

Appendix F

*Stormwater Management Report
by Graves Engineering Inc, dated August 18, 2025*

STORMWATER REPORT

for

CLUBHOUSE RENOVATIONS

Franklin Country Club
672 East Central Street
Franklin, MA 02038

Prepared for:

Franklin Country Club
672 East Central Street
Franklin, MA 02038

Date:

August 18, 2025

Prepared By:



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NARRATIVE

Project Description

Site Location: Clubhouse Building
Franklin Country Club
672 East Central Street, Franklin, MA 02038

Development Type: Golf Course

Project Summary:

The proposed project will consist of an addition to the existing Clubhouse building, reconfiguration of Hole #5 tee boxes, re-paving of cart paths adjacent to site improvements, and the installation of related stormwater improvements on the site. The project will increase impervious surfaces in the study area by 1,351 sq. ft.

A drainage and stormwater management system will recharge and attenuate runoff from the building in full compliance with MassDEP Stormwater Management Standards and applicable Town of Franklin Bylaws and Regulations pertaining to stormwater management.

Existing Site Conditions

Location: The project site is located at 672 East Franklin Street

Ground Cover: The ground cover in the drainage study area is a mix of impervious, lawn, paved cart path.

Slopes: Much of the disturbed area in the study area generally slopes from northeast to southwest towards Uncas Brook. The remaining portion of the site drains to an existing subsurface infiltration (Cultec) system.

Soil Types: Project site soil types as mapped by the USDA-NRCS are primarily Hinckley; loamy sand (map unit symbol 245C) and small area of Merrimac fine sandy loam (map unit symbol 254B). These soils are classified as hydrologic soil group (HSG) "A". No onsite soil testing has been conducted in the project area as it is within the daily-use golf course area.

HYDROLOGY CALCULATIONS

Methodology

Peak rate of runoff flows were calculated using SCS TR-20 and TR-55 methodology as implemented by the HydroCAD Stormwater Modeling System computer program. The 2, 10, 25, and 100-year storm events were analyzed with the HydroCAD program using site-specific Northeast Regional Climate Center (NRCC) rainfall frequency data as follows:

| Rainfall Amounts (inches) by Frequency (NRCC) | | | |
|--|----------------|----------------|-----------------|
| 2 Year | 10 Year | 25 Year | 100 Year |
| 3.28 | 4.94 | 6.25 | 8.95 |

**Clubhouse Renovations
Franklin Country Club**

Pre-Development

The pre-development drainage area has been modeled as two subcatchments that drain to separate discharge points (design points).

Design Point #1 (Uncas Brook): This design point represents runoff from the existing paved cart paths and #5 tee box southwestern patio area, existing building, and pervious area to the Uncas Brook.

Design Point #2 (Outfall of Existing Cultec system): This design point represents runoff from the existing roof drain system to an existing Cultec subsurface system.

In accordance with the Town of Franklin “Best Development Practices Guidebook”, new developments are required to match both peak rates of runoff and volumes from pre-development to post-development conditions; as such volumes are presented in the tables below in addition to peak rates of runoff. Refer to Appendix B for the HydroCAD output sheets for each storm event. A summary is as follows:

| Pre-Development Peak Rate of Runoff (cfs) | | | | |
|--|---------------|----------------|----------------|-----------------|
| | 2 Year | 10 Year | 25 Year | 100 Year |
| Design Point #1 | 0.02 | 0.52 | 1.19 | 2.91 |
| Design Point #2 | 0.00 | 0.25 | 0.53 | 0.90 |

| Pre-Development Volume (cf) | | | | |
|------------------------------------|---------------|----------------|----------------|-----------------|
| | 2 Year | 10 Year | 25 Year | 100 Year |
| Design Point #1 | 567 | 2,435 | 4,539 | 10,030 |
| Design Point #2 | 0 | 755 | 1,534 | 3,371 |

Post-Development

The total post-development drainage area is the same total area as the pre-development and is broken into three subcatchments that drain to either Design Point #1 or Design Point #2.

Refer to Appendix C for the HydroCAD output sheets for each storm event. A summary of the peak rate of runoff and volumes is as follows:

| Post-Development Peak Rate of Runoff (cfs) | | | | |
|---|---------------|----------------|----------------|-----------------|
| | 2 Year | 10 Year | 25 Year | 100 Year |
| Design Point #1 | 0.00 | 0.05 | 0.31 | 2.13 |
| Design Point #2 | 0.00 | 0.14 | 0.41 | 0.82 |

| Post-Development Volume (cf) | | | | |
|-------------------------------------|---------------|----------------|----------------|-----------------|
| | 2 Year | 10 Year | 25 Year | 100 Year |
| Design Point #1 | 75 | 710 | 2,015 | 6,536 |
| Design Point #2 | 0.00 | 526 | 1,443 | 3,634 |

The total net change in peak rate of runoff and volume from pre-development to post-development is as follows:

| Comparison of Pre- vs. Post-Development Peak Rate of Runoff (cfs) Net Change | | | | |
|---|---------------|----------------|----------------|-----------------|
| | 2 Year | 10 Year | 25 Year | 100 Year |
| Design Point #1 | -0.02 | -0.47 | -0.88 | -0.78 |
| Design Point #2 | 0.00 | -0.11 | -0.12 | -0.08 |

| Comparison of Pre- vs. Post-Development Volume (cf) Net Change | | | | |
|---|---------------|----------------|----------------|---------------------|
| | 2 Year | 10 Year | 25 Year | 100 Year |
| Design Point #1 | -492 | -1,725 | -2,524 | -3,494 |
| Design Point #2 | 0.00 | -229 | -91 | +263 ⁽¹⁾ |

⁽¹⁾ The increase in volume for the 100-year storm is considered minimal and does not negatively impact receiving lands or waters.

STORMWATER MANAGEMENT

To demonstrate compliance with MassDEP Stormwater Management and the Town of Franklin Bylaws and Regulations pertaining to stormwater management. Due to the proposed increase of impervious surfaces with the project, it is considered a “mix of new and redevelopment” in terms of MassDEP.

Drain Outfall Riprap Sizing Calculations (Stormwater Management Standard 1)

In lieu of a traditional riprap-stabilized drain outfall apron, a naturalized drain outfall apron has been designed to compliment the golf course landscape plan and mask the outfall location, while also providing adequate stabilization for the prescribed outfall flows and velocities. Specifically, a permanent erosion control matting (North American Green SC250) has been selected for the apron which can withstand velocities up to 15 feet per second (when vegetated). The maximum velocity at the outfall during the 100-year is 10.9 feet per second this the selected matting will protect against erosion for all design storms.

Peak Rate Attenuation (Stormwater Management Standard 2)

Runoff is attenuated for the 2, 10, 25 and 100-year storm events.

Recharge to Groundwater (Stormwater Management Standard 3)

USDA-NRCS soil survey indicates site soils in the project area are hydrologic group A soils.

Required recharge volume

Required Recharge Volume (R_v) = $F \times$ Impervious Area where, F = Target Depth Factor (in.)
 $F = 0.06$ " for 'A' Soils

Net increase in site impervious area (pre to post conditions) = 1,351 ft²

$$R_v = (0.06"/12") \times 1,351 \text{ ft}^2 = 68 \text{ ft}^3$$

The proposed subsurface infiltration system has a total volume of 592 ft³ below the lowest outlet, thus Standard 3 is satisfied. See attached HydroCAD Stage-Area-Storage worksheet demonstrating the volume of the system.

Based upon an exfiltration rate of 2.41 in./hr. (a conservative Rawls rate for sandy loam 'A' soils), the drawdown time is calculated as follows:

$\text{Time}_{\text{drawdown}} = R_v / (K \times \text{Bottom Area})$ where, R_v = recharge BMP storage volume
 K = Saturated Hydraulic Conductivity (Rawls) Rate

$$\text{Time}_{\text{drawdown}} = 617 \text{ ft}^3 / (2.41 \text{ in./hr./12"} \times 396 \text{ ft}^2) = 7.8 \text{ hours} < 72 \text{ hours.}$$

**Clubhouse Renovations
Franklin Country Club**

Water Quality Calculations (Stormwater Management Standard 4)

The new impervious surfaces created by the project include roof area and cart paths. As cart paths are used by pedestrian and electric-only carts, seasonal in use (not in winter), they are considered to produce “clean” runoff similar to roof runoff that does not require treatment of total suspended solids (TSS) or total phosphorus (TP), as required by the Town of Franklin Bylaws Chapter 153-Stormwater Management. As such, water quality TSS and TP removal calculations are not required, however we have provided the calculations below to demonstrate that the proposed subsurface infiltration system provides the required water quality volume.

WQV for 1": $1\frac{1}{12} \times 4,110 \text{ ft}^2 = 343 \text{ ft}^3$

(4,110 ft^2 =total post-development impervious area to the proposed subsurface system. 1" depth required due to the presence of critical areas and per Town of Franklin Bylaws Chapter 153-Stormwater Management).

The proposed subsurface infiltration system has a total volume of 592 ft^3 below the lowest outlet, thus Standard 4 would be satisfied, if so required.

Additionally, a Long-Term Pollution Prevention Plan has been developed for the project.

Higher Potential Pollutant Loads (Stormwater Management Standard 5)

The site is not classified as a land use with a higher potential pollutant load (LUHPPL).

Protection of Critical Areas (Stormwater Management Standard 6)

The site discharges to a critical area as shown on MassGIS (Zone II of a public water supply; PWS ID 4350000, Town of Wrentham Water Division). Per the Massachusetts DEP Stormwater Handbook, infiltration BMPs are “highly recommended” in such critical areas thus the design is appropriate.

Redevelopment Projects (Stormwater Management Standard 7)

The site does not meet the criteria of a redevelopment project as the net impervious area will increase.

Erosion/Sediment Control (Stormwater Management Standard 8)

Site plans provide details for erosion and sediment control during construction.

Operation/Maintenance Plan (Stormwater Management Standard 9)

Refer to the attached Long-Term Drainage System Operation & Maintenance Plan.

Illicit Discharge Compliance Statement (Stormwater Management Standard 10)

There are no existing illicit discharges to GEI or the owner’s knowledge and there are no proposed illicit discharges. There are no cross-connections between the stormwater system and the wastewater system and discharges to each will remain separate; these systems are shown on the project drawings to the extent that they are known.

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Metadata for Point

| | |
|------------------------|---|
| Smoothing State | Yes |
| Location | |
| Latitude | 42.075 degrees North |
| Longitude | 71.366 degrees West |
| Elevation | 70 feet |
| Date/Time | Thu Jun 19 2025 15:54:31 GMT-0400 (Eastern Daylight Time) |

Site: Franklin County Club

Extreme Precipitation Estimates

| | 5min | 10min | 15min | 30min | 60min | 120min | | 1hr | 2hr | 3hr | 6hr | 12hr | 24hr | 48hr | | 1day | 2day |
|--------------|------|-------|-------|-------|-------|--------|--------------|------|------|------|------|-------|-------|-------|--------------|-------|-------|
| 1yr | 0.29 | 0.45 | 0.55 | 0.73 | 0.91 | 1.15 | 1yr | 0.78 | 1.08 | 1.33 | 1.69 | 2.14 | 2.74 | 3.02 | 1yr | 2.42 | 2.91 |
| 2yr | 0.36 | 0.55 | 0.68 | 0.90 | 1.13 | 1.43 | 2yr | 0.98 | 1.32 | 1.65 | 2.08 | 2.61 | 3.28 | 3.62 | 2yr | 2.90 | 3.48 |
| 5yr | 0.43 | 0.66 | 0.83 | 1.12 | 1.43 | 1.81 | 5yr | 1.23 | 1.64 | 2.11 | 2.65 | 3.31 | 4.14 | 4.62 | 5yr | 3.66 | 4.44 |
| 10yr | 0.48 | 0.76 | 0.96 | 1.30 | 1.70 | 2.17 | 10yr | 1.46 | 1.94 | 2.53 | 3.18 | 3.97 | 4.94 | 5.55 | 10yr | 4.37 | 5.34 |
| 25yr | 0.57 | 0.91 | 1.16 | 1.60 | 2.13 | 2.76 | 25yr | 1.84 | 2.43 | 3.23 | 4.07 | 5.06 | 6.25 | 7.09 | 25yr | 5.53 | 6.82 |
| 50yr | 0.65 | 1.05 | 1.35 | 1.89 | 2.54 | 3.32 | 50yr | 2.20 | 2.87 | 3.89 | 4.89 | 6.08 | 7.48 | 8.54 | 50yr | 6.62 | 8.21 |
| 100yr | 0.75 | 1.22 | 1.57 | 2.22 | 3.03 | 3.98 | 100yr | 2.62 | 3.40 | 4.68 | 5.89 | 7.30 | 8.95 | 10.29 | 100yr | 7.92 | 9.89 |
| 200yr | 0.86 | 1.41 | 1.83 | 2.62 | 3.62 | 4.79 | 200yr | 3.13 | 4.03 | 5.63 | 7.09 | 8.78 | 10.73 | 12.40 | 200yr | 9.49 | 11.91 |
| 500yr | 1.05 | 1.73 | 2.25 | 3.27 | 4.59 | 6.09 | 500yr | 3.96 | 5.04 | 7.18 | 9.05 | 11.19 | 13.65 | 15.88 | 500yr | 12.08 | 15.21 |

Lower Confidence Limits

| | 5min | 10min | 15min | 30min | 60min | 120min | | 1hr | 2hr | 3hr | 6hr | 12hr | 24hr | 48hr | | 1day | 2day |
|------------|------|-------|-------|-------|-------|--------|------------|------|------|------|------|------|------|------|------------|------|------|
| 1yr | 0.24 | 0.38 | 0.46 | 0.62 | 0.76 | 0.90 | 1yr | 0.66 | 0.88 | 1.07 | 1.41 | 1.85 | 2.58 | 2.65 | 1yr | 2.28 | 2.54 |

FranklinCC_PostDevelopment

Prepared by Graves Engineering, Inc

HydroCAD® 10.20-7a s/n 00448 © 2025 HydroCAD Software Solutions LLC

NRCC 24-hr D 100-year Rainfall=8.95"

Printed 8/8/2025

Stage-Area-Storage for Pond 2P: Subsurface System

| Elevation (feet) | Surface (sq-ft) | Storage (cubic-feet) | Elevation (feet) | Surface (sq-ft) | Storage (cubic-feet) | Elevation (feet) | Surface (sq-ft) | Storage (cubic-feet) |
|---------------------|--------------------|-------------------------|---------------------|--------------------|-------------------------|---------------------|--------------------|-------------------------|
| 255.07 | 396 | 0 | 256.39 | 396 | 326 | 257.71 | 396 | 680 |
| 255.09 | 396 | 3 | 256.41 | 396 | 332 | 257.73 | 396 | 685 |
| 255.11 | 396 | 6 | 256.43 | 396 | 338 | 257.75 | 396 | 690 |
| 255.13 | 396 | 9 | 256.45 | 396 | 344 | 257.77 | 396 | 694 |
| 255.15 | 396 | 13 | 256.47 | 396 | 350 | 257.79 | 396 | 699 |
| 255.17 | 396 | 16 | 256.49 | 396 | 356 | 257.81 | 396 | 703 |
| 255.19 | 396 | 19 | 256.51 | 396 | 361 | 257.83 | 396 | 708 |
| 255.21 | 396 | 22 | 256.53 | 396 | 367 | 257.85 | 396 | 712 |
| 255.23 | 396 | 25 | 256.55 | 396 | 373 | 257.87 | 396 | 716 |
| 255.25 | 396 | 28 | 256.57 | 396 | 379 | 257.89 | 396 | 721 |
| 255.27 | 396 | 32 | 256.59 | 396 | 384 | 257.91 | 396 | 725 |
| 255.29 | 396 | 35 | 256.61 | 396 | 390 | 257.93 | 396 | 729 |
| 255.31 | 396 | 38 | 256.63 | 396 | 396 | 257.95 | 396 | 733 |
| 255.33 | 396 | 41 | 256.65 | 396 | 402 | 257.97 | 396 | 738 |
| 255.35 | 396 | 44 | 256.67 | 396 | 407 | 257.99 | 396 | 742 |
| 255.37 | 396 | 47 | 256.69 | 396 | 413 | 258.01 | 396 | 746 |
| 255.39 | 396 | 51 | 256.71 | 396 | 419 | 258.03 | 396 | 749 |
| 255.41 | 396 | 54 | 256.73 | 396 | 424 | 258.05 | 396 | 753 |
| 255.43 | 396 | 57 | 256.75 | 396 | 430 | 258.07 | 396 | 757 |
| 255.45 | 396 | 60 | 256.77 | 396 | 436 | 258.09 | 396 | 761 |
| 255.47 | 396 | 63 | 256.79 | 396 | 441 | 258.11 | 396 | 764 |
| 255.49 | 396 | 66 | 256.81 | 396 | 447 | 258.13 | 396 | 768 |
| 255.51 | 396 | 70 | 256.83 | 396 | 452 | 258.15 | 396 | 771 |
| 255.53 | 396 | 73 | 256.85 | 396 | 458 | 258.17 | 396 | 775 |
| 255.55 | 396 | 76 | 256.87 | 396 | 464 | 258.19 | 396 | 778 |
| 255.57 | 396 | 79 | 256.89 | 396 | 469 | 258.21 | 396 | 782 |
| 255.59 | 396 | 85 | 256.91 | 396 | 475 | 258.23 | 396 | 785 |
| 255.61 | 396 | 91 | 256.93 | 396 | 480 | 258.25 | 396 | 788 |
| 255.63 | 396 | 98 | 256.95 | 396 | 486 | 258.27 | 396 | 792 |
| 255.65 | 396 | 104 | 256.97 | 396 | 491 | 258.29 | 396 | 795 |
| 255.67 | 396 | 110 | 256.99 | 396 | 497 | 258.31 | 396 | 798 |
| 255.69 | 396 | 116 | 257.01 | 396 | 502 | 258.33 | 396 | 801 |
| 255.71 | 396 | 122 | 257.03 | 396 | 507 | 258.35 | 396 | 805 |
| 255.73 | 396 | 128 | 257.05 | 396 | 513 | 258.37 | 396 | 808 |
| 255.75 | 396 | 135 | 257.07 | 396 | 518 | 258.39 | 396 | 811 |
| 255.77 | 396 | 141 | 257.09 | 396 | 524 | 258.41 | 396 | 814 |
| 255.79 | 396 | 147 | 257.11 | 396 | 529 | 258.43 | 396 | 817 |
| 255.81 | 396 | 153 | 257.13 | 396 | 534 | 258.45 | 396 | 820 |
| 255.83 | 396 | 159 | 257.15 | 396 | 540 | 258.47 | 396 | 824 |
| 255.85 | 396 | 165 | 257.17 | 396 | 545 | 258.49 | 396 | 827 |
| 255.87 | 396 | 171 | 257.19 | 396 | 550 | 258.51 | 396 | 830 |
| 255.89 | 396 | 177 | 257.21 | 396 | 556 | 258.53 | 396 | 833 |
| 255.91 | 396 | 183 | 257.23 | 396 | 561 | 258.55 | 396 | 836 |
| 255.93 | 396 | 189 | 257.25 | 396 | 566 | 258.57 | 396 | 839 |
| 255.95 | 396 | 195 | 257.27 | 396 | 571 | 258.59 | 396 | 842 |
| 255.97 | 396 | 201 | 257.29 | 396 | 577 | 258.61 | 396 | 846 |
| 255.99 | 396 | 208 | 257.31 | 396 | 582 | 258.63 | 396 | 849 |
| 256.01 | 396 | 214 | 257.33 | 396 | 587 | 258.65 | 396 | 852 |
| 256.03 | 396 | 220 | 257.35 | 396 | 592 | 258.67 | 396 | 855 |
| 256.05 | 396 | 226 | 257.37 | 396 | 597 | 258.69 | 396 | 858 |
| 256.07 | 396 | 232 | 257.39 | 396 | 602 | 258.71 | 396 | 861 |
| 256.09 | 396 | 238 | 257.41 | 396 | 607 | 258.73 | 396 | 865 |
| 256.11 | 396 | 244 | 257.43 | 396 | 612 | 258.75 | 396 | 868 |
| 256.13 | 396 | 250 | 257.45 | 396 | 617 | 258.77 | 396 | 871 |
| 256.15 | 396 | 256 | 257.47 | 396 | 622 | 258.79 | 396 | 874 |
| 256.17 | 396 | 261 | 257.49 | 396 | 627 | 258.81 | 396 | 877 |
| 256.19 | 396 | 267 | 257.51 | 396 | 632 | | | |
| 256.21 | 396 | 273 | 257.53 | 396 | 637 | | | |
| 256.23 | 396 | 279 | 257.55 | 396 | 642 | | | |
| 256.25 | 396 | 285 | 257.57 | 396 | 647 | | | |
| 256.27 | 396 | 291 | 257.59 | 396 | 652 | | | |
| 256.29 | 396 | 297 | 257.61 | 396 | 657 | | | |
| 256.31 | 396 | 303 | 257.63 | 396 | 662 | | | |
| 256.33 | 396 | 309 | 257.65 | 396 | 666 | | | |
| 256.35 | 396 | 315 | 257.67 | 396 | 671 | | | |
| 256.37 | 396 | 321 | 257.69 | 396 | 676 | | | |

Volume below lowest outlet=592 cf

APPENDIX A

MASSDEP STORMWATER REPORT 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.¹ 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 8²
- 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.

¹ 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.

² 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.

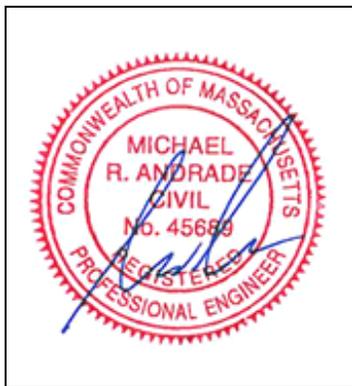
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the 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



Electronically stamped by
Michael Andrade, PE:
08/13/25

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

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

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 Field¹
- 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.

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

Checklist for Stormwater Report

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

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

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

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

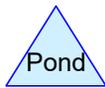
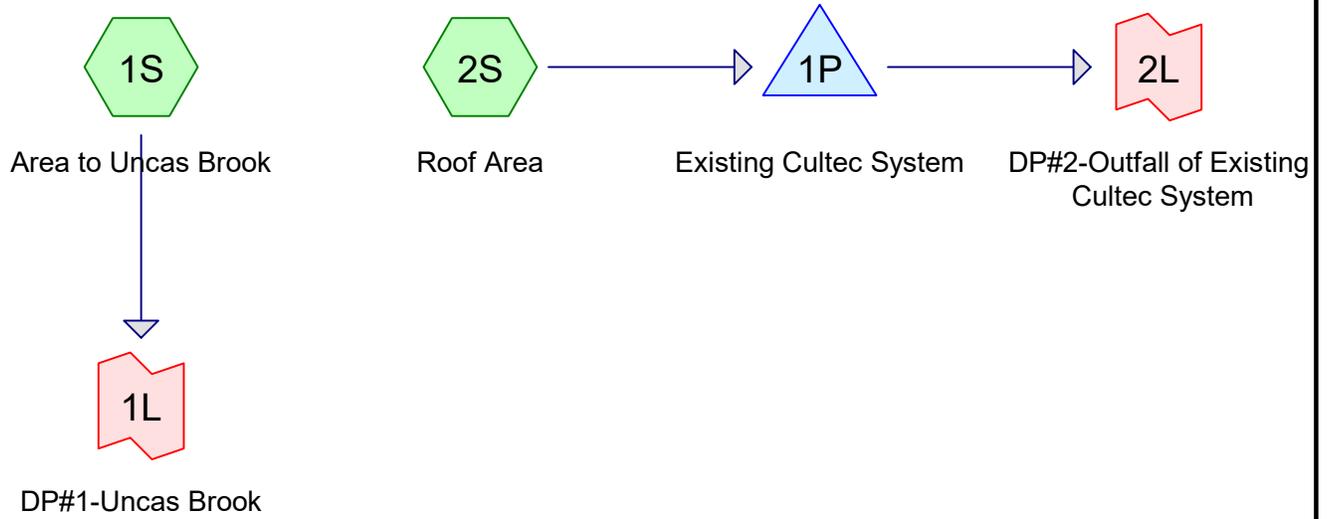
- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance 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.

APPENDIX B

HydroCAD Reports - Pre-development 2, 10, 25, & 100-year



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Page 2

Area Listing (all nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|-----------------|-----------|---------------------------------------|
| 32,003 | 39 | >75% Grass cover, Good, HSG A (1S) |
| 8,150 | 98 | Paved parking, HSG A (1S) |
| 13,157 | 98 | Roofs, HSG A (2S) |
| 460 | 30 | Woods, Good, HSG A (1S) |
| 53,770 | 62 | TOTAL AREA |

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Page 3

Soil Listing (all nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|-----------------|---------------|-------------------------|
| 53,770 | HSG A | 1S, 2S |
| 0 | HSG B | |
| 0 | HSG C | |
| 0 | HSG D | |
| 0 | Other | |
| 53,770 | | TOTAL AREA |

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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 | Subcatchment Numbers |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------------|-------------------------|
| 32,003 | 0 | 0 | 0 | 0 | 32,003 | >75% Grass cover, Good | 1S |
| 8,150 | 0 | 0 | 0 | 0 | 8,150 | Paved parking | 1S |
| 13,157 | 0 | 0 | 0 | 0 | 13,157 | Roofs | 2S |
| 460 | 0 | 0 | 0 | 0 | 460 | Woods, Good | 1S |
| 53,770 | 0 | 0 | 0 | 0 | 53,770 | TOTAL AREA | |

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

Subcatchment 1S: Area to Uncas Brook

Runoff Area=40,613 sf 20.07% Impervious Runoff Depth>0.17"
Flow Length=227' Tc=6.0 min CN=51 Runoff=0.02 cfs 567 cf

Subcatchment 2S: Roof Area

Runoff Area=13,157 sf 100.00% Impervious Runoff Depth>3.04"
Tc=6.0 min CN=98 Runoff=0.86 cfs 3,337 cf

Pond 1P: Existing Cultec System

Peak Elev=250.49' Storage=936 cf Inflow=0.86 cfs 3,337 cf
Discarded=0.09 cfs 3,334 cf Primary=0.00 cfs 0 cf Outflow=0.09 cfs 3,334 cf

Link 1L: DP#1-Uncas Brook

Inflow=0.02 cfs 567 cf
Primary=0.02 cfs 567 cf

Link 2L: DP#2-Outfall of Existing Cultec System

Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 53,770 sf Runoff Volume = 3,904 cf Average Runoff Depth = 0.87"
60.37% Pervious = 32,463 sf 39.63% Impervious = 21,307 sf

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NRCC 24-hr D 2-year Rainfall=3.28"

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Summary for Subcatchment 1S: Area to Uncas Brook

Runoff = 0.02 cfs @ 12.95 hrs, Volume= 567 cf, Depth> 0.17"
 Routed to Link 1L : DP#1-Uncas Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 NRCC 24-hr D 2-year Rainfall=3.28"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 8,150 | 98 | Paved parking, HSG A |
| 32,003 | 39 | >75% Grass cover, Good, HSG A |
| 460 | 30 | Woods, Good, HSG A |
| 40,613 | 51 | Weighted Average |
| 32,463 | | 79.93% Pervious Area |
| 8,150 | | 20.07% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|--|-------------------|----------------|--|
| 0.7 | 50 | 0.0200 | 1.23 | | Sheet Flow, A-B Smooth surfaces n= 0.011 P2= 3.37" |
| 0.2 | 30 | 0.0200 | 2.87 | | Shallow Concentrated Flow, B-C Paved Kv= 20.3 fps |
| 0.4 | 123 | 0.0570 | 4.85 | | Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps |
| 0.1 | 24 | 0.2100 | 3.21 | | Shallow Concentrated Flow, D-E Short Grass Pasture Kv= 7.0 fps |
| 1.4 | 227 | Total, Increased to minimum Tc = 6.0 min | | | |

Summary for Subcatchment 2S: Roof Area

Runoff = 0.86 cfs @ 12.13 hrs, Volume= 3,337 cf, Depth> 3.04"
 Routed to Pond 1P : Existing Cultec System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 NRCC 24-hr D 2-year Rainfall=3.28"

| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| 13,157 | 98 | Roofs, HSG A |
| 13,157 | | 100.00% Impervious Area |

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

Summary for Pond 1P: Existing Cultec System

Inflow Area = 13,157 sf, 100.00% Impervious, Inflow Depth > 3.04" for 2-year event
 Inflow = 0.86 cfs @ 12.13 hrs, Volume= 3,337 cf
 Outflow = 0.09 cfs @ 11.25 hrs, Volume= 3,334 cf, Atten= 90%, Lag= 0.0 min
 Discarded = 0.09 cfs @ 11.25 hrs, Volume= 3,334 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link 2L : DP#2-Outfall of Existing Cultec System

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 250.49' @ 13.04 hrs Surf.Area= 1,531 sf Storage= 936 cf
 Flood Elev= 252.50' Surf.Area= 1,531 sf Storage= 3,116 cf

Plug-Flow detention time= 68.8 min calculated for 3,327 cf (100% of inflow)
 Center-of-Mass det. time= 68.0 min (827.0 - 759.1)

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NRCC 24-hr D 2-year Rainfall=3.28"

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| Volume | Invert | Avail.Storage | Storage Description |
|--------|---------|---------------|--|
| #1A | 249.50' | 1,317 cf | 20.83'W x 73.50'L x 3.54'H Field A 5,423 cf Overall - 2,131 cf Embedded = 3,292 cf x 40.0% Voids |
| #2A | 250.00' | 2,131 cf | Cultec R-330XLHD x 40 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 4 rows |
| | | 3,448 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|---------|--|
| #1 | Primary | 250.50' | 6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads |
| #2 | Discarded | 249.50' | 2.410 in/hr Exfiltration over Surface area |

Discarded OutFlow Max=0.09 cfs @ 11.25 hrs HW=249.54' (Free Discharge)↑**2=Exfiltration** (Exfiltration Controls 0.09 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=249.50' (Free Discharge)↑**1=Orifice/Grate** (Controls 0.00 cfs)**Summary for Link 1L: DP#1-Uncas Brook**

Inflow Area = 40,613 sf, 20.07% Impervious, Inflow Depth > 0.17" for 2-year event
 Inflow = 0.02 cfs @ 12.95 hrs, Volume= 567 cf
 Primary = 0.02 cfs @ 12.95 hrs, Volume= 567 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Link 2L: DP#2-Outfall of Existing Cultec System

Inflow Area = 13,157 sf, 100.00% Impervious, Inflow Depth = 0.00" for 2-year event
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

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NRCC 24-hr D 10-year Rainfall=4.94"

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Page 1

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

Subcatchment 1S: Area to Uncas Brook

Runoff Area=40,613 sf 20.07% Impervious Runoff Depth>0.72"
Flow Length=227' Tc=6.0 min CN=51 Runoff=0.52 cfs 2,435 cf

Subcatchment 2S: Roof Area

Runoff Area=13,157 sf 100.00% Impervious Runoff Depth>4.70"
Tc=6.0 min CN=98 Runoff=1.31 cfs 5,151 cf

Pond 1P: Existing Cultec System

Peak Elev=250.82' Storage=1,348 cf Inflow=1.31 cfs 5,151 cf
Discarded=0.09 cfs 4,391 cf Primary=0.25 cfs 755 cf Outflow=0.34 cfs 5,146 cf

Link 1L: DP#1-Uncas Brook

Inflow=0.52 cfs 2,435 cf
Primary=0.52 cfs 2,435 cf

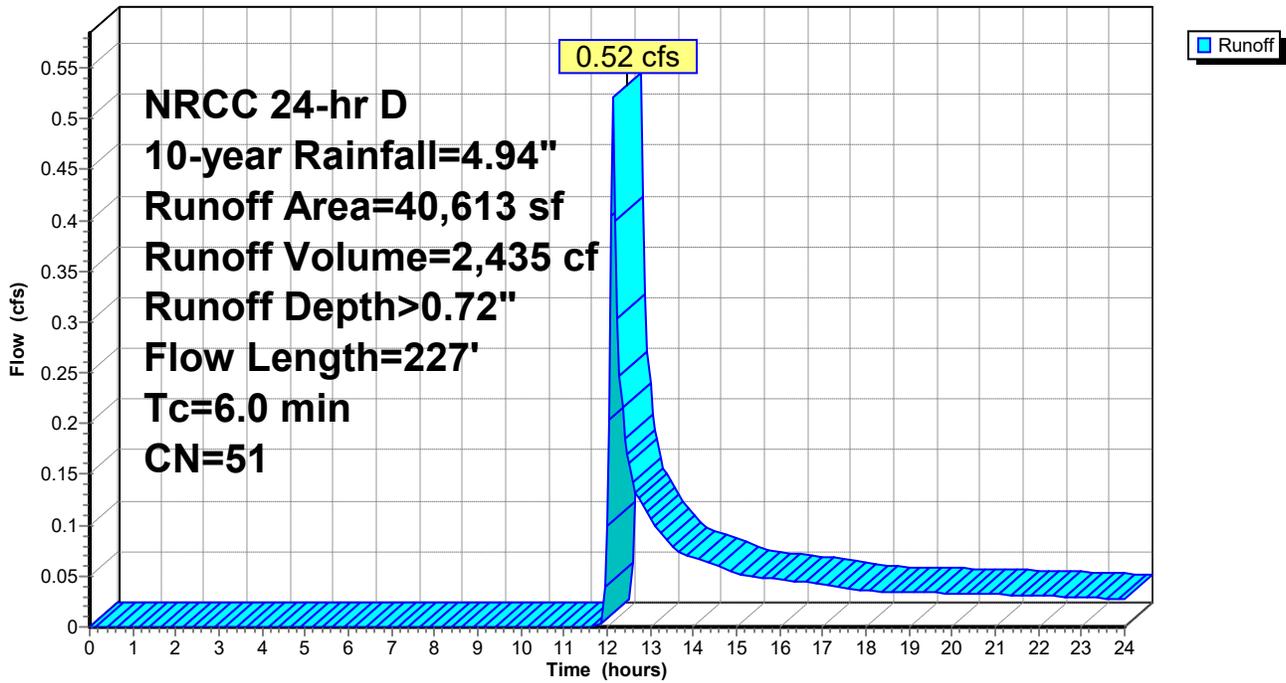
Link 2L: DP#2-Outfall of Existing Cultec System

Inflow=0.25 cfs 755 cf
Primary=0.25 cfs 755 cf

Total Runoff Area = 53,770 sf Runoff Volume = 7,587 cf Average Runoff Depth = 1.69"
60.37% Pervious = 32,463 sf 39.63% Impervious = 21,307 sf

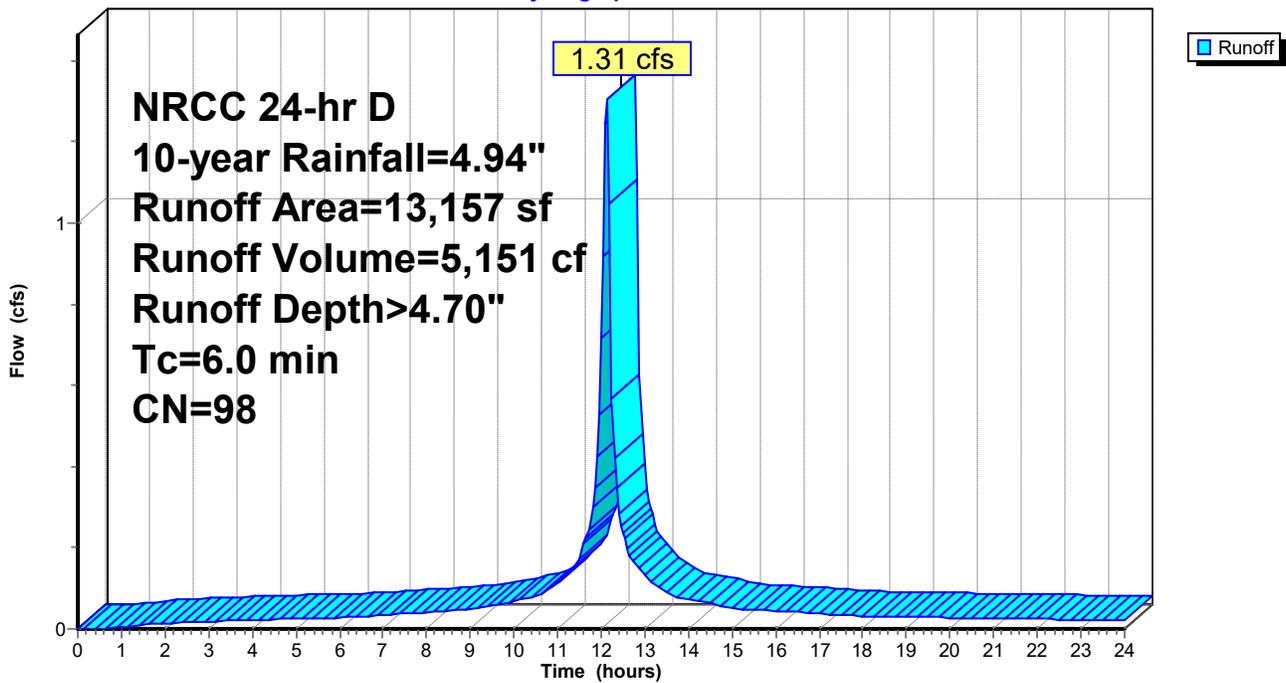
Subcatchment 1S: Area to Uncas Brook

Hydrograph



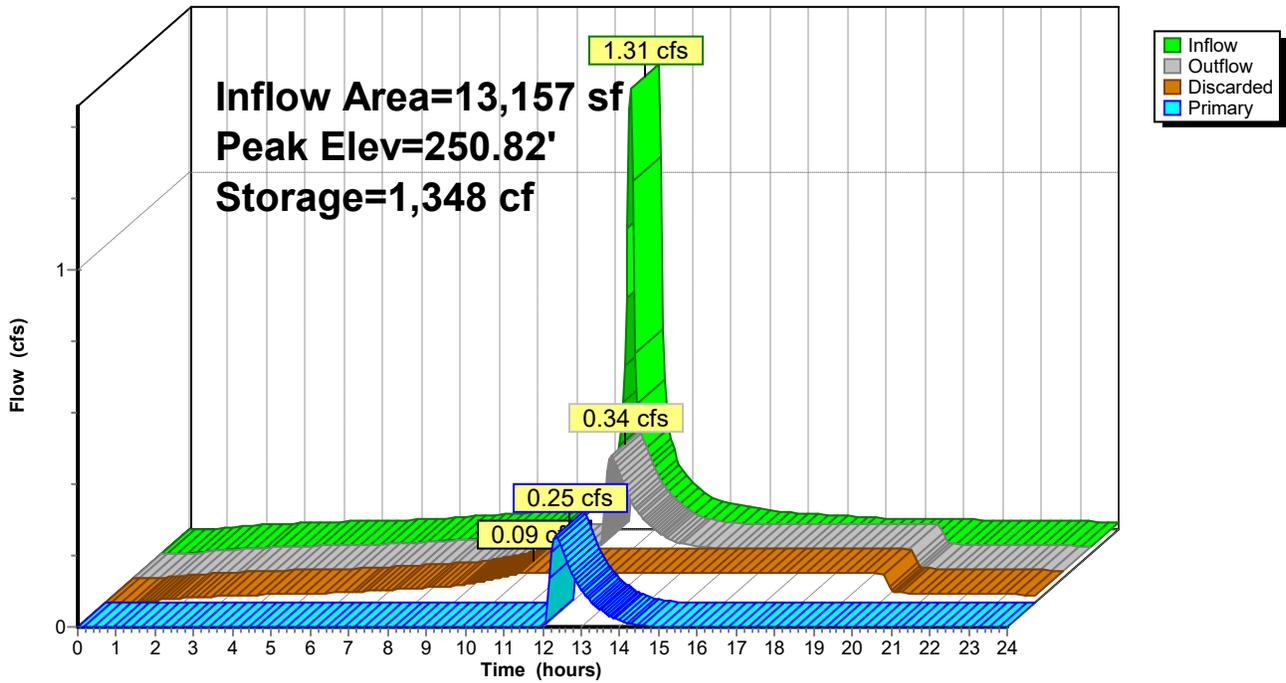
Subcatchment 2S: Roof Area

Hydrograph



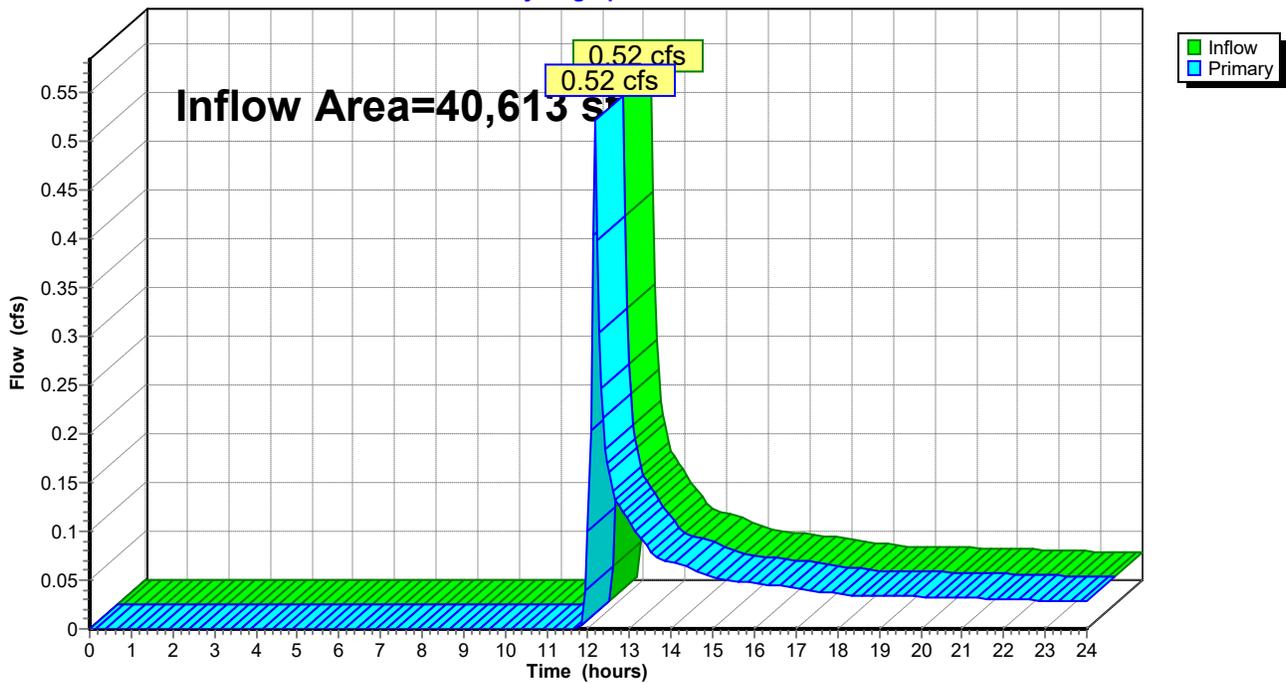
Pond 1P: Existing Cultec System

Hydrograph



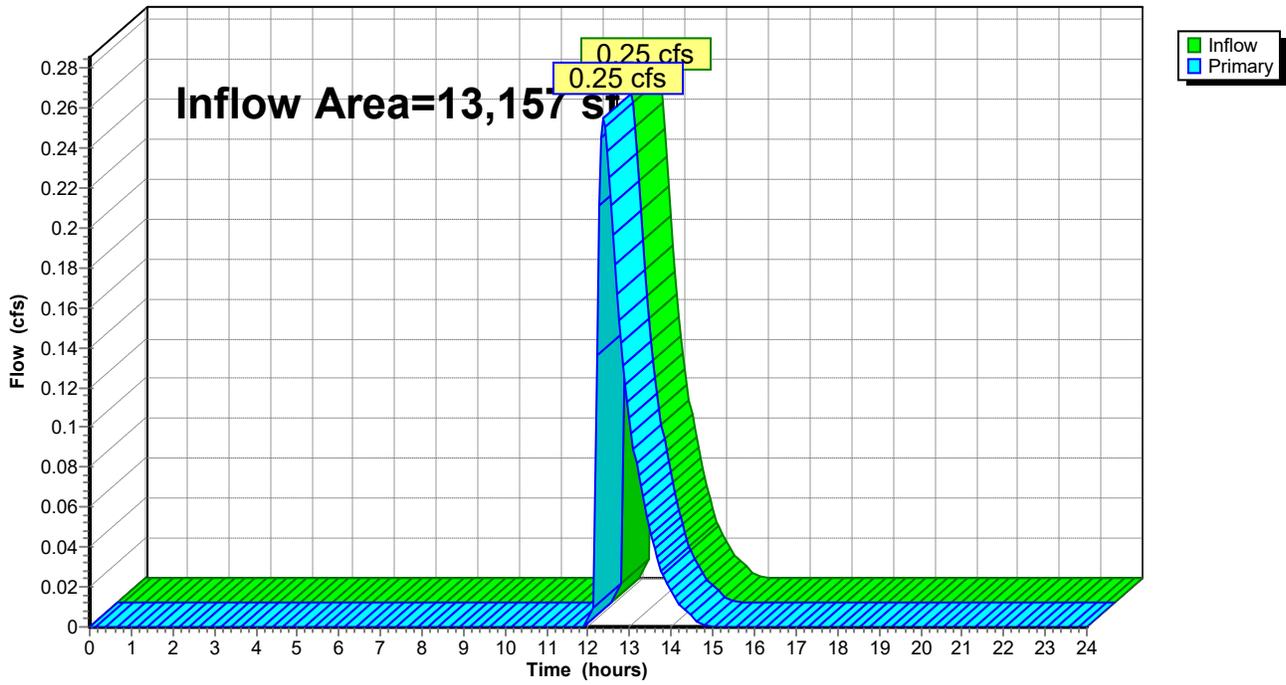
Link 1L: DP#1-Uncas Brook

Hydrograph



Link 2L: DP#2-Outfall of Existing Cultec System

Hydrograph



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NRCC 24-hr D 25-year Rainfall=6.25"

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

Subcatchment 1S: Area to Uncas Brook

Runoff Area=40,613 sf 20.07% Impervious Runoff Depth>1.34"
Flow Length=227' Tc=6.0 min CN=51 Runoff=1.19 cfs 4,539 cf

Subcatchment 2S: Roof Area

Runoff Area=13,157 sf 100.00% Impervious Runoff Depth>6.01"
Tc=6.0 min CN=98 Runoff=1.65 cfs 6,584 cf

Pond 1P: Existing Cultec System

Peak Elev=251.06' Storage=1,651 cf Inflow=1.65 cfs 6,584 cf
Discarded=0.09 cfs 5,044 cf Primary=0.53 cfs 1,534 cf Outflow=0.62 cfs 6,578 cf

Link 1L: DP#1-Uncas Brook

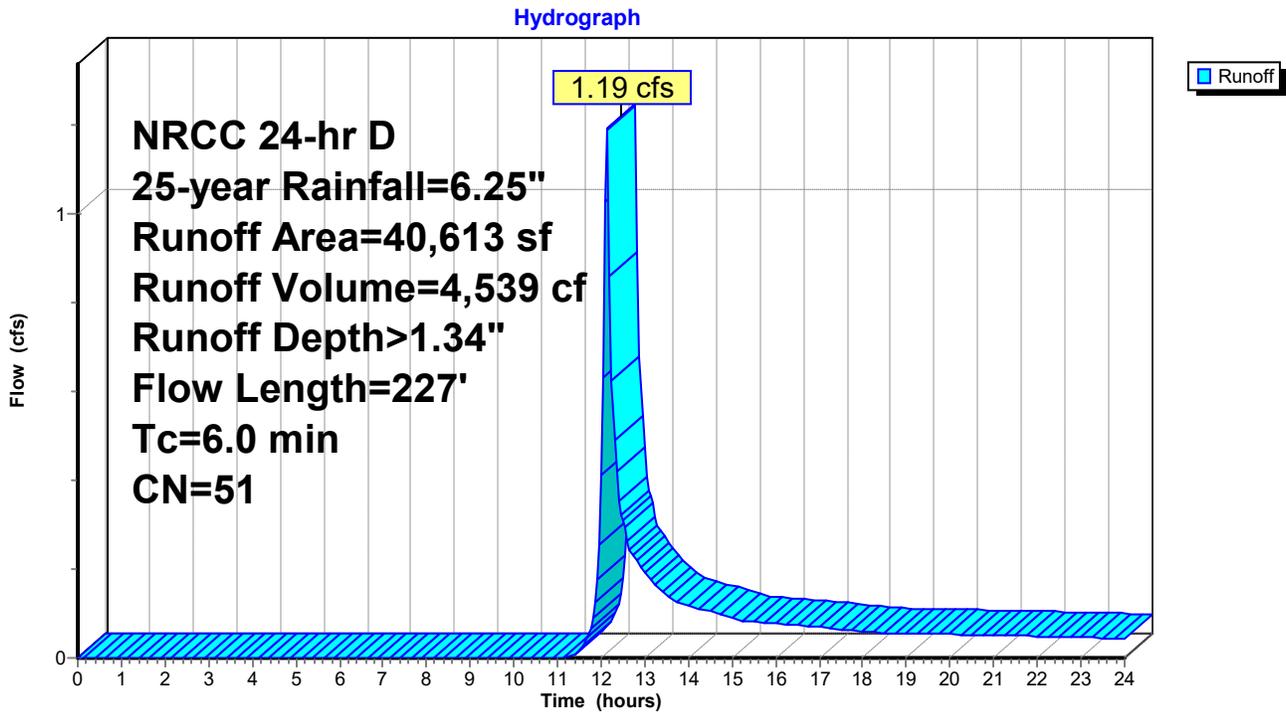
Inflow=1.19 cfs 4,539 cf
Primary=1.19 cfs 4,539 cf

Link 2L: DP#2-Outfall of Existing Cultec System

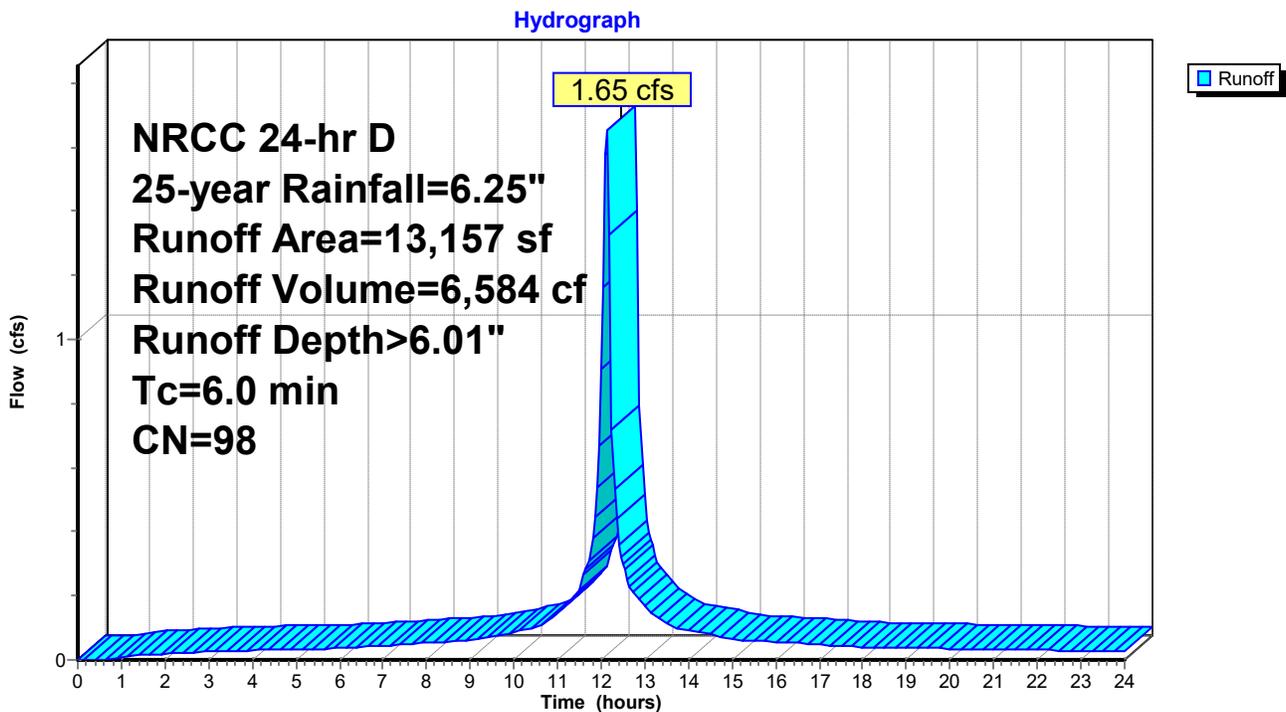
Inflow=0.53 cfs 1,534 cf
Primary=0.53 cfs 1,534 cf

Total Runoff Area = 53,770 sf Runoff Volume = 11,123 cf Average Runoff Depth = 2.48"
60.37% Pervious = 32,463 sf 39.63% Impervious = 21,307 sf

Subcatchment 1S: Area to Uncas Brook

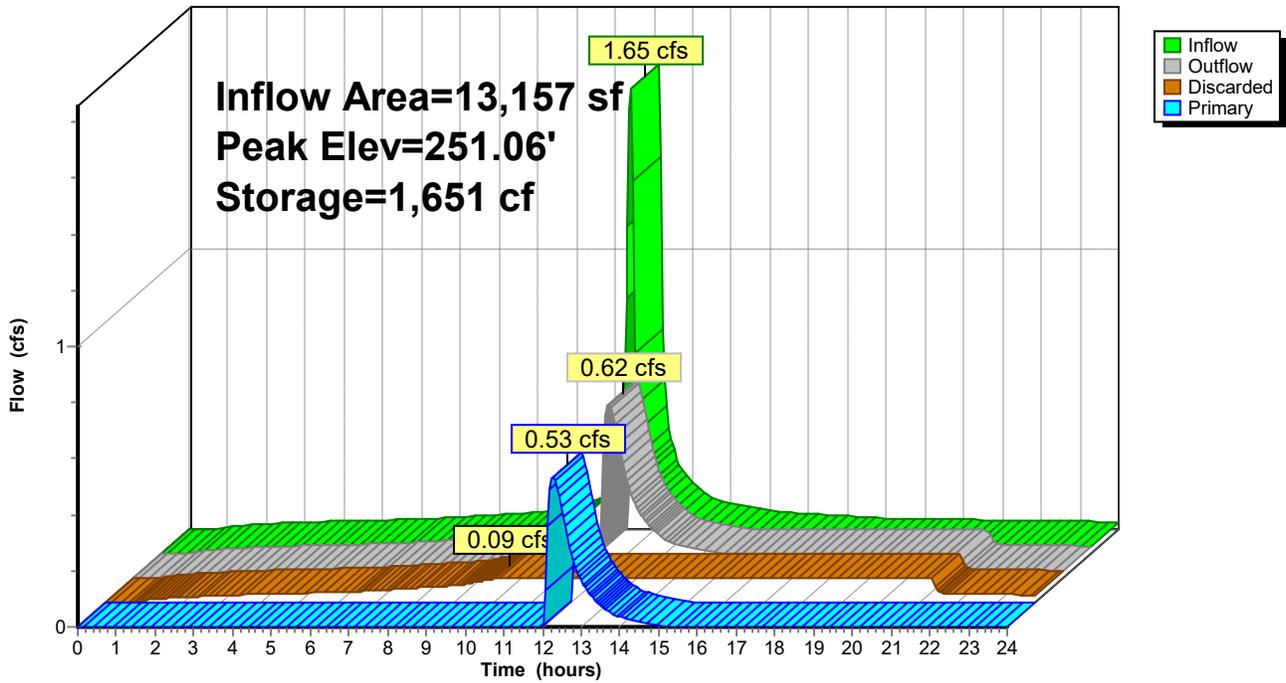


Subcatchment 2S: Roof Area



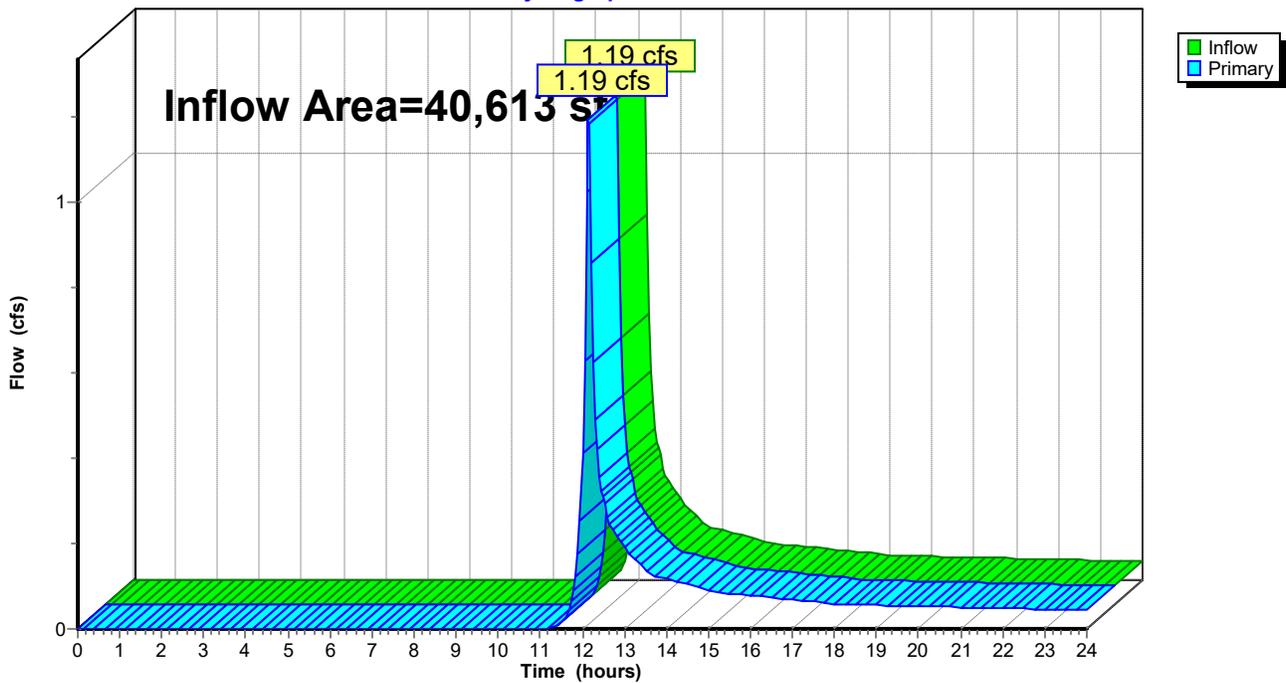
Pond 1P: Existing Cultec System

Hydrograph



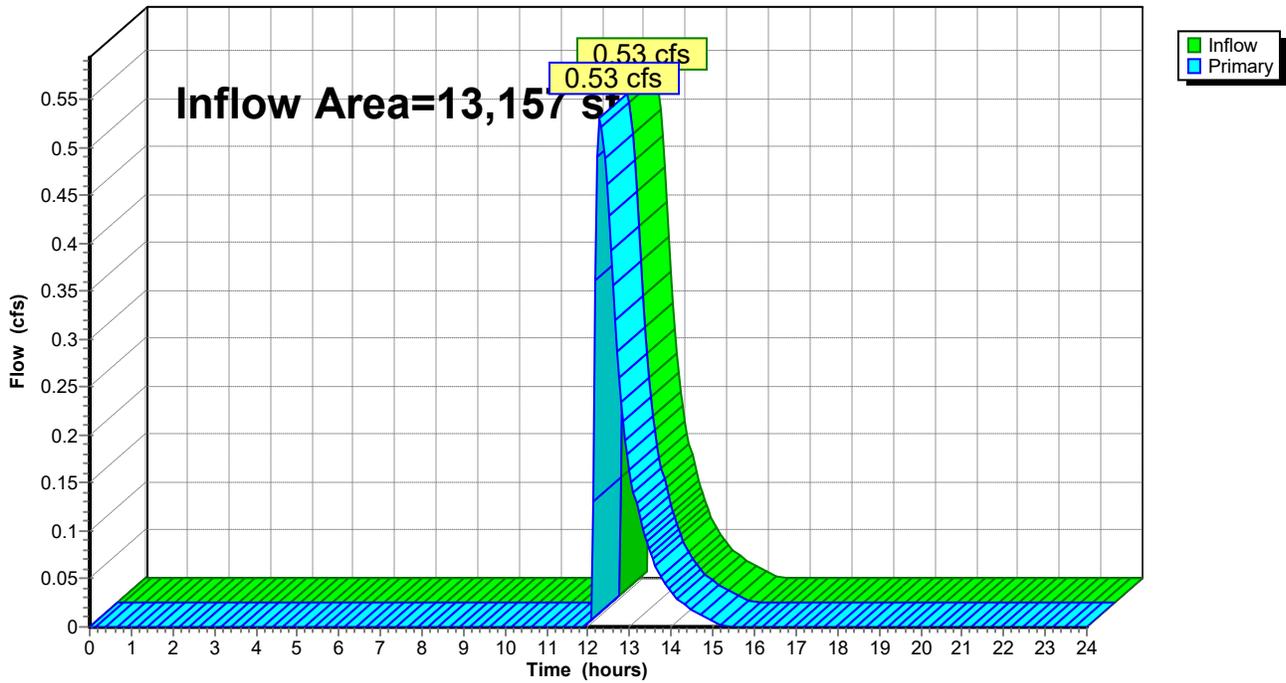
Link 1L: DP#1-Uncas Brook

Hydrograph



Link 2L: DP#2-Outfall of Existing Cultec System

Hydrograph



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NRCC 24-hr D 100-year Rainfall=8.95"

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

Subcatchment 1S: Area to Uncas Brook

Runoff Area=40,613 sf 20.07% Impervious Runoff Depth>2.96"
Flow Length=227' Tc=6.0 min CN=51 Runoff=2.91 cfs 10,030 cf

Subcatchment 2S: Roof Area

Runoff Area=13,157 sf 100.00% Impervious Runoff Depth>8.70"
Tc=6.0 min CN=98 Runoff=2.37 cfs 9,540 cf

Pond 1P: Existing Cultec System

Peak Elev=251.66' Storage=2,346 cf Inflow=2.37 cfs 9,540 cf
Discarded=0.09 cfs 6,126 cf Primary=0.90 cfs 3,371 cf Outflow=0.99 cfs 9,497 cf

Link 1L: DP#1-Uncas Brook

Inflow=2.91 cfs 10,030 cf
Primary=2.91 cfs 10,030 cf

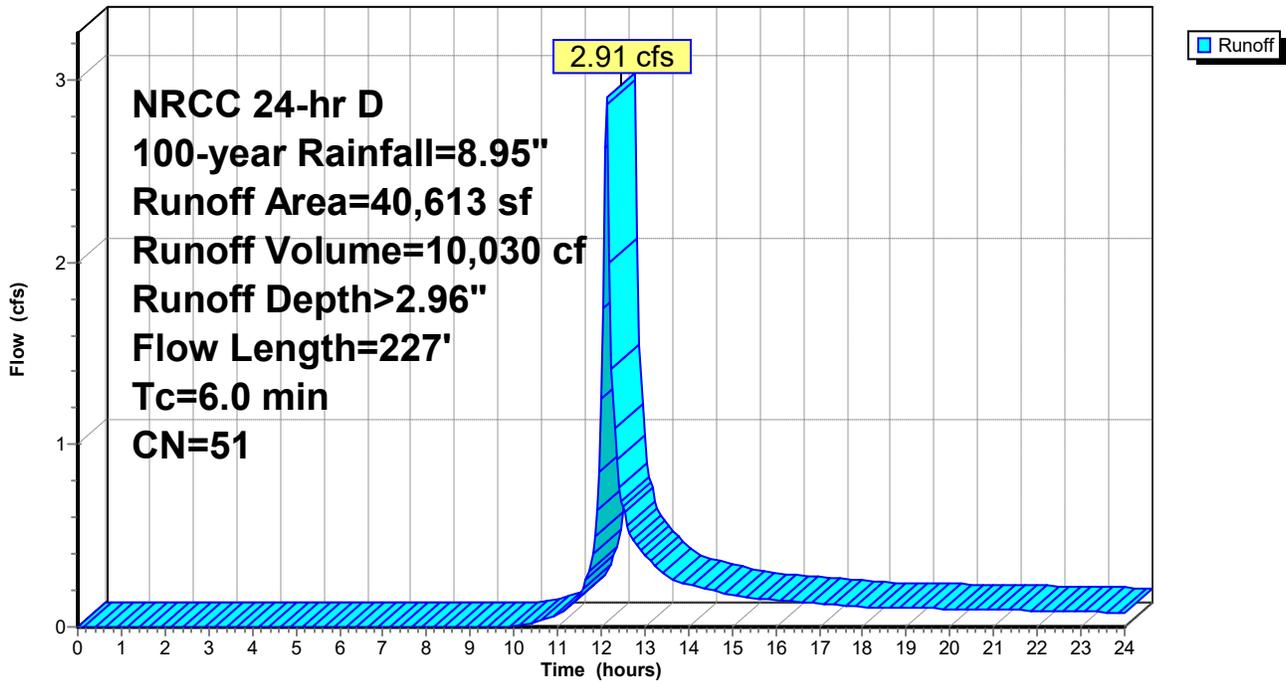
Link 2L: DP#2-Outfall of Existing Cultec System

Inflow=0.90 cfs 3,371 cf
Primary=0.90 cfs 3,371 cf

Total Runoff Area = 53,770 sf Runoff Volume = 19,569 cf Average Runoff Depth = 4.37"
60.37% Pervious = 32,463 sf 39.63% Impervious = 21,307 sf

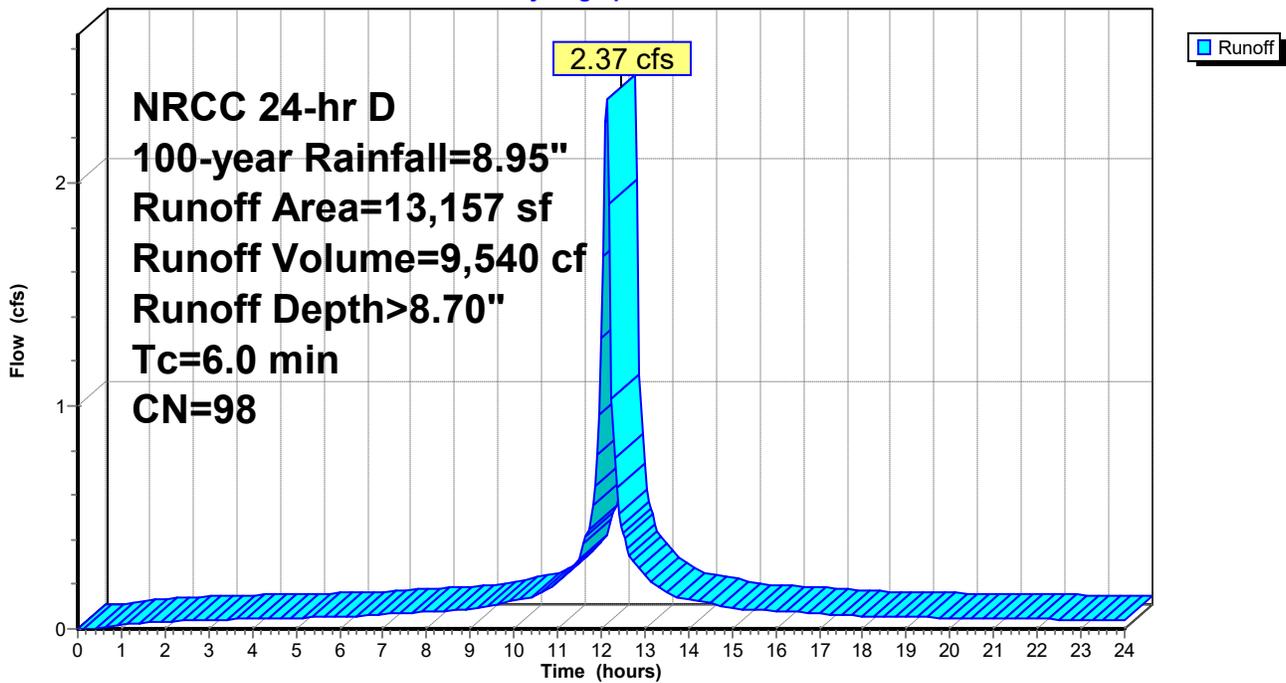
Subcatchment 1S: Area to Uncas Brook

Hydrograph



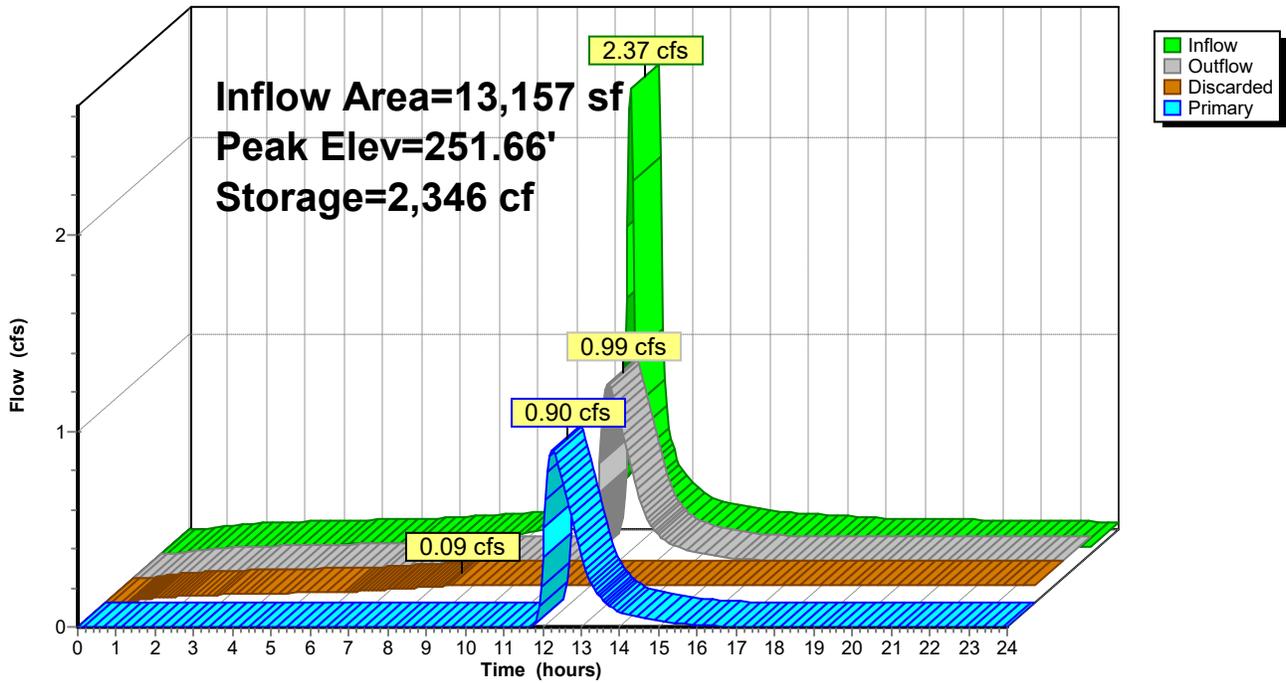
Subcatchment 2S: Roof Area

Hydrograph



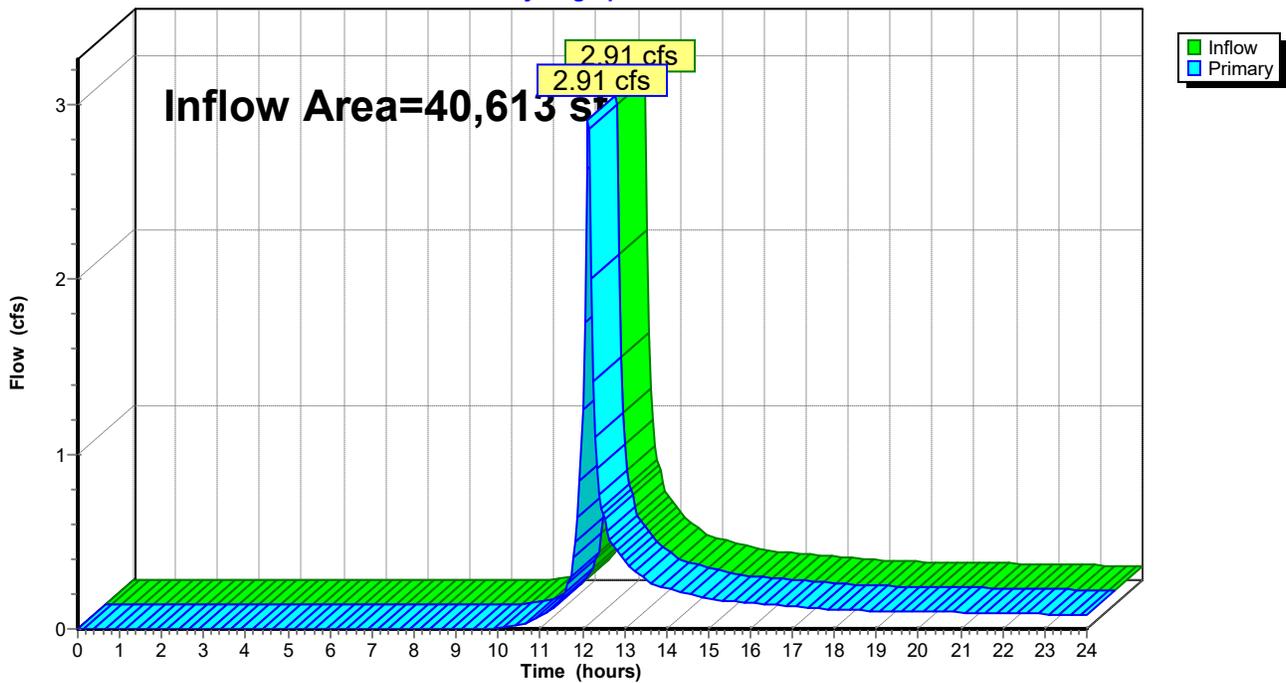
Pond 1P: Existing Cultec System

Hydrograph



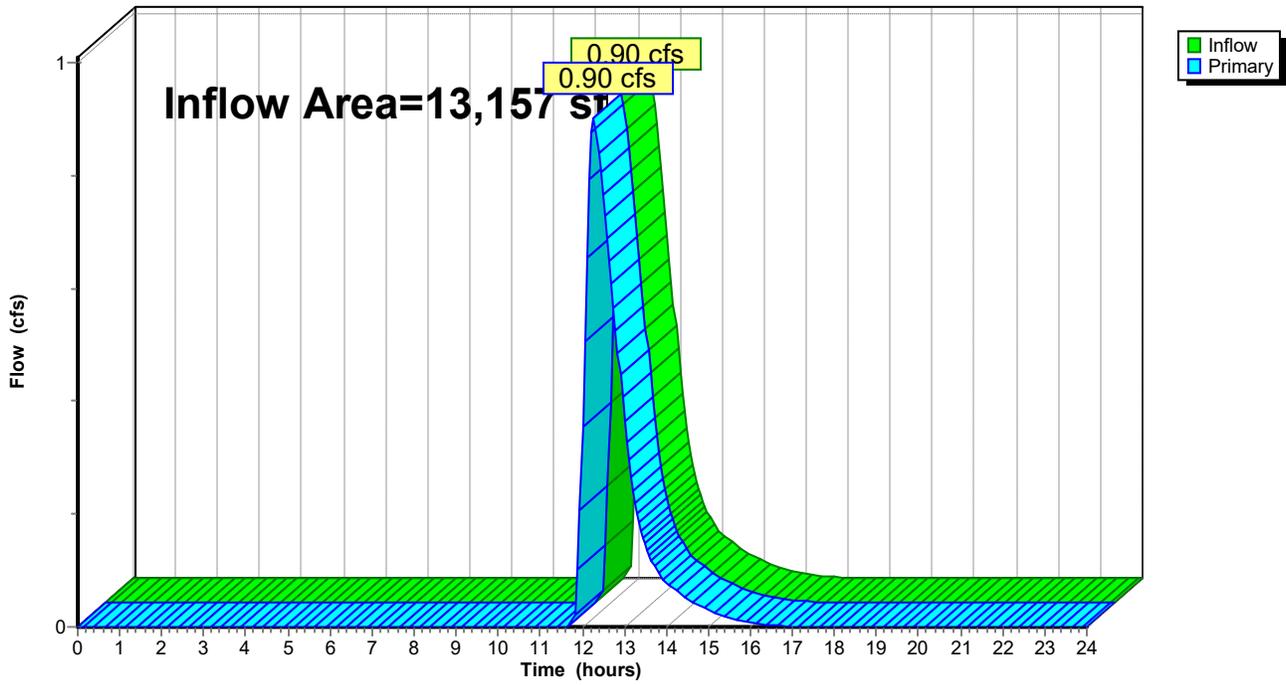
Link 1L: DP#1-Uncas Brook

Hydrograph



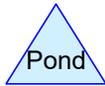
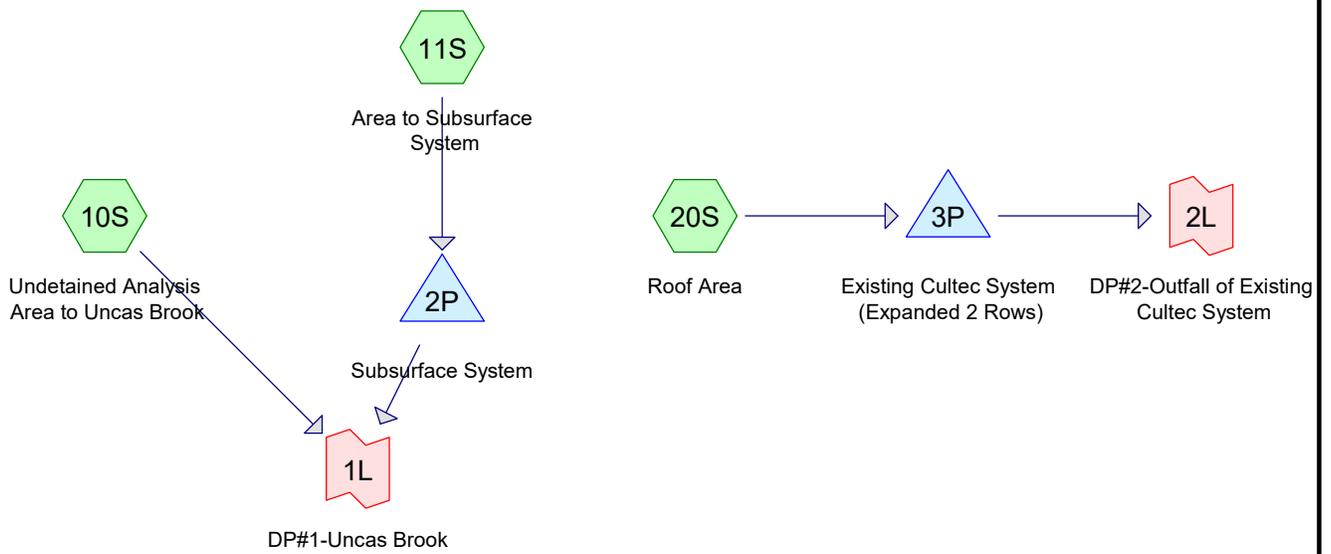
Link 2L: DP#2-Outfall of Existing Cultec System

Hydrograph



APPENDIX C

HydroCAD Reports - Post-development 2, 10, 25, & 100-year



Routing Diagram for FranklinCC_PostDevelopment
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Page 2

Area Listing (all nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|-----------------|-----------|--|
| 30,900 | 39 | >75% Grass cover, Good, HSG A (10S, 11S) |
| 6,018 | 98 | Paved parking, HSG A (10S, 11S) |
| 16,640 | 98 | Roofs, HSG A (20S) |
| 460 | 30 | Woods, Good, HSG A (10S) |
| 54,018 | 64 | TOTAL AREA |

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Page 3

Soil Listing (all nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|-----------------|---------------|-------------------------|
| 54,018 | HSG A | 10S, 11S, 20S |
| 0 | HSG B | |
| 0 | HSG C | |
| 0 | HSG D | |
| 0 | Other | |
| 54,018 | | TOTAL AREA |

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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 | Subcatchment Numbers |
|------------------|------------------|------------------|------------------|------------------|------------------|------------------------|-------------------------|
| 30,900 | 0 | 0 | 0 | 0 | 30,900 | >75% Grass cover, Good | 10S, 11S |
| 6,018 | 0 | 0 | 0 | 0 | 6,018 | Paved parking | 10S, 11S |
| 16,640 | 0 | 0 | 0 | 0 | 16,640 | Roofs | 20S |
| 460 | 0 | 0 | 0 | 0 | 460 | Woods, Good | 10S |
| 54,018 | 0 | 0 | 0 | 0 | 54,018 | TOTAL AREA | |

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NRCC 24-hr D 2-year Rainfall=3.28"

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

Subcatchment 10S: Undetained Analysis Area to Uncas Brook

Runoff Area=22,545 sf 8.46% Impervious Runoff Depth>0.04"
Flow Length=125' Tc=6.0 min CN=44 Runoff=0.00 cfs 75 cf

Subcatchment 11S: Area to Subsurface System

Runoff Area=14,833 sf 27.71% Impervious Runoff Depth>0.27"
Flow Length=77' Tc=6.0 min CN=55 Runoff=0.03 cfs 339 cf

Subcatchment 20S: Roof Area

Runoff Area=16,640 sf 100.00% Impervious Runoff Depth>3.04"
Tc=6.0 min CN=98 Runoff=1.09 cfs 4,221 cf

Pond 2P: Subsurface System

Peak Elev=255.12' Storage=8 cf Inflow=0.03 cfs 339 cf
Discarded=0.02 cfs 337 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 337 cf

Pond 3P: Existing Cultec System (Expanded 2 Rows)

Peak Elev=250.33' Storage=1,084 cf Inflow=1.09 cfs 4,221 cf
Discarded=0.13 cfs 4,216 cf Primary=0.00 cfs 0 cf Outflow=0.13 cfs 4,216 cf

Link 1L: DP#1-Uncas Brook

Inflow=0.00 cfs 75 cf
Primary=0.00 cfs 75 cf

Link 2L: DP#2-Outfall of Existing Cultec System

Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Total Runoff Area = 54,018 sf Runoff Volume = 4,634 cf Average Runoff Depth = 1.03"
58.05% Pervious = 31,360 sf 41.95% Impervious = 22,658 sf

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NRCC 24-hr D 2-year Rainfall=3.28"

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Summary for Subcatchment 10S: Undetained Analysis Area to Uncas Brook

Runoff = 0.00 cfs @ 24.00 hrs, Volume= 75 cf, Depth> 0.04"
 Routed to Link 1L : DP#1-Uncas Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 NRCC 24-hr D 2-year Rainfall=3.28"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 1,908 | 98 | Paved parking, HSG A |
| 20,177 | 39 | >75% Grass cover, Good, HSG A |
| 460 | 30 | Woods, Good, HSG A |
| 22,545 | 44 | Weighted Average |
| 20,637 | | 91.54% Pervious Area |
| 1,908 | | 8.46% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|--|-------------------|----------------|--|
| 2.7 | 50 | 0.1200 | 0.31 | | Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.37" |
| 0.2 | 38 | 0.1900 | 3.05 | | Shallow Concentrated Flow, B-C Short Grass Pasture Kv= 7.0 fps |
| 0.1 | 18 | 0.0600 | 4.97 | | Shallow Concentrated Flow, C-D Paved Kv= 20.3 fps |
| 0.1 | 19 | 0.2100 | 3.21 | | Shallow Concentrated Flow, D-E Short Grass Pasture Kv= 7.0 fps |
| 3.1 | 125 | Total, Increased to minimum Tc = 6.0 min | | | |

Summary for Subcatchment 11S: Area to Subsurface System

Runoff = 0.03 cfs @ 12.19 hrs, Volume= 339 cf, Depth> 0.27"
 Routed to Pond 2P : Subsurface System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 NRCC 24-hr D 2-year Rainfall=3.28"

| Area (sf) | CN | Description |
|-----------|----|-------------------------------|
| 4,110 | 98 | Paved parking, HSG A |
| 10,723 | 39 | >75% Grass cover, Good, HSG A |
| 14,833 | 55 | Weighted Average |
| 10,723 | | 72.29% Pervious Area |
| 4,110 | | 27.71% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|----------|---------------|--|-------------------|----------------|---|
| 2.7 | 50 | 0.1200 | 0.31 | | Sheet Flow, A-B Grass: Short n= 0.150 P2= 3.37" |
| 0.1 | 27 | 0.0300 | 3.52 | | Shallow Concentrated Flow, B-C Paved Kv= 20.3 fps |
| 2.8 | 77 | Total, Increased to minimum Tc = 6.0 min | | | |

Summary for Subcatchment 20S: Roof Area

Runoff = 1.09 cfs @ 12.13 hrs, Volume= 4,221 cf, Depth> 3.04"
 Routed to Pond 3P : Existing Cultec System (Expanded 2 Rows)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 NRCC 24-hr D 2-year Rainfall=3.28"

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NRCC 24-hr D 2-year Rainfall=3.28"

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| Area (sf) | CN | Description |
|-----------|----|-------------------------|
| 16,640 | 98 | Roofs, HSG A |
| 16,640 | | 100.00% Impervious Area |

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

Summary for Pond 2P: Subsurface System

Inflow Area = 14,833 sf, 27.71% Impervious, Inflow Depth > 0.27" for 2-year event
 Inflow = 0.03 cfs @ 12.19 hrs, Volume= 339 cf
 Outflow = 0.02 cfs @ 12.25 hrs, Volume= 337 cf, Atten= 27%, Lag= 3.5 min
 Discarded = 0.02 cfs @ 12.25 hrs, Volume= 337 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link 1L : DP#1-Uncas Brook

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 255.12' @ 12.38 hrs Surf.Area= 396 sf Storage= 8 cf
 Flood Elev= 258.82' Surf.Area= 396 sf Storage= 879 cf

Plug-Flow detention time= 4.6 min calculated for 337 cf (99% of inflow)
 Center-of-Mass det. time= 2.9 min (1,002.8 - 999.9)

| Volume | Invert | Avail.Storage | Storage Description |
|--------|---------|---------------|--|
| #1A | 255.07' | 403 cf | 15.75'W x 25.12'L x 3.75'H Field A 1,483 cf Overall - 476 cf Embedded = 1,008 cf x 40.0% Voids |
| #2A | 255.57' | 476 cf | ADS_StormTech SC-800 +Cap x 9 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 9 Chambers in 3 Rows Cap Storage= 3.4 cf x 2 x 3 rows = 20.5 cf |
| | | 879 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|---------|--|
| #1 | Discarded | 255.07' | 2.410 in/hr Exfiltration over Surface area |
| #2 | Primary | 257.45' | 8.0" Vert. Outlet Pipe C= 0.600 Limited to weir flow at low heads |

Discarded OutFlow Max=0.02 cfs @ 12.25 hrs HW=255.11' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=255.07' (Free Discharge)
 ↑**2=Outlet Pipe** (Controls 0.00 cfs)

Summary for Pond 3P: Existing Cultec System (Expanded 2 Rows)

Inflow Area = 16,640 sf,100.00% Impervious, Inflow Depth > 3.04" for 2-year event
 Inflow = 1.09 cfs @ 12.13 hrs, Volume= 4,221 cf
 Outflow = 0.13 cfs @ 11.45 hrs, Volume= 4,216 cf, Atten= 89%, Lag= 0.0 min
 Discarded = 0.13 cfs @ 11.45 hrs, Volume= 4,216 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link 2L : DP#2-Outfall of Existing Cultec System

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 250.33' @ 12.87 hrs Surf.Area= 2,242 sf Storage= 1,084 cf
 Flood Elev= 252.50' Surf.Area= 2,242 sf Storage= 4,608 cf

Plug-Flow detention time= 51.5 min calculated for 4,208 cf (100% of inflow)
 Center-of-Mass det. time= 50.6 min (809.7 - 759.1)

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NRCC 24-hr D 2-year Rainfall=3.28"

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| Volume | Invert | Avail.Storage | Storage Description |
|--------|---------|---------------|--|
| #1A | 249.50' | 1,897 cf | 30.50'W x 73.50'L x 3.54'H Field A 7,940 cf Overall - 3,196 cf Embedded = 4,743 cf x 40.0% Voids |
| #2A | 250.00' | 3,196 cf | Cultec R-330XLHD x 60 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 6 rows |
| | | 5,094 cf | Total Available Storage |

Storage Group A created with Chamber Wizard

| Device | Routing | Invert | Outlet Devices |
|--------|-----------|---------|--|
| #1 | Primary | 250.50' | 6.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads |
| #2 | Discarded | 249.50' | 2.410 in/hr Exfiltration over Surface area |

Discarded OutFlow Max=0.13 cfs @ 11.45 hrs HW=249.54' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=249.50' (Free Discharge)
 ↳ **1=Orifice/Grate** (Controls 0.00 cfs)

Summary for Link 1L: DP#1-Uncas Brook

Inflow Area = 37,378 sf, 16.10% Impervious, Inflow Depth > 0.02" for 2-year event
 Inflow = 0.00 cfs @ 24.00 hrs, Volume= 75 cf
 Primary = 0.00 cfs @ 24.00 hrs, Volume= 75 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Link 2L: DP#2-Outfall of Existing Cultec System

Inflow Area = 16,640 sf, 100.00% Impervious, Inflow Depth = 0.00" for 2-year event
 Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

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

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NRCC 24-hr D 10-year Rainfall=4.94"

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

Subcatchment 10S: Undetained Analysis Area to Uncas Brook

Runoff Area=22,545 sf 8.46% Impervious Runoff Depth>0.38"
Flow Length=125' Tc=6.0 min CN=44 Runoff=0.05 cfs 710 cf

Subcatchment 11S: Area to Subsurface System

Runoff Area=14,833 sf 27.71% Impervious Runoff Depth>0.95"
Flow Length=77' Tc=6.0 min CN=55 Runoff=0.29 cfs 1,172 cf

Subcatchment 20S: Roof Area

Runoff Area=16,640 sf 100.00% Impervious Runoff Depth>4.70"
Tc=6.0 min CN=98 Runoff=1.65 cfs 6,515 cf

Pond 2P: Subsurface System

Peak Elev=256.68' Storage=410 cf Inflow=0.29 cfs 1,172 cf
Discarded=0.02 cfs 972 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 972 cf

Pond 3P: Existing Cultec System (Expanded 2 Rows)

Peak Elev=250.72' Storage=1,813 cf Inflow=1.65 cfs 6,515 cf
Discarded=0.13 cfs 5,982 cf Primary=0.14 cfs 526 cf Outflow=0.26 cfs 6,508 cf

Link 1L: DP#1-Uncas Brook

Inflow=0.05 cfs 710 cf
Primary=0.05 cfs 710 cf

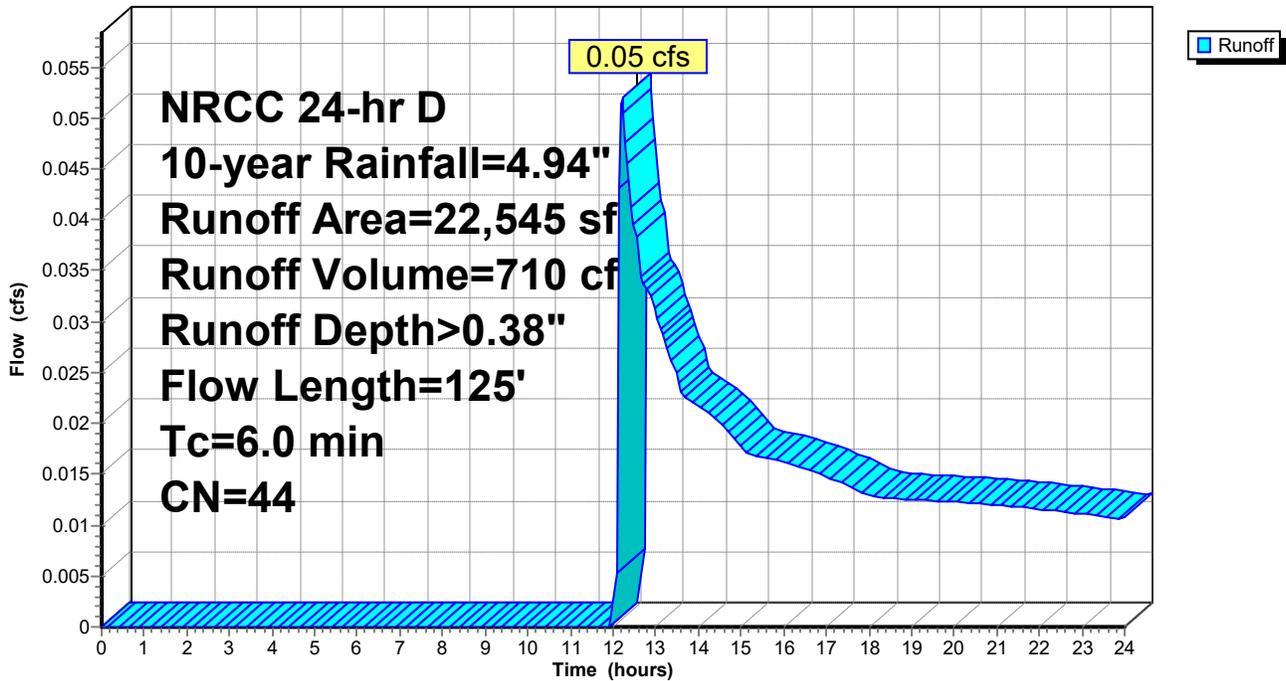
Link 2L: DP#2-Outfall of Existing Cultec System

Inflow=0.14 cfs 526 cf
Primary=0.14 cfs 526 cf

Total Runoff Area = 54,018 sf Runoff Volume = 8,396 cf Average Runoff Depth = 1.87"
58.05% Pervious = 31,360 sf 41.95% Impervious = 22,658 sf

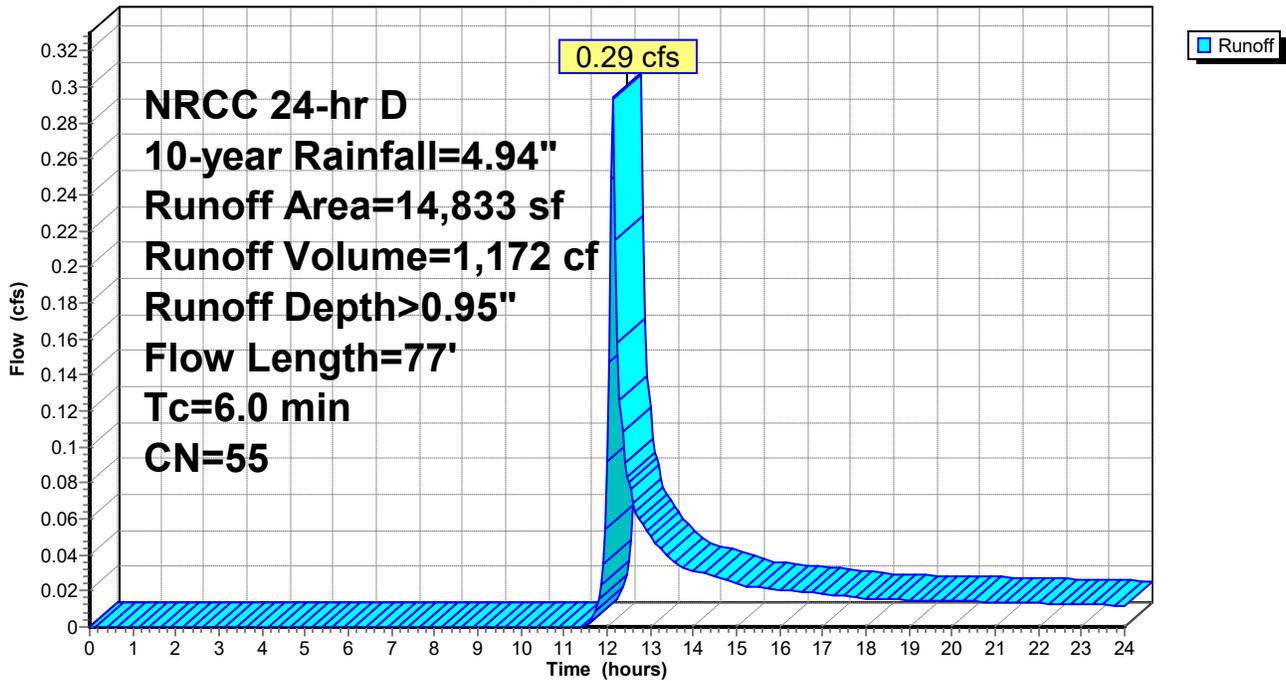
Subcatchment 10S: Undetained Analysis Area to Uncas Brook

Hydrograph



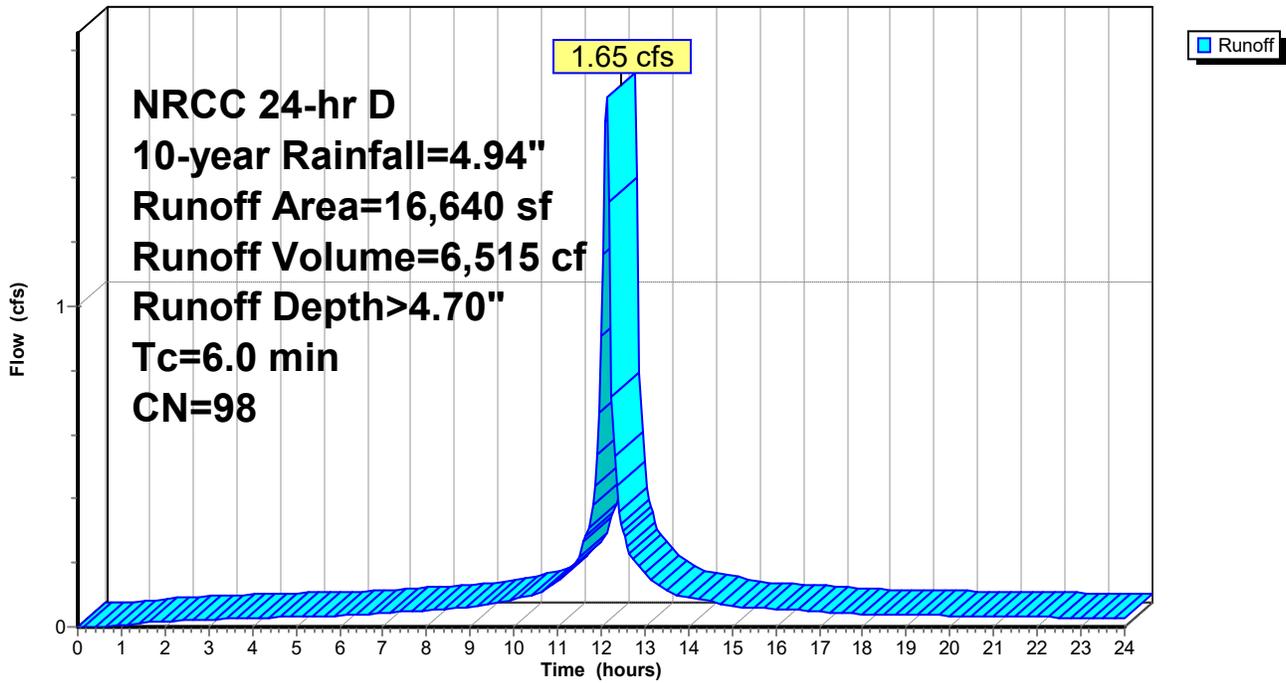
Subcatchment 11S: Area to Subsurface System

Hydrograph



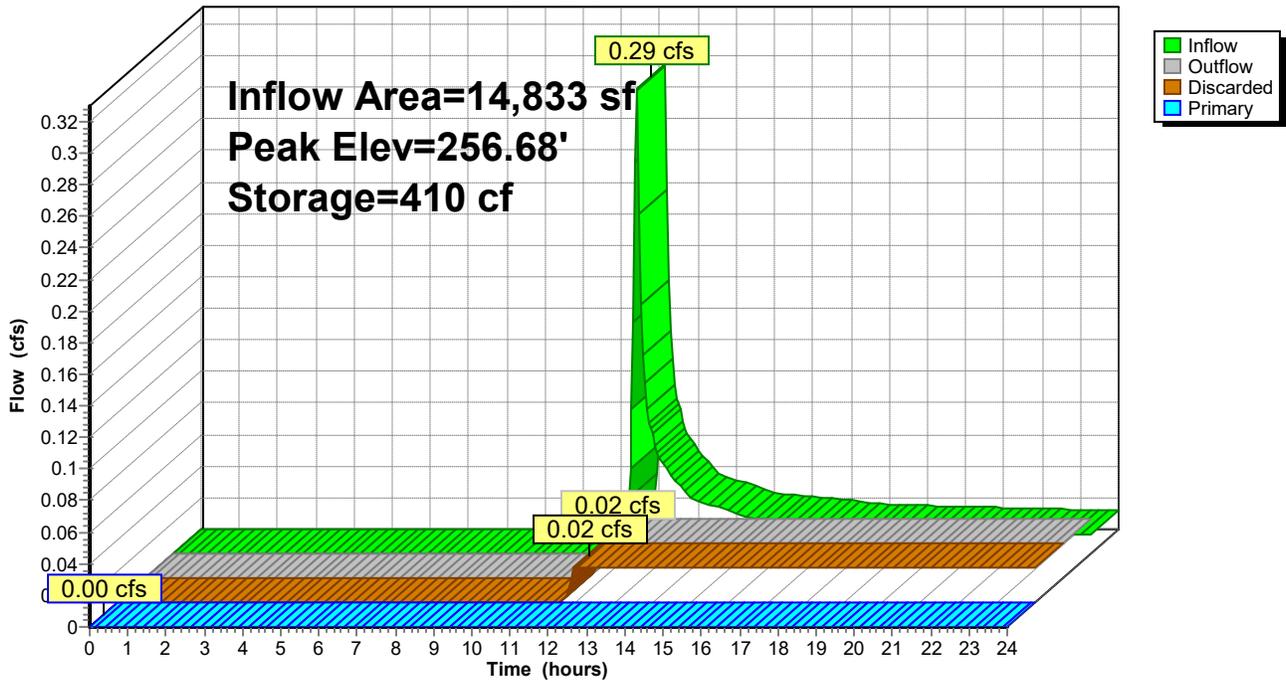
Subcatchment 20S: Roof Area

Hydrograph

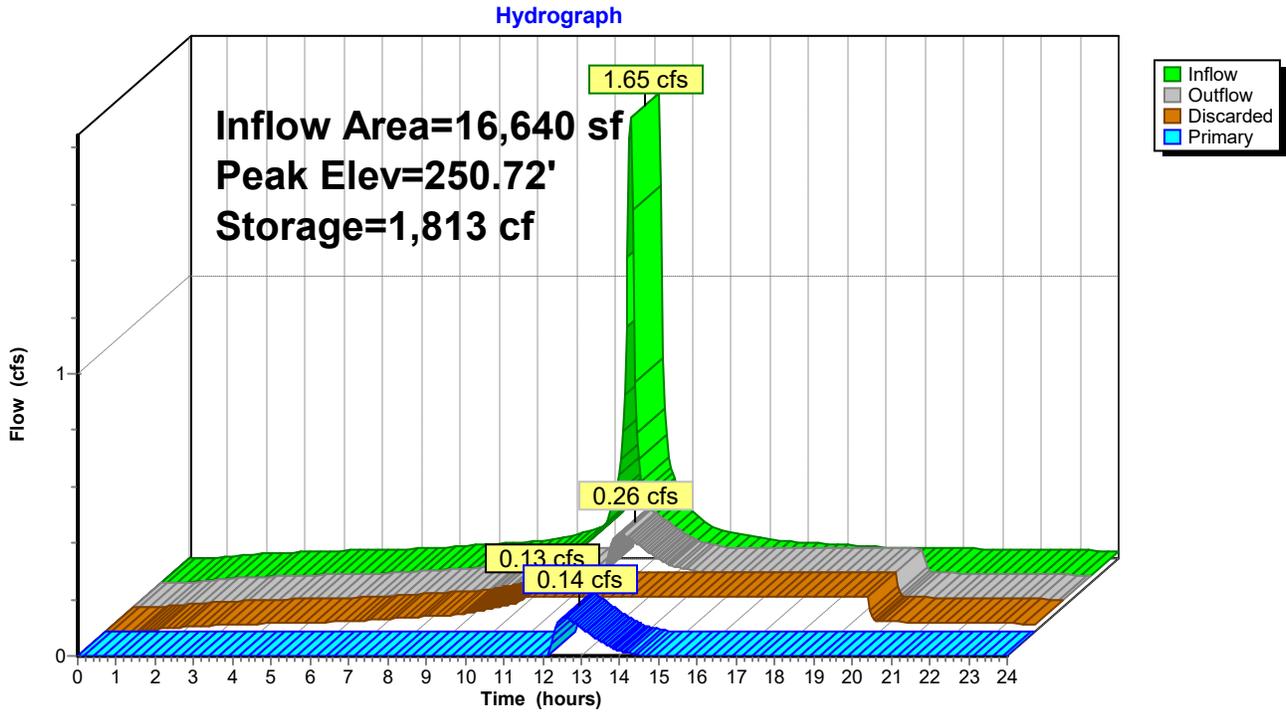


Pond 2P: Subsurface System

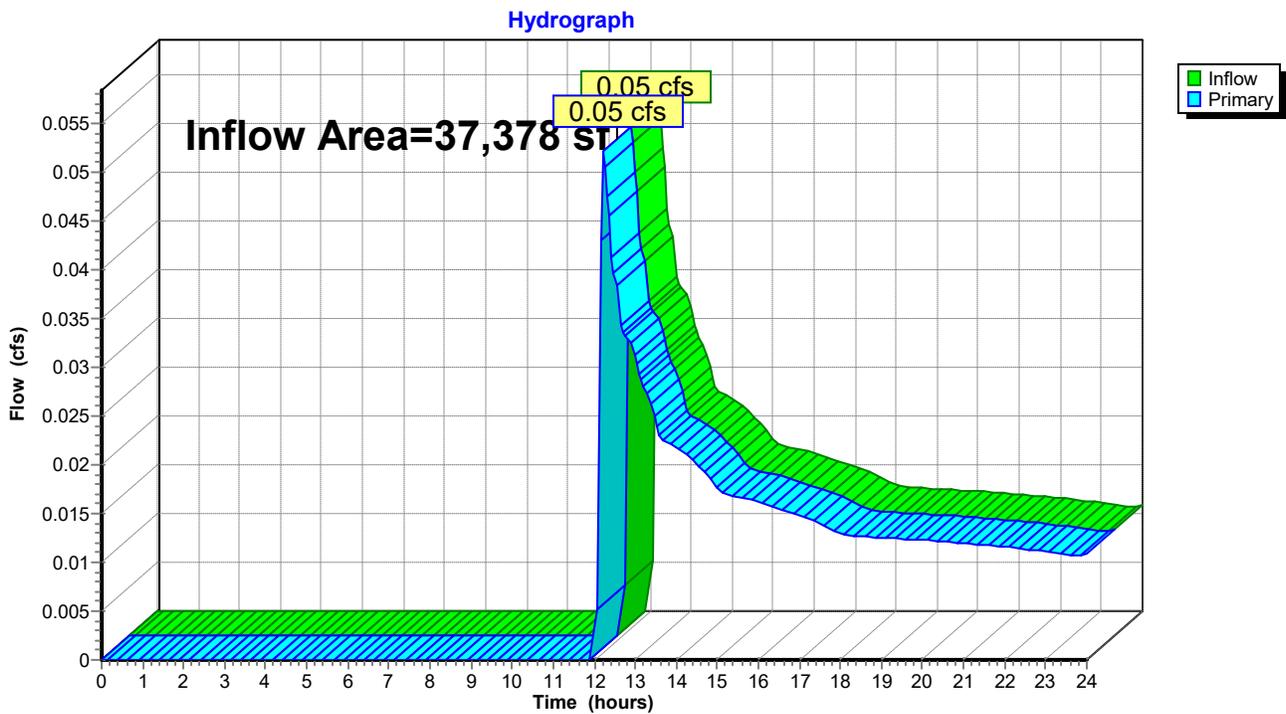
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Pond 3P: Existing Cultec System (Expanded 2 Rows)

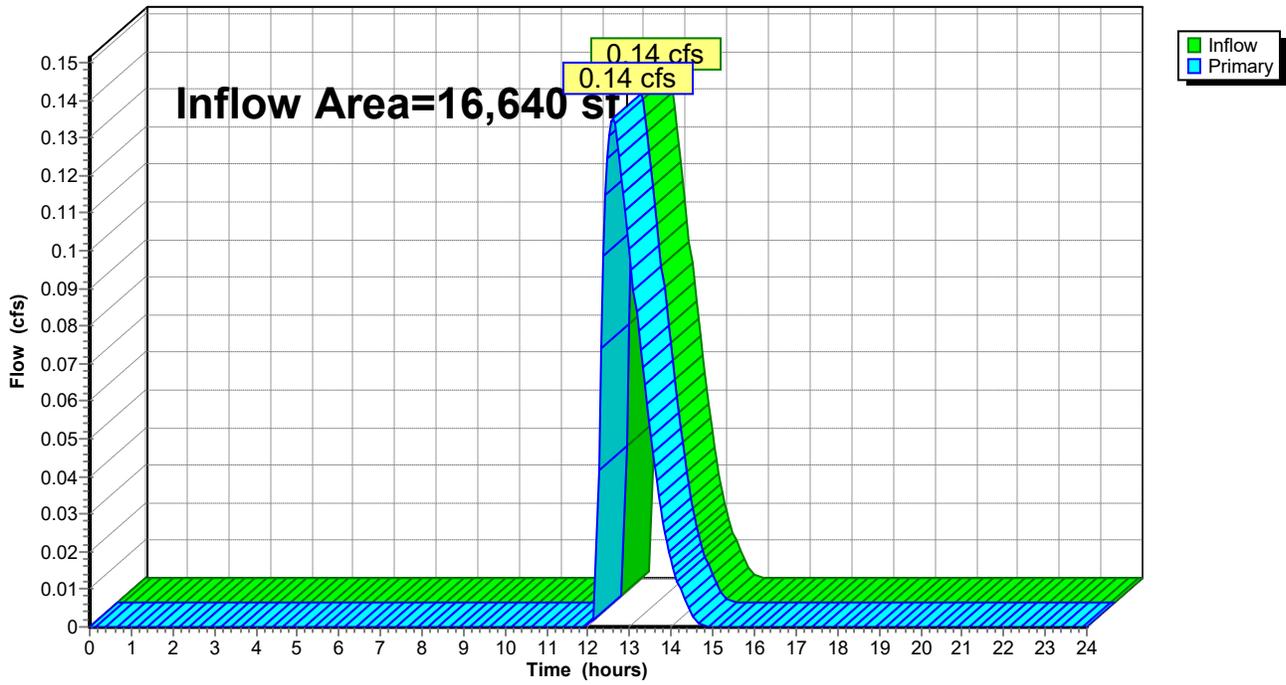


Link 1L: DP#1-Uncas Brook



Link 2L: DP#2-Outfall of Existing Cultec System

Hydrograph



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NRCC 24-hr D 25-year Rainfall=6.25"

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

Subcatchment 10S: Undetained Analysis Area to Uncas Brook

Runoff Area=22,545 sf 8.46% Impervious Runoff Depth>0.83"
Flow Length=125' Tc=6.0 min CN=44 Runoff=0.31 cfs 1,564 cf

Subcatchment 11S: Area to Subsurface System

Runoff Area=14,833 sf 27.71% Impervious Runoff Depth>1.66"
Flow Length=77' Tc=6.0 min CN=55 Runoff=0.57 cfs 2,052 cf

Subcatchment 20S: Roof Area

Runoff Area=16,640 sf 100.00% Impervious Runoff Depth>6.01"
Tc=6.0 min CN=98 Runoff=2.09 cfs 8,328 cf

Pond 2P: Subsurface System

Peak Elev=257.59' Storage=653 cf Inflow=0.57 cfs 2,052 cf
Discarded=0.02 cfs 1,012 cf Primary=0.07 cfs 450 cf Outflow=0.10 cfs 1,462 cf

Pond 3P: Existing Cultec System (Expanded 2 Rows)

Peak Elev=250.94' Storage=2,211 cf Inflow=2.09 cfs 8,328 cf
Discarded=0.13 cfs 6,876 cf Primary=0.41 cfs 1,443 cf Outflow=0.54 cfs 8,319 cf

Link 1L: DP#1-Uncas Brook

Inflow=0.31 cfs 2,015 cf
Primary=0.31 cfs 2,015 cf

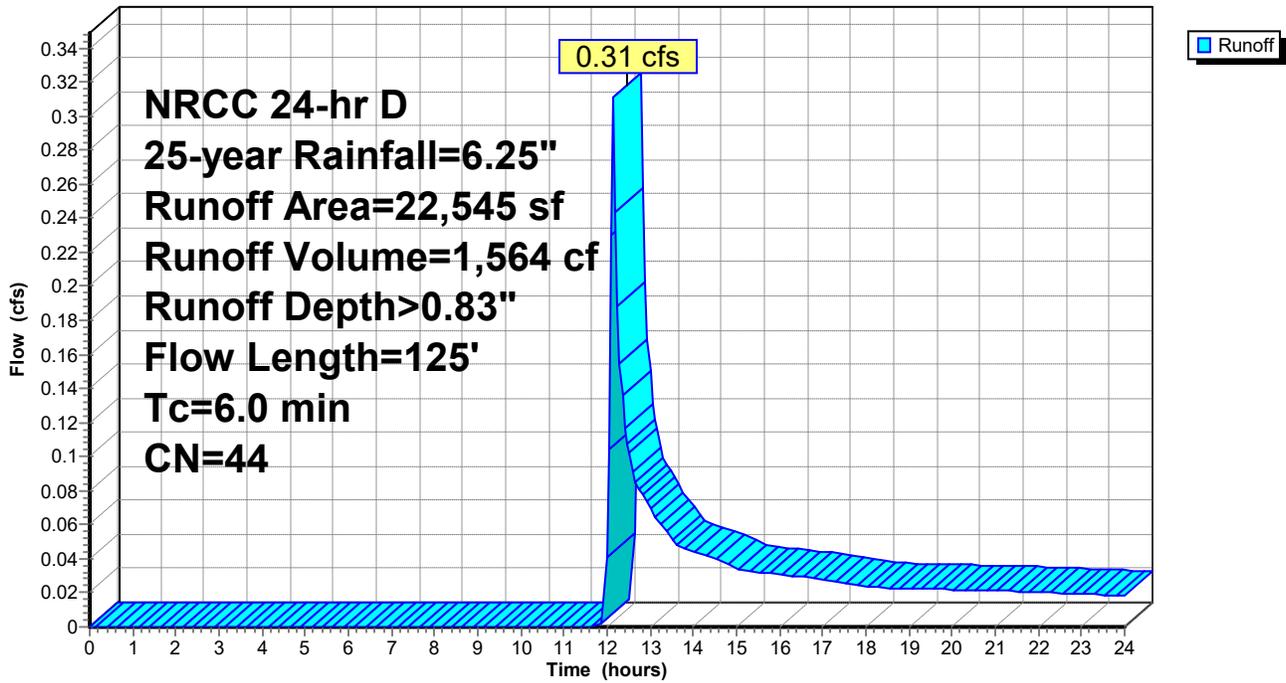
Link 2L: DP#2-Outfall of Existing Cultec System

Inflow=0.41 cfs 1,443 cf
Primary=0.41 cfs 1,443 cf

Total Runoff Area = 54,018 sf Runoff Volume = 11,944 cf Average Runoff Depth = 2.65"
58.05% Pervious = 31,360 sf 41.95% Impervious = 22,658 sf

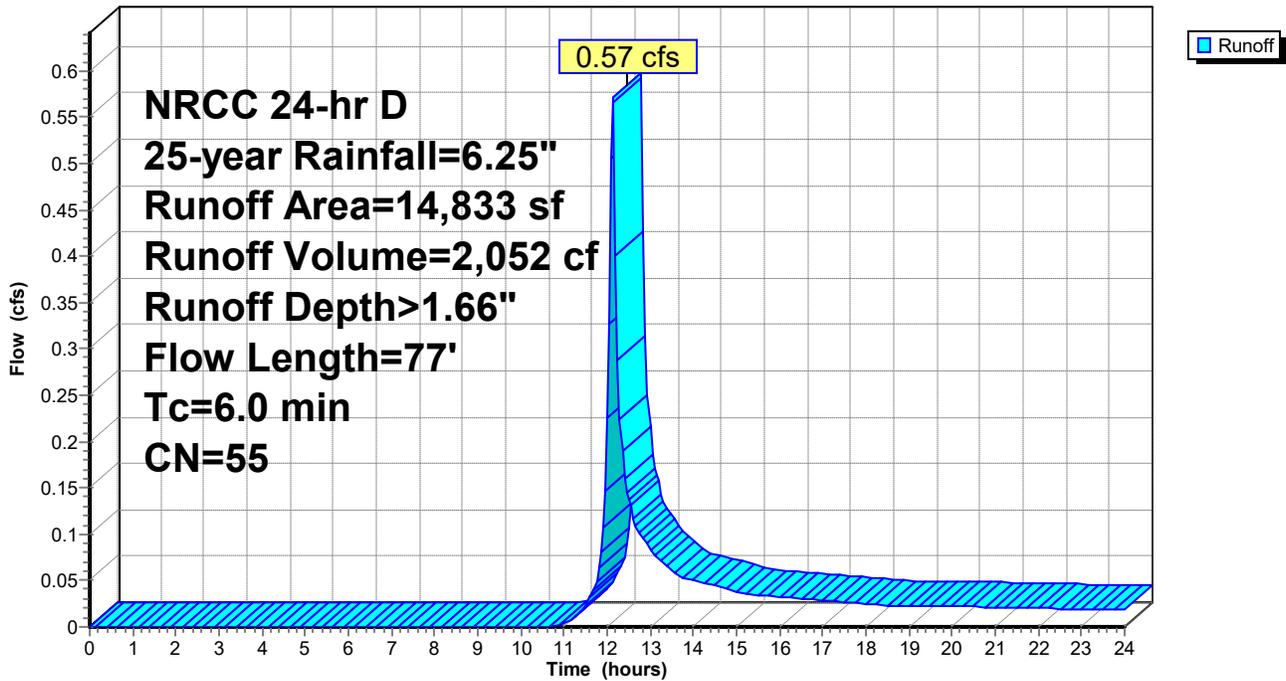
Subcatchment 10S: Undetained Analysis Area to Uncas Brook

Hydrograph



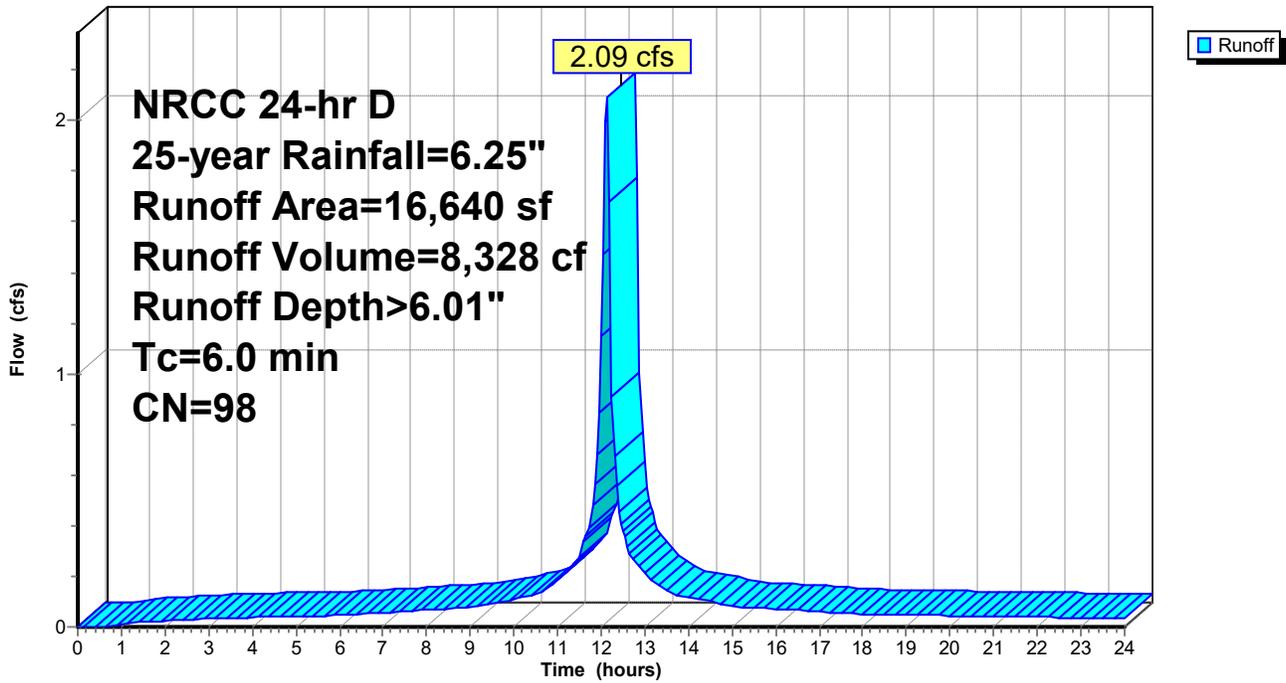
Subcatchment 11S: Area to Subsurface System

Hydrograph



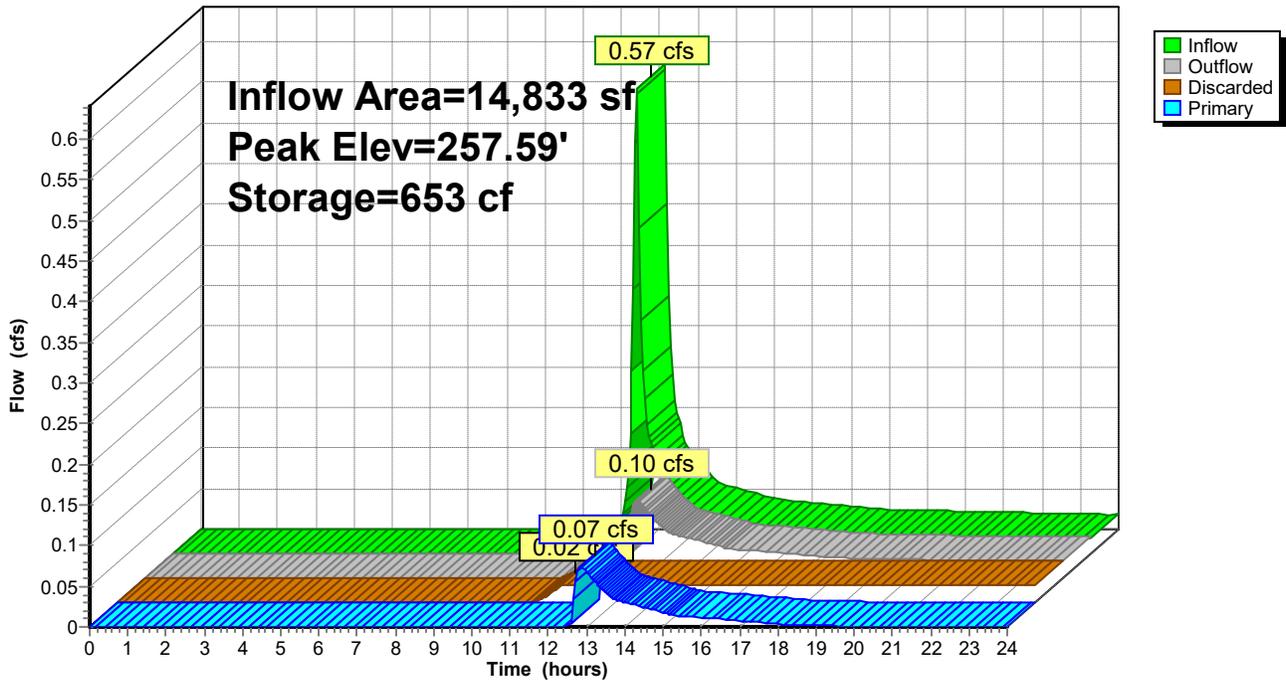
Subcatchment 20S: Roof Area

Hydrograph



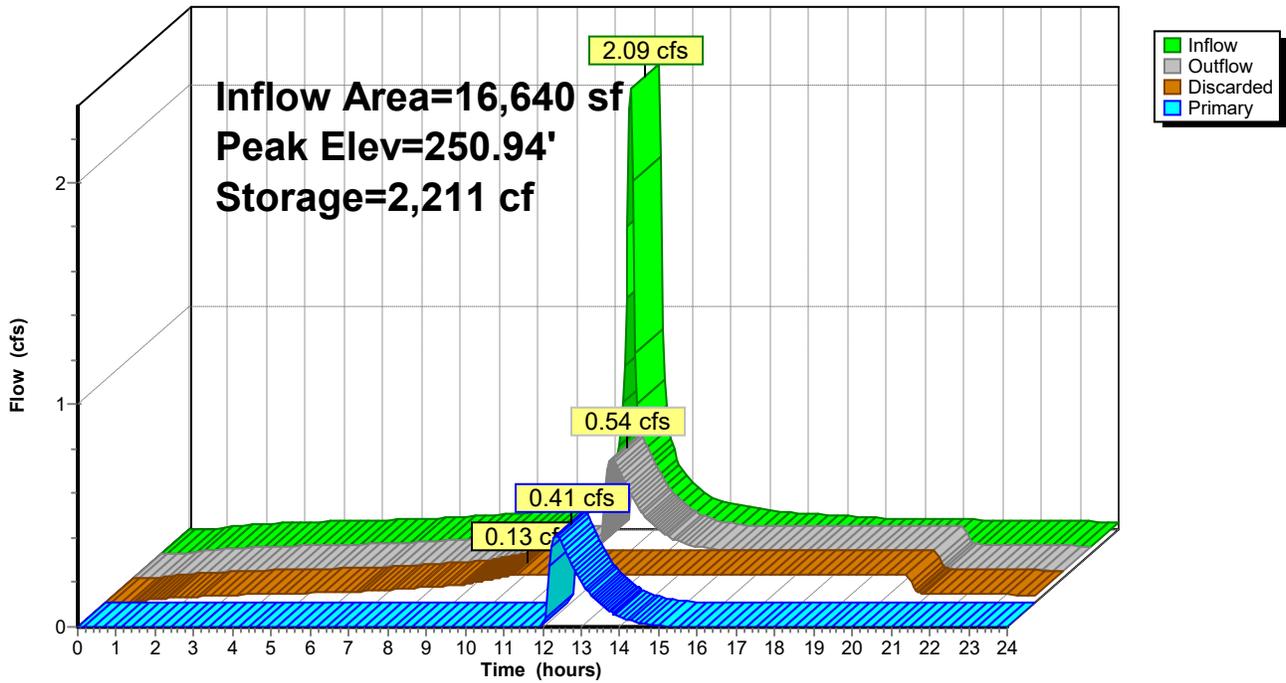
Pond 2P: Subsurface System

Hydrograph



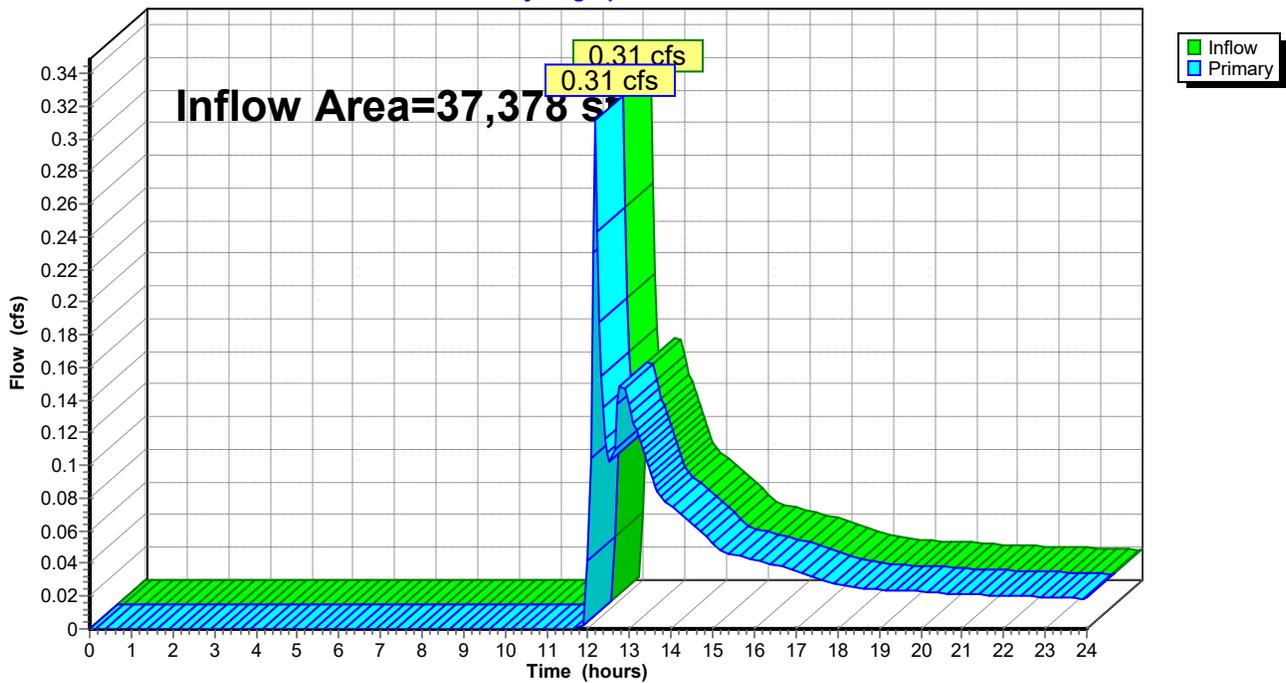
Pond 3P: Existing Cultec System (Expanded 2 Rows)

Hydrograph



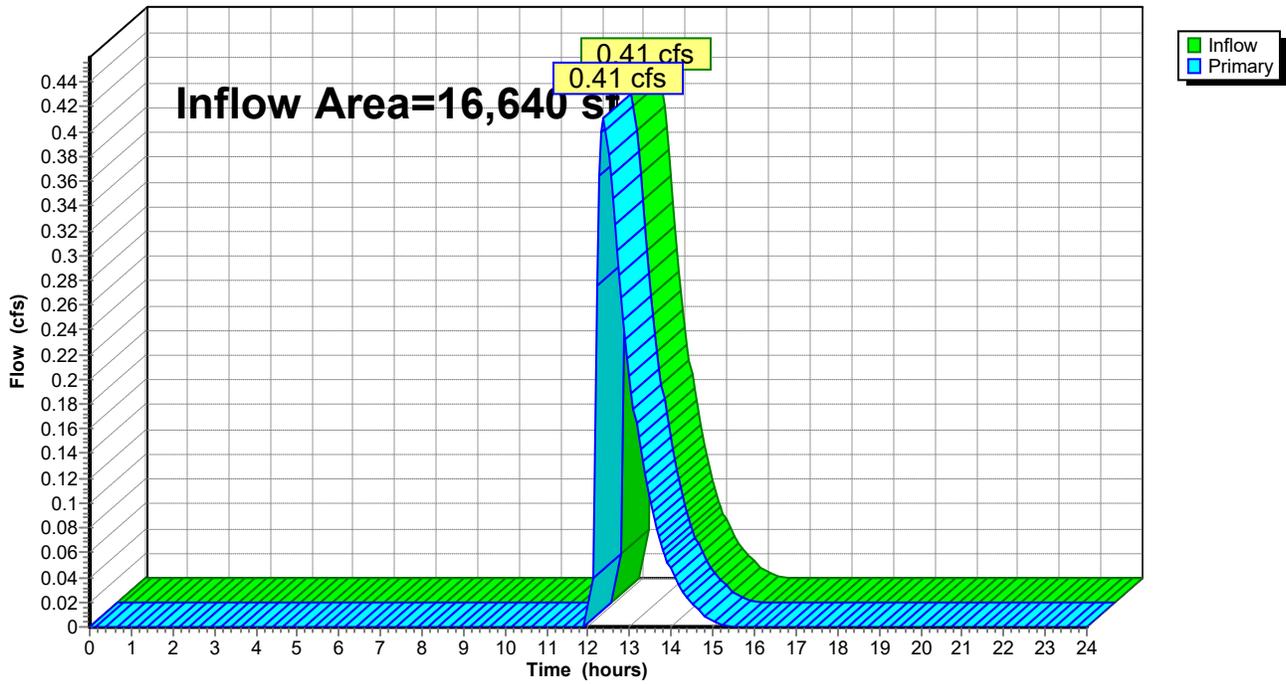
Link 1L: DP#1-Uncas Brook

Hydrograph



Link 2L: DP#2-Outfall of Existing Cultec System

Hydrograph



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NRCC 24-hr D 100-year Rainfall=8.95"

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

Subcatchment 10S: Undetained Analysis Area to Uncas Brook

Runoff Area=22,545 sf 8.46% Impervious Runoff Depth>2.14"
Flow Length=125' Tc=6.0 min CN=44 Runoff=1.09 cfs 4,019 cf

Subcatchment 11S: Area to Subsurface System

Runoff Area=14,833 sf 27.71% Impervious Runoff Depth>3.45"
Flow Length=77' Tc=6.0 min CN=55 Runoff=1.26 cfs 4,259 cf

Subcatchment 20S: Roof Area

Runoff Area=16,640 sf 100.00% Impervious Runoff Depth>8.70"
Tc=6.0 min CN=98 Runoff=3.00 cfs 12,065 cf

Pond 2P: Subsurface System

Peak Elev=258.19' Storage=779 cf Inflow=1.26 cfs 4,259 cf
Discarded=0.02 cfs 1,112 cf Primary=1.10 cfs 2,517 cf Outflow=1.12 cfs 3,629 cf

Pond 3P: Existing Cultec System (Expanded 2 Rows)

Peak Elev=251.51' Storage=3,221 cf Inflow=3.00 cfs 12,065 cf
Discarded=0.13 cfs 8,418 cf Primary=0.82 cfs 3,634 cf Outflow=0.95 cfs 12,053 cf

Link 1L: DP#1-Uncas Brook

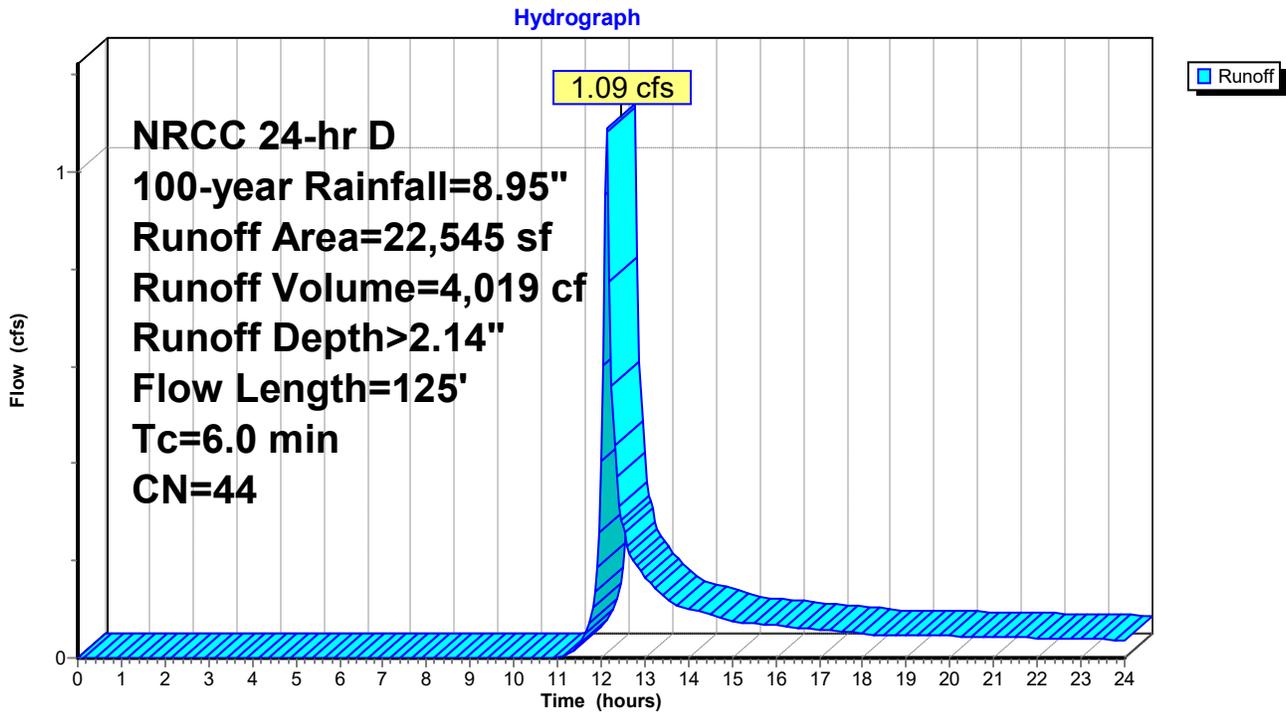
Inflow=2.13 cfs 6,536 cf
Primary=2.13 cfs 6,536 cf

Link 2L: DP#2-Outfall of Existing Cultec System

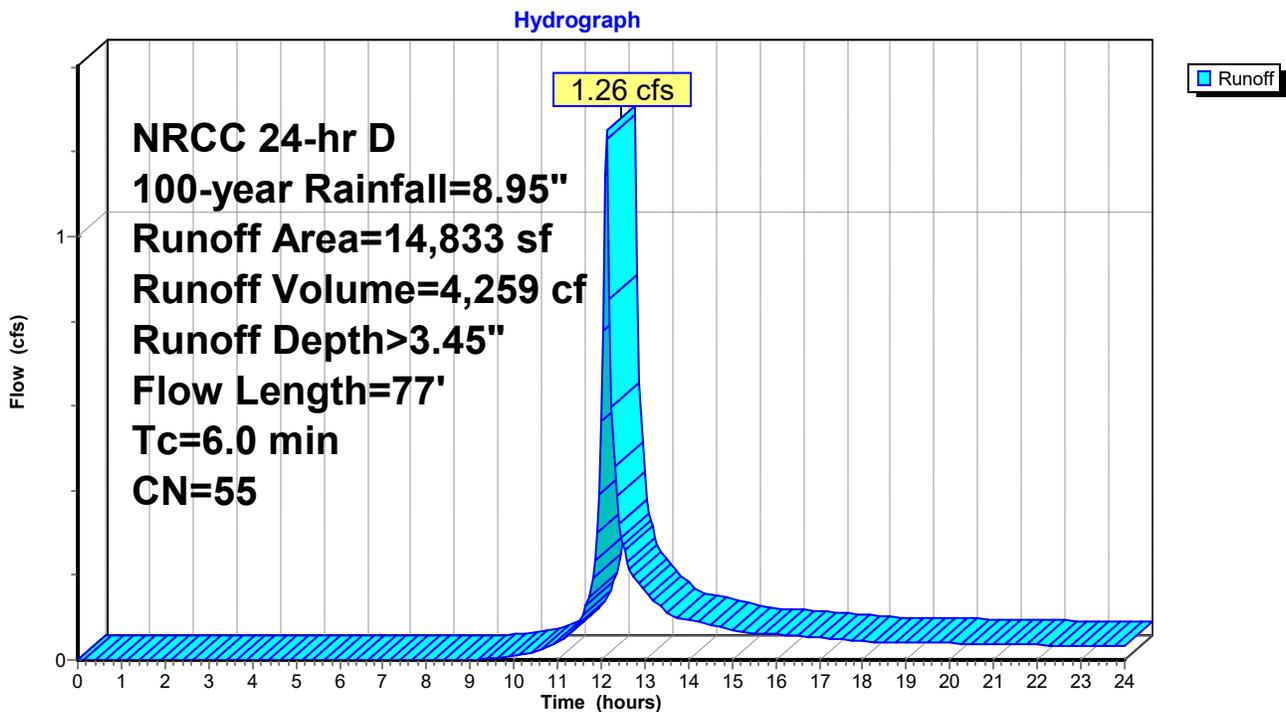
Inflow=0.82 cfs 3,634 cf
Primary=0.82 cfs 3,634 cf

Total Runoff Area = 54,018 sf Runoff Volume = 20,343 cf Average Runoff Depth = 4.52"
58.05% Pervious = 31,360 sf 41.95% Impervious = 22,658 sf

Subcatchment 10S: Undetained Analysis Area to Uncas Brook

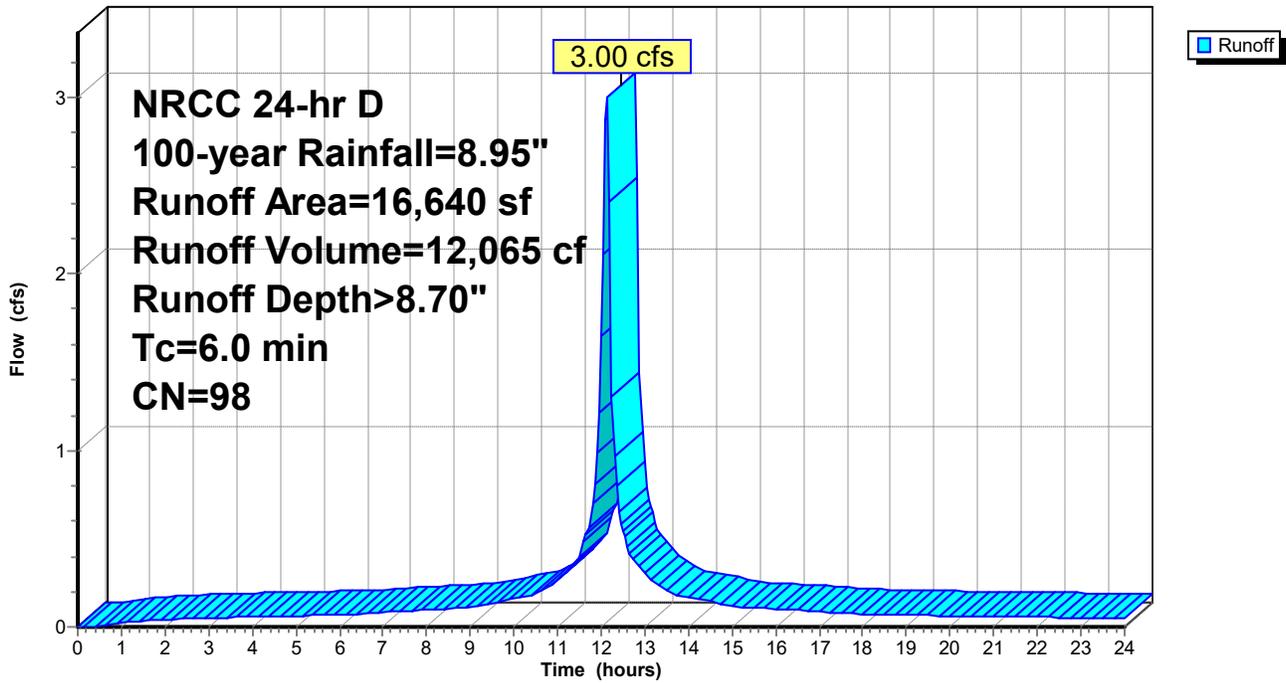


Subcatchment 11S: Area to Subsurface System



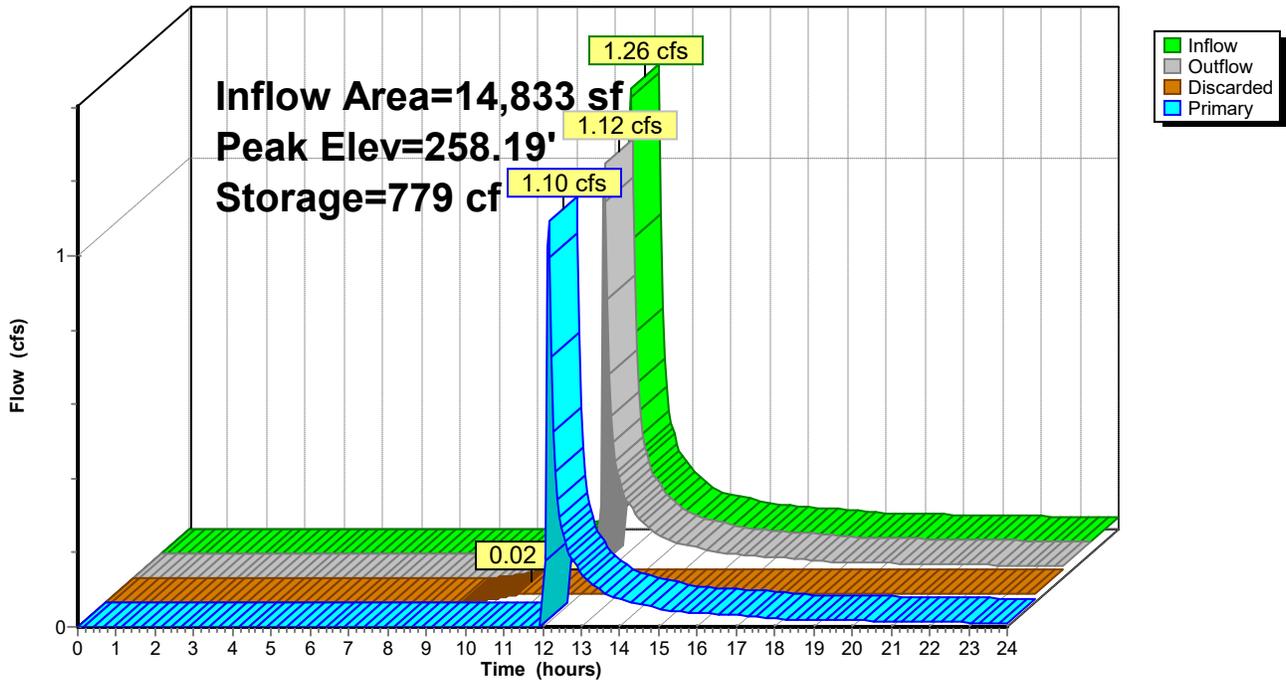
Subcatchment 20S: Roof Area

Hydrograph

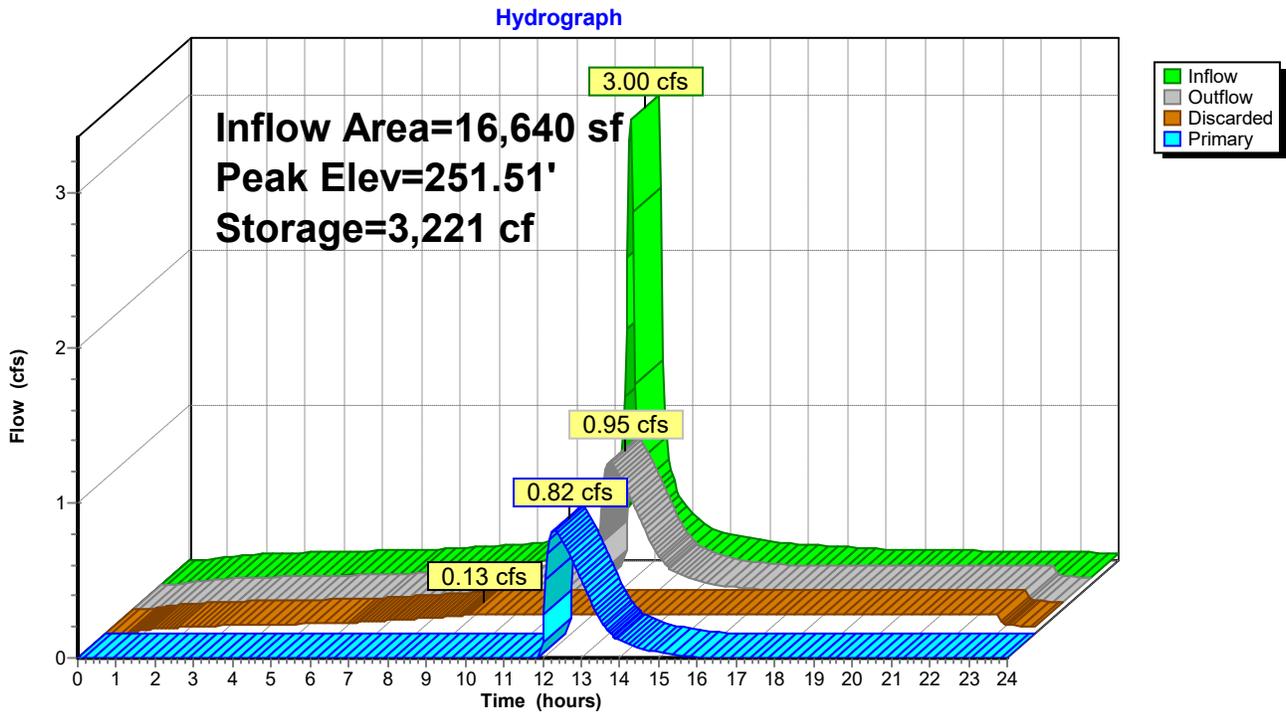


Pond 2P: Subsurface System

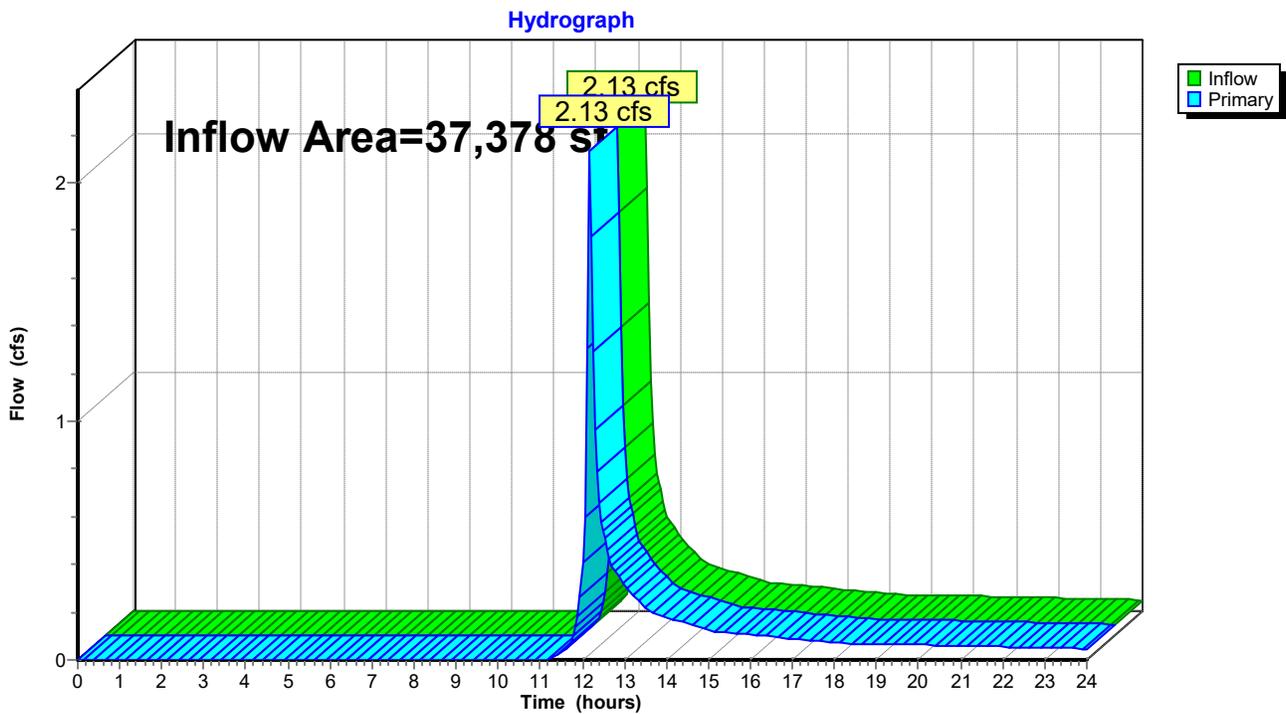
Hydrograph



Pond 3P: Existing Cultec System (Expanded 2 Rows)

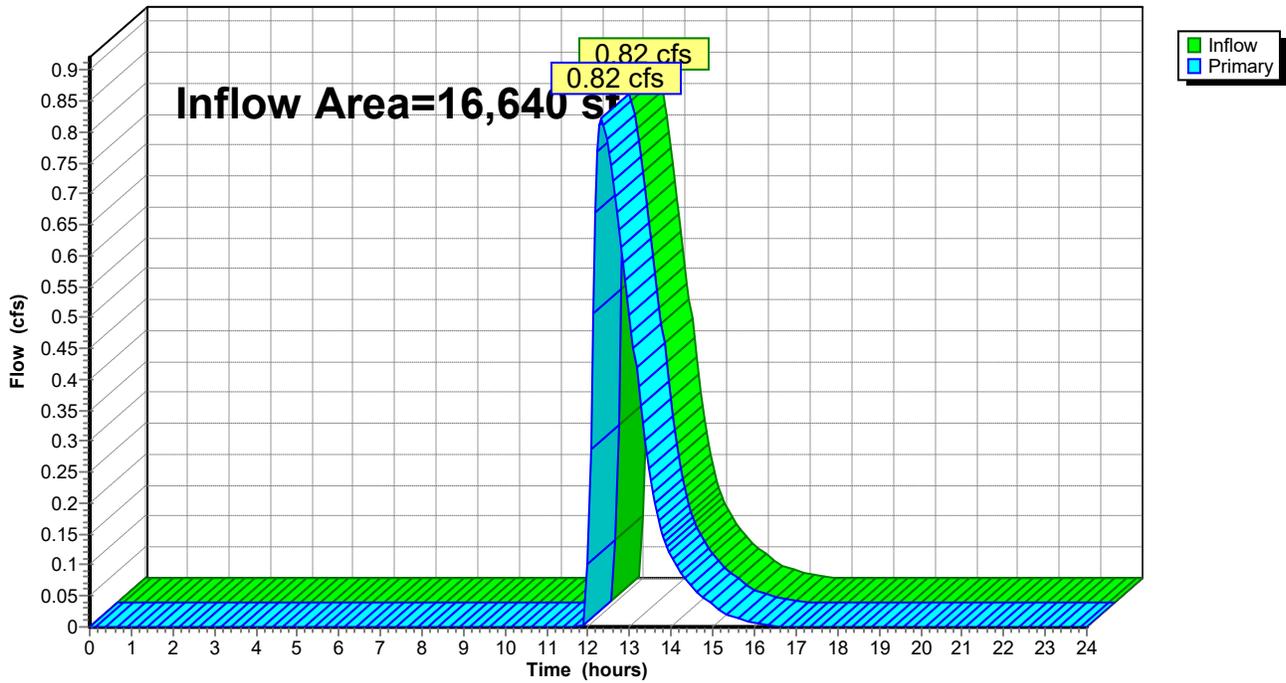


Link 1L: DP#1-Uncas Brook



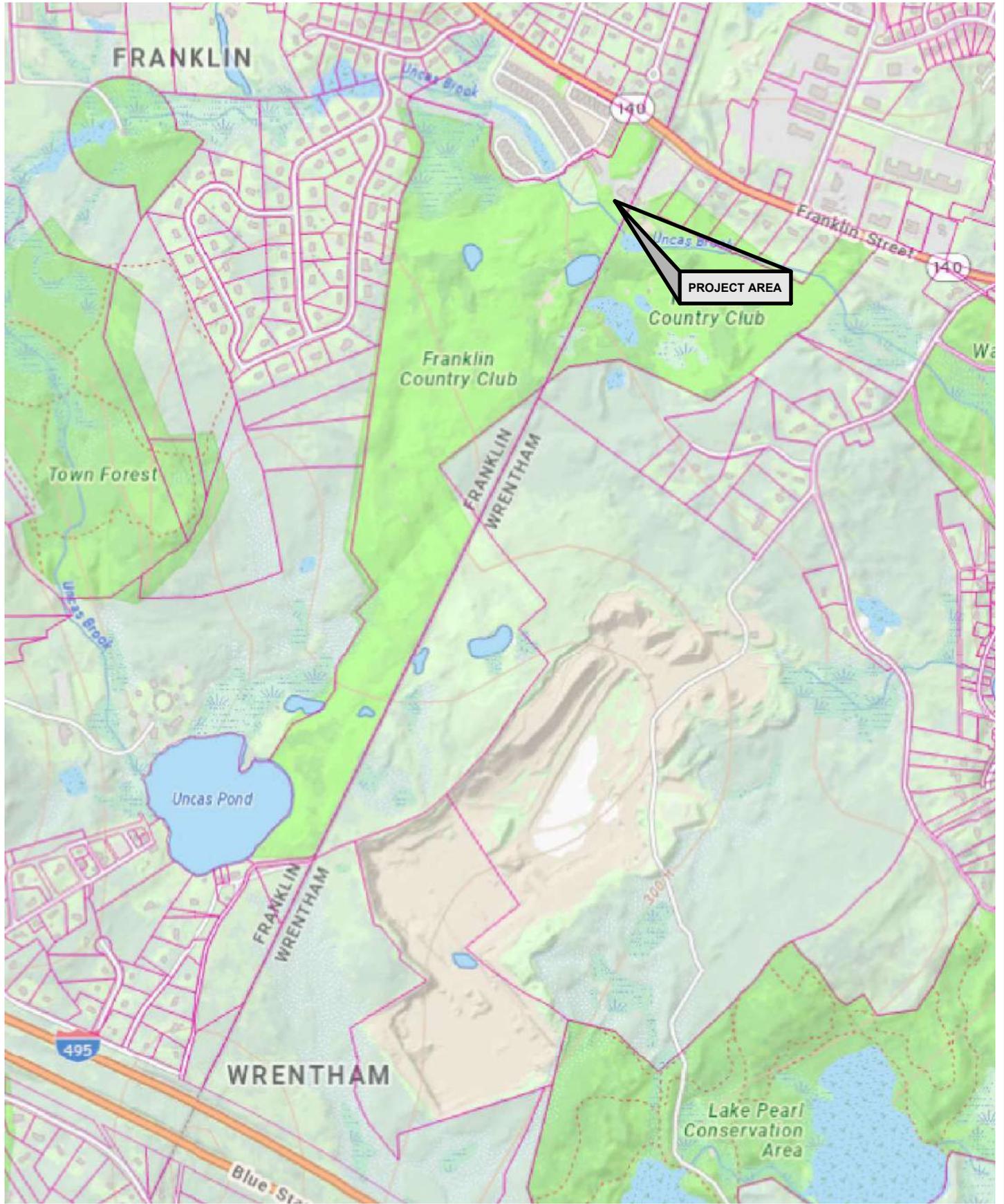
Link 2L: DP#2-Outfall of Existing Cultec System

Hydrograph



APPENDIX D

USGS LOCUS MAP



GRAVES
ENGINEERING, Inc.
100 GROVE STREET, SUITE 219, WORCESTER MA 01605
T 508-856-0321
gravesengineering.com

DATE: 08/13/2025
SCALE: 1"=1000'
DRW. BY: SDM
CHK. BY: MRA
PRJ. NO.: 25109

CLIENT:
FRANKLIN COUNTRY CLUB
672 EAST CENTRAL STREET

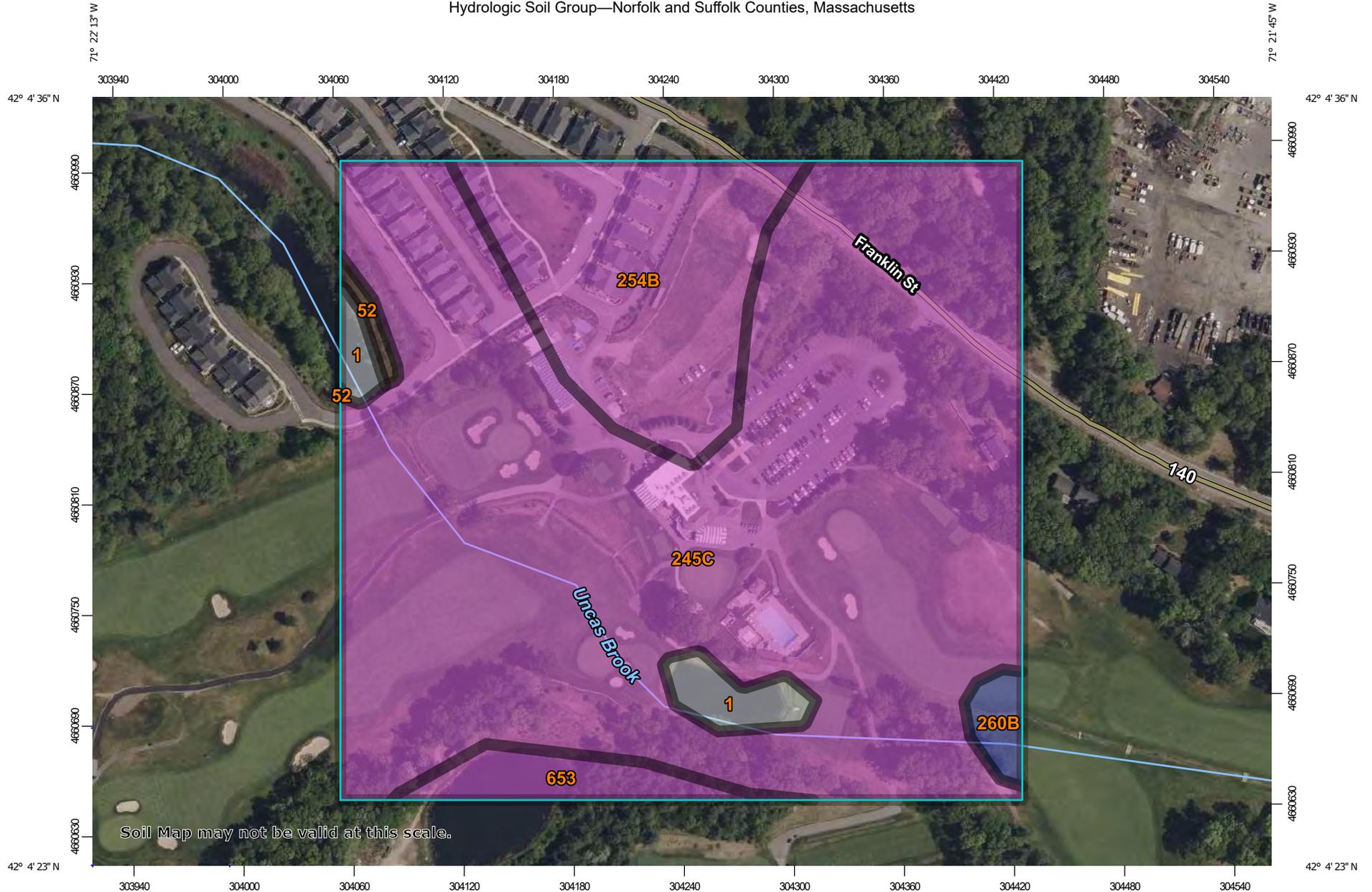
SHEET 1 OF 1

USGS LOCUS

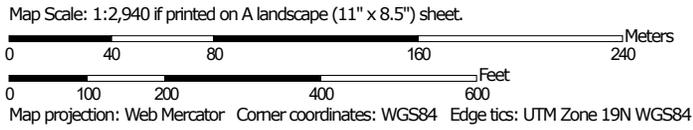
CLUBHOUSE RENONVATIONS
672 EAST CENTRAL STREET

APPENDIX E
USDA-NRCS SITE SOILS MAP

Hydrologic Soil Group—Norfolk and Suffolk Counties, Massachusetts



Soil Map may not be valid at this scale.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

Soil Rating Polygons

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points

 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

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 20, Aug 27, 2024

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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.

Hydrologic Soil Group

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|------------------------------------|---|--------|--------------|----------------|
| 1 | Water | | 0.8 | 2.4% |
| 52 | Freetown muck, 0 to 1 percent slopes | B/D | 0.2 | 0.5% |
| 245C | Hinckley loamy sand, 8 to 15 percent slopes | A | 24.9 | 77.9% |
| 254B | Merrimac fine sandy loam, 3 to 8 percent slopes | A | 4.8 | 15.1% |
| 260B | Sudbury fine sandy loam, 2 to 8 percent slopes | B | 0.4 | 1.2% |
| 653 | Udorthents, sandy | A | 0.9 | 2.9% |
| Totals for Area of Interest | | | 32.0 | 100.0% |

Description

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

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

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

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

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

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

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX F

LONG-TERM DRAINAGE SYSTEM OPERATION & MAINTENANCE PLAN

LONG-TERM DRAINAGE SYSTEM OPERATION & MAINTENANCE PLAN

System

The drainage system associated with the Clubhouse Improvements project at the Franklin Country Club consists of area and trench drain inlets, a subsurface infiltration system, and drain outfall. See project plans for locations of all system components. NOTE: This O&M Plan is intended to supplement that of any existing O&M Plan for the site that may exist (as prepared by others); O&M duties, etc. for the remainder of the site are not included in this plan.

Responsible Parties

The drainage system located on site property will be operated and maintained by the owner, Franklin Country Club, post-construction. Drainage system maintenance tasks shall include routine cleaning of the overall drainage network and specific duties as listed below.

The responsible party must designate a “qualified personnel” to perform the inspections associated with this plan. This means a person knowledgeable of the layout and overall function of the stormwater system. As necessary, this “qualified personnel” shall employ the services of a registered professional engineer when inspections reveal a failing stormwater system component or when similar attention is needed beyond the knowledge or experience of the inspector.

Operation and Maintenance Duties

The following duties shall be considered the minimum required and may be supplemented by additional measures as necessary to maintain the function of the drainage system. All tasks conducted shall be recorded on the attached Log Form.

Sweeping:

As the impervious areas in this project are cart paths and of seasonal use (i.e. no winter sanding), sweeping is not generally required.

Naturalized Drain Outfall Apron:

The drain outfall shall be inspected four times per year and repaired as necessary. Erosion control matting shall be replaced as necessary, and debris and accumulated sediment removed.

Area Drain and Trench Drain:

The area and trench drains shall be inspected and sediment removed at least four times per year and at the end of the foliage season. Outlet pipes shall be visually inspected and cleaned if found to be obstructed in any way.

Subsurface Infiltration System:

There is no routine maintenance for a subsurface system therefore an aggressive inspection and maintenance schedule of all upstream BMPs must be maintained to prolong its operation life. Utilizing the observation ports, the system shall be inspected after the first several rain events upon installation. A log shall be kept noting the date and time of the inspection and the level of standing water or sediment (if any) observed within each observation port. The system must be inspected at least every 6 months or after every rainfall event exceeding the 2-year storm frequency (3.17 inches in 24 hours) and the log must estimate the volume of discharge (depth of outflow in inches will suffice) from the system by observing the outflow from the outlet control structure.

The subsurface system is designed to fully drain after a storm event therefore if standing water is observed within the system beyond 24 hours since the cessation of inflow to the system from a rainstorm, this may indicate a problem and it should be noted on the inspection log and further inspected for repairs.

***Clubhouse Renovations
Franklin Country Club***

The Owner may need to contact a Registered Professional Engineer to evaluate the system in the event of major problems.

Annual Budget

An annual budget for the operation and maintenance tasks is not estimated as the owner will utilize existing groundskeeping staff for the work.

Records

A copy of the O&M Plan will be kept by owner, Franklin Country Club.

APPENDIX G

LONG-TERM POLLUTION PREVENTION PLAN

LONG-TERM POLLUTION PREVENTION PLAN

Pollution Prevention and Source Control Plan

The site owner, Franklin Country Club, shall designate a pollution prevention team whose responsibilities are the following:

NOTE: This Plan is intended to supplement that of any existing Plan for the site that may exist (as prepared by others); duties, etc. for the remainder of the site are not included in this plan.

- Good housekeeping: General trash and litter cleanup of the site, inspect all resident vehicles on a regular basis for detection of leaking oil, gas and other fluids, provide routine visual inspections of potential pollution sources, and maintain an inventory of potential pollution sources stored on site (i.e. paints, solvent, etc.). Initiate and maintain record keeping of activity regarding the contents of this plan.
- Storing materials and waste products inside or under cover: All materials and waste products shall be stored within a building or within a covered dumpster.
- Routine inspections and maintenance of stormwater BMPs: Follow the requirements of the site *Long-Term Drainage System Operation & Maintenance Plan*. Be aware of site drainage components and Best Management Practices (BMPs).
- Spill prevention and response: In the event of a spill outside of the building, immediately initiate containment and cleanup procedures appropriate for the material including but not limited to sorbent media, towels, and barriers, catch basin inlet seals, etc. as well as notifying the proper authorities. All attempts must be made to prevent spilled material from entering the drainage system or infiltrating into the ground.
- Maintenance of lawns and landscaped areas: Regularly mow lawn areas and weed landscaped areas.
- Storage and use of fertilizers, herbicides, and pesticides: All such materials shall be stored inside a building. It is recommended not to store such materials in large quantities.

The owner shall be responsible for training designated staff in the procedures described herein. Note that this Plan does not indemnify the owner of the requirements of any local, state, or federal requirements of regulations regarding the storage or release of potentially hazardous materials.

Snow Management Plan

As the impervious areas in this project are cart paths and of seasonal use (i.e. no winter sanding), snow management is not required.