

# **Stormwater Analysis & Report**

**For**

**McDonald Keohane Funeral Home  
809 Main Street  
Weymouth, MA**

**February 4, 2022**

**Revised April 8, 2022**

**Prepared for:**

**McDonald Keohane Funeral Home, Inc.  
785 Hancock Street  
Quincy, MA 02170**

**Prepared by:**

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*Gabriel R. Crocker*  
4-8-2022

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## **SECTION 1 - NARRATIVE**

## 1.1 EXECUTIVE SUMMARY

In accordance with the provisions of the Town of Weymouth Zoning Bylaws, the Applicant, McDonald-Keohane Funeral Home, Inc. proposes a new 5,571 +/- sf building addition off the rear of the existing building on the subject property. Site renovations include a reconfigured parking lot, a new accessory garage (1,950+/- sf) as well as upgrades to the stormwater management system, utilities and landscaping.

The site is bound to the east by Main Street (Route 18 – State Highway Layout), Cypress Street (town Right-of-Way) to the east, commercial property to the north (owned by South Shore Hospital), and several residential properties to the south. The 2.82 +/- acre site consisted of 3 parcels which were utilized as an active funeral home, an existing residential home and a vacant wooded lot. These parcels have been combined via ANR which was endorsed by the Planning board on December 3, 2021.

The site topography ranges from a high of approximately 190 in the center of the site to an approximate low of 170 in the northeastern corner abutting Main Street and elevation 173+/- westerly in the northwest corner abutting Cypress Street. The property has active vehicular access via Main Street through two (2) one-way driveways. Vehicles enter the funeral home facility at the northern curb cut on Main Street and depart the facility via the one-way out driveway connection in the southeast corner of the property. These access points will be retained and will remain as the connections for the improved site. Internal driveway widths will be improved to provide for minimum 20' wide. In addition, the existing access driveway via Cypress Street will be eliminated along with the demolition of the existing single-family residence along Cypress Street

The property is within two (2) Zoning districts including Medical Service (fronting on Main Street) and R-1 (Fronting on Cypress Street). The site located within the Watershed Protection District but not the Groundwater Protection District the according to the Town of Weymouth Zoning Map revised to January 1, 2018. The site is entirely outside of the FEMA 100-year floodplain. The site is not located within an NHESP Estimated or Priority Habitat, nor located in an ACEC nor Critical Area. Refer to Section 1.9 - Figures for the accompanying figures. The site not located within a Zone II.

The Project will implement significant stormwater improvements and BMPs where very little infrastructure exists on the site today as is further described throughout this report, and has been designed in accordance with the Massachusetts Stormwater Handbook.



## **1.2 OBJECTIVE OF CALCULATIONS**

The purpose of this stormwater analysis is to examine the stormwater runoff from the proposed site based upon the Massachusetts Department of Environmental Protection Stormwater Management Policy and the applicable provisions of the Town of Weymouth Bylaws and regulations.

The goal of the stormwater management system design on this project is to provide improved water quality, ensure post-development peak runoff rates do not exceed pre-development peak flow rates, maximize the opportunities for recharge and infiltration, and protect the surrounding area from any potential flooding and/or environmental impacts associated with the unmitigated condition. The following stormwater hydrology calculations were performed using the 2-year, 10-year, 25-year, and 100-year frequency, 24-hour NOAA Atlas 14 design storm events and were compared for both pre-development and post-development conditions.

## **1.3 METHODOLOGY**

We utilized the latest version of HydroCAD for the overall stormwater hydrology/routing analysis to assess and compare peak rates of runoff at the various discharge points from the subject property.

Refer to Section 3 – HydroCAD Model, which includes the detailed print-out of the HydroCAD Model Reports for the 2, 10, 25 and 100-year storms as well as Section 7 – Pipe Analysis / Sizing, which includes the calculations for the 25-year storm for pipe capacity analysis and sizing.

## **1.4 ON-SITE SOIL INFORMATION**

The Natural Resource Conservation Service (NRCS) maps the majority of the on-site soil as Woodbridge Urban Land complex, 3 to 15 percent slopes, Soil Map Unit 623C, Classified as Hydrologic Soil Group (HSG) “C/D”. This soil is primarily representative in the location of the proposed development. According to the NRCS mapping there are also two (2) other soils present on the western and southerly portions of the site; Canton-Urban Land complex, Soil Map 628C and Urban Land, Soil Map 602. The soils within this area of the proposed development have “A” HSG Ratings, and this rating is what was used for the drainage calculations enclosed within this permit submission.

A test pit plan and associated logs, observed by Crocker Design Group on November of 2020 are enclosed in Section 6. Please refer to Section 6 for complete soil information.

## 1.5 SITE HYDROLOGY

### **Existing Conditions**

Please refer to the attached Existing Conditions Watershed Analysis Plan in Section 3.3. The property has been divided into several sub catchment areas based on the existing site topography and flow paths. These sub catchments then combine where appropriate from an analysis standpoint where they discharge toward adjacent rights-of-way and abutting residential and commercial properties. Each sub catchment area has been analyzed and assigned an appropriate Curve Number to represent the existing vegetative cover and underlying soils conditions. Appropriate Times of Concentration and Curve Numbers have been assigned for each catchment area. This data was then input into HydroCAD to determine peak rates of runoff at the various design points (identified as “Points of Analysis”) which provide the locations for which to compare existing versus proposed conditions to document compliance that the peak rates do not increase in the regulatory storm events as required. A Summary table is provided in the Hydrology Model Results and Conclusions Section below.

For the purposes of this analysis, the pre- and post- development drainage conditions were analyzed at five (5) “design points” where stormwater runoff currently drains to under existing conditions. The design points are described below:

- Design Point #1 (DP1) is towards the northerly property line.
- Design Point #2 (DP 2A/2B/2C) is towards Main Street ROW (Route 18) and ultimately ends up flowing into the Main Street drainage system. We note a portion of the existing pavement within the existing upper parking lot collects in two existing catch basins, who’s ultimate discharge point is unknown. As a result analysis identifies the subcatchment area is assumed to result in zero runoff toward any property line.
- Design Point #3 (DP3) is discharging towards the southerly property line.
- Design Point #4 (DP4) is flowing from the high point in the center of the property and ultimately discharging out to Cypress Street which has no formal drainage system.

The analyzed watershed consists of approximately 2.82 +/- acres of both developed land and undeveloped wooded area. The site conveys most of its stormwater to the Main Street ROW drainage system, while the rest of the site appears to convey stormwater to the wooded area at the rear of the site and out Cypress Street. A more comprehensive description of the existing sub catchment areas is provided below.

- Subcatchment 1 consists of an existing landscape/grass area. The runoff from this subcatchment drains towards the abutting commercial property to the north of the site (DP1) and currently discharges to the northerly property line. This area is a landscape area (CN: 39) and the time of concentration was calculated to be 6.6 minutes.
- Subcatchment 2A is existing bituminous pavement, roof, and landscape area (CN:78) that currently flows and discharges to Main Street ROW (Route 18). The minimum time of concentration of 6 minutes was used.
- Subcatchment 2B is the existing exit which is comprised of bituminous pavement and landscape area (CN: 59) which also flows to Main Street ROW (Route 18). The minimum time of concentration of 6 minutes was used.
- Subcatchment 2C is a combination of pavement and roof that drains into 2 existing catch basins whose discharges are unknown. This area is mainly impervious (CN: 86) and the minimum time of concentration of 6 minutes was used.
- Subcatchment 3 is existing wooded area. The stormwater in this subcatchment flows towards the abutting residential properties. This area of wooded area (CN: 32) and the time of concentration was calculated to be 25.8 minutes.
- Subcatchment 4 is an existing home and wooded area. The stormwater in this subcatchment drains towards Cypress Street. This area of woods (CN: 41) and has a calculated time of concentration of 26.1 minutes.

### **Proposed Conditions**

The proposed project consists of the construction a building addition and accessory garage. The project site includes a parking lot, drainage improvements and utility infrastructure. The parking lot has been designed to drain to deep hooded catch basins, which will capture and convey stormwater runoff, via underground pipe system to an underground system.

Please refer to the attached Proposed Conditions Watershed Analysis Plan in Section 3. The proposed project has been divided into several sub catchment areas and the stormwater underground infiltration/retention system chambers has been modeled. Appropriate Times of Concentration and Curve Numbers have been assigned for each catchment area. A Summary table is provided in the Hydrology Model Results and Conclusions Section below.

- Subcatchment 1 consists of an existing landscape/grass area. The runoff from this subcatchment drains towards the northerly property line of the site (DP1). This

area is a grass area (CN: 39) and the time of concentration was calculated to be 6.9 min.

- Subcatchment 2A is consists of roof and bituminous pavement and a small landscaped are. The stormwater runoff from this area has been significantly reduced from its existing condition but a small amount discharges to Main Street ROW (Route 18). This area is mainly impervious (CN: 75) and the minimum time of concentration of 6 minutes is used.
- Subcatchment 2B consists of bituminous pavement and a small landscape area. The stormwater in this subcatchment overland flows towards the Main Street ROW, eventually ending up in the Main Street drainage system. The area is combination of pavement and landscape area (CN: 62) and the minimum time of concentration of 6 minutes is used.
- Subcatchment 3 is grass and wood cover. The stormwater in this subcatchment overland flows towards the southern property line. The grass area and woods (CN:34) has a calculated time of concentration of 9.4 minutes.
- Subcatchment 4A consists of bituminous parking areas, the proposed building addition and accessory garage and small landscape areas. The building addition is proposed to have an underground roof drain system which will discharge to UG-1. The rest of the runoff throughout 4A will be captured by deep sump catch basins, a series of pipes and manholes, and two water quality units before discharging to the infiltration system UG-1. This area is mostly impervious (CN: 94) and the minimum time of concentration of 6 minute is used.
- Subcatchment 4B consists of grass/ landscape area. Stormwater will discharge into two proposed dry wells which will discharge into the ground. This area is pervious landscape (CN: 42) and has the minimum time of concentration of 6 minutes.
- Subcatchment 4C consists of grass/ landscape area. Stormwater will discharge into three proposed dry wells which will discharge into the ground. This area is pervious landscape (CN: 41) and has the minimum time of concentration of 6 minutes.
- Subcatchment 4D consists of grass and landscape area. A minimal amount of stormwater will discharge to Cypress Street. This area is landscaped (CN: 39) and has the minimum time of concentration of 6 minutes.

## **Hydrology Model Results and Conclusions**

The goal of the stormwater design for the project is to fully comply with the Massachusetts Stormwater Policy and the Town of Weymouth Regulations. This analysis confirms that the stormwater system is receiving proper treatment and peak rates of runoff do not exceed the pre-development rates using stormwater Best Management Practices including deep sump hooded catch basins, water quality units, and an underground ADS Infiltration/Retention system. The rear yard/landscape area is retained through the incorporation of 6-foot diameter drywells in the landscape/lawn areas as well.

The emergency overflow outlet from the underground infiltration/recharge system has been designed with the appropriate rip rap splash pad to prevent scour/erosion. The emergency discharge outlet is positioned to discharge within the rear landscape/yard area on the property.

The results of the pre- and post-development hydrology calculations provided in Section 3 are summarized in the following table:

Table 1.5.1 shows the peak rate of runoff for the existing site as well as the developed site at the 2, 10 and 100- year design storms.

<b>PEAK RATE OF DISCHARGE</b>									
<b>Design Points</b>	<b>2-Year Storm Event (CFS)</b>			<b>10-Year Storm Event (CFS)</b>			<b>100-Year Storm Event (CFS)</b>		
	Pre	Post	$\Delta$	Pre	Post	$\Delta$	Pre	Post	$\Delta$
DP-1	0.00	0.00	0	0.01	0.01	0	0.17	0.14	-0.03
DP-2	1.46	1.08	-0.38	3.09	2.44	-0.65	5.89	4.85	-1.04
DP-3	0.00	0.00	0	0.00	0.00	0	0.03	0.03	0
DP-4	0.00	0.00	0	0.08	0.00	-0.08	0.80	0.05	-0.75

Table 1.5.2 shows the peak volume for the existing site as well as the developed site at the 2, 10 and 100- year design storms.

PEAK VOLUME									
Design Points	2-Year Storm Event (CF)			10-Year Storm Event (CF)			100-Year Storm Event (CF)		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP-1	2	2	0	133	109	-24	666	543	-123
DP-2	4237	3165	-1072	8843	6960	-1883	17126	13961	-3165
DP-3	0	0	0	28	24	-4	431	224	-207
DP-4	62	1	-61	1215	36	-1179	5261	178	-5083

As can be seen based on the above tables, the peak stormwater runoff rates and volumes generated by the development are the same or less in post development conditions versus the existing conditions in all cases. Refer to Section 3 for copies of the HydroCAD Analysis that document the above results as well as the Existing Conditions Watershed Plan attached.

## 1.6 STORMWATER MANAGEMENT

The following section describes each of the nine (9) Massachusetts Stormwater Management Standards and describes how the project complies with each.

Standard 1: No New Untreated Discharges – No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

**No new stormwater conveyances are proposed. The drainage system has been designed to direct stormwater runoff from all new paved areas through stormwater BMPs designed to capture, convey, treat, retain, recharge and infiltrate the runoff. The project also reduces the amount of existing pavement surface runoff toward Route 18 compared to the existing condition.**

Standard 2: Peak Rate Attenuation – Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

**The stormwater BMPs employed either reduce or maintain pre-development peak rates as required.**

Standard 3: Recharge – Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

**The stormwater system has been designed to comply with the recharge requirements for both the MA Stormwater Management Regulations. Refer to Section 4 for a summary of the stormwater recharge calculations.**

Standard 4: Water Quality – Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

**The project utilizes deep sump hooded catch basins, CDS water quality units, and concrete drywells to fully comply with the TSS removal requirements of 80% removal. In addition, deep sump hooded catch basins and water quality units are proposed for pre-treatment. Calculations for water quality volume can be found in Section 4.3, and treatment train efficiency can be found in Section 4.4. A long Term Operation and Maintenance Manual for these systems can be found in Section 5.**

Standard 5: Land Uses with Higher Potential Pollutant Loads – For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.

**The project is not considered a LUHPL (Land Use with Higher Potential Pollutant Load).**

Standard 6: Critical Areas – Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.

**The project is located within the Town of Weymouth Watershed Protection District. The BMP's have been designed to provide 80% TSS removal prior to infiltration.**

Standard 7: Redevelopment and Other Projects Subject to the Standards only to the maximum extent practicable – A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

**The project qualifies as partial redevelopment and partial new development. All new impervious areas, as well as a portion of the existing impervious areas will now receive full treatment compared to the existing untreated conditions. The extent of existing, untreated impervious area has been reduced with this design.**

Standard 8: Construction Period Pollution Prevention Plan and Erosion and Sedimentation Control – A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

**An Erosion and Sedimentation Controls Plan has been incorporated into the Site Plans.**

Standard 9: Operation and Maintenance Plan – A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

**A long-term Operation and Maintenance Plan has been incorporated herein. See Section 5.**

Standard 10: Prohibition of Illicit Discharges – All illicit discharges to the stormwater management system are prohibited.

**An Illicit Discharge Compliance Statement is included as required.**

## **1.7 BEST MANAGEMENT PRACTICES (BMP'S)**

A system of deep sump hooded catch basins, water quality units, dry wells, and a subsurface infiltration system are to be used to treat stormwater runoff on the site. See Section 4 for stormwater management calculations.



## **1.8 PIPE SIZING**

Refer to Section 7 for the pipe sizing calculation results. The tributary area for each inlet/subcatchment area has been computed along with pipe length, slope and friction coefficient. The Rational Method is the utilized to determine the hydraulic grade line. In. For design purposes, this approach was used to size the pipes such that the 25-year storm event is contained within the pipe. In addition, pipe velocities were checked to be within the range of 2fps to 10 fps. Those calculations are included in Section 7 herein.

## **1.9 CONCLUSION**

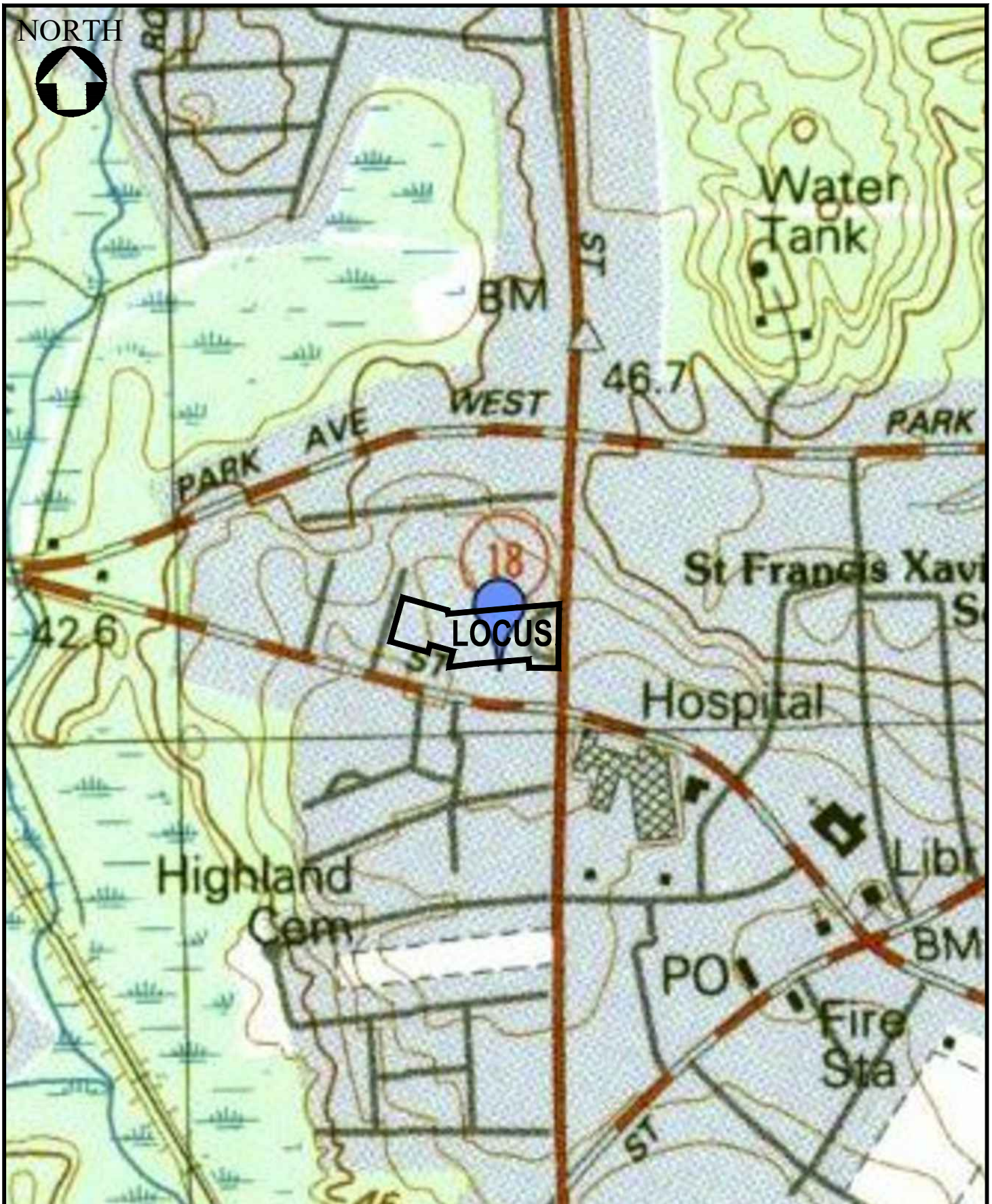
In conclusion, the project has been designed in accordance with the requirements of the MA Stormwater Management Regulations and in compliance with the Town of Weymouth Regulations.

## **1.10 FIGURES**

The following pages contain the following accompanying figures:

- FIG 1 SITE LOCUS USGS MAP
- FIG 2 SITE LOCUS ORTHOGRAPHIC MAP
- FIG 3 NHESP HABITAT MAP
- FIG 4 FEMA FLOODPLAIN MAP
- FIG 5 MASSDEP WETLANDS MAP

NORTH



Crocker  
Design  
Group

2 SHARP STREET, UNIT B  
HINGHAM, MA 02043

Project

MCDONALD-KEOHANE  
FUNERAL HOME - SOUTH

809 MAIN STREET  
WEYMOUTH, MA 02190

Prepared for

MCDONALD-KEOHANE

785 HANCOCK STREET  
QUINCY, MA 02170

Drawing Title

**SITE LOCUS USGS MAP**

DATE: 2.4.2022

DRAWN: CRM

JOB NO.: 100-60

CHECK: GRC

SCALE:

500 250 0 500

1



NORTH



LOCUS

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Design  
Group

2 SHARP STREET, UNIT B  
HINGHAM, MA 02043

Project

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WEYMOUTH, MA 02190

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785 HANCOCK STREET  
QUINCY, MA 02170

Drawing Title

**AERIAL MAP**

DATE: 2.4.2022

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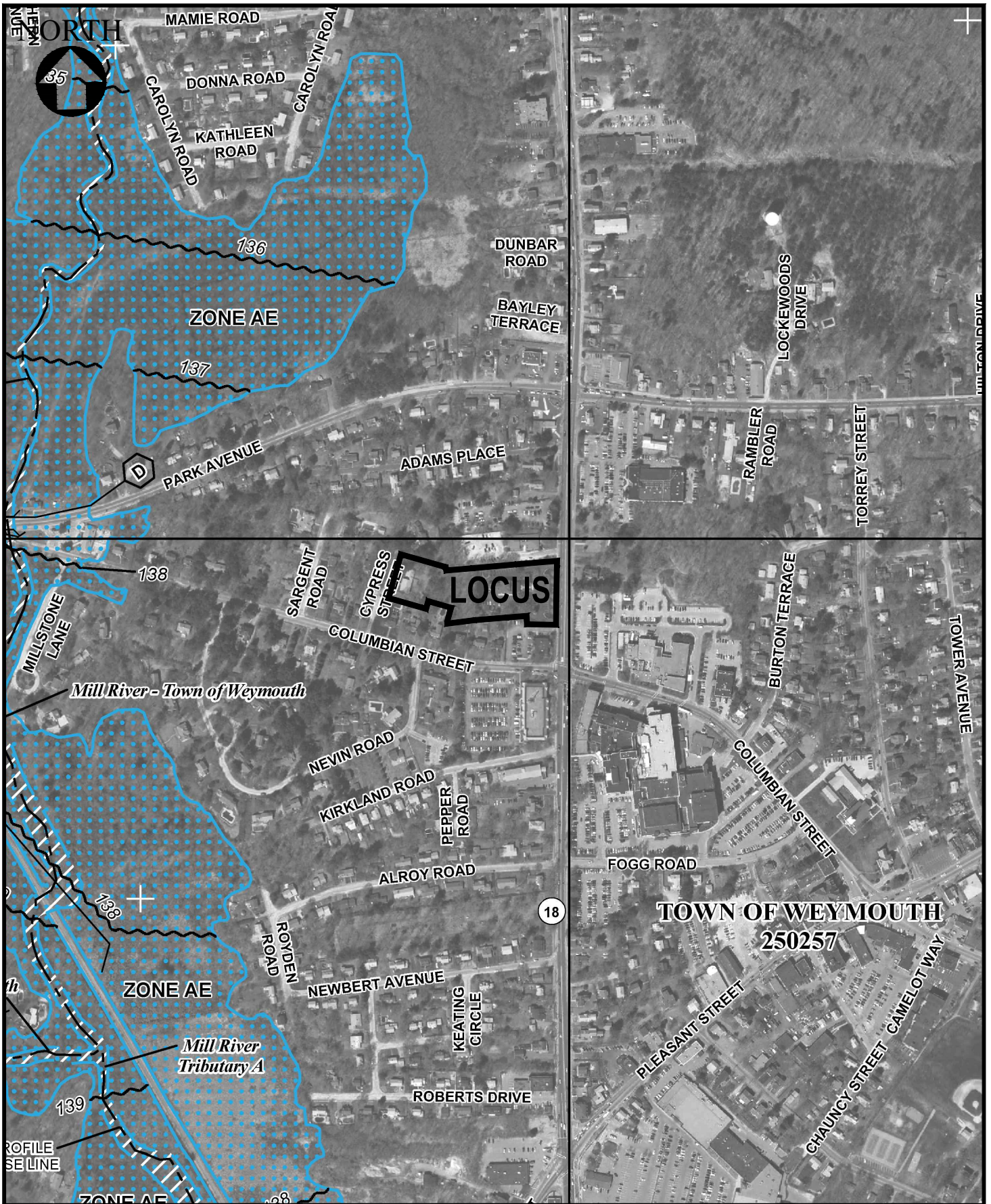
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2





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Design  
Group**

2 SHARP STREET, UNIT B  
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Drawing Title

**FEMA MAP**

DATE: 2.4.2022

DRAWN: CRM

JOB NO.: 100-60

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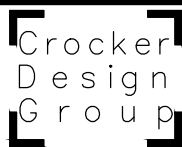
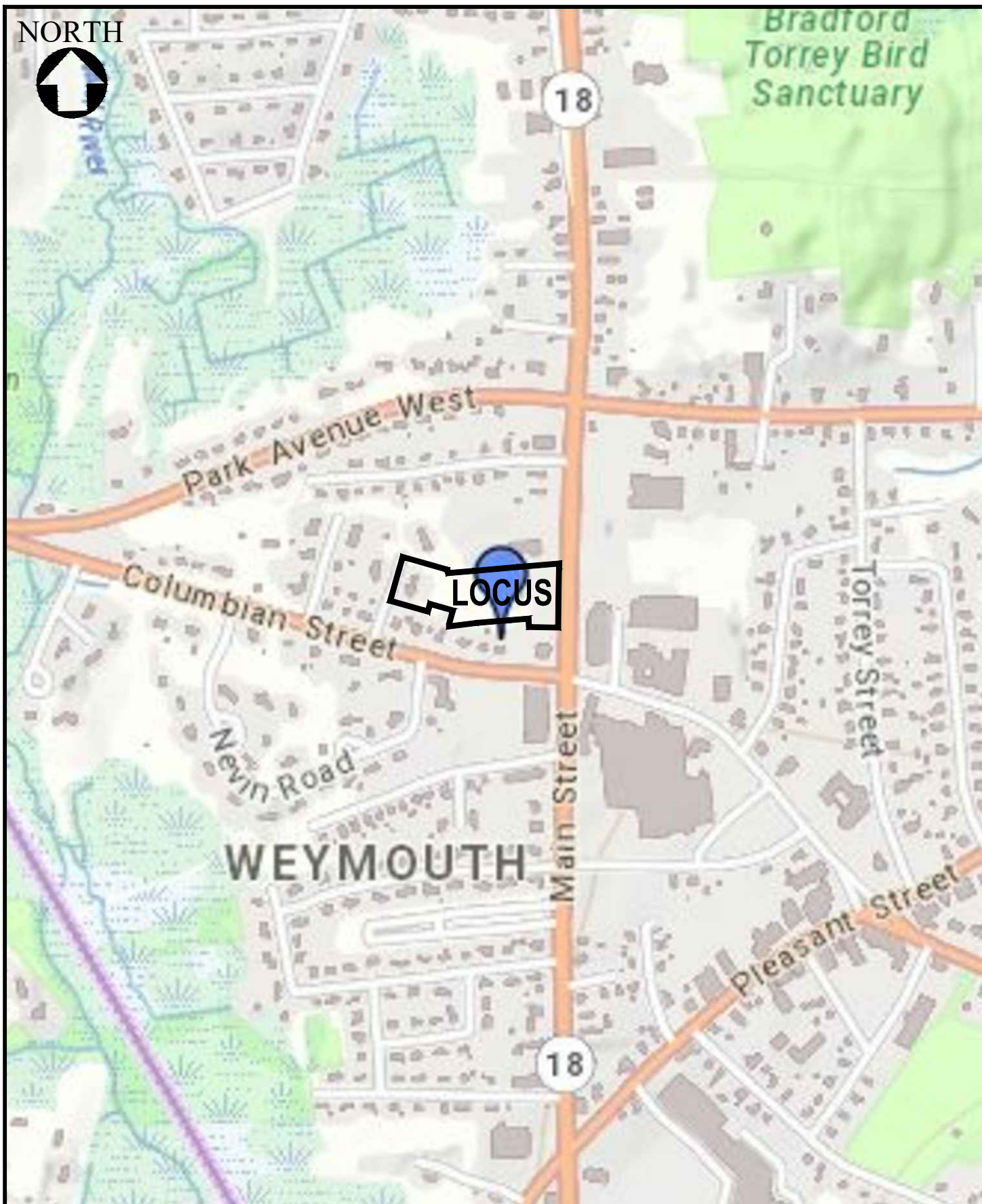
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**3**



NORTH



2 SHARP STREET, UNIT B  
HINGHAM, MA 02043

Project

**MCDONALD-KEOHANE  
FUNERAL HOME - SOUTH**

809 MAIN STREET  
WEYMOUTH, MA 02190

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785 HANCOCK STREET  
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Drawing Title

**MASS GIS NHESP MAP**

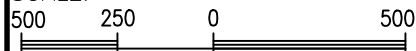
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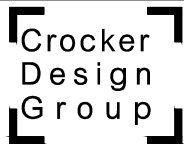
**4**



NORTH



LOCUS



2 SHARP STREET, UNIT B  
HINGHAM, MA 02043

Project

**MCDONALD-KEOHANE  
FUNERAL HOME - SOUTH**

809 MAIN STREET  
WEYMOUTH, MA 02190

Prepared for

**MCDONALD-KEOHANE**

785 HANCOCK STREET  
QUINCY, MA 02170

Drawing Title

**WETLAND MAP**

DATE: 2.4.2022

DRAWN: CRM

JOB NO.:100-60

CHECK: GRC

SCALE:

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**5**

## **SECTION 2 – STORMWATER CHECKLIST**



# Checklist for Stormwater Report

## A. Introduction

**Important:** When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.<sup>1</sup> This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8<sup>2</sup>
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

<sup>1</sup> The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

<sup>2</sup> For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.





# Checklist for Stormwater Report

## B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

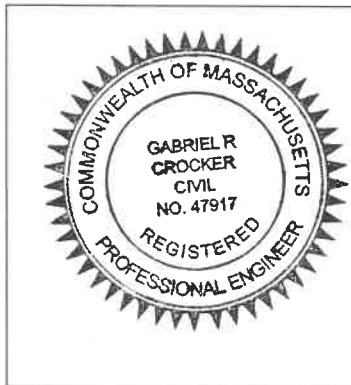
*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

### Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



*[Handwritten Signature]* 4/8/2022  
Signature and Date

## Checklist

**Project Type:** Is the application for new development, redevelopment, or a mix of new and redevelopment?

- ☐ New development
- ☐ Redevelopment
- ☒ Mix of New Development and Redevelopment



# Checklist for Stormwater Report

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## Checklist (continued)

**LID Measures:** Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): \_\_\_\_\_

## Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 2: Peak Rate Attenuation

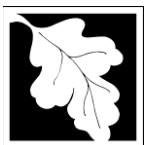
- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

### Standard 3: Recharge

- ☒ Soil Analysis provided.
- ☒ Required Recharge Volume calculation provided.
- ☐ Required Recharge volume reduced through use of the LID site Design Credits.
- ☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.
  - ☐ Static
  - ☒ Simple Dynamic
  - ☐ Dynamic Field<sup>1</sup>
- ☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.
- ☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- ☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
  - ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
  - ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
  - ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
  - ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- ☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- ☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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<sup>1</sup> 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



# Checklist for Stormwater Report

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## Checklist (continued)

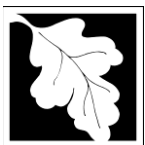
### Standard 3: Recharge (continued)

- ☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

### Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
  - Provisions for storing materials and waste products inside or under cover;
  - Vehicle washing controls;
  - Requirements for routine inspections and maintenance of stormwater BMPs;
  - Spill prevention and response plans;
  - Provisions for maintenance of lawns, gardens, and other landscaped areas;
  - Requirements for storage and use of fertilizers, herbicides, and pesticides;
  - Pet waste management provisions;
  - Provisions for operation and management of septic systems;
  - Provisions for solid waste management;
  - Snow disposal and plowing plans relative to Wetland Resource Areas;
  - Winter Road Salt and/or Sand Use and Storage restrictions;
  - Street sweeping schedules;
  - Provisions for prevention of illicit discharges to the stormwater management system;
  - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
  - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
  - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
  - ☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
    - ☐ is within the Zone II or Interim Wellhead Protection Area
    - ☐ is near or to other critical areas
    - ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
    - ☐ involves runoff from land uses with higher potential pollutant loads.
  - ☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
  - ☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 4: Water Quality (continued)

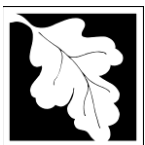
- ☒ The BMP is sized (and calculations provided) based on:
  - ☒ The ½" or 1" Water Quality Volume or
  - ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- ☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

### Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- ☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- ☐ The NPDES Multi-Sector General Permit does **not** cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

### Standard 6: Critical Areas

- ☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☐ Critical areas and BMPs are identified in the Stormwater Report.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- ☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
  - ☐ Limited Project
  - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
  - ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
  - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
  - ☐ Bike Path and/or Foot Path
  - ☐ Redevelopment Project
- ☒ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

### Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
  - Construction Period Operation and Maintenance Plan;
  - Names of Persons or Entity Responsible for Plan Compliance;
  - Construction Period Pollution Prevention Measures;
  - Erosion and Sedimentation Control Plan Drawings;
  - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
  - Vegetation Planning;
  - Site Development Plan;
  - Construction Sequencing Plan;
  - Sequencing of Erosion and Sedimentation Controls;
  - Operation and Maintenance of Erosion and Sedimentation Controls;
  - Inspection Schedule;
  - Maintenance Schedule;
  - Inspection and Maintenance Log Form.
- ☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



# Checklist for Stormwater Report

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## Checklist (continued)

### Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☐ The project is **not** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

### Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
  - ☒ Name of the stormwater management system owners;
  - ☒ Party responsible for operation and maintenance;
  - ☒ Schedule for implementation of routine and non-routine maintenance tasks;
  - ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
  - ☒ Description and delineation of public safety features;
  - ☒ Estimated operation and maintenance budget; and
  - ☒ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
  - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
  - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

### Standard 10: Prohibition of Illicit Discharges

- ☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- ☒ An Illicit Discharge Compliance Statement is attached;
- ☐ NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

## **ILLICIT DISCHARGE COMPLIANCE STATEMENT**

### **Standard 10: Massachusetts Stormwater Standards Handbook**

Illicit discharges are defined as discharges into waters of the State or municipal separate stormwater system (MS4) that are not entirely comprised of stormwater. Exclusions for non-stormwater discharges into drainage systems include activities or facilities for firefighting, water line flushing, landscape irrigation, uncontaminated groundwater discharge, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, water used to clean residential buildings without detergents, water used for street washing, and flows from riparian habitats/wetlands. These exclusions are subject to change and are under the discretion of the local governing authority.

To the best of our knowledge and professional belief no illicit discharges to the stormwater system, surface waters, or wetland resource areas will remain on the site after construction. We will agree to implement a pollution prevention plan to prevent illicit discharges into the stormwater management system. The design of the site based on the plans entitled "SITE PLANS: MACDONALD-KEOHANE FUNERAL HOME - SOUTH." prepared by Crocker Design Group, 2 Sharp Street Unit B, Hingham, Massachusetts show a separation and no direct connection between the stormwater management systems and the wastewater and/or groundwater on the site. To the maximum extent practicable, the design prevents entry of illicit discharges into the stormwater management system.

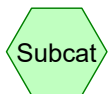
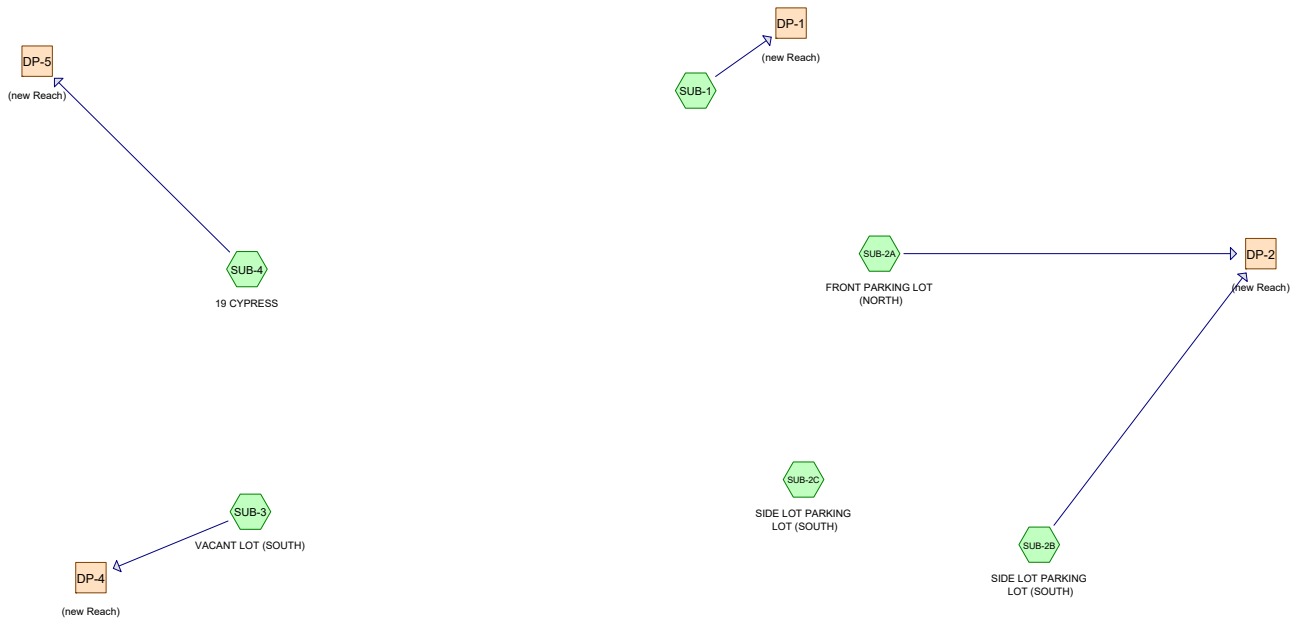
Engineer's Name: \_\_\_\_\_  
(please print)

Engineer's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Company: Crocker Design Group, LLC.



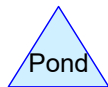
## **SECTION 3 – STORMATER HYDROLOGY MODEL**



Subcat



Reach



Pond



Link

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Page 2

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**Project Notes**

Rainfall events imported from "NRCS-Rain.txt" for 4335 MA Weymouth Norfolk County

Rainfall events imported from "NRCS-Rain.txt" for 4335 MA Weymouth Norfolk County

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Page 3

**Area Listing (all nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
44,126	39	>75% Grass cover, Good, HSG A (SUB-1, SUB-2A, SUB-2B, SUB-2C, SUB-3, SUB-4)
1,500	98	Concrete, HSG A (SUB-2A, SUB-2B, SUB-2C)
37,962	98	Paved parking, HSG A (SUB-2A, SUB-2B, SUB-2C, SUB-4)
8,391	98	Roofs, HSG A (SUB-2A, SUB-2C, SUB-4)
31,108	30	Woods, Good, HSG A (SUB-3, SUB-4)
<b>123,087</b>	<b>60</b>	<b>TOTAL AREA</b>

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### Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
123,087	HSG A	SUB-1, SUB-2A, SUB-2B, SUB-2C, SUB-3, SUB-4
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
<b>123,087</b>		<b>TOTAL AREA</b>

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**Ground Covers (all nodes)**

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
44,126	0	0	0	0	44,126	>75% Grass cover, Good	
1,500	0	0	0	0	1,500	Concrete	
37,962	0	0	0	0	37,962	Paved parking	
8,391	0	0	0	0	8,391	Roofs	
31,108	0	0	0	0	31,108	Woods, Good	
<b>123,087</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>123,087</b>	<b>TOTAL AREA</b>	

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment SUB-1:** Runoff Area=6,985 sf 0.00% Impervious Runoff Depth=0.00"  
Flow Length=114' Tc=6.6 min CN=39 Runoff=0.00 cfs 2 cf

**Subcatchment SUB-2A: FRONT PARKING** Runoff Area=34,556 sf 65.77% Impervious Runoff Depth=1.39"  
Tc=6.0 min CN=78 Runoff=1.41 cfs 4,008 cf

**Subcatchment SUB-2B: SIDE LOT PARKING** Runoff Area=6,305 sf 34.31% Impervious Runoff Depth=0.44"  
Tc=6.0 min CN=59 Runoff=0.05 cfs 229 cf

**Subcatchment SUB-2C: SIDE LOT** Runoff Area=18,470 sf 97.17% Impervious Runoff Depth=2.91"  
Tc=6.0 min CN=96 Runoff=1.42 cfs 4,474 cf

**Subcatchment SUB-3: VACANT LOT (SOUTH)** Runoff Area=9,332 sf 0.00% Impervious Runoff Depth=0.00"  
Flow Length=131' Tc=25.8 min CN=32 Runoff=0.00 cfs 0 cf

**Subcatchment SUB-4: 19 CYPRESS** Runoff Area=47,439 sf 10.58% Impervious Runoff Depth=0.02"  
Flow Length=401' Tc=26.1 min CN=41 Runoff=0.00 cfs 62 cf

**Reach DP-1: (new Reach)** Inflow=0.00 cfs 2 cf  
Outflow=0.00 cfs 2 cf

**Reach DP-2: (new Reach)** Inflow=1.46 cfs 4,237 cf  
Outflow=1.46 cfs 4,237 cf

**Reach DP-4: (new Reach)** Inflow=0.00 cfs 0 cf  
Outflow=0.00 cfs 0 cf

**Reach DP-5: (new Reach)** Inflow=0.00 cfs 62 cf  
Outflow=0.00 cfs 62 cf

**Total Runoff Area = 123,087 sf Runoff Volume = 8,775 cf Average Runoff Depth = 0.86"**  
**61.12% Pervious = 75,234 sf 38.88% Impervious = 47,853 sf**

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### Summary for Subcatchment SUB-1:

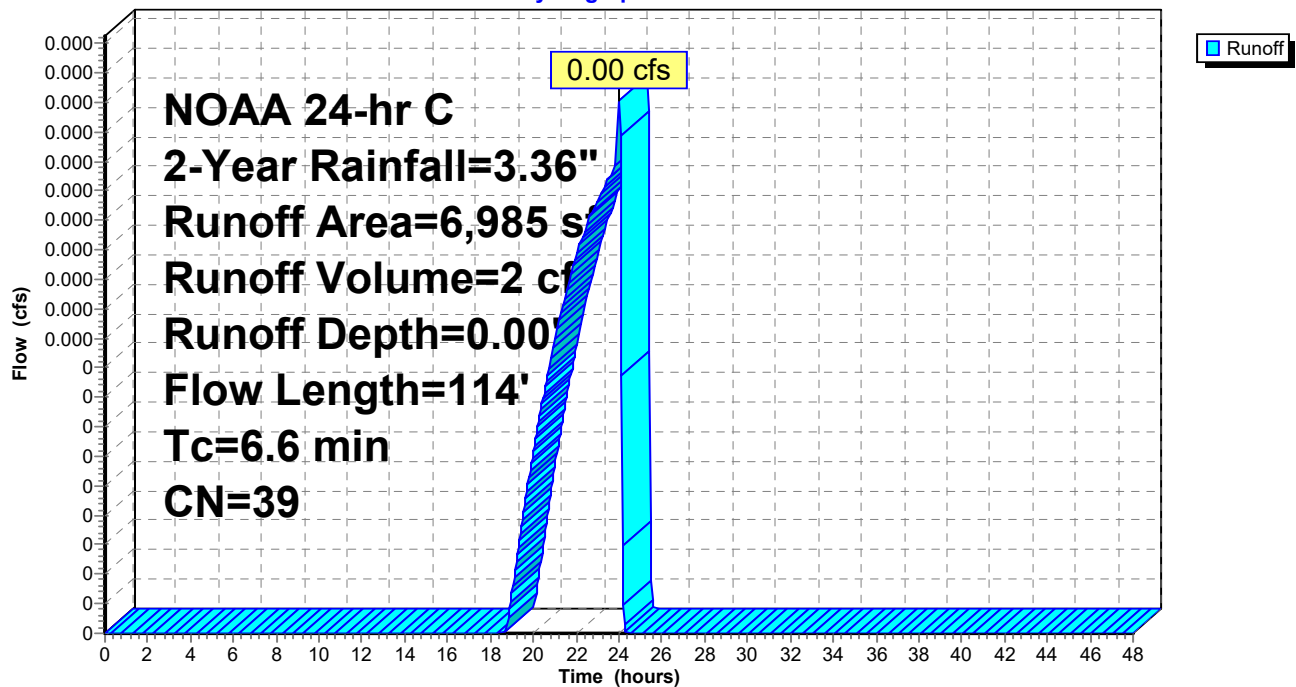
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 2 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description			
6,985	39	>75% Grass cover, Good, HSG A			
6,985		100.00% Pervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.0360	0.13		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.36"
0.3	64	0.0500	3.60		
6.6	114	Total			

### Subcatchment SUB-1:

## Hydrograph





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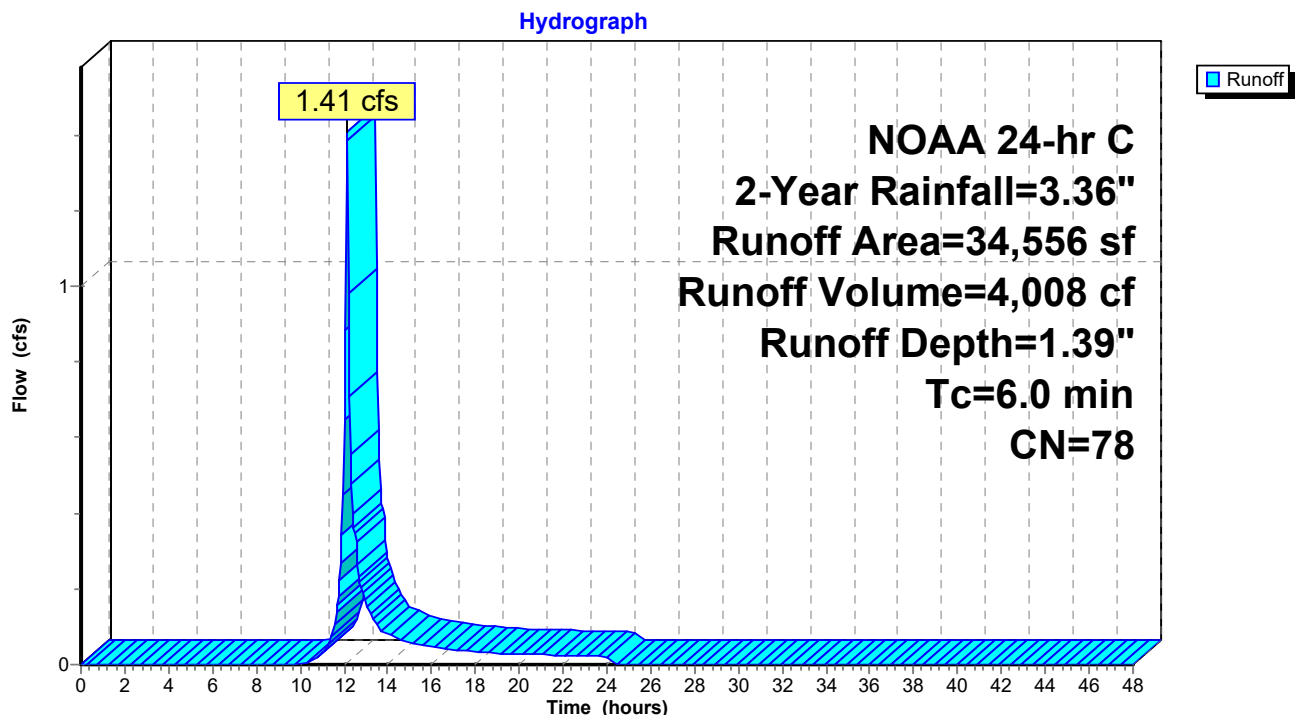
**Summary for Subcatchment SUB-2A: FRONT PARKING LOT (NORTH)**

Runoff = 1.41 cfs @ 12.13 hrs, Volume= 4,008 cf, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
18,985	98	Paved parking, HSG A
11,830	39	>75% Grass cover, Good, HSG A
2,769	98	Roofs, HSG A
* 972	98	Concrete, HSG A
34,556	78	Weighted Average
11,830		34.23% Pervious Area
22,726		65.77% Impervious Area

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

**Subcatchment SUB-2A: FRONT PARKING LOT (NORTH)**

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**Summary for Subcatchment SUB-2B: SIDE LOT PARKING LOT (SOUTH)**

Runoff = 0.05 cfs @ 12.16 hrs, Volume= 229 cf, Depth= 0.44"

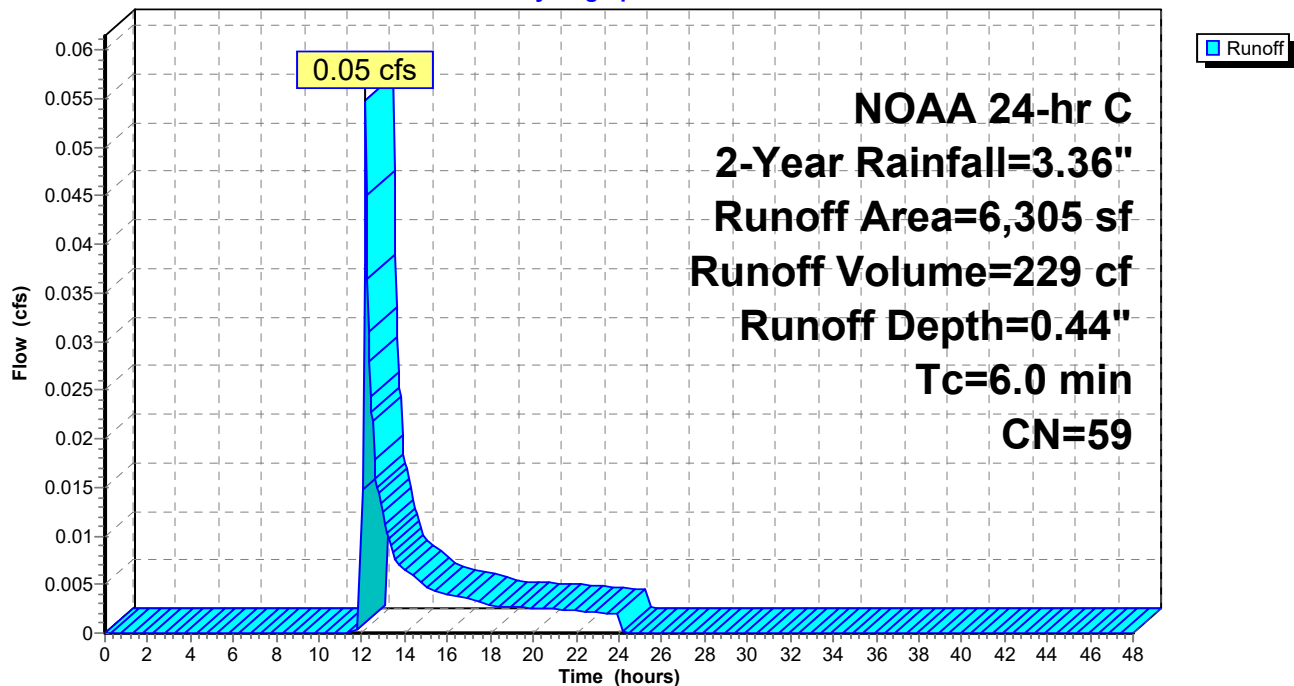
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
4,142	39	>75% Grass cover, Good, HSG A
2,158	98	Paved parking, HSG A
* 5	98	Concrete, HSG A
6,305	59	Weighted Average
4,142		65.69% Pervious Area
2,163		34.31% Impervious Area

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

**Subcatchment SUB-2B: SIDE LOT PARKING LOT (SOUTH)**

Hydrograph



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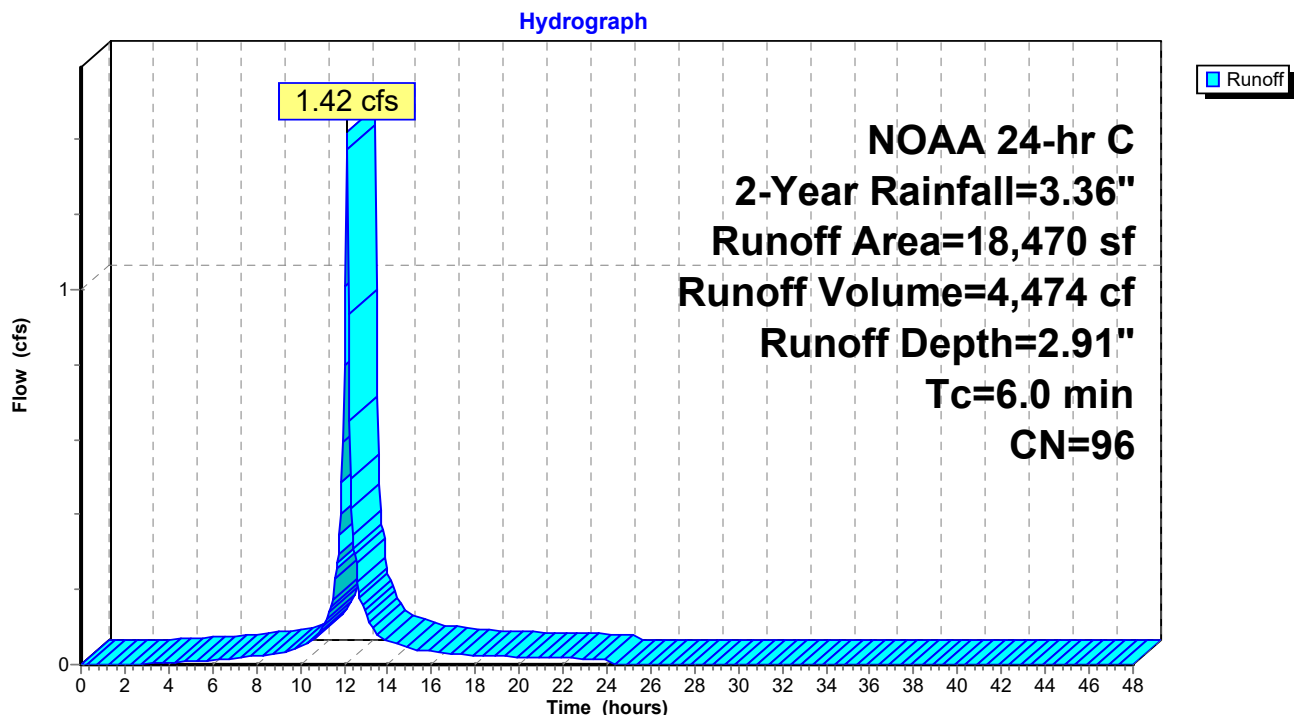
**Summary for Subcatchment SUB-2C: SIDE LOT PARKING LOT (SOUTH)**

Runoff = 1.42 cfs @ 12.13 hrs, Volume= 4,474 cf, Depth= 2.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
523	39	>75% Grass cover, Good, HSG A
14,418	98	Paved parking, HSG A
3,006	98	Roofs, HSG A
* 523	98	Concrete, HSG A
18,470	96	Weighted Average
523		2.83% Pervious Area
17,947		97.17% Impervious Area

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

**Subcatchment SUB-2C: SIDE LOT PARKING LOT (SOUTH)**

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NOAA 24-hr C 2-Year Rainfall=3.36"

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**Summary for Subcatchment SUB-3: VACANT LOT (SOUTH)**

[45] Hint: Runoff=Zero

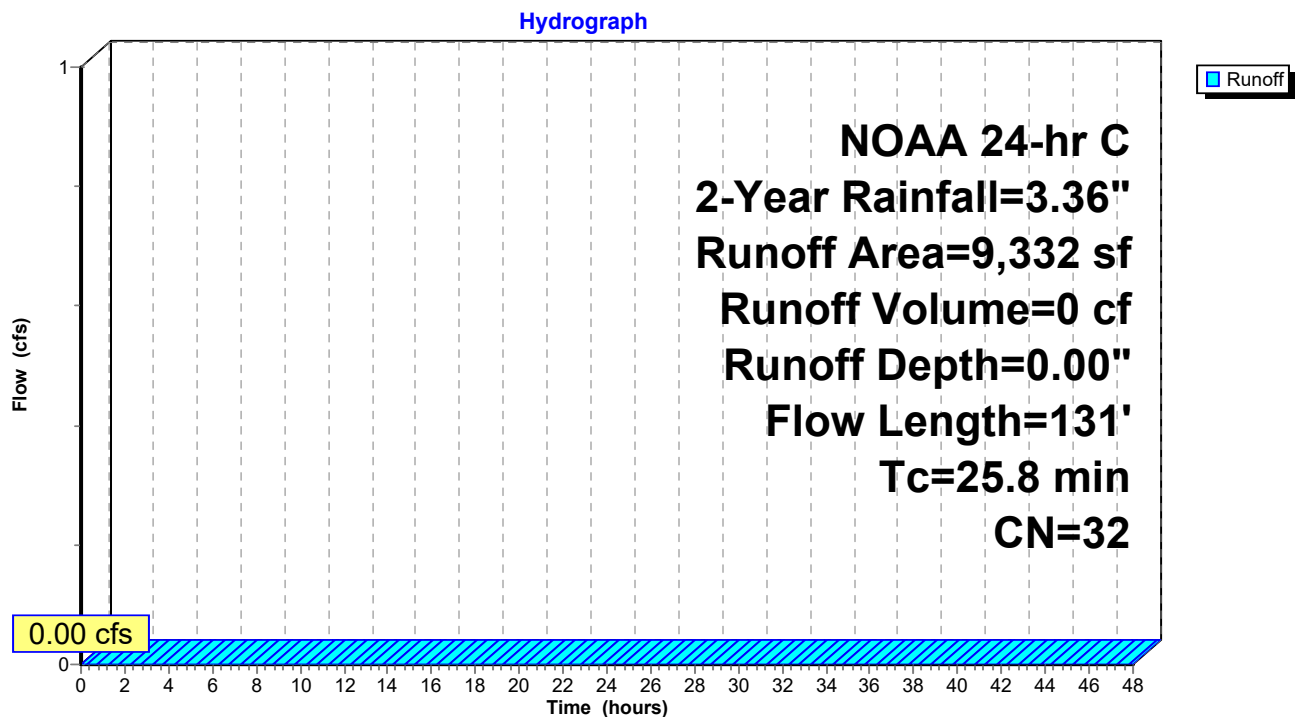
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
6,877	30	Woods, Good, HSG A
2,455	39	>75% Grass cover, Good, HSG A
9,332	32	Weighted Average
9,332		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	50	0.0140	0.03		<b>Sheet Flow,</b> Woods: Dense underbrush n= 0.800 P2= 3.36"
1.6	81	0.0280	0.84		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
25.8	131	Total			

**Subcatchment SUB-3: VACANT LOT (SOUTH)**

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NOAA 24-hr C 2-Year Rainfall=3.36"

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**Summary for Subcatchment SUB-4: 19 CYPRESS**

Runoff = 0.00 cfs @ 22.90 hrs, Volume= 62 cf, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
24,231	30	Woods, Good, HSG A
18,191	39	>75% Grass cover, Good, HSG A
2,616	98	Roofs, HSG A
2,401	98	Paved parking, HSG A
47,439	41	Weighted Average
42,422		89.42% Pervious Area
5,017		10.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.9	50	0.0180	0.04		<b>Sheet Flow,</b> Woods: Dense underbrush n= 0.800 P2= 3.36"
2.1	107	0.0300	0.87		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
0.6	66	0.1200	1.73		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
1.2	107	0.0090	1.53		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.3	71	0.0500	3.60		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
26.1	401	Total			

## Existing

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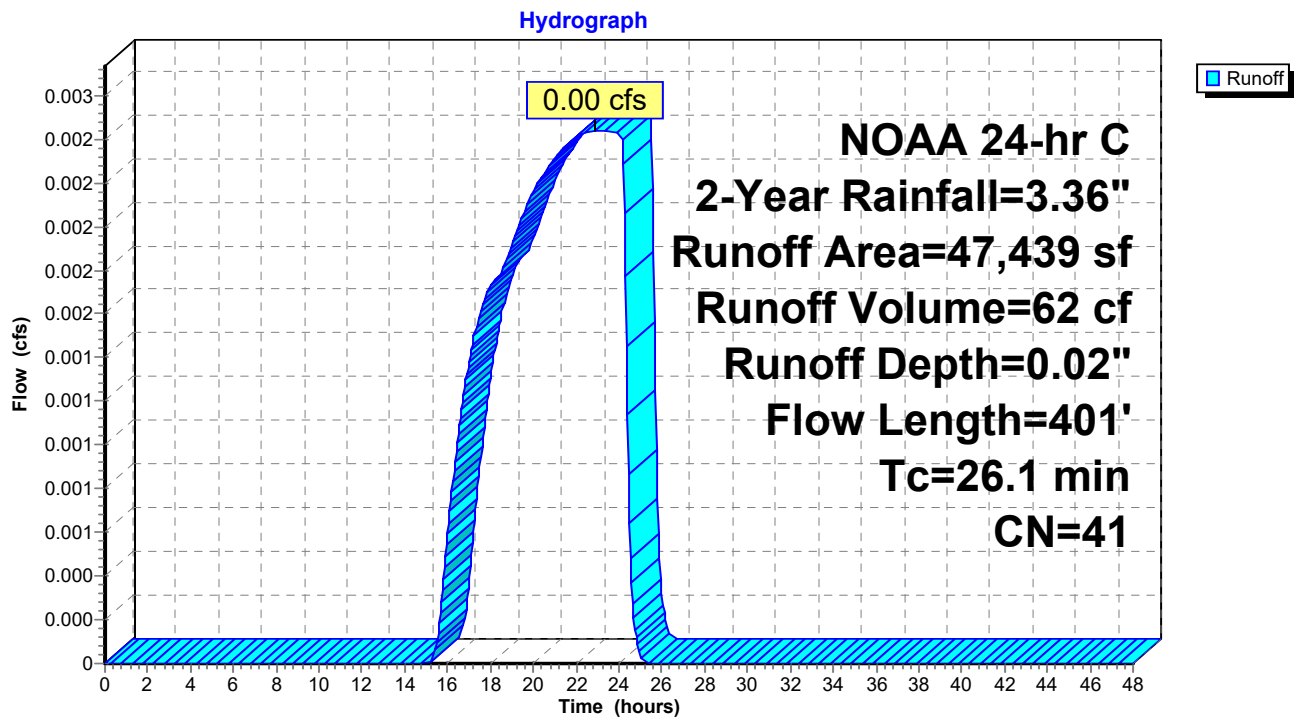
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NOAA 24-hr C 2-Year Rainfall=3.36"

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### Subcatchment SUB-4: 19 CYPRESS



## Existing

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NOAA 24-hr C 2-Year Rainfall=3.36"

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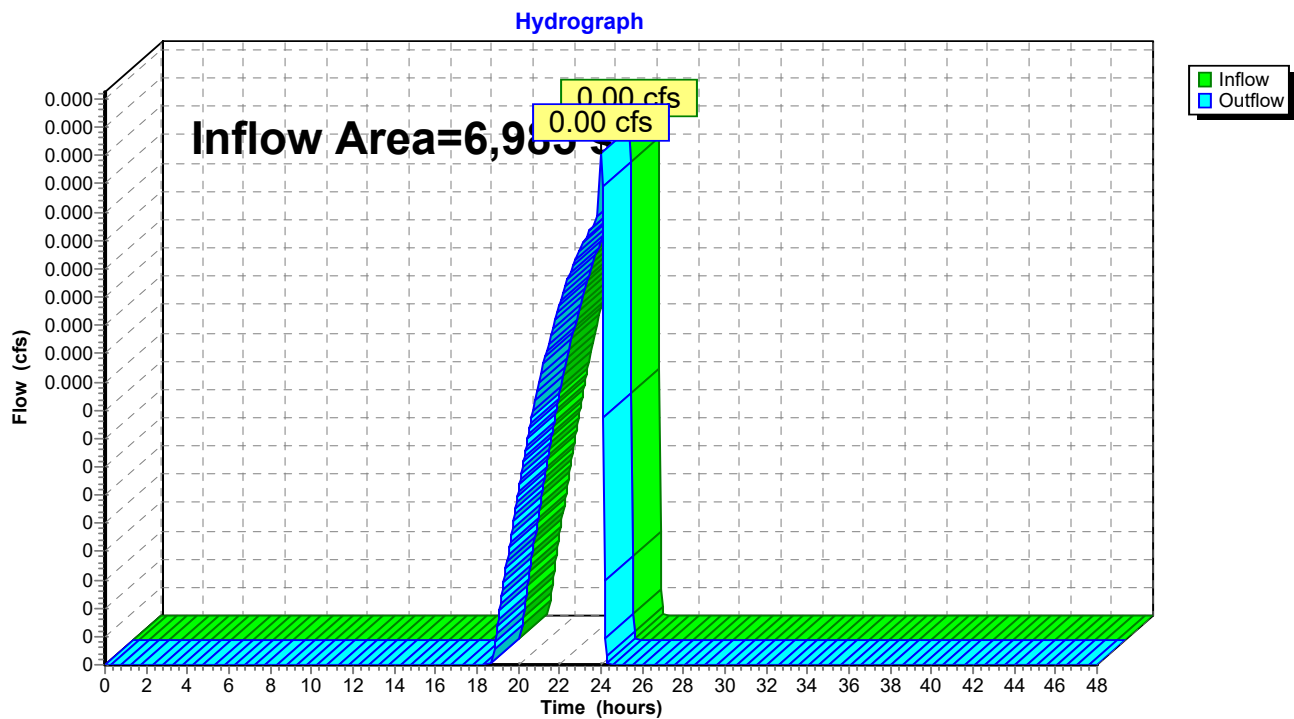
### Summary for Reach DP-1: (new Reach)

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

Inflow Area = 6,985 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event  
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 2 cf  
Outflow = 0.00 cfs @ 24.00 hrs, Volume= 2 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-1: (new Reach)



## Existing

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NOAA 24-hr C 2-Year Rainfall=3.36"

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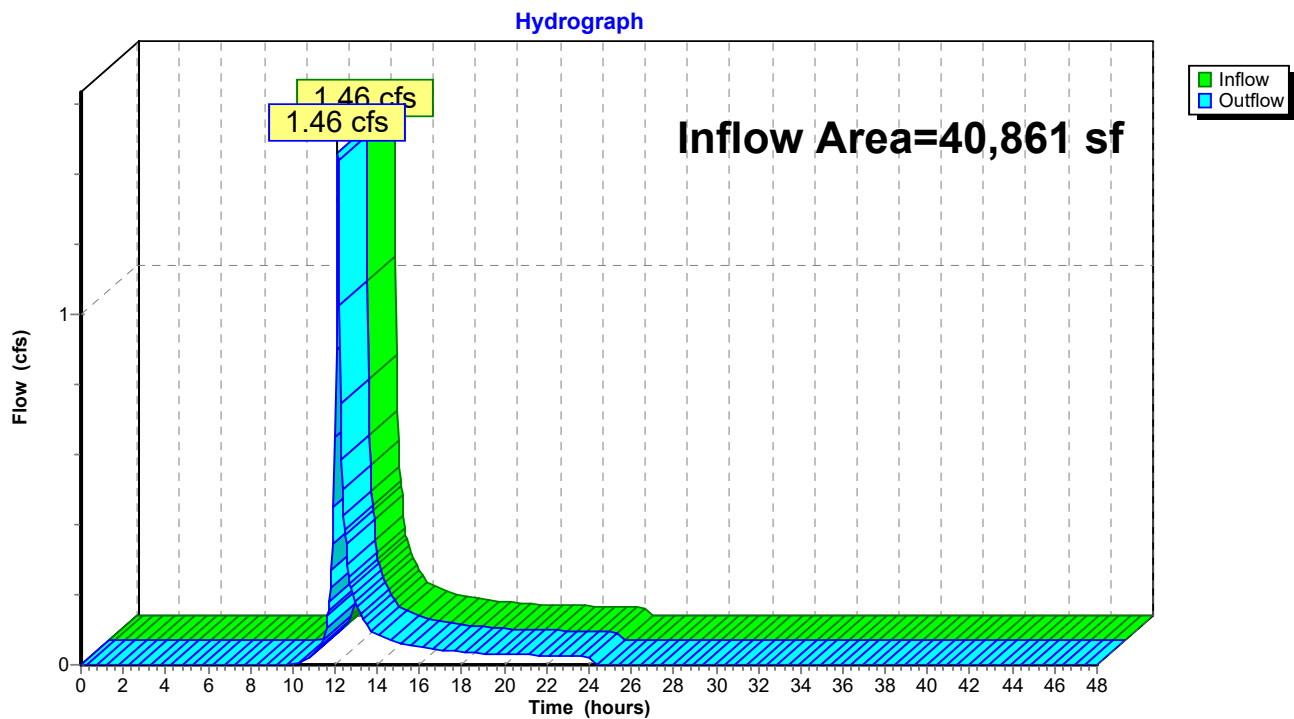
### Summary for Reach DP-2: (new Reach)

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

Inflow Area = 40,861 sf, 60.91% Impervious, Inflow Depth = 1.24" for 2-Year event  
Inflow = 1.46 cfs @ 12.14 hrs, Volume= 4,237 cf  
Outflow = 1.46 cfs @ 12.14 hrs, Volume= 4,237 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-2: (new Reach)





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NOAA 24-hr C 2-Year Rainfall=3.36"

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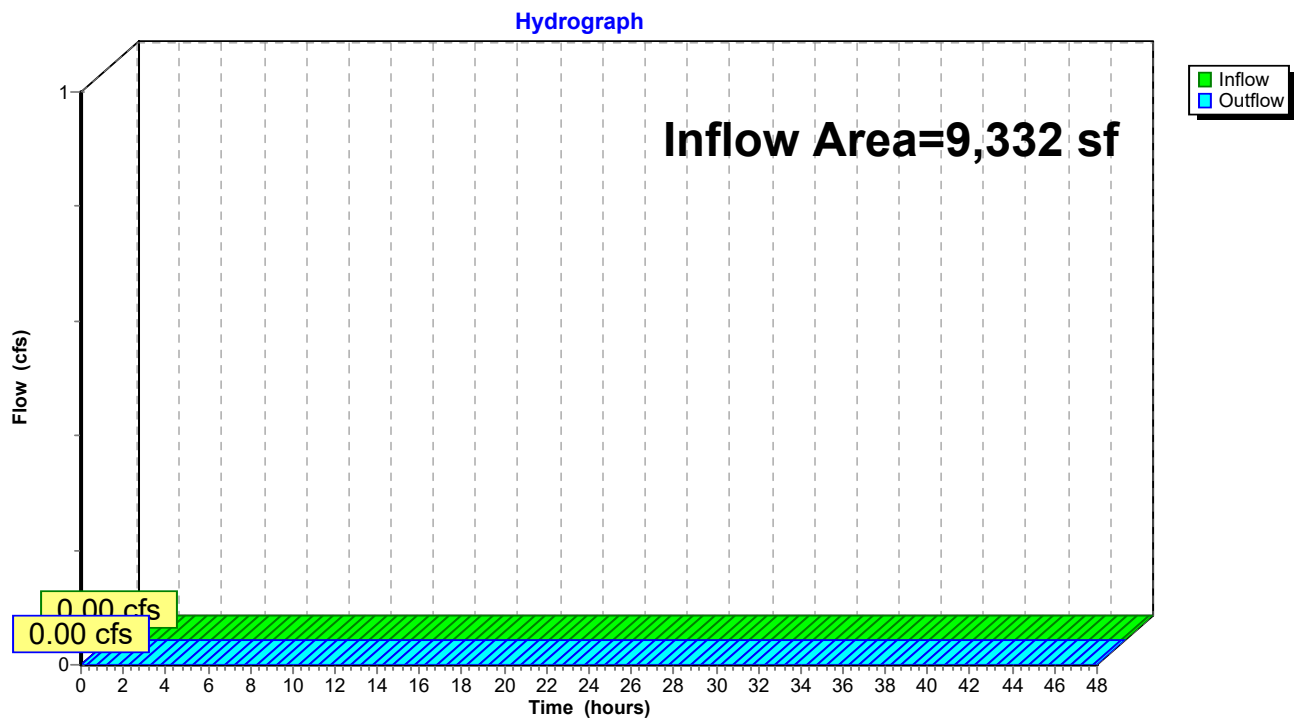
### Summary for Reach DP-4: (new Reach)

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

Inflow Area = 9,332 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event  
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-4: (new Reach)



## Existing

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NOAA 24-hr C 2-Year Rainfall=3.36"

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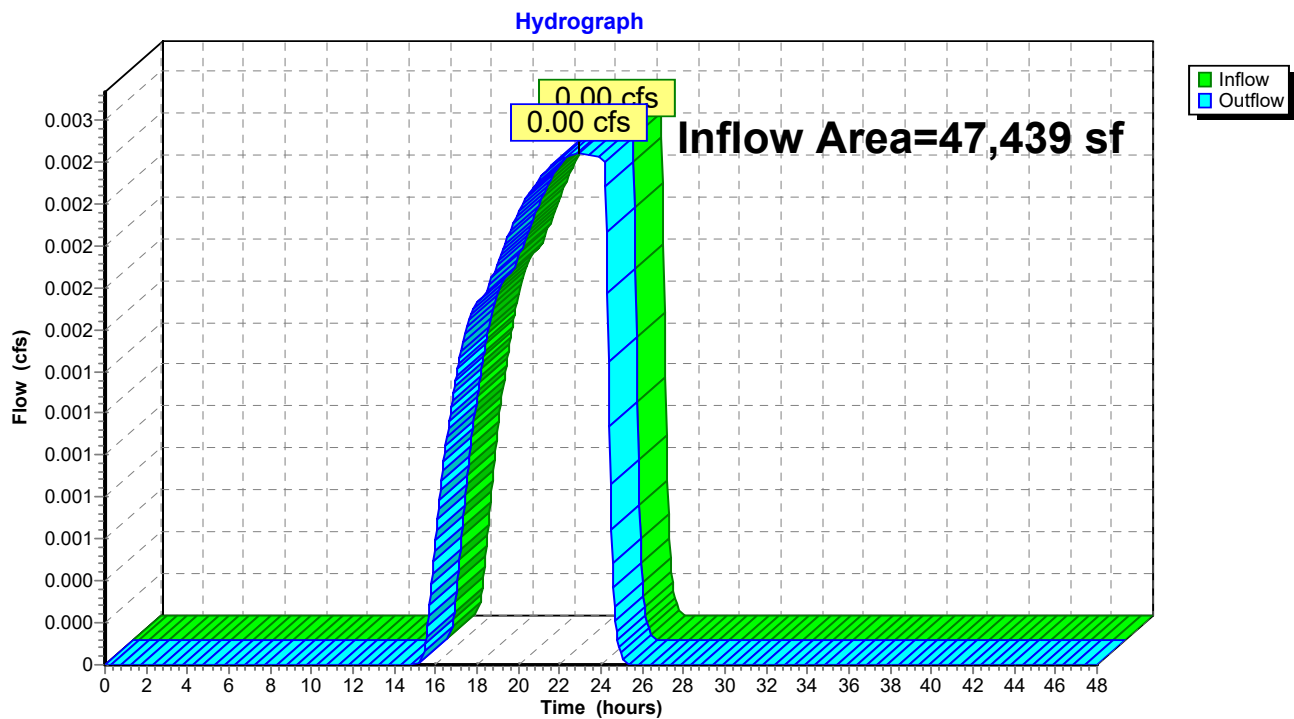
### Summary for Reach DP-5: (new Reach)

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

Inflow Area = 47,439 sf, 10.58% Impervious, Inflow Depth = 0.02" for 2-Year event  
Inflow = 0.00 cfs @ 22.90 hrs, Volume= 62 cf  
Outflow = 0.00 cfs @ 22.90 hrs, Volume= 62 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-5: (new Reach)



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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment SUB-1:** Runoff Area=6,985 sf 0.00% Impervious Runoff Depth=0.23"  
Flow Length=114' Tc=6.6 min CN=39 Runoff=0.01 cfs 133 cf

**Subcatchment SUB-2A: FRONT PARKING** Runoff Area=34,556 sf 65.77% Impervious Runoff Depth=2.83"  
Tc=6.0 min CN=78 Runoff=2.86 cfs 8,152 cf

**Subcatchment SUB-2B: SIDE LOT PARKING** Runoff Area=6,305 sf 34.31% Impervious Runoff Depth=1.31"  
Tc=6.0 min CN=59 Runoff=0.23 cfs 691 cf

**Subcatchment SUB-2C: SIDE LOT** Runoff Area=18,470 sf 97.17% Impervious Runoff Depth=4.67"  
Tc=6.0 min CN=96 Runoff=2.22 cfs 7,191 cf

**Subcatchment SUB-3: VACANT LOT (SOUTH)** Runoff Area=9,332 sf 0.00% Impervious Runoff Depth=0.04"  
Flow Length=131' Tc=25.8 min CN=32 Runoff=0.00 cfs 28 cf

**Subcatchment SUB-4: 19 CYPRESS** Runoff Area=47,439 sf 10.58% Impervious Runoff Depth=0.31"  
Flow Length=401' Tc=26.1 min CN=41 Runoff=0.08 cfs 1,215 cf

**Reach DP-1: (new Reach)** Inflow=0.01 cfs 133 cf  
Outflow=0.01 cfs 133 cf

**Reach DP-2: (new Reach)** Inflow=3.09 cfs 8,843 cf  
Outflow=3.09 cfs 8,843 cf

**Reach DP-4: (new Reach)** Inflow=0.00 cfs 28 cf  
Outflow=0.00 cfs 28 cf

**Reach DP-5: (new Reach)** Inflow=0.08 cfs 1,215 cf  
Outflow=0.08 cfs 1,215 cf

**Total Runoff Area = 123,087 sf Runoff Volume = 17,409 cf Average Runoff Depth = 1.70"**  
**61.12% Pervious = 75,234 sf 38.88% Impervious = 47,853 sf**

**Existing**

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**Summary for Subcatchment SUB-1:**

Runoff = 0.01 cfs @ 12.54 hrs, Volume= 133 cf, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 10-Year Rainfall=5.14"

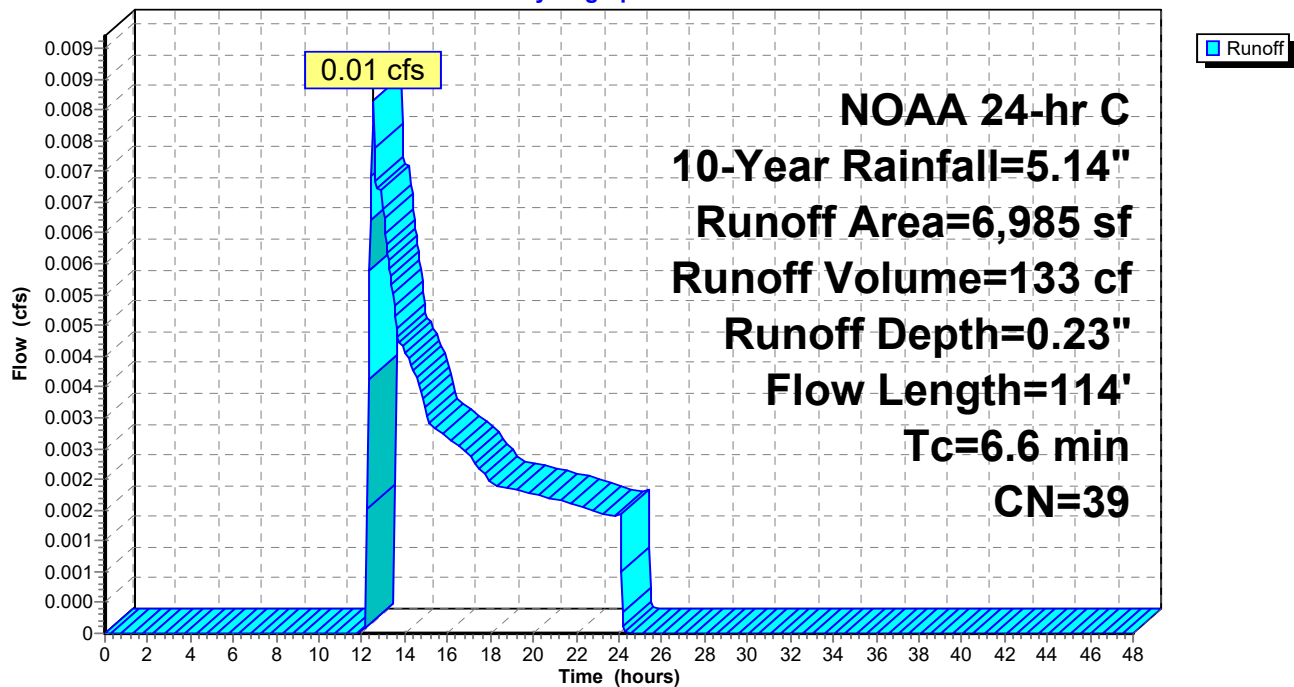
Area (sf)	CN	Description
6,985	39	>75% Grass cover, Good, HSG A
6,985		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.0360	0.13		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.36"
0.3	64	0.0500	3.60		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
6.6	114	Total			

**Subcatchment SUB-1:**

Hydrograph



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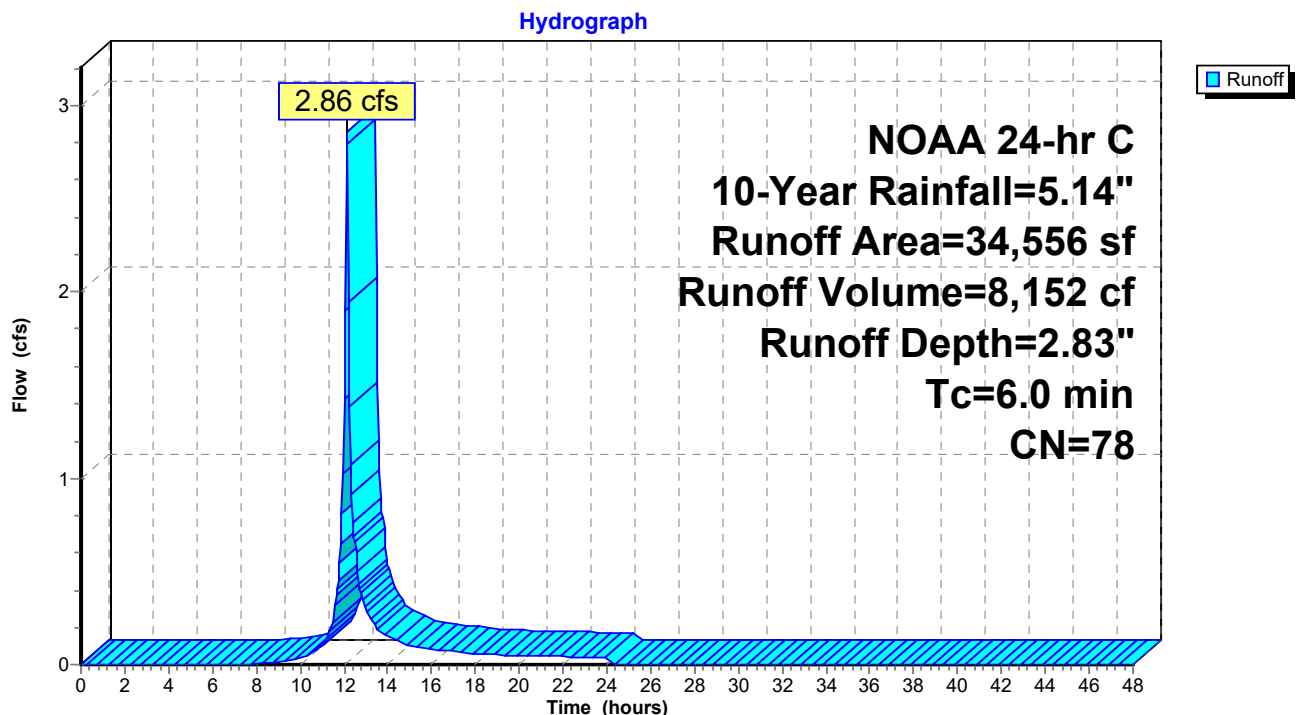
**Summary for Subcatchment SUB-2A: FRONT PARKING LOT (NORTH)**

Runoff = 2.86 cfs @ 12.13 hrs, Volume= 8,152 cf, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 10-Year Rainfall=5.14"

Area (sf)	CN	Description
18,985	98	Paved parking, HSG A
11,830	39	>75% Grass cover, Good, HSG A
2,769	98	Roofs, HSG A
* 972	98	Concrete, HSG A
34,556	78	Weighted Average
11,830		34.23% Pervious Area
22,726		65.77% Impervious Area

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

**Subcatchment SUB-2A: FRONT PARKING LOT (NORTH)**

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**Summary for Subcatchment SUB-2B: SIDE LOT PARKING LOT (SOUTH)**

Runoff = 0.23 cfs @ 12.14 hrs, Volume= 691 cf, Depth= 1.31"

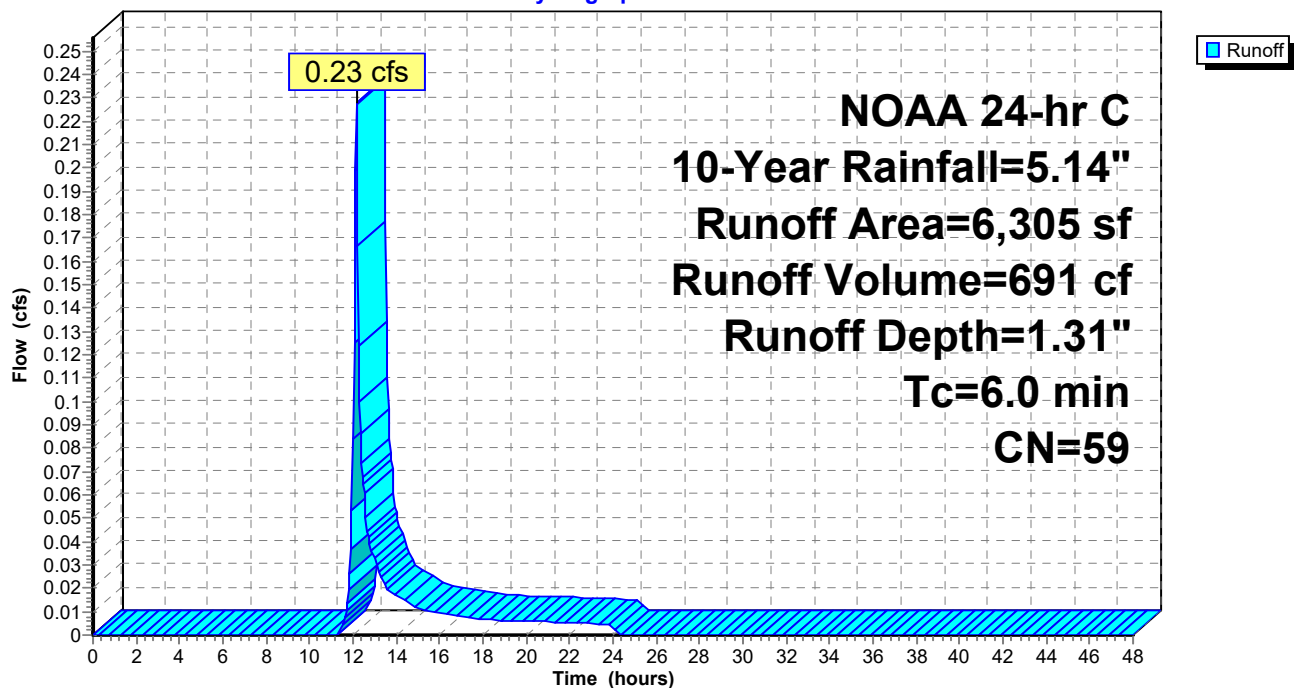
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 10-Year Rainfall=5.14"

Area (sf)	CN	Description
4,142	39	>75% Grass cover, Good, HSG A
2,158	98	Paved parking, HSG A
* 5	98	Concrete, HSG A
6,305	59	Weighted Average
4,142		65.69% Pervious Area
2,163		34.31% Impervious Area

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

**Subcatchment SUB-2B: SIDE LOT PARKING LOT (SOUTH)**

Hydrograph



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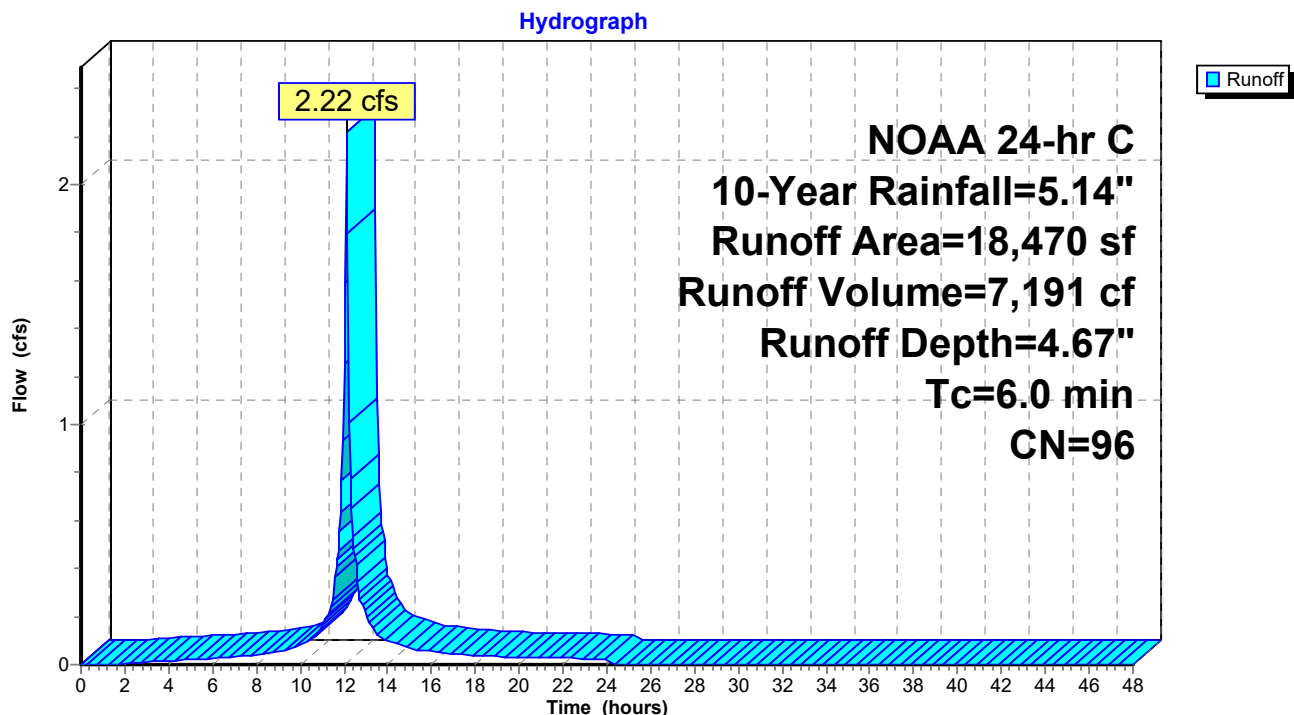
**Summary for Subcatchment SUB-2C: SIDE LOT PARKING LOT (SOUTH)**

Runoff = 2.22 cfs @ 12.13 hrs, Volume= 7,191 cf, Depth= 4.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 10-Year Rainfall=5.14"

Area (sf)	CN	Description
523	39	>75% Grass cover, Good, HSG A
14,418	98	Paved parking, HSG A
3,006	98	Roofs, HSG A
* 523	98	Concrete, HSG A
18,470	96	Weighted Average
523		2.83% Pervious Area
17,947		97.17% Impervious Area

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

**Subcatchment SUB-2C: SIDE LOT PARKING LOT (SOUTH)**

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NOAA 24-hr C 10-Year Rainfall=5.14"

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**Summary for Subcatchment SUB-3: VACANT LOT (SOUTH)**

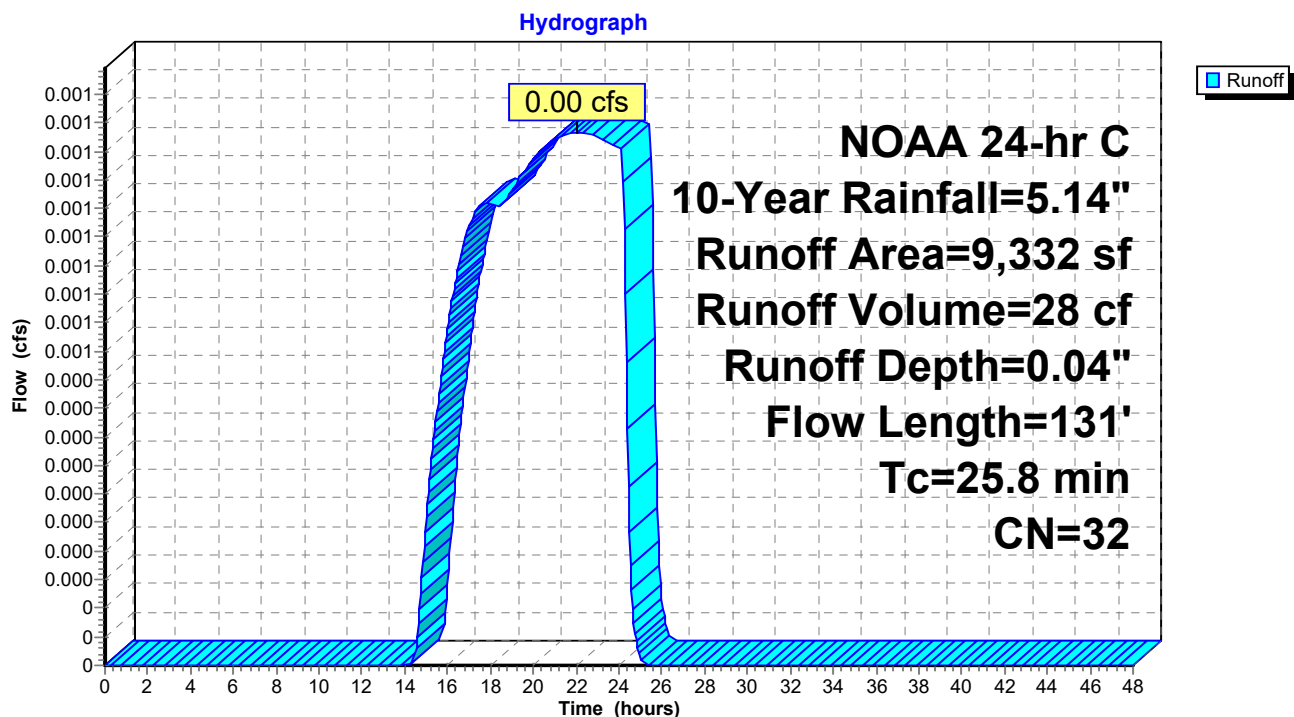
Runoff = 0.00 cfs @ 22.07 hrs, Volume= 28 cf, Depth= 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 10-Year Rainfall=5.14"

Area (sf)	CN	Description
6,877	30	Woods, Good, HSG A
2,455	39	>75% Grass cover, Good, HSG A
9,332	32	Weighted Average
9,332		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	50	0.0140	0.03		<b>Sheet Flow,</b> Woods: Dense underbrush n= 0.800 P2= 3.36"
1.6	81	0.0280	0.84		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
25.8	131	Total			

**Subcatchment SUB-3: VACANT LOT (SOUTH)**



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**Summary for Subcatchment SUB-4: 19 CYPRESS**

Runoff = 0.08 cfs @ 12.76 hrs, Volume= 1,215 cf, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 10-Year Rainfall=5.14"

Area (sf)	CN	Description
24,231	30	Woods, Good, HSG A
18,191	39	>75% Grass cover, Good, HSG A
2,616	98	Roofs, HSG A
2,401	98	Paved parking, HSG A
47,439	41	Weighted Average
42,422		89.42% Pervious Area
5,017		10.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.9	50	0.0180	0.04		<b>Sheet Flow,</b> Woods: Dense underbrush n= 0.800 P2= 3.36"
2.1	107	0.0300	0.87		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
0.6	66	0.1200	1.73		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
1.2	107	0.0090	1.53		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.3	71	0.0500	3.60		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
26.1	401	Total			

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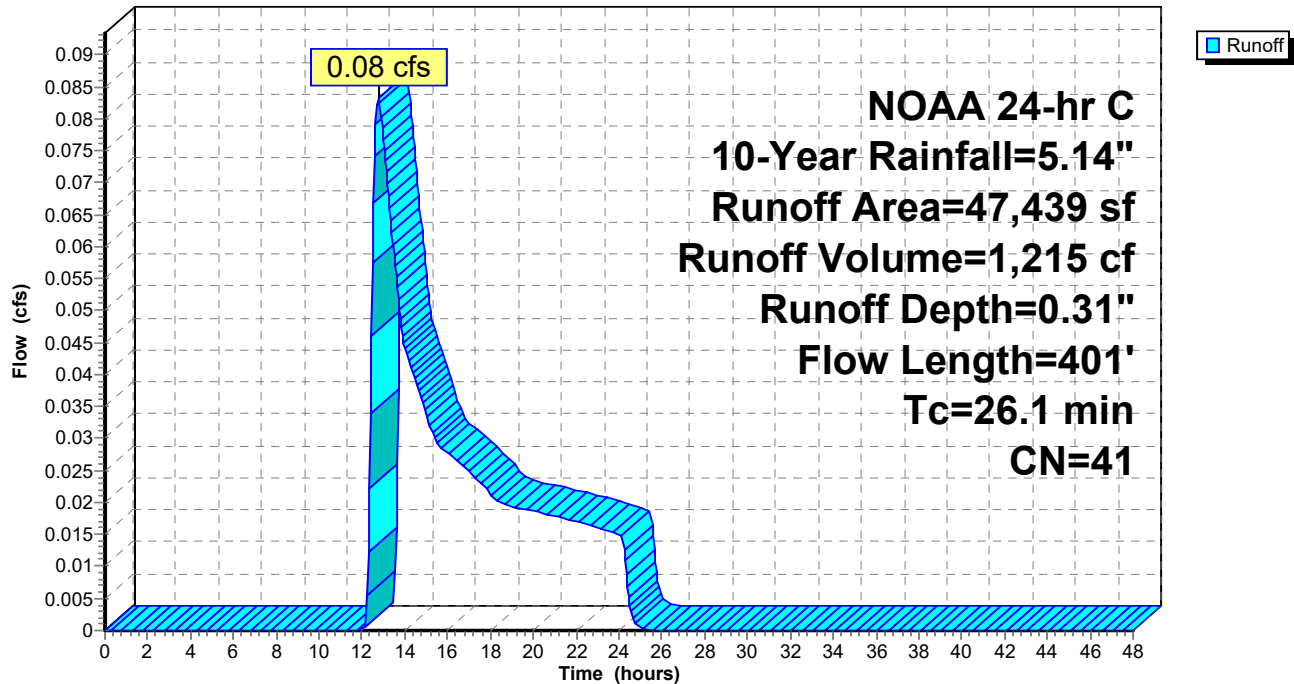
NOAA 24-hr C 10-Year Rainfall=5.14"

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### Subcatchment SUB-4: 19 CYPRESS

Hydrograph



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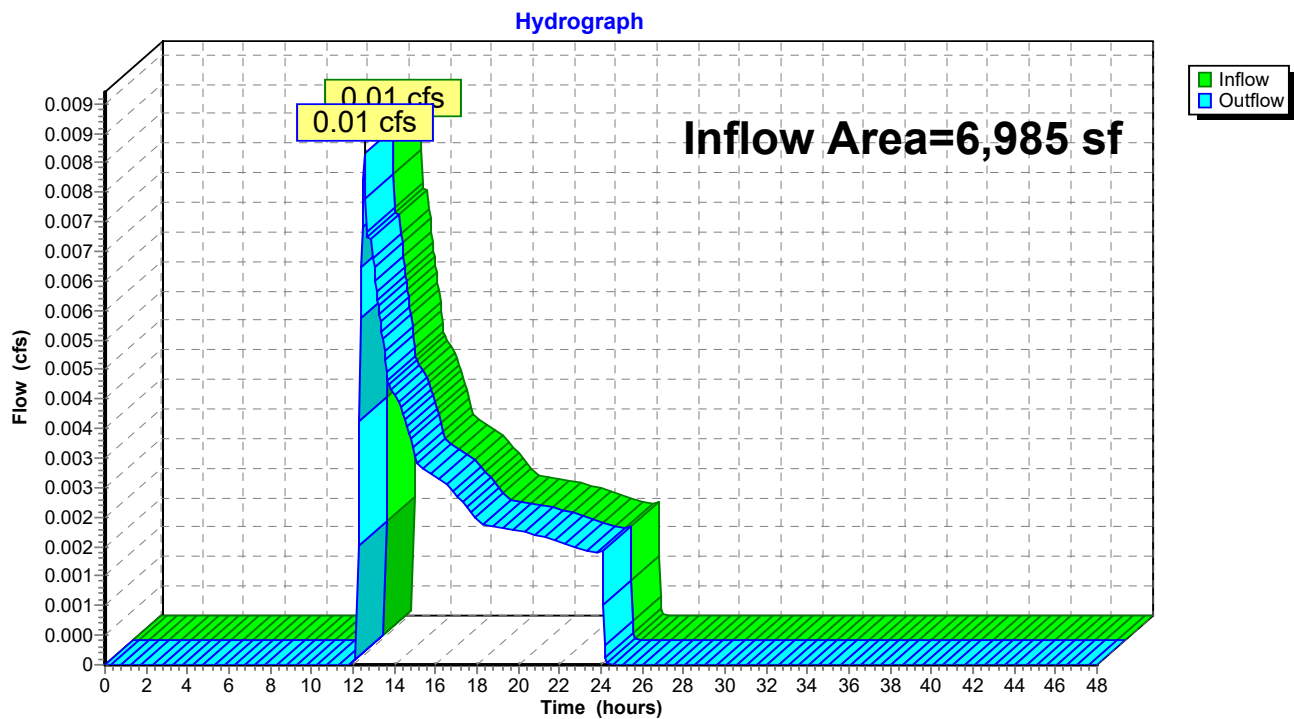
### Summary for Reach DP-1: (new Reach)

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

Inflow Area = 6,985 sf, 0.00% Impervious, Inflow Depth = 0.23" for 10-Year event  
Inflow = 0.01 cfs @ 12.54 hrs, Volume= 133 cf  
Outflow = 0.01 cfs @ 12.54 hrs, Volume= 133 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-1: (new Reach)



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NOAA 24-hr C 10-Year Rainfall=5.14"

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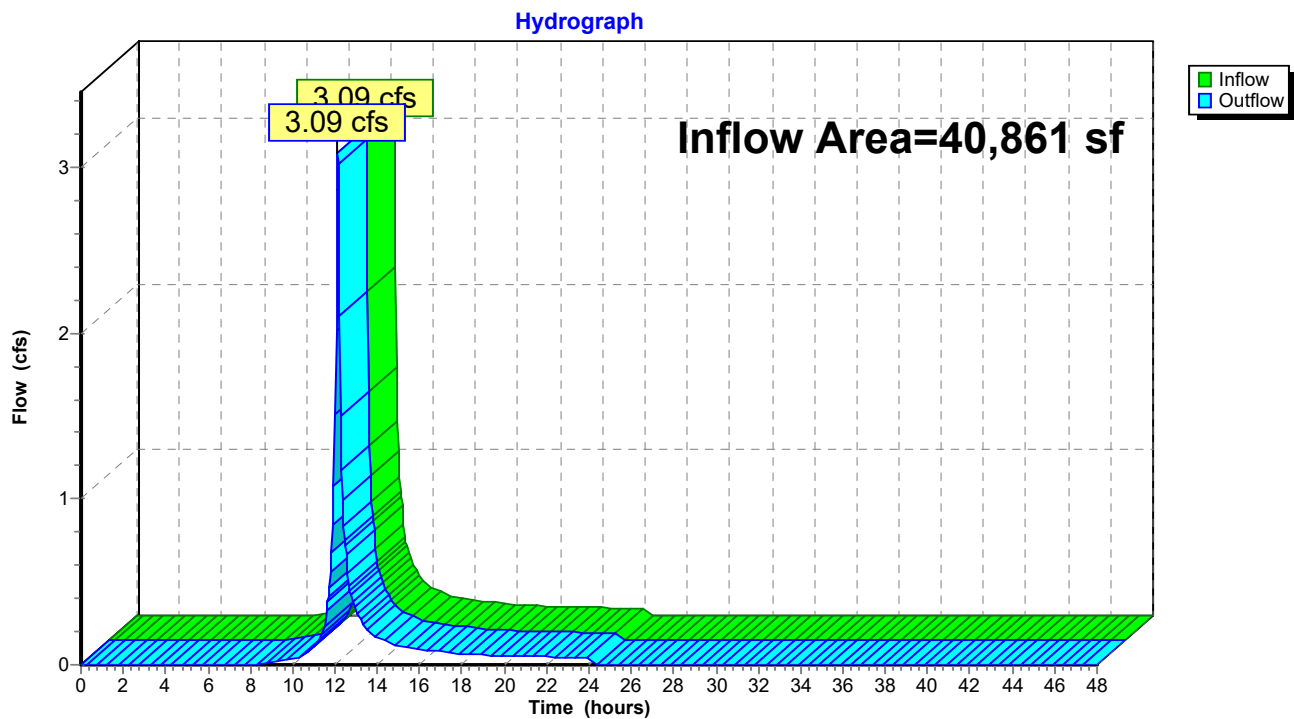
### Summary for Reach DP-2: (new Reach)

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

Inflow Area = 40,861 sf, 60.91% Impervious, Inflow Depth = 2.60" for 10-Year event  
Inflow = 3.09 cfs @ 12.13 hrs, Volume= 8,843 cf  
Outflow = 3.09 cfs @ 12.13 hrs, Volume= 8,843 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-2: (new Reach)



## Existing

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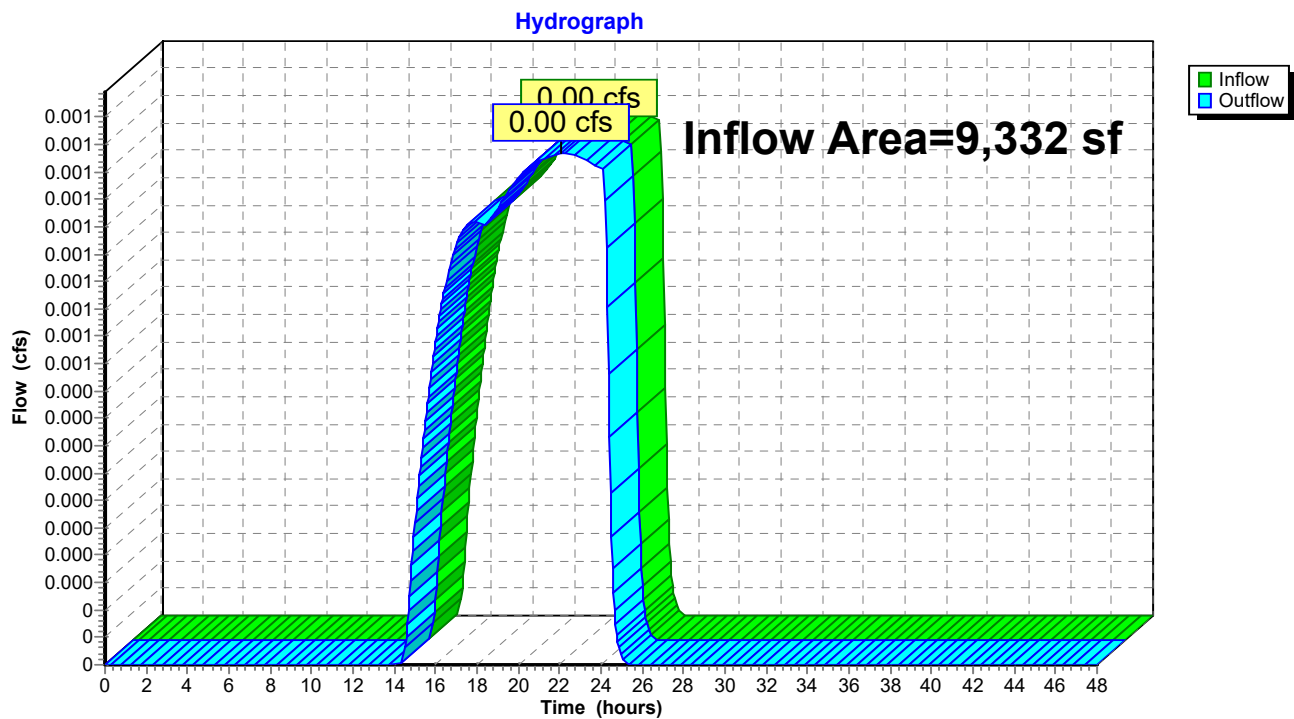
### Summary for Reach DP-4: (new Reach)

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

Inflow Area = 9,332 sf, 0.00% Impervious, Inflow Depth = 0.04" for 10-Year event  
Inflow = 0.00 cfs @ 22.07 hrs, Volume= 28 cf  
Outflow = 0.00 cfs @ 22.07 hrs, Volume= 28 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-4: (new Reach)



## Existing

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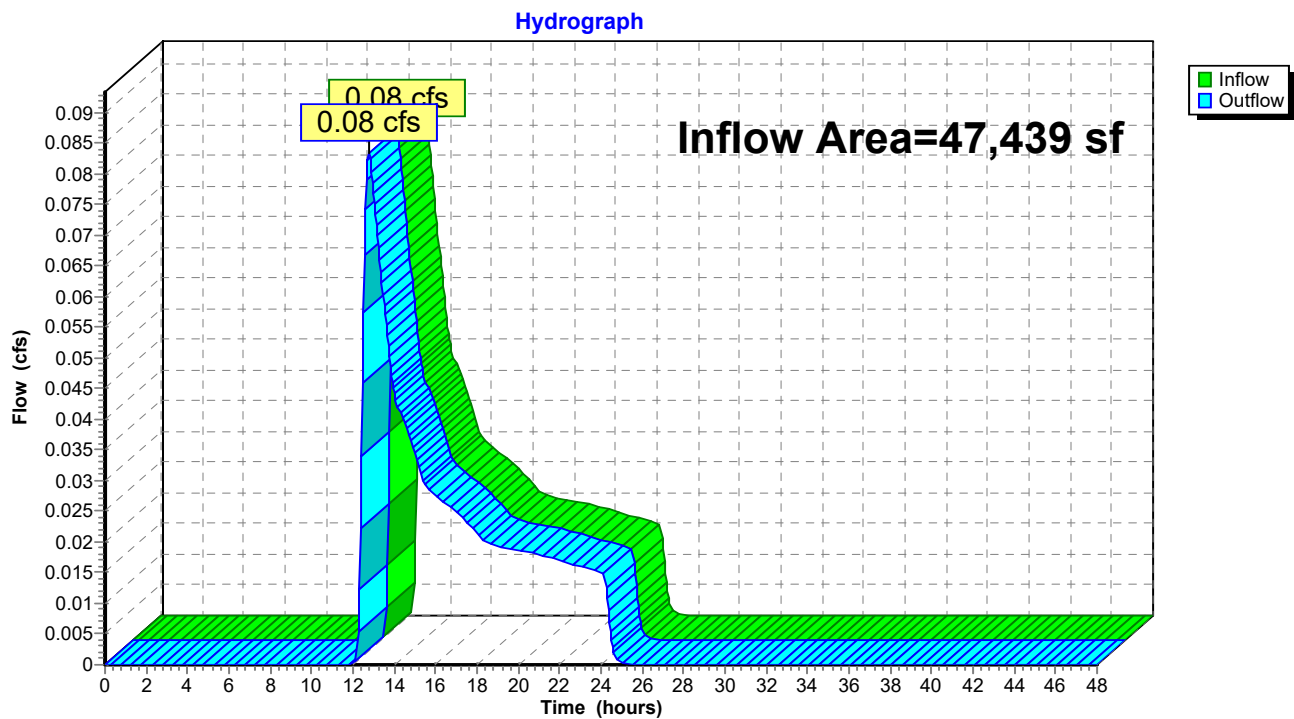
### Summary for Reach DP-5: (new Reach)

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

Inflow Area = 47,439 sf, 10.58% Impervious, Inflow Depth = 0.31" for 10-Year event  
Inflow = 0.08 cfs @ 12.76 hrs, Volume= 1,215 cf  
Outflow = 0.08 cfs @ 12.76 hrs, Volume= 1,215 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-5: (new Reach)



**Existing**

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment SUB-1:** Runoff Area=6,985 sf 0.00% Impervious Runoff Depth=0.52"  
Flow Length=114' Tc=6.6 min CN=39 Runoff=0.04 cfs 302 cf

**Subcatchment SUB-2A: FRONT PARKING** Runoff Area=34,556 sf 65.77% Impervious Runoff Depth=3.80"  
Tc=6.0 min CN=78 Runoff=3.81 cfs 10,944 cf

**Subcatchment SUB-2B: SIDE LOT PARKING** Runoff Area=6,305 sf 34.31% Impervious Runoff Depth=2.00"  
Tc=6.0 min CN=59 Runoff=0.36 cfs 1,051 cf

**Subcatchment SUB-2C: SIDE LOT** Runoff Area=18,470 sf 97.17% Impervious Runoff Depth=5.78"  
Tc=6.0 min CN=96 Runoff=2.71 cfs 8,891 cf

**Subcatchment SUB-3: VACANT LOT (SOUTH)** Runoff Area=9,332 sf 0.00% Impervious Runoff Depth=0.17"  
Flow Length=131' Tc=25.8 min CN=32 Runoff=0.01 cfs 134 cf

**Subcatchment SUB-4: 19 CYPRESS** Runoff Area=47,439 sf 10.58% Impervious Runoff Depth=0.64"  
Flow Length=401' Tc=26.1 min CN=41 Runoff=0.27 cfs 2,531 cf

**Reach DP-1: (new Reach)** Inflow=0.04 cfs 302 cf  
Outflow=0.04 cfs 302 cf

**Reach DP-2: (new Reach)** Inflow=4.17 cfs 11,995 cf  
Outflow=4.17 cfs 11,995 cf

**Reach DP-4: (new Reach)** Inflow=0.01 cfs 134 cf  
Outflow=0.01 cfs 134 cf

**Reach DP-5: (new Reach)** Inflow=0.27 cfs 2,531 cf  
Outflow=0.27 cfs 2,531 cf

**Total Runoff Area = 123,087 sf Runoff Volume = 23,853 cf Average Runoff Depth = 2.33"**  
**61.12% Pervious = 75,234 sf 38.88% Impervious = 47,853 sf**

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NOAA 24-hr C 25-Year Rainfall=6.25"

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**Summary for Subcatchment SUB-1:**

Runoff = 0.04 cfs @ 12.21 hrs, Volume= 302 cf, Depth= 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 25-Year Rainfall=6.25"

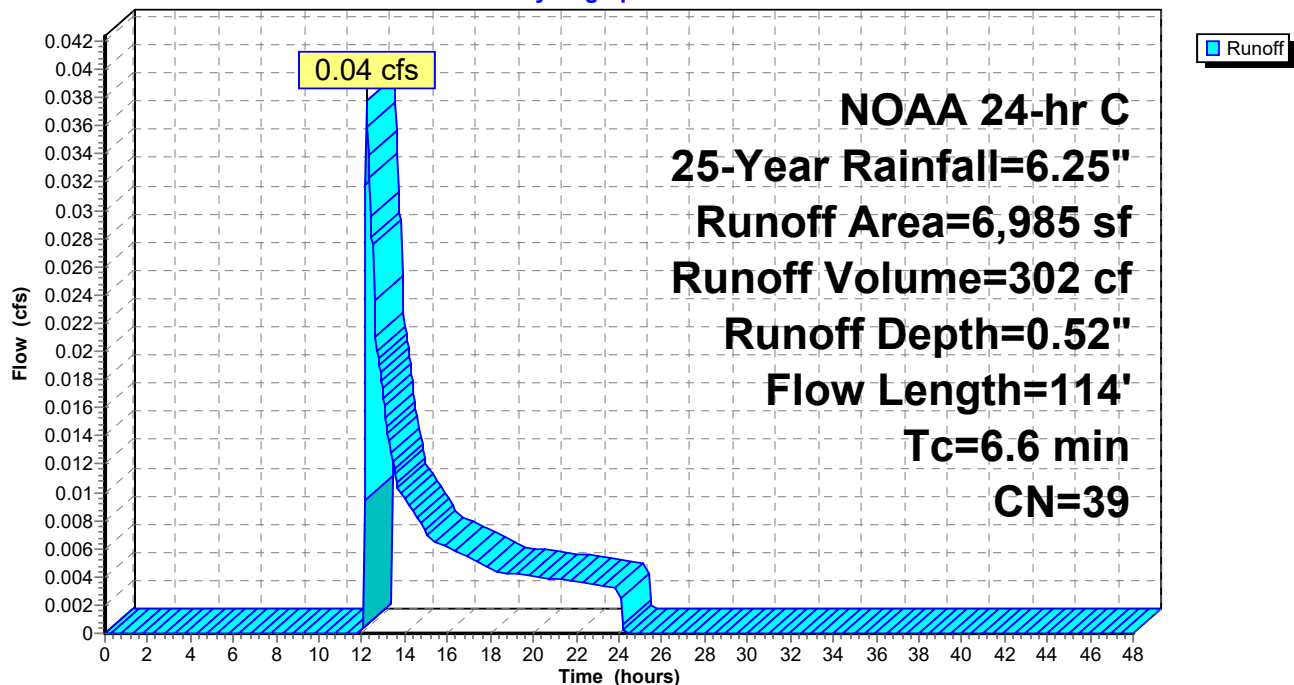
Area (sf)	CN	Description
6,985	39	>75% Grass cover, Good, HSG A
6,985		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.0360	0.13		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.36"
0.3	64	0.0500	3.60		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
6.6	114	Total			

**Subcatchment SUB-1:**

Hydrograph





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NOAA 24-hr C 25-Year Rainfall=6.25"

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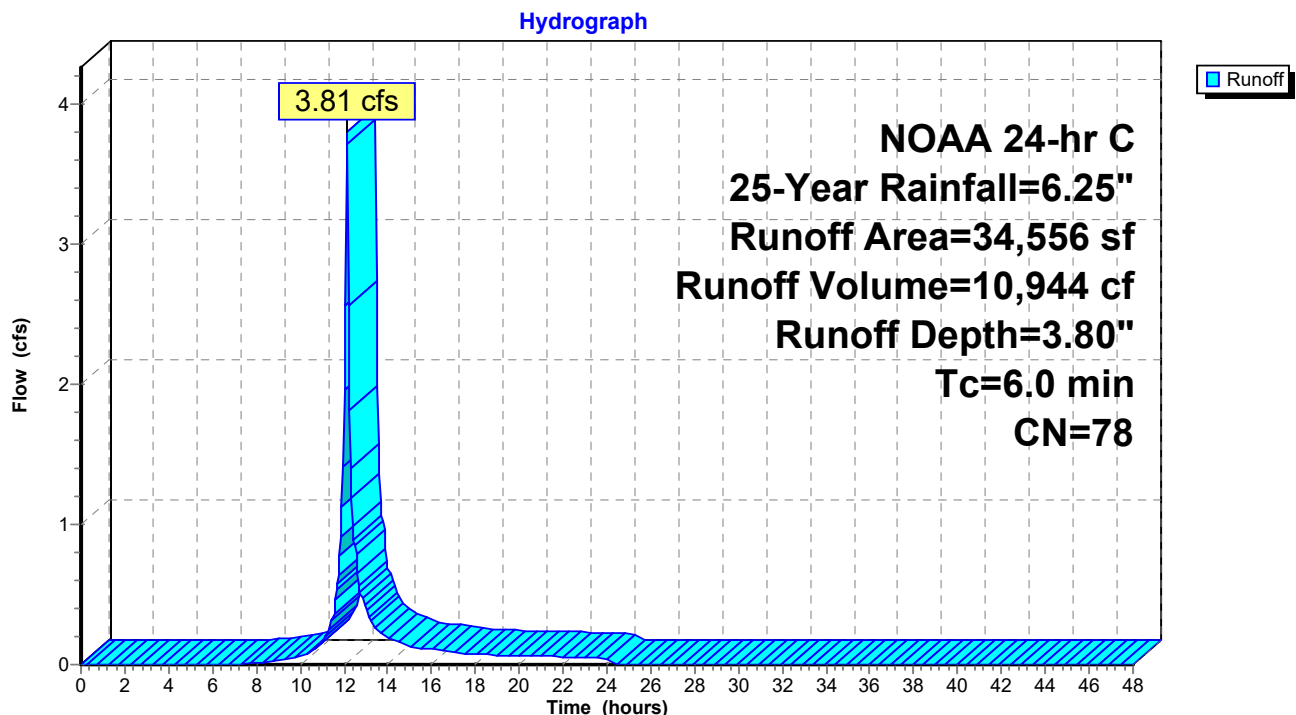
**Summary for Subcatchment SUB-2A: FRONT PARKING LOT (NORTH)**

Runoff = 3.81 cfs @ 12.13 hrs, Volume= 10,944 cf, Depth= 3.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 25-Year Rainfall=6.25"

Area (sf)	CN	Description
18,985	98	Paved parking, HSG A
11,830	39	>75% Grass cover, Good, HSG A
2,769	98	Roofs, HSG A
* 972	98	Concrete, HSG A
34,556	78	Weighted Average
11,830		34.23% Pervious Area
22,726		65.77% Impervious Area

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

**Subcatchment SUB-2A: FRONT PARKING LOT (NORTH)**

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NOAA 24-hr C 25-Year Rainfall=6.25"

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**Summary for Subcatchment SUB-2B: SIDE LOT PARKING LOT (SOUTH)**

Runoff = 0.36 cfs @ 12.14 hrs, Volume= 1,051 cf, Depth= 2.00"

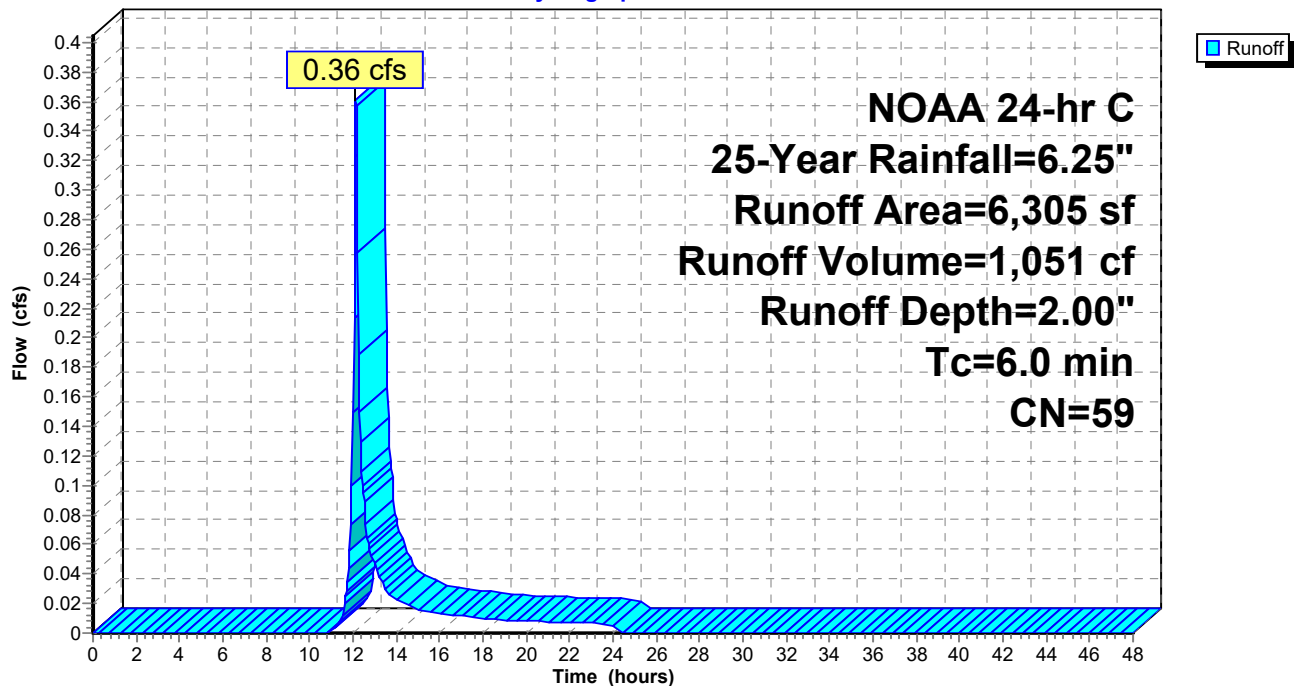
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 25-Year Rainfall=6.25"

Area (sf)	CN	Description
4,142	39	>75% Grass cover, Good, HSG A
2,158	98	Paved parking, HSG A
* 5	98	Concrete, HSG A
6,305	59	Weighted Average
4,142		65.69% Pervious Area
2,163		34.31% Impervious Area

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

**Subcatchment SUB-2B: SIDE LOT PARKING LOT (SOUTH)**

Hydrograph



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NOAA 24-hr C 25-Year Rainfall=6.25"

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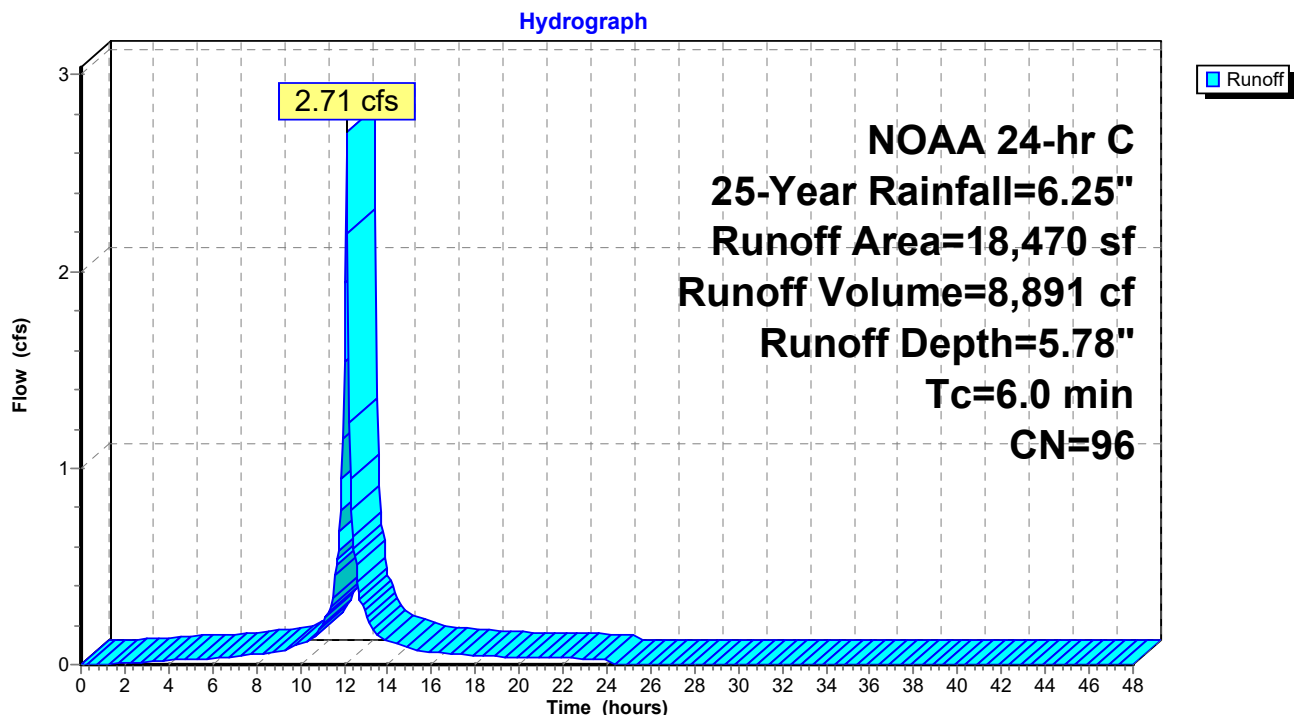
**Summary for Subcatchment SUB-2C: SIDE LOT PARKING LOT (SOUTH)**

Runoff = 2.71 cfs @ 12.13 hrs, Volume= 8,891 cf, Depth= 5.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 25-Year Rainfall=6.25"

Area (sf)	CN	Description
523	39	>75% Grass cover, Good, HSG A
14,418	98	Paved parking, HSG A
3,006	98	Roofs, HSG A
* 523	98	Concrete, HSG A
18,470	96	Weighted Average
523		2.83% Pervious Area
17,947		97.17% Impervious Area

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

**Subcatchment SUB-2C: SIDE LOT PARKING LOT (SOUTH)**

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NOAA 24-hr C 25-Year Rainfall=6.25"

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**Summary for Subcatchment SUB-3: VACANT LOT (SOUTH)**

Runoff = 0.01 cfs @ 13.52 hrs, Volume= 134 cf, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 25-Year Rainfall=6.25"

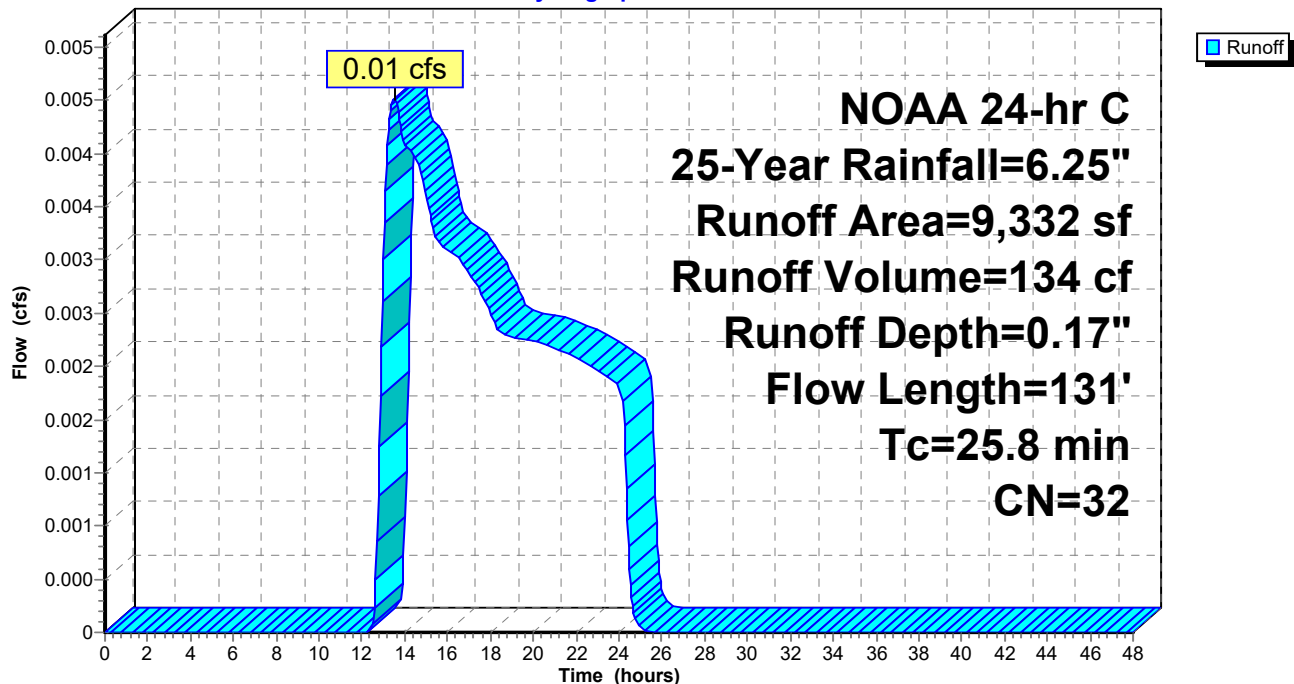
Area (sf)	CN	Description
6,877	30	Woods, Good, HSG A
2,455	39	>75% Grass cover, Good, HSG A
9,332	32	Weighted Average
9,332		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	50	0.0140	0.03		<b>Sheet Flow,</b> Woods: Dense underbrush n= 0.800 P2= 3.36"
1.6	81	0.0280	0.84		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
25.8	131	Total			

**Subcatchment SUB-3: VACANT LOT (SOUTH)**

Hydrograph



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NOAA 24-hr C 25-Year Rainfall=6.25"

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**Summary for Subcatchment SUB-4: 19 CYPRESS**

Runoff = 0.27 cfs @ 12.54 hrs, Volume= 2,531 cf, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 25-Year Rainfall=6.25"

Area (sf)	CN	Description
24,231	30	Woods, Good, HSG A
18,191	39	>75% Grass cover, Good, HSG A
2,616	98	Roofs, HSG A
2,401	98	Paved parking, HSG A
47,439	41	Weighted Average
42,422		89.42% Pervious Area
5,017		10.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.9	50	0.0180	0.04		<b>Sheet Flow,</b> Woods: Dense underbrush n= 0.800 P2= 3.36"
2.1	107	0.0300	0.87		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
0.6	66	0.1200	1.73		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
1.2	107	0.0090	1.53		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.3	71	0.0500	3.60		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
26.1	401	Total			

## Existing

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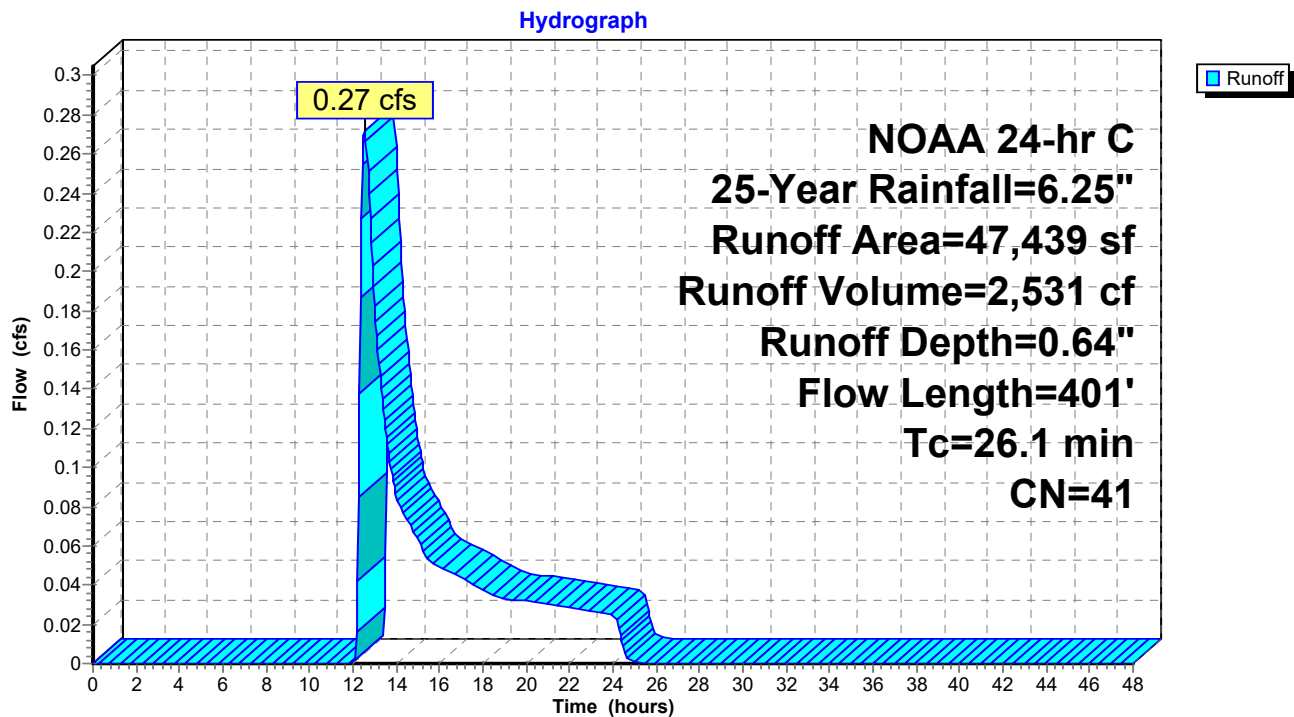
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NOAA 24-hr C 25-Year Rainfall=6.25"

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### Subcatchment SUB-4: 19 CYPRESS



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### Summary for Reach DP-1: (new Reach)

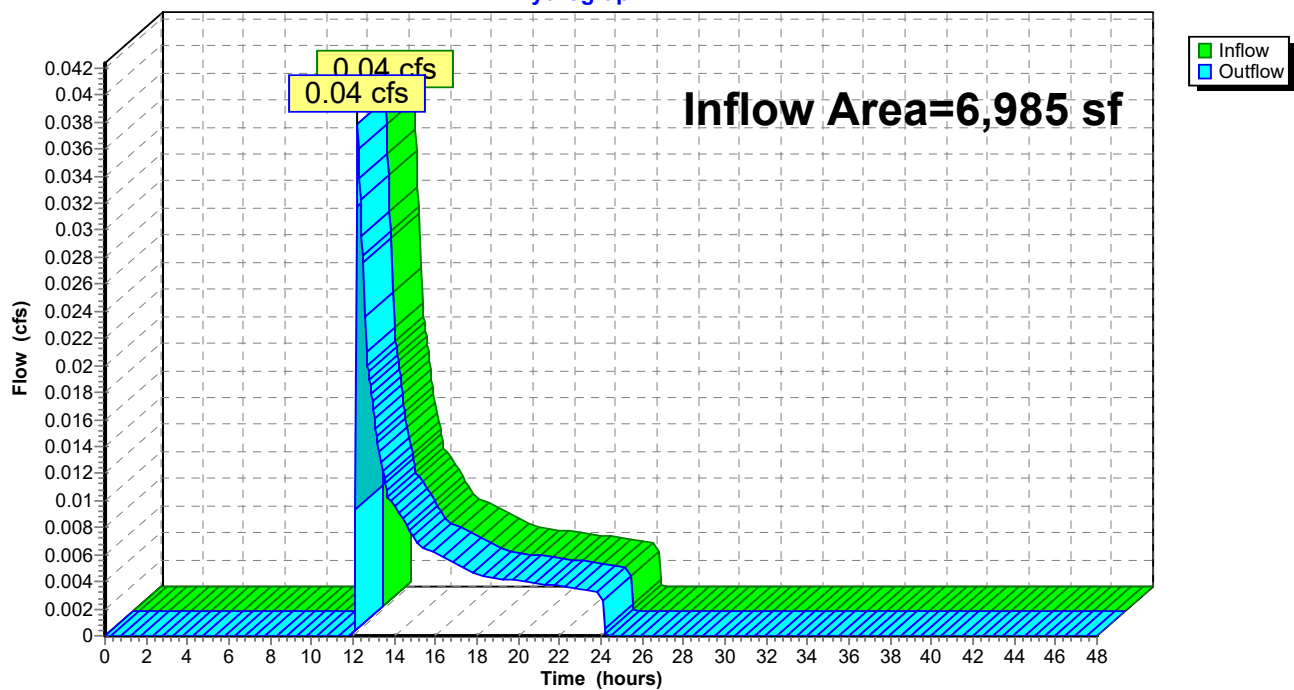
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6,985 sf, 0.00% Impervious, Inflow Depth = 0.52" for 25-Year event  
Inflow = 0.04 cfs @ 12.21 hrs, Volume= 302 cf  
Outflow = 0.04 cfs @ 12.21 hrs, Volume= 302 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-1: (new Reach)

Hydrograph



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NOAA 24-hr C 25-Year Rainfall=6.25"

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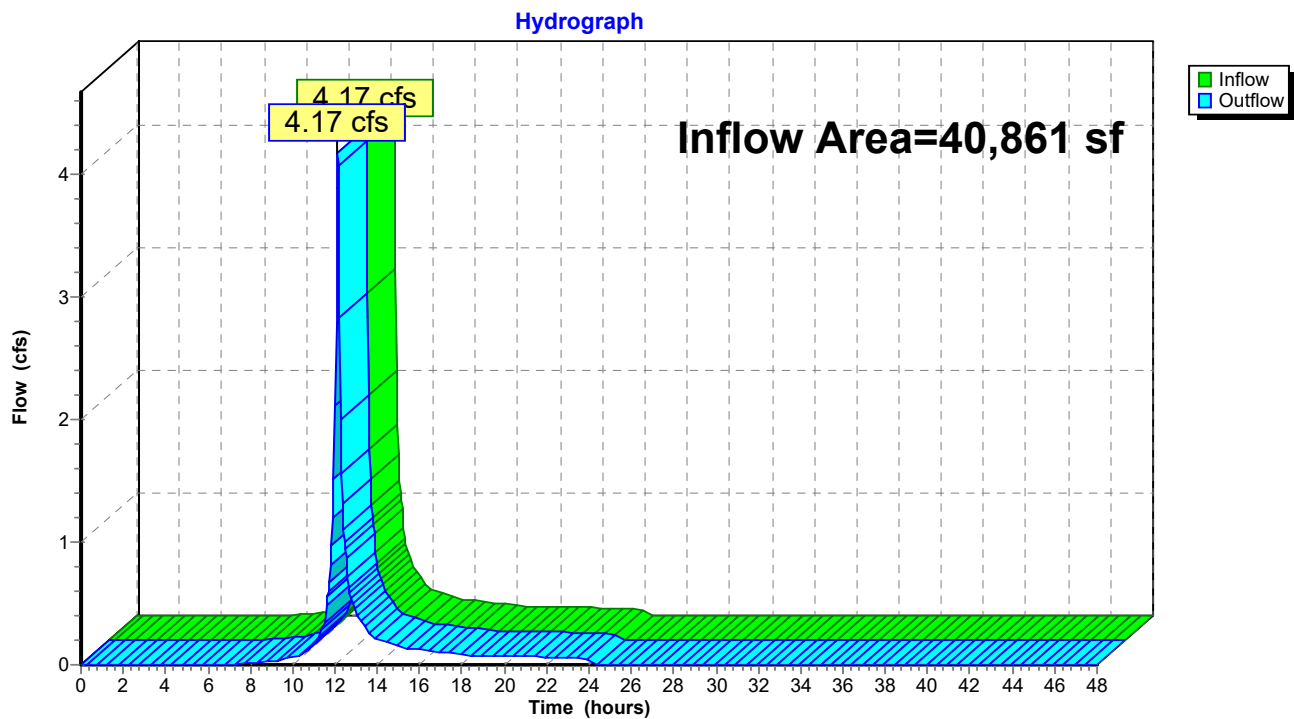
### Summary for Reach DP-2: (new Reach)

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

Inflow Area = 40,861 sf, 60.91% Impervious, Inflow Depth = 3.52" for 25-Year event  
Inflow = 4.17 cfs @ 12.13 hrs, Volume= 11,995 cf  
Outflow = 4.17 cfs @ 12.13 hrs, Volume= 11,995 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-2: (new Reach)





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NOAA 24-hr C 25-Year Rainfall=6.25"

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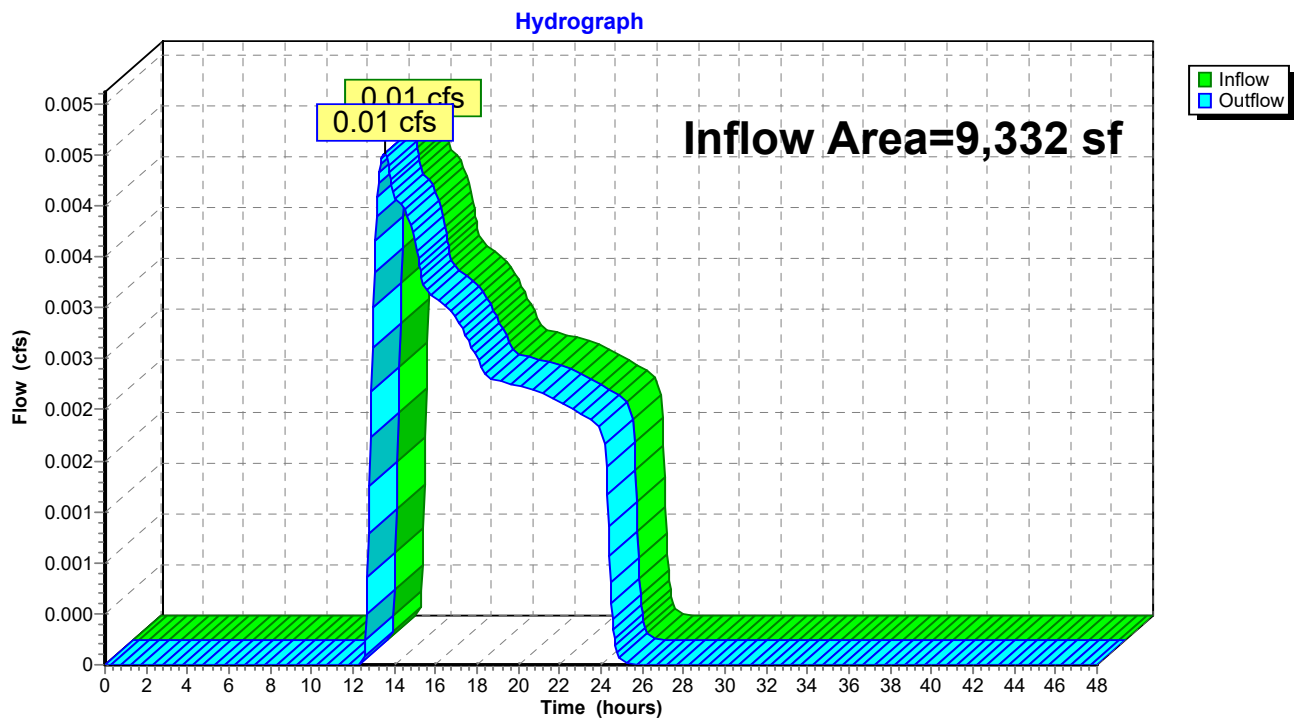
### Summary for Reach DP-4: (new Reach)

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

Inflow Area = 9,332 sf, 0.00% Impervious, Inflow Depth = 0.17" for 25-Year event  
Inflow = 0.01 cfs @ 13.52 hrs, Volume= 134 cf  
Outflow = 0.01 cfs @ 13.52 hrs, Volume= 134 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-4: (new Reach)



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### Summary for Reach DP-5: (new Reach)

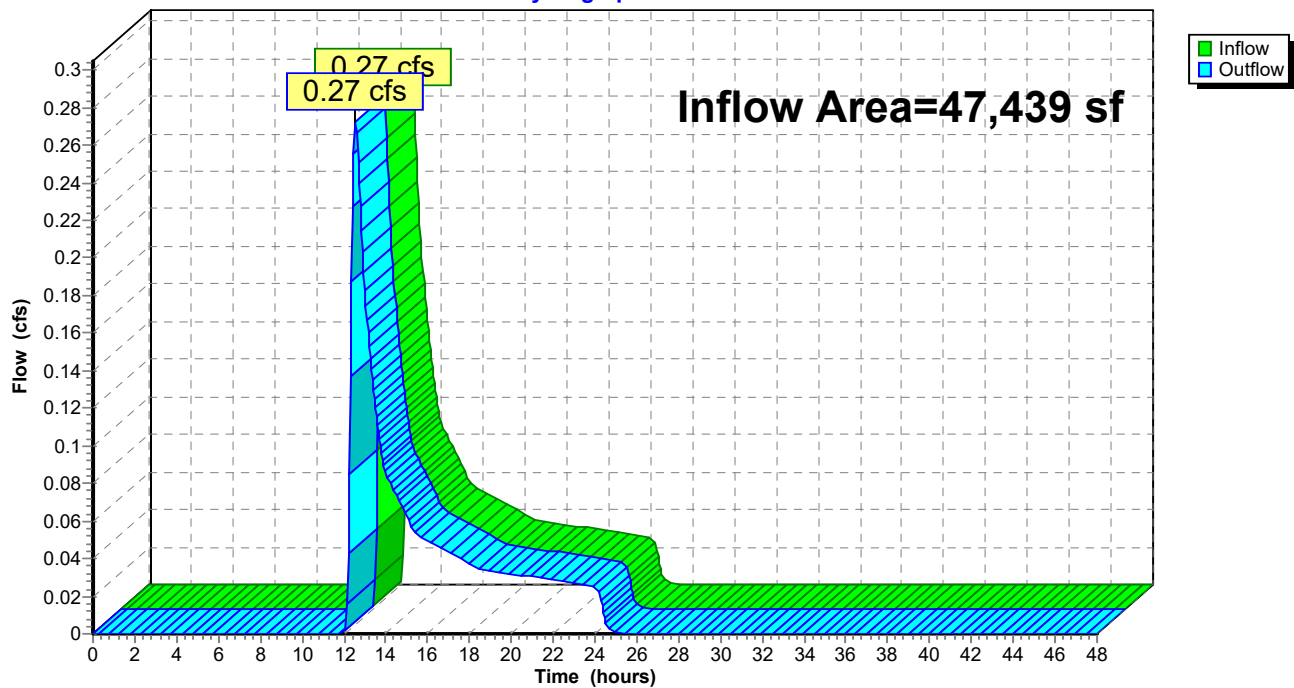
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 47,439 sf, 10.58% Impervious, Inflow Depth = 0.64" for 25-Year event  
Inflow = 0.27 cfs @ 12.54 hrs, Volume= 2,531 cf  
Outflow = 0.27 cfs @ 12.54 hrs, Volume= 2,531 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-5: (new Reach)

Hydrograph



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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment SUB-1:** Runoff Area=6,985 sf 0.00% Impervious Runoff Depth=1.14"  
Flow Length=114' Tc=6.6 min CN=39 Runoff=0.17 cfs 666 cf

**Subcatchment SUB-2A: FRONT PARKING** Runoff Area=34,556 sf 65.77% Impervious Runoff Depth=5.36"  
Tc=6.0 min CN=78 Runoff=5.30 cfs 15,445 cf

**Subcatchment SUB-2B: SIDE LOT PARKING** Runoff Area=6,305 sf 34.31% Impervious Runoff Depth=3.20"  
Tc=6.0 min CN=59 Runoff=0.59 cfs 1,682 cf

**Subcatchment SUB-2C: SIDE LOT** Runoff Area=18,470 sf 97.17% Impervious Runoff Depth=7.49"  
Tc=6.0 min CN=96 Runoff=3.48 cfs 11,530 cf

**Subcatchment SUB-3: VACANT LOT (SOUTH)** Runoff Area=9,332 sf 0.00% Impervious Runoff Depth=0.55"  
Flow Length=131' Tc=25.8 min CN=32 Runoff=0.03 cfs 431 cf

**Subcatchment SUB-4: 19 CYPRESS** Runoff Area=47,439 sf 10.58% Impervious Runoff Depth=1.33"  
Flow Length=401' Tc=26.1 min CN=41 Runoff=0.80 cfs 5,261 cf

**Reach DP-1: (new Reach)** Inflow=0.17 cfs 666 cf  
Outflow=0.17 cfs 666 cf

**Reach DP-2: (new Reach)** Inflow=5.89 cfs 17,126 cf  
Outflow=5.89 cfs 17,126 cf

**Reach DP-4: (new Reach)** Inflow=0.03 cfs 431 cf  
Outflow=0.03 cfs 431 cf

**Reach DP-5: (new Reach)** Inflow=0.80 cfs 5,261 cf  
Outflow=0.80 cfs 5,261 cf

**Total Runoff Area = 123,087 sf Runoff Volume = 35,014 cf Average Runoff Depth = 3.41"**  
**61.12% Pervious = 75,234 sf 38.88% Impervious = 47,853 sf**

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**Summary for Subcatchment SUB-1:**

Runoff = 0.17 cfs @ 12.16 hrs, Volume= 666 cf, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 100-Year Rainfall=7.97"

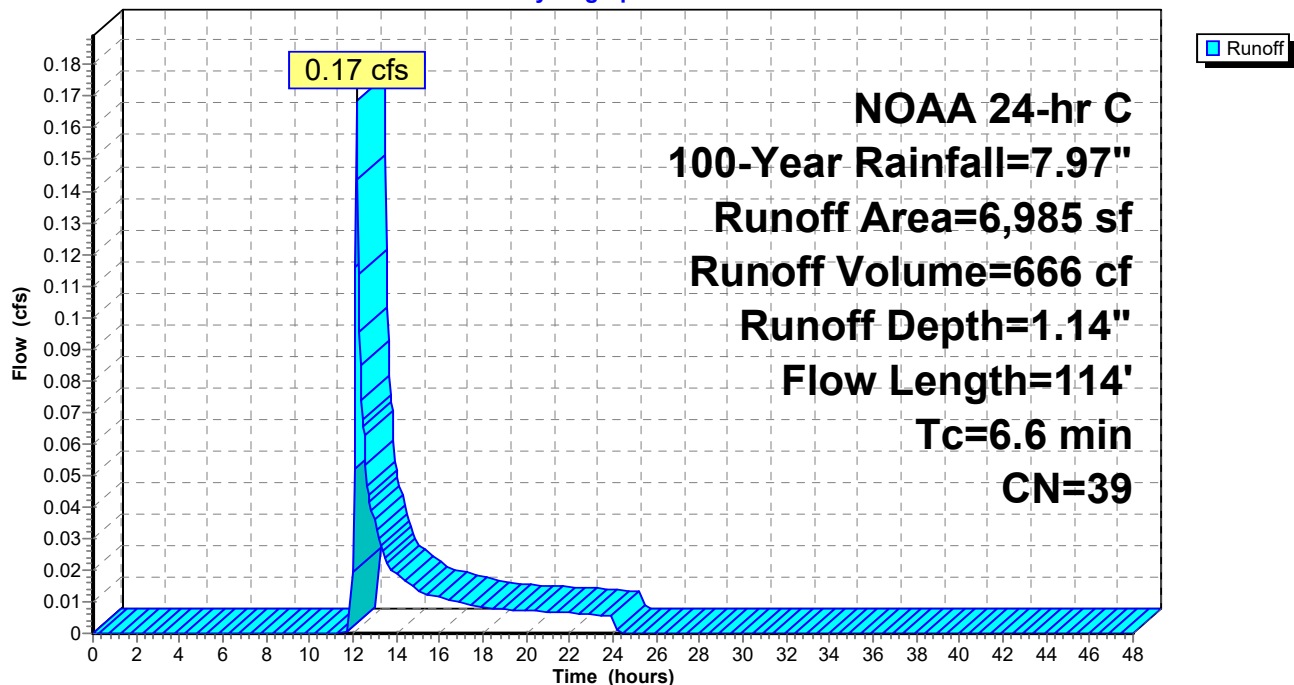
Area (sf)	CN	Description
6,985	39	>75% Grass cover, Good, HSG A
6,985		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.0360	0.13		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.36"
0.3	64	0.0500	3.60		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
6.6	114	Total			

**Subcatchment SUB-1:**

Hydrograph



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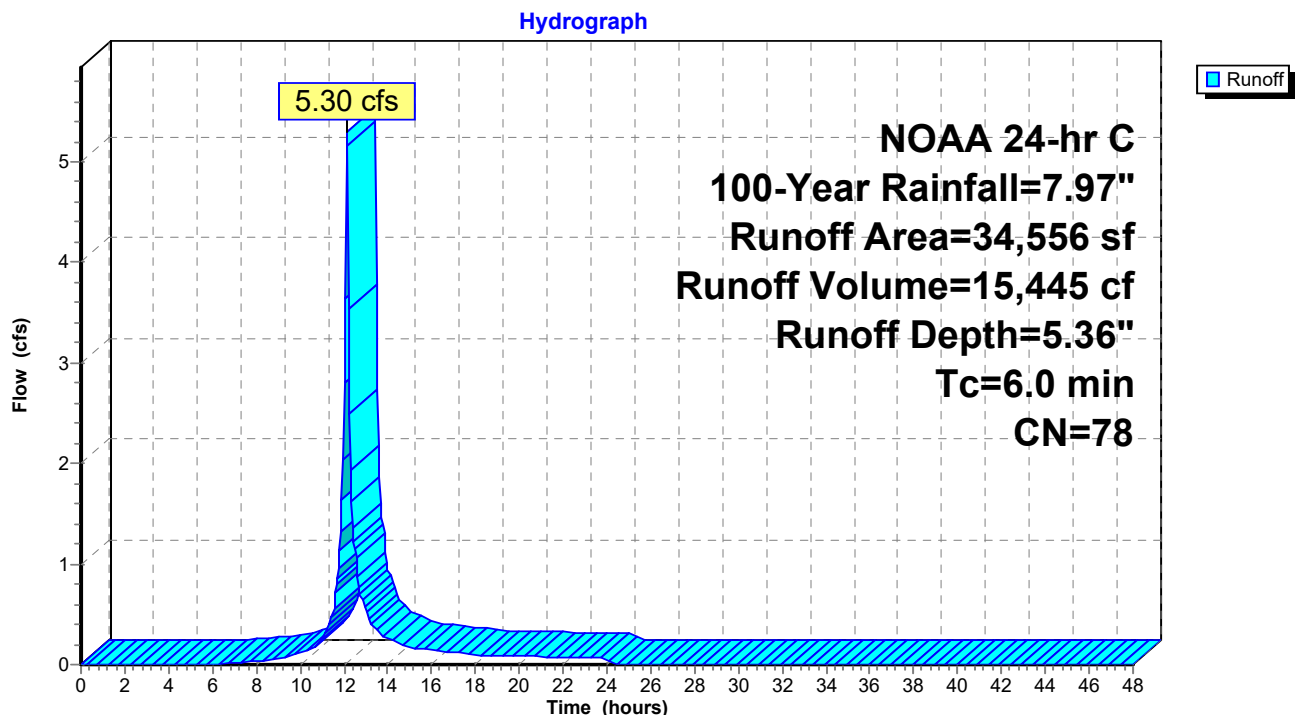
**Summary for Subcatchment SUB-2A: FRONT PARKING LOT (NORTH)**

Runoff = 5.30 cfs @ 12.13 hrs, Volume= 15,445 cf, Depth= 5.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 100-Year Rainfall=7.97"

Area (sf)	CN	Description
18,985	98	Paved parking, HSG A
11,830	39	>75% Grass cover, Good, HSG A
2,769	98	Roofs, HSG A
* 972	98	Concrete, HSG A
34,556	78	Weighted Average
11,830		34.23% Pervious Area
22,726		65.77% Impervious Area

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

**Subcatchment SUB-2A: FRONT PARKING LOT (NORTH)**

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**Summary for Subcatchment SUB-2B: SIDE LOT PARKING LOT (SOUTH)**

Runoff = 0.59 cfs @ 12.14 hrs, Volume= 1,682 cf, Depth= 3.20"

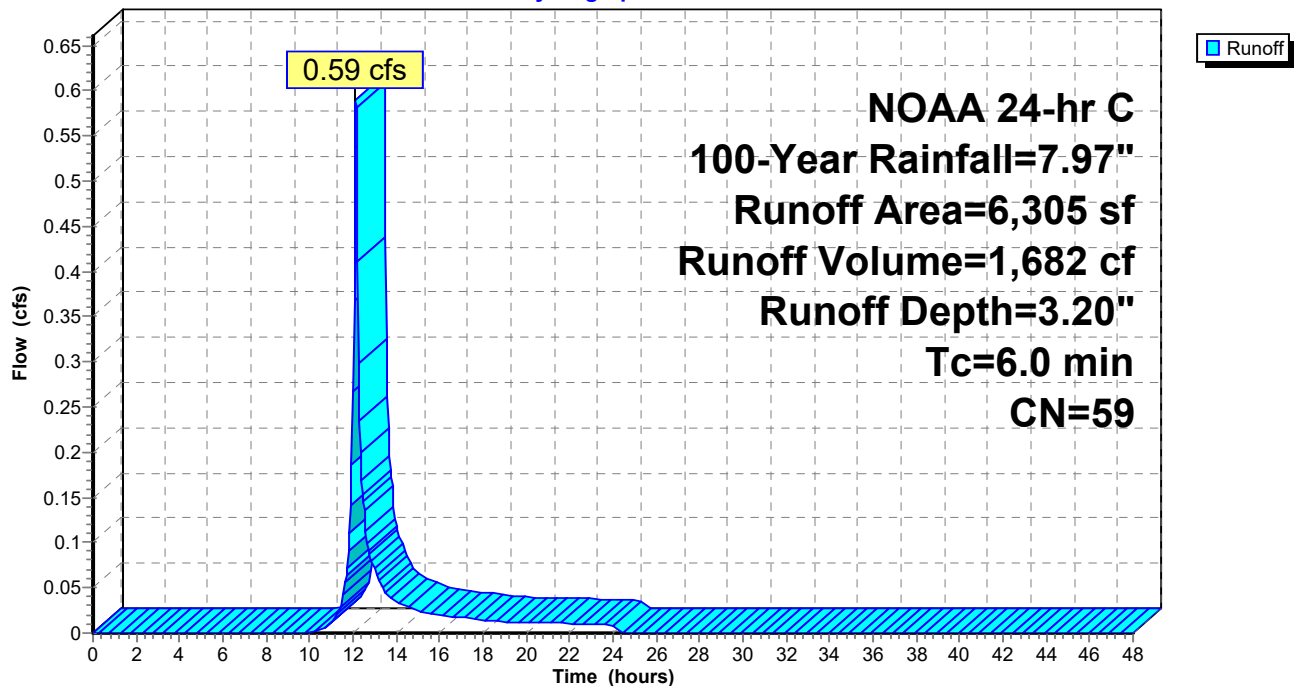
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 100-Year Rainfall=7.97"

Area (sf)	CN	Description
4,142	39	>75% Grass cover, Good, HSG A
2,158	98	Paved parking, HSG A
* 5	98	Concrete, HSG A
6,305	59	Weighted Average
4,142		65.69% Pervious Area
2,163		34.31% Impervious Area

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

**Subcatchment SUB-2B: SIDE LOT PARKING LOT (SOUTH)**

Hydrograph



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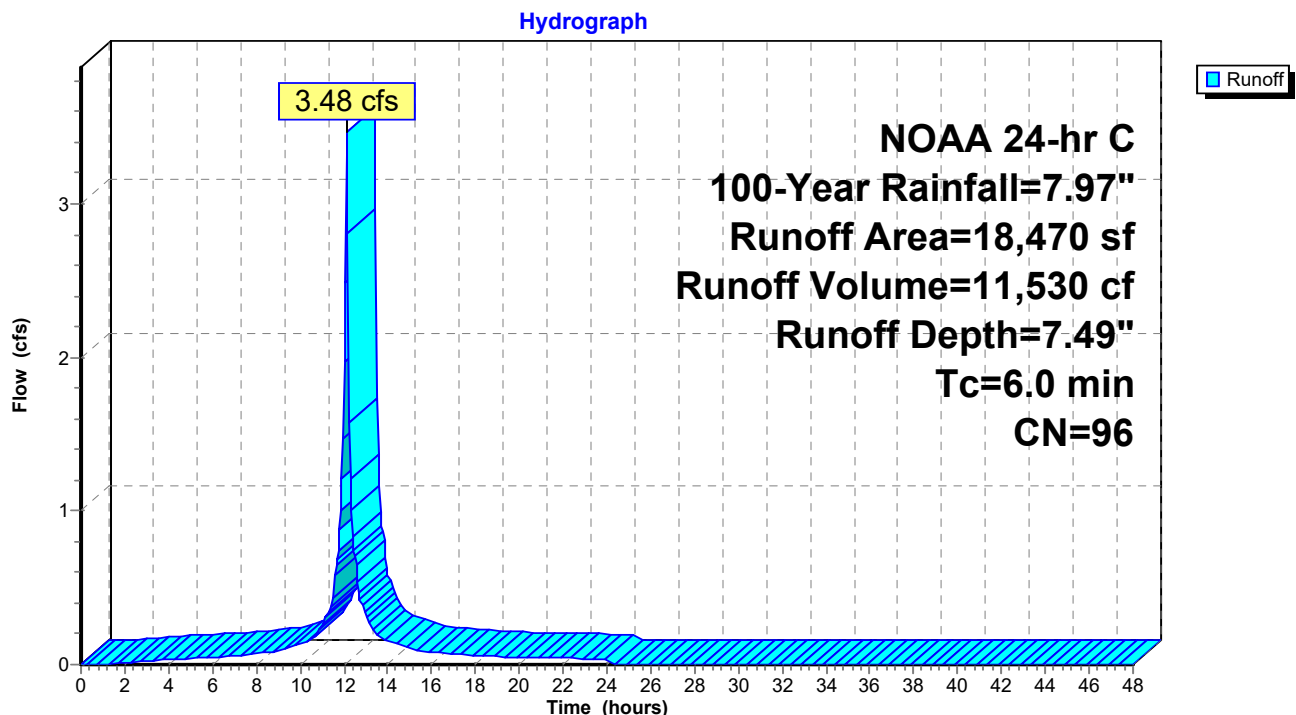
**Summary for Subcatchment SUB-2C: SIDE LOT PARKING LOT (SOUTH)**

Runoff = 3.48 cfs @ 12.13 hrs, Volume= 11,530 cf, Depth= 7.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 100-Year Rainfall=7.97"

Area (sf)	CN	Description
523	39	>75% Grass cover, Good, HSG A
14,418	98	Paved parking, HSG A
3,006	98	Roofs, HSG A
* 523	98	Concrete, HSG A
18,470	96	Weighted Average
523		2.83% Pervious Area
17,947		97.17% Impervious Area

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

**Subcatchment SUB-2C: SIDE LOT PARKING LOT (SOUTH)**

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**Summary for Subcatchment SUB-3: VACANT LOT (SOUTH)**

Runoff = 0.03 cfs @ 12.70 hrs, Volume= 431 cf, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 100-Year Rainfall=7.97"

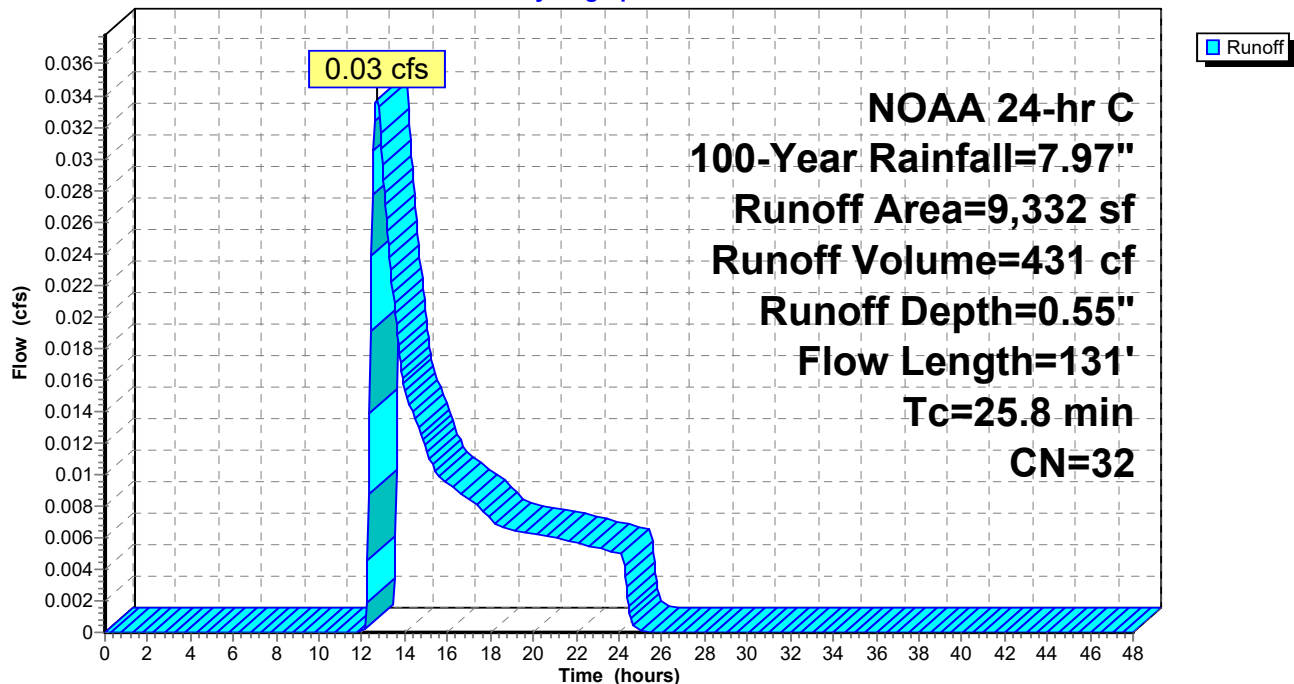
Area (sf)	CN	Description
6,877	30	Woods, Good, HSG A
2,455	39	>75% Grass cover, Good, HSG A
9,332	32	Weighted Average
9,332		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	50	0.0140	0.03		<b>Sheet Flow,</b> Woods: Dense underbrush n= 0.800 P2= 3.36"
1.6	81	0.0280	0.84		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
25.8	131	Total			

**Subcatchment SUB-3: VACANT LOT (SOUTH)**

Hydrograph





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NOAA 24-hr C 100-Year Rainfall=7.97"

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**Summary for Subcatchment SUB-4: 19 CYPRESS**

Runoff = 0.80 cfs @ 12.46 hrs, Volume= 5,261 cf, Depth= 1.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 100-Year Rainfall=7.97"

Area (sf)	CN	Description
24,231	30	Woods, Good, HSG A
18,191	39	>75% Grass cover, Good, HSG A
2,616	98	Roofs, HSG A
2,401	98	Paved parking, HSG A
47,439	41	Weighted Average
42,422		89.42% Pervious Area
5,017		10.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.9	50	0.0180	0.04		<b>Sheet Flow,</b> Woods: Dense underbrush n= 0.800 P2= 3.36"
2.1	107	0.0300	0.87		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
0.6	66	0.1200	1.73		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
1.2	107	0.0090	1.53		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.3	71	0.0500	3.60		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
26.1	401	Total			

## Existing

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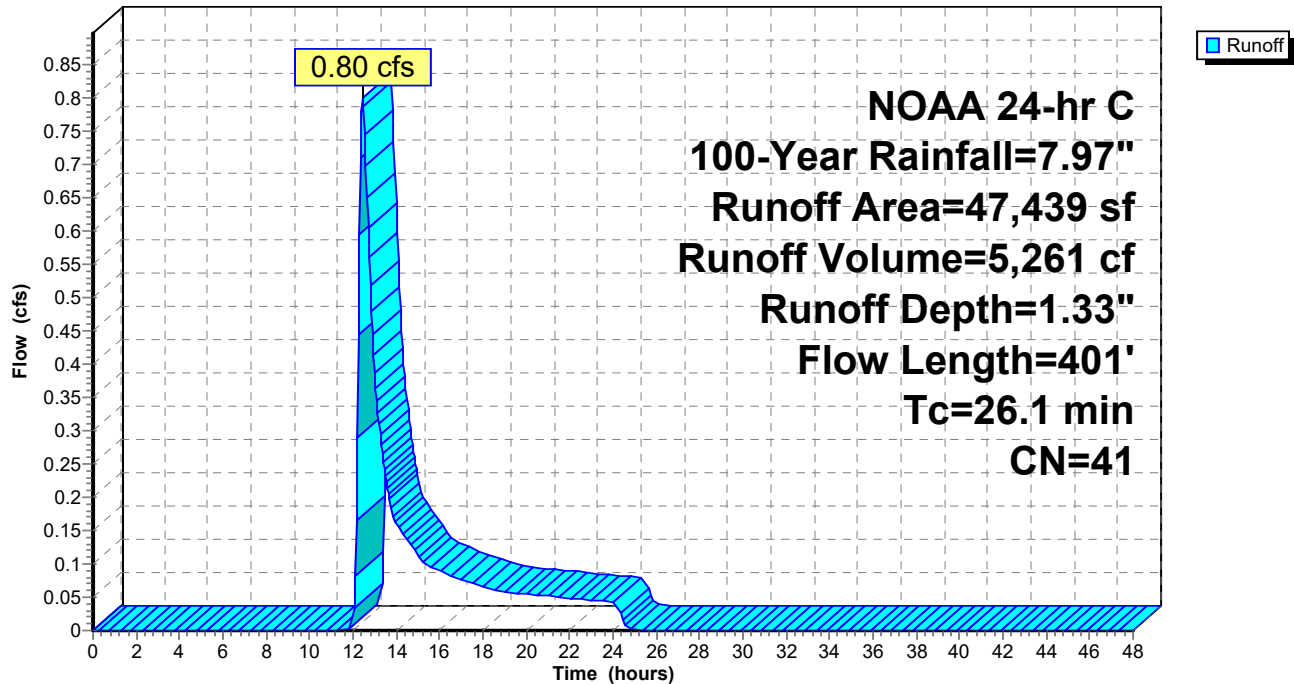
NOAA 24-hr C 100-Year Rainfall=7.97"

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### Subcatchment SUB-4: 19 CYPRESS

Hydrograph



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### Summary for Reach DP-1: (new Reach)

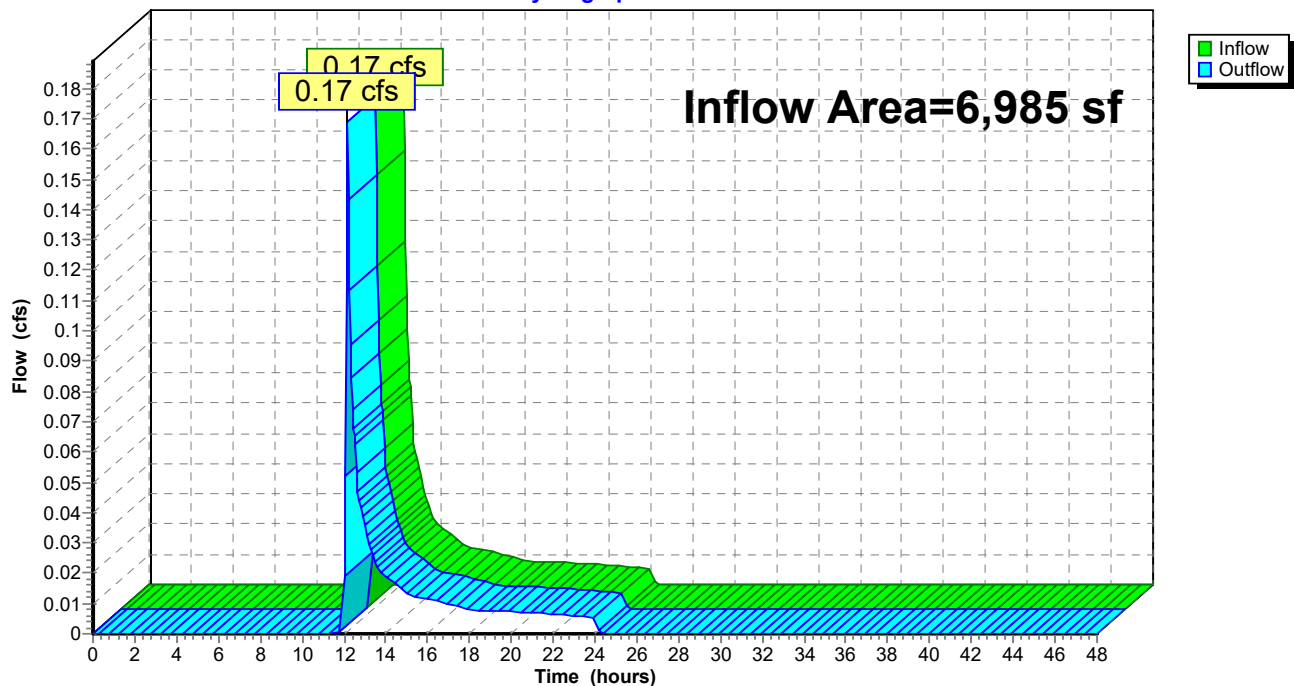
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6,985 sf, 0.00% Impervious, Inflow Depth = 1.14" for 100-Year event  
Inflow = 0.17 cfs @ 12.16 hrs, Volume= 666 cf  
Outflow = 0.17 cfs @ 12.16 hrs, Volume= 666 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-1: (new Reach)

Hydrograph



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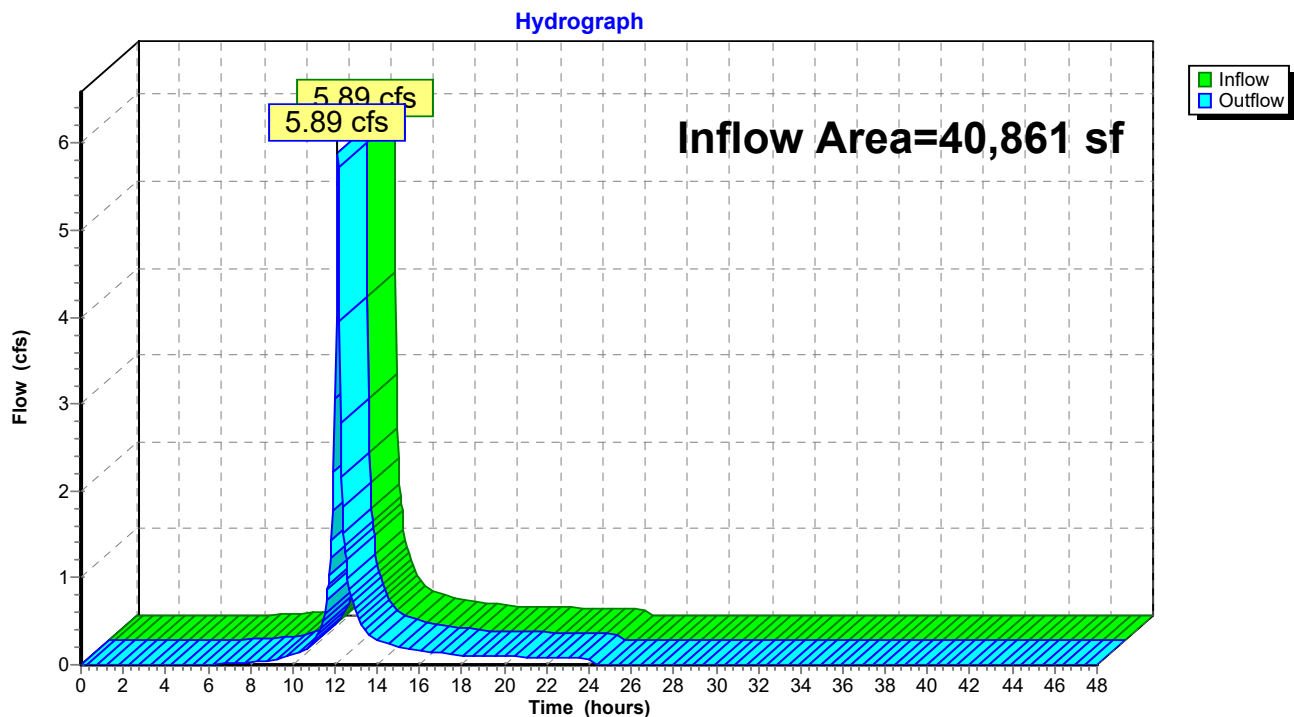
### Summary for Reach DP-2: (new Reach)

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

Inflow Area = 40,861 sf, 60.91% Impervious, Inflow Depth = 5.03" for 100-Year event  
Inflow = 5.89 cfs @ 12.13 hrs, Volume= 17,126 cf  
Outflow = 5.89 cfs @ 12.13 hrs, Volume= 17,126 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-2: (new Reach)



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### Summary for Reach DP-4: (new Reach)

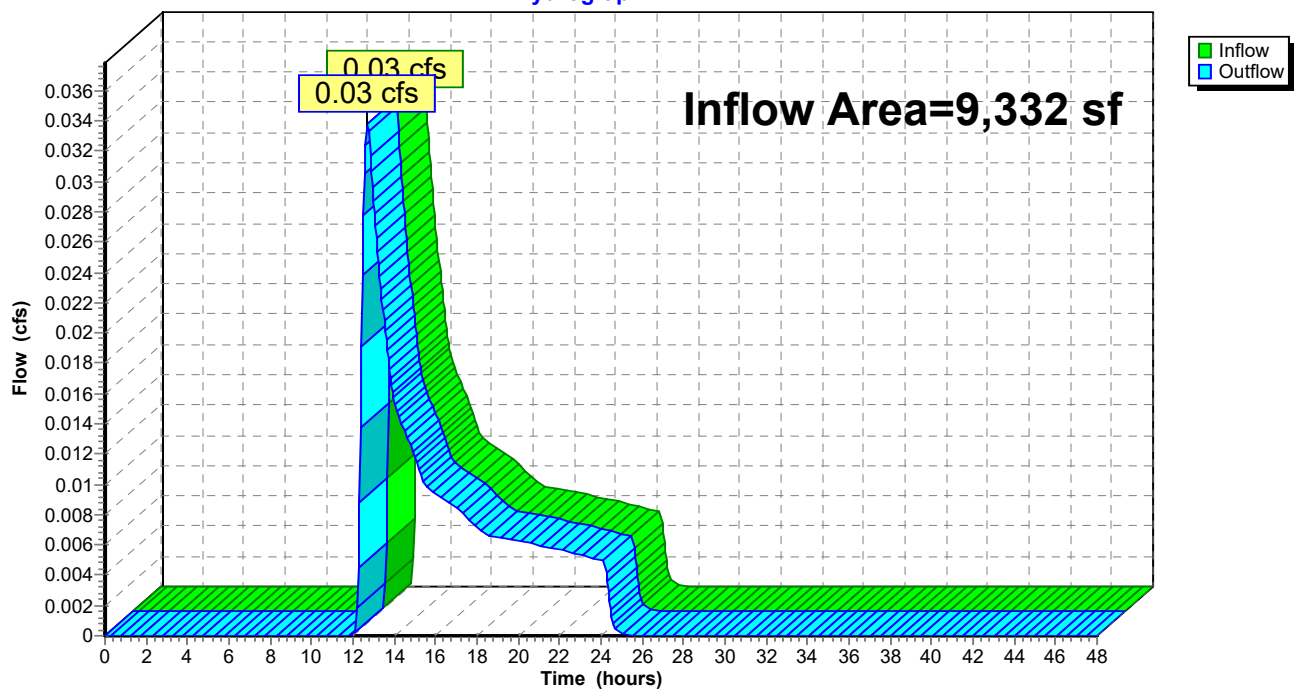
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 9,332 sf, 0.00% Impervious, Inflow Depth = 0.55" for 100-Year event  
Inflow = 0.03 cfs @ 12.70 hrs, Volume= 431 cf  
Outflow = 0.03 cfs @ 12.70 hrs, Volume= 431 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-4: (new Reach)

Hydrograph



## Existing

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NOAA 24-hr C 100-Year Rainfall=7.97"

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### Summary for Reach DP-5: (new Reach)

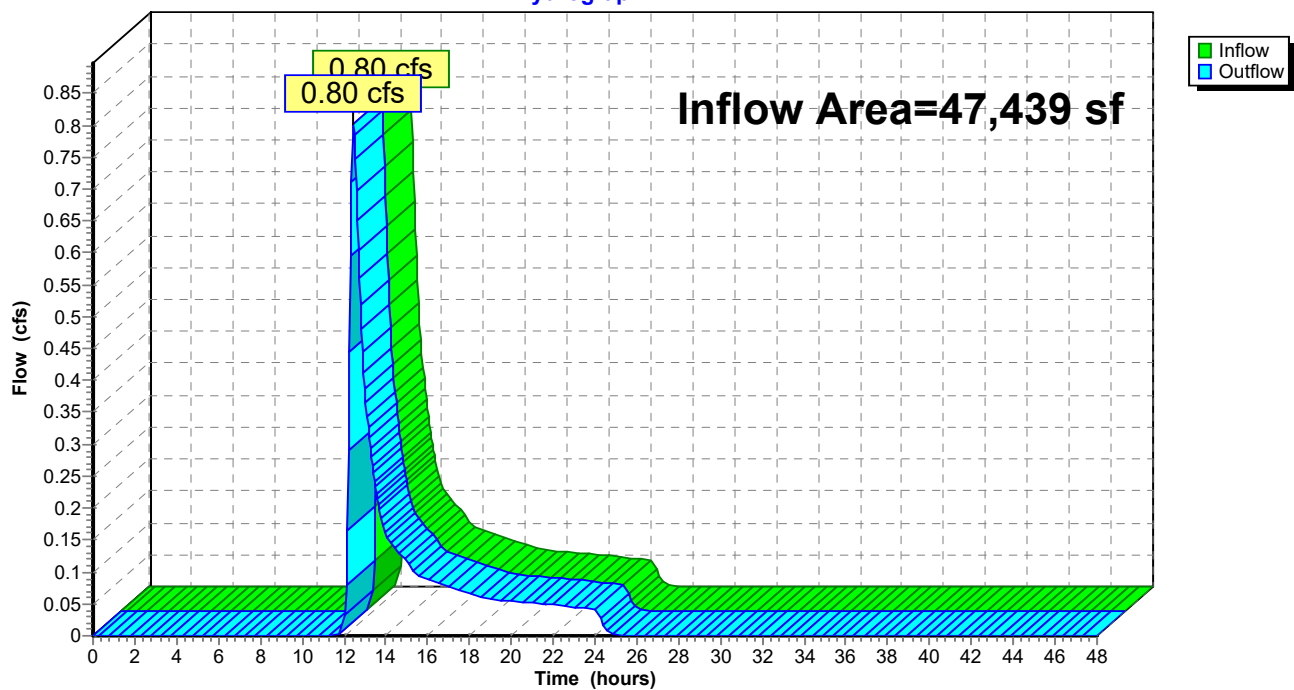
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 47,439 sf, 10.58% Impervious, Inflow Depth = 1.33" for 100-Year event  
Inflow = 0.80 cfs @ 12.46 hrs, Volume= 5,261 cf  
Outflow = 0.80 cfs @ 12.46 hrs, Volume= 5,261 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-5: (new Reach)

Hydrograph



**Existing**

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment SUB-1:** Runoff Area=6,985 sf 0.00% Impervious Runoff Depth=0.00"  
Flow Length=114' Tc=6.6 min CN=39 Runoff=0.00 cfs 0 cf

**Subcatchment SUB-2A: FRONT PARKING** Runoff Area=34,556 sf 65.77% Impervious Runoff Depth=1.29"  
Tc=6.0 min CN=78 Runoff=1.30 cfs 3,709 cf

**Subcatchment SUB-2B: SIDE LOT PARKING** Runoff Area=6,305 sf 34.31% Impervious Runoff Depth=0.38"  
Tc=6.0 min CN=59 Runoff=0.04 cfs 200 cf

**Subcatchment SUB-2C: SIDE LOT** Runoff Area=18,470 sf 97.17% Impervious Runoff Depth=2.77"  
Tc=6.0 min CN=96 Runoff=1.36 cfs 4,262 cf

**Subcatchment SUB-3: VACANT LOT (SOUTH)** Runoff Area=9,332 sf 0.00% Impervious Runoff Depth=0.00"  
Flow Length=131' Tc=25.8 min CN=32 Runoff=0.00 cfs 0 cf

**Subcatchment SUB-4: 19 CYPRESS** Runoff Area=47,439 sf 10.58% Impervious Runoff Depth=0.01"  
Flow Length=401' Tc=26.1 min CN=41 Runoff=0.00 cfs 31 cf

**Reach DP-1: (new Reach)** Inflow=0.00 cfs 0 cf  
Outflow=0.00 cfs 0 cf

**Reach DP-2: (new Reach)** Inflow=1.34 cfs 3,910 cf  
Outflow=1.34 cfs 3,910 cf

**Reach DP-4: (new Reach)** Inflow=0.00 cfs 0 cf  
Outflow=0.00 cfs 0 cf

**Reach DP-5: (new Reach)** Inflow=0.00 cfs 31 cf  
Outflow=0.00 cfs 31 cf

**Total Runoff Area = 123,087 sf Runoff Volume = 8,203 cf Average Runoff Depth = 0.80"**  
**61.12% Pervious = 75,234 sf 38.88% Impervious = 47,853 sf**

**Existing**

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**Summary for Subcatchment SUB-1:**

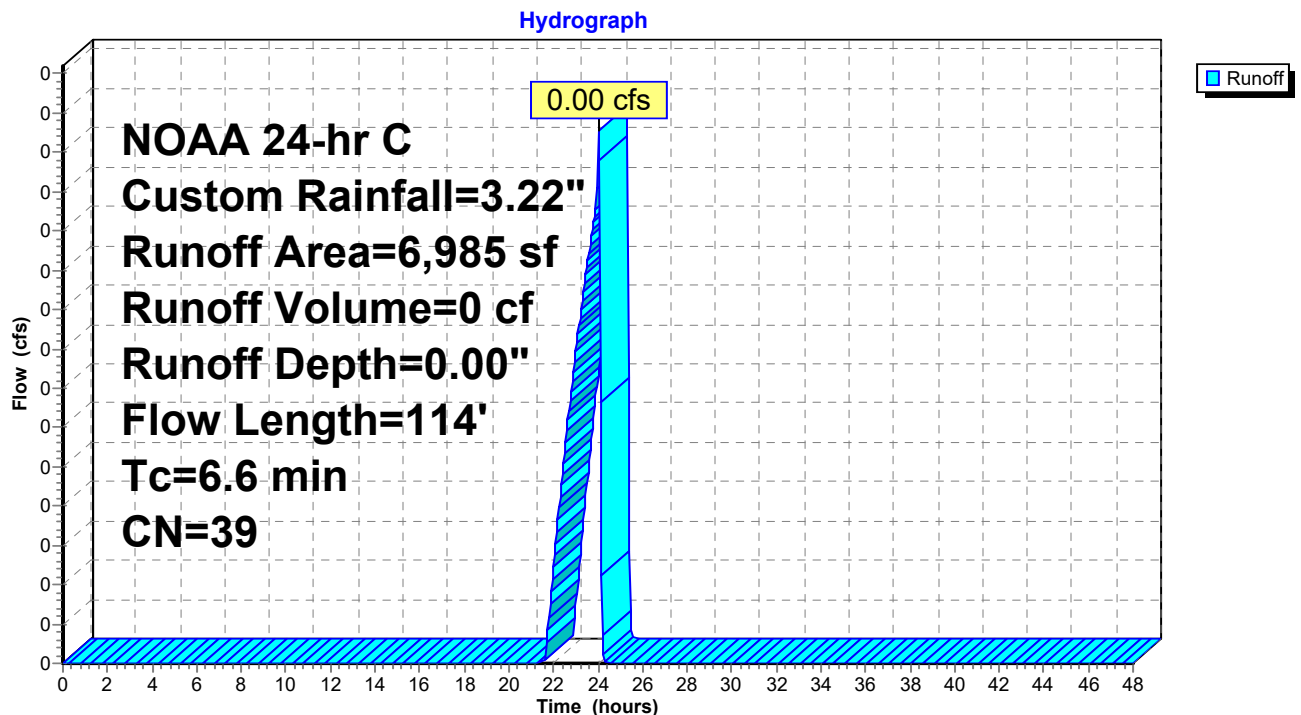
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
 NOAA 24-hr C Custom Rainfall=3.22"

Area (sf)	CN	Description
6,985	39	>75% Grass cover, Good, HSG A
6,985		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.0360	0.13		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.36"
0.3	64	0.0500	3.60		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
6.6	114	Total			

**Subcatchment SUB-1:**



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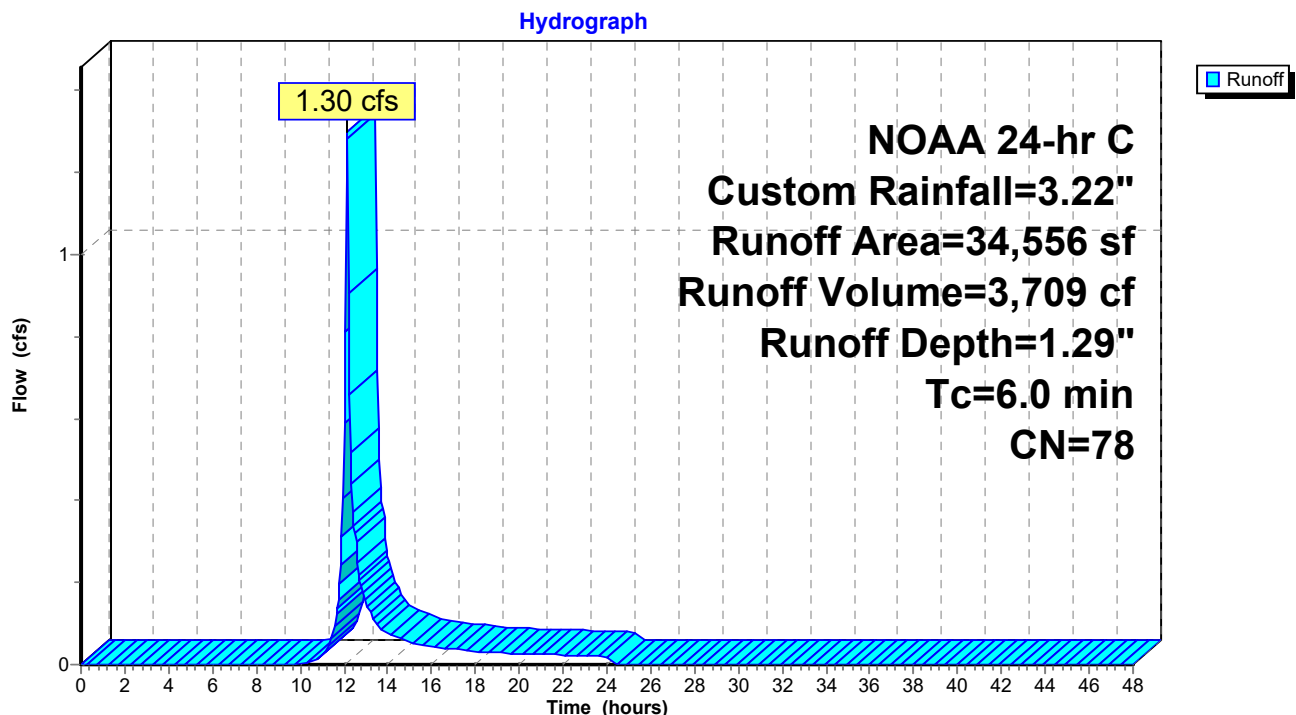
**Summary for Subcatchment SUB-2A: FRONT PARKING LOT (NORTH)**

Runoff = 1.30 cfs @ 12.14 hrs, Volume= 3,709 cf, Depth= 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C Custom Rainfall=3.22"

Area (sf)	CN	Description
18,985	98	Paved parking, HSG A
11,830	39	>75% Grass cover, Good, HSG A
2,769	98	Roofs, HSG A
* 972	98	Concrete, HSG A
34,556	78	Weighted Average
11,830		34.23% Pervious Area
22,726		65.77% Impervious Area

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

**Subcatchment SUB-2A: FRONT PARKING LOT (NORTH)**

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NOAA 24-hr C Custom Rainfall=3.22"

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**Summary for Subcatchment SUB-2B: SIDE LOT PARKING LOT (SOUTH)**

Runoff = 0.04 cfs @ 12.16 hrs, Volume= 200 cf, Depth= 0.38"

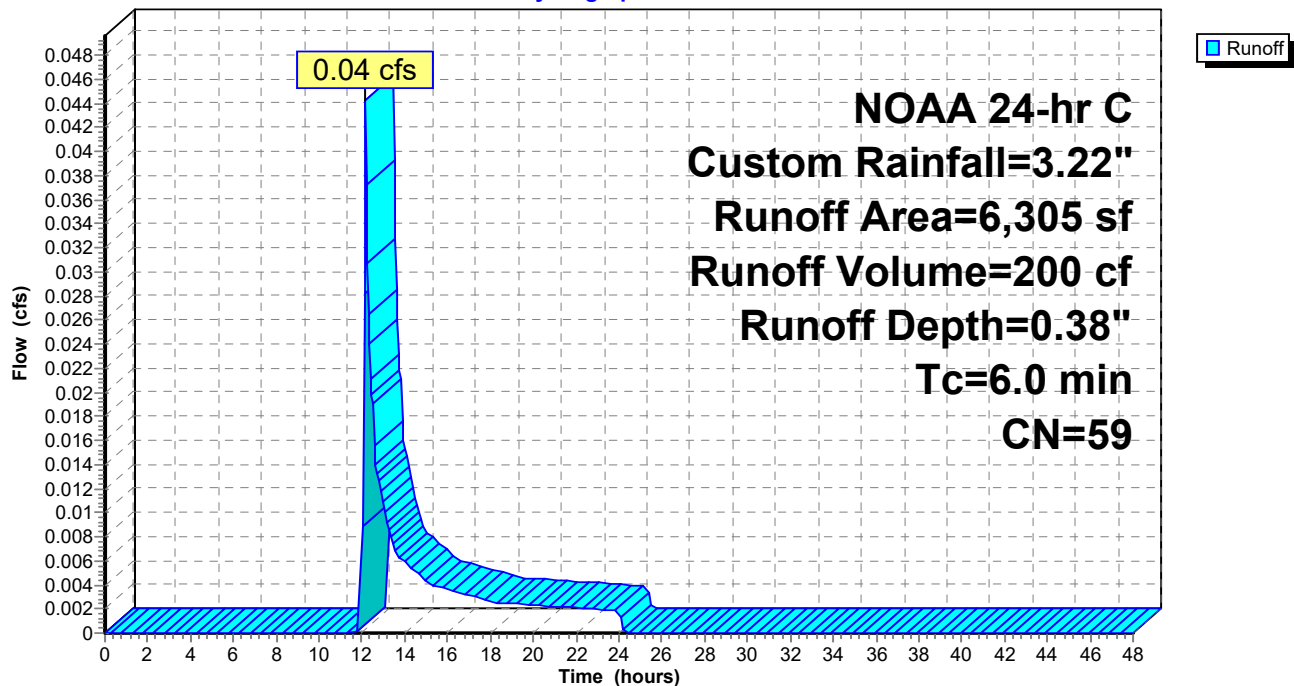
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C Custom Rainfall=3.22"

Area (sf)	CN	Description
4,142	39	>75% Grass cover, Good, HSG A
2,158	98	Paved parking, HSG A
* 5	98	Concrete, HSG A
6,305	59	Weighted Average
4,142		65.69% Pervious Area
2,163		34.31% Impervious Area

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

**Subcatchment SUB-2B: SIDE LOT PARKING LOT (SOUTH)**

Hydrograph



**Existing**

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NOAA 24-hr C Custom Rainfall=3.22"

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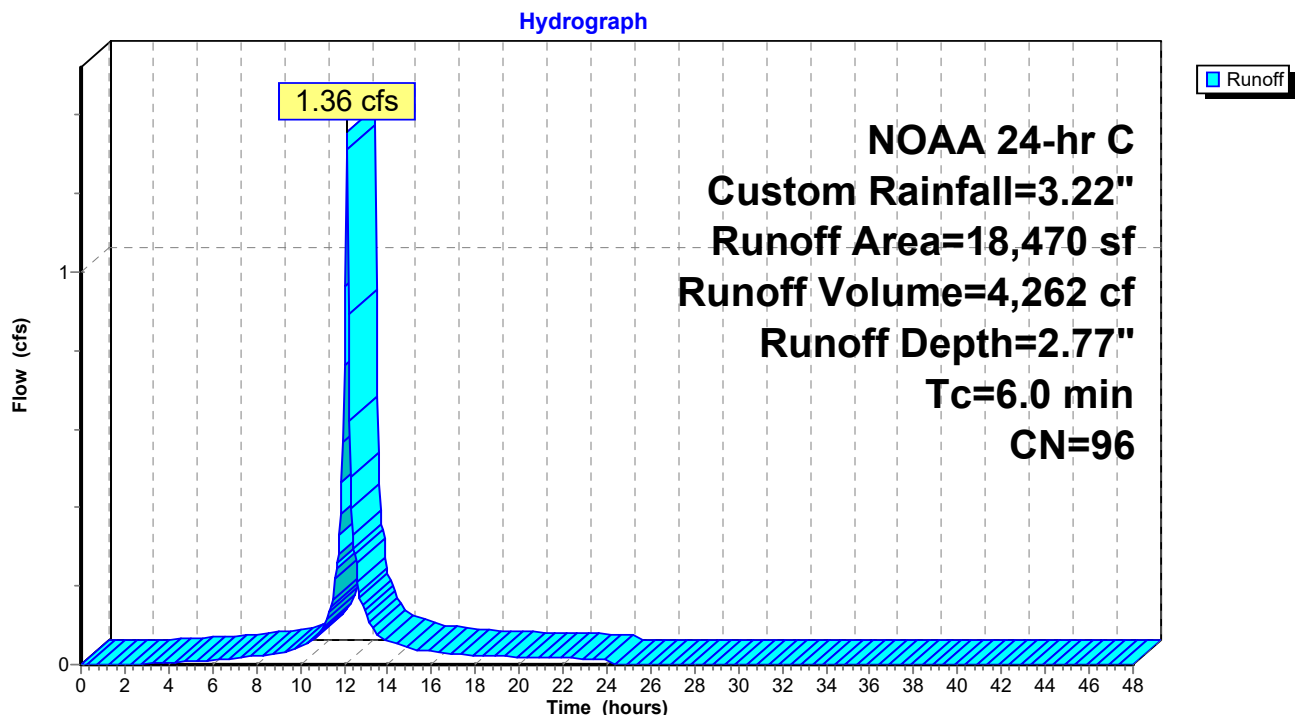
**Summary for Subcatchment SUB-2C: SIDE LOT PARKING LOT (SOUTH)**

Runoff = 1.36 cfs @ 12.13 hrs, Volume= 4,262 cf, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C Custom Rainfall=3.22"

Area (sf)	CN	Description
523	39	>75% Grass cover, Good, HSG A
14,418	98	Paved parking, HSG A
3,006	98	Roofs, HSG A
* 523	98	Concrete, HSG A
18,470	96	Weighted Average
523		2.83% Pervious Area
17,947		97.17% Impervious Area

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

**Subcatchment SUB-2C: SIDE LOT PARKING LOT (SOUTH)**

**Existing**

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NOAA 24-hr C Custom Rainfall=3.22"

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**Summary for Subcatchment SUB-3: VACANT LOT (SOUTH)**

[45] Hint: Runoff=Zero

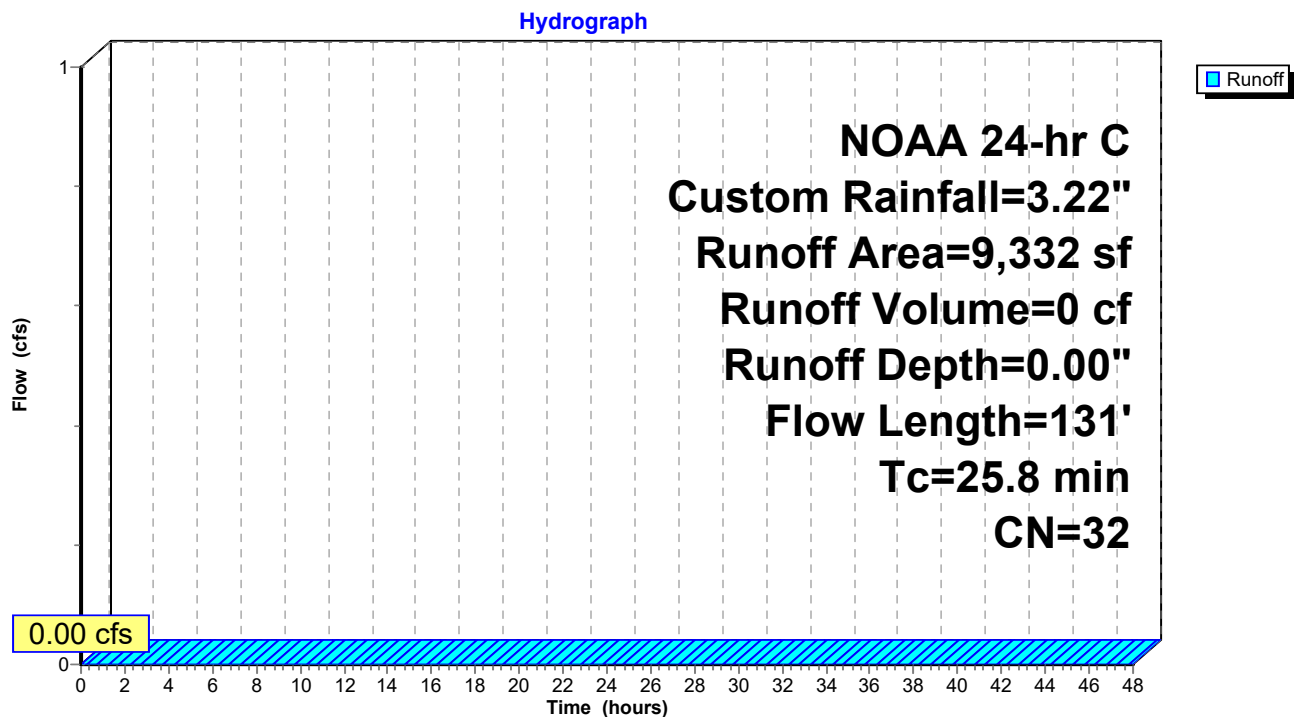
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C Custom Rainfall=3.22"

Area (sf)	CN	Description
6,877	30	Woods, Good, HSG A
2,455	39	>75% Grass cover, Good, HSG A
9,332	32	Weighted Average
9,332		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.2	50	0.0140	0.03		<b>Sheet Flow,</b> Woods: Dense underbrush n= 0.800 P2= 3.36"
1.6	81	0.0280	0.84		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
25.8	131	Total			

**Subcatchment SUB-3: VACANT LOT (SOUTH)**

**Existing**

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**Summary for Subcatchment SUB-4: 19 CYPRESS**

Runoff = 0.00 cfs @ 24.08 hrs, Volume= 31 cf, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C Custom Rainfall=3.22"

Area (sf)	CN	Description
24,231	30	Woods, Good, HSG A
18,191	39	>75% Grass cover, Good, HSG A
2,616	98	Roofs, HSG A
2,401	98	Paved parking, HSG A
47,439	41	Weighted Average
42,422		89.42% Pervious Area
5,017		10.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.9	50	0.0180	0.04		<b>Sheet Flow,</b> Woods: Dense underbrush n= 0.800 P2= 3.36"
2.1	107	0.0300	0.87		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
0.6	66	0.1200	1.73		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
1.2	107	0.0090	1.53		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.3	71	0.0500	3.60		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
26.1	401	Total			

# Existing

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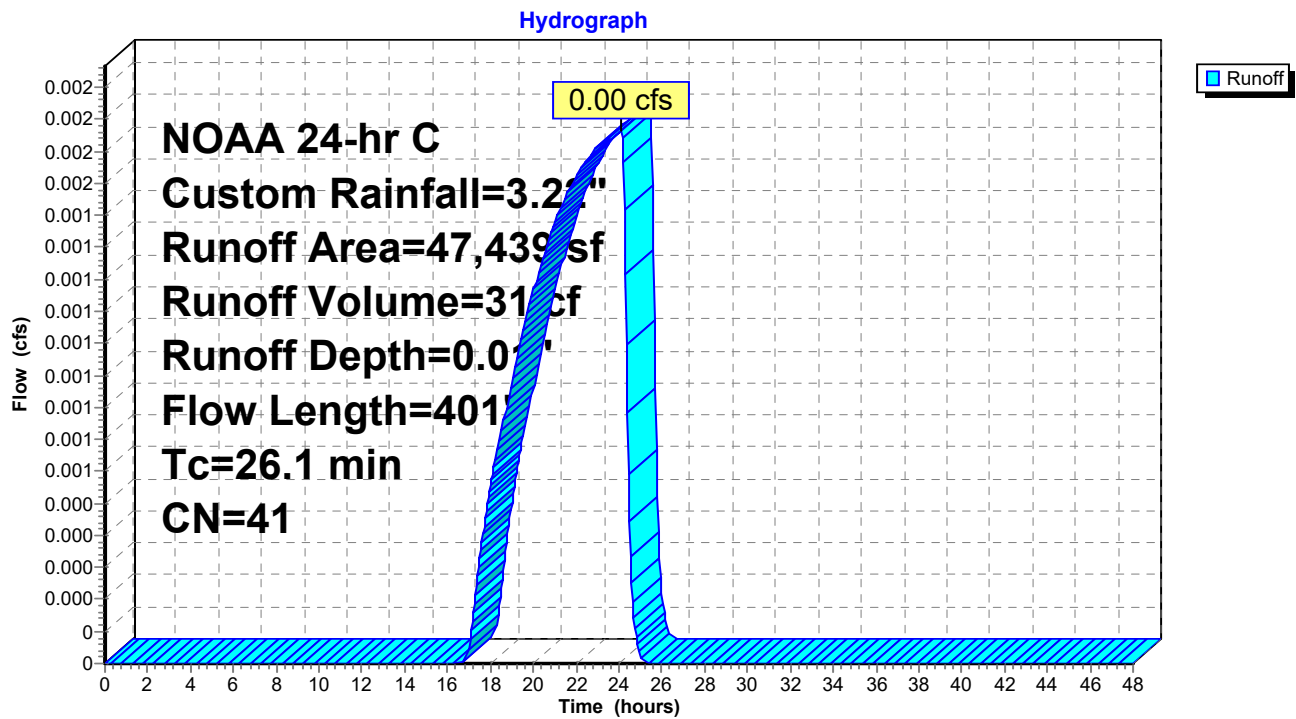
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NOAA 24-hr C Custom Rainfall=3.22"

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## Subcatchment SUB-4: 19 CYPRESS



## Existing

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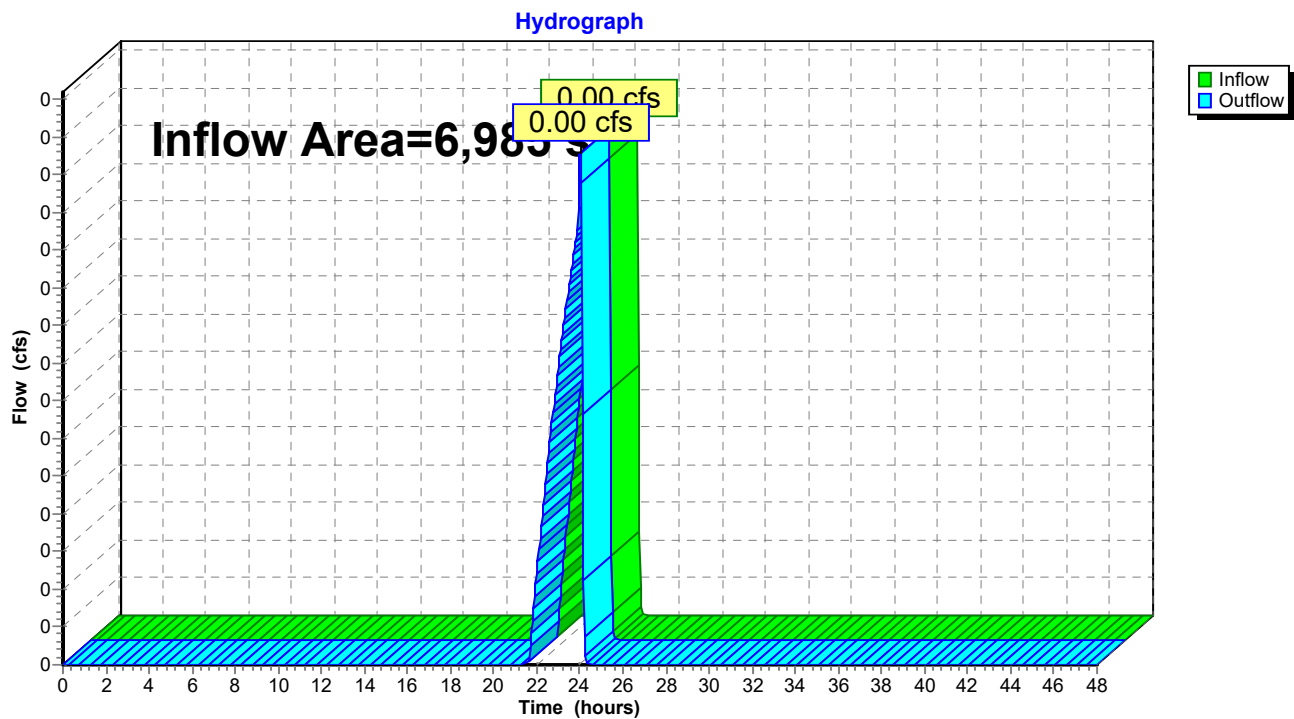
### Summary for Reach DP-1: (new Reach)

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

Inflow Area = 6,985 sf, 0.00% Impervious, Inflow Depth = 0.00" for Custom event  
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0 cf  
Outflow = 0.00 cfs @ 24.01 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-1: (new Reach)



## Existing

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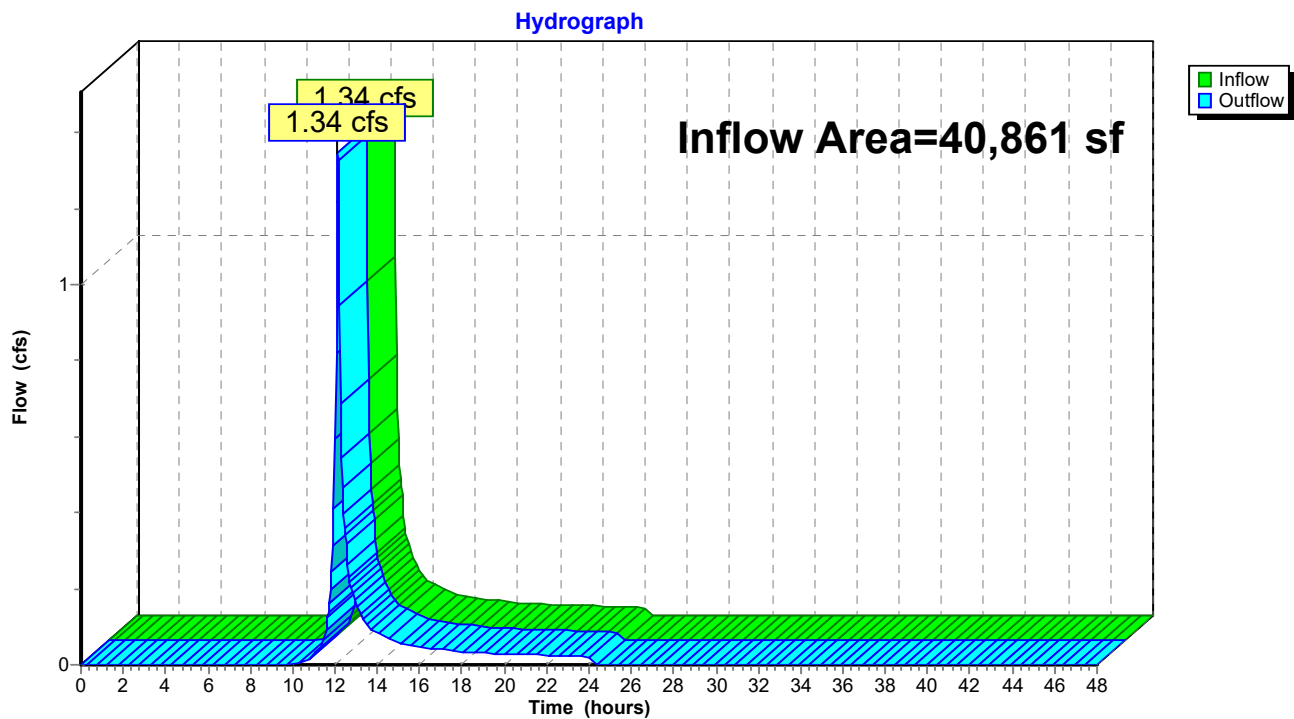
### Summary for Reach DP-2: (new Reach)

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

Inflow Area = 40,861 sf, 60.91% Impervious, Inflow Depth = 1.15" for Custom event  
Inflow = 1.34 cfs @ 12.14 hrs, Volume= 3,910 cf  
Outflow = 1.34 cfs @ 12.14 hrs, Volume= 3,910 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-2: (new Reach)





## Existing

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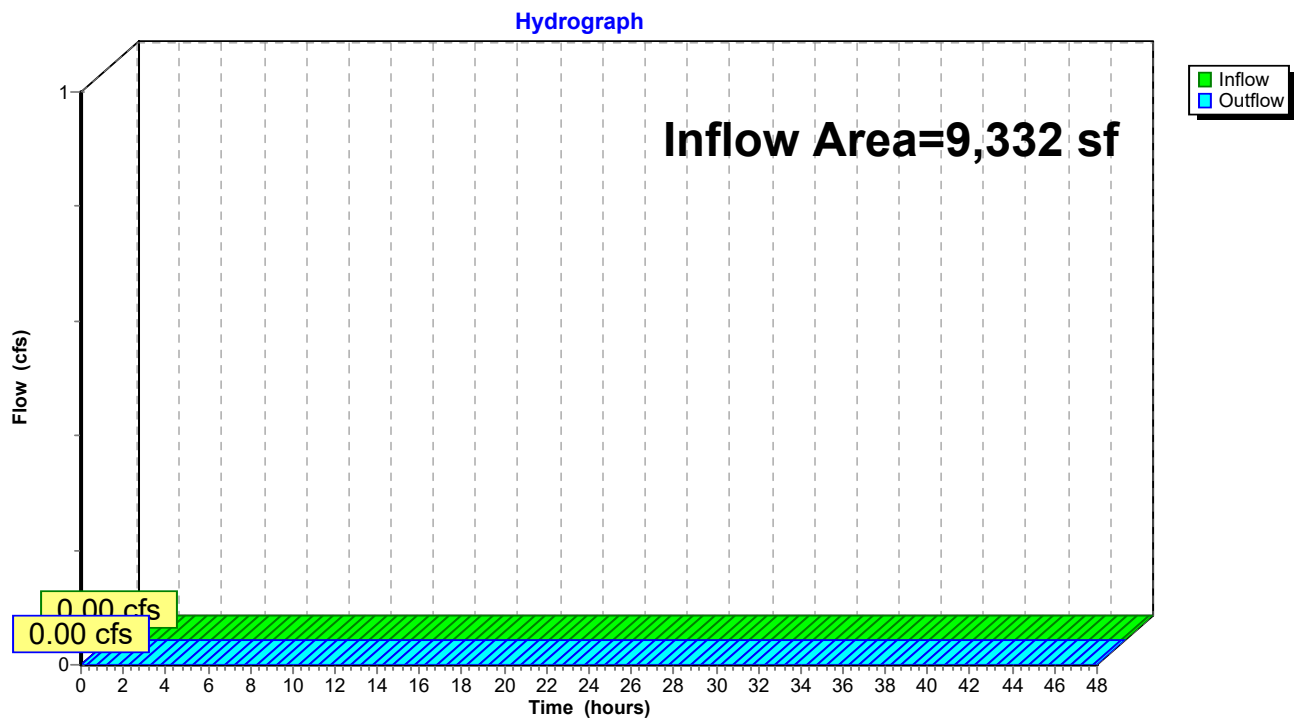
### Summary for Reach DP-4: (new Reach)

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

Inflow Area = 9,332 sf, 0.00% Impervious, Inflow Depth = 0.00" for Custom event  
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-4: (new Reach)



## Existing

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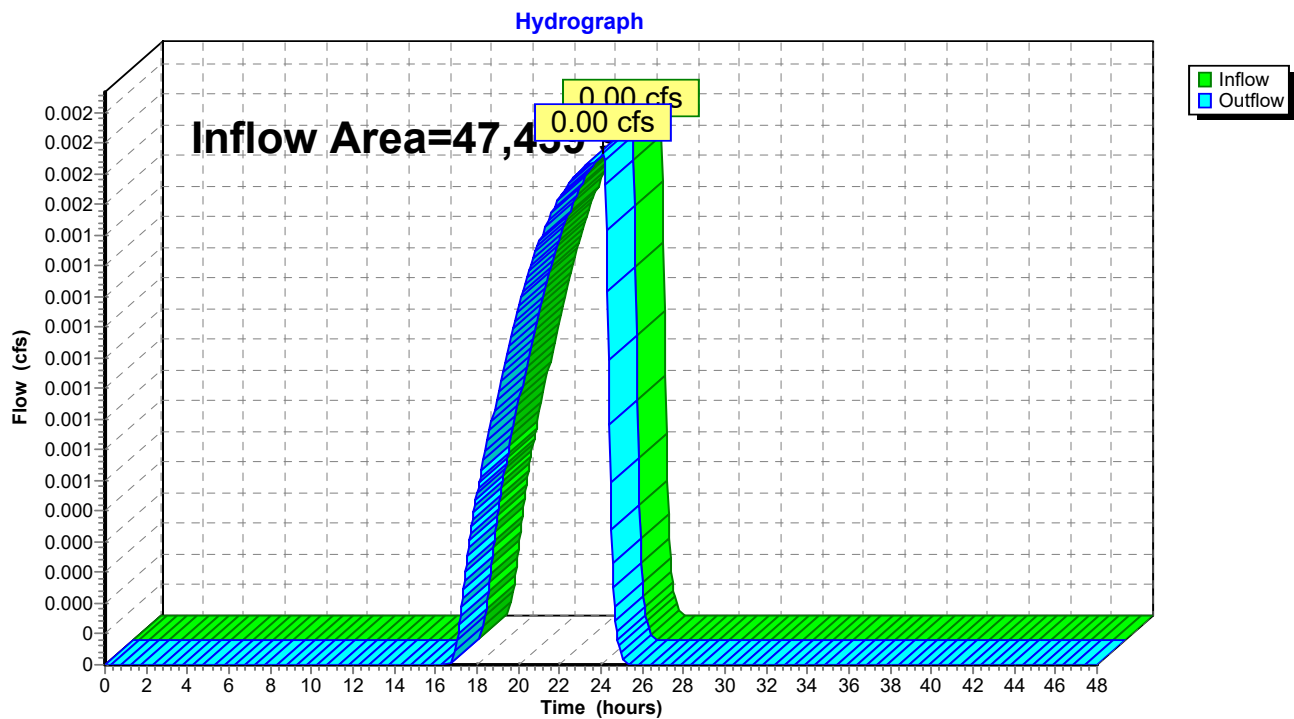
### Summary for Reach DP-5: (new Reach)

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

Inflow Area = 47,439 sf, 10.58% Impervious, Inflow Depth = 0.01" for Custom event  
Inflow = 0.00 cfs @ 24.08 hrs, Volume= 31 cf  
Outflow = 0.00 cfs @ 24.08 hrs, Volume= 31 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-5: (new Reach)





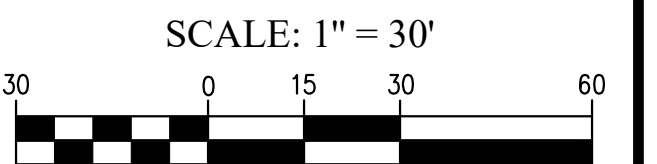
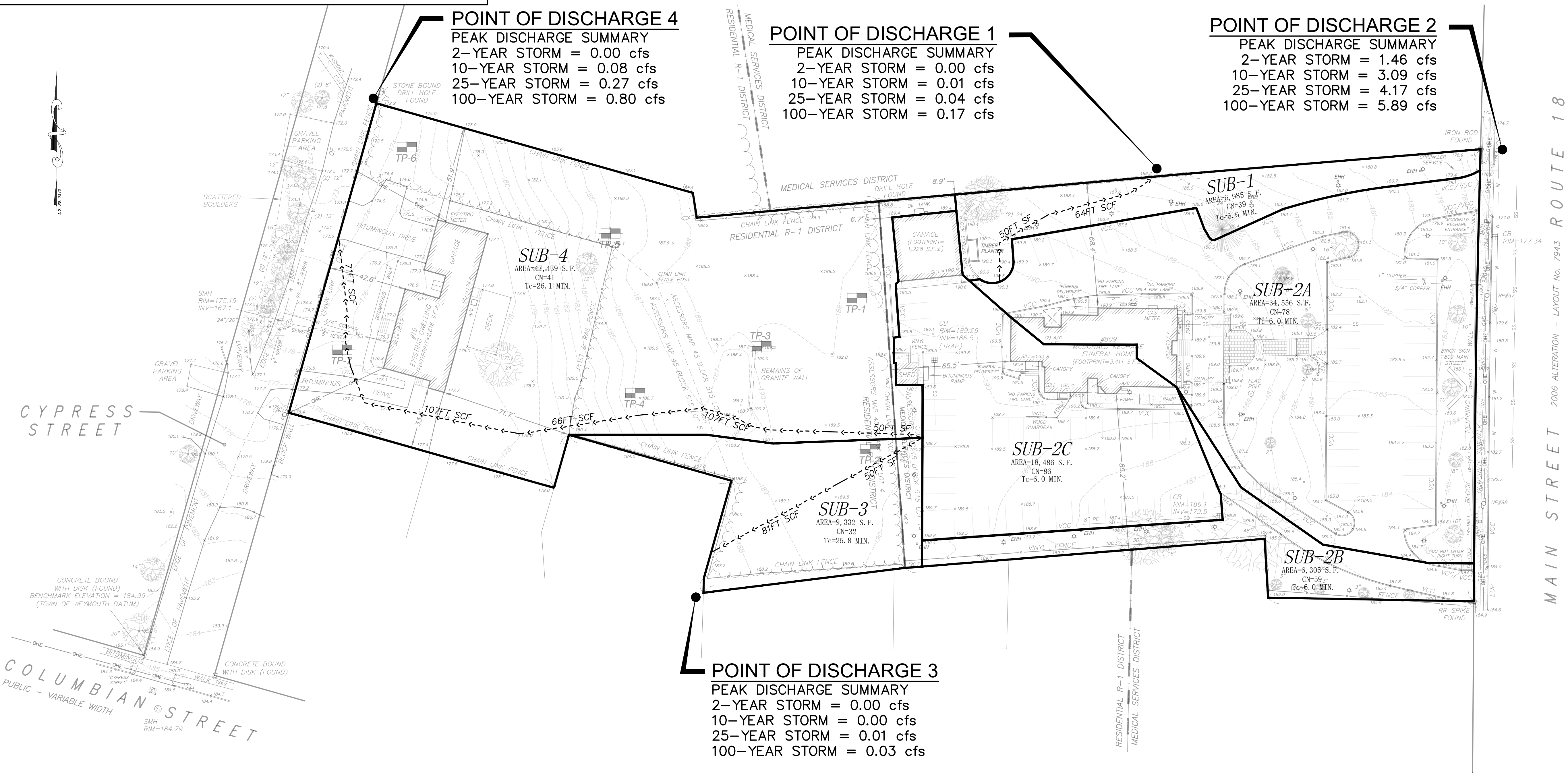
# SOIL TEST DATA

SOIL TESTING AND EVALUATION BY: DAVID NEWHALL S.E. #14226  
SOIL TESTING WITNESSED BY: UNWITNESSED  
DATE: NOVEMBER 24, 2020

TP-1	APPROX. GRADE EL. 189.5	TP-2	APPROX. GRADE EL. 189.6	TP-3	APPROX. GRADE EL. 189.0	TP-4	APPROX. GRADE EL. 186.5	TP-5	APPROX. GRADE EL. 186.2	TP-6	APPROX. GRADE EL. 174.5	TP-7	APPROX. GRADE EL. 176.4
EL. 188.2	A HORIZON LOAMY SAND 10YR 3/2	EL. 188.3	A HORIZON LOAMY SAND 10YR 3/2	EL. 185.3	FILL	EL. 182.5	FILL	EL. 188.3	A HORIZON LOAMY SAND 10YR 3/2	EL. 173.5	A HORIZON LOAMY SAND 10YR 3/2	EL. 173.5	A HORIZON LOAMY SAND 10YR 3/2
EL. 186.8	B HORIZON LOAMY SAND 10YR 5/6	EL. 187.1	B HORIZON LOAMY SAND 10YR 5/6	EL. 177.0	C1 HORIZON SAND 2.5Y 6/2	EL. 174.0	C1 HORIZON SAND 2.5Y 6/2	EL. 187.1	B HORIZON LOAMY SAND 10YR 5/6	EL. 172.5	B HORIZON LOAMY SAND 10YR 5/6	EL. 172.5	B HORIZON LOAMY SAND 10YR 5/6
EL. 185.2	B/C HORIZON LOAMY SAND 10YR 4/4	EL. 183.6	B/C HORIZON LOAMY SAND 10YR 4/4					EL. 183.6	C1 HORIZON LOAMY SAND 2.5Y 5/3	EL. 169.0	C HORIZON LOAMY SAND 10YR 4/4	EL. 169.0	C HORIZON LOAMY SAND 10YR 4/4
EL. 176.5	C1 HORIZON SAND 2.5Y 6/2	EL. 176.1	C1 HORIZON SAND 2.5Y 6/2						C2 HORIZON SAND 2.5Y 5/3	EL. 164.5	C2 HORIZON SAND 2.5Y 5/3	EL. 166.4	C2 HORIZON SAND 2.5Y 5/3
MOTTILING OBSERVED: NONE WEEPING OBSERVED: NONE E.S.H.G.W.: >156"		MOTTILING OBSERVED: 120" (EL. 179.6) WEEPING OBSERVED: NONE E.S.H.G.W.: 120" (EL. 179.6)		MOTTILING OBSERVED: 132" (EL. 178.0) WEEPING OBSERVED: NONE E.S.H.G.W.: 132" (EL. 178.0)		MOTTILING OBSERVED: NONE WEEPING OBSERVED: NONE E.S.H.G.W.: >150"		MOTTILING OBSERVED: NONE WEEPING OBSERVED: NONE E.S.H.G.W.: >150"		MOTTILING OBSERVED: NONE WEEPING OBSERVED: NONE E.S.H.G.W.: >120"		MOTTILING OBSERVED: NONE WEEPING OBSERVED: NONE E.S.H.G.W.: >120"	

MAP UNIT SYMBOL	MAP UNIT NAME	HYDROLOGIC RATING
623C	WOODBIDGE-URBAN LAND COMPLEX, 3-15% SLOPES	D
628C	CANTON-URBAN LAND COMPLEX, 3-15% SLOPES	A
602	URBAN LAND, 0-15% SLOPES	UNRANKED

SF=SHEET FLOW  
SCF= SHALLOW CONCENTRATED FLOW



Date	Description	No.
4-8-22	ADDRESS ENGINEERING COMMENTS	1

Revisions

*Gabriel R. Crocker*  
4-8-2022  
GABRIEL R. CROCKER  
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

**Crocker Design Group**

2 SHARP STREET, UNIT A  
HINGHAM, MA 02043  
P: 781-919-0808

Project

**MCDONALD-KEOHANE FUNERAL HOME - SOUTH**  
809 MAIN STREET  
WEYMOUTH, MA 02190

Prepared for

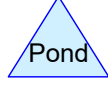
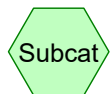
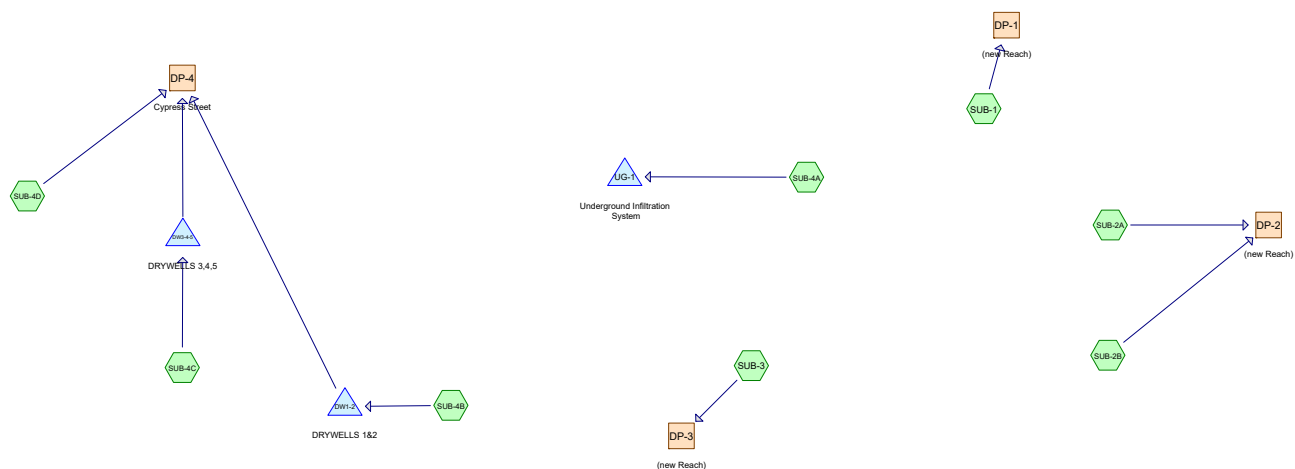
**MCDONALD KEOHANE FUNERAL HOME, INC.**  
785 HANCOCK STREET  
QUINCY, MA 02170

Drawing Title

**PRE-CONSTRUCTION WATERSHED PLAN**

Project No.	100-060	Drawing No.	<b>WS-1</b>
Date	02 / 04 / 2022		
Scale	SEE PLAN		
Drawn By	CM / JM		
Approved By	GRC		





**Routing Diagram for Proposed**  
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**Proposed**

Prepared by HP Inc.

Printed 2/3/2022

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**Project Notes**

Rainfall events imported from "NRCS-Rain.txt" for 4335 MA Weymouth Norfolk County

**Proposed**

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Page 3

**Area Listing (all nodes)**

Area (sq-ft)	CN	Description (subcatchment-numbers)
43,731	39	>75% Grass cover, Good, HSG A (SUB-1, SUB-2A, SUB-2B, SUB-3, SUB-4A, SUB-4B, SUB-4C, SUB-4D)
4,576	98	Concrete, HSG A (SUB-2A, SUB-4A, SUB-4B, SUB-4C)
60,490	98	Paved parking, HSG A (SUB-2A, SUB-2B, SUB-4A)
12,231	98	Roofs, HSG A (SUB-2A, SUB-4A)
2,059	30	Woods, Good, HSG A (SUB-3)
<b>123,087</b>	<b>76</b>	<b>TOTAL AREA</b>

**Proposed**

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**Soil Listing (all nodes)**

Area (sq-ft)	Soil Group	Subcatchment Numbers
123,087	HSG A	SUB-1, SUB-2A, SUB-2B, SUB-3, SUB-4A, SUB-4B, SUB-4C, SUB-4D
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
<b>123,087</b>		<b>TOTAL AREA</b>

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**Ground Covers (all nodes)**

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
43,731	0	0	0	0	43,731	>75% Grass cover, Good	
4,576	0	0	0	0	4,576	Concrete	
60,490	0	0	0	0	60,490	Paved parking	
12,231	0	0	0	0	12,231	Roofs	
2,059	0	0	0	0	2,059	Woods, Good	
<b>123,087</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>123,087</b>	<b>TOTAL AREA</b>	



**Proposed**

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

<b>Subcatchment SUB-1:</b>	Runoff Area=5,695 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=155' Tc=6.9 min CN=39 Runoff=0.00 cfs 2 cf
<b>Subcatchment SUB-2A:</b>	Runoff Area=28,101 sf 60.43% Impervious Runoff Depth=1.20" Tc=6.0 min CN=75 Runoff=0.98 cfs 2,819 cf
<b>Subcatchment SUB-2B:</b>	Runoff Area=7,532 sf 39.46% Impervious Runoff Depth=0.55" Tc=6.0 min CN=62 Runoff=0.10 cfs 346 cf
<b>Subcatchment SUB-3:</b>	Runoff Area=3,787 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=67' Tc=9.4 min CN=34 Runoff=0.00 cfs 0 cf
<b>Subcatchment SUB-4A:</b>	Runoff Area=60,886 sf 93.21% Impervious Runoff Depth=2.70" Tc=6.0 min CN=94 Runoff=4.49 cfs 13,696 cf
<b>Subcatchment SUB-4B:</b>	Runoff Area=5,529 sf 4.41% Impervious Runoff Depth=0.02" Tc=6.0 min CN=42 Runoff=0.00 cfs 11 cf
<b>Subcatchment SUB-4C:</b>	Runoff Area=9,693 sf 3.61% Impervious Runoff Depth=0.02" Tc=6.0 min CN=41 Runoff=0.00 cfs 13 cf
<b>Subcatchment SUB-4D:</b>	Runoff Area=1,864 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=39 Runoff=0.00 cfs 1 cf
<b>Reach DP-1: (new Reach)</b>	Inflow=0.00 cfs 2 cf Outflow=0.00 cfs 2 cf
<b>Reach DP-2: (new Reach)</b>	Inflow=1.08 cfs 3,165 cf Outflow=1.08 cfs 3,165 cf
<b>Reach DP-3: (new Reach)</b>	Inflow=0.00 cfs 0 cf Outflow=0.00 cfs 0 cf
<b>Reach DP-4: Cypress Street</b>	Inflow=0.00 cfs 1 cf Outflow=0.00 cfs 1 cf
<b>Pond DW1-2: DRYWELLS 1&amp;2</b>	Peak Elev=171.40' Storage=0 cf Inflow=0.00 cfs 11 cf Outflow=0.00 cfs 11 cf
<b>Pond DW3-4-5: DRYWELLS 3,4,5</b>	Peak Elev=169.50' Storage=0 cf Inflow=0.00 cfs 13 cf Outflow=0.00 cfs 13 cf
<b>Pond UG-1: Underground Infiltration</b>	Peak Elev=179.90' Storage=4,731 cf Inflow=4.49 cfs 13,696 cf Outflow=0.49 cfs 13,696 cf

**Total Runoff Area = 123,087 sf Runoff Volume = 16,887 cf Average Runoff Depth = 1.65"**  
**37.20% Pervious = 45,790 sf 62.80% Impervious = 77,297 sf**

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**Summary for Subcatchment SUB-1:**

Runoff = 0.00 cfs @ 24.01 hrs, Volume= 2 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 2-Year Rainfall=3.36"

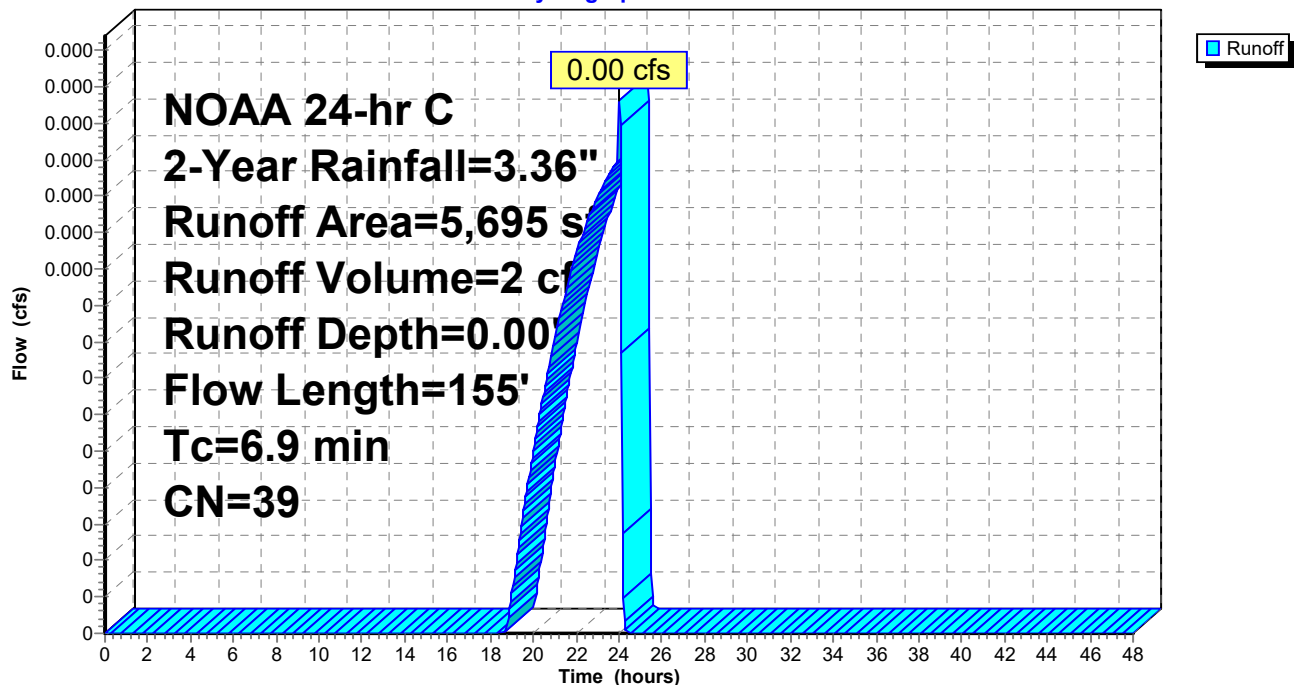
Area (sf)	CN	Description
5,695	39	>75% Grass cover, Good, HSG A
5,695		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0350	0.13		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.36"
0.5	105	0.0500	3.60		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
6.9	155	Total			

**Subcatchment SUB-1:**

Hydrograph



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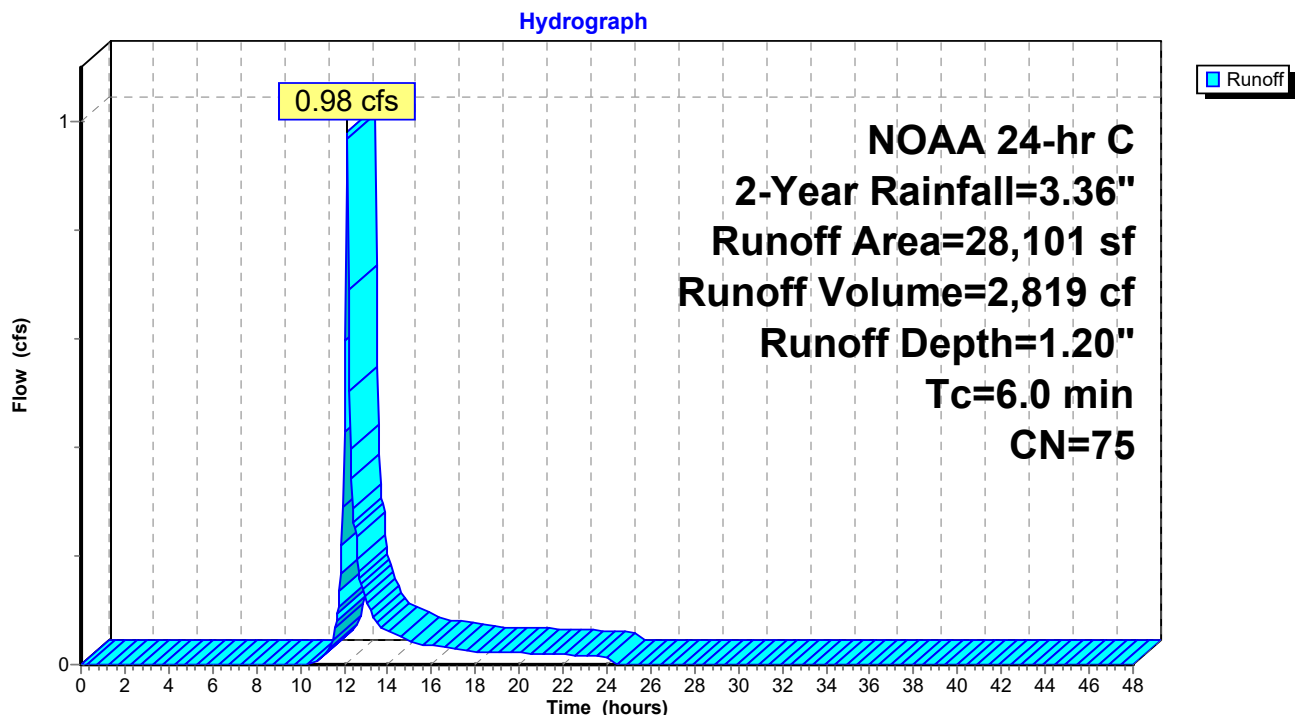
**Summary for Subcatchment SUB-2A:**

Runoff = 0.98 cfs @ 12.14 hrs, Volume= 2,819 cf, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
13,100	98	Paved parking, HSG A
* 1,667	98	Concrete, HSG A
2,214	98	Roofs, HSG A
11,120	39	>75% Grass cover, Good, HSG A
28,101	75	Weighted Average
11,120		39.57% Pervious Area
16,981		60.43% Impervious Area

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

**Subcatchment SUB-2A:**

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**Summary for Subcatchment SUB-2B:**

Runoff = 0.10 cfs @ 12.15 hrs, Volume= 346 cf, Depth= 0.55"

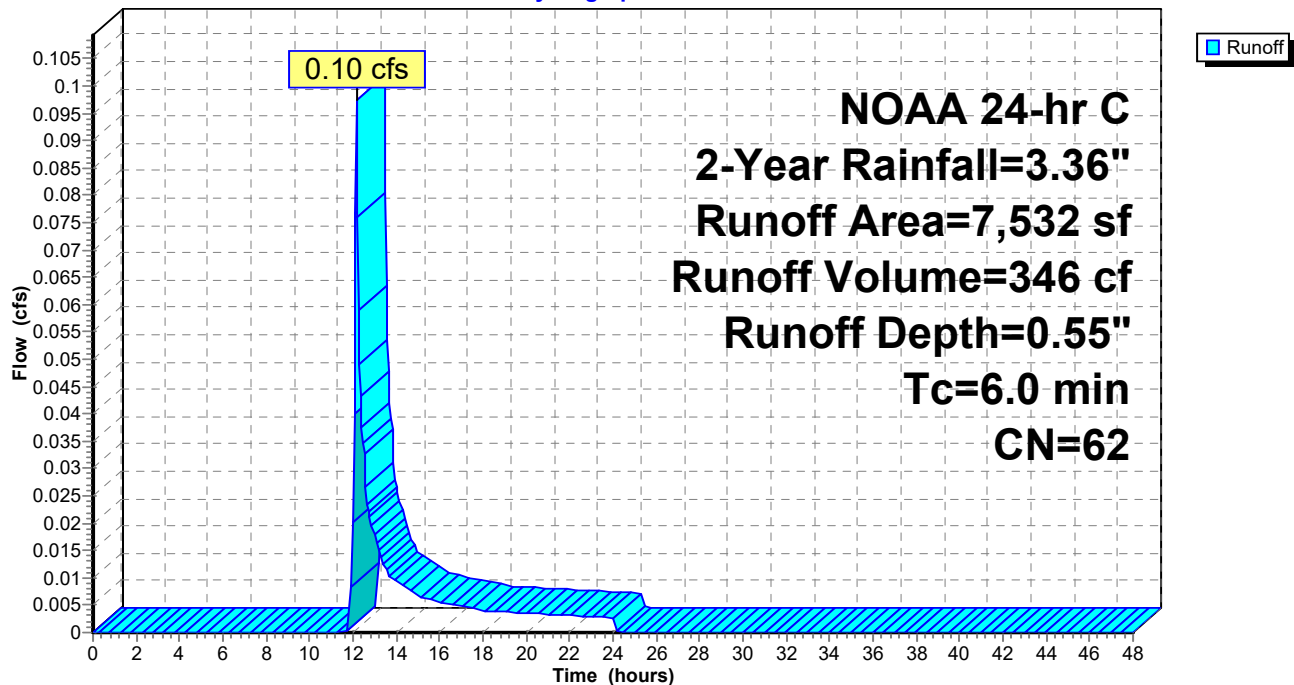
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
2,972	98	Paved parking, HSG A
4,560	39	>75% Grass cover, Good, HSG A
7,532	62	Weighted Average
4,560		60.54% Pervious Area
2,972		39.46% Impervious Area

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

**Subcatchment SUB-2B:**

Hydrograph



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**Summary for Subcatchment SUB-3:**

[45] Hint: Runoff=Zero

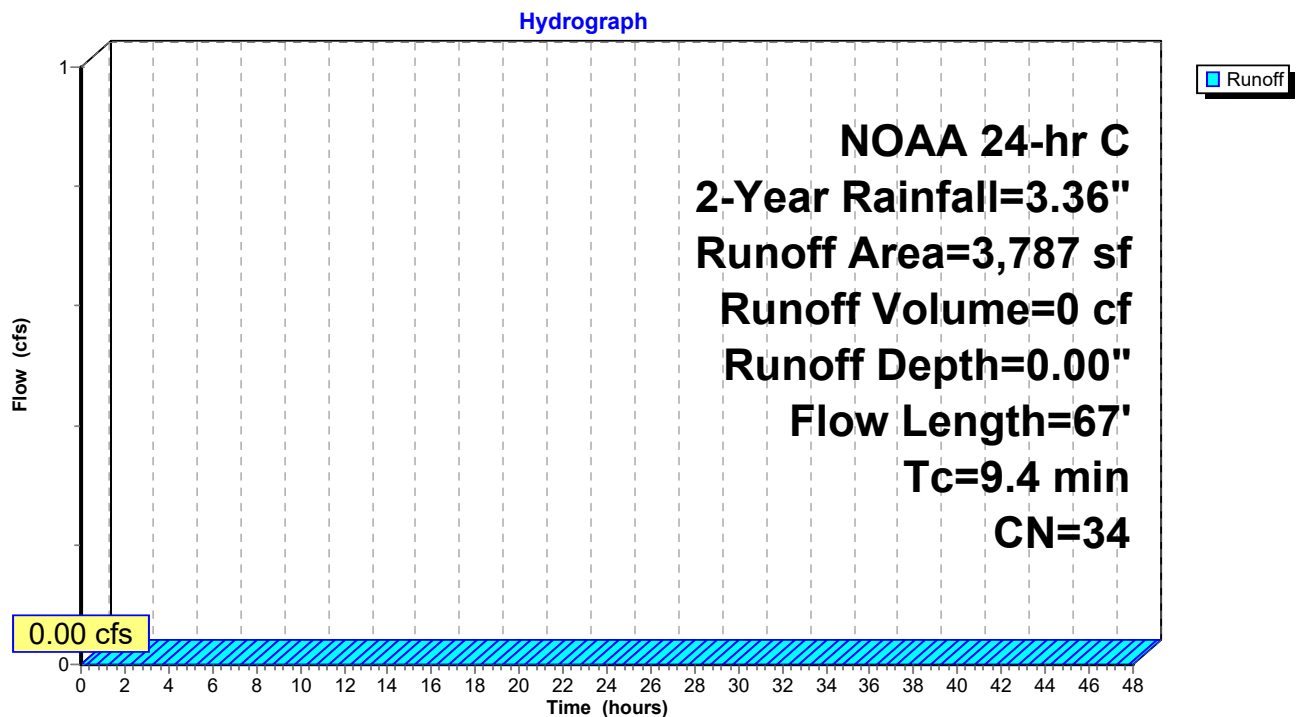
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
1,728	39	>75% Grass cover, Good, HSG A
2,059	30	Woods, Good, HSG A
3,787	34	Weighted Average
3,787		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0380	0.09		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.36"
0.1	17	0.0300	2.79		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
9.4	67	Total			

**Subcatchment SUB-3:**

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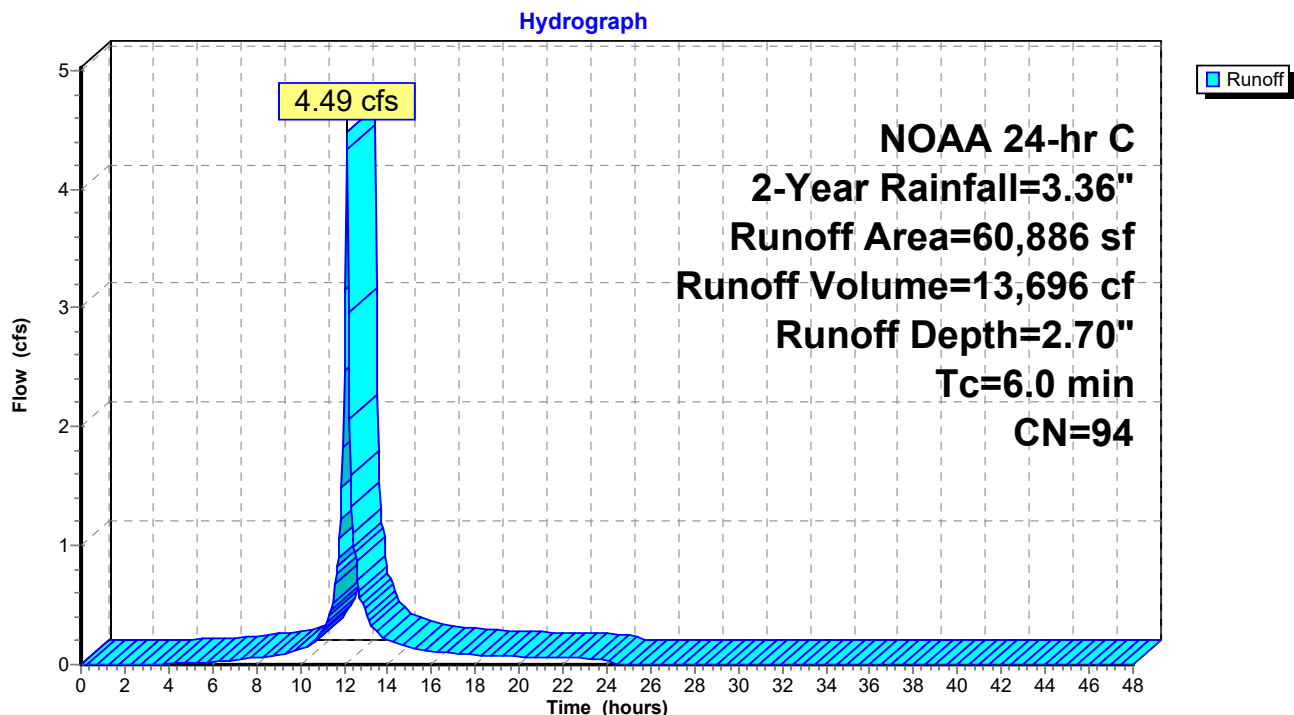
**Summary for Subcatchment SUB-4A:**

Runoff = 4.49 cfs @ 12.13 hrs, Volume= 13,696 cf, Depth= 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
10,017	98	Roofs, HSG A
44,418	98	Paved parking, HSG A
* 2,315	98	Concrete, HSG A
4,136	39	>75% Grass cover, Good, HSG A
60,886	94	Weighted Average
4,136		6.79% Pervious Area
56,750		93.21% Impervious Area

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

**Subcatchment SUB-4A:**

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### Summary for Subcatchment SUB-4B:

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 11 cf, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 2-Year Rainfall=3.36"

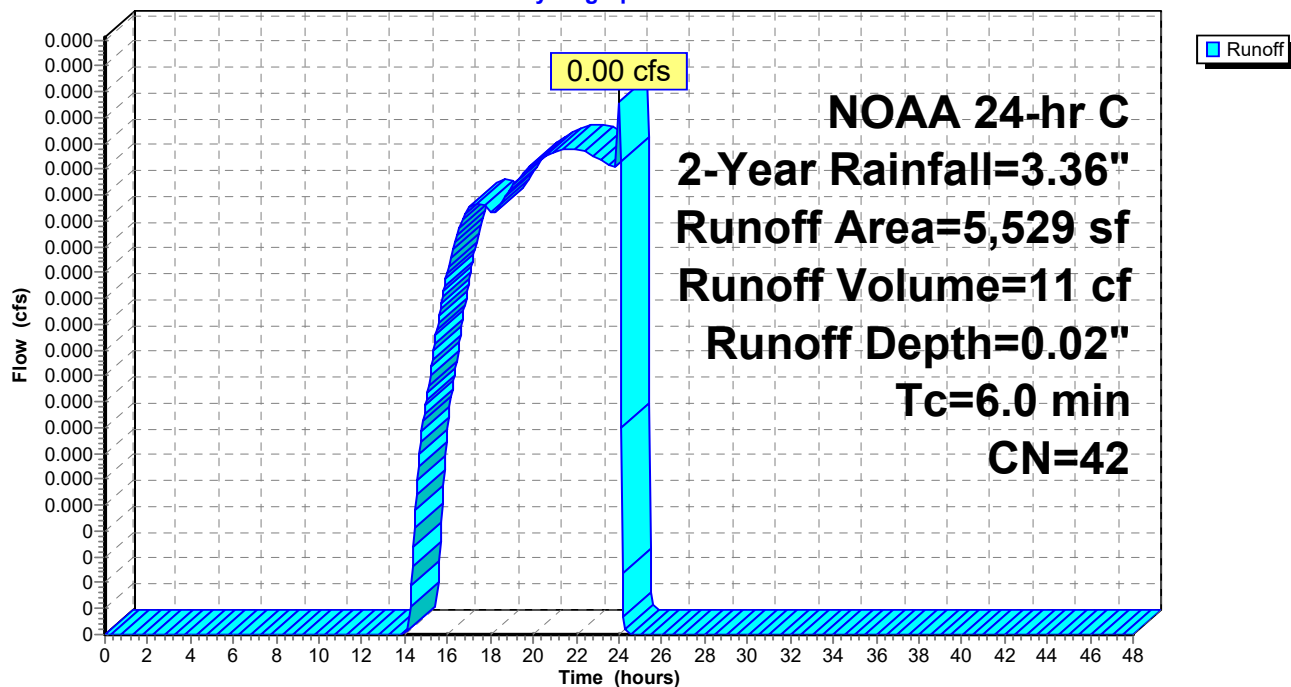
	Area (sf)	CN	Description
*	244	98	Concrete, HSG A
	5,285	39	>75% Grass cover, Good, HSG A
	5,529	42	Weighted Average
	5,285		95.59% Pervious Area
	244		4.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					<b>Direct Entry.</b>

## Direct Entry,

### Subcatchment SUB-4B:

## Hydrograph



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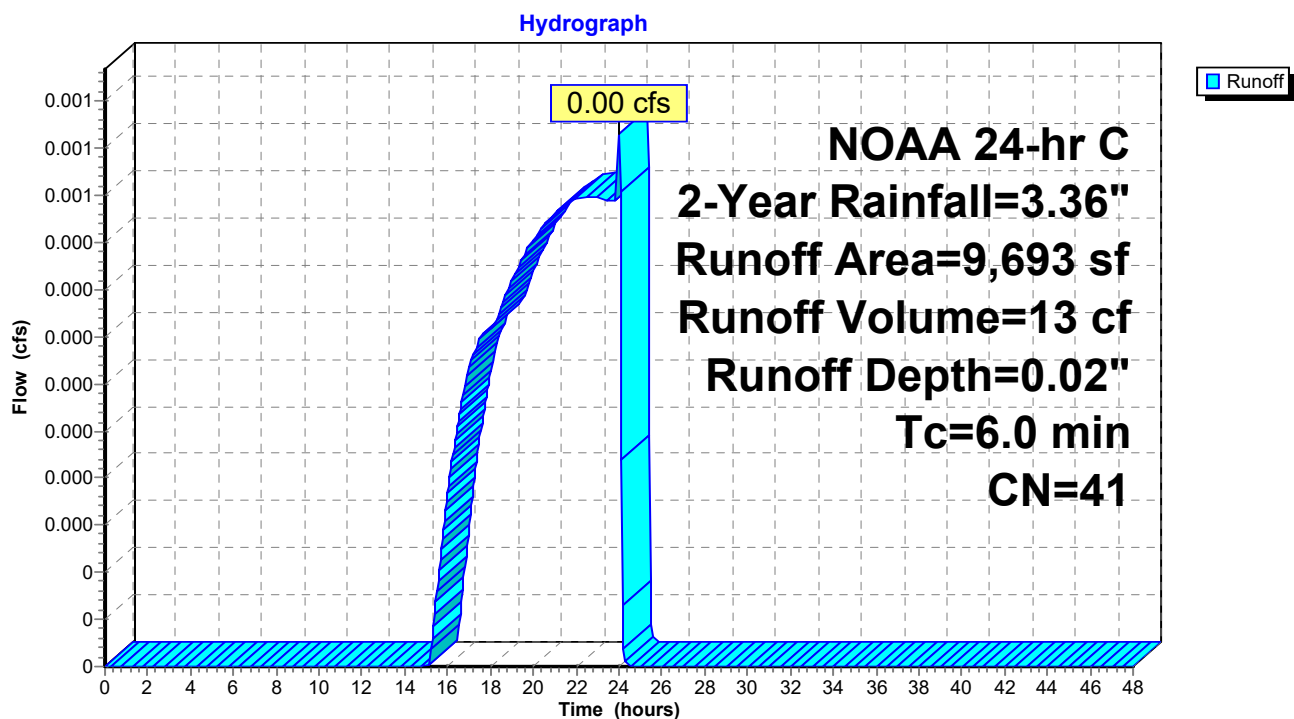
**Summary for Subcatchment SUB-4C:**

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 13 cf, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
* 350	98	Concrete, HSG A
9,343	39	>75% Grass cover, Good, HSG A
9,693	41	Weighted Average
9,343		96.39% Pervious Area
350		3.61% Impervious Area

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

**Subcatchment SUB-4C:**



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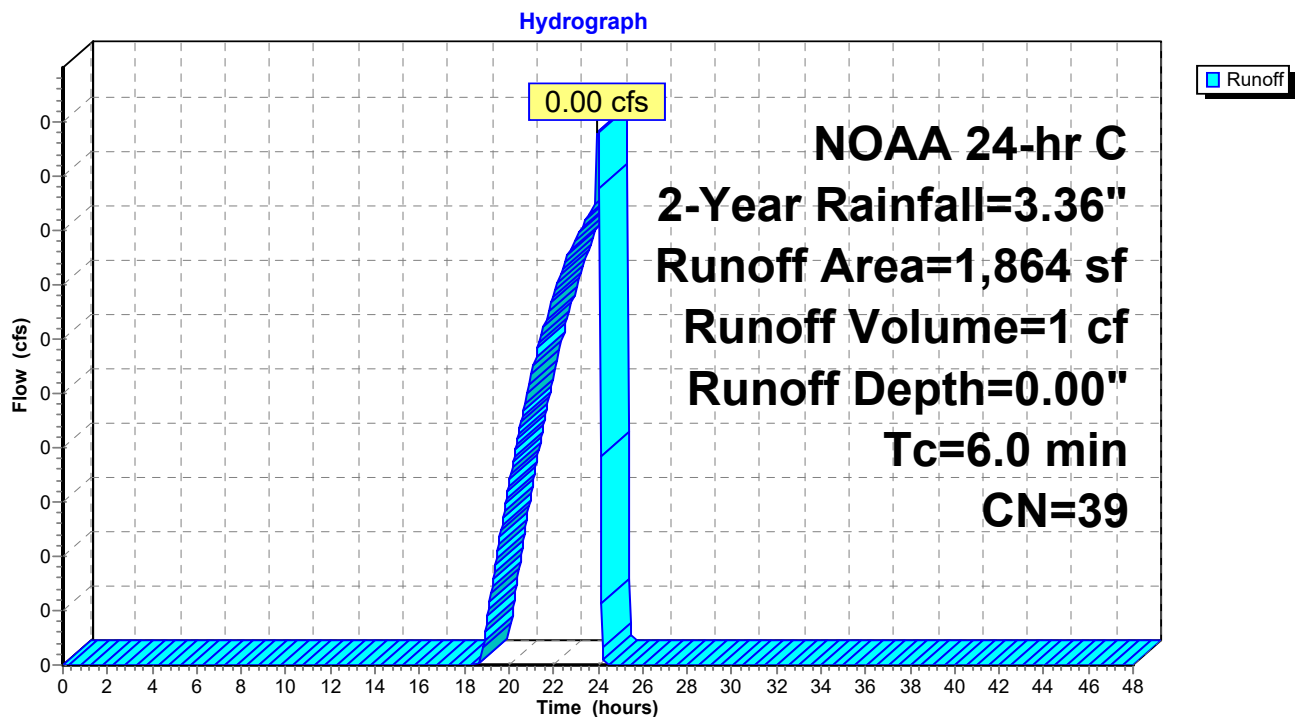
**Summary for Subcatchment SUB-4D:**

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 1 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 2-Year Rainfall=3.36"

Area (sf)	CN	Description
1,864	39	>75% Grass cover, Good, HSG A
1,864		100.00% Pervious Area

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

**Subcatchment SUB-4D:**

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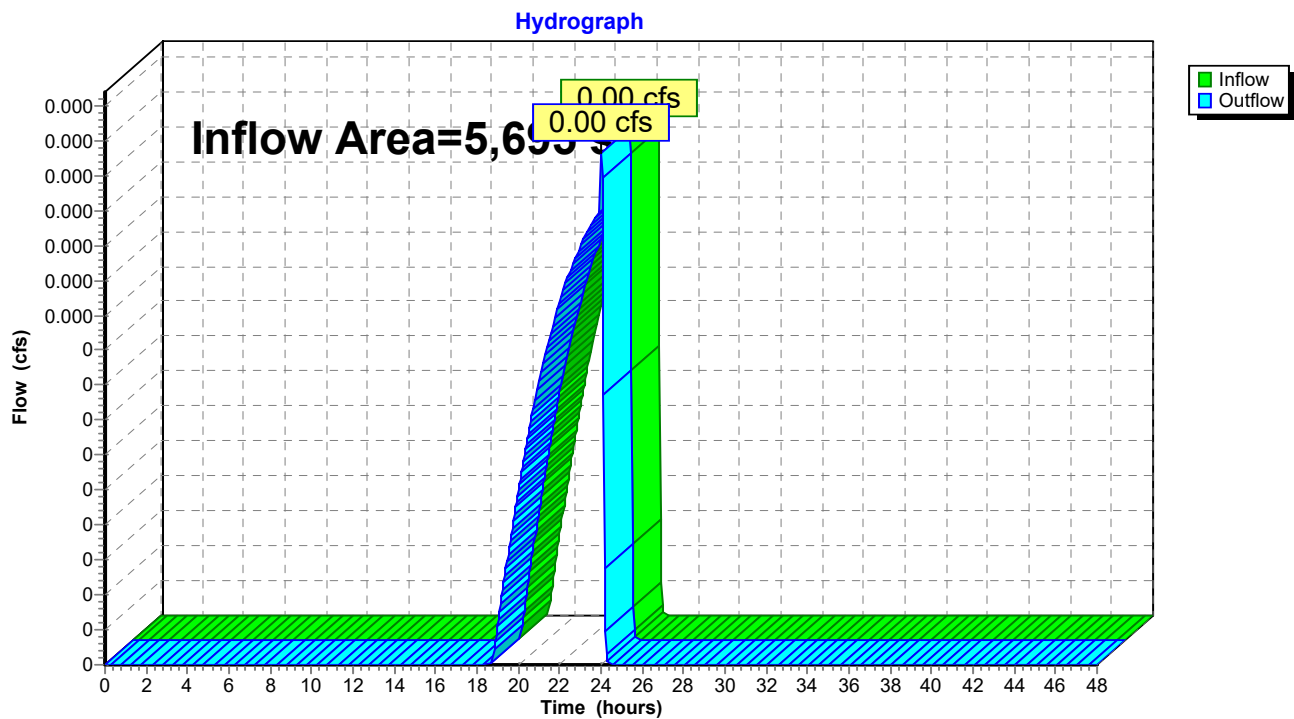
### Summary for Reach DP-1: (new Reach)

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

Inflow Area = 5,695 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event  
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 2 cf  
Outflow = 0.00 cfs @ 24.01 hrs, Volume= 2 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-1: (new Reach)



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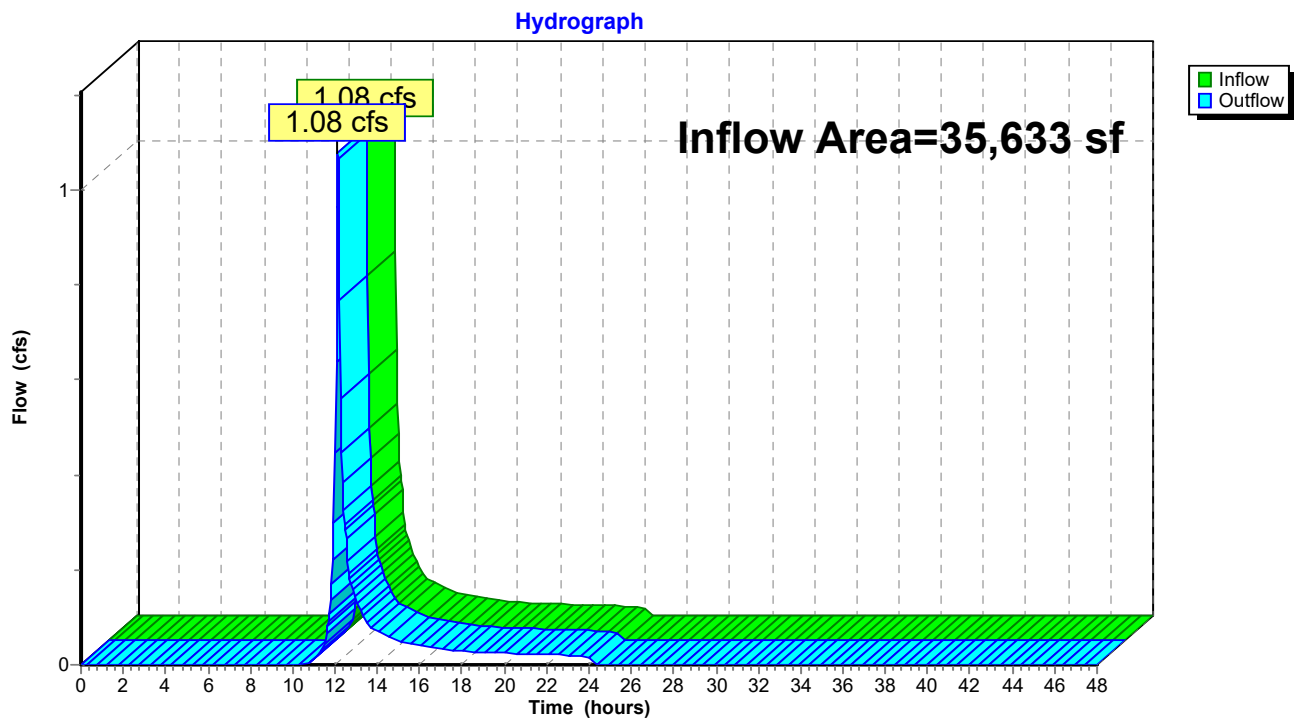
### Summary for Reach DP-2: (new Reach)

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

Inflow Area = 35,633 sf, 56.00% Impervious, Inflow Depth = 1.07" for 2-Year event  
Inflow = 1.08 cfs @ 12.14 hrs, Volume= 3,165 cf  
Outflow = 1.08 cfs @ 12.14 hrs, Volume= 3,165 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-2: (new Reach)



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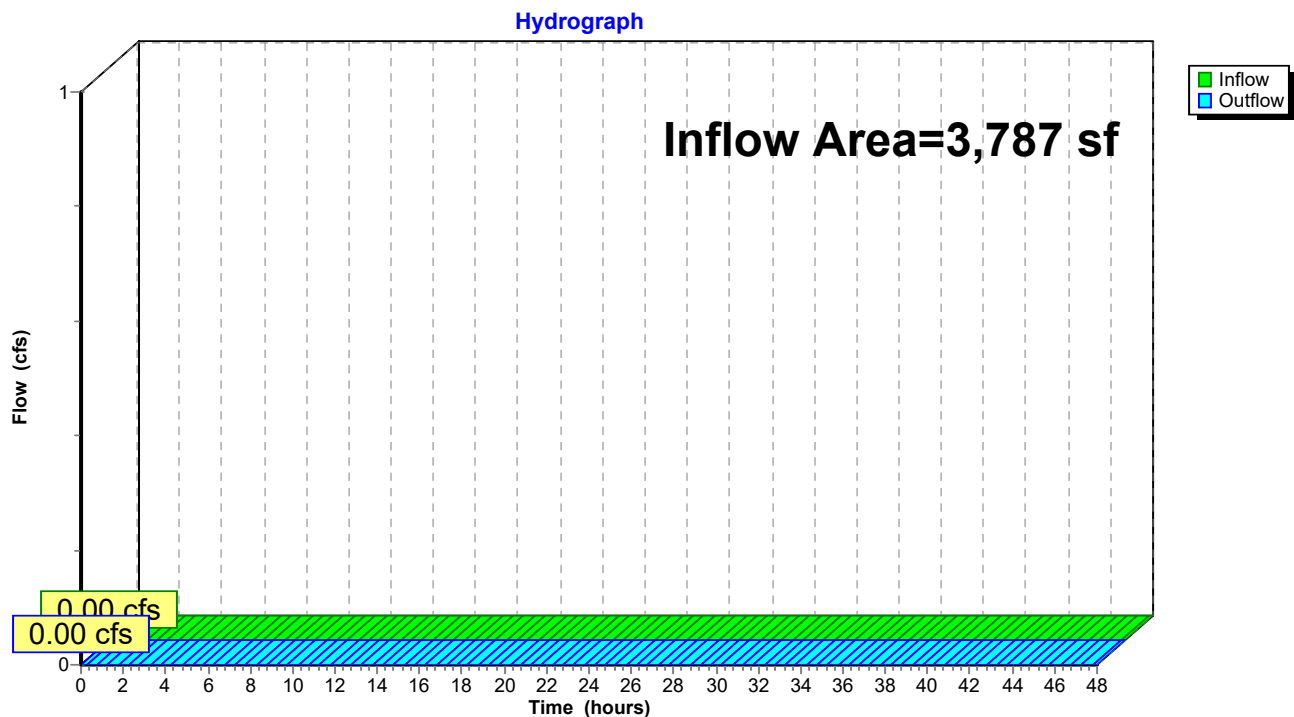
### Summary for Reach DP-3: (new Reach)

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

Inflow Area = 3,787 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event  
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-3: (new Reach)



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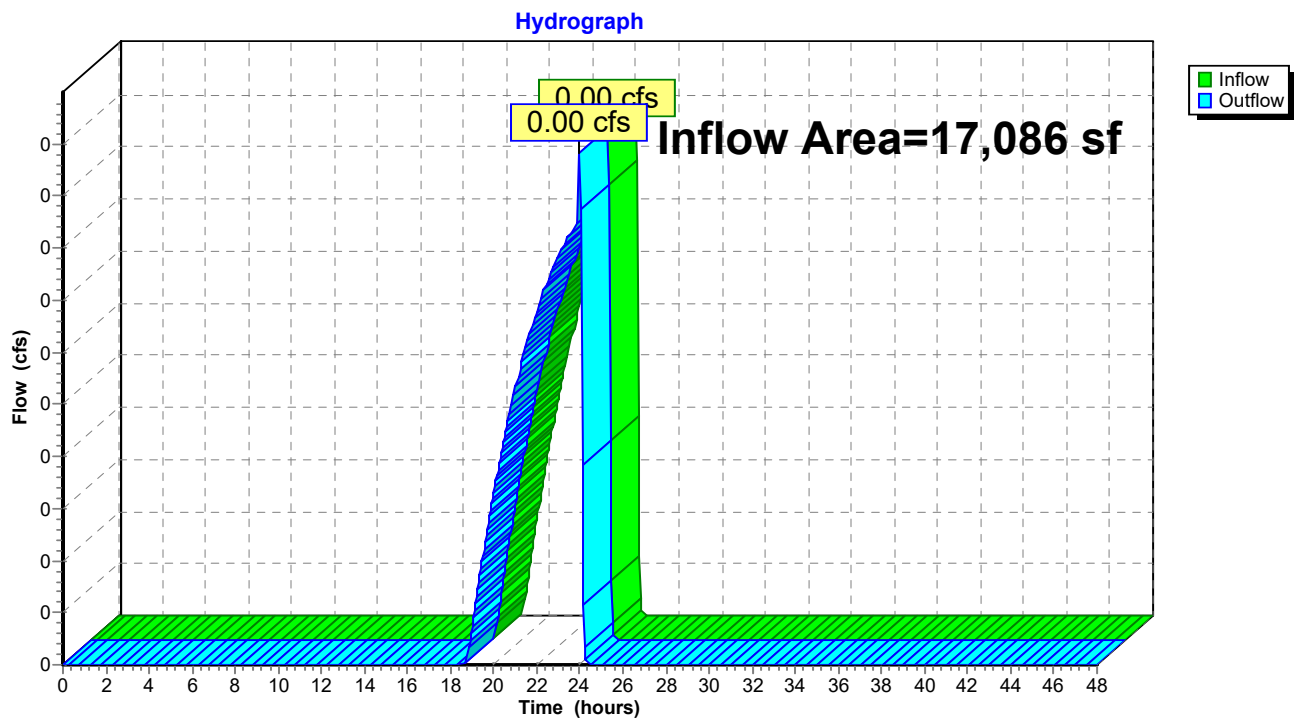
### Summary for Reach DP-4: Cypress Street

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

Inflow Area = 17,086 sf, 3.48% Impervious, Inflow Depth = 0.00" for 2-Year event  
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 1 cf  
Outflow = 0.00 cfs @ 24.00 hrs, Volume= 1 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-4: Cypress Street



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**Summary for Pond DW1-2: DRYWELLS 1&2**

Inflow Area = 5,529 sf, 4.41% Impervious, Inflow Depth = 0.02" for 2-Year event  
 Inflow = 0.00 cfs @ 24.00 hrs, Volume= 11 cf  
 Outflow = 0.00 cfs @ 24.03 hrs, Volume= 11 cf, Atten= 8%, Lag= 1.9 min  
 Discarded = 0.00 cfs @ 24.03 hrs, Volume= 11 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 171.40' @ 24.03 hrs Surf.Area= 179 sf Storage= 0 cf

Plug-Flow detention time= 7.3 min calculated for 11 cf (100% of inflow)  
 Center-of-Mass det. time= 7.3 min ( 1,188.7 - 1,181.4 )

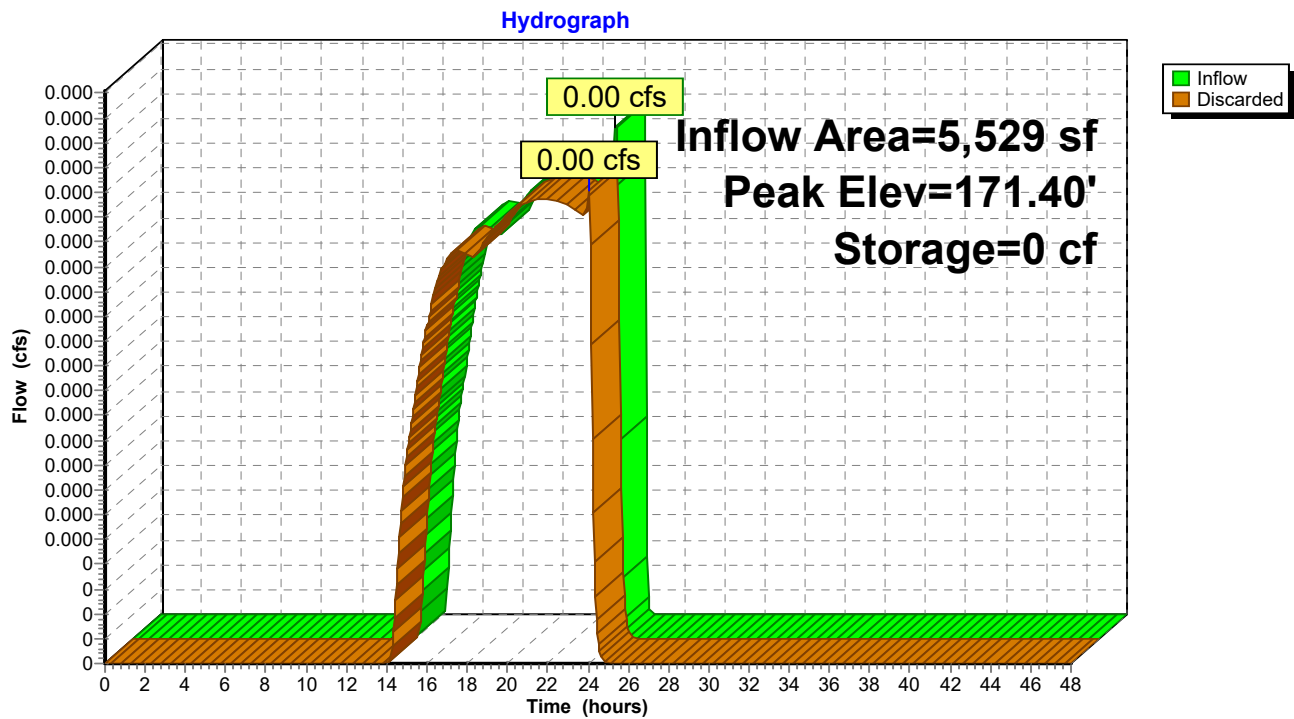
Volume	Invert	Avail.Storage	Storage Description
#1	171.40'	98 cf	<b>10.67'D x 5.00'H Vertical Cone/Cylinder</b> 447 cf Overall - 201 cf Embedded = 246 cf x 40.0% Voids
#2	172.40'	140 cf	<b>6.67'D x 4.00'H Vertical Cone/Cylinder</b> Inside #1 201 cf Overall - 8.0" Wall Thickness = 140 cf
#3	176.40'	168 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
		406 cf	x 2.00 = 812 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
176.40	29	0	0
177.40	29	29	29
177.50	2,752	139	168

Device	Routing	Invert	Outlet Devices
#1	Discarded	171.40'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 24.03 hrs HW=171.40' (Free Discharge)  
 ↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

## Pond DW1-2: DRYWELLS 1&2



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**Summary for Pond DW3-4-5: DRYWELLS 3,4,5**

Inflow Area = 9,693 sf, 3.61% Impervious, Inflow Depth = 0.02" for 2-Year event  
 Inflow = 0.00 cfs @ 24.00 hrs, Volume= 13 cf  
 Outflow = 0.00 cfs @ 24.03 hrs, Volume= 13 cf, Atten= 8%, Lag= 2.0 min  
 Discarded = 0.00 cfs @ 24.03 hrs, Volume= 13 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 169.50' @ 24.03 hrs Surf.Area= 268 sf Storage= 0 cf

Plug-Flow detention time= 7.7 min calculated for 13 cf (100% of inflow)  
 Center-of-Mass det. time= 7.8 min ( 1,230.3 - 1,222.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	169.50'	98 cf	<b>10.67'D x 5.00'H Vertical Cone/Cylinder</b> 447 cf Overall - 201 cf Embedded = 246 cf x 40.0% Voids
#2	170.50'	140 cf	<b>6.67'D x 4.00'H Vertical Cone/Cylinder</b> Inside #1 201 cf Overall - 8.0" Wall Thickness = 140 cf
#3	174.50'	490 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
		728 cf	x 3.00 = 2,183 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
174.50	29	0	0
175.50	29	29	29
176.00	1,813	461	490

Device	Routing	Invert	Outlet Devices
#1	Discarded	169.50'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 24.03 hrs HW=169.50' (Free Discharge)  
 ↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)



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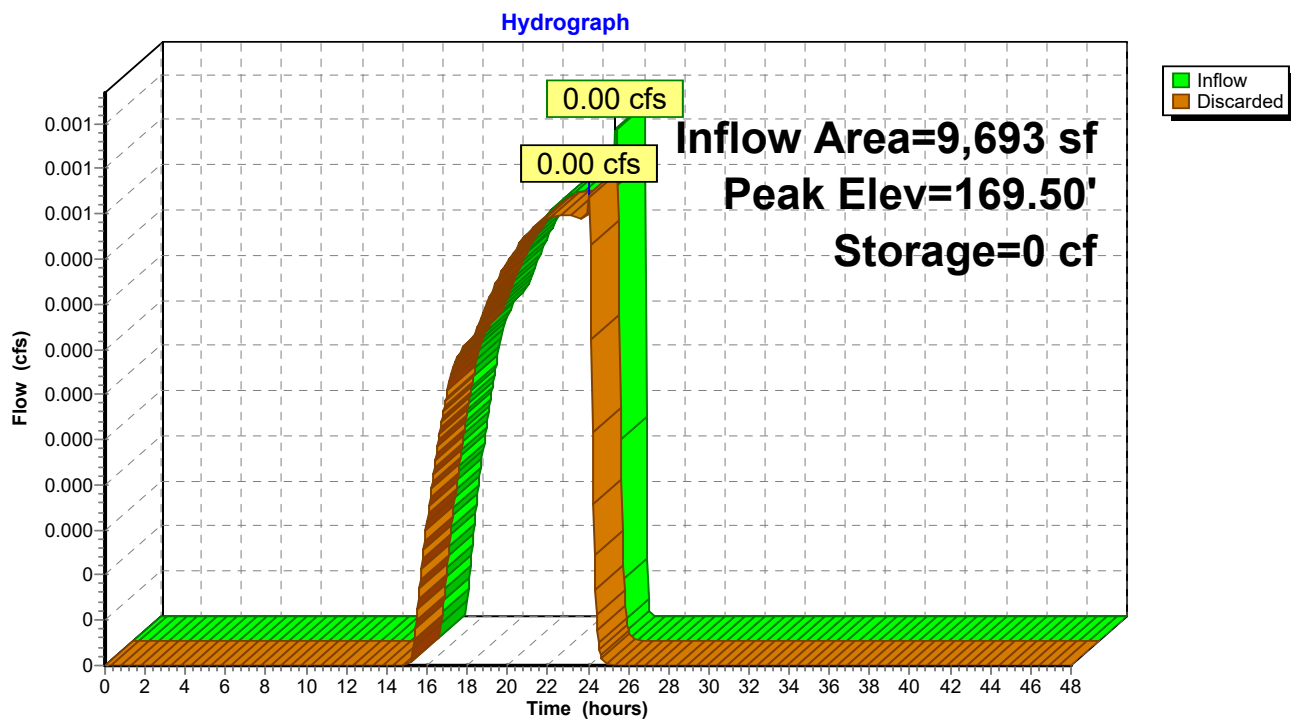
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## Pond DW3-4-5: DRYWELLS 3,4,5



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**Summary for Pond UG-1: Underground Infiltration System**

Inflow Area = 60,886 sf, 93.21% Impervious, Inflow Depth = 2.70" for 2-Year event  
 Inflow = 4.49 cfs @ 12.13 hrs, Volume= 13,696 cf  
 Outflow = 0.49 cfs @ 11.60 hrs, Volume= 13,696 cf, Atten= 89%, Lag= 0.0 min  
 Discarded = 0.49 cfs @ 11.60 hrs, Volume= 13,696 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
 Peak Elev= 179.90' @ 12.87 hrs Surf.Area= 8,785 sf Storage= 4,731 cf

Plug-Flow detention time= 67.1 min calculated for 13,682 cf (100% of inflow)  
 Center-of-Mass det. time= 67.1 min ( 854.9 - 787.8 )

Volume	Invert	Avail.Storage	Storage Description
#1A	179.00'	7,760 cf	<b>63.25'W x 138.90'L x 3.50'H Field A</b> 30,748 cf Overall - 11,347 cf Embedded = 19,401 cf x 40.0% Voids
#2A	179.50'	11,347 cf	<b>ADS_StormTech SC-740 +Cap</b> x 247 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 247 Chambers in 13 Rows
		19,108 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	179.00'	<b>2.410 in/hr Exfiltration over Horizontal area</b>

**Discarded OutFlow** Max=0.49 cfs @ 11.60 hrs HW=179.04' (Free Discharge)**↑1=Exfiltration** (Exfiltration Controls 0.49 cfs)

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### Pond UG-1: Underground Infiltration System - Chamber Wizard Field A

**Chamber Model = ADS\_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)**

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

19 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 136.90' Row Length +12.0" End Stone x 2 = 138.90' Base Length

13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

247 Chambers x 45.9 cf = 11,347.2 cf Chamber Storage

30,748.2 cf Field - 11,347.2 cf Chambers = 19,401.1 cf Stone x 40.0% Voids = 7,760.4 cf Stone Storage

Chamber Storage + Stone Storage = 19,107.6 cf = 0.439 af

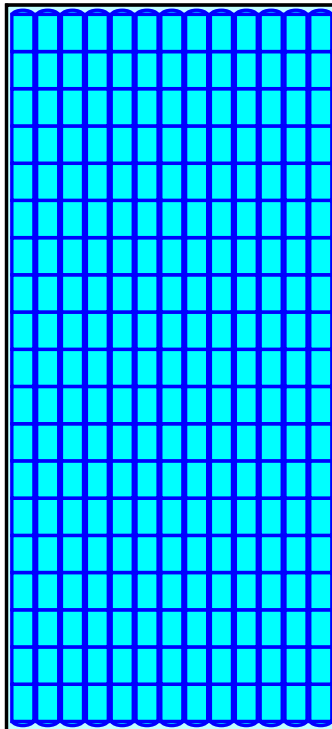
Overall Storage Efficiency = 62.1%

Overall System Size = 138.90' x 63.25' x 3.50'

247 Chambers

1,138.8 cy Field

718.6 cy Stone



## Proposed

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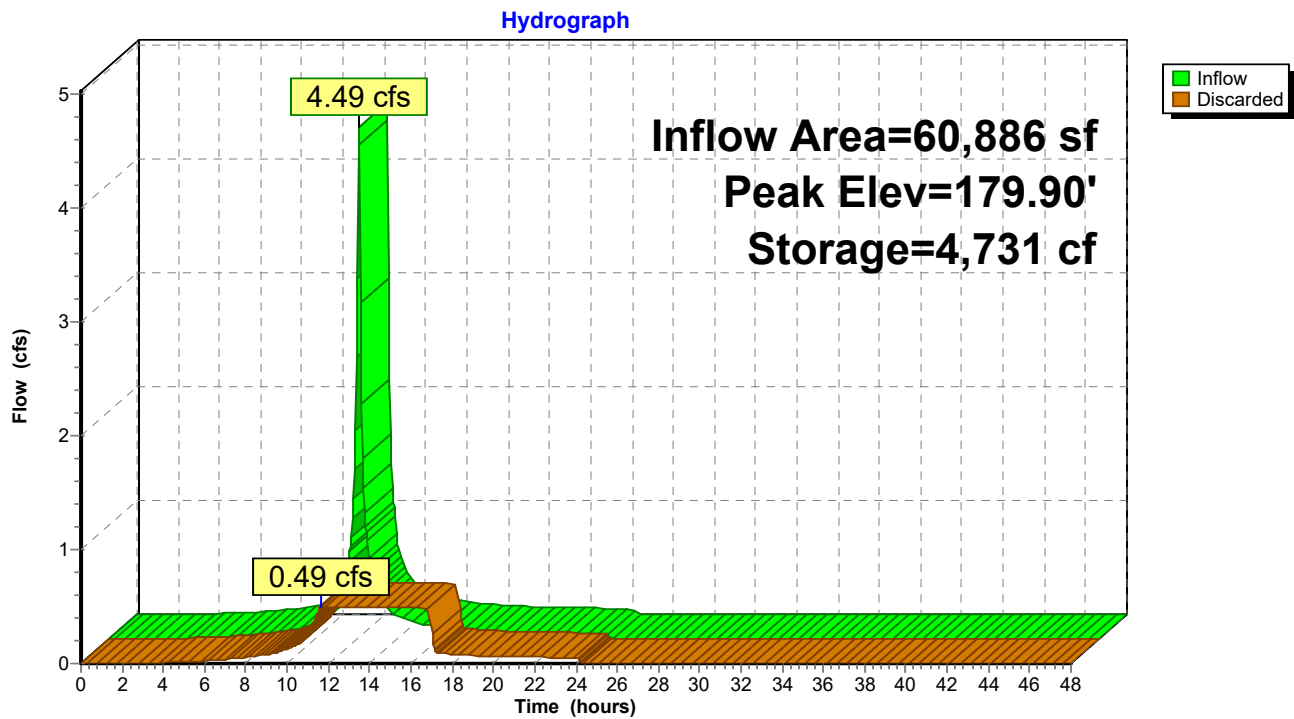
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### Pond UG-1: Underground Infiltration System



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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

<b>Subcatchment SUB-1:</b>	Runoff Area=5,695 sf 0.00% Impervious Runoff Depth=0.23" Flow Length=155' Tc=6.9 min CN=39 Runoff=0.01 cfs 109 cf
<b>Subcatchment SUB-2A:</b>	Runoff Area=28,101 sf 60.43% Impervious Runoff Depth=2.56" Tc=6.0 min CN=75 Runoff=2.11 cfs 6,003 cf
<b>Subcatchment SUB-2B:</b>	Runoff Area=7,532 sf 39.46% Impervious Runoff Depth=1.53" Tc=6.0 min CN=62 Runoff=0.33 cfs 958 cf
<b>Subcatchment SUB-3:</b>	Runoff Area=3,787 sf 0.00% Impervious Runoff Depth=0.08" Flow Length=67' Tc=9.4 min CN=34 Runoff=0.00 cfs 24 cf
<b>Subcatchment SUB-4A:</b>	Runoff Area=60,886 sf 93.21% Impervious Runoff Depth=4.45" Tc=6.0 min CN=94 Runoff=7.16 cfs 22,559 cf
<b>Subcatchment SUB-4B:</b>	Runoff Area=5,529 sf 4.41% Impervious Runoff Depth=0.35" Tc=6.0 min CN=42 Runoff=0.01 cfs 161 cf
<b>Subcatchment SUB-4C:</b>	Runoff Area=9,693 sf 3.61% Impervious Runoff Depth=0.31" Tc=6.0 min CN=41 Runoff=0.02 cfs 248 cf
<b>Subcatchment SUB-4D:</b>	Runoff Area=1,864 sf 0.00% Impervious Runoff Depth=0.23" Tc=6.0 min CN=39 Runoff=0.00 cfs 36 cf
<b>Reach DP-1: (new Reach)</b>	Inflow=0.01 cfs 109 cf Outflow=0.01 cfs 109 cf
<b>Reach DP-2: (new Reach)</b>	Inflow=2.44 cfs 6,960 cf Outflow=2.44 cfs 6,960 cf
<b>Reach DP-3: (new Reach)</b>	Inflow=0.00 cfs 24 cf Outflow=0.00 cfs 24 cf
<b>Reach DP-4: Cypress Street</b>	Inflow=0.00 cfs 36 cf Outflow=0.00 cfs 36 cf
<b>Pond DW1-2: DRYWELLS 1&amp;2</b>	Peak Elev=171.53' Storage=9 cf Inflow=0.01 cfs 161 cf Outflow=0.01 cfs 161 cf
<b>Pond DW3-4-5: DRYWELLS 3,4,5</b>	Peak Elev=169.60' Storage=11 cf Inflow=0.02 cfs 248 cf Outflow=0.01 cfs 248 cf
<b>Pond UG-1: Underground Infiltration</b>	Peak Elev=180.57' Storage=9,470 cf Inflow=7.16 cfs 22,559 cf Outflow=0.49 cfs 22,559 cf

**Total Runoff Area = 123,087 sf Runoff Volume = 30,097 cf Average Runoff Depth = 2.93"**  
**37.20% Pervious = 45,790 sf 62.80% Impervious = 77,297 sf**

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**Summary for Subcatchment SUB-1:**

Runoff = 0.01 cfs @ 12.55 hrs, Volume= 109 cf, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 10-Year Rainfall=5.14"

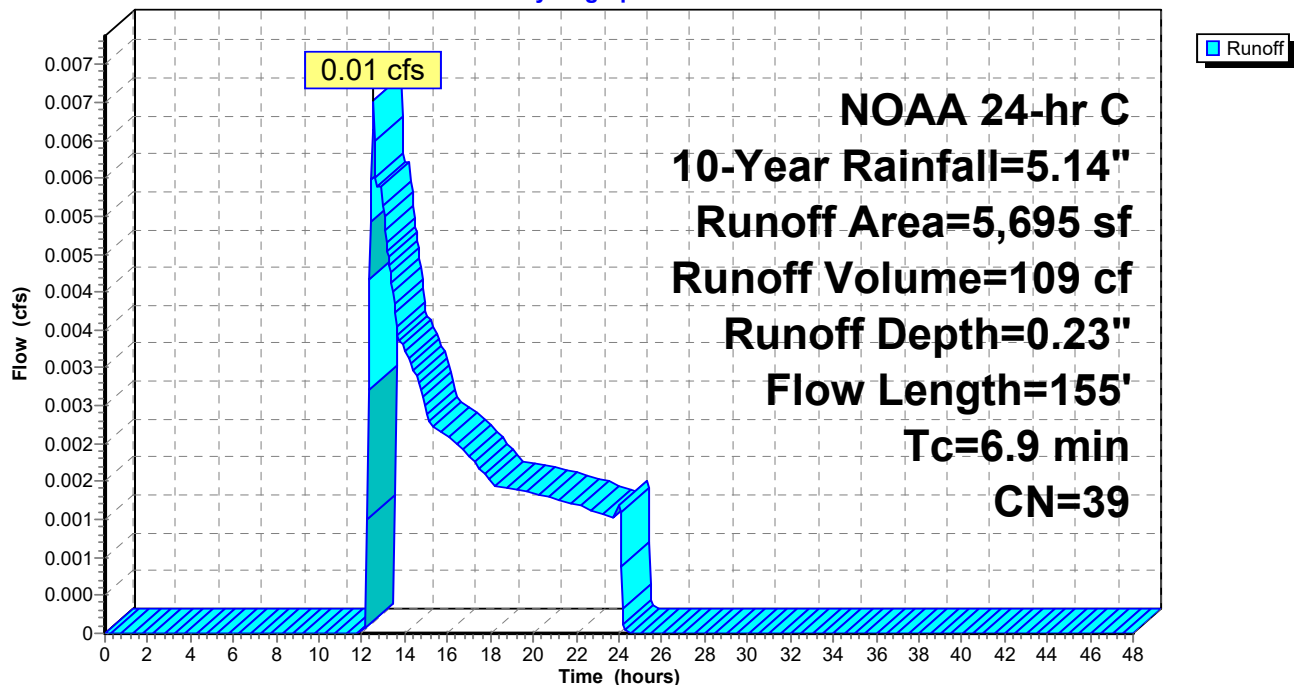
Area (sf)	CN	Description
5,695	39	>75% Grass cover, Good, HSG A
5,695		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0350	0.13		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.36"
0.5	105	0.0500	3.60		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
6.9	155	Total			

**Subcatchment SUB-1:**

Hydrograph



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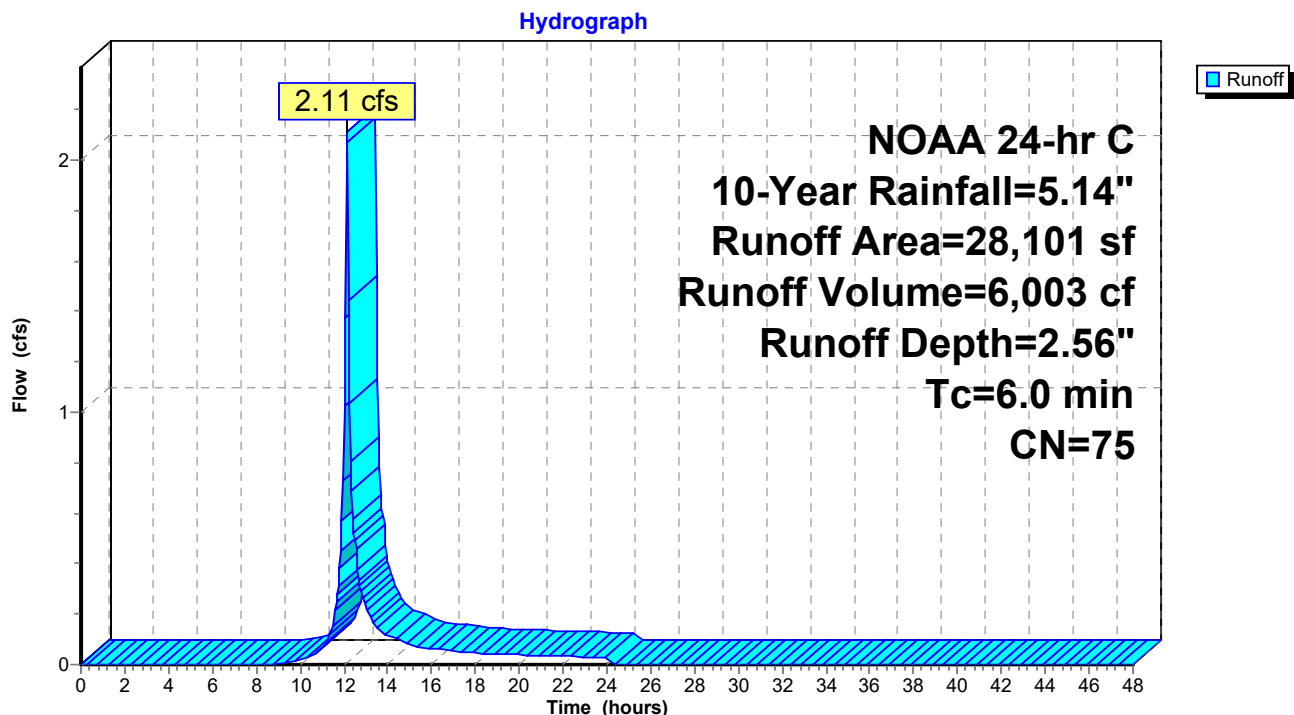
**Summary for Subcatchment SUB-2A:**

Runoff = 2.11 cfs @ 12.13 hrs, Volume= 6,003 cf, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 10-Year Rainfall=5.14"

Area (sf)	CN	Description
13,100	98	Paved parking, HSG A
* 1,667	98	Concrete, HSG A
2,214	98	Roofs, HSG A
11,120	39	>75% Grass cover, Good, HSG A
28,101	75	Weighted Average
11,120		39.57% Pervious Area
16,981		60.43% Impervious Area

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

**Subcatchment SUB-2A:**

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**Summary for Subcatchment SUB-2B:**

Runoff = 0.33 cfs @ 12.14 hrs, Volume= 958 cf, Depth= 1.53"

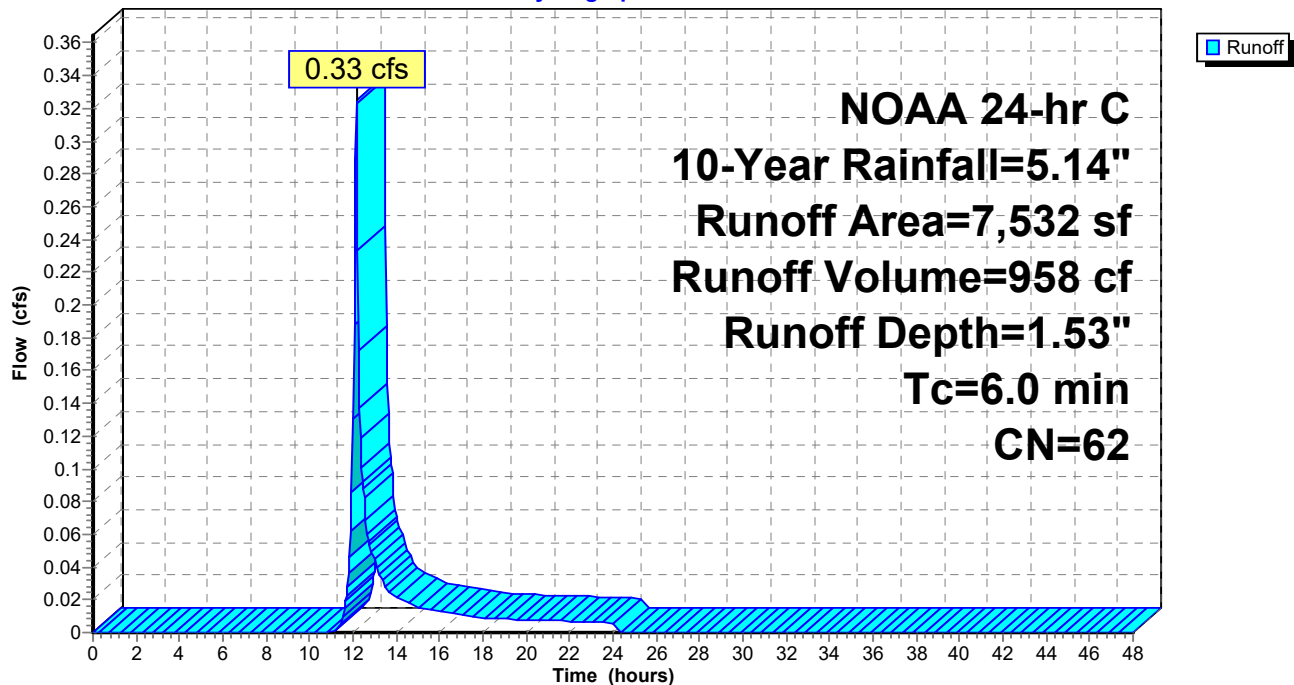
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 10-Year Rainfall=5.14"

Area (sf)	CN	Description
2,972	98	Paved parking, HSG A
4,560	39	>75% Grass cover, Good, HSG A
7,532	62	Weighted Average
4,560		60.54% Pervious Area
2,972		39.46% Impervious Area

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

**Subcatchment SUB-2B:**

Hydrograph





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**Summary for Subcatchment SUB-3:**

Runoff = 0.00 cfs @ 16.26 hrs, Volume= 24 cf, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 10-Year Rainfall=5.14"

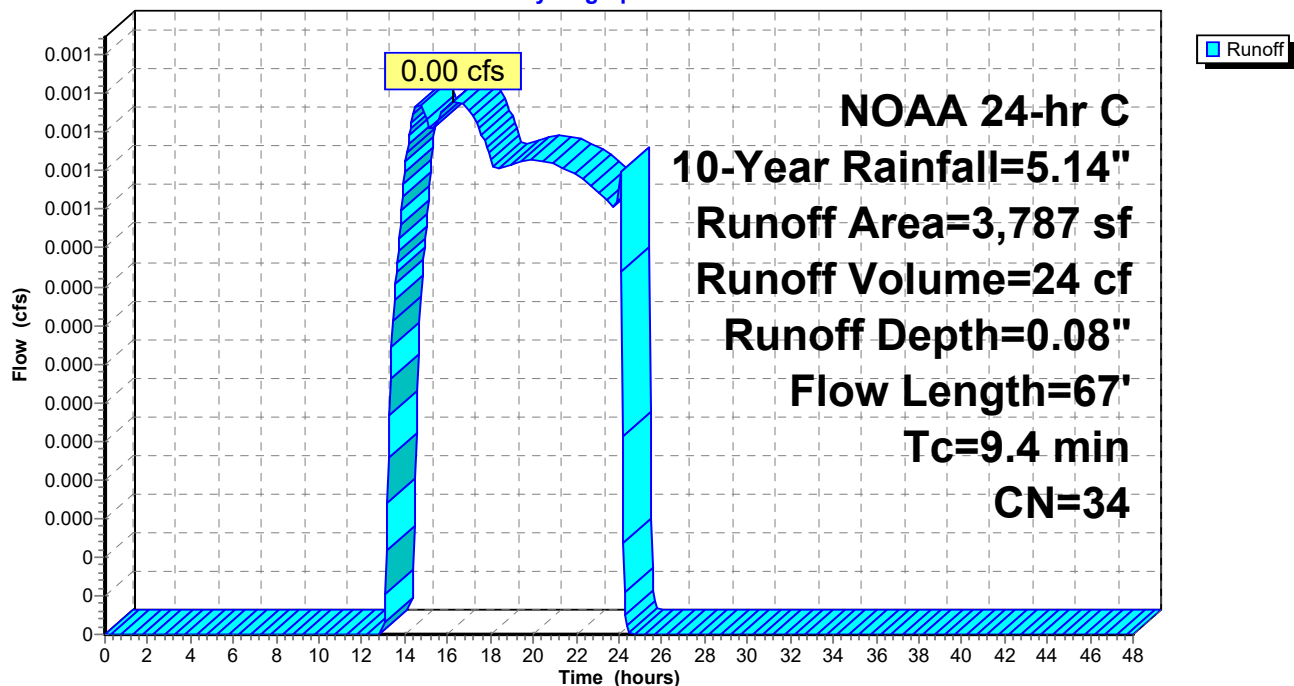
Area (sf)	CN	Description
1,728	39	>75% Grass cover, Good, HSG A
2,059	30	Woods, Good, HSG A
3,787	34	Weighted Average
3,787		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0380	0.09		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.36"
0.1	17	0.0300	2.79		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
9.4	67	Total			

**Subcatchment SUB-3:**

Hydrograph



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**Summary for Subcatchment SUB-4A:**

Runoff = 7.16 cfs @ 12.13 hrs, Volume= 22,559 cf, Depth= 4.45"

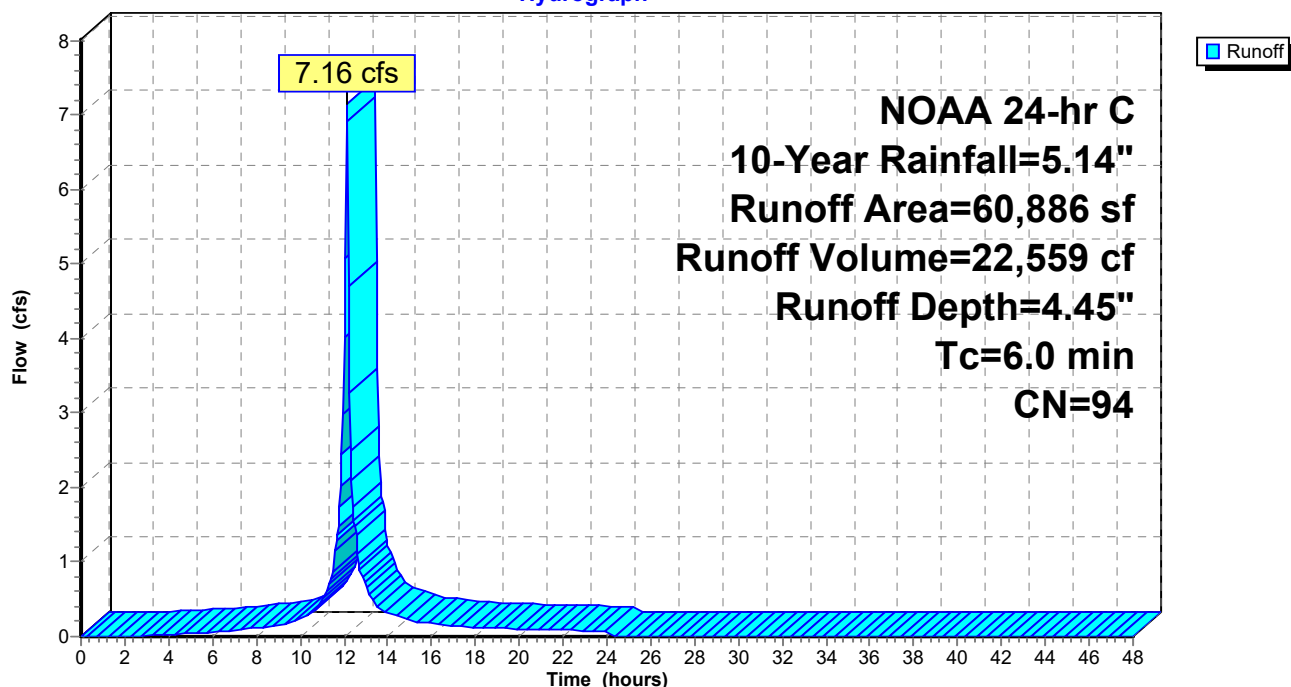
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 10-Year Rainfall=5.14"

Area (sf)	CN	Description
10,017	98	Roofs, HSG A
44,418	98	Paved parking, HSG A
* 2,315	98	Concrete, HSG A
4,136	39	>75% Grass cover, Good, HSG A
60,886	94	Weighted Average
4,136		6.79% Pervious Area
56,750		93.21% Impervious Area

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

**Subcatchment SUB-4A:**

Hydrograph



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**Summary for Subcatchment SUB-4B:**

Runoff = 0.01 cfs @ 12.33 hrs, Volume= 161 cf, Depth= 0.35"

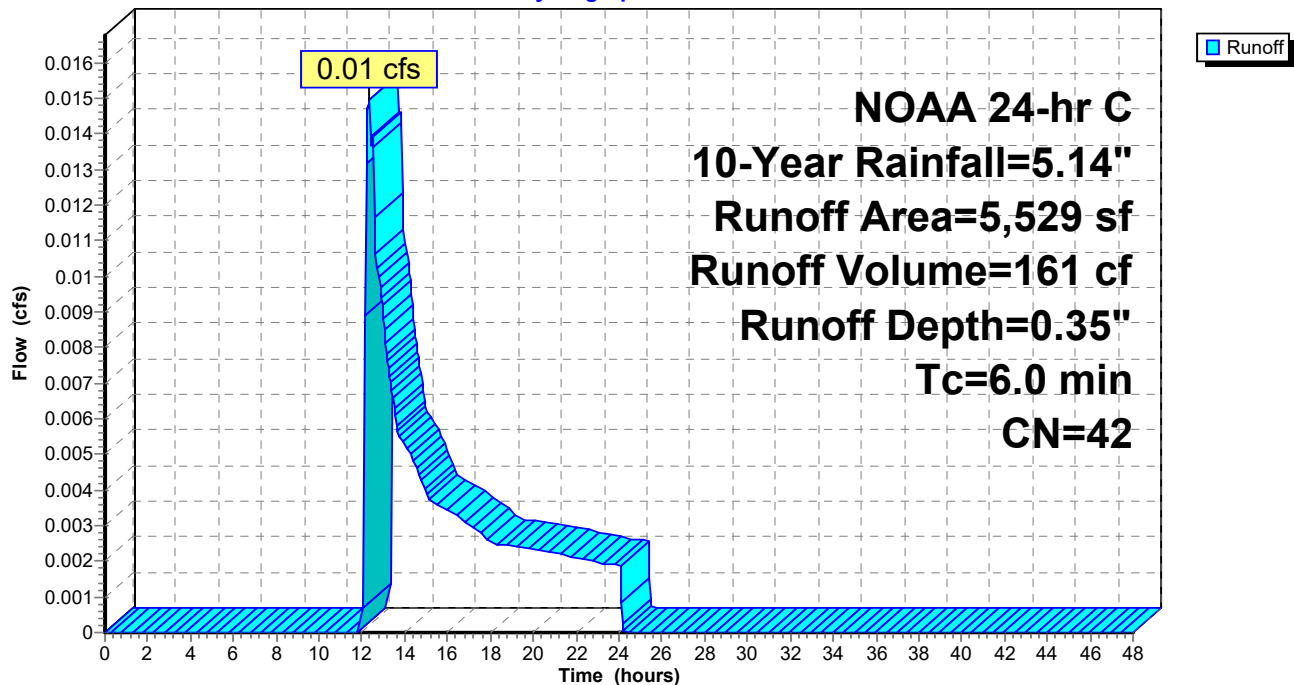
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 10-Year Rainfall=5.14"

Area (sf)	CN	Description
* 244	98	Concrete, HSG A
5,285	39	>75% Grass cover, Good, HSG A
5,529	42	Weighted Average
5,285		95.59% Pervious Area
244		4.41% Impervious Area

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

**Subcatchment SUB-4B:**

Hydrograph



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**Summary for Subcatchment SUB-4C:**

Runoff = 0.02 cfs @ 12.35 hrs, Volume= 248 cf, Depth= 0.31"

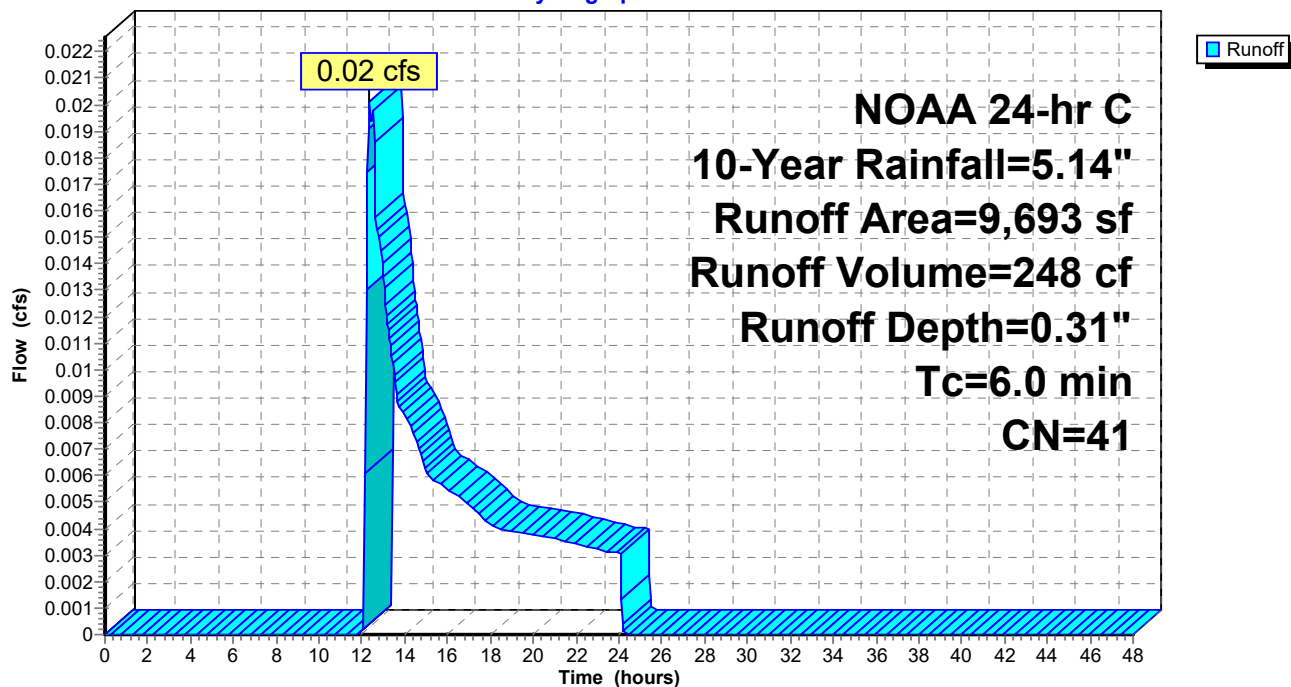
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 10-Year Rainfall=5.14"

Area (sf)	CN	Description
* 350	98	Concrete, HSG A
9,343	39	>75% Grass cover, Good, HSG A
9,693	41	Weighted Average
9,343		96.39% Pervious Area
350		3.61% Impervious Area

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

**Subcatchment SUB-4C:**

Hydrograph



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**Summary for Subcatchment SUB-4D:**

Runoff = 0.00 cfs @ 12.54 hrs, Volume= 36 cf, Depth= 0.23"

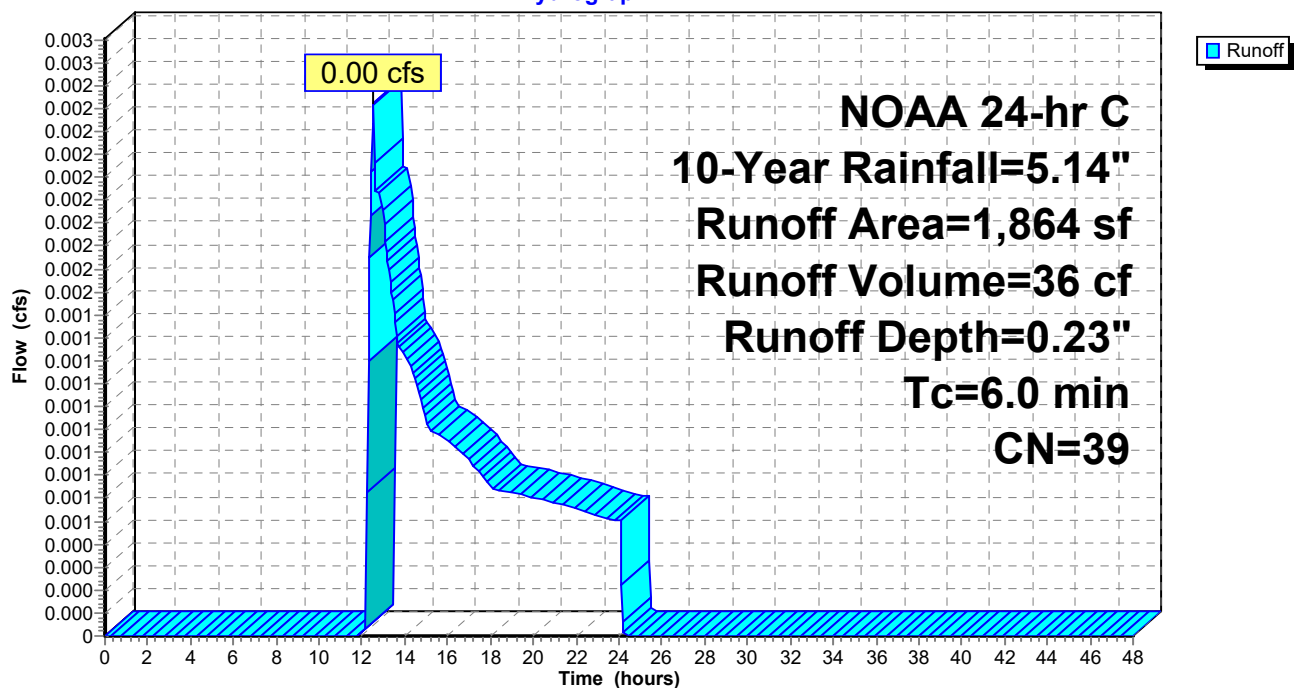
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 10-Year Rainfall=5.14"

Area (sf)	CN	Description
1,864	39	>75% Grass cover, Good, HSG A
1,864		100.00% Pervious Area

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

**Subcatchment SUB-4D:**

Hydrograph



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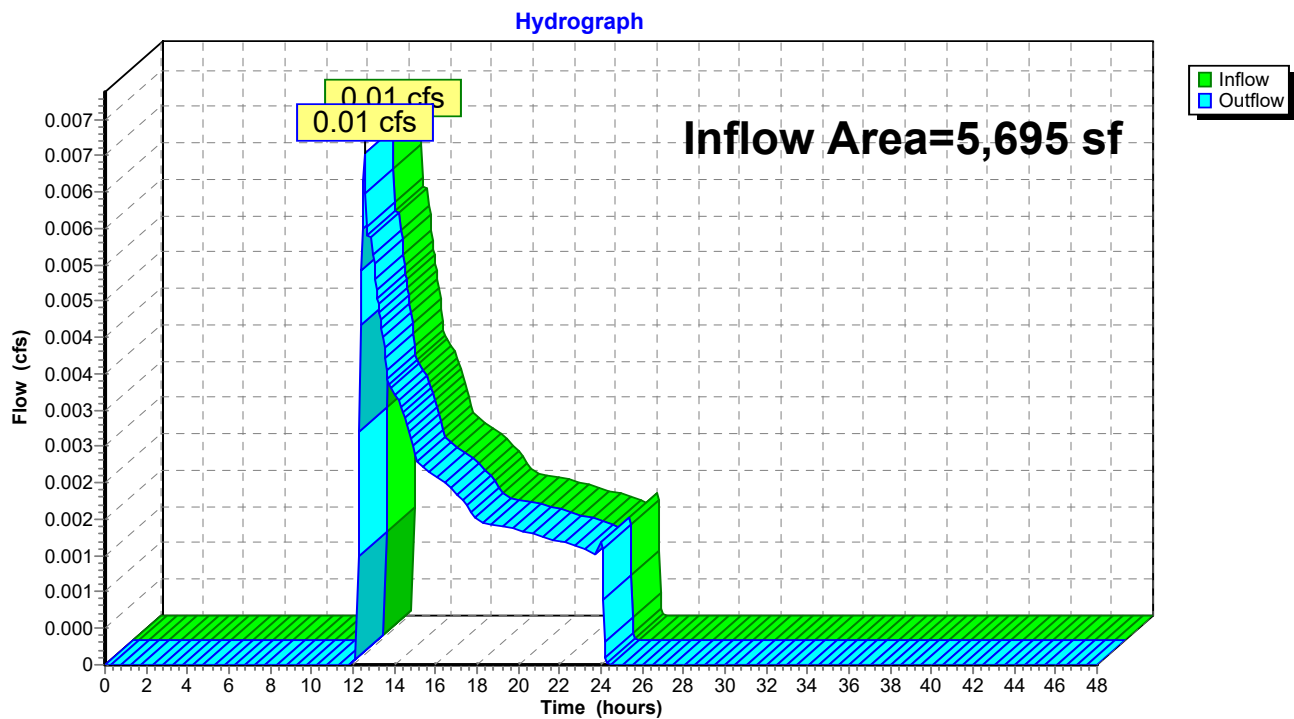
### Summary for Reach DP-1: (new Reach)

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

Inflow Area = 5,695 sf, 0.00% Impervious, Inflow Depth = 0.23" for 10-Year event  
Inflow = 0.01 cfs @ 12.55 hrs, Volume= 109 cf  
Outflow = 0.01 cfs @ 12.55 hrs, Volume= 109 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-1: (new Reach)



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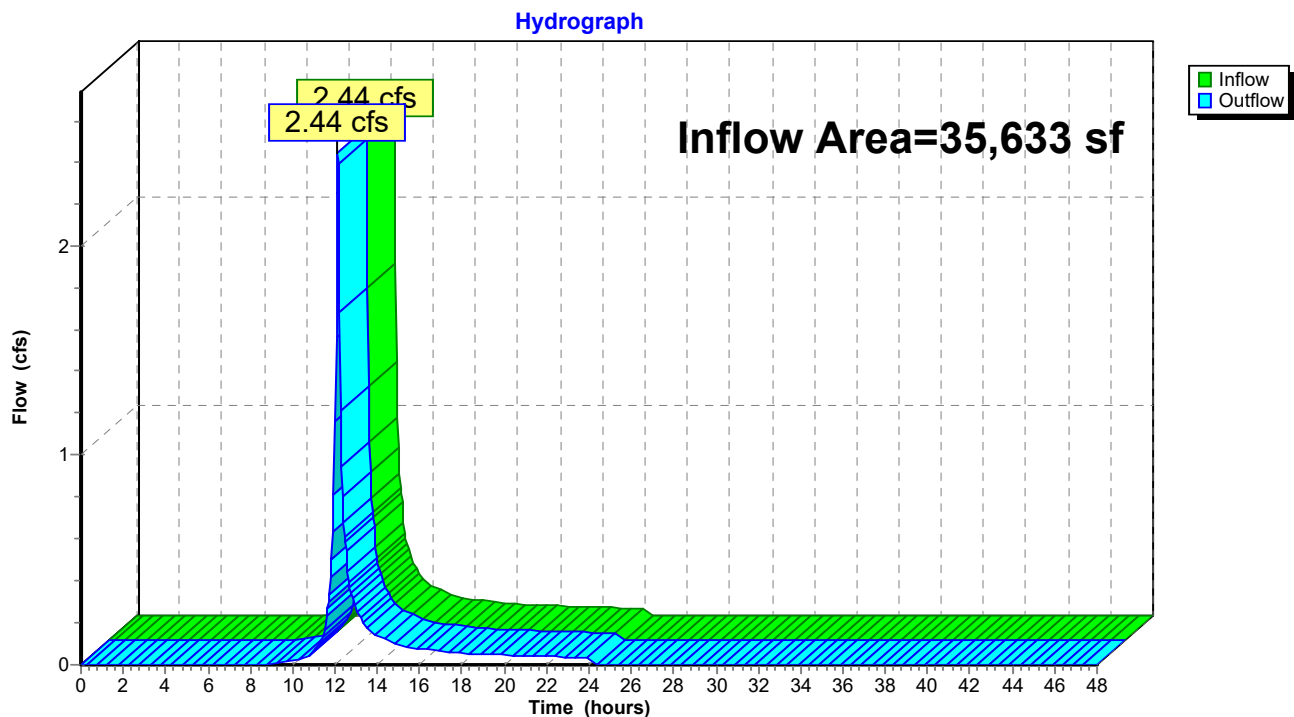
### Summary for Reach DP-2: (new Reach)

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

Inflow Area = 35,633 sf, 56.00% Impervious, Inflow Depth = 2.34" for 10-Year event  
Inflow = 2.44 cfs @ 12.13 hrs, Volume= 6,960 cf  
Outflow = 2.44 cfs @ 12.13 hrs, Volume= 6,960 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-2: (new Reach)



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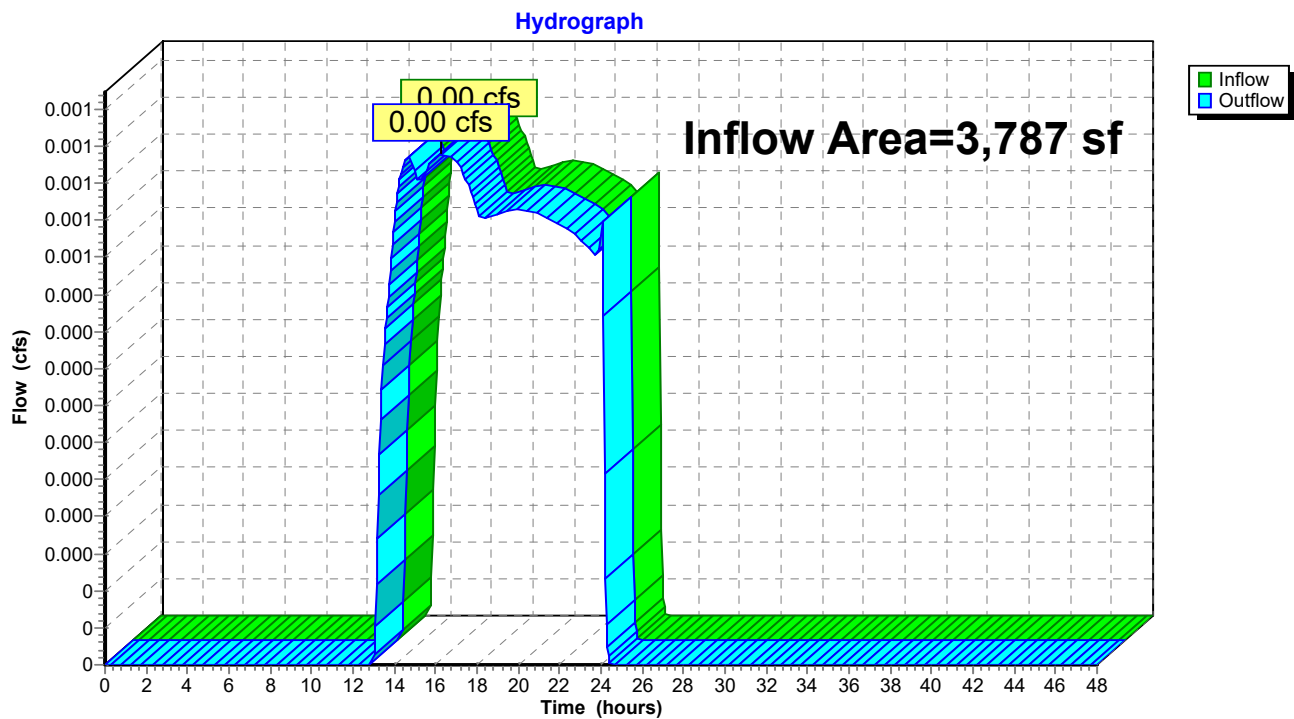
### Summary for Reach DP-3: (new Reach)

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

Inflow Area = 3,787 sf, 0.00% Impervious, Inflow Depth = 0.08" for 10-Year event  
Inflow = 0.00 cfs @ 16.26 hrs, Volume= 24 cf  
Outflow = 0.00 cfs @ 16.26 hrs, Volume= 24 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-3: (new Reach)





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### Summary for Reach DP-4: Cypress Street

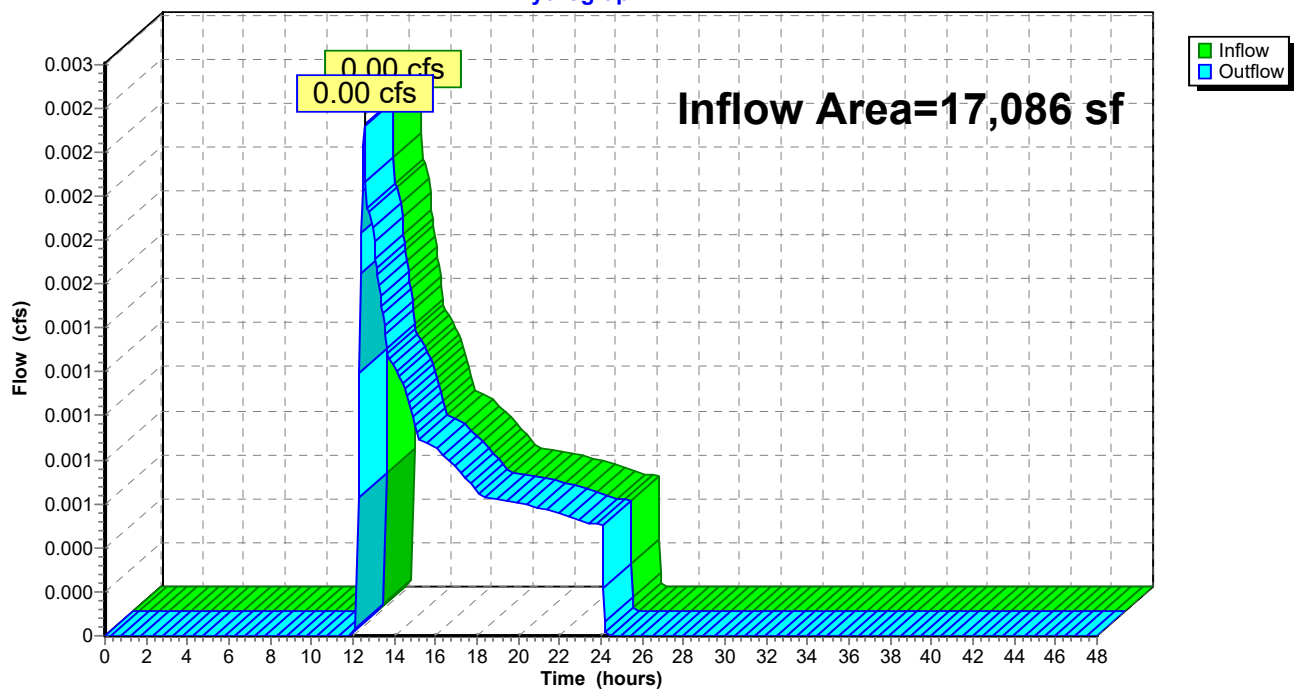
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 17,086 sf, 3.48% Impervious, Inflow Depth = 0.03" for 10-Year event  
Inflow = 0.00 cfs @ 12.54 hrs, Volume= 36 cf  
Outflow = 0.00 cfs @ 12.54 hrs, Volume= 36 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-4: Cypress Street

Hydrograph



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**Summary for Pond DW1-2: DRYWELLS 1&2**

Inflow Area = 5,529 sf, 4.41% Impervious, Inflow Depth = 0.35" for 10-Year event  
 Inflow = 0.01 cfs @ 12.33 hrs, Volume= 161 cf  
 Outflow = 0.01 cfs @ 12.30 hrs, Volume= 161 cf, Atten= 33%, Lag= 0.0 min  
 Discarded = 0.01 cfs @ 12.30 hrs, Volume= 161 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 171.53' @ 12.78 hrs Surf.Area= 179 sf Storage= 9 cf

Plug-Flow detention time= 8.7 min calculated for 161 cf (100% of inflow)  
 Center-of-Mass det. time= 8.7 min ( 982.1 - 973.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	171.40'	98 cf	<b>10.67'D x 5.00'H Vertical Cone/Cylinder</b> 447 cf Overall - 201 cf Embedded = 246 cf x 40.0% Voids
#2	172.40'	140 cf	<b>6.67'D x 4.00'H Vertical Cone/Cylinder</b> Inside #1 201 cf Overall - 8.0" Wall Thickness = 140 cf
#3	176.40'	168 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
		406 cf	x 2.00 = 812 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
176.40	29	0	0
177.40	29	29	29
177.50	2,752	139	168

Device	Routing	Invert	Outlet Devices
#1	Discarded	171.40'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 12.30 hrs HW=171.46' (Free Discharge)  
 ↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

# Proposed

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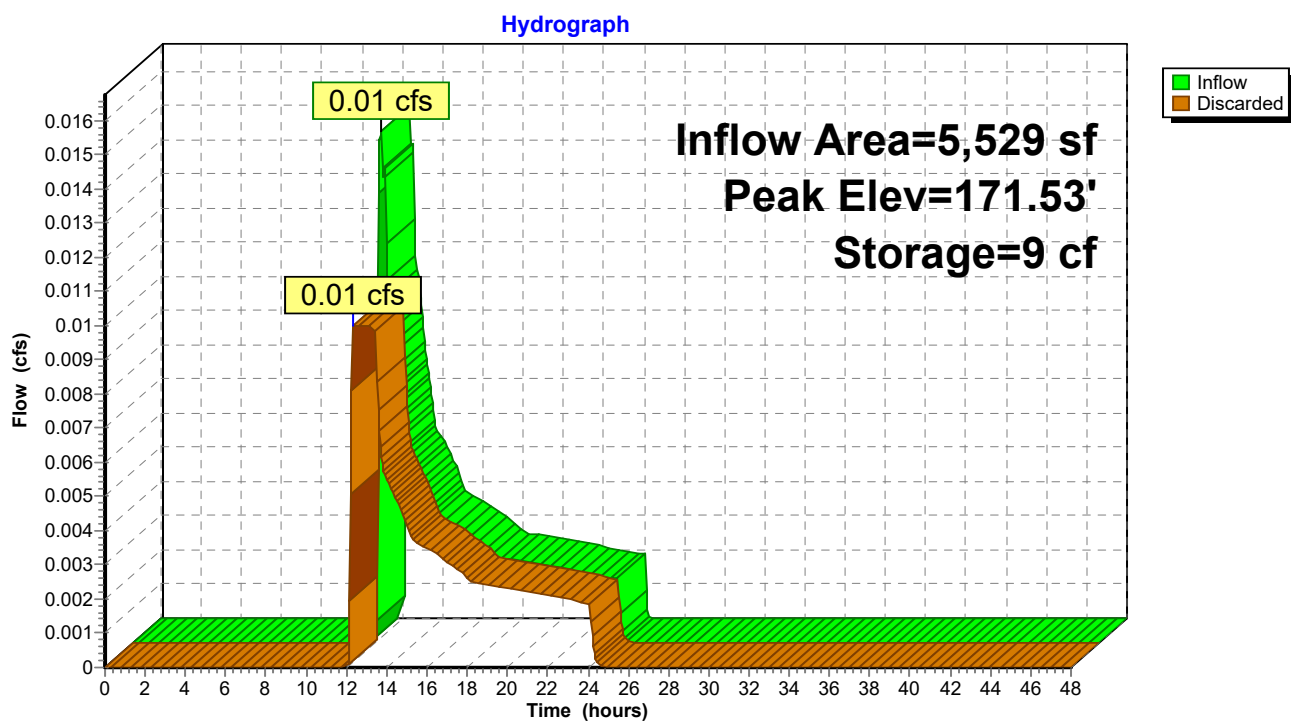
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## Pond DW1-2: DRYWELLS 1&2



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NOAA 24-hr C 10-Year Rainfall=5.14"

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**Summary for Pond DW3-4-5: DRYWELLS 3,4,5**

Inflow Area = 9,693 sf, 3.61% Impervious, Inflow Depth = 0.31" for 10-Year event  
 Inflow = 0.02 cfs @ 12.35 hrs, Volume= 248 cf  
 Outflow = 0.01 cfs @ 12.40 hrs, Volume= 248 cf, Atten= 26%, Lag= 2.8 min  
 Discarded = 0.01 cfs @ 12.40 hrs, Volume= 248 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 169.60' @ 12.79 hrs Surf.Area= 268 sf Storage= 11 cf

Plug-Flow detention time= 8.4 min calculated for 248 cf (100% of inflow)  
 Center-of-Mass det. time= 8.4 min ( 992.5 - 984.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	169.50'	98 cf	<b>10.67'D x 5.00'H Vertical Cone/Cylinder</b> 447 cf Overall - 201 cf Embedded = 246 cf x 40.0% Voids
#2	170.50'	140 cf	<b>6.67'D x 4.00'H Vertical Cone/Cylinder</b> Inside #1 201 cf Overall - 8.0" Wall Thickness = 140 cf
#3	174.50'	490 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
		728 cf	x 3.00 = 2,183 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
174.50	29	0	0
175.50	29	29	29
176.00	1,813	461	490

Device	Routing	Invert	Outlet Devices
#1	Discarded	169.50'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 12.40 hrs HW=169.57' (Free Discharge)  
 ↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

# Proposed

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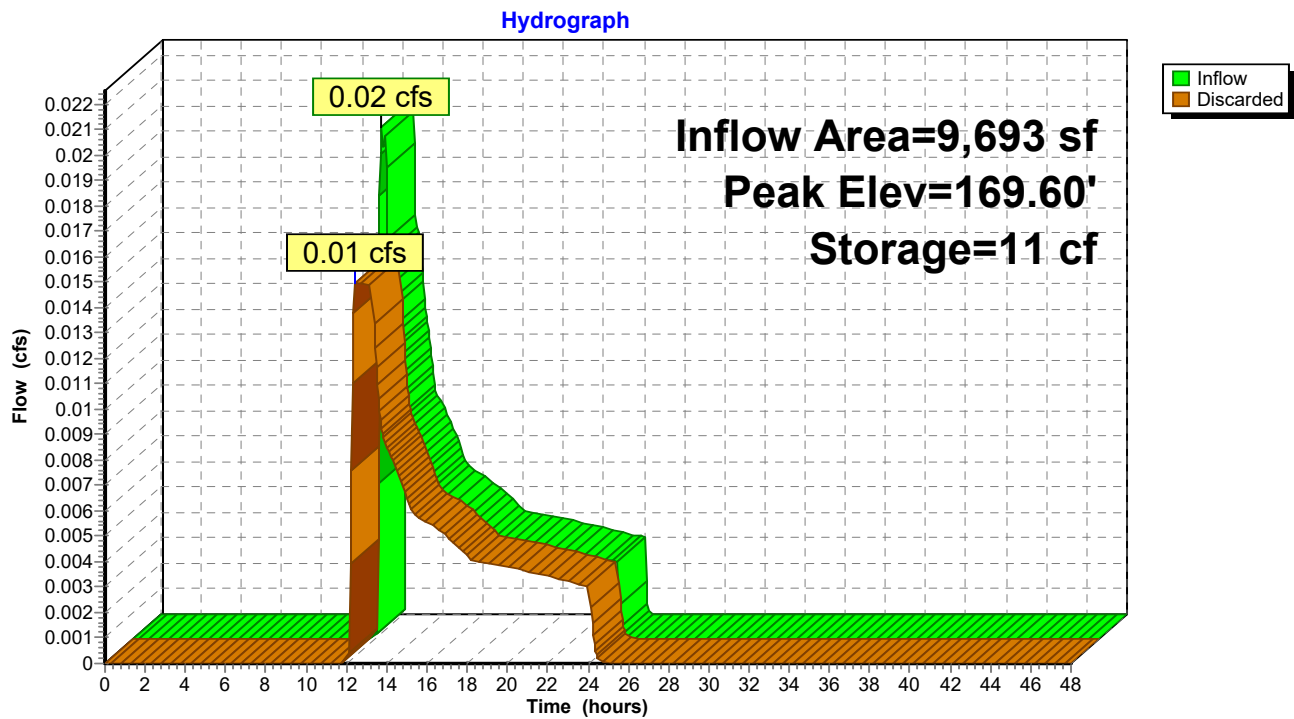
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## Pond DW3-4-5: DRYWELLS 3,4,5



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NOAA 24-hr C 10-Year Rainfall=5.14"

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**Summary for Pond UG-1: Underground Infiltration System**

Inflow Area = 60,886 sf, 93.21% Impervious, Inflow Depth = 4.45" for 10-Year event  
 Inflow = 7.16 cfs @ 12.13 hrs, Volume= 22,559 cf  
 Outflow = 0.49 cfs @ 11.10 hrs, Volume= 22,559 cf, Atten= 93%, Lag= 0.0 min  
 Discarded = 0.49 cfs @ 11.10 hrs, Volume= 22,559 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
 Peak Elev= 180.57' @ 13.32 hrs Surf.Area= 8,785 sf Storage= 9,470 cf

Plug-Flow detention time= 148.2 min calculated for 22,559 cf (100% of inflow)  
 Center-of-Mass det. time= 148.1 min ( 922.7 - 774.5 )

Volume	Invert	Avail.Storage	Storage Description
#1A	179.00'	7,760 cf	<b>63.25'W x 138.90'L x 3.50'H Field A</b> 30,748 cf Overall - 11,347 cf Embedded = 19,401 cf x 40.0% Voids
#2A	179.50'	11,347 cf	<b>ADS_StormTech SC-740 +Cap</b> x 247 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 247 Chambers in 13 Rows
		19,108 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	179.00'	<b>2.410 in/hr Exfiltration over Horizontal area</b>

**Discarded OutFlow** Max=0.49 cfs @ 11.10 hrs HW=179.04' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.49 cfs)

## Proposed

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NOAA 24-hr C 10-Year Rainfall=5.14"

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### Pond UG-1: Underground Infiltration System - Chamber Wizard Field A

**Chamber Model = ADS\_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)**

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

19 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 136.90' Row Length +12.0" End Stone x 2 = 138.90' Base Length

13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

247 Chambers x 45.9 cf = 11,347.2 cf Chamber Storage

30,748.2 cf Field - 11,347.2 cf Chambers = 19,401.1 cf Stone x 40.0% Voids = 7,760.4 cf Stone Storage

Chamber Storage + Stone Storage = 19,107.6 cf = 0.439 af

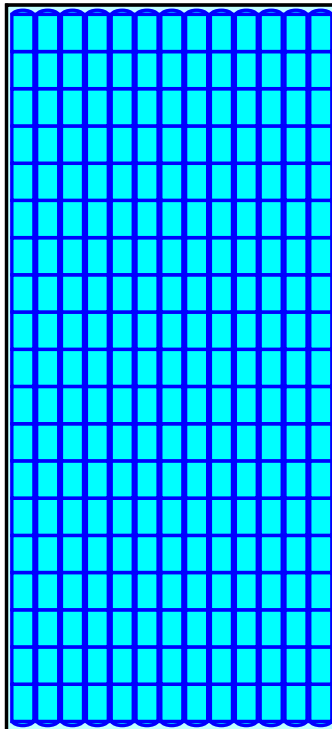
Overall Storage Efficiency = 62.1%

Overall System Size = 138.90' x 63.25' x 3.50'

247 Chambers

1,138.8 cy Field

718.6 cy Stone



**Proposed**

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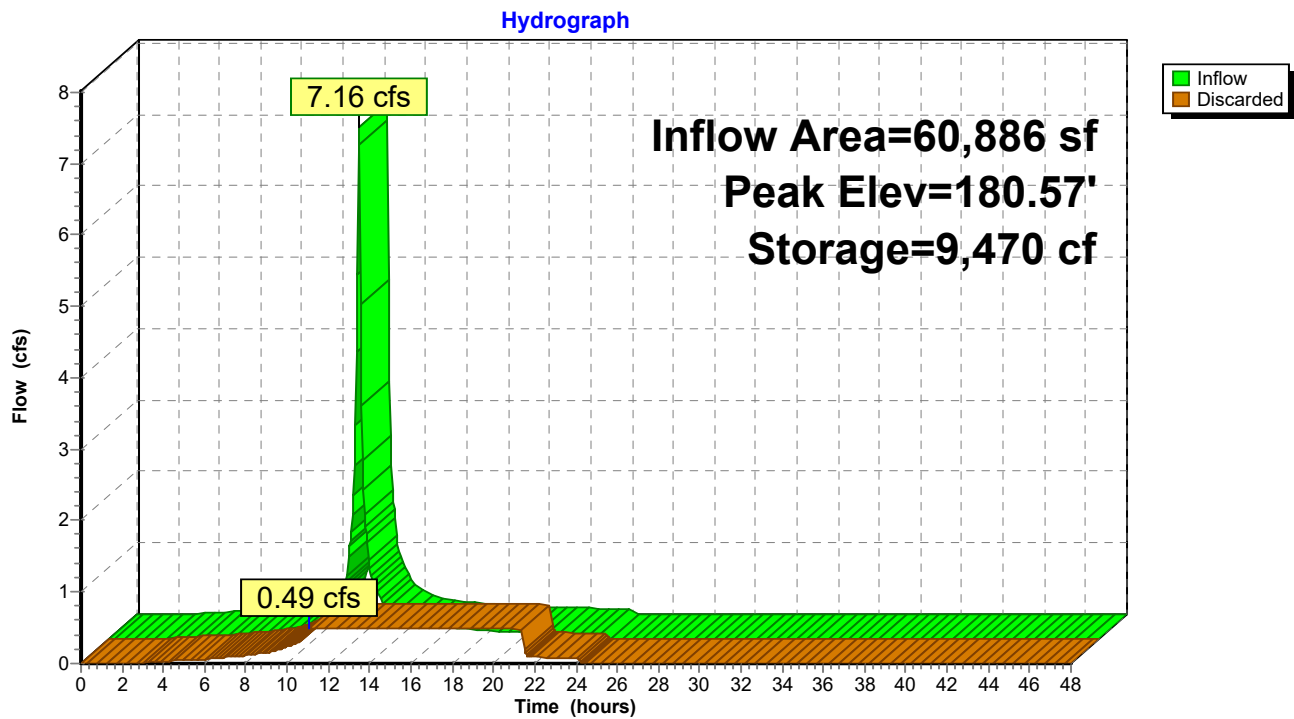
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**Pond UG-1: Underground Infiltration System**





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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

<b>Subcatchment SUB-1:</b>	Runoff Area=5,695 sf 0.00% Impervious Runoff Depth=0.52" Flow Length=155' Tc=6.9 min CN=39 Runoff=0.03 cfs 247 cf
<b>Subcatchment SUB-2A:</b>	Runoff Area=28,101 sf 60.43% Impervious Runoff Depth=3.50" Tc=6.0 min CN=75 Runoff=2.87 cfs 8,187 cf
<b>Subcatchment SUB-2B:</b>	Runoff Area=7,532 sf 39.46% Impervious Runoff Depth=2.26" Tc=6.0 min CN=62 Runoff=0.49 cfs 1,421 cf
<b>Subcatchment SUB-3:</b>	Runoff Area=3,787 sf 0.00% Impervious Runoff Depth=0.26" Flow Length=67' Tc=9.4 min CN=34 Runoff=0.00 cfs 81 cf
<b>Subcatchment SUB-4A:</b>	Runoff Area=60,886 sf 93.21% Impervious Runoff Depth=5.54" Tc=6.0 min CN=94 Runoff=8.81 cfs 28,131 cf
<b>Subcatchment SUB-4B:</b>	Runoff Area=5,529 sf 4.41% Impervious Runoff Depth=0.70" Tc=6.0 min CN=42 Runoff=0.07 cfs 324 cf
<b>Subcatchment SUB-4C:</b>	Runoff Area=9,693 sf 3.61% Impervious Runoff Depth=0.64" Tc=6.0 min CN=41 Runoff=0.10 cfs 517 cf
<b>Subcatchment SUB-4D:</b>	Runoff Area=1,864 sf 0.00% Impervious Runoff Depth=0.52" Tc=6.0 min CN=39 Runoff=0.01 cfs 81 cf
<b>Reach DP-1: (new Reach)</b>	Inflow=0.03 cfs 247 cf Outflow=0.03 cfs 247 cf
<b>Reach DP-2: (new Reach)</b>	Inflow=3.36 cfs 9,608 cf Outflow=3.36 cfs 9,608 cf
<b>Reach DP-3: (new Reach)</b>	Inflow=0.00 cfs 81 cf Outflow=0.00 cfs 81 cf
<b>Reach DP-4: Cypress Street</b>	Inflow=0.01 cfs 81 cf Outflow=0.01 cfs 81 cf
<b>Pond DW1-2: DRYWELLS 1&amp;2</b>	Peak Elev=172.53' Storage=85 cf Inflow=0.07 cfs 324 cf Outflow=0.01 cfs 324 cf
<b>Pond DW3-4-5: DRYWELLS 3,4,5</b>	Peak Elev=170.68' Storage=134 cf Inflow=0.10 cfs 517 cf Outflow=0.01 cfs 517 cf
<b>Pond UG-1: Underground Infiltration</b>	Peak Elev=181.07' Storage=12,714 cf Inflow=8.81 cfs 28,131 cf Outflow=0.49 cfs 28,131 cf

**Total Runoff Area = 123,087 sf Runoff Volume = 38,988 cf Average Runoff Depth = 3.80"**  
**37.20% Pervious = 45,790 sf 62.80% Impervious = 77,297 sf**

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**Summary for Subcatchment SUB-1:**

Runoff = 0.03 cfs @ 12.22 hrs, Volume= 247 cf, Depth= 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 25-Year Rainfall=6.25"

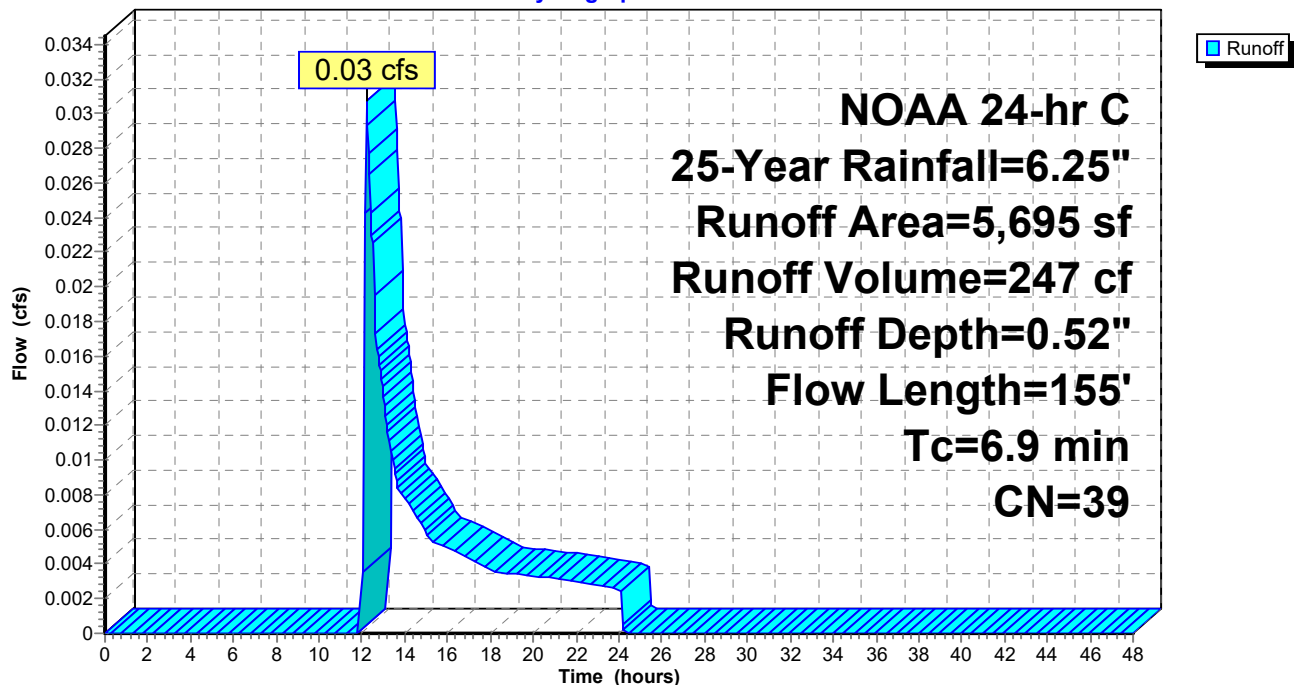
Area (sf)	CN	Description
5,695	39	>75% Grass cover, Good, HSG A
5,695		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0350	0.13		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.36"
0.5	105	0.0500	3.60		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
6.9	155	Total			

**Subcatchment SUB-1:**

Hydrograph



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**Summary for Subcatchment SUB-2A:**

Runoff = 2.87 cfs @ 12.13 hrs, Volume= 8,187 cf, Depth= 3.50"

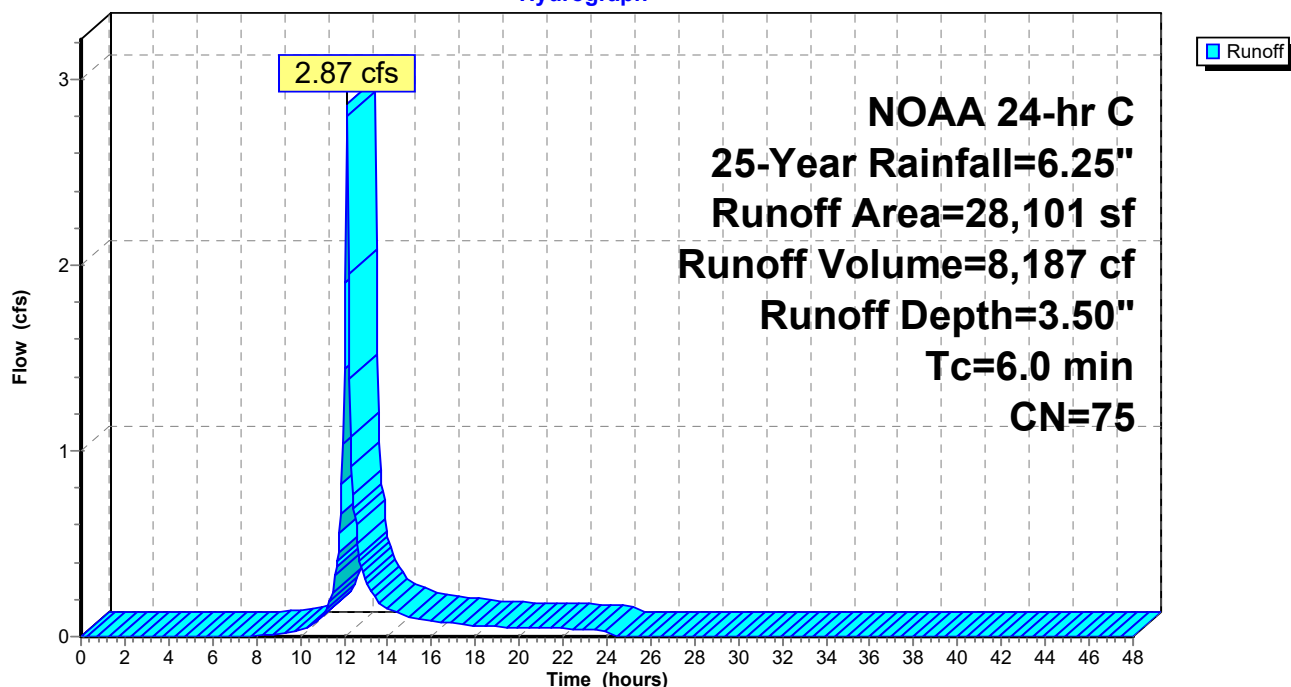
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 25-Year Rainfall=6.25"

Area (sf)	CN	Description
13,100	98	Paved parking, HSG A
* 1,667	98	Concrete, HSG A
2,214	98	Roofs, HSG A
11,120	39	>75% Grass cover, Good, HSG A
28,101	75	Weighted Average
11,120		39.57% Pervious Area
16,981		60.43% Impervious Area

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

**Subcatchment SUB-2A:**

Hydrograph



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**Summary for Subcatchment SUB-2B:**

Runoff = 0.49 cfs @ 12.14 hrs, Volume= 1,421 cf, Depth= 2.26"

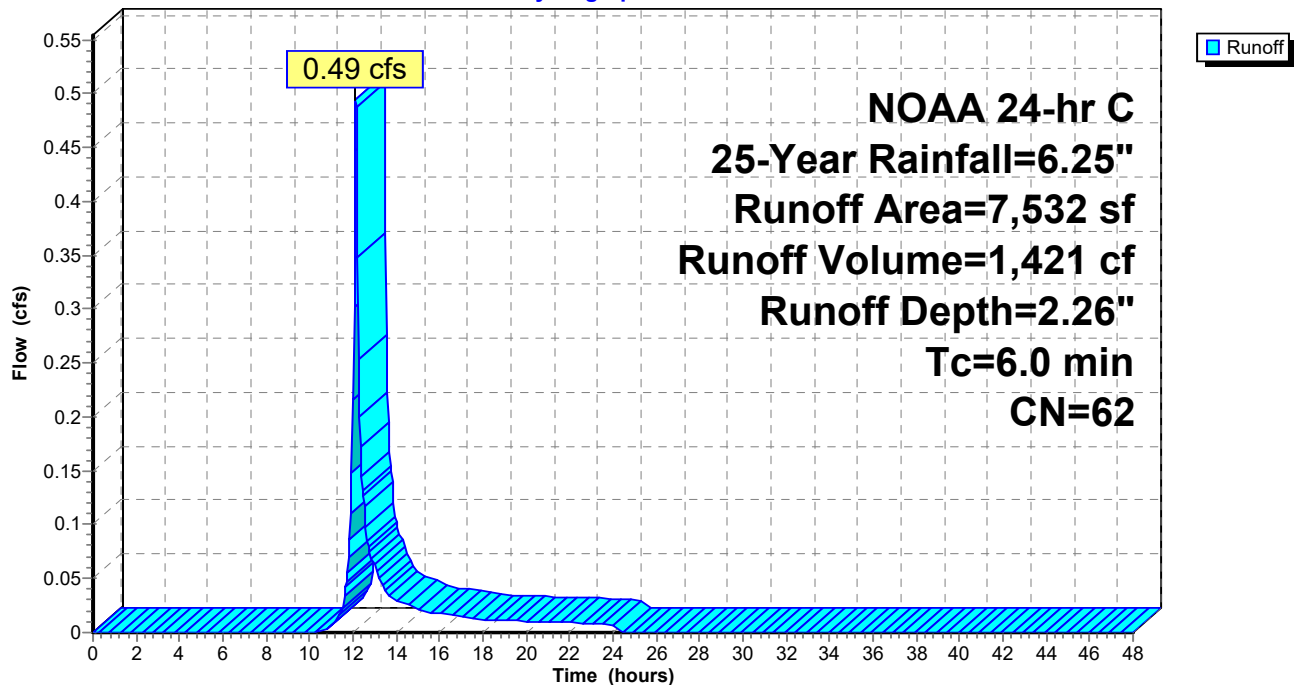
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 25-Year Rainfall=6.25"

Area (sf)	CN	Description
2,972	98	Paved parking, HSG A
4,560	39	>75% Grass cover, Good, HSG A
7,532	62	Weighted Average
4,560		60.54% Pervious Area
2,972		39.46% Impervious Area

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

**Subcatchment SUB-2B:**

Hydrograph



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**Summary for Subcatchment SUB-3:**

Runoff = 0.00 cfs @ 12.59 hrs, Volume= 81 cf, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 25-Year Rainfall=6.25"

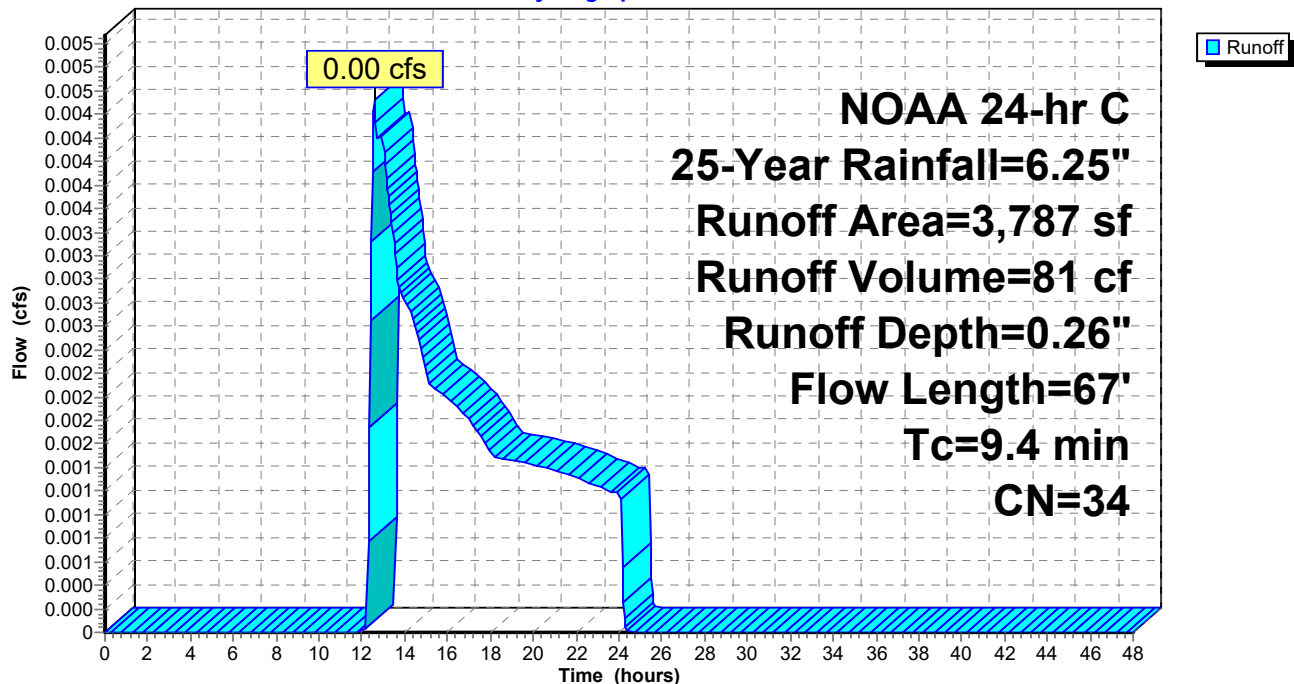
Area (sf)	CN	Description
1,728	39	>75% Grass cover, Good, HSG A
2,059	30	Woods, Good, HSG A
3,787	34	Weighted Average
3,787		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0380	0.09		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.36"
0.1	17	0.0300	2.79		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
9.4	67	Total			

**Subcatchment SUB-3:**

Hydrograph



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**Summary for Subcatchment SUB-4A:**

Runoff = 8.81 cfs @ 12.13 hrs, Volume= 28,131 cf, Depth= 5.54"

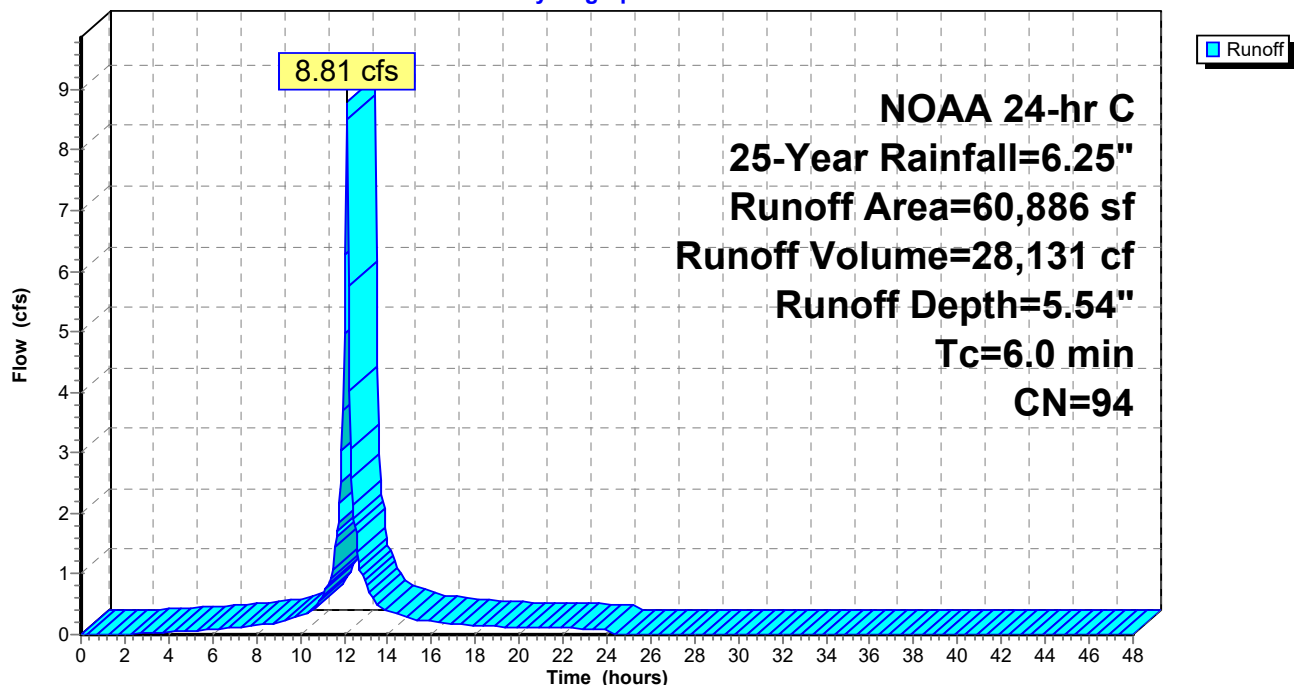
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 25-Year Rainfall=6.25"

Area (sf)	CN	Description
10,017	98	Roofs, HSG A
44,418	98	Paved parking, HSG A
* 2,315	98	Concrete, HSG A
4,136	39	>75% Grass cover, Good, HSG A
60,886	94	Weighted Average
4,136		6.79% Pervious Area
56,750		93.21% Impervious Area

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

**Subcatchment SUB-4A:**

Hydrograph



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**Summary for Subcatchment SUB-4B:**

Runoff = 0.07 cfs @ 12.16 hrs, Volume= 324 cf, Depth= 0.70"

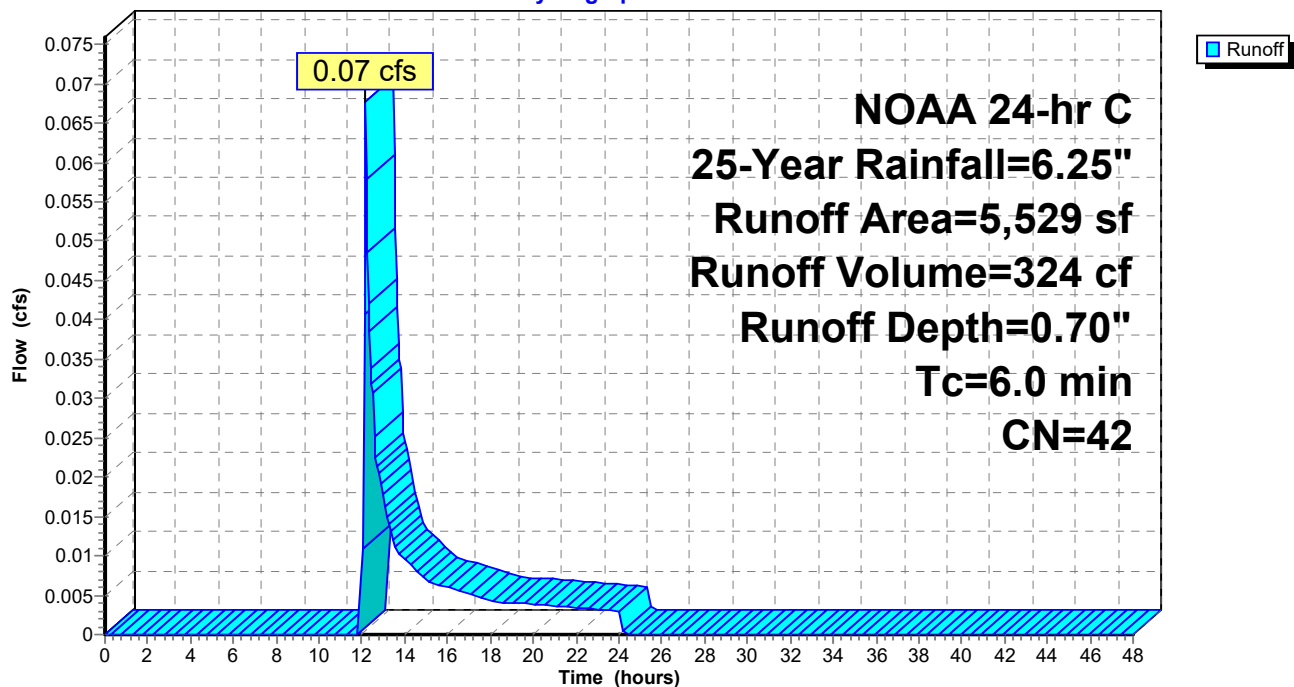
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 25-Year Rainfall=6.25"

Area (sf)	CN	Description
* 244	98	Concrete, HSG A
5,285	39	>75% Grass cover, Good, HSG A
5,529	42	Weighted Average
5,285		95.59% Pervious Area
244		4.41% Impervious Area

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

**Subcatchment SUB-4B:**

Hydrograph



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**Summary for Subcatchment SUB-4C:**

Runoff = 0.10 cfs @ 12.17 hrs, Volume= 517 cf, Depth= 0.64"

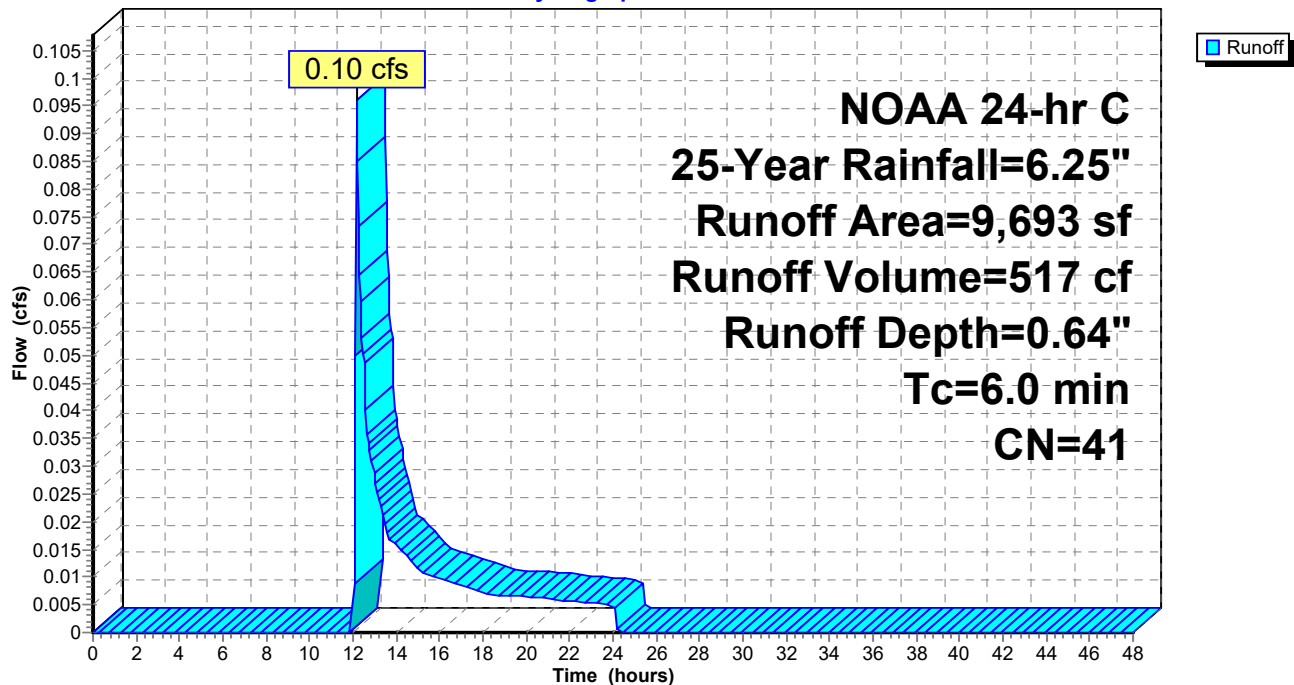
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 25-Year Rainfall=6.25"

Area (sf)	CN	Description
* 350	98	Concrete, HSG A
9,343	39	>75% Grass cover, Good, HSG A
9,693	41	Weighted Average
9,343		96.39% Pervious Area
350		3.61% Impervious Area

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

**Subcatchment SUB-4C:**

Hydrograph





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**Summary for Subcatchment SUB-4D:**

Runoff = 0.01 cfs @ 12.20 hrs, Volume= 81 cf, Depth= 0.52"

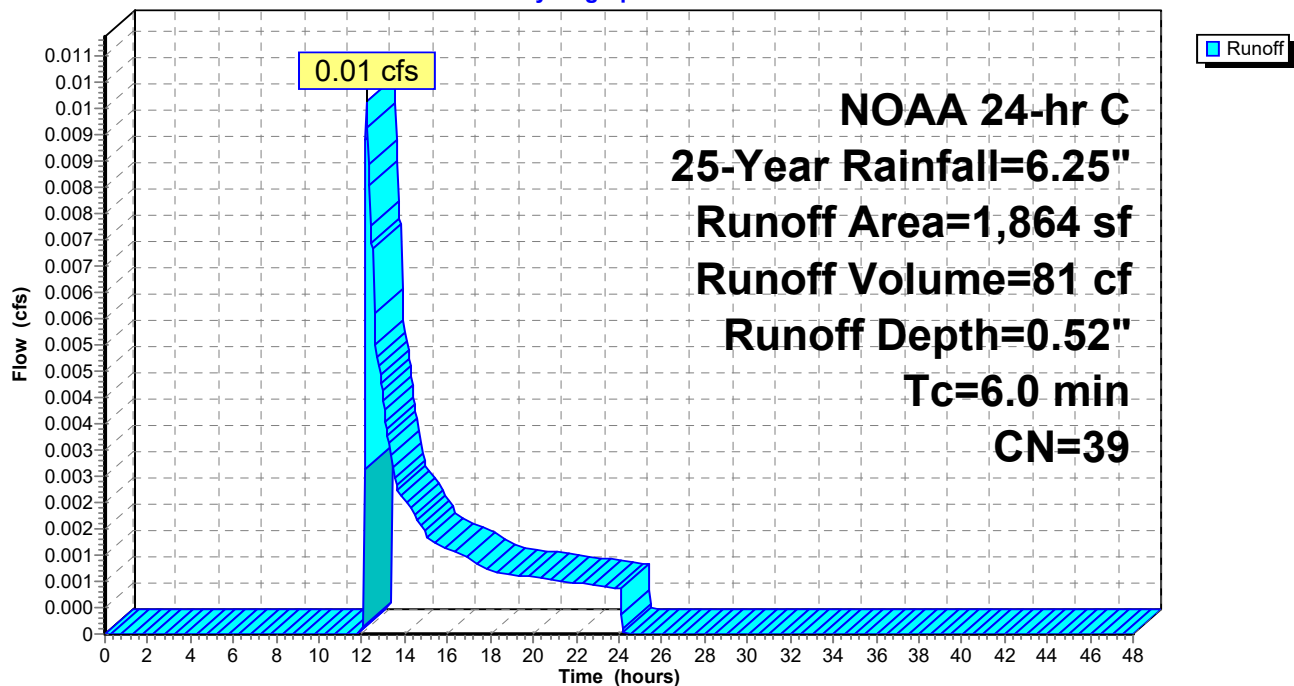
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 25-Year Rainfall=6.25"

Area (sf)	CN	Description
1,864	39	>75% Grass cover, Good, HSG A
1,864		100.00% Pervious Area

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

**Subcatchment SUB-4D:**

Hydrograph



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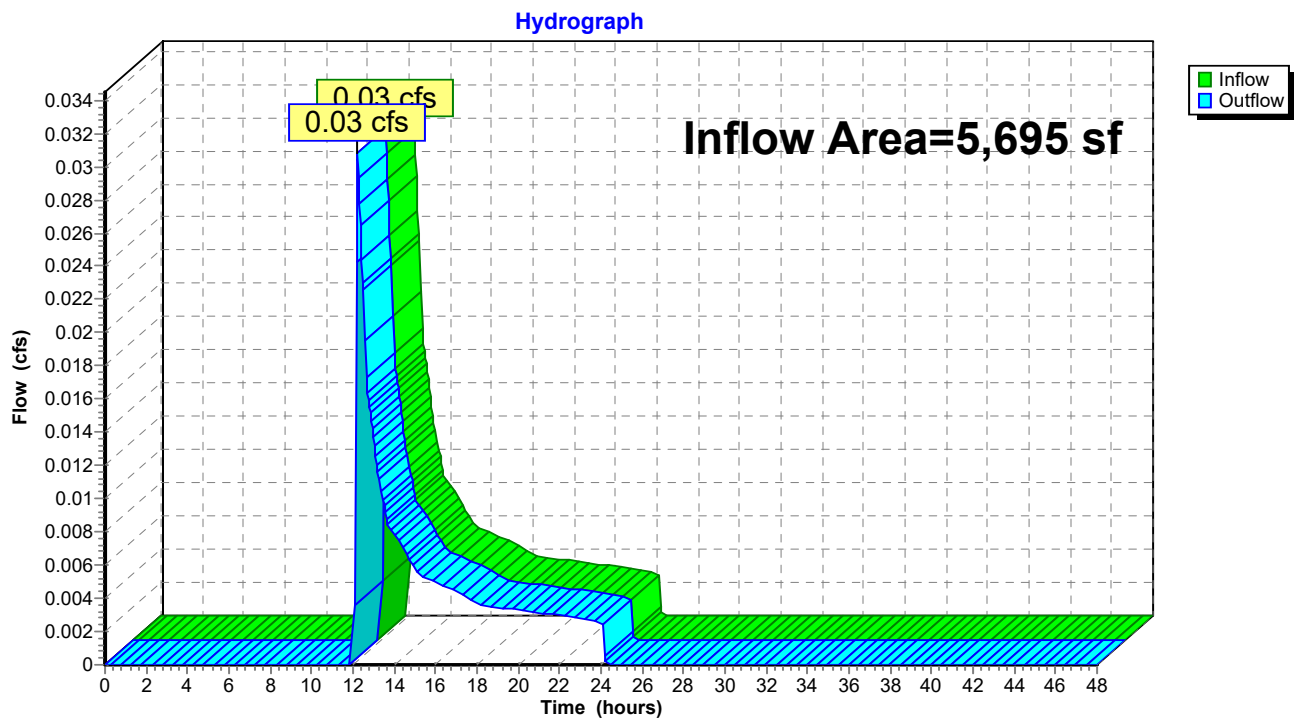
### Summary for Reach DP-1: (new Reach)

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

Inflow Area = 5,695 sf, 0.00% Impervious, Inflow Depth = 0.52" for 25-Year event  
Inflow = 0.03 cfs @ 12.22 hrs, Volume= 247 cf  
Outflow = 0.03 cfs @ 12.22 hrs, Volume= 247 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-1: (new Reach)



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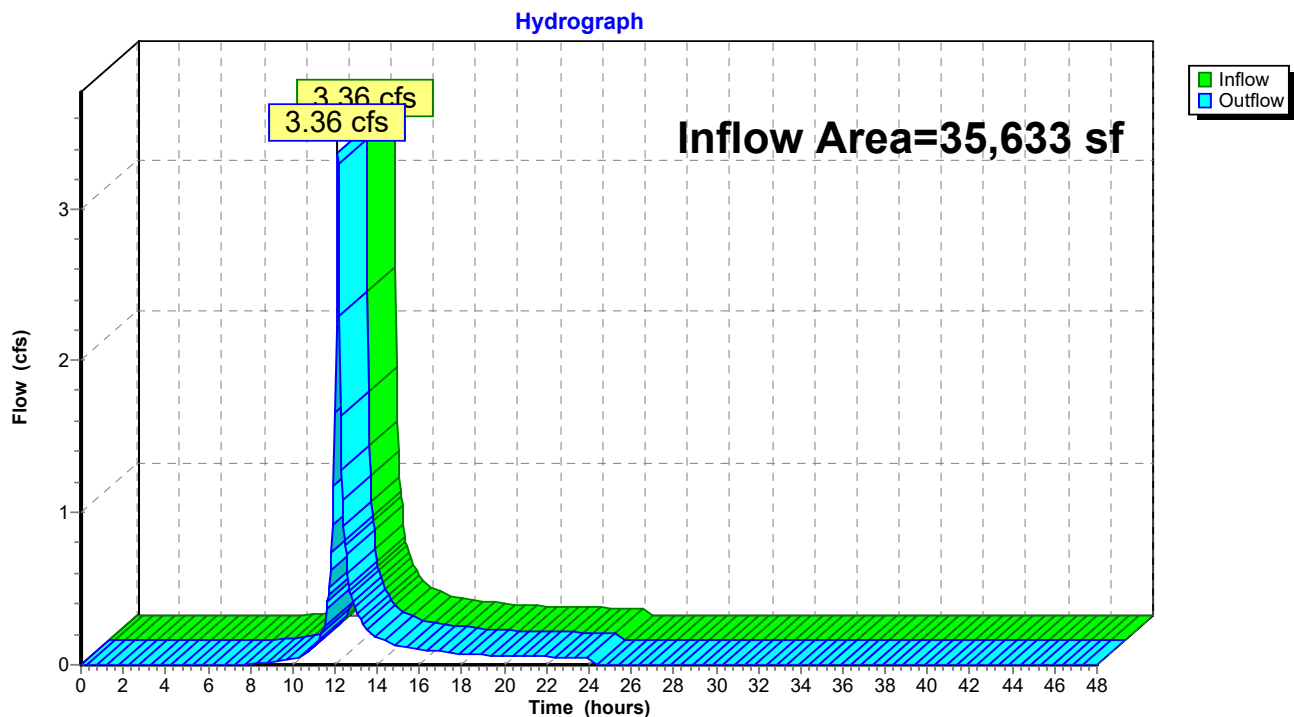
### Summary for Reach DP-2: (new Reach)

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

Inflow Area = 35,633 sf, 56.00% Impervious, Inflow Depth = 3.24" for 25-Year event  
Inflow = 3.36 cfs @ 12.13 hrs, Volume= 9,608 cf  
Outflow = 3.36 cfs @ 12.13 hrs, Volume= 9,608 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-2: (new Reach)



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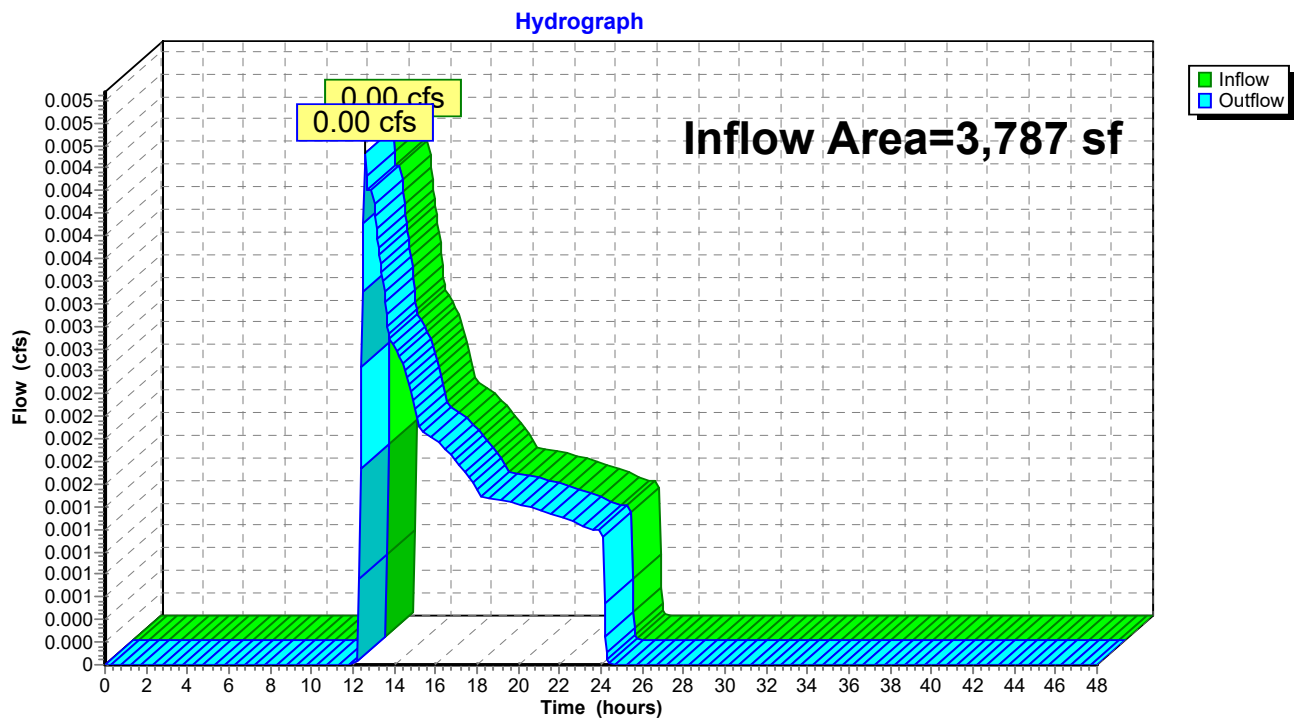
### Summary for Reach DP-3: (new Reach)

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

Inflow Area = 3,787 sf, 0.00% Impervious, Inflow Depth = 0.26" for 25-Year event  
Inflow = 0.00 cfs @ 12.59 hrs, Volume= 81 cf  
Outflow = 0.00 cfs @ 12.59 hrs, Volume= 81 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-3: (new Reach)



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### Summary for Reach DP-4: Cypress Street

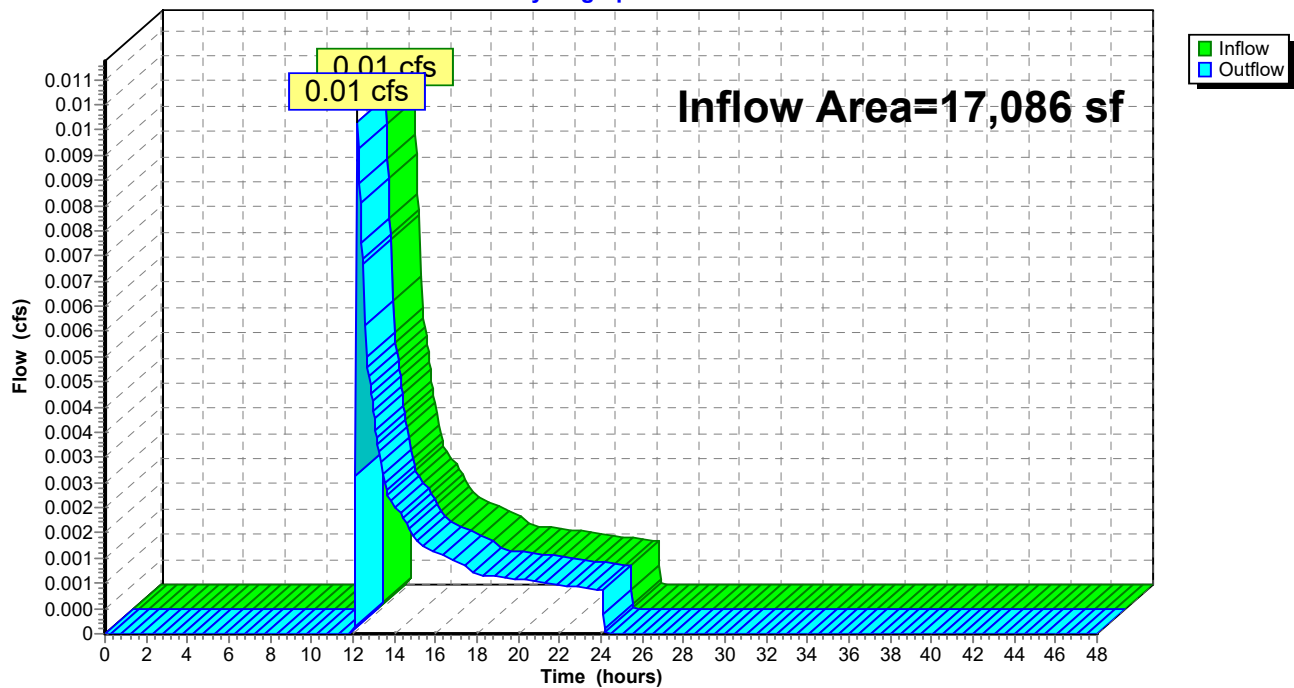
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 17,086 sf, 3.48% Impervious, Inflow Depth = 0.06" for 25-Year event  
Inflow = 0.01 cfs @ 12.20 hrs, Volume= 81 cf  
Outflow = 0.01 cfs @ 12.20 hrs, Volume= 81 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-4: Cypress Street

Hydrograph



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**Summary for Pond DW1-2: DRYWELLS 1&2**

Inflow Area = 5,529 sf, 4.41% Impervious, Inflow Depth = 0.70" for 25-Year event  
 Inflow = 0.07 cfs @ 12.16 hrs, Volume= 324 cf  
 Outflow = 0.01 cfs @ 12.10 hrs, Volume= 324 cf, Atten= 85%, Lag= 0.0 min  
 Discarded = 0.01 cfs @ 12.10 hrs, Volume= 324 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 172.53' @ 13.85 hrs Surf.Area= 179 sf Storage= 85 cf

Plug-Flow detention time= 76.4 min calculated for 324 cf (100% of inflow)  
 Center-of-Mass det. time= 76.5 min ( 1,011.1 - 934.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	171.40'	98 cf	<b>10.67'D x 5.00'H Vertical Cone/Cylinder</b> 447 cf Overall - 201 cf Embedded = 246 cf x 40.0% Voids
#2	172.40'	140 cf	<b>6.67'D x 4.00'H Vertical Cone/Cylinder</b> Inside #1 201 cf Overall - 8.0" Wall Thickness = 140 cf
#3	176.40'	168 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
		406 cf	x 2.00 = 812 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
176.40	29	0	0
177.40	29	29	29
177.50	2,752	139	168

Device	Routing	Invert	Outlet Devices
#1	Discarded	171.40'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 12.10 hrs HW=171.46' (Free Discharge)  
 ↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

**Proposed**

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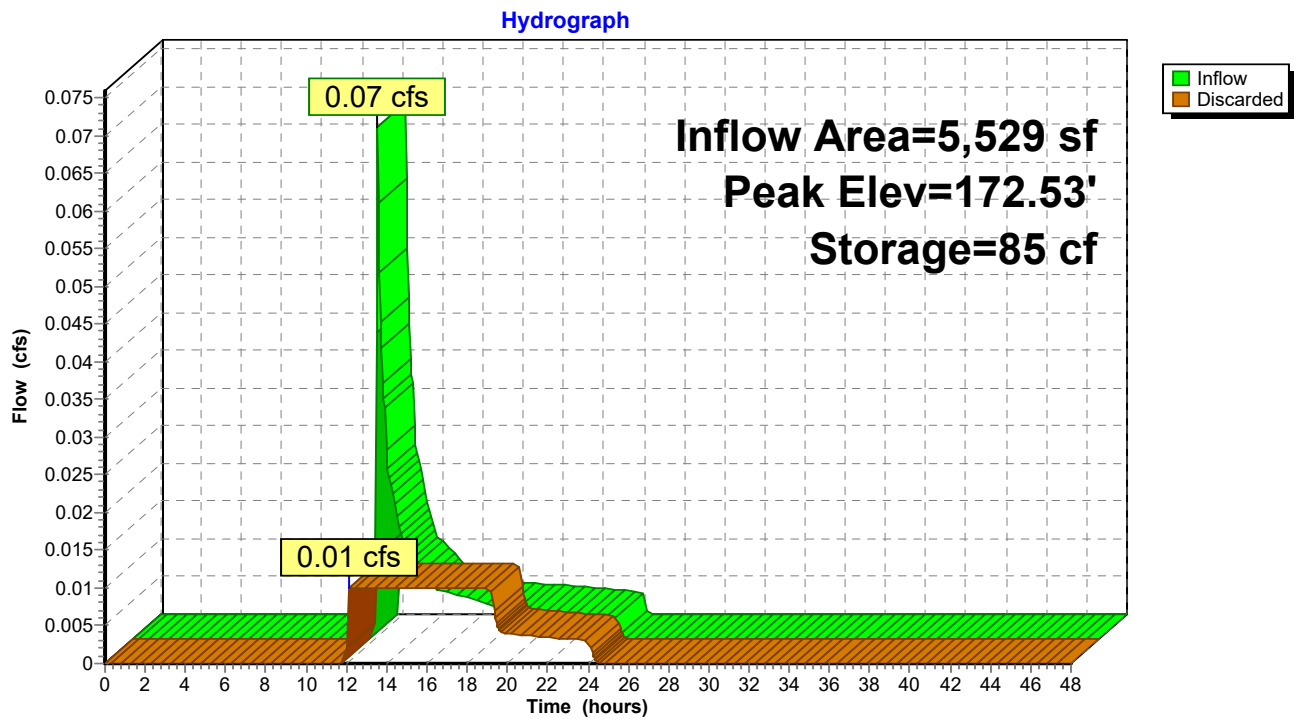
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**Pond DW1-2: DRYWELLS 1&2**



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NOAA 24-hr C 25-Year Rainfall=6.25"

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**Summary for Pond DW3-4-5: DRYWELLS 3,4,5**

Inflow Area = 9,693 sf, 3.61% Impervious, Inflow Depth = 0.64" for 25-Year event  
 Inflow = 0.10 cfs @ 12.17 hrs, Volume= 517 cf  
 Outflow = 0.01 cfs @ 12.15 hrs, Volume= 517 cf, Atten= 84%, Lag= 0.0 min  
 Discarded = 0.01 cfs @ 12.15 hrs, Volume= 517 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 170.68' @ 14.20 hrs Surf.Area= 268 sf Storage= 134 cf

Plug-Flow detention time= 83.3 min calculated for 516 cf (100% of inflow)  
 Center-of-Mass det. time= 83.2 min ( 1,024.7 - 941.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	169.50'	98 cf	<b>10.67'D x 5.00'H Vertical Cone/Cylinder</b> 447 cf Overall - 201 cf Embedded = 246 cf x 40.0% Voids
#2	170.50'	140 cf	<b>6.67'D x 4.00'H Vertical Cone/Cylinder</b> Inside #1 201 cf Overall - 8.0" Wall Thickness = 140 cf
#3	174.50'	490 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
		728 cf	x 3.00 = 2,183 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
174.50	29	0	0
175.50	29	29	29
176.00	1,813	461	490

Device	Routing	Invert	Outlet Devices
#1	Discarded	169.50'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 12.15 hrs HW=169.64' (Free Discharge)  
 ↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)



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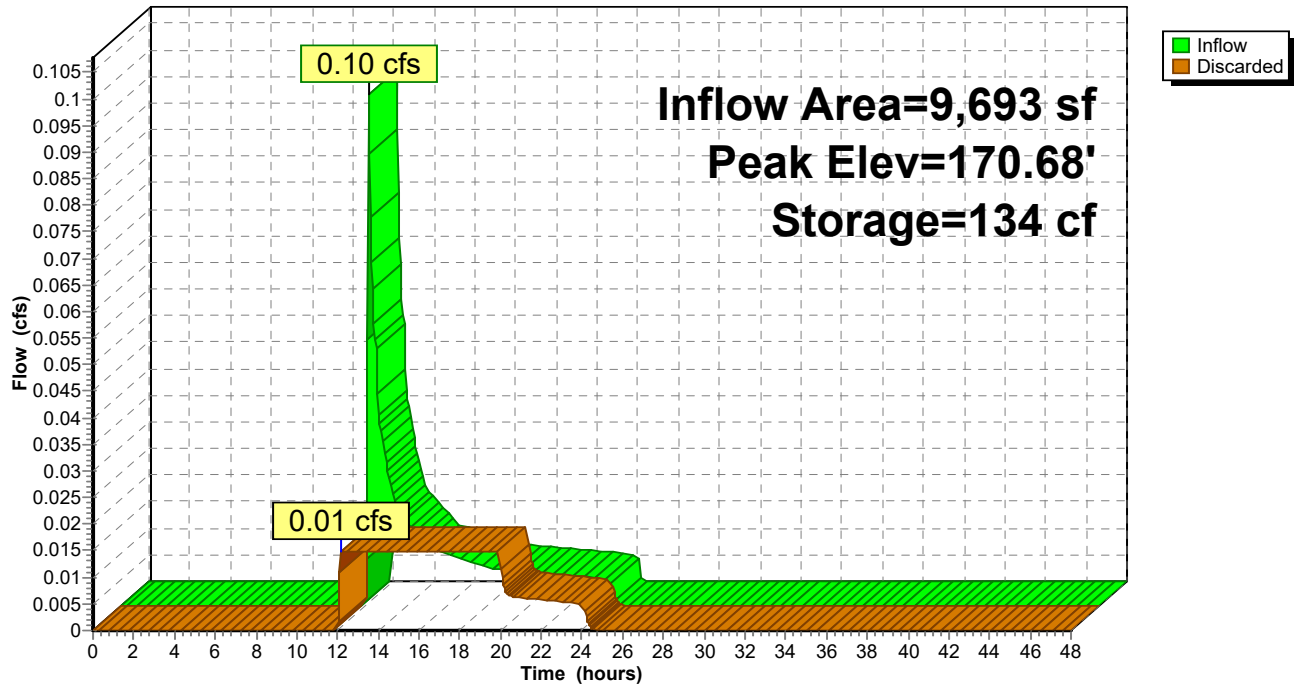
NOAA 24-hr C 25-Year Rainfall=6.25"

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### Pond DW3-4-5: DRYWELLS 3,4,5

Hydrograph



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NOAA 24-hr C 25-Year Rainfall=6.25"

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**Summary for Pond UG-1: Underground Infiltration System**

Inflow Area = 60,886 sf, 93.21% Impervious, Inflow Depth = 5.54" for 25-Year event  
 Inflow = 8.81 cfs @ 12.13 hrs, Volume= 28,131 cf  
 Outflow = 0.49 cfs @ 10.85 hrs, Volume= 28,131 cf, Atten= 94%, Lag= 0.0 min  
 Discarded = 0.49 cfs @ 10.85 hrs, Volume= 28,131 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
 Peak Elev= 181.07' @ 13.54 hrs Surf.Area= 8,785 sf Storage= 12,714 cf

Plug-Flow detention time= 209.1 min calculated for 28,131 cf (100% of inflow)  
 Center-of-Mass det. time= 209.1 min ( 978.1 - 769.1 )

Volume	Invert	Avail.Storage	Storage Description
#1A	179.00'	7,760 cf	<b>63.25'W x 138.90'L x 3.50'H Field A</b> 30,748 cf Overall - 11,347 cf Embedded = 19,401 cf x 40.0% Voids
#2A	179.50'	11,347 cf	<b>ADS_StormTech SC-740 +Cap</b> x 247 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 247 Chambers in 13 Rows
		19,108 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	179.00'	<b>2.410 in/hr Exfiltration over Horizontal area</b>

**Discarded OutFlow** Max=0.49 cfs @ 10.85 hrs HW=179.04' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.49 cfs)

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### Pond UG-1: Underground Infiltration System - Chamber Wizard Field A

**Chamber Model = ADS\_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)**

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

19 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 136.90' Row Length +12.0" End Stone x 2 = 138.90' Base Length

13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

247 Chambers x 45.9 cf = 11,347.2 cf Chamber Storage

30,748.2 cf Field - 11,347.2 cf Chambers = 19,401.1 cf Stone x 40.0% Voids = 7,760.4 cf Stone Storage

Chamber Storage + Stone Storage = 19,107.6 cf = 0.439 af

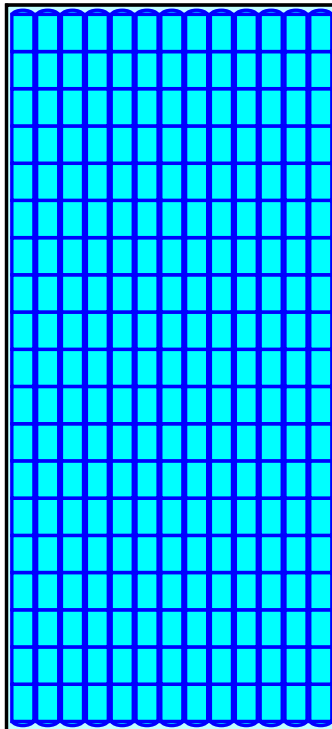
Overall Storage Efficiency = 62.1%

Overall System Size = 138.90' x 63.25' x 3.50'

247 Chambers

1,138.8 cy Field

718.6 cy Stone



## Proposed

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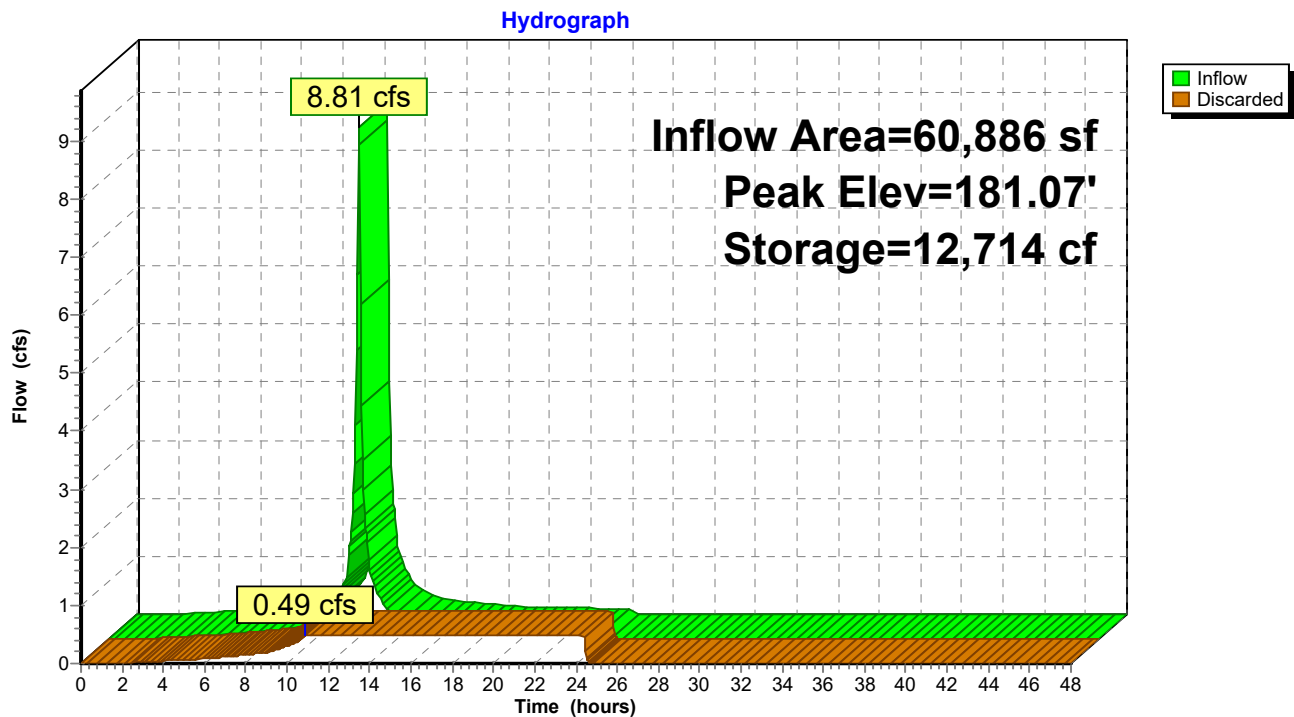
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### Pond UG-1: Underground Infiltration System



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NOAA 24-hr C 100-Year Rainfall=7.97"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

<b>Subcatchment SUB-1:</b>	Runoff Area=5,695 sf 0.00% Impervious Runoff Depth=1.14" Flow Length=155' Tc=6.9 min CN=39 Runoff=0.14 cfs 543 cf
<b>Subcatchment SUB-2A:</b>	Runoff Area=28,101 sf 60.43% Impervious Runoff Depth=5.01" Tc=6.0 min CN=75 Runoff=4.07 cfs 11,743 cf
<b>Subcatchment SUB-2B:</b>	Runoff Area=7,532 sf 39.46% Impervious Runoff Depth=3.53" Tc=6.0 min CN=62 Runoff=0.78 cfs 2,218 cf
<b>Subcatchment SUB-3:</b>	Runoff Area=3,787 sf 0.00% Impervious Runoff Depth=0.71" Flow Length=67' Tc=9.4 min CN=34 Runoff=0.03 cfs 224 cf
<b>Subcatchment SUB-4A:</b>	Runoff Area=60,886 sf 93.21% Impervious Runoff Depth=7.25" Tc=6.0 min CN=94 Runoff=11.35 cfs 36,796 cf
<b>Subcatchment SUB-4B:</b>	Runoff Area=5,529 sf 4.41% Impervious Runoff Depth=1.43" Tc=6.0 min CN=42 Runoff=0.19 cfs 657 cf
<b>Subcatchment SUB-4C:</b>	Runoff Area=9,693 sf 3.61% Impervious Runoff Depth=1.33" Tc=6.0 min CN=41 Runoff=0.31 cfs 1,075 cf
<b>Subcatchment SUB-4D:</b>	Runoff Area=1,864 sf 0.00% Impervious Runoff Depth=1.14" Tc=6.0 min CN=39 Runoff=0.05 cfs 178 cf
<b>Reach DP-1: (new Reach)</b>	Inflow=0.14 cfs 543 cf Outflow=0.14 cfs 543 cf
<b>Reach DP-2: (new Reach)</b>	Inflow=4.85 cfs 13,961 cf Outflow=4.85 cfs 13,961 cf
<b>Reach DP-3: (new Reach)</b>	Inflow=0.03 cfs 224 cf Outflow=0.03 cfs 224 cf
<b>Reach DP-4: Cypress Street</b>	Inflow=0.05 cfs 178 cf Outflow=0.05 cfs 178 cf
<b>Pond DW1-2: DRYWELLS 1&amp;2</b>	Peak Elev=174.77' Storage=311 cf Inflow=0.19 cfs 657 cf Outflow=0.01 cfs 657 cf
<b>Pond DW3-4-5: DRYWELLS 3,4,5</b>	Peak Elev=173.26' Storage=526 cf Inflow=0.31 cfs 1,075 cf Outflow=0.01 cfs 1,075 cf
<b>Pond UG-1: Underground Infiltration</b>	Peak Elev=182.19' Storage=18,022 cf Inflow=11.35 cfs 36,796 cf Outflow=0.49 cfs 36,796 cf

**Total Runoff Area = 123,087 sf Runoff Volume = 53,434 cf Average Runoff Depth = 5.21"**  
**37.20% Pervious = 45,790 sf 62.80% Impervious = 77,297 sf**

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**Summary for Subcatchment SUB-1:**

Runoff = 0.14 cfs @ 12.16 hrs, Volume= 543 cf, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 100-Year Rainfall=7.97"

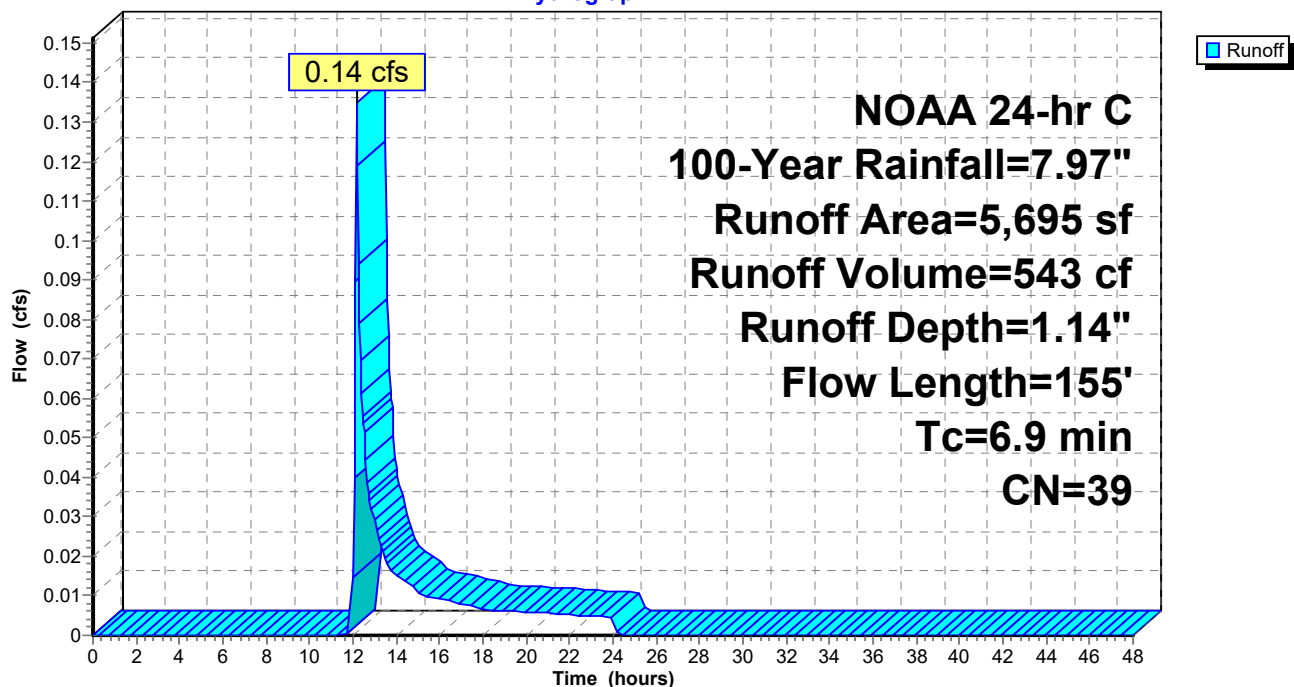
Area (sf)	CN	Description
5,695	39	>75% Grass cover, Good, HSG A
5,695		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0350	0.13		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.36"
0.5	105	0.0500	3.60		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
6.9	155	Total			

**Subcatchment SUB-1:**

Hydrograph



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**Summary for Subcatchment SUB-2A:**

Runoff = 4.07 cfs @ 12.13 hrs, Volume= 11,743 cf, Depth= 5.01"

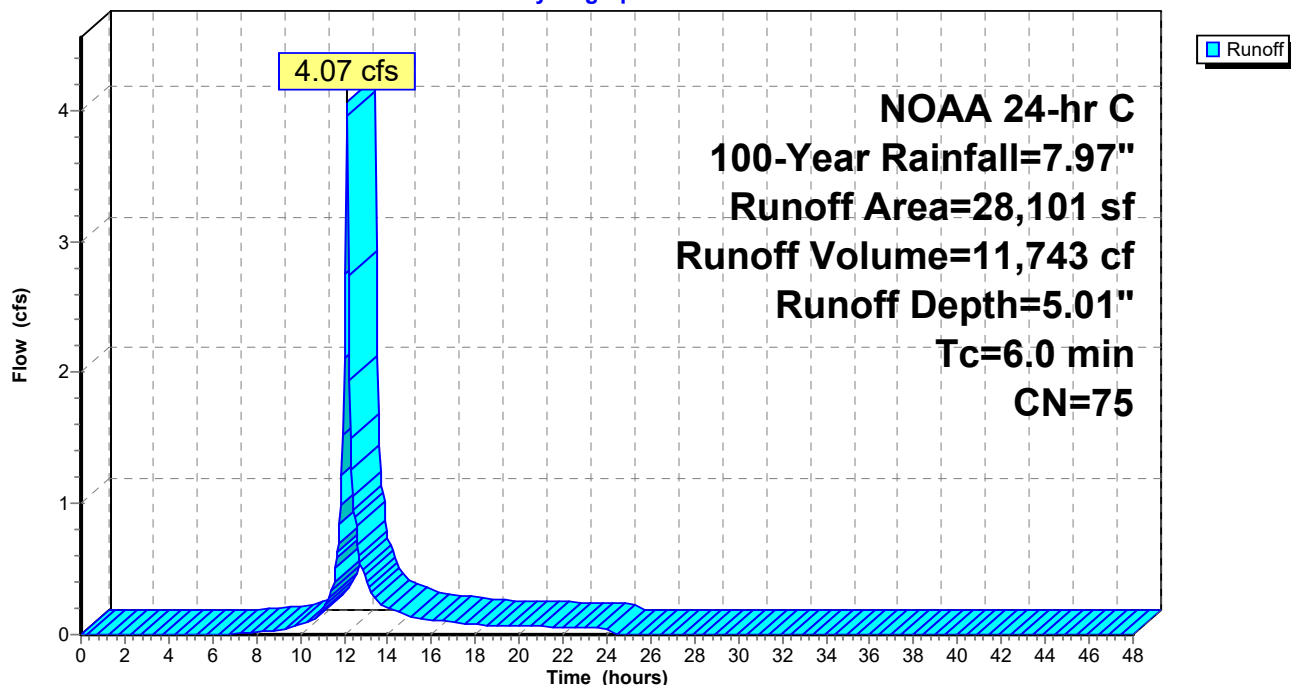
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 100-Year Rainfall=7.97"

Area (sf)	CN	Description
13,100	98	Paved parking, HSG A
* 1,667	98	Concrete, HSG A
2,214	98	Roofs, HSG A
11,120	39	>75% Grass cover, Good, HSG A
28,101	75	Weighted Average
11,120		39.57% Pervious Area
16,981		60.43% Impervious Area

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

**Subcatchment SUB-2A:**

Hydrograph



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**Summary for Subcatchment SUB-2B:**

Runoff = 0.78 cfs @ 12.13 hrs, Volume= 2,218 cf, Depth= 3.53"

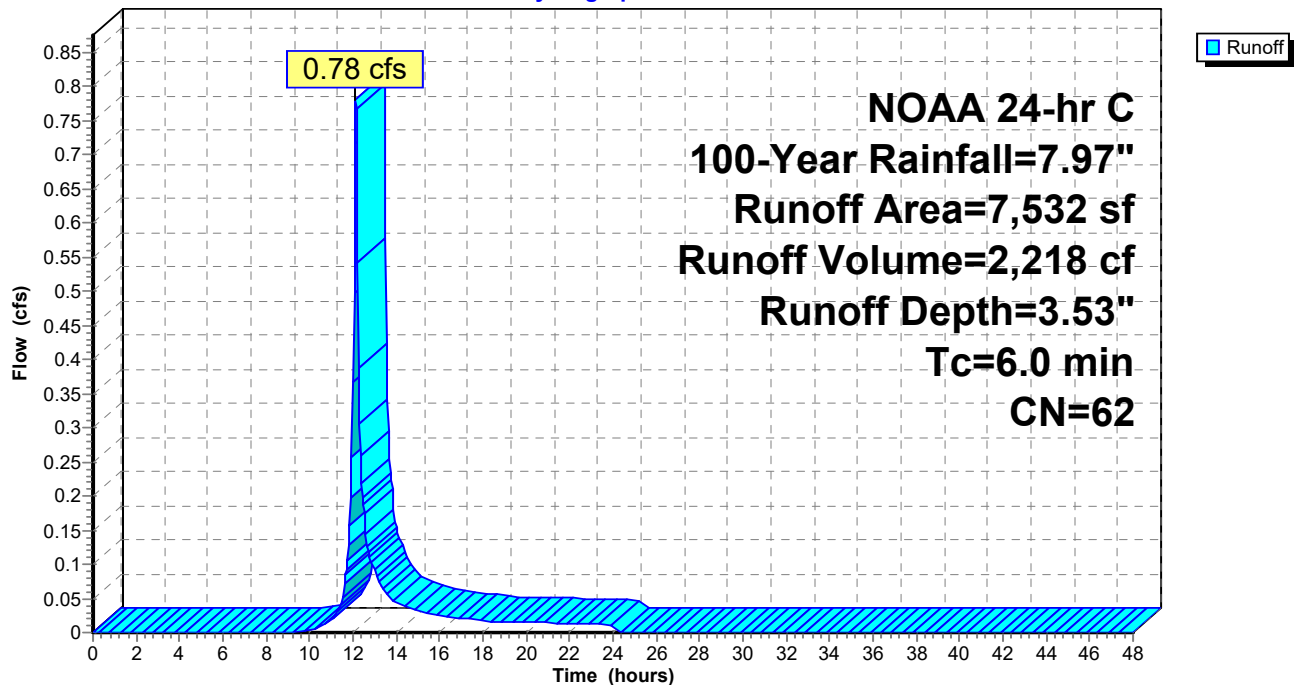
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 100-Year Rainfall=7.97"

Area (sf)	CN	Description
2,972	98	Paved parking, HSG A
4,560	39	>75% Grass cover, Good, HSG A
7,532	62	Weighted Average
4,560		60.54% Pervious Area
2,972		39.46% Impervious Area

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

**Subcatchment SUB-2B:**

Hydrograph





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**Summary for Subcatchment SUB-3:**

Runoff = 0.03 cfs @ 12.26 hrs, Volume= 224 cf, Depth= 0.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 100-Year Rainfall=7.97"

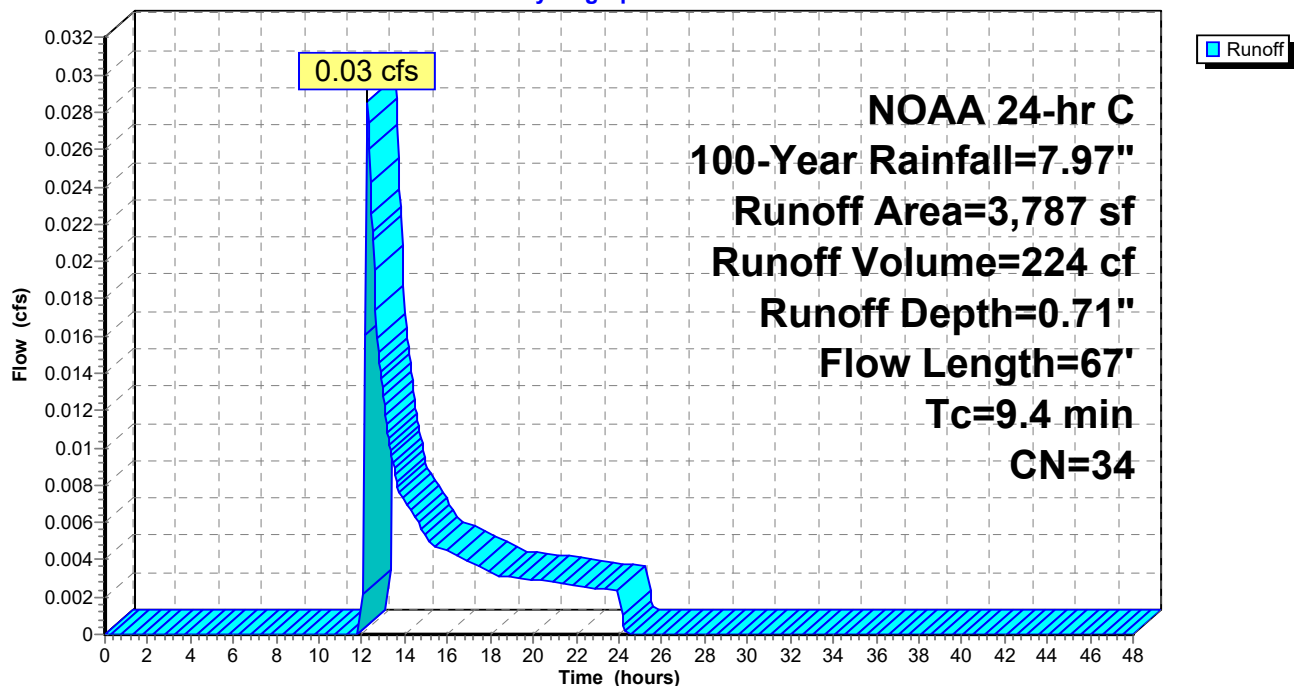
Area (sf)	CN	Description
1,728	39	>75% Grass cover, Good, HSG A
2,059	30	Woods, Good, HSG A
3,787	34	Weighted Average
3,787		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0380	0.09		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.36"
0.1	17	0.0300	2.79		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
9.4	67	Total			

**Subcatchment SUB-3:**

Hydrograph



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**Summary for Subcatchment SUB-4A:**

Runoff = 11.35 cfs @ 12.13 hrs, Volume= 36,796 cf, Depth= 7.25"

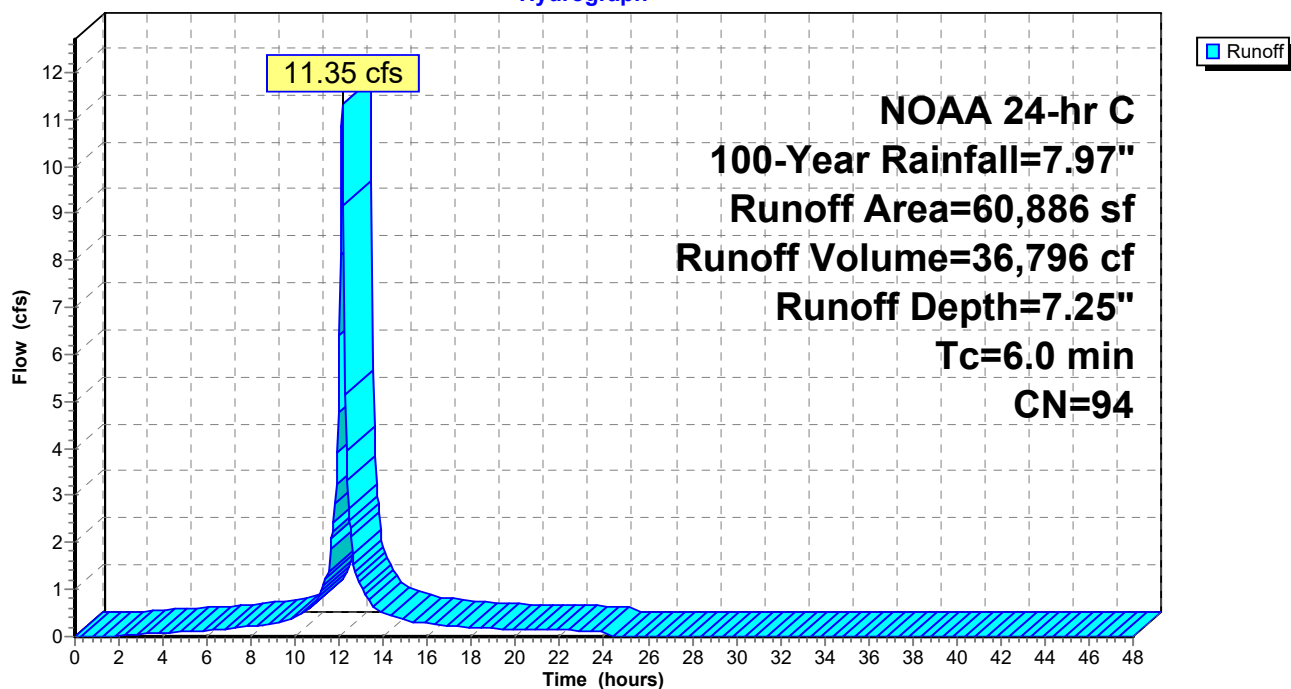
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 100-Year Rainfall=7.97"

Area (sf)	CN	Description
10,017	98	Roofs, HSG A
44,418	98	Paved parking, HSG A
* 2,315	98	Concrete, HSG A
4,136	39	>75% Grass cover, Good, HSG A
60,886	94	Weighted Average
4,136		6.79% Pervious Area
56,750		93.21% Impervious Area

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

**Subcatchment SUB-4A:**

Hydrograph



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**Summary for Subcatchment SUB-4B:**

Runoff = 0.19 cfs @ 12.15 hrs, Volume= 657 cf, Depth= 1.43"

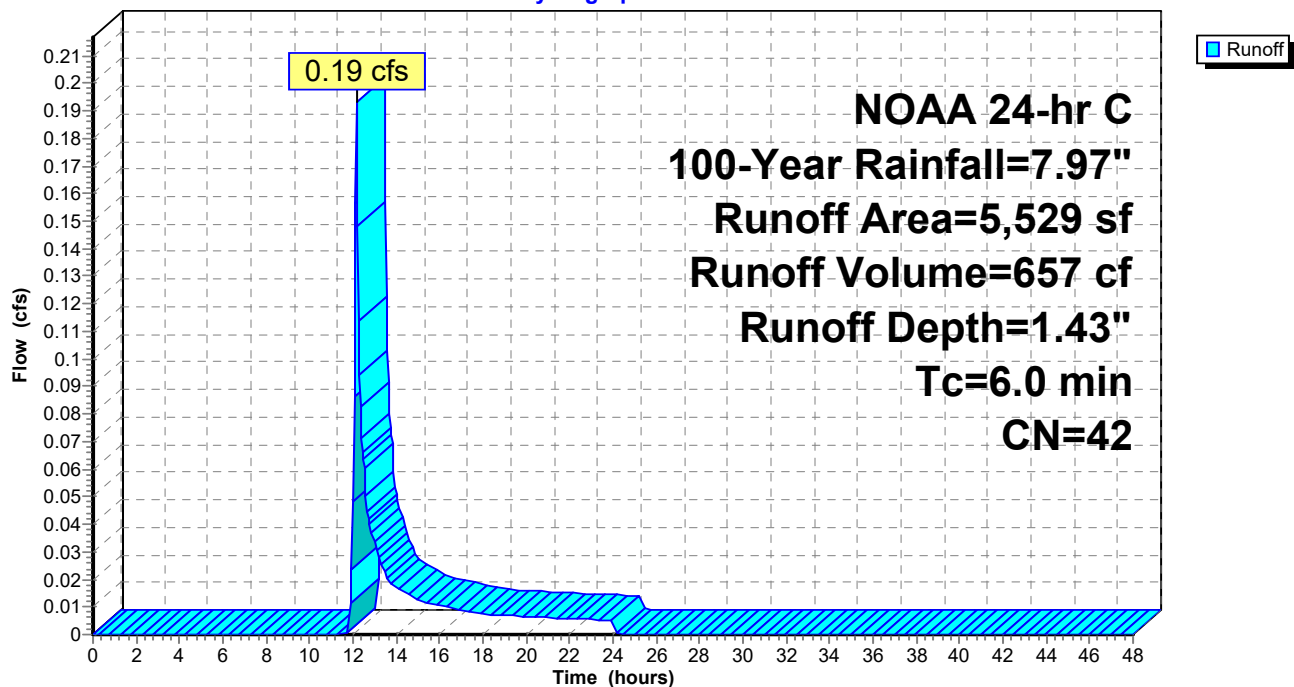
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 100-Year Rainfall=7.97"

	Area (sf)	CN	Description
*	244	98	Concrete, HSG A
	5,285	39	>75% Grass cover, Good, HSG A
	5,529	42	Weighted Average
	5,285		95.59% Pervious Area
	244		4.41% Impervious Area

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

**Subcatchment SUB-4B:**

Hydrograph



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**Summary for Subcatchment SUB-4C:**

Runoff = 0.31 cfs @ 12.15 hrs, Volume= 1,075 cf, Depth= 1.33"

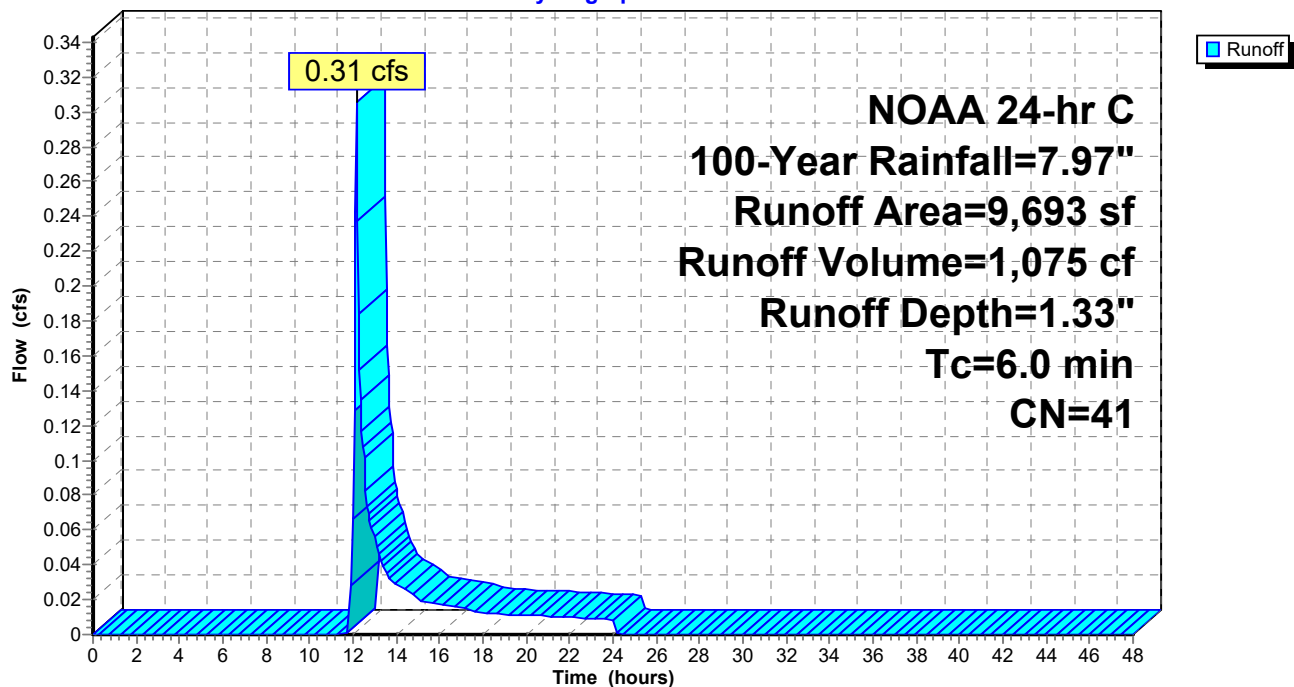
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 100-Year Rainfall=7.97"

	Area (sf)	CN	Description
*	350	98	Concrete, HSG A
	9,343	39	>75% Grass cover, Good, HSG A
	9,693	41	Weighted Average
	9,343		96.39% Pervious Area
	350		3.61% Impervious Area

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

**Subcatchment SUB-4C:**

Hydrograph



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**Summary for Subcatchment SUB-4D:**

Runoff = 0.05 cfs @ 12.15 hrs, Volume= 178 cf, Depth= 1.14"

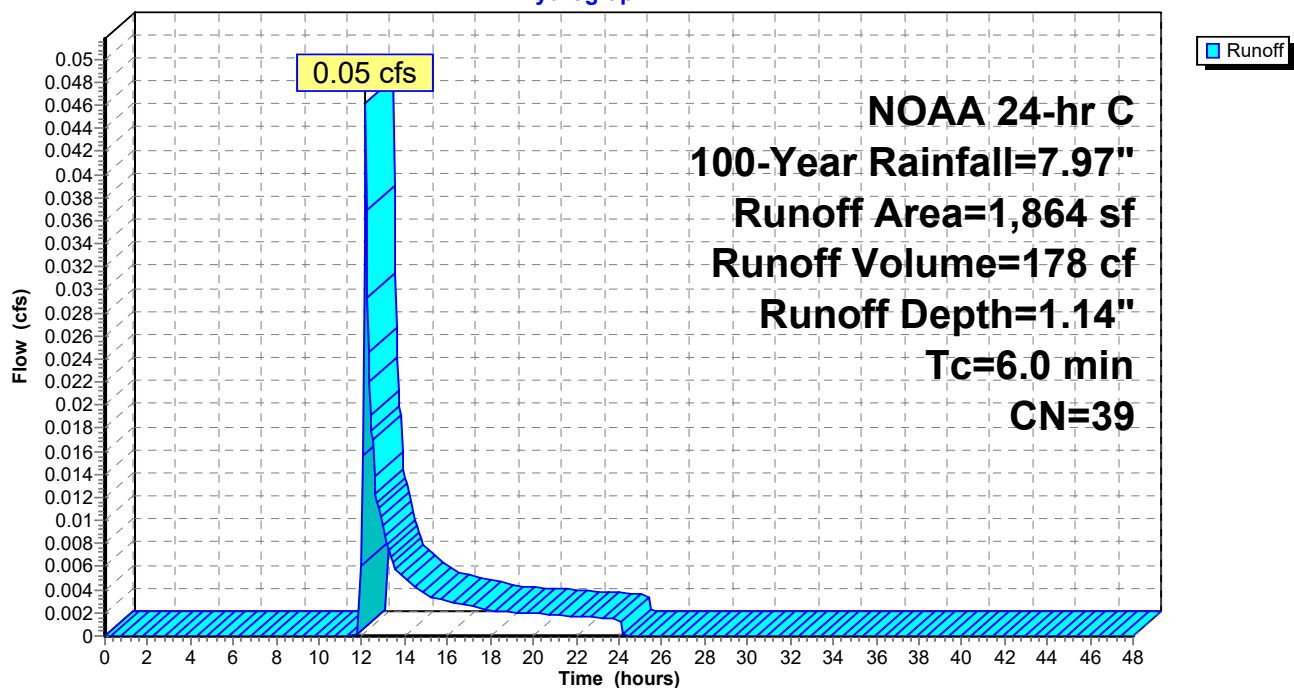
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NOAA 24-hr C 100-Year Rainfall=7.97"

Area (sf)	CN	Description
1,864	39	>75% Grass cover, Good, HSG A
1,864		100.00% Pervious Area

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

**Subcatchment SUB-4D:**

Hydrograph



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### Summary for Reach DP-1: (new Reach)

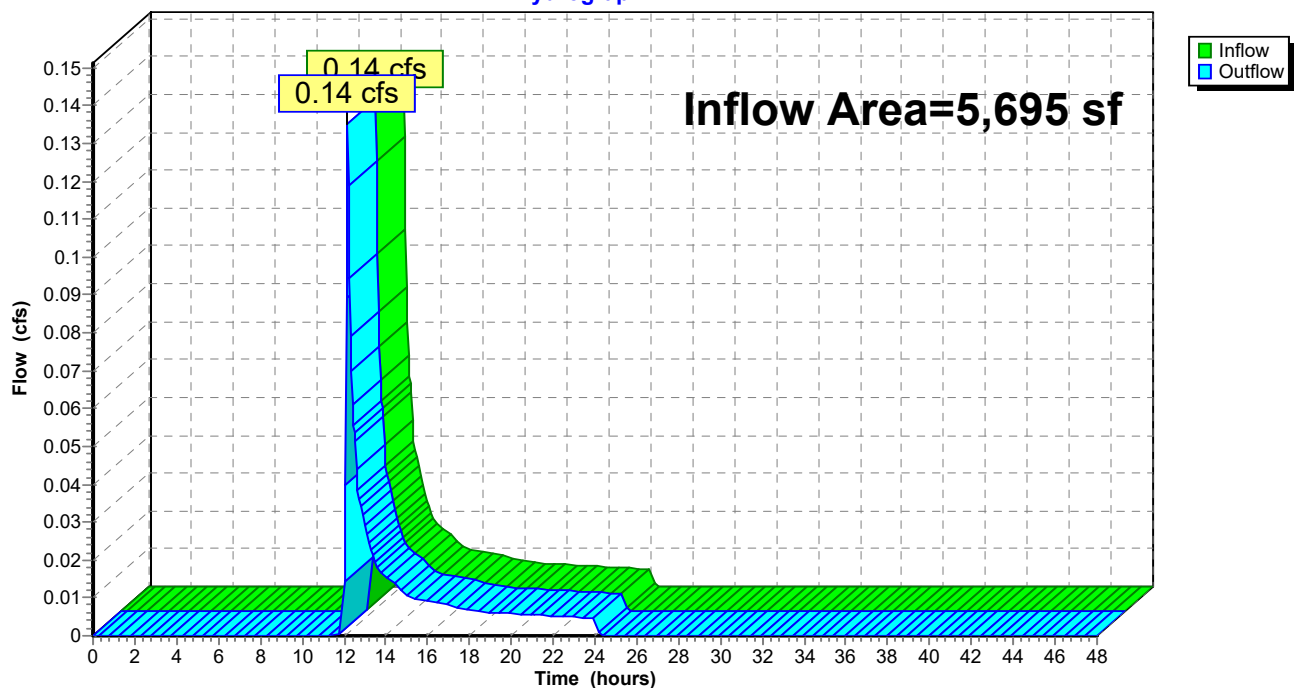
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5,695 sf, 0.00% Impervious, Inflow Depth = 1.14" for 100-Year event  
Inflow = 0.14 cfs @ 12.16 hrs, Volume= 543 cf  
Outflow = 0.14 cfs @ 12.16 hrs, Volume= 543 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-1: (new Reach)

Hydrograph



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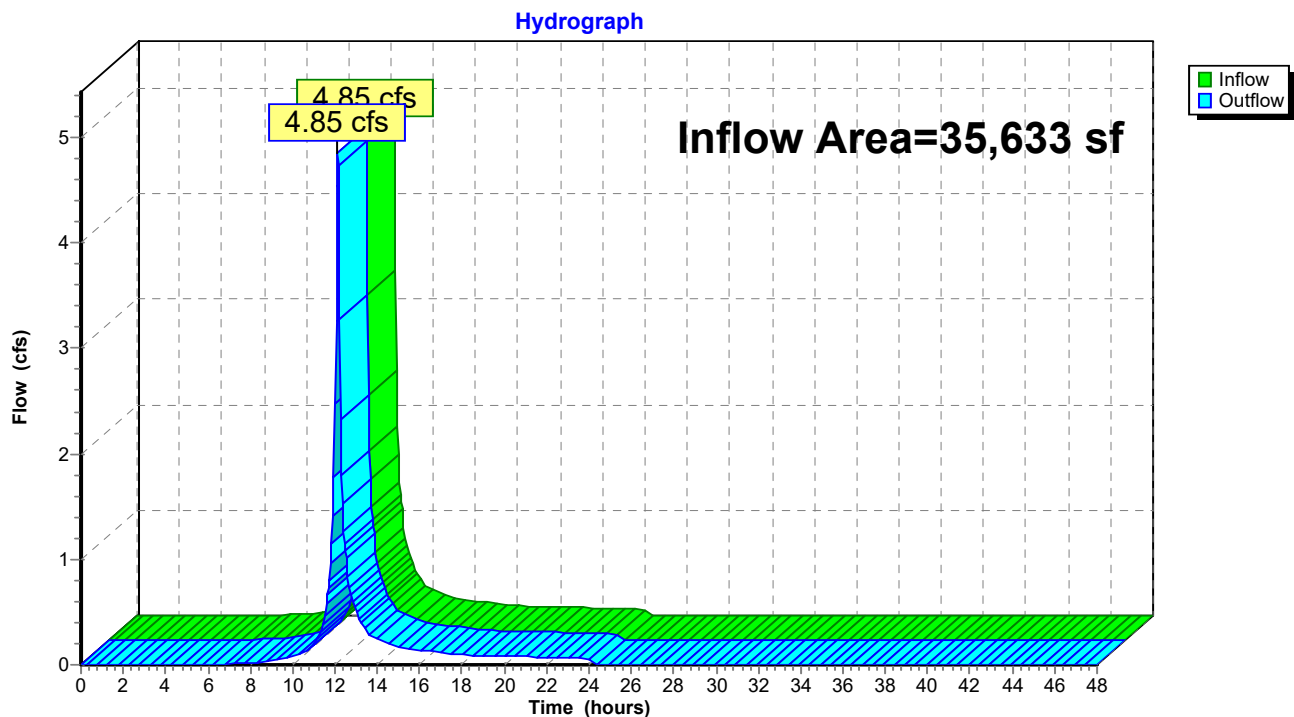
### Summary for Reach DP-2: (new Reach)

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

Inflow Area = 35,633 sf, 56.00% Impervious, Inflow Depth = 4.70" for 100-Year event  
Inflow = 4.85 cfs @ 12.13 hrs, Volume= 13,961 cf  
Outflow = 4.85 cfs @ 12.13 hrs, Volume= 13,961 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-2: (new Reach)



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### Summary for Reach DP-3: (new Reach)

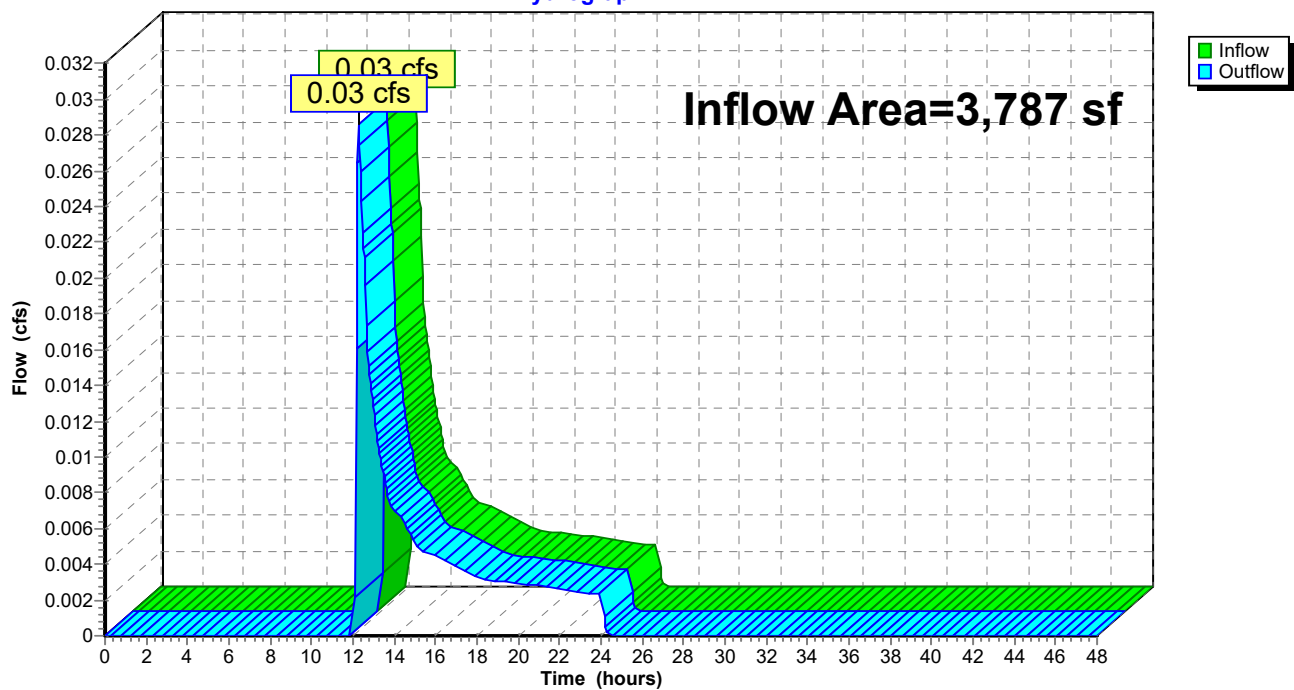
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3,787 sf, 0.00% Impervious, Inflow Depth = 0.71" for 100-Year event  
Inflow = 0.03 cfs @ 12.26 hrs, Volume= 224 cf  
Outflow = 0.03 cfs @ 12.26 hrs, Volume= 224 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-3: (new Reach)

Hydrograph





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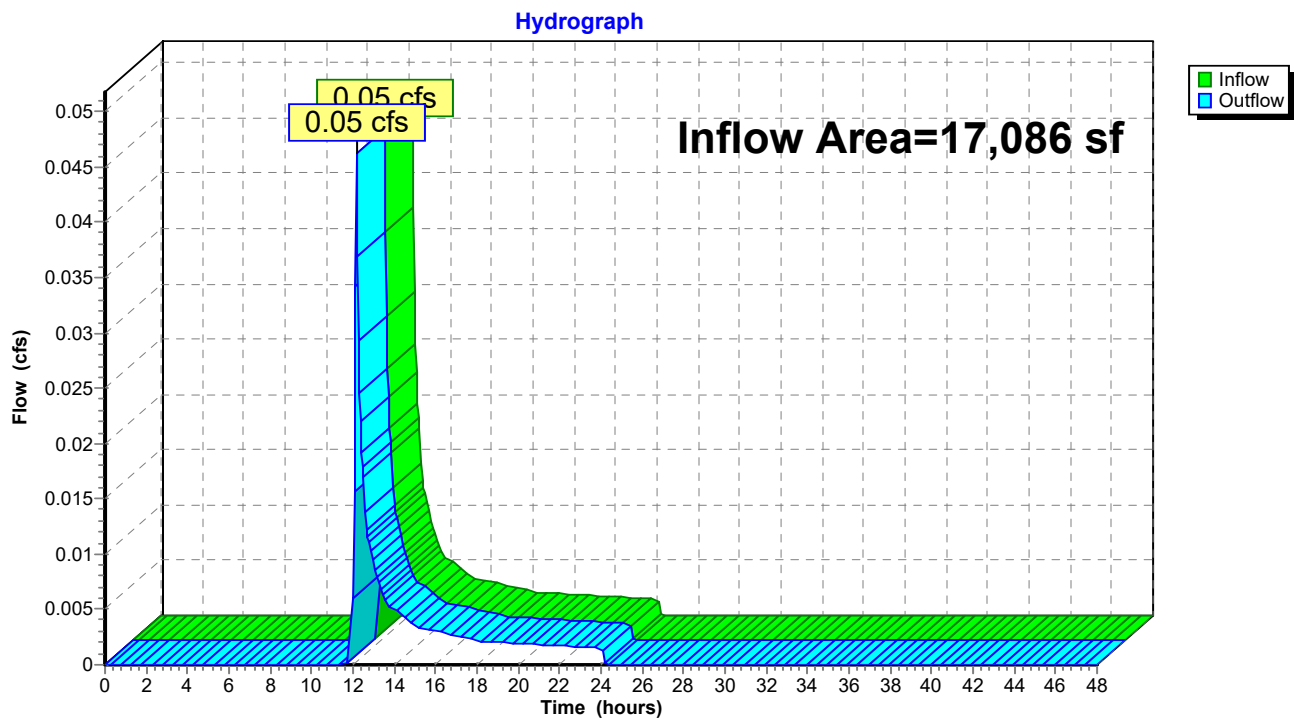
### Summary for Reach DP-4: Cypress Street

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

Inflow Area = 17,086 sf, 3.48% Impervious, Inflow Depth = 0.12" for 100-Year event  
Inflow = 0.05 cfs @ 12.15 hrs, Volume= 178 cf  
Outflow = 0.05 cfs @ 12.15 hrs, Volume= 178 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-4: Cypress Street



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**Summary for Pond DW1-2: DRYWELLS 1&2**

Inflow Area = 5,529 sf, 4.41% Impervious, Inflow Depth = 1.43" for 100-Year event  
 Inflow = 0.19 cfs @ 12.15 hrs, Volume= 657 cf  
 Outflow = 0.01 cfs @ 12.00 hrs, Volume= 657 cf, Atten= 95%, Lag= 0.0 min  
 Discarded = 0.01 cfs @ 12.00 hrs, Volume= 657 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 174.77' @ 16.30 hrs Surf.Area= 179 sf Storage= 311 cf

Plug-Flow detention time= 360.9 min calculated for 657 cf (100% of inflow)  
 Center-of-Mass det. time= 360.8 min ( 1,263.7 - 902.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	171.40'	98 cf	<b>10.67'D x 5.00'H Vertical Cone/Cylinder</b> 447 cf Overall - 201 cf Embedded = 246 cf x 40.0% Voids
#2	172.40'	140 cf	<b>6.67'D x 4.00'H Vertical Cone/Cylinder</b> Inside #1 201 cf Overall - 8.0" Wall Thickness = 140 cf
#3	176.40'	168 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
		406 cf	x 2.00 = 812 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
176.40	29	0	0
177.40	29	29	29
177.50	2,752	139	168

Device	Routing	Invert	Outlet Devices
#1	Discarded	171.40'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 12.00 hrs HW=171.52' (Free Discharge)  
 ↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

## Proposed

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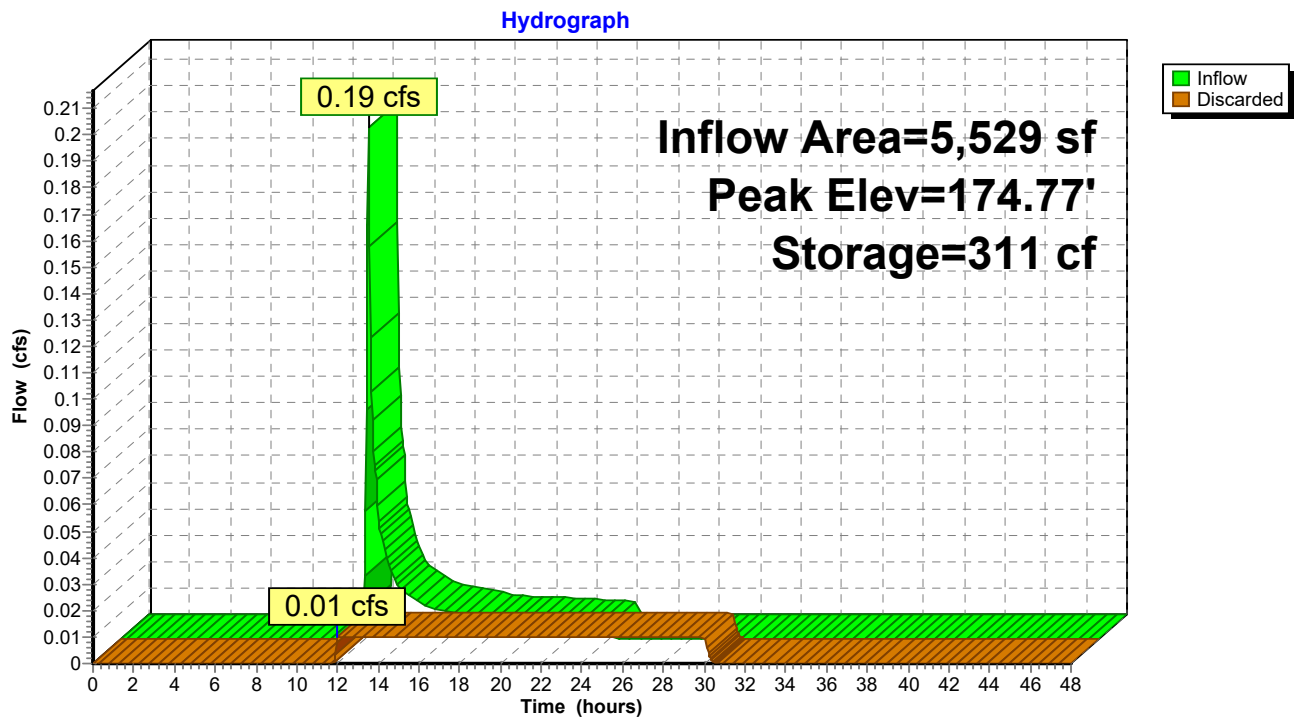
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NOAA 24-hr C 100-Year Rainfall=7.97"

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### Pond DW1-2: DRYWELLS 1&2



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NOAA 24-hr C 100-Year Rainfall=7.97"

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**Summary for Pond DW3-4-5: DRYWELLS 3,4,5**

Inflow Area = 9,693 sf, 3.61% Impervious, Inflow Depth = 1.33" for 100-Year event  
 Inflow = 0.31 cfs @ 12.15 hrs, Volume= 1,075 cf  
 Outflow = 0.01 cfs @ 12.00 hrs, Volume= 1,075 cf, Atten= 95%, Lag= 0.0 min  
 Discarded = 0.01 cfs @ 12.00 hrs, Volume= 1,075 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 173.26' @ 17.03 hrs Surf.Area= 268 sf Storage= 526 cf

Plug-Flow detention time= 407.6 min calculated for 1,074 cf (100% of inflow)  
 Center-of-Mass det. time= 407.6 min ( 1,315.1 - 907.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	169.50'	98 cf	<b>10.67'D x 5.00'H Vertical Cone/Cylinder</b> 447 cf Overall - 201 cf Embedded = 246 cf x 40.0% Voids
#2	170.50'	140 cf	<b>6.67'D x 4.00'H Vertical Cone/Cylinder</b> Inside #1 201 cf Overall - 8.0" Wall Thickness = 140 cf
#3	174.50'	490 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
		728 cf	x 3.00 = 2,183 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
174.50	29	0	0
175.50	29	29	29
176.00	1,813	461	490

Device	Routing	Invert	Outlet Devices
#1	Discarded	169.50'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 12.00 hrs HW=169.59' (Free Discharge)  
 ↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

## Proposed

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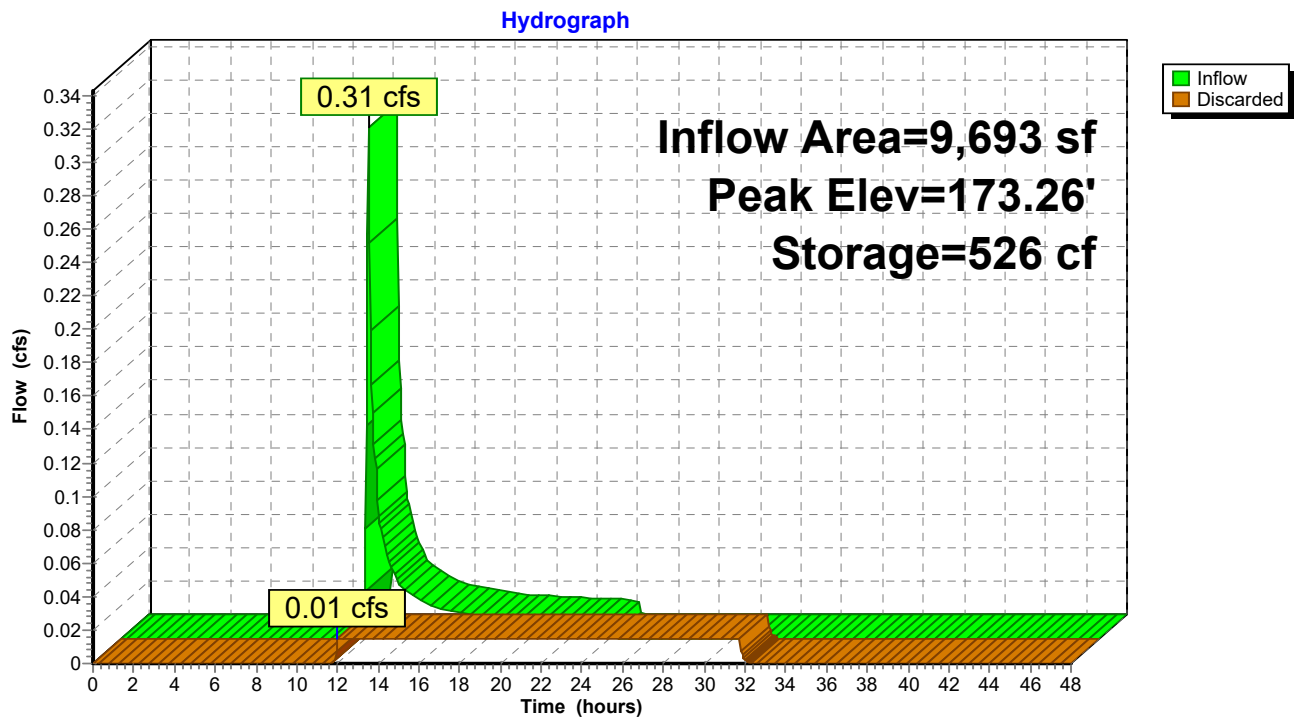
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NOAA 24-hr C 100-Year Rainfall=7.97"

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### Pond DW3-4-5: DRYWELLS 3,4,5



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**Summary for Pond UG-1: Underground Infiltration System**

Inflow Area = 60,886 sf, 93.21% Impervious, Inflow Depth = 7.25" for 100-Year event  
 Inflow = 11.35 cfs @ 12.13 hrs, Volume= 36,796 cf  
 Outflow = 0.49 cfs @ 10.50 hrs, Volume= 36,796 cf, Atten= 96%, Lag= 0.0 min  
 Discarded = 0.49 cfs @ 10.50 hrs, Volume= 36,796 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
 Peak Elev= 182.19' @ 14.08 hrs Surf.Area= 8,785 sf Storage= 18,022 cf

Plug-Flow detention time= 309.2 min calculated for 36,758 cf (100% of inflow)  
 Center-of-Mass det. time= 309.2 min ( 1,072.0 - 762.8 )

Volume	Invert	Avail.Storage	Storage Description
#1A	179.00'	7,760 cf	<b>63.25'W x 138.90'L x 3.50'H Field A</b> 30,748 cf Overall - 11,347 cf Embedded = 19,401 cf x 40.0% Voids
#2A	179.50'	11,347 cf	<b>ADS_StormTech SC-740 +Cap</b> x 247 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 247 Chambers in 13 Rows
		19,108 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	179.00'	<b>2.410 in/hr Exfiltration over Horizontal area</b>

**Discarded OutFlow** Max=0.49 cfs @ 10.50 hrs HW=179.04' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.49 cfs)

## Proposed

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### Pond UG-1: Underground Infiltration System - Chamber Wizard Field A

**Chamber Model = ADS\_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)**

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

19 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 136.90' Row Length +12.0" End Stone x 2 = 138.90' Base Length

13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

247 Chambers x 45.9 cf = 11,347.2 cf Chamber Storage

30,748.2 cf Field - 11,347.2 cf Chambers = 19,401.1 cf Stone x 40.0% Voids = 7,760.4 cf Stone Storage

Chamber Storage + Stone Storage = 19,107.6 cf = 0.439 af

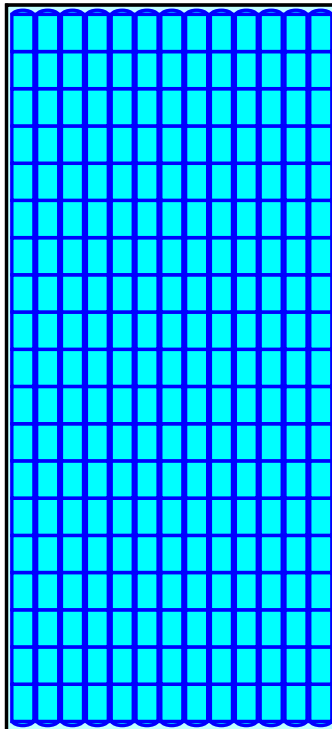
Overall Storage Efficiency = 62.1%

Overall System Size = 138.90' x 63.25' x 3.50'

247 Chambers

1,138.8 cy Field

718.6 cy Stone



## Proposed

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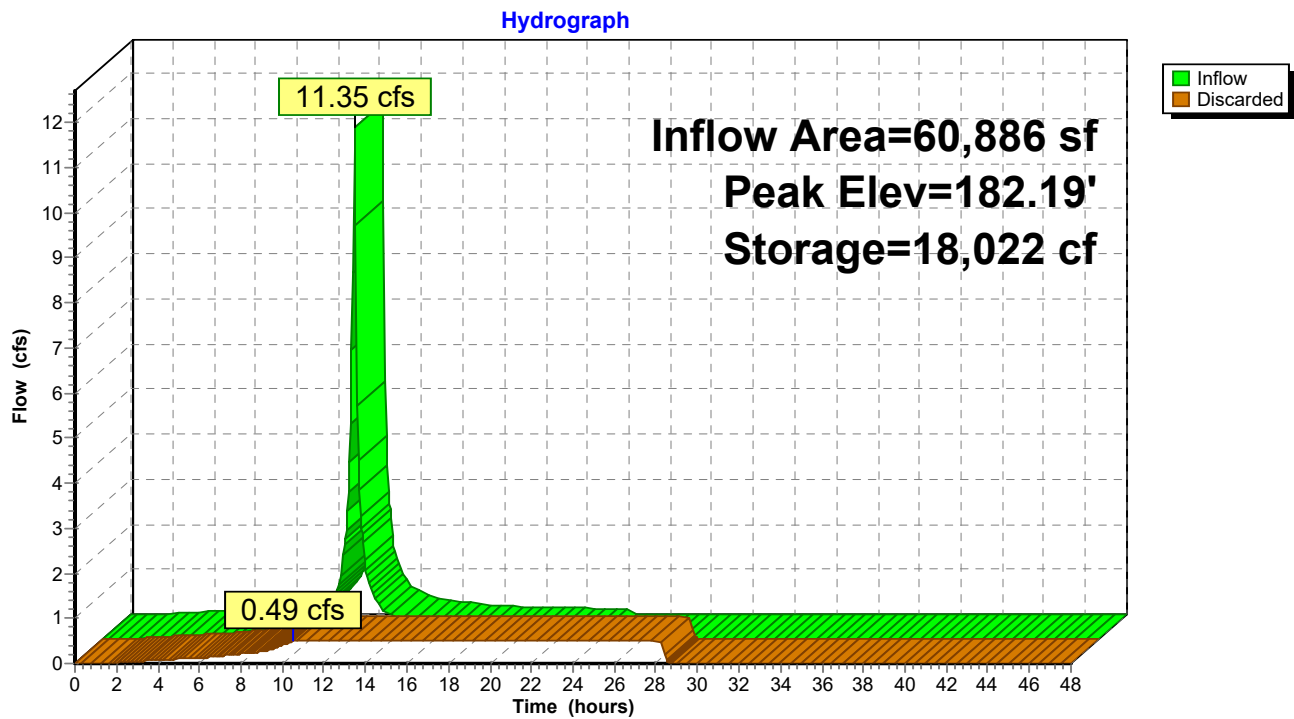
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### Pond UG-1: Underground Infiltration System





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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

<b>Subcatchment SUB-1:</b>	Runoff Area=5,695 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=155' Tc=6.9 min CN=39 Runoff=0.00 cfs 0 cf
<b>Subcatchment SUB-2A:</b>	Runoff Area=28,101 sf 60.43% Impervious Runoff Depth=0.03" Tc=6.0 min CN=75 Runoff=0.00 cfs 71 cf
<b>Subcatchment SUB-2B:</b>	Runoff Area=7,532 sf 39.46% Impervious Runoff Depth=0.00" Tc=6.0 min CN=62 Runoff=0.00 cfs 0 cf
<b>Subcatchment SUB-3:</b>	Runoff Area=3,787 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=67' Tc=9.4 min CN=34 Runoff=0.00 cfs 0 cf
<b>Subcatchment SUB-4A:</b>	Runoff Area=60,886 sf 93.21% Impervious Runoff Depth=0.50" Tc=6.0 min CN=94 Runoff=0.86 cfs 2,556 cf
<b>Subcatchment SUB-4B:</b>	Runoff Area=5,529 sf 4.41% Impervious Runoff Depth=0.00" Tc=6.0 min CN=42 Runoff=0.00 cfs 0 cf
<b>Subcatchment SUB-4C:</b>	Runoff Area=9,693 sf 3.61% Impervious Runoff Depth=0.00" Tc=6.0 min CN=41 Runoff=0.00 cfs 0 cf
<b>Subcatchment SUB-4D:</b>	Runoff Area=1,864 sf 0.00% Impervious Runoff Depth=0.00" Tc=6.0 min CN=39 Runoff=0.00 cfs 0 cf
<b>Reach DP-1: (new Reach)</b>	Inflow=0.00 cfs 0 cf Outflow=0.00 cfs 0 cf
<b>Reach DP-2: (new Reach)</b>	Inflow=0.00 cfs 71 cf Outflow=0.00 cfs 71 cf
<b>Reach DP-3: (new Reach)</b>	Inflow=0.00 cfs 0 cf Outflow=0.00 cfs 0 cf
<b>Reach DP-4: Cypress Street</b>	Inflow=0.00 cfs 0 cf Outflow=0.00 cfs 0 cf
<b>Pond DW1-2: DRYWELLS 1&amp;2</b>	Peak Elev=171.40' Storage=0 cf Inflow=0.00 cfs 0 cf Outflow=0.00 cfs 0 cf
<b>Pond DW3-4-5: DRYWELLS 3,4,5</b>	Peak Elev=169.50' Storage=0 cf Inflow=0.00 cfs 0 cf Outflow=0.00 cfs 0 cf
<b>Pond UG-1: Underground Infiltration System</b>	Peak Elev=179.07' Storage=244 cf Inflow=0.86 cfs 2,556 cf Outflow=0.49 cfs 2,556 cf

**Total Runoff Area = 123,087 sf Runoff Volume = 2,627 cf Average Runoff Depth = 0.26"**  
**37.20% Pervious = 45,790 sf 62.80% Impervious = 77,297 sf**

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**Summary for Subcatchment SUB-1:**

[45] Hint: Runoff=Zero

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

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NRCC 24-hr C Custom Rainfall=1.00"

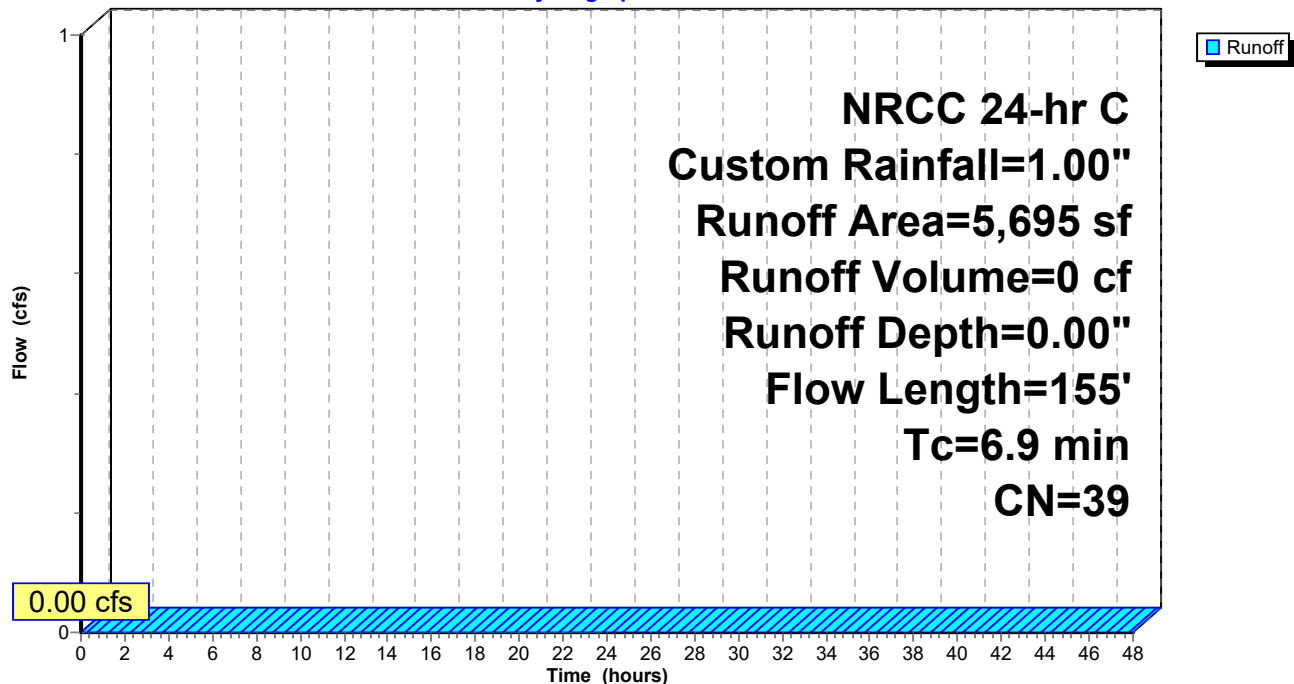
Area (sf)	CN	Description
5,695	39	>75% Grass cover, Good, HSG A
5,695		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	50	0.0350	0.13		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.36"
0.5	105	0.0500	3.60		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
6.9	155	Total			

**Subcatchment SUB-1:**

Hydrograph



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**Summary for Subcatchment SUB-2A:**

Runoff = 0.00 cfs @ 13.26 hrs, Volume= 71 cf, Depth= 0.03"

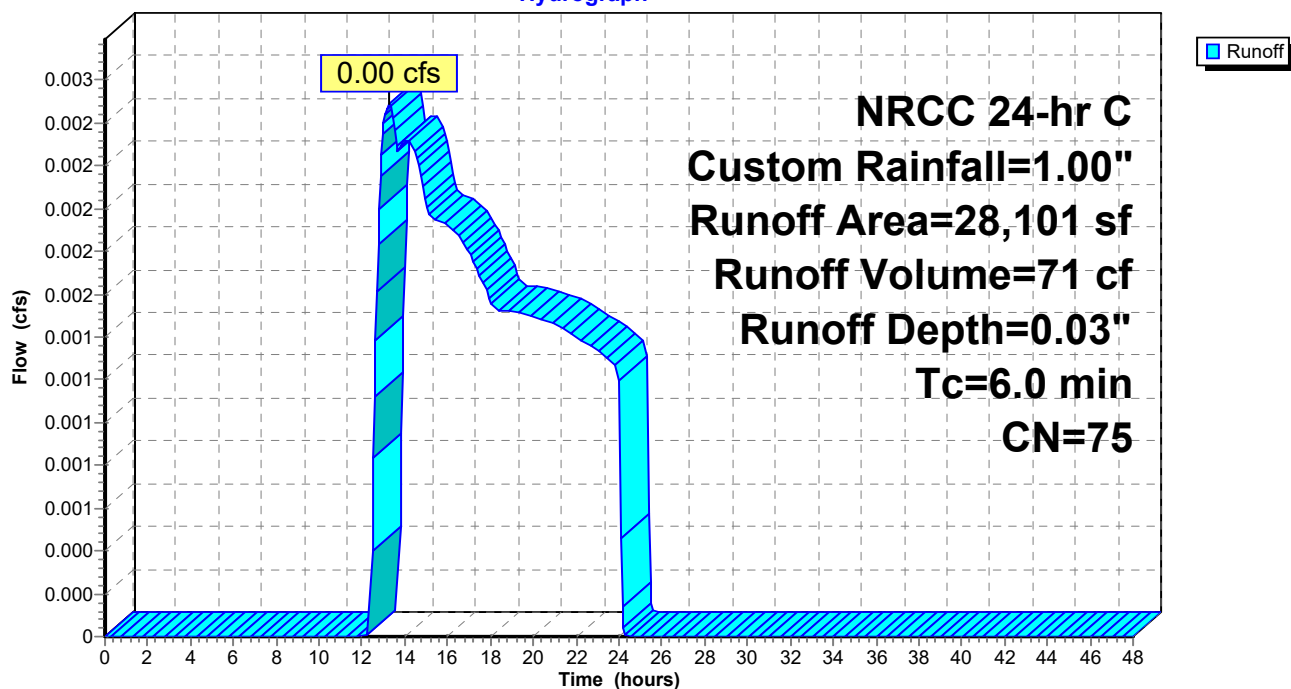
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NRCC 24-hr C Custom Rainfall=1.00"

Area (sf)	CN	Description
13,100	98	Paved parking, HSG A
* 1,667	98	Concrete, HSG A
2,214	98	Roofs, HSG A
11,120	39	>75% Grass cover, Good, HSG A
28,101	75	Weighted Average
11,120		39.57% Pervious Area
16,981		60.43% Impervious Area

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

**Subcatchment SUB-2A:**

Hydrograph



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**Summary for Subcatchment SUB-2B:**

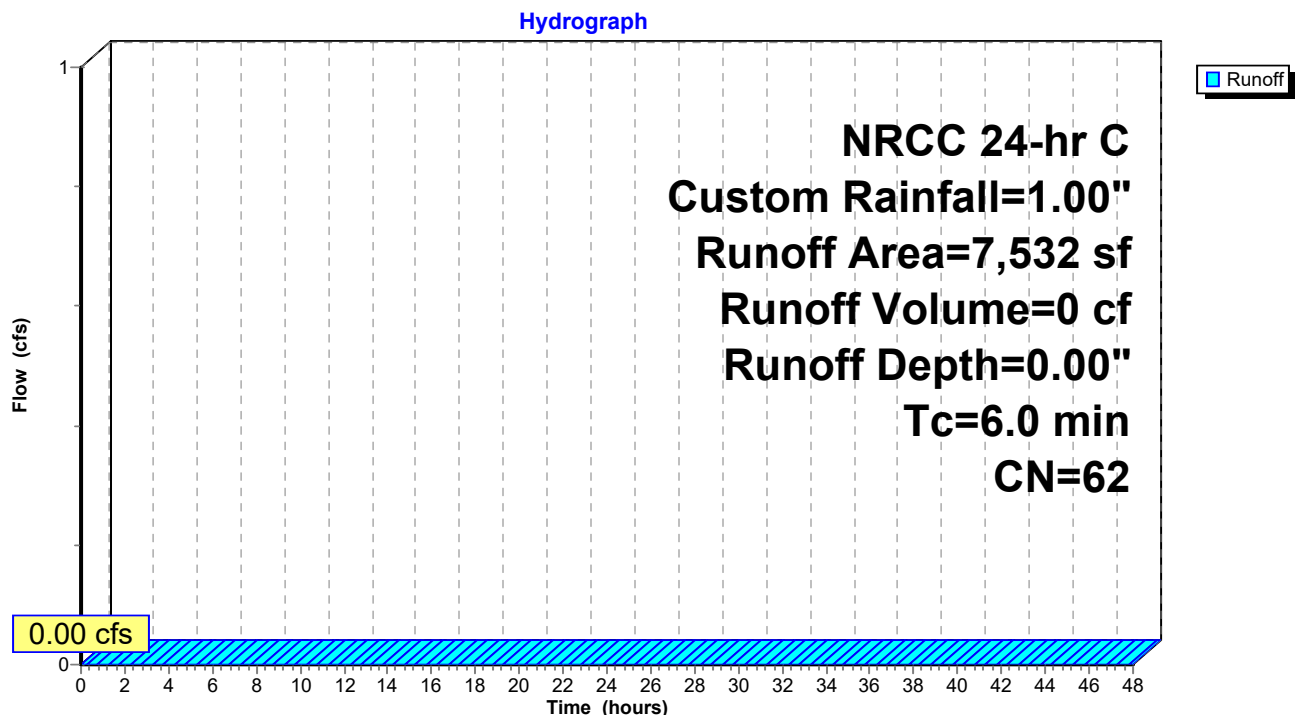
[45] Hint: Runoff=Zero

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

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NRCC 24-hr C Custom Rainfall=1.00"

Area (sf)	CN	Description
2,972	98	Paved parking, HSG A
4,560	39	>75% Grass cover, Good, HSG A
7,532	62	Weighted Average
4,560		60.54% Pervious Area
2,972		39.46% Impervious Area

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

**Subcatchment SUB-2B:**

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NRCC 24-hr C Custom Rainfall=1.00"

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**Summary for Subcatchment SUB-3:**

[45] Hint: Runoff=Zero

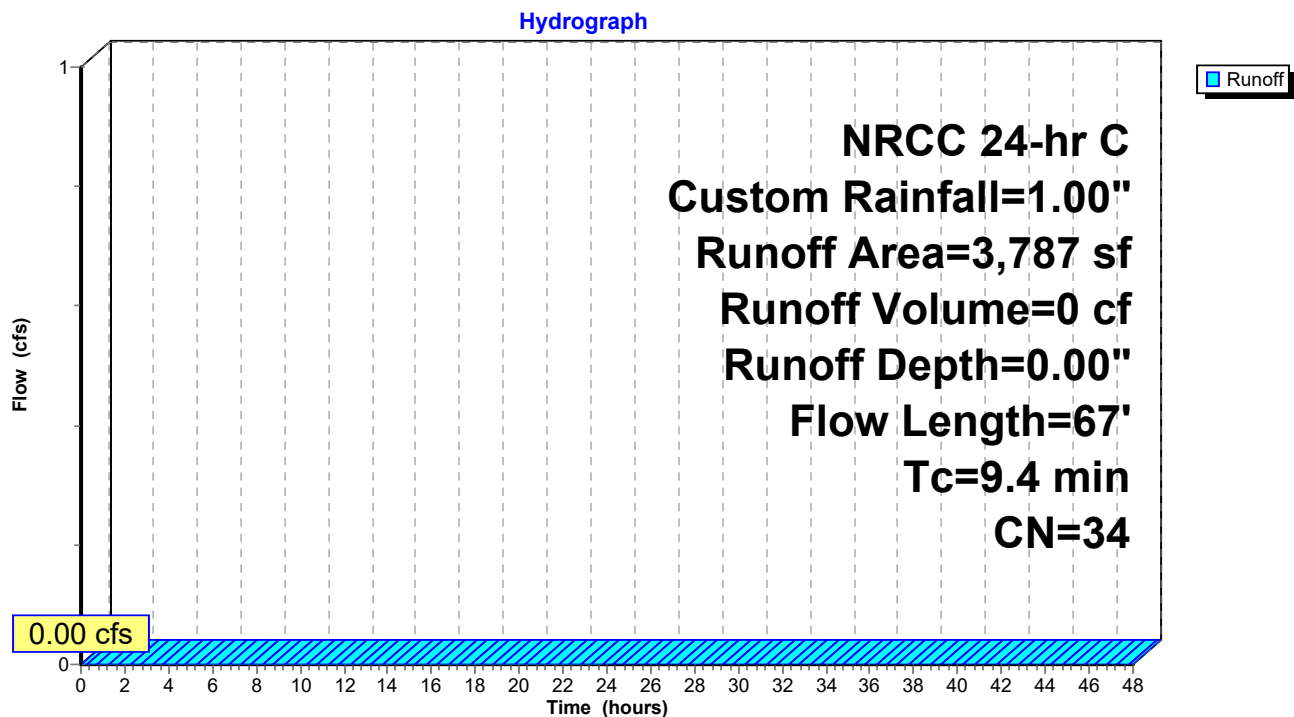
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NRCC 24-hr C Custom Rainfall=1.00"

Area (sf)	CN	Description
1,728	39	>75% Grass cover, Good, HSG A
2,059	30	Woods, Good, HSG A
3,787	34	Weighted Average
3,787		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0380	0.09		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.36"
0.1	17	0.0300	2.79		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
9.4	67	Total			

**Subcatchment SUB-3:**

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**Summary for Subcatchment SUB-4A:**

Runoff = 0.86 cfs @ 12.13 hrs, Volume= 2,556 cf, Depth= 0.50"

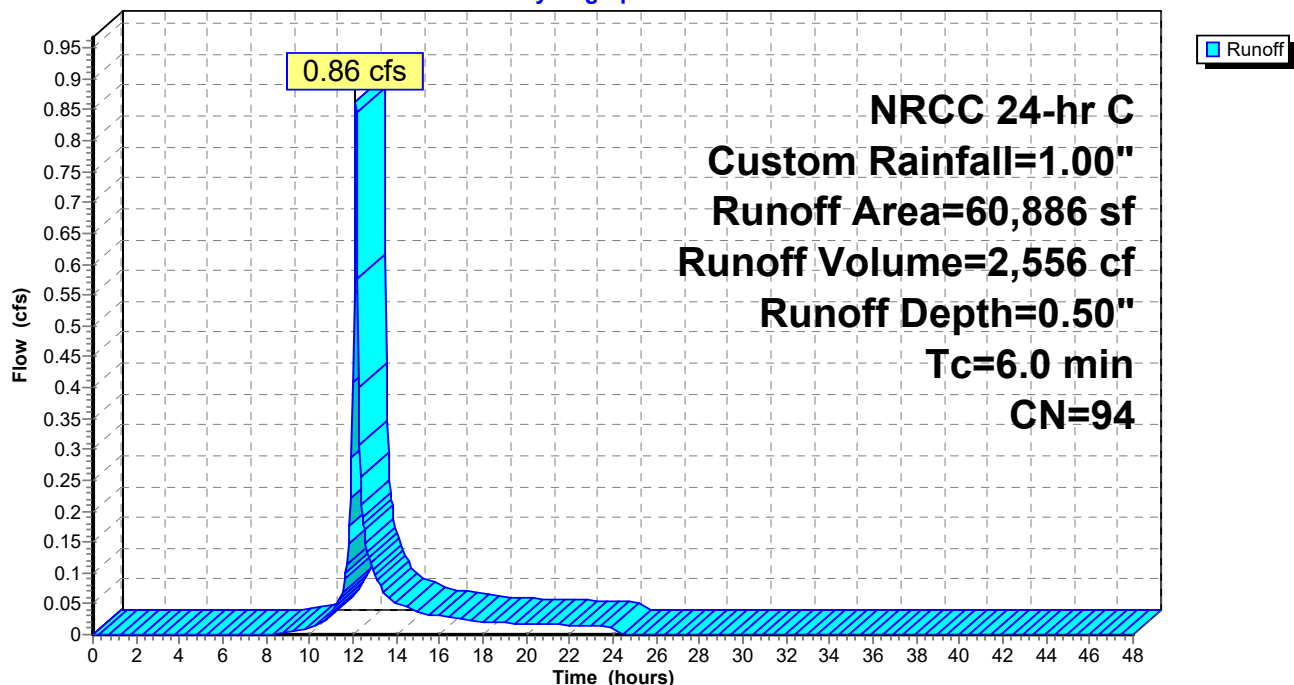
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NRCC 24-hr C Custom Rainfall=1.00"

Area (sf)	CN	Description
10,017	98	Roofs, HSG A
44,418	98	Paved parking, HSG A
* 2,315	98	Concrete, HSG A
4,136	39	>75% Grass cover, Good, HSG A
60,886	94	Weighted Average
4,136		6.79% Pervious Area
56,750		93.21% Impervious Area

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

**Subcatchment SUB-4A:**

Hydrograph



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**Summary for Subcatchment SUB-4B:**

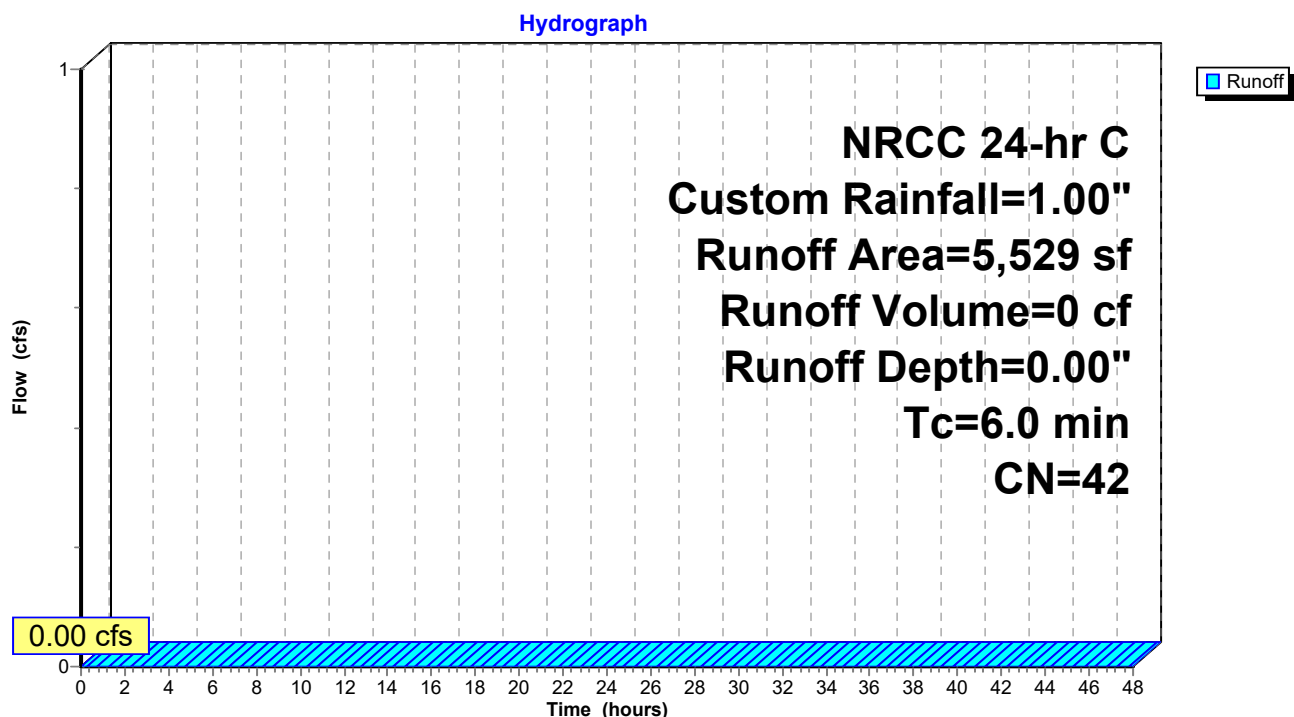
[45] Hint: Runoff=Zero

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

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NRCC 24-hr C Custom Rainfall=1.00"

Area (sf)	CN	Description
* 244	98	Concrete, HSG A
5,285	39	>75% Grass cover, Good, HSG A
5,529	42	Weighted Average
5,285		95.59% Pervious Area
244		4.41% Impervious Area

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

**Subcatchment SUB-4B:**

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**Summary for Subcatchment SUB-4C:**

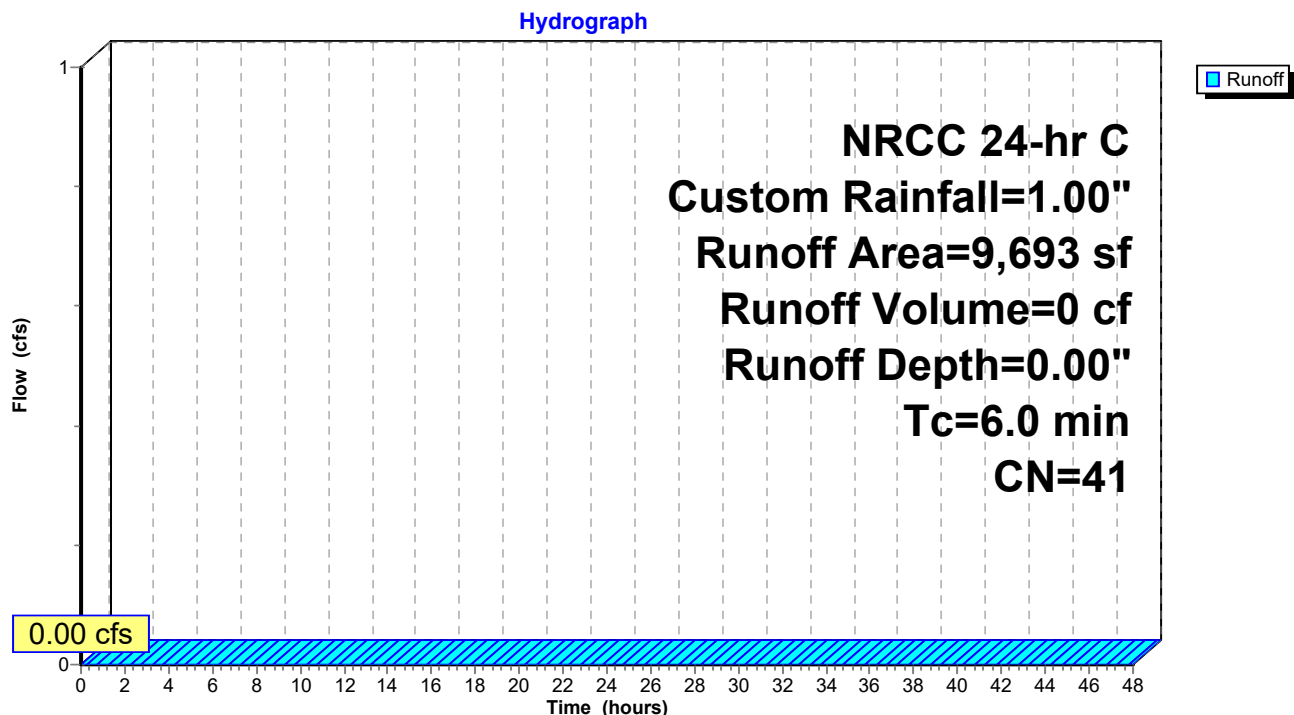
[45] Hint: Runoff=Zero

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

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NRCC 24-hr C Custom Rainfall=1.00"

	Area (sf)	CN	Description
*	350	98	Concrete, HSG A
	9,343	39	>75% Grass cover, Good, HSG A
	9,693	41	Weighted Average
	9,343		96.39% Pervious Area
	350		3.61% Impervious Area

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

**Subcatchment SUB-4C:**



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**Summary for Subcatchment SUB-4D:**

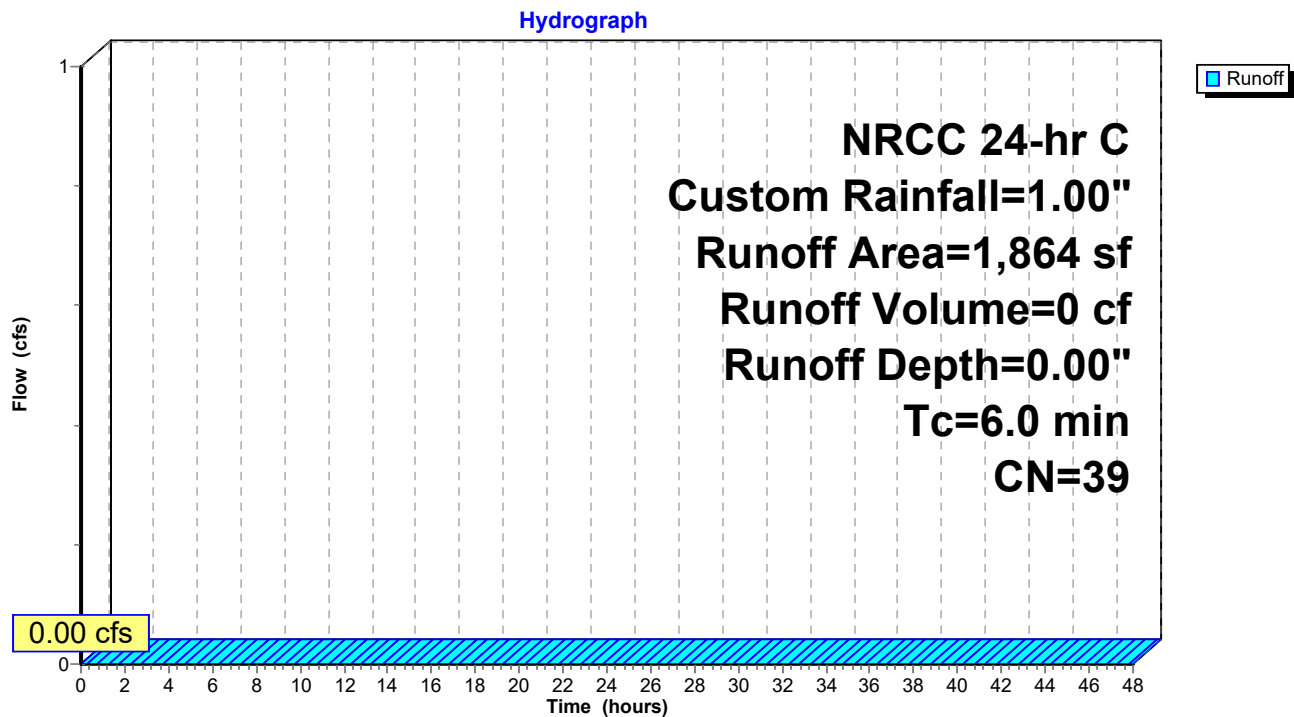
[45] Hint: Runoff=Zero

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

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
NRCC 24-hr C Custom Rainfall=1.00"

Area (sf)	CN	Description
1,864	39	>75% Grass cover, Good, HSG A
1,864		100.00% Pervious Area

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

**Subcatchment SUB-4D:**

## Proposed

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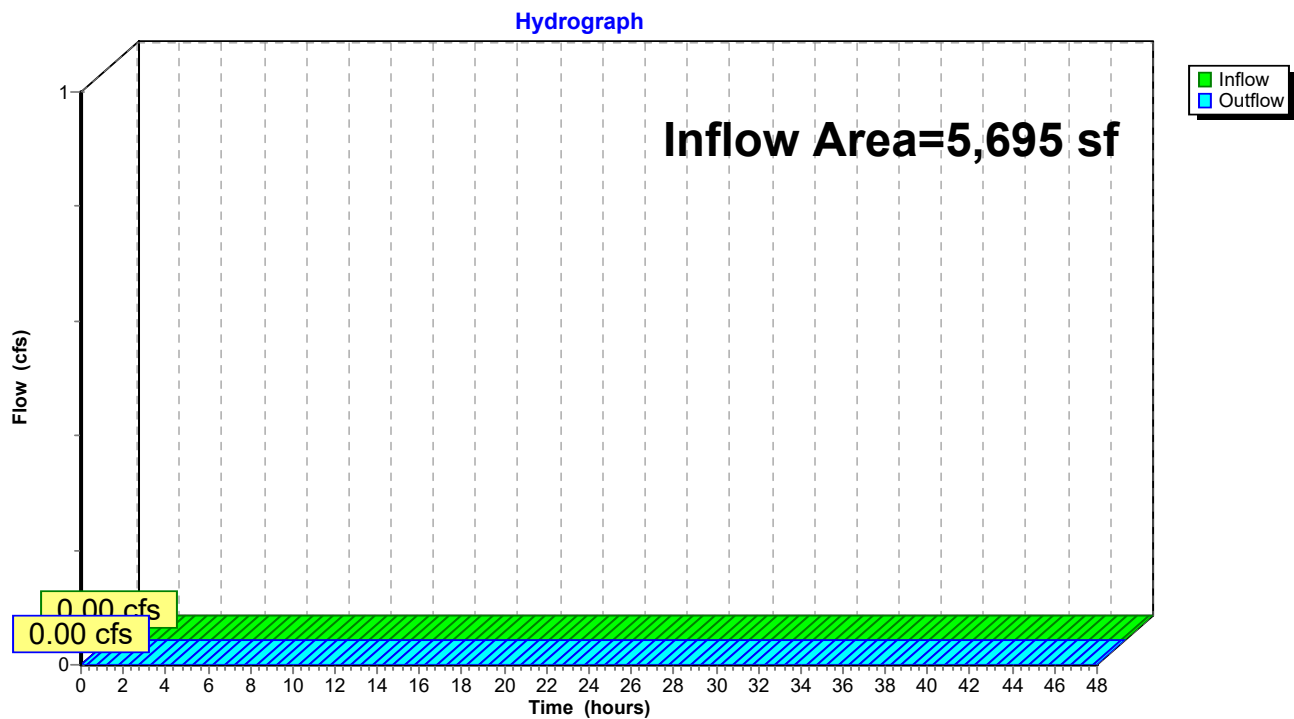
### Summary for Reach DP-1: (new Reach)

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

Inflow Area = 5,695 sf, 0.00% Impervious, Inflow Depth = 0.00" for Custom event  
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-1: (new Reach)



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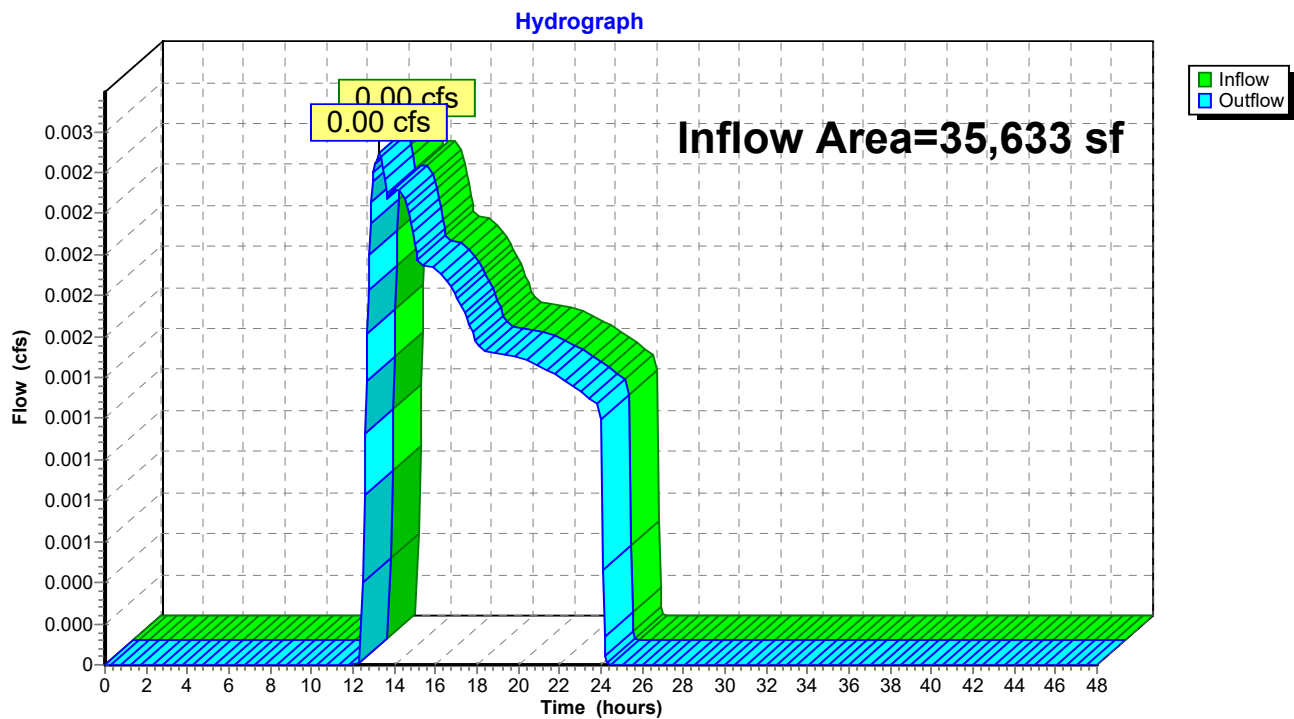
### Summary for Reach DP-2: (new Reach)

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

Inflow Area = 35,633 sf, 56.00% Impervious, Inflow Depth = 0.02" for Custom event  
Inflow = 0.00 cfs @ 13.26 hrs, Volume= 71 cf  
Outflow = 0.00 cfs @ 13.26 hrs, Volume= 71 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-2: (new Reach)



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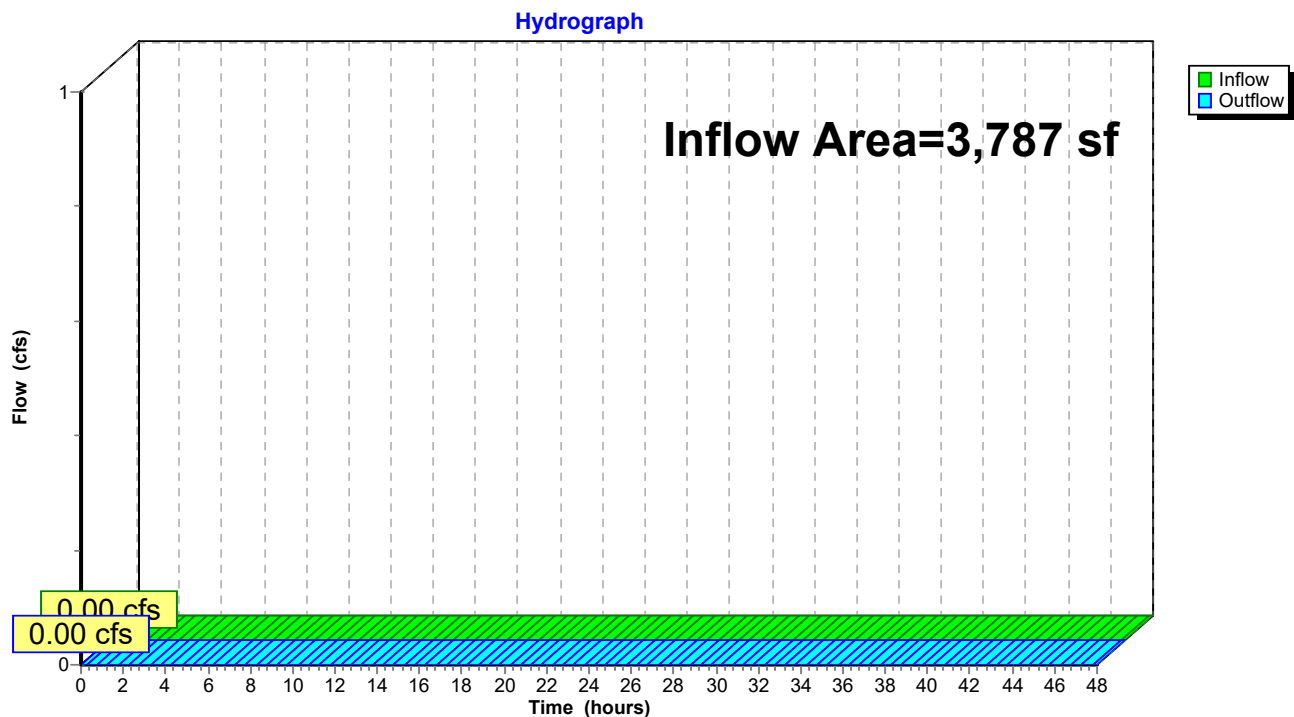
### Summary for Reach DP-3: (new Reach)

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

Inflow Area = 3,787 sf, 0.00% Impervious, Inflow Depth = 0.00" for Custom event  
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-3: (new Reach)



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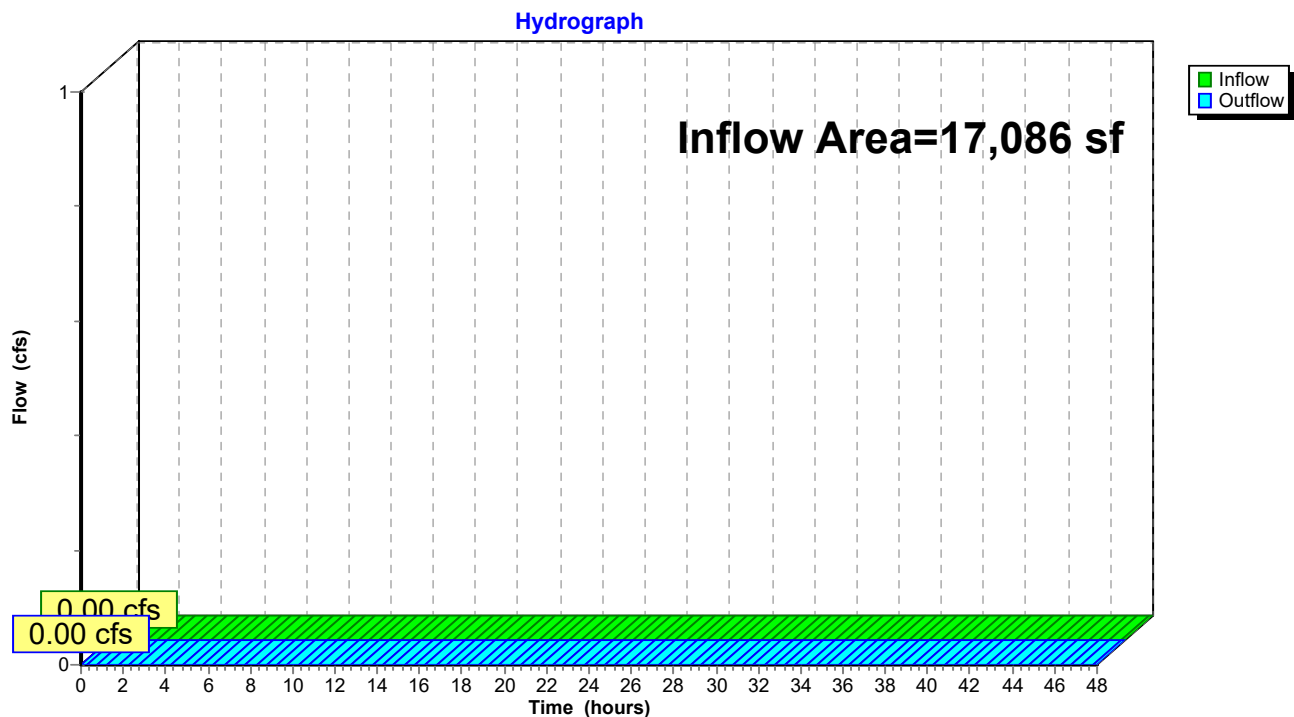
### Summary for Reach DP-4: Cypress Street

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

Inflow Area = 17,086 sf, 3.48% Impervious, Inflow Depth = 0.00" for Custom event  
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

### Reach DP-4: Cypress Street



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**Summary for Pond DW1-2: DRYWELLS 1&2**

Inflow Area = 5,529 sf, 4.41% Impervious, Inflow Depth = 0.00" for Custom event  
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2

Peak Elev= 171.40' @ 0.00 hrs Surf.Area= 179 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)

Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	171.40'	98 cf	<b>10.67'D x 5.00'H Vertical Cone/Cylinder</b> 447 cf Overall - 201 cf Embedded = 246 cf x 40.0% Voids
#2	172.40'	140 cf	<b>6.67'D x 4.00'H Vertical Cone/Cylinder</b> Inside #1 201 cf Overall - 8.0" Wall Thickness = 140 cf
#3	176.40'	168 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
		406 cf	x 2.00 = 812 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
176.40	29	0	0
177.40	29	29	29
177.50	2,752	139	168

Device	Routing	Invert	Outlet Devices
#1	Discarded	171.40'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=171.40' (Free Discharge)↑**1=Exfiltration** (Passes 0.00 cfs of 0.01 cfs potential flow)

**Proposed**

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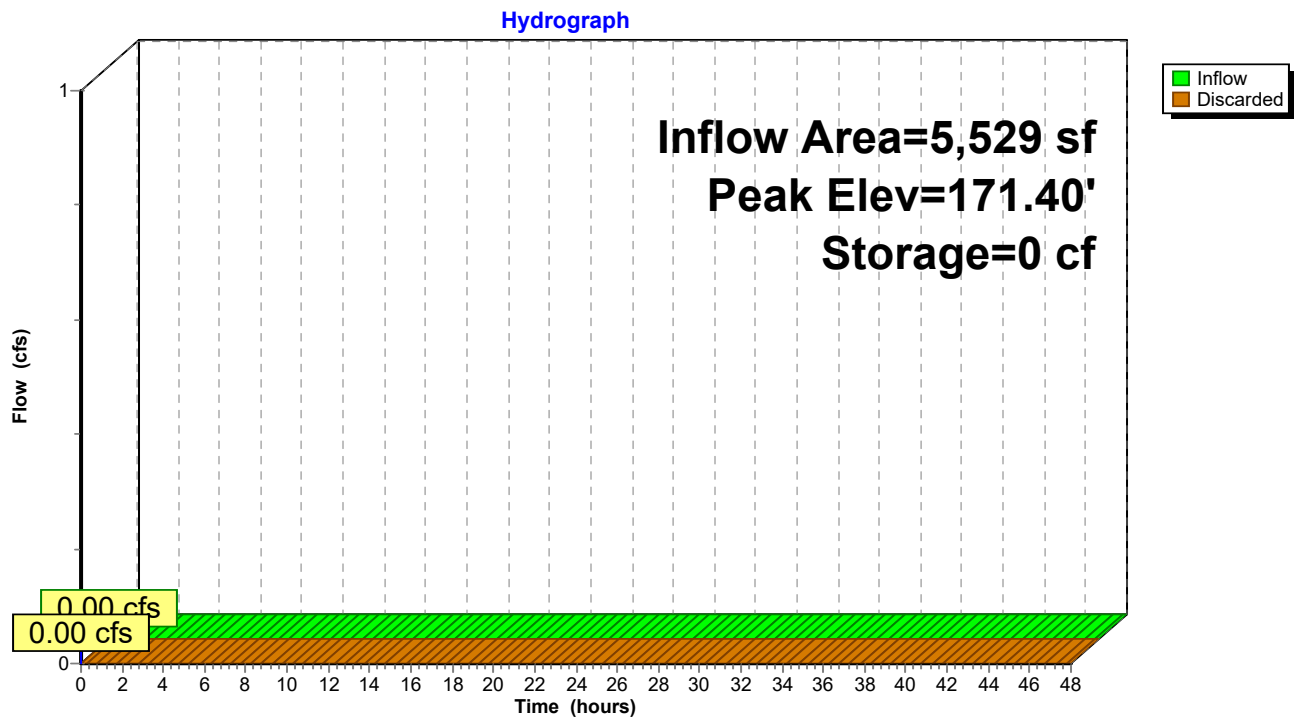
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**Pond DW1-2: DRYWELLS 1&2**



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**Summary for Pond DW3-4-5: DRYWELLS 3,4,5**

Inflow Area = 9,693 sf, 3.61% Impervious, Inflow Depth = 0.00" for Custom event  
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min  
 Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 169.50' @ 0.00 hrs Surf.Area= 268 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	169.50'	98 cf	<b>10.67'D x 5.00'H Vertical Cone/Cylinder</b> 447 cf Overall - 201 cf Embedded = 246 cf x 40.0% Voids
#2	170.50'	140 cf	<b>6.67'D x 4.00'H Vertical Cone/Cylinder</b> Inside #1 201 cf Overall - 8.0" Wall Thickness = 140 cf
#3	174.50'	490 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
		728 cf	x 3.00 = 2,183 cf Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
174.50	29	0	0
175.50	29	29	29
176.00	1,813	461	490

Device	Routing	Invert	Outlet Devices
#1	Discarded	169.50'	<b>2.410 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.00 cfs @ 0.00 hrs HW=169.50' (Free Discharge)  
 ↑**1=Exfiltration** (Passes 0.00 cfs of 0.01 cfs potential flow)



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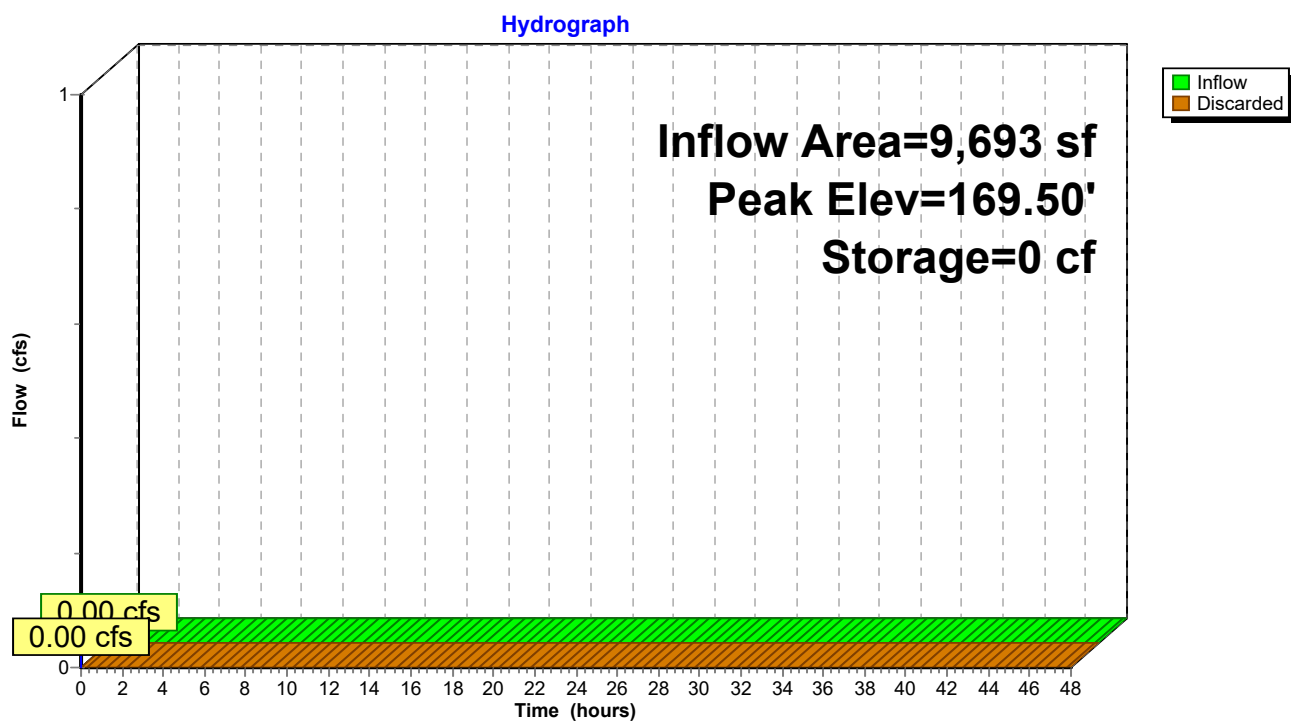
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**Pond DW3-4-5: DRYWELLS 3,4,5**



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**Summary for Pond UG-1: Underground Infiltration System**

Inflow Area = 60,886 sf, 93.21% Impervious, Inflow Depth = 0.50" for Custom event  
 Inflow = 0.86 cfs @ 12.13 hrs, Volume= 2,556 cf  
 Outflow = 0.49 cfs @ 12.10 hrs, Volume= 2,556 cf, Atten= 43%, Lag= 0.0 min  
 Discarded = 0.49 cfs @ 12.10 hrs, Volume= 2,556 cf

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs  
 Peak Elev= 179.07' @ 12.22 hrs Surf.Area= 8,785 sf Storage= 244 cf

Plug-Flow detention time= 4.7 min calculated for 2,553 cf (100% of inflow)  
 Center-of-Mass det. time= 4.7 min ( 847.8 - 843.0 )

Volume	Invert	Avail.Storage	Storage Description
#1A	179.00'	7,760 cf	<b>63.25'W x 138.90'L x 3.50'H Field A</b> 30,748 cf Overall - 11,347 cf Embedded = 19,401 cf x 40.0% Voids
#2A	179.50'	11,347 cf	<b>ADS_StormTech SC-740 +Cap</b> x 247 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 247 Chambers in 13 Rows
		19,108 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	179.00'	<b>2.410 in/hr Exfiltration over Horizontal area</b>

**Discarded OutFlow** Max=0.49 cfs @ 12.10 hrs HW=179.04' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.49 cfs)

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### Pond UG-1: Underground Infiltration System - Chamber Wizard Field A

**Chamber Model = ADS\_StormTech SC-740 +Cap (ADS StormTech® SC-740 with cap length)**

Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf

Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

19 Chambers/Row x 7.12' Long +0.81' Cap Length x 2 = 136.90' Row Length +12.0" End Stone x 2 = 138.90' Base Length

13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width

6.0" Base + 30.0" Chamber Height + 6.0" Cover = 3.50' Field Height

247 Chambers x 45.9 cf = 11,347.2 cf Chamber Storage

30,748.2 cf Field - 11,347.2 cf Chambers = 19,401.1 cf Stone x 40.0% Voids = 7,760.4 cf Stone Storage

Chamber Storage + Stone Storage = 19,107.6 cf = 0.439 af

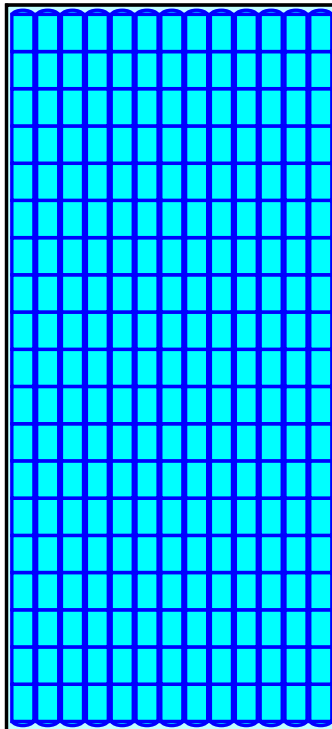
Overall Storage Efficiency = 62.1%

Overall System Size = 138.90' x 63.25' x 3.50'

247 Chambers

1,138.8 cy Field

718.6 cy Stone



## Proposed

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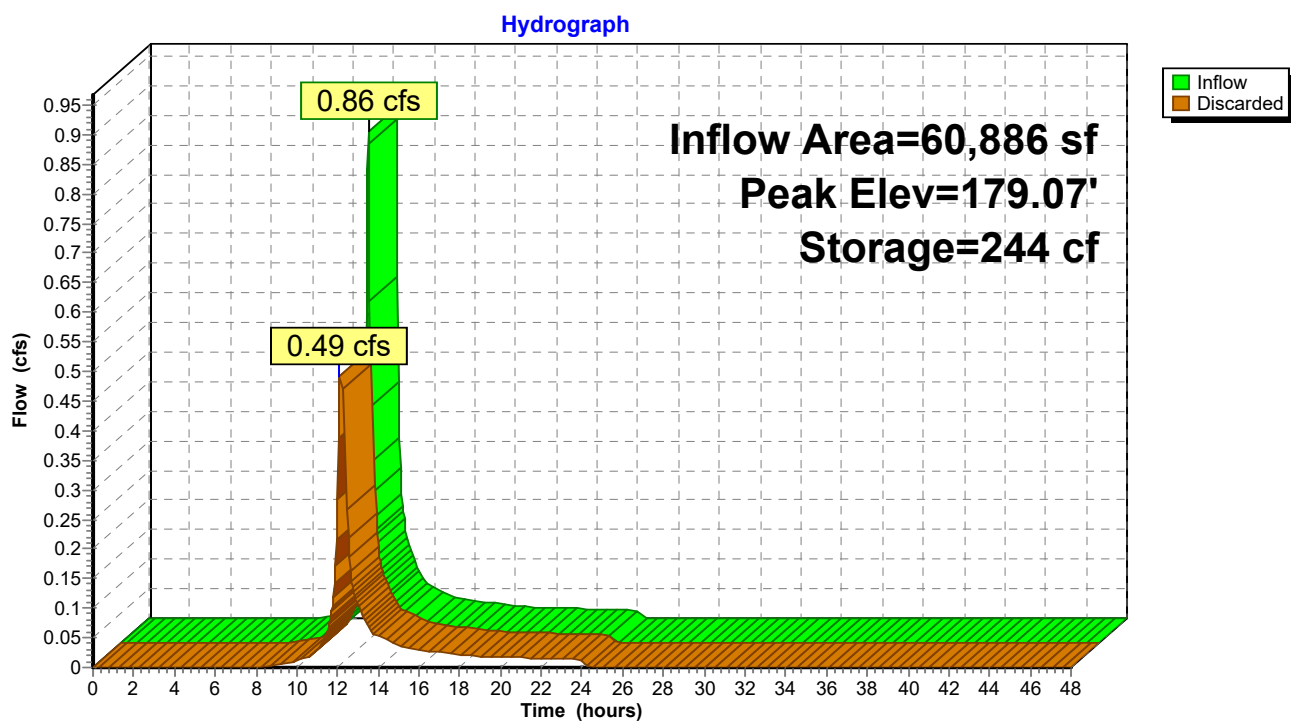
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### Pond UG-1: Underground Infiltration System



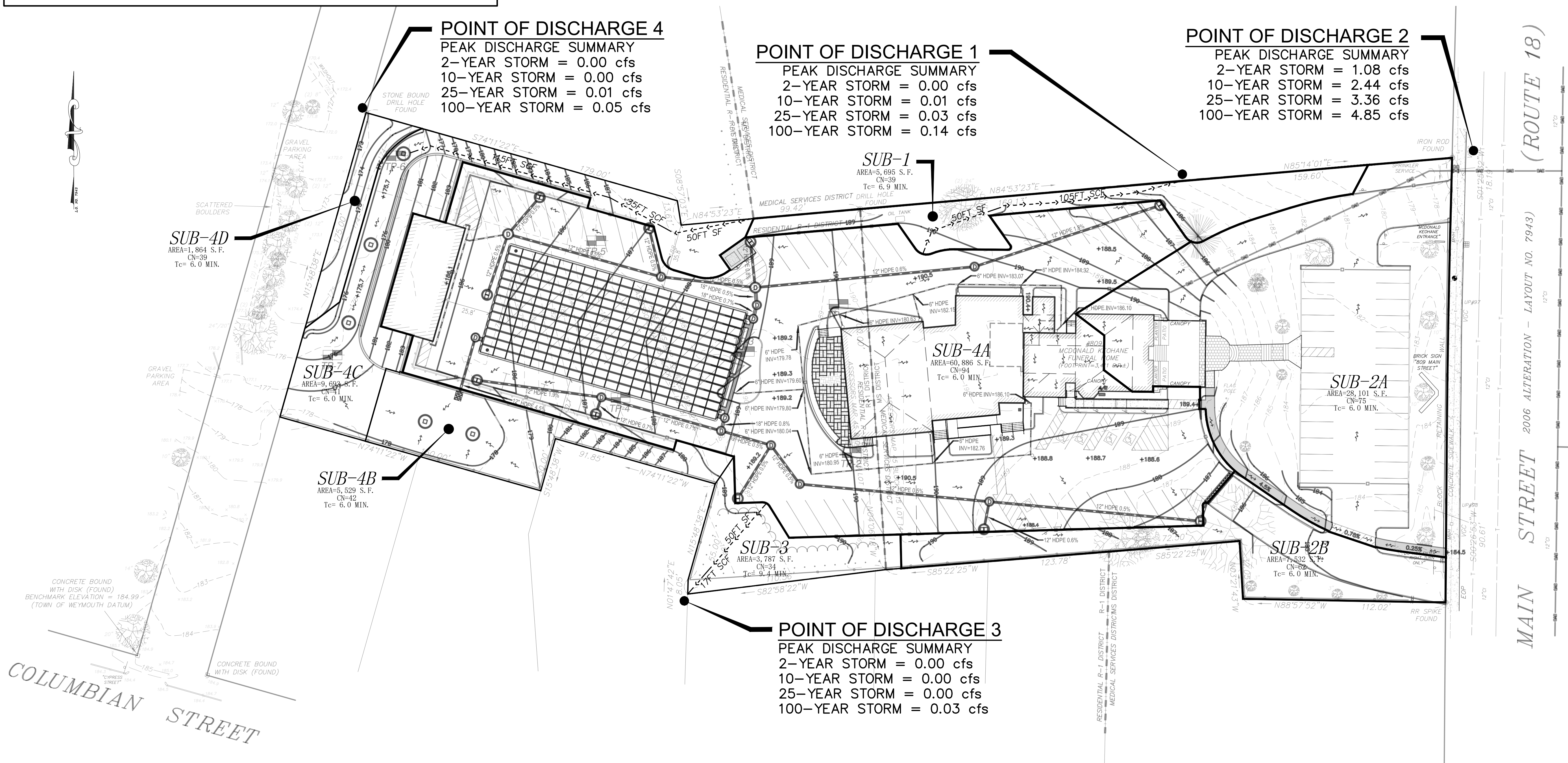


SOIL TEST DATA  
SOIL TESTING AND EVALUATION BY: DAVID NEWMAN S.E. #14226  
SOIL TESTING WITNESSED BY: UNWITNESSED  
DATE: NOVEMBER 24, 2020

TP-1	APPROX. GRADE EL. 189.5	TP-2	APPROX. GRADE EL. 189.6	TP-3	APPROX. GRADE EL. 189.0	TP-4	APPROX. GRADE EL. 186.5	TP-5	APPROX. GRADE EL. 186.2	TP-6	APPROX. GRADE EL. 174.5	TP-7	APPROX. GRADE EL. 176.4
EL. 188.2	A HORIZON LOAMY SAND 10YR 3/2	EL. 188.3	A HORIZON LOAMY SAND 10YR 3/2	EL. 185.3	FILL	EL. 182.5	FILL	EL. 188.3	A HORIZON LOAMY SAND 10YR 3/2	EL. 173.5	A HORIZON LOAMY SAND 10YR 3/2	EL. 173.5	A HORIZON LOAMY SAND 10YR 3/2
EL. 186.8	B HORIZON LOAMY SAND 10YR 5/8	EL. 187.1	B HORIZON LOAMY SAND 10YR 5/8	EL. 177.0	C1 HORIZON SAND 2.5Y 6/2	EL. 174.0	C1 HORIZON SAND 2.5Y 6/2	EL. 187.1	B HORIZON LOAMY SAND 10YR 5/8	EL. 172.5	B HORIZON LOAMY SAND 10YR 5/8	EL. 172.5	B HORIZON LOAMY SAND 10YR 5/8
EL. 185.2	B/C HORIZON LOAMY SAND 10YR 4/4	EL. 183.6	B/C HORIZON LOAMY SAND 10YR 4/4					EL. 183.6	C1 HORIZON SAND 2.5Y 5/3	EL. 169.0	C HORIZON LOAMY SAND 10YR 4/4	EL. 169.0	C HORIZON LOAMY SAND 10YR 4/4
EL. 176.5	C1 HORIZON SAND 2.5Y 6/2	EL. 176.1	C1 HORIZON SAND 2.5Y 6/2							EL. 164.5	C2 HORIZON SAND 2.5Y 5/3	EL. 166.4	C2 HORIZON SAND 2.5Y 5/3
MOTTILING OBSERVED: NONE WEAVING OBSERVED: NONE E.S.H.G.W.: >156"		MOTTILING OBSERVED: 120" (EL. 179.6) WEAVING OBSERVED: NONE E.S.H.G.W.: 120" (EL. 179.6)		MOTTILING OBSERVED: 132" (EL. 178.0) WEAVING OBSERVED: NONE E.S.H.G.W.: 132" (EL. 178.0)		MOTTILING OBSERVED: NONE WEAVING OBSERVED: NONE E.S.H.G.W.: >150"		MOTTILING OBSERVED: NONE WEAVING OBSERVED: NONE E.S.H.G.W.: >150"		MOTTILING OBSERVED: NONE WEAVING OBSERVED: NONE E.S.H.G.W.: >120"		MOTTILING OBSERVED: NONE WEAVING OBSERVED: NONE E.S.H.G.W.: >120"	

MAP UNIT SYMBOL	MAP UNIT NAME	HYDROLOGIC RATING
623C	WOODBIDGE-URBAN LAND COMPLEX, 3-15% SLOPES	D
628C	CANTON-URBAN LAND COMPLEX, 3-15% SLOPES	A
602	URBAN LAND, 0-15% SLOPES	UNRANKED

SF=SHEET FLOW  
SCF= SHALLOW CONCENTRATED FLOW



SCALE: 1" = 30'

Date	Description	No.
4-8-22	ADDRESS ENGINEERING COMMENTS	1

GABRIEL R. CROCKER  
PROFESSIONAL ENGINEER, MA REGISTRATION #47917

Crocker Design Group  
2 SHARP STREET, UNIT A  
HINGHAM, MA 02043  
P: 781-919-0808

Project  
MCDONALD-KEOHANE  
FUNERAL HOME - SOUTH  
809 MAIN STREET  
WEYMOUTH, MA 02190

Prepared for  
MCDONALD KEOHANE  
FUNERAL HOME, INC.  
785 HANCOCK STREET  
QUINCY, MA 02170

Drawing Title  
POST-CONSTRUCTION  
WATERSHED  
PLAN

Project No.	100-060	Drawing No.	WS-2
Date	02 / 04 / 2022		
Scale	SEE PLAN		
Drawn By	CM / JM		
Approved By	GRC		



## **SECTION 4 – STORMWATER MANAGEMENT CALCS**

## 4.1 RECHARGE CALCULATIONS

The Required Recharge Volume is computed using the equation provided in the 2008 Massachusetts Stormwater Handbook. The volume is computed as an equivalent depth of rainfall over the proposed impervious areas in accordance with a Target Depth Factor based on the soil classifications. The Calculations is as follows:

- $R_v = F \times \text{impervious area}$  (Equation 1) Volume 3, Ch 1, page 15
- $R_v = \text{Required Recharge Volume}$ , expressed in cubic feet, cubic yards, or acre-feet
- $F = \text{Target Depth Factor}$  associated with each Hydrologic Soil Group (HSG)
- $\text{Impervious Area} = \text{new pavement and new rooftop area}$
- *The Target Depth Factor “F” per Table 2.3.2, Volume 3, Chapter 1 for each soil classification is as follows:*
  - A soils = 0.60 inches
  - B soils = 0.35 inches
  - C soils = 0.25 inches
  - D soils = 0.10 inches

Based on the above formula, the required recharge volume for the site is as follows:

### Recharge Within “A” Soils:

- Impervious Area = 29,444 SF
- 0.6 inches x 1/12 feet x 29,444 SF = 1,472 CUBIC FEET

### **TOTAL RECHARGE VOLUME REQUIRED = 1,472 CUBIC FEET**

### Capture Area Adjustment:

19,953 S.F. of impervious does not go to recharge BMPs. Thus, the balance of impervious area, 57,344 S.F. is directed to recharge BMPs. Performing the capture area adjustment. Dividing total impervious area of 77,297 S.F. by impervious area draining to recharge areas, 57,344 S.F. yields an adjusted required recharge volume of 1.35 times the calculated amount. Thus, 1.35 x 3,865 S.F. yields an adjusted total recharge volume required of 5,218 cubic feet.

### **TOTAL RECHARGE VOLUME PROVIDED = 18,856 CUBIC FEET (see next page)**

# Recharge Volume BMP Table

<b>TOTAL RECHARGE VOLUME</b>			
<b><i>Infiltration BMP</i></b>	<b><i>Infiltration Rate (in/hr) k</i></b>	<b><i>Storage (Recharge) Volume (c.f.) Rv</i></b>	<b><i>Bottom Area (s.f.)</i></b>
<i>UG-1</i>	<i>2.41</i>	<i>18,018</i>	<i>8,785</i>
<i>DW-1&amp;2</i>	<i>2.41</i>	<i>312</i>	<i>179</i>
<i>DW-3,4,5</i>	<i>2.41</i>	<i>526</i>	<i>268</i>
<b><i>Totals</i></b>		<b><i>18,856</i></b>	
<i>k = saturated hydraulic conductivity (in/hr)</i> <i>Rv = storage volume (c.f.)</i> <i>Bottom Area (s.f.)</i> <i>Volume 3, Chapter 1 of the MA Stormwater Handbook</i>			

The Storage Recharge volume numbers provided in the table above have been derived utilizing the HydroCAD output for stage storage. The following pages provide a copy of those printouts and the cumulative stage-storage up to the controlling invert elevation has been highlighted.

## **Conclusion:**

The recharge provided by the proposed underground systems exceeds the required recharge. The project satisfies Standard 3 of the Massachusetts DEP Stormwater Regulations.



## 4.2 DRAWDOWN TIME

Below are the drawdown time calculations for the infiltration systems proposed on the site. The calculation uses estimated hydraulic conductivity values “K” in accordance with the Rawls Rates table. The formula below utilized the recommended formula per the MA Stormwater Handbook as follows:

- Drawdown Time =  $R_v / (K * \text{Bottom Area})$
- $R_v$  = Storage Volume (cf)
- K – Saturated Hydraulic Conductivity per Rawls Rate Table
- Bottom Area = Area of Bottom of Proposed Recharge Structure

Below is a summary table of the drawdown calculations:

BASIN DRAWDOWN CALCULATIONS				
<i>Infiltration BMP</i>	<i>Infiltration Rate (in/hr) k</i>	<i>Storage (Recharge) Volume (c.f.) Rv</i>	<i>Bottom Area (s.f.)</i>	<i>Draw Down Time(hours)</i>
UG-1	2.41	18,018	8,785	10.2
DW-1&2	2.41	312	179	8.7
DW-3,4,5	2.41	526	268	9.8
<b>Totals</b>		<b>18,856</b>		<b>28.7</b>
<i>k = saturated hydraulic conductivity (in/hr)</i> <i>Rv = storage volume (c.f.)</i> <i>Bottom Area (s.f.)</i> <i>Volume 3, Chapter 1 of the MA Stormwater Handbook</i>				

### Conclusion:

The calculations show that the infiltration BMP draws down in less than 72 hours, as required.

## 4.3 WATER QUALITY

A table has been provided below that provides the sizing of the proprietary water quality units selected. All the proprietary BMP's have been sized to treat 1" water quality volume (WQV) of the contributing tributary area.

Water Quality Unit Sizing Using Equivalent Flow from 1" Rainfall Depth										
Basin / WQ structure	Tributary Area (acres)	Tributary Area (sq miles)	Pervious (sf)	Impervious %	CN Value (Estimated)	WQV (In)	Tc (min)	qu (csm/in)	WQF = qu A Q (cfs)	Unit
WQU #1	0.56	0.0009	1,201	95%	96	1.00	6	795	0.66	1515-3-C
WQU #2	0.61	0.0010	2,876	89%	94	1.00	6	795	0.68	1515-3-C

The water quality calculated flow in the pipes flowing to the water quality units listed in the table above are 0.56 cfs to WQU#1 and 0.61 cfs to WQU#2 respectively. A CDS model CDS 1515-3-C is proposed to handle the treatment for both tributary areas. The unit has rated treatment capacity is 1.0 cfs and is equipped with a fiberglass separation cylinder that allows larger flows to bypass. The TSS removal rate for Water Quality Unit #1 (WQU#1) is 89.9% and 89.5% for Water Quality Unit #2 (WQU#2). Please see Section 4.5: TSS Removal for more information.

## 4.4 RIP RAP SPLASH PAD

Rip rap splash pads are designed to dissipate energy, prevent scour at the stormwater outlet, and minimize the potential for downstream erosion. A Rip Rap Splash pad calculation is not required because the underground system was designed to have no discharge up through the 100-year storm event.

### Conclusion:

However, a 20 s.f. rip rap splash pad has been provided if a storm event occurs that exceeds the rainfall depth of a 100-year storm event.

## 4.5 TSS REMOVAL

The project has been designed to comply with the required 80% TSS (minimum) removal per the Massachusetts Stormwater Regulations. Various combinations of stormwater BMPs including deep sump hooded catch basins, proprietary water quality units, subsurface infiltration and infiltration basins are utilized.

Please refer to the attached TSS calculation sheets that follow:

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NOAA 24-hr C 100-Year Rainfall=7.97"

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**Stage-Area-Storage for Pond DW1-2: DRYWELLS 1&2**

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
171.40	179	0	172.44	179	76
171.42	179	1	172.46	179	78
171.44	179	3	172.48	179	80
171.46	179	4	172.50	179	82
171.48	179	6	172.52	179	84
171.50	179	7	172.54	179	86
171.52	179	9	172.56	179	88
171.54	179	10	172.58	179	90
171.56	179	11	172.60	179	92
171.58	179	13	172.62	179	94
171.60	179	14	172.64	179	96
171.62	179	16	172.66	179	98
171.64	179	17	172.68	179	100
171.66	179	19	172.70	179	102
171.68	179	20	172.72	179	104
171.70	179	21	172.74	179	106
171.72	179	23	172.76	179	108
171.74	179	24	172.78	179	110
171.76	179	26	172.80	179	112
171.78	179	27	172.82	179	114
171.80	179	29	172.84	179	116
171.82	179	30	172.86	179	118
171.84	179	31	172.88	179	120
171.86	179	33	172.90	179	122
171.88	179	34	172.92	179	124
171.90	179	36	172.94	179	126
171.92	179	37	172.96	179	128
171.94	179	39	172.98	179	130
171.96	179	40	173.00	179	132
171.98	179	41	173.02	179	134
172.00	179	43	173.04	179	136
172.02	179	44	173.06	179	138
172.04	179	46	173.08	179	140
172.06	179	47	173.10	179	142
172.08	179	49	173.12	179	144
172.10	179	50	173.14	179	146
172.12	179	52	173.16	179	148
172.14	179	53	173.18	179	150
172.16	179	54	173.20	179	152
172.18	179	56	173.22	179	154
172.20	179	57	173.24	179	157
172.22	179	59	173.26	179	159
172.24	179	60	173.28	179	161
172.26	179	62	173.30	179	163
172.28	179	63	173.32	179	165
172.30	179	64	173.34	179	167
172.32	179	66	173.36	179	169
172.34	179	67	173.38	179	171
172.36	179	69	173.40	179	173
172.38	179	70	173.42	179	175
172.40	179	72	173.44	179	177
172.42	179	74	173.46	179	179

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NOAA 24-hr C 100-Year Rainfall=7.97"

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**Stage-Area-Storage for Pond DW1-2: DRYWELLS 1&2 (continued)**

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
173.48	179	181	174.52	179	286
173.50	179	183	174.54	179	288
173.52	179	185	174.56	179	290
173.54	179	187	174.58	179	292
173.56	179	189	174.60	179	294
173.58	179	191	174.62	179	296
173.60	179	193	174.64	179	298
173.62	179	195	174.66	179	300
173.64	179	197	174.68	179	302
173.66	179	199	174.70	179	304
173.68	179	201	174.72	179	306
173.70	179	203	174.74	179	308
173.72	179	205	174.76	179	310
173.74	179	207	174.78	179	312
173.76	179	209	174.80	179	314
173.78	179	211	174.82	179	316
173.80	179	213	174.84	179	318
173.82	179	215	174.86	179	320
173.84	179	217	174.88	179	322
173.86	179	219	174.90	179	324
173.88	179	221	174.92	179	326
173.90	179	223	174.94	179	329
173.92	179	225	174.96	179	331
173.94	179	227	174.98	179	333
173.96	179	229	175.00	179	335
173.98	179	231	175.02	179	337
174.00	179	233	175.04	179	339
174.02	179	235	175.06	179	341
174.04	179	237	175.08	179	343
174.06	179	239	175.10	179	345
174.08	179	241	175.12	179	347
174.10	179	244	175.14	179	349
174.12	179	246	175.16	179	351
174.14	179	248	175.18	179	353
174.16	179	250	175.20	179	355
174.18	179	252	175.22	179	357
174.20	179	254	175.24	179	359
174.22	179	256	175.26	179	361
174.24	179	258	175.28	179	363
174.26	179	260	175.30	179	365
174.28	179	262	175.32	179	367
174.30	179	264	175.34	179	369
174.32	179	266	175.36	179	371
174.34	179	268	175.38	179	373
174.36	179	270	175.40	179	375
174.38	179	272	175.42	179	377
174.40	179	274	175.44	179	379
174.42	179	276	175.46	179	381
174.44	179	278	175.48	179	383
174.46	179	280	175.50	179	385
174.48	179	282	175.52	179	387
174.50	179	284	175.54	179	389

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NOAA 24-hr C 100-Year Rainfall=7.97"

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**Stage-Area-Storage for Pond DW1-2: DRYWELLS 1&2 (continued)**

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
175.56	179	391	176.60	237	488
175.58	179	393	176.62	237	489
175.60	179	395	176.64	237	490
175.62	179	397	176.66	237	491
175.64	179	399	176.68	237	492
175.66	179	401	176.70	237	494
175.68	179	403	176.72	237	495
175.70	179	405	176.74	237	496
175.72	179	407	176.76	237	497
175.74	179	409	176.78	237	498
175.76	179	411	176.80	237	499
175.78	179	413	176.82	237	501
175.80	179	416	176.84	237	502
175.82	179	418	176.86	237	503
175.84	179	420	176.88	237	504
175.86	179	422	176.90	237	505
175.88	179	424	176.92	237	506
175.90	179	426	176.94	237	508
175.92	179	428	176.96	237	509
175.94	179	430	176.98	237	510
175.96	179	432	177.00	237	511
175.98	179	434	177.02	237	512
176.00	179	436	177.04	237	513
176.02	179	438	177.06	237	514
176.04	179	440	177.08	237	516
176.06	179	442	177.10	237	517
176.08	179	444	177.12	237	518
176.10	179	446	177.14	237	519
176.12	179	448	177.16	237	520
176.14	179	450	177.18	237	521
176.16	179	452	177.20	237	523
176.18	179	454	177.22	237	524
176.20	179	456	177.24	237	525
176.22	179	458	177.26	237	526
176.24	179	460	177.28	237	527
176.26	179	462	177.30	237	528
176.28	179	464	177.32	237	530
176.30	179	466	177.34	237	531
176.32	179	468	177.36	237	532
176.34	179	470	177.38	237	533
176.36	179	472	177.40	237	534
176.38	179	474	177.42	1,326	546
176.40	237	476	177.44	2,415	580
176.42	237	477	177.46	3,504	636
176.44	237	479	177.48	4,594	713
176.46	237	480	177.50	5,683	812
176.48	237	481			
176.50	237	482			
176.52	237	483			
176.54	237	484			
176.56	237	485			
176.58	237	487			

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**Stage-Area-Storage for Pond DW3-4-5: DRYWELLS 3,4,5**

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
169.50	268	0	170.54	268	113
169.52	268	2	170.56	268	116
169.54	268	4	170.58	268	119
169.56	268	6	170.60	268	122
169.58	268	9	170.62	268	126
169.60	268	11	170.64	268	129
169.62	268	13	170.66	268	132
169.64	268	15	170.68	268	135
169.66	268	17	170.70	268	138
169.68	268	19	170.72	268	141
169.70	268	21	170.74	268	144
169.72	268	24	170.76	268	147
169.74	268	26	170.78	268	150
169.76	268	28	170.80	268	153
169.78	268	30	170.82	268	156
169.80	268	32	170.84	268	159
169.82	268	34	170.86	268	162
169.84	268	36	170.88	268	165
169.86	268	39	170.90	268	168
169.88	268	41	170.92	268	171
169.90	268	43	170.94	268	174
169.92	268	45	170.96	268	177
169.94	268	47	170.98	268	180
169.96	268	49	171.00	268	183
169.98	268	52	171.02	268	186
170.00	268	54	171.04	268	189
170.02	268	56	171.06	268	192
170.04	268	58	171.08	268	195
170.06	268	60	171.10	268	198
170.08	268	62	171.12	268	201
170.10	268	64	171.14	268	204
170.12	268	67	171.16	268	207
170.14	268	69	171.18	268	210
170.16	268	71	171.20	268	214
170.18	268	73	171.22	268	217
170.20	268	75	171.24	268	220
170.22	268	77	171.26	268	223
170.24	268	79	171.28	268	226
170.26	268	82	171.30	268	229
170.28	268	84	171.32	268	232
170.30	268	86	171.34	268	235
170.32	268	88	171.36	268	238
170.34	268	90	171.38	268	241
170.36	268	92	171.40	268	244
170.38	268	94	171.42	268	247
170.40	268	97	171.44	268	250
170.42	268	99	171.46	268	253
170.44	268	101	171.48	268	256
170.46	268	103	171.50	268	259
170.48	268	105	171.52	268	262
170.50	268	107	171.54	268	265
170.52	268	110	171.56	268	268

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**Stage-Area-Storage for Pond DW3-4-5: DRYWELLS 3,4,5 (continued)**

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
171.58	268	271	172.62	268	429
171.60	268	274	172.64	268	432
171.62	268	277	172.66	268	435
171.64	268	280	172.68	268	438
171.66	268	283	172.70	268	441
171.68	268	286	172.72	268	444
171.70	268	289	172.74	268	447
171.72	268	292	172.76	268	450
171.74	268	295	172.78	268	453
171.76	268	299	172.80	268	456
171.78	268	302	172.82	268	459
171.80	268	305	172.84	268	462
171.82	268	308	172.86	268	465
171.84	268	311	172.88	268	468
171.86	268	314	172.90	268	472
171.88	268	317	172.92	268	475
171.90	268	320	172.94	268	478
171.92	268	323	172.96	268	481
171.94	268	326	172.98	268	484
171.96	268	329	173.00	268	487
171.98	268	332	173.02	268	490
172.00	268	335	173.04	268	493
172.02	268	338	173.06	268	496
172.04	268	341	173.08	268	499
172.06	268	344	173.10	268	502
172.08	268	347	173.12	268	505
172.10	268	350	173.14	268	508
172.12	268	353	173.16	268	511
172.14	268	356	173.18	268	514
172.16	268	359	173.20	268	517
172.18	268	362	173.22	268	520
172.20	268	365	173.24	268	523
172.22	268	368	173.26	268	526
172.24	268	371	173.28	268	529
172.26	268	374	173.30	268	532
172.28	268	377	173.32	268	535
172.30	268	380	173.34	268	538
172.32	268	383	173.36	268	541
172.34	268	387	173.38	268	544
172.36	268	390	173.40	268	547
172.38	268	393	173.42	268	550
172.40	268	396	173.44	268	553
172.42	268	399	173.46	268	556
172.44	268	402	173.48	268	560
172.46	268	405	173.50	268	563
172.48	268	408	173.52	268	566
172.50	268	411	173.54	268	569
172.52	268	414	173.56	268	572
172.54	268	417	173.58	268	575
172.56	268	420	173.60	268	578
172.58	268	423	173.62	268	581
172.60	268	426	173.64	268	584

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**Stage-Area-Storage for Pond DW3-4-5: DRYWELLS 3,4,5 (continued)**

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
173.66	268	587	174.70	355	732
173.68	268	590	174.72	355	733
173.70	268	593	174.74	355	735
173.72	268	596	174.76	355	737
173.74	268	599	174.78	355	739
173.76	268	602	174.80	355	740
173.78	268	605	174.82	355	742
173.80	268	608	174.84	355	744
173.82	268	611	174.86	355	746
173.84	268	614	174.88	355	747
173.86	268	617	174.90	355	749
173.88	268	620	174.92	355	751
173.90	268	623	174.94	355	753
173.92	268	626	174.96	355	754
173.94	268	629	174.98	355	756
173.96	268	632	175.00	355	758
173.98	268	635	175.02	355	760
174.00	268	638	175.04	355	761
174.02	268	641	175.06	355	763
174.04	268	645	175.08	355	765
174.06	268	648	175.10	355	767
174.08	268	651	175.12	355	768
174.10	268	654	175.14	355	770
174.12	268	657	175.16	355	772
174.14	268	660	175.18	355	773
174.16	268	663	175.20	355	775
174.18	268	666	175.22	355	777
174.20	268	669	175.24	355	779
174.22	268	672	175.26	355	780
174.24	268	675	175.28	355	782
174.26	268	678	175.30	355	784
174.28	268	681	175.32	355	786
174.30	268	684	175.34	355	787
174.32	268	687	175.36	355	789
174.34	268	690	175.38	355	791
174.36	268	693	175.40	355	793
174.38	268	696	175.42	355	794
174.40	268	699	175.44	355	796
174.42	268	702	175.46	355	798
174.44	268	705	175.48	355	800
174.46	268	708	175.50	355	801
174.48	268	711	175.52	569	805
174.50	355	714	175.54	783	813
174.52	355	716	175.56	997	826
174.54	355	718	175.58	1,212	843
174.56	355	720	175.60	1,426	864
174.58	355	721	175.62	1,640	889
174.60	355	723	175.64	1,854	918
174.62	355	725	175.66	2,068	952
174.64	355	727	175.68	2,282	990
174.66	355	728	175.70	2,496	1,033
174.68	355	730	175.72	2,710	1,079



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**Stage-Area-Storage for Pond DW3-4-5: DRYWELLS 3,4,5 (continued)**

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
175.74	2,924	1,130
175.76	3,138	1,186
175.78	3,352	1,245
175.80	3,566	1,309
175.82	3,781	1,377
175.84	3,995	1,450
175.86	4,209	1,526
175.88	4,423	1,607
175.90	4,637	1,692
175.92	4,851	1,782
175.94	5,065	1,876
175.96	5,279	1,974
175.98	5,493	2,076
176.00	<b>5,707</b>	<b>2,183</b>

**Proposed**

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**Stage-Area-Storage for Pond UG-1: Underground Infiltration System**

Elevation (feet)	Horizontal (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Horizontal (sq-ft)	Storage (cubic-feet)
179.00	8,785	0	179.52	8,785	1,906
179.01	8,785	35	179.53	8,785	1,980
179.02	8,785	70	179.54	8,785	2,055
179.03	8,785	105	179.55	8,785	2,129
179.04	8,785	141	179.56	8,785	2,203
179.05	8,785	176	179.57	8,785	2,278
179.06	8,785	211	179.58	8,785	2,352
179.07	8,785	246	179.59	8,785	2,426
179.08	8,785	281	179.60	8,785	2,501
179.09	8,785	316	179.61	8,785	2,575
179.10	8,785	351	179.62	8,785	2,649
179.11	8,785	387	179.63	8,785	2,723
179.12	8,785	422	179.64	8,785	2,797
179.13	8,785	457	179.65	8,785	2,872
179.14	8,785	492	179.66	8,785	2,946
179.15	8,785	527	179.67	8,785	3,020
179.16	8,785	562	179.68	8,785	3,094
179.17	8,785	597	179.69	8,785	3,168
179.18	8,785	633	179.70	8,785	3,242
179.19	8,785	668	179.71	8,785	3,316
179.20	8,785	703	179.72	8,785	3,390
179.21	8,785	738	179.73	8,785	3,463
179.22	8,785	773	179.74	8,785	3,537
179.23	8,785	808	179.75	8,785	3,611
179.24	8,785	843	179.76	8,785	3,684
179.25	8,785	879	179.77	8,785	3,758
179.26	8,785	914	179.78	8,785	3,832
179.27	8,785	949	179.79	8,785	3,905
179.28	8,785	984	179.80	8,785	3,979
179.29	8,785	1,019	179.81	8,785	4,052
179.30	8,785	1,054	179.82	8,785	4,125
179.31	8,785	1,089	179.83	8,785	4,199
179.32	8,785	1,125	179.84	8,785	4,272
179.33	8,785	1,160	179.85	8,785	4,345
179.34	8,785	1,195	179.86	8,785	4,418
179.35	8,785	1,230	179.87	8,785	4,491
179.36	8,785	1,265	179.88	8,785	4,564
179.37	8,785	1,300	179.89	8,785	4,637
179.38	8,785	1,335	179.90	8,785	4,710
179.39	8,785	1,370	179.91	8,785	4,783
179.40	8,785	1,406	179.92	8,785	4,856
179.41	8,785	1,441	179.93	8,785	4,929
179.42	8,785	1,476	179.94	8,785	5,001
179.43	8,785	1,511	179.95	8,785	5,074
179.44	8,785	1,546	179.96	8,785	5,147
179.45	8,785	1,581	179.97	8,785	5,219
179.46	8,785	1,616	179.98	8,785	5,292
179.47	8,785	1,652	179.99	8,785	5,364
179.48	8,785	1,687	180.00	8,785	5,436
179.49	8,785	1,722	180.01	8,785	5,509
179.50	8,785	1,757	180.02	8,785	5,581
179.51	8,785	1,831	180.03	8,785	5,653

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**Stage-Area-Storage for Pond UG-1: Underground Infiltration System (continued)**

Elevation (feet)	Horizontal (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Horizontal (sq-ft)	Storage (cubic-feet)
180.04	8,785	5,725	180.56	8,785	9,370
180.05	8,785	5,797	180.57	8,785	9,438
180.06	8,785	5,869	180.58	8,785	9,506
180.07	8,785	5,941	180.59	8,785	9,573
180.08	8,785	6,013	180.60	8,785	9,641
180.09	8,785	6,084	180.61	8,785	9,708
180.10	8,785	6,156	180.62	8,785	9,776
180.11	8,785	6,228	180.63	8,785	9,843
180.12	8,785	6,299	180.64	8,785	9,910
180.13	8,785	6,371	180.65	8,785	9,977
180.14	8,785	6,442	180.66	8,785	10,044
180.15	8,785	6,513	180.67	8,785	10,111
180.16	8,785	6,584	180.68	8,785	10,177
180.17	8,785	6,656	180.69	8,785	10,244
180.18	8,785	6,727	180.70	8,785	10,310
180.19	8,785	6,798	180.71	8,785	10,377
180.20	8,785	6,869	180.72	8,785	10,443
180.21	8,785	6,940	180.73	8,785	10,509
180.22	8,785	7,010	180.74	8,785	10,575
180.23	8,785	7,081	180.75	8,785	10,641
180.24	8,785	7,152	180.76	8,785	10,707
180.25	8,785	7,222	180.77	8,785	10,772
180.26	8,785	7,293	180.78	8,785	10,838
180.27	8,785	7,363	180.79	8,785	10,903
180.28	8,785	7,434	180.80	8,785	10,969
180.29	8,785	7,504	180.81	8,785	11,034
180.30	8,785	7,574	180.82	8,785	11,099
180.31	8,785	7,644	180.83	8,785	11,164
180.32	8,785	7,714	180.84	8,785	11,229
180.33	8,785	7,784	180.85	8,785	11,294
180.34	8,785	7,854	180.86	8,785	11,358
180.35	8,785	7,924	180.87	8,785	11,423
180.36	8,785	7,994	180.88	8,785	11,487
180.37	8,785	8,063	180.89	8,785	11,551
180.38	8,785	8,133	180.90	8,785	11,615
180.39	8,785	8,202	180.91	8,785	11,679
180.40	8,785	8,272	180.92	8,785	11,743
180.41	8,785	8,341	180.93	8,785	11,807
180.42	8,785	8,410	180.94	8,785	11,870
180.43	8,785	8,479	180.95	8,785	11,934
180.44	8,785	8,548	180.96	8,785	11,997
180.45	8,785	8,617	180.97	8,785	12,060
180.46	8,785	8,686	180.98	8,785	12,123
180.47	8,785	8,755	180.99	8,785	12,186
180.48	8,785	8,824	181.00	8,785	12,249
180.49	8,785	8,892	181.01	8,785	12,312
180.50	8,785	8,961	181.02	8,785	12,374
180.51	8,785	9,029	181.03	8,785	12,437
180.52	8,785	9,098	181.04	8,785	12,499
180.53	8,785	9,166	181.05	8,785	12,561
180.54	8,785	9,234	181.06	8,785	12,623
180.55	8,785	9,302	181.07	8,785	12,685

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**Stage-Area-Storage for Pond UG-1: Underground Infiltration System (continued)**

Elevation (feet)	Horizontal (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Horizontal (sq-ft)	Storage (cubic-feet)
181.08	8,785	12,747	181.60	8,785	15,685
181.09	8,785	12,808	181.61	8,785	15,735
181.10	8,785	12,870	181.62	8,785	15,785
181.11	8,785	12,931	181.63	8,785	15,834
181.12	8,785	12,992	181.64	8,785	15,883
181.13	8,785	13,053	181.65	8,785	15,931
181.14	8,785	13,114	181.66	8,785	15,979
181.15	8,785	13,174	181.67	8,785	16,027
181.16	8,785	13,234	181.68	8,785	16,074
181.17	8,785	13,294	181.69	8,785	16,121
181.18	8,785	13,354	181.70	8,785	16,167
181.19	8,785	13,414	181.71	8,785	16,213
181.20	8,785	13,474	181.72	8,785	16,258
181.21	8,785	13,533	181.73	8,785	16,302
181.22	8,785	13,592	181.74	8,785	16,346
181.23	8,785	13,651	181.75	8,785	16,389
181.24	8,785	13,710	181.76	8,785	16,432
181.25	8,785	13,768	181.77	8,785	16,474
181.26	8,785	13,827	181.78	8,785	16,516
181.27	8,785	13,885	181.79	8,785	16,558
181.28	8,785	13,943	181.80	8,785	16,599
181.29	8,785	14,001	181.81	8,785	16,639
181.30	8,785	14,058	181.82	8,785	16,679
181.31	8,785	14,116	181.83	8,785	16,719
181.32	8,785	14,173	181.84	8,785	16,758
181.33	8,785	14,230	181.85	8,785	16,797
181.34	8,785	14,287	181.86	8,785	16,835
181.35	8,785	14,343	181.87	8,785	16,873
181.36	8,785	14,400	181.88	8,785	16,912
181.37	8,785	14,456	181.89	8,785	16,949
181.38	8,785	14,512	181.90	8,785	16,987
181.39	8,785	14,568	181.91	8,785	17,024
181.40	8,785	14,624	181.92	8,785	17,062
181.41	8,785	14,679	181.93	8,785	17,099
181.42	8,785	14,735	181.94	8,785	17,135
181.43	8,785	14,790	181.95	8,785	17,172
181.44	8,785	14,844	181.96	8,785	17,208
181.45	8,785	14,899	181.97	8,785	17,244
181.46	8,785	14,953	181.98	8,785	17,280
181.47	8,785	15,007	181.99	8,785	17,315
181.48	8,785	15,061	182.00	8,785	17,351
181.49	8,785	15,114	182.01	8,785	17,386
181.50	8,785	15,168	182.02	8,785	17,421
181.51	8,785	15,221	182.03	8,785	17,456
181.52	8,785	15,274	182.04	8,785	17,491
181.53	8,785	15,326	182.05	8,785	17,526
181.54	8,785	15,378	182.06	8,785	17,561
181.55	8,785	15,430	182.07	8,785	17,597
181.56	8,785	15,482	182.08	8,785	17,632
181.57	8,785	15,533	182.09	8,785	17,667
181.58	8,785	15,584	182.10	8,785	17,702
181.59	8,785	15,635	182.11	8,785	17,737

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NOAA 24-hr C 100-Year Rainfall=7.97"

Printed 2/3/2022

**Stage-Area-Storage for Pond UG-1: Underground Infiltration System (continued)**

Elevation (feet)	Horizontal (sq-ft)	Storage (cubic-feet)
182.12	8,785	17,772
182.13	8,785	17,807
182.14	8,785	17,843
182.15	8,785	17,878
182.16	8,785	17,913
182.17	8,785	17,948
182.18	8,785	17,983
182.19	8,785	18,018
182.20	8,785	18,053
182.21	8,785	18,089
182.22	8,785	18,124
182.23	8,785	18,159
182.24	8,785	18,194
182.25	8,785	18,229
182.26	8,785	18,264
182.27	8,785	18,299
182.28	8,785	18,335
182.29	8,785	18,370
182.30	8,785	18,405
182.31	8,785	18,440
182.32	8,785	18,475
182.33	8,785	18,510
182.34	8,785	18,545
182.35	8,785	18,580
182.36	8,785	18,616
182.37	8,785	18,651
182.38	8,785	18,686
182.39	8,785	18,721
182.40	8,785	18,756
182.41	8,785	18,791
182.42	8,785	18,826
182.43	8,785	18,862
182.44	8,785	18,897
182.45	8,785	18,932
182.46	8,785	18,967
182.47	8,785	19,002
182.48	8,785	19,037
182.49	8,785	19,072
182.50	8,785	19,108

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: **Concrete Drywells**

**TSS Removal Calculation  
Worksheet**

A BMP <sup>1</sup>	B TSS Removal Rate <sup>1</sup>	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Concrete Drywells (DW 1-5)	0.80	1.00	0.80	0.20

\*No impervious area directed to drywell.

**Total TSS Removal =**

**80%**

**Separate Form Needs to  
be Completed for Each  
Outlet or BMP Train**

Project: **100-060 MacDonald-Keohane**  
Prepared By: **CRM**  
Date: **2/3/2022**

\*Equals remaining load from previous BMP (E)  
which enters the BMP

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: **CDS Water Quality Unit 1515-3 (WQU#1)**

**TSS Removal Calculation  
Worksheet**

A BMP <sup>1</sup>	B TSS Removal Rate <sup>1</sup>	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
CDS Proprietary Treatment Device Model 1515-3 (Structure ID: WQU#1)	0.90	0.75	0.67	0.08

**Total TSS Removal =**

**100%**

**Separate Form Needs to be Completed for Each Outlet or BMP Train**

Project: **100-060 MacDonald-Keohane**  
 Prepared By: **CRM**  
 Date: **4/8/2022**

\*Equals remaining load from previous BMP (E) which enters the BMP

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: **CDS Water Quality Unit 1515-3 (WQU#2)**

**TSS Removal Calculation  
Worksheet**

A BMP <sup>1</sup>	B TSS Removal Rate <sup>1</sup>	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
CDS Proprietary Treatment Device Model 1515-3 (Structure ID: WQU#2)	0.90	0.75	0.67	0.08

**Total TSS Removal =**

**100%**

**Separate Form Needs to be Completed for Each Outlet or BMP Train**

Project: **100-060 MacDonald-Keohane**  
 Prepared By: **CRM**  
 Date: **4/8/2022**

\*Equals remaining load from previous BMP (E) which enters the BMP



## CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

### MCDONALD-KEOHANE WEYMOUTH, MA

Area **0.56 ac**  
Weighted C **0.9**  
 $t_c$  **6 min**  
CDS Model **1515-3**

Unit Site Designation **WQU #1**  
Rainfall Station # **69**

CDS Treatment Capacity **1.0 cfs**

<u>Rainfall Intensity<sup>1</sup></u> (in/hr)	<u>Percent Rainfall Volume<sup>1</sup></u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate</u> (cfs)	<u>Treated Flowrate</u> (cfs)	<u>Incremental Removal (%)</u>
0.02	10.2%	10.2%	0.01	0.01	10.2
0.04	9.6%	19.8%	0.02	0.02	9.6
0.06	9.4%	29.3%	0.03	0.03	9.4
0.08	7.7%	37.0%	0.04	0.04	7.7
0.10	8.6%	45.6%	0.05	0.05	8.5
0.12	6.3%	51.9%	0.06	0.06	6.2
0.14	4.7%	56.5%	0.07	0.07	4.6
0.16	4.6%	61.2%	0.08	0.08	4.5
0.18	3.5%	64.7%	0.09	0.09	3.4
0.20	4.3%	69.1%	0.10	0.10	4.2
0.25	8.0%	77.1%	0.13	0.13	7.6
0.30	5.6%	82.7%	0.15	0.15	5.3
0.35	4.4%	87.0%	0.18	0.18	4.1
0.40	2.5%	89.5%	0.20	0.20	2.3
0.45	2.5%	92.1%	0.23	0.23	2.3
0.50	1.4%	93.5%	0.25	0.25	1.2
0.75	5.0%	98.5%	0.38	0.38	4.2
1.00	1.0%	99.5%	0.50	0.50	0.8
1.50	0.0%	99.5%	0.76	0.76	0.0
2.00	0.0%	99.5%	1.01	1.00	0.0
3.00	0.5%	100.0%	1.51	1.00	0.2
					96.3
Removal Efficiency Adjustment <sup>2</sup> =					6.5%
Predicted % Annual Rainfall Treated =					93.4%
<b>Predicted Net Annual Load Removal Efficiency =</b>					<b>89.9%</b>

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

## CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

### MCDONALD-KEOHANE WEYMOUTH, MA

Area **0.61 ac**  
Weighted C **0.9**  
 $t_c$  **6 min**  
CDS Model **1515-3**

Unit Site Designation **WQU #2**  
Rainfall Station # **69**

CDS Treatment Capacity **1.0 cfs**

<u>Rainfall Intensity<sup>1</sup></u> <u>(in/hr)</u>	<u>Percent Rainfall Volume<sup>1</sup></u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.02	10.2%	10.2%	0.01	0.01	10.2
0.04	9.6%	19.8%	0.02	0.02	9.6
0.06	9.4%	29.3%	0.03	0.03	9.4
0.08	7.7%	37.0%	0.04	0.04	7.7
0.10	8.6%	45.6%	0.05	0.05	8.5
0.12	6.3%	51.9%	0.07	0.07	6.2
0.14	4.7%	56.5%	0.08	0.08	4.6
0.16	4.6%	61.2%	0.09	0.09	4.5
0.18	3.5%	64.7%	0.10	0.10	3.4
0.20	4.3%	69.1%	0.11	0.11	4.2
0.25	8.0%	77.1%	0.14	0.14	7.6
0.30	5.6%	82.7%	0.16	0.16	5.2
0.35	4.4%	87.0%	0.19	0.19	4.0
0.40	2.5%	89.5%	0.22	0.22	2.3
0.45	2.5%	92.1%	0.25	0.25	2.3
0.50	1.4%	93.5%	0.27	0.27	1.2
0.75	5.0%	98.5%	0.41	0.41	4.1
1.00	1.0%	99.5%	0.55	0.55	0.8
1.50	0.0%	99.5%	0.82	0.82	0.0
2.00	0.0%	99.5%	1.10	1.00	0.0
3.00	0.5%	100.0%	1.65	1.00	0.2
					95.9
Removal Efficiency Adjustment <sup>2</sup> =					6.5%
Predicted % Annual Rainfall Treated =					93.4%
<b>Predicted Net Annual Load Removal Efficiency =</b>					<b>89.5%</b>

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

**SECTION 5- LONG-TERM STORMWATER  
OPERATION & MAINTENANCE PLAN**

# **LONG-TERM STORMWATER OPERATION & MAINTENANCE PLAN**

## **McDonald-Keohane Funeral Home - South**

### **PROJECT OVERVIEW:**

The proposed project consists of the construction of 5,571+/- s.f. addition off the rear of the existing funeral home and an accessory 1,950+/- s.f. garage. The project also proposes additional parking and site infrastructure on the existing 2.8 +/- acre site. The project has been designed to comply with the Massachusetts Stormwater Management Regulations.

Appended to this document is a sample maintenance form and a chart describing the anticipated frequency of tasks.

### **OWNER AND RESPONSIBLE PARTY:**

#### ***Current Land Owners:***

MK Main Street, LLC  
785 Hancock Street  
Quincy, MA 02170

MK Charles Street, LLC  
785 Hancock Street  
Quincy, MA 02170

Contractor should have facilities maintenance personnel on-staff. For any service beyond their service ability, the contractor should subcontract to the appropriate vendors such as street sweeping, catch basin and water quality unit cleaning, etc.

***Ultimately, the owner will take over long-term O&M Responsibilities upon project completion and turnover from the contractor to the owner.***

### **CONSTRUCTION MANAGEMENT:**

A construction manager with adequate knowledge and experience on projects of similar size and scope shall be employed to oversee all site work related construction. The contractor shall incorporate the appropriate techniques to control sediment and erosion pollution during construction in accordance with the *Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas* and any conditions of approval from the local conservation commission.

Care should be taken when constructing stormwater control structures. Light earth-moving equipment shall be used to excavate in the vicinity of the infiltration areas. Use of heavy-

equipment causes excessive compaction of the soils beneath the basin resulting in reduced infiltration capacity. At no time shall temporary infiltration areas or settling basins be constructed in the vicinity of the proposed infiltration basins in order to prevent the soils from becoming clogged with sediment.

## **ON-GOING MAINTENANCE CONTRACT**

The non-structural and structural approaches recommended below, as well as the required BMP maintenance, will be completed by the selected contractor. Adequate personnel with appropriate training and access to proper equipment will be available to complete the tasks. Future responsible parties must be notified of their responsibility to operate and maintain the system in perpetuity.

## **MAINTENANCE LOG**

The Responsible Party shall develop and maintain a log of inspections, maintenance, repairs, and disposal (including location of disposal) during the life of the project. Records will be maintained for at least 3 years and be made available to the Massachusetts Department of Environmental Protection or the Town of Weymouth in accordance with the provisions of the Massachusetts Stormwater Handbook. A sample of such a maintenance log is provided.

## **STORMWATER BMP MAINTENANCE**

The proposed stormwater management system has been designed with appropriate BMPs aimed at reducing the pollutants discharge based upon the intended use of the property. All BMPs require regular maintenance to function as intended. Some management measures have simple maintenance requirements; others are more involved. The Responsible Party must have all BMPs regularly inspected to ensure they are operating properly on an as needed basis, including during runoff events exceeding 0.5 inches of rainfall.

A description of the non-structural and structural approaches to be incorporated is indicated below. The following best management practices are proposed to be incorporated into the stormwater management design to reduce source runoff and improve stormwater runoff discharge quality. The Responsible Party will regularly inspect all BMPs to ensure they are operating properly. If any deficiencies are identified during these inspections, action to resolve it will be initiated and documented on the maintenance log.

## **STRUCTURAL BMPs**

### Deep Sump Hooded Catch Basins/ Dry Wells

On a regular basis the inlet pipe and outlet pipe and dry wells shall be checked for debris and removed as necessary to ensure unobstructed flow of water. Inspections shall occur at least twice annually, once in the fall and then in the spring after the snow melts. Inspections shall verify the tees are secure and free flowing. Depth of sediment below water line. Basins are to be cleaned whenever sediment and hydrocarbons are observed.

Basins shall be cleaned using a vacuum pump. All liquid shall be pumped from the sump of each basin at least once per year. All sediments and hydrocarbons should be properly handled and disposed of in accordance with local, state and federal guidelines and regulations.

#### Water Quality Units

The water quality units (Contech) have been designed with drain manholes at grade to aid in the removal of sediment and debris accumulating in the structure and inspection ports to monitor the accumulation of sediment. Preventative maintenance shall be performed in accordance with manufacturer's instructions, which is enclosed in this section. Cleaning will take place at the completion of construction and as deemed necessary based on the inspections. Refer to the enclosed "CDS Inspection and Maintenance Guide".

#### Subsurface Infiltration System

The subsurface system (Stormtech) has been designed with drain manholes at grade to aid in the removal of sediment and debris accumulating in the structure and inspection ports to monitor the accumulation of sediment. Preventative maintenance shall be performed in accordance with manufacturer's instructions, which is enclosed in this section. Inspection should occur monthly during the first year following installation, and then twice annually, once in the fall and then in the spring after the snow melts. Cleaning will take place at the completion of construction and as deemed necessary based on the inspections.

### **NON-STRUCTURAL BMPs**

#### Pavement Sweeping

As street sweeping is a BMP under DEP guidelines, this non-structural BMP is an effective removal of Total Suspended Solids (TSS) in a comprehensive stormwater management program. Litter and debris are to be regularly picked up and removed from the pavement. Paved areas are to be swept a minimum of quarterly per year.

#### Pervious Areas and Slopes

Runoff from pervious areas and slopes shall be directed over vegetated areas to promote settlement of suspended solids. Steep pervious slopes will be permanently vegetated to dissipate energy and reduce potential erosion. No constructed vegetated slopes should exceed 2H:1V. Slopes exceeding 2:1 shall be stabilized with riprap, jute netting or other similar measures to minimize the potential for future erosion.

#### Drainage Control Structures, Flared End Sections, Riprap Pads, Swales

Basin control structures, flared end sections, riprap pads and swales shall be inspected and any debris or growth surrounding or within these structures shall be removed.

Any/all debris or vegetation encroaching on the control structures or outfall components shall be removed or appropriately trimmed back to maintain the designed control elevation and flow patterns/cross section without impediment. Inspection should occur twice annually, once in the fall and then in the spring after the snow melts. Cleaning will take place at the completion of construction and as deemed necessary based on the inspections and manufacturer's requirements.

#### Pest and Insect Control

- As a first-line defense against pests/insects and weeds (the "First-Line Defense"), the party responsible for maintenance shall avoid the use of non-organic pesticides, herbicides, fungicides and insecticides unless spot treatment is required for a specific control application. The owner shall not be required to undertake extraordinary measures or incur unreasonable cost to locate, purchase or apply non-organic products.
- If the First-Line Defense fails, as determined by the owner or party responsible for maintenance, in its sole but reasonable discretion, non-organic approaches to pest/insect control may be used, the same to be applied by a professional licensed in the Commonwealth of Massachusetts, where required. But in no event shall such non-organic approaches be used within the 25ft. buffer zone to the wetlands.

#### Waste Management

Solid waste and recycling will be contained in dumpsters (shown on the plan) maintained by the funeral home for routine and regular trash pickup. Waste deposition in the dumpsters will be consistent with state and local regulations.

#### Snow Removal

Deicing compounds must be stored or sheltered on impervious pads (i.e. in garages or maintenance room). Snow that is plowed from the paved parking surfaces shall be plowed to the edges of the pavement. Refer to landscape plan for designated snow storage areas. When capacity of these areas is exceeded, accumulated snow shall be removed.

#### Trash Pickup

Trash will be picked up by a garbage truck in the standard dumpsters required by the local trash company.

#### Hazardous Waste and Spill Control Containment

In the event of a discharge or spill of oil or another hazardous material, outlets to stormwater management facilities immediately downstream of the spill shall be plugged so that hazardous materials do not enter the system. In the event of a discharge of oil or other hazardous material, responsible facility personnel shall notify the appropriate state agencies, the Town of Weymouth DPW and the EPA National Response Center 1-800-424-8802 shall be notified. All hazardous waste materials will be disposed of in a manner specified by local, state and/or federal regulations and by the manufacturer of such products.



## Stormwater BMP Inspection and Maintenance Log

Facility Name	
Address	
Begin Date	End Date

Date	BMP ID#	BMP Description	Inspected by:	Cause for Inspection	Exceptions Noted	Comments and Actions Taken

**Instructions:** Record all inspections and maintenance for all treatment BMPs on this form. Use additional log sheets and/or attach extended comments or documentation as necessary. Submit a copy of the completed log with the annual independent inspectors' report to the municipality and start a new log at that time.

BMP ID# — Always use ID# from the Operation and Maintenance Manual.

Inspected by — Note all inspections and maintenance on this form, including the required independent annual inspection.

Cause for inspection — Note if the inspection is routine, pre-rainy-season, post-storm, annual, or in response to a noted problem or complaint.

Exceptions noted — Note any condition that requires correction or indicates a need for maintenance.

Comments and actions taken — Describe any maintenance done and need for follow-up.

## Stormwater BMP Inspection Matrix

Conventional & LID Best Management Practices	Inspection & Maint. Frequency	Erosion& Scour	Obstructions	Trash & Debris	Sediment Build- Up Removal	Vegetation Cover	Remove/Reset Filter Fabric & Stone As Required	Vac Truck Sediment & Contaminants	Remove/Reset Riprap as Required
Deep Hooded Catch Basins	Twice- Annually (Spring and Fall)								
Dry Wells	Twice- Annually (Spring and Fall)								
Pavement	Twice- Annually (Spring and Fall)								
Drainage Swales	Twice- Annually (Spring and Fall)								
Outlet Structure	Twice- Annually (Spring and Fall)								
Infiltration Basin	Twice- Annually (Spring and Fall)								
Emergency Overflows	Twice- Annually (Spring and Fall)								
Outlets (FES, Rip Rap Pad)	Twice- Annually (Spring and Fall)								

## CDS<sup>®</sup> Inspection and Maintenance Guide

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## Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

## Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allow both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine whether the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

## Cleaning

Cleaning of a CDS system should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.





CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	yd3	m3
CDS2015-4	4	1.2	3.0	0.9	0.5	0.4
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities



#### Support

- Drawings and specifications are available at [www.contechstormwater.com](http://www.contechstormwater.com).
- Site-specific design support is available from our engineers.

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## CDS Inspection & Maintenance Log

CDS Model: \_\_\_\_\_ Location: \_\_\_\_\_

[illegible]

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than eighteen inches the system should be cleaned out. **Note: To avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**
2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

## **SECTION 6 – SOILS TESTING DATA**



# Soil Map—Norfolk and Suffolk Counties, Massachusetts



Soil Map may not be valid at this scale.

Map Scale: 1:1,580 if printed on A landscape (11" x 8.5") sheet.

0 20 40 80 120 Meters

0 50 100 200 300 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84



**Natural Resources  
Conservation Service**

Web Soil Survey  
National Cooperative Soil Survey

11/19/2020  
Page 1 of 3



## MAP LEGEND

### Area of Interest (AOI)

 Area of Interest (AOI)

### Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

### Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

### Water Features



Streams and Canals

### Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

### Background



Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts

Survey Area Data: Version 16, Jun 11, 2020

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

Date(s) aerial images were photographed: Aug 26, 2014—Sep 4, 2014

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

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
602	Urban land, 0 to 15 percent slopes	1.4	16.2%
623C	Woodbridge-Urban land complex, 3 to 15 percent slopes	4.4	50.7%
628C	Canton-Urban land complex, 3 to 15 percent slopes	2.9	33.1%
<b>Totals for Area of Interest</b>		<b>8.7</b>	<b>100.0%</b>

## Norfolk and Suffolk Counties, Massachusetts

### 628C—Canton-Urban land complex, 3 to 15 percent slopes

#### Map Unit Setting

*National map unit symbol:* vktb

*Elevation:* 0 to 1,000 feet

*Mean annual precipitation:* 32 to 54 inches

*Mean annual air temperature:* 43 to 54 degrees F

*Frost-free period:* 120 to 240 days

*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Canton and similar soils:* 70 percent

*Urban land:* 20 percent

*Minor components:* 10 percent

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

#### Description of Canton

##### Setting

*Landform:* Ice-contact slopes

*Landform position (two-dimensional):* Shoulder

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

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Parent material:* Friable coarse-loamy eolian deposits over loose sandy and gravelly ablation till

##### Typical profile

*H1 - 0 to 3 inches:* fine sandy loam

*H2 - 3 to 18 inches:* fine sandy loam

*H3 - 18 to 60 inches:* gravelly loamy sand

##### Properties and qualities

*Slope:* 3 to 8 percent

*Depth to restrictive feature:* 18 to 36 inches to strongly contrasting textural stratification

*Drainage class:* Well drained

*Runoff class:* Low

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

*Depth to water table:* More than 80 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Available water capacity:* Very low (about 2.7 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated):* 2e

*Hydrologic Soil Group:* A

*Ecological site:* F144AY034CT - Well Drained Till Uplands  
*Hydric soil rating:* No

### **Description of Urban Land**

#### **Setting**

*Parent material:* Excavated and filled land

### **Minor Components**

#### **Montauk**

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

#### **Scituate**

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

#### **Charlton**

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

#### **Udorthents**

*Percent of map unit:* 2 percent  
*Hydric soil rating:* Unranked

## **Data Source Information**

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts  
Survey Area Data: Version 16, Jun 11, 2020

## Norfolk and Suffolk Counties, Massachusetts

### 623C—Woodbridge-Urban land complex, 3 to 15 percent slopes

#### Map Unit Setting

*National map unit symbol:* 2w68b

*Elevation:* 0 to 550 feet

*Mean annual precipitation:* 36 to 71 inches

*Mean annual air temperature:* 39 to 55 degrees F

*Frost-free period:* 145 to 240 days

*Farmland classification:* Not prime farmland

#### Map Unit Composition

*Woodbridge and similar soils:* 58 percent

*Urban land:* 28 percent

*Minor components:* 14 percent

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

#### Description of Woodbridge

##### Setting

*Landform:* Drumlins, hills, ground moraines

*Landform position (two-dimensional):* Backslope, footslope, summit

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

*Down-slope shape:* Convex

*Across-slope shape:* Linear

*Parent material:* Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

##### Typical profile

*Ap - 0 to 7 inches:* fine sandy loam

*Bw1 - 7 to 18 inches:* fine sandy loam

*Bw2 - 18 to 30 inches:* fine sandy loam

*Cd - 30 to 65 inches:* gravelly fine sandy loam

##### Properties and qualities

*Slope:* 3 to 15 percent

*Depth to restrictive feature:* 20 to 39 inches to densic material

*Drainage class:* Moderately well drained

*Runoff class:* Very high

*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.14 in/hr)

*Depth to water table:* About 18 to 30 inches

*Frequency of flooding:* None

*Frequency of ponding:* None

*Maximum salinity:* Nonsaline (0.0 to 1.9 mmhos/cm)

*Available water capacity:* Low (about 4.7 inches)

##### Interpretive groups

*Land capability classification (irrigated):* None specified

*Land capability classification (nonirrigated): 3e*  
*Hydrologic Soil Group: C/D*  
*Ecological site: F144AY037MA - Moist Dense Till Uplands*  
*Hydric soil rating: No*

## **Description of Urban Land**

### **Typical profile**

*M - 0 to 10 inches: cemented material*

### **Properties and qualities**

*Slope: 3 to 15 percent*  
*Depth to restrictive feature: 0 inches to manufactured layer*  
*Runoff class: Very high*  
*Capacity of the most limiting layer to transmit water (Ksat): Very low*  
*(0.00 to 0.00 in/hr)*  
*Available water capacity: Very low (about 0.0 inches)*

### **Interpretive groups**

*Land capability classification (irrigated): None specified*  
*Land capability classification (nonirrigated): 8*  
*Hydrologic Soil Group: D*  
*Hydric soil rating: Unranked*

## **Minor Components**

### **Paxton**

*Percent of map unit: 9 percent*  
*Landform: Drumlins, hills, ground moraines*  
*Landform position (two-dimensional): Backslope, shoulder, summit*  
*Landform position (three-dimensional): Side slope, crest*  
*Down-slope shape: Linear, convex*  
*Across-slope shape: Convex*  
*Hydric soil rating: No*

### **Ridgebury**

*Percent of map unit: 5 percent*  
*Landform: Drainageways, hills, ground moraines, depressions, drumlins*  
*Landform position (two-dimensional): Toeslope, footslope*  
*Landform position (three-dimensional): Base slope, head slope*  
*Down-slope shape: Linear, concave*  
*Across-slope shape: Concave, linear*  
*Hydric soil rating: Yes*

## **Data Source Information**

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts  
Survey Area Data: Version 16, Jun 11, 2020



## Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

**C. On-Site Review** (minimum of two holes required at every proposed primary and reserve disposal area)

Deep Observation Hole Number: 28-01

Date 11/24/20 Time 7:30 AM

Clear Sunny

Longitude:

Latitude

1. Land Use

## Vegetation

Surface Stones (e.g., cobbles, stones, boulders, etc.)

Slope (%)

Description of Location: Woods posterior of developed lot

**2. Soil Parent Material:**

## Landform

Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body >100 feet

Drainage Way > 50 feet

4/80 feet

Property Line 7/6 feet

Drinking Water Well 5180 feet

feet \_\_\_\_\_

4. Unsuitable Materials Present: ☐ Yes ☒ No

☐ Fill Material

☐ **Bedrock**

5. Groundwater Observed: ☐ Yes ☒ No

**If yes:**

### Depth Standing Water in Hole

# Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-16"	A	LS	10 YR 3/2	—	—	—	—	—	Granular	FR	
16-32"	B	LS	10 YR 5/6	—	—	—	—	—	massive	FR	
32-52"	BC	LS	10 YR 4/4	—	—	—	—	—	massive	FR	
52-156"	C <sub>1</sub>	SAND	2.5 Y 6/2	—	—	—	15% <del>10%</del>	20%	SC	FR	Loose (Firm in place, Firm to loose to hand)
	Consistent down to AND STRUCTURE. NO MOTTLES	DOWN TO	BOTTOM OF	HOLE	UP/MATERIAL	NO			LARGE BUNDLES ARE PRESENT IN HOLE.	Loose to hand	
	Test PIT WAS DRY	TEST PIT WAS	DRY	CONSIDERING	WEIGHTING	OBSERVED			COULD NOT MAKE BALL IN HAND BY HANDS WERE STAINED BY FIELD TEST		
	HAD RAIN BEFORE.	HAD RAIN BEFORE.	@ HIGHEST	POINT	OF	LOT.					

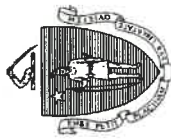
**Additional Notes:**

Bottom 11.doc • rev. 3/15/18

Bottom C Layer, Excavator had some difficulty. Very bony / compacted. Tough to dig through C Layer. C<sub>1</sub> = Sand based on field test. Does contain fines tough to excavate. Turnover moderate staining of hands. Very dry → dry bars yesterday

Form 11 – Soil Suitability Assessment for On-Site Sewage Disposal • Page 2 of 5





Commonwealth of Massachusetts  
City/Town of

# Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

## C. On-Site Review (minimum of two holes required at every proposed primary and reserve disposal area)

Deep Observation Hole Number: 20-02

Date: 11/24/20

Time: 8:15

Weather: Sunny Clear

Longitude: \_\_\_\_\_

Latitude: \_\_\_\_\_

1. Land Use Commercial (e.g., woodland, agricultural field, vacant lot, etc.)

Vegetation: wooded

Weather: yes

Surface Stones (e.g., cobbles, stones, boulders, etc.): \_\_\_\_\_

Slope (%): \_\_\_\_\_

Description of Location: SEE LOG 20-01

2. Soil Parent Material: \_\_\_\_\_

Landform: \_\_\_\_\_

Position on Landscape (SU, SH, BS, FS, TS): \_\_\_\_\_

3. Distances from: Open Water Body 7100 feet

Drainage Way 750 feet

Wetlands 700 feet

Property Line 710 feet

Drinking Water Well 700 feet

Other \_\_\_\_\_ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No

Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No

If yes: N/A Depth Weeping from Pit

N/A Depth Standing Water in Hole

### Soil Log

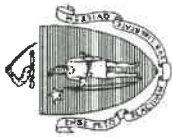
Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features		Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones		
0-16"	A	LS	10YR 7/2	-	-	-	-	-	-	GRAIN/FR
16-36"	B	LS	10YR 5/6	-	-	-	-	-	-	MASSIVE/FR
36-72"	3C	LS	10YR 4/4	-	-	-	-	-	-	MASSIVE/FR
72-120"	C	SAND	2.5 YG 6/2	120"	10YR 7/6	5%	20%	20%	20%	SG/LOOS
		MATERIAL IS DRY/NO WATER	OBSERVED.							
		FRACTION ORANGE MATERIAL CONSISTENT	DOWN				10' on.			

LENSES ALL AROUND HOLE OF FATANT CRACKS COLOR. (POTENTIAL MOTTLES HARD TO SEE IN SHADOW PRESENTLY SPOTTY ALL AROUND HOLE.

Additional Notes:

ABOUT 40' DOWN SOME RESISTANCE TO EXCAVATION. NOT AS DIFFICULT TO EXCAVATE AS FIRST HOLE. (LAYER WOULD BE A LITTLE MORE COMPACT THAN THE DEEPER HOLE 60)





Commonwealth of Massachusetts  
City/Town of

## Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

### C. On-Site Review (minimum of two holes required at every proposed primary and reserve disposal area)

Deep Observation Hole Number: 20-03

Date: 11/24/20

Time: 8:50 AM

Weather: Sunny / CLEAR

Hole #

Date

Time

Weather

Latitude

Longitude:

1. Land Use Commercial (e.g., woodland, agricultural field, vacant lot, etc.)

Vegetation: WOODED

Surface Stones (e.g., cobbles, stones, boulders, etc.)

YES

Slope (%)

0-3

Description of Location: see 20-01

2. Soil Parent Material:

Landform

Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body 7100 feet

Drainage Way 750 feet

Wetlands 7100 feet

Property Line 210 feet

Drinking Water Well 7100 feet

Other \_\_\_\_\_ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No

If Yes: ☐ Disturbed Soil ☒ Fill Material

☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No

If yes: N/A Depth Weeping from Pit

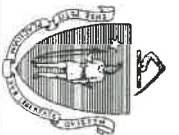
N/A Depth Standing Water in Hole

#### Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-4 1/4" FILL											
4 1/4"-14 1/4" C		SAND	2.5 Y 6/2	132"	10 YR 7/6	2%	75%	75%	sg loose	Dry	
Does		SOME FINES / UNABLE		TO MAKE BALL IN	HAND			DURING FIELD	TEST.		
FAINT GRANGE SOIL			ABOUT	11" FEET DOWN				SIMILAR TO TH 20-02.	VERY CONSISTENT SOIL		
GOING DOWN TO BOTTOM OF HOLE				NEAR FILL. POTENTIAL MOTTLES @	132"						

Additional Notes:

FILL - LOAM WITH SOME CONC. BLOCKS AT SURFACE TO ALMOST 4' DOWN



Commonwealth of Massachusetts  
City/Town of

# Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

## C. On-Site Review (minimum of two holes required at every proposed primary and reserve disposal area)

Deep Observation Hole Number: 20-04

Hole #

Date

Time

Weather

Latitude

Longitude:

1. Land Use

(e.g., woodland, agricultural field, vacant lot, etc.)

Vegetation

Surface Stones (e.g., cobbles, stones, boulders, etc.)

Slope (%)

Description of Location:

2. Soil Parent Material:

Landform

Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from:

Open Water Body 7100 feet

Drainage Way 7100 feet

Wetlands 7100 feet

Property Line

710 feet

Drinking Water Well 7100 feet

Other        feet

4. Unsuitable Materials Present: ☒ Yes ☐ No

If Yes: ☒ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No

If yes:        Depth Weeping from Pit

       Depth Standing Water in Hole

### Soil Log

Depth (in)	Soil Horizon / Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-48"	Fill	-	-	-	-	-	-	-	-	-	-
48-150"	C <sub>1</sub>	2.5 Y <sup>6</sup> /2 Sand	-	-	-	-	10	15	SC loose	-	very close to L.S. F. Sand
NOT A coarse material. Sand that is very close to loamy sand. Almost can turn blue when the water is added.											
Boulders in material. Some fines in sand, relatively dry consisting of first rain. Very consistent all the way down the hole.											
Top material that was destroyed does look more coarse than other test pits.											
Do not see any signs of nodules/lumps when											
* Appears they came and dug a little bit (probably the dry they called) and that's why top is FILL?											

Additional Notes:

Heavy plants up to 30' Diameter some 12' 1" 20'



# Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

**C. On-Site Review** (minimum of two holes required at every proposed primary and reserve disposal area)

Longitude: \_\_\_\_\_

Slope (%)

Position on Landscape (SU, SH, BS, FS, TS)

Wetlands 760 feet

Other \_\_\_\_\_ feet

☐ Bedrock

### Depth Standing Water in Hole

## Soil Log

[illegible]

Additional Notes:

Not to differentiate	Exchange	Just some scenarios
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Commonwealth of Massachusetts  
City/Town of

# Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (minimum of two holes required at every proposed primary and reserve disposal area)

Deep Observation Hole Number: 25-06

Hole #

Date 12/2/20

Time

Weather clear

Latitude

Longitude: 0-3

1. Land Use

(e.g., woodland, agricultural field, vacant lot, etc.)

Vegetation

Surface Stones (e.g., cobbles, stones, boulders, etc.)

Slope (%)

Description of Location:

2. Soil Parent Material:

3. Distances from:

Open Water Body 7/100 feet

Drainage Way 750 feet

Wetlands 200 feet

Property Line

200 feet

Drinking Water Well 700 feet

Other        feet

4. Unsuitable Materials Present:

☐ Yes ☒ No

If Yes:

☐ Disturbed Soil

☐ Fill Material

☐ Weathered/Fractured Rock

☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No

If yes:

Depth Weeping from Pit

Depth Standing Water in Hole

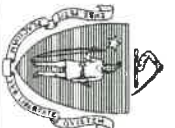
## Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume			Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones				
0-12"	A	LS	10 YR 3/2	—	—	—	—	—	—	Gr. Fr.	—	Gr. Fr.
12"-24"	B	LS	10 YR 5/8	—	—	—	—	—	—	Massive Fr.	—	Massive Fr.
24"-46"	C <sub>1</sub>	SAND	10 YR 4/4	—	—	—	—	3	—	Sl. loose	—	Sl. loose
46"-126"	C <sub>2</sub>	SAND	2.5 Y 5/3	—	—	—	—	15	—	SG. loose	—	SG. loose
	Both C <sub>1</sub> and C <sub>2</sub>		RAE FERN	—	—	—	—	—	—	Place (light compacted)	—	Loose and excavated
			More coarse than soil up on	—	—	—	—	—	—	thick in soil	—	Loose and excavated
			STEEL ORNAMENTAL	—	—	—	—	—	—	Loose and excavated	—	Loose and excavated
			No water on	—	—	—	—	—	—	Moisture in soil	—	Moisture in soil

Additional Notes:

Test pits 2/7 at low levels of soil. Pockets of boulders means excavation more difficult.





Commonwealth of Massachusetts  
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (minimum of two holes required at every proposed primary and reserve disposal area)

Deep Observation Hole Number: 200

Hole #

Date 12/2/10

Time

10:00

Weather

Sunny clouds

Latitude

—

Longitude:

8-3

1. Land Use

Residential  
(e.g., woodland, agricultural field, vacant lot, etc.)

Vegetation

Grass

Surface Stones (e.g., cobbles, stones, boulders, etc.)

Yes

Slope (%)

0-3

Description of Location:

Residential house, due to front yard

2. Soil Parent Material:

Landform

Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from:

Open Water Body 2100 feet

Drainage Way 250 feet

Wetlands 2100 feet

Property Line 710 feet

Drinking Water Well — feet

Other — feet

4. Unsuitable Materials Present:

☐ Yes ☐ No

If Yes:

☐ Disturbed Soil

☐ Fill Material

☐ Weathered/Fractured Rock

☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No

If yes:

Depth Weeping from Pit

Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume			Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones				
0-56"	Fill	—	—	—	—	—	20	20	20	St. loose	From top of pit	
56"-76"	C <sub>1</sub>	SAND	10 YR 5/3	—	—	—	20	20	20	St. loose	From top of pit	
76"-100"	C <sub>2</sub>	SAND	2.5 Y 6/2	—	—	—	20	20	20	St. loose	From top of pit	
	Coarse sand, cemented/fragm to place, no water or mottles present											
	INTILL HOLE											
	* DEPTHS TAKEN BASED ON SIDE W/ FILL.											
	most coarse material of this test pit											

Additional Notes:

Separate large rocks (small boulders) @ top of test pit for I.C. (1st few feet)  
Excavated 10' deep to verify to make sure source source was protected.  
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal • Page 2 of 5



## Briggs Engineering & Testing

A DIVISION OF PK ASSOCIATES, INC.

December 29, 2020

Crocker Design Group  
2 Sharp Street  
Hingham, MA 02043

Attn: Ms. Taylor Cursano

### Title V Soil Analysis

Address: MK Funeral Home  
Briggs # 31074  
Tested: 12/24/20

1.	Lab Ref. No.	Description	Source
	M-32133	- #10 Fraction	TP4

#### 2. Particle Size Analysis {ASTM D 422}:

Sieve Size		Results
Standard	Alternate	{% Passing by Wt.}
2.0 mm	#10	100
0.850 mm	#20	87
0.425 mm	#40	73
0.180 mm	#80	50
0.150 mm	#100	44
0.053 mm	#270	23
0.0373 mm		21
0.0241 mm		15
0.0142 mm		9
0.0101 mm		7
0.0072 mm		4
0.0036 mm		2
0.0015 mm		1

3. The above analysis was performed in accordance with D.E.P. policy# BRP/DWM/PeP-001-1, Appendix 2.

Respectfully Submitted,

BRIGGS ENGINEERING & TESTING  
A Division of PK Associates, Inc.

Sean Skorohod  
Director of Testing Services  
Construction Technology Division

enclosures: graph

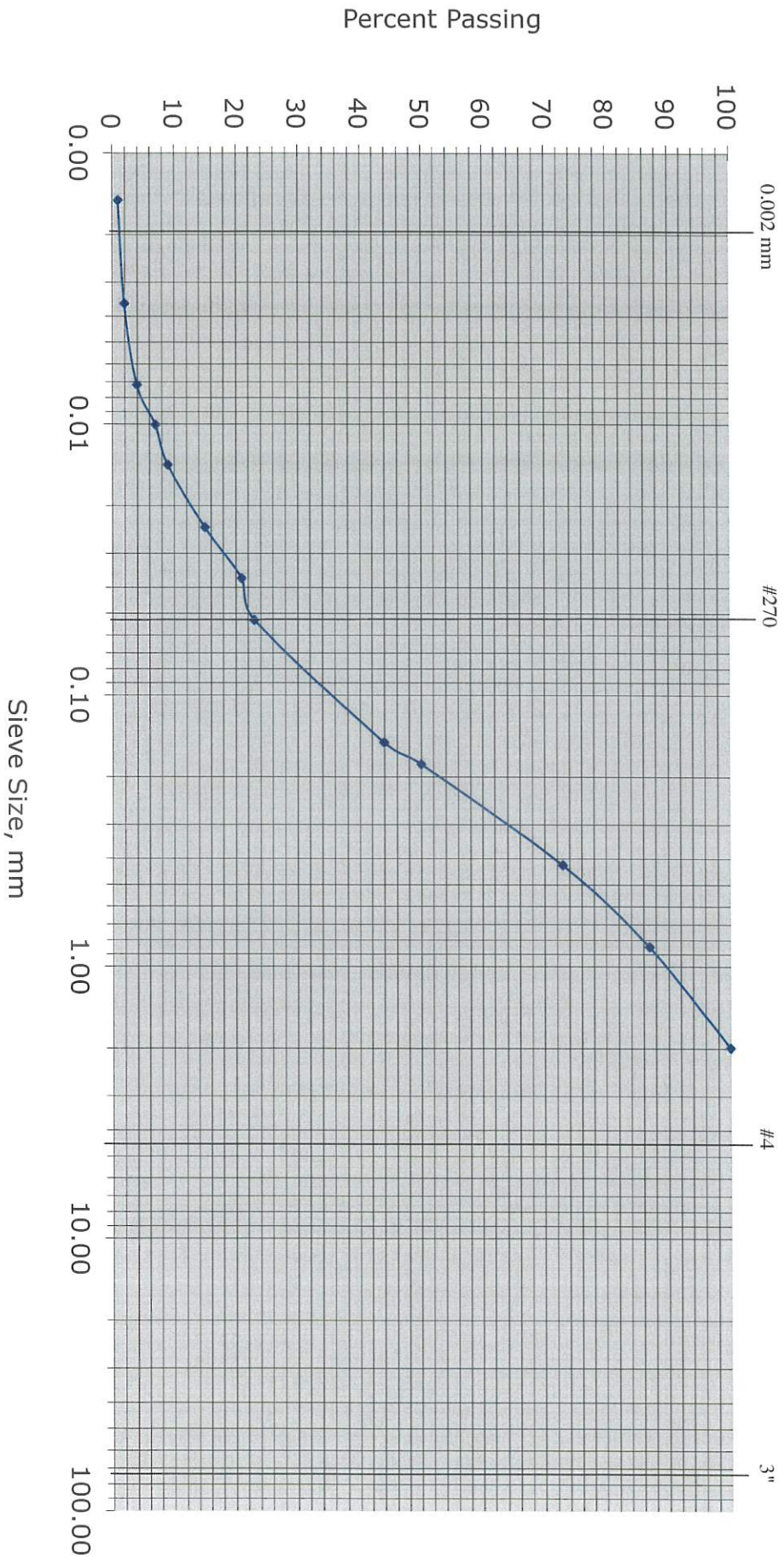
[www.briggsengineering.com](http://www.briggsengineering.com)



**Briggs Engineering & Testing**  
A Division of PK Associates, Inc.

Project:	MK Funeral Home
Date Tested:	12/24/20
Lab Ref. No.:	M-32133

### Particle Size Analysis



Note: The illustrated graph represents the sand fraction only as defined by D.E.P. policy# BRP/DWM/PeP-P00-1, Appendix 2.





## Briggs Engineering & Testing

A DIVISION OF PK ASSOCIATES, INC.

December 29, 2020

Crocker Design Group  
2 Sharp Street  
Hingham, MA 02043

Attn: Ms. Taylor Cursano

### Title V Soil Analysis

Address: MK Funeral Home  
Briggs # 31074  
Tested: 12/24/20

1.	Lab Ref. No.	Description	Source
	M-32134	- #10 Fraction	TP4

#### 2. Particle Size Analysis {ASTM D 422}:

Sieve Size		Results
Standard	Alternate	{% Passing by Wt.}
2.0 mm	#10	100
0.850 mm	#20	88
0.425 mm	#40	74
0.180 mm	#80	52
0.150 mm	#100	46
0.053 mm	#270	24
0.0377 mm		18
0.0242 mm		13
0.0141 mm		10
0.0101 mm		9
0.0072 mm		6
0.0036 mm		5
0.0015 mm		4

3. The above analysis was performed in accordance with D.E.P. policy# BRP/DWM/PeP-001-1, Appendix 2.

Respectfully Submitted,  
BRIGGS ENGINEERING & TESTING  
A Division of PK Associates, Inc.

Sean Skorohod  
Director of Testing Services  
Construction Technology Division

enclosures: graph

[www.briggsengineering.com](http://www.briggsengineering.com)

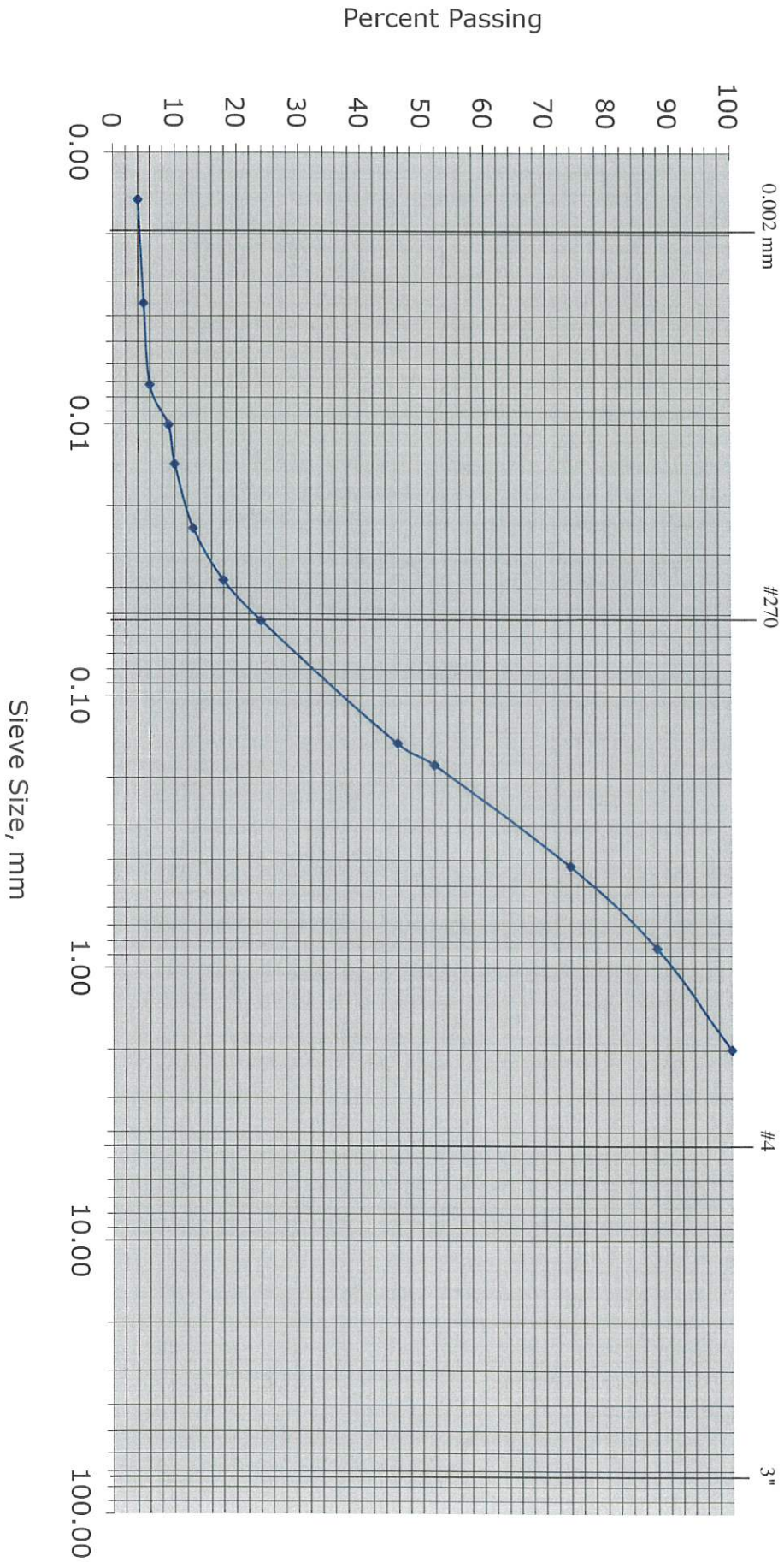




**Briggs Engineering & Testing**  
A Division of PK Associates, Inc.

Project:	MK Funeral Home
Date Tested:	12/24/20
Lab Ref. No.:	M-32134

### Particle Size Analysis



Note: The illustrated graph represents the sand fraction only as defined by D.E.P. policy# BRP/DWM/PeP-P00-1, Appendix 2.



## Briggs Engineering & Testing

A DIVISION OF PK ASSOCIATES, INC.

December 29, 2020

Crocker Design Group  
2 Sharp Street  
Hingham, MA 02043

Attn: Ms. Taylor Cursano

### Title V Soil Analysis

Address: MK Funeral Home  
Briggs # 31074  
Tested: 12/24/20

1.	Lab Ref. No.	Description	Source
	M-32135	- #10 Fraction	TP6

#### 2. Particle Size Analysis {ASTM D 422}:

Sieve Size		Results
Standard	Alternate	{% Passing by Wt.}
2.0 mm	#10	100
0.850 mm	#20	86
0.425 mm	#40	70
0.180 mm	#80	48
0.150 mm	#100	42
0.053 mm	#270	25
0.0367 mm		24
0.0238 mm		18
0.0139 mm		15
0.0100 mm		12
0.0071 mm		9
0.0035 mm		8
0.0015 mm		6

3. The above analysis was performed in accordance with D.E.P. policy# BRP/DWM/PeP-001-1, Appendix 2.

Respectfully Submitted,

BRIGGS ENGINEERING & TESTING  
A Division of PK Associates, Inc.

Sean Skorohod  
Director of Testing Services  
Construction Technology Division

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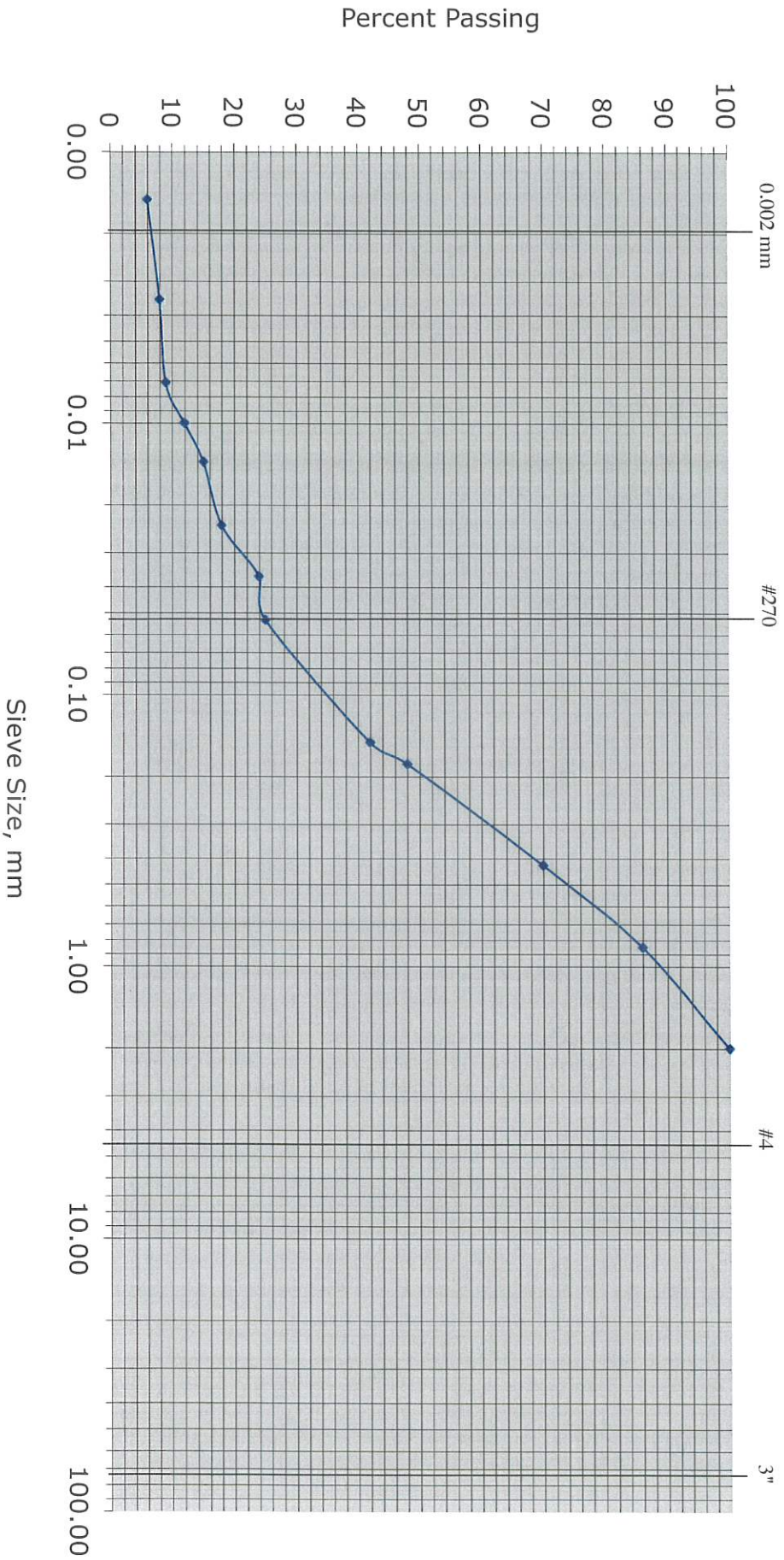




**Briggs Engineering & Testing**  
A Division of PK Associates, Inc.

Project:	MK Funeral Home
Date Tested:	12/24/20
Lab Ref. No.:	M-32135

**Particle Size Analysis**



Note: The illustrated graph represents the sand fraction only as defined by D.E.P. policy# BRP/DWM/PeP-P00-1, Appendix 2.



## Briggs Engineering & Testing

A DIVISION OF PK ASSOCIATES, INC.

December 29, 2020

Crocker Design Group  
2 Sharp Street  
Hingham, MA 02043

Attn: Ms. Taylor Cursano

### Title V Soil Analysis

Address: MK Funeral Home  
Briggs # 31074  
Tested: 12/24/20

1.	Lab Ref. No.	Description	Source
	M-32136	- #10 Fraction	TP6

#### 2. Particle Size Analysis {ASTM D 422}:

Sieve Size		Results
Standard	Alternate	{% Passing by Wt.}
2.0 mm	#10	100
0.850 mm	#20	84
0.425 mm	#40	67
0.180 mm	#80	43
0.150 mm	#100	37
0.053 mm	#270	21
0.0374 mm		19
0.0242 mm		13
0.0141 mm		10
0.0101 mm		9
0.0071 mm		7
0.0036 mm		5
0.0015 mm		4

3. The above analysis was performed in accordance with D.E.P. policy# BRP/DWM/PeP-001-1, Appendix 2.

Respectfully Submitted,  
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Sean Skorohod  
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100 Weymouth Street - Unit C-2  
Rockland, MA 02370  
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100 Pound Road  
Cumberland, RI 02864  
Phone (401) 658-2990 • Fax (401) 658-2977

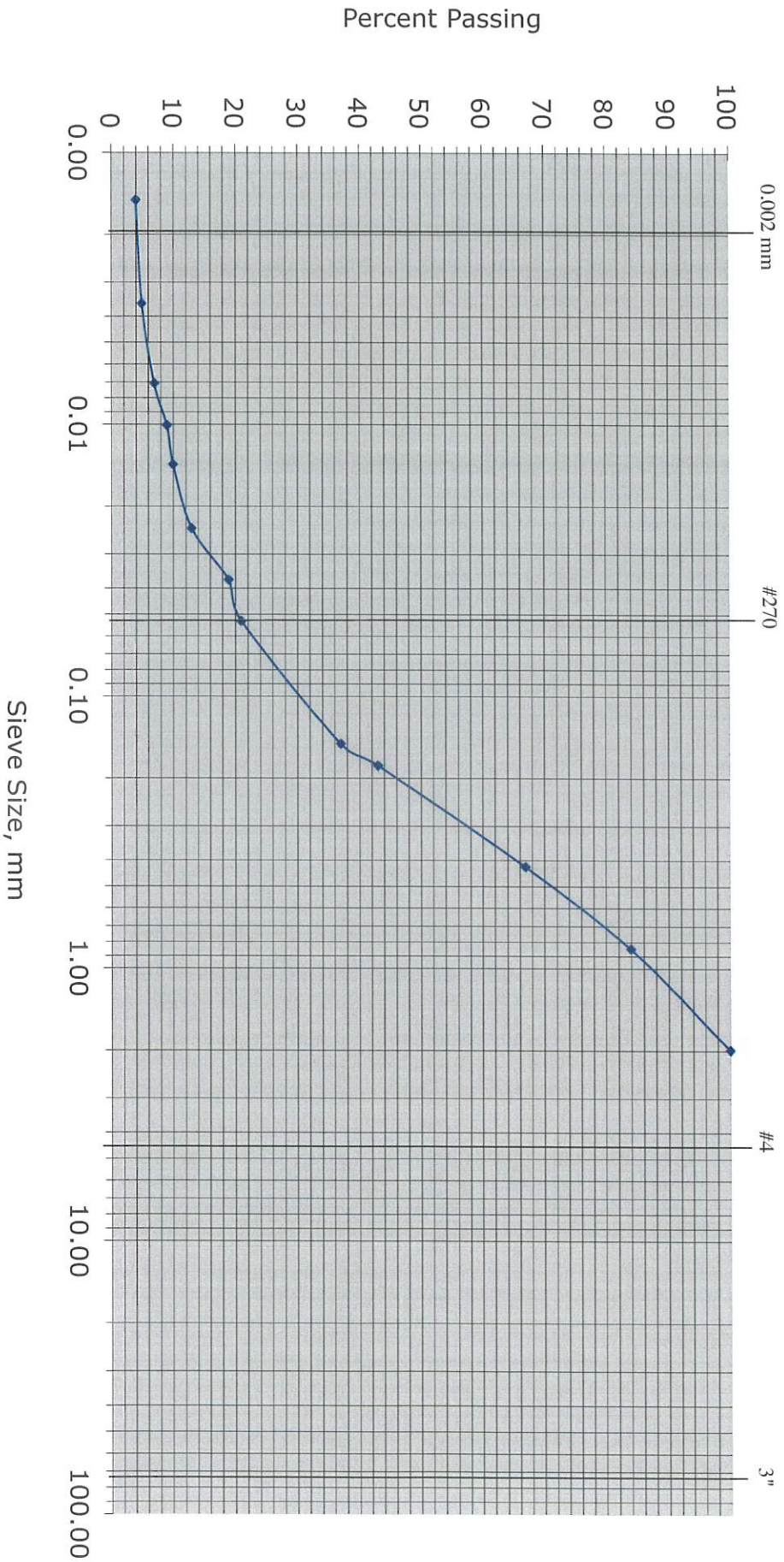




**Briggs Engineering & Testing**  
A Division of PK Associates, Inc.

Project:	MK Funeral Home
Date Tested:	12/24/20
Lab Ref. No.:	M-32136

### Particle Size Analysis



Note: The illustrated graph represents the sand fraction only as defined by D.E.P. policy# BRP/DWM/PeP-P00-1, Appendix 2.



## Briggs Engineering & Testing

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December 29, 2020

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2 Sharp Street  
Hingham, MA 02043

Attn: Ms. Taylor Cursano

### Title V Soil Analysis

Address: MK Funeral Home  
Briggs # 31074  
Tested: 12/24/20

1.	Lab Ref. No.	Description	Source
	M-32137	- #10 Fraction	TP7

#### 2. Particle Size Analysis {ASTM D 422}:

Sieve Size		Results
Standard	Alternate	{% Passing by Wt.}
2.0 mm	#10	100
0.850 mm	#20	88
0.425 mm	#40	70
0.180 mm	#80	44
0.150 mm	#100	39
0.053 mm	#270	17
0.0374 mm		16
0.0244 mm		12
0.0142 mm		9
0.0101 mm		9
0.0071 mm		7
0.0035 mm		4
0.0015 mm		4

3. The above analysis was performed in accordance with D.E.P. policy# BRP/DWM/PeP-001-1, Appendix 2.

Respectfully Submitted,

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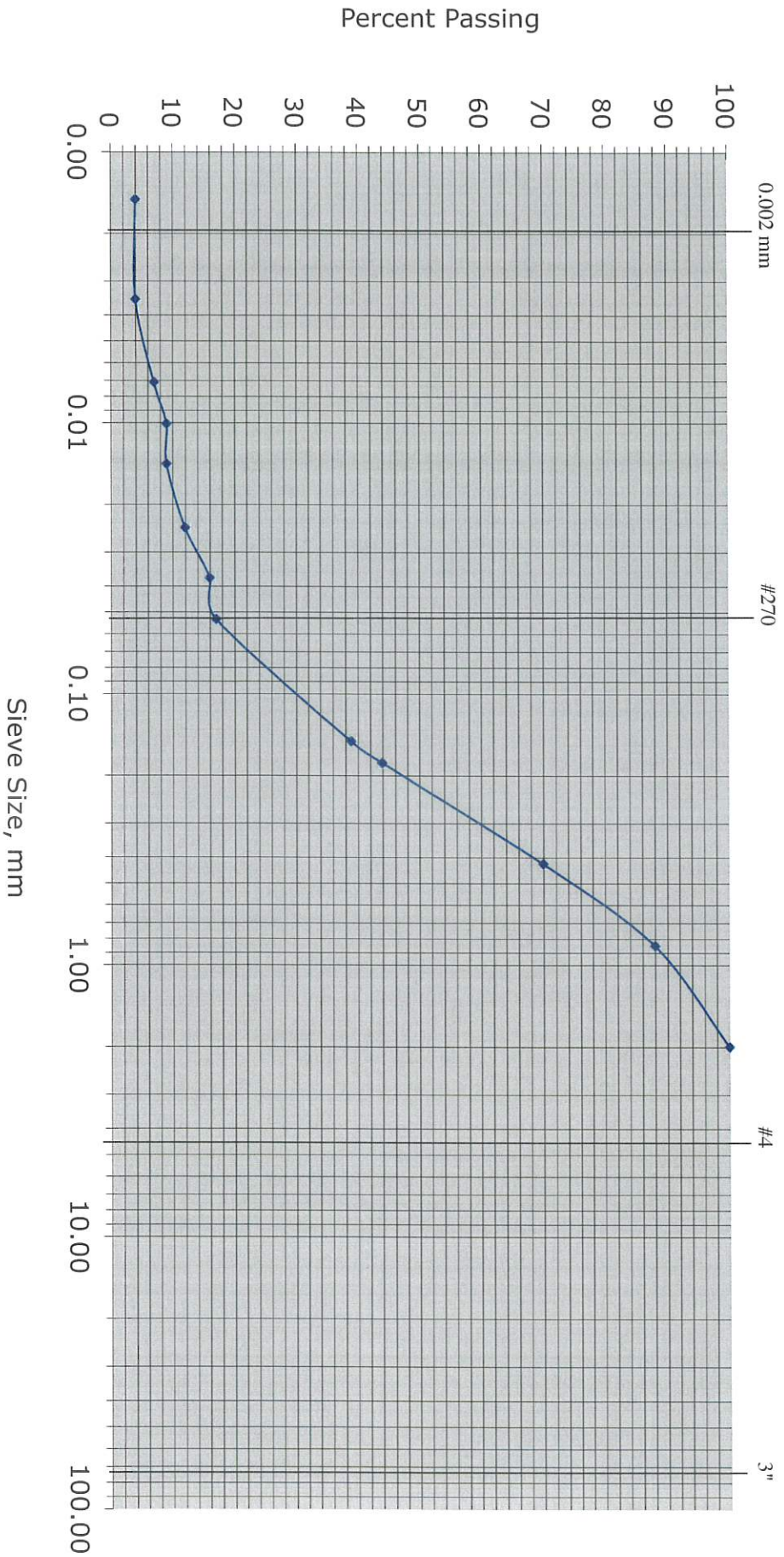




**Briggs Engineering & Testing**  
A Division of PK Associates, Inc.

Project:	MK Funeral Home
Date Tested:	12/24/20
Lab Ref. No.:	M-32137

**Particle Size Analysis**





Briggs Engineering & Testing  
A DIVISION OF PK ASSOCIATES, INC.

December 29, 2020

Crocker Design Group  
2 Sharp Street  
Hingham, MA 02043

Attn: Ms. Taylor Cursano

Title V Soil Analysis

Address: MK Funeral Home  
Briggs # 31074  
Tested: 12/24/20

1.	Lab Ref. No.	Description	Source
	M-32138	- #10 Fraction	TP7

2. Particle Size Analysis {ASTM D 422}:

Sieve Size		Results
Standard	Alternate	{% Passing by Wt.}
2.0 mm	#10	100
0.850 mm	#20	87
0.425 mm	#40	72
0.180 mm	#80	50
0.150 mm	#100	45
0.053 mm	#270	28
0.0367 mm		24
0.0238 mm		18
0.0141 mm		12
0.0100 mm		10
0.0071 mm		7
0.0035 mm		3
0.0015 mm		3

3. The above analysis was performed in accordance with D.E.P. policy# BRP/DWM/PeP-001-1, Appendix 2.

Respectfully Submitted,

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Construction Technology Division

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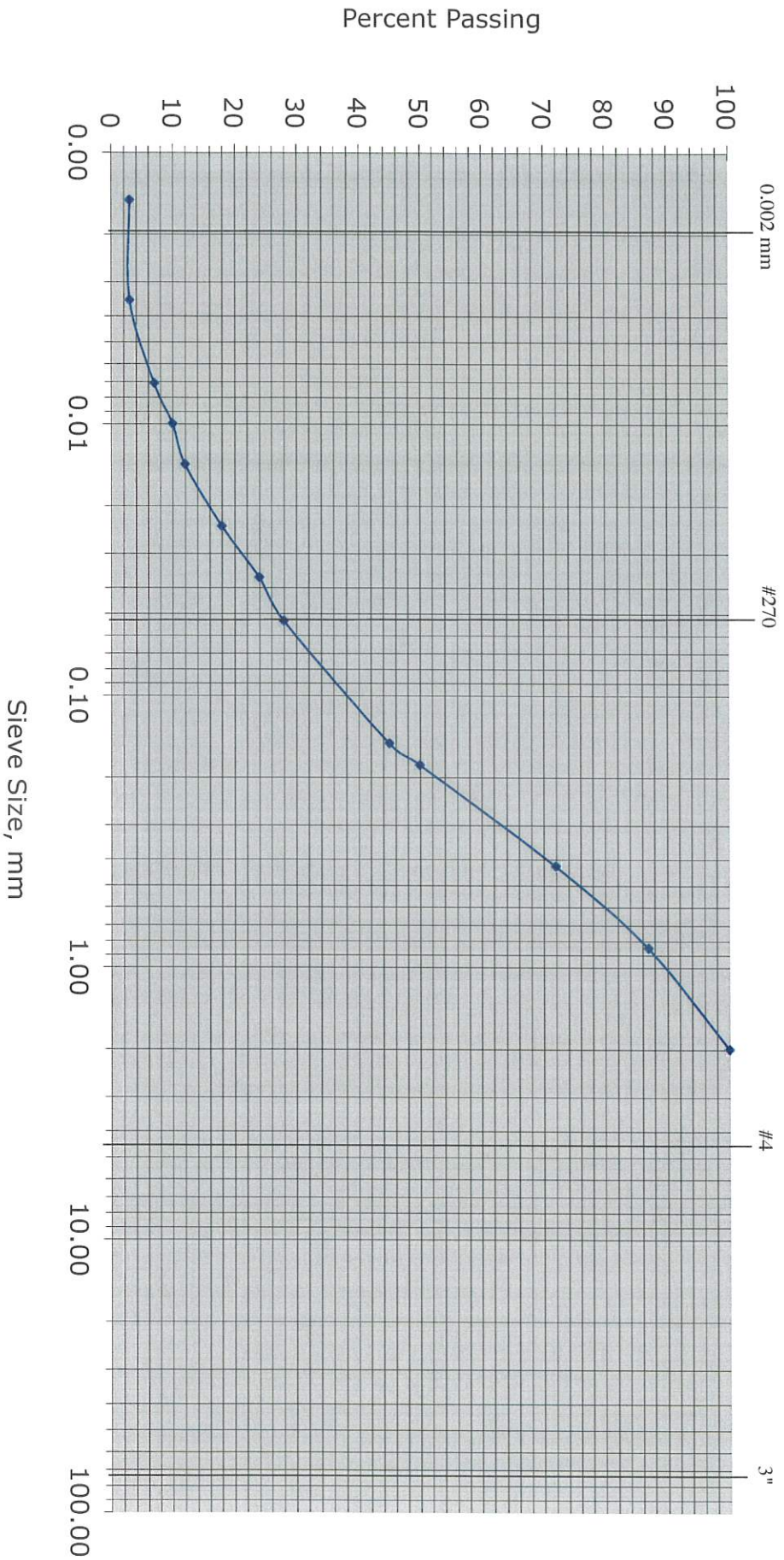




**Briggs Engineering & Testing**  
A Division of PK Associates, Inc.

Project:	MK Funeral Home
Date Tested:	12/24/20
Lab Ref. No.:	M-32138

### Particle Size Analysis



Note: The illustrated graph represents the sand fraction only as defined by D.E.P. policy# BRP/DWM/PeP-P00-1, Appendix 2.



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December 29, 2020

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Hingham, MA 02043

Attn: Ms. Taylor Cursano

Title V Soil Analysis

Address: MK Funeral Home  
Briggs # 31074  
Tested: 12/24/20

1.	Lab Ref. No.	Description	Source
	M-32139	- #10 Fraction	TP7

2. Particle Size Analysis {ASTM D 422}:

Sieve Size		Results
Standard	Alternate	{% Passing by Wt.}
2.0 mm	#10	100
0.850 mm	#20	85
0.425 mm	#40	66
0.180 mm	#80	36
0.150 mm	#100	29
0.053 mm	#270	13
0.0386 mm		12
0.0246 mm		9
0.0143 mm		7
0.0102 mm		6
0.0072 mm		4
0.0035 mm		4
0.0015 mm		3

3. The above analysis was performed in accordance with D.E.P. policy# BRP/DWM/PeP-001-1, Appendix 2.

Respectfully Submitted,

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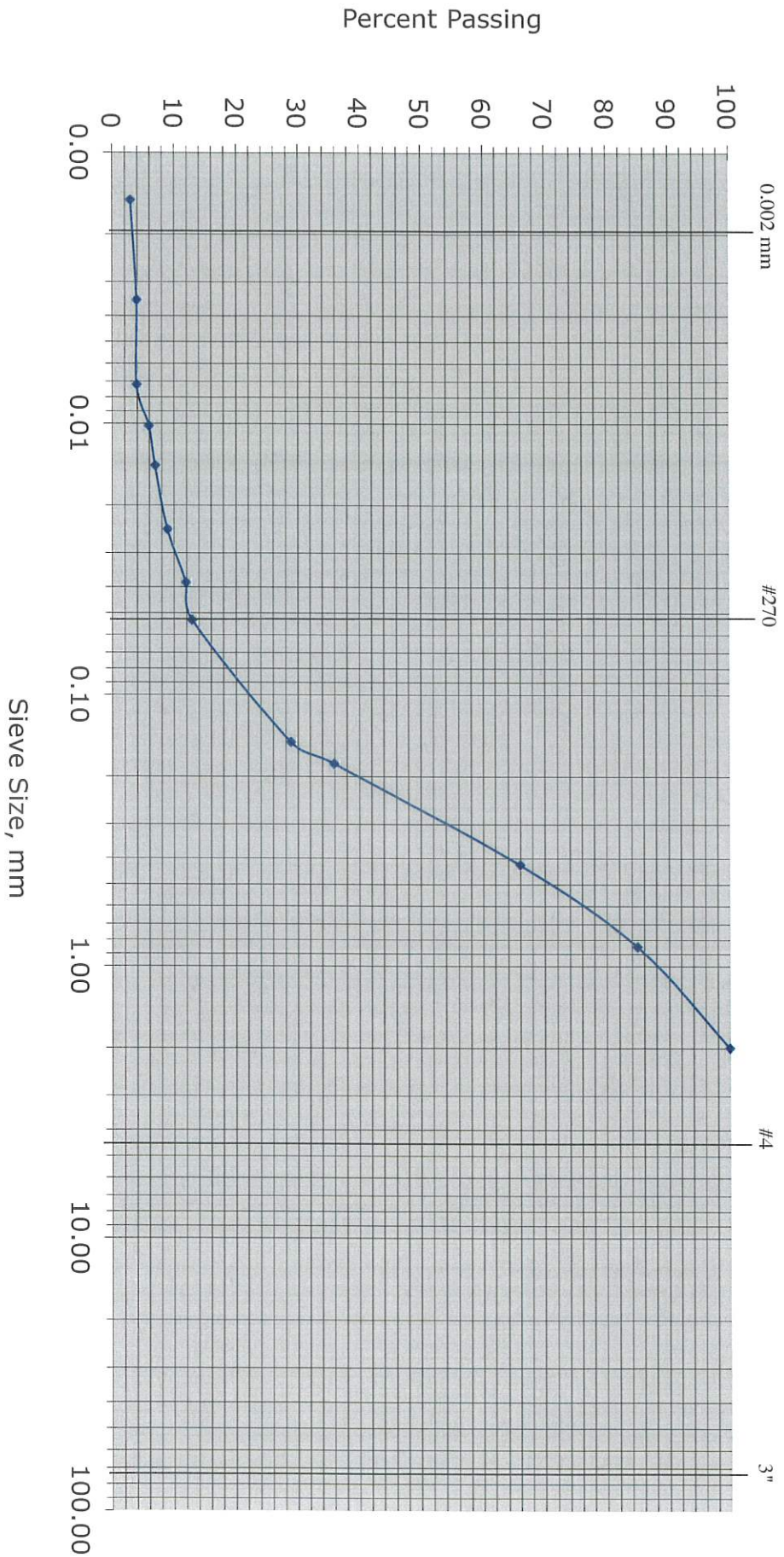




**Briggs Engineering & Testing**  
*A Division of PK Associates, Inc.*

Project:	MK Funeral Home
Date Tested:	12/24/20
Lab Ref. No.:	M-32139

### Particle Size Analysis



Note: The illustrated graph represents the sand fraction only as defined by D.E.P. policy# BRP/DWM/PeP-P00-1, Appendix 2.



Briggs Engineering & Testing  
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December 29, 2020

Crocker Design Group  
2 Sharp Street  
Hingham, MA 02043

Attn: Ms. Taylor Cursano

Title V Soil Analysis

Address: MK Funeral Home  
Briggs # 31074  
Tested: 12/24/20

1.	Lab Ref. No.	Description	Source
	M-32140	- #10 Fraction	TP7

2. Particle Size Analysis {ASTM D 422}:

Sieve Size		Results
Standard	Alternate	{% Passing by Wt.}
2.0 mm	#10	100
0.850 mm	#20	86
0.425 mm	#40	68
0.180 mm	#80	40
0.150 mm	#100	34
0.053 mm	#270	15
0.0387 mm		10
0.0246 mm		9
0.0143 mm		7
0.0102 mm		6
0.0072 mm		3
0.0035 mm		1
0.0015 mm		1

3. The above analysis was performed in accordance with D.E.P. policy# BRP/DWM/PeP-001-1, Appendix 2.

Respectfully Submitted,

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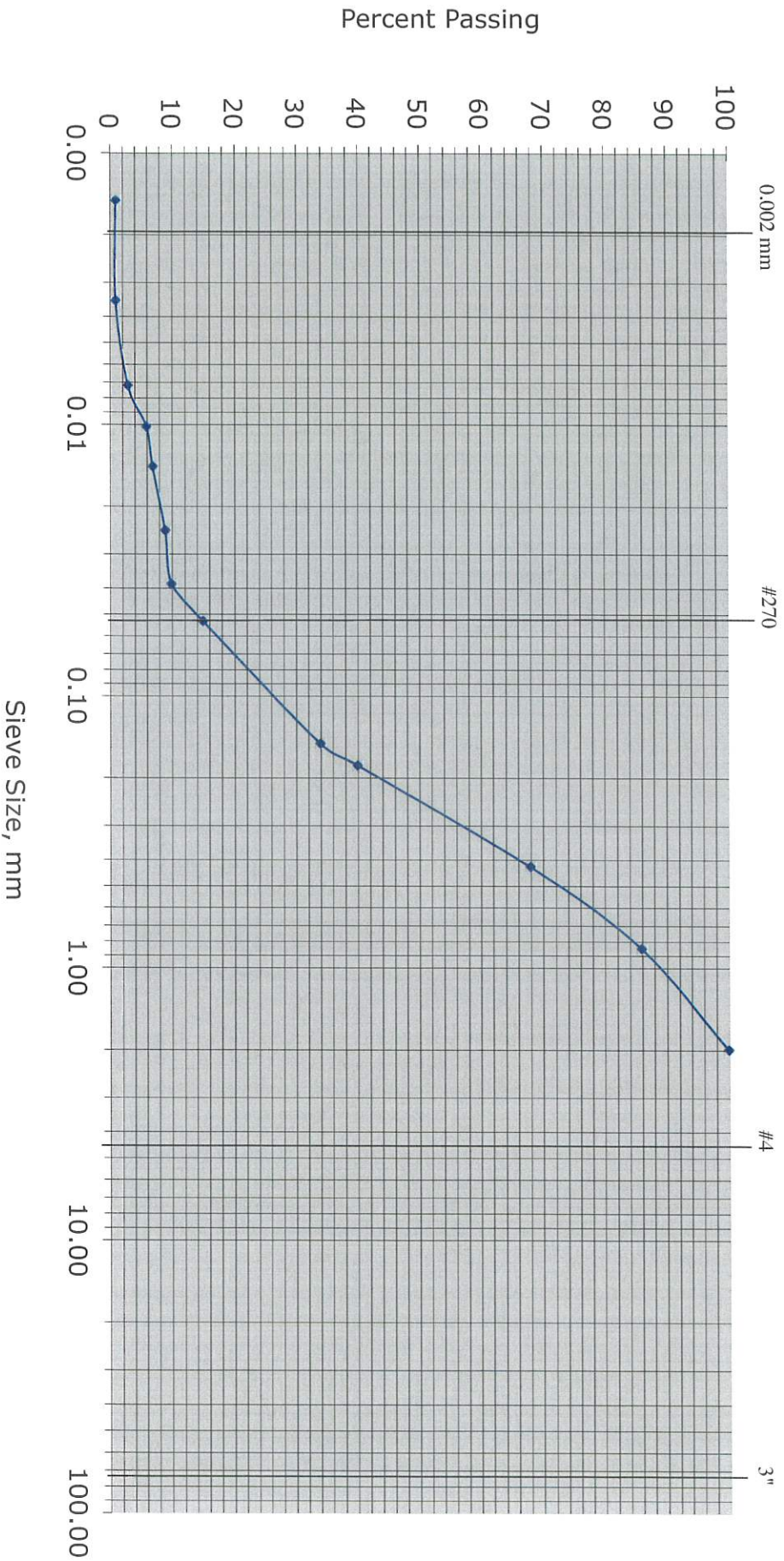




**Briggs Engineering & Testing**  
*A Division of PK Associates, Inc.*

Project:	MK Funeral Home
Date Tested:	12/24/20
Lab Ref. No.:	M-32140

**Particle Size Analysis**



Note: The illustrated graph represents the sand fraction only as defined by D.E.P. policy# BRP/DWM/PeP-P00-1, Appendix 2.

## **SECTION 7 – HYDRAULIC PIPE SIZING**

Crocker

Design

Group

STORM DRAIN DESIGN

Design Assumptions

Project No.

100-060

Project

Mcdonald-Keohane Funeral Home

Location

Weymouth, MA

25 Year Storm

Pipe Coefficient "n" 0.013 HDPE

24 Hour Duration

COMPUTED BY CRM

REVISD

CHECKED BY

DATE 4/8/2022

DATE

DATE

DRAINAGE STURCTURE			TRIBUTRARY AREA		RUNOFF COEFFICIENT	RUNOFF						PIPE								FROM
		INCREMENTAL (AC)TOTAL		"C"		"C" X "A"	TIME OF FLOW		RAINFALL INTENSITY	DISCHARGE (Q)										STRUCTURE
FROM	TO						TC(MIN)	TF(MIN)		IN/HR)	INCREM									
STA	STRUCT.	STRUCT.										LENGTH	DIA	SLOPE	Q	VF	VR			
	CB1A	DMH1F	0.14	0.14	0.83	0.12	5		6.25	0.74	0.74	103	12	0.018	4.83	6.16		182.45	180.56	186.45
	DMH1F	DMH1G	0.14	0.14	0.83	0.12		5	6.25	0.74	0.74	116	12	0.006	2.77	3.53		180.46	179.76	190.12
	DMH1G	WQU1	0.56	0.56	0.87	0.48		5	6.25	3.02	3.02	4.2	18	0.005	7.26	4.11		179.66	179.64	188.90
	CB1E	DMH1I	0.12	0.12	0.81	0.10	5		6.25	0.61	0.61	21	12	0.005	2.58	3.29		180.72	180.61	185.40
	CB1D	DMH1I	0.10	0.10	0.90	0.09	5		6.25	0.57	0.57	30	12	0.005	2.61	3.32		180.77	180.61	185.56
	DMH1I	DMH1H	0.22	0.22	0.86	0.19		5	6.25	1.18	1.18	82	12	0.005	2.55	3.25		180.52	180.10	185.50
	CB1C	DMH1H	0.12	0.12	0.89	0.11	5		6.25	0.67	0.67	22	12	0.005	2.52	3.21		182.12	182.01	187.12
	DMH1H	DMH1G	0.34	0.34	0.87	0.30		5	6.25	1.85	1.85	50	12	0.005	2.47	3.15		180.00	179.76	187.60
	CB1B	DMH1G	0.07	0.07	0.90	0.07	5		6.25	0.42	0.42	19.4	12	0.008	3.24	4.13		183.75	183.59	188.75
	CB2A	DMH2J	0.23	0.23	0.84	0.20	5		6.25	1.22	1.22	112	12	0.005	2.52	3.21		181.24	180.68	186.66
	CB2B	DMH2J	0.05	0.05	0.81	0.04	5		6.25	0.24	0.24	10.1	12	0.006	2.75	3.50		183.88	183.82	188.88
	DMH2J	DMH2K	0.28	0.28	0.82	0.23		5	6.25	1.45	1.45	100	12	0.005	2.57	3.28		180.59	180.07	188.86
	DMH2K	DMH2K(B)	0.28	0.28	0.82	0.23		5	6.25	1.44	1.44	21.8	12	0.005	2.54	3.23		179.97	179.86	189.56
	CB2C	DMH2K(B)	0.10	0.10	0.88	0.08	5		6.25	0.52	0.52	29	12	0.005	2.57	3.27		184.10	183.95	189.10
	DMH2K(B)	WQU2	0.38	0.38	0.84	0.32		5	6.25	1.98	1.98	23.7	12	0.005	2.54	3.24		179.76	179.64	189.40
	WQU2	DVM2	0.61	0.61	0.82	0.50		5	6.25	3.15	3.15	2.5	18	0.008	9.41	5.33		179.64	179.62	188.87
	CB2E	DMH2M	0.09	0.09	0.75	0.07	5		6.25	0.43	0.43	64	12	0.019	4.95	6.30		181.43	180.20	185.40
	CB2D	DMH2M	0.14	0.14	0.83	0.12	5		6.25	0.75	0.75	4.3	12	0.007	2.98	3.80		182.12	182.09	187.14
	DMH2M	WQU2	0.24	0.24	0.79	0.19		5	6.25	1.17	1.17	63.8	12	0.007	3.03	3.86		180.10	179.64	187.25
	WQU1	DVM1	0.56	0.56	0.87	0.48		5	6.25	3.02	3.02	2.9	18	0.007	8.74	4.95		179.64	179.62	188.95