STORMWATER MANAGEMENT REPORT

FOR

33 DANTON DRIVE
METHUEN, MA 01844

Prepared for:
Boghos Properties LLC
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INTRODUCTION

Boghos Properties LLC proposes to remove the existing trailer yard located at 33 Danton Drive, Methuen, and construct an approximately 58,300 SF warehouse building in its place. The purpose of this report is to provide an analysis of the proposed onsite stormwater drainage.

SITE INFORMATION

Included Properties:
412-131-6AA

Zoning and Planning:
The parcel included in this study is zoned industrial. This report does not go into specifics about the site's specific planning and zoning requirements. For more information, see Methuen's Zoning Ordinances.

Topography & Existing Conditions:
The subject site topography slopes consistently from west to east, toward Danton Drive. The elevation grades from approximately 124' to 114' (NAVD88 Datum) across the site. The site was previously used as a trailer yard/parking facility and has a current impervious area of about 40%. The parcel in question has an area of 135,678 (+/-) square feet. *(See Appendix B: Existing Conditions Plan)*

Flood Hazard Zone:
In reviewing FEMA documents for the area, the site falls within FIRM Panel 25009C0202F. Portions of the site fall under Zone X, the 0.2% annual hazard area, and directly adjacent to the site across Danton Drive is a wetland classified as Zone AE. However, the site does not come close to any of the FEMA cross-sections or the floodway. The closest FEMA cross-sections to the site are sections I or H, which show a Base Flood Elevation (BFE) of 114.5 to 112 feet. **No portions of the parcel or the project fall within the Special Flood Hazard Areas.** Copies of FIRM Panel 25009C0202F and relevant portions of FIS 25009CV003C are included in *Appendix E: FEMA Flood Insurance Rate Map.*

STORMWATER REGULATORY REQUIREMENTS & ANALYSIS APPROACH

The governing requirements for stormwater at the proposed project is the Massachusetts Stormwater Handbook issued by MassDEP. The following report explains how the standards are met and provides an overview of the project's impact on the surrounding stormwater infrastructure. This stormwater analysis aims to demonstrate the ways in which the proposed project has mitigated any hydrologic impacts of the new construction on the surrounding environment. Additionally, the limits of the hydrologic analysis are limited to the areas described in this report.

Software Tools:
The analysis for the proposed project used a variety of tools to provide the necessary calculations in line with the Massachusetts Stormwater Handbook. The project's main analysis was conducted with HydroCAD, a computer program based on USDA's Technical Release TR-55, Urban Hydrology for Small Watersheds. HydroCAD allows for variable

rainfall intensity throughout the storm duration, peaking near the middle of the Type III, 24-hour storm. All other calculations were conducted using Microsoft Excel with templates provided from MassDEP.

SOILS

Typically, an analysis of the soils on site would be conducted with Natural Resources Conservation Service (NRCS) Web Soil Survey. However, the initial results of this survey were inconclusive at the project. Therefore, DCI and EBI Consulting conducted a field investigation on October 22, 2020 of the underlying soils onsite. The results of these investigations, including an NRCS report, test pit logs, and a locus map showing the test pit locations and the proposed drainage facility's is shown in *Appendix F: Soils Information.*

Generally speaking, the site consists of very well-drained sand and sandy loam throughout the A, B, and C layers. Throughout the central and northern (particularly northeastern) portions of the site there are pockets of organic material, in layers varying from 2 to 4 feet. There is evidence near the northern to NW portion of the site of small pockets of an impervious layer. With test pit 4 showing redoximorphic features and potentially perched stormwater. The subsurface investigations as a whole showed estimated high groundwater around 10 FT Below Ground Surface (BGS) across most of the site, with higher groundwater in the northeastern portion of the site. Based on the results of this investigation, the site has been classified as Type A Hydraulic Soil Group (HSG).

EXISTING STORMWATER CONDITION

Watershed & Sub-Watersheds:

The existing site and the surrounding area drains to Peat Meadow Brook. Peat Meadow Brook drains a portion of western Methuen bounded by Harris Brook to the north and Bartlett Brook to the south. Peat Meadow Brook itself is a tributary of the Spicket River and meets the Spicket River near the Interstate 93 and Highway 213 Interchange.

The main complication of the project site's drainage design was that the project site consists of multiple sub-watersheds of Peat Meadow Brook. These sub-watershed areas are defined as follows:

1. The most western portion of the site drains to the small pond area that is a part of Peat Meadow Brook to the west of the industrial development. While it is a very minor portion of the site that is mostly wooded and likely contributes very little runoff, we assume that the runoff from the project site makes its way to Spencer Street and drains southward to Peat Meadow Brook.
2. The southwestern portion of the site drains to Peat Meadow Brook after the small pond area through a drainage system on 35 Danton Drive. This drainage system is hard piped with catch basins and underground storm drainage piping. This area's drainage eventually makes it to an independent outfall at the downstream portion of Peat Meadow Brook.
3. The remainder of the site flows to Danton Drive. Like the 35 Danton Drive drainage area, the Danton Drive sub-watershed consists of underground drainage pipes and catch basin collection systems and eventually makes it to an outfall point at the

Peat Meadow Brook & Danton Drive crossing. For project analysis purposes, this sub-watershed was broken up into two watersheds based on their entry locations to the Danton Drive conveyance pipe.

- An analysis point was placed at the lowest outfall point on the project—the catch basins between 33 Danton Drive and 25 Danton Drive.
- An additional analysis point was assumed for the site's portions that drains north to 31 Danton Drive and meets the 18" conveyance pipe about 150' north of the project.

This created four (4) design or analysis points. A general overview of these sub-watersheds, including overall delineations and outfall points, is shown in the first figure in Appendix D for clarity. See *Appendix D, Existing & Proposed Drainage Areas,* for a full definition of the watersheds used on the project. Including impervious areas, landscaped areas, and other pertinent information. In total, 187,080 SF of drainage area was analyzed for project impact.

Existing Site Infrastructure:

The existing site has a set of stormwater and conveyance swales that can be seen on the existing conditions plan. It appears as though the stormwater from the lower parking lots on the site was addressed with these swales. DCI's expectation is that these swales were installed by the development of the front parking lots in the mid-2000' to address stormwater quality. This is based on historical satellite imagery. However, no design calculations have been discovered regarding these swales.

These stormwater swales and their underdrains were investigated by DCI. We found no evidence of an overflow or a connection to the existing storm drain system in Danton Drive. There is clear evidence of an underdrain throughout the conveyance swales on the uphill portions. However, there is no evidence that this underdrain continues beyond the area drain discovered at the top of the swale's last segment. The last and deeper section of swale shows no evidence of storm drainage infrastructure. We suspect that based on the soil type at the project site, the swales are expected to infiltrate and convey the rainwater to the last section of the swales where the rainwater was to be held in the swale until it could be infiltrated into the ground. Since there is no clear outfall for the project, we suspect that excess runoff during major rainfall events overland releases onto Danton Drive itself—eventually making it to the catch basins at the analysis point. However, without design plans or calculations to corroborate, we can only speculate.

Regardless of its true purpose/intent, it is clear that the storm drainage conveyance swales will physically store stormwater during runoff events. Therefore, we included them in the hydrologic model to accurately represent current project conditions. We also placed the project's underground storm drain connection at the assumed existing Danton Drive outfall location. This assumes that the underdrain carried through the last swale to the 18" drain in Danton Drive. The intent is to mimic any existing connection of the site to the 18" trunk line in Danton Drive.

Times of Concentration:

Of the four analysis points and their associated areas in the project analysis, only one analysis point (two analysis areas) has a flow path long enough to exceed the 6-minute minimum by TR-55. The main Danton Drive analysis point has a much longer time of concentration (t_c) as the majority of the water flows down the entire length of the site before reaching the analysis point. These flow paths and their associated inputs for the time of concentration calculations are shown in *Appendix D: Existing & Proposed Drainage Areas.* It should be noted that the time of concentrations in the analysis will not correctly represent the project's impact on Peat Meadow Brook as a full analysis of the impact on Peat Meadow Brook is beyond the scope of our analysis. The hydrologic analysis for the watershed of Peat Meadow Brook was ended at the limits shown in *Appendix D: Existing & Proposed Catchment Areas.*

PROPOSED STORMWATER CONDITION

To develop the 58,300 SF building with additional proposed pavement at the project site, multiple stormwater mitigation measures have been included in the design. A large infiltration system has been proposed in the southeast corner of site for the collection, detention and infiltration of stormwater runoff from the pavement and roof areas. *Appendix C: Utility Site Plan* show this system and the other facilities & *Appendix A: MassDEP Checklist* includes a MassDEP checklist showing compliance with the ten(10) required stormwater standards.

Sub-Watershed Adjustments:

To place the building onsite with the required parking, landscape areas, and associated amenities, the existing drainage patterns from the site will need to be slightly modified. The table below goes into detail regarding the changes in the drainage areas.

Table 1-Project Area Comparison

	Project Site	**Area to 35 Danton Drive**	**Area to 31 Danton Drive**	**Woods Behind Project**
HydroCAD Numbers	10S & 11S (Existing) 110S to 120S (Proposed)	20S (Existing) 200S (Proposed)	30S (Existing) 300S (Proposed)	40S (Existing) 400S (Proposed)
Total Existing Area (sf)	148,711	20,048	6,412	11,909
Total Proposed Area (sf)	159,123	8,897	6,743	8,905
Difference (sf)	+10,412	-11,151	+331	-3,004

The main modification to the drainage areas is that the main area draining from the project site has increased and the area draining to 35 Danton Drive has deceased greatly. This creates a twofold benefit for Peat Meadow Brook. First, it increases the mitigation requirements and increases the groundwater recharge reducing the area's runoff contribution to Peat Meadow Brook during peak events. Second, it places the entry point for the runoff contributions during peak events further downstream on Peat Meadow Brook than they previously were. Typically, this results in a reduced risk of flooding upstream as peak flows are discharged earlier in a flood, creating additional flood storage upstream that would have been used up by the existing drainage contributions.

Additionally, the project proposes to increase the impervious areas in each drainage area, as shown in the table below.

Table 2-Impervious Area Comparison

	Project Site	**Area to 35 Danton Drive**	**Area to 31 Danton Drive**	**Woods Behind Project**
HydroCAD Numbers	10S & 11S (Existing) 100S to 130S (Proposed)	20S (Existing) 200S (Proposed)	30S (Existing) 300S (Proposed)	40S (Existing) 400S (Proposed)
Existing Impervious	52.78%	52.50%	21.97%	0%
Proposed Impervious	80.17%	86.93%	0%	0%
Difference (sf)	+27.39%	+34.43%	-21.97%	0%

An analysis of the site's impervious area shows that the project will increase imperviousness by about 25% across the project site. The onsite stormwater system will mitigate this increase.

Proposed Stormwater Infrastructure:

The project proposes to use infiltration and collection devices around the site to mitigate and clean the stormwater runoff bound for Peat Meadow Brook. Per the requirements of the standards listed in later sections of this report, a majority of the runoff will be infiltrated back into the ground via infiltration systems. The proposed stormwater design is discussed below:

Design Point 1

In the proposed design all runoff from the roof area will be collected via gutters and downspouts and directed (without pretreatment because the roof runoff is clean) directly to the infiltration system below the parking area. The runoff from the paved area, making up the majority of the site, will be collected via deep-sump hooded catch basins to water quality units prior to being routed to the infiltration system as well. The deep-sump hooded catch basins and the water quality units will provide the 44% pretreatment of the pavement area runoff prior to the being collected at the infiltration system. The infiltration system will consist of thirty (30) 8' x 14' x 6.7' concrete galleys that will collect

the runoff and provide the appropriate recharge and water quality volume. The infiltration system will have three separate 12" overflow outlets that will direct the water to a drain manhole where a 15" overflow outlet will connect to the drain line at Danton Drive. (*See Appendix B: Site Plan*)

Design Points 2, 3 and 4
The changes to the site design will change the areas draining to design points 2, 3, and 4. However, the surface areas within these drainage areas will remain unchanged, therefore decreasing the runoff to these design points in the larger storms.

Times of Concentration:
Due to the proposed infiltration facilities, only one analysis area will have a flow path long enough to exceed the 6-minute minimum by TR-55 in the proposed design. The Danton Drive Drainage Area will mostly remain unchanged and will match the time of concentration from the existing conditions. All other drainage areas will use the 6-minute minimum from TR-55.

MASSDEP STANDARD COMPLIANCE

Standard 1-No New Untreated Stormwater Discharges:
The project proposes no new discharge points. Nor untreated stormwater.

Standard 2-Peak Rate Attenuation: A hydrologic analysis with HydroCAD of the pre-development and post-development condition was conducted on the proposed site and the surrounding area. This analysis was performed using the inputs previously identified in earlier sections of this report. Per the Stormwater Management Handbook, the 2-year, 10-year, and 100-year rainfall storms were analyzed following the Hydrology Handbook for Conservation Commissioners for this standard. The results of this Hydrologic Analysis are included in *Appendix G: Existing and Proposed Hydrology.* The following tables are summaries of these results.

Table 3-Hydrological Design Point Summary

	Design Point 1		**Design Point 2**		**Design Point 3**		**Design Point 4**	
	Existing	**Proposed**	**Existing**	**Proposed**	**Existing**	**Proposed**	**Existing**	**Proposed**
Storm Event (Year)	Peak Runoff (CFS)	Peak Runoff (CFS)	Peak Runoff (CFS)	Peak Runoff (CFS)	Peak Runoff (CFS)	Peak Runoff (CFS)	Peak Runoff (CFS)	Peak Runoff (CFS)
2	4.03	3.14	0.38	0.47	0.00	0.00	0.00	0.00
10	7.19	6.76	0.98	0.80	0.09	0.00	0.00	0.00
100	17.91	17.17	2.70	1.60	0.50	0.22	0.27	0.20

Table 4-Project Hydrological Impact on Peat Meadow Brook

Description	**Existing Conditions**		**Proposed Conditions**	
Drainage Area	187,080 +/- Square Feet		183,668 +/- Square Feet	
Storm Event (Year)	Peak Runoff (CFS)	Runoff Volume (CF)	Offsite Peak Runoff (CFS)	Offsite Runoff Volume (CF)
2	4.30	15,249	3.47	12,800
10	8.01	32,853	7.44	30,394
100	20.65	84,938	18.86	82,319

The results in the table above show the project's compliance with Standard 3. Also, by maintaining the pre to post rates for design point 1, it can be inferred that the project will have no impact on the hydraulic capacity of the existing storm drainage in Danton Drive.

Standard 3-Stormwater Recharge:

The project has be designed to fully comply with Standard 3. To this end, groundwater recharge has been provided by a large infiltration system proposed on the southeast corner of the project site. The standard states the "the annual recharge from post-development site shall approximate the annual recharge from pre-development conditions based on soil type." The net increase in impervious area within the project site between the existing and proposed conditions is as follows:

127,615 SF (Proposed impervious area)
– 90,427 SF (Existing impervious area)
77,666 SF (Net increase in impervious area)

As mentioned above, groundwater recharge is provided through a large infiltration system in the southeast corner of the site. Therefore, using the net increase in impervious area calculated above, and using a value of 0.6" for HSG A soils as required, the calculations are as followed for required groundwater recharge:

77,666 SF of impervious area x 0.6" = **3,883 CF of GW recharge required**

The infiltration system proposed at the site will provide 15,960 CF of total groundwater charge, largely exceeding the groundwater recharge required by the calculations. Therefore, this project exceeds Standard 3.

Standard 4-Water Quality:

The project is likely categorized as a Land Use with Higher Potential Pollutant Load (LUHPPL), therefore this subjects the project to the 1.0-inch runoff requirement (rather than 0.5") as well as the 44% TSS pretreatment requirement.

To meet these requirements for Water Quality, the project will employ Deep Sump Hooded Catch Basins with CDS units to pretreat the new pavement to meet the 44% TSS removal requirements. Additionally, to meet the full 80% TSS requirement, the infiltration facilities will be included in the TSS calculation. A full calculation of the TSS removal for the project for each facility is included in *Appendix H: TSS Removal Calculations.*

The project has also been designed to meet the Water Quality Volume (WQV) required by the MassDEP Stormwater Handbook. As discussed above, the project is subject to hold 1.0" of runoff over all the pavement area within the project site. The project proposes 61,591 SF of pavement area in the proposed conditions (the roof area is not included as the roof runoff is clean). Therefore, the calculations of required WQV for the pavement area in the proposed conditions are as follows:

61,591 SF (Proposed pavement) x 1.0" = **5,133 CF of WQV required**

The required WQV is provided by the infiltration system in the southeast corner of the site which will collect all the runoff from the pavement area. The infiltration system will hold 5,258 CF of storage volume below the lowest outlet (*See Appendix H: Hydrologic Calculations for details*). This volume exceeds the required volume of 5,137 CF. Therefore, the infiltration system provides more than the required WQV and this project exceeds Standard 4.

Standard 5-Higher Pollutant Loads:
The final project use is possibly subject to an NPDES general industrial permit. Depending on the definition of food processing. However, the designer is unaware of this determination at this time and should follow the existing permitting on 35 Danton Drive. Regardless of whether the proposed use is subject to the NPDES permit, the project was designed with LUHPPL's to allow the site to be compliant in any future uses that require an NPDES permit.

Standard 6-Critical Areas:
The project is not subject to this standard.

Standard 7-Redevelopment:
The project is not subject to this standard.

Standard 8-Construction Pollution & Prevention Plan:
An Erosion and Sedimentation Control Plan has been included with the project plans, and a SWPPP has been completed for the project and filed with the EPA. A copy of the SWPPP is on file at the site currently for reference and can additionally be provided upon request.

Standard 9-Operation and Maintenance Plan:
An O&M plan has been included in *Appendix I: Operations & Maintenance Plan* and provides guidance for all BMP's included in the project.

Standard 10-Illicit Discharge Plan:

An Illicit Discharge Compliance Statement will be submitted prior to the discharge to post-construction BMPs.

CONCLUSION

Based on DCI's analysis of the existing and proposed conditions, the proposed site condition meets the stormwater management criteria set out by MassDEP for new developments. The results of these analyses indicate that the proposed project will mitigate the stormwater impact of the increases in the impervious area due to the development of a 60,200 SF building, reducing the peak flows to Peat Meadow Brook, adding groundwater recharge, and removing the required TSS from the proposed development. This leads DCI to determine that the proposed project will not significantly impact the hydrologic characteristics of Peat Meadow Brook, and the mitigation measures included with the development will provide an adequate level of flood and stormwater quality protection to the public.

Appendix A

MASSDEP CHECKLIST

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

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

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 Field[1]

☒ 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

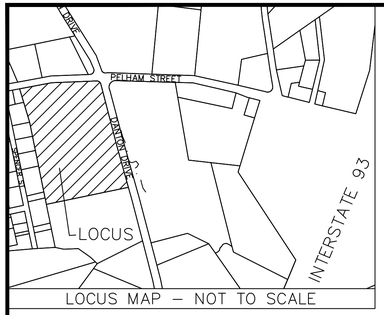
☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ 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

EXISTING CONDITIONS PLAN



LOCUS MAP – NOT TO SCALE

N/F
FMX REALTY LLC
31 DANTON DRIVE
MAP 412, BLOCK 131, LOT 5D
1 STORY INDUSTRIAL

292.92' S14°38'23"E

N/F
GARY & TINA HEANEY
58 SPENCER STREET
MAP 412, BLOCK 131,
LOT 6
1 STORY RESIDENTIAL

GRASS

K RAIL

TBM 402
XCUT BOLT LIGHT POLE
ELEV.=122.80 (NAVD 88 DATUM)

TBM 401
X CUT BOLT HYD
ELEV.=115.92 (NAVD 88 DATUM)

FIRE HYDRANT

BIT. CONC.

GRASS

WOODEN BRIDGE

N75°21'22"E 561.72'

N11°59'50"W 92.80'

N/F
CHRISTOPHER GRIER
60 SPENCER STREET
MAP 412, BLOCK 131,
LOT 7
1 STORY RESIDENTIAL

IRON PIPE (NOT FOUND)

BIT. CONC.

STORMWATER SWALE

TOTAL LOT AREA:
135,678± SF
3.115± ACRES

GRASS

GRAVEL

STORMWATER SWALE

SEWER EASEMENT PER PLAN 6710

BIT. CONC.

12" WATER

N12°17'36"W 144.44'

N/F
THOMAS WHITTAKER
62 SPENCER STREET
MAP 412, BLOCK 131,
LOT 9
UNDEVELOPED LAND

GRASS

WOODED AREA

WOODED AREA

241.56' S14°38'23"E

20' SEWER EASEMENT PER PLAN 6710

PICNIC AREA

IRON ROD

571.93' S75°48'40"W

TBM 400
SPKS UP#6
ELEV.=114.77 (NAVD 88 DATUM)

SHED

TOP OF SLOPE

RETAINING WALL

STAIRS

RETAINING WALL

FIRE HYDRANT

CONCRETE

CONCRETE

CONCRETE

N/F
CITY OF METHUEN
64 SPENCER STREET
MAP 412, BLOCK 131,
LOT 10
UNDEVELOPED LAND

N/F
192 PELHAM ST LLC
35 DANTON DRIVE
MAP 412, BLOCK 131, LOT 5D
1 STORY INDUSTRIAL

DANTON DRIVE (PUBLIC – 60' WIDE)

BM20 MET
BM19 MET
BM18 MET
BM17 MET
BM16 MET
BM15 MET
BM14 MET
BM11 MET
BM13 MET
BM12 MET
BM10 MET
BM9 MET
BM8 MET
BM7 MET
BM6 MET
BM5 MET
BM4 MET
BM3 MET
BM2 MET

WETLAND DELINEATION PERFORMED BY MARY TRUDEAU ON 12-2-2020

WETLAND DELINEATION PERFORMED BY MARY TRUDEAU ON 12-2-2020

MERIDIAN OF THE MASSACHUSETTS GRID COORDINATE SYSTEM(NAD 83)

UTILITY TABLE

NO.	TYPE	RIM	INVERTS
1	SANITARY SEWER MANHOLE	115.20	a)101.65 24" b)101.50 12" c)100.50 24" d)104.45 12"
2	SANITARY SEWER MANHOLE	114.88	a&b)101.58 24"
3	SANITARY SEWER MANHOLE	114.88	a&b)102.21 24"
4	SANITARY SEWER MANHOLE	124.98	a&b)103.05 24"(calculated)
5	SANITARY SEWER MANHOLE	124.43	a&b)103.08 24"(calculated)
6	SANITARY SEWER MANHOLE	113.80	a)103.30 8" b&c)102.50 12"
7	STORM DRAINAGE MANHOLE	113.67	a)109.59 12" b)109.37 18" c)109.62 12" d)109.42 18"
8	CATCH BASIN	113.21	a)109.61 12"
9	CATCH BASIN	113.31	a)109.62 12"
10	STORM DRAINAGE MANHOLE	113.80	a)111.75 12" b)111.50 12" c)111.45 12" d)111.35 18"
11	CATCH BASIN	##	a)111.70 12"

LEGEND

- CS — COMBINED SEWER & DRAIN
- S — SANITARY SEWER
- D — DRAIN LINE
- W — WATER LINE
- E — ELECTRIC LINE
- G — GAS LINE
- T — TELEPHONE LINE
- ST — STEAM LINE
- Ⓢ SANITARY MANHOLE
- Ⓓ DRAIN MANHOLE
- Ⓤ UNKNOWN MANHOLE
- Ⓔ ELECTRIC MANHOLE
- Ⓣ TELEPHONE MANHOLE
- CATCH BASIN
- DECIDUOUS TREE
- CONIFEROUS TREE
- PL PLANTER
- FIRE HYDRANT
- WG WATER GATE
- GG GAS GATE
- WASTE BASKET
- PM PARKING METER
- MB MAIL BOX
- TS TRAFFIC SIGNAL
- LIGHT POLE
- HH HANDHOLE
- × xx.xx SPOT GRADE

WE HEREBY CERTIFY:

THE PURPOSE OF THIS PLAN IS TO SHOW THE EXISTING CONDITIONS OF THE LOCUS PARCEL FOR DESIGN PURPOSES. THIS PLAN IS THE RESULT OF AN ON-THE-GROUND INSTRUMENT SURVEY PERFORMED BETWEEN AUGUST, 2020 AND OCTOBER, 2020, BY DESIGN CONSULTANTS, INC. (DCI).

BOUNDARY LINES AND EASEMENTS FOR THE SUBJECT PROPERTY ARE PER DEED AND PLAN RESEARCH BY DESIGN CONSULTANTS, INC. THIS PLAN WAS PREPARED WITHOUT A FULL TITLE EXAMINATION, UNRECORDED EASEMENTS AND/OR ADVERSE CLAIMS BY OTHERS ARE NOT SHOWN.

LOCATION OF UNDERGROUND UTILITIES FEATURES SHOWN ARE THE RESULT OF SURFACE EVIDENCE AS LOCATED BY: FIELD SURVEY, AERIAL PHOTOGRAMMETRY, PLANS OF RECORD, INFORMATION FURNISHED BY THE RESPECTIVE UTILITY COMPANIES, AND OTHER AVAILABLE SOURCES. OVERHEAD WIRES DEPICTED HEREON ARE SHOWN FOR GENERAL LOCATION PURPOSES ONLY, ACTUAL WIDTH, TYPE, NUMBER, AND HEIGHT SHOULD BE FIELD VERIFIED PRIOR TO ANY SITE DESIGN WORK. THIS PLAN DOES NOT NECESSARILY DEPICT THE EXACT LOCATION OF ALL UTILITIES WHICH MAY EXIST AT THIS TIME WITHIN THE PREMISES SURVEYED. CALL DIGSAFE PRIOR TO EXCAVATION.

PROFESSIONAL LAND SURVEYOR FOR DESIGN CONSULTANTS, INC.

DATE: _____

PLAN REFERENCES:

PLAN NO. 711 (1968)
PLAN NO. 8810 (1982)
PLAN NO. 17581 (2017)
PLAN NO. 17610 (2017)
PLAN NO. 17678 (2017)
PLAN NO. 17704 (2017)
PLAN NO. 17872 (2018)
PLAN NO. 17887 (2019)

LOCUS TITLE INFORMATION

33 DANTON DRIVE

OWNER:	JBX REALTY, LLC
DEED REFERENCE:	BK. 15735 PG. 995
PLAN REFERENCE:	17872 (2018)
ASSESSORS:	PARCEL ID 412-131-6AA

0 30 60 100
SCALE: 1" = 30'

P:\2020 Projects\2020-041 33 Danton Dr Methuen\Dwg_SURVEYING\20-041ec.dwg

Design Consultants, Inc.
CIVIL ENGINEERS and LAND SURVEYORS
120 MIDDLESEX AVENUE
SOMERVILLE, MA 02145
617-776-3350

SCALE:
HORIZ: 1" = 30'
VERT: _____

NO.	DATE	BY	REVISIONS

FIELD: LG
CALCS: RTC
CHECKED: KJK
APPROVED: KJK

EXISTING CONDITIONS PLAN

33 DANTON DRIVE

LAND LOCATED IN
METHUEN, MASSACHUSETTS
SURVEYED FOR
NABIL BOGHOS

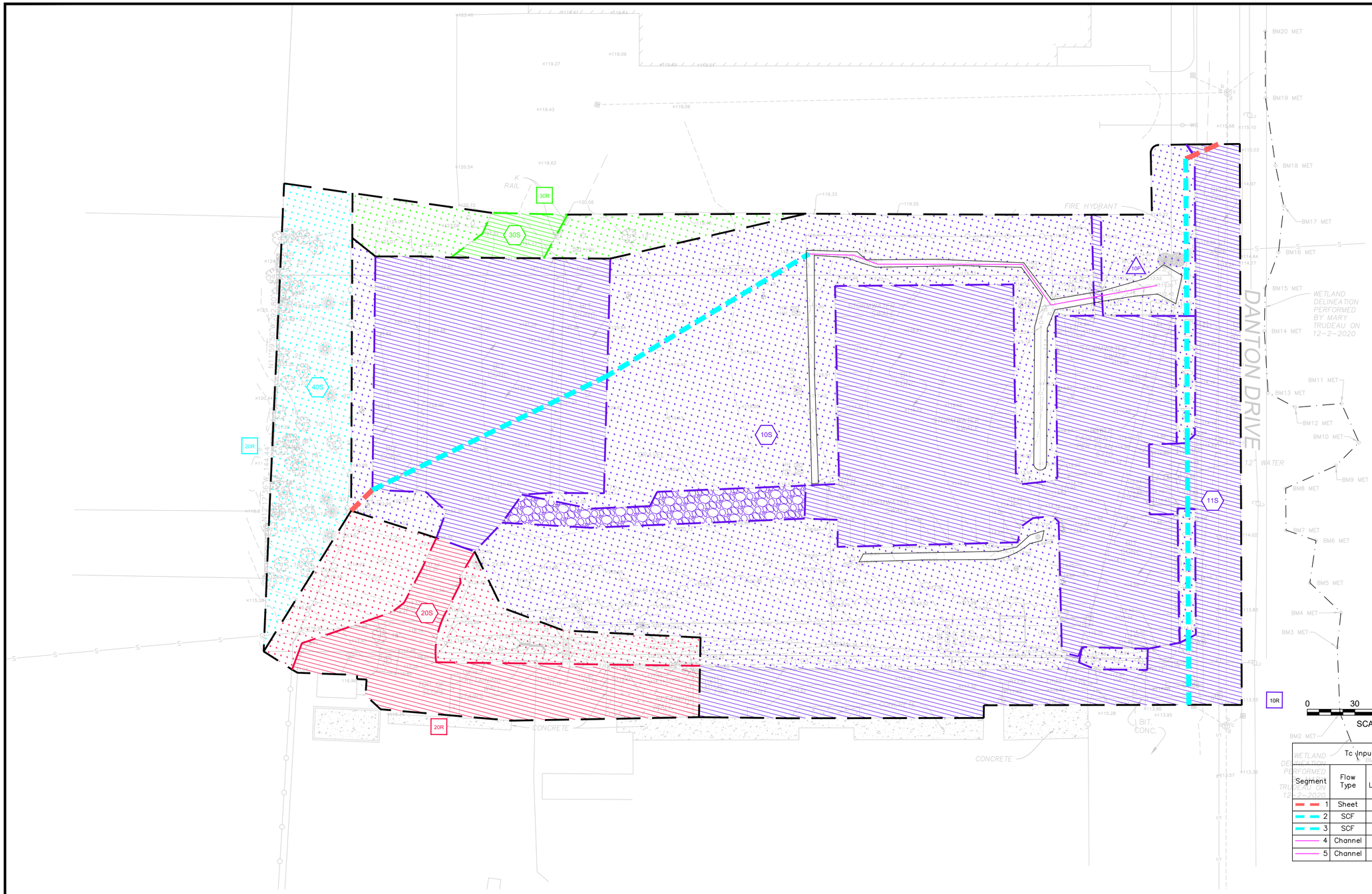
PROJECT NO. 2020-041
DATE: DEC 7, 2020
SHEET NO. 1 OF 1

Appendix C

SITE PLAN

Appendix D

EXISTING & PROPOSED CATCHMENT AREAS



LEGEND

1R	DESIGN POINT
	SUBCATCHMENT BOUNDRY
1S	SUBCATCHMENT
1P	POND
	IMPERVIOUS AREA
	LANDSCAPE
	GRAVEL SURFACE

SUB WATERSHED AREAS - COLORS

- TO PROJECT OUTFALL
- TO 35 DANTON DRIVE
- TO 31 DANTON DRIVE
- TO SPENCER STREET

Tc Inputs – 10S

Segment	Flow Type	Flow Length	Slope	Surface Type
1	Sheet	20	0.005	Woods
2	SCF	164	.0145	Pave
3	SCF	155	0.0158	Grass
4	Channel	148	0.0225	N/A
5	Channel	68	0.0558	N/A

Tc Inputs – 11S

Segment	Flow Type	Flow Length	Slope	Surface Type
1	Sheet	10	0.02	Pave
2	SCF	178	.0050	Grass
3	SCF	42	.0050	Pave
4	SCF	81	.0050	Grass
5	SCF	42	.0050	Pave

NORTH

Design Consultants Inc.
Somerville - Quincy - Newburyport
www.dci-mass.com

OWNER:
BOGHOS PROPERTIES LLC
1630 Osgood Street #1210
North Andover, MA 01845

33 DANTON DRIVE,
METHUEN, MA

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP:

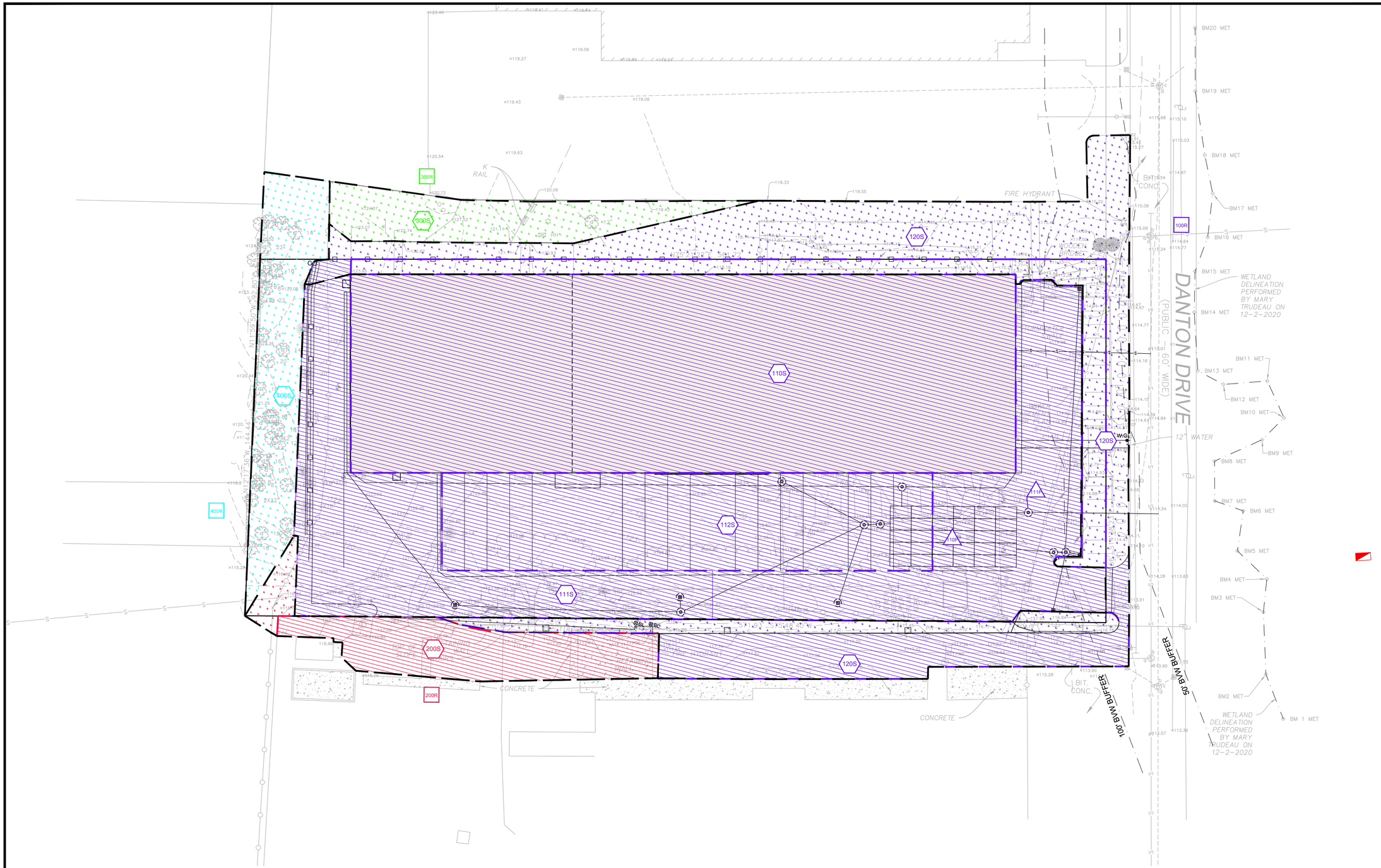
EXISTING DRAINAGE AREA PLAN

SHEET NAME:

D1.0

SHT NO:

DR BY: MCH
CHK BY: SS
PROJ NO: 2020-041
DATE: 06/02/2021
SCALE: AS SHOWN



LEGEND

1R — DESIGN POINT	1S — SUBCATCHMENT
SUBCATCHMENT BOUNDRY	1P — POND
IMPERVIOUS AREA	
LANDSCAPE	
GRAVEL SURFACE	

SUB WATERSHED AREAS - COLORS

- TO PROJECT OUTFALL
- TO 35 DANTON DRIVE
- TO 31 DANTON DRIVE
- TO SPENCER STREET

0 30 60 100

SCALE: 1" = 30'

NORTH

Design Consultants Inc.
Somerville - Quincy - Newburyport
www.dci-mass.com

OWNER:
BOGHOS PROPERTIES LLC
1630 Osgood Street #1210
North Andover, MA 01845

33 DANTON DRIVE,
METHUEN, MA

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP:

PROPOSED DRAINAGE AREA PLAN

SHEET NAME:

D2.0

SHT NO:

DR BY: MCH
CHK BY: SS
PROJ NO: 2020-041
DATE: 06/02/2021
SCALE: AS SHOWN

Appendix E

FEMA FLOOD INSURANCE RATE MAP

National Flood Hazard Layer FIRMette

FEMA

71°13'W 42°43'50"N

71°12'23"W 42°43'24"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/2/2021 at 11:37 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix F

SOILS INFORMATION

Map Scale: 1:2,790 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

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 1:15,800.

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: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 16, Jun 9, 2020

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

Date(s) aerial images were photographed: Aug 13, 2020—Sep 15, 2020

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
52A	Freetown muck, 0 to 1 percent slopes	15.3	38.4%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	1.4	3.5%
255B	Windsor loamy sand, 3 to 8 percent slopes	0.4	1.1%
421B	Canton fine sandy loam, 0 to 8 percent slopes, very stony	5.4	13.5%
421C	Canton fine sandy loam, 8 to 15 percent slopes, very stony	0.6	1.4%
651	Udorthents, smoothed	16.8	42.1%
Totals for Area of Interest		**39.8**	**100.0%**

Commonwealth of Massachusetts
City/Town of Methuen

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

A. Facility Information

Owner Name

35 Danton Drive — Street Address

412-131-6A — Map/Lot #

Methuen — City

MA — State

01844 — Zip Code

B. Site Information

1. (Check one) ☐ New Construction ☒ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: NRCS (Source) 651 (Soil Map Unit)

Udorthents — Soil Name

Soil Limitations

Soil Parent material

Landform

3. Surficial Geological Report Available? ☐ Yes ☐ No If yes: Year Published/Source Map Unit

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer: Wetland Type

7. Current Water Resource Conditions (USGS): 10/16/2020 (Month/Day/ Year) Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site ~~Sewage~~ STORMWATER Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 1 (Hole #) 10/22/2020 (Date) 9 (Time) 65° SUNNY (Weather) 42.7283 (Latitude) -71.2123 (Longitude)

1. Land Use: DEVELOPED - INDUSTRIAL (e.g., woodland, agricultural field, vacant lot, etc.) GRASS (Vegetation) — (Surface Stones (e.g., cobbles, stones, boulders, etc.)) FLAT 0-3 (Slope (%))

Description of Location: GRASS AREA @ SW CORNER OF LOT

2. Soil Parent Material: HILL (Landform) BACKSLOPE (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body ~300 feet; Drainage Way ~400 feet; Wetlands 300 feet; Property Line 50 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			
0-8	A	SANDY LOAM	10yr 3/2						MASSIVE	FRIABLE	TOPSOIL
8-30	B	SANDY LOAM	10YR 3/3						MASSIVE	FRIABLE	
30-114"+	C	FINE SAND	10YR 7/2	—	—	—		15	MASSIVE	V. FRIABLE	

Additional Notes: PIT = 9.5' DEEP, -3.5 TO TOP OF PERC HOLE (12" x 18"D) 5 MIN/IN

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 2 (Hole #) 10/22/2020 (Date) 9:30 (Time) 65° SUN (Weather) ~~42.43~~ 42.7272 (Latitude) -71.2136 (Longitude)

1. Land Use: DEVELOPED - INDUSTRIAL (e.g., woodland, agricultural field, vacant lot, etc.) | Vegetation | — (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-3 (Slope (%))

Description of Location: GRASS AREA @ EDGE OF PAVEMENT

2. Soil Parent Material: | HILL (Landform) | BACKSLOPE (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body _____ feet; Drainage Way _____ feet; Wetlands _____ feet; Property Line _____ 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			
0-8		SANDY LOAM	10YR 3/2								
8-30		SANDY LOAM	10YR 3/3								
30-114		FINE SAND	10YR 7/2								

Additional Notes: SAME AS TP 1, DID NOT PERC TEST

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole #_____	Obs. Hole #_____
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☐ Depth to soil redoximorphic features (mottles)	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number _____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: 114+ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☐ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: _____ inches Lower boundary: _____ inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

10/29/2020
Date

Ryan Boucher 14350
Typed or Printed Name of Soil Evaluator / License #

7/1/2022
Expiration Date of License

Name of Approving Authority Witness

Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

See Lots

Commonwealth of Massachusetts
City/Town of Methuen

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

A. Facility Information

Owner Name

35 Danton Drive — Street Address

412-131-6A — Map/Lot #

Methuen — City

MA — State

01844 — Zip Code

B. Site Information

1. (Check one) ☐ New Construction ☒ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: NRCS (Source) 651 (Soil Map Unit)

Udorthents — Soil Name

Soil Limitations

Soil Parent material

Landform

3. Surficial Geological Report Available? ☐ Yes ☐ No If yes: Year Published/Source Map Unit

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer: Wetland Type

7. Current Water Resource Conditions (USGS): 10/16/2020 (Month/Day/ Year) Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site ~~Sewage~~ Stormwater Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 3 (Hole #) · 10/22/2020 (Date) · 10:30 (Time) · 65° SUN (Weather) · 42.7275 (Latitude) · -71.2130 (Longitude)

1 Land Use: DEVELOPED - INDUSTRIAL (e.g., woodland, agricultural field, vacant lot, etc.) · Vegetation: GRASS · Surface Stones (e.g., cobbles, stones, boulders, etc.): — · Slope (%): 0-3

Description of Location: GRASS AREA @ EDGE OF PAVEMENT

2 Soil Parent Material: _____ · Landform: HILL · Position on Landscape (SU, SH, BS, FS, TS): BACK SLOPE

3 Distances from: Open Water Body ~ 300 feet · Drainage Way ~ 400 feet · Wetlands 300 feet · Property Line _____ 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			
0-8	Ap	SANDY LOAM	10yr 3/2								
8-36	B	SANDY LOAM	10yr 3/3								
36-72	C	FINE SAND	10yr 7/2								

Additional Notes:
HOLE DEPTH = 6FT, VERY SIMILIAR TO TP1 & TP2 PERC: 1½" / 8 MIN

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site ~~Sewage~~ Disposal

STORMWATER

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number: 4 (Hole #) 10/22/2020 (Date) ____ (Time) 65° SUN (Weather) 42.7276 (Latitude) -71.2428 (Longitude)

1. Land Use: DEVELOPED - INDUSTRIAL (e.g., woodland, agricultural field, vacant lot, etc.) ____ (Vegetation) ____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 0-3 (Slope (%))

Description of Location: ____

2. Soil Parent Material: ____ Landform ____ Position on Landscape (SU, SH, BS, FS, TS) ____

3. Distances from: Open Water Body 500 feet; Drainage Way 400 feet; Wetlands 300 feet; Property Line 100 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			
0-12		SANDY LOAM	10YR 4/3								TOPSOIL
12-24		SANDY LOAM									~~FINE-MED SAND (SAME AS~~
24-38		FINE-MED SAND	2.5Y 6/3								FINE-MED SAND, FR-S) SAME AS TP 1-3, WET - LOW PERM
38-90+		FINE SANDY LOAM	10YR 3/2	38" ↑	5YR 6/8	↑					NOT GREASY, NO ODOR
				↳ REDOX		↑ 1/2" LAYER AROUND HOLE					
				IN SAND LAYER (VARIEGATED SOIL)							

SAME, DEPTH/ANGLE

Additional Notes:
HOLE = 7.5' DEEP, REDOX FROM PERCHED STORMWATER @ -38"
↳ VARIEGATED SOIL, NOT ESHGW

Commonwealth of Massachusetts
City/Town of Methuen

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole #_____	Obs. Hole #_____
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☐ Depth to soil redoximorphic features (mottles)	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number _____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: 90+ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☐ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: _____ inches Lower boundary: _____ inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

10/29/2020
Date

Ryan Boucher 14350
Typed or Printed Name of Soil Evaluator / License #

7/1/2022
Expiration Date of License

Name of Approving Authority Witness

Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

See Logs

Commonwealth of Massachusetts
City/Town of Methuen

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

A. Facility Information

Owner Name

35 Danton Drive — Street Address

412-131-6A — Map/Lot #

Methuen — City

MA — State

01844 — Zip Code

B. Site Information

1. (Check one) ☐ New Construction ☒ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: NRCS — Source; 651 — Soil Map Unit

Udorthents — Soil Name

Soil Limitations

Soil Parent material

Landform

3. Surficial Geological Report Available? ☐ Yes ☐ No If yes:

Year Published/Source

Map Unit

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer:

Wetland Type

7. Current Water Resource Conditions (USGS): 10/16/2020 — Month/Day/ Year Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 5 (Hole #) 10/28/2020 (Date) ____ (Time) 65° SUN (Weather) 42.7277 (Latitude) -71.2121 (Longitude:)

1. Land Use DEVELOPED-INDUSTRIAL (e.g., woodland, agricultural field, vacant lot, etc.) ____ (Vegetation) ____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 0-3 (Slope (%))

Description of Location: GRASS AREA @ EDGE OF PAVEMENT

2. Soil Parent Material: ____ Landform ____ Position on Landscape (SU, SH, BS, FS, TS) ____

3. Distances from: Open Water Body 300 feet; Drainage Way 400 feet; Wetlands 150 feet; Property Line 75 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			
Asphalt 0-3"											
3-24		FINE SANDY LOAM	10yr 4/4								
24-60+		FINE/MED SAND	10yr 6/2								

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area*)

Deep Observation Hole Number: 6 (Hole #) 10/22/2020 (Date) ____ (Time) 65° Sun (Weather) 42.7276 (Latitude) -71.2120 (Longitude)

1. Land Use: INDUSTRIAL (e.g., woodland, agricultural field, vacant lot, etc.) ____ Vegetation ____ Surface Stones (e.g., cobbles, stones, boulders, etc.) ____ Slope (%)

Description of Location: PAVED AREA

2. Soil Parent Material: ____ Landform ____ Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body 500 feet; Drainage Way ____ feet; Wetlands 150 feet
Property Line 75 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			
0-3	Asphalt										
3-24		Fine Sandy Loam	10yr 4/4								
24-62+		Fine/ Med Sand	10yr 6/2								
62-84	C										
84-102+		Dark Brown Sandy Loam									

Additional Notes: PERC = 1/2" IN 37 MIN = 0.8"/HR

Commonwealth of Massachusetts
City/Town of Methuen

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole #_____	Obs. Hole #_____
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☐ Depth to soil redoximorphic features (mottles)	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number _____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: 64+ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☐ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: _____ inches Lower boundary: _____ inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

10/29/2020
Date

Ryan Boucher 14350
Typed or Printed Name of Soil Evaluator / License #

7/1/2022
Expiration Date of License

Name of Approving Authority Witness

Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

See Logs

Commonwealth of Massachusetts
City/Town of Methuen

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

A. Facility Information

Owner Name

35 Danton Drive — Street Address

412-131-6A — Map/Lot #

Methuen — City

MA — State

01844 — Zip Code

B. Site Information

1. (Check one) ☐ New Construction ☒ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: NRCS — Source; 651 — Soil Map Unit

Udorthents — Soil Name

Soil Limitations

Soil Parent material

Landform

3. Surficial Geological Report Available? ☐ Yes ☐ No If yes:

Year Published/Source

Map Unit

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer:

Wetland Type

7. Current Water Resource Conditions (USGS): 10/16/2020 — Month/Day/ Year Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 7 (Hole #) 10/22/2020 (Date) ____ (Time) 65° SUN (Weather) 42.7273 (Latitude) ~~-71.2120~~ -71.2120 (Longitude)

1. Land Use: INDUSTRIAL (e.g., woodland, agricultural field, vacant lot, etc.) ____ (Vegetation) ____ (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 0-3 (Slope (%))

Description of Location: PARKING LOT

2. Soil Parent Material: ____ Landform: ____ Position on Landscape (SU, SH, BS, FS, TS): ____

3. Distances from: Open Water Body 500 feet; Drainage Way 500 feet; Wetlands 150 feet; Property Line 75 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			
0-3	ASPHALT										
3-24		FINE/MED SANDY LOAM	10yr 3/2				~~TRACE~~ TRACE				
24-~~53~~ 53		FINE/MED SAND	10yr 7/3				TRACE				WET
53-72+ 0			10yr 2/1								WET

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 8 (Hole #) 10/22/2020 (Date) ____ (Time) 65° Sun (Weather) 42.7272 (Latitude) -71.2119 (Longitude)

1. Land Use: INDUSTRIAL (e.g., woodland, agricultural field, vacant lot, etc.) ____ (Vegetation) — (Surface Stones (e.g., cobbles, stones, boulders, etc.)) 0-3 (Slope (%))

   Description of Location: PARKING LOT

2. Soil Parent Material: ____ ____ (Landform) ____ (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body ____ feet; Property Line ____ feet; Drainage Way ____ feet; Drinking Water Well ____ feet; Wetlands ____ 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			
~~0-3~~	~~Asphalt~~										
~~3-35~~		~~SAND~~ FINE SAND	~~10YR 6/3~~ 2.5YR 6/3								SOME SILT
~~35-70+~~		FINE SAND	~~10YR 5/8~~								SOME SILT (STAINING)
0-3	ASPHALT										
3-35	FILL										
35-41	B										
41-80+	Bw	MED SAND	10YR 6/4				TRACE	5%			

Additional Notes: PERC < 2 min/IN.

Commonwealth of Massachusetts
City/Town of Methuen

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

D. Determination of High Groundwater Elevation

1. Method Used: Obs. Hole #_____ Obs. Hole #_____

☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☐ Depth to soil redoximorphic features (mottles)	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number _____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: 80+ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☐ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: _____ inches Lower boundary: _____ inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

10/29/2020
Date

Ryan Boucher 14350
Typed or Printed Name of Soil Evaluator / License #

7/1/2022
Expiration Date of License

Name of Approving Authority Witness

Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

See Lots

Commonwealth of Massachusetts
City/Town of Methuen

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

A. Facility Information

Owner Name

35 Danton Drive — Street Address

412-131-6A — Map/Lot #

Methuen — City

MA — State

01844 — Zip Code

B. Site Information

1. (Check one) ☐ New Construction ☒ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: NRCS — Source; 651 — Soil Map Unit

Udorthents — Soil Name

Soil Limitations

Soil Parent material

Landform

3. Surficial Geological Report Available? ☐ Yes ☐ No If yes:

Year Published/Source

Map Unit

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer:

Wetland Type

7. Current Water Resource Conditions (USGS): 10/16/2020 — Month/Day/ Year Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site ~~Sewage~~ Disposal

STORMWATER

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 9 (Hole #) | 10/22/2020 (Date) | Time | 65° SUN (Weather) | 42.7277 (Latitude) | -71.2122 (Longitude)

1. Land Use: INDUSTRIAL (e.g., woodland, agricultural field, vacant lot, etc.) | Vegetation | — (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-3 (Slope (%))

Description of Location: GRASS AREA @ EDGE OF PARKING LOT

2. Soil Parent Material: | Landform | Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body 500 feet | Drainage Way 500 feet | Wetlands 150 feet | Property Line 85 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			
0-12	TOPSOIL										
12-62		FINE/MED SAND	10YR 6/3				15				SOME STAIN

Additional Notes:

Commonwealth of Massachusetts
City/Town of Methuen

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

D. Determination of High Groundwater Elevation

1. Method Used: Obs. Hole #_____ Obs. Hole #_____

☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☐ Depth to soil redoximorphic features (mottles)	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number _____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: 62+ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☐ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: _____ inches Lower boundary: _____ inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Stormwater Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

10/29/2020
Date

Ryan Boucher 14350
Typed or Printed Name of Soil Evaluator / License #

7/1/2022
Expiration Date of License

Name of Approving Authority Witness

Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

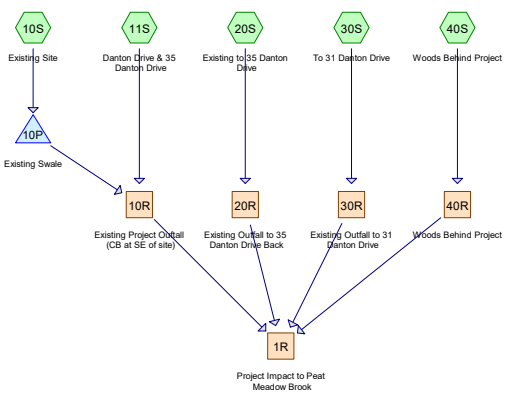
Field Diagrams: Use this area for field diagrams:

See Logs

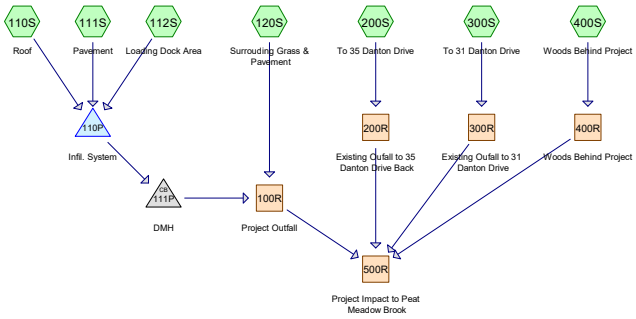
Appendix G

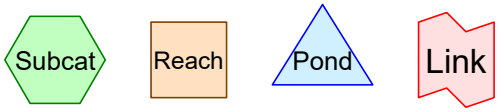
EXISTING AND PROPOSED HYDROLOGY

Existing Analysis



Proposed Analysis





Routing Diagram for 2020-041
Prepared by Design Consultants, Inc., Printed 6/2/2021

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
66,983	49	50-75% Grass cover, Fair, HSG A (10S, 11S)
53,979	39	>75% Grass cover, Good, HSG A (20S, 30S, 120S, 200S, 300S)
3,237	96	Gravel surface, HSG A (10S)
167,732	98	Paved parking, HSG A (10S, 11S, 20S, 30S, 111S, 112S, 120S, 200S)
58,003	98	Roofs, HSG A (110S)
20,814	36	Woods, Fair, HSG A (40S, 400S)

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
370,748	HSG A	10S, 11S, 20S, 30S, 40S, 110S, 111S, 112S, 120S, 200S, 300S, 400S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
66,983	0	0	0	0	66,983	50-75% Grass cover, Fair	
53,979	0	0	0	0	53,979	>75% Grass cover, Good	
3,237	0	0	0	0	3,237	Gravel surface	
167,732	0	0	0	0	167,732	Paved parking	
58,003	0	0	0	0	58,003	Roofs	
20,814	0	0	0	0	20,814	Woods, Fair	

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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: Existing Site Runoff Area=127,488 sf 45.36% Impervious Runoff Depth=0.90"
Flow Length=555' Tc=11.5 min CN=72 Runoff=2.21 cfs 9,549 cf

Subcatchment 11S: Danton Drive & 35 Runoff Area=21,223 sf 97.37% Impervious Runoff Depth=2.81"
Flow Length=353' Tc=9.9 min CN=97 Runoff=1.18 cfs 4,964 cf

Subcatchment 20S: Existing to 35 Danton Runoff Area=20,048 sf 52.50% Impervious Runoff Depth=0.80"
Tc=6.0 min CN=70 Runoff=0.38 cfs 1,335 cf

Subcatchment 30S: To 31 Danton Drive Runoff Area=6,412 sf 21.97% Impervious Runoff Depth=0.16"
Tc=6.0 min CN=52 Runoff=0.00 cfs 86 cf

Subcatchment 40S: Woods Behind Project Runoff Area=11,909 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=36 Runoff=0.00 cfs 0 cf

Subcatchment 110S: Roof Runoff Area=58,003 sf 100.00% Impervious Runoff Depth=2.92"
Tc=6.0 min CN=98 Runoff=3.77 cfs 14,103 cf

Subcatchment 111S: Pavement Runoff Area=40,002 sf 100.00% Impervious Runoff Depth=2.92"
Tc=0.0 min CN=98 Runoff=2.87 cfs 9,726 cf

Subcatchment 112S: Loading Dock Area Runoff Area=21,102 sf 100.00% Impervious Runoff Depth=2.92"
Tc=0.0 min CN=98 Runoff=1.51 cfs 5,131 cf

Subcatchment 120S: Surrouding Grass & Runoff Area=40,016 sf 21.16% Impervious Runoff Depth=0.14"
Tc=0.0 min CN=51 Runoff=0.02 cfs 464 cf

Subcatchment 200S: To 35 Danton Drive Runoff Area=8,897 sf 86.93% Impervious Runoff Depth=2.12"
Tc=6.0 min CN=90 Runoff=0.47 cfs 1,574 cf

Subcatchment 300S: To 31 Danton Drive Runoff Area=6,743 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0 cf

Subcatchment 400S: Woods Behind Project Runoff Area=8,905 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=36 Runoff=0.00 cfs 0 cf

Reach 1R: Project Impact to Peat Meadow Brook Inflow=4.30 cfs 15,258 cf
Outflow=4.30 cfs 15,258 cf

Reach 10R: Existing Project Ouftall (CB at SE of site) Inflow=4.03 cfs 13,836 cf
Outflow=4.03 cfs 13,836 cf

Reach 20R: Existing Outfall to 35 Danton Drive Back Inflow=0.38 cfs 1,335 cf
Outflow=0.38 cfs 1,335 cf

Reach 30R: Existing Outfall to 31 Danton Drive Inflow=0.00 cfs 86 cf
Outflow=0.00 cfs 86 cf

Reach 40R: Woods Behind Project Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Reach 100R: Project Outfall Inflow=3.14 cfs 11,227 cf
Outflow=3.14 cfs 11,227 cf

Reach 200R: Existing Oufall to 35 Danton Drive Back Inflow=0.47 cfs 1,574 cf
Outflow=0.47 cfs 1,574 cf

Reach 300R: Existing Oufall to 31 Danton Drive Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Reach 400R: Woods Behind Project Inflow=0.00 cfs 0 cf
Outflow=0.00 cfs 0 cf

Reach 500R: Project Impact to Peat Meadow Brook Inflow=3.47 cfs 12,800 cf
Outflow=3.47 cfs 12,800 cf

Pond 10P: Existing Swale Peak Elev=4.20' Storage=689 cf Inflow=2.21 cfs 9,549 cf
Outflow=2.88 cfs 8,872 cf

Pond 110P: Infil. System Peak Elev=112.19' Storage=8,894 cf Inflow=7.82 cfs 28,960 cf
Discarded=0.19 cfs 18,197 cf Primary=3.14 cfs 10,762 cf Outflow=3.33 cfs 28,960 cf

Pond 111P: DMH Peak Elev=112.63' Inflow=3.14 cfs 10,762 cf
18.0" Round Culvert n=0.009 L=83.0' S=0.0171 '/' Outflow=3.14 cfs 10,762 cf

Summary for Subcatchment 10S: Existing Site

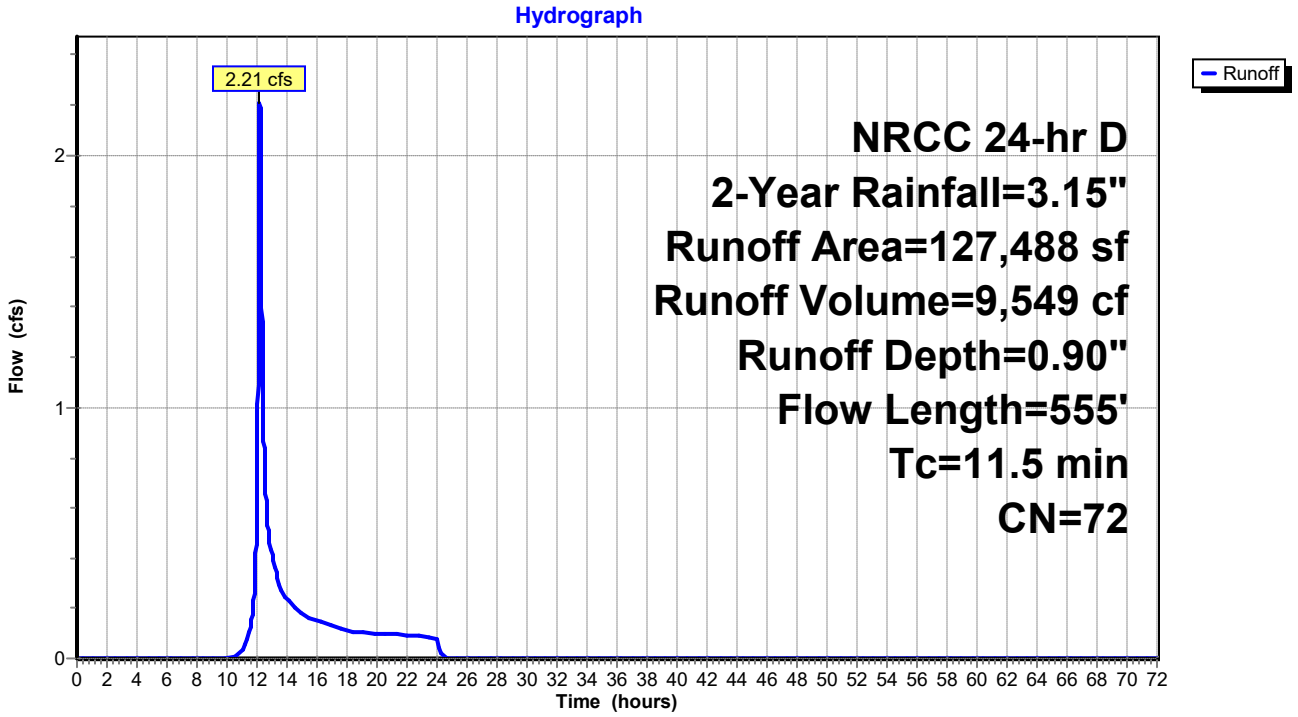
Runoff = 2.21 cfs @ 12.20 hrs, Volume= 9,549 cf, Depth= 0.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
66,425	49	50-75% Grass cover, Fair, HSG A
57,826	98	Paved parking, HSG A
3,237	96	Gravel surface, HSG A
127,488	72	Weighted Average
69,662		54.64% Pervious Area
57,826		45.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	20	0.0050	0.05		**Sheet Flow, Woodland Sheet Flow** Grass: Dense n= 0.240 P2= 3.15"
1.1	164	0.0145	2.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.9	155	0.0158	0.88		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	148	0.0225	4.68	46.78	**Channel Flow, X-Sec and Perimeter** Area= 10.0 sf Perim= 13.0' r= 0.77' n= 0.040 Earth, cobble bottom, clean sides
0.1	68	0.0558	13.14	157.70	**Channel Flow, X-Section and Perimeter** Area= 12.0 sf Perim= 8.0' r= 1.50' n= 0.035 Earth, dense weeds
11.5	555	Total			

Subcatchment 10S: Existing Site



Summary for Subcatchment 11S: Danton Drive & 35 Danton Drive

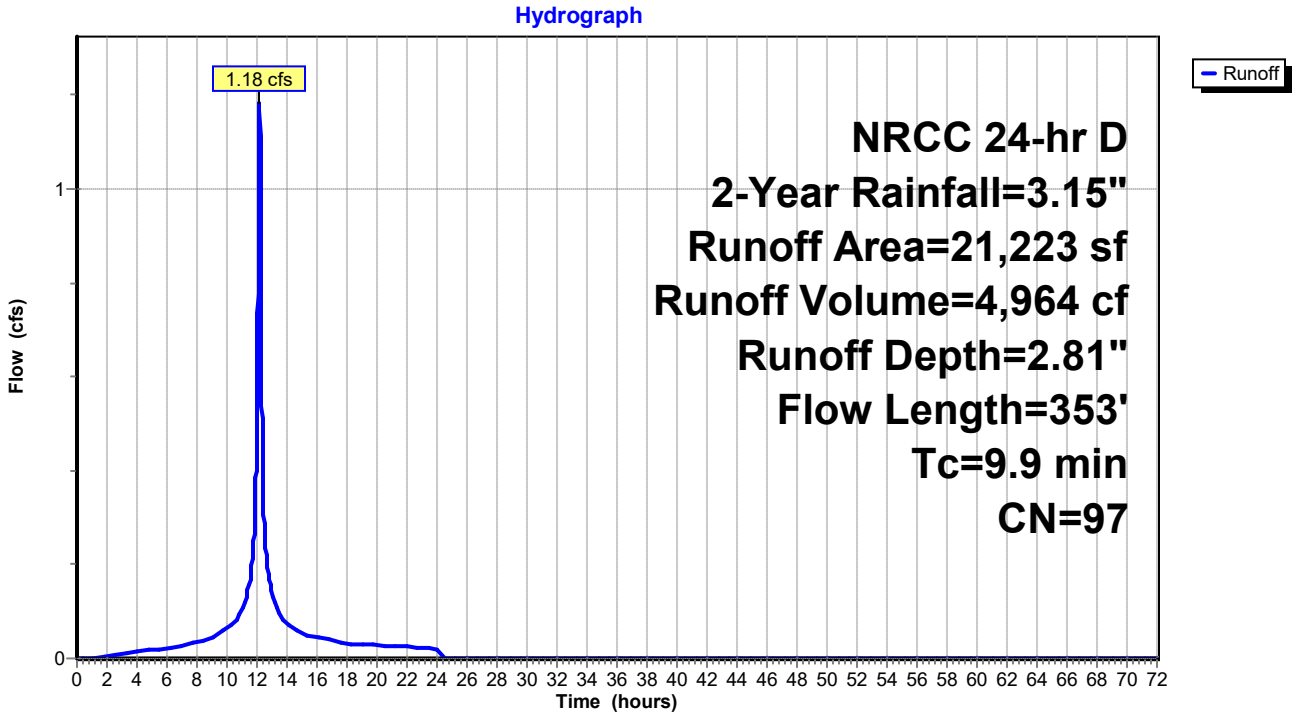
Runoff = 1.18 cfs @ 12.17 hrs, Volume= 4,964 cf, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
20,665	98	Paved parking, HSG A
558	49	50-75% Grass cover, Fair, HSG A
21,223	97	Weighted Average
558		2.63% Pervious Area
20,665		97.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0200	0.86		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.15"
6.0	178	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	42	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	81	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	42	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.9	353	Total			

Subcatchment 11S: Danton Drive & 35 Danton Drive



Summary for Subcatchment 20S: Existing to 35 Danton Drive

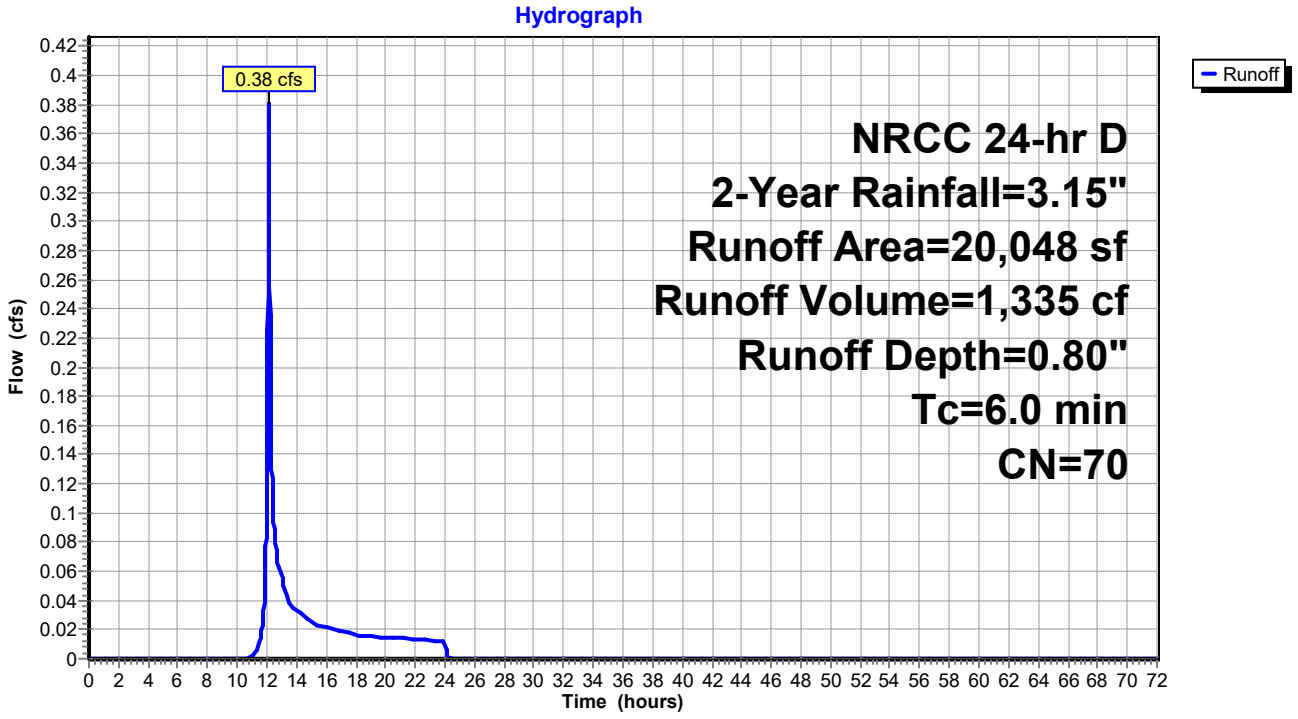
Runoff = 0.38 cfs @ 12.14 hrs, Volume= 1,335 cf, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
10,526	98	Paved parking, HSG A
9,522	39	>75% Grass cover, Good, HSG A
20,048	70	Weighted Average
9,522		47.50% Pervious Area
10,526		52.50% Impervious Area

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

Subcatchment 20S: Existing to 35 Danton Drive



Summary for Subcatchment 30S: To 31 Danton Drive

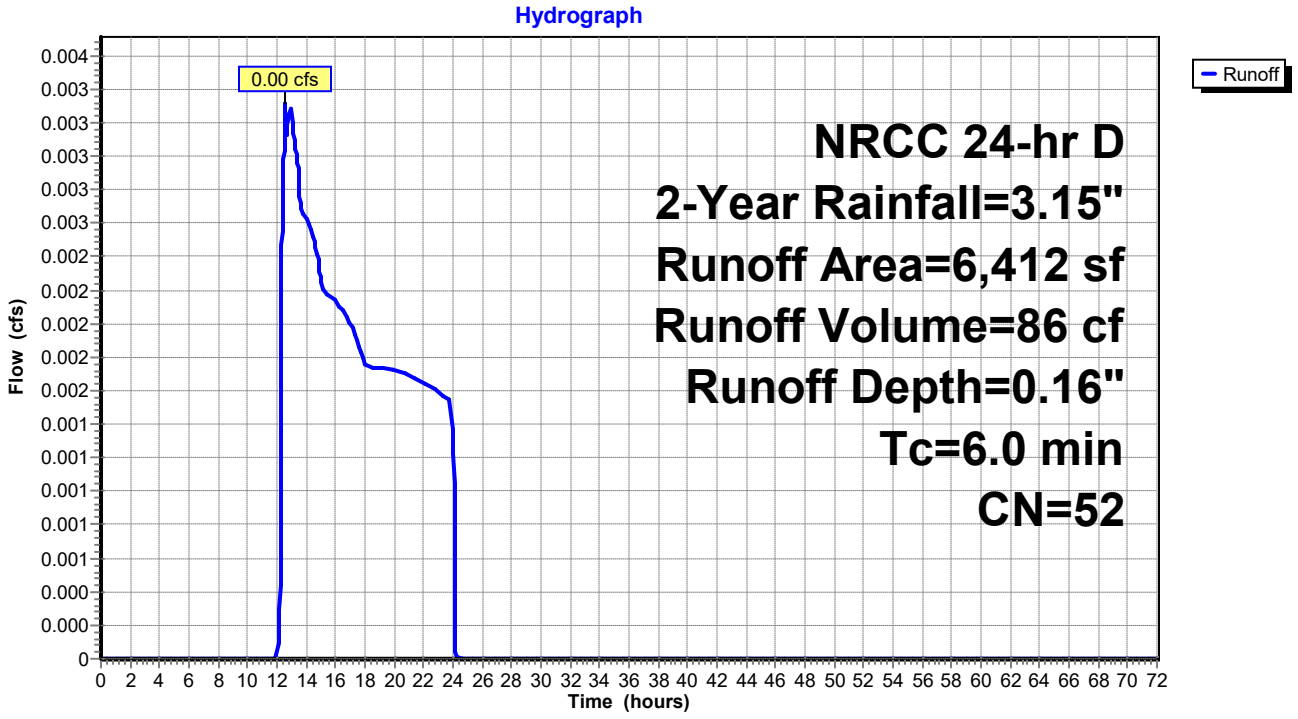
Runoff = 0.00 cfs @ 12.55 hrs, Volume= 86 cf, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
1,409	98	Paved parking, HSG A
5,003	39	>75% Grass cover, Good, HSG A
6,412	52	Weighted Average
5,003		78.03% Pervious Area
1,409		21.97% Impervious Area

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

Subcatchment 30S: To 31 Danton Drive



Summary for Subcatchment 40S: Woods Behind Project

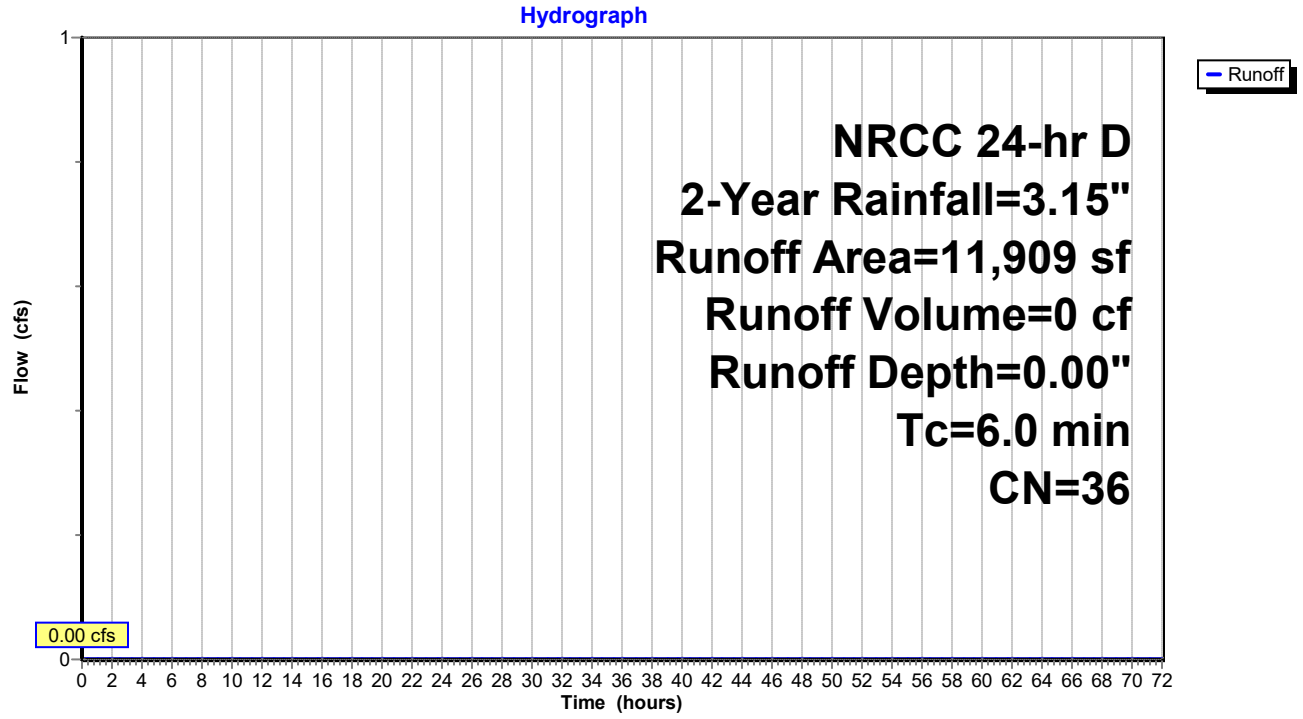
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
11,909	36	Woods, Fair, HSG A
11,909		100.00% Pervious Area

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

Subcatchment 40S: Woods Behind Project



Summary for Subcatchment 110S: Roof

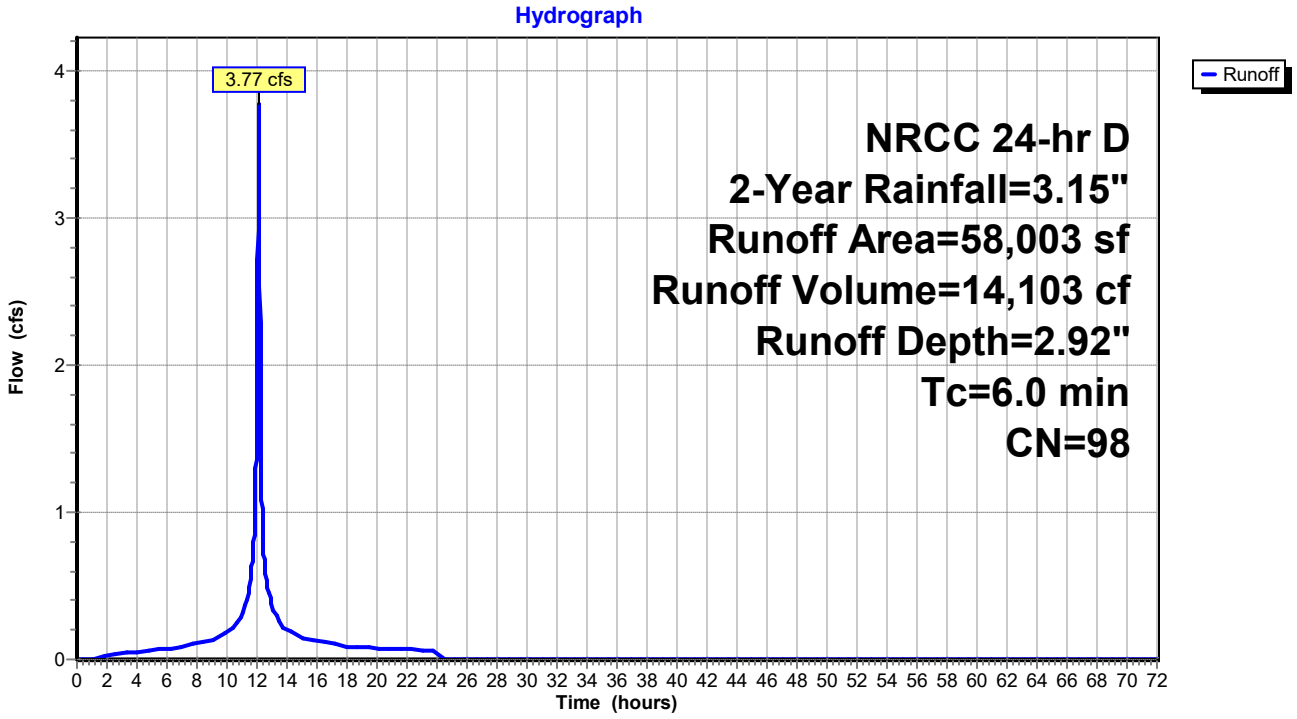
Runoff = 3.77 cfs @ 12.13 hrs, Volume= 14,103 cf, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
58,003	98	Roofs, HSG A
58,003		100.00% Impervious Area

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

Subcatchment 110S: Roof



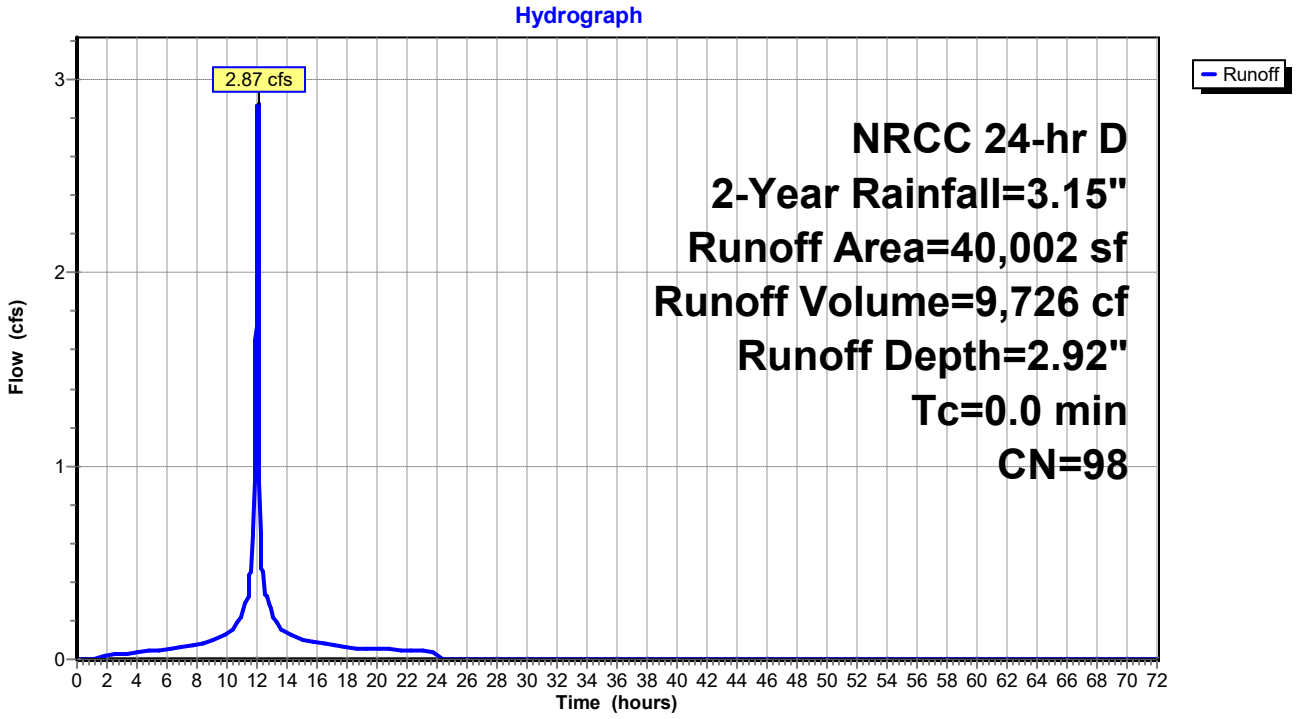
Summary for Subcatchment 111S: Pavement

Runoff = 2.87 cfs @ 12.09 hrs, Volume= 9,726 cf, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
40,002	98	Paved parking, HSG A
40,002		100.00% Impervious Area

Subcatchment 111S: Pavement



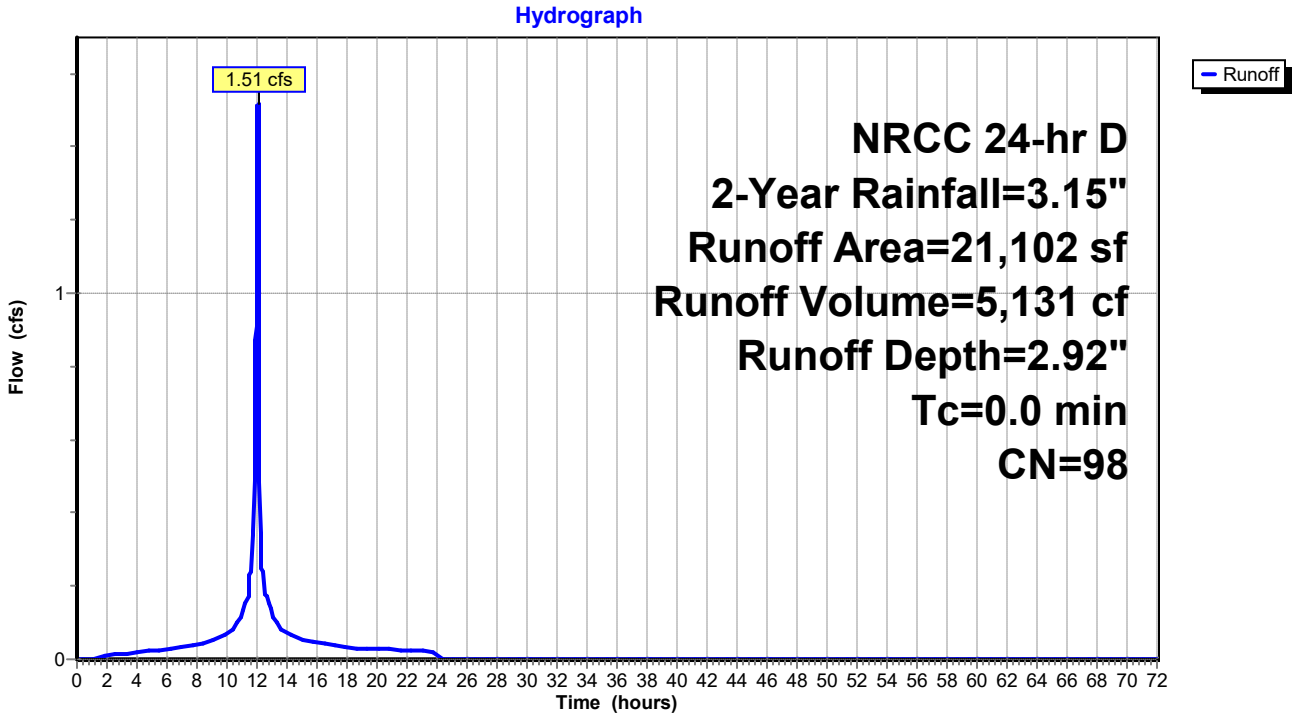
Summary for Subcatchment 112S: Loading Dock Area

Runoff = 1.51 cfs @ 12.09 hrs, Volume= 5,131 cf, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
21,102	98	Paved parking, HSG A
21,102		100.00% Impervious Area

Subcatchment 112S: Loading Dock Area



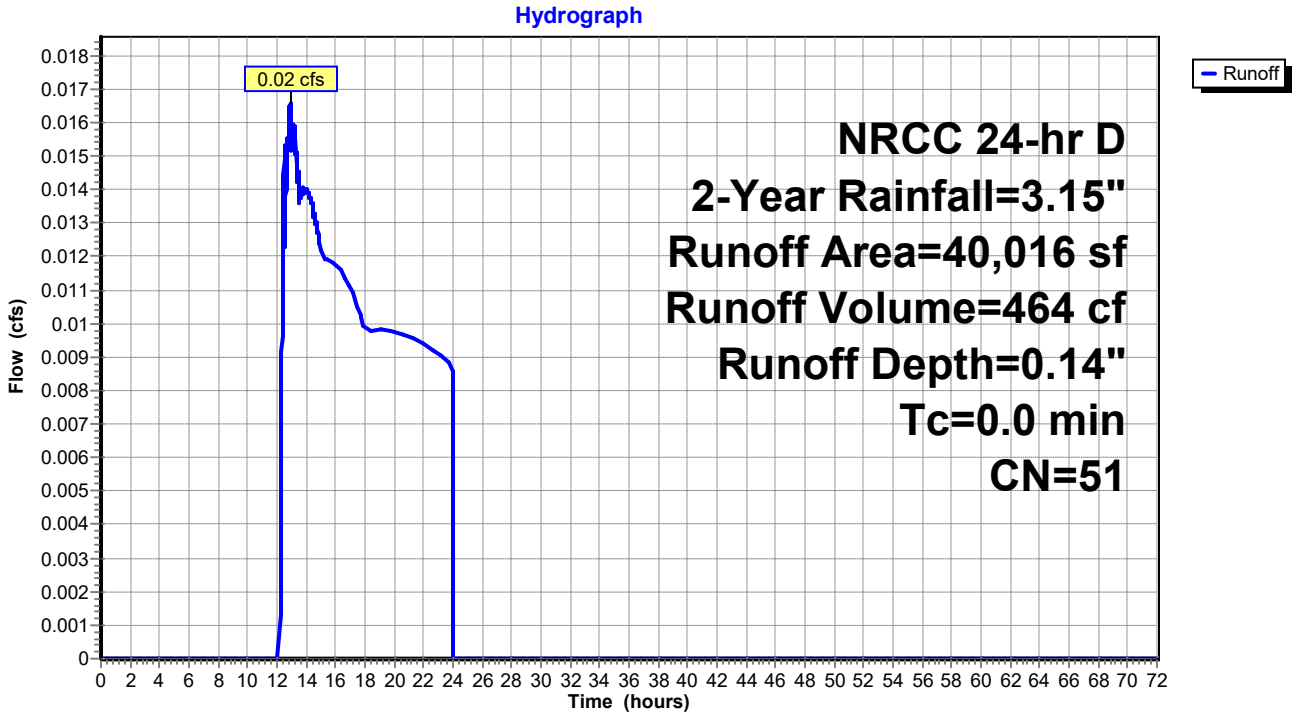
Summary for Subcatchment 120S: Surrouding Grass & Pavement

Runoff = 0.02 cfs @ 12.89 hrs, Volume= 464 cf, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
31,548	39	>75% Grass cover, Good, HSG A
8,468	98	Paved parking, HSG A
40,016	51	Weighted Average
31,548		78.84% Pervious Area
8,468		21.16% Impervious Area

Subcatchment 120S: Surrouding Grass & Pavement



Summary for Subcatchment 200S: To 35 Danton Drive

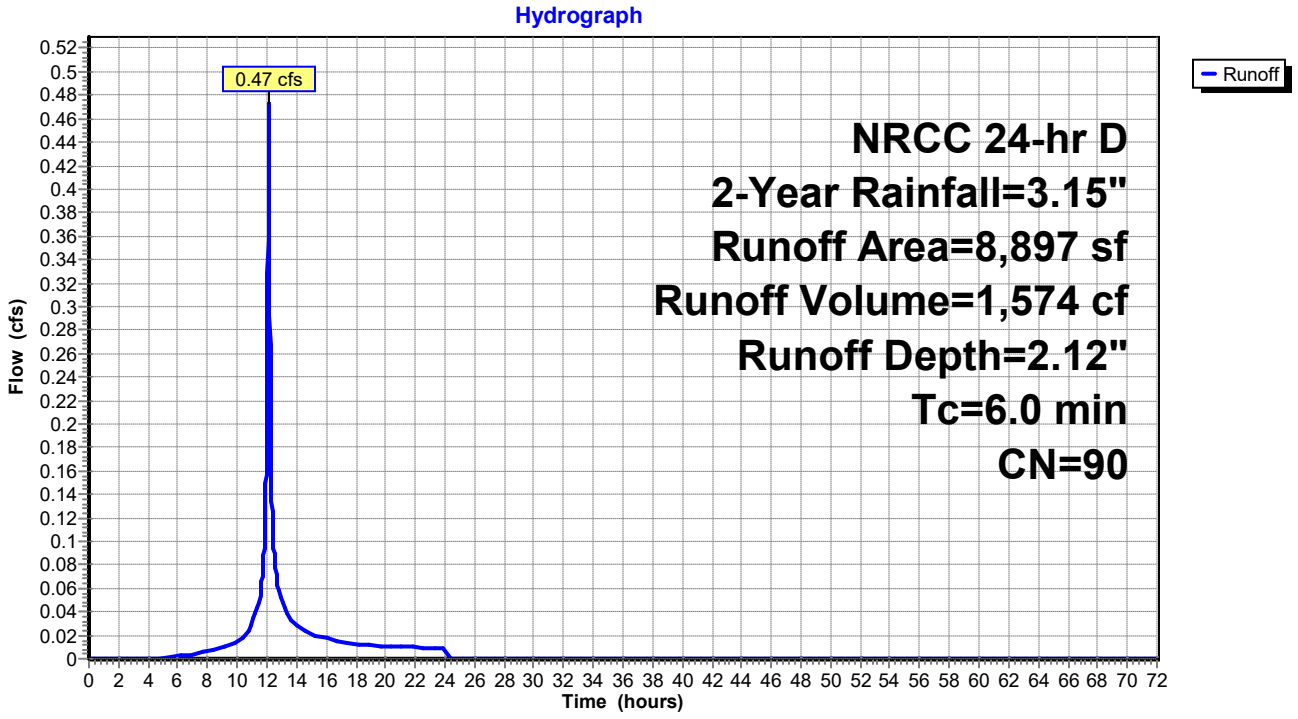
Runoff = 0.47 cfs @ 12.13 hrs, Volume= 1,574 cf, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
1,163	39	>75% Grass cover, Good, HSG A
7,734	98	Paved parking, HSG A
8,897	90	Weighted Average
1,163		13.07% Pervious Area
7,734		86.93% Impervious Area

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

Subcatchment 200S: To 35 Danton Drive



Summary for Subcatchment 300S: To 31 Danton Drive

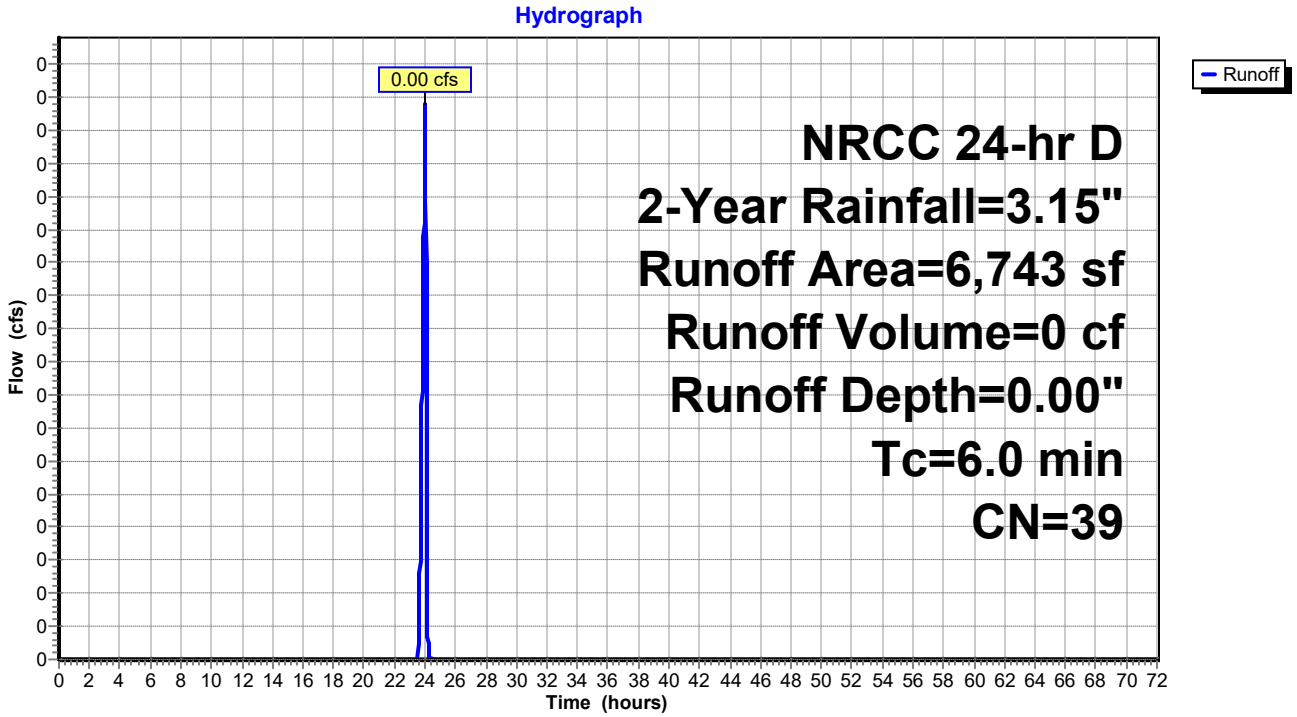
Runoff = 0.00 cfs @ 24.03 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
6,743	39	>75% Grass cover, Good, HSG A
6,743		100.00% Pervious Area

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

Subcatchment 300S: To 31 Danton Drive



Summary for Subcatchment 400S: Woods Behind Project

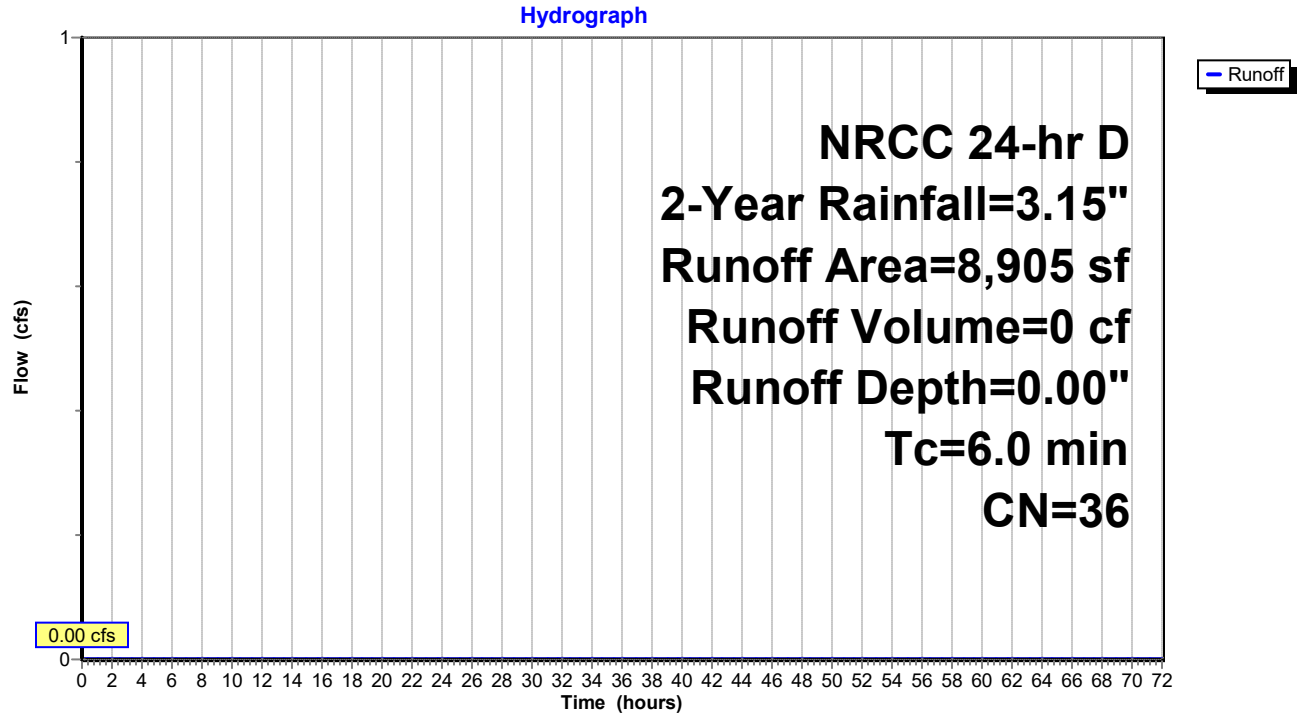
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.15"

Area (sf)	CN	Description
8,905	36	Woods, Fair, HSG A
8,905		100.00% Pervious Area

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

Subcatchment 400S: Woods Behind Project

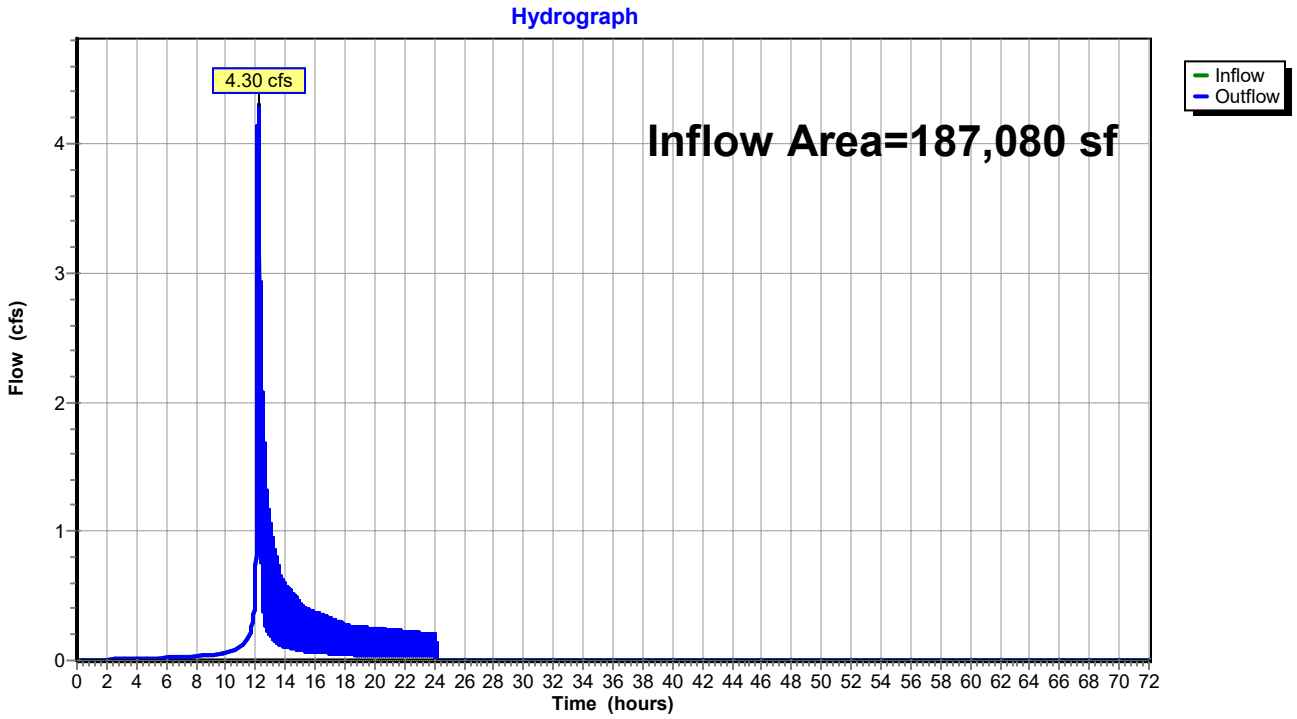


Summary for Reach 1R: Project Impact to Peat Meadow Brook

Inflow Area = 187,080 sf, 48.34% Impervious, Inflow Depth = 0.98" for 2-Year event
Inflow = 4.30 cfs @ 12.19 hrs, Volume= 15,258 cf
Outflow = 4.30 cfs @ 12.19 hrs, Volume= 15,258 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 1R: Project Impact to Peat Meadow Brook

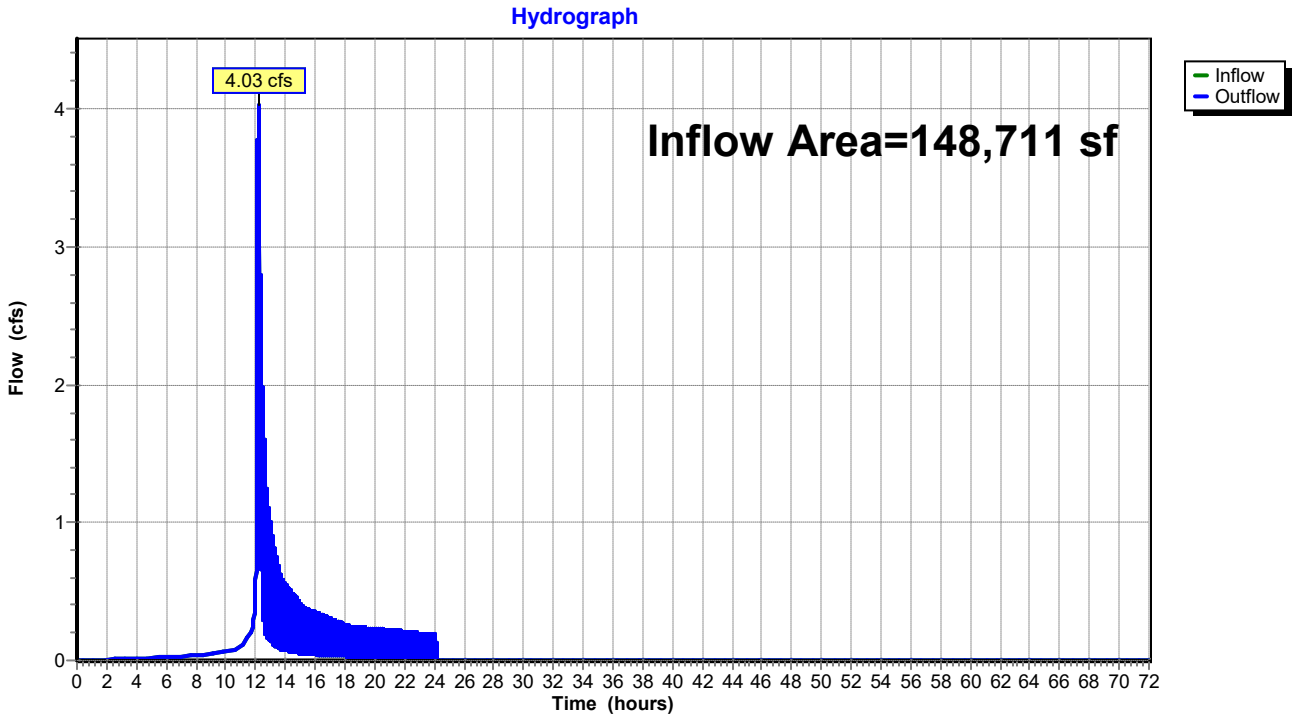


Summary for Reach 10R: Existing Project Outfall (CB at SE of site)

Inflow Area = 148,711 sf, 52.78% Impervious, Inflow Depth = 1.12" for 2-Year event
Inflow = 4.03 cfs @ 12.19 hrs, Volume= 13,836 cf
Outflow = 4.03 cfs @ 12.19 hrs, Volume= 13,836 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 10R: Existing Project Outfall (CB at SE of site)

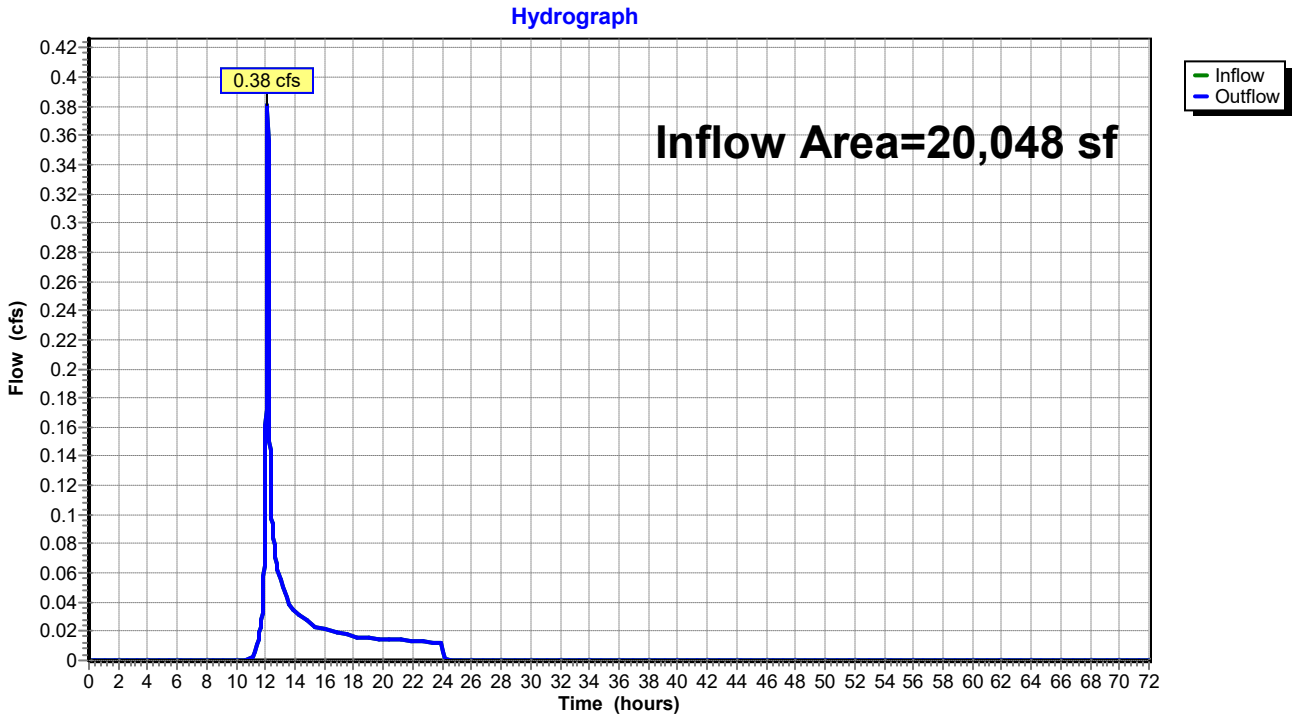


Summary for Reach 20R: Existing Outfall to 35 Danton Drive Back

Inflow Area = 20,048 sf, 52.50% Impervious, Inflow Depth = 0.80" for 2-Year event
Inflow = 0.38 cfs @ 12.14 hrs, Volume= 1,335 cf
Outflow = 0.38 cfs @ 12.14 hrs, Volume= 1,335 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 20R: Existing Outfall to 35 Danton Drive Back

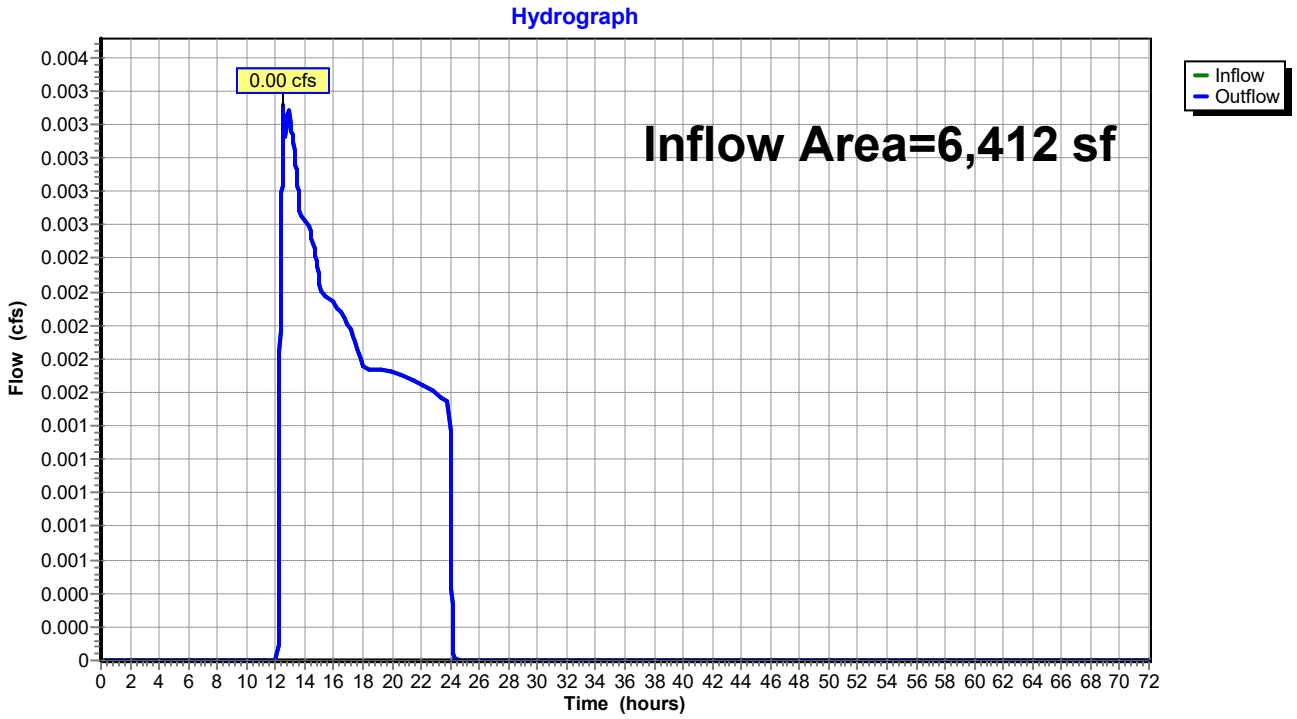


Summary for Reach 30R: Existing Outfall to 31 Danton Drive

Inflow Area = 6,412 sf, 21.97% Impervious, Inflow Depth = 0.16" for 2-Year event
Inflow = 0.00 cfs @ 12.55 hrs, Volume= 86 cf
Outflow = 0.00 cfs @ 12.55 hrs, Volume= 86 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 30R: Existing Outfall to 31 Danton Drive

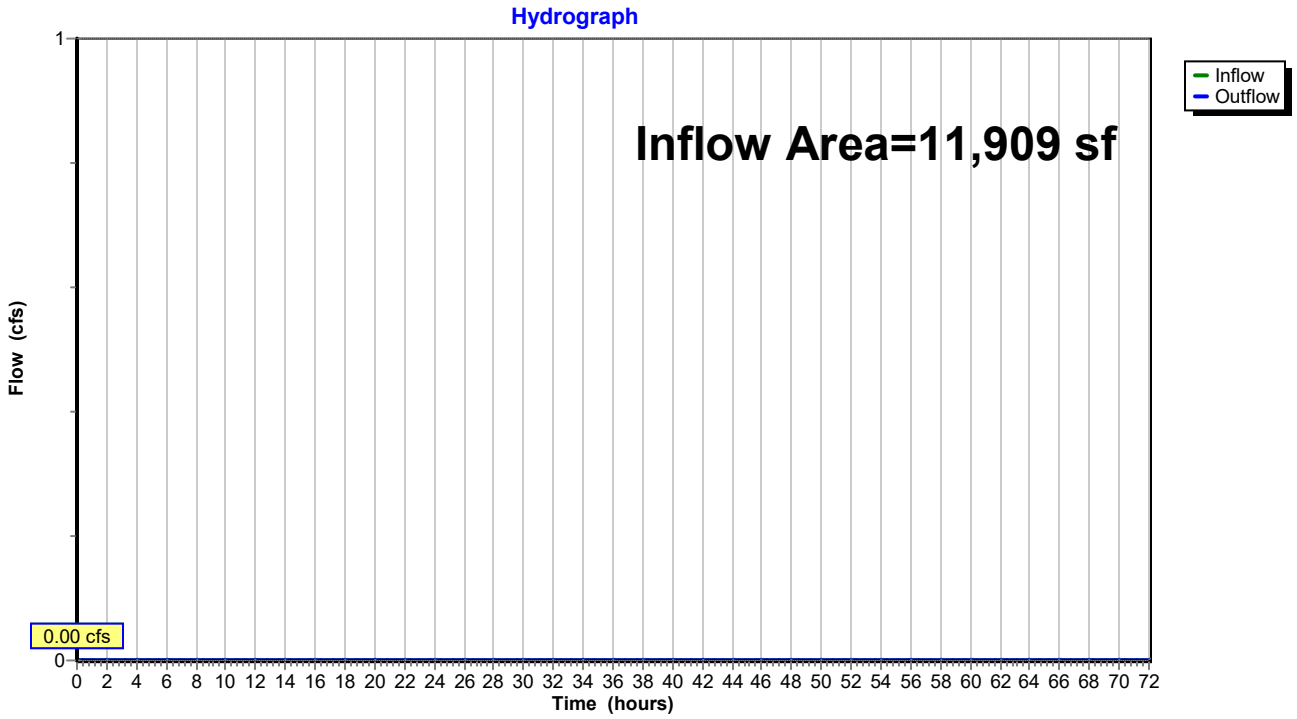


Summary for Reach 40R: Woods Behind Project

Inflow Area = 11,909 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= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 40R: Woods Behind Project

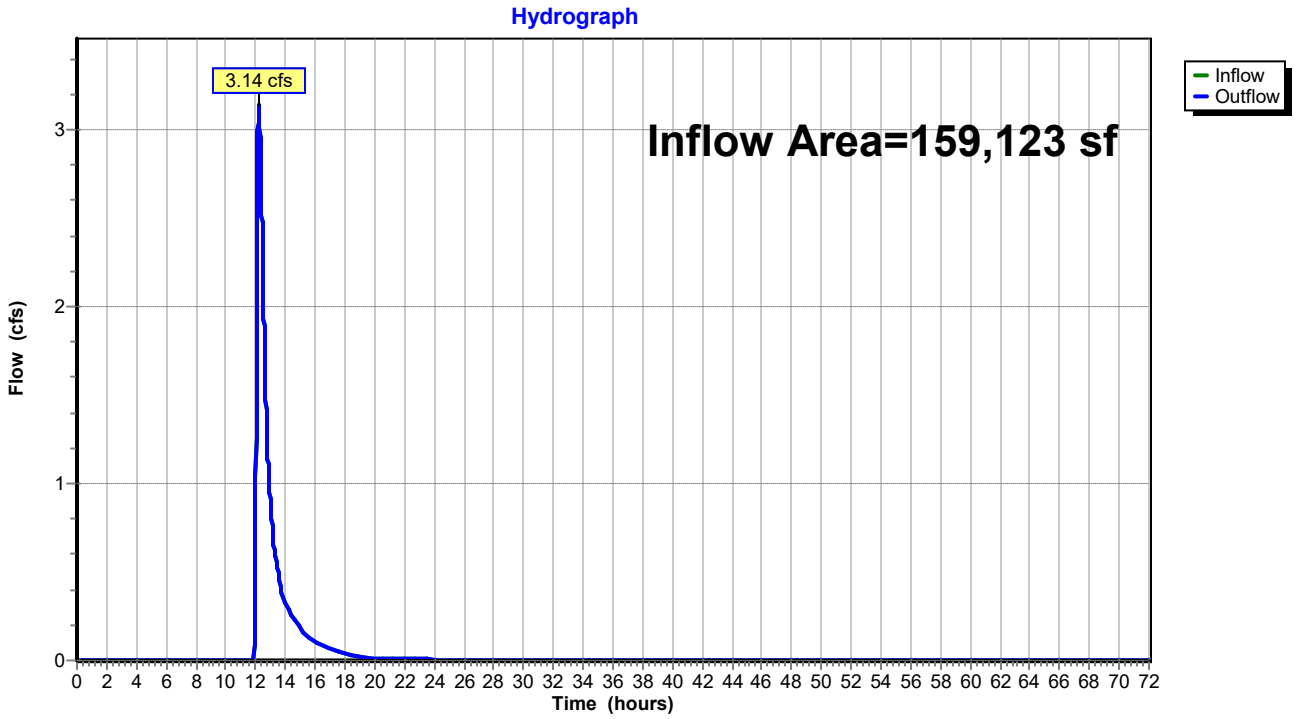


Summary for Reach 100R: Project Outfall

Inflow Area = 159,123 sf, 80.17% Impervious, Inflow Depth = 0.85" for 2-Year event
Inflow = 3.14 cfs @ 12.21 hrs, Volume= 11,227 cf
Outflow = 3.14 cfs @ 12.21 hrs, Volume= 11,227 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 100R: Project Outfall

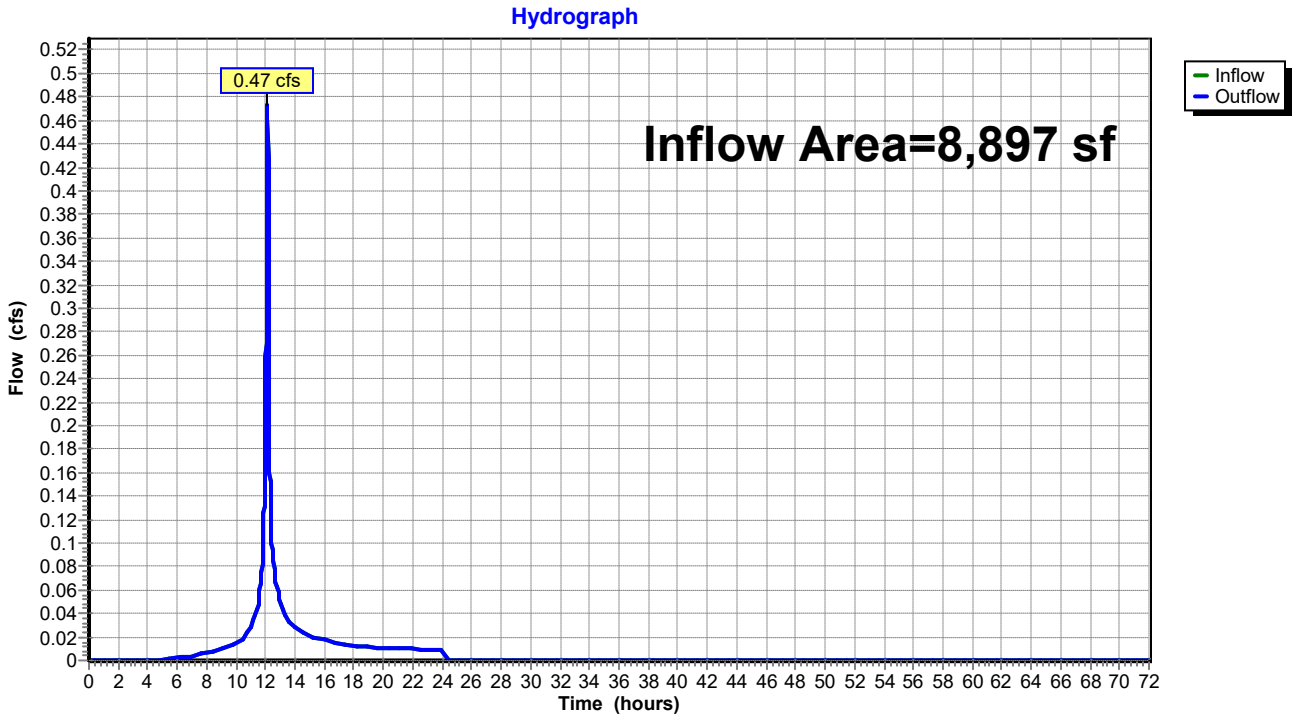


Summary for Reach 200R: Existing Oufall to 35 Danton Drive Back

Inflow Area = 8,897 sf, 86.93% Impervious, Inflow Depth = 2.12" for 2-Year event
Inflow = 0.47 cfs @ 12.13 hrs, Volume= 1,574 cf
Outflow = 0.47 cfs @ 12.13 hrs, Volume= 1,574 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 200R: Existing Oufall to 35 Danton Drive Back

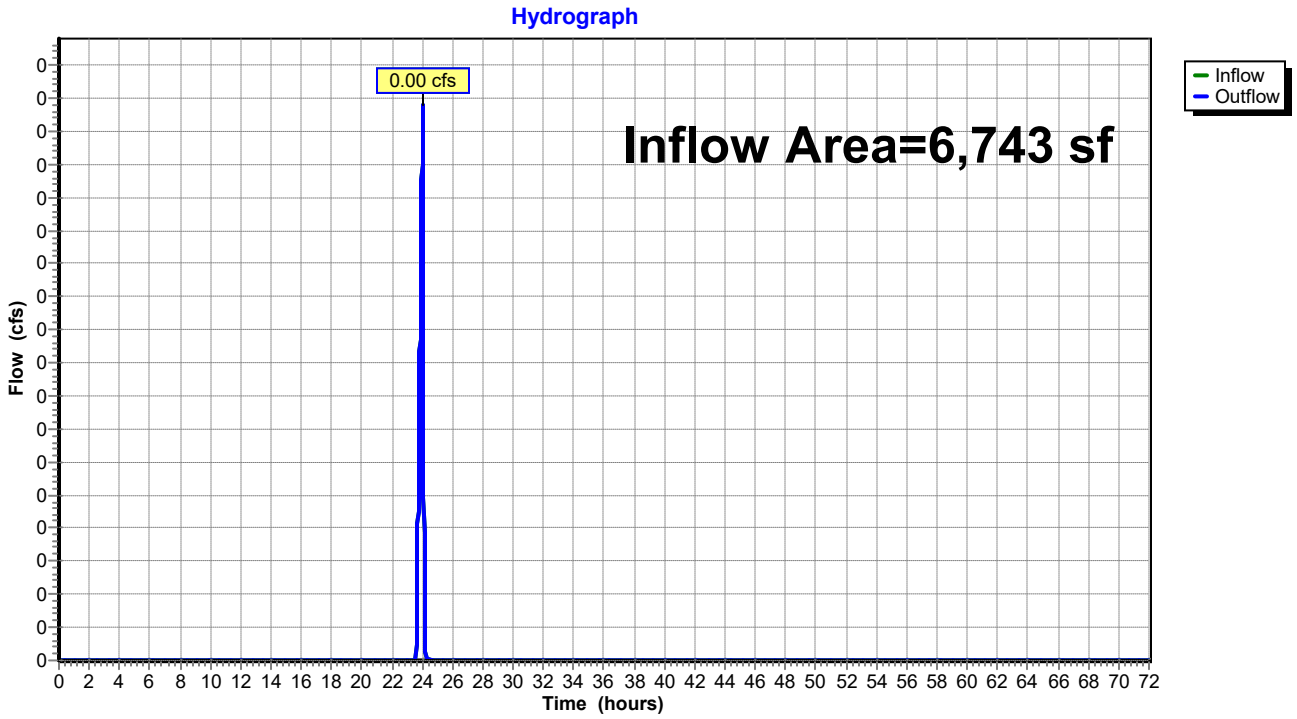


Summary for Reach 300R: Existing Oufall to 31 Danton Drive

Inflow Area = 6,743 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.03 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 24.03 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 300R: Existing Oufall to 31 Danton Drive

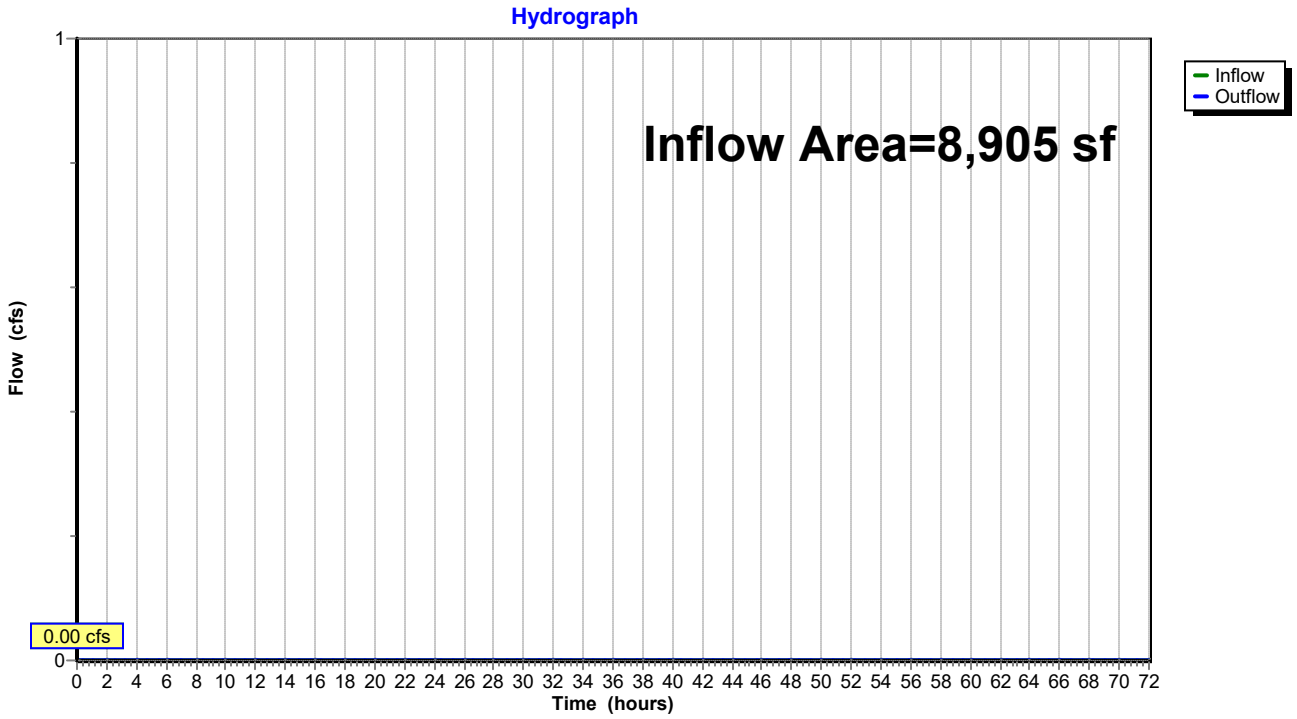


Summary for Reach 400R: Woods Behind Project

Inflow Area = 8,905 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= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 400R: Woods Behind Project

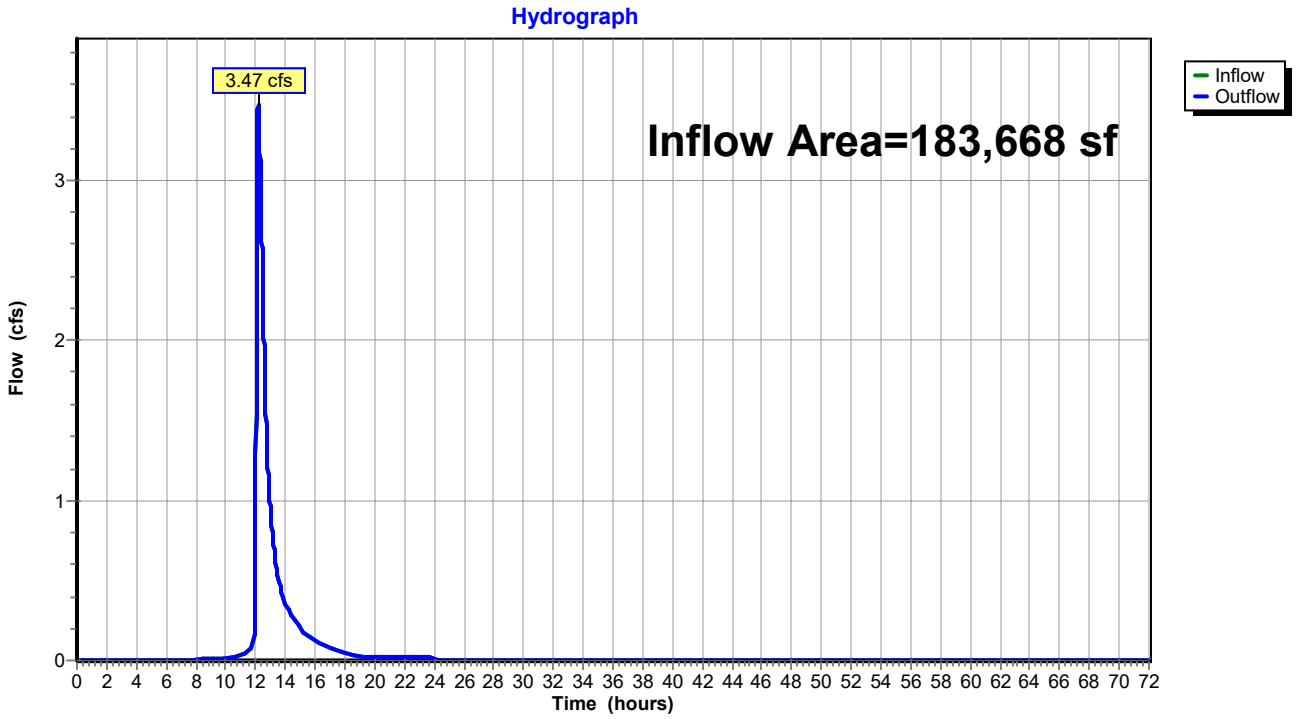


Summary for Reach 500R: Project Impact to Peat Meadow Brook

Inflow Area = 183,668 sf, 73.67% Impervious, Inflow Depth = 0.84" for 2-Year event
Inflow = 3.47 cfs @ 12.17 hrs, Volume= 12,800 cf
Outflow = 3.47 cfs @ 12.17 hrs, Volume= 12,800 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 500R: Project Impact to Peat Meadow Brook



Summary for Pond 10P: Existing Swale

Inflow Area = 127,488 sf, 45.36% Impervious, Inflow Depth = 0.90" for 2-Year event
Inflow = 2.21 cfs @ 12.20 hrs, Volume= 9,549 cf
Outflow = 2.88 cfs @ 12.19 hrs, Volume= 8,872 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.88 cfs @ 12.19 hrs, Volume= 8,872 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 4.20' @ 12.19 hrs Surf.Area= 0 sf Storage= 689 cf

Plug-Flow detention time= 52.0 min calculated for 8,871 cf (93% of inflow)
Center-of-Mass det. time= 15.9 min (925.5 - 909.7)

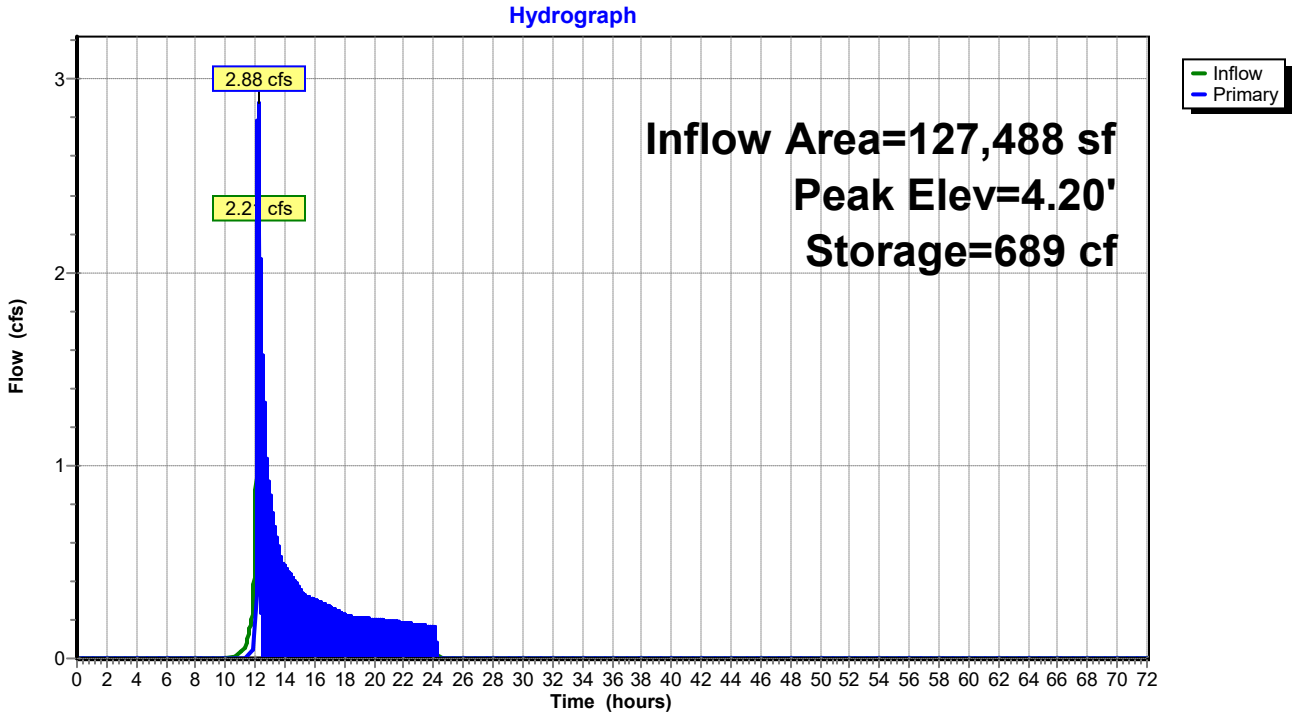
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	690 cf	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (cubic-feet)
0.00	0
0.20	4
0.40	14
0.60	28
0.80	45
1.00	66
1.20	91
1.40	121
1.60	157
1.80	200
2.00	248
2.20	305
2.40	371
2.60	447
2.80	555
3.00	635
3.20	657
3.40	660
3.60	674
3.80	684
4.00	687
4.20	689
5.00	690

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**Special & User-Defined** Elev. (feet) 0.00 4.20 4.21 Disch. (cfs) 0.000 0.000 5,000.000

Primary OutFlow Max=2.88 cfs @ 12.19 hrs HW=4.20' (Free Discharge)
↑—**1=Special & User-Defined** (Custom Controls 2.88 cfs)

Pond 10P: Existing Swale



Summary for Pond 110P: Infil. System

Inflow Area = 119,107 sf,100.00% Impervious, Inflow Depth = 2.92" for 2-Year event
Inflow = 7.82 cfs @ 12.09 hrs, Volume= 28,960 cf
Outflow = 3.33 cfs @ 12.20 hrs, Volume= 28,960 cf, Atten= 57%, Lag= 7.1 min
Discarded = 0.19 cfs @ 7.21 hrs, Volume= 18,197 cf
Primary = 3.14 cfs @ 12.20 hrs, Volume= 10,762 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 112.19' @ 12.20 hrs Surf.Area= 3,360 sf Storage= 8,894 cf

Plug-Flow detention time= 184.6 min calculated for 28,960 cf (100% of inflow)
Center-of-Mass det. time= 184.6 min (942.6 - 758.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	109.00'	672 cf	**40.00'W x 84.00'L x 6.17'H Field A** 20,731 cf Overall - 19,051 cf Embedded = 1,680 cf x 40.0% Voids
#2A	109.50'	15,288 cf	**Concrete Galley 8x14x5.7** x 30 Inside #1 Inside= 84.0"W x 60.0"H => 39.20 sf x 13.00'L = 509.6 cf Outside= 96.0"W x 68.0"H => 45.36 sf x 14.00'L = 635.0 cf 5 Rows of 6 Chambers
		15,960 cf	Total Available Storage

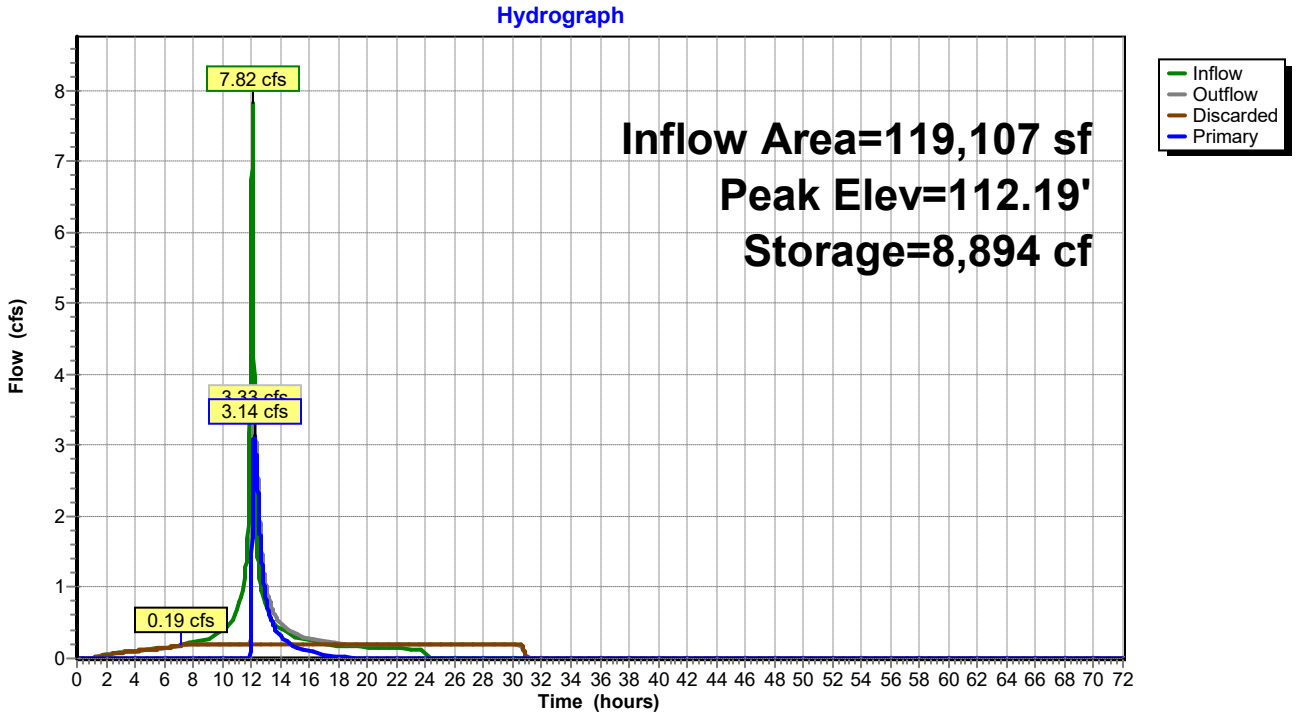
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	111.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Discarded	109.00'	**2.410 in/hr Exfiltration over Surface area**
#3	Primary	112.40'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Primary	113.10'	**12.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.19 cfs @ 7.21 hrs HW=109.06' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=3.14 cfs @ 12.20 hrs HW=112.19' (Free Discharge)
├**1=Orifice/Grate** (Orifice Controls 3.14 cfs @ 4.00 fps)
├**3=Orifice/Grate** (Controls 0.00 cfs)
└**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 110P: Infil. System



Summary for Pond 111P: DMH

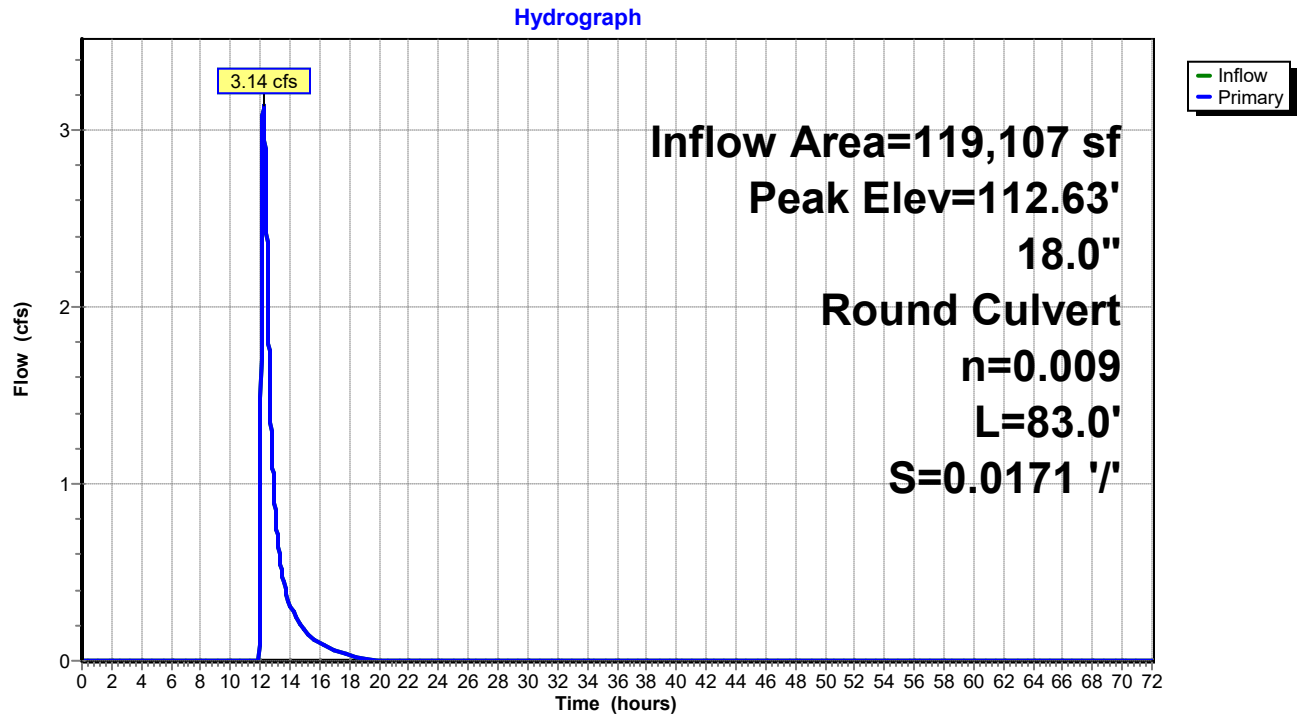
Inflow Area = 119,107 sf,100.00% Impervious, Inflow Depth = 1.08" for 2-Year event
Inflow = 3.14 cfs @ 12.20 hrs, Volume= 10,762 cf
Outflow = 3.14 cfs @ 12.20 hrs, Volume= 10,762 cf, Atten= 0%, Lag= 0.0 min
Primary = 3.14 cfs @ 12.20 hrs, Volume= 10,762 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 112.63' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	111.67'	**18.0" Round Culvert** L= 83.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 111.67' / 110.25' S= 0.0171 '/' Cc= 0.900 n= 0.009 PVC, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.14 cfs @ 12.20 hrs HW=112.63' (Free Discharge)
1=Culvert (Inlet Controls 3.14 cfs @ 2.63 fps)

Pond 111P: DMH



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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: Existing Site Runoff Area=127,488 sf 45.36% Impervious Runoff Depth=2.07"
Flow Length=555' Tc=11.5 min CN=72 Runoff=5.40 cfs 21,968 cf

Subcatchment 11S: Danton Drive & 35 Runoff Area=21,223 sf 97.37% Impervious Runoff Depth=4.48"
Flow Length=353' Tc=9.9 min CN=97 Runoff=1.84 cfs 7,919 cf

Subcatchment 20S: Existing to 35 Danton Runoff Area=20,048 sf 52.50% Impervious Runoff Depth=1.91"
Tc=6.0 min CN=70 Runoff=0.98 cfs 3,193 cf

Subcatchment 30S: To 31 Danton Drive Runoff Area=6,412 sf 21.97% Impervious Runoff Depth=0.73"
Tc=6.0 min CN=52 Runoff=0.09 cfs 389 cf

Subcatchment 40S: Woods Behind Project Runoff Area=11,909 sf 0.00% Impervious Runoff Depth=0.09"
Tc=6.0 min CN=36 Runoff=0.00 cfs 85 cf

Subcatchment 110S: Roof Runoff Area=58,003 sf 100.00% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=98 Runoff=5.83 cfs 22,203 cf

Subcatchment 111S: Pavement Runoff Area=40,002 sf 100.00% Impervious Runoff Depth=4.59"
Tc=0.0 min CN=98 Runoff=4.43 cfs 15,312 cf

Subcatchment 112S: Loading Dock Area Runoff Area=21,102 sf 100.00% Impervious Runoff Depth=4.59"
Tc=0.0 min CN=98 Runoff=2.34 cfs 8,078 cf

Subcatchment 120S: Surrouding Grass & Runoff Area=40,016 sf 21.16% Impervious Runoff Depth=0.68"
Tc=0.0 min CN=51 Runoff=0.69 cfs 2,254 cf

Subcatchment 200S: To 35 Danton Drive Runoff Area=8,897 sf 86.93% Impervious Runoff Depth=3.71"
Tc=6.0 min CN=90 Runoff=0.80 cfs 2,753 cf

Subcatchment 300S: To 31 Danton Drive Runoff Area=6,743 sf 0.00% Impervious Runoff Depth=0.17"
Tc=6.0 min CN=39 Runoff=0.00 cfs 94 cf

Subcatchment 400S: Woods Behind Project Runoff Area=8,905 sf 0.00% Impervious Runoff Depth=0.09"
Tc=6.0 min CN=36 Runoff=0.00 cfs 63 cf

Reach 1R: Project Impact to Peat Meadow Brook Inflow=8.01 cfs 32,865 cf
Outflow=8.01 cfs 32,865 cf

Reach 10R: Existing Project Ouftall (CB at SE of site) Inflow=7.19 cfs 29,198 cf
Outflow=7.19 cfs 29,198 cf

Reach 20R: Existing Outfall to 35 Danton Drive Back Inflow=0.98 cfs 3,193 cf
Outflow=0.98 cfs 3,193 cf

Reach 30R: Existing Outfall to 31 Danton Drive Inflow=0.09 cfs 389 cf
Outflow=0.09 cfs 389 cf

Reach 40R: Woods Behind Project Inflow=0.00 cfs 85 cf
Outflow=0.00 cfs 85 cf

Reach 100R: Project Outfall Inflow=6.76 cfs 27,485 cf
Outflow=6.76 cfs 27,485 cf

Reach 200R: Existing Oufall to 35 Danton Drive Back Inflow=0.80 cfs 2,753 cf
Outflow=0.80 cfs 2,753 cf

Reach 300R: Existing Oufall to 31 Danton Drive Inflow=0.00 cfs 94 cf
Outflow=0.00 cfs 94 cf

Reach 400R: Woods Behind Project Inflow=0.00 cfs 63 cf
Outflow=0.00 cfs 63 cf

Reach 500R: Project Impact to Peat Meadow Brook Inflow=7.44 cfs 30,394 cf
Outflow=7.44 cfs 30,394 cf

Pond 10P: Existing Swale Peak Elev=4.20' Storage=689 cf Inflow=5.40 cfs 21,968 cf
Outflow=5.40 cfs 21,279 cf

Pond 110P: Infil. System Peak Elev=113.11' Storage=11,707 cf Inflow=12.07 cfs 45,593 cf
Discarded=0.19 cfs 20,362 cf Primary=6.51 cfs 25,231 cf Outflow=6.69 cfs 45,593 cf

Pond 111P: DMH Peak Elev=113.36' Inflow=6.51 cfs 25,231 cf
18.0" Round Culvert n=0.009 L=83.0' S=0.0171 '/' Outflow=6.51 cfs 25,231 cf

Summary for Subcatchment 10S: Existing Site

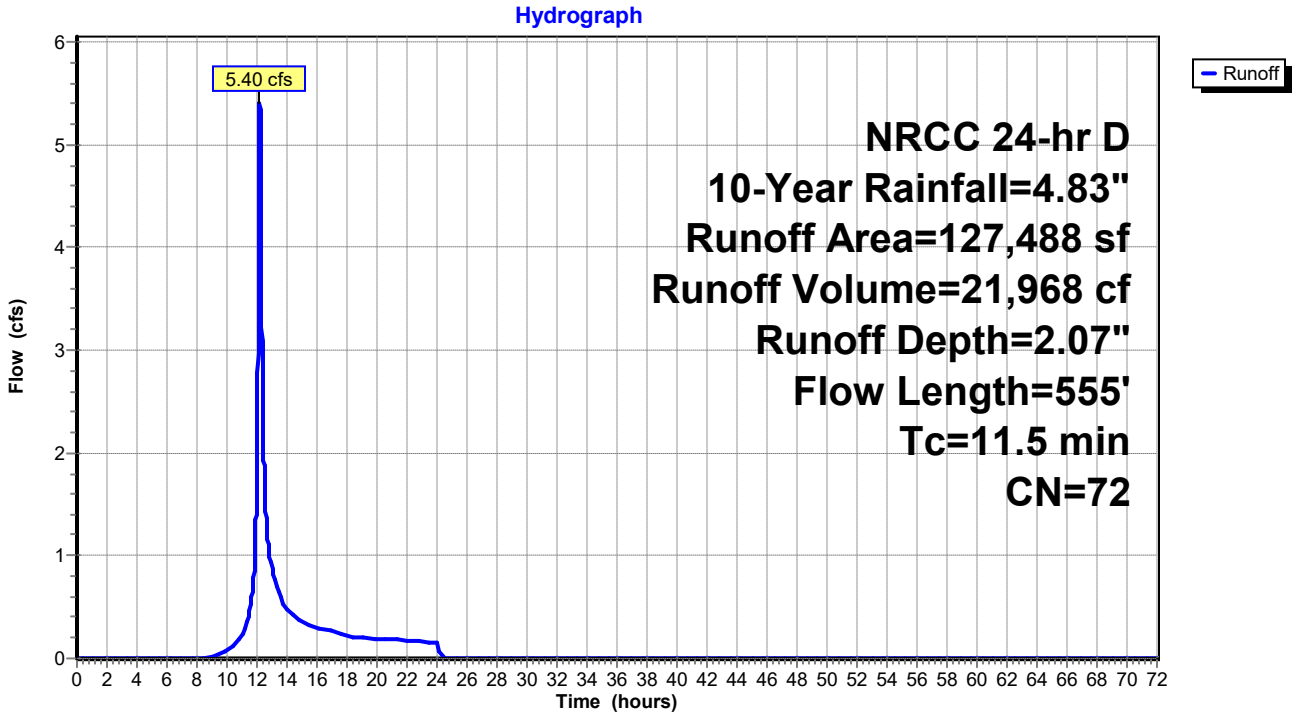
Runoff = 5.40 cfs @ 12.20 hrs, Volume= 21,968 cf, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
66,425	49	50-75% Grass cover, Fair, HSG A
57,826	98	Paved parking, HSG A
3,237	96	Gravel surface, HSG A
127,488	72	Weighted Average
69,662		54.64% Pervious Area
57,826		45.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	20	0.0050	0.05		**Sheet Flow, Woodland Sheet Flow** Grass: Dense n= 0.240 P2= 3.15"
1.1	164	0.0145	2.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.9	155	0.0158	0.88		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	148	0.0225	4.68	46.78	**Channel Flow, X-Sec and Perimeter** Area= 10.0 sf Perim= 13.0' r= 0.77' n= 0.040 Earth, cobble bottom, clean sides
0.1	68	0.0558	13.14	157.70	**Channel Flow, X-Section and Perimeter** Area= 12.0 sf Perim= 8.0' r= 1.50' n= 0.035 Earth, dense weeds
11.5	555	Total			

Subcatchment 10S: Existing Site



Summary for Subcatchment 11S: Danton Drive & 35 Danton Drive

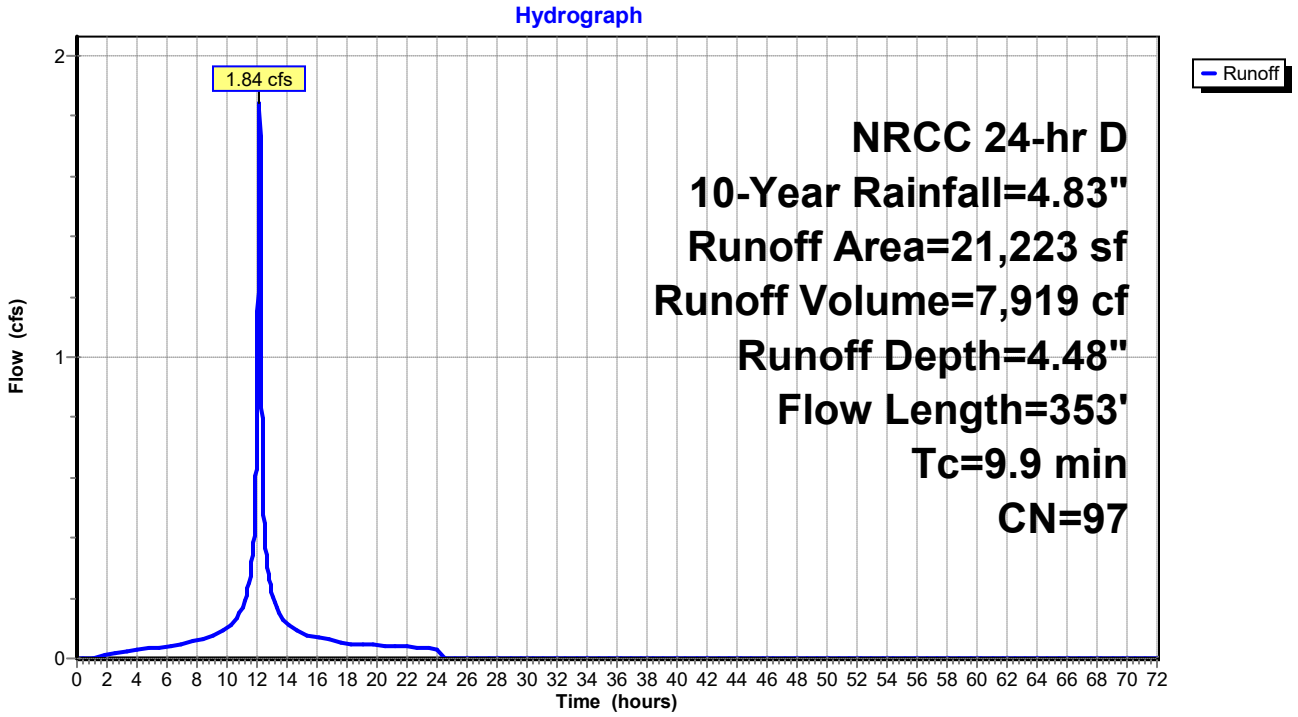
Runoff = 1.84 cfs @ 12.17 hrs, Volume= 7,919 cf, Depth= 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
20,665	98	Paved parking, HSG A
558	49	50-75% Grass cover, Fair, HSG A
21,223	97	Weighted Average
558		2.63% Pervious Area
20,665		97.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0200	0.86		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.15"
6.0	178	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	42	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	81	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	42	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.9	353	Total			

Subcatchment 11S: Danton Drive & 35 Danton Drive



Summary for Subcatchment 20S: Existing to 35 Danton Drive

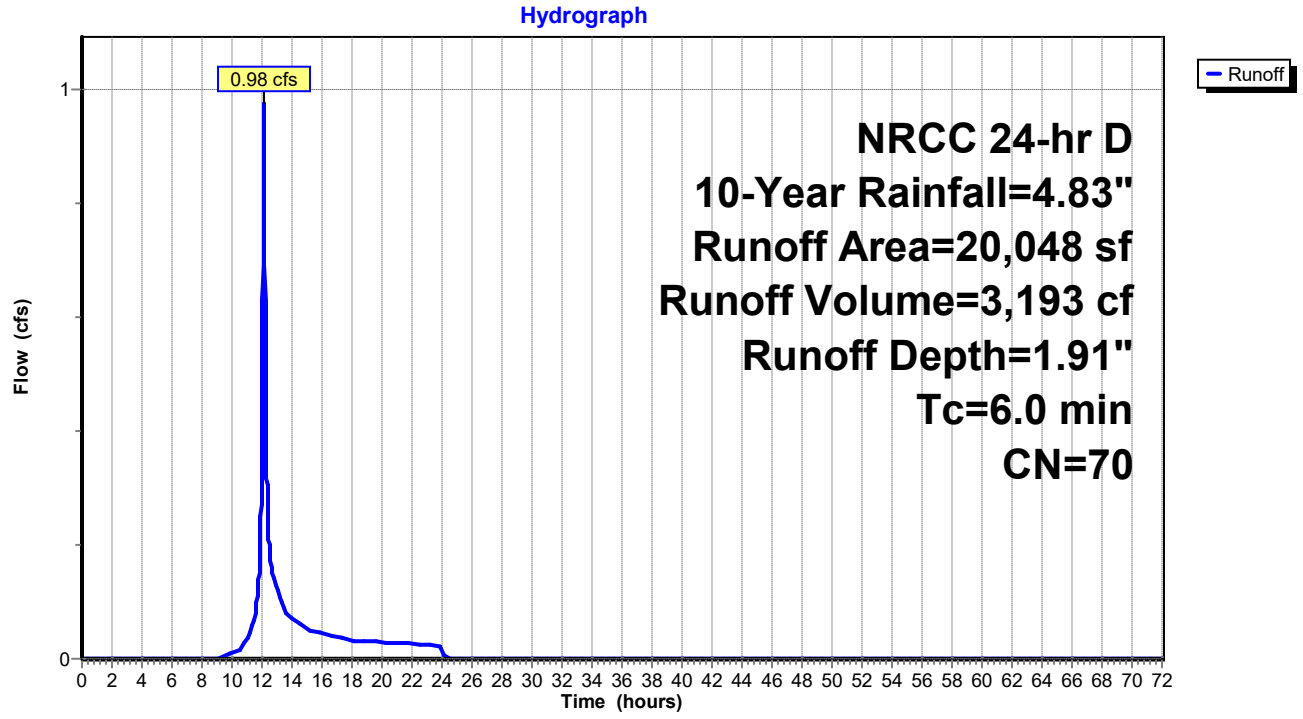
Runoff = 0.98 cfs @ 12.13 hrs, Volume= 3,193 cf, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
10,526	98	Paved parking, HSG A
9,522	39	>75% Grass cover, Good, HSG A
20,048	70	Weighted Average
9,522		47.50% Pervious Area
10,526		52.50% Impervious Area

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

Subcatchment 20S: Existing to 35 Danton Drive



Summary for Subcatchment 30S: To 31 Danton Drive

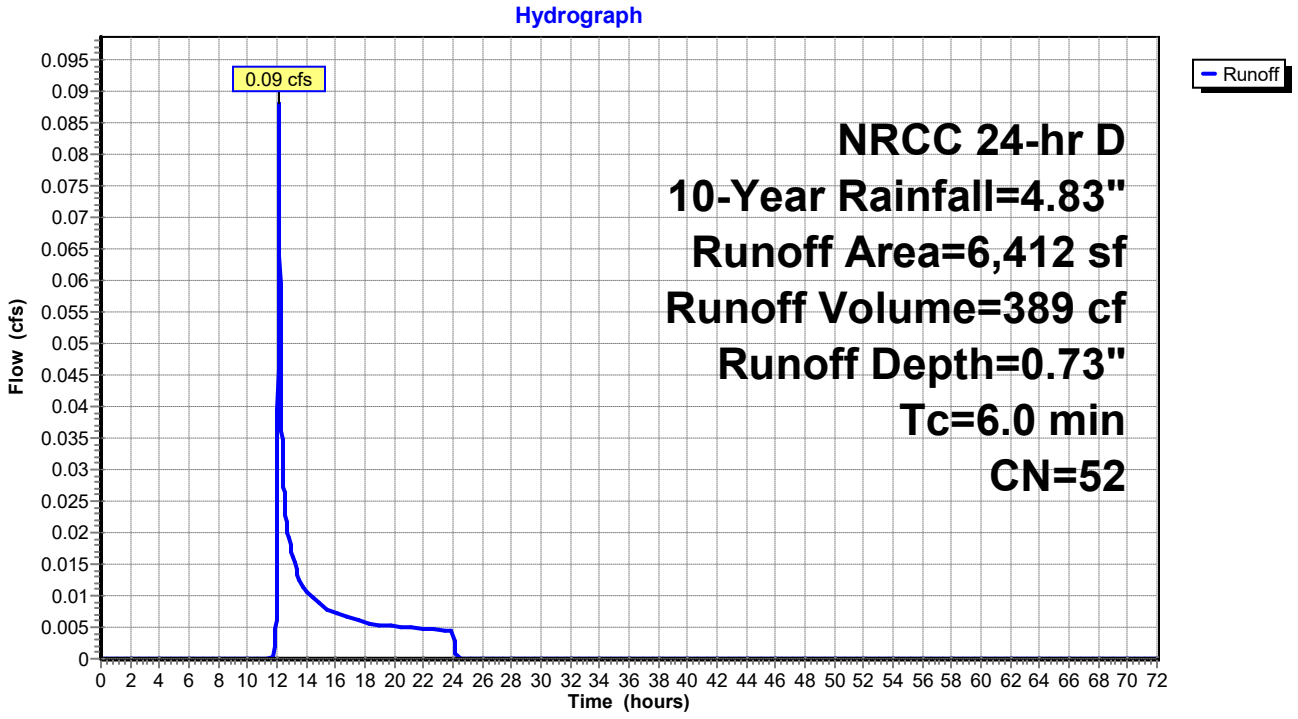
Runoff = 0.09 cfs @ 12.14 hrs, Volume= 389 cf, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
1,409	98	Paved parking, HSG A
5,003	39	>75% Grass cover, Good, HSG A
6,412	52	Weighted Average
5,003		78.03% Pervious Area
1,409		21.97% Impervious Area

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

Subcatchment 30S: To 31 Danton Drive



Summary for Subcatchment 40S: Woods Behind Project

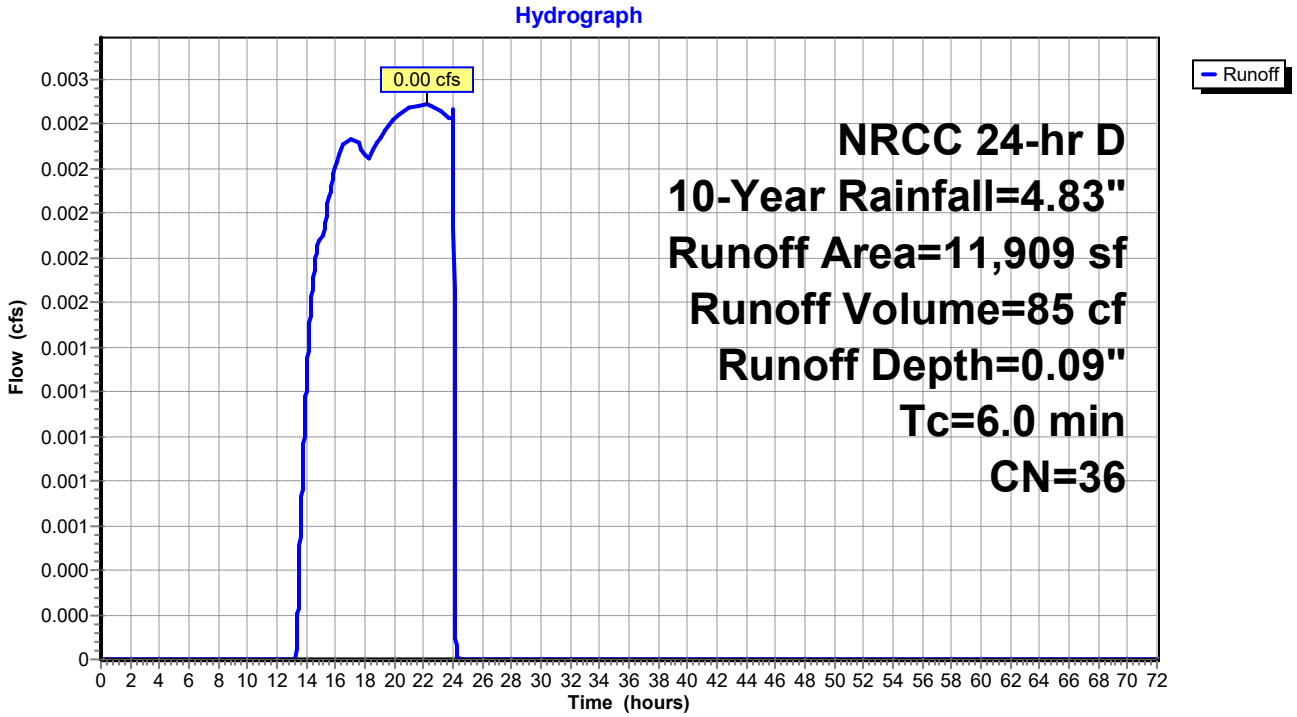
Runoff = 0.00 cfs @ 22.23 hrs, Volume= 85 cf, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
11,909	36	Woods, Fair, HSG A
11,909		100.00% Pervious Area

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

Subcatchment 40S: Woods Behind Project



Summary for Subcatchment 110S: Roof

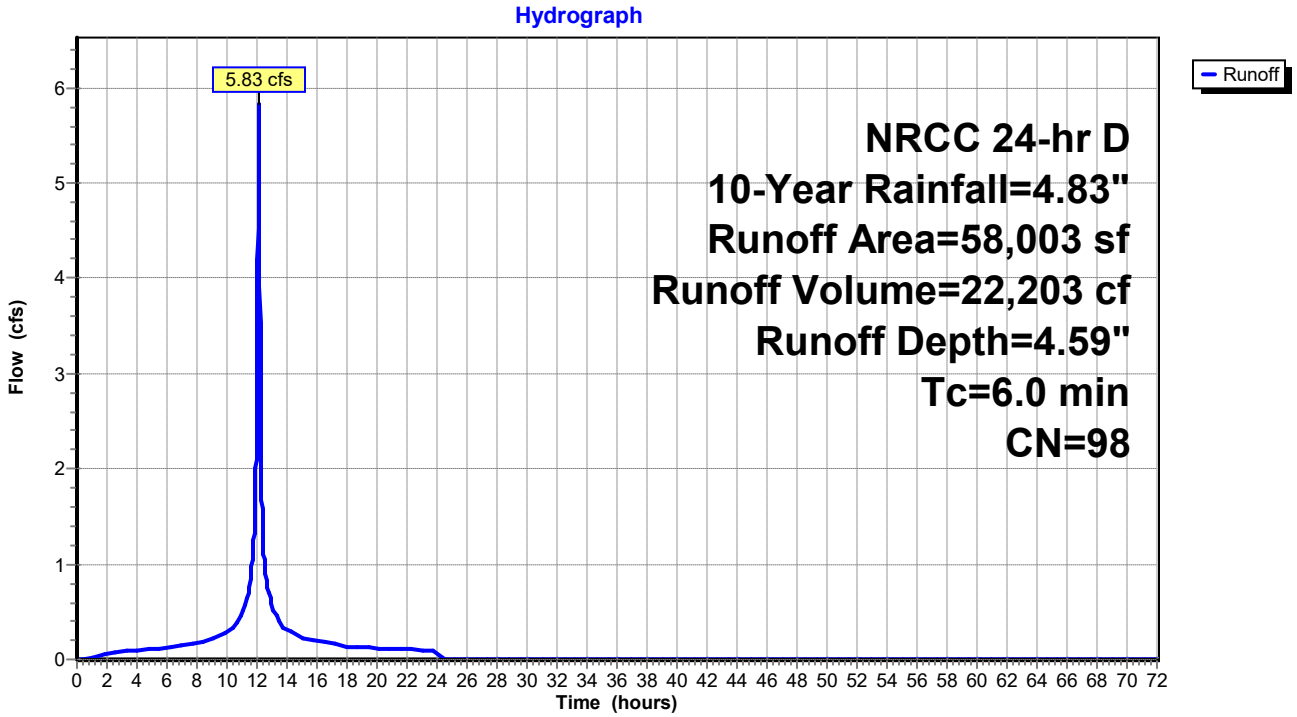
Runoff = 5.83 cfs @ 12.13 hrs, Volume= 22,203 cf, Depth= 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
58,003	98	Roofs, HSG A
58,003		100.00% Impervious Area

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

Subcatchment 110S: Roof



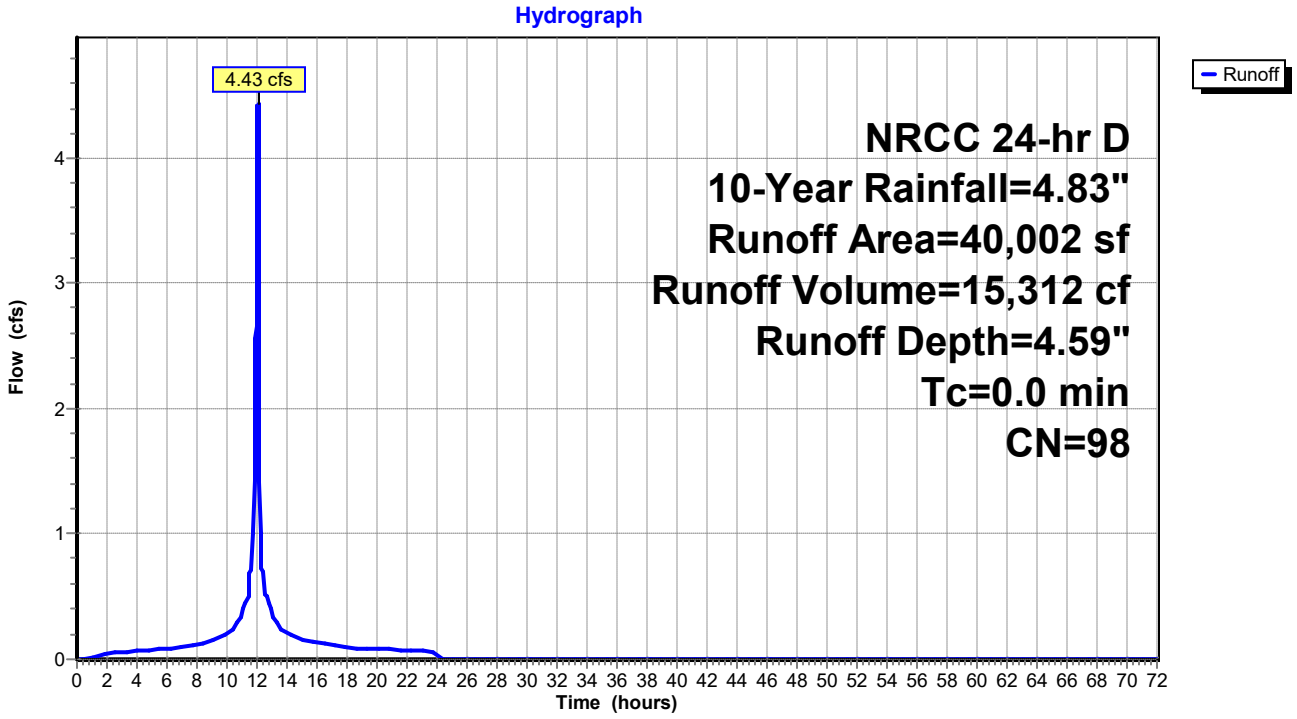
Summary for Subcatchment 111S: Pavement

Runoff = 4.43 cfs @ 12.09 hrs, Volume= 15,312 cf, Depth= 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
40,002	98	Paved parking, HSG A
40,002		100.00% Impervious Area

Subcatchment 111S: Pavement



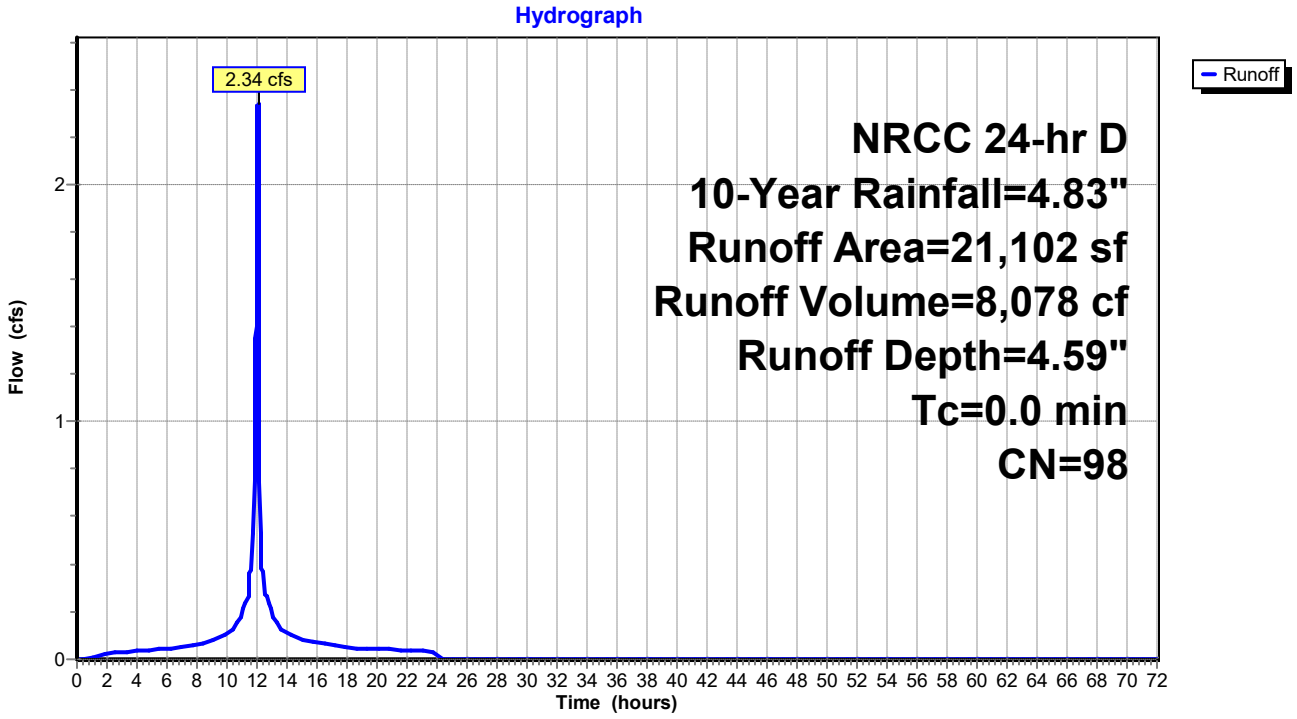
Summary for Subcatchment 112S: Loading Dock Area

Runoff = 2.34 cfs @ 12.09 hrs, Volume= 8,078 cf, Depth= 4.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
21,102	98	Paved parking, HSG A
21,102		100.00% Impervious Area

Subcatchment 112S: Loading Dock Area



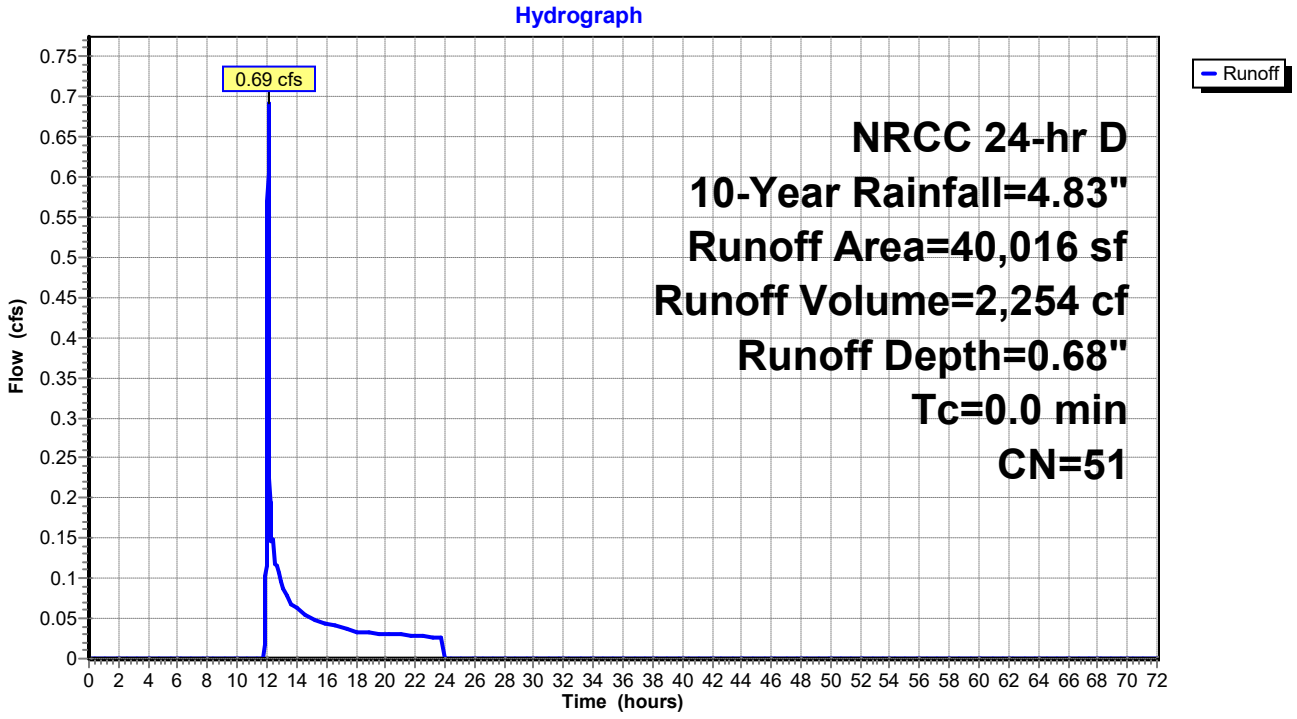
Summary for Subcatchment 120S: Surrouding Grass & Pavement

Runoff = 0.69 cfs @ 12.09 hrs, Volume= 2,254 cf, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
31,548	39	>75% Grass cover, Good, HSG A
8,468	98	Paved parking, HSG A
40,016	51	Weighted Average
31,548		78.84% Pervious Area
8,468		21.16% Impervious Area

Subcatchment 120S: Surrouding Grass & Pavement



Summary for Subcatchment 200S: To 35 Danton Drive

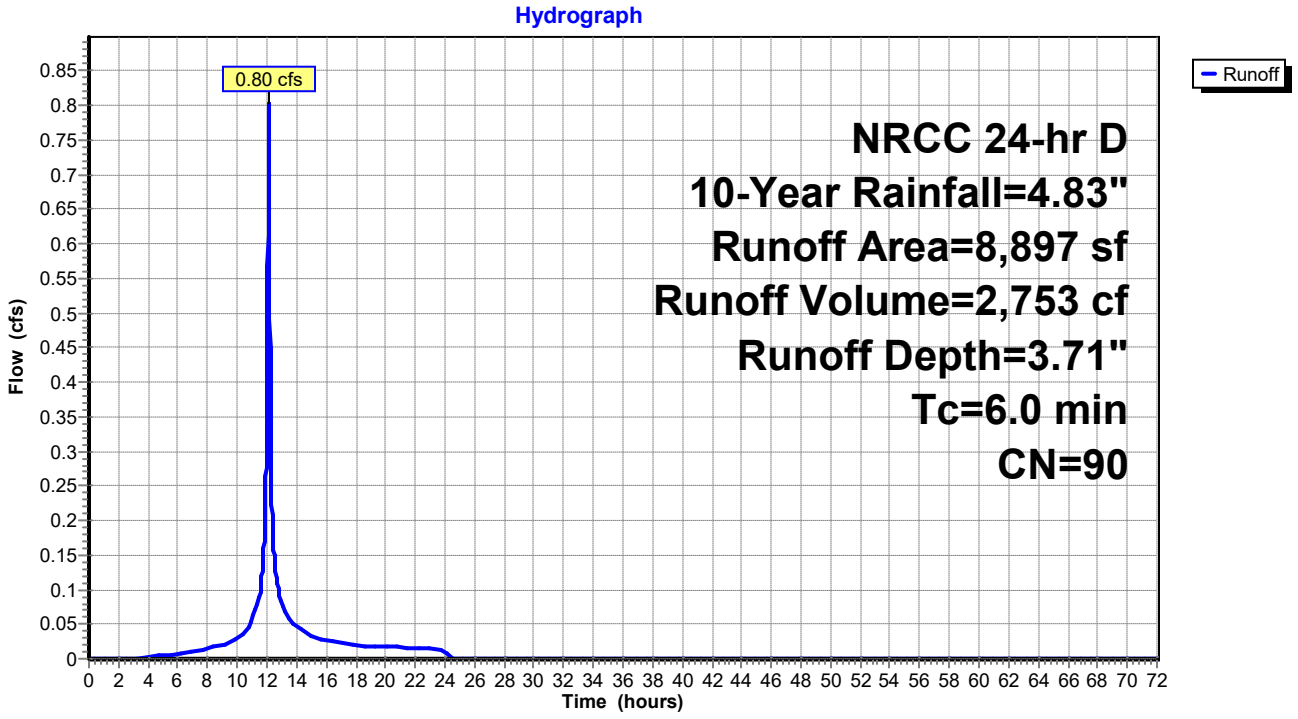
Runoff = 0.80 cfs @ 12.13 hrs, Volume= 2,753 cf, Depth= 3.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
1,163	39	>75% Grass cover, Good, HSG A
7,734	98	Paved parking, HSG A
8,897	90	Weighted Average
1,163		13.07% Pervious Area
7,734		86.93% Impervious Area

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

Subcatchment 200S: To 35 Danton Drive



Summary for Subcatchment 300S: To 31 Danton Drive

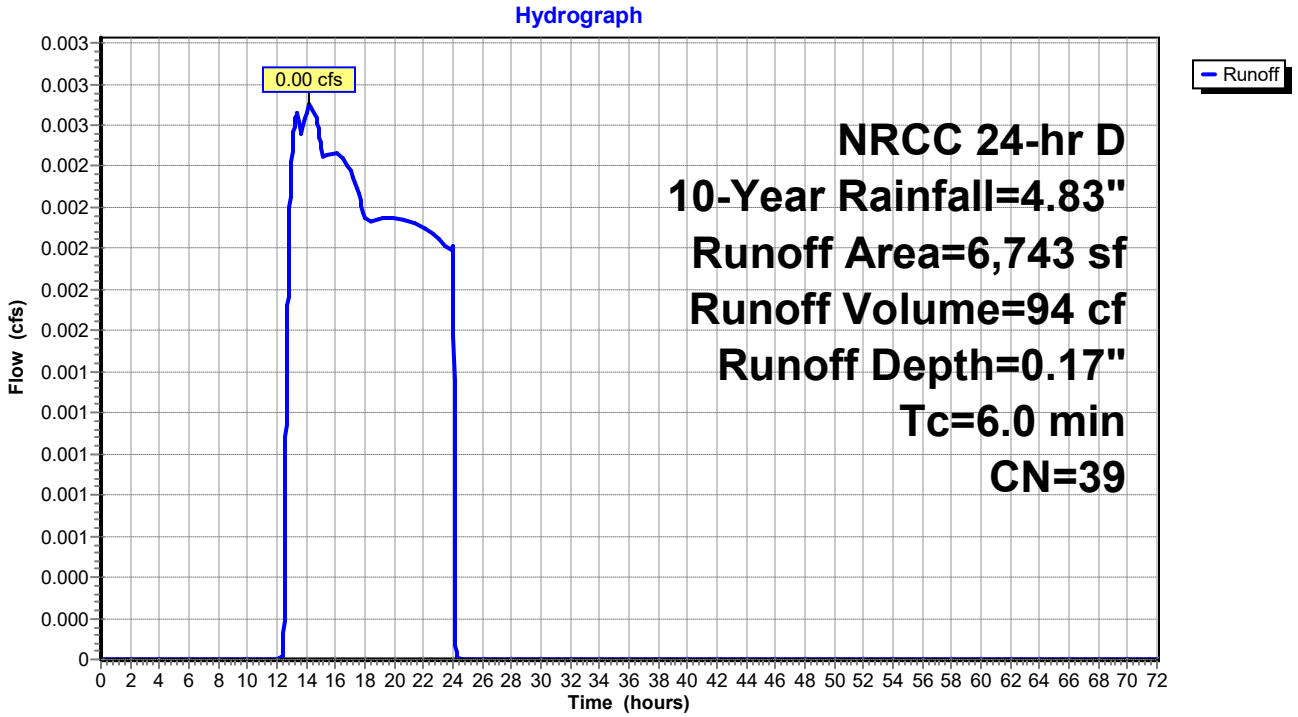
Runoff = 0.00 cfs @ 14.25 hrs, Volume= 94 cf, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
6,743	39	>75% Grass cover, Good, HSG A
6,743		100.00% Pervious Area

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

Subcatchment 300S: To 31 Danton Drive



Summary for Subcatchment 400S: Woods Behind Project

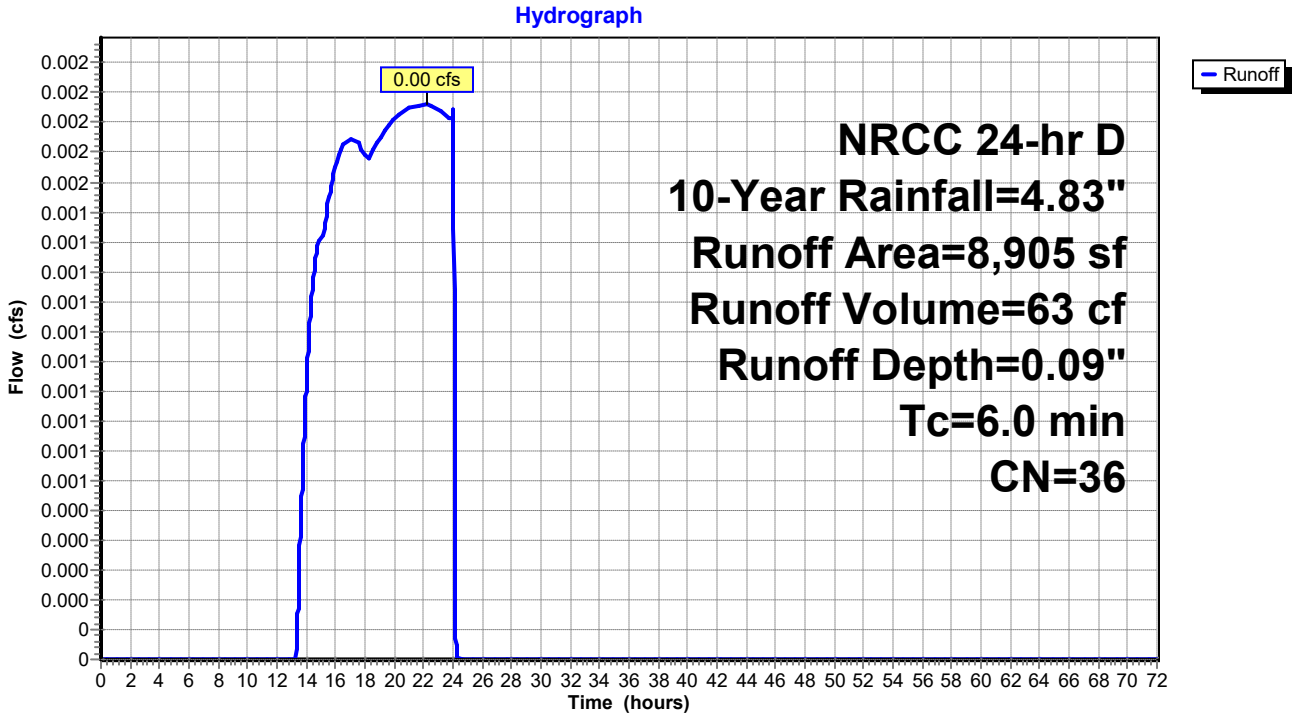
Runoff = 0.00 cfs @ 22.23 hrs, Volume= 63 cf, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.83"

Area (sf)	CN	Description
8,905	36	Woods, Fair, HSG A
8,905		100.00% Pervious Area

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

Subcatchment 400S: Woods Behind Project

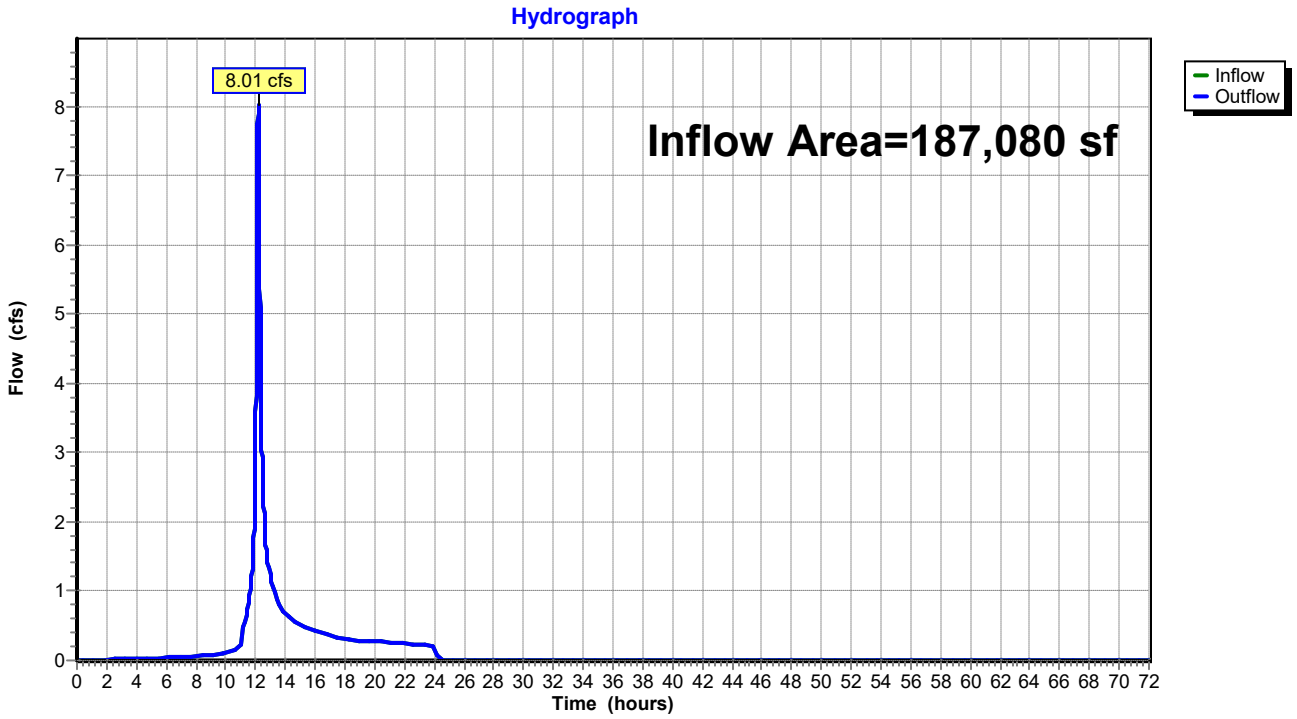


Summary for Reach 1R: Project Impact to Peat Meadow Brook

Inflow Area = 187,080 sf, 48.34% Impervious, Inflow Depth = 2.11" for 10-Year event
Inflow = 8.01 cfs @ 12.18 hrs, Volume= 32,865 cf
Outflow = 8.01 cfs @ 12.18 hrs, Volume= 32,865 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 1R: Project Impact to Peat Meadow Brook

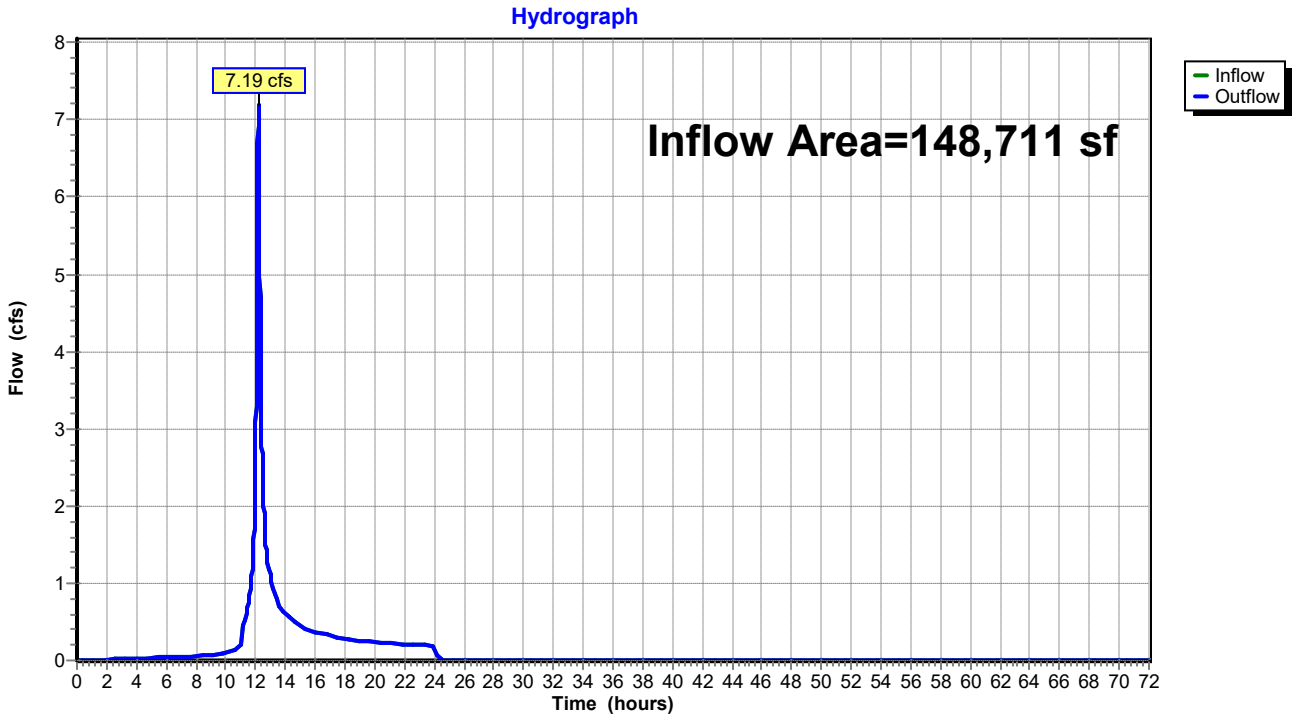


Summary for Reach 10R: Existing Project Outfall (CB at SE of site)

Inflow Area = 148,711 sf, 52.78% Impervious, Inflow Depth = 2.36" for 10-Year event
Inflow = 7.19 cfs @ 12.19 hrs, Volume= 29,198 cf
Outflow = 7.19 cfs @ 12.19 hrs, Volume= 29,198 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 10R: Existing Project Outfall (CB at SE of site)

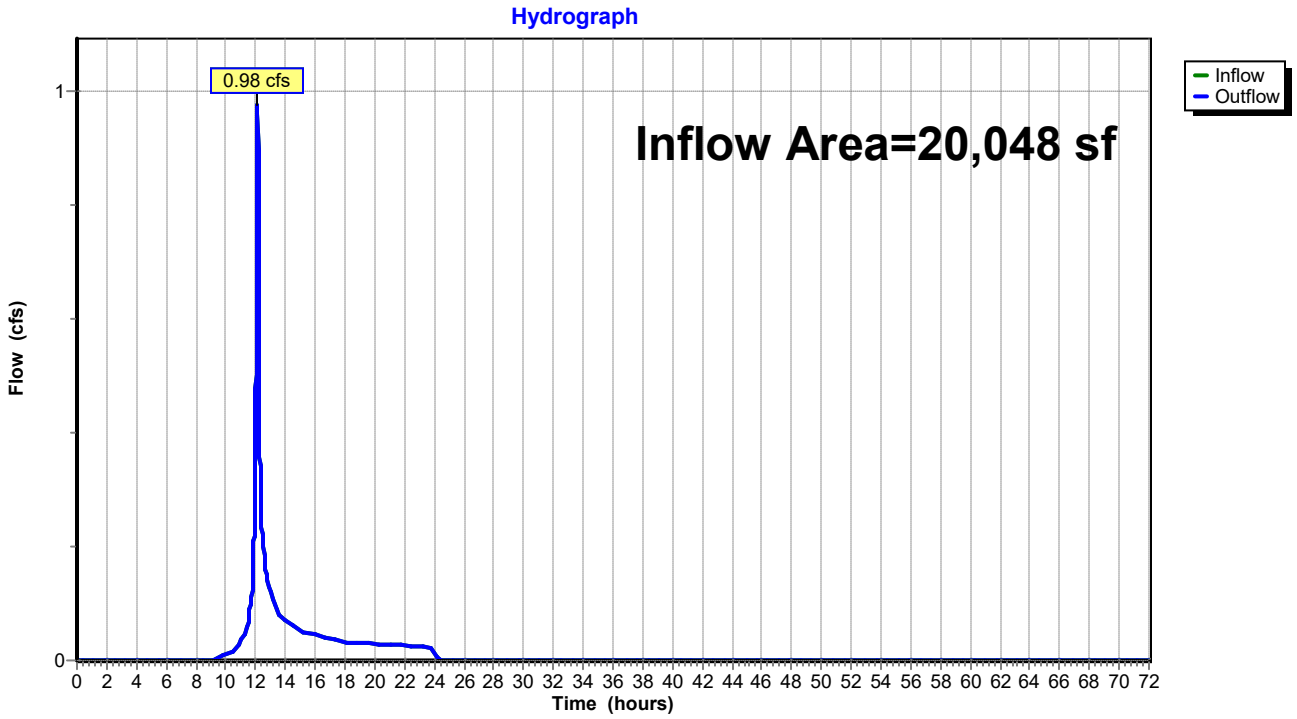


Summary for Reach 20R: Existing Outfall to 35 Danton Drive Back

Inflow Area = 20,048 sf, 52.50% Impervious, Inflow Depth = 1.91" for 10-Year event
Inflow = 0.98 cfs @ 12.13 hrs, Volume= 3,193 cf
Outflow = 0.98 cfs @ 12.13 hrs, Volume= 3,193 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 20R: Existing Outfall to 35 Danton Drive Back

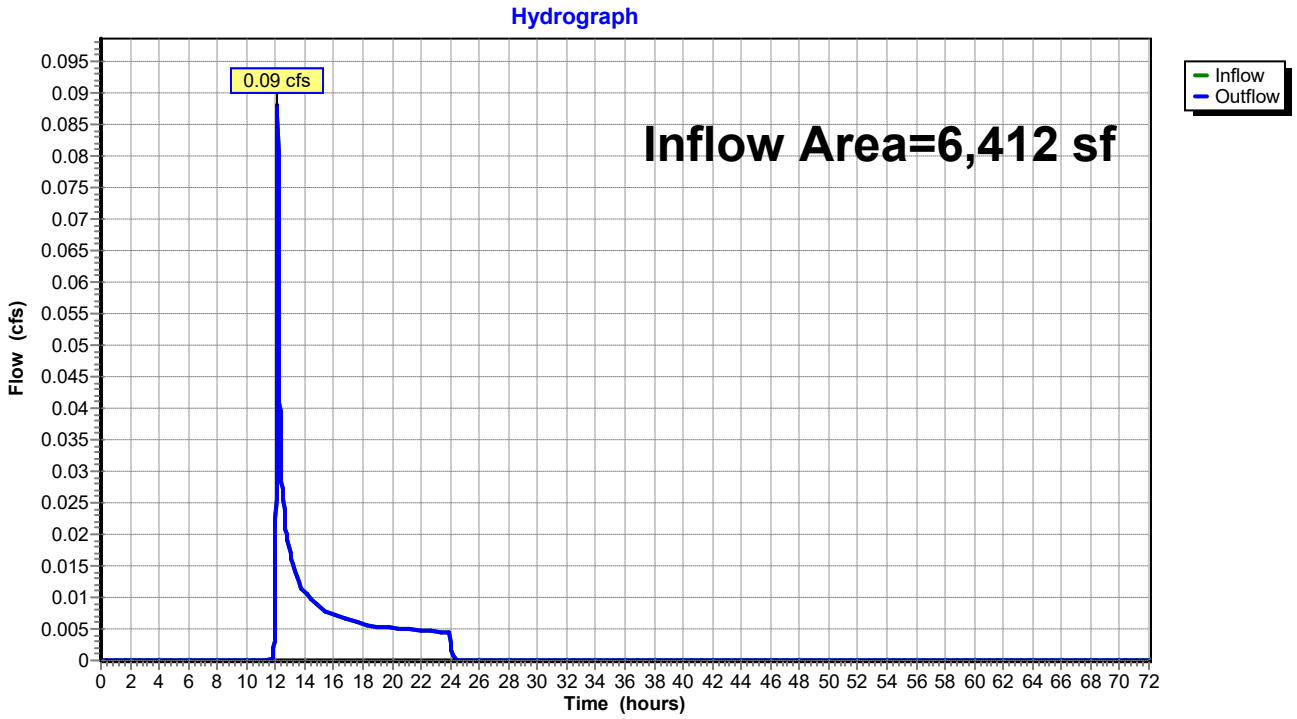


Summary for Reach 30R: Existing Outfall to 31 Danton Drive

Inflow Area = 6,412 sf, 21.97% Impervious, Inflow Depth = 0.73" for 10-Year event
Inflow = 0.09 cfs @ 12.14 hrs, Volume= 389 cf
Outflow = 0.09 cfs @ 12.14 hrs, Volume= 389 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 30R: Existing Outfall to 31 Danton Drive

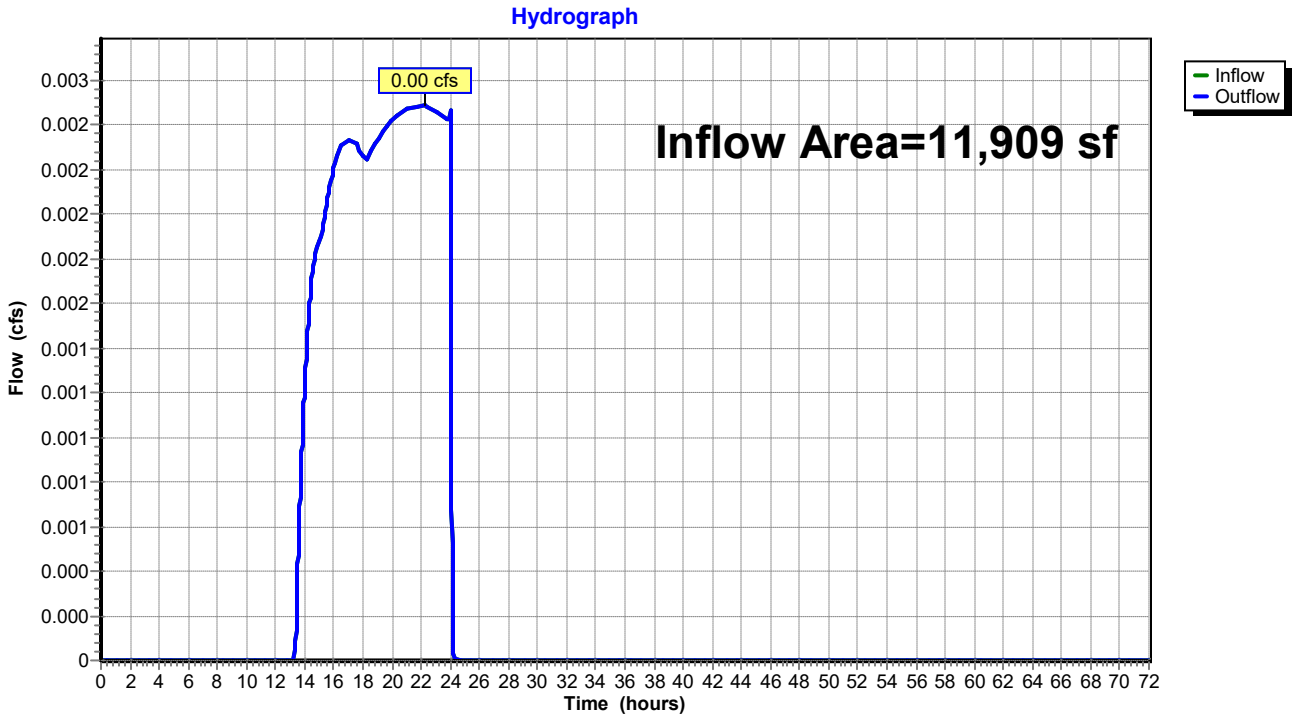


Summary for Reach 40R: Woods Behind Project

Inflow Area = 11,909 sf, 0.00% Impervious, Inflow Depth = 0.09" for 10-Year event
Inflow = 0.00 cfs @ 22.23 hrs, Volume= 85 cf
Outflow = 0.00 cfs @ 22.23 hrs, Volume= 85 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 40R: Woods Behind Project

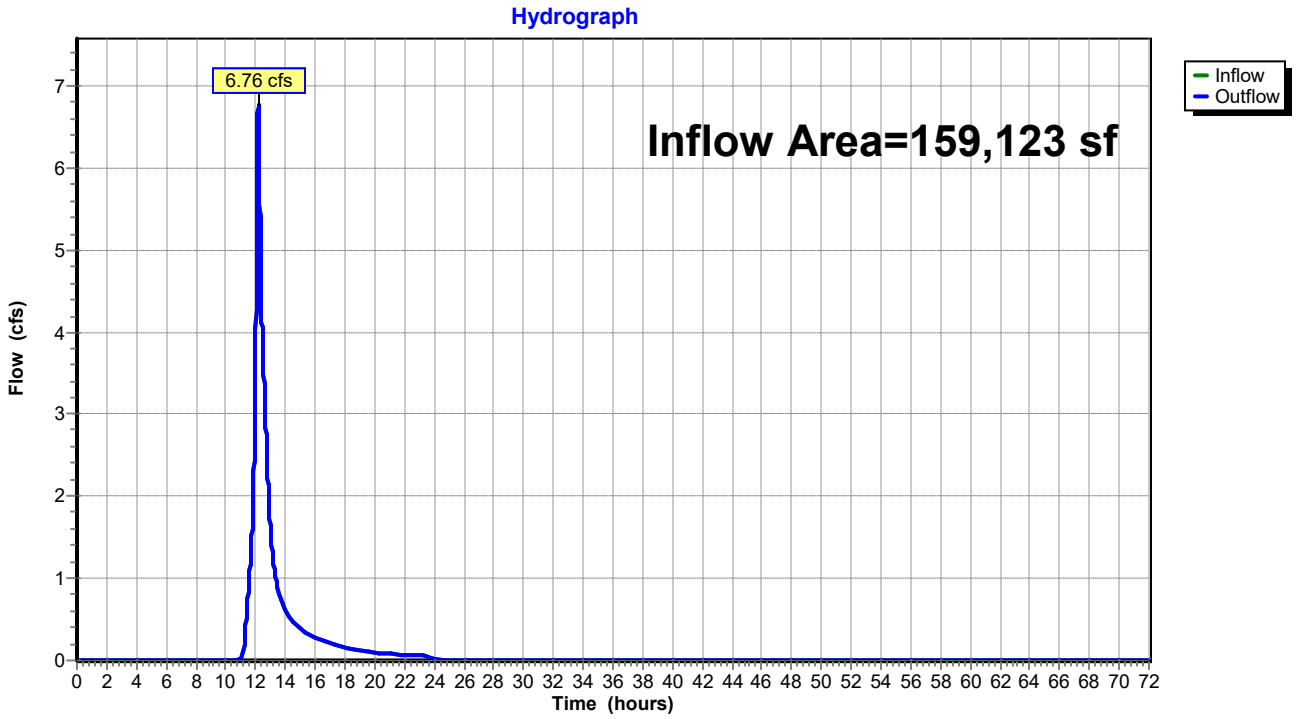


Summary for Reach 100R: Project Outfall

Inflow Area = 159,123 sf, 80.17% Impervious, Inflow Depth = 2.07" for 10-Year event
Inflow = 6.76 cfs @ 12.18 hrs, Volume= 27,485 cf
Outflow = 6.76 cfs @ 12.18 hrs, Volume= 27,485 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 100R: Project Outfall

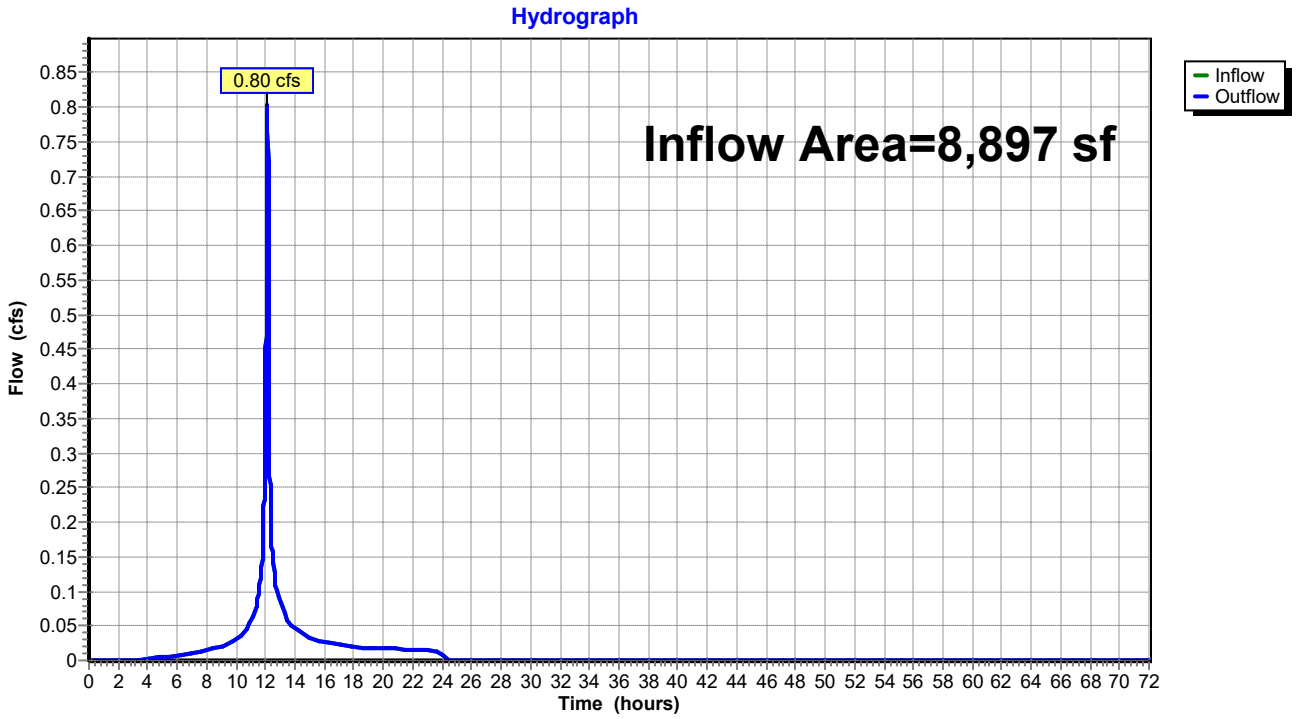


Summary for Reach 200R: Existing Oufall to 35 Danton Drive Back

Inflow Area = 8,897 sf, 86.93% Impervious, Inflow Depth = 3.71" for 10-Year event
Inflow = 0.80 cfs @ 12.13 hrs, Volume= 2,753 cf
Outflow = 0.80 cfs @ 12.13 hrs, Volume= 2,753 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 200R: Existing Oufall to 35 Danton Drive Back

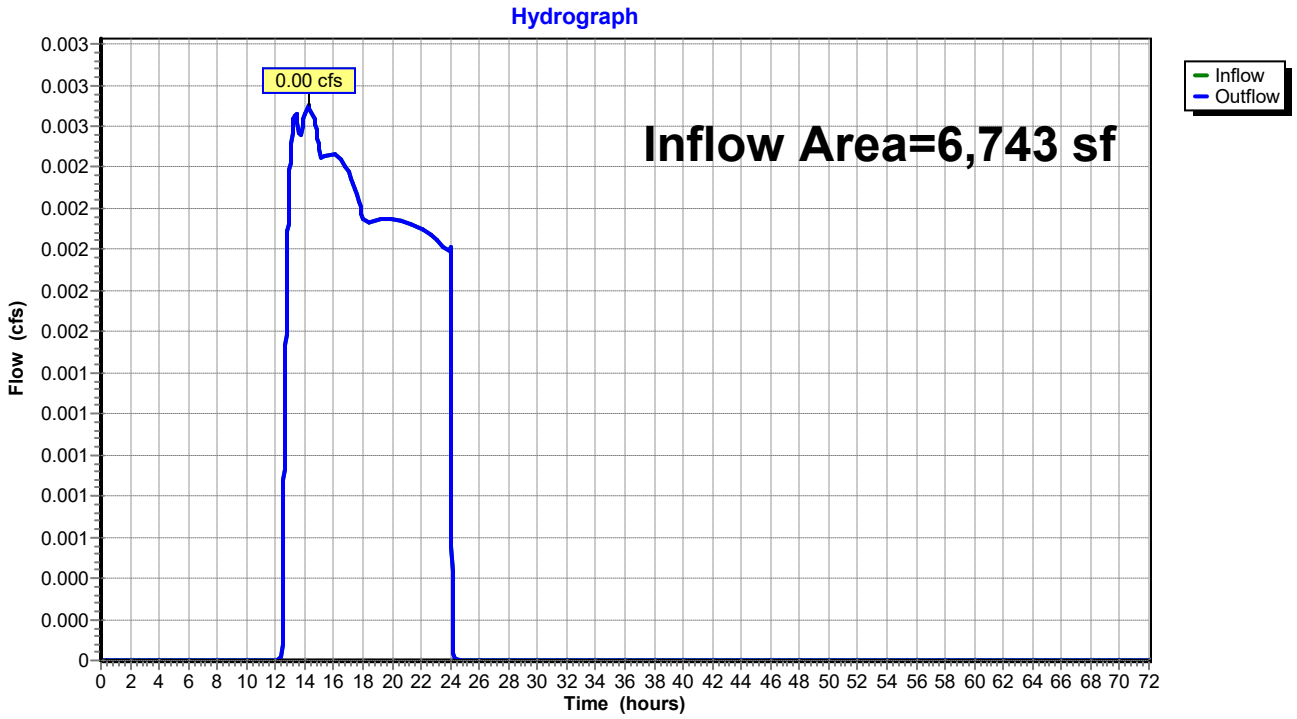


Summary for Reach 300R: Existing Oufall to 31 Danton Drive

Inflow Area = 6,743 sf, 0.00% Impervious, Inflow Depth = 0.17" for 10-Year event
Inflow = 0.00 cfs @ 14.25 hrs, Volume= 94 cf
Outflow = 0.00 cfs @ 14.25 hrs, Volume= 94 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 300R: Existing Oufall to 31 Danton Drive

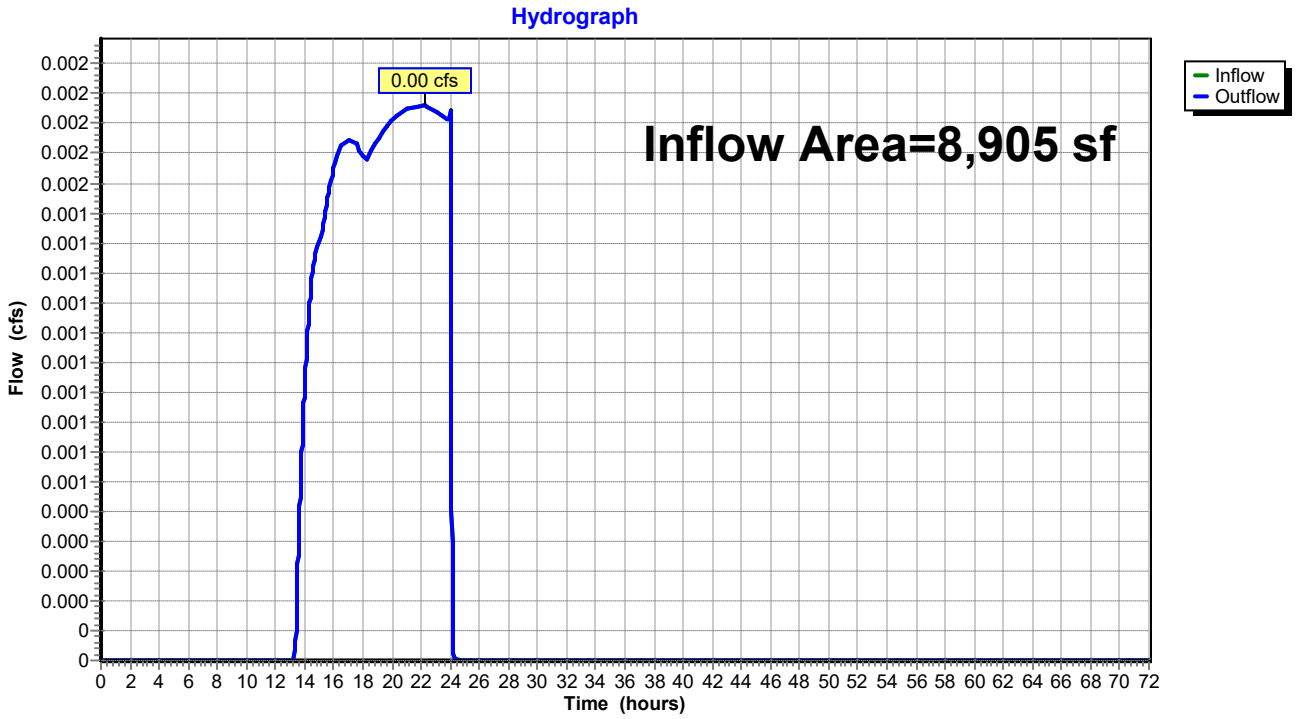


Summary for Reach 400R: Woods Behind Project

Inflow Area = 8,905 sf, 0.00% Impervious, Inflow Depth = 0.09" for 10-Year event
Inflow = 0.00 cfs @ 22.23 hrs, Volume= 63 cf
Outflow = 0.00 cfs @ 22.23 hrs, Volume= 63 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 400R: Woods Behind Project

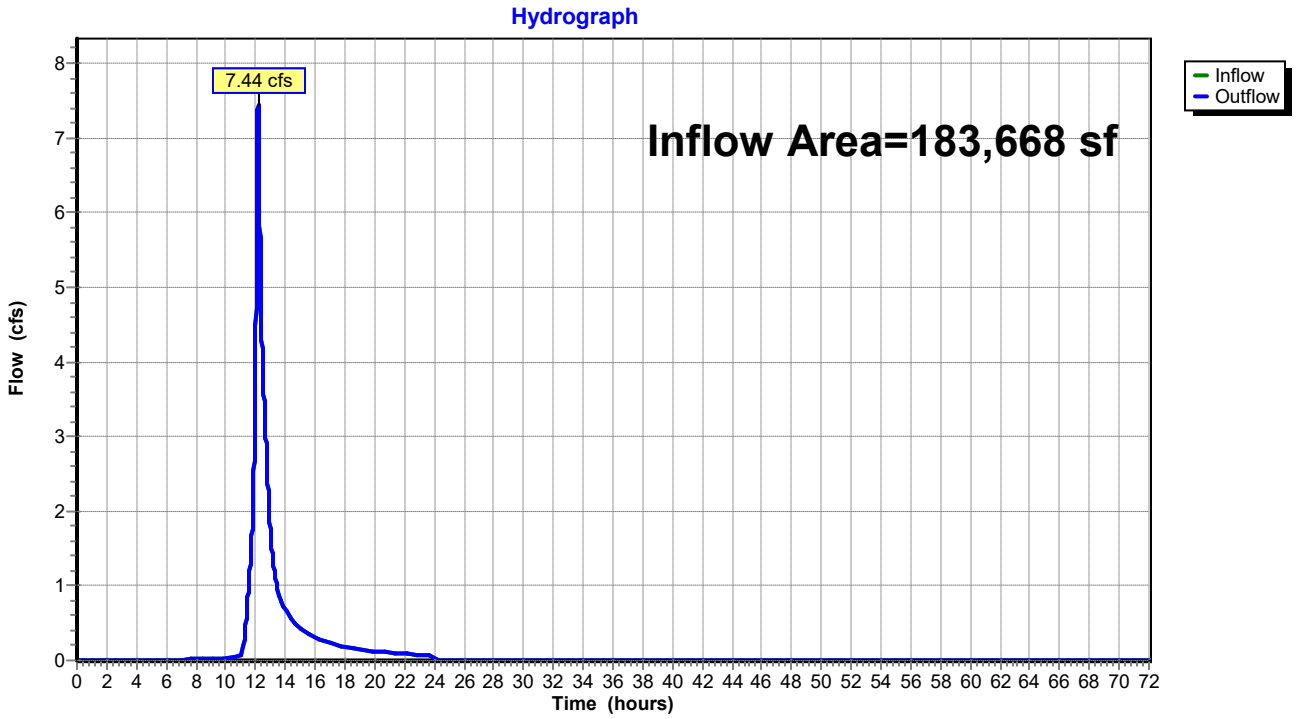


Summary for Reach 500R: Project Impact to Peat Meadow Brook

Inflow Area = 183,668 sf, 73.67% Impervious, Inflow Depth = 1.99" for 10-Year event
Inflow = 7.44 cfs @ 12.16 hrs, Volume= 30,394 cf
Outflow = 7.44 cfs @ 12.16 hrs, Volume= 30,394 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 500R: Project Impact to Peat Meadow Brook



Summary for Pond 10P: Existing Swale

Inflow Area = 127,488 sf, 45.36% Impervious, Inflow Depth = 2.07" for 10-Year event
Inflow = 5.40 cfs @ 12.20 hrs, Volume= 21,968 cf
Outflow = 5.40 cfs @ 12.19 hrs, Volume= 21,279 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.40 cfs @ 12.19 hrs, Volume= 21,279 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 4.20' @ 12.19 hrs Surf.Area= 0 sf Storage= 689 cf

Plug-Flow detention time= 25.7 min calculated for 21,279 cf (97% of inflow)
Center-of-Mass det. time= 8.4 min (886.0 - 877.6)

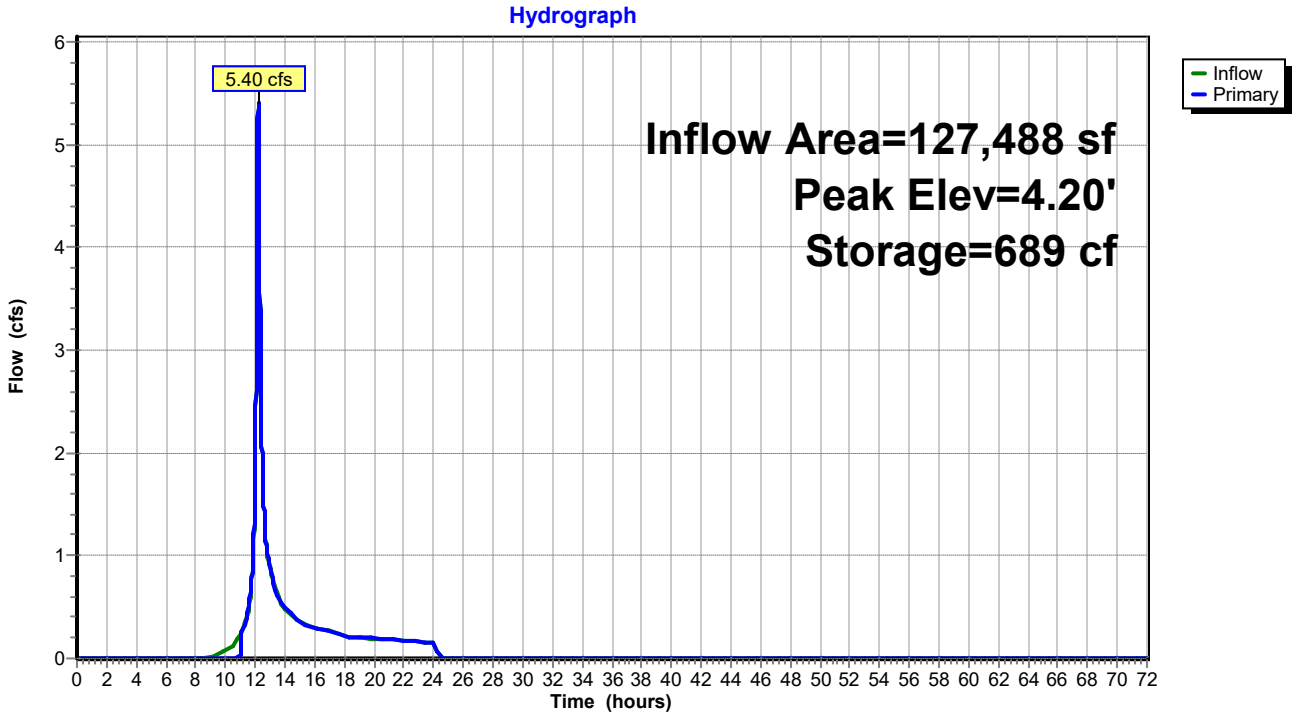
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	690 cf	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (cubic-feet)
0.00	0
0.20	4
0.40	14
0.60	28
0.80	45
1.00	66
1.20	91
1.40	121
1.60	157
1.80	200
2.00	248
2.20	305
2.40	371
2.60	447
2.80	555
3.00	635
3.20	657
3.40	660
3.60	674
3.80	684
4.00	687
4.20	689
5.00	690

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**Special & User-Defined** Elev. (feet) 0.00 4.20 4.21 Disch. (cfs) 0.000 0.000 5,000.000

Primary OutFlow Max=5.39 cfs @ 12.19 hrs HW=4.20' (Free Discharge)
↑**1=Special & User-Defined** (Custom Controls 5.39 cfs)

Pond 10P: Existing Swale



Summary for Pond 110P: Infil. System

Inflow Area = 119,107 sf,100.00% Impervious, Inflow Depth = 4.59" for 10-Year event
Inflow = 12.07 cfs @ 12.09 hrs, Volume= 45,593 cf
Outflow = 6.69 cfs @ 12.18 hrs, Volume= 45,593 cf, Atten= 45%, Lag= 5.4 min
Discarded = 0.19 cfs @ 3.83 hrs, Volume= 20,362 cf
Primary = 6.51 cfs @ 12.18 hrs, Volume= 25,231 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 113.11' @ 12.18 hrs Surf.Area= 3,360 sf Storage= 11,707 cf

Plug-Flow detention time= 147.8 min calculated for 45,586 cf (100% of inflow)
Center-of-Mass det. time= 147.8 min (896.1 - 748.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	109.00'	672 cf	**40.00'W x 84.00'L x 6.17'H Field A** 20,731 cf Overall - 19,051 cf Embedded = 1,680 cf x 40.0% Voids
#2A	109.50'	15,288 cf	**Concrete Galley 8x14x5.7** x 30 Inside #1 Inside= 84.0"W x 60.0"H => 39.20 sf x 13.00'L = 509.6 cf Outside= 96.0"W x 68.0"H => 45.36 sf x 14.00'L = 635.0 cf 5 Rows of 6 Chambers
		15,960 cf	Total Available Storage

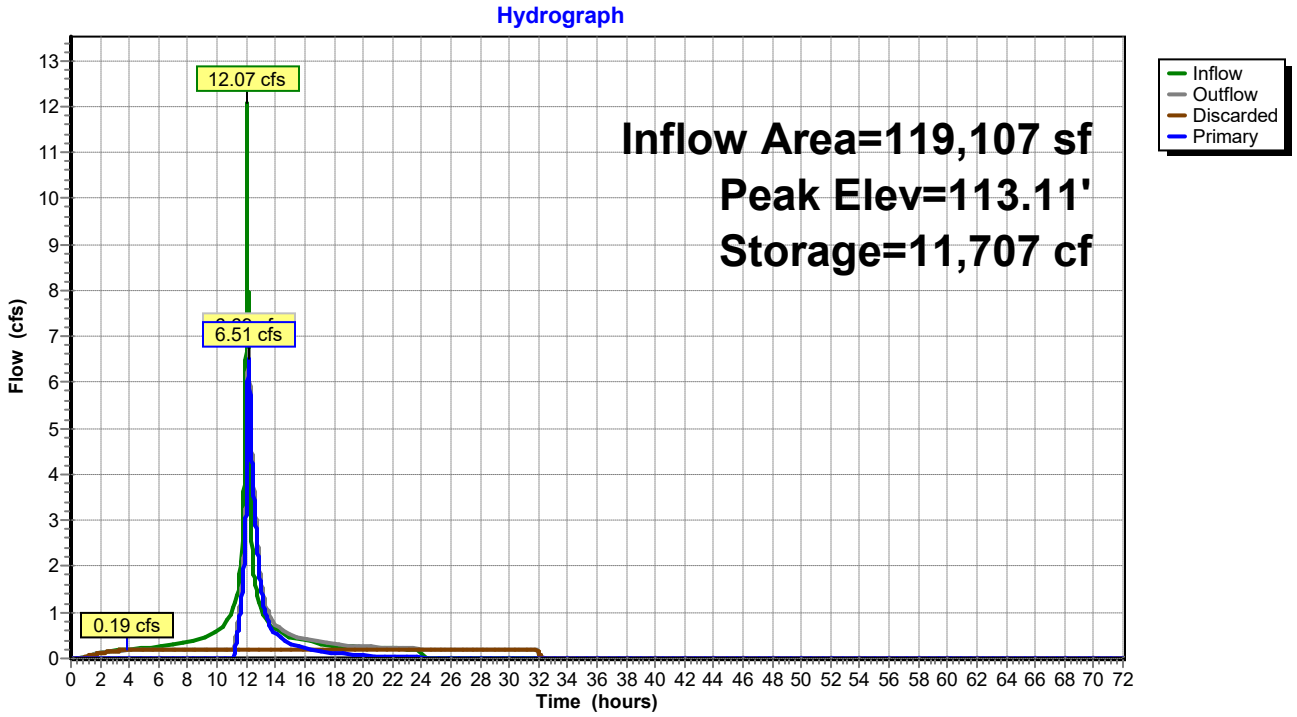
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	111.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Discarded	109.00'	**2.410 in/hr Exfiltration over Surface area**
#3	Primary	112.40'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Primary	113.10'	**12.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.19 cfs @ 3.83 hrs HW=109.06' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=6.50 cfs @ 12.18 hrs HW=113.11' (Free Discharge)
├**1=Orifice/Grate** (Orifice Controls 4.80 cfs @ 6.11 fps)
├**3=Orifice/Grate** (Orifice Controls 1.70 cfs @ 2.87 fps)
└**4=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.31 fps)

Pond 110P: Infil. System



Summary for Pond 111P: DMH

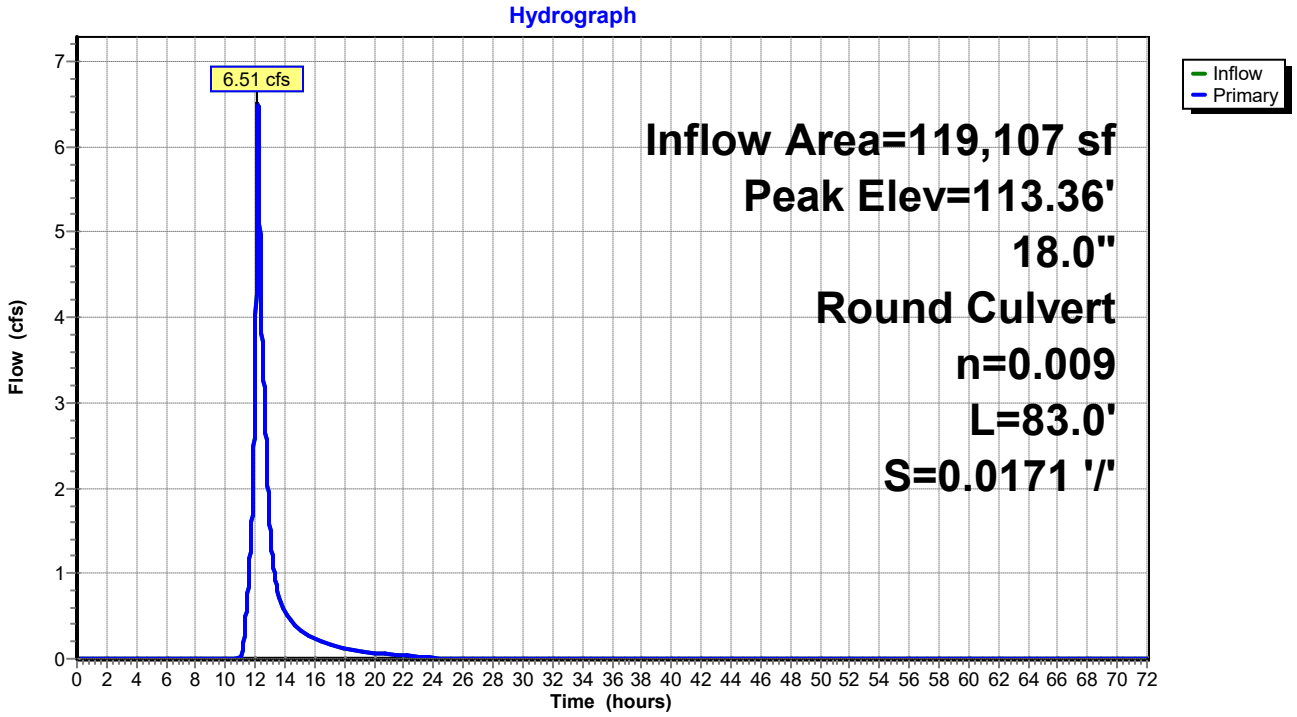
Inflow Area = 119,107 sf,100.00% Impervious, Inflow Depth = 2.54" for 10-Year event
Inflow = 6.51 cfs @ 12.18 hrs, Volume= 25,231 cf
Outflow = 6.51 cfs @ 12.18 hrs, Volume= 25,231 cf, Atten= 0%, Lag= 0.0 min
Primary = 6.51 cfs @ 12.18 hrs, Volume= 25,231 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 113.36' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	111.67'	**18.0" Round Culvert** L= 83.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 111.67' / 110.25' S= 0.0171 '/' Cc= 0.900 n= 0.009 PVC, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=6.50 cfs @ 12.18 hrs HW=113.36' (Free Discharge)
1=Culvert (Inlet Controls 6.50 cfs @ 3.68 fps)

Pond 111P: DMH



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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: Existing Site Runoff Area=127,488 sf 45.36% Impervious Runoff Depth=5.53"
Flow Length=555' Tc=11.5 min CN=72 Runoff=14.46 cfs 58,732 cf

Subcatchment 11S: Danton Drive & 35 Runoff Area=21,223 sf 97.37% Impervious Runoff Depth=8.58"
Flow Length=353' Tc=9.9 min CN=97 Runoff=3.44 cfs 15,173 cf

Subcatchment 20S: Existing to 35 Danton Runoff Area=20,048 sf 52.50% Impervious Runoff Depth=5.28"
Tc=6.0 min CN=70 Runoff=2.70 cfs 8,825 cf

Subcatchment 30S: To 31 Danton Drive Runoff Area=6,412 sf 21.97% Impervious Runoff Depth=3.08"
Tc=6.0 min CN=52 Runoff=0.50 cfs 1,647 cf

Subcatchment 40S: Woods Behind Project Runoff Area=11,909 sf 0.00% Impervious Runoff Depth=1.25"
Tc=6.0 min CN=36 Runoff=0.27 cfs 1,242 cf

Subcatchment 110S: Roof Runoff Area=58,003 sf 100.00% Impervious Runoff Depth=8.70"
Tc=6.0 min CN=98 Runoff=10.83 cfs 42,051 cf

Subcatchment 111S: Pavement Runoff Area=40,002 sf 100.00% Impervious Runoff Depth=8.70"
Tc=0.0 min CN=98 Runoff=8.23 cfs 29,000 cf

Subcatchment 112S: Loading Dock Area Runoff Area=21,102 sf 100.00% Impervious Runoff Depth=8.70"
Tc=0.0 min CN=98 Runoff=4.34 cfs 15,298 cf

Subcatchment 120S: Surrouding Grass & Runoff Area=40,016 sf 21.16% Impervious Runoff Depth=2.96"
Tc=0.0 min CN=51 Runoff=3.70 cfs 9,880 cf

Subcatchment 200S: To 35 Danton Drive Runoff Area=8,897 sf 86.93% Impervious Runoff Depth=7.73"
Tc=6.0 min CN=90 Runoff=1.60 cfs 5,733 cf

Subcatchment 300S: To 31 Danton Drive Runoff Area=6,743 sf 0.00% Impervious Runoff Depth=1.57"
Tc=6.0 min CN=39 Runoff=0.22 cfs 885 cf

Subcatchment 400S: Woods Behind Project Runoff Area=8,905 sf 0.00% Impervious Runoff Depth=1.25"
Tc=6.0 min CN=36 Runoff=0.20 cfs 929 cf

Reach 1R: Project Impact to Peat Meadow Brook Inflow=20.65 cfs 84,933 cf
Outflow=20.65 cfs 84,933 cf

Reach 10R: Existing Project Ouftall (CB at SE of site) Inflow=17.91 cfs 73,219 cf
Outflow=17.91 cfs 73,219 cf

Reach 20R: Existing Outfall to 35 Danton Drive Back Inflow=2.70 cfs 8,825 cf
Outflow=2.70 cfs 8,825 cf

Reach 30R: Existing Outfall to 31 Danton Drive Inflow=0.50 cfs 1,647 cf
Outflow=0.50 cfs 1,647 cf

Reach 40R: Woods Behind Project Inflow=0.27 cfs 1,242 cf
Outflow=0.27 cfs 1,242 cf

Reach 100R: Project Outfall Inflow=17.17 cfs 74,773 cf
Outflow=17.17 cfs 74,773 cf

Reach 200R: Existing Oufall to 35 Danton Drive Back Inflow=1.60 cfs 5,733 cf
Outflow=1.60 cfs 5,733 cf

Reach 300R: Existing Oufall to 31 Danton Drive Inflow=0.22 cfs 885 cf
Outflow=0.22 cfs 885 cf

Reach 400R: Woods Behind Project Inflow=0.20 cfs 929 cf
Outflow=0.20 cfs 929 cf

Reach 500R: Project Impact to Peat Meadow Brook Inflow=18.86 cfs 82,319 cf
Outflow=18.86 cfs 82,319 cf

Pond 10P: Existing Swale Peak Elev=4.20' Storage=689 cf Inflow=14.46 cfs 58,732 cf
Outflow=14.57 cfs 58,045 cf

Pond 110P: Infil. System Peak Elev=114.35' Storage=15,488 cf Inflow=22.43 cfs 86,349 cf
Discarded=0.19 cfs 21,456 cf Primary=14.19 cfs 64,893 cf Outflow=14.38 cfs 86,349 cf

Pond 111P: DMH Peak Elev=116.88' Inflow=14.19 cfs 64,893 cf
18.0" Round Culvert n=0.009 L=83.0' S=0.0171 '/' Outflow=14.19 cfs 64,893 cf

Summary for Subcatchment 10S: Existing Site

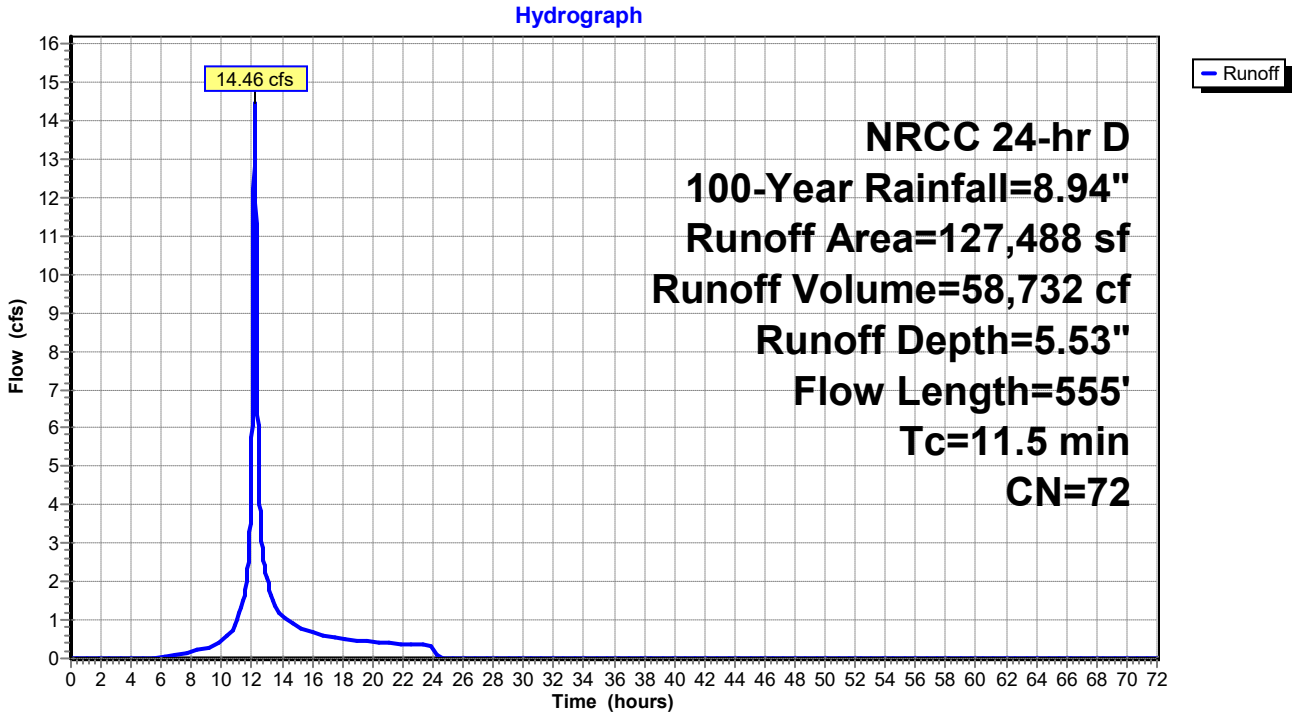
Runoff = 14.46 cfs @ 12.19 hrs, Volume= 58,732 cf, Depth= 5.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
66,425	49	50-75% Grass cover, Fair, HSG A
57,826	98	Paved parking, HSG A
3,237	96	Gravel surface, HSG A
127,488	72	Weighted Average
69,662		54.64% Pervious Area
57,826		45.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	20	0.0050	0.05		**Sheet Flow, Woodland Sheet Flow** Grass: Dense n= 0.240 P2= 3.15"
1.1	164	0.0145	2.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.9	155	0.0158	0.88		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	148	0.0225	4.68	46.78	**Channel Flow, X-Sec and Perimeter** Area= 10.0 sf Perim= 13.0' r= 0.77' n= 0.040 Earth, cobble bottom, clean sides
0.1	68	0.0558	13.14	157.70	**Channel Flow, X-Section and Perimeter** Area= 12.0 sf Perim= 8.0' r= 1.50' n= 0.035 Earth, dense weeds
11.5	555	Total			

Subcatchment 10S: Existing Site



Summary for Subcatchment 11S: Danton Drive & 35 Danton Drive

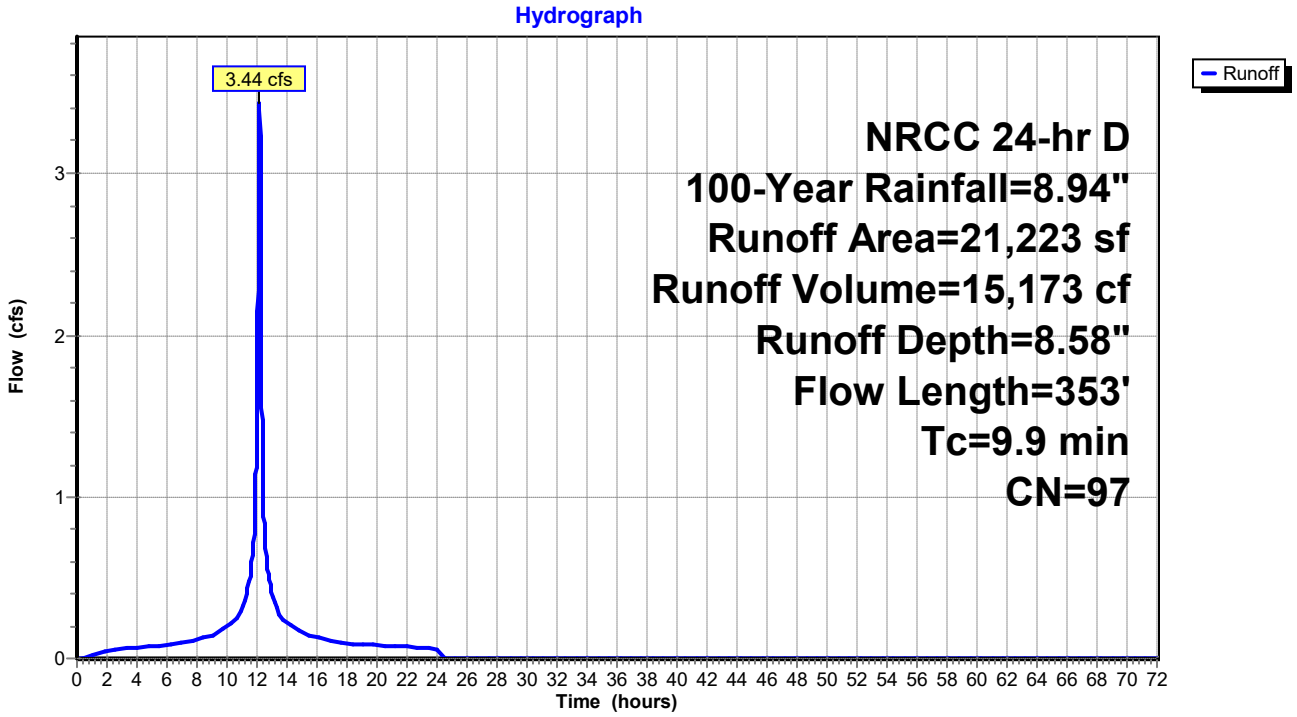
Runoff = 3.44 cfs @ 12.17 hrs, Volume= 15,173 cf, Depth= 8.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
20,665	98	Paved parking, HSG A
558	49	50-75% Grass cover, Fair, HSG A
21,223	97	Weighted Average
558		2.63% Pervious Area
20,665		97.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0200	0.86		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.15"
6.0	178	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	42	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.7	81	0.0050	0.49		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	42	0.0050	1.44		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.9	353	Total			

Subcatchment 11S: Danton Drive & 35 Danton Drive



Summary for Subcatchment 20S: Existing to 35 Danton Drive

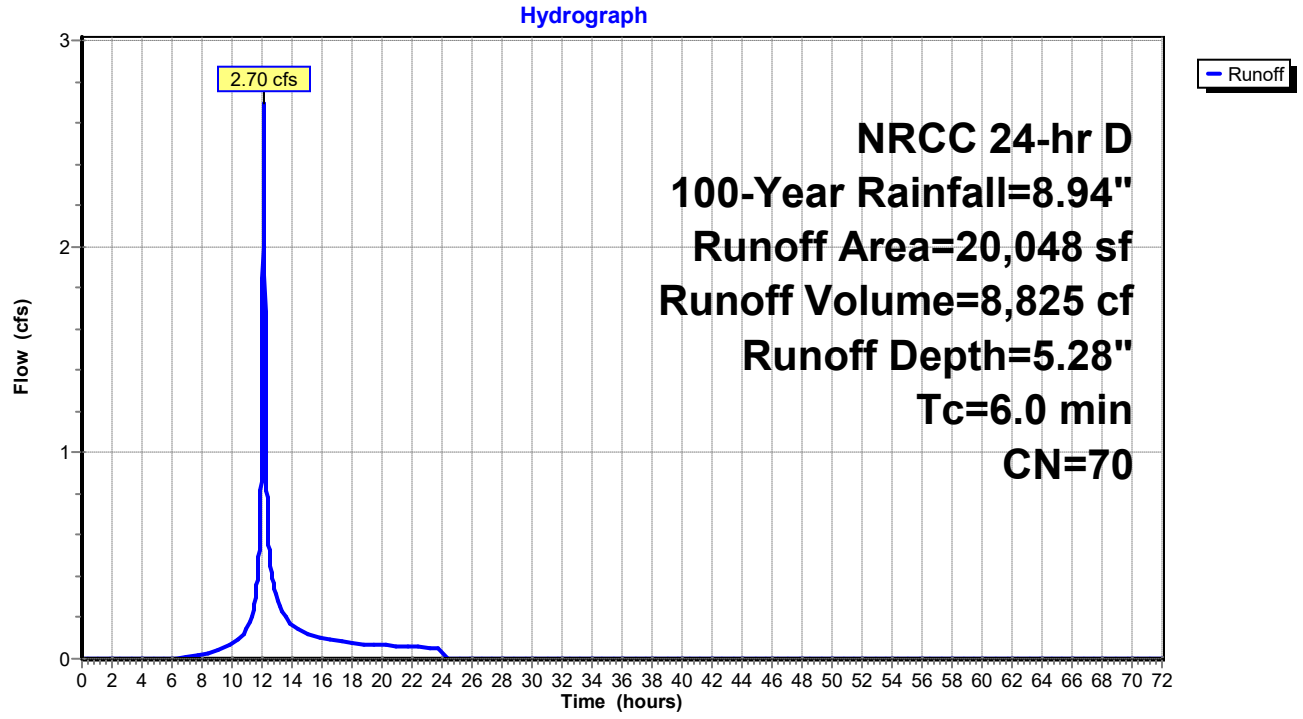
Runoff = 2.70 cfs @ 12.13 hrs, Volume= 8,825 cf, Depth= 5.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
10,526	98	Paved parking, HSG A
9,522	39	>75% Grass cover, Good, HSG A
20,048	70	Weighted Average
9,522		47.50% Pervious Area
10,526		52.50% Impervious Area

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

Subcatchment 20S: Existing to 35 Danton Drive



Summary for Subcatchment 30S: To 31 Danton Drive

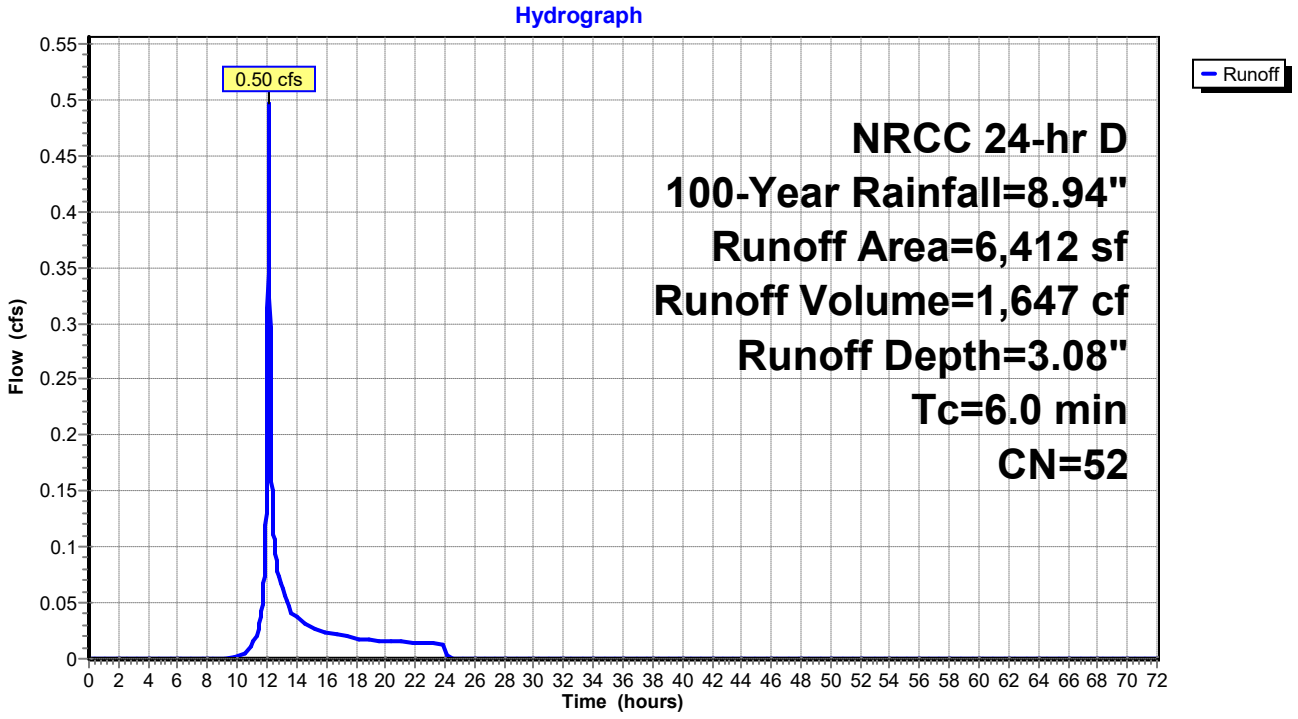
Runoff = 0.50 cfs @ 12.14 hrs, Volume= 1,647 cf, Depth= 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
1,409	98	Paved parking, HSG A
5,003	39	>75% Grass cover, Good, HSG A
6,412	52	Weighted Average
5,003		78.03% Pervious Area
1,409		21.97% Impervious Area

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

Subcatchment 30S: To 31 Danton Drive



Summary for Subcatchment 40S: Woods Behind Project

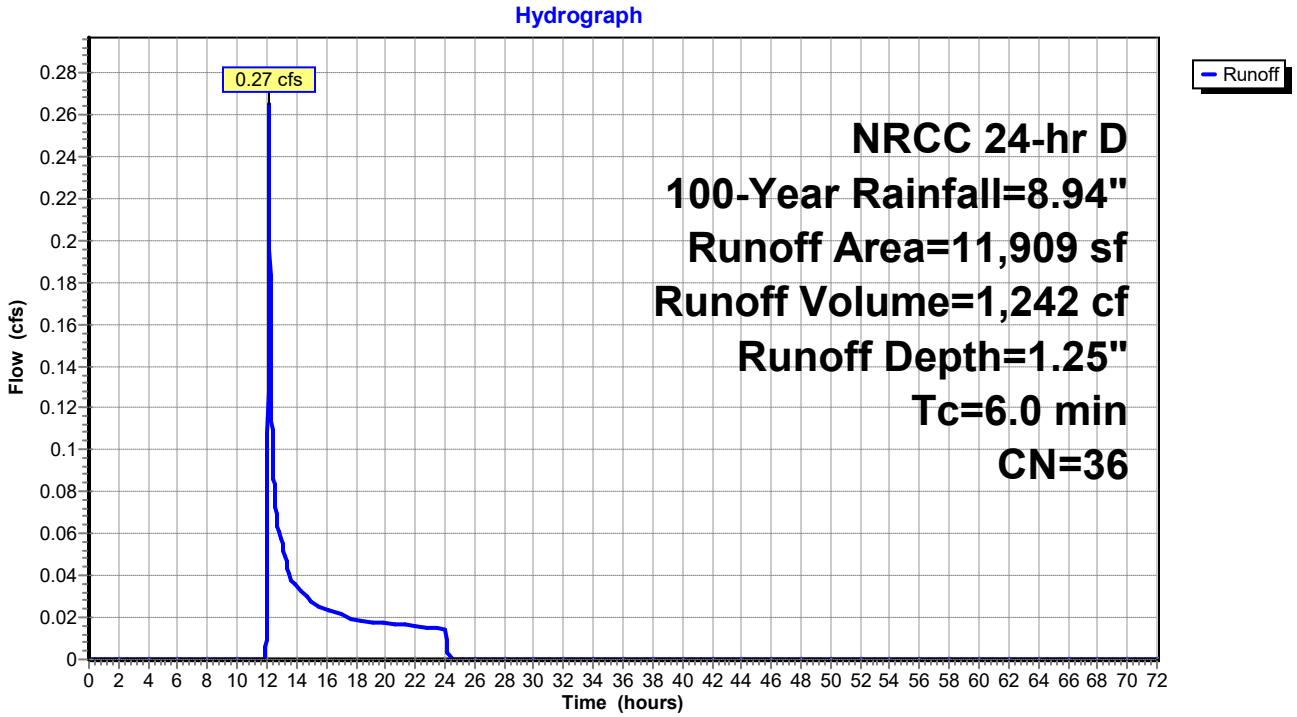
Runoff = 0.27 cfs @ 12.15 hrs, Volume= 1,242 cf, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
11,909	36	Woods, Fair, HSG A
11,909		100.00% Pervious Area

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

Subcatchment 40S: Woods Behind Project



Summary for Subcatchment 110S: Roof

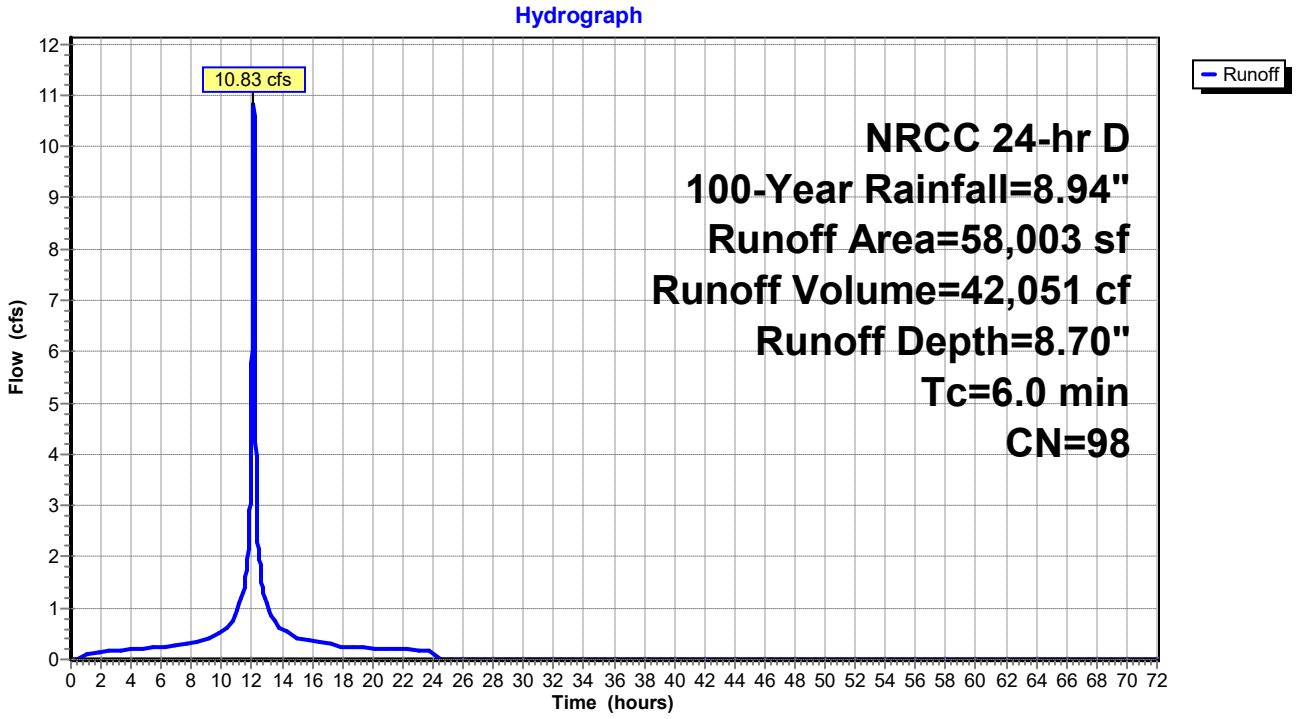
Runoff = 10.83 cfs @ 12.13 hrs, Volume= 42,051 cf, Depth= 8.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
58,003	98	Roofs, HSG A
58,003		100.00% Impervious Area

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

Subcatchment 110S: Roof



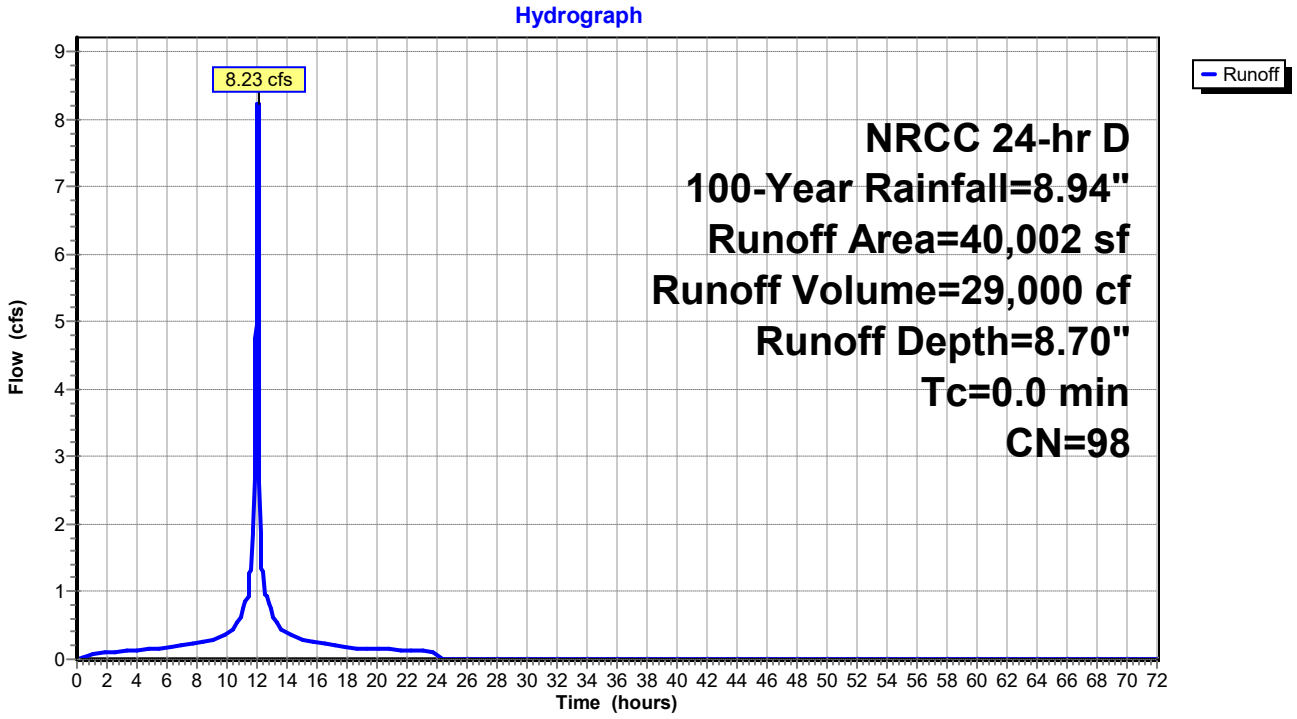
Summary for Subcatchment 111S: Pavement

Runoff = 8.23 cfs @ 12.09 hrs, Volume= 29,000 cf, Depth= 8.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
40,002	98	Paved parking, HSG A
40,002		100.00% Impervious Area

Subcatchment 111S: Pavement



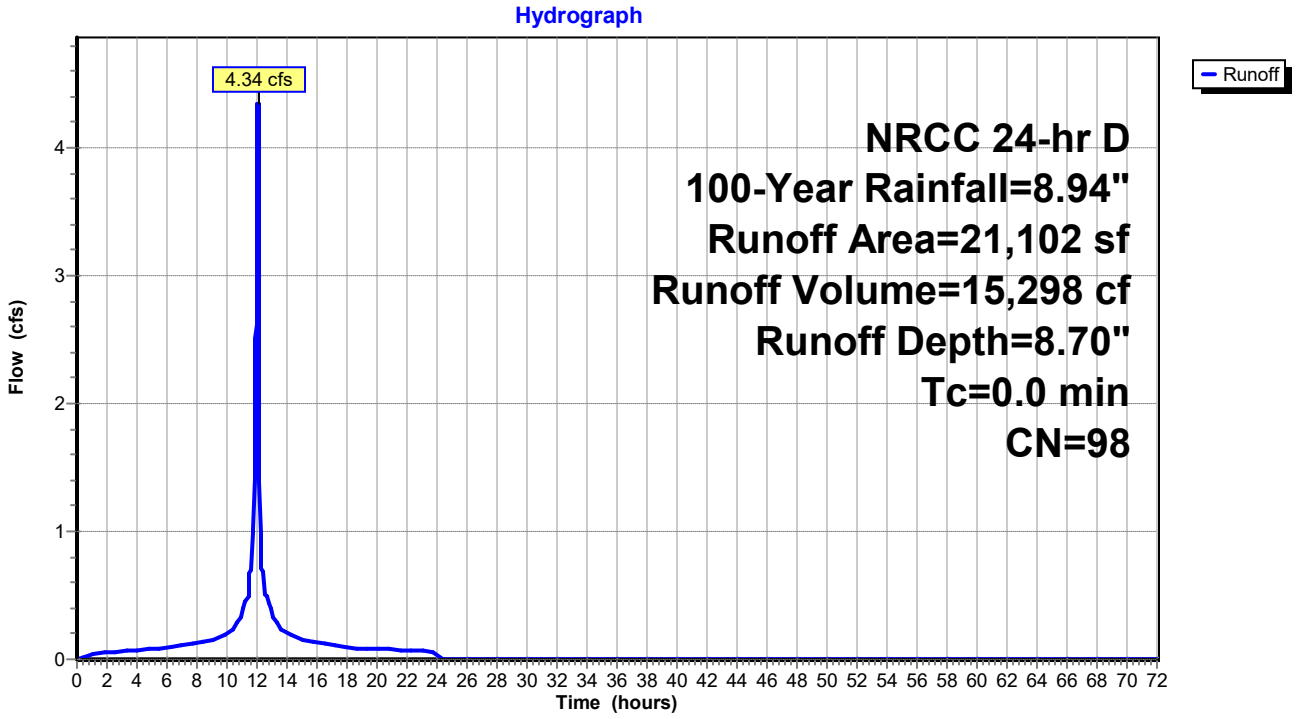
Summary for Subcatchment 112S: Loading Dock Area

Runoff = 4.34 cfs @ 12.09 hrs, Volume= 15,298 cf, Depth= 8.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
21,102	98	Paved parking, HSG A
21,102		100.00% Impervious Area

Subcatchment 112S: Loading Dock Area



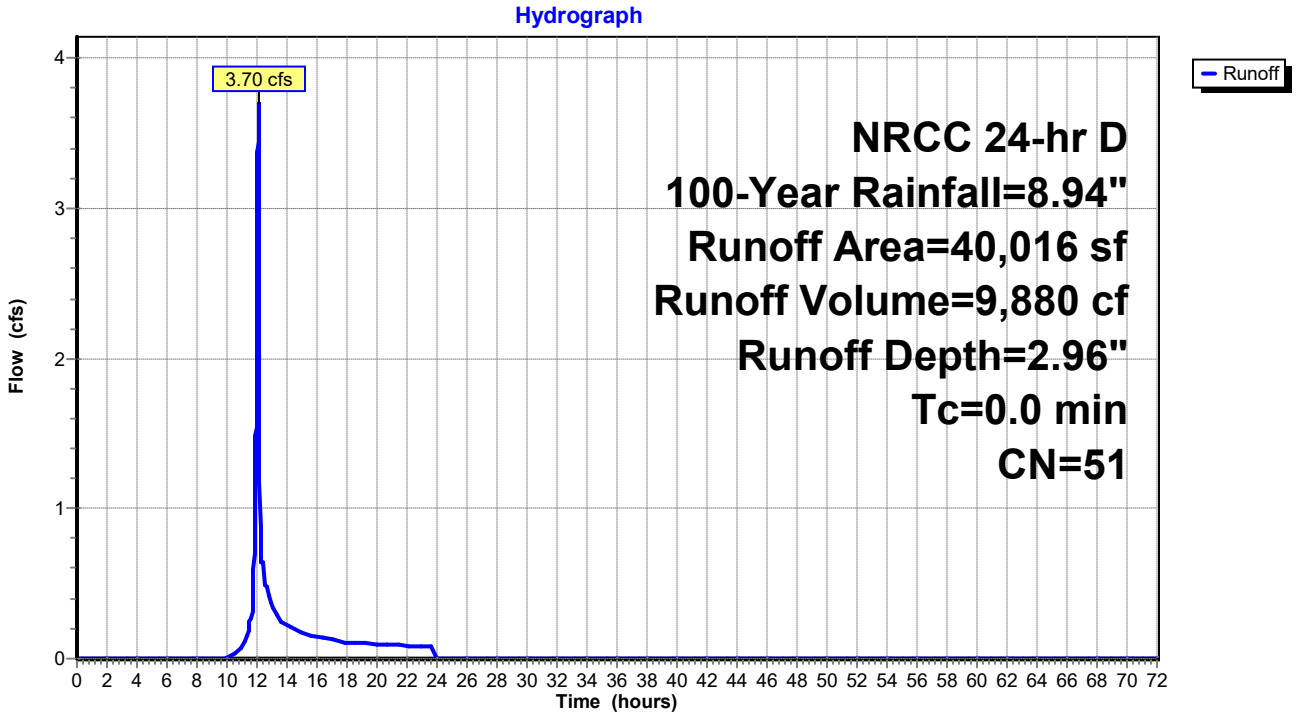
Summary for Subcatchment 120S: Surrouding Grass & Pavement

Runoff = 3.70 cfs @ 12.09 hrs, Volume= 9,880 cf, Depth= 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
31,548	39	>75% Grass cover, Good, HSG A
8,468	98	Paved parking, HSG A
40,016	51	Weighted Average
31,548		78.84% Pervious Area
8,468		21.16% Impervious Area

Subcatchment 120S: Surrouding Grass & Pavement



Summary for Subcatchment 200S: To 35 Danton Drive

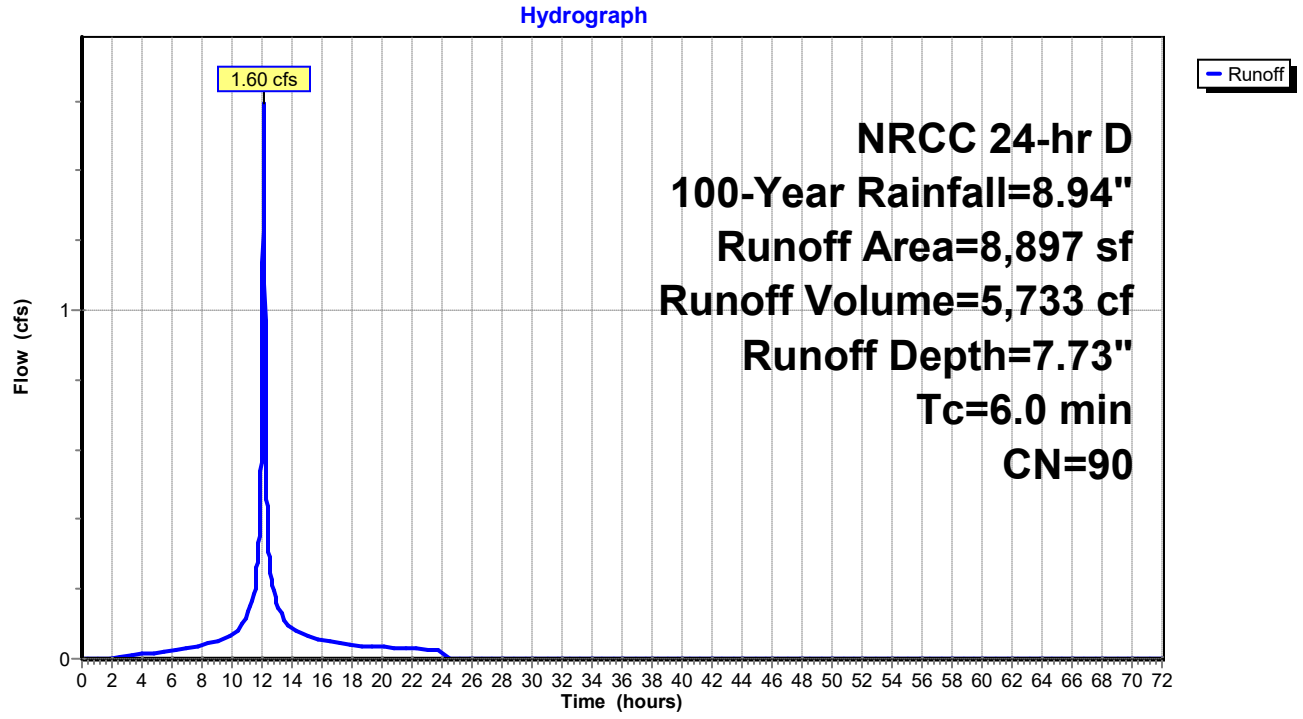
Runoff = 1.60 cfs @ 12.13 hrs, Volume= 5,733 cf, Depth= 7.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
1,163	39	>75% Grass cover, Good, HSG A
7,734	98	Paved parking, HSG A
8,897	90	Weighted Average
1,163		13.07% Pervious Area
7,734		86.93% Impervious Area

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

Subcatchment 200S: To 35 Danton Drive



Summary for Subcatchment 300S: To 31 Danton Drive

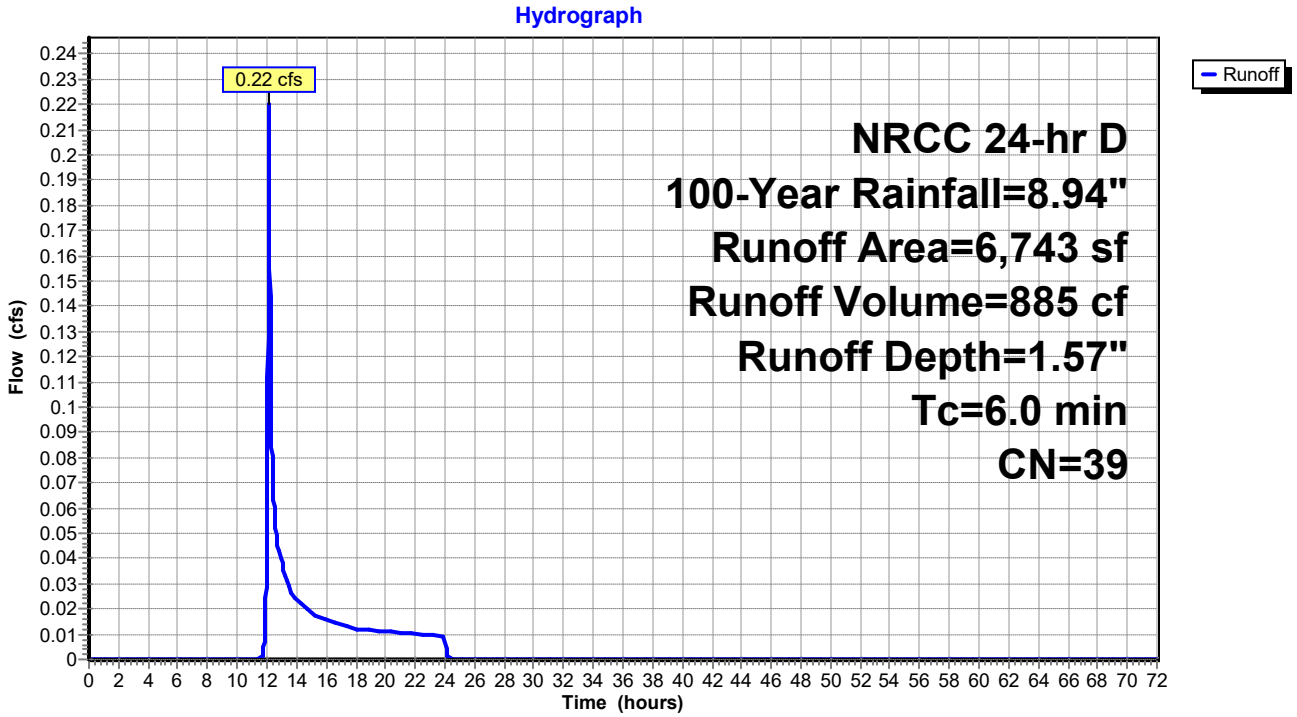
Runoff = 0.22 cfs @ 12.14 hrs, Volume= 885 cf, Depth= 1.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
6,743	39	>75% Grass cover, Good, HSG A
6,743		100.00% Pervious Area

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

Subcatchment 300S: To 31 Danton Drive



Summary for Subcatchment 400S: Woods Behind Project

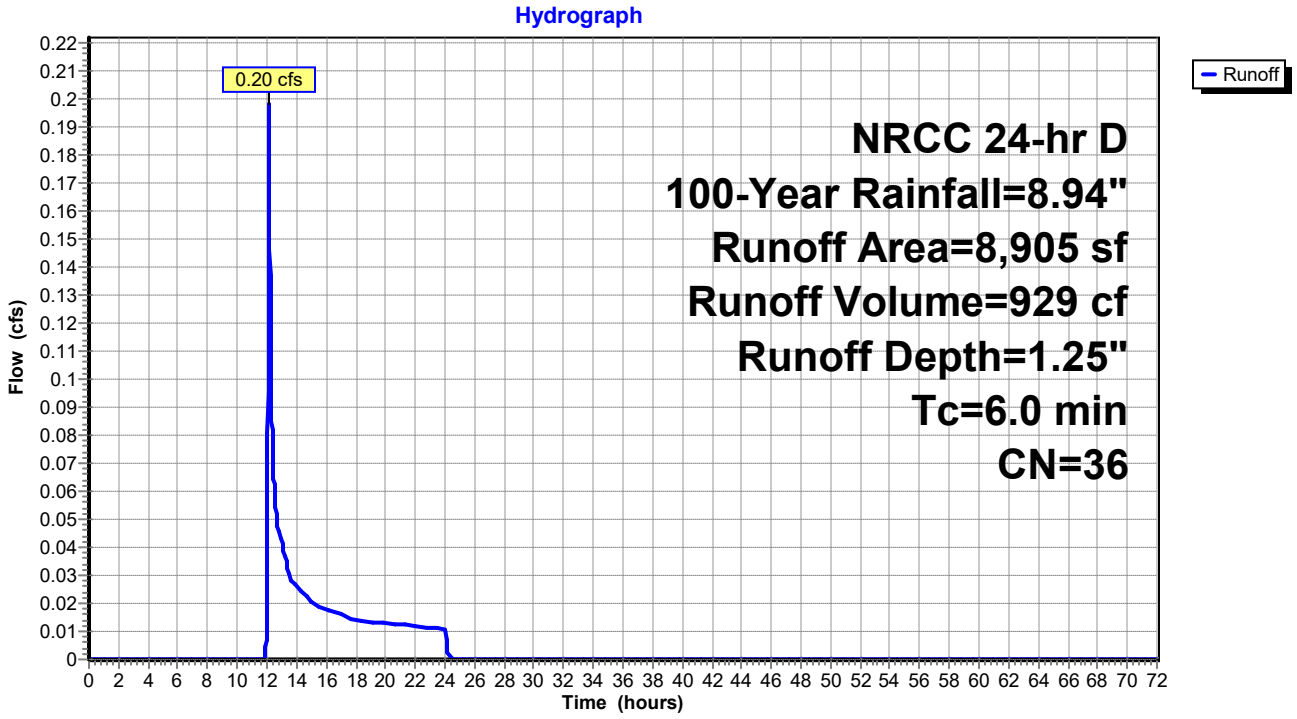
Runoff = 0.20 cfs @ 12.15 hrs, Volume= 929 cf, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.94"

Area (sf)	CN	Description
8,905	36	Woods, Fair, HSG A
8,905		100.00% Pervious Area

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

Subcatchment 400S: Woods Behind Project

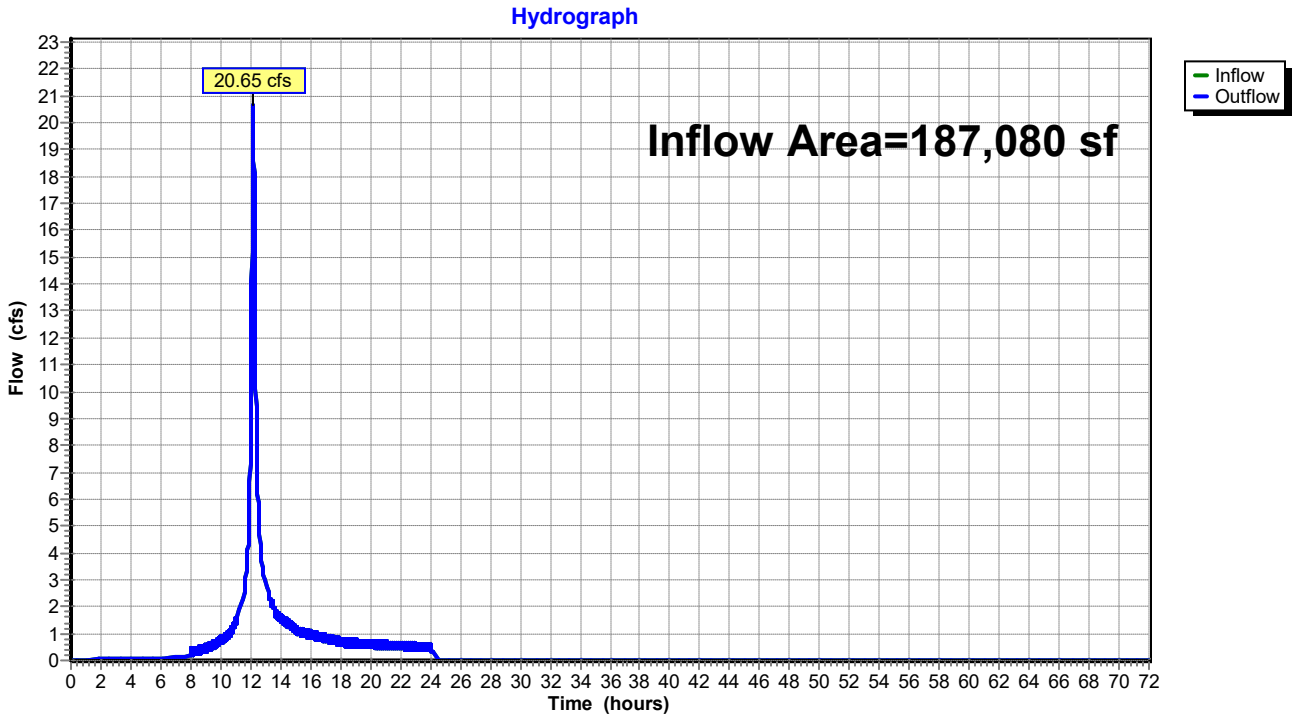


Summary for Reach 1R: Project Impact to Peat Meadow Brook

Inflow Area = 187,080 sf, 48.34% Impervious, Inflow Depth = 5.45" for 100-Year event
Inflow = 20.65 cfs @ 12.17 hrs, Volume= 84,933 cf
Outflow = 20.65 cfs @ 12.17 hrs, Volume= 84,933 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 1R: Project Impact to Peat Meadow Brook

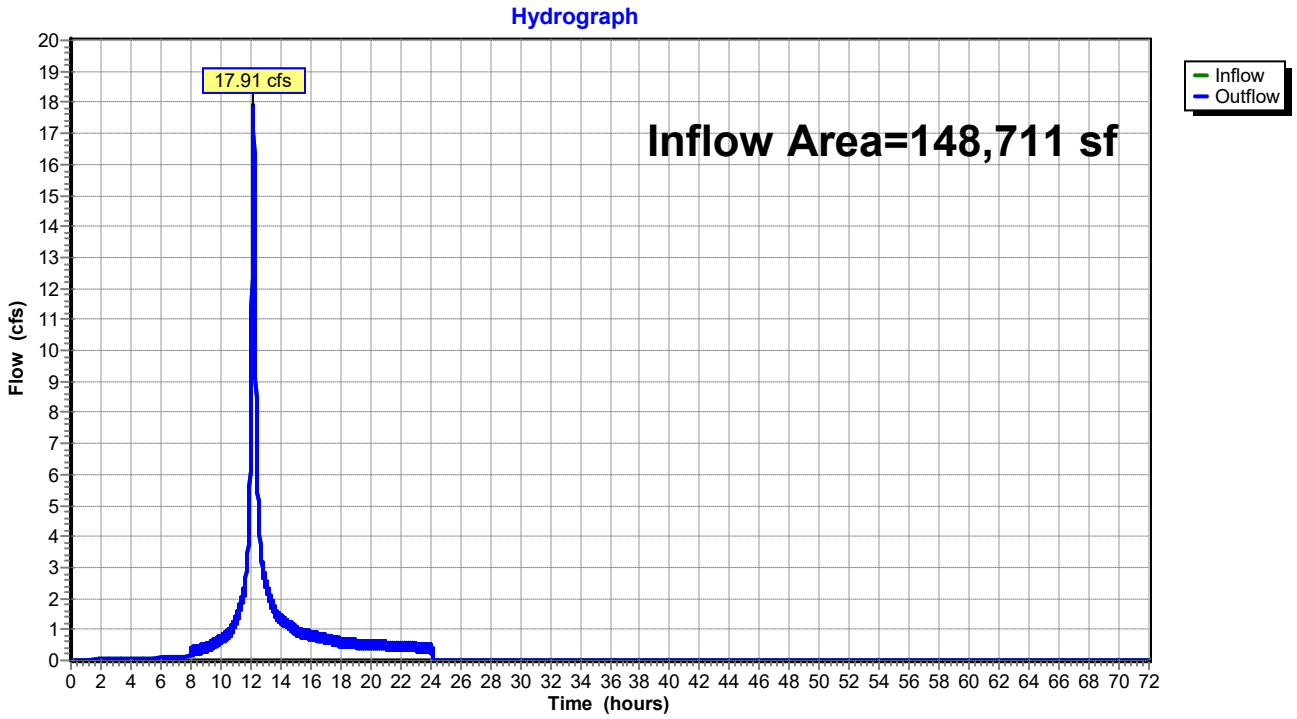


Summary for Reach 10R: Existing Project Outfall (CB at SE of site)

Inflow Area = 148,711 sf, 52.78% Impervious, Inflow Depth = 5.91" for 100-Year event
Inflow = 17.91 cfs @ 12.19 hrs, Volume= 73,219 cf
Outflow = 17.91 cfs @ 12.19 hrs, Volume= 73,219 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 10R: Existing Project Outfall (CB at SE of site)

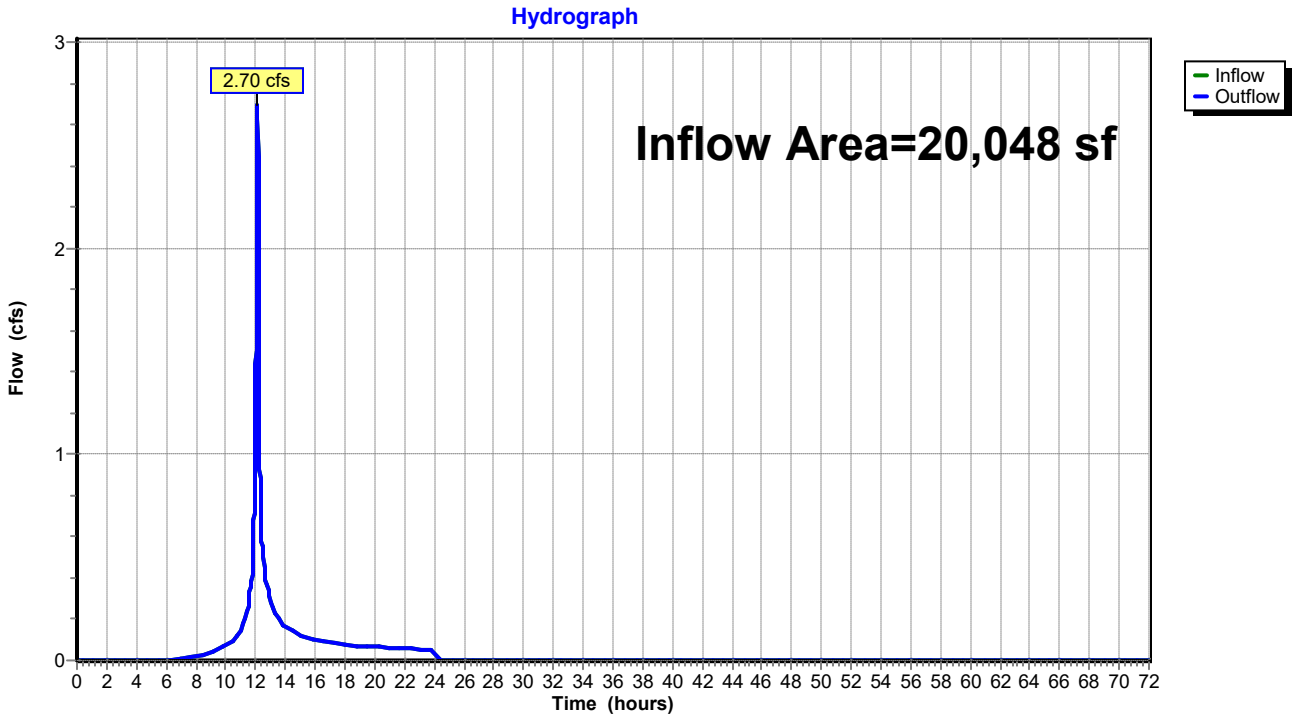


Summary for Reach 20R: Existing Outfall to 35 Danton Drive Back

Inflow Area = 20,048 sf, 52.50% Impervious, Inflow Depth = 5.28" for 100-Year event
Inflow = 2.70 cfs @ 12.13 hrs, Volume= 8,825 cf
Outflow = 2.70 cfs @ 12.13 hrs, Volume= 8,825 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 20R: Existing Outfall to 35 Danton Drive Back

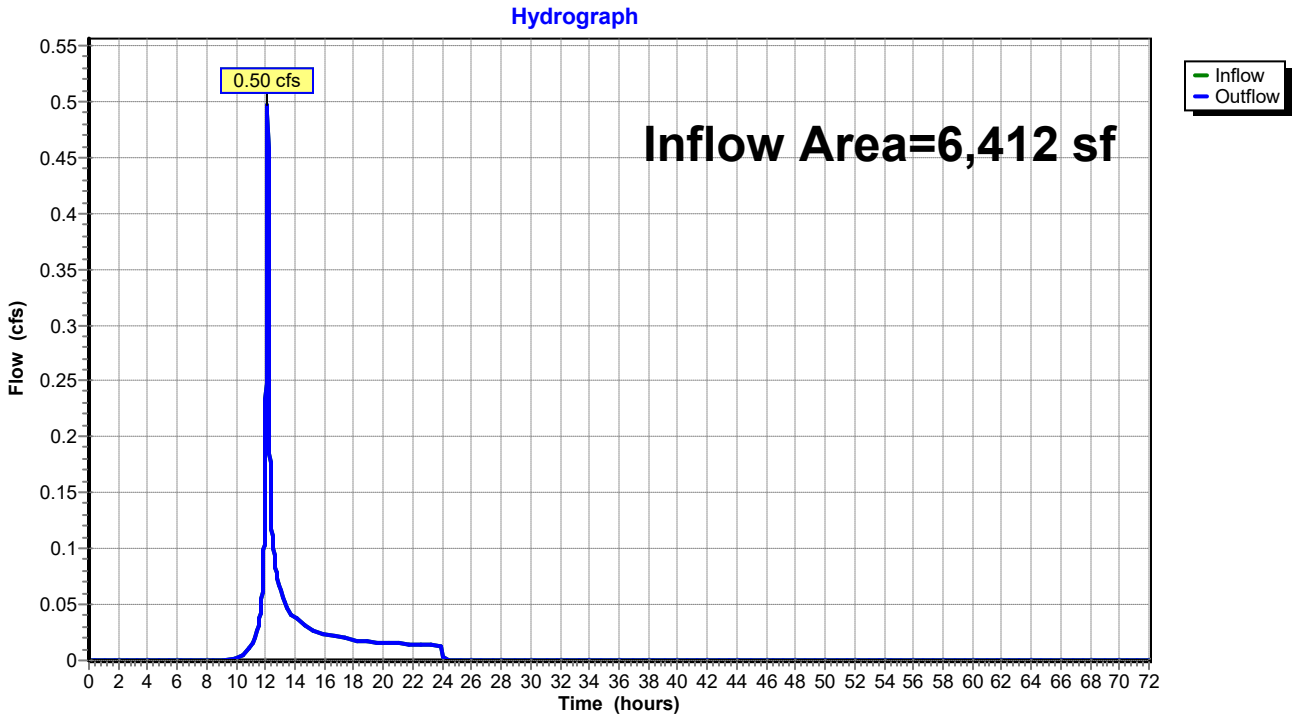


Summary for Reach 30R: Existing Outfall to 31 Danton Drive

Inflow Area = 6,412 sf, 21.97% Impervious, Inflow Depth = 3.08" for 100-Year event
Inflow = 0.50 cfs @ 12.14 hrs, Volume= 1,647 cf
Outflow = 0.50 cfs @ 12.14 hrs, Volume= 1,647 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 30R: Existing Outfall to 31 Danton Drive

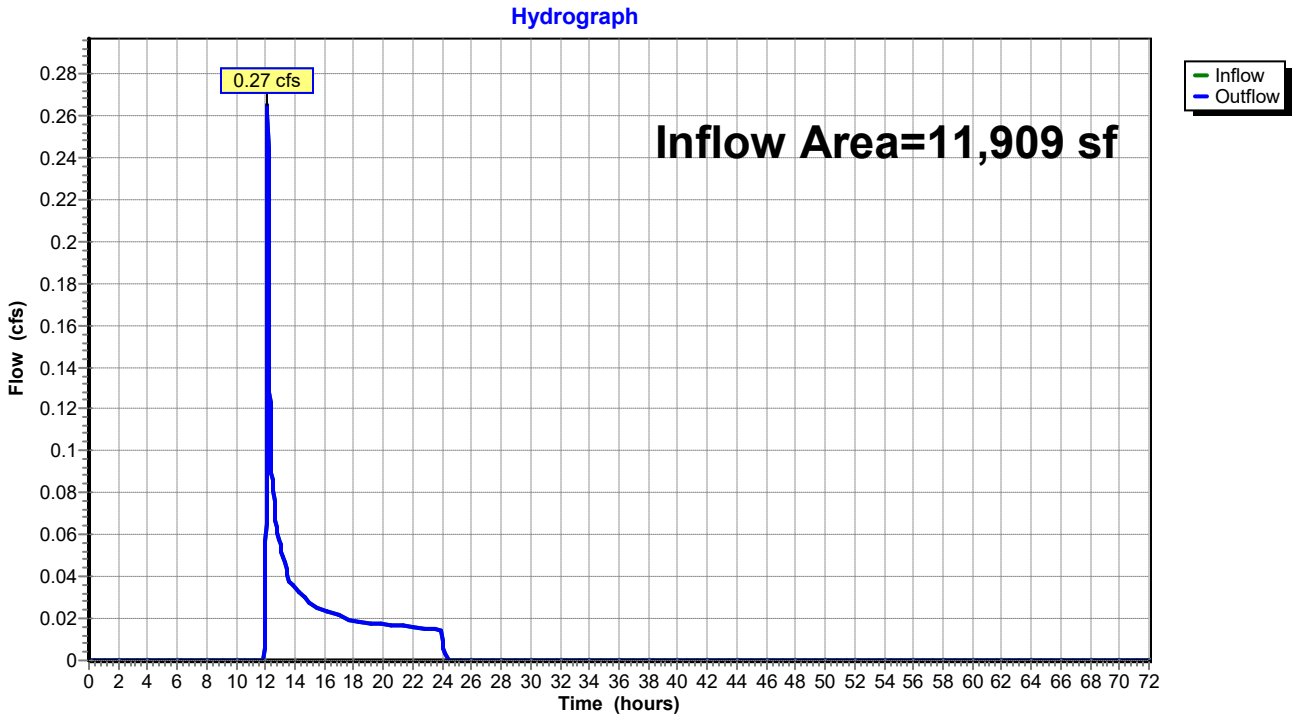


Summary for Reach 40R: Woods Behind Project

Inflow Area = 11,909 sf, 0.00% Impervious, Inflow Depth = 1.25" for 100-Year event
Inflow = 0.27 cfs @ 12.15 hrs, Volume= 1,242 cf
Outflow = 0.27 cfs @ 12.15 hrs, Volume= 1,242 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 40R: Woods Behind Project

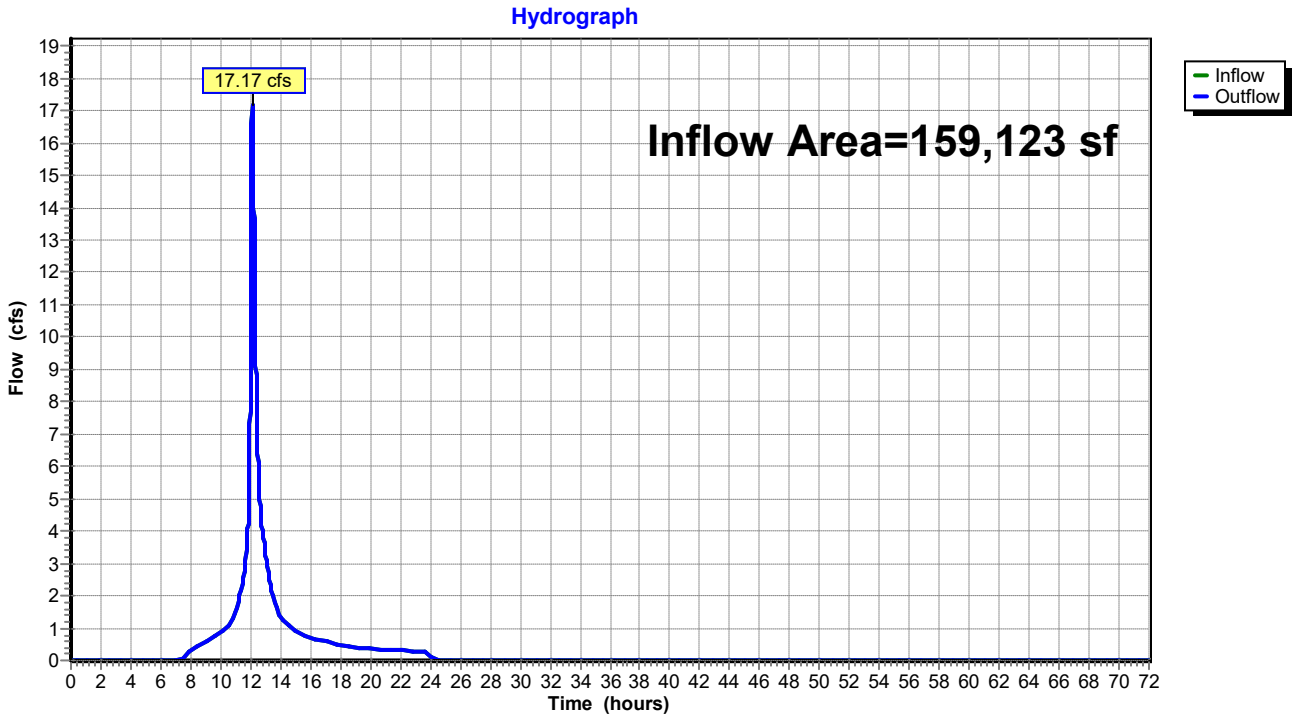


Summary for Reach 100R: Project Outfall

Inflow Area = 159,123 sf, 80.17% Impervious, Inflow Depth = 5.64" for 100-Year event
Inflow = 17.17 cfs @ 12.09 hrs, Volume= 74,773 cf
Outflow = 17.17 cfs @ 12.09 hrs, Volume= 74,773 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 100R: Project Outfall

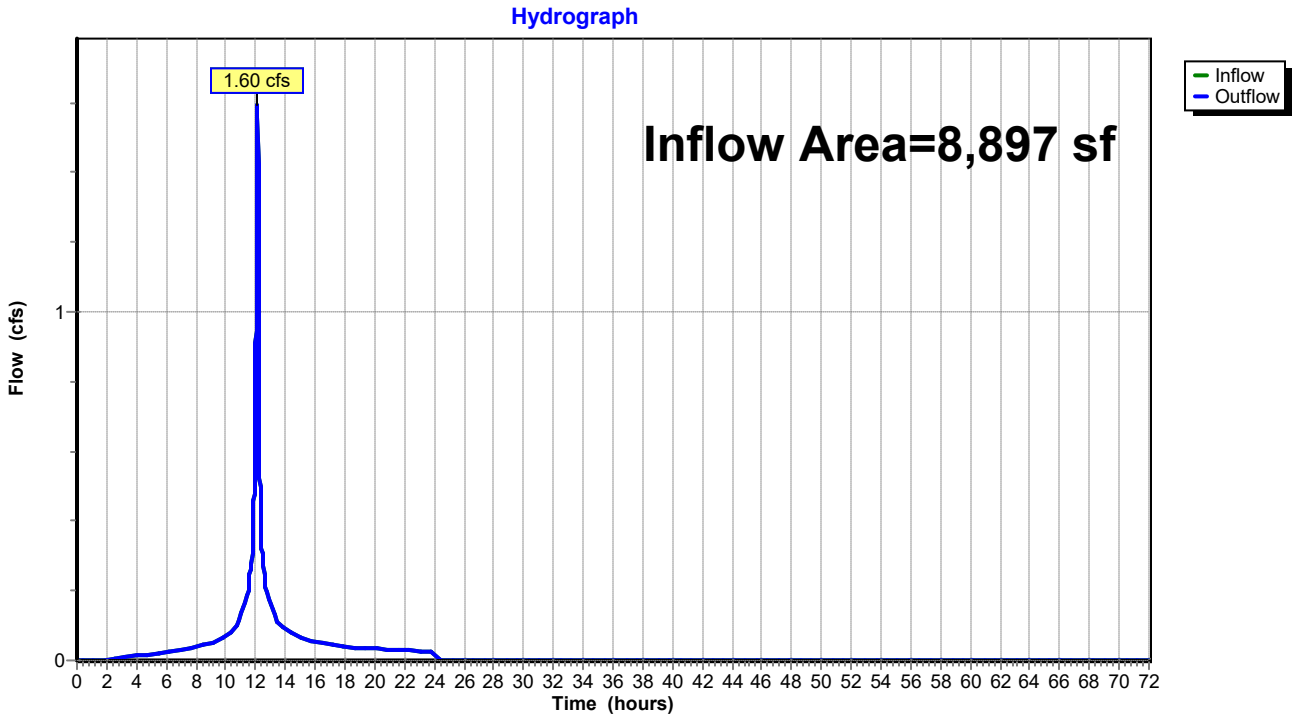


Summary for Reach 200R: Existing Oufall to 35 Danton Drive Back

Inflow Area = 8,897 sf, 86.93% Impervious, Inflow Depth = 7.73" for 100-Year event
Inflow = 1.60 cfs @ 12.13 hrs, Volume= 5,733 cf
Outflow = 1.60 cfs @ 12.13 hrs, Volume= 5,733 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 200R: Existing Oufall to 35 Danton Drive Back

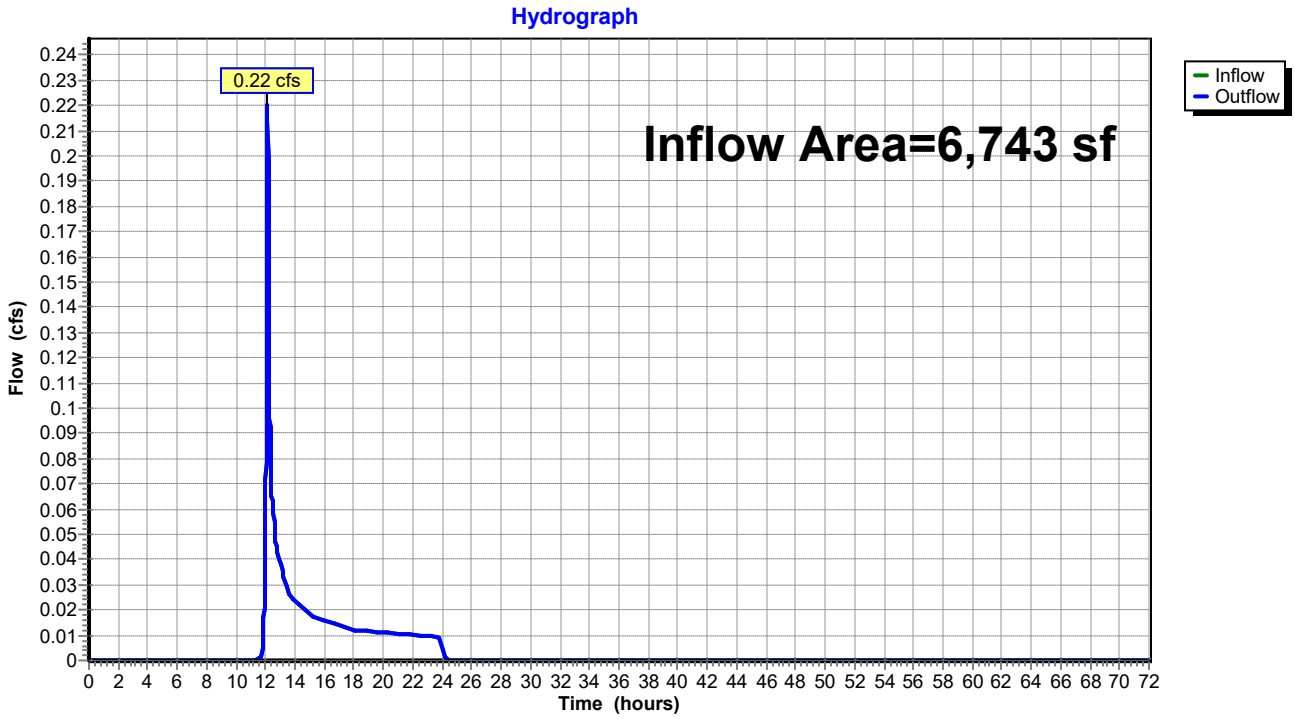


Summary for Reach 300R: Existing Oufall to 31 Danton Drive

Inflow Area = 6,743 sf, 0.00% Impervious, Inflow Depth = 1.57" for 100-Year event
Inflow = 0.22 cfs @ 12.14 hrs, Volume= 885 cf
Outflow = 0.22 cfs @ 12.14 hrs, Volume= 885 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 300R: Existing Oufall to 31 Danton Drive

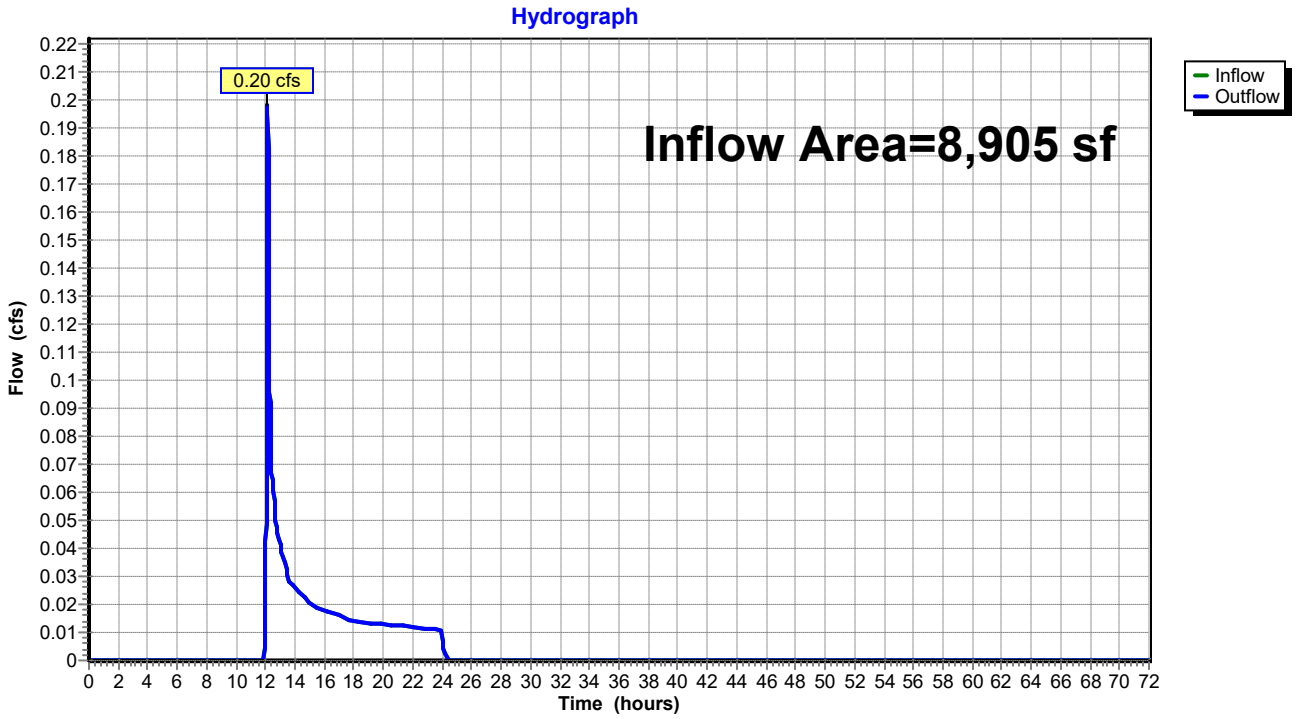


Summary for Reach 400R: Woods Behind Project

Inflow Area = 8,905 sf, 0.00% Impervious, Inflow Depth = 1.25" for 100-Year event
Inflow = 0.20 cfs @ 12.15 hrs, Volume= 929 cf
Outflow = 0.20 cfs @ 12.15 hrs, Volume= 929 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 400R: Woods Behind Project

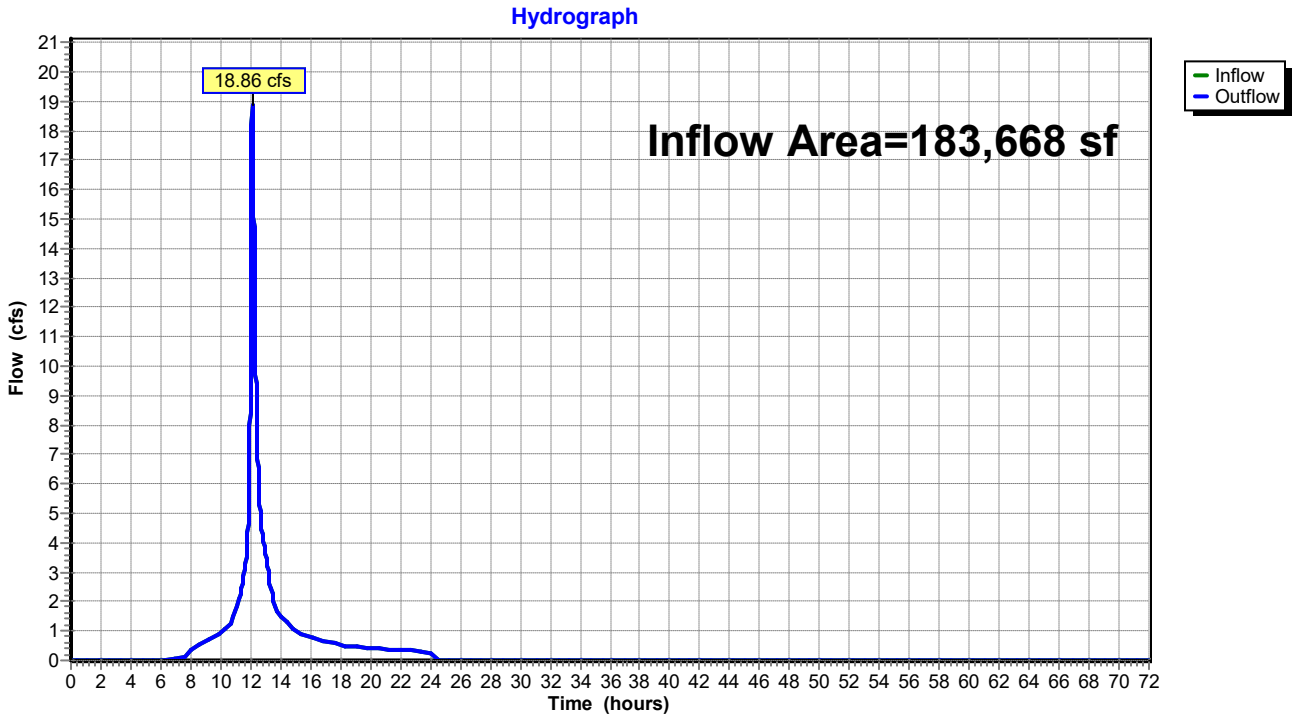


Summary for Reach 500R: Project Impact to Peat Meadow Brook

Inflow Area = 183,668 sf, 73.67% Impervious, Inflow Depth = 5.38" for 100-Year event
Inflow = 18.86 cfs @ 12.09 hrs, Volume= 82,319 cf
Outflow = 18.86 cfs @ 12.09 hrs, Volume= 82,319 cf, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 500R: Project Impact to Peat Meadow Brook



Summary for Pond 10P: Existing Swale

Inflow Area = 127,488 sf, 45.36% Impervious, Inflow Depth = 5.53" for 100-Year event
Inflow = 14.46 cfs @ 12.19 hrs, Volume= 58,732 cf
Outflow = 14.57 cfs @ 12.19 hrs, Volume= 58,045 cf, Atten= 0%, Lag= 0.0 min
Primary = 14.57 cfs @ 12.19 hrs, Volume= 58,045 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 4.20' @ 12.19 hrs Surf.Area= 0 sf Storage= 689 cf

Plug-Flow detention time= 11.9 min calculated for 58,045 cf (99% of inflow)
Center-of-Mass det. time= 4.9 min (845.9 - 841.0)

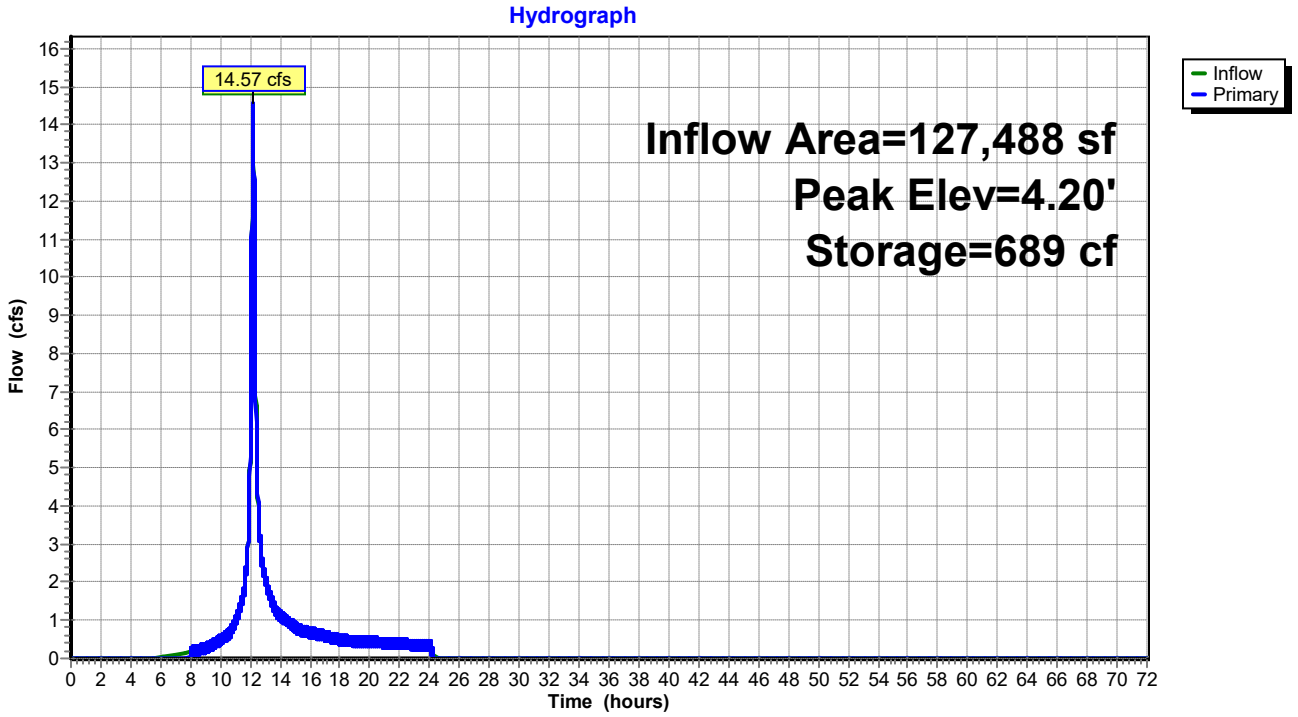
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	690 cf	**Custom Stage Data** Listed below

Elevation (feet)	Cum.Store (cubic-feet)
0.00	0
0.20	4
0.40	14
0.60	28
0.80	45
1.00	66
1.20	91
1.40	121
1.60	157
1.80	200
2.00	248
2.20	305
2.40	371
2.60	447
2.80	555
3.00	635
3.20	657
3.40	660
3.60	674
3.80	684
4.00	687
4.20	689
5.00	690

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**Special & User-Defined** Elev. (feet) 0.00 4.20 4.21 Disch. (cfs) 0.000 0.000 5,000.000

Primary OutFlow Max=14.57 cfs @ 12.19 hrs HW=4.20' (Free Discharge)
↑**1=Special & User-Defined** (Custom Controls 14.57 cfs)

Pond 10P: Existing Swale



Summary for Pond 110P: Infil. System

Inflow Area = 119,107 sf,100.00% Impervious, Inflow Depth = 8.70" for 100-Year event
Inflow = 22.43 cfs @ 12.09 hrs, Volume= 86,349 cf
Outflow = 14.38 cfs @ 12.15 hrs, Volume= 86,349 cf, Atten= 36%, Lag= 3.7 min
Discarded = 0.19 cfs @ 1.16 hrs, Volume= 21,456 cf
Primary = 14.19 cfs @ 12.15 hrs, Volume= 64,893 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 114.35' @ 12.15 hrs Surf.Area= 3,360 sf Storage= 15,488 cf

Plug-Flow detention time= 104.5 min calculated for 86,349 cf (100% of inflow)
Center-of-Mass det. time= 104.5 min (842.8 - 738.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	109.00'	672 cf	**40.00'W x 84.00'L x 6.17'H Field A** 20,731 cf Overall - 19,051 cf Embedded = 1,680 cf x 40.0% Voids
#2A	109.50'	15,288 cf	**Concrete Galley 8x14x5.7** x 30 Inside #1 Inside= 84.0"W x 60.0"H => 39.20 sf x 13.00'L = 509.6 cf Outside= 96.0"W x 68.0"H => 45.36 sf x 14.00'L = 635.0 cf 5 Rows of 6 Chambers
		15,960 cf	Total Available Storage

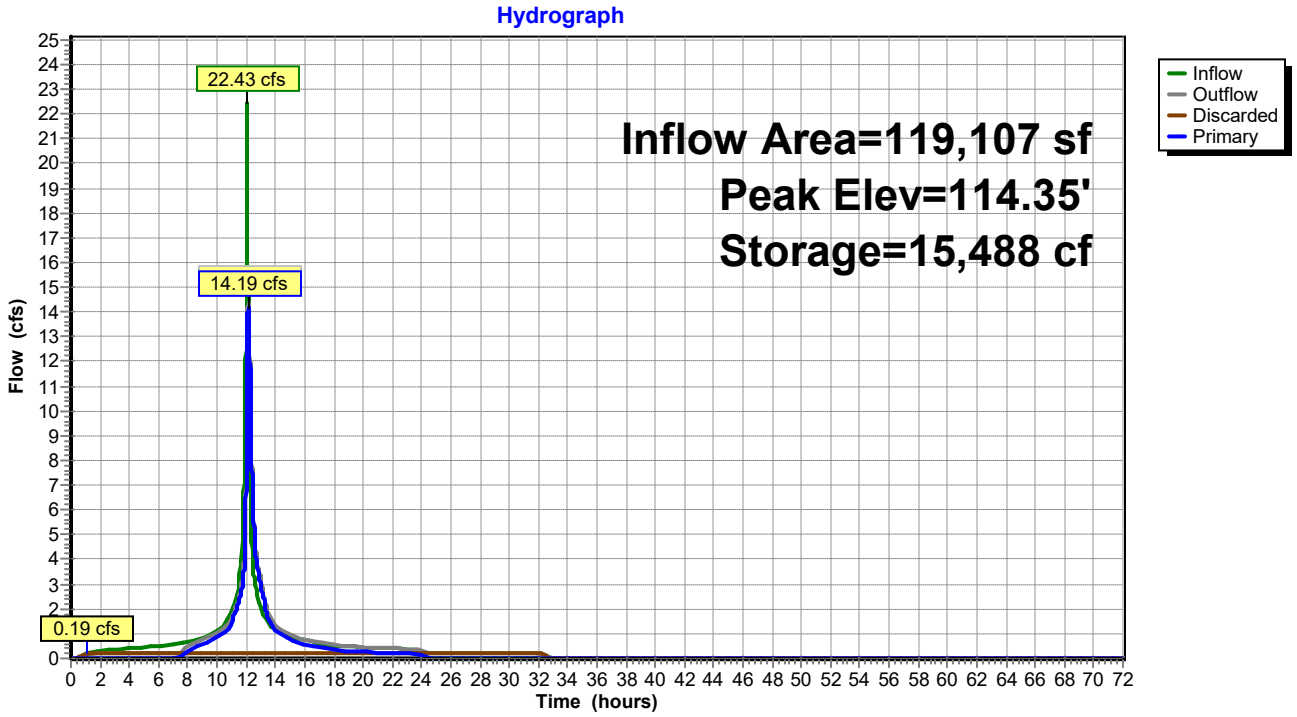
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	111.00'	**12.0" Vert. Orifice/Grate** C= 0.600
#2	Discarded	109.00'	**2.410 in/hr Exfiltration over Surface area**
#3	Primary	112.40'	**12.0" Vert. Orifice/Grate** C= 0.600
#4	Primary	113.10'	**12.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.19 cfs @ 1.16 hrs HW=109.06' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=14.19 cfs @ 12.15 hrs HW=114.35' (Free Discharge)
├**1=Orifice/Grate** (Orifice Controls 6.38 cfs @ 8.12 fps)
├**3=Orifice/Grate** (Orifice Controls 4.55 cfs @ 5.79 fps)
└**4=Orifice/Grate** (Orifice Controls 3.26 cfs @ 4.16 fps)

Pond 110P: Infil. System



Summary for Pond 111P: DMH

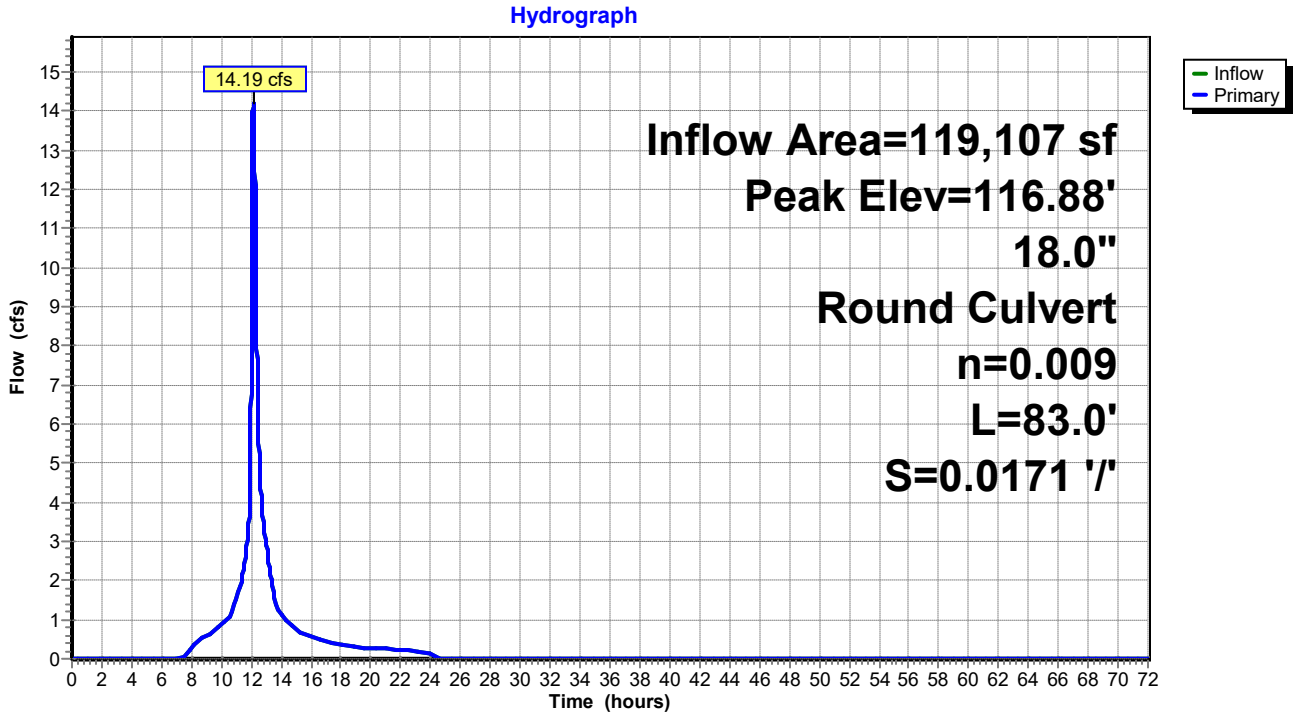
Inflow Area = 119,107 sf,100.00% Impervious, Inflow Depth = 6.54" for 100-Year event
Inflow = 14.19 cfs @ 12.15 hrs, Volume= 64,893 cf
Outflow = 14.19 cfs @ 12.15 hrs, Volume= 64,893 cf, Atten= 0%, Lag= 0.0 min
Primary = 14.19 cfs @ 12.15 hrs, Volume= 64,893 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 116.88' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	111.67'	**18.0" Round Culvert** L= 83.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 111.67' / 110.25' S= 0.0171 '/' Cc= 0.900 n= 0.009 PVC, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=14.19 cfs @ 12.15 hrs HW=116.88' (Free Discharge)
1=Culvert (Inlet Controls 14.19 cfs @ 8.03 fps)

Pond 111P: DMH



Appendix H

TSS CALCULATIONS

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: 33 Danton Drive - Underground Facilites

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	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**
Contech Unit	**0.25**	**0.75**	**0.19**	**0.56**
Subsurface Infiltration Structure	**0.80**	**0.56**	**0.45**	**0.11**
	0.00	**0.11**	**0.00**	**0.11**
	0.00	**0.11**	**0.00**	**0.11**

Total TSS Removal = **89%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: 33 Danton Drive

Prepared By: MCH

Date: 6/1/2021

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Appendix I

OPERATION & MAINTENANCE PLAN

Operation & Maintenance Plan (Permanent BMPs)

FOR

33 Danton Drive

Date: June, 2021

Owner/Operator: Boghos Properties LLC
1630 Osgood Street #1210
North Andover, MA 01845

Inspection and Maintenance Schedule

Facility personnel under the direction of the Owner will inspect the stormwater management system on a routine basis not less than once per month for the first six (6) months of operation and annually thereafter. Refer to plans for landscaped area locations. Inspection and maintenance shall be performed as follows:

1. Landscaped Areas:

Landscaped areas shall be inspected and maintained on a regular basis. Areas that may be subject to erosion will be stabilized and reseeded immediately. Inspect soil and repair eroded areas monthly. Re-plant void areas as needed. Remove litter and debris monthly. Remove and replace dead vegetation twice per year in spring and fall. Replace soil media if ponding is witnessed more than 48 hours after rainfall event.

2. Roof Drains:

Inspections: The downspout inlets on the roof of the building will need periodic maintenance to ensure proper function. The required interval for this maintenance will vary by season; however, downspout inlets should be inspected for debris before the rainy season. When trees and other deciduous vegetation shed leaves that drop into the gutters, this will inhibit the flow of water and possibly clog downspouts. The leaves and/or debris must be removed in order for the system to work as designed.

Maintenance: Debris, such as leaves and trash, shall be removed by hand. Sediments shall be swept and collected or vacuumed.

3. Deep Sump Catch Basins:

Inspection: Inspect the catch basin after precipitation events at a minimum of four times per year to ensure proper drainage. Inspection should preferably occur during extended precipitation events, high-intensity rainfall, and/or rain-on-snow events. If standing water shows on the surface of the catch basin, cleaning of porous pavers is recommended.

Cleaning: When the depth of the sediment reaches halfway to the top of the catch basin, the catch basin requires cleaning. Sediment should be removed from the catch basin. With care not to damage the catch basin hood or allowing sediment to follow the outfall.

4. Infiltration Chambers:

Inspections: During first year visually inspect after each major storm (>1.5") and again 72 hours later to verify exfiltration is occurring as designed. Note if water remains in basin after 72 hours. After first year visually inspect twice per year. Infiltration Systems shall be inspected for accumulation of silt, sediment, standing water, or debris on an annual basis. Debris and sediment shall be removed.

Inspection & Maintenance procedure is as follows: The inspection port for the infiltration system is at the outlet structure for each facility. Removing the manhole cover will provide access to the outlet structure and a 24" access pipe will provide access to the Chambers adjacent to the structure. From the surface, through this access, the sediment may be measured at this location by measuring the amount of sediment on the side of the structure with the 24" access pipe (largest pipe in the structure). A stadia rod may be used to measure the depth of sediment, if any, in this outlet structure. If the depth of sediment is in excess of 3 inches (76 mm), then this row should be cleaned with high pressure water through a culvert cleaning nozzle. This would be carried out through an upstream structure. CCTV inspection of this row can be deployed through this access port to determine if any sediment has accumulated in the inlet row.

5. CDS Unit – Particle Separator

Inspection and Maintenance of the CDS unit shall follow the manufacturer's guidelines attached to this manual.

Inspection and Maintenance Reporting

The Owner will maintain copies of the inspection reports and will submit annual inspection reports to City of Methuen Conservation Commission on an annually basis, on or before December 31 of each year.

Stormwater System Inspection Report

General Information			
Location: 33 Danton Drive			
Date of Inspection		Start/End Time	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Purpose of Inspection			
Weather Information			
Has it rained since the last inspection? ❑Yes ❑No			
Weather at time of this inspection?			

Site-Specific Stormwater Devices

	Description	Installed and Operating Properly?	Corrective Action Needed	Date for Corrective Action/Responsible Person
1		❑Yes ❑No		
2		❑Yes ❑No		
3		❑Yes ❑No		
4		❑Yes ❑No		
5		❑Yes ❑No		
6		❑Yes ❑No		
7		❑Yes ❑No		
8		❑Yes ❑No		

Overall Site Issues

	Description		Corrective Action	Date for Corrective Action/Responsible Person
1	Are all slopes properly stabilized?	❑Yes ❑No		
2	Are natural resource areas (e.g., streams, wetlands, etc.) being subjected to erosion?	❑Yes ❑No		
3	Are discharge points free of sediment deposits?	❑Yes ❑No		

Certification Statement:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name:

Signature:

Date: