Memorandum

Red Cloud – Stormwater Management

To:	City of La Crosse – Engineering Department
	Attn: Yuri Nasonovs
From:	Kris Roppe, PE
Date:	April 02, 2021
Subject:	Red Cloud – Stormwater Management

This stormwater management memo has been prepared to accompany the submitted plans and stormwater calculations for the proposed Red Cloud Development which will be located at 1325 Saint Andrew ST. The property is currently zoned Planned Development. Therefore, the project will need to meet the requirements of the City of La Crosse Commercial Design Standards Handbook. The project will consist of the construction of 2 multi-family apartments, 2 townhomes, and an activity center, along with concrete pavement, concrete walk, utilities, erosion control, stormwater management, and landscaping. Since the project will be multi-family the City of La Crosse Multi-Family Housing Design standards have been followed. A project location map is provided on Sheet G1-10 in the submitted plan set.

A geotechnical Investigation has not been completed for the project at this time. However previous geotechnical information is available for the portion of the site directly south of the proposed project. This report was prepared by Braun Intertec on August 15, 2019 and is included for reference. Soil evaluations indicate that the infiltration rates on site range from 0.5 inches/hour to 3.6 inches/hour based on the requirements of Wisconsin DNR Conservation Practice Standard 1002. Although infiltration rates are generally adequate for stormwater infiltration no infiltration has been included as part of the project since soil and groundwater contamination are present. Prior to construction, a soil management plan will be prepared for testing and handling of contaminated soil during excavation.

DESIGN STANDARDS

The existing site is currently vacant however was fully developed prior to 2008/2009. Therefore, the project will follow redevelopment standards from NR 151 as listed in the table below. Peak runoff from the site has also been evaluated to maintain or reduce based on current conditions as required by the City of La Crosse.

Table 1. Design Criteria

	Performance Standard	Requirements
Wisconsin Department of Natural Resources NR 151	Total Suspended Solids NR 151.122	Redevelopment – 40% TSS reduction from parking areas and roads.
	Peak Discharge NR 151.123	Exempt per NR 151.123(2)(b) – Redevelopment Site.
	Infiltration NR 151.124	Exempt per NR 151.124 (3)(b)3 – Redevelopment Site.
	Protective Areas NR 151.125	N/A – No protective areas within proposed site.
	Fueling & Vehicle Maintenance NR 151.126	N/A – No fueling or vehicle maintenance areas within proposed site.
	Location NR 151.127	BMP's will be located on site.
	Timing NR 151.128	BMP's will be installed prior to final stabilization.

The disturbed area for this project is 4.51 acres and will slightly decrease the onsite impervious area by 2.41 acres compared to current vacant conditions. Due to the fact that the disturbed area for this project is over an acre, a Wisconsin DNR WPDES permit will be required.

EXISTING CONDITIONS

The existing site is currently vacant grass area which has been raised up approximately 5 feet to get out of the floodplain. There are retaining walls along the north, south, and west side of the site. The existing drainage areas and ground cover are provided in the attachments.

PROPOSED CONDISTIONS

The proposed site has been separated into 20 drainage areas. Stormwater management for the site will be a combination of a proposed bio-filtration basin for the proposed Hagar Street, and an ADS MC-3500 Stormtech Chamber System with Isolator Row located under the parking lot for site stormwater runoff. These systems will provide both water quality and peak flow reduction. The proposed watersheds and ground cover are provided in the attachments.

CALCULATION SUMMARY

Water quantity calculations were completed using hydraulic models developed by utilizing the design data and the HydroCAD Version 10.10-4a computer modeling system. This was used to provide sizing and analysis for the bio-filtration basin and Stormtech Chambers. Hydrographs for existing and proposed scenarios were generated and routed through these models using the Atlas-14 rainfall distribution. The proposed runoff from the analyzed events is provided in the table below. The HydroCAD calculations for the proposed conditions are included in the attachments. The table below shows that the runoff from the site is reduced compared to existing conditions up to the 25-year storm event and the 100-year storm event is safely conveyed by the proposed stormwater management for the site.

Table 2. Runoff Calculations

Rainfall Event	Existing Conditions Peak Flow (CFS)	Proposed Conditions Peak Flow (CFS)
1-Year	1.43	1.35
2-Year	2.31	1.79
5-Year	4.16	3.35
10-Year	6.02	5.27
25-Year	9.02	9.00
100-Year	14.92	16.92

Water quality calculations were completed by utilizing the design data and the WinSLAMM Version 10.4.1 computer modeling system. This was used to provide analysis of the reduction in total suspended solids for the bio-filtration basin and Stormtech Chambers. Results show a reduction of 61.67% of the total suspended solids from the proposed site conditions using suitable parameters for the La Crosse area when compared to no controls. The WinSLAMM models show that the proposed conditions meet the City and State requirements to reduce total suspended solids by 40% from parking areas and road surfaces compared to no controls. The WinSLAMM Output Report with input parameters can be found in the attachments. A breakdown of each treatment device removal efficiency is also included on the output page.

A maintenance agreement with the City will be required for the underground chambers. A draft maintenance plan for the permanent stormwater management facilities on site can be found in the attachments. The proposed bio-filtration basin will be owned and maintained by the City so an agreement will not be needed.

Attachments:

- Red Cloud Site Plans
- Braun Intertec Geotechnical Report
- Existing Drainage Map
- Proposed Drainage Map
- HydroCAD Analysis
- WinSLAMM Report
- Draft Maintenance Plan

Geotechnical Evaluation Report

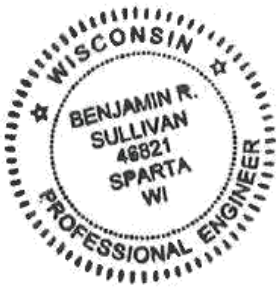
Proposed STAR Center Facility
1319 and 1325 St. Andrew Street
La Crosse, Wisconsin

Prepared for

STAR Association

Professional Certification:
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Wisconsin.

Benjamin R. Sullivan, PE
Project Engineer
License Number: 46821
August 15, 2019



Project B1907847

Braun Intertec Corporation

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August 15, 2019 Project B1907847

Ms. Virginia Wintersteen
STAR Association
PO Box 1024
La Crosse, Wisconsin 54602

Re: Geotechnical Evaluation
Proposed STAR Center Facility
1319 and 1325 St. Andrew Street
La Crosse, Wisconsin

Dear Ms. Wintersteen:

We are pleased to present this Geotechnical Evaluation Report for the proposed STAR Center Facility to be located at 1319 and 1325 St. Andrew Street in La Crosse, Wisconsin.

Thank you for making Braun Intertec your geotechnical consultant for this project. If you have questions about this report, or if there are other services that we can provide in support of our work to date, please contact Ben Sullivan or Brandon Wright at 608.781.7277 or by email at bsullivan@braunintertec.com or bwright@braunintertec.com.

Sincerely,

BRAUN INTERTEC CORPORATION

Benjamin R. Sullivan, PE
Project Engineer

Brandon K. Wright, PE
Senior Engineer

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Appendix

A. Introduction

A.1. Project Description

This Geotechnical Evaluation Report addresses the proposed design and construction of the STAR Center Facility to be located at 1319 and 1325 St. Andrew Street in La Crosse, Wisconsin. The project will include construction of an approximate 63,435 square-foot, one- and two-story, structural-steel framed building with structural masonry walls and concrete floor slabs. Construction will also include pavements for parking lots as well as associated utilities and storm water improvements. Table 1 provides the project details.

Table 1. Project Description

Aspect	Description
Proposed STAR Center Facility	▪ One- and two-story, structural steel-framed building with structural masonry walls and concrete floor slabs. ▪ Construction will also include an in-ground swimming pool and therapy pool supported on pier foundations with structural floor slabs. ▪ We have assumed that column loads will be 350 kips or less, walls loads will be 25 kips per lineal foot or less, and interior floor slabs will support 100 pounds per square foot or less. ▪ According to I & S Group, Inc. the preliminary finished floor elevation is reported to be 648.0 with fills of less than 1-foot expected to achieve finished floor elevation.
Pavement and Assumed Traffic Loads	▪ Bituminous flexible pavements for the parking lot. ▪ Concrete rigid pavements for access drives. ▪ Light-duty parking areas: 50,000 ESALs* ▪ Heavy-duty drive lanes: 250,000 ESALs* ▪ Cuts and fills of 2 feet or less assumed.

*Equivalent 18,000-lb single axle loads based on 20-year design for bituminous pavements and 35-year for concrete pavements.

The figure below shows an illustration of the proposed site layout.

Figure 1. Site Layout

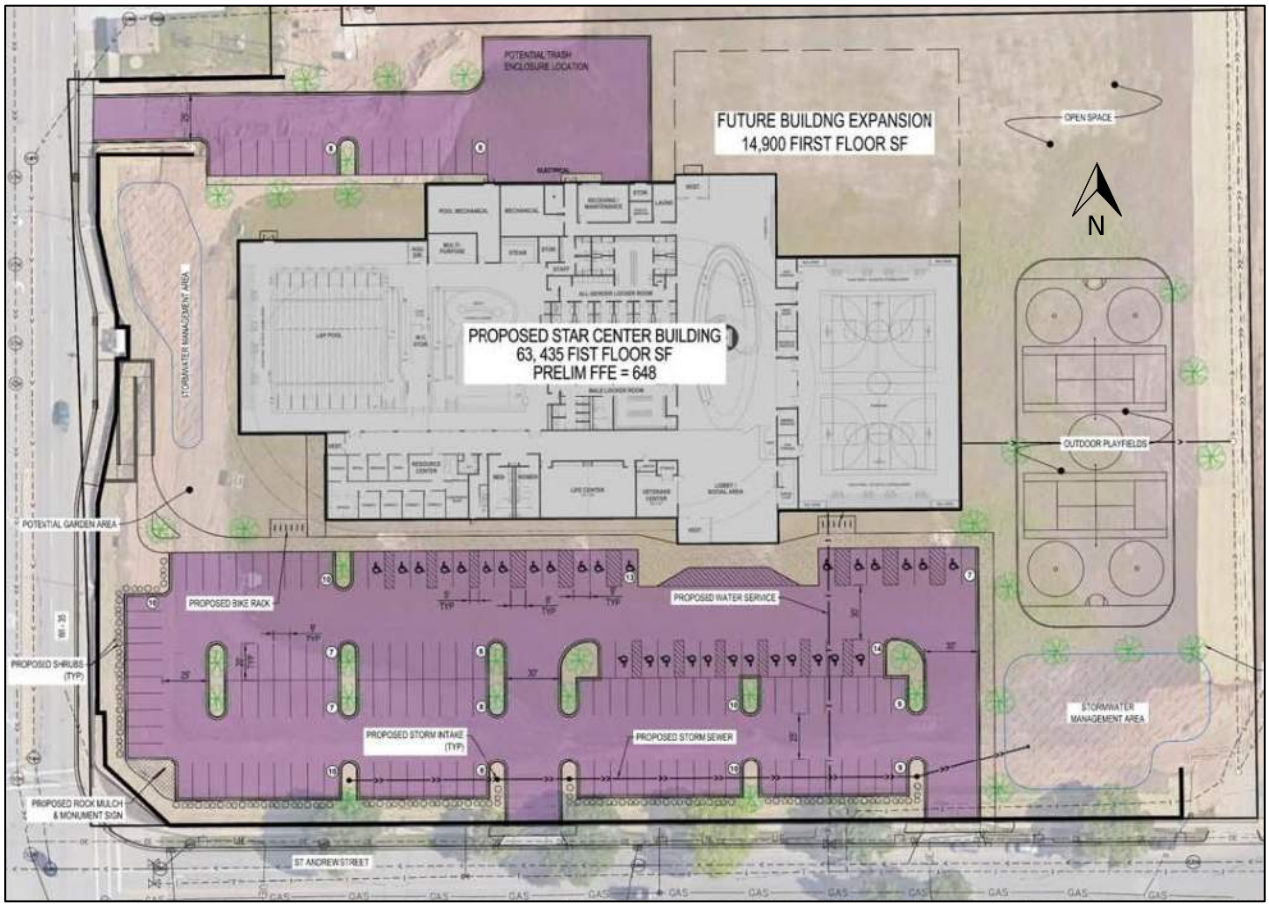


Figure provided by I & S Group, Inc., dated August 2, 2019.

We have described our understanding of the proposed construction and site to the extent others reported it to us. Depending on the extent of available information, we may have made assumptions based on our experience with similar projects. If we have not correctly recorded or interpreted the project details, the project team should notify us. New or changed information could require additional evaluation, analyses and/or recommendations.

A.2. Site Conditions and History

Based on our referenced documents and knowledge of the site, we understand the site was previously developed. The previous structure was demolished and backfilled. To our knowledge, earthwork associated with the backfill, including proper lift thickness, compaction effort, testing records, and

documentation of the backfill was not conducted during the demolition process. The site was then elevated above the flood plain by importing approximately 60,000 cubic yards of soil, bringing the site to the approximate elevation of 648. The additional fill brought to the site was tested for in-place density and level of compaction.

The site currently exists as a vacant lot with surficial vegetation. Based on elevations at the boring locations, the site is relatively flat and has less than 1-foot of relief. The photograph below provides an aerial image of the site.

Photograph 1. Aerial Photograph of the Site

Photograph provided by Google Earth, dated September 28, 2015.

A.3. Purpose

The purpose of our geotechnical evaluation was to characterize subsurface geologic conditions at selected exploration locations, evaluate their impact and provide geotechnical recommendations for the design and construction of the proposed building and associated site improvements.

A.4. Background Information and Reference Documents

We reviewed the following information:

- Historical aerial photographs and topographic maps of the site.
- Geologic maps of La Crosse County, Wisconsin.
- Preliminary site layout plan prepared by I & S Group, Inc., dated August 2, 2019.
- Proposed concept design prepared by I & S Group, River Architects, and KPF, dated August 2, 2019.
- Final site grading plan prepared by Cedar Corporation, dated September 2015.
- Previous Geotechnical Evaluation Report prepared by Braun Intertec, project number B1407491, dated December 17, 2014.
- Addendum to Final Case Closure with Continuing Obligations Letter Dated January 30, 2014; Former Trane Company Plant #6 Located at 606 George Street/1319 St. Andrew Street (f/k/a 1305 St. Andrew Street) La Crosse, Wisconsin WDNR BRRT Activity # 02-32-000195 & # 07-32-547753, dated April 30, 2015.
- Communications with River Architects, Inc., and I & S Group, Inc. regarding project details.

Our referenced documents and past project experience in the general area indicate that the site is underlain with engineered fill over uncontrolled fill and undocumented fill over buried topsoil and alluvial sand soils.

A.5. Scope of Services

We performed our scope of services for the project in accordance with our Proposal QTB104228 to STAR Association, dated July 17, 2019, who authorized us to proceed. The following list describes the geotechnical tasks completed in accordance with our authorized scope of services.

- Reviewing the background information and reference documents previously cited.

- Staking and clearing the exploration location of underground utilities. I & S Group, Inc. selected, and we staked the boring exploration locations. We acquired the surface elevations and locations with GPS technology using the State of Minnesota's permanent GPS base station network. The Soil Boring Location Sketch included in the Appendix shows the approximate locations of the borings.

- Performing six (6) standard penetration test (SPT) borings, denoted as ST-1 to ST-6, to nominal depths of 15 to 30 feet below grade across the site.

- Performing laboratory testing on select samples to aid in soil classification and engineering analysis.

- Preparing this report containing a boring location sketch, logs of soil borings, a summary of the soils encountered, results of laboratory tests, and recommendations for structure and pavement subgrade preparation and the design of foundations, floor slabs, below-grade walls, exterior slabs, pavements, underground utilities, and stormwater improvements.

Our scope of services did not include environmental services or testing, and we did not train the personnel performing this evaluation to provide environmental services or testing. We can provide these services or testing at your request.

B. Results

B.1. Geologic Overview

We based the geologic origins used in this report on the soil types, laboratory testing, and available common knowledge of the geological history of the site. Because of the complex depositional history, geologic origins can be difficult to ascertain. We did not perform a detailed investigation of the geologic history for the site.

B.2. Previous Geotechnical Information

We performed six (6) soil borings at this site in October of 2014 and completed a Geotechnical Evaluation Report for a proposed site redevelopment. The previous evaluation was completed prior to the additional fill brought to the site to raise site grades above the flood plain to elevation 648. Those borings encountered approximately 4 to 9 feet of uncontrolled and undocumented fill that contained pockets of debris including concrete, glass, bricks, and large voids over buried topsoil. Below the fill and buried topsoil, the borings encountered alluvial sand soils.

B.3. Boring Results

Table 2 provides a summary of the soil boring results, in the general order we encountered the strata. Please refer to the Log of Boring sheets in the Appendix for additional details. The Descriptive Terminology sheets in the Appendix include definitions of abbreviations used in Table 2.

Table 2. Subsurface Profile Summary*

Strata	Soil Type - ASTM Classification	Range of Penetration Resistances	Commentary and Details
Topsoil Fill	SM	---	▪ Topsoil fill was encountered at the ground surface in all borings. ▪ The topsoil fill consisted of silty sand (SM) with roots that was dark brown in color and was moist. ▪ Thicknesses at the boring locations varied from less than ½-foot to 2 feet.

Strata	Soil Type - ASTM Classification	Range of Penetration Resistances	Commentary and Details
Engineered Fill	SP, SP-SM	9 to 42 BPF	▪ Engineered fill was encountered below the topsoil in all borings and extended to depths of about 4 to 5 feet. ▪ This fill was placed to elevate the site above the flood plain and has been tested for in-place density and level of compaction during placement. ▪ The fill consisted of fine- to medium-grained poorly graded sand (SP) and poorly graded sand with silt (SP-SM) that was brown and was moist.
Undocumented Fill	SP, SP-SM	4 to 28 BPF	▪ Fill was encountered in all borings below the topsoil fill and engineered fill, and extended to depths of approximately 8 to 17 feet. ▪ General penetration resistance suggests the fill received variable compaction. ▪ The fill consisted of fine- to medium-grained poorly graded sand (SP), poorly graded sand with silt (SP-SM), and silty sand (SM) that was light brown, brown, and yellowish brown in color and was moist to wet. ▪ The fill contained various amounts of gravel.
Alluvial	SP, SP-SM, SM	3 to 21 BPF	▪ Alluvial soils were encountered in all borings below the topsoil fill and fill and extended to the termination depths of our borings. ▪ Penetration resistance testing in the sandy alluvial soils indicates they are very loose to medium dense in relative density. ▪ Consisted of fine- to coarse-grained poorly graded sand (SP), poorly graded sand with silt (SP-SM), and silty sand (SM) that contained with traces of gravel that was brown and gray in color. ▪ Moisture condition was wet. ▪ Trace organics encountered in Boring ST-4 at a depth of 12 to 14 feet.

*Abbreviations defined in the attached Descriptive Terminology sheets.

B.4. Groundwater

Table 3 summarizes the depths where we observed groundwater; the attached Log of Boring sheets in the Appendix also include this information and additional details. Corresponding groundwater elevations were determined from comparisons of the measured/estimated depths to groundwater and surface elevations and were rounded to the nearest ½-foot.

Table 3. Groundwater Summary

Location	Surface Elevation	Measured or Estimated Depth to Groundwater (ft)	Corresponding Groundwater Elevation (ft)
ST-1	647.7	11	636 ½
ST-2	647.8	12	636
ST-3	647.7	12	635 ½
ST-4	648.0	11	637
ST-5	647.6	9 ½	638
ST-6	647.9	10	638

At the time of our observation, we observed groundwater at depths of 9 ½ to 12 feet as our borings were advanced. These depths correspond to elevation 635 ½ to 638. Seasonal and annual fluctuations of groundwater should also be anticipated.

B.5. Environmental Discussion

We understand contaminated soil, slag, and rubble were identified in Wisconsin Department of Natural Resources (WDNR) approved NR700 Remedial Action Plan. The cleanup site is register as WDNR BRRTS #02-32-000195 and #07-32-547753. Continuing obligations remain associated with the site. It is imperative that a soil management plan be developed and implemented prior to any earthwork taking placed in the impacted areas. The soil management plan will provide direction to properly handle all impacted soils properly during all aspects of the new construction. We can be contacted to help the project team with the soil management plan prior to construction.

B.6. Laboratory Test Results

Overall, the soils encountered within our borings at this site consisted of sandy soils. These soils are not expansive. More information, soil characteristics, and test results are presented in the following sections.

B.6.a. Mechanical Sieve Analysis Tests

We performed a mechanical sieve analysis (ASTM D6913) on a selected sample from Boring ST-3 at a depth of 20 feet to assist in classification. The test indicated the sample tested classified as poorly graded sand (SP). The Log of Boring sheets present the percent passing a #200 sieve result and the Appendix includes a graph showing the results of the mechanical sieve analysis.

B.6.b. Moisture Content and Particles Passing a #200 Sieve Tests

Results of our laboratory tests for soil classification, moisture content, and particles passing a #200 sieve are presented below in Table 4.

Table 4. Laboratory Classification Test Results

Location	Sample Depth (ft)	Classification	Moisture Content (w, %)	Percent Passing a #200 Sieve
ST-1	5	FILL: Poorly Graded Sand (SP)	8	5
ST-2	6	FILL: Poorly Graded Sand (SP)	8	5
ST-3	20	Poorly Graded Sand (SP)	23	1
ST-4	2 ½	FILL: Poorly Graded Sand with Silt (SP-SM)	9	9
ST-5	2	FILL: Poorly Graded Sand with Silt (SP-SM)	9	10

C. Basis for Recommendations

C.1. Design Considerations

C.1.a. Introduction

The site contains fill that extends to depths of 8 to 17 feet across the site, corresponding to elevation 631 to 640. The fill was noted to have variable compaction and consistency. Based on previous site explorations, buried topsoil is also likely present beneath the fill. These materials are not suitable for

support of the proposed building. To limit post-construction settlement, the building should be supported on improved subgrades or intermediate foundation systems. Removal and replacement of the soils will require installation of dewatering systems and careful handling of contaminated fill soils. Installation of intermediate foundation systems, however, would limit the need for dewatering systems and reduce the handling and amount of disturbance to the contaminated soils. After discussing this with I & S Group, Inc. and River Architects, we developed our recommendations for improving subgrades by installation of rammed aggregate piers.

C.1.b. Building Support

As mentioned above, to reduce the risk of future excessive building and site settlements it is our opinion the building will need to be supported on intermediate foundations. The proposed building foundations, pools, and interior slabs should be supported on rammed aggregate piers.

Alternatively, if the owner is willing to accept the risk of some settlement, then the fill below the interior slabs could be surface-compacted and left in place provided the building foundations and pool areas are supported on rammed aggregate piers. The amount of settlement associate with this approach is dependent on the amount of compacted soil below the structure and the composition of the existing fill but is expected to be less than 1-inch under the assumed loads. Additional settlements may occur if undetected loose fill, deleterious material, or voids are present within the fill that were not detected by the soil borings.

There is some risk associated with this approach. The recommendations and parameters discussed below are based on the conditions encountered in our borings and our experiences on similar sites. Please note that actual settlements will vary and could be much higher, if voids or compressible materials are concealed by the fill. The owner needs to accept the additional risk of differential settlement by leaving the fill in place, in return for the cost savings. These risks can be reduced through additional testing and observations but cannot be eliminated unless the fill is removed in its entirety, or an intermediate foundation system is used to support all components of the proposed building.

C.1.c. Swimming Pools and Below-Grade Walls

Swimming pools and below-grade walls should be backfilled with medium- to coarse-grained sand or gravel to limit buildup of hydrostatic pressure on the walls and to promote drainage of subsurface and accumulated water to a drain tile or sump pump.

C.1.d. Pavements

Areas receiving new pavements should be prepared by removing the topsoil fill and surficial vegetation from below the proposed pavement subgrade elevations and be replaced with granular fill. Prior to elevating or placing additional fill required, the exposed subgrade soils should be surface-compacted to densify and enhance uniformity of the exposed soils. The fill present below these materials appeared to be free of debris and can be left in place provided it is evaluated for suitability at the time of construction. If the fill is considered suitable, it should be surface-compacted. If the fill is unsuitable, additional sub-cuts and subgrade improvements may be required. A proofroll should also be performed after the aggregate base material is in place, and prior to placing bituminous or concrete pavement.

C.2. Construction Considerations

From a construction perspective, the project team should also be aware that:

- Excavations will penetrate the groundwater surface at a depth of approximately 9 ½ to 12 feet. Dewatering will be required for excavations that extent below elevation 638 to facilitate an evaluation of the geologic materials exposed in the excavation sides and bottoms, and the placement and compaction of backfill.

- The on-site existing fill can be considered for re-use as backfill and additional required fill provided debris and organic soils (if encountered) is first removed. The alluvial soils can also be considered for reuse as backfill and additional required fill.

- Imported material needed to replace excavation spoils or balance cut and fill quantities, should consist of sandy soils having less than 20 percent of the particles by weight passing a #200 sieve. Soil needed to facilitate drainage should consist of sand and gravel soils with less than 5 percent passing a #200 sieve.

D. Recommendations

D.1. Earthwork

D.1.a. Building Subgrade Preparation

We recommend removing the topsoil fill and surficial vegetation from below the proposed building footprint and their oversize areas. To provide support for construction equipment for installation of the rammed aggregate piers, we recommend the building pad be filled to subgrade elevation with granular soils having less than 20 percent passing a #200 sieve followed by 6 inches of aggregate base.

A geotechnical representative should observe the excavations to make the necessary field judgments regarding the suitability of the exposed soils.

D.1.b. Excavated Slopes

Based on the borings, we anticipate on-site soils in excavations will consist of sandy fill and alluvial sand soils. These soils are considered Type C Soil under OSHA (Occupational Safety and Health Administration) guidelines. OSHA guidelines indicate unsupported excavations in Type C soils should have a gradient no steeper than 1 ½H:1V. Slopes constructed in this manner may still exhibit surface sloughing. OSHA requires an engineer to evaluate slopes or excavations over 20 feet in depth.

An OSHA-approved qualified person should review the soil classification in the field. Excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, “Excavations and Trenches.” This document states excavation safety is the responsibility of the contractor. The project specifications should reference these OSHA requirements.

D.1.c. Excavation Dewatering

We recommend removing groundwater from the excavations with well points. Dewatering of high-permeability soils (e.g., sands) from within the excavation with conventional pumps has the potential to loosen the soils, due to upward flow. A dewatering contractor should develop a dewatering plan; the design team should review this plan.

D.1.d. Surface Compaction

Due to the areas of loose sandy fill soils below the proposed building and pavement areas, we recommend that exposed soils be surface-compacted prior to placing additional required fill and slabs for

the proposed building and pavement areas. This will densify and enhance uniformity of the exposed soils.

D.1.e. Engineered Fill Materials and Compaction

We recommend spreading fill in loose lifts of approximately 12 inches thick. Table 5 below contains our recommendations for fill materials, gradation, and minimum compaction level for compacted fills.

Table 5. Soil for Fill Description*

Fill Classification	Locations to Be Used	Fill Source and Soil Descriptions	Gradation	Relative Compaction, percent (ASTM D1557 – Modified Proctor)
Structural fill	▪ General site grading ▪ Elevating the building pad to finished floor elevation ▪ Interior and exterior foundation wall backfill ▪ Below interior and exterior slabs	On-site fill free of debris or imported sand and gravel consisting of GP, GW, SW, SP, SP-SM, SM	100% passing 2-inch sieve <20% passing #200 sieve < 2% Organic Content (OC)	95
Non-frost-susceptible fill	Non-frost-susceptible below building entry slabs	Imported sand or gravel: GP, GW, SP, SW	100% passing 1-inch sieve < 50% passing #40 sieve < 5% passing #200 sieve < 2% OC	95
Retained fill	Drainage layer behind below-grade walls and retaining walls	Imported sand or gravel: GP, GW, SP, SW	100% passing 3-inch sieve < 5% passing #200 sieve < 2% OC	95
	Re-placed or retained on-site soils	On-site soils or imported sand and gravel consisting of GP, GW, SW, SP, SP-SM, SM	100% passing 2-inch sieve <20% passing #200 sieve < 2% OC	95
Non-structural fill	Below landscaped surfaces, where subsidence is not a concern	On-site soils and imported soils	100% passing 6-inch sieve < 10% OC	90

* More select soils comprised of coarse sands with < 5% passing #200 sieve may be needed to accommodate work occurring in periods of wet or freezing weather.

Sand soil with less than 12 percent particles by weight passing a number 200 sieve may be compacted without moisture conditioning, although, some water may be needed to achieve compaction. Silty sand,

soils used as backfill should be moisture conditioned to between 3 percent below to 3 percent above their optimum moisture content.

The project documents should not allow the contractor to use frozen material as fill or to place fill on frozen material. Frost should not penetrate under foundations or slabs during construction.

We recommend performing density tests in fill to evaluate if the contractors are effectively compacting the soil and meeting project requirements.

D.2. Foundation Support on Rammed Aggregate Piers

D.2.a. Rammed Aggregate Piers

Based on the anticipated depth of excavations needed to remove the existing fill from the proposed building footprint, it appears that conventional soil corrections would add a significant cost to the project. Thus, we recommend performing ground improvements with rammed aggregate piers.

A subgrade improved with rammed aggregate piers will reduce the potential for detrimental settlement associated with the existing fill to occur, provide adequate bearing capacity, eliminate the need for deep excavations, reduce the need to dewatering excavations, reduce the need to handle contaminated soils, reduce impacts to adjacent site features, and reduce the volume of subgrade soils disturbed at this site.

Different contractors use varying techniques to construct rammed aggregate piers, but generally consist of excavating soil from a hole with an auger or vibrating a probe into the ground, and then building a column of clean, open-graded aggregate. The contractor constructs the pier by placing the aggregate in lifts from the bottom of the pier and compacting each lift before placing aggregate for the subsequent lift. The vibratory energy, and sometimes ramming action, causes the aggregate to interlock, forming a stiff pier that provides soil reinforcement and increases shear resistance. Due to the many variations in techniques, we recommend using performance-based specifications with design-build contracting. We recommend requiring the contractor to have at least five years of experience in performing this work, and to demonstrate performing the proposed protection system(s) on at least three previous projects of similar size and scope. The specifications should require the design engineer be licensed in the project state. We can assist you with developing a list of pre-qualified contractors prior to bidding or with reviewing contractor experience as part of the bidding process.

Rammed aggregate piers are a Special Inspection item in accordance with Chapter 17 of the IBC. The observations should include installed length, consistency of soil profile with the geotechnical evaluation confirmation of the materials, and confirmation of installation techniques.

We recommend installing rammed aggregate piers under both foundations and pools for the building. The rammed aggregate piers should extend through the existing fill to bear on the alluvial sand soils at depth.

D.2.b. Spread Footing Design Parameters

Table 6 below contains our design parameters for foundations supported on rammed aggregate piers.

Table 6. Recommended Spread Footing Design Parameters on Rammed Aggregate Piers

Item	Description
Maximum net allowable bearing pressure (psf) Interior column pad footings Perimeter strip footings	Determined by aggregate pier designer.
Minimum embedment below final exterior grade for heated structures (inches)	48
Minimum embedment below final exterior grade for unheated structures or for footings not protected from freezing temperatures during construction (inches)	60
Total and Differential settlement	Typically, less than 1-inch and ½-inch, respectively. *

* Actual settlement amounts will depend on final loads, foundation layout, and design criteria from aggregate pier designer.

D.3. Interior Slabs

D.3.a. Subgrade Modulus

We recommend the interior slabs be supported on rammed aggregate piers that extend through the existing fill to bear on the alluvial sand soils at depth. The aggregate pier designer will provide a modulus of subgrade reaction for slab design based on the pier layout and load transfer platform design.

Alternatively, if the owner is willing to accept the risk of some settlement, then interior slabs could be supported on the existing fill provided it is surface-compacted prior to place additional fill required or

concrete. Interiors slabs supported on surface-compacted engineered fill may be designed using a modulus of subgrade reaction, k, of 200 pounds per square inch per inch of deflection (pci). If the slab design requires placing 6 inches of compacted crushed aggregate base immediately below the slab, the slab design may increase the k-value by 50 pci. We recommend that the aggregate base materials be free of bituminous. In addition to improving the modulus of subgrade reaction, an aggregate base facilitates construction activities and is less weather sensitive.

There is an elevated risk of settlement with this approach based on the nature of the fill and that the fill could contain voids or compressible materials. The owner needs to accept the additional risk of differential settlement by leaving a portion of the fill in place, in return for the cost savings. These risks can be reduced through additional testing and observations but cannot be eliminated unless the interior slabs are supported on rammed aggregate piers.

D.3.b. Moisture Vapor Protection

Excess transmission of water vapor could cause floor dampness, certain types of floor bonding agents to separate, or mold to form under floor coverings. If project planning includes using floor coverings or coatings, we recommend placing a vapor retarder or vapor barrier immediately beneath the slab. We also recommend consulting with floor covering manufacturers regarding the appropriate type, use and installation of the vapor retarder or barrier to preserve warranty assurances.

D.3.c. Water Table Separation

We recommend maintaining a 5-foot separation from anticipated long-term water levels. This separation will reduce the risk of seepage, buoyant forces, and other water related issues.

D.4. Swimming Pool and Therapy Pool

D.4.a. Swimming Pool and Therapy Pool Support

We understand the swimming pool and therapy pool will be supported on rammed aggregate piers with a structural floor slab around the pools.

D.4.b. Hydrostatic Pressure

The swimming pool and therapy pool should be designed for hydrostatic uplift up to elevation 641 (this is the anticipated groundwater elevation due to seasonal fluctuation).

We recommend the fill located within 5 feet of the walls consist of free-draining fill with less than 5 percent passing a #200 sieve. This material will control lateral pressures on the wall. If final design uses non-sand material for fill, project planning should account for the following items:

- Other fill material may result in higher lateral pressure on the wall.
- Other fill material may be more difficult to compact.
- Post-construction consolidation of other fill material may result in settlement-related damage to the structures or slabs supported on the fill.

D.4.c. Configuring and Resisting Lateral Loads

The swimming pool and therapy pool wall design can use at-rest earth pressure conditions. Table 7 presents our recommended equivalent fluid pressures for wall design of active, at-rest, and passive earth pressure conditions. The table also provides recommended wet unit weights and internal friction angles. Designs should also consider the slope of any fill and dead or live loads placed behind the walls within a horizontal distance that is equal to the height of the walls. Our recommended values assume the wall design provides drainage, so water cannot accumulate behind the walls. The construction documents should clearly identify what soils the contractor should use for the fill of walls.

Table 7. Recommended Pool Wall Design Parameters – Drained Conditions

Retained Soil	Wet Unit Weight (pcf)	Friction Angle (degrees)	Active Equivalent Fluid Pressure* (pcf)	At-Rest Equivalent Fluid Pressure* (pcf)	Passive Equivalent Fluid Pressure* (pcf)
Free-draining fill	120	32	37	56	390

* Based on Rankine model for soils in a region behind the wall extending at least 2 horizontal feet beyond the bottom outer edges of the wall footings and then rising up and away from the wall at an angle no steeper than 60 degrees from horizontal.

The values presented in the table above are un-factored.

D.5. Below-Grade Walls

D.5.a. Below-Grade Wall Support

We understand the below-grade walls for elevator pits and pool maintenance room will be supported by rammed aggregate piers with a concrete floor slab below.

D.5.b. Hydrostatic Pressure

Below-grade walls that extent below the groundwater table should be designed for hydrostatic uplift up to elevation 641 (this is the anticipated groundwater elevation due to seasonal fluctuation).

We recommend the fill located within 5 feet of the walls consist of free-draining fill with less than 5 percent passing a #200 sieve. This material will control lateral pressures on the wall. If final design uses non-sand material for fill, project planning should account for the following items:

- Other fill material may result in higher lateral pressure on the wall.
- Other fill material may be more difficult to compact.
- Post-construction consolidation of other fill material may result in settlement-related damage to the structures or slabs supported on the fill.

D.5.c. Drainage Control and Waterproofing

We recommend below-grade walls be backfilled with medium- to coarse-grained sand or gravel to limit buildup of hydrostatic pressure on the walls. We also recommend general waterproofing of below-grade walls that surround occupied or potentially occupied areas because of the potential cost impacts related to seepage after construction is complete.

D.5.d. Configuring and Resisting Lateral Loads

Below-grade wall design can use at-rest earth pressure conditions. Table 8 presents our recommended equivalent fluid pressures for wall design of active, at-rest, and passive earth pressure conditions. The table also provides recommended wet unit weights and internal friction angles. Designs should also consider the slope of any fill and dead or live loads placed behind the walls within a horizontal distance that is equal to the height of the walls. Our recommended values assume the wall design provides drainage, so water cannot accumulate behind the walls. The construction documents should clearly identify what soils the contractor should use for the fill of walls.

Table 8. Recommended Below-Grade Wall Design Parameters – Drained Conditions

Retained Soil	Wet Unit Weight (pcf)	Friction Angle (degrees)	Active Equivalent Fluid Pressure* (pcf)	At-Rest Equivalent Fluid Pressure* (pcf)	Passive Equivalent Fluid Pressure* (pcf)
Free-draining fill	120	32	37	56	390

* Based on Rankine model for soils in a region behind the wall extending at least 2 horizontal feet beyond the bottom outer edges of the wall footings and then rising up and away from the wall at an angle no steeper than 60 degrees from horizontal.

Sliding resistance between the bottom of the footing and the soil can also resist lateral pressures. We recommend assuming a sliding coefficient equal to 0.40 between the concrete and soil.

The values presented in this section are un-factored.

D.6. Pavements and Exterior Slabs

D.6.a. Pavement Subgrade Preparation

We recommend areas receiving new pavement be prepared by removing the topsoil fill and surficial vegetation from below the proposed pavement subgrade elevations and be replaced with granular fill. Prior to elevating or placing additional fill required, we recommend surface-compacting the exposed subgrade soils to densify and enhance uniformity of the exposed soils. The fill present below these materials appeared to be free of debris and could be left in place provided it is evaluated for suitability at the time of construction. If the fill is considered suitable, it should be surface compacted. If the fill is unsuitable, additional sub-cuts and subgrade improvements may be required.

We also recommend performing a proofroll with a fully loaded tandem-axle truck after the aggregate base material is in place, and prior to placing bituminous or concrete pavement. The contractor should correct areas that display excessive yielding or rutting during the proofroll, as determined by the geotechnical representative. Possible options for subgrade correction include moisture conditioning and re-compaction or sub-cutting and replacement with soil or crushed aggregate.

D.6.b. Pavement and Exterior Slab Design Sections

Our scope of services for this project did not include laboratory tests on subgrade soils to determine a California Bearing Ratio (CBR) value for pavement design. Based on our experience with sand soils anticipated at the pavement subgrade elevation, we recommend pavement design assume a CBR-value of 15. Note the contractor may need to perform limited removal of unsuitable or less suitable soils and

surface compact subgrade soils to achieve this value. Table 9 provides recommended bituminous pavement sections, based on the soils estimated support and assumed traffic loads.

Table 9. Recommended Bituminous Pavement Sections

Pavement Material	Light Duty Pavements Thickness/Preparations	Heavy Duty Pavements Thickness/Preparations
Minimum Bituminous Thickness (in.)	3	4
Minimum Aggregate Base Thickness (in.)	8	12
Subgrade Preparation	Surface compact, then proofroll after placement of aggregate base to locate loose or weak subgrade materials prior to placement of pavement materials.	

For concrete pavements based upon the aforementioned traffic loads and an estimated modulus of subgrade reaction (k) of 200 pci, we recommend light- and heavy-duty pavement section as shown in Table 10 below.

Table 10. Recommended Concrete Pavement Sections

Pavement Material	Light Duty Pavements Thickness/Preparations	Heavy Duty Pavements Thickness/Preparations
Minimum Concrete Thickness (in.)	5	6 ½
Minimum Aggregate Base Thickness (in.)	4	4
Subgrade Preparation	Surface compact, then proofroll after placement of aggregate base to locate loose or weak subgrade materials prior to placement of pavement materials.	

D.6.c. Bituminous Pavements

Appropriate mix designs are critical to the performance of flexible pavements. We recommend utilizing hot mix asphalt meeting the specifications of Wisconsin Department of Transportation (WisDOT) Section 460. We recommend utilizing a nominal 12.5 mm gradation for the base course and a nominal 9.5 mm gradation for the surface course as defined in Table 460-1 in Section 460.2.2.3. We recommend the Performance Graded Asphalt cement be a PG 58-28 in the lower layer and a PG 58-28 in the upper layer.

D.6.d. Concrete Pavements

We recommend specifying concrete for pavements that has a minimum 28-day compressive strength of 4,000 psi, and a modulus of rupture (M_r) of at least 600 psi. We also recommend Type I cement meeting the requirements of ASTM International C 150. We recommend specifying 5 to 7 percent entrained air

for exposed concrete to provide resistance to freeze-thaw deterioration. We also recommend using a water/cement ratio of 0.45 or less for concrete exposed to deicers.

We assumed the concrete pavement sections in Table 10 will have edge support. We recommend placing an aggregate base below the pavement to provide a suitable subgrade for concrete placement, reduce faulting and help dissipate loads. Appropriate mix designs, panel sizing, jointing, doweling and edge reinforcement are critical to performance of rigid pavements. We recommend you contact your civil engineer to determine the final design or consult with us for guidance on these items.

D.6.e. Pavement Materials and Compaction

Table 11 below contains our recommendations for fill materials, minimum compaction level, and moisture content for compacted fills.

Table 11. Recommended Pavement Materials and Compaction

Locations to Be Used	Fill Source and Soil Descriptions	Gradation	Relative Compaction, percent (ASTM D1557 – Modified Proctor)	Moisture Content Variance from Optimum, percentage points
Dense Graded Base	Imported aggregate	WisDOT Standard Spec 305 Dense Graded Base	95	-3 to +3 for aggregate base
Granular Subbase	Imported sand and gravel	WisDOT Standard Spec 209 Grade 1 or Grade 2	95	-6 to +3 for granular subbase
Pavements subgrades and grading	On-site soils	100% passing 3-inch sieve < 2% OC	95	-6 to +3 for pavement subgrade

D.6.f. Performance and Maintenance

We based the above pavement designs on a 20-year performance life for bituminous and a 35-year life for concrete. This is the amount of time before we anticipate the pavement will require reconstruction. This performance life assumes routine maintenance, such as seal coating and crack sealing. The actual pavement life will vary depending on variations in weather, traffic conditions and maintenance.

It is common to place the binder course of bituminous and then delay placement of wear course. For this situation, we recommend evaluating if the reduced pavement section will have sufficient structure to support construction traffic.

Many conditions affect the overall performance of the exterior slabs and pavements. Some of these conditions include the environment, loading conditions and the level of ongoing maintenance. With

regard to bituminous pavements in particular, it is common to have thermal cracking develop within the first few years of placement and continue throughout the life of the pavement. We recommend developing a regular maintenance plan for filling cracks in exterior slabs and pavements to lessen the potential impacts for cold weather distress due to frost heave or warm weather distress due to wetting and softening of the subgrade.

D.7. Utilities

D.7.a. Subgrade Stabilization

Earthwork activities associated with utility installations located inside the building area should adhere to the recommendations in Section D.1.

For exterior utilities, we anticipate the soils at typical invert elevations will be suitable for utility support. However, if construction encounters unfavorable conditions such as soft clay, organic soils or perched water at invert grades, the unsuitable soils may require some additional sub cutting and replacement with sand or crushed rock to prepare a proper subgrade for pipe support. Project design and construction should not place utilities within the 1H:1V oversizing of foundations.

D.7.b. Corrosion Potential

A majority of the soil borings indicated the site predominantly consists of sandy soils. We consider these soils non- to slightly-corrosive to metallic conduits. If utilities extend through clay soils, we recommend bedding the utilities in sandy soil free of any clay lumps or constructing the utilities with non-corrosive materials.

D.8. Storm Water

Borings ST-2, ST-3, ST-5, and ST-6 were drilled and sampled continuously to depths of approximately 15 feet near the proposed storm water drainage system locations. The borings encountered fill and alluvial soils consisting of fine- to coarse-grained loamy sand, sandy loam, and sand. Groundwater was encountered at depths of 9 ½ to 12 feet as our borings were advanced. These depths correspond to elevation 635 ½ to 638 and are the elevations of the limiting factor per the Wisconsin DNR. Seasonal and annual fluctuations of groundwater should also be anticipated.

Infiltration rates associated with the soils present at this location are included on the Soil Evaluation – Storm form included in the Appendix of this report. The reported infiltration rates were determined by

referencing Table 2 in the Wisconsin DNR Storm Water Infiltration Technical Standard 1002, dated September 2017.

Fine-grained soils (silts and clays), topsoil or organic matter that mixes into or washes onto the soil will lower the permeability. The contractor should maintain and protect infiltration areas during construction. Furthermore, organic matter and silt washed into the system after construction can fill the soil pores and reduce permeability over time. Proper maintenance is important for long-term performance of infiltration systems.

This geotechnical evaluation does not constitute a review of site suitability for storm water infiltration or evaluate the potential impacts, if any, from infiltration of large amounts of storm water.

D.9. Equipment Support

The recommendations included in the report may not be applicable to equipment used for the construction and maintenance of this project. We recommend evaluating subgrade conditions in areas of shoring, scaffolding, cranes, pumps, lifts and other construction equipment prior to mobilization to determine if the exposed materials are suitable for equipment support or require some form of subgrade improvement. We also recommend project planning consider the effect that loads applied by such equipment may have on structures they bear on or surcharge – including pavements, buried utilities, below-grade walls, etc. We can assist you in this evaluation.

E. Procedures

E.1. Penetration Test Borings

We drilled the penetration test borings with a truck-mounted core and auger drill equipped with hollow-stem auger. We performed the borings in general accordance with ASTM D6151 taking penetration test samples at 2 ½- or 5-foot intervals in general accordance to ASTM D1586. The boring logs show the actual sample intervals and corresponding depths.

We sealed penetration test boreholes meeting the Wisconsin Administrative Code NR 141.25 criteria using 3/8-inch bentonite chips. A copy of the sealing record can be obtained upon request.

E.2. Exploration Logs

E.2.a. Log of Boring Sheets

The Appendix includes Log of Boring sheets for our penetration test borings. The logs identify and describe the penetrated geologic materials and present the results of penetration resistance and other in-situ tests performed. The logs also present the results of laboratory tests performed on penetration test samples and groundwater measurements. The Appendix also includes a Fence Diagram intended to provide a summarized cross-sectional view of the soil profile across the site.

We inferred strata boundaries from changes in the penetration test samples and the auger cuttings. Because we did not perform continuous sampling, the strata boundary depths are only approximate. The boundary depths likely vary away from the boring locations, and the boundaries themselves may occur as gradual rather than abrupt transitions.

E.2.b. Geologic Origins

We assigned geologic origins to the materials shown on the logs and referenced within this report, based on: (1) a review of the background information and reference documents cited above, (2) visual classification of the various geologic material samples retrieved during the course of our subsurface exploration, (3) penetration resistance testing performed for the project, (4) laboratory test results, and (5) available common knowledge of the geologic processes and environments that have impacted the site and surrounding area in the past.

E.3. Material Classification and Testing

E.3.a. Visual and Manual Classification

We visually and manually classified the geologic materials encountered based on ASTM D2488. When we performed laboratory classification tests, we used the results to classify the geologic materials in accordance with ASTM D2487. The Appendix includes a chart explaining the classification system we used.

E.3.b. Laboratory Testing

The exploration logs in the Appendix note most of the results of the laboratory tests performed on geologic material samples. The remaining laboratory test results follow the exploration logs. We performed the tests in general accordance with ASTM procedures.

E.4. Groundwater Measurements

The drillers checked for groundwater while advancing the penetration test borings, and again after auger withdrawal. We then filled the boreholes or allowed them to remain open for an extended period of observation, as noted on the boring logs.

F. Qualifications

F.1. Variations in Subsurface Conditions

F.1.a. Material Strata

We developed our evaluation, analyses and recommendations from a limited amount of site and subsurface information. It is not standard engineering practice to retrieve material samples from exploration locations continuously with depth. Therefore, we must infer strata boundaries and thicknesses to some extent. Strata boundaries may also be gradual transitions, and project planning should expect the strata to vary in depth, elevation and thickness, away from the exploration locations.

Variations in subsurface conditions present between exploration locations may not be revealed until performing additional exploration work or starting construction. If future activity for this project reveals any such variations, you should notify us so that we may reevaluate our recommendations. Such variations could increase construction costs, and we recommend including a contingency to accommodate them.

F.1.b. Groundwater Levels

We made groundwater measurements under the conditions reported herein and shown on the exploration logs and interpreted in the text of this report. Note that the observation periods were relatively short, and project planning can expect groundwater levels to fluctuate in response to rainfall, flooding, irrigation, seasonal freezing and thawing, surface drainage modifications and other seasonal and annual factors.

F.2. Continuity of Professional Responsibility

F.2.a. Plan Review

We based this report on a limited amount of information, and we made a number of assumptions to help us develop our recommendations. We should be retained to review the geotechnical aspects of the designs and specifications. This review will allow us to evaluate whether we anticipated the design correctly, if any design changes affect the validity of our recommendations, and if the design and specifications correctly interpret and implement our recommendations.

F.2.b. Construction Observations and Testing

We recommend retaining us to perform the required observations and testing during construction as part of the ongoing geotechnical evaluation. This will allow us to correlate the subsurface conditions exposed during construction with those encountered by the borings and provide professional continuity from the design phase to the construction phase. If we do not perform observations and testing during construction, it becomes the responsibility of others to validate the assumption made during the preparation of this report and to accept the construction-related geotechnical engineer-of-record responsibilities.

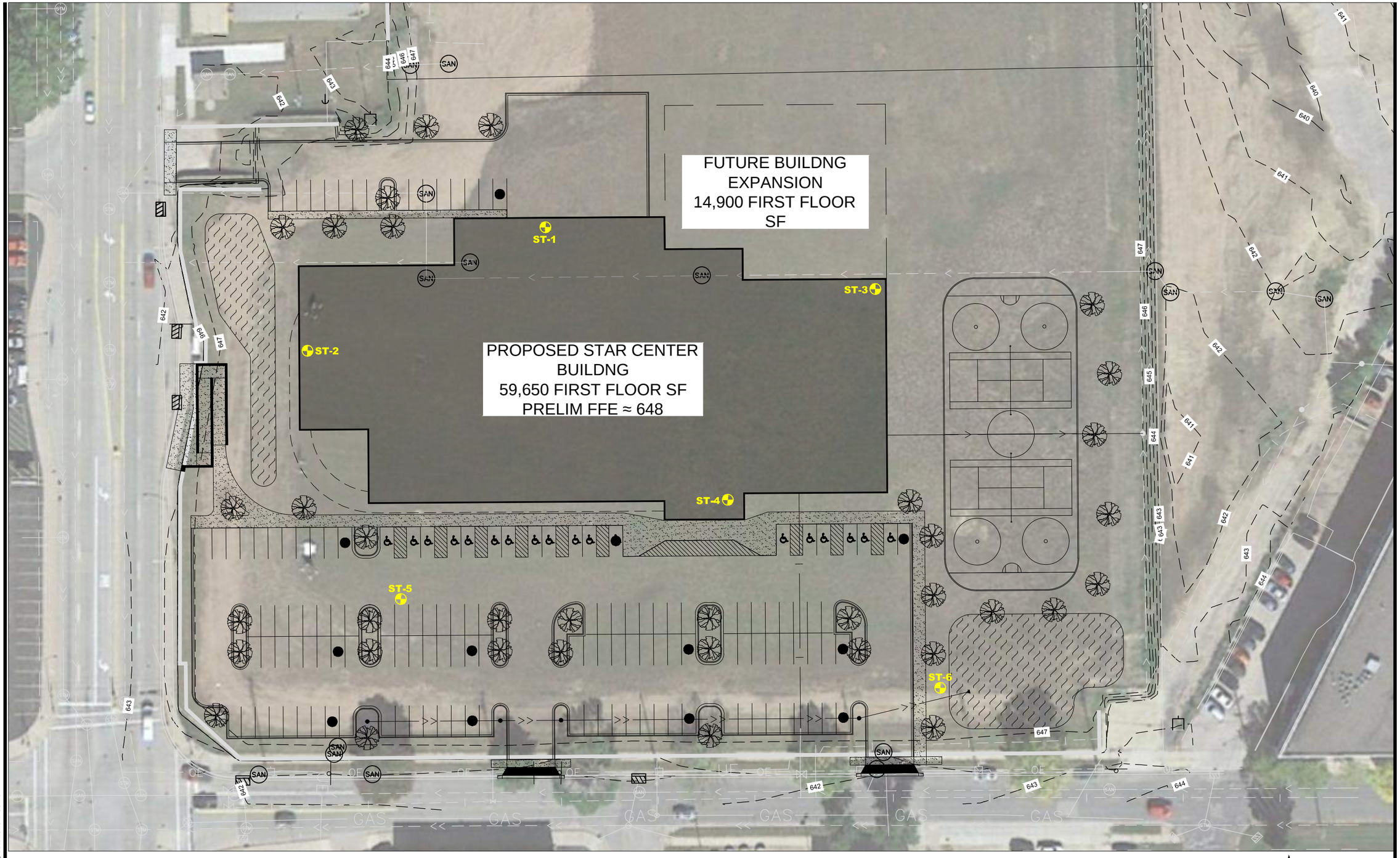
F.3. Use of Report

This report is for the exclusive use of the addressed parties. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

F.4. Standard of Care

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

Appendix



DENOTES APPROXIMATE LOCATION OF
STANDARD PENETRATION TEST BORING

30' 0 60'

SCALE: 1"= 60'

F:\2019\B1907847.dwg,Geotech,7/31/2019 2:55:45 PM

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11001 Hampshire Avenue S
Minneapolis, MN 55438
952.995.2000
braunintertec.com

Drawing Information

Project No:	B1907847
Drawing No:	B1907847
Drawn By:	JAG
Date Drawn:	7/23/19
Checked By:	BS
Last Modified:	7/31/19

Project Information

Proposed STAR Center Facility

1319 and 1325 St. Andrew Street

La Crosse, Wisconsin

Soil Boring Location Sketch

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1907847
Geotechnical Evaluation
Proposed STAR Center Facility
1319 and 1325 Saint Andrew Street
La Crosse, Wisconsin

BORING: **ST-1**

LOCATION: See attached sketch

NORTHING: 139810 EASTING: 448635

DRILLER: Geotechnical Drilling Contractors | LOGGED BY: B. Sullivan | START DATE: 07/30/19 | END DATE: 07/30/19

SURFACE ELEVATION: 647.7 ft | RIG: Subcontractor | METHOD: 4 1/4" HSA | SURFACING: Grass | WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
647.2		SILTY SAND (SM), fine-grained Sand, with roots, dark brown, moist (TOPSOIL FILL)					Benchmark: Boring elevations and surface elevations were measured with GPS technology.
0.5		FILL: POORLY GRADED SAND (SP), fine to medium-grained Sand, brown, moist to wet		6-8-11 (19)			
			5	5-7-12 (19)		8	P200=5%
				7-7-14 (21)			
			10	6-8-12 (20)			
	▽			5-7-8 (15)			
634.7							
13.0		POORLY GRADED SAND (SP), fine to medium-grained Sand, brown, wet, loose (ALLUVIUM)	15	4-4-6 (10)			
630.7							
17.0		POORLY GRADED SAND (SP), fine to coarse-grained Sand, trace Gravel, brown, wet, loose (ALLUVIUM)		3-4-5			

Continued on next page

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Geotechnical Evaluation
Proposed STAR Center Facility
1319 and 1325 Saint Andrew Street
La Crosse, Wisconsin

BORING: **ST-1**

LOCATION: See attached sketch

NORTHING: 139810 EASTING: 448635

DRILLER: Geotechnical Drilling Contractors | LOGGED BY: B. Sullivan | START DATE: 07/30/19 | END DATE: 07/30/19

SURFACE ELEVATION: 647.7 ft | RIG: Subcontractor | METHOD: 4 1/4" HSA | SURFACING: Grass | WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND (SP), fine to coarse-grained Sand, trace Gravel, brown, wet, loose (ALLUVIUM)		(9)			
			25	4-4-5 (9)			
619.7							
28.0		POORLY GRADED SAND (SP), fine-grained Sand, brown, wet, loose (ALLUVIUM)					
			30	2-3-5 (8)			
616.7							
31.0		END OF BORING					Water observed at 11.0 feet while drilling.
		Boring immediately backfilled with bentonite grout					Cave-in depth of 13.0 feet immediately after withdrawal of auger.
			35				

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1907847
Geotechnical Evaluation
Proposed STAR Center Facility
1319 and 1325 Saint Andrew Street
La Crosse, Wisconsin

BORING: **ST-2**
LOCATION: See attached sketch
NORTHING: 139731 EASTING: 448482
START DATE: 07/30/19 END DATE: 07/30/19
SURFACE ELEVATION: 647.8 ft
DRILLER: Geotechnical Drilling Contractors
LOGGED BY: B. Sullivan
RIG: Subcontractor
METHOD: 4 1/4" HSA
SURFACING: Grass
WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
645.8		SILTY SAND (SM), fine-grained Sand, with roots, dark brown, moist (TOPSOIL FILL)					
2.0 644.8		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, brown, moist		4-6 (10)			
3.0		FILL: POORLY GRADED SAND (SP), fine to medium-grained Sand, trace Gravel, yellowish brown, moist to wet		6-8 (14)			
				6-14 (20)			
			5	21-21 (42)		8	P200=5%
				14-14 (28)			
				11-12 (23)			
				10-11 (21)			
				14-14 (28)			
			10	8-12 (20)			
				12-12 (24)			
	▽			8-10 (18)			
				10-9 (19)			
				8-12 (20)			
			15	7-7 (14)			No recovery
630.8							
17.0		POORLY GRADED SAND (SP), fine to coarse-grained Sand, trace Gravel, brown, wet, medium dense to loose (ALLUVIUM)					
				3-4-7			

Continued on next page

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See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1907847
Geotechnical Evaluation
Proposed STAR Center Facility
1319 and 1325 Saint Andrew Street
La Crosse, Wisconsin

BORING: **ST-2**

LOCATION: See attached sketch

NORTHING: 139731 EASTING: 448482

DRILLER: Geotechnical Drilling Contractors | LOGGED BY: B. Sullivan | START DATE: 07/30/19 | END DATE: 07/30/19

SURFACE ELEVATION: 647.8 ft | RIG: Subcontractor | METHOD: 4 1/4" HSA | SURFACING: Grass | WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND (SP), fine to coarse-grained Sand, trace Gravel, brown, wet, medium dense to loose (ALLUVIUM)		(11)			
25				3-4-6 (10)			
30				3-3-4 (7)			
616.8 31.0		END OF BORING Boring immediately backfilled with bentonite grout					Water observed at 12.0 feet while drilling. Cave-in depth of 11.0 feet immediately after withdrawal of auger.
35							

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1907847
Geotechnical Evaluation
Proposed STAR Center Facility
1319 and 1325 Saint Andrew Street
La Crosse, Wisconsin

BORING: **ST-3**
LOCATION: See attached sketch
NORTHING: 139771 EASTING: 448847
START DATE: 07/30/19 END DATE: 07/30/19
SURFACE ELEVATION: 647.7 ft
DRILLER: Geotechnical Drilling Contractors
LOGGED BY: B. Sullivan
RIG: Subcontractor
METHOD: 4 1/4" HSA
SURFACING: Grass
WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
647.0		SILTY SAND (SM), fine-grained Sand, with roots, dark brown, moist (TOPSOIL FILL)					
0.7		FILL: POORLY GRADED SAND (SP), fine to medium-grained Sand, brown, moist		4-5 (9)			
				5-7 (12)			
				4-5 (9)			
			5	6-5 (11)			
				4-4 (8)			
				2-2 (4)			
				5-8 (13)			No recovery
				8-7 (15)			
			10	5-7 (12)			
				7-7 (14)			
635.7	▽						
12.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, brownish gray, moist (ALLUVIUM)		7-8 (15)			
				8-10 (18)			
				5-8 (13)			
			15	10-11 (21)			
630.7							
17.0		POORLY GRADED SAND (SP), fine to medium-grained Sand, brown, wet, loose to medium dense (ALLUVIUM)					
				2-2-3		23	P200=1%

Continued on next page

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1907847
Geotechnical Evaluation
Proposed STAR Center Facility
1319 and 1325 Saint Andrew Street
La Crosse, Wisconsin

BORING: **ST-3**

LOCATION: See attached sketch

NORTHING: 139771 EASTING: 448847

DRILLER: Geotechnical Drilling Contractors | LOGGED BY: B. Sullivan | START DATE: 07/30/19 | END DATE: 07/30/19

SURFACE ELEVATION: 647.7 ft | RIG: Subcontractor | METHOD: 4 1/4" HSA | SURFACING: Grass | WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND (SP), fine to medium-grained Sand, brown, wet, loose to medium dense (ALLUVIUM)		(5)			
25				4-5-7 (12)			
30				3-5-7 (12)			
616.7 31.0		END OF BORING Boring immediately backfilled with bentonite grout					Water observed at 12.0 feet while drilling. Cave-in depth of 15.0 feet immediately after withdrawal of auger.
35							

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1907847
Geotechnical Evaluation
Proposed STAR Center Facility
1319 and 1325 Saint Andrew Street
La Crosse, Wisconsin

BORING: **ST-4**
LOCATION: See attached sketch
NORTHING: 139635 EASTING: 448752
START DATE: 07/30/19 END DATE: 07/30/19
SURFACE ELEVATION: 648.0 ft
DRILLER: Geotechnical Drilling Contractors
LOGGED BY: B. Sullivan
RIG: Subcontractor
METHOD: 4 1/4" HSA
SURFACING: Grass
WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
646.8		SILTY SAND (SM), fine-grained Sand, with roots, dark brown, moist (TOPSOIL FILL)					
1.2		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, brown, moist		6-8-12 (20)		9	P200=9%
			5	8-12-12 (24)			
				4-5-6 (11)			
			10	4-4-5 (9)			
636.0	▽						
12.0		SILTY SAND (SM), fine to medium-grained Sand, trace organics, gray, wet, loose (ALLUVIUM)		3-4-4 (8)			
634.0							
14.0		POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained Sand, brownish gray, wet, loose (ALLUVIUM)	15	2-3-4 (7)			
631.0							
17.0		POORLY GRADED SAND (SP), fine to medium-grained Sand, light brown, wet, loose to medium dense (ALLUVIUM)					
				2-4-6			

Continued on next page

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1907847
Geotechnical Evaluation
Proposed STAR Center Facility
1319 and 1325 Saint Andrew Street
La Crosse, Wisconsin

BORING: **ST-4**

LOCATION: See attached sketch

NORTHING: 139635 EASTING: 448752

DRILLER: Geotechnical Drilling Contractors | LOGGED BY: B. Sullivan | START DATE: 07/30/19 | END DATE: 07/30/19

SURFACE ELEVATION: 648.0 ft | RIG: Subcontractor | METHOD: 4 1/4" HSA | SURFACING: Grass | WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
		POORLY GRADED SAND (SP), fine to medium-grained Sand, light brown, wet, loose to medium dense (ALLUVIUM)		(10)			
25				3-5-9 (14)			
30				5-7-7 (14)			
617.0 31.0		END OF BORING Boring immediately backfilled with bentonite grout					Water observed at 11.0 feet while drilling. Cave-in depth of 12.5 feet immediately after withdrawal of auger.
35							

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1907847
Geotechnical Evaluation
Proposed STAR Center Facility
1319 and 1325 Saint Andrew Street
La Crosse, Wisconsin

BORING: **ST-5**

LOCATION: See attached sketch

NORTHING: 139572 EASTING: 448542

DRILLER: Geotechnical Drilling Contractors | LOGGED BY: B. Sullivan | START DATE: 07/30/19 | END DATE: 07/30/19

SURFACE ELEVATION: 647.6 ft | RIG: Subcontractor | METHOD: 4 1/4" HSA | SURFACING: Grass | WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
645.8		SILTY SAND (SM), fine-grained Sand, with roots, dark brown, moist (TOPSOIL FILL)					
1.8		FILL: POORLY GRADED SAND with SILT (SP-SM), with Gravel, brown, moist		10-10 (20)		9	P200=10%
				12-14 (26)			
				12-12 (24)			
			5	14-7 (21)			
641.6							
6.0		FILL: POORLY GRADED SAND (SP), fine to medium-grained Sand, trace Gravel, brown, moist		10-10 (20)			
				11-14 (25)			
				6-8 (14)			
				2-3 (5)			
637.6	▽		10				
10.0		POORLY GRADED SAND (SP), fine-grained Sand, brown, wet, very loose to medium dense (ALLUVIUM)		2-1 (3)			
				3-3 (6)			
		Silt seam at 12 feet		2-4 (6)			
				5-7 (12)			
				2-4 (6)			
			15	6-4 (10)			
631.6							
16.0		END OF BORING					Water observed at 9.5 feet while drilling.
		Boring immediately backfilled with bentonite grout					

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LOG OF BORING

See Descriptive Terminology sheet for explanation of abbreviations

Project Number B1907847
Geotechnical Evaluation
Proposed STAR Center Facility
1319 and 1325 Saint Andrew Street
La Crosse, Wisconsin

BORING: **ST-6**

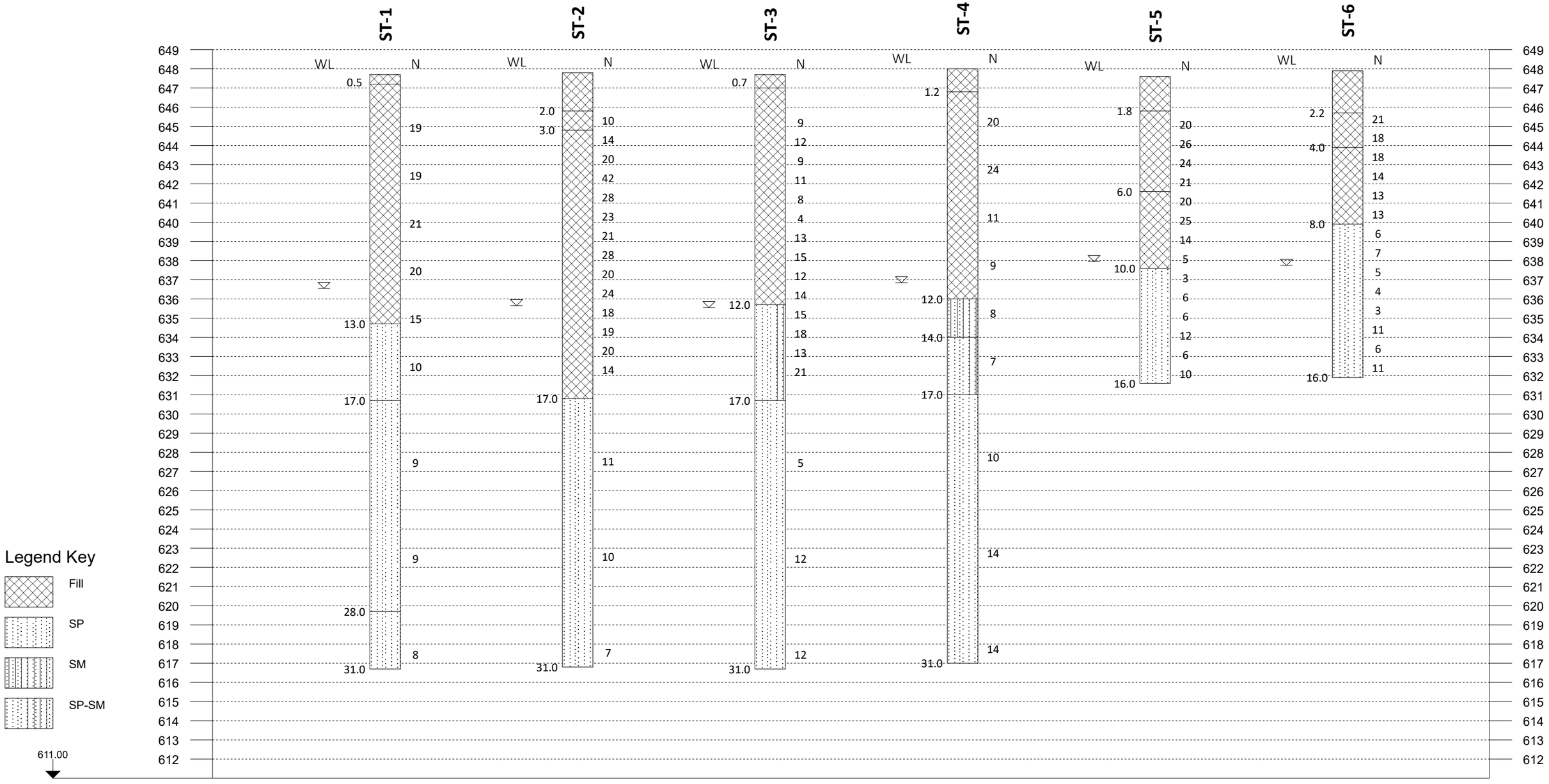
LOCATION: See attached sketch

NORTHING: 139514 EASTING: 448889

DRILLER: Geotechnical Drilling Contractors | LOGGED BY: B. Sullivan | START DATE: 07/30/19 | END DATE: 07/30/19

SURFACE ELEVATION: 647.9 ft | RIG: Subcontractor | METHOD: 4 1/4" HSA | SURFACING: Grass | WEATHER: Sunny

Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q_p tsf	MC %	Tests or Remarks
645.7		SILTY SAND (SM), fine-grained Sand, with roots, dark brown, moist (TOPSOIL FILL)					
2.2		FILL: POORLY GRADED SAND (SP), fine to medium-grained Sand, brown, moist		10-11 (21)			
643.9				9-9 (18)			
4.0		FILL: POORLY GRADED SAND (SP), fine to medium-grained Sand, light brown, moist	5	9-9 (18)			
639.9				8-6 (14)			
				6-7 (13)			
				7-6 (13)			
8.0	▽	POORLY GRADED SAND (SP), fine to medium-grained Sand, black, moist to wet, very loose to medium dense (ALLUVIUM)		3-3 (6)			
				3-4 (7)			
			10	2-3 (5)			
				2-2 (4)			
				1-2 (3)			
				4-7 (11)			
				3-3 (6)			
			15	4-7 (11)			
631.9							
16.0		END OF BORING Boring immediately backfilled with bentonite grout					Water observed at 10.0 feet while drilling. Cave-in depth of 11.0 feet immediately after withdrawal of auger.



Project ID: B1907847
Vert. Scale: 1"= 5"
Hor. Scale: NTS
Date: 08-07-2019

Fence Diagram
Geotechnical Evaluation
Proposed STAR Center Facility
1319 and 1325 Saint Andrew Street
La Crosse, Wisconsin

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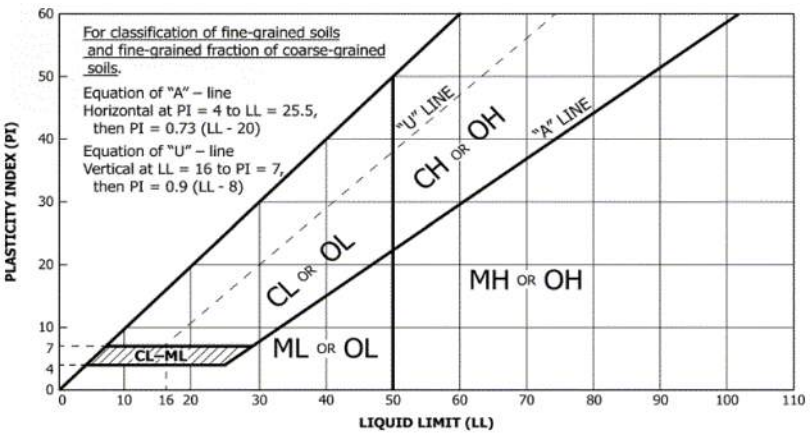
Descriptive Terminology of Soil

Based on Standards ASTM D2487/2488
(Unified Soil Classification System)

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name[B]
Coarse-grained Soils (more than 50% retained on No. 200 sieve)	Gravels (More than 50% of coarse fraction retained on No. 4 sieve)	Clean Gravels (Less than 5% fines[C])	$C_u \geq 4$ and $1 \leq C_c \leq 3$[D]	GW	Well-graded gravel[E]
			$C_u < 4$ and/or ($C_c < 1$ or $C_c > 3$)[D]	GP	Poorly graded gravel[E]
		Gravels with Fines (More than 12% fines[C])	Fines classify as ML or MH	GM	Silty gravel[E F G]
			Fines Classify as CL or CH	GC	Clayey gravel[E F G]
	Sands (50% or more coarse fraction passes No. 4 sieve)	Clean Sands (Less than 5% fines[H])	$C_u \geq 6$ and $1 \leq C_c \leq 3$[D]	SW	Well-graded sand[I]
			$C_u < 6$ and/or ($C_c < 1$ or $C_c > 3$)[D]	SP	Poorly graded sand[J]
		Sands with Fines (More than 12% fines[H])	Fines classify as ML or MH	SM	Silty sand[F G I]
			Fines classify as CL or CH	SC	Clayey sand[F G I]
Fine-grained Soils (50% or more passes the No. 200 sieve)	Silts and Clays (Liquid limit less than 50)	Inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K L M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K L M]
		Organic	Liquid Limit – oven dried / Liquid Limit – not dried <0.75	OL	Organic clay[K L M N] / Organic silt[K L M O]
	Silts and Clays (Liquid limit 50 or more)	Inorganic	PI plots on or above "A" line	CH	Fat clay[K L M]
			PI plots below "A" line	MH	Elastic silt[K L M]
		Organic	Liquid Limit – oven dried / Liquid Limit – not dried <0.75	OH	Organic clay[K L M P] / Organic silt[K L M Q]
Highly Organic Soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

A. Based on the material passing the 3-inch (75-mm) sieve.
B. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
C. Gravels with 5 to 12% fines require dual symbols:
   GW-GM well-graded gravel with silt
   GW-GC well-graded gravel with clay
   GP-GM poorly graded gravel with silt
   GP-GC poorly graded gravel with clay
D. $C_u = D_{60} / D_{10}$ $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
E. If soil contains ≥ 15% sand, add "with sand" to group name.
F. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
G. If fines are organic, add "with organic fines" to group name.
H. Sands with 5 to 12% fines require dual symbols:
   SW-SM well-graded sand with silt
   SW-SC well-graded sand with clay
   SP-SM poorly graded sand with silt
   SP-SC poorly graded sand with clay
I. If soil contains ≥ 15% gravel, add "with gravel" to group name.
J. If Atterberg limits plot in hatched area, soil is CL-ML, silty clay.
K. If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant.
L. If soil contains ≥ 30% plus No. 200, predominantly sand, add "sandy" to group name.
M. If soil contains ≥ 30% plus No. 200 predominantly gravel, add "gravelly" to group name.
N. PI ≥ 4 and plots on or above "A" line.
O. PI < 4 or plots below "A" line.
P. PI plots on or above "A" line.
Q. PI plots below "A" line.



Particle Size Identification

Boulders	over 12"
Cobbles	3" to 12"
Gravel	
Coarse	3/4" to 3" (19.00 mm to 75.00 mm)
Fine	No. 4 to 3/4" (4.75 mm to 19.00 mm)
Sand	
Coarse	No. 10 to No. 4 (2.00 mm to 4.75 mm)
Medium	No. 40 to No. 10 (0.425 mm to 2.00 mm)
Fine	No. 200 to No. 40 (0.075 mm to 0.425 mm)
Silt	No. 200 (0.075 mm) to .005 mm
Clay	< .005 mm

Relative Proportions[L, M]

trace	0 to 5%
little	6 to 14%
with	≥ 15%

Inclusion Thicknesses

lens	0 to 1/8"
seam	1/8" to 1"
layer	over 1"

Apparent Relative Density of Cohesionless Soils

Very loose	0 to 4 BPF
Loose	5 to 10 BPF
Medium dense	11 to 30 BPF
Dense	31 to 50 BPF
Very dense	over 50 BPF

Consistency of Cohesive Soils	Blows Per Foot	Approximate Unconfined Compressive Strength
Very soft	0 to 1 BPF	< 0.25 tsf
Soft	2 to 4 BPF	0.25 to 0.5 tsf
Medium	5 to 8 BPF	0.5 to 1 tsf
Stiff	9 to 15 BPF	1 to 2 tsf
Very Stiff	16 to 30 BPF	2 to 4 tsf
Hard	over 30 BPF	> 4 tsf

Moisture Content:

Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp but no visible water.
Wet: Visible free water, usually soil is below water table.

Drilling Notes:

Blows/N-value: Blows indicate the driving resistance recorded for each 6-inch interval. The reported N-value is the blows per foot recorded by summing the second and third interval in accordance with the Standard Penetration Test, ASTM D1586.

Partial Penetration: If the sampler could not be driven through a full 6-inch interval, the number of blows for that partial penetration is shown as #/x" (i.e. 50/2"). The N-value is reported as "REF" indicating refusal.

Recovery: Indicates the inches of sample recovered from the sampled interval. For a standard penetration test, full recovery is 18", and is 24" for a thinwall/shelby tube sample.

WOH: Indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WOR: Indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

Water Level: Indicates the water level measured by the drillers either while drilling (▽), at the end of drilling (▼), or at some time after drilling (▼).

Laboratory Tests

DD	Dry density, pcf	**OC**	Organic content, %	**LL**	Liquid limit
WD	Wet density, pcf	**q_p**	Pocket penetrometer strength, tsf	**PL**	Plastic limit
P200	% Passing #200 sieve	**MC**	Moisture content, %	**PI**	Plasticity index
		q_U	Unconfined compression test, tsf		

Sieve Analysis Of Soil

ASTM D6913

8/6/2019

2309 Palace Street
La Crosse, WI 54603
Phone: 608-781-7277

Client:

STAR (Sports, Therapeutic and Adaptive Recreation) Association
PO Box 1024
Lacrosse, WI 54602

Project:

B1907847
Proposed STAR Center Facility
1319 and 1325 Saint Andrew Street
La Crosse, WI 54602

Sample Information

Sample Number: 258813
Depth (ft): 20
Sampling Method: Penetration Boring ASTM D1586
Sampled By: Contractor
Boring Number: ST-3
Location: Native Soil
Location Details: Proposed building footprint
Sample Date: 07/30/2019
Received Date: 07/31/2019
Lab: 2309 Palace Street, La Crosse, WI
Tested Date: 08/02/2019

Sieve Data

Sieve Size	Percent Passing	Specifications
4.75 mm (No. 4)	100	-
2 mm (No. 10)	100	-
850 µm (No. 20)	99	-
600 µm (No. 30)	96	-
425 µm (No. 40)	74	-
300 µm (No. 50)	22	-
250 µm (No. 60)	11	-
150 µm (No. 100)	3	-
75 µm (No. 200)	1.3	-

Classification: SP Poorly graded sand
Specimen Obtained: Moist
Test Method: Method A (Composite Sieving)
Dispersion Apparatus: Shaking

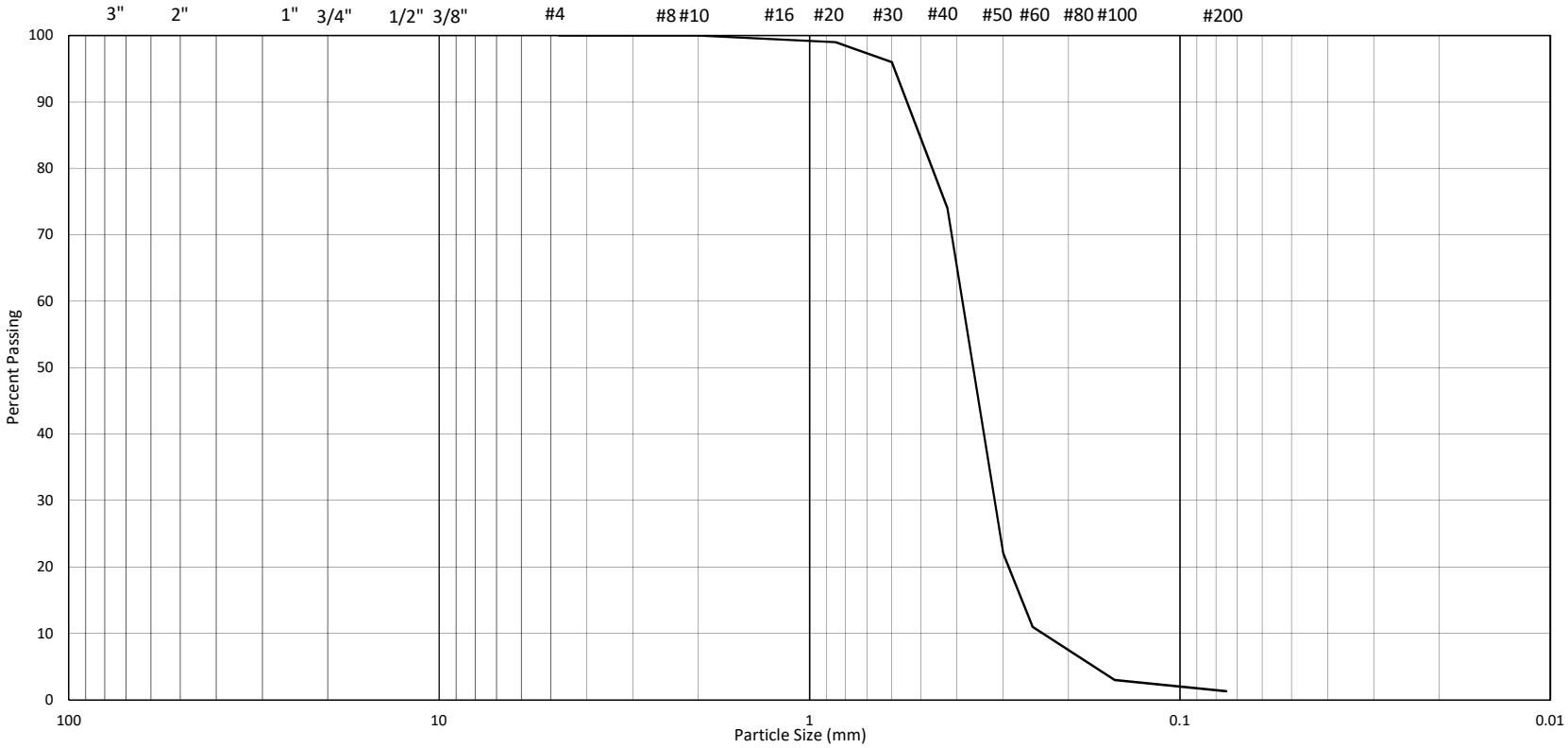
General

Results: The test is for informational purposes.

See Gradation G-01.pdf in the documents section at the end of this report.

Grain Size Accumulation Curve (ASTM)

Gravel		Sand			Fines
Coarse	Fine	Coarse	Medium	Fine	Silt & Clay



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Project Number	B1907847
Sample Number	G-01
Boring Number	ST-3
Depth	20

Gravel	0.0		
Sand	98.7		
Silt & Clay	1.3		
D60=	0.3910	Cu=	1.6
D30=	0.3190		
D10=	0.2380	Cc=	1.1

Classification

Brown Poorly Graded Sand (SP)

1002-CPS-23
Division of Industry Services
PO Box 2658
Madison, Wisconsin

Attachment 2:

SOIL AND SITE EVALUATION - STORM

In accordance with SPS 382.365, 385, Wis. Adm. Code, and WDNR Standard 1002

Attach a complete site plan on paper not less than 8 ½ x 11 inches in size. Plan must include, but not limited to: vertical and horizontal reference point (BM), direction and percent of slope, scale or dimensions, north arrow, and BM reference to nearest road. ***Please print all information*** Personal information you provide may be used for secondary purposes [Privacy Law, s. 15.04(1)(m)]	County La Crosse Parcel I.D. 17-10289-40 Reviewed by: Date:

Property Owner: Stizo Development, LLC	Property Location Govt. Lot SW¼ NE¼ S29 T07 R16 W		
Property Owner's Mailing Address: PO Box 609	Lot	Block #	Subd. Name or CSM #
City, State Zip Phone Number La Crosse, WI 54602	☒ City ☐ Village ☐ Town La Crosse		Nearest Road Saint Andrew Street

Drainage Area _____ ☐ sq. ft. ☐ acres Test site suitable for (check all that apply): ☐ Bio-retention; ☐ Subsurface Dispersal System; ☐ Reuse; ☐ Irrigation ☒ Other	Hydraulic Application Test Method ☒ Morphological Evaluation ☐ Double Ring Infiltrometer Other: (specify)	Soil Moisture Date of soil Borings: July 30, 2019 USDA-NRCS WETS Value: ☐ Dry = 1; ☒ Normal = 2; ☒ Wet = 3.

ST-2 #OBS ☐ Pit ☒ Boring Ground surface Elevation 647.8 ft. Elevation of limiting factor 12 ft.

Horizon	Depth In.	Dominate Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr.
FILL	0 - 25	10YR 3/2	---	f.sl	0.sg.f	ml	c	0	< 20	0.50
FILL	25 - 36	10YR 3/3	---	f.ls	0.sg.f	ml	a	0	< 10	0.50
FILL	36 - 204	2.5Y 7/6	---	f.s	0.sg.f	ml	c	10	< 5	0.50
C	204 - 372	10YR 5/3	---	c.s	0.sg.c	ml	c	10	< 5	3.60

Comments: Groundwater was encountered at 12 feet while drilling and is a limiting layer. Seasonal and annual fluctuations of groundwater should also be anticipated.

ST-3 #OBS ☐ Pit ☒ Boring Ground surface Elevation 647.7 ft. Elevation of limiting factor 12 ft.

Horizon	Depth In.	Dominate Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr.
FILL	0 - 8	10YR 3/2	---	f.sl	0.sg.f	ml	c	0	< 20	0.50
FILL	8 - 144	10YR 4/4	---	f.s	0.sg.f	ml	g	0	< 5	0.50
FILL	144 - 204	10YR 4/1	---	f.ls	0.sg.f	ml	g	0	< 10	0.50
C	204 - 372	10YR 5/3	---	m.s	0.sg.m	ml	g	0	< 5	3.60

Comments: Groundwater was encountered at 12 feet while drilling and is a limiting layer. Seasonal and annual fluctuations of groundwater should also be anticipated.

Name: Benjamin R. Sullivan	Signature: Ben Sullivan	Credential Number: 1324025
Address: 2309 Palace Street, La Crosse, WI	Date of Evaluation: 8/2/2019	Phone Number: 608.781.7277

ST-5 #OBS ☐ Pit ☒ Boring Ground surface Elevation 647.6 ft. Elevation of limiting factor 9 ½ ft.

Horizon	Depth In.	Dominate Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr.
FILL	0 - 22	10YR 3/2	---	f.sl	0.sg.f	ml	c	0	< 20	0.50
FILL	22 - 72	10YR 4/4	---	f.ls	0.sg.f	ml	g	15	< 10	0.50
FILL	72 - 120	10YR 4/4	---	f.s	0.sg.f	ml	g	0	< 5	0.50
C	120 - 192	10YR 4/3	---	f.s	0.sg.f	ml	g	0	< 5	0.50

Comments: Groundwater was encountered at 9 ½ feet while drilling and is a limiting layer. Seasonal and annual fluctuations of groundwater should also be anticipated.

ST-6 #OBS ☐ Pit ☒ Boring Ground surface Elevation 647.9 ft. Elevation of limiting factor 10 ft.

Horizon	Depth In.	Dominate Color Munsell	Redox Description Qu. Sz. Cont. Color	Texture	Structure Gr. Sz. Sh.	Consistence	Boundary	% Rock Frags.	% Fines	Hydraulic App Rate Inches/Hr.
FILL	0 - 26	10YR 3/2	---	f.sl	0.sg.f	ml	c	0	< 20	0.50
FILL	26 - 48	10YR 5/4	---	f.s	0.sg.f	ml	g	0	< 5	0.50
FILL	48 - 96	10YR 5/3	---	f.s	0.sg.f	ml	g	0	< 5	0.50
C	96 - 192	10YR 5/6	---	f.s	0.sg.f	ml	g	0	< 5	0.50

Comments: Groundwater was encountered at 10 feet while drilling and is a limiting layer. Seasonal and annual fluctuations of groundwater should also be anticipated.

Overall Site Comments: The site contains deep fills that consist of sandy soils. Groundwater was encountered at depths of 9 ½ to 12 feet across the site.

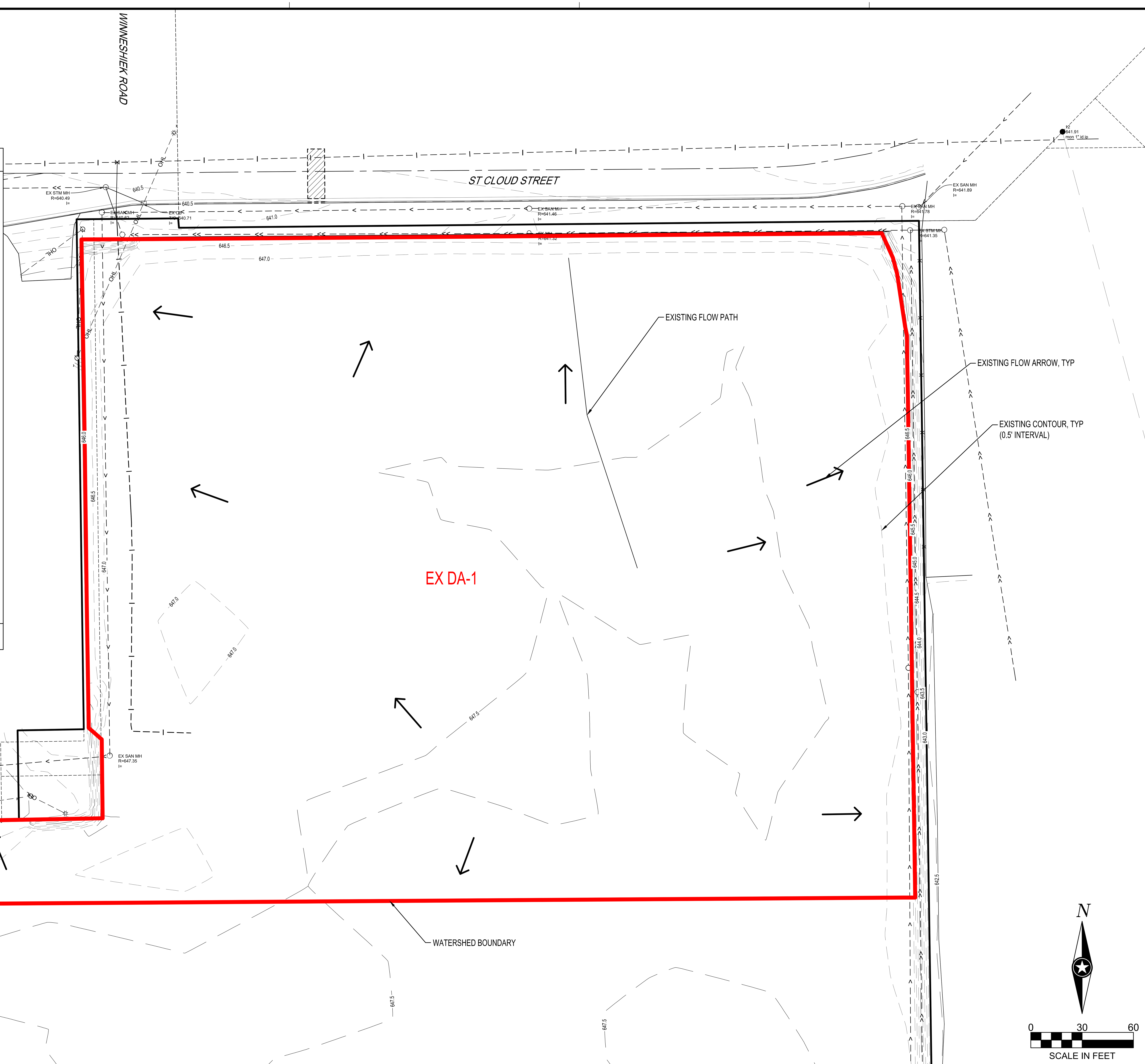
Watershed	Surface Cover	Area (SF)	Area (AC)	Percent Impervious
EX DA-1	Impervious	*1543*	0.035	1%
	Pervious	192103	4.411	
	Total	***193646***	**4.446**	

TOTAL IMPERVIOUS	**0.035**	1%
TOTAL PERVIOUS	**4.411**	
TOTAL AREA	**4.446**	

LEGEND

EXISTING		PROPOSED
	STORM DRAIN	
	SANITARY SEWER	
	SANITARY SEWER FORCEMAIN	
	WATER MAIN	
	GAS	
	OVERHEAD ELECTRIC	
	UNDERGROUND ELECTRIC	
	UNDERGROUND TELEPHONE	
	UNDERGROUND TV	
	OVERHEAD UTILITY	
	UNDERGROUND UTILITY	
	FIBER OPTIC	
	WETLAND	
	WATER EDGE	
	FENCE LINE	
	PROPERTY / LOT LINE	
	RIGHT OF WAY LINE	
	ACCESS CONTROL	
	EASEMENT LINE	
	CONTOURS (MAJOR)	
	CONTOURS (MINOR)	
	SPOT ELEVATION	
	TOP BACK OF CURB SPOT ELEVATION	

NOTE:
CONTRACTOR SHALL FIELD VERIFY THE LOCATIONS OF ALL EXISTING UTILITIES.



ISG

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PROJECT

RED CLOUD DEVELOPMENT

LA CROSSE WISCONSIN

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO.	20-24403
FILE NAME	24403 EXISTING STORMWATER
DRAWN BY	CLF, SMD
DESIGNED BY	KBR
REVIEWED BY	KBR
ORIGINAL ISSUE DATE	---
CLIENT PROJECT NO.	-

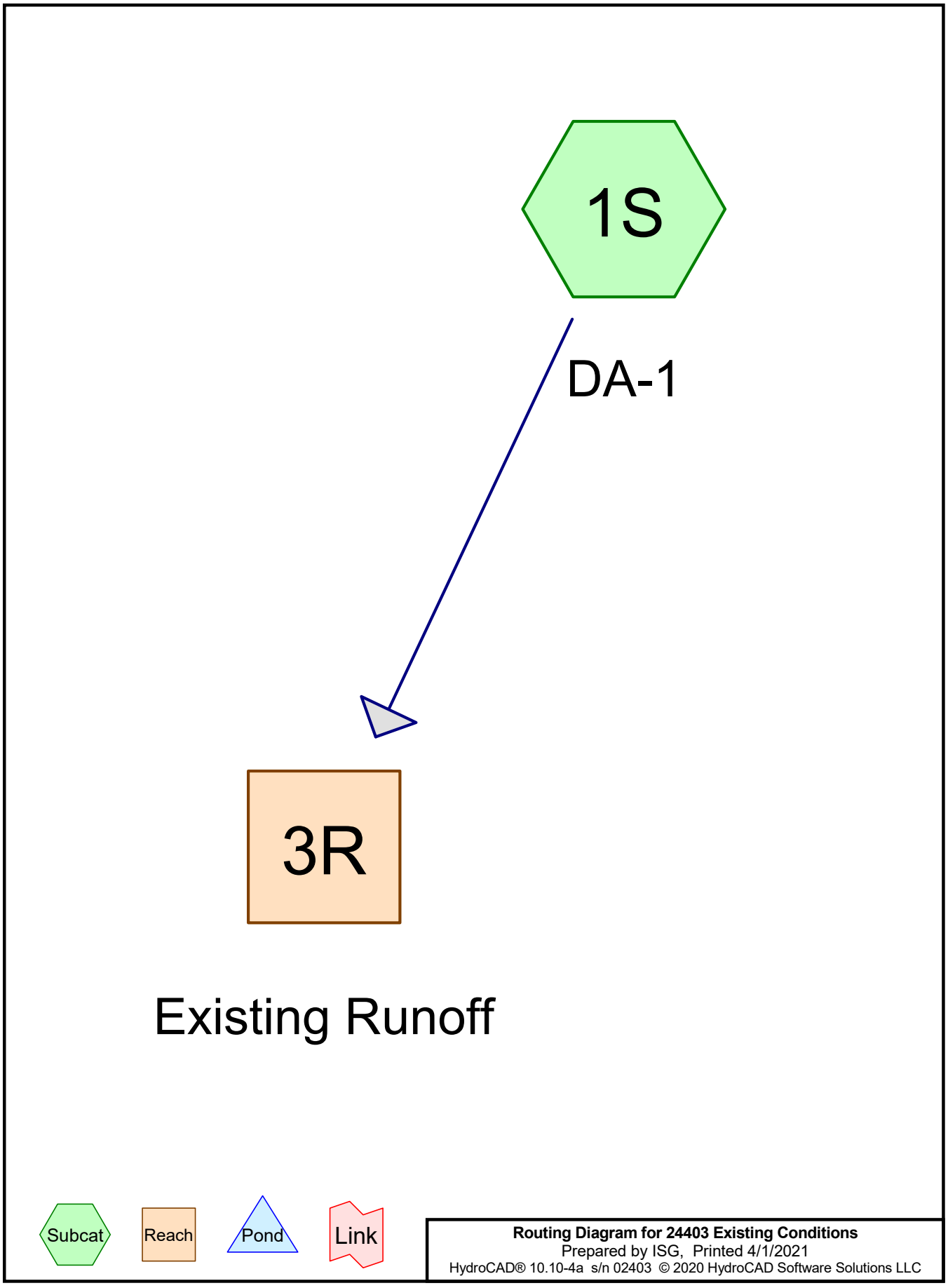
TITLE

EXISTING DRAINAGE CONDITIONS

SHEET

A

PRELIMINARY NOT FOR CONSTRUCTION PRELIMINARY NOT FOR CONSTRUCTION



Routing Diagram for 24403 Existing Conditions
Prepared by ISG, Printed 4/1/2021

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr	fe_text_mean 24-hr S0	1-yr	Default	24.00	1	2.61	2
2	2-yr	fe_text_mean 24-hr S0	2-yr	Default	24.00	1	3.01	2
3	5-yr	fe_text_mean 24-hr S0	5-yr	Default	24.00	1	3.75	2
4	10-yr	fe_text_mean 24-hr S0	10-yr	Default	24.00	1	4.46	2
5	25-yr	fe_text_mean 24-hr S0	25-yr	Default	24.00	1	5.56	2
6	100-yr	fe_text_mean 24-hr S0	100-yr	Default	24.00	1	7.55	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.411	69	50-75% Grass cover, Fair, HSG B (1S)
0.035	98	Paved parking, HSG B (1S)
4.446	**69**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
4.446	HSG B	1S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
4.446		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	4.411	0.000	0.000	0.000	4.411	50-75% Grass cover, Fair	1S
0.000	0.035	0.000	0.000	0.000	0.035	Paved parking	1S
0.000	**4.446**	**0.000**	**0.000**	**0.000**	**4.446**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=4.446 ac 0.79% Impervious Runoff Depth=0.47"
Flow Length=185' Slope=0.0030 '/' Tc=25.3 min CN=69 Runoff=1.43 cfs 0.175 af

Reach 3R: Existing Runoff Inflow=1.43 cfs 0.175 af
Outflow=1.43 cfs 0.175 af

Total Runoff Area = 4.446 ac Runoff Volume = 0.175 af Average Runoff Depth = 0.47"
99.21% Pervious = 4.411 ac 0.79% Impervious = 0.035 ac

Summary for Subcatchment 1S: DA-1

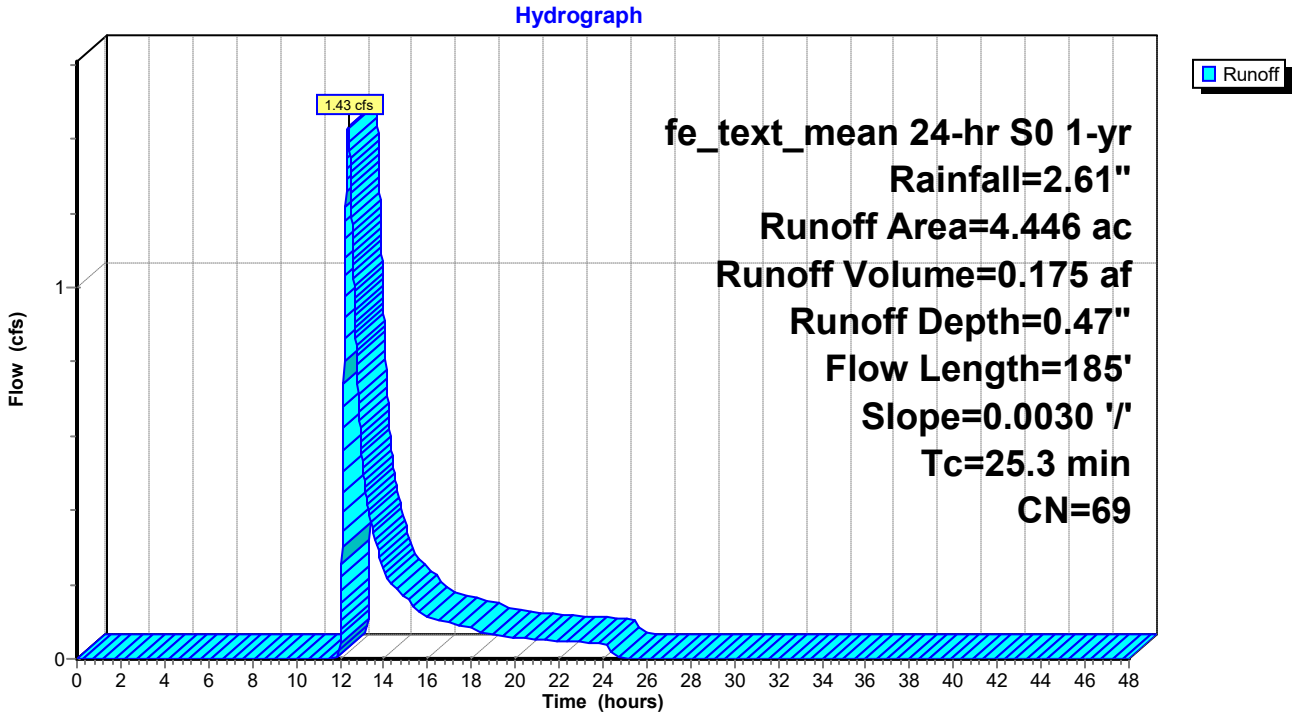
Runoff = 1.43 cfs @ 12.39 hrs, Volume= 0.175 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

Area (ac)	CN	Description
4.411	69	50-75% Grass cover, Fair, HSG B
0.035	98	Paved parking, HSG B
4.446	69	Weighted Average
4.411		99.21% Pervious Area
0.035		0.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.6	100	0.0030	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.01"
3.7	85	0.0030	0.38		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.3	185	Total			

Subcatchment 1S: DA-1

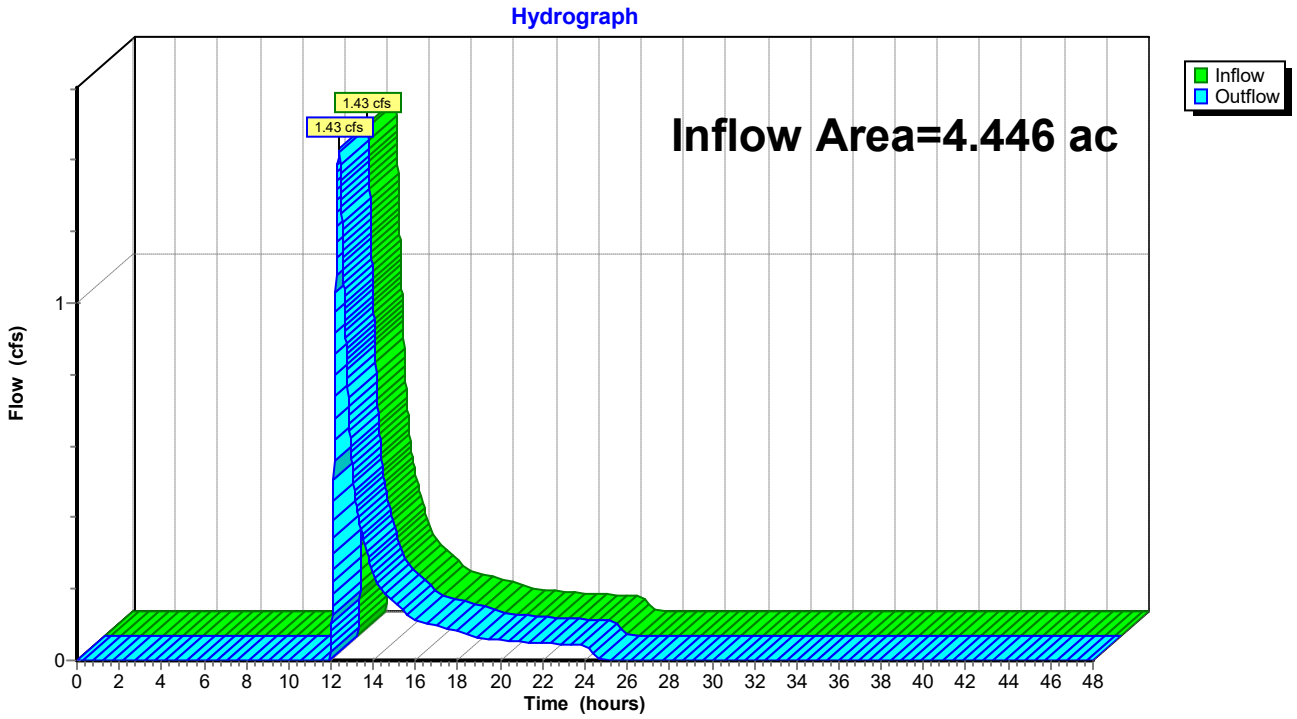


Summary for Reach 3R: Existing Runoff

Inflow Area = 4.446 ac, 0.79% Impervious, Inflow Depth = 0.47" for 1-yr event
Inflow = 1.43 cfs @ 12.39 hrs, Volume= 0.175 af
Outflow = 1.43 cfs @ 12.39 hrs, Volume= 0.175 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 3R: Existing Runoff



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=4.446 ac 0.79% Impervious Runoff Depth=0.68"
Flow Length=185' Slope=0.0030 '/' Tc=25.3 min CN=69 Runoff=2.31 cfs 0.250 af

Reach 3R: Existing Runoff Inflow=2.31 cfs 0.250 af
Outflow=2.31 cfs 0.250 af

Total Runoff Area = 4.446 ac Runoff Volume = 0.250 af Average Runoff Depth = 0.68"
99.21% Pervious = 4.411 ac 0.79% Impervious = 0.035 ac

Summary for Subcatchment 1S: DA-1

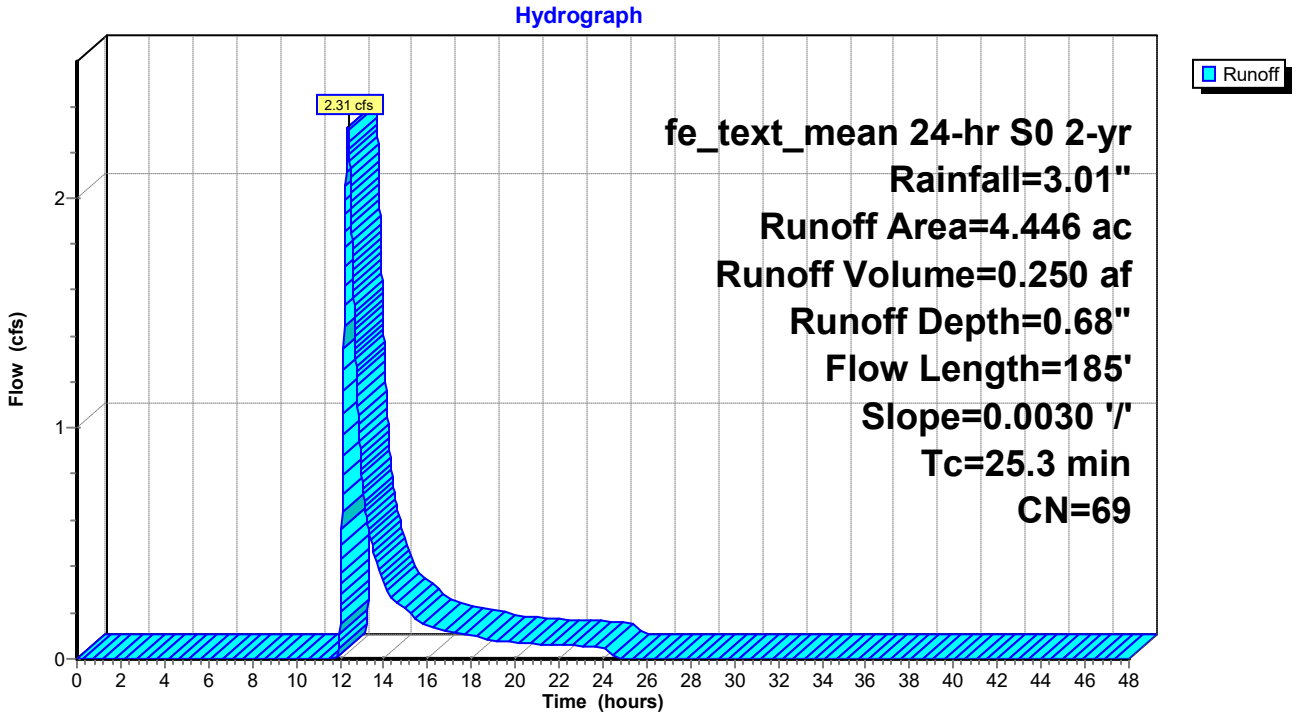
Runoff = 2.31 cfs @ 12.37 hrs, Volume= 0.250 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

Area (ac)	CN	Description
4.411	69	50-75% Grass cover, Fair, HSG B
0.035	98	Paved parking, HSG B
4.446	69	Weighted Average
4.411		99.21% Pervious Area
0.035		0.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.6	100	0.0030	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.01"
3.7	85	0.0030	0.38		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.3	185	Total			

Subcatchment 1S: DA-1

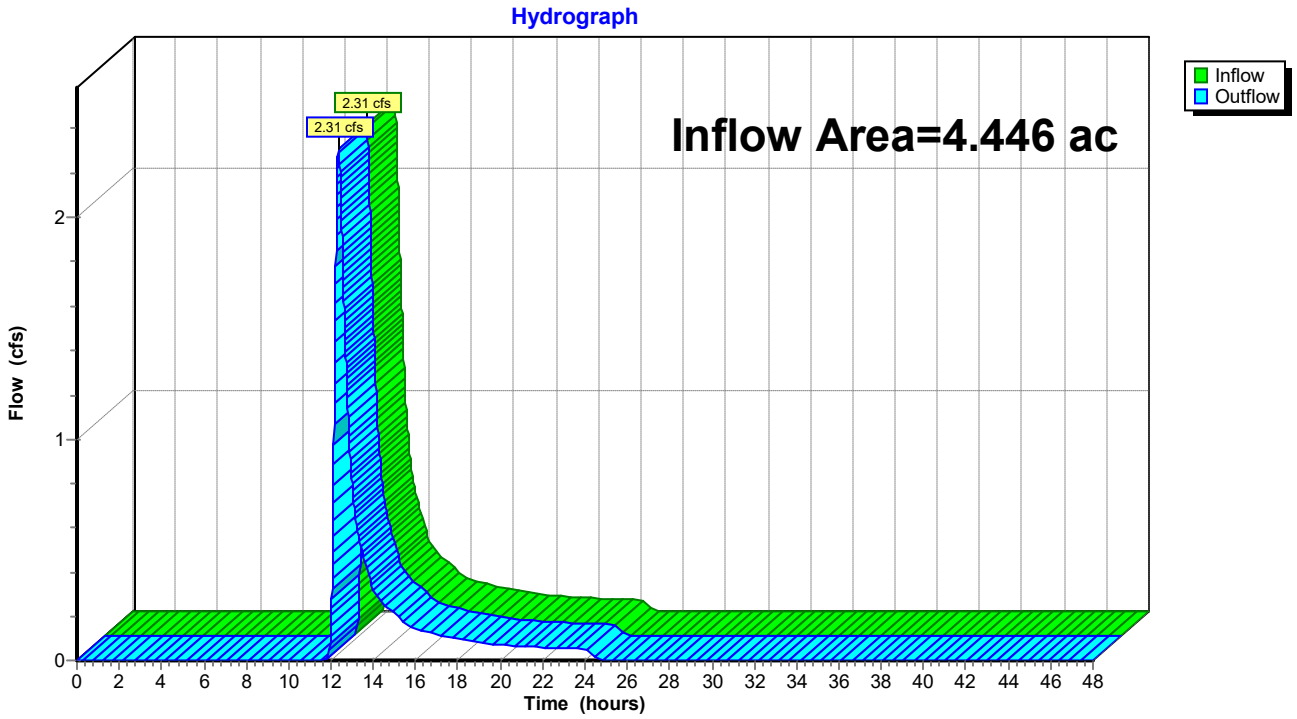


Summary for Reach 3R: Existing Runoff

Inflow Area = 4.446 ac, 0.79% Impervious, Inflow Depth = 0.68" for 2-yr event
Inflow = 2.31 cfs @ 12.37 hrs, Volume= 0.250 af
Outflow = 2.31 cfs @ 12.37 hrs, Volume= 0.250 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 3R: Existing Runoff



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=4.446 ac 0.79% Impervious Runoff Depth=1.11"
Flow Length=185' Slope=0.0030 '/' Tc=25.3 min CN=69 Runoff=4.16 cfs 0.410 af

Reach 3R: Existing Runoff Inflow=4.16 cfs 0.410 af
Outflow=4.16 cfs 0.410 af

Total Runoff Area = 4.446 ac Runoff Volume = 0.410 af Average Runoff Depth = 1.11"
99.21% Pervious = 4.411 ac 0.79% Impervious = 0.035 ac

Summary for Subcatchment 1S: DA-1

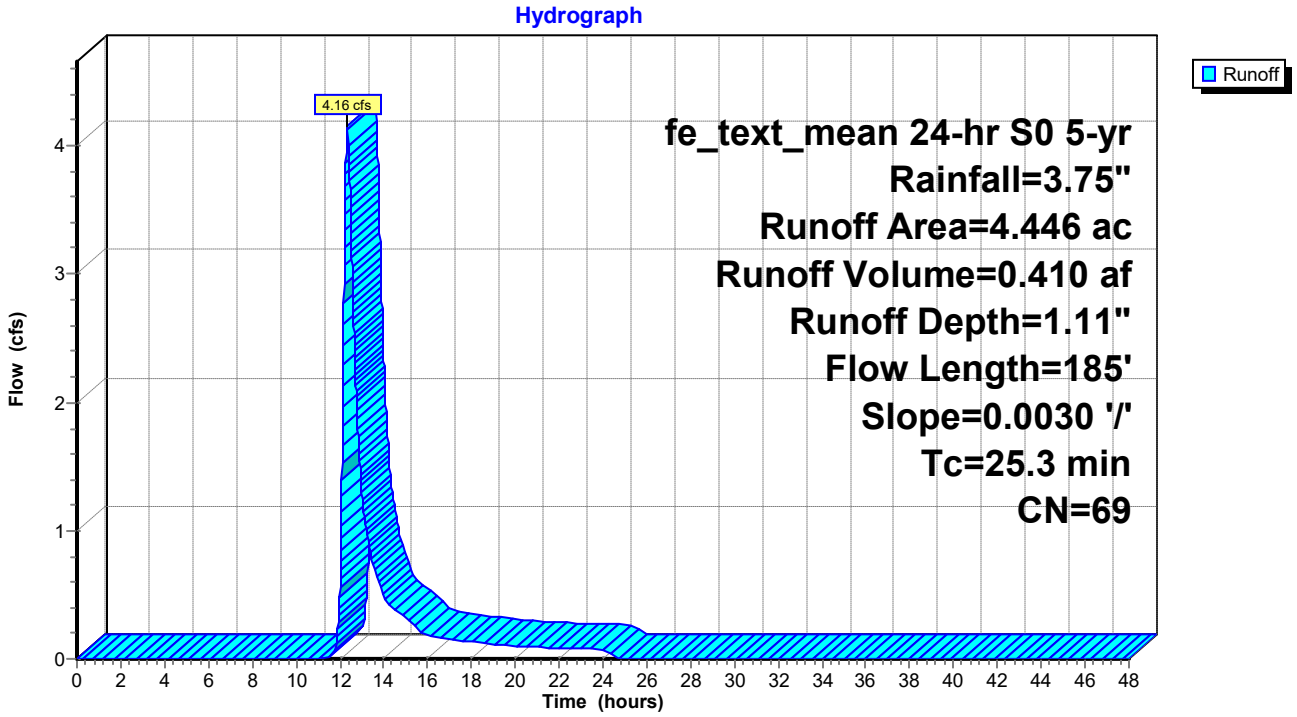
Runoff = 4.16 cfs @ 12.34 hrs, Volume= 0.410 af, Depth= 1.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

Area (ac)	CN	Description
4.411	69	50-75% Grass cover, Fair, HSG B
0.035	98	Paved parking, HSG B
4.446	69	Weighted Average
4.411		99.21% Pervious Area
0.035		0.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.6	100	0.0030	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.01"
3.7	85	0.0030	0.38		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.3	185	Total			

Subcatchment 1S: DA-1

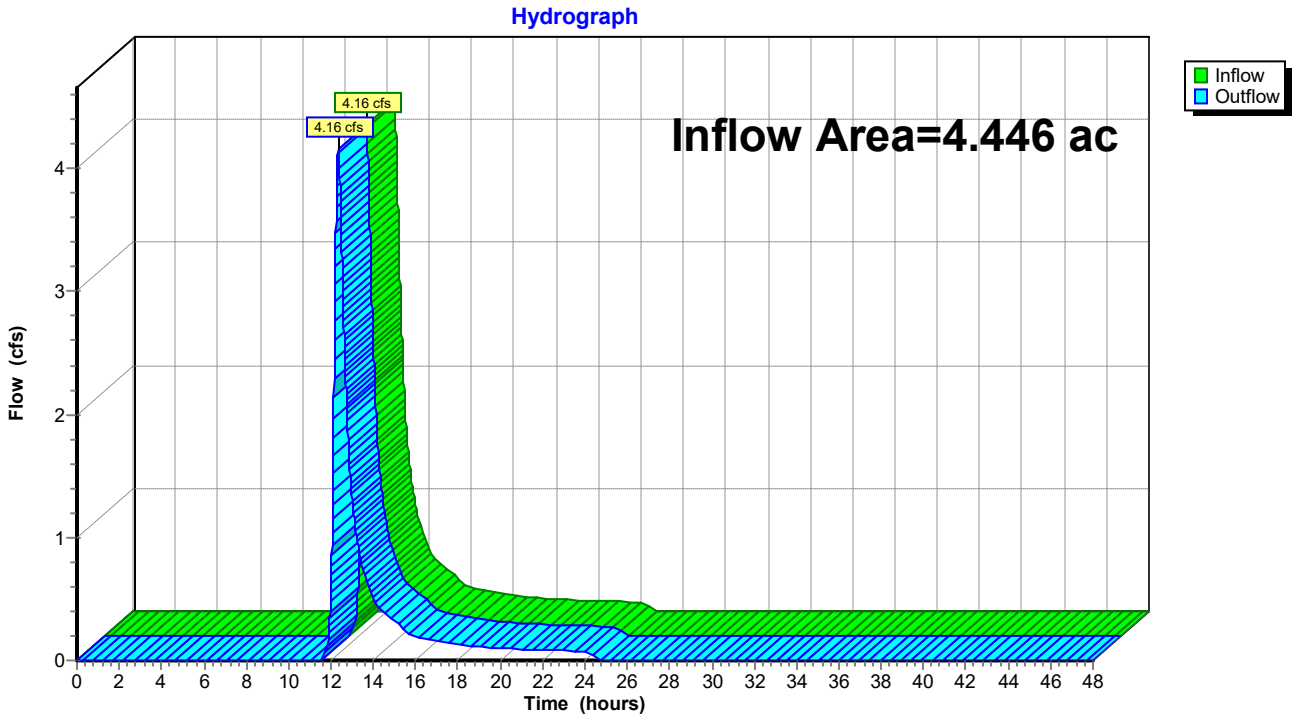


Summary for Reach 3R: Existing Runoff

Inflow Area = 4.446 ac, 0.79% Impervious, Inflow Depth = 1.11" for 5-yr event
Inflow = 4.16 cfs @ 12.34 hrs, Volume= 0.410 af
Outflow = 4.16 cfs @ 12.34 hrs, Volume= 0.410 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 3R: Existing Runoff



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=4.446 ac 0.79% Impervious Runoff Depth=1.57"
Flow Length=185' Slope=0.0030 '/' Tc=25.3 min CN=69 Runoff=6.02 cfs 0.583 af

Reach 3R: Existing Runoff Inflow=6.02 cfs 0.583 af
Outflow=6.02 cfs 0.583 af

Total Runoff Area = 4.446 ac Runoff Volume = 0.583 af Average Runoff Depth = 1.57"
99.21% Pervious = 4.411 ac 0.79% Impervious = 0.035 ac

Summary for Subcatchment 1S: DA-1

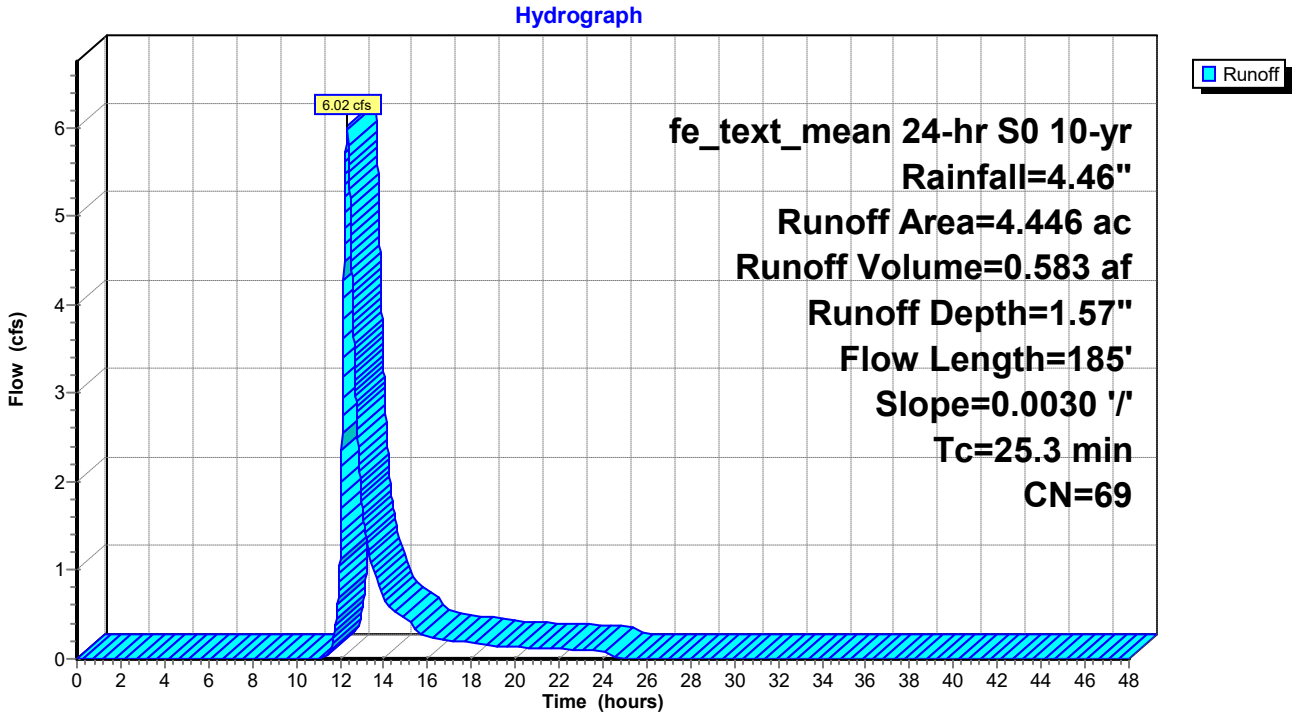
Runoff = 6.02 cfs @ 12.34 hrs, Volume= 0.583 af, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

Area (ac)	CN	Description
4.411	69	50-75% Grass cover, Fair, HSG B
0.035	98	Paved parking, HSG B
4.446	69	Weighted Average
4.411		99.21% Pervious Area
0.035		0.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.6	100	0.0030	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.01"
3.7	85	0.0030	0.38		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.3	185	Total			

Subcatchment 1S: DA-1

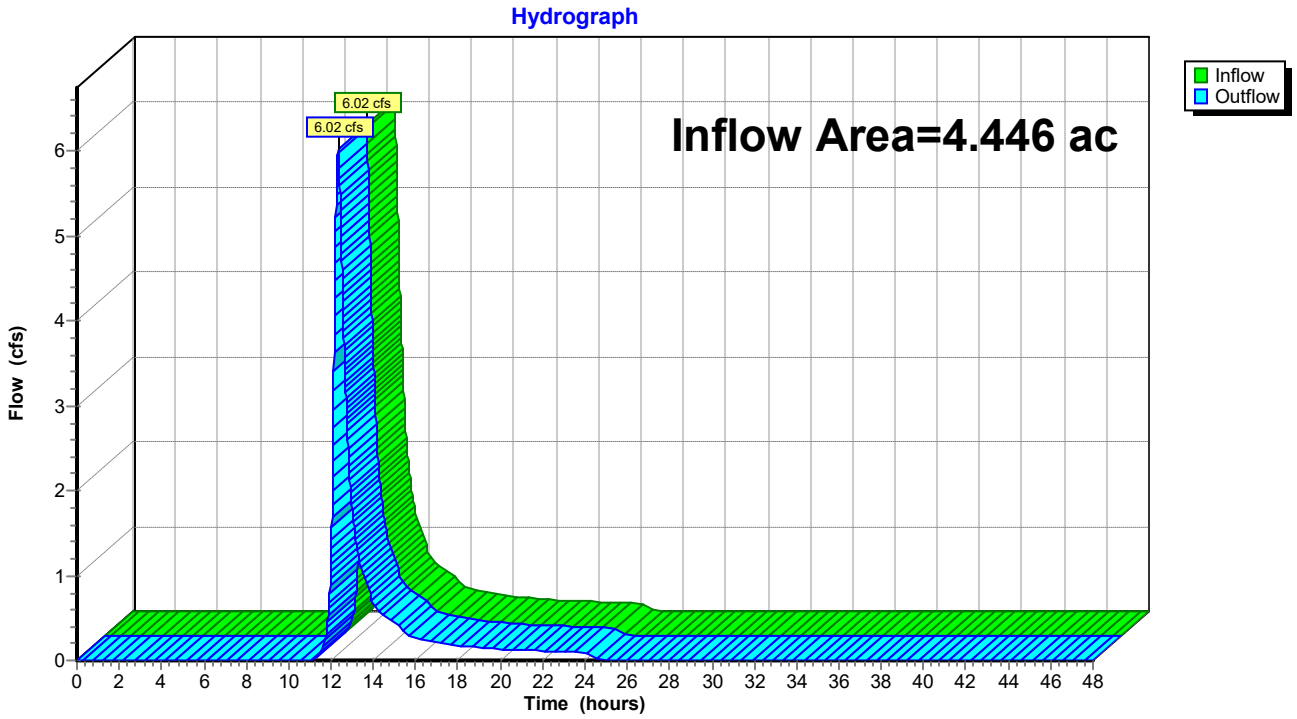


Summary for Reach 3R: Existing Runoff

Inflow Area = 4.446 ac, 0.79% Impervious, Inflow Depth = 1.57" for 10-yr event
Inflow = 6.02 cfs @ 12.34 hrs, Volume= 0.583 af
Outflow = 6.02 cfs @ 12.34 hrs, Volume= 0.583 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 3R: Existing Runoff



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=4.446 ac 0.79% Impervious Runoff Depth=2.37"
Flow Length=185' Slope=0.0030 '/' Tc=25.3 min CN=69 Runoff=9.02 cfs 0.879 af

Reach 3R: Existing Runoff Inflow=9.02 cfs 0.879 af
Outflow=9.02 cfs 0.879 af

Total Runoff Area = 4.446 ac Runoff Volume = 0.879 af Average Runoff Depth = 2.37"
99.21% Pervious = 4.411 ac 0.79% Impervious = 0.035 ac

Summary for Subcatchment 1S: DA-1

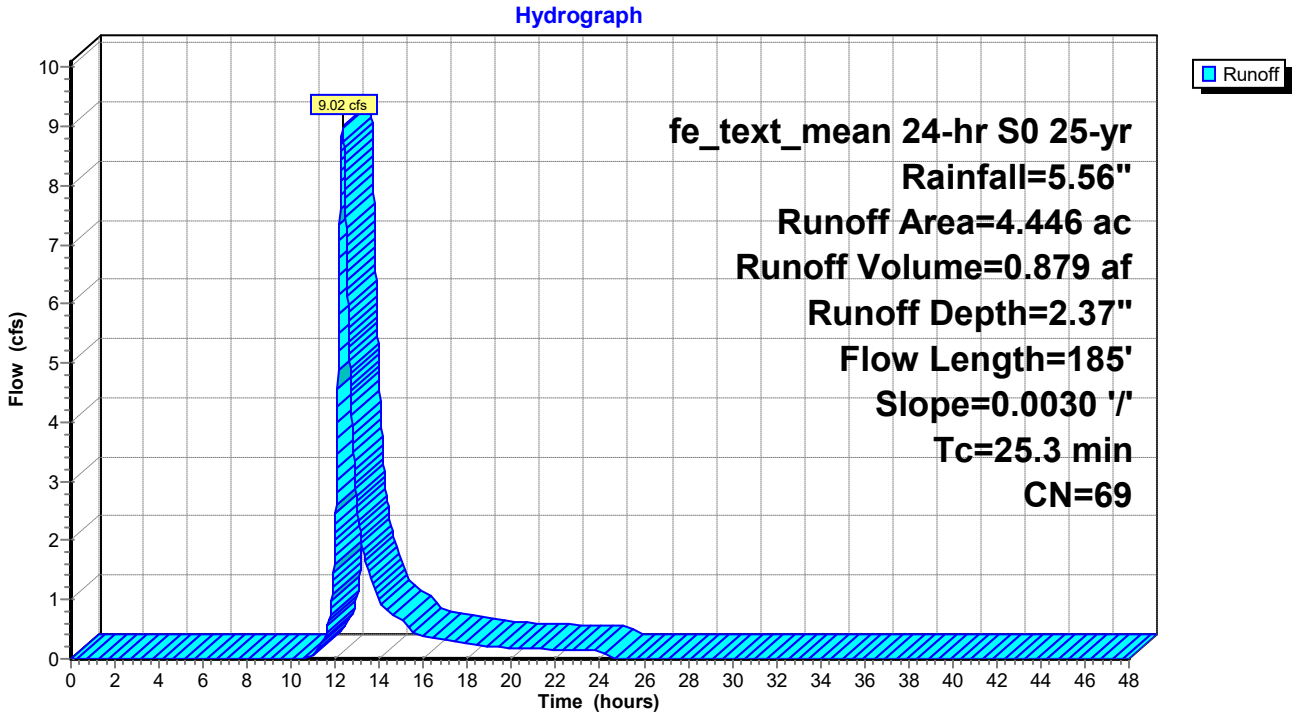
Runoff = 9.02 cfs @ 12.33 hrs, Volume= 0.879 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

Area (ac)	CN	Description
4.411	69	50-75% Grass cover, Fair, HSG B
0.035	98	Paved parking, HSG B
4.446	69	Weighted Average
4.411		99.21% Pervious Area
0.035		0.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.6	100	0.0030	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.01"
3.7	85	0.0030	0.38		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.3	185	Total			

Subcatchment 1S: DA-1

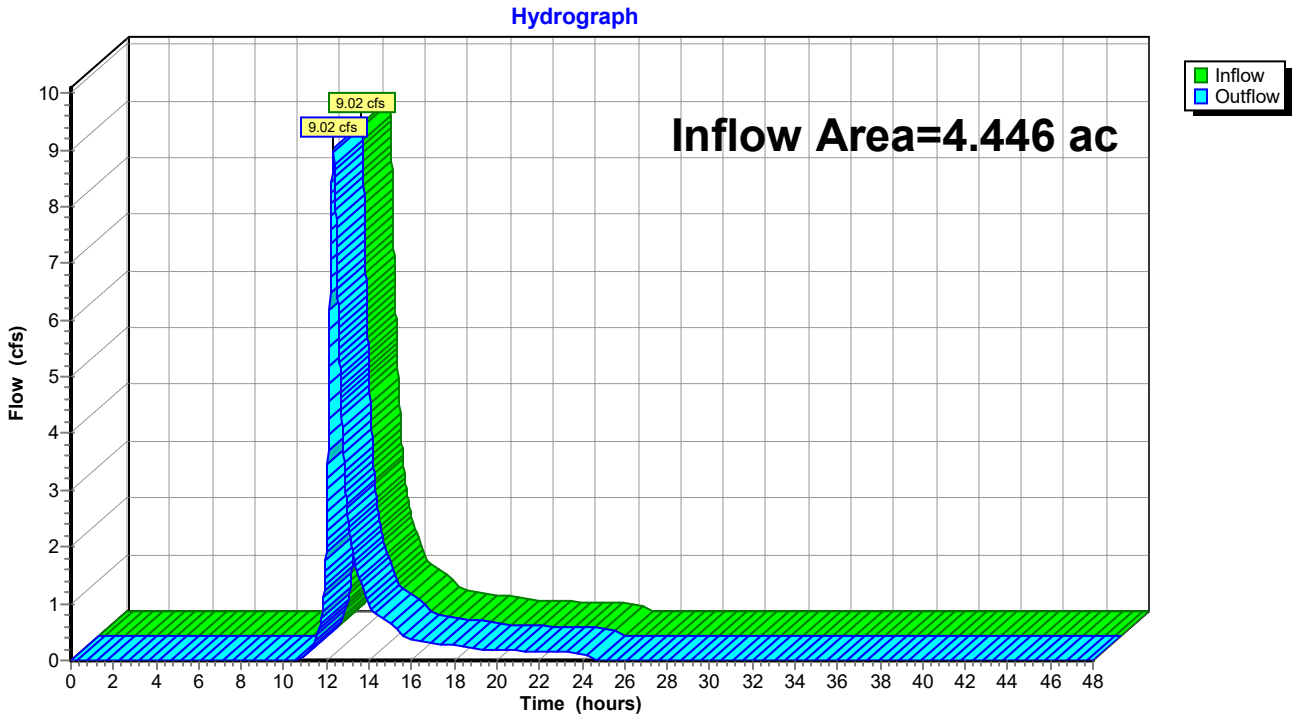


Summary for Reach 3R: Existing Runoff

Inflow Area = 4.446 ac, 0.79% Impervious, Inflow Depth = 2.37" for 25-yr event
Inflow = 9.02 cfs @ 12.33 hrs, Volume= 0.879 af
Outflow = 9.02 cfs @ 12.33 hrs, Volume= 0.879 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 3R: Existing Runoff



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=4.446 ac 0.79% Impervious Runoff Depth=3.97"
Flow Length=185' Slope=0.0030 '/' Tc=25.3 min CN=69 Runoff=14.29 cfs 1.471 af

Reach 3R: Existing Runoff Inflow=14.29 cfs 1.471 af
Outflow=14.29 cfs 1.471 af

Total Runoff Area = 4.446 ac Runoff Volume = 1.471 af Average Runoff Depth = 3.97"
99.21% Pervious = 4.411 ac 0.79% Impervious = 0.035 ac

Summary for Subcatchment 1S: DA-1

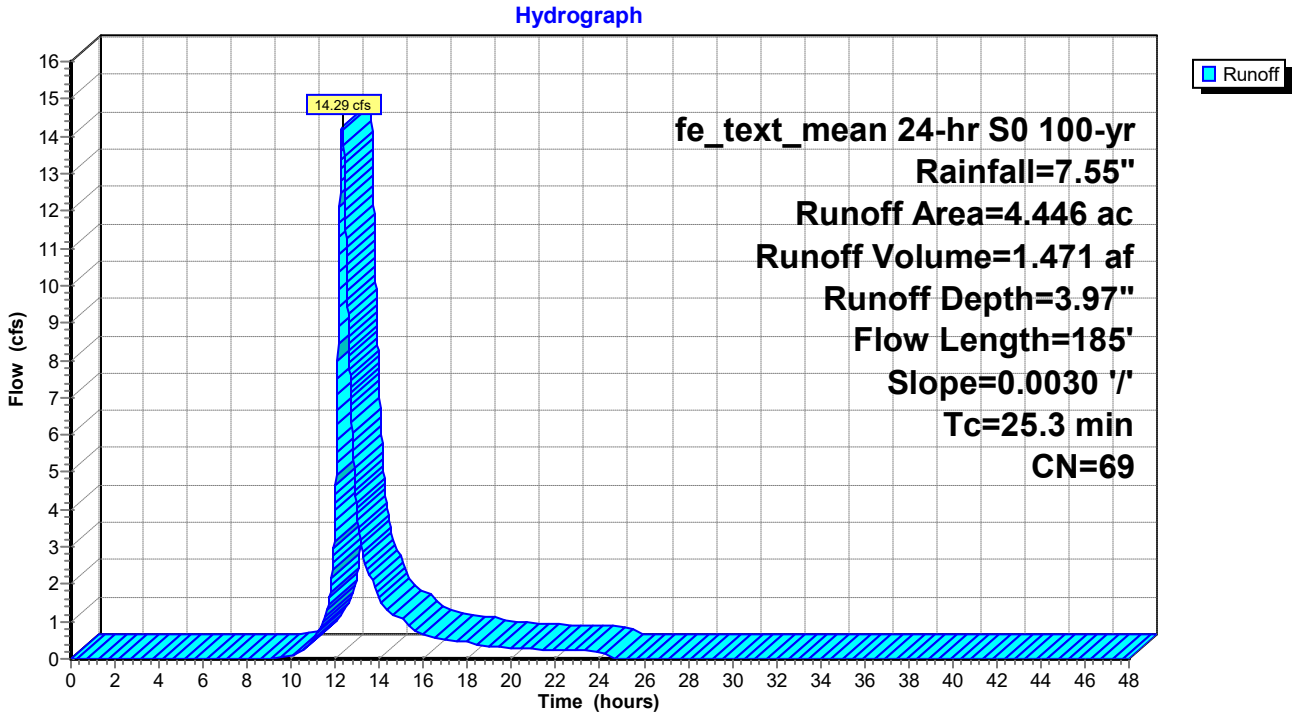
Runoff = 14.29 cfs @ 12.31 hrs, Volume= 1.471 af, Depth= 3.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

Area (ac)	CN	Description
4.411	69	50-75% Grass cover, Fair, HSG B
0.035	98	Paved parking, HSG B
4.446	69	Weighted Average
4.411		99.21% Pervious Area
0.035		0.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.6	100	0.0030	0.08		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.01"
3.7	85	0.0030	0.38		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
25.3	185	Total			

Subcatchment 1S: DA-1

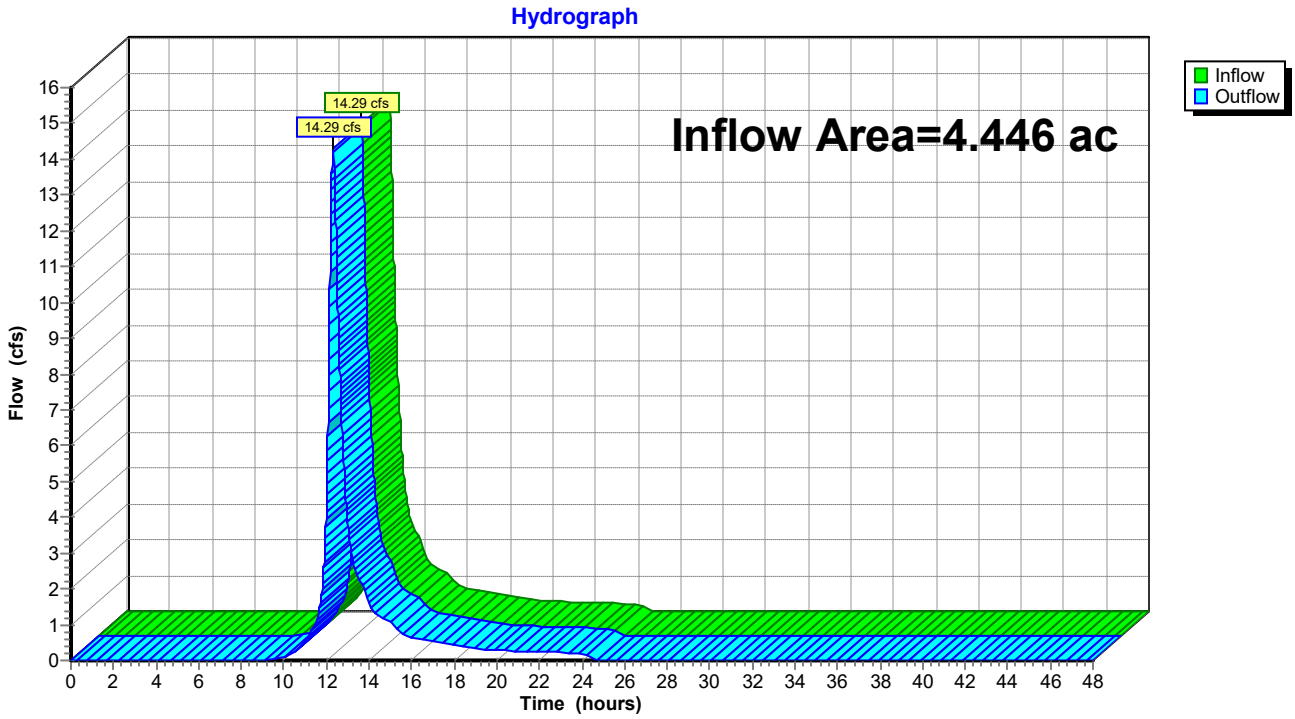


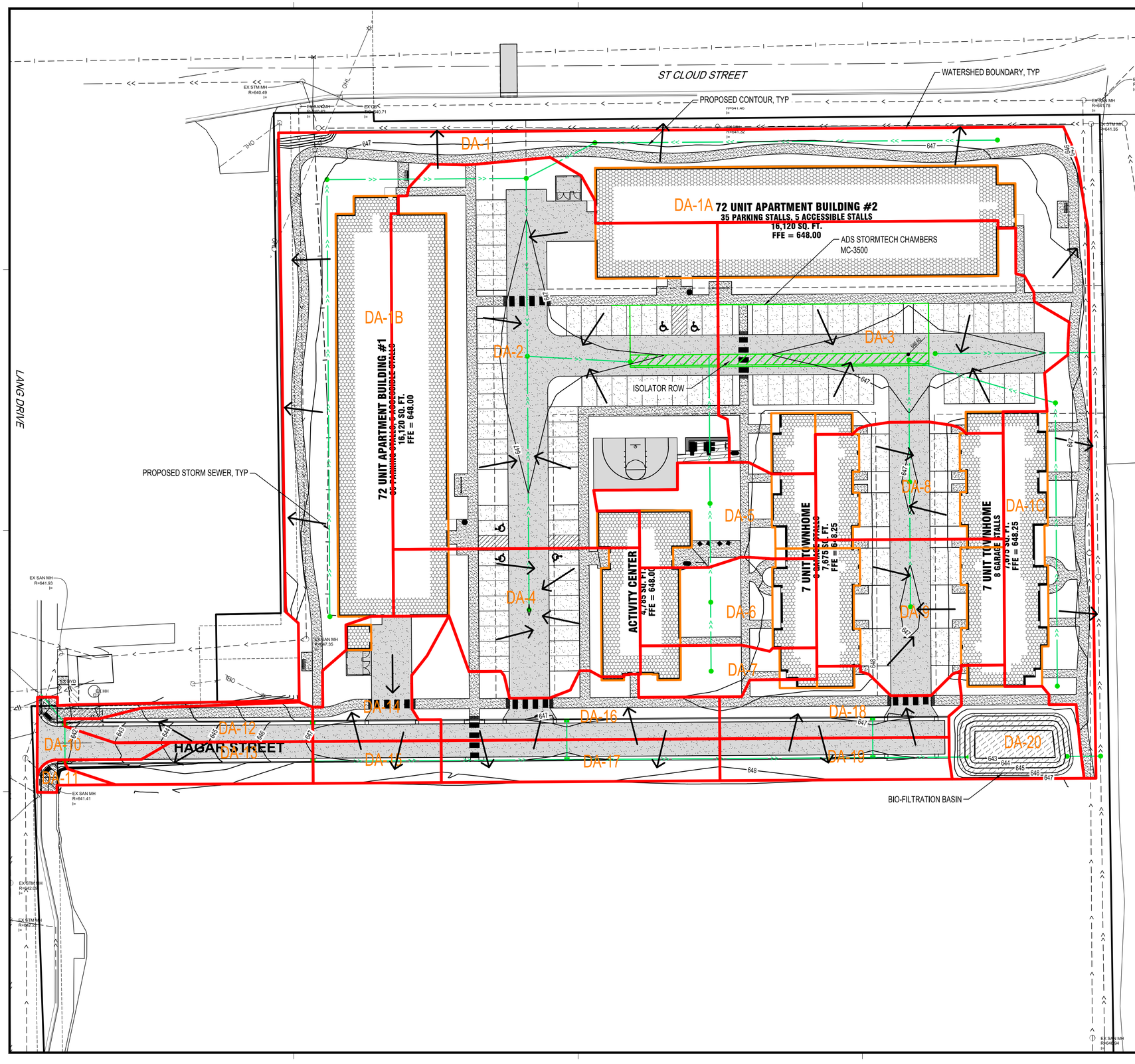
Summary for Reach 3R: Existing Runoff

Inflow Area = 4.446 ac, 0.79% Impervious, Inflow Depth = 3.97" for 100-yr event
Inflow = 14.29 cfs @ 12.31 hrs, Volume= 1.471 af
Outflow = 14.29 cfs @ 12.31 hrs, Volume= 1.471 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

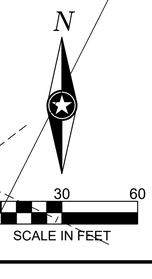
Reach 3R: Existing Runoff





Watershed	Surface Cover	Area (SF)	Area (AC)	Percent Impervious
DA-1	Impervious	8625	0.198	28%
	Pervious	22353	0.513	
	Total	**30971**	**0.711**	
DA-1A	Impervious	8200	0.188	100%
	Pervious	0	0.000	
	Total	**8200**	**0.188**	
DA-1B	Impervious	8200	0.188	100%
	Pervious	0	0.000	
	Total	**8200**	**0.188**	
DA-1C	Impervious	4162	0.096	100%
	Pervious	0	0.000	
	Total	**4162**	**0.096**	
DA-2	Impervious	31150	0.715	79%
	Pervious	8268	0.190	
	Total	**39418**	**0.905**	
DA-3	Impervious	19875	0.456	81%
	Pervious	4791	0.110	
	Total	**24667**	**0.566**	
DA-4	Impervious	8844	0.203	87%
	Pervious	1307	0.030	
	Total	**10151**	**0.233**	
DA-5	Impervious	3123	0.072	52%
	Pervious	2892	0.066	
	Total	**6015**	**0.138**	
DA-6	Impervious	3183	0.073	60%
	Pervious	2080	0.048	
	Total	**5263**	**0.121**	
DA-7	Impervious	1089	0.025	40%
	Pervious	1647	0.038	
	Total	**2737**	**0.063**	
DA-8	Impervious	6560	0.151	88%
	Pervious	870	0.020	
	Total	**7430**	**0.171**	
DA-9	Impervious	7820	0.180	85%
	Pervious	1372	0.031	
	Total	**9192**	**0.211**	
DA-10	Impervious	1569	0.036	86%
	Pervious	247	0.006	
	Total	**1816**	**0.042**	
DA-11	Impervious	216	0.005	50%
	Pervious	212	0.005	
	Total	**427**	**0.010**	
DA-12	Impervious	2387	0.055	85%
	Pervious	447	0.010	
	Total	**2834**	**0.065**	
DA-13	Impervious	1307	0.030	43%
	Pervious	1692	0.039	
	Total	**3000**	**0.069**	
DA-14	Impervious	3137	0.072	73%
	Pervious	1190	0.027	
	Total	**4327**	**0.099**	
DA-15	Impervious	956	0.022	50%
	Pervious	955	0.022	
	Total	**1911**	**0.044**	
DA-16	Impervious	3690	0.085	58%
	Pervious	2651	0.061	
	Total	**6341**	**0.146**	
DA-17	Impervious	2078	0.048	51%
	Pervious	2075	0.047	
	Total	**4154**	**0.095**	
DA-18	Impervious	3205	0.074	69%
	Pervious	1463	0.033	
	Total	**4667**	**0.107**	
DA-19	Impervious	1710	0.039	49%
	Pervious	1718	0.040	
	Total	**3428**	**0.079**	
DA-20	Impervious	3340	0.077	78%
	Pervious	961	0.022	
	Total	**4302**	**0.099**	

TOTAL IMPERVIOUS	**3.088**	69%
TOTAL PERVIOUS	**1.358**	
TOTAL AREA	**4.446**	



ISG

PRELIMINARY NOT FOR CONSTRUCTION

PROJECT

RED CLOUD DEVELOPMENT

LA CROSSE WISCONSIN

REVISION SCHEDULE

DATE	DESCRIPTION	BY

PROJECT NO.	20-24403
FILE NAME	24403 PROPOSED STORMWATER
DRAWN BY	CLF, SMD
DESIGNED BY	KBR
REVIEWED BY	KBR
ORIGINAL ISSUE DATE	---
CLIENT PROJECT NO.	-

TITLE

PROPOSED DRAINAGE CONDITIONS

SHEET

B

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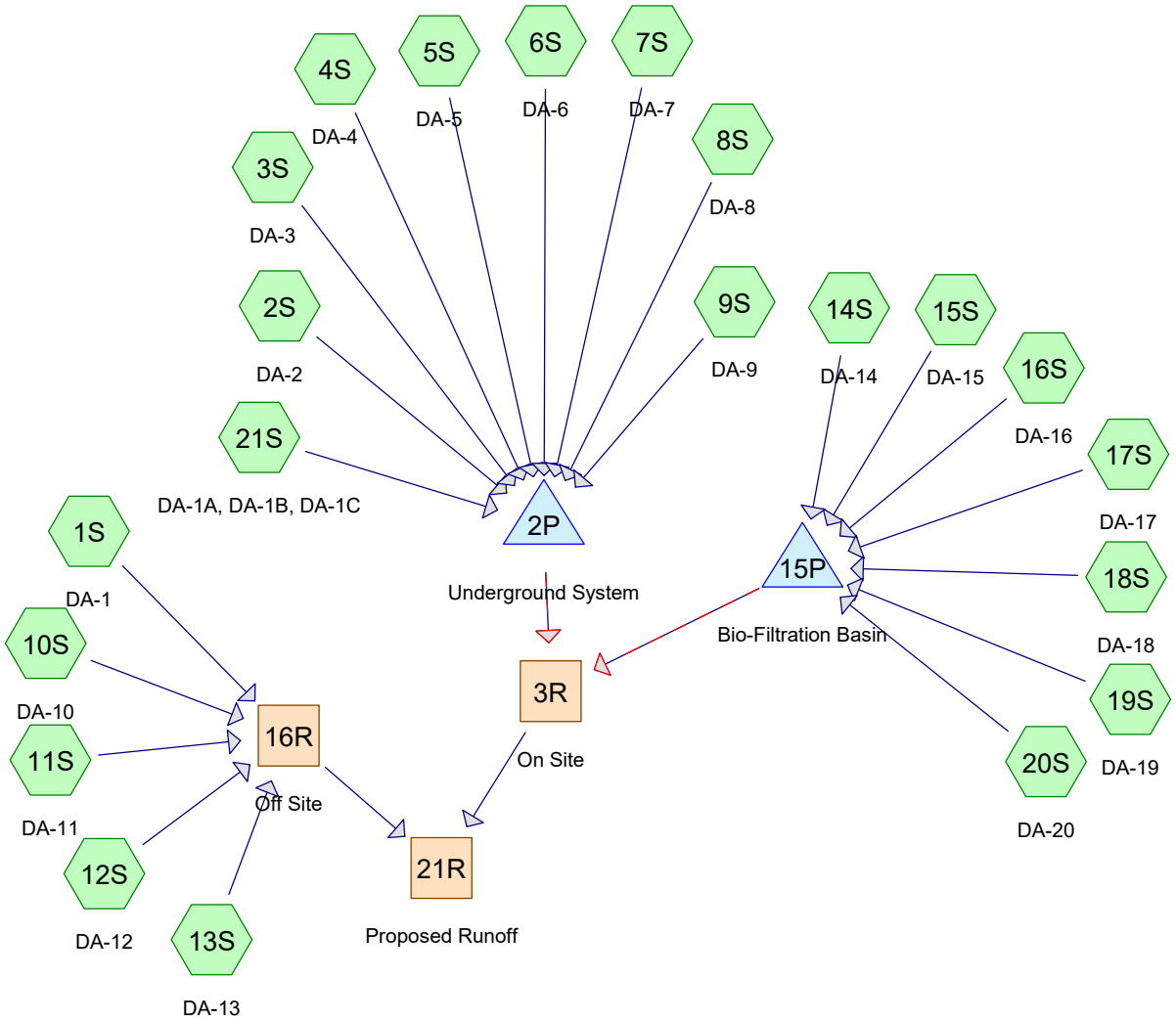


Subcat Reach Pond Link

Routing Diagram for 24403 Proposed Conditions
Prepared by ISG, Printed 4/1/2021

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-yr	fe_text_mean 24-hr S0	1-yr	Default	24.00	1	2.61	2
2	2-yr	fe_text_mean 24-hr S0	2-yr	Default	24.00	1	3.01	2
3	5-yr	fe_text_mean 24-hr S0	5-yr	Default	24.00	1	3.75	2
4	10-yr	fe_text_mean 24-hr S0	10-yr	Default	24.00	1	4.46	2
5	25-yr	fe_text_mean 24-hr S0	25-yr	Default	24.00	1	5.56	2
6	100-yr	fe_text_mean 24-hr S0	100-yr	Default	24.00	1	7.55	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.358	61	>75% Grass cover, Good, HSG B (1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S, 17S, 18S, 19S, 20S)
2.616	98	Impervious, HSG B (1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S, 17S, 18S, 19S, 20S)
0.472	98	Roofs, HSG B (21S)
4.446	**87**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
4.446	HSG B	1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S, 17S, 18S, 19S, 20S, 21S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
4.446		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	1.358	0.000	0.000	0.000	1.358	>75% Grass cover, Good	1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S, 17S, 18S, 19S, 20S
0.000	2.616	0.000	0.000	0.000	2.616	Impervious	1S, 2S, 3S, 4S, 5S, 6S, 7S, 8S, 9S, 10S, 11S, 12S, 13S, 14S, 15S, 16S, 17S, 18S, 19S, 20S
0.000	0.472	0.000	0.000	0.000	0.472	Roofs	21S
0.000	**4.446**	**0.000**	**0.000**	**0.000**	**4.446**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	2P	640.25	639.75	100.0	0.0050	0.013	12.0	0.0	0.0

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=0.711 ac 27.85% Impervious Runoff Depth=0.55"
Tc=5.0 min CN=71 Runoff=0.55 cfs 0.032 af

Subcatchment 2S: DA-2 Runoff Area=0.905 ac 79.01% Impervious Runoff Depth=1.63"
Tc=5.0 min CN=90 Runoff=2.63 cfs 0.123 af

Subcatchment 3S: DA-3 Runoff Area=0.566 ac 80.57% Impervious Runoff Depth=1.71"
Tc=5.0 min CN=91 Runoff=1.72 cfs 0.081 af

Subcatchment 4S: DA-4 Runoff Area=0.233 ac 87.12% Impervious Runoff Depth=1.88"
Tc=5.0 min CN=93 Runoff=0.77 cfs 0.037 af

Subcatchment 5S: DA-5 Runoff Area=0.138 ac 52.17% Impervious Runoff Depth=0.97"
Tc=5.0 min CN=80 Runoff=0.23 cfs 0.011 af

Subcatchment 6S: DA-6 Runoff Area=0.121 ac 60.33% Impervious Runoff Depth=1.14"
Tc=5.0 min CN=83 Runoff=0.24 cfs 0.011 af

Subcatchment 7S: DA-7 Runoff Area=0.063 ac 39.68% Impervious Runoff Depth=0.76"
Tc=5.0 min CN=76 Runoff=0.08 cfs 0.004 af

Subcatchment 8S: DA-8 Runoff Area=0.171 ac 88.30% Impervious Runoff Depth=1.97"
Tc=5.0 min CN=94 Runoff=0.59 cfs 0.028 af

Subcatchment 9S: DA-9 Runoff Area=0.211 ac 85.31% Impervious Runoff Depth=1.88"
Tc=5.0 min CN=93 Runoff=0.70 cfs 0.033 af

Subcatchment 10S: DA-10 Runoff Area=0.042 ac 85.71% Impervious Runoff Depth=1.88"
Tc=5.0 min CN=93 Runoff=0.14 cfs 0.007 af

Subcatchment 11S: DA-11 Runoff Area=0.010 ac 50.00% Impervious Runoff Depth=0.97"
Tc=5.0 min CN=80 Runoff=0.02 cfs 0.001 af

Subcatchment 12S: DA-12 Runoff Area=0.065 ac 84.62% Impervious Runoff Depth=1.80"
Tc=5.0 min CN=92 Runoff=0.21 cfs 0.010 af

Subcatchment 13S: DA-13 Runoff Area=0.069 ac 43.48% Impervious Runoff Depth=0.81"
Tc=5.0 min CN=77 Runoff=0.09 cfs 0.005 af

Subcatchment 14S: DA-14 Runoff Area=0.099 ac 72.73% Impervious Runoff Depth=1.48"
Tc=5.0 min CN=88 Runoff=0.26 cfs 0.012 af

Subcatchment 15S: DA-15 Runoff Area=0.044 ac 50.00% Impervious Runoff Depth=0.97"
Tc=5.0 min CN=80 Runoff=0.07 cfs 0.004 af

Subcatchment 16S: DA-16 Runoff Area=0.146 ac 58.22% Impervious Runoff Depth=1.14"
Tc=5.0 min CN=83 Runoff=0.29 cfs 0.014 af

Subcatchment 17S: DA-17 Runoff Area=0.095 ac 50.53% Impervious Runoff Depth=0.97"
Tc=5.0 min CN=80 Runoff=0.16 cfs 0.008 af

Subcatchment 18S: DA-18 Runoff Area=0.107 ac 69.16% Impervious Runoff Depth=1.40"
Tc=5.0 min CN=87 Runoff=0.27 cfs 0.013 af

Subcatchment 19S: DA-19 Runoff Area=0.079 ac 49.37% Impervious Runoff Depth=0.91"
Tc=5.0 min CN=79 Runoff=0.12 cfs 0.006 af

Subcatchment 20S: DA-20 Runoff Area=0.099 ac 77.78% Impervious Runoff Depth=1.63"
Tc=5.0 min CN=90 Runoff=0.29 cfs 0.013 af

Subcatchment 21S: DA-1A, DA-1B, DA-1C Runoff Area=0.472 ac 100.00% Impervious Runoff Depth=2.38"
Tc=5.0 min CN=98 Runoff=1.83 cfs 0.094 af

Reach 3R: On Site Inflow=0.52 cfs 0.490 af
Outflow=0.52 cfs 0.490 af

Reach 16R: Off Site Inflow=1.00 cfs 0.054 af
Outflow=1.00 cfs 0.054 af

Reach 21R: Proposed Runoff Inflow=1.35 cfs 0.544 af
Outflow=1.35 cfs 0.544 af

Pond 2P: Underground System Peak Elev=642.61' Storage=0.253 af Inflow=8.79 cfs 0.422 af
Primary=0.41 cfs 0.421 af Secondary=0.00 cfs 0.000 af Outflow=0.41 cfs 0.421 af

Pond 15P: Bio-Filtration Basin Peak Elev=644.27' Storage=1,332 cf Inflow=1.46 cfs 0.069 af
Primary=0.11 cfs 0.069 af Secondary=0.00 cfs 0.000 af Outflow=0.11 cfs 0.069 af

Total Runoff Area = 4.446 ac Runoff Volume = 0.545 af Average Runoff Depth = 1.47"
30.54% Pervious = 1.358 ac 69.46% Impervious = 3.088 ac

Summary for Subcatchment 1S: DA-1

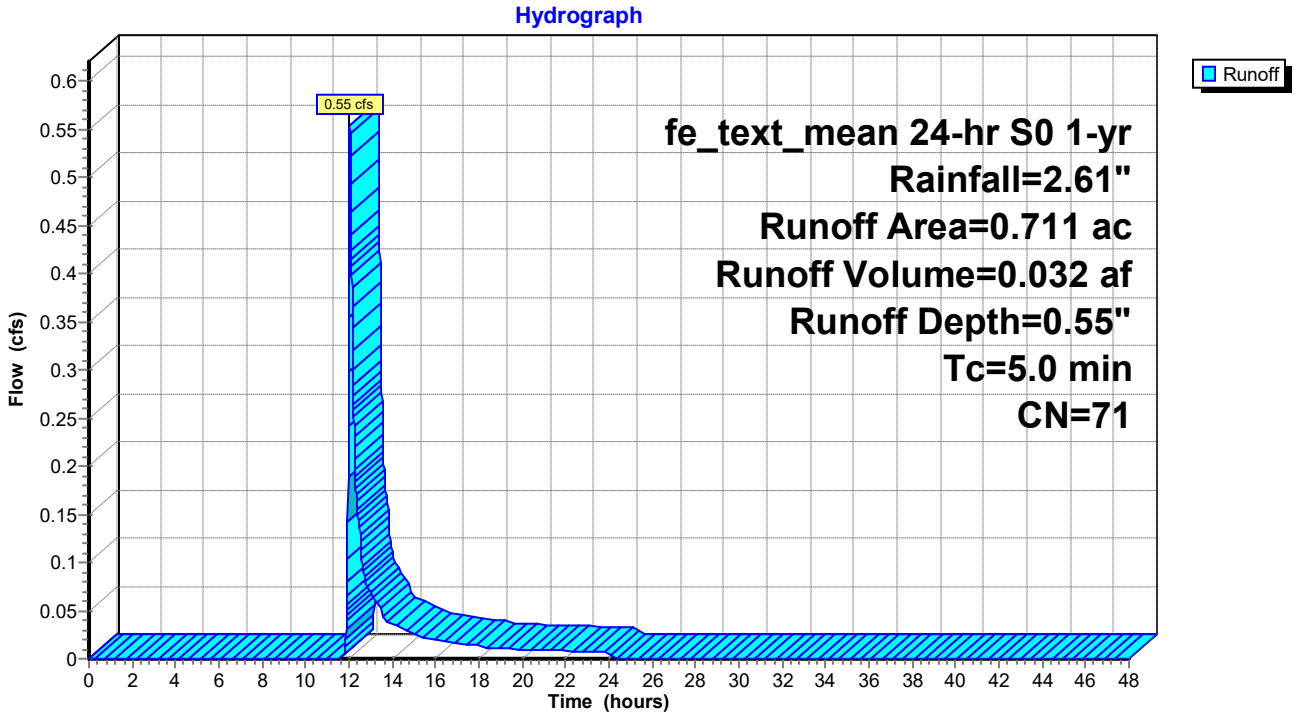
Runoff = 0.55 cfs @ 12.04 hrs, Volume= 0.032 af, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.198	98	Impervious, HSG B
	0.513	61	>75% Grass cover, Good, HSG B
	0.711	71	Weighted Average
	0.513		72.15% Pervious Area
	0.198		27.85% Impervious Area

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

Subcatchment 1S: DA-1



Summary for Subcatchment 2S: DA-2

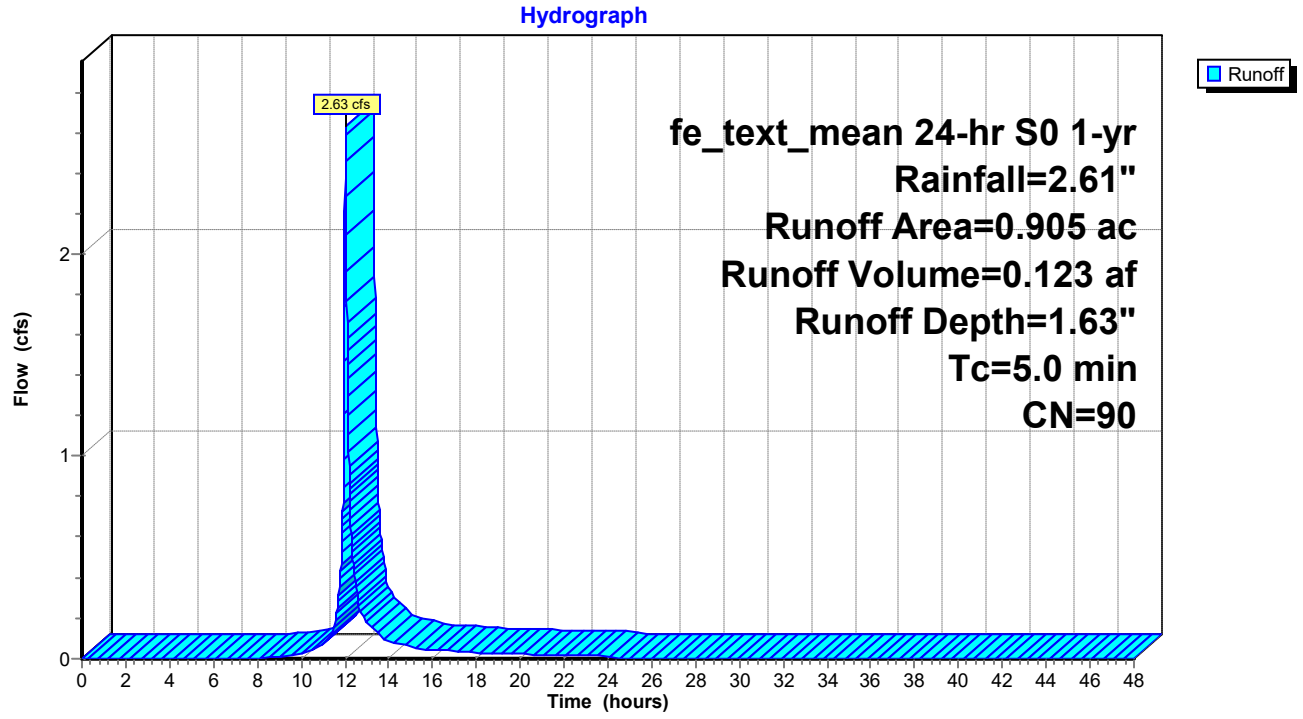
Runoff = 2.63 cfs @ 12.03 hrs, Volume= 0.123 af, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.715	98	Impervious, HSG B
	0.190	61	>75% Grass cover, Good, HSG B
	0.905	90	Weighted Average
	0.190		20.99% Pervious Area
	0.715		79.01% Impervious Area

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

Subcatchment 2S: DA-2



Summary for Subcatchment 3S: DA-3

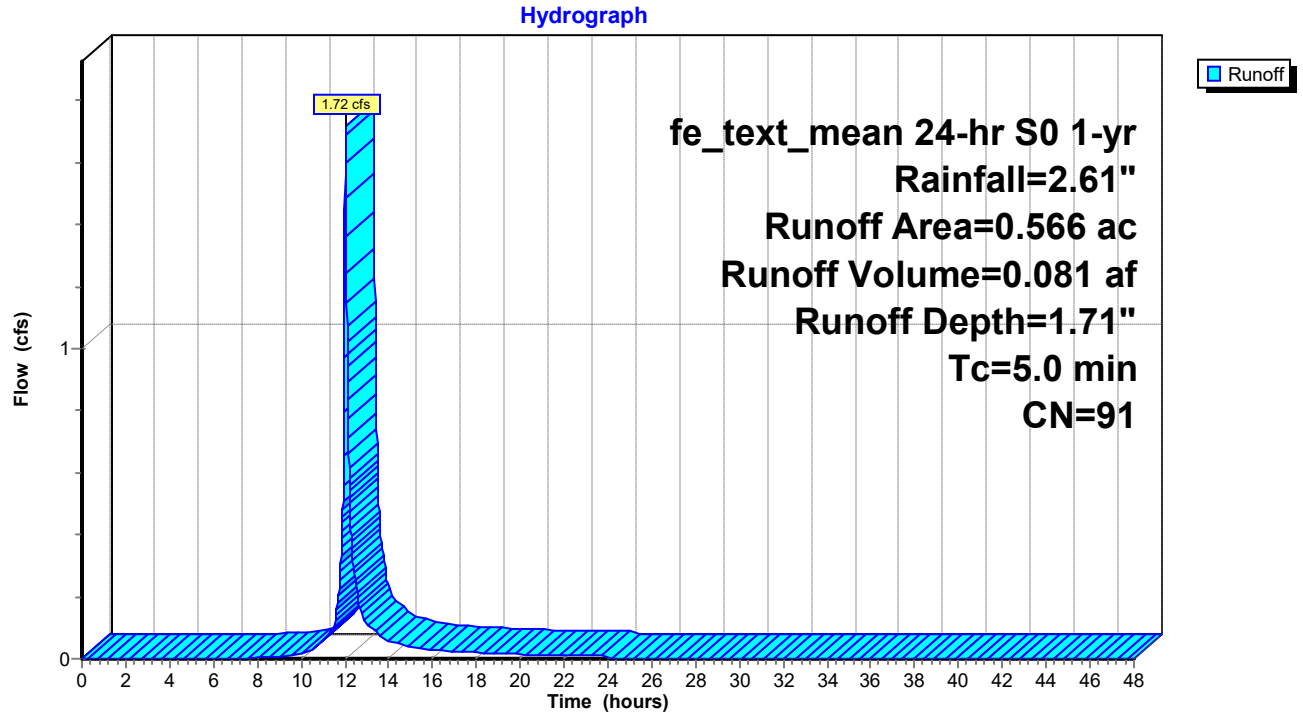
Runoff = 1.72 cfs @ 12.03 hrs, Volume= 0.081 af, Depth= 1.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.456	98	Impervious, HSG B
	0.110	61	>75% Grass cover, Good, HSG B
	0.566	91	Weighted Average
	0.110		19.43% Pervious Area
	0.456		80.57% Impervious Area

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

Subcatchment 3S: DA-3



Summary for Subcatchment 4S: DA-4

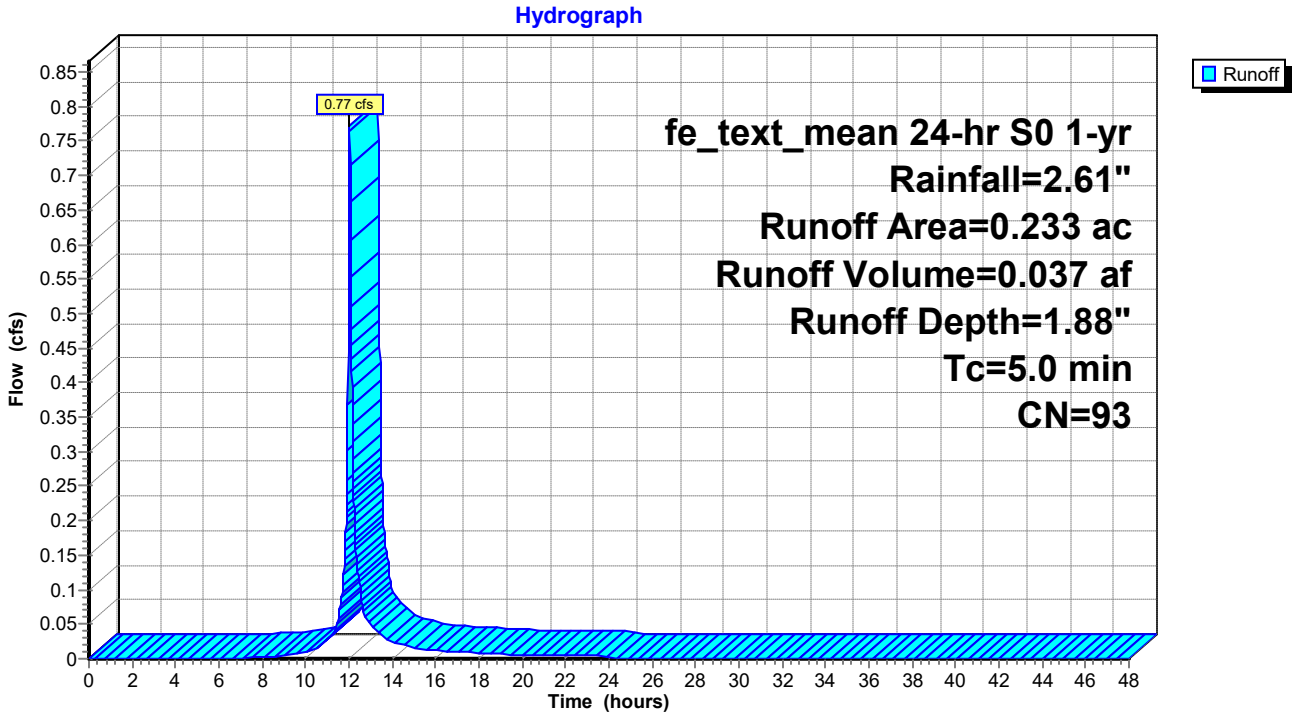
Runoff = 0.77 cfs @ 12.03 hrs, Volume= 0.037 af, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.203	98	Impervious, HSG B
	0.030	61	>75% Grass cover, Good, HSG B
	0.233	93	Weighted Average
	0.030		12.88% Pervious Area
	0.203		87.12% Impervious Area

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

Subcatchment 4S: DA-4



Summary for Subcatchment 5S: DA-5

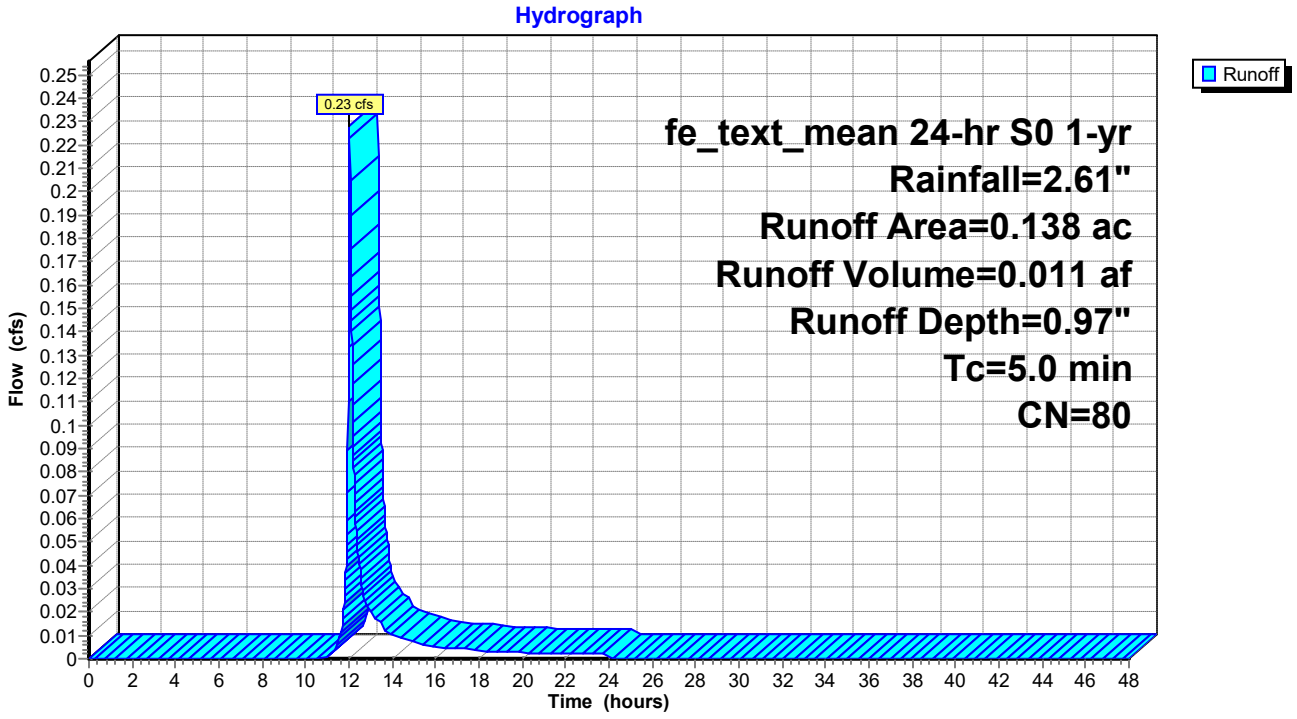
Runoff = 0.23 cfs @ 12.03 hrs, Volume= 0.011 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.072	98	Impervious, HSG B
	0.066	61	>75% Grass cover, Good, HSG B
	0.138	80	Weighted Average
	0.066		47.83% Pervious Area
	0.072		52.17% Impervious Area

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

Subcatchment 5S: DA-5



Summary for Subcatchment 6S: DA-6

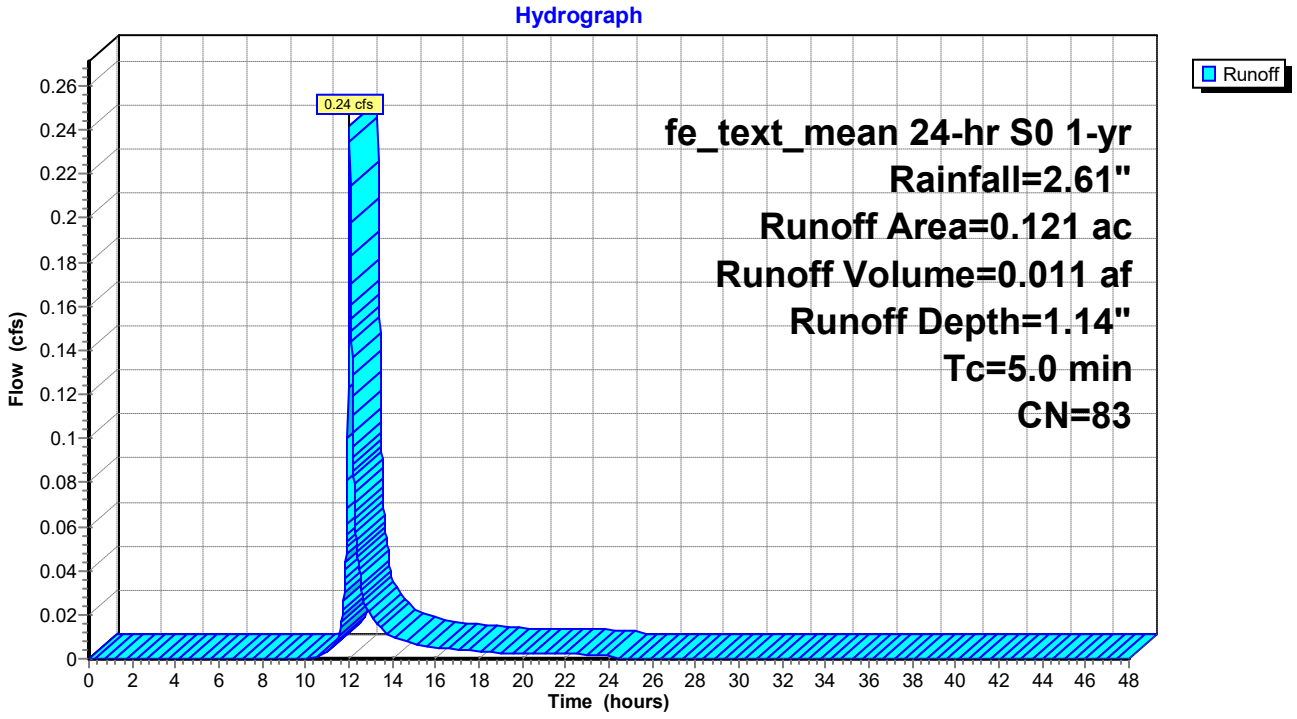
Runoff = 0.24 cfs @ 12.03 hrs, Volume= 0.011 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.073	98	Impervious, HSG B
	0.048	61	>75% Grass cover, Good, HSG B
	0.121	83	Weighted Average
	0.048		39.67% Pervious Area
	0.073		60.33% Impervious Area

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

Subcatchment 6S: DA-6



Summary for Subcatchment 7S: DA-7

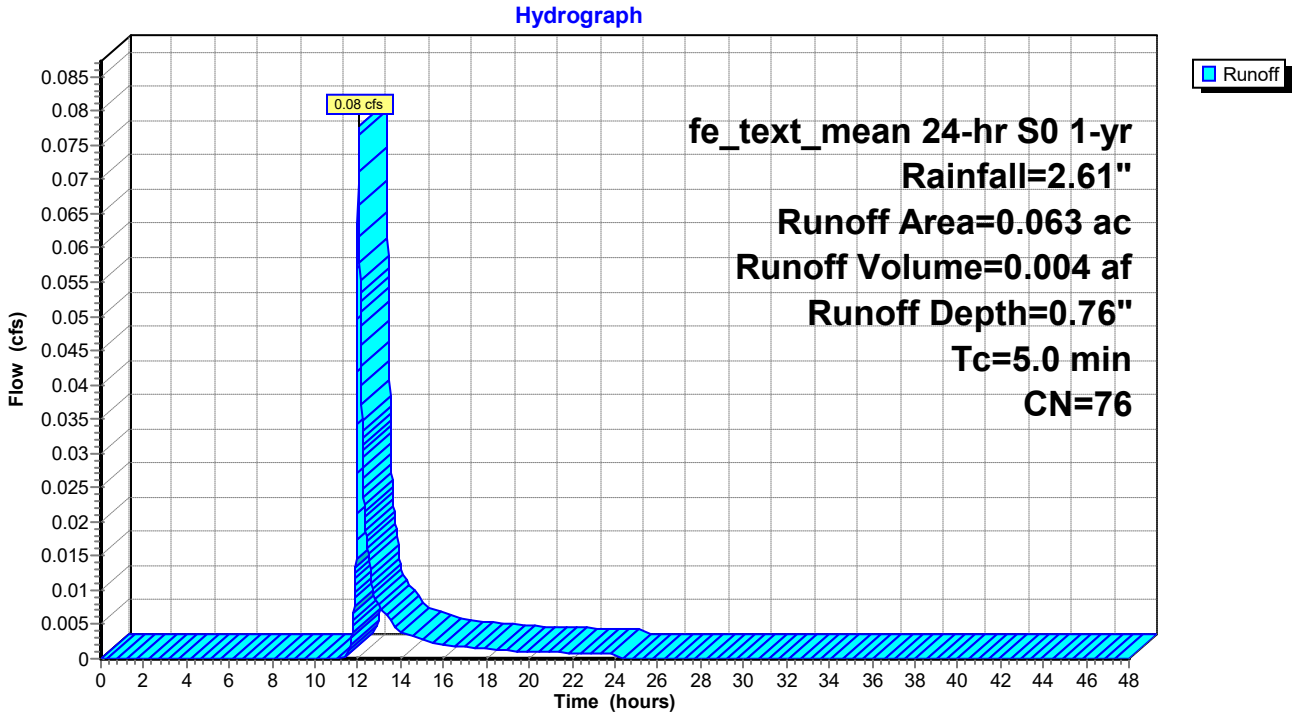
Runoff = 0.08 cfs @ 12.04 hrs, Volume= 0.004 af, Depth= 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.025	98	Impervious, HSG B
	0.038	61	>75% Grass cover, Good, HSG B
	0.063	76	Weighted Average
	0.038		60.32% Pervious Area
	0.025		39.68% Impervious Area

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

Subcatchment 7S: DA-7



Summary for Subcatchment 8S: DA-8

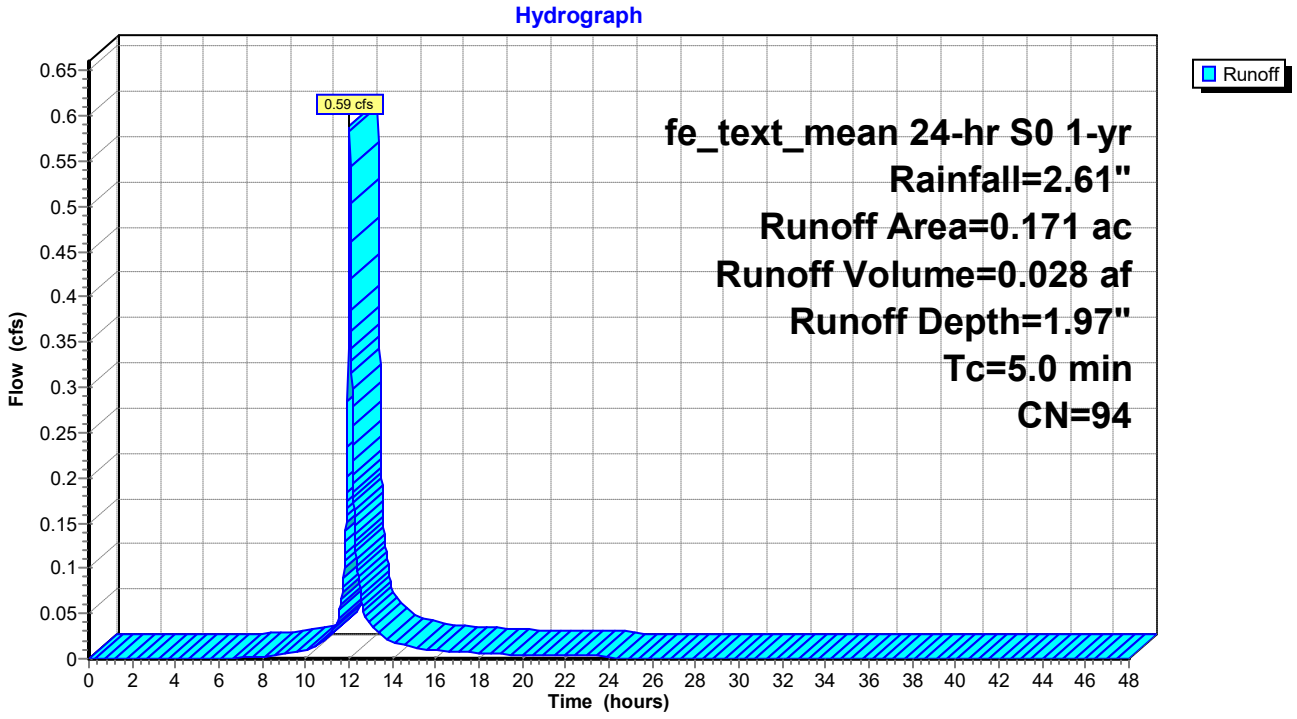
Runoff = 0.59 cfs @ 12.03 hrs, Volume= 0.028 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.151	98	Impervious, HSG B
	0.020	61	>75% Grass cover, Good, HSG B
	0.171	94	Weighted Average
	0.020		11.70% Pervious Area
	0.151		88.30% Impervious Area

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

Subcatchment 8S: DA-8



Summary for Subcatchment 9S: DA-9

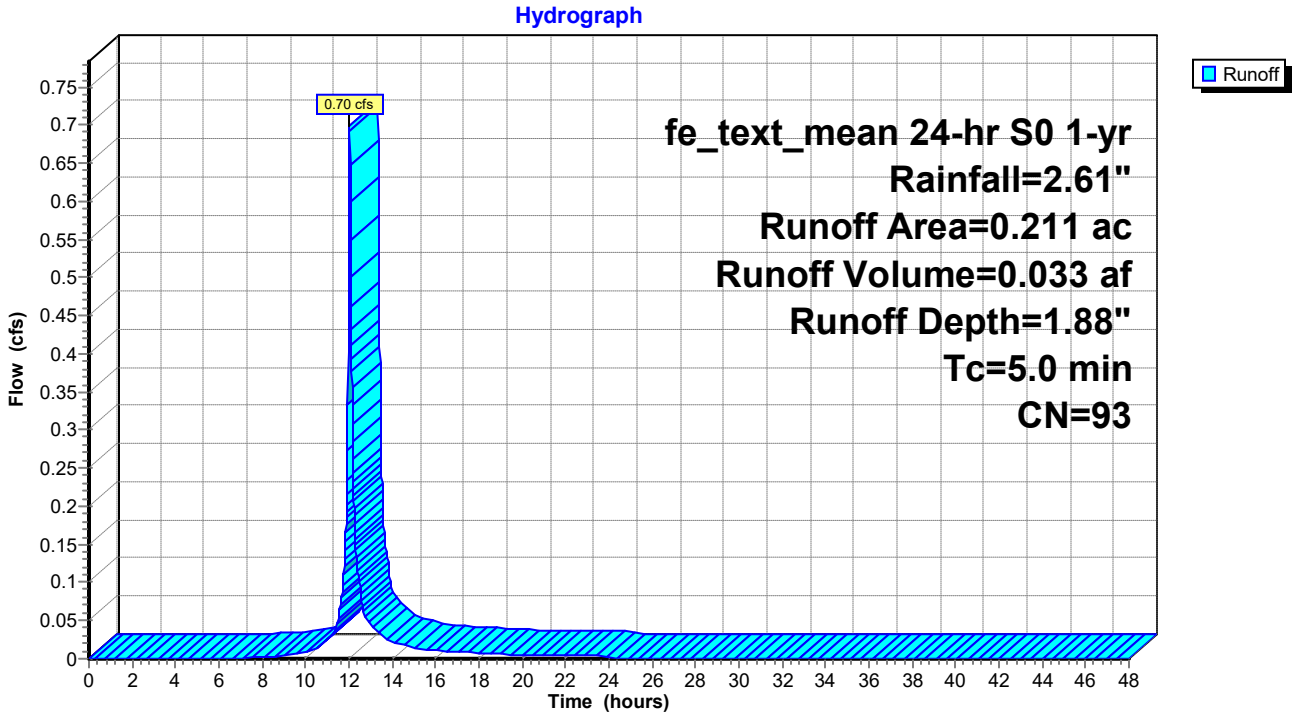
Runoff = 0.70 cfs @ 12.03 hrs, Volume= 0.033 af, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.180	98	Impervious, HSG B
	0.031	61	>75% Grass cover, Good, HSG B
	0.211	93	Weighted Average
	0.031		14.69% Pervious Area
	0.180		85.31% Impervious Area

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

Subcatchment 9S: DA-9



Summary for Subcatchment 10S: DA-10

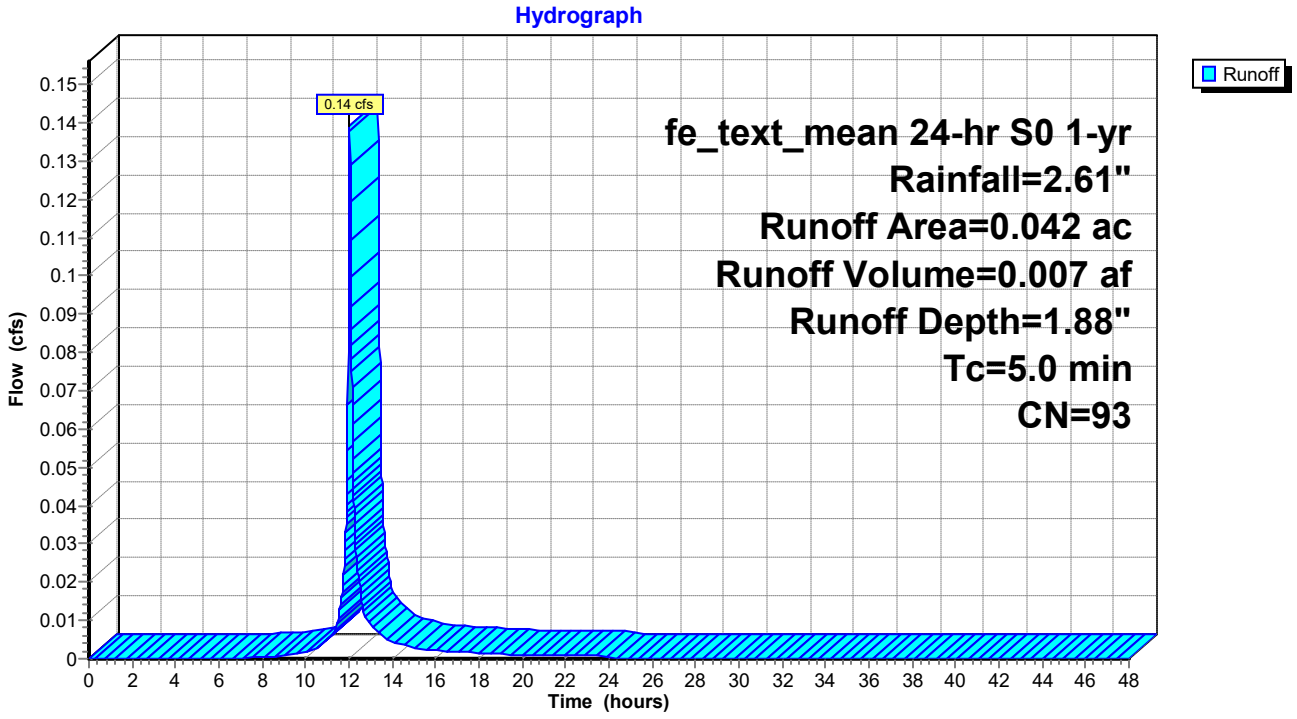
Runoff = 0.14 cfs @ 12.03 hrs, Volume= 0.007 af, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.036	98	Impervious, HSG B
	0.006	61	>75% Grass cover, Good, HSG B
	0.042	93	Weighted Average
	0.006		14.29% Pervious Area
	0.036		85.71% Impervious Area

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

Subcatchment 10S: DA-10



Summary for Subcatchment 11S: DA-11

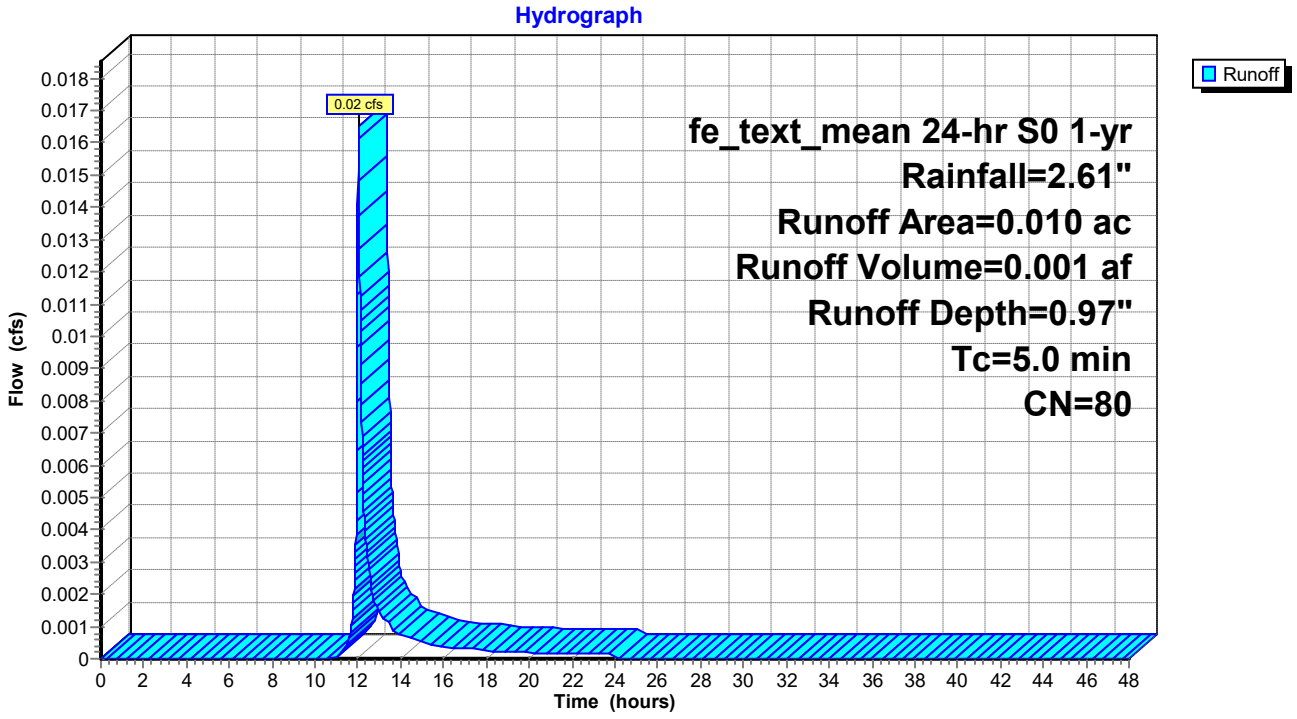
Runoff = 0.02 cfs @ 12.03 hrs, Volume= 0.001 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.005	98	Impervious, HSG B
	0.005	61	>75% Grass cover, Good, HSG B
	0.010	80	Weighted Average
	0.005		50.00% Pervious Area
	0.005		50.00% Impervious Area

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

Subcatchment 11S: DA-11



Summary for Subcatchment 12S: DA-12

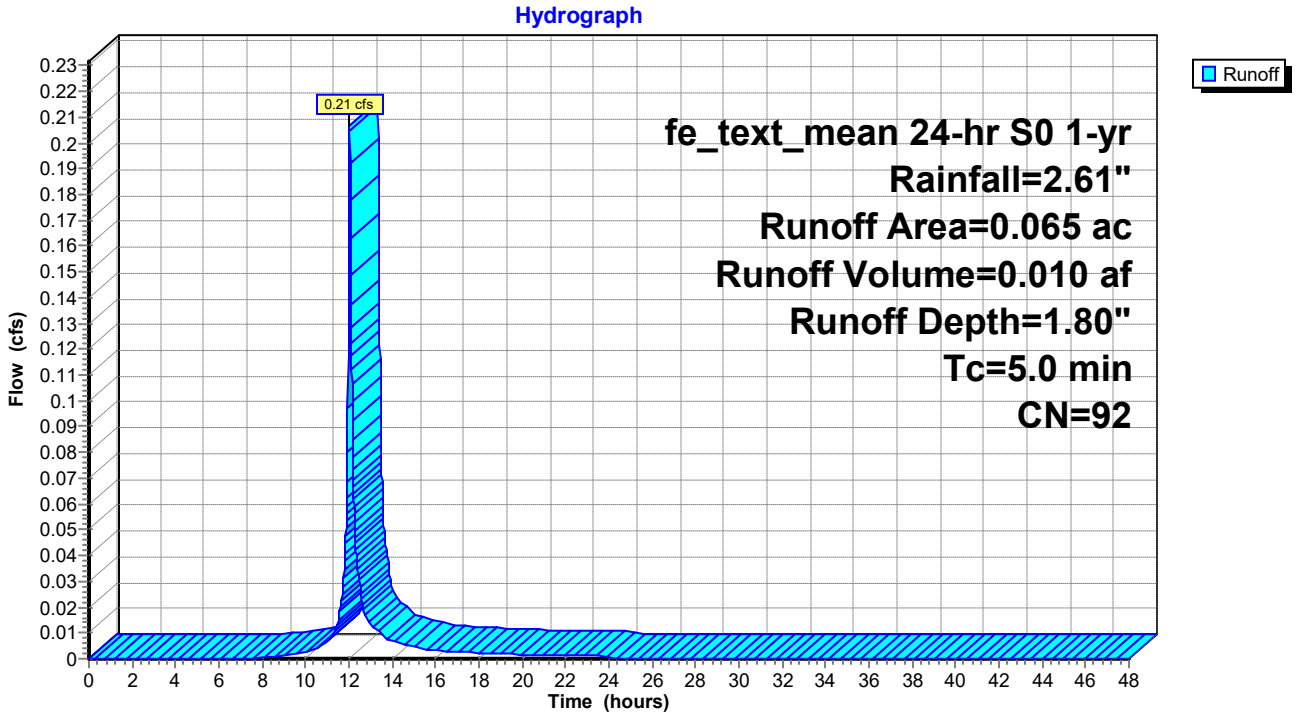
Runoff = 0.21 cfs @ 12.03 hrs, Volume= 0.010 af, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.055	98	Impervious, HSG B
	0.010	61	>75% Grass cover, Good, HSG B
	0.065	92	Weighted Average
	0.010		15.38% Pervious Area
	0.055		84.62% Impervious Area

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

Subcatchment 12S: DA-12



Summary for Subcatchment 13S: DA-13

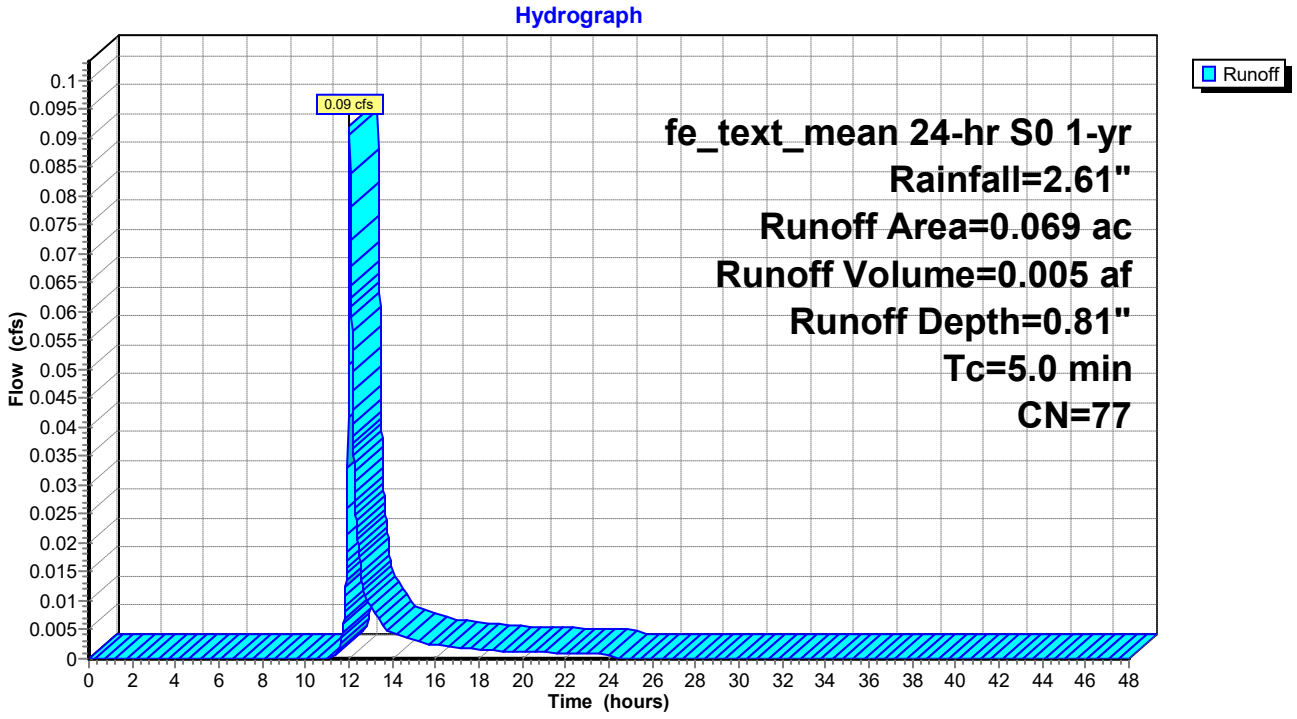
Runoff = 0.09 cfs @ 12.04 hrs, Volume= 0.005 af, Depth= 0.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.030	98	Impervious, HSG B
	0.039	61	>75% Grass cover, Good, HSG B
	0.069	77	Weighted Average
	0.039		56.52% Pervious Area
	0.030		43.48% Impervious Area

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

Subcatchment 13S: DA-13



Summary for Subcatchment 14S: DA-14

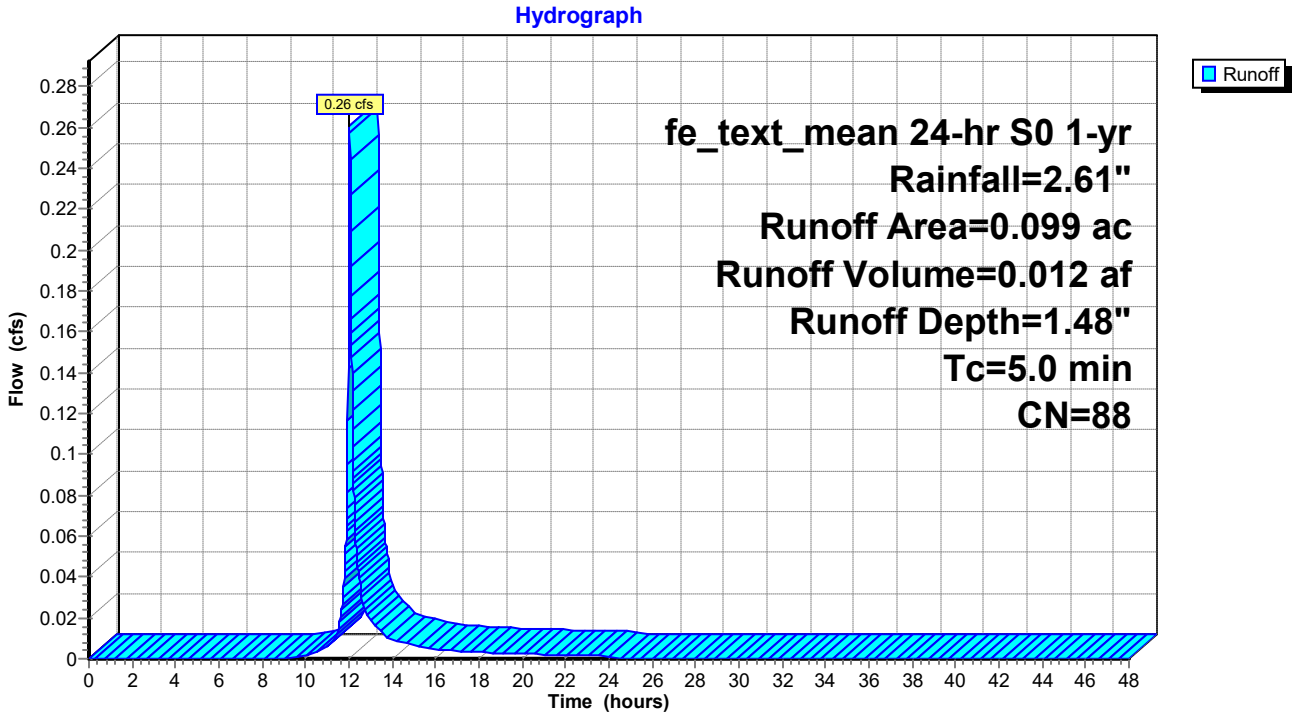
Runoff = 0.26 cfs @ 12.03 hrs, Volume= 0.012 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.072	98	Impervious, HSG B
	0.027	61	>75% Grass cover, Good, HSG B
	0.099	88	Weighted Average
	0.027		27.27% Pervious Area
	0.072		72.73% Impervious Area

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

Subcatchment 14S: DA-14



Summary for Subcatchment 15S: DA-15

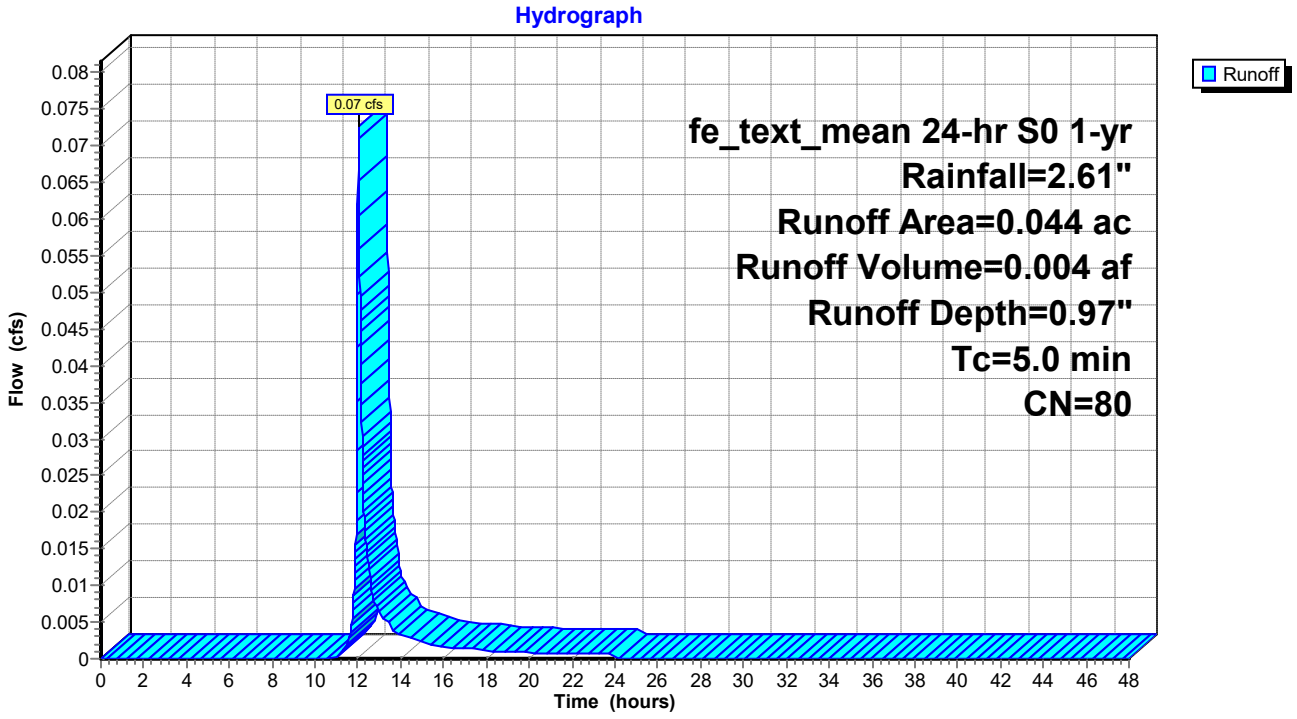
Runoff = 0.07 cfs @ 12.03 hrs, Volume= 0.004 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.022	98	Impervious, HSG B
	0.022	61	>75% Grass cover, Good, HSG B
	0.044	80	Weighted Average
	0.022		50.00% Pervious Area
	0.022		50.00% Impervious Area

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

Subcatchment 15S: DA-15



Summary for Subcatchment 16S: DA-16

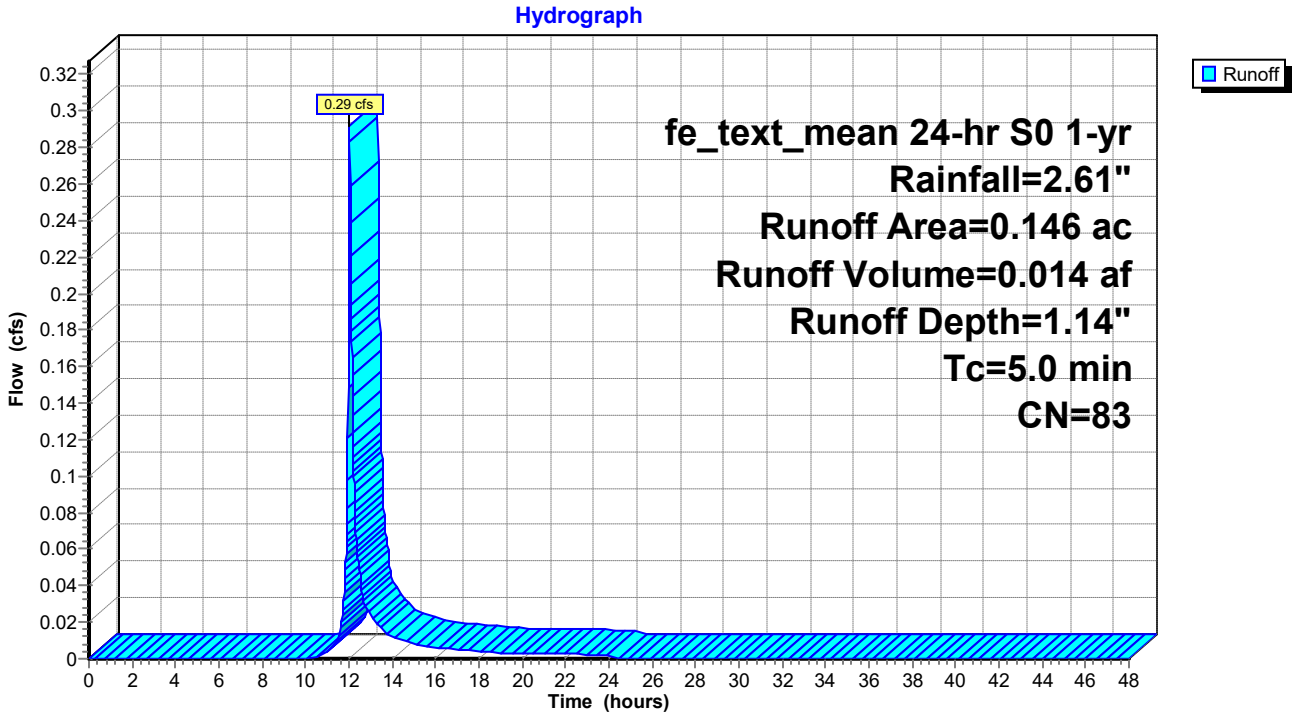
Runoff = 0.29 cfs @ 12.03 hrs, Volume= 0.014 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.085	98	Impervious, HSG B
	0.061	61	>75% Grass cover, Good, HSG B
	0.146	83	Weighted Average
	0.061		41.78% Pervious Area
	0.085		58.22% Impervious Area

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

Subcatchment 16S: DA-16



Summary for Subcatchment 17S: DA-17

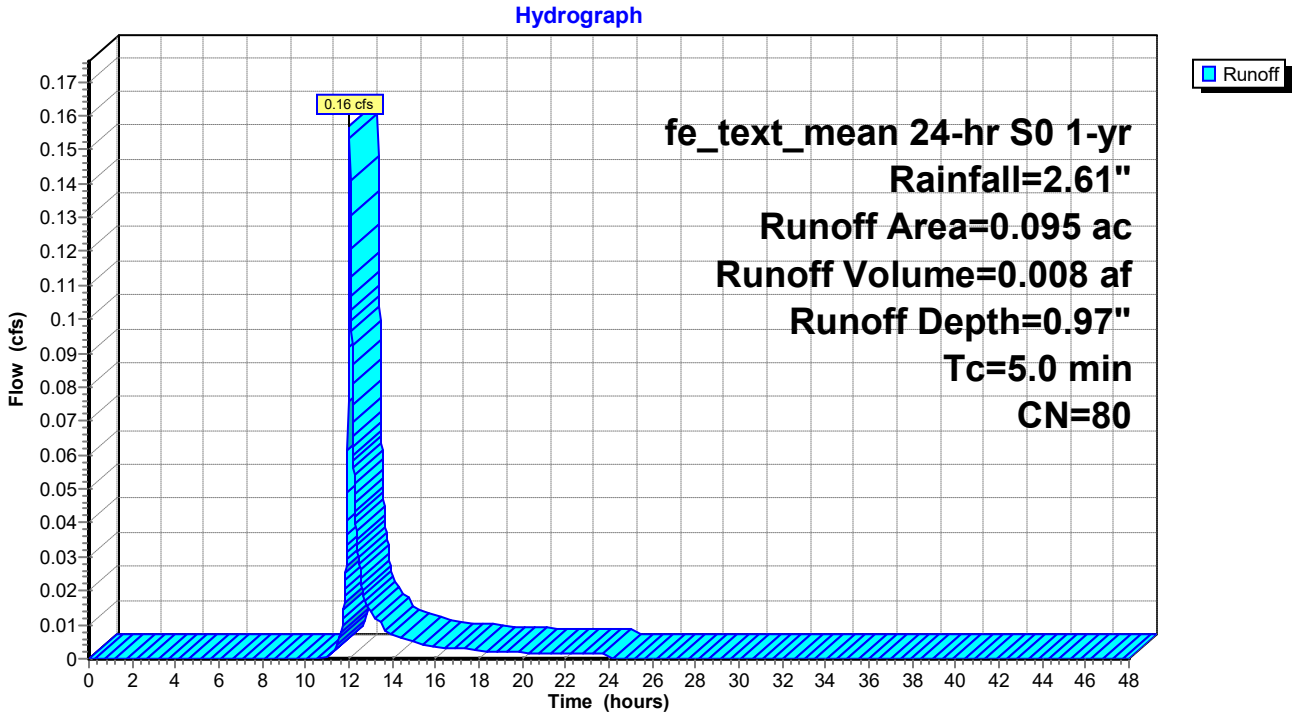
Runoff = 0.16 cfs @ 12.03 hrs, Volume= 0.008 af, Depth= 0.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.048	98	Impervious, HSG B
	0.047	61	>75% Grass cover, Good, HSG B
	0.095	80	Weighted Average
	0.047		49.47% Pervious Area
	0.048		50.53% Impervious Area

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

Subcatchment 17S: DA-17



Summary for Subcatchment 18S: DA-18

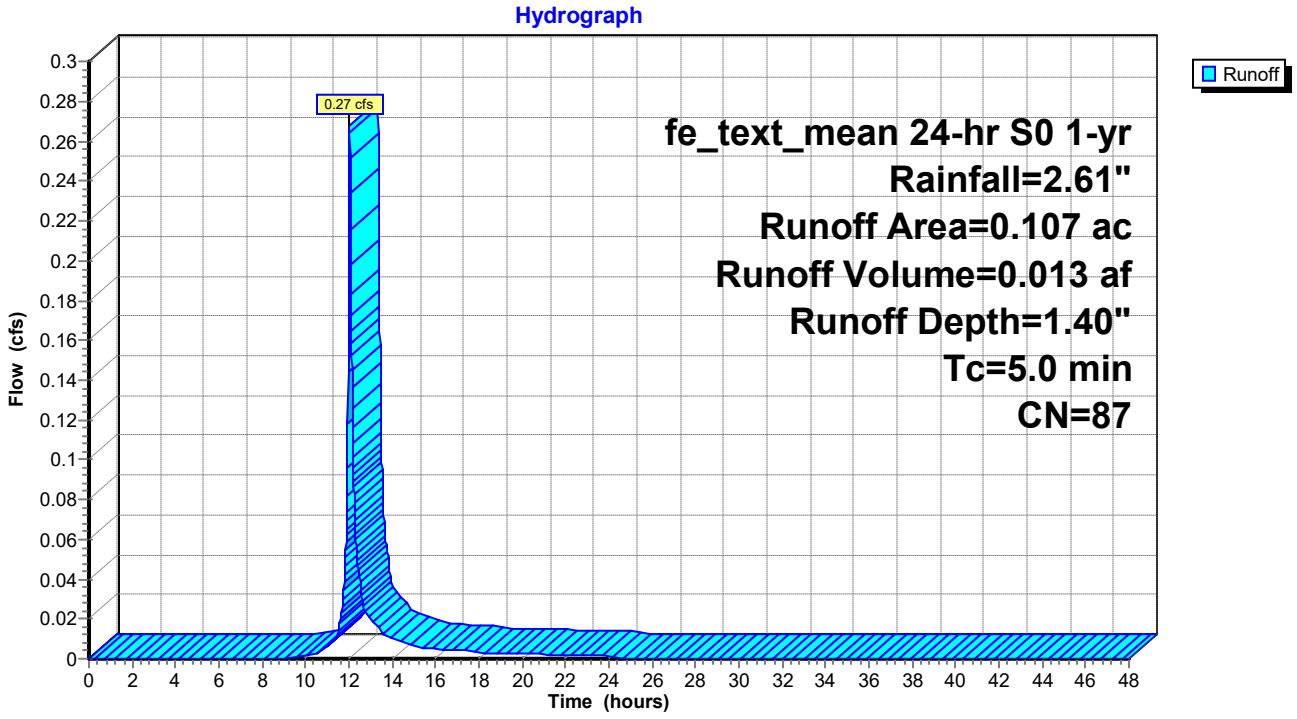
Runoff = 0.27 cfs @ 12.03 hrs, Volume= 0.013 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.074	98	Impervious, HSG B
	0.033	61	>75% Grass cover, Good, HSG B
	0.107	87	Weighted Average
	0.033		30.84% Pervious Area
	0.074		69.16% Impervious Area

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

Subcatchment 18S: DA-18



Summary for Subcatchment 19S: DA-19

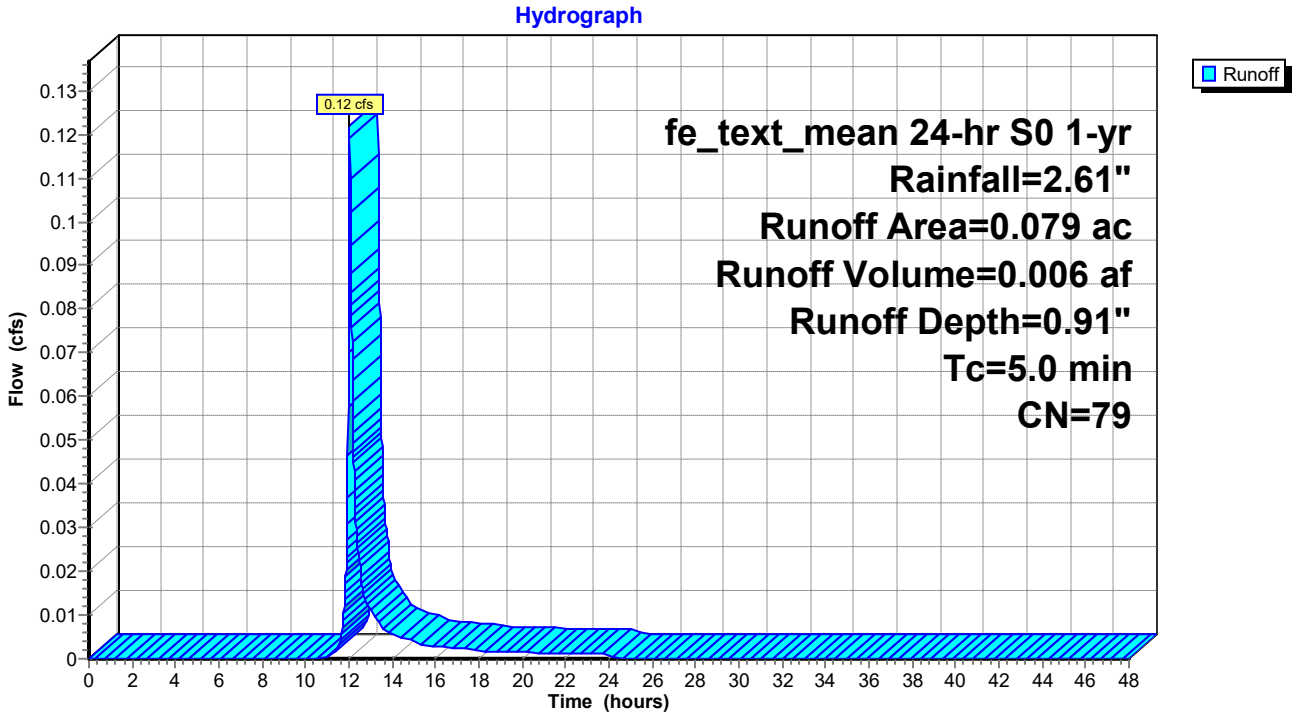
Runoff = 0.12 cfs @ 12.03 hrs, Volume= 0.006 af, Depth= 0.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.039	98	Impervious, HSG B
	0.040	61	>75% Grass cover, Good, HSG B
	0.079	79	Weighted Average
	0.040		50.63% Pervious Area
	0.039		49.37% Impervious Area

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

Subcatchment 19S: DA-19



Summary for Subcatchment 20S: DA-20

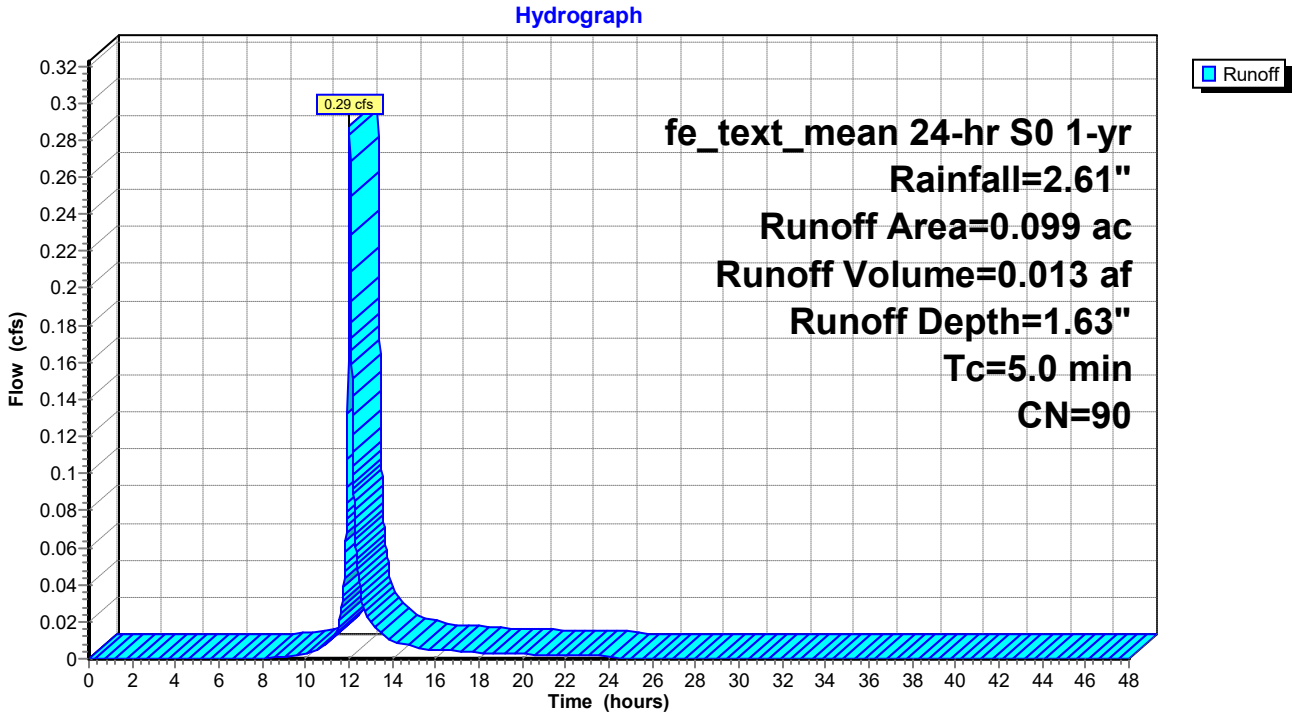
Runoff = 0.29 cfs @ 12.03 hrs, Volume= 0.013 af, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

	Area (ac)	CN	Description
*	0.077	98	Impervious, HSG B
	0.022	61	>75% Grass cover, Good, HSG B
	0.099	90	Weighted Average
	0.022		22.22% Pervious Area
	0.077		77.78% Impervious Area

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

Subcatchment 20S: DA-20



Summary for Subcatchment 21S: DA-1A, DA-1B, DA-1C

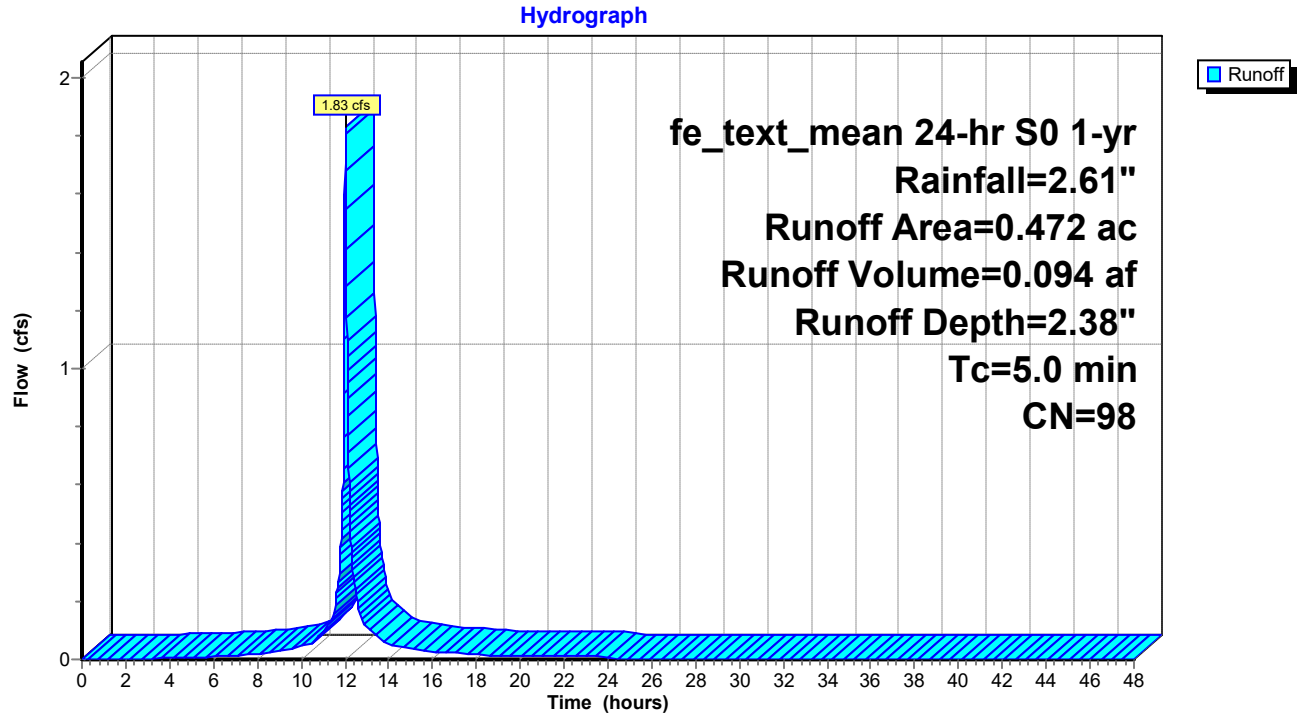
Runoff = 1.83 cfs @ 12.03 hrs, Volume= 0.094 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 1-yr Rainfall=2.61"

Area (ac)	CN	Description
0.472	98	Roofs, HSG B
0.472		100.00% Impervious Area

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

Subcatchment 21S: DA-1A, DA-1B, DA-1C

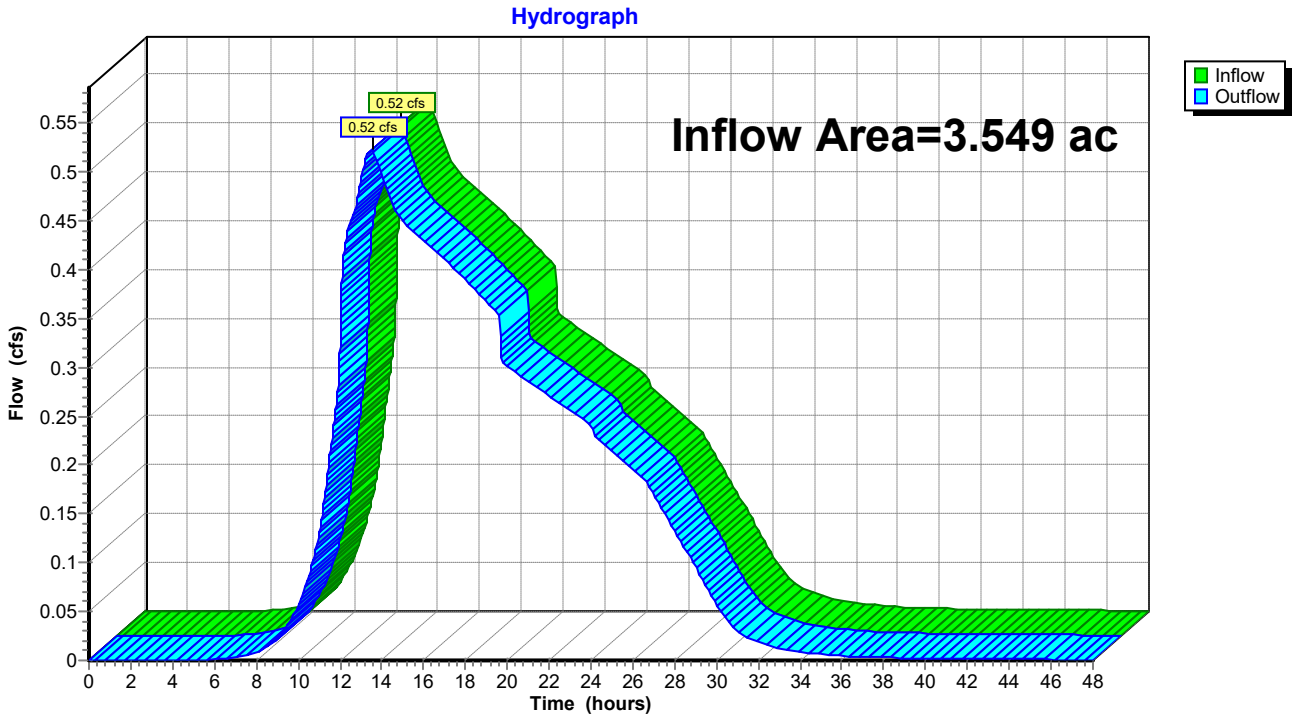


Summary for Reach 3R: On Site

Inflow Area = 3.549 ac, 77.88% Impervious, Inflow Depth > 1.66" for 1-yr event
Inflow = 0.52 cfs @ 13.54 hrs, Volume= 0.490 af
Outflow = 0.52 cfs @ 13.54 hrs, Volume= 0.490 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 3R: On Site

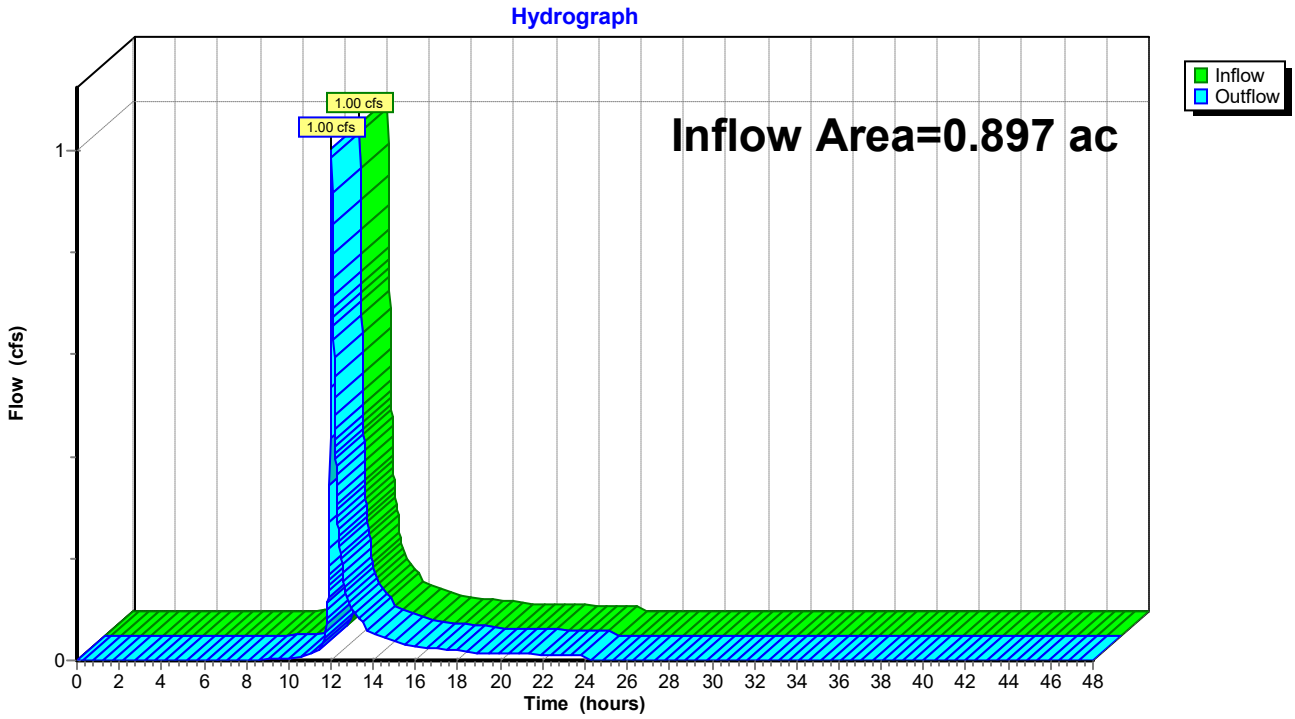


Summary for Reach 16R: Off Site

Inflow Area = 0.897 ac, 36.12% Impervious, Inflow Depth = 0.72" for 1-yr event
Inflow = 1.00 cfs @ 12.04 hrs, Volume= 0.054 af
Outflow = 1.00 cfs @ 12.04 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 16R: Off Site

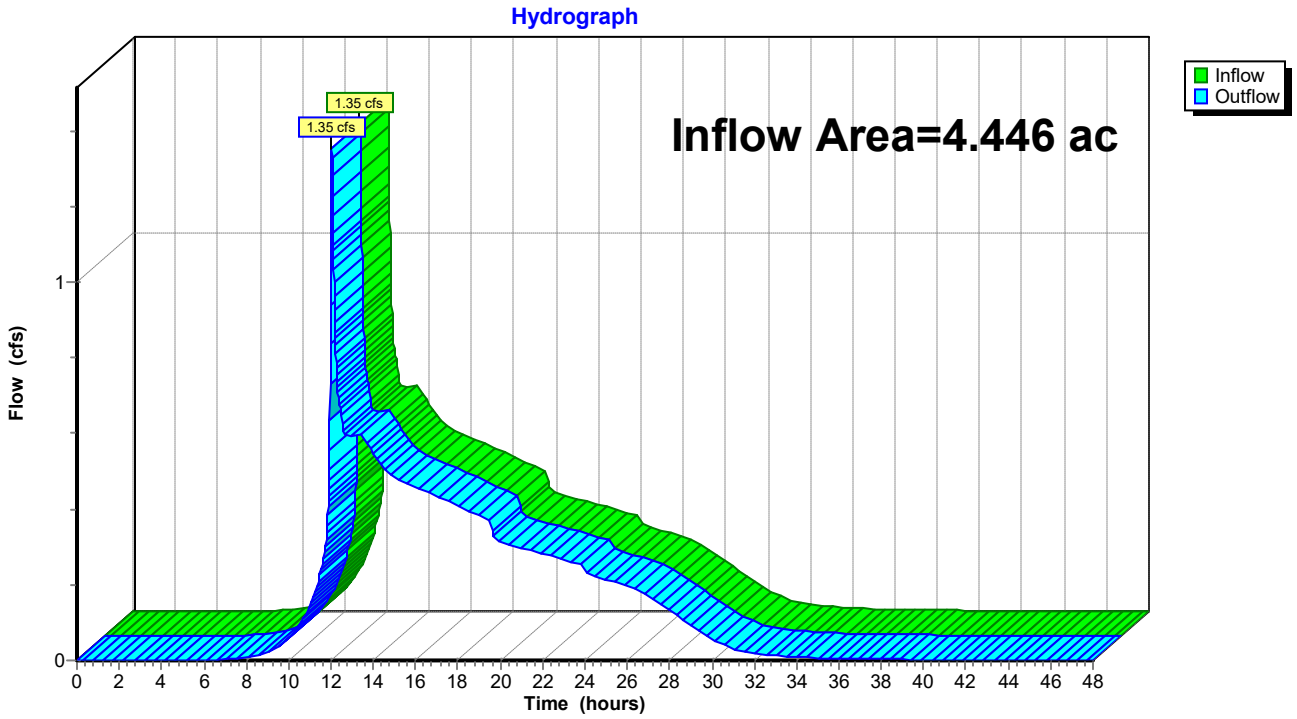


Summary for Reach 21R: Proposed Runoff

Inflow Area = 4.446 ac, 69.46% Impervious, Inflow Depth > 1.47" for 1-yr event
Inflow = 1.35 cfs @ 12.04 hrs, Volume= 0.544 af
Outflow = 1.35 cfs @ 12.04 hrs, Volume= 0.544 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 21R: Proposed Runoff



Summary for Pond 2P: Underground System

Inflow Area = 2.880 ac, 81.49% Impervious, Inflow Depth = 1.76" for 1-yr event
Inflow = 8.79 cfs @ 12.03 hrs, Volume= 0.422 af
Outflow = 0.41 cfs @ 13.55 hrs, Volume= 0.421 af, Atten= 95%, Lag= 91.1 min
Primary = 0.41 cfs @ 13.55 hrs, Volume= 0.421 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 642.61' @ 13.55 hrs Surf.Area= 0.153 ac Storage= 0.253 af

Plug-Flow detention time= 365.9 min calculated for 0.420 af (100% of inflow)
Center-of-Mass det. time= 364.5 min (1,152.9 - 788.4)

Volume	Invert	Avail.Storage	Storage Description
#1	640.25'	0.011 af	**4.00'D x 6.50'H Vertical Cone/Cylinder** x 6
#2A	640.25'	0.210 af	**37.08'W x 177.78'L x 5.50'H Field A** 0.832 af Overall - 0.306 af Embedded = 0.526 af x 40.0% Voids
#3A	641.00'	0.306 af	**ADS_StormTech MC-3500 d +Cap** x 120 Inside #2 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 120 Chambers in 5 Rows Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf
#4	646.60'	2.683 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		3.211 af	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
646.60	0.000	0.000	0.000
647.00	0.190	0.038	0.038
648.00	5.100	2.645	2.683

Device	Routing	Invert	Outlet Devices
#1	Device 4	640.25'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 4	642.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	645.00'	**4.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)
#4	Primary	640.25'	**12.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 640.25' / 639.75' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#5	Secondary	647.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.20 1.20 Width (feet) 0.00 20.00 80.00

Primary OutFlow Max=0.41 cfs @ 13.55 hrs HW=642.61' TW=0.00' (Dynamic Tailwater)
└─**4=Culvert** (Passes 0.41 cfs of 4.00 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.35 cfs @ 7.21 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 0.06 cfs @ 1.15 fps)
  └─**3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=640.25' TW=0.00' (Dynamic Tailwater)
└─**5=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 2P: Underground System - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

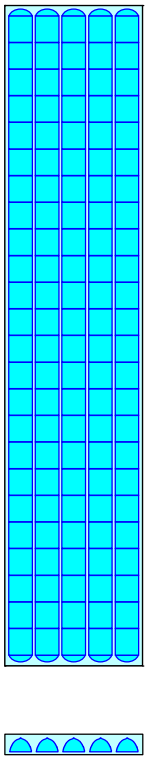
24 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 175.78' Row Length +12.0" End Stone x 2 = 177.78' Base Length
5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

120 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 13,343.2 cf Chamber Storage

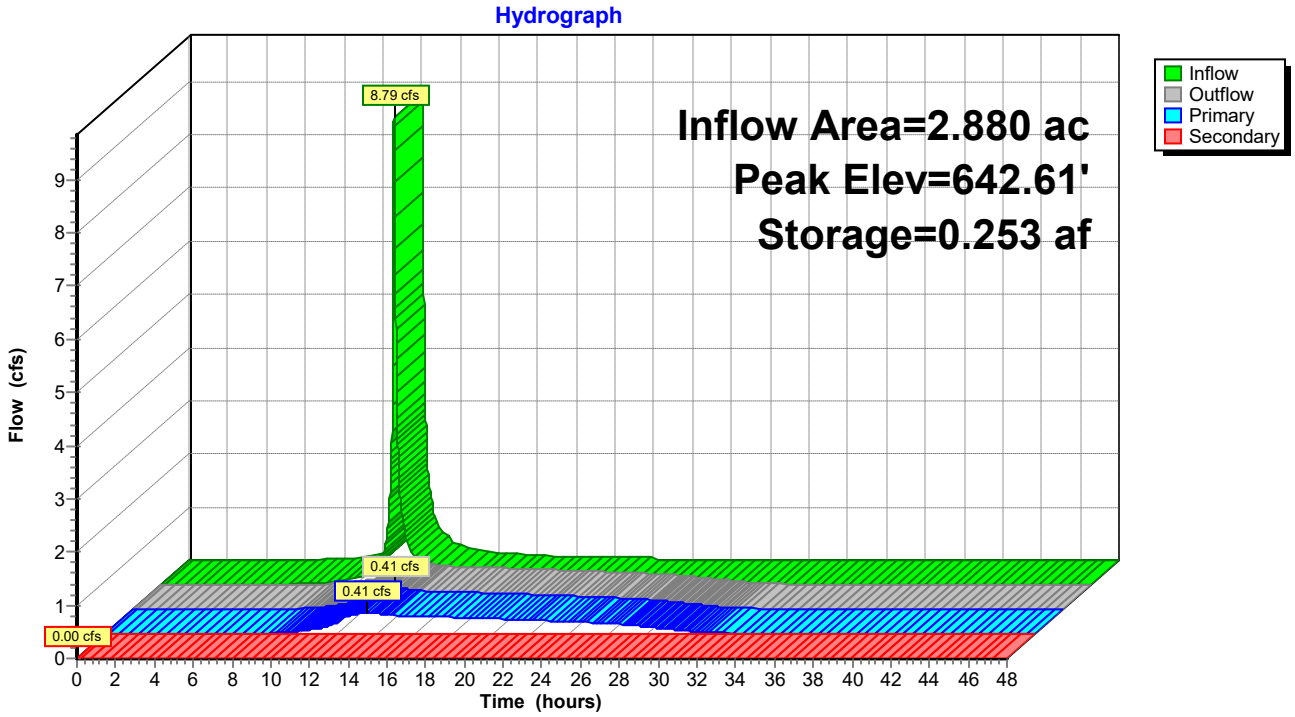
36,259.7 cf Field - 13,343.2 cf Chambers = 22,916.5 cf Stone x 40.0% Voids = 9,166.6 cf Stone Storage

Chamber Storage + Stone Storage = 22,509.8 cf = 0.517 af
Overall Storage Efficiency = 62.1%
Overall System Size = 177.78' x 37.08' x 5.50'

120 Chambers
1,343.0 cy Field
848.8 cy Stone



Pond 2P: Underground System



Summary for Pond 15P: Bio-Filtration Basin

Inflow Area = 0.669 ac, 62.33% Impervious, Inflow Depth = 1.24" for 1-yr event
Inflow = 1.46 cfs @ 12.03 hrs, Volume= 0.069 af
Outflow = 0.11 cfs @ 13.00 hrs, Volume= 0.069 af, Atten= 92%, Lag= 57.9 min
Primary = 0.11 cfs @ 13.00 hrs, Volume= 0.069 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 644.27' @ 13.00 hrs Surf.Area= 1,356 sf Storage= 1,332 cf

Plug-Flow detention time= 116.7 min calculated for 0.069 af (100% of inflow)
Center-of-Mass det. time= 116.7 min (932.7 - 816.1)

Volume	Invert	Avail.Storage	Storage Description
#1	643.00'	5,556 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

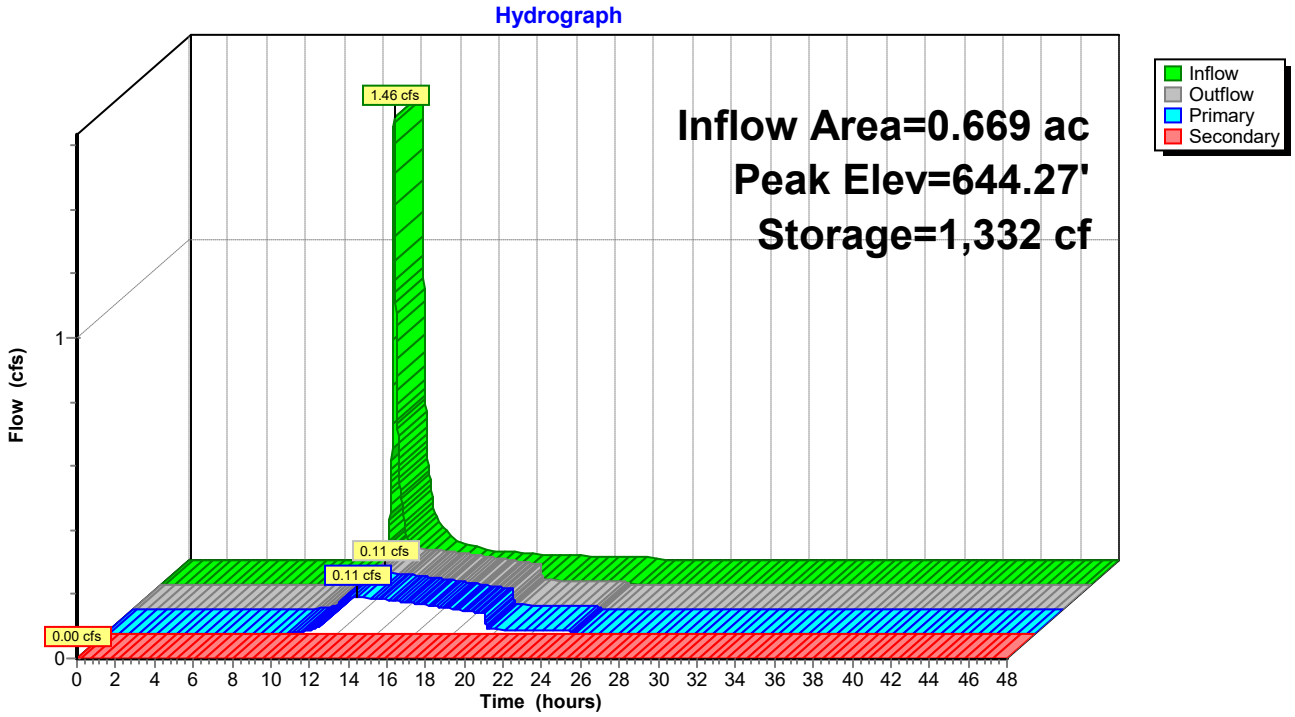
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
643.00	750	0	0
646.50	2,425	5,556	5,556

Device	Routing	Invert	Outlet Devices
#1	Primary	643.00'	**3.600 in/hr Underdrain over Surface area** Phase-In= 0.01'
#2	Secondary	645.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 in 24.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.11 cfs @ 13.00 hrs HW=644.27' TW=0.00' (Dynamic Tailwater)
↑—**1=Underdrain** (Exfiltration Controls 0.11 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=643.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 15P: Bio-Filtration Basin



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=0.711 ac 27.85% Impervious Runoff Depth=0.77"
Tc=5.0 min CN=71 Runoff=0.85 cfs 0.045 af

Subcatchment 2S: DA-2 Runoff Area=0.905 ac 79.01% Impervious Runoff Depth=1.99"
Tc=5.0 min CN=90 Runoff=3.22 cfs 0.150 af

Subcatchment 3S: DA-3 Runoff Area=0.566 ac 80.57% Impervious Runoff Depth=2.08"
Tc=5.0 min CN=91 Runoff=2.10 cfs 0.098 af

Subcatchment 4S: DA-4 Runoff Area=0.233 ac 87.12% Impervious Runoff Depth=2.26"
Tc=5.0 min CN=93 Runoff=0.93 cfs 0.044 af

Subcatchment 5S: DA-5 Runoff Area=0.138 ac 52.17% Impervious Runoff Depth=1.26"
Tc=5.0 min CN=80 Runoff=0.30 cfs 0.014 af

Subcatchment 6S: DA-6 Runoff Area=0.121 ac 60.33% Impervious Runoff Depth=1.45"
Tc=5.0 min CN=83 Runoff=0.31 cfs 0.015 af

Subcatchment 7S: DA-7 Runoff Area=0.063 ac 39.68% Impervious Runoff Depth=1.02"
Tc=5.0 min CN=76 Runoff=0.11 cfs 0.005 af

Subcatchment 8S: DA-8 Runoff Area=0.171 ac 88.30% Impervious Runoff Depth=2.36"
Tc=5.0 min CN=94 Runoff=0.70 cfs 0.034 af

Subcatchment 9S: DA-9 Runoff Area=0.211 ac 85.31% Impervious Runoff Depth=2.26"
Tc=5.0 min CN=93 Runoff=0.84 cfs 0.040 af

Subcatchment 10S: DA-10 Runoff Area=0.042 ac 85.71% Impervious Runoff Depth=2.26"
Tc=5.0 min CN=93 Runoff=0.17 cfs 0.008 af

Subcatchment 11S: DA-11 Runoff Area=0.010 ac 50.00% Impervious Runoff Depth=1.26"
Tc=5.0 min CN=80 Runoff=0.02 cfs 0.001 af

Subcatchment 12S: DA-12 Runoff Area=0.065 ac 84.62% Impervious Runoff Depth=2.17"
Tc=5.0 min CN=92 Runoff=0.25 cfs 0.012 af

Subcatchment 13S: DA-13 Runoff Area=0.069 ac 43.48% Impervious Runoff Depth=1.08"
Tc=5.0 min CN=77 Runoff=0.13 cfs 0.006 af

Subcatchment 14S: DA-14 Runoff Area=0.099 ac 72.73% Impervious Runoff Depth=1.83"
Tc=5.0 min CN=88 Runoff=0.32 cfs 0.015 af

Subcatchment 15S: DA-15 Runoff Area=0.044 ac 50.00% Impervious Runoff Depth=1.26"
Tc=5.0 min CN=80 Runoff=0.10 cfs 0.005 af

Subcatchment 16S: DA-16 Runoff Area=0.146 ac 58.22% Impervious Runoff Depth=1.45"
Tc=5.0 min CN=83 Runoff=0.38 cfs 0.018 af

Subcatchment 17S: DA-17 Runoff Area=0.095 ac 50.53% Impervious Runoff Depth=1.26"
Tc=5.0 min CN=80 Runoff=0.21 cfs 0.010 af

Subcatchment 18S: DA-18 Runoff Area=0.107 ac 69.16% Impervious Runoff Depth=1.75"
Tc=5.0 min CN=87 Runoff=0.34 cfs 0.016 af

Subcatchment 19S: DA-19 Runoff Area=0.079 ac 49.37% Impervious Runoff Depth=1.20"
Tc=5.0 min CN=79 Runoff=0.16 cfs 0.008 af

Subcatchment 20S: DA-20 Runoff Area=0.099 ac 77.78% Impervious Runoff Depth=1.99"
Tc=5.0 min CN=90 Runoff=0.35 cfs 0.016 af

Subcatchment 21S: DA-1A, DA-1B, DA-1C Runoff Area=0.472 ac 100.00% Impervious Runoff Depth=2.78"
Tc=5.0 min CN=98 Runoff=2.14 cfs 0.109 af

Reach 3R: On Site Inflow=1.12 cfs 0.596 af
Outflow=1.12 cfs 0.596 af

Reach 16R: Off Site Inflow=1.41 cfs 0.072 af
Outflow=1.41 cfs 0.072 af

Reach 21R: Proposed Runoff Inflow=1.79 cfs 0.668 af
Outflow=1.79 cfs 0.668 af

Pond 2P: Underground System Peak Elev=642.89' Storage=0.286 af Inflow=10.64 cfs 0.510 af
Primary=0.99 cfs 0.508 af Secondary=0.00 cfs 0.000 af Outflow=0.99 cfs 0.508 af

Pond 15P: Bio-Filtration Basin Peak Elev=644.62' Storage=1,845 cf Inflow=1.86 cfs 0.087 af
Primary=0.13 cfs 0.087 af Secondary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.087 af

Total Runoff Area = 4.446 ac Runoff Volume = 0.669 af Average Runoff Depth = 1.81"
30.54% Pervious = 1.358 ac 69.46% Impervious = 3.088 ac

Summary for Subcatchment 1S: DA-1

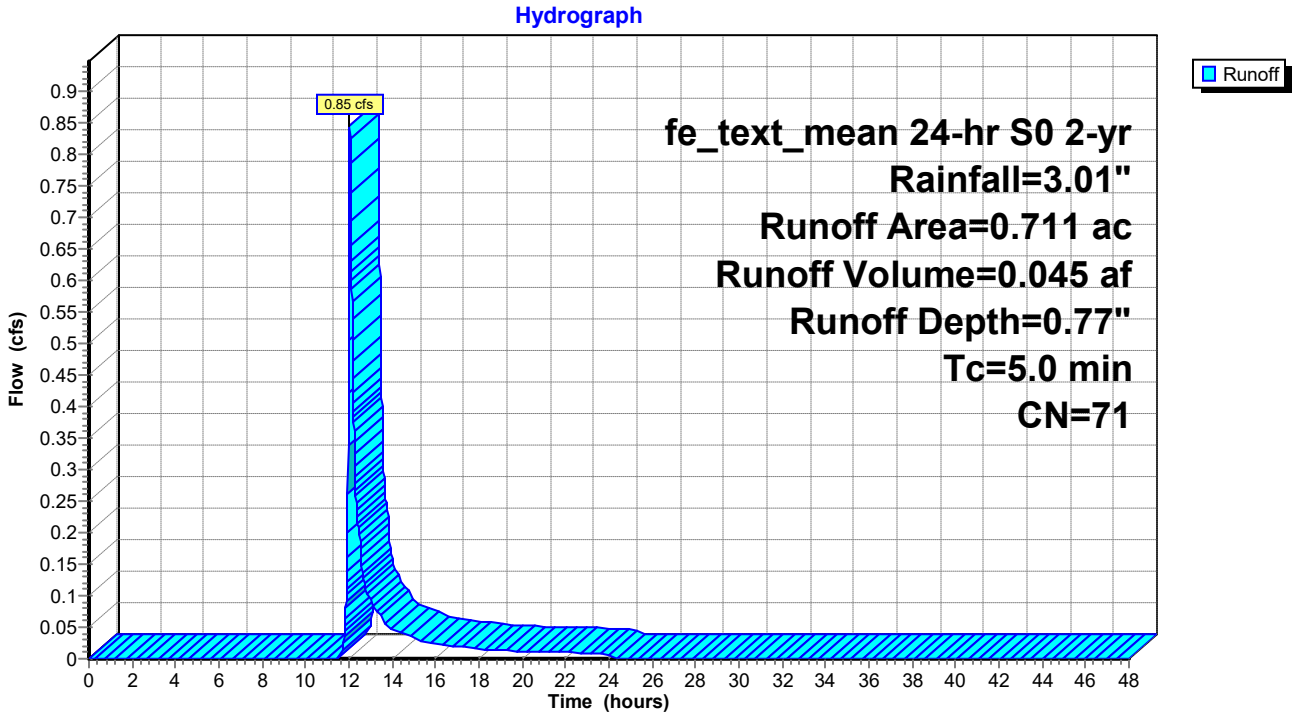
Runoff = 0.85 cfs @ 12.04 hrs, Volume= 0.045 af, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.198	98	Impervious, HSG B
	0.513	61	>75% Grass cover, Good, HSG B
	0.711	71	Weighted Average
	0.513		72.15% Pervious Area
	0.198		27.85% Impervious Area

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

Subcatchment 1S: DA-1



Summary for Subcatchment 2S: DA-2

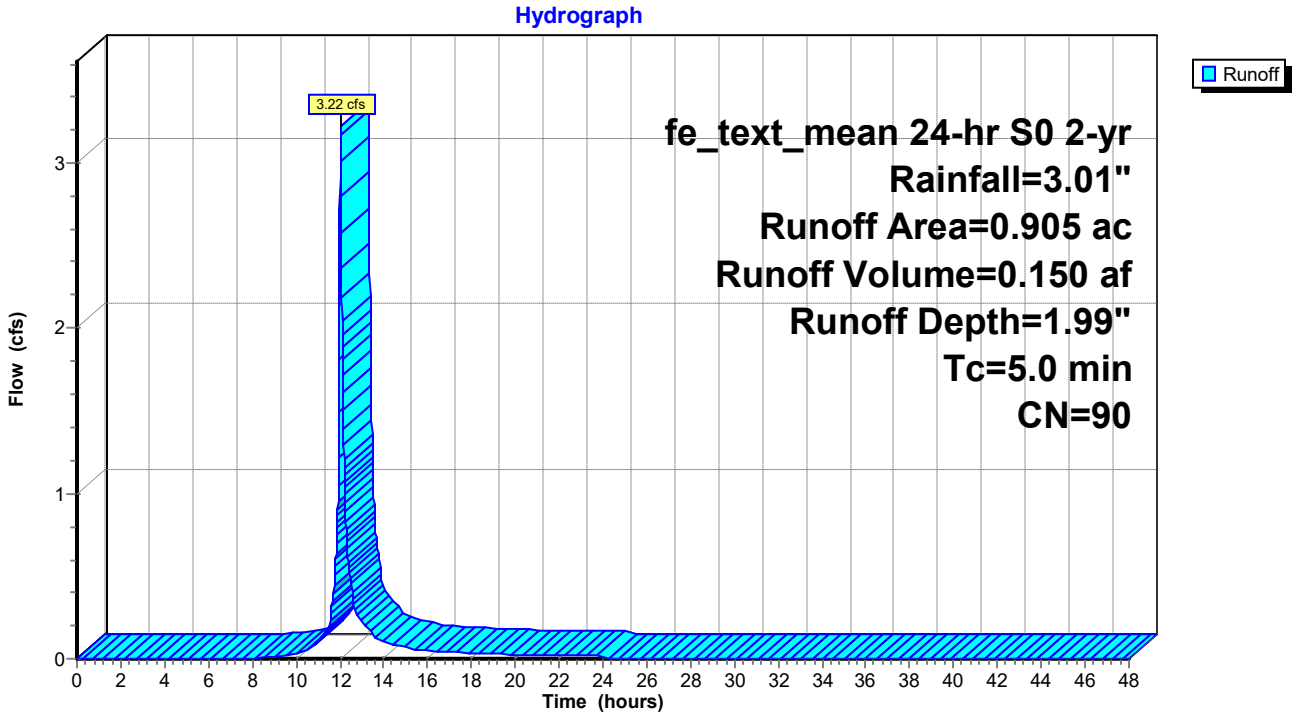
Runoff = 3.22 cfs @ 12.03 hrs, Volume= 0.150 af, Depth= 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.715	98	Impervious, HSG B
	0.190	61	>75% Grass cover, Good, HSG B
	0.905	90	Weighted Average
	0.190		20.99% Pervious Area
	0.715		79.01% Impervious Area

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

Subcatchment 2S: DA-2



Summary for Subcatchment 3S: DA-3

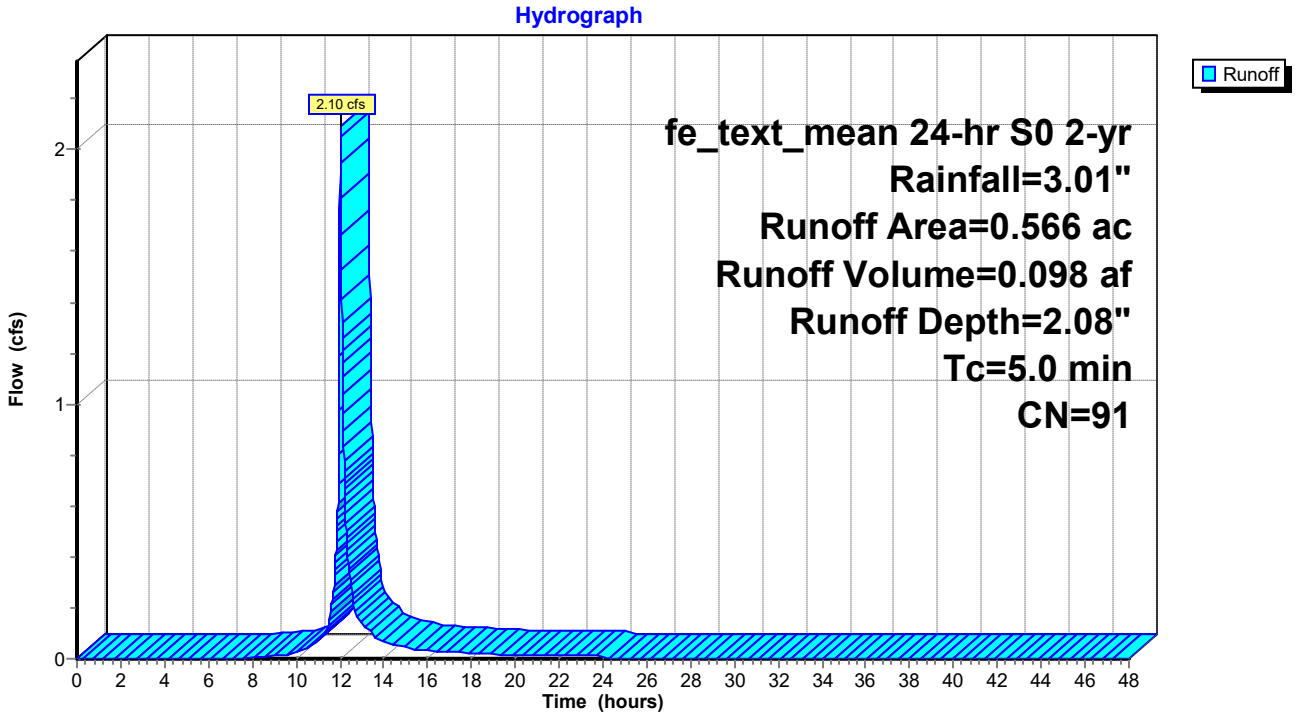
Runoff = 2.10 cfs @ 12.03 hrs, Volume= 0.098 af, Depth= 2.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.456	98	Impervious, HSG B
	0.110	61	>75% Grass cover, Good, HSG B
	0.566	91	Weighted Average
	0.110		19.43% Pervious Area
	0.456		80.57% Impervious Area

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

Subcatchment 3S: DA-3



Summary for Subcatchment 4S: DA-4

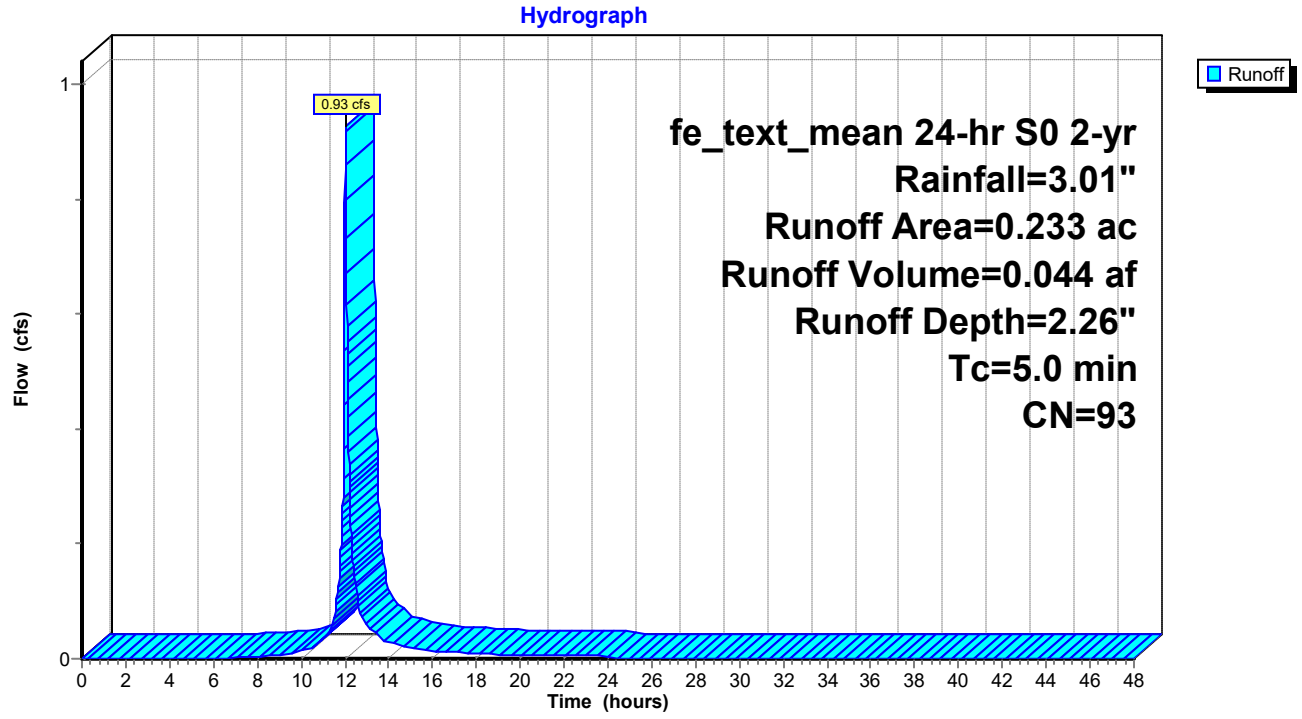
Runoff = 0.93 cfs @ 12.03 hrs, Volume= 0.044 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.203	98	Impervious, HSG B
	0.030	61	>75% Grass cover, Good, HSG B
	0.233	93	Weighted Average
	0.030		12.88% Pervious Area
	0.203		87.12% Impervious Area

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

Subcatchment 4S: DA-4



Summary for Subcatchment 5S: DA-5

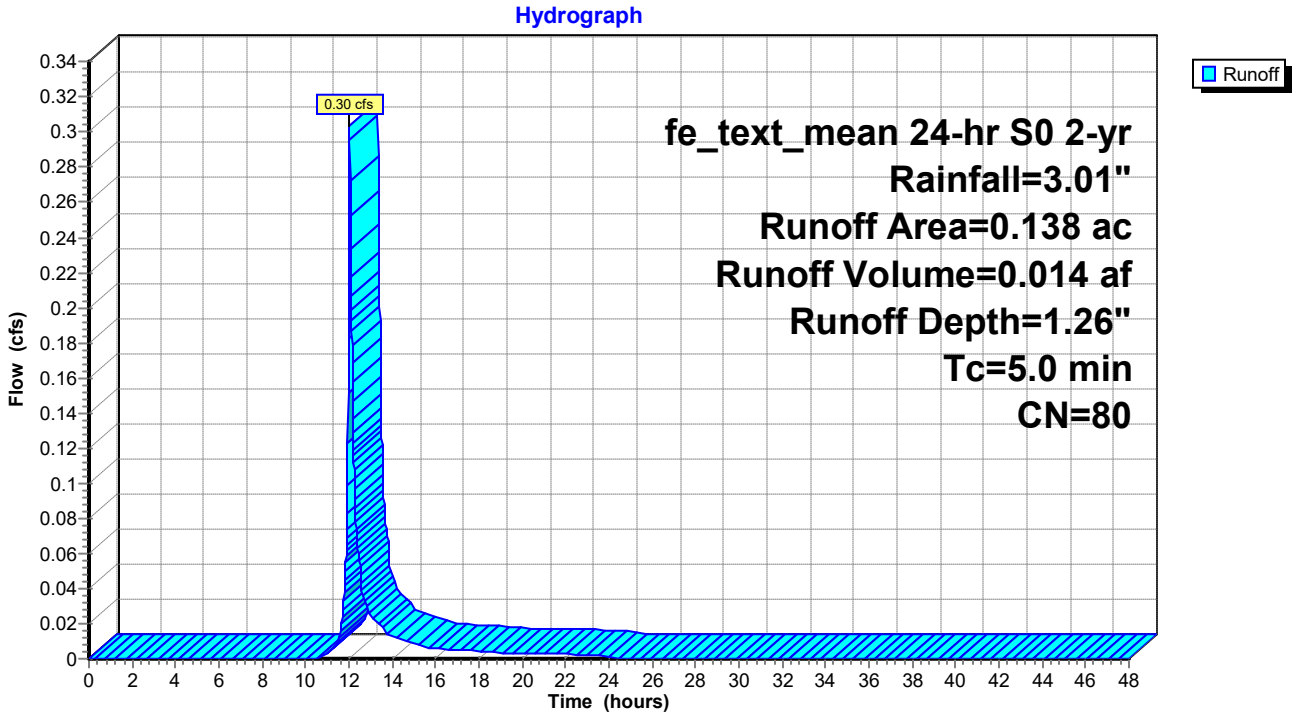
Runoff = 0.30 cfs @ 12.03 hrs, Volume= 0.014 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.072	98	Impervious, HSG B
	0.066	61	>75% Grass cover, Good, HSG B
	0.138	80	Weighted Average
	0.066		47.83% Pervious Area
	0.072		52.17% Impervious Area

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

Subcatchment 5S: DA-5



Summary for Subcatchment 6S: DA-6

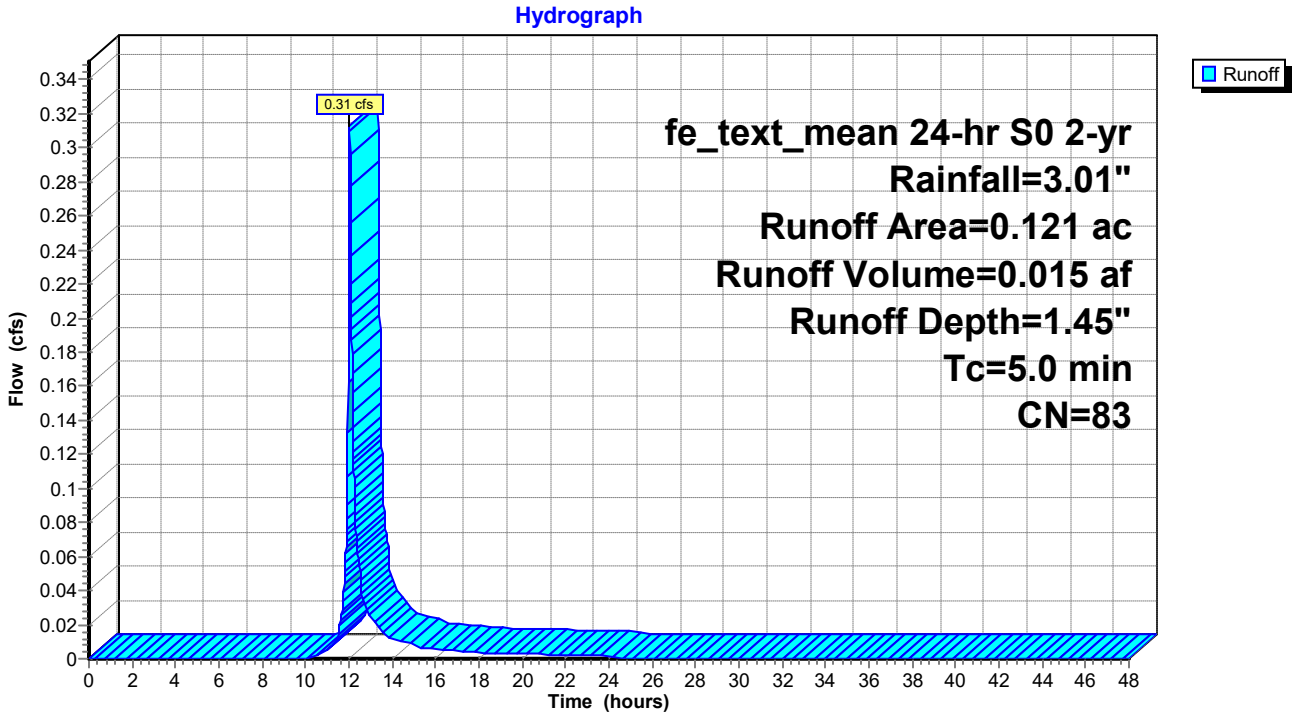
Runoff = 0.31 cfs @ 12.03 hrs, Volume= 0.015 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.073	98	Impervious, HSG B
	0.048	61	>75% Grass cover, Good, HSG B
	0.121	83	Weighted Average
	0.048		39.67% Pervious Area
	0.073		60.33% Impervious Area

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

Subcatchment 6S: DA-6



Summary for Subcatchment 7S: DA-7

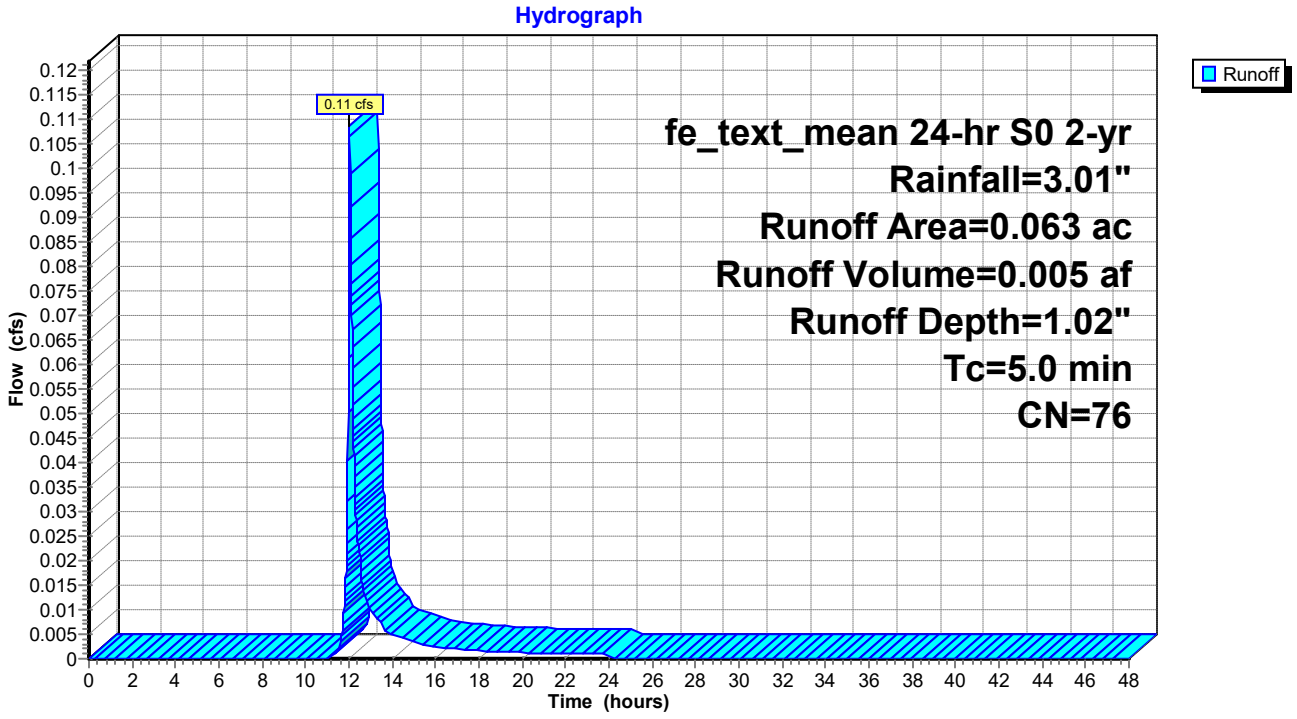
Runoff = 0.11 cfs @ 12.04 hrs, Volume= 0.005 af, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.025	98	Impervious, HSG B
	0.038	61	>75% Grass cover, Good, HSG B
	0.063	76	Weighted Average
	0.038		60.32% Pervious Area
	0.025		39.68% Impervious Area

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

Subcatchment 7S: DA-7



Summary for Subcatchment 8S: DA-8

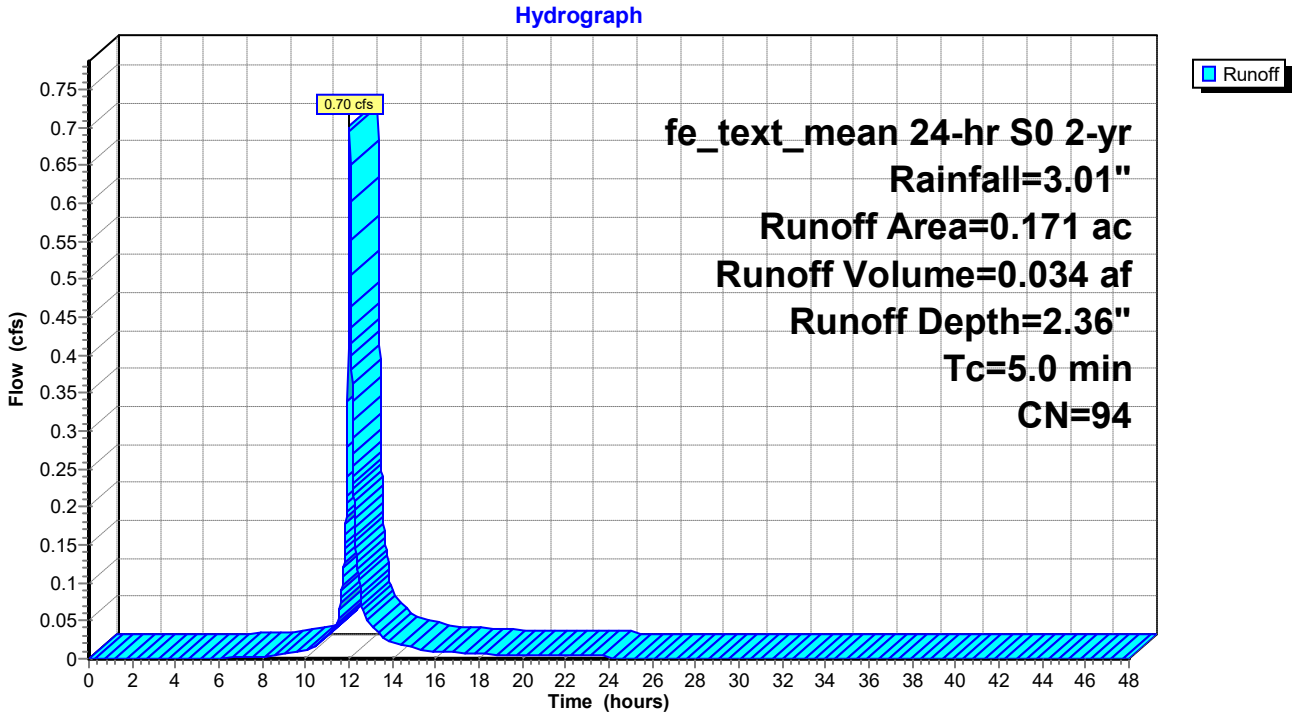
Runoff = 0.70 cfs @ 12.03 hrs, Volume= 0.034 af, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.151	98	Impervious, HSG B
	0.020	61	>75% Grass cover, Good, HSG B
	0.171	94	Weighted Average
	0.020		11.70% Pervious Area
	0.151		88.30% Impervious Area

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

Subcatchment 8S: DA-8



Summary for Subcatchment 9S: DA-9

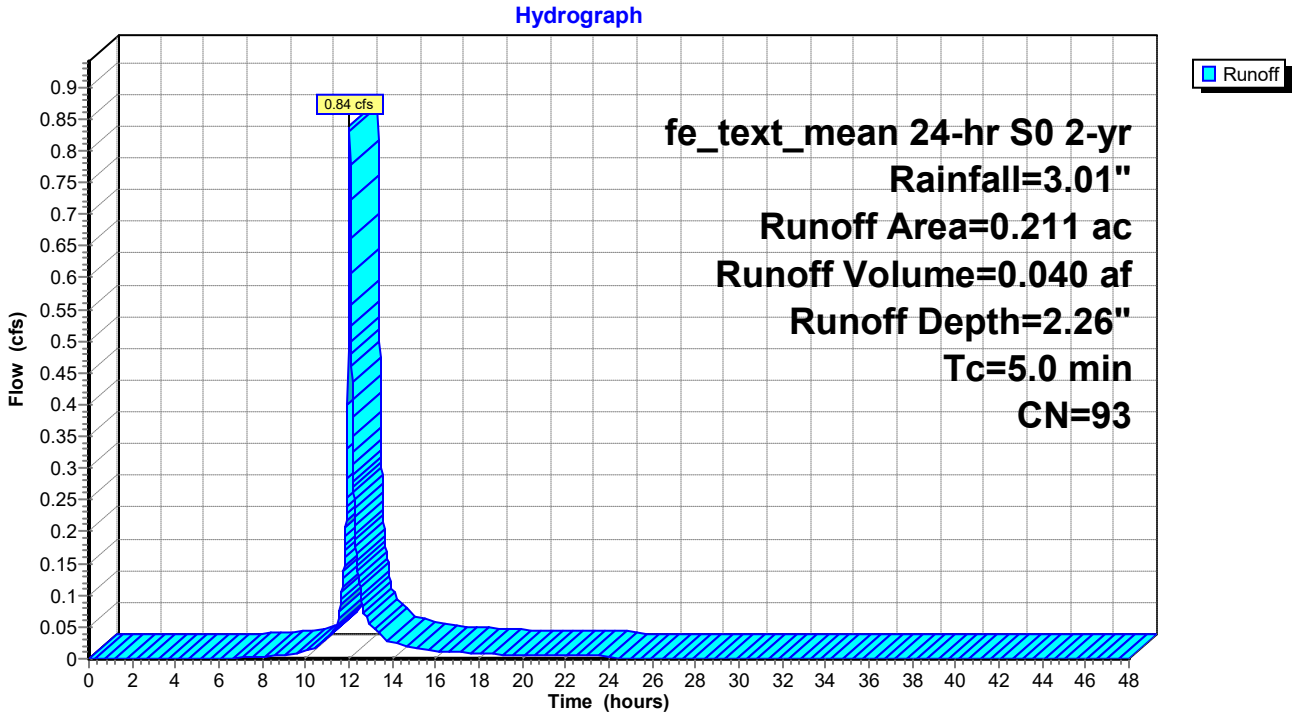
Runoff = 0.84 cfs @ 12.03 hrs, Volume= 0.040 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.180	98	Impervious, HSG B
	0.031	61	>75% Grass cover, Good, HSG B
	0.211	93	Weighted Average
	0.031		14.69% Pervious Area
	0.180		85.31% Impervious Area

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

Subcatchment 9S: DA-9



Summary for Subcatchment 10S: DA-10

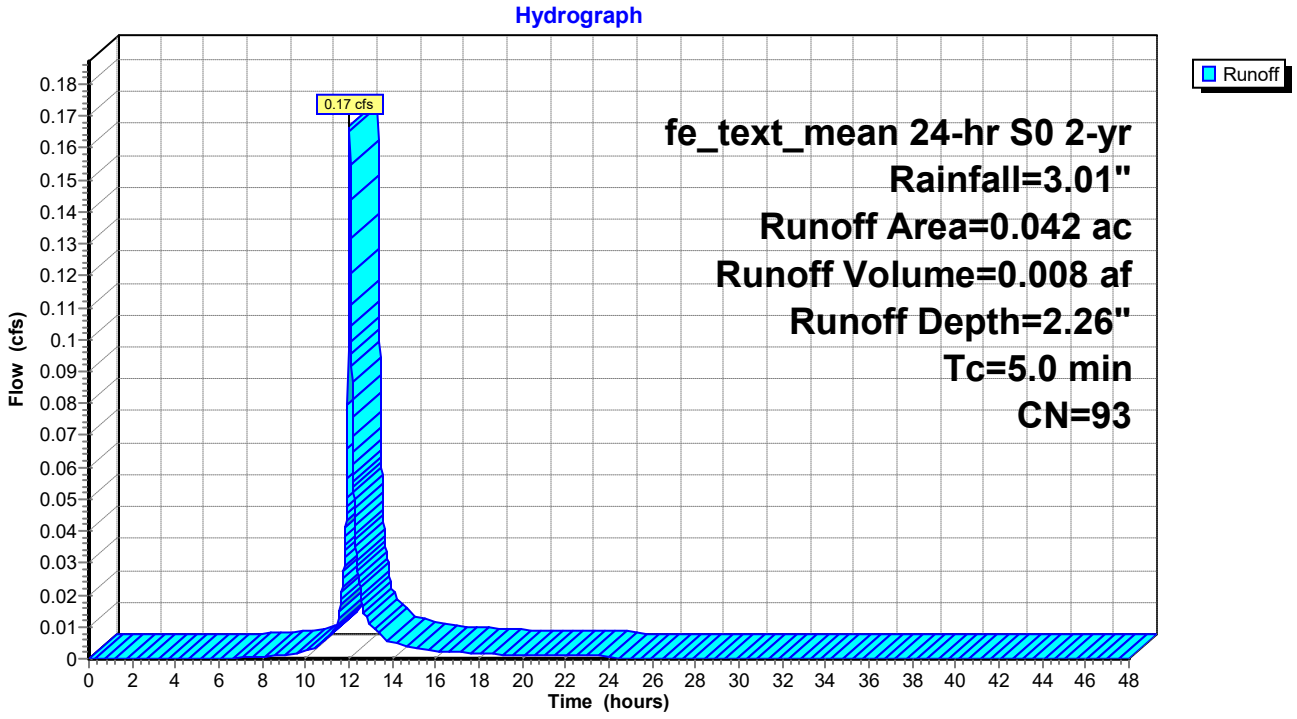
Runoff = 0.17 cfs @ 12.03 hrs, Volume= 0.008 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.036	98	Impervious, HSG B
	0.006	61	>75% Grass cover, Good, HSG B
	0.042	93	Weighted Average
	0.006		14.29% Pervious Area
	0.036		85.71% Impervious Area

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

Subcatchment 10S: DA-10



Summary for Subcatchment 11S: DA-11

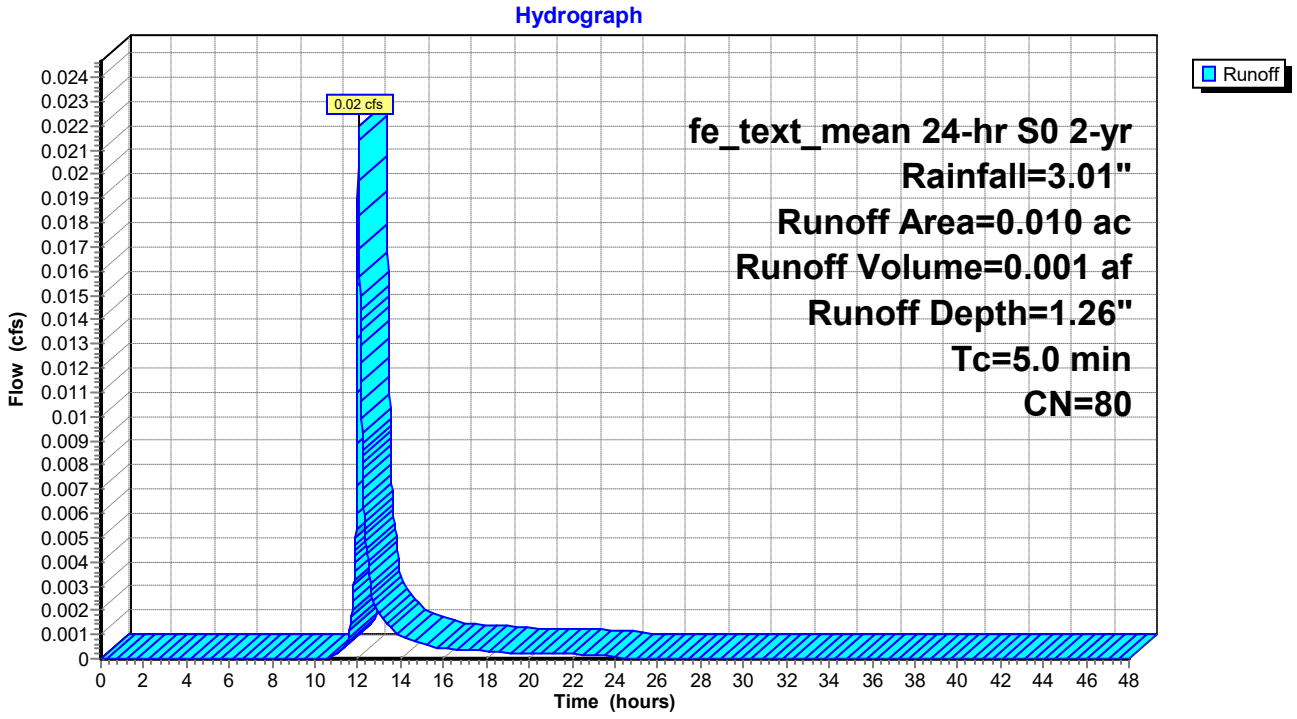
Runoff = 0.02 cfs @ 12.03 hrs, Volume= 0.001 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.005	98	Impervious, HSG B
	0.005	61	>75% Grass cover, Good, HSG B
	0.010	80	Weighted Average
	0.005		50.00% Pervious Area
	0.005		50.00% Impervious Area

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

Subcatchment 11S: DA-11



Summary for Subcatchment 12S: DA-12

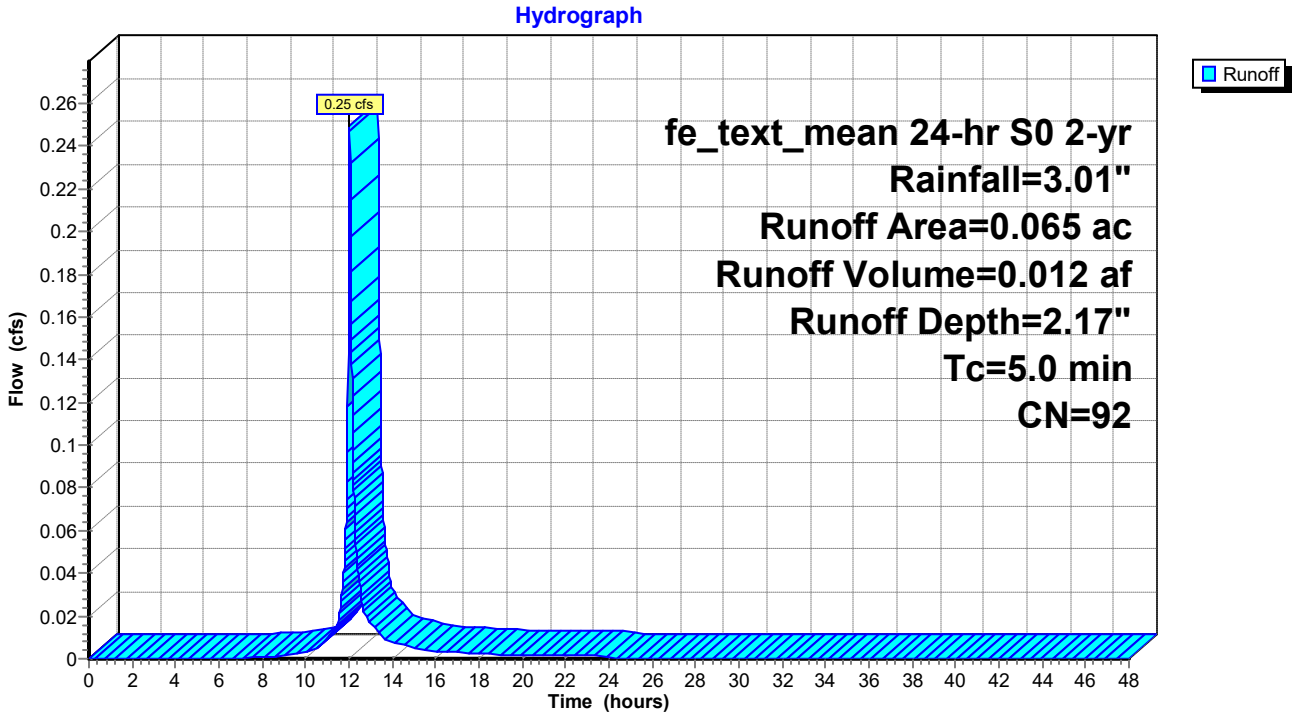
Runoff = 0.25 cfs @ 12.03 hrs, Volume= 0.012 af, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.055	98	Impervious, HSG B
	0.010	61	>75% Grass cover, Good, HSG B
	0.065	92	Weighted Average
	0.010		15.38% Pervious Area
	0.055		84.62% Impervious Area

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

Subcatchment 12S: DA-12



Summary for Subcatchment 13S: DA-13

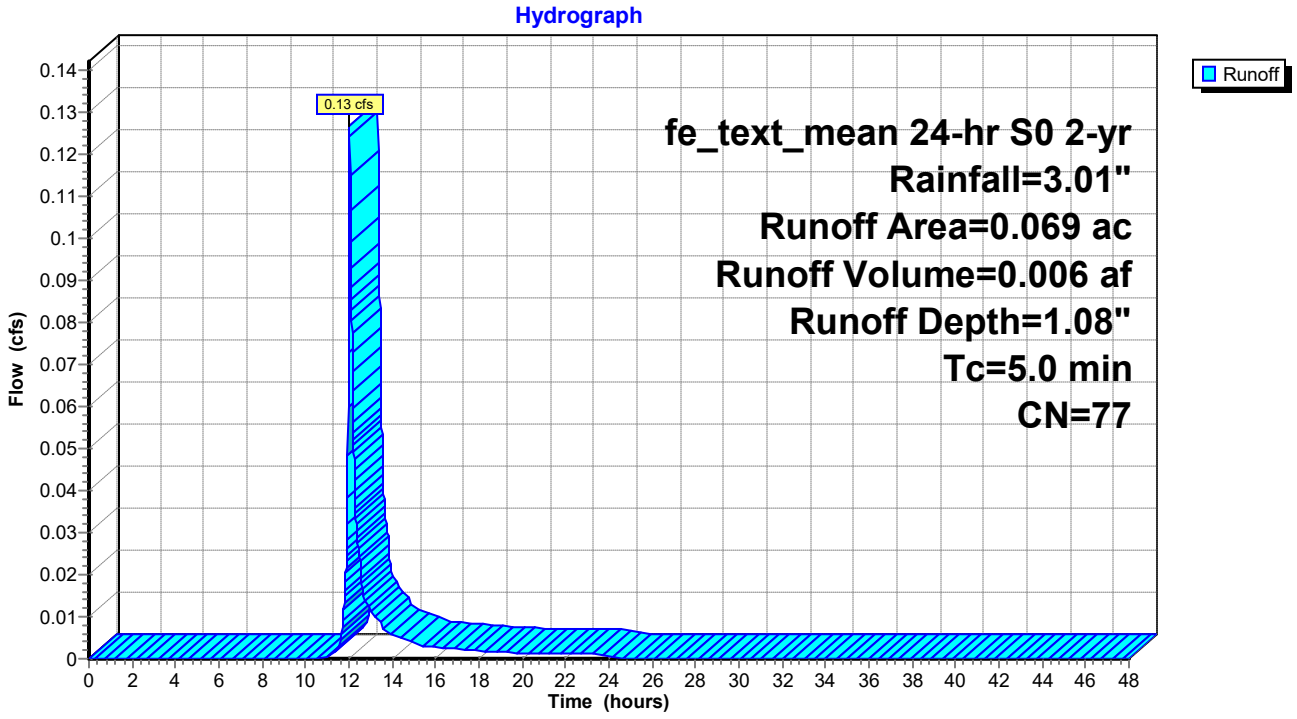
Runoff = 0.13 cfs @ 12.03 hrs, Volume= 0.006 af, Depth= 1.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.030	98	Impervious, HSG B
	0.039	61	>75% Grass cover, Good, HSG B
	0.069	77	Weighted Average
	0.039		56.52% Pervious Area
	0.030		43.48% Impervious Area

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

Subcatchment 13S: DA-13



Summary for Subcatchment 14S: DA-14

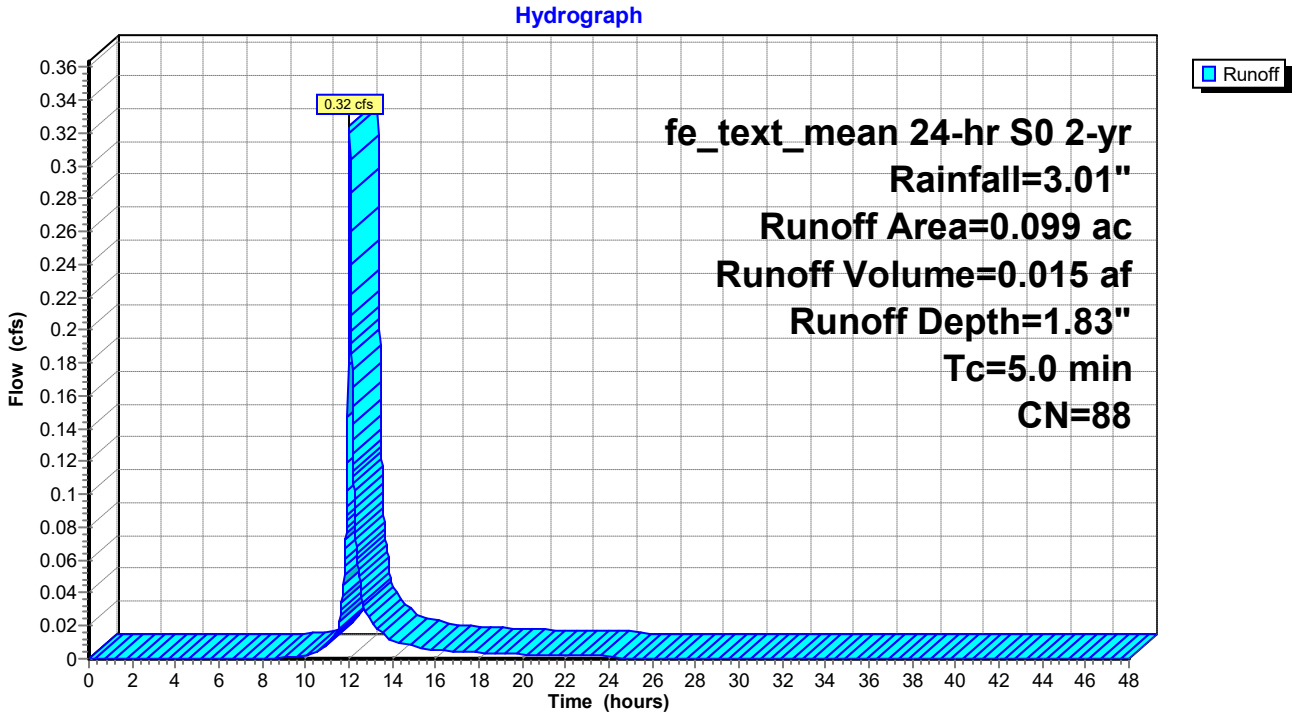
Runoff = 0.32 cfs @ 12.03 hrs, Volume= 0.015 af, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.072	98	Impervious, HSG B
	0.027	61	>75% Grass cover, Good, HSG B
	0.099	88	Weighted Average
	0.027		27.27% Pervious Area
	0.072		72.73% Impervious Area

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

Subcatchment 14S: DA-14



Summary for Subcatchment 15S: DA-15

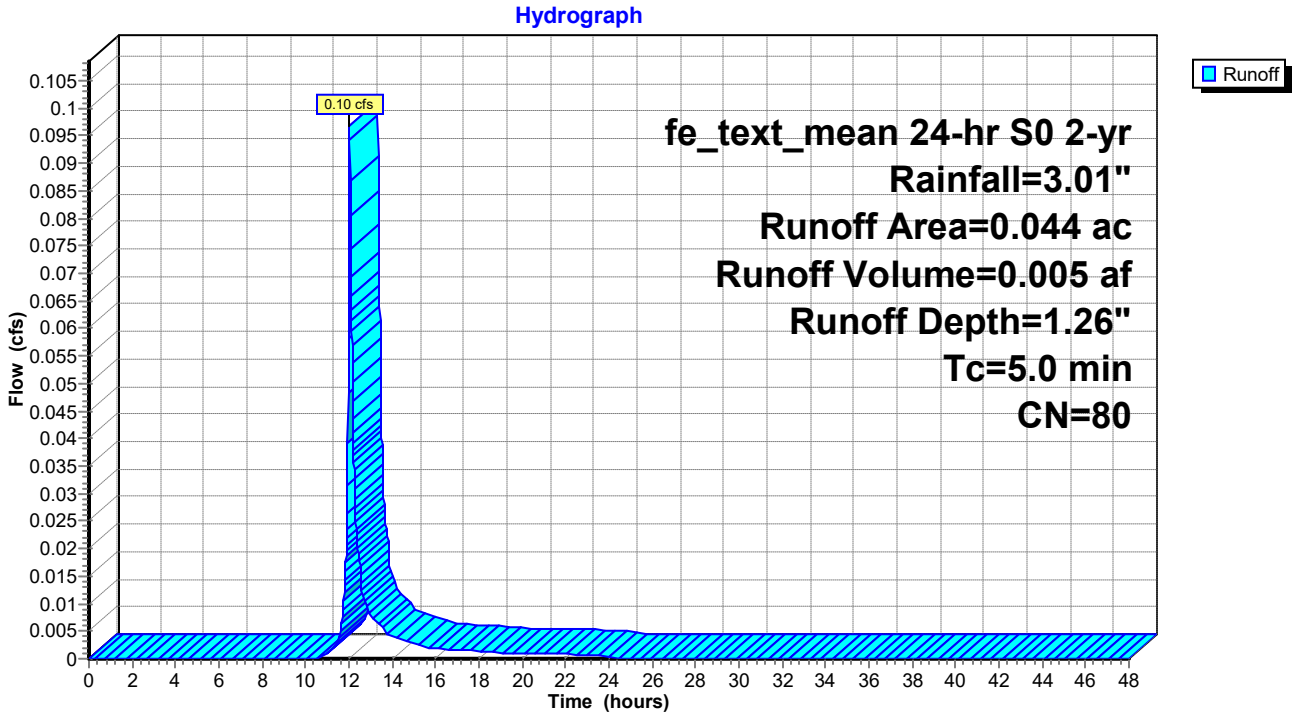
Runoff = 0.10 cfs @ 12.03 hrs, Volume= 0.005 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.022	98	Impervious, HSG B
	0.022	61	>75% Grass cover, Good, HSG B
	0.044	80	Weighted Average
	0.022		50.00% Pervious Area
	0.022		50.00% Impervious Area

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

Subcatchment 15S: DA-15



Summary for Subcatchment 16S: DA-16

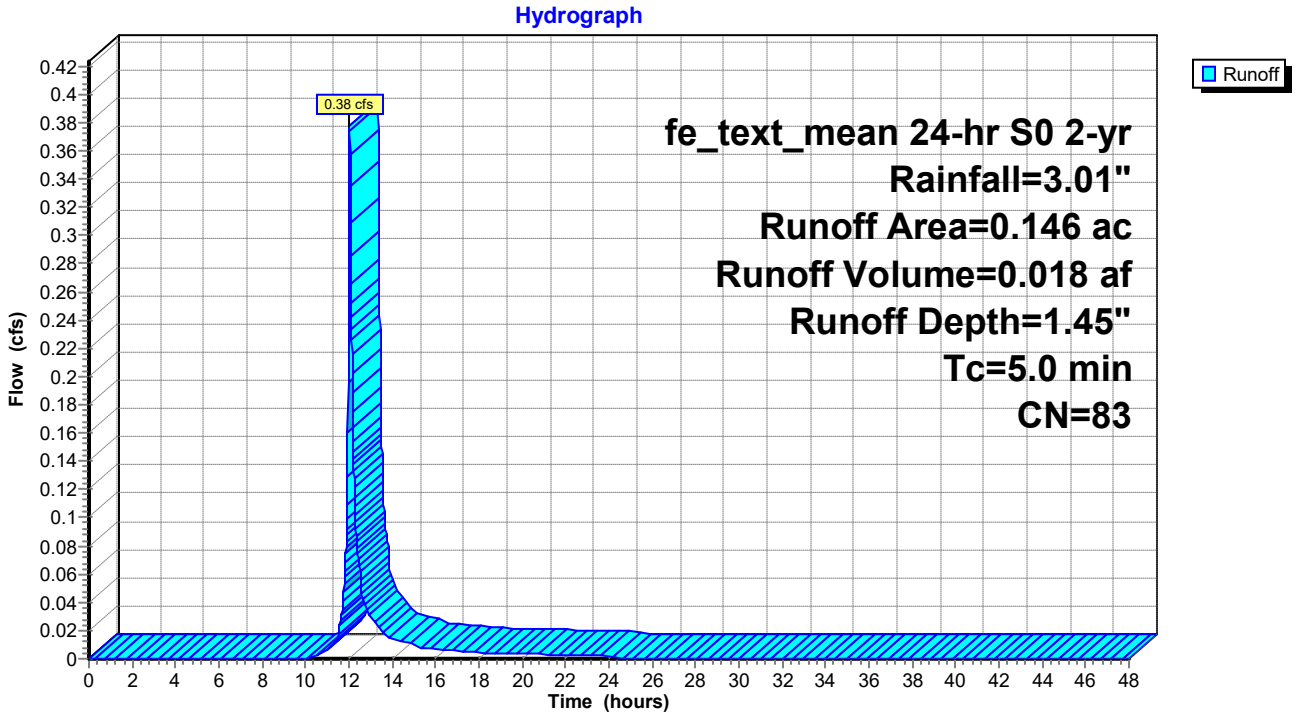
Runoff = 0.38 cfs @ 12.03 hrs, Volume= 0.018 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.085	98	Impervious, HSG B
	0.061	61	>75% Grass cover, Good, HSG B
	0.146	83	Weighted Average
	0.061		41.78% Pervious Area
	0.085		58.22% Impervious Area

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

Subcatchment 16S: DA-16



Summary for Subcatchment 17S: DA-17

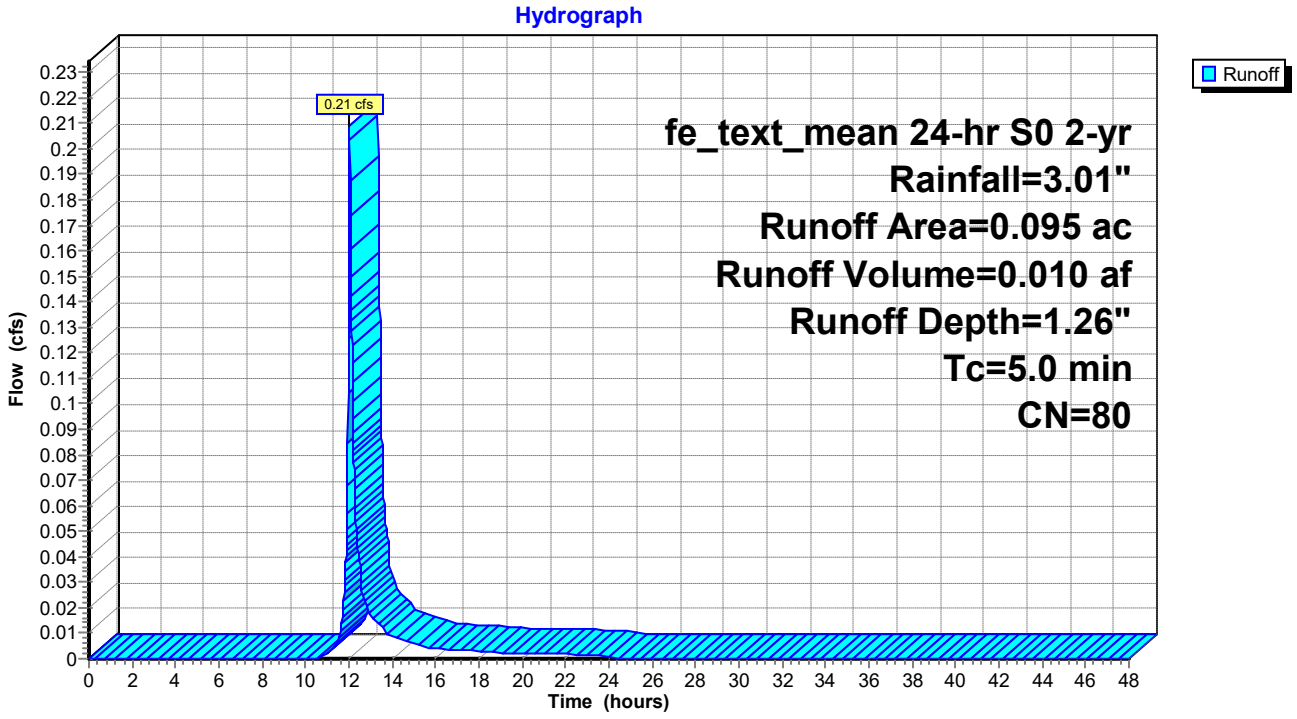
Runoff = 0.21 cfs @ 12.03 hrs, Volume= 0.010 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.048	98	Impervious, HSG B
	0.047	61	>75% Grass cover, Good, HSG B
	0.095	80	Weighted Average
	0.047		49.47% Pervious Area
	0.048		50.53% Impervious Area

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

Subcatchment 17S: DA-17



Summary for Subcatchment 18S: DA-18

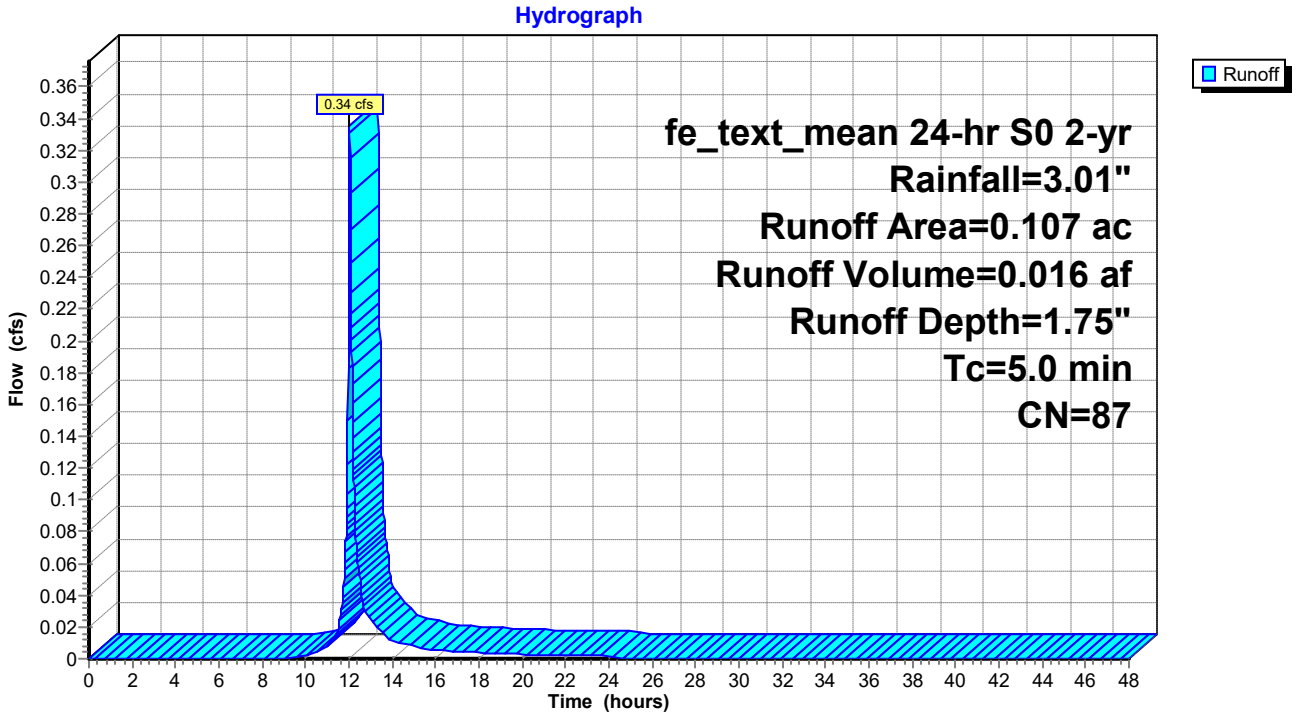
Runoff = 0.34 cfs @ 12.03 hrs, Volume= 0.016 af, Depth= 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.074	98	Impervious, HSG B
	0.033	61	>75% Grass cover, Good, HSG B
	0.107	87	Weighted Average
	0.033		30.84% Pervious Area
	0.074		69.16% Impervious Area

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

Subcatchment 18S: DA-18



Summary for Subcatchment 19S: DA-19

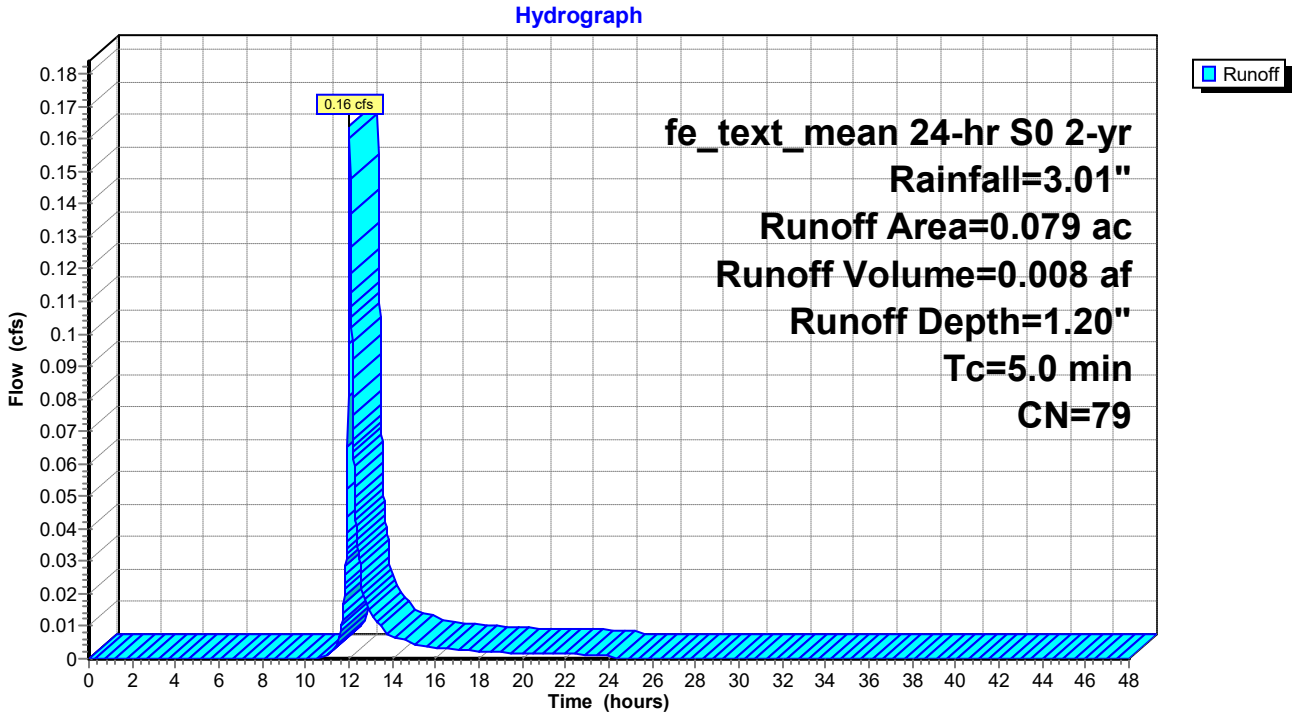
Runoff = 0.16 cfs @ 12.03 hrs, Volume= 0.008 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.039	98	Impervious, HSG B
	0.040	61	>75% Grass cover, Good, HSG B
	0.079	79	Weighted Average
	0.040		50.63% Pervious Area
	0.039		49.37% Impervious Area

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

Subcatchment 19S: DA-19



Summary for Subcatchment 20S: DA-20

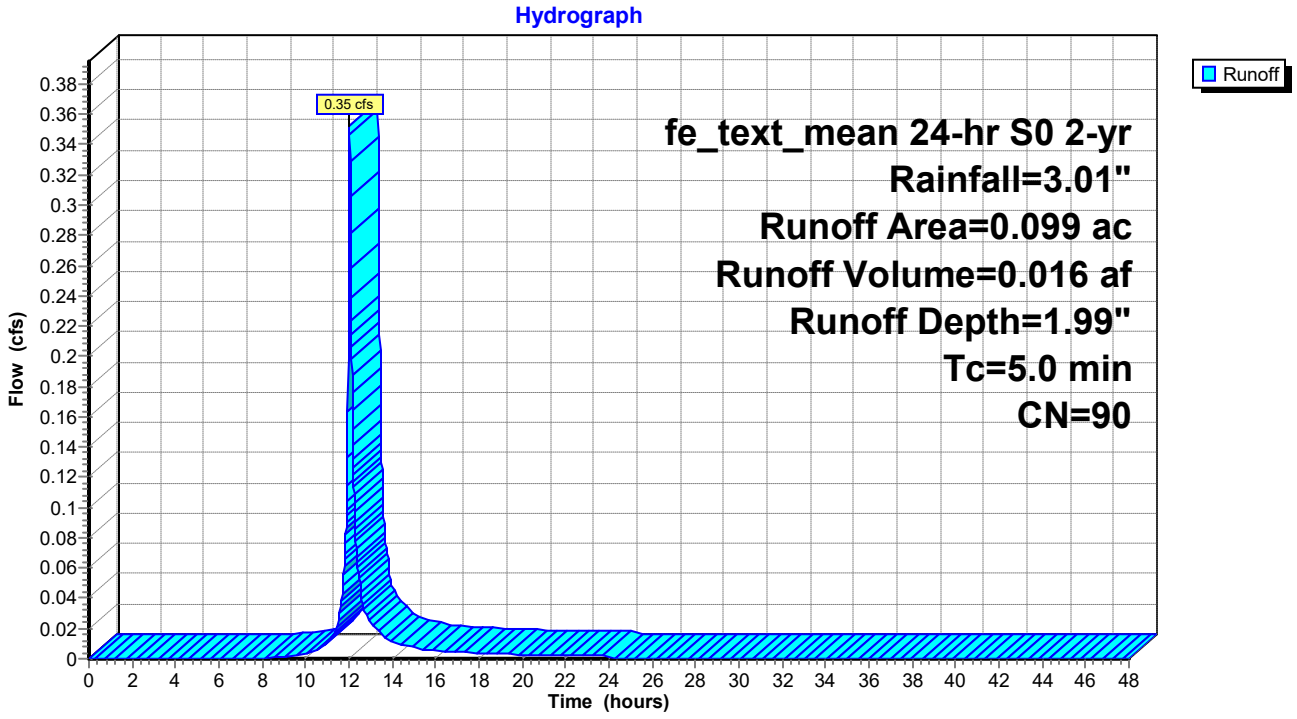
Runoff = 0.35 cfs @ 12.03 hrs, Volume= 0.016 af, Depth= 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

	Area (ac)	CN	Description
*	0.077	98	Impervious, HSG B
	0.022	61	>75% Grass cover, Good, HSG B
	0.099	90	Weighted Average
	0.022		22.22% Pervious Area
	0.077		77.78% Impervious Area

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

Subcatchment 20S: DA-20



Summary for Subcatchment 21S: DA-1A, DA-1B, DA-1C

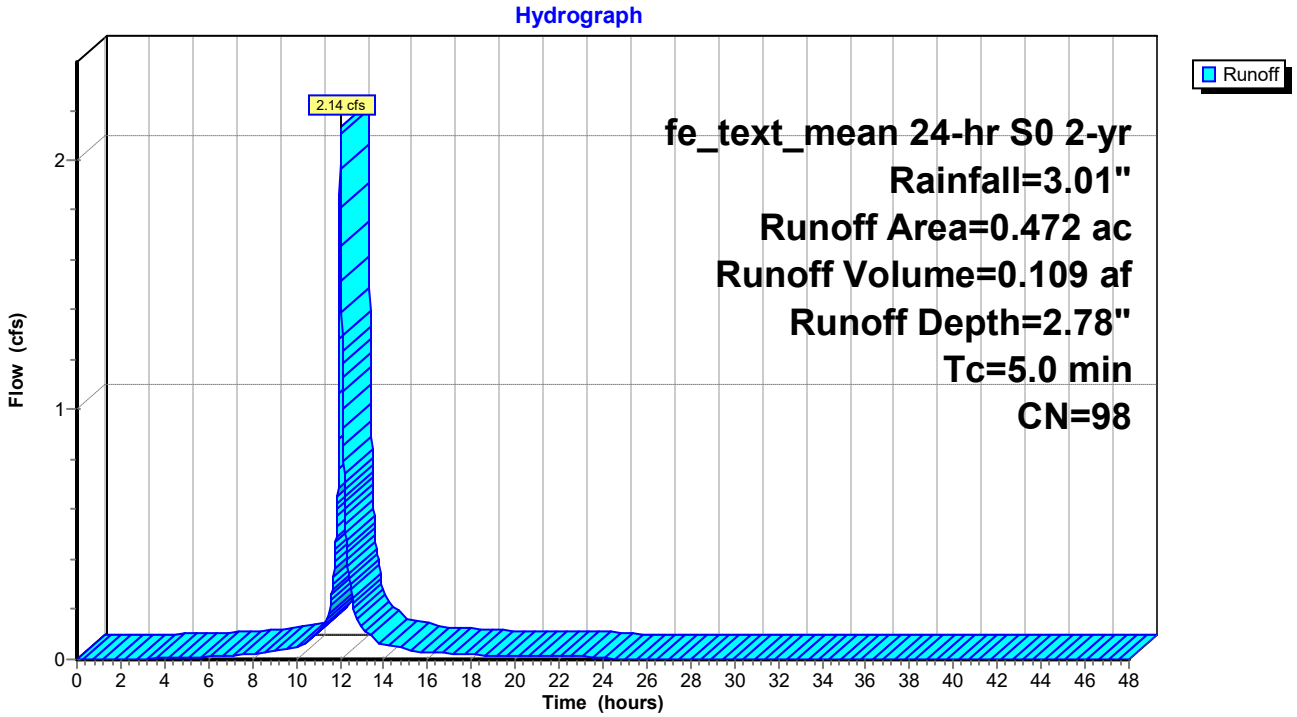
Runoff = 2.14 cfs @ 12.03 hrs, Volume= 0.109 af, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 2-yr Rainfall=3.01"

Area (ac)	CN	Description
0.472	98	Roofs, HSG B
0.472		100.00% Impervious Area

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

Subcatchment 21S: DA-1A, DA-1B, DA-1C

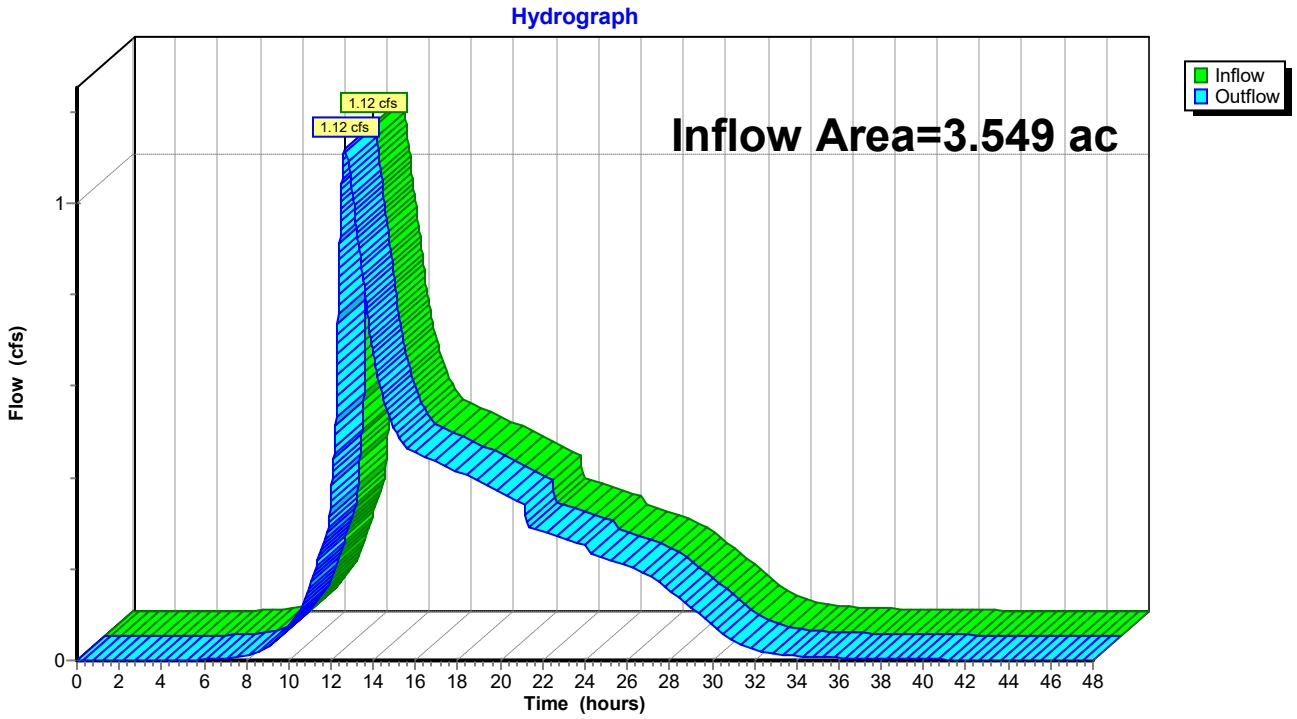


Summary for Reach 3R: On Site

Inflow Area = 3.549 ac, 77.88% Impervious, Inflow Depth > 2.01" for 2-yr event
Inflow = 1.12 cfs @ 12.66 hrs, Volume= 0.596 af
Outflow = 1.12 cfs @ 12.66 hrs, Volume= 0.596 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 3R: On Site

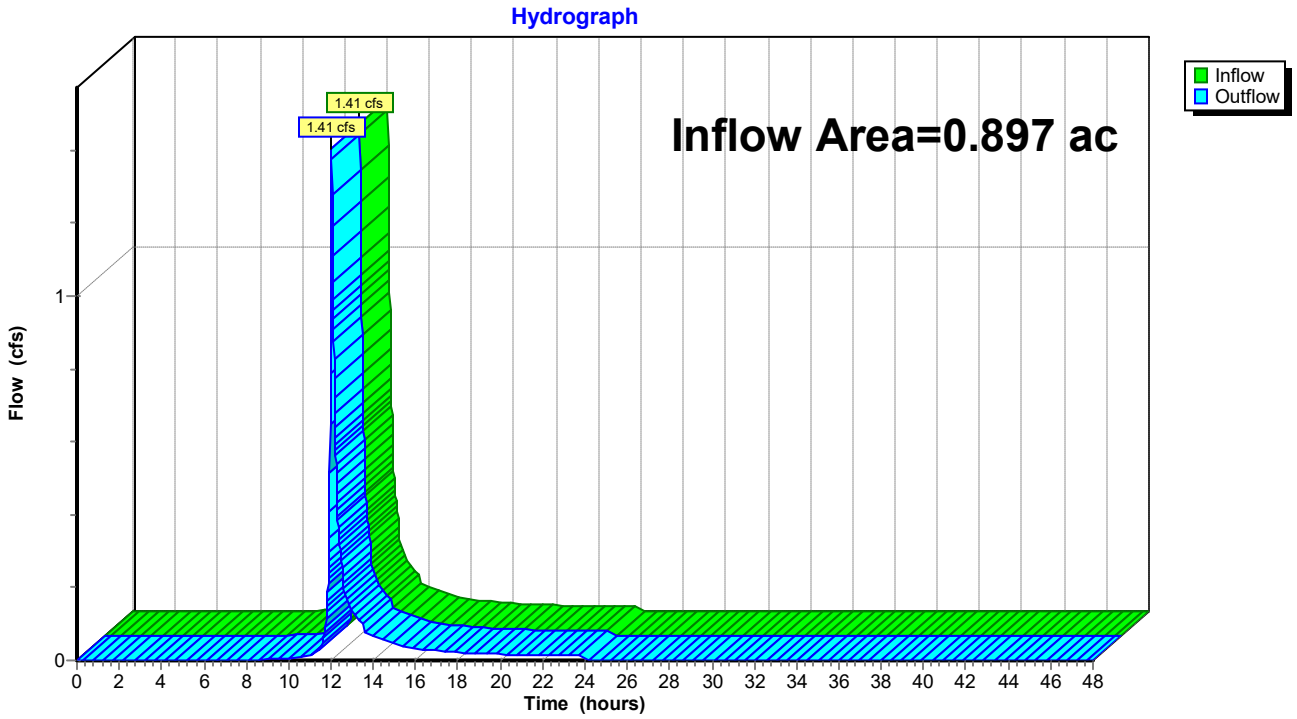


Summary for Reach 16R: Off Site

Inflow Area = 0.897 ac, 36.12% Impervious, Inflow Depth = 0.97" for 2-yr event
Inflow = 1.41 cfs @ 12.04 hrs, Volume= 0.072 af
Outflow = 1.41 cfs @ 12.04 hrs, Volume= 0.072 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 16R: Off Site

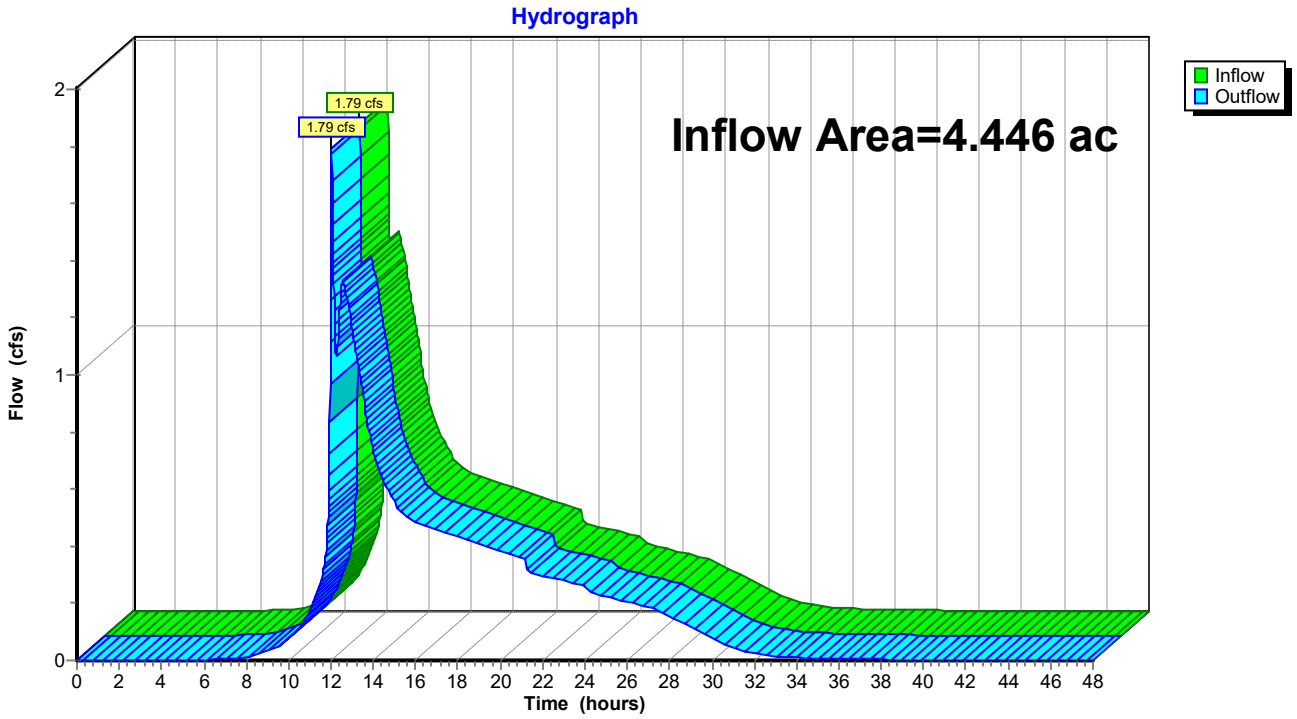


Summary for Reach 21R: Proposed Runoff

Inflow Area = 4.446 ac, 69.46% Impervious, Inflow Depth > 1.80" for 2-yr event
Inflow = 1.79 cfs @ 12.04 hrs, Volume= 0.668 af
Outflow = 1.79 cfs @ 12.04 hrs, Volume= 0.668 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 21R: Proposed Runoff



Summary for Pond 2P: Underground System

Inflow Area = 2.880 ac, 81.49% Impervious, Inflow Depth = 2.12" for 2-yr event
Inflow = 10.64 cfs @ 12.03 hrs, Volume= 0.510 af
Outflow = 0.99 cfs @ 12.66 hrs, Volume= 0.508 af, Atten= 91%, Lag= 37.6 min
Primary = 0.99 cfs @ 12.66 hrs, Volume= 0.508 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 642.89' @ 12.66 hrs Surf.Area= 0.153 ac Storage= 0.286 af

Plug-Flow detention time= 330.9 min calculated for 0.508 af (100% of inflow)
Center-of-Mass det. time= 329.4 min (1,112.1 - 782.6)

Volume	Invert	Avail.Storage	Storage Description
#1	640.25'	0.011 af	**4.00'D x 6.50'H Vertical Cone/Cylinder** x 6
#2A	640.25'	0.210 af	**37.08'W x 177.78'L x 5.50'H Field A** 0.832 af Overall - 0.306 af Embedded = 0.526 af x 40.0% Voids
#3A	641.00'	0.306 af	**ADS_StormTech MC-3500 d +Cap** x 120 Inside #2 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 120 Chambers in 5 Rows Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf
#4	646.60'	2.683 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		3.211 af	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
646.60	0.000	0.000	0.000
647.00	0.190	0.038	0.038
648.00	5.100	2.645	2.683

Device	Routing	Invert	Outlet Devices
#1	Device 4	640.25'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 4	642.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	645.00'	**4.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)
#4	Primary	640.25'	**12.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 640.25' / 639.75' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#5	Secondary	647.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.20 1.20 Width (feet) 0.00 20.00 80.00

Primary OutFlow Max=0.99 cfs @ 12.66 hrs HW=642.89' TW=0.00' (Dynamic Tailwater)
└**4=Culvert** (Passes 0.99 cfs of 4.29 cfs potential flow)
  ├**1=Orifice/Grate** (Orifice Controls 0.38 cfs @ 7.64 fps)
  ├**2=Orifice/Grate** (Orifice Controls 0.62 cfs @ 2.14 fps)
  └**3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=640.25' TW=0.00' (Dynamic Tailwater)
└**5=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 2P: Underground System - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

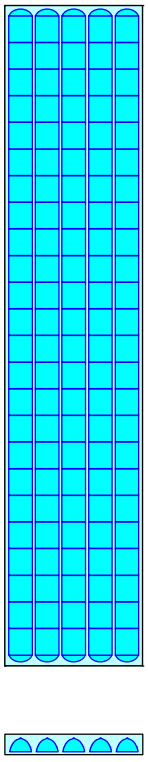
24 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 175.78' Row Length +12.0" End Stone x 2 = 177.78' Base Length
5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

120 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 13,343.2 cf Chamber Storage

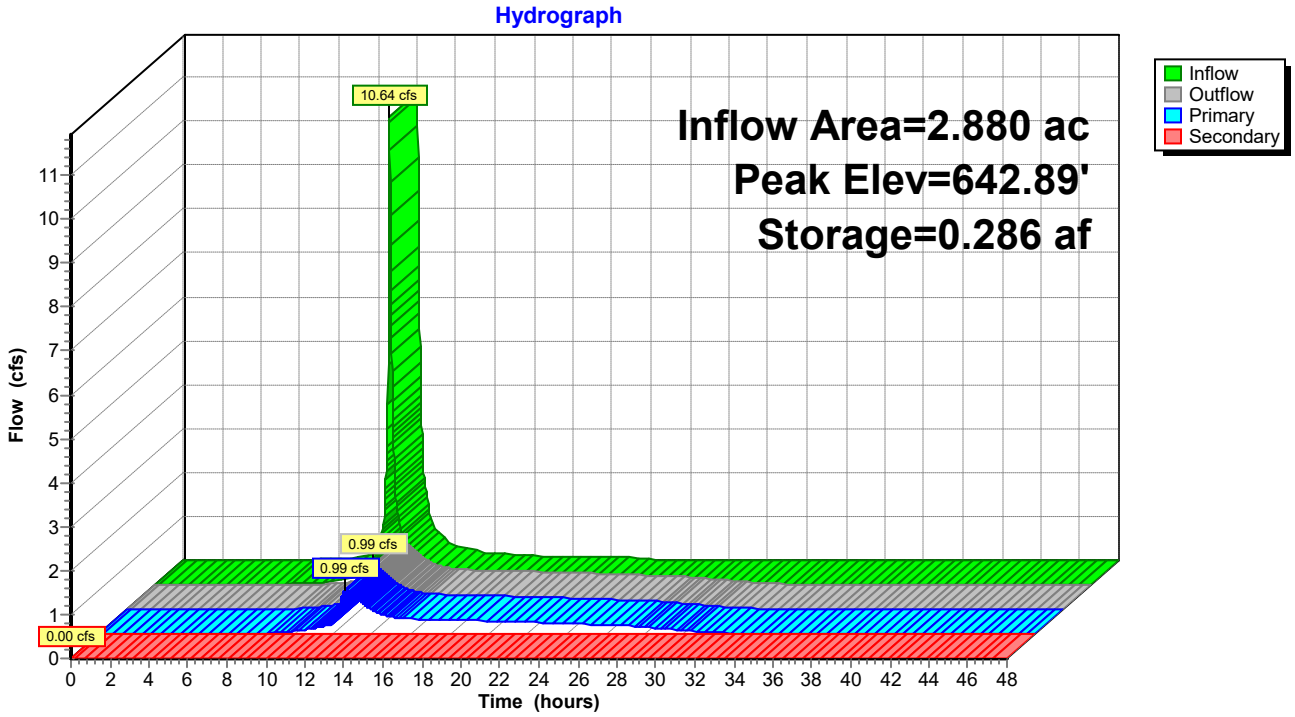
36,259.7 cf Field - 13,343.2 cf Chambers = 22,916.5 cf Stone x 40.0% Voids = 9,166.6 cf Stone Storage

Chamber Storage + Stone Storage = 22,509.8 cf = 0.517 af
Overall Storage Efficiency = 62.1%
Overall System Size = 177.78' x 37.08' x 5.50'

120 Chambers
1,343.0 cy Field
848.8 cy Stone



Pond 2P: Underground System



Summary for Pond 15P: Bio-Filtration Basin

Inflow Area = 0.669 ac, 62.33% Impervious, Inflow Depth = 1.56" for 2-yr event
Inflow = 1.86 cfs @ 12.03 hrs, Volume= 0.087 af
Outflow = 0.13 cfs @ 13.13 hrs, Volume= 0.087 af, Atten= 93%, Lag= 65.8 min
Primary = 0.13 cfs @ 13.13 hrs, Volume= 0.087 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 644.62' @ 13.13 hrs Surf.Area= 1,526 sf Storage= 1,845 cf

Plug-Flow detention time= 149.4 min calculated for 0.087 af (100% of inflow)
Center-of-Mass det. time= 149.4 min (956.8 - 807.4)

Volume	Invert	Avail.Storage	Storage Description
#1	643.00'	5,556 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

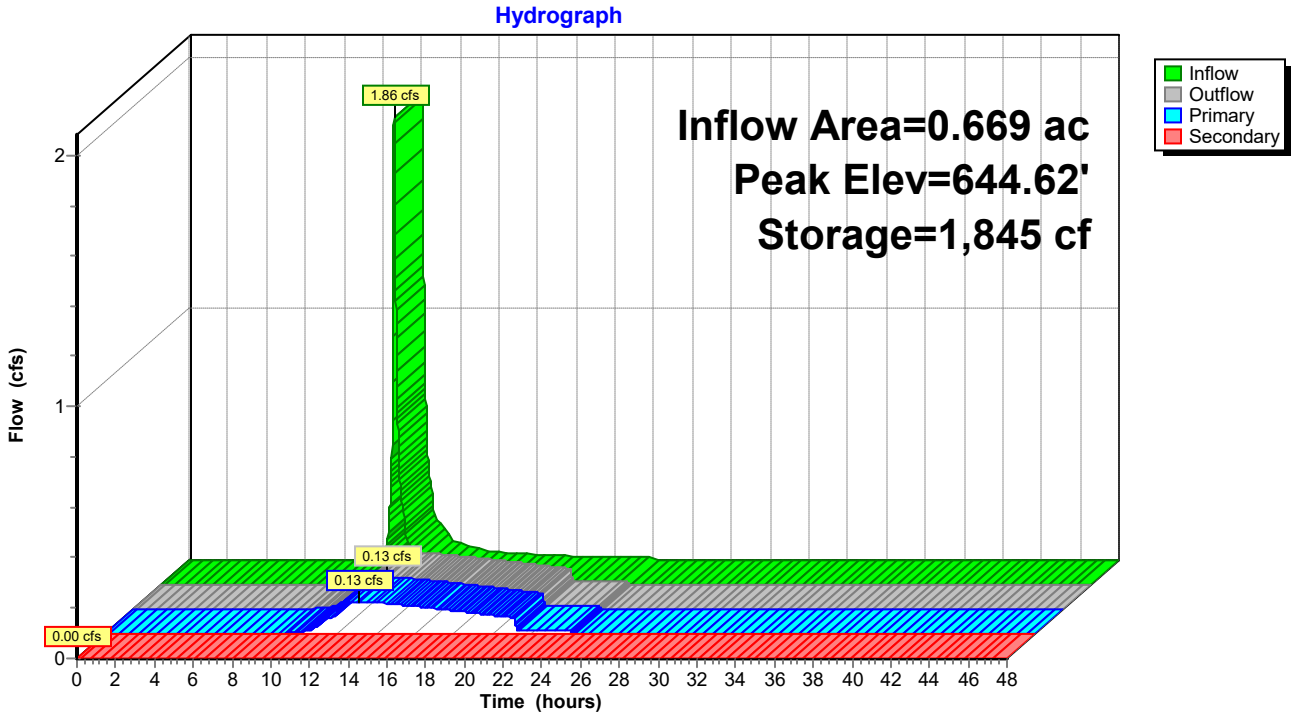
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
643.00	750	0	0
646.50	2,425	5,556	5,556

Device	Routing	Invert	Outlet Devices
#1	Primary	643.00'	**3.600 in/hr Underdrain over Surface area** Phase-In= 0.01'
#2	Secondary	645.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 in 24.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.13 cfs @ 13.13 hrs HW=644.62' TW=0.00' (Dynamic Tailwater)
↑—**1=Underdrain** (Exfiltration Controls 0.13 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=643.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 15P: Bio-Filtration Basin



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=0.711 ac 27.85% Impervious Runoff Depth=1.23"
Tc=5.0 min CN=71 Runoff=1.46 cfs 0.073 af

Subcatchment 2S: DA-2 Runoff Area=0.905 ac 79.01% Impervious Runoff Depth=2.68"
Tc=5.0 min CN=90 Runoff=4.30 cfs 0.202 af

Subcatchment 3S: DA-3 Runoff Area=0.566 ac 80.57% Impervious Runoff Depth=2.78"
Tc=5.0 min CN=91 Runoff=2.77 cfs 0.131 af

Subcatchment 4S: DA-4 Runoff Area=0.233 ac 87.12% Impervious Runoff Depth=2.98"
Tc=5.0 min CN=93 Runoff=1.20 cfs 0.058 af

Subcatchment 5S: DA-5 Runoff Area=0.138 ac 52.17% Impervious Runoff Depth=1.84"
Tc=5.0 min CN=80 Runoff=0.45 cfs 0.021 af

Subcatchment 6S: DA-6 Runoff Area=0.121 ac 60.33% Impervious Runoff Depth=2.07"
Tc=5.0 min CN=83 Runoff=0.45 cfs 0.021 af

Subcatchment 7S: DA-7 Runoff Area=0.063 ac 39.68% Impervious Runoff Depth=1.55"
Tc=5.0 min CN=76 Runoff=0.17 cfs 0.008 af

Subcatchment 8S: DA-8 Runoff Area=0.171 ac 88.30% Impervious Runoff Depth=3.08"
Tc=5.0 min CN=94 Runoff=0.90 cfs 0.044 af

Subcatchment 9S: DA-9 Runoff Area=0.211 ac 85.31% Impervious Runoff Depth=2.98"
Tc=5.0 min CN=93 Runoff=1.09 cfs 0.052 af

Subcatchment 10S: DA-10 Runoff Area=0.042 ac 85.71% Impervious Runoff Depth=2.98"
Tc=5.0 min CN=93 Runoff=0.22 cfs 0.010 af

Subcatchment 11S: DA-11 Runoff Area=0.010 ac 50.00% Impervious Runoff Depth=1.84"
Tc=5.0 min CN=80 Runoff=0.03 cfs 0.002 af

Subcatchment 12S: DA-12 Runoff Area=0.065 ac 84.62% Impervious Runoff Depth=2.88"
Tc=5.0 min CN=92 Runoff=0.33 cfs 0.016 af

Subcatchment 13S: DA-13 Runoff Area=0.069 ac 43.48% Impervious Runoff Depth=1.62"
Tc=5.0 min CN=77 Runoff=0.20 cfs 0.009 af

Subcatchment 14S: DA-14 Runoff Area=0.099 ac 72.73% Impervious Runoff Depth=2.50"
Tc=5.0 min CN=88 Runoff=0.44 cfs 0.021 af

Subcatchment 15S: DA-15 Runoff Area=0.044 ac 50.00% Impervious Runoff Depth=1.84"
Tc=5.0 min CN=80 Runoff=0.14 cfs 0.007 af

Subcatchment 16S: DA-16 Runoff Area=0.146 ac 58.22% Impervious Runoff Depth=2.07"
Tc=5.0 min CN=83 Runoff=0.54 cfs 0.025 af

Subcatchment 17S: DA-17 Runoff Area=0.095 ac 50.53% Impervious Runoff Depth=1.84"
Tc=5.0 min CN=80 Runoff=0.31 cfs 0.015 af

Subcatchment 18S: DA-18 Runoff Area=0.107 ac 69.16% Impervious Runoff Depth=2.41"
Tc=5.0 min CN=87 Runoff=0.46 cfs 0.021 af

Subcatchment 19S: DA-19 Runoff Area=0.079 ac 49.37% Impervious Runoff Depth=1.76"
Tc=5.0 min CN=79 Runoff=0.25 cfs 0.012 af

Subcatchment 20S: DA-20 Runoff Area=0.099 ac 77.78% Impervious Runoff Depth=2.68"
Tc=5.0 min CN=90 Runoff=0.47 cfs 0.022 af

Subcatchment 21S: DA-1A, DA-1B, DA-1C Runoff Area=0.472 ac 100.00% Impervious Runoff Depth=3.52"
Tc=5.0 min CN=98 Runoff=2.67 cfs 0.138 af

Reach 3R: On Site Inflow=2.75 cfs 0.797 af
Outflow=2.75 cfs 0.797 af

Reach 16R: Off Site Inflow=2.23 cfs 0.109 af
Outflow=2.23 cfs 0.109 af

Reach 21R: Proposed Runoff Inflow=3.35 cfs 0.906 af
Outflow=3.35 cfs 0.906 af

Pond 2P: Underground System Peak Elev=643.34' Storage=0.337 af Inflow=14.01 cfs 0.676 af
Primary=2.60 cfs 0.675 af Secondary=0.00 cfs 0.000 af Outflow=2.60 cfs 0.675 af

Pond 15P: Bio-Filtration Basin Peak Elev=645.22' Storage=2,849 cf Inflow=2.62 cfs 0.122 af
Primary=0.15 cfs 0.122 af Secondary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.122 af

Total Runoff Area = 4.446 ac Runoff Volume = 0.908 af Average Runoff Depth = 2.45"
30.54% Pervious = 1.358 ac 69.46% Impervious = 3.088 ac

Summary for Subcatchment 1S: DA-1

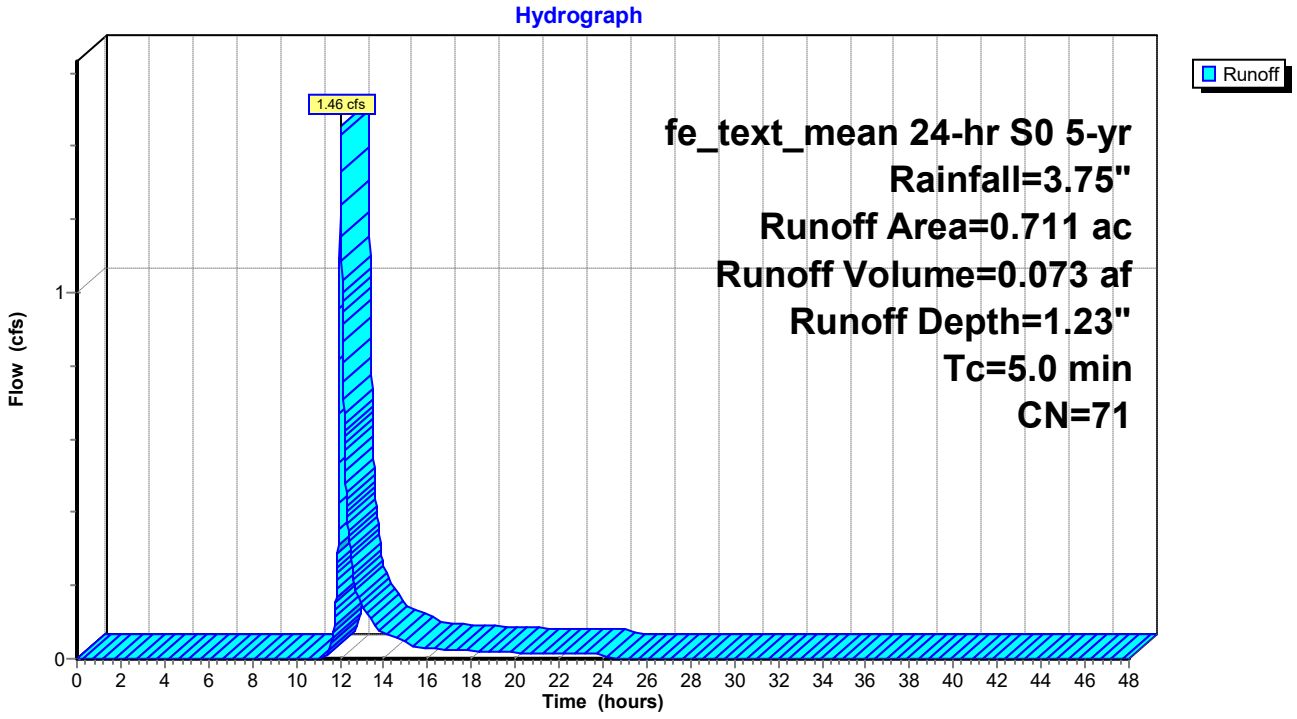
Runoff = 1.46 cfs @ 12.04 hrs, Volume= 0.073 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.198	98	Impervious, HSG B
	0.513	61	>75% Grass cover, Good, HSG B
	0.711	71	Weighted Average
	0.513		72.15% Pervious Area
	0.198		27.85% Impervious Area

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

Subcatchment 1S: DA-1



Summary for Subcatchment 2S: DA-2

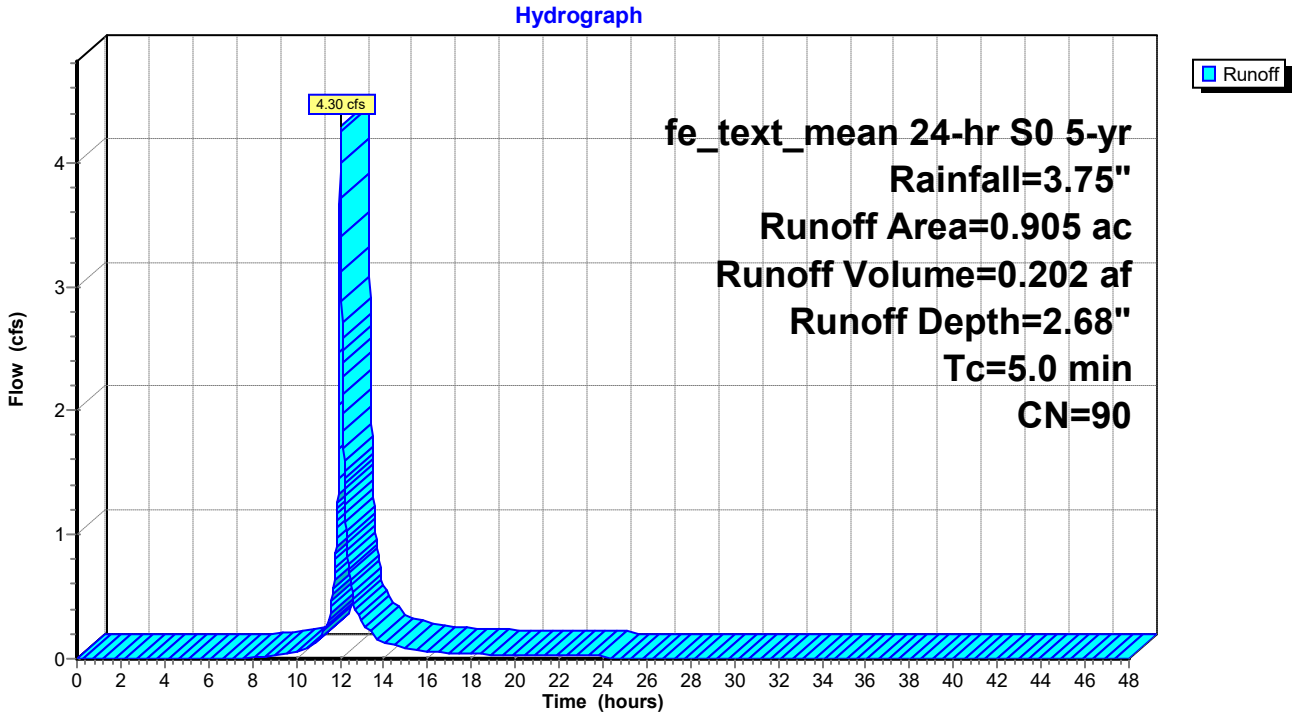
Runoff = 4.30 cfs @ 12.03 hrs, Volume= 0.202 af, Depth= 2.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.715	98	Impervious, HSG B
	0.190	61	>75% Grass cover, Good, HSG B
	0.905	90	Weighted Average
	0.190		20.99% Pervious Area
	0.715		79.01% Impervious Area

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

Subcatchment 2S: DA-2



Summary for Subcatchment 3S: DA-3

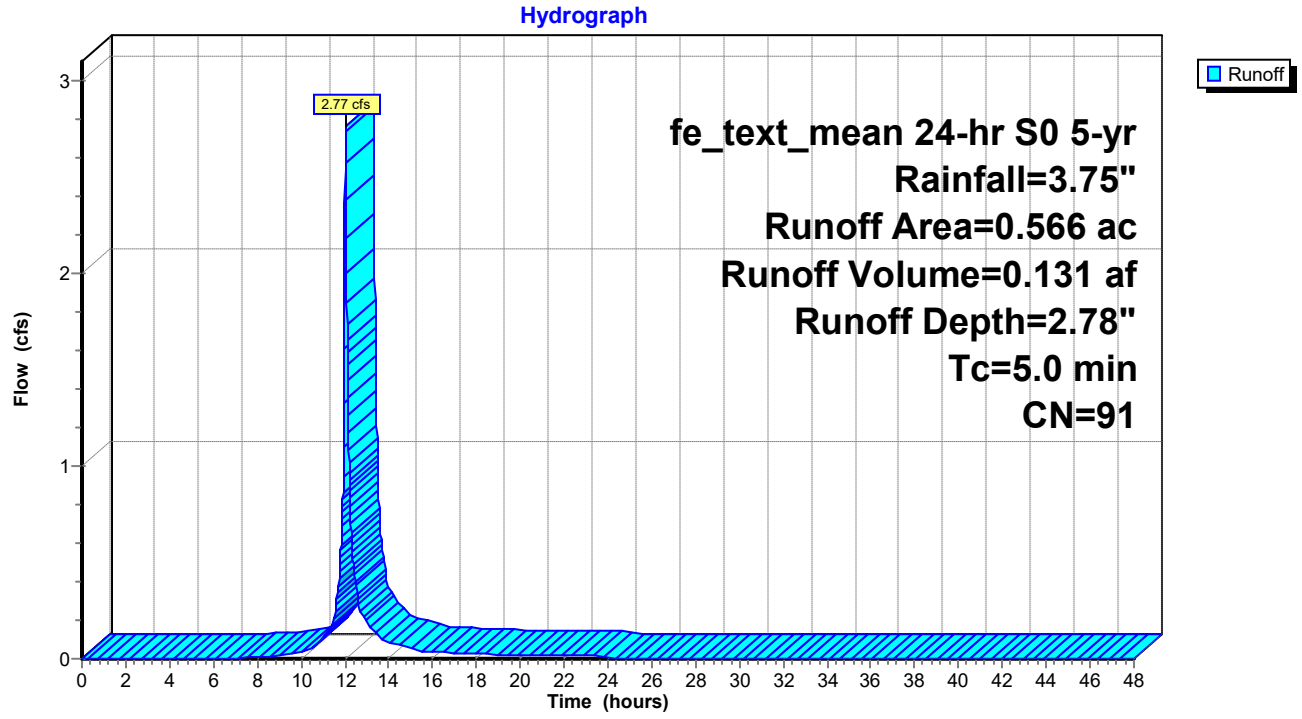
Runoff = 2.77 cfs @ 12.03 hrs, Volume= 0.131 af, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.456	98	Impervious, HSG B
	0.110	61	>75% Grass cover, Good, HSG B
	0.566	91	Weighted Average
	0.110		19.43% Pervious Area
	0.456		80.57% Impervious Area

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

Subcatchment 3S: DA-3



Summary for Subcatchment 4S: DA-4

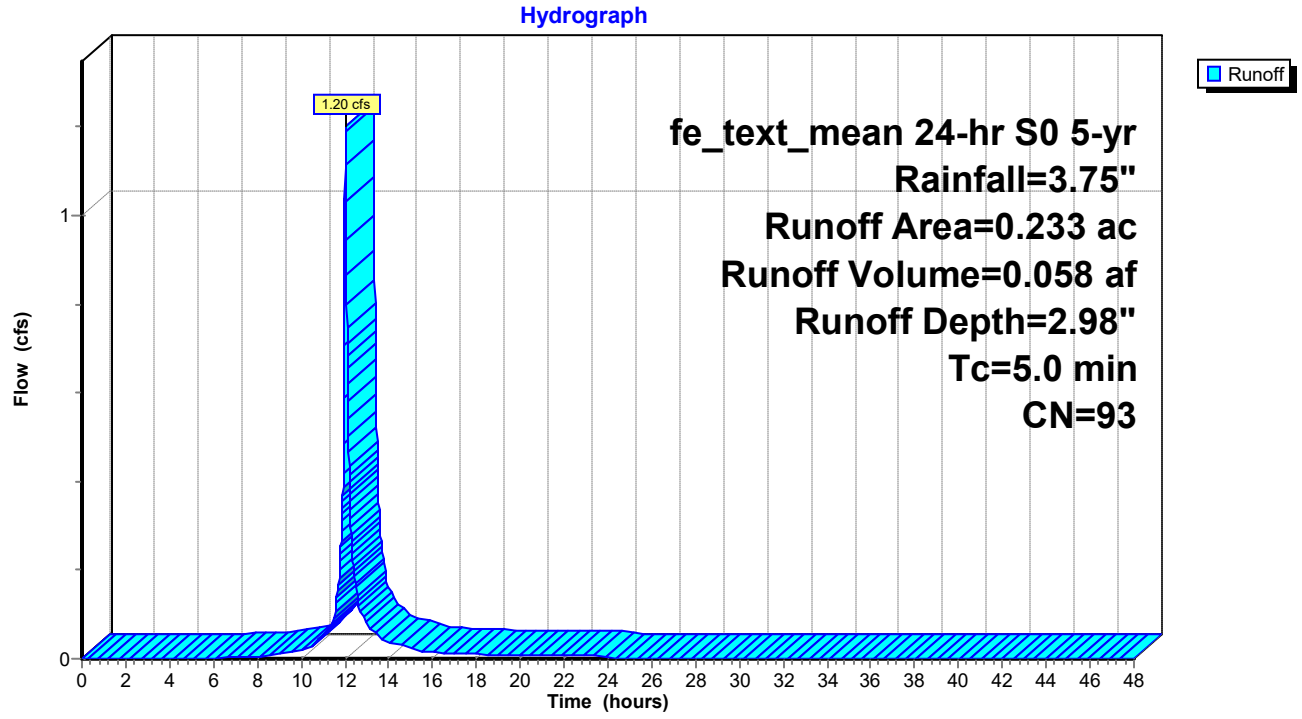
Runoff = 1.20 cfs @ 12.03 hrs, Volume= 0.058 af, Depth= 2.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.203	98	Impervious, HSG B
	0.030	61	>75% Grass cover, Good, HSG B
	0.233	93	Weighted Average
	0.030		12.88% Pervious Area
	0.203		87.12% Impervious Area

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

Subcatchment 4S: DA-4



Summary for Subcatchment 5S: DA-5

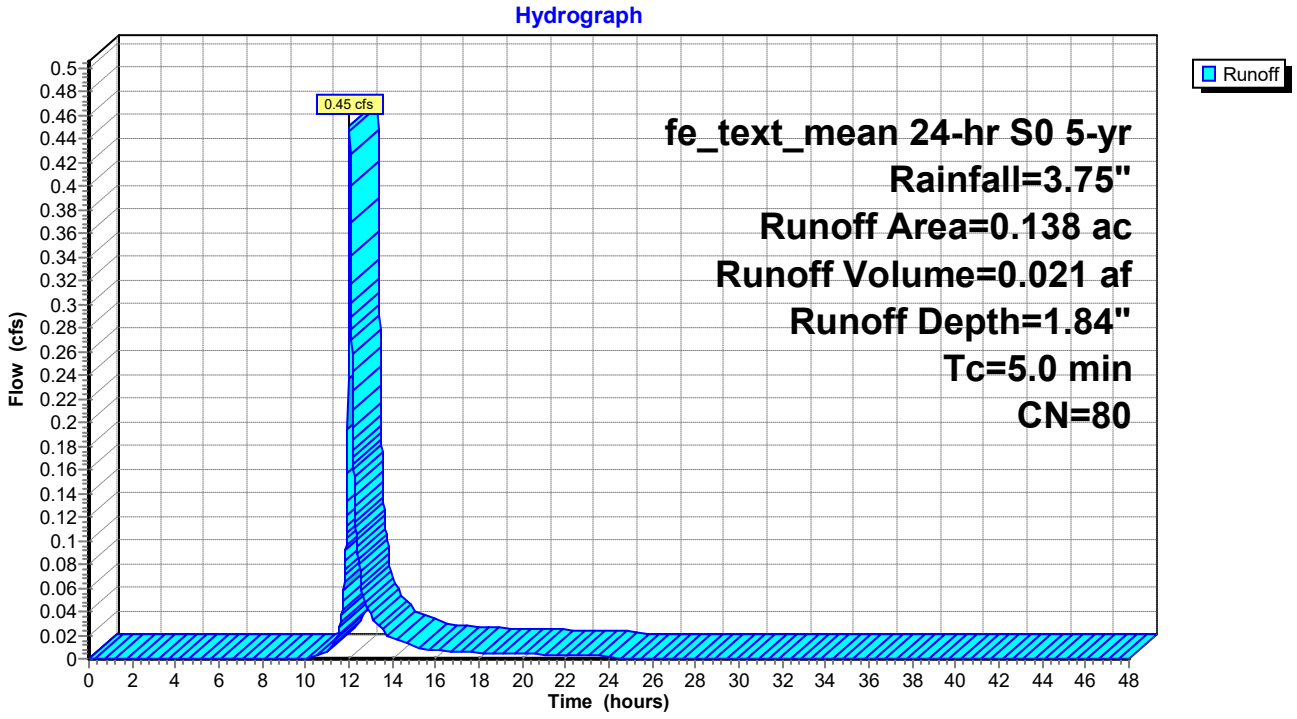
Runoff = 0.45 cfs @ 12.03 hrs, Volume= 0.021 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.072	98	Impervious, HSG B
	0.066	61	>75% Grass cover, Good, HSG B
	0.138	80	Weighted Average
	0.066		47.83% Pervious Area
	0.072		52.17% Impervious Area

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

Subcatchment 5S: DA-5



Summary for Subcatchment 6S: DA-6

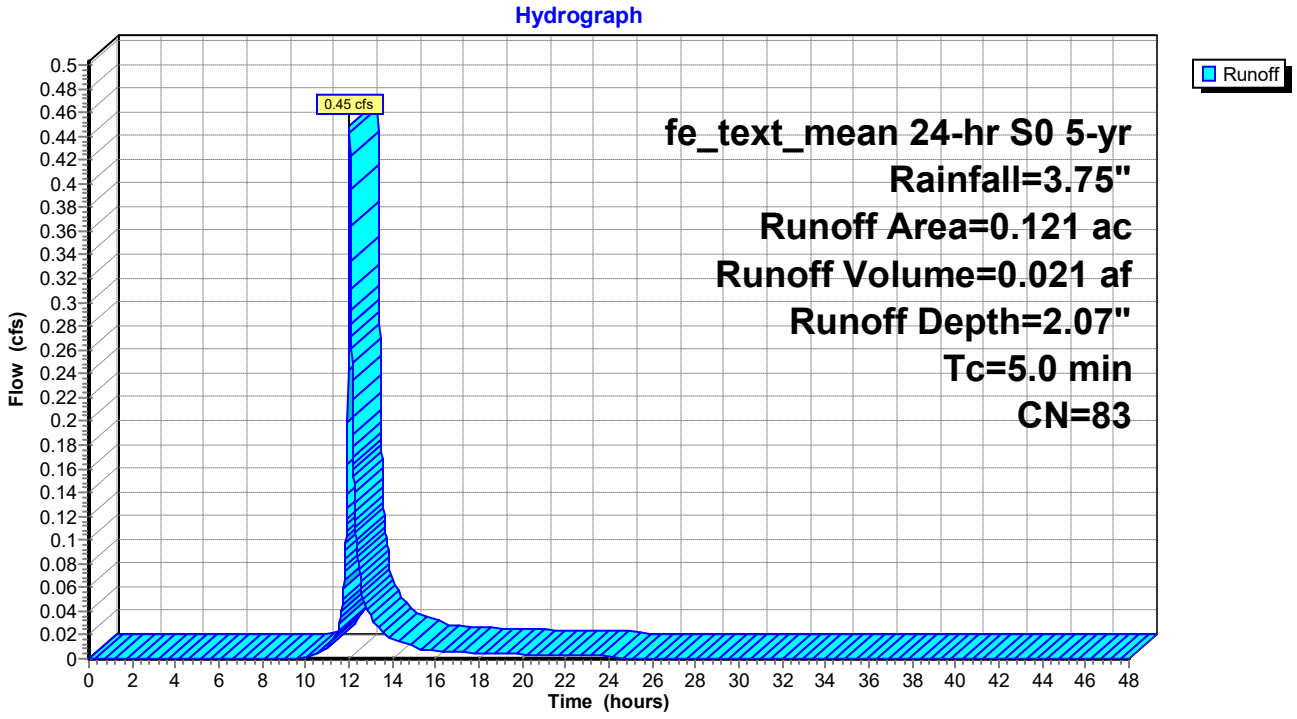
Runoff = 0.45 cfs @ 12.03 hrs, Volume= 0.021 af, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.073	98	Impervious, HSG B
	0.048	61	>75% Grass cover, Good, HSG B
	0.121	83	Weighted Average
	0.048		39.67% Pervious Area
	0.073		60.33% Impervious Area

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

Subcatchment 6S: DA-6



Summary for Subcatchment 7S: DA-7

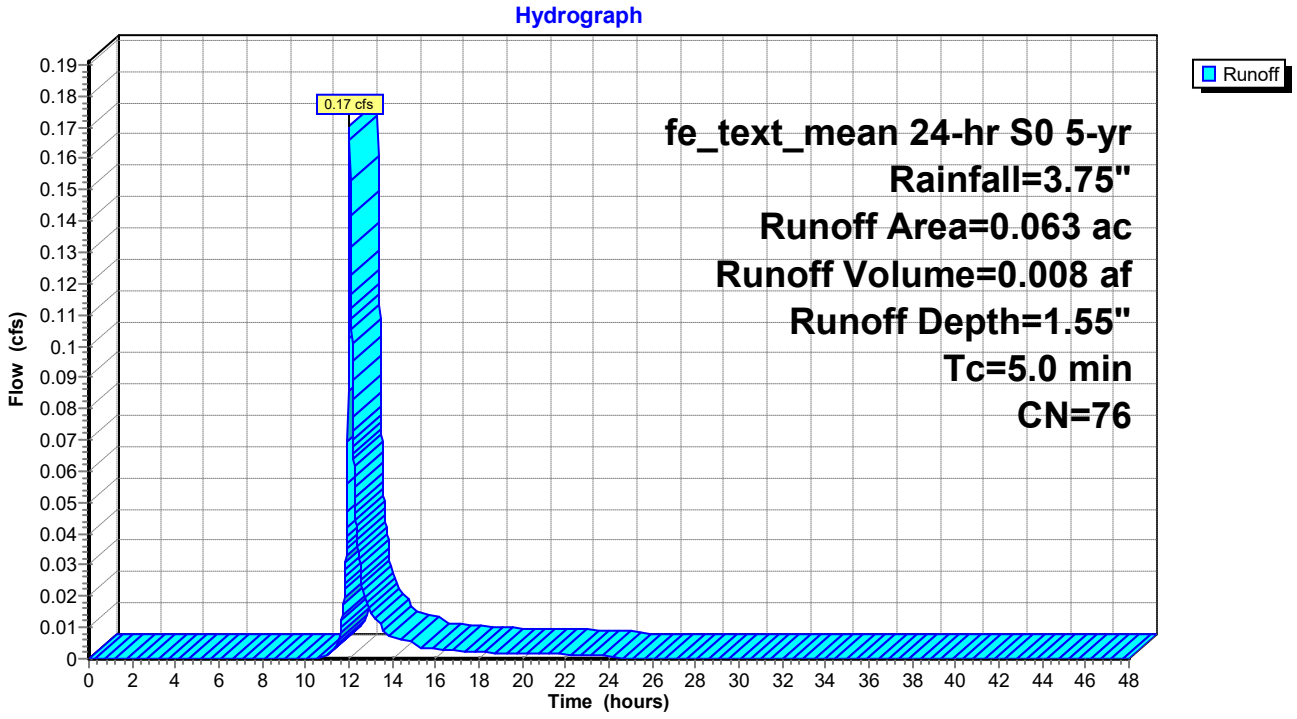
Runoff = 0.17 cfs @ 12.03 hrs, Volume= 0.008 af, Depth= 1.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.025	98	Impervious, HSG B
	0.038	61	>75% Grass cover, Good, HSG B
	0.063	76	Weighted Average
	0.038		60.32% Pervious Area
	0.025		39.68% Impervious Area

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

Subcatchment 7S: DA-7



Summary for Subcatchment 8S: DA-8

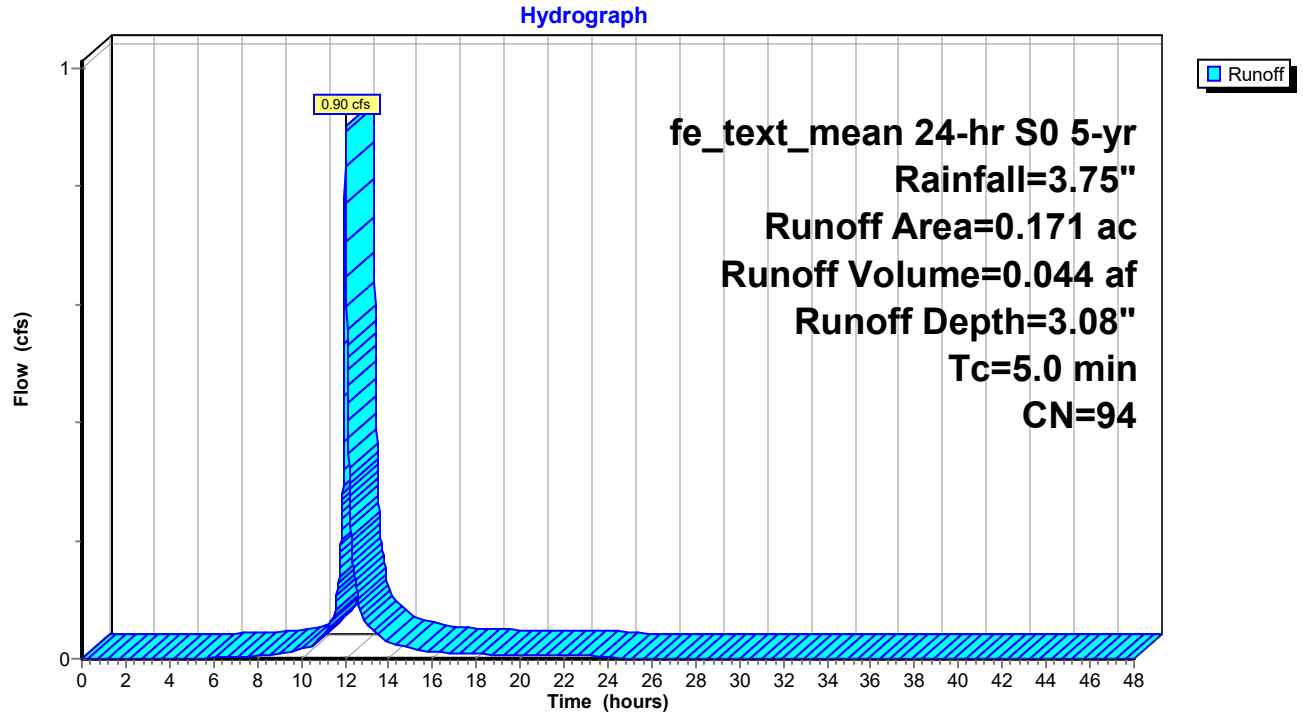
Runoff = 0.90 cfs @ 12.03 hrs, Volume= 0.044 af, Depth= 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.151	98	Impervious, HSG B
	0.020	61	>75% Grass cover, Good, HSG B
	0.171	94	Weighted Average
	0.020		11.70% Pervious Area
	0.151		88.30% Impervious Area

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

Subcatchment 8S: DA-8



Summary for Subcatchment 9S: DA-9

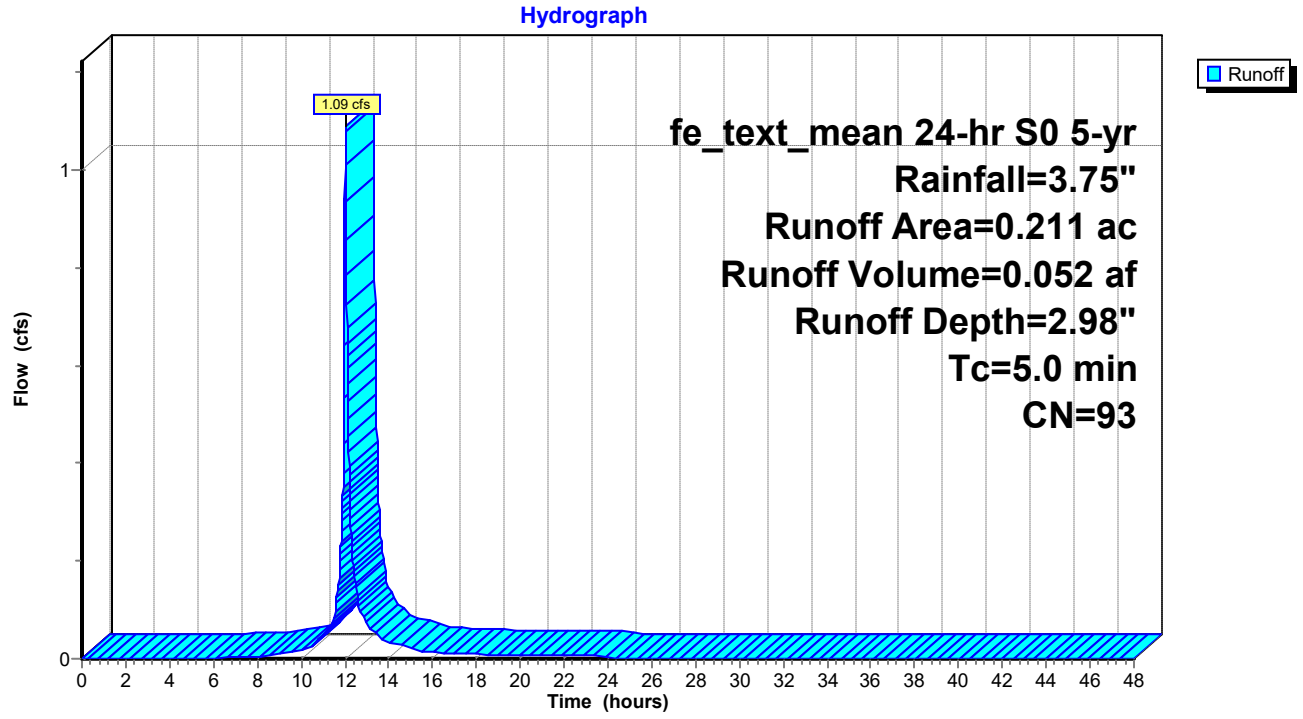
Runoff = 1.09 cfs @ 12.03 hrs, Volume= 0.052 af, Depth= 2.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.180	98	Impervious, HSG B
	0.031	61	>75% Grass cover, Good, HSG B
	0.211	93	Weighted Average
	0.031		14.69% Pervious Area
	0.180		85.31% Impervious Area

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

Subcatchment 9S: DA-9



Summary for Subcatchment 10S: DA-10

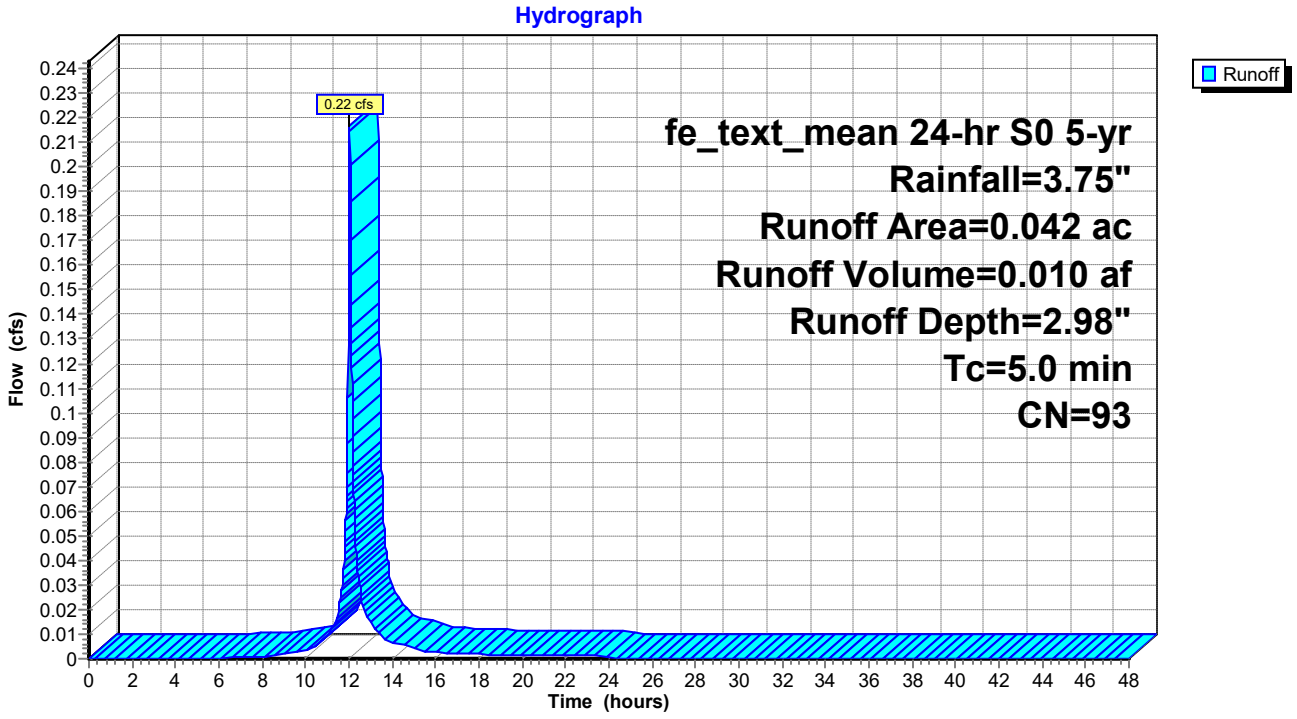
Runoff = 0.22 cfs @ 12.03 hrs, Volume= 0.010 af, Depth= 2.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.036	98	Impervious, HSG B
	0.006	61	>75% Grass cover, Good, HSG B
	0.042	93	Weighted Average
	0.006		14.29% Pervious Area
	0.036		85.71% Impervious Area

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

Subcatchment 10S: DA-10



Summary for Subcatchment 11S: DA-11

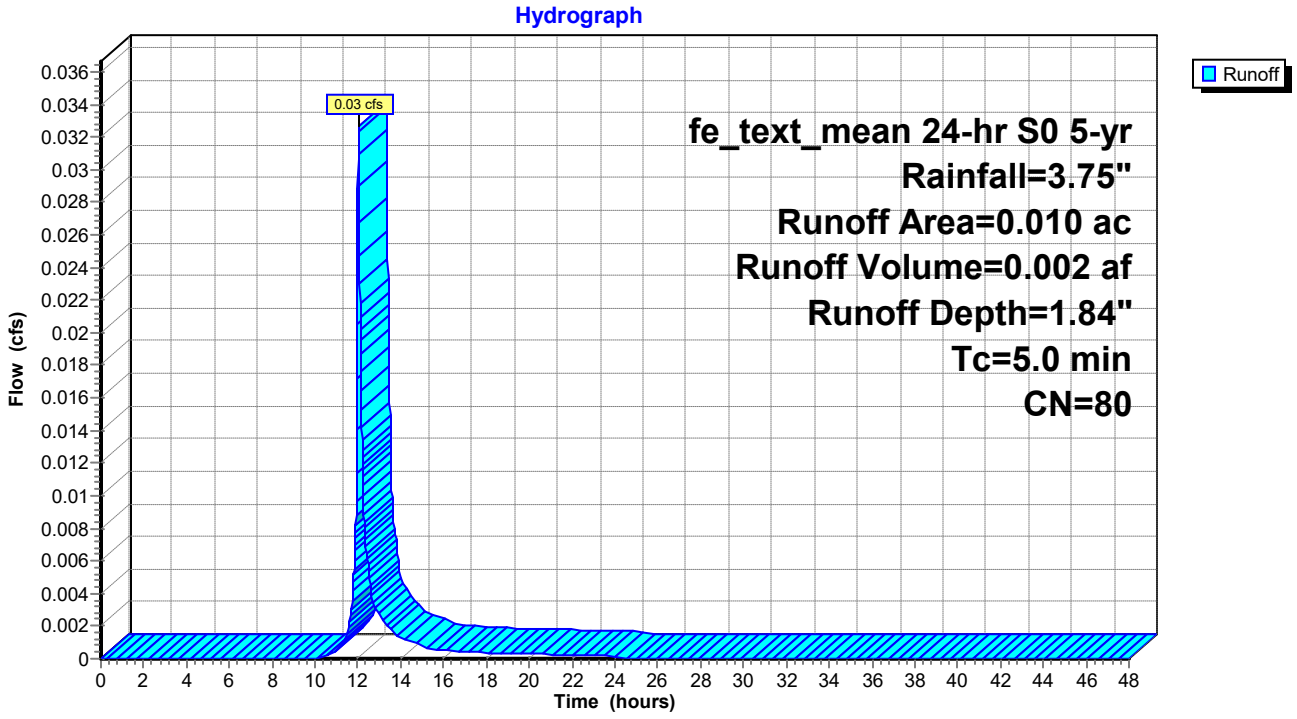
Runoff = 0.03 cfs @ 12.03 hrs, Volume= 0.002 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.005	98	Impervious, HSG B
	0.005	61	>75% Grass cover, Good, HSG B
	0.010	80	Weighted Average
	0.005		50.00% Pervious Area
	0.005		50.00% Impervious Area

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

Subcatchment 11S: DA-11



Summary for Subcatchment 12S: DA-12

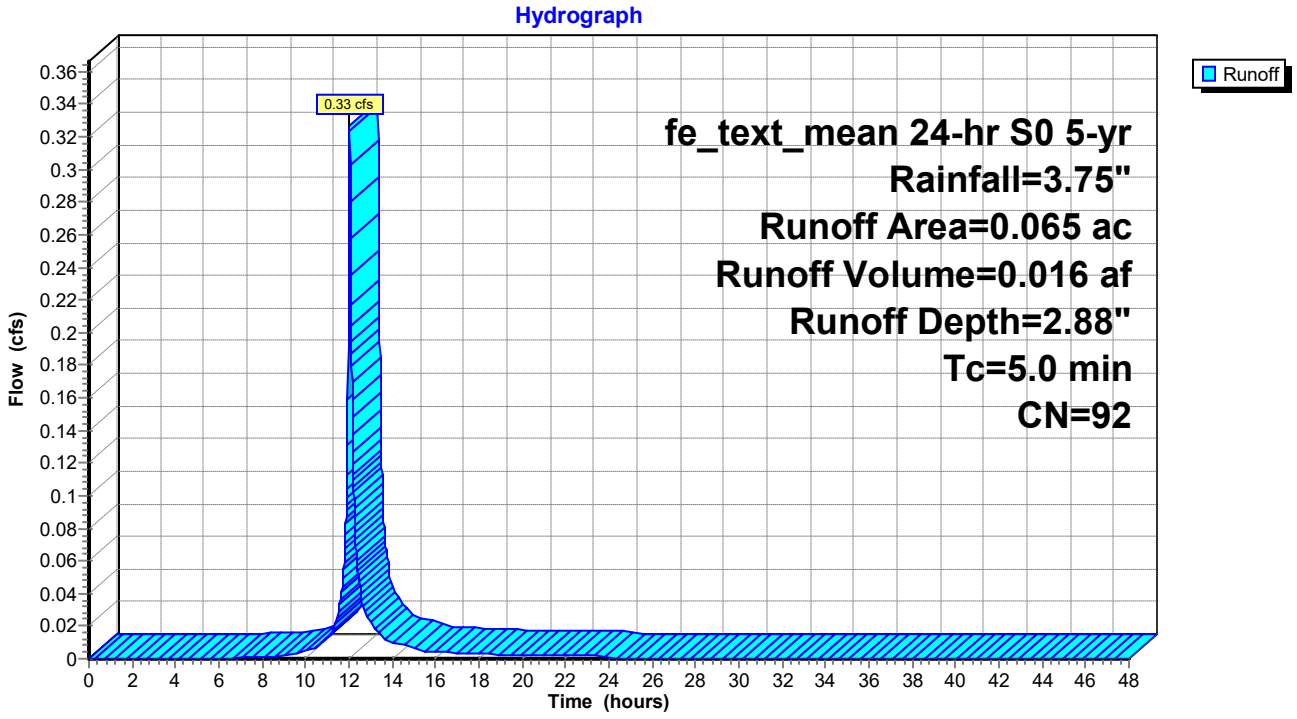
Runoff = 0.33 cfs @ 12.03 hrs, Volume= 0.016 af, Depth= 2.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.055	98	Impervious, HSG B
	0.010	61	>75% Grass cover, Good, HSG B
	0.065	92	Weighted Average
	0.010		15.38% Pervious Area
	0.055		84.62% Impervious Area

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

Subcatchment 12S: DA-12



Summary for Subcatchment 13S: DA-13

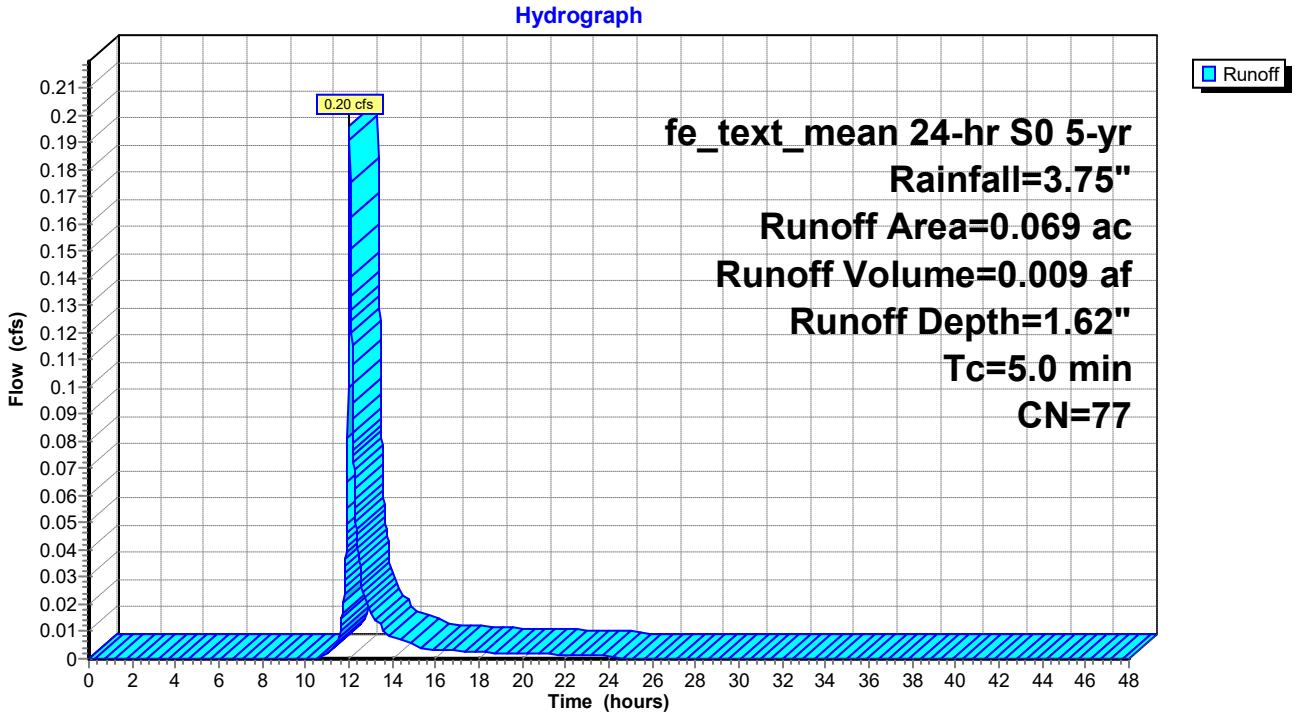
Runoff = 0.20 cfs @ 12.03 hrs, Volume= 0.009 af, Depth= 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.030	98	Impervious, HSG B
	0.039	61	>75% Grass cover, Good, HSG B
	0.069	77	Weighted Average
	0.039		56.52% Pervious Area
	0.030		43.48% Impervious Area

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

Subcatchment 13S: DA-13



Summary for Subcatchment 14S: DA-14

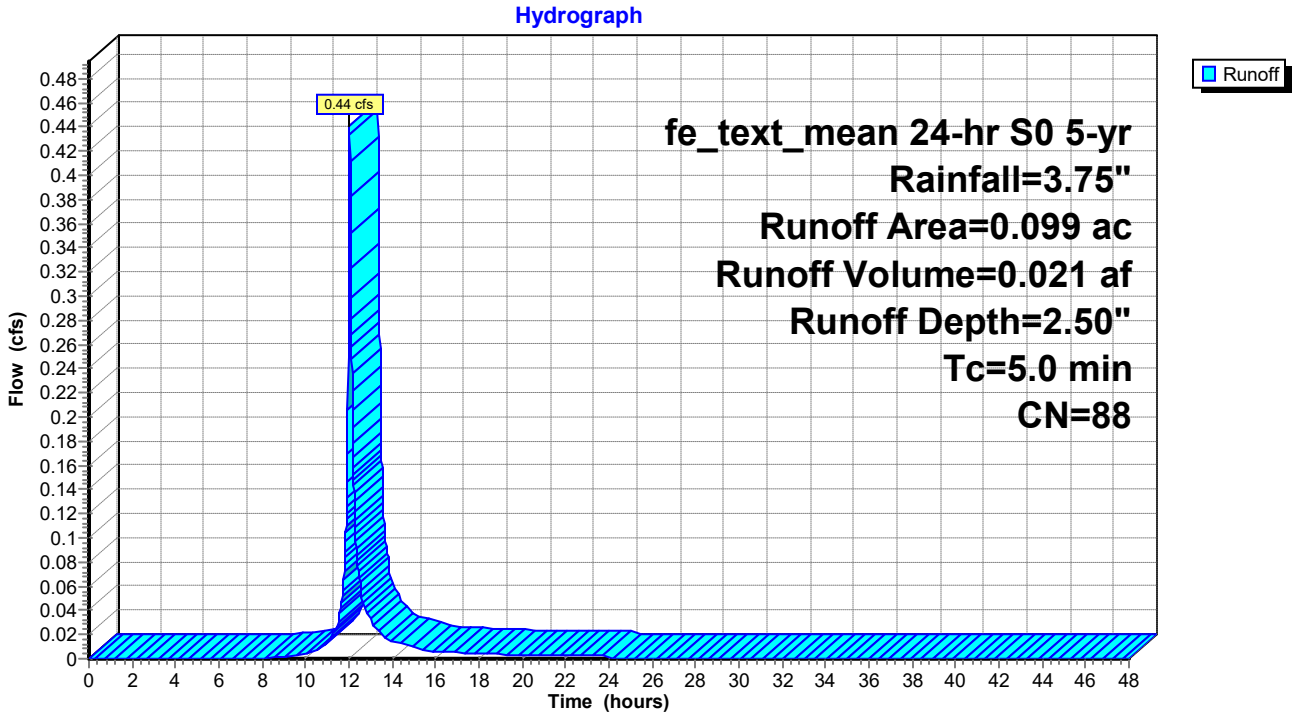
Runoff = 0.44 cfs @ 12.03 hrs, Volume= 0.021 af, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.072	98	Impervious, HSG B
	0.027	61	>75% Grass cover, Good, HSG B
	0.099	88	Weighted Average
	0.027		27.27% Pervious Area
	0.072		72.73% Impervious Area

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

Subcatchment 14S: DA-14



Summary for Subcatchment 15S: DA-15

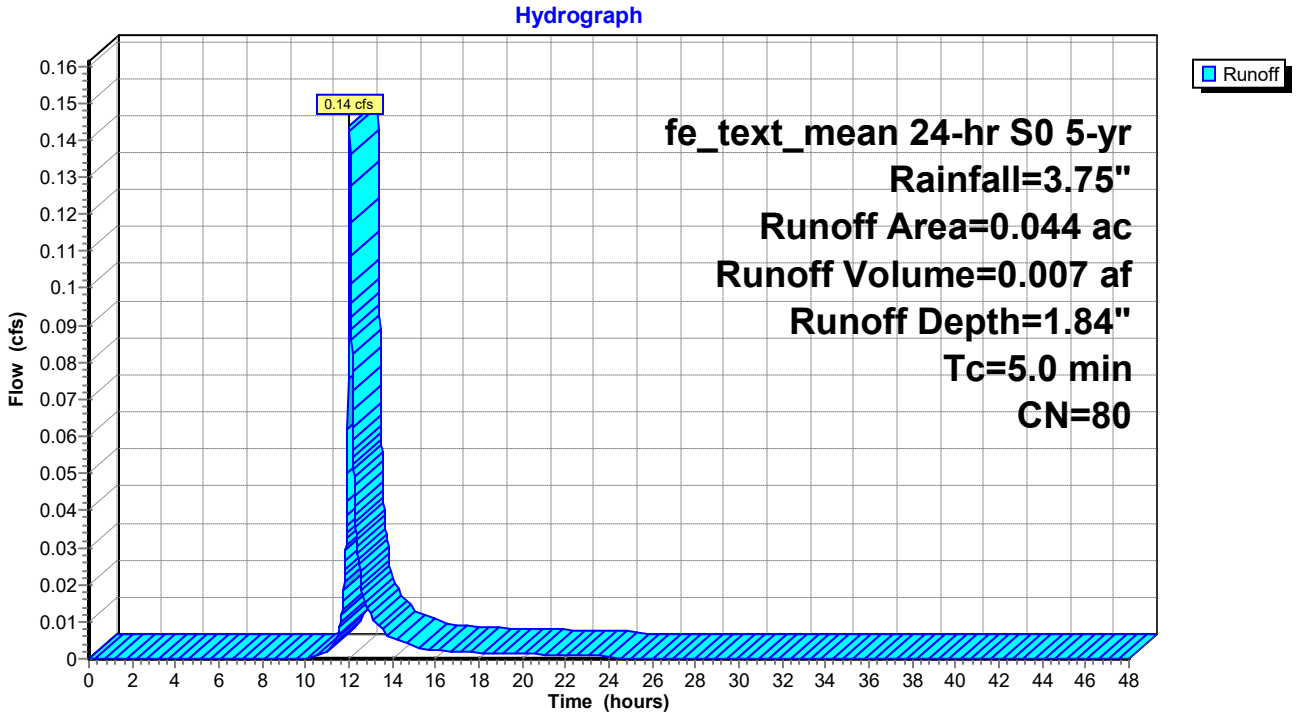
Runoff = 0.14 cfs @ 12.03 hrs, Volume= 0.007 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.022	98	Impervious, HSG B
	0.022	61	>75% Grass cover, Good, HSG B
	0.044	80	Weighted Average
	0.022		50.00% Pervious Area
	0.022		50.00% Impervious Area

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

Subcatchment 15S: DA-15



Summary for Subcatchment 16S: DA-16

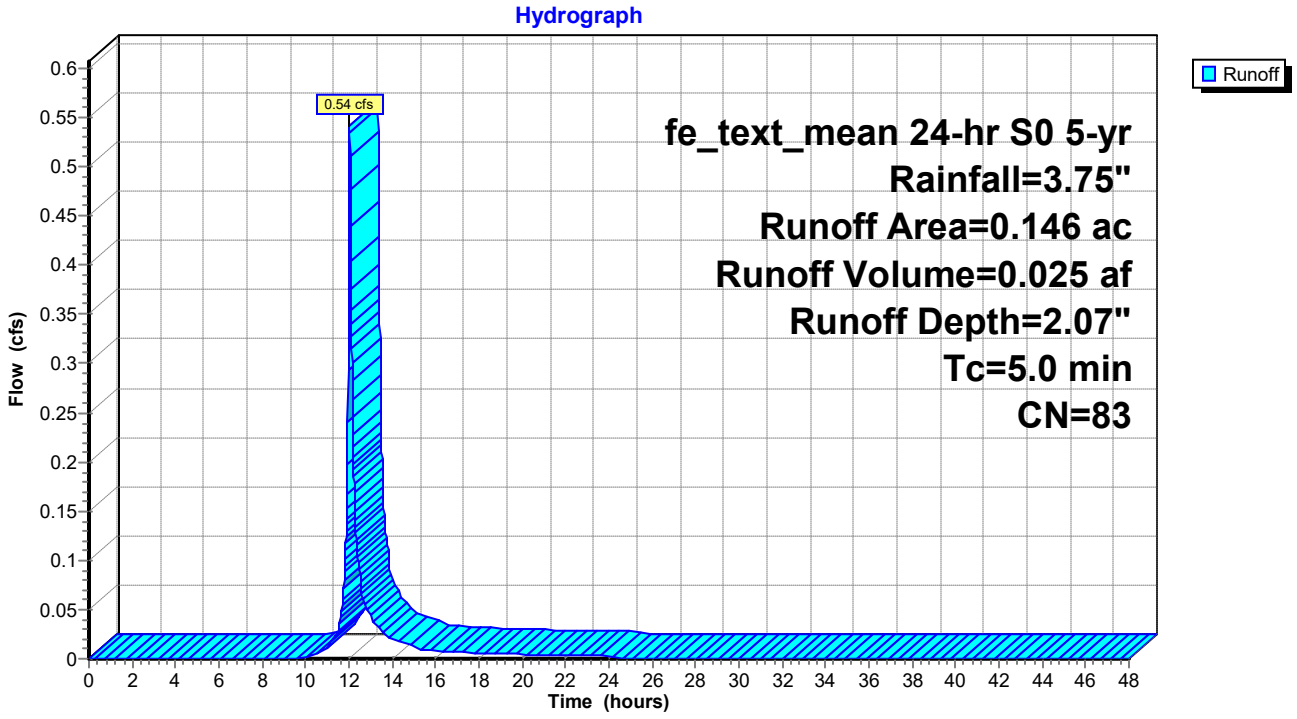
Runoff = 0.54 cfs @ 12.03 hrs, Volume= 0.025 af, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.085	98	Impervious, HSG B
	0.061	61	>75% Grass cover, Good, HSG B
	0.146	83	Weighted Average
	0.061		41.78% Pervious Area
	0.085		58.22% Impervious Area

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

Subcatchment 16S: DA-16



Summary for Subcatchment 17S: DA-17

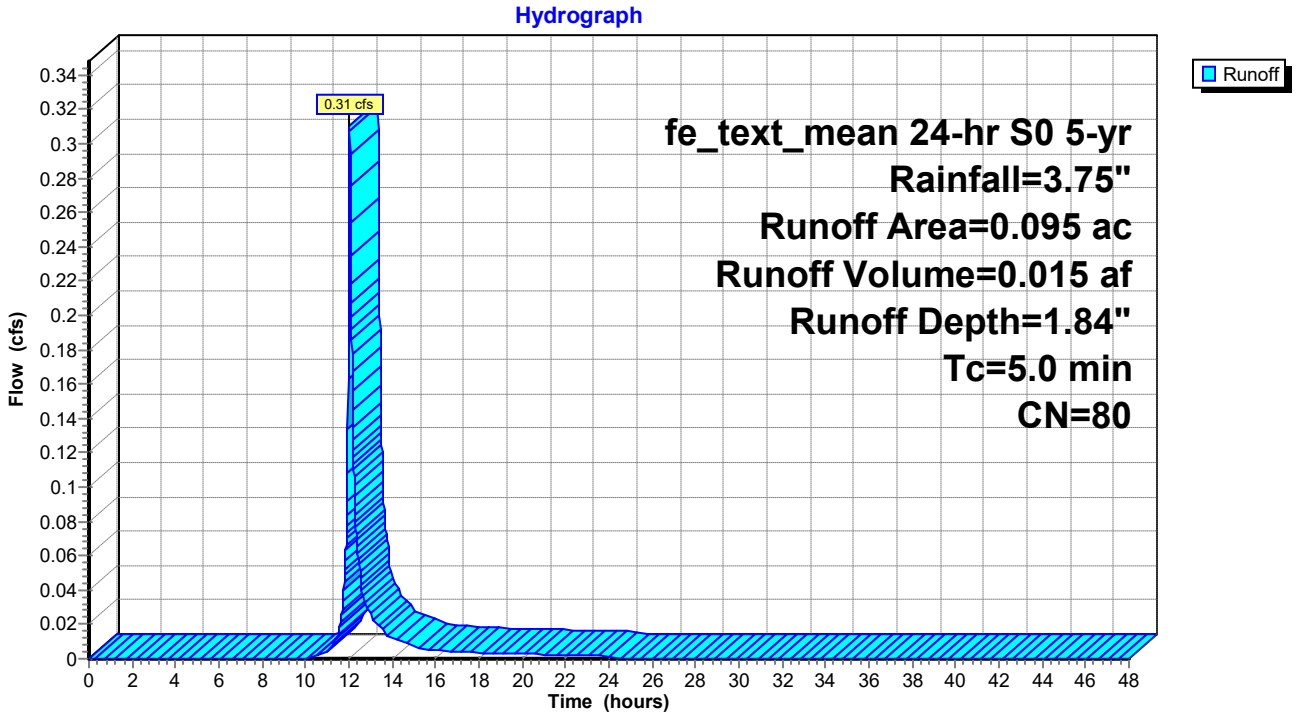
Runoff = 0.31 cfs @ 12.03 hrs, Volume= 0.015 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.048	98	Impervious, HSG B
	0.047	61	>75% Grass cover, Good, HSG B
	0.095	80	Weighted Average
	0.047		49.47% Pervious Area
	0.048		50.53% Impervious Area

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

Subcatchment 17S: DA-17



Summary for Subcatchment 18S: DA-18

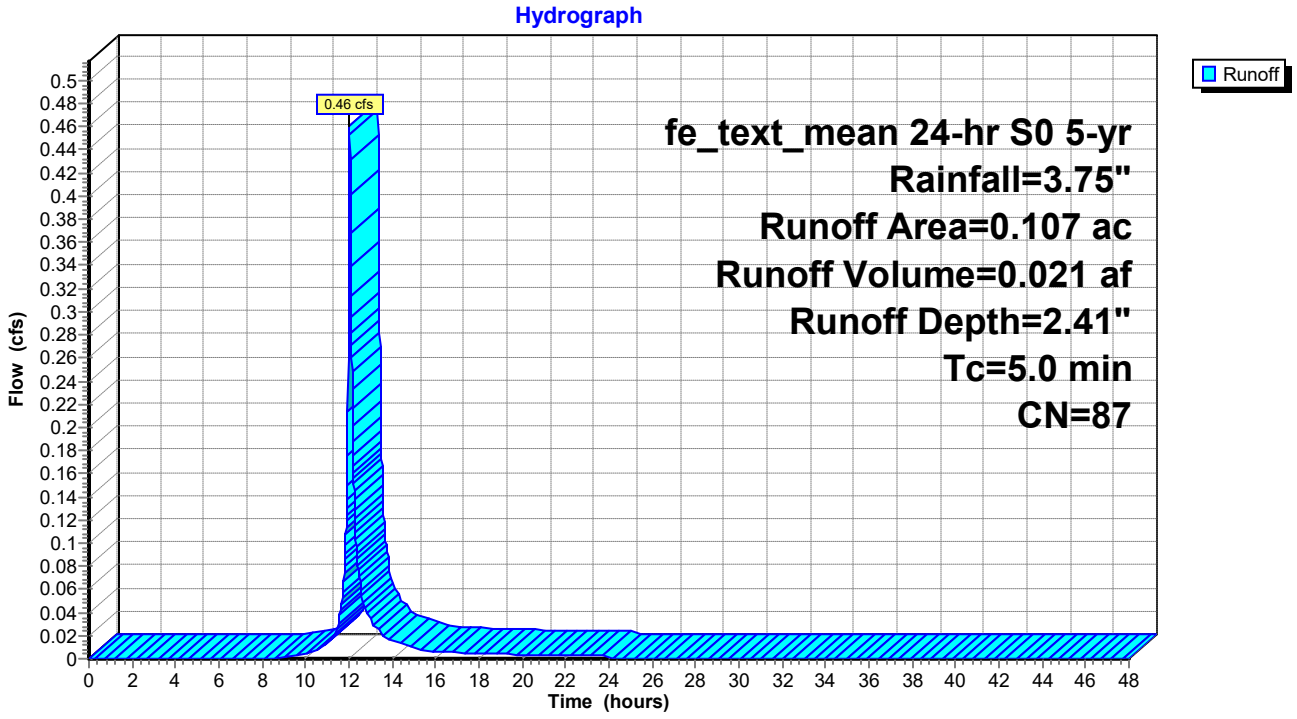
Runoff = 0.46 cfs @ 12.03 hrs, Volume= 0.021 af, Depth= 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.074	98	Impervious, HSG B
	0.033	61	>75% Grass cover, Good, HSG B
	0.107	87	Weighted Average
	0.033		30.84% Pervious Area
	0.074		69.16% Impervious Area

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

Subcatchment 18S: DA-18



Summary for Subcatchment 19S: DA-19

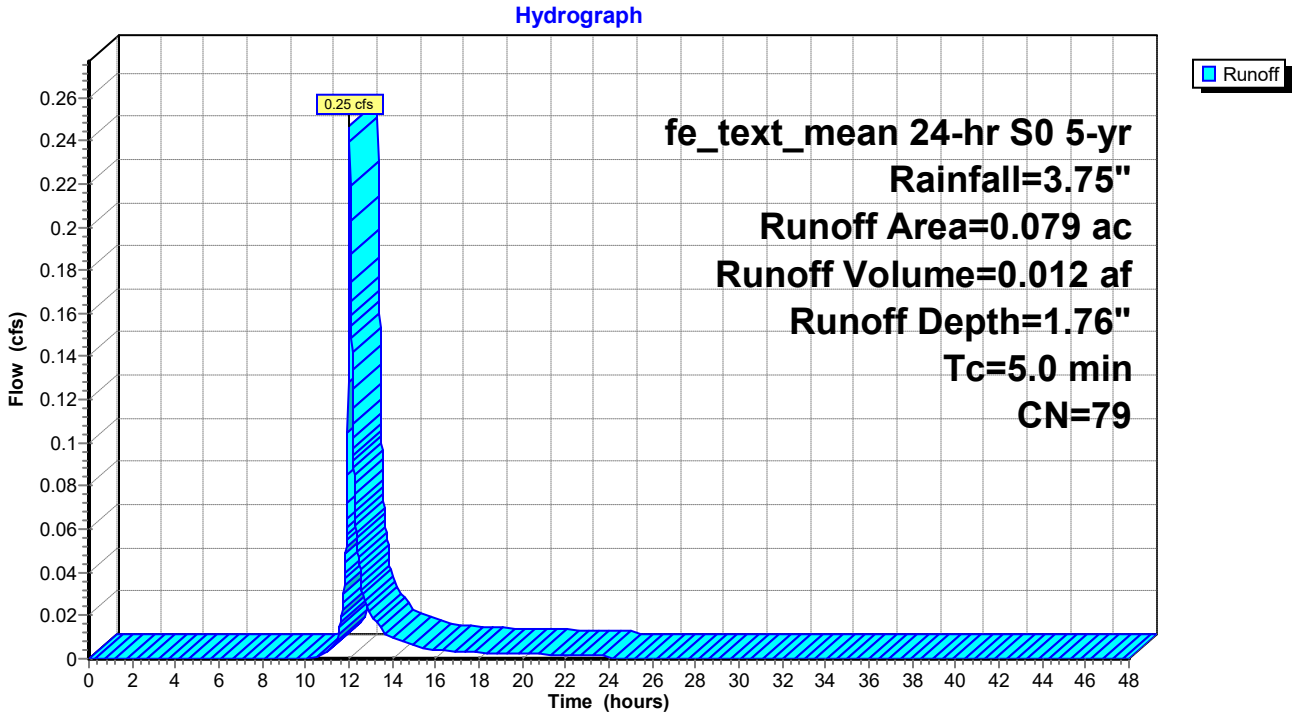
Runoff = 0.25 cfs @ 12.03 hrs, Volume= 0.012 af, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.039	98	Impervious, HSG B
	0.040	61	>75% Grass cover, Good, HSG B
	0.079	79	Weighted Average
	0.040		50.63% Pervious Area
	0.039		49.37% Impervious Area

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

Subcatchment 19S: DA-19



Summary for Subcatchment 20S: DA-20

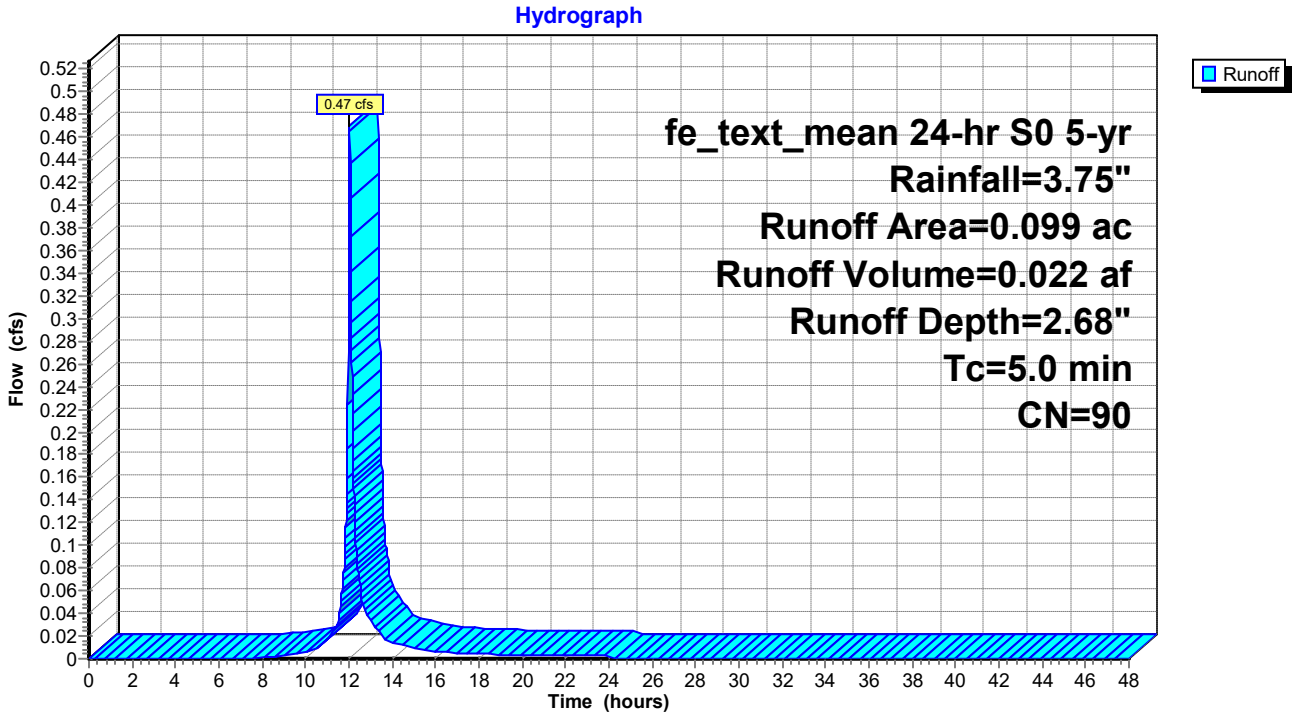
Runoff = 0.47 cfs @ 12.03 hrs, Volume= 0.022 af, Depth= 2.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

	Area (ac)	CN	Description
*	0.077	98	Impervious, HSG B
	0.022	61	>75% Grass cover, Good, HSG B
	0.099	90	Weighted Average
	0.022		22.22% Pervious Area
	0.077		77.78% Impervious Area

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

Subcatchment 20S: DA-20



Summary for Subcatchment 21S: DA-1A, DA-1B, DA-1C

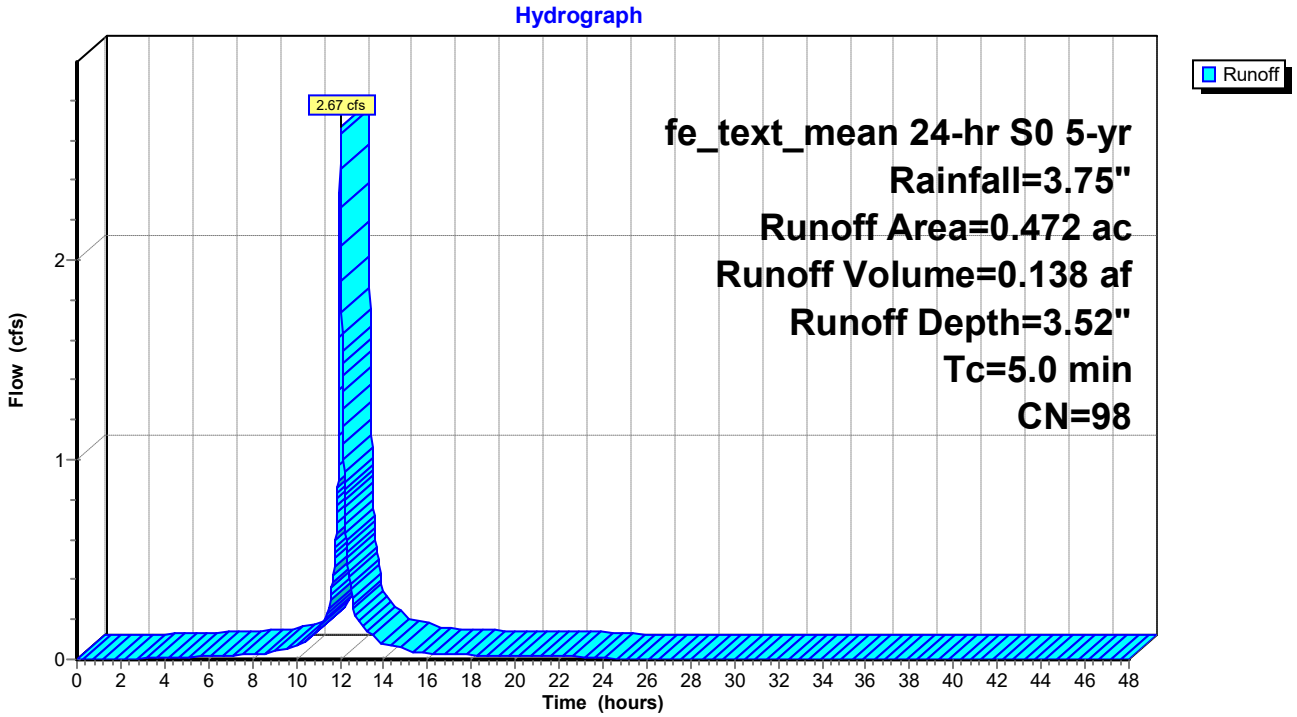
Runoff = 2.67 cfs @ 12.03 hrs, Volume= 0.138 af, Depth= 3.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 5-yr Rainfall=3.75"

Area (ac)	CN	Description
0.472	98	Roofs, HSG B
0.472		100.00% Impervious Area

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

Subcatchment 21S: DA-1A, DA-1B, DA-1C

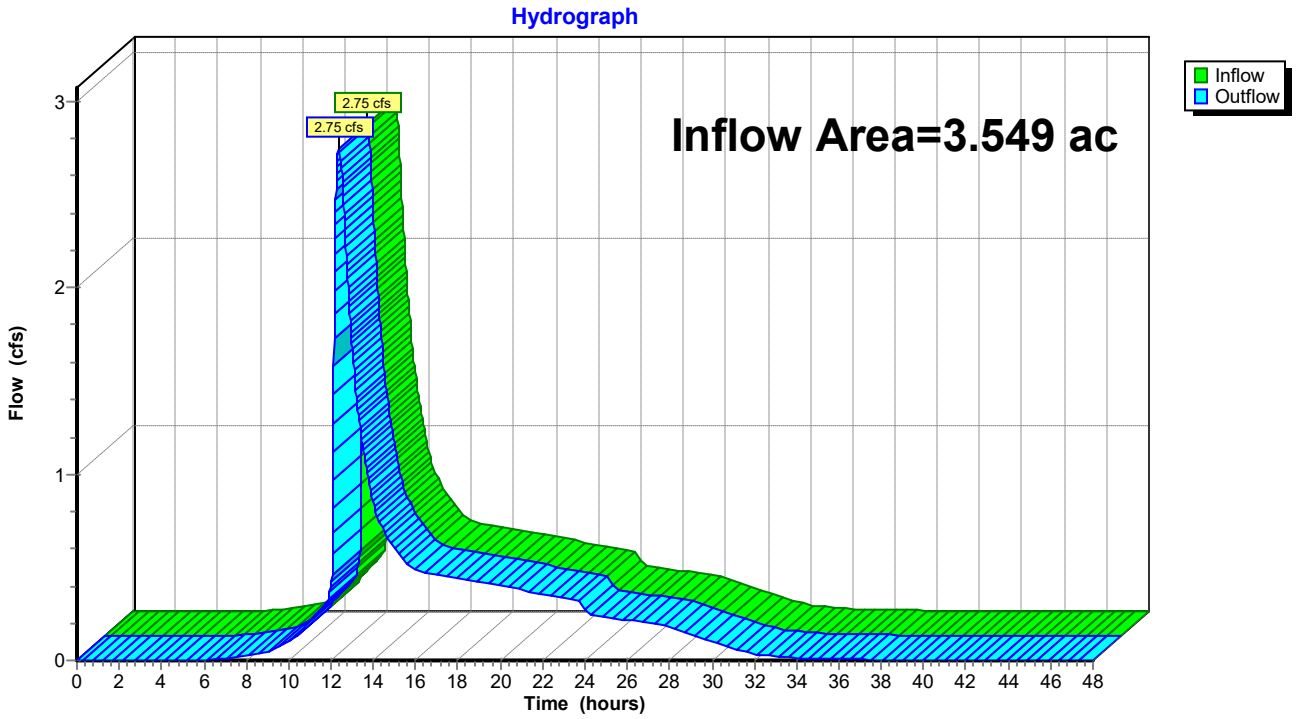


Summary for Reach 3R: On Site

Inflow Area = 3.549 ac, 77.88% Impervious, Inflow Depth > 2.69" for 5-yr event
Inflow = 2.75 cfs @ 12.36 hrs, Volume= 0.797 af
Outflow = 2.75 cfs @ 12.36 hrs, Volume= 0.797 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 3R: On Site

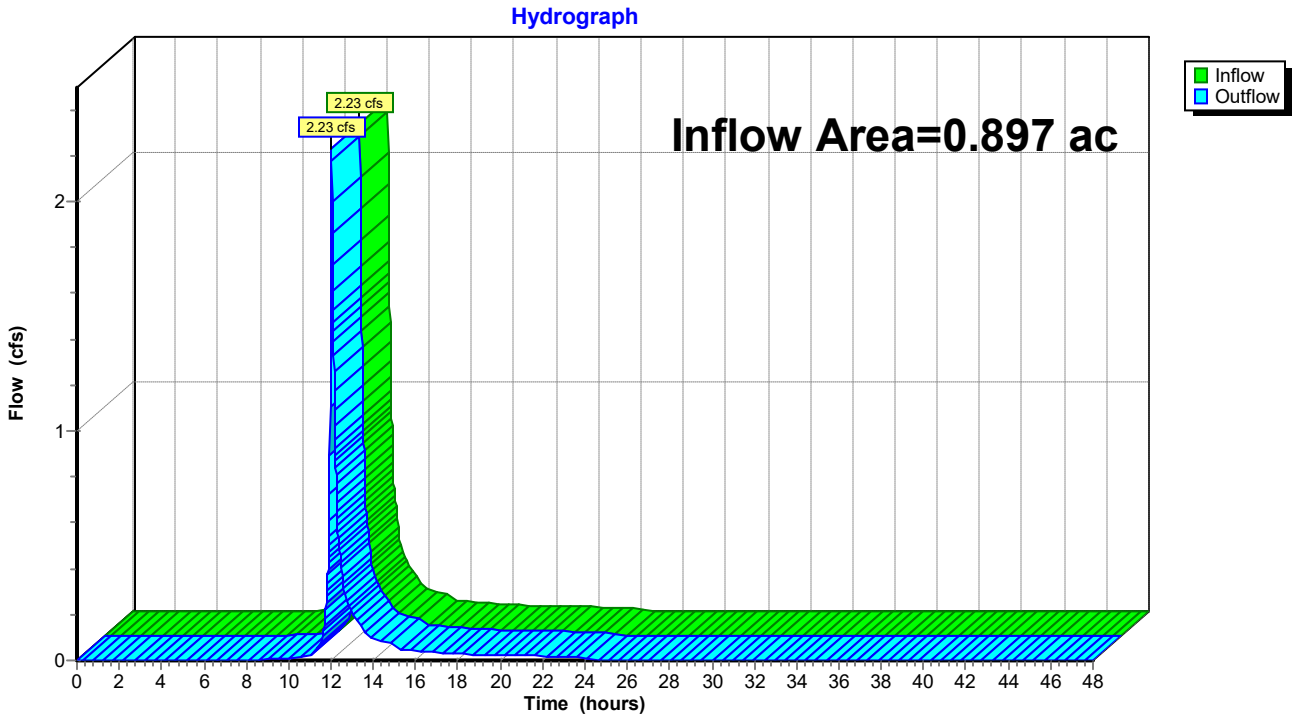


Summary for Reach 16R: Off Site

Inflow Area = 0.897 ac, 36.12% Impervious, Inflow Depth = 1.46" for 5-yr event
Inflow = 2.23 cfs @ 12.03 hrs, Volume= 0.109 af
Outflow = 2.23 cfs @ 12.03 hrs, Volume= 0.109 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 16R: Off Site

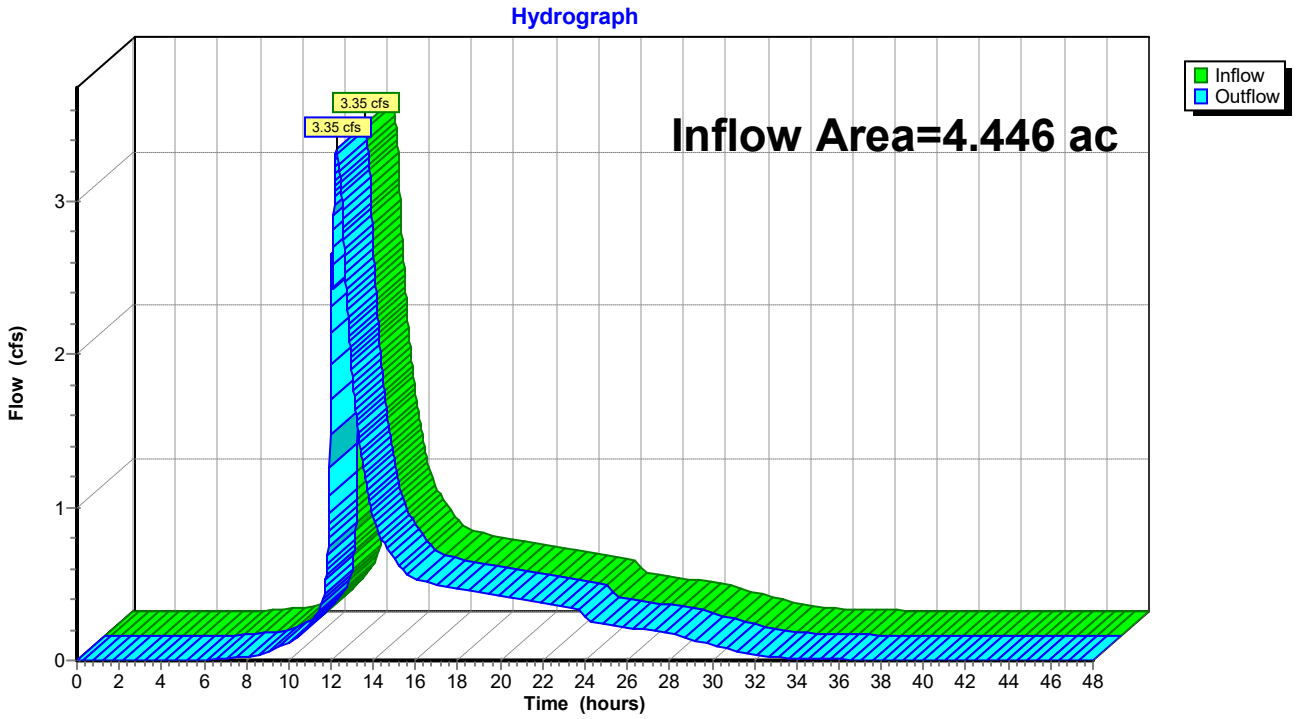


Summary for Reach 21R: Proposed Runoff

Inflow Area = 4.446 ac, 69.46% Impervious, Inflow Depth > 2.45" for 5-yr event
Inflow = 3.35 cfs @ 12.25 hrs, Volume= 0.906 af
Outflow = 3.35 cfs @ 12.25 hrs, Volume= 0.906 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 21R: Proposed Runoff



Summary for Pond 2P: Underground System

Inflow Area = 2.880 ac, 81.49% Impervious, Inflow Depth = 2.82" for 5-yr event
Inflow = 14.01 cfs @ 12.03 hrs, Volume= 0.676 af
Outflow = 2.60 cfs @ 12.36 hrs, Volume= 0.675 af, Atten= 81%, Lag= 19.8 min
Primary = 2.60 cfs @ 12.36 hrs, Volume= 0.675 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 643.34' @ 12.36 hrs Surf.Area= 0.153 ac Storage= 0.337 af

Plug-Flow detention time= 273.8 min calculated for 0.675 af (100% of inflow)
Center-of-Mass det. time= 272.9 min (1,048.9 - 776.0)

Volume	Invert	Avail.Storage	Storage Description
#1	640.25'	0.011 af	**4.00'D x 6.50'H Vertical Cone/Cylinder** x 6
#2A	640.25'	0.210 af	**37.08'W x 177.78'L x 5.50'H Field A** 0.832 af Overall - 0.306 af Embedded = 0.526 af x 40.0% Voids
#3A	641.00'	0.306 af	**ADS_StormTech MC-3500 d +Cap** x 120 Inside #2 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 120 Chambers in 5 Rows Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf
#4	646.60'	2.683 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		3.211 af	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
646.60	0.000	0.000	0.000
647.00	0.190	0.038	0.038
648.00	5.100	2.645	2.683

Device	Routing	Invert	Outlet Devices
#1	Device 4	640.25'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 4	642.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	645.00'	**4.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)
#4	Primary	640.25'	**12.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 640.25' / 639.75' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#5	Secondary	647.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.20 1.20 Width (feet) 0.00 20.00 80.00

Primary OutFlow Max=2.60 cfs @ 12.36 hrs HW=643.34' TW=0.00' (Dynamic Tailwater)
└─**4=Culvert** (Passes 2.60 cfs of 4.71 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.41 cfs @ 8.29 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 2.20 cfs @ 3.12 fps)
  └─**3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=640.25' TW=0.00' (Dynamic Tailwater)
└─**5=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 2P: Underground System - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

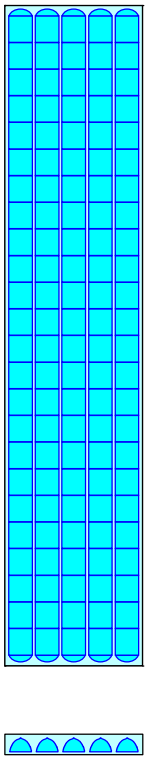
24 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 175.78' Row Length +12.0" End Stone x 2 = 177.78' Base Length
5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

120 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 13,343.2 cf Chamber Storage

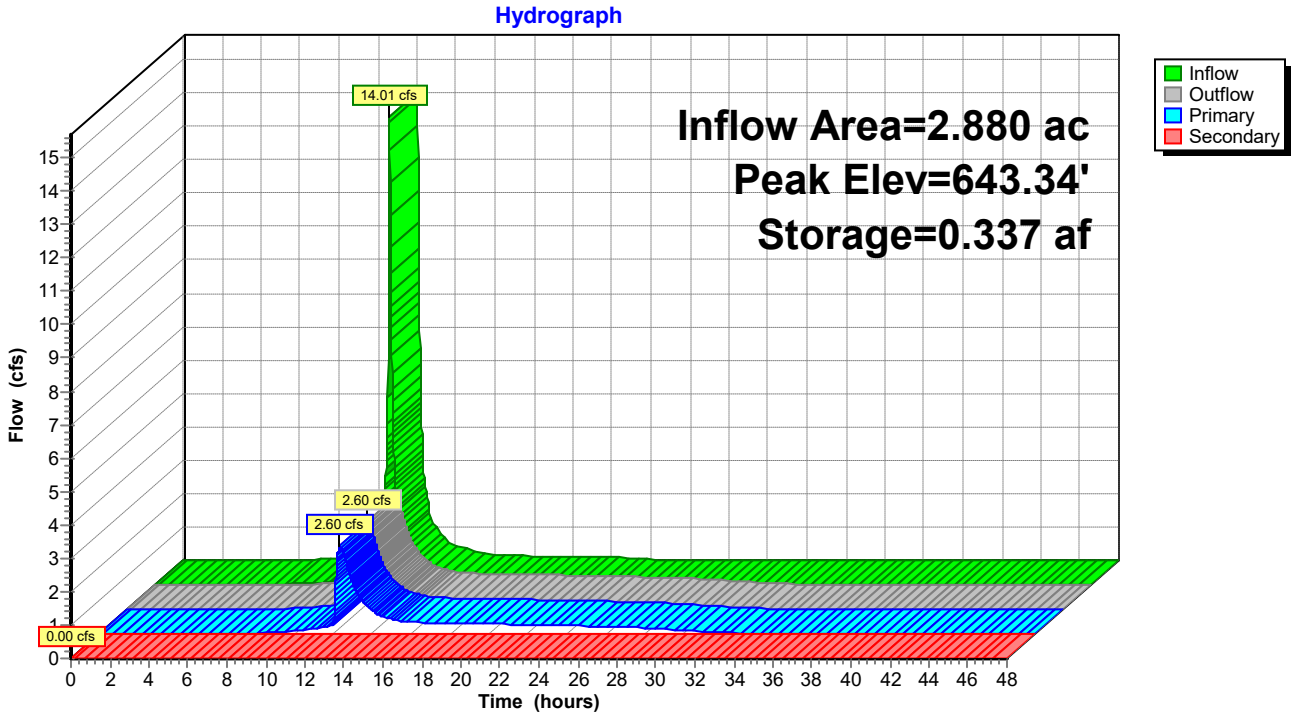
36,259.7 cf Field - 13,343.2 cf Chambers = 22,916.5 cf Stone x 40.0% Voids = 9,166.6 cf Stone Storage

Chamber Storage + Stone Storage = 22,509.8 cf = 0.517 af
Overall Storage Efficiency = 62.1%
Overall System Size = 177.78' x 37.08' x 5.50'

120 Chambers
1,343.0 cy Field
848.8 cy Stone



Pond 2P: Underground System



Summary for Pond 15P: Bio-Filtration Basin

Inflow Area = 0.669 ac, 62.33% Impervious, Inflow Depth = 2.19" for 5-yr event
Inflow = 2.62 cfs @ 12.03 hrs, Volume= 0.122 af
Outflow = 0.15 cfs @ 13.36 hrs, Volume= 0.122 af, Atten= 94%, Lag= 79.8 min
Primary = 0.15 cfs @ 13.36 hrs, Volume= 0.122 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 645.22' @ 13.36 hrs Surf.Area= 1,814 sf Storage= 2,849 cf

Plug-Flow detention time= 202.9 min calculated for 0.122 af (100% of inflow)
Center-of-Mass det. time= 202.9 min (1,000.8 - 797.9)

Volume	Invert	Avail.Storage	Storage Description
#1	643.00'	5,556 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

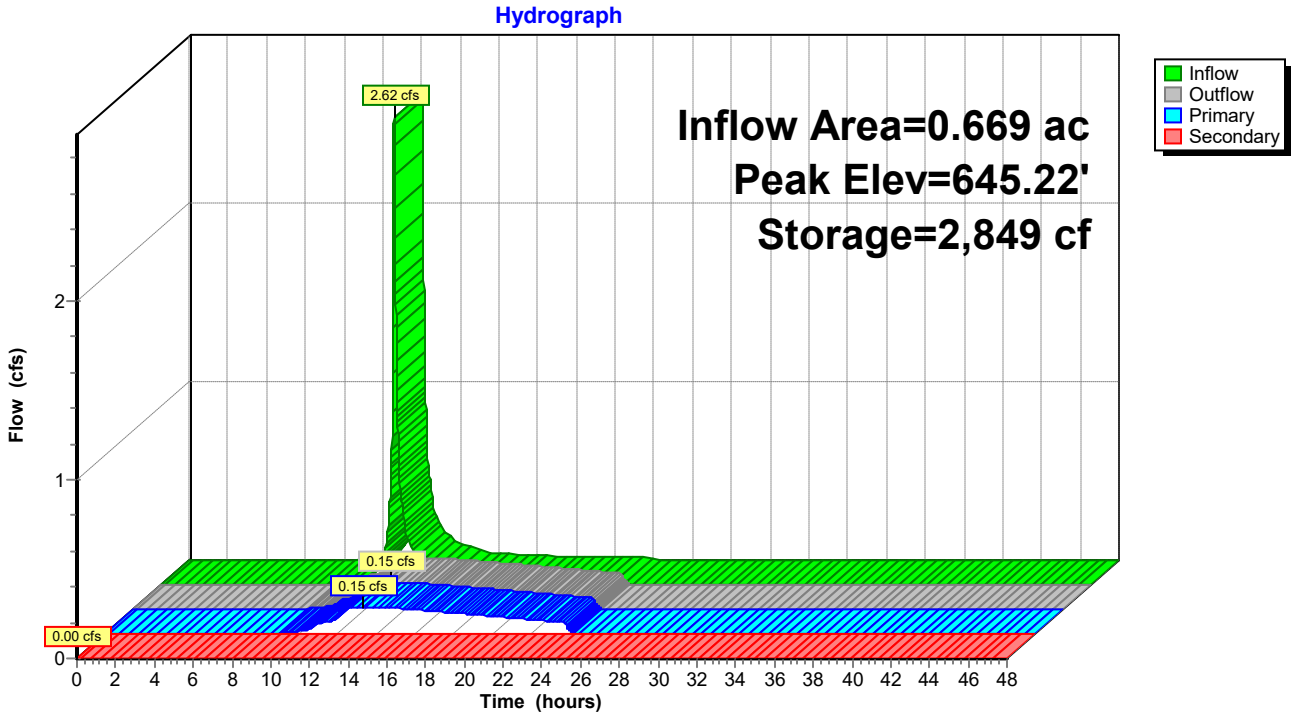
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
643.00	750	0	0
646.50	2,425	5,556	5,556

Device	Routing	Invert	Outlet Devices
#1	Primary	643.00'	**3.600 in/hr Underdrain over Surface area** Phase-In= 0.01'
#2	Secondary	645.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 in 24.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.15 cfs @ 13.36 hrs HW=645.22' TW=0.00' (Dynamic Tailwater)
↑—**1=Underdrain** (Exfiltration Controls 0.15 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=643.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 15P: Bio-Filtration Basin



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=0.711 ac 27.85% Impervious Runoff Depth=1.72"
Tc=5.0 min CN=71 Runoff=2.06 cfs 0.102 af

Subcatchment 2S: DA-2 Runoff Area=0.905 ac 79.01% Impervious Runoff Depth=3.36"
Tc=5.0 min CN=90 Runoff=5.21 cfs 0.253 af

Subcatchment 3S: DA-3 Runoff Area=0.566 ac 80.57% Impervious Runoff Depth=3.46"
Tc=5.0 min CN=91 Runoff=3.33 cfs 0.163 af

Subcatchment 4S: DA-4 Runoff Area=0.233 ac 87.12% Impervious Runoff Depth=3.67"
Tc=5.0 min CN=93 Runoff=1.43 cfs 0.071 af

Subcatchment 5S: DA-5 Runoff Area=0.138 ac 52.17% Impervious Runoff Depth=2.43"
Tc=5.0 min CN=80 Runoff=0.59 cfs 0.028 af

Subcatchment 6S: DA-6 Runoff Area=0.121 ac 60.33% Impervious Runoff Depth=2.69"
Tc=5.0 min CN=83 Runoff=0.57 cfs 0.027 af

Subcatchment 7S: DA-7 Runoff Area=0.063 ac 39.68% Impervious Runoff Depth=2.10"
Tc=5.0 min CN=76 Runoff=0.23 cfs 0.011 af

Subcatchment 8S: DA-8 Runoff Area=0.171 ac 88.30% Impervious Runoff Depth=3.78"
Tc=5.0 min CN=94 Runoff=1.07 cfs 0.054 af

Subcatchment 9S: DA-9 Runoff Area=0.211 ac 85.31% Impervious Runoff Depth=3.67"
Tc=5.0 min CN=93 Runoff=1.30 cfs 0.065 af

Subcatchment 10S: DA-10 Runoff Area=0.042 ac 85.71% Impervious Runoff Depth=3.67"
Tc=5.0 min CN=93 Runoff=0.26 cfs 0.013 af

Subcatchment 11S: DA-11 Runoff Area=0.010 ac 50.00% Impervious Runoff Depth=2.43"
Tc=5.0 min CN=80 Runoff=0.04 cfs 0.002 af

Subcatchment 12S: DA-12 Runoff Area=0.065 ac 84.62% Impervious Runoff Depth=3.56"
Tc=5.0 min CN=92 Runoff=0.39 cfs 0.019 af

Subcatchment 13S: DA-13 Runoff Area=0.069 ac 43.48% Impervious Runoff Depth=2.18"
Tc=5.0 min CN=77 Runoff=0.26 cfs 0.013 af

Subcatchment 14S: DA-14 Runoff Area=0.099 ac 72.73% Impervious Runoff Depth=3.16"
Tc=5.0 min CN=88 Runoff=0.54 cfs 0.026 af

Subcatchment 15S: DA-15 Runoff Area=0.044 ac 50.00% Impervious Runoff Depth=2.43"
Tc=5.0 min CN=80 Runoff=0.19 cfs 0.009 af

Subcatchment 16S: DA-16 Runoff Area=0.146 ac 58.22% Impervious Runoff Depth=2.69"
Tc=5.0 min CN=83 Runoff=0.69 cfs 0.033 af

Subcatchment 17S: DA-17 Runoff Area=0.095 ac 50.53% Impervious Runoff Depth=2.43"
Tc=5.0 min CN=80 Runoff=0.40 cfs 0.019 af

Subcatchment 18S: DA-18 Runoff Area=0.107 ac 69.16% Impervious Runoff Depth=3.06"
Tc=5.0 min CN=87 Runoff=0.57 cfs 0.027 af

Subcatchment 19S: DA-19 Runoff Area=0.079 ac 49.37% Impervious Runoff Depth=2.34"
Tc=5.0 min CN=79 Runoff=0.32 cfs 0.015 af

Subcatchment 20S: DA-20 Runoff Area=0.099 ac 77.78% Impervious Runoff Depth=3.36"
Tc=5.0 min CN=90 Runoff=0.57 cfs 0.028 af

Subcatchment 21S: DA-1A, DA-1B, DA-1C Runoff Area=0.472 ac 100.00% Impervious Runoff Depth=4.22"
Tc=5.0 min CN=98 Runoff=3.11 cfs 0.166 af

Reach 3R: On Site Inflow=4.10 cfs 0.994 af
Outflow=4.10 cfs 0.994 af

Reach 16R: Off Site Inflow=3.01 cfs 0.148 af
Outflow=3.01 cfs 0.148 af

Reach 21R: Proposed Runoff Inflow=5.27 cfs 1.143 af
Outflow=5.27 cfs 1.143 af

Pond 2P: Underground System Peak Elev=643.86' Storage=0.392 af Inflow=16.83 cfs 0.838 af
Primary=3.94 cfs 0.837 af Secondary=0.00 cfs 0.000 af Outflow=3.94 cfs 0.837 af

Pond 15P: Bio-Filtration Basin Peak Elev=645.55' Storage=3,475 cf Inflow=3.28 cfs 0.157 af
Primary=0.16 cfs 0.147 af Secondary=0.25 cfs 0.011 af Outflow=0.42 cfs 0.157 af

Total Runoff Area = 4.446 ac Runoff Volume = 1.144 af Average Runoff Depth = 3.09"
30.54% Pervious = 1.358 ac 69.46% Impervious = 3.088 ac

Summary for Subcatchment 1S: DA-1

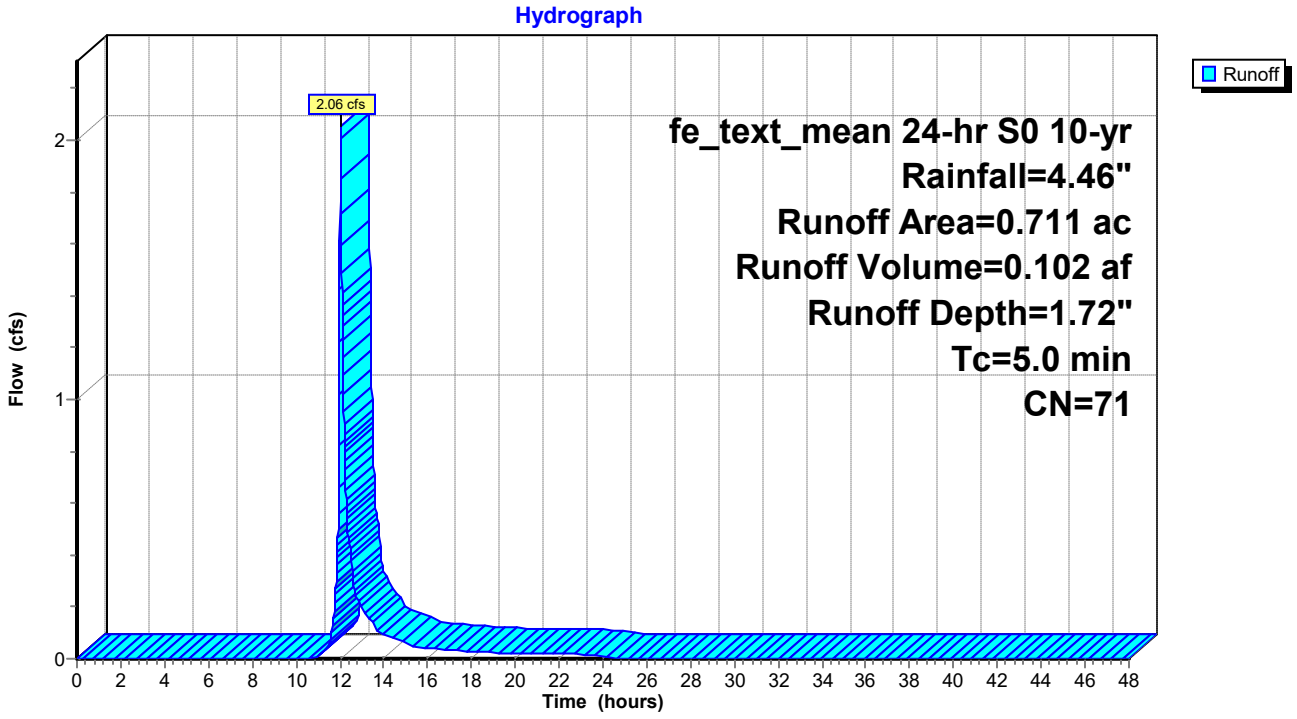
Runoff = 2.06 cfs @ 12.03 hrs, Volume= 0.102 af, Depth= 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.198	98	Impervious, HSG B
	0.513	61	>75% Grass cover, Good, HSG B
	0.711	71	Weighted Average
	0.513		72.15% Pervious Area
	0.198		27.85% Impervious Area

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

Subcatchment 1S: DA-1



Summary for Subcatchment 2S: DA-2

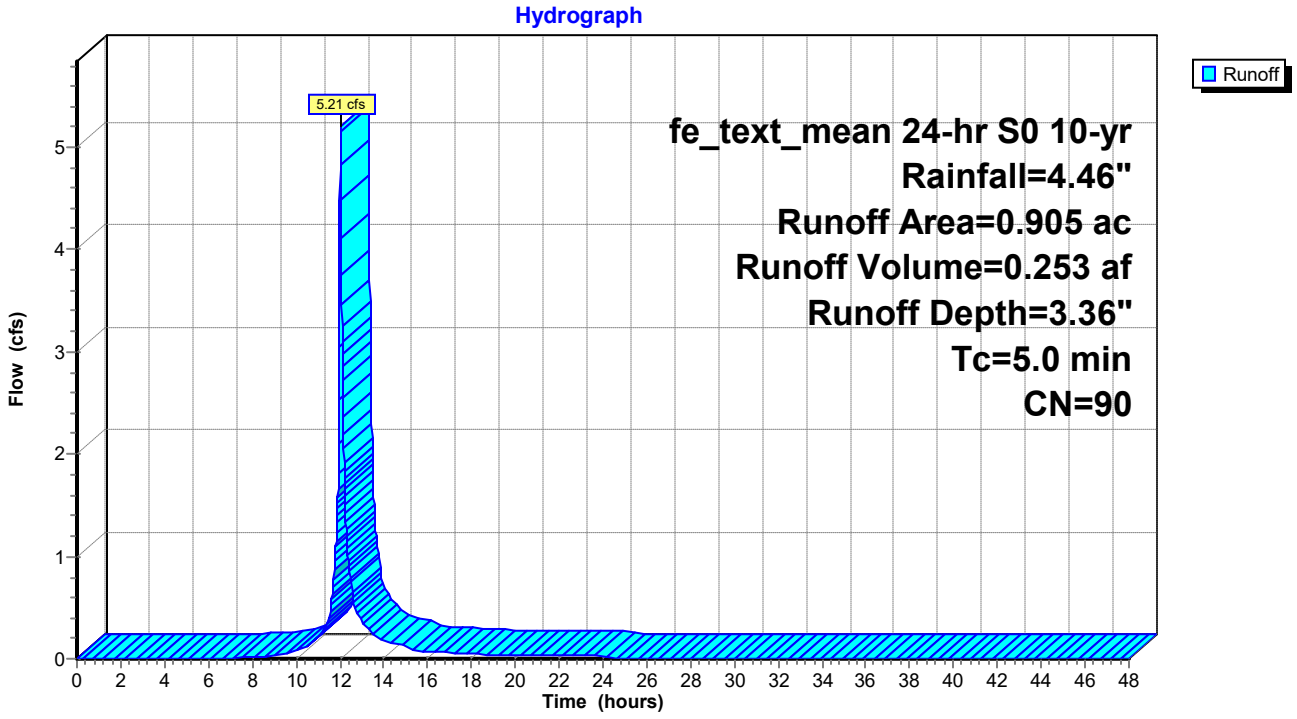
Runoff = 5.21 cfs @ 12.03 hrs, Volume= 0.253 af, Depth= 3.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.715	98	Impervious, HSG B
	0.190	61	>75% Grass cover, Good, HSG B
	0.905	90	Weighted Average
	0.190		20.99% Pervious Area
	0.715		79.01% Impervious Area

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

Subcatchment 2S: DA-2



Summary for Subcatchment 3S: DA-3

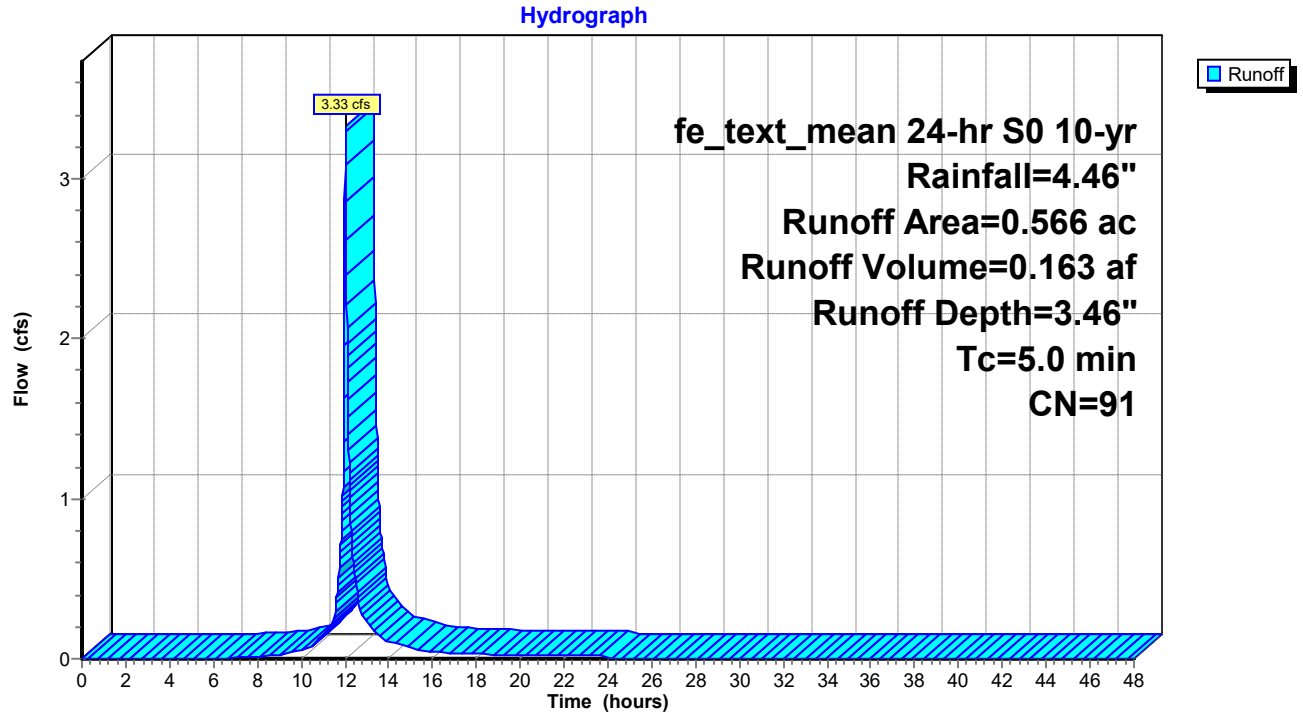
Runoff = 3.33 cfs @ 12.03 hrs, Volume= 0.163 af, Depth= 3.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.456	98	Impervious, HSG B
	0.110	61	>75% Grass cover, Good, HSG B
	0.566	91	Weighted Average
	0.110		19.43% Pervious Area
	0.456		80.57% Impervious Area

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

Subcatchment 3S: DA-3



Summary for Subcatchment 4S: DA-4

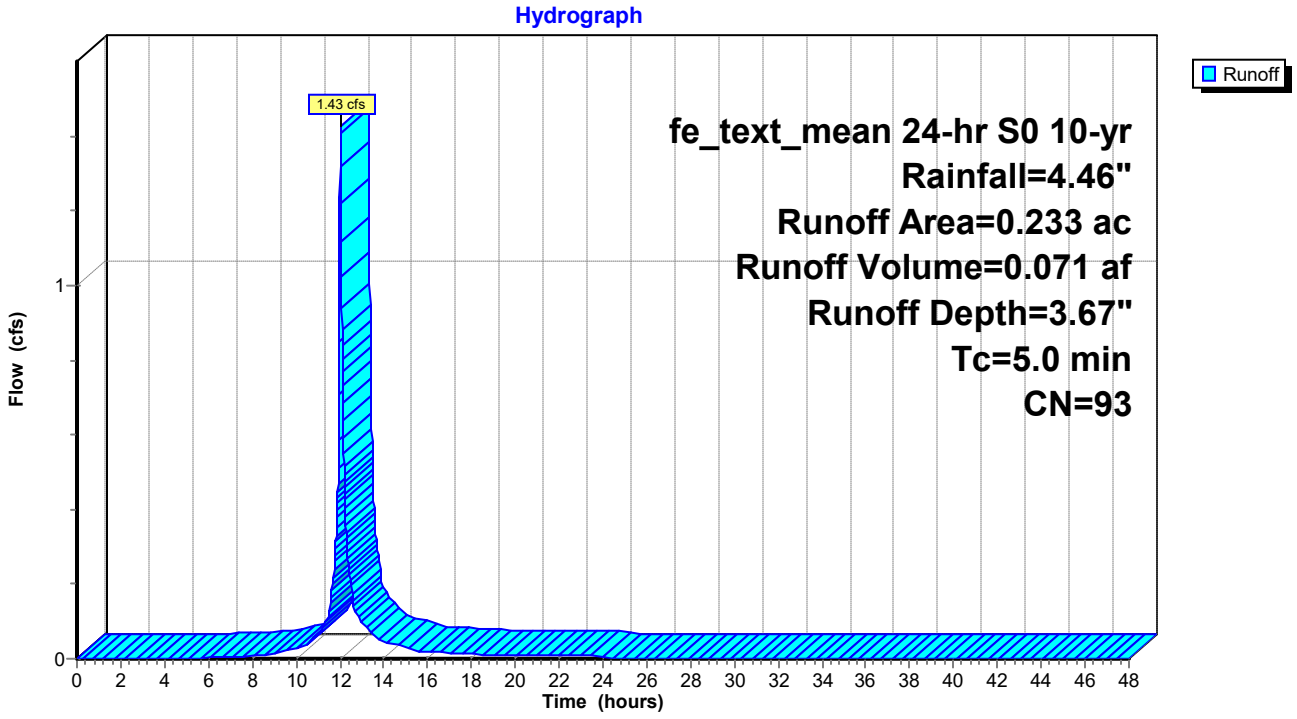
Runoff = 1.43 cfs @ 12.03 hrs, Volume= 0.071 af, Depth= 3.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.203	98	Impervious, HSG B
	0.030	61	>75% Grass cover, Good, HSG B
	0.233	93	Weighted Average
	0.030		12.88% Pervious Area
	0.203		87.12% Impervious Area

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

Subcatchment 4S: DA-4



Summary for Subcatchment 5S: DA-5

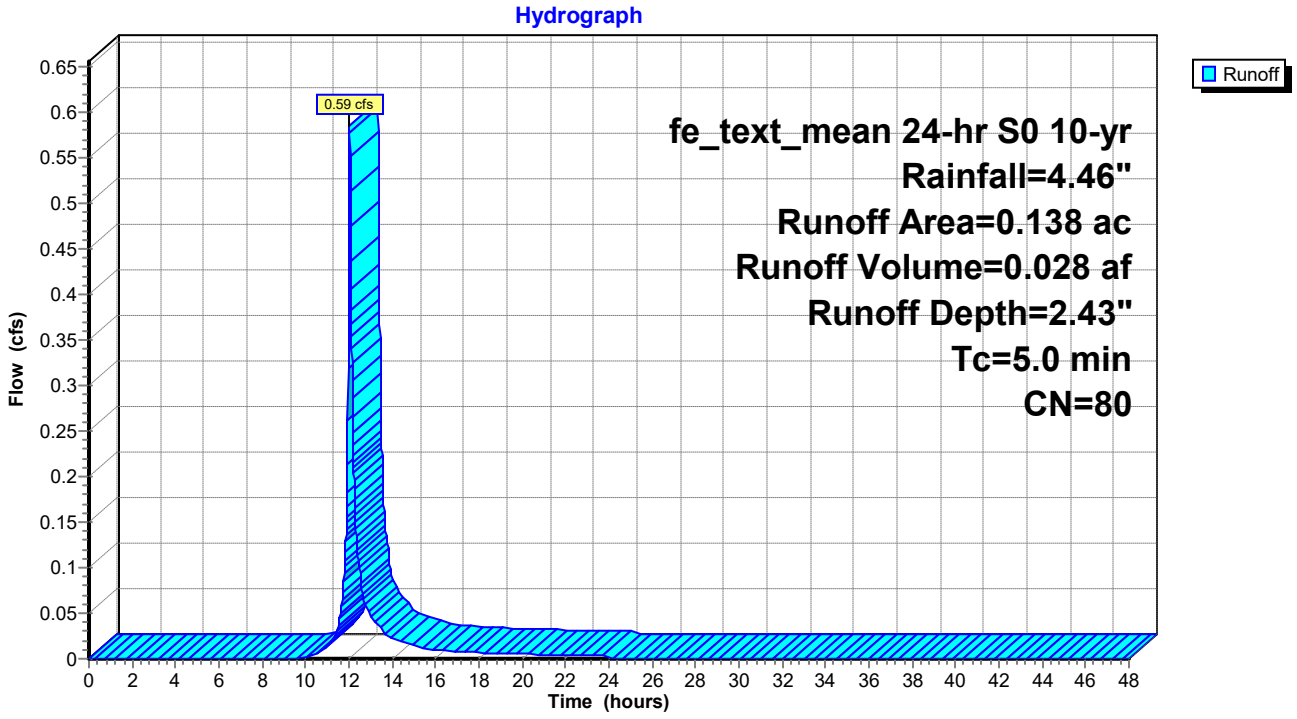
Runoff = 0.59 cfs @ 12.03 hrs, Volume= 0.028 af, Depth= 2.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.072	98	Impervious, HSG B
	0.066	61	>75% Grass cover, Good, HSG B
	0.138	80	Weighted Average
	0.066		47.83% Pervious Area
	0.072		52.17% Impervious Area

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

Subcatchment 5S: DA-5



Summary for Subcatchment 6S: DA-6

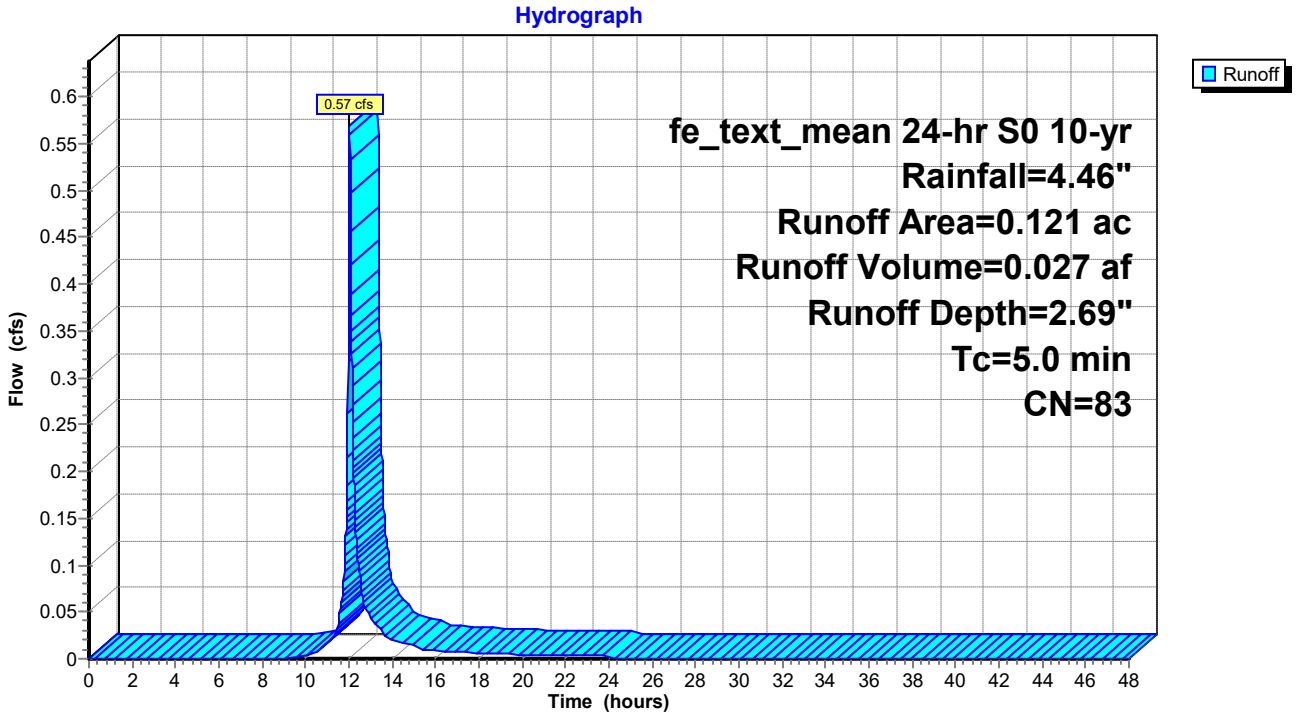
Runoff = 0.57 cfs @ 12.03 hrs, Volume= 0.027 af, Depth= 2.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.073	98	Impervious, HSG B
	0.048	61	>75% Grass cover, Good, HSG B
	0.121	83	Weighted Average
	0.048		39.67% Pervious Area
	0.073		60.33% Impervious Area

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

Subcatchment 6S: DA-6



Summary for Subcatchment 7S: DA-7

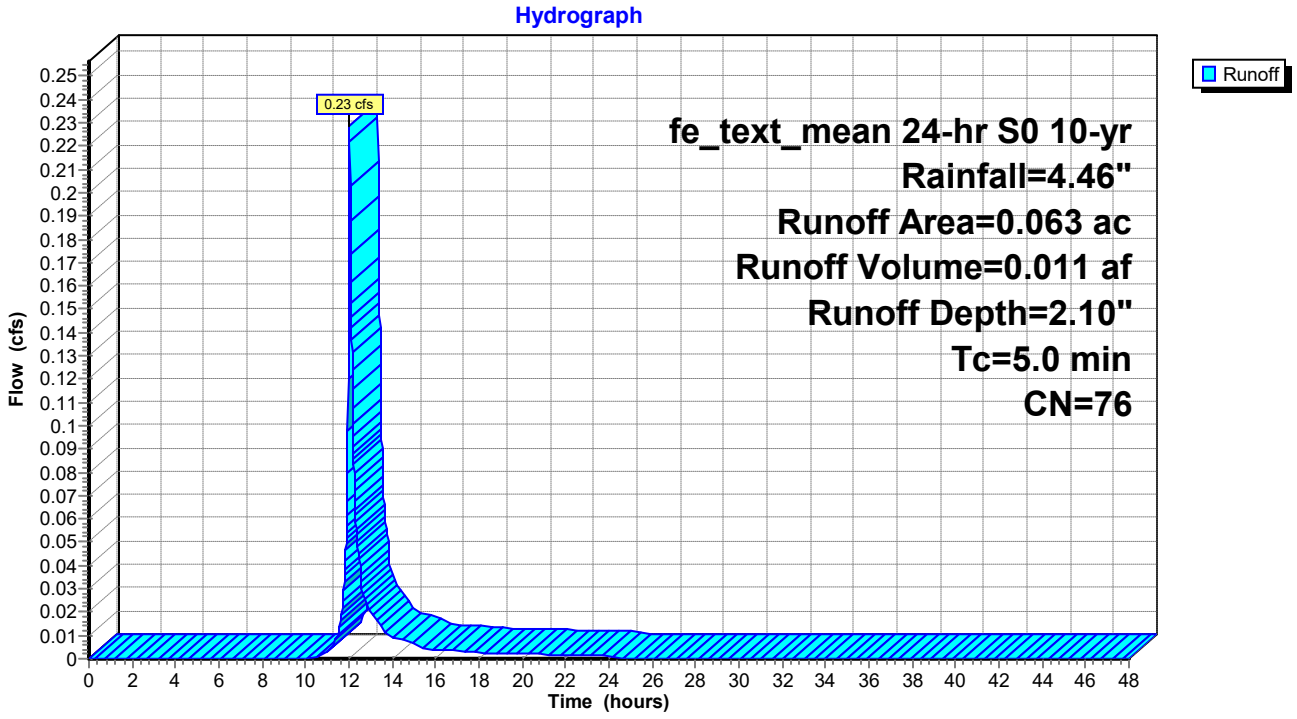
Runoff = 0.23 cfs @ 12.03 hrs, Volume= 0.011 af, Depth= 2.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.025	98	Impervious, HSG B
	0.038	61	>75% Grass cover, Good, HSG B
	0.063	76	Weighted Average
	0.038		60.32% Pervious Area
	0.025		39.68% Impervious Area

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

Subcatchment 7S: DA-7



Summary for Subcatchment 8S: DA-8

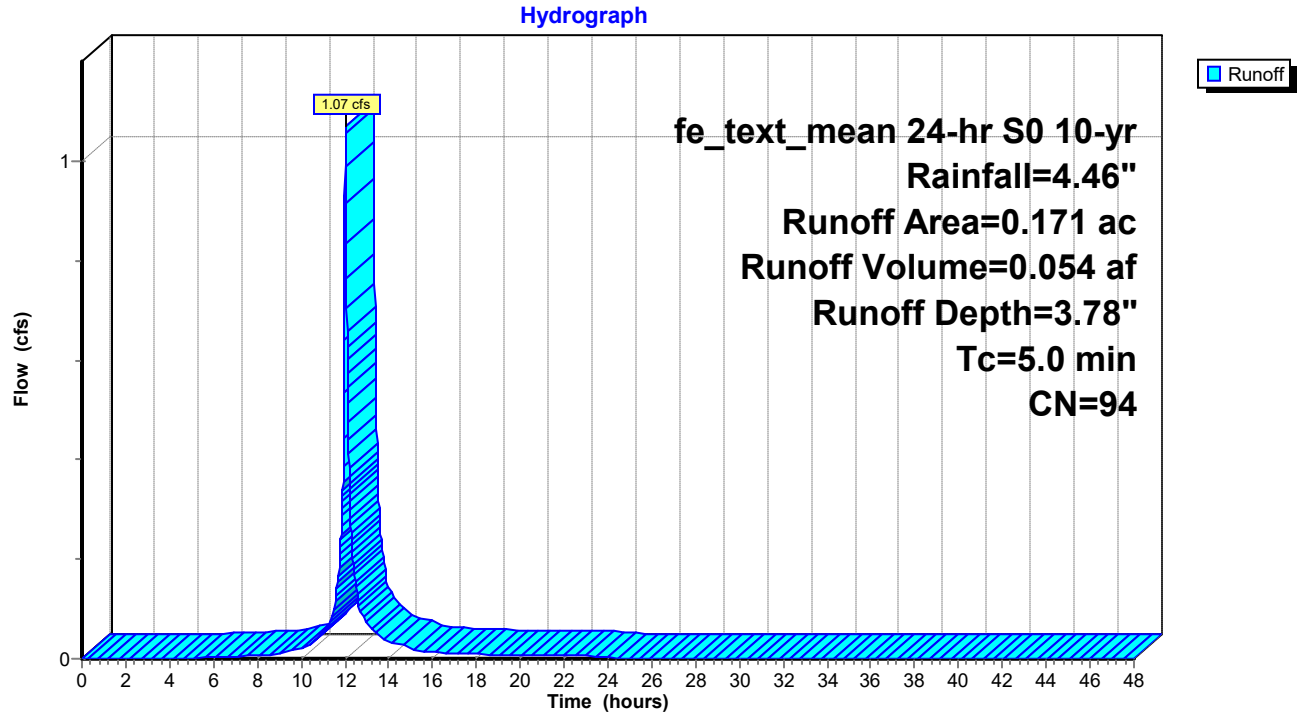
Runoff = 1.07 cfs @ 12.03 hrs, Volume= 0.054 af, Depth= 3.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.151	98	Impervious, HSG B
	0.020	61	>75% Grass cover, Good, HSG B
	0.171	94	Weighted Average
	0.020		11.70% Pervious Area
	0.151		88.30% Impervious Area

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

Subcatchment 8S: DA-8



Summary for Subcatchment 9S: DA-9

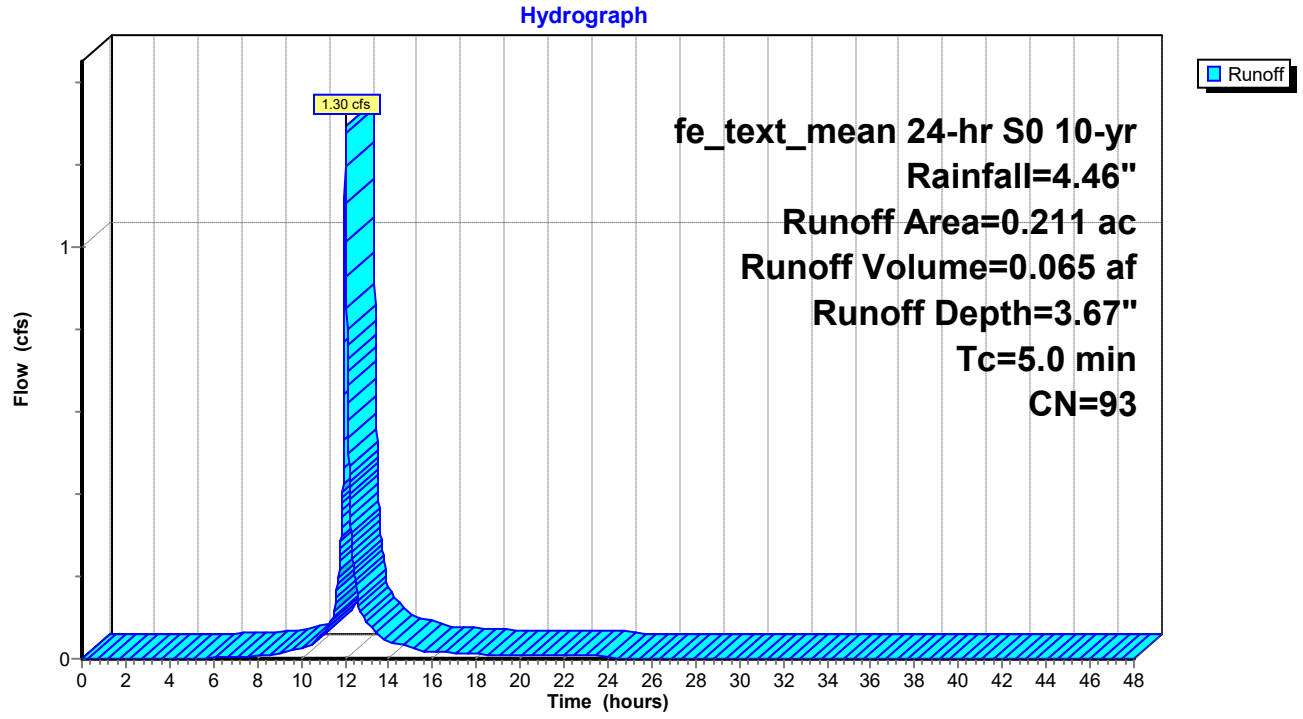
Runoff = 1.30 cfs @ 12.03 hrs, Volume= 0.065 af, Depth= 3.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.180	98	Impervious, HSG B
	0.031	61	>75% Grass cover, Good, HSG B
	0.211	93	Weighted Average
	0.031		14.69% Pervious Area
	0.180		85.31% Impervious Area

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

Subcatchment 9S: DA-9



Summary for Subcatchment 10S: DA-10

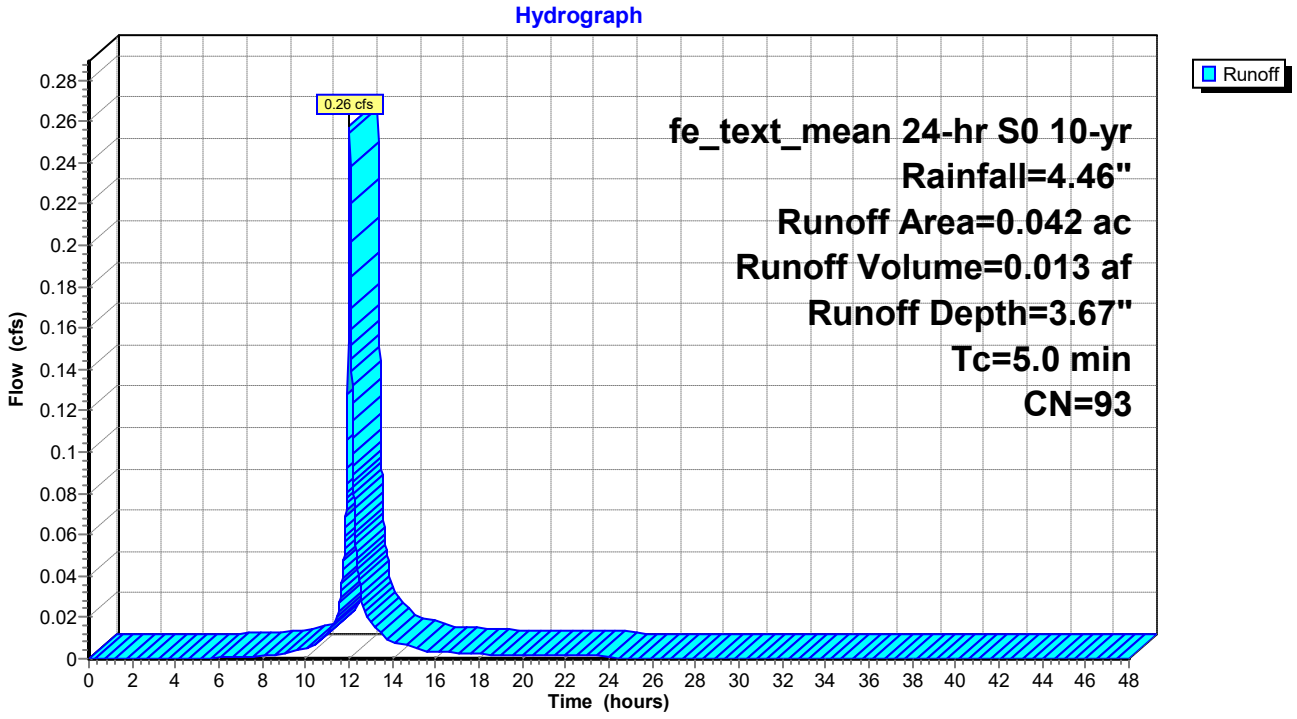
Runoff = 0.26 cfs @ 12.03 hrs, Volume= 0.013 af, Depth= 3.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.036	98	Impervious, HSG B
	0.006	61	>75% Grass cover, Good, HSG B
	0.042	93	Weighted Average
	0.006		14.29% Pervious Area
	0.036		85.71% Impervious Area

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

Subcatchment 10S: DA-10



Summary for Subcatchment 11S: DA-11

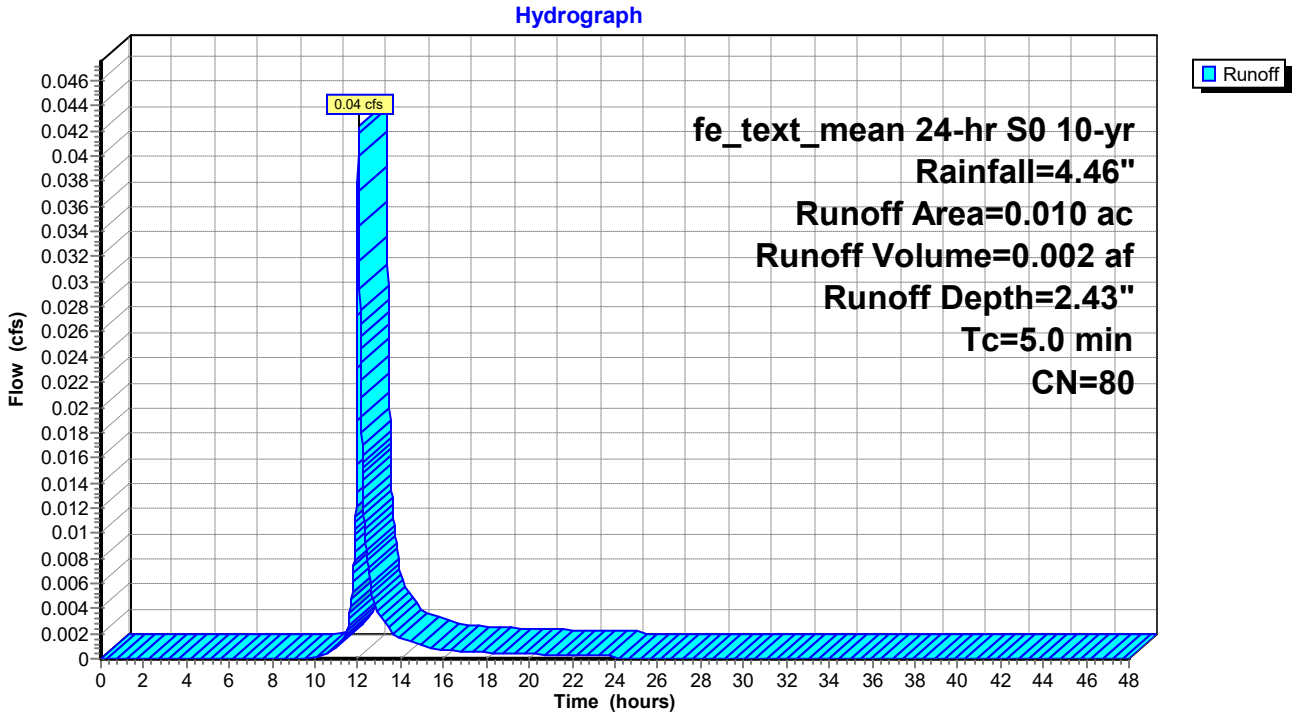
Runoff = 0.04 cfs @ 12.03 hrs, Volume= 0.002 af, Depth= 2.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.005	98	Impervious, HSG B
	0.005	61	>75% Grass cover, Good, HSG B
	0.010	80	Weighted Average
	0.005		50.00% Pervious Area
	0.005		50.00% Impervious Area

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

Subcatchment 11S: DA-11



Summary for Subcatchment 12S: DA-12

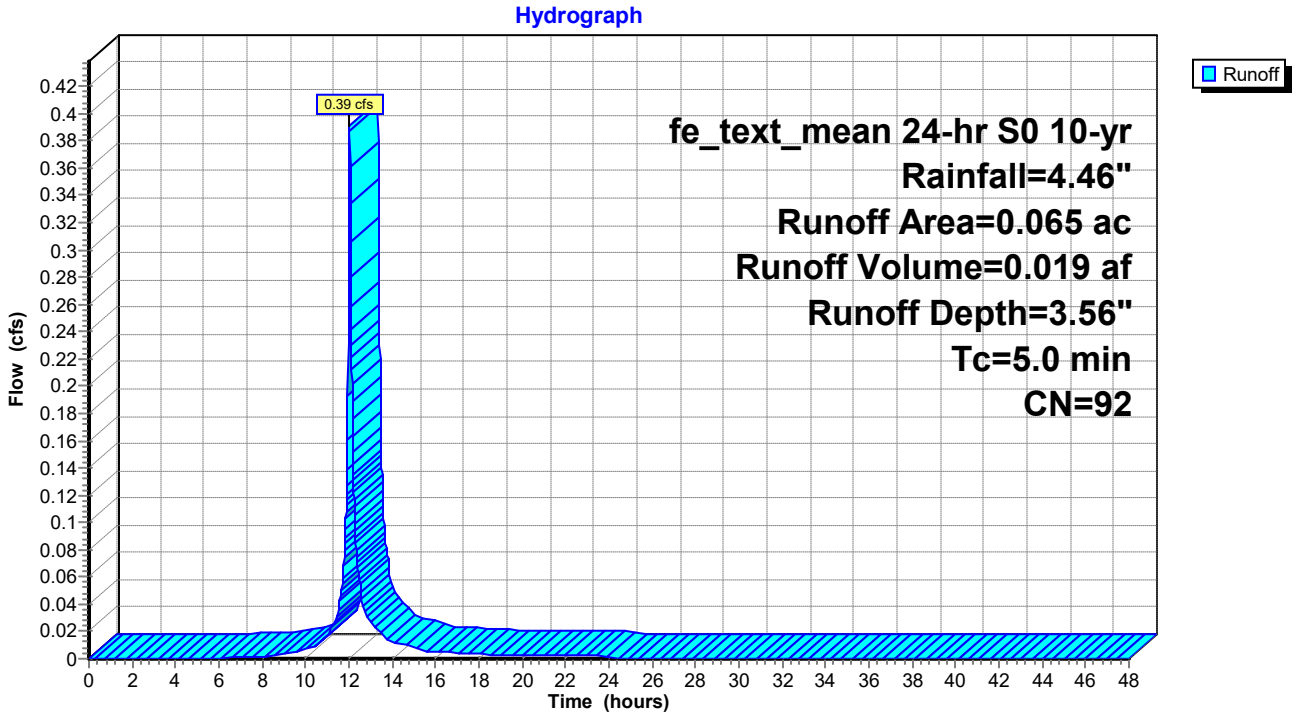
Runoff = 0.39 cfs @ 12.03 hrs, Volume= 0.019 af, Depth= 3.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.055	98	Impervious, HSG B
	0.010	61	>75% Grass cover, Good, HSG B
	0.065	92	Weighted Average
	0.010		15.38% Pervious Area
	0.055		84.62% Impervious Area

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

Subcatchment 12S: DA-12



Summary for Subcatchment 13S: DA-13

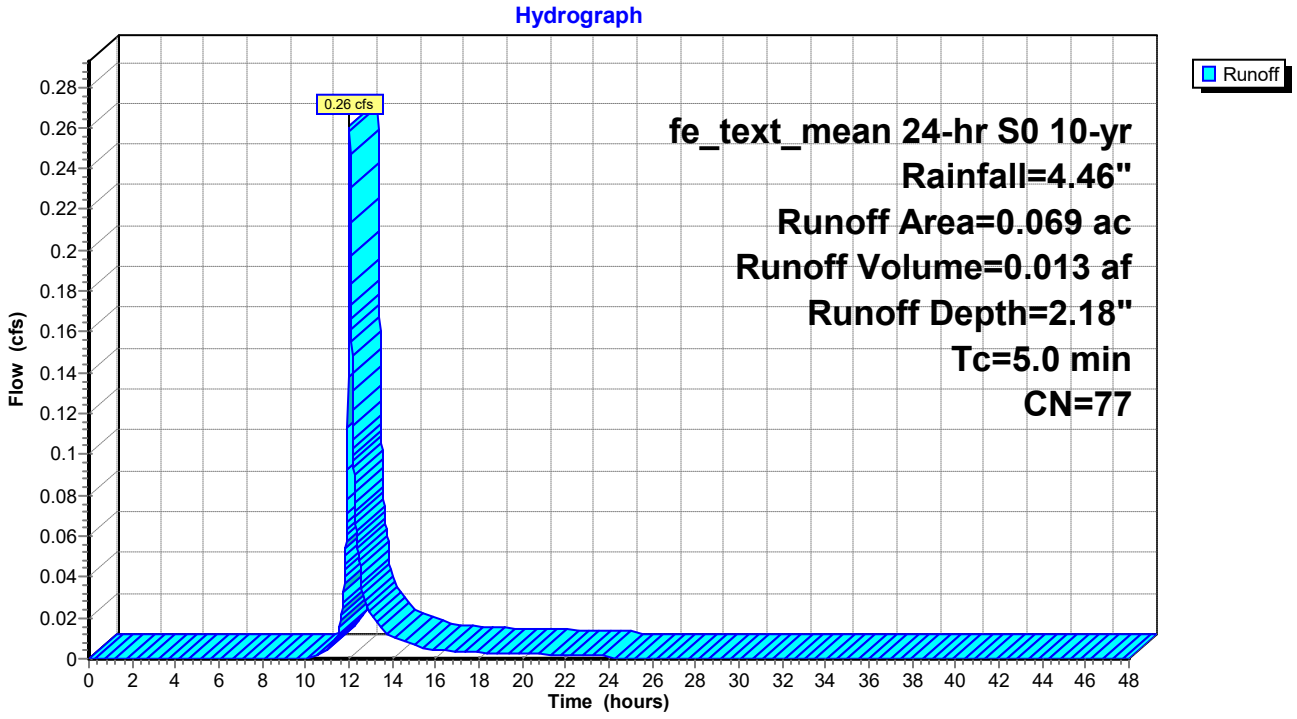
Runoff = 0.26 cfs @ 12.03 hrs, Volume= 0.013 af, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.030	98	Impervious, HSG B
	0.039	61	>75% Grass cover, Good, HSG B
	0.069	77	Weighted Average
	0.039		56.52% Pervious Area
	0.030		43.48% Impervious Area

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

Subcatchment 13S: DA-13



Summary for Subcatchment 14S: DA-14

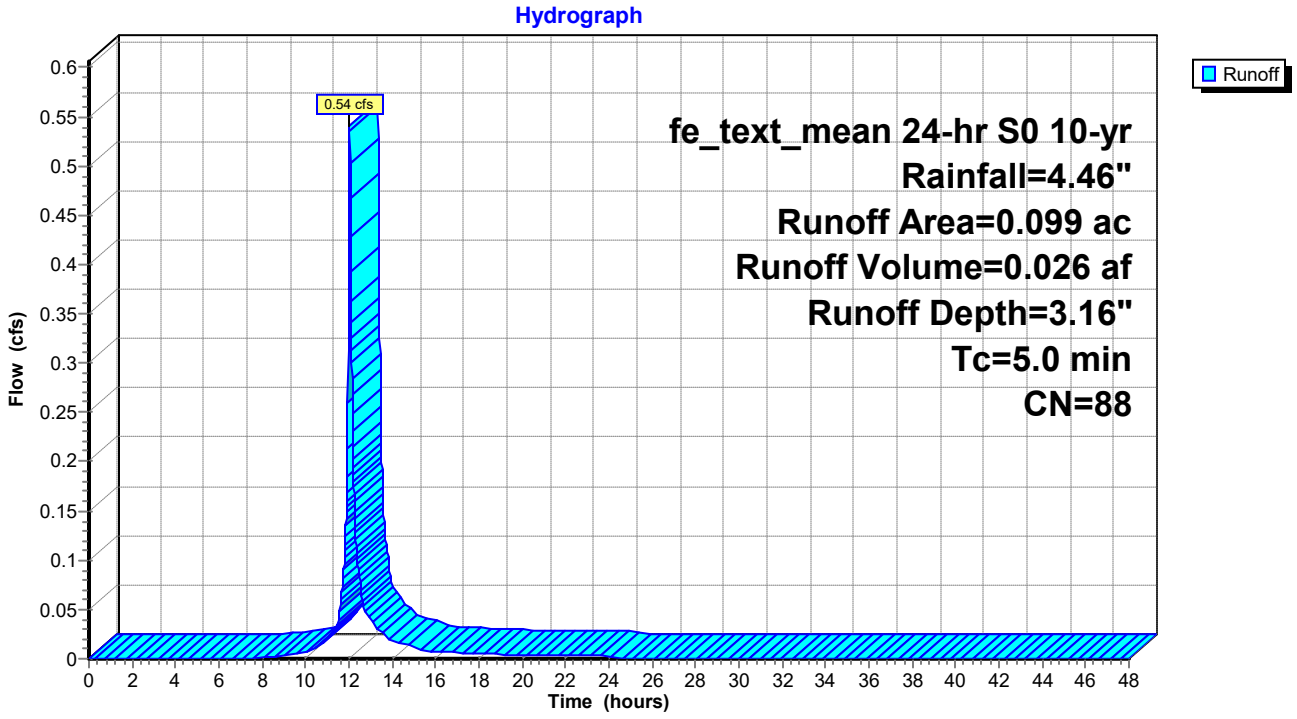
Runoff = 0.54 cfs @ 12.03 hrs, Volume= 0.026 af, Depth= 3.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.072	98	Impervious, HSG B
	0.027	61	>75% Grass cover, Good, HSG B
	0.099	88	Weighted Average
	0.027		27.27% Pervious Area
	0.072		72.73% Impervious Area

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

Subcatchment 14S: DA-14



Summary for Subcatchment 15S: DA-15

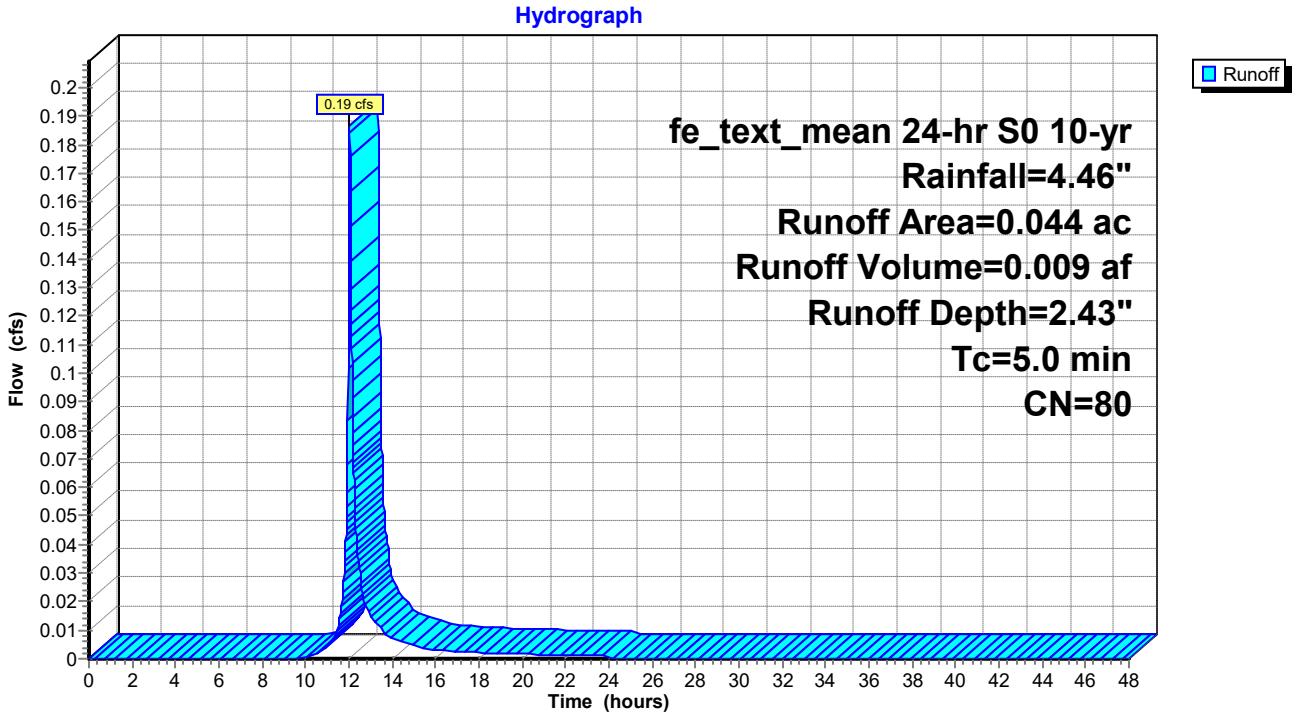
Runoff = 0.19 cfs @ 12.03 hrs, Volume= 0.009 af, Depth= 2.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.022	98	Impervious, HSG B
	0.022	61	>75% Grass cover, Good, HSG B
	0.044	80	Weighted Average
	0.022		50.00% Pervious Area
	0.022		50.00% Impervious Area

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

Subcatchment 15S: DA-15



Summary for Subcatchment 16S: DA-16

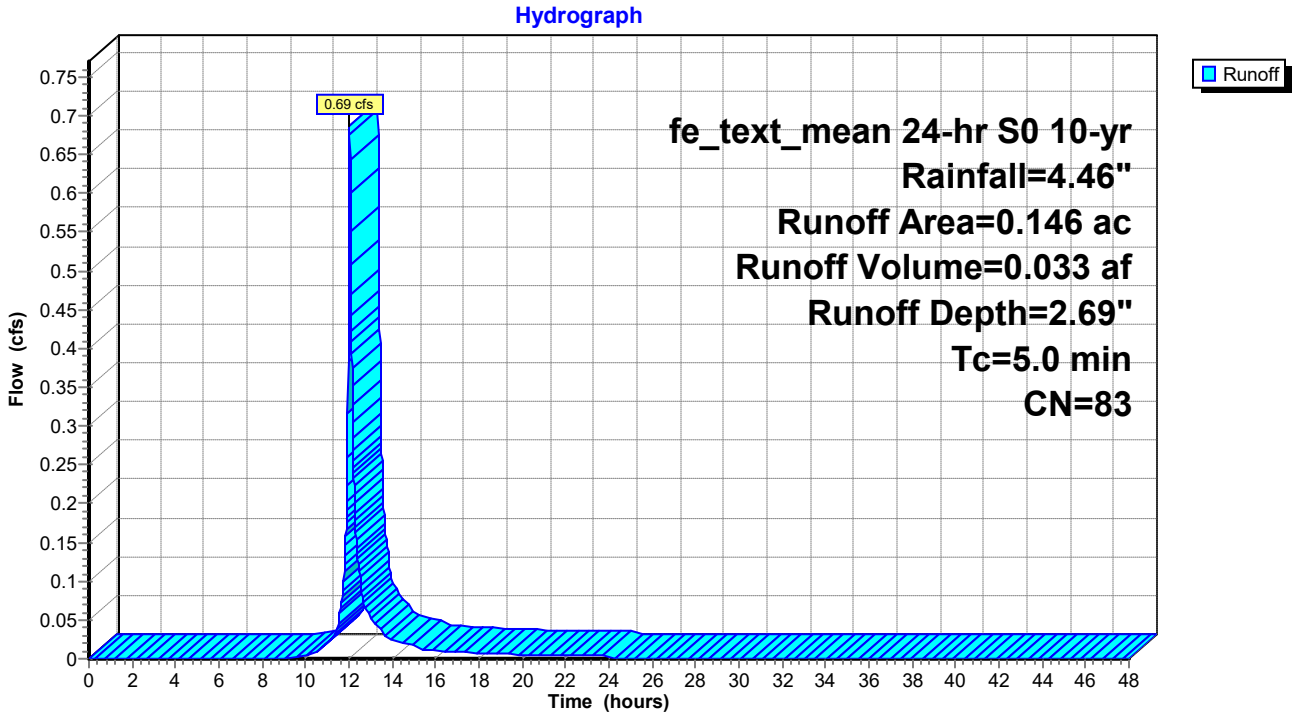
Runoff = 0.69 cfs @ 12.03 hrs, Volume= 0.033 af, Depth= 2.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.085	98	Impervious, HSG B
	0.061	61	>75% Grass cover, Good, HSG B
	0.146	83	Weighted Average
	0.061		41.78% Pervious Area
	0.085		58.22% Impervious Area

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

Subcatchment 16S: DA-16



Summary for Subcatchment 17S: DA-17

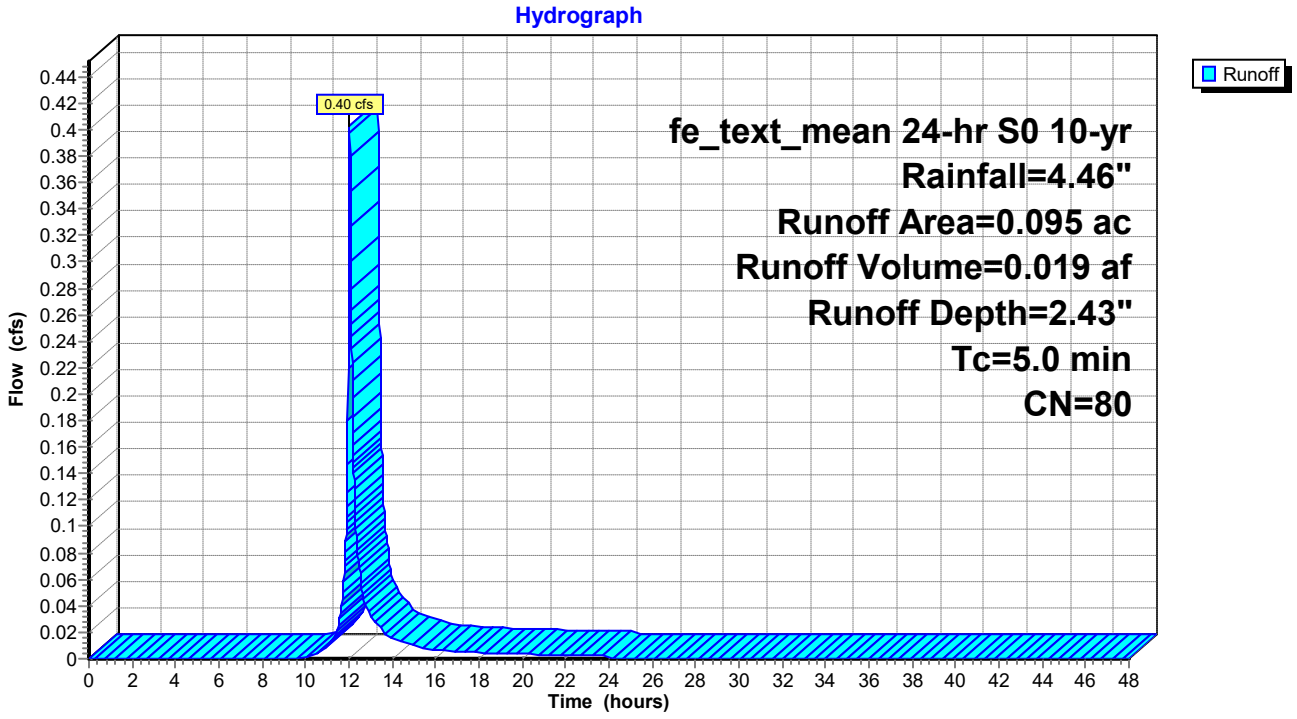
Runoff = 0.40 cfs @ 12.03 hrs, Volume= 0.019 af, Depth= 2.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.048	98	Impervious, HSG B
	0.047	61	>75% Grass cover, Good, HSG B
	0.095	80	Weighted Average
	0.047		49.47% Pervious Area
	0.048		50.53% Impervious Area

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

Subcatchment 17S: DA-17



Summary for Subcatchment 18S: DA-18

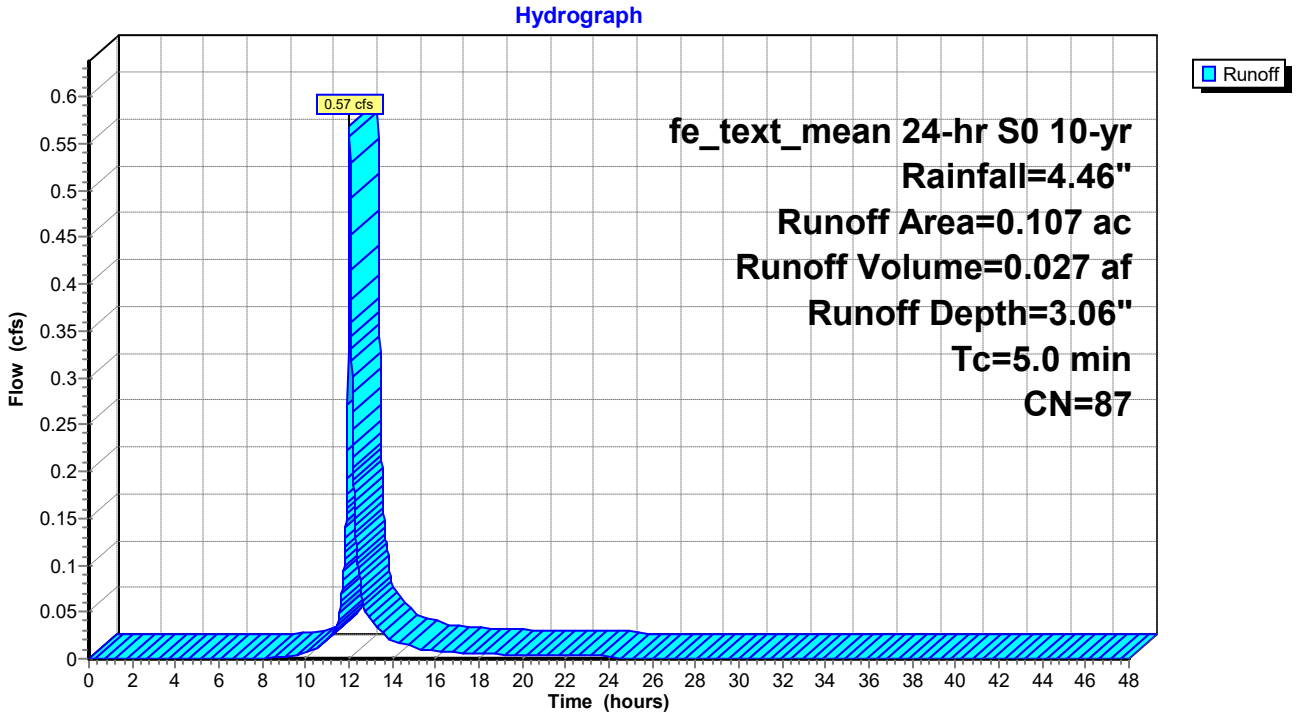
Runoff = 0.57 cfs @ 12.03 hrs, Volume= 0.027 af, Depth= 3.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.074	98	Impervious, HSG B
	0.033	61	>75% Grass cover, Good, HSG B
	0.107	87	Weighted Average
	0.033		30.84% Pervious Area
	0.074		69.16% Impervious Area

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

Subcatchment 18S: DA-18



Summary for Subcatchment 19S: DA-19

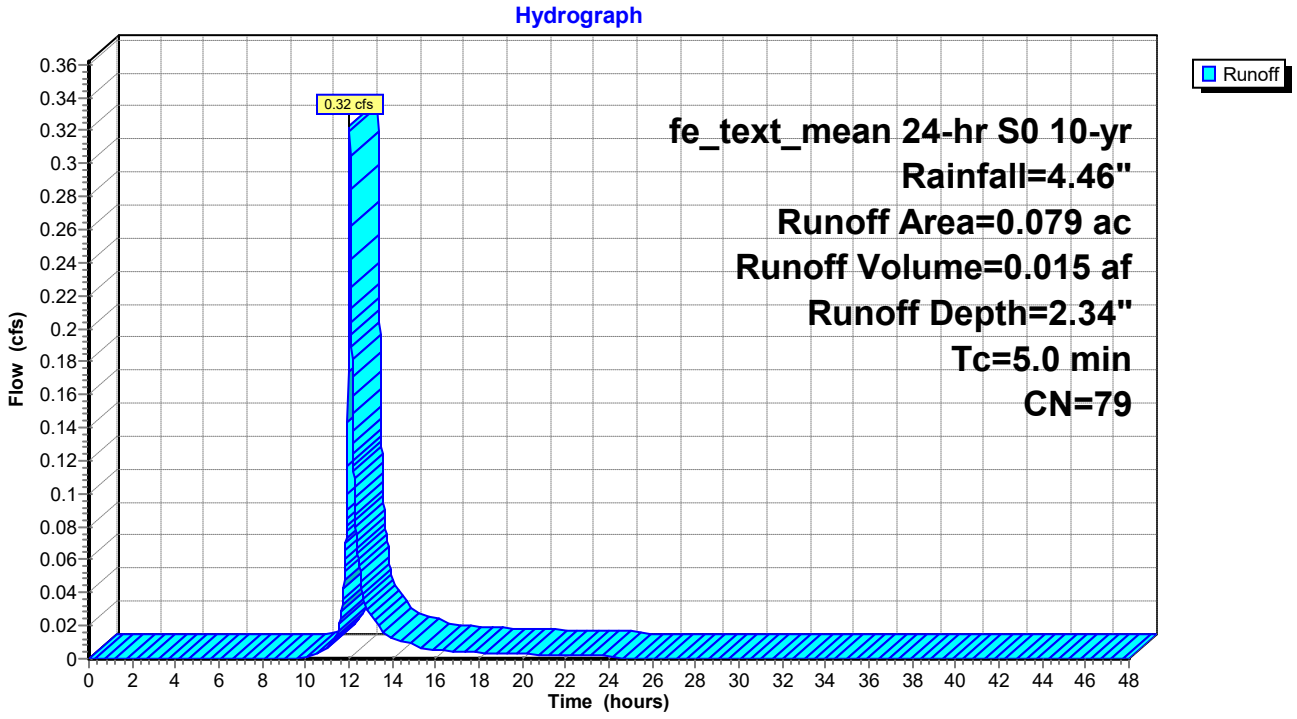
Runoff = 0.32 cfs @ 12.03 hrs, Volume= 0.015 af, Depth= 2.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.039	98	Impervious, HSG B
	0.040	61	>75% Grass cover, Good, HSG B
	0.079	79	Weighted Average
	0.040		50.63% Pervious Area
	0.039		49.37% Impervious Area

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

Subcatchment 19S: DA-19



Summary for Subcatchment 20S: DA-20

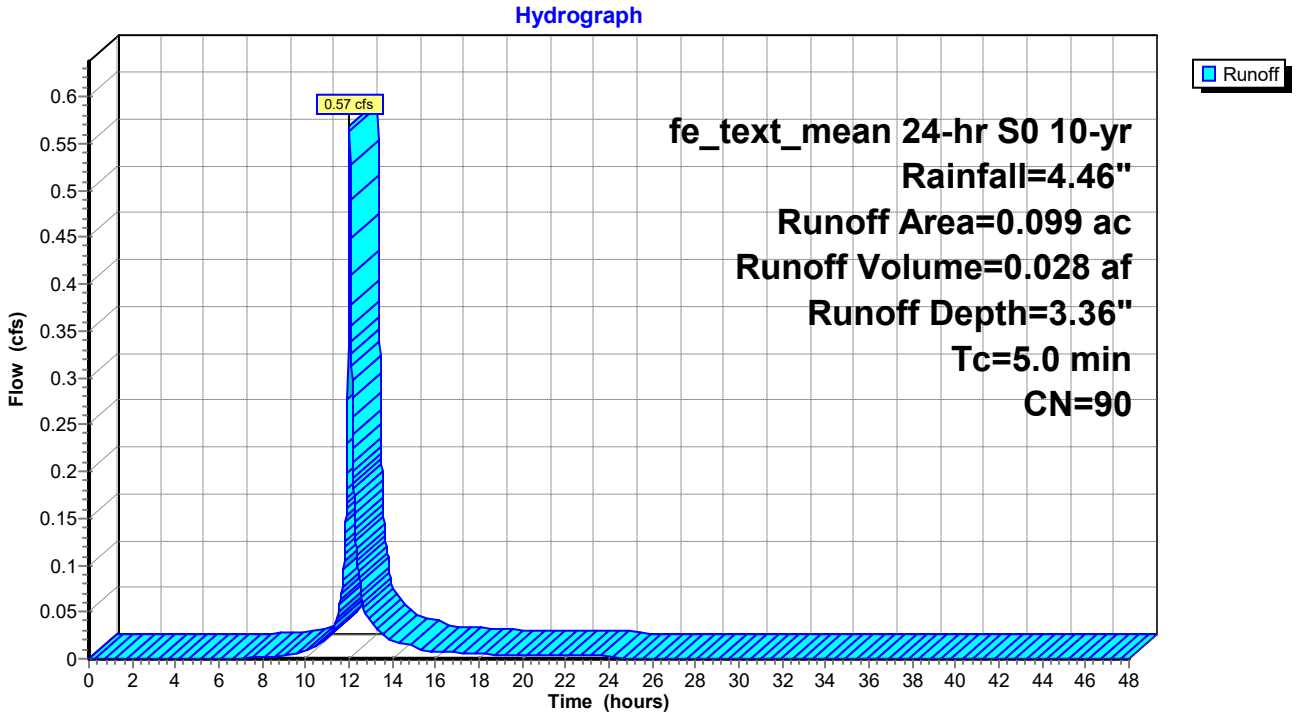
Runoff = 0.57 cfs @ 12.03 hrs, Volume= 0.028 af, Depth= 3.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

	Area (ac)	CN	Description
*	0.077	98	Impervious, HSG B
	0.022	61	>75% Grass cover, Good, HSG B
	0.099	90	Weighted Average
	0.022		22.22% Pervious Area
	0.077		77.78% Impervious Area

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

Subcatchment 20S: DA-20



Summary for Subcatchment 21S: DA-1A, DA-1B, DA-1C

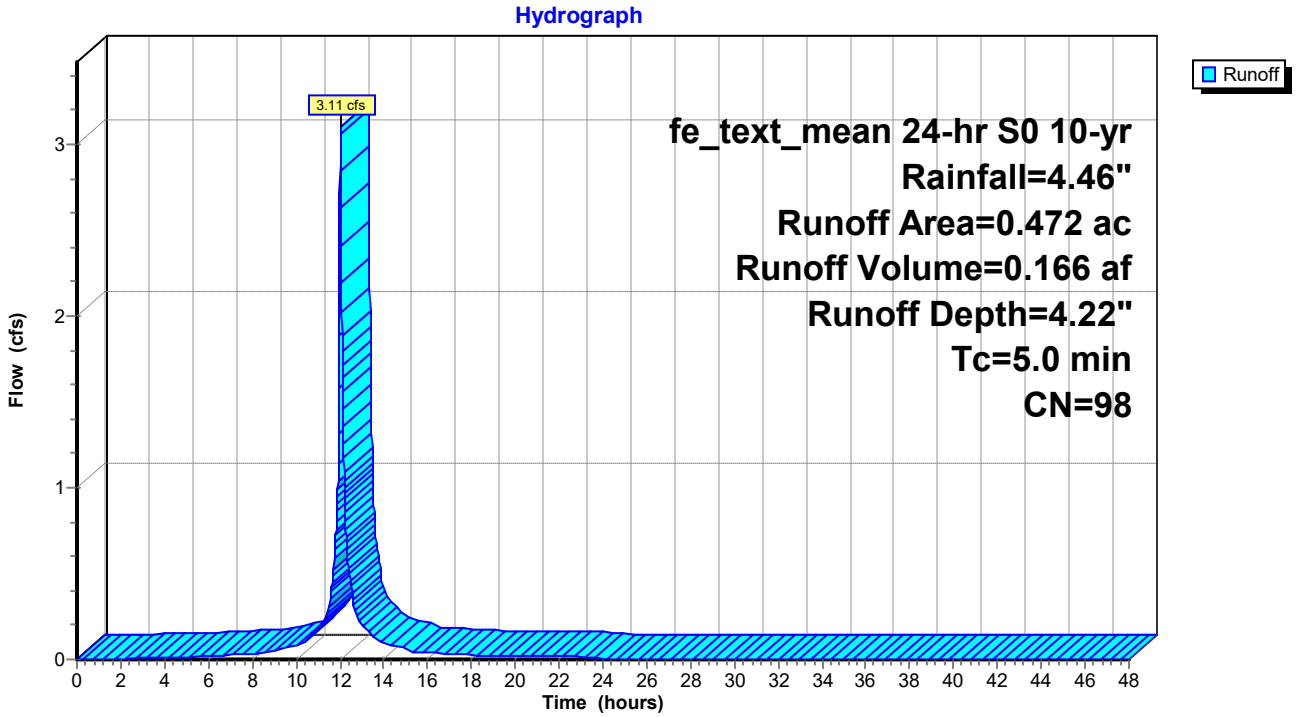
Runoff = 3.11 cfs @ 12.03 hrs, Volume= 0.166 af, Depth= 4.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 10-yr Rainfall=4.46"

Area (ac)	CN	Description
0.472	98	Roofs, HSG B
0.472		100.00% Impervious Area

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

Subcatchment 21S: DA-1A, DA-1B, DA-1C

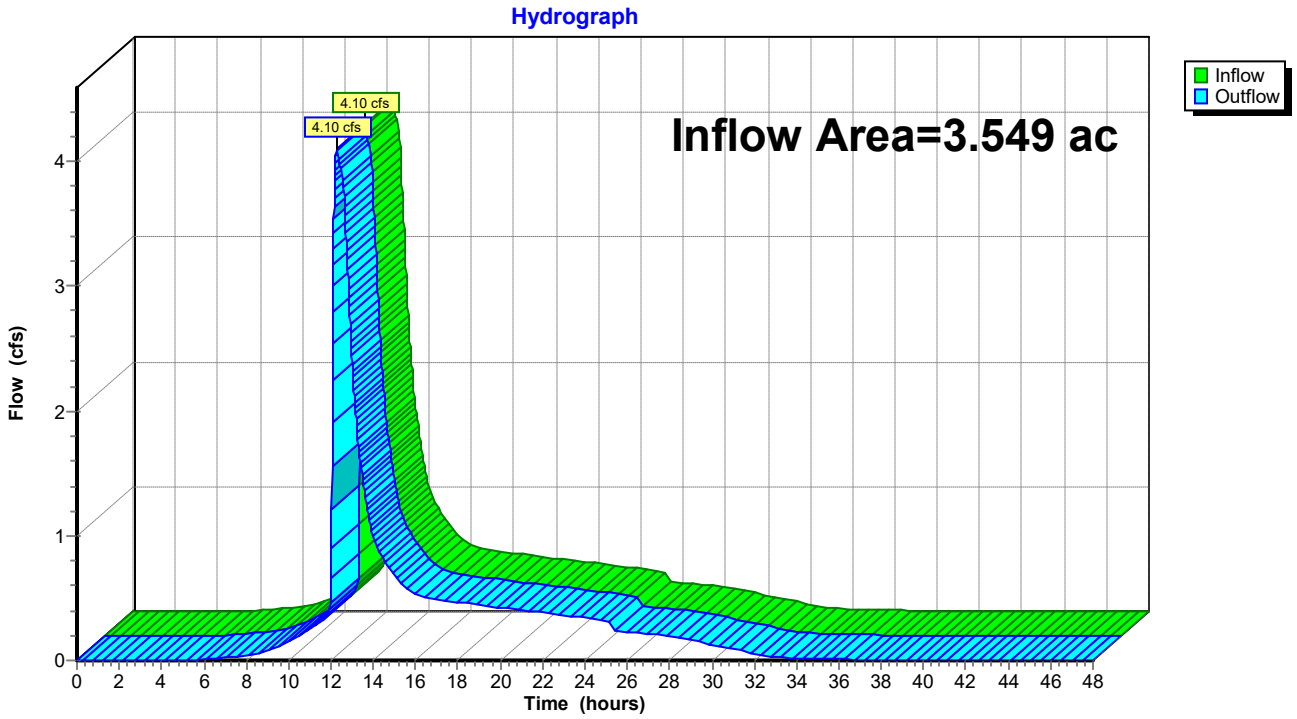


Summary for Reach 3R: On Site

Inflow Area = 3.549 ac, 77.88% Impervious, Inflow Depth > 3.36" for 10-yr event
Inflow = 4.10 cfs @ 12.29 hrs, Volume= 0.994 af
Outflow = 4.10 cfs @ 12.29 hrs, Volume= 0.994 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 3R: On Site

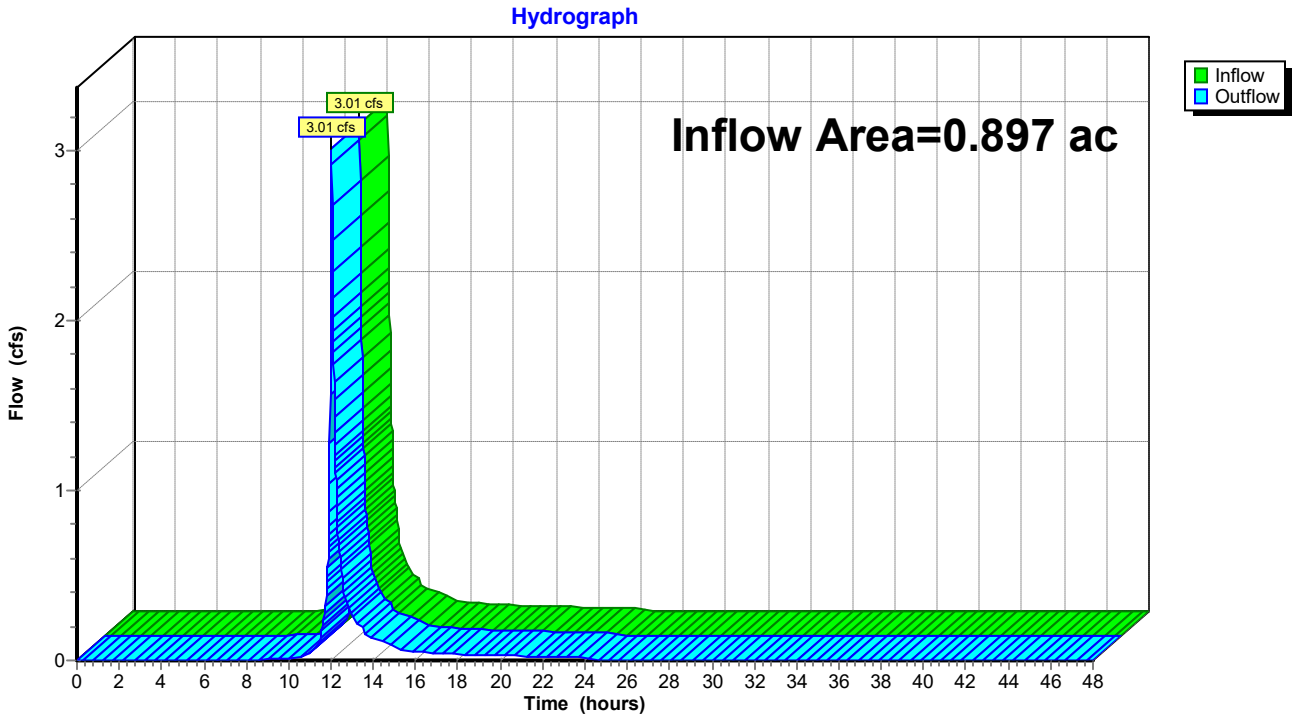


Summary for Reach 16R: Off Site

Inflow Area = 0.897 ac, 36.12% Impervious, Inflow Depth = 1.99" for 10-yr event
Inflow = 3.01 cfs @ 12.03 hrs, Volume= 0.148 af
Outflow = 3.01 cfs @ 12.03 hrs, Volume= 0.148 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 16R: Off Site

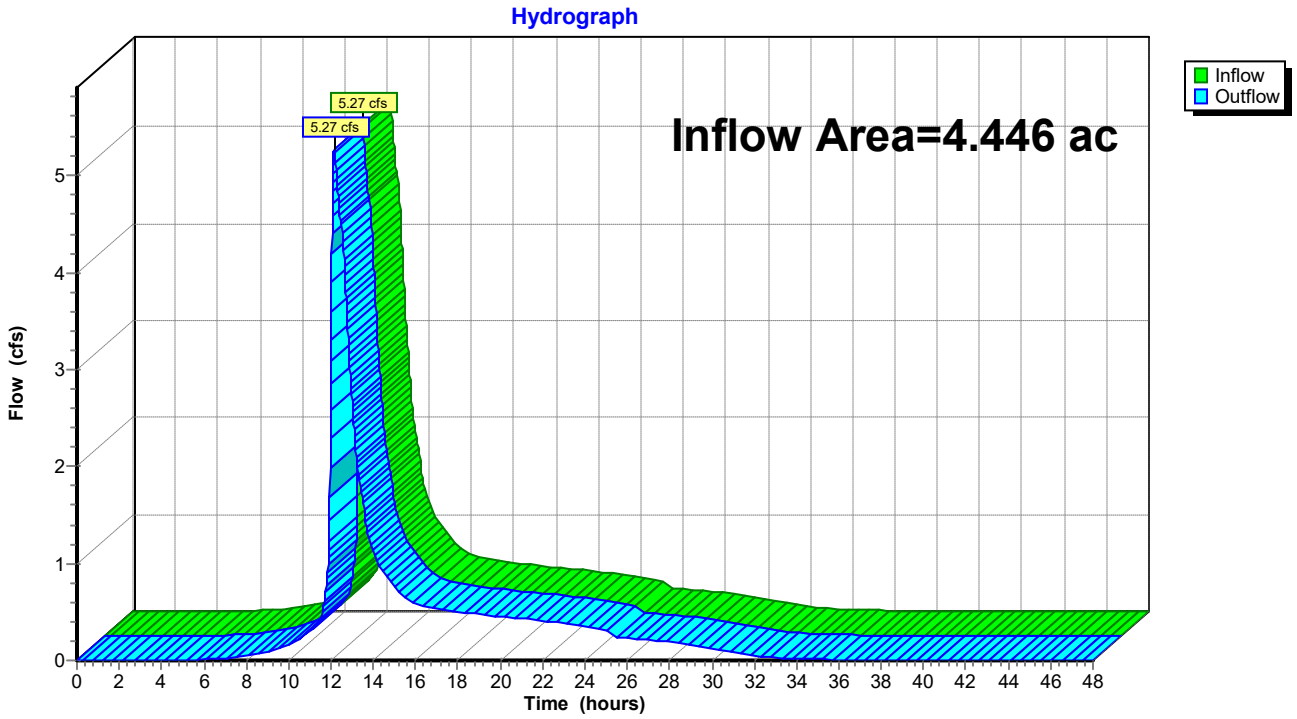


Summary for Reach 21R: Proposed Runoff

Inflow Area = 4.446 ac, 69.46% Impervious, Inflow Depth > 3.08" for 10-yr event
Inflow = 5.27 cfs @ 12.15 hrs, Volume= 1.143 af
Outflow = 5.27 cfs @ 12.15 hrs, Volume= 1.143 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 21R: Proposed Runoff



Summary for Pond 2P: Underground System

Inflow Area = 2.880 ac, 81.49% Impervious, Inflow Depth = 3.49" for 10-yr event
Inflow = 16.83 cfs @ 12.03 hrs, Volume= 0.838 af
Outflow = 3.94 cfs @ 12.29 hrs, Volume= 0.837 af, Atten= 77%, Lag= 15.5 min
Primary = 3.94 cfs @ 12.29 hrs, Volume= 0.837 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 643.86' @ 12.29 hrs Surf.Area= 0.153 ac Storage= 0.392 af

Plug-Flow detention time= 241.3 min calculated for 0.837 af (100% of inflow)
Center-of-Mass det. time= 240.6 min (1,012.8 - 772.2)

Volume	Invert	Avail.Storage	Storage Description
#1	640.25'	0.011 af	**4.00'D x 6.50'H Vertical Cone/Cylinder** x 6
#2A	640.25'	0.210 af	**37.08'W x 177.78'L x 5.50'H Field A** 0.832 af Overall - 0.306 af Embedded = 0.526 af x 40.0% Voids
#3A	641.00'	0.306 af	**ADS_StormTech MC-3500 d +Cap** x 120 Inside #2 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 120 Chambers in 5 Rows Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf
#4	646.60'	2.683 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		3.211 af	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
646.60	0.000	0.000	0.000
647.00	0.190	0.038	0.038
648.00	5.100	2.645	2.683

Device	Routing	Invert	Outlet Devices
#1	Device 4	640.25'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 4	642.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	645.00'	**4.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)
#4	Primary	640.25'	**12.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 640.25' / 639.75' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#5	Secondary	647.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.20 1.20 Width (feet) 0.00 20.00 80.00

Primary OutFlow Max=3.94 cfs @ 12.29 hrs HW=643.86' TW=0.00' (Dynamic Tailwater)
└─**4=Culvert** (Passes 3.94 cfs of 5.16 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.44 cfs @ 8.98 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 3.50 cfs @ 4.46 fps)
  └─**3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=640.25' TW=0.00' (Dynamic Tailwater)
└─**5=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 2P: Underground System - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

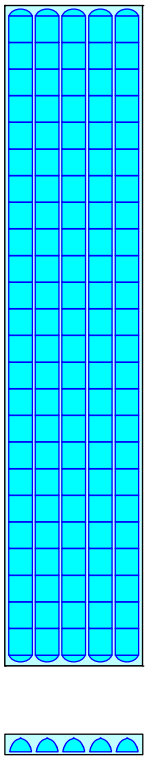
24 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 175.78' Row Length +12.0" End Stone x 2 = 177.78' Base Length
5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

120 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 13,343.2 cf Chamber Storage

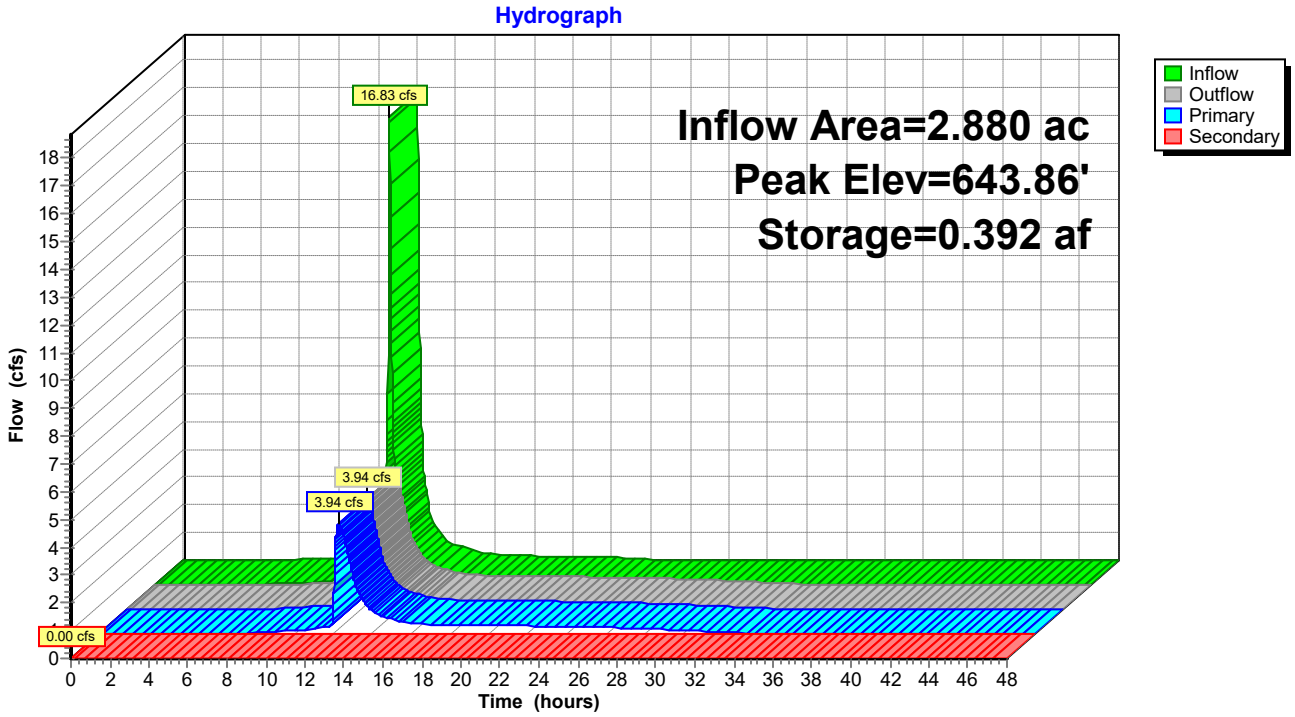
36,259.7 cf Field - 13,343.2 cf Chambers = 22,916.5 cf Stone x 40.0% Voids = 9,166.6 cf Stone Storage

Chamber Storage + Stone Storage = 22,509.8 cf = 0.517 af
Overall Storage Efficiency = 62.1%
Overall System Size = 177.78' x 37.08' x 5.50'

120 Chambers
1,343.0 cy Field
848.8 cy Stone



Pond 2P: Underground System



Summary for Pond 15P: Bio-Filtration Basin

Inflow Area = 0.669 ac, 62.33% Impervious, Inflow Depth = 2.82" for 10-yr event
Inflow = 3.28 cfs @ 12.03 hrs, Volume= 0.157 af
Outflow = 0.42 cfs @ 12.58 hrs, Volume= 0.157 af, Atten= 87%, Lag= 32.9 min
Primary = 0.16 cfs @ 12.58 hrs, Volume= 0.147 af
Secondary = 0.25 cfs @ 12.58 hrs, Volume= 0.011 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 645.55' @ 12.58 hrs Surf.Area= 1,972 sf Storage= 3,475 cf

Plug-Flow detention time= 215.0 min calculated for 0.157 af (100% of inflow)
Center-of-Mass det. time= 214.9 min (1,007.9 - 793.0)

Volume	Invert	Avail.Storage	Storage Description
#1	643.00'	5,556 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

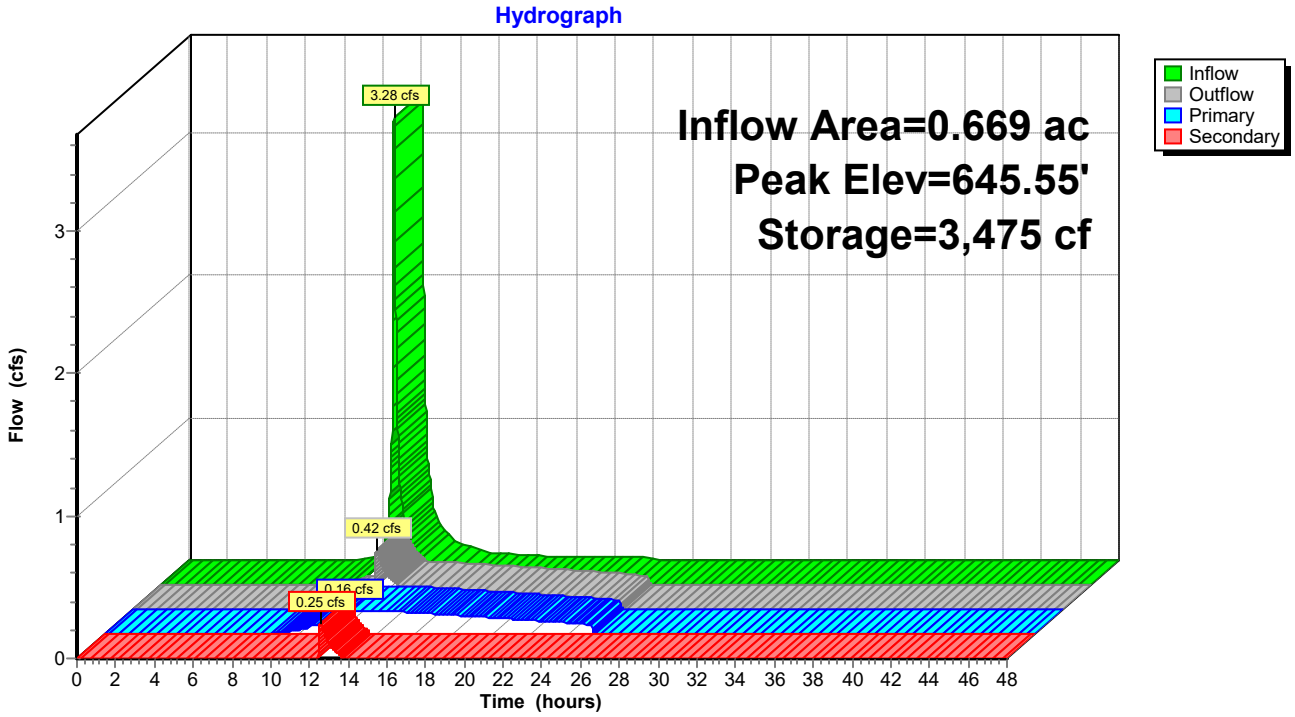
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
643.00	750	0	0
646.50	2,425	5,556	5,556

Device	Routing	Invert	Outlet Devices
#1	Primary	643.00'	**3.600 in/hr Underdrain over Surface area** Phase-In= 0.01'
#2	Secondary	645.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 in 24.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.16 cfs @ 12.58 hrs HW=645.55' TW=0.00' (Dynamic Tailwater)
↑—**1=Underdrain** (Exfiltration Controls 0.16 cfs)

Secondary OutFlow Max=0.25 cfs @ 12.58 hrs HW=645.55' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Weir Controls 0.25 cfs @ 0.75 fps)

Pond 15P: Bio-Filtration Basin



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=0.711 ac 27.85% Impervious Runoff Depth=2.55"
Tc=5.0 min CN=71 Runoff=3.02 cfs 0.151 af

Subcatchment 2S: DA-2 Runoff Area=0.905 ac 79.01% Impervious Runoff Depth=4.42"
Tc=5.0 min CN=90 Runoff=6.51 cfs 0.333 af

Subcatchment 3S: DA-3 Runoff Area=0.566 ac 80.57% Impervious Runoff Depth=4.53"
Tc=5.0 min CN=91 Runoff=4.15 cfs 0.214 af

Subcatchment 4S: DA-4 Runoff Area=0.233 ac 87.12% Impervious Runoff Depth=4.75"
Tc=5.0 min CN=93 Runoff=1.76 cfs 0.092 af

Subcatchment 5S: DA-5 Runoff Area=0.138 ac 52.17% Impervious Runoff Depth=3.39"
Tc=5.0 min CN=80 Runoff=0.79 cfs 0.039 af

Subcatchment 6S: DA-6 Runoff Area=0.121 ac 60.33% Impervious Runoff Depth=3.68"
Tc=5.0 min CN=83 Runoff=0.75 cfs 0.037 af

Subcatchment 7S: DA-7 Runoff Area=0.063 ac 39.68% Impervious Runoff Depth=3.00"
Tc=5.0 min CN=76 Runoff=0.32 cfs 0.016 af

Subcatchment 8S: DA-8 Runoff Area=0.171 ac 88.30% Impervious Runoff Depth=4.86"
Tc=5.0 min CN=94 Runoff=1.31 cfs 0.069 af

Subcatchment 9S: DA-9 Runoff Area=0.211 ac 85.31% Impervious Runoff Depth=4.75"
Tc=5.0 min CN=93 Runoff=1.59 cfs 0.083 af

Subcatchment 10S: DA-10 Runoff Area=0.042 ac 85.71% Impervious Runoff Depth=4.75"
Tc=5.0 min CN=93 Runoff=0.32 cfs 0.017 af

Subcatchment 11S: DA-11 Runoff Area=0.010 ac 50.00% Impervious Runoff Depth=3.39"
Tc=5.0 min CN=80 Runoff=0.06 cfs 0.003 af

Subcatchment 12S: DA-12 Runoff Area=0.065 ac 84.62% Impervious Runoff Depth=4.64"
Tc=5.0 min CN=92 Runoff=0.48 cfs 0.025 af

Subcatchment 13S: DA-13 Runoff Area=0.069 ac 43.48% Impervious Runoff Depth=3.10"
Tc=5.0 min CN=77 Runoff=0.36 cfs 0.018 af

Subcatchment 14S: DA-14 Runoff Area=0.099 ac 72.73% Impervious Runoff Depth=4.20"
Tc=5.0 min CN=88 Runoff=0.69 cfs 0.035 af

Subcatchment 15S: DA-15 Runoff Area=0.044 ac 50.00% Impervious Runoff Depth=3.39"
Tc=5.0 min CN=80 Runoff=0.25 cfs 0.012 af

Subcatchment 16S: DA-16 Runoff Area=0.146 ac 58.22% Impervious Runoff Depth=3.68"
Tc=5.0 min CN=83 Runoff=0.90 cfs 0.045 af

Subcatchment 17S: DA-17 Runoff Area=0.095 ac 50.53% Impervious Runoff Depth=3.39"
Tc=5.0 min CN=80 Runoff=0.54 cfs 0.027 af

Subcatchment 18S: DA-18 Runoff Area=0.107 ac 69.16% Impervious Runoff Depth=4.10"
Tc=5.0 min CN=87 Runoff=0.73 cfs 0.037 af

Subcatchment 19S: DA-19 Runoff Area=0.079 ac 49.37% Impervious Runoff Depth=3.29"
Tc=5.0 min CN=79 Runoff=0.44 cfs 0.022 af

Subcatchment 20S: DA-20 Runoff Area=0.099 ac 77.78% Impervious Runoff Depth=4.42"
Tc=5.0 min CN=90 Runoff=0.71 cfs 0.036 af

Subcatchment 21S: DA-1A, DA-1B, DA-1C Runoff Area=0.472 ac 100.00% Impervious Runoff Depth=5.32"
Tc=5.0 min CN=98 Runoff=3.74 cfs 0.209 af

Reach 3R: On Site Inflow=7.34 cfs 1.305 af
Outflow=7.34 cfs 1.305 af

Reach 16R: Off Site Inflow=4.23 cfs 0.213 af
Outflow=4.23 cfs 0.213 af

Reach 21R: Proposed Runoff Inflow=9.00 cfs 1.518 af
Outflow=9.00 cfs 1.518 af

Pond 2P: Underground System Peak Elev=645.01' Storage=0.480 af Inflow=20.92 cfs 1.093 af
Primary=5.89 cfs 1.092 af Secondary=0.00 cfs 0.000 af Outflow=5.89 cfs 1.092 af

Pond 15P: Bio-Filtration Basin Peak Elev=645.66' Storage=3,692 cf Inflow=4.26 cfs 0.213 af
Primary=0.17 cfs 0.164 af Secondary=1.34 cfs 0.049 af Outflow=1.51 cfs 0.213 af

Total Runoff Area = 4.446 ac Runoff Volume = 1.520 af Average Runoff Depth = 4.10"
30.54% Pervious = 1.358 ac 69.46% Impervious = 3.088 ac

Summary for Subcatchment 1S: DA-1

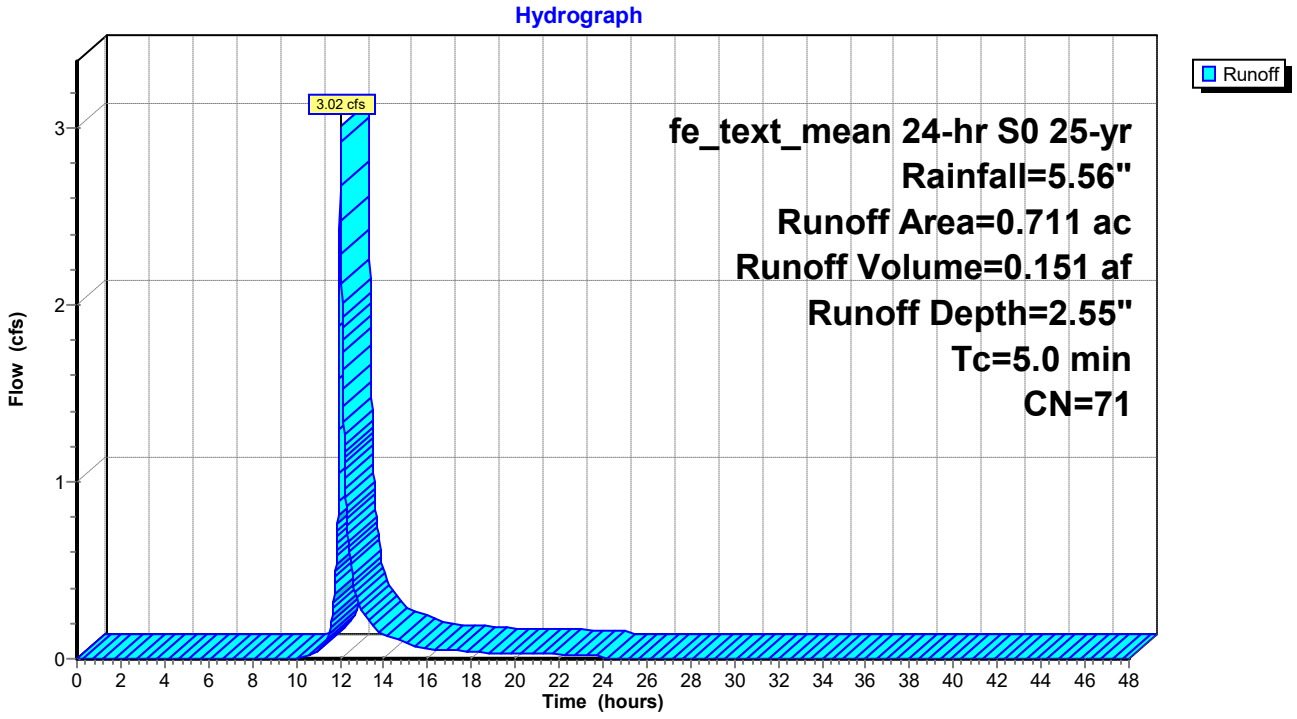
Runoff = 3.02 cfs @ 12.03 hrs, Volume= 0.151 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.198	98	Impervious, HSG B
	0.513	61	>75% Grass cover, Good, HSG B
	0.711	71	Weighted Average
	0.513		72.15% Pervious Area
	0.198		27.85% Impervious Area

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

Subcatchment 1S: DA-1



Summary for Subcatchment 2S: DA-2

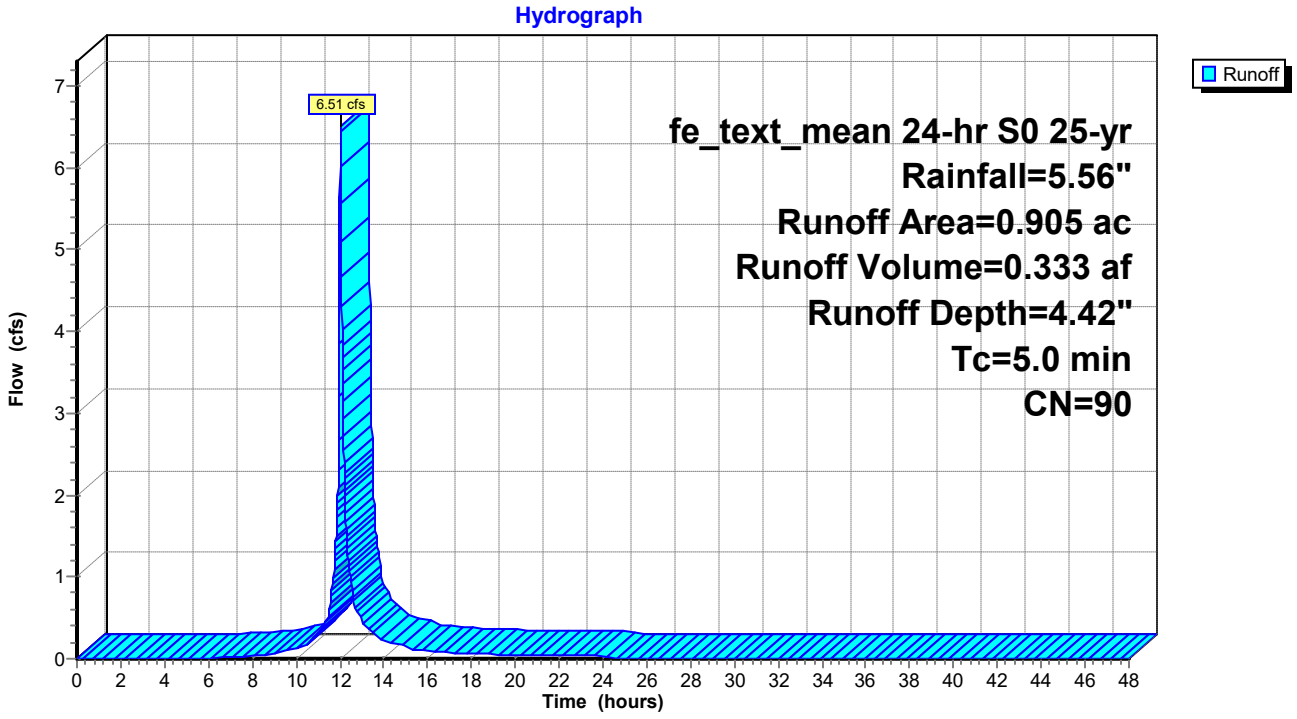
Runoff = 6.51 cfs @ 12.03 hrs, Volume= 0.333 af, Depth= 4.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.715	98	Impervious, HSG B
	0.190	61	>75% Grass cover, Good, HSG B
	0.905	90	Weighted Average
	0.190		20.99% Pervious Area
	0.715		79.01% Impervious Area

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

Subcatchment 2S: DA-2



Summary for Subcatchment 3S: DA-3

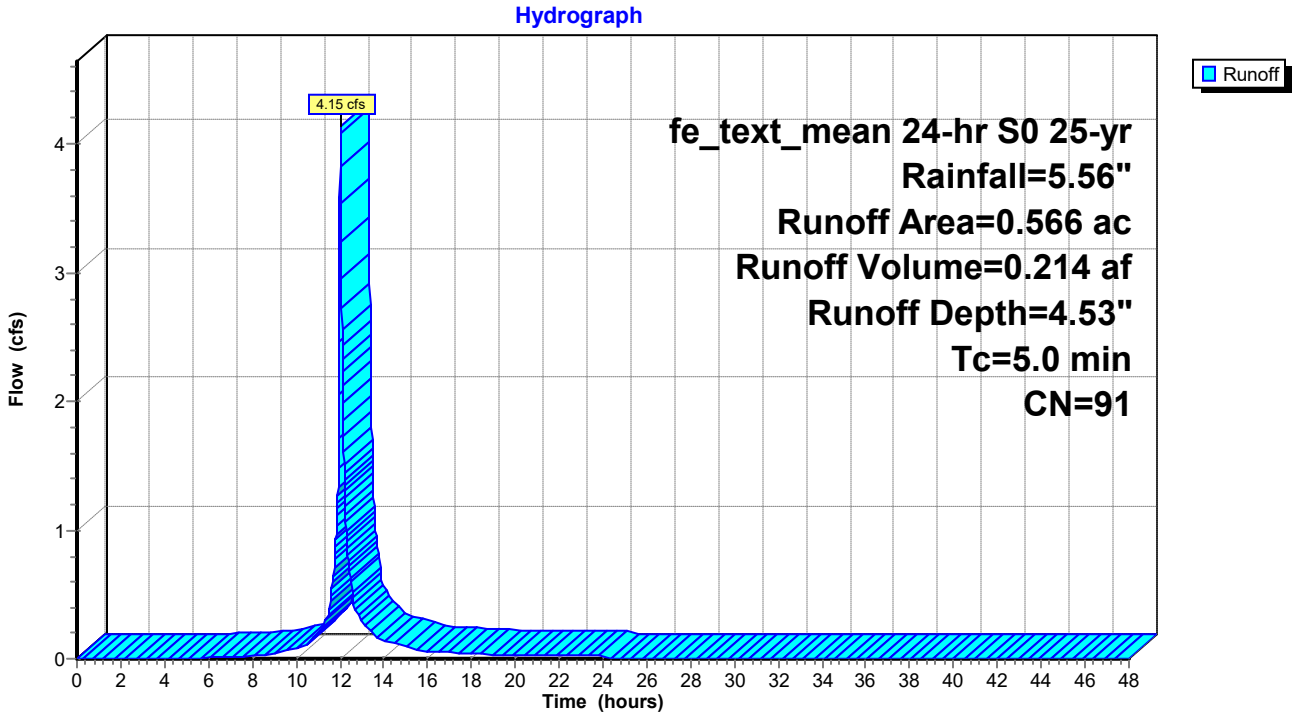
Runoff = 4.15 cfs @ 12.03 hrs, Volume= 0.214 af, Depth= 4.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.456	98	Impervious, HSG B
	0.110	61	>75% Grass cover, Good, HSG B
	0.566	91	Weighted Average
	0.110		19.43% Pervious Area
	0.456		80.57% Impervious Area

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

Subcatchment 3S: DA-3



Summary for Subcatchment 4S: DA-4

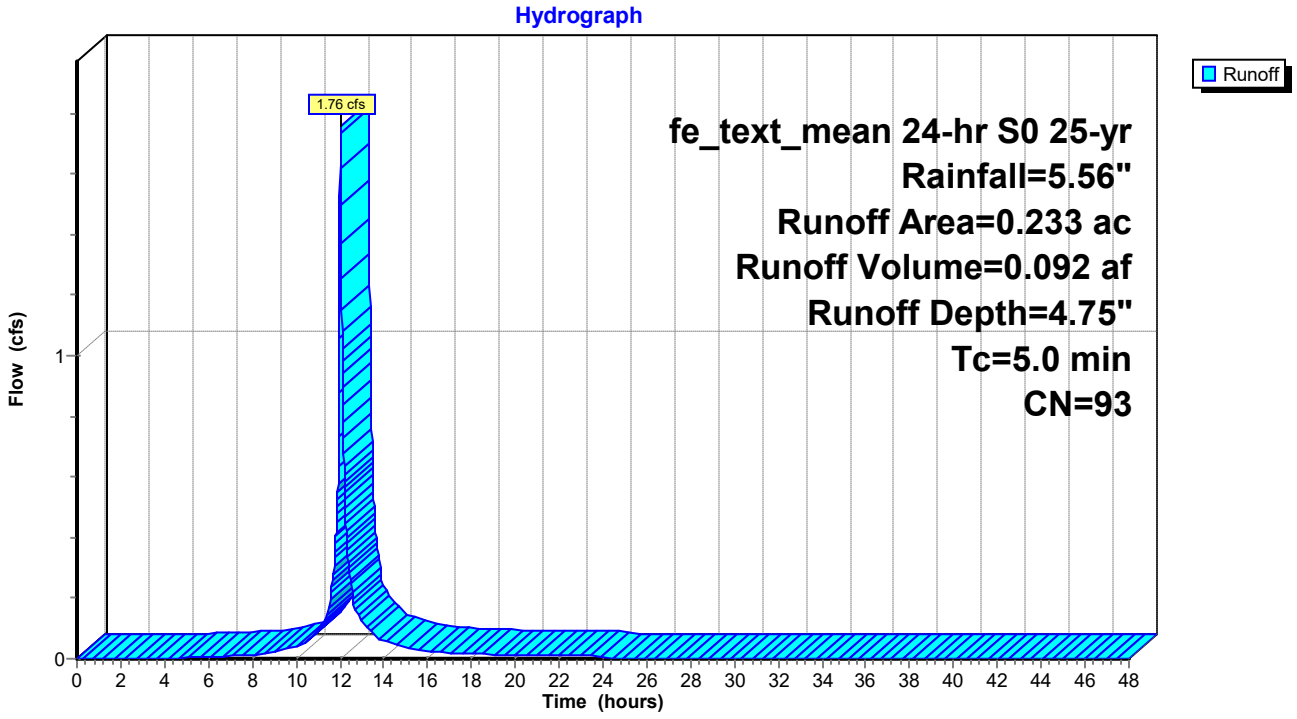
Runoff = 1.76 cfs @ 12.03 hrs, Volume= 0.092 af, Depth= 4.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.203	98	Impervious, HSG B
	0.030	61	>75% Grass cover, Good, HSG B
	0.233	93	Weighted Average
	0.030		12.88% Pervious Area
	0.203		87.12% Impervious Area

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

Subcatchment 4S: DA-4



Summary for Subcatchment 5S: DA-5

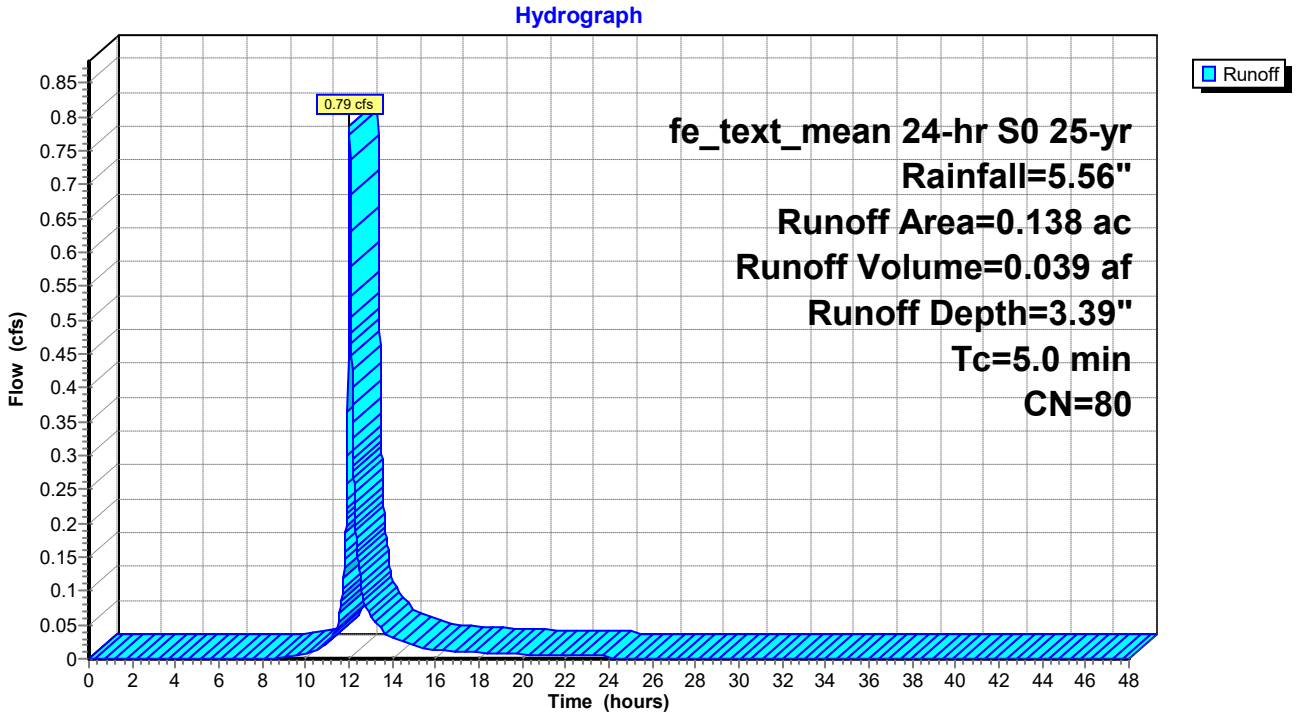
Runoff = 0.79 cfs @ 12.03 hrs, Volume= 0.039 af, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.072	98	Impervious, HSG B
	0.066	61	>75% Grass cover, Good, HSG B
	0.138	80	Weighted Average
	0.066		47.83% Pervious Area
	0.072		52.17% Impervious Area

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

Subcatchment 5S: DA-5



Summary for Subcatchment 6S: DA-6

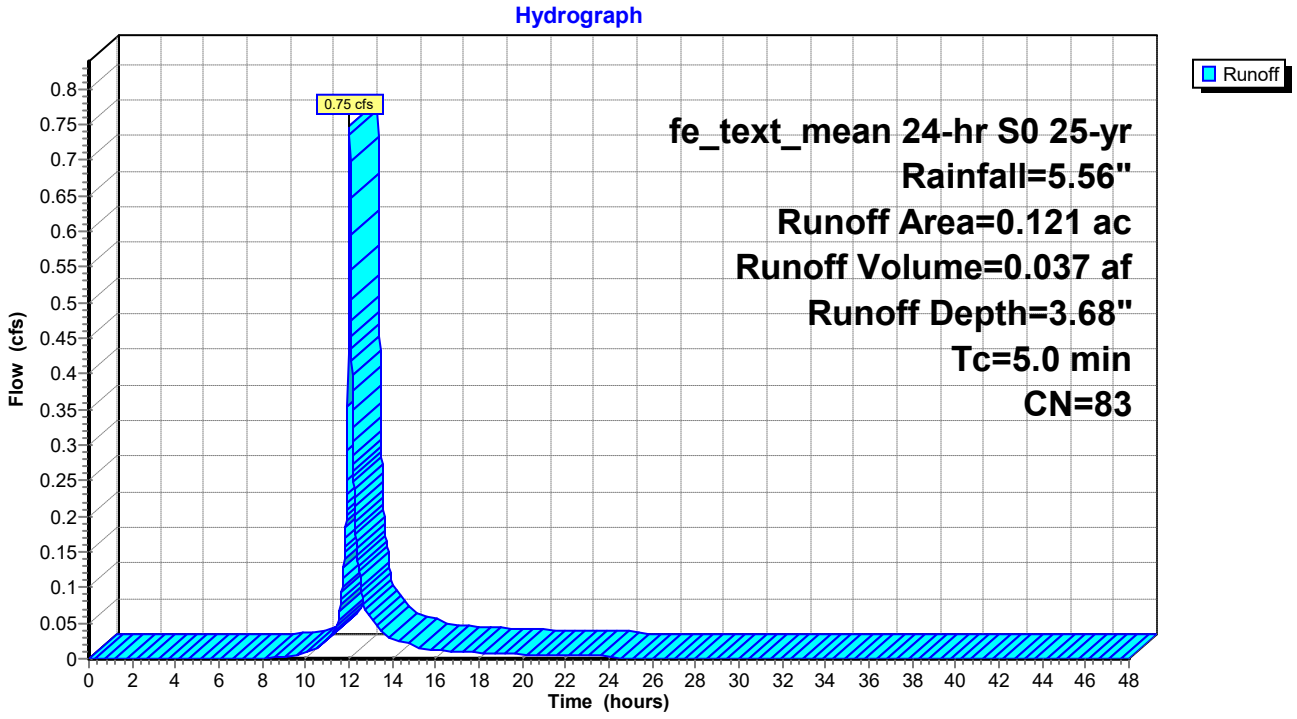
Runoff = 0.75 cfs @ 12.03 hrs, Volume= 0.037 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.073	98	Impervious, HSG B
	0.048	61	>75% Grass cover, Good, HSG B
	0.121	83	Weighted Average
	0.048		39.67% Pervious Area
	0.073		60.33% Impervious Area

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

Subcatchment 6S: DA-6



Summary for Subcatchment 7S: DA-7

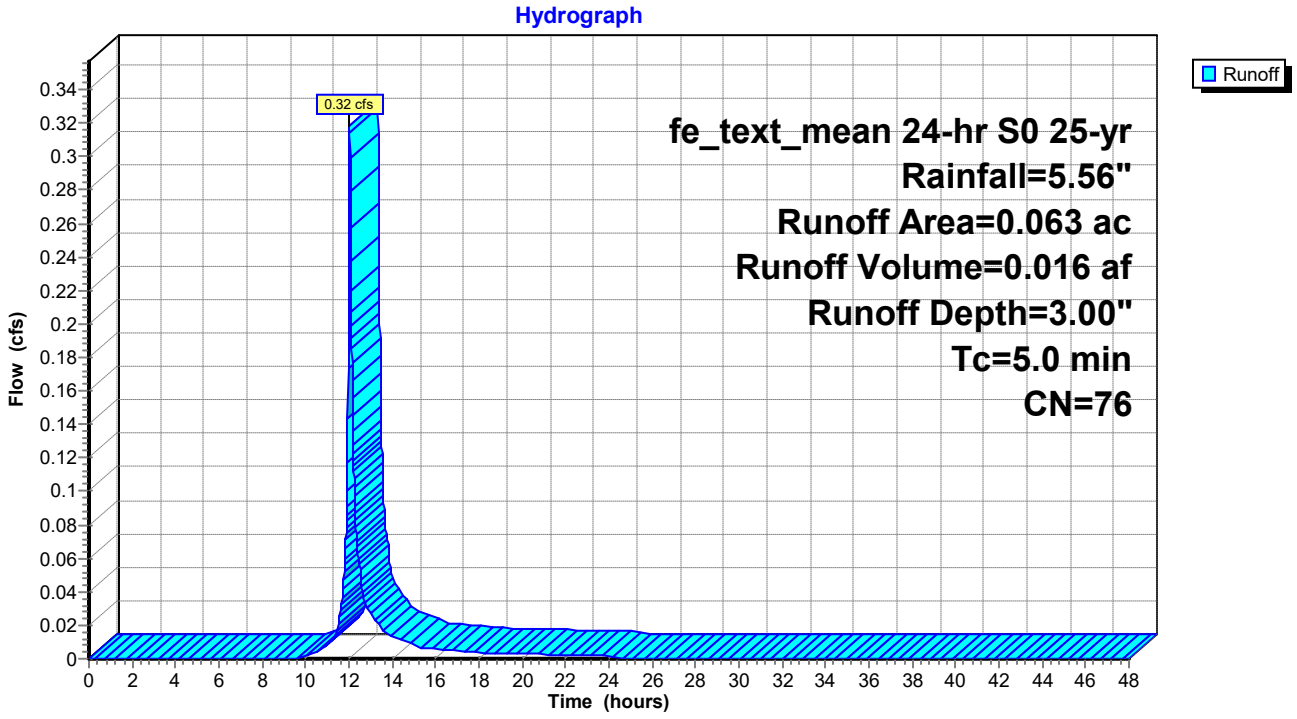
Runoff = 0.32 cfs @ 12.03 hrs, Volume= 0.016 af, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.025	98	Impervious, HSG B
	0.038	61	>75% Grass cover, Good, HSG B
	0.063	76	Weighted Average
	0.038		60.32% Pervious Area
	0.025		39.68% Impervious Area

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

Subcatchment 7S: DA-7



Summary for Subcatchment 8S: DA-8

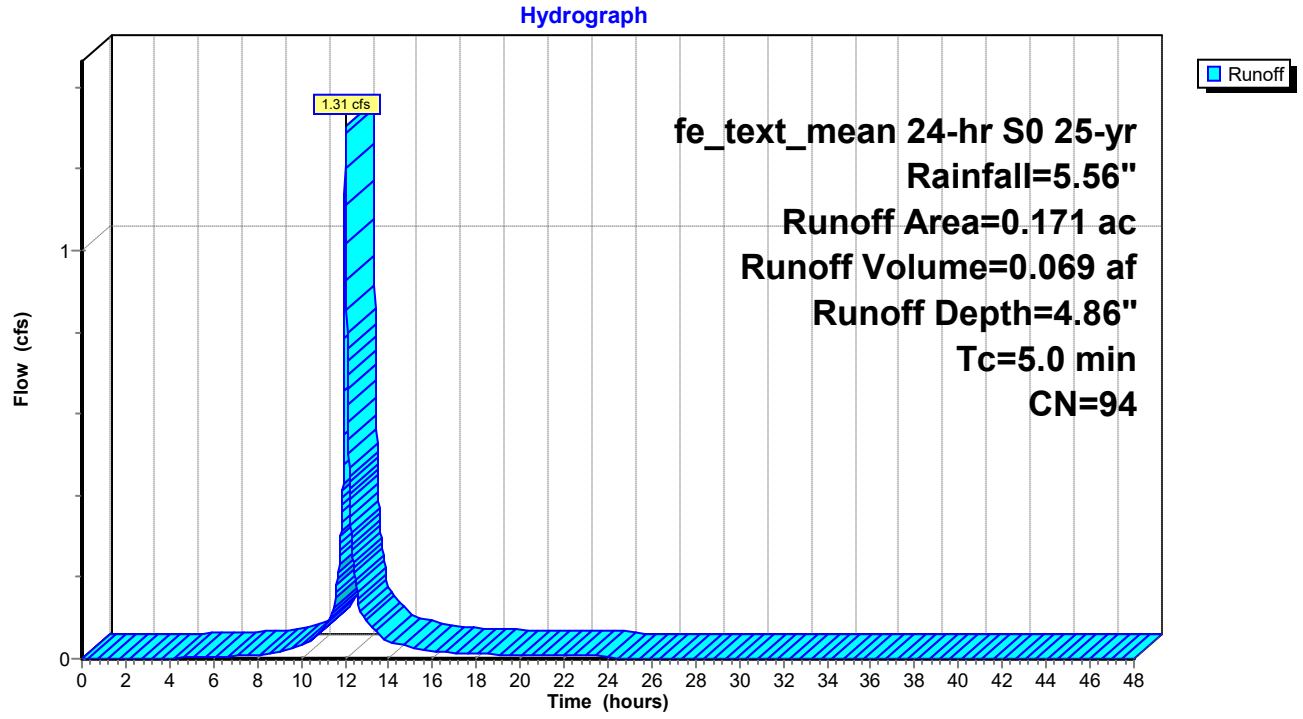
Runoff = 1.31 cfs @ 12.03 hrs, Volume= 0.069 af, Depth= 4.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.151	98	Impervious, HSG B
	0.020	61	>75% Grass cover, Good, HSG B
	0.171	94	Weighted Average
	0.020		11.70% Pervious Area
	0.151		88.30% Impervious Area

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

Subcatchment 8S: DA-8



Summary for Subcatchment 9S: DA-9

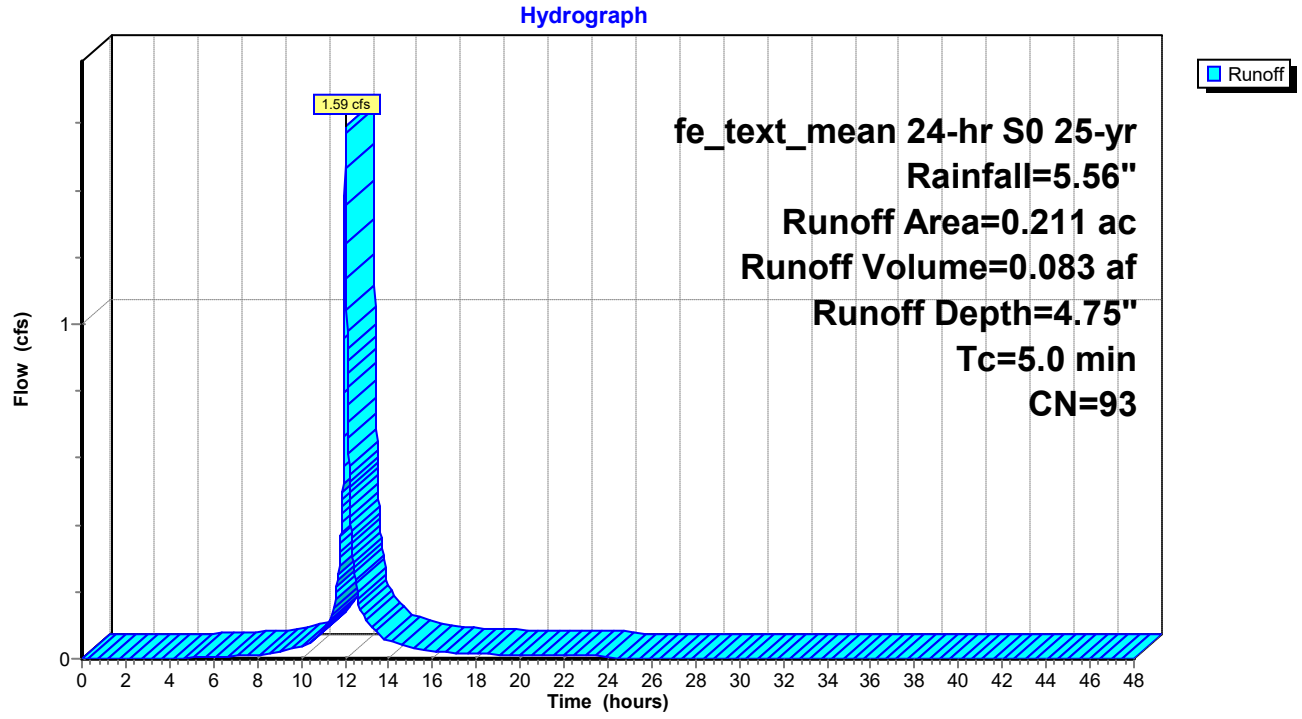
Runoff = 1.59 cfs @ 12.03 hrs, Volume= 0.083 af, Depth= 4.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.180	98	Impervious, HSG B
	0.031	61	>75% Grass cover, Good, HSG B
	0.211	93	Weighted Average
	0.031		14.69% Pervious Area
	0.180		85.31% Impervious Area

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

Subcatchment 9S: DA-9



Summary for Subcatchment 10S: DA-10

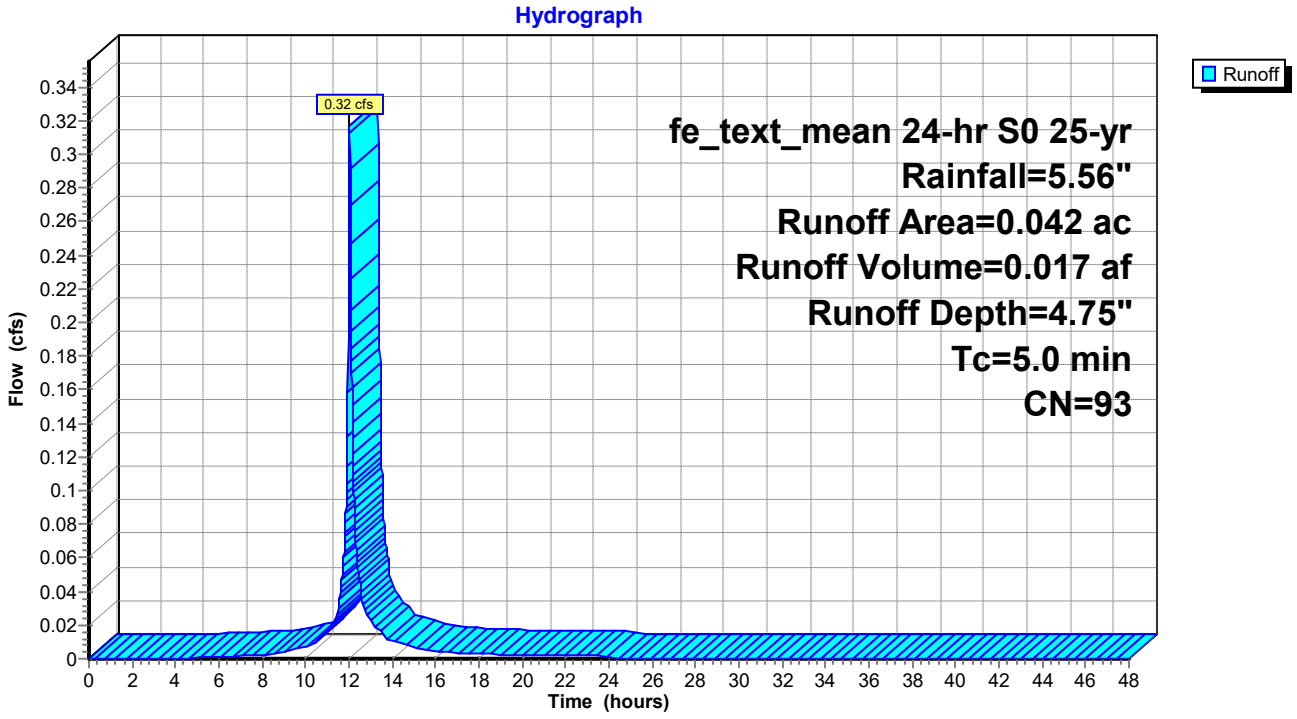
Runoff = 0.32 cfs @ 12.03 hrs, Volume= 0.017 af, Depth= 4.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.036	98	Impervious, HSG B
	0.006	61	>75% Grass cover, Good, HSG B
	0.042	93	Weighted Average
	0.006		14.29% Pervious Area
	0.036		85.71% Impervious Area

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

Subcatchment 10S: DA-10



Summary for Subcatchment 11S: DA-11

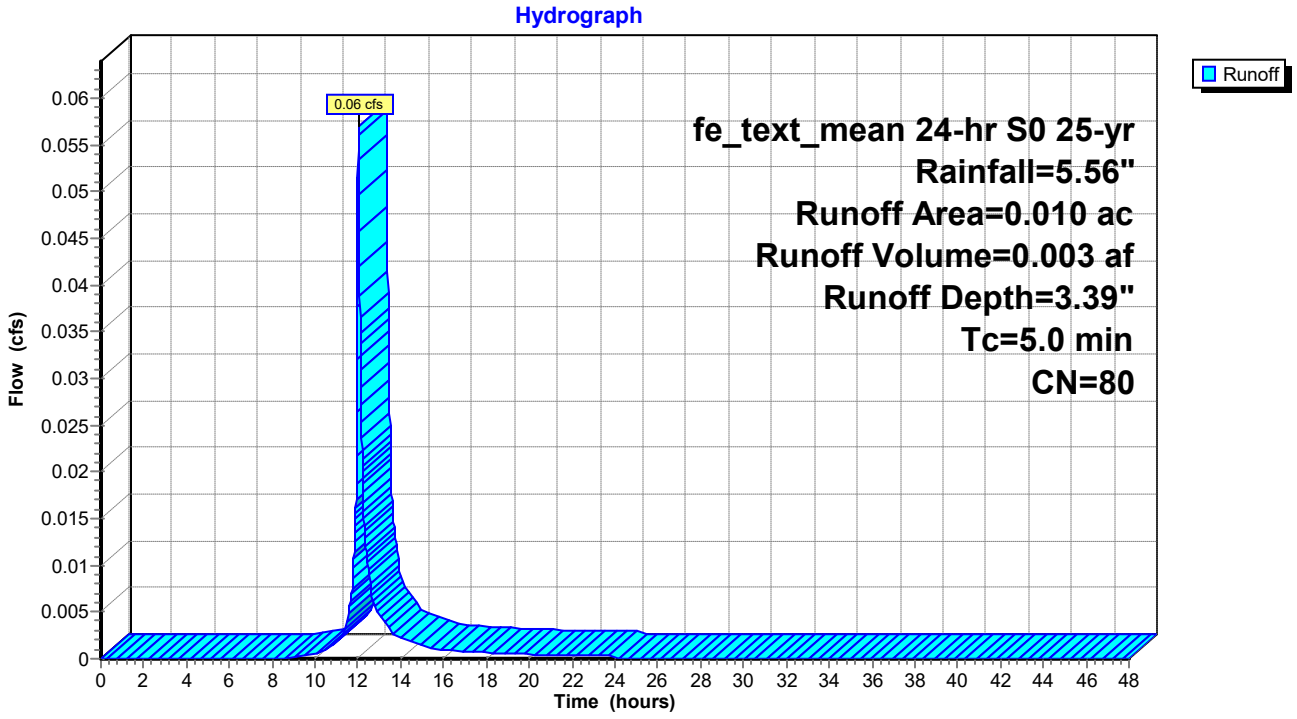
Runoff = 0.06 cfs @ 12.03 hrs, Volume= 0.003 af, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.005	98	Impervious, HSG B
	0.005	61	>75% Grass cover, Good, HSG B
	0.010	80	Weighted Average
	0.005		50.00% Pervious Area
	0.005		50.00% Impervious Area

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

Subcatchment 11S: DA-11



Summary for Subcatchment 12S: DA-12

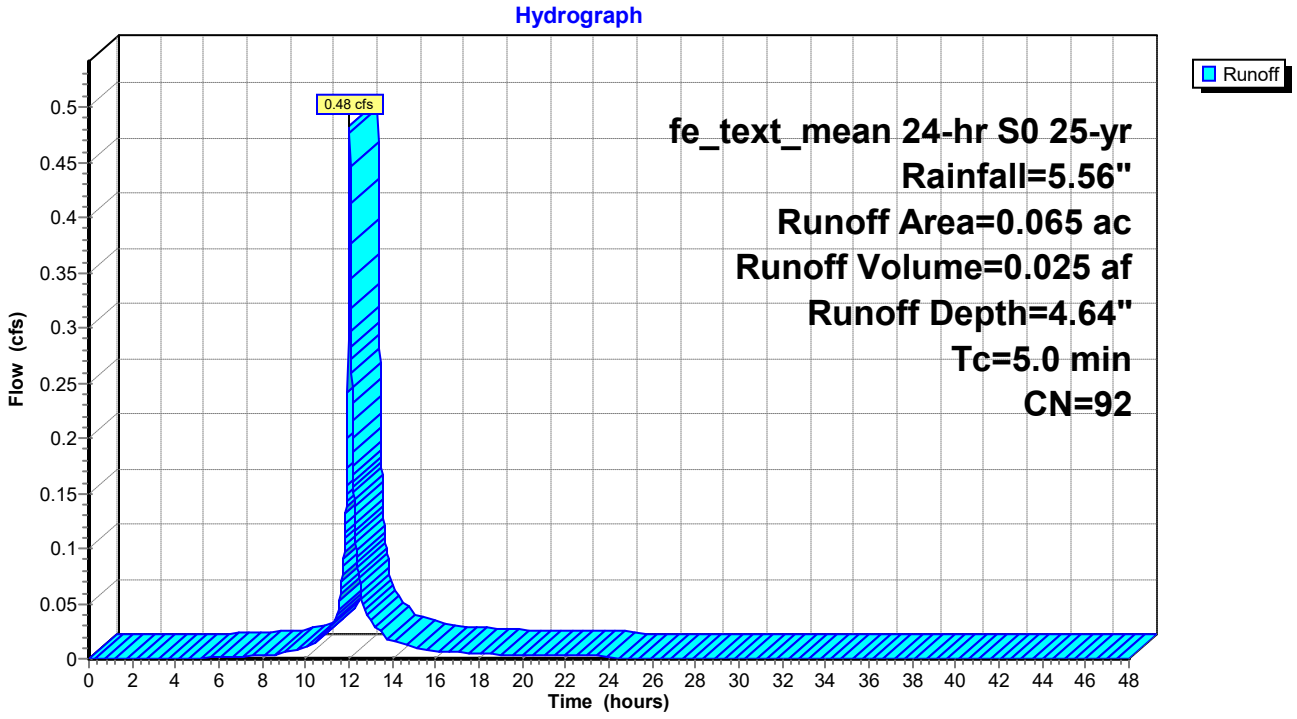
Runoff = 0.48 cfs @ 12.03 hrs, Volume= 0.025 af, Depth= 4.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.055	98	Impervious, HSG B
	0.010	61	>75% Grass cover, Good, HSG B
	0.065	92	Weighted Average
	0.010		15.38% Pervious Area
	0.055		84.62% Impervious Area

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

Subcatchment 12S: DA-12



Summary for Subcatchment 13S: DA-13

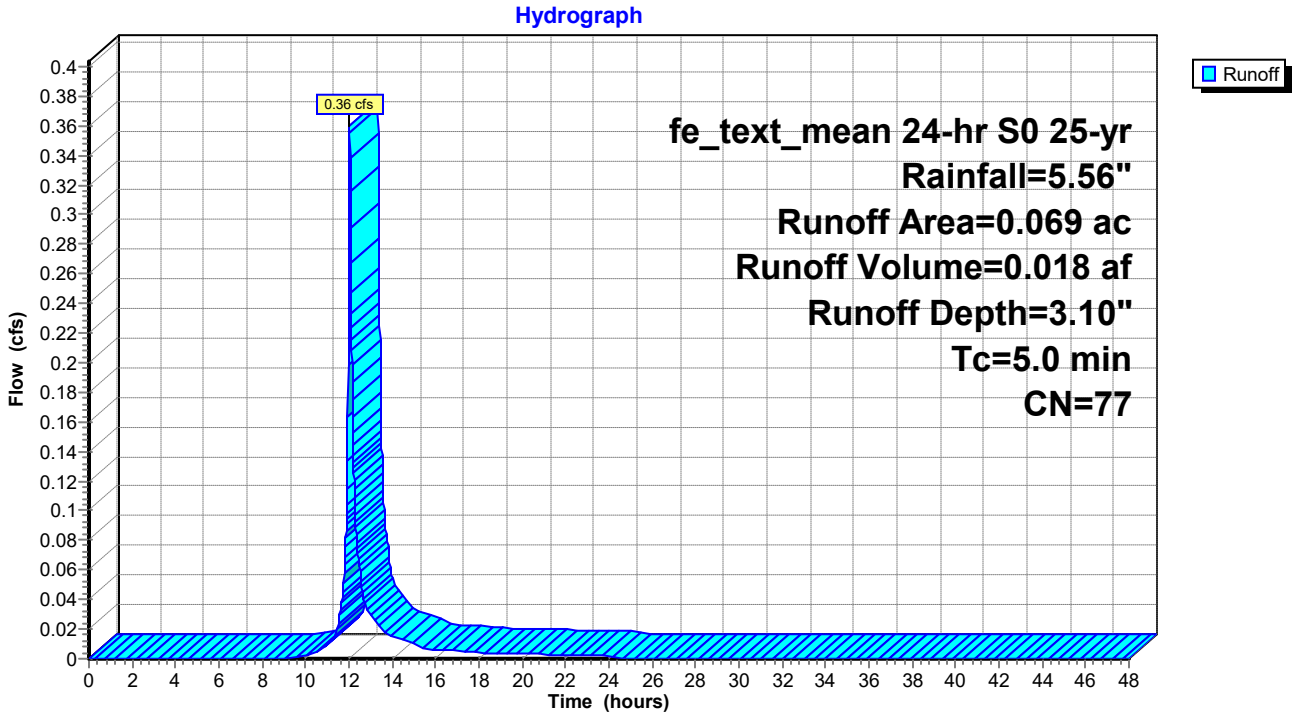
Runoff = 0.36 cfs @ 12.03 hrs, Volume= 0.018 af, Depth= 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.030	98	Impervious, HSG B
	0.039	61	>75% Grass cover, Good, HSG B
	0.069	77	Weighted Average
	0.039		56.52% Pervious Area
	0.030		43.48% Impervious Area

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

Subcatchment 13S: DA-13



Summary for Subcatchment 14S: DA-14

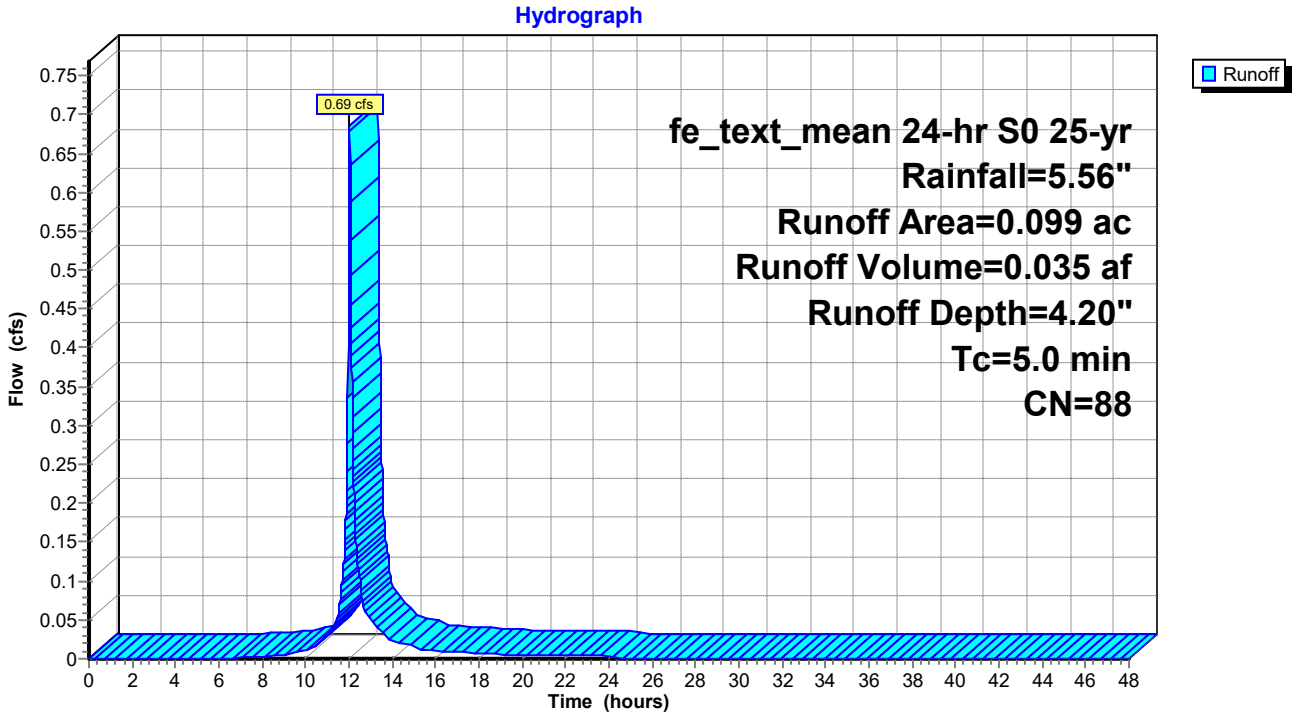
Runoff = 0.69 cfs @ 12.03 hrs, Volume= 0.035 af, Depth= 4.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.072	98	Impervious, HSG B
	0.027	61	>75% Grass cover, Good, HSG B
	0.099	88	Weighted Average
	0.027		27.27% Pervious Area
	0.072		72.73% Impervious Area

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

Subcatchment 14S: DA-14



Summary for Subcatchment 15S: DA-15

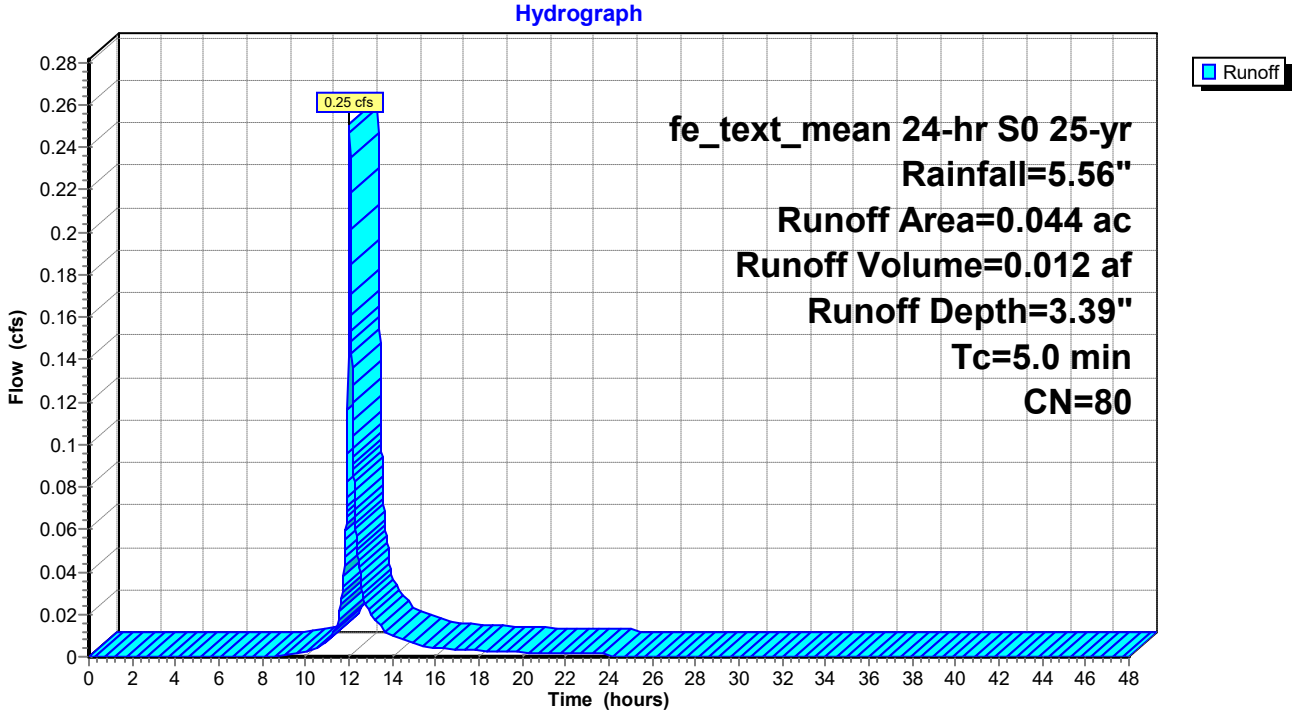
Runoff = 0.25 cfs @ 12.03 hrs, Volume= 0.012 af, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.022	98	Impervious, HSG B
	0.022	61	>75% Grass cover, Good, HSG B
	0.044	80	Weighted Average
	0.022		50.00% Pervious Area
	0.022		50.00% Impervious Area

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

Subcatchment 15S: DA-15



Summary for Subcatchment 16S: DA-16

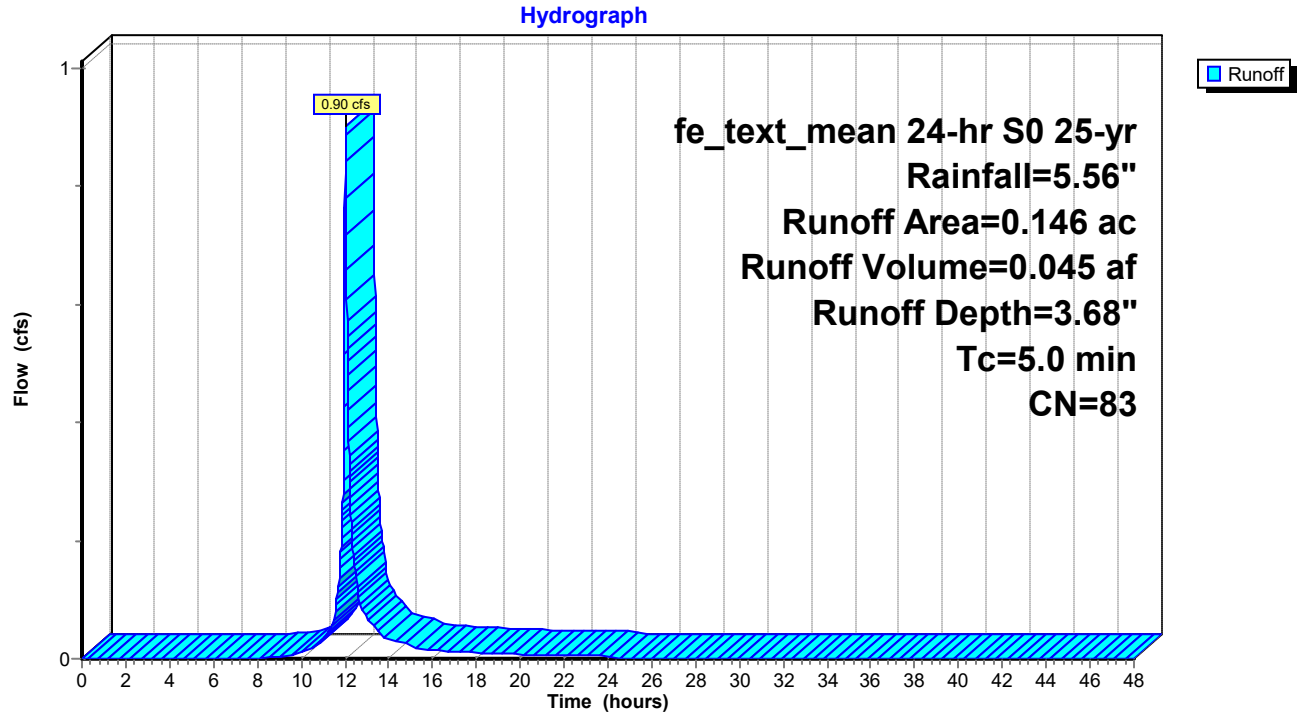
Runoff = 0.90 cfs @ 12.03 hrs, Volume= 0.045 af, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.085	98	Impervious, HSG B
	0.061	61	>75% Grass cover, Good, HSG B
	0.146	83	Weighted Average
	0.061		41.78% Pervious Area
	0.085		58.22% Impervious Area

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

Subcatchment 16S: DA-16



Summary for Subcatchment 17S: DA-17

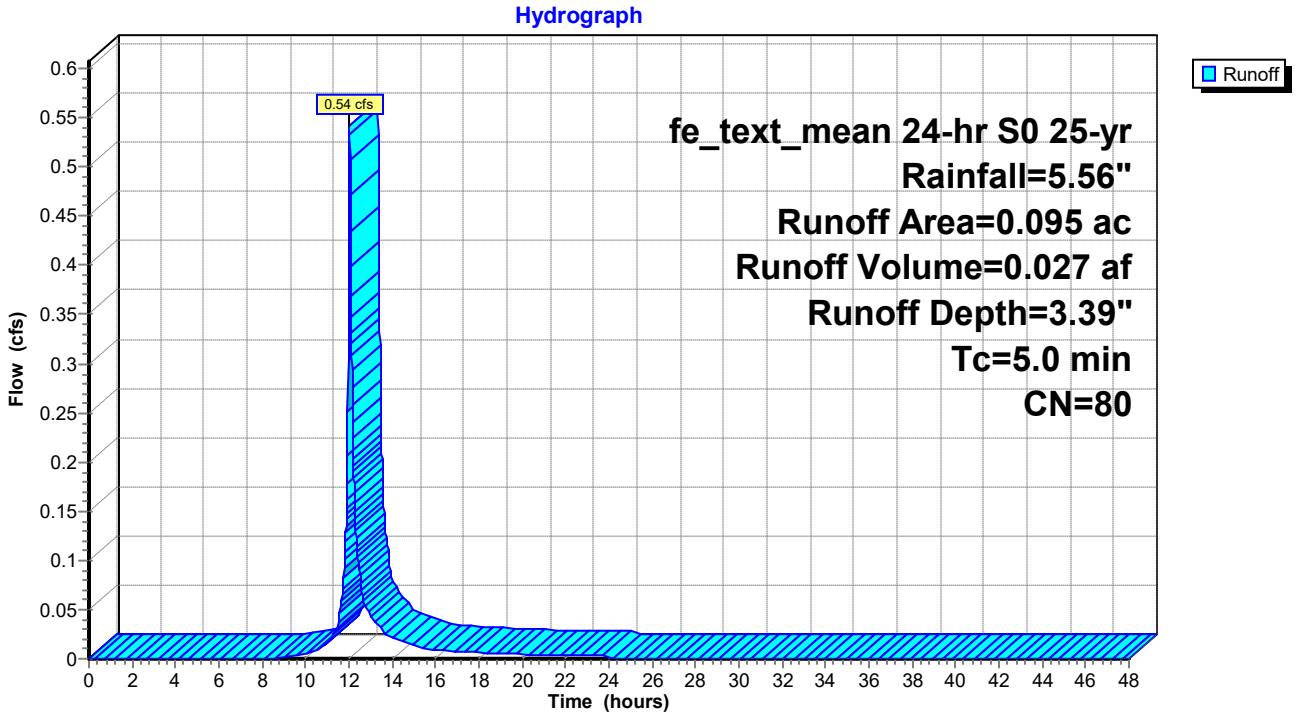
Runoff = 0.54 cfs @ 12.03 hrs, Volume= 0.027 af, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.048	98	Impervious, HSG B
	0.047	61	>75% Grass cover, Good, HSG B
	0.095	80	Weighted Average
	0.047		49.47% Pervious Area
	0.048		50.53% Impervious Area

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

Subcatchment 17S: DA-17



Summary for Subcatchment 18S: DA-18

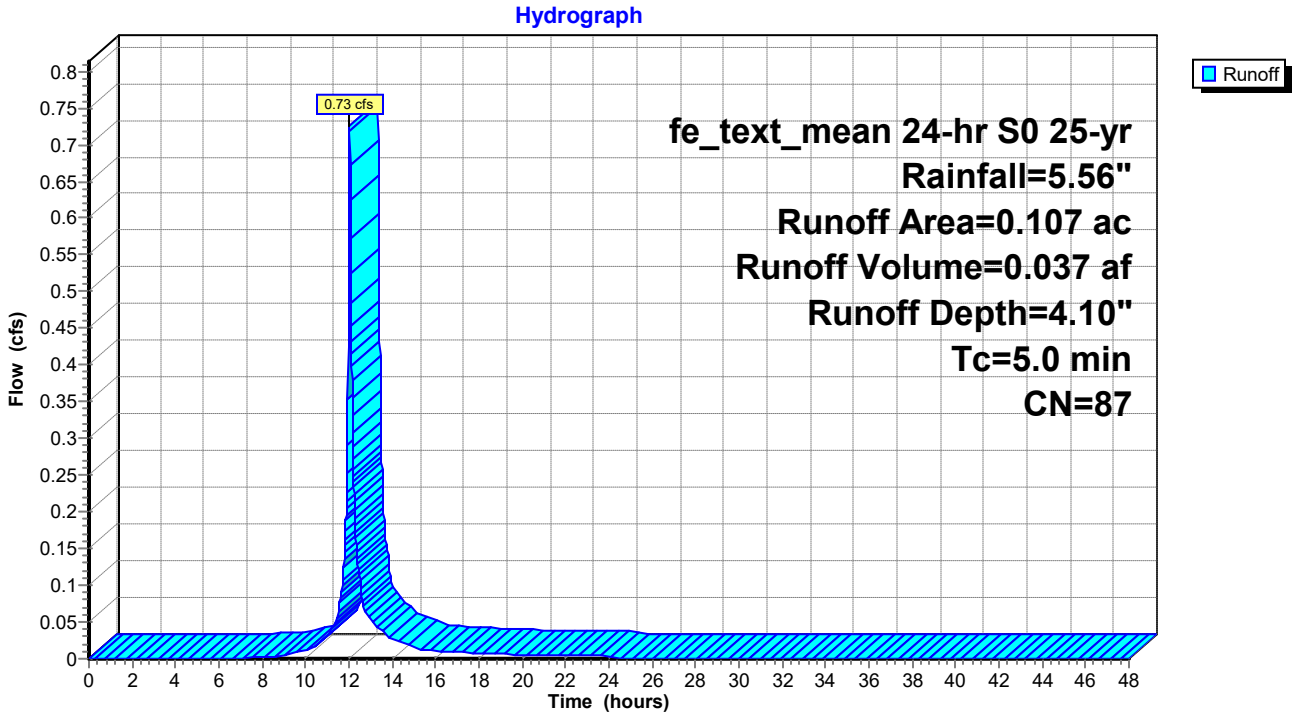
Runoff = 0.73 cfs @ 12.03 hrs, Volume= 0.037 af, Depth= 4.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.074	98	Impervious, HSG B
	0.033	61	>75% Grass cover, Good, HSG B
	0.107	87	Weighted Average
	0.033		30.84% Pervious Area
	0.074		69.16% Impervious Area

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

Subcatchment 18S: DA-18



Summary for Subcatchment 19S: DA-19

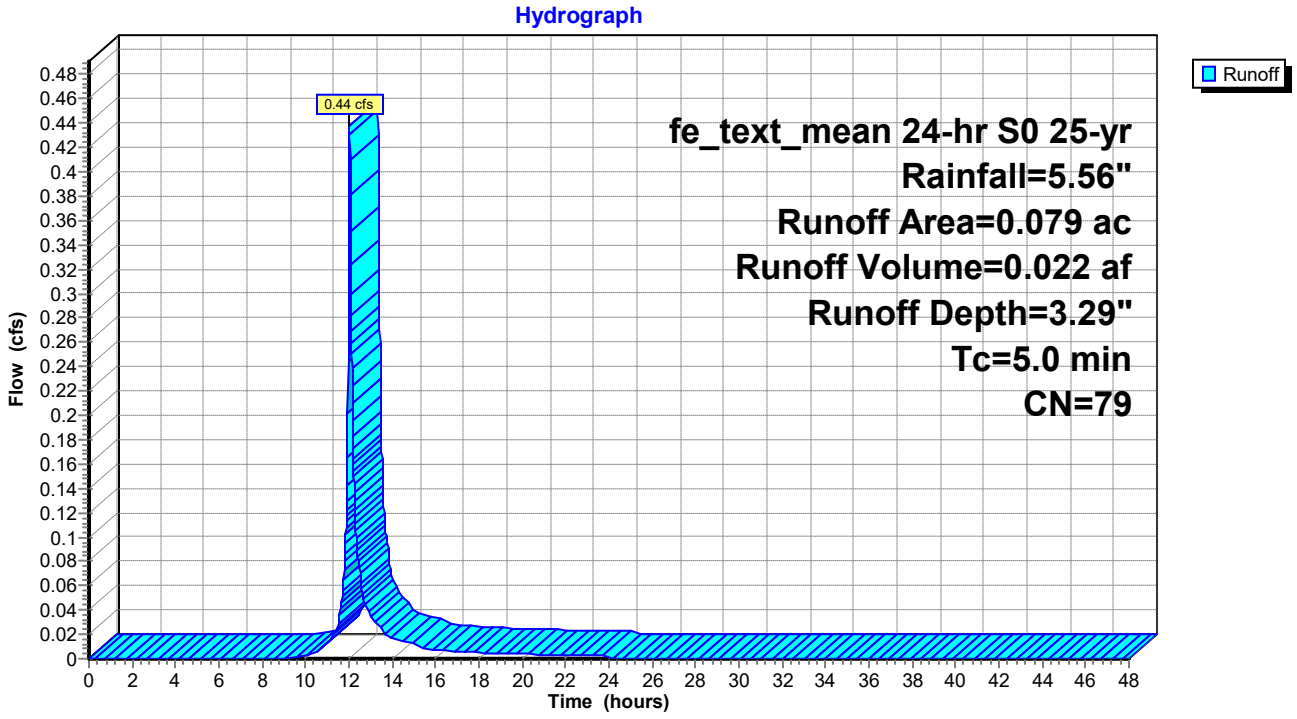
Runoff = 0.44 cfs @ 12.03 hrs, Volume= 0.022 af, Depth= 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.039	98	Impervious, HSG B
	0.040	61	>75% Grass cover, Good, HSG B
	0.079	79	Weighted Average
	0.040		50.63% Pervious Area
	0.039		49.37% Impervious Area

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

Subcatchment 19S: DA-19



Summary for Subcatchment 20S: DA-20

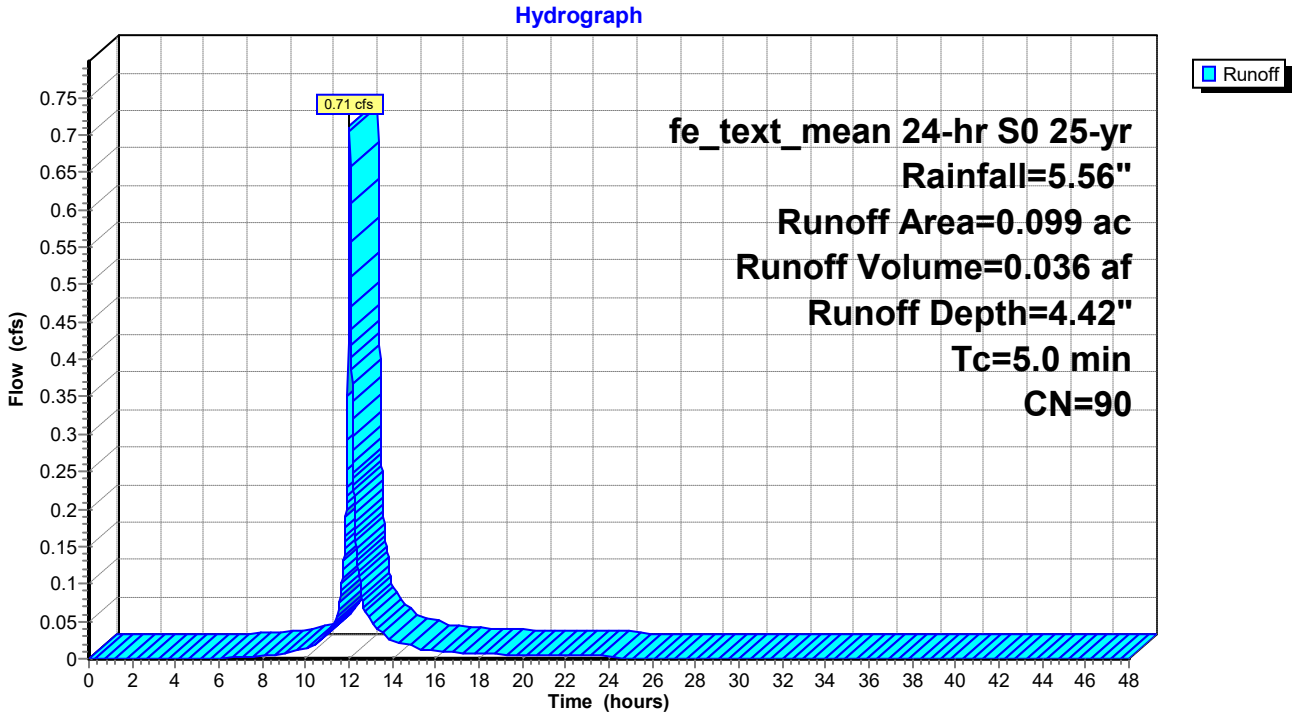
Runoff = 0.71 cfs @ 12.03 hrs, Volume= 0.036 af, Depth= 4.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

	Area (ac)	CN	Description
*	0.077	98	Impervious, HSG B
	0.022	61	>75% Grass cover, Good, HSG B
	0.099	90	Weighted Average
	0.022		22.22% Pervious Area
	0.077		77.78% Impervious Area

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

Subcatchment 20S: DA-20



Summary for Subcatchment 21S: DA-1A, DA-1B, DA-1C

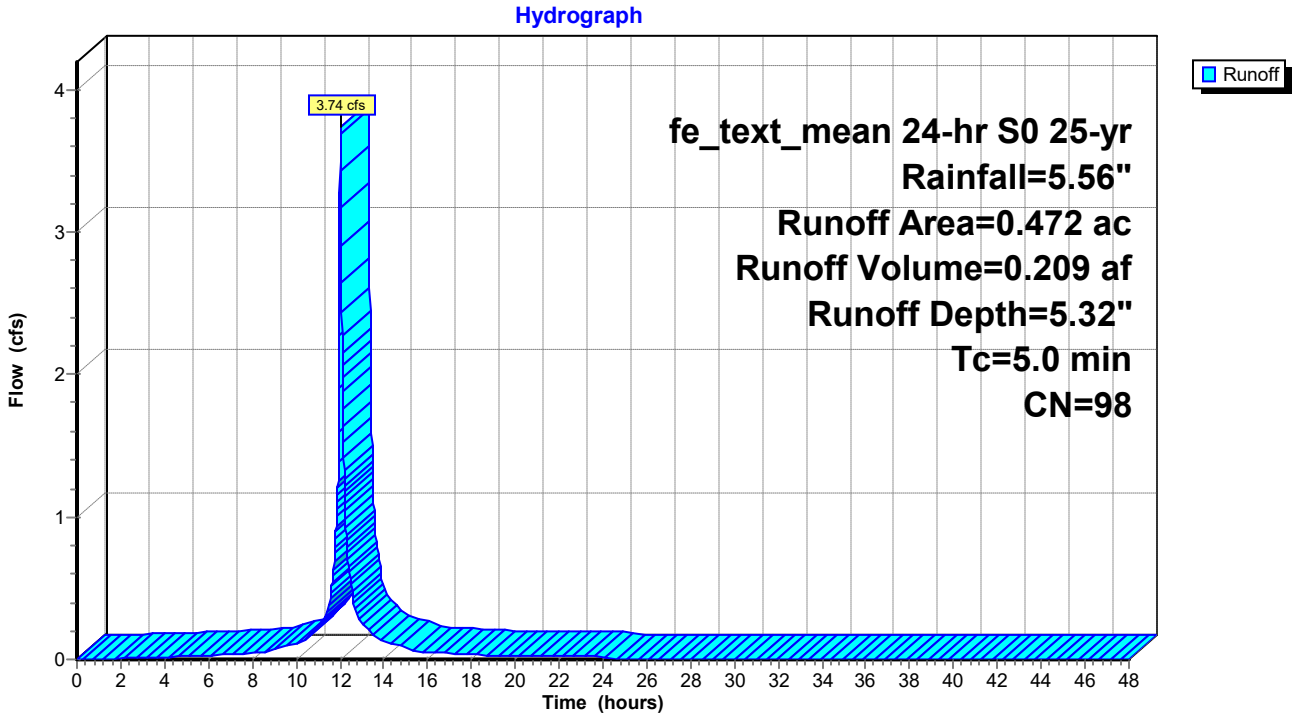
Runoff = 3.74 cfs @ 12.03 hrs, Volume= 0.209 af, Depth= 5.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 25-yr Rainfall=5.56"

Area (ac)	CN	Description
0.472	98	Roofs, HSG B
0.472		100.00% Impervious Area

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

Subcatchment 21S: DA-1A, DA-1B, DA-1C

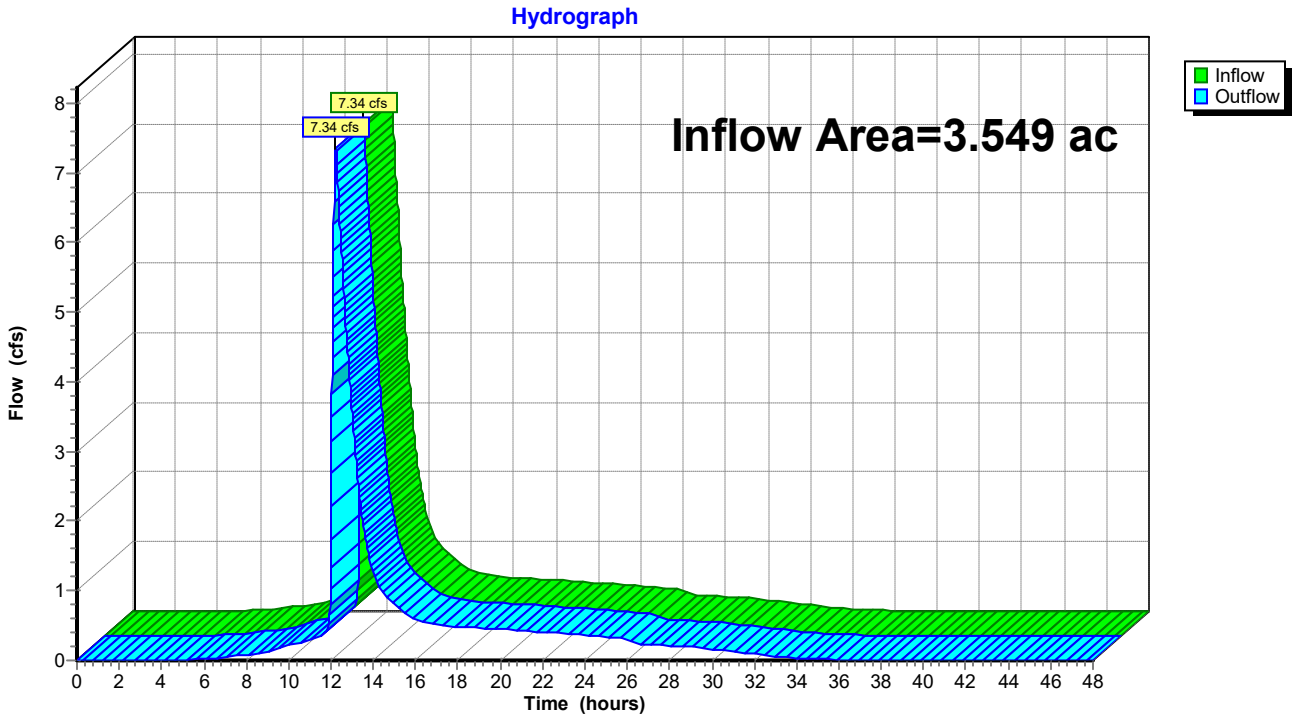


Summary for Reach 3R: On Site

Inflow Area = 3.549 ac, 77.88% Impervious, Inflow Depth > 4.41" for 25-yr event
Inflow = 7.34 cfs @ 12.23 hrs, Volume= 1.305 af
Outflow = 7.34 cfs @ 12.23 hrs, Volume= 1.305 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 3R: On Site

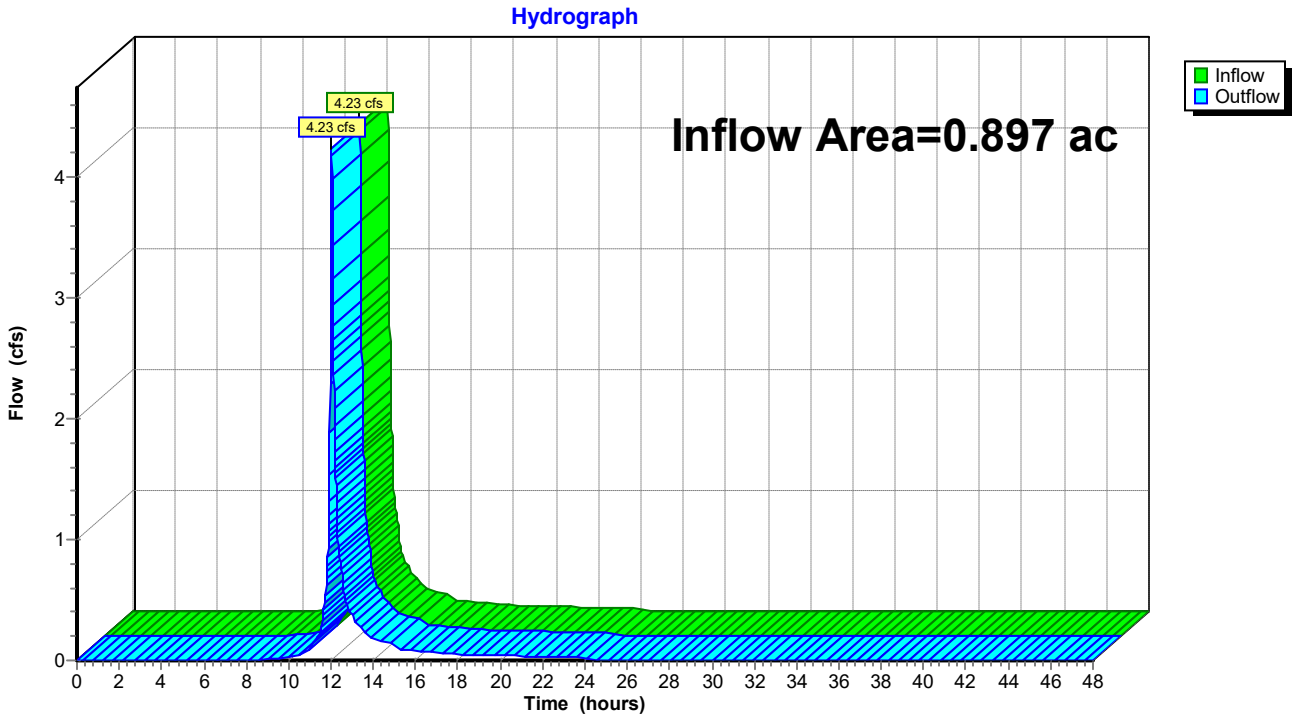


Summary for Reach 16R: Off Site

Inflow Area = 0.897 ac, 36.12% Impervious, Inflow Depth = 2.85" for 25-yr event
Inflow = 4.23 cfs @ 12.03 hrs, Volume= 0.213 af
Outflow = 4.23 cfs @ 12.03 hrs, Volume= 0.213 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 16R: Off Site

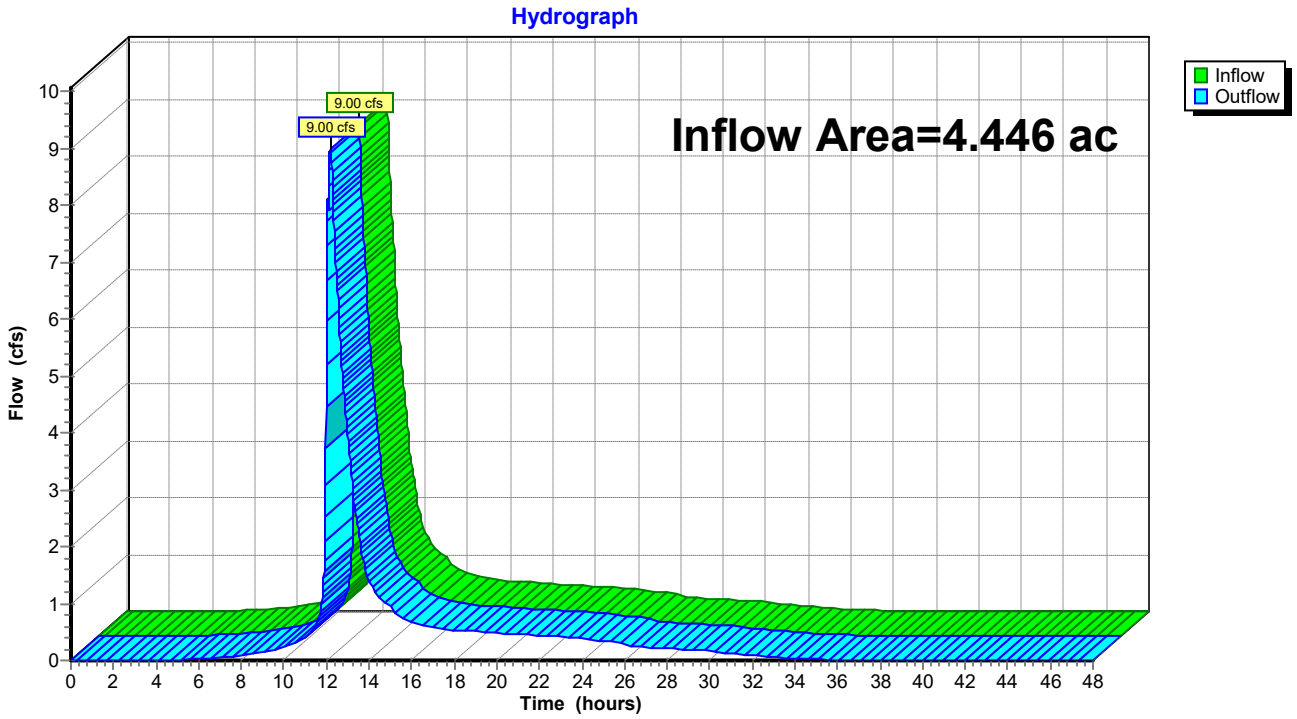


Summary for Reach 21R: Proposed Runoff

Inflow Area = 4.446 ac, 69.46% Impervious, Inflow Depth > 4.10" for 25-yr event
Inflow = 9.00 cfs @ 12.18 hrs, Volume= 1.518 af
Outflow = 9.00 cfs @ 12.18 hrs, Volume= 1.518 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 21R: Proposed Runoff



Summary for Pond 2P: Underground System

Inflow Area = 2.880 ac, 81.49% Impervious, Inflow Depth = 4.55" for 25-yr event
Inflow = 20.92 cfs @ 12.03 hrs, Volume= 1.093 af
Outflow = 5.89 cfs @ 12.25 hrs, Volume= 1.092 af, Atten= 72%, Lag= 13.6 min
Primary = 5.89 cfs @ 12.25 hrs, Volume= 1.092 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 645.01' @ 12.25 hrs Surf.Area= 0.153 ac Storage= 0.480 af

Plug-Flow detention time= 211.0 min calculated for 1.092 af (100% of inflow)
Center-of-Mass det. time= 210.2 min (978.6 - 768.4)

Volume	Invert	Avail.Storage	Storage Description
#1	640.25'	0.011 af	**4.00'D x 6.50'H Vertical Cone/Cylinder** x 6
#2A	640.25'	0.210 af	**37.08'W x 177.78'L x 5.50'H Field A** 0.832 af Overall - 0.306 af Embedded = 0.526 af x 40.0% Voids
#3A	641.00'	0.306 af	**ADS_StormTech MC-3500 d +Cap** x 120 Inside #2 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 120 Chambers in 5 Rows Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf
#4	646.60'	2.683 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		3.211 af	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
646.60	0.000	0.000	0.000
647.00	0.190	0.038	0.038
648.00	5.100	2.645	2.683

Device	Routing	Invert	Outlet Devices
#1	Device 4	640.25'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 4	642.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	645.00'	**4.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)
#4	Primary	640.25'	**12.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 640.25' / 639.75' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#5	Secondary	647.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.20 1.20 Width (feet) 0.00 20.00 80.00

Primary OutFlow Max=5.89 cfs @ 12.25 hrs HW=645.01' TW=0.00' (Dynamic Tailwater)
└─**4=Culvert** (Passes 5.89 cfs of 6.04 cfs potential flow)
  ├─**1=Orifice/Grate** (Orifice Controls 0.51 cfs @ 10.37 fps)
  ├─**2=Orifice/Grate** (Orifice Controls 5.36 cfs @ 6.83 fps)
  └─**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.02 cfs @ 0.37 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=640.25' TW=0.00' (Dynamic Tailwater)
└─**5=Custom Weir/Orifice** (Controls 0.00 cfs)

Pond 2P: Underground System - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

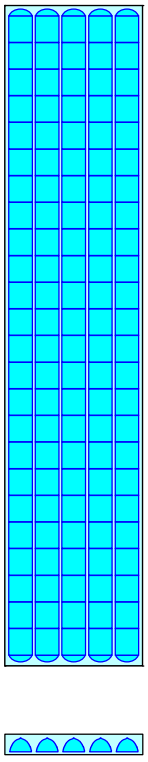
24 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 175.78' Row Length +12.0" End Stone x 2 = 177.78' Base Length
5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

120 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 13,343.2 cf Chamber Storage

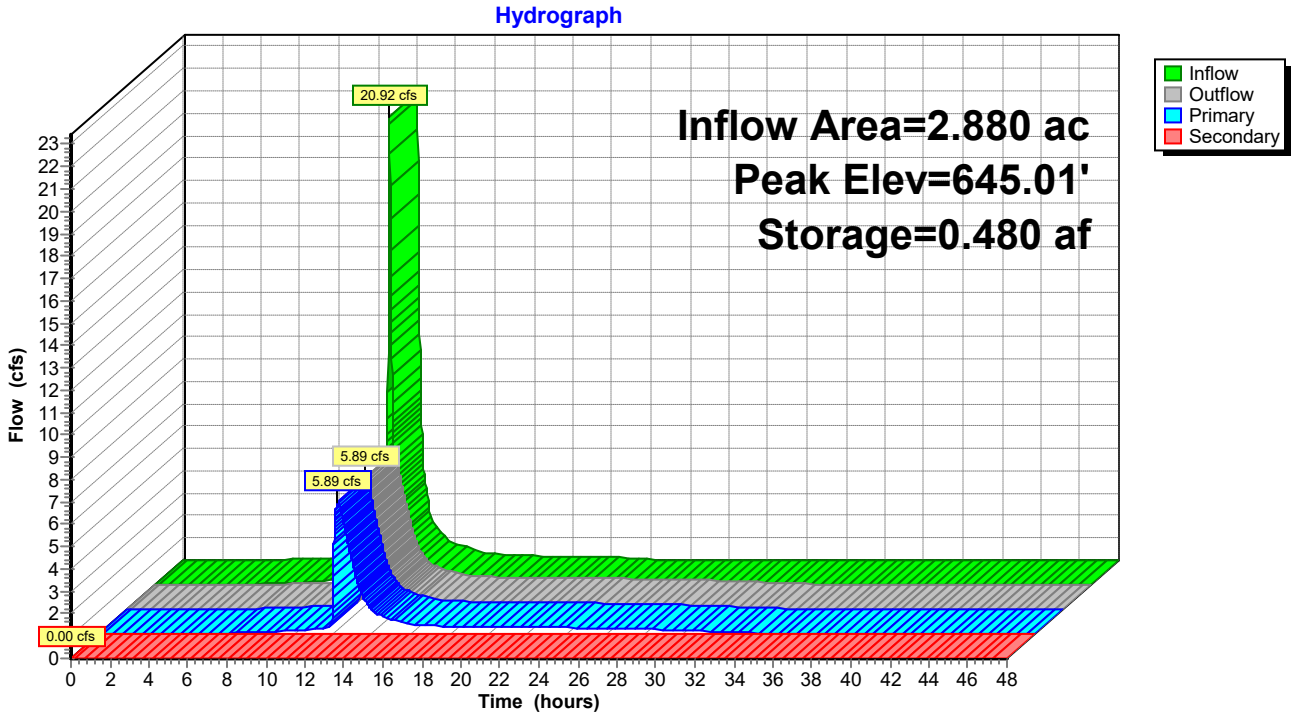
36,259.7 cf Field - 13,343.2 cf Chambers = 22,916.5 cf Stone x 40.0% Voids = 9,166.6 cf Stone Storage

Chamber Storage + Stone Storage = 22,509.8 cf = 0.517 af
Overall Storage Efficiency = 62.1%
Overall System Size = 177.78' x 37.08' x 5.50'

120 Chambers
1,343.0 cy Field
848.8 cy Stone



Pond 2P: Underground System



Summary for Pond 15P: Bio-Filtration Basin

Inflow Area = 0.669 ac, 62.33% Impervious, Inflow Depth = 3.83" for 25-yr event
Inflow = 4.26 cfs @ 12.03 hrs, Volume= 0.213 af
Outflow = 1.51 cfs @ 12.21 hrs, Volume= 0.213 af, Atten= 65%, Lag= 10.7 min
Primary = 0.17 cfs @ 12.21 hrs, Volume= 0.164 af
Secondary = 1.34 cfs @ 12.21 hrs, Volume= 0.049 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 645.66' @ 12.21 hrs Surf.Area= 2,024 sf Storage= 3,692 cf

Plug-Flow detention time= 181.3 min calculated for 0.213 af (100% of inflow)
Center-of-Mass det. time= 181.3 min (969.6 - 788.3)

Volume	Invert	Avail.Storage	Storage Description
#1	643.00'	5,556 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

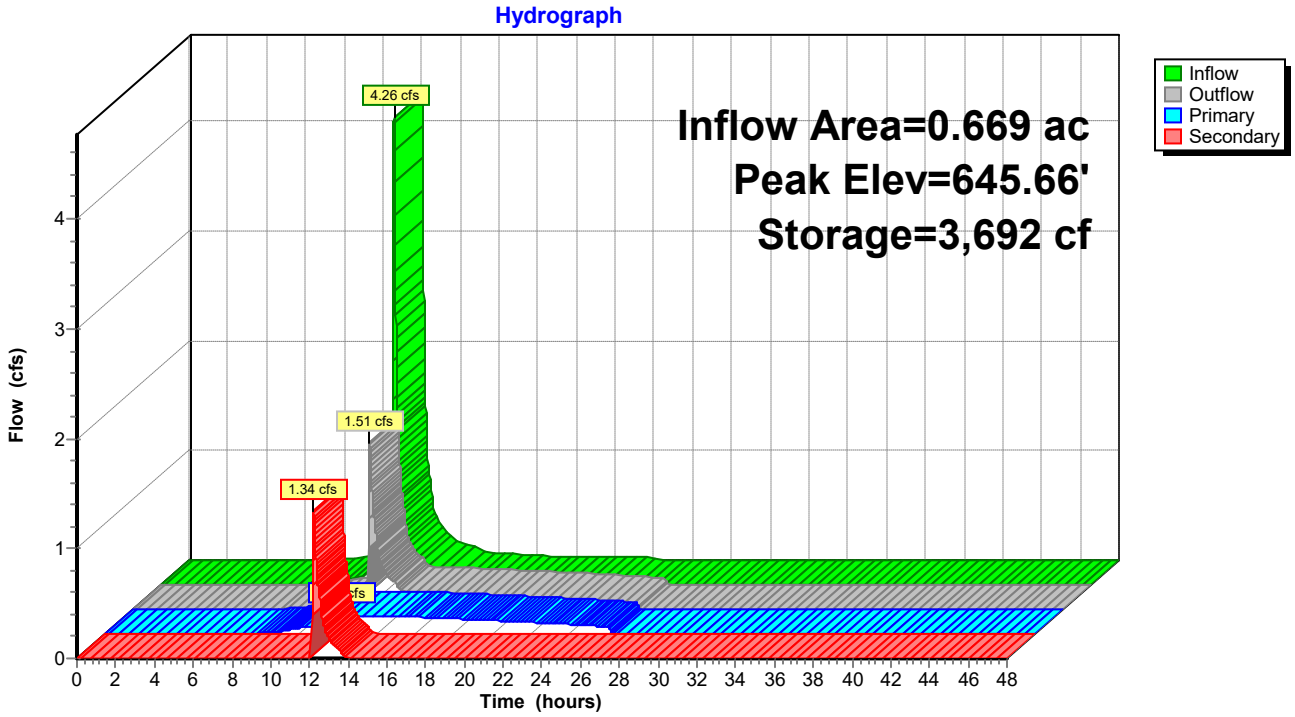
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
643.00	750	0	0
646.50	2,425	5,556	5,556

Device	Routing	Invert	Outlet Devices
#1	Primary	643.00'	**3.600 in/hr Underdrain over Surface area** Phase-In= 0.01'
#2	Secondary	645.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 in 24.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.17 cfs @ 12.21 hrs HW=645.66' TW=0.00' (Dynamic Tailwater)
↑—**1=Underdrain** (Exfiltration Controls 0.17 cfs)

Secondary OutFlow Max=1.34 cfs @ 12.21 hrs HW=645.66' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Weir Controls 1.34 cfs @ 1.32 fps)

Pond 15P: Bio-Filtration Basin



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: DA-1 Runoff Area=0.711 ac 27.85% Impervious Runoff Depth=4.19"
Tc=5.0 min CN=71 Runoff=4.65 cfs 0.248 af

Subcatchment 2S: DA-2 Runoff Area=0.905 ac 79.01% Impervious Runoff Depth=6.36"
Tc=5.0 min CN=90 Runoff=8.52 cfs 0.480 af

Subcatchment 3S: DA-3 Runoff Area=0.566 ac 80.57% Impervious Runoff Depth=6.48"
Tc=5.0 min CN=91 Runoff=5.39 cfs 0.306 af

Subcatchment 4S: DA-4 Runoff Area=0.233 ac 87.12% Impervious Runoff Depth=6.72"
Tc=5.0 min CN=93 Runoff=2.26 cfs 0.130 af

Subcatchment 5S: DA-5 Runoff Area=0.138 ac 52.17% Impervious Runoff Depth=5.20"
Tc=5.0 min CN=80 Runoff=1.11 cfs 0.060 af

Subcatchment 6S: DA-6 Runoff Area=0.121 ac 60.33% Impervious Runoff Depth=5.55"
Tc=5.0 min CN=83 Runoff=1.03 cfs 0.056 af

Subcatchment 7S: DA-7 Runoff Area=0.063 ac 39.68% Impervious Runoff Depth=4.75"
Tc=5.0 min CN=76 Runoff=0.47 cfs 0.025 af

Subcatchment 8S: DA-8 Runoff Area=0.171 ac 88.30% Impervious Runoff Depth=6.83"
Tc=5.0 min CN=94 Runoff=1.67 cfs 0.097 af

Subcatchment 9S: DA-9 Runoff Area=0.211 ac 85.31% Impervious Runoff Depth=6.72"
Tc=5.0 min CN=93 Runoff=2.05 cfs 0.118 af

Subcatchment 10S: DA-10 Runoff Area=0.042 ac 85.71% Impervious Runoff Depth=6.72"
Tc=5.0 min CN=93 Runoff=0.41 cfs 0.024 af

Subcatchment 11S: DA-11 Runoff Area=0.010 ac 50.00% Impervious Runoff Depth=5.20"
Tc=5.0 min CN=80 Runoff=0.08 cfs 0.004 af

Subcatchment 12S: DA-12 Runoff Area=0.065 ac 84.62% Impervious Runoff Depth=6.60"
Tc=5.0 min CN=92 Runoff=0.62 cfs 0.036 af

Subcatchment 13S: DA-13 Runoff Area=0.069 ac 43.48% Impervious Runoff Depth=4.86"
Tc=5.0 min CN=77 Runoff=0.52 cfs 0.028 af

Subcatchment 14S: DA-14 Runoff Area=0.099 ac 72.73% Impervious Runoff Depth=6.13"
Tc=5.0 min CN=88 Runoff=0.91 cfs 0.051 af

Subcatchment 15S: DA-15 Runoff Area=0.044 ac 50.00% Impervious Runoff Depth=5.20"
Tc=5.0 min CN=80 Runoff=0.35 cfs 0.019 af

Subcatchment 16S: DA-16 Runoff Area=0.146 ac 58.22% Impervious Runoff Depth=5.55"
Tc=5.0 min CN=83 Runoff=1.24 cfs 0.068 af

Subcatchment 17S: DA-17 Runoff Area=0.095 ac 50.53% Impervious Runoff Depth=5.20"
Tc=5.0 min CN=80 Runoff=0.77 cfs 0.041 af

Subcatchment 18S: DA-18 Runoff Area=0.107 ac 69.16% Impervious Runoff Depth=6.01"
Tc=5.0 min CN=87 Runoff=0.97 cfs 0.054 af

Subcatchment 19S: DA-19 Runoff Area=0.079 ac 49.37% Impervious Runoff Depth=5.09"
Tc=5.0 min CN=79 Runoff=0.62 cfs 0.034 af

Subcatchment 20S: DA-20 Runoff Area=0.099 ac 77.78% Impervious Runoff Depth=6.36"
Tc=5.0 min CN=90 Runoff=0.93 cfs 0.052 af

Subcatchment 21S: DA-1A, DA-1B, DA-1C Runoff Area=0.472 ac 100.00% Impervious Runoff Depth=7.31"
Tc=5.0 min CN=98 Runoff=4.71 cfs 0.288 af

Reach 3R: On Site Inflow=11.68 cfs 1.876 af
Outflow=11.68 cfs 1.876 af

Reach 16R: Off Site Inflow=6.28 cfs 0.340 af
Outflow=6.28 cfs 0.340 af

Reach 21R: Proposed Runoff Inflow=16.92 cfs 2.216 af
Outflow=16.92 cfs 2.216 af

Pond 2P: Underground System Peak Elev=647.12' Storage=0.626 af Inflow=27.21 cfs 1.560 af
Primary=7.39 cfs 1.544 af Secondary=0.69 cfs 0.014 af Outflow=8.08 cfs 1.558 af

Pond 15P: Bio-Filtration Basin Peak Elev=645.85' Storage=4,077 cf Inflow=5.80 cfs 0.318 af
Primary=0.18 cfs 0.193 af Secondary=4.22 cfs 0.125 af Outflow=4.39 cfs 0.318 af

Total Runoff Area = 4.446 ac Runoff Volume = 2.218 af Average Runoff Depth = 5.99"
30.54% Pervious = 1.358 ac 69.46% Impervious = 3.088 ac

Summary for Subcatchment 1S: DA-1

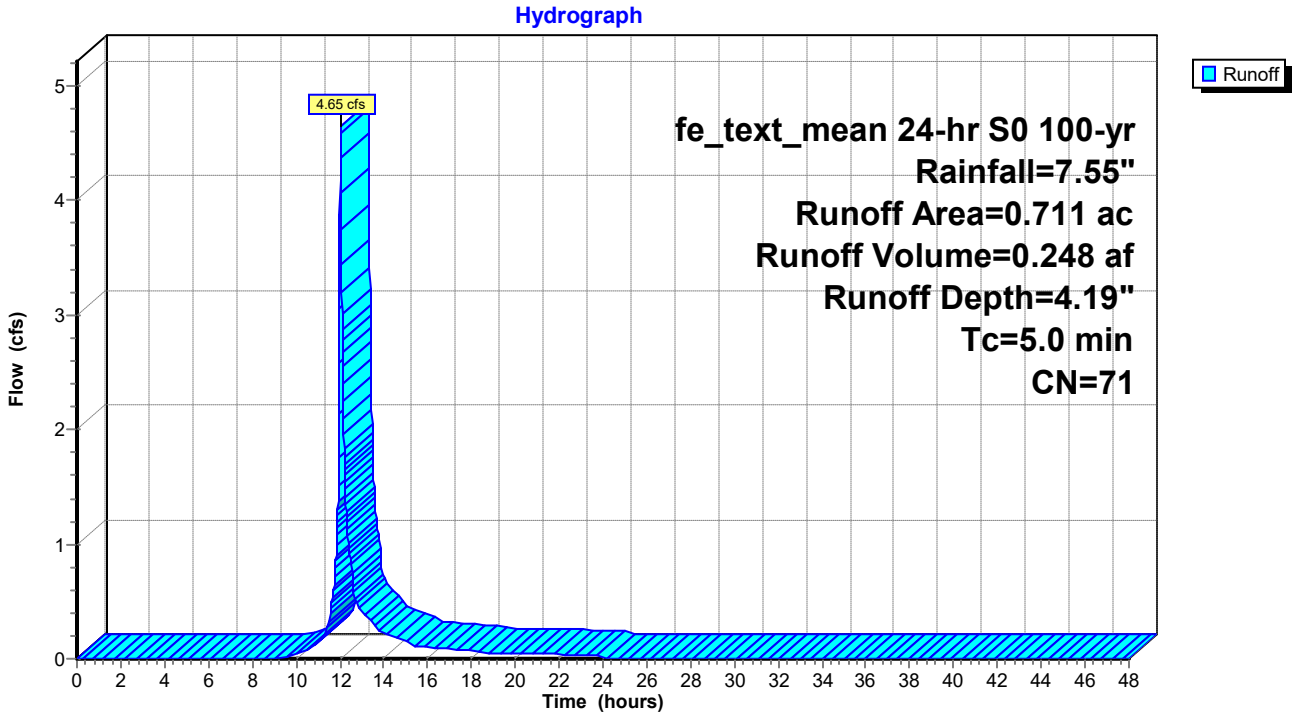
Runoff = 4.65 cfs @ 12.03 hrs, Volume= 0.248 af, Depth= 4.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.198	98	Impervious, HSG B
	0.513	61	>75% Grass cover, Good, HSG B
	0.711	71	Weighted Average
	0.513		72.15% Pervious Area
	0.198		27.85% Impervious Area

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

Subcatchment 1S: DA-1



Summary for Subcatchment 2S: DA-2

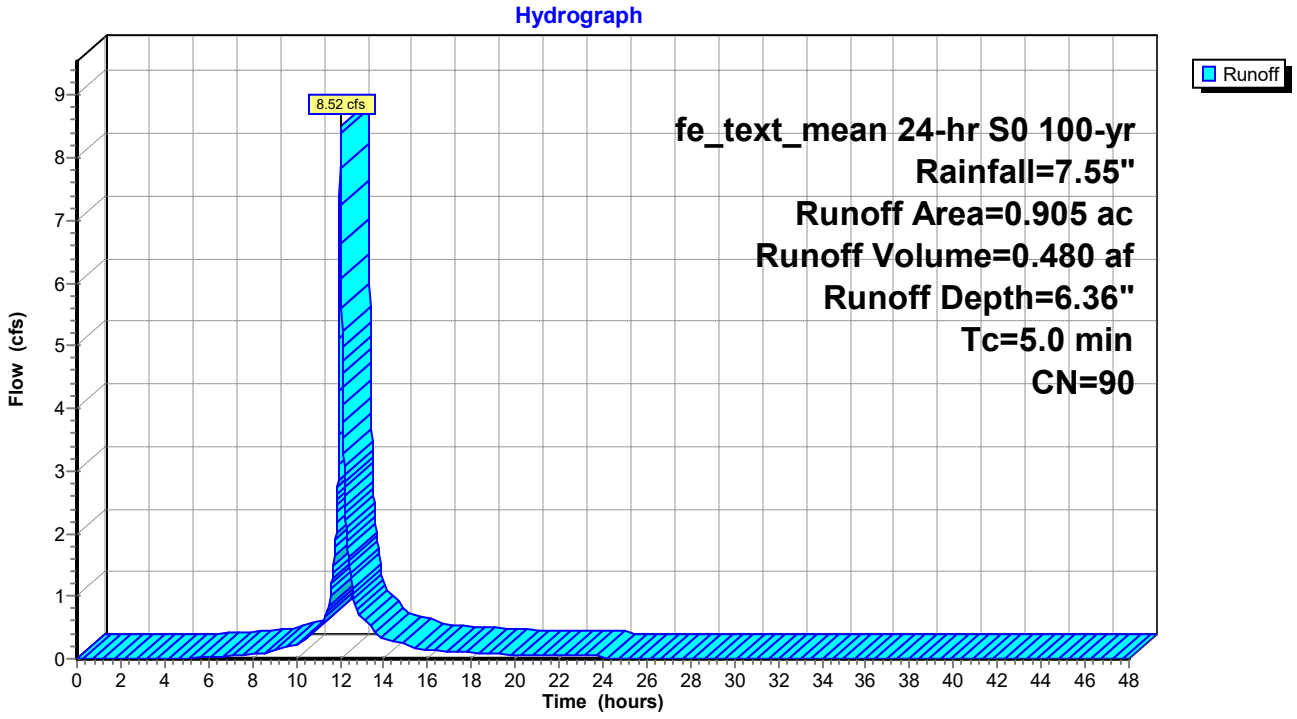
Runoff = 8.52 cfs @ 12.03 hrs, Volume= 0.480 af, Depth= 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.715	98	Impervious, HSG B
	0.190	61	>75% Grass cover, Good, HSG B
	0.905	90	Weighted Average
	0.190		20.99% Pervious Area
	0.715		79.01% Impervious Area

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

Subcatchment 2S: DA-2



Summary for Subcatchment 3S: DA-3

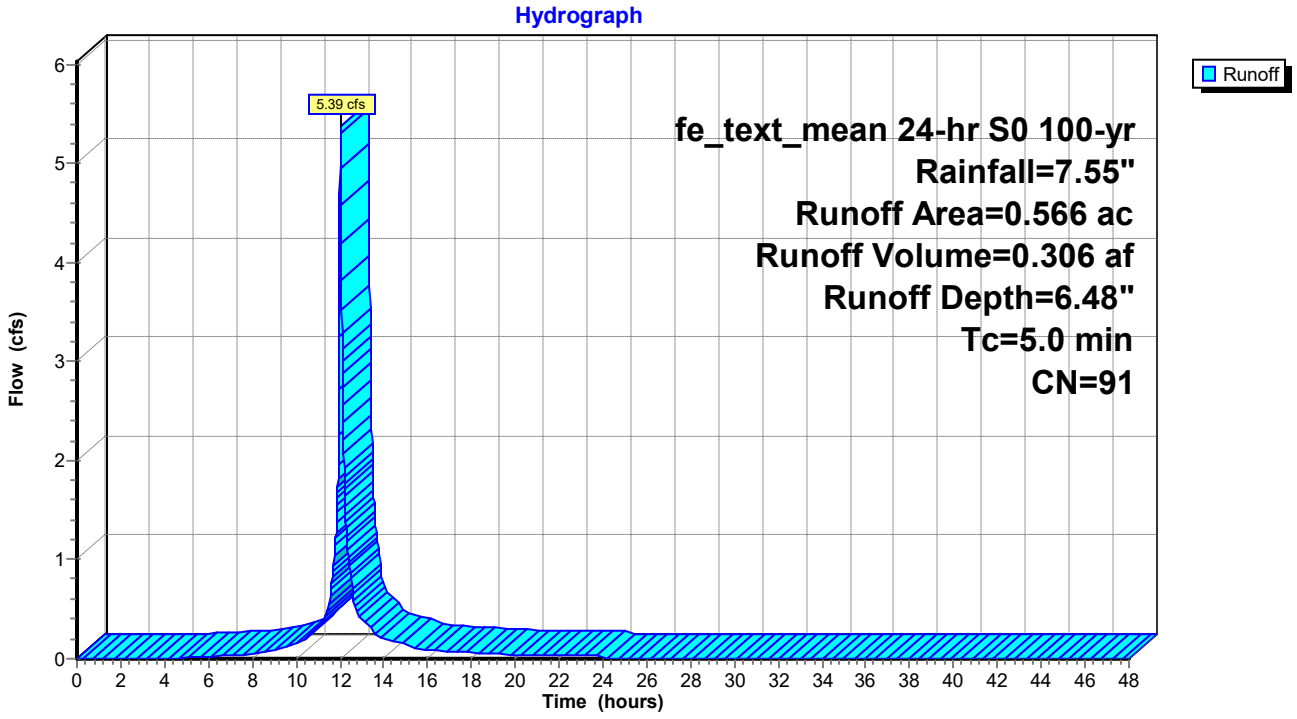
Runoff = 5.39 cfs @ 12.03 hrs, Volume= 0.306 af, Depth= 6.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.456	98	Impervious, HSG B
	0.110	61	>75% Grass cover, Good, HSG B
	0.566	91	Weighted Average
	0.110		19.43% Pervious Area
	0.456		80.57% Impervious Area

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

Subcatchment 3S: DA-3



Summary for Subcatchment 4S: DA-4

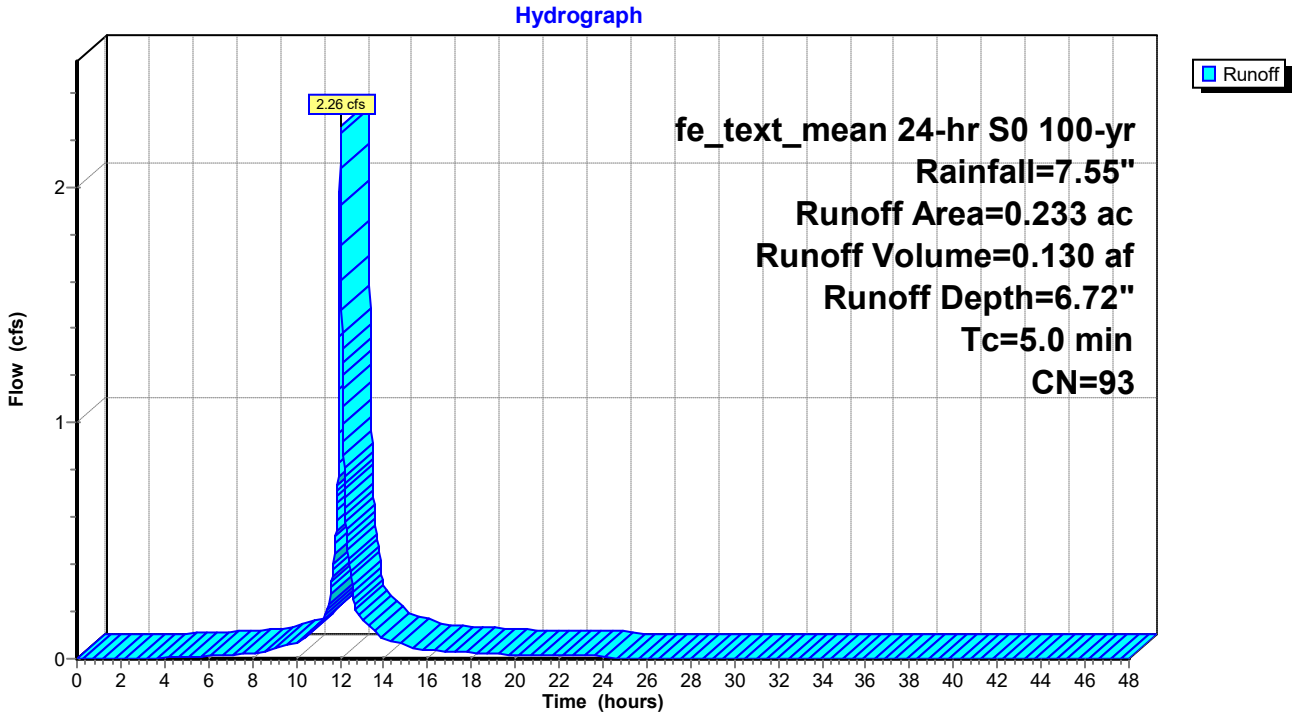
Runoff = 2.26 cfs @ 12.03 hrs, Volume= 0.130 af, Depth= 6.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.203	98	Impervious, HSG B
	0.030	61	>75% Grass cover, Good, HSG B
	0.233	93	Weighted Average
	0.030		12.88% Pervious Area
	0.203		87.12% Impervious Area

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

Subcatchment 4S: DA-4



Summary for Subcatchment 5S: DA-5

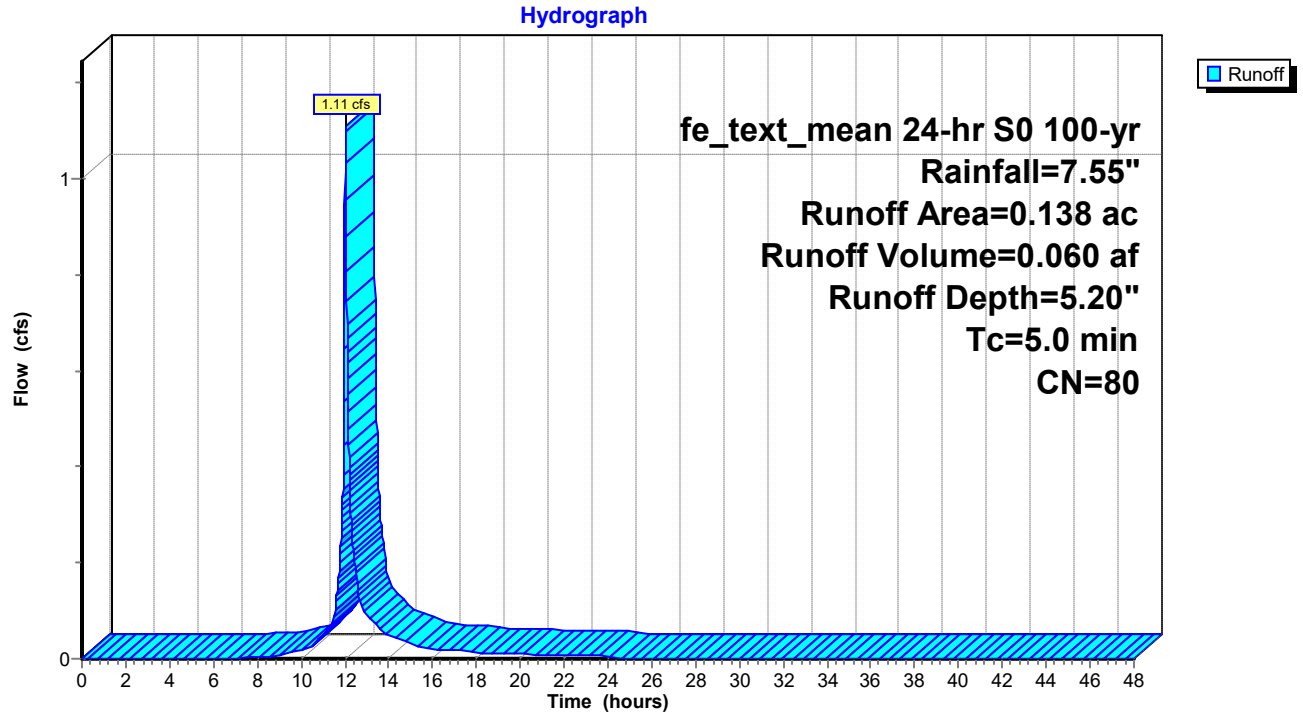
Runoff = 1.11 cfs @ 12.03 hrs, Volume= 0.060 af, Depth= 5.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.072	98	Impervious, HSG B
	0.066	61	>75% Grass cover, Good, HSG B
	0.138	80	Weighted Average
	0.066		47.83% Pervious Area
	0.072		52.17% Impervious Area

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

Subcatchment 5S: DA-5



Summary for Subcatchment 6S: DA-6

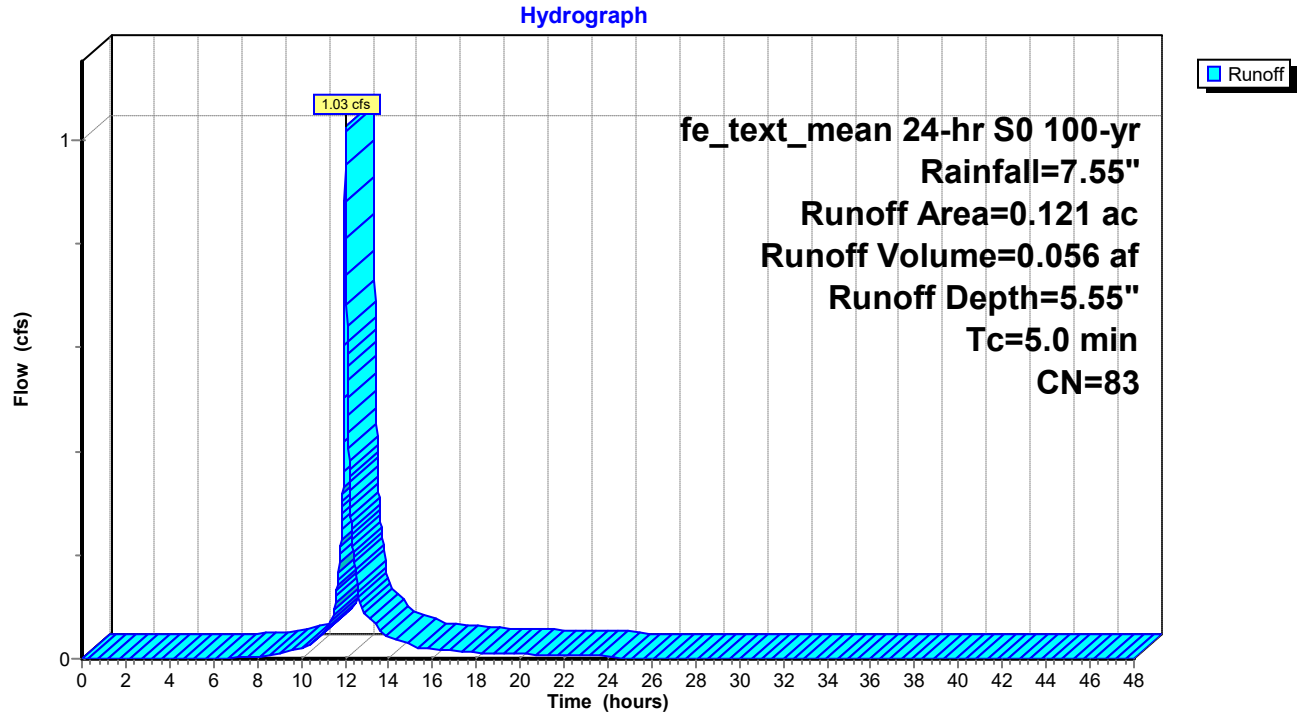
Runoff = 1.03 cfs @ 12.03 hrs, Volume= 0.056 af, Depth= 5.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.073	98	Impervious, HSG B
	0.048	61	>75% Grass cover, Good, HSG B
	0.121	83	Weighted Average
	0.048		39.67% Pervious Area
	0.073		60.33% Impervious Area

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

Subcatchment 6S: DA-6



Summary for Subcatchment 7S: DA-7

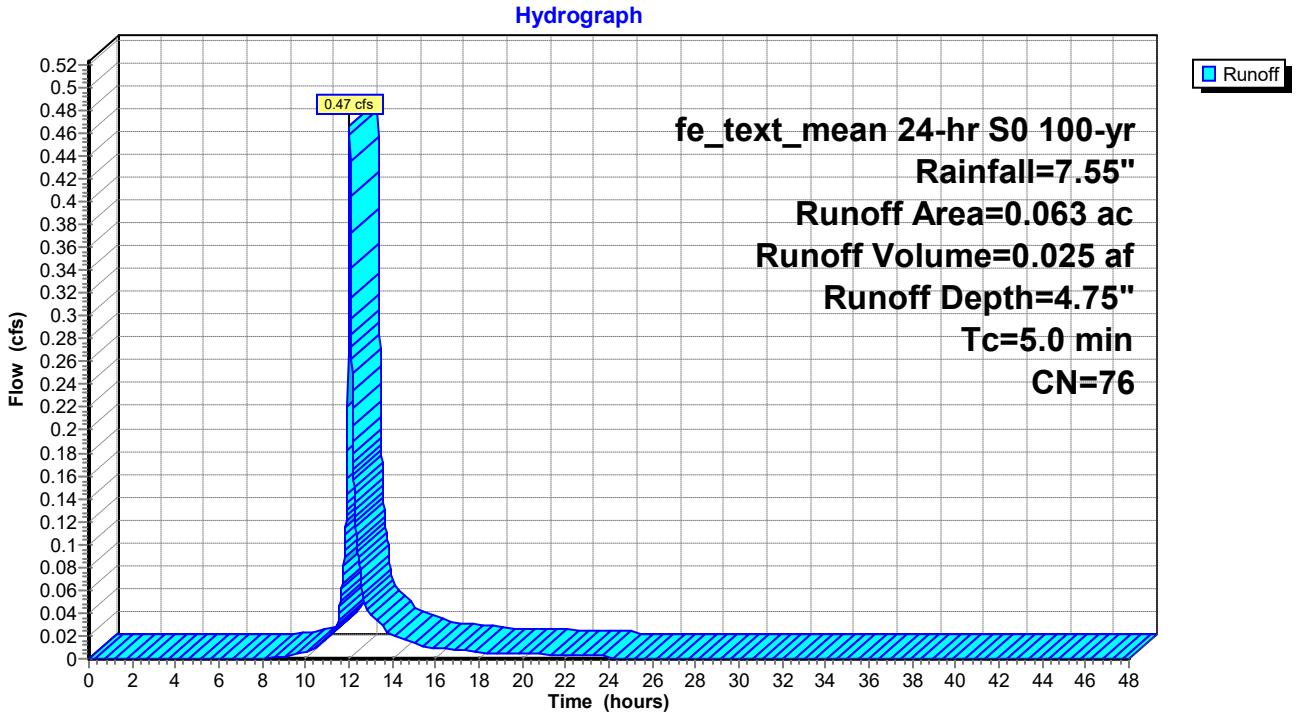
Runoff = 0.47 cfs @ 12.03 hrs, Volume= 0.025 af, Depth= 4.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.025	98	Impervious, HSG B
	0.038	61	>75% Grass cover, Good, HSG B
	0.063	76	Weighted Average
	0.038		60.32% Pervious Area
	0.025		39.68% Impervious Area

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

Subcatchment 7S: DA-7



Summary for Subcatchment 8S: DA-8

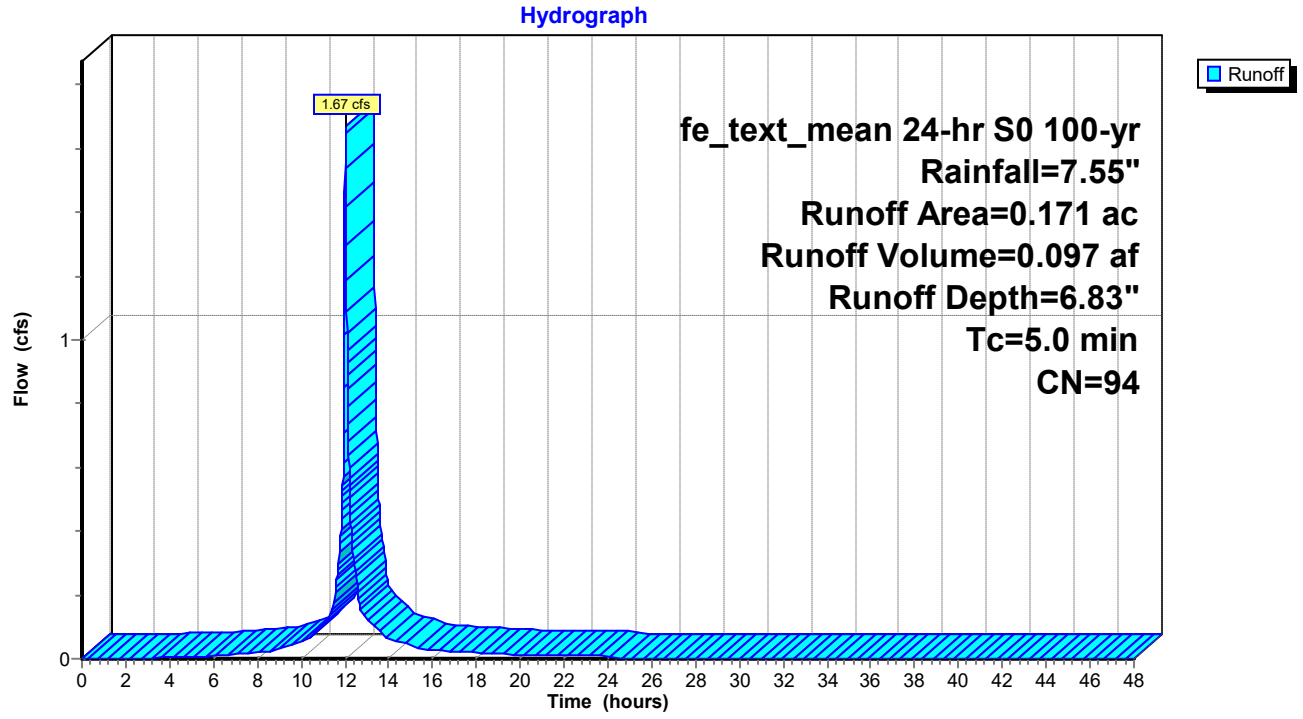
Runoff = 1.67 cfs @ 12.03 hrs, Volume= 0.097 af, Depth= 6.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.151	98	Impervious, HSG B
	0.020	61	>75% Grass cover, Good, HSG B
	0.171	94	Weighted Average
	0.020		11.70% Pervious Area
	0.151		88.30% Impervious Area

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

Subcatchment 8S: DA-8



Summary for Subcatchment 9S: DA-9

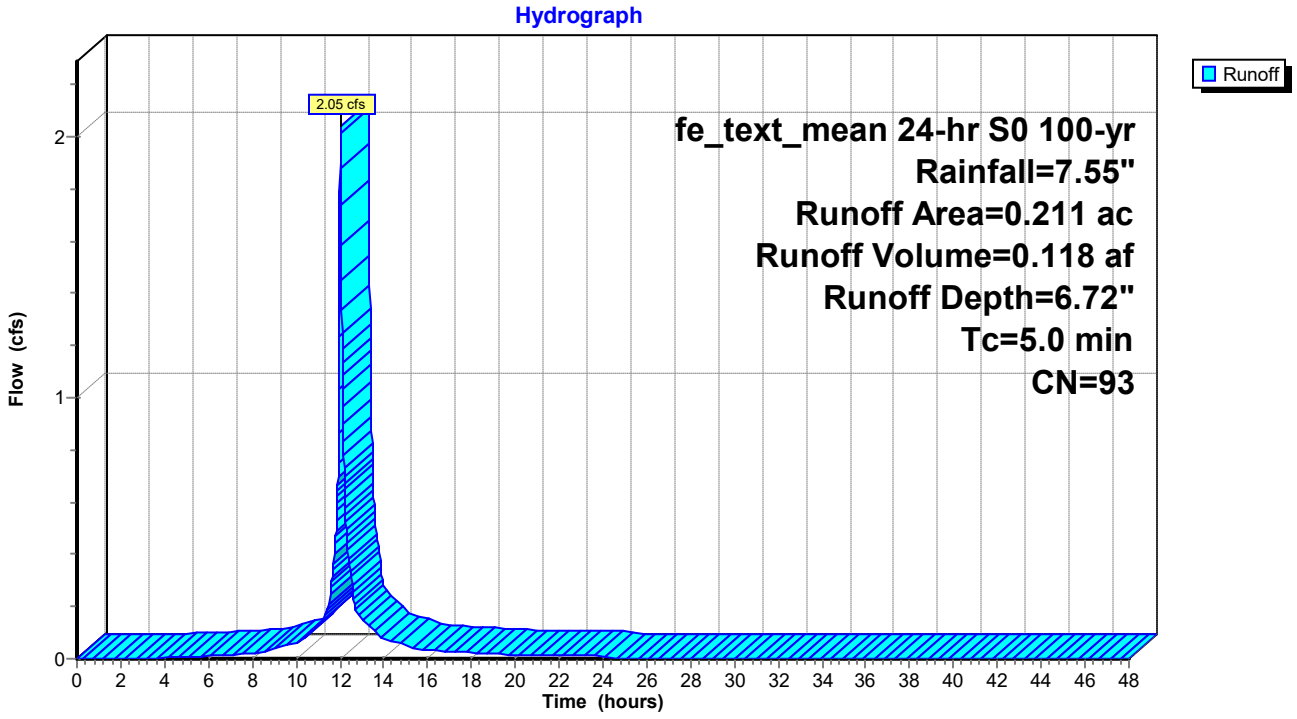
Runoff = 2.05 cfs @ 12.03 hrs, Volume= 0.118 af, Depth= 6.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.180	98	Impervious, HSG B
	0.031	61	>75% Grass cover, Good, HSG B
	0.211	93	Weighted Average
	0.031		14.69% Pervious Area
	0.180		85.31% Impervious Area

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

Subcatchment 9S: DA-9



Summary for Subcatchment 10S: DA-10

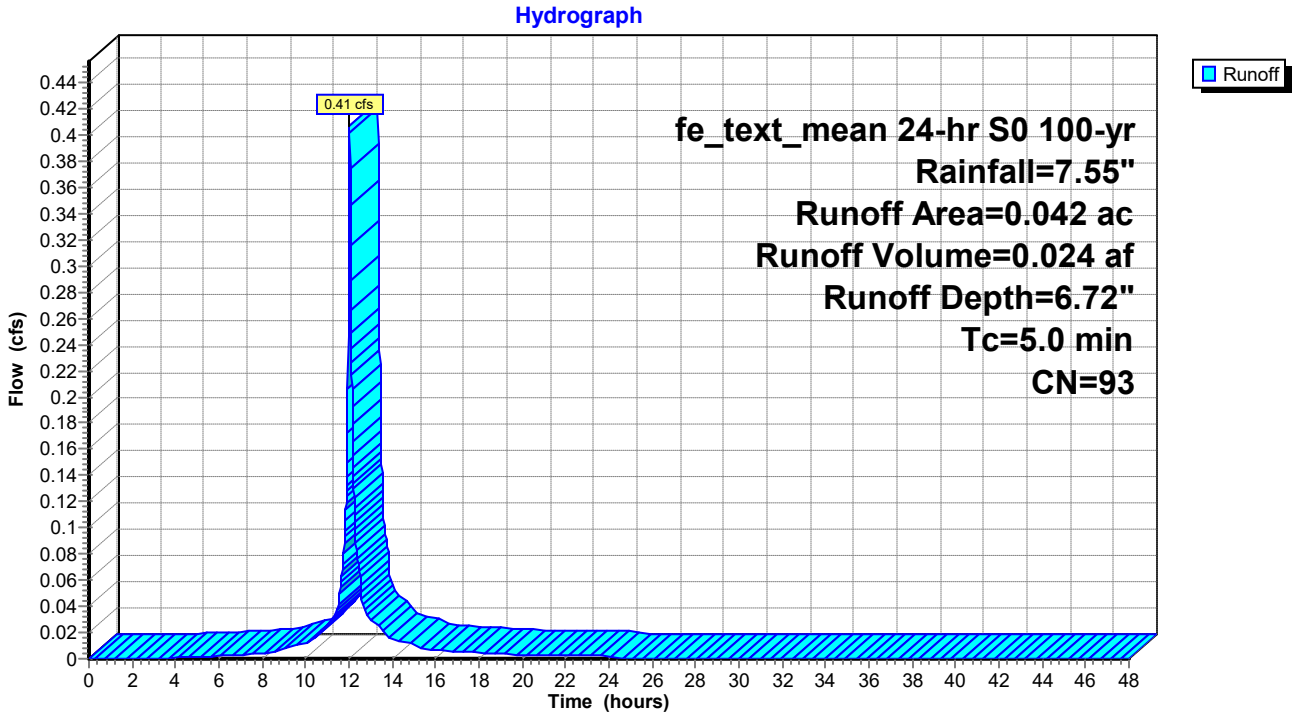
Runoff = 0.41 cfs @ 12.03 hrs, Volume= 0.024 af, Depth= 6.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.036	98	Impervious, HSG B
	0.006	61	>75% Grass cover, Good, HSG B
	0.042	93	Weighted Average
	0.006		14.29% Pervious Area
	0.036		85.71% Impervious Area

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

Subcatchment 10S: DA-10



Summary for Subcatchment 11S: DA-11

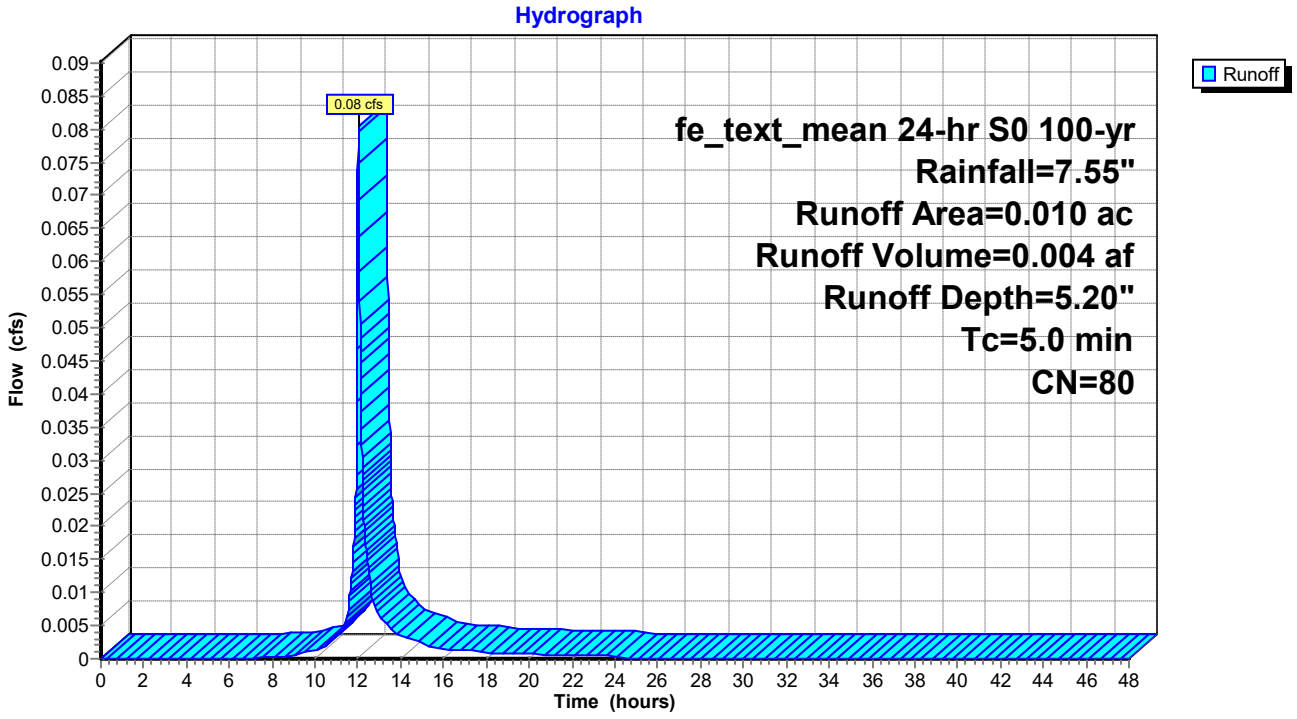
Runoff = 0.08 cfs @ 12.03 hrs, Volume= 0.004 af, Depth= 5.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.005	98	Impervious, HSG B
	0.005	61	>75% Grass cover, Good, HSG B
	0.010	80	Weighted Average
	0.005		50.00% Pervious Area
	0.005		50.00% Impervious Area

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

Subcatchment 11S: DA-11



Summary for Subcatchment 12S: DA-12

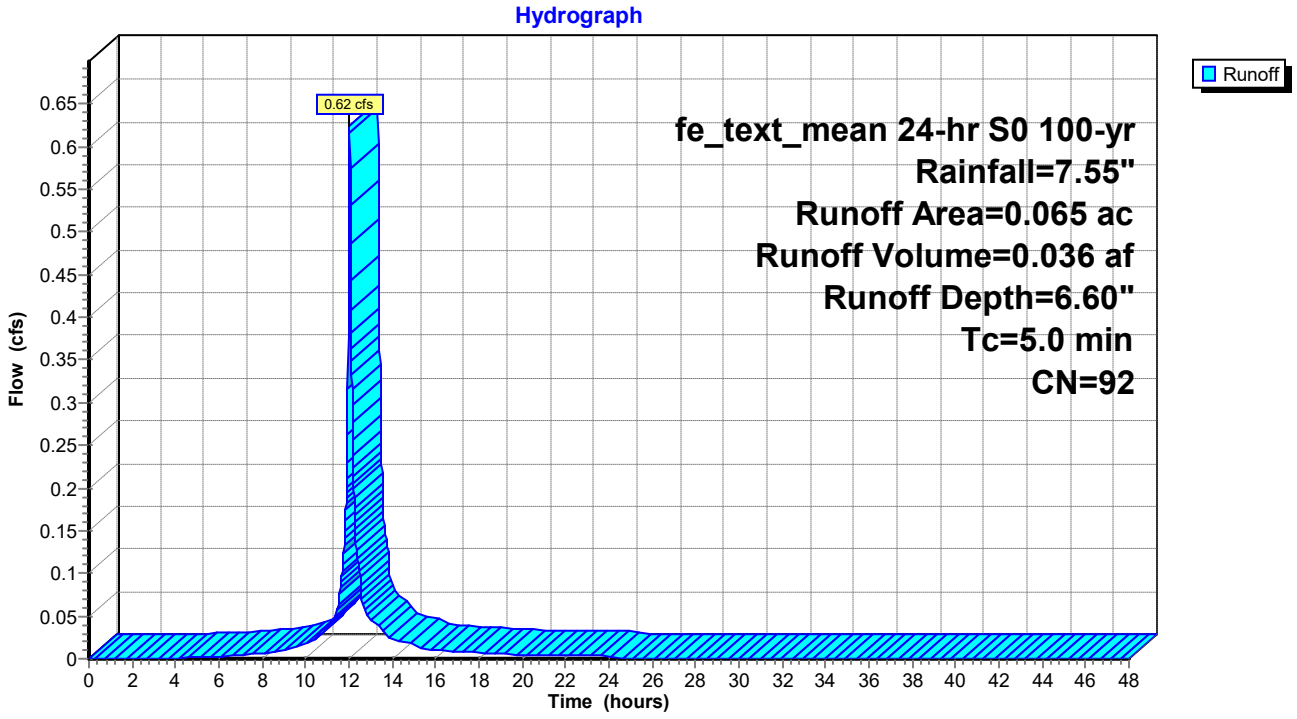
Runoff = 0.62 cfs @ 12.03 hrs, Volume= 0.036 af, Depth= 6.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.055	98	Impervious, HSG B
	0.010	61	>75% Grass cover, Good, HSG B
	0.065	92	Weighted Average
	0.010		15.38% Pervious Area
	0.055		84.62% Impervious Area

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

Subcatchment 12S: DA-12



Summary for Subcatchment 13S: DA-13

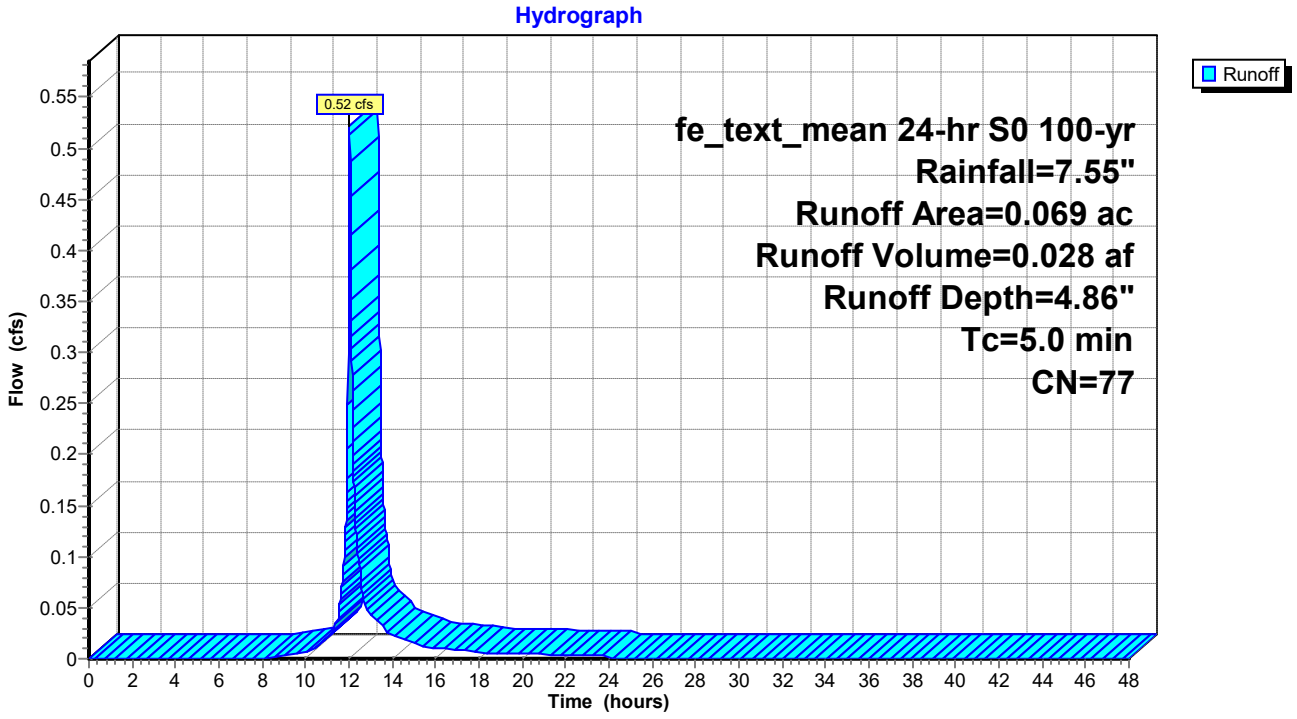
Runoff = 0.52 cfs @ 12.03 hrs, Volume= 0.028 af, Depth= 4.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.030	98	Impervious, HSG B
	0.039	61	>75% Grass cover, Good, HSG B
	0.069	77	Weighted Average
	0.039		56.52% Pervious Area
	0.030		43.48% Impervious Area

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

Subcatchment 13S: DA-13



Summary for Subcatchment 14S: DA-14

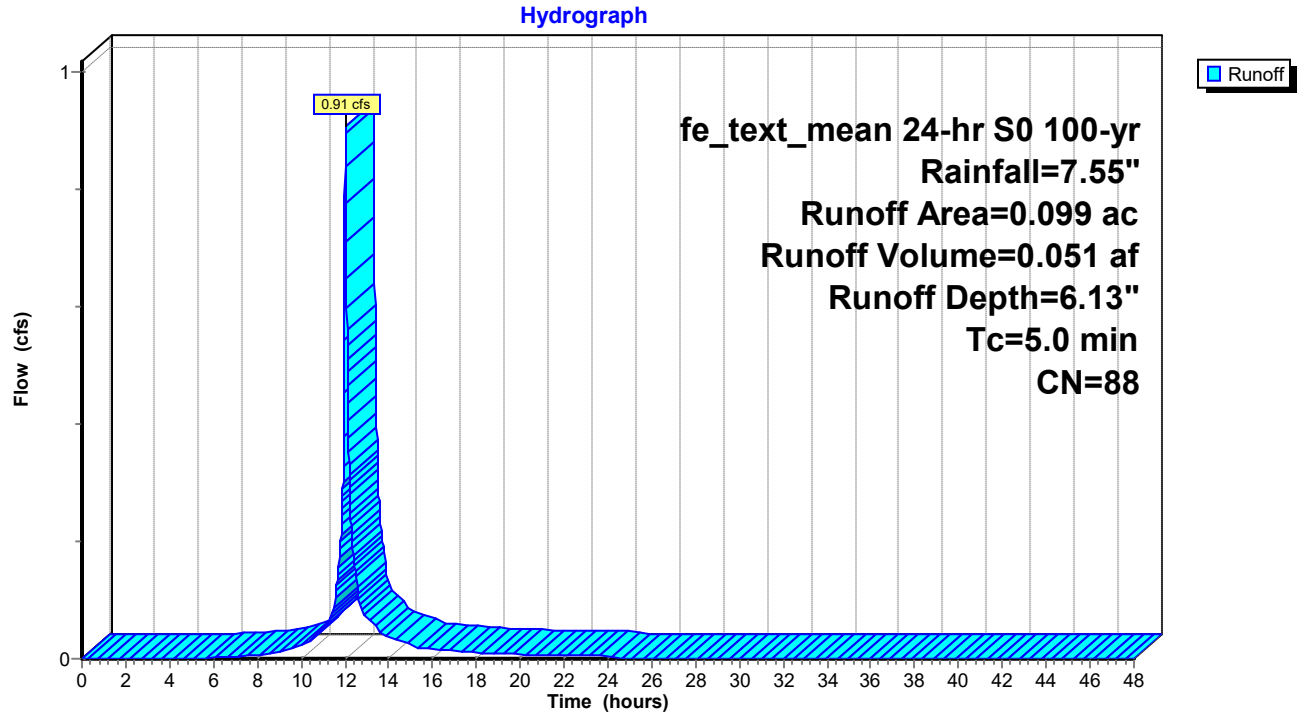
Runoff = 0.91 cfs @ 12.03 hrs, Volume= 0.051 af, Depth= 6.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.072	98	Impervious, HSG B
	0.027	61	>75% Grass cover, Good, HSG B
	0.099	88	Weighted Average
	0.027		27.27% Pervious Area
	0.072		72.73% Impervious Area

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

Subcatchment 14S: DA-14



Summary for Subcatchment 15S: DA-15

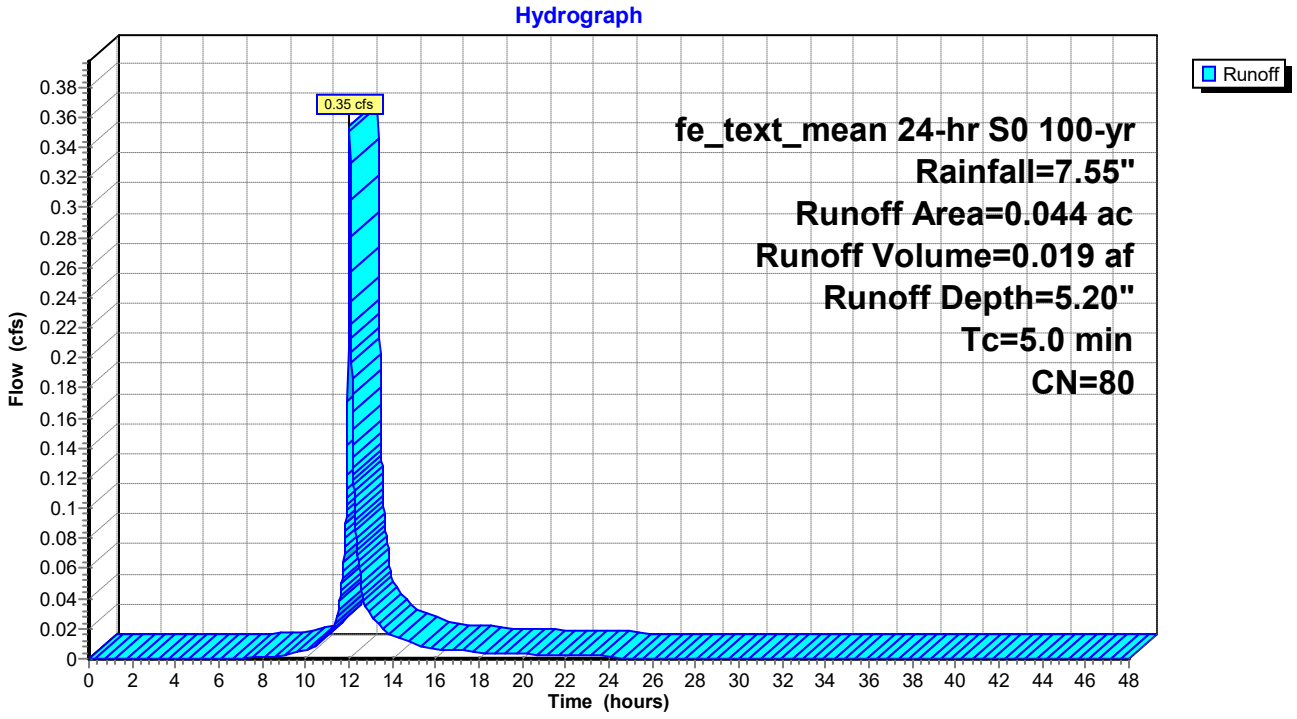
Runoff = 0.35 cfs @ 12.03 hrs, Volume= 0.019 af, Depth= 5.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.022	98	Impervious, HSG B
	0.022	61	>75% Grass cover, Good, HSG B
	0.044	80	Weighted Average
	0.022		50.00% Pervious Area
	0.022		50.00% Impervious Area

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

Subcatchment 15S: DA-15



Summary for Subcatchment 16S: DA-16

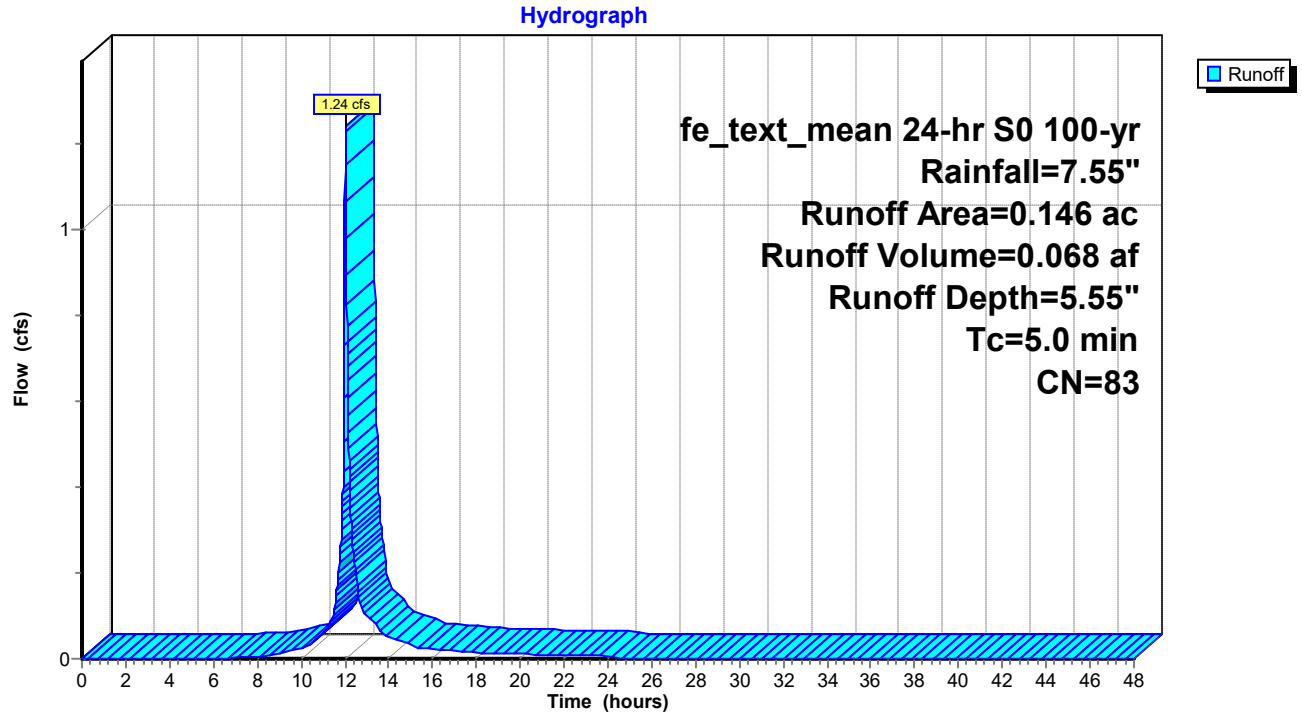
Runoff = 1.24 cfs @ 12.03 hrs, Volume= 0.068 af, Depth= 5.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.085	98	Impervious, HSG B
	0.061	61	>75% Grass cover, Good, HSG B
	0.146	83	Weighted Average
	0.061		41.78% Pervious Area
	0.085		58.22% Impervious Area

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

Subcatchment 16S: DA-16



Summary for Subcatchment 17S: DA-17

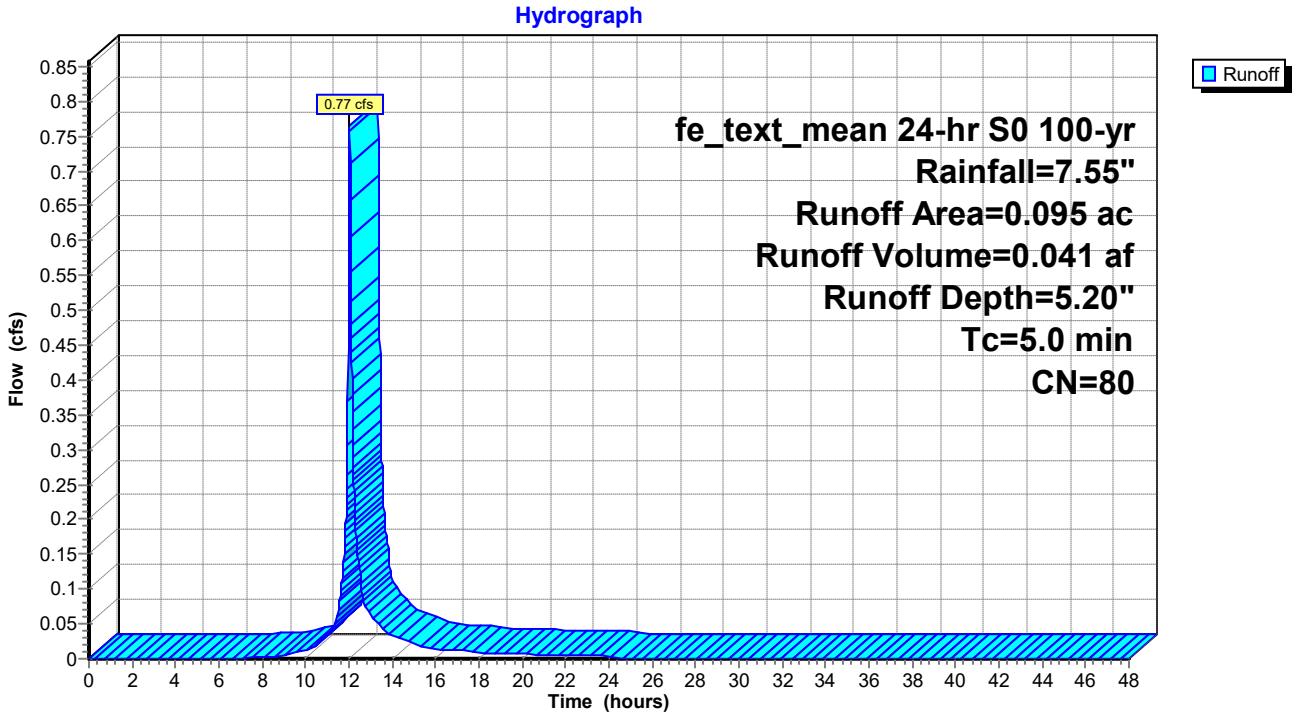
Runoff = 0.77 cfs @ 12.03 hrs, Volume= 0.041 af, Depth= 5.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.048	98	Impervious, HSG B
	0.047	61	>75% Grass cover, Good, HSG B
	0.095	80	Weighted Average
	0.047		49.47% Pervious Area
	0.048		50.53% Impervious Area

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

Subcatchment 17S: DA-17



Summary for Subcatchment 18S: DA-18

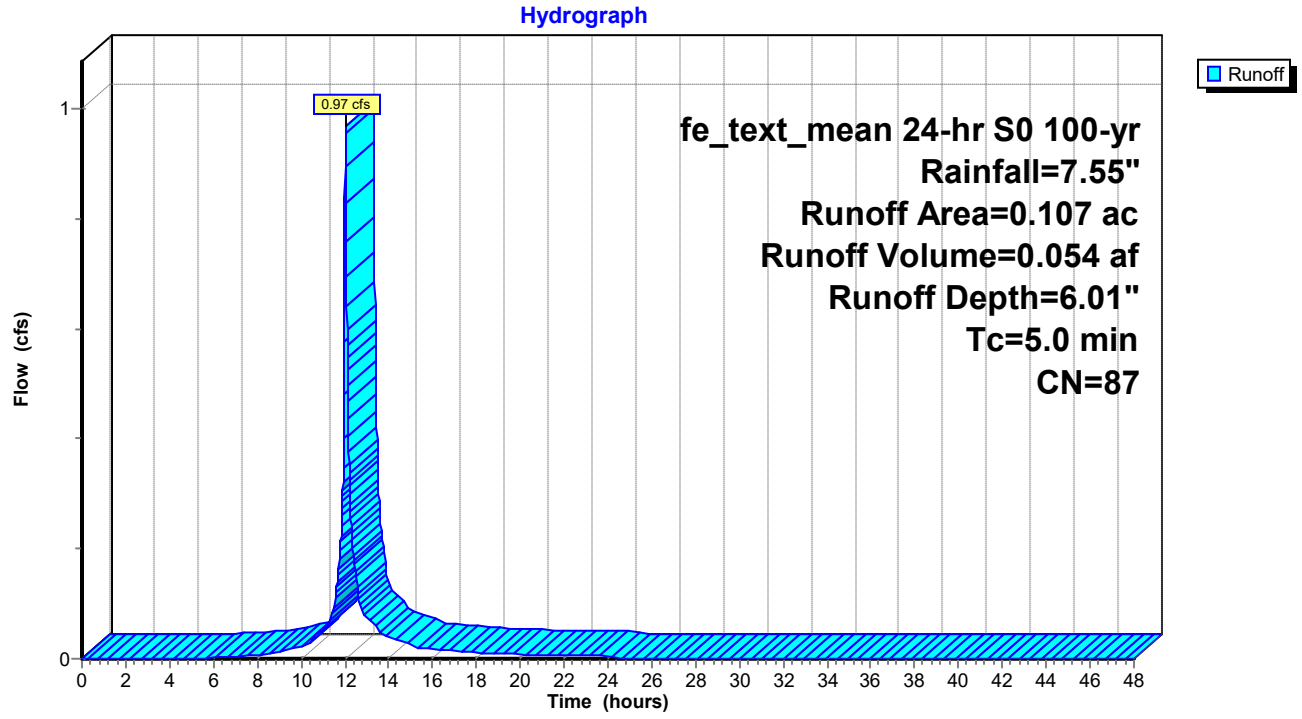
Runoff = 0.97 cfs @ 12.03 hrs, Volume= 0.054 af, Depth= 6.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.074	98	Impervious, HSG B
	0.033	61	>75% Grass cover, Good, HSG B
	0.107	87	Weighted Average
	0.033		30.84% Pervious Area
	0.074		69.16% Impervious Area

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

Subcatchment 18S: DA-18



Summary for Subcatchment 19S: DA-19

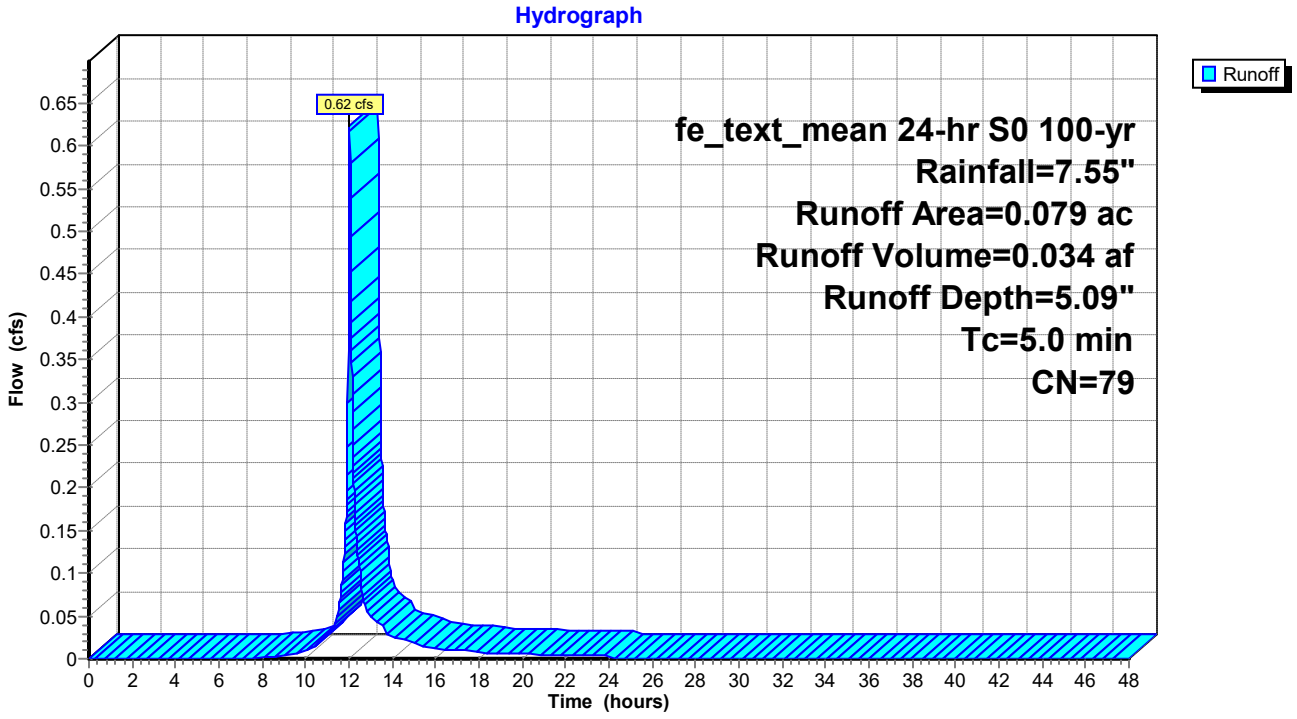
Runoff = 0.62 cfs @ 12.03 hrs, Volume= 0.034 af, Depth= 5.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.039	98	Impervious, HSG B
	0.040	61	>75% Grass cover, Good, HSG B
	0.079	79	Weighted Average
	0.040		50.63% Pervious Area
	0.039		49.37% Impervious Area

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

Subcatchment 19S: DA-19



Summary for Subcatchment 20S: DA-20

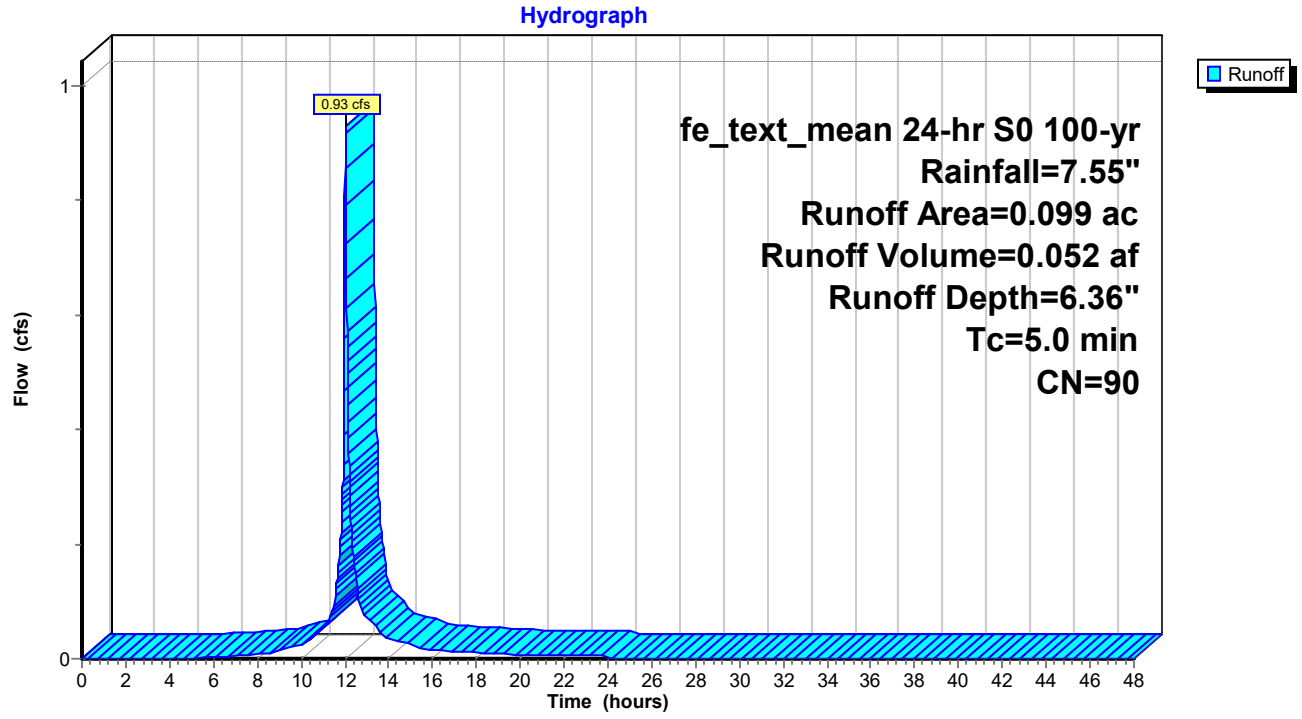
Runoff = 0.93 cfs @ 12.03 hrs, Volume= 0.052 af, Depth= 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

	Area (ac)	CN	Description
*	0.077	98	Impervious, HSG B
	0.022	61	>75% Grass cover, Good, HSG B
	0.099	90	Weighted Average
	0.022		22.22% Pervious Area
	0.077		77.78% Impervious Area

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

Subcatchment 20S: DA-20



Summary for Subcatchment 21S: DA-1A, DA-1B, DA-1C

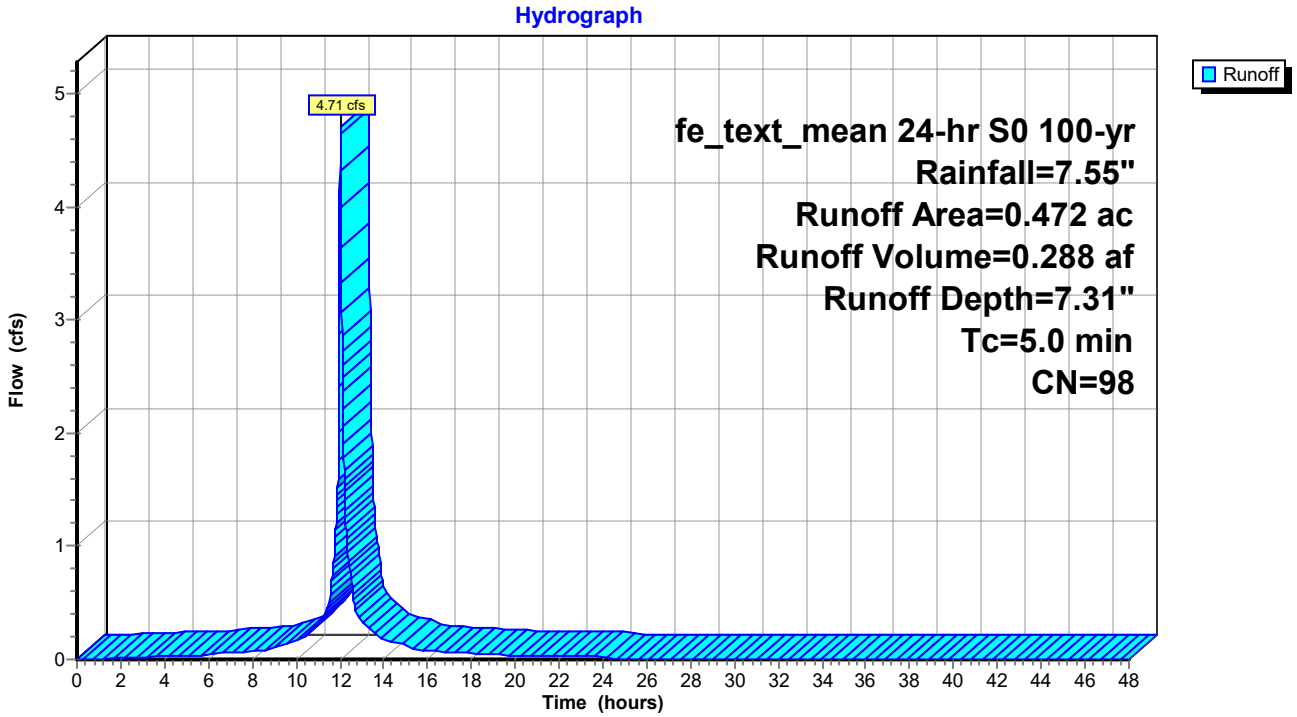
Runoff = 4.71 cfs @ 12.03 hrs, Volume= 0.288 af, Depth= 7.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
fe_text_mean 24-hr S0 100-yr Rainfall=7.55"

Area (ac)	CN	Description
0.472	98	Roofs, HSG B
0.472		100.00% Impervious Area

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

Subcatchment 21S: DA-1A, DA-1B, DA-1C

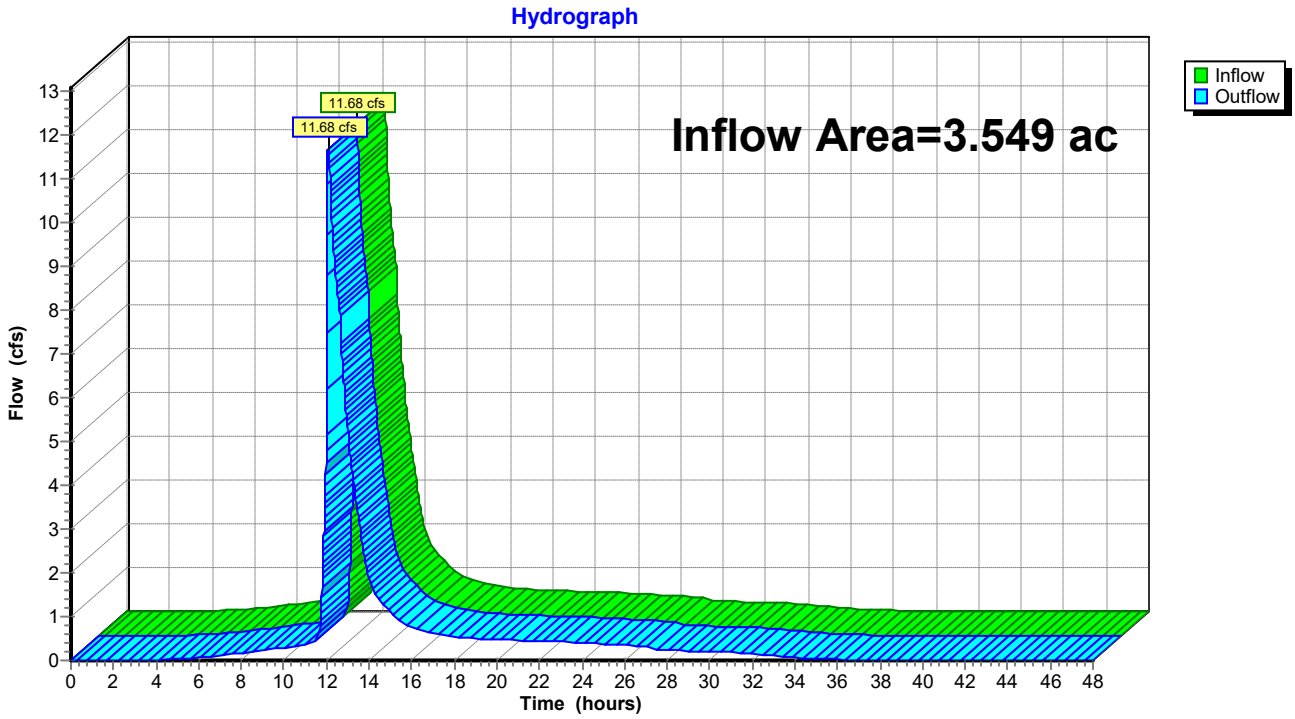


Summary for Reach 3R: On Site

Inflow Area = 3.549 ac, 77.88% Impervious, Inflow Depth = 6.34" for 100-yr event
Inflow = 11.68 cfs @ 12.08 hrs, Volume= 1.876 af
Outflow = 11.68 cfs @ 12.08 hrs, Volume= 1.876 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 3R: On Site

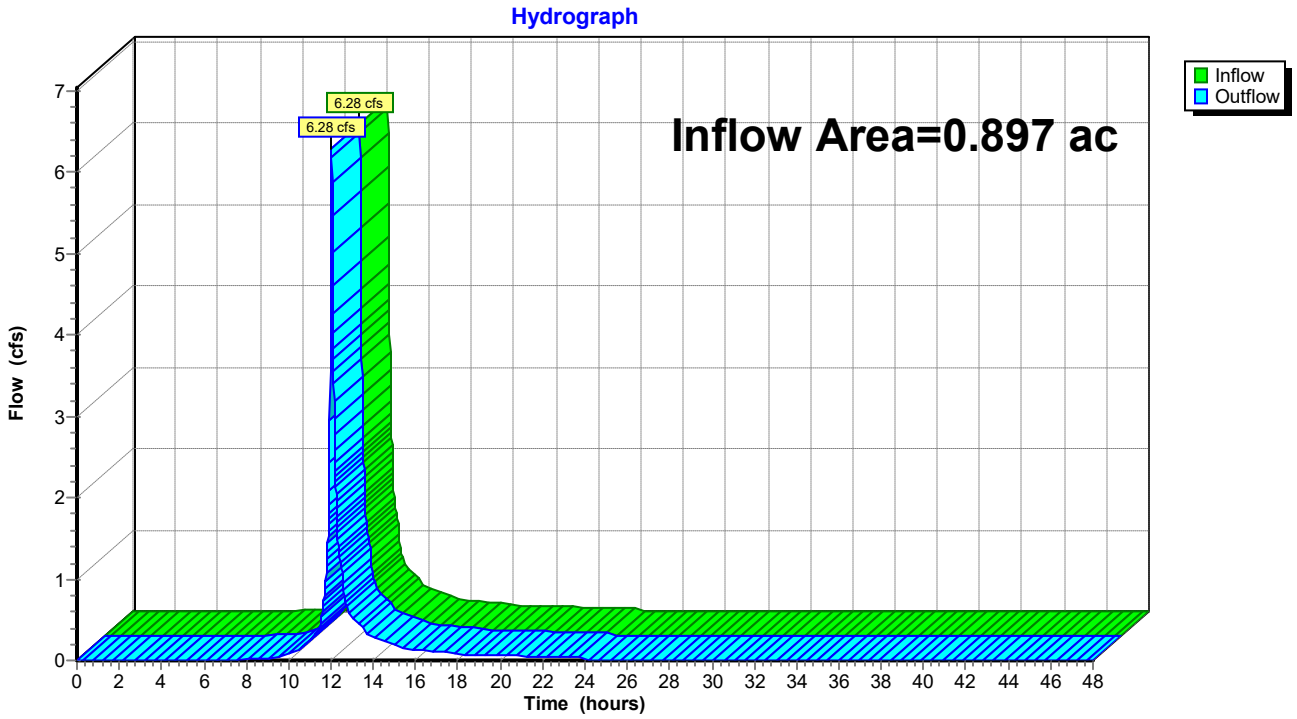


Summary for Reach 16R: Off Site

Inflow Area = 0.897 ac, 36.12% Impervious, Inflow Depth = 4.55" for 100-yr event
Inflow = 6.28 cfs @ 12.03 hrs, Volume= 0.340 af
Outflow = 6.28 cfs @ 12.03 hrs, Volume= 0.340 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 16R: Off Site

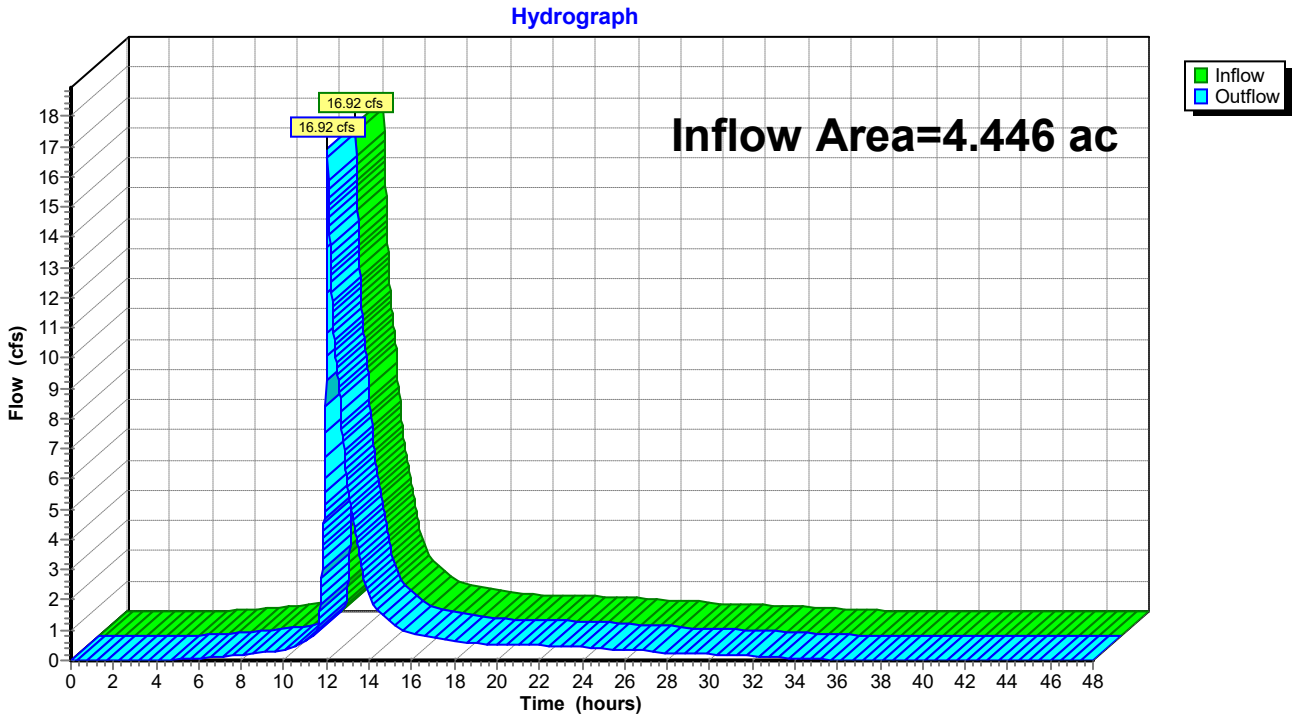


Summary for Reach 21R: Proposed Runoff

Inflow Area = 4.446 ac, 69.46% Impervious, Inflow Depth = 5.98" for 100-yr event
Inflow = 16.92 cfs @ 12.06 hrs, Volume= 2.216 af
Outflow = 16.92 cfs @ 12.06 hrs, Volume= 2.216 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Reach 21R: Proposed Runoff



Summary for Pond 2P: Underground System

Inflow Area = 2.880 ac, 81.49% Impervious, Inflow Depth = 6.50" for 100-yr event
Inflow = 27.21 cfs @ 12.03 hrs, Volume= 1.560 af
Outflow = 8.08 cfs @ 12.24 hrs, Volume= 1.558 af, Atten= 70%, Lag= 12.9 min
Primary = 7.39 cfs @ 12.24 hrs, Volume= 1.544 af
Secondary = 0.69 cfs @ 12.24 hrs, Volume= 0.014 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 647.12' @ 12.24 hrs Surf.Area= 0.946 ac Storage= 0.626 af

Plug-Flow detention time= 180.0 min calculated for 1.558 af (100% of inflow)
Center-of-Mass det. time= 179.4 min (942.7 - 763.3)

Volume	Invert	Avail.Storage	Storage Description
#1	640.25'	0.011 af	**4.00'D x 6.50'H Vertical Cone/Cylinder** x 6
#2A	640.25'	0.210 af	**37.08'W x 177.78'L x 5.50'H Field A** 0.832 af Overall - 0.306 af Embedded = 0.526 af x 40.0% Voids
#3A	641.00'	0.306 af	**ADS_StormTech MC-3500 d +Cap** x 120 Inside #2 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 120 Chambers in 5 Rows Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf
#4	646.60'	2.683 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		3.211 af	Total Available Storage

Storage Group A created with Chamber Wizard

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
646.60	0.000	0.000	0.000
647.00	0.190	0.038	0.038
648.00	5.100	2.645	2.683

Device	Routing	Invert	Outlet Devices
#1	Device 4	640.25'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 4	642.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	645.00'	**4.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)
#4	Primary	640.25'	**12.0" Round Culvert** L= 100.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 640.25' / 639.75' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#5	Secondary	647.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.20 1.20 Width (feet) 0.00 20.00 80.00

Primary OutFlow Max=7.39 cfs @ 12.24 hrs HW=647.12' TW=0.00' (Dynamic Tailwater)
└─**4=Culvert** (Barrel Controls 7.39 cfs @ 9.40 fps)
  ├─**1=Orifice/Grate** (Passes < 0.61 cfs potential flow)
  ├─**2=Orifice/Grate** (Passes < 7.68 cfs potential flow)
  └─**3=Sharp-Crested Vee/Trap Weir** (Passes < 40.51 cfs potential flow)

Secondary OutFlow Max=0.69 cfs @ 12.24 hrs HW=647.12' TW=0.00' (Dynamic Tailwater)
└─**5=Custom Weir/Orifice** (Weir Controls 0.69 cfs @ 0.92 fps)

Pond 2P: Underground System - Chamber Wizard Field A

Chamber Model = ADS_StormTech MC-3500 d +Cap (ADS StormTech® MC-3500 d rev 03/14 with Cap volume)
Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf
Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap
Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf

77.0" Wide + 9.0" Spacing = 86.0" C-C Row Spacing

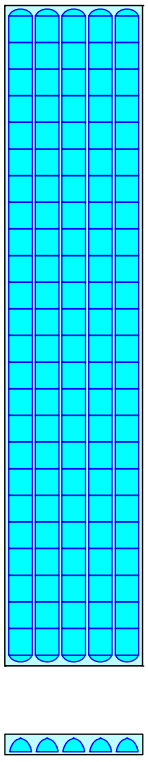
24 Chambers/Row x 7.17' Long +1.85' Cap Length x 2 = 175.78' Row Length +12.0" End Stone x 2 = 177.78' Base Length
5 Rows x 77.0" Wide + 9.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.08' Base Width
9.0" Stone Base + 45.0" Chamber Height + 12.0" Stone Cover = 5.50' Field Height

120 Chambers x 110.0 cf + 14.9 cf Cap Volume x 2 x 5 Rows = 13,343.2 cf Chamber Storage

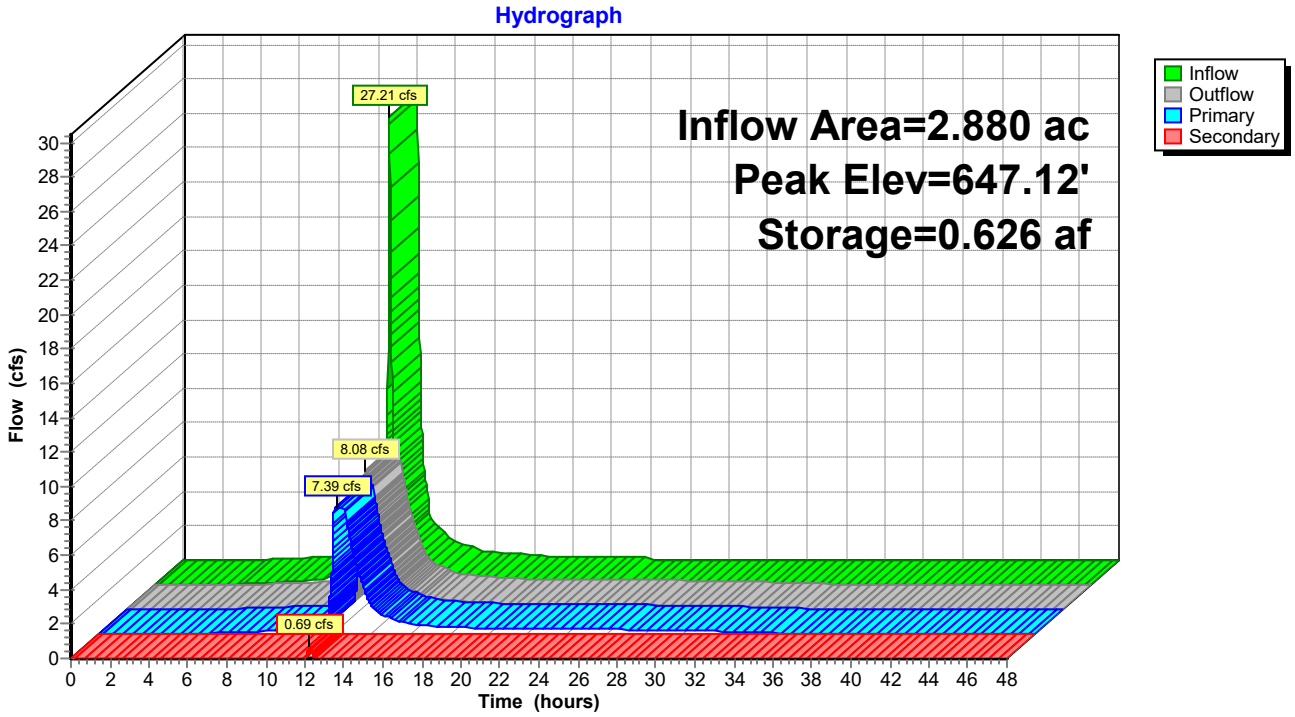
36,259.7 cf Field - 13,343.2 cf Chambers = 22,916.5 cf Stone x 40.0% Voids = 9,166.6 cf Stone Storage

Chamber Storage + Stone Storage = 22,509.8 cf = 0.517 af
Overall Storage Efficiency = 62.1%
Overall System Size = 177.78' x 37.08' x 5.50'

120 Chambers
1,343.0 cy Field
848.8 cy Stone



Pond 2P: Underground System



Summary for Pond 15P: Bio-Filtration Basin

Inflow Area = 0.669 ac, 62.33% Impervious, Inflow Depth = 5.70" for 100-yr event
Inflow = 5.80 cfs @ 12.03 hrs, Volume= 0.318 af
Outflow = 4.39 cfs @ 12.07 hrs, Volume= 0.318 af, Atten= 24%, Lag= 2.8 min
Primary = 0.18 cfs @ 12.07 hrs, Volume= 0.193 af
Secondary = 4.22 cfs @ 12.07 hrs, Volume= 0.125 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 645.85' @ 12.07 hrs Surf.Area= 2,113 sf Storage= 4,077 cf

Plug-Flow detention time= 147.8 min calculated for 0.318 af (100% of inflow)
Center-of-Mass det. time= 147.8 min (930.1 - 782.3)

Volume	Invert	Avail.Storage	Storage Description
#1	643.00'	5,556 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

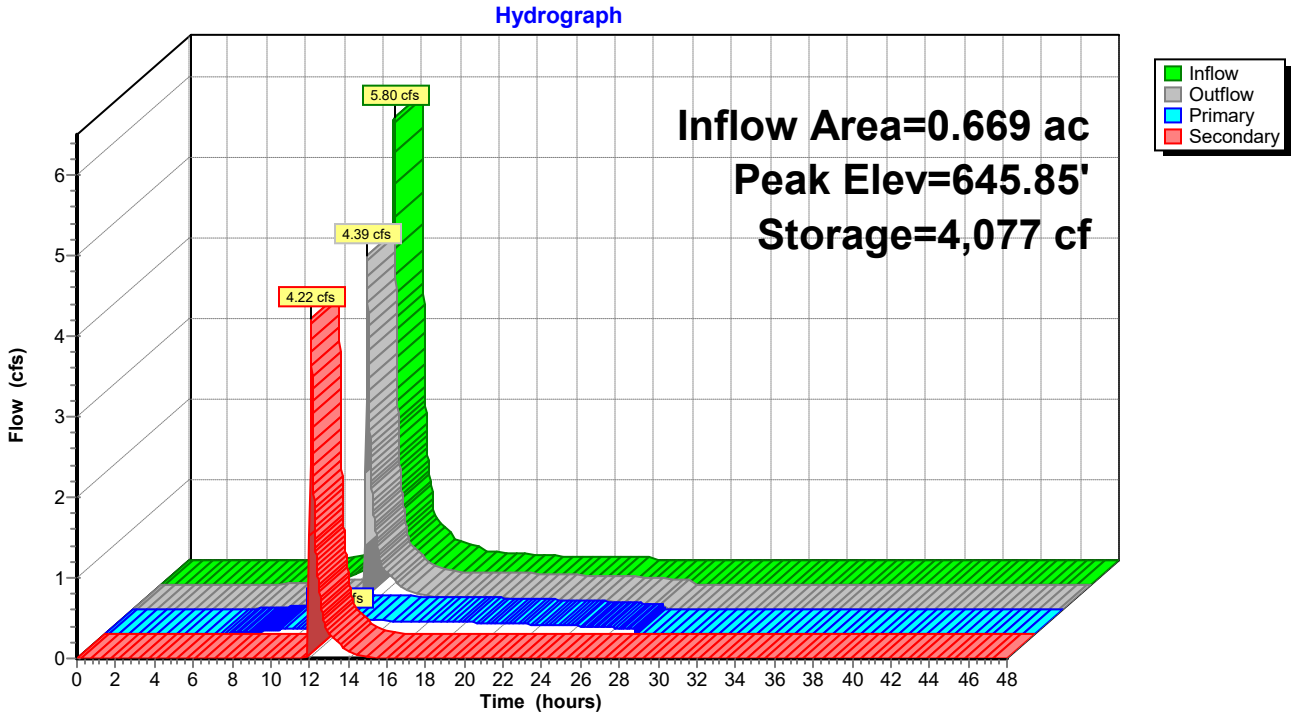
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
643.00	750	0	0
646.50	2,425	5,556	5,556

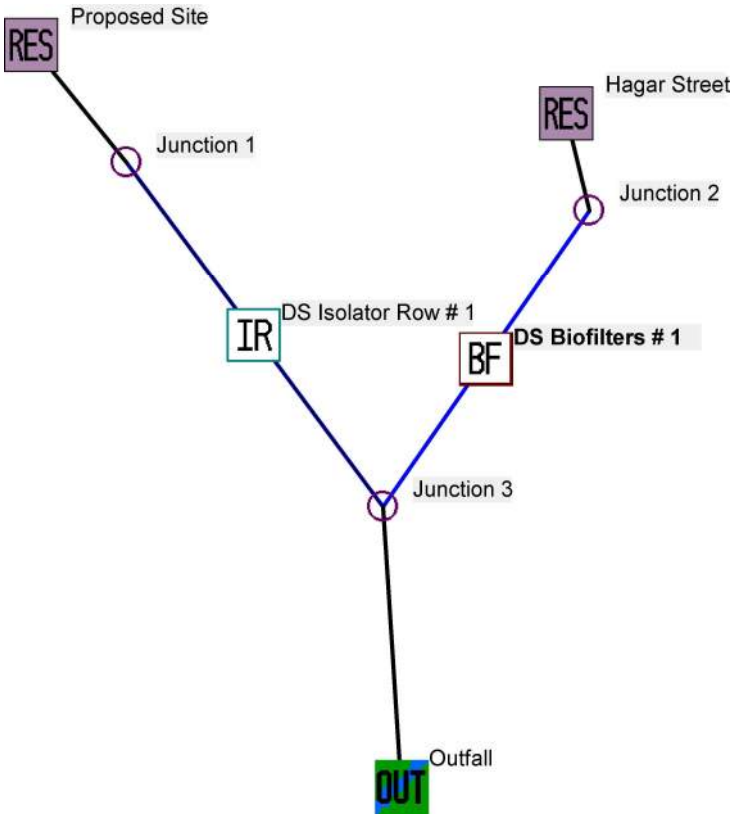
Device	Routing	Invert	Outlet Devices
#1	Primary	643.00'	**3.600 in/hr Underdrain over Surface area** Phase-In= 0.01'
#2	Secondary	645.50'	**24.0" Horiz. Orifice/Grate** C= 0.600 in 24.0" Grate (100% open area) Limited to weir flow at low heads

Primary OutFlow Max=0.18 cfs @ 12.07 hrs HW=645.85' TW=0.00' (Dynamic Tailwater)
↑—**1=Underdrain** (Exfiltration Controls 0.18 cfs)

Secondary OutFlow Max=4.20 cfs @ 12.07 hrs HW=645.85' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Weir Controls 4.20 cfs @ 1.93 fps)

Pond 15P: Bio-Filtration Basin




Proposed Site
RES
Junction 1
Hagar Street
RES
Junction 2
IR
DS Isolator Row # 1
BF
DS Biofilters # 1
Junction 3
Outfall
OUT

Data file name: \\isgfile1\Shared\Projects\24000 PROJ\24400-24499\24403 Red Cloud Development La Crosse, WI\24403 Civil-Survey\Civil Calcs\Stormwater\24403 P
WinSLAMM Version 10.4.1
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
If Other Device Pollutant Load Reduction Values = 1, Off-site Pollutant Loads are Removed from Pollutant Load % Reduction calculations
Seed for random number generator: -42
Study period starting date: 01/05/69 Study period ending date: 12/31/69
Start of Winter Season: 12/02 End of Winter Season: 03/12
Date: 04-01-2021 Time: 15:13:52
Site information:

LU# 1 - Residential: Proposed Site Total area (ac): 2.880
1 - Roofs 1: 1.202 ac. Pitched Connected PSD File: C:\WinSLAMM Files\NURP.cpz
13 - Paved Parking 1: 1.145 ac. Connected PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.533 ac. Moderately Compacted Sandy PSD File: C:\WinSLAMM Files\NURP.cpz

LU# 2 - Residential: Hagar Street Total area (ac): 0.669
37 - Streets 1: 0.417 ac. Smooth Street Length = 0.144 curb-mi Street Width (assuming two curb-mi per street mile) = 47.78125 ft
Default St. Dirt Accum. Annual Winter Load = 2500 lbs PSD File: C:\WinSLAMM Files\NURP.cpz
45 - Large Landscaped Areas 1: 0.252 ac. Moderately Compacted Sandy PSD File: C:\WinSLAMM Files\NURP.cpz

Control Practice 1: Isolator Row CP# 1 (DS) - DS Isolator Row # 1
Total available system length (ft) = 178
Total available system width (ft) = 37
Available height from chamber base to surface (ft) = 5.75
Number of isolator rows = 1
Native soil infiltration rate (in/hr) = 0.00
Assumed stone porosity () = 0.40
Sizing option: Use all available area
Selected Chamber Information
Chamber type: MC-3500
Chamber height (in): 45.00
Chamber width (in): 86.00
Chamber segment length (in): 86.00
Final storage volume (cf): 17404.8
Number of rows: 4
Row length (ft): 166.8
Total system length (ft): 659.3
Total system width (ft): 28.7
Number of chambers: 92
Overflow weir invert elevation (ft) = 0.00
Orifice 1 invert elevation (ft) = 0.00
Orifice 1 diameter (ft) = 0.00
Orifice 2 invert elevation (ft) = 0.00
Orifice 2 diameter (ft) = 0.00

Control Practice 2: Biofilter CP# 1 (DS) - DS Biofilters # 1

1. Top area (square feet) = 2425
2. Bottom aea (square feet) = 750
3. Depth (ft): 6.25
4. Biofilter width (ft) - for Cost Purposes Only: 10
5. Infiltration rate (in/hr) = 0
6. Random infiltration rate generation? No
7. Infiltration rate fraction (side): 0.01
8. Infiltration rate fraction (bottom): 1
9. Depth of biofilter that is rock filled (ft) 0.75
10. Porosity of rock filled volume = 0.4
11. Engineered soil infiltration rate: 3.6
12. Engineered soil depth (ft) = 2
13. Engineered soil porosity = 0.27
14. Percent solids reduction due to flow through engineered soil = 80
15. Biofilter peak to average flow ratio = 3.8
16. Number of biofiltration control devices = 1
17. Particle size distribution file: Not needed - calculated by program
18. Initial water surface elevation (ft): 0

Soil Data Soil Type Fraction in Eng. Soil

User-Defined Soil Type 1.000

Saturation water content percent (Porosity) = 0
Field capacity (%) = 0
Permanent Wilting Point (%) = 0
Infiltration rate (in/hr) = 3.6

Biofilter Outlet/Discharge Characteristics:

Outlet type: Broad Crested Weir

1. Weir crest length (ft): 5
2. Weir crest width (ft): 5
3. Height of datum to bottom of weir opening: 6

Outlet type: Vertical Stand Pipe

1. Stand pipe diameter (ft): 2
2. Stand pipe height above datum (ft): 5.25

Outlet type: Drain Tile/Underdrain

1. Underdrain outlet diameter (ft): 0.25
2. Invert elevation above datum (ft): 0
3. Number of underdrain outlets: 1

SLAMM for Windows Version 10.4.1

Data file name: \\isgfile1\Shared\Projects\24000 PROJ\24400-24499\24403 Red Cloud Development La Crosse, WI\24403 Civil-Survey\Civil Calcs\Stormwater\24403 P
WinSLAMM Version 10.4.1
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Milwaukee WI 1969.RAN
Particulate Solids Concentration file name: C:\WinSLAMM Files\v10.1 WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\WI_SL06 Dec06.rsvx
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO03.ppdx
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Source Area PSD and Peak to Average Flow Ratio File: C:\WinSLAMM Files\NURP Source Area PSD Files.csv
Cost Data file name:
If Other Device Pollutant Load Reduction Values = 1, Off-site Pollutant Loads are Removed from Pollutant Load % Reduction calculations
Seed for random number generator: -42
Study period starting date: 01/05/69 Study period ending date: 12/31/69
Start of Winter Season: 12/02 End of Winter Season: 03/12
Model Run Start Date: 01/05/69 Model Run End Date: 12/31/69
Date of run: 04-01-2021 Time of run: 15:11:10
Total Area Modeled (acres): 3.549
Years in Model Run: 0.99

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of all Land Uses without Controls:	290602	-	103.7	1882	-
Outfall Total with Controls:	290872	-0.09%	39.72	721.3	61.67%
Annualized Total After Outfall Controls:	294912			731.3	

Data File: \\isgfile1\Shared\Projects\24000 PROJ\24400-24499\24403 Red Cloud Development La Crosse, WI\24403 Civil-Survey\Civil Calcs\Stormwater\24403 Proposed Conditions.mdb
Rain File: WisReg - Milwaukee WI 1969.RAN
Date: 04-01-21 Time: 3:10:20 PM
Site Description:

Col. #:	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Control Practice No.	Control Practice Type	Control Practice Name or Location	Total Inflow Volume (cf)	Total Outflow Volume (cf)	Percent Volume Reduction	Total Influent Load (lbs)	Total Effluent Load (lbs)	Percent Load Reduction	Flow Weighted Influent Conc (mg/L)	Flow Weighted Effluent Conc (mg/L)	Percent Conc. Reduction	Influent Median Part. Size (microns)	Effluent Median Part. Size (microns)	Notes
1	Isolator Row	DS Isolator Row # 1	239236	239505	-0.112	1419	628.7	55.69	95.01	42.05	55.740	7.80	2.99	No Isolator Row Overflows
2	Biofilter	DS Biofilters # 1	51366	51366	0	462.8	92.57	80.00	144.3	28.87	80.000	7.80	1.67	No Biofilter Overflows

Post-Construction Stormwater Management Maintenance Agreement

This Maintenance Agreement is made this _____ day of _____, by and between _____., hereinafter referred to as "Grantor" and the City of La Crosse hereinafter referred to as the "Grantee".

WITNESSETH

WHEREAS, the "Grantee" is authorized to regulate and control disposition of storm and surface waters within the City of La Crosse as set forth by the City of La Crosse, Wisconsin code of ordinances; and

WHEREAS, the Grantor is the owner of the certain tract or parcel of land more particularly described as:

LOT 1 AND LOT 2 OF THE RED CLOUD ADDITION IN THE CITY OF LA CROSSE, COUNTY OF LA CROSSE, STATE OF WISCONSIN

such property being hereinafter referred to as "the property."

WHEREAS, the Grantor desires to construct certain improvements on the property which will alter existing storm and surface water conditions on the property and adjacent lands; and

WHEREAS, in order to accommodate and regulate these anticipated changes in existing storm and surface water flow conditions, the Grantor, its successors and assigns, desire to build and maintain at their expense a storm and surface water management facility and system more specifically described as an ADS Stormtech Chamber System as shown and described in the Post-Construction Stormwater management Maintenance Plan, copies of which are attached here to as Exhibit A; and

WHEREAS, the Grantee has reviewed and approved these plans subject to execution of this agreement.

NOW THEREFORE, in consideration of the benefit received by the Grantor, its heirs and assigns, and as a result of the City of La Crosse's approval of its plans, the Grantor, its successors and assigns, with full authority to execute this Maintenance Agreement hereby covenants with the City of La Crosse as follows:

1. Grantor, its successors and assigns shall construct and perpetually maintain, at its sole expense, the above referenced storm and surface water management facility and system in strict accordance with the plan approval granted by the City of La Crosse.
2. Grantor, its successors and assigns shall, at its sole expense, make such changes or modifications to the storm and surface water management facility and system as may, at the City of La Crosse's discretion, and within its lawful regulatory authority, be determined necessary to ensure that the facility and system are properly maintained and continues to operate as designed and approved.
3. The City of La Crosse, its agents, employees and contractors shall have the perpetual right of ingress and egress over the Property to inspect the storm and surface water management facility and system to ensure that the system is being properly maintained and is continuing to perform in an adequate manner.
4. The Grantor, its successors and assigns agree that should it fail to correct any defects in the above described facility and system within ten days from the issuance of written notice, or shall fail to maintain the facility in accordance with the approved design standards and in accordance with the law and applicable regulations, or in the event of an emergency as determined by the City of La Crosse in its sole discretion, the City of La Crosse is authorized to enter the Property to make all repairs, and to perform all maintenance, construction and reconstruction the City of La Crosse deems necessary. The City of La Crosse shall assess the Grantor, its successors or assigns for the cost of the work and applicable penalties per City of La Crosse ordinances. Said assessment shall be a

lien against all properties described within this Maintenance Agreement and may be placed on the property tax bills of said properties and collected as ordinary taxes by the City of La Crosse.

5. Grantor, its successors and assigns shall indemnify, hold harmless and defend the City of La Crosse from and against any and all claims, demands, suits, liabilities, losses, damages and payments, including attorney fees claimed or made against the City of La Crosse that are alleged or proven to result or arise from the failure of Grantor or Grantor's successors or assigns to comply with the terms and conditions of the Maintenance Agreement.
6. The Covenants contained herein shall run with the land and the Grantor, its successors and assigns further agree whenever the Property shall be held, sold and conveyed, it shall be subject to the covenants, stipulations, agreements and provisions of this Agreement, which shall apply to, bind all present and subsequent owners of the Property described herein, provided, however, that the Grantor and its successors and assigns shall have no further liability under this Maintenance Agreement after such party has transferred its fee simple interest in the Property, except for any obligations that occurred during such party's period of ownership.
7. The provisions of this Maintenance Agreement shall be severable and if any phase, clause, sentence, or provision is declared unconstitutional, or the applicability to the Grantor, its successors and assigns is held invalid, the remainder of this Agreement shall not be affected thereby.
8. The Maintenance Agreement shall be recorded with the La Crosse City Recorder's Office at the Grantor's expense.
9. In the event that the City of La Crosse shall determine in its sole discretion at any future time that this Maintenance Agreement is no longer required, then the City of La Crosse and the Grantor or its successors or assigns, shall execute a release of this Maintenance Agreement, which the Grantor, its successors and assigns shall record, in the La Crosse City Recorder's Office at its expense.

IN WITNESS THEREOF, the Grantor has executed this Maintenance Agreement
On the _____ day of _____.

By Officer or Authorized Agent:_____

Title:_____

Date:_____

State of Wisconsin:
City of La Crosse:

To with: The foregoing instrument was acknowledged before me this _____ day of _____,
by _____

Notary Public
My Commission Expires:_____

Exhibit A

Post Construction Stormwater Management Maintenance Plan

Red Cloud – La Crosse, Wisconsin

This document will provide direction for performing an inspection and any necessary maintenance of stormwater management practices. It is the responsibility of the property owner to perform the inspections of the stormwater management practices and to perform maintenance as needed. This maintenance plan provides a map of the site which identifies all applicable maintenance areas as well as an inspection checklist to be used by the inspector.

This plan shall remain onsite and be available for inspection when requested by the State of Wisconsin. When requested, the owner shall make available for inspection all maintenance records to the State of Wisconsin for the life of the system.

The Inspection Process

Below are the manufacturer's instructions and inspection checklists to be completed on a scheduled interval stated on each checklist by the property owner or an assigned subcontractor. Refer to the Site Map for item identification.

Perform Necessary Maintenance

After performing the inspection process, any required maintenance must be performed by the property owner or an assigned subcontractor within 30 calendar days.

During inspections, if 3 inches or more sediment is observed on the bottom of the isolator row, maintenance should be performed. Maintenance shall include jetting and vacuuming the accumulated sediment according to manufacturer recommendations. If standing water is observed in the underground infiltration system greater than 48 hours after a storm event, the system may have become clogged. Refer to manufacturer recommendations for further maintenance requirements to repair the system. Outlet structure and pipe shall be cleaned annually (at a minimum) and as needed to remove trash/debris and sediment to provide proper conveyance from the underground infiltration system. All removed material shall be properly disposed in a landfill in accordance with state and local laws.

All removed sediment must be disposed of according to applicable regulations.

It is assumed that maintenance will consist of a combination of labor and equipment use to accomplish tasks ranging from sediment removal to trash cleanup.

Additional Underground System Maintenance

After construction of the system and prior to operation beginning, a post installation inspection shall be performed by the owner/operator of the system to measure the invert and inspect the system prior to the accumulation of sediment. Adequate maintenance access shall be maintained to the underground system at all times. During inspections the sediment buildup shall be measured at each riser, inspection port, and cleanout location and if in any case the sediment buildup is greater than 20% of the pipe diameter, cleaning should be performed immediately. During inspections all manifolds, laterals, and outlet pipe should be inspected for sediment buildup, obstructions, damage or any other potential problems. When sediment removal is to take place is should be done using jetting and vacuuming according to manufacturer's recommendations. Manual removal should be avoided if at all possible. All applicable confined space entry procedures must be followed by all personal performing sediment removal or other system maintenance.

Vector Control

Eliminate all stagnant water and undesired ponding areas to prevent mosquito breeding. Eliminate all undesired vegetation from the site. Eliminate all potential tick breeding areas.

Contingency Plan in the Event of System Failure

In the event of plumbing failure, all stormwater would flow over land off the site before encroaching on the building. In the event of stormwater plumbing system failure, contingency plans for conveying

water and protecting the property include sand bagging, pumping, and earthen berms. In the event of standing water, the source of the standing water shall be determined and remedial steps shall be taken to eliminate the disturbance. Remedial methods shall not disturb or disrupt the integrity of each system component.

Record Keeping
It is the responsibility of the property owner to maintain accurate inspection and maintenance records. Inspection and maintenance records shall be kept on site and made available to the City of La Crosse upon request.

Annual Compliance Reporting
The City may request an annual report by which the property owner has up to 30 days to fulfill the request by the City.

City Inspection and Maintenance
If at any point the property owner falls behind on the required inspections or maintenance, the authority will perform an inspection at the cost of the property owner after sending a notice. If emergency maintenance is required and deemed necessary by the authority, the authority will perform the necessary maintenance at the property owner's cost. It is important to remember that the property owner is the party responsible for the inspection, maintenance, and the record keeping, and this responsibility should not be assumed to the authority.

Maintenance Schedule and Inspection Checklist Information

Facility ID Red Cloud – La Crosse, WI

Location 1325 Saint Andrews ST Lacrosse, WI

Inspector(s) _____

Date _____

Time _____

Party/Department Responsible for Maintenance: _____

_____

_____

Contact(s): _____

_____

_____

Phone Number(s): _____

_____

Email: _____

_____

Mailing Address: _____

_____

_____

BMP Inspection Schedule and Checklist

A. Inlets
1 = Good Condition
2 = Acceptable, Item on Watch
3 = Item Requires Maintenance Within the Year
4 = Failed Item, Requires Immediate Maintenance

Note: All items associated with Pretreatment shall be inspected twice a year.
Once in early Spring and once in late Fall.

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
1. Structural deficiencies of concrete ring reinforcement? Spalling?																					
2. Damage to castings?																					
3. Sediment build up?																					
4. Free of debris?																					

B. ADS Stormtech Chambers
1 = Good Condition
2 = Acceptable, Item on Watch
3 = Item Requires Maintenance Within the Year
4 = Failed Item, Requires Immediate Maintenance

Note: All items associated with the Facility shall be inspected quarterly or as otherwise noted.

	2021	2021	2022	2022	2023	2023	2024	2024	2025	2025	2025	2026	2027	2027	2028	2028	2029	2029	2030	2030	2031
1. Maintenance access to facility																					
2. Excessive sediment accumulation																					
4. Is there evidence of pollution entering the system? Y/N. Where?																					
5. Outlets																					
a. Maintenance access to outlet																					
b. Outlet condition																					
d. Trash/debris accumulation (Remove as quickly as possible)																					

C. Miscellaneous
1 = Good Condition
2 = Acceptable, Item on Watch
3 = Item Requires Maintenance Within the Year
4 = Failed Item, Requires Immediate Maintenance

Note: All miscellaneous items shall be inspected annually or as otherwise noted.

	2021	2021	2022	2022	2023	2023	2024	2024	2025	2025	2025	2026	2027	2027	2028	2028	2029	2029	2030	2030	2031
1. Complaints from local residents																					
2. Pest problems																					
3. Adequate safety signage																					

BMP Inspection Schedule and Checklist

Inspector's Summary

BMP Inspection Schedule and Checklist

Photographs	
Photo ID	Description
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	
17.	
18.	
19.	
20.	

BMP Inspection Schedule and Checklist

Sketch of Facility