Skate Park at Kiwanis Park

15 & 19 Loudon Road
Concord, NH 03301

PREPARED FOR

City of Concord
41 Green Street
Concord, New Hampshire 03301
603.225.8610

PREPARED BY

2 Bedford Farms Drive
Suite 200
Bedford, New Hampshire 03110
603.391.3900

February 18, 2026

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Appendices

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1

Introduction

This report has been prepared by VHB to provide a brief description of existing and proposed drainage areas, design methodology, soil characteristics, and a summary of peak discharge rates for the project area. The proposed project will require review by the City of Concord.

The Site is located off of Loudon Road in Concord, New Hampshire (see Figure 1: Site Location Map). The site is owned by the City of Concord, and the 14.9-acre parcel is currently developed with a sports arena, associated parking field, skate park, and an accessory building. The Project Site consists of approximately 1.4-acres that will be disturbed during the construction of the new skate park and associate parking. The Site is bounded by the Merrimack River to the west and north, a State owned property to the east, and Loudon Road to the south. There is a wetland resource to the south of the Project Site, along with a channel to the east of the Site. No impacts to either the wetland resource or channel are expected with the development of the new skate park project.

The Project Site consists of bituminous asphalt paving, gravel surfaces, woodland, and grassed land cover. Under existing conditions, stormwater runoff drains to the Merrimack River through an open channel and via overland flow. Within the proposed development area, stormwater runoff is primarily directed to the open channel via overland flow and proceeds to the Merrimack River. The proposed surface sand filter will provide water quality treatment, groundwater recharge, and water quantity control to properly mitigate the increase in new impervious area created by the Project. Wherever possible, existing drainage and grading patterns were maintained in the proposed design. The project is the first phase of the overall master plan vision for the Kiwanis Park and Everett Arena. The installed stormwater measures are temporary for this phase until the full plan is built out with the permanent drainage design and mitigation measures.

A hydrologic model was developed to evaluate the existing and proposed drainage conditions on the Site. The 2-year storm, under existing conditions, produces 0.0 cfs whereas under proposed conditions peak runoff rates produce 0.1. Similarly, in the 100-year storm, existing condition runoff is 3.2 cfs, where in the proposed conditions runoff rates are 5.1, however, is in close proximity to the Merrimack River and will not impact any property. It should be noted that the full build out of the master plan includes full stormwater management measures to be implemented and replace the measures installed under this initial skate park phase. The pre- and post-development peak discharge rates are presented in the Stormwater Management Impacts Section of this report.

2

Existing Conditions

2.1 Description of Contributing Areas

The study area for the development is primarily comprised of developed land within the Merrimack River watershed (see Figure 2: Existing Conditions Drainage Plan). The existing drainage study area is 2.3-acres in size and is extremely flat within the proposed development area with elevations ranging from 230′ up to 233.′ The study area is developed bituminous asphalt paving, gravel surfaces, an accessory building, woodland, and grass with trees to the east and south.

The study area consists of one drainage area that discharges to the Merrimack River through an open channel.

Table 1 summarizes the study area and its characteristics.

Table 1: Drainage Area Characteristics Summary (Existing Conditions)

Discharge Point		Sub-Area(s)	Area (Acres)	Tc (Min.)	CN
DP-1	Merrimack River	EX-1	2.3	17.1	47
Total			2.3	n/a	47*

* Weighted CN Value

2.2 Soil Conditions

The study area is comprised of several different soil types as defined by the Natural Resources Conservation Service (NRCS). As part of the required site investigations before development on the project site can occur, a Site Specific Soil Investigation was performed onsite, on November 19, 2024. The findings of that report are listed in Table 2, below, and is included in this Report's Appendices. Table 2, Soil Types, lists the designations, names, and groups of the soils located within the study area. The Appendices contains a copy of the soil mapping and soil types found within the study area.

Table 2: Soil Types

Soil Designation	Soil Name	Hydrologic Soil Group
34A/P	Wareham – Mixed, mesic Humaqueptic Psammaquents	C
34C/P	Wareham – Mixed, mesic Humaqueptic Psammaquents	C
34D/P	Wareham – Mixed, mesic Humaqueptic Psammaquents	C
26A	Windsor – Taxonomic class: Mixed, mesic Typic Udipsamments	A
26B	Windsor – Taxonomic class: Mixed, mesic Typic Udipsamments	A
26C	Windsor – Taxonomic class: Mixed, mesic Typic Udipsamments	A
26D	Windsor – Taxonomic class: Mixed, mesic Typic Udipsamments	A
26E	Windsor – Taxonomic class: Mixed, mesic Typic Udipsamments	A
200A/haade	Udorthents, refuse substratum	*
200B/haade	Udorthents, refuse substratum	*
200C/haade	Udorthents, refuse substratum	*
200D/haade	Udorthents, refuse substratum	*
299A/abhaa	Udorthents, smoothed Paved/Developed areas	A
299B/abhaa	Udorthents, smoothed Paved/Developed areas	A
299A/abaaa	Udorthents, smoothed Buried Windsor soils	A
299B/abaaa	Udorthents, smoothed Buried Windsor soils	A

299C/abaaa	Udorthents, smoothed Buried Windsor soils	A
299D/abaaa	Udorthents, smoothed Buried Windsor soils	A
7D/hahde	Fluvaquents – Concrete-line drainage ditch	**

* Represents soil between the bank of the Merrimack River and the parking lot of the arena. Materials unearthed primarily contained ash and burnt construction materials including wood, brick, metals, and glass. Infiltration testing was not performed to determine a Ksat value. Due to the absence of natural soil, a drainage class and hydrologic soil group were not assigned.

** Represents the concrete-lined drainage ditch that extends in a straight line from an outlet in the bank located north of Loudon Road to the Merrimack Riverbank. Direct observation of the soils beneath the ditch was not possible such that determination of drainage class, parent material, Ksat value and Hydrological Soil Group was not possible. It is assumed that the parent materials are likely Windsor soils in upland areas and Wareham soils where excavation intercepts the groundwater table.

2.3 Existing Hydrologic Flow Patterns

Stormwater runoff from the existing study area flows generally from north to south from the higher elevation terrain elevations towards the southern drainage system.

The following describes the existing stormwater flow pattern for the sub area.

› Sub Area EX-1 consists of bituminous asphalt pavement, gravel surfaces, woodland, and grass and flows from west to east towards the open channel via overland flow. From the open channel, stormwater is directed to the Merrimack River (DP-1)

3

Proposed Conditions

3.1 Description of Contributing Areas

The proposed development for the study area includes the construction of a new skate park. The project will also include the construction of pedestrian amenities and walkways, landscaping, drainage, and utility improvements. Temporary and permanent erosion control measures will be incorporated into the site design. (See Figure 3: Proposed Conditions Drainage Plan)

The proposed conditions sub-areas are comprised of the same 2.3-acre study area represented in the existing conditions drainage analysis. The study area has been divided into 2 subcatchments that discharge into the same design point as in the existing conditions analysis. The proposed development will add approximately 0.7-acres of impervious area to the site with the remaining areas of the development covered with landscaping, grass, existing vegetation, and/or current existing land cover.

Table 3 summarizes the proposed sub areas and their characteristics.

Table 3: Drainage Area Characteristics Summary (Proposed Conditions)

Discharge Point		Sub-Area(s)	Area (Acres)	Tc (Min.)	CN
DP-1	Merrimack River	PR-1	1.1	6.0	86
		PR-2	1.2	14.7	44
Total			2.3	n/a	64*

* Weighted CN Value

3.2 Proposed Hydrologic Flow Patterns

The proposed development has been designed to direct the stormwater runoff from the site's impervious areas into one surface sand filter for water quality treatment and peak rate control which will then discharge towards existing flow patterns. Runoff from the remaining areas within the study area will generally maintain their existing overland flow patterns.

The following describes the proposed stormwater flow patterns for each of the sub areas.

- Sub Area PR-1 consists of the new skate park, pedestrian amenities, sidewalk, and gravel parking field. The area is primarily impervious and runs to the surface sand filter before being discharged to DP-1 via an existing enclosed drainage pipe network that discharges to the Merrimack River (DP-1).

- Sub Area PR-2 consists of the remaining area of EX-1 that will not be developed. The area runs to an open channel via overland flow and is then discharged to the Merrimack River (DP-1).

The proposed development will add approximately 0.7-acres of impervious area to the studied watershed. As a result, the peak stormwater runoff rates will increase from pre- to post-development conditions. However, to mitigate the increase in peak runoff rates, one surface sand filter has been incorporated into the design. The basin will mitigate the increased runoff rates by restricting stormwater outflow from the basin through the use of an outlet control structure.

4

Methodology & Design Criteria

VHB evaluated the hydrologic and hydraulic impacts for proposed development's stormwater runoff. VHB analyzed the proposed development's hydrologic impacts using the Soil Conservation Service (SCS) Technical Release 20 (TR-20) methodology. The following section summarizes the design parameters/constraints that were used during the drainage design for this development under the SCS and Rational Methodologies. Additionally, this section summarizes the methodology used for the development's proposed erosion control and stormwater treatment methods.

4.1 Hydrologic Model Description

VHB analyzed the proposed developments stormwater runoff impacts using the SCS TR-20 methodology. The hydrologic program HydroCAD, as developed by HydroCAD Software Solutions, LLC., was utilized to compute and develop the stormwater runoff model. HydroCAD's SCS TR-20 program is designed to model complex watersheds, such as the watershed analyzed in this report. The complexity of the watershed has been based on multiple land uses (surface conditions) with varying soil conditions and inter-connected sub-watersheds reflecting complex hydrologic flow patterns.

4.1.1 Design Storms

VHB analyzed the proposed stormwater impacts for the 2, 10, 25, and 100-year design storms per the City of Concord requirements. These rainfall events are based on a 24-hour storm duration using a Type III distribution curve. The appendices contain copies of the rainfall data charts used in the calculations.

4.1.2 Curve Number

VHB developed weighted curve numbers for each sub-area based on the different ground covers and hydrologic soil group types found within each area. The curve numbers were based on the SCS TR-55 methodology and are included in hydrologic calculations.

4.1.3 Travel Times & Time of Concentration

VHB calculated the Travel Times (Tt) and the Time of Concentrations (Tc) for each of the individual sub-areas using the hydraulically most distant point within each area. A minimum time of 6 minutes was used in the calculations. The Tt's and Tc's were based on SCS TR-55 methodology and are included in hydrologic calculations.

4.2 Stormwater Detention

The proposed development increases the amount of impervious area from that of the existing conditions; as a result, the runoff curve numbers will increase for the proposed conditions. The higher curve numbers will increase the calculated stormwater runoff rate from that of the existing site, therefore, stormwater detention has been proposed for this project. This detention area, which consists of a surface sand filter, will mitigate the increased stormwater runoff rates by infiltration/detaining water and using an outlet control structure to reduce the proposed stormwater discharge rates from the site.

VHB used the following design parameter and criteria to design the detention areas:

- Design Storms: 2, 10, 25, and 100-year
- Detention Time: Less than 72 Hours

Refer to the appendices for further information and design calculations.

Table 4: Surface Sand Filter Characteristics Summary

Characteristic		Pond #1
Storage Volume (cf)		9,295
Max. Storage Height (ft)		230.80
Peak Water Elevation (ft)	2 Year	228.60
	10 Year	229.78
	25 Year	230.22
	50 Year	230.53
	100 Year	230.76

4.2.1 Outlet Control Structure

The stormwater that discharges from basin will be controlled through an outlet control structure. The outlet control structure has been designed to reduce the peak outflow rates from the basin for the design storm events.

4.3 Base Calculations (GRV and WQV)

Computations can be found in Appendix A.

5

Stormwater Management Impacts/Conclusion

5.1 Stormwater Quality Mitigation

Under the proposed conditions, the peak flow rates were calculated for the 2, 10, 25, 50 and 100-year storm events. The peak runoff rates for the proposed conditions, in the absence of mitigation, are anticipated to increase over the existing condition rates. These peak flow increases are to be reduced to below current peak runoff rates at the Discharge Point by routing the runoff through the proposed surface sand filter. The proposed development will incorporate a stormwater collection system that will capture runoff from impervious areas by means of area drains and proposed grades, and will then direct runoff to the proposed surface sand filter.

The surface sand filter is designed to attenuate site runoff by utilizing restrictive outlet control structure that will cause excess runoff to be temporarily detained within the system. The outlet structure will meter outflow rates from the detention area, such that the outflow will be approximately equal to or below the existing flow rates for the design storm events.

Table 5 provides a summary of the peak stormwater runoff rates from the proposed development. For the design storms (2-, 10-, 25-, 50-, and 100-year) at the discharge point, the peak stormwater runoff rate is being reduced or matched, with exception to the 2-year and 100-year storm, thus having a positive impact not only on site but on all stormwater areas downstream of our site.

The 2-year storm, under existing conditions, produces 0.0 cfs whereas under proposed conditions peak runoff rates produce 0.1. Similarly, in the 100-year storm, existing condition runoff is 3.2 cfs, where in the proposed conditions runoff rates are 5.1, however, is in close proximity to the Merrimack River and will not impact any property. It should be noted that the full build out of the master plan includes full stormwater management measures to be implemented and replace the measures installed under this initial skate park phase. The pre- and post-development peak discharge rates are presented in the Stormwater Management Impacts Section of this report.

Table 5: Peak Stormwater Runoff Rate Summary (cfs)

Discharge Point		Condition	2-yr	10-yr	25-yr	50-yr	100-yr
DP-1	Merrimack River	Existing	0.0	0.3	1.2	2.1	3.2
		Proposed	0.1	0.3	1.1	2.1	5.1

5.2 Stormwater Quality Mitigation – Best Management Practices (BMP's)

The proposed Stormwater Management System contains Best Management Practices (BMP's) that will provide treatment of site generated stormwater runoff. Infiltration systems have been used to achieve 90% removal of Total Suspended Solids (TSS), 60% total nitrogen (TN), and 65% total phosphorus (TP) per the New Hampshire Volume 2 – Post-Construction Best Management Practices Section and Design Manual.

The proposed BMPs are described below:

5.2.1 Catch Basins with Sumps

Stormwater from the paved surfaces on-site will be collected in catch basins with sumps (3' deep). Catch basin sumps are effective pollution control devices for removal of large particulate and adsorbed pollutants. Catch basins with sumps are designed to collect sediment particles that are the largest constituents of the pollutant load in urban runoff. Regular maintenance and cleaning of catch basins is required to ensure adequate performance of these structures.

5.2.2 Surface Sand Filter

The proposed surface sand filter has been designed to handle the 100-year storm event and will function as a water quality sedimentation basin.

5.3 Erosion Control Measures

5.3.1 Temporary Erosion Control

During construction of the proposed development, the contractor shall be responsible for installation and maintenance of temporary sedimentation and erosion control measures to prevent off-site tracking and waterborne loss of earth sediment and debris. The specific measures proposed as a part of the project plan are shown in the Site Plan Package on the Sedimentation and Erosion Control Plan and the Erosion Control Details.

Removal of temporary erosion control measures will be prohibited until paving has been installed and vegetation (grass) is well established.

5.3.2 Permanent Erosion Control

At the completion of construction, all soils will be permanently stabilized by one or more of the following measures:

- Parking/Access: Driveways, parking areas and access roads will be stabilized with bituminous concrete pavement.
- Landscaped Areas: All disturbed areas, not permanently stabilized by pavement or buildings, will be covered with bark mulch, stone, sod, or a minimum of six (6) inches of topsoil and seeded.

Additionally, all catch basins will be constructed with deep sumps to collect sediment from parking areas and access roads.

5.4 Conclusion

By implementing standard stormwater management techniques, the proposed development is designed to successfully mitigate its impact on peak stormwater runoff rates. Furthermore, stormwater quality issues can be addressed through the proposed implementation of standard practices (i.e. surface sand filter) that are accepted by the City of Concord.

6

Figures

- Figure 1: Site Location Map
- Figure 2: Existing Conditions Drainage Area Plan
- Figure 3: Proposed Conditions Drainage Area Plan

0 500 1000 Feet

Site Location Map
Skate Park at Kiwanis Park
15 & 19 Loudon Road
Concord, New Hampshire

Figure 1

February 2026

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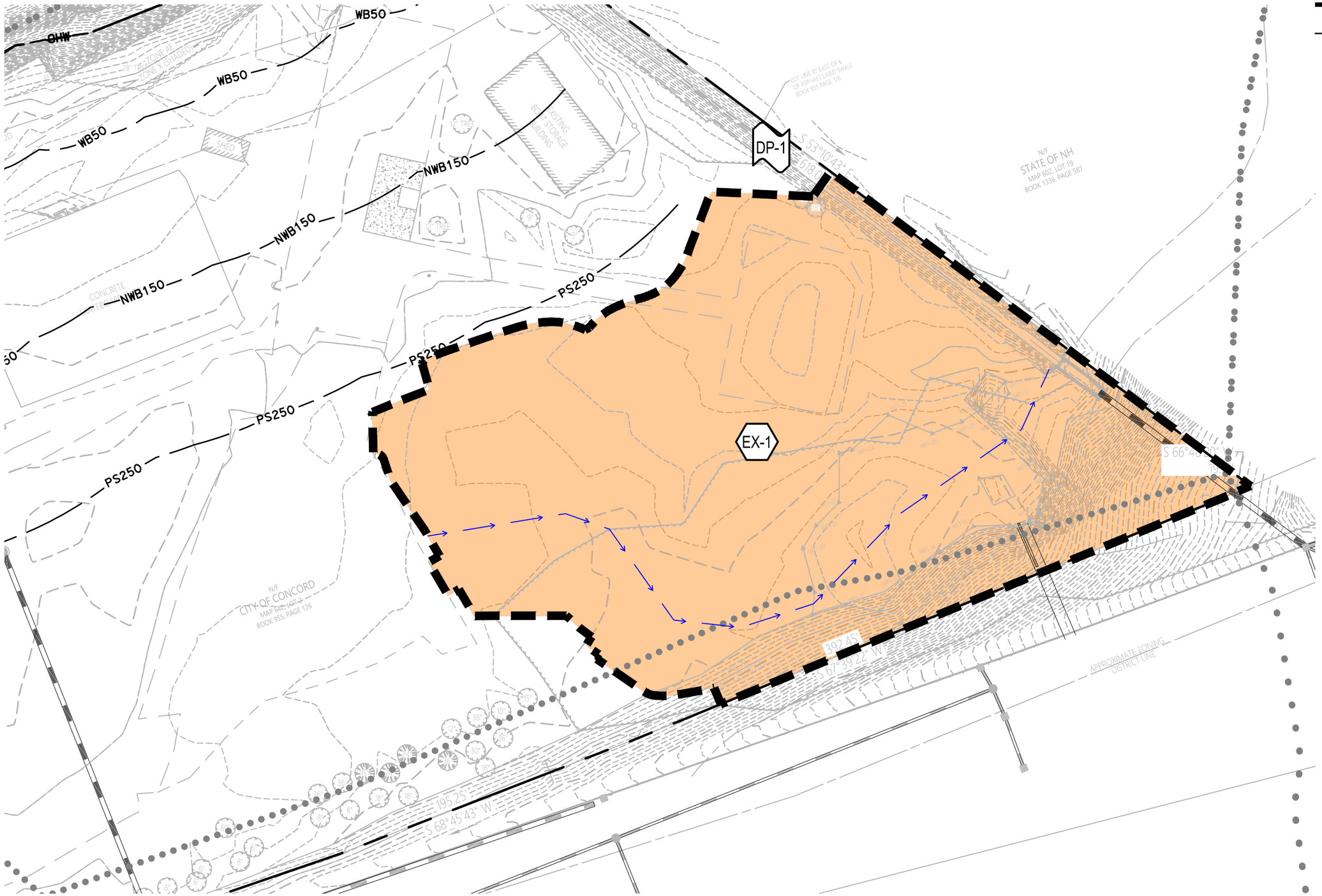


Legend

SYMBOLS

- DESIGN POINT
- DRAINAGE AREA DESIGNATION
- POND
- REACH

LINETYPES

- DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION FLOW LINE
- NRCS SOIL TYPE BOUNDARY
- LIMITS OF SITE SPECIFIC SOIL SURVEY
- SITE SPECIFIC SOIL BOUNDARY

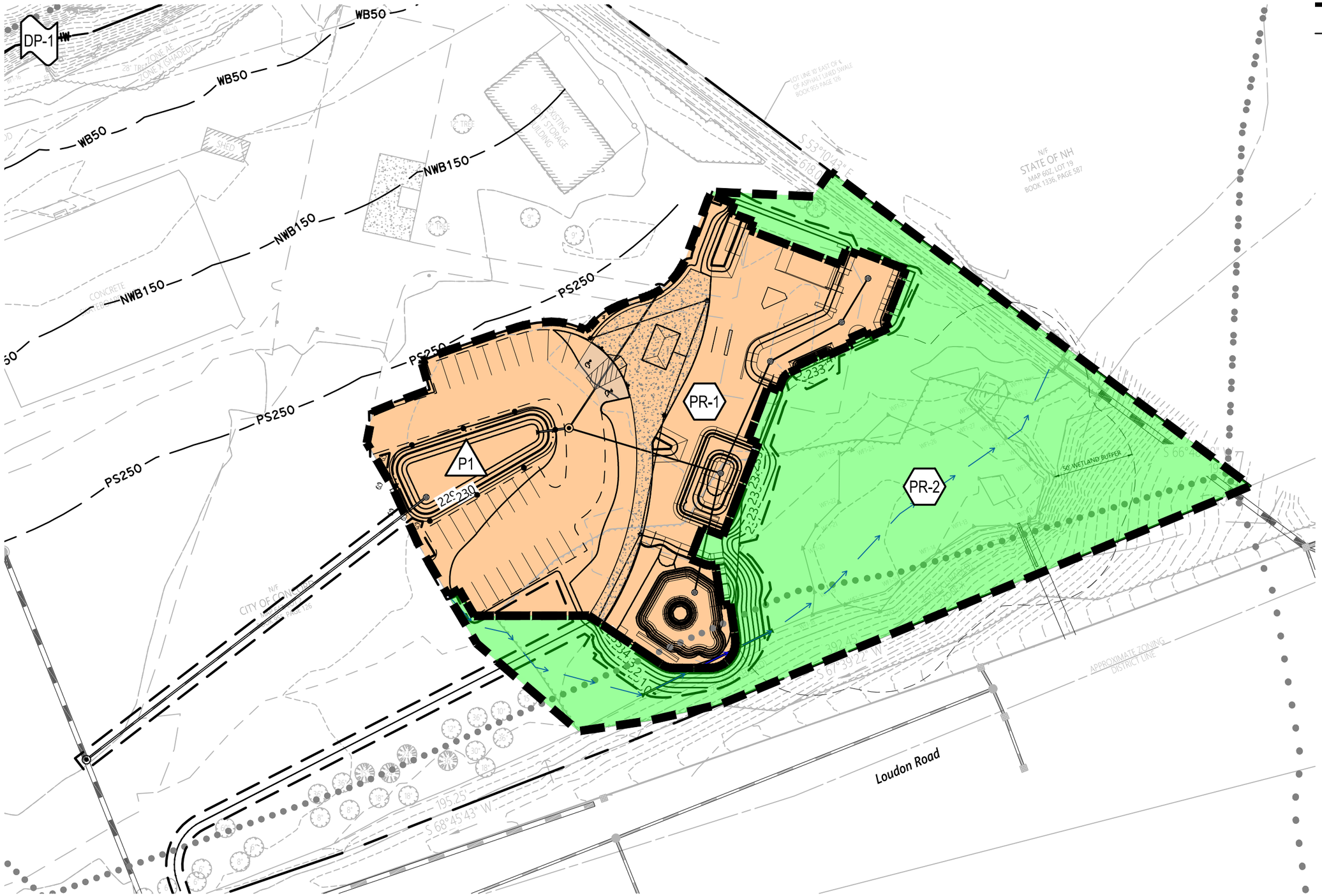
0 30 60 Feet

Existing Conditions Drainage Plan
Skate Park at Kiwanis Park
15 & 19 Loudon Road
Concord, New Hampshire

Figure 2

February 2026

\\vhb.com\gbl\proj\Bedford\52938.11 Kiwanis Park\cad\ld\Eng\Stormwater\Phase 1\52938.11-PR-Drainage.dwg



0 30 60 Feet

Proposed Conditions Drainage Figure **Figure 3**
Skate Park at Kiwanis Park
15 & 19 Loudon Road February 2026
Concord, New Hampshire

Appendix A: Support Data

- FEMA Map
- Site Specific Soils Map and Report
- Groundwater Recharge Volume Calculations (GRV)
- BMP Worksheets

FEMA Map

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was New Hampshire State Plane (FIPSZONE 2800). The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC- 3, #9202
1315 East- West Highway
Silver Spring, MD 20910- 3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was derived from U.S. Geological Survey Digital Orthophoto Quadrangles produced at a scale of 1:12,000 from photography dated 1998 or later. These images were recast by NH GRANIT onto the NH State Plane coordinate system.

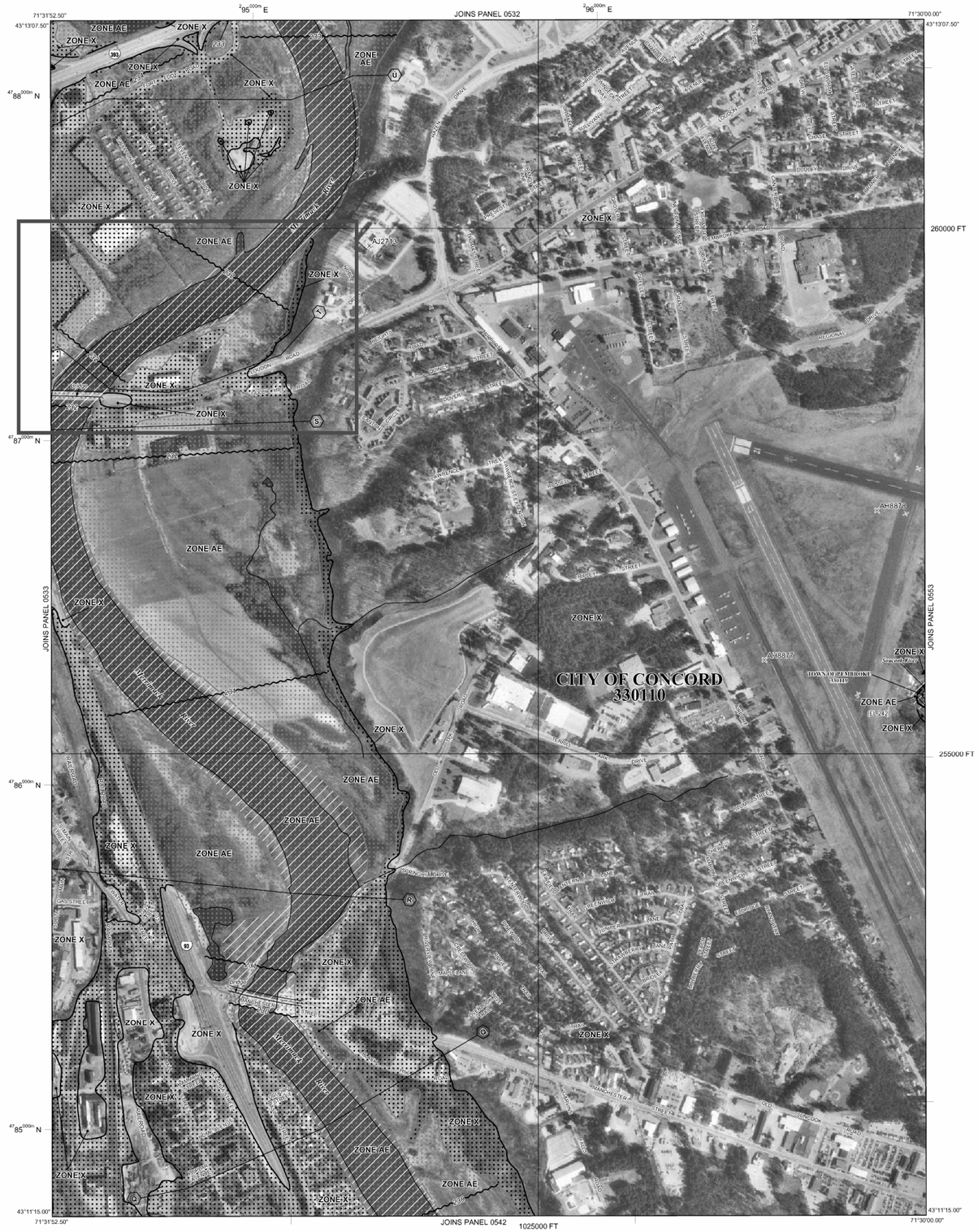
This map reflects more detailed and up- to- date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de- annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1- 800- 358- 9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, *a Flood Insurance Study report*, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1- 800- 358- 9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1- 877- FEMA MAP** (1- 877- 336- 2627) or visit the FEMA website at http://www.fema.gov/.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- **ZONE A** No Base Flood Elevations determined.
- **ZONE AE** Base Flood Elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- **ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- **ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- **ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- **ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- **ZONE D** Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 967) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 19
- 6000000 FT — 5000-foot grid values: New Hampshire State Plane coordinate system, (FIPSZONE 2800), Transverse Mercator
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
April 19, 2010
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1- 800- 638- 6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0534E

FIRM
FLOOD INSURANCE RATE MAP
MERRIMACK COUNTY, NEW HAMPSHIRE
(ALL JURISDICTIONS)

PANEL 534 OF 705
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CONCORD, CITY OF	330119	0534	E
PEMBROKE, TOWN OF	330119	0534	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
33013C0534E

EFFECTIVE DATE
APRIL 19, 2010

Federal Emergency Management Agency

Site Specific Soils Map and Report

Memorandum

To: Dave Fenstermacher, PE

Date: November 22, 2024
Project #: 52938.11

From: Sherrie Trefry, CSS
Trent Delehanty

Re: Site-Specific Soil Mapping Report

Vanasse Hangen Brustlin, Inc. (VHB) has prepared this Site-Specific Soil Mapping Report to accompany the soils map that was prepared for the City of Concord for lots 64/Z 1 and 64/Z 2 identified as Kiwanis Park (the site). Certified Soil Scientist, Sherrie Trefry, CSS #93, developed a soils map on November 19th of 2024 to classify the soils within the 10.1±–acre site located at 15 Loudon Road in Concord, NH. The map will be used to support the Stormwater Management Report required for a NHDES Alteration of Terrain permit application. This Site Specific Soil Map (SSSM) and Report were developed in accordance with Site-Specific Soil Mapping Standards for New Hampshire and Vermont, Special Publication No. 3, Version 7.0 (July 2021). The soils map was prepared on an existing conditions plan at a scale of 1" = 40' included as Attachment C.

The site's boundary is defined by the Merrimack River to the west and north. The southern boundary of the site is Loudon Road, and the eastern boundary is defined by the property line that is east of a concrete lined stormwater drainage channel. The site currently contains the Douglas N. Everett Arena, boat storage facility, two boat dock/launches, the Concord skate park, the Kiwanis waterfront park, and a large parking area. The site is currently being operated as a recreational park. A portion of the site was historically used as a training facility for fire fighters.

The site is located on a nearly level stream terrace that was formed in glacial fluvial sandy deposits. In review of historic photos dating back to the mid-1980s, the site has been disturbed in the recent past for the development of the boat house, boat launch, skate park development and paving to support storage and access to the boat facilities. It also appears that the site has been cleared and regraded to support this development east of the arena and its associated paved parking area. As a result, three test pit observations in this area revealed natural Windsor soils buried under several inches of sandy fill or a couple inches of pavement. Fill was not observed over Windsor soils on the east portion of the property approaching the stormwater drainage ditch. However, disturbance was observed within the forested area that contains the wetlands on the site. Observed disturbance in this area consisted of ruts from a vehicle and trash and debris from a previous encampment that was removed. Along the northern portion of the property between the Merrimack River and the existing parking lot near the Douglas N. Everett Arena no natural soils were observed in the excavated test pits. Test pits contained layers of ash and debris that may be attributed to previous firefighting training activities. Disturbed map units and modifiers were used to identify areas of soils altered or disturbed by human influence. See Attachment A for detailed information about the units and modifiers.

The portion of the site that was relatively undisturbed consisted of loamy fine sands formed in sandy glacial outwash on a glaciofluvial terrace above the Merrimack River. Windsor soils are very deep, excessively drained soils. Saturated hydraulic conductivity is high or very high. In the same catena, Wareham soils were identified in the wetland areas. These soils are very deep, poorly drained soils formed in glacial outwash. Permeability is rapid throughout the solum; however, a high water table results in a Hydrologic Soil Group C designation. See Attachment B for Official Soil Descriptions.

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Memorandum

Test Pit Observations:

Wareham	Located in the constructed drainage basin. Very deep, poorly drained sandy soils formed in glacial outwash on a terrace of the Merrimack River. Soil classification: Wareham Taxonomic class: Mixed, mesic Humaqueptic Psammaquents Soil was saturated to the surface at the time of observation.	

Depth	Horizon	Color	Texture	Structure	Consistence	Redox	Other observations
0-8"	A	10YR 2/2	Loamy Sand	Granular	Friable	None	Many fine roots Saturated to the surface
8-14"	Bw1	10YR 5/4	Loamy sand	Granular	Very friable	Concentrations: 5YR 5/6 Reductions: 10YR 4/2	Reductions and Oxidations begin at 8"
14-18"	Bw2	10 YR 4/3	Loamy sand	Granular	Very friable	Concentrations: 5YR 4/6 Reductions: 10YR 4/2	
18-34+"	Cg	10YR 4/2	Loamy fine sand	Single grain	Very friable	Concentrations: 7.5YR 4/6 Reductions: 10YR 5/1	

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Urban fill	Located in the northwestern portion of the site between the parking area and the Merrimack River. Multiple test pits observations between the river and the parking lot contained ash and debris presumably from fire fighting training activities. The fill was covered with approximately 7 inches of loam. Soil classification: Udipsamments Primarily buried ash and burnt construction materials including wood, brick, metals, and glass. During excavation no water was observed.	

Depth	Horizon	Color	Texture	Structure	Consistence	Redox	Other observations
0-7″	A	10YR 3/2	Loamy Sand	Granular	Very friable	None	Many fine roots
7″-8′	Cu					Some buried metals have oxidized, no redox observed	Layered profile of fill including ash, bottles, iron rods, brick, metals, and wood.

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Windsor	Located in the northeastern portion of the site adjacent to the driveway to the rowing boat house. The pit was located on a 0-3% slope. Very deep, excessively drained soils formed in sandy outwash or eolian deposits on a terrace above the Merrimack River. Soil classification: Windsor soil buried at 12" Taxonomic class: Mixed, mesic Typic Udipsamments No observed seasonal high-water table or bedrock within profile. No coarse fragments were found in natural soil.	

Depth	Horizon	Color	Texture	Structure	Consistence	Redox	Other observations
0-12"	1C	10 YR 4/4	Loamy sand	Granular	Friable	no redox	50% Coarse fragments, gravel, rounded cobbles
12-13"	2A	10YR 3/2	Loamy sand	Granular	Friable	no redox	
13-15"	2Bw	2.5Y 4/4	Loamy fine sand	Massive	Very friable	no redox	No coarse fragments, mixed colors
15-48"	2C	2.5Y 5/4	Loamy fine sand	Massive	Very friable	no redox	Slight color variations in C layers but no clear boundaries

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Soil symbol	Soil series; Taxonomic class	Soil Unit Map Description
34A/P	Wareham Mixed, mesic Humaqueptic Psammaquents	Very deep, poorly drained sandy soils formed on a glacial fluvial terrace above the Merrimack River. The map unit represents the wetlands located on the site particularly in the southeast corner. These wetlands are formed from inputs from surrounding upland areas and inputs from a culvert under Loudon Road. This soil is on a 0-3% slope. Hydrologic Soil Group C.
34C/P	Wareham Mixed, mesic Humaqueptic Psammaquents	Very deep, poorly drained sandy soils formed on a glacial fluvial terrace above the Merrimack River. The map unit represents the wetlands located on the relatively steep banks of the wetland in the southeast corner. This soil is on a 8-15% slope. Hydrologic Soil Group C.
34D/P	Wareham Mixed, mesic Humaqueptic Psammaquents	Very deep, poorly drained sandy soils formed on a glacial fluvial terrace above the Merrimack River. The map unit represents the wetlands located on the relatively steep banks of the wetland in the southeast corner. This soil is on a 15-25% slope. Hydrologic Soil Group C.
26A	Windsor Taxonomic class: Mixed, mesic Typic Udipsamments	Very deep, excessively drained soils formed in sandy outwash or eolian deposits on a glacial fluvial terrace above the Merrimack River. This map unit represents undisturbed Windsor soils on the eastern portion of the site. This soil is on a 0-3% slope. Hydrologic Soil Group A.

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26B	Windsor Taxonomic class: Mixed, mesic Typic Udipsamments	Very deep, excessively drained soils formed in sandy outwash or eolian deposits on a glacial fluvial terrace above the Merrimack River. This map unit represents undisturbed Windsor soils on the eastern portion of the site. This soil is on a 3-8% slope. Hydrologic Soil Group A.
26C	Windsor Taxonomic class: Mixed, mesic Typic Udipsamments	Very deep, excessively drained soils formed in sandy outwash or eolian deposits on a glacial fluvial terrace above the Merrimack River. This map unit represents undisturbed Windsor soils on the banks of the Merrimack River, and banks outside of the wetlands near the eastern property boundary. This soil is on a 8-15% slope. Hydrologic Soil Group A.
26D	Windsor Taxonomic class: Mixed, mesic Typic Udipsamments	Very deep, excessively drained soils formed in sandy outwash or eolian deposits on a glacial fluvial terrace above the Merrimack River. This map unit represents undisturbed Windsor soils on the banks of the Merrimack River, and banks outside of the wetlands near the eastern property boundary. This soil is on a 15-25% slope. Hydrologic Soil Group A.
26E	Windsor Taxonomic class: Mixed, mesic Typic Udipsamments	Very deep, excessively drained soils formed in sandy outwash or eolian deposits on a glacial fluvial terrace above the Merrimack River. This map unit represents undisturbed Windsor soils on the banks of the Merrimack River, and banks outside of the wetlands near the eastern property boundary. This soil is on a 25-50% slope. Hydrologic Soil Group A.
200A/haade	Udorthents, refuse substratum	This map unit represents an area between the bank of the Merrimack River and the parking lot of the arena. Materials unearthed primarily contained ash and burnt construction materials including wood, brick, metals, and glass. Infiltration testing was not performed to determine a Ksat value. Due to the absence of the natural soil, a drainage class and hydrologic soil group were not assigned. The soil in this map unit is located on a 0-3% slope.

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200B/haade	Udorthents, refuse substratum	This map unit represents an area between the bank of the Merrimack River and the parking lot of the arena. Materials unearthed primarily contained ash and burnt construction materials including wood, brick, metals, and glass. Infiltration testing was not performed to determine a Ksat value. Due to the absence of the natural soil, a drainage class and hydrologic soil group were not assigned. The soil in this map unit is located on a 3-8% slope.
200C/haade	Udorthents, refuse substratum	This map unit represents an area between the bank of the Merrimack River and the parking lot of the arena. Materials unearthed primarily contained ash and burnt construction materials including wood, brick, metals, and glass. Infiltration testing was not performed to determine a Ksat value. Due to the absence of the natural soil, a drainage class and hydrologic soil group were not assigned. The soil in this map unit is located on a 8-15% slope.
200D/haade	Udorthents, refuse substratum	This map unit represents an area between the bank of the Merrimack River and the parking lot of the arena. Materials unearthed primarily contained ash and burnt construction materials including wood, brick, metals, and glass. Infiltration testing was not performed to determine a Ksat value. Due to the absence of the natural soil, a drainage class and hydrologic soil group were not assigned. The soil in this map unit is located on a 15-25% slope.
299A/abhaa	Udorthents, smoothed Paved/Developed areas	This map unit represents the portion of the site that is covered with impervious surfaces and includes the footprint of the parking lot, driveways, buildings, and skate park. One test pit was excavated in the paved parking lot east of the arena. Windsor soils were observed below the paved area. The drainage class is excessively drained if the impervious surface layer were removed. The Ksat value is high and the Hydrologic Soil Group is A. This soil is on a 0-3% slope.
299B/abhaa	Udorthents, smoothed Paved/Developed areas	This map unit represents the portion of the site that is covered with impervious surfaces and includes the footprint of the parking lot, driveways, buildings, and skate park. One test pit was excavated in

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		the paved parking lot east of the arena. Windsor soils were observed below the paved area. The drainage class is excessively drained if the impervious surface layer were removed. The estimated Ksat value is high and the Hydrologic Soil Group is A. This soil is on a 3-8% slope.
299A/abaaa	Udorthents, smoothed Buried Windsor soils	This map unit represents portions of the site that have been filled over underlying Windsor soils. Test pits revealed 8-12 inches of loamy sands and loamy fine sands over buried natural soils. Very deep, excessively drained Windsor soils formed in sandy outwash or eolian deposits on the glaciofluvial terrace landform. Estimated Ksat value is high. Hydrologic Soil Group A. This soil is on a 0-3% slope.
299B/abaaa	Udorthents, smoothed Buried Windsor soils	This map unit represents portions of the site that have been filled over underlying Windsor soils. Test pits revealed 8-12 inches of loamy sands and loamy fine sands over buried natural soils. Very deep, excessively drained Windsor soils formed in sandy outwash or eolian deposits on the glaciofluvial terrace landform. Estimated Ksat value is high. Hydrologic Soil Group A. This soil is on a 3-8% slope.
299C/abaaa	Udorthents, smoothed Buried Windsor soils	This map unit represents portions of the site that have been filled over underlying Windsor soils. Test pits revealed 8-12 inches of loamy sands and loamy fine sands over buried natural soils. Very deep, excessively drained Windsor soils formed in sandy outwash or eolian deposits on the glaciofluvial terrace landform. Estimated Ksat value is high. Hydrologic Soil Group A. This soil is on a 8-15% slope.
299D/abaaa	Udorthents, smoothed Buried Windsor soils	This map unit represents portions of the site that have been filled over underlying Windsor soils. Test pits revealed 8-12 inches of loamy sands and loamy fine sands over buried natural soils. Very deep, excessively drained Windsor soils formed in sandy outwash or eolian deposits on the glaciofluvial terrace landform. Estimated Ksat value is high. Hydrologic Soil Group A. This soil is on a 15-25% slope.

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7D/hahde	Fluvaquents Concrete-line drainage ditch	This map unit represents the concrete-lined drainage ditch that extends in a straight line from an outlet in the bank located north of Loudon Road to the Merrimack Riverbank. Direct observation of the soils beneath the ditch was not possible such that determination of drainage class, parent material, Ksat value and Hydrological Soil Group was not possible. It is assumed that the parent materials are likely Windsor soils in upland areas and Wareham soils where excavation intercepts the groundwater table.

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Disturbed Map Units

This edition of the New Hampshire State-Wide Numerical Soil Legend contains eleven distinct map units used for identifying areas of soils altered or disturbed by human influence and the addition of one naturally formed map unit. These map units were designed for the Order 2 and Order 3 levels of mapping intensity, but can be used in Order 1 mapping if appropriate.

The definition of disturbed map units is intentionally brief and vague. Classification at the Great Group level allows for a wide range in soil properties and behavioral characteristics. The variability in soil properties typically requires on-site investigations before any interpretation can be developed. The map unit descriptions are intended to provide guidance in differentiating map units. The author of the soil map is expected to provide additional information to reflect the nature of the disturbed areas within the survey area.

I. Excavated land

300 Udipsamments

This map unit is characterized by soil textures of loamy fine sand to sand and gravel throughout the entire particle-size class control section (25 - 100 cm or 10 - 40 inches). Saturated hydraulic conductivity (K_{sat}) is high or very high. Drainage class ranges from excessively drained to well drained. The Hydrologic Soil Group (HSG) is A. Typical sand pit.

350 Udipsamments, wet substratum

This map unit is characterized by soil textures of loamy fine sand to sand and gravel throughout the entire particle-size class control section (25 - 100 cm or 10 - 40 inches). Saturated hydraulic conductivity (K_{sat}) is high or very high. Drainage class ranges from moderately well drained to somewhat poorly drained.

400 Udorthents, sandy or gravelly

This map unit typically includes the following concepts: 1) very gravelly (> 35%) sand or very gravelly loamy sand; Or 2) sand or loamy sand textures that may have lenses of loamy very fine sand or finer somewhere in the particle-size class control section (25 - 100 cm or 10 - 40"). Saturated hydraulic conductivity (K_{sat}) is high or very high. Drainage class ranges from excessively drained to somewhat poorly drained. Typical gravel pit.

Disturbed Map Units (continued)

500 Udorthents, loamy

This map unit is characterized typically by soil textures that are sandy loam, loam, or silt loam within the particle size control section (25 – 100cm or 10 – 40”). Saturated hydraulic conductivity (K_{sat}) is low through high. Drainage class ranges from well drained to somewhat poorly drained. These areas typically represent excavated glacial till or perhaps areas where sand and gravel was excavated down to the loamy underlying material.

550 Udorthents, Bedrock substratum

This map unit is characterized by soil textures of sandy loam, loam, or silt loam within the particle-size class control section (25 - 100 cm or 10 - 40 inches). These areas typically represent excavated soil materials where the range in depth to bedrock is 10 - 60 inches (25 - 152 cm). Saturated hydraulic conductivity (K_{sat}) is low through high. Drainage class ranges from somewhat excessively drained to somewhat poorly drained.

600 Endoaquents, loamy

This map unit represents areas where soil material was excavated down to, or near the water table. Soil material is typically sandy loam, loam or silt loam within the particle-size class control section (25 - 100 cm or 10 - 40 inches). Saturated hydraulic conductivity (K_{sat}) is low through high. Drainage class is poorly or very poorly drained. The Hydrologic Soil Group (HSG) is D.

900 Endoaquents, sandy or gravelly

This map unit represents areas where soil material was excavated down to / near the water table. This map unit is characterized typically by soil textures of: 1) very gravelly (> 35% gravel) sand or very gravelly loamy sand or; 2) sand or loamy sand textures that may have lenses of loamy very fine sand or finer somewhere in the particle-size class control section (25 - 100 cm or 10 - 40"). Saturated hydraulic conductivity (K_{sat}) is high or very high. Drainage class is poorly or very poorly drained. The Hydrologic Soil Group (HSG) is D. Typical gravel pit dug down to or close to the water table.

Disturbed Map Units (continued)

II. Filled land

100 Udorthents, wet substratum

This map unit represents areas that have been filled and leveled over what were originally hydric soils.

199 Dumps, bark chips, and organic material

This map unit consists of man-made deposits of bark, wood chips, sawdust, paper mill sludge, cinders, waste paper, ashes, and other similar refuse from the operation of paper mills and sawmills.

200 Udorthents, refuse substratum

This map unit represents alternating layers of soil and refuse such as in sanitary landfills. Closed landfills typically have 2 feet of loamy material capping the area.

299 Udorthents, smoothed

This map unit represents areas that have been cut and filled to create a large level or nearly level area. Soil material making up the map units typically came from the immediate area. School athletic fields are an example (unless they were created on hydric soils – see Map Unit 100).

III. Bottom Land

7 Fluvaquents

This map unit represents areas of various kinds of soil materials on the bottom lands of streams and rivers. The soil material ranges in texture from silt loam to sand and gravel within the particle-size class control section (25 - 100 cm or 10 - 40 inches). Drainage class is poorly or very poorly drained. The Hydrologic Soil Group (HSG) is D.

Disturbed Map Units (continued)

Catena Key for Excavated & Bottom Land

Disturbed Map Units	Map Unit						
	Drainage Class						
Parent Material	Excessively Drained	Somewhat Excessively Drained	Well Drained	Moderately Well Drained	Somewhat Poorly Drained	Poorly Drained	Very Poorly Drained
I. Excavated Land							
Typically sands	**300** Udipsamments nearly level	**300** Udipsamments nearly level	**300** Udipsamment nearly level	**350** Udipsamments wet substratum	**350** Udipsamments wet substratum	**900** Endoaquents sandy or gravelly	**900** Endoaquents, sandy or gravelly
Typically gravels	**400** Udorthents, sandy or gravelly	**400** Udorthents, sandy or gravelly	**400** Udorthents, sandy or gravelly	**400** Udorthents, sandy or gravelly	**400** Udorthents, sandy or gravelly	**900** Endoaquents sandy or gravelly	**900** Endoaquent, sandy or gravelly
Typically loams			**500** Udorthents, loamy	**500** Udorthents, loamy	**500** Udorthents, loamy	**600** Endoaquents loamy	**600** Endoaquent, loamy
Bedrock controlled loams		**550** Udorthents, Bedrock substratum	**550** Udorthents, Bedrock substratum	**550** Udorthents, Bedrock substratum	**550** Udorthents, Bedrock substratum	**600** Endoaquents loamy	**600** Endoaquent, loamy
III. Bottom Land							
Typically silt loam to sands and gravels						**7** Fluvaquents	**7** Fluvaquents

NOTE: Filled soils in Section II page 21 are too variable to place into the above key.

Disturbed Map Unit (Anthropogenic Soils) Supplement for New Hampshire DES AoT Site-Specific Soil Maps

Introduction

The NRCS NH State-Wide Legend, as amended, contains a number of distinct map units used for identifying areas of soils altered or disturbed by human influence. However, in preparing the required Site-Specific Soil Maps for compliance with NH Department of Environmental Services Alteration of Terrain (AoT) rules, additional information is often needed and desired. This supplement provides a means to supply the user a more detailed soil mapping unit description to meet this need.

Purpose

The purpose of the following map units is to provide Soil Scientists with additional soil mapping tools for disturbed sites (Anthropogenic soils). These map units are intended to enhance Site-Specific Soil Maps and interpretations, reflecting requirements under NHDES, Alteration of Terrain (AoT) regulations (Env-Wq 1500). This supplement allows for the creation of soil maps with mapping units that can be expanded beyond those listed in the USDA, NRCS NH State-Wide Numerical Legend and the standards of the National Cooperative Soil Survey.

Note that the disturbed soil supplement has been created by SSSNNE and is not a product of the NRCS or the National Cooperative Soil Survey. This supplemental legend can only be used in conjunction with the Site-Specific Soil Mapping standards and cannot be used to create a stand-alone soils map.

For the purposes of this supplement, the definition of disturbed soil, includes: areas where the natural soils have been partially removed and areas where human-transported soil material (HTM) has been placed on top of a native soil, other disturbed soil or bedrock, as defined by RSA 485-A: 6, VIII; RSA 485-A: 17, and NHDES Env-Wq 1500, etc.

Map Notation

Notation on the Site-Specific Soil Map completed to comply with the NH AoT rules should include the following disclaimer:

1. ***This detailed Site-Specific Soil Map conforms to the standards of SSSNNE Publication No. 3, as amended, "Site-Specific Soil Mapping Standards for NH and VT".***

2. ***This map has been prepared to comply with soil mapping requirements of RSA 485 A: 17and NHDES Env-Wq 1500, Alteration of Terrain.***

3. ***See accompanying narrative report for methodology, map symbol legend, and interpretations.***

4. ***Use of the map symbol denominators for disturbed or altered soils, is at the discretion of the Certified Soil Scientist.***

Map Symbol Denominators for Disturbed or Altered Soil Map Units

The map symbols for Site-Specific Soil Mapping of disturbed or altered soils in New Hampshire is a two-part symbol with parts separated by a forward slash (***/***).

The first part consists of the USDA-NRCS Disturbed Map Unit symbol from the NH State-Wide Numerical Soil Legend. The map symbol is composed of 1 to 3 digits followed by a capital letter designating slope.

The second part consists of symbols of the SSSNNE NH Disturbed or Altered Soil Supplement to the Site-Specific Soil Survey Standards, as detailed below. The disturbed map symbol is composed of 5 lower case letters.

A Site-Specific Map symbol for a map prepared for an AoT application would be formatted as follows: ***400A/aaaaa***

These New Hampshire Disturbed Soil Supplemental symbols can only be used in conjunction with the USDA-NRCS Disturbed Map Unit symbols for the NH Statewide Numerical Soil Legend.

Supplemental Symbols

Supplemental symbols may be used at the discretion of the Certified Soil Scientist who creates the Site-Specific Soil Survey. The five components of the Disturbed Soil Mapping Unit Supplement are as follows:

Symbol 1: Drainage Class
a -Excessively Drained
b-Somewhat Excessively Drained
c-Well Drained
d-Moderately Well Drained
e-Somewhat Poorly Drained
f-Poorly Drained
g-Very Poorly Drained
h-Not Determined

Symbol 2: Parent Material (of naturally formed soil only, if present)
a-No natural soil within 60”
b-Glaciofluvial Deposits (outwash/terraces of sand or sand and gravel)
c-Glacial till Material (active ice)
d-Glaciolacustrine very fine sand and silt deposits (glacial lakes)
e-Loamy/sandy over Silt/Clay deposits
f-Marine Silt and Clay deposits (ocean waters)
g-Alluvial Deposits (floodplains)
h-Organic Materials-Fresh water wetlands
i- Organic Materials-Tidal wetlands

Symbol 3: Restrictive/Impervious Layers

a-None
b-Bouldery surface with more than 15% of the surface covered with boulders
c-Mineral restrictive layer(s) are present in the soil profile less than 40 inches below the soil surface such as hard pan, platy structure or clayey texture with consistence of at least firm (i.e., more than 20 newtons). For other examples of soil characteristics that qualify for restrictive layers, see “Soil Manual for Site evaluations in NH” 2 Ed., (page 3-17, figure 3-14)
d-Bedrock in the soil profile; 0-20 inches
e-Bedrock in the soil profile; 20-60 inches
f-Areas where depth to bedrock is so variable that a single soil type cannot be applied, will be mapped as a complex of soil types
g-Subject to Flooding
h–Man-made impervious surface including pavement, concrete, or built-up surfaces (i.e., buildings) with no morphological restrictive layer within control section

Symbol 4: Estimated Ksat* (most limiting layer excluding symbol 3h above).

a- High.
b- Moderate
c- Low
d- Not determined *See “Guidelines for Ksat Class Placement” in Chapter 3 of the Soil Survey Manual, USDA

Symbol 5: Hydrologic Soil Group*

a-Group A
b-Group B
c-Group C
d-Group D
e-Not determined

*Excluding man-made surface impervious/restrictive layers

LOCATION WAREHAM MA +CT NH NY VT

Established Series
Rev. JFH-DGG-WHT
04/2005

WAREHAM SERIES

The Wareham series consists of very deep, poorly and somewhat poorly drained sandy soils formed in outwash on plains, deltas, and terraces. Slope ranges from 0 to 8 percent. Permeability is rapid throughout. Mean annual temperature is about 49 degrees F. and mean annual precipitation is about 47 inches.

TAXONOMIC CLASS: Mixed, mesic Humaqueptic Psammaquents

TYPICAL PEDON: Wareham loamy sand, in a hayfield at an elevation of about 35 meters. (Colors are for moist soils)

Oa--O to 1 inches, black (10YR 2/2) highly decomposed plant material (sapric material). (0 to 5 inches thick)

A--1 to 7 inches, very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak medium granular structure; very friable; many medium and fine roots; very strongly acid; abrupt wavy boundary. (6 to 10 inches thick)

Bw--7 to 17 inches, yellowish brown (10YR 5/4) loamy coarse sand; single grain; loose; common medium and fine roots; common medium prominent yellowish red (5YR 5/6) masses of iron accumulation and common medium distinct light brownish gray (10YR 6/2) iron depletions; very strongly acid; clear wavy boundary. (0 to 20 inches thick)

Cg1--17 to 37 inches, light brownish gray (2.5Y 6/2) loamy coarse sand; single grain; loose; few fine roots; common medium and coarse prominent strong brown (7.5YR 5/6) masses of iron accumulation and common medium and coarse faint light brownish gray (10YR 6/2) iron depletions; very strongly acid; clear wavy boundary. (10 to 30 inches thick)

Cg2--37 to 60 inches, pale olive (5Y 6/3) coarse sand; single grain; loose; many medium and coarse prominent light olive brown (2.5Y 5/6) masses of iron accumulations and brown (7.5YR 5/2) iron depletions; strongly acid.

TYPE LOCATION: Bristol County, Massachusetts, Town of Easton; 0.6 miles west of intersection of Routes 24 and 123; 100 feet north of Route 123; Lat. 42 degrees, 03 minutes, 24 seconds N. and 71 degrees 04 minutes 19 seconds W., NAD 27.

RANGE IN CHARACTERISTICS: Solum thickness ranges from 6 to 30 inches. Gravel content to a depth of about 40 inches ranges from 0 to 15 percent. Below 36 inches the gravel content ranges from 0 to 60 percent and cobblestones range from 0 to 3 percent. Reaction ranges from extremely acid through strongly acid throughout unless limed.

The A horizon, or Ap where present, has hue of 10YR or 2.5Y, value of 2 to 3, and chroma of 0 to 2. Dry value is 5 or less. It is sand, loamy fine sand, or loamy sand. Structure is weak fine or medium granular or the horizon is single grain. Consistence is very friable or loose. Some pedons have E horizons with hue 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. They are sand or loamy sand.

The Bw or Bg horizons where present have a hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 1 to 4. It is loamy fine sand, loamy sand, loamy coarse sand, fine sand, or sand. Structure is weak fine or medium granular or subangular blocky, or the horizon is single grain. Consistence is very friable or loose.

The Cg horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 0 to 3. It is loamy fine sand, loamy sand, loamy coarse sand, fine sand, sand or coarse sand in the fine earth fraction. Some pedons have strata of sand and gravel below a depth of 40 inches, and some have lenses or bodies of fine sandy loam. Within a depth of 20 inches chroma is either 2 or less, when hue is 10YR or redder, or 3 or less, when hue is 2.5Y or 5Y. The Cg horizon is massive or single grain in the upper part and single grain in the lower part. Consistence is very friable or loose.

COMPETING SERIES: Gougeville is the only other series in the same family. Gougeville soils are less acid and receive less than 40 inches of annual precipitation.

GEOGRAPHIC SETTING: Wareham soils are level to gently sloping soils on outwash plains, deltas, and stream terraces in areas that receive run on water. Slope ranges from 0 to 8 percent. The soils formed in sandy glaciofluvial materials derived from granite and gneiss. The mean annual temperature is 45 to 50 degrees F., and the mean annual precipitation is 40 to 47 inches. Mean growing season ranges from 120 to 200 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Agawam, Deerfield, Hinckley, Ninigret, Pipestone, Saugatuck, Scarboro, Sudbury, and Windsor soils. Agawam, Hinckley, Ninigret, and Sudbury soils are all better drained. The excessively drained Windsor, moderately well drained Deerfield, somewhat poorly drained Pipestone and Saugatuck and very poorly drained Scarboro soils, are in a drainage sequence with the Wareham soils.

DRAINAGE AND PERMEABILITY: Poorly and somewhat poorly drained. Runoff is negligible or very low. Permeability is rapid.

USE AND VEGETATION: Most areas are forested or idle. Cleared and drained areas are used for growing hay, pasture, and row crops. Red maple, elm, hemlock, white pine, aspen, and tamarack are the most common trees, but in the northern range of the series red spruce and balsam fir are prominent.

DISTRIBUTION AND EXTENT: New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, eastern New York, and northern New Jersey; MLRAs 142, 144A, 144B, 145, and 149B. Moderately extensive.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Franklin County, Massachusetts, 1964.

REMARKS: Narrative location (and resulting geographic coordinates added in 1997) as described place pedon in drainage area near Hinckley, Windsor, and Sudbury map units.

Diagnostic horizons and other features recognized in this pedon are:

1. Ochric epipedon - from 0 to 7 inches (A horizon).
2. Aquic conditions as evidenced by a matrix chroma of 2 and redox concentrations within a layer between 16 and 20 inches from the mineral soil surface (C1 horizon).
3. Humaqueptic subgroup color value, moist of 3 and color value, dry of 5 in the upper 15 cm. (A horizon) and base saturation generally averages less than 25 percent within 100 cm. in similar soils.

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LOCATION WINDSOR CT+MA NH NY RI VT

Established Series
Rev. MFF-SMF-DCP
03/2014

WINDSOR SERIES

The Windsor series consists of very deep, excessively drained soils formed in sandy outwash or eolian deposits. They are nearly level through very steep soils on glaciofluvial landforms. Slope ranges from 0 through 60 percent. Saturated hydraulic conductivity is high or very high. Mean annual temperature is about 10 degrees C and mean annual precipitation is about 1092 mm.

TAXONOMIC CLASS: Mixed, mesic Typic Udipsamments

TYPICAL PEDON: Windsor loamy sand - forested, 3 percent slope, at an elevation of about 24 meters. (Colors are for moist soil.)

Oe--0 to 3 cm; black (10YR 2/1) moderately decomposed forest plant material; many very fine and fine roots; very strongly acid; abrupt smooth boundary. (0 to 8 cm thick.)

A--3 to 8 cm; very dark grayish brown (10YR 3/2) loamy sand; weak medium granular structure; very friable; many very fine and fine roots; strongly acid; abrupt wavy boundary. (3 to 25 cm thick.)

Bw1--8 to 23 cm; strong brown (7.5YR 5/6) loamy sand; very weak fine granular structure; very friable; many fine and medium roots; strongly acid; gradual wavy boundary.

Bw2--23 to 53 cm; yellowish brown (10YR 5/6) loamy sand; very weak fine granular structure; very friable; common fine and medium roots; strongly acid; gradual wavy boundary.

Bw3--53 to 64 cm; light yellowish brown (10YR 6/4) sand; single grain; loose; few coarse roots; strongly acid; clear wavy boundary. (Combined thickness of the Bw horizons is 23 to 86 cm.)

C--64 to 165 cm; pale brown (10YR 6/3) and light brownish gray (10YR 6/2) sand; single grain; loose; few coarse roots; strongly acid.

TYPE LOCATION: Hartford County, Connecticut; town of South Windsor, 1100 feet northwest along Chapel Road from the intersection of Chapel Road and Ellington Road and 100 feet due south of Chapel Road. USGS Manchester, CT topographic quadrangle, Latitude 41 degrees, 48 minutes, 35 seconds N., Longitude 72 degrees, 36 minutes, 22 seconds W., NAD 1983

RANGE IN CHARACTERISTICS: Thickness of the solum ranges from 25 to 92 cm. Rock fragments, dominantly fine gravel, range from 0 through 10 percent by volume in the solum and from 0 to 15 percent in the substratum. Thin strata of gravel or thin subhorizons of coarse sand or loamy coarse sand are present in some pedons. Unless limed, reaction in the solum commonly is extremely acid to moderately acid, but the range includes slightly acid. Unless limed, reaction in the substratum commonly is very strongly acid to slightly acid, but the range includes neutral.

O horizons are present in some pedons.

The A horizon has hue of 7.5YR or 10YR, value of 2 or 3, and chroma of 1 to 3. Many pedons have an Ap horizon up to 12 inches thick with value of 3 or 4 and chroma of 2 to 4. The A or Ap horizon is loamy fine sand, loamy sand, fine sand, or sand. It has weak or moderate granular structure and is very friable, friable, or loose.

Some pedons have a thin E horizon with hue 7.5YR or 10YR, value of 4 to 6, and chroma of 1 or 2.

The upper part of the Bw horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 4 to 8. The lower part of Bw horizon has hue of 7.5YR to 5Y, value of 4 to 7, and chroma of 3 to 6. The Bw horizon is loamy sand or loamy fine sand in the upper part and loamy fine sand, loamy sand, fine sand, or sand in the lower part. The Bw horizon has weak granular or weak subangular blocky structure, or it is massive or single grain. Consistence is very friable or loose.

Some pedons have a BC horizon similar to the lower part of the Bw horizon.

The C horizon has hue of 5YR to 5Y, value of 4 to 7, and chroma of 1 to 6. It is fine sand, sand, coarse sand, loamy fine sand, or loamy sand. The horizon is massive or single grain and consistence is very friable or loose.

COMPETING SERIES: These are the Acquango, Aldo, Bigapple, Biltmore, Boplain, Breeze, Caesar, Chute, Dabney, Hodge, Oakville, Osolo, Pahuk, Penwood, Perks, Pinegrove, Plainfield, Poquonock, Ronda, Samoa, Sardak, Sarpy, Scotah, Spessard, Suncook, Tyner, and Wapanucket series. Aquango, Aldo, Biltmore, Boplain, Chute, Dabney, Hodge, Osolo, Pahuk, Perks, Ronda, Samoa, Sardak, Spessard, and Tyner soils are from outside of LRRs L, R, and S. Acquango soils are very slightly to moderately saline within the soil profile. Aldo soils have a water table and saturation within the series control section for as much as one month per year in 6 out of 10 years. Bigapple soils formed in human transported soil material from dredging activities. Biltmore and Spessard soils are well drained. Breeze soils formed in human transported sandy soil materials intermingled with construction debris. Caesar soils contain more coarse sand. Chute, Hodge, and Sarpy soils contain free carbonates and do not have a B horizon. Dabney soils do not have a B horizon and receive more than 152 cm of precipitation annually. Oakville soils typically average 50 percent or more fine sand in the subsoil. Osolo soils have a solum thicker than 1.5 m. Penwood soils have hue of 5YR or redder in the B horizon. Pahuk, Perks, Samoa, and Suncook soils do not have a B horizon. Plainfield soils are less moist in all parts of the control section for the 120 days following the summer solstice. Poquonock soils have a densic contact with in 1 m. Ronda soils formed in alluvium from residuum sources. Sardak soils formed in alluvium and are calcareous. Tyner soils have a thicker solum. Wapanucket soils are underlain by glaciolacustrine deposits with in the series control section.

GEOGRAPHIC SETTING: Windsor soils are nearly level through very steep soils typically on glaciofluvial landforms but include late-Wisconsin-aged dunes. The steeper slopes are typically on terrace escarpments. Slope ranges from 0 to 60 percent. The soils formed in outwash or eolian deposits of poorly graded sands and loamy sands derived mainly from crystalline rocks. Mean annual temperature ranges from 7 to 12 degrees C, and the mean annual precipitation typically ranges from 965 to 1270 mm, but the range includes as low as 660 mm in some places east of Adirondack Mountains in the Champlain Valley of New York. The growing season ranges from 120 to 190 days.

GEOGRAPHICALLY ASSOCIATED SOILS: These are the Deerfield, Hinckley, Merrimac, Quonset, Suncook, Agawam, Hadley, Haven, Occum, Pootatuck, Scarboro, Sudbury, Walpole, Wareham, and Winooski soils on nearby landscapes. The moderately well drained Deerfield and Sudbury, the somewhat poorly drained and poorly drained Walpole and Wareham, and the very poorly drained Scarboro soils are common drainage associates. Agawam and Haven soils are coarse-loamy over sandy or sandy-skeletal or coarse-loamy terrace associates, respectively. Hadley, Occum, Pootatuck, and Winooski soils are on nearby flood plains.

DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY: Excessively drained. Surface runoff is negligible to medium. Saturated hydraulic conductivity is high or very high.

USE AND VEGETATION: Most areas are forested or in low growing brushy vegetation. Some areas are used

for silage corn, hay, and pasture. Small areas, mostly irrigated, are used for shade tobacco, vegetables and nursery stock. Some areas are in community development. Common trees are white, black, and northern red oak, eastern white pine, pitch pine, gray birch, poplar, red maple, and sugar maple.

DISTRIBUTION AND EXTENT: Late Wisconsin glaciofluvial or eolian landforms in Connecticut, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont; MLRAs 101, 142, 144A, and 145. The series is of large extent.

MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE: Amherst, Massachusetts.

SERIES ESTABLISHED: Connecticut Valley Area, 1899.

REMARKS: The use of the Windsor series in Maine, and in MLRAs 141, 144B, and 143 is relict to before temperature classes in soil taxoonomy. These have been removed from the SC file.

Diagnostic horizons and features recognized in this pedon include:
1. Ochric epipedon - the zone from 0 to 8 cm (Oe and A horizons).
2. Particle-size class - averages sandy in the control section from 25 to 100 cm.
3. No cambic horizon and development of color - the zone from 8 to 64 cm demonstrates development of color with no illuvial accumulation of material (Bw horizons).

ADDITIONAL DATA: Reference samples from pedons 54MA023005, 63VT011001, 63VT011002, 64NH017003, 64NH017004, 70CT003003, 70MA011003, 70VT017002, 73MA005003, 73MA005004, 91MA023006, 95NH013001, 96NH013004, 98NY045002, 98NY085002, S07VT011004.

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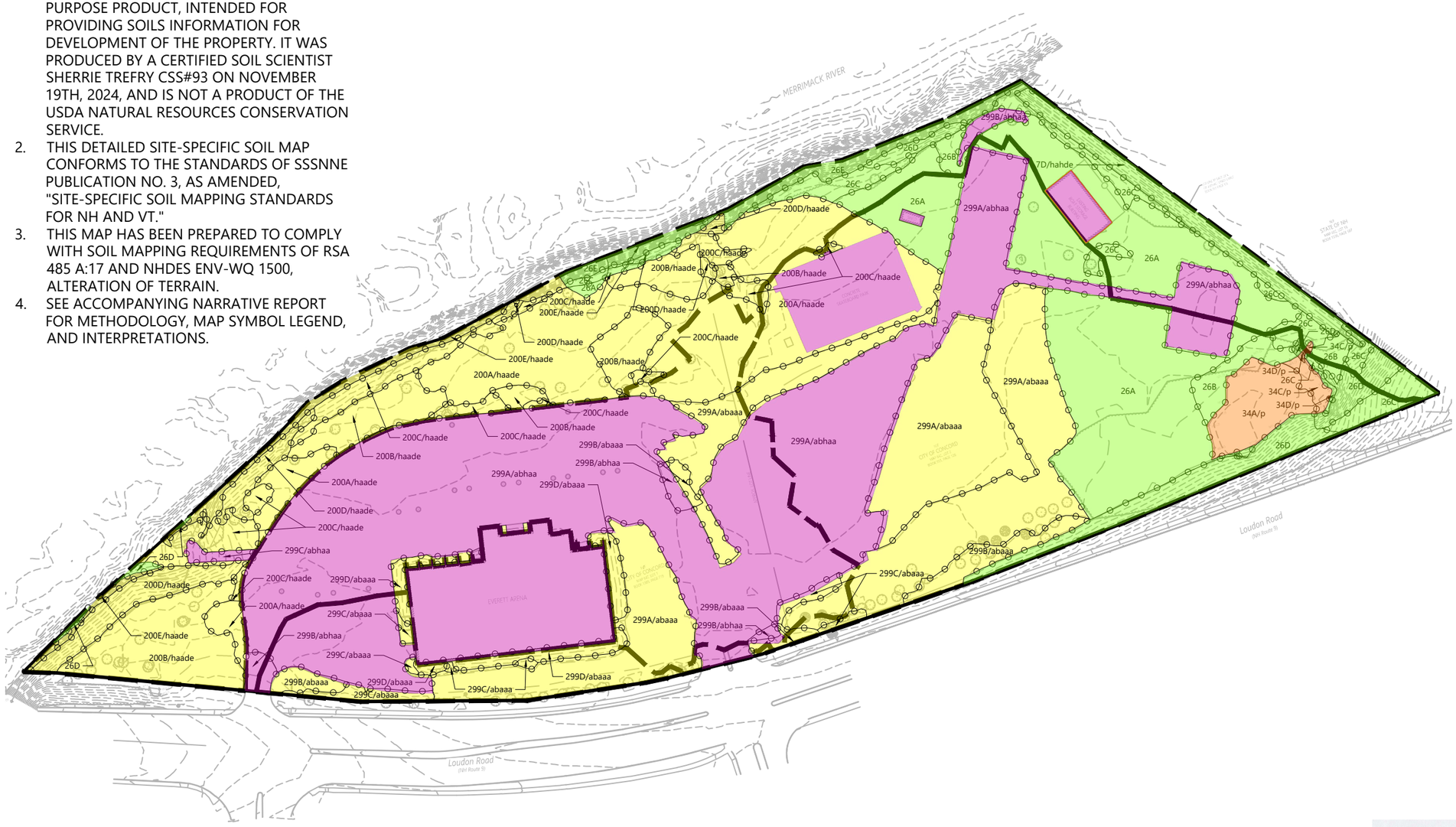
NOTES:

1. THIS MAP PRODUCT IS WITHIN THE TECHNICAL STANDARDS OF THE NATIONAL COOPERATIVE SOIL SURVEY. IT IS A SPECIAL PURPOSE PRODUCT, INTENDED FOR PROVIDING SOILS INFORMATION FOR DEVELOPMENT OF THE PROPERTY. IT WAS PRODUCED BY A CERTIFIED SOIL SCIENTIST SHERRIE TREFRY CSS#93 ON NOVEMBER 19TH, 2024, AND IS NOT A PRODUCT OF THE USDA NATURAL RESOURCES CONSERVATION SERVICE.
2. THIS DETAILED SITE-SPECIFIC SOIL MAP CONFORMS TO THE STANDARDS OF SSSNNE PUBLICATION NO. 3, AS AMENDED, "SITE-SPECIFIC SOIL MAPPING STANDARDS FOR NH AND VT."
3. THIS MAP HAS BEEN PREPARED TO COMPLY WITH SOIL MAPPING REQUIREMENTS OF RSA 485 A:17 AND NHDES ENV-WQ 1500, ALTERATION OF TERRAIN.
4. SEE ACCOMPANYING NARRATIVE REPORT FOR METHODOLOGY, MAP SYMBOL LEGEND, AND INTERPRETATIONS.



Legend

LINETYPES

- SUBCATCHMENT BOUNDARIES
- SITE SPECIFIC SOIL BOUNDARY
- HYDROLOGIC SOIL GROUP A
- HYDROLOGIC SOIL GROUP B
- HYDROLOGIC SOIL GROUP C
- HYDROLOGIC SOIL GROUP D
- IMPERVIOUS AREA
- LIMITS OF SITE SPECIFIC SOIL SURVEY

SITE SPECIFIC SOIL MAP UNIT LEGEND

34A/P - WAREHAM; 0-3% SLOPE
34C/P - WAREHAM; 8-15% SLOPE
34D/P - WAREHAM; 15-25% SLOPE
26A - WINDSOR; 0-3% SLOPE
26B - WINDSOR; 3-8% SLOPE
26C - WINDSOR; 8-15% SLOPE
26D - WINDSOR; 15-25% SLOPE
26E - WINDSOR; 25-50% SLOPE
200A/haade - UDORTHENTS; REFUSE SUBSTRATUM; 0-3% SLOPE
200B/haade - UDORTHENTS; REFUSE SUBSTRATUM; 3-8% SLOPE
200C/haade - UDORTHENTS; REFUSE SUBSTRATUM; 8-15% SLOPE
200D/haade - UDORTHENTS; REFUSE SUBSTRATUM; 15-25% SLOPE
299A/abhaa - UDORTHENTS; SMOOTHED, PAVED/DEVELOPED AREAS; 0-3% SLOPE
299B/abhaa - UDORTHENTS; SMOOTHED, PAVED/DEVELOPED AREAS; 3-8% SLOPE
299A/abaaa - UDORTHENTS; SMOOTHED, BURIED WINDSOR SOILS; 0-3% SLOPE
299B/abaaa - UDORTHENTS; SMOOTHED, BURIED WINDSOR SOILS; 3-8% SLOPE
299C/abaaa - UDORTHENTS; SMOOTHED, BURIED WINDSOR SOILS; 8-15% SLOPE
299D/abaaa - UDORTHENTS; SMOOTHED, BURIED WINDSOR SOILS; 15-25% SLOPE
7D/hahde - FLUVAQUENTS; CONCRETE-LINED DITCH; 15-25% SLOPE

SHERRIE TREFRY NH 0093

vhb

Existing Color Coded Soil Map **Figure 2**
Kiwanis Park
Loudon Road
Concord, New Hampshire
April 2025

Groundwater Recharge Volume (GRV) Calculation

GROUNDWATER RECHARGE VOLULME (GRV) CALCULATION (Env-Wq 1507.04)

0.57	ac	Area of HSG A soil that was replaced by impervious cover	0.40"
0.13	ac	Area of HSG B soil that was replaced by impervious cover	0.25"
	ac	Area of HSG C soil that was replaced by impervious cover	0.10"
	ac	Area of HSG D soil or impervious cover that was replaced by impervious cover	0.0"
0.37	inches	Rd = Weighted groundwater recharge depth	
0.2605	ac-in	GRV = AI * Rd	
946	cf	GRV conversion (ac-in x 43,560 sf/ac x 1ft/12”)	

Provide calculations below showing that the project meets the groundwater recharge requirements (Env-Wq 1507.04):

Pond #1 provides recharge (total volume = 9,295 CF); exceeds GRV requirement.

BMP Worksheets

FILTRATION PRACTICE DESIGN CRITERIA
(Env-Wq 1508.07)

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Type/Node Name: **Subsurface Sand Filter #1 (P1)**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable.

		Check if you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.07(a).	
1.10	ac	A = Area draining to the practice	
0.84	ac	A_I = Impervious area draining to the practice	
0.77	decimal	I = Percent impervious area draining to the practice, in decimal form	
0.74	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.81	ac-in	WQV= 1" x Rv x A	
2,940	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
735	cf	25% x WQV (check calc for sediment forebay volume)	
2,205	cf	75% x WQV (check calc for surface sand filter volume)	
		Method of Pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = Sediment forebay volume, if used for pretreatment	**≥ 25%WQV**
Calculate time to drain if system IS NOT underdrained:			
	sf	A_{SA} = Surface area of the practice	
	iph	$Ksat_{DESIGN}$ = Design infiltration rate[1]	
		If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided?	
	Yes/No	(Use the calculations below)	
-	hours	T_{DRAIN} = Drain time = V / (A_{SA} * I_{DESIGN})	**≤ 72-hrs**
Calculate time to drain if system IS underdrained:			
	ft	E_{WQV} = Elevation of WQV (attach stage-storage table)	
	cfs	Q_{WQV} = Discharge at the E_{WQV} (attach stage-discharge table)	
-	hours	T_{DRAIN} = Drain time = 2WQV/Q_{WQV}	**≤ 72-hrs**
	feet	E_{FC} = Elevation of the bottom of the filter course material[2]	
	feet	E_{UD} = Invert elevation of the underdrain (UD), if applicable	
	feet	E_{SHWT} = Elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
	feet	E_{ROCK} = Elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
-	feet	$D_{FC\ to\ UD}$ = Depth to UD from the bottom of the filter course	**≥ 1'**
-	feet	$D_{FC\ to\ ROCK}$ = Depth to bedrock from the bottom of the filter course	**≥ 1'**
-	feet	$D_{FC\ to\ SHWT}$ = Depth to SHWT from the bottom of the filter course	**≥ 1'**
	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
	ft	Elevation of the top of the practice	
-		50 peak elevation ≤ Elevation of the top of the practice	**← yes**
If a surface sand filter or underground sand filter is proposed:			
YES	ac	Drainage Area check.	**< 10 ac**
	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ 75%WQV**
	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course specification.	
	Yes/No	Access grate provided?	**← yes**

If a bioretention area is proposed:			
YES	ac	Drainage Area no larger than 5 ac?	**← yes**
	cf	V = Volume of storage[3] (attach a stage-storage table)	**≥ WQV**
	inches	D_{FC} = Filter course thickness	**18", or 24" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course specification	
	:1	Pond side slopes	**≥ 3:1**
Sheet		Note what sheet in the plan set contains the planting plans and surface cover	
If porous pavement is proposed:			
		Type of pavement proposed (Concrete? Asphalt? Pavers? Etc.)	
	acres	A_{SA} = Surface area of the pervious pavement	
	:1	Ratio of the contributing area to the pervious surface area	**≤ 5:1**
	inches	D_{FC} = Filter course thickness	**12", or 18" if within GPA mod. 304.1 (see spec)**
Sheet		Note what sheet in the plan set contains the filter course spec.	

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes:

Appendix B: Hydrologic Calculations

- Rainfall Data
- Existing Conditions
- Proposed Conditions

Rainfall Data

NOAA Atlas 14, Volume 10, Version 3
Location name: Concord, New Hampshire, USA*
Latitude: 43.2103°, Longitude: -71.5253°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.282** (0.231-0.345)	**0.337** (0.275-0.413)	**0.427** (0.347-0.525)	**0.502** (0.405-0.621)	**0.605** (0.469-0.785)	**0.682** (0.516-0.908)	**0.763** (0.556-1.06)	**0.854** (0.583-1.22)	**0.985** (0.642-1.46)	**1.09** (0.692-1.65)
10-min	**0.400** (0.327-0.489)	**0.478** (0.390-0.585)	**0.606** (0.492-0.745)	**0.711** (0.574-0.879)	**0.857** (0.664-1.11)	**0.967** (0.730-1.29)	**1.08** (0.787-1.50)	**1.21** (0.828-1.72)	**1.40** (0.911-2.07)	**1.55** (0.980-2.34)
15-min	**0.470** (0.385-0.575)	**0.562** (0.459-0.688)	**0.712** (0.579-0.875)	**0.837** (0.676-1.04)	**1.01** (0.782-1.31)	**1.14** (0.860-1.51)	**1.27** (0.926-1.76)	**1.42** (0.973-2.03)	**1.64** (1.07-2.43)	**1.82** (1.15-2.76)
30-min	**0.663** (0.542-0.811)	**0.793** (0.647-0.970)	**1.00** (0.816-1.24)	**1.18** (0.952-1.46)	**1.42** (1.10-1.84)	**1.60** (1.21-2.13)	**1.79** (1.31-2.48)	**2.01** (1.37-2.86)	**2.32** (1.51-3.43)	**2.57** (1.63-3.89)
60-min	**0.856** (0.700-1.05)	**1.02** (0.835-1.25)	**1.30** (1.05-1.59)	**1.52** (1.23-1.88)	**1.83** (1.42-2.38)	**2.07** (1.56-2.75)	**2.32** (1.68-3.21)	**2.59** (1.77-3.69)	**2.99** (1.95-4.42)	**3.32** (2.10-5.02)
2-hr	**1.08** (0.886-1.31)	**1.29** (1.06-1.57)	**1.64** (1.34-2.00)	**1.93** (1.57-2.37)	**2.33** (1.82-3.02)	**2.62** (2.01-3.50)	**2.94** (2.18-4.11)	**3.34** (2.29-4.73)	**3.96** (2.59-5.83)	**4.50** (2.85-6.76)
3-hr	**1.22** (1.01-1.48)	**1.47** (1.21-1.78)	**1.88** (1.54-2.29)	**2.22** (1.81-2.72)	**2.69** (2.11-3.48)	**3.03** (2.33-4.03)	**3.41** (2.54-4.76)	**3.88** (2.66-5.48)	**4.64** (3.03-6.80)	**5.30** (3.37-7.93)
6-hr	**1.51** (1.26-1.82)	**1.85** (1.53-2.22)	**2.39** (1.98-2.89)	**2.84** (2.33-3.46)	**3.47** (2.74-4.45)	**3.92** (3.02-5.18)	**4.42** (3.30-6.12)	**5.04** (3.47-7.07)	**6.00** (3.94-8.74)	**6.83** (4.36-10.2)
12-hr	**1.86** (1.55-2.21)	**2.30** (1.92-2.75)	**3.02** (2.52-3.63)	**3.63** (2.99-4.38)	**4.46** (3.53-5.67)	**5.08** (3.91-6.62)	**5.74** (4.26-7.80)	**6.50** (4.49-9.03)	**7.61** (5.02-11.0)	**8.54** (5.46-12.6)
24-hr	**2.21** (1.86-2.62)	**2.75** (2.31-3.27)	**3.64** (3.05-4.34)	**4.38** (3.64-5.25)	**5.40** (4.29-6.82)	**6.16** (4.77-7.97)	**6.97** (5.19-9.40)	**7.88** (5.48-10.9)	**9.22** (6.10-13.2)	**10.3** (6.63-15.2)
2-day	**2.55** (2.16-3.01)	**3.16** (2.68-3.73)	**4.15** (3.50-4.92)	**4.98** (4.16-5.93)	**6.11** (4.90-7.69)	**6.95** (5.43-8.98)	**7.86** (5.93-10.6)	**8.95** (6.24-12.3)	**10.6** (7.04-15.2)	**12.0** (7.75-17.6)
3-day	**2.81** (2.39-3.30)	**3.45** (2.93-4.05)	**4.49** (3.80-5.30)	**5.36** (4.50-6.36)	**6.55** (5.28-8.22)	**7.43** (5.84-9.57)	**8.39** (6.36-11.3)	**9.56** (6.68-13.1)	**11.4** (7.54-16.1)	**12.9** (8.32-18.7)
4-day	**3.04** (2.59-3.56)	**3.70** (3.15-4.33)	**4.78** (4.05-5.62)	**5.67** (4.77-6.71)	**6.90** (5.57-8.62)	**7.81** (6.14-10.0)	**8.80** (6.68-11.8)	**10.0** (7.00-13.6)	**11.9** (7.89-16.8)	**13.4** (8.68-19.5)
7-day	**3.67** (3.14-4.26)	**4.36** (3.73-5.08)	**5.49** (4.68-6.42)	**6.43** (5.44-7.56)	**7.72** (6.25-9.56)	**8.67** (6.84-11.0)	**9.70** (7.37-12.9)	**10.9** (7.69-14.8)	**12.8** (8.55-18.0)	**14.4** (9.32-20.7)
10-day	**4.26** (3.67-4.94)	**4.98** (4.28-5.77)	**6.14** (5.25-7.15)	**7.11** (6.03-8.33)	**8.44** (6.85-10.4)	**9.43** (7.45-11.9)	**10.5** (7.96-13.8)	**11.7** (8.26-15.8)	**13.5** (9.06-19.0)	**15.1** (9.76-21.6)
20-day	**6.06** (5.25-6.97)	**6.83** (5.91-7.87)	**8.10** (6.97-9.36)	**9.14** (7.81-10.6)	**10.6** (8.63-12.9)	**11.7** (9.25-14.5)	**12.8** (9.68-16.5)	**14.0** (9.94-18.7)	**15.6** (10.5-21.7)	**16.9** (11.0-24.1)
30-day	**7.57** (6.58-8.68)	**8.40** (7.29-9.64)	**9.75** (8.43-11.2)	**10.9** (9.32-12.6)	**12.4** (10.2-15.0)	**13.6** (10.8-16.8)	**14.8** (11.2-18.9)	**16.0** (11.4-21.2)	**17.5** (11.8-24.2)	**18.6** (12.1-26.4)
45-day	**9.48** (8.28-10.8)	**10.4** (9.05-11.9)	**11.8** (10.3-13.6)	**13.1** (11.2-15.1)	**14.7** (12.1-17.7)	**16.1** (12.7-19.7)	**17.3** (13.1-21.9)	**18.5** (13.2-24.5)	**19.9** (13.5-27.4)	**20.9** (13.6-29.5)
60-day	**11.1** (9.72-12.6)	**12.1** (10.5-13.7)	**13.6** (11.9-15.6)	**14.9** (12.9-17.2)	**16.7** (13.8-20.0)	**18.2** (14.4-22.1)	**19.5** (14.7-24.5)	**20.7** (14.8-27.3)	**22.1** (15.0-30.3)	**23.0** (15.1-32.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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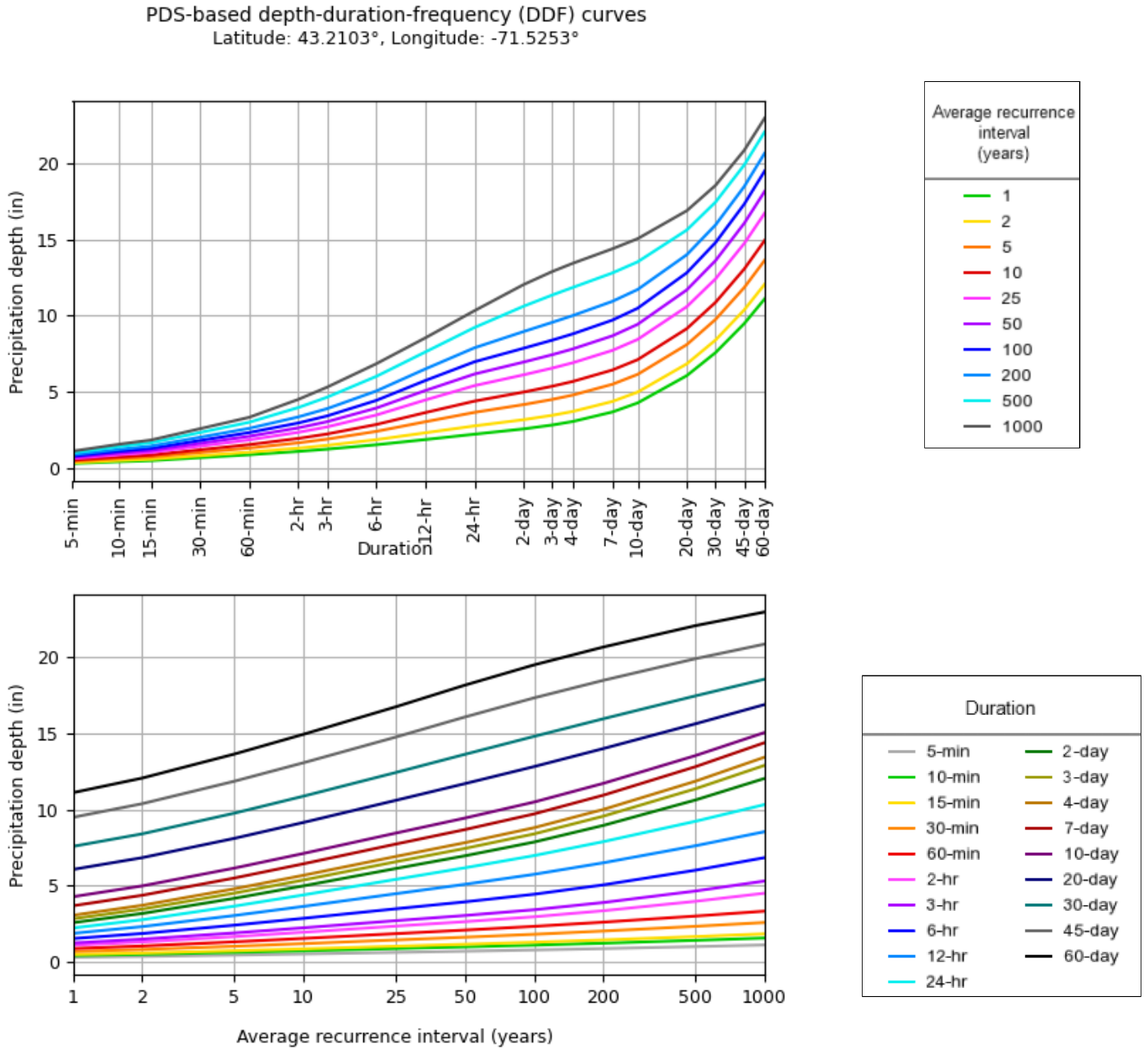
PF graphical



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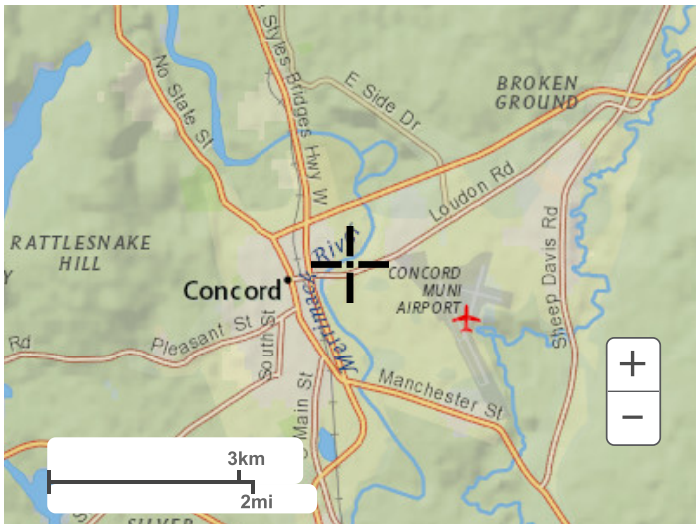
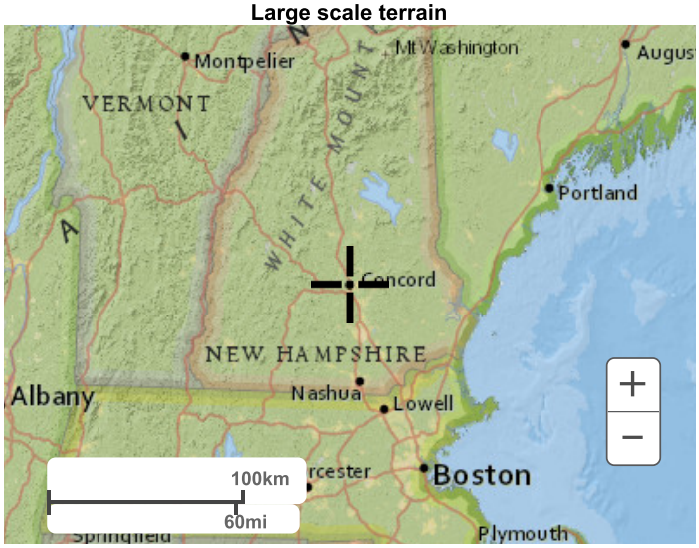
Maps & aerials

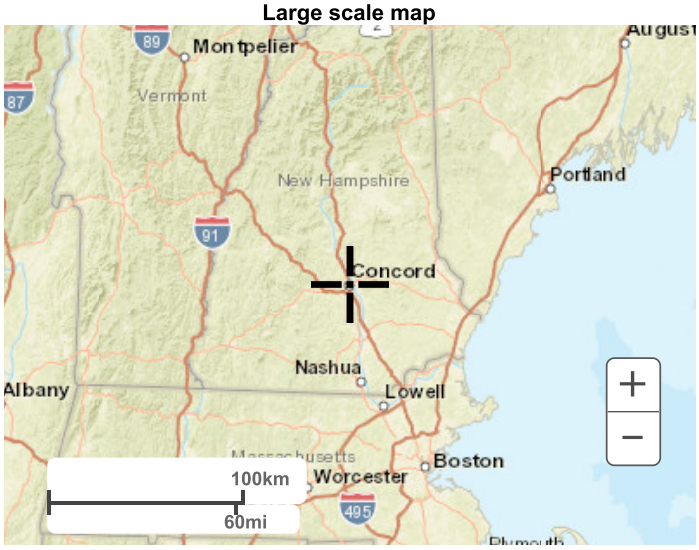
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
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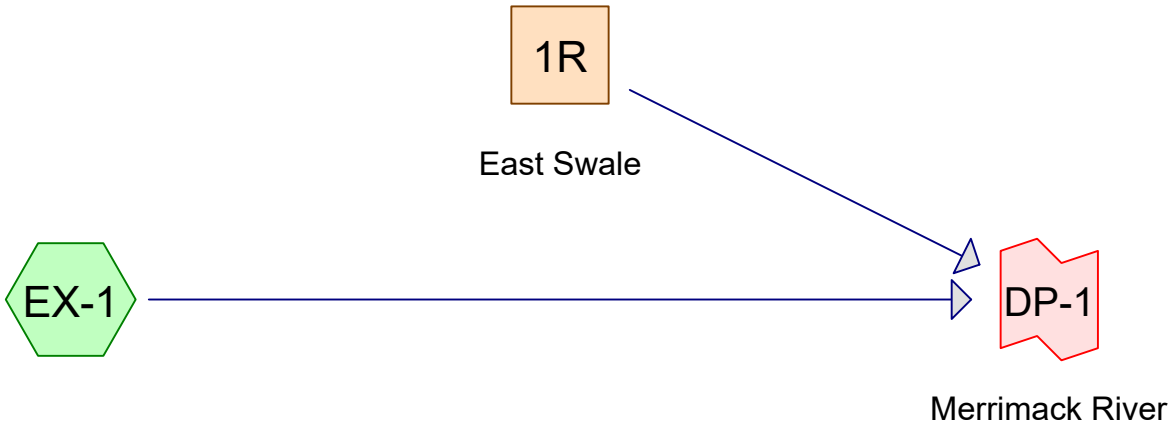


Subcat Reach Pond Link

Routing Diagram for 52938.11-EX_Phase 1
Prepared by VHB, Inc, Printed 2/17/2026

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-YR	Type II 24-hr		Default	24.00	1	2.75	2
2	10-YR	Type II 24-hr		Default	24.00	1	4.38	2
3	25-YR	Type II 24-hr		Default	24.00	1	5.40	2
4	50-YR	Type II 24-hr		Default	24.00	1	6.16	2
5	100-YR	Type II 24-hr		Default	24.00	1	6.97	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
35,327	39	>75% Grass cover, Good, HSG A (EX-1)
10,531	61	>75% Grass cover, Good, HSG B (EX-1)
11,356	74	>75% Grass cover, Good, HSG C (EX-1)
8,286	98	Paved parking, HSG A (EX-1)
34,277	30	Woods, Good, HSG A (EX-1)
77	55	Woods, Good, HSG B (EX-1)
99,854	**47**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
77,890	HSG A	EX-1
10,608	HSG B	EX-1
11,356	HSG C	EX-1
0	HSG D	
0	Other	
99,854		**TOTAL AREA**

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
35,327	10,531	11,356	0	0	57,214	>75% Grass cover, Good	
8,286	0	0	0	0	8,286	Paved parking	
34,277	77	0	0	0	34,354	Woods, Good	
77,890	**10,608**	**11,356**	**0**	**0**	**99,854**	**TOTAL AREA**	

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

SubcatchmentEX-1: Runoff Area=2.292 ac 8.30% Impervious Runoff Depth=0.02"
Flow Length=484' Tc=17.1 min CN=47 Runoff=0.0 cfs 173 cf

Reach 1R: East Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.017 L=480.0' S=0.0035 '/' Capacity=209.2 cfs Outflow=0.0 cfs 0 cf

Link DP-1: Merrimack River Inflow=0.0 cfs 173 cf
Primary=0.0 cfs 173 cf

Total Runoff Area = 99,854 sf Runoff Volume = 173 cf Average Runoff Depth = 0.02"
91.70% Pervious = 91,568 sf 8.30% Impervious = 8,286 sf

Summary for Subcatchment EX-1:

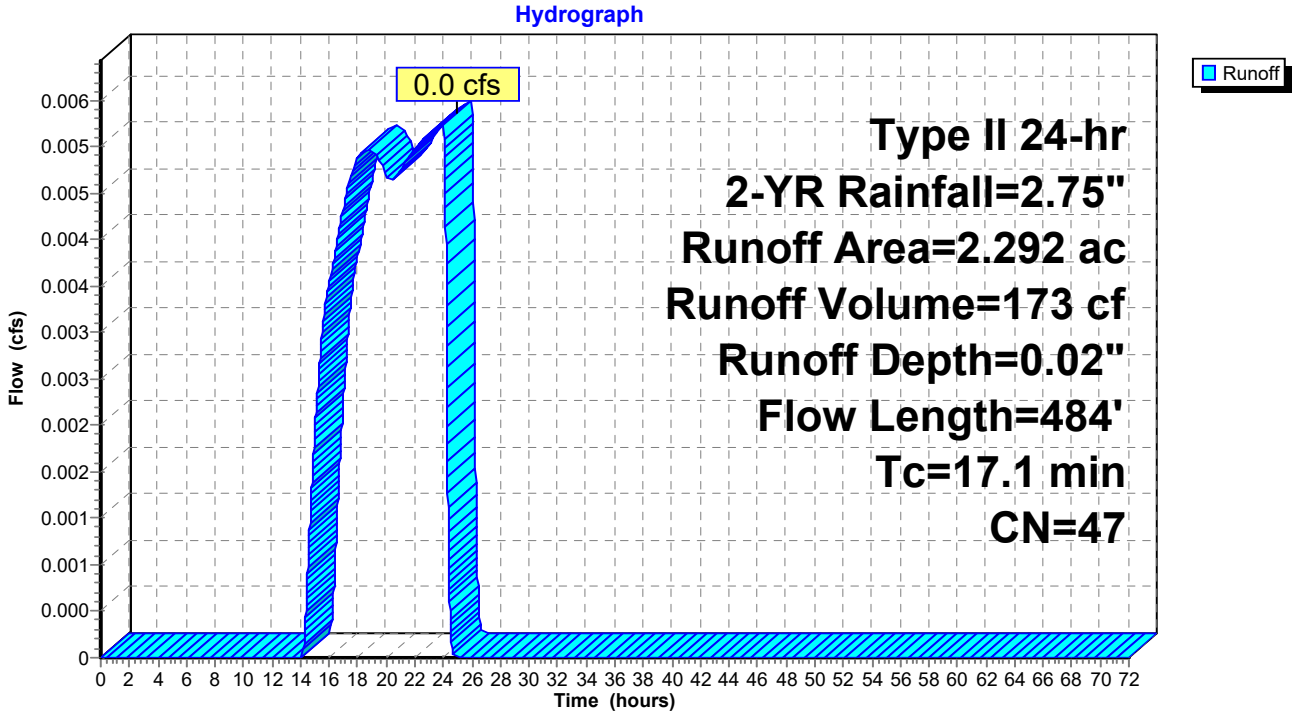
Runoff = 0.0 cfs @ 24.00 hrs, Volume= 173 cf, Depth= 0.02"
Routed to Link DP-1 : Merrimack River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-YR Rainfall=2.75"

Area (ac)	CN	Description
0.811	39	>75% Grass cover, Good, HSG A
0.242	61	>75% Grass cover, Good, HSG B
0.261	74	>75% Grass cover, Good, HSG C
0.190	98	Paved parking, HSG A
0.787	30	Woods, Good, HSG A
0.002	55	Woods, Good, HSG B
2.292	47	Weighted Average
2.102		91.70% Pervious Area
0.190		8.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.75"
1.3	66	0.0148	0.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	158	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	159	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	51	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.1	484	Total			

Subcatchment EX-1:



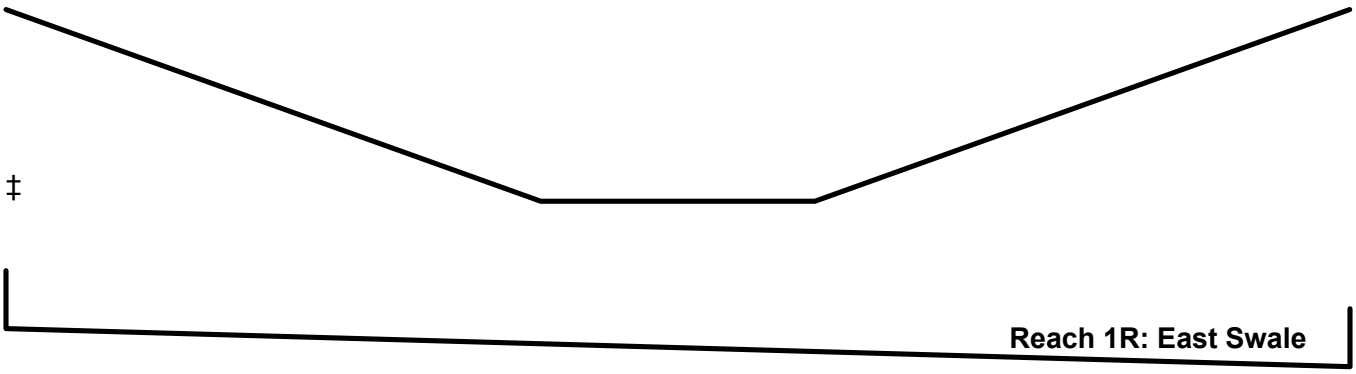
Hydrograph for Subcatchment EX-1:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.00	0.03	0.00	0.0
2.00	0.06	0.00	0.0
3.00	0.09	0.00	0.0
4.00	0.13	0.00	0.0
5.00	0.17	0.00	0.0
6.00	0.22	0.00	0.0
7.00	0.27	0.00	0.0
8.00	0.33	0.00	0.0
9.00	0.40	0.00	0.0
10.00	0.50	0.00	0.0
11.00	0.65	0.00	0.0
12.00	1.82	0.00	0.0
13.00	2.12	0.00	0.0
14.00	2.26	0.00	0.0
15.00	2.35	0.00	0.0
16.00	2.42	0.00	0.0
17.00	2.48	0.00	0.0
18.00	2.53	0.01	0.0
19.00	2.58	0.01	0.0
20.00	2.62	0.01	0.0
21.00	2.65	0.01	0.0
22.00	2.69	0.02	0.0
23.00	2.72	0.02	0.0
24.00	**2.75**	**0.02**	**0.0**
25.00	2.75	0.02	0.0
26.00	2.75	0.02	0.0
27.00	2.75	0.02	0.0
28.00	2.75	0.02	0.0
29.00	2.75	0.02	0.0
30.00	2.75	0.02	0.0
31.00	2.75	0.02	0.0
32.00	2.75	0.02	0.0
33.00	2.75	0.02	0.0
34.00	2.75	0.02	0.0
35.00	2.75	0.02	0.0
36.00	2.75	0.02	0.0
37.00	2.75	0.02	0.0
38.00	2.75	0.02	0.0
39.00	2.75	0.02	0.0
40.00	2.75	0.02	0.0
41.00	2.75	0.02	0.0
42.00	2.75	0.02	0.0
43.00	2.75	0.02	0.0
44.00	2.75	0.02	0.0
45.00	2.75	0.02	0.0
46.00	2.75	0.02	0.0
47.00	2.75	0.02	0.0
48.00	2.75	0.02	0.0
49.00	2.75	0.02	0.0
50.00	2.75	0.02	0.0
51.00	2.75	0.02	0.0
52.00	2.75	0.02	0.0
53.00	2.75	0.02	0.0
54.00	2.75	0.02	0.0
55.00	2.75	0.02	0.0
56.00	2.75	0.02	0.0
57.00	2.75	0.02	0.0
58.00	2.75	0.02	0.0
59.00	2.75	0.02	0.0
60.00	2.75	0.02	0.0
61.00	2.75	0.02	0.0
62.00	2.75	0.02	0.0
63.00	2.75	0.02	0.0
64.00	2.75	0.02	0.0
65.00	2.75	0.02	0.0
66.00	2.75	0.02	0.0
67.00	2.75	0.02	0.0
68.00	2.75	0.02	0.0
69.00	2.75	0.02	0.0
70.00	2.75	0.02	0.0
71.00	2.75	0.02	0.0
72.00	2.75	0.02	0.0

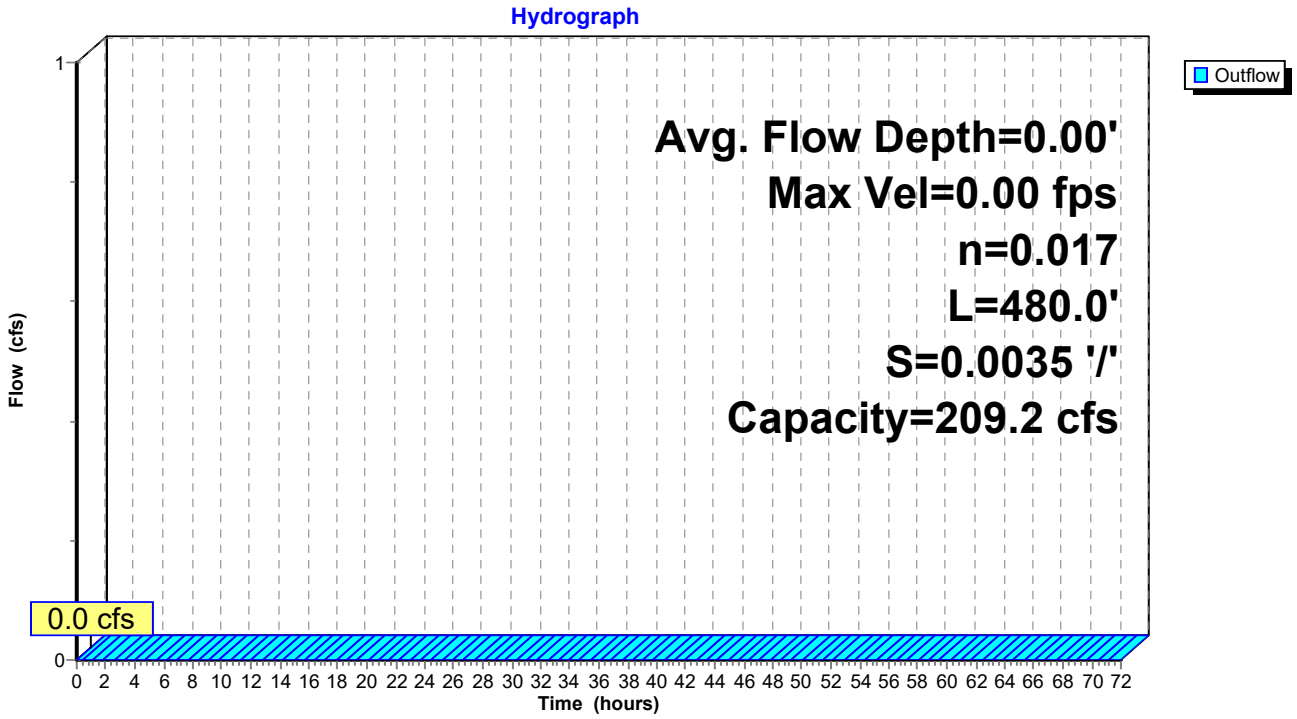
Summary for Reach 1R: East Swale

Bank-Full Depth= 2.60' Flow Area= 30.7 sf, Capacity= 209.2 cfs

4.00' x 2.60' deep channel, n= 0.017 Concrete, unfinished
Side Slope Z-value= 3.0 '/' Top Width= 19.60'
Length= 480.0' Slope= 0.0035 '/'
Inlet Invert= 228.20', Outlet Invert= 226.50'



Reach 1R: East Swale



Stage-Discharge for Reach 1R: East Swale

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
228.20	0.00	0.0
228.22	0.35	0.0
228.24	0.59	0.1
228.26	0.77	0.2
228.28	0.93	0.3
228.30	1.07	0.5
228.32	1.19	0.6
228.34	1.31	0.8
228.36	1.42	1.0
228.38	1.53	1.2
228.40	1.63	1.5
228.42	1.72	1.8
228.44	1.81	2.1
228.46	1.90	2.4
228.48	1.98	2.7
228.50	2.06	3.0
228.52	2.14	3.4
228.54	2.21	3.8
228.56	2.29	4.2
228.58	2.36	4.6
228.60	2.43	5.1
228.62	2.49	5.5
228.64	2.56	6.0
228.66	2.62	6.5
228.68	2.69	7.0
228.70	2.75	7.6
228.72	2.81	8.1
228.74	2.87	8.7
228.76	2.93	9.3
228.78	2.98	9.9
228.80	3.04	10.6
228.82	3.09	11.2
228.84	3.15	11.9
228.86	3.20	12.6
228.88	3.25	13.4
228.90	3.31	14.1
228.92	3.36	14.9
228.94	3.41	15.7
228.96	3.46	16.5
228.98	3.51	17.3
229.00	3.56	18.2
229.02	3.60	19.1
229.04	3.65	20.0
229.06	3.70	20.9
229.08	3.75	21.9
229.10	3.79	22.9
229.12	3.84	23.9
229.14	3.88	24.9
229.16	3.93	25.9
229.18	3.97	27.0
229.20	4.01	28.1
229.22	4.06	29.2
229.24	4.10	30.4
229.26	4.14	31.5
229.28	4.19	32.7
229.30	4.23	34.0
229.32	4.27	35.2
229.34	4.31	36.5
229.36	4.35	37.8
229.38	4.39	39.1
229.40	4.43	40.4
229.42	4.47	41.8
229.44	4.51	43.2
229.46	4.55	44.6
229.48	4.59	46.1
229.50	4.63	47.6
229.52	4.67	49.1
229.54	4.71	50.6
229.56	4.75	52.2
229.58	4.79	53.8
229.60	4.82	55.4
229.62	4.86	57.0
229.64	4.90	58.7
229.66	4.94	60.4
229.68	4.97	62.1
229.70	5.01	63.9
229.72	5.05	65.7
229.74	5.08	67.5
229.76	5.12	69.3
229.78	5.16	71.2
229.80	5.19	73.1
229.82	5.23	75.0
229.84	5.26	77.0
229.86	5.30	79.0
229.88	5.33	81.0
229.90	5.37	83.1
229.92	5.40	85.2
229.94	5.44	87.3
229.96	5.47	89.4
229.98	5.51	91.6
230.00	5.54	93.8
230.02	5.58	96.0
230.04	5.61	98.3
230.06	5.64	100.6
230.08	5.68	102.9
230.10	5.71	105.3
230.12	5.75	107.7
230.14	5.78	110.1
230.16	5.81	112.6
230.18	5.85	115.1
230.20	5.88	117.6
230.22	5.91	120.1
230.24	5.94	122.7
230.26	5.98	125.3
230.28	6.01	128.0
230.30	6.04	130.7
230.32	6.07	133.4
230.34	6.11	136.2
230.36	6.14	139.0
230.38	6.17	141.8
230.40	6.20	144.6
230.42	6.23	147.5
230.44	6.27	150.5
230.46	6.30	153.4
230.48	6.33	156.4
230.50	6.36	159.4
230.52	6.39	162.5
230.54	6.42	165.6
230.56	6.45	168.7
230.58	6.48	171.9
230.60	6.51	175.1
230.62	6.55	178.4
230.64	6.58	181.6
230.66	6.61	185.0
230.68	6.64	188.3
230.70	6.67	191.7
230.72	6.70	195.1
230.74	6.73	198.6
230.76	6.76	202.1
230.78	6.79	205.6
230.80	**6.82**	**209.2**

Stage-Area-Storage for Reach 1R: East Swale

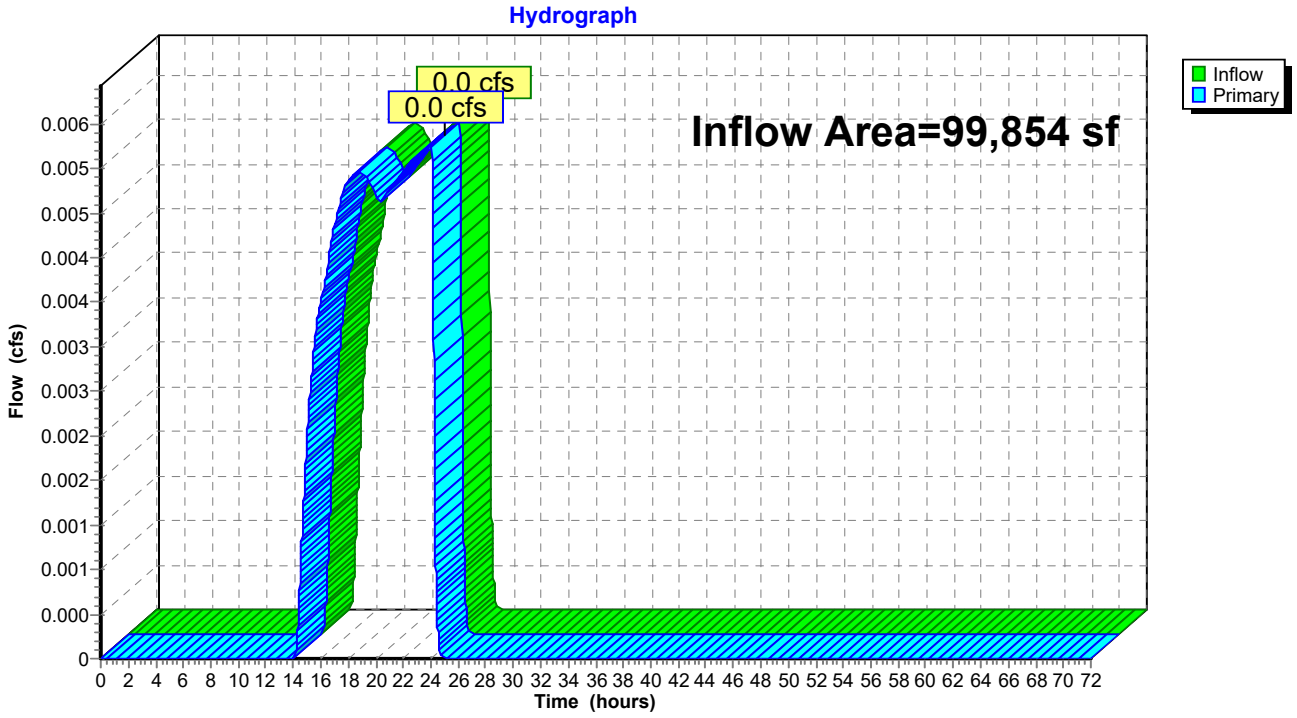
Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
228.20	0.0	0
228.25	0.2	100
228.30	0.4	207
228.35	0.7	321
228.40	0.9	442
228.45	1.2	570
228.50	1.5	706
228.55	1.8	849
228.60	2.1	999
228.65	2.4	1,156
228.70	2.8	1,320
228.75	3.1	1,492
228.80	3.5	1,670
228.85	3.9	1,856
228.90	4.3	2,050
228.95	4.7	2,250
229.00	5.1	2,458
229.05	5.6	2,673
229.10	6.0	2,895
229.15	6.5	3,124
229.20	7.0	3,360
229.25	7.5	3,604
229.30	8.0	3,855
229.35	8.6	4,113
229.40	9.1	4,378
229.45	9.7	4,650
229.50	10.3	4,930
229.55	10.9	5,216
229.60	11.5	5,511
229.65	12.1	5,812
229.70	12.8	6,120
229.75	13.4	6,436
229.80	14.1	6,759
229.85	14.8	7,089
229.90	15.5	7,426
229.95	16.2	7,770
230.00	16.9	8,122
230.05	17.7	8,481
230.10	18.4	8,846
230.15	19.2	9,220
230.20	20.0	9,600
230.25	20.8	9,988
230.30	21.6	10,383
230.35	22.5	10,785
230.40	23.3	11,194
230.45	24.2	11,610
230.50	25.1	12,034
230.55	26.0	12,465
230.60	26.9	12,903
230.65	27.8	13,348
230.70	28.8	13,800
230.75	29.7	14,260
230.80	**30.7**	**14,726**

Summary for Link DP-1: Merrimack River

Inflow Area = 99,854 sf, 8.30% Impervious, Inflow Depth = 0.02" for 2-YR event
Inflow = 0.0 cfs @ 24.00 hrs, Volume= 173 cf
Primary = 0.0 cfs @ 24.00 hrs, Volume= 173 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node DP-99

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Merrimack River



Hydrograph for Link DP-1: Merrimack River

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	**0.00**	0.0
1.00	0.0	0.00	0.0
2.00	0.0	0.00	0.0
3.00	0.0	0.00	0.0
4.00	0.0	0.00	0.0
5.00	0.0	0.00	0.0
6.00	0.0	0.00	0.0
7.00	0.0	0.00	0.0
8.00	0.0	0.00	0.0
9.00	0.0	0.00	0.0
10.00	0.0	0.00	0.0
11.00	0.0	0.00	0.0
12.00	0.0	0.00	0.0
13.00	0.0	0.00	0.0
14.00	0.0	0.00	0.0
15.00	0.0	0.00	0.0
16.00	0.0	0.00	0.0
17.00	0.0	0.00	0.0
18.00	0.0	0.00	0.0
19.00	0.0	0.00	0.0
20.00	0.0	0.00	0.0
21.00	0.0	0.00	0.0
22.00	0.0	0.00	0.0
23.00	0.0	0.00	0.0
24.00	**0.0**	0.00	**0.0**
25.00	0.0	0.00	0.0
26.00	0.0	0.00	0.0
27.00	0.0	0.00	0.0
28.00	0.0	0.00	0.0
29.00	0.0	0.00	0.0
30.00	0.0	0.00	0.0
31.00	0.0	0.00	0.0
32.00	0.0	0.00	0.0
33.00	0.0	0.00	0.0
34.00	0.0	0.00	0.0
35.00	0.0	0.00	0.0
36.00	0.0	0.00	0.0
37.00	0.0	0.00	0.0
38.00	0.0	0.00	0.0
39.00	0.0	0.00	0.0
40.00	0.0	0.00	0.0
41.00	0.0	0.00	0.0
42.00	0.0	0.00	0.0
43.00	0.0	0.00	0.0
44.00	0.0	0.00	0.0
45.00	0.0	0.00	0.0
46.00	0.0	0.00	0.0
47.00	0.0	0.00	0.0
48.00	0.0	0.00	0.0
49.00	0.0	0.00	0.0
50.00	0.0	0.00	0.0
51.00	0.0	0.00	0.0
52.00	0.0	0.00	0.0
53.00	0.0	0.00	0.0
54.00	0.0	0.00	0.0
55.00	0.0	0.00	0.0
56.00	0.0	0.00	0.0
57.00	0.0	0.00	0.0
58.00	0.0	0.00	0.0
59.00	0.0	0.00	0.0
60.00	0.0	0.00	0.0
61.00	0.0	0.00	0.0
62.00	0.0	0.00	0.0
63.00	0.0	0.00	0.0
64.00	0.0	0.00	0.0
65.00	0.0	0.00	0.0
66.00	0.0	0.00	0.0
67.00	0.0	0.00	0.0
68.00	0.0	0.00	0.0
69.00	0.0	0.00	0.0
70.00	0.0	0.00	0.0
71.00	0.0	0.00	0.0
72.00	0.0	0.00	0.0

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

SubcatchmentEX-1: Runoff Area=2.292 ac 8.30% Impervious Runoff Depth=0.34"
Flow Length=484' Tc=17.1 min CN=47 Runoff=0.3 cfs 2,803 cf

Reach 1R: East Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.017 L=480.0' S=0.0035 '/' Capacity=209.2 cfs Outflow=0.0 cfs 0 cf

Link DP-1: Merrimack River Inflow=0.3 cfs 2,803 cf
Primary=0.3 cfs 2,803 cf

Total Runoff Area = 99,854 sf Runoff Volume = 2,803 cf Average Runoff Depth = 0.34"
91.70% Pervious = 91,568 sf 8.30% Impervious = 8,286 sf

Summary for Subcatchment EX-1:

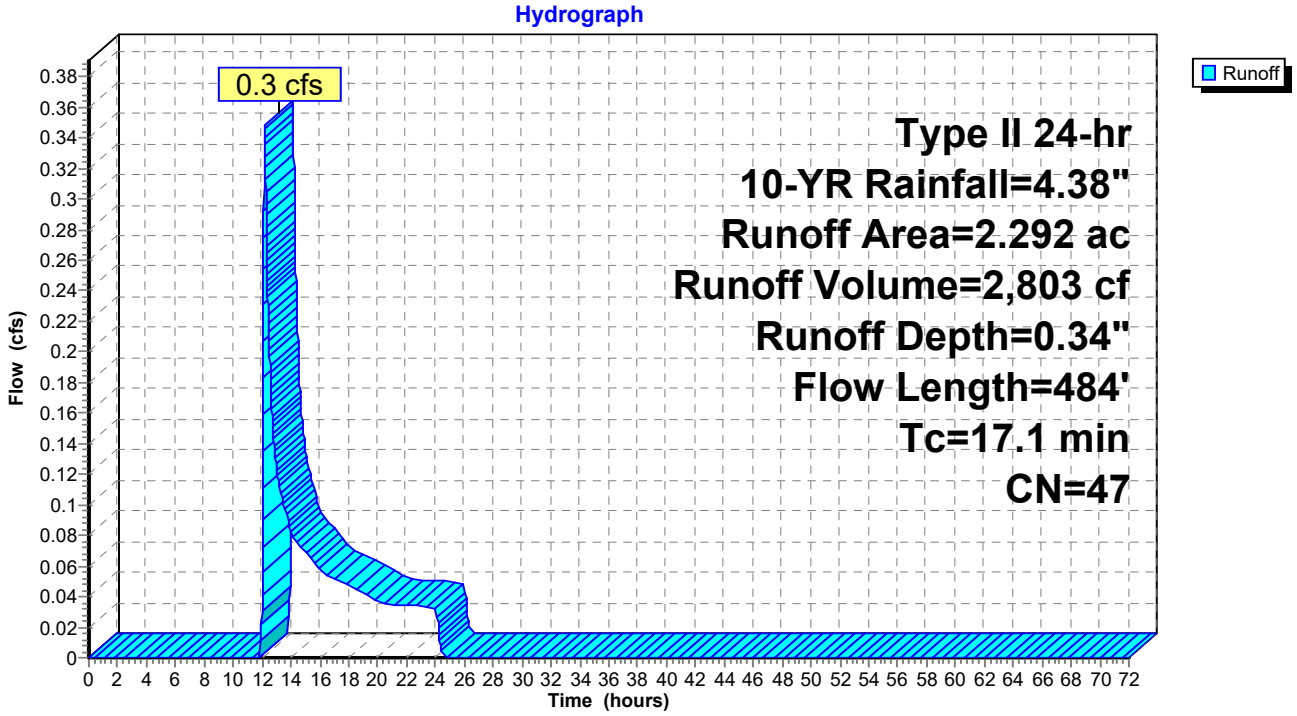
Runoff = 0.3 cfs @ 12.18 hrs, Volume= 2,803 cf, Depth= 0.34"
Routed to Link DP-1 : Merrimack River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=4.38"

Area (ac)	CN	Description
0.811	39	>75% Grass cover, Good, HSG A
0.242	61	>75% Grass cover, Good, HSG B
0.261	74	>75% Grass cover, Good, HSG C
0.190	98	Paved parking, HSG A
0.787	30	Woods, Good, HSG A
0.002	55	Woods, Good, HSG B
2.292	47	Weighted Average
2.102		91.70% Pervious Area
0.190		8.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.75"
1.3	66	0.0148	0.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	158	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	159	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	51	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.1	484	Total			

Subcatchment EX-1:



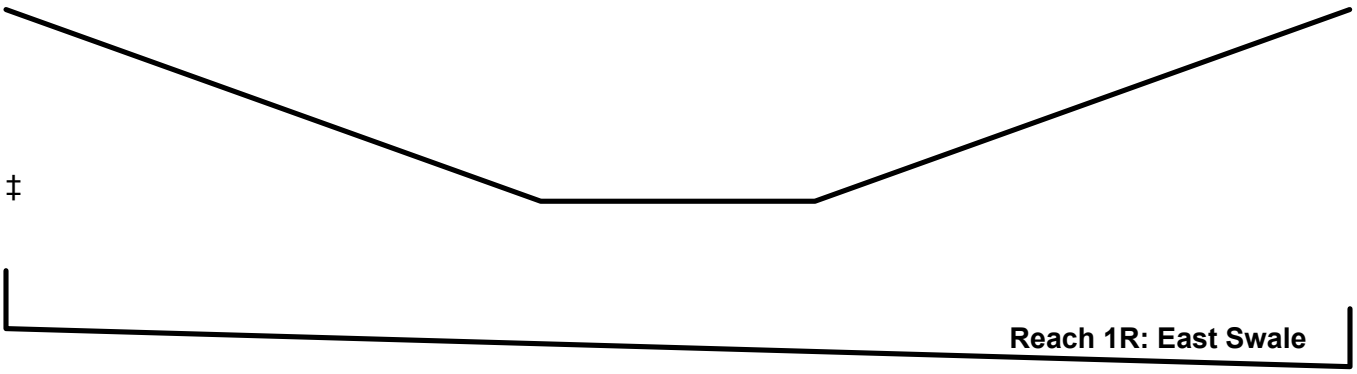
Hydrograph for Subcatchment EX-1:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.00	0.05	0.00	0.0
2.00	0.10	0.00	0.0
3.00	0.15	0.00	0.0
4.00	0.21	0.00	0.0
5.00	0.28	0.00	0.0
6.00	0.35	0.00	0.0
7.00	0.43	0.00	0.0
8.00	0.53	0.00	0.0
9.00	0.64	0.00	0.0
10.00	0.79	0.00	0.0
11.00	1.03	0.00	0.0
12.00	2.90	0.04	**0.1**
13.00	3.38	0.10	**0.1**
14.00	3.59	0.14	0.1
15.00	3.74	0.17	0.1
16.00	3.85	0.20	0.1
17.00	3.95	0.22	0.1
18.00	4.03	0.24	0.0
19.00	4.11	0.26	0.0
20.00	4.17	0.28	0.0
21.00	4.23	0.29	0.0
22.00	4.28	0.31	0.0
23.00	4.33	0.32	0.0
24.00	**4.38**	**0.34**	0.0
25.00	4.38	0.34	0.0
26.00	4.38	0.34	0.0
27.00	4.38	0.34	0.0
28.00	4.38	0.34	0.0
29.00	4.38	0.34	0.0
30.00	4.38	0.34	0.0
31.00	4.38	0.34	0.0
32.00	4.38	0.34	0.0
33.00	4.38	0.34	0.0
34.00	4.38	0.34	0.0
35.00	4.38	0.34	0.0
36.00	4.38	0.34	0.0
37.00	4.38	0.34	0.0
38.00	4.38	0.34	0.0
39.00	4.38	0.34	0.0
40.00	4.38	0.34	0.0
41.00	4.38	0.34	0.0
42.00	4.38	0.34	0.0
43.00	4.38	0.34	0.0
44.00	4.38	0.34	0.0
45.00	4.38	0.34	0.0
46.00	4.38	0.34	0.0
47.00	4.38	0.34	0.0
48.00	4.38	0.34	0.0
49.00	4.38	0.34	0.0
50.00	4.38	0.34	0.0
51.00	4.38	0.34	0.0
52.00	4.38	0.34	0.0
53.00	4.38	0.34	0.0
54.00	4.38	0.34	0.0
55.00	4.38	0.34	0.0
56.00	4.38	0.34	0.0
57.00	4.38	0.34	0.0
58.00	4.38	0.34	0.0
59.00	4.38	0.34	0.0
60.00	4.38	0.34	0.0
61.00	4.38	0.34	0.0
62.00	4.38	0.34	0.0
63.00	4.38	0.34	0.0
64.00	4.38	0.34	0.0
65.00	4.38	0.34	0.0
66.00	4.38	0.34	0.0
67.00	4.38	0.34	0.0
68.00	4.38	0.34	0.0
69.00	4.38	0.34	0.0
70.00	4.38	0.34	0.0
71.00	4.38	0.34	0.0
72.00	4.38	0.34	0.0

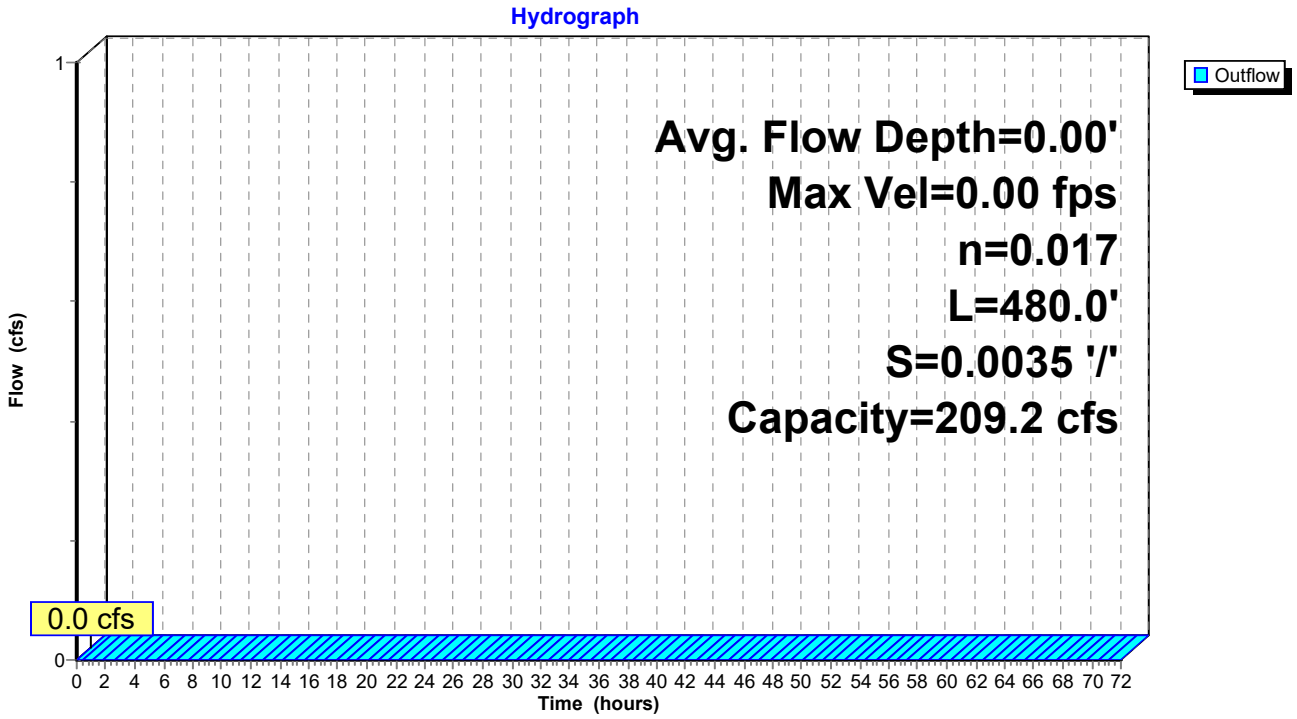
Summary for Reach 1R: East Swale

Bank-Full Depth= 2.60' Flow Area= 30.7 sf, Capacity= 209.2 cfs

4.00' x 2.60' deep channel, n= 0.017 Concrete, unfinished
Side Slope Z-value= 3.0 '/' Top Width= 19.60'
Length= 480.0' Slope= 0.0035 '/'
Inlet Invert= 228.20', Outlet Invert= 226.50'



Reach 1R: East Swale



Stage-Discharge for Reach 1R: East Swale

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
228.20	0.00	0.0
228.22	0.35	0.0
228.24	0.59	0.1
228.26	0.77	0.2
228.28	0.93	0.3
228.30	1.07	0.5
228.32	1.19	0.6
228.34	1.31	0.8
228.36	1.42	1.0
228.38	1.53	1.2
228.40	1.63	1.5
228.42	1.72	1.8
228.44	1.81	2.1
228.46	1.90	2.4
228.48	1.98	2.7
228.50	2.06	3.0
228.52	2.14	3.4
228.54	2.21	3.8
228.56	2.29	4.2
228.58	2.36	4.6
228.60	2.43	5.1
228.62	2.49	5.5
228.64	2.56	6.0
228.66	2.62	6.5
228.68	2.69	7.0
228.70	2.75	7.6
228.72	2.81	8.1
228.74	2.87	8.7
228.76	2.93	9.3
228.78	2.98	9.9
228.80	3.04	10.6
228.82	3.09	11.2
228.84	3.15	11.9
228.86	3.20	12.6
228.88	3.25	13.4
228.90	3.31	14.1
228.92	3.36	14.9
228.94	3.41	15.7
228.96	3.46	16.5
228.98	3.51	17.3
229.00	3.56	18.2
229.02	3.60	19.1
229.04	3.65	20.0
229.06	3.70	20.9
229.08	3.75	21.9
229.10	3.79	22.9
229.12	3.84	23.9
229.14	3.88	24.9
229.16	3.93	25.9
229.18	3.97	27.0
229.20	4.01	28.1
229.22	4.06	29.2
229.24	4.10	30.4
229.26	4.14	31.5
229.28	4.19	32.7
229.30	4.23	34.0
229.32	4.27	35.2
229.34	4.31	36.5
229.36	4.35	37.8
229.38	4.39	39.1
229.40	4.43	40.4
229.42	4.47	41.8
229.44	4.51	43.2
229.46	4.55	44.6
229.48	4.59	46.1
229.50	4.63	47.6
229.52	4.67	49.1
229.54	4.71	50.6
229.56	4.75	52.2
229.58	4.79	53.8
229.60	4.82	55.4
229.62	4.86	57.0
229.64	4.90	58.7
229.66	4.94	60.4
229.68	4.97	62.1
229.70	5.01	63.9
229.72	5.05	65.7
229.74	5.08	67.5
229.76	5.12	69.3
229.78	5.16	71.2
229.80	5.19	73.1
229.82	5.23	75.0
229.84	5.26	77.0
229.86	5.30	79.0
229.88	5.33	81.0
229.90	5.37	83.1
229.92	5.40	85.2
229.94	5.44	87.3
229.96	5.47	89.4
229.98	5.51	91.6
230.00	5.54	93.8
230.02	5.58	96.0
230.04	5.61	98.3
230.06	5.64	100.6
230.08	5.68	102.9
230.10	5.71	105.3
230.12	5.75	107.7
230.14	5.78	110.1
230.16	5.81	112.6
230.18	5.85	115.1
230.20	5.88	117.6
230.22	5.91	120.1
230.24	5.94	122.7
230.26	5.98	125.3
230.28	6.01	128.0
230.30	6.04	130.7
230.32	6.07	133.4
230.34	6.11	136.2
230.36	6.14	139.0
230.38	6.17	141.8
230.40	6.20	144.6
230.42	6.23	147.5
230.44	6.27	150.5
230.46	6.30	153.4
230.48	6.33	156.4
230.50	6.36	159.4
230.52	6.39	162.5
230.54	6.42	165.6
230.56	6.45	168.7
230.58	6.48	171.9
230.60	6.51	175.1
230.62	6.55	178.4
230.64	6.58	181.6
230.66	6.61	185.0
230.68	6.64	188.3
230.70	6.67	191.7
230.72	6.70	195.1
230.74	6.73	198.6
230.76	6.76	202.1
230.78	6.79	205.6
230.80	**6.82**	**209.2**

Stage-Area-Storage for Reach 1R: East Swale

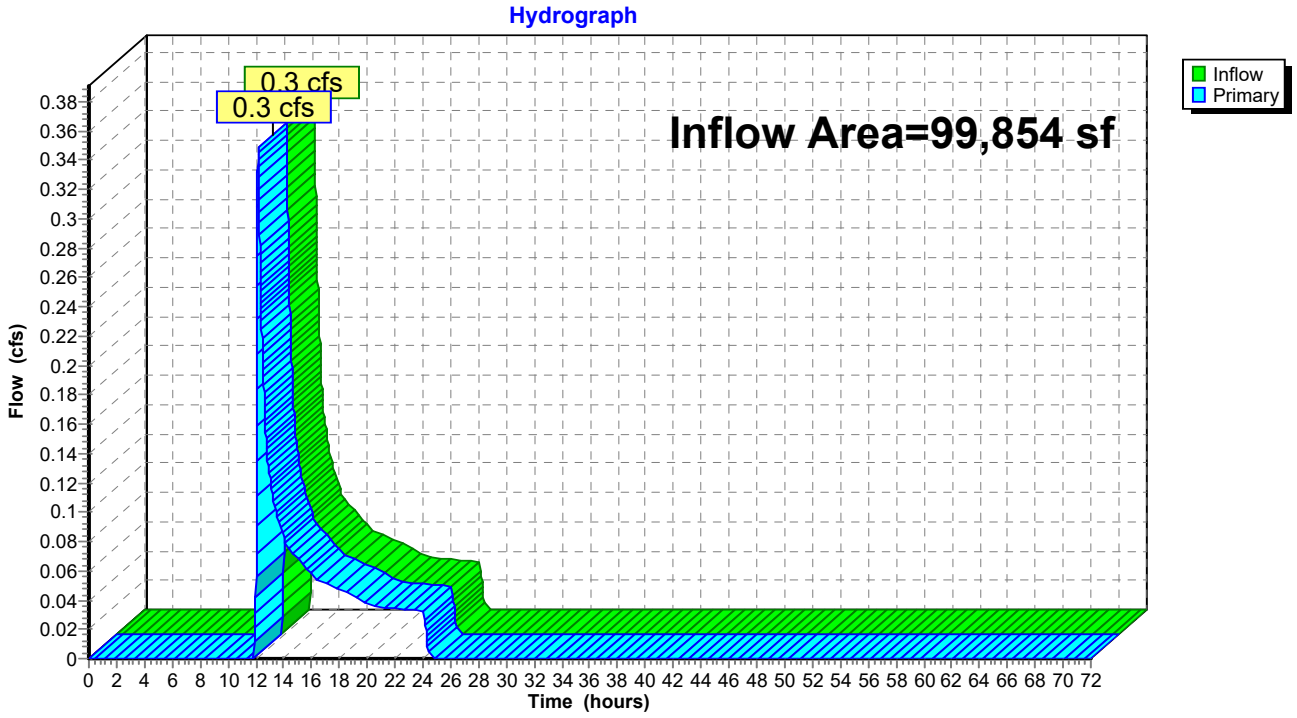
Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
228.20	0.0	0
228.25	0.2	100
228.30	0.4	207
228.35	0.7	321
228.40	0.9	442
228.45	1.2	570
228.50	1.5	706
228.55	1.8	849
228.60	2.1	999
228.65	2.4	1,156
228.70	2.8	1,320
228.75	3.1	1,492
228.80	3.5	1,670
228.85	3.9	1,856
228.90	4.3	2,050
228.95	4.7	2,250
229.00	5.1	2,458
229.05	5.6	2,673
229.10	6.0	2,895
229.15	6.5	3,124
229.20	7.0	3,360
229.25	7.5	3,604
229.30	8.0	3,855
229.35	8.6	4,113
229.40	9.1	4,378
229.45	9.7	4,650
229.50	10.3	4,930
229.55	10.9	5,216
229.60	11.5	5,511
229.65	12.1	5,812
229.70	12.8	6,120
229.75	13.4	6,436
229.80	14.1	6,759
229.85	14.8	7,089
229.90	15.5	7,426
229.95	16.2	7,770
230.00	16.9	8,122
230.05	17.7	8,481
230.10	18.4	8,846
230.15	19.2	9,220
230.20	20.0	9,600
230.25	20.8	9,988
230.30	21.6	10,383
230.35	22.5	10,785
230.40	23.3	11,194
230.45	24.2	11,610
230.50	25.1	12,034
230.55	26.0	12,465
230.60	26.9	12,903
230.65	27.8	13,348
230.70	28.8	13,800
230.75	29.7	14,260
230.80	**30.7**	**14,726**

Summary for Link DP-1: Merrimack River

Inflow Area = 99,854 sf, 8.30% Impervious, Inflow Depth = 0.34" for 10-YR event
Inflow = 0.3 cfs @ 12.18 hrs, Volume= 2,803 cf
Primary = 0.3 cfs @ 12.18 hrs, Volume= 2,803 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node DP-99

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Merrimack River



Hydrograph for Link DP-1: Merrimack River

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	**0.00**	0.0	51.00	0.0	0.00	0.0
1.00	0.0	0.00	0.0	52.00	0.0	0.00	0.0
2.00	0.0	0.00	0.0	53.00	0.0	0.00	0.0
3.00	0.0	0.00	0.0	54.00	0.0	0.00	0.0
4.00	0.0	0.00	0.0	55.00	0.0	0.00	0.0
5.00	0.0	0.00	0.0	56.00	0.0	0.00	0.0
6.00	0.0	0.00	0.0	57.00	0.0	0.00	0.0
7.00	0.0	0.00	0.0	58.00	0.0	0.00	0.0
8.00	0.0	0.00	0.0	59.00	0.0	0.00	0.0
9.00	0.0	0.00	0.0	60.00	0.0	0.00	0.0
10.00	0.0	0.00	0.0	61.00	0.0	0.00	0.0
11.00	0.0	0.00	0.0	62.00	0.0	0.00	0.0
12.00	**0.1**	0.00	**0.1**	63.00	0.0	0.00	0.0
13.00	**0.1**	0.00	**0.1**	64.00	0.0	0.00	0.0
14.00	0.1	0.00	0.1	65.00	0.0	0.00	0.0
15.00	0.1	0.00	0.1	66.00	0.0	0.00	0.0
16.00	0.1	0.00	0.1	67.00	0.0	0.00	0.0
17.00	0.1	0.00	0.1	68.00	0.0	0.00	0.0
18.00	0.0	0.00	0.0	69.00	0.0	0.00	0.0
19.00	0.0	0.00	0.0	70.00	0.0	0.00	0.0
20.00	0.0	0.00	0.0	71.00	0.0	0.00	0.0
21.00	0.0	0.00	0.0	72.00	0.0	0.00	0.0
22.00	0.0	0.00	0.0				
23.00	0.0	0.00	0.0				
24.00	0.0	0.00	0.0				
25.00	0.0	0.00	0.0				
26.00	0.0	0.00	0.0				
27.00	0.0	0.00	0.0				
28.00	0.0	0.00	0.0				
29.00	0.0	0.00	0.0				
30.00	0.0	0.00	0.0				
31.00	0.0	0.00	0.0				
32.00	0.0	0.00	0.0				
33.00	0.0	0.00	0.0				
34.00	0.0	0.00	0.0				
35.00	0.0	0.00	0.0				
36.00	0.0	0.00	0.0				
37.00	0.0	0.00	0.0				
38.00	0.0	0.00	0.0				
39.00	0.0	0.00	0.0				
40.00	0.0	0.00	0.0				
41.00	0.0	0.00	0.0				
42.00	0.0	0.00	0.0				
43.00	0.0	0.00	0.0				
44.00	0.0	0.00	0.0				
45.00	0.0	0.00	0.0				
46.00	0.0	0.00	0.0				
47.00	0.0	0.00	0.0				
48.00	0.0	0.00	0.0				
49.00	0.0	0.00	0.0				
50.00	0.0	0.00	0.0				

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

SubcatchmentEX-1: Runoff Area=2.292 ac 8.30% Impervious Runoff Depth=0.69"
Flow Length=484' Tc=17.1 min CN=47 Runoff=1.2 cfs 5,706 cf

Reach 1R: East Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.017 L=480.0' S=0.0035 '/' Capacity=209.2 cfs Outflow=0.0 cfs 0 cf

Link DP-1: Merrimack River Inflow=1.2 cfs 5,706 cf
Primary=1.2 cfs 5,706 cf

Total Runoff Area = 99,854 sf Runoff Volume = 5,706 cf Average Runoff Depth = 0.69"
91.70% Pervious = 91,568 sf 8.30% Impervious = 8,286 sf

Summary for Subcatchment EX-1:

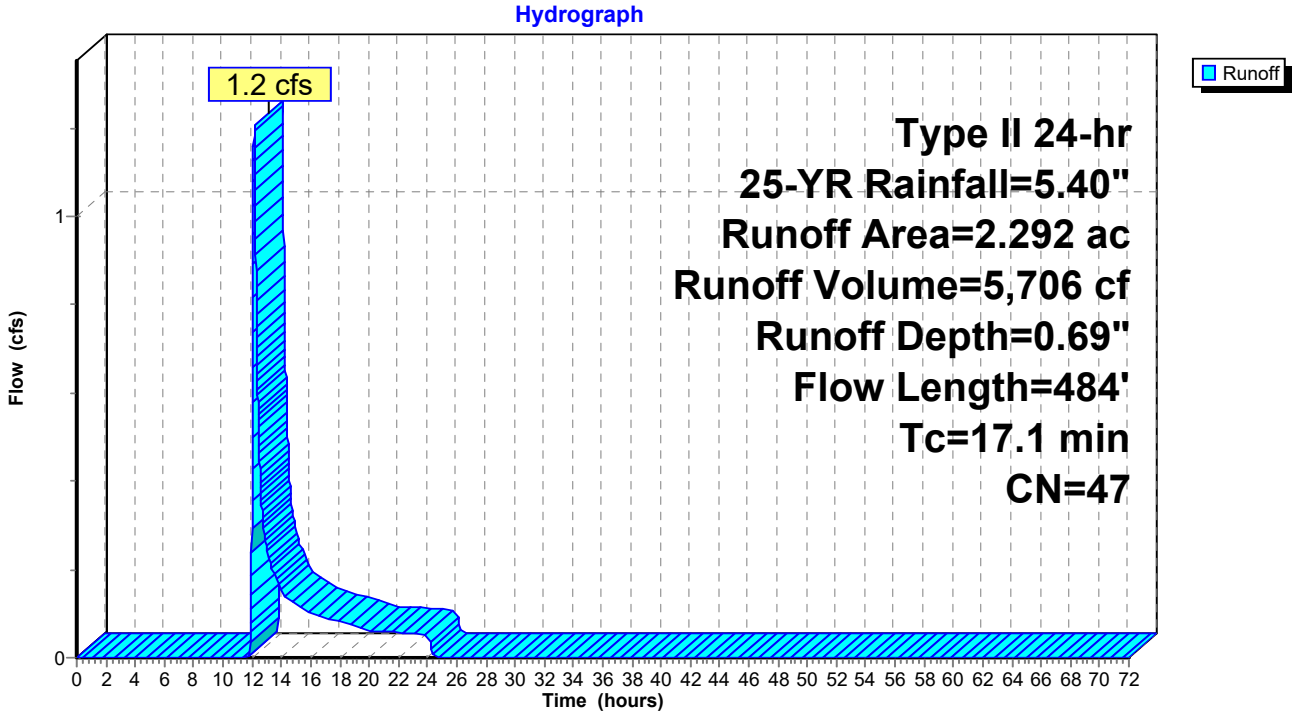
Runoff = 1.2 cfs @ 12.14 hrs, Volume= 5,706 cf, Depth= 0.69"
Routed to Link DP-1 : Merrimack River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-YR Rainfall=5.40"

Area (ac)	CN	Description
0.811	39	>75% Grass cover, Good, HSG A
0.242	61	>75% Grass cover, Good, HSG B
0.261	74	>75% Grass cover, Good, HSG C
0.190	98	Paved parking, HSG A
0.787	30	Woods, Good, HSG A
0.002	55	Woods, Good, HSG B
2.292	47	Weighted Average
2.102		91.70% Pervious Area
0.190		8.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.75"
1.3	66	0.0148	0.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	158	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	159	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	51	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.1	484	Total			

Subcatchment EX-1:



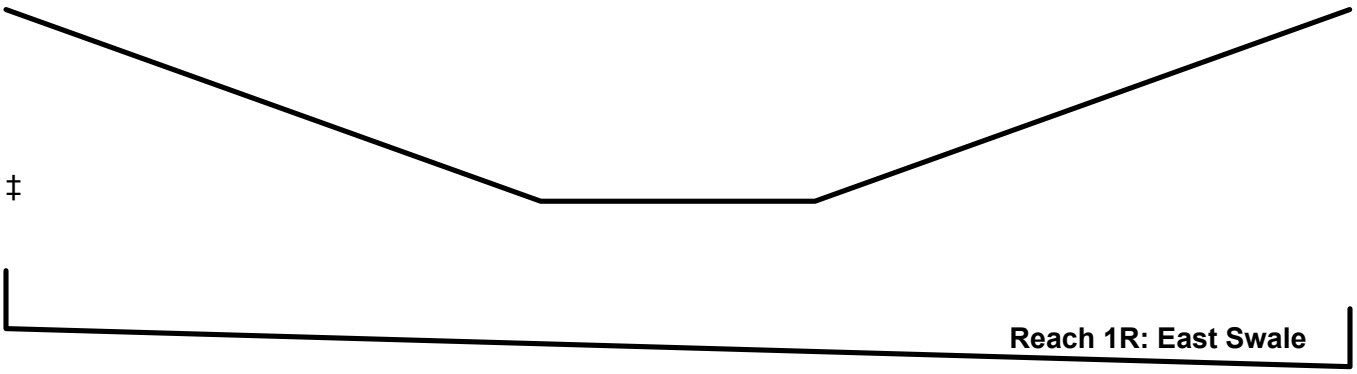
Hydrograph for Subcatchment EX-1:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.00	0.06	0.00	0.0
2.00	0.12	0.00	0.0
3.00	0.19	0.00	0.0
4.00	0.26	0.00	0.0
5.00	0.34	0.00	0.0
6.00	0.43	0.00	0.0
7.00	0.53	0.00	0.0
8.00	0.65	0.00	0.0
9.00	0.79	0.00	0.0
10.00	0.98	0.00	0.0
11.00	1.27	0.00	0.0
12.00	3.58	0.14	**0.4**
13.00	4.17	0.28	**0.2**
14.00	4.43	0.35	0.2
15.00	4.61	0.41	0.1
16.00	4.75	0.45	0.1
17.00	4.87	0.49	0.1
18.00	4.97	0.53	0.1
19.00	5.06	0.56	0.1
20.00	5.14	0.59	0.1
21.00	5.21	0.61	0.1
22.00	5.28	0.64	0.1
23.00	5.34	0.66	0.1
24.00	**5.40**	**0.69**	0.1
25.00	5.40	0.69	0.0
26.00	5.40	0.69	0.0
27.00	5.40	0.69	0.0
28.00	5.40	0.69	0.0
29.00	5.40	0.69	0.0
30.00	5.40	0.69	0.0
31.00	5.40	0.69	0.0
32.00	5.40	0.69	0.0
33.00	5.40	0.69	0.0
34.00	5.40	0.69	0.0
35.00	5.40	0.69	0.0
36.00	5.40	0.69	0.0
37.00	5.40	0.69	0.0
38.00	5.40	0.69	0.0
39.00	5.40	0.69	0.0
40.00	5.40	0.69	0.0
41.00	5.40	0.69	0.0
42.00	5.40	0.69	0.0
43.00	5.40	0.69	0.0
44.00	5.40	0.69	0.0
45.00	5.40	0.69	0.0
46.00	5.40	0.69	0.0
47.00	5.40	0.69	0.0
48.00	5.40	0.69	0.0
49.00	5.40	0.69	0.0
50.00	5.40	0.69	0.0
51.00	5.40	0.69	0.0
52.00	5.40	0.69	0.0
53.00	5.40	0.69	0.0
54.00	5.40	0.69	0.0
55.00	5.40	0.69	0.0
56.00	5.40	0.69	0.0
57.00	5.40	0.69	0.0
58.00	5.40	0.69	0.0
59.00	5.40	0.69	0.0
60.00	5.40	0.69	0.0
61.00	5.40	0.69	0.0
62.00	5.40	0.69	0.0
63.00	5.40	0.69	0.0
64.00	5.40	0.69	0.0
65.00	5.40	0.69	0.0
66.00	5.40	0.69	0.0
67.00	5.40	0.69	0.0
68.00	5.40	0.69	0.0
69.00	5.40	0.69	0.0
70.00	5.40	0.69	0.0
71.00	5.40	0.69	0.0
72.00	5.40	0.69	0.0

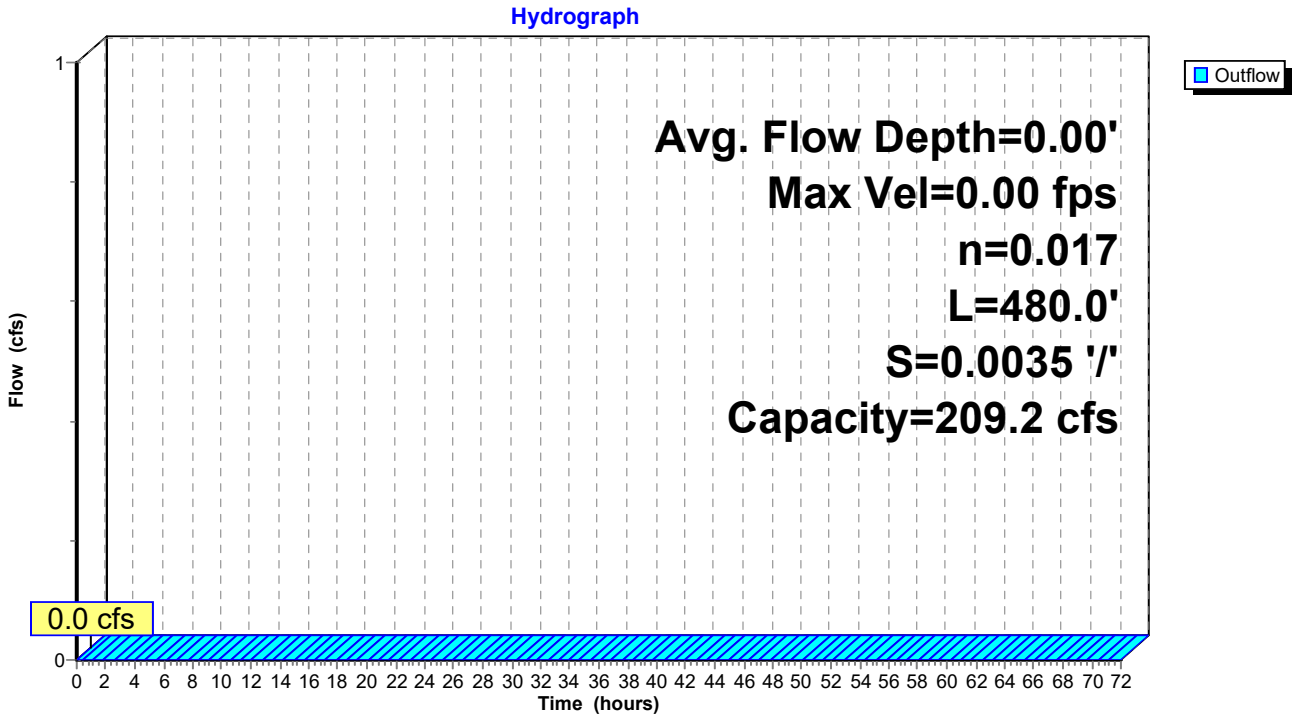
Summary for Reach 1R: East Swale

Bank-Full Depth= 2.60' Flow Area= 30.7 sf, Capacity= 209.2 cfs

4.00' x 2.60' deep channel, n= 0.017 Concrete, unfinished
Side Slope Z-value= 3.0 '/' Top Width= 19.60'
Length= 480.0' Slope= 0.0035 '/'
Inlet Invert= 228.20', Outlet Invert= 226.50'



Reach 1R: East Swale



Stage-Discharge for Reach 1R: East Swale

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
228.20	0.00	0.0
228.22	0.35	0.0
228.24	0.59	0.1
228.26	0.77	0.2
228.28	0.93	0.3
228.30	1.07	0.5
228.32	1.19	0.6
228.34	1.31	0.8
228.36	1.42	1.0
228.38	1.53	1.2
228.40	1.63	1.5
228.42	1.72	1.8
228.44	1.81	2.1
228.46	1.90	2.4
228.48	1.98	2.7
228.50	2.06	3.0
228.52	2.14	3.4
228.54	2.21	3.8
228.56	2.29	4.2
228.58	2.36	4.6
228.60	2.43	5.1
228.62	2.49	5.5
228.64	2.56	6.0
228.66	2.62	6.5
228.68	2.69	7.0
228.70	2.75	7.6
228.72	2.81	8.1
228.74	2.87	8.7
228.76	2.93	9.3
228.78	2.98	9.9
228.80	3.04	10.6
228.82	3.09	11.2
228.84	3.15	11.9
228.86	3.20	12.6
228.88	3.25	13.4
228.90	3.31	14.1
228.92	3.36	14.9
228.94	3.41	15.7
228.96	3.46	16.5
228.98	3.51	17.3
229.00	3.56	18.2
229.02	3.60	19.1
229.04	3.65	20.0
229.06	3.70	20.9
229.08	3.75	21.9
229.10	3.79	22.9
229.12	3.84	23.9
229.14	3.88	24.9
229.16	3.93	25.9
229.18	3.97	27.0
229.20	4.01	28.1
229.22	4.06	29.2
229.24	4.10	30.4
229.26	4.14	31.5
229.28	4.19	32.7
229.30	4.23	34.0
229.32	4.27	35.2
229.34	4.31	36.5
229.36	4.35	37.8
229.38	4.39	39.1
229.40	4.43	40.4
229.42	4.47	41.8
229.44	4.51	43.2
229.46	4.55	44.6
229.48	4.59	46.1
229.50	4.63	47.6
229.52	4.67	49.1
229.54	4.71	50.6
229.56	4.75	52.2
229.58	4.79	53.8
229.60	4.82	55.4
229.62	4.86	57.0
229.64	4.90	58.7
229.66	4.94	60.4
229.68	4.97	62.1
229.70	5.01	63.9
229.72	5.05	65.7
229.74	5.08	67.5
229.76	5.12	69.3
229.78	5.16	71.2
229.80	5.19	73.1
229.82	5.23	75.0
229.84	5.26	77.0
229.86	5.30	79.0
229.88	5.33	81.0
229.90	5.37	83.1
229.92	5.40	85.2
229.94	5.44	87.3
229.96	5.47	89.4
229.98	5.51	91.6
230.00	5.54	93.8
230.02	5.58	96.0
230.04	5.61	98.3
230.06	5.64	100.6
230.08	5.68	102.9
230.10	5.71	105.3
230.12	5.75	107.7
230.14	5.78	110.1
230.16	5.81	112.6
230.18	5.85	115.1
230.20	5.88	117.6
230.22	5.91	120.1
230.24	5.94	122.7
230.26	5.98	125.3
230.28	6.01	128.0
230.30	6.04	130.7
230.32	6.07	133.4
230.34	6.11	136.2
230.36	6.14	139.0
230.38	6.17	141.8
230.40	6.20	144.6
230.42	6.23	147.5
230.44	6.27	150.5
230.46	6.30	153.4
230.48	6.33	156.4
230.50	6.36	159.4
230.52	6.39	162.5
230.54	6.42	165.6
230.56	6.45	168.7
230.58	6.48	171.9
230.60	6.51	175.1
230.62	6.55	178.4
230.64	6.58	181.6
230.66	6.61	185.0
230.68	6.64	188.3
230.70	6.67	191.7
230.72	6.70	195.1
230.74	6.73	198.6
230.76	6.76	202.1
230.78	6.79	205.6
230.80	**6.82**	**209.2**

Stage-Area-Storage for Reach 1R: East Swale

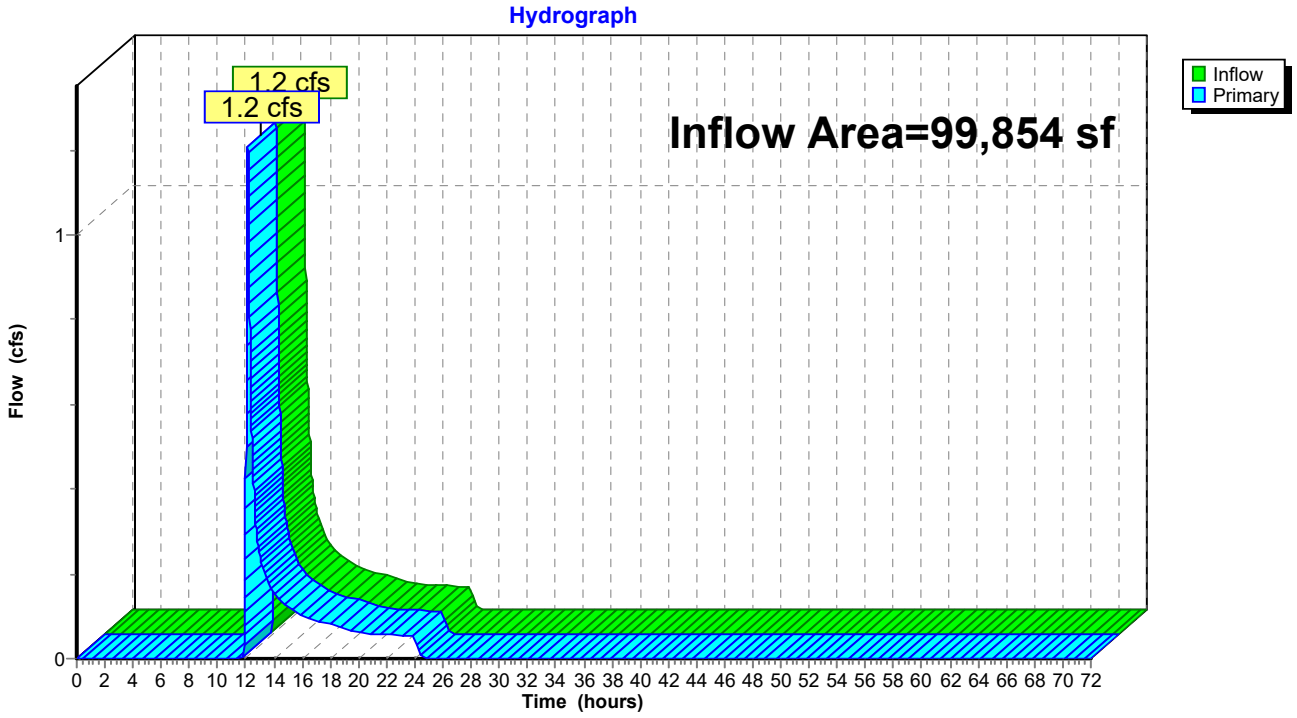
Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
228.20	0.0	0
228.25	0.2	100
228.30	0.4	207
228.35	0.7	321
228.40	0.9	442
228.45	1.2	570
228.50	1.5	706
228.55	1.8	849
228.60	2.1	999
228.65	2.4	1,156
228.70	2.8	1,320
228.75	3.1	1,492
228.80	3.5	1,670
228.85	3.9	1,856
228.90	4.3	2,050
228.95	4.7	2,250
229.00	5.1	2,458
229.05	5.6	2,673
229.10	6.0	2,895
229.15	6.5	3,124
229.20	7.0	3,360
229.25	7.5	3,604
229.30	8.0	3,855
229.35	8.6	4,113
229.40	9.1	4,378
229.45	9.7	4,650
229.50	10.3	4,930
229.55	10.9	5,216
229.60	11.5	5,511
229.65	12.1	5,812
229.70	12.8	6,120
229.75	13.4	6,436
229.80	14.1	6,759
229.85	14.8	7,089
229.90	15.5	7,426
229.95	16.2	7,770
230.00	16.9	8,122
230.05	17.7	8,481
230.10	18.4	8,846
230.15	19.2	9,220
230.20	20.0	9,600
230.25	20.8	9,988
230.30	21.6	10,383
230.35	22.5	10,785
230.40	23.3	11,194
230.45	24.2	11,610
230.50	25.1	12,034
230.55	26.0	12,465
230.60	26.9	12,903
230.65	27.8	13,348
230.70	28.8	13,800
230.75	29.7	14,260
230.80	**30.7**	**14,726**

Summary for Link DP-1: Merrimack River

Inflow Area = 99,854 sf, 8.30% Impervious, Inflow Depth = 0.69" for 25-YR event
Inflow = 1.2 cfs @ 12.14 hrs, Volume= 5,706 cf
Primary = 1.2 cfs @ 12.14 hrs, Volume= 5,706 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node DP-99

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Merrimack River



Hydrograph for Link DP-1: Merrimack River

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	**0.00**	0.0	51.00	0.0	0.00	0.0
1.00	0.0	0.00	0.0	52.00	0.0	0.00	0.0
2.00	0.0	0.00	0.0	53.00	0.0	0.00	0.0
3.00	0.0	0.00	0.0	54.00	0.0	0.00	0.0
4.00	0.0	0.00	0.0	55.00	0.0	0.00	0.0
5.00	0.0	0.00	0.0	56.00	0.0	0.00	0.0
6.00	0.0	0.00	0.0	57.00	0.0	0.00	0.0
7.00	0.0	0.00	0.0	58.00	0.0	0.00	0.0
8.00	0.0	0.00	0.0	59.00	0.0	0.00	0.0
9.00	0.0	0.00	0.0	60.00	0.0	0.00	0.0
10.00	0.0	0.00	0.0	61.00	0.0	0.00	0.0
11.00	0.0	0.00	0.0	62.00	0.0	0.00	0.0
12.00	**0.4**	0.00	**0.4**	63.00	0.0	0.00	0.0
13.00	**0.2**	0.00	**0.2**	64.00	0.0	0.00	0.0
14.00	0.2	0.00	0.2	65.00	0.0	0.00	0.0
15.00	0.1	0.00	0.1	66.00	0.0	0.00	0.0
16.00	0.1	0.00	0.1	67.00	0.0	0.00	0.0
17.00	0.1	0.00	0.1	68.00	0.0	0.00	0.0
18.00	0.1	0.00	0.1	69.00	0.0	0.00	0.0
19.00	0.1	0.00	0.1	70.00	0.0	0.00	0.0
20.00	0.1	0.00	0.1	71.00	0.0	0.00	0.0
21.00	0.1	0.00	0.1	72.00	0.0	0.00	0.0
22.00	0.1	0.00	0.1				
23.00	0.1	0.00	0.1				
24.00	0.1	0.00	0.1				
25.00	0.0	0.00	0.0				
26.00	0.0	0.00	0.0				
27.00	0.0	0.00	0.0				
28.00	0.0	0.00	0.0				
29.00	0.0	0.00	0.0				
30.00	0.0	0.00	0.0				
31.00	0.0	0.00	0.0				
32.00	0.0	0.00	0.0				
33.00	0.0	0.00	0.0				
34.00	0.0	0.00	0.0				
35.00	0.0	0.00	0.0				
36.00	0.0	0.00	0.0				
37.00	0.0	0.00	0.0				
38.00	0.0	0.00	0.0				
39.00	0.0	0.00	0.0				
40.00	0.0	0.00	0.0				
41.00	0.0	0.00	0.0				
42.00	0.0	0.00	0.0				
43.00	0.0	0.00	0.0				
44.00	0.0	0.00	0.0				
45.00	0.0	0.00	0.0				
46.00	0.0	0.00	0.0				
47.00	0.0	0.00	0.0				
48.00	0.0	0.00	0.0				
49.00	0.0	0.00	0.0				
50.00	0.0	0.00	0.0				

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

SubcatchmentEX-1: Runoff Area=2.292 ac 8.30% Impervious Runoff Depth=1.00"
Flow Length=484' Tc=17.1 min CN=47 Runoff=2.1 cfs 8,357 cf

Reach 1R: East Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.017 L=480.0' S=0.0035 '/' Capacity=209.2 cfs Outflow=0.0 cfs 0 cf

Link DP-1: Merrimack River Inflow=2.1 cfs 8,357 cf
Primary=2.1 cfs 8,357 cf

Total Runoff Area = 99,854 sf Runoff Volume = 8,357 cf Average Runoff Depth = 1.00"
91.70% Pervious = 91,568 sf 8.30% Impervious = 8,286 sf

Summary for Subcatchment EX-1:

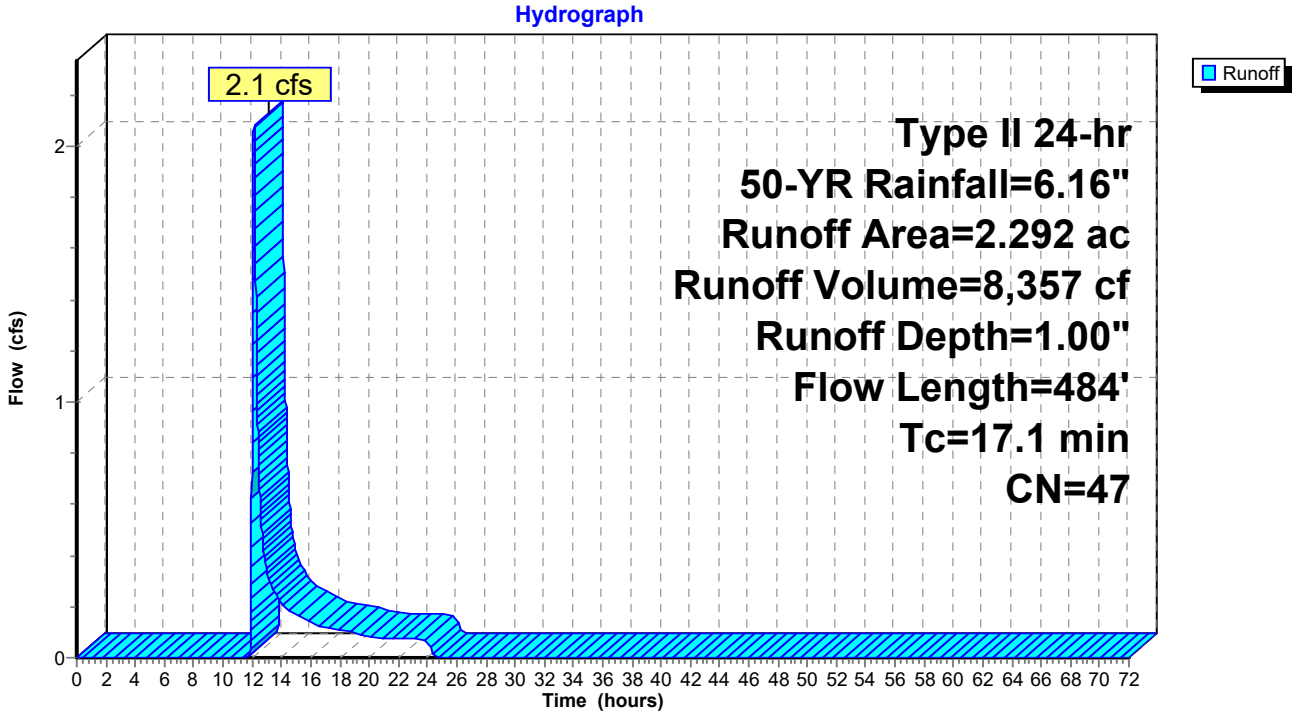
Runoff = 2.1 cfs @ 12.13 hrs, Volume= 8,357 cf, Depth= 1.00"
Routed to Link DP-1 : Merrimack River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-YR Rainfall=6.16"

Area (ac)	CN	Description
0.811	39	>75% Grass cover, Good, HSG A
0.242	61	>75% Grass cover, Good, HSG B
0.261	74	>75% Grass cover, Good, HSG C
0.190	98	Paved parking, HSG A
0.787	30	Woods, Good, HSG A
0.002	55	Woods, Good, HSG B
2.292	47	Weighted Average
2.102		91.70% Pervious Area
0.190		8.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.75"
1.3	66	0.0148	0.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	158	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	159	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	51	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.1	484	Total			

Subcatchment EX-1:



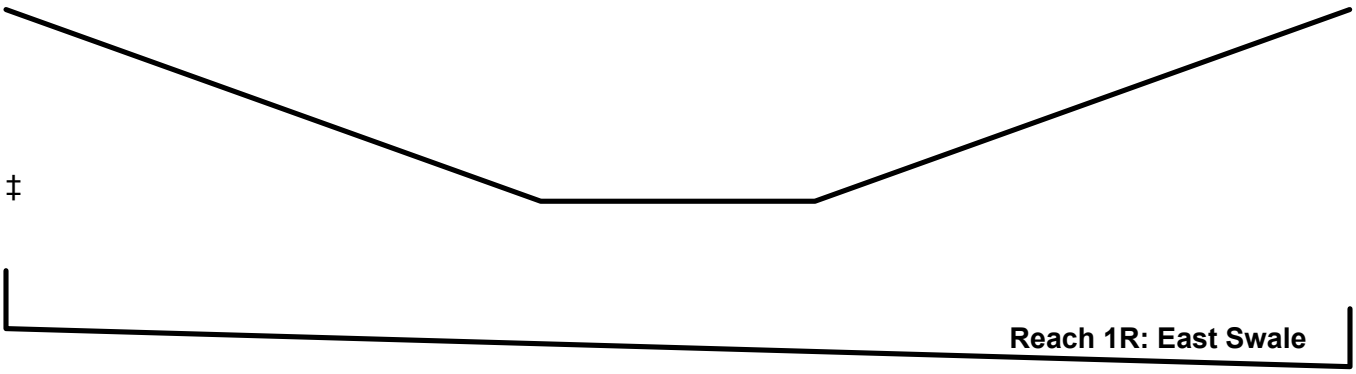
Hydrograph for Subcatchment EX-1:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.00	0.06	0.00	0.0
2.00	0.14	0.00	0.0
3.00	0.21	0.00	0.0
4.00	0.30	0.00	0.0
5.00	0.39	0.00	0.0
6.00	0.49	0.00	0.0
7.00	0.61	0.00	0.0
8.00	0.74	0.00	0.0
9.00	0.91	0.00	0.0
10.00	1.11	0.00	0.0
11.00	1.45	0.00	0.0
12.00	4.08	0.26	**1.0**
13.00	4.76	0.45	**0.3**
14.00	5.05	0.56	0.2
15.00	5.26	0.63	0.2
16.00	5.42	0.69	0.1
17.00	5.55	0.75	0.1
18.00	5.67	0.80	0.1
19.00	5.78	0.84	0.1
20.00	5.86	0.87	0.1
21.00	5.94	0.91	0.1
22.00	6.02	0.94	0.1
23.00	6.09	0.97	0.1
24.00	**6.16**	**1.00**	0.1
25.00	6.16	1.00	0.0
26.00	6.16	1.00	0.0
27.00	6.16	1.00	0.0
28.00	6.16	1.00	0.0
29.00	6.16	1.00	0.0
30.00	6.16	1.00	0.0
31.00	6.16	1.00	0.0
32.00	6.16	1.00	0.0
33.00	6.16	1.00	0.0
34.00	6.16	1.00	0.0
35.00	6.16	1.00	0.0
36.00	6.16	1.00	0.0
37.00	6.16	1.00	0.0
38.00	6.16	1.00	0.0
39.00	6.16	1.00	0.0
40.00	6.16	1.00	0.0
41.00	6.16	1.00	0.0
42.00	6.16	1.00	0.0
43.00	6.16	1.00	0.0
44.00	6.16	1.00	0.0
45.00	6.16	1.00	0.0
46.00	6.16	1.00	0.0
47.00	6.16	1.00	0.0
48.00	6.16	1.00	0.0
49.00	6.16	1.00	0.0
50.00	6.16	1.00	0.0
51.00	6.16	1.00	0.0
52.00	6.16	1.00	0.0
53.00	6.16	1.00	0.0
54.00	6.16	1.00	0.0
55.00	6.16	1.00	0.0
56.00	6.16	1.00	0.0
57.00	6.16	1.00	0.0
58.00	6.16	1.00	0.0
59.00	6.16	1.00	0.0
60.00	6.16	1.00	0.0
61.00	6.16	1.00	0.0
62.00	6.16	1.00	0.0
63.00	6.16	1.00	0.0
64.00	6.16	1.00	0.0
65.00	6.16	1.00	0.0
66.00	6.16	1.00	0.0
67.00	6.16	1.00	0.0
68.00	6.16	1.00	0.0
69.00	6.16	1.00	0.0
70.00	6.16	1.00	0.0
71.00	6.16	1.00	0.0
72.00	6.16	1.00	0.0

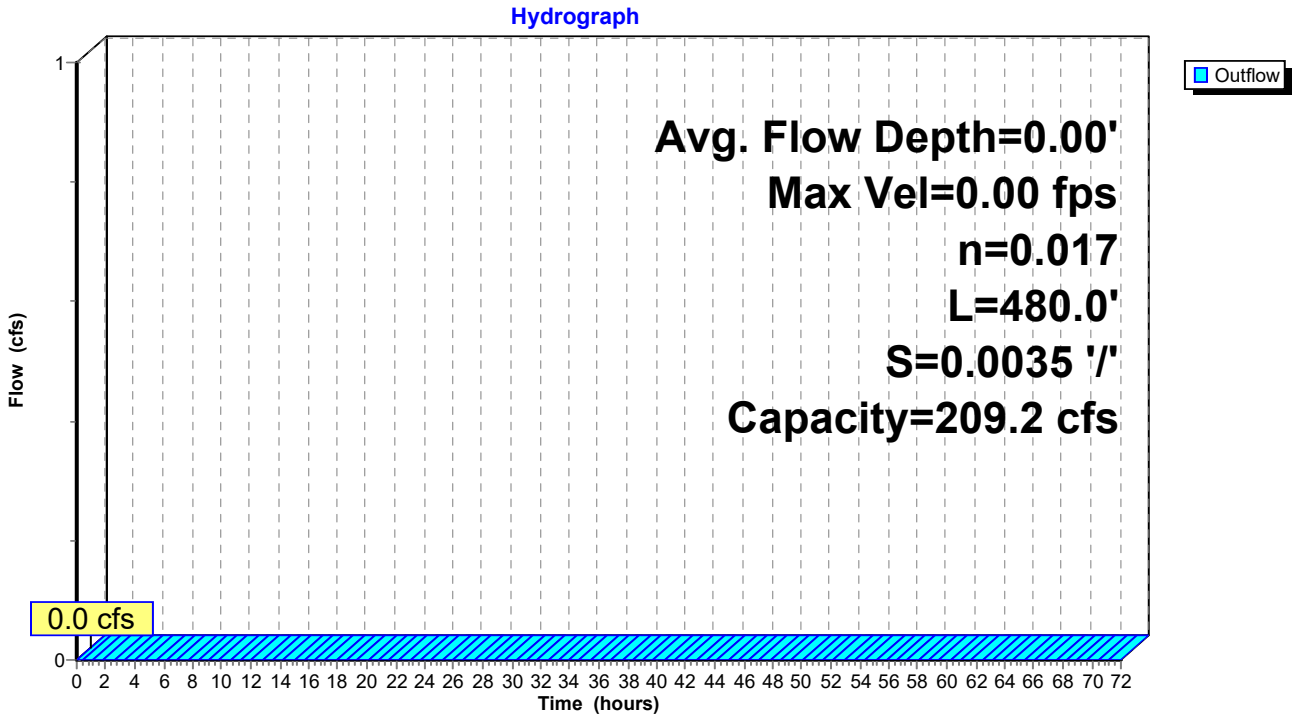
Summary for Reach 1R: East Swale

Bank-Full Depth= 2.60' Flow Area= 30.7 sf, Capacity= 209.2 cfs

4.00' x 2.60' deep channel, n= 0.017 Concrete, unfinished
Side Slope Z-value= 3.0 '/' Top Width= 19.60'
Length= 480.0' Slope= 0.0035 '/'
Inlet Invert= 228.20', Outlet Invert= 226.50'



Reach 1R: East Swale



Stage-Discharge for Reach 1R: East Swale

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
228.20	0.00	0.0
228.22	0.35	0.0
228.24	0.59	0.1
228.26	0.77	0.2
228.28	0.93	0.3
228.30	1.07	0.5
228.32	1.19	0.6
228.34	1.31	0.8
228.36	1.42	1.0
228.38	1.53	1.2
228.40	1.63	1.5
228.42	1.72	1.8
228.44	1.81	2.1
228.46	1.90	2.4
228.48	1.98	2.7
228.50	2.06	3.0
228.52	2.14	3.4
228.54	2.21	3.8
228.56	2.29	4.2
228.58	2.36	4.6
228.60	2.43	5.1
228.62	2.49	5.5
228.64	2.56	6.0
228.66	2.62	6.5
228.68	2.69	7.0
228.70	2.75	7.6
228.72	2.81	8.1
228.74	2.87	8.7
228.76	2.93	9.3
228.78	2.98	9.9
228.80	3.04	10.6
228.82	3.09	11.2
228.84	3.15	11.9
228.86	3.20	12.6
228.88	3.25	13.4
228.90	3.31	14.1
228.92	3.36	14.9
228.94	3.41	15.7
228.96	3.46	16.5
228.98	3.51	17.3
229.00	3.56	18.2
229.02	3.60	19.1
229.04	3.65	20.0
229.06	3.70	20.9
229.08	3.75	21.9
229.10	3.79	22.9
229.12	3.84	23.9
229.14	3.88	24.9
229.16	3.93	25.9
229.18	3.97	27.0
229.20	4.01	28.1
229.22	4.06	29.2
229.24	4.10	30.4
229.26	4.14	31.5
229.28	4.19	32.7
229.30	4.23	34.0
229.32	4.27	35.2
229.34	4.31	36.5
229.36	4.35	37.8
229.38	4.39	39.1
229.40	4.43	40.4
229.42	4.47	41.8
229.44	4.51	43.2
229.46	4.55	44.6
229.48	4.59	46.1
229.50	4.63	47.6
229.52	4.67	49.1
229.54	4.71	50.6
229.56	4.75	52.2
229.58	4.79	53.8
229.60	4.82	55.4
229.62	4.86	57.0
229.64	4.90	58.7
229.66	4.94	60.4
229.68	4.97	62.1
229.70	5.01	63.9
229.72	5.05	65.7
229.74	5.08	67.5
229.76	5.12	69.3
229.78	5.16	71.2
229.80	5.19	73.1
229.82	5.23	75.0
229.84	5.26	77.0
229.86	5.30	79.0
229.88	5.33	81.0
229.90	5.37	83.1
229.92	5.40	85.2
229.94	5.44	87.3
229.96	5.47	89.4
229.98	5.51	91.6
230.00	5.54	93.8
230.02	5.58	96.0
230.04	5.61	98.3
230.06	5.64	100.6
230.08	5.68	102.9
230.10	5.71	105.3
230.12	5.75	107.7
230.14	5.78	110.1
230.16	5.81	112.6
230.18	5.85	115.1
230.20	5.88	117.6
230.22	5.91	120.1
230.24	5.94	122.7
230.26	5.98	125.3
230.28	6.01	128.0
230.30	6.04	130.7
230.32	6.07	133.4
230.34	6.11	136.2
230.36	6.14	139.0
230.38	6.17	141.8
230.40	6.20	144.6
230.42	6.23	147.5
230.44	6.27	150.5
230.46	6.30	153.4
230.48	6.33	156.4
230.50	6.36	159.4
230.52	6.39	162.5
230.54	6.42	165.6
230.56	6.45	168.7
230.58	6.48	171.9
230.60	6.51	175.1
230.62	6.55	178.4
230.64	6.58	181.6
230.66	6.61	185.0
230.68	6.64	188.3
230.70	6.67	191.7
230.72	6.70	195.1
230.74	6.73	198.6
230.76	6.76	202.1
230.78	6.79	205.6
230.80	**6.82**	**209.2**

Stage-Area-Storage for Reach 1R: East Swale

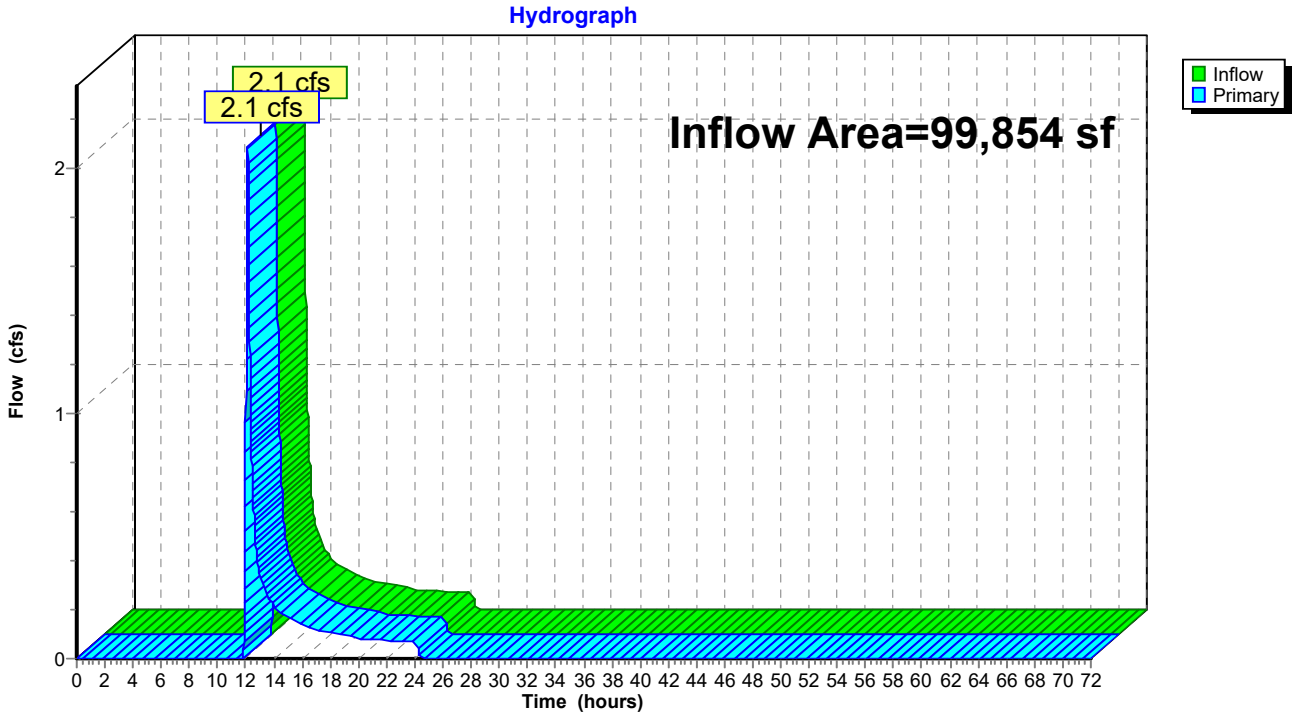
Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
228.20	0.0	0
228.25	0.2	100
228.30	0.4	207
228.35	0.7	321
228.40	0.9	442
228.45	1.2	570
228.50	1.5	706
228.55	1.8	849
228.60	2.1	999
228.65	2.4	1,156
228.70	2.8	1,320
228.75	3.1	1,492
228.80	3.5	1,670
228.85	3.9	1,856
228.90	4.3	2,050
228.95	4.7	2,250
229.00	5.1	2,458
229.05	5.6	2,673
229.10	6.0	2,895
229.15	6.5	3,124
229.20	7.0	3,360
229.25	7.5	3,604
229.30	8.0	3,855
229.35	8.6	4,113
229.40	9.1	4,378
229.45	9.7	4,650
229.50	10.3	4,930
229.55	10.9	5,216
229.60	11.5	5,511
229.65	12.1	5,812
229.70	12.8	6,120
229.75	13.4	6,436
229.80	14.1	6,759
229.85	14.8	7,089
229.90	15.5	7,426
229.95	16.2	7,770
230.00	16.9	8,122
230.05	17.7	8,481
230.10	18.4	8,846
230.15	19.2	9,220
230.20	20.0	9,600
230.25	20.8	9,988
230.30	21.6	10,383
230.35	22.5	10,785
230.40	23.3	11,194
230.45	24.2	11,610
230.50	25.1	12,034
230.55	26.0	12,465
230.60	26.9	12,903
230.65	27.8	13,348
230.70	28.8	13,800
230.75	29.7	14,260
230.80	**30.7**	**14,726**

Summary for Link DP-1: Merrimack River

Inflow Area = 99,854 sf, 8.30% Impervious, Inflow Depth = 1.00" for 50-YR event
Inflow = 2.1 cfs @ 12.13 hrs, Volume= 8,357 cf
Primary = 2.1 cfs @ 12.13 hrs, Volume= 8,357 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node DP-99

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Merrimack River



Hydrograph for Link DP-1: Merrimack River

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	**0.00**	0.0	51.00	0.0	0.00	0.0
1.00	0.0	0.00	0.0	52.00	0.0	0.00	0.0
2.00	0.0	0.00	0.0	53.00	0.0	0.00	0.0
3.00	0.0	0.00	0.0	54.00	0.0	0.00	0.0
4.00	0.0	0.00	0.0	55.00	0.0	0.00	0.0
5.00	0.0	0.00	0.0	56.00	0.0	0.00	0.0
6.00	0.0	0.00	0.0	57.00	0.0	0.00	0.0
7.00	0.0	0.00	0.0	58.00	0.0	0.00	0.0
8.00	0.0	0.00	0.0	59.00	0.0	0.00	0.0
9.00	0.0	0.00	0.0	60.00	0.0	0.00	0.0
10.00	0.0	0.00	0.0	61.00	0.0	0.00	0.0
11.00	0.0	0.00	0.0	62.00	0.0	0.00	0.0
12.00	**1.0**	0.00	**1.0**	63.00	0.0	0.00	0.0
13.00	**0.3**	0.00	**0.3**	64.00	0.0	0.00	0.0
14.00	0.2	0.00	0.2	65.00	0.0	0.00	0.0
15.00	0.2	0.00	0.2	66.00	0.0	0.00	0.0
16.00	0.1	0.00	0.1	67.00	0.0	0.00	0.0
17.00	0.1	0.00	0.1	68.00	0.0	0.00	0.0
18.00	0.1	0.00	0.1	69.00	0.0	0.00	0.0
19.00	0.1	0.00	0.1	70.00	0.0	0.00	0.0
20.00	0.1	0.00	0.1	71.00	0.0	0.00	0.0
21.00	0.1	0.00	0.1	72.00	0.0	0.00	0.0
22.00	0.1	0.00	0.1				
23.00	0.1	0.00	0.1				
24.00	0.1	0.00	0.1				
25.00	0.0	0.00	0.0				
26.00	0.0	0.00	0.0				
27.00	0.0	0.00	0.0				
28.00	0.0	0.00	0.0				
29.00	0.0	0.00	0.0				
30.00	0.0	0.00	0.0				
31.00	0.0	0.00	0.0				
32.00	0.0	0.00	0.0				
33.00	0.0	0.00	0.0				
34.00	0.0	0.00	0.0				
35.00	0.0	0.00	0.0				
36.00	0.0	0.00	0.0				
37.00	0.0	0.00	0.0				
38.00	0.0	0.00	0.0				
39.00	0.0	0.00	0.0				
40.00	0.0	0.00	0.0				
41.00	0.0	0.00	0.0				
42.00	0.0	0.00	0.0				
43.00	0.0	0.00	0.0				
44.00	0.0	0.00	0.0				
45.00	0.0	0.00	0.0				
46.00	0.0	0.00	0.0				
47.00	0.0	0.00	0.0				
48.00	0.0	0.00	0.0				
49.00	0.0	0.00	0.0				
50.00	0.0	0.00	0.0				

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

SubcatchmentEX-1: Runoff Area=2.292 ac 8.30% Impervious Runoff Depth=1.39"
Flow Length=484' Tc=17.1 min CN=47 Runoff=3.2 cfs 11,567 cf

Reach 1R: East Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.017 L=480.0' S=0.0035 '/' Capacity=209.2 cfs Outflow=0.0 cfs 0 cf

Link DP-1: Merrimack River Inflow=3.2 cfs 11,567 cf
Primary=3.2 cfs 11,567 cf

Total Runoff Area = 99,854 sf Runoff Volume = 11,567 cf Average Runoff Depth = 1.39"
91.70% Pervious = 91,568 sf 8.30% Impervious = 8,286 sf

Summary for Subcatchment EX-1:

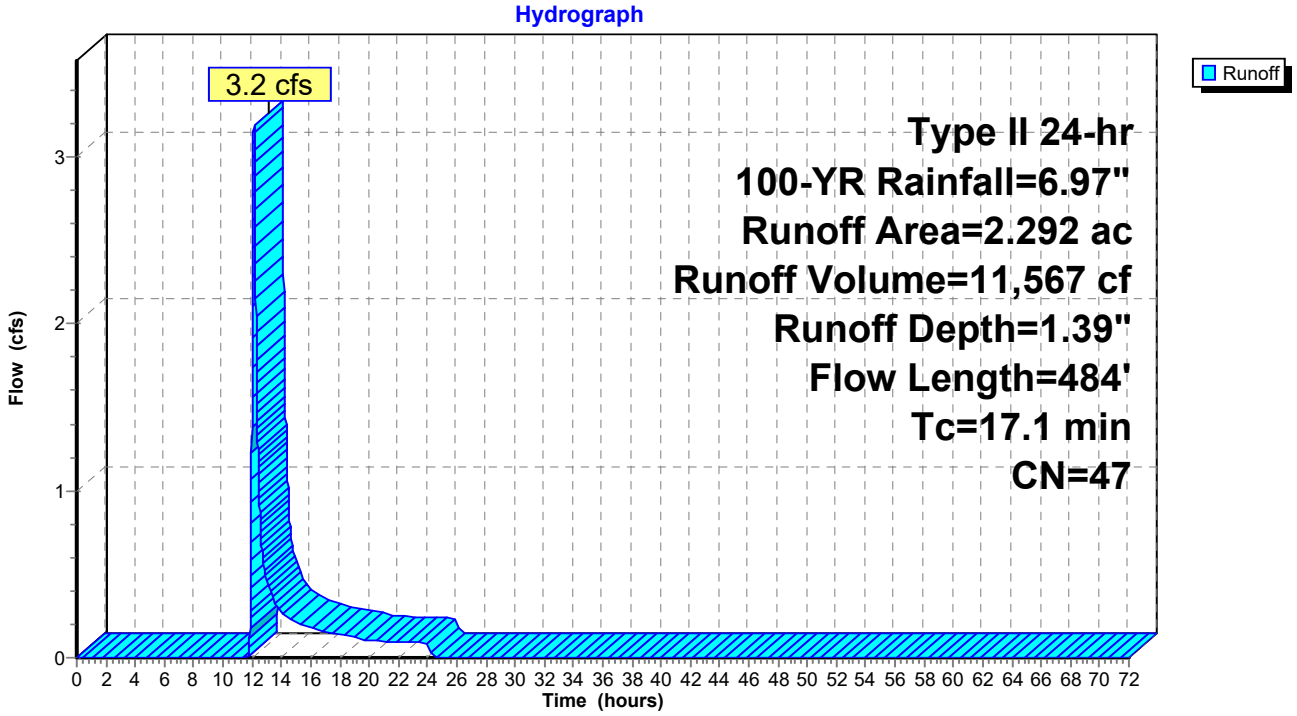
Runoff = 3.2 cfs @ 12.12 hrs, Volume= 11,567 cf, Depth= 1.39"
Routed to Link DP-1 : Merrimack River

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=6.97"

Area (ac)	CN	Description
0.811	39	>75% Grass cover, Good, HSG A
0.242	61	>75% Grass cover, Good, HSG B
0.261	74	>75% Grass cover, Good, HSG C
0.190	98	Paved parking, HSG A
0.787	30	Woods, Good, HSG A
0.002	55	Woods, Good, HSG B
2.292	47	Weighted Average
2.102		91.70% Pervious Area
0.190		8.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.75"
1.3	66	0.0148	0.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	158	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	159	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	51	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
17.1	484	Total			

Subcatchment EX-1:



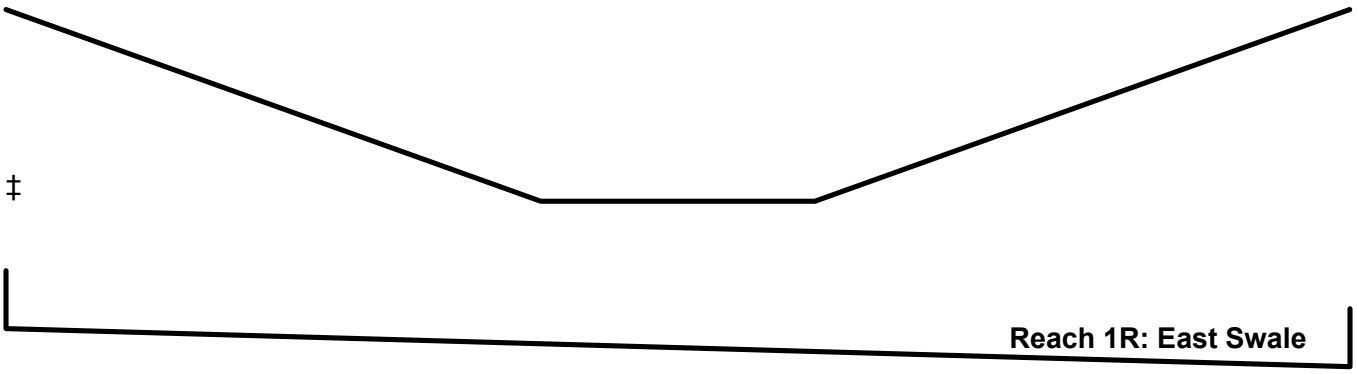
Hydrograph for Subcatchment EX-1:

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.00	0.07	0.00	0.0
2.00	0.15	0.00	0.0
3.00	0.24	0.00	0.0
4.00	0.33	0.00	0.0
5.00	0.44	0.00	0.0
6.00	0.56	0.00	0.0
7.00	0.69	0.00	0.0
8.00	0.84	0.00	0.0
9.00	1.02	0.00	0.0
10.00	1.26	0.00	0.0
11.00	1.64	0.00	0.0
12.00	4.62	0.41	**1.7**
13.00	5.38	0.68	**0.5**
14.00	5.72	0.81	0.3
15.00	5.95	0.91	0.2
16.00	6.13	0.99	0.2
17.00	6.29	1.06	0.2
18.00	6.42	1.12	0.1
19.00	6.54	1.18	0.1
20.00	6.64	1.23	0.1
21.00	6.72	1.27	0.1
22.00	6.81	1.31	0.1
23.00	6.89	1.35	0.1
24.00	**6.97**	**1.39**	0.1
25.00	6.97	1.39	0.0
26.00	6.97	1.39	0.0
27.00	6.97	1.39	0.0
28.00	6.97	1.39	0.0
29.00	6.97	1.39	0.0
30.00	6.97	1.39	0.0
31.00	6.97	1.39	0.0
32.00	6.97	1.39	0.0
33.00	6.97	1.39	0.0
34.00	6.97	1.39	0.0
35.00	6.97	1.39	0.0
36.00	6.97	1.39	0.0
37.00	6.97	1.39	0.0
38.00	6.97	1.39	0.0
39.00	6.97	1.39	0.0
40.00	6.97	1.39	0.0
41.00	6.97	1.39	0.0
42.00	6.97	1.39	0.0
43.00	6.97	1.39	0.0
44.00	6.97	1.39	0.0
45.00	6.97	1.39	0.0
46.00	6.97	1.39	0.0
47.00	6.97	1.39	0.0
48.00	6.97	1.39	0.0
49.00	6.97	1.39	0.0
50.00	6.97	1.39	0.0
51.00	6.97	1.39	0.0
52.00	6.97	1.39	0.0
53.00	6.97	1.39	0.0
54.00	6.97	1.39	0.0
55.00	6.97	1.39	0.0
56.00	6.97	1.39	0.0
57.00	6.97	1.39	0.0
58.00	6.97	1.39	0.0
59.00	6.97	1.39	0.0
60.00	6.97	1.39	0.0
61.00	6.97	1.39	0.0
62.00	6.97	1.39	0.0
63.00	6.97	1.39	0.0
64.00	6.97	1.39	0.0
65.00	6.97	1.39	0.0
66.00	6.97	1.39	0.0
67.00	6.97	1.39	0.0
68.00	6.97	1.39	0.0
69.00	6.97	1.39	0.0
70.00	6.97	1.39	0.0
71.00	6.97	1.39	0.0
72.00	6.97	1.39	0.0

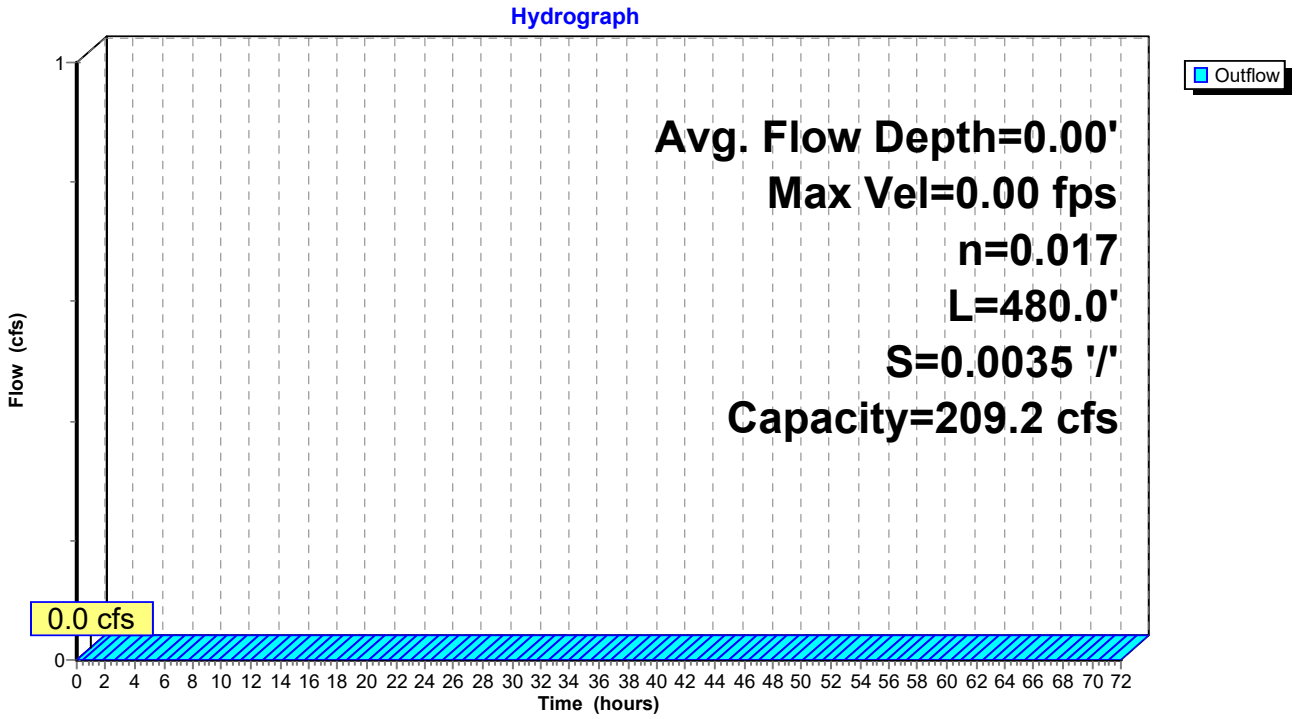
Summary for Reach 1R: East Swale

Bank-Full Depth= 2.60' Flow Area= 30.7 sf, Capacity= 209.2 cfs

4.00' x 2.60' deep channel, n= 0.017 Concrete, unfinished
Side Slope Z-value= 3.0 '/' Top Width= 19.60'
Length= 480.0' Slope= 0.0035 '/'
Inlet Invert= 228.20', Outlet Invert= 226.50'



Reach 1R: East Swale



Stage-Discharge for Reach 1R: East Swale

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
228.20	0.00	0.0
228.22	0.35	0.0
228.24	0.59	0.1
228.26	0.77	0.2
228.28	0.93	0.3
228.30	1.07	0.5
228.32	1.19	0.6
228.34	1.31	0.8
228.36	1.42	1.0
228.38	1.53	1.2
228.40	1.63	1.5
228.42	1.72	1.8
228.44	1.81	2.1
228.46	1.90	2.4
228.48	1.98	2.7
228.50	2.06	3.0
228.52	2.14	3.4
228.54	2.21	3.8
228.56	2.29	4.2
228.58	2.36	4.6
228.60	2.43	5.1
228.62	2.49	5.5
228.64	2.56	6.0
228.66	2.62	6.5
228.68	2.69	7.0
228.70	2.75	7.6
228.72	2.81	8.1
228.74	2.87	8.7
228.76	2.93	9.3
228.78	2.98	9.9
228.80	3.04	10.6
228.82	3.09	11.2
228.84	3.15	11.9
228.86	3.20	12.6
228.88	3.25	13.4
228.90	3.31	14.1
228.92	3.36	14.9
228.94	3.41	15.7
228.96	3.46	16.5
228.98	3.51	17.3
229.00	3.56	18.2
229.02	3.60	19.1
229.04	3.65	20.0
229.06	3.70	20.9
229.08	3.75	21.9
229.10	3.79	22.9
229.12	3.84	23.9
229.14	3.88	24.9
229.16	3.93	25.9
229.18	3.97	27.0
229.20	4.01	28.1
229.22	4.06	29.2
229.24	4.10	30.4
229.26	4.14	31.5
229.28	4.19	32.7
229.30	4.23	34.0
229.32	4.27	35.2
229.34	4.31	36.5
229.36	4.35	37.8
229.38	4.39	39.1
229.40	4.43	40.4
229.42	4.47	41.8
229.44	4.51	43.2
229.46	4.55	44.6
229.48	4.59	46.1
229.50	4.63	47.6
229.52	4.67	49.1
229.54	4.71	50.6
229.56	4.75	52.2
229.58	4.79	53.8
229.60	4.82	55.4
229.62	4.86	57.0
229.64	4.90	58.7
229.66	4.94	60.4
229.68	4.97	62.1
229.70	5.01	63.9
229.72	5.05	65.7
229.74	5.08	67.5
229.76	5.12	69.3
229.78	5.16	71.2
229.80	5.19	73.1
229.82	5.23	75.0
229.84	5.26	77.0
229.86	5.30	79.0
229.88	5.33	81.0
229.90	5.37	83.1
229.92	5.40	85.2
229.94	5.44	87.3
229.96	5.47	89.4
229.98	5.51	91.6
230.00	5.54	93.8
230.02	5.58	96.0
230.04	5.61	98.3
230.06	5.64	100.6
230.08	5.68	102.9
230.10	5.71	105.3
230.12	5.75	107.7
230.14	5.78	110.1
230.16	5.81	112.6
230.18	5.85	115.1
230.20	5.88	117.6
230.22	5.91	120.1
230.24	5.94	122.7
230.26	5.98	125.3
230.28	6.01	128.0
230.30	6.04	130.7
230.32	6.07	133.4
230.34	6.11	136.2
230.36	6.14	139.0
230.38	6.17	141.8
230.40	6.20	144.6
230.42	6.23	147.5
230.44	6.27	150.5
230.46	6.30	153.4
230.48	6.33	156.4
230.50	6.36	159.4
230.52	6.39	162.5
230.54	6.42	165.6
230.56	6.45	168.7
230.58	6.48	171.9
230.60	6.51	175.1
230.62	6.55	178.4
230.64	6.58	181.6
230.66	6.61	185.0
230.68	6.64	188.3
230.70	6.67	191.7
230.72	6.70	195.1
230.74	6.73	198.6
230.76	6.76	202.1
230.78	6.79	205.6
230.80	**6.82**	**209.2**

Stage-Area-Storage for Reach 1R: East Swale

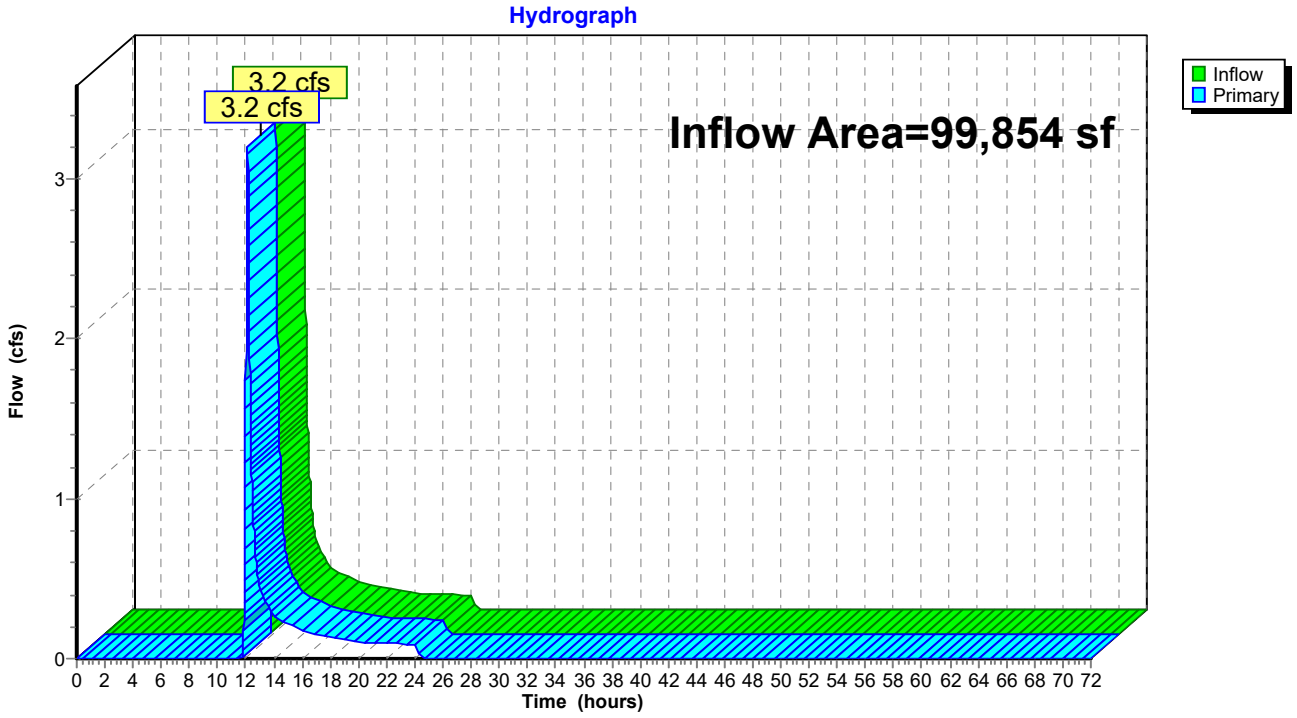
Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
228.20	0.0	0
228.25	0.2	100
228.30	0.4	207
228.35	0.7	321
228.40	0.9	442
228.45	1.2	570
228.50	1.5	706
228.55	1.8	849
228.60	2.1	999
228.65	2.4	1,156
228.70	2.8	1,320
228.75	3.1	1,492
228.80	3.5	1,670
228.85	3.9	1,856
228.90	4.3	2,050
228.95	4.7	2,250
229.00	5.1	2,458
229.05	5.6	2,673
229.10	6.0	2,895
229.15	6.5	3,124
229.20	7.0	3,360
229.25	7.5	3,604
229.30	8.0	3,855
229.35	8.6	4,113
229.40	9.1	4,378
229.45	9.7	4,650
229.50	10.3	4,930
229.55	10.9	5,216
229.60	11.5	5,511
229.65	12.1	5,812
229.70	12.8	6,120
229.75	13.4	6,436
229.80	14.1	6,759
229.85	14.8	7,089
229.90	15.5	7,426
229.95	16.2	7,770
230.00	16.9	8,122
230.05	17.7	8,481
230.10	18.4	8,846
230.15	19.2	9,220
230.20	20.0	9,600
230.25	20.8	9,988
230.30	21.6	10,383
230.35	22.5	10,785
230.40	23.3	11,194
230.45	24.2	11,610
230.50	25.1	12,034
230.55	26.0	12,465
230.60	26.9	12,903
230.65	27.8	13,348
230.70	28.8	13,800
230.75	29.7	14,260
230.80	**30.7**	**14,726**

Summary for Link DP-1: Merrimack River

Inflow Area = 99,854 sf, 8.30% Impervious, Inflow Depth = 1.39" for 100-YR event
Inflow = 3.2 cfs @ 12.12 hrs, Volume= 11,567 cf
Primary = 3.2 cfs @ 12.12 hrs, Volume= 11,567 cf, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node DP-99

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

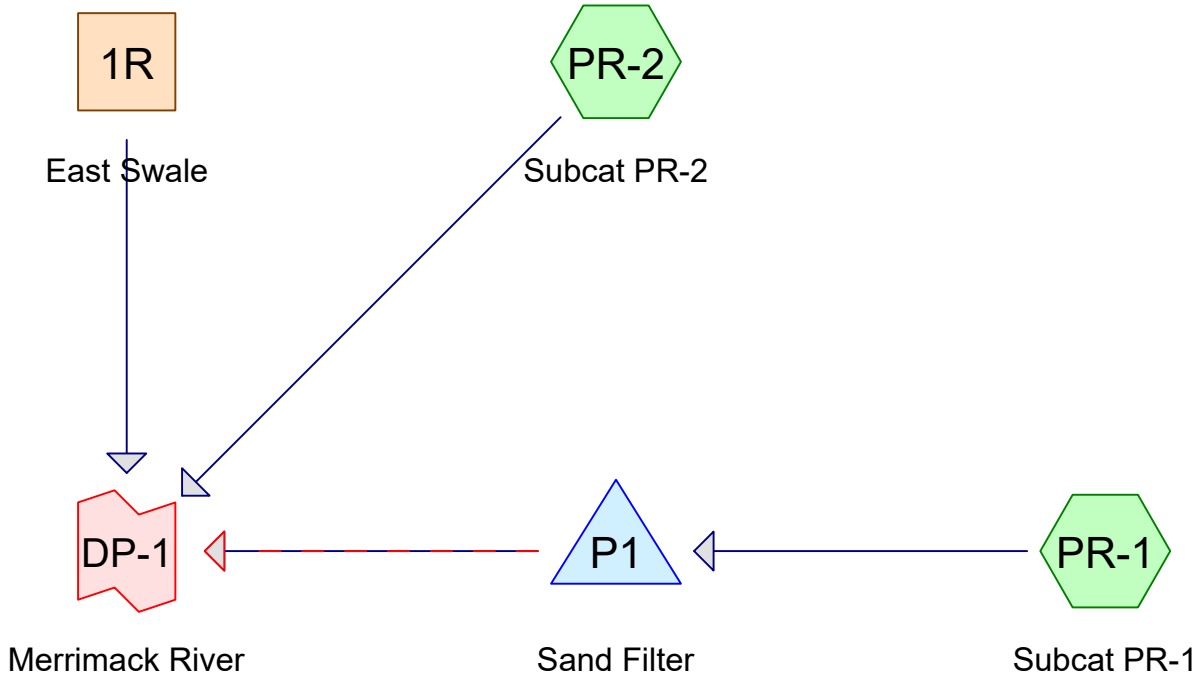
Link DP-1: Merrimack River



Hydrograph for Link DP-1: Merrimack River

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	**0.00**	0.0	51.00	0.0	0.00	0.0
1.00	0.0	0.00	0.0	52.00	0.0	0.00	0.0
2.00	0.0	0.00	0.0	53.00	0.0	0.00	0.0
3.00	0.0	0.00	0.0	54.00	0.0	0.00	0.0
4.00	0.0	0.00	0.0	55.00	0.0	0.00	0.0
5.00	0.0	0.00	0.0	56.00	0.0	0.00	0.0
6.00	0.0	0.00	0.0	57.00	0.0	0.00	0.0
7.00	0.0	0.00	0.0	58.00	0.0	0.00	0.0
8.00	0.0	0.00	0.0	59.00	0.0	0.00	0.0
9.00	0.0	0.00	0.0	60.00	0.0	0.00	0.0
10.00	0.0	0.00	0.0	61.00	0.0	0.00	0.0
11.00	0.0	0.00	0.0	62.00	0.0	0.00	0.0
12.00	**1.7**	0.00	**1.7**	63.00	0.0	0.00	0.0
13.00	**0.5**	0.00	**0.5**	64.00	0.0	0.00	0.0
14.00	0.3	0.00	0.3	65.00	0.0	0.00	0.0
15.00	0.2	0.00	0.2	66.00	0.0	0.00	0.0
16.00	0.2	0.00	0.2	67.00	0.0	0.00	0.0
17.00	0.2	0.00	0.2	68.00	0.0	0.00	0.0
18.00	0.1	0.00	0.1	69.00	0.0	0.00	0.0
19.00	0.1	0.00	0.1	70.00	0.0	0.00	0.0
20.00	0.1	0.00	0.1	71.00	0.0	0.00	0.0
21.00	0.1	0.00	0.1	72.00	0.0	0.00	0.0
22.00	0.1	0.00	0.1				
23.00	0.1	0.00	0.1				
24.00	0.1	0.00	0.1				
25.00	0.0	0.00	0.0				
26.00	0.0	0.00	0.0				
27.00	0.0	0.00	0.0				
28.00	0.0	0.00	0.0				
29.00	0.0	0.00	0.0				
30.00	0.0	0.00	0.0				
31.00	0.0	0.00	0.0				
32.00	0.0	0.00	0.0				
33.00	0.0	0.00	0.0				
34.00	0.0	0.00	0.0				
35.00	0.0	0.00	0.0				
36.00	0.0	0.00	0.0				
37.00	0.0	0.00	0.0				
38.00	0.0	0.00	0.0				
39.00	0.0	0.00	0.0				
40.00	0.0	0.00	0.0				
41.00	0.0	0.00	0.0				
42.00	0.0	0.00	0.0				
43.00	0.0	0.00	0.0				
44.00	0.0	0.00	0.0				
45.00	0.0	0.00	0.0				
46.00	0.0	0.00	0.0				
47.00	0.0	0.00	0.0				
48.00	0.0	0.00	0.0				
49.00	0.0	0.00	0.0				
50.00	0.0	0.00	0.0				

Proposed Conditions



Subcat Reach Pond Link

Routing Diagram for 52938.11-PR_Phase1
Prepared by VHB, Inc, Printed 2/17/2026

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-YR	Type II 24-hr		Default	24.00	1	2.75	2
2	10-YR	Type II 24-hr		Default	24.00	1	4.38	2
3	25-YR	Type II 24-hr		Default	24.00	1	5.40	2
4	50-YR	Type II 24-hr		Default	24.00	1	6.16	2
5	100-YR	Type II 24-hr		Default	24.00	1	6.97	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
25,515	39	>75% Grass cover, Good, HSG A (PR-1, PR-2)
5,348	61	>75% Grass cover, Good, HSG B (PR-1, PR-2)
11,356	74	>75% Grass cover, Good, HSG C (PR-2)
5,530	96	Gravel surface, HSG A (PR-1)
6,662	96	Gravel surface, HSG B (PR-1)
0	98	Paved parking, HSG A (PR-1)
26,212	98	Unconnected pavement, HSG A (PR-1, PR-2)
24,737	30	Woods, Good, HSG A (PR-2)
1	55	Woods, Good, HSG B (PR-2)
105,361	**63**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
81,994	HSG A	PR-1, PR-2
12,010	HSG B	PR-1, PR-2
11,356	HSG C	PR-2
0	HSG D	
0	Other	
105,361		**TOTAL AREA**

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
25,515	5,348	11,356	0	0	42,219	>75% Grass cover, Good	
5,530	6,662	0	0	0	12,192	Gravel surface	
0	0	0	0	0	0	Paved parking	
26,212	0	0	0	0	26,212	Unconnected pavement	
24,737	1	0	0	0	24,738	Woods, Good	
81,994	**12,010**	**11,356**	**0**	**0**	**105,361**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	PR-2	0.00	0.00	89.0	0.0050	0.013	0.0	12.0	0.0	
2	P1	224.80	223.49	271.0	0.0048	0.013	0.0	12.0	0.0	
3	P1	224.83	224.83	70.0	0.0000	0.013	0.0	6.0	0.0	

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 PR-1: Subcat PR-1 Runoff Area=1.096 ac 51.03% Impervious Runoff Depth=1.45"
Tc=6.0 min CN=86 Runoff=2.8 cfs 5,770 cf

Subcatchment PR-2: Subcat PR-2 Runoff Area=1.323 ac 3.21% Impervious Runoff Depth=0.00"
Flow Length=381' Tc=14.7 min UI Adjusted CN=43 Runoff=0.0 cfs 4 cf

Reach 1R: East Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.017 L=480.0' S=0.0035 '/' Capacity=209.2 cfs Outflow=0.0 cfs 0 cf

Pond P1: Sand Filter Peak Elev=228.60' Storage=2,694 cf Inflow=2.8 cfs 5,770 cf
Primary=0.1 cfs 5,770 cf Secondary=0.0 cfs 0 cf Outflow=0.1 cfs 5,770 cf

Link DP-1: Merrimack River Inflow=0.1 cfs 5,774 cf
Primary=0.1 cfs 5,774 cf

Total Runoff Area = 105,361 sf Runoff Volume = 5,774 cf Average Runoff Depth = 0.66"
75.12% Pervious = 79,148 sf 24.88% Impervious = 26,212 sf

Summary for Subcatchment PR-1: Subcat PR-1

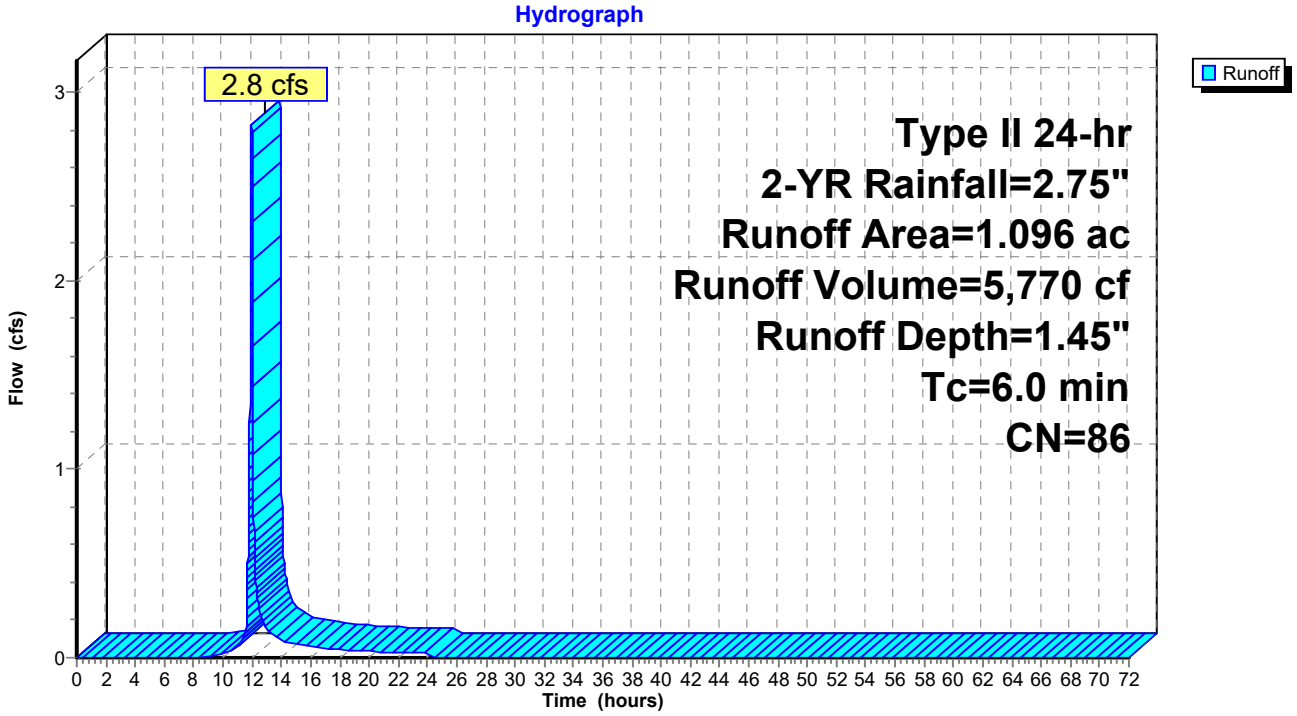
Runoff = 2.8 cfs @ 11.97 hrs, Volume= 5,770 cf, Depth= 1.45"
Routed to Pond P1 : Sand Filter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-YR Rainfall=2.75"

Area (ac)	CN	Description
0.157	39	>75% Grass cover, Good, HSG A
0.100	61	>75% Grass cover, Good, HSG B
0.127	96	Gravel surface, HSG A
0.153	96	Gravel surface, HSG B
0.000	98	Paved parking, HSG A
0.559	98	Unconnected pavement, HSG A
1.096	86	Weighted Average
0.537		48.97% Pervious Area
0.559		51.03% Impervious Area
0.559		100.00% Unconnected

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

Subcatchment PR-1: Subcat PR-1



Hydrograph for Subcatchment PR-1: Subcat PR-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.00	0.03	0.00	0.0
2.00	0.06	0.00	0.0
3.00	0.09	0.00	0.0
4.00	0.13	0.00	0.0
5.00	0.17	0.00	0.0
6.00	0.22	0.00	0.0
7.00	0.27	0.00	0.0
8.00	0.33	0.00	0.0
9.00	0.40	0.00	0.0
10.00	0.50	0.02	0.0
11.00	0.65	0.05	**0.1**
12.00	1.82	0.72	**2.7**
13.00	2.12	0.94	0.2
14.00	2.26	1.05	0.1
15.00	2.35	1.12	0.1
16.00	2.42	1.18	0.1
17.00	2.48	1.23	0.1
18.00	2.53	1.27	0.0
19.00	2.58	1.31	0.0
20.00	2.62	1.34	0.0
21.00	2.65	1.37	0.0
22.00	2.69	1.40	0.0
23.00	2.72	1.42	0.0
24.00	**2.75**	**1.45**	0.0
25.00	2.75	1.45	0.0
26.00	2.75	1.45	0.0
27.00	2.75	1.45	0.0
28.00	2.75	1.45	0.0
29.00	2.75	1.45	0.0
30.00	2.75	1.45	0.0
31.00	2.75	1.45	0.0
32.00	2.75	1.45	0.0
33.00	2.75	1.45	0.0
34.00	2.75	1.45	0.0
35.00	2.75	1.45	0.0
36.00	2.75	1.45	0.0
37.00	2.75	1.45	0.0
38.00	2.75	1.45	0.0
39.00	2.75	1.45	0.0
40.00	2.75	1.45	0.0
41.00	2.75	1.45	0.0
42.00	2.75	1.45	0.0
43.00	2.75	1.45	0.0
44.00	2.75	1.45	0.0
45.00	2.75	1.45	0.0
46.00	2.75	1.45	0.0
47.00	2.75	1.45	0.0
48.00	2.75	1.45	0.0
49.00	2.75	1.45	0.0
50.00	2.75	1.45	0.0
51.00	2.75	1.45	0.0
52.00	2.75	1.45	0.0
53.00	2.75	1.45	0.0
54.00	2.75	1.45	0.0
55.00	2.75	1.45	0.0
56.00	2.75	1.45	0.0
57.00	2.75	1.45	0.0
58.00	2.75	1.45	0.0
59.00	2.75	1.45	0.0
60.00	2.75	1.45	0.0
61.00	2.75	1.45	0.0
62.00	2.75	1.45	0.0
63.00	2.75	1.45	0.0
64.00	2.75	1.45	0.0
65.00	2.75	1.45	0.0
66.00	2.75	1.45	0.0
67.00	2.75	1.45	0.0
68.00	2.75	1.45	0.0
69.00	2.75	1.45	0.0
70.00	2.75	1.45	0.0
71.00	2.75	1.45	0.0
72.00	2.75	1.45	0.0

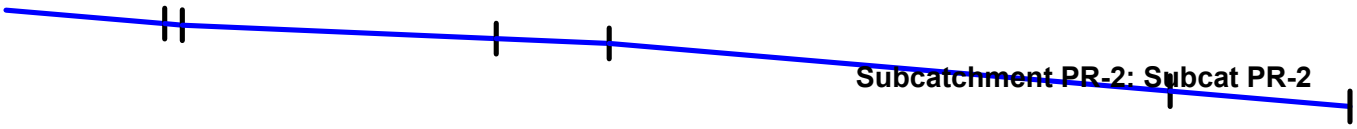
Summary for Subcatchment PR-2: Subcat PR-2

Runoff = 0.0 cfs @ 24.03 hrs, Volume= 4 cf, Depth= 0.00"
Routed to Link DP-1 : Merrimack River

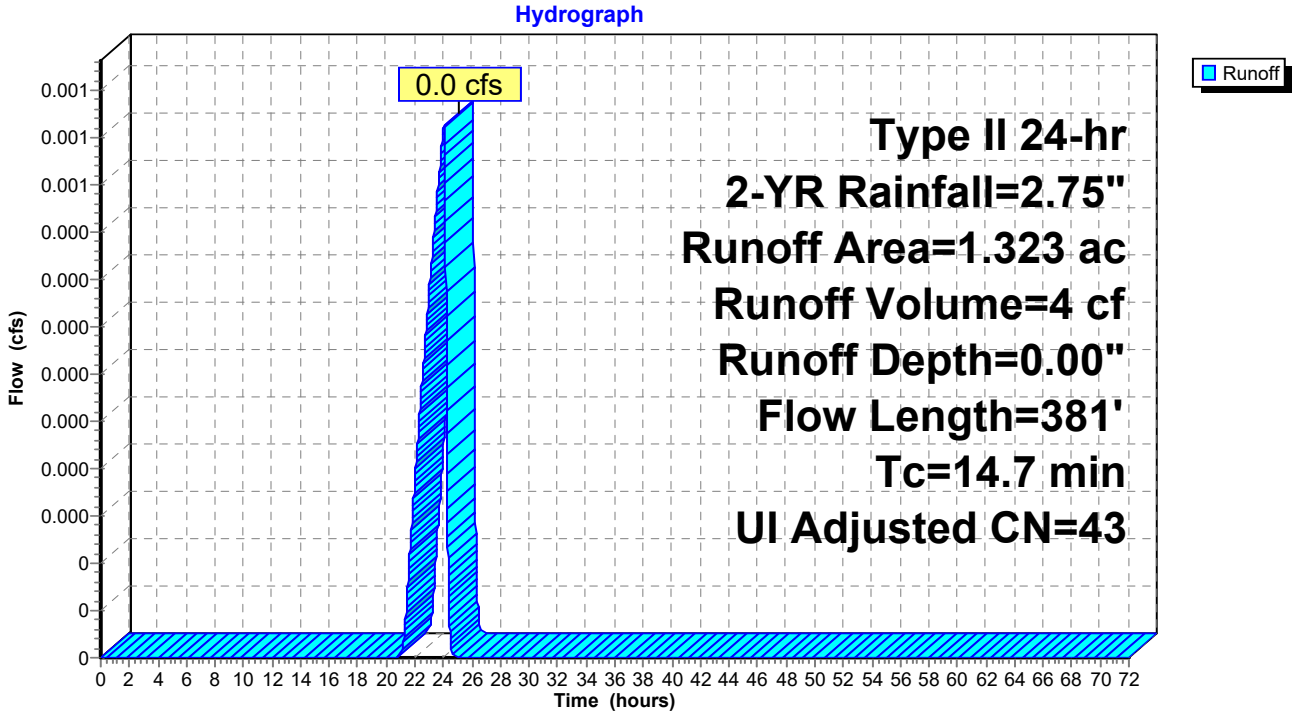
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 2-YR Rainfall=2.75"

Area (ac)	CN	Adj	Description
0.429	39		>75% Grass cover, Good, HSG A
0.023	61		>75% Grass cover, Good, HSG B
0.261	74		>75% Grass cover, Good, HSG C
0.042	98		Unconnected pavement, HSG A
0.568	30		Woods, Good, HSG A
0.000	55		Woods, Good, HSG B
1.323	44	43	Weighted Average, UI Adjusted
1.280			96.79% Pervious Area
0.042			3.21% Impervious Area
0.042			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	45	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.75"
2.8	5	0.0100	0.03		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.75"
0.5	89	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
1.5	32	0.0050	0.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	159	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	51	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.7	381	Total			



Subcatchment PR-2: Subcat PR-2



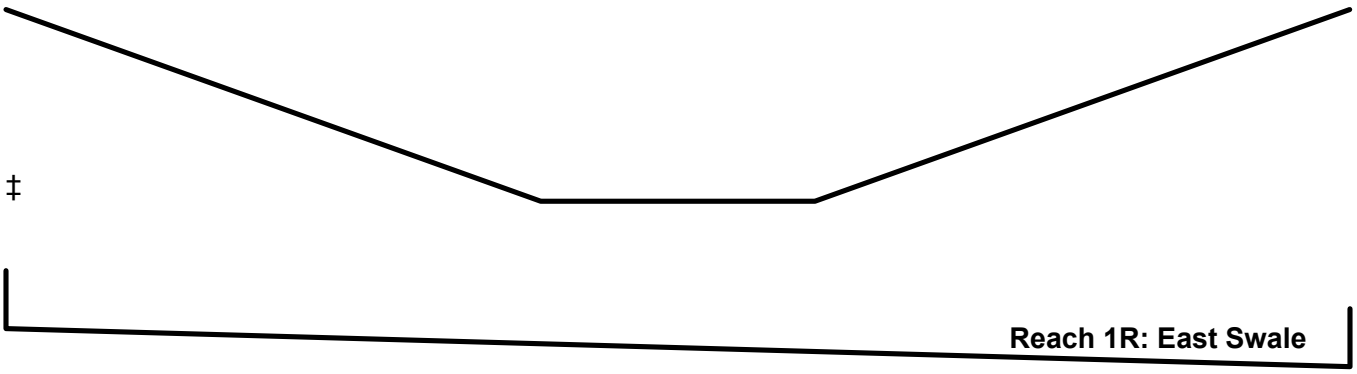
Hydrograph for Subcatchment PR-2: Subcat PR-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)	Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0	51.00	2.75	0.00	0.0
1.00	0.03	0.00	0.0	52.00	2.75	0.00	0.0
2.00	0.06	0.00	0.0	53.00	2.75	0.00	0.0
3.00	0.09	0.00	0.0	54.00	2.75	0.00	0.0
4.00	0.13	0.00	0.0	55.00	2.75	0.00	0.0
5.00	0.17	0.00	0.0	56.00	2.75	0.00	0.0
6.00	0.22	0.00	0.0	57.00	2.75	0.00	0.0
7.00	0.27	0.00	0.0	58.00	2.75	0.00	0.0
8.00	0.33	0.00	0.0	59.00	2.75	0.00	0.0
9.00	0.40	0.00	0.0	60.00	2.75	0.00	0.0
10.00	0.50	0.00	0.0	61.00	2.75	0.00	0.0
11.00	0.65	0.00	0.0	62.00	2.75	0.00	0.0
12.00	1.82	0.00	0.0	63.00	2.75	0.00	0.0
13.00	2.12	0.00	0.0	64.00	2.75	0.00	0.0
14.00	2.26	0.00	0.0	65.00	2.75	0.00	0.0
15.00	2.35	0.00	0.0	66.00	2.75	0.00	0.0
16.00	2.42	0.00	0.0	67.00	2.75	0.00	0.0
17.00	2.48	0.00	0.0	68.00	2.75	0.00	0.0
18.00	2.53	0.00	0.0	69.00	2.75	0.00	0.0
19.00	2.58	0.00	0.0	70.00	2.75	0.00	0.0
20.00	2.62	0.00	0.0	71.00	2.75	0.00	0.0
21.00	2.65	0.00	0.0	72.00	2.75	0.00	0.0
22.00	2.69	0.00	0.0				
23.00	2.72	0.00	0.0				
24.00	**2.75**	**0.00**	**0.0**				
25.00	2.75	0.00	**0.0**				
26.00	2.75	0.00	0.0				
27.00	2.75	0.00	0.0				
28.00	2.75	0.00	0.0				
29.00	2.75	0.00	0.0				
30.00	2.75	0.00	0.0				
31.00	2.75	0.00	0.0				
32.00	2.75	0.00	0.0				
33.00	2.75	0.00	0.0				
34.00	2.75	0.00	0.0				
35.00	2.75	0.00	0.0				
36.00	2.75	0.00	0.0				
37.00	2.75	0.00	0.0				
38.00	2.75	0.00	0.0				
39.00	2.75	0.00	0.0				
40.00	2.75	0.00	0.0				
41.00	2.75	0.00	0.0				
42.00	2.75	0.00	0.0				
43.00	2.75	0.00	0.0				
44.00	2.75	0.00	0.0				
45.00	2.75	0.00	0.0				
46.00	2.75	0.00	0.0				
47.00	2.75	0.00	0.0				
48.00	2.75	0.00	0.0				
49.00	2.75	0.00	0.0				
50.00	2.75	0.00	0.0				

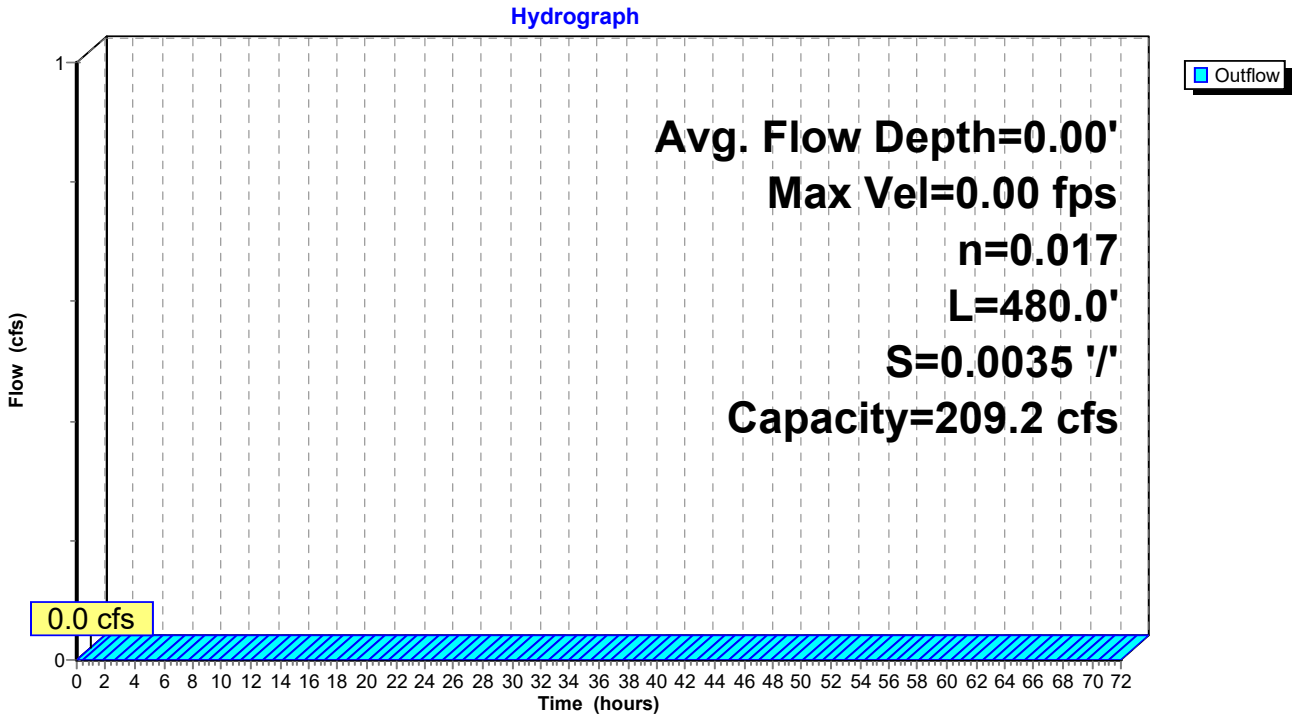
Summary for Reach 1R: East Swale

Bank-Full Depth= 2.60' Flow Area= 30.7 sf, Capacity= 209.2 cfs

4.00' x 2.60' deep channel, n= 0.017 Concrete, unfinished
Side Slope Z-value= 3.0 '/' Top Width= 19.60'
Length= 480.0' Slope= 0.0035 '/'
Inlet Invert= 228.20', Outlet Invert= 226.50'



Reach 1R: East Swale



Stage-Discharge for Reach 1R: East Swale

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
228.20	0.00	0.0
228.22	0.35	0.0
228.24	0.59	0.1
228.26	0.77	0.2
228.28	0.93	0.3
228.30	1.07	0.5
228.32	1.19	0.6
228.34	1.31	0.8
228.36	1.42	1.0
228.38	1.53	1.2
228.40	1.63	1.5
228.42	1.72	1.8
228.44	1.81	2.1
228.46	1.90	2.4
228.48	1.98	2.7
228.50	2.06	3.0
228.52	2.14	3.4
228.54	2.21	3.8
228.56	2.29	4.2
228.58	2.36	4.6
228.60	2.43	5.1
228.62	2.49	5.5
228.64	2.56	6.0
228.66	2.62	6.5
228.68	2.69	7.0
228.70	2.75	7.6
228.72	2.81	8.1
228.74	2.87	8.7
228.76	2.93	9.3
228.78	2.98	9.9
228.80	3.04	10.6
228.82	3.09	11.2
228.84	3.15	11.9
228.86	3.20	12.6
228.88	3.25	13.4
228.90	3.31	14.1
228.92	3.36	14.9
228.94	3.41	15.7
228.96	3.46	16.5
228.98	3.51	17.3
229.00	3.56	18.2
229.02	3.60	19.1
229.04	3.65	20.0
229.06	3.70	20.9
229.08	3.75	21.9
229.10	3.79	22.9
229.12	3.84	23.9
229.14	3.88	24.9
229.16	3.93	25.9
229.18	3.97	27.0
229.20	4.01	28.1
229.22	4.06	29.2
229.24	4.10	30.4
229.26	4.14	31.5
229.28	4.19	32.7
229.30	4.23	34.0
229.32	4.27	35.2
229.34	4.31	36.5
229.36	4.35	37.8
229.38	4.39	39.1
229.40	4.43	40.4
229.42	4.47	41.8
229.44	4.51	43.2
229.46	4.55	44.6
229.48	4.59	46.1
229.50	4.63	47.6
229.52	4.67	49.1
229.54	4.71	50.6
229.56	4.75	52.2
229.58	4.79	53.8
229.60	4.82	55.4
229.62	4.86	57.0
229.64	4.90	58.7
229.66	4.94	60.4
229.68	4.97	62.1
229.70	5.01	63.9
229.72	5.05	65.7
229.74	5.08	67.5
229.76	5.12	69.3
229.78	5.16	71.2
229.80	5.19	73.1
229.82	5.23	75.0
229.84	5.26	77.0
229.86	5.30	79.0
229.88	5.33	81.0
229.90	5.37	83.1
229.92	5.40	85.2
229.94	5.44	87.3
229.96	5.47	89.4
229.98	5.51	91.6
230.00	5.54	93.8
230.02	5.58	96.0
230.04	5.61	98.3
230.06	5.64	100.6
230.08	5.68	102.9
230.10	5.71	105.3
230.12	5.75	107.7
230.14	5.78	110.1
230.16	5.81	112.6
230.18	5.85	115.1
230.20	5.88	117.6
230.22	5.91	120.1
230.24	5.94	122.7
230.26	5.98	125.3
230.28	6.01	128.0
230.30	6.04	130.7
230.32	6.07	133.4
230.34	6.11	136.2
230.36	6.14	139.0
230.38	6.17	141.8
230.40	6.20	144.6
230.42	6.23	147.5
230.44	6.27	150.5
230.46	6.30	153.4
230.48	6.33	156.4
230.50	6.36	159.4
230.52	6.39	162.5
230.54	6.42	165.6
230.56	6.45	168.7
230.58	6.48	171.9
230.60	6.51	175.1
230.62	6.55	178.4
230.64	6.58	181.6
230.66	6.61	185.0
230.68	6.64	188.3
230.70	6.67	191.7
230.72	6.70	195.1
230.74	6.73	198.6
230.76	6.76	202.1
230.78	6.79	205.6
230.80	**6.82**	**209.2**

Stage-Area-Storage for Reach 1R: East Swale

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
228.20	0.0	0
228.25	0.2	100
228.30	0.4	207
228.35	0.7	321
228.40	0.9	442
228.45	1.2	570
228.50	1.5	706
228.55	1.8	849
228.60	2.1	999
228.65	2.4	1,156
228.70	2.8	1,320
228.75	3.1	1,492
228.80	3.5	1,670
228.85	3.9	1,856
228.90	4.3	2,050
228.95	4.7	2,250
229.00	5.1	2,458
229.05	5.6	2,673
229.10	6.0	2,895
229.15	6.5	3,124
229.20	7.0	3,360
229.25	7.5	3,604
229.30	8.0	3,855
229.35	8.6	4,113
229.40	9.1	4,378
229.45	9.7	4,650
229.50	10.3	4,930
229.55	10.9	5,216
229.60	11.5	5,511
229.65	12.1	5,812
229.70	12.8	6,120
229.75	13.4	6,436
229.80	14.1	6,759
229.85	14.8	7,089
229.90	15.5	7,426
229.95	16.2	7,770
230.00	16.9	8,122
230.05	17.7	8,481
230.10	18.4	8,846
230.15	19.2	9,220
230.20	20.0	9,600
230.25	20.8	9,988
230.30	21.6	10,383
230.35	22.5	10,785
230.40	23.3	11,194
230.45	24.2	11,610
230.50	25.1	12,034
230.55	26.0	12,465
230.60	26.9	12,903
230.65	27.8	13,348
230.70	28.8	13,800
230.75	29.7	14,260
230.80	**30.7**	**14,726**

Summary for Pond P1: Sand Filter

Inflow Area = 47,739 sf, 51.03% Impervious, Inflow Depth = 1.45" for 2-YR event
Inflow = 2.8 cfs @ 11.97 hrs, Volume= 5,770 cf
Outflow = 0.1 cfs @ 13.08 hrs, Volume= 5,770 cf, Atten= 95%, Lag= 66.2 min
Primary = 0.1 cfs @ 13.08 hrs, Volume= 5,770 cf
Routed to Link DP-1 : Merrimack River
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP-1 : Merrimack River

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 228.60' @ 13.08 hrs Surf.Area= 1,284 sf Storage= 2,694 cf
Flood Elev= 229.80' Surf.Area= 1,284 sf Storage= 5,814 cf

Plug-Flow detention time= 180.5 min calculated for 5,770 cf (100% of inflow)
Center-of-Mass det. time= 180.5 min (1,006.6 - 826.2)

Volume	Invert	Avail.Storage	Storage Description
#1	225.90'	578 cf	**Sand Filter (Irregular)**Listed below (Recalc) 1,926 cf Overall x 30.0% Voids
#2	227.40'	8,717 cf	**Detention (Irregular)**Listed below (Recalc) x 1.1 -Impervious
		9,295 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
225.90	1,284	191.9	0	0	1,284
227.40	1,284	191.9	1,926	1,926	1,572

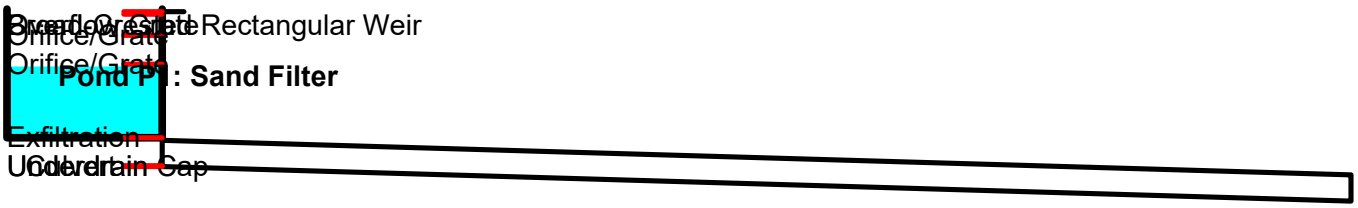
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
227.40	1,284	191.9	0	0	1,284
230.80	3,568	255.9	7,925	7,925	3,688

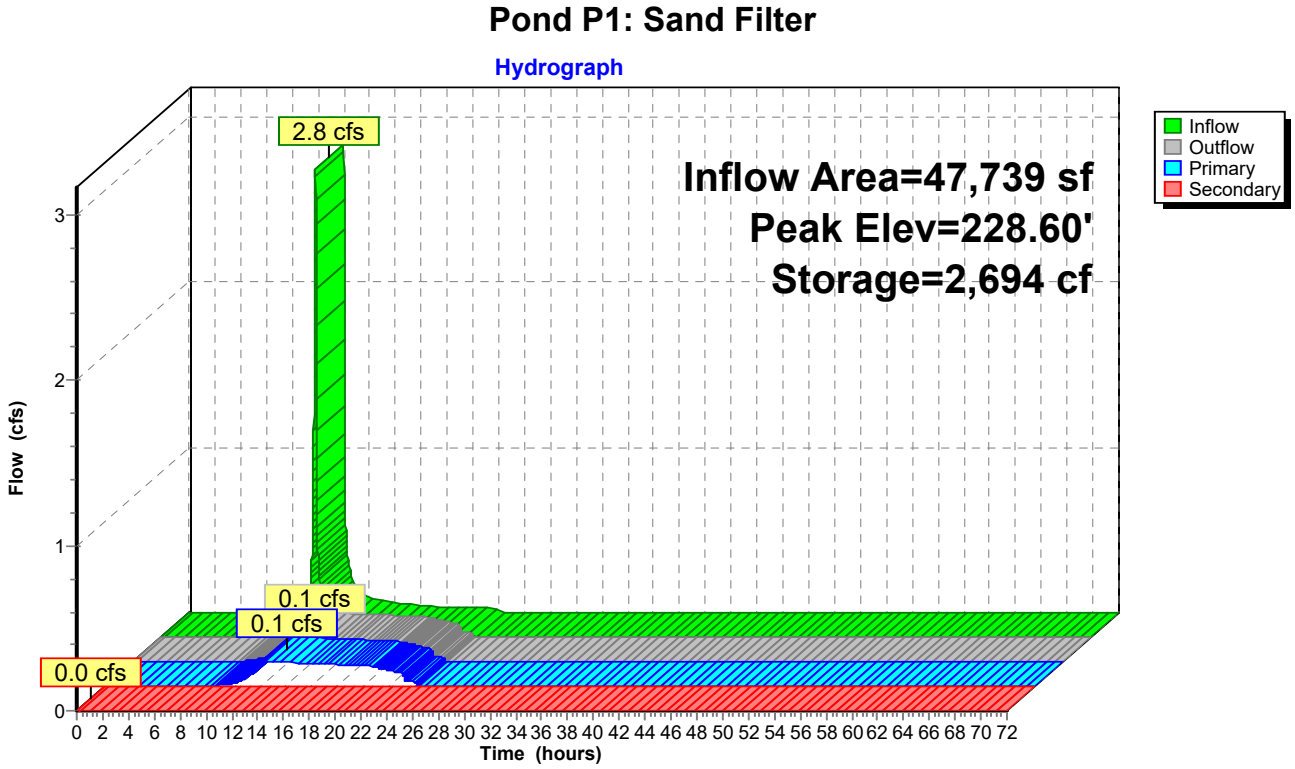
Device	Routing	Invert	Outlet Devices
#1	Primary	224.80'	**12.0" Round Culvert** L= 271.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 224.80' / 223.49' S= 0.0048 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	224.83'	**1.7" Vert. Underdrain Cap** C= 0.600 Limited to weir flow at low heads
#3	Device 2	224.83'	**6.0" Round Underdrain** L= 70.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 224.83' / 224.83' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf
#4	Device 3	225.90'	**10.000 in/hr Exfiltration over Surface area**
#5	Device 1	228.70'	**2.2" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Device 1	229.80'	**6.0" W x 9.6" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Device 1	230.60'	**24.0" x 24.0" Horiz. Overflow Grate** C= 0.600 Limited to weir flow at low heads

#8	Secondary	230.70'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.1 cfs @ 13.08 hrs HW=228.60' (Free Discharge)
- **1=Culvert** (Passes 0.1 cfs of 4.0 cfs potential flow)
  - **2=Underdrain Cap** (Orifice Controls 0.1 cfs @ 9.26 fps)
    - **3=Underdrain** (Passes 0.1 cfs of 1.1 cfs potential flow)
      - **4=Exfiltration** (Passes 0.1 cfs of 0.3 cfs potential flow)
  - **5=Orifice/Grate** (Controls 0.0 cfs)
  - **6=Orifice/Grate** (Controls 0.0 cfs)
  - **7=Overflow Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=225.90' (Free Discharge)
- **8=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)





Hydrograph for Pond P1: Sand Filter

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.0	0	225.90	0.0	0.0	**0.0**
2.00	0.0	0	225.90	0.0	0.0	0.0
4.00	0.0	0	225.90	0.0	0.0	0.0
6.00	0.0	0	225.90	0.0	0.0	0.0
8.00	0.0	0	225.90	0.0	0.0	0.0
10.00	**0.0**	5	225.91	0.0	0.0	0.0
12.00	**2.7**	**1,711**	**228.10**	**0.1**	**0.1**	0.0
14.00	0.1	**2,600**	**228.55**	**0.1**	**0.1**	0.0
16.00	0.1	2,108	228.31	0.1	0.1	0.0
18.00	0.0	1,492	227.98	0.1	0.1	0.0
20.00	0.0	848	227.58	0.1	0.1	0.0
22.00	0.0	253	226.56	0.1	0.1	0.0
24.00	0.0	7	225.92	0.0	0.0	0.0
26.00	0.0	0	225.90	0.0	0.0	0.0
28.00	0.0	0	225.90	0.0	0.0	0.0
30.00	0.0	0	225.90	0.0	0.0	0.0
32.00	0.0	0	225.90	0.0	0.0	0.0
34.00	0.0	0	225.90	0.0	0.0	0.0
36.00	0.0	0	225.90	0.0	0.0	0.0
38.00	0.0	0	225.90	0.0	0.0	0.0
40.00	0.0	0	225.90	0.0	0.0	0.0
42.00	0.0	0	225.90	0.0	0.0	0.0
44.00	0.0	0	225.90	0.0	0.0	0.0
46.00	0.0	0	225.90	0.0	0.0	0.0
48.00	0.0	0	225.90	0.0	0.0	0.0
50.00	0.0	0	225.90	0.0	0.0	0.0
52.00	0.0	0	225.90	0.0	0.0	0.0
54.00	0.0	0	225.90	0.0	0.0	0.0
56.00	0.0	0	225.90	0.0	0.0	0.0
58.00	0.0	0	225.90	0.0	0.0	0.0
60.00	0.0	0	225.90	0.0	0.0	0.0
62.00	0.0	0	225.90	0.0	0.0	0.0
64.00	0.0	0	225.90	0.0	0.0	0.0
66.00	0.0	0	225.90	0.0	0.0	0.0
68.00	0.0	0	225.90	0.0	0.0	0.0
70.00	0.0	0	225.90	0.0	0.0	0.0
72.00	0.0	0	225.90	0.0	0.0	0.0

Stage-Discharge for Pond P1: Sand Filter

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
225.90	0.0	0.0	0.0
225.95	0.1	0.1	0.0
226.00	0.1	0.1	0.0
226.05	0.1	0.1	0.0
226.10	0.1	0.1	0.0
226.15	0.1	0.1	0.0
226.20	0.1	0.1	0.0
226.25	0.1	0.1	0.0
226.30	0.1	0.1	0.0
226.35	0.1	0.1	0.0
226.40	0.1	0.1	0.0
226.45	0.1	0.1	0.0
226.50	0.1	0.1	0.0
226.55	0.1	0.1	0.0
226.60	0.1	0.1	0.0
226.65	0.1	0.1	0.0
226.70	0.1	0.1	0.0
226.75	0.1	0.1	0.0
226.80	0.1	0.1	0.0
226.85	0.1	0.1	0.0
226.90	0.1	0.1	0.0
226.95	0.1	0.1	0.0
227.00	0.1	0.1	0.0
227.05	0.1	0.1	0.0
227.10	0.1	0.1	0.0
227.15	0.1	0.1	0.0
227.20	0.1	0.1	0.0
227.25	0.1	0.1	0.0
227.30	0.1	0.1	0.0
227.35	0.1	0.1	0.0
227.40	0.1	0.1	0.0
227.45	0.1	0.1	0.0
227.50	0.1	0.1	0.0
227.55	0.1	0.1	0.0
227.60	0.1	0.1	0.0
227.65	0.1	0.1	0.0
227.70	0.1	0.1	0.0
227.75	0.1	0.1	0.0
227.80	0.1	0.1	0.0
227.85	0.1	0.1	0.0
227.90	0.1	0.1	0.0
227.95	0.1	0.1	0.0
228.00	0.1	0.1	0.0
228.05	0.1	0.1	0.0
228.10	0.1	0.1	0.0
228.15	0.1	0.1	0.0
228.20	0.1	0.1	0.0
228.25	0.1	0.1	0.0
228.30	0.1	0.1	0.0
228.35	0.1	0.1	0.0
228.40	0.1	0.1	0.0
228.45	0.1	0.1	0.0
228.50	0.1	0.1	0.0
228.55	0.1	0.1	0.0
228.60	0.1	0.1	0.0
228.65	0.1	0.1	0.0
228.70	0.1	0.1	0.0
228.75	0.2	0.2	0.0
228.80	0.2	0.2	0.0
228.85	0.2	0.2	0.0
228.90	0.2	0.2	0.0
228.95	0.2	0.2	0.0
229.00	0.2	0.2	0.0
229.05	0.2	0.2	0.0
229.10	0.2	0.2	0.0
229.15	0.2	0.2	0.0
229.20	0.2	0.2	0.0
229.25	0.2	0.2	0.0
229.30	0.2	0.2	0.0
229.35	0.3	0.3	0.0
229.40	0.3	0.3	0.0
229.45	0.3	0.3	0.0
229.50	0.3	0.3	0.0
229.55	0.3	0.3	0.0
229.60	0.3	0.3	0.0
229.65	0.3	0.3	0.0
229.70	0.3	0.3	0.0
229.75	0.3	0.3	0.0
229.80	0.3	0.3	0.0
229.85	0.3	0.3	0.0
229.90	0.4	0.4	0.0
229.95	0.4	0.4	0.0
230.00	0.5	0.5	0.0
230.05	0.5	0.5	0.0
230.10	0.6	0.6	0.0
230.15	0.7	0.7	0.0
230.20	0.7	0.7	0.0
230.25	0.8	0.8	0.0
230.30	0.9	0.9	0.0
230.35	1.0	1.0	0.0
230.40	1.1	1.1	0.0
230.45	1.2	1.2	0.0
230.50	1.3	1.3	0.0
230.55	1.4	1.4	0.0
230.60	1.5	1.5	0.0
230.65	1.9	1.9	0.0
230.70	2.5	2.5	0.0
230.75	3.5	3.3	0.3
230.80	**4.9**	**4.2**	**0.7**

Stage-Area-Storage for Pond P1: Sand Filter

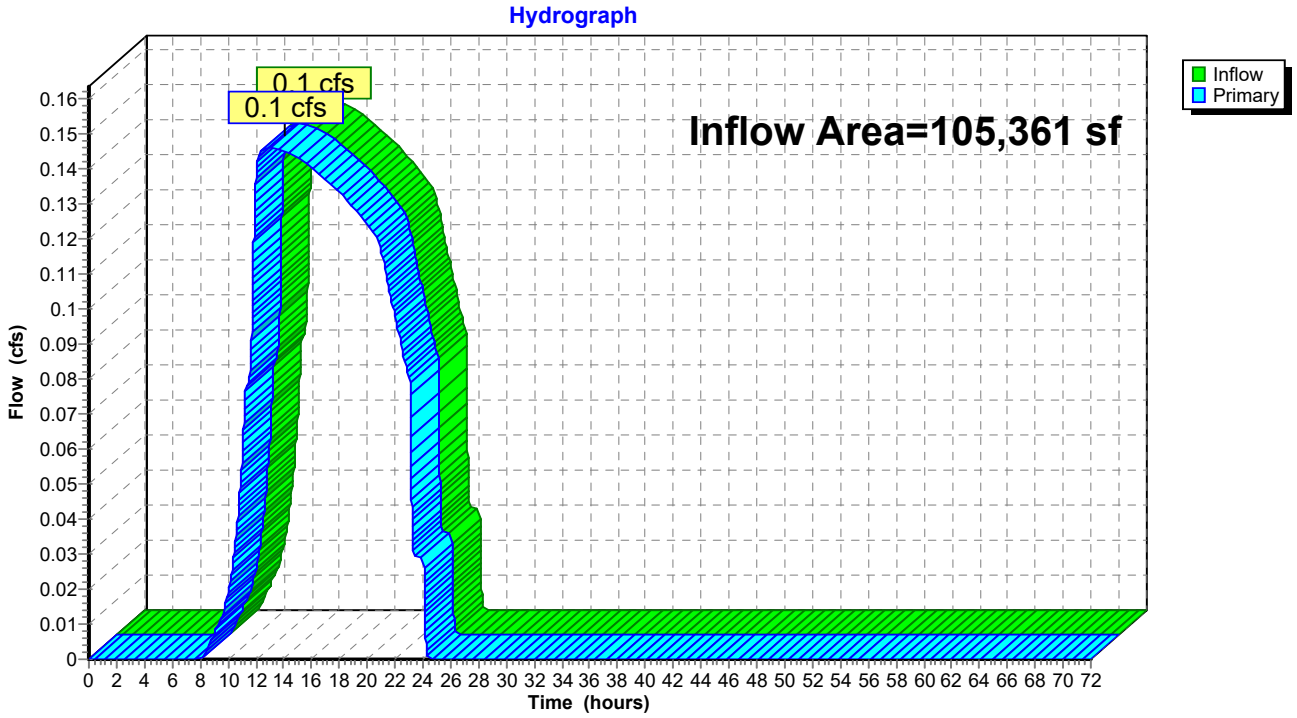
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
225.90	**1,284**	0
225.95	1,284	19
226.00	1,284	39
226.05	1,284	58
226.10	1,284	77
226.15	1,284	96
226.20	1,284	116
226.25	1,284	135
226.30	1,284	154
226.35	1,284	173
226.40	1,284	193
226.45	1,284	212
226.50	1,284	231
226.55	1,284	250
226.60	1,284	270
226.65	1,284	289
226.70	1,284	308
226.75	1,284	327
226.80	1,284	347
226.85	1,284	366
226.90	1,284	385
226.95	1,284	404
227.00	1,284	424
227.05	1,284	443
227.10	1,284	462
227.15	1,284	482
227.20	1,284	501
227.25	1,284	520
227.30	1,284	539
227.35	1,284	559
227.40	1,284	578
227.45	1,284	649
227.50	1,284	722
227.55	1,284	796
227.60	1,284	872
227.65	1,284	948
227.70	1,284	1,027
227.75	1,284	1,107
227.80	1,284	1,188
227.85	1,284	1,271
227.90	1,284	1,356
227.95	1,284	1,441
228.00	1,284	1,529
228.05	1,284	1,618
228.10	1,284	1,708
228.15	1,284	1,801
228.20	1,284	1,894
228.25	1,284	1,990
228.30	1,284	2,087
228.35	1,284	2,185
228.40	1,284	2,285
228.45	1,284	2,387
228.50	1,284	2,491
228.55	1,284	2,596
228.60	1,284	2,703
228.65	1,284	2,812
228.70	1,284	2,922
228.75	1,284	3,034
228.80	1,284	3,148
228.85	1,284	3,264
228.90	1,284	3,381
228.95	1,284	3,500
229.00	1,284	3,621
229.05	1,284	3,744
229.10	1,284	3,869
229.15	1,284	3,995
229.20	1,284	4,123
229.25	1,284	4,254
229.30	1,284	4,386
229.35	1,284	4,520
229.40	1,284	4,656
229.45	1,284	4,794
229.50	1,284	4,934
229.55	1,284	5,075
229.60	1,284	5,219
229.65	1,284	5,365
229.70	1,284	5,512
229.75	1,284	5,662
229.80	1,284	5,814
229.85	1,284	5,968
229.90	1,284	6,124
229.95	1,284	6,281
230.00	1,284	6,441
230.05	1,284	6,604
230.10	1,284	6,768
230.15	1,284	6,934
230.20	1,284	7,102
230.25	1,284	7,273
230.30	1,284	7,446
230.35	1,284	7,621
230.40	1,284	7,798
230.45	1,284	7,977
230.50	1,284	8,159
230.55	1,284	8,342
230.60	1,284	8,528
230.65	1,284	8,717
230.70	1,284	8,907
230.75	1,284	9,100
230.80	1,284	**9,295**

Summary for Link DP-1: Merrimack River

Inflow Area = 105,361 sf, 24.88% Impervious, Inflow Depth = 0.66" for 2-YR event
Inflow = 0.1 cfs @ 13.08 hrs, Volume= 5,774 cf
Primary = 0.1 cfs @ 13.08 hrs, Volume= 5,774 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Merrimack River



Hydrograph for Link DP-1: Merrimack River

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	**0.00**	0.0	51.00	0.0	0.00	0.0
1.00	0.0	0.00	0.0	52.00	0.0	0.00	0.0
2.00	0.0	0.00	0.0	53.00	0.0	0.00	0.0
3.00	0.0	0.00	0.0	54.00	0.0	0.00	0.0
4.00	0.0	0.00	0.0	55.00	0.0	0.00	0.0
5.00	0.0	0.00	0.0	56.00	0.0	0.00	0.0
6.00	0.0	0.00	0.0	57.00	0.0	0.00	0.0
7.00	0.0	0.00	0.0	58.00	0.0	0.00	0.0
8.00	0.0	0.00	0.0	59.00	0.0	0.00	0.0
9.00	0.0	0.00	0.0	60.00	0.0	0.00	0.0
10.00	0.0	0.00	0.0	61.00	0.0	0.00	0.0
11.00	0.1	0.00	0.1	62.00	0.0	0.00	0.0
12.00	0.1	0.00	0.1	63.00	0.0	0.00	0.0
13.00	**0.1**	0.00	**0.1**	64.00	0.0	0.00	0.0
14.00	**0.1**	0.00	**0.1**	65.00	0.0	0.00	0.0
15.00	0.1	0.00	0.1	66.00	0.0	0.00	0.0
16.00	0.1	0.00	0.1	67.00	0.0	0.00	0.0
17.00	0.1	0.00	0.1	68.00	0.0	0.00	0.0
18.00	0.1	0.00	0.1	69.00	0.0	0.00	0.0
19.00	0.1	0.00	0.1	70.00	0.0	0.00	0.0
20.00	0.1	0.00	0.1	71.00	0.0	0.00	0.0
21.00	0.1	0.00	0.1	72.00	0.0	0.00	0.0
22.00	0.1	0.00	0.1				
23.00	0.1	0.00	0.1				
24.00	0.0	0.00	0.0				
25.00	0.0	0.00	0.0				
26.00	0.0	0.00	0.0				
27.00	0.0	0.00	0.0				
28.00	0.0	0.00	0.0				
29.00	0.0	0.00	0.0				
30.00	0.0	0.00	0.0				
31.00	0.0	0.00	0.0				
32.00	0.0	0.00	0.0				
33.00	0.0	0.00	0.0				
34.00	0.0	0.00	0.0				
35.00	0.0	0.00	0.0				
36.00	0.0	0.00	0.0				
37.00	0.0	0.00	0.0				
38.00	0.0	0.00	0.0				
39.00	0.0	0.00	0.0				
40.00	0.0	0.00	0.0				
41.00	0.0	0.00	0.0				
42.00	0.0	0.00	0.0				
43.00	0.0	0.00	0.0				
44.00	0.0	0.00	0.0				
45.00	0.0	0.00	0.0				
46.00	0.0	0.00	0.0				
47.00	0.0	0.00	0.0				
48.00	0.0	0.00	0.0				
49.00	0.0	0.00	0.0				
50.00	0.0	0.00	0.0				

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 PR-1: Subcat PR-1 Runoff Area=1.096 ac 51.03% Impervious Runoff Depth=2.89"
Tc=6.0 min CN=86 Runoff=5.5 cfs 11,509 cf

Subcatchment PR-2: Subcat PR-2 Runoff Area=1.323 ac 3.21% Impervious Runoff Depth=0.20"
Flow Length=381' Tc=14.7 min UI Adjusted CN=43 Runoff=0.1 cfs 958 cf

Reach 1R: East Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.017 L=480.0' S=0.0035 '/' Capacity=209.2 cfs Outflow=0.0 cfs 0 cf

Pond P1: Sand Filter Peak Elev=229.78' Storage=5,741 cf Inflow=5.5 cfs 11,509 cf
Primary=0.3 cfs 11,509 cf Secondary=0.0 cfs 0 cf Outflow=0.3 cfs 11,509 cf

Link DP-1: Merrimack River Inflow=0.3 cfs 12,466 cf
Primary=0.3 cfs 12,466 cf

Total Runoff Area = 105,361 sf Runoff Volume = 12,466 cf Average Runoff Depth = 1.42"
75.12% Pervious = 79,148 sf 24.88% Impervious = 26,212 sf

Summary for Subcatchment PR-1: Subcat PR-1

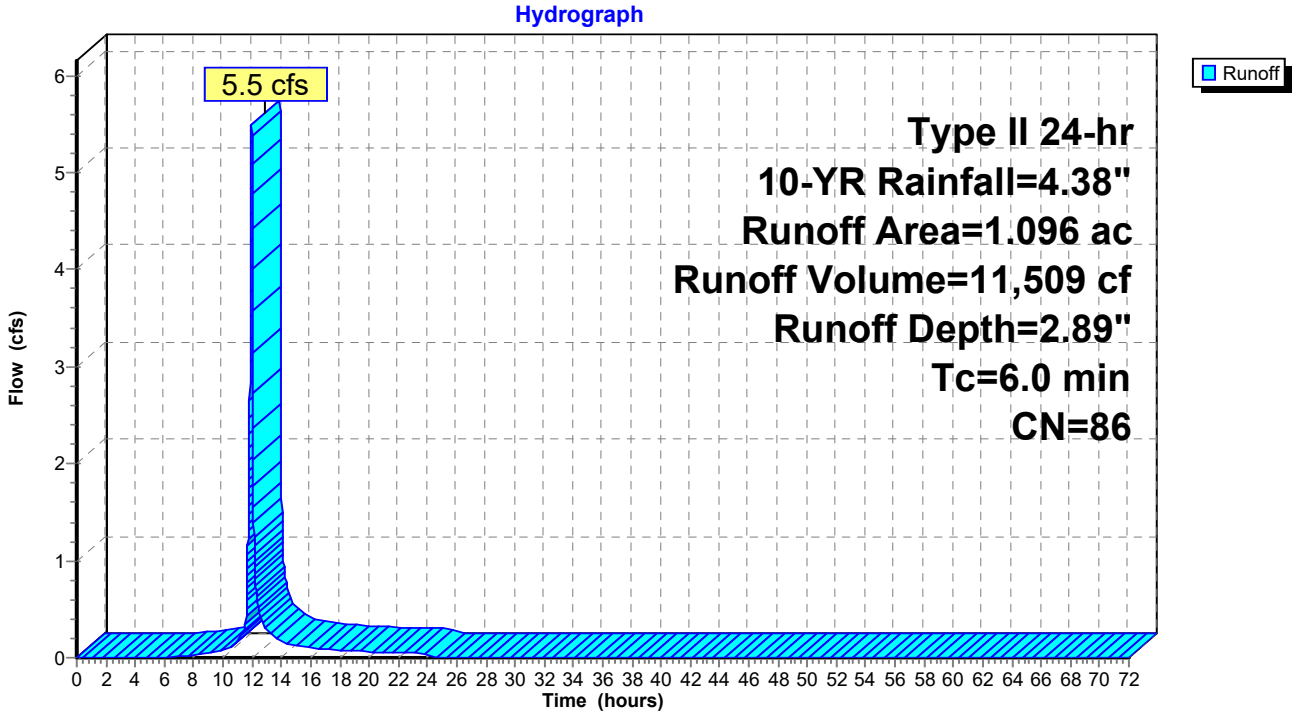
Runoff = 5.5 cfs @ 11.97 hrs, Volume= 11,509 cf, Depth= 2.89"
Routed to Pond P1 : Sand Filter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=4.38"

Area (ac)	CN	Description
0.157	39	>75% Grass cover, Good, HSG A
0.100	61	>75% Grass cover, Good, HSG B
0.127	96	Gravel surface, HSG A
0.153	96	Gravel surface, HSG B
0.000	98	Paved parking, HSG A
0.559	98	Unconnected pavement, HSG A
1.096	86	Weighted Average
0.537		48.97% Pervious Area
0.559		51.03% Impervious Area
0.559		100.00% Unconnected

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

Subcatchment PR-1: Subcat PR-1



Hydrograph for Subcatchment PR-1: Subcat PR-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.00	0.05	0.00	0.0
2.00	0.10	0.00	0.0
3.00	0.15	0.00	0.0
4.00	0.21	0.00	0.0
5.00	0.28	0.00	0.0
6.00	0.35	0.00	0.0
7.00	0.43	0.01	0.0
8.00	0.53	0.02	0.0
9.00	0.64	0.05	0.0
10.00	0.79	0.10	0.1
11.00	1.03	0.21	**0.2**
12.00	2.90	1.58	**5.1**
13.00	3.38	1.99	0.3
14.00	3.59	2.18	0.2
15.00	3.74	2.31	0.1
16.00	3.85	2.41	0.1
17.00	3.95	2.50	0.1
18.00	4.03	2.58	0.1
19.00	4.11	2.64	0.1
20.00	4.17	2.70	0.1
21.00	4.23	2.75	0.1
22.00	4.28	2.80	0.1
23.00	4.33	2.85	0.1
24.00	**4.38**	**2.89**	0.0
25.00	4.38	2.89	0.0
26.00	4.38	2.89	0.0
27.00	4.38	2.89	0.0
28.00	4.38	2.89	0.0
29.00	4.38	2.89	0.0
30.00	4.38	2.89	0.0
31.00	4.38	2.89	0.0
32.00	4.38	2.89	0.0
33.00	4.38	2.89	0.0
34.00	4.38	2.89	0.0
35.00	4.38	2.89	0.0
36.00	4.38	2.89	0.0
37.00	4.38	2.89	0.0
38.00	4.38	2.89	0.0
39.00	4.38	2.89	0.0
40.00	4.38	2.89	0.0
41.00	4.38	2.89	0.0
42.00	4.38	2.89	0.0
43.00	4.38	2.89	0.0
44.00	4.38	2.89	0.0
45.00	4.38	2.89	0.0
46.00	4.38	2.89	0.0
47.00	4.38	2.89	0.0
48.00	4.38	2.89	0.0
49.00	4.38	2.89	0.0
50.00	4.38	2.89	0.0
51.00	4.38	2.89	0.0
52.00	4.38	2.89	0.0
53.00	4.38	2.89	0.0
54.00	4.38	2.89	0.0
55.00	4.38	2.89	0.0
56.00	4.38	2.89	0.0
57.00	4.38	2.89	0.0
58.00	4.38	2.89	0.0
59.00	4.38	2.89	0.0
60.00	4.38	2.89	0.0
61.00	4.38	2.89	0.0
62.00	4.38	2.89	0.0
63.00	4.38	2.89	0.0
64.00	4.38	2.89	0.0
65.00	4.38	2.89	0.0
66.00	4.38	2.89	0.0
67.00	4.38	2.89	0.0
68.00	4.38	2.89	0.0
69.00	4.38	2.89	0.0
70.00	4.38	2.89	0.0
71.00	4.38	2.89	0.0
72.00	4.38	2.89	0.0

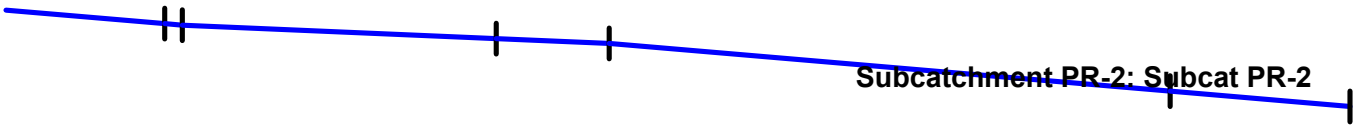
Summary for Subcatchment PR-2: Subcat PR-2

Runoff = 0.1 cfs @ 12.43 hrs, Volume= 958 cf, Depth= 0.20"
Routed to Link DP-1 : Merrimack River

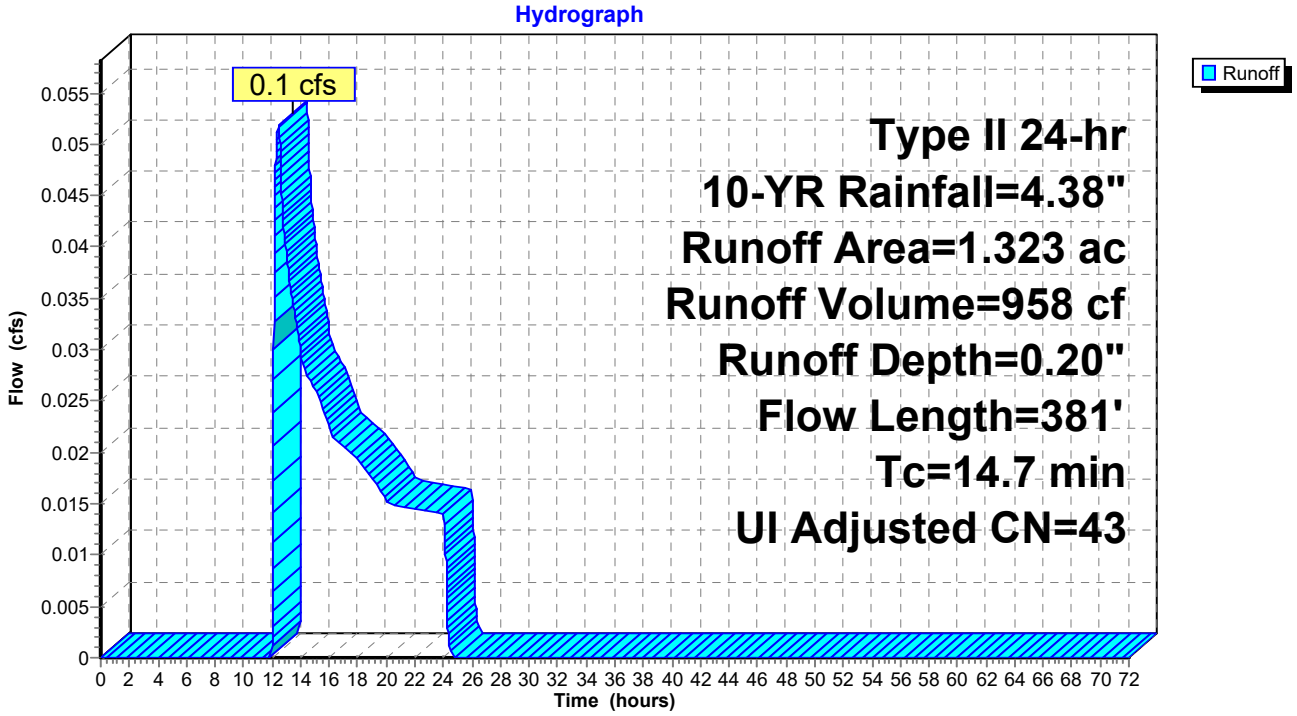
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-YR Rainfall=4.38"

Area (ac)	CN	Adj	Description
0.429	39		>75% Grass cover, Good, HSG A
0.023	61		>75% Grass cover, Good, HSG B
0.261	74		>75% Grass cover, Good, HSG C
0.042	98		Unconnected pavement, HSG A
0.568	30		Woods, Good, HSG A
0.000	55		Woods, Good, HSG B
1.323	44	43	Weighted Average, UI Adjusted
1.280			96.79% Pervious Area
0.042			3.21% Impervious Area
0.042			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	45	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.75"
2.8	5	0.0100	0.03		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.75"
0.5	89	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
1.5	32	0.0050	0.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	159	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	51	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.7	381	Total			



Subcatchment PR-2: Subcat PR-2



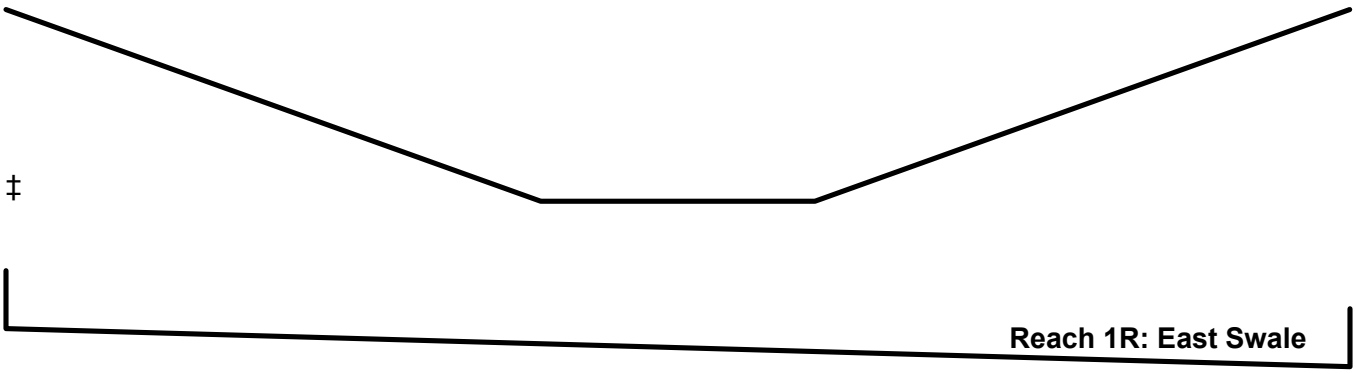
Hydrograph for Subcatchment PR-2: Subcat PR-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.00	0.05	0.00	0.0
2.00	0.10	0.00	0.0
3.00	0.15	0.00	0.0
4.00	0.21	0.00	0.0
5.00	0.28	0.00	0.0
6.00	0.35	0.00	0.0
7.00	0.43	0.00	0.0
8.00	0.53	0.00	0.0
9.00	0.64	0.00	0.0
10.00	0.79	0.00	0.0
11.00	1.03	0.00	0.0
12.00	2.90	0.00	**0.0**
13.00	3.38	0.04	**0.0**
14.00	3.59	0.06	0.0
15.00	3.74	0.08	0.0
16.00	3.85	0.10	0.0
17.00	3.95	0.12	0.0
18.00	4.03	0.13	0.0
19.00	4.11	0.14	0.0
20.00	4.17	0.16	0.0
21.00	4.23	0.17	0.0
22.00	4.28	0.18	0.0
23.00	4.33	0.19	0.0
24.00	**4.38**	**0.20**	0.0
25.00	4.38	0.20	0.0
26.00	4.38	0.20	0.0
27.00	4.38	0.20	0.0
28.00	4.38	0.20	0.0
29.00	4.38	0.20	0.0
30.00	4.38	0.20	0.0
31.00	4.38	0.20	0.0
32.00	4.38	0.20	0.0
33.00	4.38	0.20	0.0
34.00	4.38	0.20	0.0
35.00	4.38	0.20	0.0
36.00	4.38	0.20	0.0
37.00	4.38	0.20	0.0
38.00	4.38	0.20	0.0
39.00	4.38	0.20	0.0
40.00	4.38	0.20	0.0
41.00	4.38	0.20	0.0
42.00	4.38	0.20	0.0
43.00	4.38	0.20	0.0
44.00	4.38	0.20	0.0
45.00	4.38	0.20	0.0
46.00	4.38	0.20	0.0
47.00	4.38	0.20	0.0
48.00	4.38	0.20	0.0
49.00	4.38	0.20	0.0
50.00	4.38	0.20	0.0
51.00	4.38	0.20	0.0
52.00	4.38	0.20	0.0
53.00	4.38	0.20	0.0
54.00	4.38	0.20	0.0
55.00	4.38	0.20	0.0
56.00	4.38	0.20	0.0
57.00	4.38	0.20	0.0
58.00	4.38	0.20	0.0
59.00	4.38	0.20	0.0
60.00	4.38	0.20	0.0
61.00	4.38	0.20	0.0
62.00	4.38	0.20	0.0
63.00	4.38	0.20	0.0
64.00	4.38	0.20	0.0
65.00	4.38	0.20	0.0
66.00	4.38	0.20	0.0
67.00	4.38	0.20	0.0
68.00	4.38	0.20	0.0
69.00	4.38	0.20	0.0
70.00	4.38	0.20	0.0
71.00	4.38	0.20	0.0
72.00	4.38	0.20	0.0

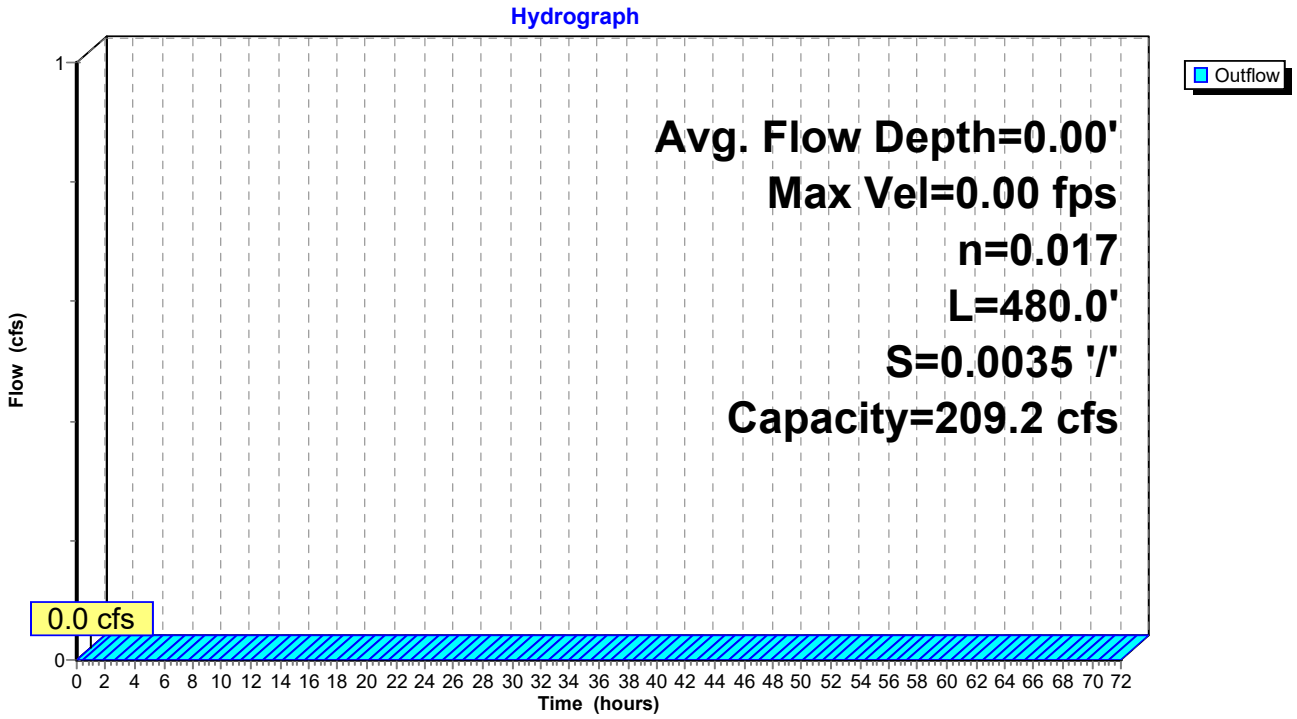
Summary for Reach 1R: East Swale

Bank-Full Depth= 2.60' Flow Area= 30.7 sf, Capacity= 209.2 cfs

4.00' x 2.60' deep channel, n= 0.017 Concrete, unfinished
Side Slope Z-value= 3.0 '/' Top Width= 19.60'
Length= 480.0' Slope= 0.0035 '/'
Inlet Invert= 228.20', Outlet Invert= 226.50'



Reach 1R: East Swale



Stage-Discharge for Reach 1R: East Swale

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
228.20	0.00	0.0
228.22	0.35	0.0
228.24	0.59	0.1
228.26	0.77	0.2
228.28	0.93	0.3
228.30	1.07	0.5
228.32	1.19	0.6
228.34	1.31	0.8
228.36	1.42	1.0
228.38	1.53	1.2
228.40	1.63	1.5
228.42	1.72	1.8
228.44	1.81	2.1
228.46	1.90	2.4
228.48	1.98	2.7
228.50	2.06	3.0
228.52	2.14	3.4
228.54	2.21	3.8
228.56	2.29	4.2
228.58	2.36	4.6
228.60	2.43	5.1
228.62	2.49	5.5
228.64	2.56	6.0
228.66	2.62	6.5
228.68	2.69	7.0
228.70	2.75	7.6
228.72	2.81	8.1
228.74	2.87	8.7
228.76	2.93	9.3
228.78	2.98	9.9
228.80	3.04	10.6
228.82	3.09	11.2
228.84	3.15	11.9
228.86	3.20	12.6
228.88	3.25	13.4
228.90	3.31	14.1
228.92	3.36	14.9
228.94	3.41	15.7
228.96	3.46	16.5
228.98	3.51	17.3
229.00	3.56	18.2
229.02	3.60	19.1
229.04	3.65	20.0
229.06	3.70	20.9
229.08	3.75	21.9
229.10	3.79	22.9
229.12	3.84	23.9
229.14	3.88	24.9
229.16	3.93	25.9
229.18	3.97	27.0
229.20	4.01	28.1
229.22	4.06	29.2
229.24	4.10	30.4
229.26	4.14	31.5
229.28	4.19	32.7
229.30	4.23	34.0
229.32	4.27	35.2
229.34	4.31	36.5
229.36	4.35	37.8
229.38	4.39	39.1
229.40	4.43	40.4
229.42	4.47	41.8
229.44	4.51	43.2
229.46	4.55	44.6
229.48	4.59	46.1
229.50	4.63	47.6
229.52	4.67	49.1
229.54	4.71	50.6
229.56	4.75	52.2
229.58	4.79	53.8
229.60	4.82	55.4
229.62	4.86	57.0
229.64	4.90	58.7
229.66	4.94	60.4
229.68	4.97	62.1
229.70	5.01	63.9
229.72	5.05	65.7
229.74	5.08	67.5
229.76	5.12	69.3
229.78	5.16	71.2
229.80	5.19	73.1
229.82	5.23	75.0
229.84	5.26	77.0
229.86	5.30	79.0
229.88	5.33	81.0
229.90	5.37	83.1
229.92	5.40	85.2
229.94	5.44	87.3
229.96	5.47	89.4
229.98	5.51	91.6
230.00	5.54	93.8
230.02	5.58	96.0
230.04	5.61	98.3
230.06	5.64	100.6
230.08	5.68	102.9
230.10	5.71	105.3
230.12	5.75	107.7
230.14	5.78	110.1
230.16	5.81	112.6
230.18	5.85	115.1
230.20	5.88	117.6
230.22	5.91	120.1
230.24	5.94	122.7
230.26	5.98	125.3
230.28	6.01	128.0
230.30	6.04	130.7
230.32	6.07	133.4
230.34	6.11	136.2
230.36	6.14	139.0
230.38	6.17	141.8
230.40	6.20	144.6
230.42	6.23	147.5
230.44	6.27	150.5
230.46	6.30	153.4
230.48	6.33	156.4
230.50	6.36	159.4
230.52	6.39	162.5
230.54	6.42	165.6
230.56	6.45	168.7
230.58	6.48	171.9
230.60	6.51	175.1
230.62	6.55	178.4
230.64	6.58	181.6
230.66	6.61	185.0
230.68	6.64	188.3
230.70	6.67	191.7
230.72	6.70	195.1
230.74	6.73	198.6
230.76	6.76	202.1
230.78	6.79	205.6
230.80	**6.82**	**209.2**

Stage-Area-Storage for Reach 1R: East Swale

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
228.20	0.0	0
228.25	0.2	100
228.30	0.4	207
228.35	0.7	321
228.40	0.9	442
228.45	1.2	570
228.50	1.5	706
228.55	1.8	849
228.60	2.1	999
228.65	2.4	1,156
228.70	2.8	1,320
228.75	3.1	1,492
228.80	3.5	1,670
228.85	3.9	1,856
228.90	4.3	2,050
228.95	4.7	2,250
229.00	5.1	2,458
229.05	5.6	2,673
229.10	6.0	2,895
229.15	6.5	3,124
229.20	7.0	3,360
229.25	7.5	3,604
229.30	8.0	3,855
229.35	8.6	4,113
229.40	9.1	4,378
229.45	9.7	4,650
229.50	10.3	4,930
229.55	10.9	5,216
229.60	11.5	5,511
229.65	12.1	5,812
229.70	12.8	6,120
229.75	13.4	6,436
229.80	14.1	6,759
229.85	14.8	7,089
229.90	15.5	7,426
229.95	16.2	7,770
230.00	16.9	8,122
230.05	17.7	8,481
230.10	18.4	8,846
230.15	19.2	9,220
230.20	20.0	9,600
230.25	20.8	9,988
230.30	21.6	10,383
230.35	22.5	10,785
230.40	23.3	11,194
230.45	24.2	11,610
230.50	25.1	12,034
230.55	26.0	12,465
230.60	26.9	12,903
230.65	27.8	13,348
230.70	28.8	13,800
230.75	29.7	14,260
230.80	**30.7**	**14,726**

Summary for Pond P1: Sand Filter

Inflow Area = 47,739 sf, 51.03% Impervious, Inflow Depth = 2.89" for 10-YR event
Inflow = 5.5 cfs @ 11.97 hrs, Volume= 11,509 cf
Outflow = 0.3 cfs @ 12.94 hrs, Volume= 11,509 cf, Atten= 95%, Lag= 57.9 min
Primary = 0.3 cfs @ 12.94 hrs, Volume= 11,509 cf
Routed to Link DP-1 : Merrimack River
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP-1 : Merrimack River

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 229.78' @ 12.94 hrs Surf.Area= 1,284 sf Storage= 5,741 cf
Flood Elev= 229.80' Surf.Area= 1,284 sf Storage= 5,814 cf

Plug-Flow detention time= 246.8 min calculated for 11,507 cf (100% of inflow)
Center-of-Mass det. time= 246.8 min (1,053.3 - 806.5)

Volume	Invert	Avail.Storage	Storage Description
#1	225.90'	578 cf	**Sand Filter (Irregular)**Listed below (Recalc) 1,926 cf Overall x 30.0% Voids
#2	227.40'	8,717 cf	**Detention (Irregular)**Listed below (Recalc) x 1.1 -Impervious
		9,295 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
225.90	1,284	191.9	0	0	1,284
227.40	1,284	191.9	1,926	1,926	1,572

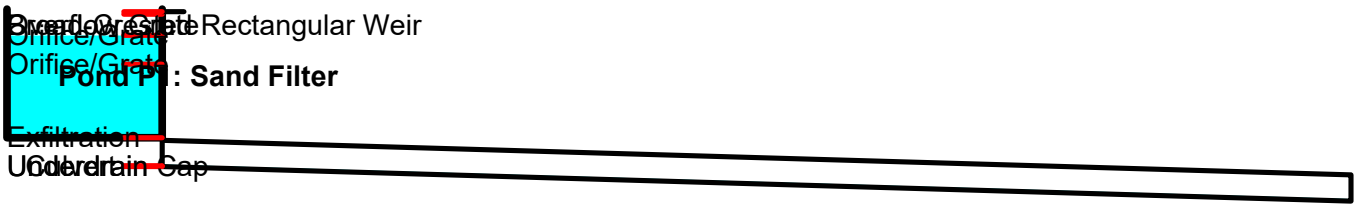
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
227.40	1,284	191.9	0	0	1,284
230.80	3,568	255.9	7,925	7,925	3,688

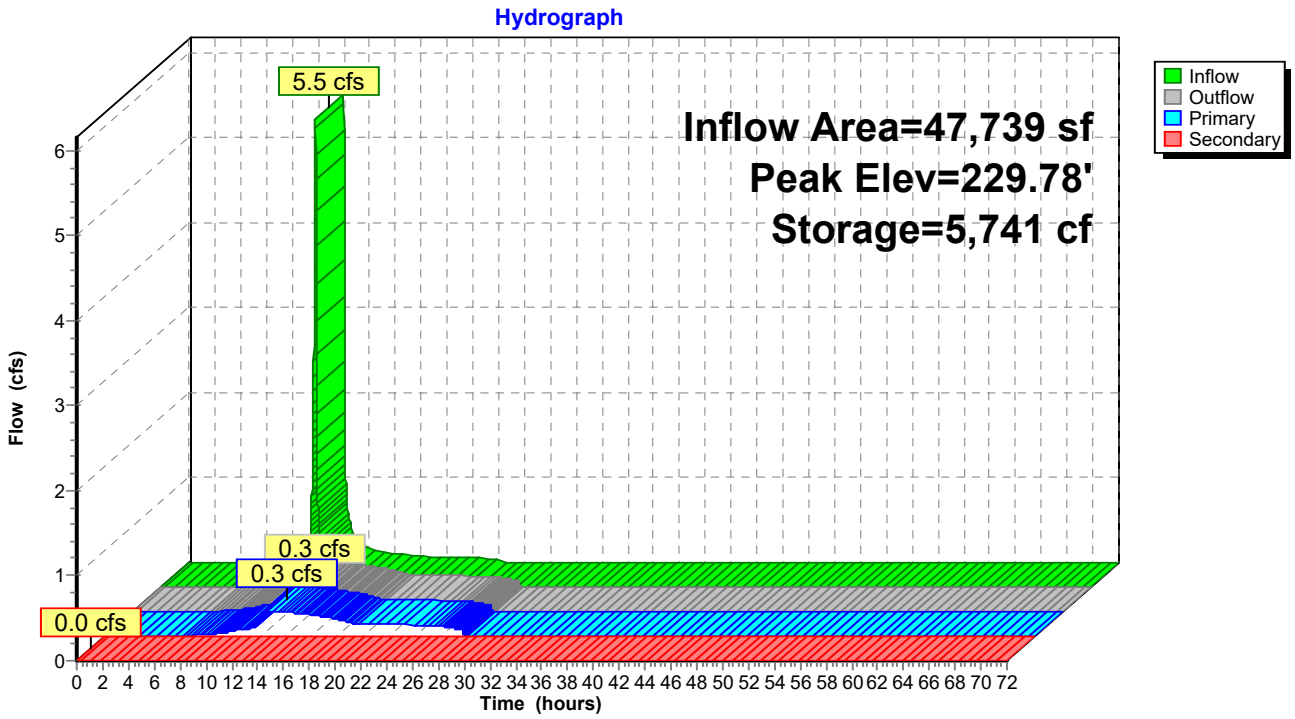
Device	Routing	Invert	Outlet Devices
#1	Primary	224.80'	**12.0" Round Culvert** L= 271.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 224.80' / 223.49' S= 0.0048 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	224.83'	**1.7" Vert. Underdrain Cap** C= 0.600 Limited to weir flow at low heads
#3	Device 2	224.83'	**6.0" Round Underdrain** L= 70.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 224.83' / 224.83' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf
#4	Device 3	225.90'	**10.000 in/hr Exfiltration over Surface area**
#5	Device 1	228.70'	**2.2" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Device 1	229.80'	**6.0" W x 9.6" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Device 1	230.60'	**24.0" x 24.0" Horiz. Overflow Grate** C= 0.600 Limited to weir flow at low heads

#8	Secondary	230.70'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.3 cfs @ 12.94 hrs HW=229.78' (Free Discharge)
- **1=Culvert** (Passes 0.3 cfs of 4.6 cfs potential flow)
  - **2=Underdrain Cap** (Orifice Controls 0.2 cfs @ 10.63 fps)
    - **3=Underdrain** (Passes 0.2 cfs of 1.3 cfs potential flow)
      - **4=Exfiltration** (Passes 0.2 cfs of 0.3 cfs potential flow)
  - **5=Orifice/Grate** (Orifice Controls 0.1 cfs @ 4.78 fps)
  - **6=Orifice/Grate** (Controls 0.0 cfs)
  - **7=Overflow Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=225.90' (Free Discharge)
- **8=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)





Hydrograph for Pond P1: Sand Filter

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.0	0	225.90	0.0	0.0	**0.0**
2.00	0.0	0	225.90	0.0	0.0	0.0
4.00	0.0	0	225.90	0.0	0.0	0.0
6.00	0.0	0	225.90	0.0	0.0	0.0
8.00	0.0	5	225.91	0.0	0.0	0.0
10.00	**0.1**	17	225.94	0.1	0.1	0.0
12.00	**5.1**	**3,974**	**229.14**	**0.2**	**0.2**	0.0
14.00	0.2	**5,469**	**229.69**	**0.3**	**0.3**	0.0
16.00	0.1	4,473	229.33	0.3	0.3	0.0
18.00	0.1	3,476	228.94	0.2	0.2	0.0
20.00	0.1	2,782	228.64	0.1	0.1	0.0
22.00	0.1	2,147	228.33	0.1	0.1	0.0
24.00	0.0	1,528	228.00	0.1	0.1	0.0
26.00	0.0	626	227.43	0.1	0.1	0.0
28.00	0.0	0	225.90	0.0	0.0	0.0
30.00	0.0	0	225.90	0.0	0.0	0.0
32.00	0.0	0	225.90	0.0	0.0	0.0
34.00	0.0	0	225.90	0.0	0.0	0.0
36.00	0.0	0	225.90	0.0	0.0	0.0
38.00	0.0	0	225.90	0.0	0.0	0.0
40.00	0.0	0	225.90	0.0	0.0	0.0
42.00	0.0	0	225.90	0.0	0.0	0.0
44.00	0.0	0	225.90	0.0	0.0	0.0
46.00	0.0	0	225.90	0.0	0.0	0.0
48.00	0.0	0	225.90	0.0	0.0	0.0
50.00	0.0	0	225.90	0.0	0.0	0.0
52.00	0.0	0	225.90	0.0	0.0	0.0
54.00	0.0	0	225.90	0.0	0.0	0.0
56.00	0.0	0	225.90	0.0	0.0	0.0
58.00	0.0	0	225.90	0.0	0.0	0.0
60.00	0.0	0	225.90	0.0	0.0	0.0
62.00	0.0	0	225.90	0.0	0.0	0.0
64.00	0.0	0	225.90	0.0	0.0	0.0
66.00	0.0	0	225.90	0.0	0.0	0.0
68.00	0.0	0	225.90	0.0	0.0	0.0
70.00	0.0	0	225.90	0.0	0.0	0.0
72.00	0.0	0	225.90	0.0	0.0	0.0

Stage-Discharge for Pond P1: Sand Filter

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
225.90	0.0	0.0	0.0
225.95	0.1	0.1	0.0
226.00	0.1	0.1	0.0
226.05	0.1	0.1	0.0
226.10	0.1	0.1	0.0
226.15	0.1	0.1	0.0
226.20	0.1	0.1	0.0
226.25	0.1	0.1	0.0
226.30	0.1	0.1	0.0
226.35	0.1	0.1	0.0
226.40	0.1	0.1	0.0
226.45	0.1	0.1	0.0
226.50	0.1	0.1	0.0
226.55	0.1	0.1	0.0
226.60	0.1	0.1	0.0
226.65	0.1	0.1	0.0
226.70	0.1	0.1	0.0
226.75	0.1	0.1	0.0
226.80	0.1	0.1	0.0
226.85	0.1	0.1	0.0
226.90	0.1	0.1	0.0
226.95	0.1	0.1	0.0
227.00	0.1	0.1	0.0
227.05	0.1	0.1	0.0
227.10	0.1	0.1	0.0
227.15	0.1	0.1	0.0
227.20	0.1	0.1	0.0
227.25	0.1	0.1	0.0
227.30	0.1	0.1	0.0
227.35	0.1	0.1	0.0
227.40	0.1	0.1	0.0
227.45	0.1	0.1	0.0
227.50	0.1	0.1	0.0
227.55	0.1	0.1	0.0
227.60	0.1	0.1	0.0
227.65	0.1	0.1	0.0
227.70	0.1	0.1	0.0
227.75	0.1	0.1	0.0
227.80	0.1	0.1	0.0
227.85	0.1	0.1	0.0
227.90	0.1	0.1	0.0
227.95	0.1	0.1	0.0
228.00	0.1	0.1	0.0
228.05	0.1	0.1	0.0
228.10	0.1	0.1	0.0
228.15	0.1	0.1	0.0
228.20	0.1	0.1	0.0
228.25	0.1	0.1	0.0
228.30	0.1	0.1	0.0
228.35	0.1	0.1	0.0
228.40	0.1	0.1	0.0
228.45	0.1	0.1	0.0
228.50	0.1	0.1	0.0
228.55	0.1	0.1	0.0
228.60	0.1	0.1	0.0
228.65	0.1	0.1	0.0
228.70	0.1	0.1	0.0
228.75	0.2	0.2	0.0
228.80	0.2	0.2	0.0
228.85	0.2	0.2	0.0
228.90	0.2	0.2	0.0
228.95	0.2	0.2	0.0
229.00	0.2	0.2	0.0
229.05	0.2	0.2	0.0
229.10	0.2	0.2	0.0
229.15	0.2	0.2	0.0
229.20	0.2	0.2	0.0
229.25	0.2	0.2	0.0
229.30	0.2	0.2	0.0
229.35	0.3	0.3	0.0
229.40	0.3	0.3	0.0
229.45	0.3	0.3	0.0
229.50	0.3	0.3	0.0
229.55	0.3	0.3	0.0
229.60	0.3	0.3	0.0
229.65	0.3	0.3	0.0
229.70	0.3	0.3	0.0
229.75	0.3	0.3	0.0
229.80	0.3	0.3	0.0
229.85	0.3	0.3	0.0
229.90	0.4	0.4	0.0
229.95	0.4	0.4	0.0
230.00	0.5	0.5	0.0
230.05	0.5	0.5	0.0
230.10	0.6	0.6	0.0
230.15	0.7	0.7	0.0
230.20	0.7	0.7	0.0
230.25	0.8	0.8	0.0
230.30	0.9	0.9	0.0
230.35	1.0	1.0	0.0
230.40	1.1	1.1	0.0
230.45	1.2	1.2	0.0
230.50	1.3	1.3	0.0
230.55	1.4	1.4	0.0
230.60	1.5	1.5	0.0
230.65	1.9	1.9	0.0
230.70	2.5	2.5	0.0
230.75	3.5	3.3	0.3
230.80	**4.9**	**4.2**	**0.7**

Stage-Area-Storage for Pond P1: Sand Filter

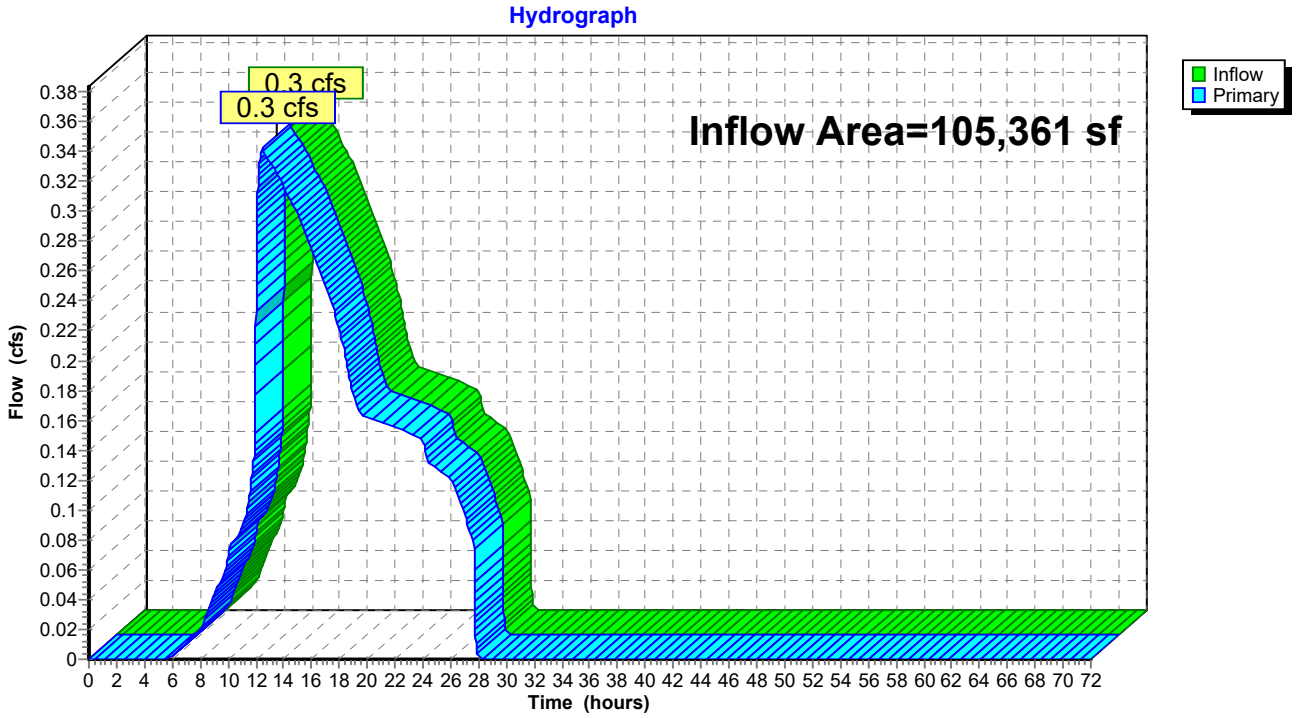
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
225.90	**1,284**	0
225.95	1,284	19
226.00	1,284	39
226.05	1,284	58
226.10	1,284	77
226.15	1,284	96
226.20	1,284	116
226.25	1,284	135
226.30	1,284	154
226.35	1,284	173
226.40	1,284	193
226.45	1,284	212
226.50	1,284	231
226.55	1,284	250
226.60	1,284	270
226.65	1,284	289
226.70	1,284	308
226.75	1,284	327
226.80	1,284	347
226.85	1,284	366
226.90	1,284	385
226.95	1,284	404
227.00	1,284	424
227.05	1,284	443
227.10	1,284	462
227.15	1,284	482
227.20	1,284	501
227.25	1,284	520
227.30	1,284	539
227.35	1,284	559
227.40	1,284	578
227.45	1,284	649
227.50	1,284	722
227.55	1,284	796
227.60	1,284	872
227.65	1,284	948
227.70	1,284	1,027
227.75	1,284	1,107
227.80	1,284	1,188
227.85	1,284	1,271
227.90	1,284	1,356
227.95	1,284	1,441
228.00	1,284	1,529
228.05	1,284	1,618
228.10	1,284	1,708
228.15	1,284	1,801
228.20	1,284	1,894
228.25	1,284	1,990
228.30	1,284	2,087
228.35	1,284	2,185
228.40	1,284	2,285
228.45	1,284	2,387
228.50	1,284	2,491
228.55	1,284	2,596
228.60	1,284	2,703
228.65	1,284	2,812
228.70	1,284	2,922
228.75	1,284	3,034
228.80	1,284	3,148
228.85	1,284	3,264
228.90	1,284	3,381
228.95	1,284	3,500
229.00	1,284	3,621
229.05	1,284	3,744
229.10	1,284	3,869
229.15	1,284	3,995
229.20	1,284	4,123
229.25	1,284	4,254
229.30	1,284	4,386
229.35	1,284	4,520
229.40	1,284	4,656
229.45	1,284	4,794
229.50	1,284	4,934
229.55	1,284	5,075
229.60	1,284	5,219
229.65	1,284	5,365
229.70	1,284	5,512
229.75	1,284	5,662
229.80	1,284	5,814
229.85	1,284	5,968
229.90	1,284	6,124
229.95	1,284	6,281
230.00	1,284	6,441
230.05	1,284	6,604
230.10	1,284	6,768
230.15	1,284	6,934
230.20	1,284	7,102
230.25	1,284	7,273
230.30	1,284	7,446
230.35	1,284	7,621
230.40	1,284	7,798
230.45	1,284	7,977
230.50	1,284	8,159
230.55	1,284	8,342
230.60	1,284	8,528
230.65	1,284	8,717
230.70	1,284	8,907
230.75	1,284	9,100
230.80	1,284	**9,295**

Summary for Link DP-1: Merrimack River

Inflow Area = 105,361 sf, 24.88% Impervious, Inflow Depth = 1.42" for 10-YR event
Inflow = 0.3 cfs @ 12.49 hrs, Volume= 12,466 cf
Primary = 0.3 cfs @ 12.49 hrs, Volume= 12,466 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Merrimack River



Hydrograph for Link DP-1: Merrimack River

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	**0.00**	0.0	51.00	0.0	0.00	0.0
1.00	0.0	0.00	0.0	52.00	0.0	0.00	0.0
2.00	0.0	0.00	0.0	53.00	0.0	0.00	0.0
3.00	0.0	0.00	0.0	54.00	0.0	0.00	0.0
4.00	0.0	0.00	0.0	55.00	0.0	0.00	0.0
5.00	0.0	0.00	0.0	56.00	0.0	0.00	0.0
6.00	0.0	0.00	0.0	57.00	0.0	0.00	0.0
7.00	0.0	0.00	0.0	58.00	0.0	0.00	0.0
8.00	0.0	0.00	0.0	59.00	0.0	0.00	0.0
9.00	0.0	0.00	0.0	60.00	0.0	0.00	0.0
10.00	0.1	0.00	0.1	61.00	0.0	0.00	0.0
11.00	0.1	0.00	0.1	62.00	0.0	0.00	0.0
12.00	**0.2**	0.00	**0.2**	63.00	0.0	0.00	0.0
13.00	**0.3**	0.00	**0.3**	64.00	0.0	0.00	0.0
14.00	0.3	0.00	0.3	65.00	0.0	0.00	0.0
15.00	0.3	0.00	0.3	66.00	0.0	0.00	0.0
16.00	0.3	0.00	0.3	67.00	0.0	0.00	0.0
17.00	0.3	0.00	0.3	68.00	0.0	0.00	0.0
18.00	0.2	0.00	0.2	69.00	0.0	0.00	0.0
19.00	0.2	0.00	0.2	70.00	0.0	0.00	0.0
20.00	0.2	0.00	0.2	71.00	0.0	0.00	0.0
21.00	0.2	0.00	0.2	72.00	0.0	0.00	0.0
22.00	0.2	0.00	0.2				
23.00	0.2	0.00	0.2				
24.00	0.1	0.00	0.1				
25.00	0.1	0.00	0.1				
26.00	0.1	0.00	0.1				
27.00	0.1	0.00	0.1				
28.00	0.0	0.00	0.0				
29.00	0.0	0.00	0.0				
30.00	0.0	0.00	0.0				
31.00	0.0	0.00	0.0				
32.00	0.0	0.00	0.0				
33.00	0.0	0.00	0.0				
34.00	0.0	0.00	0.0				
35.00	0.0	0.00	0.0				
36.00	0.0	0.00	0.0				
37.00	0.0	0.00	0.0				
38.00	0.0	0.00	0.0				
39.00	0.0	0.00	0.0				
40.00	0.0	0.00	0.0				
41.00	0.0	0.00	0.0				
42.00	0.0	0.00	0.0				
43.00	0.0	0.00	0.0				
44.00	0.0	0.00	0.0				
45.00	0.0	0.00	0.0				
46.00	0.0	0.00	0.0				
47.00	0.0	0.00	0.0				
48.00	0.0	0.00	0.0				
49.00	0.0	0.00	0.0				
50.00	0.0	0.00	0.0				

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 PR-1: Subcat PR-1 Runoff Area=1.096 ac 51.03% Impervious Runoff Depth=3.84"
Tc=6.0 min CN=86 Runoff=7.2 cfs 15,284 cf

Subcatchment PR-2: Subcat PR-2 Runoff Area=1.323 ac 3.21% Impervious Runoff Depth=0.47"
Flow Length=381' Tc=14.7 min UI Adjusted CN=43 Runoff=0.4 cfs 2,267 cf

Reach 1R: East Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.017 L=480.0' S=0.0035 '/' Capacity=209.2 cfs Outflow=0.0 cfs 0 cf

Pond P1: Sand Filter Peak Elev=230.22' Storage=7,186 cf Inflow=7.2 cfs 15,284 cf
Primary=0.8 cfs 15,284 cf Secondary=0.0 cfs 0 cf Outflow=0.8 cfs 15,284 cf

Link DP-1: Merrimack River Inflow=1.1 cfs 17,551 cf
Primary=1.1 cfs 17,551 cf

Total Runoff Area = 105,361 sf Runoff Volume = 17,551 cf Average Runoff Depth = 2.00"
75.12% Pervious = 79,148 sf 24.88% Impervious = 26,212 sf

Summary for Subcatchment PR-1: Subcat PR-1

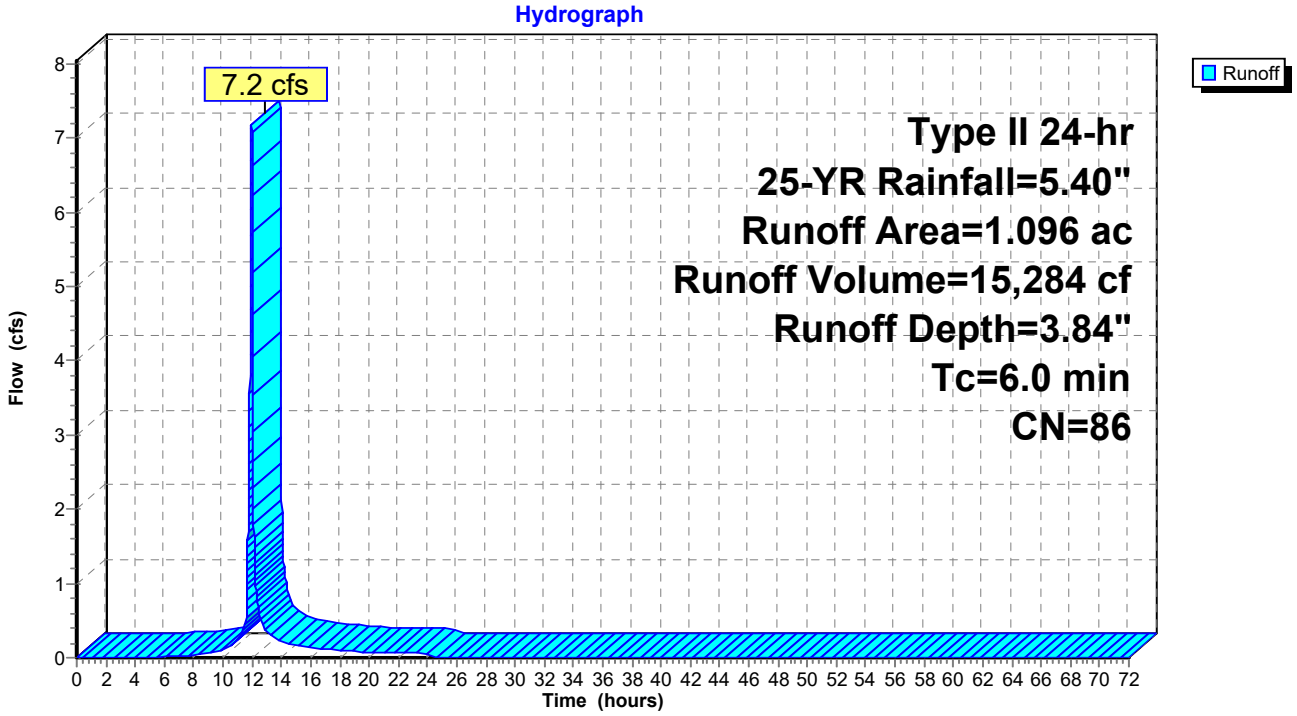
Runoff = 7.2 cfs @ 11.97 hrs, Volume= 15,284 cf, Depth= 3.84"
Routed to Pond P1 : Sand Filter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-YR Rainfall=5.40"

Area (ac)	CN	Description
0.157	39	>75% Grass cover, Good, HSG A
0.100	61	>75% Grass cover, Good, HSG B
0.127	96	Gravel surface, HSG A
0.153	96	Gravel surface, HSG B
0.000	98	Paved parking, HSG A
0.559	98	Unconnected pavement, HSG A
1.096	86	Weighted Average
0.537		48.97% Pervious Area
0.559		51.03% Impervious Area
0.559		100.00% Unconnected

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

Subcatchment PR-1: Subcat PR-1



Hydrograph for Subcatchment PR-1: Subcat PR-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.00	0.06	0.00	0.0
2.00	0.12	0.00	0.0
3.00	0.19	0.00	0.0
4.00	0.26	0.00	0.0
5.00	0.34	0.00	0.0
6.00	0.43	0.01	0.0
7.00	0.53	0.02	0.0
8.00	0.65	0.05	0.0
9.00	0.79	0.10	0.1
10.00	0.98	0.19	0.1
11.00	1.27	0.35	**0.2**
12.00	3.58	2.17	**6.6**
13.00	4.17	2.70	0.4
14.00	4.43	2.94	0.2
15.00	4.61	3.10	0.2
16.00	4.75	3.24	0.1
17.00	4.87	3.35	0.1
18.00	4.97	3.44	0.1
19.00	5.06	3.53	0.1
20.00	5.14	3.60	0.1
21.00	5.21	3.66	0.1
22.00	5.28	3.73	0.1
23.00	5.34	3.78	0.1
24.00	**5.40**	**3.84**	0.1
25.00	5.40	3.84	0.0
26.00	5.40	3.84	0.0
27.00	5.40	3.84	0.0
28.00	5.40	3.84	0.0
29.00	5.40	3.84	0.0
30.00	5.40	3.84	0.0
31.00	5.40	3.84	0.0
32.00	5.40	3.84	0.0
33.00	5.40	3.84	0.0
34.00	5.40	3.84	0.0
35.00	5.40	3.84	0.0
36.00	5.40	3.84	0.0
37.00	5.40	3.84	0.0
38.00	5.40	3.84	0.0
39.00	5.40	3.84	0.0
40.00	5.40	3.84	0.0
41.00	5.40	3.84	0.0
42.00	5.40	3.84	0.0
43.00	5.40	3.84	0.0
44.00	5.40	3.84	0.0
45.00	5.40	3.84	0.0
46.00	5.40	3.84	0.0
47.00	5.40	3.84	0.0
48.00	5.40	3.84	0.0
49.00	5.40	3.84	0.0
50.00	5.40	3.84	0.0
51.00	5.40	3.84	0.0
52.00	5.40	3.84	0.0
53.00	5.40	3.84	0.0
54.00	5.40	3.84	0.0
55.00	5.40	3.84	0.0
56.00	5.40	3.84	0.0
57.00	5.40	3.84	0.0
58.00	5.40	3.84	0.0
59.00	5.40	3.84	0.0
60.00	5.40	3.84	0.0
61.00	5.40	3.84	0.0
62.00	5.40	3.84	0.0
63.00	5.40	3.84	0.0
64.00	5.40	3.84	0.0
65.00	5.40	3.84	0.0
66.00	5.40	3.84	0.0
67.00	5.40	3.84	0.0
68.00	5.40	3.84	0.0
69.00	5.40	3.84	0.0
70.00	5.40	3.84	0.0
71.00	5.40	3.84	0.0
72.00	5.40	3.84	0.0

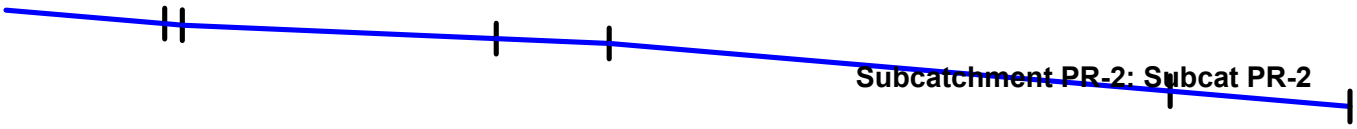
Summary for Subcatchment PR-2: Subcat PR-2

Runoff = 0.4 cfs @ 12.13 hrs, Volume= 2,267 cf, Depth= 0.47"
Routed to Link DP-1 : Merrimack River

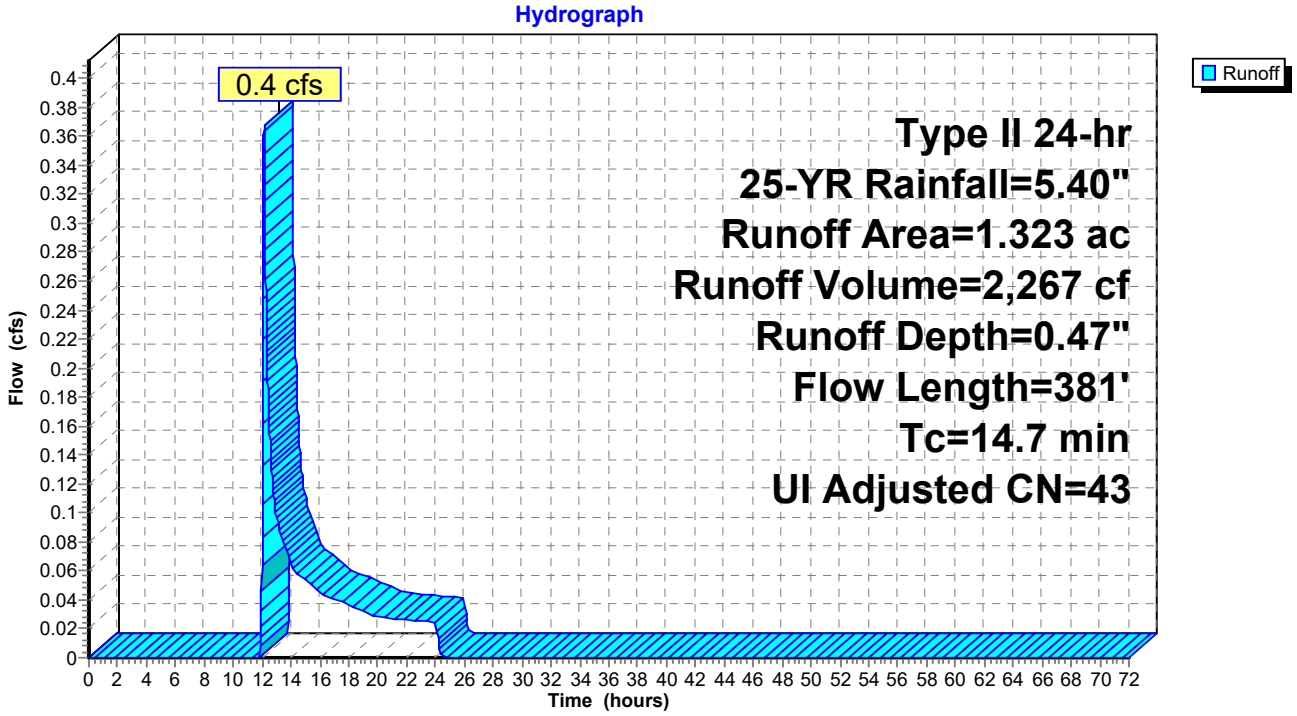
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 25-YR Rainfall=5.40"

Area (ac)	CN	Adj	Description
0.429	39		>75% Grass cover, Good, HSG A
0.023	61		>75% Grass cover, Good, HSG B
0.261	74		>75% Grass cover, Good, HSG C
0.042	98		Unconnected pavement, HSG A
0.568	30		Woods, Good, HSG A
0.000	55		Woods, Good, HSG B
1.323	44	43	Weighted Average, UI Adjusted
1.280			96.79% Pervious Area
0.042			3.21% Impervious Area
0.042			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	45	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.75"
2.8	5	0.0100	0.03		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.75"
0.5	89	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
1.5	32	0.0050	0.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	159	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	51	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.7	381	Total			



Subcatchment PR-2: Subcat PR-2



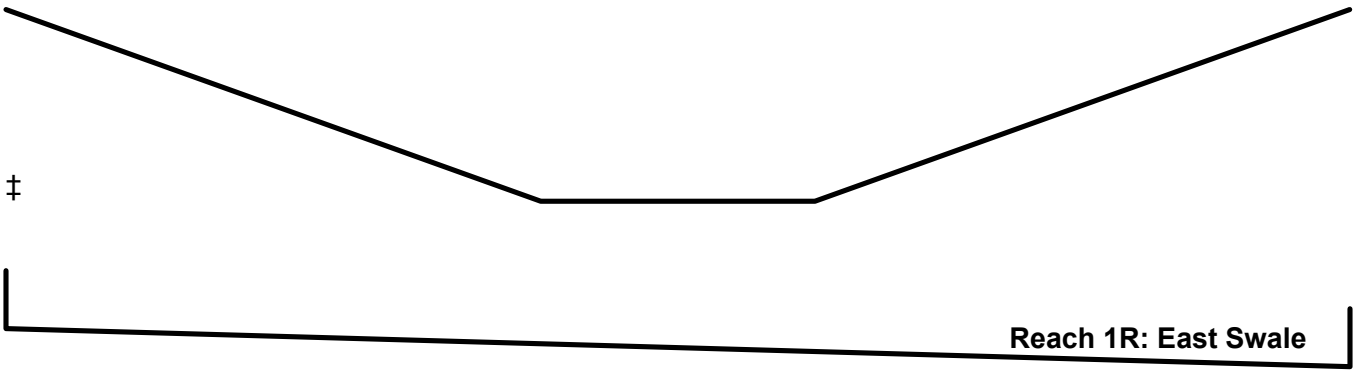
Hydrograph for Subcatchment PR-2: Subcat PR-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.00	0.06	0.00	0.0
2.00	0.12	0.00	0.0
3.00	0.19	0.00	0.0
4.00	0.26	0.00	0.0
5.00	0.34	0.00	0.0
6.00	0.43	0.00	0.0
7.00	0.53	0.00	0.0
8.00	0.65	0.00	0.0
9.00	0.79	0.00	0.0
10.00	0.98	0.00	0.0
11.00	1.27	0.00	0.0
12.00	3.58	0.06	**0.1**
13.00	4.17	0.16	**0.1**
14.00	4.43	0.21	0.1
15.00	4.61	0.25	0.1
16.00	4.75	0.29	0.0
17.00	4.87	0.32	0.0
18.00	4.97	0.35	0.0
19.00	5.06	0.37	0.0
20.00	5.14	0.39	0.0
21.00	5.21	0.41	0.0
22.00	5.28	0.43	0.0
23.00	5.34	0.45	0.0
24.00	**5.40**	**0.47**	0.0
25.00	5.40	0.47	0.0
26.00	5.40	0.47	0.0
27.00	5.40	0.47	0.0
28.00	5.40	0.47	0.0
29.00	5.40	0.47	0.0
30.00	5.40	0.47	0.0
31.00	5.40	0.47	0.0
32.00	5.40	0.47	0.0
33.00	5.40	0.47	0.0
34.00	5.40	0.47	0.0
35.00	5.40	0.47	0.0
36.00	5.40	0.47	0.0
37.00	5.40	0.47	0.0
38.00	5.40	0.47	0.0
39.00	5.40	0.47	0.0
40.00	5.40	0.47	0.0
41.00	5.40	0.47	0.0
42.00	5.40	0.47	0.0
43.00	5.40	0.47	0.0
44.00	5.40	0.47	0.0
45.00	5.40	0.47	0.0
46.00	5.40	0.47	0.0
47.00	5.40	0.47	0.0
48.00	5.40	0.47	0.0
49.00	5.40	0.47	0.0
50.00	5.40	0.47	0.0
51.00	5.40	0.47	0.0
52.00	5.40	0.47	0.0
53.00	5.40	0.47	0.0
54.00	5.40	0.47	0.0
55.00	5.40	0.47	0.0
56.00	5.40	0.47	0.0
57.00	5.40	0.47	0.0
58.00	5.40	0.47	0.0
59.00	5.40	0.47	0.0
60.00	5.40	0.47	0.0
61.00	5.40	0.47	0.0
62.00	5.40	0.47	0.0
63.00	5.40	0.47	0.0
64.00	5.40	0.47	0.0
65.00	5.40	0.47	0.0
66.00	5.40	0.47	0.0
67.00	5.40	0.47	0.0
68.00	5.40	0.47	0.0
69.00	5.40	0.47	0.0
70.00	5.40	0.47	0.0
71.00	5.40	0.47	0.0
72.00	5.40	0.47	0.0

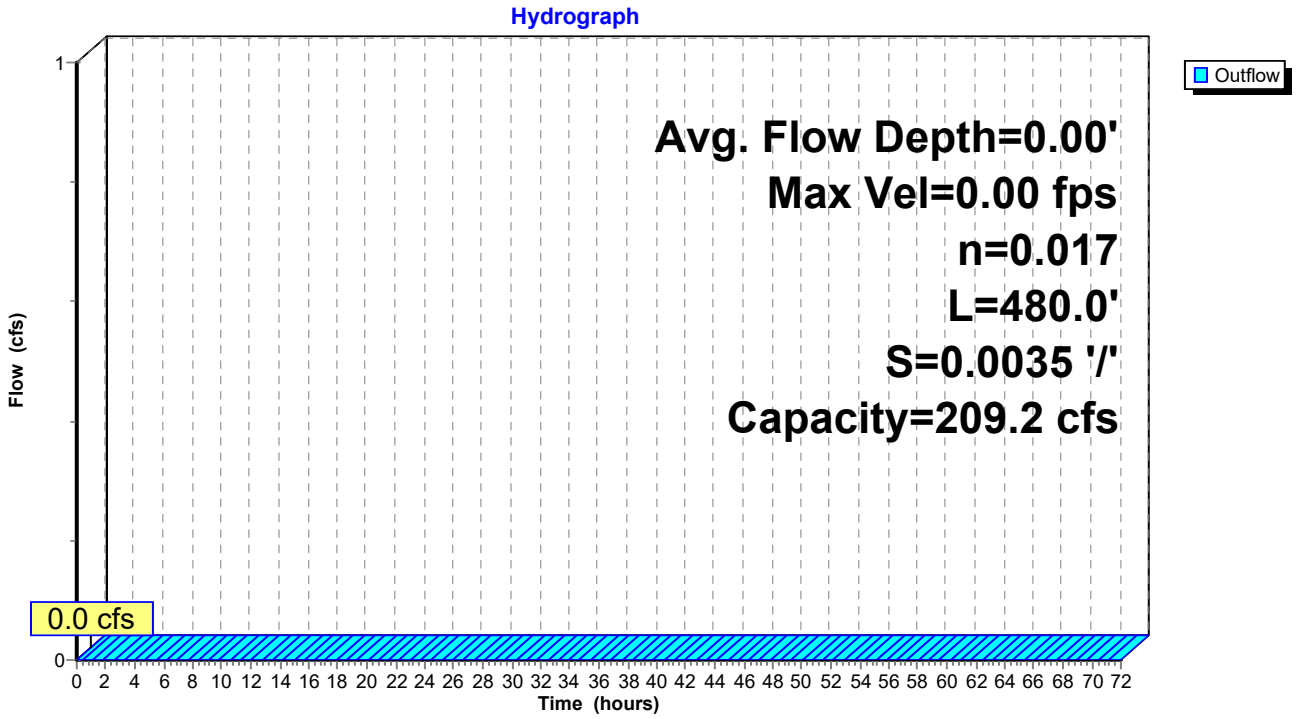
Summary for Reach 1R: East Swale

Bank-Full Depth= 2.60' Flow Area= 30.7 sf, Capacity= 209.2 cfs

4.00' x 2.60' deep channel, n= 0.017 Concrete, unfinished
Side Slope Z-value= 3.0 '/' Top Width= 19.60'
Length= 480.0' Slope= 0.0035 '/'
Inlet Invert= 228.20', Outlet Invert= 226.50'



Reach 1R: East Swale



Stage-Discharge for Reach 1R: East Swale

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
228.20	0.00	0.0
228.22	0.35	0.0
228.24	0.59	0.1
228.26	0.77	0.2
228.28	0.93	0.3
228.30	1.07	0.5
228.32	1.19	0.6
228.34	1.31	0.8
228.36	1.42	1.0
228.38	1.53	1.2
228.40	1.63	1.5
228.42	1.72	1.8
228.44	1.81	2.1
228.46	1.90	2.4
228.48	1.98	2.7
228.50	2.06	3.0
228.52	2.14	3.4
228.54	2.21	3.8
228.56	2.29	4.2
228.58	2.36	4.6
228.60	2.43	5.1
228.62	2.49	5.5
228.64	2.56	6.0
228.66	2.62	6.5
228.68	2.69	7.0
228.70	2.75	7.6
228.72	2.81	8.1
228.74	2.87	8.7
228.76	2.93	9.3
228.78	2.98	9.9
228.80	3.04	10.6
228.82	3.09	11.2
228.84	3.15	11.9
228.86	3.20	12.6
228.88	3.25	13.4
228.90	3.31	14.1
228.92	3.36	14.9
228.94	3.41	15.7
228.96	3.46	16.5
228.98	3.51	17.3
229.00	3.56	18.2
229.02	3.60	19.1
229.04	3.65	20.0
229.06	3.70	20.9
229.08	3.75	21.9
229.10	3.79	22.9
229.12	3.84	23.9
229.14	3.88	24.9
229.16	3.93	25.9
229.18	3.97	27.0
229.20	4.01	28.1
229.22	4.06	29.2
229.24	4.10	30.4
229.26	4.14	31.5
229.28	4.19	32.7
229.30	4.23	34.0
229.32	4.27	35.2
229.34	4.31	36.5
229.36	4.35	37.8
229.38	4.39	39.1
229.40	4.43	40.4
229.42	4.47	41.8
229.44	4.51	43.2
229.46	4.55	44.6
229.48	4.59	46.1
229.50	4.63	47.6
229.52	4.67	49.1
229.54	4.71	50.6
229.56	4.75	52.2
229.58	4.79	53.8
229.60	4.82	55.4
229.62	4.86	57.0
229.64	4.90	58.7
229.66	4.94	60.4
229.68	4.97	62.1
229.70	5.01	63.9
229.72	5.05	65.7
229.74	5.08	67.5
229.76	5.12	69.3
229.78	5.16	71.2
229.80	5.19	73.1
229.82	5.23	75.0
229.84	5.26	77.0
229.86	5.30	79.0
229.88	5.33	81.0
229.90	5.37	83.1
229.92	5.40	85.2
229.94	5.44	87.3
229.96	5.47	89.4
229.98	5.51	91.6
230.00	5.54	93.8
230.02	5.58	96.0
230.04	5.61	98.3
230.06	5.64	100.6
230.08	5.68	102.9
230.10	5.71	105.3
230.12	5.75	107.7
230.14	5.78	110.1
230.16	5.81	112.6
230.18	5.85	115.1
230.20	5.88	117.6
230.22	5.91	120.1
230.24	5.94	122.7
230.26	5.98	125.3
230.28	6.01	128.0
230.30	6.04	130.7
230.32	6.07	133.4
230.34	6.11	136.2
230.36	6.14	139.0
230.38	6.17	141.8
230.40	6.20	144.6
230.42	6.23	147.5
230.44	6.27	150.5
230.46	6.30	153.4
230.48	6.33	156.4
230.50	6.36	159.4
230.52	6.39	162.5
230.54	6.42	165.6
230.56	6.45	168.7
230.58	6.48	171.9
230.60	6.51	175.1
230.62	6.55	178.4
230.64	6.58	181.6
230.66	6.61	185.0
230.68	6.64	188.3
230.70	6.67	191.7
230.72	6.70	195.1
230.74	6.73	198.6
230.76	6.76	202.1
230.78	6.79	205.6
230.80	**6.82**	**209.2**

Stage-Area-Storage for Reach 1R: East Swale

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
228.20	0.0	0
228.25	0.2	100
228.30	0.4	207
228.35	0.7	321
228.40	0.9	442
228.45	1.2	570
228.50	1.5	706
228.55	1.8	849
228.60	2.1	999
228.65	2.4	1,156
228.70	2.8	1,320
228.75	3.1	1,492
228.80	3.5	1,670
228.85	3.9	1,856
228.90	4.3	2,050
228.95	4.7	2,250
229.00	5.1	2,458
229.05	5.6	2,673
229.10	6.0	2,895
229.15	6.5	3,124
229.20	7.0	3,360
229.25	7.5	3,604
229.30	8.0	3,855
229.35	8.6	4,113
229.40	9.1	4,378
229.45	9.7	4,650
229.50	10.3	4,930
229.55	10.9	5,216
229.60	11.5	5,511
229.65	12.1	5,812
229.70	12.8	6,120
229.75	13.4	6,436
229.80	14.1	6,759
229.85	14.8	7,089
229.90	15.5	7,426
229.95	16.2	7,770
230.00	16.9	8,122
230.05	17.7	8,481
230.10	18.4	8,846
230.15	19.2	9,220
230.20	20.0	9,600
230.25	20.8	9,988
230.30	21.6	10,383
230.35	22.5	10,785
230.40	23.3	11,194
230.45	24.2	11,610
230.50	25.1	12,034
230.55	26.0	12,465
230.60	26.9	12,903
230.65	27.8	13,348
230.70	28.8	13,800
230.75	29.7	14,260
230.80	**30.7**	**14,726**

Summary for Pond P1: Sand Filter

Inflow Area = 47,739 sf, 51.03% Impervious, Inflow Depth = 3.84" for 25-YR event
Inflow = 7.2 cfs @ 11.97 hrs, Volume= 15,284 cf
Outflow = 0.8 cfs @ 12.34 hrs, Volume= 15,284 cf, Atten= 89%, Lag= 22.4 min
Primary = 0.8 cfs @ 12.34 hrs, Volume= 15,284 cf
Routed to Link DP-1 : Merrimack River
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP-1 : Merrimack River

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 230.22' @ 12.34 hrs Surf.Area= 1,284 sf Storage= 7,186 cf
Flood Elev= 229.80' Surf.Area= 1,284 sf Storage= 5,814 cf

Plug-Flow detention time= 228.5 min calculated for 15,284 cf (100% of inflow)
Center-of-Mass det. time= 228.5 min (1,026.9 - 798.4)

Volume	Invert	Avail.Storage	Storage Description
#1	225.90'	578 cf	**Sand Filter (Irregular)**Listed below (Recalc) 1,926 cf Overall x 30.0% Voids
#2	227.40'	8,717 cf	**Detention (Irregular)**Listed below (Recalc) x 1.1 -Impervious
		9,295 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
225.90	1,284	191.9	0	0	1,284
227.40	1,284	191.9	1,926	1,926	1,572

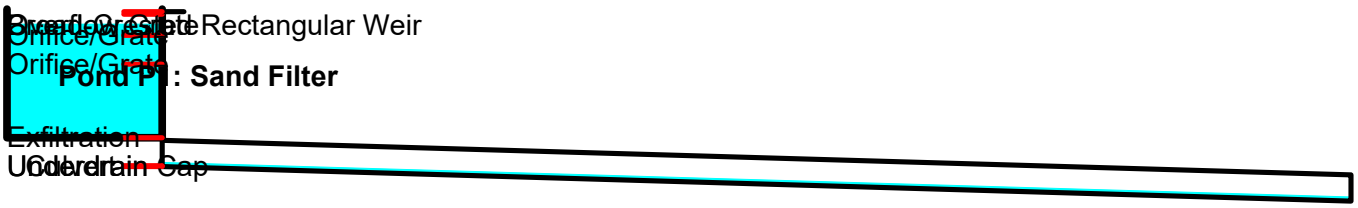
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
227.40	1,284	191.9	0	0	1,284
230.80	3,568	255.9	7,925	7,925	3,688

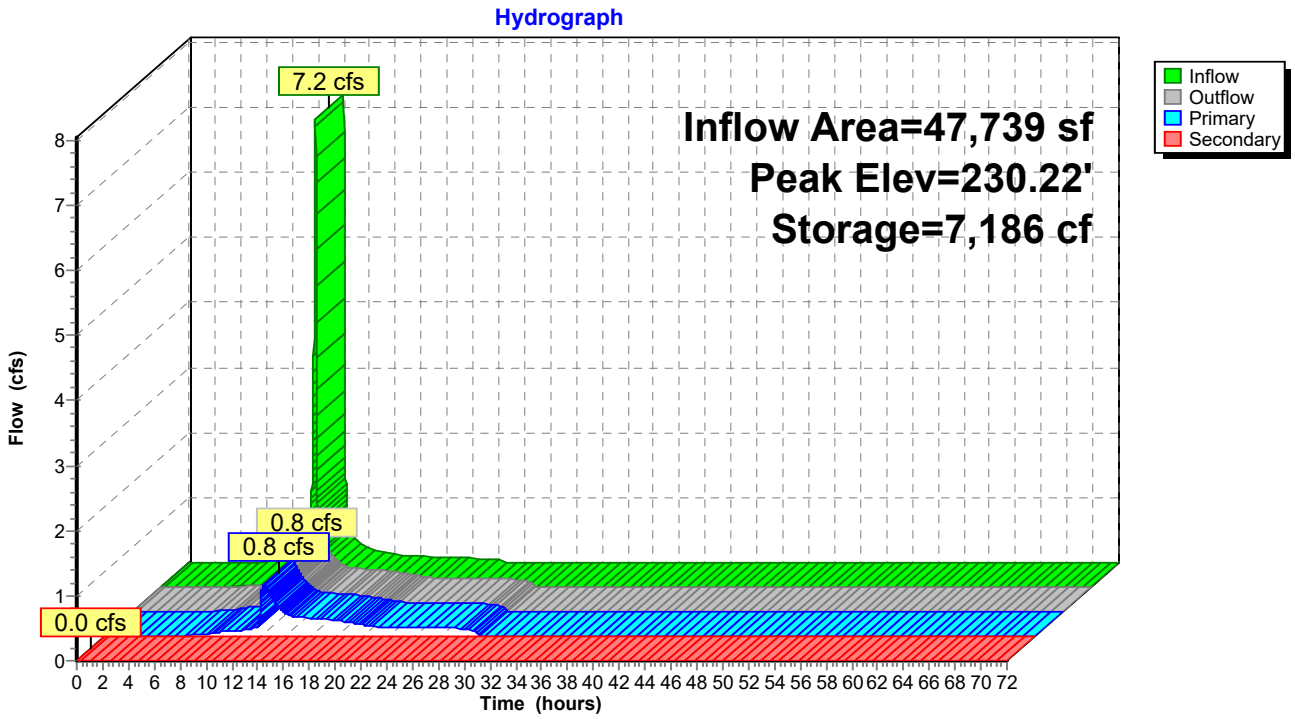
Device	Routing	Invert	Outlet Devices
#1	Primary	224.80'	**12.0" Round Culvert** L= 271.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 224.80' / 223.49' S= 0.0048 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	224.83'	**1.7" Vert. Underdrain Cap** C= 0.600 Limited to weir flow at low heads
#3	Device 2	224.83'	**6.0" Round Underdrain** L= 70.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 224.83' / 224.83' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf
#4	Device 3	225.90'	**10.000 in/hr Exfiltration over Surface area**
#5	Device 1	228.70'	**2.2" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Device 1	229.80'	**6.0" W x 9.6" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Device 1	230.60'	**24.0" x 24.0" Horiz. Overflow Grate** C= 0.600 Limited to weir flow at low heads

#8	Secondary	230.70'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.8 cfs @ 12.34 hrs HW=230.22' (Free Discharge)
- **1=Culvert** (Passes 0.8 cfs of 4.8 cfs potential flow)
  - **2=Underdrain Cap** (Orifice Controls 0.2 cfs @ 11.11 fps)
    - **3=Underdrain** (Passes 0.2 cfs of 1.3 cfs potential flow)
      - **4=Exfiltration** (Passes 0.2 cfs of 0.3 cfs potential flow)
  - **5=Orifice/Grate** (Orifice Controls 0.2 cfs @ 5.76 fps)
  - **6=Orifice/Grate** (Orifice Controls 0.4 cfs @ 2.09 fps)
  - **7=Overflow Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=225.90' (Free Discharge)
- **8=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)





Hydrograph for Pond P1: Sand Filter

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.0	0	225.90	0.0	0.0	**0.0**
2.00	0.0	0	225.90	0.0	0.0	0.0
4.00	0.0	0	225.90	0.0	0.0	0.0
6.00	0.0	3	225.91	0.0	0.0	0.0
8.00	0.0	9	225.92	0.0	0.0	0.0
10.00	**0.1**	50	226.03	0.1	0.1	0.0
12.00	**6.6**	**5,559**	**229.72**	**0.3**	**0.3**	0.0
14.00	0.2	**6,121**	**229.90**	**0.4**	**0.4**	0.0
16.00	0.1	5,190	229.59	0.3	0.3	0.0
18.00	0.1	4,149	229.21	0.2	0.2	0.0
20.00	0.1	3,247	228.84	0.2	0.2	0.0
22.00	0.1	2,649	228.57	0.1	0.1	0.0
24.00	0.1	2,087	228.30	0.1	0.1	0.0
26.00	0.0	1,139	227.77	0.1	0.1	0.0
28.00	0.0	282	226.63	0.1	0.1	0.0
30.00	0.0	0	225.90	0.0	0.0	0.0
32.00	0.0	0	225.90	0.0	0.0	0.0
34.00	0.0	0	225.90	0.0	0.0	0.0
36.00	0.0	0	225.90	0.0	0.0	0.0
38.00	0.0	0	225.90	0.0	0.0	0.0
40.00	0.0	0	225.90	0.0	0.0	0.0
42.00	0.0	0	225.90	0.0	0.0	0.0
44.00	0.0	0	225.90	0.0	0.0	0.0
46.00	0.0	0	225.90	0.0	0.0	0.0
48.00	0.0	0	225.90	0.0	0.0	0.0
50.00	0.0	0	225.90	0.0	0.0	0.0
52.00	0.0	0	225.90	0.0	0.0	0.0
54.00	0.0	0	225.90	0.0	0.0	0.0
56.00	0.0	0	225.90	0.0	0.0	0.0
58.00	0.0	0	225.90	0.0	0.0	0.0
60.00	0.0	0	225.90	0.0	0.0	0.0
62.00	0.0	0	225.90	0.0	0.0	0.0
64.00	0.0	0	225.90	0.0	0.0	0.0
66.00	0.0	0	225.90	0.0	0.0	0.0
68.00	0.0	0	225.90	0.0	0.0	0.0
70.00	0.0	0	225.90	0.0	0.0	0.0
72.00	0.0	0	225.90	0.0	0.0	0.0

Stage-Discharge for Pond P1: Sand Filter

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
225.90	0.0	0.0	0.0
225.95	0.1	0.1	0.0
226.00	0.1	0.1	0.0
226.05	0.1	0.1	0.0
226.10	0.1	0.1	0.0
226.15	0.1	0.1	0.0
226.20	0.1	0.1	0.0
226.25	0.1	0.1	0.0
226.30	0.1	0.1	0.0
226.35	0.1	0.1	0.0
226.40	0.1	0.1	0.0
226.45	0.1	0.1	0.0
226.50	0.1	0.1	0.0
226.55	0.1	0.1	0.0
226.60	0.1	0.1	0.0
226.65	0.1	0.1	0.0
226.70	0.1	0.1	0.0
226.75	0.1	0.1	0.0
226.80	0.1	0.1	0.0
226.85	0.1	0.1	0.0
226.90	0.1	0.1	0.0
226.95	0.1	0.1	0.0
227.00	0.1	0.1	0.0
227.05	0.1	0.1	0.0
227.10	0.1	0.1	0.0
227.15	0.1	0.1	0.0
227.20	0.1	0.1	0.0
227.25	0.1	0.1	0.0
227.30	0.1	0.1	0.0
227.35	0.1	0.1	0.0
227.40	0.1	0.1	0.0
227.45	0.1	0.1	0.0
227.50	0.1	0.1	0.0
227.55	0.1	0.1	0.0
227.60	0.1	0.1	0.0
227.65	0.1	0.1	0.0
227.70	0.1	0.1	0.0
227.75	0.1	0.1	0.0
227.80	0.1	0.1	0.0
227.85	0.1	0.1	0.0
227.90	0.1	0.1	0.0
227.95	0.1	0.1	0.0
228.00	0.1	0.1	0.0
228.05	0.1	0.1	0.0
228.10	0.1	0.1	0.0
228.15	0.1	0.1	0.0
228.20	0.1	0.1	0.0
228.25	0.1	0.1	0.0
228.30	0.1	0.1	0.0
228.35	0.1	0.1	0.0
228.40	0.1	0.1	0.0
228.45	0.1	0.1	0.0
228.50	0.1	0.1	0.0
228.55	0.1	0.1	0.0
228.60	0.1	0.1	0.0
228.65	0.1	0.1	0.0
228.70	0.1	0.1	0.0
228.75	0.2	0.2	0.0
228.80	0.2	0.2	0.0
228.85	0.2	0.2	0.0
228.90	0.2	0.2	0.0
228.95	0.2	0.2	0.0
229.00	0.2	0.2	0.0
229.05	0.2	0.2	0.0
229.10	0.2	0.2	0.0
229.15	0.2	0.2	0.0
229.20	0.2	0.2	0.0
229.25	0.2	0.2	0.0
229.30	0.2	0.2	0.0
229.35	0.3	0.3	0.0
229.40	0.3	0.3	0.0
229.45	0.3	0.3	0.0
229.50	0.3	0.3	0.0
229.55	0.3	0.3	0.0
229.60	0.3	0.3	0.0
229.65	0.3	0.3	0.0
229.70	0.3	0.3	0.0
229.75	0.3	0.3	0.0
229.80	0.3	0.3	0.0
229.85	0.3	0.3	0.0
229.90	0.4	0.4	0.0
229.95	0.4	0.4	0.0
230.00	0.5	0.5	0.0
230.05	0.5	0.5	0.0
230.10	0.6	0.6	0.0
230.15	0.7	0.7	0.0
230.20	0.7	0.7	0.0
230.25	0.8	0.8	0.0
230.30	0.9	0.9	0.0
230.35	1.0	1.0	0.0
230.40	1.1	1.1	0.0
230.45	1.2	1.2	0.0
230.50	1.3	1.3	0.0
230.55	1.4	1.4	0.0
230.60	1.5	1.5	0.0
230.65	1.9	1.9	0.0
230.70	2.5	2.5	0.0
230.75	3.5	3.3	0.3
230.80	**4.9**	**4.2**	**0.7**

Stage-Area-Storage for Pond P1: Sand Filter

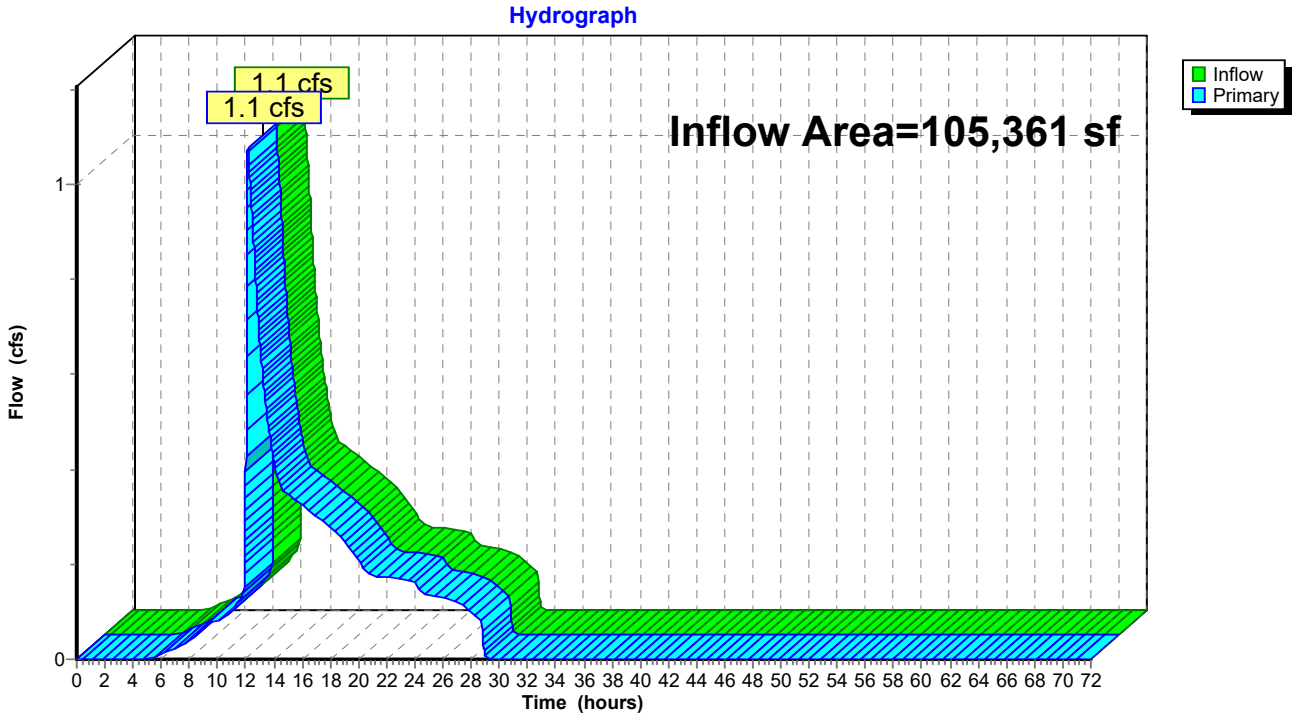
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
225.90	**1,284**	0
225.95	1,284	19
226.00	1,284	39
226.05	1,284	58
226.10	1,284	77
226.15	1,284	96
226.20	1,284	116
226.25	1,284	135
226.30	1,284	154
226.35	1,284	173
226.40	1,284	193
226.45	1,284	212
226.50	1,284	231
226.55	1,284	250
226.60	1,284	270
226.65	1,284	289
226.70	1,284	308
226.75	1,284	327
226.80	1,284	347
226.85	1,284	366
226.90	1,284	385
226.95	1,284	404
227.00	1,284	424
227.05	1,284	443
227.10	1,284	462
227.15	1,284	482
227.20	1,284	501
227.25	1,284	520
227.30	1,284	539
227.35	1,284	559
227.40	1,284	578
227.45	1,284	649
227.50	1,284	722
227.55	1,284	796
227.60	1,284	872
227.65	1,284	948
227.70	1,284	1,027
227.75	1,284	1,107
227.80	1,284	1,188
227.85	1,284	1,271
227.90	1,284	1,356
227.95	1,284	1,441
228.00	1,284	1,529
228.05	1,284	1,618
228.10	1,284	1,708
228.15	1,284	1,801
228.20	1,284	1,894
228.25	1,284	1,990
228.30	1,284	2,087
228.35	1,284	2,185
228.40	1,284	2,285
228.45	1,284	2,387
228.50	1,284	2,491
228.55	1,284	2,596
228.60	1,284	2,703
228.65	1,284	2,812
228.70	1,284	2,922
228.75	1,284	3,034
228.80	1,284	3,148
228.85	1,284	3,264
228.90	1,284	3,381
228.95	1,284	3,500
229.00	1,284	3,621
229.05	1,284	3,744
229.10	1,284	3,869
229.15	1,284	3,995
229.20	1,284	4,123
229.25	1,284	4,254
229.30	1,284	4,386
229.35	1,284	4,520
229.40	1,284	4,656
229.45	1,284	4,794
229.50	1,284	4,934
229.55	1,284	5,075
229.60	1,284	5,219
229.65	1,284	5,365
229.70	1,284	5,512
229.75	1,284	5,662
229.80	1,284	5,814
229.85	1,284	5,968
229.90	1,284	6,124
229.95	1,284	6,281
230.00	1,284	6,441
230.05	1,284	6,604
230.10	1,284	6,768
230.15	1,284	6,934
230.20	1,284	7,102
230.25	1,284	7,273
230.30	1,284	7,446
230.35	1,284	7,621
230.40	1,284	7,798
230.45	1,284	7,977
230.50	1,284	8,159
230.55	1,284	8,342
230.60	1,284	8,528
230.65	1,284	8,717
230.70	1,284	8,907
230.75	1,284	9,100
230.80	1,284	**9,295**

Summary for Link DP-1: Merrimack River

Inflow Area = 105,361 sf, 24.88% Impervious, Inflow Depth = 2.00" for 25-YR event
Inflow = 1.1 cfs @ 12.16 hrs, Volume= 17,551 cf
Primary = 1.1 cfs @ 12.16 hrs, Volume= 17,551 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Merrimack River



Hydrograph for Link DP-1: Merrimack River

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	**0.00**	0.0	51.00	0.0	0.00	0.0
1.00	0.0	0.00	0.0	52.00	0.0	0.00	0.0
2.00	0.0	0.00	0.0	53.00	0.0	0.00	0.0
3.00	0.0	0.00	0.0	54.00	0.0	0.00	0.0
4.00	0.0	0.00	0.0	55.00	0.0	0.00	0.0
5.00	0.0	0.00	0.0	56.00	0.0	0.00	0.0
6.00	0.0	0.00	0.0	57.00	0.0	0.00	0.0
7.00	0.0	0.00	0.0	58.00	0.0	0.00	0.0
8.00	0.0	0.00	0.0	59.00	0.0	0.00	0.0
9.00	0.1	0.00	0.1	60.00	0.0	0.00	0.0
10.00	0.1	0.00	0.1	61.00	0.0	0.00	0.0
11.00	0.1	0.00	0.1	62.00	0.0	0.00	0.0
12.00	**0.4**	0.00	**0.4**	63.00	0.0	0.00	0.0
13.00	**0.7**	0.00	**0.7**	64.00	0.0	0.00	0.0
14.00	0.4	0.00	0.4	65.00	0.0	0.00	0.0
15.00	0.3	0.00	0.3	66.00	0.0	0.00	0.0
16.00	0.3	0.00	0.3	67.00	0.0	0.00	0.0
17.00	0.3	0.00	0.3	68.00	0.0	0.00	0.0
18.00	0.3	0.00	0.3	69.00	0.0	0.00	0.0
19.00	0.2	0.00	0.2	70.00	0.0	0.00	0.0
20.00	0.2	0.00	0.2	71.00	0.0	0.00	0.0
21.00	0.2	0.00	0.2	72.00	0.0	0.00	0.0
22.00	0.2	0.00	0.2				
23.00	0.2	0.00	0.2				
24.00	0.2	0.00	0.2				
25.00	0.1	0.00	0.1				
26.00	0.1	0.00	0.1				
27.00	0.1	0.00	0.1				
28.00	0.1	0.00	0.1				
29.00	0.0	0.00	0.0				
30.00	0.0	0.00	0.0				
31.00	0.0	0.00	0.0				
32.00	0.0	0.00	0.0				
33.00	0.0	0.00	0.0				
34.00	0.0	0.00	0.0				
35.00	0.0	0.00	0.0				
36.00	0.0	0.00	0.0				
37.00	0.0	0.00	0.0				
38.00	0.0	0.00	0.0				
39.00	0.0	0.00	0.0				
40.00	0.0	0.00	0.0				
41.00	0.0	0.00	0.0				
42.00	0.0	0.00	0.0				
43.00	0.0	0.00	0.0				
44.00	0.0	0.00	0.0				
45.00	0.0	0.00	0.0				
46.00	0.0	0.00	0.0				
47.00	0.0	0.00	0.0				
48.00	0.0	0.00	0.0				
49.00	0.0	0.00	0.0				
50.00	0.0	0.00	0.0				

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 PR-1: Subcat PR-1 Runoff Area=1.096 ac 51.03% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=86 Runoff=8.4 cfs 18,147 cf

Subcatchment PR-2: Subcat PR-2 Runoff Area=1.323 ac 3.21% Impervious Runoff Depth=0.73"
Flow Length=381' Tc=14.7 min UI Adjusted CN=43 Runoff=0.8 cfs 3,526 cf

Reach 1R: East Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.017 L=480.0' S=0.0035 '/' Capacity=209.2 cfs Outflow=0.0 cfs 0 cf

Pond P1: Sand Filter Peak Elev=230.53' Storage=8,278 cf Inflow=8.4 cfs 18,147 cf
Primary=1.4 cfs 18,147 cf Secondary=0.0 cfs 0 cf Outflow=1.4 cfs 18,147 cf

Link DP-1: Merrimack River Inflow=2.1 cfs 21,674 cf
Primary=2.1 cfs 21,674 cf

Total Runoff Area = 105,361 sf Runoff Volume = 21,674 cf Average Runoff Depth = 2.47"
75.12% Pervious = 79,148 sf 24.88% Impervious = 26,212 sf

Summary for Subcatchment PR-1: Subcat PR-1

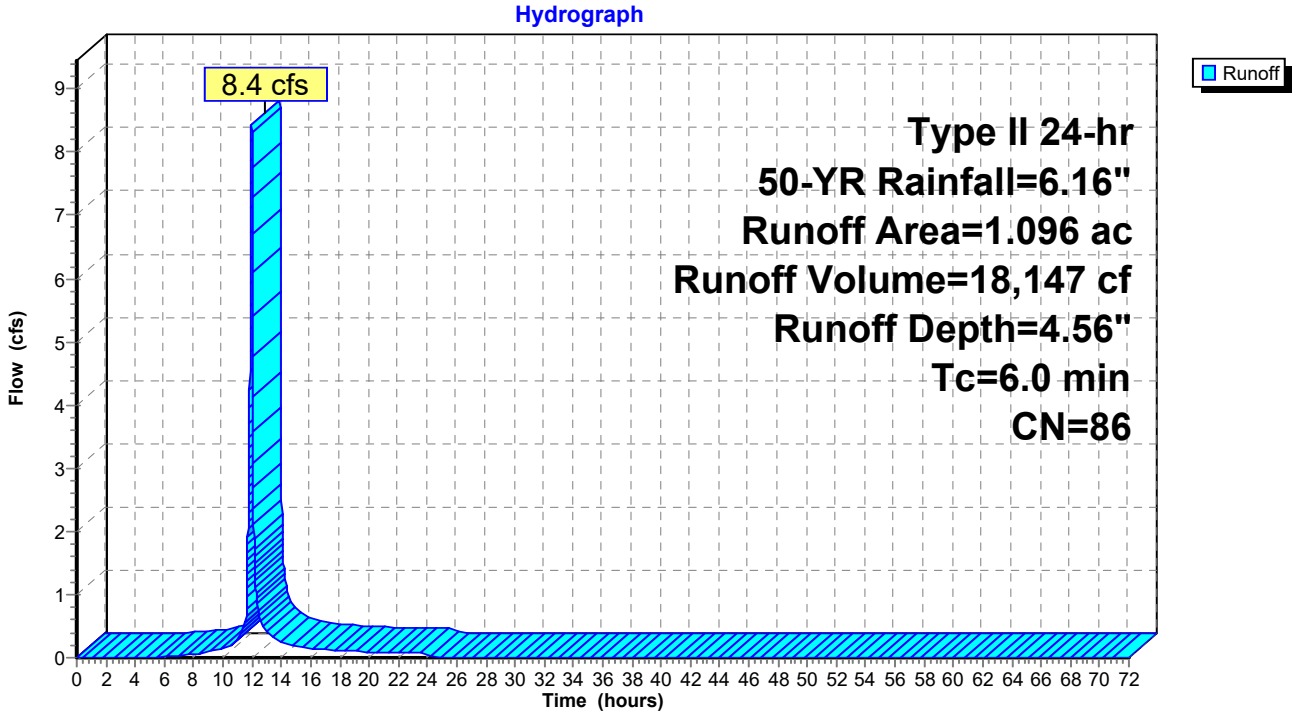
Runoff = 8.4 cfs @ 11.97 hrs, Volume= 18,147 cf, Depth= 4.56"
Routed to Pond P1 : Sand Filter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-YR Rainfall=6.16"

Area (ac)	CN	Description
0.157	39	>75% Grass cover, Good, HSG A
0.100	61	>75% Grass cover, Good, HSG B
0.127	96	Gravel surface, HSG A
0.153	96	Gravel surface, HSG B
0.000	98	Paved parking, HSG A
0.559	98	Unconnected pavement, HSG A
1.096	86	Weighted Average
0.537		48.97% Pervious Area
0.559		51.03% Impervious Area
0.559		100.00% Unconnected

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

Subcatchment PR-1: Subcat PR-1



Hydrograph for Subcatchment PR-1: Subcat PR-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.00	0.06	0.00	0.0
2.00	0.14	0.00	0.0
3.00	0.21	0.00	0.0
4.00	0.30	0.00	0.0
5.00	0.39	0.00	0.0
6.00	0.49	0.02	0.0
7.00	0.61	0.04	0.0
8.00	0.74	0.08	0.1
9.00	0.91	0.15	0.1
10.00	1.11	0.26	0.1
11.00	1.45	0.46	**0.3**
12.00	4.08	2.62	**7.8**
13.00	4.76	3.24	0.4
14.00	5.05	3.51	0.2
15.00	5.26	3.71	0.2
16.00	5.42	3.86	0.2
17.00	5.55	3.99	0.1
18.00	5.67	4.10	0.1
19.00	5.78	4.20	0.1
20.00	5.86	4.28	0.1
21.00	5.94	4.36	0.1
22.00	6.02	4.43	0.1
23.00	6.09	4.50	0.1
24.00	**6.16**	**4.56**	0.1
25.00	6.16	4.56	0.0
26.00	6.16	4.56	0.0
27.00	6.16	4.56	0.0
28.00	6.16	4.56	0.0
29.00	6.16	4.56	0.0
30.00	6.16	4.56	0.0
31.00	6.16	4.56	0.0
32.00	6.16	4.56	0.0
33.00	6.16	4.56	0.0
34.00	6.16	4.56	0.0
35.00	6.16	4.56	0.0
36.00	6.16	4.56	0.0
37.00	6.16	4.56	0.0
38.00	6.16	4.56	0.0
39.00	6.16	4.56	0.0
40.00	6.16	4.56	0.0
41.00	6.16	4.56	0.0
42.00	6.16	4.56	0.0
43.00	6.16	4.56	0.0
44.00	6.16	4.56	0.0
45.00	6.16	4.56	0.0
46.00	6.16	4.56	0.0
47.00	6.16	4.56	0.0
48.00	6.16	4.56	0.0
49.00	6.16	4.56	0.0
50.00	6.16	4.56	0.0
51.00	6.16	4.56	0.0
52.00	6.16	4.56	0.0
53.00	6.16	4.56	0.0
54.00	6.16	4.56	0.0
55.00	6.16	4.56	0.0
56.00	6.16	4.56	0.0
57.00	6.16	4.56	0.0
58.00	6.16	4.56	0.0
59.00	6.16	4.56	0.0
60.00	6.16	4.56	0.0
61.00	6.16	4.56	0.0
62.00	6.16	4.56	0.0
63.00	6.16	4.56	0.0
64.00	6.16	4.56	0.0
65.00	6.16	4.56	0.0
66.00	6.16	4.56	0.0
67.00	6.16	4.56	0.0
68.00	6.16	4.56	0.0
69.00	6.16	4.56	0.0
70.00	6.16	4.56	0.0
71.00	6.16	4.56	0.0
72.00	6.16	4.56	0.0

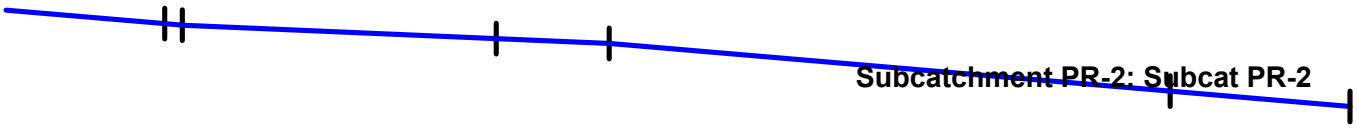
Summary for Subcatchment PR-2: Subcat PR-2

Runoff = 0.8 cfs @ 12.11 hrs, Volume= 3,526 cf, Depth= 0.73"
Routed to Link DP-1 : Merrimack River

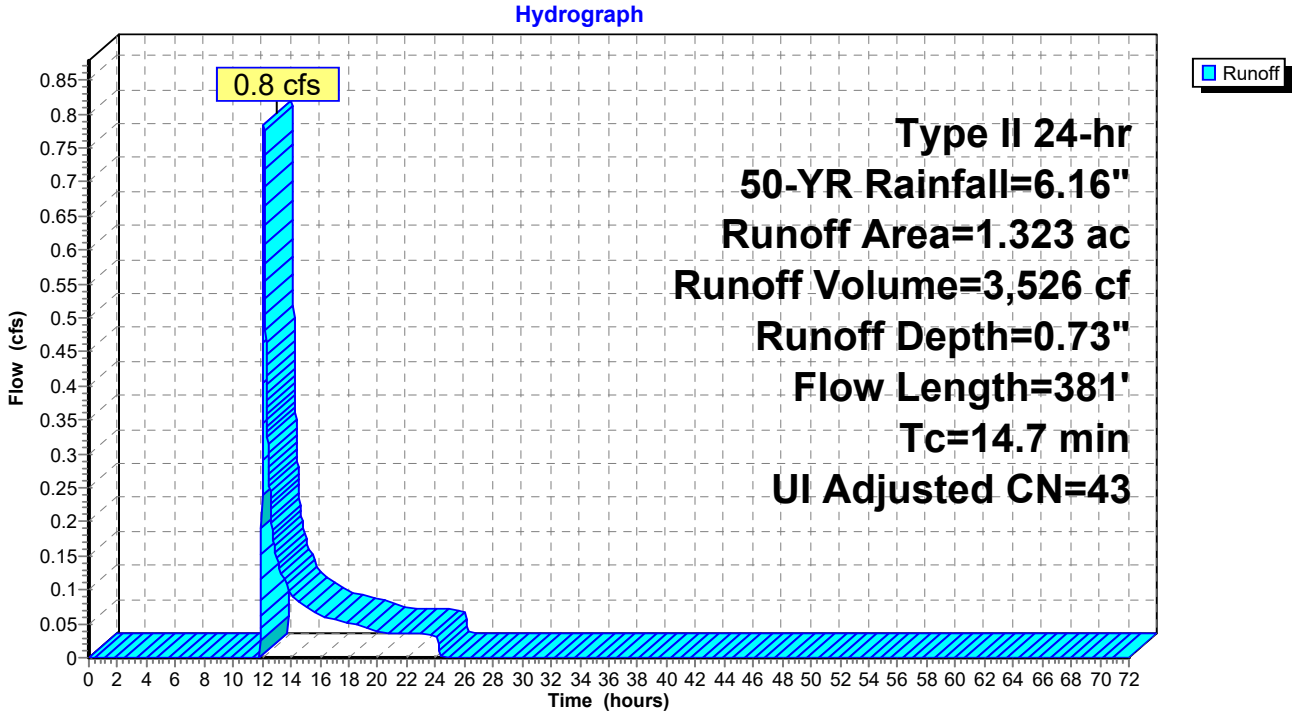
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 50-YR Rainfall=6.16"

Area (ac)	CN	Adj	Description
0.429	39		>75% Grass cover, Good, HSG A
0.023	61		>75% Grass cover, Good, HSG B
0.261	74		>75% Grass cover, Good, HSG C
0.042	98		Unconnected pavement, HSG A
0.568	30		Woods, Good, HSG A
0.000	55		Woods, Good, HSG B
1.323	44	43	Weighted Average, UI Adjusted
1.280			96.79% Pervious Area
0.042			3.21% Impervious Area
0.042			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	45	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.75"
2.8	5	0.0100	0.03		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.75"
0.5	89	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
1.5	32	0.0050	0.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	159	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	51	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.7	381	Total			



Subcatchment PR-2: Subcat PR-2



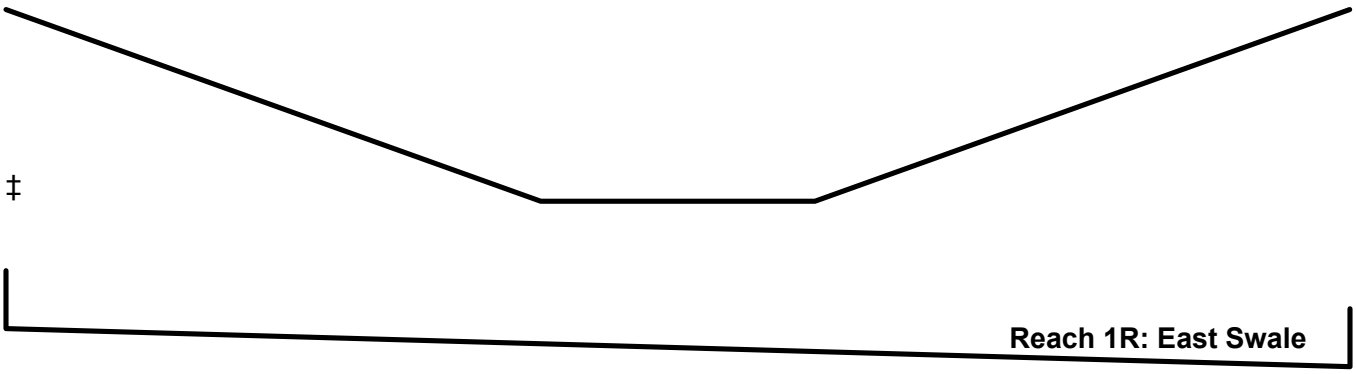
Hydrograph for Subcatchment PR-2: Subcat PR-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.00	0.06	0.00	0.0
2.00	0.14	0.00	0.0
3.00	0.21	0.00	0.0
4.00	0.30	0.00	0.0
5.00	0.39	0.00	0.0
6.00	0.49	0.00	0.0
7.00	0.61	0.00	0.0
8.00	0.74	0.00	0.0
9.00	0.91	0.00	0.0
10.00	1.11	0.00	0.0
11.00	1.45	0.00	0.0
12.00	4.08	0.14	**0.3**
13.00	4.76	0.29	**0.1**
14.00	5.05	0.37	0.1
15.00	5.26	0.43	0.1
16.00	5.42	0.48	0.1
17.00	5.55	0.52	0.1
18.00	5.67	0.56	0.1
19.00	5.78	0.60	0.0
20.00	5.86	0.63	0.0
21.00	5.94	0.65	0.0
22.00	6.02	0.68	0.0
23.00	6.09	0.71	0.0
24.00	**6.16**	**0.73**	0.0
25.00	6.16	0.73	0.0
26.00	6.16	0.73	0.0
27.00	6.16	0.73	0.0
28.00	6.16	0.73	0.0
29.00	6.16	0.73	0.0
30.00	6.16	0.73	0.0
31.00	6.16	0.73	0.0
32.00	6.16	0.73	0.0
33.00	6.16	0.73	0.0
34.00	6.16	0.73	0.0
35.00	6.16	0.73	0.0
36.00	6.16	0.73	0.0
37.00	6.16	0.73	0.0
38.00	6.16	0.73	0.0
39.00	6.16	0.73	0.0
40.00	6.16	0.73	0.0
41.00	6.16	0.73	0.0
42.00	6.16	0.73	0.0
43.00	6.16	0.73	0.0
44.00	6.16	0.73	0.0
45.00	6.16	0.73	0.0
46.00	6.16	0.73	0.0
47.00	6.16	0.73	0.0
48.00	6.16	0.73	0.0
49.00	6.16	0.73	0.0
50.00	6.16	0.73	0.0
51.00	6.16	0.73	0.0
52.00	6.16	0.73	0.0
53.00	6.16	0.73	0.0
54.00	6.16	0.73	0.0
55.00	6.16	0.73	0.0
56.00	6.16	0.73	0.0
57.00	6.16	0.73	0.0
58.00	6.16	0.73	0.0
59.00	6.16	0.73	0.0
60.00	6.16	0.73	0.0
61.00	6.16	0.73	0.0
62.00	6.16	0.73	0.0
63.00	6.16	0.73	0.0
64.00	6.16	0.73	0.0
65.00	6.16	0.73	0.0
66.00	6.16	0.73	0.0
67.00	6.16	0.73	0.0
68.00	6.16	0.73	0.0
69.00	6.16	0.73	0.0
70.00	6.16	0.73	0.0
71.00	6.16	0.73	0.0
72.00	6.16	0.73	0.0

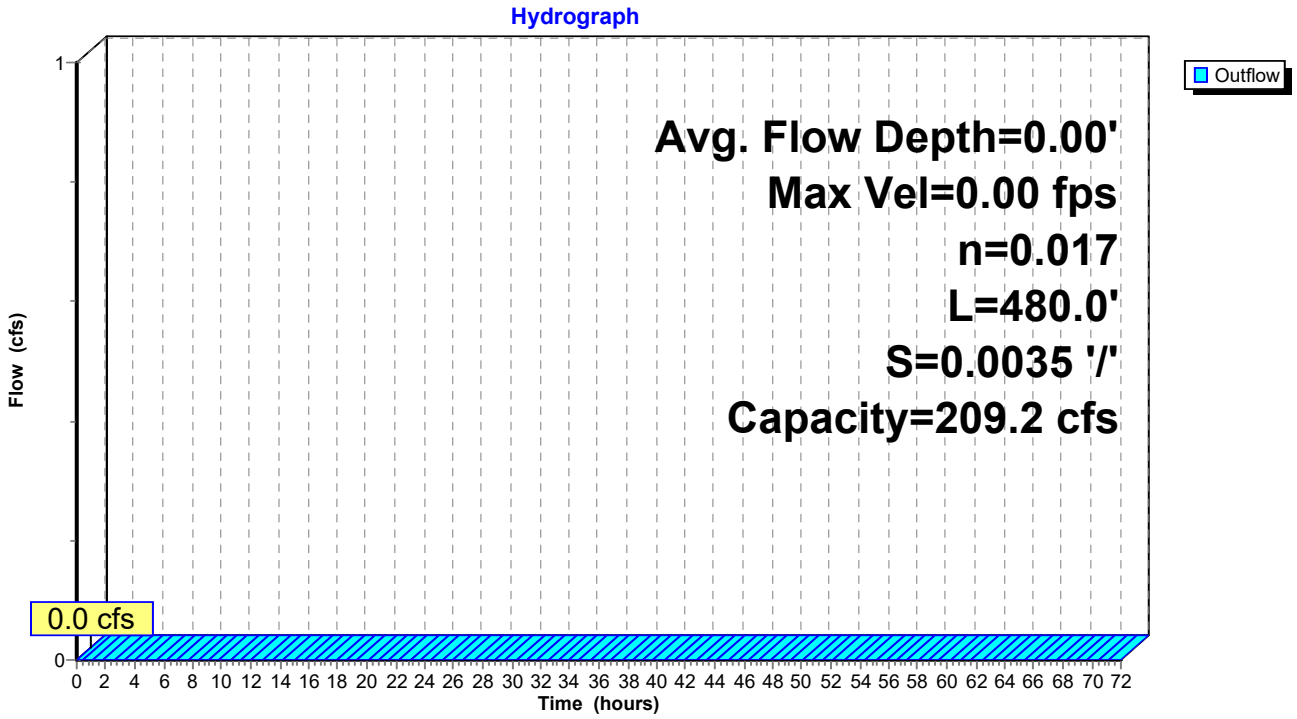
Summary for Reach 1R: East Swale

Bank-Full Depth= 2.60' Flow Area= 30.7 sf, Capacity= 209.2 cfs

4.00' x 2.60' deep channel, n= 0.017 Concrete, unfinished
Side Slope Z-value= 3.0 '/' Top Width= 19.60'
Length= 480.0' Slope= 0.0035 '/'
Inlet Invert= 228.20', Outlet Invert= 226.50'



Reach 1R: East Swale



Stage-Discharge for Reach 1R: East Swale

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
228.20	0.00	0.0
228.22	0.35	0.0
228.24	0.59	0.1
228.26	0.77	0.2
228.28	0.93	0.3
228.30	1.07	0.5
228.32	1.19	0.6
228.34	1.31	0.8
228.36	1.42	1.0
228.38	1.53	1.2
228.40	1.63	1.5
228.42	1.72	1.8
228.44	1.81	2.1
228.46	1.90	2.4
228.48	1.98	2.7
228.50	2.06	3.0
228.52	2.14	3.4
228.54	2.21	3.8
228.56	2.29	4.2
228.58	2.36	4.6
228.60	2.43	5.1
228.62	2.49	5.5
228.64	2.56	6.0
228.66	2.62	6.5
228.68	2.69	7.0
228.70	2.75	7.6
228.72	2.81	8.1
228.74	2.87	8.7
228.76	2.93	9.3
228.78	2.98	9.9
228.80	3.04	10.6
228.82	3.09	11.2
228.84	3.15	11.9
228.86	3.20	12.6
228.88	3.25	13.4
228.90	3.31	14.1
228.92	3.36	14.9
228.94	3.41	15.7
228.96	3.46	16.5
228.98	3.51	17.3
229.00	3.56	18.2
229.02	3.60	19.1
229.04	3.65	20.0
229.06	3.70	20.9
229.08	3.75	21.9
229.10	3.79	22.9
229.12	3.84	23.9
229.14	3.88	24.9
229.16	3.93	25.9
229.18	3.97	27.0
229.20	4.01	28.1
229.22	4.06	29.2
229.24	4.10	30.4
229.26	4.14	31.5
229.28	4.19	32.7
229.30	4.23	34.0
229.32	4.27	35.2
229.34	4.31	36.5
229.36	4.35	37.8
229.38	4.39	39.1
229.40	4.43	40.4
229.42	4.47	41.8
229.44	4.51	43.2
229.46	4.55	44.6
229.48	4.59	46.1
229.50	4.63	47.6
229.52	4.67	49.1
229.54	4.71	50.6
229.56	4.75	52.2
229.58	4.79	53.8
229.60	4.82	55.4
229.62	4.86	57.0
229.64	4.90	58.7
229.66	4.94	60.4
229.68	4.97	62.1
229.70	5.01	63.9
229.72	5.05	65.7
229.74	5.08	67.5
229.76	5.12	69.3
229.78	5.16	71.2
229.80	5.19	73.1
229.82	5.23	75.0
229.84	5.26	77.0
229.86	5.30	79.0
229.88	5.33	81.0
229.90	5.37	83.1
229.92	5.40	85.2
229.94	5.44	87.3
229.96	5.47	89.4
229.98	5.51	91.6
230.00	5.54	93.8
230.02	5.58	96.0
230.04	5.61	98.3
230.06	5.64	100.6
230.08	5.68	102.9
230.10	5.71	105.3
230.12	5.75	107.7
230.14	5.78	110.1
230.16	5.81	112.6
230.18	5.85	115.1
230.20	5.88	117.6
230.22	5.91	120.1
230.24	5.94	122.7
230.26	5.98	125.3
230.28	6.01	128.0
230.30	6.04	130.7
230.32	6.07	133.4
230.34	6.11	136.2
230.36	6.14	139.0
230.38	6.17	141.8
230.40	6.20	144.6
230.42	6.23	147.5
230.44	6.27	150.5
230.46	6.30	153.4
230.48	6.33	156.4
230.50	6.36	159.4
230.52	6.39	162.5
230.54	6.42	165.6
230.56	6.45	168.7
230.58	6.48	171.9
230.60	6.51	175.1
230.62	6.55	178.4
230.64	6.58	181.6
230.66	6.61	185.0
230.68	6.64	188.3
230.70	6.67	191.7
230.72	6.70	195.1
230.74	6.73	198.6
230.76	6.76	202.1
230.78	6.79	205.6
230.80	**6.82**	**209.2**

Stage-Area-Storage for Reach 1R: East Swale

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
228.20	0.0	0
228.25	0.2	100
228.30	0.4	207
228.35	0.7	321
228.40	0.9	442
228.45	1.2	570
228.50	1.5	706
228.55	1.8	849
228.60	2.1	999
228.65	2.4	1,156
228.70	2.8	1,320
228.75	3.1	1,492
228.80	3.5	1,670
228.85	3.9	1,856
228.90	4.3	2,050
228.95	4.7	2,250
229.00	5.1	2,458
229.05	5.6	2,673
229.10	6.0	2,895
229.15	6.5	3,124
229.20	7.0	3,360
229.25	7.5	3,604
229.30	8.0	3,855
229.35	8.6	4,113
229.40	9.1	4,378
229.45	9.7	4,650
229.50	10.3	4,930
229.55	10.9	5,216
229.60	11.5	5,511
229.65	12.1	5,812
229.70	12.8	6,120
229.75	13.4	6,436
229.80	14.1	6,759
229.85	14.8	7,089
229.90	15.5	7,426
229.95	16.2	7,770
230.00	16.9	8,122
230.05	17.7	8,481
230.10	18.4	8,846
230.15	19.2	9,220
230.20	20.0	9,600
230.25	20.8	9,988
230.30	21.6	10,383
230.35	22.5	10,785
230.40	23.3	11,194
230.45	24.2	11,610
230.50	25.1	12,034
230.55	26.0	12,465
230.60	26.9	12,903
230.65	27.8	13,348
230.70	28.8	13,800
230.75	29.7	14,260
230.80	**30.7**	**14,726**

Summary for Pond P1: Sand Filter

Inflow Area = 47,739 sf, 51.03% Impervious, Inflow Depth = 4.56" for 50-YR event
Inflow = 8.4 cfs @ 11.97 hrs, Volume= 18,147 cf
Outflow = 1.4 cfs @ 12.17 hrs, Volume= 18,147 cf, Atten= 84%, Lag= 11.9 min
Primary = 1.4 cfs @ 12.17 hrs, Volume= 18,147 cf
Routed to Link DP-1 : Merrimack River
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link DP-1 : Merrimack River

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 230.53' @ 12.17 hrs Surf.Area= 1,284 sf Storage= 8,278 cf
Flood Elev= 229.80' Surf.Area= 1,284 sf Storage= 5,814 cf

Plug-Flow detention time= 210.6 min calculated for 18,145 cf (100% of inflow)
Center-of-Mass det. time= 210.6 min (1,004.2 - 793.6)

Volume	Invert	Avail.Storage	Storage Description
#1	225.90'	578 cf	**Sand Filter (Irregular)**Listed below (Recalc) 1,926 cf Overall x 30.0% Voids
#2	227.40'	8,717 cf	**Detention (Irregular)**Listed below (Recalc) x 1.1 -Impervious
		9,295 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
225.90	1,284	191.9	0	0	1,284
227.40	1,284	191.9	1,926	1,926	1,572

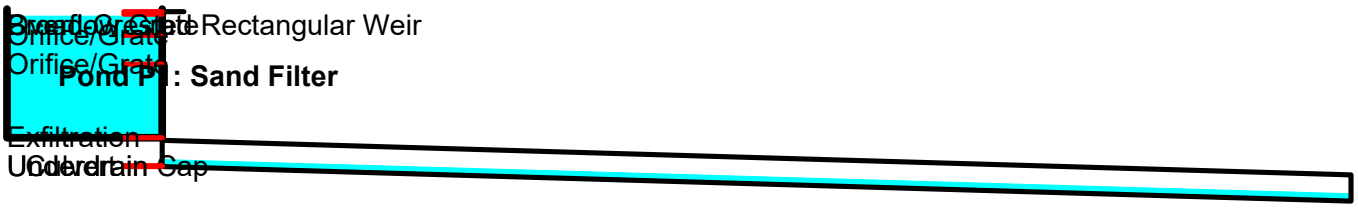
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
227.40	1,284	191.9	0	0	1,284
230.80	3,568	255.9	7,925	7,925	3,688

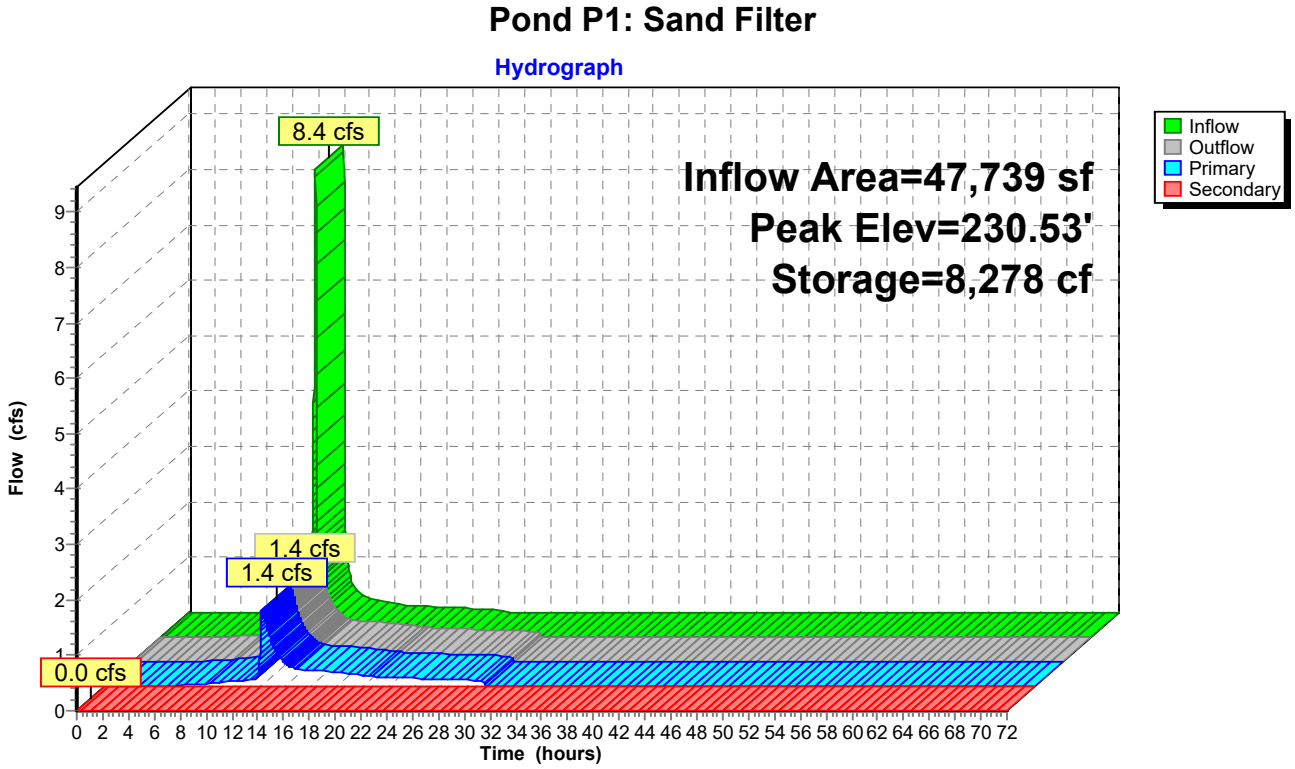
Device	Routing	Invert	Outlet Devices
#1	Primary	224.80'	**12.0" Round Culvert** L= 271.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 224.80' / 223.49' S= 0.0048 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	224.83'	**1.7" Vert. Underdrain Cap** C= 0.600 Limited to weir flow at low heads
#3	Device 2	224.83'	**6.0" Round Underdrain** L= 70.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 224.83' / 224.83' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf
#4	Device 3	225.90'	**10.000 in/hr Exfiltration over Surface area**
#5	Device 1	228.70'	**2.2" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Device 1	229.80'	**6.0" W x 9.6" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Device 1	230.60'	**24.0" x 24.0" Horiz. Overflow Grate** C= 0.600 Limited to weir flow at low heads

#8 Secondary 230.70' **10.0' long x 5.0' breadth Broad-Crested Rectangular Weir**
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=1.4 cfs @ 12.17 hrs HW=230.53' (Free Discharge)
└─**1=Culvert** (Passes 1.4 cfs of 4.9 cfs potential flow)
└─**2=Underdrain Cap** (Orifice Controls 0.2 cfs @ 11.43 fps)
└─**3=Underdrain** (Passes 0.2 cfs of 1.4 cfs potential flow)
└─**4=Exfiltration** (Passes 0.2 cfs of 0.3 cfs potential flow)
└─**5=Orifice/Grate** (Orifice Controls 0.2 cfs @ 6.35 fps)
└─**6=Orifice/Grate** (Orifice Controls 1.0 cfs @ 2.75 fps)
└─**7=Overflow Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=225.90' (Free Discharge)
└─**8=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)





Hydrograph for Pond P1: Sand Filter

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.0	0	225.90	0.0	0.0	**0.0**
2.00	0.0	0	225.90	0.0	0.0	0.0
4.00	0.0	0	225.90	0.0	0.0	0.0
6.00	0.0	5	225.91	0.0	0.0	0.0
8.00	0.1	13	225.93	0.1	0.1	0.0
10.00	**0.1**	135	226.25	0.1	0.1	0.0
12.00	**7.8**	**6,797**	**230.11**	**0.6**	**0.6**	0.0
14.00	0.2	**6,311**	**229.96**	**0.4**	**0.4**	0.0
16.00	0.2	5,434	229.67	0.3	0.3	0.0
18.00	0.1	4,452	229.32	0.3	0.3	0.0
20.00	0.1	3,522	228.96	0.2	0.2	0.0
22.00	0.1	2,882	228.68	0.1	0.1	0.0
24.00	0.1	2,374	228.44	0.1	0.1	0.0
26.00	0.0	1,406	227.93	0.1	0.1	0.0
28.00	0.0	503	227.21	0.1	0.1	0.0
30.00	0.0	0	225.90	0.0	0.0	0.0
32.00	0.0	0	225.90	0.0	0.0	0.0
34.00	0.0	0	225.90	0.0	0.0	0.0
36.00	0.0	0	225.90	0.0	0.0	0.0
38.00	0.0	0	225.90	0.0	0.0	0.0
40.00	0.0	0	225.90	0.0	0.0	0.0
42.00	0.0	0	225.90	0.0	0.0	0.0
44.00	0.0	0	225.90	0.0	0.0	0.0
46.00	0.0	0	225.90	0.0	0.0	0.0
48.00	0.0	0	225.90	0.0	0.0	0.0
50.00	0.0	0	225.90	0.0	0.0	0.0
52.00	0.0	0	225.90	0.0	0.0	0.0
54.00	0.0	0	225.90	0.0	0.0	0.0
56.00	0.0	0	225.90	0.0	0.0	0.0
58.00	0.0	0	225.90	0.0	0.0	0.0
60.00	0.0	0	225.90	0.0	0.0	0.0
62.00	0.0	0	225.90	0.0	0.0	0.0
64.00	0.0	0	225.90	0.0	0.0	0.0
66.00	0.0	0	225.90	0.0	0.0	0.0
68.00	0.0	0	225.90	0.0	0.0	0.0
70.00	0.0	0	225.90	0.0	0.0	0.0
72.00	0.0	0	225.90	0.0	0.0	0.0

Stage-Discharge for Pond P1: Sand Filter

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
225.90	0.0	0.0	0.0
225.95	0.1	0.1	0.0
226.00	0.1	0.1	0.0
226.05	0.1	0.1	0.0
226.10	0.1	0.1	0.0
226.15	0.1	0.1	0.0
226.20	0.1	0.1	0.0
226.25	0.1	0.1	0.0
226.30	0.1	0.1	0.0
226.35	0.1	0.1	0.0
226.40	0.1	0.1	0.0
226.45	0.1	0.1	0.0
226.50	0.1	0.1	0.0
226.55	0.1	0.1	0.0
226.60	0.1	0.1	0.0
226.65	0.1	0.1	0.0
226.70	0.1	0.1	0.0
226.75	0.1	0.1	0.0
226.80	0.1	0.1	0.0
226.85	0.1	0.1	0.0
226.90	0.1	0.1	0.0
226.95	0.1	0.1	0.0
227.00	0.1	0.1	0.0
227.05	0.1	0.1	0.0
227.10	0.1	0.1	0.0
227.15	0.1	0.1	0.0
227.20	0.1	0.1	0.0
227.25	0.1	0.1	0.0
227.30	0.1	0.1	0.0
227.35	0.1	0.1	0.0
227.40	0.1	0.1	0.0
227.45	0.1	0.1	0.0
227.50	0.1	0.1	0.0
227.55	0.1	0.1	0.0
227.60	0.1	0.1	0.0
227.65	0.1	0.1	0.0
227.70	0.1	0.1	0.0
227.75	0.1	0.1	0.0
227.80	0.1	0.1	0.0
227.85	0.1	0.1	0.0
227.90	0.1	0.1	0.0
227.95	0.1	0.1	0.0
228.00	0.1	0.1	0.0
228.05	0.1	0.1	0.0
228.10	0.1	0.1	0.0
228.15	0.1	0.1	0.0
228.20	0.1	0.1	0.0
228.25	0.1	0.1	0.0
228.30	0.1	0.1	0.0
228.35	0.1	0.1	0.0
228.40	0.1	0.1	0.0
228.45	0.1	0.1	0.0
228.50	0.1	0.1	0.0
228.55	0.1	0.1	0.0
228.60	0.1	0.1	0.0
228.65	0.1	0.1	0.0
228.70	0.1	0.1	0.0
228.75	0.2	0.2	0.0
228.80	0.2	0.2	0.0
228.85	0.2	0.2	0.0
228.90	0.2	0.2	0.0
228.95	0.2	0.2	0.0
229.00	0.2	0.2	0.0
229.05	0.2	0.2	0.0
229.10	0.2	0.2	0.0
229.15	0.2	0.2	0.0
229.20	0.2	0.2	0.0
229.25	0.2	0.2	0.0
229.30	0.2	0.2	0.0
229.35	0.3	0.3	0.0
229.40	0.3	0.3	0.0
229.45	0.3	0.3	0.0
229.50	0.3	0.3	0.0
229.55	0.3	0.3	0.0
229.60	0.3	0.3	0.0
229.65	0.3	0.3	0.0
229.70	0.3	0.3	0.0
229.75	0.3	0.3	0.0
229.80	0.3	0.3	0.0
229.85	0.3	0.3	0.0
229.90	0.4	0.4	0.0
229.95	0.4	0.4	0.0
230.00	0.5	0.5	0.0
230.05	0.5	0.5	0.0
230.10	0.6	0.6	0.0
230.15	0.7	0.7	0.0
230.20	0.7	0.7	0.0
230.25	0.8	0.8	0.0
230.30	0.9	0.9	0.0
230.35	1.0	1.0	0.0
230.40	1.1	1.1	0.0
230.45	1.2	1.2	0.0
230.50	1.3	1.3	0.0
230.55	1.4	1.4	0.0
230.60	1.5	1.5	0.0
230.65	1.9	1.9	0.0
230.70	2.5	2.5	0.0
230.75	3.5	3.3	0.3
230.80	**4.9**	**4.2**	**0.7**

Stage-Area-Storage for Pond P1: Sand Filter

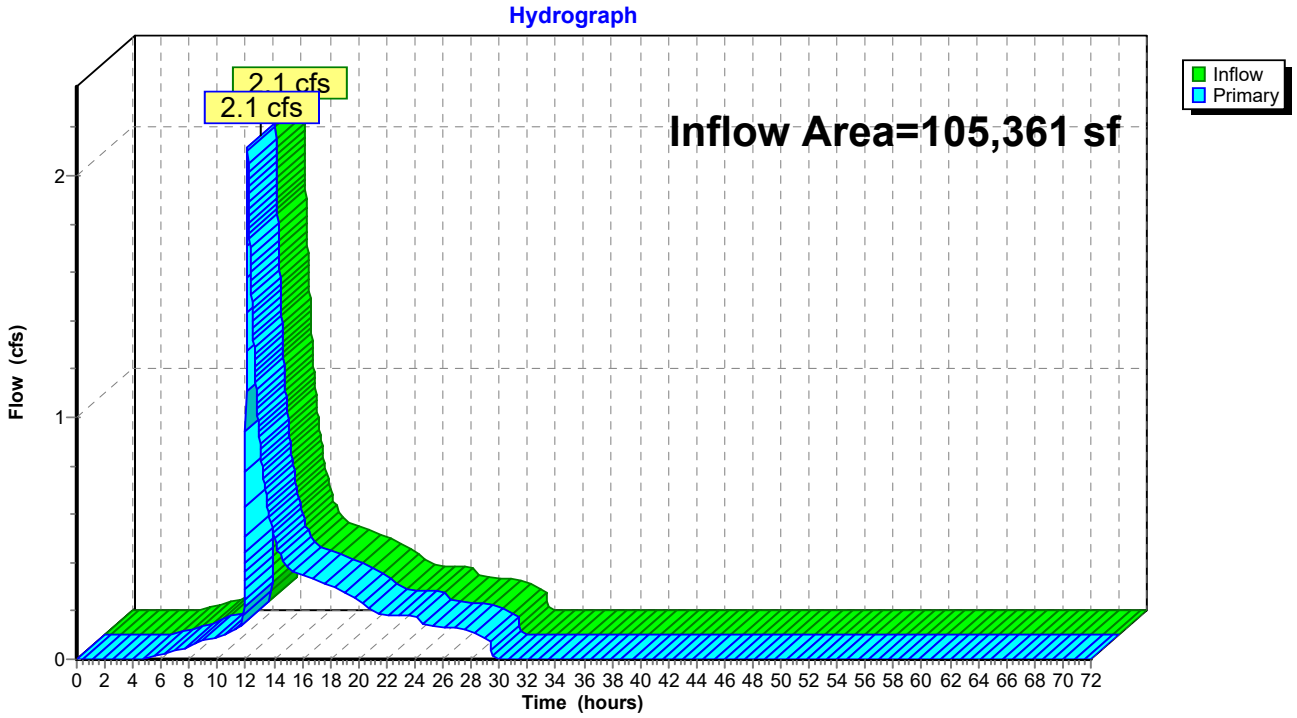
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
225.90	**1,284**	0
225.95	1,284	19
226.00	1,284	39
226.05	1,284	58
226.10	1,284	77
226.15	1,284	96
226.20	1,284	116
226.25	1,284	135
226.30	1,284	154
226.35	1,284	173
226.40	1,284	193
226.45	1,284	212
226.50	1,284	231
226.55	1,284	250
226.60	1,284	270
226.65	1,284	289
226.70	1,284	308
226.75	1,284	327
226.80	1,284	347
226.85	1,284	366
226.90	1,284	385
226.95	1,284	404
227.00	1,284	424
227.05	1,284	443
227.10	1,284	462
227.15	1,284	482
227.20	1,284	501
227.25	1,284	520
227.30	1,284	539
227.35	1,284	559
227.40	1,284	578
227.45	1,284	649
227.50	1,284	722
227.55	1,284	796
227.60	1,284	872
227.65	1,284	948
227.70	1,284	1,027
227.75	1,284	1,107
227.80	1,284	1,188
227.85	1,284	1,271
227.90	1,284	1,356
227.95	1,284	1,441
228.00	1,284	1,529
228.05	1,284	1,618
228.10	1,284	1,708
228.15	1,284	1,801
228.20	1,284	1,894
228.25	1,284	1,990
228.30	1,284	2,087
228.35	1,284	2,185
228.40	1,284	2,285
228.45	1,284	2,387
228.50	1,284	2,491
228.55	1,284	2,596
228.60	1,284	2,703
228.65	1,284	2,812
228.70	1,284	2,922
228.75	1,284	3,034
228.80	1,284	3,148
228.85	1,284	3,264
228.90	1,284	3,381
228.95	1,284	3,500
229.00	1,284	3,621
229.05	1,284	3,744
229.10	1,284	3,869
229.15	1,284	3,995
229.20	1,284	4,123
229.25	1,284	4,254
229.30	1,284	4,386
229.35	1,284	4,520
229.40	1,284	4,656
229.45	1,284	4,794
229.50	1,284	4,934
229.55	1,284	5,075
229.60	1,284	5,219
229.65	1,284	5,365
229.70	1,284	5,512
229.75	1,284	5,662
229.80	1,284	5,814
229.85	1,284	5,968
229.90	1,284	6,124
229.95	1,284	6,281
230.00	1,284	6,441
230.05	1,284	6,604
230.10	1,284	6,768
230.15	1,284	6,934
230.20	1,284	7,102
230.25	1,284	7,273
230.30	1,284	7,446
230.35	1,284	7,621
230.40	1,284	7,798
230.45	1,284	7,977
230.50	1,284	8,159
230.55	1,284	8,342
230.60	1,284	8,528
230.65	1,284	8,717
230.70	1,284	8,907
230.75	1,284	9,100
230.80	1,284	**9,295**

Summary for Link DP-1: Merrimack River

Inflow Area = 105,361 sf, 24.88% Impervious, Inflow Depth = 2.47" for 50-YR event
Inflow = 2.1 cfs @ 12.13 hrs, Volume= 21,674 cf
Primary = 2.1 cfs @ 12.13 hrs, Volume= 21,674 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Merrimack River



Hydrograph for Link DP-1: Merrimack River

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	**0.00**	0.0	51.00	0.0	0.00	0.0
1.00	0.0	0.00	0.0	52.00	0.0	0.00	0.0
2.00	0.0	0.00	0.0	53.00	0.0	0.00	0.0
3.00	0.0	0.00	0.0	54.00	0.0	0.00	0.0
4.00	0.0	0.00	0.0	55.00	0.0	0.00	0.0
5.00	0.0	0.00	0.0	56.00	0.0	0.00	0.0
6.00	0.0	0.00	0.0	57.00	0.0	0.00	0.0
7.00	0.0	0.00	0.0	58.00	0.0	0.00	0.0
8.00	0.1	0.00	0.1	59.00	0.0	0.00	0.0
9.00	0.1	0.00	0.1	60.00	0.0	0.00	0.0
10.00	0.1	0.00	0.1	61.00	0.0	0.00	0.0
11.00	0.1	0.00	0.1	62.00	0.0	0.00	0.0
12.00	**0.9**	0.00	**0.9**	63.00	0.0	0.00	0.0
13.00	**0.9**	0.00	**0.9**	64.00	0.0	0.00	0.0
14.00	0.5	0.00	0.5	65.00	0.0	0.00	0.0
15.00	0.4	0.00	0.4	66.00	0.0	0.00	0.0
16.00	0.3	0.00	0.3	67.00	0.0	0.00	0.0
17.00	0.3	0.00	0.3	68.00	0.0	0.00	0.0
18.00	0.3	0.00	0.3	69.00	0.0	0.00	0.0
19.00	0.3	0.00	0.3	70.00	0.0	0.00	0.0
20.00	0.2	0.00	0.2	71.00	0.0	0.00	0.0
21.00	0.2	0.00	0.2	72.00	0.0	0.00	0.0
22.00	0.2	0.00	0.2				
23.00	0.2	0.00	0.2				
24.00	0.2	0.00	0.2				
25.00	0.1	0.00	0.1				
26.00	0.1	0.00	0.1				
27.00	0.1	0.00	0.1				
28.00	0.1	0.00	0.1				
29.00	0.1	0.00	0.1				
30.00	0.0	0.00	0.0				
31.00	0.0	0.00	0.0				
32.00	0.0	0.00	0.0				
33.00	0.0	0.00	0.0				
34.00	0.0	0.00	0.0				
35.00	0.0	0.00	0.0				
36.00	0.0	0.00	0.0				
37.00	0.0	0.00	0.0				
38.00	0.0	0.00	0.0				
39.00	0.0	0.00	0.0				
40.00	0.0	0.00	0.0				
41.00	0.0	0.00	0.0				
42.00	0.0	0.00	0.0				
43.00	0.0	0.00	0.0				
44.00	0.0	0.00	0.0				
45.00	0.0	0.00	0.0				
46.00	0.0	0.00	0.0				
47.00	0.0	0.00	0.0				
48.00	0.0	0.00	0.0				
49.00	0.0	0.00	0.0				
50.00	0.0	0.00	0.0				

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 PR-1: Subcat PR-1 Runoff Area=1.096 ac 51.03% Impervious Runoff Depth=5.34"
Tc=6.0 min CN=86 Runoff=9.8 cfs 21,231 cf

Subcatchment PR-2: Subcat PR-2 Runoff Area=1.323 ac 3.21% Impervious Runoff Depth=1.06"
Flow Length=381' Tc=14.7 min UI Adjusted CN=43 Runoff=1.4 cfs 5,096 cf

Reach 1R: East Swale Avg. Flow Depth=0.00' Max Vel=0.00 fps
n=0.017 L=480.0' S=0.0035 '/' Capacity=209.2 cfs Outflow=0.0 cfs 0 cf

Pond P1: Sand Filter Peak Elev=230.76' Storage=9,139 cf Inflow=9.8 cfs 21,231 cf
Primary=3.5 cfs 21,145 cf Secondary=0.4 cfs 86 cf Outflow=3.8 cfs 21,231 cf

Link DP-1: Merrimack River Inflow=5.1 cfs 26,328 cf
Primary=5.1 cfs 26,328 cf

Total Runoff Area = 105,361 sf Runoff Volume = 26,328 cf Average Runoff Depth = 3.00"
75.12% Pervious = 79,148 sf 24.88% Impervious = 26,212 sf

Summary for Subcatchment PR-1: Subcat PR-1

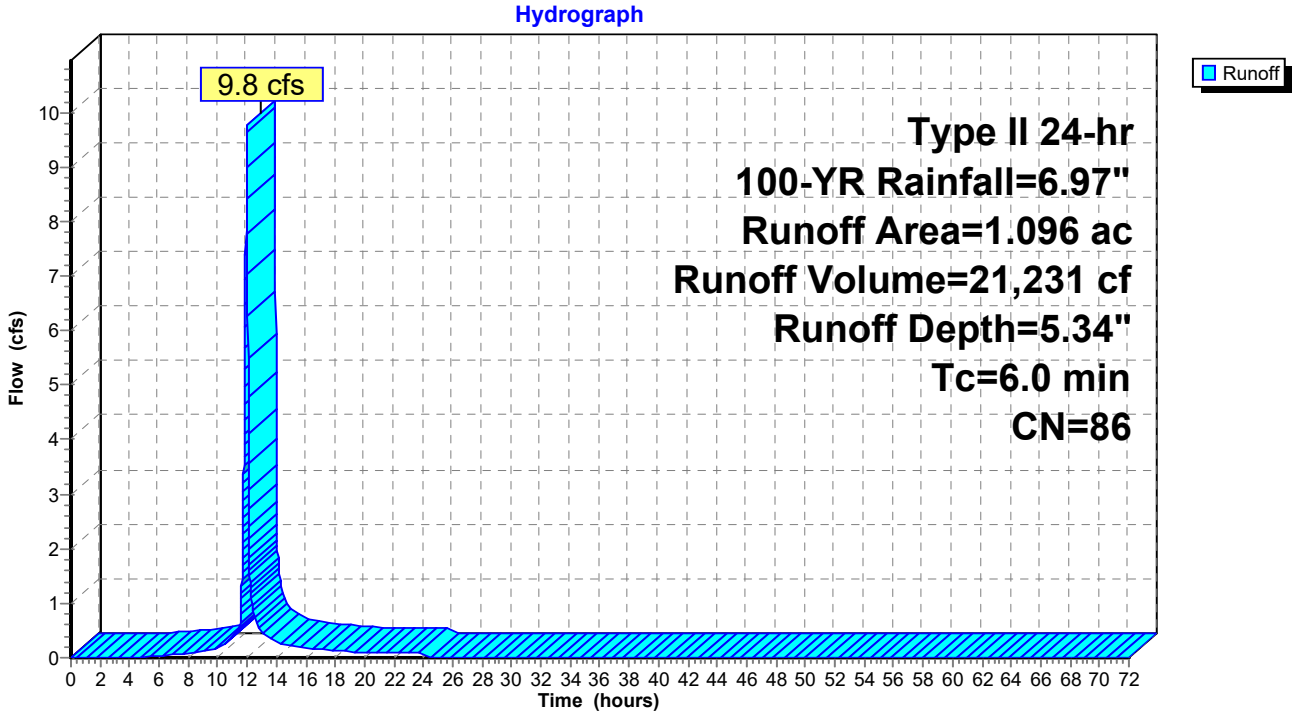
Runoff = 9.8 cfs @ 11.97 hrs, Volume= 21,231 cf, Depth= 5.34"
Routed to Pond P1 : Sand Filter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=6.97"

Area (ac)	CN	Description
0.157	39	>75% Grass cover, Good, HSG A
0.100	61	>75% Grass cover, Good, HSG B
0.127	96	Gravel surface, HSG A
0.153	96	Gravel surface, HSG B
0.000	98	Paved parking, HSG A
0.559	98	Unconnected pavement, HSG A
1.096	86	Weighted Average
0.537		48.97% Pervious Area
0.559		51.03% Impervious Area
0.559		100.00% Unconnected

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

Subcatchment PR-1: Subcat PR-1



Hydrograph for Subcatchment PR-1: Subcat PR-1

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.00	0.07	0.00	0.0
2.00	0.15	0.00	0.0
3.00	0.24	0.00	0.0
4.00	0.33	0.00	0.0
5.00	0.44	0.01	0.0
6.00	0.56	0.03	0.0
7.00	0.69	0.07	0.0
8.00	0.84	0.12	0.1
9.00	1.02	0.21	0.1
10.00	1.26	0.34	0.2
11.00	1.64	0.59	**0.4**
12.00	4.62	3.12	**9.0**
13.00	5.38	3.82	0.5
14.00	5.72	4.14	0.3
15.00	5.95	4.36	0.2
16.00	6.13	4.54	0.2
17.00	6.29	4.68	0.2
18.00	6.42	4.81	0.1
19.00	6.54	4.92	0.1
20.00	6.64	5.02	0.1
21.00	6.72	5.10	0.1
22.00	6.81	5.18	0.1
23.00	6.89	5.26	0.1
24.00	**6.97**	**5.34**	0.1
25.00	6.97	5.34	0.0
26.00	6.97	5.34	0.0
27.00	6.97	5.34	0.0
28.00	6.97	5.34	0.0
29.00	6.97	5.34	0.0
30.00	6.97	5.34	0.0
31.00	6.97	5.34	0.0
32.00	6.97	5.34	0.0
33.00	6.97	5.34	0.0
34.00	6.97	5.34	0.0
35.00	6.97	5.34	0.0
36.00	6.97	5.34	0.0
37.00	6.97	5.34	0.0
38.00	6.97	5.34	0.0
39.00	6.97	5.34	0.0
40.00	6.97	5.34	0.0
41.00	6.97	5.34	0.0
42.00	6.97	5.34	0.0
43.00	6.97	5.34	0.0
44.00	6.97	5.34	0.0
45.00	6.97	5.34	0.0
46.00	6.97	5.34	0.0
47.00	6.97	5.34	0.0
48.00	6.97	5.34	0.0
49.00	6.97	5.34	0.0
50.00	6.97	5.34	0.0
51.00	6.97	5.34	0.0
52.00	6.97	5.34	0.0
53.00	6.97	5.34	0.0
54.00	6.97	5.34	0.0
55.00	6.97	5.34	0.0
56.00	6.97	5.34	0.0
57.00	6.97	5.34	0.0
58.00	6.97	5.34	0.0
59.00	6.97	5.34	0.0
60.00	6.97	5.34	0.0
61.00	6.97	5.34	0.0
62.00	6.97	5.34	0.0
63.00	6.97	5.34	0.0
64.00	6.97	5.34	0.0
65.00	6.97	5.34	0.0
66.00	6.97	5.34	0.0
67.00	6.97	5.34	0.0
68.00	6.97	5.34	0.0
69.00	6.97	5.34	0.0
70.00	6.97	5.34	0.0
71.00	6.97	5.34	0.0
72.00	6.97	5.34	0.0

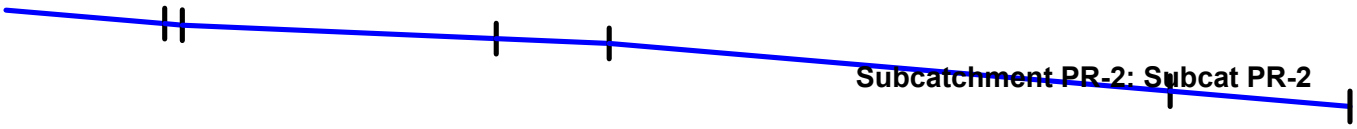
Summary for Subcatchment PR-2: Subcat PR-2

Runoff = 1.4 cfs @ 12.10 hrs, Volume= 5,096 cf, Depth= 1.06"
Routed to Link DP-1 : Merrimack River

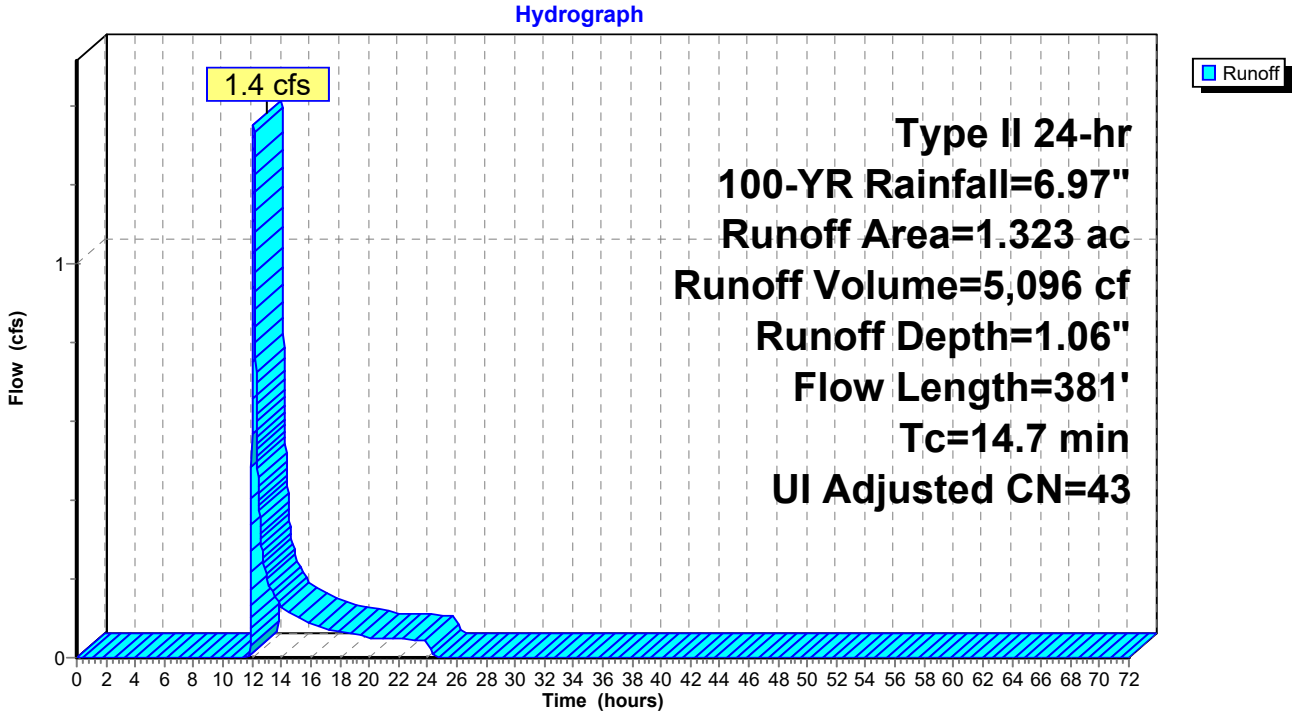
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-YR Rainfall=6.97"

Area (ac)	CN	Adj	Description
0.429	39		>75% Grass cover, Good, HSG A
0.023	61		>75% Grass cover, Good, HSG B
0.261	74		>75% Grass cover, Good, HSG C
0.042	98		Unconnected pavement, HSG A
0.568	30		Woods, Good, HSG A
0.000	55		Woods, Good, HSG B
1.323	44	43	Weighted Average, UI Adjusted
1.280			96.79% Pervious Area
0.042			3.21% Impervious Area
0.042			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	45	0.0100	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.75"
2.8	5	0.0100	0.03		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.75"
0.5	89	0.0050	3.21	2.52	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
1.5	32	0.0050	0.35		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.3	159	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.2	51	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.7	381	Total			



Subcatchment PR-2: Subcat PR-2



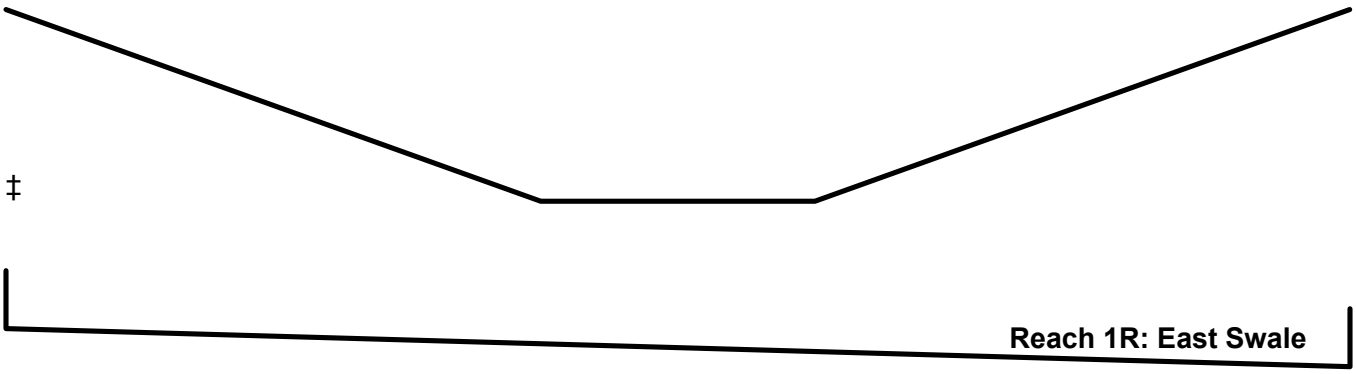
Hydrograph for Subcatchment PR-2: Subcat PR-2

Time (hours)	Precip. (inches)	Excess (inches)	Runoff (cfs)
0.00	0.00	0.00	0.0
1.00	0.07	0.00	0.0
2.00	0.15	0.00	0.0
3.00	0.24	0.00	0.0
4.00	0.33	0.00	0.0
5.00	0.44	0.00	0.0
6.00	0.56	0.00	0.0
7.00	0.69	0.00	0.0
8.00	0.84	0.00	0.0
9.00	1.02	0.00	0.0
10.00	1.26	0.00	0.0
11.00	1.64	0.00	0.0
12.00	4.62	0.25	**0.8**
13.00	5.38	0.47	**0.2**
14.00	5.72	0.58	0.1
15.00	5.95	0.66	0.1
16.00	6.13	0.72	0.1
17.00	6.29	0.78	0.1
18.00	6.42	0.83	0.1
19.00	6.54	0.88	0.1
20.00	6.64	0.92	0.1
21.00	6.72	0.96	0.0
22.00	6.81	0.99	0.0
23.00	6.89	1.03	0.0
24.00	**6.97**	**1.06**	0.0
25.00	6.97	1.06	0.0
26.00	6.97	1.06	0.0
27.00	6.97	1.06	0.0
28.00	6.97	1.06	0.0
29.00	6.97	1.06	0.0
30.00	6.97	1.06	0.0
31.00	6.97	1.06	0.0
32.00	6.97	1.06	0.0
33.00	6.97	1.06	0.0
34.00	6.97	1.06	0.0
35.00	6.97	1.06	0.0
36.00	6.97	1.06	0.0
37.00	6.97	1.06	0.0
38.00	6.97	1.06	0.0
39.00	6.97	1.06	0.0
40.00	6.97	1.06	0.0
41.00	6.97	1.06	0.0
42.00	6.97	1.06	0.0
43.00	6.97	1.06	0.0
44.00	6.97	1.06	0.0
45.00	6.97	1.06	0.0
46.00	6.97	1.06	0.0
47.00	6.97	1.06	0.0
48.00	6.97	1.06	0.0
49.00	6.97	1.06	0.0
50.00	6.97	1.06	0.0
51.00	6.97	1.06	0.0
52.00	6.97	1.06	0.0
53.00	6.97	1.06	0.0
54.00	6.97	1.06	0.0
55.00	6.97	1.06	0.0
56.00	6.97	1.06	0.0
57.00	6.97	1.06	0.0
58.00	6.97	1.06	0.0
59.00	6.97	1.06	0.0
60.00	6.97	1.06	0.0
61.00	6.97	1.06	0.0
62.00	6.97	1.06	0.0
63.00	6.97	1.06	0.0
64.00	6.97	1.06	0.0
65.00	6.97	1.06	0.0
66.00	6.97	1.06	0.0
67.00	6.97	1.06	0.0
68.00	6.97	1.06	0.0
69.00	6.97	1.06	0.0
70.00	6.97	1.06	0.0
71.00	6.97	1.06	0.0
72.00	6.97	1.06	0.0

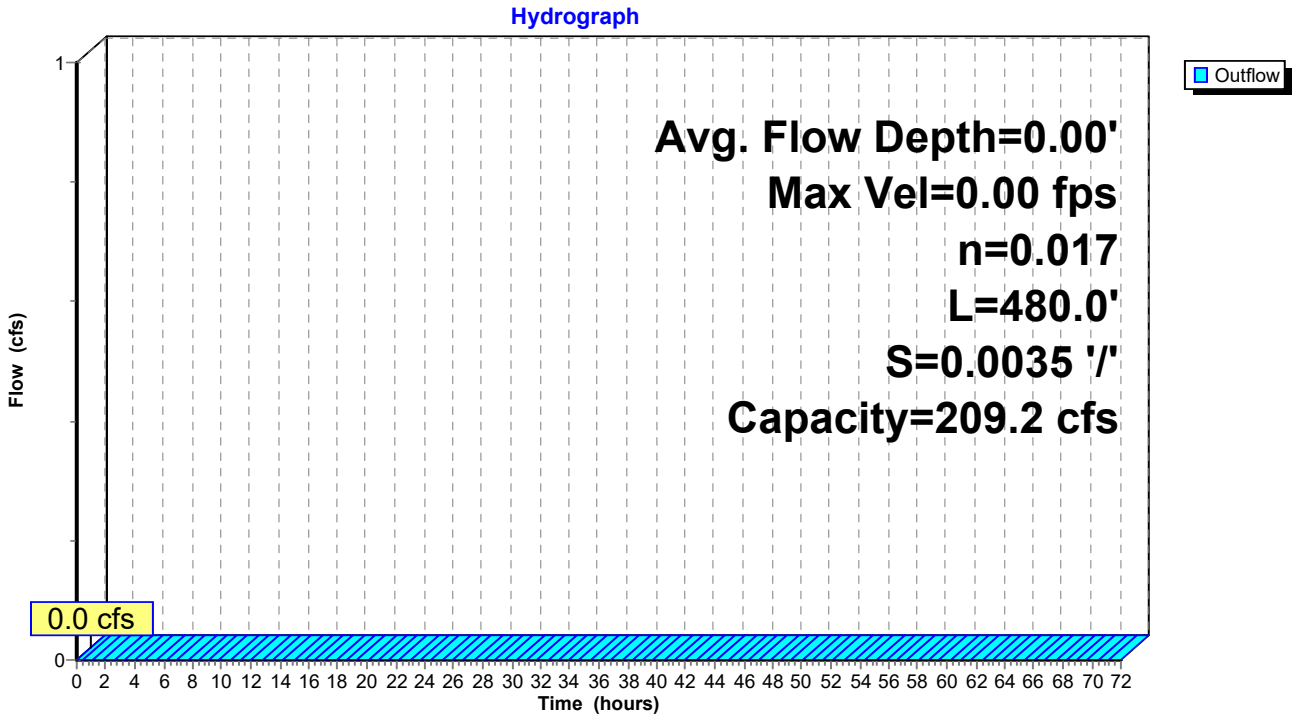
Summary for Reach 1R: East Swale

Bank-Full Depth= 2.60' Flow Area= 30.7 sf, Capacity= 209.2 cfs

4.00' x 2.60' deep channel, n= 0.017 Concrete, unfinished
Side Slope Z-value= 3.0 '/' Top Width= 19.60'
Length= 480.0' Slope= 0.0035 '/'
Inlet Invert= 228.20', Outlet Invert= 226.50'



Reach 1R: East Swale



Stage-Discharge for Reach 1R: East Swale

Elevation (feet)	Velocity (ft/sec)	Discharge (cfs)
228.20	0.00	0.0
228.22	0.35	0.0
228.24	0.59	0.1
228.26	0.77	0.2
228.28	0.93	0.3
228.30	1.07	0.5
228.32	1.19	0.6
228.34	1.31	0.8
228.36	1.42	1.0
228.38	1.53	1.2
228.40	1.63	1.5
228.42	1.72	1.8
228.44	1.81	2.1
228.46	1.90	2.4
228.48	1.98	2.7
228.50	2.06	3.0
228.52	2.14	3.4
228.54	2.21	3.8
228.56	2.29	4.2
228.58	2.36	4.6
228.60	2.43	5.1
228.62	2.49	5.5
228.64	2.56	6.0
228.66	2.62	6.5
228.68	2.69	7.0
228.70	2.75	7.6
228.72	2.81	8.1
228.74	2.87	8.7
228.76	2.93	9.3
228.78	2.98	9.9
228.80	3.04	10.6
228.82	3.09	11.2
228.84	3.15	11.9
228.86	3.20	12.6
228.88	3.25	13.4
228.90	3.31	14.1
228.92	3.36	14.9
228.94	3.41	15.7
228.96	3.46	16.5
228.98	3.51	17.3
229.00	3.56	18.2
229.02	3.60	19.1
229.04	3.65	20.0
229.06	3.70	20.9
229.08	3.75	21.9
229.10	3.79	22.9
229.12	3.84	23.9
229.14	3.88	24.9
229.16	3.93	25.9
229.18	3.97	27.0
229.20	4.01	28.1
229.22	4.06	29.2
229.24	4.10	30.4
229.26	4.14	31.5
229.28	4.19	32.7
229.30	4.23	34.0
229.32	4.27	35.2
229.34	4.31	36.5
229.36	4.35	37.8
229.38	4.39	39.1
229.40	4.43	40.4
229.42	4.47	41.8
229.44	4.51	43.2
229.46	4.55	44.6
229.48	4.59	46.1
229.50	4.63	47.6
229.52	4.67	49.1
229.54	4.71	50.6
229.56	4.75	52.2
229.58	4.79	53.8
229.60	4.82	55.4
229.62	4.86	57.0
229.64	4.90	58.7
229.66	4.94	60.4
229.68	4.97	62.1
229.70	5.01	63.9
229.72	5.05	65.7
229.74	5.08	67.5
229.76	5.12	69.3
229.78	5.16	71.2
229.80	5.19	73.1
229.82	5.23	75.0
229.84	5.26	77.0
229.86	5.30	79.0
229.88	5.33	81.0
229.90	5.37	83.1
229.92	5.40	85.2
229.94	5.44	87.3
229.96	5.47	89.4
229.98	5.51	91.6
230.00	5.54	93.8
230.02	5.58	96.0
230.04	5.61	98.3
230.06	5.64	100.6
230.08	5.68	102.9
230.10	5.71	105.3
230.12	5.75	107.7
230.14	5.78	110.1
230.16	5.81	112.6
230.18	5.85	115.1
230.20	5.88	117.6
230.22	5.91	120.1
230.24	5.94	122.7
230.26	5.98	125.3
230.28	6.01	128.0
230.30	6.04	130.7
230.32	6.07	133.4
230.34	6.11	136.2
230.36	6.14	139.0
230.38	6.17	141.8
230.40	6.20	144.6
230.42	6.23	147.5
230.44	6.27	150.5
230.46	6.30	153.4
230.48	6.33	156.4
230.50	6.36	159.4
230.52	6.39	162.5
230.54	6.42	165.6
230.56	6.45	168.7
230.58	6.48	171.9
230.60	6.51	175.1
230.62	6.55	178.4
230.64	6.58	181.6
230.66	6.61	185.0
230.68	6.64	188.3
230.70	6.67	191.7
230.72	6.70	195.1
230.74	6.73	198.6
230.76	6.76	202.1
230.78	6.79	205.6
230.80	**6.82**	**209.2**

Stage-Area-Storage for Reach 1R: East Swale

Elevation (feet)	End-Area (sq-ft)	Storage (cubic-feet)
228.20	0.0	0
228.25	0.2	100
228.30	0.4	207
228.35	0.7	321
228.40	0.9	442
228.45	1.2	570
228.50	1.5	706
228.55	1.8	849
228.60	2.1	999
228.65	2.4	1,156
228.70	2.8	1,320
228.75	3.1	1,492
228.80	3.5	1,670
228.85	3.9	1,856
228.90	4.3	2,050
228.95	4.7	2,250
229.00	5.1	2,458
229.05	5.6	2,673
229.10	6.0	2,895
229.15	6.5	3,124
229.20	7.0	3,360
229.25	7.5	3,604
229.30	8.0	3,855
229.35	8.6	4,113
229.40	9.1	4,378
229.45	9.7	4,650
229.50	10.3	4,930
229.55	10.9	5,216
229.60	11.5	5,511
229.65	12.1	5,812
229.70	12.8	6,120
229.75	13.4	6,436
229.80	14.1	6,759
229.85	14.8	7,089
229.90	15.5	7,426
229.95	16.2	7,770
230.00	16.9	8,122
230.05	17.7	8,481
230.10	18.4	8,846
230.15	19.2	9,220
230.20	20.0	9,600
230.25	20.8	9,988
230.30	21.6	10,383
230.35	22.5	10,785
230.40	23.3	11,194
230.45	24.2	11,610
230.50	25.1	12,034
230.55	26.0	12,465
230.60	26.9	12,903
230.65	27.8	13,348
230.70	28.8	13,800
230.75	29.7	14,260
230.80	**30.7**	**14,726**

Summary for Pond P1: Sand Filter

Inflow Area = 47,739 sf, 51.03% Impervious, Inflow Depth = 5.34" for 100-YR event
Inflow = 9.8 cfs @ 11.97 hrs, Volume= 21,231 cf
Outflow = 3.8 cfs @ 12.08 hrs, Volume= 21,231 cf, Atten= 61%, Lag= 6.4 min
Primary = 3.5 cfs @ 12.08 hrs, Volume= 21,145 cf
Routed to Link DP-1 : Merrimack River
Secondary = 0.4 cfs @ 12.08 hrs, Volume= 86 cf
Routed to Link DP-1 : Merrimack River

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 230.76' @ 12.08 hrs Surf.Area= 1,284 sf Storage= 9,139 cf
Flood Elev= 229.80' Surf.Area= 1,284 sf Storage= 5,814 cf

Plug-Flow detention time= 193.8 min calculated for 21,228 cf (100% of inflow)
Center-of-Mass det. time= 193.8 min (983.0 - 789.2)

Volume	Invert	Avail.Storage	Storage Description
#1	225.90'	578 cf	**Sand Filter (Irregular)**Listed below (Recalc) 1,926 cf Overall x 30.0% Voids
#2	227.40'	8,717 cf	**Detention (Irregular)**Listed below (Recalc) x 1.1 -Impervious
		9,295 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
225.90	1,284	191.9	0	0	1,284
227.40	1,284	191.9	1,926	1,926	1,572

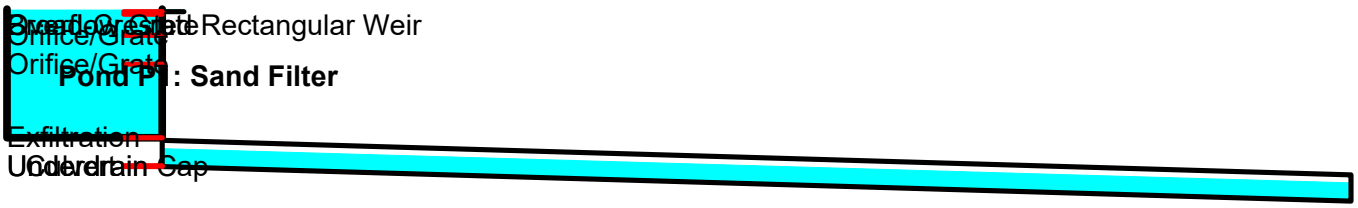
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
227.40	1,284	191.9	0	0	1,284
230.80	3,568	255.9	7,925	7,925	3,688

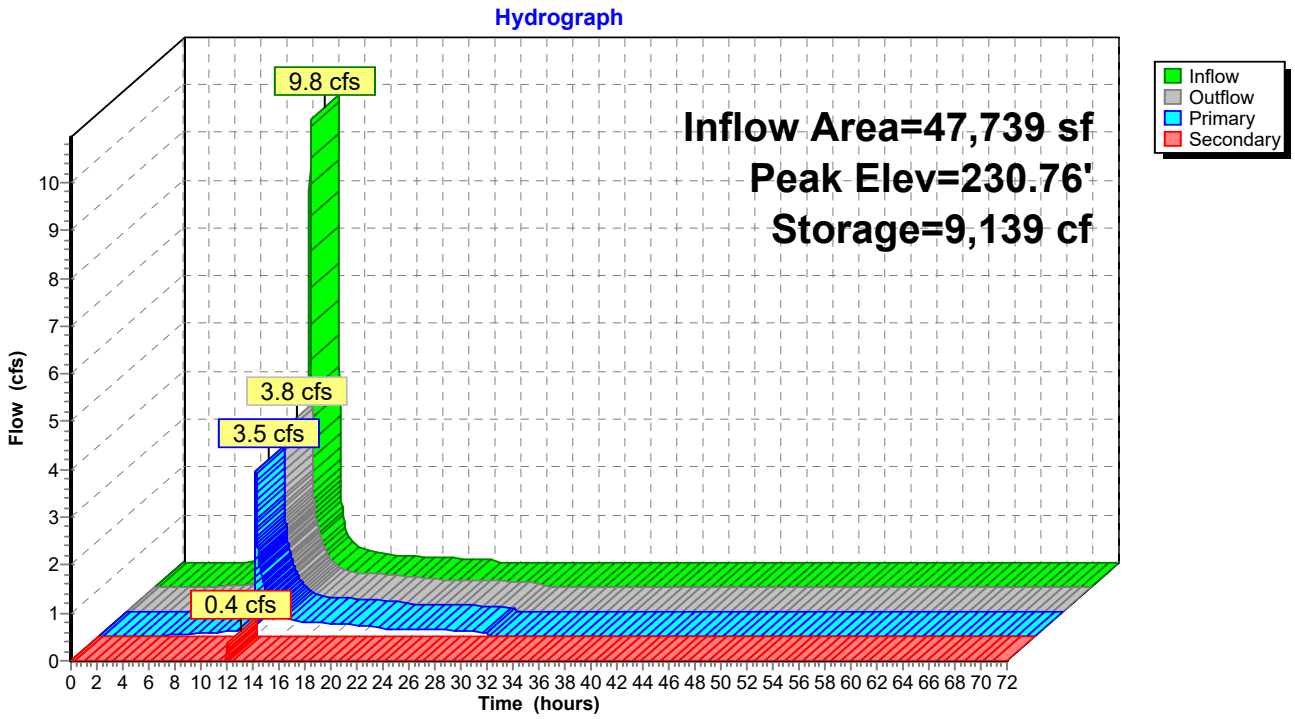
Device	Routing	Invert	Outlet Devices
#1	Primary	224.80'	**12.0" Round Culvert** L= 271.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 224.80' / 223.49' S= 0.0048 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	224.83'	**1.7" Vert. Underdrain Cap** C= 0.600 Limited to weir flow at low heads
#3	Device 2	224.83'	**6.0" Round Underdrain** L= 70.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 224.83' / 224.83' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf
#4	Device 3	225.90'	**10.000 in/hr Exfiltration over Surface area**
#5	Device 1	228.70'	**2.2" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Device 1	229.80'	**6.0" W x 9.6" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Device 1	230.60'	**24.0" x 24.0" Horiz. Overflow Grate** C= 0.600 Limited to weir flow at low heads

#8	Secondary	230.70'	**10.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=3.4 cfs @ 12.08 hrs HW=230.76' (Free Discharge)
- **1=Culvert** (Passes 3.4 cfs of 5.0 cfs potential flow)
  - **2=Underdrain Cap** (Orifice Controls 0.2 cfs @ 11.65 fps)
    - **3=Underdrain** (Passes 0.2 cfs of 1.4 cfs potential flow)
      - **4=Exfiltration** (Passes 0.2 cfs of 0.3 cfs potential flow)
  - **5=Orifice/Grate** (Orifice Controls 0.2 cfs @ 6.75 fps)
  - **6=Orifice/Grate** (Orifice Controls 1.4 cfs @ 3.52 fps)
  - **7=Overflow Grate** (Weir Controls 1.7 cfs @ 1.31 fps)

Secondary OutFlow Max=0.3 cfs @ 12.08 hrs HW=230.76' (Free Discharge)
- **8=Broad-Crested Rectangular Weir** (Weir Controls 0.3 cfs @ 0.57 fps)





Hydrograph for Pond P1: Sand Filter

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.0	0	225.90	0.0	0.0	0.0
2.00	0.0	0	225.90	0.0	0.0	0.0
4.00	0.0	0	225.90	0.0	0.0	0.0
6.00	0.0	7	225.92	0.0	0.0	0.0
8.00	0.1	17	225.94	0.1	0.1	0.0
10.00	**0.2**	254	226.56	0.1	0.1	0.0
12.00	**9.0**	**8,091**	**230.48**	**1.2**	**1.2**	**0.0**
14.00	0.3	**6,445**	**230.00**	**0.5**	**0.5**	**0.0**
16.00	0.2	5,622	229.74	0.3	0.3	0.0
18.00	0.1	4,723	229.42	0.3	0.3	0.0
20.00	0.1	3,802	229.07	0.2	0.2	0.0
22.00	0.1	3,084	228.77	0.2	0.2	0.0
24.00	0.1	2,629	228.57	0.1	0.1	0.0
26.00	0.0	1,646	228.07	0.1	0.1	0.0
28.00	0.0	718	227.50	0.1	0.1	0.0
30.00	0.0	4	225.91	0.0	0.0	0.0
32.00	0.0	0	225.90	0.0	0.0	0.0
34.00	0.0	0	225.90	0.0	0.0	0.0
36.00	0.0	0	225.90	0.0	0.0	0.0
38.00	0.0	0	225.90	0.0	0.0	0.0
40.00	0.0	0	225.90	0.0	0.0	0.0
42.00	0.0	0	225.90	0.0	0.0	0.0
44.00	0.0	0	225.90	0.0	0.0	0.0
46.00	0.0	0	225.90	0.0	0.0	0.0
48.00	0.0	0	225.90	0.0	0.0	0.0
50.00	0.0	0	225.90	0.0	0.0	0.0
52.00	0.0	0	225.90	0.0	0.0	0.0
54.00	0.0	0	225.90	0.0	0.0	0.0
56.00	0.0	0	225.90	0.0	0.0	0.0
58.00	0.0	0	225.90	0.0	0.0	0.0
60.00	0.0	0	225.90	0.0	0.0	0.0
62.00	0.0	0	225.90	0.0	0.0	0.0
64.00	0.0	0	225.90	0.0	0.0	0.0
66.00	0.0	0	225.90	0.0	0.0	0.0
68.00	0.0	0	225.90	0.0	0.0	0.0
70.00	0.0	0	225.90	0.0	0.0	0.0
72.00	0.0	0	225.90	0.0	0.0	0.0

Stage-Discharge for Pond P1: Sand Filter

Elevation (feet)	Discharge (cfs)	Primary (cfs)	Secondary (cfs)
225.90	0.0	0.0	0.0
225.95	0.1	0.1	0.0
226.00	0.1	0.1	0.0
226.05	0.1	0.1	0.0
226.10	0.1	0.1	0.0
226.15	0.1	0.1	0.0
226.20	0.1	0.1	0.0
226.25	0.1	0.1	0.0
226.30	0.1	0.1	0.0
226.35	0.1	0.1	0.0
226.40	0.1	0.1	0.0
226.45	0.1	0.1	0.0
226.50	0.1	0.1	0.0
226.55	0.1	0.1	0.0
226.60	0.1	0.1	0.0
226.65	0.1	0.1	0.0
226.70	0.1	0.1	0.0
226.75	0.1	0.1	0.0
226.80	0.1	0.1	0.0
226.85	0.1	0.1	0.0
226.90	0.1	0.1	0.0
226.95	0.1	0.1	0.0
227.00	0.1	0.1	0.0
227.05	0.1	0.1	0.0
227.10	0.1	0.1	0.0
227.15	0.1	0.1	0.0
227.20	0.1	0.1	0.0
227.25	0.1	0.1	0.0
227.30	0.1	0.1	0.0
227.35	0.1	0.1	0.0
227.40	0.1	0.1	0.0
227.45	0.1	0.1	0.0
227.50	0.1	0.1	0.0
227.55	0.1	0.1	0.0
227.60	0.1	0.1	0.0
227.65	0.1	0.1	0.0
227.70	0.1	0.1	0.0
227.75	0.1	0.1	0.0
227.80	0.1	0.1	0.0
227.85	0.1	0.1	0.0
227.90	0.1	0.1	0.0
227.95	0.1	0.1	0.0
228.00	0.1	0.1	0.0
228.05	0.1	0.1	0.0
228.10	0.1	0.1	0.0
228.15	0.1	0.1	0.0
228.20	0.1	0.1	0.0
228.25	0.1	0.1	0.0
228.30	0.1	0.1	0.0
228.35	0.1	0.1	0.0
228.40	0.1	0.1	0.0
228.45	0.1	0.1	0.0
228.50	0.1	0.1	0.0
228.55	0.1	0.1	0.0
228.60	0.1	0.1	0.0
228.65	0.1	0.1	0.0
228.70	0.1	0.1	0.0
228.75	0.2	0.2	0.0
228.80	0.2	0.2	0.0
228.85	0.2	0.2	0.0
228.90	0.2	0.2	0.0
228.95	0.2	0.2	0.0
229.00	0.2	0.2	0.0
229.05	0.2	0.2	0.0
229.10	0.2	0.2	0.0
229.15	0.2	0.2	0.0
229.20	0.2	0.2	0.0
229.25	0.2	0.2	0.0
229.30	0.2	0.2	0.0
229.35	0.3	0.3	0.0
229.40	0.3	0.3	0.0
229.45	0.3	0.3	0.0
229.50	0.3	0.3	0.0
229.55	0.3	0.3	0.0
229.60	0.3	0.3	0.0
229.65	0.3	0.3	0.0
229.70	0.3	0.3	0.0
229.75	0.3	0.3	0.0
229.80	0.3	0.3	0.0
229.85	0.3	0.3	0.0
229.90	0.4	0.4	0.0
229.95	0.4	0.4	0.0
230.00	0.5	0.5	0.0
230.05	0.5	0.5	0.0
230.10	0.6	0.6	0.0
230.15	0.7	0.7	0.0
230.20	0.7	0.7	0.0
230.25	0.8	0.8	0.0
230.30	0.9	0.9	0.0
230.35	1.0	1.0	0.0
230.40	1.1	1.1	0.0
230.45	1.2	1.2	0.0
230.50	1.3	1.3	0.0
230.55	1.4	1.4	0.0
230.60	1.5	1.5	0.0
230.65	1.9	1.9	0.0
230.70	2.5	2.5	0.0
230.75	3.5	3.3	0.3
230.80	**4.9**	**4.2**	**0.7**

Stage-Area-Storage for Pond P1: Sand Filter

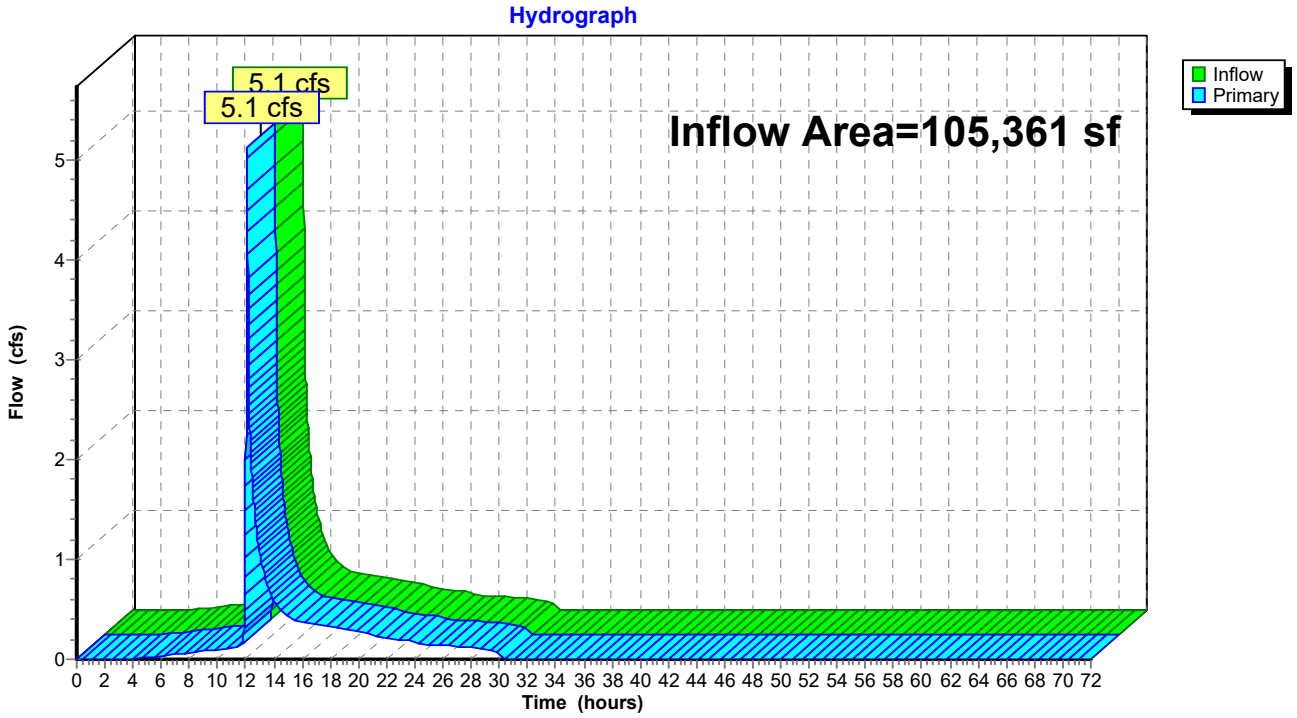
Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
225.90	**1,284**	0
225.95	1,284	19
226.00	1,284	39
226.05	1,284	58
226.10	1,284	77
226.15	1,284	96
226.20	1,284	116
226.25	1,284	135
226.30	1,284	154
226.35	1,284	173
226.40	1,284	193
226.45	1,284	212
226.50	1,284	231
226.55	1,284	250
226.60	1,284	270
226.65	1,284	289
226.70	1,284	308
226.75	1,284	327
226.80	1,284	347
226.85	1,284	366
226.90	1,284	385
226.95	1,284	404
227.00	1,284	424
227.05	1,284	443
227.10	1,284	462
227.15	1,284	482
227.20	1,284	501
227.25	1,284	520
227.30	1,284	539
227.35	1,284	559
227.40	1,284	578
227.45	1,284	649
227.50	1,284	722
227.55	1,284	796
227.60	1,284	872
227.65	1,284	948
227.70	1,284	1,027
227.75	1,284	1,107
227.80	1,284	1,188
227.85	1,284	1,271
227.90	1,284	1,356
227.95	1,284	1,441
228.00	1,284	1,529
228.05	1,284	1,618
228.10	1,284	1,708
228.15	1,284	1,801
228.20	1,284	1,894
228.25	1,284	1,990
228.30	1,284	2,087
228.35	1,284	2,185
228.40	1,284	2,285
228.45	1,284	2,387
228.50	1,284	2,491
228.55	1,284	2,596
228.60	1,284	2,703
228.65	1,284	2,812
228.70	1,284	2,922
228.75	1,284	3,034
228.80	1,284	3,148
228.85	1,284	3,264
228.90	1,284	3,381
228.95	1,284	3,500
229.00	1,284	3,621
229.05	1,284	3,744
229.10	1,284	3,869
229.15	1,284	3,995
229.20	1,284	4,123
229.25	1,284	4,254
229.30	1,284	4,386
229.35	1,284	4,520
229.40	1,284	4,656
229.45	1,284	4,794
229.50	1,284	4,934
229.55	1,284	5,075
229.60	1,284	5,219
229.65	1,284	5,365
229.70	1,284	5,512
229.75	1,284	5,662
229.80	1,284	5,814
229.85	1,284	5,968
229.90	1,284	6,124
229.95	1,284	6,281
230.00	1,284	6,441
230.05	1,284	6,604
230.10	1,284	6,768
230.15	1,284	6,934
230.20	1,284	7,102
230.25	1,284	7,273
230.30	1,284	7,446
230.35	1,284	7,621
230.40	1,284	7,798
230.45	1,284	7,977
230.50	1,284	8,159
230.55	1,284	8,342
230.60	1,284	8,528
230.65	1,284	8,717
230.70	1,284	8,907
230.75	1,284	9,100
230.80	1,284	**9,295**

Summary for Link DP-1: Merrimack River

Inflow Area = 105,361 sf, 24.88% Impervious, Inflow Depth = 3.00" for 100-YR event
Inflow = 5.1 cfs @ 12.08 hrs, Volume= 26,328 cf
Primary = 5.1 cfs @ 12.08 hrs, Volume= 26,328 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link DP-1: Merrimack River



Hydrograph for Link DP-1: Merrimack River

Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)	Time (hours)	Inflow (cfs)	Elevation (feet)	Primary (cfs)
0.00	0.0	**0.00**	0.0	51.00	0.0	0.00	0.0
1.00	0.0	0.00	0.0	52.00	0.0	0.00	0.0
2.00	0.0	0.00	0.0	53.00	0.0	0.00	0.0
3.00	0.0	0.00	0.0	54.00	0.0	0.00	0.0
4.00	0.0	0.00	0.0	55.00	0.0	0.00	0.0
5.00	0.0	0.00	0.0	56.00	0.0	0.00	0.0
6.00	0.0	0.00	0.0	57.00	0.0	0.00	0.0
7.00	0.0	0.00	0.0	58.00	0.0	0.00	0.0
8.00	0.1	0.00	0.1	59.00	0.0	0.00	0.0
9.00	0.1	0.00	0.1	60.00	0.0	0.00	0.0
10.00	0.1	0.00	0.1	61.00	0.0	0.00	0.0
11.00	0.1	0.00	0.1	62.00	0.0	0.00	0.0
12.00	**2.0**	0.00	**2.0**	63.00	0.0	0.00	0.0
13.00	**1.1**	0.00	**1.1**	64.00	0.0	0.00	0.0
14.00	0.6	0.00	0.6	65.00	0.0	0.00	0.0
15.00	0.4	0.00	0.4	66.00	0.0	0.00	0.0
16.00	0.4	0.00	0.4	67.00	0.0	0.00	0.0
17.00	0.4	0.00	0.4	68.00	0.0	0.00	0.0
18.00	0.3	0.00	0.3	69.00	0.0	0.00	0.0
19.00	0.3	0.00	0.3	70.00	0.0	0.00	0.0
20.00	0.3	0.00	0.3	71.00	0.0	0.00	0.0
21.00	0.2	0.00	0.2	72.00	0.0	0.00	0.0
22.00	0.2	0.00	0.2				
23.00	0.2	0.00	0.2				
24.00	0.2	0.00	0.2				
25.00	0.1	0.00	0.1				
26.00	0.1	0.00	0.1				
27.00	0.1	0.00	0.1				
28.00	0.1	0.00	0.1				
29.00	0.1	0.00	0.1				
30.00	0.0	0.00	0.0				
31.00	0.0	0.00	0.0				
32.00	0.0	0.00	0.0				
33.00	0.0	0.00	0.0				
34.00	0.0	0.00	0.0				
35.00	0.0	0.00	0.0				
36.00	0.0	0.00	0.0				
37.00	0.0	0.00	0.0				
38.00	0.0	0.00	0.0				
39.00	0.0	0.00	0.0				
40.00	0.0	0.00	0.0				
41.00	0.0	0.00	0.0				
42.00	0.0	0.00	0.0				
43.00	0.0	0.00	0.0				
44.00	0.0	0.00	0.0				
45.00	0.0	0.00	0.0				
46.00	0.0	0.00	0.0				
47.00	0.0	0.00	0.0				
48.00	0.0	0.00	0.0				
49.00	0.0	0.00	0.0				
50.00	0.0	0.00	0.0				

Appendix C: Inspection and Maintenance Manual

Skate Park at Kiwanis Park

Concord, New Hampshire

PREPARED FOR

City of Concord
41 Green Street
Concord, New Hampshire 03301
603.225.8610

PREPARED BY

2 Bedford Farms Drive
Suite 200
Bedford, New Hampshire 03110
603.391.3900

February 18, 2026

Table of Contents

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Introduction

VHB has prepared the following Stormwater Management System Inspection & Maintenance Manual for the Skate Park at Kiwanis Park Project located in Concord, New Hampshire. The intent of this plan is to provide the applicant/owner with a list of procedures that document the inspection and maintenance requirements of the Stormwater Management System for this development.

The following inspection and maintenance program is necessary in order to keep the Stormwater Management System functioning properly. By following the enclosed procedures, the applicant will be able to maintain the functional design of the Stormwater Management System and maximize its ability to remove sediment and other contaminants from site generated stormwater runoff.

Responsible Party

The oversight of the inspection and maintenance program will be provided by:
City of Concord
41 Green Street
Concord, NH 03301

Stormwater Management System Components

The Stormwater Management System is designed to mitigate both the quantity and quality of site-generated stormwater runoff. As a result, its design includes the following elements:

Non-Structural BMP's

Non-structural best management practices (BMP's) are designed to minimize and/or remove contaminants before they enter the stormwater collection system. Several of these BMP's have been incorporated into the Stormwater Management System including reduced used of road deicing agents, and litter/trash removal. These types of BMP's are a highly effective initial treatment measure for reducing stormwater pollutant loading.

Structural BMP's

Structural BMP's have been incorporated into the overall stormwater management plan. Structural BMP's include deep sump catch basins.

Inspection & Maintenance Plan

By implementing the following procedures, the applicant will be able to maintain the functional design of the Stormwater Management System and maximize the system's ability to remove sediment and other contaminants from site generated stormwater runoff.

Source Control

- Routinely empty all outside waste receptacles provided for public use.
- Clearing litter from the parking area, islands and perimeter landscape areas.

Vegetated Areas Maintenance

Although not a specific component of the drainage system, the maintenance of vegetated areas may affect the functioning of stormwater management practices. This includes the health/density of vegetative cover and activities such as the application and disposal of lawn and garden care products, disposal of leaves and yard trimmings.

- Inspect planted areas on a semi-annual basis and remove any litter.
- Maintain planted areas adjacent to pavement to prevent soil washout.
- Immediately clean any soil deposited on pavement.
- Re-seed bare areas; install appropriate erosion control measures when native soil is exposed or erosion channels are forming.
- Plant alternative mixture of grass species in the event of unsuccessful establishment.
- The grass vegetation should be cut to a height between three and four inches.
- Pesticide/Herbicide Usage – No pesticides are to be used unless a single spot treatment is required for a specific control application.
- Fertilizer usage should be avoided. If deemed necessary, slow release fertilizer should be used. Fertilizer may be used to begin the establishment of

vegetation in bare or damaged areas, but should not be applied on a regular basis unless necessary.

Deicing Agents

Deicing agents should be used in accordance with the following:

- Use sand as the primary agent for parking lot safety during ice and snow conditions.
- Use de-icing or anti-caking agents, added to enhance performance and application characteristics of sand mixtures, only as necessary and at minimum application rates.
- Maintain a Deicing Log to track the amount and type of deicing materials applied to the site.

Snow Management

Snow storage areas shall be maintained as follows:

- Snow storage areas will be managed to prevent blockage of storm drain catch basins. Snow combined with sand and debris may block a storm drainage system, diminishing the infiltration capacity of the system and causing localized flooding.
- Sand and debris deposited on vegetated or paved areas shall be cleared from the site and properly disposed of at the end of the snow season, no later than May 15.
- Snow shall not be dumped into any water body, pond, wetland resource area or stormwater detention basin.

Catch Basins

The proposed catch basins are constructed with sumps (minimum 3 feet) to trap debris, sediments, and floating contaminants. Disposal of all sediments must be in accordance with applicable local, state, and federal guidelines.

- Inspect catch basins at least two times per year and clean a minimum of once per year.
- Sediment greater than half the sump depth and/or floatable pollutants shall be pumped from the basin and disposed of at an approved offsite facility in accordance with all applicable regulations.

- Any structural damage or other indication of malfunction will be reported to the site manager and repaired as necessary.
- During colder periods, the catch basin grates must be kept free from snow and ice.
- During warmer periods, the catch basin grates must be kept free of leaves, litter, sand and debris.

Storm Drain Manholes

- Inspect at least once annually for clogging or sediment accumulation and clean as needed to ensure proper stormwater conveyance.

Invasive Plant Species Control

- Invasive plant species are alien or non-native plants which have been moved by people from their native habitat to a new area. Some exotic plants are imported for human use such as landscaping, erosion control or food crops; or arrive as "hitchhikers" among shipments of other plants, seeds, packing materials, or fresh produce. Some of these exotic plants become invasive and cause harm by:
  - becoming weedy and overgrown;
  - killing established shade trees;
  - obstructing pipes and drainage systems;
  - forming dense beds in water;
  - lowering water levels in lakes, streams and wetlands;
  - destroying natural communities;
  - promoting erosion on stream banks and hillsides; and
  - resisting control except by hazardous chemical.
- As part of the routine inspections of the drainage system and stormwater outfalls, the site should be checked for the presence of invasive plant species as defined by the New Hampshire Department of Agriculture, Markets & Food (a list is provide at the end of this manual).
- If invasive plant species are found to be present they should be controlled as described in the "Control of Invasive Plants" document prepared by the NH Department of Agriculture, Markets & Food. A copy is provided at the end of this manual.

Record Keeping

- Inspections of the stormwater management system shall be conducted in accordance with the Inspection & Maintenance Checklist provided in this Manual.
- An Inspection & Maintenance Log shall be completed for each inspection and maintenance activity.
- All record keeping required by the I&M manual shall be maintained by the Responsible Party.
- A deicing log shall be maintained that tracks the amount and type of deicing materials applied to the site.
- Any transfer of responsibility for the I&M activities or transfer of ownership shall be documented to the NHDES Water Division in writing.

Inspection & Maintenance Checklist/Log

The following pages contain an Inspection & Maintenance Checklist, a blank copy of the Stormwater Management System's Inspection & Maintenance Log, and a reduced copy of the Grading and Utility Plans. These forms/plans are provided to assist the applicant with the inspection and maintenance of the Stormwater Management System.

Invasive Species Information

A copy of the New Hampshire Department of Agriculture, Markets & Food's document "Control of Invasive Plants" is provide at the end of this manual.

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Stormwater Management System

Inspection & Maintenance Checklist

BMP/System Component	Minimum Inspection Frequency	Minimum Inspection Requirements	Maintenance/Cleanout Threshold
Source Control	Routinely	Inspect outdoor waste receptacles areas for spillage. Inspect and clear litter from parking area, islands and perimeter landscape areas.	Clean as required.
Deicing Agents	N/A	N/A	Use sand as primary agent for site roadway and parking safety during winter.

Inspection & Maintenance Checklist

Closed Drainage System			
Catch Basins	2 times per year	Check for sediment accumulation. Check for floatable contaminants.	≥ 2 ft. sediment depth. ≥ 3 in. floatable depth.
Storm Drain Manholes	1 time per 2 years	Check for sediment accumulation.	≥ 3 in. sediment depth.
Drainage Pipes	1 time per 2 years	Check for sediment accumulation/clogging.	≥ 2 in. sediment depth.
Surface Sand Filter	1 time per year	Check for sediment accumulation.	≥ 2 in. sediment depth.
Outlet Control Structure	2 times per year	Check for sediment accumulation/clogging	Clean/repair as needed.

Stormwater Management System

Inspection & Maintenance Log

BMP/System Component	Date Inspected	Inspector	Cleaning/Repair Needed *(List Items/Comments)*	Date of Cleaning/Repair	Performed By

Stormwater Management System

Inspection & Maintenance Log

BMP/System Component	Date Inspected	Inspector	Cleaning/Repair Needed *(List Items/Comments)*	Date of Cleaning/Repair	Performed By

Notes:

Stormwater Management System

Deicing Log

Date	Type	Location/Amount	Name(s) of Maintenance Personnel

Control of Invasive Plants

New Hampshire Department of Agriculture, Markets & Food
Douglas Cygan
603-271-3488
doug.cygan@agr.nh.gov

This guide lists garden plants and weeds which are already causing significant changes to natural areas in the Mid-Atlantic. **Measures for controlling each species are indicated by number, e.g., (3), in the text with a full explanation at the end of this article.** Click on the word Control: to jump to that section. Then click your "back" button to return to the text. Following each section suggested alternative plants are given. These alternatives are native plants, well adapted and needing little care, attractive to birds and butterflies, and an important part of the food web for our indigenous species.

INVASIVE TREES

NORWAY MAPLE (*Acer platanoides*) has large leaves similar to sugar maple. To easily confirm that the plant is Norway maple, break off a leaf and if it's truly Norway maple it will exude milky white sap. Fall foliage is yellow. (Exception: cultivars such as 'Crimson King,' which have red leaves in spring or summer, may have red autumn leaves.) The leaves turn color late, usually in late October after native trees have dropped their foliage. This tree suppresses growth of grass, garden plants, and forest understory beneath it, at least as far as the drip-line. Its wind-borne seeds can germinate and grow in deep shade. The presence of young Norway maples in our woodlands is increasing.
Control: (1); (7), (8), (9), or (10); (11) in mid-October to early November, before the leaves turn color.

TREE OF HEAVEN (*Ailanthus altissima*), is incredibly tough and can grow in the poorest conditions. It produces huge quantities of wind-borne seeds, grows rapidly, and secretes a toxin that kills other plants. Its long compound leaves, with 11-25 lance-shaped leaflets, smell like peanut butter or burnt coffee when crushed. Once established, this tree cannot be removed by mechanical means alone.
Control: (1) - seedlings only. Herbicide - use Garlon 3a (9) with no more than a 1" gap between cuts, or (10); plus (11) on re-growth. Or paint bottom 12" of bark with Garlon 4 Ultra (in February or March to protect surrounding plants). USE MAXIMUM STRENGTH SPECIFIED ON LABEL for all herbicide applications on Ailanthus. Glyphosate is not effective against Ailanthus.

INVASIVE SHRUBS

AUTUMN OLIVE (*Eleagnus umbellata*): Formerly recommended for erosion control and wildlife value, these have proved highly invasive and diminish the overall quality of wildlife habitat.
Control: (1) - up to 4" diameter trunks; (7) or (10) or bury stump. Do not mow.
MULTIFLORA ROSE (*Rosa multiflora*), formerly recommended for erosion control, hedges, and wildlife habitat, becomes a huge shrub that chokes out all other vegetation and is too dense for many species of birds to nest in, though a few favor it. In shade, it grows up trees like a vine. It is covered with white flowers in June. (Our native roses have fewer flowers, mostly pink.) Distinguish multiflora by its size, and by the presence of very hard, curved thorns, and a fringed edge to the leaf stalk.
Control: (1) - pull seedlings, dig out larger plants at least 6" from the crown and 6" down; (4) on extensive infestations; (10) or (11). It may remain green in winter, so herbicide may *applied when other plants are dormant. For foliar application, mix Rodeo with extra sticker-spreader, or use Roundup Sure Shot Foam on small plants.*

BUSH HONEYSUCKLES (*Lonicera spp.*), including Belle, Amur, Morrow's, and Tatarian honeysuckle. (In our region, assume that any honeysuckle is exotic unless it is a scarlet-flowered vine). Bush honeysuckles create denser shade than native shrubs, reducing plant diversity and eliminating nest sites for many forest interior species.
Control: (2) on ornamentals; (1); on shady sites only, brush cut in early spring and again in early fall (3); (4) during the growing season; (7); or (10) late in the growing season.

BLUNT-LEAVED PRIVET (*Ligustrum* obtusifolium). *Control*: (1); (7) or (10); or trim off all flowers. Do not cut back or mow.

BURNING BUSH, WINGED EUONYMUS (*Euonymus alatus*), identified by wide, corky wings on the branches.
Control: (1); (7) or (10); or trim off all flowers.

JAPANESE BARBERRY (*Berberis thunbergii*), and all cultivars and varieties.
Control: (1); (7) or (10); or trim off all flowers.

INVASIVE WOODY VINES

All of these vines shade out the shrubs and young trees of the forest understory, eventually killing them, and changing the open structure of the forest into a dense tangle. DO NOT PLANT NEXT TO OPEN SPACE.

JAPANESE HONEYSUCKLE (*Lonicera japonica*), including Hall's honeysuckle, has gold-and-white flowers with a heavenly scent and sweet nectar in June. This is probably the familiar honeysuckle of your childhood. It is a rampant grower that spirals around trees, often strangling them.
Control: (1); (3); (10); (11) in fall or early spring when native vegetation is dormant. Plan to re-treat repeatedly.

ORIENTAL BITTERSWEET (*Celastrus orbiculatus*) has almost completely displaced American bittersweet (*C. scandens*). The Asian plant has its flowers and bright orange seed capsules in clusters all along the stem, while the native species bears them only at the branch tips.
Control: (1); keep ornamental plants cut back, remove all fruits as soon as they open, and bag or burn fruits; to eradicate use Garlon 3a (10).

JAPANESE KNOTWEED, MEXICAN BAMBOO (*Polygonum cuspidatum*) can grow in shade. The stems have knotty joints, reminiscent of bamboo. It grows 6-10' tall and has large pointed oval or triangular leaves.
Control: Cut at least 3 times each growing season and/or treat with Rodeo (10) or (11). In gardens, heavy mulch or dense shade may kill it.

INVASIVE HERBACEOUS PLANTS

GARLIC MUSTARD (*Alliaria petiolata*, *A. officinalis*), a white-flowered biennial with rough, scalloped leaves (kidney-, heart- or arrow-shaped), recognizable by the smell of garlic and taste of mustard when its leaves are crushed. (The odor fades by fall.)
Control: Pull before it flowers in spring (1), removing crown and roots. Tamp down soil afterwards. Once it has flowered, cut (2), being careful not to scatter seed, then bag and burn or send to the landfill. (11) may be appropriate in some settings.

JAPANESE STILT GRASS (*Microstegium vimineum*) can be identified by its lime-green color and a line of silvery hairs down the middle of the 2-3" long blade. It tolerates sun or dense shade and quickly invades areas left bare or disturbed by tilling or flooding. An annual grass, it builds up a large seed bank in the soil.
Control: Easily pulled in early to mid-summer (1) - be sure to pull before it goes to seed. If seeds have formed, bag and burn or send to landfill. Mowing weekly or when it has just begun to flower may prevent it from setting seed (3). Use glyphosate (11) or herbicidal soap (less effective) on large infestations. Follow up with (5) in spring.

MILE-A-MINUTE VINE, DEVIL'S TAIL TEARTHUMB (*Polygonum perfoliatum*), a rapidly growing annual vine with triangular leaves, barbed stems, and turquoise berries in August which are spread by birds. It quickly covers and shades out herbaceous plants.
Control: same as for stilt grass.

SPOTTED KNAPWEED (*Centaurea maculosa*), a biennial with thistle-like flowers.
Control: Do NOT pull (1) unless the plant is young and the ground is very soft - the tap root will break off and produce several new plants. Wear sturdy gloves. (2); (6); (10) or (11).

CONTROL MEASURES

(1) PULL seedlings and small or shallow-rooted plants when soil is moist. Dig out larger plants, including the root systems. Use a forked spade or weed wrench for trees or shrubs.
(2) DEADHEAD to prevent spread of seeds of invasive plants. Cut off seeds or fruits before they ripen. Bag, and burn or send to a landfill.
(3) MOW or CUTTING at least 4 times a season to deplete plants' store of nutrients and carbohydrates, reduce seed formation, and kill or minimize spread of plants. If necessary, repeat each year.
(4) CONTROLLED BURNING during the spring, repeated over several years, allows native vegetation to compete more effectively with the invasive species. This requires a permit. Spot treatment with glyphosate in late fall can be used to make this method more effective.
(5) Use a CORN-BASED PRE-EMERGENCE HERBICIDE on annual weeds. This product is also an organic fertilizer, i.e., it can stimulate growth of existing plants, including weeds, so it is appropriate for lawns and gardens but may not be appropriate in woodlands.
(6) In lawns, SPOT TREAT with BROAD-LEAF WEEDKILLER. Good lawn-care practices (test soil; use lime and fertilizer only when soil test shows a need; mow high and frequently; leave clippings on lawn) reduce weed infestations.
(7) CUT DOWN the tree. Grind out the stump, or clip off re-growth.
(8) GIRDLE tree: cut through the bark and growing layer (cambium) all around the trunk, about 6" above the ground. Girdling is most effective in spring when the sap is rising, and from middle to late summer when the tree is sending down food to the roots. Clip off sucker sprouts.
(9)) FRILL: Using a machete, hatchet or similar device, hack scars (several holes in larger trees) downward into the cambium layer, and squirt in glyphosate (or triclopyr if recommended in text above). Follow label directions for Injection and Frill Applications. This is most effective from middle to late summer. Clip off any sucker sprouts or treat with glyphosate.
(10) CUT STEM / CUT STUMP WITH GLYPHOSATE (or triclopyr if specified above). Follow label directions for Cut Stump Application. Clip off sucker sprouts or paint with glyphosate. See Note on Herbicides.
(11) OLIAR SPRAY WITH GLYPHOSATE herbicide (see Note on Herbicides). Use a backpack or garden sprayer or mist blower, following label directions. Avoid overspray and/or dripping onto non-target plants, because glyphosate kills most plants except moss. If it rolls off waxy or grass-like foliage, use additional sticker-spreader. Deciduous trees, shrubs, and perennials move nutrients down to the roots in late summer. Glyphosate is particularly effective at this time and when plants have just gone out of flowering. Several invasive species retain their foliage after native plants have lost theirs, and resume growth earlier in spring than most natives. This allows you to treat them without harming the natives. However, the plant must be actively growing for the herbicide to work. Retreatments may be necessary the following year if suckering occurs or the plant hasn't been entirely killed.

NOTE ON HERBICIDES: It is highly recommended that small populations try to be controlled using non-chemical methods wherever feasible. However, for large infestations, and for a few plants specified above, herbicide use is essential. Apply herbicides carefully to avoid non-target plants, glyphosate is the least environmentally damaging herbicide in most cases. Add food coloring for visibility, and a soap-based sticker such as Cide-Kick. Glyphosate is ineffective on some plants; for these, triclopyr (Garlon) may be indicated. When using herbicides, read the entire label and observe all precautions listed, including proper disposal. If in doubt, call your local Cooperative Extension Service.