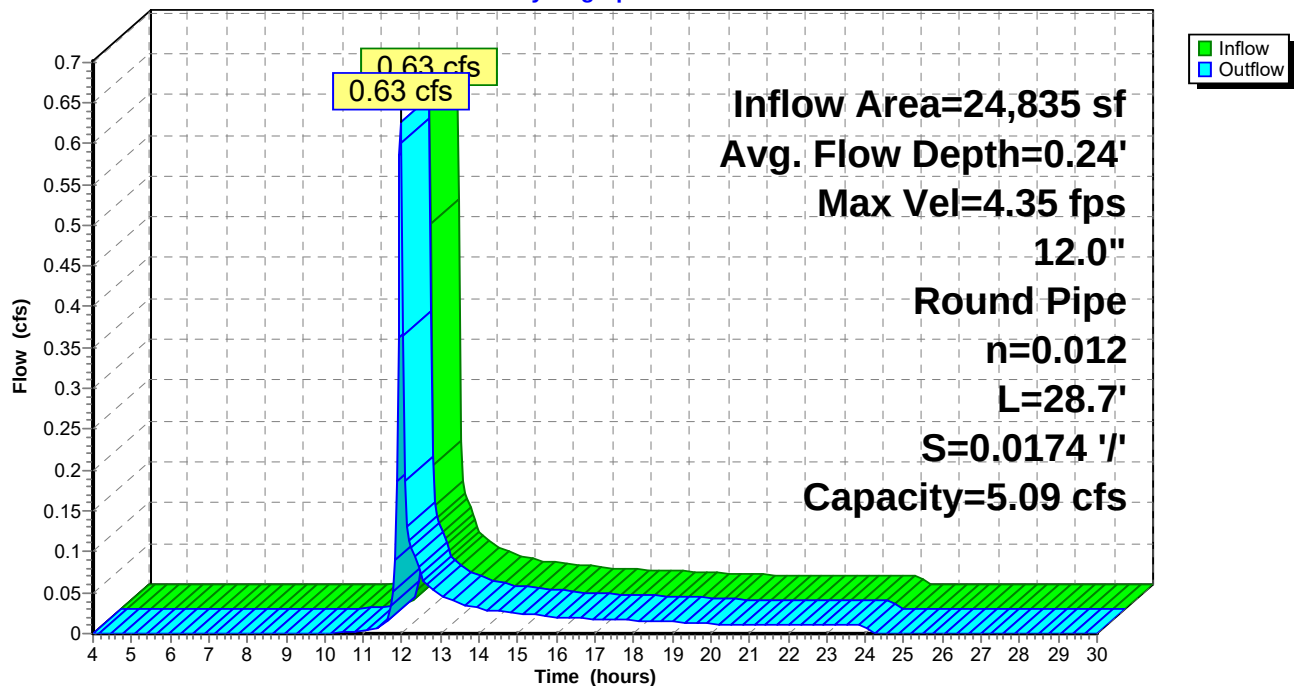
Length= 28.7' Slope= 0.0174 '/'

Inlet Invert= 972.00', Outlet Invert= 971.50'



## Reach 4R: Culvert #1

Hydrograph



## MLV 505LD86\_Culvert 1-3\_rev2

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Type II 24-hr 2-yr Rainfall=3.26"

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### Summary for Reach 6R: Culvert #2

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 63,362 sf, 7.29% Impervious, Inflow Depth = 0.63" for 2-yr event  
Inflow = 1.49 cfs @ 11.98 hrs, Volume= 3,325 cf  
Outflow = 1.48 cfs @ 11.98 hrs, Volume= 3,325 cf, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.41 fps, Min. Travel Time= 0.2 min

Avg. Velocity = 1.62 fps, Avg. Travel Time= 0.5 min

Peak Storage= 17 cf @ 11.98 hrs

Average Depth at Peak Storage= 0.37'

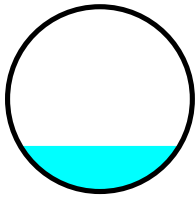
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.38 cfs

18.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

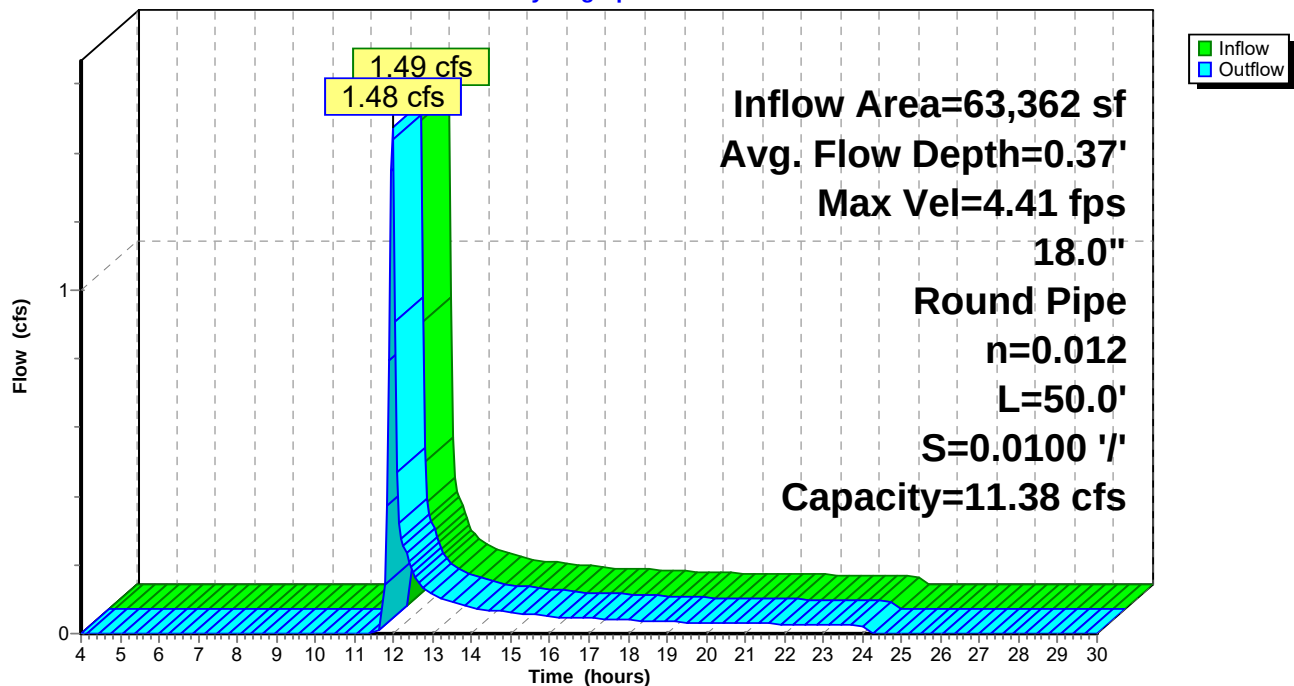
Length= 50.0' Slope= 0.0100 '/'

Inlet Invert= 951.50', Outlet Invert= 951.00'



### Reach 6R: Culvert #2

Hydrograph





# MLV 505LD86\_Culvert 1-3\_rev2

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Type II 24-hr 2-yr Rainfall=3.26"

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## Summary for Reach 8R: Culvert #3

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 5,181 sf, 57.98% Impervious, Inflow Depth = 1.45" for 2-yr event  
Inflow = 0.31 cfs @ 11.96 hrs, Volume= 625 cf  
Outflow = 0.31 cfs @ 11.96 hrs, Volume= 625 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.70 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 1.17 fps, Avg. Travel Time= 0.4 min

Peak Storage= 2 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.16'

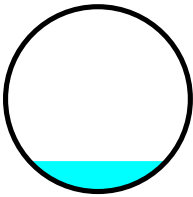
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.35 cfs

12.0" Round Pipe

n= 0.012

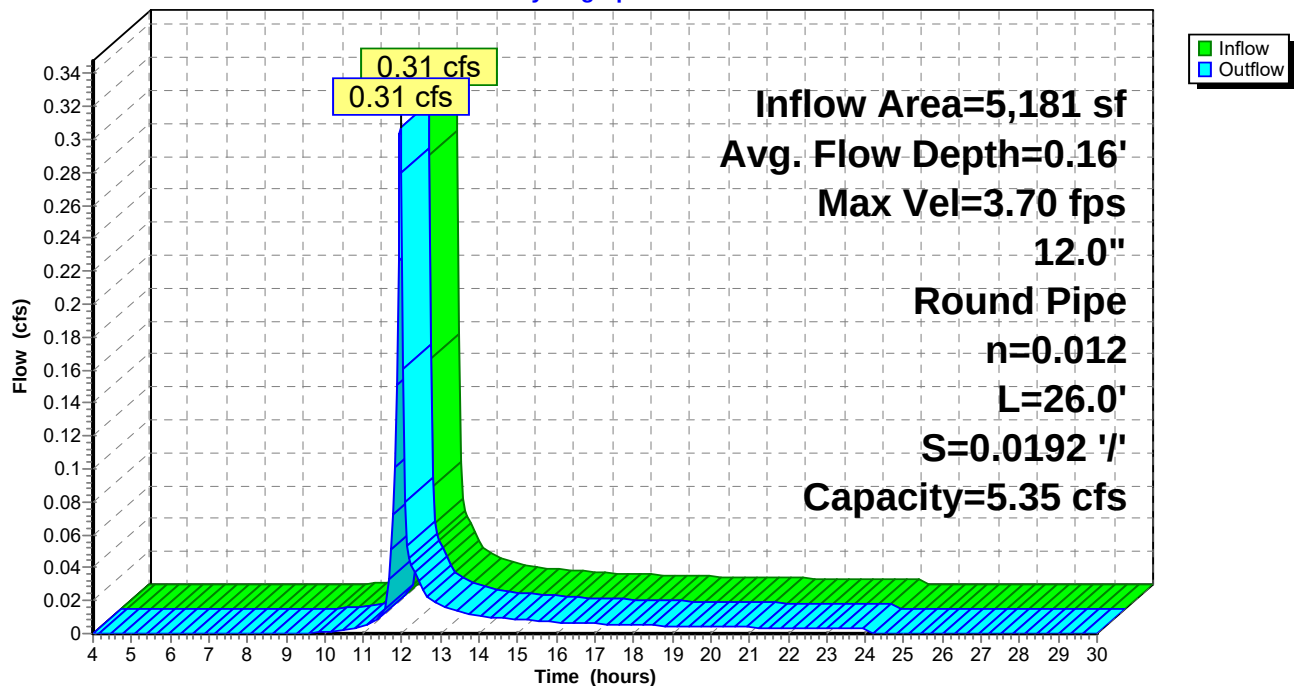
Length= 26.0' Slope= 0.0192 '/'

Inlet Invert= 927.00', Outlet Invert= 926.50'



## Reach 8R: Culvert #3

### Hydrograph



**MLV 505LD86\_Culvert 1-3\_rev2***Type II 24-hr 10-yr Rainfall=4.74"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                                                                                                                                                                 |                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment5S: CC-5</b>                                                                                                                                     | Runoff Area=63,362 sf 7.29% Impervious Runoff Depth=1.48"<br>Tc=5.0 min CN=65 Runoff=3.82 cfs 7,831 cf                                                       |
| <b>Subcatchment7S: CC-7</b>                                                                                                                                     | Runoff Area=5,181 sf 57.98% Impervious Runoff Depth=2.67"<br>Tc=5.0 min CN=80 Runoff=0.57 cfs 1,152 cf                                                       |
| <b>Subcatchment9S: CC-2</b>                                                                                                                                     | Runoff Area=3,973 sf 3.80% Impervious Runoff Depth=2.58"<br>Tc=5.0 min CN=79 Runoff=0.42 cfs 854 cf                                                          |
| <b>Subcatchment10S: CC-3</b>                                                                                                                                    | Runoff Area=20,862 sf 29.48% Impervious Runoff Depth=1.35"<br>Tc=5.0 min CN=63 Runoff=1.13 cfs 2,341 cf                                                      |
| <b>Reach 4R: Culvert #1</b>                                                                                                                                     | Avg. Flow Depth=0.38' Max Vel=5.66 fps Inflow=1.55 cfs 3,195 cf<br>12.0" Round Pipe n=0.012 L=28.7' S=0.0174 '/ Capacity=5.09 cfs Outflow=1.54 cfs 3,195 cf  |
| <b>Reach 6R: Culvert #2</b>                                                                                                                                     | Avg. Flow Depth=0.60' Max Vel=5.76 fps Inflow=3.82 cfs 7,831 cf<br>18.0" Round Pipe n=0.012 L=50.0' S=0.0100 '/ Capacity=11.38 cfs Outflow=3.77 cfs 7,831 cf |
| <b>Reach 8R: Culvert #3</b>                                                                                                                                     | Avg. Flow Depth=0.22' Max Vel=4.42 fps Inflow=0.57 cfs 1,152 cf<br>12.0" Round Pipe n=0.012 L=26.0' S=0.0192 '/ Capacity=5.35 cfs Outflow=0.56 cfs 1,152 cf  |
| <b>Total Runoff Area = 93,378 sf Runoff Volume = 12,178 cf Average Runoff Depth = 1.56"</b><br><b>85.09% Pervious = 79,456 sf 14.91% Impervious = 13,922 sf</b> |                                                                                                                                                              |

**MLV 505LD86\_Culvert 1-3\_rev2**

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Type II 24-hr 10-yr Rainfall=4.74"

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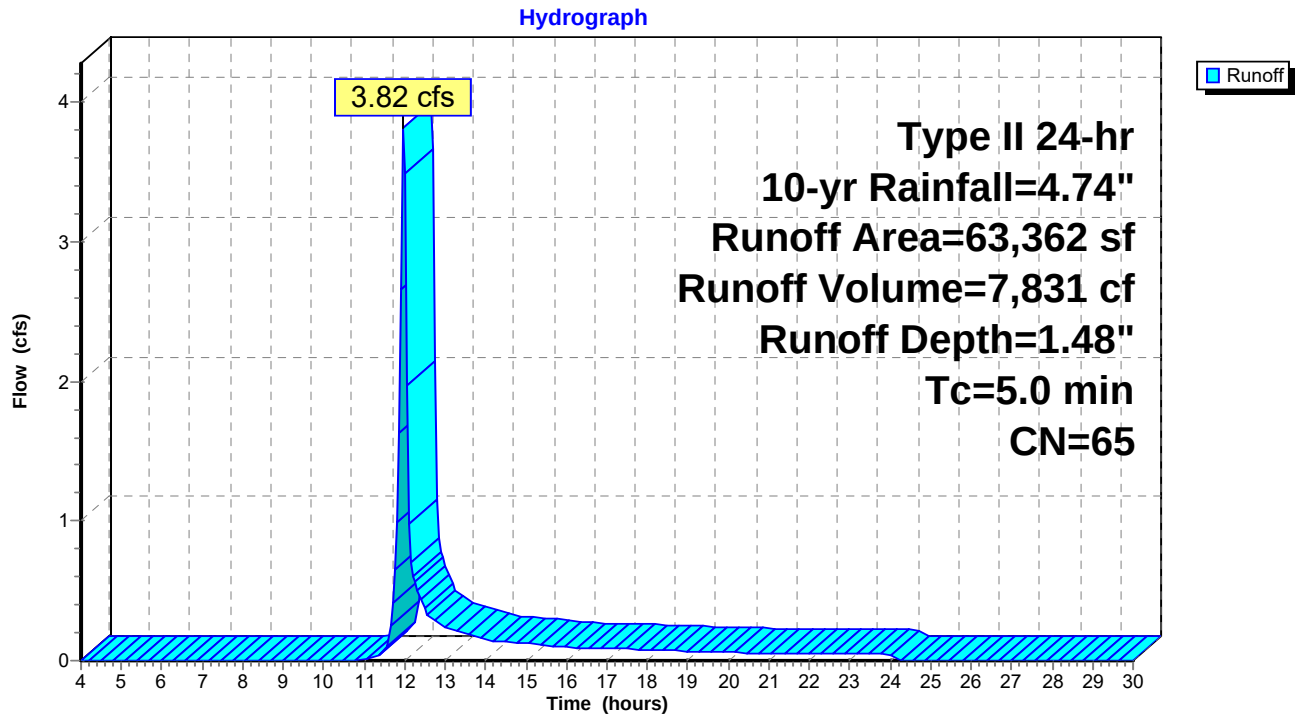
**Summary for Subcatchment 5S: CC-5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 3.82 cfs @ 11.97 hrs, Volume= 7,831 cf, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 18,807    | 30 | Meadow, non-grazed, HSG A |
| 39,939    | 78 | Meadow, non-grazed, HSG D |
| 2,138     | 98 | Paved parking, HSG A      |
| 2,478     | 98 | Paved parking, HSG D      |
| 63,362    | 65 | Weighted Average          |
| 58,746    |    | 92.71% Pervious Area      |
| 4,616     |    | 7.29% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 5S: CC-5**

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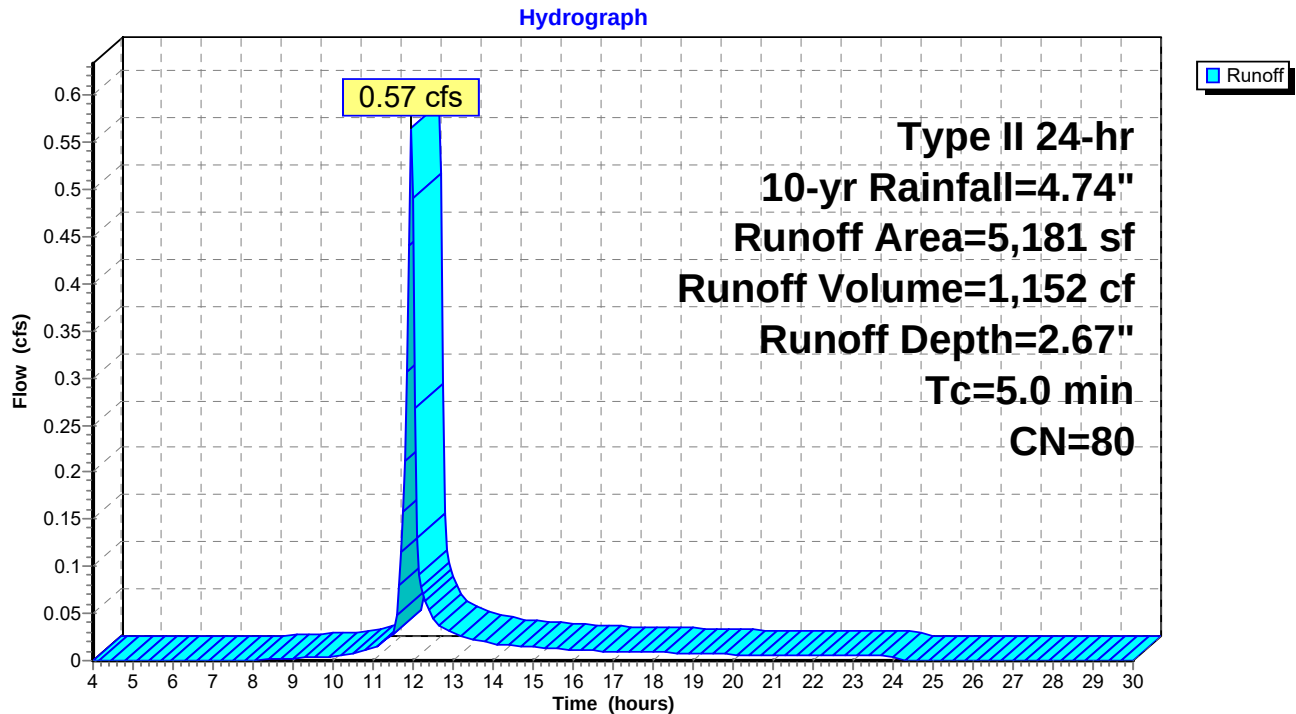
**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.57 cfs @ 11.96 hrs, Volume= 1,152 cf, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,049     | 30 | Meadow, non-grazed, HSG A |
| 1,128     | 78 | Meadow, non-grazed, HSG D |
| 2,071     | 98 | Paved parking, HSG A      |
| 933       | 98 | Paved parking, HSG D      |
| 5,181     | 80 | Weighted Average          |
| 2,177     |    | 42.02% Pervious Area      |
| 3,004     |    | 57.98% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

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Type II 24-hr 10-yr Rainfall=4.74"

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**Summary for Subcatchment 9S: CC-2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.42 cfs @ 11.96 hrs, Volume= 854 cf, Depth= 2.58"

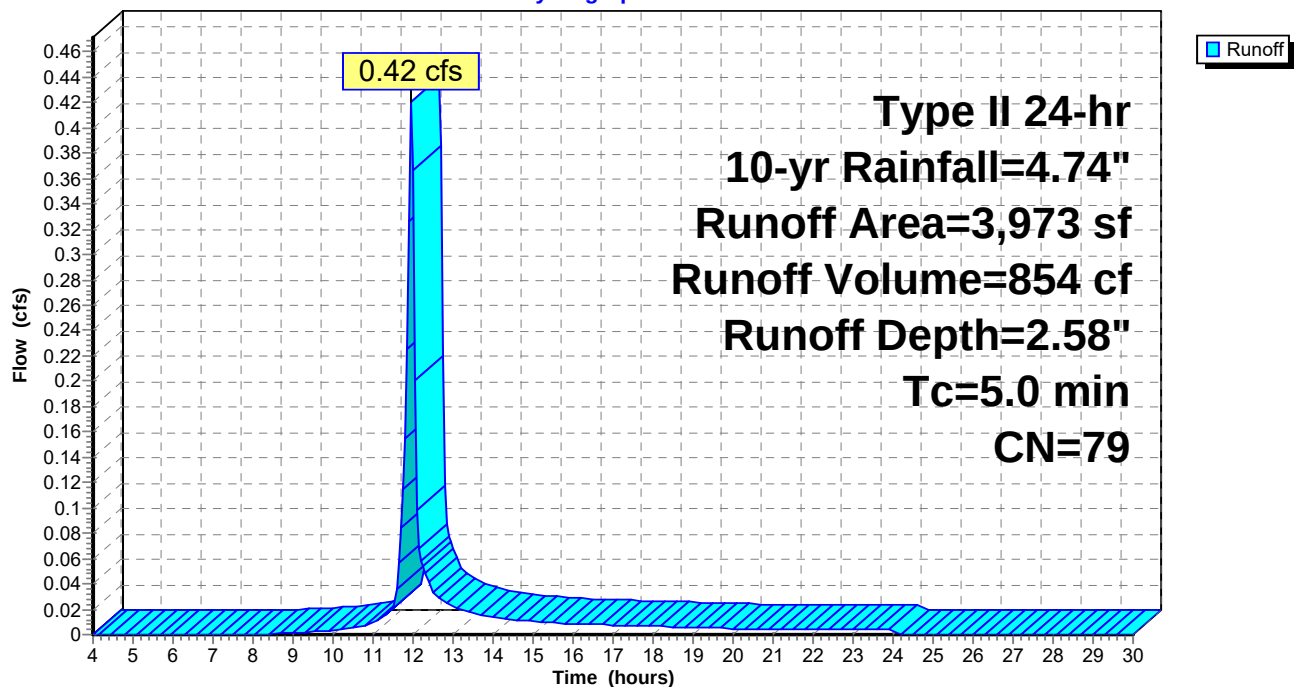
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,822     | 78 | Meadow, non-grazed, HSG D |
| 151       | 98 | Paved parking, HSG D      |
| 3,973     | 79 | Weighted Average          |
| 3,822     |    | 96.20% Pervious Area      |
| 151       |    | 3.80% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 9S: CC-2**

Hydrograph



**MLV 505LD86\_Culvert 1-3\_rev2**

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Type II 24-hr 10-yr Rainfall=4.74"

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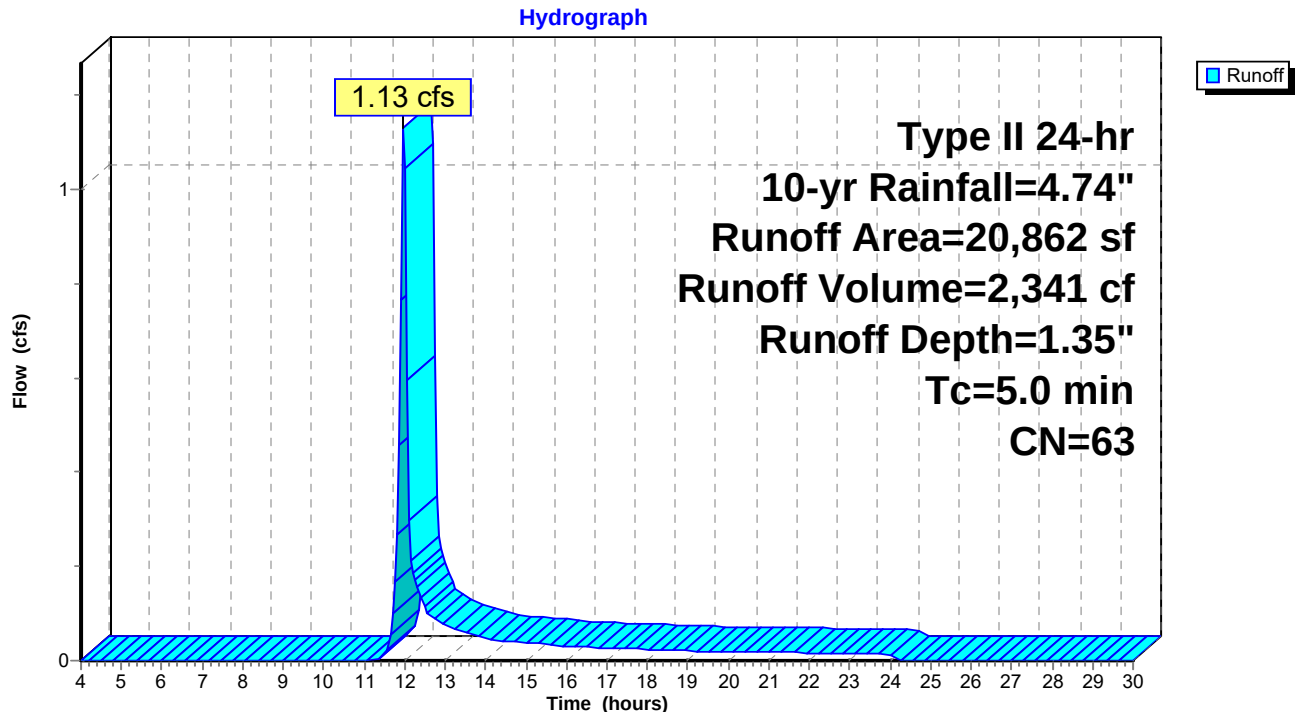
**Summary for Subcatchment 10S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.13 cfs @ 11.97 hrs, Volume= 2,341 cf, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 5,459     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 1,100     | 98 | Paved parking, HSG D      |
| 20,862    | 63 | Weighted Average          |
| 14,711    |    | 70.52% Pervious Area      |
| 6,151     |    | 29.48% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 10S: CC-3**

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Type II 24-hr 10-yr Rainfall=4.74"

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### Summary for Reach 4R: Culvert #1

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 24,835 sf, 25.38% Impervious, Inflow Depth = 1.54" for 10-yr event  
Inflow = 1.55 cfs @ 11.96 hrs, Volume= 3,195 cf  
Outflow = 1.54 cfs @ 11.97 hrs, Volume= 3,195 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.66 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 1.74 fps, Avg. Travel Time= 0.3 min

Peak Storage= 8 cf @ 11.97 hrs

Average Depth at Peak Storage= 0.38'

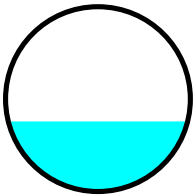
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.09 cfs

12.0" Round Pipe

n= 0.012

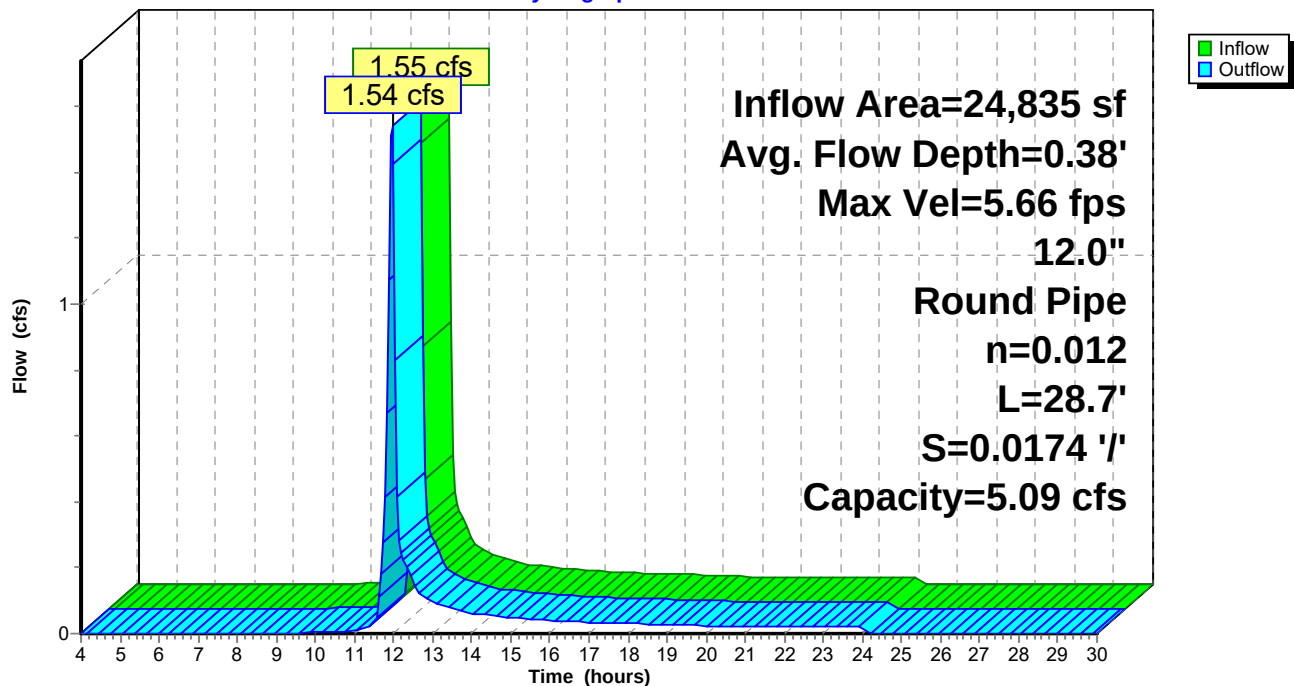
Length= 28.7' Slope= 0.0174 '/'

Inlet Invert= 972.00', Outlet Invert= 971.50'



### Reach 4R: Culvert #1

Hydrograph



## MLV 505LD86\_Culvert 1-3\_rev2

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Type II 24-hr 10-yr Rainfall=4.74"

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### Summary for Reach 6R: Culvert #2

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 63,362 sf, 7.29% Impervious, Inflow Depth = 1.48" for 10-yr event  
Inflow = 3.82 cfs @ 11.97 hrs, Volume= 7,831 cf  
Outflow = 3.77 cfs @ 11.97 hrs, Volume= 7,831 cf, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.76 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 1.99 fps, Avg. Travel Time= 0.4 min

Peak Storage= 33 cf @ 11.97 hrs

Average Depth at Peak Storage= 0.60'

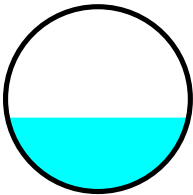
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.38 cfs

18.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

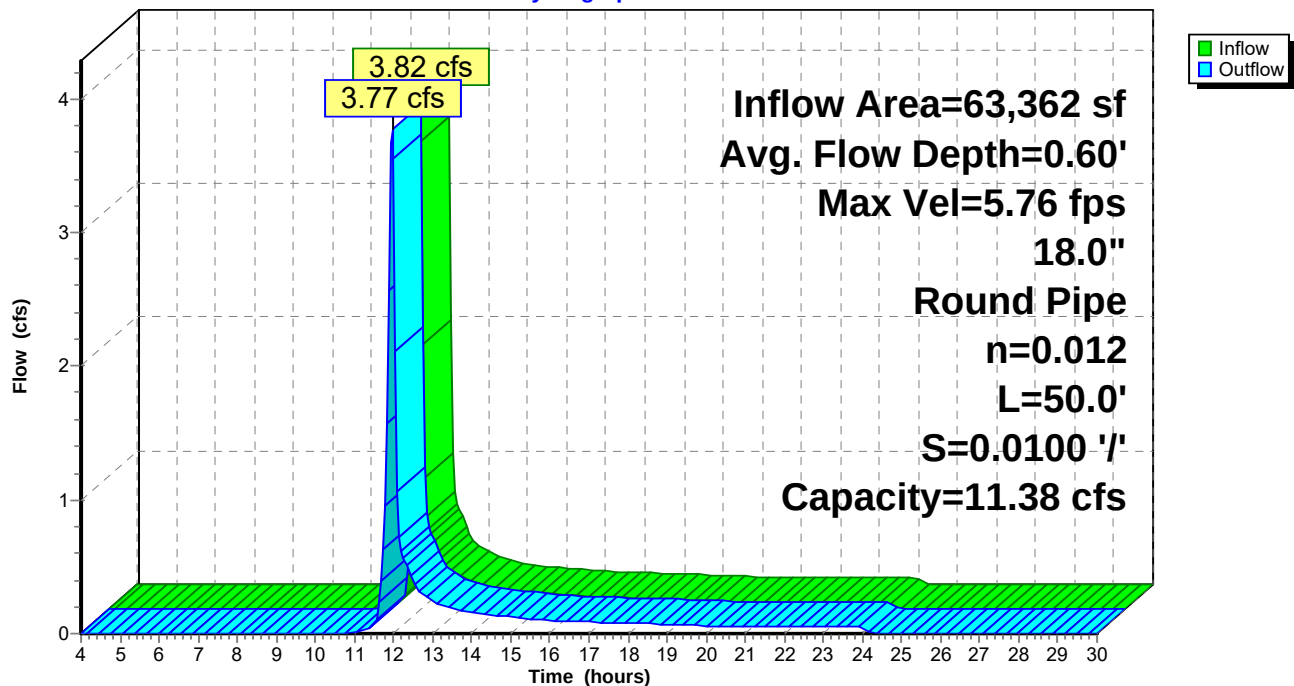
Length= 50.0' Slope= 0.0100 '/'

Inlet Invert= 951.50', Outlet Invert= 951.00'



### Reach 6R: Culvert #2

Hydrograph





## MLV 505LD86\_Culvert 1-3\_rev2

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Type II 24-hr 10-yr Rainfall=4.74"

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### Summary for Reach 8R: Culvert #3

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 5,181 sf, 57.98% Impervious, Inflow Depth = 2.67" for 10-yr event  
Inflow = 0.57 cfs @ 11.96 hrs, Volume= 1,152 cf  
Outflow = 0.56 cfs @ 11.96 hrs, Volume= 1,152 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.42 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 1.33 fps, Avg. Travel Time= 0.3 min

Peak Storage= 3 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.22'

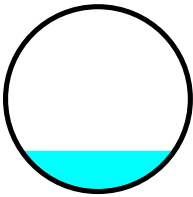
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.35 cfs

12.0" Round Pipe

n= 0.012

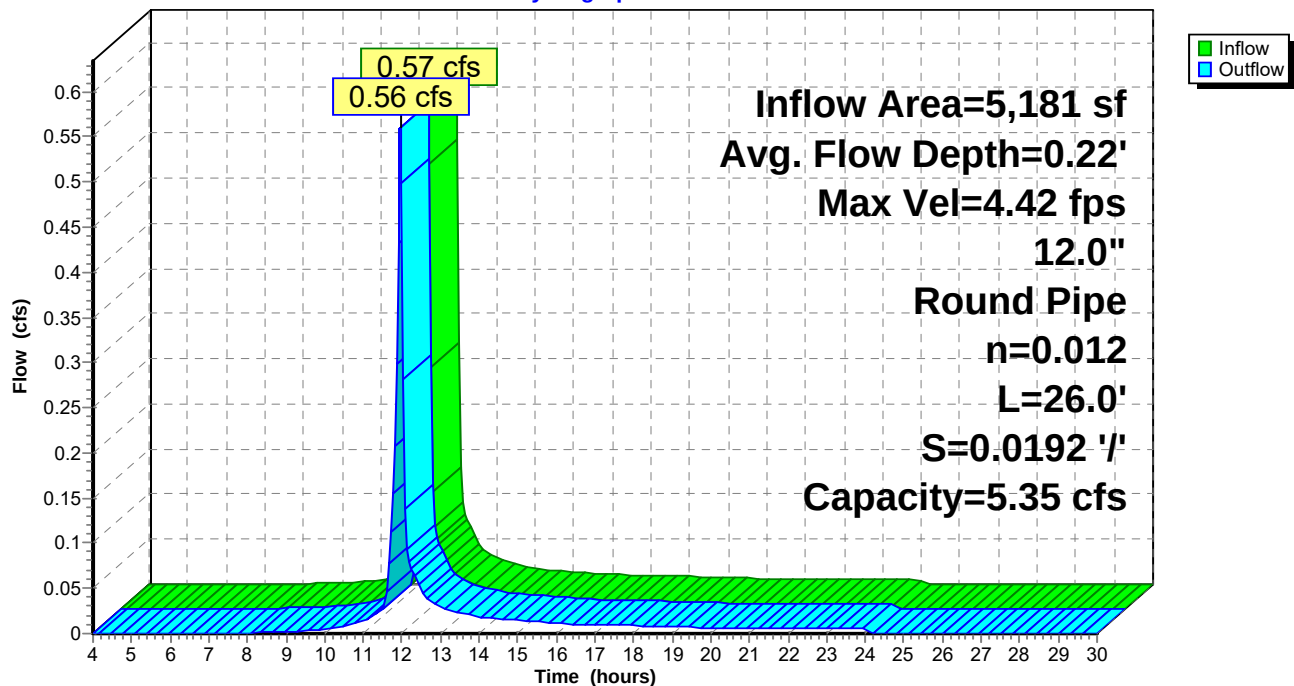
Length= 26.0' Slope= 0.0192 '/'

Inlet Invert= 927.00', Outlet Invert= 926.50'



### Reach 8R: Culvert #3

Hydrograph



**MLV 505LD86\_Culvert 1-3\_rev2***Type II 24-hr 25-yr Rainfall=5.85"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                                                                                                                                                                 |                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment5S: CC-5</b>                                                                                                                                     | Runoff Area=63,362 sf 7.29% Impervious Runoff Depth=2.24"<br>Tc=5.0 min CN=65 Runoff=5.87 cfs 11,843 cf                                                        |
| <b>Subcatchment7S: CC-7</b>                                                                                                                                     | Runoff Area=5,181 sf 57.98% Impervious Runoff Depth=3.65"<br>Tc=5.0 min CN=80 Runoff=0.77 cfs 1,574 cf                                                         |
| <b>Subcatchment9S: CC-2</b>                                                                                                                                     | Runoff Area=3,973 sf 3.80% Impervious Runoff Depth=3.55"<br>Tc=5.0 min CN=79 Runoff=0.57 cfs 1,174 cf                                                          |
| <b>Subcatchment10S: CC-3</b>                                                                                                                                    | Runoff Area=20,862 sf 29.48% Impervious Runoff Depth=2.07"<br>Tc=5.0 min CN=63 Runoff=1.78 cfs 3,603 cf                                                        |
| <b>Reach 4R: Culvert #1</b>                                                                                                                                     | Avg. Flow Depth=0.48' Max Vel=6.33 fps Inflow=2.35 cfs 4,777 cf<br>12.0" Round Pipe n=0.012 L=28.7' S=0.0174 '/ Capacity=5.09 cfs Outflow=2.33 cfs 4,777 cf    |
| <b>Reach 6R: Culvert #2</b>                                                                                                                                     | Avg. Flow Depth=0.76' Max Vel=6.46 fps Inflow=5.87 cfs 11,843 cf<br>18.0" Round Pipe n=0.012 L=50.0' S=0.0100 '/ Capacity=11.38 cfs Outflow=5.79 cfs 11,843 cf |
| <b>Reach 8R: Culvert #3</b>                                                                                                                                     | Avg. Flow Depth=0.26' Max Vel=4.83 fps Inflow=0.77 cfs 1,574 cf<br>12.0" Round Pipe n=0.012 L=26.0' S=0.0192 '/ Capacity=5.35 cfs Outflow=0.76 cfs 1,574 cf    |
| <b>Total Runoff Area = 93,378 sf Runoff Volume = 18,194 cf Average Runoff Depth = 2.34"</b><br><b>85.09% Pervious = 79,456 sf 14.91% Impervious = 13,922 sf</b> |                                                                                                                                                                |

**MLV 505LD86\_Culvert 1-3\_rev2**

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Type II 24-hr 25-yr Rainfall=5.85"

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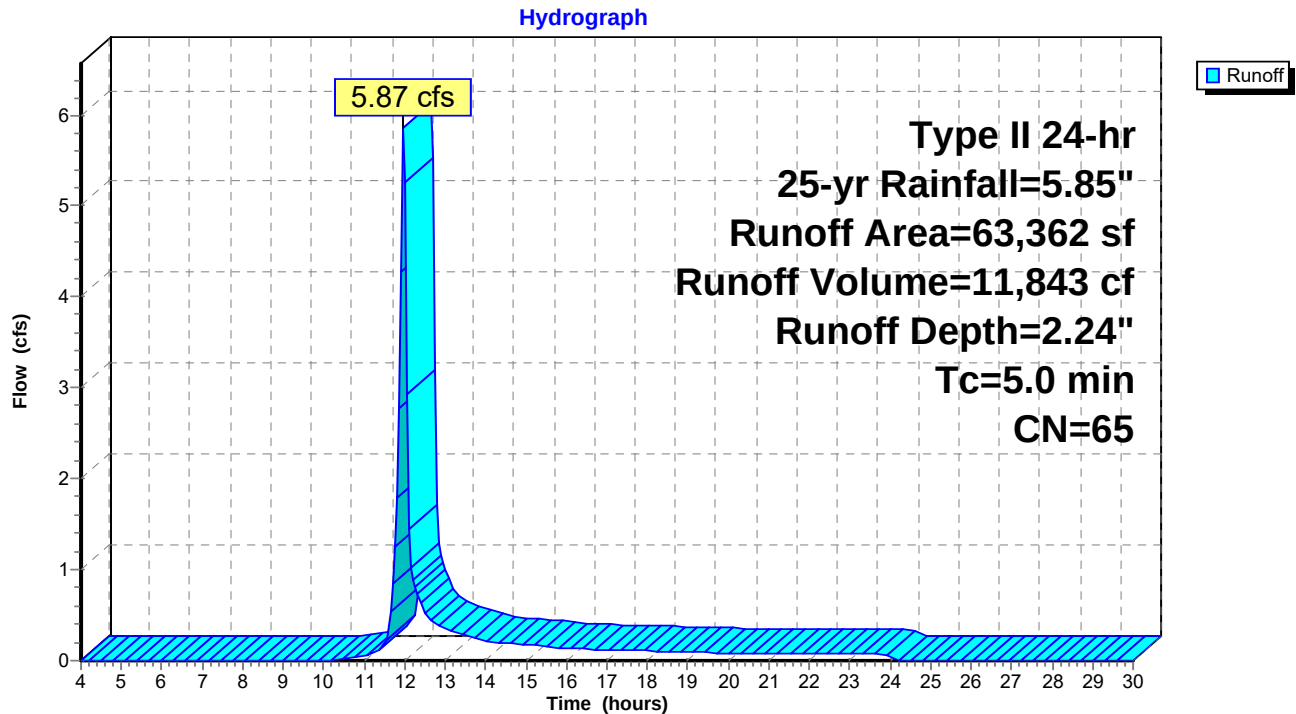
**Summary for Subcatchment 5S: CC-5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 5.87 cfs @ 11.96 hrs, Volume= 11,843 cf, Depth= 2.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 18,807    | 30 | Meadow, non-grazed, HSG A |
| 39,939    | 78 | Meadow, non-grazed, HSG D |
| 2,138     | 98 | Paved parking, HSG A      |
| 2,478     | 98 | Paved parking, HSG D      |
| 63,362    | 65 | Weighted Average          |
| 58,746    |    | 92.71% Pervious Area      |
| 4,616     |    | 7.29% Impervious Area     |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 5S: CC-5**

**MLV 505LD86\_Culvert 1-3\_rev2**

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Type II 24-hr 25-yr Rainfall=5.85"

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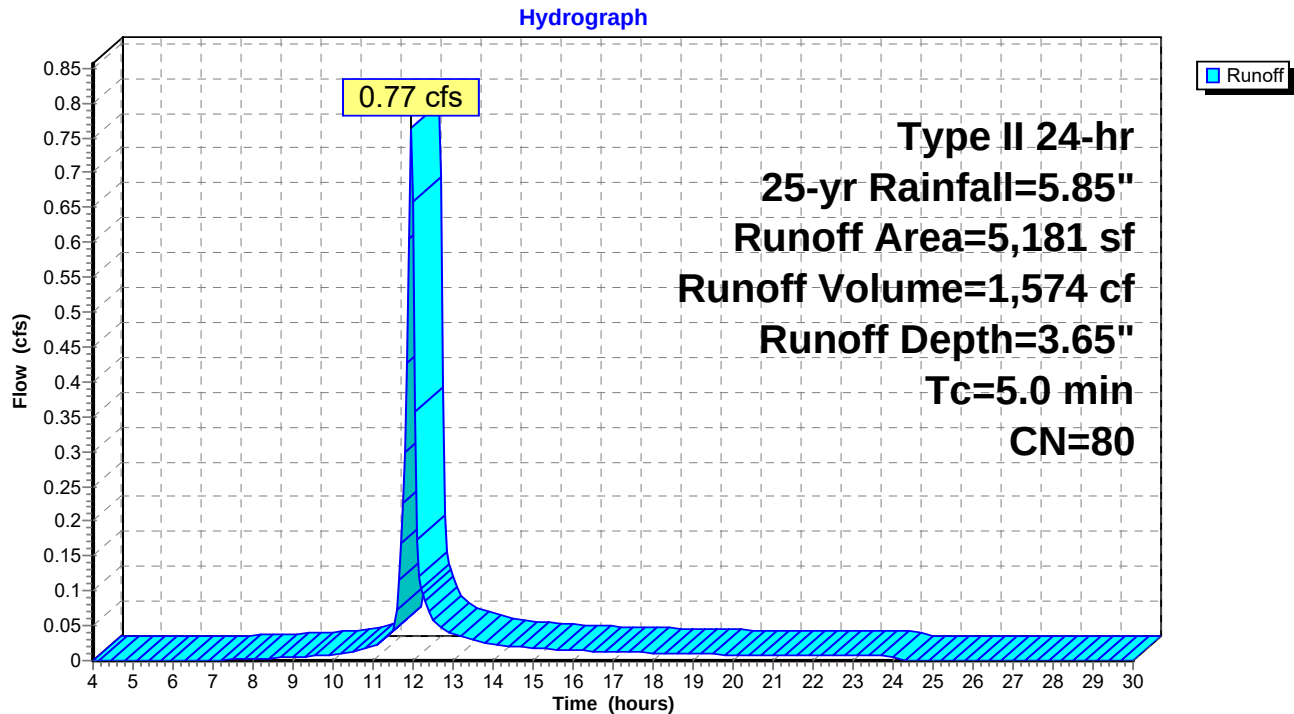
**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.77 cfs @ 11.96 hrs, Volume= 1,574 cf, Depth= 3.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,049     | 30 | Meadow, non-grazed, HSG A |
| 1,128     | 78 | Meadow, non-grazed, HSG D |
| 2,071     | 98 | Paved parking, HSG A      |
| 933       | 98 | Paved parking, HSG D      |
| 5,181     | 80 | Weighted Average          |
| 2,177     |    | 42.02% Pervious Area      |
| 3,004     |    | 57.98% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

**MLV 505LD86\_Culvert 1-3\_rev2**

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Type II 24-hr 25-yr Rainfall=5.85"

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**Summary for Subcatchment 9S: CC-2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.57 cfs @ 11.96 hrs, Volume= 1,174 cf, Depth= 3.55"

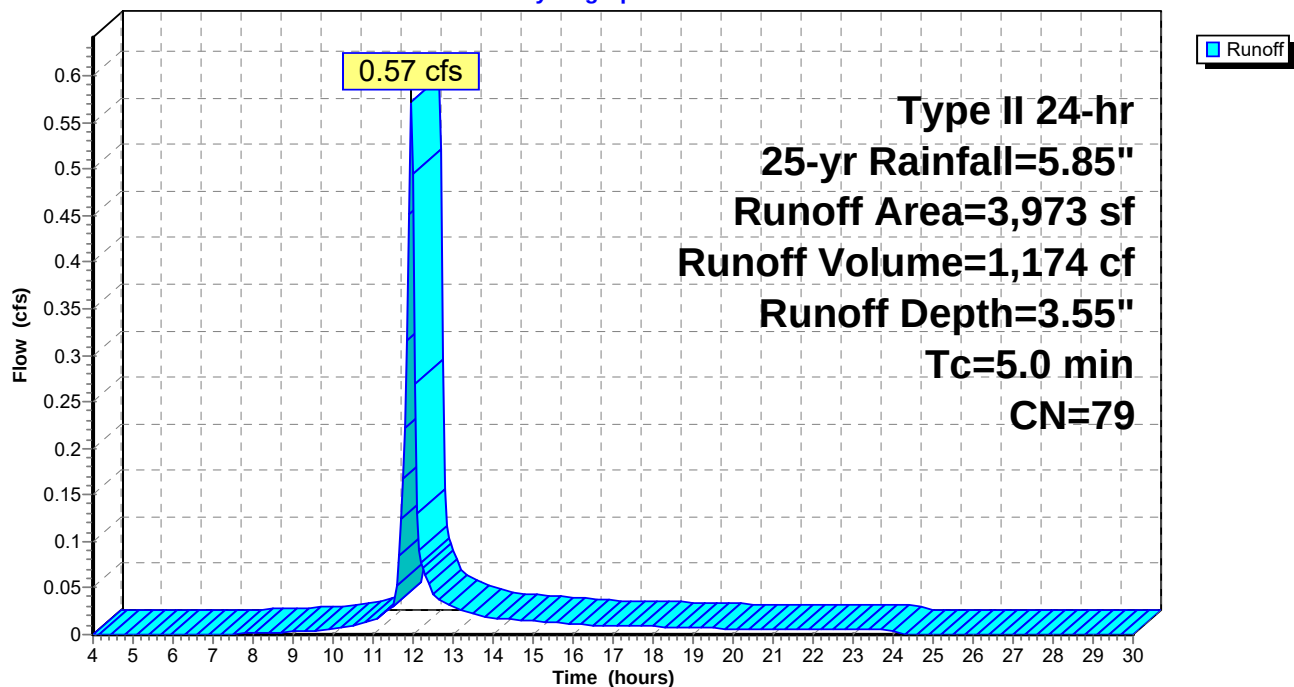
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,822     | 78 | Meadow, non-grazed, HSG D |
| 151       | 98 | Paved parking, HSG D      |
| 3,973     | 79 | Weighted Average          |
| 3,822     |    | 96.20% Pervious Area      |
| 151       |    | 3.80% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 9S: CC-2**

Hydrograph



**MLV 505LD86\_Culvert 1-3\_rev2**

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Type II 24-hr 25-yr Rainfall=5.85"

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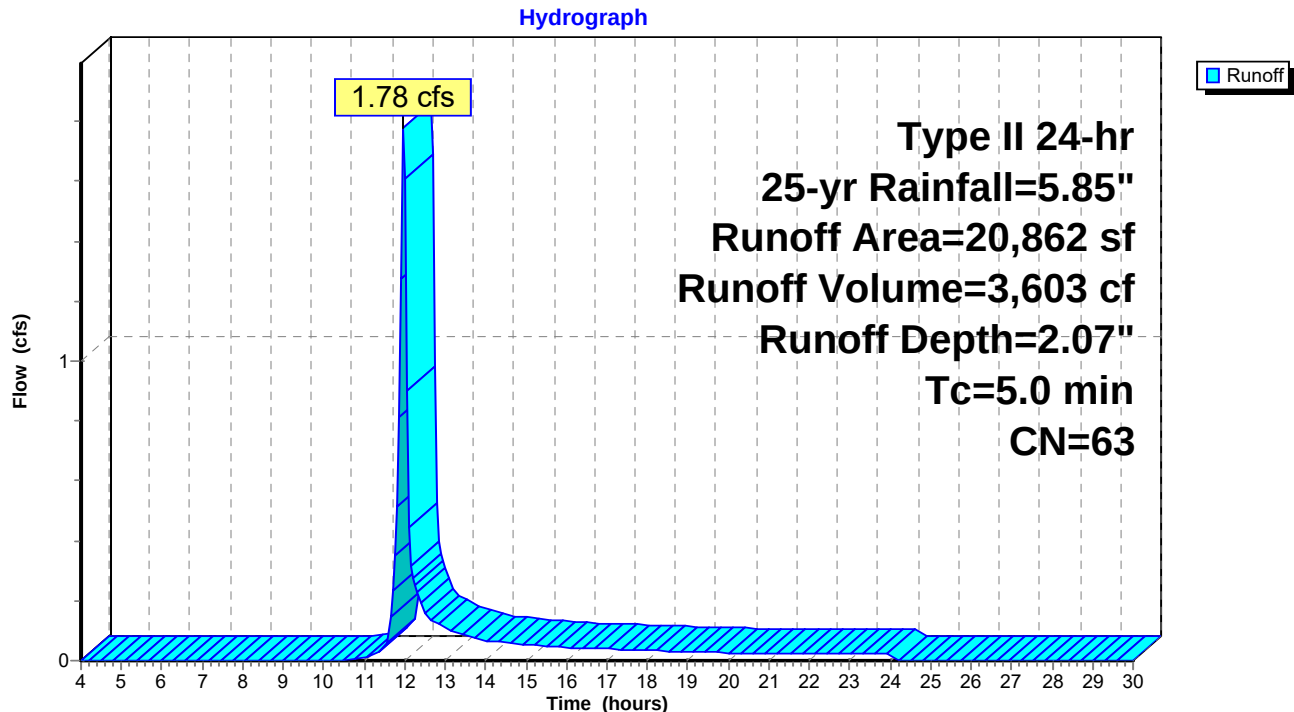
**Summary for Subcatchment 10S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.78 cfs @ 11.96 hrs, Volume= 3,603 cf, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 5,459     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 1,100     | 98 | Paved parking, HSG D      |
| 20,862    | 63 | Weighted Average          |
| 14,711    |    | 70.52% Pervious Area      |
| 6,151     |    | 29.48% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 10S: CC-3**

## MLV 505LD86\_Culvert 1-3\_rev2

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Type II 24-hr 25-yr Rainfall=5.85"

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### Summary for Reach 4R: Culvert #1

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 24,835 sf, 25.38% Impervious, Inflow Depth = 2.31" for 25-yr event  
Inflow = 2.35 cfs @ 11.96 hrs, Volume= 4,777 cf  
Outflow = 2.33 cfs @ 11.96 hrs, Volume= 4,777 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.33 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 1.87 fps, Avg. Travel Time= 0.3 min

Peak Storage= 11 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.48'

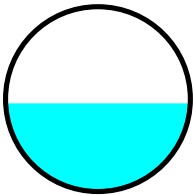
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.09 cfs

12.0" Round Pipe

n= 0.012

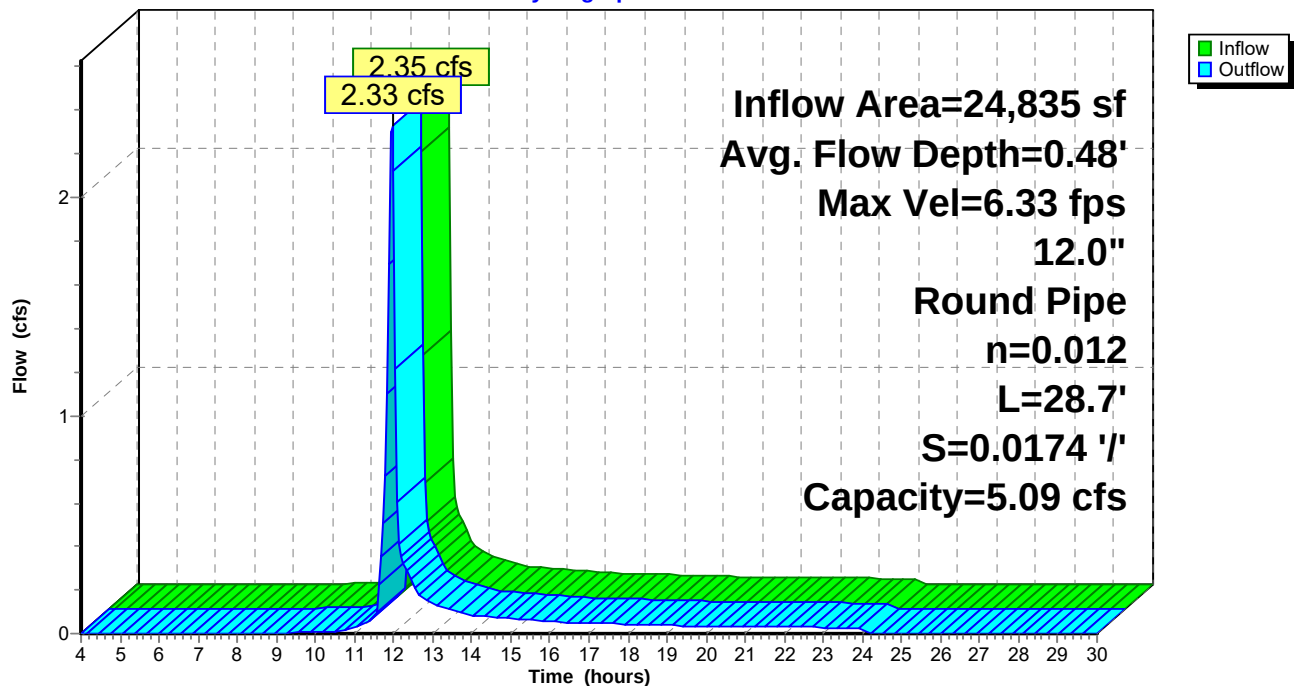
Length= 28.7' Slope= 0.0174 '/'

Inlet Invert= 972.00', Outlet Invert= 971.50'



### Reach 4R: Culvert #1

Hydrograph



## MLV 505LD86\_Culvert 1-3\_rev2

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Type II 24-hr 25-yr Rainfall=5.85"

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### Summary for Reach 6R: Culvert #2

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 63,362 sf, 7.29% Impervious, Inflow Depth = 2.24" for 25-yr event  
Inflow = 5.87 cfs @ 11.96 hrs, Volume= 11,843 cf  
Outflow = 5.79 cfs @ 11.97 hrs, Volume= 11,843 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.46 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 2.17 fps, Avg. Travel Time= 0.4 min

Peak Storage= 45 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.76'

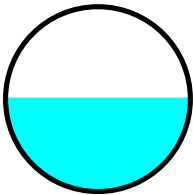
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.38 cfs

18.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

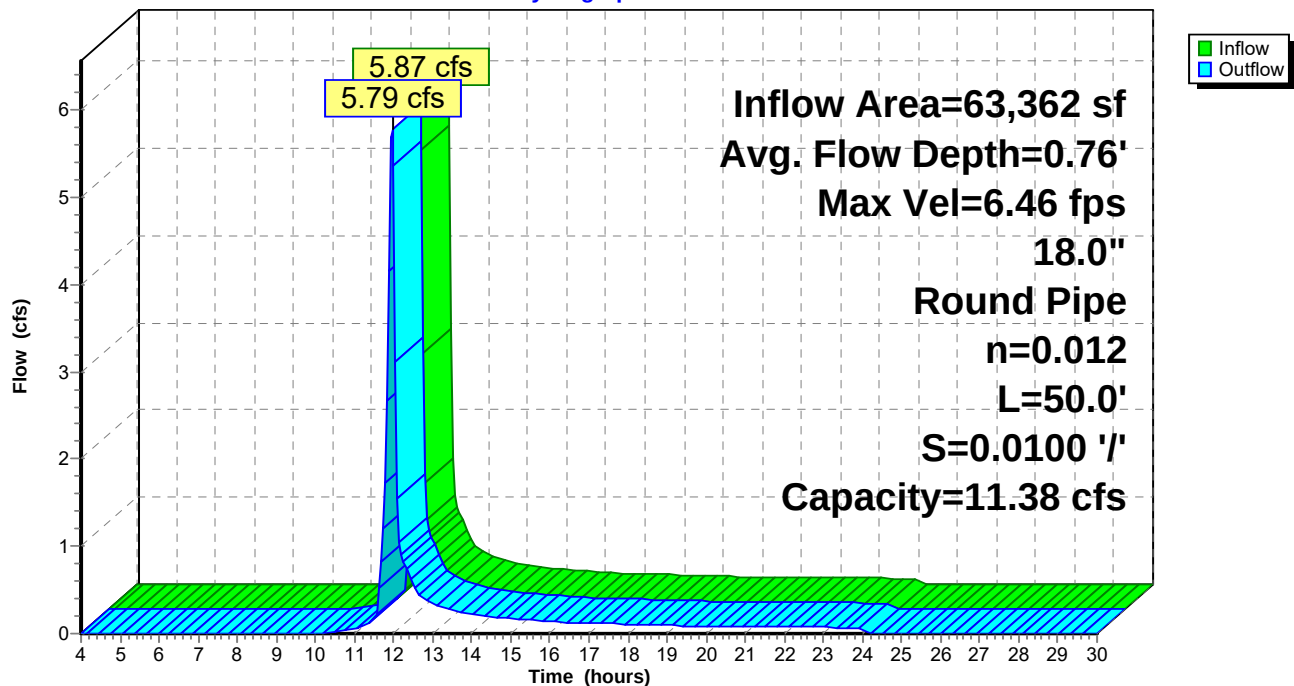
Length= 50.0' Slope= 0.0100 '/

Inlet Invert= 951.50', Outlet Invert= 951.00'



### Reach 6R: Culvert #2

Hydrograph





## MLV 505LD86\_Culvert 1-3\_rev2

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Type II 24-hr 25-yr Rainfall=5.85"

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### Summary for Reach 8R: Culvert #3

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 5,181 sf, 57.98% Impervious, Inflow Depth = 3.65" for 25-yr event  
Inflow = 0.77 cfs @ 11.96 hrs, Volume= 1,574 cf  
Outflow = 0.76 cfs @ 11.96 hrs, Volume= 1,574 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.83 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 1.42 fps, Avg. Travel Time= 0.3 min

Peak Storage= 4 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.26'

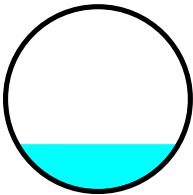
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.35 cfs

12.0" Round Pipe

n= 0.012

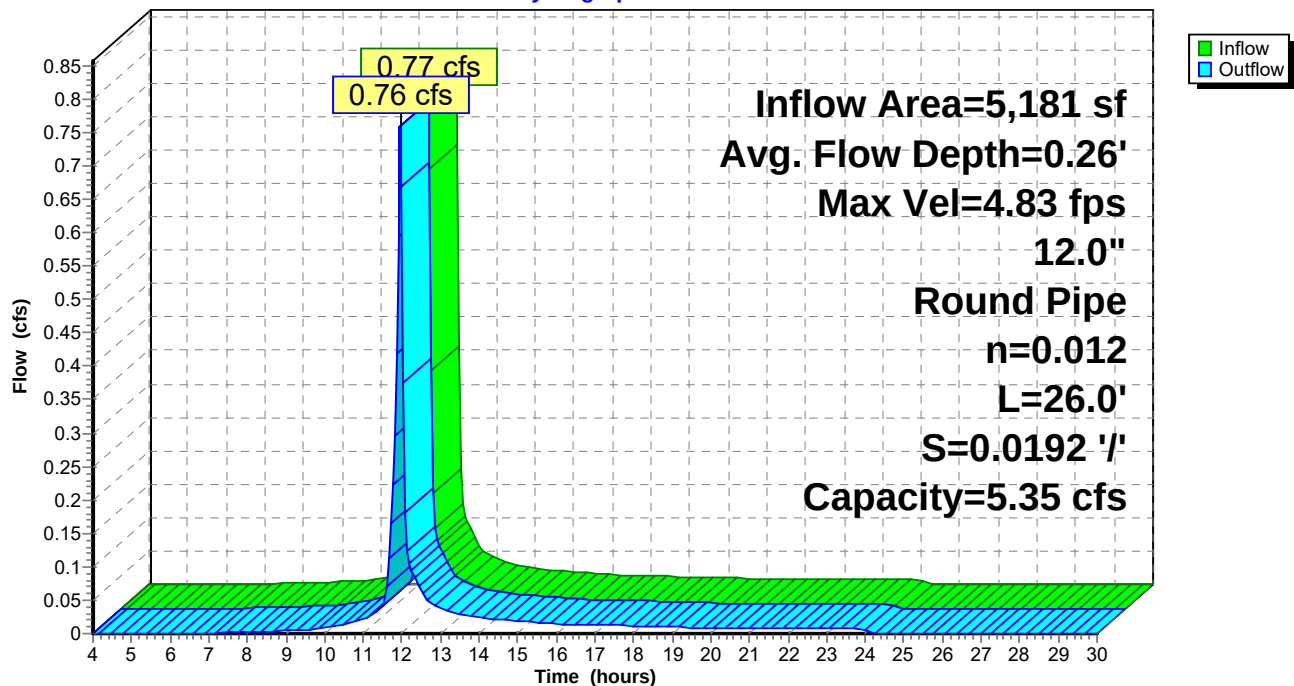
Length= 26.0' Slope= 0.0192 '/'

Inlet Invert= 927.00', Outlet Invert= 926.50'



### Reach 8R: Culvert #3

Hydrograph



**MLV 505LD86\_Culvert 1-3\_rev2***Type II 24-hr 50-yr Rainfall=6.87"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                                                                                                                                                                 |                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment5S: CC-5</b>                                                                                                                                     | Runoff Area=63,362 sf 7.29% Impervious Runoff Depth=3.00"<br>Tc=5.0 min CN=65 Runoff=7.87 cfs 15,853 cf                                                        |
| <b>Subcatchment7S: CC-7</b>                                                                                                                                     | Runoff Area=5,181 sf 57.98% Impervious Runoff Depth=4.57"<br>Tc=5.0 min CN=80 Runoff=0.95 cfs 1,975 cf                                                         |
| <b>Subcatchment9S: CC-2</b>                                                                                                                                     | Runoff Area=3,973 sf 3.80% Impervious Runoff Depth=4.47"<br>Tc=5.0 min CN=79 Runoff=0.71 cfs 1,478 cf                                                          |
| <b>Subcatchment10S: CC-3</b>                                                                                                                                    | Runoff Area=20,862 sf 29.48% Impervious Runoff Depth=2.80"<br>Tc=5.0 min CN=63 Runoff=2.42 cfs 4,875 cf                                                        |
| <b>Reach 4R: Culvert #1</b>                                                                                                                                     | Avg. Flow Depth=0.57' Max Vel=6.80 fps Inflow=3.13 cfs 6,353 cf<br>12.0" Round Pipe n=0.012 L=28.7' S=0.0174 '/ Capacity=5.09 cfs Outflow=3.11 cfs 6,353 cf    |
| <b>Reach 6R: Culvert #2</b>                                                                                                                                     | Avg. Flow Depth=0.92' Max Vel=6.93 fps Inflow=7.87 cfs 15,853 cf<br>18.0" Round Pipe n=0.012 L=50.0' S=0.0100 '/ Capacity=11.38 cfs Outflow=7.78 cfs 15,853 cf |
| <b>Reach 8R: Culvert #3</b>                                                                                                                                     | Avg. Flow Depth=0.28' Max Vel=5.14 fps Inflow=0.95 cfs 1,975 cf<br>12.0" Round Pipe n=0.012 L=26.0' S=0.0192 '/ Capacity=5.35 cfs Outflow=0.94 cfs 1,975 cf    |
| <b>Total Runoff Area = 93,378 sf Runoff Volume = 24,181 cf Average Runoff Depth = 3.11"</b><br><b>85.09% Pervious = 79,456 sf 14.91% Impervious = 13,922 sf</b> |                                                                                                                                                                |

**MLV 505LD86\_Culvert 1-3\_rev2**

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Type II 24-hr 50-yr Rainfall=6.87"

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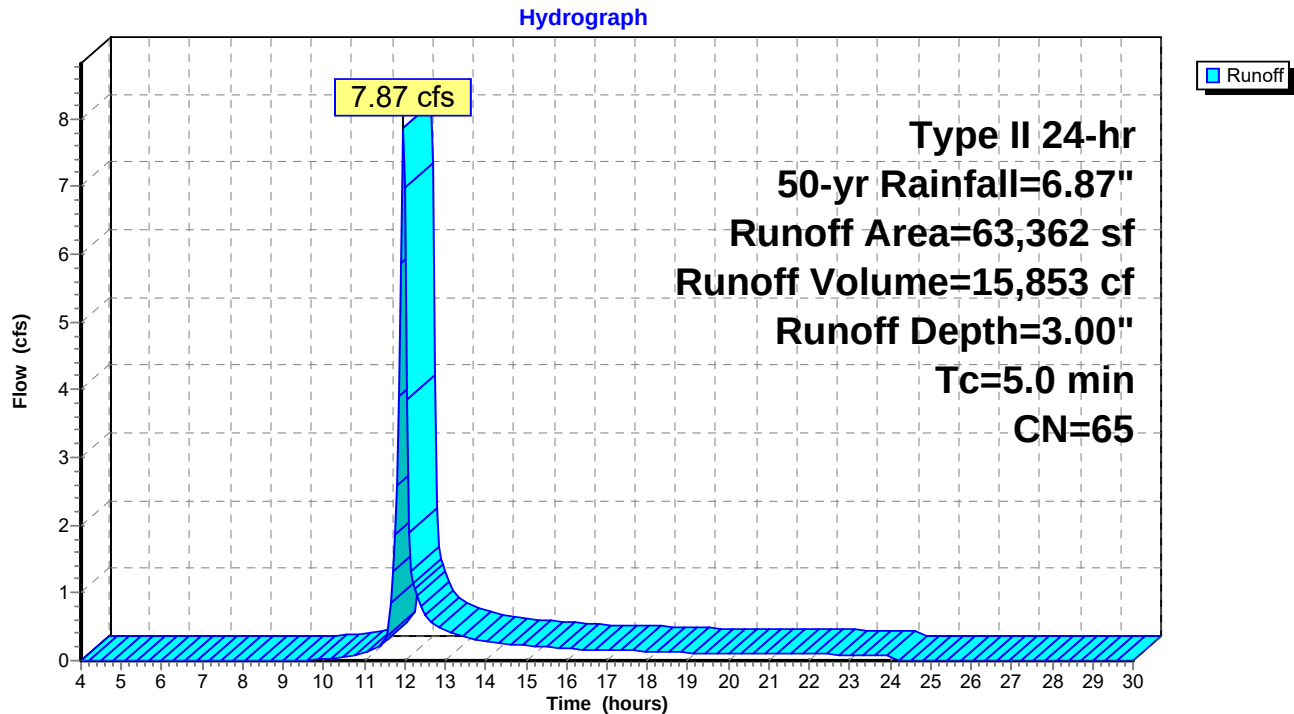
**Summary for Subcatchment 5S: CC-5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 7.87 cfs @ 11.96 hrs, Volume= 15,853 cf, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 18,807    | 30 | Meadow, non-grazed, HSG A |
| 39,939    | 78 | Meadow, non-grazed, HSG D |
| 2,138     | 98 | Paved parking, HSG A      |
| 2,478     | 98 | Paved parking, HSG D      |
| 63,362    | 65 | Weighted Average          |
| 58,746    |    | 92.71% Pervious Area      |
| 4,616     |    | 7.29% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 5S: CC-5**

**MLV 505LD86\_Culvert 1-3\_rev2**

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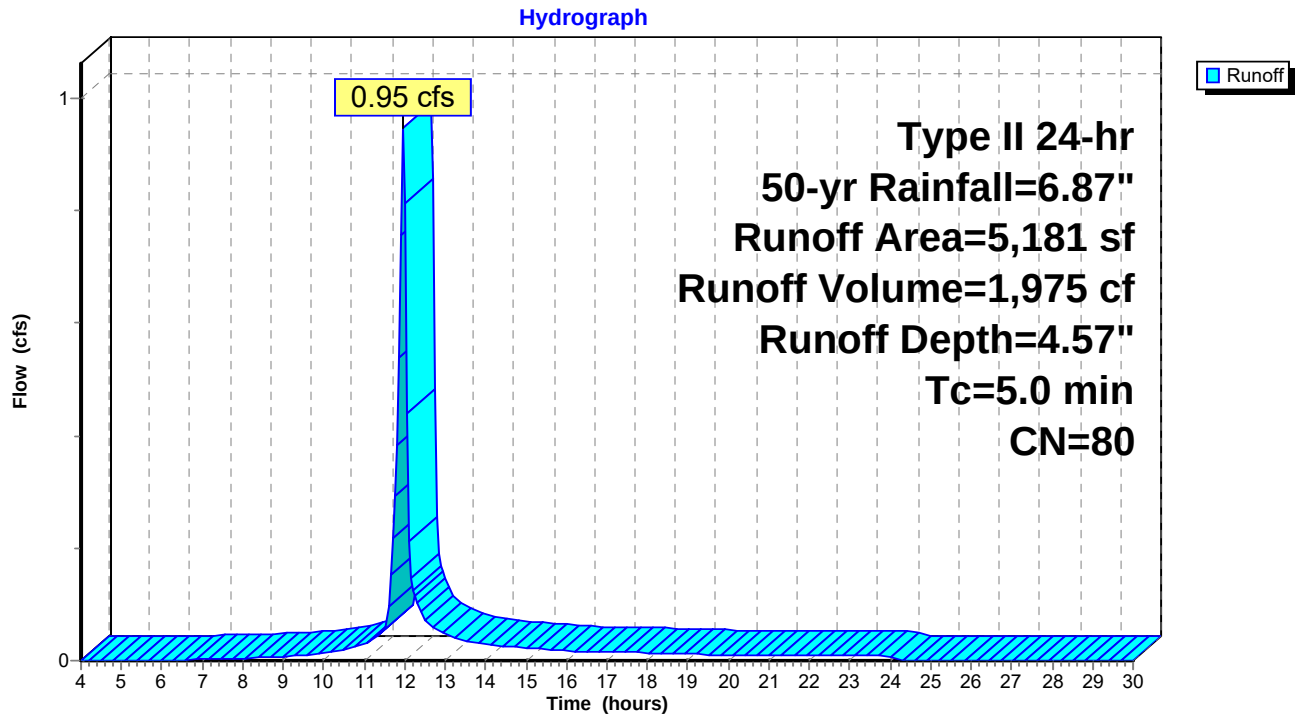
**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.95 cfs @ 11.95 hrs, Volume= 1,975 cf, Depth= 4.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,049     | 30 | Meadow, non-grazed, HSG A |
| 1,128     | 78 | Meadow, non-grazed, HSG D |
| 2,071     | 98 | Paved parking, HSG A      |
| 933       | 98 | Paved parking, HSG D      |
| 5,181     | 80 | Weighted Average          |
| 2,177     |    | 42.02% Pervious Area      |
| 3,004     |    | 57.98% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

**MLV 505LD86\_Culvert 1-3\_rev2**

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**Summary for Subcatchment 9S: CC-2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.71 cfs @ 11.95 hrs, Volume= 1,478 cf, Depth= 4.47"

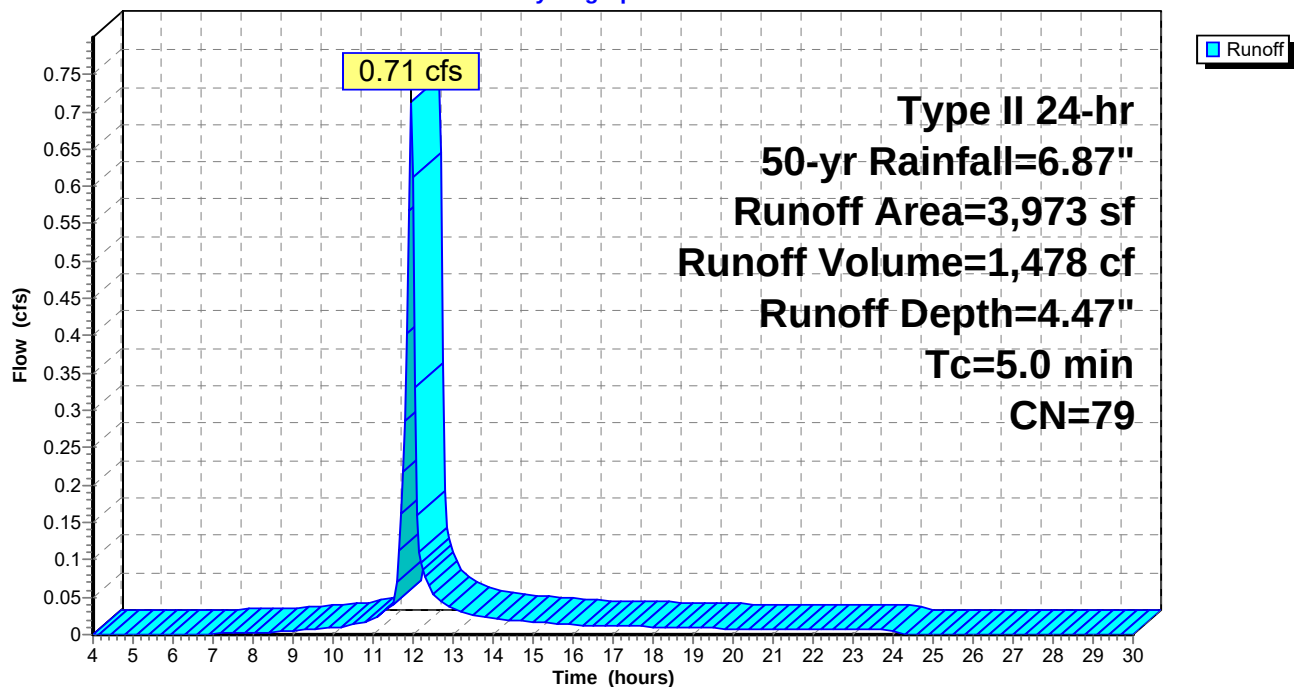
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,822     | 78 | Meadow, non-grazed, HSG D |
| 151       | 98 | Paved parking, HSG D      |
| 3,973     | 79 | Weighted Average          |
| 3,822     |    | 96.20% Pervious Area      |
| 151       |    | 3.80% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 9S: CC-2**

Hydrograph



**MLV 505LD86\_Culvert 1-3\_rev2**

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Type II 24-hr 50-yr Rainfall=6.87"

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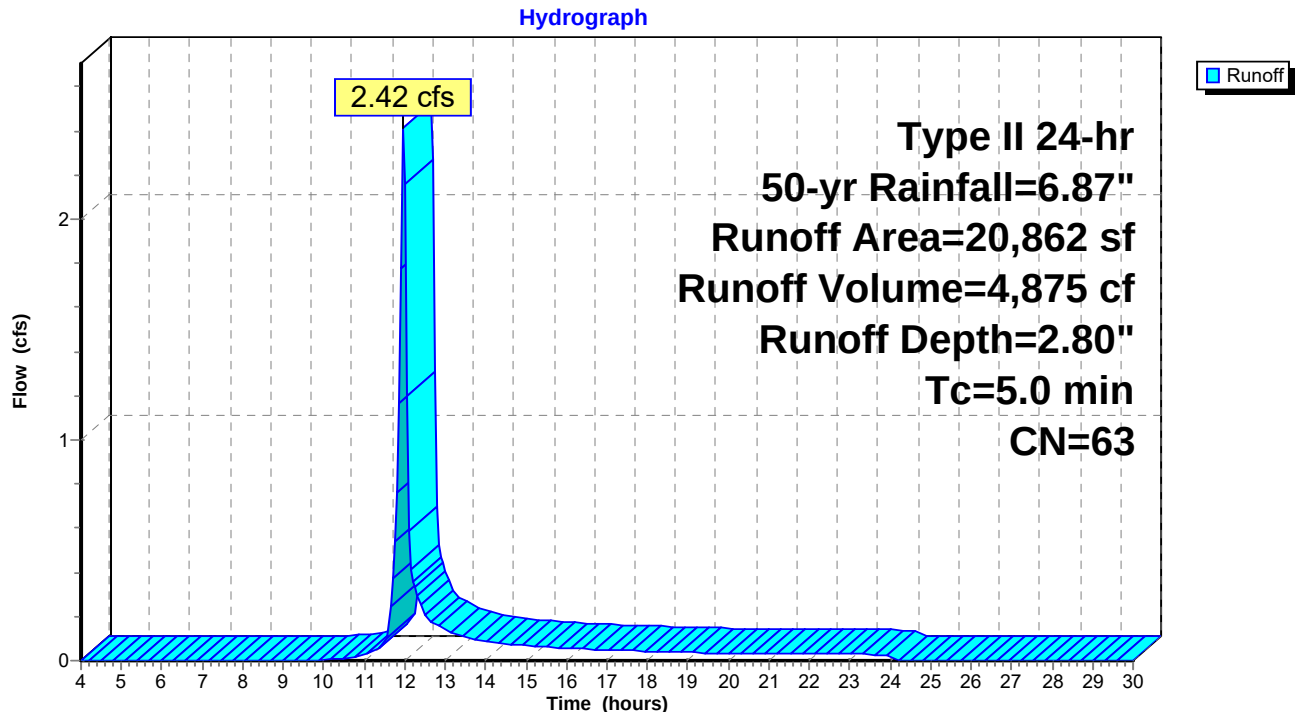
**Summary for Subcatchment 10S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 2.42 cfs @ 11.96 hrs, Volume= 4,875 cf, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 5,459     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 1,100     | 98 | Paved parking, HSG D      |
| 20,862    | 63 | Weighted Average          |
| 14,711    |    | 70.52% Pervious Area      |
| 6,151     |    | 29.48% Impervious Area    |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 10S: CC-3**

## MLV 505LD86\_Culvert 1-3\_rev2

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Type II 24-hr 50-yr Rainfall=6.87"

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### Summary for Reach 4R: Culvert #1

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 24,835 sf, 25.38% Impervious, Inflow Depth = 3.07" for 50-yr event  
Inflow = 3.13 cfs @ 11.96 hrs, Volume= 6,353 cf  
Outflow = 3.11 cfs @ 11.96 hrs, Volume= 6,353 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.80 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 1.99 fps, Avg. Travel Time= 0.2 min

Peak Storage= 13 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.57'

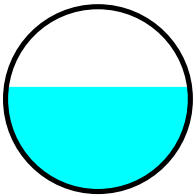
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.09 cfs

12.0" Round Pipe

n= 0.012

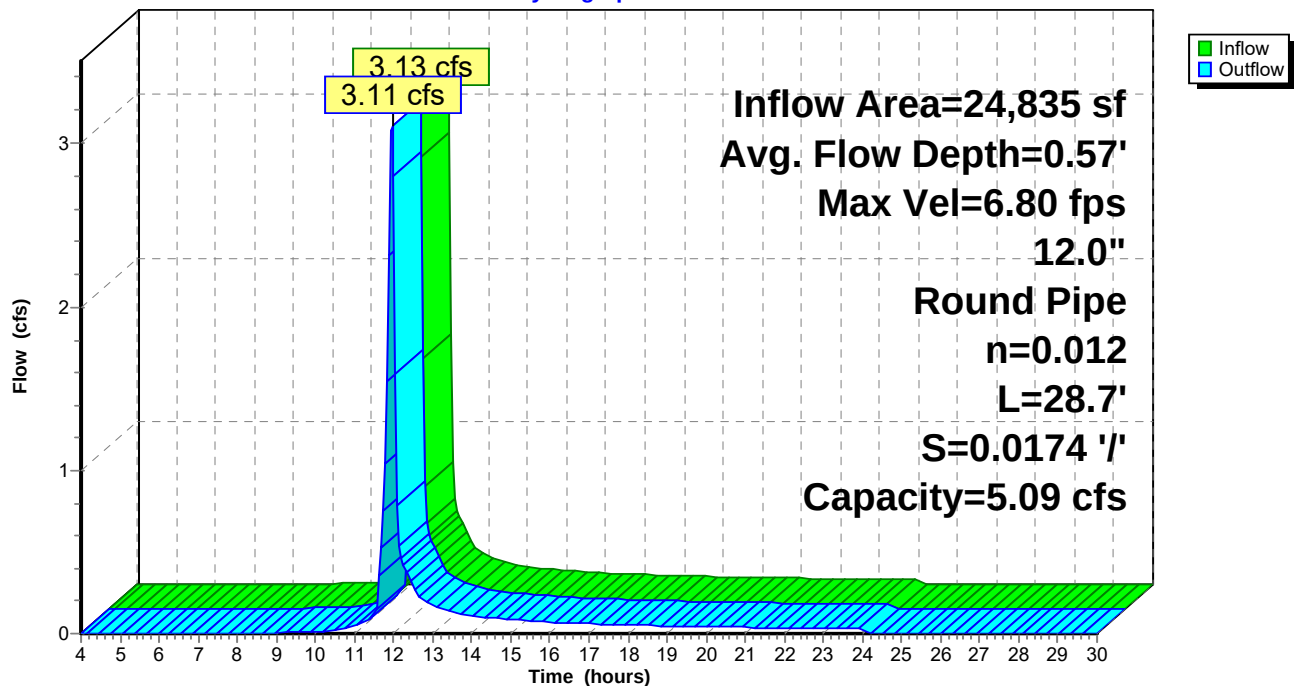
Length= 28.7' Slope= 0.0174 '/'

Inlet Invert= 972.00', Outlet Invert= 971.50'



### Reach 4R: Culvert #1

Hydrograph



## MLV 505LD86\_Culvert 1-3\_rev2

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Type II 24-hr 50-yr Rainfall=6.87"

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### Summary for Reach 6R: Culvert #2

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 63,362 sf, 7.29% Impervious, Inflow Depth = 3.00" for 50-yr event  
Inflow = 7.87 cfs @ 11.96 hrs, Volume= 15,853 cf  
Outflow = 7.78 cfs @ 11.96 hrs, Volume= 15,853 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.93 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 2.30 fps, Avg. Travel Time= 0.4 min

Peak Storage= 56 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.92'

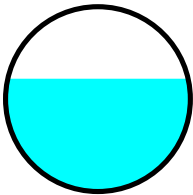
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.38 cfs

18.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

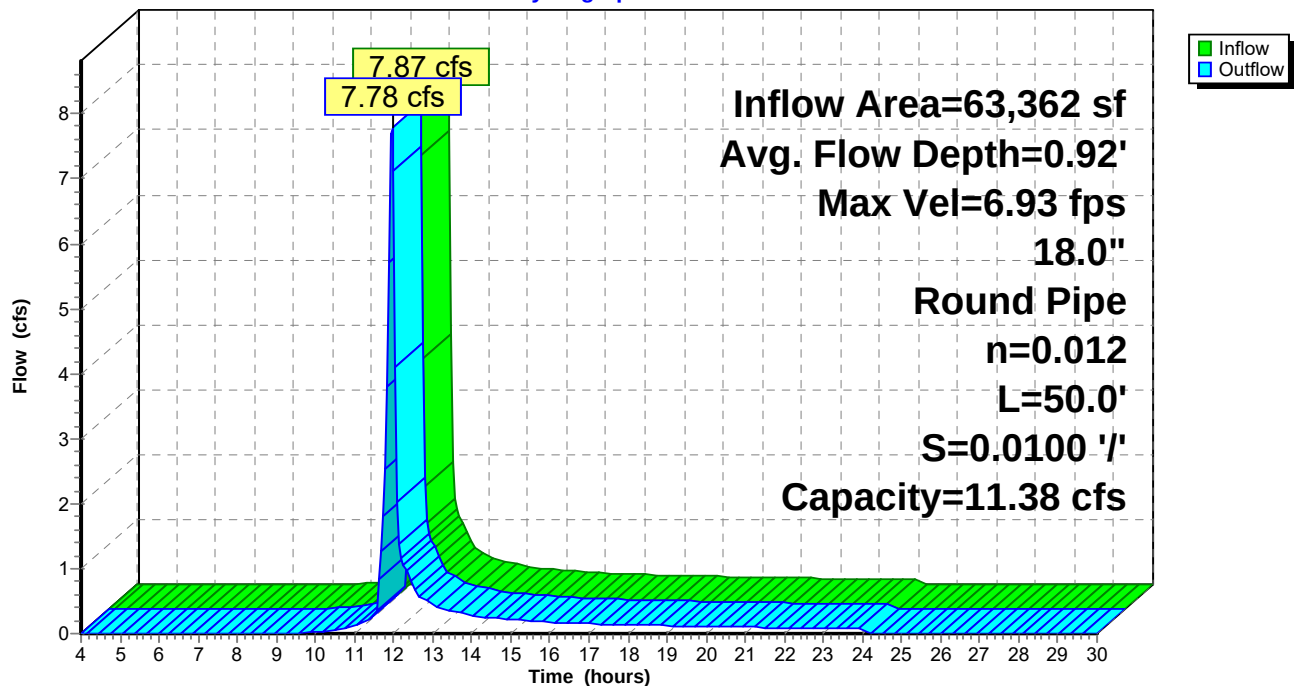
Length= 50.0' Slope= 0.0100 '/'

Inlet Invert= 951.50', Outlet Invert= 951.00'



### Reach 6R: Culvert #2

Hydrograph





## MLV 505LD86\_Culvert 1-3\_rev2

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Type II 24-hr 50-yr Rainfall=6.87"

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### Summary for Reach 8R: Culvert #3

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 5,181 sf, 57.98% Impervious, Inflow Depth = 4.57" for 50-yr event  
Inflow = 0.95 cfs @ 11.95 hrs, Volume= 1,975 cf  
Outflow = 0.94 cfs @ 11.96 hrs, Volume= 1,975 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.14 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 1.50 fps, Avg. Travel Time= 0.3 min

Peak Storage= 5 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.28'

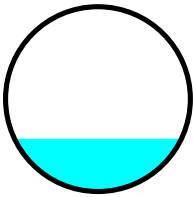
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.35 cfs

12.0" Round Pipe

n= 0.012

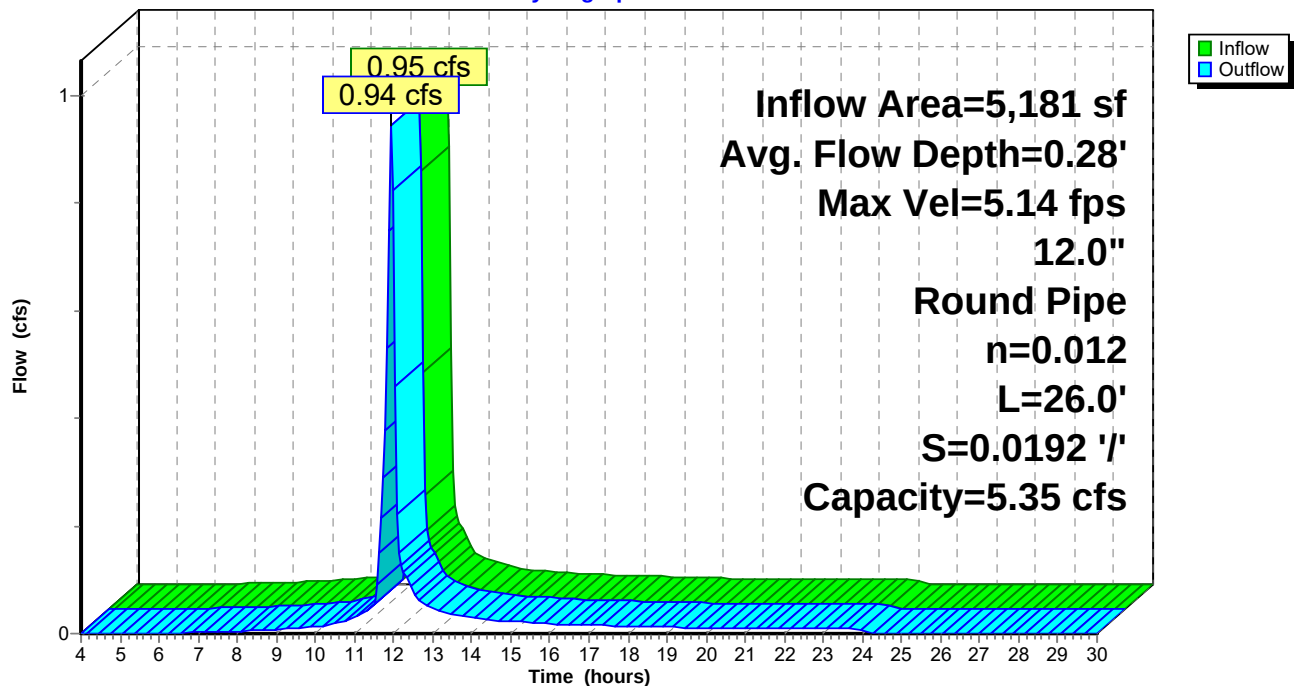
Length= 26.0' Slope= 0.0192 '/'

Inlet Invert= 927.00', Outlet Invert= 926.50'



### Reach 8R: Culvert #3

Hydrograph



**MLV 505LD86\_Culvert 1-3\_rev2**

Type II 24-hr 100-yr Rainfall=8.09"

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

|                                                                                                                                                                 |                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subcatchment5S: CC-5</b>                                                                                                                                     | Runoff Area=63,362 sf 7.29% Impervious Runoff Depth=3.97"<br>Tc=5.0 min CN=65 Runoff=10.38 cfs 20,947 cf                                                          |
| <b>Subcatchment7S: CC-7</b>                                                                                                                                     | Runoff Area=5,181 sf 57.98% Impervious Runoff Depth=5.71"<br>Tc=5.0 min CN=80 Runoff=1.17 cfs 2,465 cf                                                            |
| <b>Subcatchment9S: CC-2</b>                                                                                                                                     | Runoff Area=3,973 sf 3.80% Impervious Runoff Depth=5.59"<br>Tc=5.0 min CN=79 Runoff=0.88 cfs 1,851 cf                                                             |
| <b>Subcatchment10S: CC-3</b>                                                                                                                                    | Runoff Area=20,862 sf 29.48% Impervious Runoff Depth=3.74"<br>Tc=5.0 min CN=63 Runoff=3.23 cfs 6,501 cf                                                           |
| <b>Reach 4R: Culvert #1</b>                                                                                                                                     | Avg. Flow Depth=0.68' Max Vel=7.21 fps Inflow=4.11 cfs 8,353 cf<br>12.0" Round Pipe n=0.012 L=28.7' S=0.0174 '/' Capacity=5.09 cfs Outflow=4.08 cfs 8,353 cf      |
| <b>Reach 6R: Culvert #2</b>                                                                                                                                     | Avg. Flow Depth=1.12' Max Vel=7.29 fps Inflow=10.38 cfs 20,947 cf<br>18.0" Round Pipe n=0.012 L=50.0' S=0.0100 '/' Capacity=11.38 cfs Outflow=10.26 cfs 20,947 cf |
| <b>Reach 8R: Culvert #3</b>                                                                                                                                     | Avg. Flow Depth=0.32' Max Vel=5.45 fps Inflow=1.17 cfs 2,465 cf<br>12.0" Round Pipe n=0.012 L=26.0' S=0.0192 '/' Capacity=5.35 cfs Outflow=1.16 cfs 2,465 cf      |
| <b>Total Runoff Area = 93,378 sf Runoff Volume = 31,765 cf Average Runoff Depth = 4.08"</b><br><b>85.09% Pervious = 79,456 sf 14.91% Impervious = 13,922 sf</b> |                                                                                                                                                                   |

**MLV 505LD86\_Culvert 1-3\_rev2**

Type II 24-hr 100-yr Rainfall=8.09"

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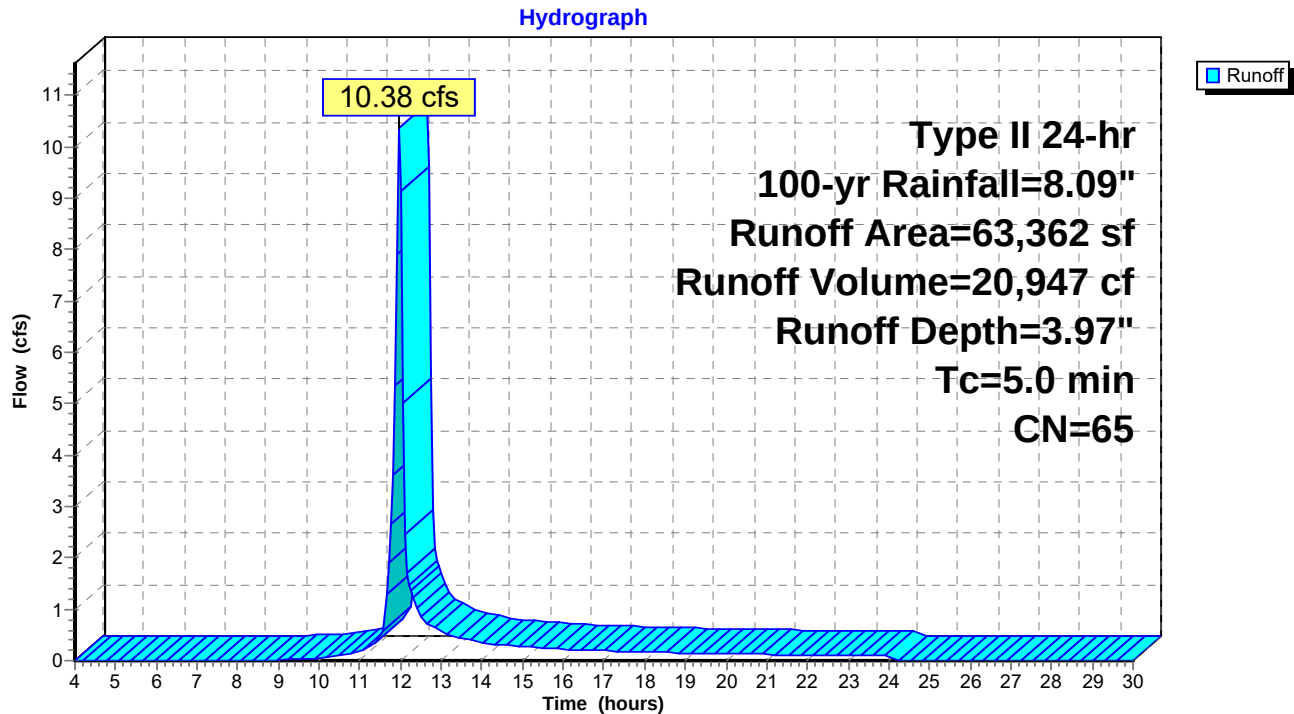
**Summary for Subcatchment 5S: CC-5**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 10.38 cfs @ 11.96 hrs, Volume= 20,947 cf, Depth= 3.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 18,807    | 30 | Meadow, non-grazed, HSG A |
| 39,939    | 78 | Meadow, non-grazed, HSG D |
| 2,138     | 98 | Paved parking, HSG A      |
| 2,478     | 98 | Paved parking, HSG D      |
| 63,362    | 65 | Weighted Average          |
| 58,746    |    | 92.71% Pervious Area      |
| 4,616     |    | 7.29% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 5S: CC-5**

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Type II 24-hr 100-yr Rainfall=8.09"

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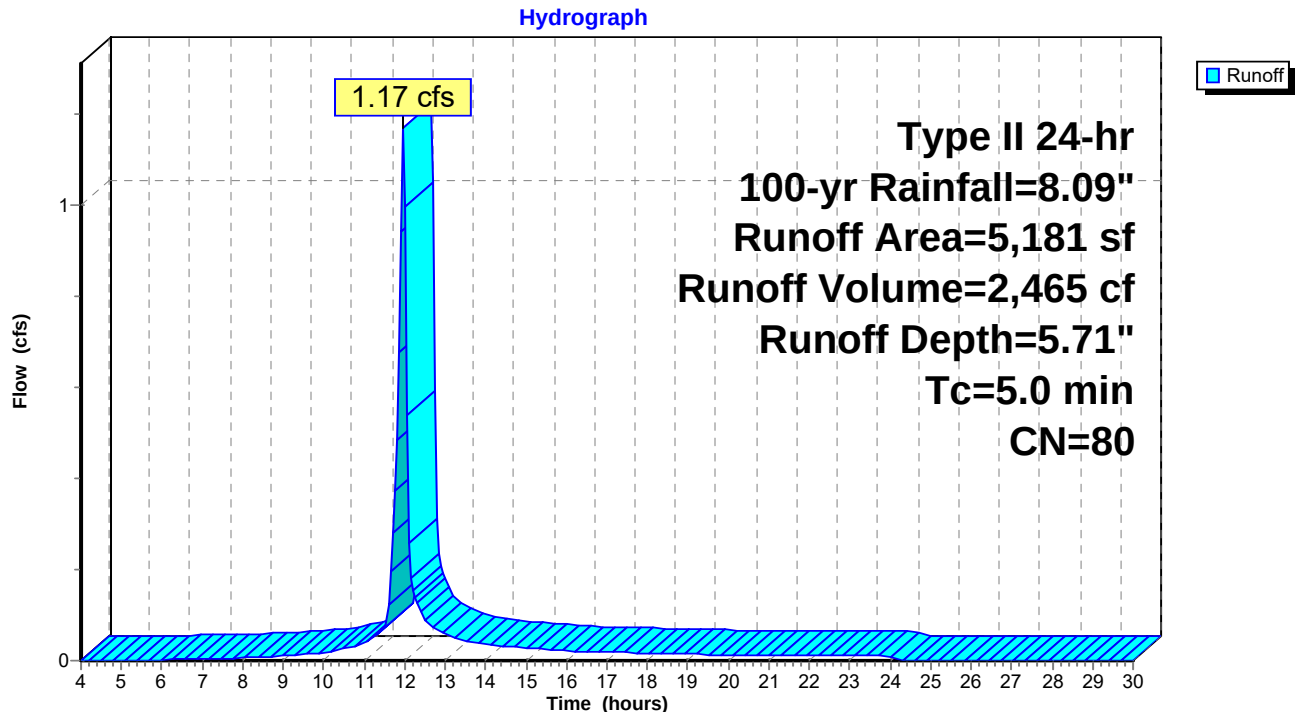
**Summary for Subcatchment 7S: CC-7**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 1.17 cfs @ 11.95 hrs, Volume= 2,465 cf, Depth= 5.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 1,049     | 30 | Meadow, non-grazed, HSG A |
| 1,128     | 78 | Meadow, non-grazed, HSG D |
| 2,071     | 98 | Paved parking, HSG A      |
| 933       | 98 | Paved parking, HSG D      |
| 5,181     | 80 | Weighted Average          |
| 2,177     |    | 42.02% Pervious Area      |
| 3,004     |    | 57.98% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 7S: CC-7**

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Type II 24-hr 100-yr Rainfall=8.09"

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**Summary for Subcatchment 9S: CC-2**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.88 cfs @ 11.95 hrs, Volume= 1,851 cf, Depth= 5.59"

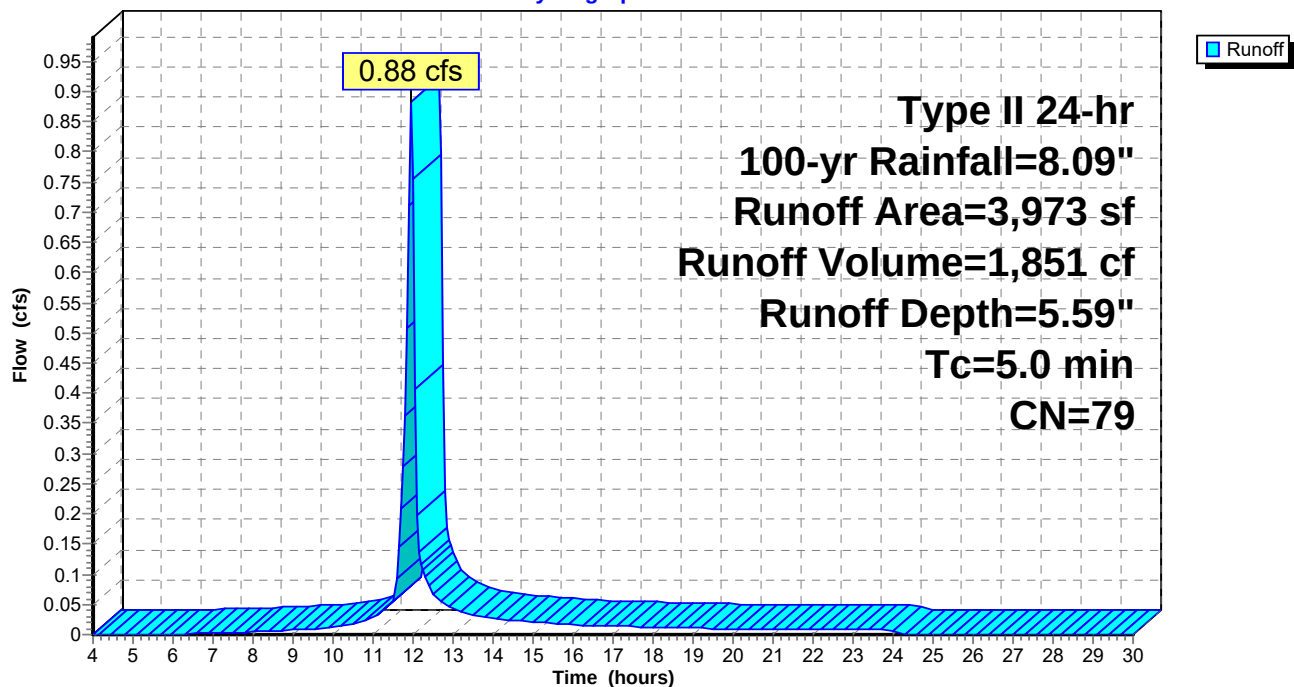
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 3,822     | 78 | Meadow, non-grazed, HSG D |
| 151       | 98 | Paved parking, HSG D      |
| 3,973     | 79 | Weighted Average          |
| 3,822     |    | 96.20% Pervious Area      |
| 151       |    | 3.80% Impervious Area     |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 9S: CC-2**

Hydrograph



**MLV 505LD86\_Culvert 1-3\_rev2**

Type II 24-hr 100-yr Rainfall=8.09"

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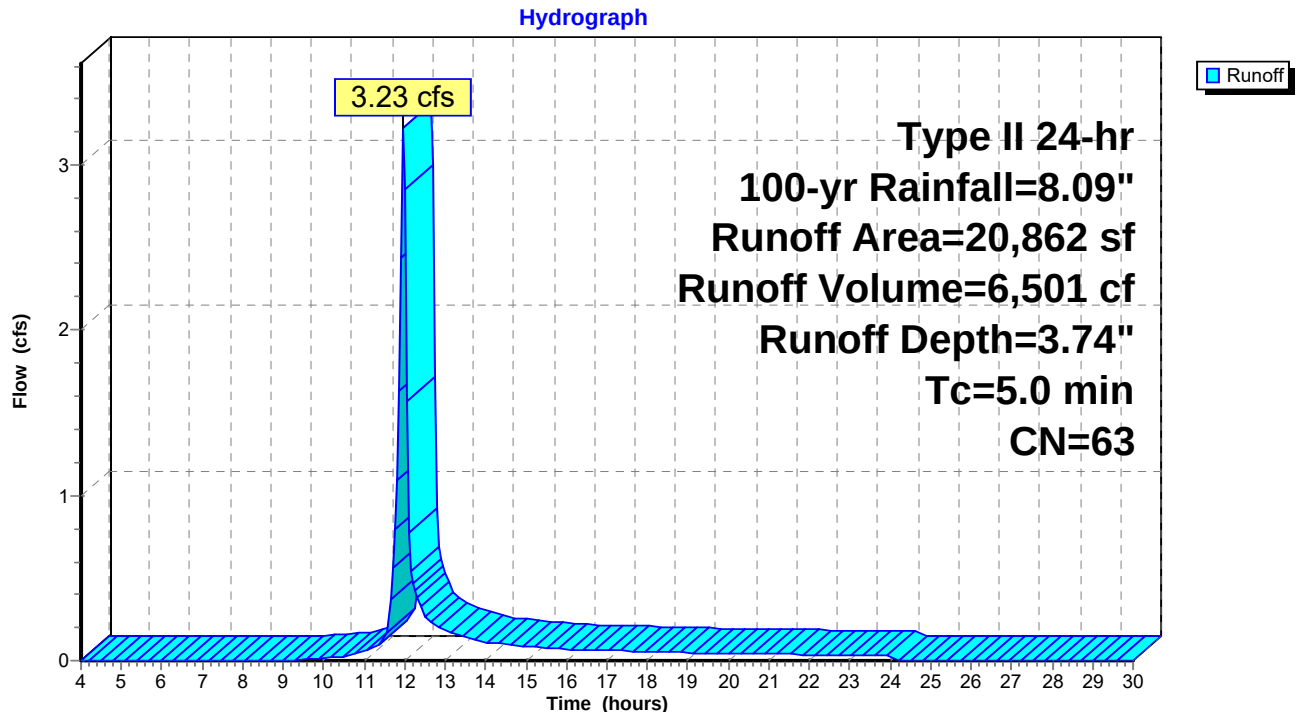
**Summary for Subcatchment 10S: CC-3**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 3.23 cfs @ 11.96 hrs, Volume= 6,501 cf, Depth= 3.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 9,252     | 30 | Meadow, non-grazed, HSG A |
| 5,459     | 78 | Meadow, non-grazed, HSG D |
| 5,051     | 98 | Paved parking, HSG A      |
| 1,100     | 98 | Paved parking, HSG D      |
| 20,862    | 63 | Weighted Average          |
| 14,711    |    | 70.52% Pervious Area      |
| 6,151     |    | 29.48% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 10S: CC-3**

## MLV 505LD86\_Culvert 1-3\_rev2

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Type II 24-hr 100-yr Rainfall=8.09"

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### Summary for Reach 4R: Culvert #1

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 24,835 sf, 25.38% Impervious, Inflow Depth = 4.04" for 100-yr event  
Inflow = 4.11 cfs @ 11.96 hrs, Volume= 8,353 cf  
Outflow = 4.08 cfs @ 11.96 hrs, Volume= 8,353 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 7.21 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 2.12 fps, Avg. Travel Time= 0.2 min

Peak Storage= 16 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.68'

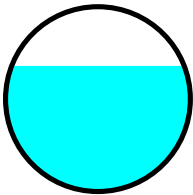
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.09 cfs

12.0" Round Pipe

n= 0.012

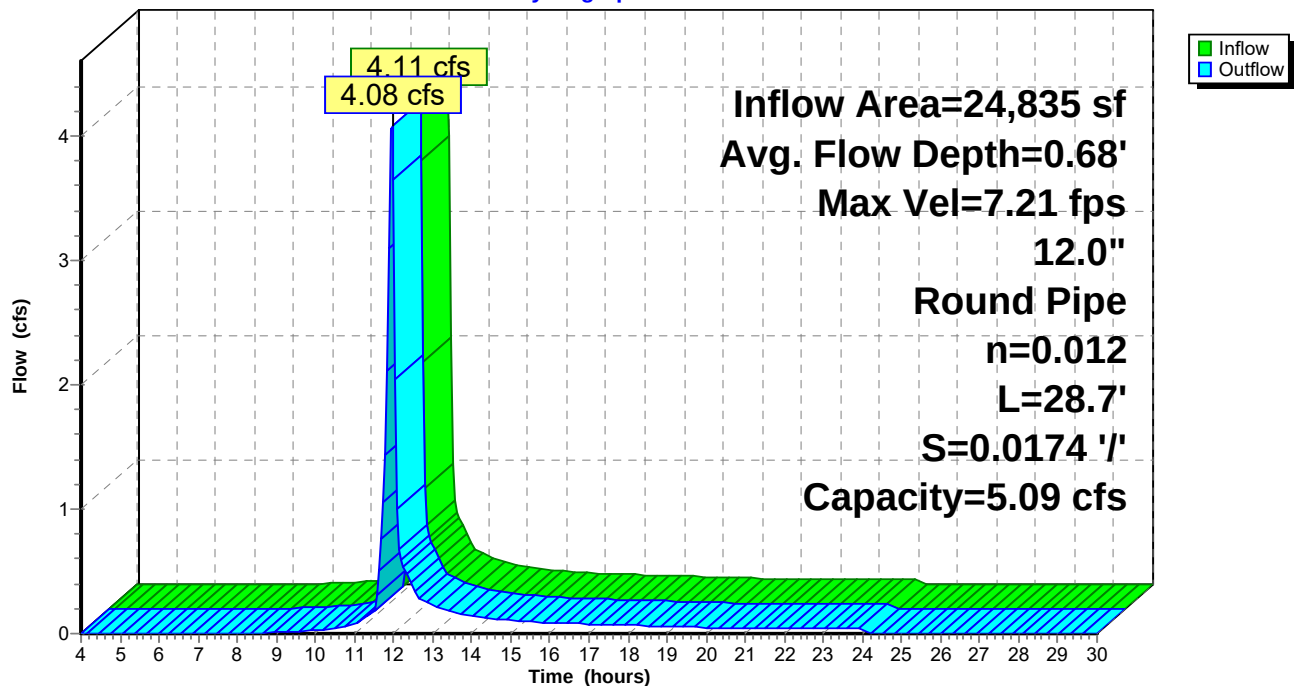
Length= 28.7' Slope= 0.0174 '/'

Inlet Invert= 972.00', Outlet Invert= 971.50'



### Reach 4R: Culvert #1

Hydrograph



## MLV 505LD86\_Culvert 1-3\_rev2

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Type II 24-hr 100-yr Rainfall=8.09"

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### Summary for Reach 6R: Culvert #2

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 63,362 sf, 7.29% Impervious, Inflow Depth = 3.97" for 100-yr event  
Inflow = 10.38 cfs @ 11.96 hrs, Volume= 20,947 cf  
Outflow = 10.26 cfs @ 11.96 hrs, Volume= 20,947 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 7.29 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 2.44 fps, Avg. Travel Time= 0.3 min

Peak Storage= 71 cf @ 11.96 hrs

Average Depth at Peak Storage= 1.12'

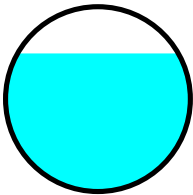
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 11.38 cfs

18.0" Round Pipe

n= 0.012 Corrugated PP, smooth interior

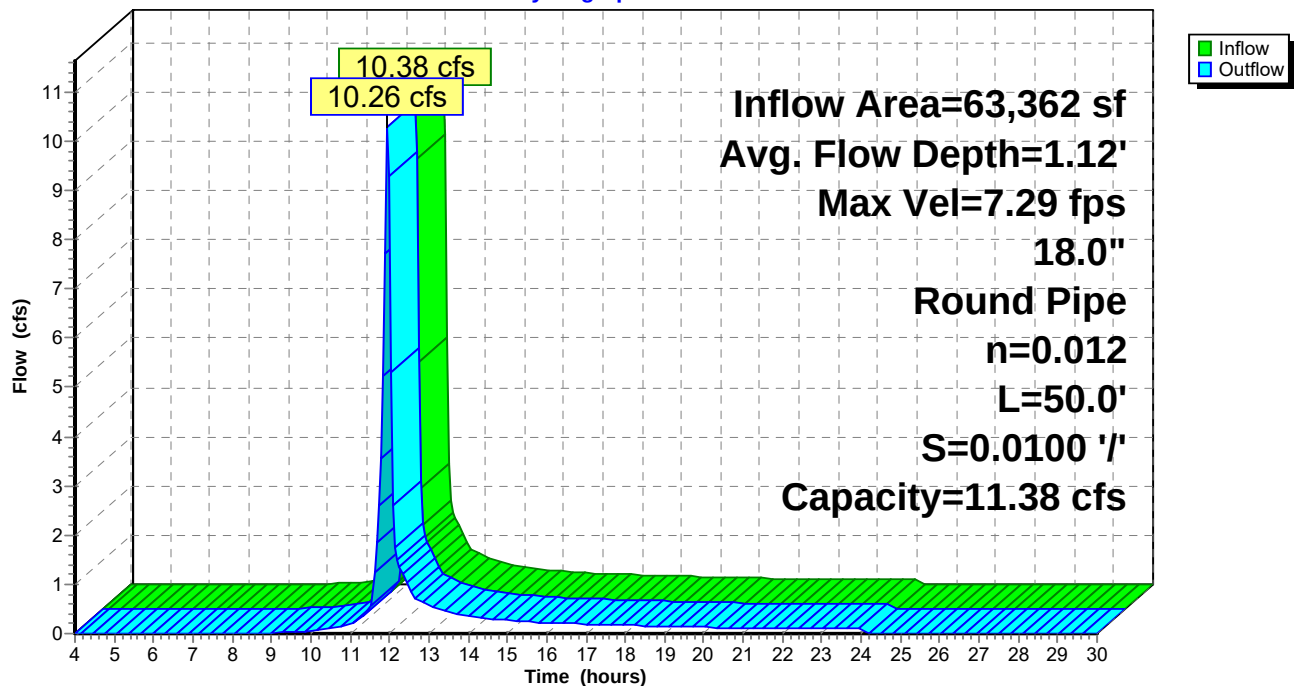
Length= 50.0' Slope= 0.0100 '/

Inlet Invert= 951.50', Outlet Invert= 951.00'



### Reach 6R: Culvert #2

Hydrograph





## MLV 505LD86\_Culvert 1-3\_rev2

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### Summary for Reach 8R: Culvert #3

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 5,181 sf, 57.98% Impervious, Inflow Depth = 5.71" for 100-yr event  
Inflow = 1.17 cfs @ 11.95 hrs, Volume= 2,465 cf  
Outflow = 1.16 cfs @ 11.96 hrs, Volume= 2,465 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.45 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 1.58 fps, Avg. Travel Time= 0.3 min

Peak Storage= 6 cf @ 11.95 hrs

Average Depth at Peak Storage= 0.32'

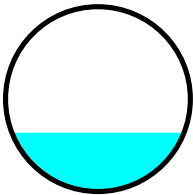
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.35 cfs

12.0" Round Pipe

n= 0.012

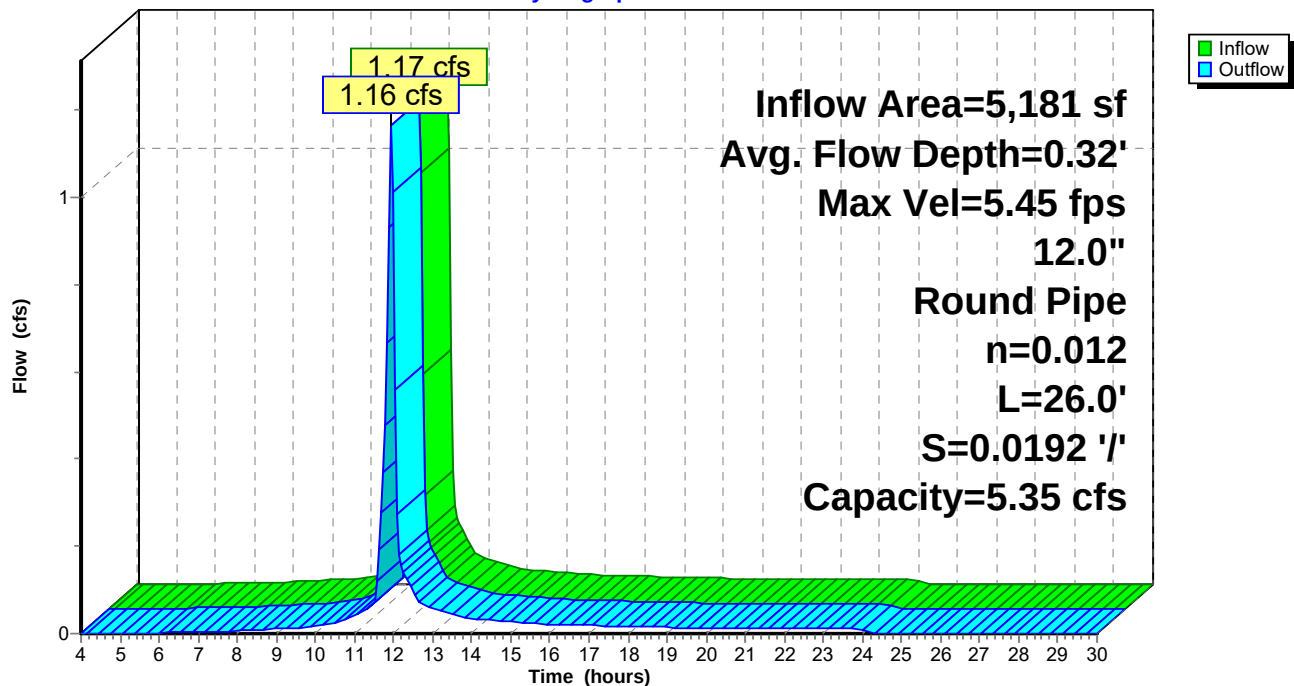
Length= 26.0' Slope= 0.0192 '/'

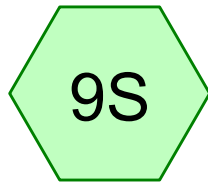
Inlet Invert= 927.00', Outlet Invert= 926.50'



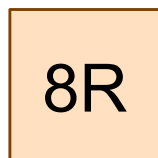
### Reach 8R: Culvert #3

Hydrograph

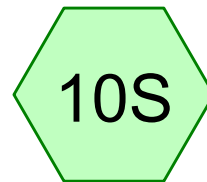




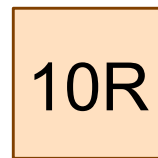
CC-9



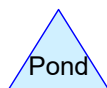
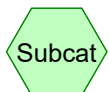
Culvert #4



CC-10



Culvert #5



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**Area Listing (all nodes)**

| Area<br>(sq-ft) | CN        | Description<br>(subcatchment-numbers) |
|-----------------|-----------|---------------------------------------|
| 1,482           | 30        | Meadow, non-grazed, HSG A (9S, 10S)   |
| 1,123           | 78        | Meadow, non-grazed, HSG D (9S, 10S)   |
| 1,308           | 98        | Paved parking, HSG A (9S, 10S)        |
| 678             | 98        | Paved parking, HSG D (10S)            |
| 783             | 98        | Water Surface, HSG D (9S)             |
| <b>5,374</b>    | <b>75</b> | <b>TOTAL AREA</b>                     |

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**Soil Listing (all nodes)**

| Area<br>(sq-ft) | Soil<br>Group | Subcatchment<br>Numbers |
|-----------------|---------------|-------------------------|
| 2,790           | HSG A         | 9S, 10S                 |
| 0               | HSG B         |                         |
| 0               | HSG C         |                         |
| 2,584           | HSG D         | 9S, 10S                 |
| 0               | Other         |                         |
| <b>5,374</b>    |               | <b>TOTAL AREA</b>       |

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**Ground Covers (all nodes)**

| HSG-A<br>(sq-ft) | HSG-B<br>(sq-ft) | HSG-C<br>(sq-ft) | HSG-D<br>(sq-ft) | Other<br>(sq-ft) | Total<br>(sq-ft) | Ground<br>Cover       | Subcat<br>Number |
|------------------|------------------|------------------|------------------|------------------|------------------|-----------------------|------------------|
| 1,482            | 0                | 0                | 1,123            | 0                | 2,605            | Meadow,<br>non-grazed |                  |
| 1,308            | 0                | 0                | 678              | 0                | 1,986            | Paved parking         |                  |
| 0                | 0                | 0                | 783              | 0                | 783              | Water Surface         |                  |
| <b>2,790</b>     | <b>0</b>         | <b>0</b>         | <b>2,584</b>     | <b>0</b>         | <b>5,374</b>     | <b>TOTAL AREA</b>     |                  |

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**Pipe Listing (all nodes)**

| Line# | Node<br>Number | In-Invert<br>(feet) | Out-Invert<br>(feet) | Length<br>(feet) | Slope<br>(ft/ft) | n     | Diam/Width<br>(inches) | Height<br>(inches) | Inside-Fill<br>(inches) |
|-------|----------------|---------------------|----------------------|------------------|------------------|-------|------------------------|--------------------|-------------------------|
| 1     | 8R             | 913.00              | 912.50               | 27.0             | 0.0185           | 0.012 | 12.0                   | 0.0                | 0.0                     |
| 2     | 10R            | 916.00              | 912.50               | 31.0             | 0.1129           | 0.012 | 12.0                   | 0.0                | 0.0                     |

**MLV 505LD86\_Culvert 4-5\_rev2***Type II 24-hr 1-yr Rainfall=2.72"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment9S: CC-9**

Runoff Area=2,509 sf 56.44% Impervious Runoff Depth=0.74"  
Tc=5.0 min CN=74 Runoff=0.07 cfs 154 cf

**Subcatchment10S: CC-10**

Runoff Area=2,865 sf 47.23% Impervious Runoff Depth=0.83"  
Tc=5.0 min CN=76 Runoff=0.10 cfs 198 cf

**Reach 8R: Culvert #4**

Avg. Flow Depth=0.08' Max Vel=2.36 fps Inflow=0.07 cfs 154 cf  
12.0" Round Pipe n=0.012 L=27.0' S=0.0185 '/' Capacity=5.25 cfs Outflow=0.07 cfs 154 cf

**Reach 10R: Culvert #5**

Avg. Flow Depth=0.06' Max Vel=4.82 fps Inflow=0.10 cfs 198 cf  
12.0" Round Pipe n=0.012 L=31.0' S=0.1129 '/' Capacity=12.97 cfs Outflow=0.10 cfs 198 cf

**Total Runoff Area = 5,374 sf Runoff Volume = 352 cf Average Runoff Depth = 0.79"**  
**48.47% Pervious = 2,605 sf 51.53% Impervious = 2,769 sf**

**MLV 505LD86\_Culvert 4-5\_rev2**

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Type II 24-hr 1-yr Rainfall=2.72"

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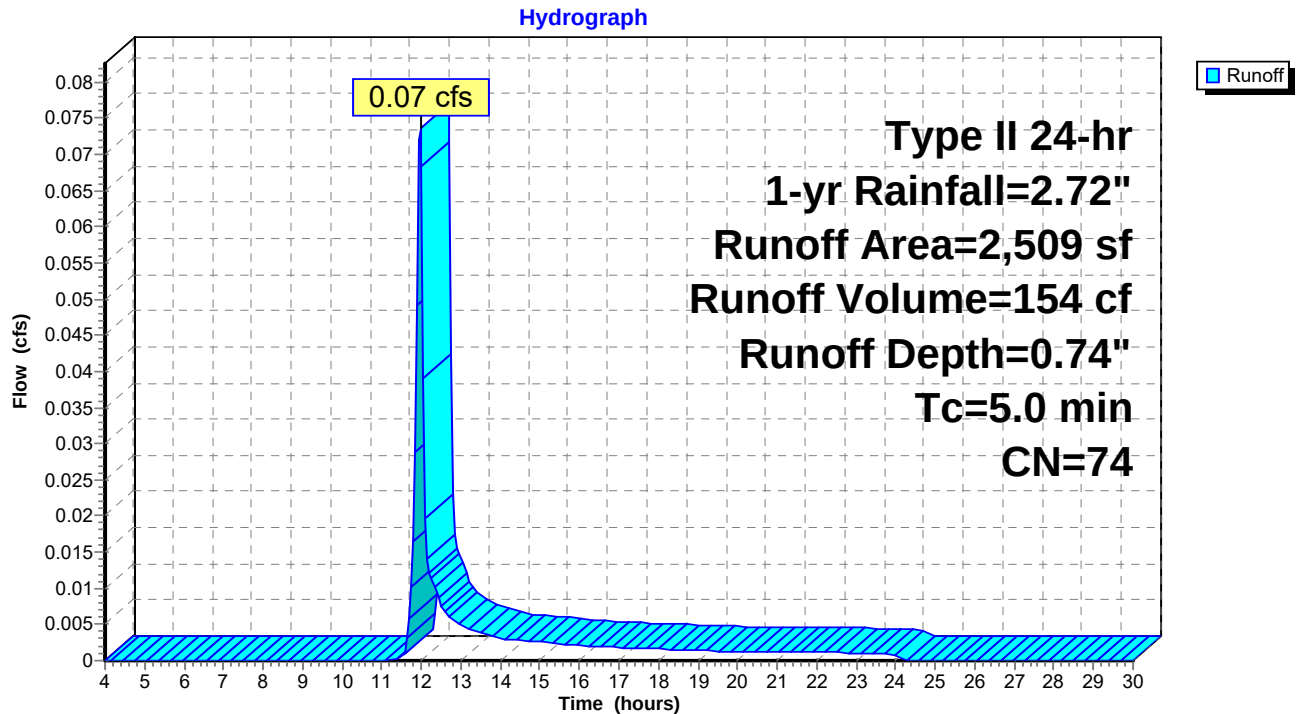
**Summary for Subcatchment 9S: CC-9**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.07 cfs @ 11.97 hrs, Volume= 154 cf, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 815       | 30 | Meadow, non-grazed, HSG A |
| 278       | 78 | Meadow, non-grazed, HSG D |
| 633       | 98 | Paved parking, HSG A      |
| 783       | 98 | Water Surface, HSG D      |
| 2,509     | 74 | Weighted Average          |
| 1,093     |    | 43.56% Pervious Area      |
| 1,416     |    | 56.44% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 9S: CC-9**



**MLV 505LD86\_Culvert 4-5\_rev2**

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Type II 24-hr 1-yr Rainfall=2.72"

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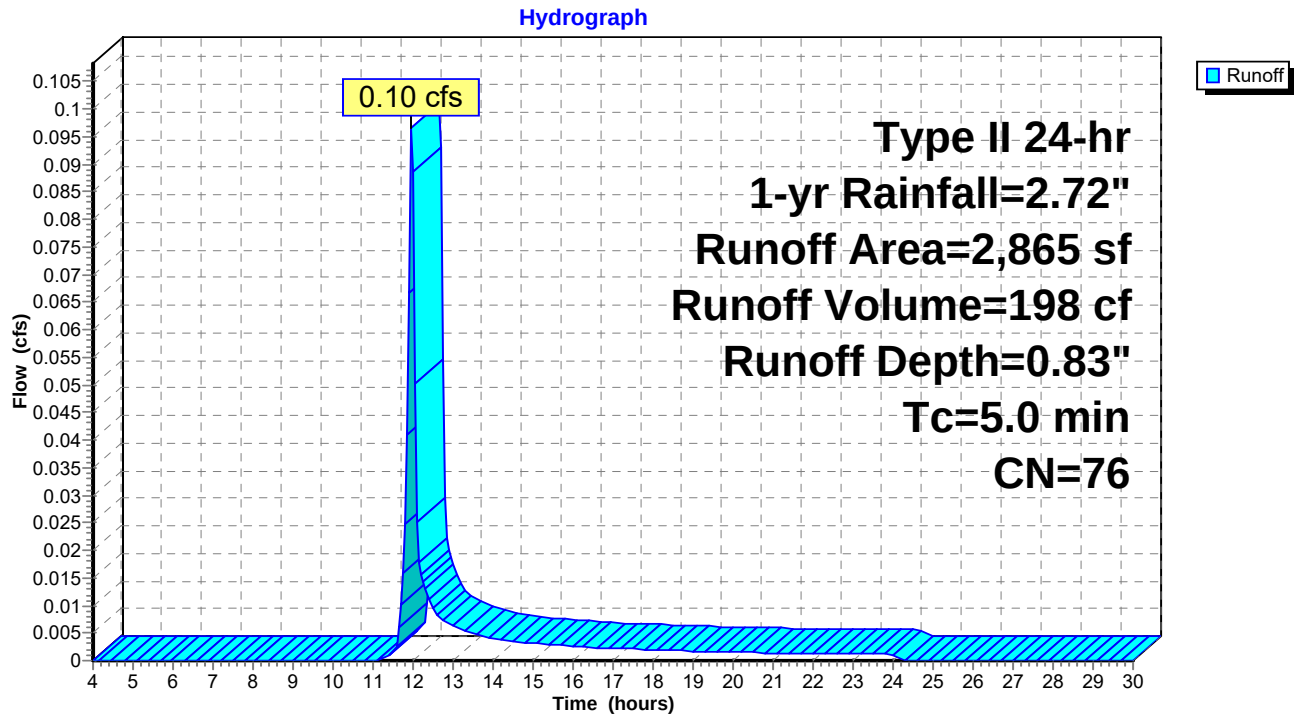
**Summary for Subcatchment 10S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.10 cfs @ 11.97 hrs, Volume= 198 cf, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 667       | 30 | Meadow, non-grazed, HSG A |
| 845       | 78 | Meadow, non-grazed, HSG D |
| 675       | 98 | Paved parking, HSG A      |
| 678       | 98 | Paved parking, HSG D      |
| 2,865     | 76 | Weighted Average          |
| 1,512     |    | 52.77% Pervious Area      |
| 1,353     |    | 47.23% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 10S: CC-10**

# MLV 505LD86\_Culvert 4-5\_rev2

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Type II 24-hr 1-yr Rainfall=2.72"

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## Summary for Reach 8R: Culvert #4

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 2,509 sf, 56.44% Impervious, Inflow Depth = 0.74" for 1-yr event  
Inflow = 0.07 cfs @ 11.97 hrs, Volume= 154 cf  
Outflow = 0.07 cfs @ 11.98 hrs, Volume= 154 cf, Atten= 1%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.36 fps, Min. Travel Time= 0.2 min

Avg. Velocity = 0.84 fps, Avg. Travel Time= 0.5 min

Peak Storage= 1 cf @ 11.97 hrs

Average Depth at Peak Storage= 0.08'

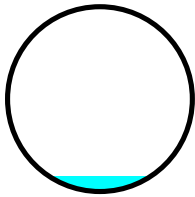
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.25 cfs

12.0" Round Pipe

n= 0.012

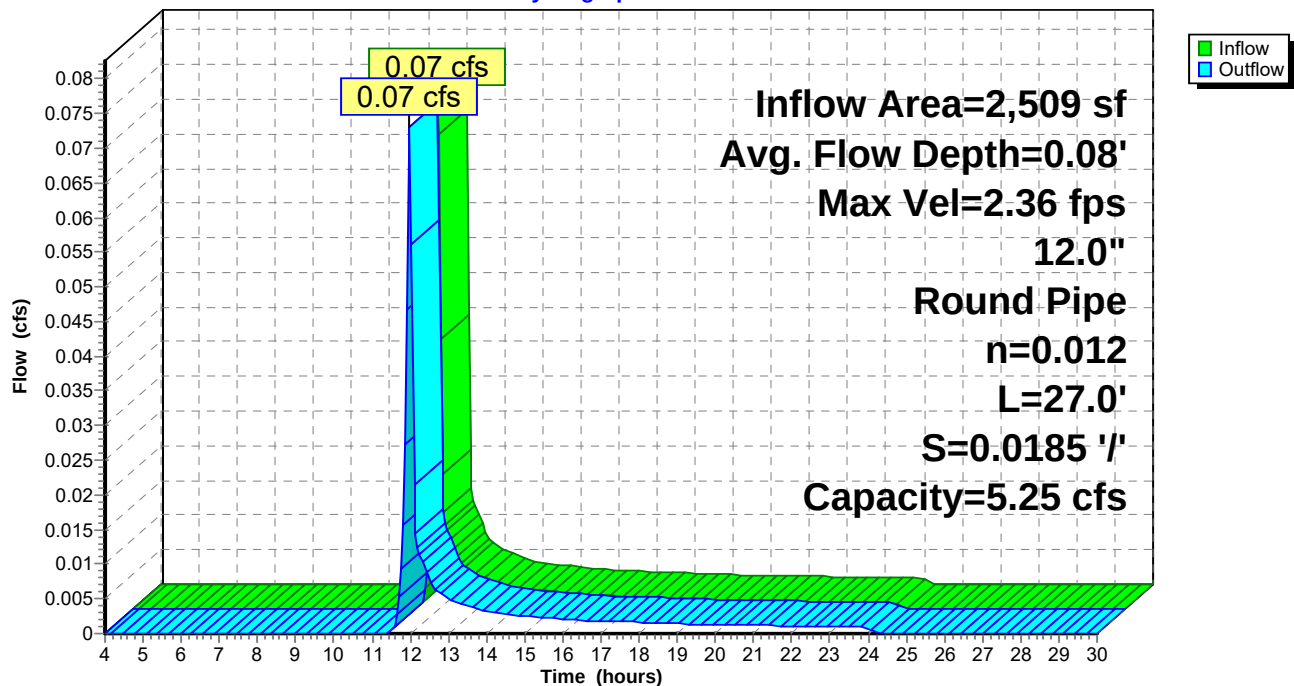
Length= 27.0' Slope= 0.0185 '/'

Inlet Invert= 913.00', Outlet Invert= 912.50'



## Reach 8R: Culvert #4

Hydrograph



## MLV 505LD86\_Culvert 4-5\_rev2

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Type II 24-hr 1-yr Rainfall=2.72"

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### Summary for Reach 10R: Culvert #5

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 2,865 sf, 47.23% Impervious, Inflow Depth = 0.83" for 1-yr event  
Inflow = 0.10 cfs @ 11.97 hrs, Volume= 198 cf  
Outflow = 0.10 cfs @ 11.97 hrs, Volume= 198 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.82 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 1.72 fps, Avg. Travel Time= 0.3 min

Peak Storage= 1 cf @ 11.97 hrs

Average Depth at Peak Storage= 0.06'

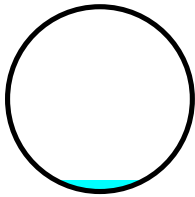
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 12.97 cfs

12.0" Round Pipe

n= 0.012

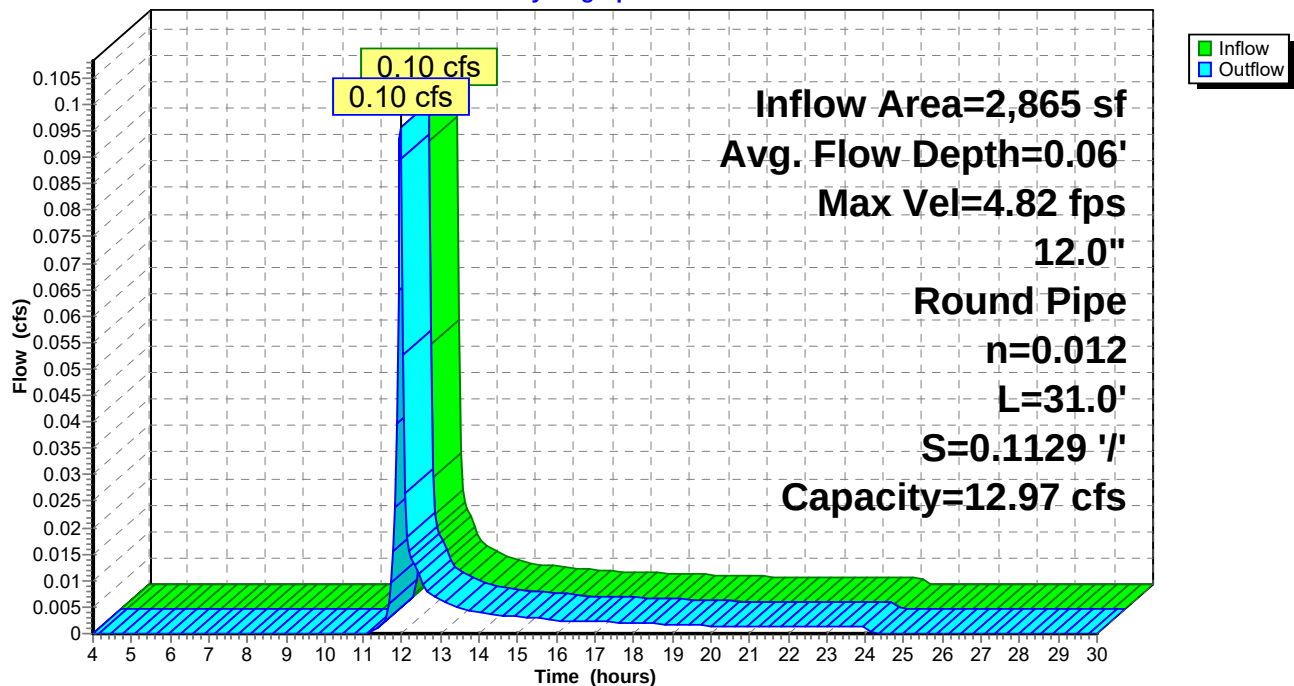
Length= 31.0' Slope= 0.1129 '/'

Inlet Invert= 916.00', Outlet Invert= 912.50'



### Reach 10R: Culvert #5

#### Hydrograph



**MLV 505LD86\_Culvert 4-5\_rev2***Type II 24-hr 2-yr Rainfall=3.26"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment9S: CC-9**

Runoff Area=2,509 sf 56.44% Impervious Runoff Depth=1.08"  
Tc=5.0 min CN=74 Runoff=0.11 cfs 225 cf

**Subcatchment10S: CC-10**

Runoff Area=2,865 sf 47.23% Impervious Runoff Depth=1.19"  
Tc=5.0 min CN=76 Runoff=0.14 cfs 285 cf

**Reach 8R: Culvert #4**

Avg. Flow Depth=0.10' Max Vel=2.67 fps Inflow=0.11 cfs 225 cf  
12.0" Round Pipe n=0.012 L=27.0' S=0.0185 ' Capacity=5.25 cfs Outflow=0.11 cfs 225 cf

**Reach 10R: Culvert #5**

Avg. Flow Depth=0.07' Max Vel=5.42 fps Inflow=0.14 cfs 285 cf  
12.0" Round Pipe n=0.012 L=31.0' S=0.1129 ' Capacity=12.97 cfs Outflow=0.14 cfs 285 cf

**Total Runoff Area = 5,374 sf Runoff Volume = 510 cf Average Runoff Depth = 1.14"**  
**48.47% Pervious = 2,605 sf 51.53% Impervious = 2,769 sf**

**MLV 505LD86\_Culvert 4-5\_rev2**

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Type II 24-hr 2-yr Rainfall=3.26"

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**Summary for Subcatchment 9S: CC-9**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.11 cfs @ 11.96 hrs, Volume= 225 cf, Depth= 1.08"

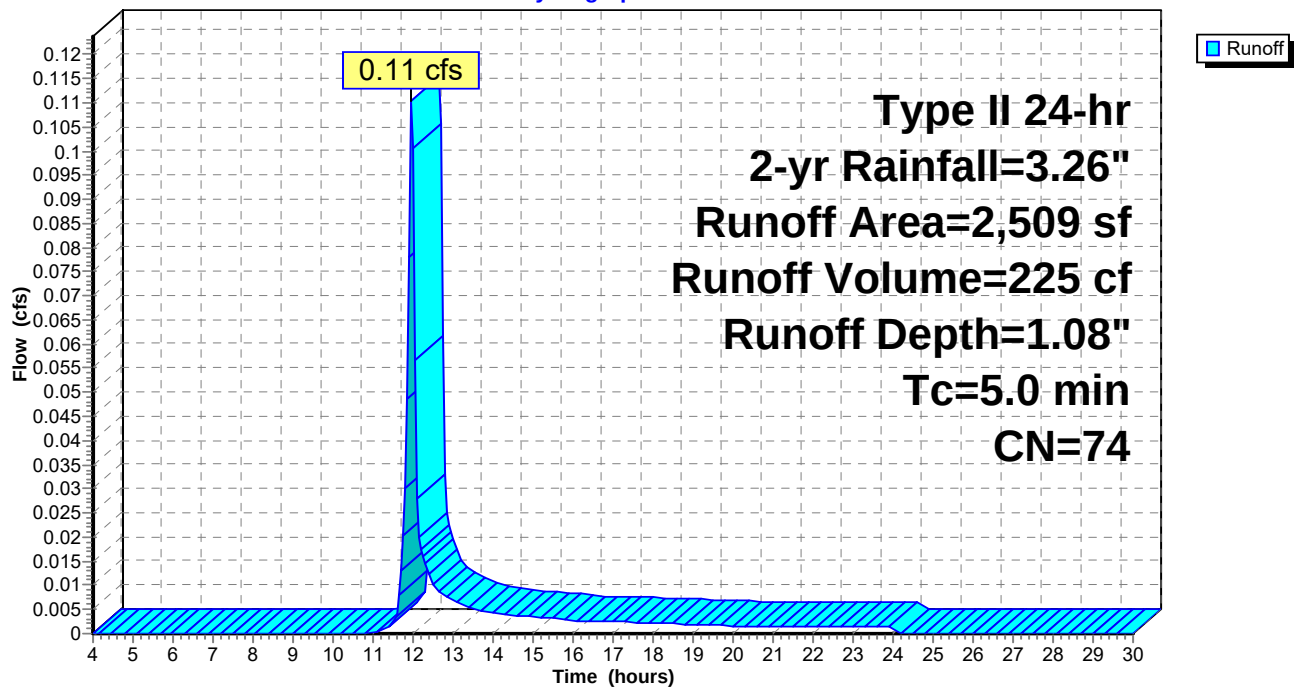
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 815       | 30 | Meadow, non-grazed, HSG A |
| 278       | 78 | Meadow, non-grazed, HSG D |
| 633       | 98 | Paved parking, HSG A      |
| 783       | 98 | Water Surface, HSG D      |
| 2,509     | 74 | Weighted Average          |
| 1,093     |    | 43.56% Pervious Area      |
| 1,416     |    | 56.44% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 9S: CC-9**

Hydrograph



**MLV 505LD86\_Culvert 4-5\_rev2**

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Type II 24-hr 2-yr Rainfall=3.26"

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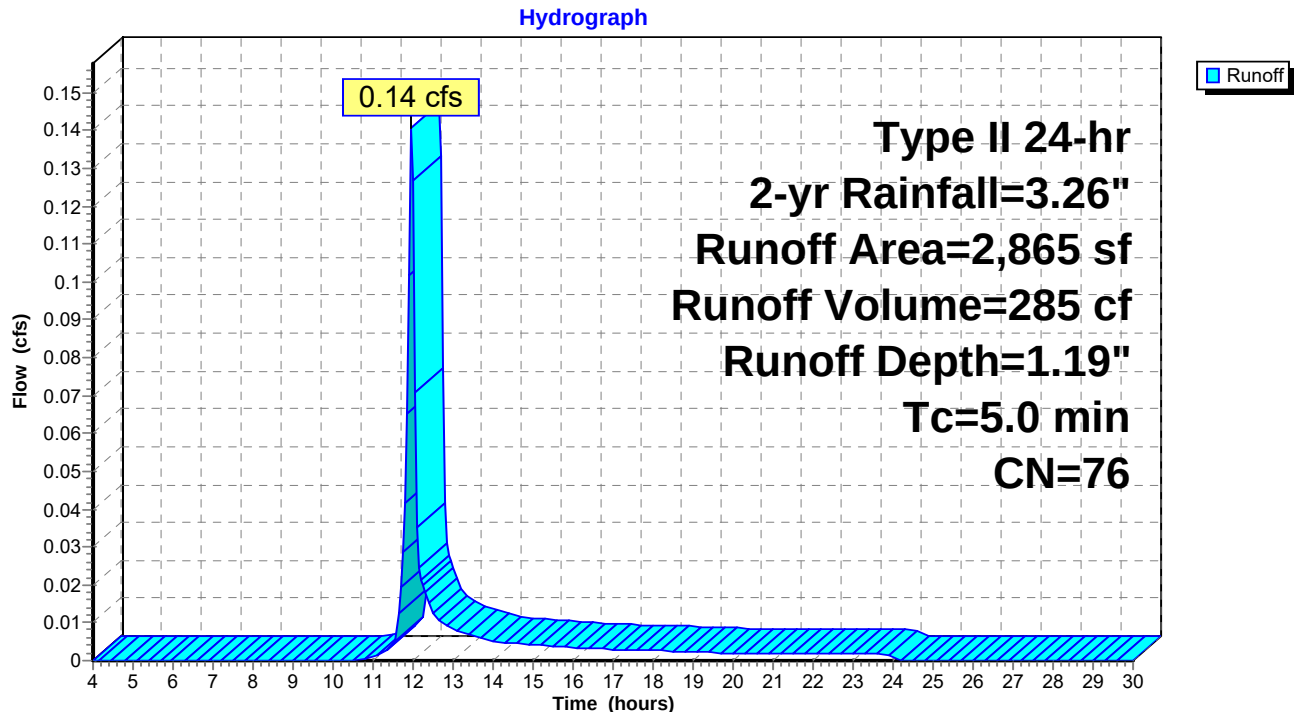
**Summary for Subcatchment 10S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.14 cfs @ 11.96 hrs, Volume= 285 cf, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 667       | 30 | Meadow, non-grazed, HSG A |
| 845       | 78 | Meadow, non-grazed, HSG D |
| 675       | 98 | Paved parking, HSG A      |
| 678       | 98 | Paved parking, HSG D      |
| 2,865     | 76 | Weighted Average          |
| 1,512     |    | 52.77% Pervious Area      |
| 1,353     |    | 47.23% Impervious Area    |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 10S: CC-10**

# MLV 505LD86\_Culvert 4-5\_rev2

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Type II 24-hr 2-yr Rainfall=3.26"

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## Summary for Reach 8R: Culvert #4

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 2,509 sf, 56.44% Impervious, Inflow Depth = 1.08" for 2-yr event  
Inflow = 0.11 cfs @ 11.96 hrs, Volume= 225 cf  
Outflow = 0.11 cfs @ 11.97 hrs, Volume= 225 cf, Atten= 2%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 2.67 fps, Min. Travel Time= 0.2 min

Avg. Velocity = 0.92 fps, Avg. Travel Time= 0.5 min

Peak Storage= 1 cf @ 11.97 hrs

Average Depth at Peak Storage= 0.10'

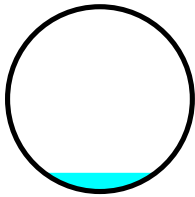
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.25 cfs

12.0" Round Pipe

n= 0.012

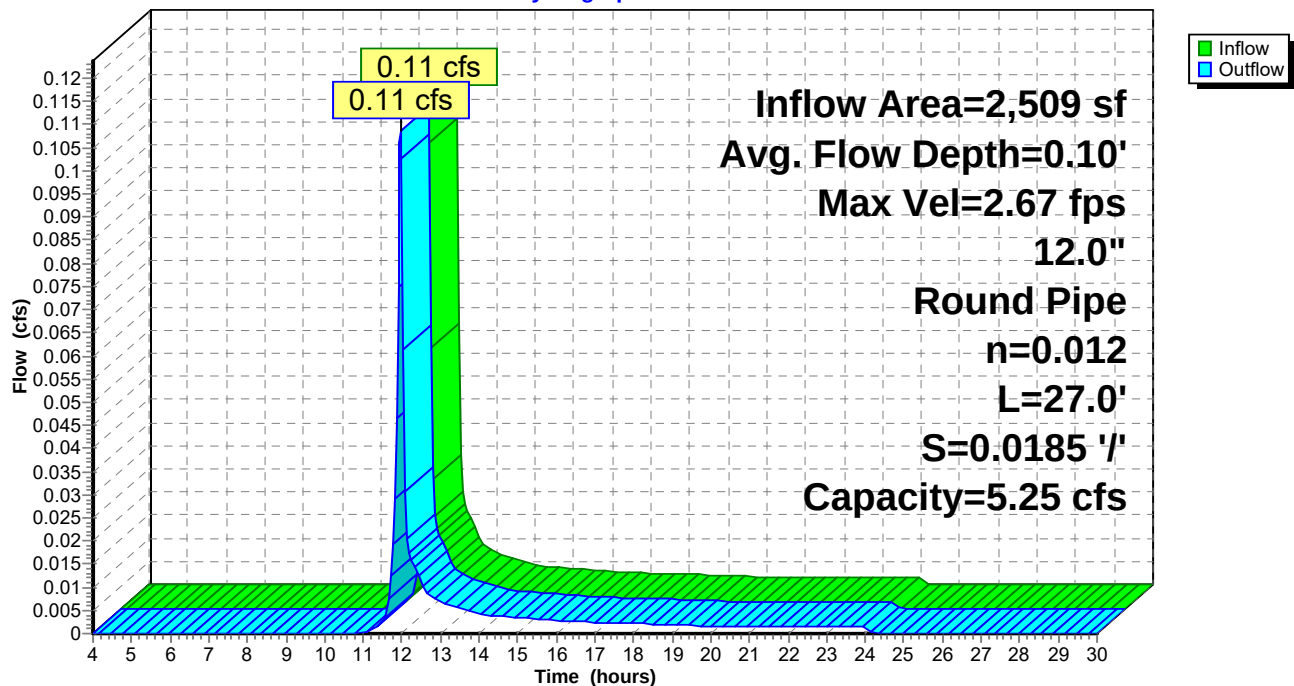
Length= 27.0' Slope= 0.0185 '/'

Inlet Invert= 913.00', Outlet Invert= 912.50'



## Reach 8R: Culvert #4

### Hydrograph



# MLV 505LD86\_Culvert 4-5\_rev2

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Type II 24-hr 2-yr Rainfall=3.26"

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## Summary for Reach 10R: Culvert #5

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 2,865 sf, 47.23% Impervious, Inflow Depth = 1.19" for 2-yr event  
Inflow = 0.14 cfs @ 11.96 hrs, Volume= 285 cf  
Outflow = 0.14 cfs @ 11.97 hrs, Volume= 285 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 5.42 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 1.84 fps, Avg. Travel Time= 0.3 min

Peak Storage= 1 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.07'

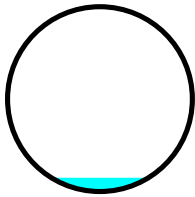
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 12.97 cfs

12.0" Round Pipe

n= 0.012

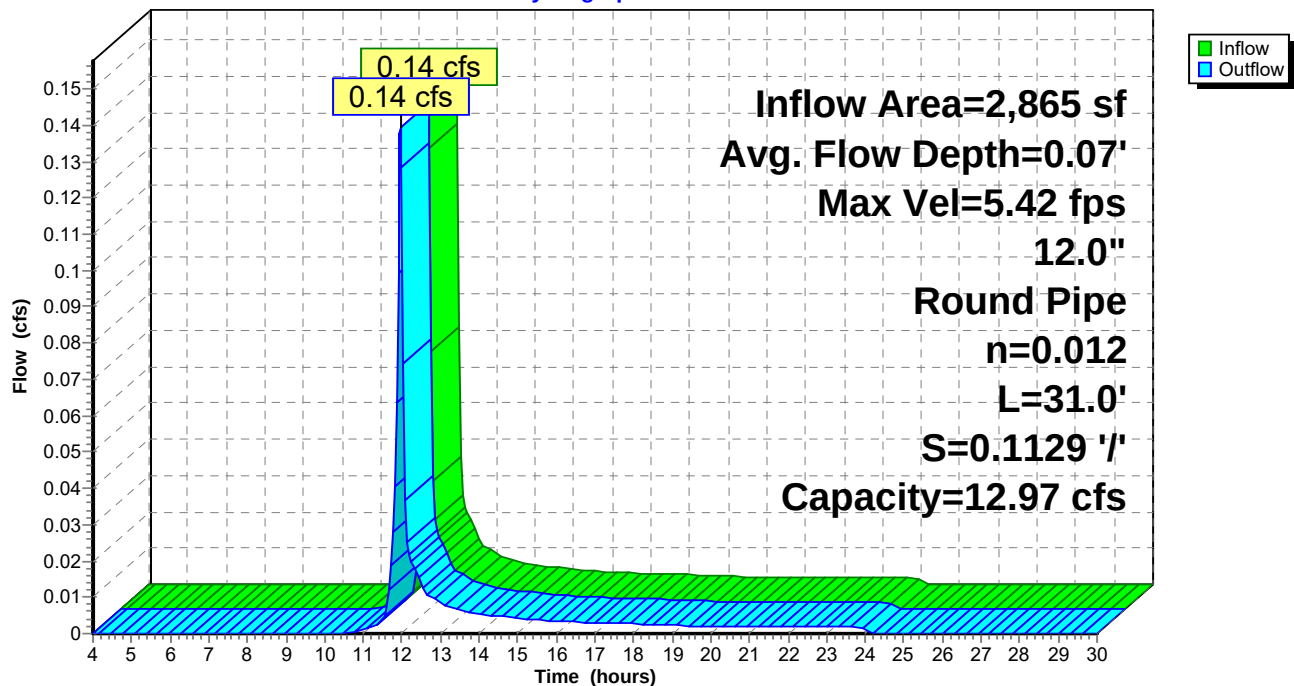
Length= 31.0' Slope= 0.1129 '/'

Inlet Invert= 916.00', Outlet Invert= 912.50'



## Reach 10R: Culvert #5

### Hydrograph





**MLV 505LD86\_Culvert 4-5\_rev2***Type II 24-hr 10-yr Rainfall=4.74"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment9S: CC-9**

Runoff Area=2,509 sf 56.44% Impervious Runoff Depth=2.16"  
Tc=5.0 min CN=74 Runoff=0.22 cfs 451 cf

**Subcatchment10S: CC-10**

Runoff Area=2,865 sf 47.23% Impervious Runoff Depth=2.32"  
Tc=5.0 min CN=76 Runoff=0.27 cfs 555 cf

**Reach 8R: Culvert #4**

Avg. Flow Depth=0.14' Max Vel=3.31 fps Inflow=0.22 cfs 451 cf  
12.0" Round Pipe n=0.012 L=27.0' S=0.0185 ' Capacity=5.25 cfs Outflow=0.22 cfs 451 cf

**Reach 10R: Culvert #5**

Avg. Flow Depth=0.10' Max Vel=6.64 fps Inflow=0.27 cfs 555 cf  
12.0" Round Pipe n=0.012 L=31.0' S=0.1129 ' Capacity=12.97 cfs Outflow=0.27 cfs 555 cf

**Total Runoff Area = 5,374 sf Runoff Volume = 1,006 cf Average Runoff Depth = 2.25"**  
**48.47% Pervious = 2,605 sf 51.53% Impervious = 2,769 sf**

**MLV 505LD86\_Culvert 4-5\_rev2**

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Type II 24-hr 10-yr Rainfall=4.74"

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**Summary for Subcatchment 9S: CC-9**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.22 cfs @ 11.96 hrs, Volume= 451 cf, Depth= 2.16"

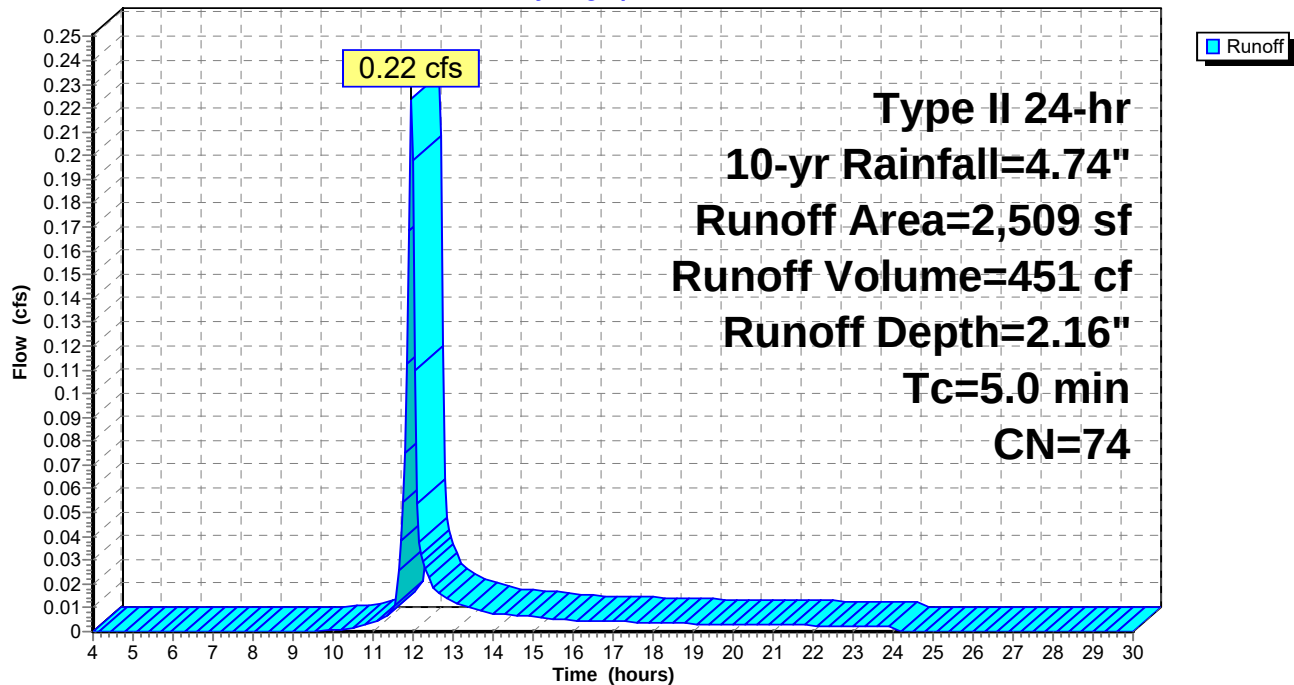
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 815       | 30 | Meadow, non-grazed, HSG A |
| 278       | 78 | Meadow, non-grazed, HSG D |
| 633       | 98 | Paved parking, HSG A      |
| 783       | 98 | Water Surface, HSG D      |
| 2,509     | 74 | Weighted Average          |
| 1,093     |    | 43.56% Pervious Area      |
| 1,416     |    | 56.44% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 9S: CC-9**

Hydrograph



**MLV 505LD86\_Culvert 4-5\_rev2**

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Type II 24-hr 10-yr Rainfall=4.74"

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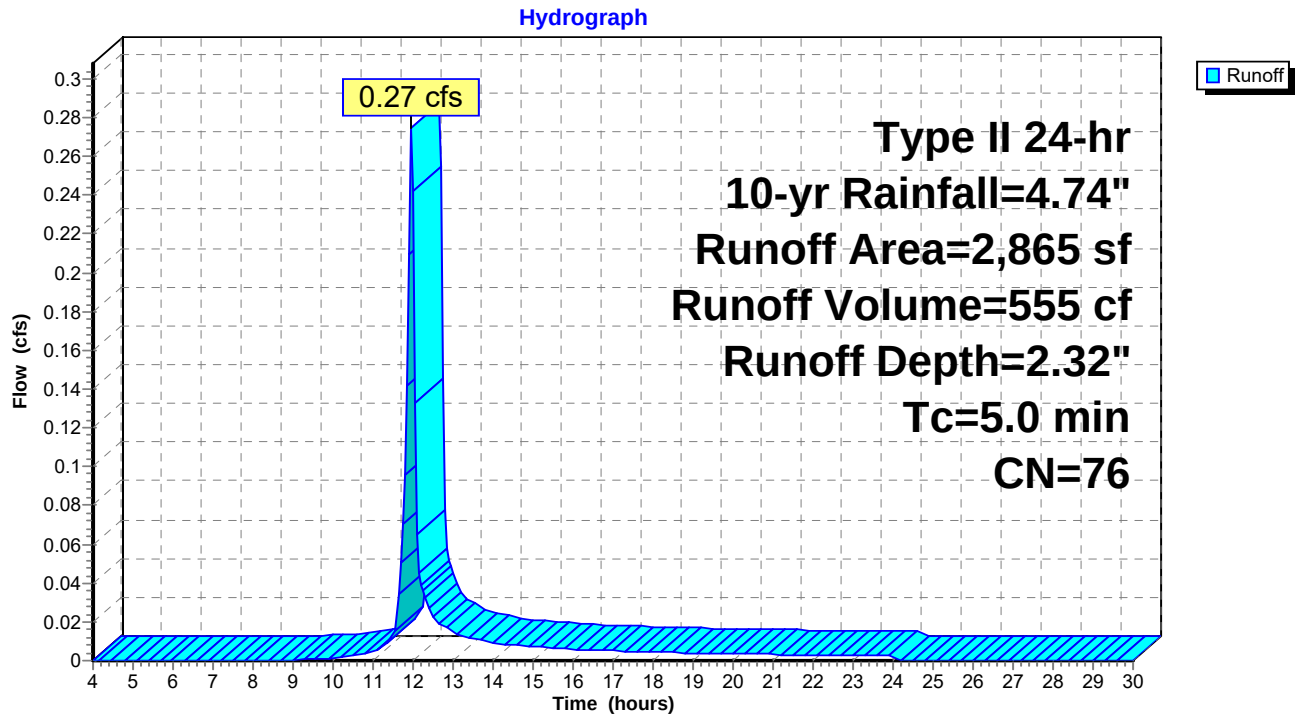
**Summary for Subcatchment 10S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.27 cfs @ 11.96 hrs, Volume= 555 cf, Depth= 2.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 667       | 30 | Meadow, non-grazed, HSG A |
| 845       | 78 | Meadow, non-grazed, HSG D |
| 675       | 98 | Paved parking, HSG A      |
| 678       | 98 | Paved parking, HSG D      |
| 2,865     | 76 | Weighted Average          |
| 1,512     |    | 52.77% Pervious Area      |
| 1,353     |    | 47.23% Impervious Area    |

| $T_c$<br>(min) | Length<br>(feet) | Slope<br>(ft/ft) | Velocity<br>(ft/sec) | Capacity<br>(cfs) | Description           |
|----------------|------------------|------------------|----------------------|-------------------|-----------------------|
| 5.0            |                  |                  |                      |                   | Direct Entry, Assumed |

**Subcatchment 10S: CC-10**

# MLV 505LD86\_Culvert 4-5\_rev2

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Type II 24-hr 10-yr Rainfall=4.74"

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## Summary for Reach 8R: Culvert #4

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 2,509 sf, 56.44% Impervious, Inflow Depth = 2.16" for 10-yr event  
Inflow = 0.22 cfs @ 11.96 hrs, Volume= 451 cf  
Outflow = 0.22 cfs @ 11.96 hrs, Volume= 451 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.31 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 1.05 fps, Avg. Travel Time= 0.4 min

Peak Storage= 2 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.14'

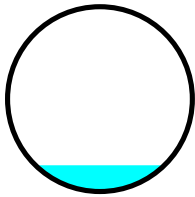
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.25 cfs

12.0" Round Pipe

n= 0.012

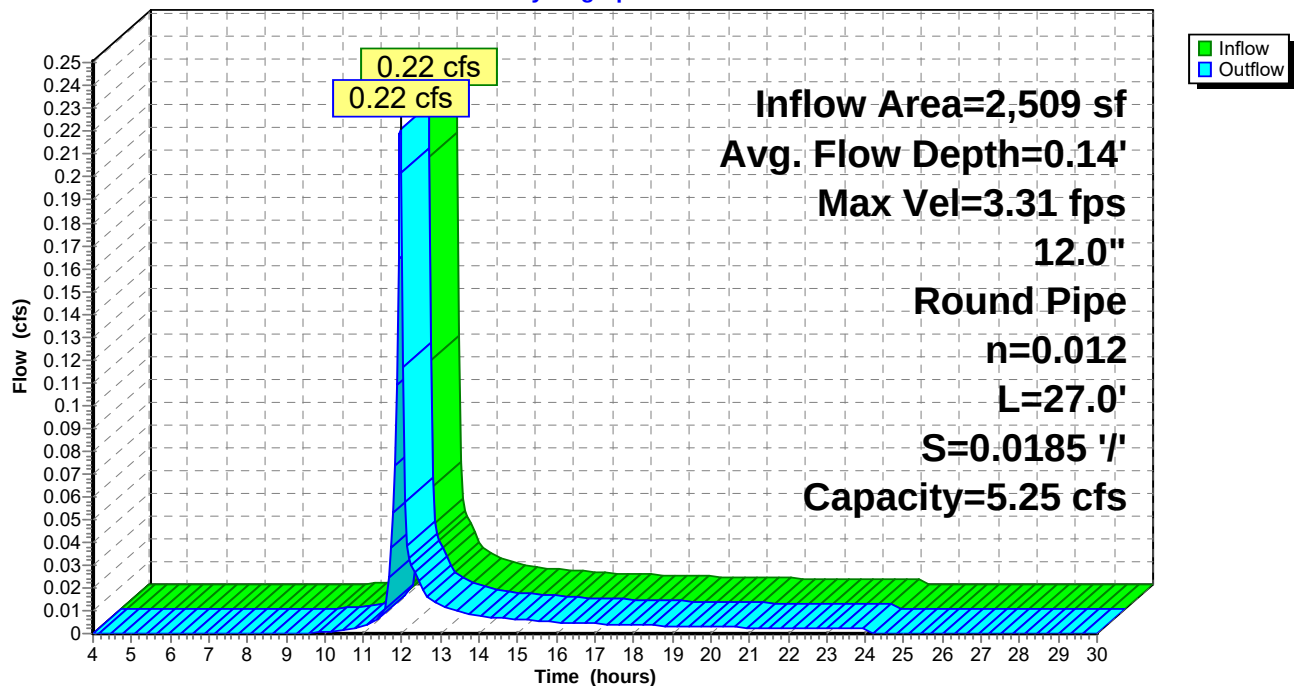
Length= 27.0' Slope= 0.0185 '/'

Inlet Invert= 913.00', Outlet Invert= 912.50'



## Reach 8R: Culvert #4

### Hydrograph



# MLV 505LD86\_Culvert 4-5\_rev2

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Type II 24-hr 10-yr Rainfall=4.74"

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## Summary for Reach 10R: Culvert #5

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 2,865 sf, 47.23% Impervious, Inflow Depth = 2.32" for 10-yr event  
Inflow = 0.27 cfs @ 11.96 hrs, Volume= 555 cf  
Outflow = 0.27 cfs @ 11.96 hrs, Volume= 555 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 6.64 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 2.13 fps, Avg. Travel Time= 0.2 min

Peak Storage= 1 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.10'

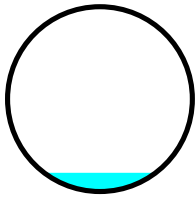
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 12.97 cfs

12.0" Round Pipe

n= 0.012

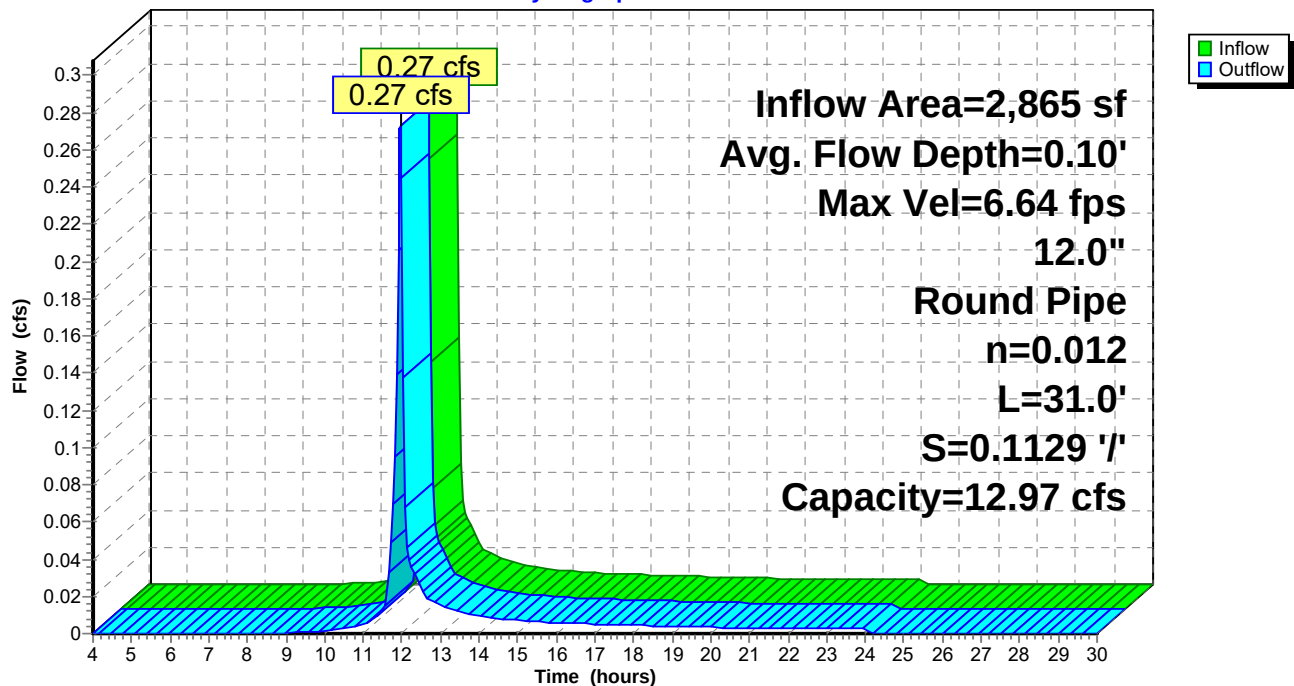
Length= 31.0' Slope= 0.1129 '/'

Inlet Invert= 916.00', Outlet Invert= 912.50'



## Reach 10R: Culvert #5

Hydrograph



**MLV 505LD86\_Culvert 4-5\_rev2***Type II 24-hr 25-yr Rainfall=5.85"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment9S: CC-9**

Runoff Area=2,509 sf 56.44% Impervious Runoff Depth=3.06"  
Tc=5.0 min CN=74 Runoff=0.32 cfs 640 cf

**Subcatchment10S: CC-10**

Runoff Area=2,865 sf 47.23% Impervious Runoff Depth=3.25"  
Tc=5.0 min CN=76 Runoff=0.38 cfs 776 cf

**Reach 8R: Culvert #4**

Avg. Flow Depth=0.17' Max Vel=3.67 fps Inflow=0.32 cfs 640 cf  
12.0" Round Pipe n=0.012 L=27.0' S=0.0185 ' Capacity=5.25 cfs Outflow=0.31 cfs 640 cf

**Reach 10R: Culvert #5**

Avg. Flow Depth=0.12' Max Vel=7.34 fps Inflow=0.38 cfs 776 cf  
12.0" Round Pipe n=0.012 L=31.0' S=0.1129 ' Capacity=12.97 cfs Outflow=0.38 cfs 776 cf

**Total Runoff Area = 5,374 sf Runoff Volume = 1,416 cf Average Runoff Depth = 3.16"**  
**48.47% Pervious = 2,605 sf 51.53% Impervious = 2,769 sf**

**MLV 505LD86\_Culvert 4-5\_rev2**

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Type II 24-hr 25-yr Rainfall=5.85"

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**Summary for Subcatchment 9S: CC-9**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.32 cfs @ 11.96 hrs, Volume= 640 cf, Depth= 3.06"

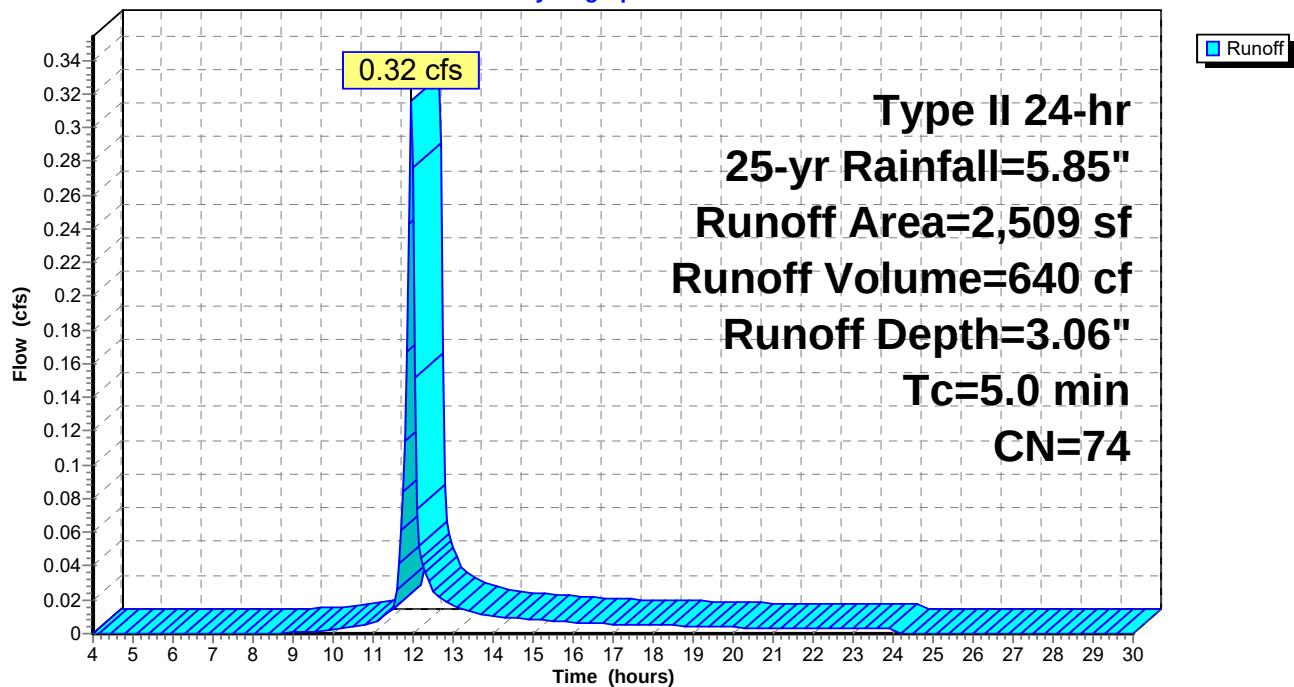
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 815       | 30 | Meadow, non-grazed, HSG A |
| 278       | 78 | Meadow, non-grazed, HSG D |
| 633       | 98 | Paved parking, HSG A      |
| 783       | 98 | Water Surface, HSG D      |
| 2,509     | 74 | Weighted Average          |
| 1,093     |    | 43.56% Pervious Area      |
| 1,416     |    | 56.44% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 9S: CC-9**

Hydrograph



**MLV 505LD86\_Culvert 4-5\_rev2**

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Type II 24-hr 25-yr Rainfall=5.85"

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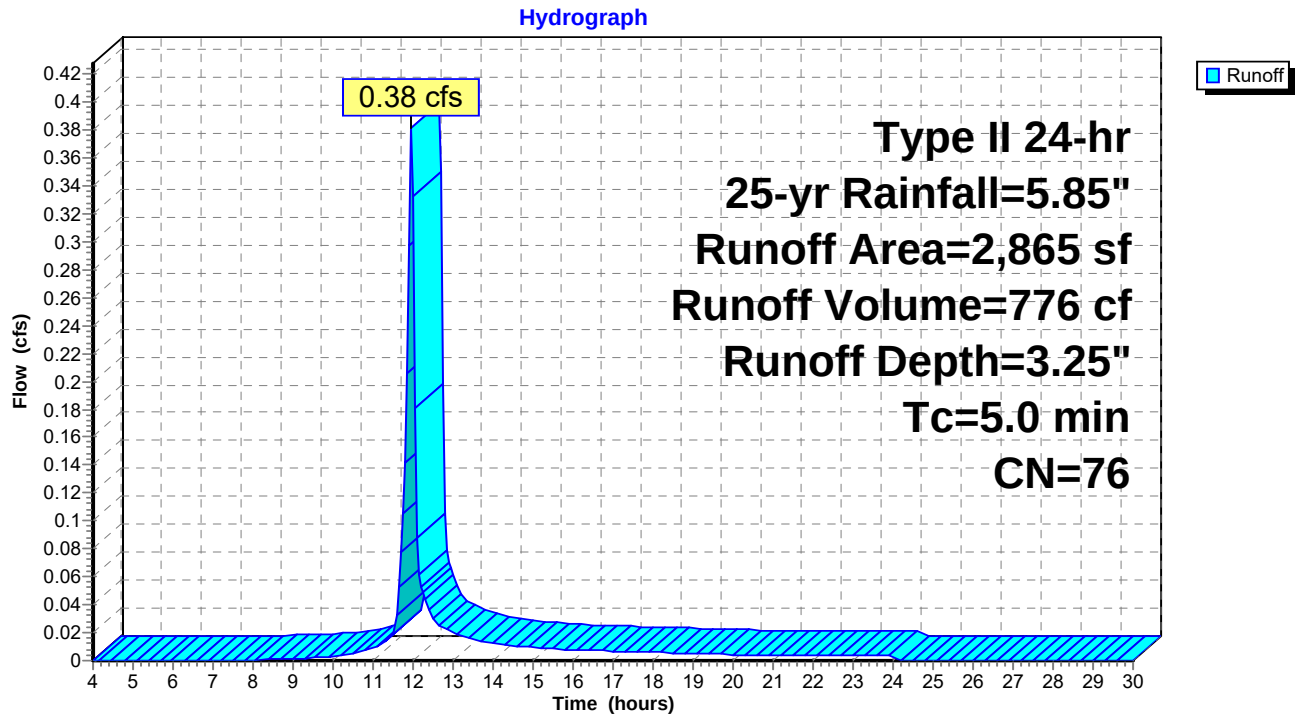
**Summary for Subcatchment 10S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.38 cfs @ 11.96 hrs, Volume= 776 cf, Depth= 3.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 667       | 30 | Meadow, non-grazed, HSG A |
| 845       | 78 | Meadow, non-grazed, HSG D |
| 675       | 98 | Paved parking, HSG A      |
| 678       | 98 | Paved parking, HSG D      |
| 2,865     | 76 | Weighted Average          |
| 1,512     |    | 52.77% Pervious Area      |
| 1,353     |    | 47.23% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 10S: CC-10**



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Type II 24-hr 25-yr Rainfall=5.85"

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## Summary for Reach 8R: Culvert #4

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 2,509 sf, 56.44% Impervious, Inflow Depth = 3.06" for 25-yr event  
Inflow = 0.32 cfs @ 11.96 hrs, Volume= 640 cf  
Outflow = 0.31 cfs @ 11.96 hrs, Volume= 640 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.67 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 1.13 fps, Avg. Travel Time= 0.4 min

Peak Storage= 2 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.17'

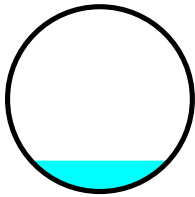
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.25 cfs

12.0" Round Pipe

n= 0.012

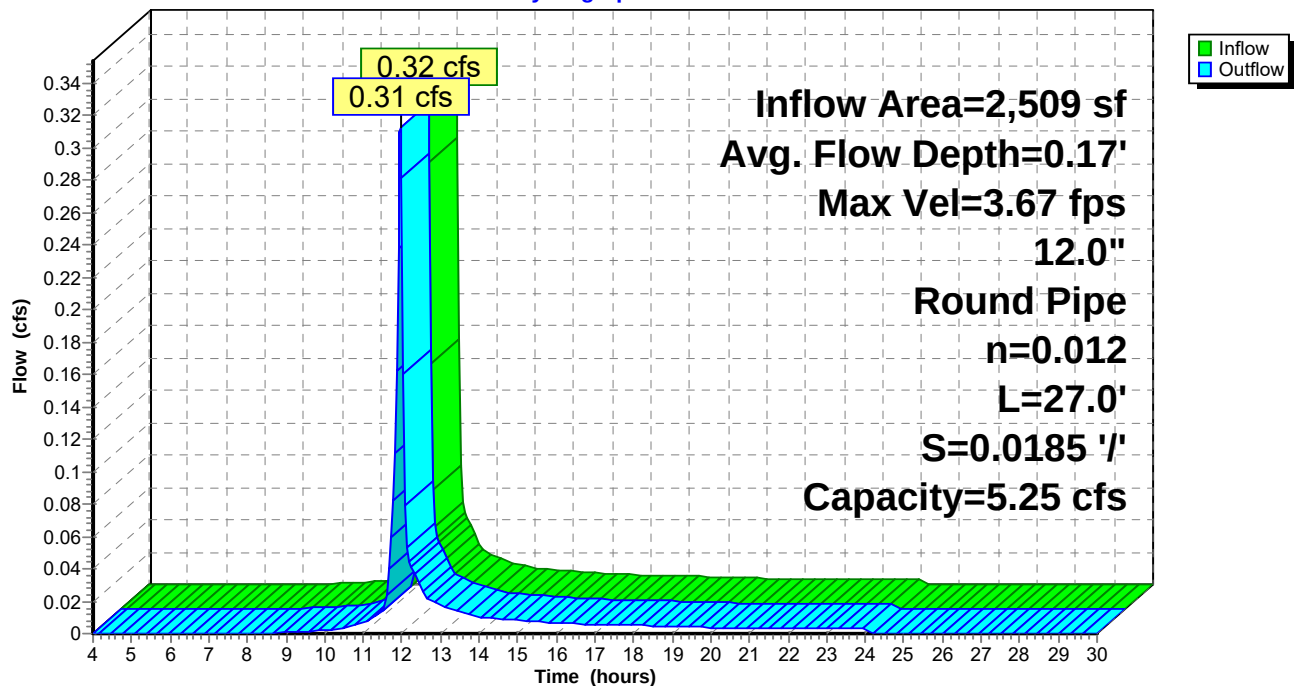
Length= 27.0' Slope= 0.0185 '/'

Inlet Invert= 913.00', Outlet Invert= 912.50'



## Reach 8R: Culvert #4

### Hydrograph



# MLV 505LD86\_Culvert 4-5\_rev2

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Type II 24-hr 25-yr Rainfall=5.85"

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## Summary for Reach 10R: Culvert #5

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 2,865 sf, 47.23% Impervious, Inflow Depth = 3.25" for 25-yr event  
Inflow = 0.38 cfs @ 11.96 hrs, Volume= 776 cf  
Outflow = 0.38 cfs @ 11.96 hrs, Volume= 776 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 7.34 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 2.28 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.12'

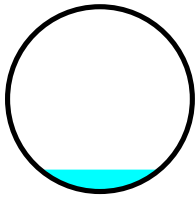
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 12.97 cfs

12.0" Round Pipe

n= 0.012

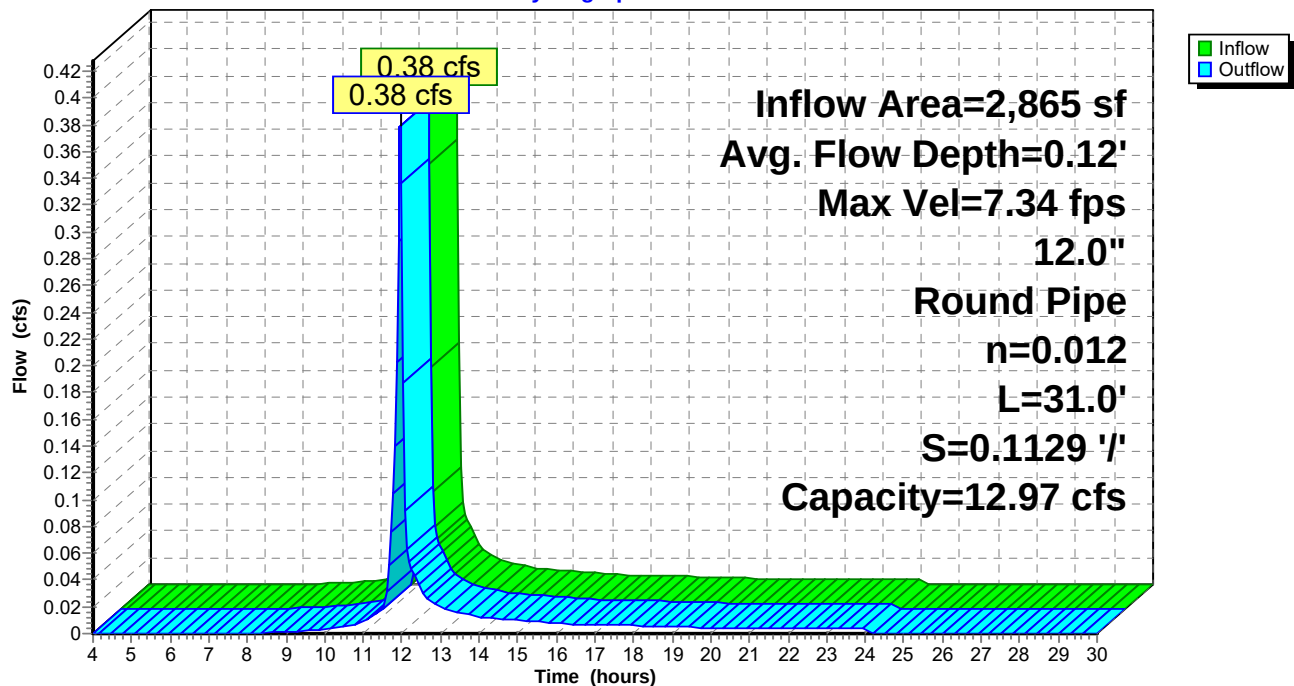
Length= 31.0' Slope= 0.1129 '/'

Inlet Invert= 916.00', Outlet Invert= 912.50'



## Reach 10R: Culvert #5

Hydrograph



**MLV 505LD86\_Culvert 4-5\_rev2***Type II 24-hr 50-yr Rainfall=6.87"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment9S: CC-9**

Runoff Area=2,509 sf 56.44% Impervious Runoff Depth=3.93"  
Tc=5.0 min CN=74 Runoff=0.40 cfs 821 cf

**Subcatchment10S: CC-10**

Runoff Area=2,865 sf 47.23% Impervious Runoff Depth=4.14"  
Tc=5.0 min CN=76 Runoff=0.48 cfs 989 cf

**Reach 8R: Culvert #4**

Avg. Flow Depth=0.19' Max Vel=3.95 fps Inflow=0.40 cfs 821 cf  
12.0" Round Pipe n=0.012 L=27.0' S=0.0185 '/' Capacity=5.25 cfs Outflow=0.40 cfs 821 cf

**Reach 10R: Culvert #5**

Avg. Flow Depth=0.13' Max Vel=7.87 fps Inflow=0.48 cfs 989 cf  
12.0" Round Pipe n=0.012 L=31.0' S=0.1129 '/' Capacity=12.97 cfs Outflow=0.48 cfs 989 cf

**Total Runoff Area = 5,374 sf Runoff Volume = 1,810 cf Average Runoff Depth = 4.04"**  
**48.47% Pervious = 2,605 sf 51.53% Impervious = 2,769 sf**

**MLV 505LD86\_Culvert 4-5\_rev2**

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Type II 24-hr 50-yr Rainfall=6.87"

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**Summary for Subcatchment 9S: CC-9**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.40 cfs @ 11.96 hrs, Volume= 821 cf, Depth= 3.93"

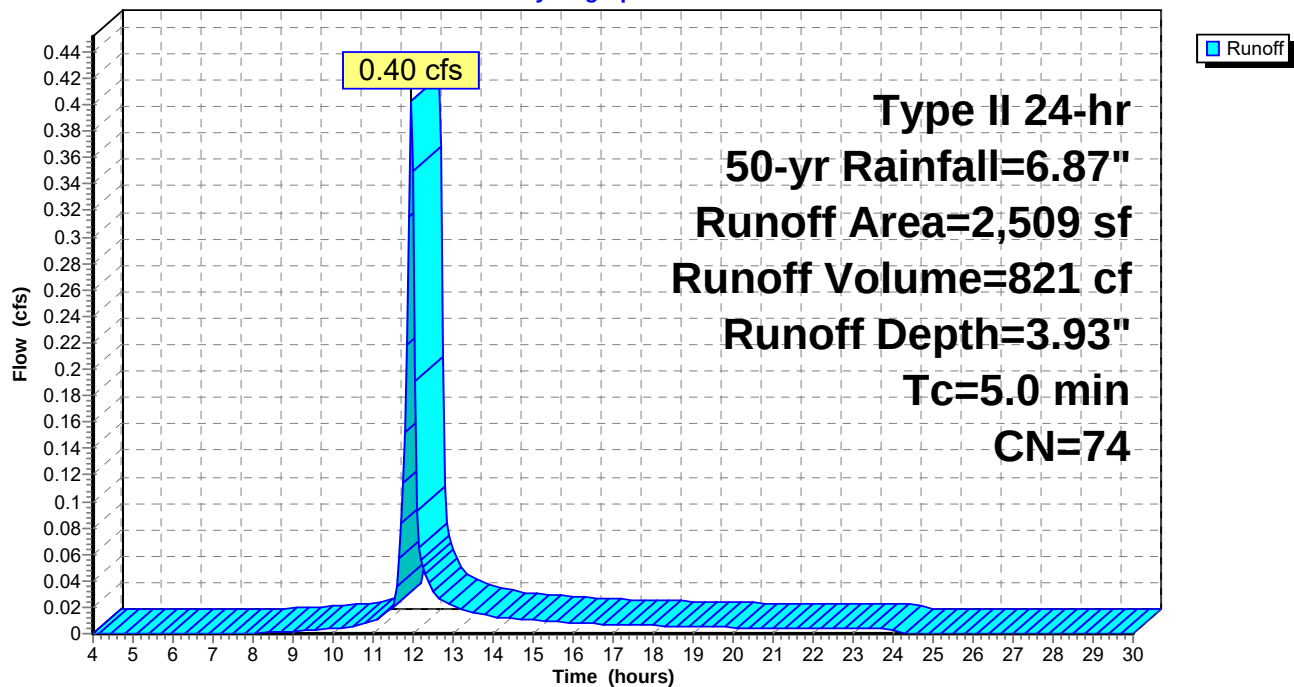
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 815       | 30 | Meadow, non-grazed, HSG A |
| 278       | 78 | Meadow, non-grazed, HSG D |
| 633       | 98 | Paved parking, HSG A      |
| 783       | 98 | Water Surface, HSG D      |
| 2,509     | 74 | Weighted Average          |
| 1,093     |    | 43.56% Pervious Area      |
| 1,416     |    | 56.44% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 9S: CC-9**

Hydrograph



**MLV 505LD86\_Culvert 4-5\_rev2**

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Type II 24-hr 50-yr Rainfall=6.87"

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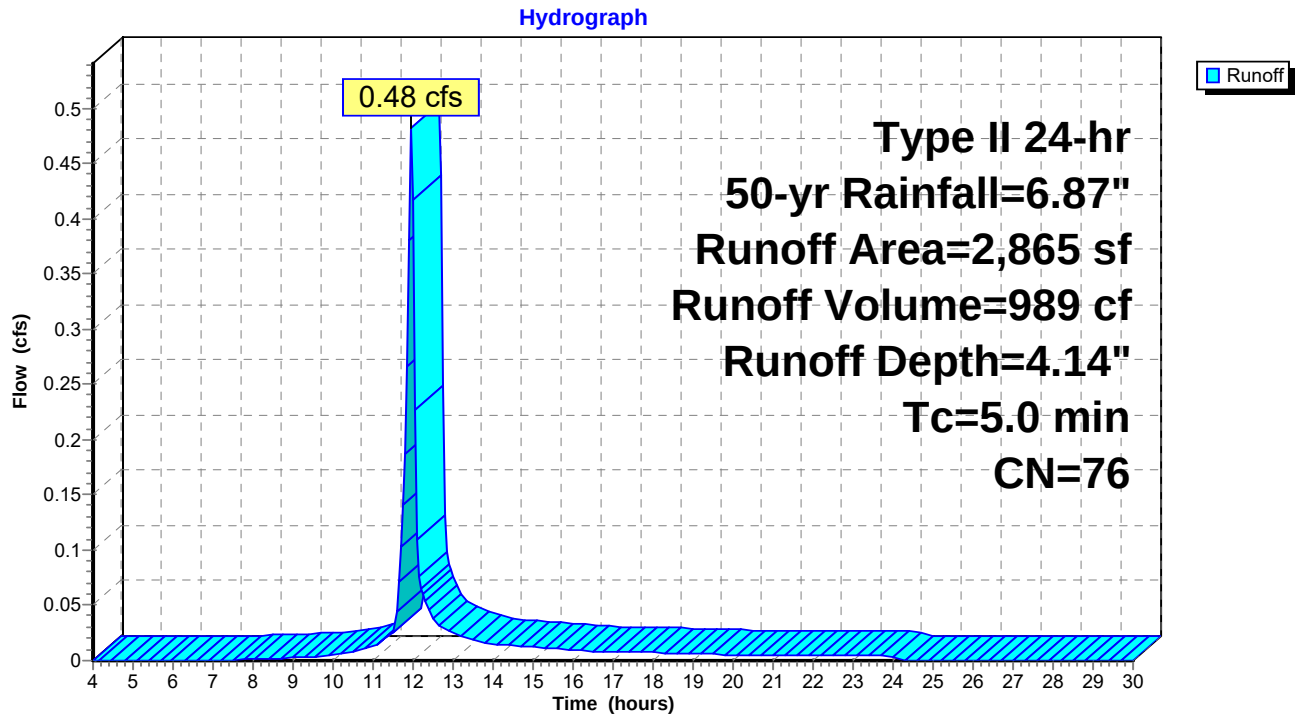
**Summary for Subcatchment 10S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.48 cfs @ 11.96 hrs, Volume= 989 cf, Depth= 4.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 667       | 30 | Meadow, non-grazed, HSG A |
| 845       | 78 | Meadow, non-grazed, HSG D |
| 675       | 98 | Paved parking, HSG A      |
| 678       | 98 | Paved parking, HSG D      |
| 2,865     | 76 | Weighted Average          |
| 1,512     |    | 52.77% Pervious Area      |
| 1,353     |    | 47.23% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 10S: CC-10**

# MLV 505LD86\_Culvert 4-5\_rev2

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Type II 24-hr 50-yr Rainfall=6.87"

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## Summary for Reach 8R: Culvert #4

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 2,509 sf, 56.44% Impervious, Inflow Depth = 3.93" for 50-yr event  
Inflow = 0.40 cfs @ 11.96 hrs, Volume= 821 cf  
Outflow = 0.40 cfs @ 11.96 hrs, Volume= 821 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 3.95 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 1.19 fps, Avg. Travel Time= 0.4 min

Peak Storage= 3 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.19'

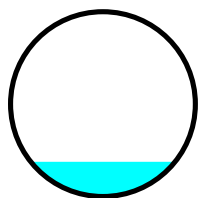
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.25 cfs

12.0" Round Pipe

n= 0.012

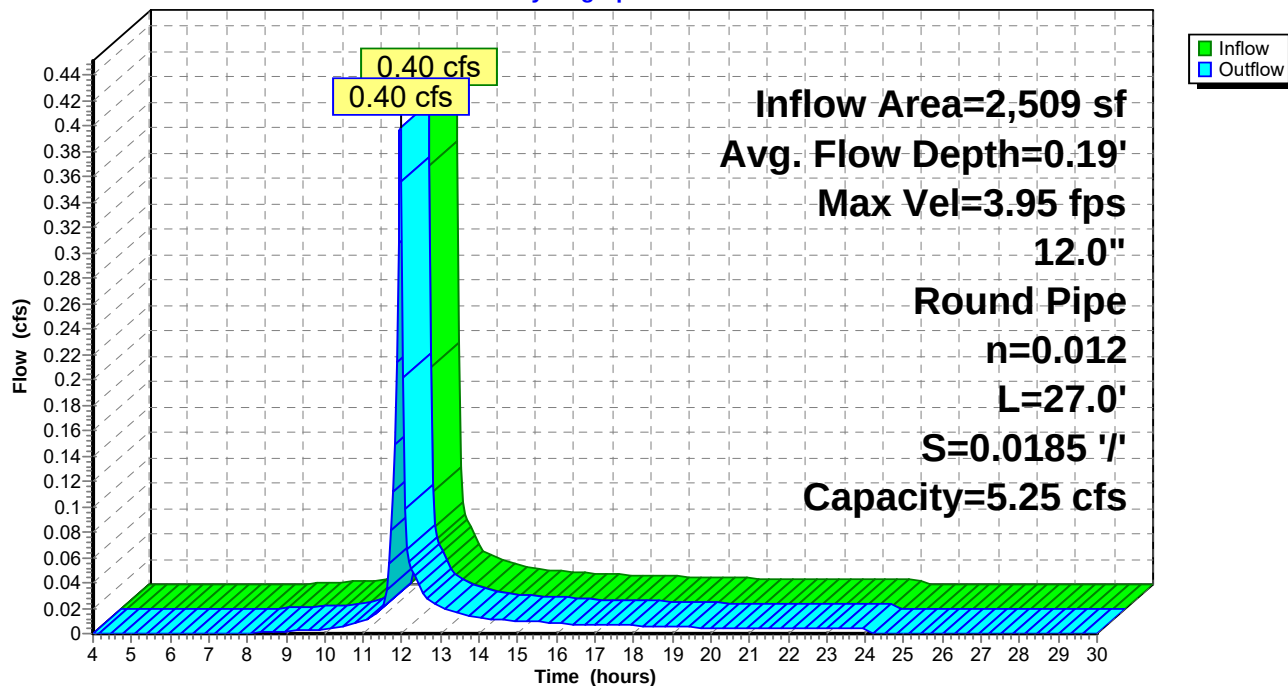
Length= 27.0' Slope= 0.0185 '/

Inlet Invert= 913.00', Outlet Invert= 912.50'



## Reach 8R: Culvert #4

### Hydrograph



## MLV 505LD86\_Culvert 4-5\_rev2

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Type II 24-hr 50-yr Rainfall=6.87"

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### Summary for Reach 10R: Culvert #5

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 2,865 sf, 47.23% Impervious, Inflow Depth = 4.14" for 50-yr event  
Inflow = 0.48 cfs @ 11.96 hrs, Volume= 989 cf  
Outflow = 0.48 cfs @ 11.96 hrs, Volume= 989 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 7.87 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 2.39 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.13'

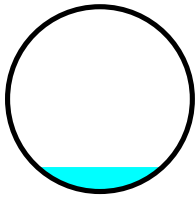
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 12.97 cfs

12.0" Round Pipe

n= 0.012

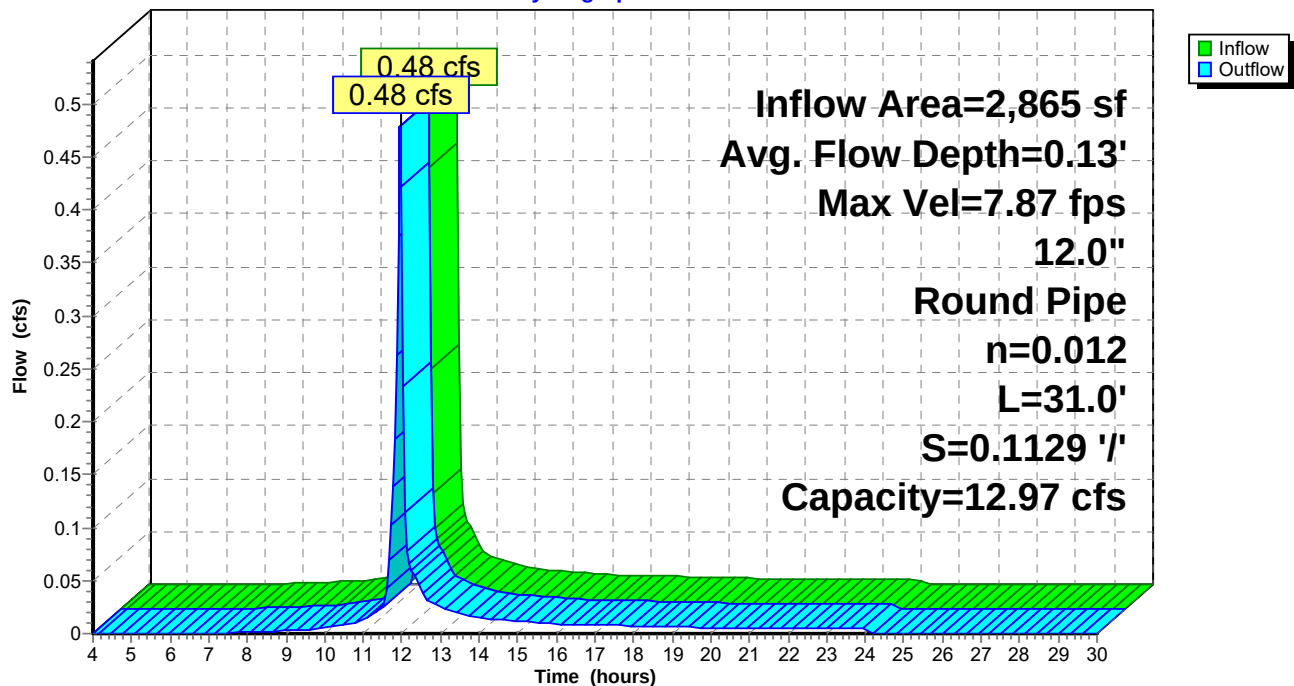
Length= 31.0' Slope= 0.1129 '/'

Inlet Invert= 916.00', Outlet Invert= 912.50'



### Reach 10R: Culvert #5

Hydrograph



**MLV 505LD86\_Culvert 4-5\_rev2***Type II 24-hr 100-yr Rainfall=8.09"*

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Time span=4.00-30.00 hrs, dt=0.05 hrs, 521 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment9S: CC-9**

Runoff Area=2,509 sf 56.44% Impervious Runoff Depth=5.01"  
Tc=5.0 min CN=74 Runoff=0.51 cfs 1,047 cf

**Subcatchment10S: CC-10**

Runoff Area=2,865 sf 47.23% Impervious Runoff Depth=5.24"  
Tc=5.0 min CN=76 Runoff=0.60 cfs 1,251 cf

**Reach 8R: Culvert #4**

Avg. Flow Depth=0.21' Max Vel=4.23 fps Inflow=0.51 cfs 1,047 cf  
12.0" Round Pipe n=0.012 L=27.0' S=0.0185 '/' Capacity=5.25 cfs Outflow=0.50 cfs 1,047 cf

**Reach 10R: Culvert #5**

Avg. Flow Depth=0.15' Max Vel=8.42 fps Inflow=0.60 cfs 1,251 cf  
12.0" Round Pipe n=0.012 L=31.0' S=0.1129 '/' Capacity=12.97 cfs Outflow=0.60 cfs 1,251 cf

**Total Runoff Area = 5,374 sf Runoff Volume = 2,298 cf Average Runoff Depth = 5.13"**  
**48.47% Pervious = 2,605 sf 51.53% Impervious = 2,769 sf**



**MLV 505LD86\_Culvert 4-5\_rev2**

Type II 24-hr 100-yr Rainfall=8.09"

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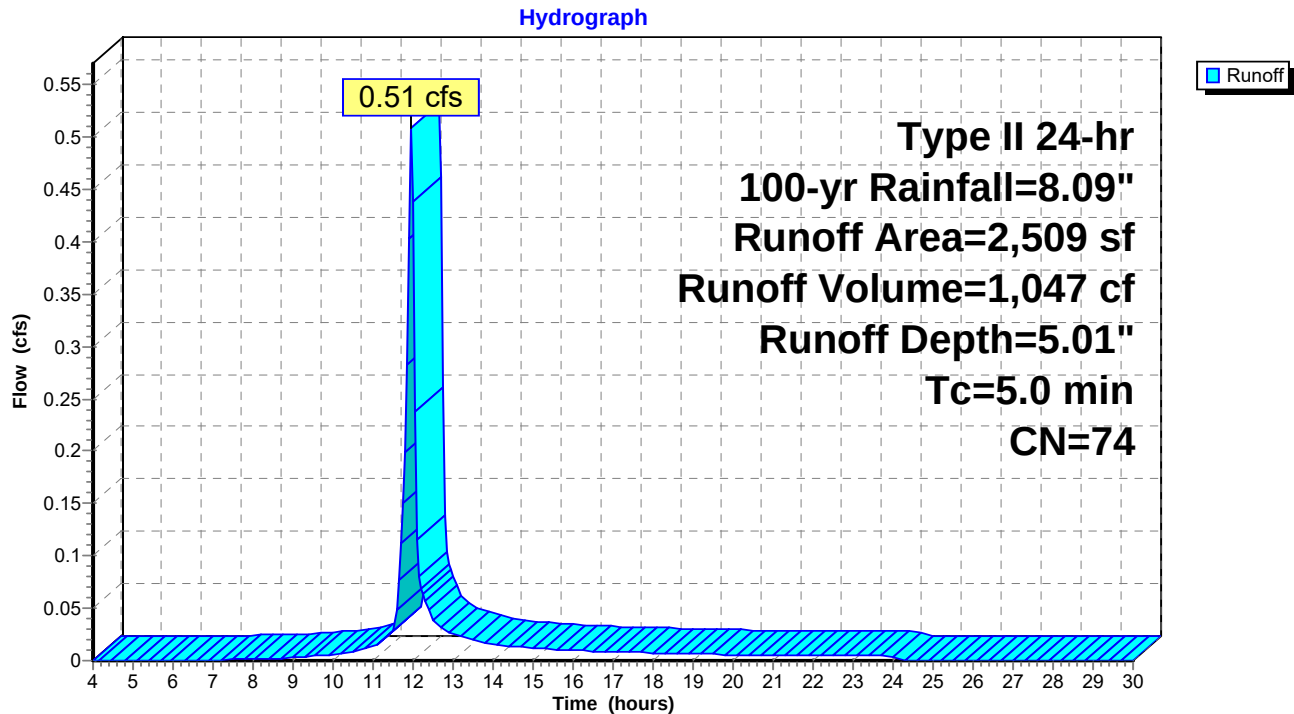
**Summary for Subcatchment 9S: CC-9**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.51 cfs @ 11.96 hrs, Volume= 1,047 cf, Depth= 5.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 815       | 30 | Meadow, non-grazed, HSG A |
| 278       | 78 | Meadow, non-grazed, HSG D |
| 633       | 98 | Paved parking, HSG A      |
| 783       | 98 | Water Surface, HSG D      |
| 2,509     | 74 | Weighted Average          |
| 1,093     |    | 43.56% Pervious Area      |
| 1,416     |    | 56.44% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 9S: CC-9**

**MLV 505LD86\_Culvert 4-5\_rev2**

Type II 24-hr 100-yr Rainfall=8.09"

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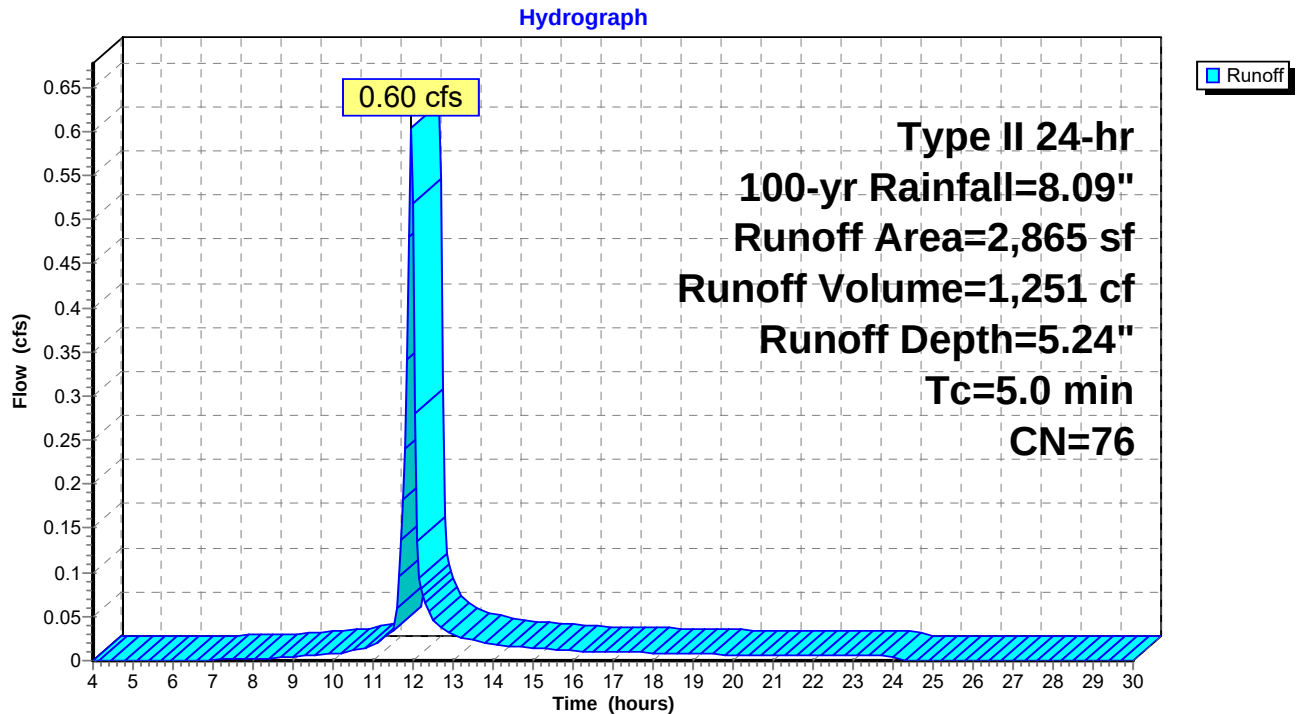
**Summary for Subcatchment 10S: CC-10**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.60 cfs @ 11.95 hrs, Volume= 1,251 cf, Depth= 5.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-30.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 667       | 30 | Meadow, non-grazed, HSG A |
| 845       | 78 | Meadow, non-grazed, HSG D |
| 675       | 98 | Paved parking, HSG A      |
| 678       | 98 | Paved parking, HSG D      |
| 2,865     | 76 | Weighted Average          |
| 1,512     |    | 52.77% Pervious Area      |
| 1,353     |    | 47.23% Impervious Area    |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description           |
|----------|---------------|---------------|-------------------|----------------|-----------------------|
| 5.0      |               |               |                   |                | Direct Entry, Assumed |

**Subcatchment 10S: CC-10**

## MLV 505LD86\_Culvert 4-5\_rev2

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Type II 24-hr 100-yr Rainfall=8.09"

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### Summary for Reach 8R: Culvert #4

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 2,509 sf, 56.44% Impervious, Inflow Depth = 5.01" for 100-yr event  
Inflow = 0.51 cfs @ 11.96 hrs, Volume= 1,047 cf  
Outflow = 0.50 cfs @ 11.96 hrs, Volume= 1,047 cf, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 4.23 fps, Min. Travel Time= 0.1 min

Avg. Velocity= 1.25 fps, Avg. Travel Time= 0.4 min

Peak Storage= 3 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.21'

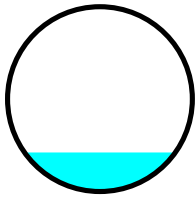
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.25 cfs

12.0" Round Pipe

n= 0.012

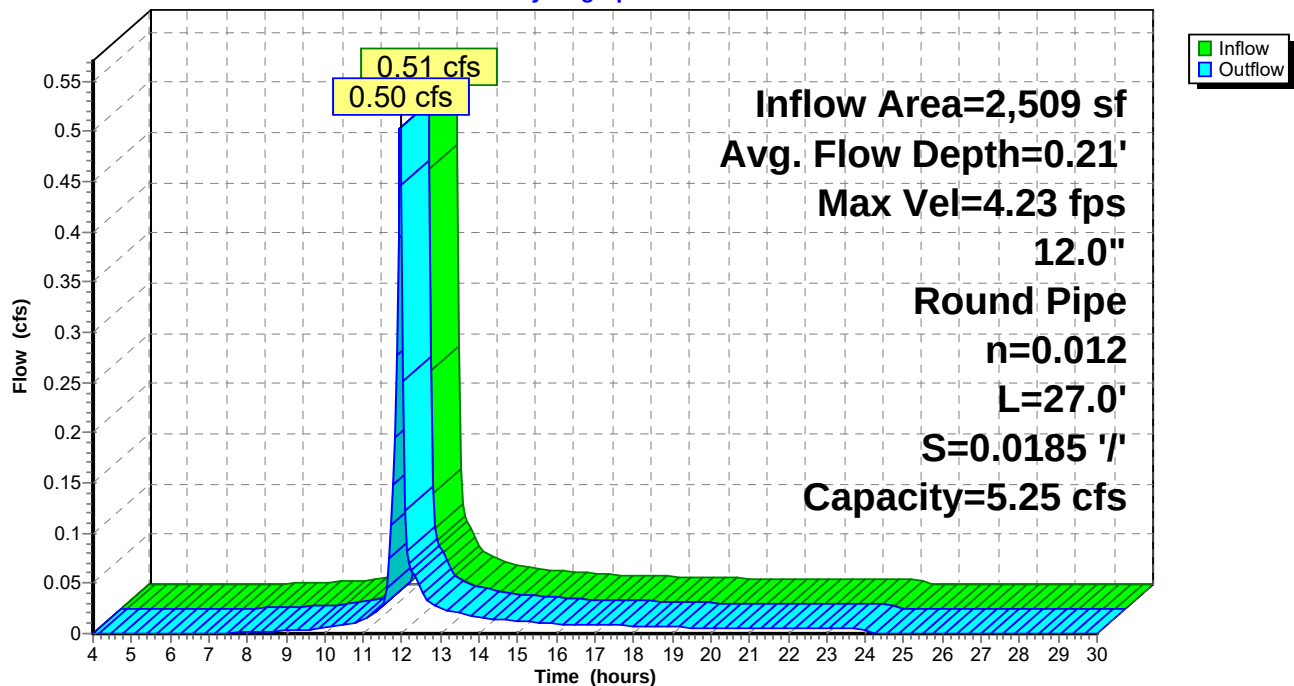
Length= 27.0' Slope= 0.0185 '/'

Inlet Invert= 913.00', Outlet Invert= 912.50'



### Reach 8R: Culvert #4

Hydrograph



## MLV 505LD86\_Culvert 4-5\_rev2

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Type II 24-hr 100-yr Rainfall=8.09"

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### Summary for Reach 10R: Culvert #5

[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 2,865 sf, 47.23% Impervious, Inflow Depth = 5.24" for 100-yr event  
Inflow = 0.60 cfs @ 11.95 hrs, Volume= 1,251 cf  
Outflow = 0.60 cfs @ 11.96 hrs, Volume= 1,251 cf, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 4.00-30.00 hrs, dt= 0.05 hrs

Max. Velocity= 8.42 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 2.50 fps, Avg. Travel Time= 0.2 min

Peak Storage= 2 cf @ 11.96 hrs

Average Depth at Peak Storage= 0.15'

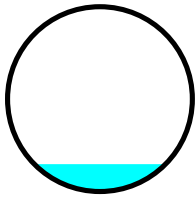
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 12.97 cfs

12.0" Round Pipe

n= 0.012

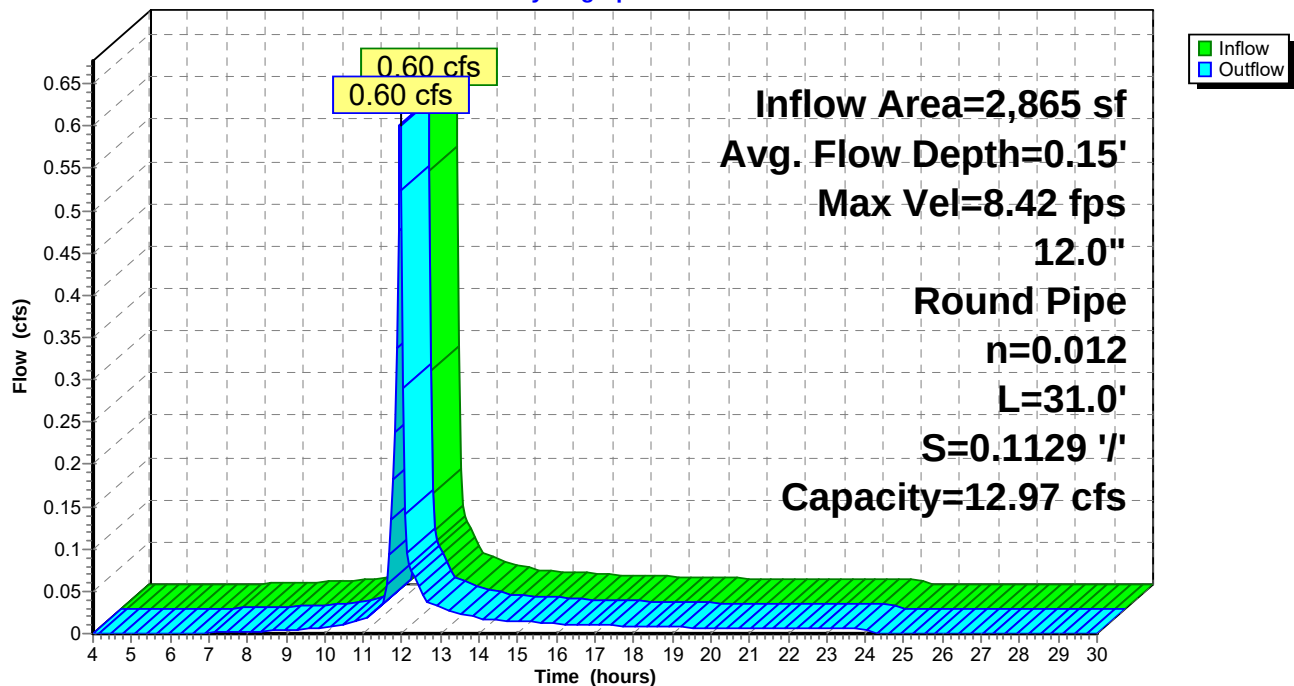
Length= 31.0' Slope= 0.1129 '/'

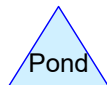
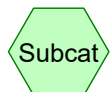
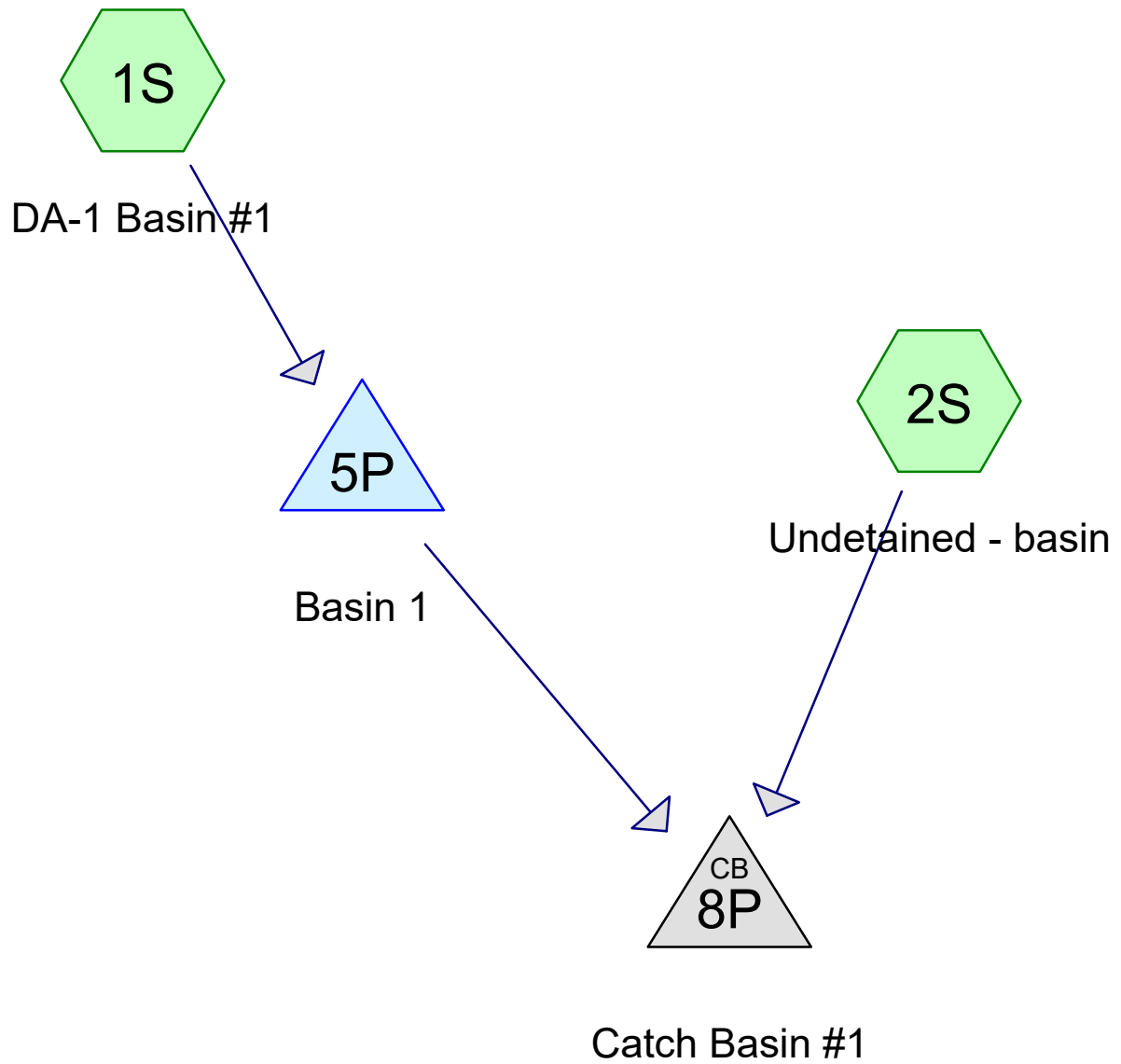
Inlet Invert= 916.00', Outlet Invert= 912.50'



### Reach 10R: Culvert #5

Hydrograph





**MLV 505LD86\_Culvert 6-7\_rev2**

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**Area Listing (all nodes)**

| Area<br>(sq-ft) | CN        | Description<br>(subcatchment-numbers) |
|-----------------|-----------|---------------------------------------|
| 4,613           | 98        | Impervious (1S, 2S)                   |
| 113,033         | 30        | Meadow, non-grazed, HSG A (1S, 2S)    |
| 50,291          | 78        | Meadow, non-grazed, HSG D (1S, 2S)    |
| 42,062          | 30        | Woods, Good, HSG A (1S, 2S)           |
| 13,443          | 77        | Woods, Good, HSG D (1S, 2S)           |
| <b>223,442</b>  | <b>45</b> | <b>TOTAL AREA</b>                     |

**MLV 505LD86\_Culvert 6-7\_rev2**

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**Soil Listing (all nodes)**

| Area<br>(sq-ft) | Soil<br>Group | Subcatchment<br>Numbers |
|-----------------|---------------|-------------------------|
| 155,095         | HSG A         | 1S, 2S                  |
| 0               | HSG B         |                         |
| 0               | HSG C         |                         |
| 63,734          | HSG D         | 1S, 2S                  |
| 4,613           | Other         | 1S, 2S                  |
| <b>223,442</b>  |               | <b>TOTAL AREA</b>       |

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**Ground Covers (all nodes)**

| HSG-A<br>(sq-ft) | HSG-B<br>(sq-ft) | HSG-C<br>(sq-ft) | HSG-D<br>(sq-ft) | Other<br>(sq-ft) | Total<br>(sq-ft) | Ground<br>Cover       | Subcat<br>Number |
|------------------|------------------|------------------|------------------|------------------|------------------|-----------------------|------------------|
| 0                | 0                | 0                | 0                | 4,613            | 4,613            | Impervious            |                  |
| 113,033          | 0                | 0                | 50,291           | 0                | 163,324          | Meadow,<br>non-grazed |                  |
| 42,062           | 0                | 0                | 13,443           | 0                | 55,505           | Woods, Good           |                  |
| <b>155,095</b>   | <b>0</b>         | <b>0</b>         | <b>63,734</b>    | <b>4,613</b>     | <b>223,442</b>   | <b>TOTAL AREA</b>     |                  |



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**Pipe Listing (all nodes)**

| Line# | Node<br>Number | In-Invert<br>(feet) | Out-Invert<br>(feet) | Length<br>(feet) | Slope<br>(ft/ft) | n     | Diam/Width<br>(inches) | Height<br>(inches) | Inside-Fill<br>(inches) |
|-------|----------------|---------------------|----------------------|------------------|------------------|-------|------------------------|--------------------|-------------------------|
| 1     | 5P             | 924.50              | 910.00               | 51.0             | 0.2843           | 0.012 | 18.0                   | 0.0                | 0.0                     |
| 2     | 8P             | 911.50              | 908.00               | 142.0            | 0.0246           | 0.012 | 18.0                   | 0.0                | 0.0                     |

**MLV 505LD86\_Culvert 6-7\_rev2***Type II 24-hr 1-yr Rainfall=2.72"*

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Time span=4.00-24.00 hrs, dt=0.05 hrs, 401 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DA-1 Basin #1**

Runoff Area=191,207 sf 2.18% Impervious Runoff Depth>0.02"  
Flow Length=1,332' Tc=25.9 min CN=47 Runoff=0.01 cfs 279 cf

**Subcatchment2S: Undetained - basin**

Runoff Area=32,235 sf 1.40% Impervious Runoff Depth=0.00"  
Flow Length=247' Tc=5.6 min CN=32 Runoff=0.00 cfs 0 cf

**Pond 5P: Basin 1**

Peak Elev=924.50' Storage=6 cf Inflow=0.01 cfs 279 cf  
Discarded=0.01 cfs 273 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 273 cf

**Pond 8P: Catch Basin #1**

Peak Elev=911.50' Inflow=0.00 cfs 0 cf  
18.0" Round Culvert n=0.012 L=142.0' S=0.0246 '/' Outflow=0.00 cfs 0 cf

**Total Runoff Area = 223,442 sf Runoff Volume = 279 cf Average Runoff Depth = 0.01"**  
**97.94% Pervious = 218,829 sf 2.06% Impervious = 4,613 sf**

**MLV 505LD86\_Culvert 6-7\_rev2**

Type II 24-hr 1-yr Rainfall=2.72"

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**Summary for Subcatchment 1S: DA-1 Basin #1**

[73] Warning: Peak may fall outside time span

Runoff = 0.01 cfs @ 24.00 hrs, Volume= 279 cf, Depth&gt; 0.02"

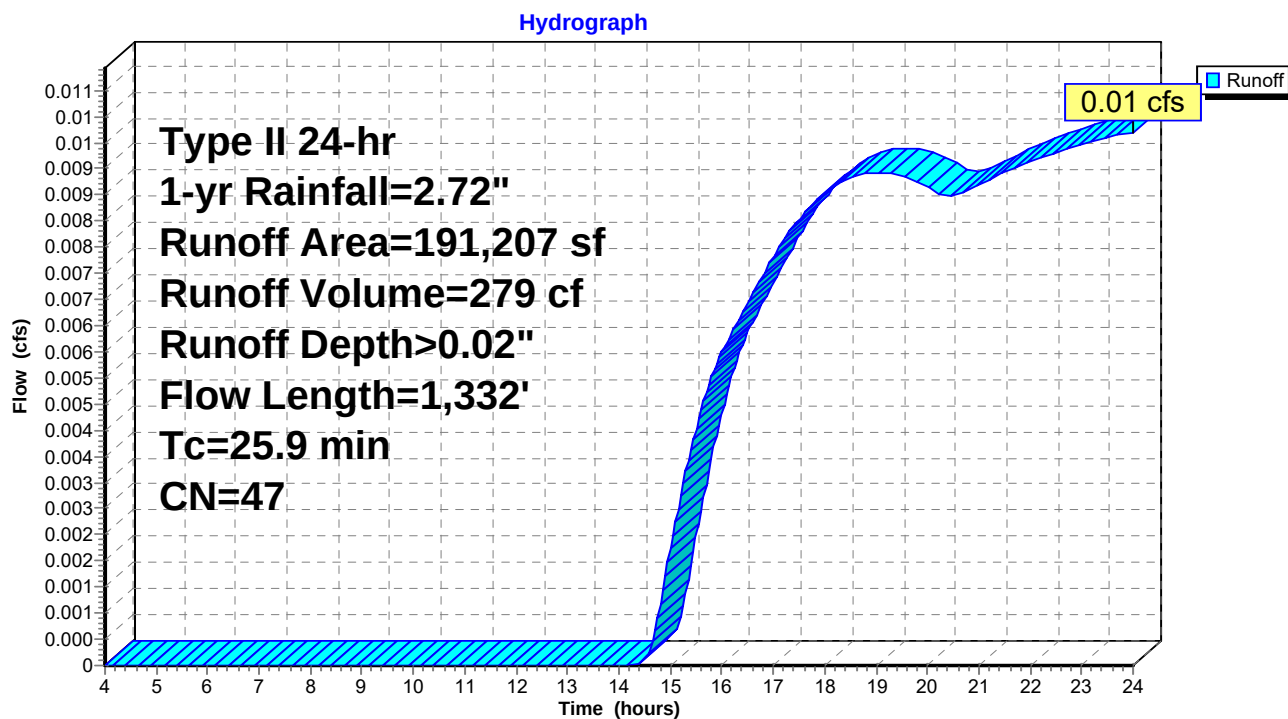
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 31,537    | 30 | Woods, Good, HSG A        |
| 12,873    | 77 | Woods, Good, HSG D        |
| 92,642    | 30 | Meadow, non-grazed, HSG A |
| 49,992    | 78 | Meadow, non-grazed, HSG D |
| * 4,163   | 98 | Impervious                |
| 191,207   | 47 | Weighted Average          |
| 187,044   |    | 97.82% Pervious Area      |
| 4,163     |    | 2.18% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.5      | 463           | 0.1167        | 1.71              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.3      | 554           | 0.0922        | 2.13              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 1.0      | 215           | 0.0630        | 3.64              | 5.10           | <b>Channel Flow,</b><br>Area= 1.4 sf Perim= 4.1' r= 0.34' n= 0.050   |
| 25.9     | 1,332         | Total         |                   |                |                                                                      |

## Subcatchment 1S: DA-1 Basin #1



**MLV 505LD86\_Culvert 6-7\_rev2**

Type II 24-hr 1-yr Rainfall=2.72"

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**Summary for Subcatchment 2S: Undetained - basin**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Depth= 0.00"

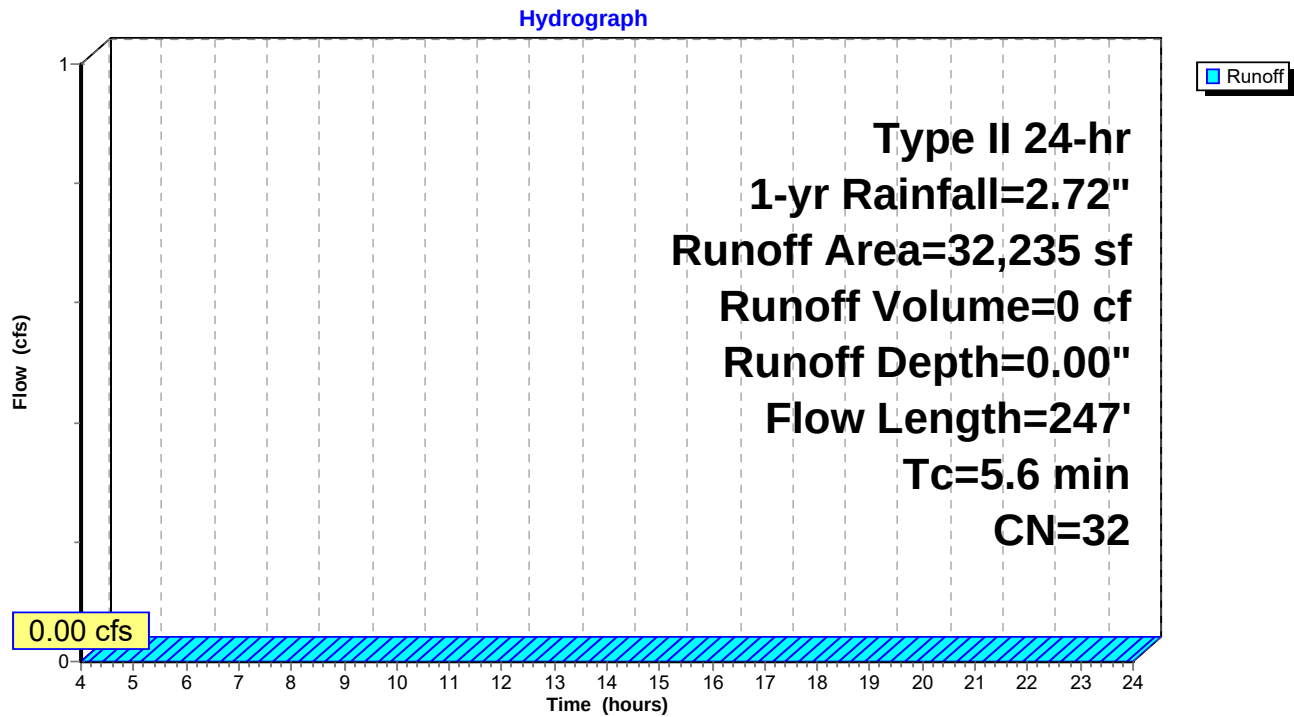
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-24.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 1-yr Rainfall=2.72"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 10,525    | 30 | Woods, Good, HSG A        |
| 570       | 77 | Woods, Good, HSG D        |
| 20,391    | 30 | Meadow, non-grazed, HSG A |
| 299       | 78 | Meadow, non-grazed, HSG D |
| * 450     | 98 | Impervious                |
| 32,235    | 32 | Weighted Average          |
| 31,785    |    | 98.60% Pervious Area      |
| 450       |    | 1.40% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 4.7      | 100           | 0.1200        | 0.35              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.26"                |
| 0.9      | 147           | 0.1630        | 2.83              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 5.6      | 247           | Total         |                   |                |                                                                      |

## Subcatchment 2S: Undetained - basin



**Summary for Pond 5P: Basin 1**

Inflow Area = 191,207 sf, 2.18% Impervious, Inflow Depth > 0.02" for 1-yr event  
 Inflow = 0.01 cfs @ 24.00 hrs, Volume= 279 cf  
 Outflow = 0.01 cfs @ 24.00 hrs, Volume= 273 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.01 cfs @ 24.00 hrs, Volume= 273 cf  
 Primary = 0.00 cfs @ 4.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 924.50' @ 24.00 hrs Surf.Area= 2,840 sf Storage= 6 cf

Plug-Flow detention time= 9.4 min calculated for 273 cf (98% of inflow)  
 Center-of-Mass det. time= 4.3 min ( 1,199.5 - 1,195.2 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 924.50' | 15,897 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 924.50              | 2,838                | 0                         | 0                         |
| 925.00              | 3,298                | 1,534                     | 1,534                     |
| 926.00              | 4,260                | 3,779                     | 5,313                     |
| 927.00              | 5,278                | 4,769                     | 10,082                    |
| 928.00              | 6,352                | 5,815                     | 15,897                    |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                          |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 927.00' | <b>4.0' long x 20.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63       |
| #2     | Discarded | 924.50' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 916.00'                                                                                    |
| #3     | Device 4  | 926.50' | <b>24.0" Vert. Orifice/Grate</b> C= 0.600                                                                                                                                               |
| #4     | Primary   | 924.50' | <b>18.0" Round Culvert#6</b><br>L= 51.0' Box, headwall w/3 rounded edges, Ke= 0.200<br>Inlet / Outlet Invert= 924.50' / 910.00' S= 0.2843 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.77 sf |

**Discarded OutFlow** Max=0.20 cfs @ 24.00 hrs HW=924.50' (Free Discharge)

↑ **2=Exfiltration** ( Controls 0.20 cfs)

**Primary OutFlow** Max=0.00 cfs @ 4.00 hrs HW=924.50' (Free Discharge)

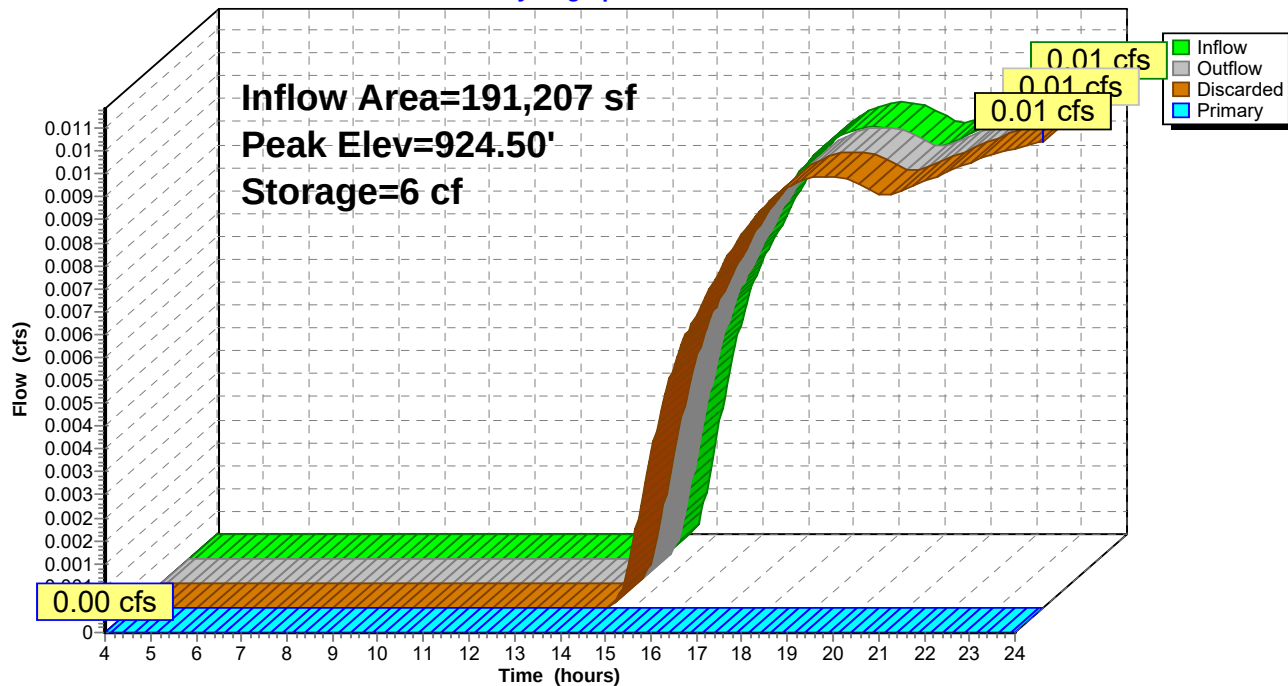
↑ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

↑ **4=Culvert#6** ( Controls 0.00 cfs)

↑ **3=Orifice/Grate** ( Controls 0.00 cfs)

## Pond 5P: Basin 1

## Hydrograph





**Summary for Pond 8P: Catch Basin #1**

[57] Hint: Peaked at 911.50' (Flood elevation advised)

[79] Warning: Submerged Pond 5P Primary device # 4 OUTLET by 1.50'

Inflow Area = 223,442 sf, 2.06% Impervious, Inflow Depth = 0.00" for 1-yr event  
 Inflow = 0.00 cfs @ 4.00 hrs, Volume= 0 cf  
 Outflow = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 4.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 911.50' @ 4.00 hrs

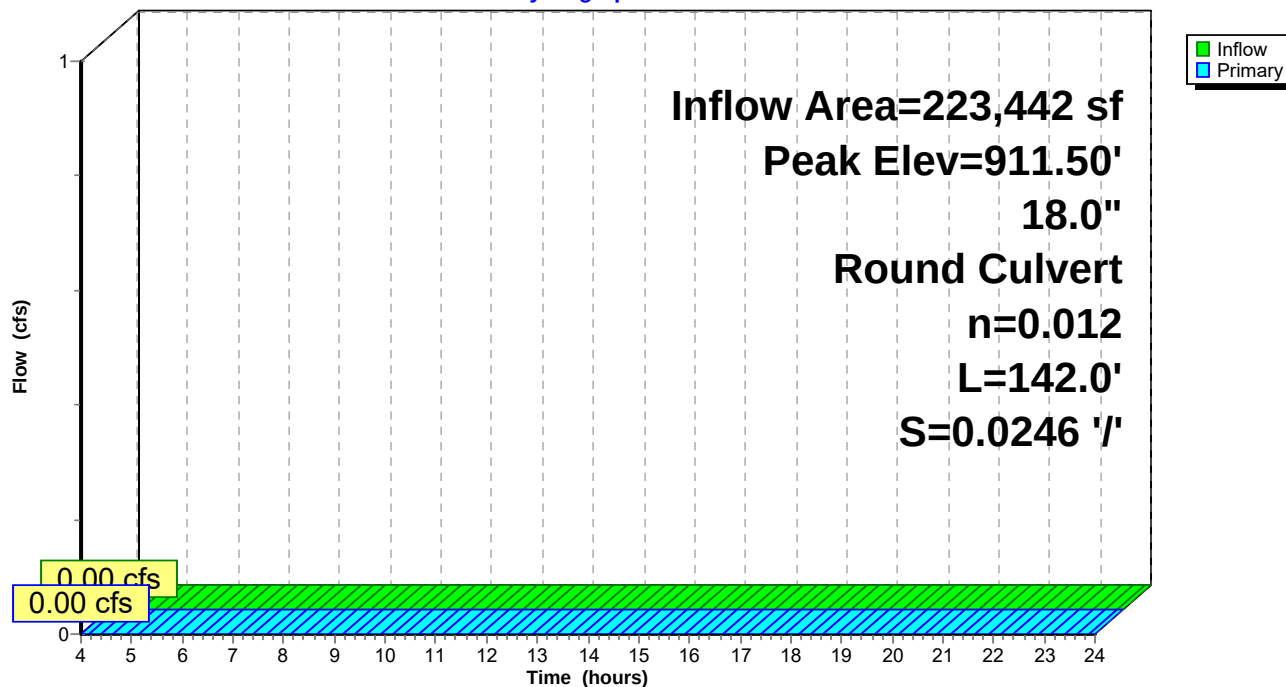
| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                         |
|--------|---------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 911.50' | <b>18.0" Round Culvert#7</b><br>L= 142.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 911.50' / 908.00' S= 0.0246 '/ Cc= 0.900<br>n= 0.012, Flow Area= 1.77 sf |

Primary OutFlow Max=0.00 cfs @ 4.00 hrs HW=911.50' (Free Discharge)

↑1=Culvert#7 ( Controls 0.00 cfs)

**Pond 8P: Catch Basin #1**

Hydrograph



**MLV 505LD86\_Culvert 6-7\_rev2***Type II 24-hr 2-yr Rainfall=3.26"*

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Time span=4.00-24.00 hrs, dt=0.05 hrs, 401 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DA-1 Basin #1**

Runoff Area=191,207 sf 2.18% Impervious Runoff Depth>0.08"  
Flow Length=1,332' Tc=25.9 min CN=47 Runoff=0.04 cfs 1,276 cf

**Subcatchment2S: Undetained - basin**

Runoff Area=32,235 sf 1.40% Impervious Runoff Depth=0.00"  
Flow Length=247' Tc=5.6 min CN=32 Runoff=0.00 cfs 0 cf

**Pond 5P: Basin 1**

Peak Elev=924.51' Storage=23 cf Inflow=0.04 cfs 1,276 cf  
Discarded=0.04 cfs 1,262 cf Primary=0.00 cfs 0 cf Outflow=0.04 cfs 1,262 cf

**Pond 8P: Catch Basin #1**

Peak Elev=911.50' Inflow=0.00 cfs 0 cf  
18.0" Round Culvert n=0.012 L=142.0' S=0.0246 '/' Outflow=0.00 cfs 0 cf

**Total Runoff Area = 223,442 sf Runoff Volume = 1,276 cf Average Runoff Depth = 0.07"**  
**97.94% Pervious = 218,829 sf 2.06% Impervious = 4,613 sf**

**MLV 505LD86\_Culvert 6-7\_rev2**

Type II 24-hr 2-yr Rainfall=3.26"

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**Summary for Subcatchment 1S: DA-1 Basin #1**

Runoff = 0.04 cfs @ 13.70 hrs, Volume= 1,276 cf, Depth&gt; 0.08"

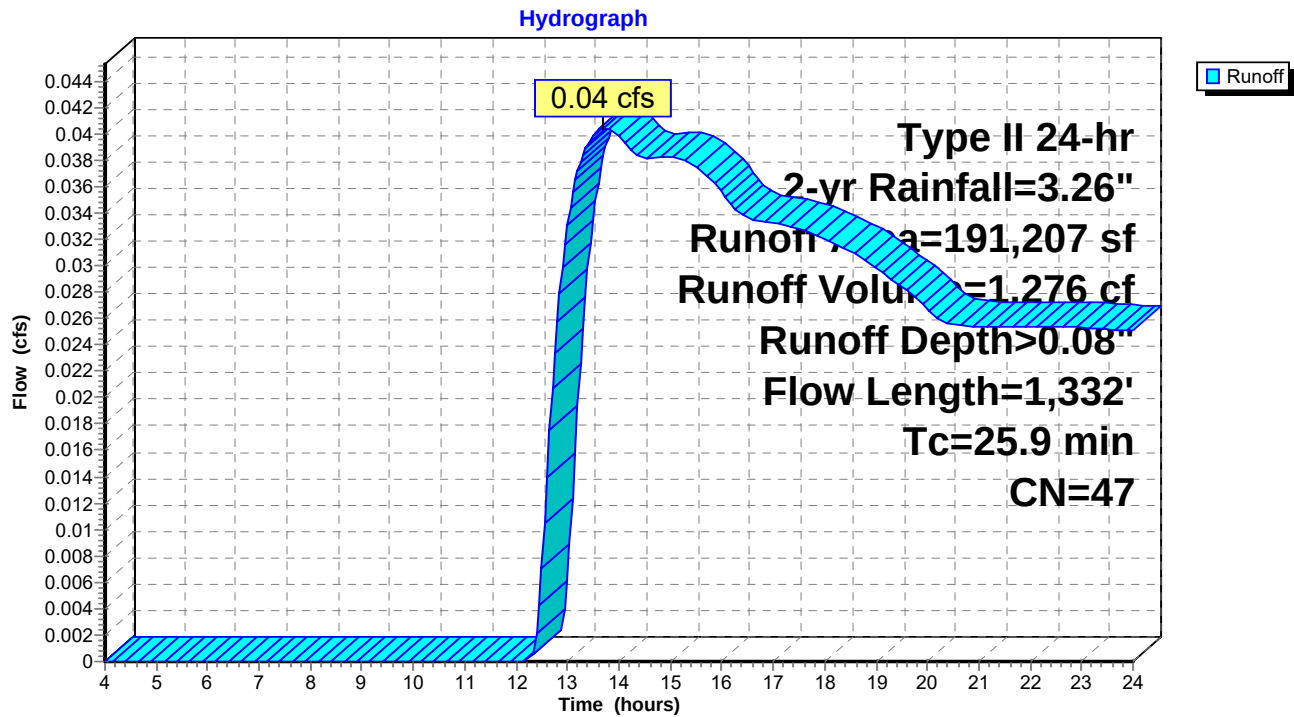
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 31,537    | 30 | Woods, Good, HSG A        |
| 12,873    | 77 | Woods, Good, HSG D        |
| 92,642    | 30 | Meadow, non-grazed, HSG A |
| 49,992    | 78 | Meadow, non-grazed, HSG D |
| * 4,163   | 98 | Impervious                |
| 191,207   | 47 | Weighted Average          |
| 187,044   |    | 97.82% Pervious Area      |
| 4,163     |    | 2.18% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.5      | 463           | 0.1167        | 1.71              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.3      | 554           | 0.0922        | 2.13              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 1.0      | 215           | 0.0630        | 3.64              | 5.10           | <b>Channel Flow,</b><br>Area= 1.4 sf Perim= 4.1' r= 0.34' n= 0.050   |
| 25.9     | 1,332         | Total         |                   |                |                                                                      |

## Subcatchment 1S: DA-1 Basin #1



**MLV 505LD86\_Culvert 6-7\_rev2**

Type II 24-hr 2-yr Rainfall=3.26"

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**Summary for Subcatchment 2S: Undetained - basin**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Depth= 0.00"

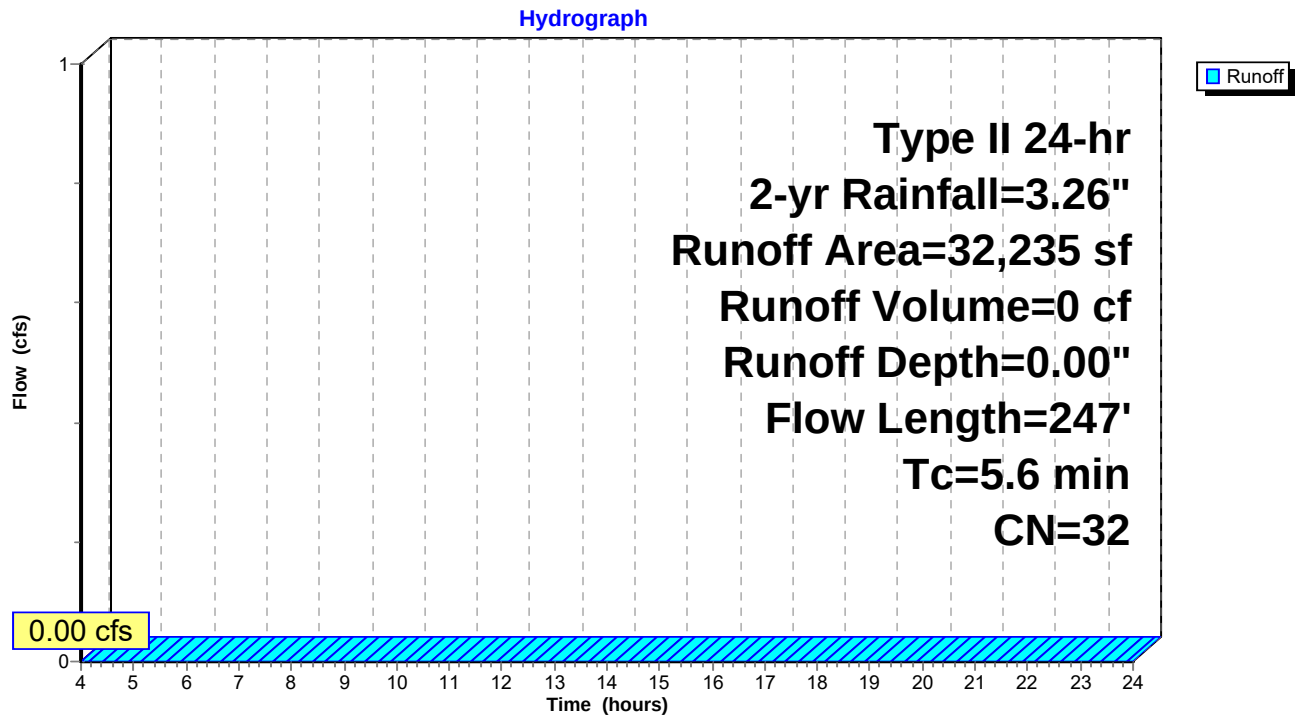
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-24.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 2-yr Rainfall=3.26"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 10,525    | 30 | Woods, Good, HSG A        |
| 570       | 77 | Woods, Good, HSG D        |
| 20,391    | 30 | Meadow, non-grazed, HSG A |
| 299       | 78 | Meadow, non-grazed, HSG D |
| * 450     | 98 | Impervious                |
| 32,235    | 32 | Weighted Average          |
| 31,785    |    | 98.60% Pervious Area      |
| 450       |    | 1.40% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 4.7      | 100           | 0.1200        | 0.35              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.26"                |
| 0.9      | 147           | 0.1630        | 2.83              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 5.6      | 247           | Total         |                   |                |                                                                      |

Subcatchment 2S: Undetained - basin



**Summary for Pond 5P: Basin 1**

Inflow Area = 191,207 sf, 2.18% Impervious, Inflow Depth > 0.08" for 2-yr event  
 Inflow = 0.04 cfs @ 13.70 hrs, Volume= 1,276 cf  
 Outflow = 0.04 cfs @ 13.90 hrs, Volume= 1,262 cf, Atten= 1%, Lag= 12.4 min  
 Discarded = 0.04 cfs @ 13.90 hrs, Volume= 1,262 cf  
 Primary = 0.00 cfs @ 4.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 924.51' @ 13.90 hrs Surf.Area= 2,845 sf Storage= 23 cf

Plug-Flow detention time= 9.4 min calculated for 1,262 cf (99% of inflow)  
 Center-of-Mass det. time= 5.3 min ( 1,074.5 - 1,069.2 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 924.50' | 15,897 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 924.50              | 2,838                | 0                         | 0                         |
| 925.00              | 3,298                | 1,534                     | 1,534                     |
| 926.00              | 4,260                | 3,779                     | 5,313                     |
| 927.00              | 5,278                | 4,769                     | 10,082                    |
| 928.00              | 6,352                | 5,815                     | 15,897                    |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                          |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 927.00' | <b>4.0' long x 20.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63       |
| #2     | Discarded | 924.50' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 916.00'                                                                                    |
| #3     | Device 4  | 926.50' | <b>24.0" Vert. Orifice/Grate</b> C= 0.600                                                                                                                                               |
| #4     | Primary   | 924.50' | <b>18.0" Round Culvert#6</b><br>L= 51.0' Box, headwall w/3 rounded edges, Ke= 0.200<br>Inlet / Outlet Invert= 924.50' / 910.00' S= 0.2843 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.77 sf |

**Discarded OutFlow** Max=0.20 cfs @ 13.90 hrs HW=924.51' (Free Discharge)

↑**2=Exfiltration** ( Controls 0.20 cfs)

**Primary OutFlow** Max=0.00 cfs @ 4.00 hrs HW=924.50' (Free Discharge)

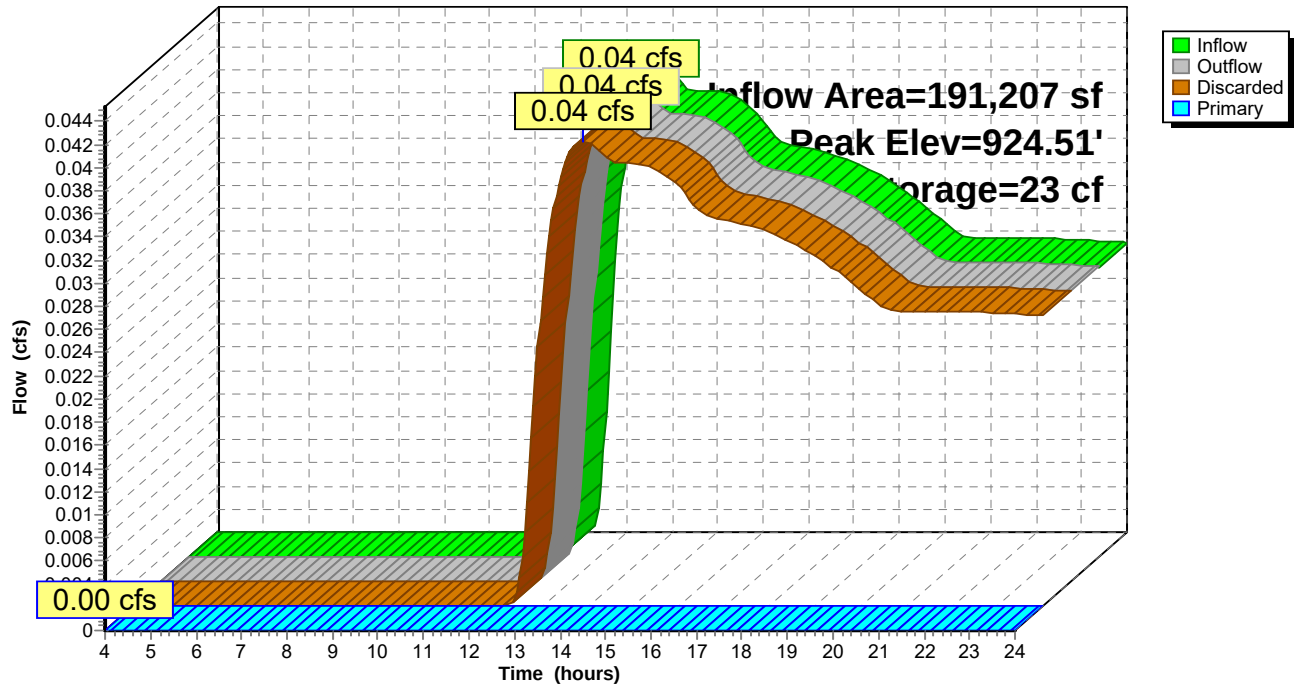
↑**1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

↑**4=Culvert#6** ( Controls 0.00 cfs)

↑**3=Orifice/Grate** ( Controls 0.00 cfs)

## Pond 5P: Basin 1

## Hydrograph





**Summary for Pond 8P: Catch Basin #1**

[57] Hint: Peaked at 911.50' (Flood elevation advised)

[79] Warning: Submerged Pond 5P Primary device # 4 OUTLET by 1.50'

Inflow Area = 223,442 sf, 2.06% Impervious, Inflow Depth = 0.00" for 2-yr event  
 Inflow = 0.00 cfs @ 4.00 hrs, Volume= 0 cf  
 Outflow = 0.00 cfs @ 4.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 4.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 911.50' @ 4.00 hrs

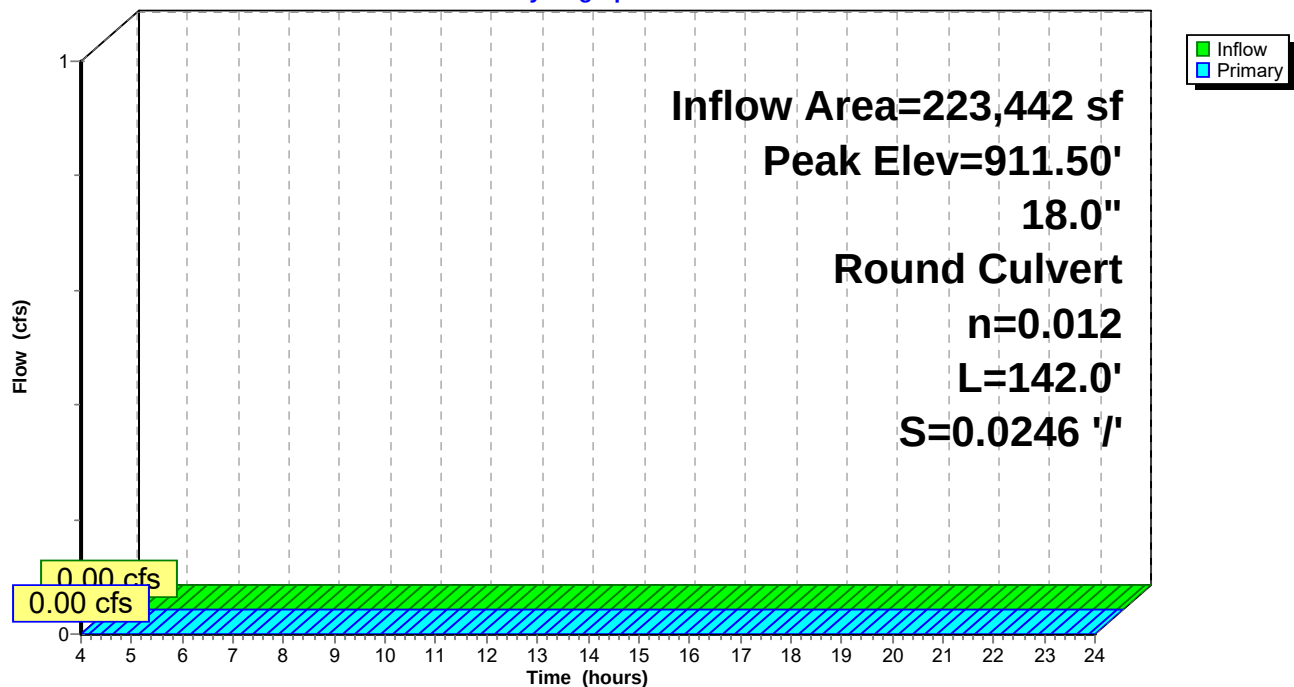
| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                          |
|--------|---------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 911.50' | <b>18.0" Round Culvert#7</b><br>L= 142.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 911.50' / 908.00' S= 0.0246 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.77 sf |

Primary OutFlow Max=0.00 cfs @ 4.00 hrs HW=911.50' (Free Discharge)

↑1=Culvert#7 ( Controls 0.00 cfs)

**Pond 8P: Catch Basin #1**

Hydrograph



**MLV 505LD86\_Culvert 6-7\_rev2***Type II 24-hr 10-yr Rainfall=4.74"*

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Time span=4.00-24.00 hrs, dt=0.05 hrs, 401 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DA-1 Basin #1**

Runoff Area=191,207 sf 2.18% Impervious Runoff Depth>0.44"  
Flow Length=1,332' Tc=25.9 min CN=47 Runoff=0.87 cfs 7,045 cf

**Subcatchment2S: Undetained - basin**

Runoff Area=32,235 sf 1.40% Impervious Runoff Depth>0.01"  
Flow Length=247' Tc=5.6 min CN=32 Runoff=0.00 cfs 29 cf

**Pond 5P: Basin 1**

Peak Elev=924.96' Storage=1,418 cf Inflow=0.87 cfs 7,045 cf  
Discarded=0.24 cfs 7,001 cf Primary=0.00 cfs 0 cf Outflow=0.24 cfs 7,001 cf

**Pond 8P: Catch Basin #1**

Peak Elev=911.52' Inflow=0.00 cfs 29 cf  
18.0" Round Culvert n=0.012 L=142.0' S=0.0246 '/' Outflow=0.00 cfs 29 cf

**Total Runoff Area = 223,442 sf Runoff Volume = 7,074 cf Average Runoff Depth = 0.38"**  
**97.94% Pervious = 218,829 sf 2.06% Impervious = 4,613 sf**

**MLV 505LD86\_Culvert 6-7\_rev2**

Type II 24-hr 10-yr Rainfall=4.74"

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**Summary for Subcatchment 1S: DA-1 Basin #1**

Runoff = 0.87 cfs @ 12.30 hrs, Volume= 7,045 cf, Depth&gt; 0.44"

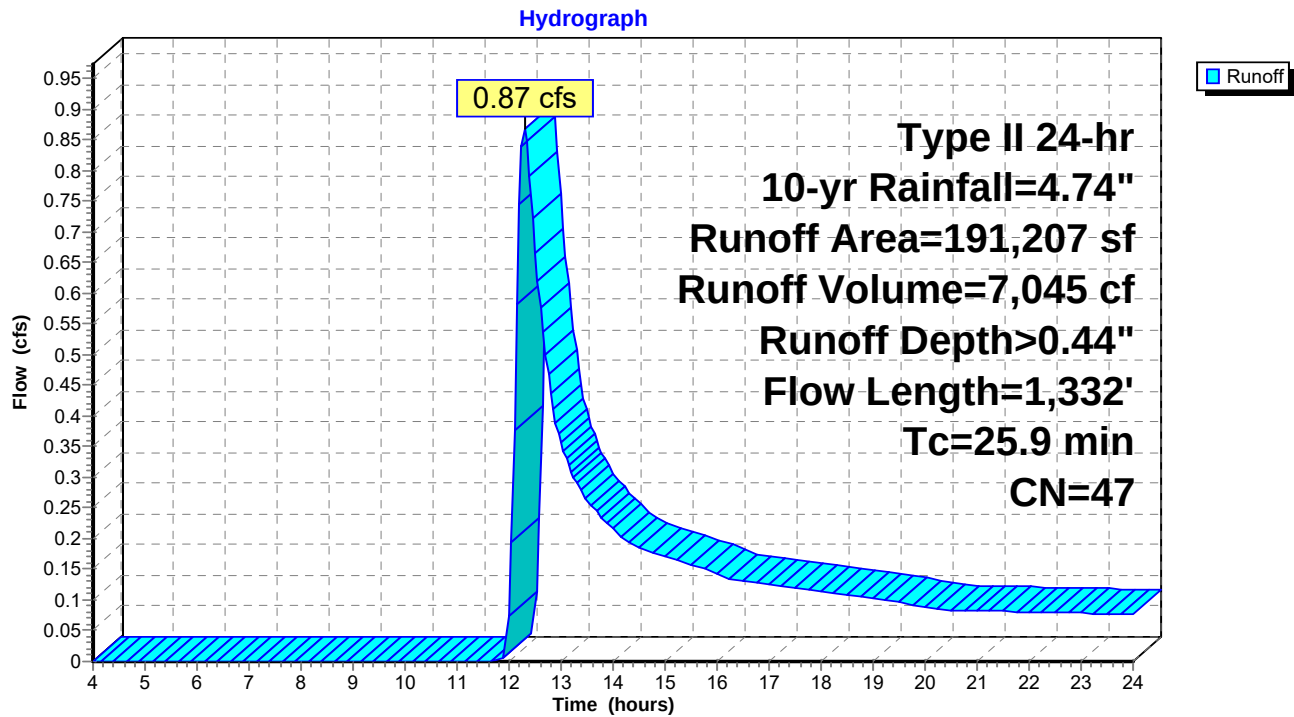
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 31,537    | 30 | Woods, Good, HSG A        |
| 12,873    | 77 | Woods, Good, HSG D        |
| 92,642    | 30 | Meadow, non-grazed, HSG A |
| 49,992    | 78 | Meadow, non-grazed, HSG D |
| * 4,163   | 98 | Impervious                |
| 191,207   | 47 | Weighted Average          |
| 187,044   |    | 97.82% Pervious Area      |
| 4,163     |    | 2.18% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.5      | 463           | 0.1167        | 1.71              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.3      | 554           | 0.0922        | 2.13              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 1.0      | 215           | 0.0630        | 3.64              | 5.10           | <b>Channel Flow,</b><br>Area= 1.4 sf Perim= 4.1' r= 0.34' n= 0.050   |
| 25.9     | 1,332         | Total         |                   |                |                                                                      |

## Subcatchment 1S: DA-1 Basin #1



**MLV 505LD86\_Culvert 6-7\_rev2**

Type II 24-hr 10-yr Rainfall=4.74"

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**Summary for Subcatchment 2S: Undetained - basin**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

[73] Warning: Peak may fall outside time span

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 29 cf, Depth&gt; 0.01"

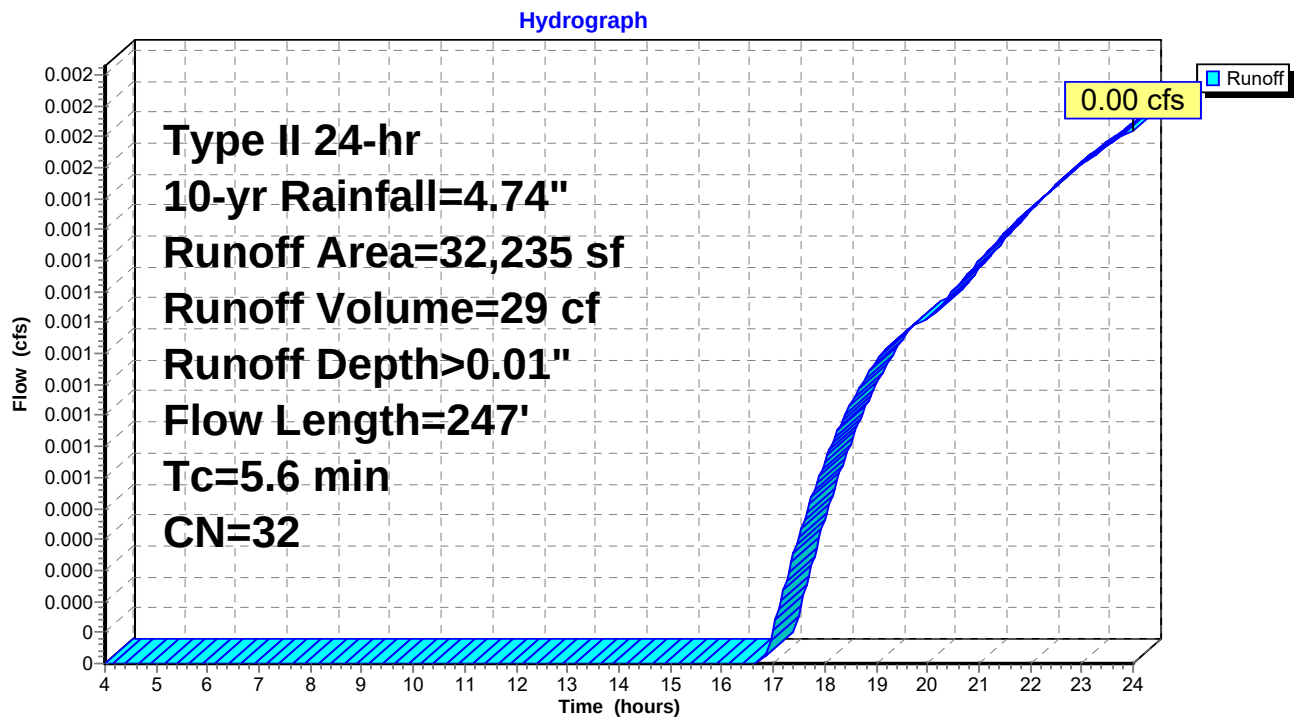
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-24.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 10-yr Rainfall=4.74"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 10,525    | 30 | Woods, Good, HSG A        |
| 570       | 77 | Woods, Good, HSG D        |
| 20,391    | 30 | Meadow, non-grazed, HSG A |
| 299       | 78 | Meadow, non-grazed, HSG D |
| * 450     | 98 | Impervious                |
| 32,235    | 32 | Weighted Average          |
| 31,785    |    | 98.60% Pervious Area      |
| 450       |    | 1.40% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 4.7      | 100           | 0.1200        | 0.35              |                | <b>Sheet Flow,</b><br>Grass: Short n= 0.150 P2= 3.26"                |
| 0.9      | 147           | 0.1630        | 2.83              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 5.6      | 247           | Total         |                   |                |                                                                      |

## Subcatchment 2S: Undetained - basin



**MLV 505LD86\_Culvert 6-7\_rev2**

Type II 24-hr 10-yr Rainfall=4.74"

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**Summary for Pond 5P: Basin 1**

Inflow Area = 191,207 sf, 2.18% Impervious, Inflow Depth > 0.44" for 10-yr event  
 Inflow = 0.87 cfs @ 12.30 hrs, Volume= 7,045 cf  
 Outflow = 0.24 cfs @ 13.74 hrs, Volume= 7,001 cf, Atten= 73%, Lag= 86.3 min  
 Discarded = 0.24 cfs @ 13.74 hrs, Volume= 7,001 cf  
 Primary = 0.00 cfs @ 4.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 924.96' @ 13.74 hrs Surf.Area= 3,266 sf Storage= 1,418 cf

Plug-Flow detention time= 53.8 min calculated for 6,984 cf (99% of inflow)  
 Center-of-Mass det. time= 50.7 min ( 1,003.4 - 952.7 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 924.50' | 15,897 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 924.50              | 2,838                | 0                         | 0                         |
| 925.00              | 3,298                | 1,534                     | 1,534                     |
| 926.00              | 4,260                | 3,779                     | 5,313                     |
| 927.00              | 5,278                | 4,769                     | 10,082                    |
| 928.00              | 6,352                | 5,815                     | 15,897                    |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                          |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 927.00' | <b>4.0' long x 20.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63       |
| #2     | Discarded | 924.50' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 916.00'                                                                                    |
| #3     | Device 4  | 926.50' | <b>24.0" Vert. Orifice/Grate</b> C= 0.600                                                                                                                                               |
| #4     | Primary   | 924.50' | <b>18.0" Round Culvert#6</b><br>L= 51.0' Box, headwall w/3 rounded edges, Ke= 0.200<br>Inlet / Outlet Invert= 924.50' / 910.00' S= 0.2843 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.77 sf |

**Discarded OutFlow** Max=0.24 cfs @ 13.74 hrs HW=924.96' (Free Discharge)

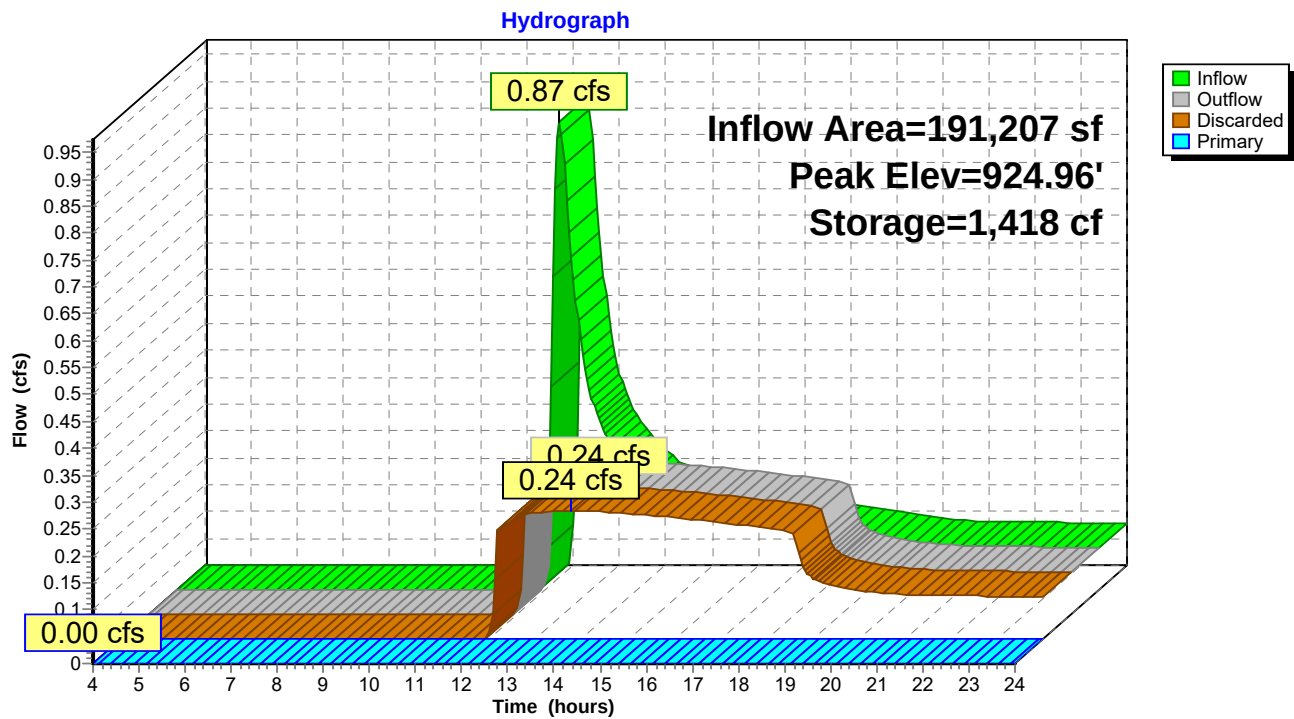
↑ **2=Exfiltration** ( Controls 0.24 cfs)

**Primary OutFlow** Max=0.00 cfs @ 4.00 hrs HW=924.50' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

↑ **4=Culvert#6** ( Controls 0.00 cfs)

↑ **3=Orifice/Grate** ( Controls 0.00 cfs)

**Pond 5P: Basin 1**



### Summary for Pond 8P: Catch Basin #1

[57] Hint: Peaked at 911.52' (Flood elevation advised)

[79] Warning: Submerged Pond 5P Primary device # 4 OUTLET by 1.52'

Inflow Area = 223,442 sf, 2.06% Impervious, Inflow Depth > 0.00" for 10-yr event  
 Inflow = 0.00 cfs @ 24.00 hrs, Volume= 29 cf  
 Outflow = 0.00 cfs @ 24.00 hrs, Volume= 29 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.00 cfs @ 24.00 hrs, Volume= 29 cf

Routing by Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 911.52' @ 24.00 hrs

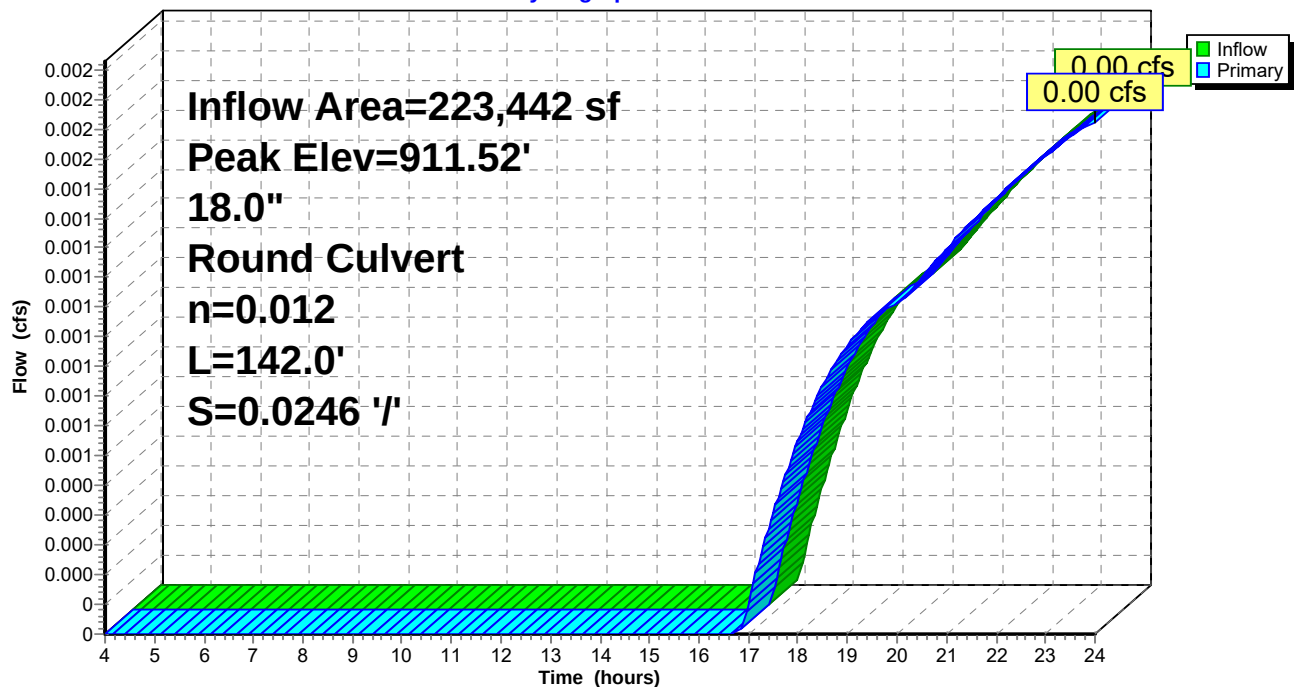
| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                          |
|--------|---------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 911.50' | <b>18.0" Round Culvert#7</b><br>L= 142.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 911.50' / 908.00' S= 0.0246 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.77 sf |

**Primary OutFlow** Max=0.00 cfs @ 24.00 hrs HW=911.52' (Free Discharge)

1=Culvert#7 (Inlet Controls 0.00 cfs @ 0.44 fps)

### Pond 8P: Catch Basin #1

## Hydrograph



**MLV 505LD86\_Culvert 6-7\_rev2***Type II 24-hr 25-yr Rainfall=5.85"*

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Time span=4.00-24.00 hrs, dt=0.05 hrs, 401 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DA-1 Basin #1**

Runoff Area=191,207 sf 2.18% Impervious Runoff Depth>0.86"  
Flow Length=1,332' Tc=25.9 min CN=47 Runoff=2.44 cfs 13,680 cf

**Subcatchment2S: Undetained - basin**

Runoff Area=32,235 sf 1.40% Impervious Runoff Depth>0.11"  
Flow Length=247' Tc=5.6 min CN=32 Runoff=0.01 cfs 300 cf

**Pond 5P: Basin 1**

Peak Elev=925.89' Storage=4,842 cf Inflow=2.44 cfs 13,680 cf  
Discarded=0.33 cfs 12,522 cf Primary=0.00 cfs 0 cf Outflow=0.33 cfs 12,522 cf

**Pond 8P: Catch Basin #1**

Peak Elev=911.54' Inflow=0.01 cfs 300 cf  
18.0" Round Culvert n=0.012 L=142.0' S=0.0246 '/' Outflow=0.01 cfs 300 cf

**Total Runoff Area = 223,442 sf Runoff Volume = 13,980 cf Average Runoff Depth = 0.75"**  
**97.94% Pervious = 218,829 sf 2.06% Impervious = 4,613 sf**

**MLV 505LD86\_Culvert 6-7\_rev2**

Type II 24-hr 25-yr Rainfall=5.85"

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**Summary for Subcatchment 1S: DA-1 Basin #1**

Runoff = 2.44 cfs @ 12.26 hrs, Volume= 13,680 cf, Depth&gt; 0.86"

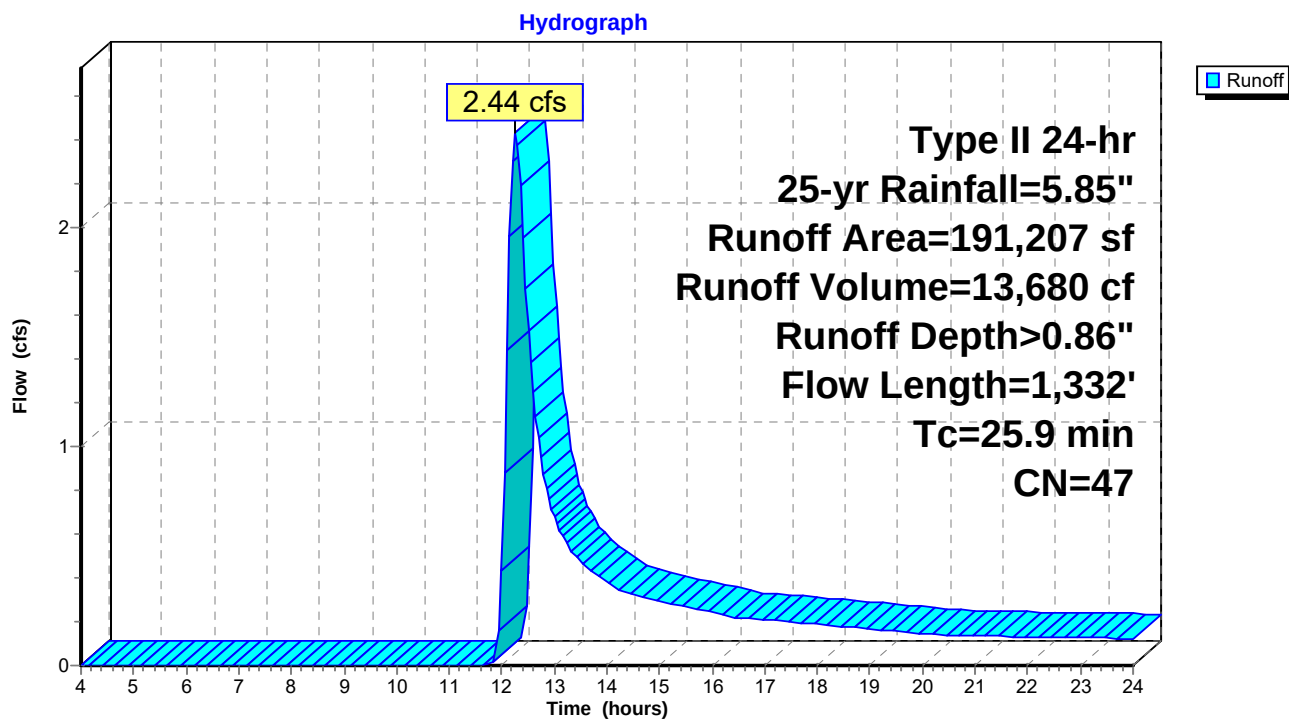
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 25-yr Rainfall=5.85"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 31,537    | 30 | Woods, Good, HSG A        |
| 12,873    | 77 | Woods, Good, HSG D        |
| 92,642    | 30 | Meadow, non-grazed, HSG A |
| 49,992    | 78 | Meadow, non-grazed, HSG D |
| * 4,163   | 98 | Impervious                |
| 191,207   | 47 | Weighted Average          |
| 187,044   |    | 97.82% Pervious Area      |
| 4,163     |    | 2.18% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.5      | 463           | 0.1167        | 1.71              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.3      | 554           | 0.0922        | 2.13              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 1.0      | 215           | 0.0630        | 3.64              | 5.10           | <b>Channel Flow,</b><br>Area= 1.4 sf Perim= 4.1' r= 0.34' n= 0.050   |
| 25.9     | 1,332         | Total         |                   |                |                                                                      |

## Subcatchment 1S: DA-1 Basin #1



**MLV 505LD86\_Culvert 6-7\_rev2**

Type II 24-hr 25-yr Rainfall=5.85"

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**Summary for Subcatchment 2S: Undetained - basin**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

Runoff = 0.01 cfs @ 15.03 hrs, Volume= 300 cf, Depth&gt; 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-24.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 25-yr Rainfall=5.85"

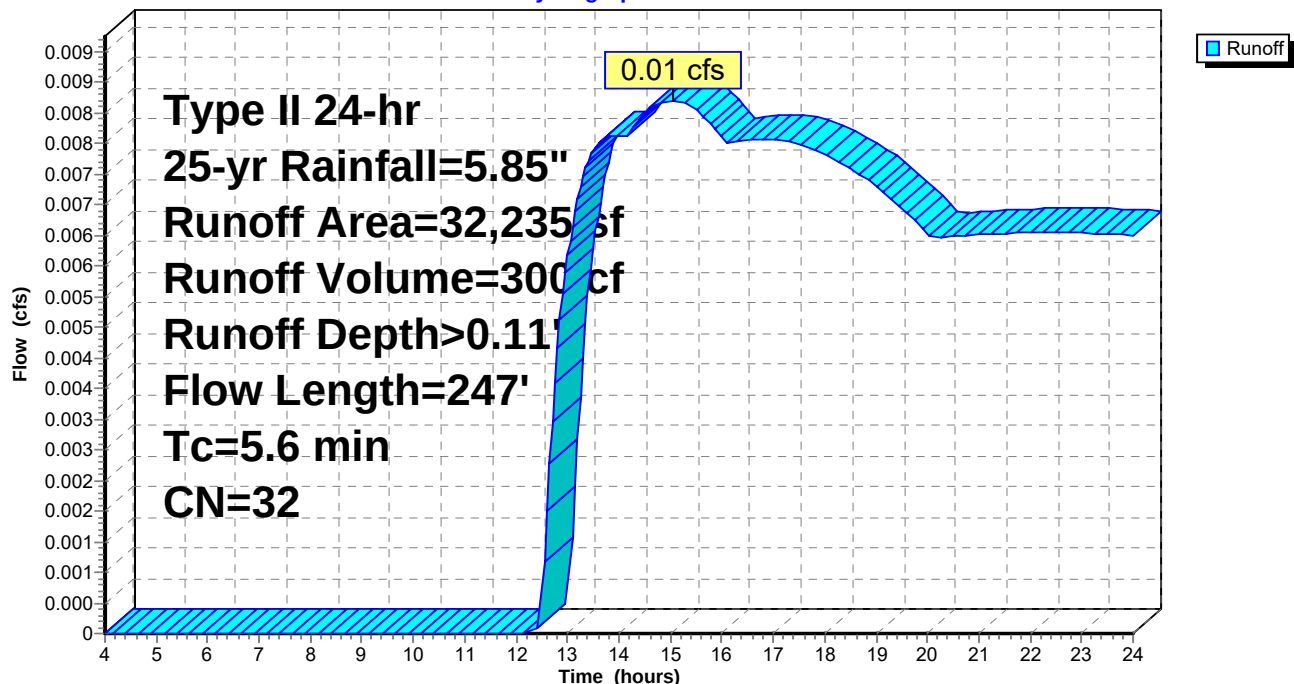
| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 10,525    | 30 | Woods, Good, HSG A        |
| 570       | 77 | Woods, Good, HSG D        |
| 20,391    | 30 | Meadow, non-grazed, HSG A |
| 299       | 78 | Meadow, non-grazed, HSG D |
| * 450     | 98 | Impervious                |
| 32,235    | 32 | Weighted Average          |
| 31,785    |    | 98.60% Pervious Area      |
| 450       |    | 1.40% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                   |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------------------------|
| 4.7      | 100           | 0.1200        | 0.35              |                | Sheet Flow,<br>Grass: Short n= 0.150 P2= 3.26"                |
| 0.9      | 147           | 0.1630        | 2.83              |                | Shallow Concentrated Flow,<br>Short Grass Pasture Kv= 7.0 fps |
| 5.6      | 247           | Total         |                   |                |                                                               |

**Subcatchment 2S: Undetained - basin**

Hydrograph



**Summary for Pond 5P: Basin 1**

Inflow Area = 191,207 sf, 2.18% Impervious, Inflow Depth > 0.86" for 25-yr event  
 Inflow = 2.44 cfs @ 12.26 hrs, Volume= 13,680 cf  
 Outflow = 0.33 cfs @ 14.41 hrs, Volume= 12,522 cf, Atten= 87%, Lag= 128.9 min  
 Discarded = 0.33 cfs @ 14.41 hrs, Volume= 12,522 cf  
 Primary = 0.00 cfs @ 4.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 925.89' @ 14.41 hrs Surf.Area= 4,152 sf Storage= 4,842 cf

Plug-Flow detention time= 185.3 min calculated for 12,491 cf (91% of inflow)  
 Center-of-Mass det. time= 144.1 min ( 1,064.8 - 920.7 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 924.50' | 15,897 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 924.50              | 2,838                | 0                         | 0                         |
| 925.00              | 3,298                | 1,534                     | 1,534                     |
| 926.00              | 4,260                | 3,779                     | 5,313                     |
| 927.00              | 5,278                | 4,769                     | 10,082                    |
| 928.00              | 6,352                | 5,815                     | 15,897                    |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                           |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 927.00' | <b>4.0' long x 20.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63        |
| #2     | Discarded | 924.50' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 916.00'                                                                                     |
| #3     | Device 4  | 926.50' | <b>24.0" Vert. Orifice/Grate</b> C= 0.600                                                                                                                                                |
| #4     | Primary   | 924.50' | <b>18.0" Round Culvert#6</b><br>L= 51.0' Box, headwall w/3 rounded edges, Ke= 0.200<br>Inlet / Outlet Invert= 924.50' / 910.00' S= 0.2843 ' /' Cc= 0.900<br>n= 0.012, Flow Area= 1.77 sf |

**Discarded OutFlow** Max=0.33 cfs @ 14.41 hrs HW=925.89' (Free Discharge)

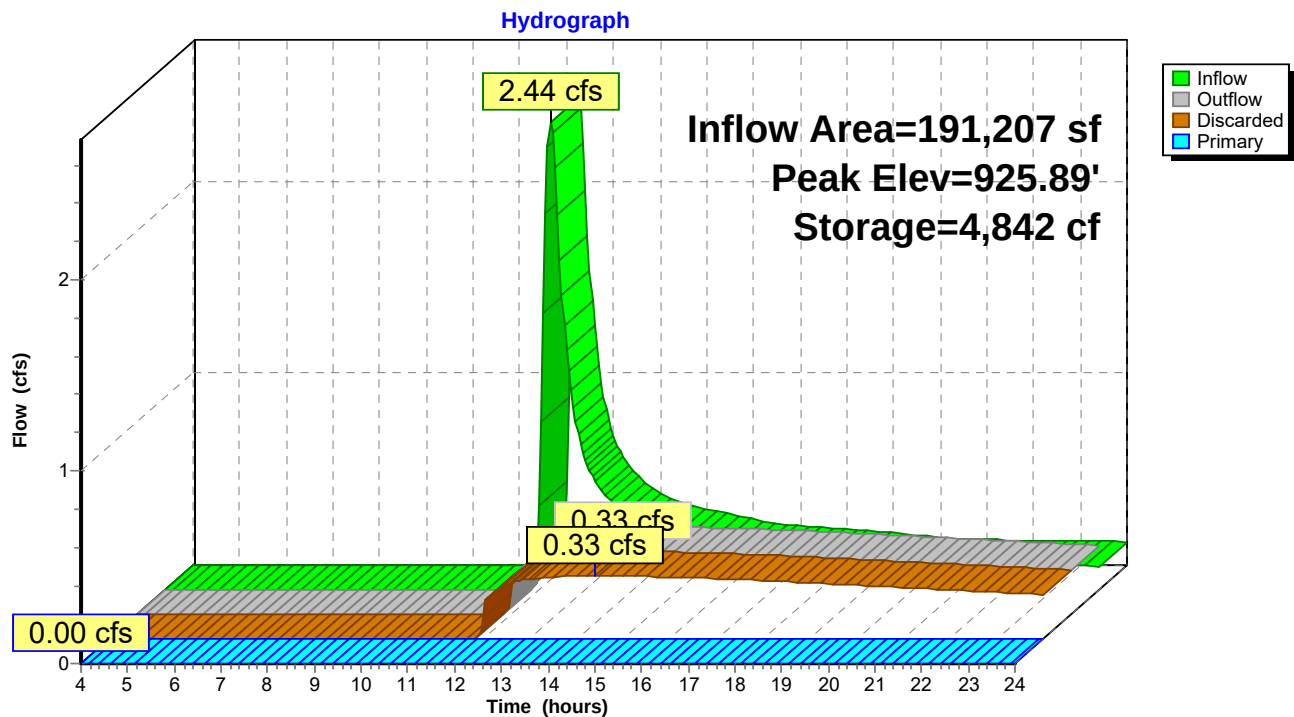
↑ **2=Exfiltration** ( Controls 0.33 cfs)

**Primary OutFlow** Max=0.00 cfs @ 4.00 hrs HW=924.50' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

↑ **4=Culvert#6** ( Controls 0.00 cfs)

↑ **3=Orifice/Grate** ( Controls 0.00 cfs)

**Pond 5P: Basin 1**

**Summary for Pond 8P: Catch Basin #1**

[57] Hint: Peaked at 911.54' (Flood elevation advised)

[79] Warning: Submerged Pond 5P Primary device # 4 OUTLET by 1.54'

Inflow Area = 223,442 sf, 2.06% Impervious, Inflow Depth > 0.02" for 25-yr event  
 Inflow = 0.01 cfs @ 15.03 hrs, Volume= 300 cf  
 Outflow = 0.01 cfs @ 15.03 hrs, Volume= 300 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.01 cfs @ 15.03 hrs, Volume= 300 cf

Routing by Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 911.54' @ 15.03 hrs

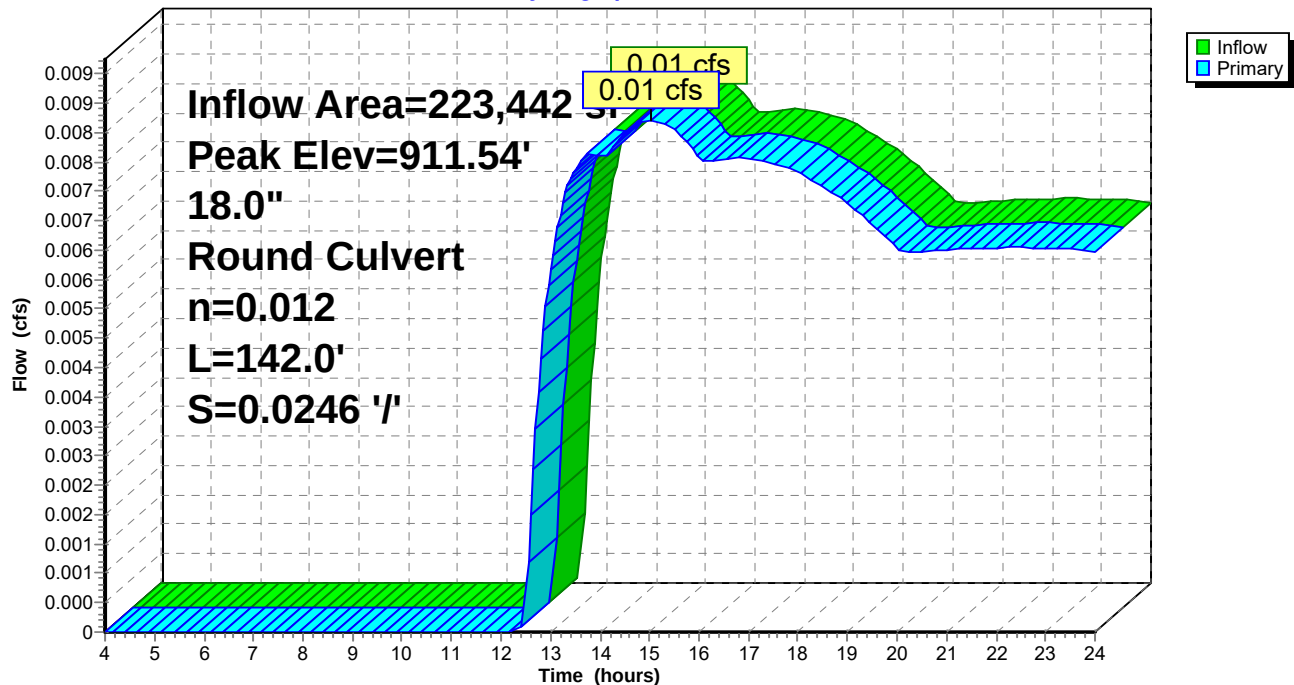
| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                          |
|--------|---------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 911.50' | <b>18.0" Round Culvert#7</b><br>L= 142.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 911.50' / 908.00' S= 0.0246 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.77 sf |

Primary OutFlow Max=0.01 cfs @ 15.03 hrs HW=911.54' (Free Discharge)

↑1=Culvert#7 (Inlet Controls 0.01 cfs @ 0.67 fps)

**Pond 8P: Catch Basin #1**

Hydrograph





**MLV 505LD86\_Culvert 6-7\_rev2***Type II 24-hr 50-yr Rainfall=6.87"*

Prepared by {enter your company name here}

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Time span=4.00-24.00 hrs, dt=0.05 hrs, 401 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DA-1 Basin #1**

Runoff Area=191,207 sf 2.18% Impervious Runoff Depth>1.33"  
Flow Length=1,332' Tc=25.9 min CN=47 Runoff=4.38 cfs 21,126 cf

**Subcatchment2S: Undetained - basin**

Runoff Area=32,235 sf 1.40% Impervious Runoff Depth>0.29"  
Flow Length=247' Tc=5.6 min CN=32 Runoff=0.04 cfs 770 cf

**Pond 5P: Basin 1**

Peak Elev=926.68' Storage=8,434 cf Inflow=4.38 cfs 21,126 cf  
Discarded=0.41 cfs 15,899 cf Primary=0.20 cfs 1,273 cf Outflow=0.61 cfs 17,173 cf

**Pond 8P: Catch Basin #1**

Peak Elev=911.71' Inflow=0.22 cfs 2,043 cf  
18.0" Round Culvert n=0.012 L=142.0' S=0.0246 ' Outflow=0.22 cfs 2,043 cf

**Total Runoff Area = 223,442 sf Runoff Volume = 21,896 cf Average Runoff Depth = 1.18"**  
**97.94% Pervious = 218,829 sf 2.06% Impervious = 4,613 sf**

**MLV 505LD86\_Culvert 6-7\_rev2**

Type II 24-hr 50-yr Rainfall=6.87"

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**Summary for Subcatchment 1S: DA-1 Basin #1**

Runoff = 4.38 cfs @ 12.24 hrs, Volume= 21,126 cf, Depth&gt; 1.33"

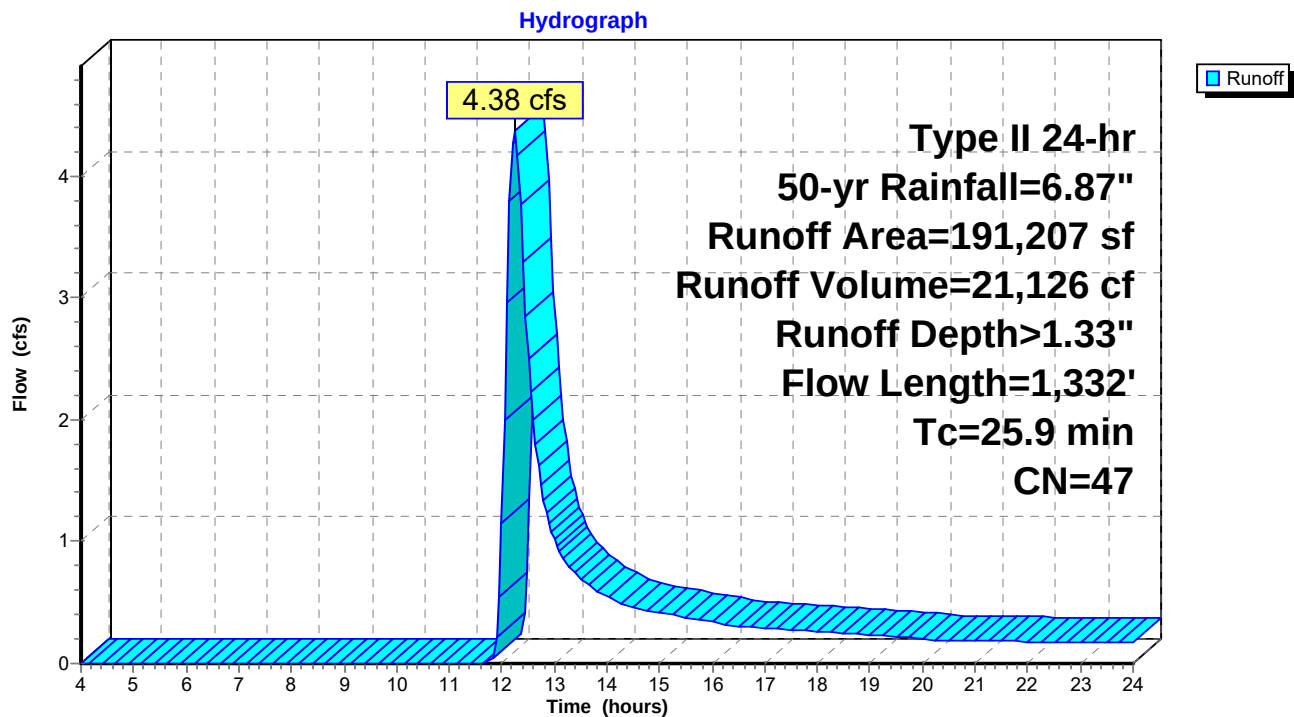
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 31,537    | 30 | Woods, Good, HSG A        |
| 12,873    | 77 | Woods, Good, HSG D        |
| 92,642    | 30 | Meadow, non-grazed, HSG A |
| 49,992    | 78 | Meadow, non-grazed, HSG D |
| * 4,163   | 98 | Impervious                |
| 191,207   | 47 | Weighted Average          |
| 187,044   |    | 97.82% Pervious Area      |
| 4,163     |    | 2.18% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.5      | 463           | 0.1167        | 1.71              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.3      | 554           | 0.0922        | 2.13              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 1.0      | 215           | 0.0630        | 3.64              | 5.10           | <b>Channel Flow,</b><br>Area= 1.4 sf Perim= 4.1' r= 0.34' n= 0.050   |
| 25.9     | 1,332         | Total         |                   |                |                                                                      |

## Subcatchment 1S: DA-1 Basin #1



**MLV 505LD86\_Culvert 6-7\_rev2**

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Type II 24-hr 50-yr Rainfall=6.87"

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**Summary for Subcatchment 2S: Undetained - basin**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

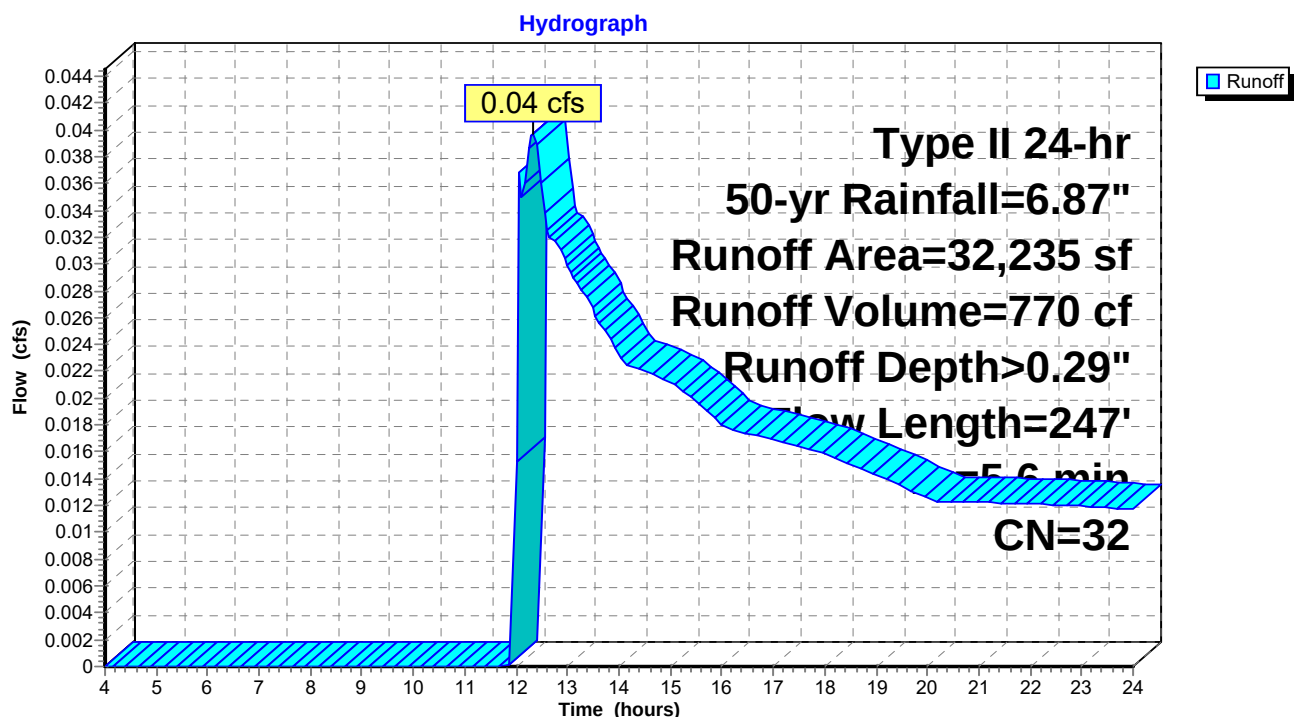
Runoff = 0.04 cfs @ 12.34 hrs, Volume= 770 cf, Depth&gt; 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-24.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 50-yr Rainfall=6.87"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 10,525    | 30 | Woods, Good, HSG A        |
| 570       | 77 | Woods, Good, HSG D        |
| 20,391    | 30 | Meadow, non-grazed, HSG A |
| 299       | 78 | Meadow, non-grazed, HSG D |
| * 450     | 98 | Impervious                |
| 32,235    | 32 | Weighted Average          |
| 31,785    |    | 98.60% Pervious Area      |
| 450       |    | 1.40% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                   |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------------------------|
| 4.7      | 100           | 0.1200        | 0.35              |                | Sheet Flow,<br>Grass: Short n= 0.150 P2= 3.26"                |
| 0.9      | 147           | 0.1630        | 2.83              |                | Shallow Concentrated Flow,<br>Short Grass Pasture Kv= 7.0 fps |
| 5.6      | 247           | Total         |                   |                |                                                               |

**Subcatchment 2S: Undetained - basin**

**MLV 505LD86\_Culvert 6-7\_rev2**

Type II 24-hr 50-yr Rainfall=6.87"

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**Summary for Pond 5P: Basin 1**

Inflow Area = 191,207 sf, 2.18% Impervious, Inflow Depth > 1.33" for 50-yr event  
 Inflow = 4.38 cfs @ 12.24 hrs, Volume= 21,126 cf  
 Outflow = 0.61 cfs @ 13.76 hrs, Volume= 17,173 cf, Atten= 86%, Lag= 91.0 min  
 Discarded = 0.41 cfs @ 13.76 hrs, Volume= 15,899 cf  
 Primary = 0.20 cfs @ 13.76 hrs, Volume= 1,273 cf

Routing by Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 926.68' @ 13.76 hrs Surf.Area= 4,950 sf Storage= 8,434 cf

Plug-Flow detention time= 231.1 min calculated for 17,173 cf (81% of inflow)  
 Center-of-Mass det. time= 148.9 min ( 1,051.9 - 903.0 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 924.50' | 15,897 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 924.50              | 2,838                | 0                         | 0                         |
| 925.00              | 3,298                | 1,534                     | 1,534                     |
| 926.00              | 4,260                | 3,779                     | 5,313                     |
| 927.00              | 5,278                | 4,769                     | 10,082                    |
| 928.00              | 6,352                | 5,815                     | 15,897                    |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                           |
|--------|-----------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 927.00' | <b>4.0' long x 20.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63        |
| #2     | Discarded | 924.50' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 916.00'                                                                                     |
| #3     | Device 4  | 926.50' | <b>24.0" Vert. Orifice/Grate</b> C= 0.600                                                                                                                                                |
| #4     | Primary   | 924.50' | <b>18.0" Round Culvert#6</b><br>L= 51.0' Box, headwall w/3 rounded edges, Ke= 0.200<br>Inlet / Outlet Invert= 924.50' / 910.00' S= 0.2843 ' /' Cc= 0.900<br>n= 0.012, Flow Area= 1.77 sf |

**Discarded OutFlow** Max=0.41 cfs @ 13.76 hrs HW=926.68' (Free Discharge)

↑ **2=Exfiltration** ( Controls 0.41 cfs)

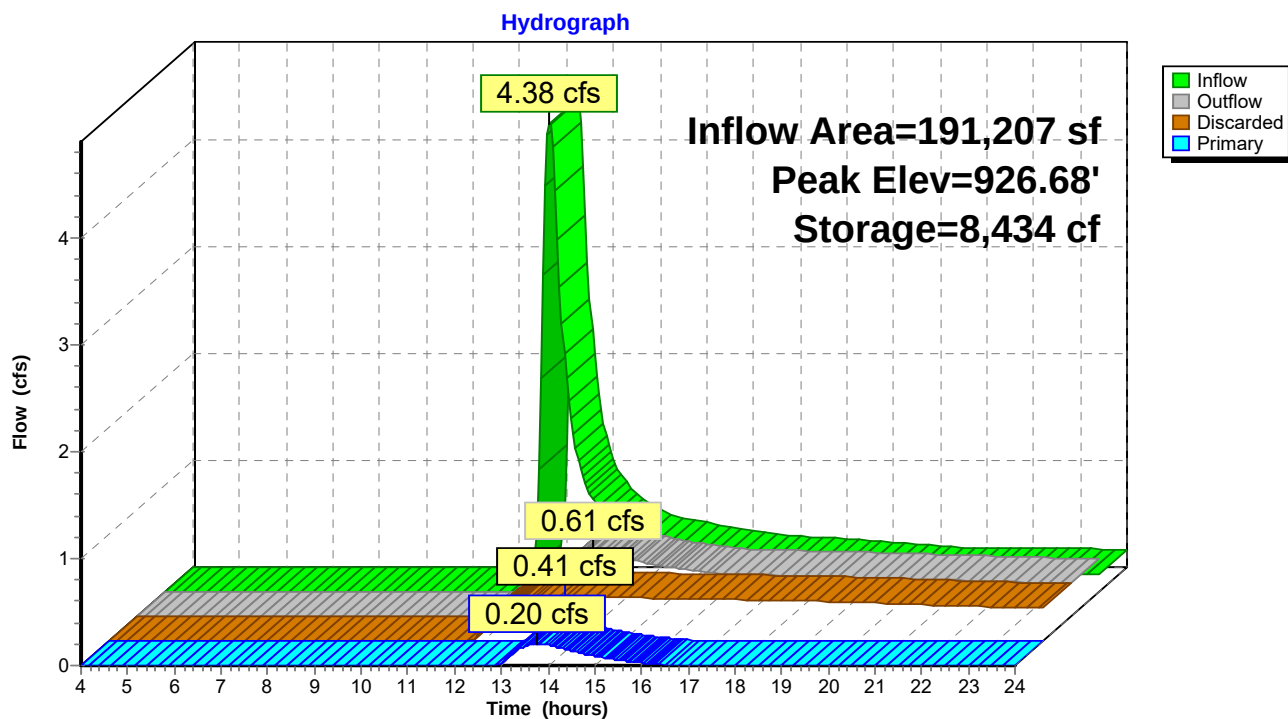
**Primary OutFlow** Max=0.20 cfs @ 13.76 hrs HW=926.68' (Free Discharge)

↑ **1=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

↑ **4=Culvert#6** (Passes 0.20 cfs of 12.71 cfs potential flow)

↑ **3=Orifice/Grate** (Orifice Controls 0.20 cfs @ 1.44 fps)

# Pond 5P: Basin 1



**Summary for Pond 8P: Catch Basin #1**

[57] Hint: Peaked at 911.71' (Flood elevation advised)

[79] Warning: Submerged Pond 5P Primary device # 4 OUTLET by 1.71'

Inflow Area = 223,442 sf, 2.06% Impervious, Inflow Depth > 0.11" for 50-yr event  
 Inflow = 0.22 cfs @ 13.74 hrs, Volume= 2,043 cf  
 Outflow = 0.22 cfs @ 13.74 hrs, Volume= 2,043 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 0.22 cfs @ 13.74 hrs, Volume= 2,043 cf

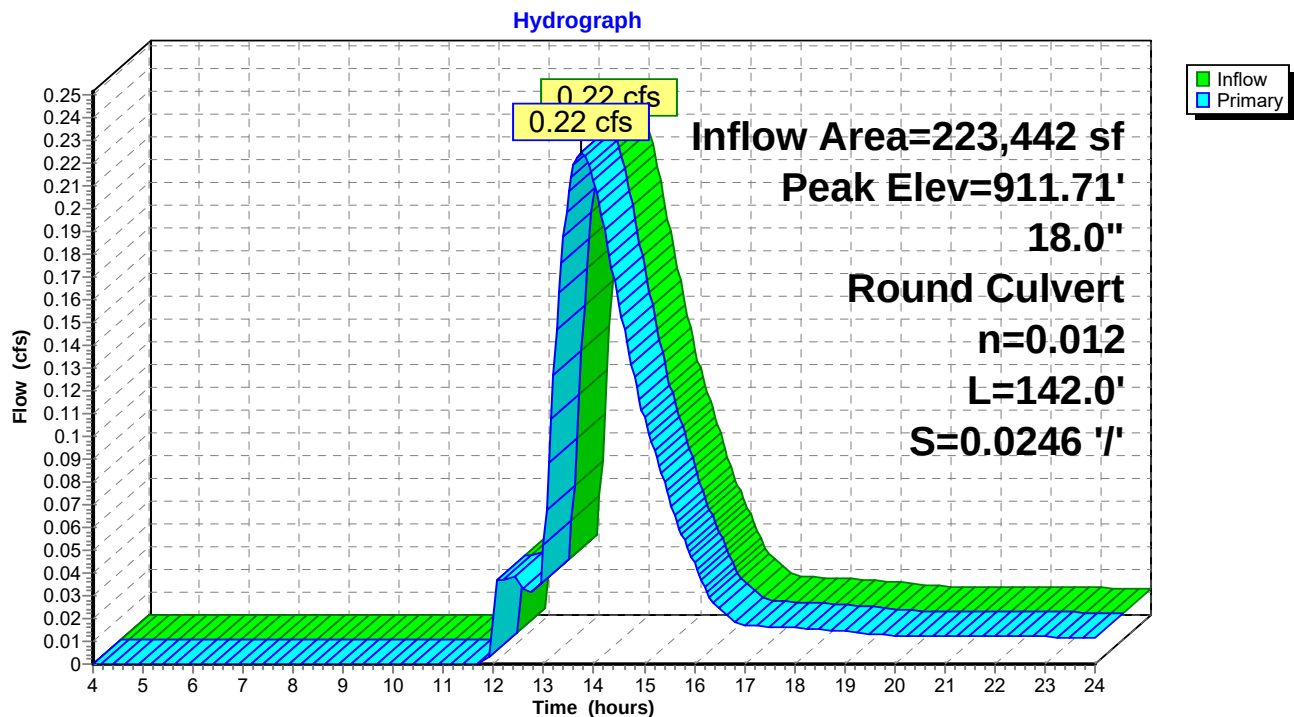
Routing by Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 911.71' @ 13.74 hrs

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                                      |
|--------|---------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 911.50' | <b>18.0" Round Culvert#7</b><br>L= 142.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 911.50' / 908.00' S= 0.0246 '/ S= 0.0246 '/ Cc= 0.900<br>n= 0.012, Flow Area= 1.77 sf |

Primary OutFlow Max=0.22 cfs @ 13.74 hrs HW=911.71' (Free Discharge)

1=Culvert#7 (Inlet Controls 0.22 cfs @ 1.54 fps)

**Pond 8P: Catch Basin #1**

**MLV 505LD86\_Culvert 6-7\_rev2***Type II 24-hr 100-yr Rainfall=8.09"*

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Time span=4.00-24.00 hrs, dt=0.05 hrs, 401 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment1S: DA-1 Basin #1**

Runoff Area=191,207 sf 2.18% Impervious Runoff Depth>1.97"  
Flow Length=1,332' Tc=25.9 min CN=47 Runoff=7.16 cfs 31,397 cf

**Subcatchment2S: Undetained - basin**

Runoff Area=32,235 sf 1.40% Impervious Runoff Depth>0.59"  
Flow Length=247' Tc=5.6 min CN=32 Runoff=0.33 cfs 1,575 cf

**Pond 5P: Basin 1**

Peak Elev=927.05' Storage=10,368 cf Inflow=7.16 cfs 31,397 cf  
Discarded=0.45 cfs 17,054 cf Primary=1.94 cfs 8,850 cf Outflow=2.39 cfs 25,904 cf

**Pond 8P: Catch Basin #1**

Peak Elev=912.15' Inflow=2.01 cfs 10,424 cf  
18.0" Round Culvert n=0.012 L=142.0' S=0.0246 '/' Outflow=2.01 cfs 10,424 cf

**Total Runoff Area = 223,442 sf Runoff Volume = 32,972 cf Average Runoff Depth = 1.77"**  
**97.94% Pervious = 218,829 sf 2.06% Impervious = 4,613 sf**



**MLV 505LD86\_Culvert 6-7\_rev2**

Type II 24-hr 100-yr Rainfall=8.09"

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**Summary for Subcatchment 1S: DA-1 Basin #1**

Runoff = 7.16 cfs @ 12.23 hrs, Volume= 31,397 cf, Depth&gt; 1.97"

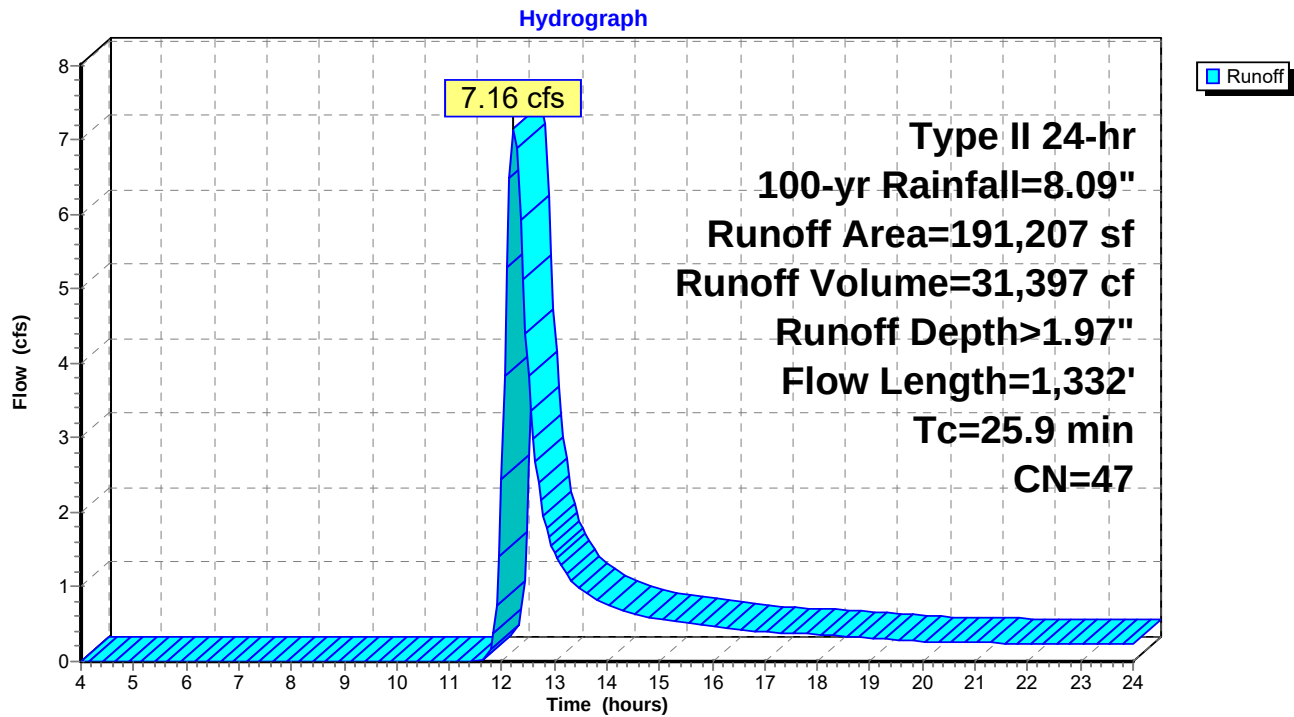
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 31,537    | 30 | Woods, Good, HSG A        |
| 12,873    | 77 | Woods, Good, HSG D        |
| 92,642    | 30 | Meadow, non-grazed, HSG A |
| 49,992    | 78 | Meadow, non-grazed, HSG D |
| * 4,163   | 98 | Impervious                |
| 191,207   | 47 | Weighted Average          |
| 187,044   |    | 97.82% Pervious Area      |
| 4,163     |    | 2.18% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                          |
|----------|---------------|---------------|-------------------|----------------|----------------------------------------------------------------------|
| 16.1     | 100           | 0.0400        | 0.10              |                | <b>Sheet Flow,</b><br>Woods: Light underbrush n= 0.400 P2= 3.26"     |
| 4.5      | 463           | 0.1167        | 1.71              |                | <b>Shallow Concentrated Flow,</b><br>Woodland Kv= 5.0 fps            |
| 4.3      | 554           | 0.0922        | 2.13              |                | <b>Shallow Concentrated Flow,</b><br>Short Grass Pasture Kv= 7.0 fps |
| 1.0      | 215           | 0.0630        | 3.64              | 5.10           | <b>Channel Flow,</b><br>Area= 1.4 sf Perim= 4.1' r= 0.34' n= 0.050   |
| 25.9     | 1,332         | Total         |                   |                |                                                                      |

## Subcatchment 1S: DA-1 Basin #1



**Summary for Subcatchment 2S: Undetained - basin**[49] Hint:  $T_c < 2dt$  may require smaller  $dt$ 

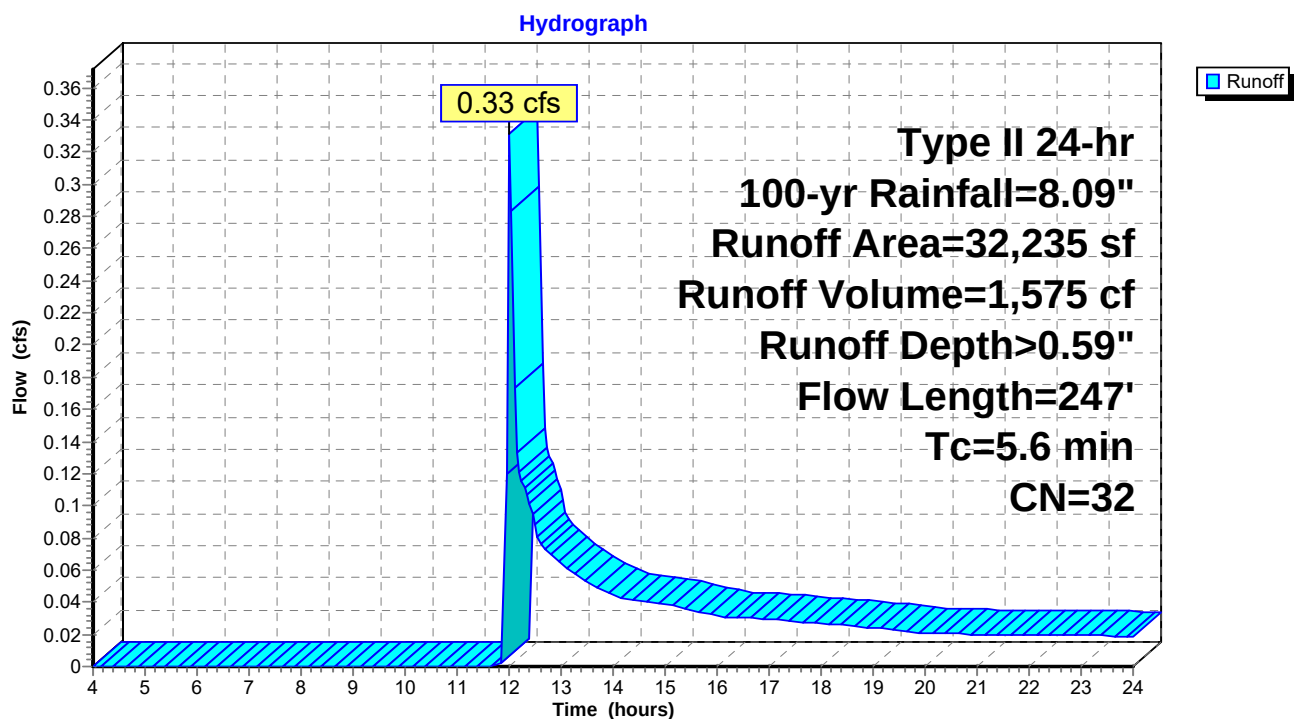
Runoff = 0.33 cfs @ 12.02 hrs, Volume= 1,575 cf, Depth&gt; 0.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 4.00-24.00 hrs,  $dt=0.05$  hrs  
Type II 24-hr 100-yr Rainfall=8.09"

| Area (sf) | CN | Description               |
|-----------|----|---------------------------|
| 10,525    | 30 | Woods, Good, HSG A        |
| 570       | 77 | Woods, Good, HSG D        |
| 20,391    | 30 | Meadow, non-grazed, HSG A |
| 299       | 78 | Meadow, non-grazed, HSG D |
| * 450     | 98 | Impervious                |
| 32,235    | 32 | Weighted Average          |
| 31,785    |    | 98.60% Pervious Area      |
| 450       |    | 1.40% Impervious Area     |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description                                                   |
|----------|---------------|---------------|-------------------|----------------|---------------------------------------------------------------|
| 4.7      | 100           | 0.1200        | 0.35              |                | Sheet Flow,<br>Grass: Short n= 0.150 P2= 3.26"                |
| 0.9      | 147           | 0.1630        | 2.83              |                | Shallow Concentrated Flow,<br>Short Grass Pasture Kv= 7.0 fps |
| 5.6      | 247           | Total         |                   |                |                                                               |

**Subcatchment 2S: Undetained - basin**

**Summary for Pond 5P: Basin 1**

Inflow Area = 191,207 sf, 2.18% Impervious, Inflow Depth > 1.97" for 100-yr event  
 Inflow = 7.16 cfs @ 12.23 hrs, Volume= 31,397 cf  
 Outflow = 2.39 cfs @ 12.71 hrs, Volume= 25,904 cf, Atten= 67%, Lag= 28.9 min  
 Discarded = 0.45 cfs @ 12.71 hrs, Volume= 17,054 cf  
 Primary = 1.94 cfs @ 12.71 hrs, Volume= 8,850 cf

Routing by Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs  
 Peak Elev= 927.05' @ 12.71 hrs Surf.Area= 5,336 sf Storage= 10,368 cf

Plug-Flow detention time= 171.2 min calculated for 25,839 cf (82% of inflow)  
 Center-of-Mass det. time= 93.9 min ( 982.7 - 888.8 )

| Volume | Invert  | Avail.Storage | Storage Description                                        |
|--------|---------|---------------|------------------------------------------------------------|
| #1     | 924.50' | 15,897 cf     | <b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) |

| Elevation<br>(feet) | Surf.Area<br>(sq-ft) | Inc.Store<br>(cubic-feet) | Cum.Store<br>(cubic-feet) |
|---------------------|----------------------|---------------------------|---------------------------|
| 924.50              | 2,838                | 0                         | 0                         |
| 925.00              | 3,298                | 1,534                     | 1,534                     |
| 926.00              | 4,260                | 3,779                     | 5,313                     |
| 927.00              | 5,278                | 4,769                     | 10,082                    |
| 928.00              | 6,352                | 5,815                     | 15,897                    |

| Device | Routing   | Invert  | Outlet Devices                                                                                                                                                                          |
|--------|-----------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary   | 927.00' | <b>4.0' long x 20.0' breadth Broad-Crested Rectangular Weir</b><br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60<br>Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63       |
| #2     | Discarded | 924.50' | <b>3.000 in/hr Exfiltration over Surface area</b><br>Conductivity to Groundwater Elevation = 916.00'                                                                                    |
| #3     | Device 4  | 926.50' | <b>24.0" Vert. Orifice/Grate</b> C= 0.600                                                                                                                                               |
| #4     | Primary   | 924.50' | <b>18.0" Round Culvert#6</b><br>L= 51.0' Box, headwall w/3 rounded edges, Ke= 0.200<br>Inlet / Outlet Invert= 924.50' / 910.00' S= 0.2843 '/' Cc= 0.900<br>n= 0.012, Flow Area= 1.77 sf |

**Discarded OutFlow** Max=0.45 cfs @ 12.71 hrs HW=927.05' (Free Discharge)

↑**2=Exfiltration** ( Controls 0.45 cfs)

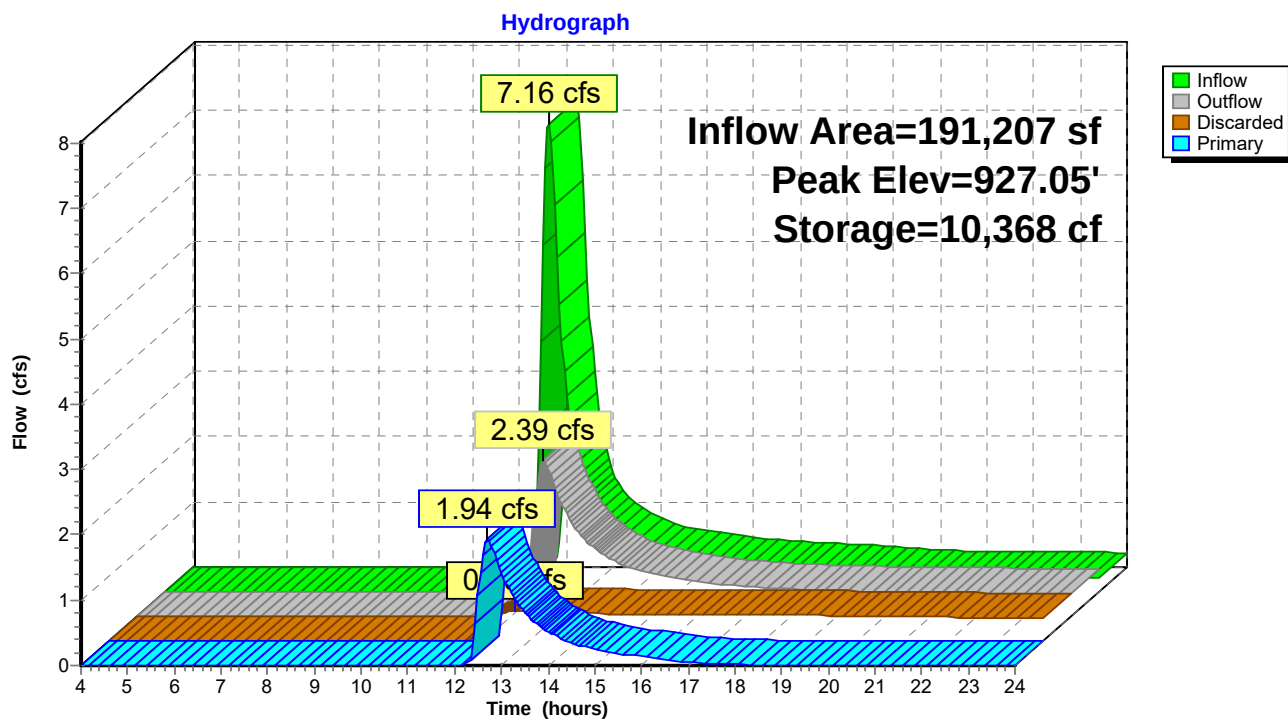
**Primary OutFlow** Max=1.93 cfs @ 12.71 hrs HW=927.05' (Free Discharge)

↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.13 cfs @ 0.62 fps)

↑**4=Culvert#6** (Passes 1.79 cfs of 14.28 cfs potential flow)

↑**3=Orifice/Grate** (Orifice Controls 1.79 cfs @ 2.53 fps)

## Pond 5P: Basin 1



**Summary for Pond 8P: Catch Basin #1**

[57] Hint: Peaked at 912.15' (Flood elevation advised)

[79] Warning: Submerged Pond 5P Primary device # 4 OUTLET by 2.15'

Inflow Area = 223,442 sf, 2.06% Impervious, Inflow Depth > 0.56" for 100-yr event  
 Inflow = 2.01 cfs @ 12.71 hrs, Volume= 10,424 cf  
 Outflow = 2.01 cfs @ 12.71 hrs, Volume= 10,424 cf, Atten= 0%, Lag= 0.0 min  
 Primary = 2.01 cfs @ 12.71 hrs, Volume= 10,424 cf

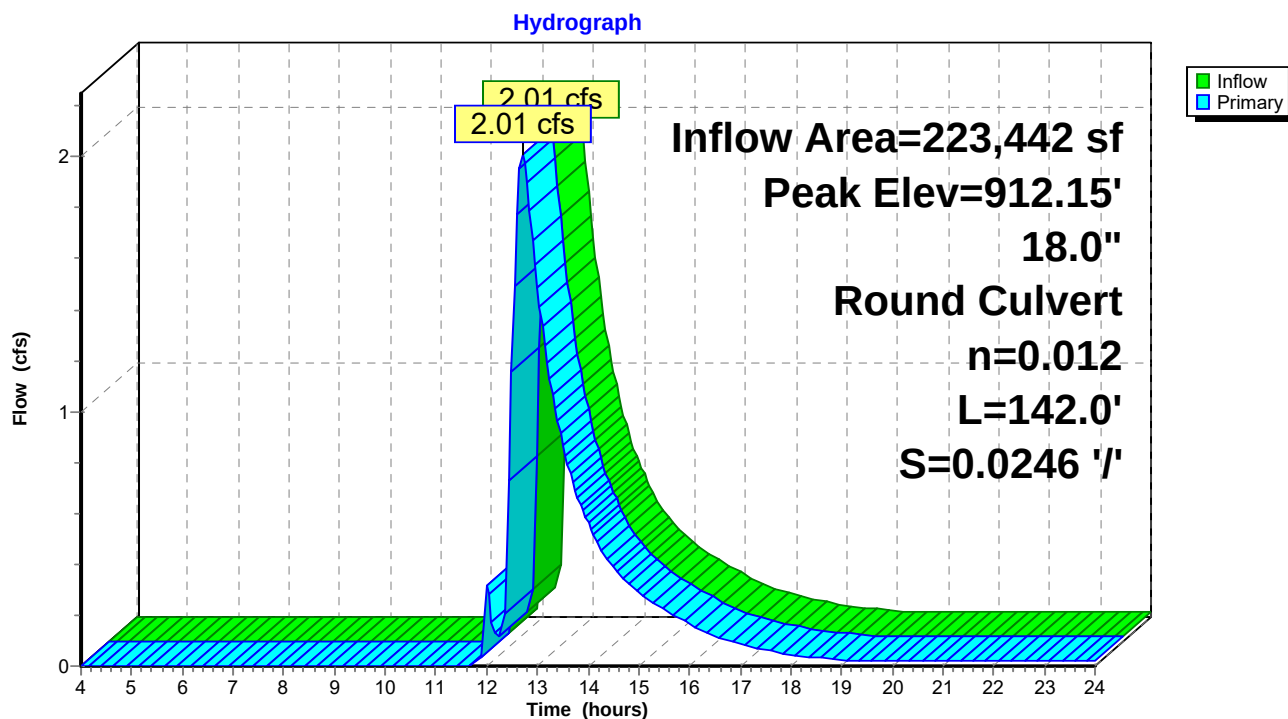
Routing by Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.05 hrs

Peak Elev= 912.15' @ 12.71 hrs

| Device | Routing | Invert  | Outlet Devices                                                                                                                                                                         |
|--------|---------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| #1     | Primary | 911.50' | <b>18.0" Round Culvert#7</b><br>L= 142.0' Box, headwall w/3 square edges, Ke= 0.500<br>Inlet / Outlet Invert= 911.50' / 908.00' S= 0.0246 '/ Cc= 0.900<br>n= 0.012, Flow Area= 1.77 sf |

Primary OutFlow Max=2.00 cfs @ 12.71 hrs HW=912.15' (Free Discharge)

1=Culvert#7 (Inlet Controls 2.00 cfs @ 2.74 fps)

**Pond 8P: Catch Basin #1**

ATTACHMENT 4.6  
RIPRAP APRON WORKSHEET –  
MLV-505LD86

# STANDARD E&S WORKSHEET # 20

## Riprap Apron Outlet Protection

PROJECT NAME: Williams REAE – MLV-505LD86

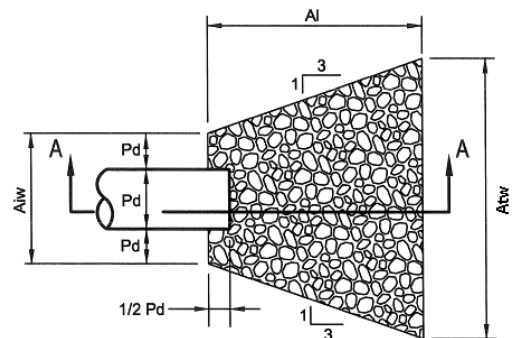
LOCATION: Monroe County, PA

PREPARED BY: CD

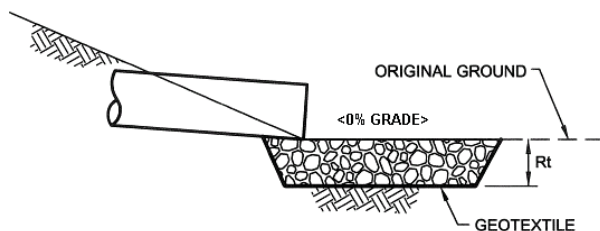
DATE: 02/17/2022

CHECKED BY: PW

DATE: 02/17/2022



PLAN VIEW



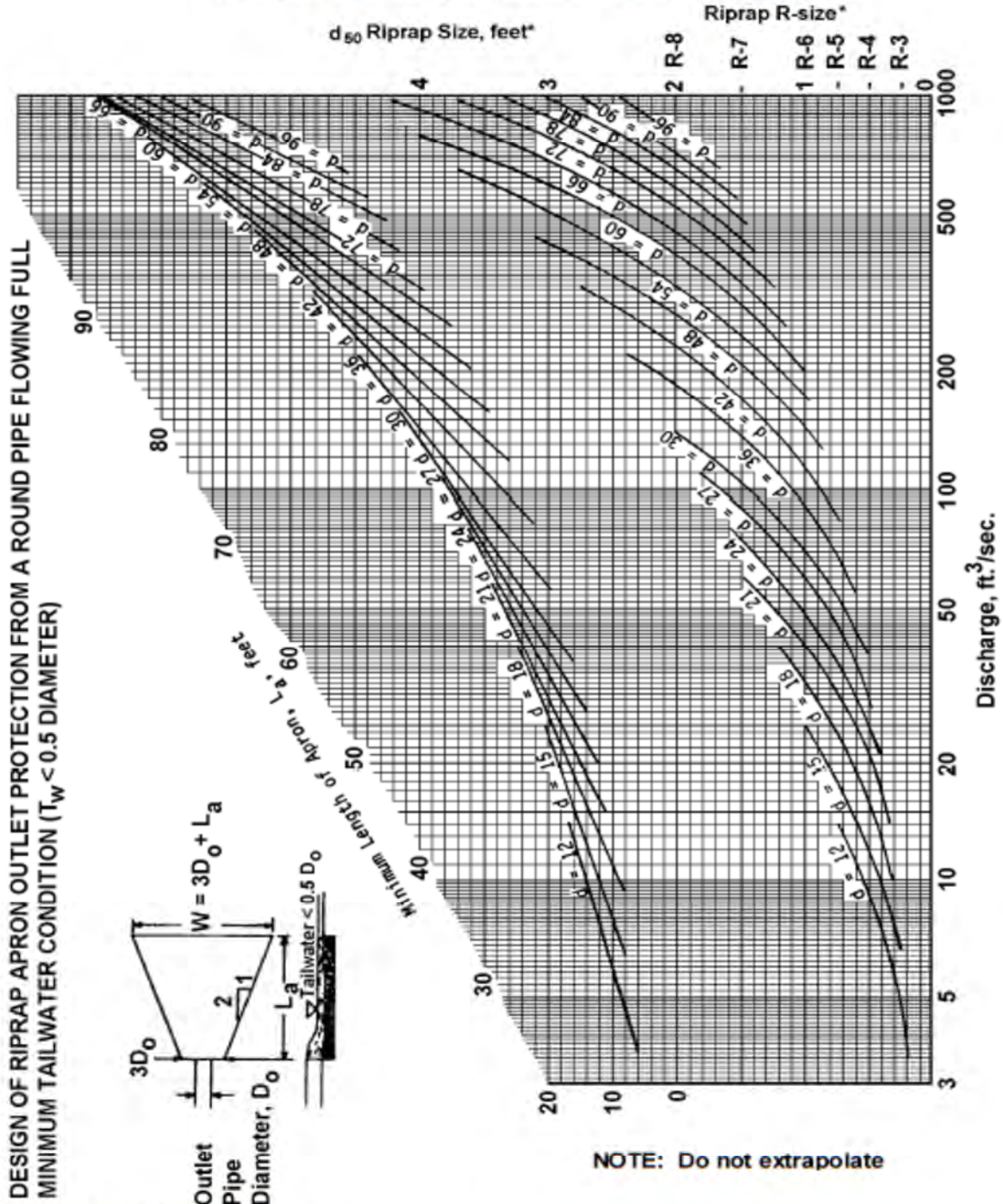
SECTION A - A

| NO. | PIPE DIA. Do (in.) | TAIL WATER COND. (Max or Min) | MAN. "n" FOR PIPE | PIPE SLOPE (FT/FT) | Q (CFS) | V* (FPS) | RIPRAP SIZE | Rt (in) | Al (ft) | Aiw (ft) | Atw (ft) |
|-----|--------------------|-------------------------------|-------------------|--------------------|---------|----------|-------------|---------|---------|----------|----------|
| 1   | 12                 | Min                           | 0.012             | 0.017              | 1.55    | 5.87     | R-3         | 9       | 6       | 3        | 9        |
| 2   | 48                 | Min                           | 0.050             | 0.110              | 1.76    | 3.74     | R-3         | 9       | 6       | 12       | 18       |
| 3   | 18                 | Min                           | 0.012             | 0.010              | 3.82    | 5.99     | R-3         | 9       | 6       | 4.5      | 10.5     |
| 4   | 36                 | Min                           | 0.070             | 0.110              | 4.12    | 3.82     | R-3         | 9       | 6       | 9        | 15       |
| 5   | 24                 | Min                           | 0.050             | 0.063              | 4.50    | 4.26     | R-3         | 9       | 6       | 6        | 12       |
| 6   | 18                 | Min                           | 0.012             | 0.17               | 6.96    | 3.93     | R-3         | 9       | 8       | 4.5      | 12.5     |
| 7   | 18                 | Min                           | 0.012             | 0.025              | 1.93    | 2.71     | R-3         | 9       | 6       | 4.5      | 10.5     |
| 8   | 4                  | Min                           | 0.012             | 0.063              | 0.38    | 4.38     | R-3         | 9       | 6       | 1        | 7        |
| 9   | 6                  | Min                           | 0.012             | 0.067              | 0.46    | 2.36     | R-3         | 9       | 6       | 1.5      | 7        |
| 10  | 18                 | Min                           | 0.012             | 0.025              | 5.85    | 3.20     | R-3         | 9       | 6       | 4.5      | 10.5     |

\*:The anticipated velocity (V) should not exceed the maximum permissible shown in Table 6.6 for the proposed riprap protection. Adjust for less than full pipe flow. Use Manning's equation to calculate velocity for pipe slopes  $\geq 0.05$  ft/ft.



FIGURE 9.3  
Riprap Apron Design, Minimum Tailwater Condition



Adapted from USDA - NRCS

Not to be used for Box Culverts

\* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase  $d_{50}$  stone size and/or provide velocity reduction device.

ATTACHMENT 4.7  
BMP EROSION CONTROL BLANKET REPORT –  
MLV-505LD86



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## SPILLWAY ANALYSIS

> > > Infiltration Berm #1

Name Infiltration Berm #1  
 Discharge 1.43  
 Peak Flow Period 12.6  
 Channel Slope 0.333  
 Channel Bottom Width 5  
 Low Flow Liner  
 Retardence Class C 6-12 in  
 Vegetation Type Sod Former  
 Vegetation Density Good 65-79%  
 Soil Type Silt Loam (SM)

### SC150BN

| Phase                | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|----------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| SC150BN Unvegetated  | Straight | 1.43 cfs  | 4.35 ft/s | 0.07 ft      | 0.032      | 2 lbs/ft <sup>2</sup>    | 1.37 lbs/ft <sup>2</sup> | 1.46          | STABLE  | D              |
| Underlying Substrate | Straight | 1.43 cfs  | 4.35 ft/s | 0.07 ft      | 0.032      | 1.47 lbs/ft <sup>2</sup> | 1.33 lbs/ft <sup>2</sup> | 1.1           | STABLE  | D              |

### Unreinforced Vegetation - Class C - Sod Former - Good 65-79%

| Phase                   | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|-------------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| Unreinforced Vegetation | Straight | 1.43 cfs  | 3.79 ft/s | 0.08 ft      | 0.04       | 4 lbs/ft <sup>2</sup>    | 1.57 lbs/ft <sup>2</sup> | 2.55          | STABLE  | --             |
| Underlying Substrate    | Straight | 1.43 cfs  | 3.79 ft/s | 0.08 ft      | 0.04       | 2.06 lbs/ft <sup>2</sup> | 1.52 lbs/ft <sup>2</sup> | 1.35          | STABLE  | --             |



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## SPILLWAY ANALYSIS

> > > Infiltration Berm #2

Name Infiltration Berm #2  
 Discharge 1.38  
 Peak Flow Period 12.6  
 Channel Slope 0.333  
 Channel Bottom Width 4  
 Low Flow Liner  
 Retardence Class C 6-12 in  
 Vegetation Type Sod Former  
 Vegetation Density Good 65-79%  
 Soil Type Silt Loam (SM)

### SC150BN

| Phase                | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|----------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| SC150BN Unvegetated  | Straight | 1.38 cfs  | 4.72 ft/s | 0.07 ft      | 0.031      | 2 lbs/ft <sup>2</sup>    | 1.51 lbs/ft <sup>2</sup> | 1.32          | STABLE  | D              |
| Underlying Substrate | Straight | 1.38 cfs  | 4.72 ft/s | 0.07 ft      | 0.031      | 1.47 lbs/ft <sup>2</sup> | 1.46 lbs/ft <sup>2</sup> | 1.01          | STABLE  | D              |

### Unreinforced Vegetation - Class C - Sod Former - Good 65-79%

| Phase                   | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|-------------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| Unreinforced Vegetation | Straight | 1.38 cfs  | 4.15 ft/s | 0.08 ft      | 0.038      | 4 lbs/ft <sup>2</sup>    | 1.72 lbs/ft <sup>2</sup> | 2.32          | STABLE  | --             |
| Underlying Substrate    | Straight | 1.38 cfs  | 4.15 ft/s | 0.08 ft      | 0.038      | 1.93 lbs/ft <sup>2</sup> | 1.66 lbs/ft <sup>2</sup> | 1.16          | STABLE  | --             |

ATTACHMENT 4.8  
CHANNEL EROSION CONTROL BLANKET REPORTS –  
MLV-505LD86



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## CHANNEL ANALYSIS

> > > SH-DC-001

Name SH-DC-001  
 Discharge 0.11  
 Channel Slope 0.01  
 Channel Bottom Width 1  
 Left Side Slope 2  
 Right Side Slope 2  
 Low Flow Liner  
 Retardence Class C 6-12 in  
 Vegetation Type Sod Former  
 Vegetation Density Good 65-79%  
 Soil Type Silt Loam (SM)

### SC150BN

| Phase                | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|----------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| SC150BN Unvegetated  | Straight | 0.11 cfs  | 0.66 ft/s | 0.13 ft      | 0.05       | 2 lbs/ft <sup>2</sup>    | 0.08 lbs/ft <sup>2</sup> | 24.41         | STABLE  | D              |
| Underlying Substrate | Straight | 0.11 cfs  | 0.66 ft/s | 0.13 ft      | 0.05       | 1.47 lbs/ft <sup>2</sup> | 0.07 lbs/ft <sup>2</sup> | 22.48         | STABLE  | D              |

### Unreinforced Vegetation

| Phase                   | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|-------------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| Unreinforced Vegetation | Straight | 0.11 cfs  | 0.66 ft/s | 0.13 ft      | 0.05       | 4 lbs/ft <sup>2</sup>    | 0.08 lbs/ft <sup>2</sup> | 48.81         | STABLE  | --             |
| Underlying Substrate    | Straight | 0.11 cfs  | 0.66 ft/s | 0.13 ft      | 0.05       | 4 lbs/ft <sup>2</sup>    | 0.07 lbs/ft <sup>2</sup> | 61.36         | STABLE  | --             |



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## CHANNEL ANALYSIS

> > > SH-CC-002

Name SH-CC-002  
 Discharge 0.42  
 Channel Slope 0.038  
 Channel Bottom Width 2  
 Left Side Slope 2  
 Right Side Slope 2  
 Low Flow Liner  
 Retardence Class C 6-12 in  
 Vegetation Type Sod Former  
 Vegetation Density Good 65-79%  
 Soil Type Silt Loam (SM)

### SC150BN

| Phase                | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|----------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| SC150BN Unvegetated  | Straight | 0.42 cfs  | 1.38 ft/s | 0.13 ft      | 0.05       | 2 lbs/ft <sup>2</sup>    | 0.32 lbs/ft <sup>2</sup> | 6.31          | STABLE  | D              |
| Underlying Substrate | Straight | 0.42 cfs  | 1.38 ft/s | 0.13 ft      | 0.05       | 1.47 lbs/ft <sup>2</sup> | 0.28 lbs/ft <sup>2</sup> | 5.29          | STABLE  | D              |

### Unreinforced Vegetation

| Phase                   | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|-------------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| Unreinforced Vegetation | Straight | 0.42 cfs  | 1.38 ft/s | 0.13 ft      | 0.05       | 4 lbs/ft <sup>2</sup>    | 0.32 lbs/ft <sup>2</sup> | 12.61         | STABLE  | --             |
| Underlying Substrate    | Straight | 0.42 cfs  | 1.38 ft/s | 0.13 ft      | 0.05       | 4 lbs/ft <sup>2</sup>    | 0.28 lbs/ft <sup>2</sup> | 14.45         | STABLE  | --             |



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## CHANNEL ANALYSIS

> > > SH-CC-003

Name SH-CC-003  
 Discharge 1.13  
 Channel Slope 0.04  
 Channel Bottom Width 2  
 Left Side Slope 2  
 Right Side Slope 2  
 Low Flow Liner  
 Retardence Class C 6-12 in  
 Vegetation Type Sod Former  
 Vegetation Density Good 65-79%  
 Soil Type Silt Loam (SM)

### SC150BN

| Phase                | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|----------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| SC150BN Unvegetated  | Straight | 1.13 cfs  | 1.96 ft/s | 0.23 ft      | 0.05       | 2 lbs/ft <sup>2</sup>    | 0.58 lbs/ft <sup>2</sup> | 3.43          | STABLE  | D              |
| Underlying Substrate | Straight | 1.13 cfs  | 1.96 ft/s | 0.23 ft      | 0.05       | 1.47 lbs/ft <sup>2</sup> | 0.47 lbs/ft <sup>2</sup> | 3.1           | STABLE  | D              |

### Unreinforced Vegetation

| Phase                   | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|-------------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| Unreinforced Vegetation | Straight | 1.13 cfs  | 1.96 ft/s | 0.23 ft      | 0.05       | 4 lbs/ft <sup>2</sup>    | 0.58 lbs/ft <sup>2</sup> | 6.86          | STABLE  | --             |
| Underlying Substrate    | Straight | 1.13 cfs  | 1.96 ft/s | 0.23 ft      | 0.05       | 4 lbs/ft <sup>2</sup>    | 0.47 lbs/ft <sup>2</sup> | 8.47          | STABLE  | --             |





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## CHANNEL ANALYSIS

> > > SH-CC-004

Name SH-CC-004  
 Discharge 1.76  
 Channel Slope 0.11  
 Channel Bottom Width 4  
 Left Side Slope 2  
 Right Side Slope 2  
 Low Flow Liner  
 Retardence Class C 6-12 in  
 Vegetation Type Sod Former  
 Vegetation Density Good 65-79%  
 Soil Type Silt Loam (SM)

### SC150BN

| Phase                | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|----------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| SC150BN Unvegetated  | Straight | 1.76 cfs  | 2.67 ft/s | 0.15 ft      | 0.05       | 2 lbs/ft <sup>2</sup>    | 1.05 lbs/ft <sup>2</sup> | 1.9           | STABLE  | D              |
| Underlying Substrate | Straight | 1.76 cfs  | 2.67 ft/s | 0.15 ft      | 0.05       | 1.47 lbs/ft <sup>2</sup> | 0.97 lbs/ft <sup>2</sup> | 1.52          | STABLE  | D              |

### Unreinforced Vegetation

| Phase                   | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|-------------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| Unreinforced Vegetation | Straight | 1.76 cfs  | 2.67 ft/s | 0.15 ft      | 0.05       | 4 lbs/ft <sup>2</sup>    | 1.05 lbs/ft <sup>2</sup> | 3.8           | STABLE  | --             |
| Underlying Substrate    | Straight | 1.76 cfs  | 2.67 ft/s | 0.15 ft      | 0.05       | 4 lbs/ft <sup>2</sup>    | 0.97 lbs/ft <sup>2</sup> | 4.14          | STABLE  | --             |



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## CHANNEL ANALYSIS

> > > SH-CC-005

Name SH-CC-005  
 Discharge 3.82  
 Channel Slope 0.09  
 Channel Bottom Width 3  
 Left Side Slope 2  
 Right Side Slope 2  
 Low Flow Liner  
 Retardence Class C 6-12 in  
 Vegetation Type Sod Former  
 Vegetation Density Good 65-79%  
 Soil Type Silt Loam (SM)

### SC150BN

| Phase                | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|----------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| SC150BN Unvegetated  | Straight | 3.82 cfs  | 3.53 ft/s | 0.3 ft       | 0.05       | 2 lbs/ft <sup>2</sup>    | 1.69 lbs/ft <sup>2</sup> | 1.19          | STABLE  | D              |
| Underlying Substrate | Straight | 3.82 cfs  | 3.53 ft/s | 0.3 ft       | 0.05       | 1.47 lbs/ft <sup>2</sup> | 1.4 lbs/ft <sup>2</sup>  | 1.05          | STABLE  | D              |

### Unreinforced Vegetation

| Phase                   | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|-------------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| Unreinforced Vegetation | Straight | 3.82 cfs  | 3.53 ft/s | 0.3 ft       | 0.05       | 4 lbs/ft <sup>2</sup>    | 1.69 lbs/ft <sup>2</sup> | 2.37          | STABLE  | --             |
| Underlying Substrate    | Straight | 3.82 cfs  | 3.53 ft/s | 0.3 ft       | 0.05       | 4 lbs/ft <sup>2</sup>    | 1.4 lbs/ft <sup>2</sup>  | 2.86          | STABLE  | --             |



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CHANNEL ANALYSIS

> > > SH-CC-006

Name SH-CC-006  
Discharge 4.12  
Channel Slope 0.13  
Channel Bottom Width 3  
Left Side Slope 2  
Right Side Slope 2  
Low Flow Liner  
Retardence Class C 6-12 in  
Vegetation Type Sod Former  
Vegetation Density Good 65-79%  
Soil Type Silt Loam (SM)

Rock Riprap

| Phase                      | Reach    | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress | Safety Factor | Remarks | Staple Pattern |
|----------------------------|----------|-----------|----------|--------------|------------|--------------------------|-------------------------|---------------|---------|----------------|
| Rock Riprap<br>Unvegetated | Straight | 4.12 cfs  | 5.5 ft/s | 0.22 ft      | 0.032      | 2 lbs/ft2                | 1.53 lbs/ft2            | 1.31          | STABLE  | --             |



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CHANNEL ANALYSIS

> > > SH-CC-007

Name SH-CC-007  
Discharge 0.57  
Channel Slope 0.13  
Channel Bottom Width 1  
Left Side Slope 2  
Right Side Slope 2  
Low Flow Liner  
Retardence Class C 6-12 in  
Vegetation Type Sod Former  
Vegetation Density Good 65-79%  
Soil Type Silt Loam (SM)

Rock Riprap

| Phase                      | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress | Safety Factor | Remarks | Staple Pattern |
|----------------------------|----------|-----------|-----------|--------------|------------|--------------------------|-------------------------|---------------|---------|----------------|
| Rock Riprap<br>Unvegetated | Straight | 0.57 cfs  | 3.16 ft/s | 0.1 ft       | 0.032      | 1 lbs/ft2                | 0.67 lbs/ft2            | 1.5           | STABLE  | --             |



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## CHANNEL ANALYSIS

> > > SH-CC-008

Name SH-CC-008  
 Discharge 4.5  
 Channel Slope 0.063  
 Channel Bottom Width 2  
 Left Side Slope 2  
 Right Side Slope 2  
 Low Flow Liner  
 Retardence Class C 6-12 in  
 Vegetation Type Sod Former  
 Vegetation Density Good 65-79%  
 Soil Type Silt Loam (SM)

### SC150BN

| Phase                | Reach    | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|----------------------|----------|-----------|----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| SC150BN Unvegetated  | Straight | 4.5 cfs   | 3.5 ft/s | 0.44 ft      | 0.05       | 2 lbs/ft <sup>2</sup>    | 1.75 lbs/ft <sup>2</sup> | 1.14          | STABLE  | D              |
| Underlying Substrate | Straight | 4.5 cfs   | 3.5 ft/s | 0.44 ft      | 0.05       | 1.47 lbs/ft <sup>2</sup> | 1.27 lbs/ft <sup>2</sup> | 1.16          | STABLE  | D              |

### Unreinforced Vegetation

| Phase                   | Reach    | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|-------------------------|----------|-----------|----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| Unreinforced Vegetation | Straight | 4.5 cfs   | 3.5 ft/s | 0.44 ft      | 0.05       | 4 lbs/ft <sup>2</sup>    | 1.75 lbs/ft <sup>2</sup> | 2.29          | STABLE  | --             |
| Underlying Substrate    | Straight | 4.5 cfs   | 3.5 ft/s | 0.44 ft      | 0.05       | 4 lbs/ft <sup>2</sup>    | 1.27 lbs/ft <sup>2</sup> | 3.16          | STABLE  | --             |



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## CHANNEL ANALYSIS

> > > SH-CC-009

Name SH-CC-009  
 Discharge 0.22  
 Channel Slope 0.139  
 Channel Bottom Width 1  
 Left Side Slope 2  
 Right Side Slope 2  
 Low Flow Liner  
 Retardence Class C 6-12 in  
 Vegetation Type Sod Former  
 Vegetation Density Good 65-79%  
 Soil Type Silt Loam (SM)

### SC150BN

| Phase                | Reach    | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|----------------------|----------|-----------|----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| SC150BN Unvegetated  | Straight | 0.22 cfs  | 2 ft/s   | 0.09 ft      | 0.05       | 2 lbs/ft <sup>2</sup>    | 0.8 lbs/ft <sup>2</sup>  | 2.52          | STABLE  | D              |
| Underlying Substrate | Straight | 0.22 cfs  | 2 ft/s   | 0.09 ft      | 0.05       | 1.47 lbs/ft <sup>2</sup> | 0.67 lbs/ft <sup>2</sup> | 2.2           | STABLE  | D              |

### Unreinforced Vegetation

| Phase                   | Reach    | Discharge | Velocity | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|-------------------------|----------|-----------|----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| Unreinforced Vegetation | Straight | 0.22 cfs  | 2 ft/s   | 0.09 ft      | 0.05       | 4 lbs/ft <sup>2</sup>    | 0.8 lbs/ft <sup>2</sup>  | 5.03          | STABLE  | --             |
| Underlying Substrate    | Straight | 0.22 cfs  | 2 ft/s   | 0.09 ft      | 0.05       | 4 lbs/ft <sup>2</sup>    | 0.67 lbs/ft <sup>2</sup> | 5.99          | STABLE  | --             |



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## CHANNEL ANALYSIS

> > > SH-CC-010

Name SH-CC-010  
 Discharge 0.27  
 Channel Slope 0.148  
 Channel Bottom Width 1  
 Left Side Slope 2  
 Right Side Slope 2  
 Low Flow Liner  
 Retardence Class C 6-12 in  
 Vegetation Type Sod Former  
 Vegetation Density Good 65-79%  
 Soil Type Silt Loam (SM)

### SC150BN

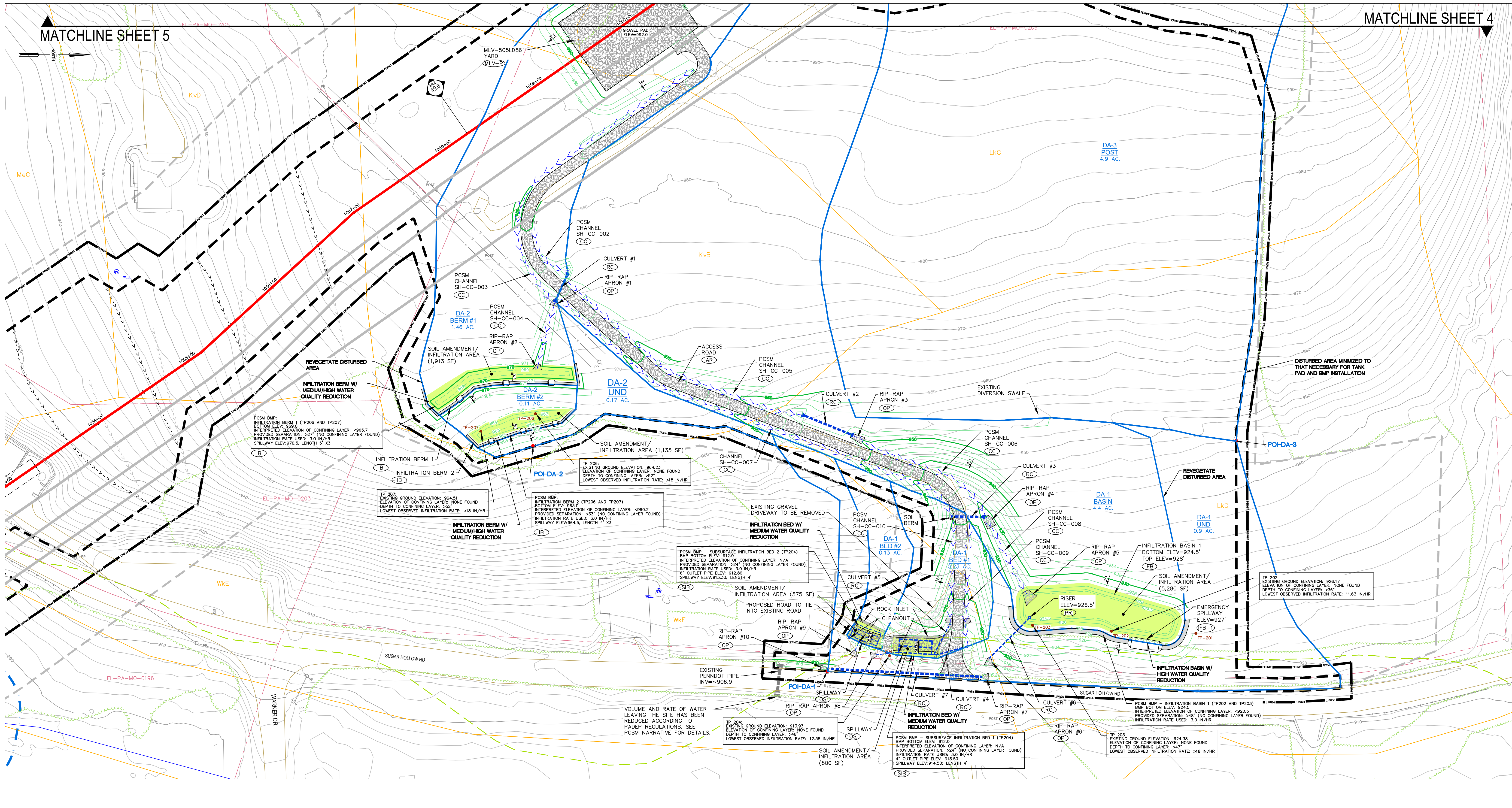
| Phase                | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|----------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| SC150BN Unvegetated  | Straight | 0.27 cfs  | 2.16 ft/s | 0.1 ft       | 0.05       | 2 lbs/ft <sup>2</sup>    | 0.91 lbs/ft <sup>2</sup> | 2.19          | STABLE  | D              |
| Underlying Substrate | Straight | 0.27 cfs  | 2.16 ft/s | 0.1 ft       | 0.05       | 1.47 lbs/ft <sup>2</sup> | 0.76 lbs/ft <sup>2</sup> | 1.93          | STABLE  | D              |

### Unreinforced Vegetation

| Phase                   | Reach    | Discharge | Velocity  | Normal Depth | Mannings N | Permissible Shear Stress | Calculated Shear Stress  | Safety Factor | Remarks | Staple Pattern |
|-------------------------|----------|-----------|-----------|--------------|------------|--------------------------|--------------------------|---------------|---------|----------------|
| Unreinforced Vegetation | Straight | 0.27 cfs  | 2.16 ft/s | 0.1 ft       | 0.05       | 4 lbs/ft <sup>2</sup>    | 0.91 lbs/ft <sup>2</sup> | 4.39          | STABLE  | --             |
| Underlying Substrate    | Straight | 0.27 cfs  | 2.16 ft/s | 0.1 ft       | 0.05       | 4 lbs/ft <sup>2</sup>    | 0.76 lbs/ft <sup>2</sup> | 5.28          | STABLE  | --             |

ATTACHMENT 5  
NON-STRUCTURAL AND STRUCTURAL WATER QUALITY  
BMPS MAP





## LEGEND

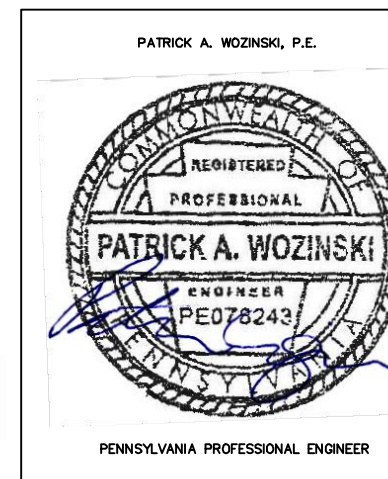
|                               |                             |                                        |                       |                  |                        |                                          |                                         |                                              |                                         |                                        |                                    |                           |                                            |                       |                           |                                         |                          |                      |                                |
|-------------------------------|-----------------------------|----------------------------------------|-----------------------|------------------|------------------------|------------------------------------------|-----------------------------------------|----------------------------------------------|-----------------------------------------|----------------------------------------|------------------------------------|---------------------------|--------------------------------------------|-----------------------|---------------------------|-----------------------------------------|--------------------------|----------------------|--------------------------------|
| PROPERTY LINE                 | EXISTING RIGHT-OF-WAY       | ESCP PERMIT BOUNDARY                   | LIMITS OF DISTURBANCE | EXISTING FENCE   | EXISTING STONE ROW     | EXISTING UNDERGROUND ELECTRIC LINE       | EXISTING EDGE OF ROAD                   | EXISTING GRADE MAJOR CONTOURS (10' C.I.)     | EXISTING GRADE MINOR CONTOURS (2' C.I.) | EXISTING WATERBAR AND OUTLET STRUCTURE | APPROX. ENVIRONMENTAL STUDY LIMITS | DELINEATED WETLAND        | DELINEATED WATERWAY / STREAM (TOP OF BANK) | STREAM FLOW DIRECTION | RIPARIAN BUFFER           | 50'/FEMA FLOODWAY                       | FEMA 100-YEAR FLOODPLAIN | SOIL BOUNDARY / TYPE | EXISTING TREELINE / TREE/SHRUB |
| EXISTING LDDY / TOL PIPELINES | EXISTING FOREIGN PIPELINES  | EXISTING UTILITY POLE / TOWER          | EXISTING VALVE        | EXISTING CULVERT | EXISTING ELECTRIC LINE | EXISTING UNDERGROUND ELECTRIC LINE       | EXISTING GAS LINE                       | EXISTING WATER LINE                          | EXISTING SANITARY LINE                  | EXISTING STORM SEWER                   | EXISTING TELEPHONE LINE            | EXISTING FIBER OPTIC LINE | EXISTING UNDERGROUND CABLE LINE            | EXISTING STORM INLET  | EXISTING SANITARY MANHOLE | EXISTING COMMUNICATION/ELECTRIC MANHOLE | EXISTING FIRE HYDRANT    | EXISTING POWER POLE  | EXISTING WELL                  |
| PROPOSED PIPELINE             | PROPOSED PIPELINE GROUNDING | PROPOSED WATERBAR AND OUTLET STRUCTURE | PROPOSED CHANNEL      | PROPOSED FENCE   | PROPOSED GRAVEL        | PROPOSED GRADE MAJOR CONTOURS (10' C.I.) | PROPOSED GRADE MINOR CONTOURS (2' C.I.) | PROPOSED INFILTRATION AREA W/ SOIL AMENDMENT | POST-CONSTRUCTION DRAINAGE AREA         |                                        |                                    |                           |                                            |                       |                           |                                         |                          |                      |                                |

## SOIL LEGEND

LK LECK KILL CHANNERY SILT LOAM, 2 TO 8 PERCENT SLOPES  
LKC LECK KILL CHANNERY SILT LOAM, 8 TO 15 PERCENT SLOPES  
KLB KUNESVILLE CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES  
KLC KUNESVILLE CHANNERY SILT LOAM, 8 TO 15 PERCENT SLOPES  
WKE WEIKERT AND KUNESVILLE SOILS, STEEP

## EXISTING CONDITION NOTES/SOURCES

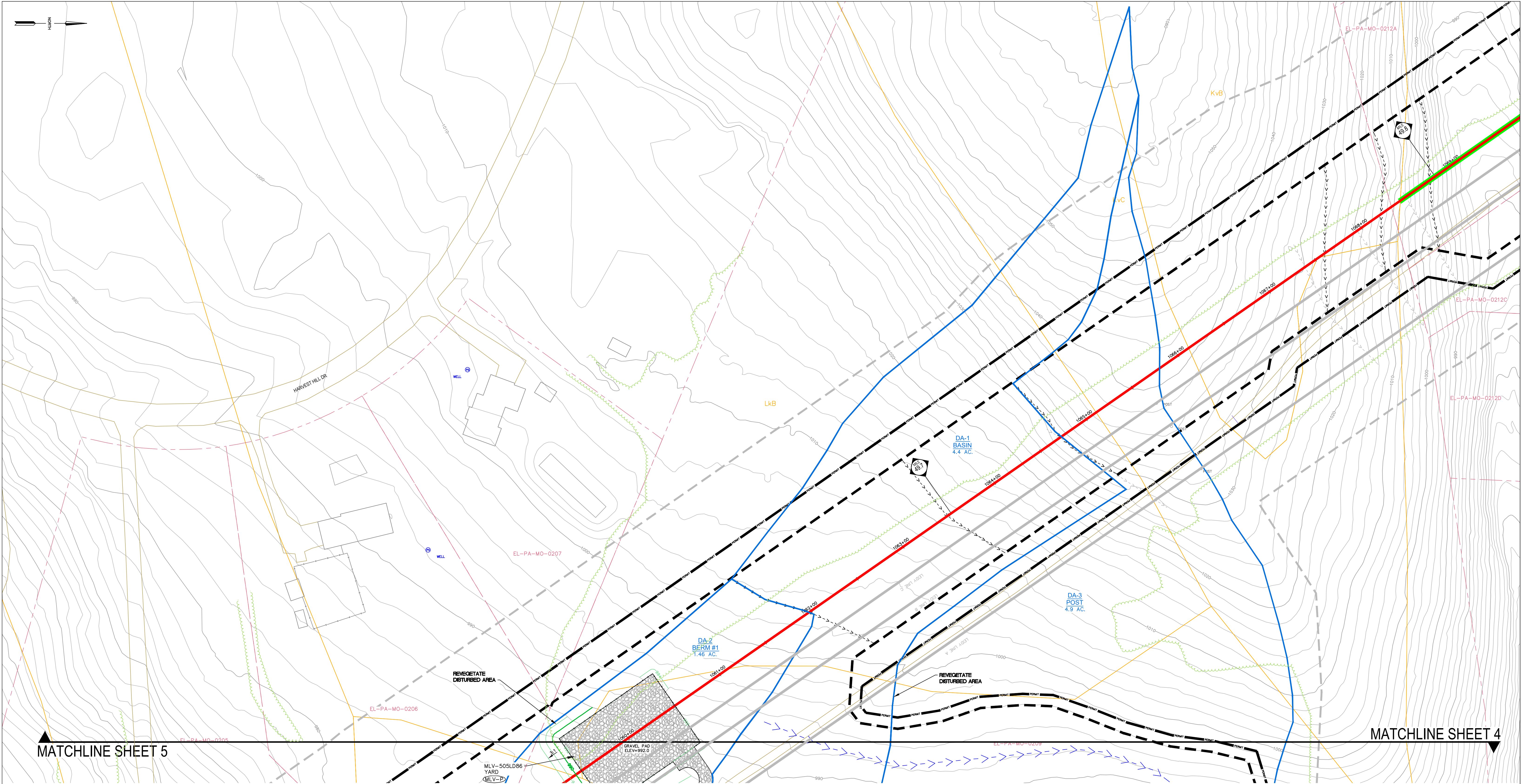
- EXISTING ROADWAYS, CONTOURS, PROPERTY LINE, TREE LINE, ETC. ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN 2010 AND 2020.
- PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
- PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
- STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WWM CONSULTING FROM MARCH 2020 TO OCTOBER 2020.
- DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD83 ELEVATION MSL, DERIVED FROM GPS OBSERVATION.



| REVISIONS |          |     |                                               |  | W.O. NO. | CHK. | APP. |
|-----------|----------|-----|-----------------------------------------------|--|----------|------|------|
| NO.       | DATE     | BY  | DESCRIPTION                                   |  |          |      |      |
| 1         | 06/29/21 | RHM | REVISED PER PADEP COMMENTS.                   |  |          |      |      |
| 2         | 03/01/22 | RHM | RESPONSE TO PADEP TECHNICAL DEFICIENCY LETTER |  |          |      |      |

|                                                                                                                                                                                                                                                        |                |                                 |                 |                                                                                       |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------|-----------------|---------------------------------------------------------------------------------------|--|
| TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC<br>REGIONAL ENERGY ACCESS EXPANSION PROJECT<br>MLV-505LD86<br>POST CONSTRUCTION STORMWATER MANAGEMENT PLAN<br>ATTACHMENT 5 WATER QUALITY BMP'S MAP 1<br>CHESTNUTHILL TOWNSHIP, MONROE COUNTY, PENNSYLVANIA |                |                                 |                 |  |  |
| DRAWN BY: RHM                                                                                                                                                                                                                                          | DATE: 03/31/21 | ISSUED FOR BID:                 | SCALE: AS NOTED | SHEET 1<br>OF 2                                                                       |  |
| CHECKED BY: RJN                                                                                                                                                                                                                                        | DATE: 03/31/21 | ISSUED FOR CONSTRUCTION:        | REVISION:       |                                                                                       |  |
| APPROVED BY: PW                                                                                                                                                                                                                                        | DATE: 03/31/21 | DRAWING NUMBER: 26-1000-70-28-D |                 |                                                                                       |  |
| WO: 122637                                                                                                                                                                                                                                             | RID: 108       |                                 |                 |                                                                                       |  |





LEGEND

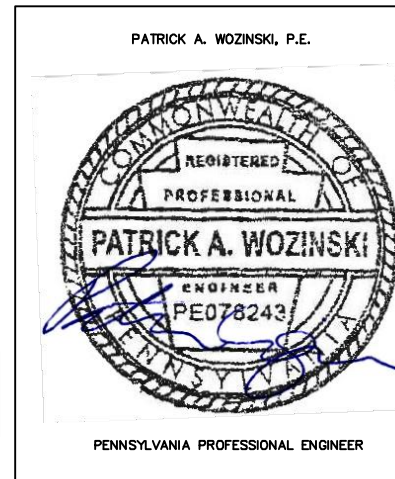
|  |                                            |  |                                         |
|--|--------------------------------------------|--|-----------------------------------------|
|  | PROPERTY LINE                              |  | EXISTING LDDY / TGPL PIPELINES          |
|  | EXISTING RIGHT-OF-WAY                      |  | EXISTING FOREIGN PIPELINES              |
|  | ESCP PERMIT BOUNDARY                       |  | EXISTING UTILITY POLE / TOWER           |
|  | LIMITS OF DISTURBANCE                      |  | EXISTING VALVE                          |
|  | EXISTING FENCE                             |  | EXISTING CULVERT                        |
|  | EXISTING STONE ROW                         |  | EXISTING ELECTRIC LINE                  |
|  | EXISTING STRUCTURE                         |  | EXISTING UNDERGROUND ELECTRIC LINE      |
|  | EXISTING EDGE OF ROAD                      |  | EXISTING GAS LINE                       |
|  | EXISTING GRADE MAJOR CONTOURS (10' C.I.)   |  | EXISTING WATER LINE                     |
|  | EXISTING GRADE MINOR CONTOURS (2' C.I.)    |  | EXISTING SANITARY LINE                  |
|  | EXISTING WATERBAR AND OUTLET STRUCTURE     |  | EXISTING STORM SEWER                    |
|  | APPROX. ENVIRONMENTAL STUDY LIMITS         |  | EXISTING TELEPHONE LINE                 |
|  | DELINEATED WETLAND                         |  | EXISTING FIBER OPTIC LINE               |
|  | DELINEATED WATERWAY / STREAM (TOP OF BANK) |  | EXISTING UNDERGROUND CABLE LINE         |
|  | STREAM FLOW DIRECTION                      |  | EXISTING STORM INLET                    |
|  | 50' FEMA FLOODWAY                          |  | EXISTING SANITARY MANHOLE               |
|  | FEMA 100-YEAR FLOODPLAIN                   |  | EXISTING COMMUNICATION/ELECTRIC MANHOLE |
|  | SOIL BOUNDARY / TYPE                       |  | EXISTING FIRE HYDRANT                   |
|  | EXISTING TREELINE / TREE/SHRUB             |  | EXISTING POWER POLE                     |
|  |                                            |  | EXISTING WELL                           |

SOIL LEGEND

|     |                                                       |
|-----|-------------------------------------------------------|
| LvB | LECK KILL CHANNERY SILT LOAM, 2 TO 8 PERCENT SLOPES   |
| LvC | LECK KILL CHANNERY SILT LOAM, 8 TO 15 PERCENT SLOPES  |
| KvB | KUNESVILLE CHANNERY SILT LOAM, 2 TO 8 PERCENT SLOPES  |
| KvC | KUNESVILLE CHANNERY SILT LOAM, 8 TO 15 PERCENT SLOPES |
| WkE | WEIKERT AND KUNESVILLE SOILS, STEEP                   |

EXISTING CONDITION NOTES/SOURCES

- EXISTING ROADWAYS, CONTOURS, PROPERTY LINE, TREE LINE, ETC. ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN 2010 AND 2020.
- PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
- PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
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- DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD83 ELEVATION MSL, DERIVED FROM GPS OBSERVATION.



| REVISIONS |          |     |                                               |  | W.O. NO. | CHK. | APP. |
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| 1         | 06/29/21 | RHM | REVISED PER PADEP COMMENTS.                   |  |          |      |      |
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|                                                                                                                                                                                                                                                        |                |                                 |                 |                 |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------|-----------------|-----------------|--|
| TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC<br>REGIONAL ENERGY ACCESS EXPANSION PROJECT<br>MLV-505LD86<br>POST CONSTRUCTION STORMWATER MANAGEMENT PLAN<br>ATTACHMENT 5 WATER QUALITY BMP'S MAP 2<br>CHESTNUTHILL TOWNSHIP, MONROE COUNTY, PENNSYLVANIA |                |                                 |                 | SCALE: AS NOTED |  |
| DRAWN BY: RHM                                                                                                                                                                                                                                          | DATE: 03/31/21 | ISSUED FOR BID:                 | SCALE: AS NOTED | SHEET 2 OF 2    |  |
| CHECKED BY: RJN                                                                                                                                                                                                                                        | DATE: 03/31/21 | ISSUED FOR CONSTRUCTION:        | REVISION:       |                 |  |
| APPROVED BY: PW                                                                                                                                                                                                                                        | DATE: 03/31/21 | DRAWING NUMBER: 26-1000-70-28-D |                 |                 |  |
| WO: 1222637                                                                                                                                                                                                                                            | RID: 108       |                                 |                 |                 |  |



ATTACHMENT 6  
OFFSITE DISCHARGE REPORT



**Transcontinental Gas Pipe Line Company, LLC**

**Offsite Discharge Report**

**Regional Energy Access Expansion Project**

**Effort Loop**

**MLV-505LD86**

**April 2021**

*(Revised March 2022)*

## **1.0 Project Description**

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc., is proposing the Regional Energy Access Expansion Project – Effort Loop (Project). MLV-505LD86 is proposed as part of the overall Project. The MLV-505LD86 site will utilize several PCSM BMPs to control stormwater runoff, attenuate peak flow rate and volume, and provide infiltration. Excess stormwater runoff will be directed to the basin, berms and subsurface beds, via a series of collection channels, for infiltration and controlled discharge. The new MLV facility will require Erosion and Sediment (E&S) Control and Post Construction Stormwater Management (PCSM) Best Management Practices (BMPs) to manage stormwater runoff during and after construction.

Transco has developed an Offsite Discharge Report for the discharges associated with the proposed BMPs. An Offsite Discharge Report is performed to ensure that no offsite erosion will occur downstream of the proposed activities. The analysis conducted for this project followed the sequence outlined in PaDEP's factsheet for offsite discharges (Document #3930-FS-DEP4124).

## **2.0 Conveyance Best Management Practices**

Erosion and Sediment Control and Post Construction Stormwater Management BMPs are proposed to manage stormwater runoff during and after construction. A series of PCSM channels along the access road will direct stormwater to discharge locations on both the north and south sides of the access road. On the south side of the access road, stormwater from the PCSM channels enters Infiltration Berm 1, flows into Infiltration Berm 2 and discharges water to a wooded area east of the berms. The remainder of PCSM channels direct stormwater water into two subsurface infiltration beds south of the access road and an infiltration basin that is north of the access road. The Infiltration Basin has an outlet that discharges into an 18" diameter pipe which directs stormwater to the Sugar Hollow Road ditch. Infiltration Bed #1 and Infiltration Bed #2 discharge below the access road and flow into the Sugar Hollow Road ditch. Stormwater from the Sugar Hollow Road ditch leaves the site via an 18" Sugar Hollow Road PennDOT culvert. These BMPs will be installed to mitigate both the net increase in volume between the pre- and post-development 2-year storm events and the increase (pre-post development) in peak runoff for the 2-, 10-, 50-, and 100-year storm events.

## 2.1 Infiltration Berm 1 and Infiltration Berm 2

Infiltration Berm 1 flows into Infiltration Berm 2 which discharges stormwater toward the adjacent forested area located east of the Limits of Disturbance. The stormwater is discharged as sheet flow and travels along a vegetative flow path until it reaches the Sugar Hollow Road ditch and then crosses Sugar Hollow Road via a PennDOT culvert, eventually entering Sugar Hollow Creek. The flow path is depicted on Exhibit 1.0. Soil types and the erodibility factors within the flow path are shown on Table 1.

| Table 1 – Soils Mapped within Flow Path |                                |
|-----------------------------------------|--------------------------------|
| Soil Mapping Unit                       | Soil Erodibility Factor, $K_f$ |
| KvB                                     | $K_f = 0.15$                   |
| WKE                                     | $K_f = 0.05$                   |
| Pp                                      | $K_f = 0.43$                   |

The soil erodibility factors are shown in Table 1. A low K value indicates the soil will not easily erode whereas a high K value means the soil will easily erode. KvB and WKE soils have a low susceptibility to erosion (0.15, 0.05) and Pp soils have a moderate susceptibility to erosion (0.43). Photos were taken along the flow path of the downstream area to show the vegetative cover.



**Photo 1: Existing Area at Proposed Infiltration Berm 2**



**Photo 2: Area Downgradient of the Proposed Infiltration Berm 2**

Photo 1 shows the existing condition where Infiltration Berm 2 is proposed. The area will be graded to facilitate the installation of Infiltration Berm 1 and Infiltration Berm 2 and then revegetated. Photo 2 shows the areas downgradient of the proposed Infiltration Berm 2, which is over 90% vegetated. In the E&S and PCSM Narrative, site calculations are provided that show the pre- and post-construction runoff flow rates and volume. These calculations show a reduction in the post-construction discharge rates and volumes. Calculations indicated that the discharge velocity at the proposed Infiltration Berm 2 is 1.31 feet per second for the 25 year, 24-hour storm event.

## **2.2 Infiltration Basin, Subsurface Infiltration Bed #1 and Subsurface Infiltration Bed #2**

The infiltration basin discharges stormwater to a basin riser pipe outlet which travels through a culvert that crosses beneath the site entrance and then continues along the Sugar Hollow Road ditch near the site entrance. Infiltration Bed #1 has a 4" outlet pipe and Infiltration Bed #2 has a 6" outlet pipe which discharge upgradient of the Sugar Hollow



Road ditch. Stormwater in the Sugar Hollow ditch leaves the site via an 18" PennDOT culvert which goes beneath Sugar Hollow Road and eventually enters Sugar Hollow Creek. The flow path is depicted in Exhibit 1.0. Soil types and the erodibility factors within the flow path are shown on Table 2.

| Table 2 – Soils Mapped within Flow Path |                                |
|-----------------------------------------|--------------------------------|
| Soil Mapping Unit                       | Soil Erodibility Factor, $K_f$ |
| WKE                                     | $K_f = 0.05$                   |
| Pp                                      | $K_f = 0.43$                   |

The soil erodibility factor is shown in Table 2. A low K value indicates the soil will not easily erode whereas a high K value means the soil will easily erode. The soil in the flow path is considered moderately erodible (0.05, 0.43). Photos were taken along the flow path of the downstream area to show the vegetative cover.



**Photo 3: Existing Area at Proposed Basin Outlet**





**Photo 4: Area Downgradient of the Proposed Basin Outlet**



**Photo 5: Existing Area and Area Downgradient Proposed Subsurface Infiltration Beds**





**Photo 6: Existing PennDOT Culvert Inlet**



**Photo 7: Existing Area Downgradient of PennDOT Culvert**

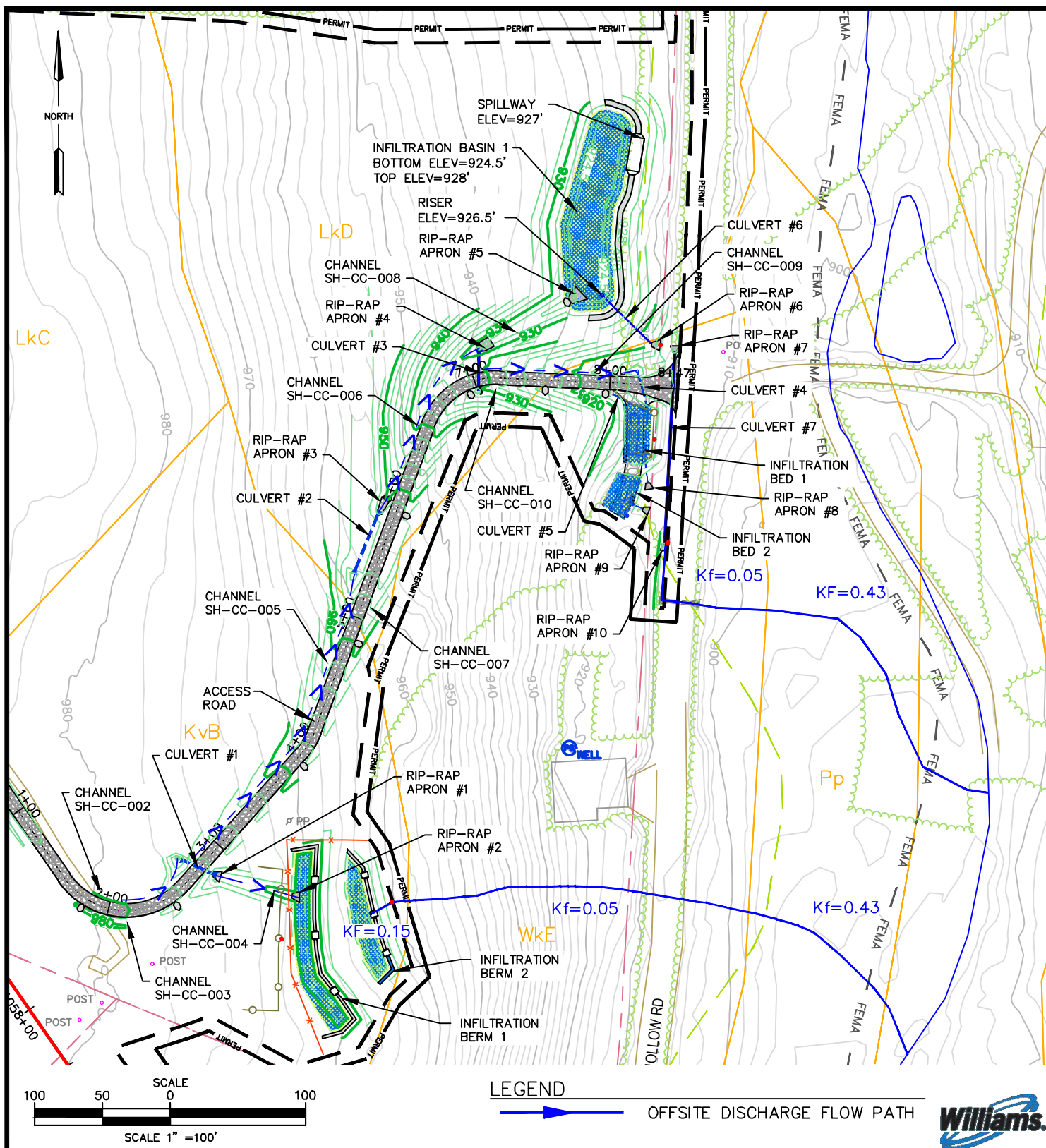
Photo 3 shows the existing condition where the basin outlet is proposed. The area will be graded to facilitate the installation of the infiltration basin and basin outlet then revegetated. Photo 4 shows the areas downgradient of the proposed basin outlet, which is over 90% vegetated. Photo 5 shows the area existing conditions where the subsurface infiltration beds are proposed as well as the area downgradient of the beds. Photo 6 shows the inlet area of the PennDOT 18" diameter culvert. Construction activities and installation of BMPs will not increase flows to or overwhelm this culvert. Photo 7 shows the existing area downstream of the PennDOT culvert.

In the E&S and PCSM Narrative, site calculations are provided that show the Pre- and Post-Construction runoff flow rates and volume. These calculations show a reduction in the post-construction discharge rates and volumes. Calculations indicated that the discharge velocity at the proposed Infiltration Basin outlet is 0.0 feet per second for the for the 25 year, 24-hour storm event. The discharge velocity from subsurface Infiltration Bed #1 is 1.61 feet per second and the discharge velocity from Infiltration Bed #2 is 1.88 feet per second for the 25 year, 24-hour storm event. Overall, stormwater volumes and rates will be reduced and discharge from the basin and infiltration beds will not promote erosion to downstream areas.

### **3.0 Conclusion**

Based on the existing vegetative conditions, low discharge velocities from the BMPs, reduced peak flow rates and volumes from the site, and the low to moderate soil erodibility values associated with the property, downgradient soil erosion is not anticipated as a result of the proposed development of this site.





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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC  
REGIONAL ENERGY ACCESS EXPANSION PROJECT  
MLV-505LD86

**EROSION AND SEDIMENTATION CONTROL PLAN**

**FLOW PATH**

CHESTNUTHILL TWP

MONROE COUNTY

PENNSYLVANIA

DATE:

**02/22/22**

DRAWN BY:

**RWS**

CHECKED:

**PW**

WHM DRAWING NO:

**FLOW PATH**

**EXHIBIT 1.0**

SECTION 3.2.2  
MLV-505LD86 DRAWINGS