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Stormwater Management Report

For

The Residences at Stow Acres

Randall Road

Stow, MA

December 12, 2023

Applicant:

MCO & Associates, Inc.

P.O. Box 372

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Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

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



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

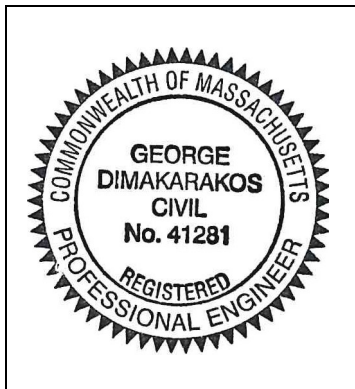
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



12/15/2023

Signature and Date

Checklist

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

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



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static
 - Simple Dynamic
 - Dynamic Field¹
- Runoff from all impervious areas at the site discharging to the infiltration BMP.
- Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - Site is comprised solely of C and D soils and/or bedrock at the land surface
 - M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - Solid Waste Landfill pursuant to 310 CMR 19.000
 - Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

Standard 4: Water Quality

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

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



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

Standard 6: Critical Areas

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



Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 9: Operation and Maintenance Plan

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

Standard 10: Prohibition of Illicit Discharges

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

Narrative

**Stormwater Management Narrative
The Residences at Stow Acres
December 12, 2023**

The project site is located on Randall Road, on a portion of the existing “North Course” of Stow Acres Country Club. The development parcel contains approximately 69 acres. The surface coverage of the site is that of a typical golf course, including grass, paved cart paths, gravel cart paths, sand bunkers, and wooded area. There is Bordering Vegetated Wetland (BVW) around the perimeter of much of the site. The Natural Resource Conservation Service (N.R.C.S.) soil survey report for Middlesex Country indicates the presence of Merrimac fine sandy loam, Hinckley loamy sand, and Deerfield loamy sand, all Hydrologic Soil Group (HSG) A; Scarboro mucky fine sandy loam, of HDG D; and Paxton fine sandy loam and Woodbridge fine sandy loam, both of HSG C.

The proposed project is for the construction of a residential development, consisting of 164 single-family dwellings and one 25-unit apartment building. A series of dead-end alleys are looped roadways are proposed to access the proposed dwellings and, in some instances, their detached garages. A clubhouse area is also proposed to serve the proposed residential community.

Pre-Development

The 69± ac. site currently contains the “North Course” at Stow Acres Country Club. There is Bordering Vegetated Wetland across the site that projects 100’ Buffer Zone onto portions of the property. There is an unnamed stream offsite that projects 200’ Riverfront Area onto the southwest corner of the property. The site coverage is primarily grass and wooded area, with gravel and paved cart paths located throughout. The site has been divided into 9 subcatchments, shown on the Pre-Development Drainage Map, and described below.

Subcatchment E-1

Subcatchment E-1A contains the most southeastern portion of the project site and offsite area. This subcatchments divide is drawn coincident to the soil divide where soil in HSG C meets soil in HSG A, because there are wetlands located at the toe of the steeper slopes along the eastern property line. Subcatchment E-1A contains the area that consists of soil in HG C. The vegetative coverage on the project site is primarily lawn and wooded area. Runoff from this subcatchment drains to onsite BVW, through which it is conveyed via culverts towards the BVW located along the western edge of the property.

Subcatchment E-1B is located west of Subcatchment E-1A and contains grass, woods, and some offsite area. Runoff from this subcatchment combines with runoff from Subcatchment E-1A to drain to the nearby BVW, from which it drains to BVW on the west side of the property via a culvert.

Subcatchment E-1C is located along the west side of the property. This subcatchments contains grass, wooded area, and some offsite area. The offsite area draining onto the site in this subcatchment contains a portion of the existing “North Course” that will remain. Runoff from this subcatchments Combines with Subcatchments E-1A and E-1B to drain to the BVW located on the west side of the property.

Subcatchment E-1D is located in the approximate middle of the site and is entirely contained within the development parcel. Runoff from this subcatchment drains to an onsite depression. The drainage analysis demonstrates that this onsite depression does not overflow during the 100-year storm event, however the outflow from this depression would combine with runoff from Subcatchments E-1A, E-1B, and E-1C to drain to the BVW on the west side of the property.

Subcatchment E-2

Subcatchment E-2 is located in the northwest portion of the site and contains grass and wooded area. Runoff from this subcatchment drains to nearby BVW.

Subcatchment E-3

Subcatchment E-3 is located in the northwest portion of the site and contains grass and wooded area. Runoff from this subcatchment drains to the BVW that it surrounds, from which it is conveyed via a culvert to BVW located north of the site.

Subcatchment E-4

Subcatchment E-4 is located in the northeastern portion of the site and contains grass and wooded area. Runoff from this subcatchment drains to the BVW located to the north of the project site.

Subcatchment E-5

Subcatchment E-5 is located in the northeast portion of the site and contains grass and wooded area. Runoff from this subcatchment drains to the abutting property to the north.

Subcatchment E-6

Subcatchment E-6 is located in the northeast portion of the site and contains grass and wooded area. Runoff from this subcatchment drains to BVW that is located onsite. This BVW has been observed overflowing onto the project site towards the depression located within Subcatchment E-1D after sustained periods of intense rainfall. This overflow has not been accounted for in the drainage analysis as it does not appear to be a regular occurrence.

Post Development

The proposed project is for the construction of 164 single family dwellings, a 25-unit apartment building, and associated roadways and parking. A clubhouse area is also proposed to serve the proposed residential community. The attached calculations demonstrate a decrease in peak runoff rates for the 2, 10, 25, and 100 year storms.

Subcatchment P-1

Subcatchment P-1A is located in the northeast corner of the main road loop (Stow Acres Drive) and contains lawn and pavement area. Runoff from this subcatchment is collected via a series of deep-sump hooded catch basins and directed to Infiltration Basin 1A (IB-1A), where it will be treated and infiltrated. IB-1A is provided with an overflow that drains to Infiltration Basin 1B (IB-1B).

Subcatchment P-1B is located south of Subcatchment P-1A and contains lawn and pavement area. Runoff from this subcatchment is collected via a series of deep-sump hooded catch basins and directed to IB-1B, where it will be treated and infiltrated. IB-1B is provided with an overflow that drains to Infiltration Basin 1C (IB-1C).

Subcatchment P-1C is located south of Subcatchment P-1B and contains lawn and pavement area. Runoff from this subcatchment is collected via a series of deep-sump hooded catch basins and directed to IB-1C, where it will be treated and infiltrated. IB-1C is provided with an overflow that drains to Infiltration Basin 1D (IB-1D).

Subcatchment P-1D is located south of Subcatchment P-1C and contains lawn and pavement area. Runoff from this subcatchment is collected via a series of deep-sump hooded catch basins and directed to IB-1D, where it will be treated and infiltrated. IB-1D is provided with an overflow that drains to Infiltration Basin 1E (IB-1E).

Subcatchment P-1E is located south of Subcatchment P-1D and contains lawn and pavement area. Runoff from this subcatchment is collected via a series of deep-sump hooded catch basins and directed to IB-1E, where it will be treated and infiltrated. IB-1E has been designed to infiltrate the 2, 10, 25, and 100-year design storms. IB-1E is provided with an overflow that drains towards the Bordering Vegetated Wetland located in the southwest corner of the property.

Subcatchment P-1F is located on the west side of the property and contains lawn and pavement area, including a portion of the proposed Stow Acres Drive. Runoff from this subcatchment is collected via a series of deep-sump hooded catch basins and directed to Infiltration Basin 1F (IB-1F), where it will be treated and infiltrated. IB-1F is provided with an overflow that drains to Infiltration Basin 1G (IB-1G).

Subcatchment P-1G is located south of Subcatchment P-1F and contains lawn and pavement area. Runoff from this subcatchment is collected via a series of deep-sump hooded catch basins and directed to IB-1G, where it will be treated and infiltrated. IB-1G has been designed to infiltrate the 2, 10, and 25-year design storms. IB-1G is provided with an overflow that drains towards the Bordering Vegetated Wetland located in the southwest corner of the property.

Subcatchment P-1H is located in the southern part of the site and contains lawn and pavement area. Runoff from this subcatchments is collected via deep-sump hooded catch basins and direction to the proposed Subsurface Chambers 1H (SC-1H) where it will be treated and infiltrated. SC-1H is designed to infiltrate the 2, 10, and 25-year design storms. SC-1H is provided with an overflow where it will drain to the BVW located southwest of the project site.

Subcatchment P-1I is located in the southern part of the site and contains lawn and pavement area, including a portion of the proposed access drive to serve the proposed clubhouse area. Runoff from this subcatchments is collected via deep-sump hooded catch basins and direction to the proposed Subsurface Chambers 1I (SC-1I) where it will be treated and infiltrated. SC-1I is designed to infiltrate the 2-year design storm. SC-1I is provided with an overflow where it will drain to the BVW located southwest of the project site.

Subcatchment P-1J is located in the southern part of the site and contains lawn, pavement area, and the proposed clubhouse building. Runoff from this subcatchments is collected via deep-sump hooded catch basins and direction to the proposed Subsurface Chambers 1J (SC-1J) where it will be treated and infiltrated. SC-1J is designed to infiltrate the 2-year design storm. SC-1I is provided with an overflow where it will drain to a BVW located in the southern portion of the site.

Subcatchment P-1K near the southwest corner of the site and contains lawn, wooded area, and offsite area. Runoff from this subcatchment drains to BVW located in the south/southeast corner of the project site, where it is conveyed via culverts to the BVW located southwest of the project site.

Subcatchment P-1L is located in the southwest corner of the site and contains lawn area. Runoff from this subcatchment drains to the BVW located in the south/southeast corner of the project site, where it is conveyed via culverts to the BVW located southwest of the project site.

The divide between subcatchments P-1K and P-1L has been drawn along the soil divide. Runoff from these subcatchments combines with the overflow from SC-1J to drain to the onsite BVW located in the southern portion of the site. Runoff is conveyed from these BVW to the BVW located to the southwest of the site.

Subcatchment P-1M is located on the west side of the property and contains lawn and wooded area. Runoff from this subcatchment will flow uncontrolled towards the BVW located southwest of the project site.

Runoff conveyed via the onsite BVW (SC-1I, P-1K, and P-1L) combines with runoff from IB-1E, IB-1G, SC-1H, SC-1I, and Subcatchment P-1M to compare to pre-development Subcatchment E-1.

Subcatchment P-2

Subcatchment P-2A is located on the west side of the site, north of Subcatchment P-1F. The subcatchment consists of lawn area, pavement, and roof area from 6 proposed single-family dwellings and their respective detached garages. Runoff from this subcatchment is collected via a deep-sump hooded catch basin where it is directed to Subsurface Chambers 2A (SC-2A) where it will be treated and infiltrated. SC-2A has been designed to infiltrate the 2, 10, and 25-year design storms. An overflow is provided to directed excess runoff towards the BVW located to the west of the subcatchment.

Subcatchment P-2B is located to the west of Subcatchment P-2A and contains lawn and wooded area. Runoff from this subcatchment will flow uncontrolled towards the BVW located to the west. Runoff from this subcatchment combines with the overflow from SC-2A to compare to pre-development Subcatchment E-2.

Subcatchment P-3

Subcatchment P-3A is located in the northern portion of the site and contains lawn area, pavement, and single-family dwellings. Runoff from this subcatchment will be directed to Subsurface Chambers 3A (SC-3A) where it will be treated and infiltrated. SC-3A has been designed to infiltrate the 2, 10, and 25-year design storms. An overflow is provided to directed excess runoff towards the BVW located to the west of the subcatchment.

Subcatchment P-3B is located in the northern portion of the site and contains lawn area, pavement, and single-family dwellings. Runoff from this subcatchment will be directed to Subsurface Chambers 3B (SC-3B) where it will be treated and infiltrated. SC-3A has been designed to infiltrate the 2, 10, and 25-year, and 100-year design storms. An overflow is provided to directed excess runoff towards the BVW located to the west of the subcatchment.

Subcatchment P-3C is located to the west of Subcatchments P-3A and P-3B and contains lawn and wooded area. Runoff from this subcatchment will flow uncontrolled to an onsite BVW. Runoff from this subcatchment combines with the overflows of SC-3A and SC-3B to compare to Pre-Development Subcatchment E-3.

Subcatchment P-4

Subcatchment P-4A contains the roof area of the northernmost dwelling units, in the cottage area at the rear of the site. Runoff from this subcatchment will be routed to the proposed Roof Drywell 4A (RD-4A), where it will be treated and infiltrated. RD-4A has been designed to infiltrate the 2, 10, 25, and 100-year design storms.

Subcatchment P-4B is located on the north side of the site and contains lawn and wooded area. Runoff from this subcatchment will flow uncontrolled towards the BVW at the rear of the site. This subcatchment compares to pre-development Subcatchment E-4.

Subcatchment P-5

Subcatchment P-5A contains the roof areas of 6 dwelling units in the cottage area. Runoff from this subcatchment will be routed to the proposed Roof Drywell 5A (RD-5A), where it will be treated and infiltrated. RD-5A is designed to infiltrate the 2, 10, 25, and 100-year design storms.

Subcatchment P-5B is located in the northeast corner of the site and contains lawn and wooded area. Runoff from this subcatchment will flow uncontrolled towards the rear property line. This subcatchment compares to pre-development Subcatchment E-5

Subcatchment P-6

Subcatchment P-6A is located north of Subcatchment P-1A and contains dwelling roofs, pavement, and lawn area. Runoff from this subcatchment will be routed to the propose Infiltration Basin 6A (IB-6A). IB-6A has been designed to infiltrate the 2, 10, and 25-year design storms.

Subcatchment P-6B is located on the east side of the site and contains lawn and wooded area. Runoff from this subcatchment will flow uncontrolled towards the BVW located along the property line shared with Butternut Farm Golf Club. Combined with the overflow from IB-6A, this subcatchment compares to pre-development Subcatchment E-6.

Roof Drywells are proposed to individually serve many of the proposed buildings. Five of the proposed cottage units at the rear of the site are proposed to be individually served by Roof Drywell A (RD-A). All 51 units on the outside of the Stow Acres Drive loop are proposed to be individually served by Roof Drywell B (RD-B). 53 units on the interior of the Stow Acres Drive loop are proposed to be individually served by Roof Drywell C (RD-C). Roof Drywell E (RD-E) is proposed to serve the proposed multi-family building. Each of these drywells has been designed to fully infiltrate up to the 100-year design storm.

Standards 1 through 10 of the Massachusetts Department of Environmental Protection Stormwater Management Standards have been met. In addition, the system design will not result in a serious flood hazard during the 100-year storm event. The peak runoff rates have been summarized in the following tables.

Compliance with MA DEP Stormwater Management Standards

Compliance with the Stormwater Management Standards is as follows:

Standard 1: No Untreated Discharges

No new untreated discharges to wetlands are proposed. Runoff from the proposed parking lot will be treated via deep-sump hooded catch basins, isolator rows, and subsurface chambers.

Standard 2: Peak Rate Attenuation

The Post-Development peak discharge rates must not be increased from pre-development rates for the 2-year, 10-year, and 100-year storm events. Also, offsite flood impact from the 100-year storm must not be increased. With a combination of infiltration and detention, the peak runoff rates have been decreased. The peak runoff rates have been summarized in the following tables.

Discharge Summary Tables
 Total Runoff – Subcatchment 1

	2-year Storm		10-year Storm		25-year Storm		100-year Storm	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Peak Flow (cfs)	22.20	21.31	47.74	46.42	66.71	64.70	101.8	95.68
Total Volume (cf)	118,877	114,602	249,424	246,554	382,190	339,291	579,643	499,278

Total Runoff – Subcatchment 2

	2-year Storm		10-year Storm		25-year Storm		100-year Storm	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Peak Flow (cfs)	0.000	0.000	0.122	0.059	0.743	0.400	2.758	2.565
Total Volume (cf)	0.000	0.000	3,189	1,539	8,035	3,878	18,852	10,976

Total Runoff – Subcatchment 3

	2-year Storm		10-year Storm		25-year Storm		100-year Storm	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Peak Flow (cfs)	0.000	0.000	0.017	0.014	0.089	0.071	0.784	0.624
Total Volume (cf)	0.000	0.000	527	419	2,357	1,874	7,324	6,256

Total Runoff – Subcatchment 4

	2-year Storm		10-year Storm		25-year Storm		100-year Storm	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Peak Flow (cfs)	0.000	0.000	0.036	0.029	0.214	0.172	1.023	0.820
Total Volume (cf)	0.000	0.000	976	782	2,868	2,299	7,348	5,891

Total Runoff – Subcatchment 5

	2-year Storm		10-year Storm		25-year Storm		100-year Storm	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Peak Flow (cfs)	0.001	0.000	0.085	0.008	0.465	0.172	1.577	0.197
Total Volume (cf)	6.19	0.000	1,900	215	4,514	542	10,217	1,273

Total Runoff – Subcatchment 6

	2-year Storm		10-year Storm		25-year Storm		100-year Storm	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Peak Flow (cfs)	0.000	0.000	0.147	0.051	0.936	0.347	3.484	1.589
Total Volume (cf)	0.000	0.000	3,815	1,368	9,612	3,695	22,552	9,605

Standard 3: Stormwater Recharge

The proposed subsurface chambers have been sized to infiltrate the required recharge volume, so there will be no loss of annual recharge to groundwater.

Standard 4: Water Quality

The proposed subsurface chambers have been sized to retain the required water quality volume. Deep-sump hooded catch basins, sediment forebays, and isolator rows are proposed to provide the required pre-treatment. Infiltration Basins and Subsurface Infiltration Chambers have been selected due to the TMDL of the Assabet River associated with Phosphorous.

Standard 5: Land Uses with Higher Potential Pollutant Loads

The site proposed will not contain “land uses with higher potential pollutant loads.”

Standard 6: Critical Areas

Much of the site is within Interim Wellhead Protection Areas associated with the proposed water supply. The stormwater management system has been designed to provide the required treatment levels.

Standard 7: Redevelopment

This project is not for redevelopment. This standard would require that the Stormwater Management Standards be met to the extent practicable. The project has been designed to meet all of the standards.

Standard 8: Construction Period Controls

The erosion and sedimentation control measures will be followed in accordance with the requirements of the NPDES Construction General Permit. The project will require coverage under the NPDES Construction General Permit.

Standard 9: Operation and Maintenance Plan

An Operation and Maintenance Plan is included in this report.

Standard 10: Illicit Discharges to Drainage System

An Illicit Discharge Compliance will be provided prior to the discharge of stormwater runoff to the post-construction stormwater BMP's.

Design Basis

1. The United States Department of Agriculture Natural Resource Conservation Service (N.R.C.S.) TR55 methodology was used to determine offsite rates of runoff.
2. The twenty-four hour rainfall, taken from the NOAA Atlas, is 7.83 inches for the 100-year storm, 6.12 inches for the 25-year storm, 5.01 inches for the 10-year storm, and 3.23 inches for the 2-year storm event.
3. The hydrologic calculations were performed using the computer program: “Hydrology Studio” by Hydrology Studio.
4. The soil types of the site were taken from the N.R.C.S. Soil Survey Map for Middlesex County.
5. Soil conditions and estimated seasonal high groundwater table were based on on-site soil evaluations.
6. The Natural Resource Conservation Service (N.R.C.S.) soil survey report for Middlesex County indicates the presence of Merrimac fine sandy loam, Hinckley loamy sand, and Deerfield loamy sand, all Hydrologic Soil Group (HSG) A; Scarboro mucky fine sandy loam, of HDG D; and Paxton fine sandy loam and Woodbridge fine sandy loam, both of HSG C.

SUMMARY TABLE

SM-6781

Project: Stow Acres By PFK Rev Date 12/12/23

Location: Stow, MA Checked _____ Date _____

EX	AREA	CN	TIME OF CONCENTRATION
E-1A	25.26	78	27.5
E-1B	3.82	40	19.9
E-1C	20.69	39	31.4
E-1D	5.88	39	17.0
E-2	5.20	38	17.3
E-3	3.32	33	13.3
E-4	2.37	36	13.3
E-5	2.59	39	18.0
E-6	6.38	38	20.2
TOTAL	75.53		

PROP	AREA	CN	TIME OF CONCENTRATION
P-1A	1.87	58	6.0
P-1B	1.49	63	6.0
P-1C	1.26	60	6.0
P-1D	1.18	60	6.0
P-1E	4.34	65	6.0
RD-E	0.25	98	6.0
P-1F	5.97	55	6.0
P-1G	2.61	64	6.0
P-1H	2.22	61	6.0
P-1I	0.59	81	6.0
P-1J	0.62	85	6.0
P-1K	24.25	78	27.5
P-1L	2.89	40	16.6
P-1M	1.90	47	8.9
P-2A	0.84	70	6.0
P-2B	2.51	38	8.9
P-3A	2.87	66	6.0
P-3B	2.06	68	6.0
P-3C	2.64	33	13.3
P-4A	0.26	98	6.0
P-4B	1.90	36	13.3
P-5A	0.13	98	6.0
P-5B	0.36	38	13.5
P-6A	2.30	54	6.0
P-6B	2.91	37	13.7
RD-A	0.13	98	6.0
RD-B	2.98	98	6.0
RD-C	2.18	98	6.0
TOTAL	75.53		

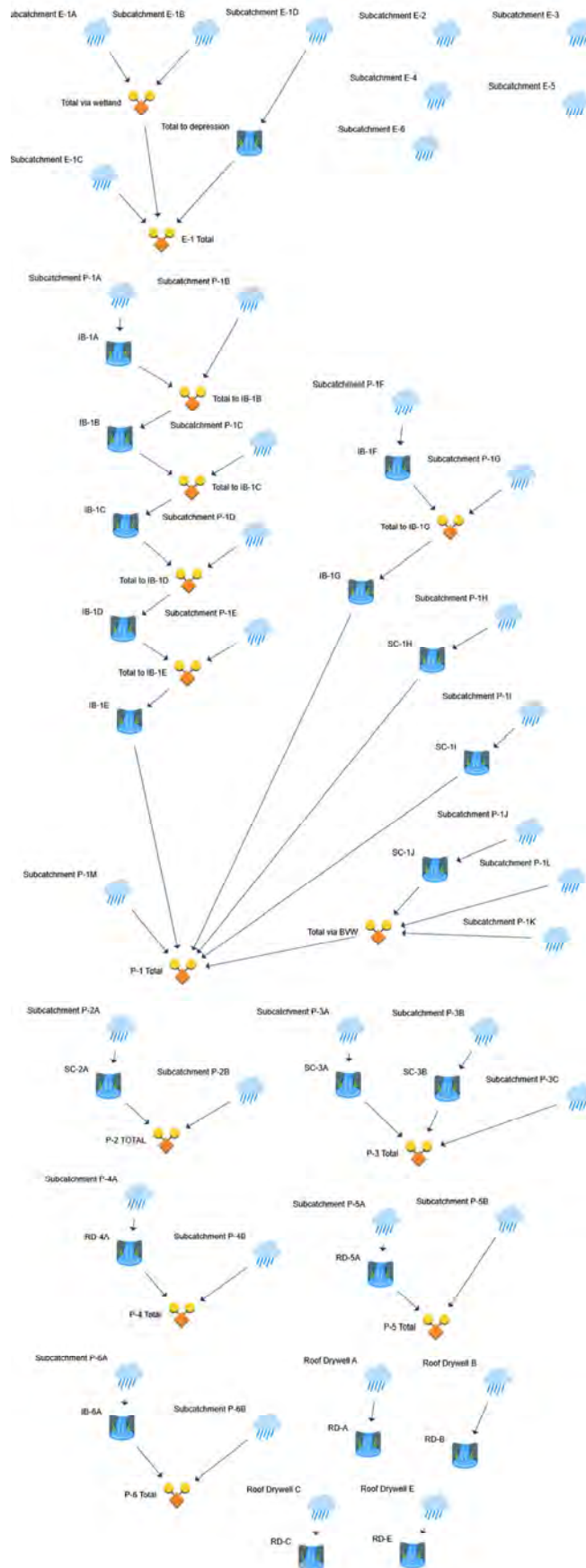
5 units
51 units
53 units

Basin Model

Hydrology Studio v 3.0.0.29

Project Name:

12-13-2023



Pre-Development Hydrology

Hydrograph 2-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	NRCS Runoff	Subcatchment E-1A	22.20	12.37	118,779	---		
2	NRCS Runoff	Subcatchment E-1B	0.003	23.90	48.2	---		
3	Junction	Total via wetland	22.20	12.37	118,827	1, 2		
4	NRCS Runoff	Subcatchment E-1C	0.007	24.00	50.5	---		
5	NRCS Runoff	Subcatchment E-1D	0.002	24.00	14.0	---		
6	Pond Route	Total to depression	0.000	0.00	0.000	5	224.00	14.0
7	Junction	E-1 Total	22.20	12.37	118,877	3, 4, 6		
8	NRCS Runoff	Subcatchment E-2	0.000	0.00	0.000	---		
9	NRCS Runoff	Subcatchment E-3	0.000	0.00	0.000	---		
10	NRCS Runoff	Subcatchment E-4	0.000	0.00	0.000	---		
11	NRCS Runoff	Subcatchment E-5	0.001	24.00	6.19	---		
12	NRCS Runoff	Subcatchment E-6	0.000	0.00	0.000	---		
14	NRCS Runoff	Subcatchment P-1A	0.359	12.13	2,237	---		
15	Pond Route	IB-1A	0.000	12.57	0.000	14	228.56	92.2
16	NRCS Runoff	Subcatchment P-1B	0.653	12.10	2,702	---		
17	Junction	Total to IB-1B	0.653	12.10	2,702	15, 16		
18	Pond Route	IB-1B	0.000	12.43	0.006	17	227.25	379
19	NRCS Runoff	Subcatchment P-1C	0.361	12.10	1,801	---		
20	Junction	Total to IB-1C	0.361	12.10	1,801	18, 19		
21	Pond Route	IB-1C	0.000	12.40	0.000	20	223.26	231
22	NRCS Runoff	Subcatchment P-1D	0.338	12.10	1,687	---		
23	Junction	Total to IB-1D	0.338	12.10	1,687	21, 22		
24	Pond Route	IB-1D	0.000	0.00	0.000	23	223.16	171
25	NRCS Runoff	Subcatchment P-1E	2.365	12.10	9,083	---		
26	Junction	Total to IB-1E	2.365	12.10	9,083	24, 25		
27	Pond Route	IB-1E	0.000	12.03	0.005	26	221.39	1,703
28	NRCS Runoff	Subcatchment P-1F	0.618	12.30	5,277	---		
29	Pond Route	IB-1F	0.000	12.50	0.000	28	222.06	298
30	NRCS Runoff	Subcatchment P-1G	1.282	12.10	5,091	---		
31	Junction	Total to IB-1G	1.282	12.10	5,091	29, 30		
32	Pond Route	IB-1G	0.000	12.47	-0.003	31	219.30	794
34	NRCS Runoff	Subcatchment P-1H	0.746	12.10	3,447	---		
35	Pond Route	SC-1H	0.000	12.70	0.000	34	217.02	34.7
36	NRCS Runoff	Subcatchment P-1I	0.998	12.07	2,997	---		

Hydrograph 2-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
37	Pond Route	SC-1I	0.000	11.07	0.000	36	218.37	1,184
38	NRCS Runoff	Subcatchment P-1J	1.259	12.07	3,763	---		
39	Pond Route	SC-1J	0.000	11.67	0.000	38	222.22	675
40	NRCS Runoff	Subcatchment P-1K	21.31	12.37	114,029	---		
41	NRCS Runoff	Subcatchment P-1L	0.002	23.83	37.6	---		
42	Junction	Total via BVW	21.31	12.37	114,067	39, 40, 41		
43	NRCS Runoff	Subcatchment P-1M	0.020	14.73	535	---		
44	Junction	P-1 Total	21.31	12.37	114,602	27, 32, 35, 37, 42, 43		
46	NRCS Runoff	Subcatchment P-2A	0.726	12.07	2,417	---		
47	Pond Route	SC-2A	0.000	17.37	0.000	46	224.73	376
48	NRCS Runoff	Subcatchment P-2B	0.000	0.00	0.000	---		
49	Junction	P-2 TOTAL	0.000	17.37	0.000	47, 48		
51	NRCS Runoff	Subcatchment P-3A	1.738	12.07	6,429	---		
52	Pond Route	SC-3A	0.000	13.17	0.000	51	225.46	416
53	NRCS Runoff	Subcatchment P-3B	1.508	12.07	5,250	---		
54	Pond Route	SC-3B	0.000	12.93	0.000	53	221.62	519
55	NRCS Runoff	Subcatchment P-3C	0.000	0.00	0.000	---		
56	Junction	P-3 Total	0.000	12.93	0.000	52, 54, 55		
58	NRCS Runoff	Subcatchment P-4A	0.786	12.07	2,652	---		
59	Pond Route	RD-4A	0.000	10.73	0.000	58	1.83	464
60	NRCS Runoff	Subcatchment P-4B	0.000	0.00	0.000	---		
61	Junction	P-4 Total	0.000	10.73	0.000	59, 60		
63	NRCS Runoff	Subcatchment P-5A	0.393	12.07	1,326	---		
64	Pond Route	RD-5A	0.000	11.53	0.000	63	1.89	244
65	NRCS Runoff	Subcatchment P-5B	0.000	0.00	0.000	---		
66	Junction	P-5 Total	0.000	11.53	0.000	64, 65		
68	NRCS Runoff	Subcatchment P-6A	0.196	12.33	1,815	---		
69	Pond Route	IB-6A	0.000	12.33	0.000	68	228.07	97.2
70	NRCS Runoff	Subcatchment P-6B	0.000	0.00	0.000	---		
71	Junction	P-6 Total	0.000	12.33	0.000	69, 70		

Hydrograph 2-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
73	NRCS Runoff	Roof Drywell A	0.091	12.07	306	---		
74	Pond Route	RD-A	0.000	11.40	0.000	73	1.95	53.9
76	NRCS Runoff	Roof Drywell B	0.175	12.07	592	---		
77	Pond Route	RD-B	0.000	10.60	0.000	76	2.03	106
79	NRCS Runoff	Roof Drywell C	0.121	12.07	408	---		
80	Pond Route	RD-C	0.000	11.53	0.000	79	1.91	66.3
82	NRCS Runoff	Roof Drywell E	0.756	12.07	2,550	---		
83	Pond Route	RD-E	0.000	13.67	0.000	82	222.15	485

Hydrograph 10-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	NRCS Runoff	Subcatchment E-1A	47.74	12.33	249,424	---		
2	NRCS Runoff	Subcatchment E-1B	0.191	12.60	3,293	---		
3	Junction	Total via wetland	47.79	12.33	252,718	1, 2		
4	NRCS Runoff	Subcatchment E-1C	0.658	13.07	15,508	---		
5	NRCS Runoff	Subcatchment E-1D	0.193	12.70	4,313	---		
6	Pond Route	Total to depression	0.000	0.00	0.000	5	225.01	4,313
7	Junction	E-1 Total	47.83	12.33	268,226	3, 4, 6		
8	NRCS Runoff	Subcatchment E-2	0.122	13.80	3,189	---		
9	NRCS Runoff	Subcatchment E-3	0.017	16.93	527	---		
10	NRCS Runoff	Subcatchment E-4	0.036	14.90	976	---		
11	NRCS Runoff	Subcatchment E-5	0.085	12.70	1,900	---		
12	NRCS Runoff	Subcatchment E-6	0.147	13.77	3,815	---		
14	NRCS Runoff	Subcatchment P-1A	2.156	12.07	7,473	---		
15	Pond Route	IB-1A	0.000	13.90	0.000	14	229.63	1,996
16	NRCS Runoff	Subcatchment P-1B	2.402	12.07	7,683	---		
17	Junction	Total to IB-1B	2.402	12.07	7,683	15, 16		
18	Pond Route	IB-1B	0.000	13.10	0.012	17	228.36	2,324
19	NRCS Runoff	Subcatchment P-1C	1.681	12.07	5,604	---		
20	Junction	Total to IB-1C	1.681	12.07	5,604	18, 19		
21	Pond Route	IB-1C	0.000	15.57	-0.002	20	224.50	1,658
22	NRCS Runoff	Subcatchment P-1D	1.574	12.07	5,248	---		
23	Junction	Total to IB-1D	1.574	12.07	5,248	21, 22		
24	Pond Route	IB-1D	0.000	12.17	0.000	23	224.25	1,494
25	NRCS Runoff	Subcatchment P-1E	7.822	12.07	24,520	---		
26	Junction	Total to IB-1E	7.822	12.07	24,520	24, 25		
27	Pond Route	IB-1E	0.000	15.17	0.005	26	222.48	7,690
28	NRCS Runoff	Subcatchment P-1F	5.302	12.07	20,010	---		
29	Pond Route	IB-1F	0.000	12.33	0.000	28	223.06	5,000
30	NRCS Runoff	Subcatchment P-1G	4.455	12.07	14,097	---		
31	Junction	Total to IB-1G	4.455	12.07	14,097	29, 30		
32	Pond Route	IB-1G	0.000	16.33	-0.004	31	220.43	4,363
34	NRCS Runoff	Subcatchment P-1H	3.166	12.07	10,389	---		
35	Pond Route	SC-1H	0.000	11.63	0.000	34	218.04	2,260
36	NRCS Runoff	Subcatchment P-1I	2.007	12.07	6,012	---		

Hydrograph 10-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
37	Pond Route	SC-1I	0.281	12.50	806	36	219.76	2,478
38	NRCS Runoff	Subcatchment P-1J	2.354	12.07	7,126	---		
39	Pond Route	SC-1J	0.000	11.47	0.000	38	223.22	2,076
40	NRCS Runoff	Subcatchment P-1K	45.83	12.33	239,451	---		
41	NRCS Runoff	Subcatchment P-1L	0.165	12.50	2,570	---		
42	Junction	Total via BVW	45.91	12.33	242,021	39, 40, 41		
43	NRCS Runoff	Subcatchment P-1M	0.546	12.20	3,727	---		
44	Junction	P-1 Total	46.42	12.33	246,554	27, 32, 35, 37, 42, 43		
46	NRCS Runoff	Subcatchment P-2A	1.924	12.07	5,842	---		
47	Pond Route	SC-2A	0.000	11.63	0.000	46	226.38	1,882
48	NRCS Runoff	Subcatchment P-2B	0.059	13.70	1,539	---		
49	Junction	P-2 TOTAL	0.059	13.70	1,539	47, 48		
51	NRCS Runoff	Subcatchment P-3A	5.448	12.07	16,941	---		
52	Pond Route	SC-3A	0.000	11.77	0.000	51	226.72	4,404
53	NRCS Runoff	Subcatchment P-3B	4.311	12.07	13,227	---		
54	Pond Route	SC-3B	0.000	12.53	0.000	53	222.96	3,724
55	NRCS Runoff	Subcatchment P-3C	0.014	16.93	419	---		
56	Junction	P-3 Total	0.014	16.93	419	52, 54, 55		
58	NRCS Runoff	Subcatchment P-4A	1.228	12.07	4,223	---		
59	Pond Route	RD-4A	0.000	11.27	0.000	58	2.60	1,040
60	NRCS Runoff	Subcatchment P-4B	0.029	14.90	782	---		
61	Junction	P-4 Total	0.029	14.90	782	59, 60		
63	NRCS Runoff	Subcatchment P-5A	0.614	12.07	2,112	---		
64	Pond Route	RD-5A	0.000	9.40	0.000	63	2.69	532
65	NRCS Runoff	Subcatchment P-5B	0.008	13.77	215	---		
66	Junction	P-5 Total	0.008	13.77	215	64, 65		
68	NRCS Runoff	Subcatchment P-6A	1.857	12.10	7,236	---		
69	Pond Route	IB-6A	0.000	12.47	0.001	68	229.14	1,796
70	NRCS Runoff	Subcatchment P-6B	0.051	14.53	1,368	---		
71	Junction	P-6 Total	0.051	14.53	1,368	69, 70		

Hydrograph 10-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
73	NRCS Runoff	Roof Drywell A	0.142	12.07	487	---		
74	Pond Route	RD-A	0.000	10.93	0.000	73	2.80	114
76	NRCS Runoff	Roof Drywell B	0.274	12.07	942	---		
77	Pond Route	RD-B	0.000	9.13	0.000	76	2.91	230
79	NRCS Runoff	Roof Drywell C	0.189	12.07	650	---		
80	Pond Route	RD-C	0.000	11.03	0.000	79	2.67	148
82	NRCS Runoff	Roof Drywell E	1.181	12.07	4,061	---		
83	Pond Route	RD-E	0.000	11.10	0.000	82	222.96	1,051

Hydrograph 25-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	NRCS Runoff	Subcatchment E-1A	64.68	12.33	337,902	---		
2	NRCS Runoff	Subcatchment E-1B	0.842	12.47	7,446	---		
3	Junction	Total via wetland	65.39	12.33	345,348	1, 2		
4	NRCS Runoff	Subcatchment E-1C	3.082	12.70	36,842	---		
5	NRCS Runoff	Subcatchment E-1D	1.056	12.50	10,247	---		
6	Pond Route	Total to depression	0.000	0.00	0.000	5	225.38	10,247
7	Junction	E-1 Total	66.71	12.33	382,190	3, 4, 6		
8	NRCS Runoff	Subcatchment E-2	0.743	12.50	8,035	---		
9	NRCS Runoff	Subcatchment E-3	0.089	13.80	2,357	---		
10	NRCS Runoff	Subcatchment E-4	0.214	12.47	2,868	---		
11	NRCS Runoff	Subcatchment E-5	0.465	12.50	4,514	---		
12	NRCS Runoff	Subcatchment E-6	0.936	12.47	9,612	---		
14	NRCS Runoff	Subcatchment P-1A	3.636	12.07	11,659	---		
15	Pond Route	IB-1A	0.000	15.23	-0.001	14	230.49	3,903
16	NRCS Runoff	Subcatchment P-1B	3.726	12.07	11,463	---		
17	Junction	Total to IB-1B	3.726	12.07	11,463	15, 16		
18	Pond Route	IB-1B	0.000	15.30	0.006	17	229.04	3,920
19	NRCS Runoff	Subcatchment P-1C	2.729	12.07	8,578	---		
20	Junction	Total to IB-1C	2.729	12.07	8,578	18, 19		
21	Pond Route	IB-1C	0.000	12.30	0.000	20	225.19	2,889
22	NRCS Runoff	Subcatchment P-1D	2.556	12.07	8,033	---		
23	Junction	Total to IB-1D	2.556	12.07	8,033	21, 22		
24	Pond Route	IB-1D	0.000	12.40	0.001	23	224.89	2,629
25	NRCS Runoff	Subcatchment P-1E	11.83	12.07	36,022	---		
26	Junction	Total to IB-1E	11.83	12.07	36,022	24, 25		
27	Pond Route	IB-1E	0.000	14.87	0.008	26	223.16	12,814
28	NRCS Runoff	Subcatchment P-1F	9.654	12.07	32,247	---		
29	Pond Route	IB-1F	0.000	12.83	-0.001	28	223.87	10,212
30	NRCS Runoff	Subcatchment P-1G	6.820	12.07	20,867	---		
31	Junction	Total to IB-1G	6.820	12.07	20,867	29, 30		
32	Pond Route	IB-1G	0.000	13.50	-0.003	31	221.12	7,281
34	NRCS Runoff	Subcatchment P-1H	5.055	12.07	15,761	---		
35	Pond Route	SC-1H	0.000	19.00	0.000	34	218.92	4,679
36	NRCS Runoff	Subcatchment P-1I	2.658	12.07	8,018	---		

Hydrograph 25-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
37	Pond Route	SC-1I	1.031	12.23	2,288	36	220.03	2,664
38	NRCS Runoff	Subcatchment P-1J	3.044	12.07	9,317	---		
39	Pond Route	SC-1J	0.000	8.60	0.000	38	224.00	3,050
40	NRCS Runoff	Subcatchment P-1K	62.09	12.33	324,391	---		
41	NRCS Runoff	Subcatchment P-1L	0.699	12.37	5,809	---		
42	Junction	Total via BVW	62.79	12.33	330,200	39, 40, 41		
43	NRCS Runoff	Subcatchment P-1M	1.419	12.13	6,803	---		
44	Junction	P-1 Total	64.70	12.33	339,291	27, 32, 35, 37, 42, 43		
46	NRCS Runoff	Subcatchment P-2A	2.765	12.07	8,292	---		
47	Pond Route	SC-2A	0.000	10.80	0.000	46	227.92	3,165
48	NRCS Runoff	Subcatchment P-2B	0.400	12.37	3,878	---		
49	Junction	P-2 TOTAL	0.400	12.37	3,878	47, 48		
51	NRCS Runoff	Subcatchment P-3A	8.147	12.07	24,705	---		
52	Pond Route	SC-3A	0.000	17.40	0.000	51	227.66	8,131
53	NRCS Runoff	Subcatchment P-3B	6.314	12.07	19,021	---		
54	Pond Route	SC-3B	0.000	13.50	0.000	53	224.03	6,600
55	NRCS Runoff	Subcatchment P-3C	0.071	13.80	1,874	---		
56	Junction	P-3 Total	0.071	13.80	1,874	52, 54, 55		
58	NRCS Runoff	Subcatchment P-4A	1.503	12.07	5,204	---		
59	Pond Route	RD-4A	0.000	15.63	0.000	58	3.14	1,422
60	NRCS Runoff	Subcatchment P-4B	0.172	12.47	2,299	---		
61	Junction	P-4 Total	0.172	12.47	2,299	59, 60		
63	NRCS Runoff	Subcatchment P-5A	0.752	12.07	2,602	---		
64	Pond Route	RD-5A	0.000	10.53	0.000	63	3.26	721
65	NRCS Runoff	Subcatchment P-5B	0.053	12.47	542	---		
66	Junction	P-5 Total	0.053	12.47	542	64, 65		
68	NRCS Runoff	Subcatchment P-6A	3.471	12.07	11,802	---		
69	Pond Route	IB-6A	0.000	12.10	0.001	68	229.90	3,614
70	NRCS Runoff	Subcatchment P-6B	0.347	12.37	3,695	---		
71	Junction	P-6 Total	0.347	12.37	3,695	69, 70		

Hydrograph 25-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
73	NRCS Runoff	Roof Drywell A	0.173	12.07	600	---		
74	Pond Route	RD-A	0.000	10.27	0.000	73	3.40	153
76	NRCS Runoff	Roof Drywell B	0.335	12.07	1,161	---		
77	Pond Route	RD-B	0.000	10.57	0.000	76	3.51	310
79	NRCS Runoff	Roof Drywell C	0.231	12.07	801	---		
80	Pond Route	RD-C	0.000	10.47	0.000	79	3.19	201
82	NRCS Runoff	Roof Drywell E	1.446	12.07	5,004	---		
83	Pond Route	RD-E	0.000	11.53	0.000	82	223.51	1,423

Hydrograph 100-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
1	NRCS Runoff	Subcatchment E-1A	91.32	12.33	479,935	---		
2	NRCS Runoff	Subcatchment E-1B	2,629	12.33	16,313	---		
3	Junction	Total via wetland	93.95	12.33	496,247	1, 2		
4	NRCS Runoff	Subcatchment E-1C	10.42	12.57	83,396	---		
5	NRCS Runoff	Subcatchment E-1D	3,580	12.37	23,195	---		
6	Pond Route	Total to depression	0.000	0.00	0.000	5	226.10	23,195
7	Junction	E-1 Total	101.8	12.33	579,643	3, 4, 6		
8	NRCS Runoff	Subcatchment E-2	2,758	12.37	18,852	---		
9	NRCS Runoff	Subcatchment E-3	0.784	12.40	7,324	---		
10	NRCS Runoff	Subcatchment E-4	1.023	12.30	7,348	---		
11	NRCS Runoff	Subcatchment E-5	1,577	12.37	10,217	---		
12	NRCS Runoff	Subcatchment E-6	3,484	12.30	22,552	---		
14	NRCS Runoff	Subcatchment P-1A	6,213	12.07	19,025	---		
15	Pond Route	IB-1A	0.173	12.83	370	14	231.72	7,319
16	NRCS Runoff	Subcatchment P-1B	5,959	12.07	17,927	---		
17	Junction	Total to IB-1B	5,959	12.07	18,297	15, 16		
18	Pond Route	IB-1B	0.409	12.53	555	17	229.93	6,752
19	NRCS Runoff	Subcatchment P-1C	4,529	12.07	13,749	---		
20	Junction	Total to IB-1C	4,529	12.07	14,304	18, 19		
21	Pond Route	IB-1C	0.924	12.40	1,407	20	225.98	4,699
22	NRCS Runoff	Subcatchment P-1D	4,242	12.07	12,876	---		
23	Junction	Total to IB-1D	4,242	12.07	14,283	21, 22		
24	Pond Route	IB-1D	1,212	12.50	1,525	23	225.84	4,960
25	NRCS Runoff	Subcatchment P-1E	18.52	12.07	55,493	---		
26	Junction	Total to IB-1E	18.52	12.07	57,018	24, 25		
27	Pond Route	IB-1E	0.000	12.43	0.003	26	224.20	23,170
28	NRCS Runoff	Subcatchment P-1F	17.39	12.07	54,215	---		
29	Pond Route	IB-1F	1,177	12.57	2,209	28	224.99	19,471
30	NRCS Runoff	Subcatchment P-1G	10.79	12.07	32,386	---		
31	Junction	Total to IB-1G	10.79	12.07	34,595	29, 30		
32	Pond Route	IB-1G	1,970	12.53	3,951	31	221.93	11,660
34	NRCS Runoff	Subcatchment P-1H	8,281	12.07	25,049	---		
35	Pond Route	SC-1H	1,857	12.40	3,271	34	220.25	7,499
36	NRCS Runoff	Subcatchment P-1I	3,670	12.07	11,208	---		

Hydrograph 100-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
37	Pond Route	SC-1I	2,798	12.13	4,810	36	220.59	2,957
38	NRCS Runoff	Subcatchment P-1J	4,104	12.07	12,764	---		
39	Pond Route	SC-1J	0,883	12.37	1,054	38	224.98	3,922
40	NRCS Runoff	Subcatchment P-1K	87.67	12.33	460,745	---		
41	NRCS Runoff	Subcatchment P-1L	2,282	12.23	12,727	---		
42	Junction	Total via BVW	90.54	12.33	474,525	39, 40, 41		
43	NRCS Runoff	Subcatchment P-1M	3,224	12.13	12,719	---		
44	Junction	P-1 Total	95.68	12.33	499,278	27, 32, 35, 37, 42, 43		
46	NRCS Runoff	Subcatchment P-2A	4,131	12.07	12,345	---		
47	Pond Route	SC-2A	1,275	12.33	1,877	46	229.35	3,958
48	NRCS Runoff	Subcatchment P-2B	1,571	12.17	9,100	---		
49	Junction	P-2 TOTAL	2,565	12.30	10,976	47, 48		
51	NRCS Runoff	Subcatchment P-3A	12.62	12.07	37,786	---		
52	Pond Route	SC-3A	0.000	11.23	0.000	51	229.82	15,255
53	NRCS Runoff	Subcatchment P-3B	9,600	12.07	28,693	---		
54	Pond Route	SC-3B	0.242	12.97	432	53	226.58	11,630
55	NRCS Runoff	Subcatchment P-3C	0.624	12.40	5,824	---		
56	Junction	P-3 Total	0.624	12.40	6,256	52, 54, 55		
58	NRCS Runoff	Subcatchment P-4A	1,926	12.07	6,716	---		
59	Pond Route	RD-4A	0.000	11.37	0.000	58	4.20	2,032
60	NRCS Runoff	Subcatchment P-4B	0,820	12.30	5,891	---		
61	Junction	P-4 Total	0,820	12.30	5,891	59, 60		
63	NRCS Runoff	Subcatchment P-5A	0,963	12.07	3,358	---		
64	Pond Route	RD-5A	0.000	10.20	0.000	63	4.46	1,023
65	NRCS Runoff	Subcatchment P-5B	0,197	12.30	1,273	---		
66	Junction	P-5 Total	0,197	12.30	1,273	64, 65		
68	NRCS Runoff	Subcatchment P-6A	6,383	12.07	20,059	---		
69	Pond Route	IB-6A	0,501	12.53	568	68	230.94	7,073
70	NRCS Runoff	Subcatchment P-6B	1,589	12.10	9,038	---		
71	Junction	P-6 Total	1,589	12.10	9,605	69, 70		

Hydrograph 100-yr Summary

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Hyd. No.	Hydrograph Type	Hydrograph Name	Peak Flow (cfs)	Time to Peak (hrs)	Hydrograph Volume (cuft)	Inflow Hyd(s)	Maximum Elevation (ft)	Maximum Storage (cuft)
73	NRCS Runoff	Roof Drywell A	0.222	12.07	775	---		
74	Pond Route	RD-A	0.000	9.43	0.000	73	4.61	214
76	NRCS Runoff	Roof Drywell B	0.430	12.07	1,498	---		
77	Pond Route	RD-B	0.000	7.90	0.000	76	4.74	438
79	NRCS Runoff	Roof Drywell C	0.296	12.07	1,033	---		
80	Pond Route	RD-C	0.000	11.37	0.000	79	4.12	286
82	NRCS Runoff	Roof Drywell E	1.852	12.07	6,458	---		
83	Pond Route	RD-E	0.000	9.93	0.000	82	224.61	2,025

Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment E-1A

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.12	12.02
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			0.00	0.00
C	Woods - Good Condition	70			2.25	157.74
C	Open Space - Good Condition	74			2.16	159.70
D	BVW	77			0.62	47.72
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			20.11	1588.76
Totals =					25.26	1965.94

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{1965.94}{25.26} = \underline{77.81} ; \text{ Use CN} = \underline{78}$$

2. Runoff

Frequency..... yr

Rainfall, P (24-hour)..... in

Runoff, Q..... in

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
1.28	2.70	5.21

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one:

Present
Tc

 Developed Tt through subarea

Subcatchment E-1A

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	Wooded		
	0.6		
ft	50		
in	3.1		
ft/ft	0.020		
Compute Tt hr	0.29		0.29

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C	C-D	D-E
	UNPAVED	UNPAVED	UNPAVED
ft	1293	91	165
ft/ft	0.023	0.05	0.036
ft/s	2.45	3.61	3.06
Compute Tt hr	0.15	0.01	0.01

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r ft			
ft/ft			
Compute V ft/s			
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.46
min 27.5

Hydrograph Report

Project Name:

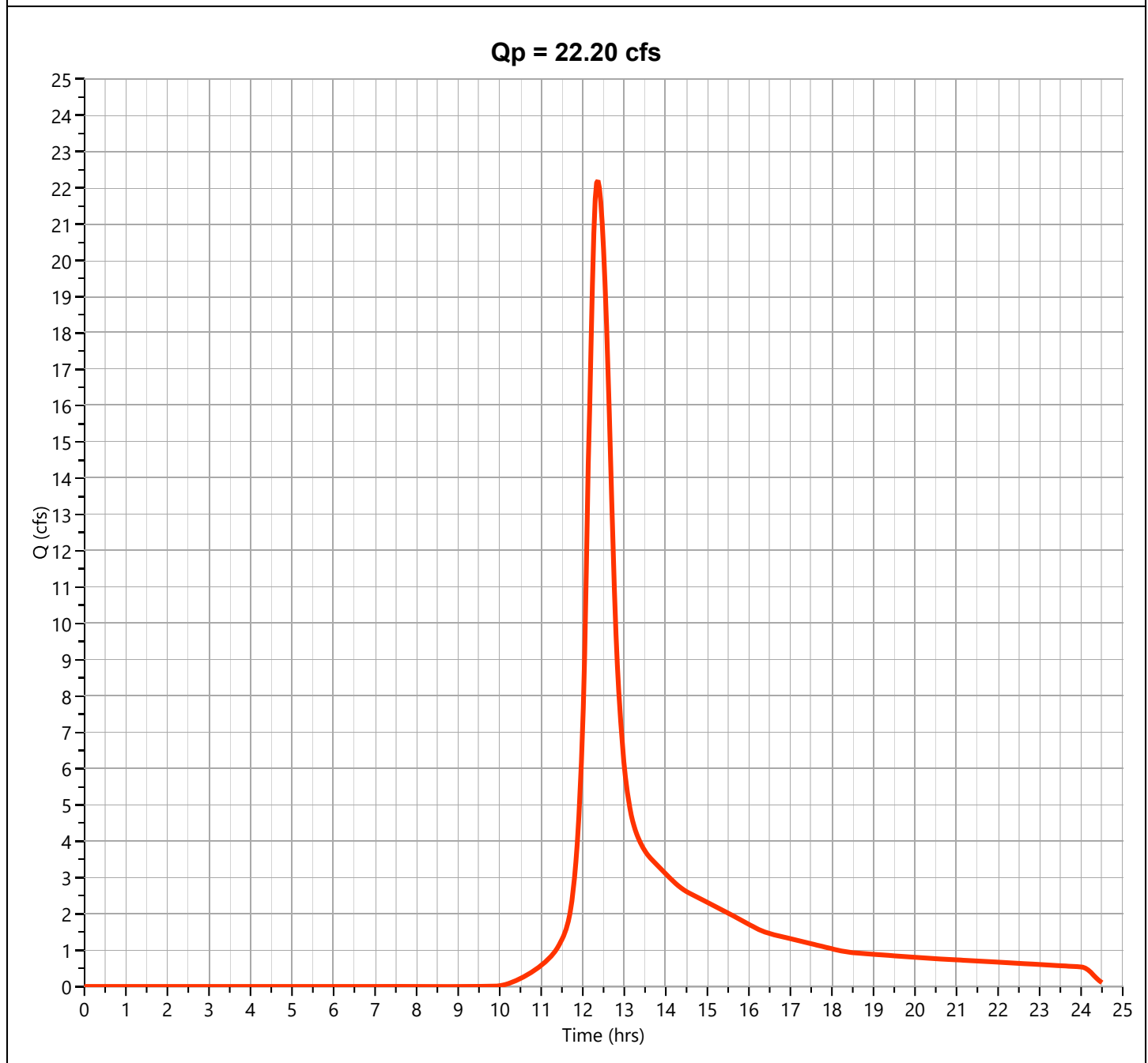
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-1A

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 22.20 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Runoff Volume	= 118,779 cuft
Drainage Area	= 25.26 ac	Curve Number	= 78
Tc Method	= User	Time of Conc. (Tc)	= 27.5 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

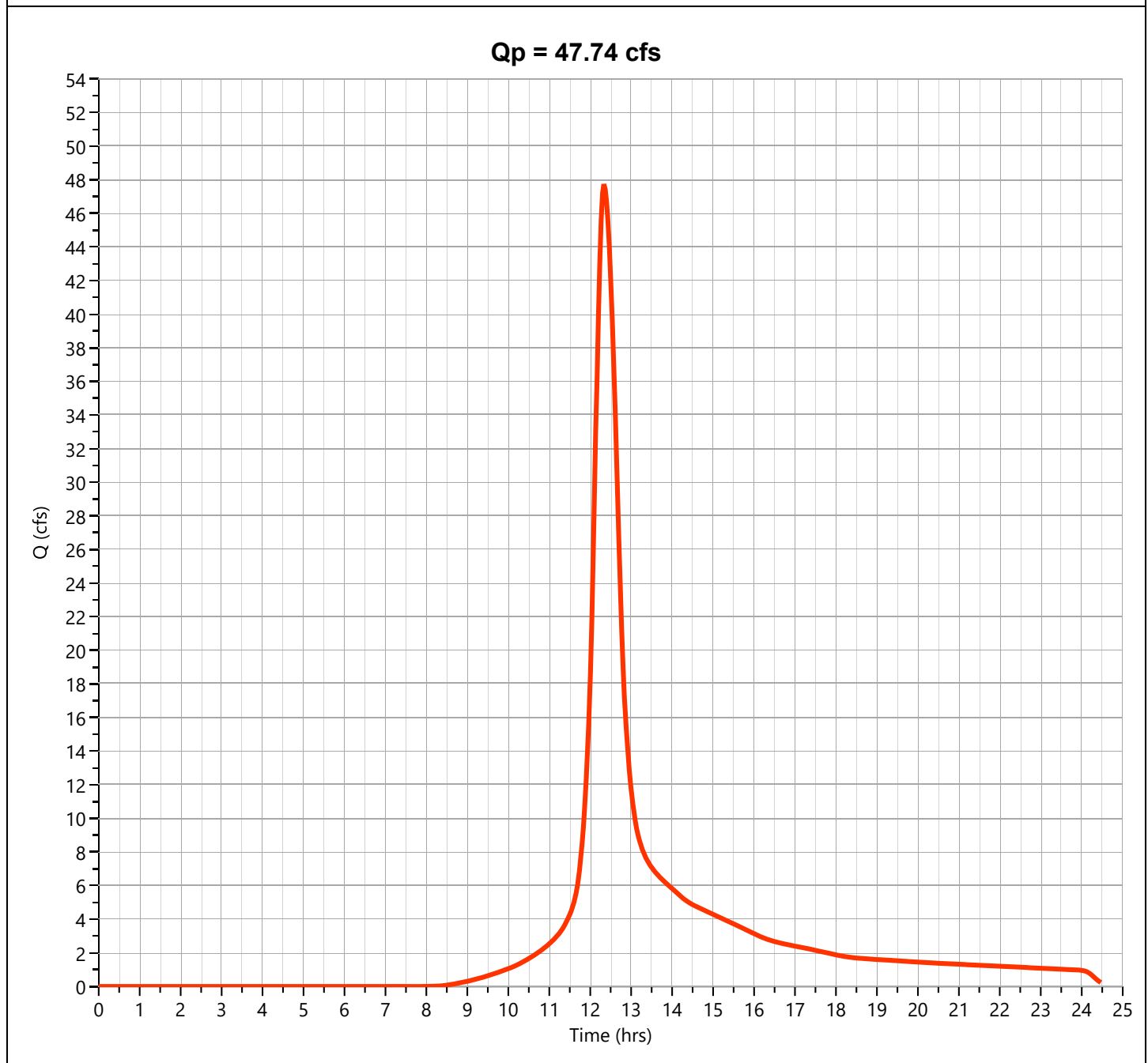
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-1A

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 47.74 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Runoff Volume	= 249,424 cuft
Drainage Area	= 25.26 ac	Curve Number	= 78
Tc Method	= User	Time of Conc. (Tc)	= 27.5 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

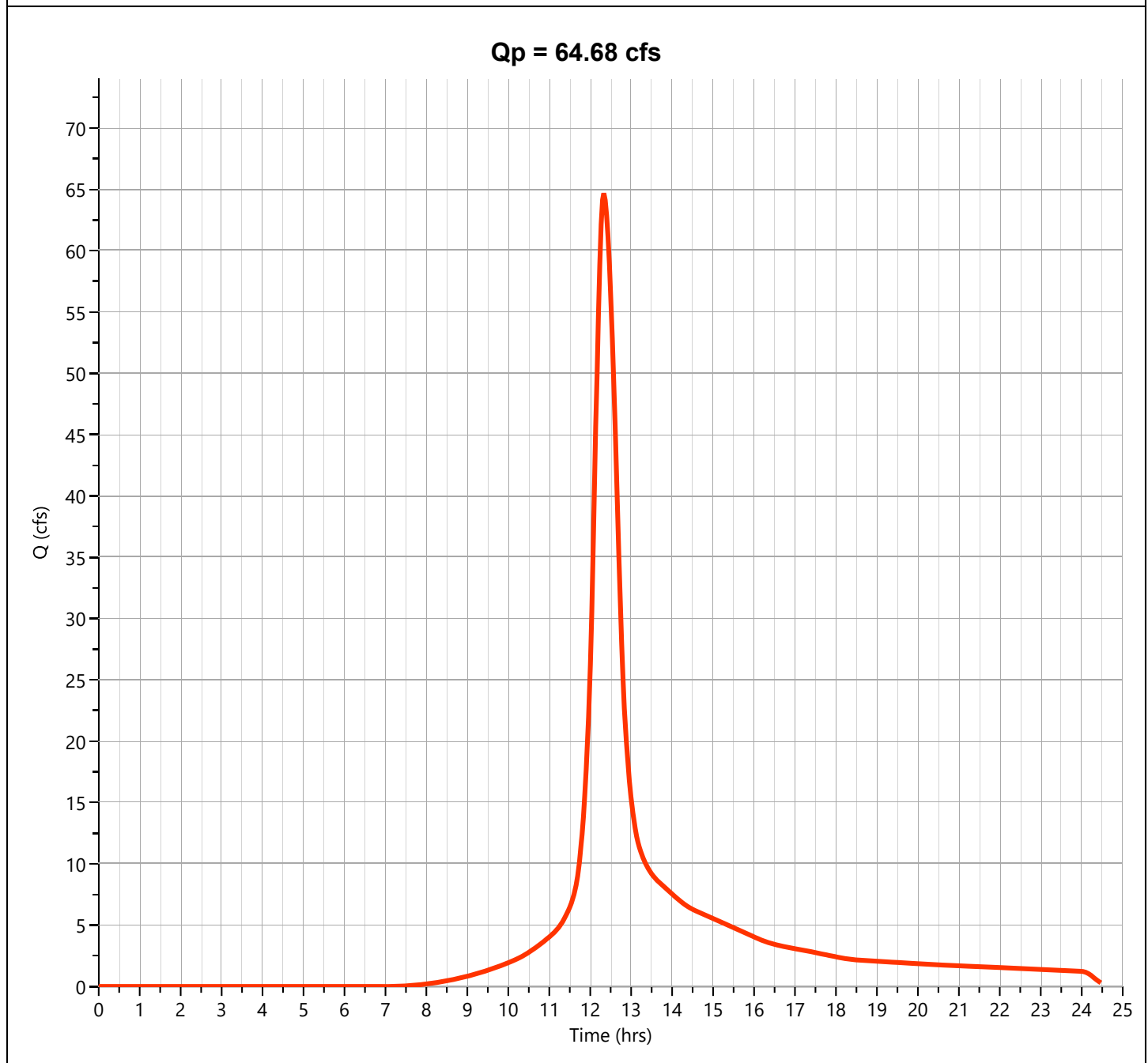
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-1A

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 64.68 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Runoff Volume	= 337,902 cuft
Drainage Area	= 25.26 ac	Curve Number	= 78
Tc Method	= User	Time of Conc. (Tc)	= 27.5 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

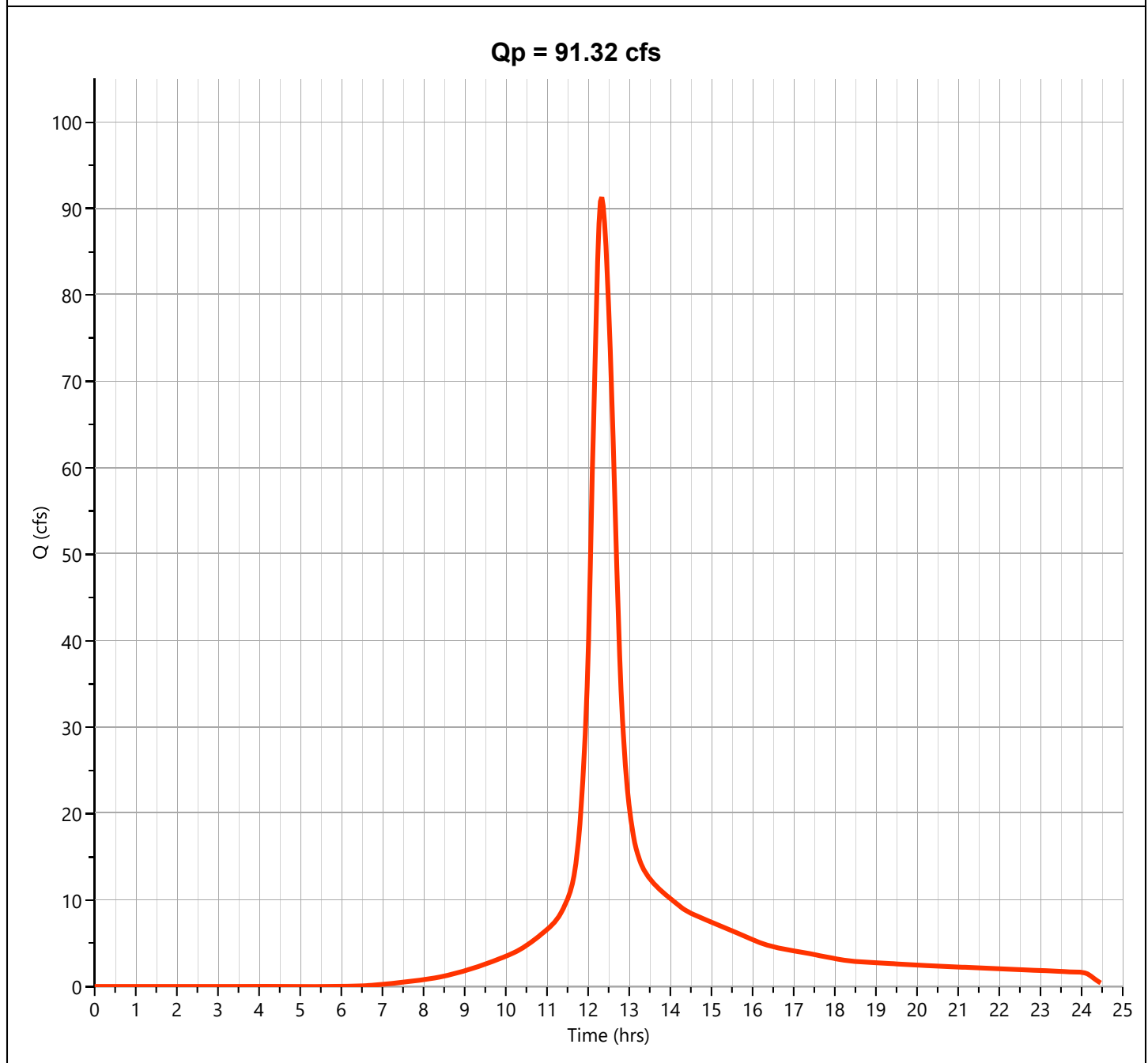
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-1A

Hyd. No. 1

Hydrograph Type	= NRCS Runoff	Peak Flow	= 91.32 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Runoff Volume	= 479,935 cuft
Drainage Area	= 25.26 ac	Curve Number	= 78
Tc Method	= User	Time of Conc. (Tc)	= 27.5 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment E-1B

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.01	1.36
A	Woods - Good Condition	30			0.14	4.32
A	Open Space - Good Condition	39			3.36	130.87
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.31	15.83
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					3.82	152.38

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{152.38}{3.82} = 39.85 ; \text{ Use CN} = \boxed{40}$$

2. Runoff

Frequency..... yr

Rainfall, P (24-hour)..... in

Runoff, Q..... in

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
0.00	0.23	1.16

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one:

Present

 Developed

Subcatchment E-1B

Circle one:

Tc

 Tt through

through subarea _____

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	Wooded		
	0.6		
ft	50		
in	3.1		
ft/ft	0.050		
Compute Tt hr	0.20		0.20

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C		
	UNPAVED		
ft	998		
ft/ft	0.017		
ft/s	2.10		
Compute Tt hr	0.13		0.13

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r	ft		
ft/ft			
Compute V	ft/s		
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.33
min 19.9

Hydrograph Report

Project Name:

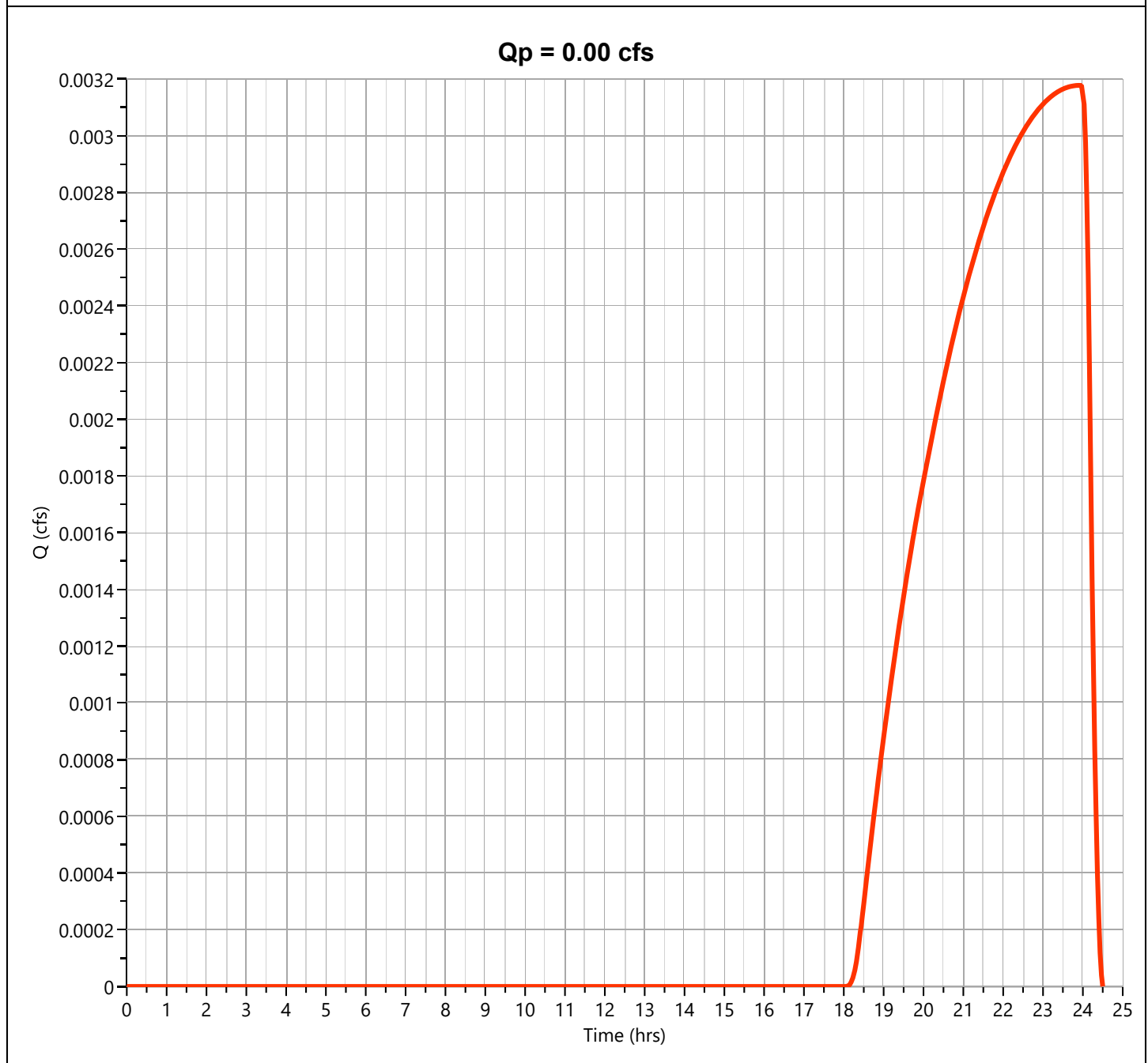
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-1B

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.003 cfs
Storm Frequency	= 2-yr	Time to Peak	= 23.90 hrs
Time Interval	= 2 min	Runoff Volume	= 48.2 cuft
Drainage Area	= 3.82 ac	Curve Number	= 40
Tc Method	= User	Time of Conc. (Tc)	= 19.9 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

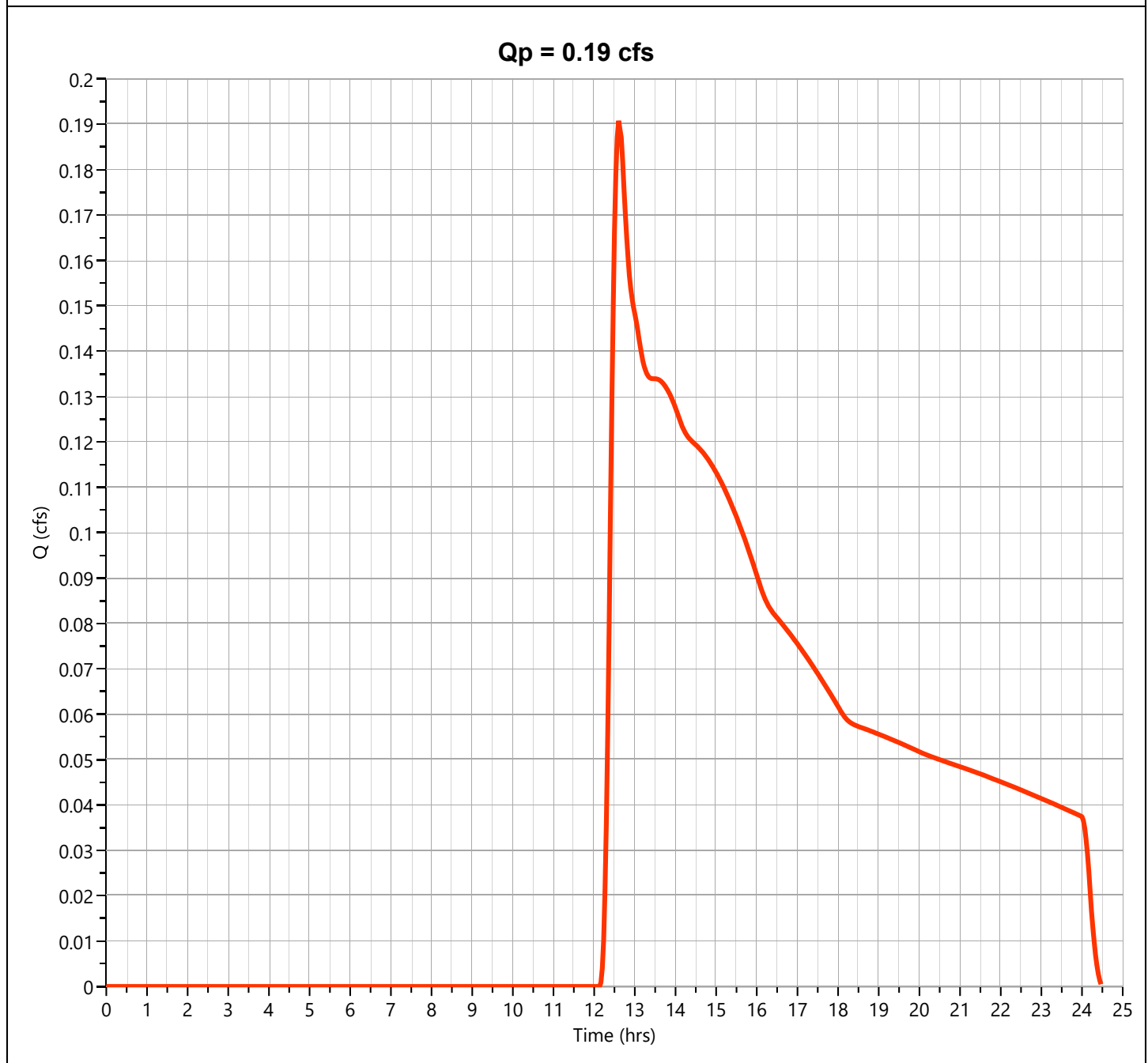
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-1B

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.191 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.60 hrs
Time Interval	= 2 min	Runoff Volume	= 3,293 cuft
Drainage Area	= 3.82 ac	Curve Number	= 40
Tc Method	= User	Time of Conc. (Tc)	= 19.9 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

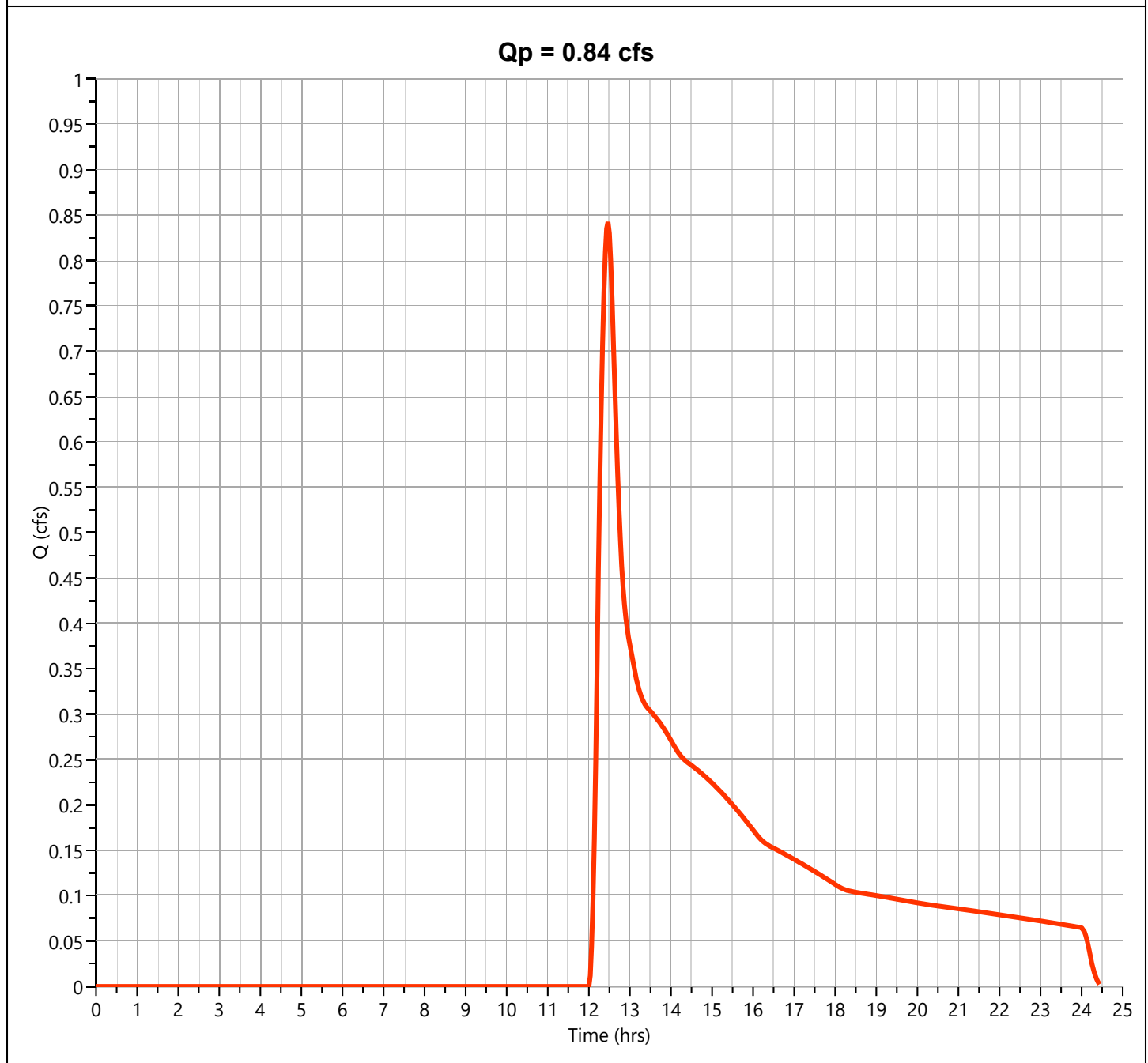
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-1B

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.842 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.47 hrs
Time Interval	= 2 min	Runoff Volume	= 7,446 cuft
Drainage Area	= 3.82 ac	Curve Number	= 40
Tc Method	= User	Time of Conc. (Tc)	= 19.9 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

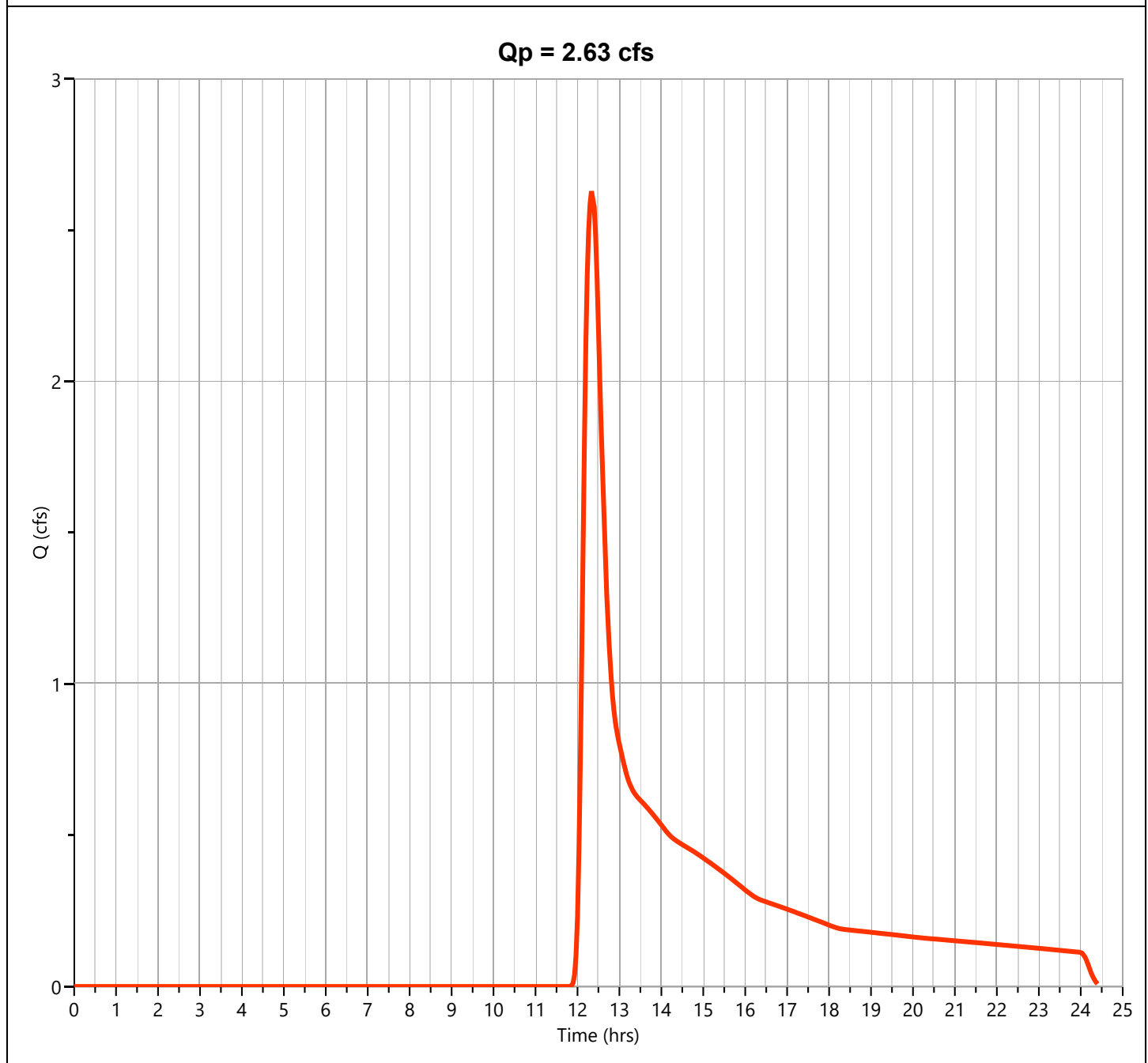
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-1B

Hyd. No. 2

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.629 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Runoff Volume	= 16,313 cuft
Drainage Area	= 3.82 ac	Curve Number	= 40
Tc Method	= User	Time of Conc. (Tc)	= 19.9 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

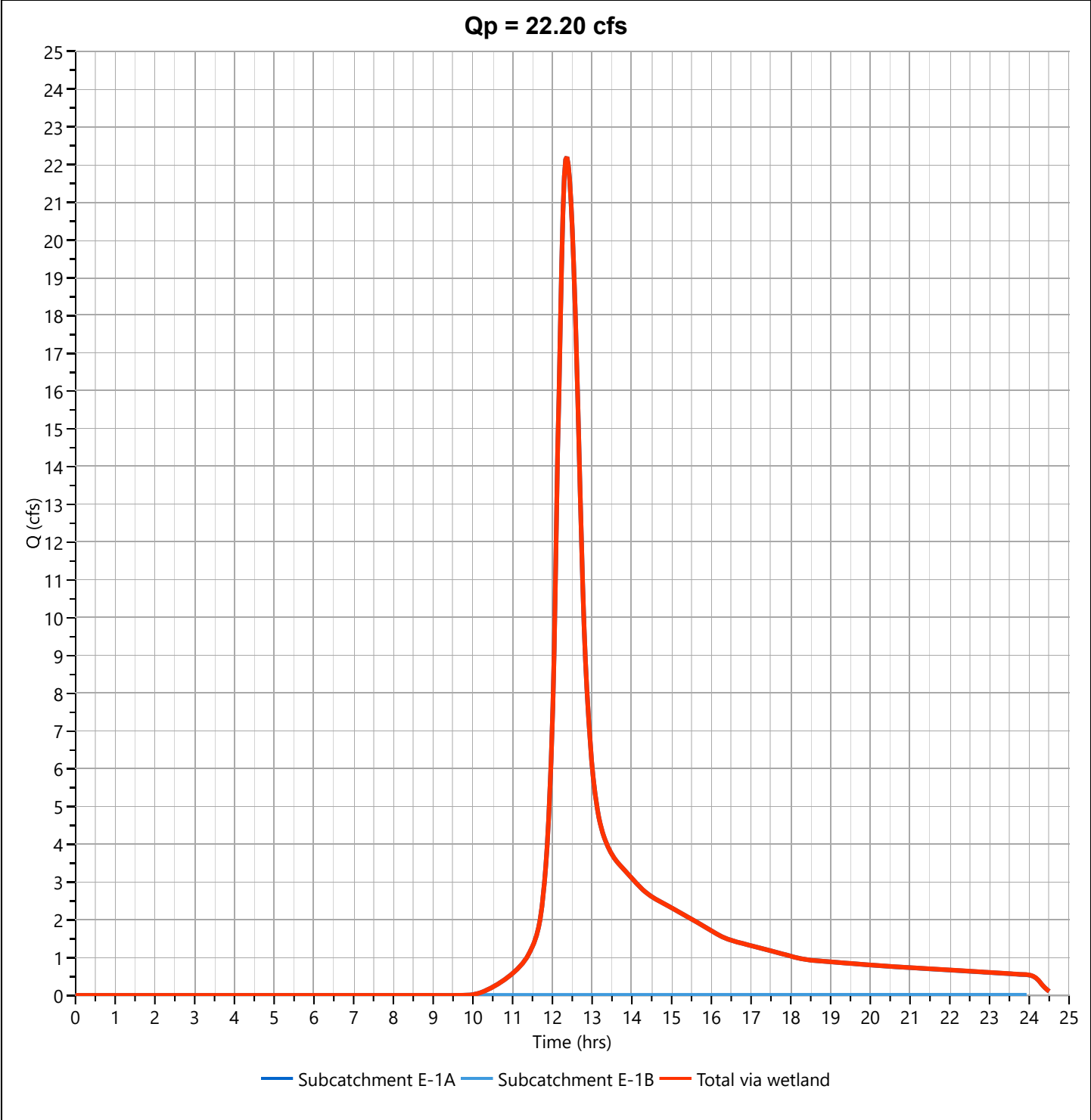
Hydrology Studio v 3.0.0.29

12-13-2023

Total via wetland

Hyd. No. 3

Hydrograph Type	= Junction	Peak Flow	= 22.20 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Hydrograph Volume	= 118,827 cuft
Inflow Hydrographs	= 1, 2	Total Contrib. Area	= 29.08 ac



Hydrograph Report

Project Name:

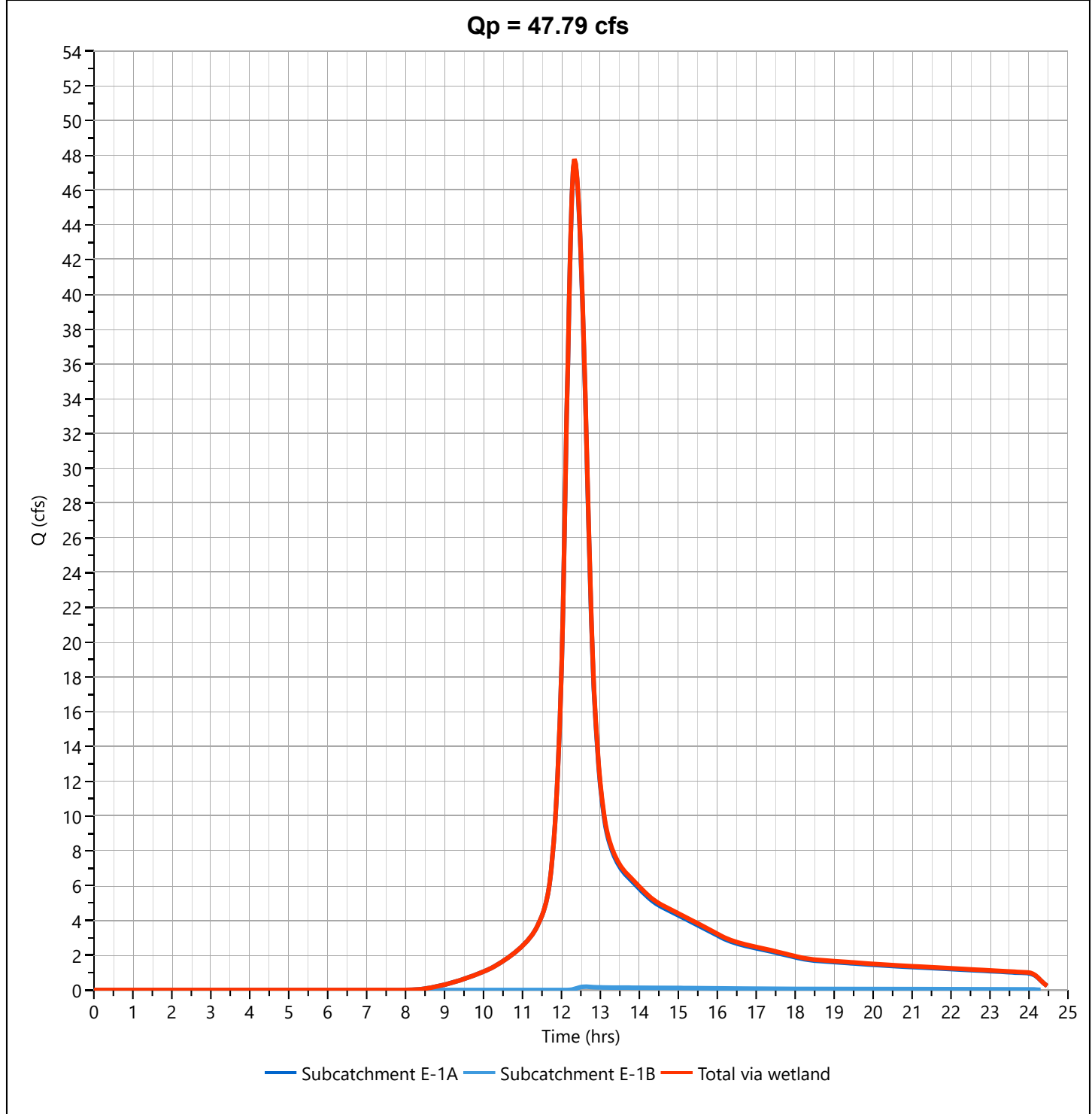
Hydrology Studio v 3.0.0.29

12-13-2023

Total via wetland

Hyd. No. 3

Hydrograph Type	= Junction	Peak Flow	= 47.79 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 252,718 cuft
Inflow Hydrographs	= 1, 2	Total Contrib. Area	= 29.08 ac



Hydrograph Report

Project Name:

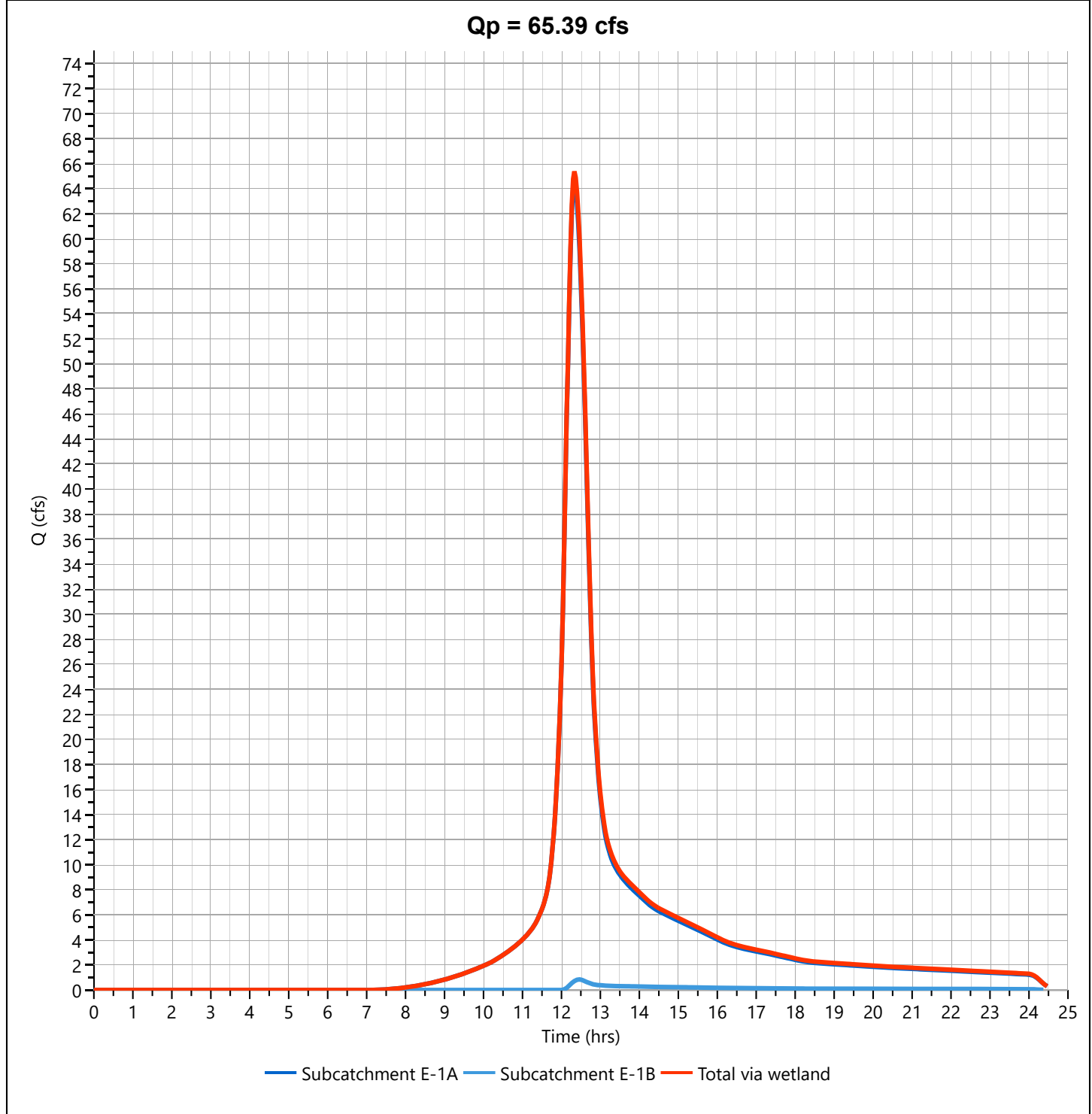
Hydrology Studio v 3.0.0.29

12-13-2023

Total via wetland

Hyd. No. 3

Hydrograph Type	= Junction	Peak Flow	= 65.39 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 345,348 cuft
Inflow Hydrographs	= 1, 2	Total Contrib. Area	= 29.08 ac



Hydrograph Report

Project Name:

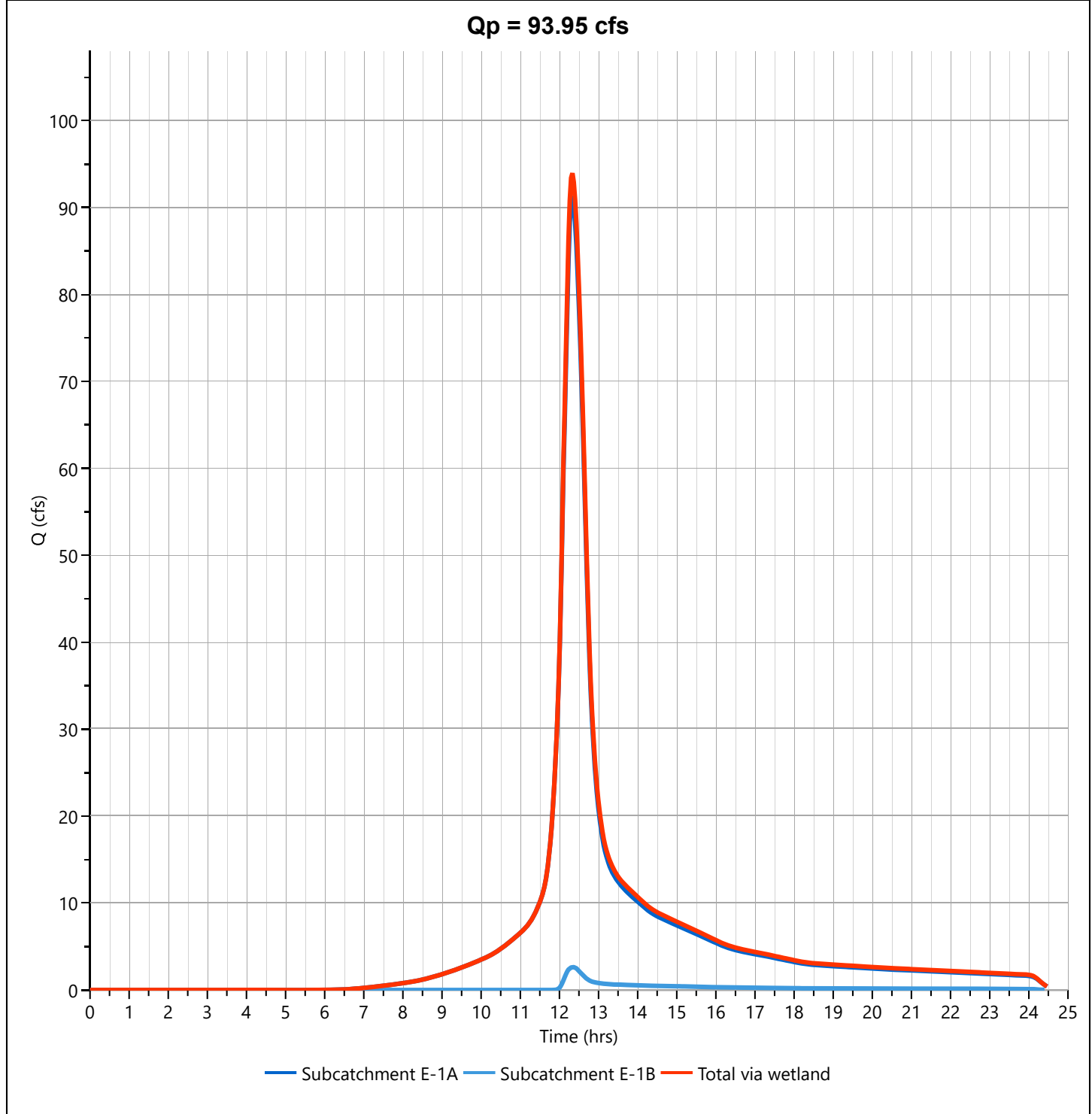
Hydrology Studio v 3.0.0.29

12-13-2023

Total via wetland

Hyd. No. 3

Hydrograph Type	= Junction	Peak Flow	= 93.95 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 496,247 cuft
Inflow Hydrographs	= 1, 2	Total Contrib. Area	= 29.08 ac



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment E-1C

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.18	17.64
A	Woods - Good Condition	30			2.32	69.47
A	Open Space - Good Condition	39			18.10	705.92
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.10	7.45
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					20.69	800.48

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{800.48}{20.69} = \underline{38.68} ; \text{ Use CN} = \underline{39}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	0.00	0.19	1.06

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one:

Present

 Developed

Subcatchment E-1C

Circle one:

Tc

 Tt through

through subarea _____

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	Wooded		
	0.6		
ft	50		
in	3.1		
ft/ft	0.040		
Compute Tt hr	0.22		0.22

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C		
	UNPAVED		
ft	1765		
ft/ft	0.01		
ft/s	1.61		
Compute Tt hr	0.30		0.30

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r ft			
ft/ft			
Compute V ft/s			
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.52
min 31.4

Hydrograph Report

Project Name:

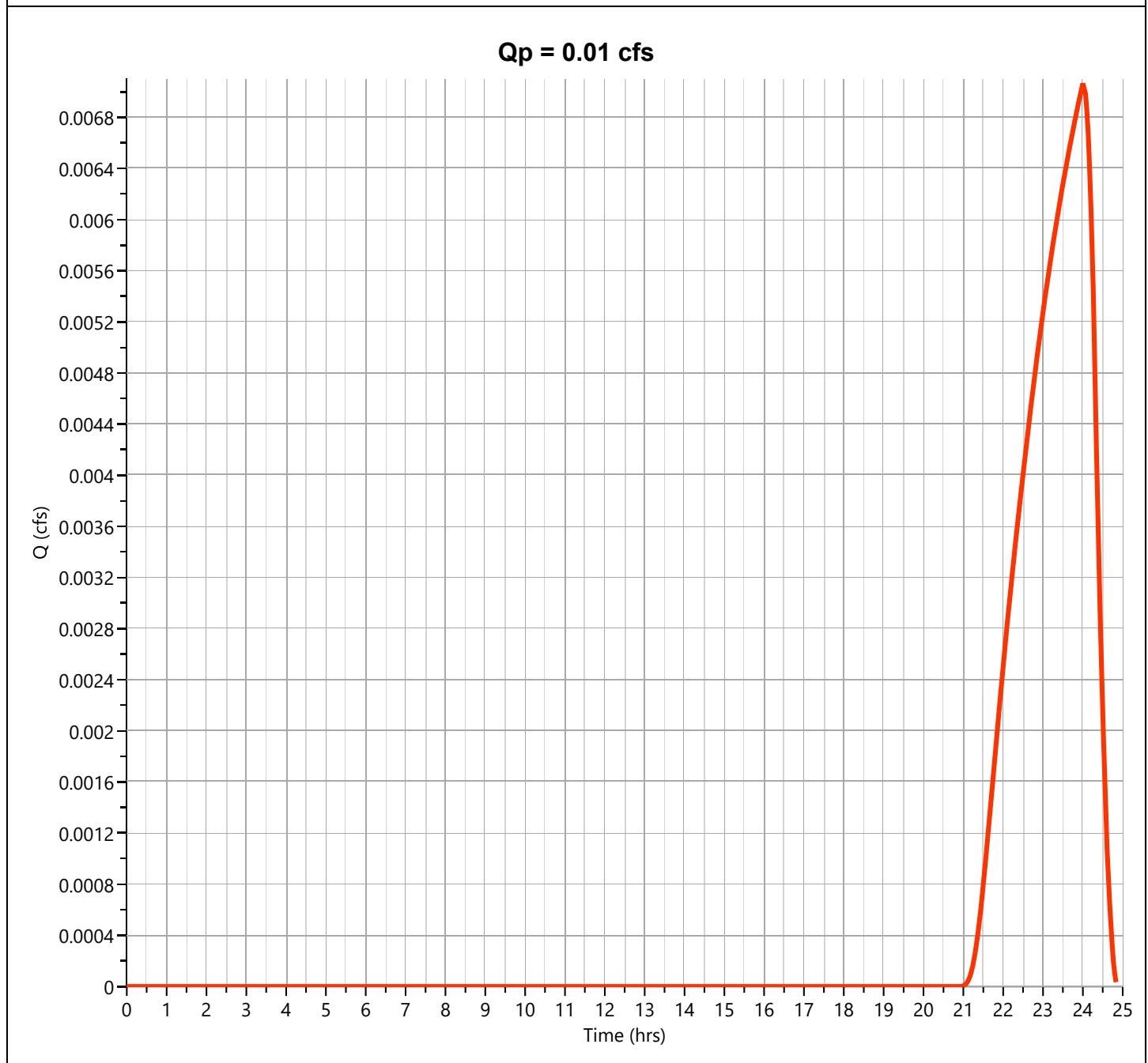
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment E-1C

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.007 cfs
Storm Frequency	= 2-yr	Time to Peak	= 24.00 hrs
Time Interval	= 2 min	Runoff Volume	= 50.5 cuft
Drainage Area	= 20.88 ac	Curve Number	= 39
Tc Method	= User	Time of Conc. (Tc)	= 31.4 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

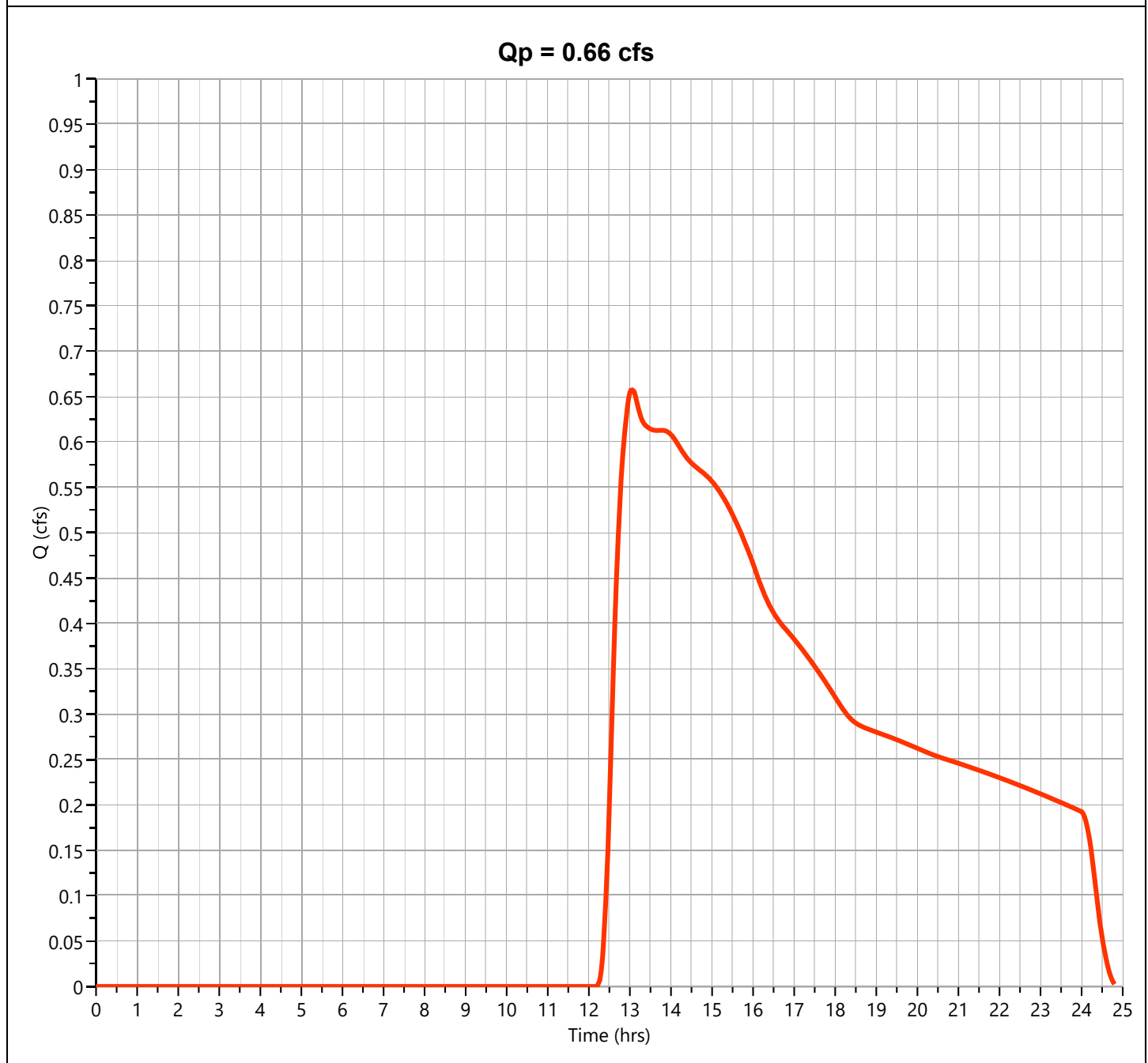
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment E-1C

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.658 cfs
Storm Frequency	= 10-yr	Time to Peak	= 13.07 hrs
Time Interval	= 2 min	Runoff Volume	= 15,508 cuft
Drainage Area	= 20.88 ac	Curve Number	= 39
Tc Method	= User	Time of Conc. (Tc)	= 31.4 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

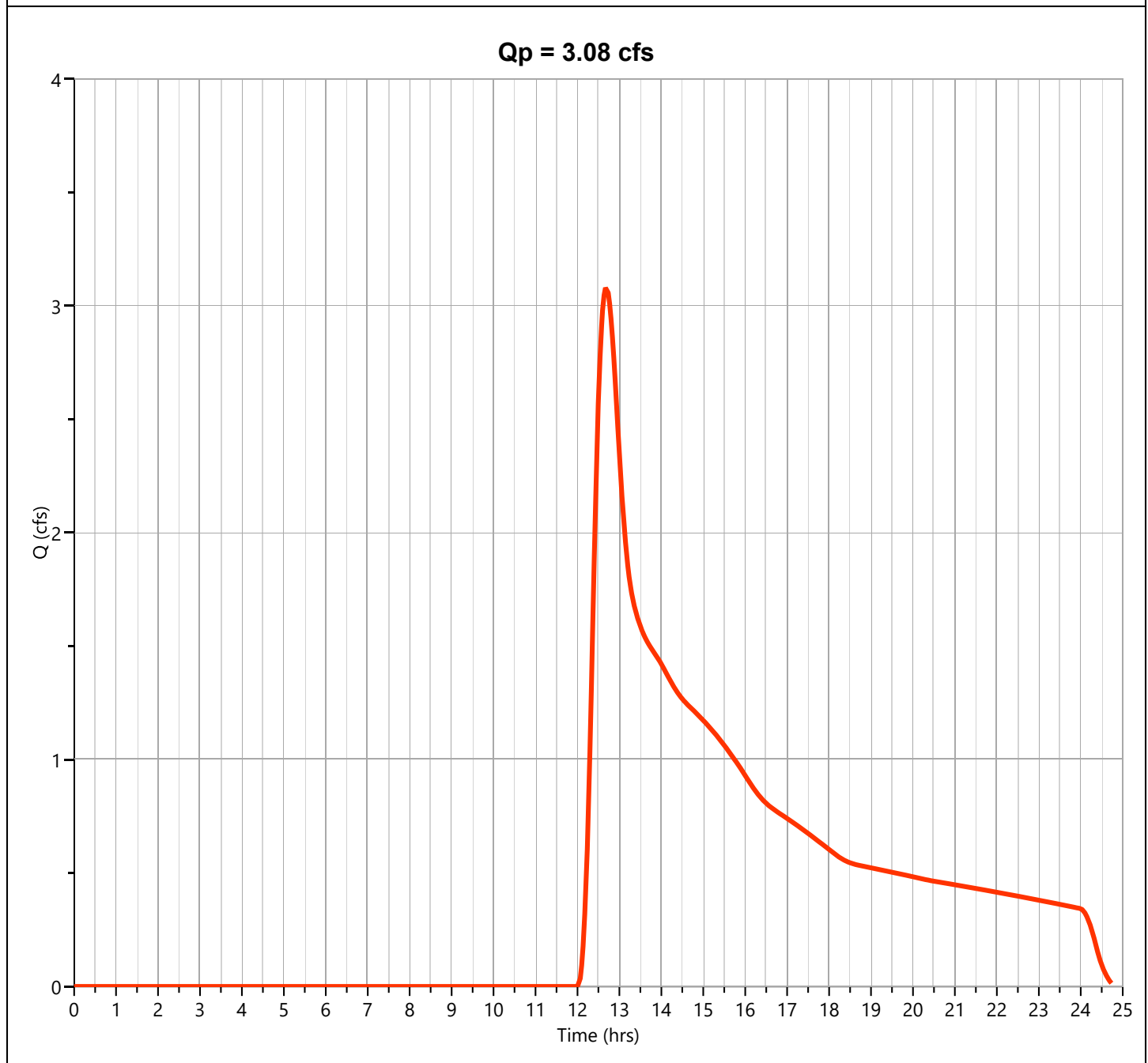
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment E-1C

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.082 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.70 hrs
Time Interval	= 2 min	Runoff Volume	= 36,842 cuft
Drainage Area	= 20.88 ac	Curve Number	= 39
Tc Method	= User	Time of Conc. (Tc)	= 31.4 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

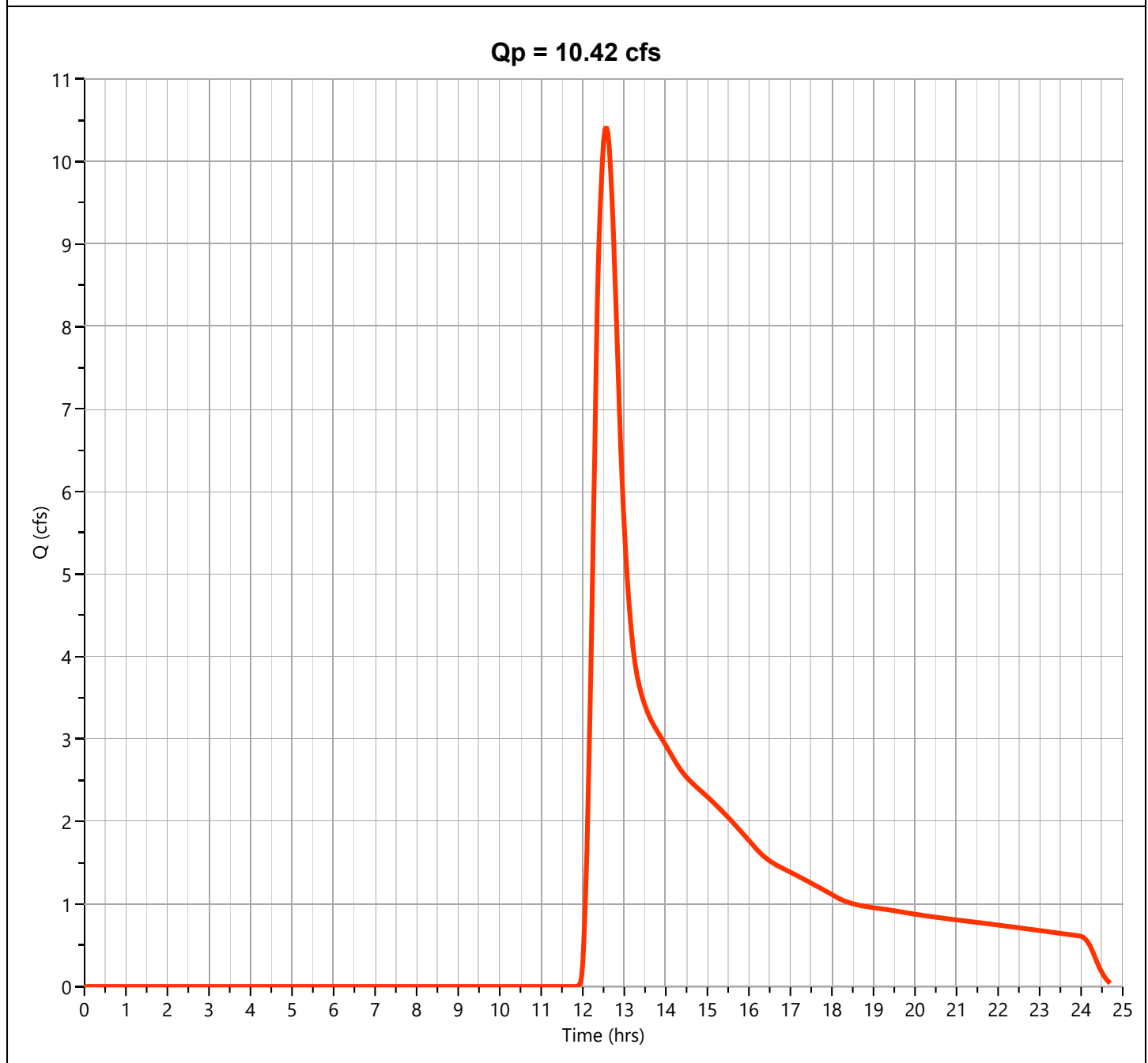
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment E-1C

Hyd. No. 4

Hydrograph Type	= NRCS Runoff	Peak Flow	= 10.42 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.57 hrs
Time Interval	= 2 min	Runoff Volume	= 83,396 cuft
Drainage Area	= 20.88 ac	Curve Number	= 39
Tc Method	= User	Time of Conc. (Tc)	= 31.4 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment E-1D

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.09	8.34
A	Woods - Good Condition	30			0.30	9.09
A	Open Space - Good Condition	39			5.49	214.14
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					5.88	231.57

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{231.57}{5.88} = 39.39 ; \text{ Use CN} = \boxed{39}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	0.00	0.22	1.12

(Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one:

Present

 Developed

Subcatchment E-1D

Circle one:

Tc

 Tt through

_____ through subarea

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	Lawn		
	0.24		
ft	50		
in	3.1		
ft/ft	0.010		
Compute Tt hr	0.18		0.18

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C		
	UNPAVED		
ft	581		
ft/ft	0.01		
ft/s	1.61		
Compute Tt hr	0.10		0.10

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r	ft		
ft/ft			
Compute V	ft/s		
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.28
min 17.0

Hydrograph Report

Project Name:

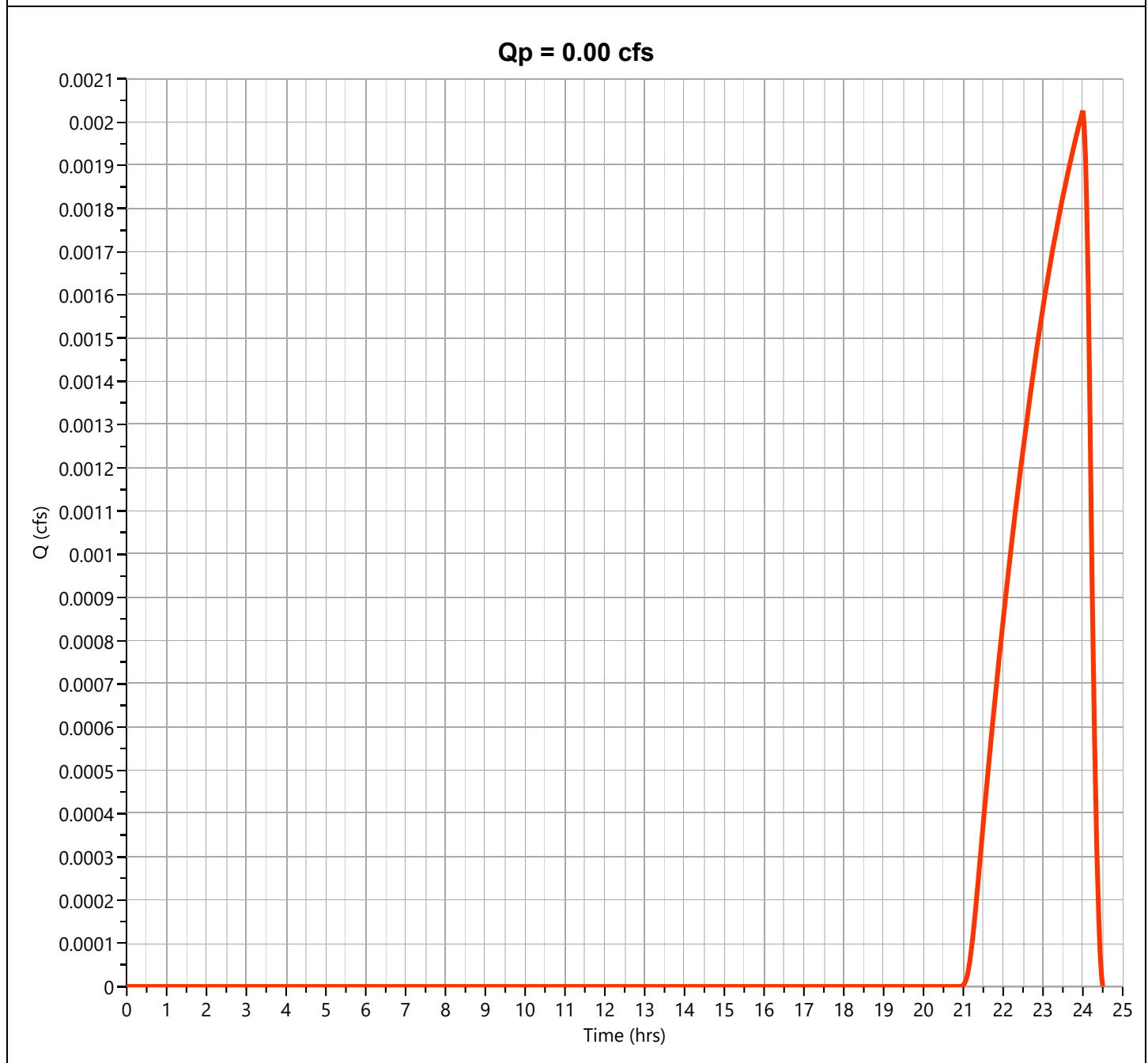
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment E-1D

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.002 cfs
Storm Frequency	= 2-yr	Time to Peak	= 24.00 hrs
Time Interval	= 2 min	Runoff Volume	= 14.0 cuft
Drainage Area	= 5.88 ac	Curve Number	= 39
Tc Method	= User	Time of Conc. (Tc)	= 17.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

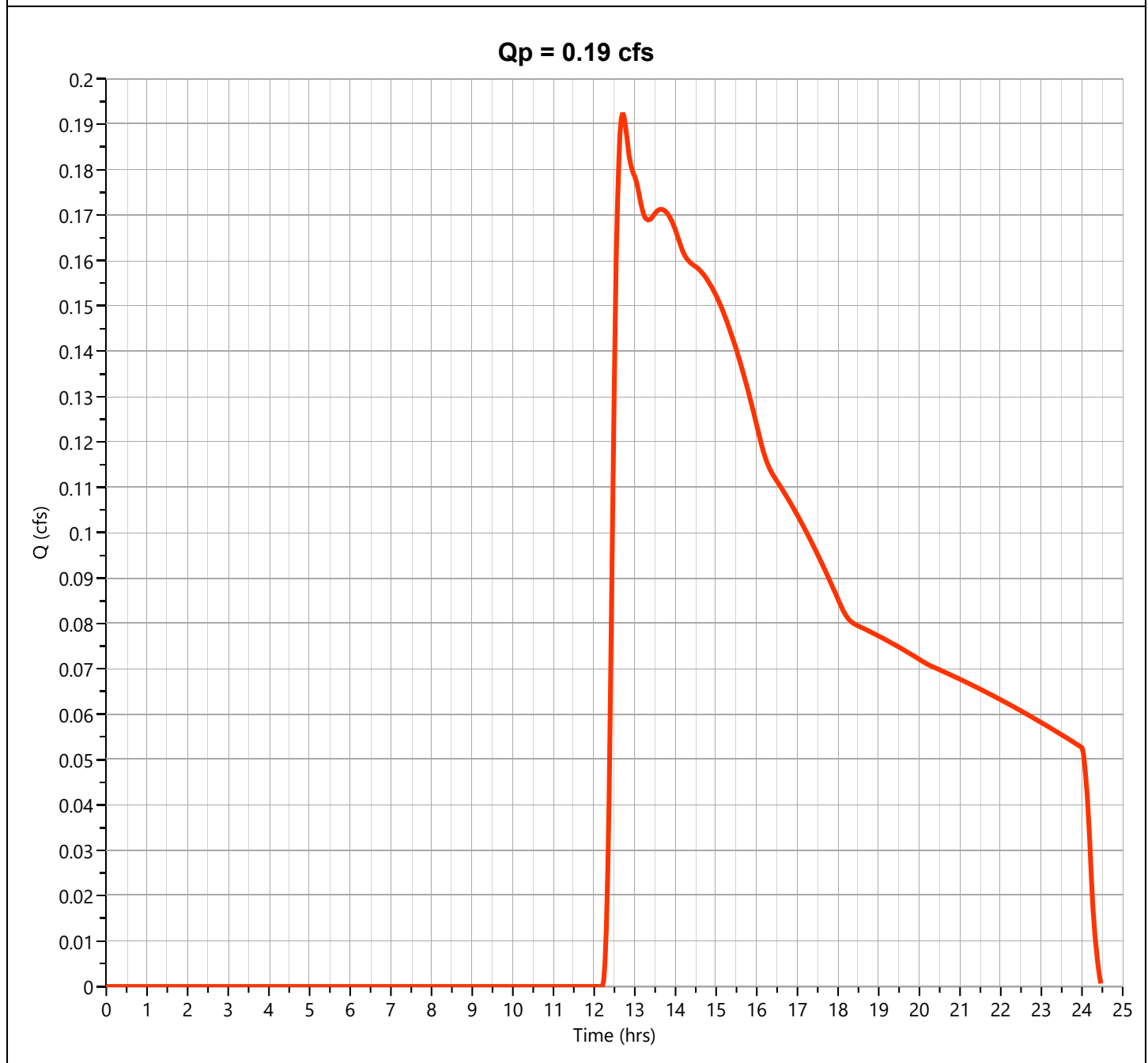
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment E-1D

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.193 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.70 hrs
Time Interval	= 2 min	Runoff Volume	= 4,313 cuft
Drainage Area	= 5.88 ac	Curve Number	= 39
Tc Method	= User	Time of Conc. (Tc)	= 17.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

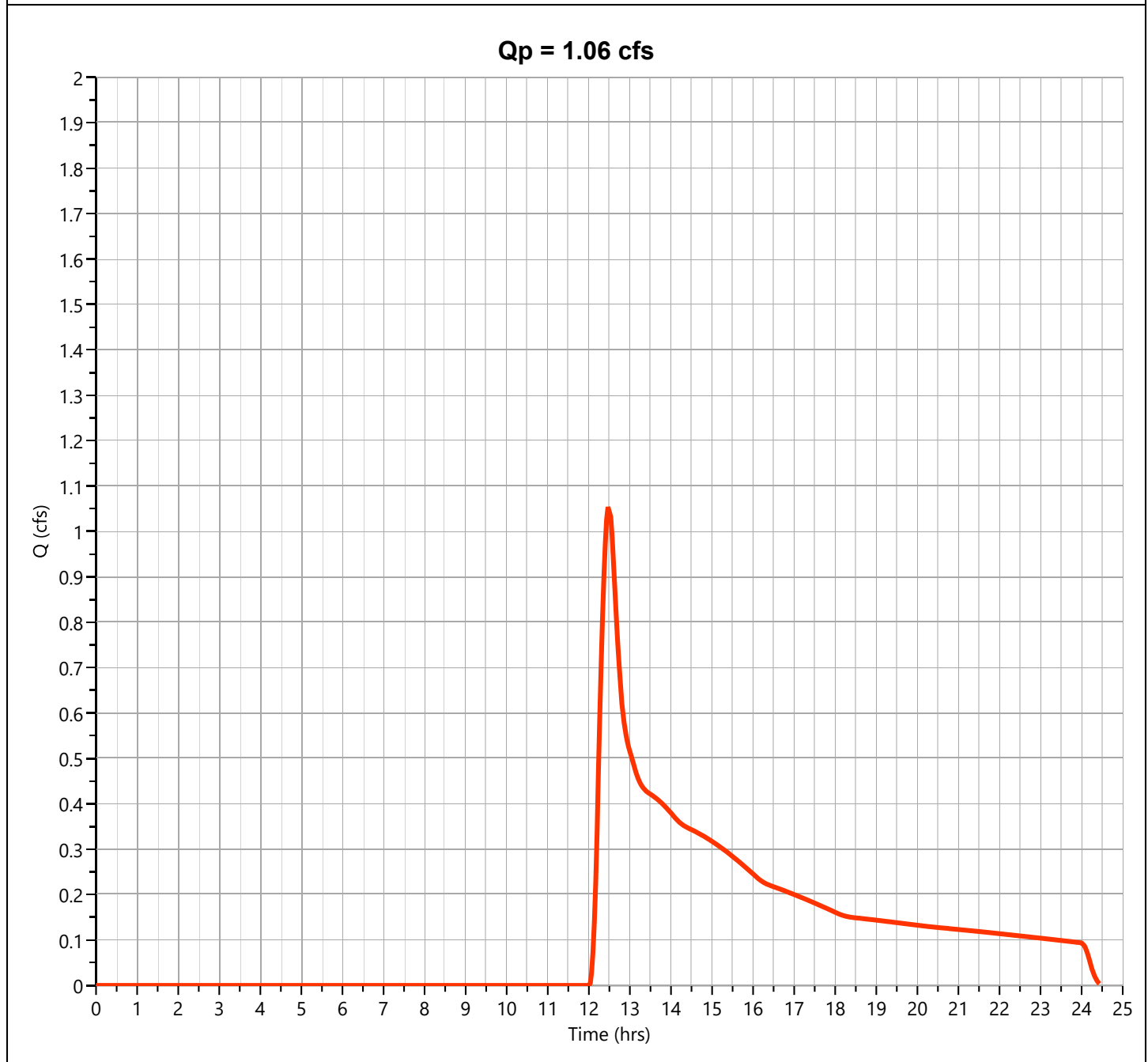
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment E-1D

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.056 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.50 hrs
Time Interval	= 2 min	Runoff Volume	= 10,247 cuft
Drainage Area	= 5.88 ac	Curve Number	= 39
Tc Method	= User	Time of Conc. (Tc)	= 17.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

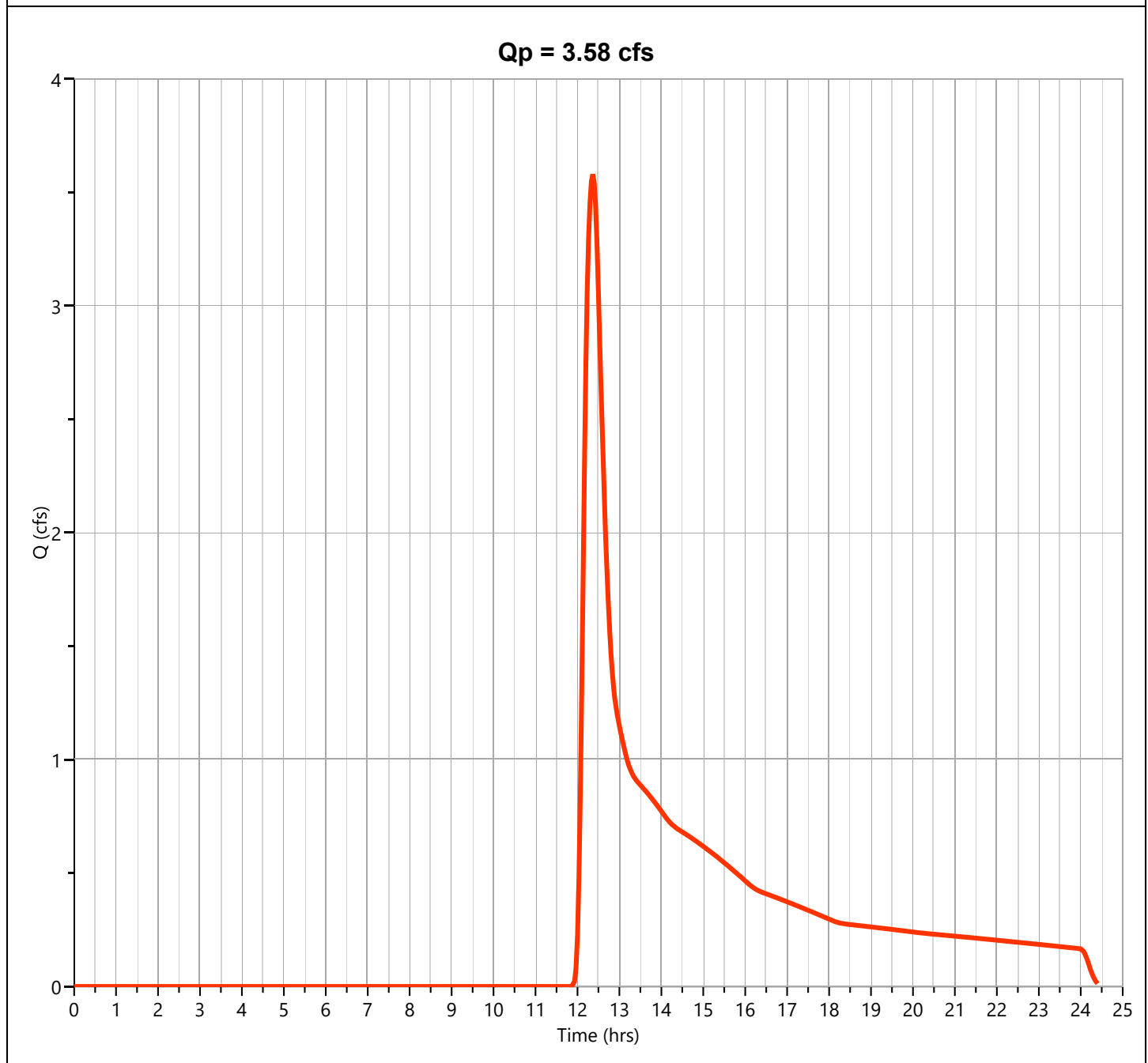
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment E-1D

Hyd. No. 5

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.580 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Runoff Volume	= 23,195 cuft
Drainage Area	= 5.88 ac	Curve Number	= 39
Tc Method	= User	Time of Conc. (Tc)	= 17.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Total to depression

Hyd. No. 6

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.00 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 5 - Subcatchment E-1D	Max. Elevation	= 224.00 ft
Pond Name	= Existing Depression	Max. Storage	= 14.0 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Total to depression

Hyd. No. 6

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 0.00 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 5 - Subcatchment E-1D	Max. Elevation	= 225.01 ft
Pond Name	= Existing Depression	Max. Storage	= 4,313 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Total to depression

Hyd. No. 6

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 0.00 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 5 - Subcatchment E-1D	Max. Elevation	= 225.38 ft
Pond Name	= Existing Depression	Max. Storage	= 10,247 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Total to depression

Hyd. No. 6

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 0.00 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 5 - Subcatchment E-1D	Max. Elevation	= 226.10 ft
Pond Name	= Existing Depression	Max. Storage	= 23,195 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs

Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

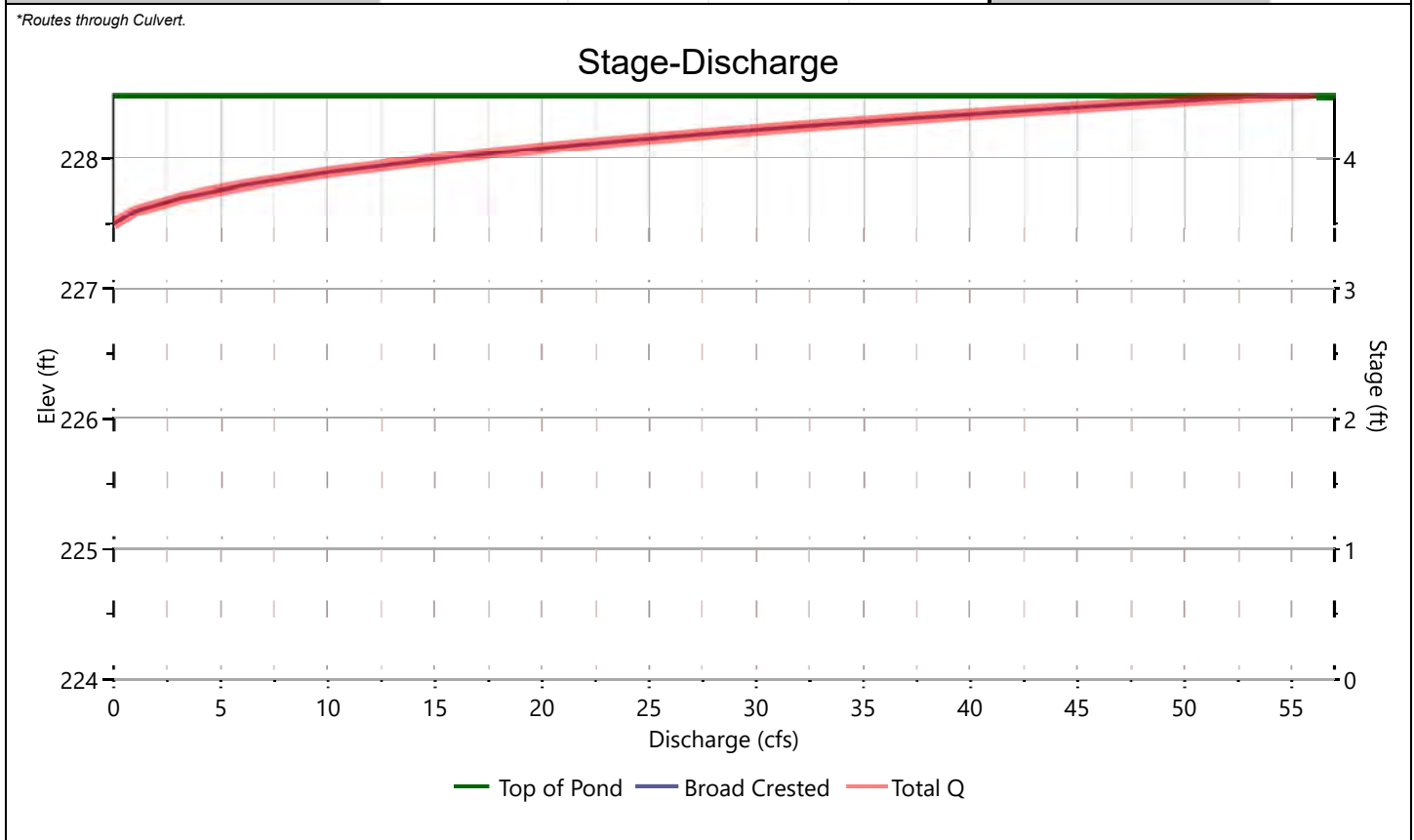
12-14-2023

Existing Depression

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in					Hole Diameter, in
Span, in					No. holes
No. Barrels					Invert Elevation, ft
Invert Elevation, ft					Height, ft
Orifice Coefficient, Co					Orifice Coefficient, Co
Length, ft					
Barrel Slope, %					
N-Value, n	0.000				
Weirs	Riser*	Weirs			Ancillary
Shape / Type		1	2	3	Exfiltration, in/hr
Crest Elevation, ft		Broad Crested			
Crest Length, ft		227.5			
Angle, deg		9			
Weir Coefficient, Cw		5.7 (10:1)			
		3.3			

*Routes through Culvert.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Existing Depression

Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	224.00	0.000						0.000						0.000
1.00	225.00	4,210						0.000						0.000
2.00	226.00	20,089						0.000						0.000
3.00	227.00	52,140						0.000						0.000
4.00	228.00	102,875						15.17						15.17
4.50	228.50	136,903						56.10						56.10

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

Pond Report

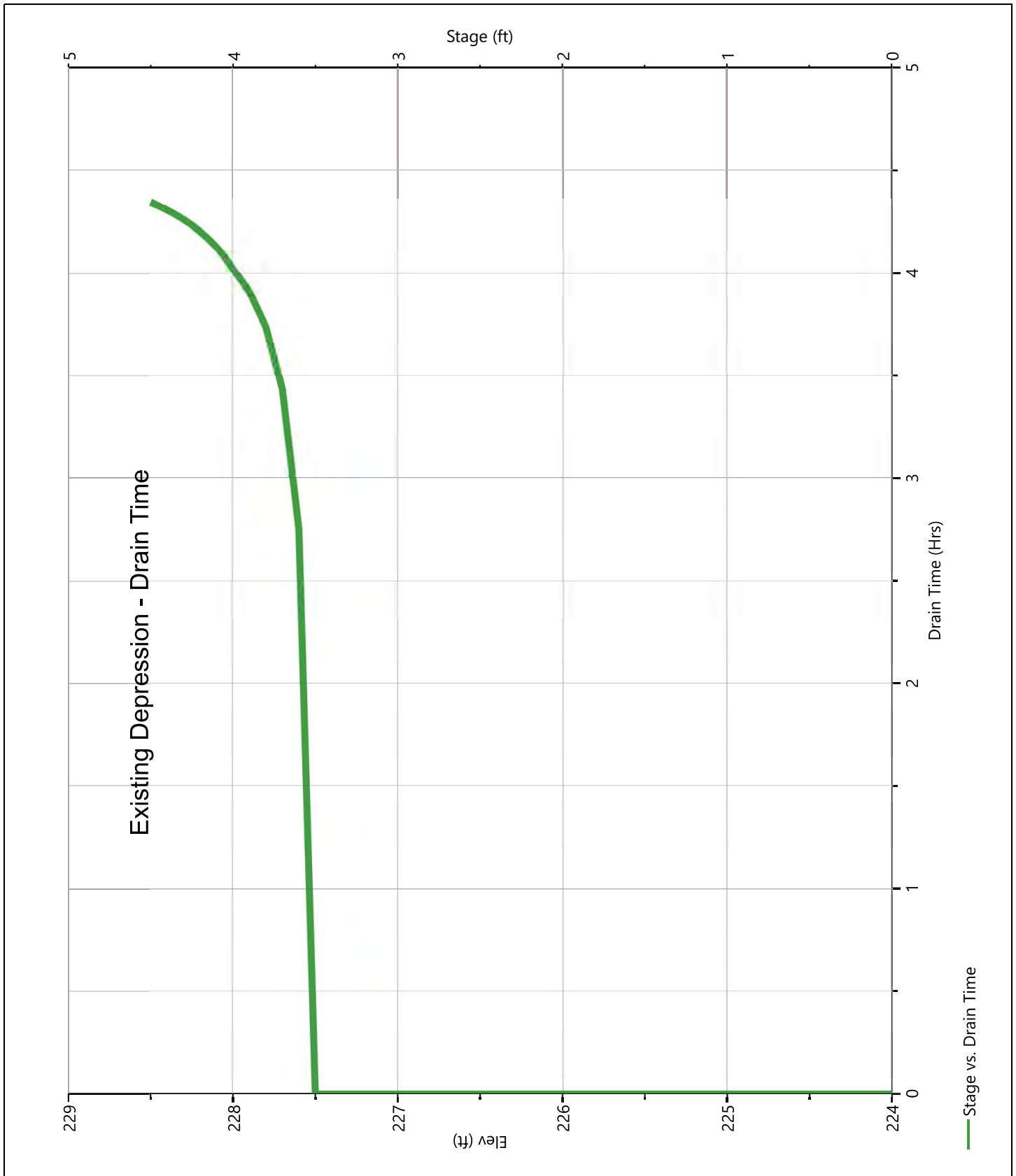
Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Existing Depression

Pond Drawdown



Hydrograph Report

Project Name:

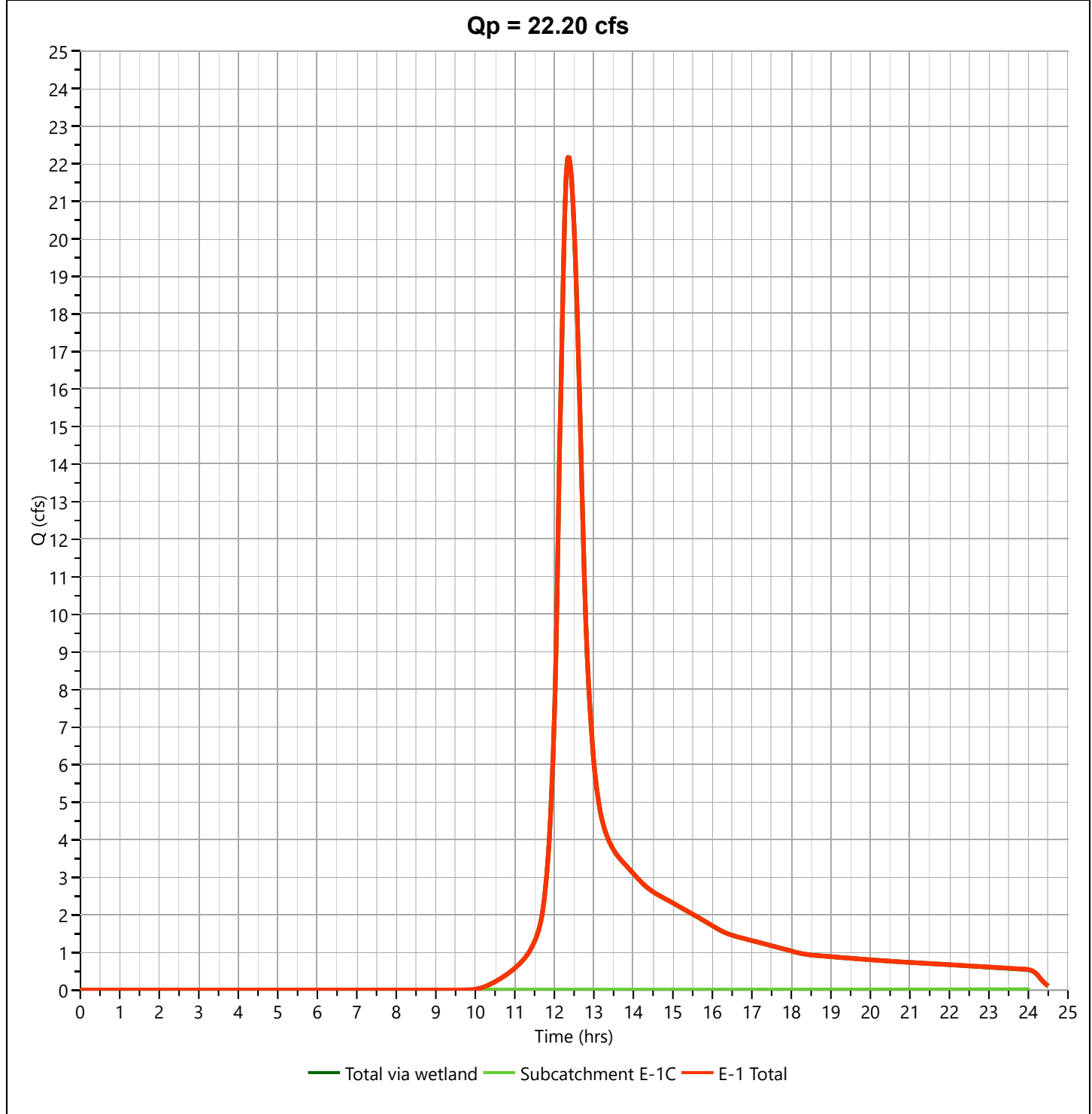
Hydrology Studio v 3.0.0.29

12-13-2023

E-1 Total

Hyd. No. 7

Hydrograph Type	= Junction	Peak Flow	= 22.20 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Hydrograph Volume	= 118,877 cuft
Inflow Hydrographs	= 3, 4, 6	Total Contrib. Area	= 49.96 ac



Hydrograph Report

Project Name:

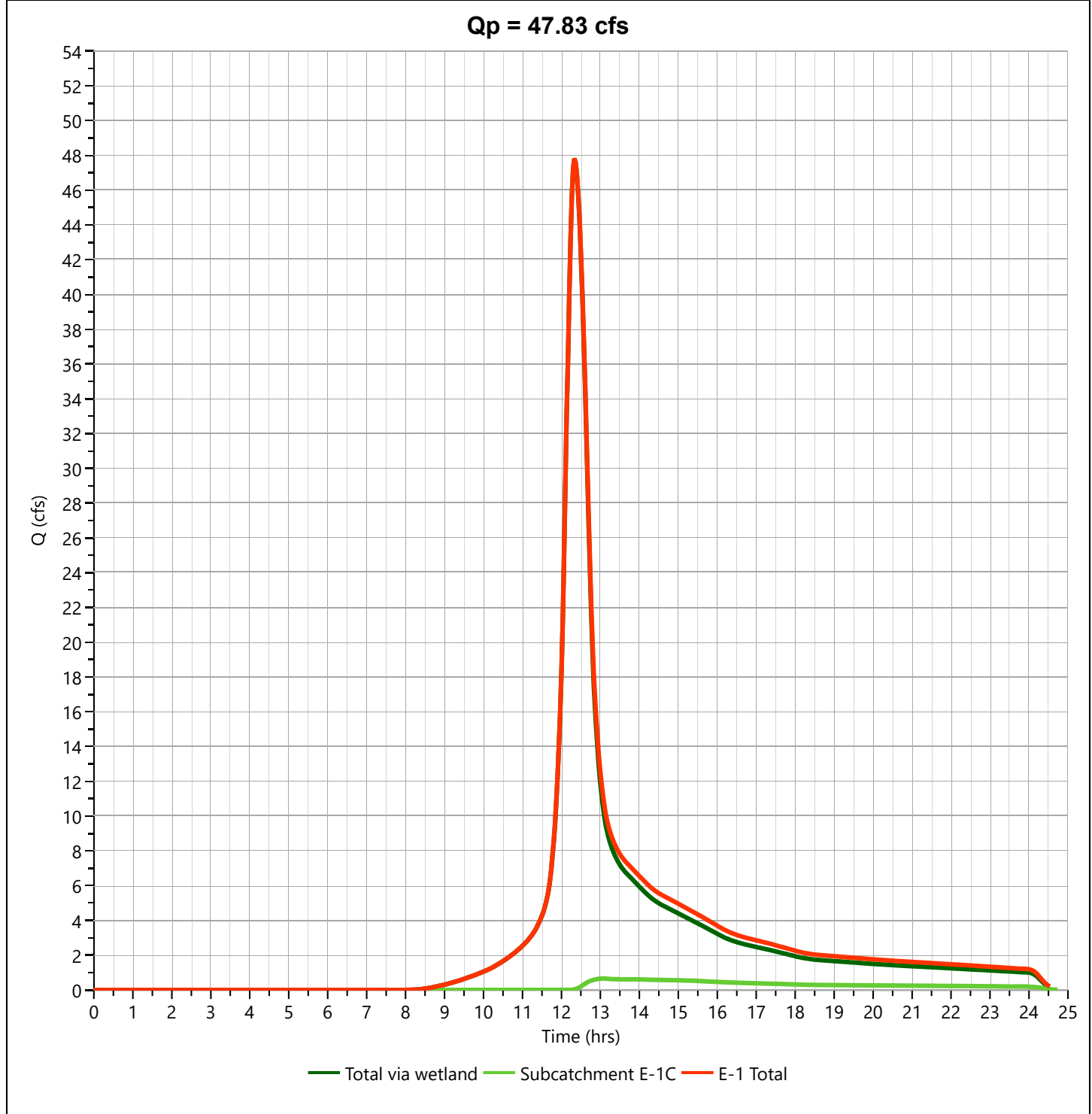
Hydrology Studio v 3.0.0.29

12-13-2023

E-1 Total

Hyd. No. 7

Hydrograph Type	= Junction	Peak Flow	= 47.83 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 268,226 cuft
Inflow Hydrographs	= 3, 4, 6	Total Contrib. Area	= 49.96 ac



Hydrograph Report

Project Name:

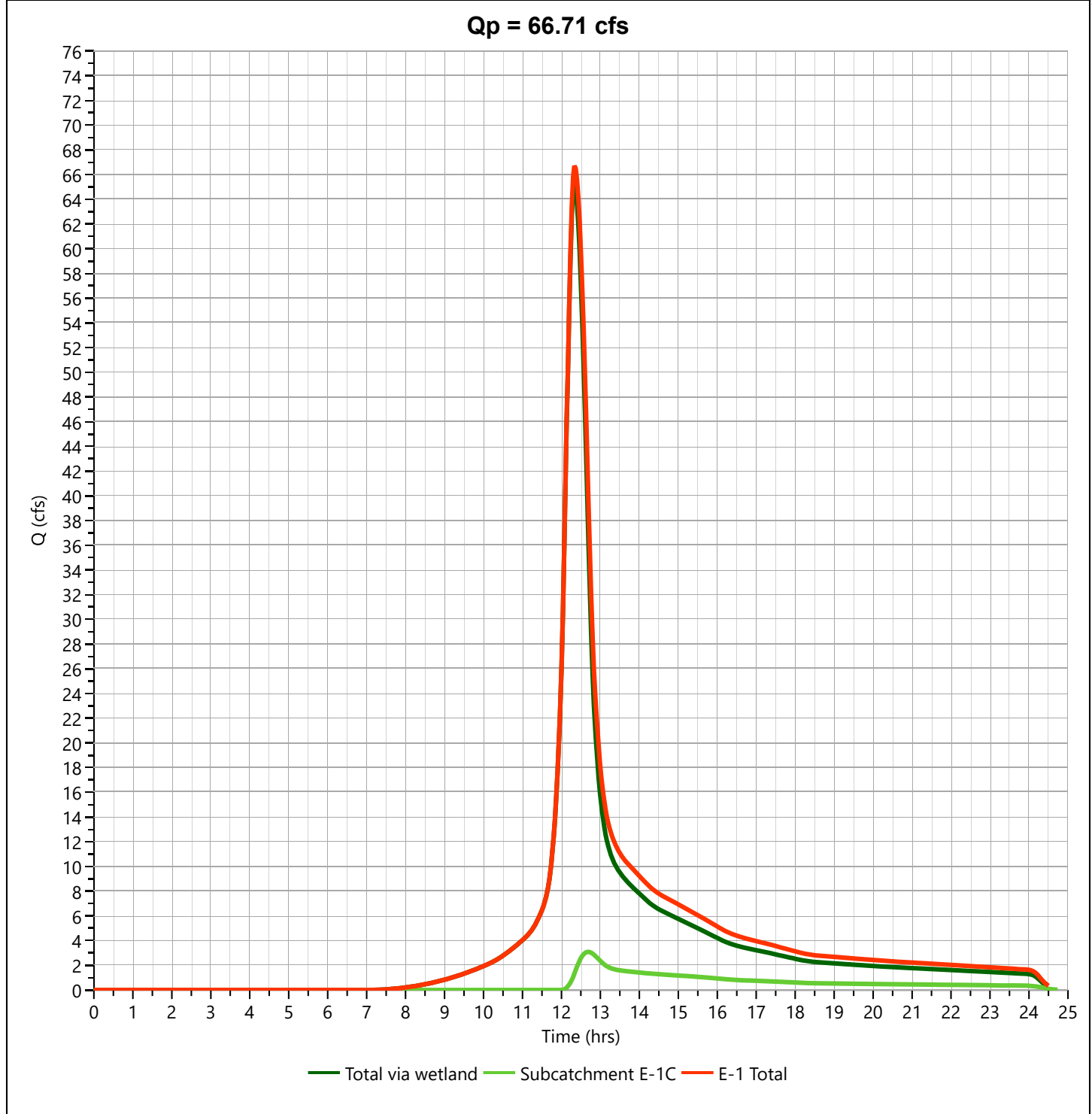
Hydrology Studio v 3.0.0.29

12-13-2023

E-1 Total

Hyd. No. 7

Hydrograph Type	= Junction	Peak Flow	= 66.71 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 382,190 cuft
Inflow Hydrographs	= 3, 4, 6	Total Contrib. Area	= 49.96 ac



Hydrograph Report

Project Name:

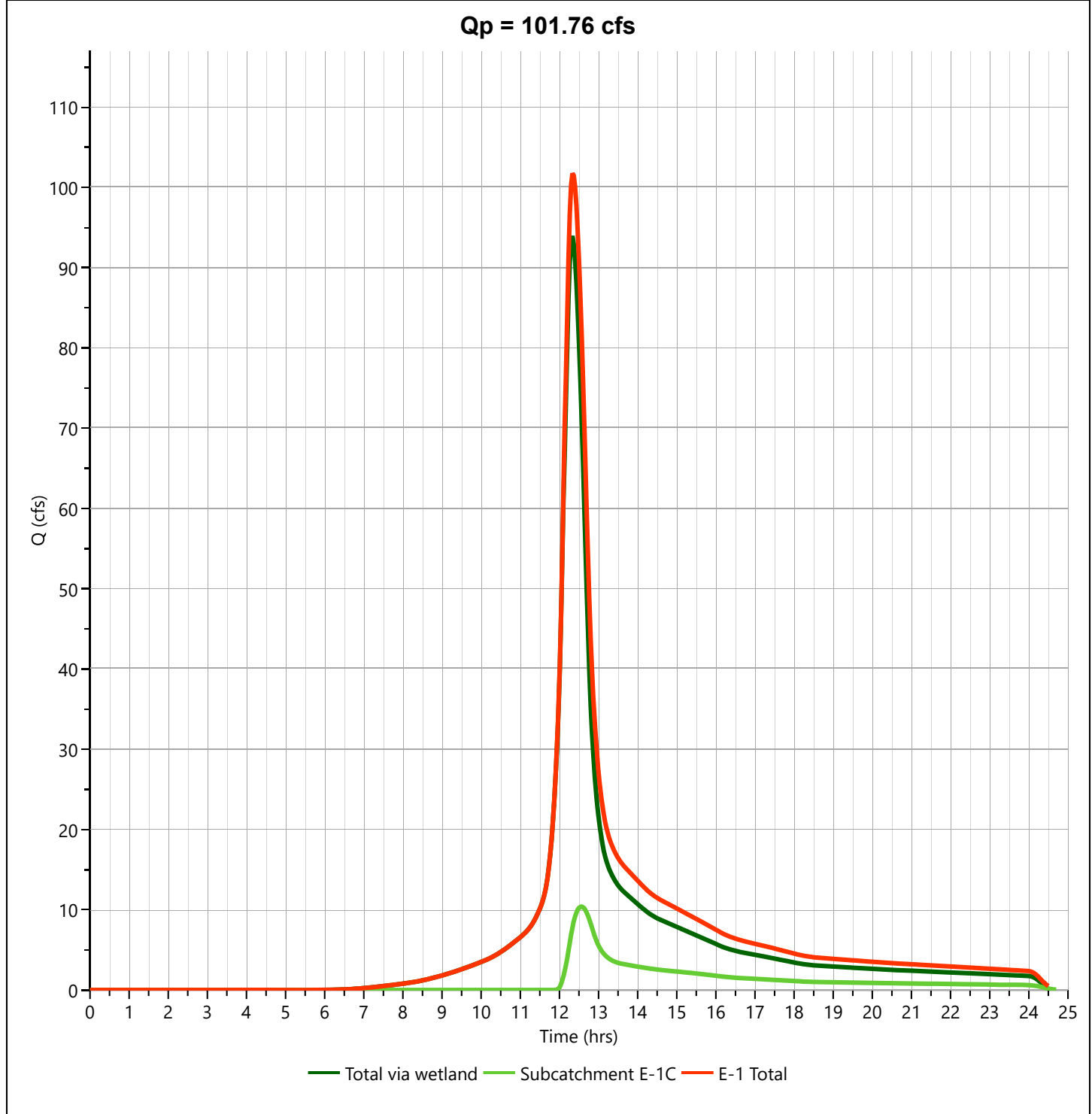
Hydrology Studio v 3.0.0.29

12-13-2023

E-1 Total

Hyd. No. 7

Hydrograph Type	= Junction	Peak Flow	= 101.8 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 579,643 cuft
Inflow Hydrographs	= 3, 4, 6	Total Contrib. Area	= 49.96 ac



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment E-2

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.07	6.92
A	Woods - Good Condition	30			1.00	29.95
A	Open Space - Good Condition	39			4.13	160.92
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.01	0.66
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					5.20	198.46

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{198.46}{5.20} = 38.14 ; \text{ Use CN} = \boxed{38}$$

2. Runoff

Frequency..... yr

Rainfall, P (24-hour)..... in

Runoff, Q..... in

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
0.00	0.17	1.01

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one:

Present

 Developed

Subcatchment E-2

Circle one:

Tc

 Tt through

through subarea _____

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	Wooded		
	0.6		
ft	50		
in	3.1		
ft/ft	0.028		
Compute Tt hr	0.25		0.25

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C	C-D	
	UNPAVED	UNPAVED	
ft	249	131	
ft/ft	0.025	0.07	
ft/s	2.55	4.27	
Compute Tt hr	0.03	0.01	0.04

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r ft			
ft/ft			
Compute V ft/s			
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.29
min 17.3

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-2

Hyd. No. 8

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.00 hrs
Time Interval	= 2 min	Runoff Volume	= 0.000 cuft
Drainage Area	= 5.2 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 17.3 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484

Qp = 0.00 cfs

Hydrograph Report

Project Name:

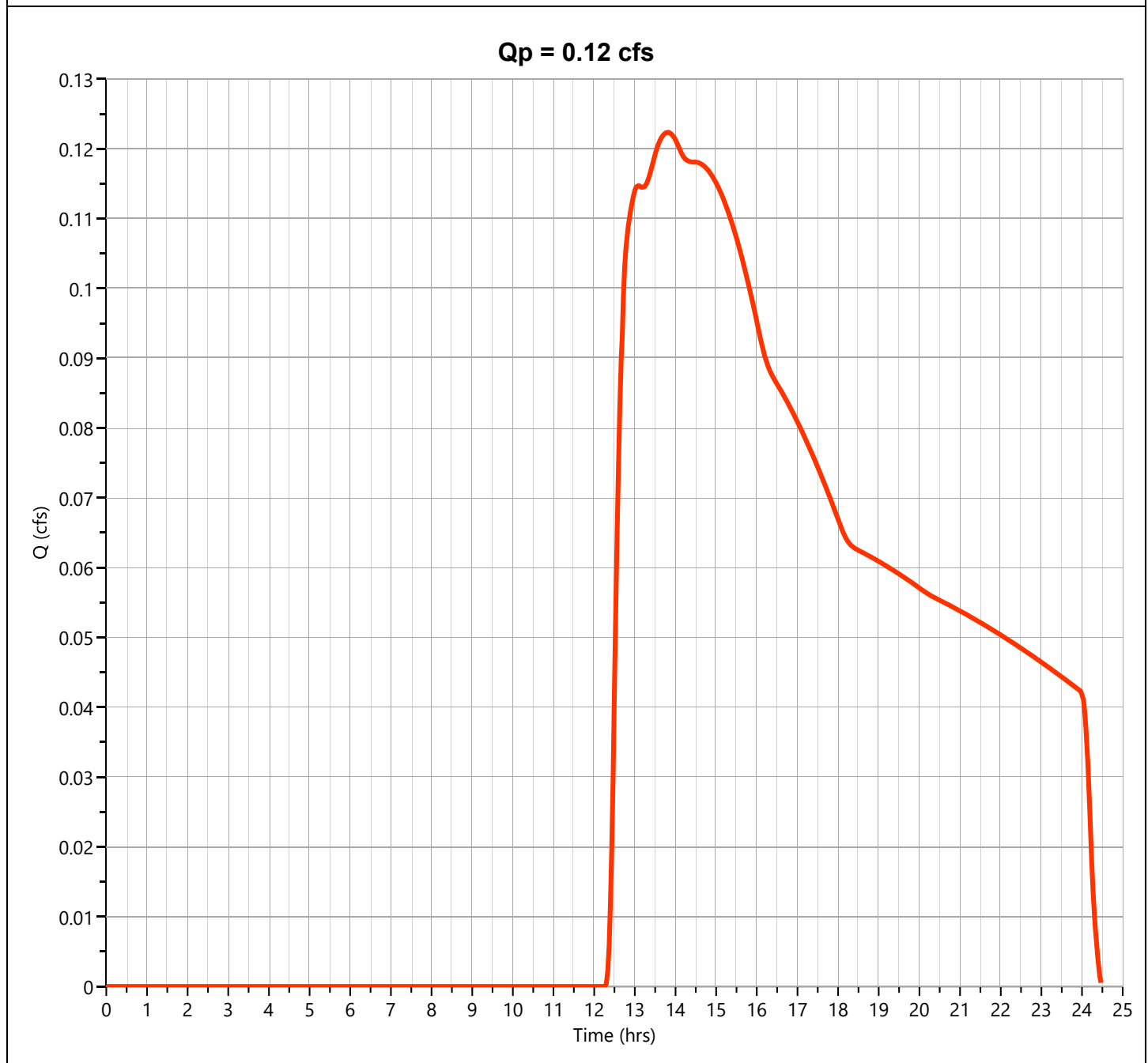
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-2

Hyd. No. 8

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.122 cfs
Storm Frequency	= 10-yr	Time to Peak	= 13.80 hrs
Time Interval	= 2 min	Runoff Volume	= 3,189 cuft
Drainage Area	= 5.2 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 17.3 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

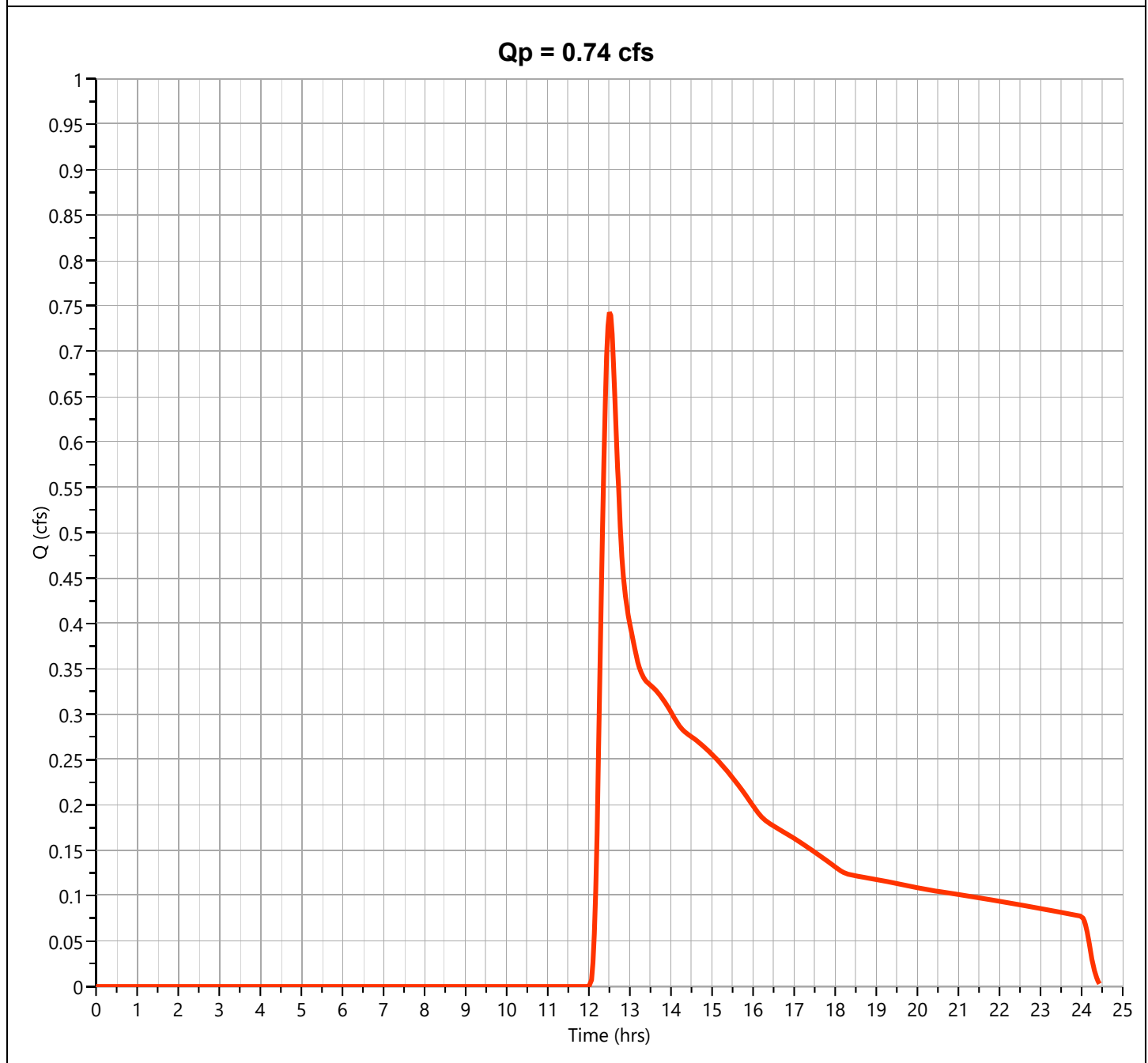
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-2

Hyd. No. 8

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.743 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.50 hrs
Time Interval	= 2 min	Runoff Volume	= 8,035 cuft
Drainage Area	= 5.2 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 17.3 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

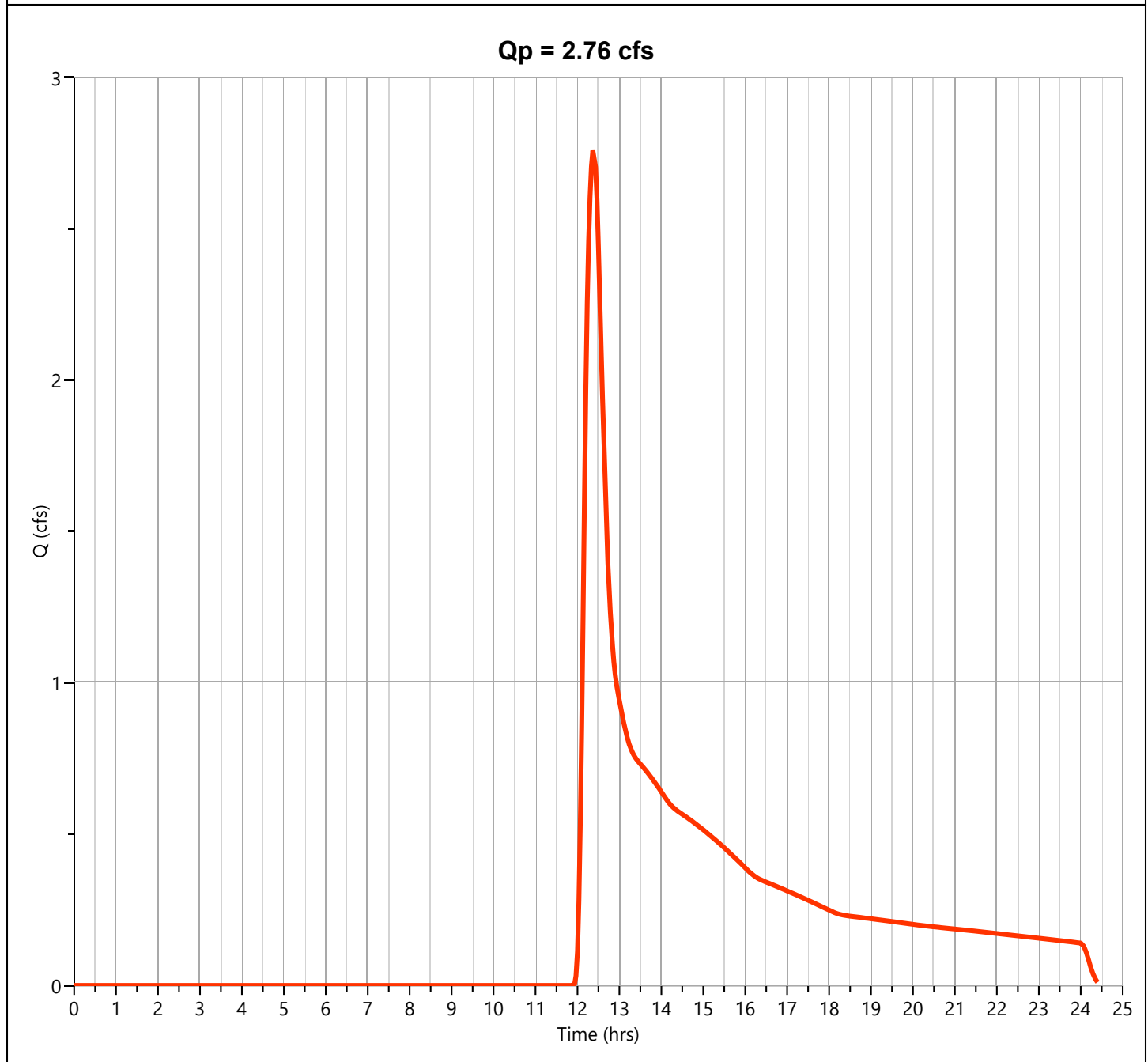
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-2

Hyd. No. 8

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.758 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Runoff Volume	= 18,852 cuft
Drainage Area	= 5.2 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 17.3 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment E-3

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.05	5.19
A	Woods - Good Condition	30			2.57	77.12
A	Open Space - Good Condition	39			0.70	27.21
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					3.32	109.51

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{109.51}{3.32} = \underline{32.97} ; \text{ Use CN} = \underline{33}$$

2. Runoff

Frequency..... yr

Rainfall, P (24-hour)..... in

Runoff, Q..... in

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
0.04	0.04	0.59

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one:

Present
Tc

 Developed Tt through subarea

Subcatchment E-3

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	Wooded		
	0.6		
ft	50		
in	3.1		
ft/ft	0.040		
Compute Tt hr	0.22		0.22

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C	C-D	
	UNPAVED	UNPAVED	
ft	30	39	
ft/ft	0.1	0.2	
ft/s	5.10	7.22	
Compute Tt hr	0.00	0.00	0.00

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r ft			
ft/ft			
Compute V ft/s			
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.22
min 13.3

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-3

Hyd. No. 9

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.00 hrs
Time Interval	= 2 min	Runoff Volume	= 0.000 cuft
Drainage Area	= 3.32 ac	Curve Number	= 33
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484

Qp = 0.00 cfs

Hydrograph Report

Project Name:

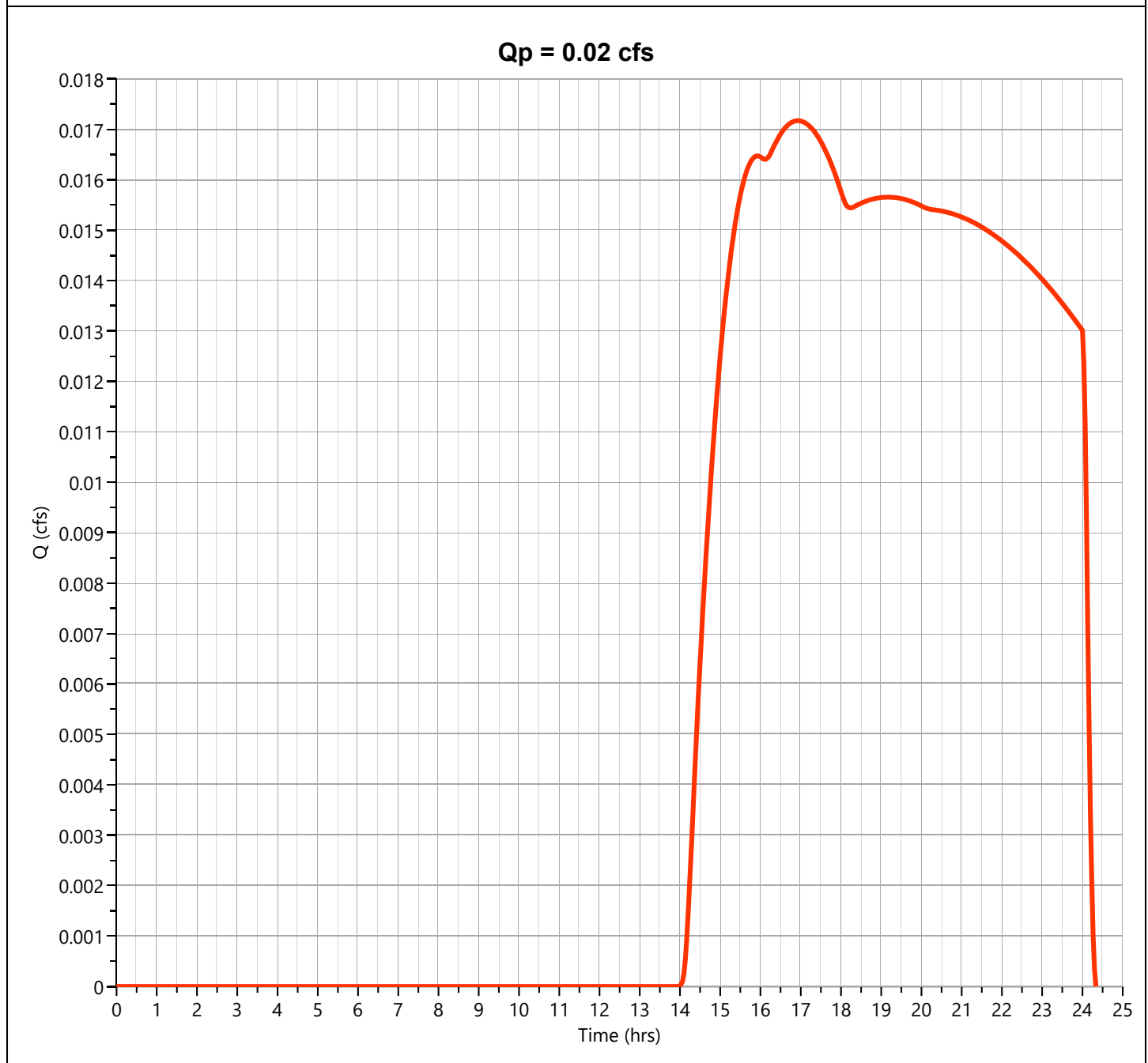
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-3

Hyd. No. 9

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.017 cfs
Storm Frequency	= 10-yr	Time to Peak	= 16.93 hrs
Time Interval	= 2 min	Runoff Volume	= 527 cuft
Drainage Area	= 3.32 ac	Curve Number	= 33
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

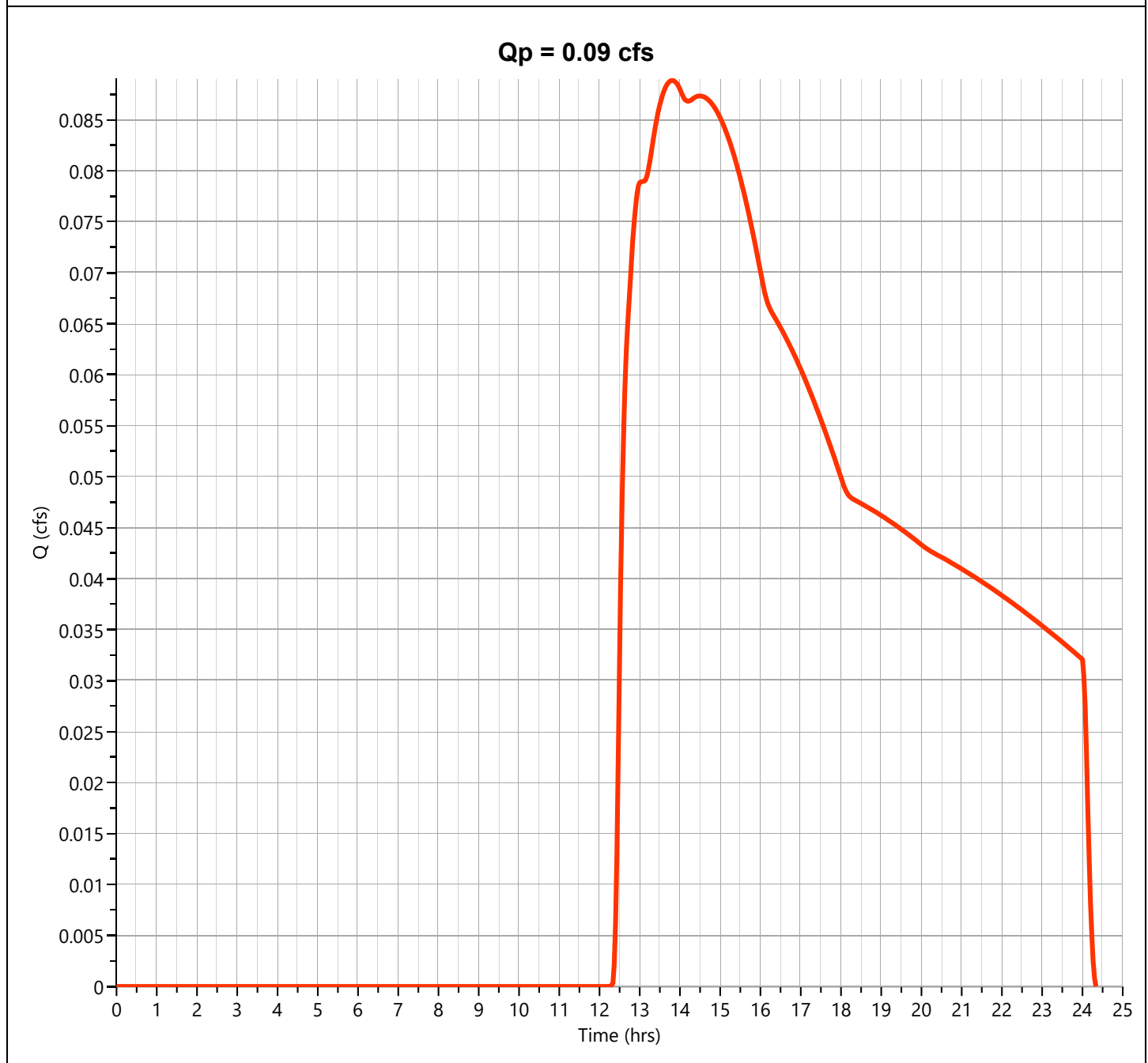
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-3

Hyd. No. 9

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.089 cfs
Storm Frequency	= 25-yr	Time to Peak	= 13.80 hrs
Time Interval	= 2 min	Runoff Volume	= 2,357 cuft
Drainage Area	= 3.32 ac	Curve Number	= 33
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

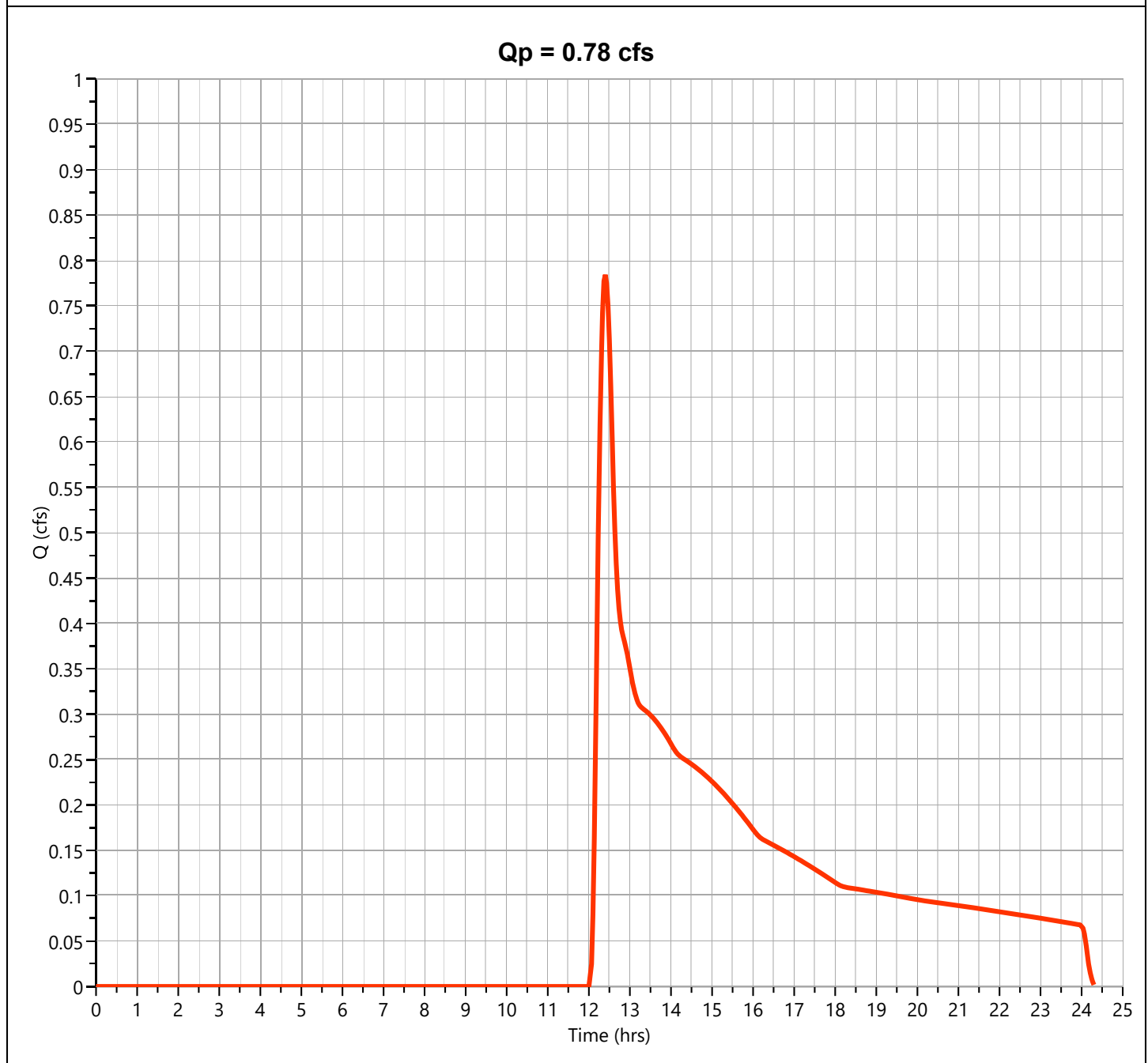
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-3

Hyd. No. 9

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.784 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.40 hrs
Time Interval	= 2 min	Runoff Volume	= 7,324 cuft
Drainage Area	= 3.32 ac	Curve Number	= 33
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment E-4

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.06	6.18
A	Woods - Good Condition	30			1.14	34.22
A	Open Space - Good Condition	39			1.16	45.41
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					2.37	85.81

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{85.81}{2.37} = 36.24 ; \text{ Use CN} = \boxed{36}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	0.00	0.12	0.85

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one:

Present

 Developed

Subcatchment E-4

Circle one:

Tc

 Tt through

subarea _____

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	Wooded		
	0.6		
ft	50		
in	3.1		
ft/ft	0.050		
Compute Tt hr	0.20		0.20

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C		
	UNPAVED		
ft	260		
ft/ft	0.045		
ft/s	3.42		
Compute Tt hr	0.02		0.02

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r ft			
ft/ft			
Compute V ft/s			
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.22
min 13.3

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-4

Hyd. No. 10

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.00 hrs
Time Interval	= 2 min	Runoff Volume	= 0.000 cuft
Drainage Area	= 2.37 ac	Curve Number	= 36
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484

Qp = 0.00 cfs

Hydrograph Report

Project Name:

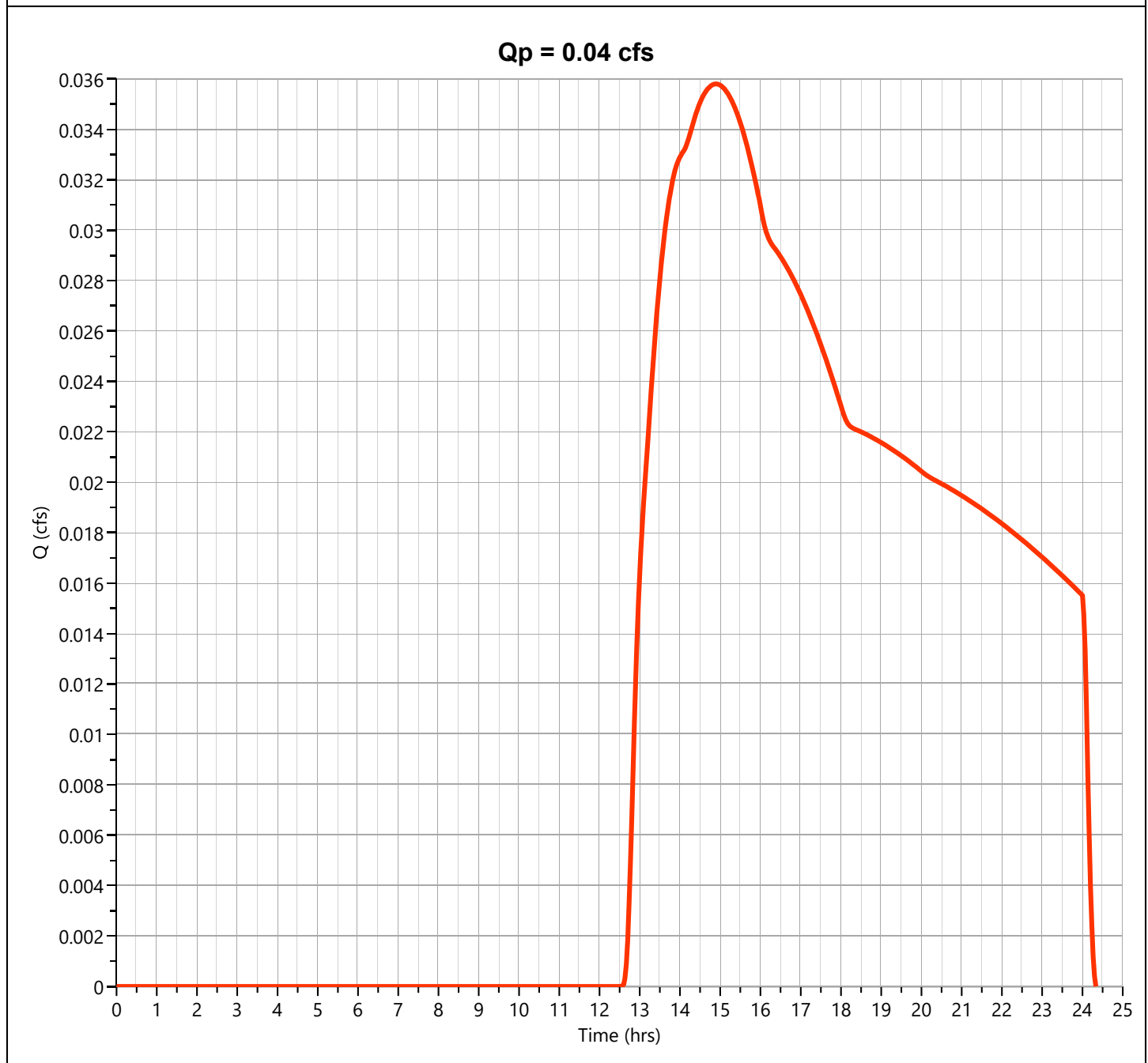
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-4

Hyd. No. 10

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.036 cfs
Storm Frequency	= 10-yr	Time to Peak	= 14.90 hrs
Time Interval	= 2 min	Runoff Volume	= 976 cuft
Drainage Area	= 2.37 ac	Curve Number	= 36
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

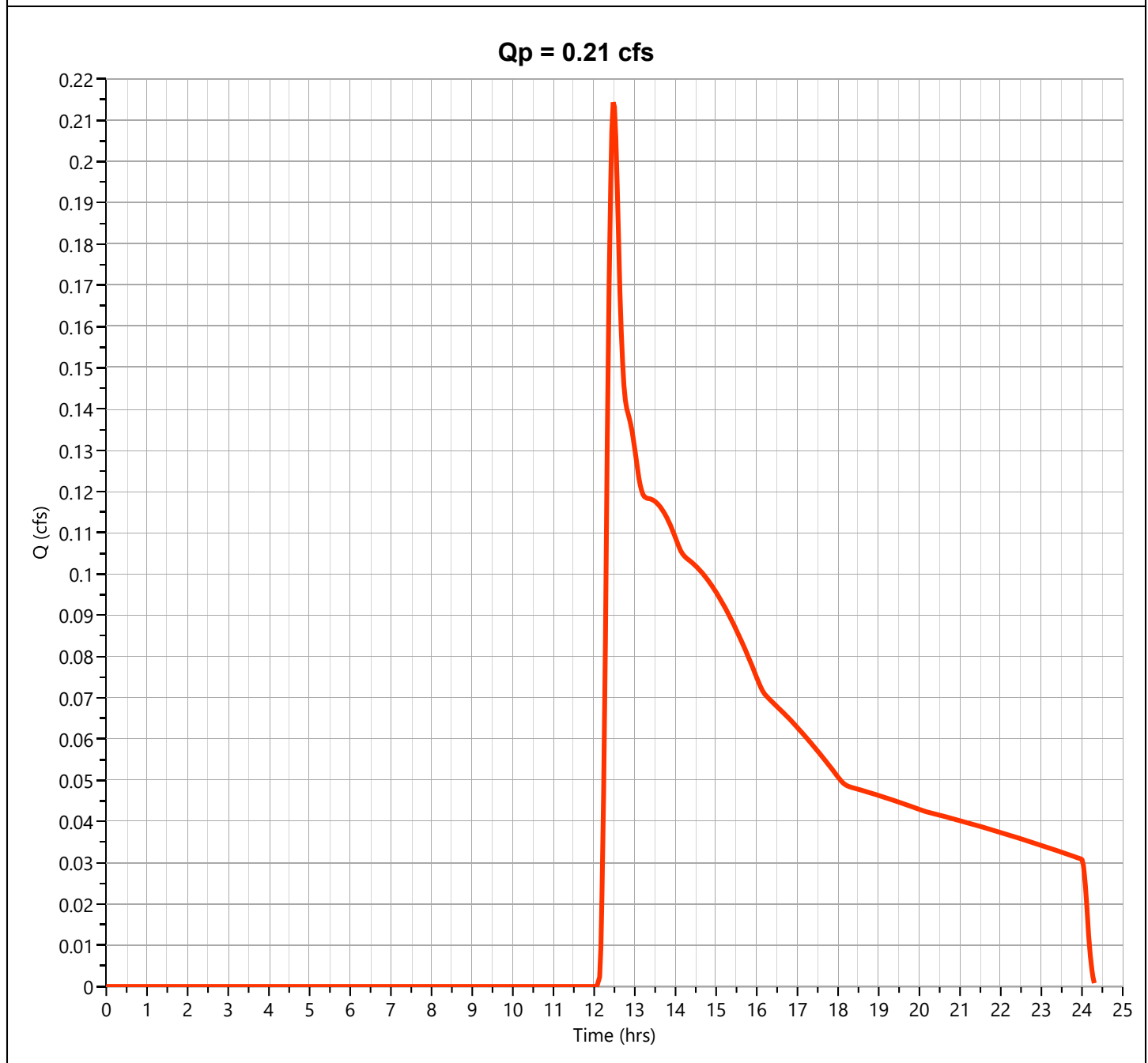
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-4

Hyd. No. 10

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.214 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.47 hrs
Time Interval	= 2 min	Runoff Volume	= 2,868 cuft
Drainage Area	= 2.37 ac	Curve Number	= 36
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

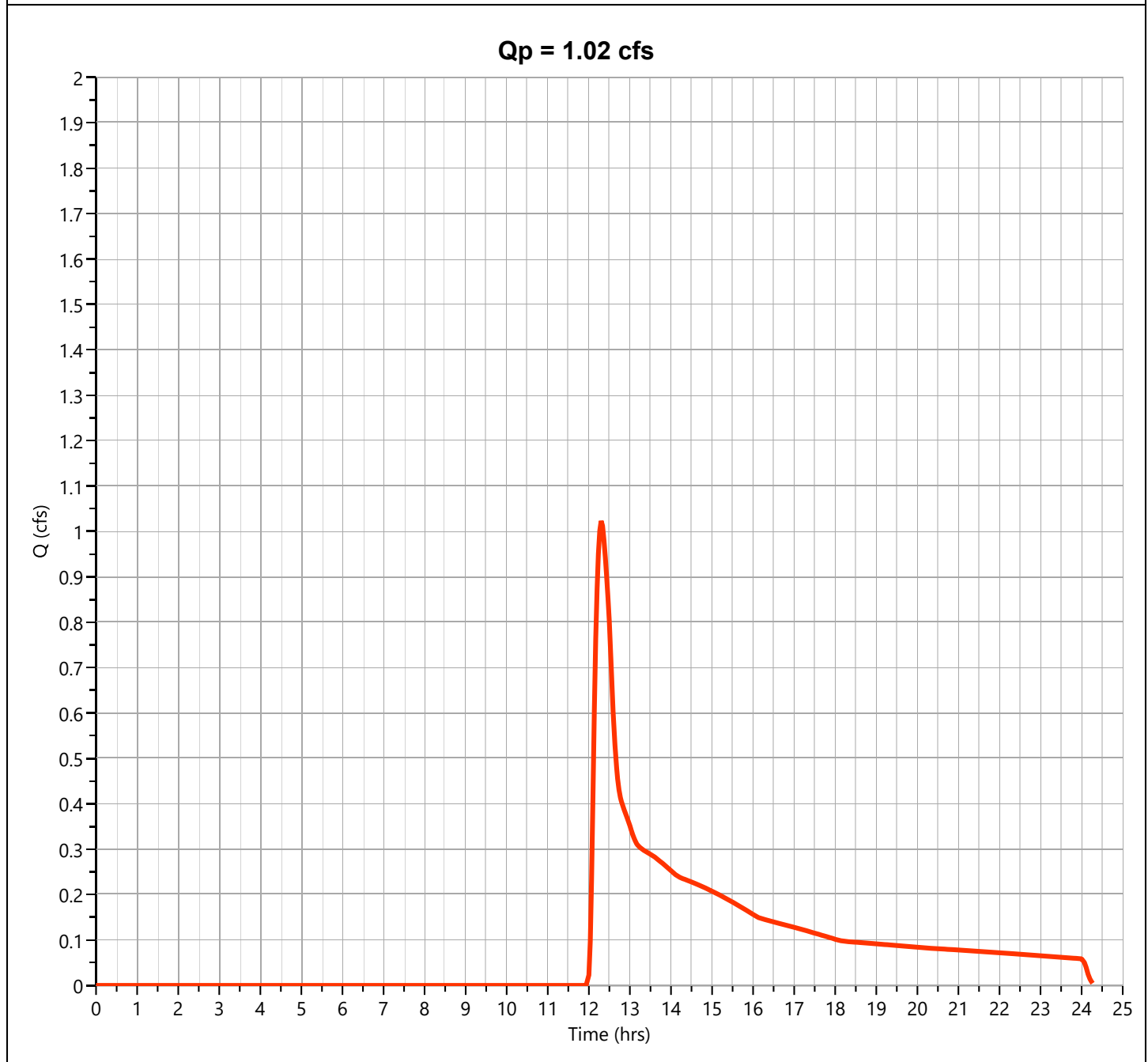
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-4

Hyd. No. 10

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.023 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.30 hrs
Time Interval	= 2 min	Runoff Volume	= 7,348 cuft
Drainage Area	= 2.37 ac	Curve Number	= 36
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment E-5

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.05	4.44
A	Woods - Good Condition	30			0.39	11.74
A	Open Space - Good Condition	39			2.15	83.84
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					2.59	100.02

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{100.02}{2.59} = 38.67 ; \text{ Use CN} = \boxed{39}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	0.00	0.19	1.06

(Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one:

Present

 Developed

Subcatchment E-5

Circle one:

Tc

 Tt through

_____ through subarea

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	Wooded		
	0.6		
ft	50		
in	3.1		
ft/ft	0.030		
Compute Tt hr	0.25		0.25

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C	C-D	
	UNPAVED	UNPAVED	
ft	184	293	
ft/ft	0.01	0.05	
ft/s	1.61	3.61	
Compute Tt hr	0.03	0.02	0.05

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r ft			
ft/ft			
Compute V ft/s			
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.30
min 18.0

Hydrograph Report

Project Name:

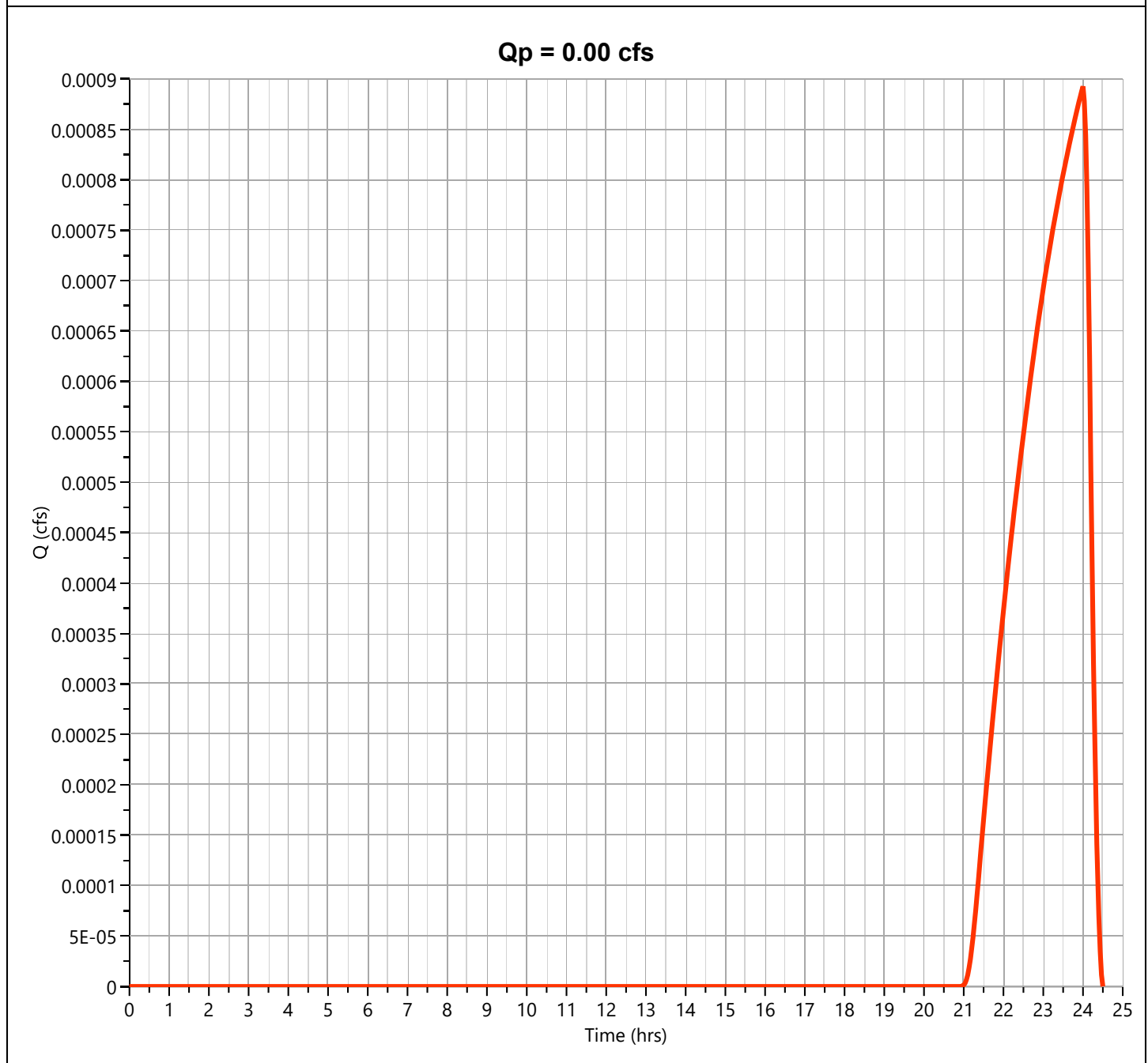
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-5

Hyd. No. 11

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.001 cfs
Storm Frequency	= 2-yr	Time to Peak	= 24.00 hrs
Time Interval	= 2 min	Runoff Volume	= 6.19 cuft
Drainage Area	= 2.59 ac	Curve Number	= 39
Tc Method	= User	Time of Conc. (Tc)	= 18.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

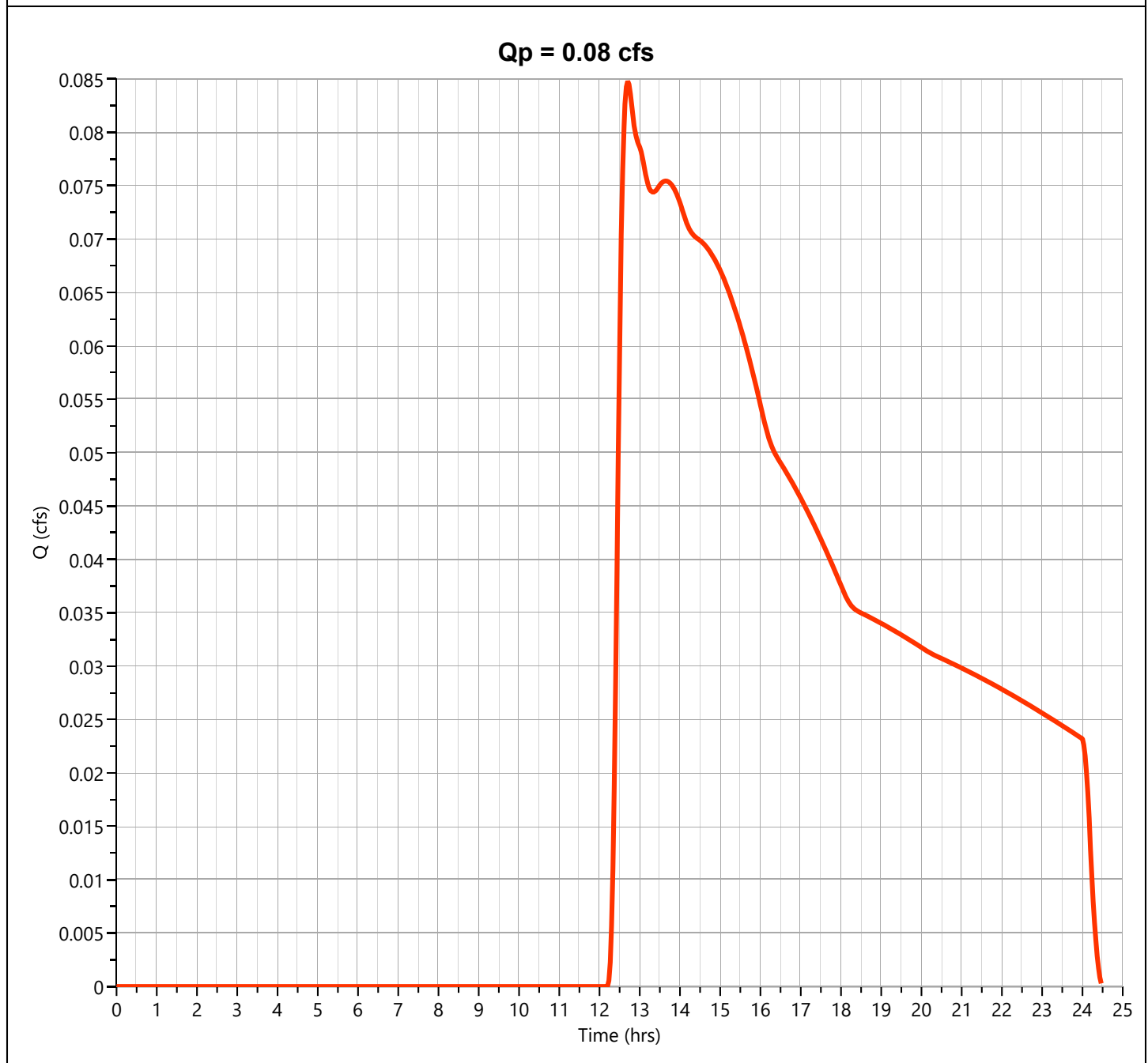
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-5

Hyd. No. 11

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.085 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.70 hrs
Time Interval	= 2 min	Runoff Volume	= 1,900 cuft
Drainage Area	= 2.59 ac	Curve Number	= 39
Tc Method	= User	Time of Conc. (Tc)	= 18.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

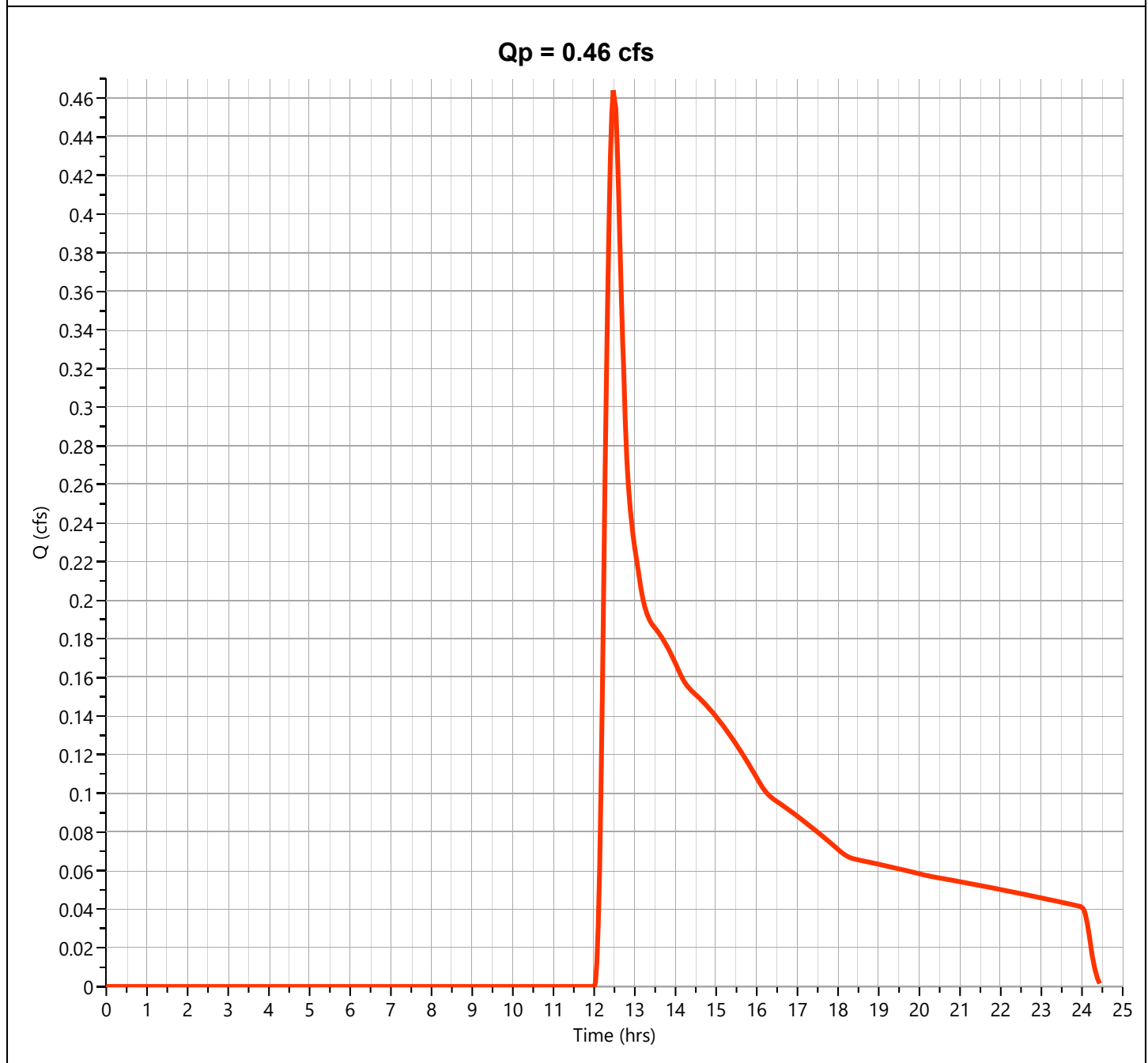
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-5

Hyd. No. 11

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.465 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.50 hrs
Time Interval	= 2 min	Runoff Volume	= 4,514 cuft
Drainage Area	= 2.59 ac	Curve Number	= 39
Tc Method	= User	Time of Conc. (Tc)	= 18.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

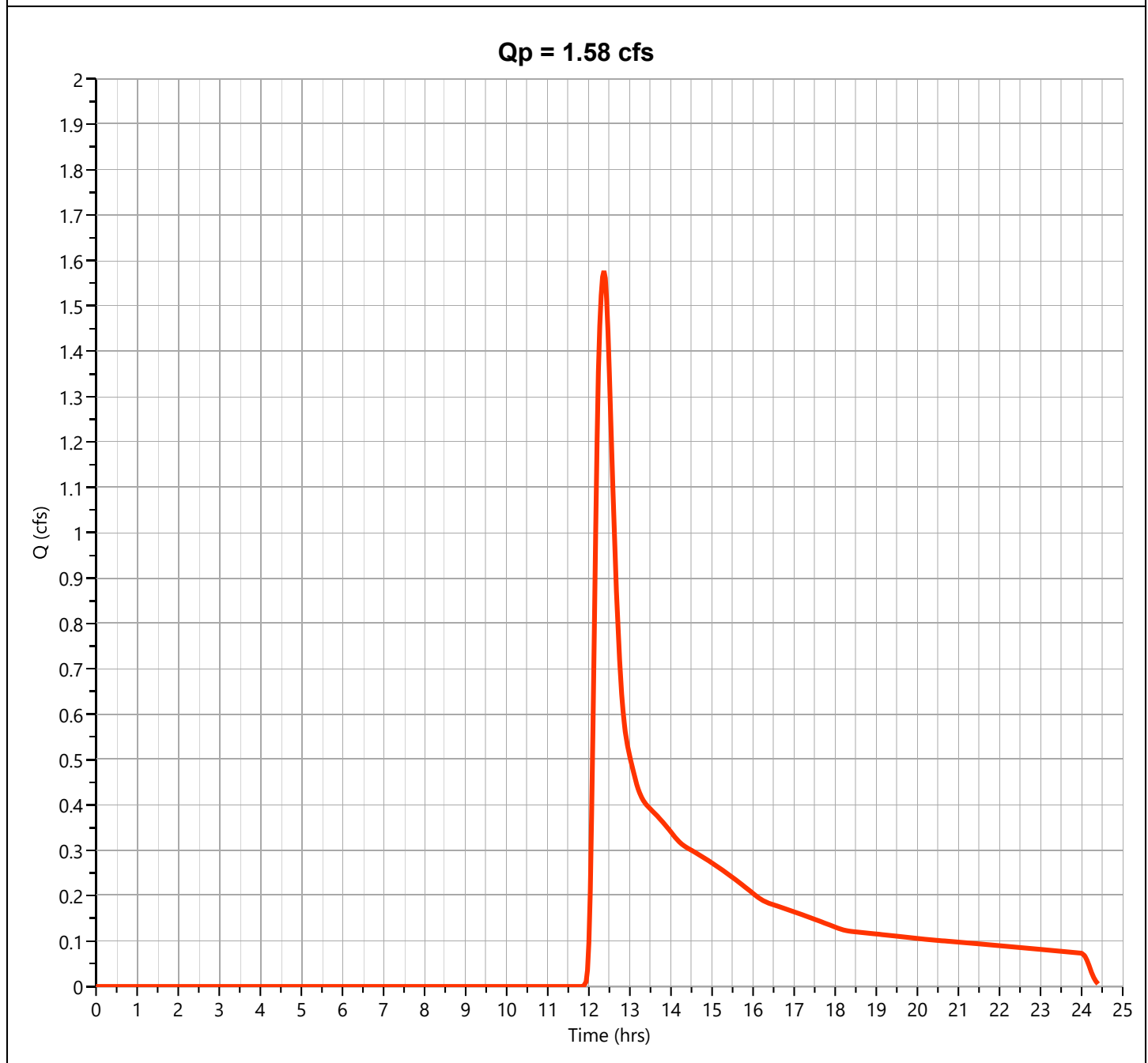
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-5

Hyd. No. 11

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.577 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Runoff Volume	= 10,217 cuft
Drainage Area	= 2.59 ac	Curve Number	= 39
Tc Method	= User	Time of Conc. (Tc)	= 18.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment E-6

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.02	1.74
A	Woods - Good Condition	30			1.00	29.85
A	Open Space - Good Condition	39			5.37	209.47
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					6.38	241.06

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{241.06}{6.38} = 37.76 ; \text{ Use CN} = \boxed{38}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	0.00	0.16	0.98

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one:

Present

 Developed

Subcatchment E-6

Circle one:

Tc

 Tt through

_____ through subarea

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	Wooded		
	0.6		
ft	50		
in	3.1		
ft/ft	0.030		
Compute Tt hr	0.25		0.25

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C		
	UNPAVED		
ft	469		
ft/ft	0.008		
ft/s	1.44		
Compute Tt hr	0.09		0.09

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r	ft		
ft/ft			
Compute V	ft/s		
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.34
min 20.2

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-6

Hyd. No. 12

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.00 hrs
Time Interval	= 2 min	Runoff Volume	= 0.000 cuft
Drainage Area	= 6.38 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 15.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484

Qp = 0.00 cfs

Hydrograph Report

Project Name:

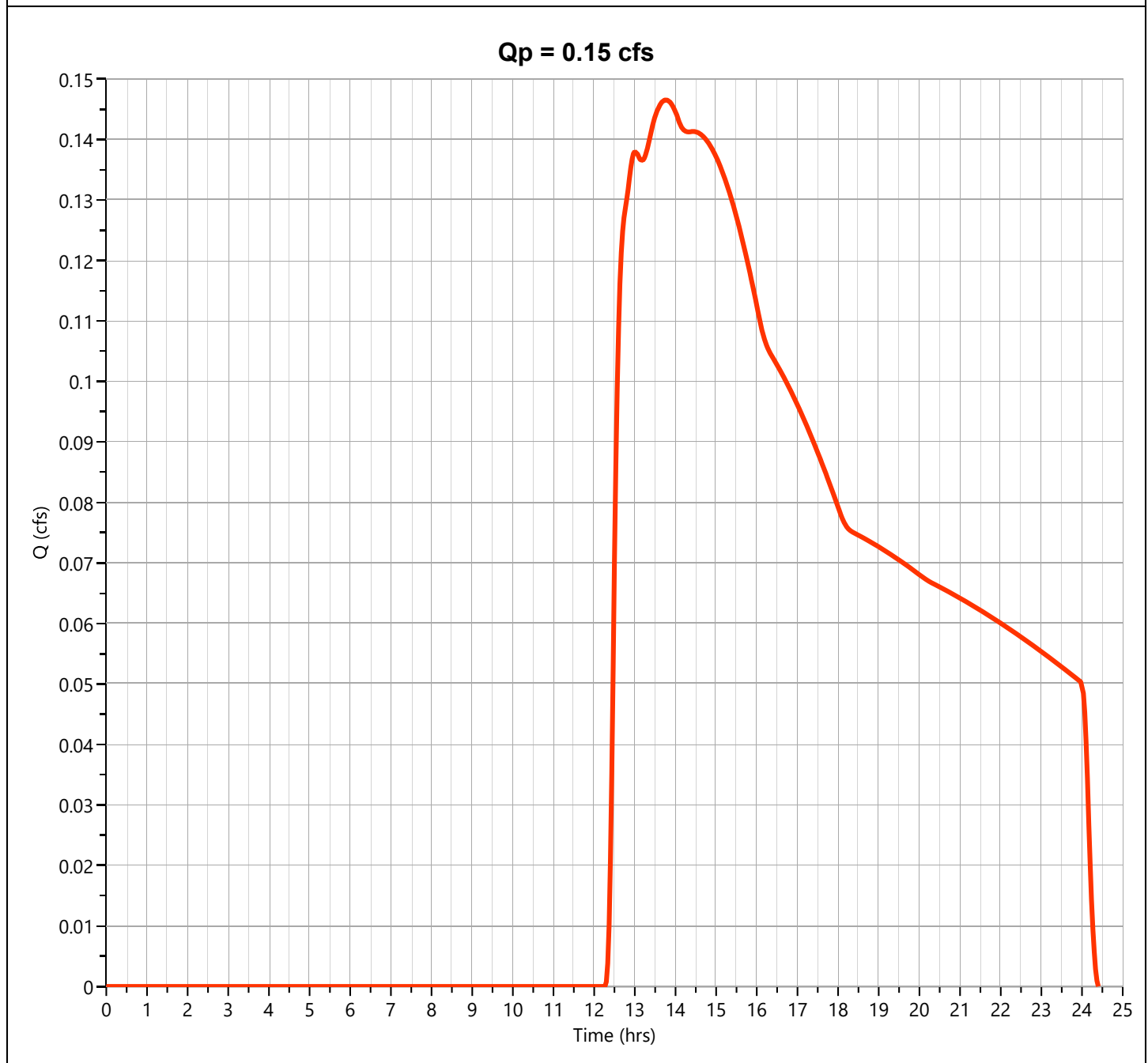
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-6

Hyd. No. 12

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.147 cfs
Storm Frequency	= 10-yr	Time to Peak	= 13.77 hrs
Time Interval	= 2 min	Runoff Volume	= 3,815 cuft
Drainage Area	= 6.38 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 15.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

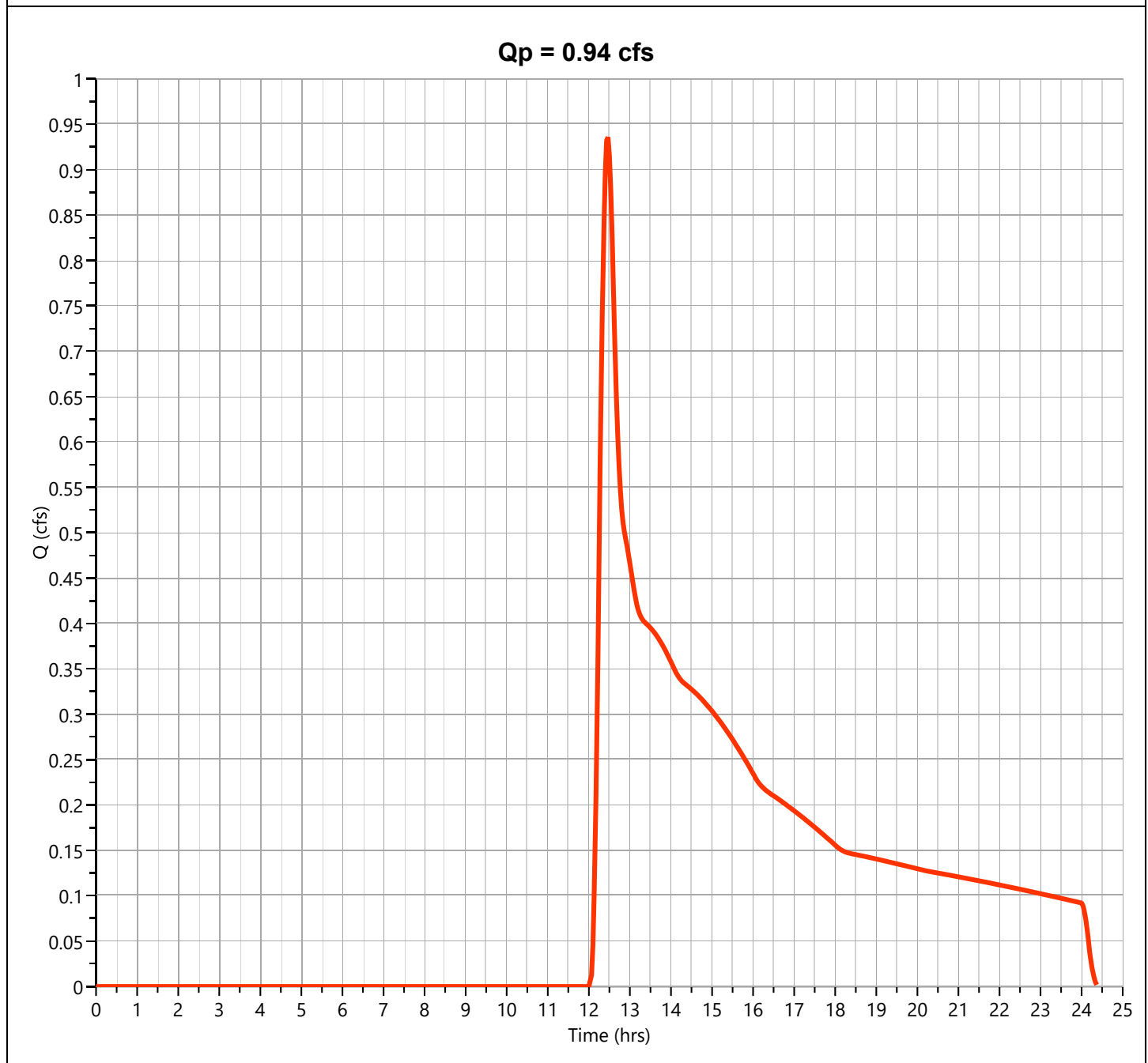
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-6

Hyd. No. 12

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.936 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.47 hrs
Time Interval	= 2 min	Runoff Volume	= 9,612 cuft
Drainage Area	= 6.38 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 15.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

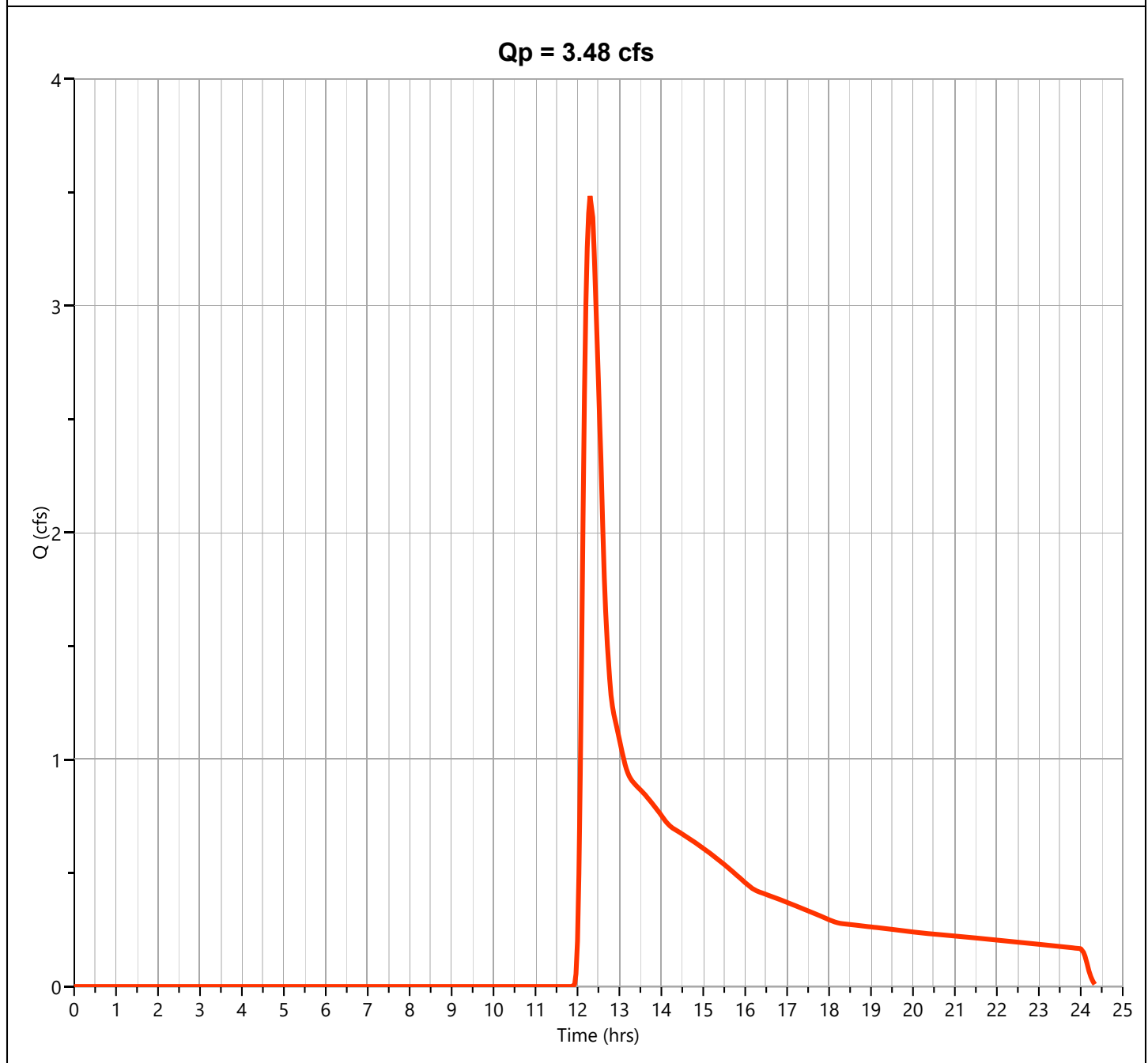
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment E-6

Hyd. No. 12

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.484 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.30 hrs
Time Interval	= 2 min	Runoff Volume	= 22,552 cuft
Drainage Area	= 6.38 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 15.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Post-Development Hydrology

Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-1A

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.61	59.83
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			1.26	49.11
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					1.87	108.94

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{108.94}{1.87} = 58.26 ; \text{ Use CN} = \boxed{58}$$

2. Runoff

Frequency..... yr

Rainfall, P (24-hour)..... in

Runoff, Q..... in

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
0.36	1.19	3.02

Hydrograph Report

Project Name:

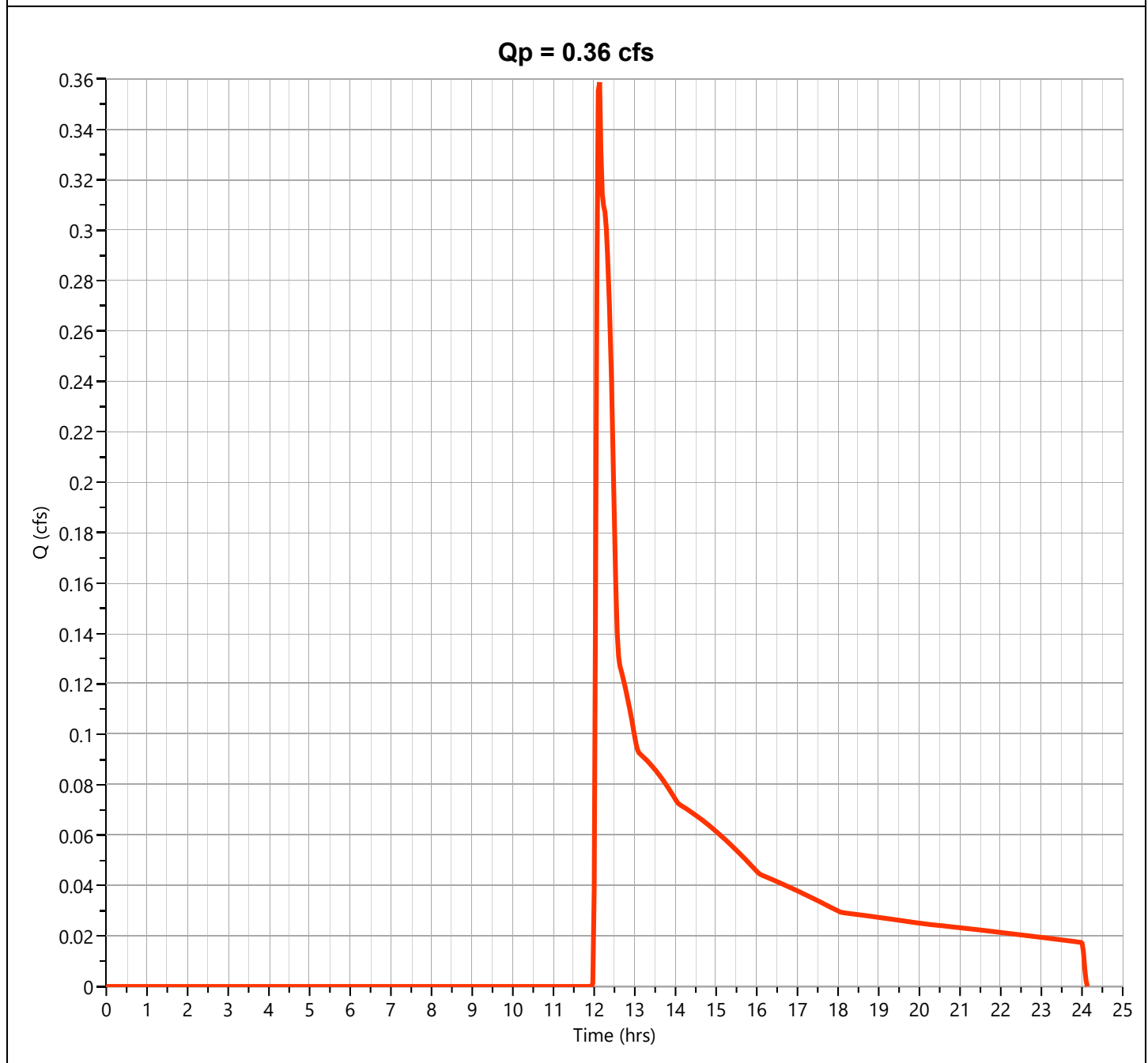
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1A

Hyd. No. 14

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.359 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.13 hrs
Time Interval	= 2 min	Runoff Volume	= 2,237 cuft
Drainage Area	= 1.87 ac	Curve Number	= 58
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

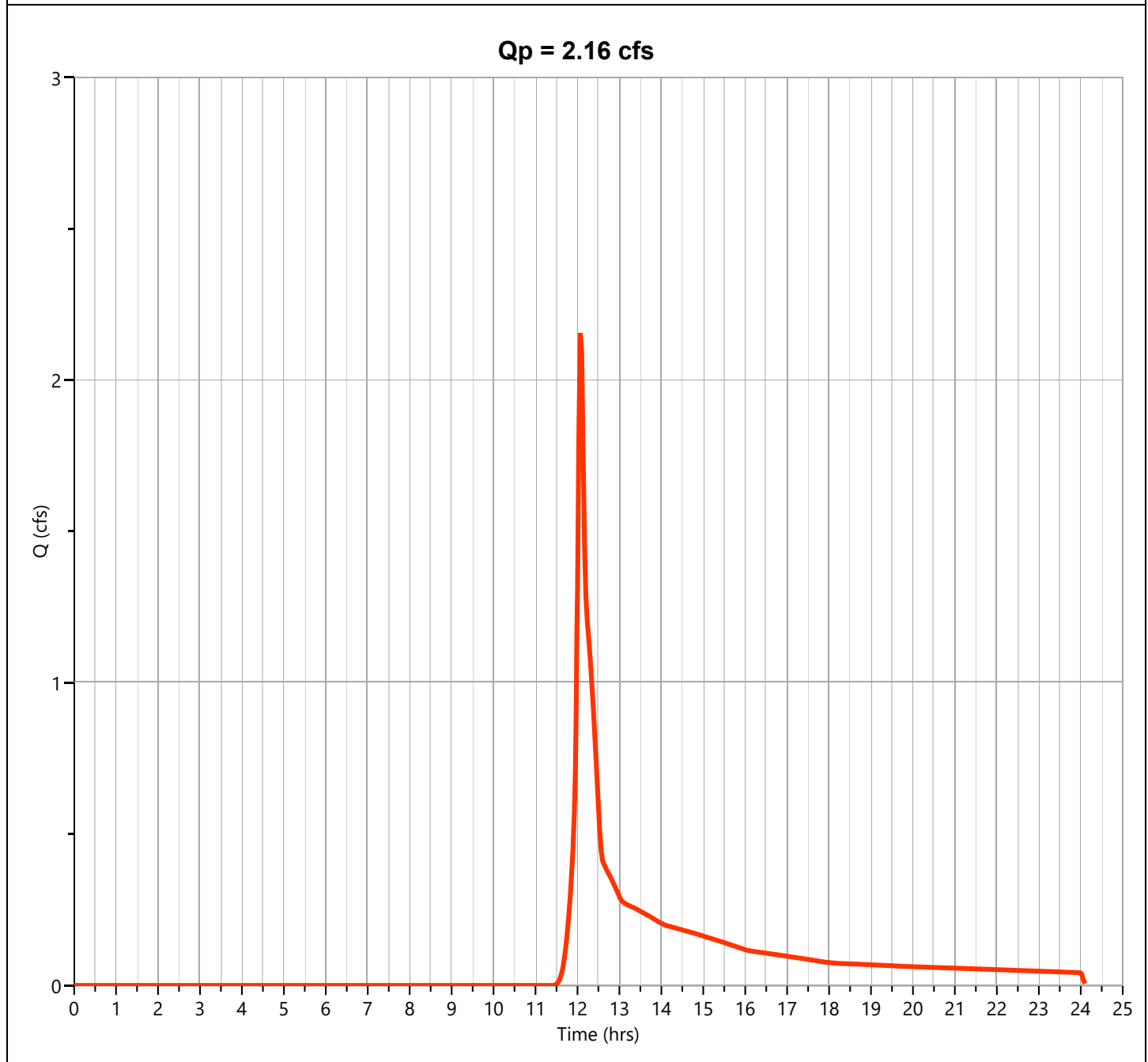
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1A

Hyd. No. 14

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.156 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 7,473 cuft
Drainage Area	= 1.87 ac	Curve Number	= 58
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

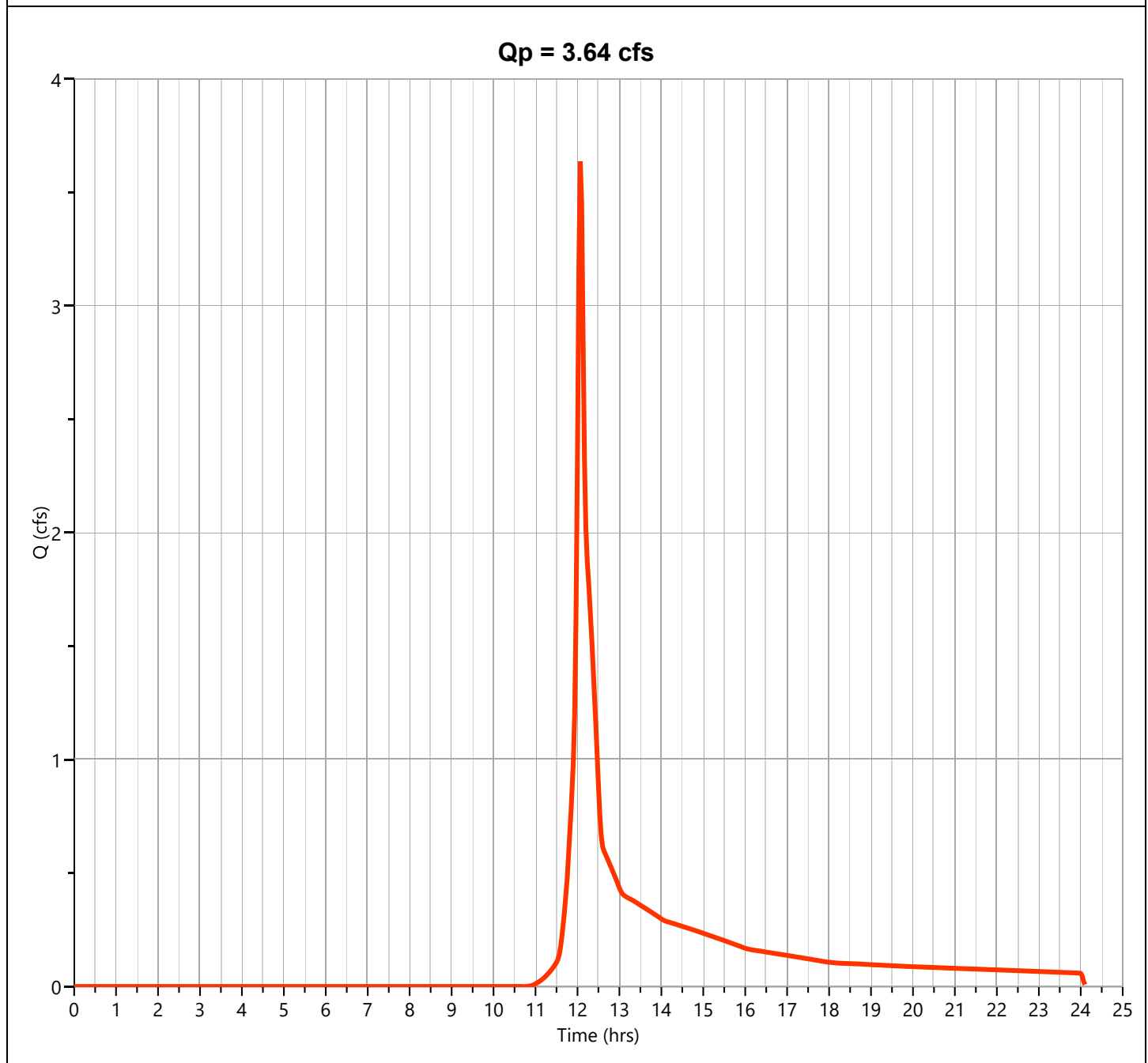
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1A

Hyd. No. 14

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.636 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 11,659 cuft
Drainage Area	= 1.87 ac	Curve Number	= 58
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

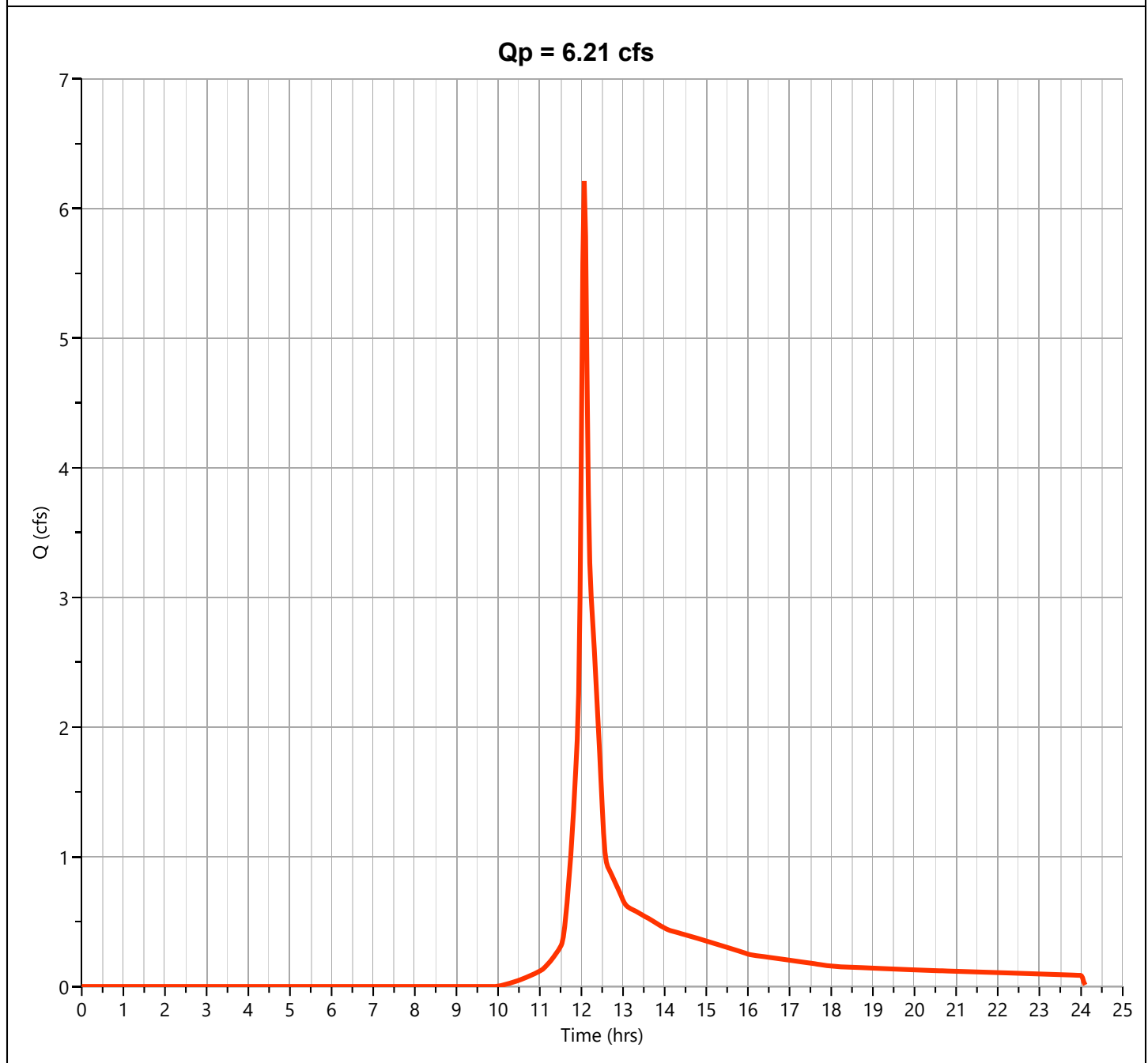
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1A

Hyd. No. 14

Hydrograph Type	= NRCS Runoff	Peak Flow	= 6.213 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 19,025 cuft
Drainage Area	= 1.87 ac	Curve Number	= 58
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

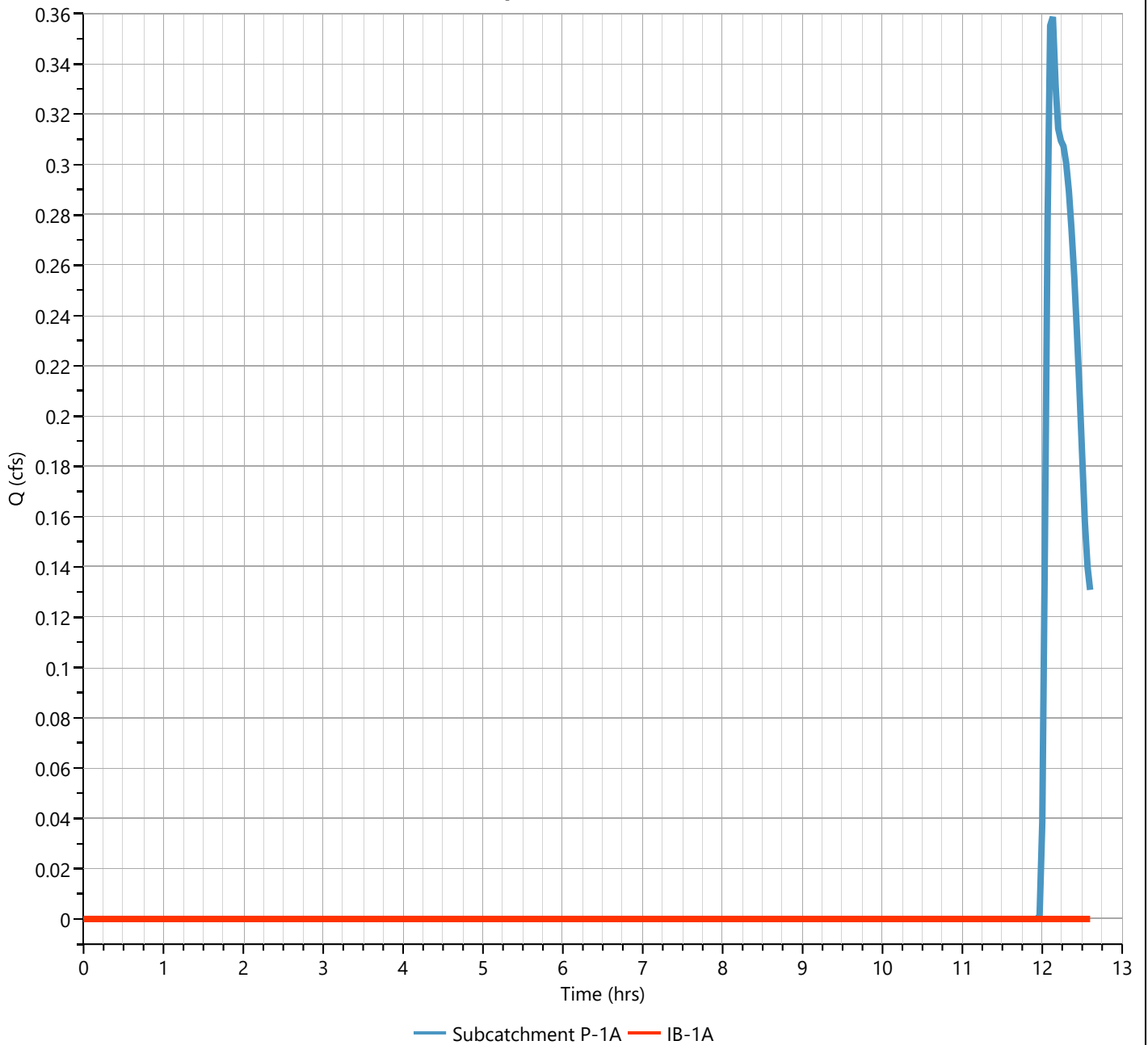
IB-1A

Hyd. No. 15

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.57 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 14 - Subcatchment P-1A	Max. Elevation	= 228.56 ft
Pond Name	= Basin P-1A	Max. Storage	= 92.2 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

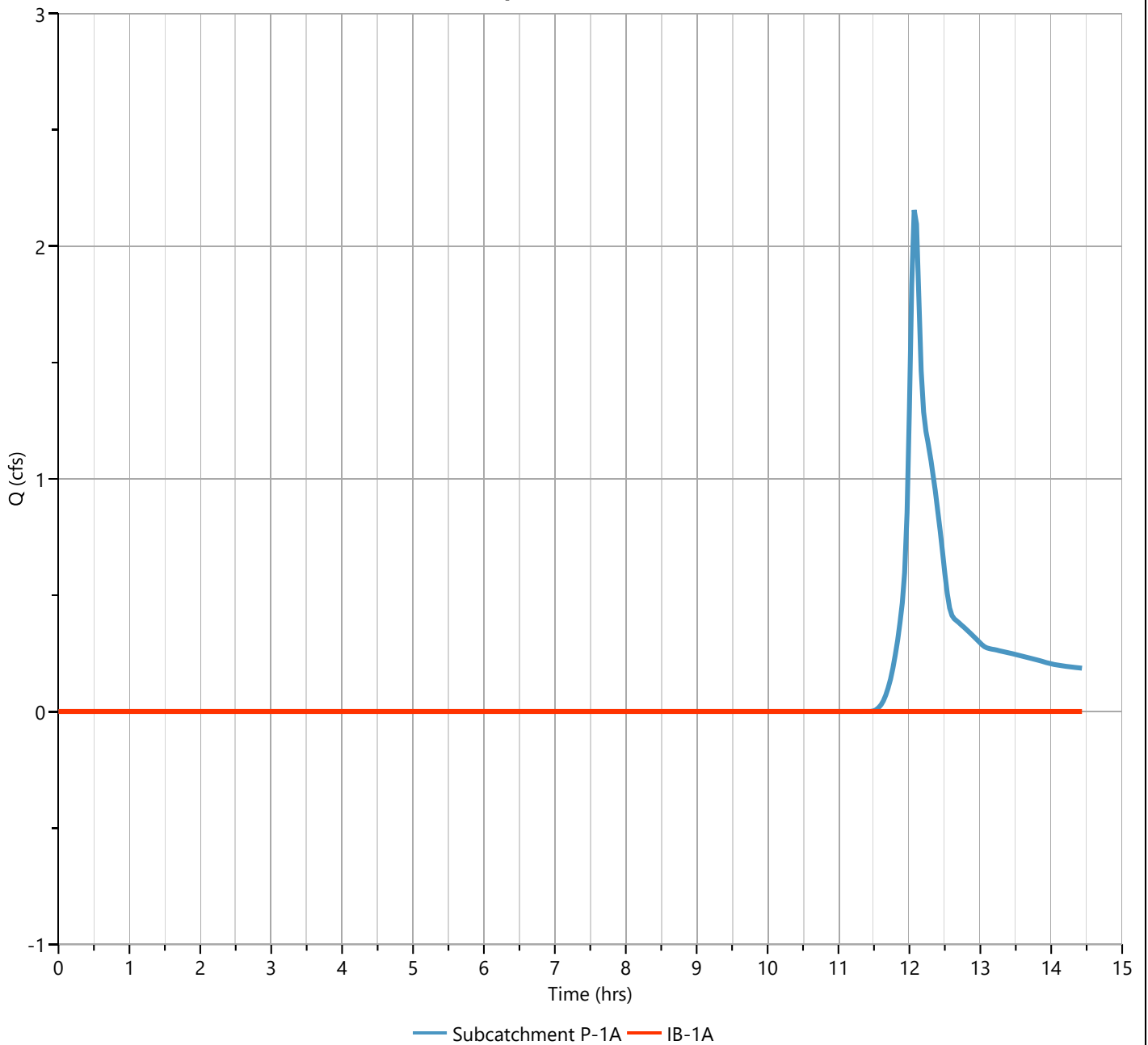
IB-1A

Hyd. No. 15

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 13.90 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 14 - Subcatchment P-1A	Max. Elevation	= 229.63 ft
Pond Name	= Basin P-1A	Max. Storage	= 1,996 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

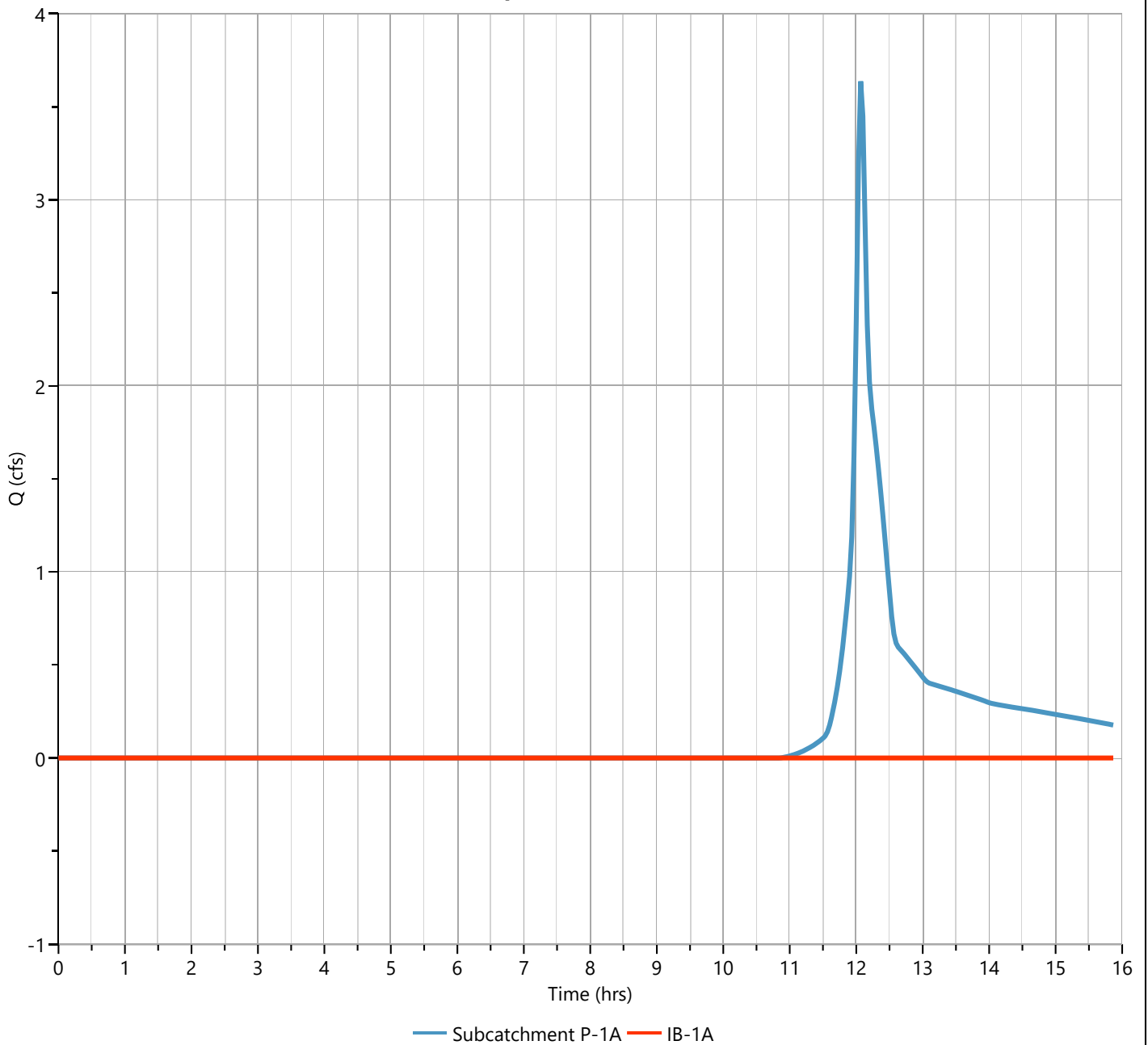
IB-1A

Hyd. No. 15

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 15.23 hrs
Time Interval	= 2 min	Hydrograph Volume	= -0.001 cuft
Inflow Hydrograph	= 14 - Subcatchment P-1A	Max. Elevation	= 230.49 ft
Pond Name	= Basin P-1A	Max. Storage	= 3,903 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

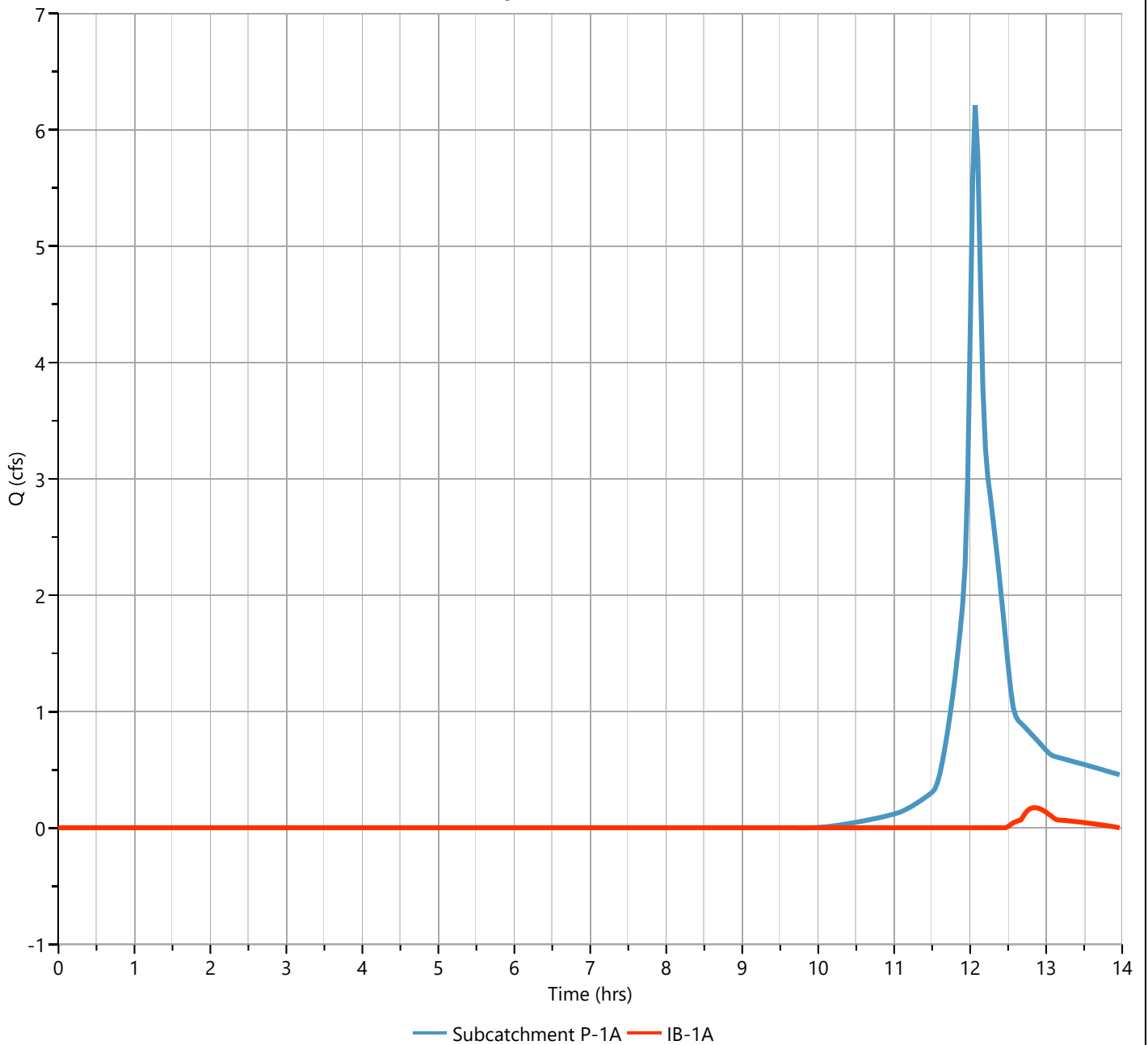
IB-1A

Hyd. No. 15

Hydrograph Type	= Pond Route	Peak Flow	= 0.173 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.83 hrs
Time Interval	= 2 min	Hydrograph Volume	= 370 cuft
Inflow Hydrograph	= 14 - Subcatchment P-1A	Max. Elevation	= 231.72 ft
Pond Name	= Basin P-1A	Max. Storage	= 7,319 cuft

Pond Routing by Storage Indication Method

Qp = 0.17 cfs



Pond Report

Project Name:

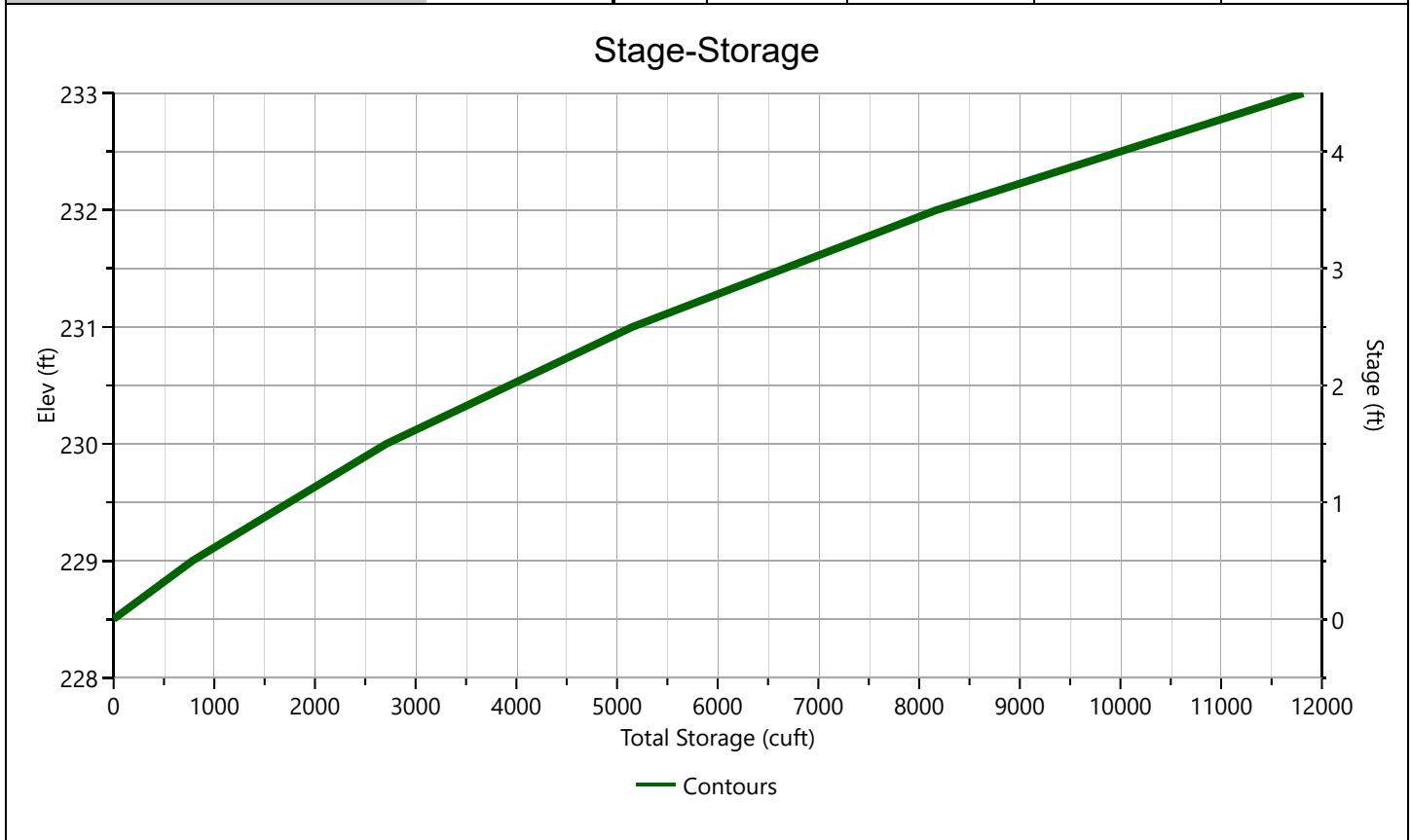
Hydrology Studio v 3.0.0.29

12-13-2023

Basin P-1A

Stage-Storage

User Defined Contours		Stage / Storage Table				
Description	Input	Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Bottom Elevation, ft	228.50	0.00	228.50	1,457	0.000	0.000
Voids (%)	100.00	0.50	229.00	1,680	784	784
Volume Calc	None	1.50	230.00	2,169	1,925	2,709
		2.50	231.00	2,715	2,442	5,151
		3.50	232.00	3,318	3,017	8,167
		4.50	233.00	3,977	3,648	11,815



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

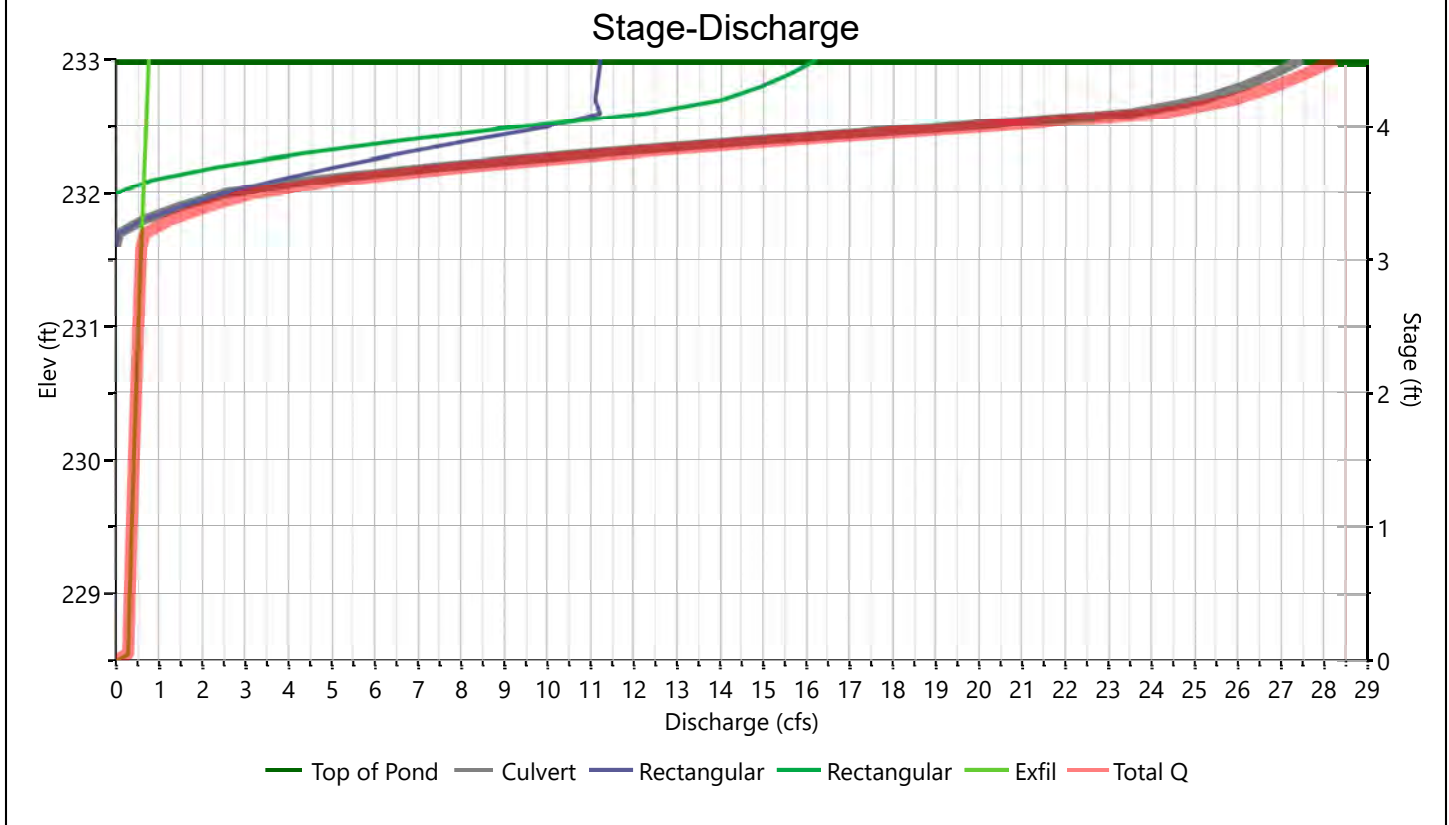
12-13-2023

Basin P-1A

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in	24				Hole Diameter, in
Span, in	24				No. holes
No. Barrels	1				Invert Elevation, ft
Invert Elevation, ft	228.50				Height, ft
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co
Length, ft	80				
Barrel Slope, %	1.25				
N-Value, n	0.012				
Weirs	Riser*	Weirs			Ancillary
		1*	2*	3	
Shape / Type	Circular	Rectangular	Rectangular		Exfiltration, in/hr
Crest Elevation, ft		231.67	232		8.27**
Crest Length, ft		4	8		
Angle, deg					
Weir Coefficient, Cw		3.3	3.3		

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

Basin P-1A

Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	228.50	0.000	0.000					0.000	0.000			0.000		0.000
0.50	229.00	784	0.000					0.000	0.000			0.322		0.322
1.50	230.00	2,709	0.000					0.000	0.000			0.415		0.415
2.50	231.00	5,151	0.000					0.000	0.000			0.520		0.520
3.50	232.00	8,167	2.502 ic					2.502	0.000			0.635		3.138
4.50	233.00	11,815	27.47 ic					11.23 s	16.25 s			0.761		28.24

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

Pond Report

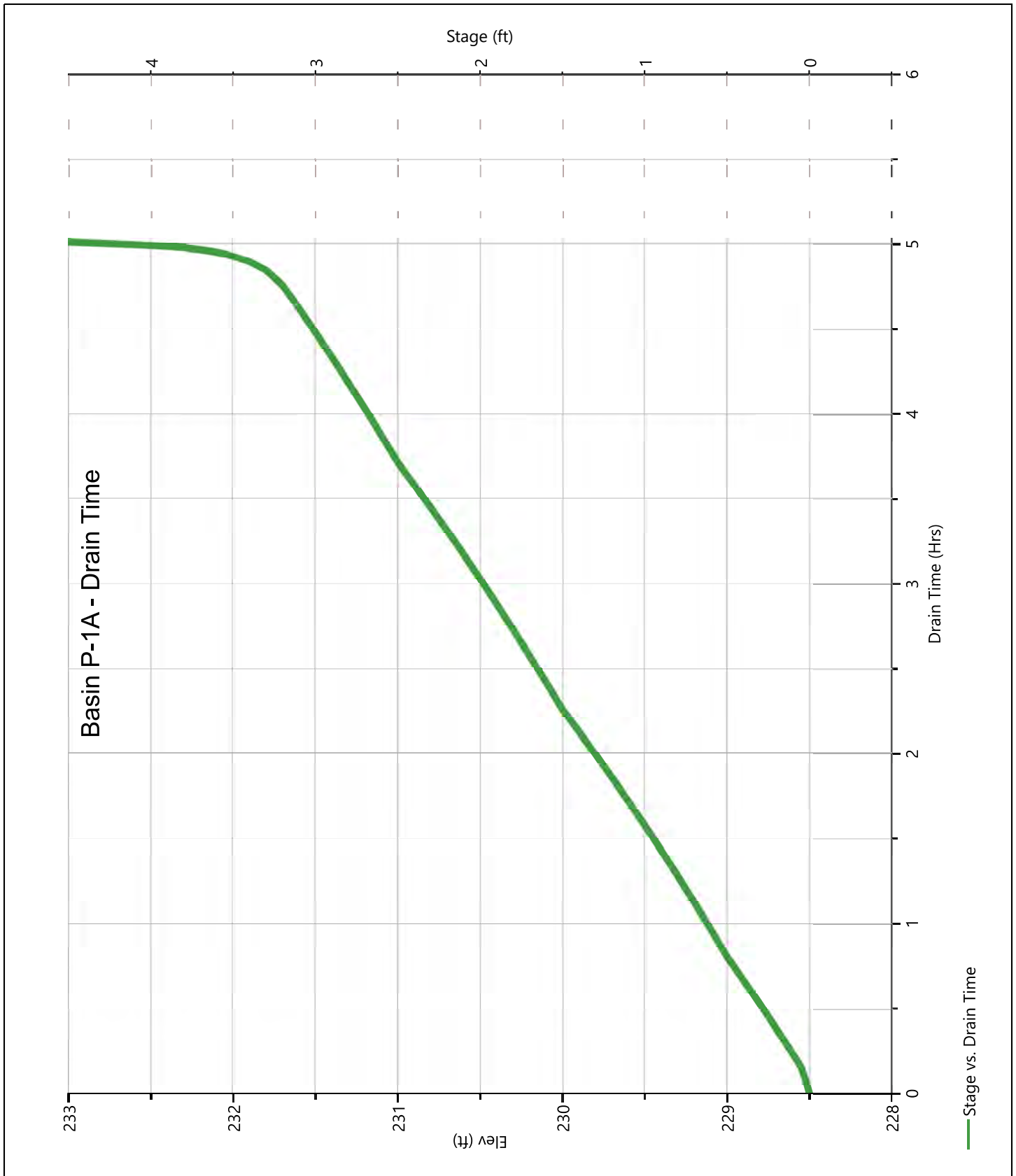
Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

Basin P-1A

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-1B

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area Acres	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
-	Impervious	98			0.61	60.07
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			0.88	34.38
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					1.49	94.45

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{94.45}{1.49} = 63.20 ; \text{ Use CN} = \boxed{63}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	0.54	1.53	3.56

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Hydrograph Report

Project Name:

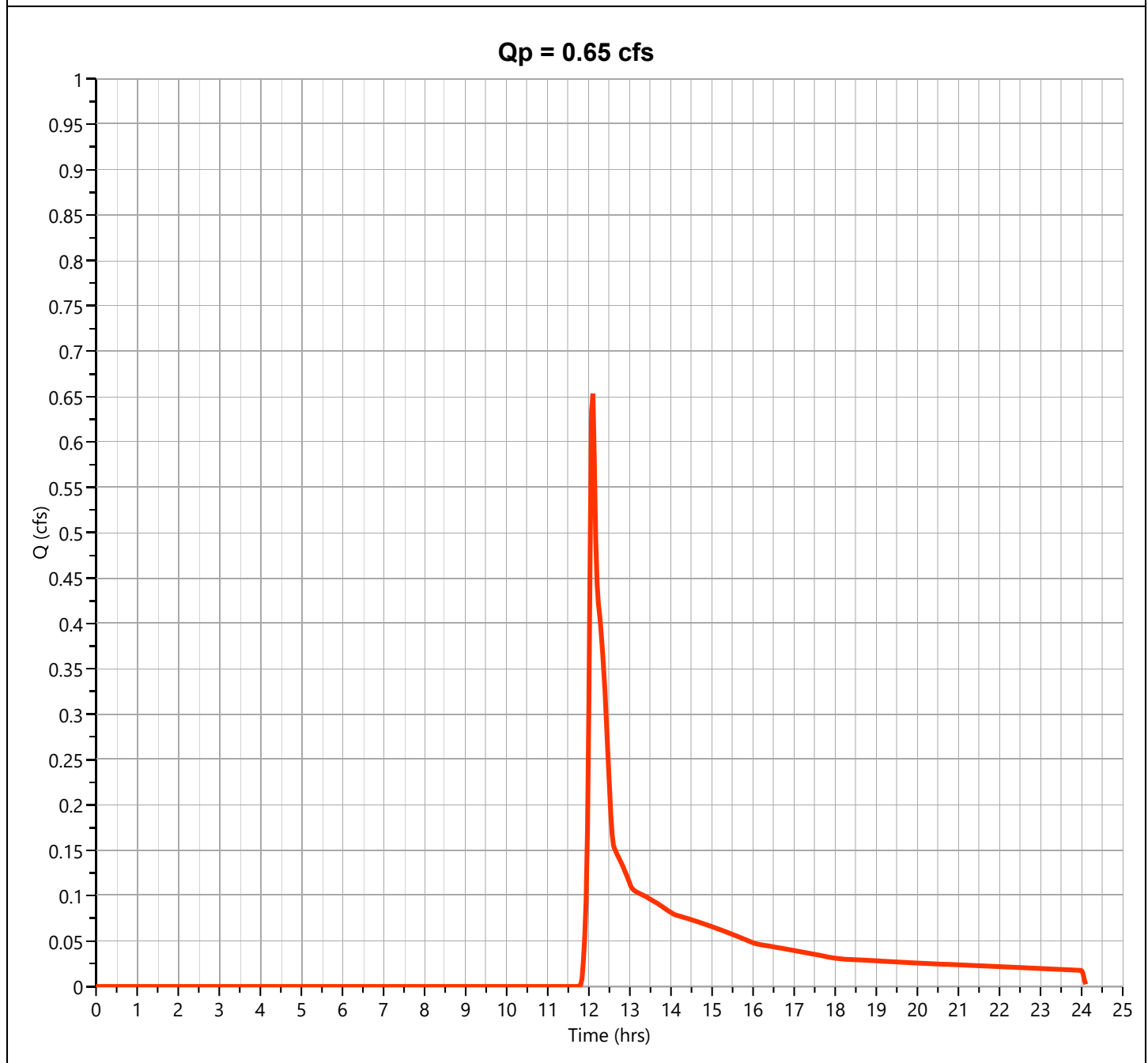
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1B

Hyd. No. 16

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.653 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 2 min	Runoff Volume	= 2,702 cuft
Drainage Area	= 1.49 ac	Curve Number	= 63
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

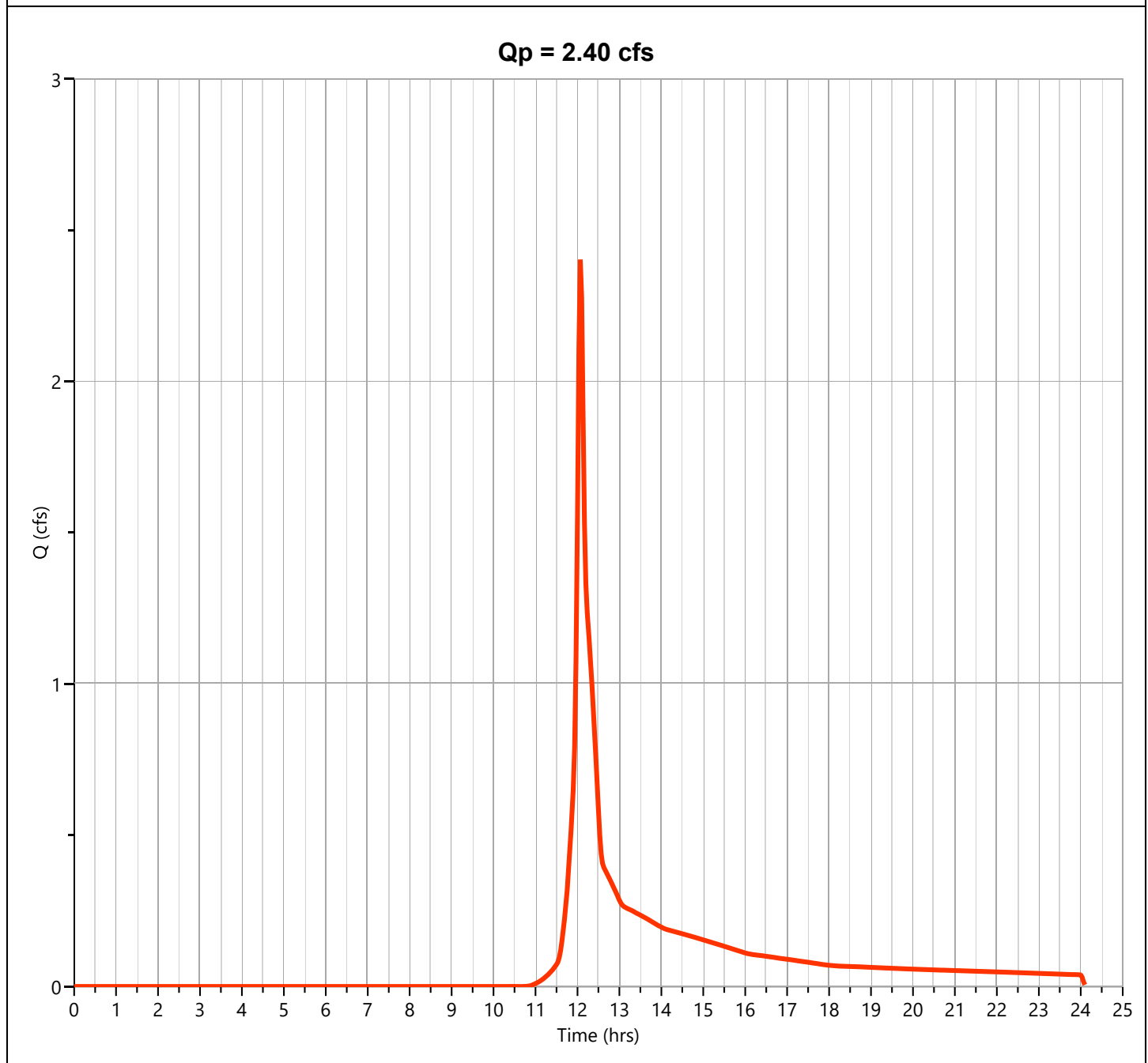
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1B

Hyd. No. 16

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.402 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 7,683 cuft
Drainage Area	= 1.49 ac	Curve Number	= 63
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

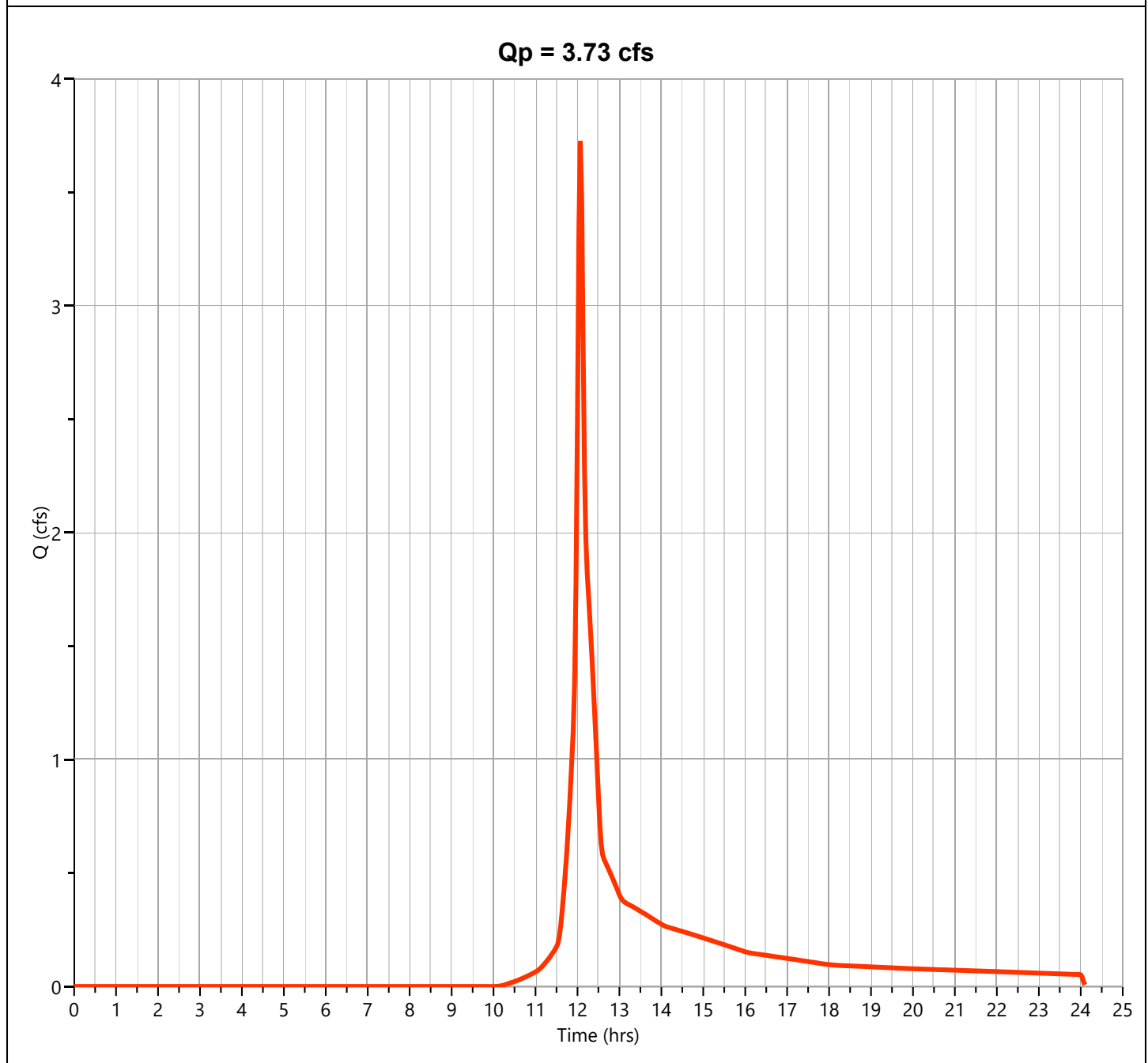
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1B

Hyd. No. 16

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.726 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 11,463 cuft
Drainage Area	= 1.49 ac	Curve Number	= 63
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

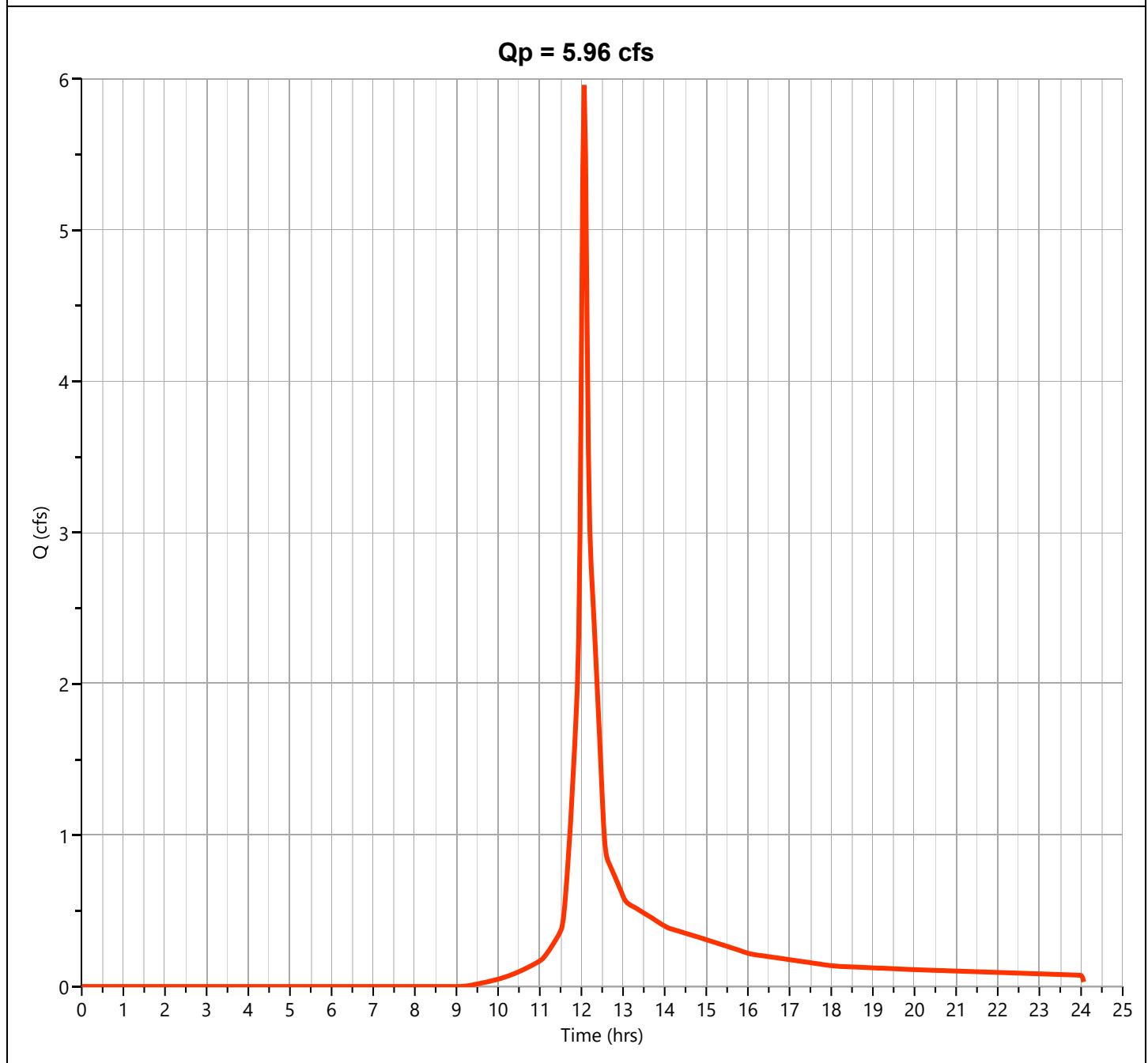
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1B

Hyd. No. 16

Hydrograph Type	= NRCS Runoff	Peak Flow	= 5.959 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 17,927 cuft
Drainage Area	= 1.49 ac	Curve Number	= 63
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

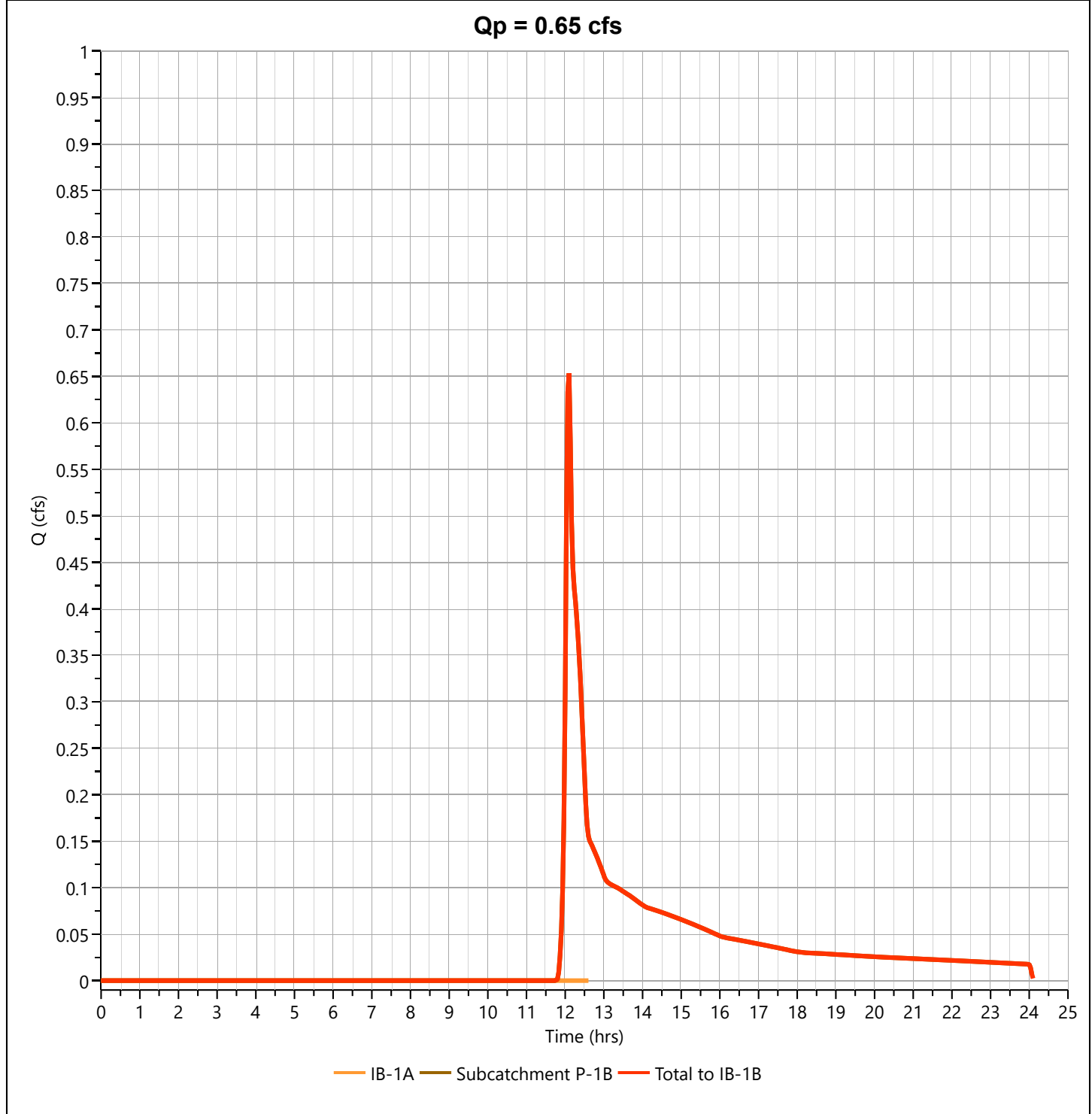
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1B

Hyd. No. 17

Hydrograph Type	= Junction	Peak Flow	= 0.653 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 2 min	Hydrograph Volume	= 2,702 cuft
Inflow Hydrographs	= 15, 16	Total Contrib. Area	= 1.49 ac



Hydrograph Report

Project Name:

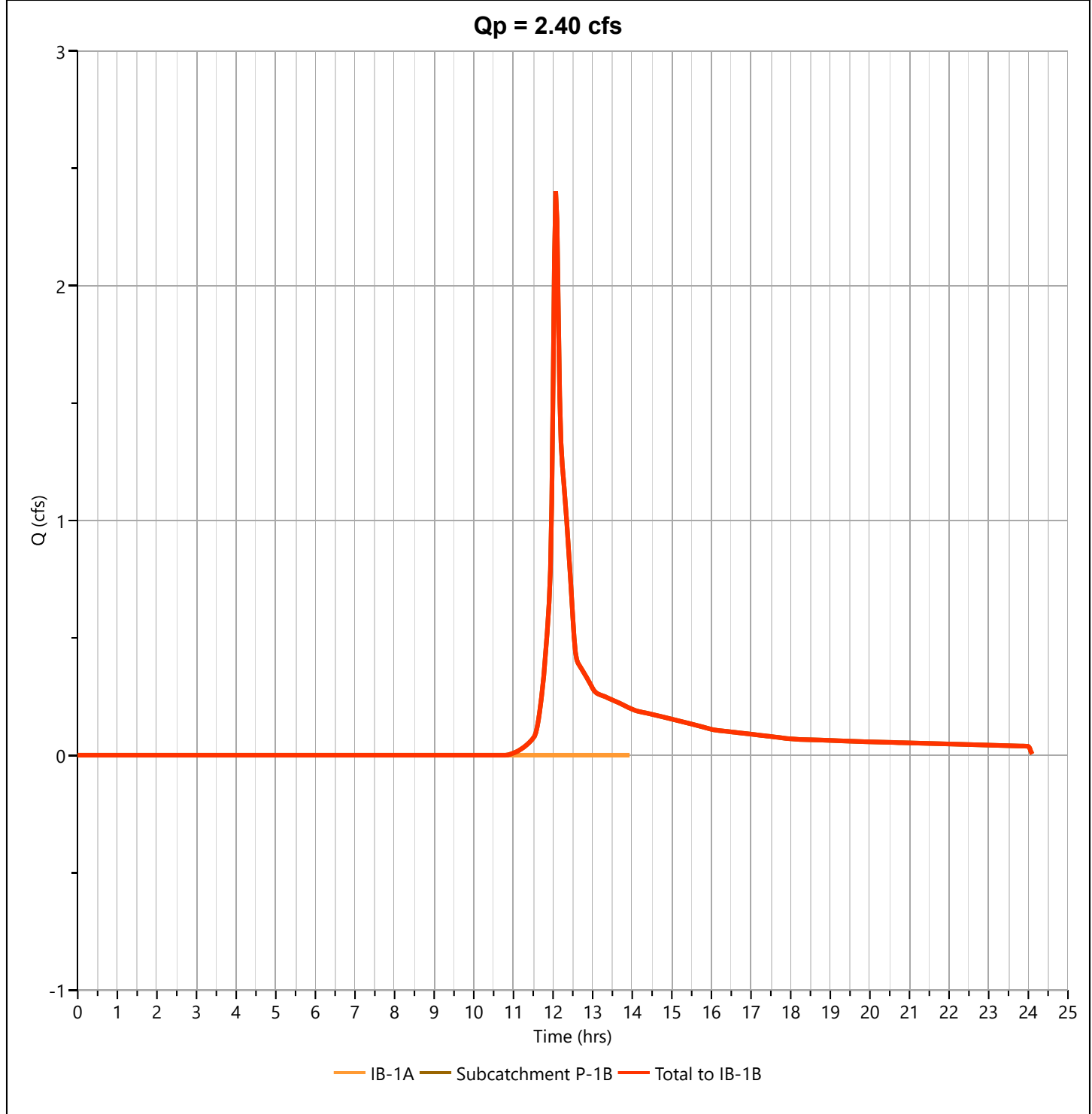
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1B

Hyd. No. 17

Hydrograph Type	= Junction	Peak Flow	= 2.402 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 7,683 cuft
Inflow Hydrographs	= 15, 16	Total Contrib. Area	= 1.49 ac



Hydrograph Report

Project Name:

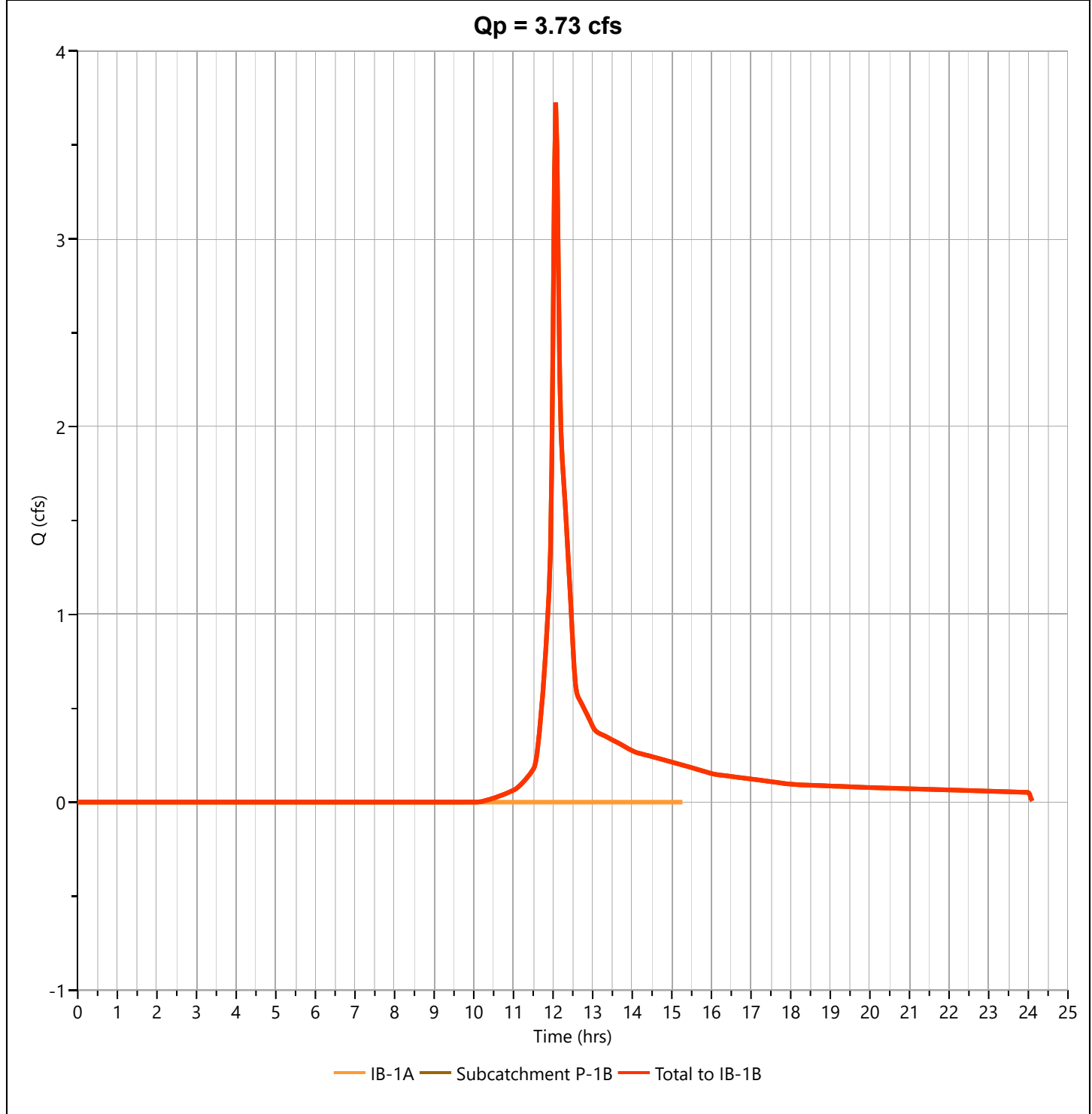
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1B

Hyd. No. 17

Hydrograph Type	= Junction	Peak Flow	= 3.726 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 11,463 cuft
Inflow Hydrographs	= 15, 16	Total Contrib. Area	= 1.49 ac



Hydrograph Report

Project Name:

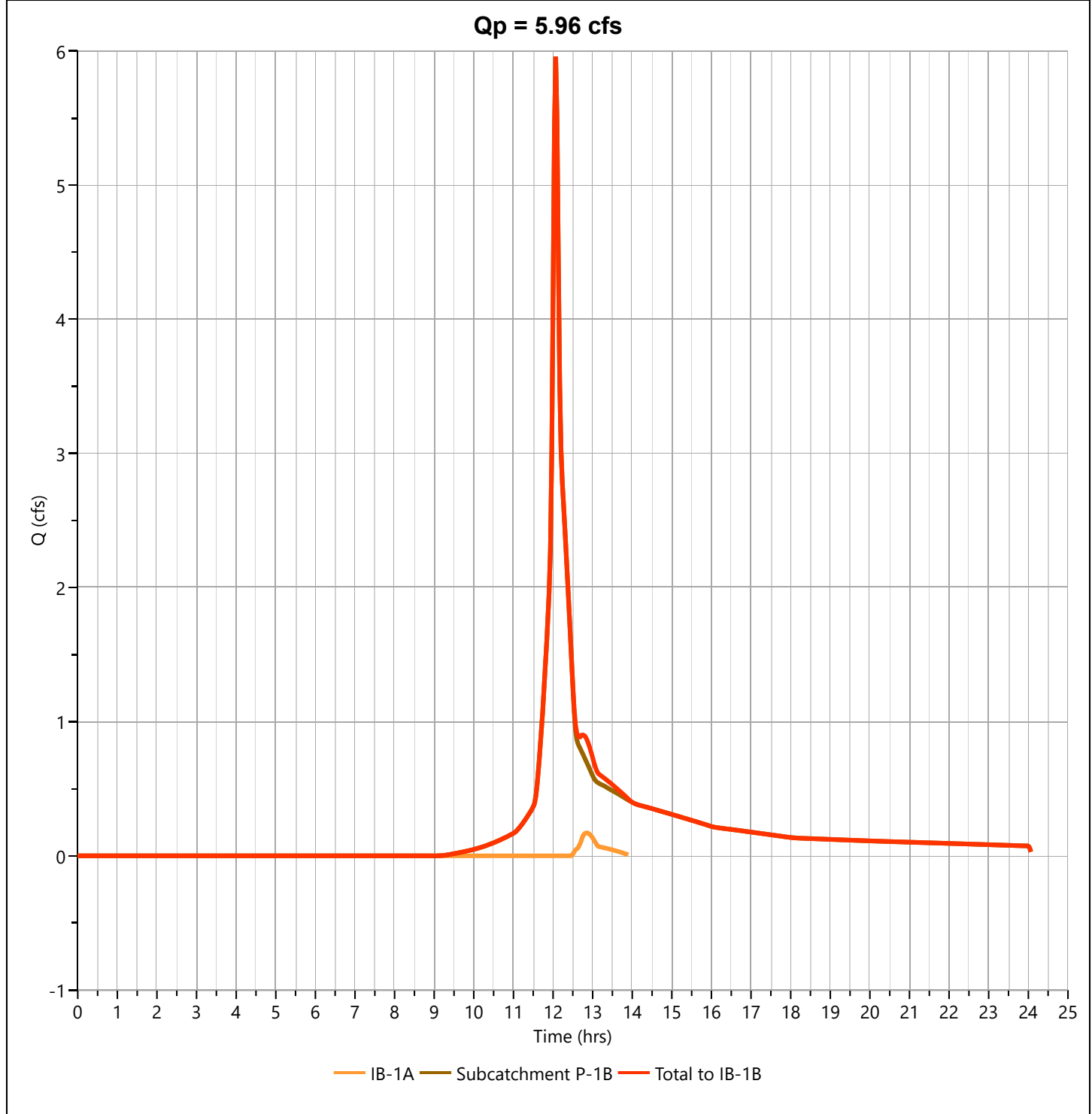
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1B

Hyd. No. 17

Hydrograph Type	= Junction	Peak Flow	= 5.959 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 18,297 cuft
Inflow Hydrographs	= 15, 16	Total Contrib. Area	= 1.49 ac



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

IB-1B

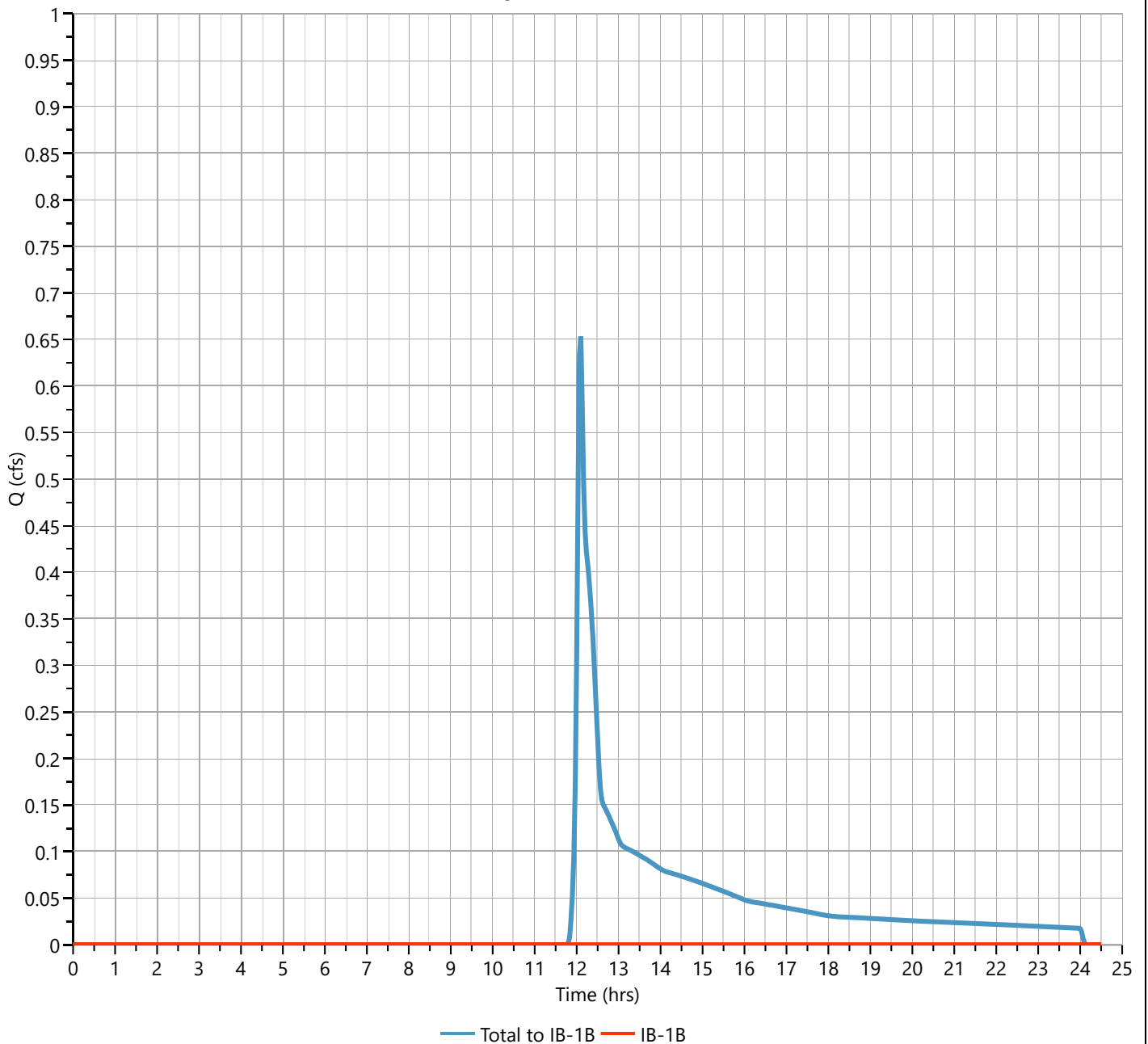
Hyd. No. 18

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.43 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.006 cuft
Inflow Hydrograph	= 17 - Total to IB-1B	Max. Elevation	= 227.25 ft
Pond Name	= BASIN P-1B	Max. Storage	= 379 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 6 min

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

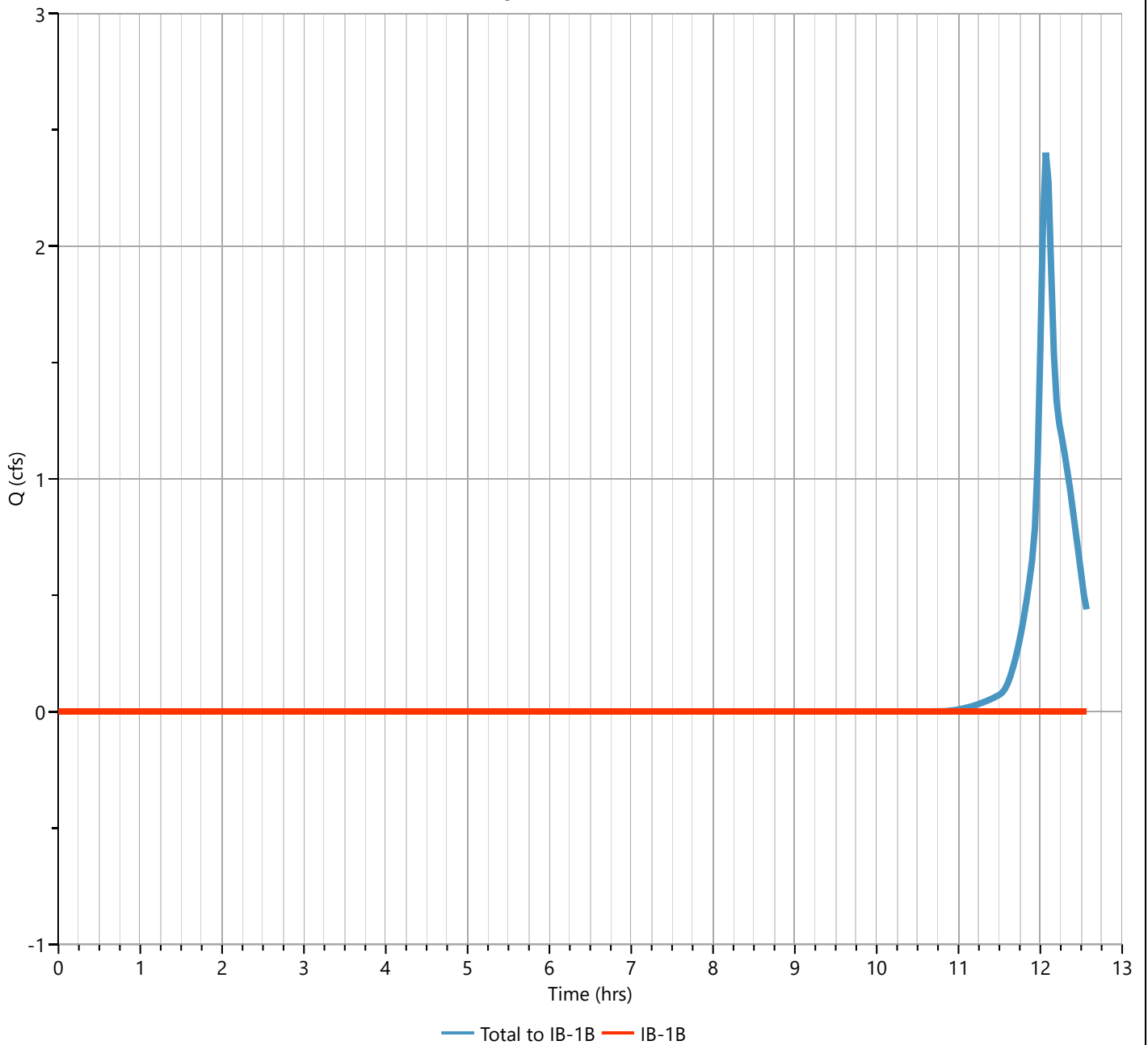
IB-1B

Hyd. No. 18

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.40 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.012 cuft
Inflow Hydrograph	= 17 - Total to IB-1B	Max. Elevation	= 228.36 ft
Pond Name	= BASIN P-1B	Max. Storage	= 2,324 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

IB-1B

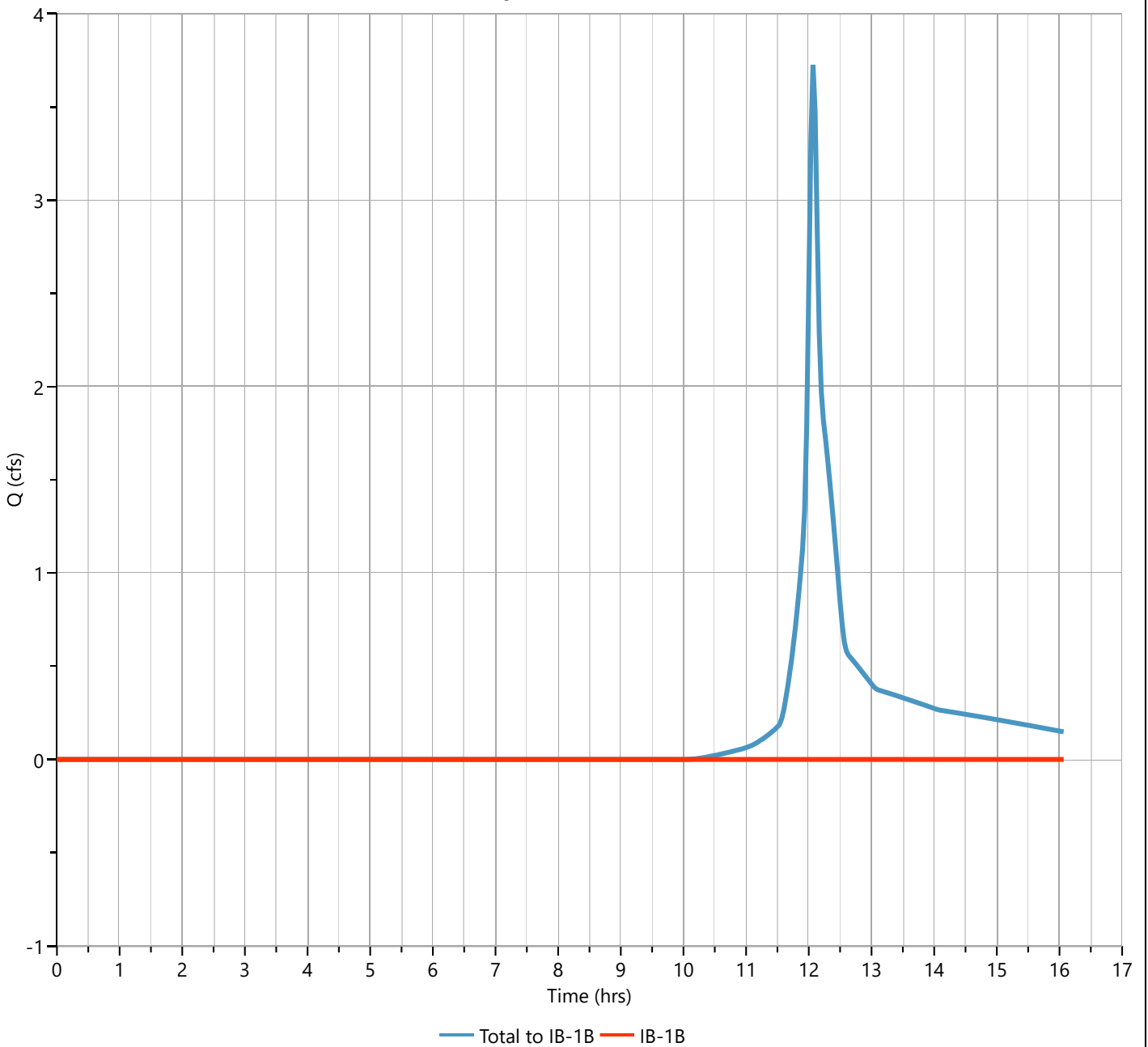
Hyd. No. 18

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 15.30 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.006 cuft
Inflow Hydrograph	= 17 - Total to IB-1B	Max. Elevation	= 229.04 ft
Pond Name	= BASIN P-1B	Max. Storage	= 3,920 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 2.59 hrs

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

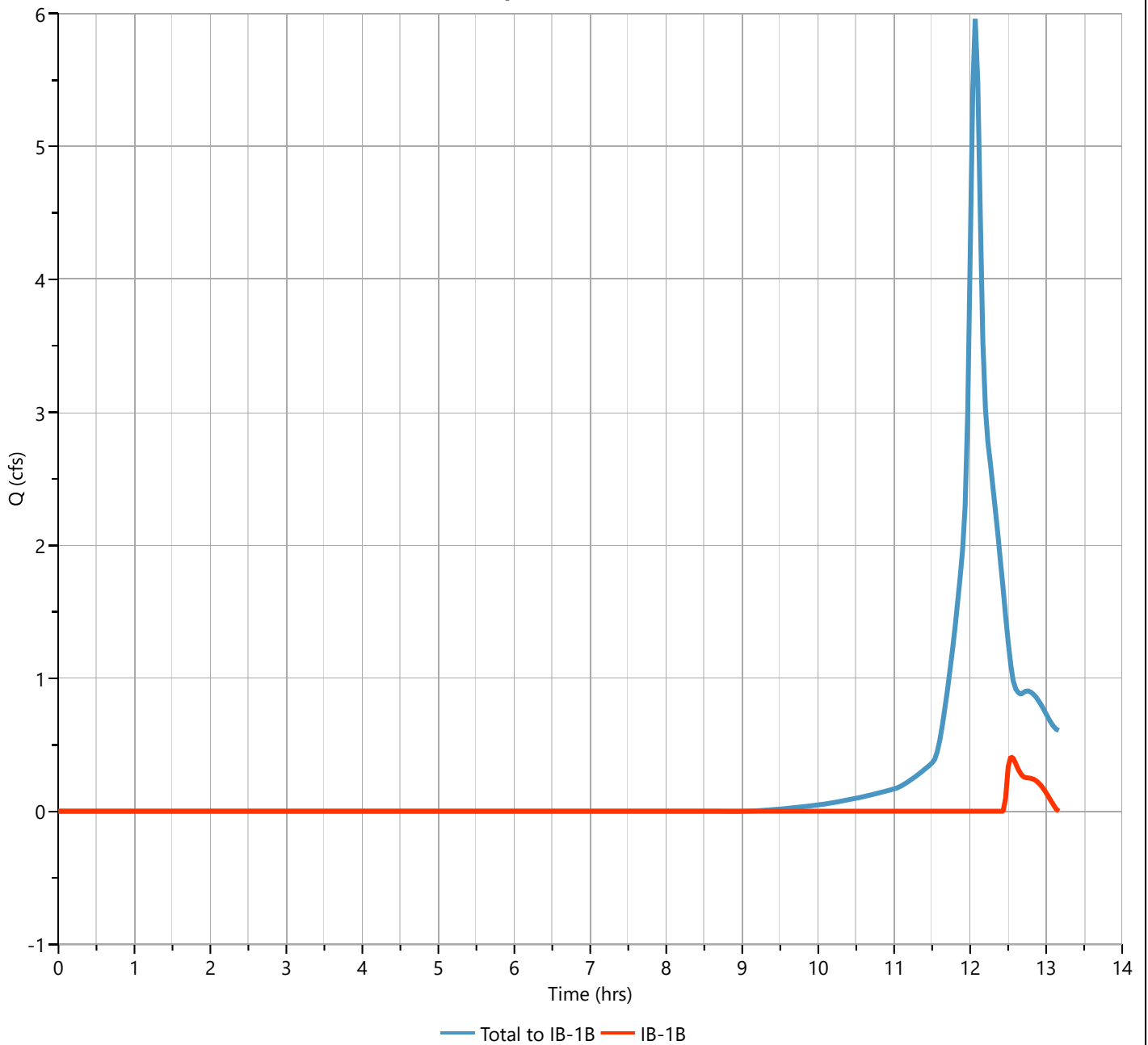
IB-1B

Hyd. No. 18

Hydrograph Type	= Pond Route	Peak Flow	= 0.409 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.53 hrs
Time Interval	= 2 min	Hydrograph Volume	= 555 cuft
Inflow Hydrograph	= 17 - Total to IB-1B	Max. Elevation	= 229.93 ft
Pond Name	= BASIN P-1B	Max. Storage	= 6,752 cuft

Pond Routing by Storage Indication Method

Qp = 0.41 cfs



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

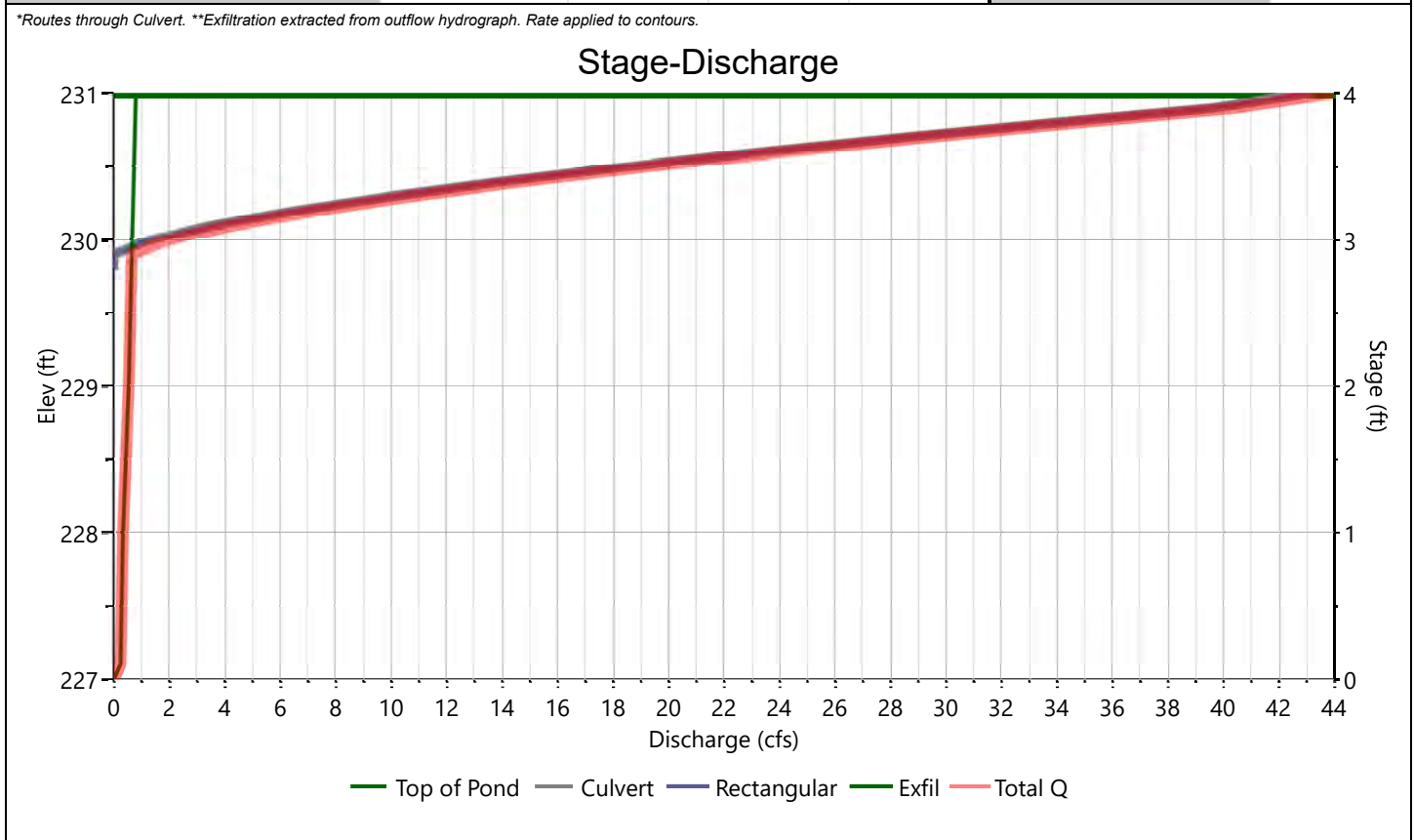
12-13-2023

BASIN P-1B

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in	27				Hole Diameter, in
Span, in	27				No. holes
No. Barrels	1				Invert Elevation, ft
Invert Elevation, ft	224.00				Height, ft
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co
Length, ft	58				
Barrel Slope, %	1.72				
N-Value, n	0.012				
Weirs	Riser*	Weirs			Ancillary
		1*	2	3	
Shape / Type		Rectangular			Exfiltration, in/hr
Crest Elevation, ft		229.9			8.27**
Crest Length, ft		12			
Angle, deg					
Weir Coefficient, Cw		3.3			

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

BASIN P-1B

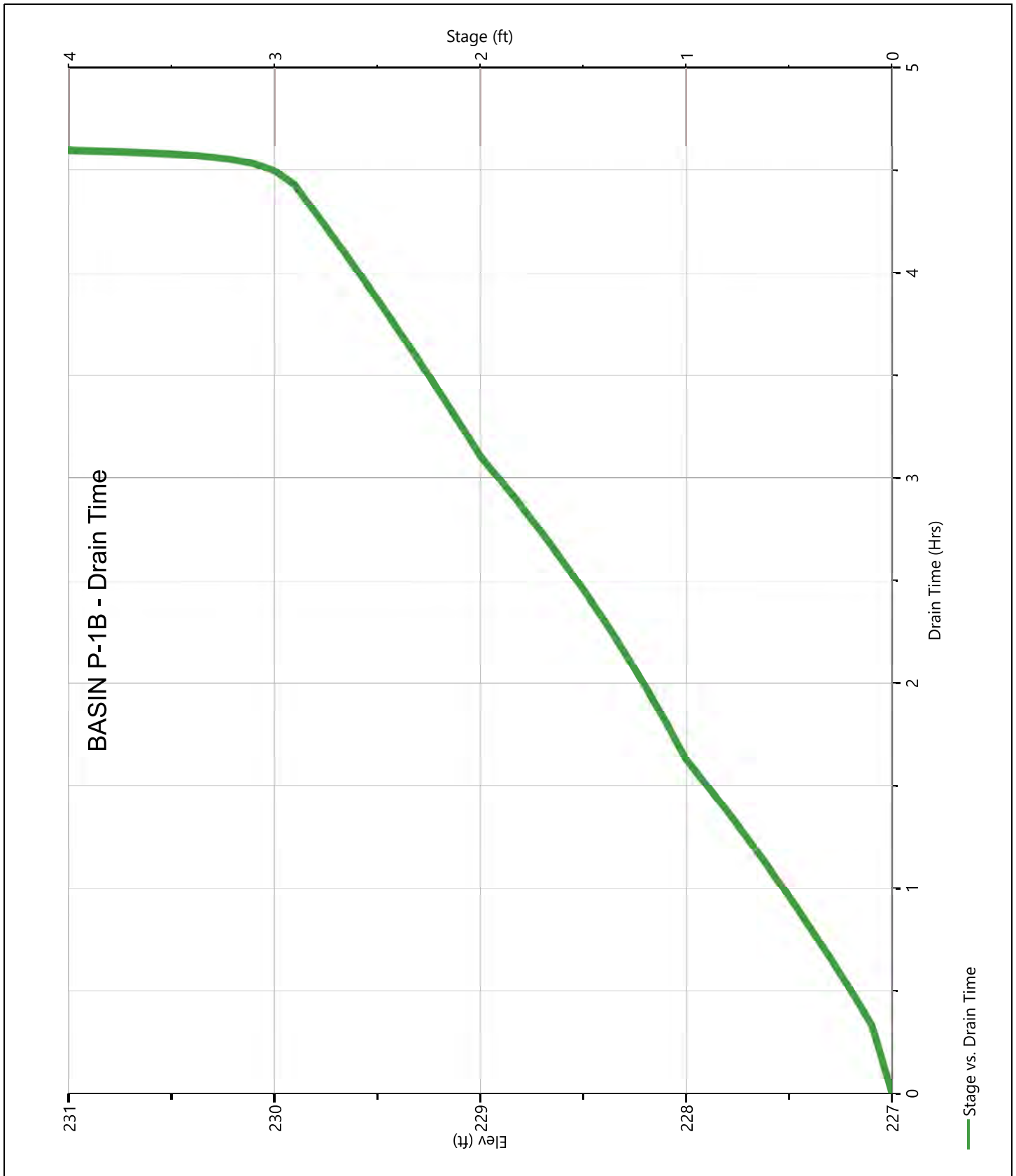
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	227.00	0.000	0.000					0.000				0.000		0.000
1.00	228.00	1,502	0.000 ic					0.000				0.337		0.337
2.00	229.00	3,802	0.000 ic					0.000				0.543		0.543
3.00	230.00	6,965	1.252 ic					1.252				0.668		1.920
4.00	231.00	10,806	43.11 ic					43.11 s				0.803		43.91

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

BASIN P-1B

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-1C

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.45	43.92
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			0.81	31.68
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					1.26	75.61

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{75.61}{1.26} = 59.98 ; \text{ Use CN} = \boxed{60}$$

2. Runoff

Frequency..... yr

Rainfall, P (24-hour)..... in

Runoff, Q..... in

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
0.42	1.31	3.20

Hydrograph Report

Project Name:

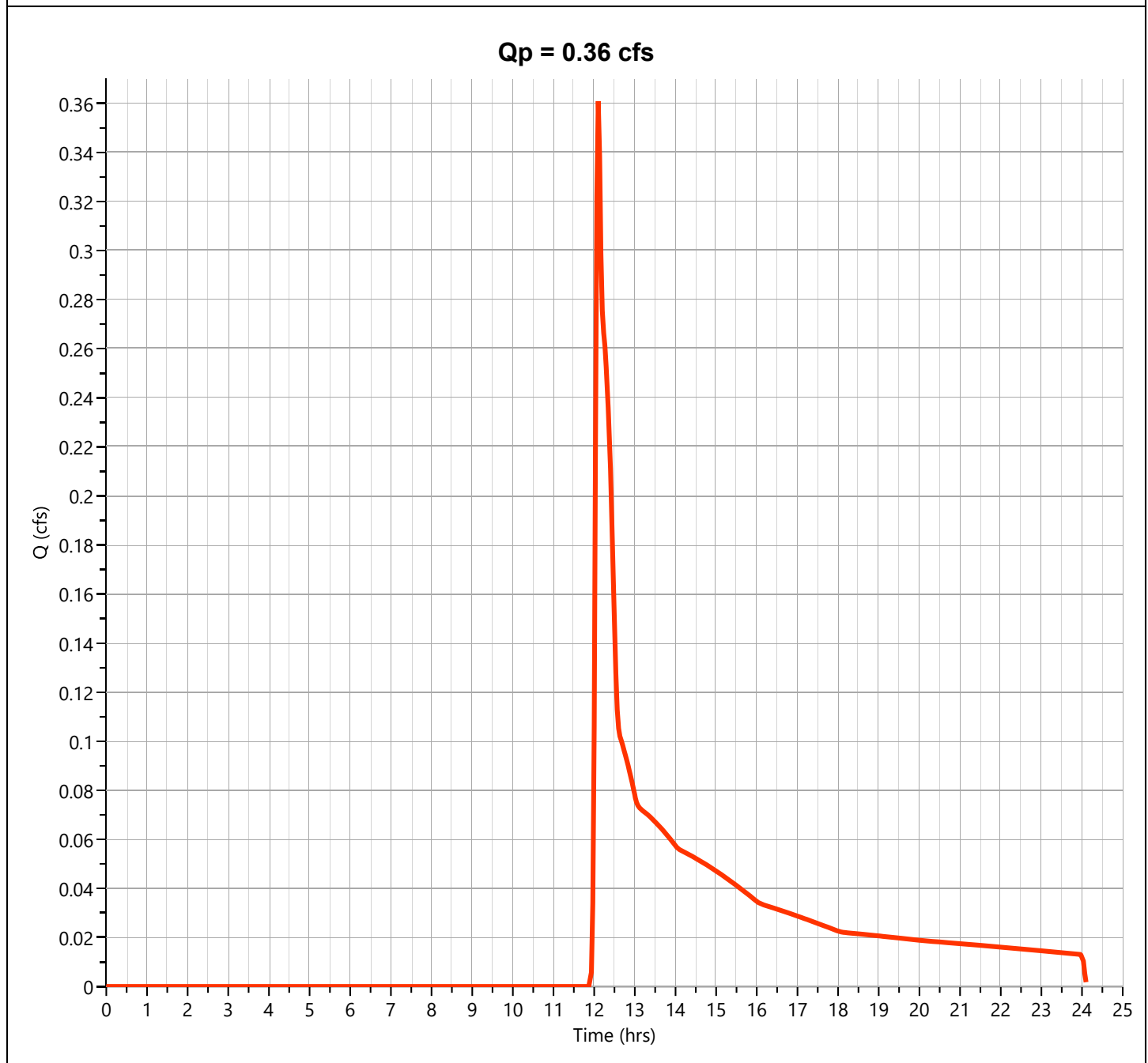
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1C

Hyd. No. 19

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.361 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 2 min	Runoff Volume	= 1,801 cuft
Drainage Area	= 1.26 ac	Curve Number	= 60
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

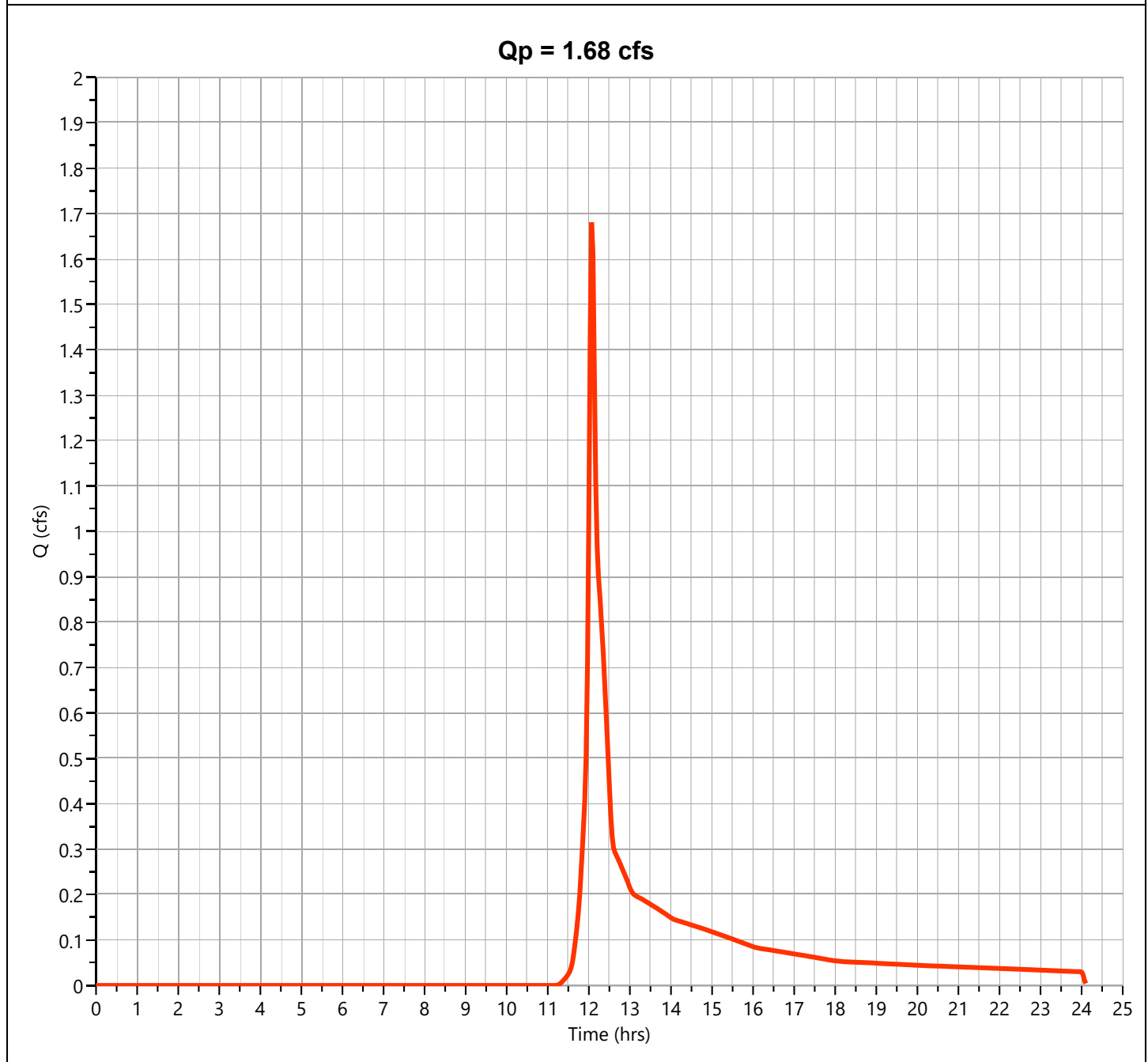
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1C

Hyd. No. 19

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.681 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 5,604 cuft
Drainage Area	= 1.26 ac	Curve Number	= 60
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

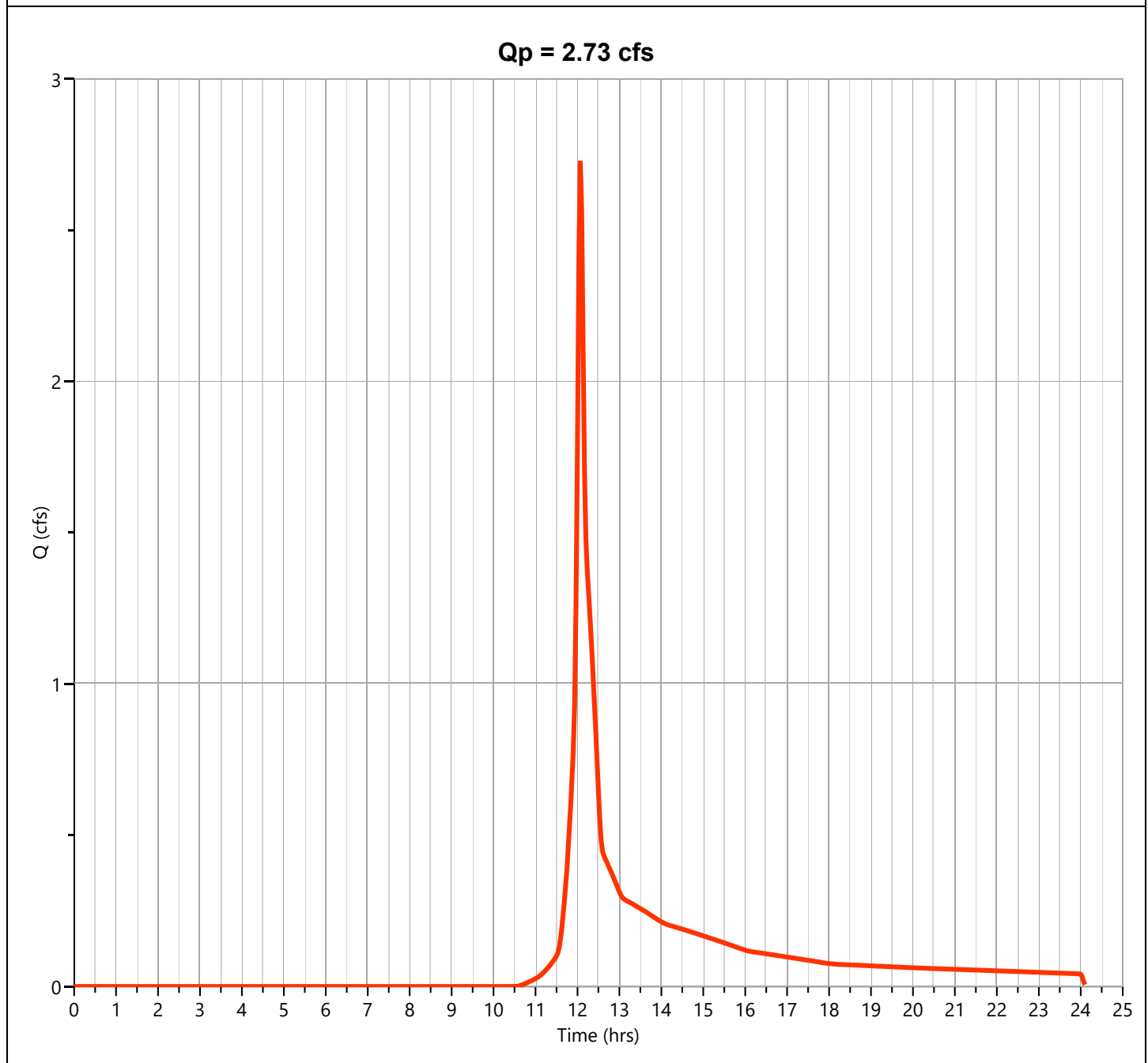
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1C

Hyd. No. 19

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.729 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 8,578 cuft
Drainage Area	= 1.26 ac	Curve Number	= 60
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

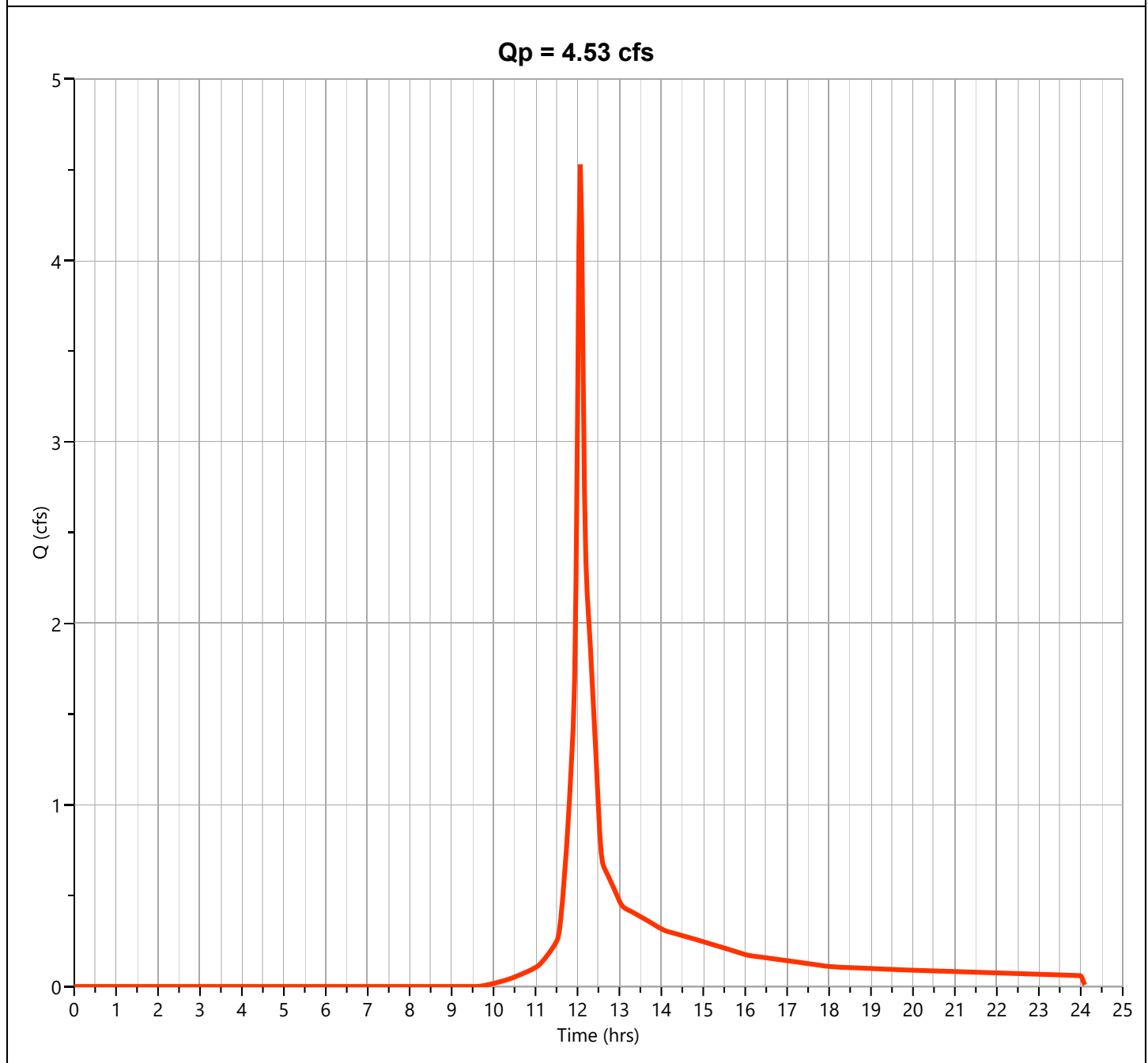
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1C

Hyd. No. 19

Hydrograph Type	= NRCS Runoff	Peak Flow	= 4.529 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 13,749 cuft
Drainage Area	= 1.26 ac	Curve Number	= 60
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

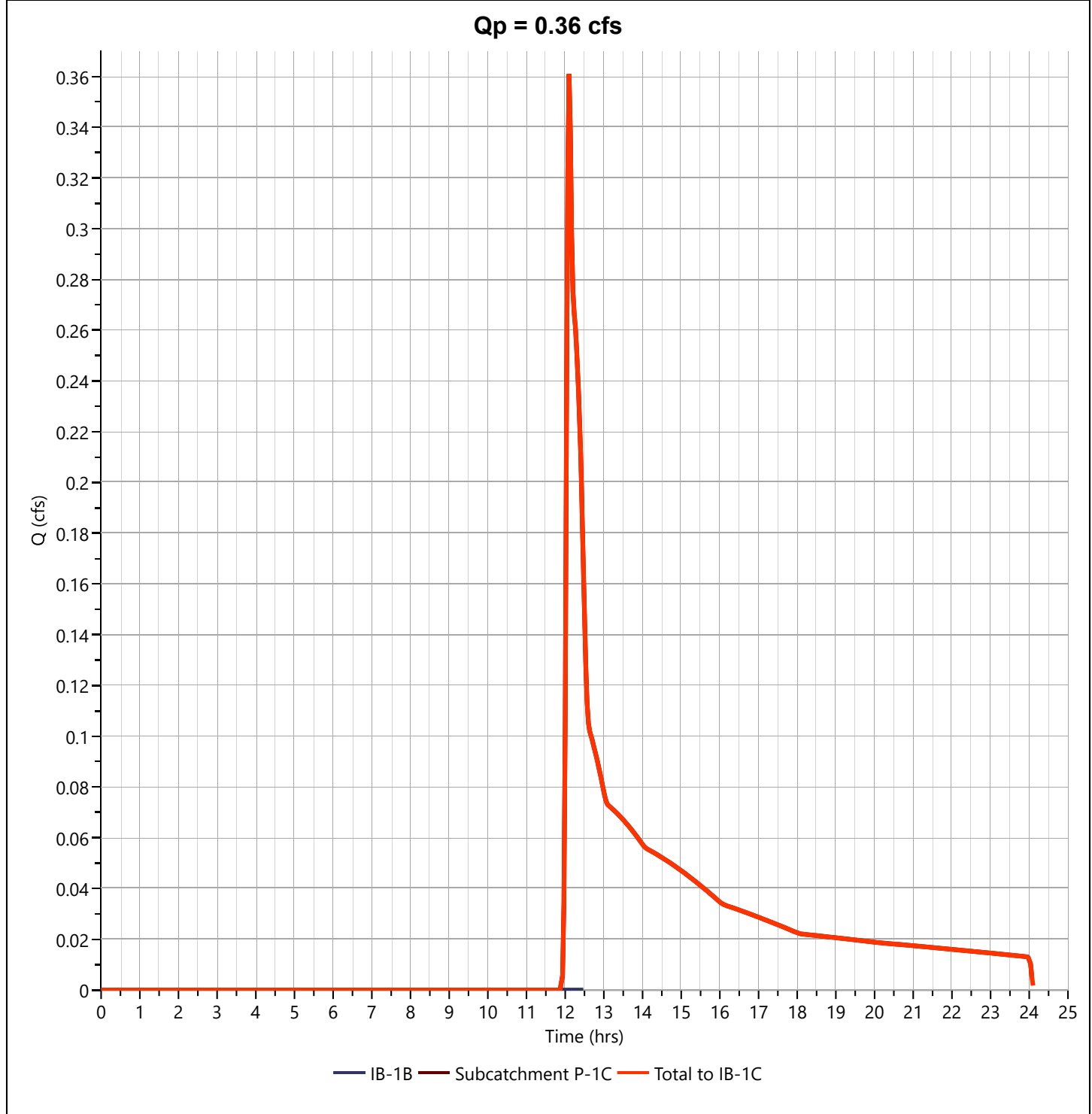
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1C

Hyd. No. 20

Hydrograph Type	= Junction	Peak Flow	= 0.361 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 2 min	Hydrograph Volume	= 1,801 cuft
Inflow Hydrographs	= 18, 19	Total Contrib. Area	= 1.26 ac



Hydrograph Report

Project Name:

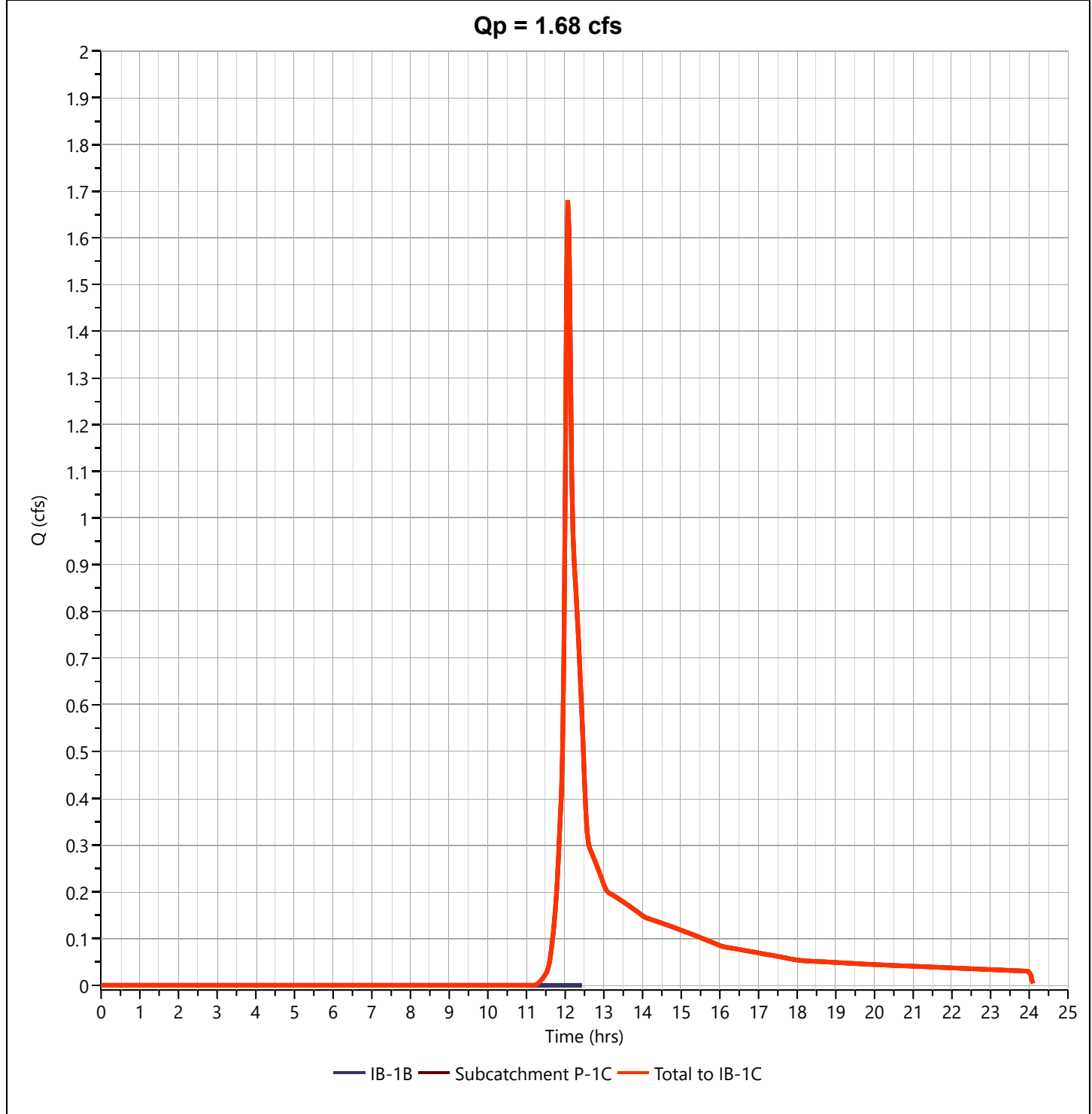
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1C

Hyd. No. 20

Hydrograph Type	= Junction	Peak Flow	= 1.681 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 5,604 cuft
Inflow Hydrographs	= 18, 19	Total Contrib. Area	= 1.26 ac



Hydrograph Report

Project Name:

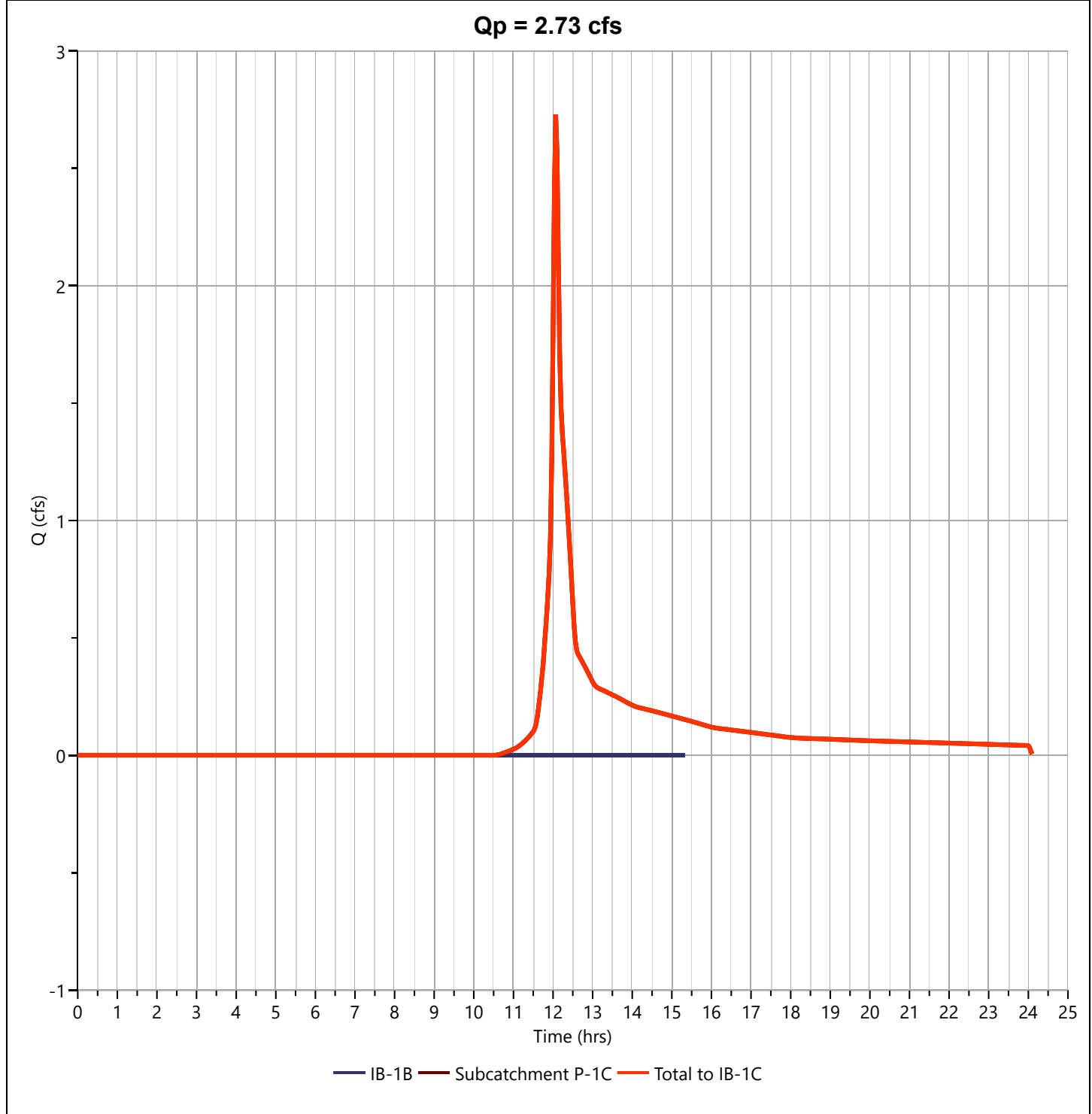
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1C

Hyd. No. 20

Hydrograph Type	= Junction	Peak Flow	= 2.729 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 8,578 cuft
Inflow Hydrographs	= 18, 19	Total Contrib. Area	= 1.26 ac



Hydrograph Report

Project Name:

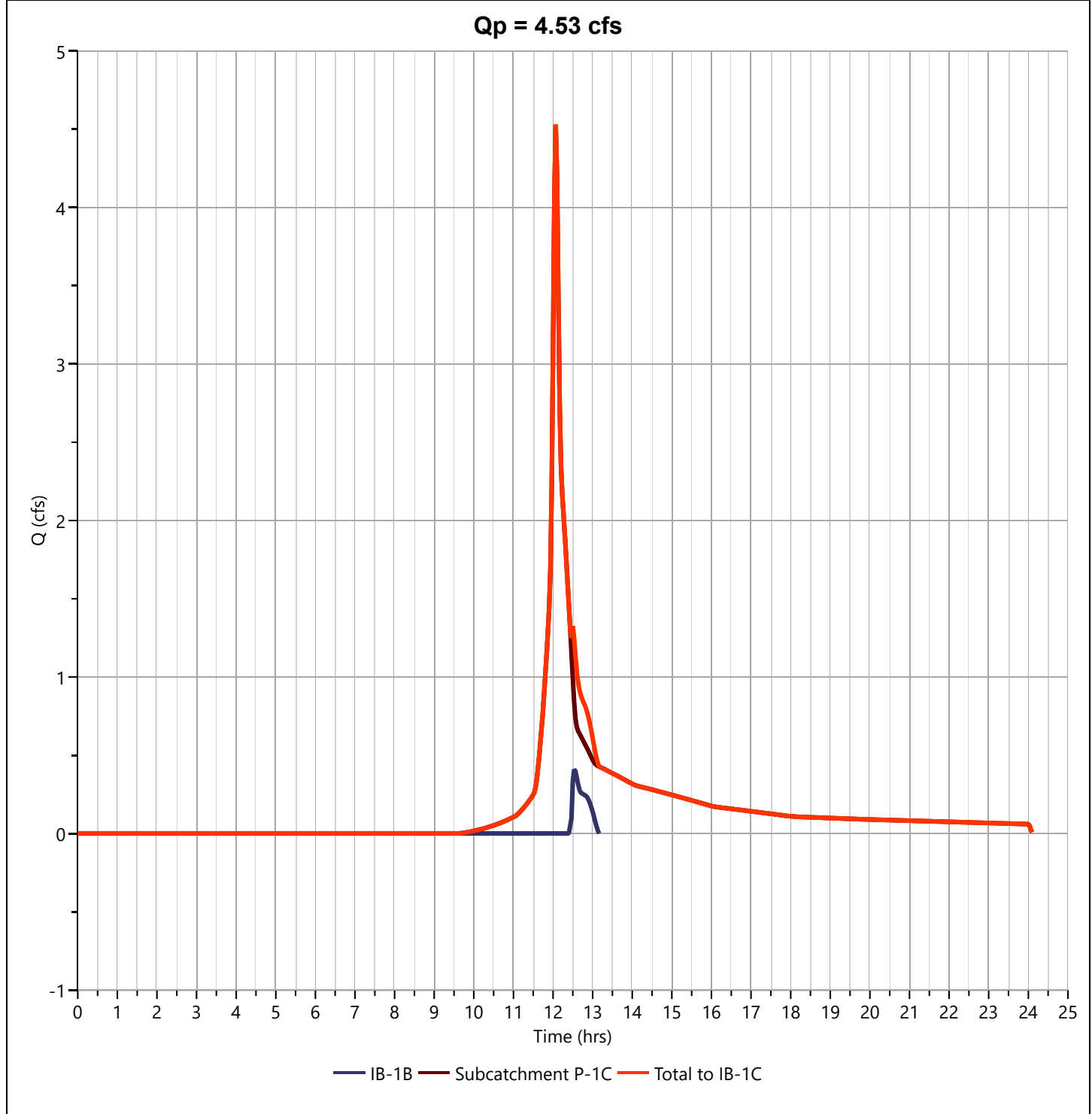
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1C

Hyd. No. 20

Hydrograph Type	= Junction	Peak Flow	= 4.529 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 14,304 cuft
Inflow Hydrographs	= 18, 19	Total Contrib. Area	= 1.26 ac



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

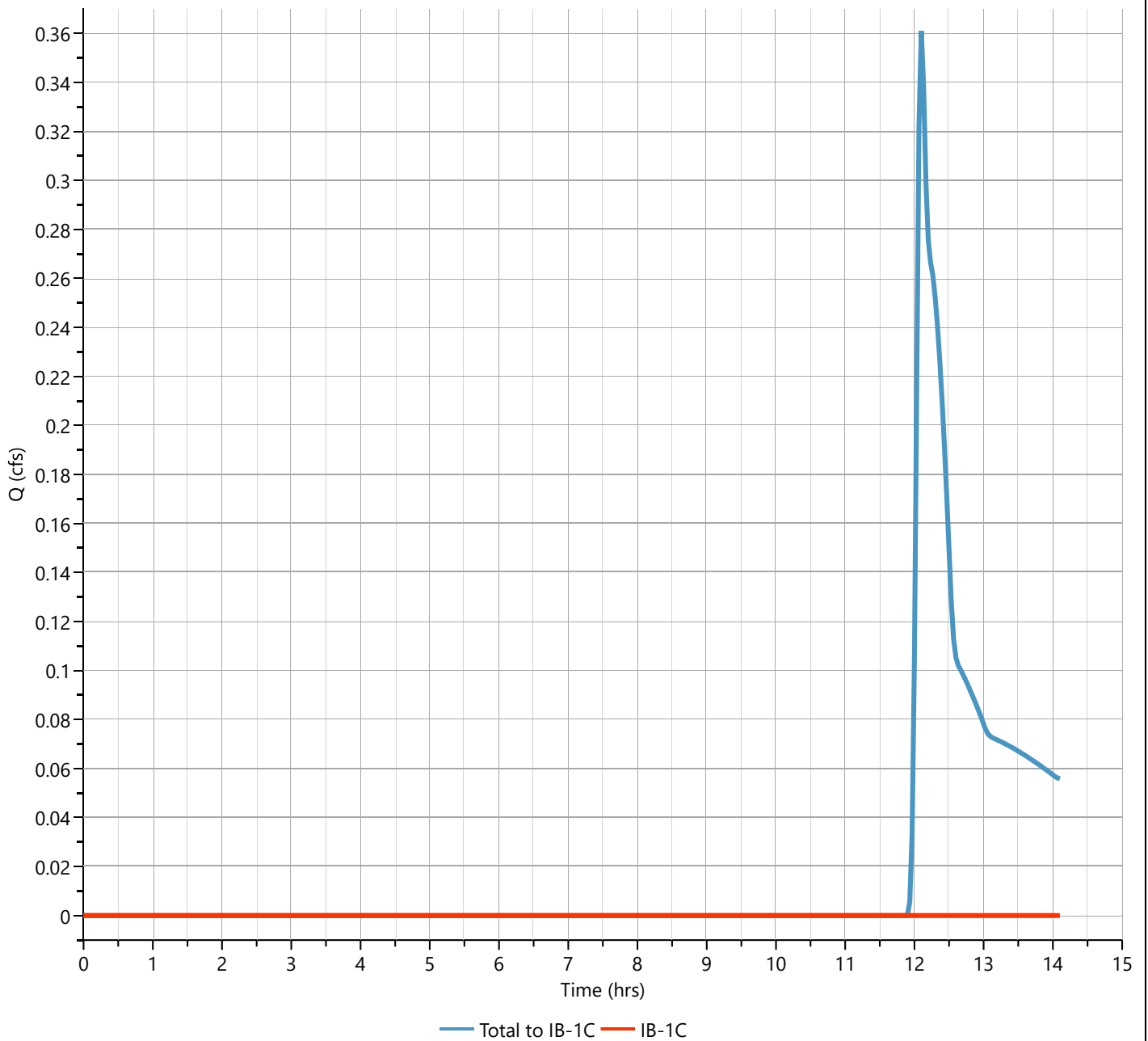
IB-1C

Hyd. No. 21

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 14.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 20 - Total to IB-1C	Max. Elevation	= 223.26 ft
Pond Name	= Basin P-1C	Max. Storage	= 231 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

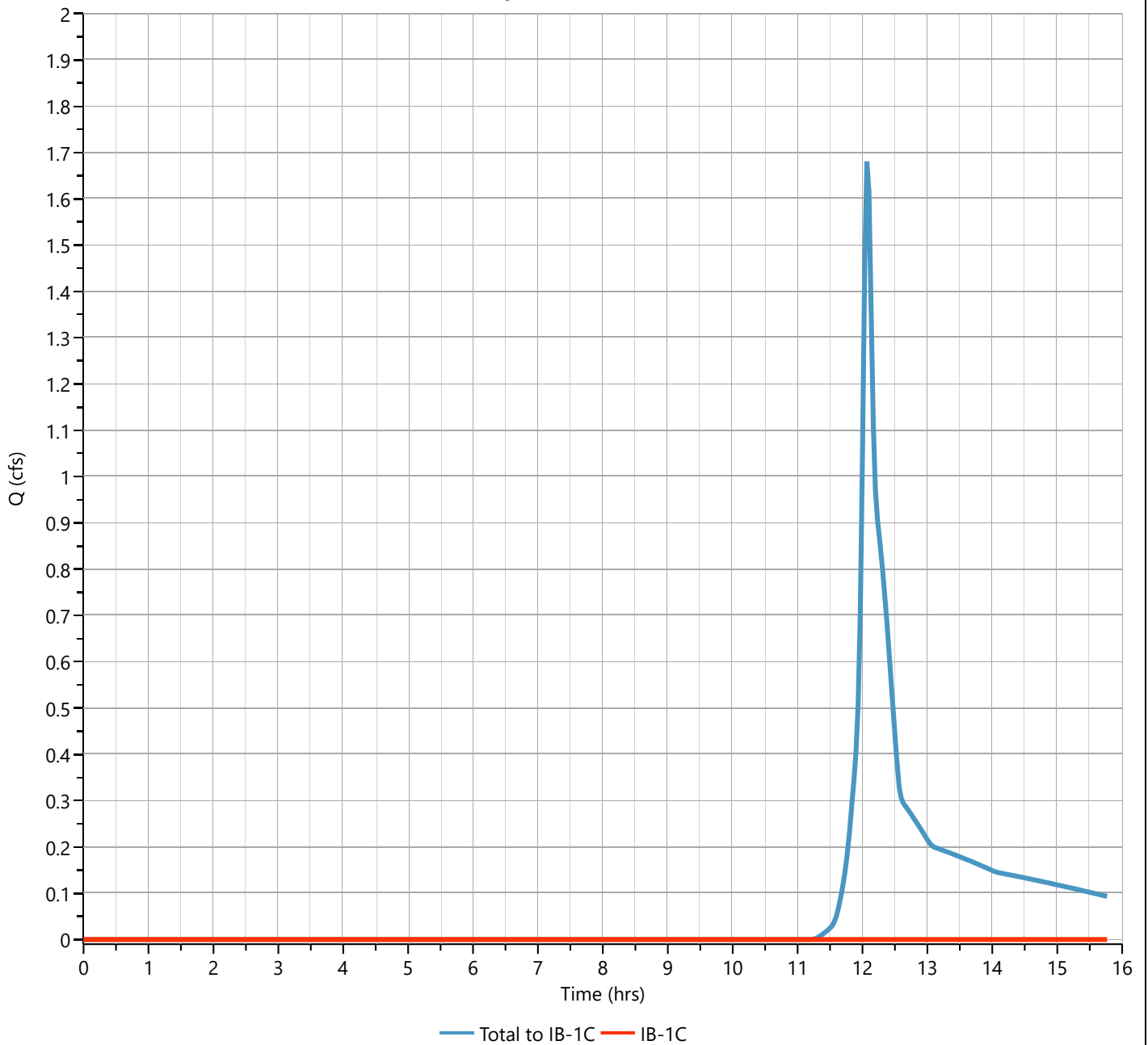
IB-1C

Hyd. No. 21

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 15.57 hrs
Time Interval	= 2 min	Hydrograph Volume	= -0.002 cuft
Inflow Hydrograph	= 20 - Total to IB-1C	Max. Elevation	= 224.50 ft
Pond Name	= Basin P-1C	Max. Storage	= 1,658 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

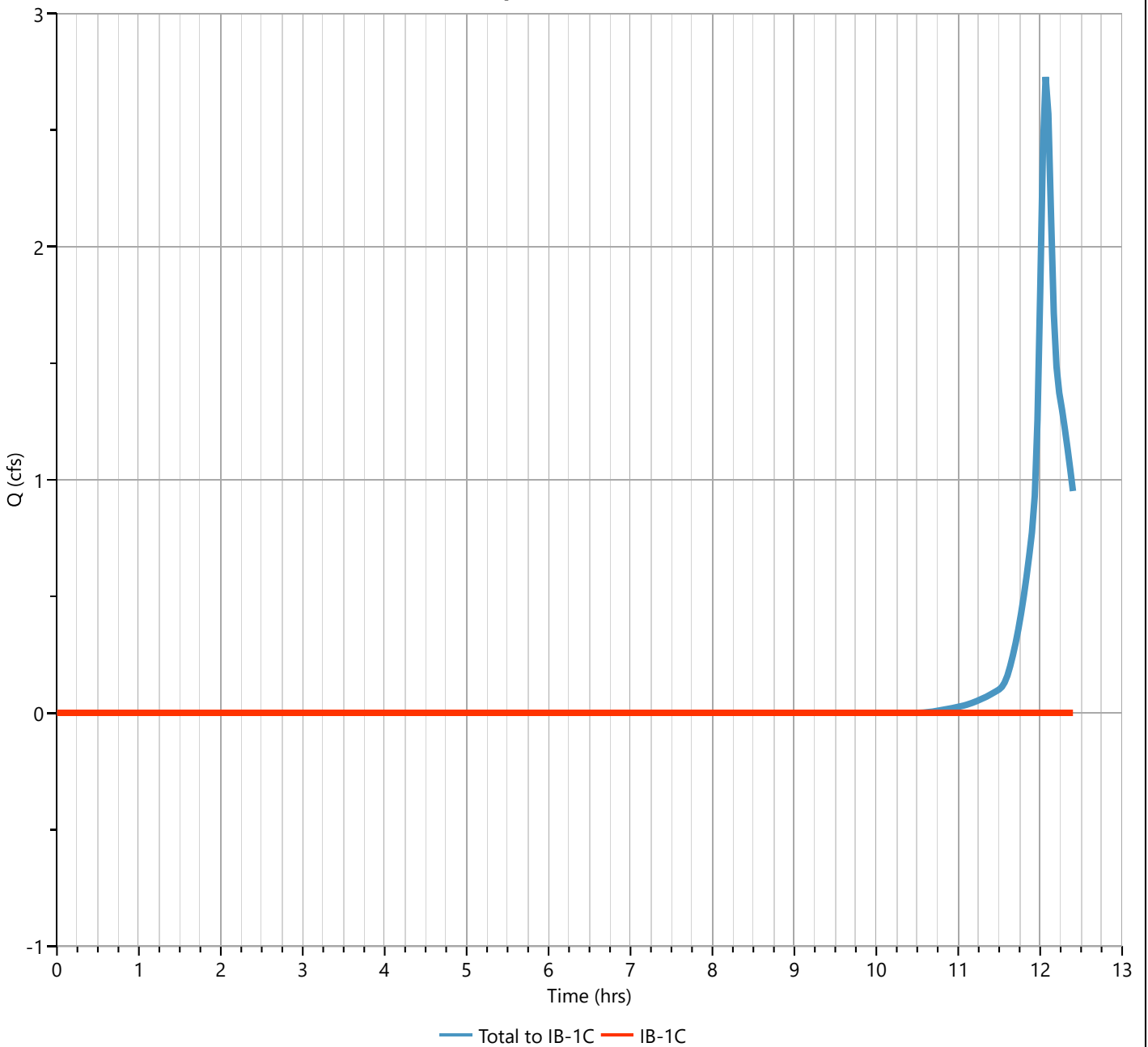
IB-1C

Hyd. No. 21

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.30 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 20 - Total to IB-1C	Max. Elevation	= 225.19 ft
Pond Name	= Basin P-1C	Max. Storage	= 2,889 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

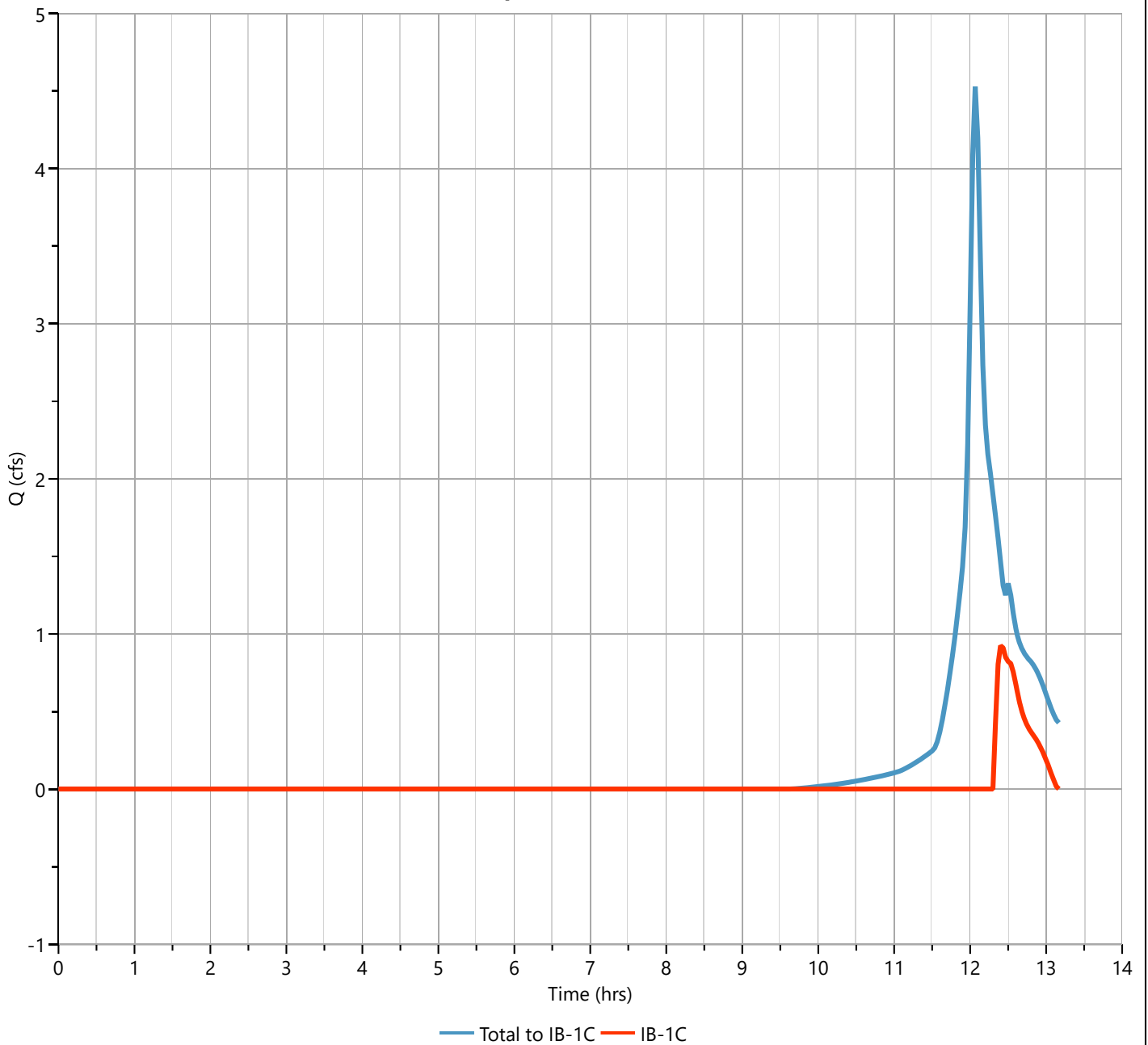
IB-1C

Hyd. No. 21

Hydrograph Type	= Pond Route	Peak Flow	= 0.924 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.40 hrs
Time Interval	= 2 min	Hydrograph Volume	= 1,407 cuft
Inflow Hydrograph	= 20 - Total to IB-1C	Max. Elevation	= 225.98 ft
Pond Name	= Basin P-1C	Max. Storage	= 4,699 cuft

Pond Routing by Storage Indication Method

Qp = 0.92 cfs



Pond Report

Project Name:

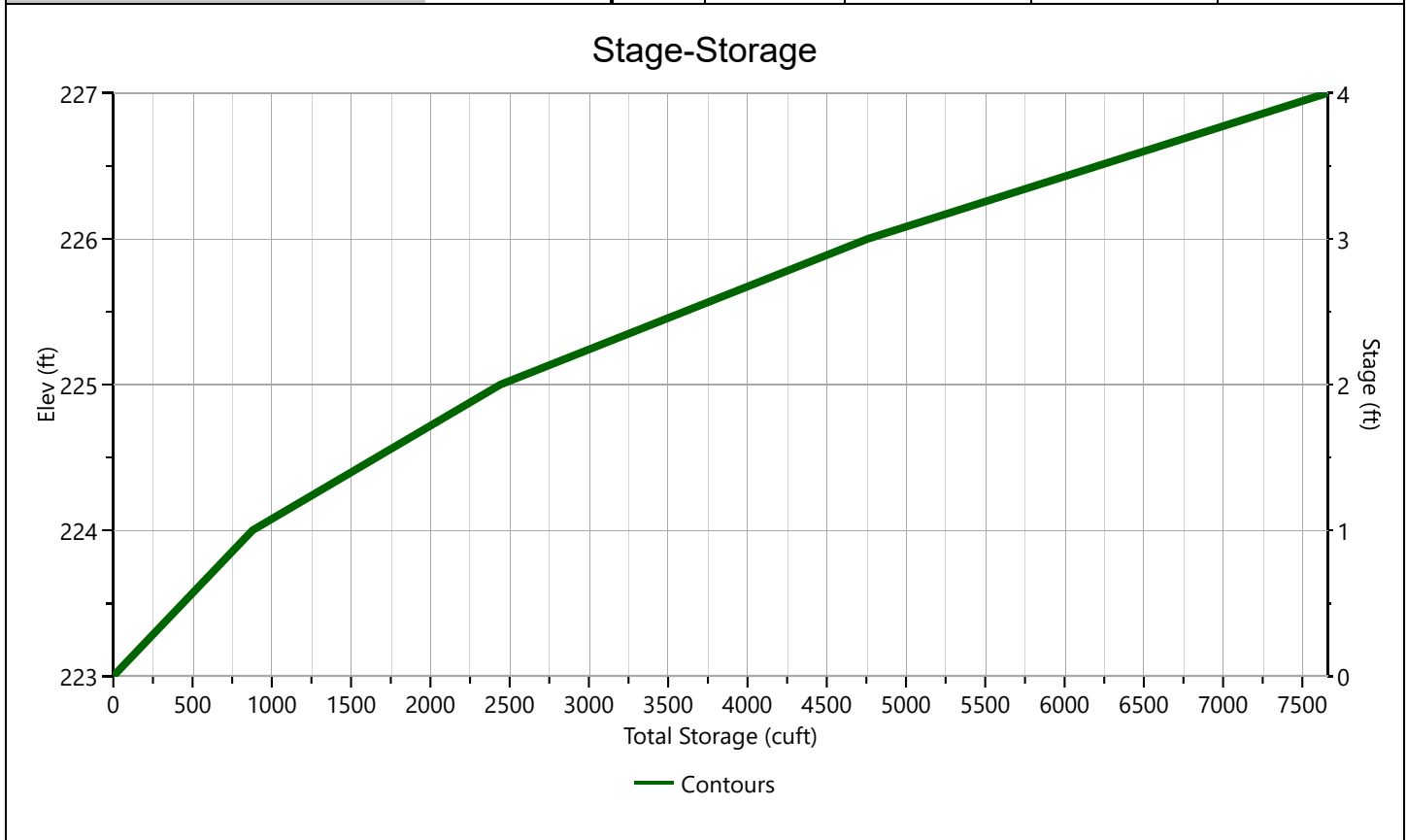
Hydrology Studio v 3.0.0.29

12-13-2023

Basin P-1C

Stage-Storage

User Defined Contours		Stage / Storage Table				
Description	Input	Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Bottom Elevation, ft	223.00	0.00	223.00	670	0.000	0.000
Voids (%)	100.00	1.00	224.00	1,086	878	878
Volume Calc	None	2.00	225.00	2,042	1,564	2,442
		3.00	226.00	2,594	2,318	4,760
		4.00	227.00	3,202	2,898	7,658



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

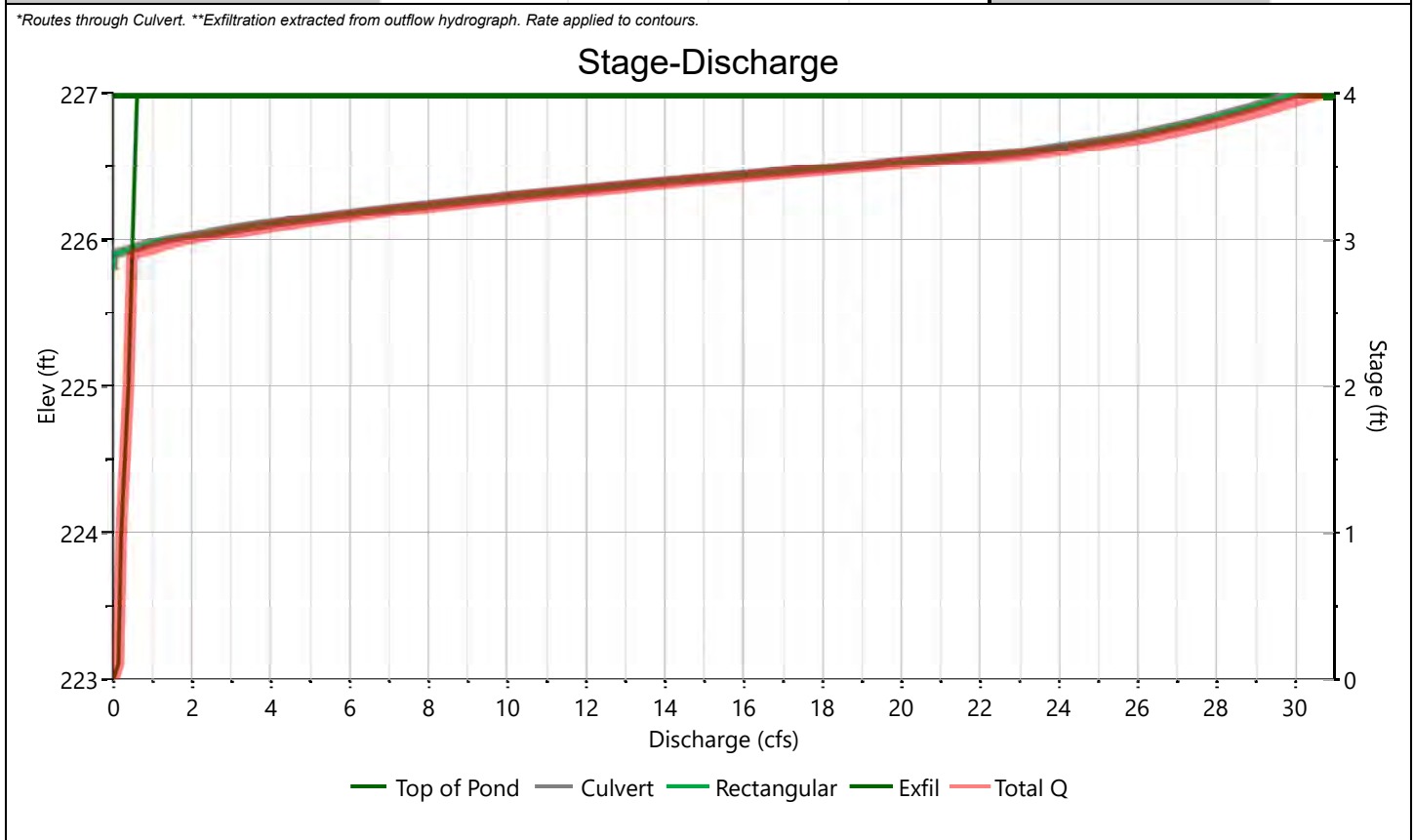
12-13-2023

Basin P-1C

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in	27				Hole Diameter, in
Span, in	27				No. holes
No. Barrels	1				Invert Elevation, ft
Invert Elevation, ft	223.00				Height, ft
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co
Length, ft	80				
Barrel Slope, %	.6				
N-Value, n	0.012				
Weirs	Riser*	Weirs			Ancillary
		1*	2*	3	
Shape / Type		Rectangular	Rectangular		Exfiltration, in/hr
Crest Elevation, ft		226	225.9		8.27**
Crest Length, ft		4	12		
Angle, deg					
Weir Coefficient, Cw		3.3	3.3		

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

Basin P-1C

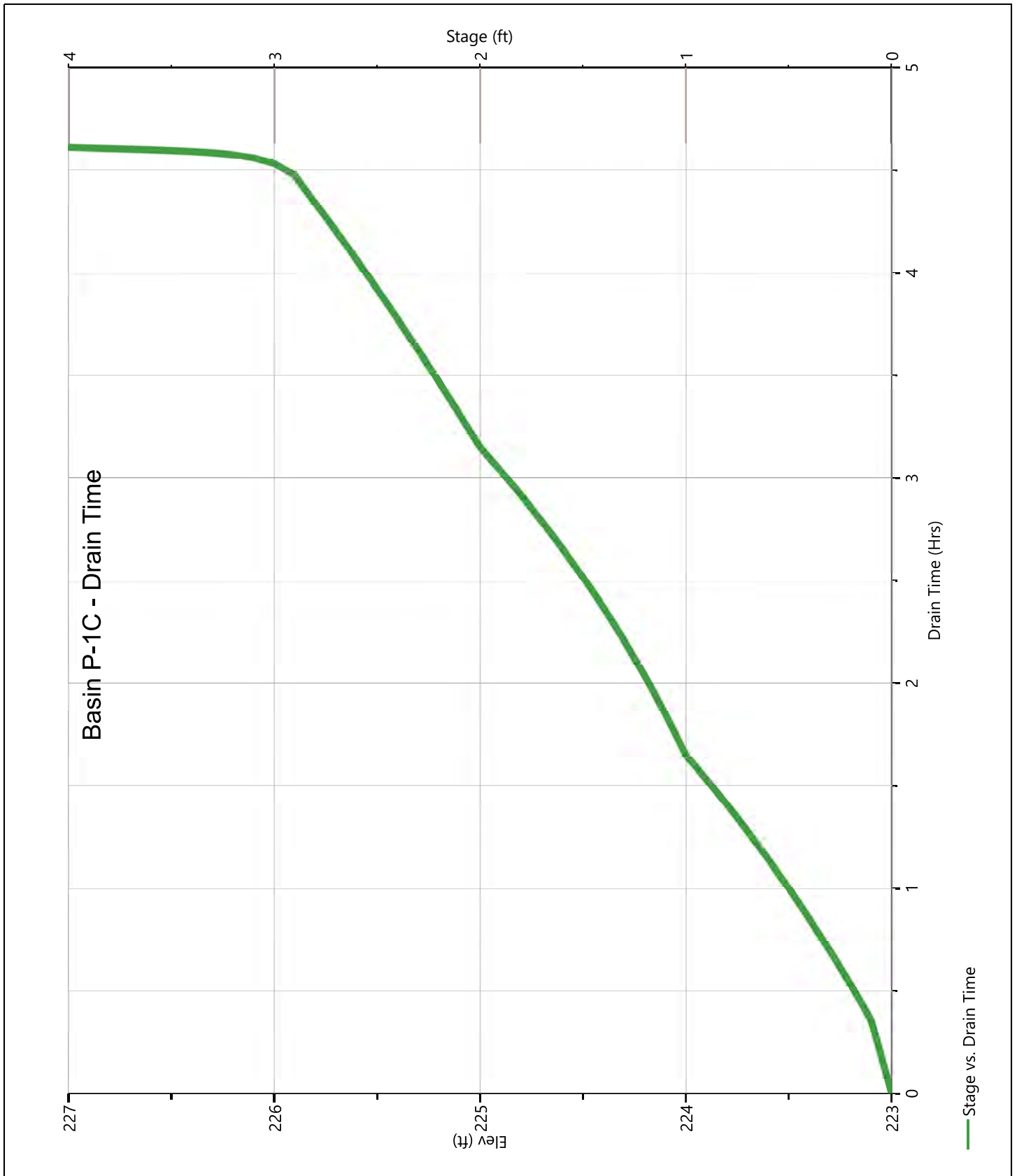
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	223.00	0.000	0.000					0.000	0.000			0.000		0.000
1.00	224.00	878	0.000					0.000	0.000			0.208		0.208
2.00	225.00	2,442	0.000					0.000	0.000			0.391		0.391
3.00	226.00	4,760	1.252 ic					0.000	1.252			0.497		1.749
4.00	227.00	7,658	30.04 oc					0.000	30.04 s			0.613		30.65

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

Basin P-1C

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-1D

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area Acres	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
-	Impervious	98			0.42	40.91
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			0.76	29.74
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					1.18	70.65

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{70.65}{1.18} = 59.87 ; \text{ Use CN} = \boxed{60}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	0.42	1.30	3.19

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Hydrograph Report

Project Name:

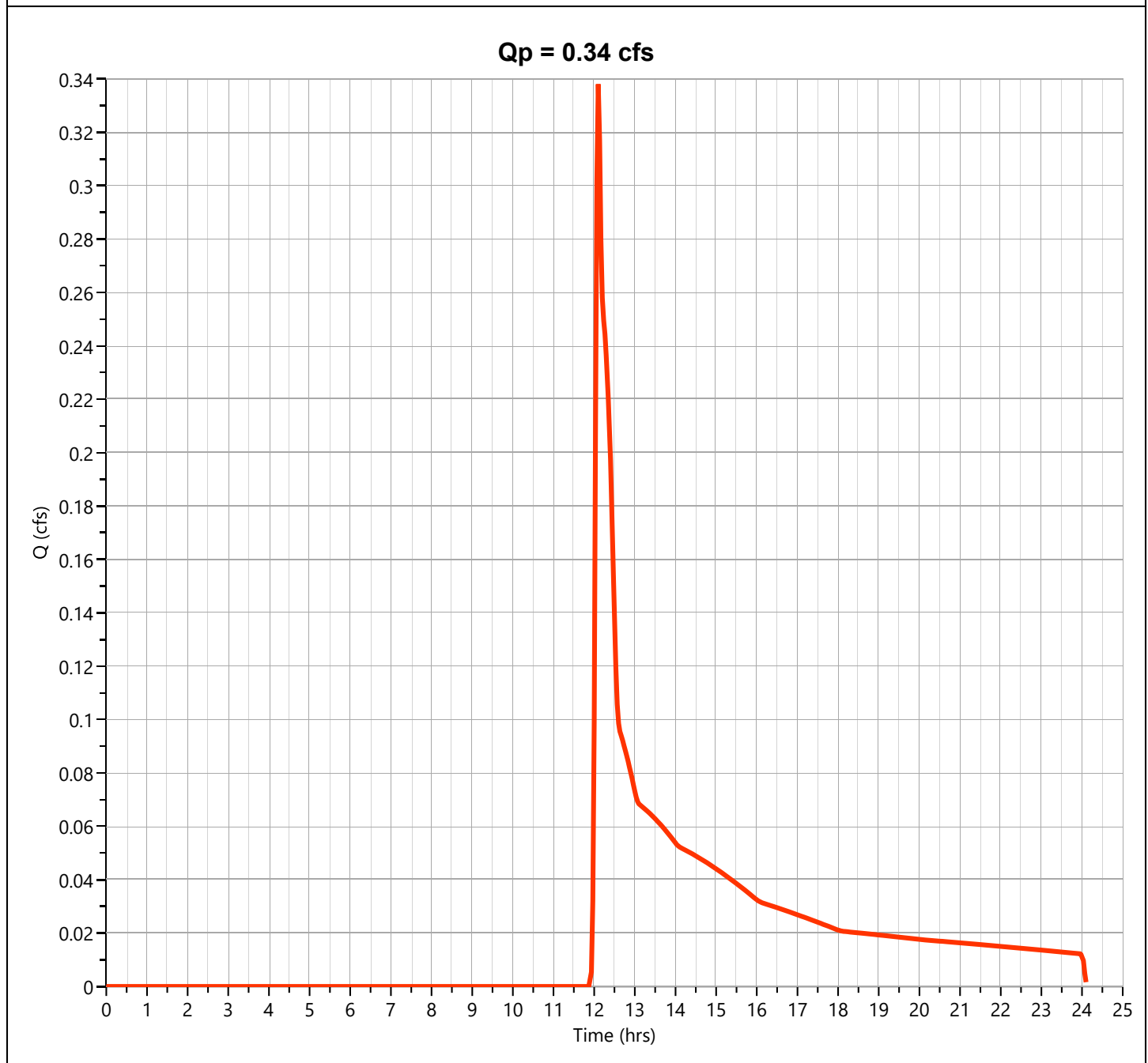
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1D

Hyd. No. 22

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.338 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 2 min	Runoff Volume	= 1,687 cuft
Drainage Area	= 1.18 ac	Curve Number	= 60
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

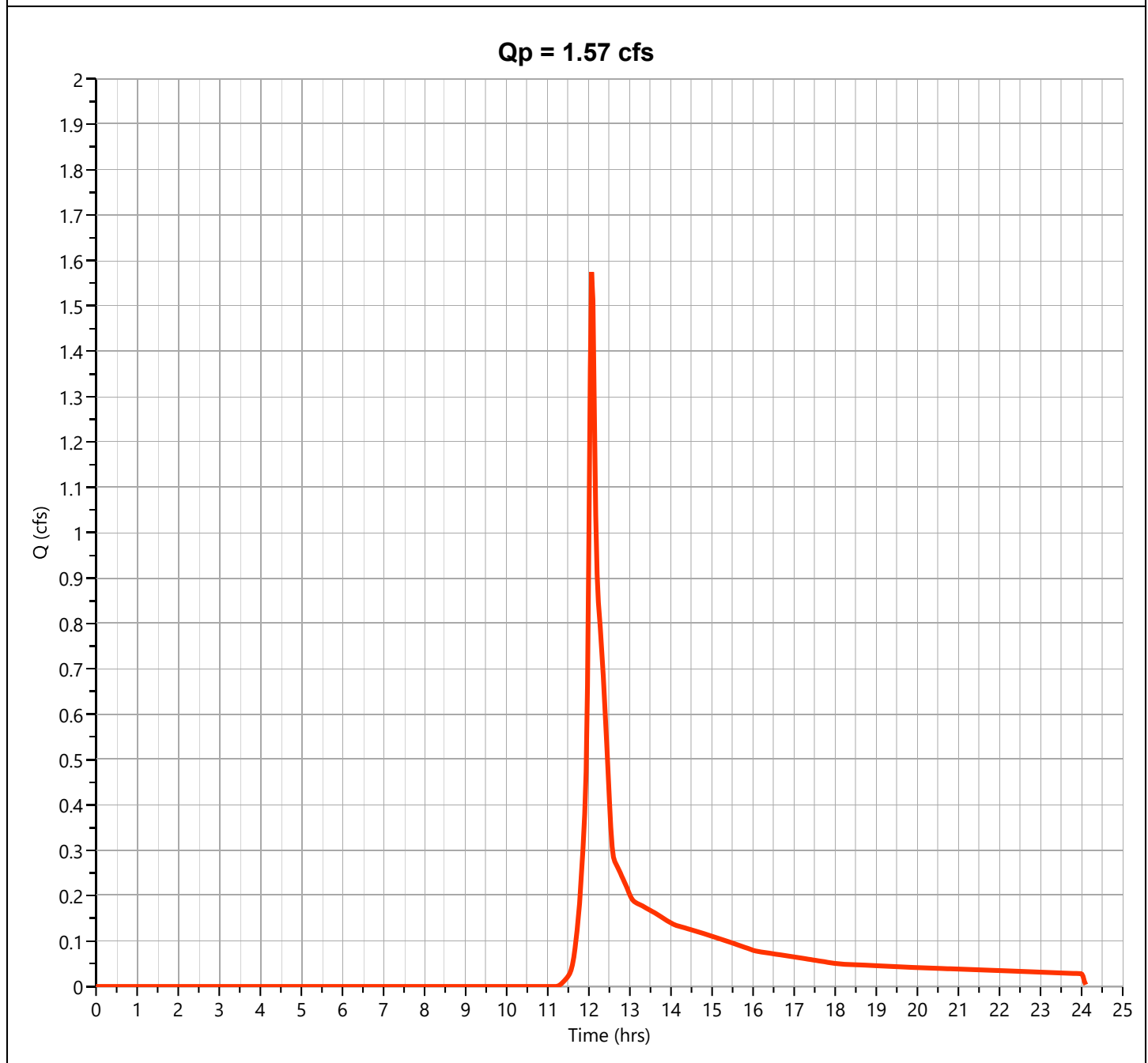
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1D

Hyd. No. 22

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.574 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 5,248 cuft
Drainage Area	= 1.18 ac	Curve Number	= 60
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

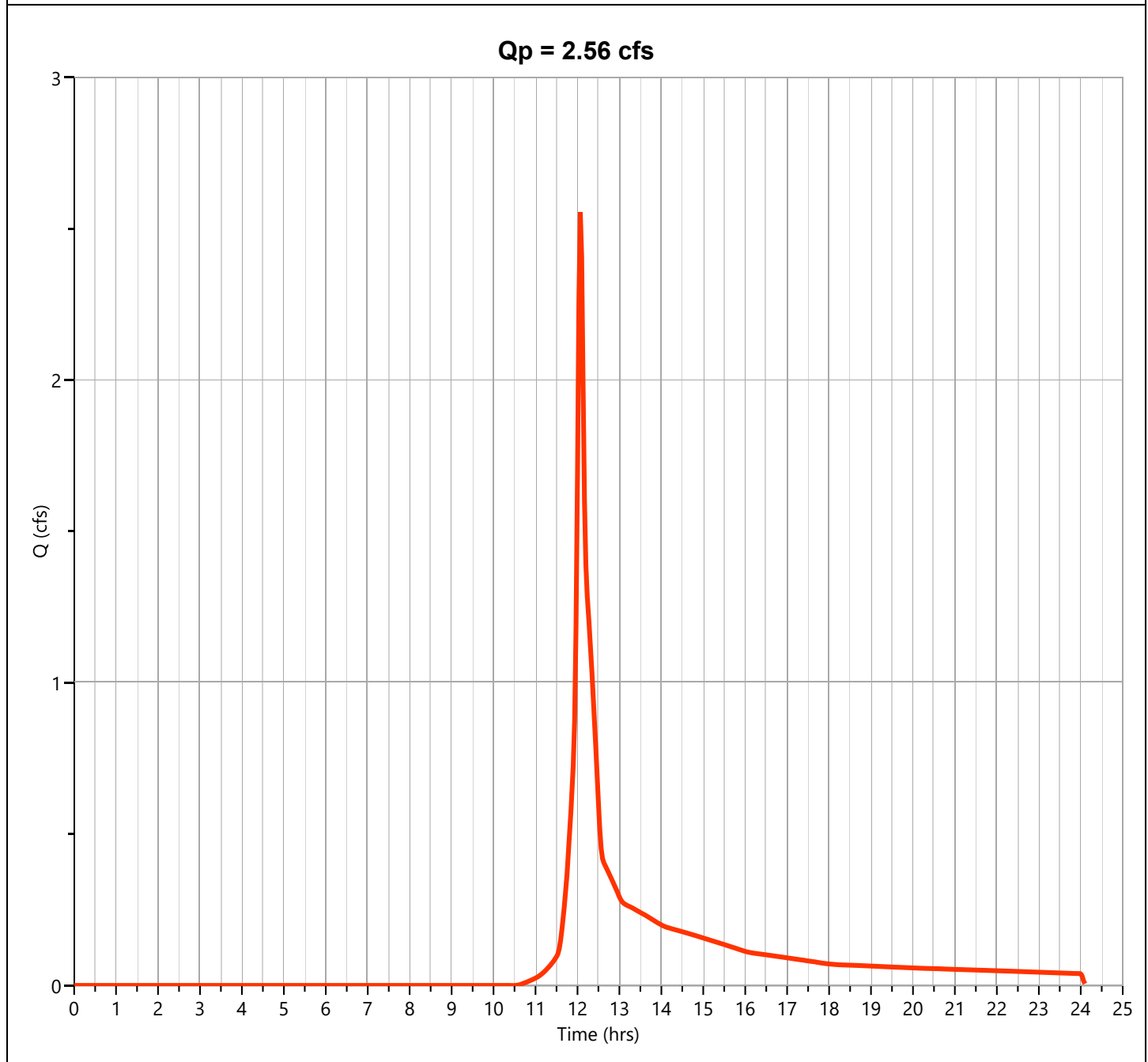
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1D

Hyd. No. 22

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.556 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 8,033 cuft
Drainage Area	= 1.18 ac	Curve Number	= 60
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

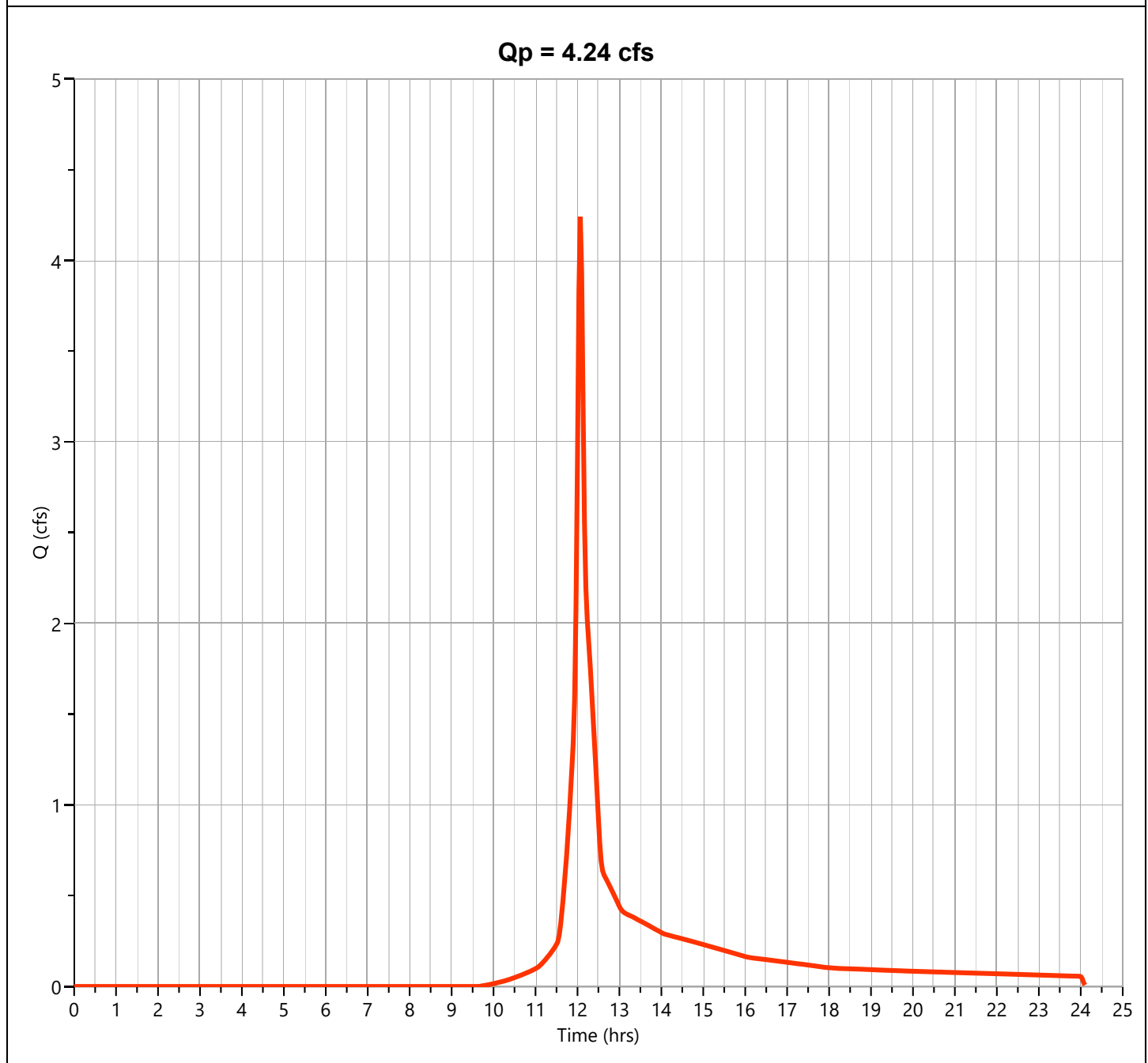
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1D

Hyd. No. 22

Hydrograph Type	= NRCS Runoff	Peak Flow	= 4.242 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 12,876 cuft
Drainage Area	= 1.18 ac	Curve Number	= 60
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

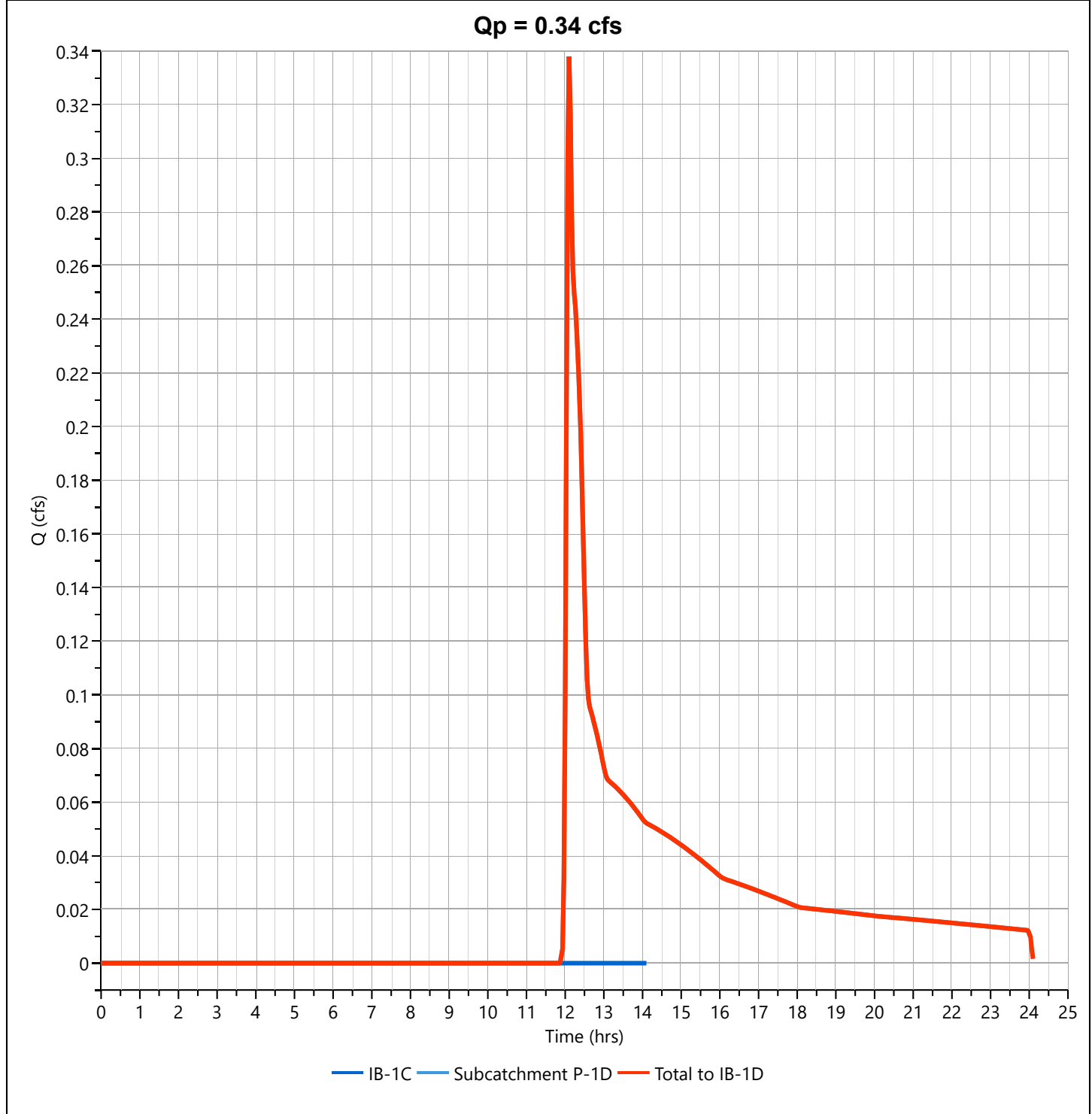
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1D

Hyd. No. 23

Hydrograph Type	= Junction	Peak Flow	= 0.338 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 2 min	Hydrograph Volume	= 1,687 cuft
Inflow Hydrographs	= 21, 22	Total Contrib. Area	= 1.18 ac



Hydrograph Report

Project Name:

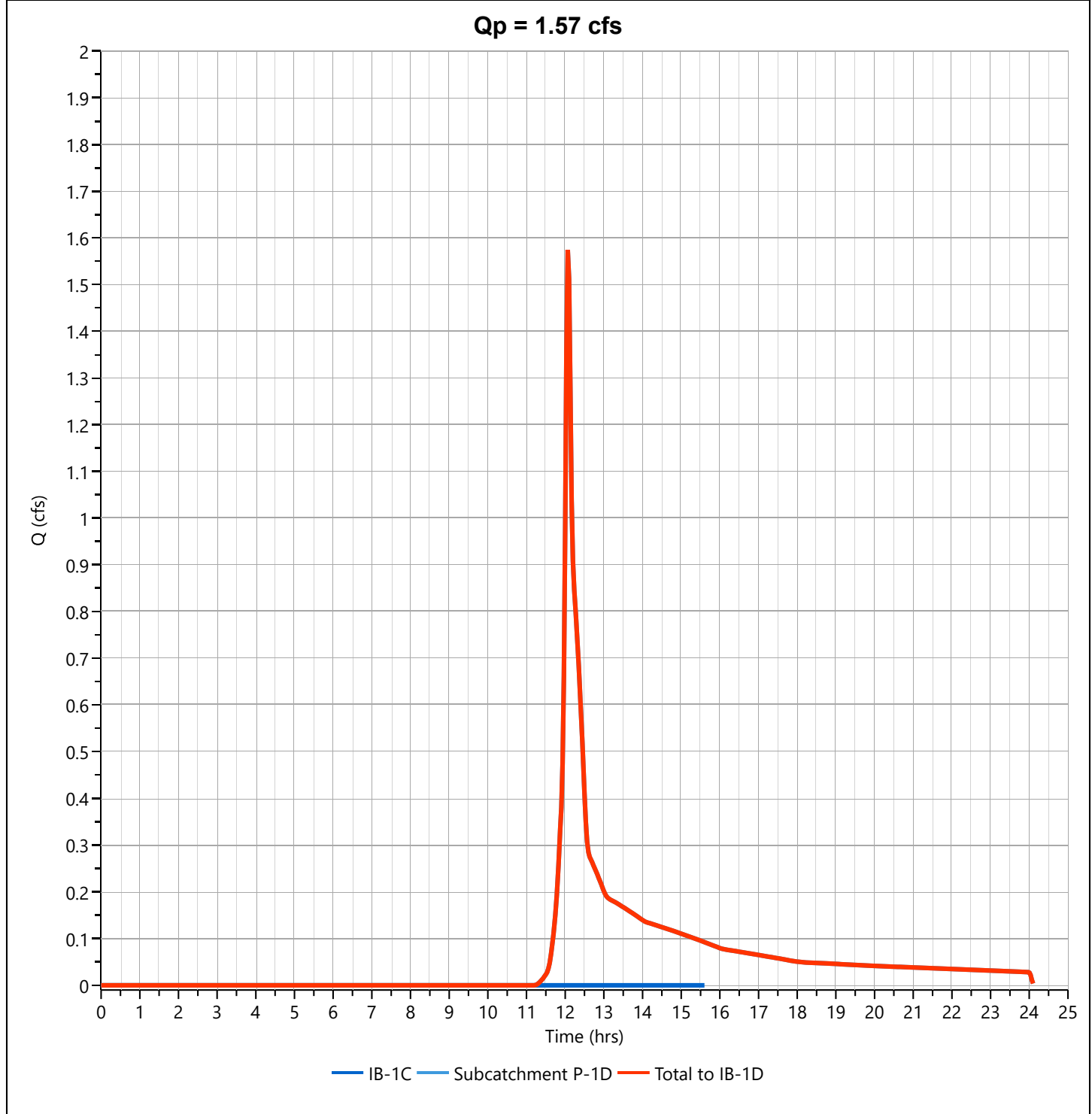
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1D

Hyd. No. 23

Hydrograph Type	= Junction	Peak Flow	= 1.574 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 5,248 cuft
Inflow Hydrographs	= 21, 22	Total Contrib. Area	= 1.18 ac



Hydrograph Report

Project Name:

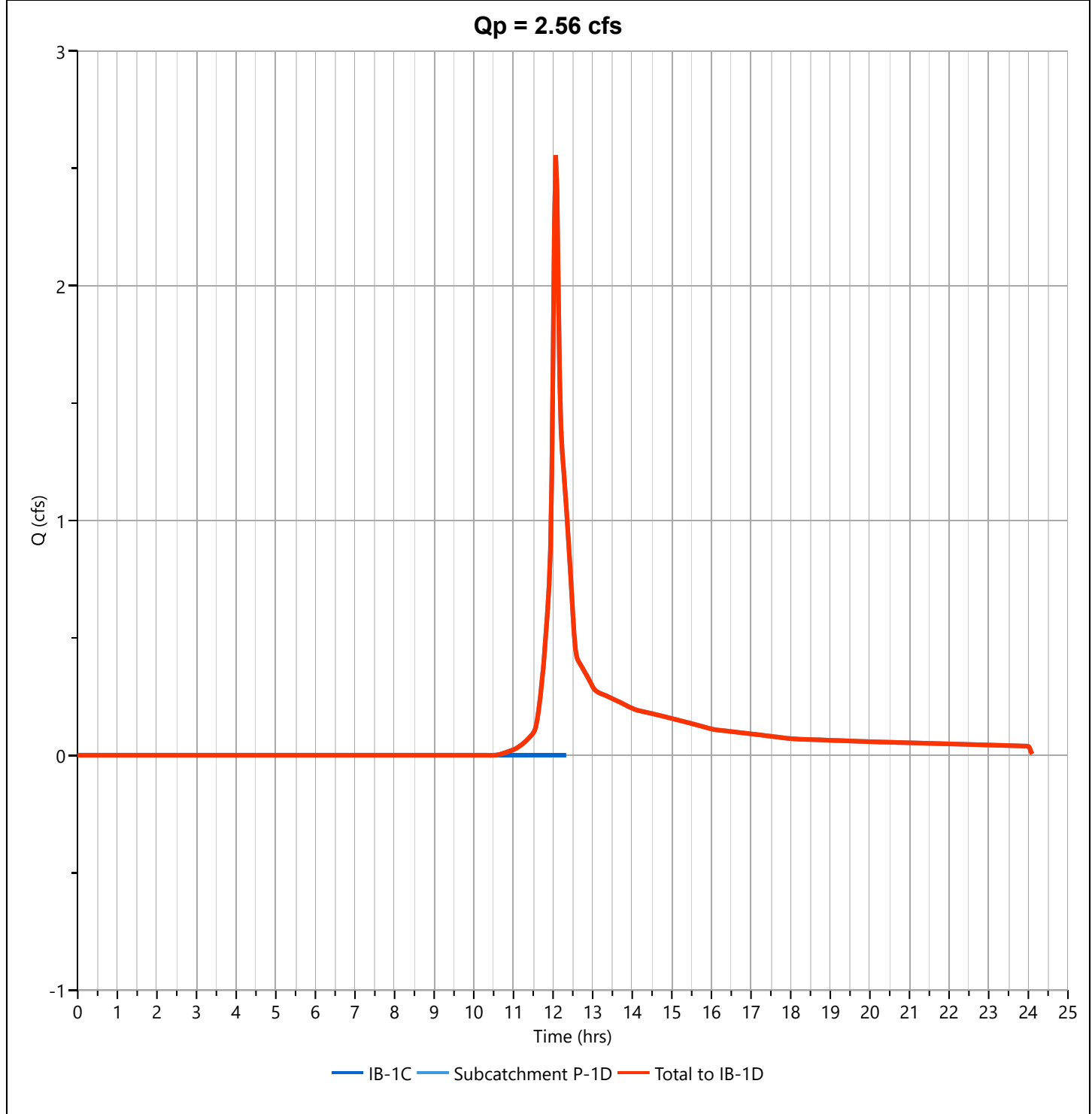
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1D

Hyd. No. 23

Hydrograph Type	= Junction	Peak Flow	= 2.556 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 8,033 cuft
Inflow Hydrographs	= 21, 22	Total Contrib. Area	= 1.18 ac



Hydrograph Report

Project Name:

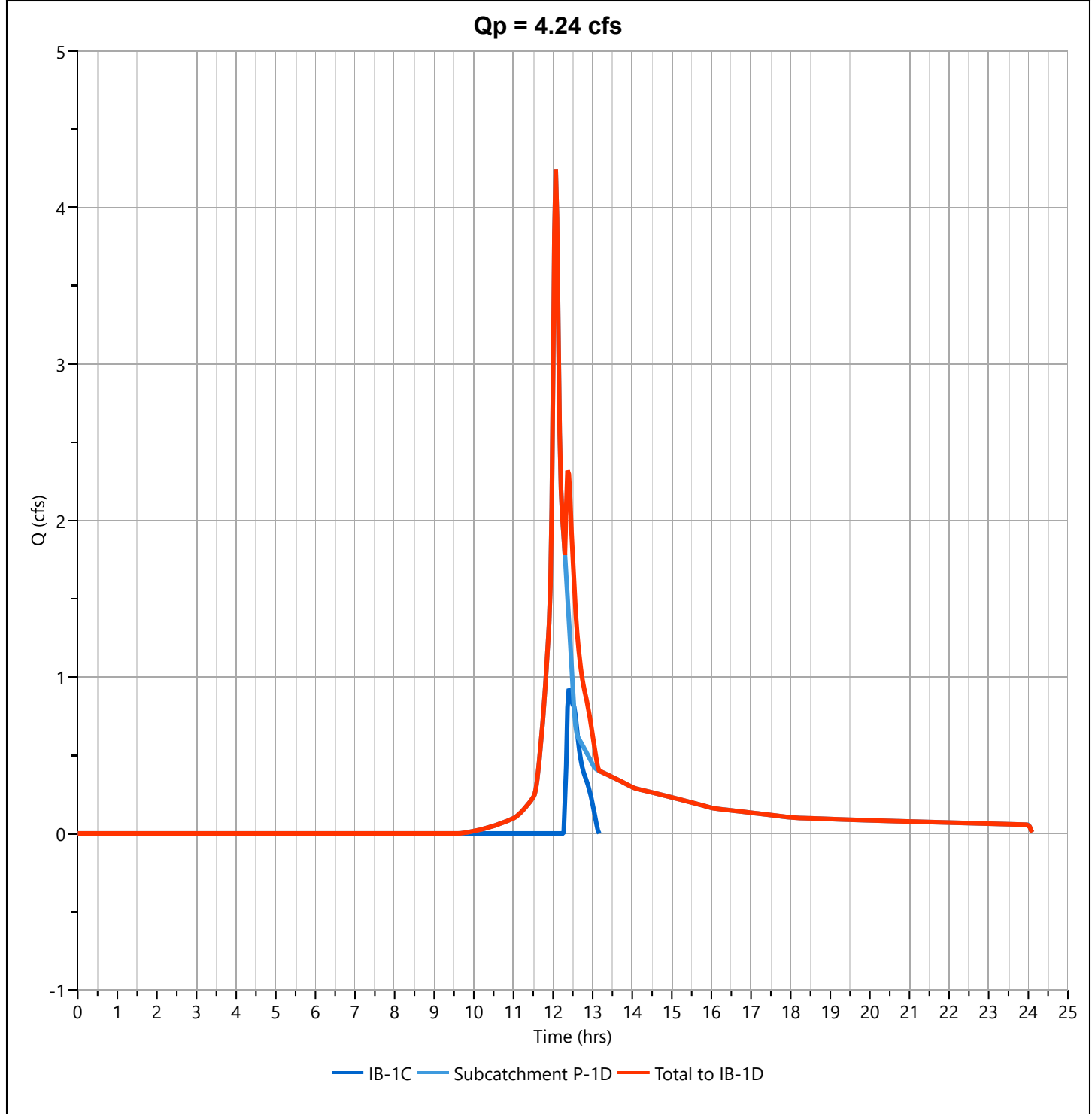
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1D

Hyd. No. 23

Hydrograph Type	= Junction	Peak Flow	= 4.242 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 14,283 cuft
Inflow Hydrographs	= 21, 22	Total Contrib. Area	= 1.18 ac



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

IB-1D

Hyd. No. 24

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.00 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 23 - Total to IB-1D	Max. Elevation	= 223.16 ft
Pond Name	= Basin P-1D	Max. Storage	= 171 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

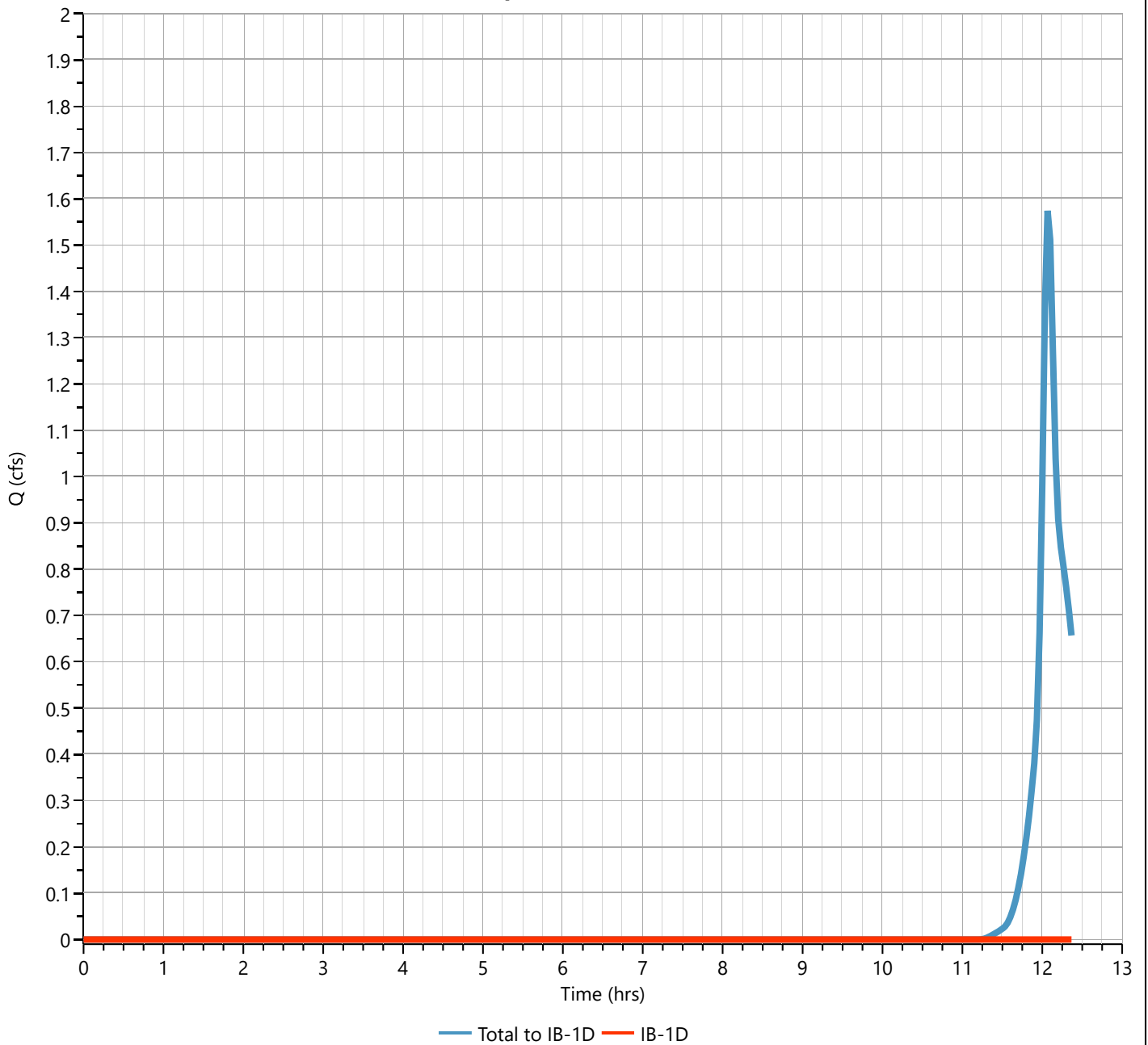
IB-1D

Hyd. No. 24

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.17 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 23 - Total to IB-1D	Max. Elevation	= 224.25 ft
Pond Name	= Basin P-1D	Max. Storage	= 1,494 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

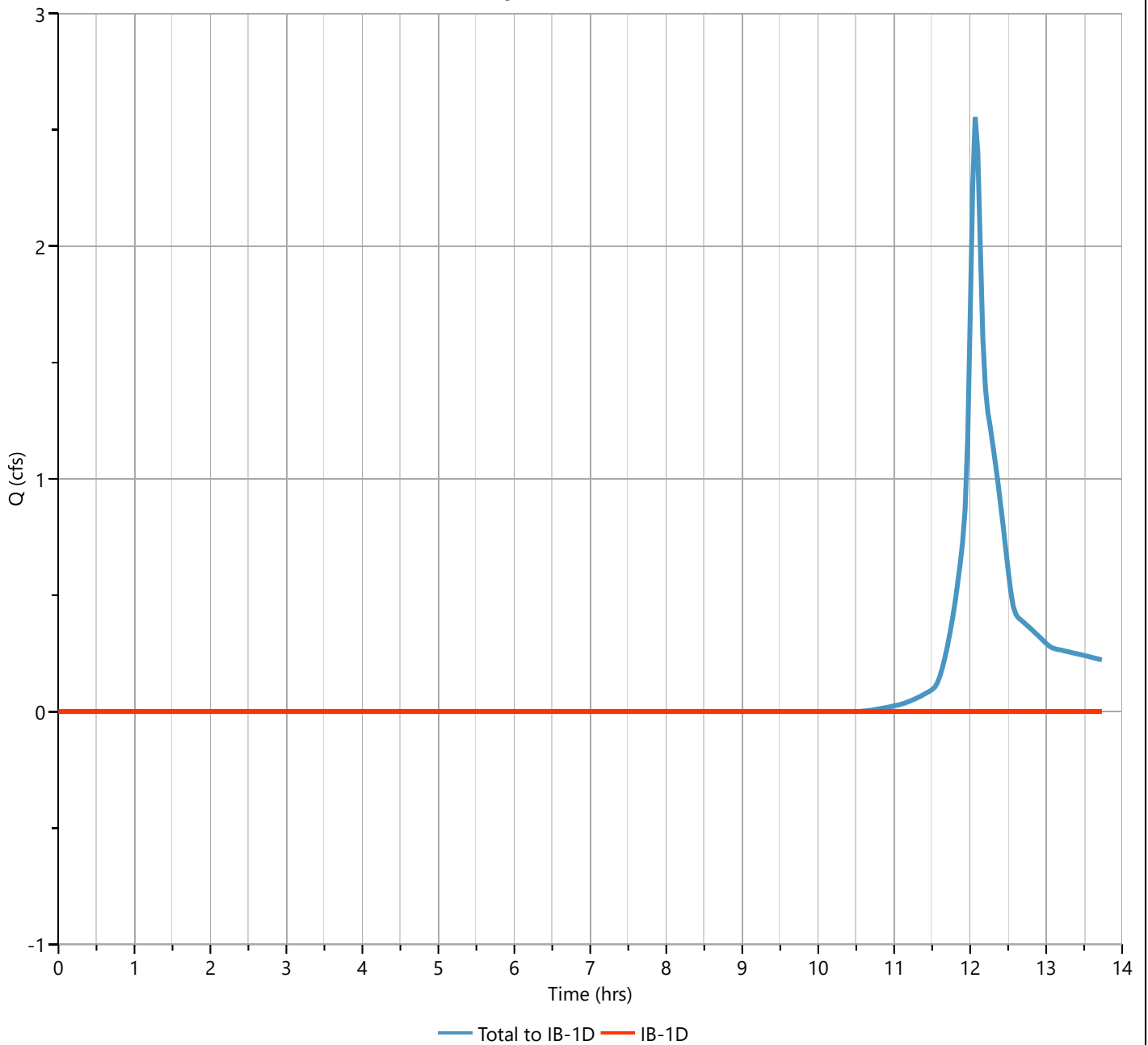
IB-1D

Hyd. No. 24

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 13.57 hrs
Time Interval	= 2 min	Hydrograph Volume	= -0.003 cuft
Inflow Hydrograph	= 23 - Total to IB-1D	Max. Elevation	= 224.89 ft
Pond Name	= Basin P-1D	Max. Storage	= 2,629 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

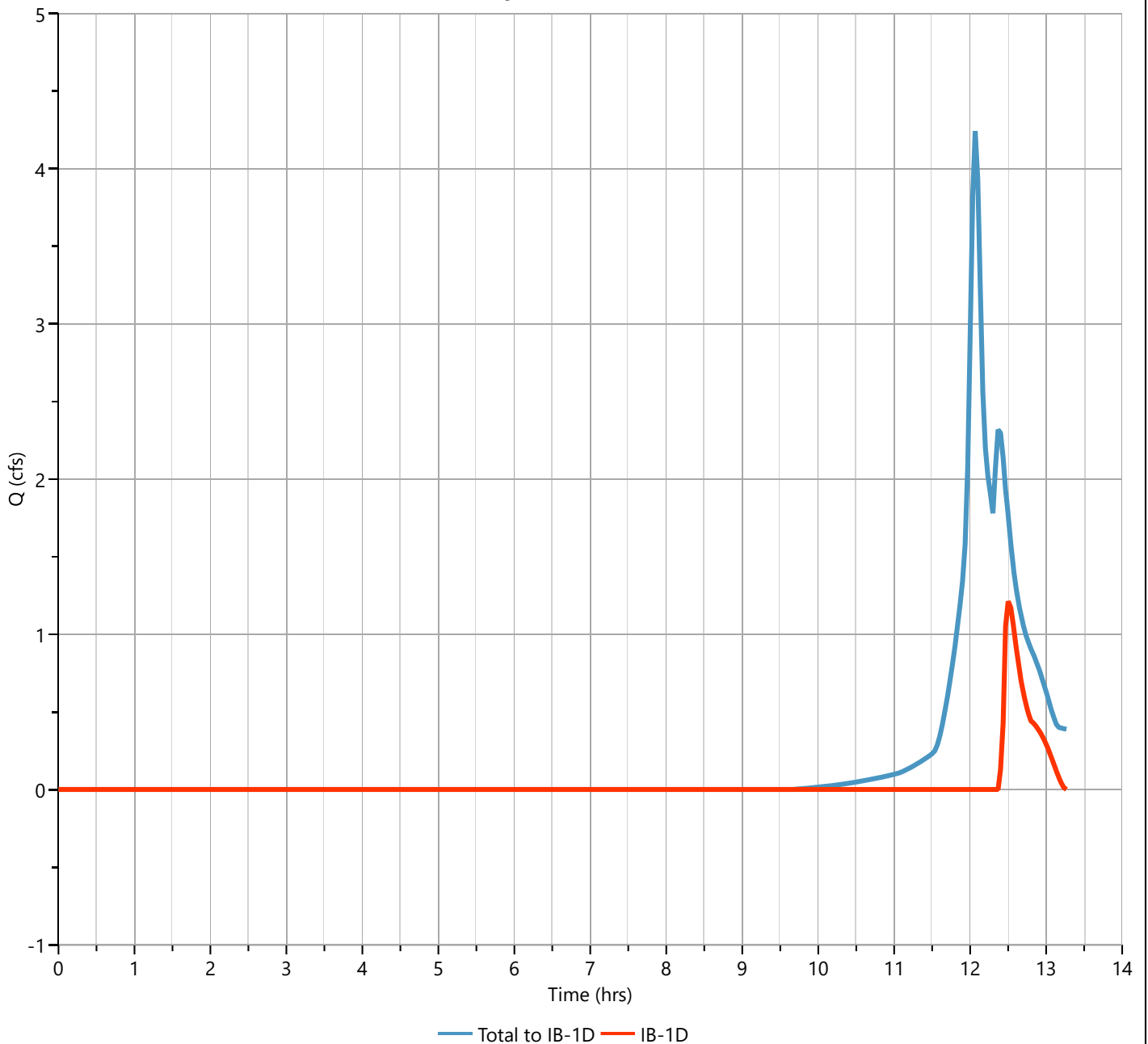
IB-1D

Hyd. No. 24

Hydrograph Type	= Pond Route	Peak Flow	= 1.213 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.50 hrs
Time Interval	= 2 min	Hydrograph Volume	= 1,525 cuft
Inflow Hydrograph	= 23 - Total to IB-1D	Max. Elevation	= 225.84 ft
Pond Name	= Basin P-1D	Max. Storage	= 4,960 cuft

Pond Routing by Storage Indication Method

Qp = 1.21 cfs



Pond Report

Project Name:

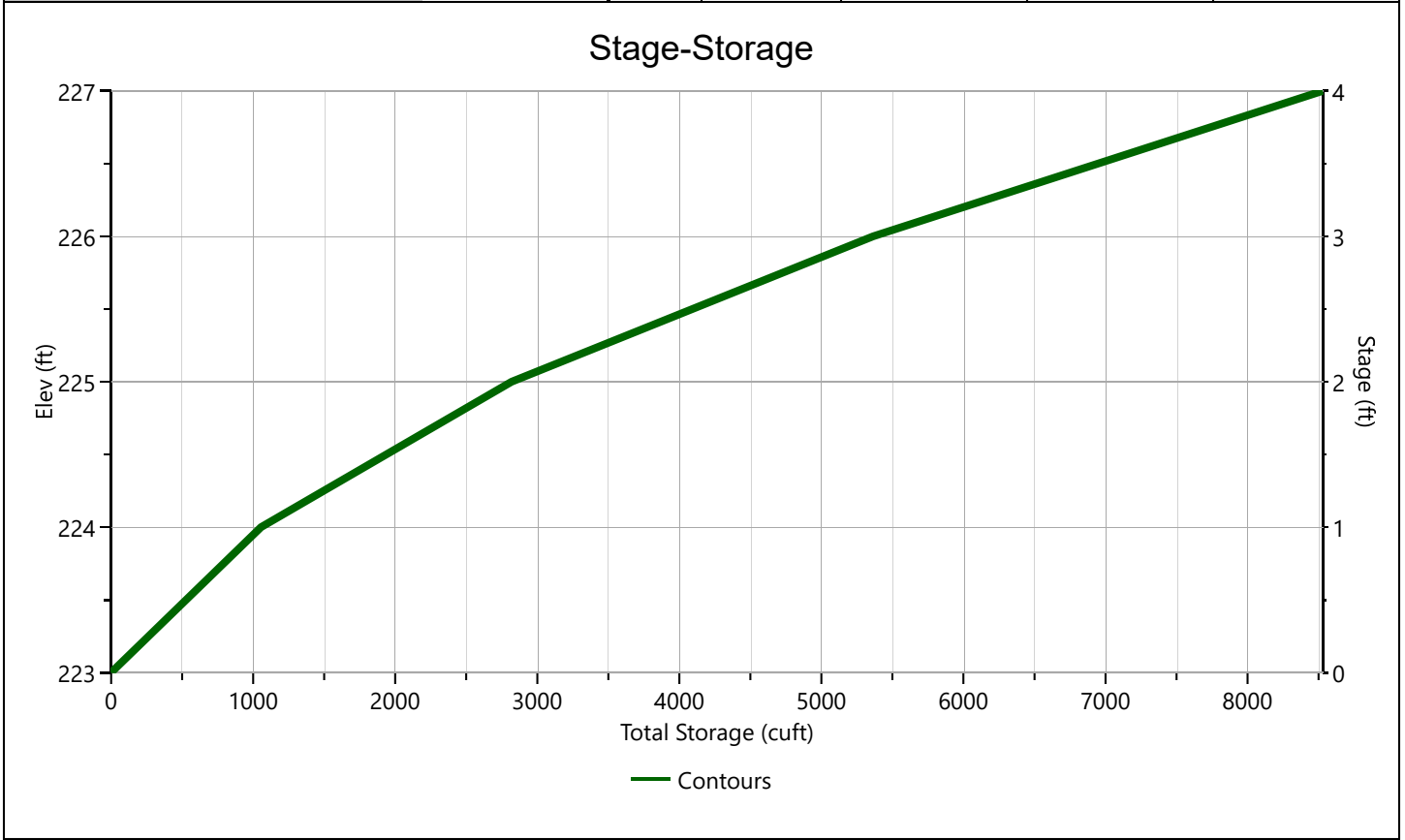
Hydrology Studio v 3.0.0.29

12-13-2023

Basin P-1D

Stage-Storage

User Defined Contours		Stage / Storage Table				
Description	Input	Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Bottom Elevation, ft	223.00	0.00	223.00	833	0.000	0.000
Voids (%)	100.00	1.00	224.00	1,278	1,056	1,056
Volume Calc	None	2.00	225.00	2,249	1,764	2,819
		3.00	226.00	2,841	2,545	5,364
		4.00	227.00	3,489	3,165	8,529



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

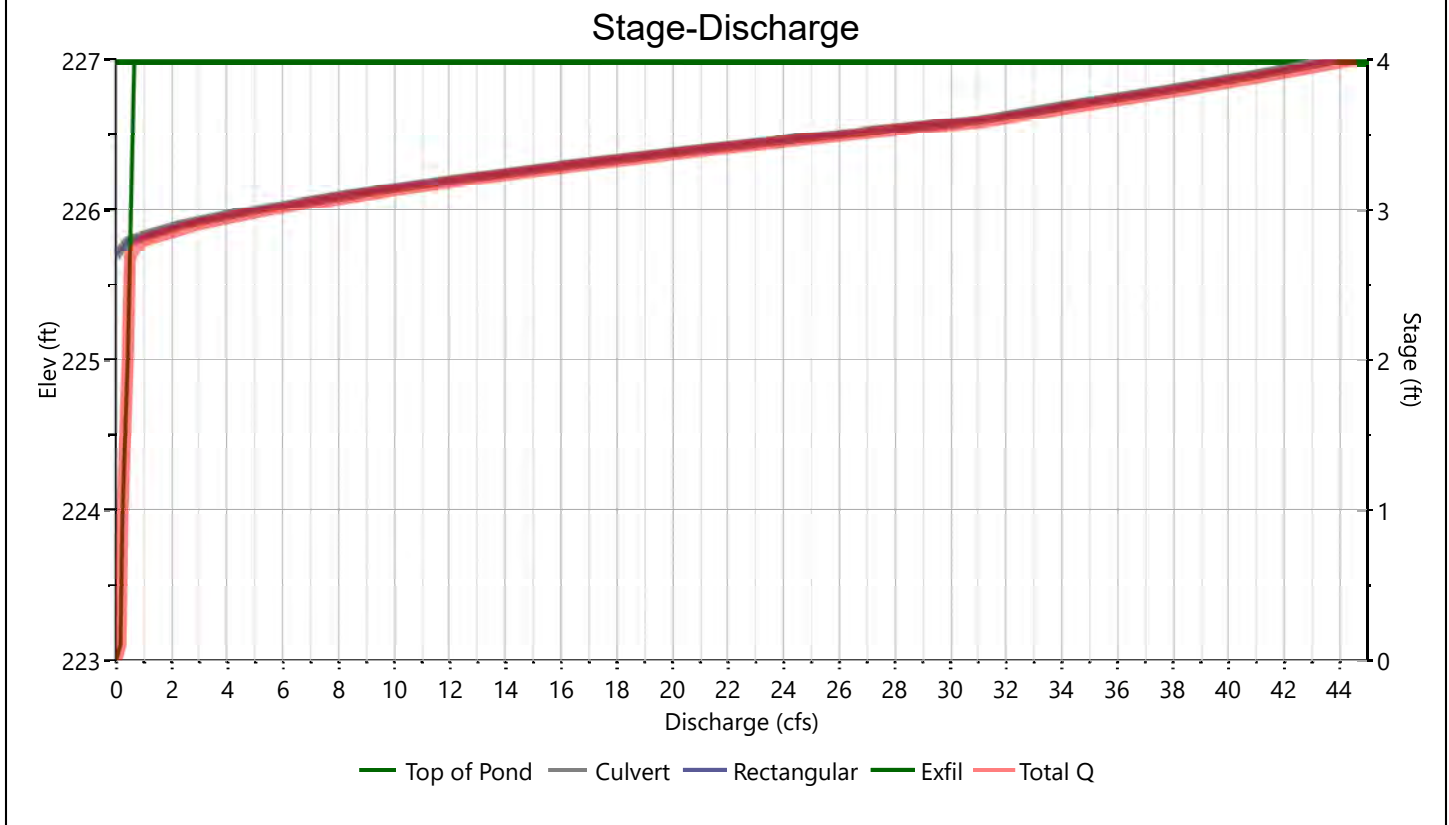
12-13-2023

Basin P-1D

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in	36				Hole Diameter, in
Span, in	36				No. holes
No. Barrels	1				Invert Elevation, ft
Invert Elevation, ft	223.00				Height, ft
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co
Length, ft	65				
Barrel Slope, %	1				
N-Value, n	0.012				
Weirs	Riser*	Weirs			Ancillary
		1*	2	3	
Shape / Type		Rectangular			Exfiltration, in/hr
Crest Elevation, ft		225.75			8.27**
Crest Length, ft		12			
Angle, deg					
Weir Coefficient, Cw		3.3			

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

Basin P-1D

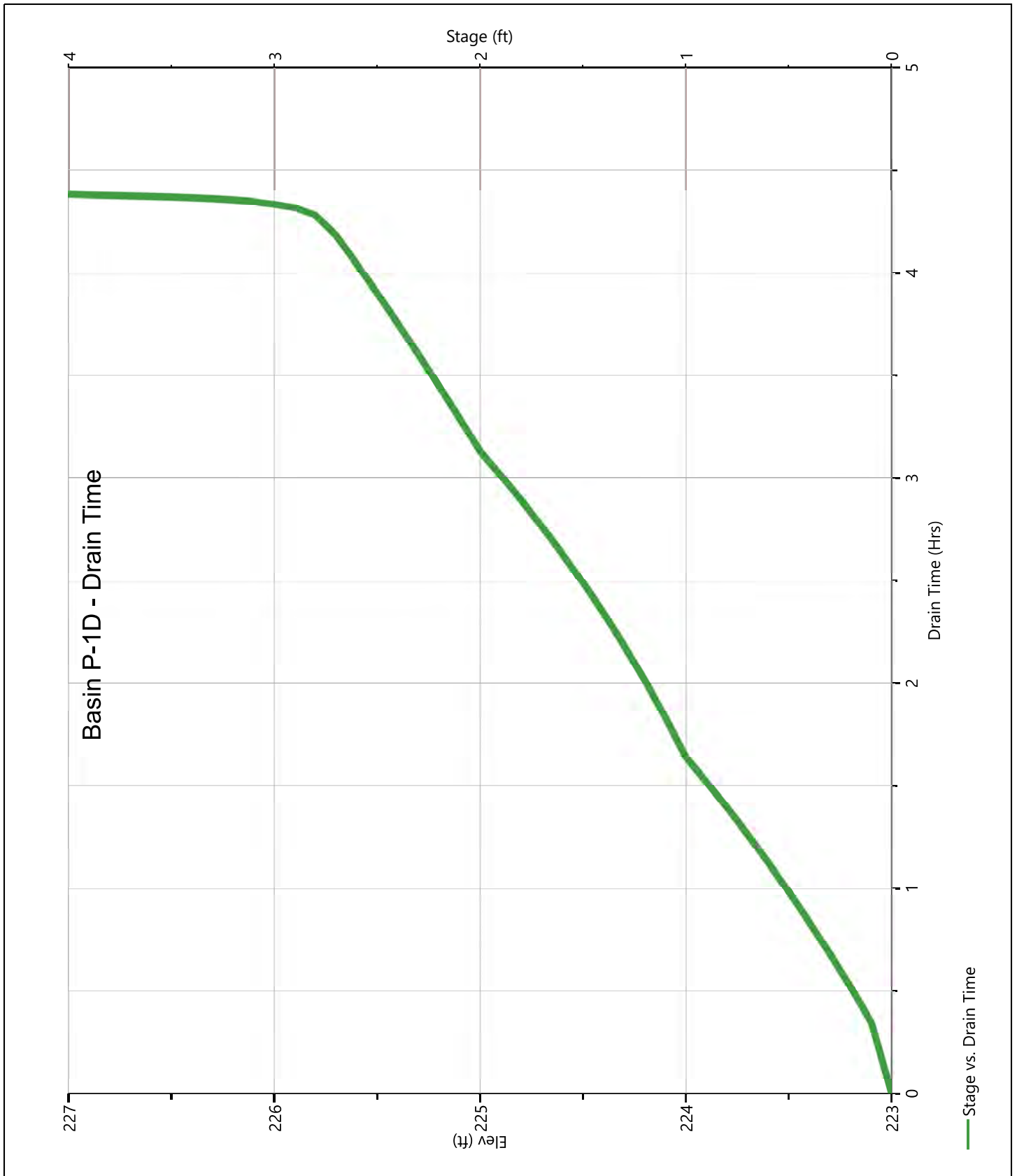
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	223.00	0.000	0.000					0.000				0.000		0.000
1.00	224.00	1,056	0.000					0.000				0.245		0.245
2.00	225.00	2,819	0.000					0.000				0.431		0.431
3.00	226.00	5,364	4.950 ic					4.950				0.544		5.494
4.00	227.00	8,529	43.89 oc					43.89 s				0.668		44.56

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

Basin P-1D

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment P-1E

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			1.94	190.55
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			2.40	93.48
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					4.34	284.03

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{284.03}{4.34} = 65.43 ; \text{ Use CN} = \boxed{65}$$

2. Runoff

Frequency..... yr

Rainfall, P (24-hour)..... in

Runoff, Q..... in

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
0.63	1.69	3.80

Hydrograph Report

Project Name:

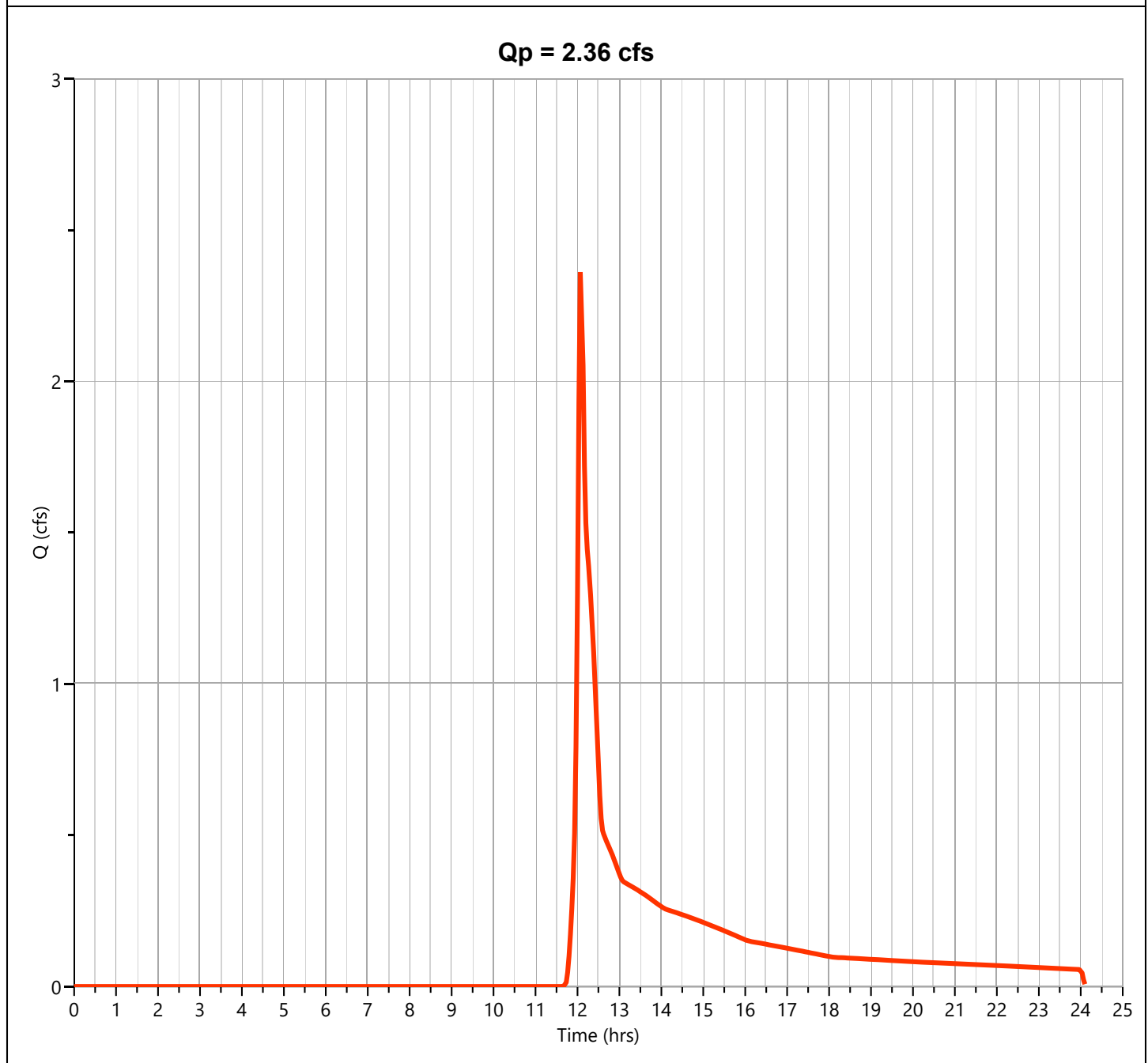
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1E

Hyd. No. 25

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.365 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 2 min	Runoff Volume	= 9,083 cuft
Drainage Area	= 4.34 ac	Curve Number	= 65
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

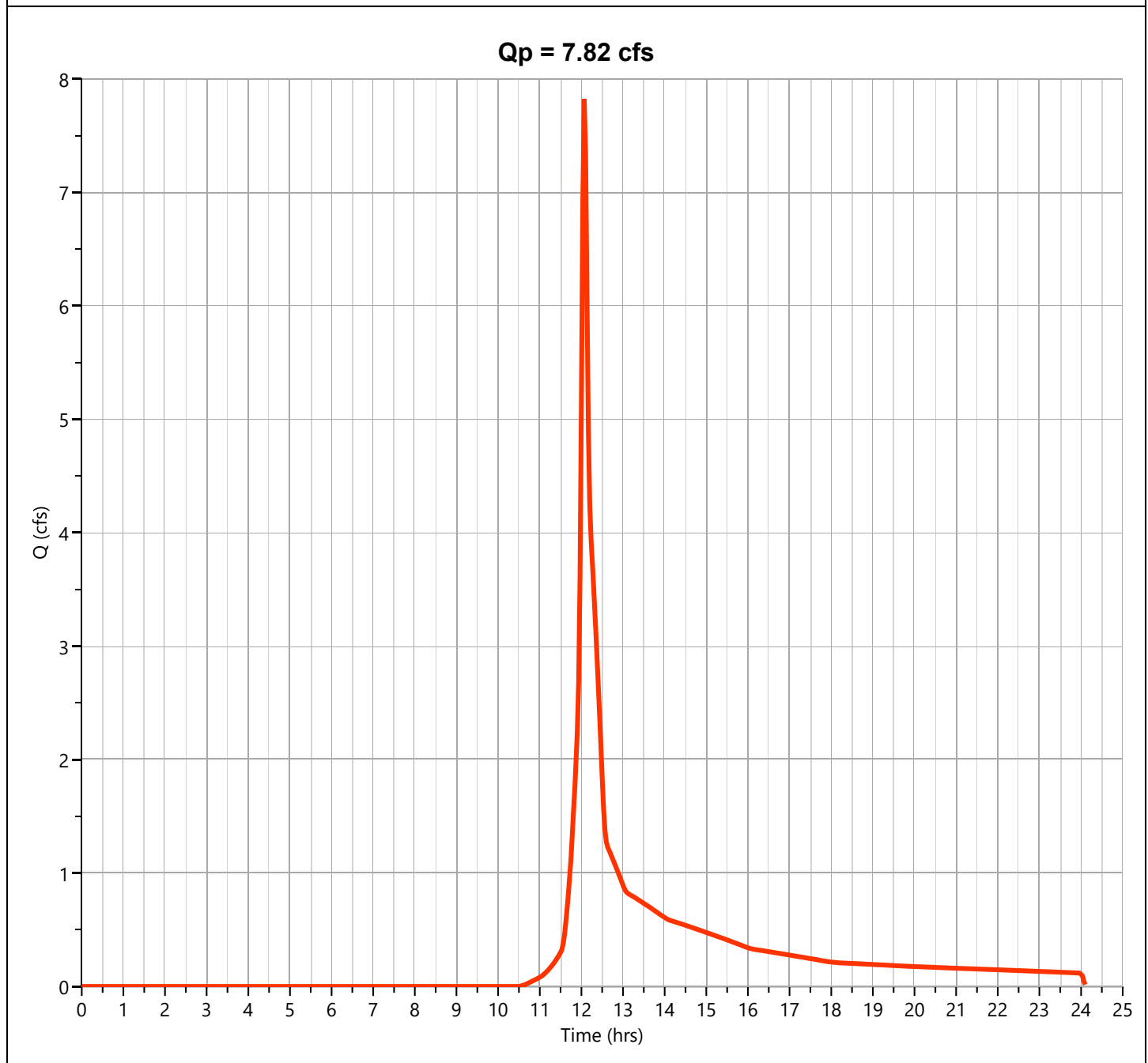
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1E

Hyd. No. 25

Hydrograph Type	= NRCS Runoff	Peak Flow	= 7.822 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 24,520 cuft
Drainage Area	= 4.34 ac	Curve Number	= 65
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

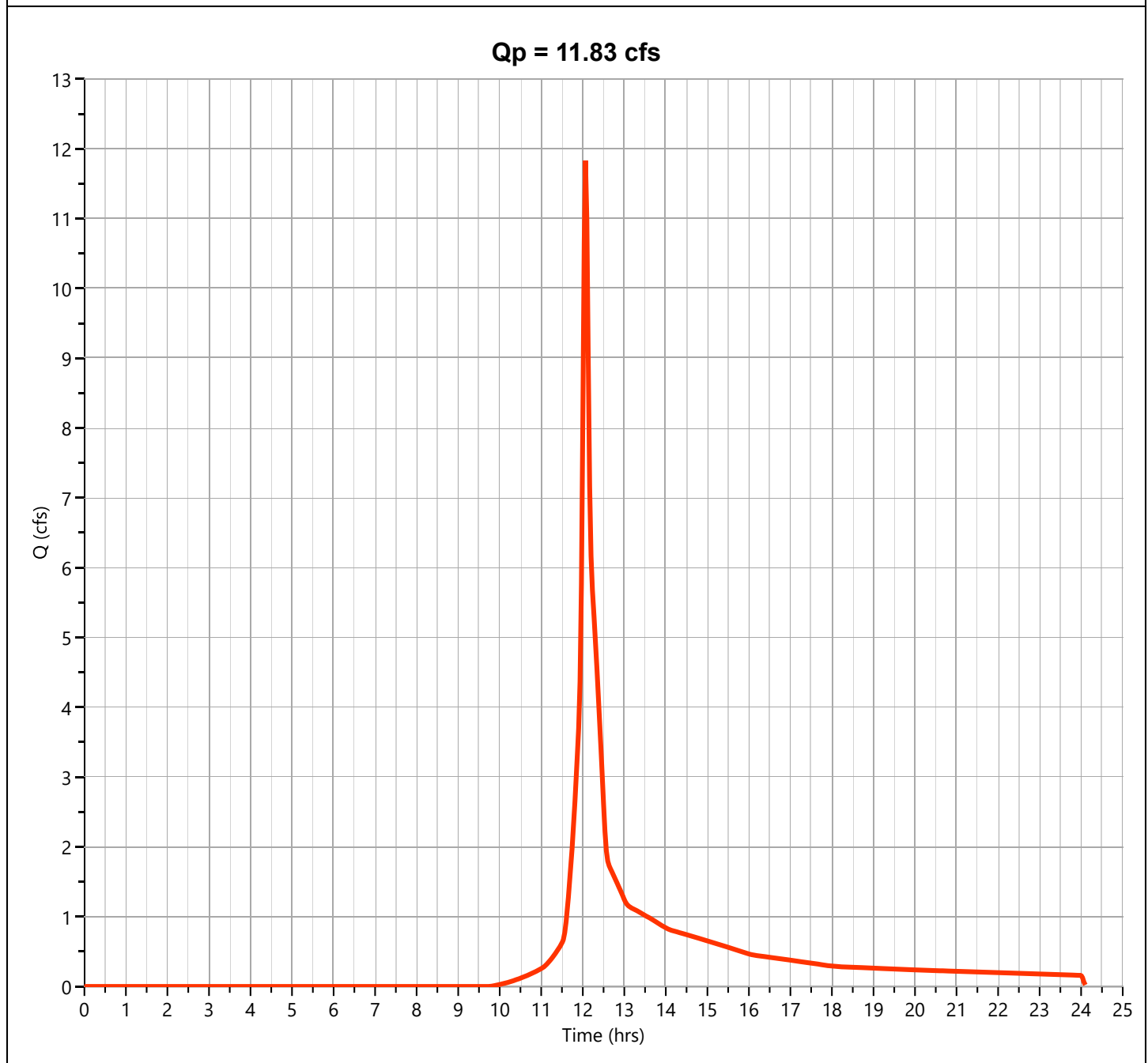
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1E

Hyd. No. 25

Hydrograph Type	= NRCS Runoff	Peak Flow	= 11.83 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 36,022 cuft
Drainage Area	= 4.34 ac	Curve Number	= 65
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

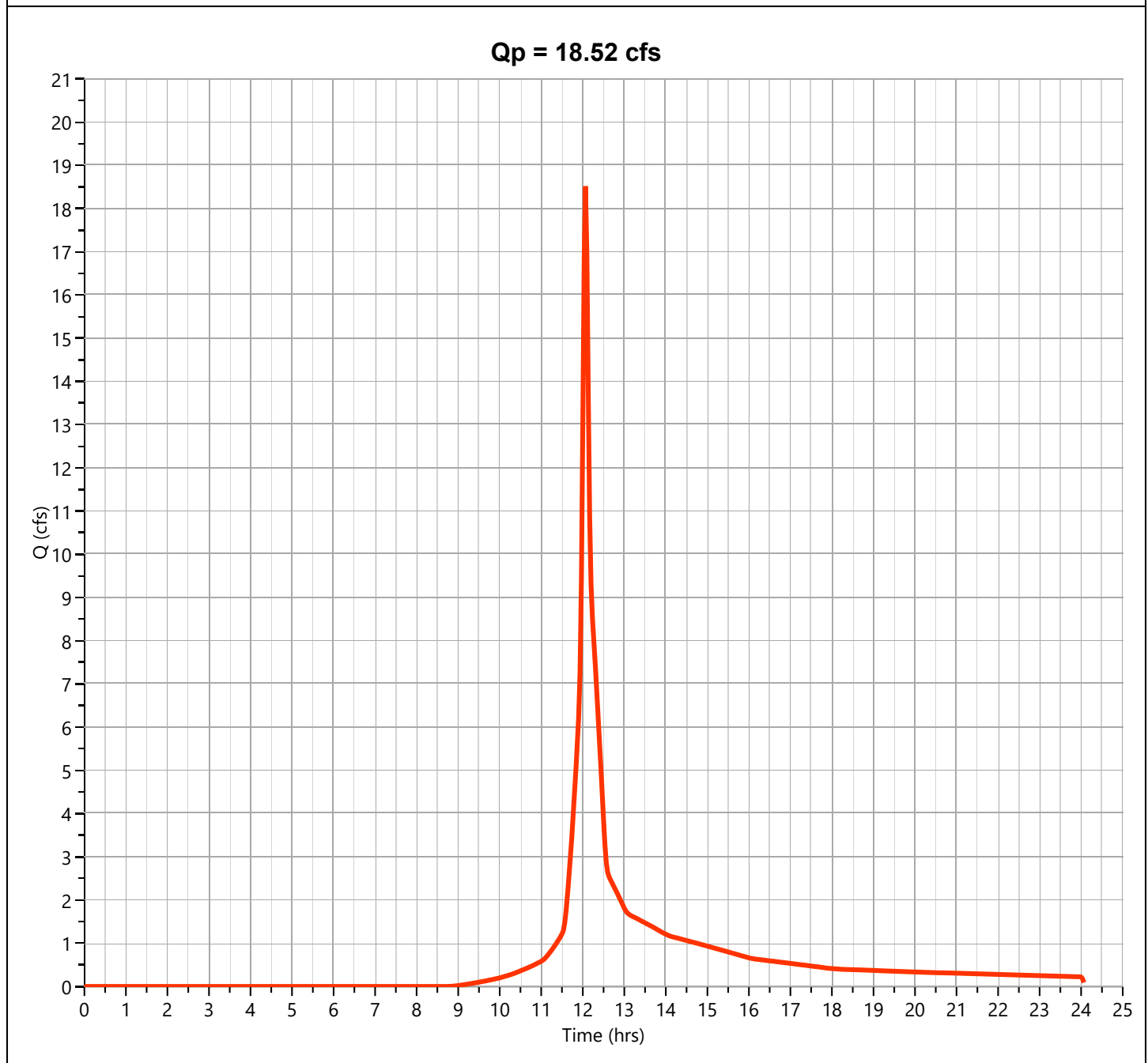
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1E

Hyd. No. 25

Hydrograph Type	= NRCS Runoff	Peak Flow	= 18.52 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 55,493 cuft
Drainage Area	= 4.34 ac	Curve Number	= 65
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

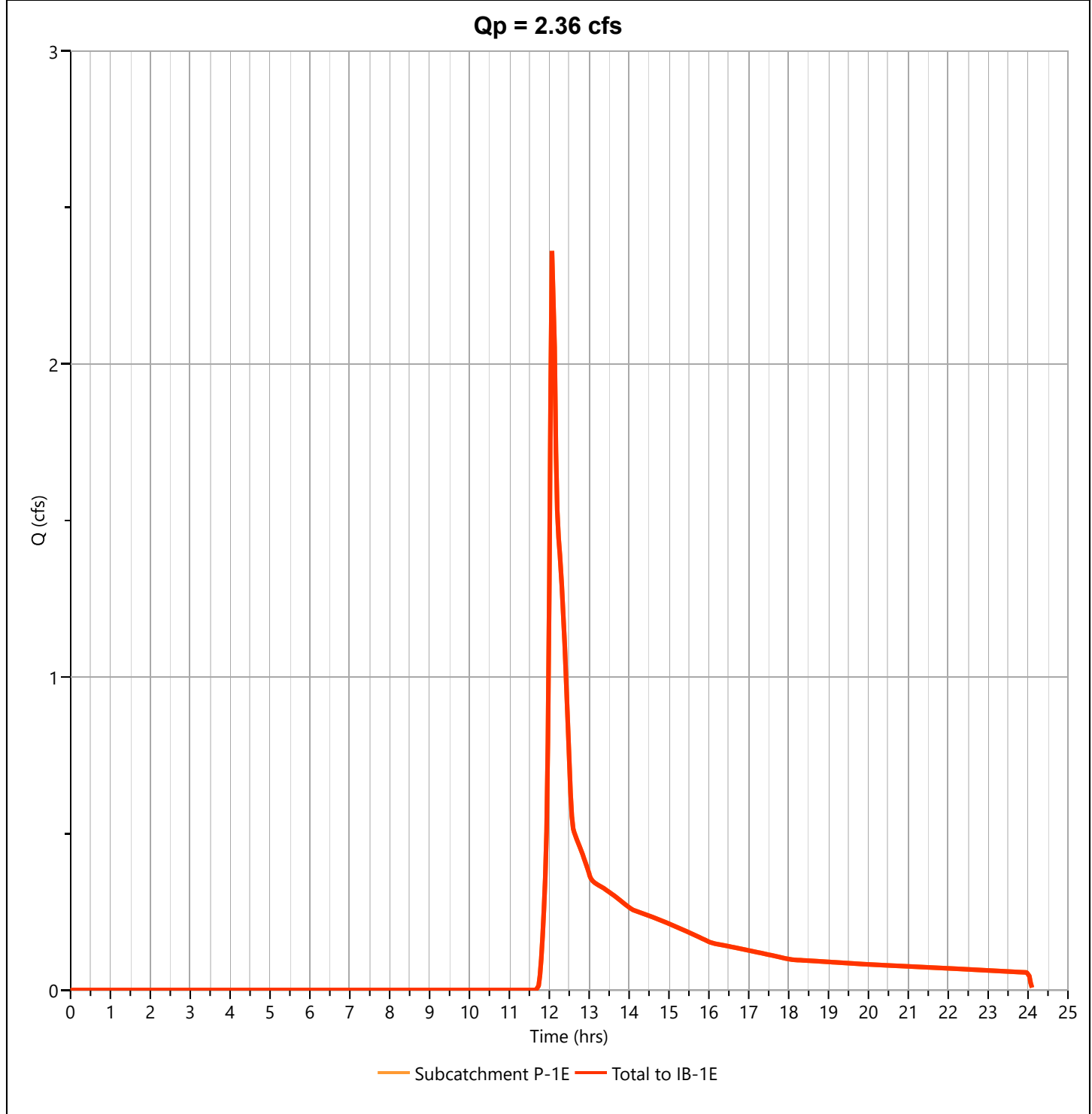
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1E

Hyd. No. 26

Hydrograph Type	= Junction	Peak Flow	= 2.365 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 2 min	Hydrograph Volume	= 9,083 cuft
Inflow Hydrographs	= 24, 25	Total Contrib. Area	= 4.34 ac



Hydrograph Report

Project Name:

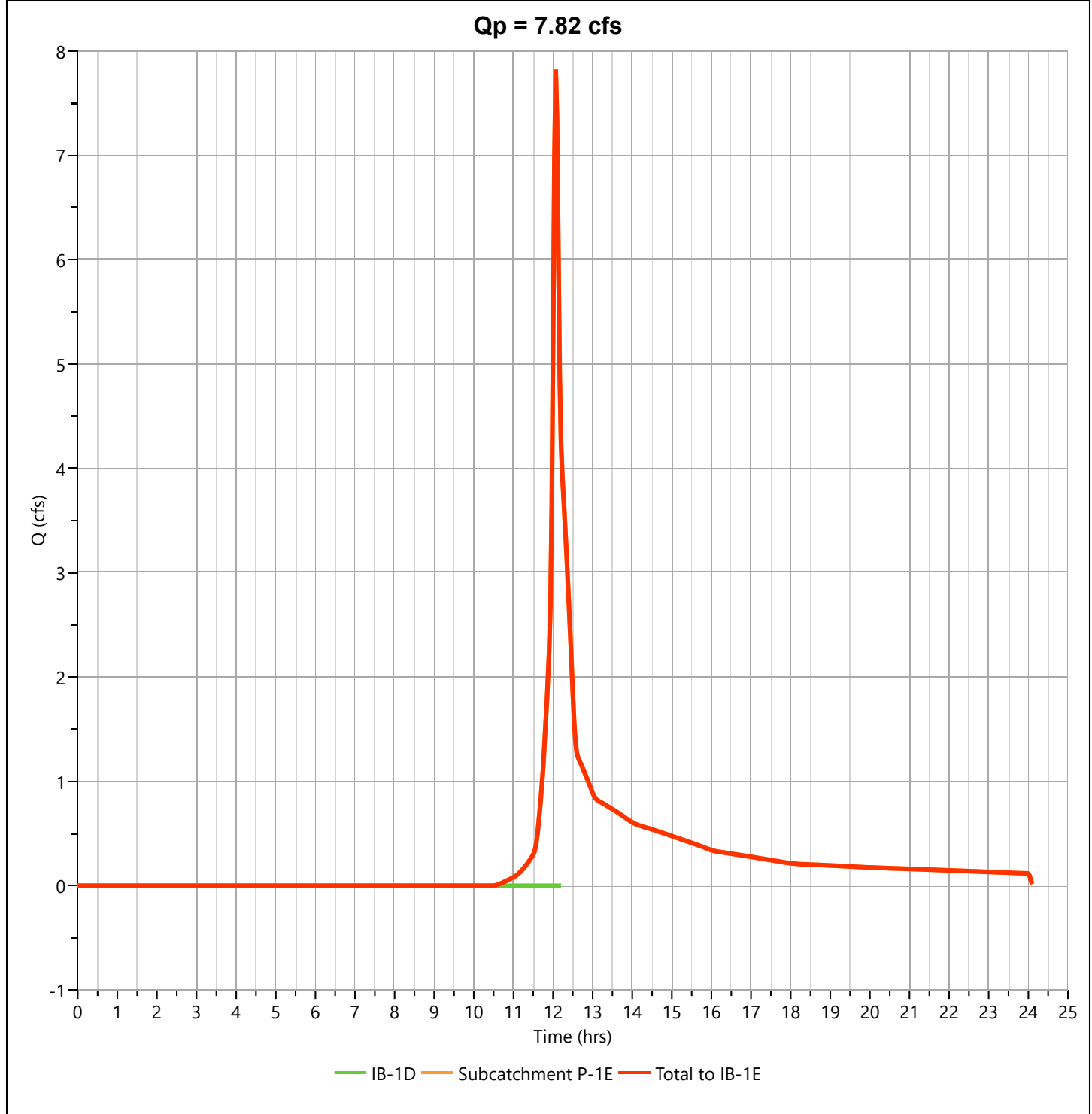
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1E

Hyd. No. 26

Hydrograph Type	= Junction	Peak Flow	= 7.822 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 24,520 cuft
Inflow Hydrographs	= 24, 25	Total Contrib. Area	= 4.34 ac



Hydrograph Report

Project Name:

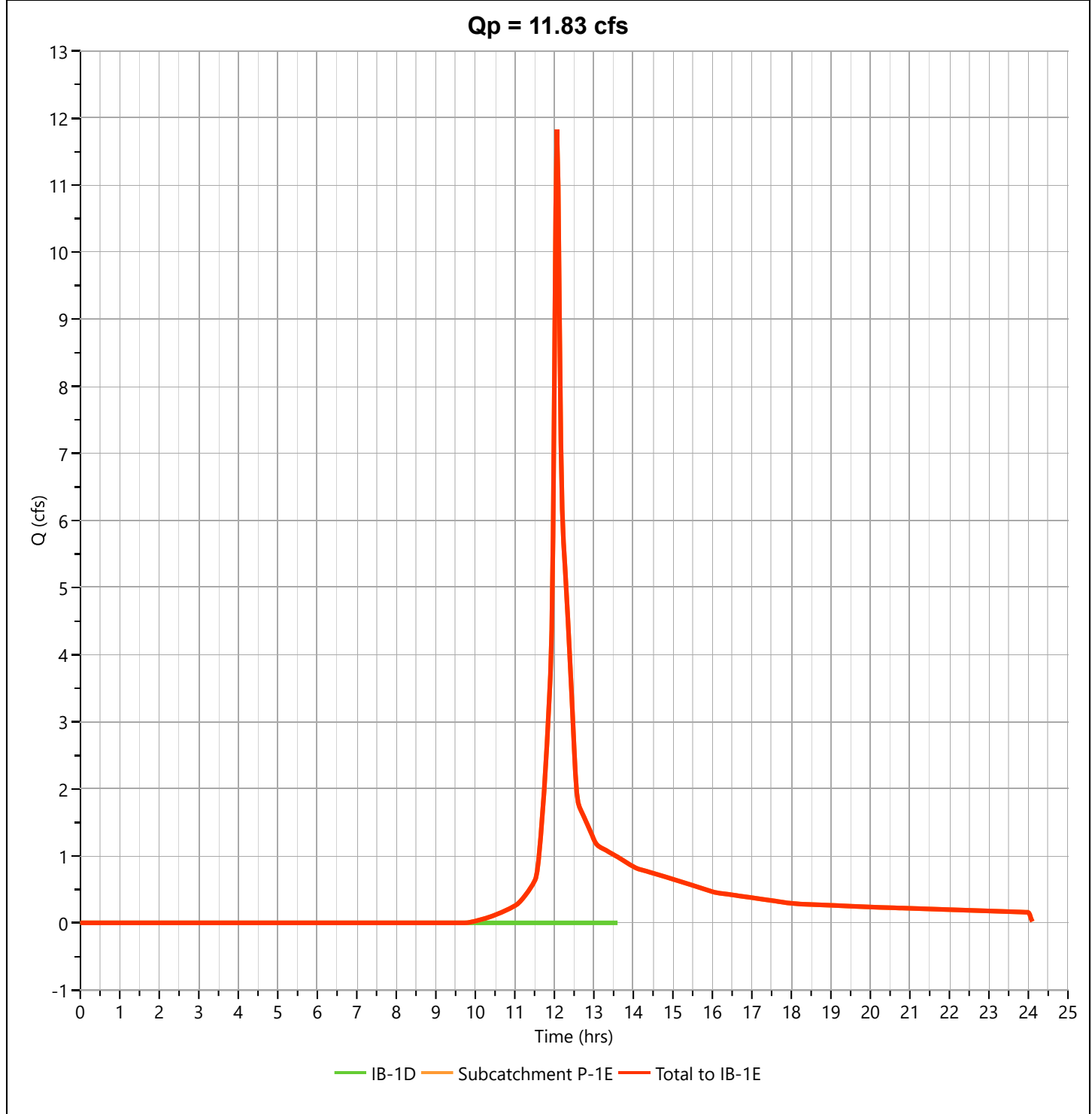
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1E

Hyd. No. 26

Hydrograph Type	= Junction	Peak Flow	= 11.83 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 36,022 cuft
Inflow Hydrographs	= 24, 25	Total Contrib. Area	= 4.34 ac



Hydrograph Report

Project Name:

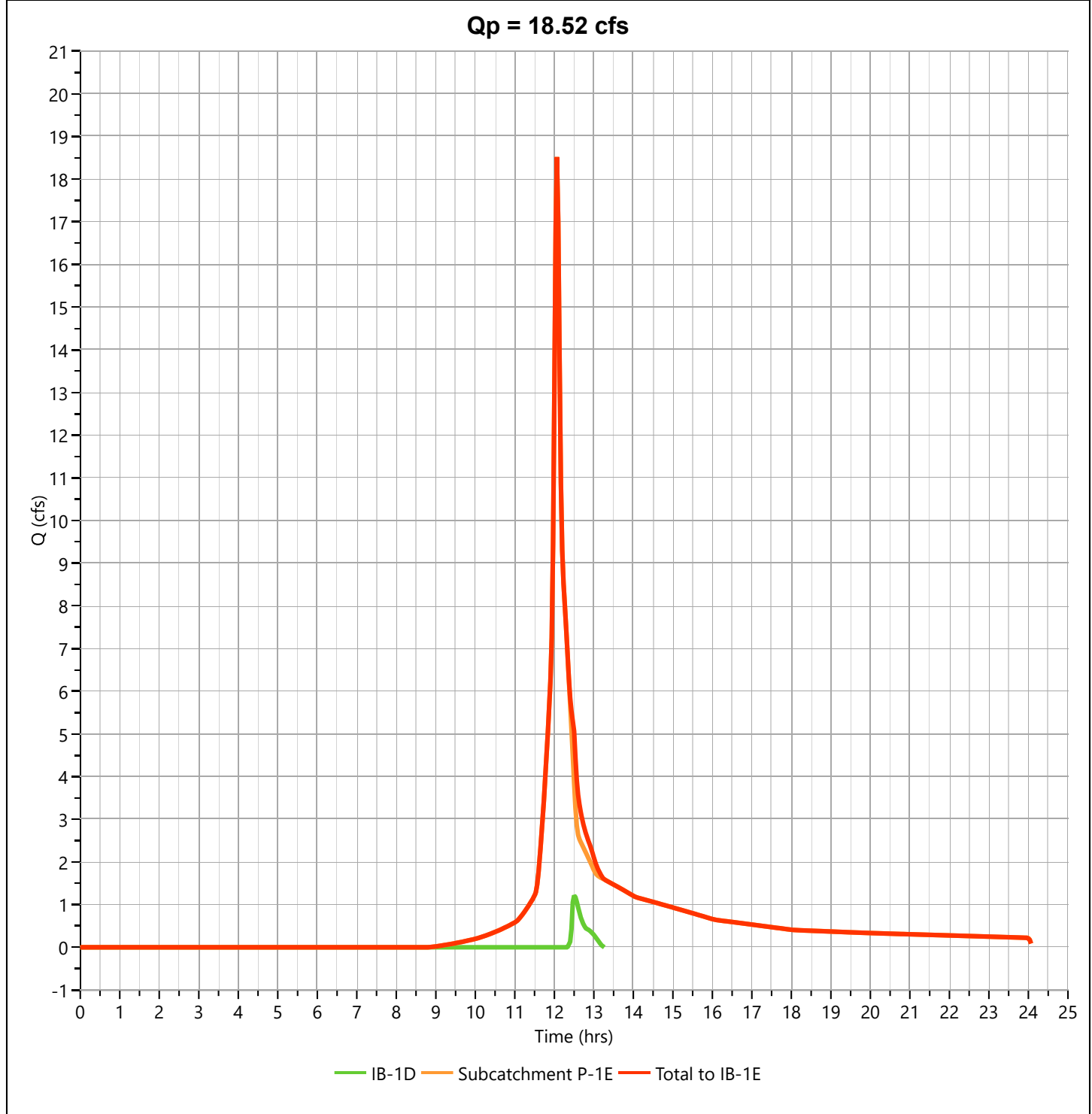
Hydrology Studio v 3.0.0.29

12-13-2023

Total to IB-1E

Hyd. No. 26

Hydrograph Type	= Junction	Peak Flow	= 18.52 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 57,018 cuft
Inflow Hydrographs	= 24, 25	Total Contrib. Area	= 4.34 ac



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

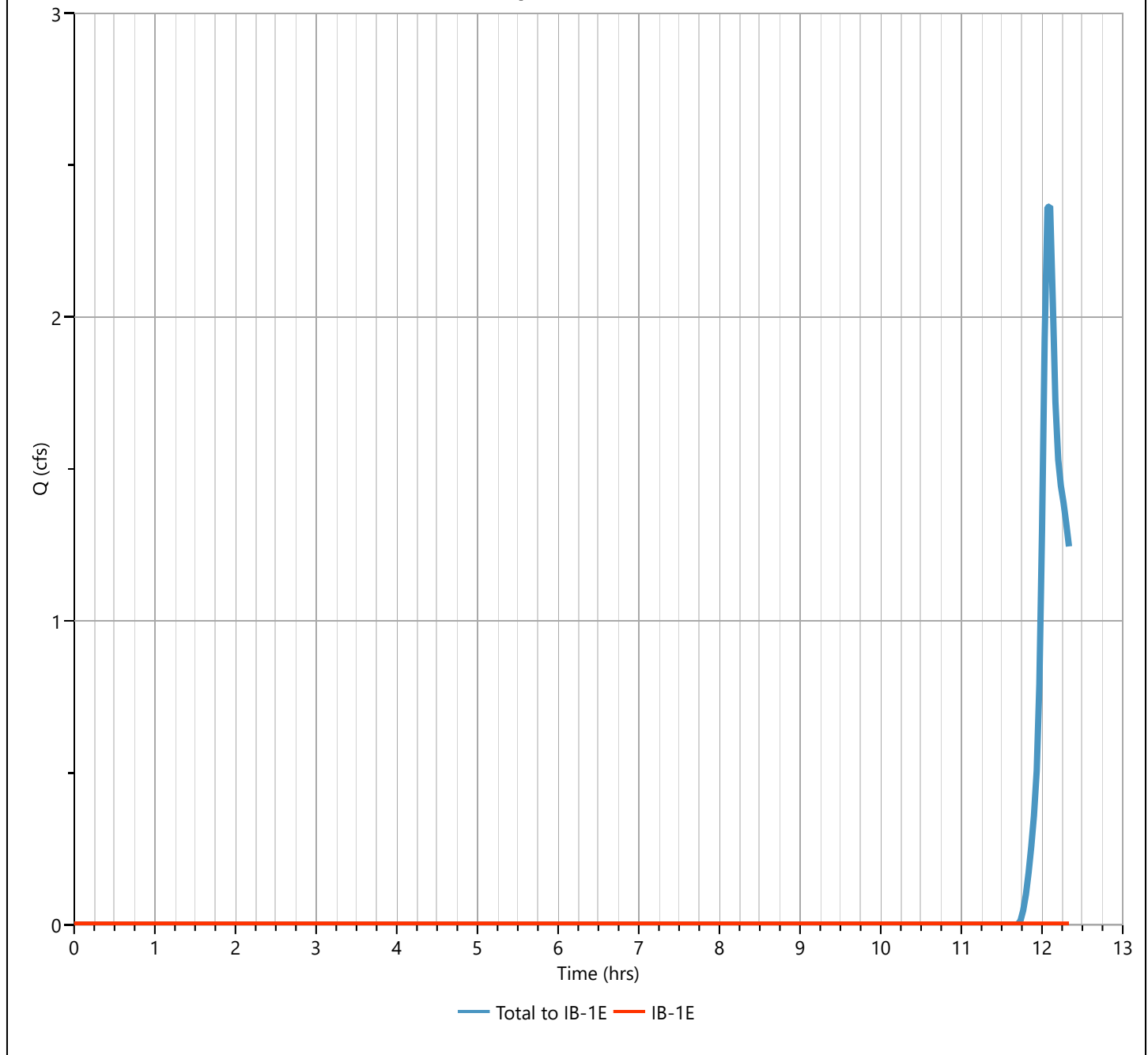
IB-1E

Hyd. No. 27

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.03 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.005 cuft
Inflow Hydrograph	= 26 - Total to IB-1E	Max. Elevation	= 221.39 ft
Pond Name	= Basin P-1E	Max. Storage	= 1,703 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

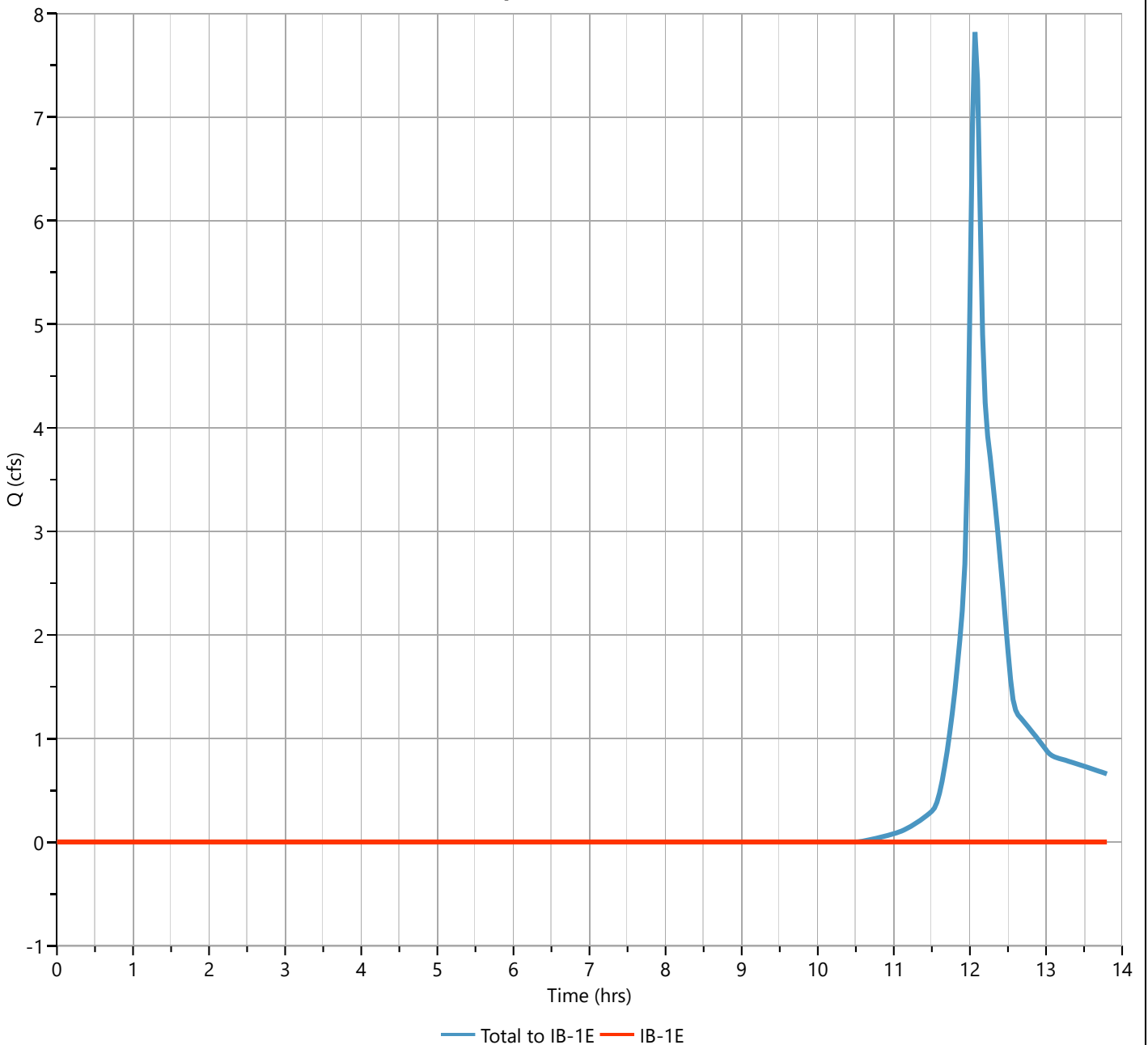
IB-1E

Hyd. No. 27

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 13.53 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.004 cuft
Inflow Hydrograph	= 26 - Total to IB-1E	Max. Elevation	= 222.48 ft
Pond Name	= Basin P-1E	Max. Storage	= 7,690 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

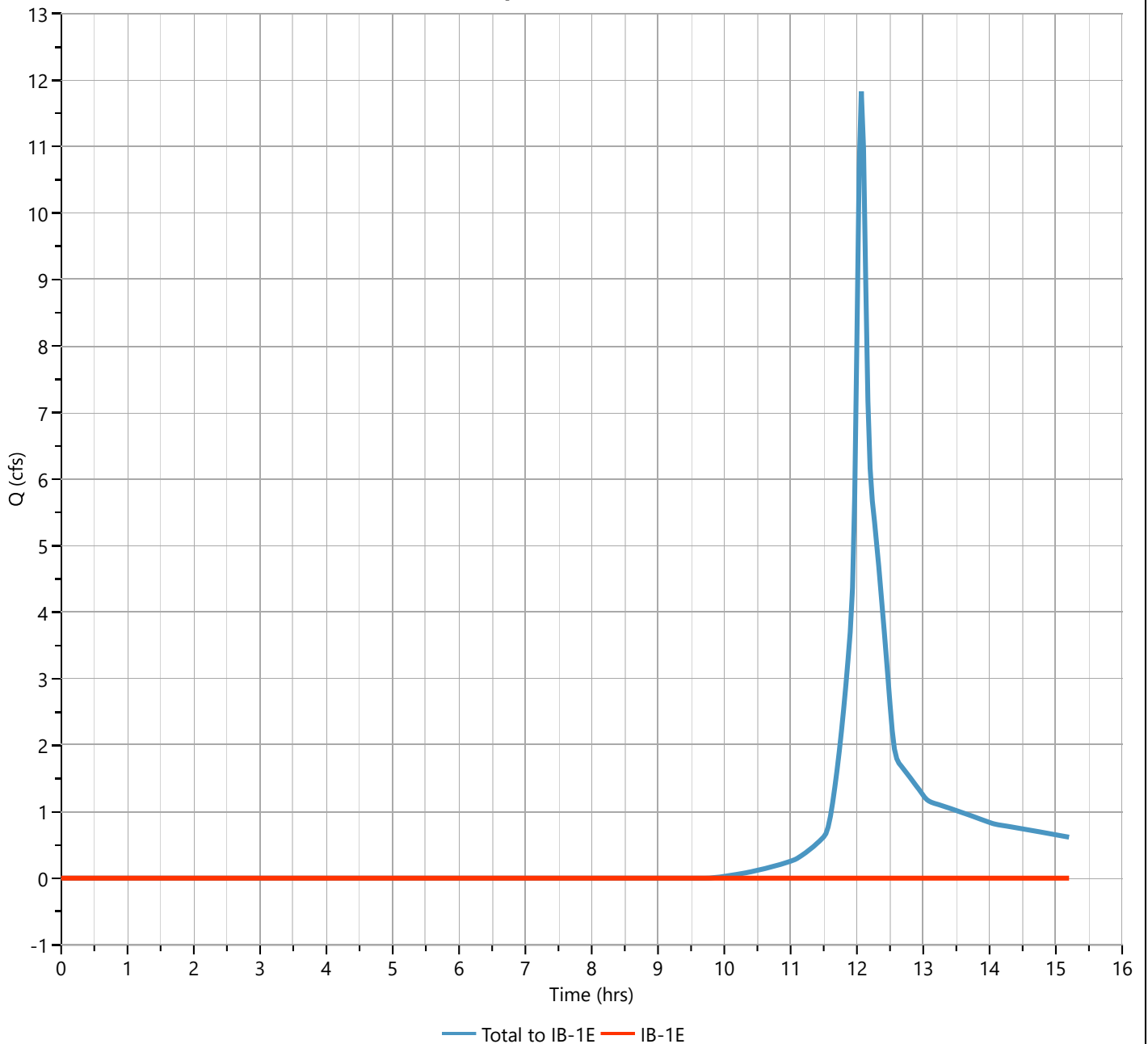
IB-1E

Hyd. No. 27

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 14.87 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.006 cuft
Inflow Hydrograph	= 26 - Total to IB-1E	Max. Elevation	= 223.16 ft
Pond Name	= Basin P-1E	Max. Storage	= 12,814 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

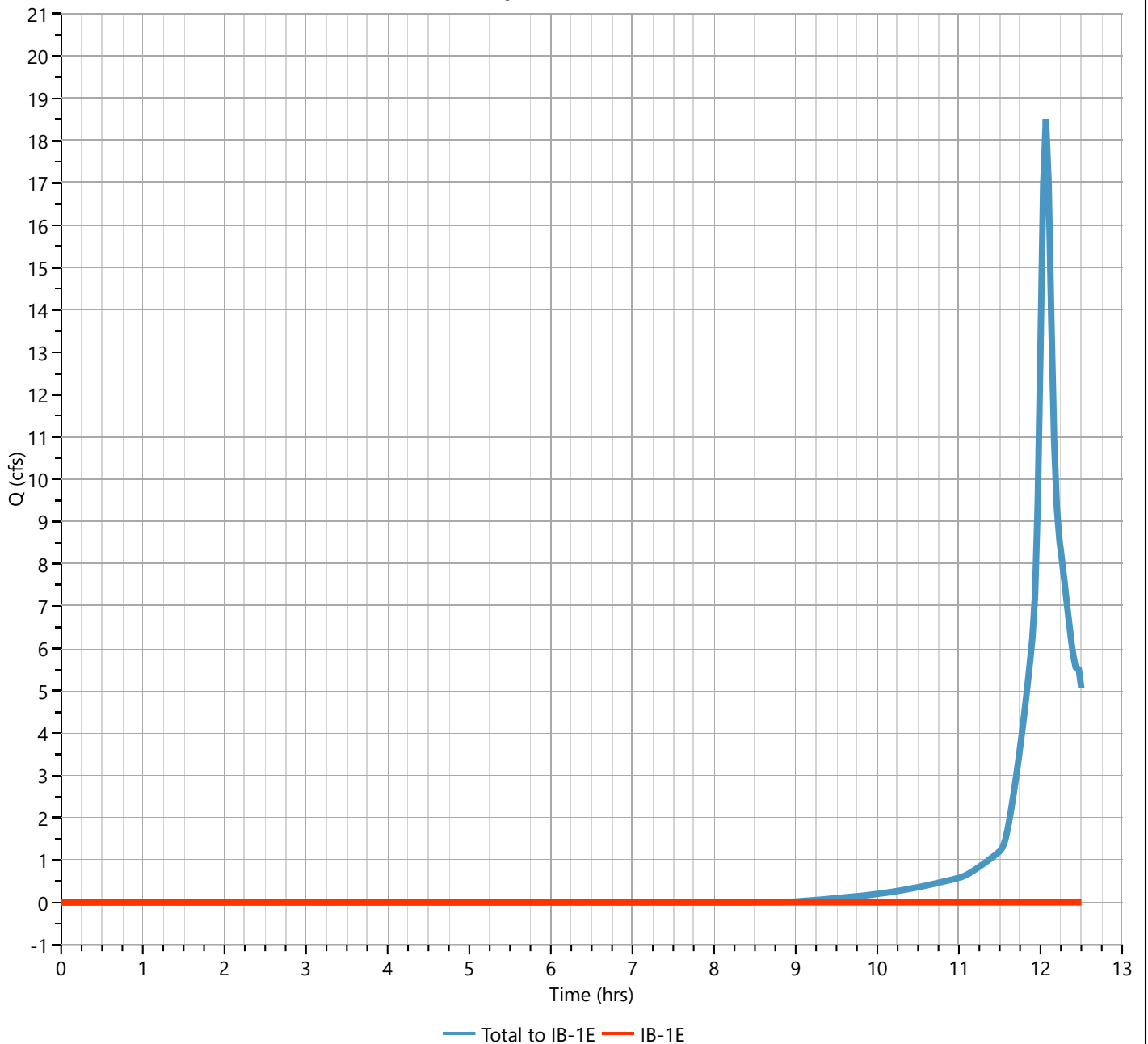
IB-1E

Hyd. No. 27

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.43 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.002 cuft
Inflow Hydrograph	= 26 - Total to IB-1E	Max. Elevation	= 224.20 ft
Pond Name	= Basin P-1E	Max. Storage	= 23,170 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

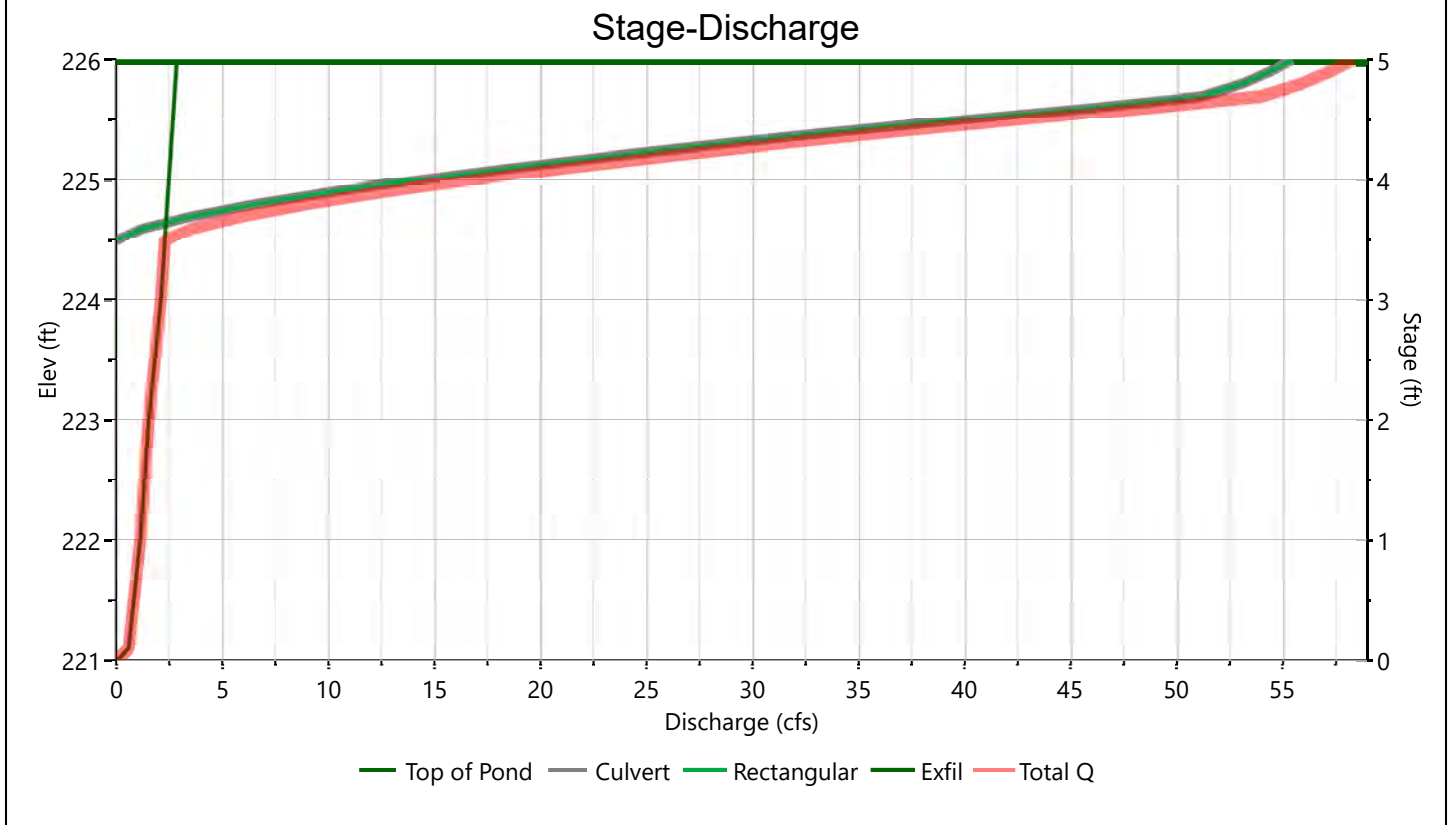
12-13-2023

Basin P-1E

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in	30				Hole Diameter, in
Span, in	30				No. holes
No. Barrels	1				Invert Elevation, ft
Invert Elevation, ft	218.70				Height, ft
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co
Length, ft	168				
Barrel Slope, %	1				
N-Value, n	0.012				
Weirs	Riser*	Weirs			Ancillary
		1	2*	3	
Shape / Type			Rectangular		Exfiltration, in/hr
Crest Elevation, ft			224.5		8.27**
Crest Length, ft			12		
Angle, deg					
Weir Coefficient, Cw			3.3		

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

Basin P-1E

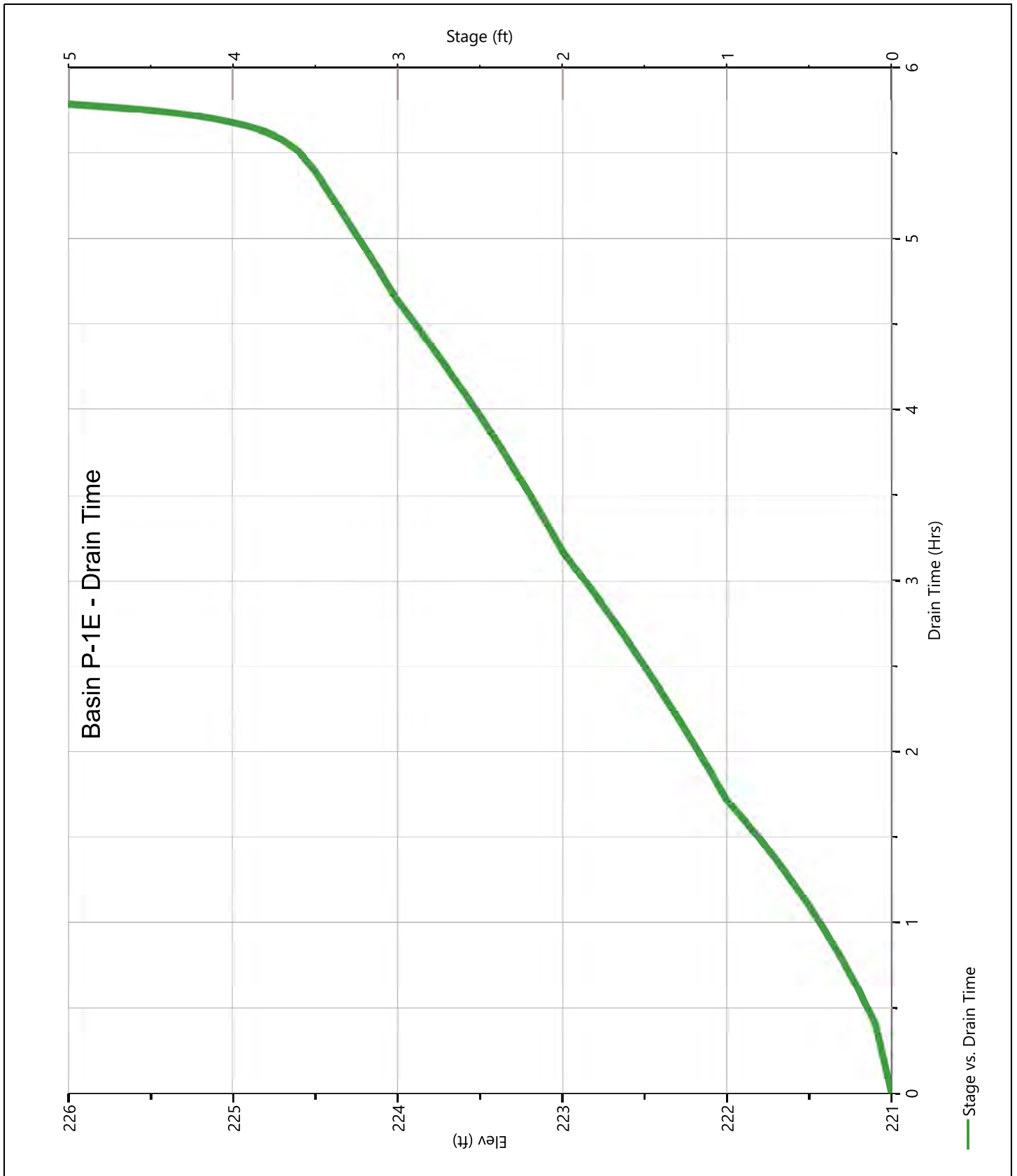
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	221.00	0.000	0.000					0.000				0.000		0.000
1.00	222.00	4,339	0.000 ic					0.000				1.133		1.133
2.00	223.00	11,311	0.000 ic					0.000				1.536		1.536
3.00	224.00	20,825	0.000 ic					0.000				2.107		2.107
4.00	225.00	32,806	14.00 ic					14.00				2.480		16.48
5.00	226.00	46,765	55.44 ic					55.44 s				2.864		58.30

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

Basin P-1E

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment P-1F

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			1.65	161.51
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			4.32	168.59
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					5.97	330.10

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{330.10}{5.97} = 55.29 ; \text{ Use CN} = \boxed{55}$$

2. Runoff

Frequency..... yr

Rainfall, P (24-hour)..... in

Runoff, Q..... in

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
0.27	1.00	2.70

Hydrograph Report

Project Name:

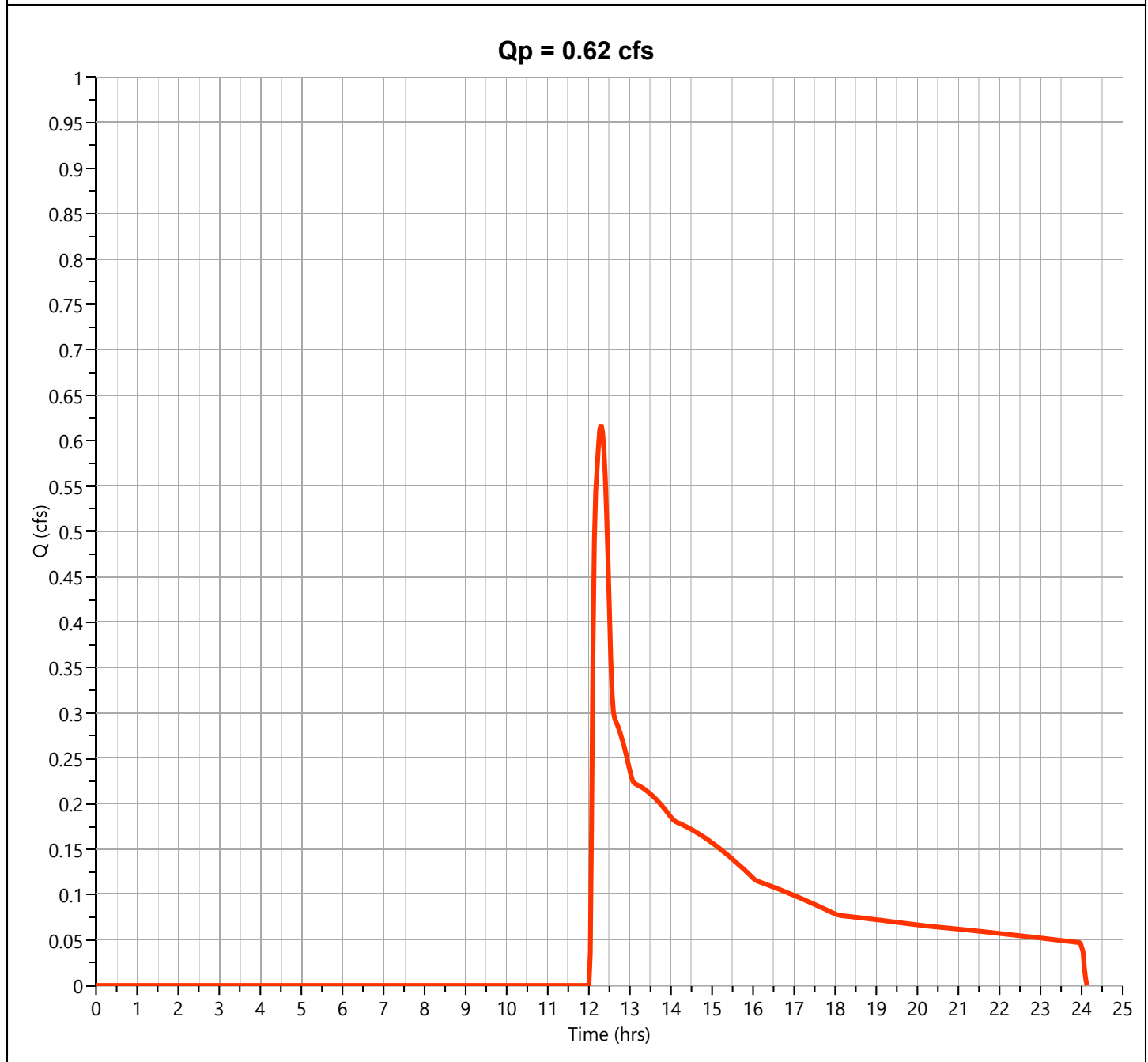
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1F

Hyd. No. 28

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.618 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.30 hrs
Time Interval	= 2 min	Runoff Volume	= 5,277 cuft
Drainage Area	= 5.97 ac	Curve Number	= 55
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

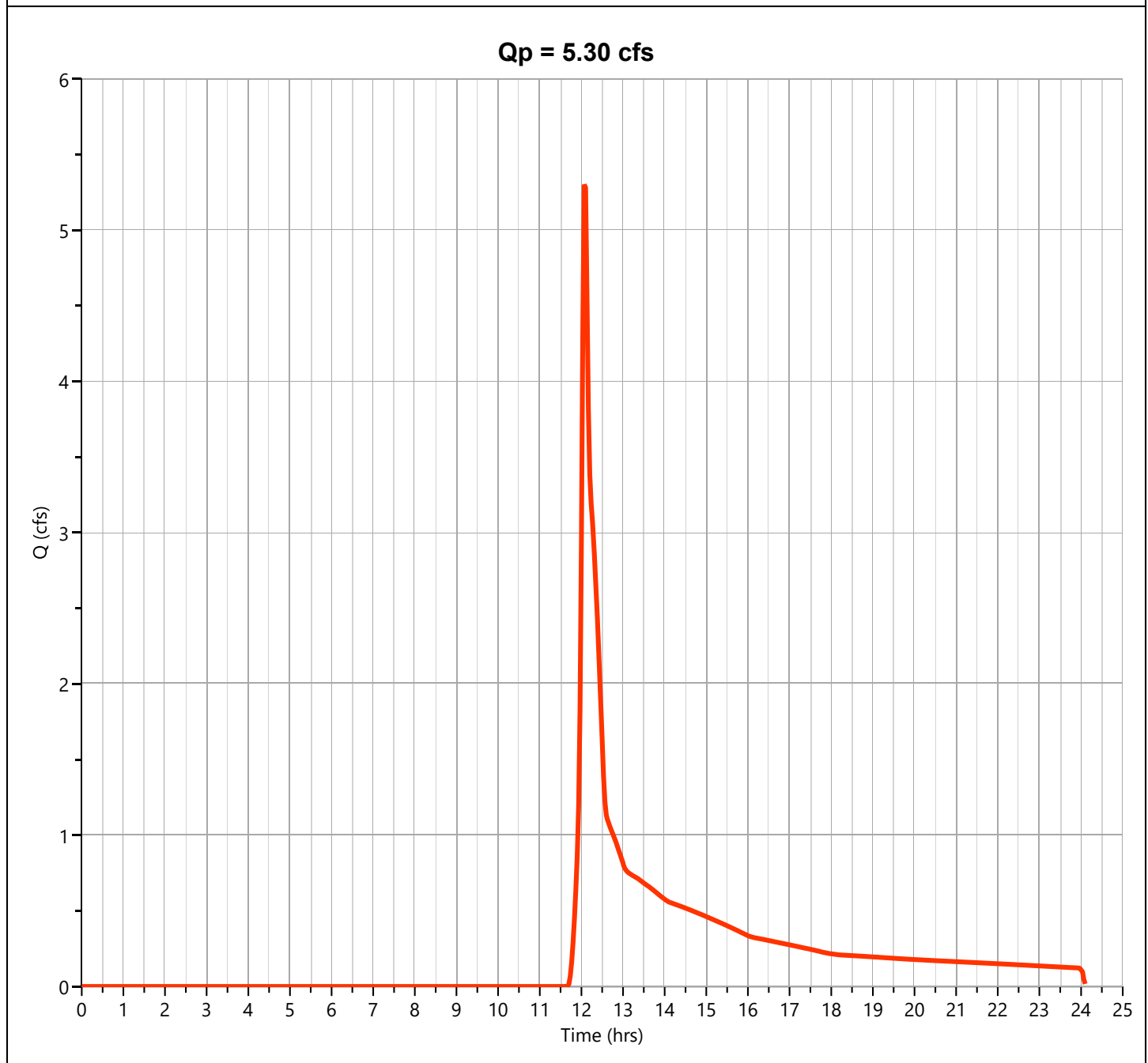
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1F

Hyd. No. 28

Hydrograph Type	= NRCS Runoff	Peak Flow	= 5.302 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 20,010 cuft
Drainage Area	= 5.97 ac	Curve Number	= 55
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

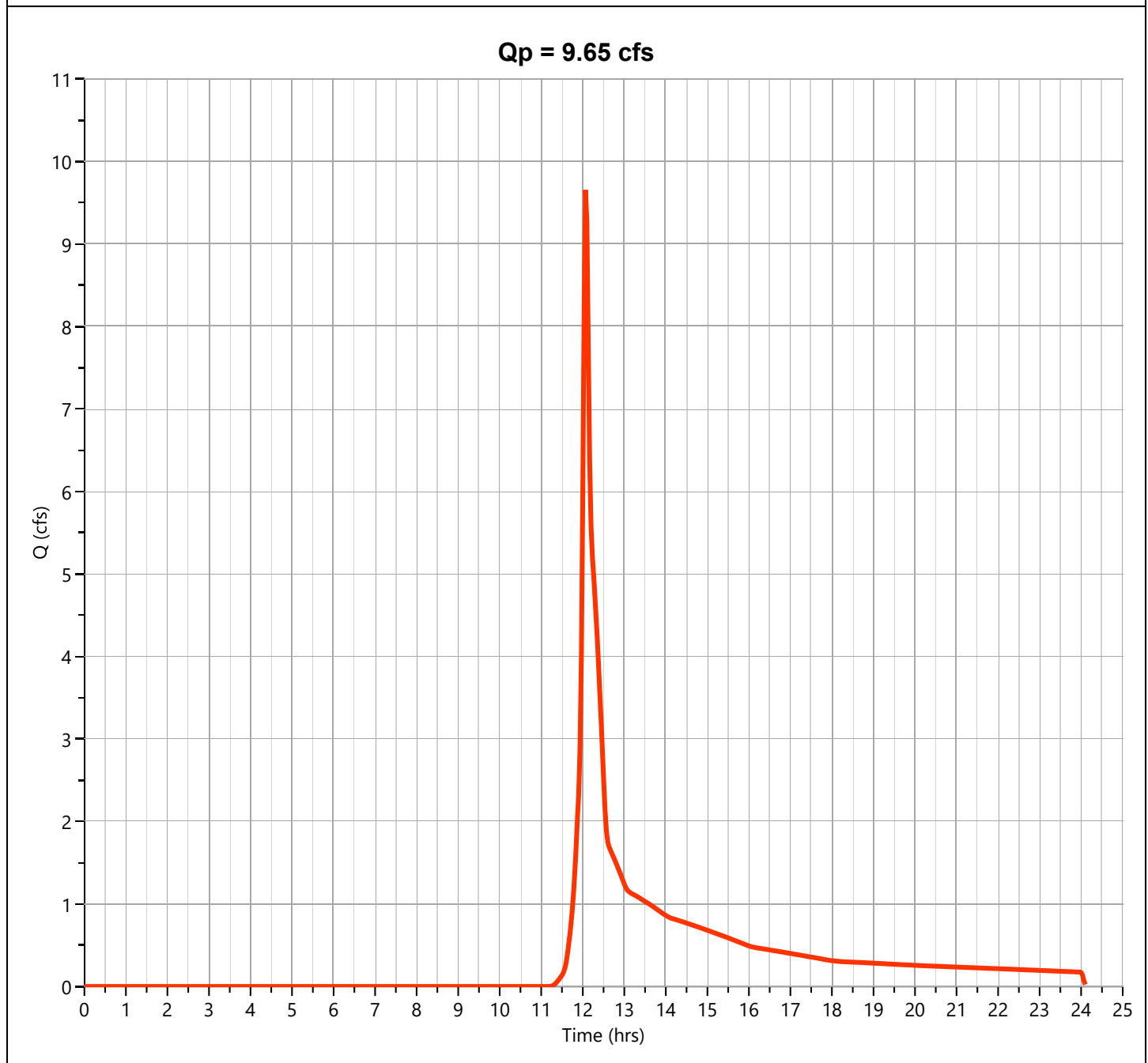
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1F

Hyd. No. 28

Hydrograph Type	= NRCS Runoff	Peak Flow	= 9.654 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 32,247 cuft
Drainage Area	= 5.97 ac	Curve Number	= 55
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

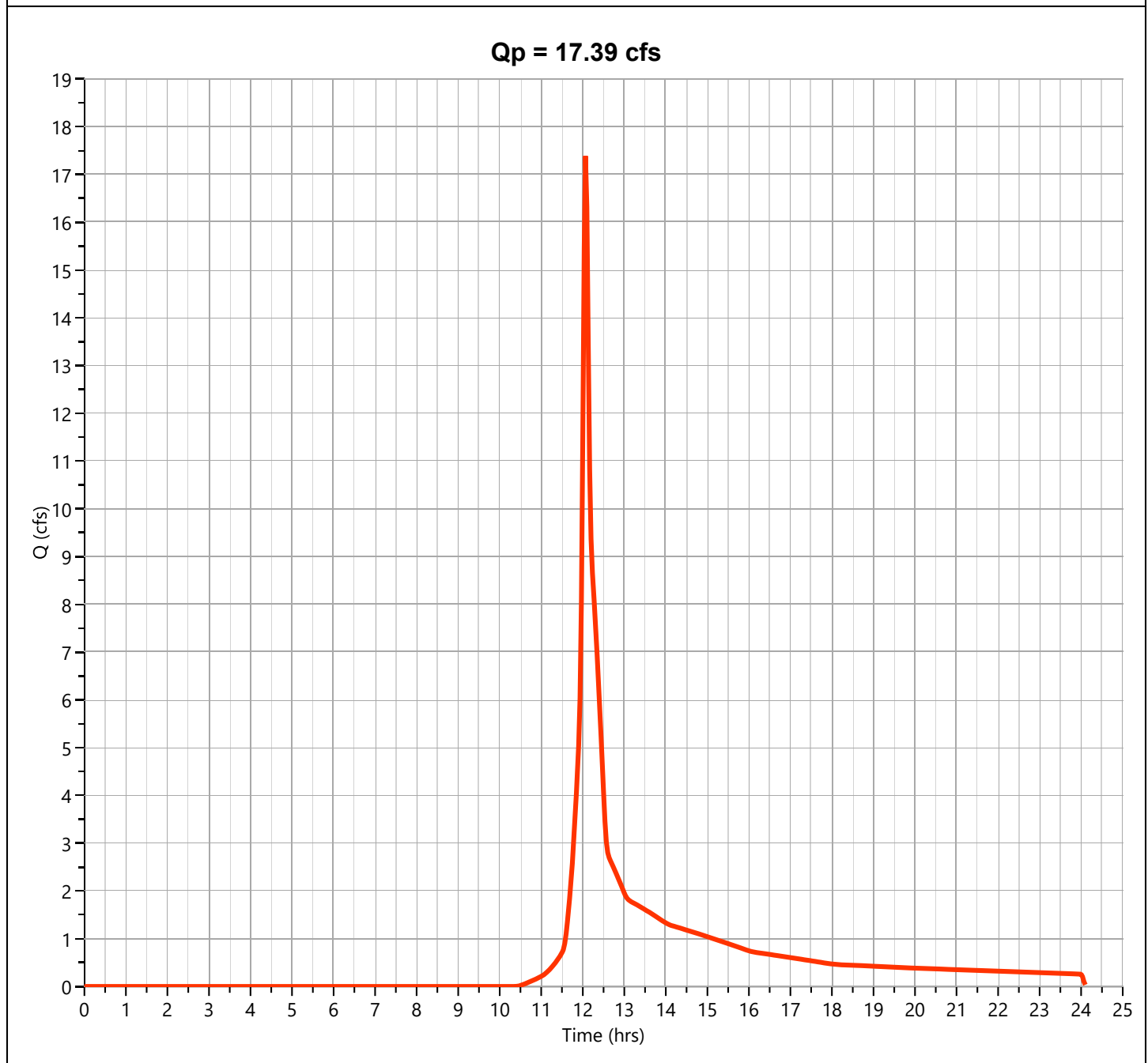
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1F

Hyd. No. 28

Hydrograph Type	= NRCS Runoff	Peak Flow	= 17.39 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 54,215 cuft
Drainage Area	= 5.97 ac	Curve Number	= 55
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

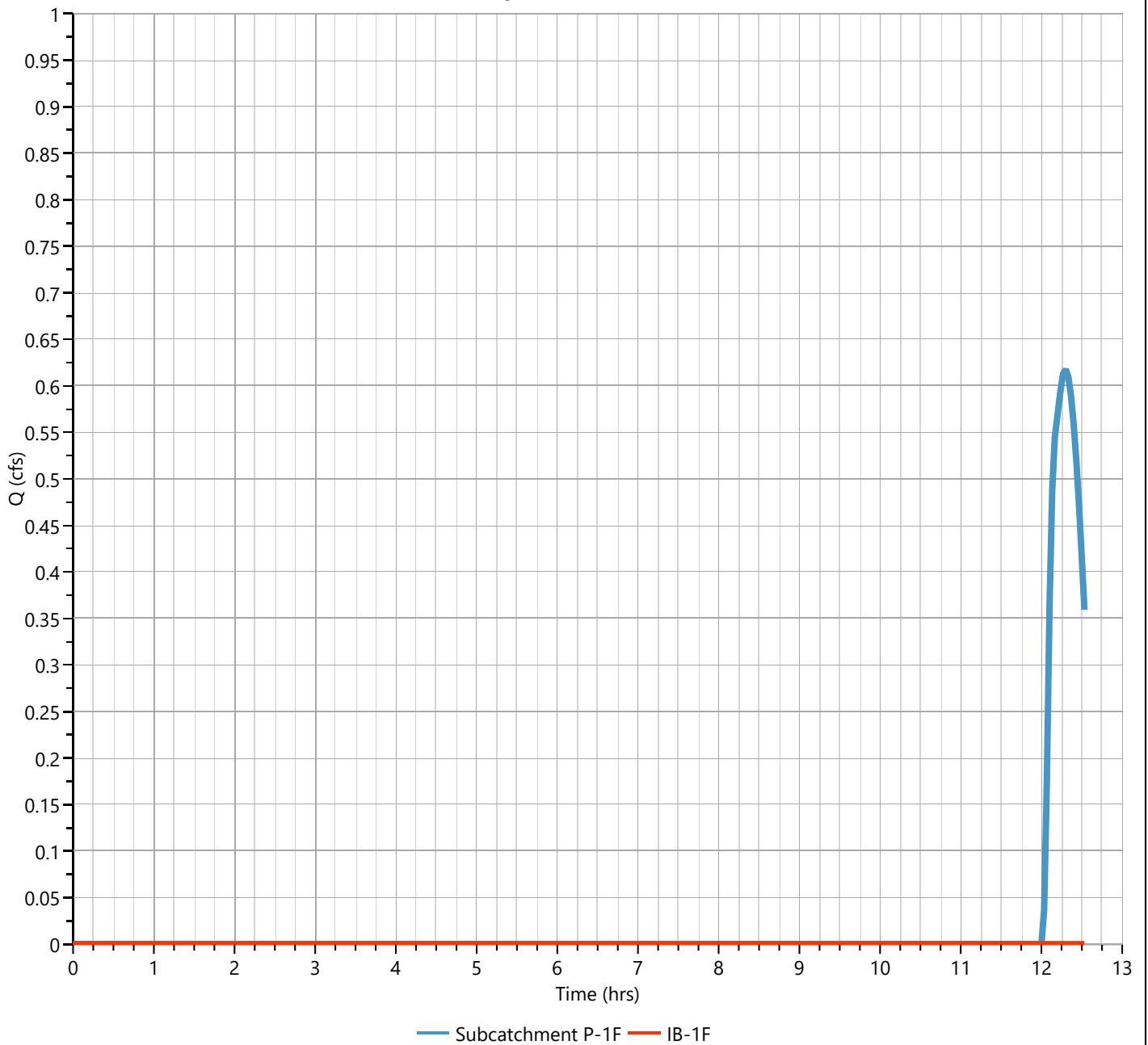
IB-1F

Hyd. No. 29

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.50 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 28 - Subcatchment P-1F	Max. Elevation	= 222.06 ft
Pond Name	= Basin P-1F	Max. Storage	= 298 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

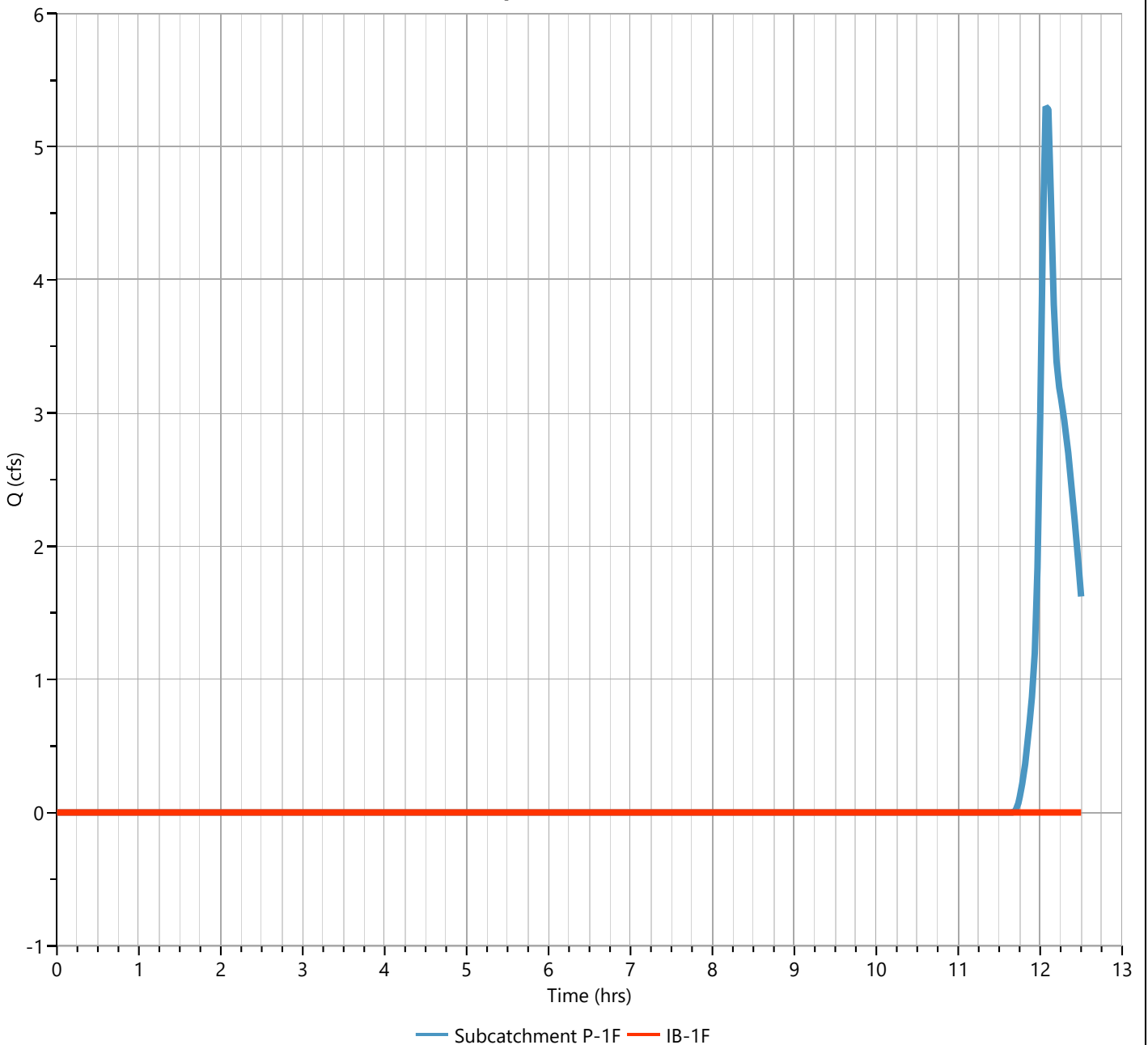
IB-1F

Hyd. No. 29

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.001 cuft
Inflow Hydrograph	= 28 - Subcatchment P-1F	Max. Elevation	= 223.06 ft
Pond Name	= Basin P-1F	Max. Storage	= 5,000 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

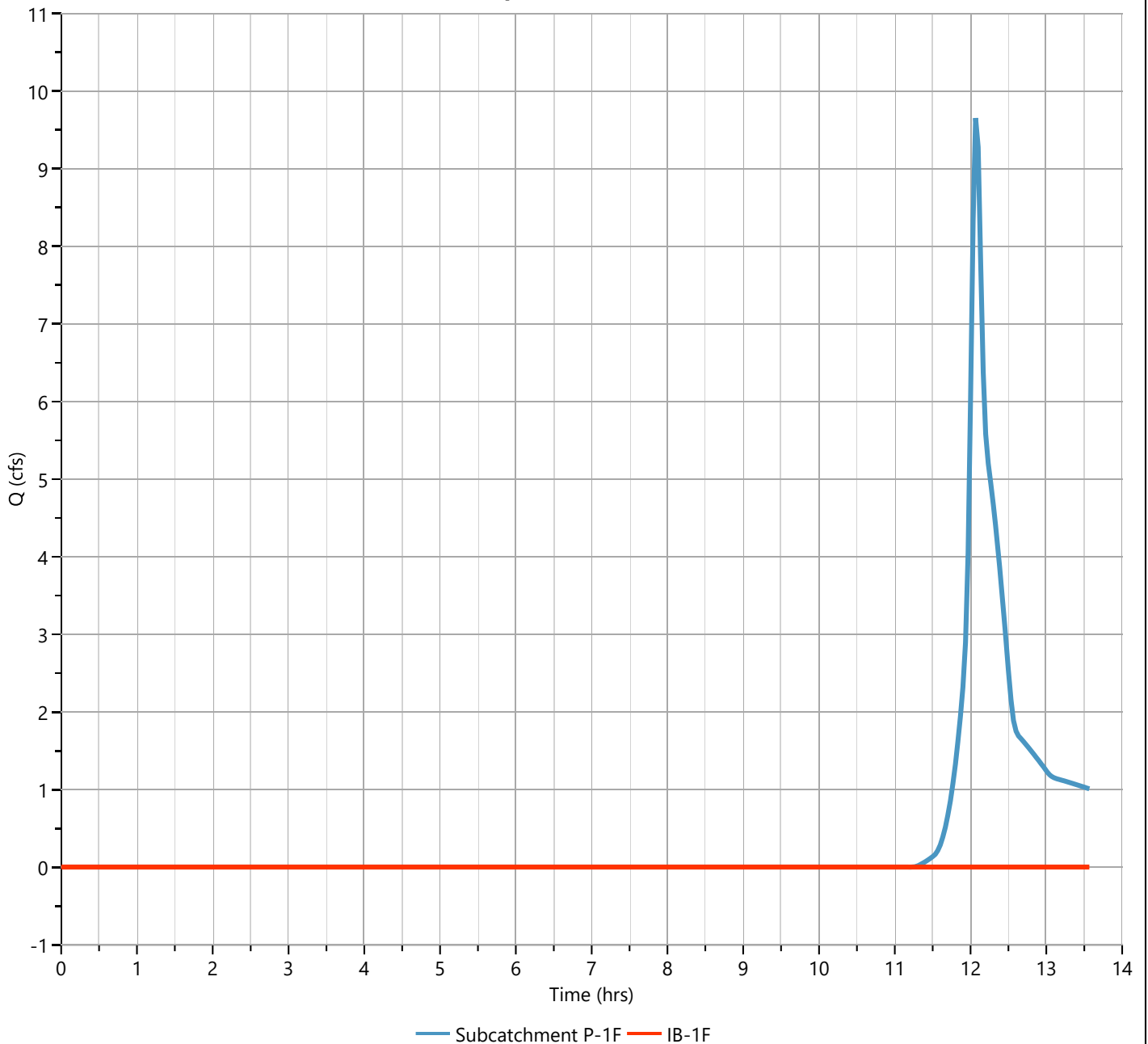
IB-1F

Hyd. No. 29

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.57 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.001 cuft
Inflow Hydrograph	= 28 - Subcatchment P-1F	Max. Elevation	= 223.87 ft
Pond Name	= Basin P-1F	Max. Storage	= 10,212 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

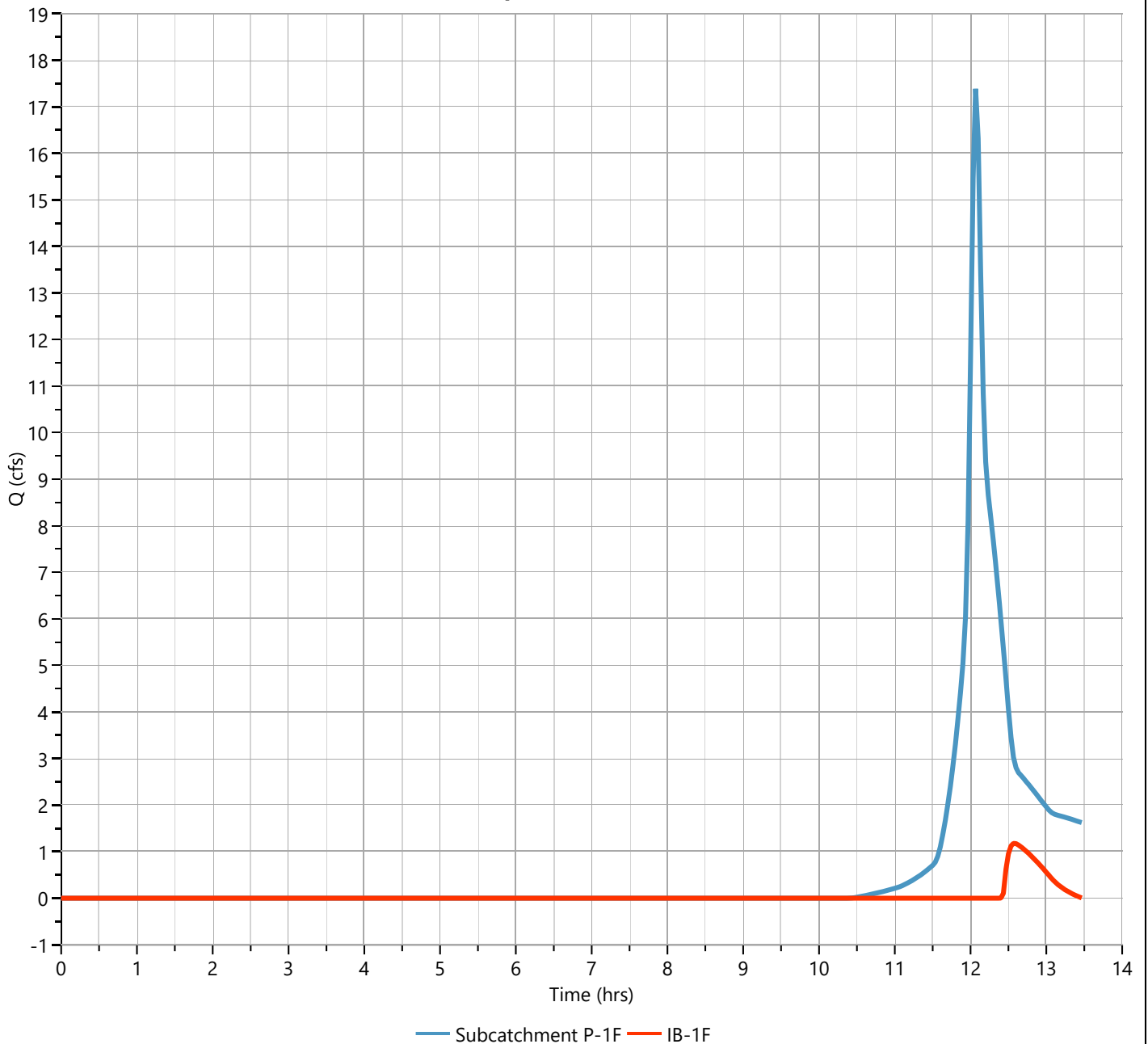
IB-1F

Hyd. No. 29

Hydrograph Type	= Pond Route	Peak Flow	= 1.177 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.57 hrs
Time Interval	= 2 min	Hydrograph Volume	= 2,209 cuft
Inflow Hydrograph	= 28 - Subcatchment P-1F	Max. Elevation	= 224.99 ft
Pond Name	= Basin P-1F	Max. Storage	= 19,471 cuft

Pond Routing by Storage Indication Method

Qp = 1.18 cfs



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

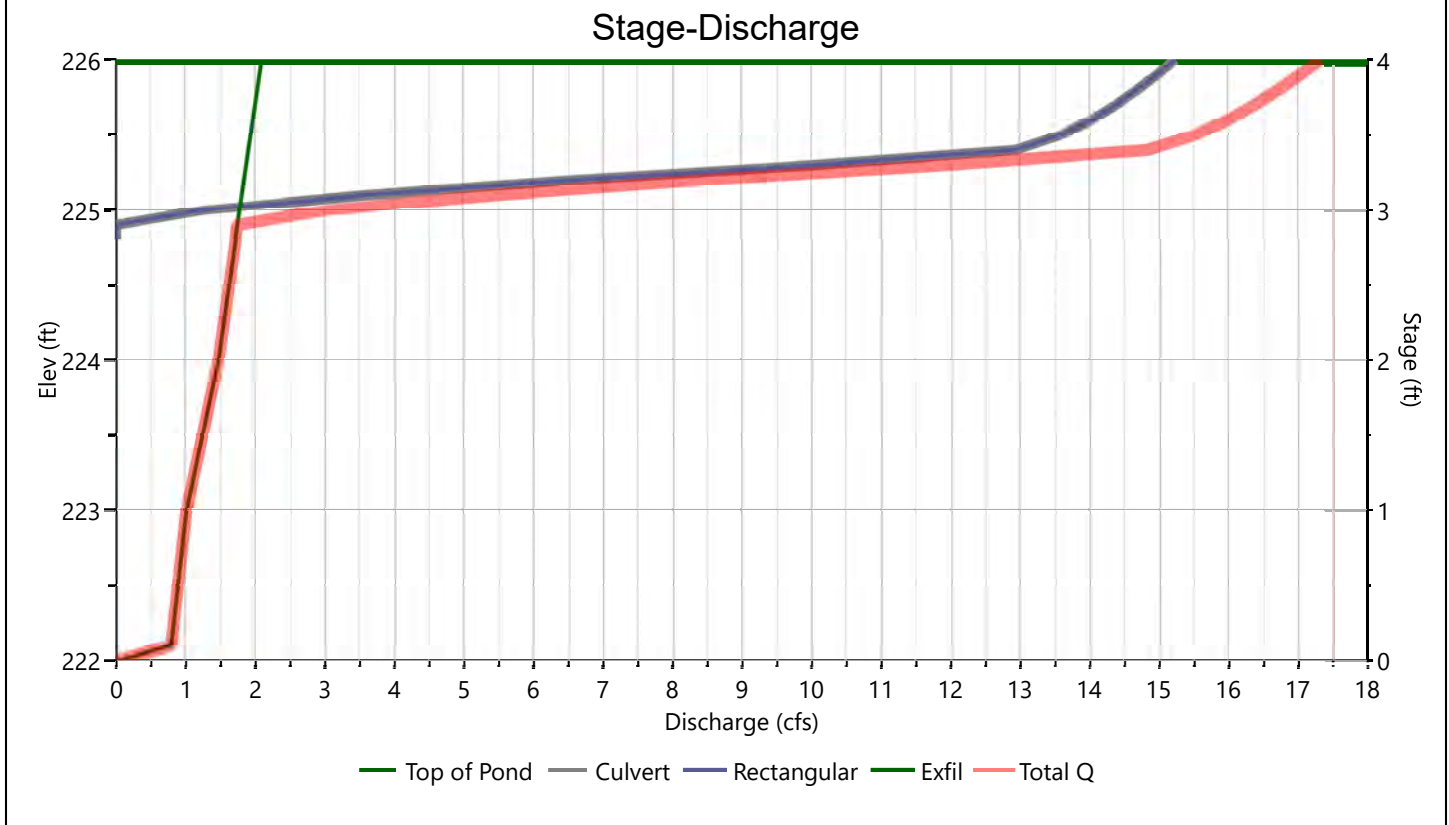
12-13-2023

Basin P-1F

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in	18				Hole Diameter, in
Span, in	18				No. holes
No. Barrels	1				Invert Elevation, ft
Invert Elevation, ft	222.00				Height, ft
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co
Length, ft	110				
Barrel Slope, %	2.7				
N-Value, n	0.012				
Weirs	Riser*	Weirs			Ancillary
Shape / Type		1*	2	3	Exfiltration, in/hr
Crest Elevation, ft		Rectangular			8.27**
Crest Length, ft		224.9			
Angle, deg		12			
Weir Coefficient, Cw		3.3			

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

Basin P-1F

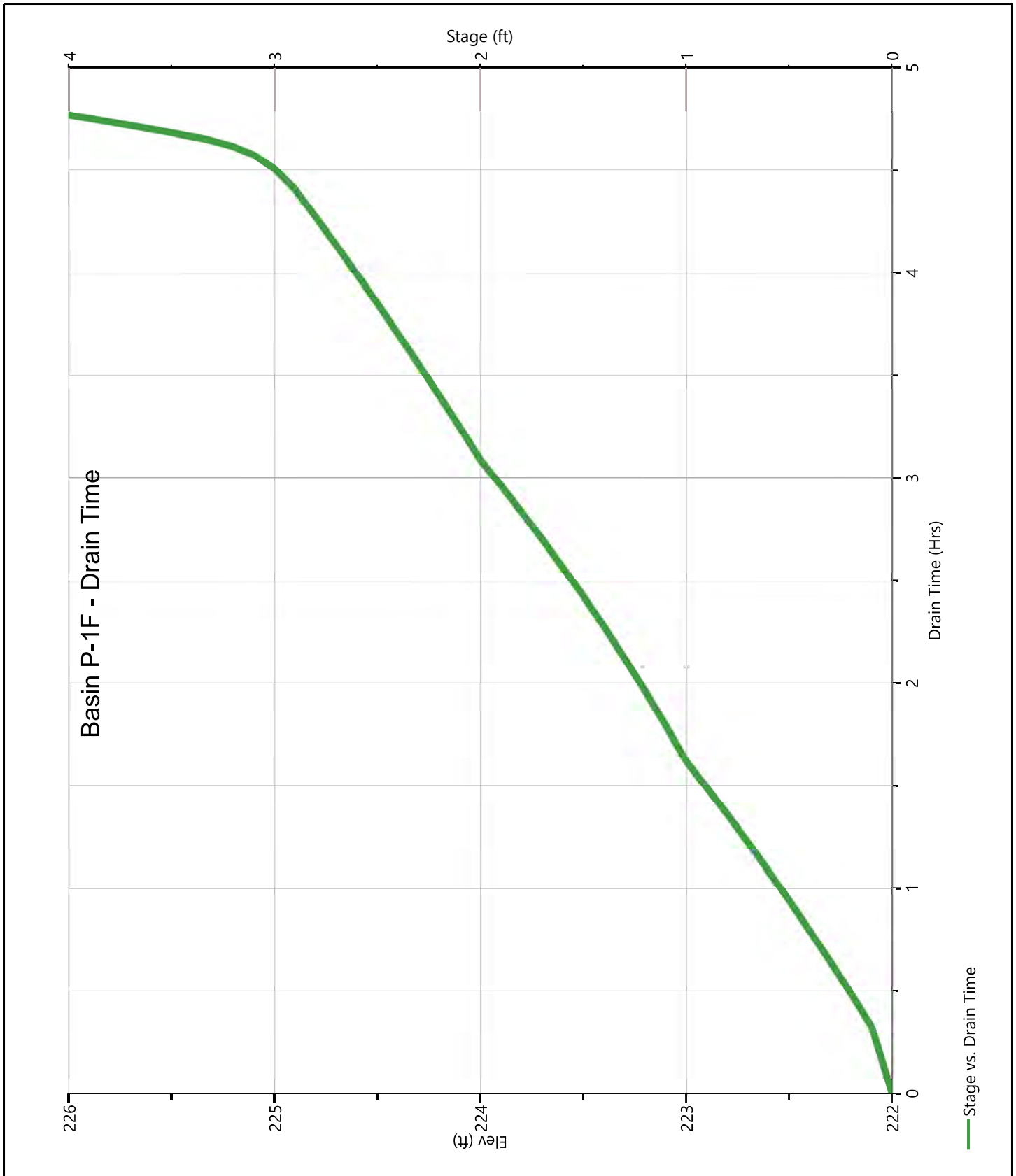
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	222.00	0.000	0.000					0.000				0.000		0.000
1.00	223.00	4,610	0.000					0.000				1.005		1.005
2.00	224.00	11,062	0.000					0.000				1.465		1.465
3.00	225.00	19,522	1.252 ic					1.252				1.774		3.026
4.00	226.00	29,622	15.23 ic					15.23 s				2.093		17.32

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

Basin P-1F

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-1G

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			1.10	107.56
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			1.52	59.16
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					2.61	166.73

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{166.73}{2.61} = \underline{63.77} ; \text{ Use CN} = \underline{64}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	0.56	1.57	3.62

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Hydrograph Report

Project Name:

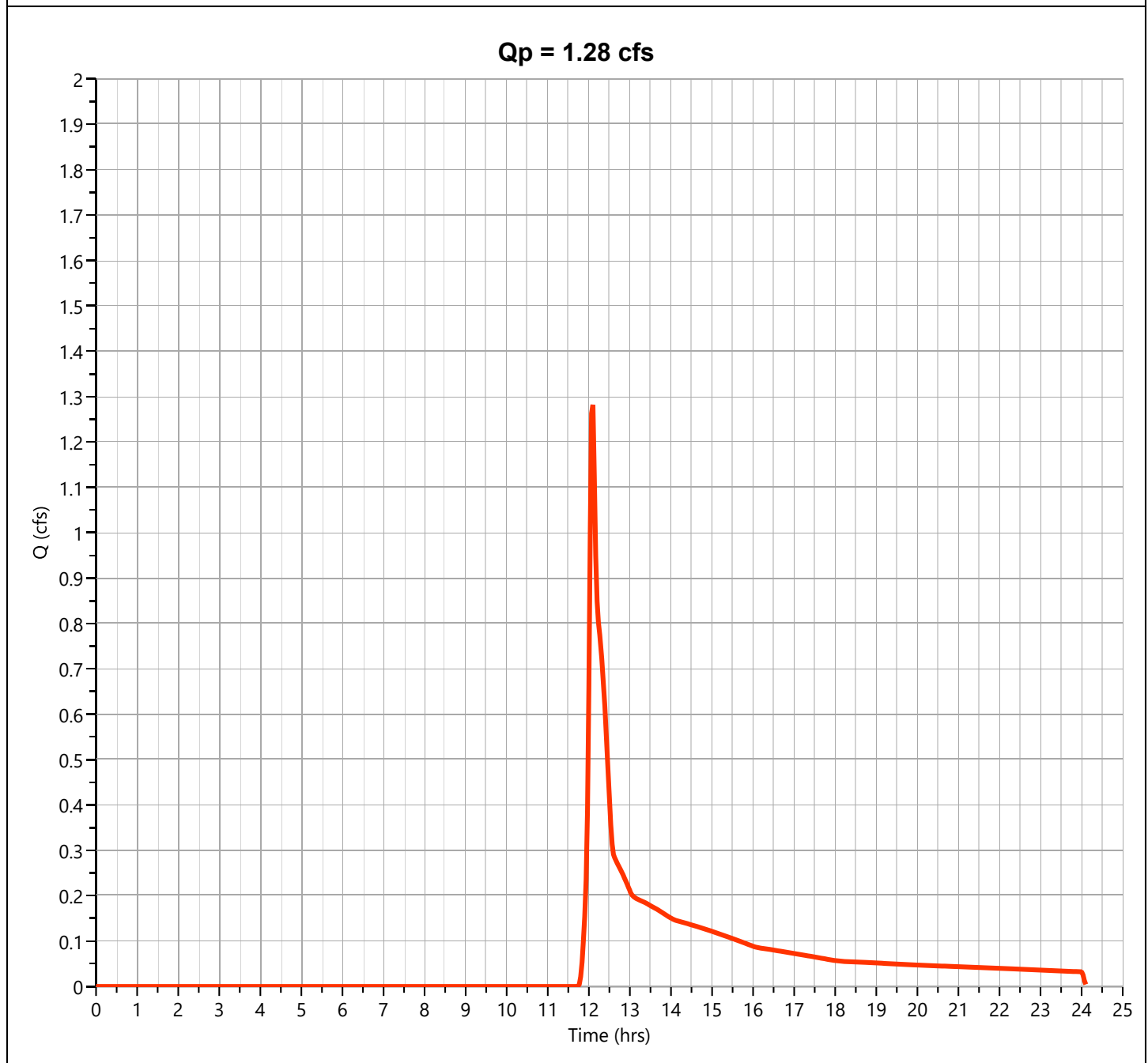
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-1G

Hyd. No. 30

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.282 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 2 min	Runoff Volume	= 5,091 cuft
Drainage Area	= 2.61 ac	Curve Number	= 64
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

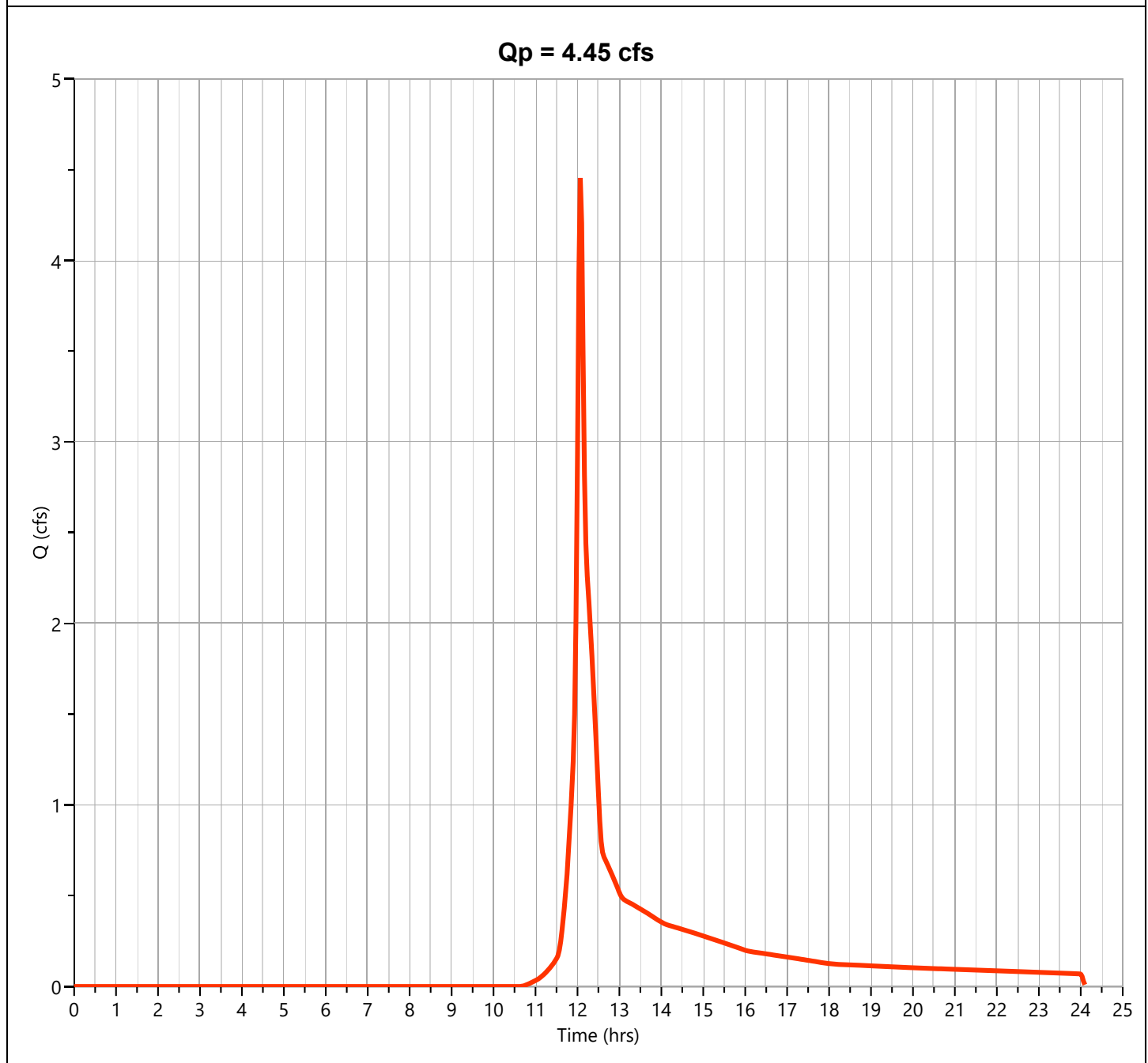
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-1G

Hyd. No. 30

Hydrograph Type	= NRCS Runoff	Peak Flow	= 4.455 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 14,097 cuft
Drainage Area	= 2.61 ac	Curve Number	= 64
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

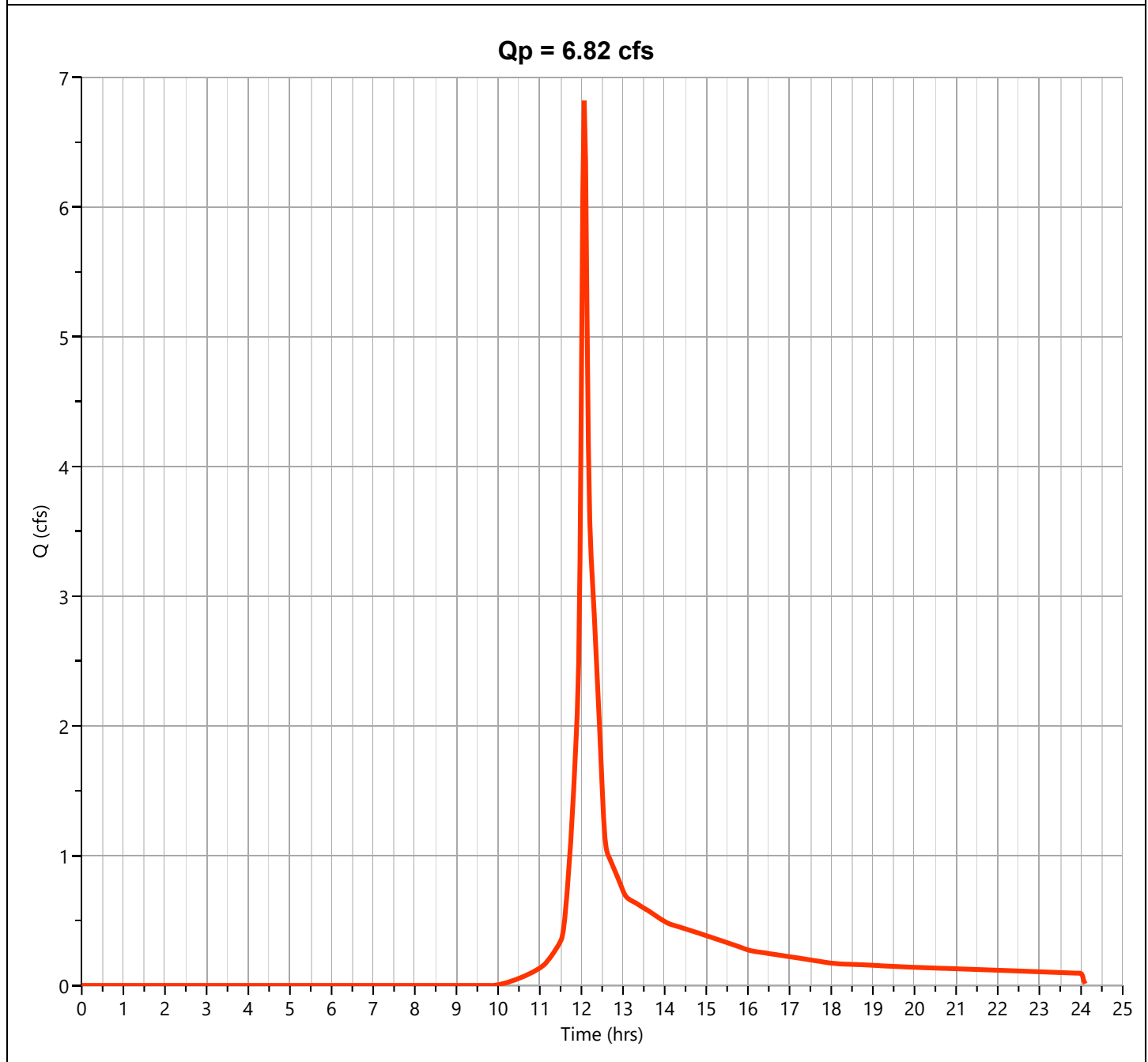
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-1G

Hyd. No. 30

Hydrograph Type	= NRCS Runoff	Peak Flow	= 6.820 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 20,867 cuft
Drainage Area	= 2.61 ac	Curve Number	= 64
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

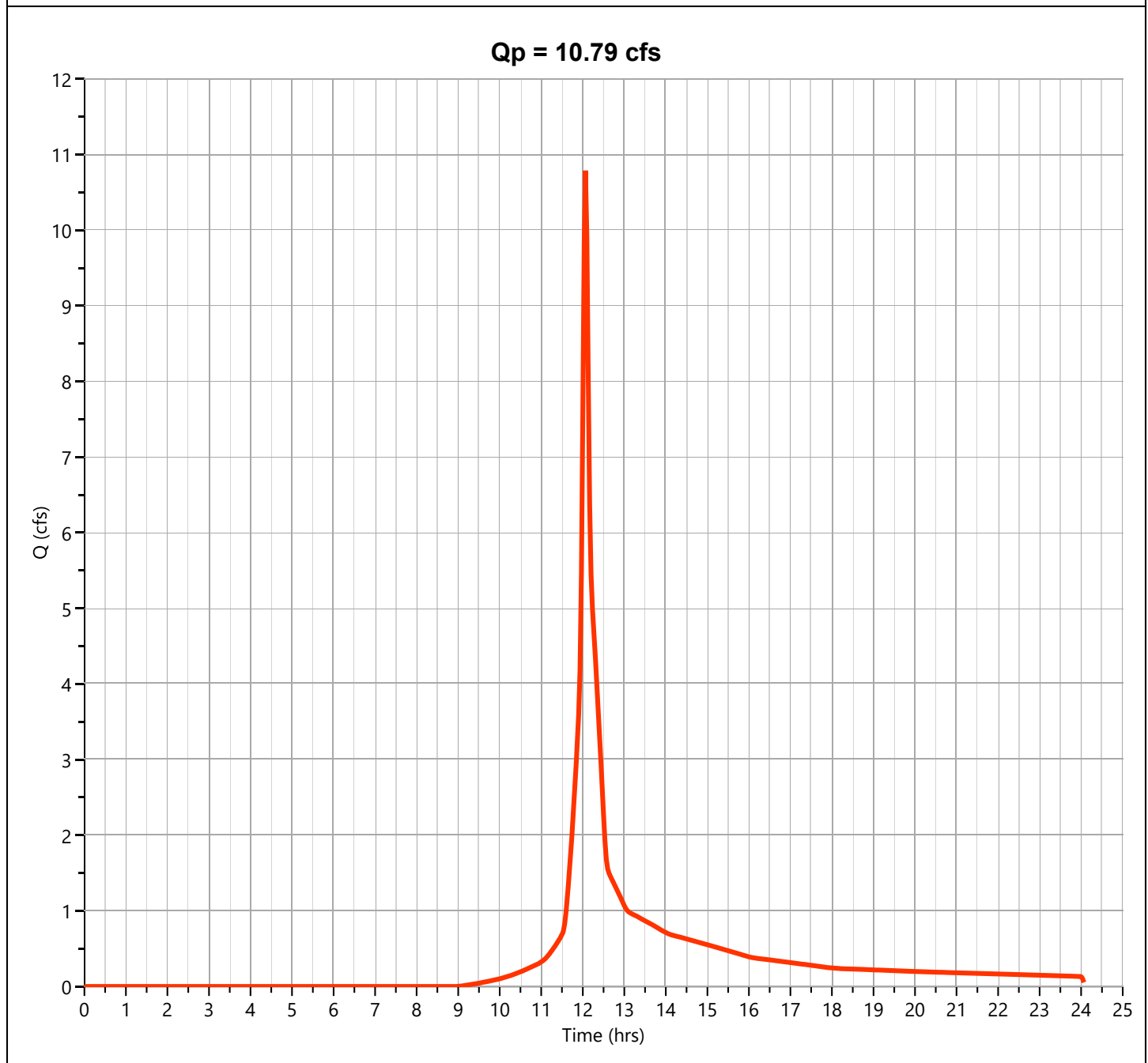
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-1G

Hyd. No. 30

Hydrograph Type	= NRCS Runoff	Peak Flow	= 10.79 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 32,386 cuft
Drainage Area	= 2.61 ac	Curve Number	= 64
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

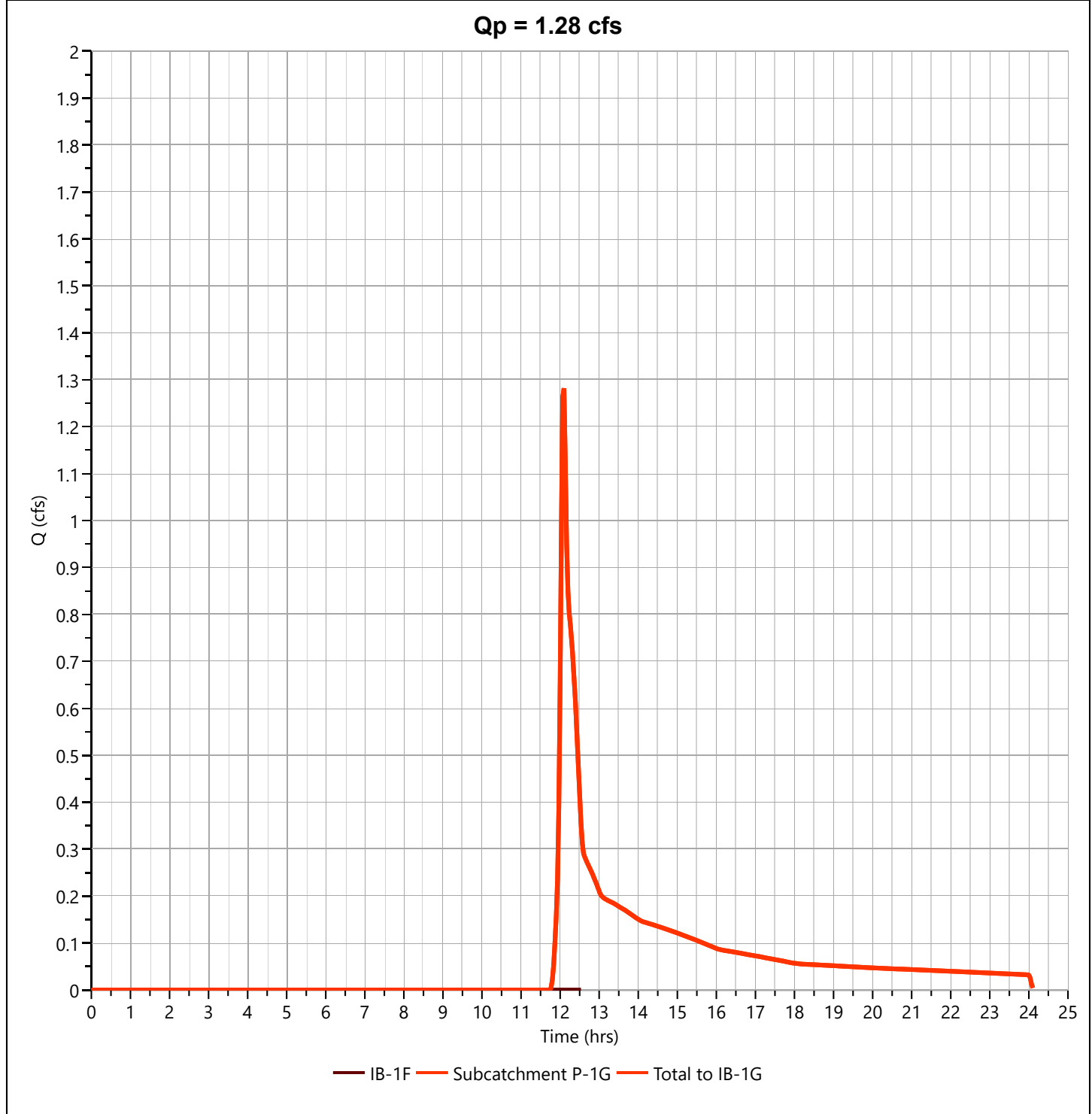
Hydrology Studio v 3.0.0.29

12-14-2023

Total to IB-1G

Hyd. No. 31

Hydrograph Type	= Junction	Peak Flow	= 1.282 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 2 min	Hydrograph Volume	= 5,091 cuft
Inflow Hydrographs	= 29, 30	Total Contrib. Area	= 2.61 ac



Hydrograph Report

Project Name:

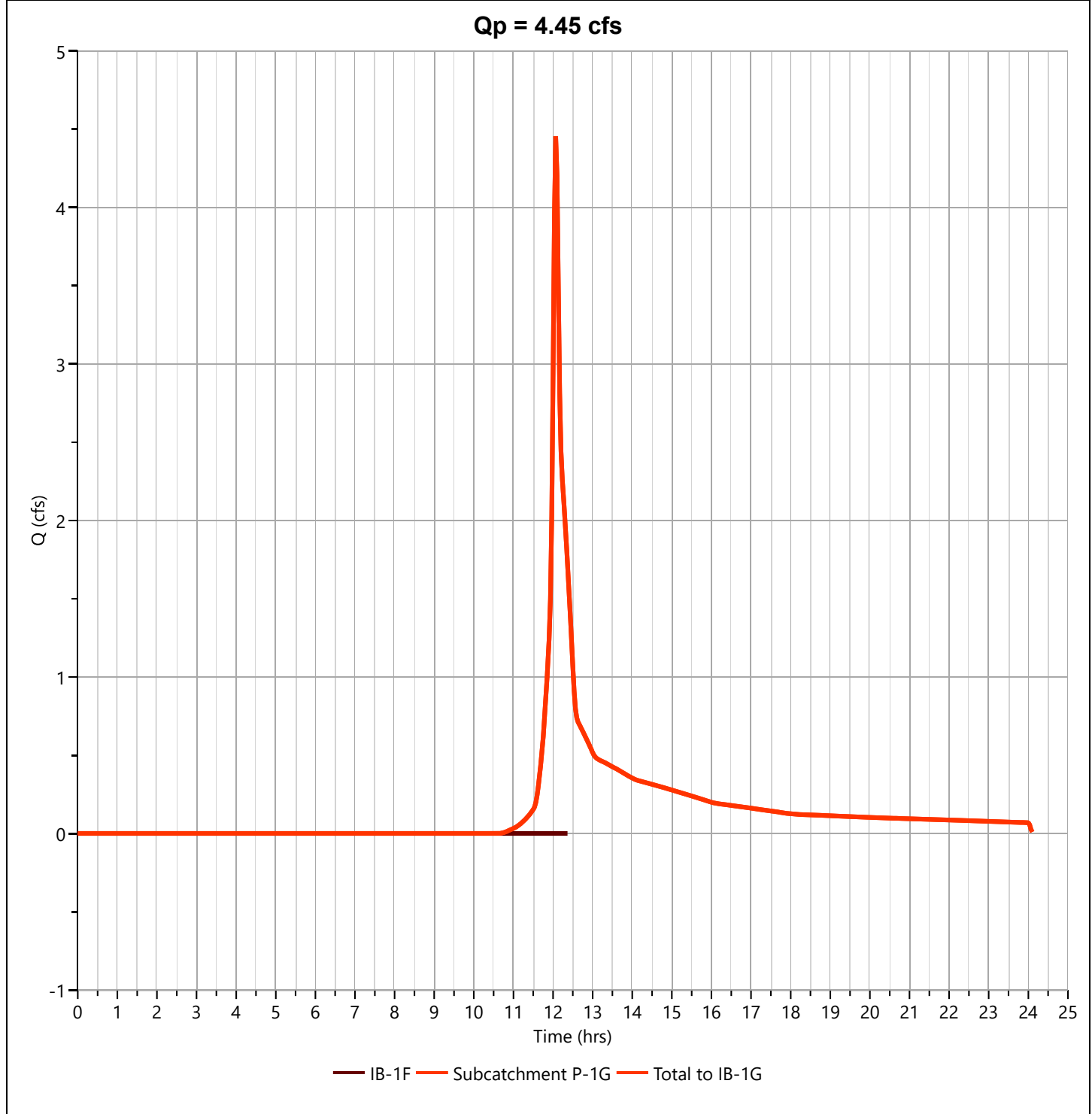
Hydrology Studio v 3.0.0.29

12-14-2023

Total to IB-1G

Hyd. No. 31

Hydrograph Type	= Junction	Peak Flow	= 4.455 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 14,097 cuft
Inflow Hydrographs	= 29, 30	Total Contrib. Area	= 2.61 ac



Hydrograph Report

Project Name:

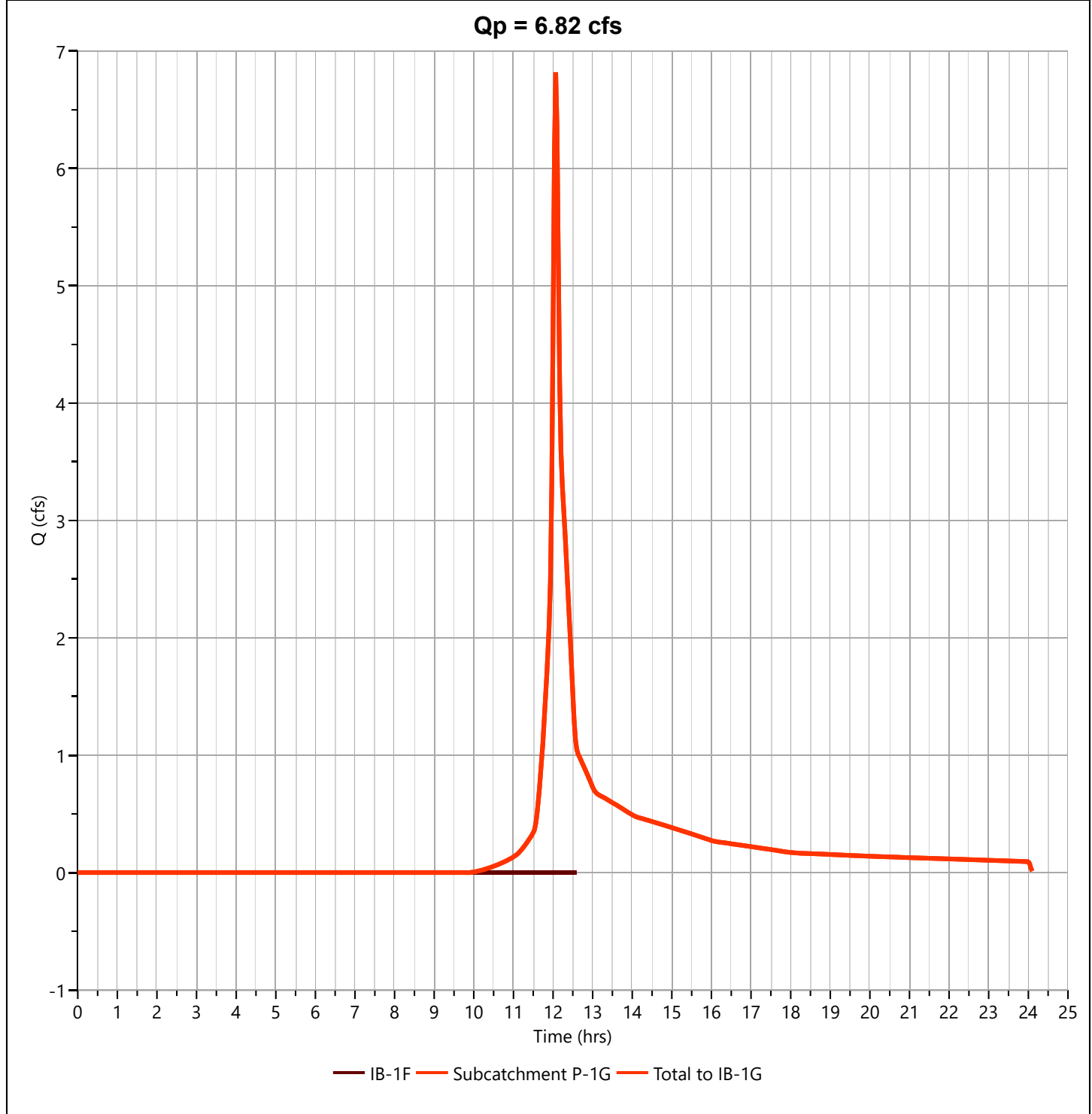
Hydrology Studio v 3.0.0.29

12-14-2023

Total to IB-1G

Hyd. No. 31

Hydrograph Type	= Junction	Peak Flow	= 6.820 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 20,867 cuft
Inflow Hydrographs	= 29, 30	Total Contrib. Area	= 2.61 ac



Hydrograph Report

Project Name:

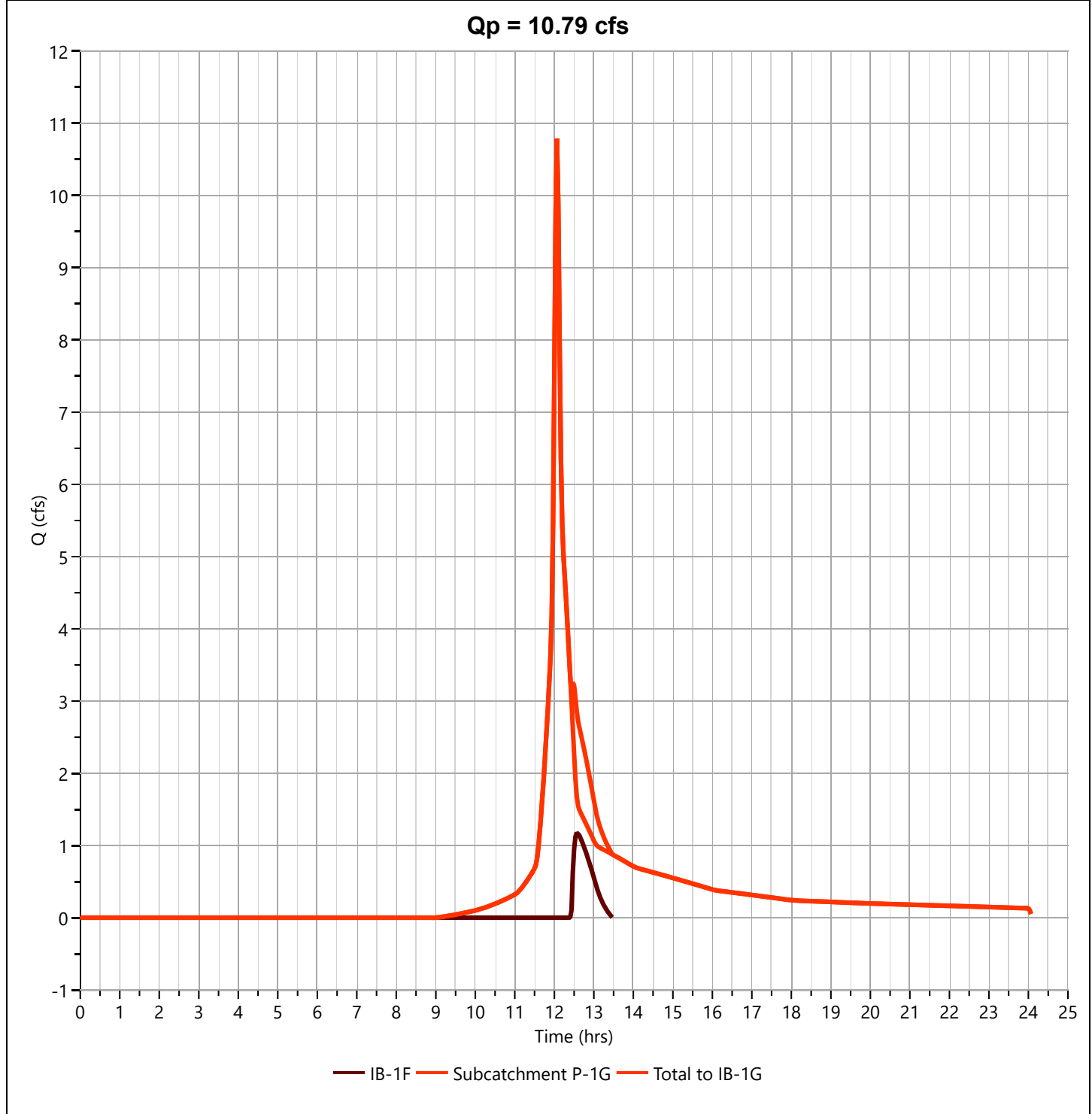
Hydrology Studio v 3.0.0.29

12-14-2023

Total to IB-1G

Hyd. No. 31

Hydrograph Type	= Junction	Peak Flow	= 10.79 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 34,595 cuft
Inflow Hydrographs	= 29, 30	Total Contrib. Area	= 2.61 ac



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

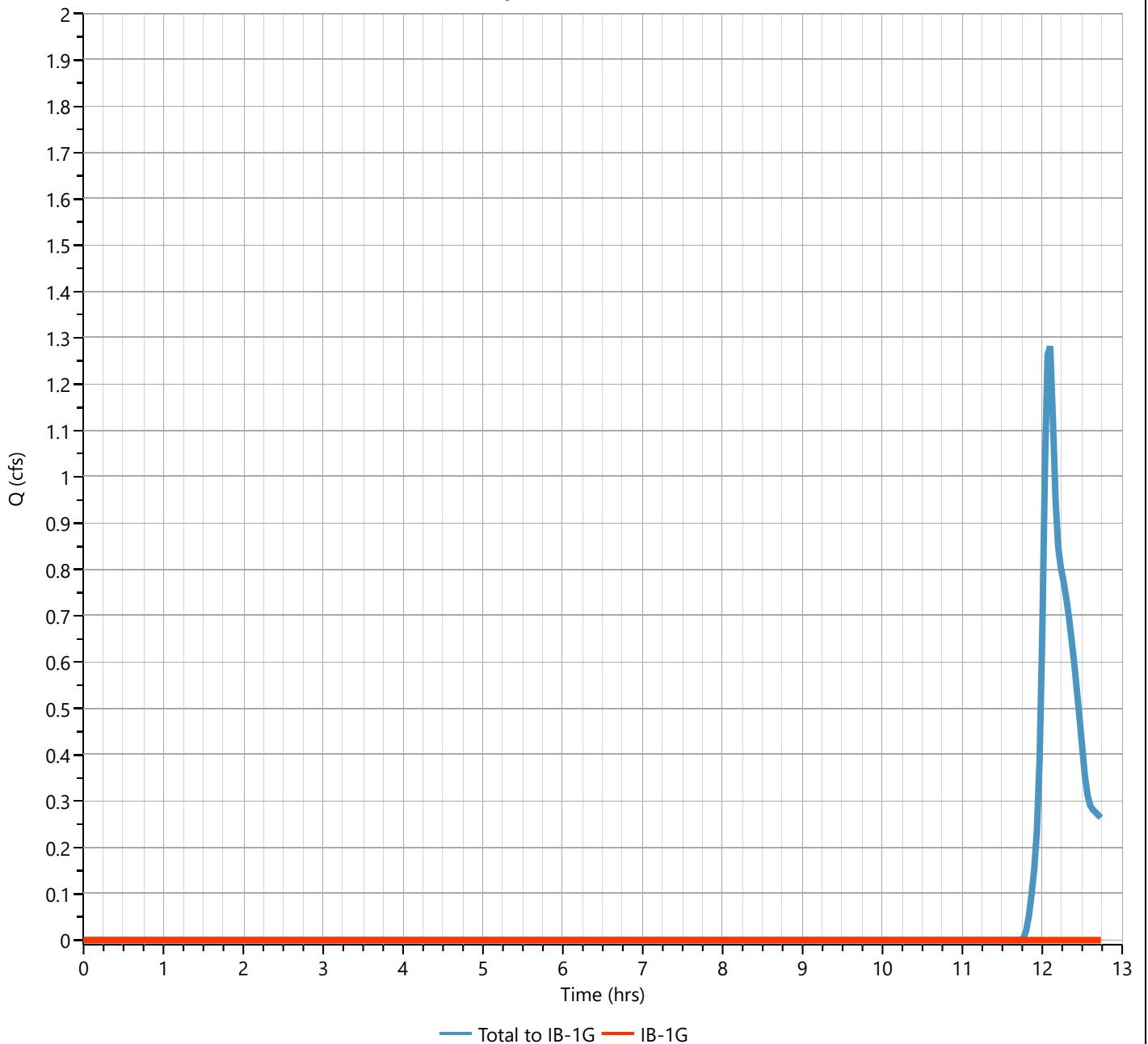
IB-1G

Hyd. No. 32

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.47 hrs
Time Interval	= 2 min	Hydrograph Volume	= -0.003 cuft
Inflow Hydrograph	= 31 - Total to IB-1G	Max. Elevation	= 219.30 ft
Pond Name	= Basin P-1G	Max. Storage	= 794 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

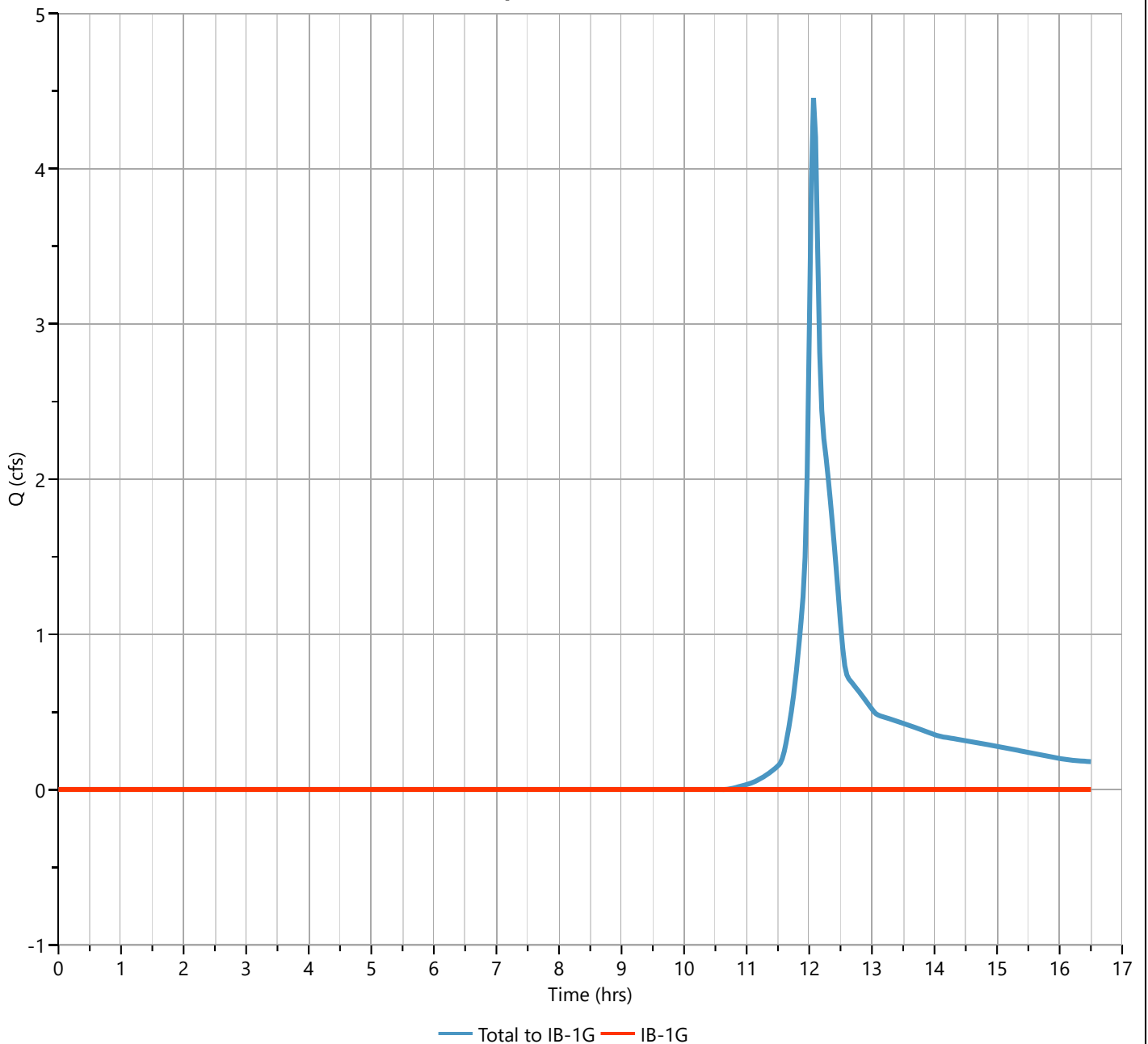
IB-1G

Hyd. No. 32

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 16.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= -0.004 cuft
Inflow Hydrograph	= 31 - Total to IB-1G	Max. Elevation	= 220.43 ft
Pond Name	= Basin P-1G	Max. Storage	= 4,363 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

IB-1G

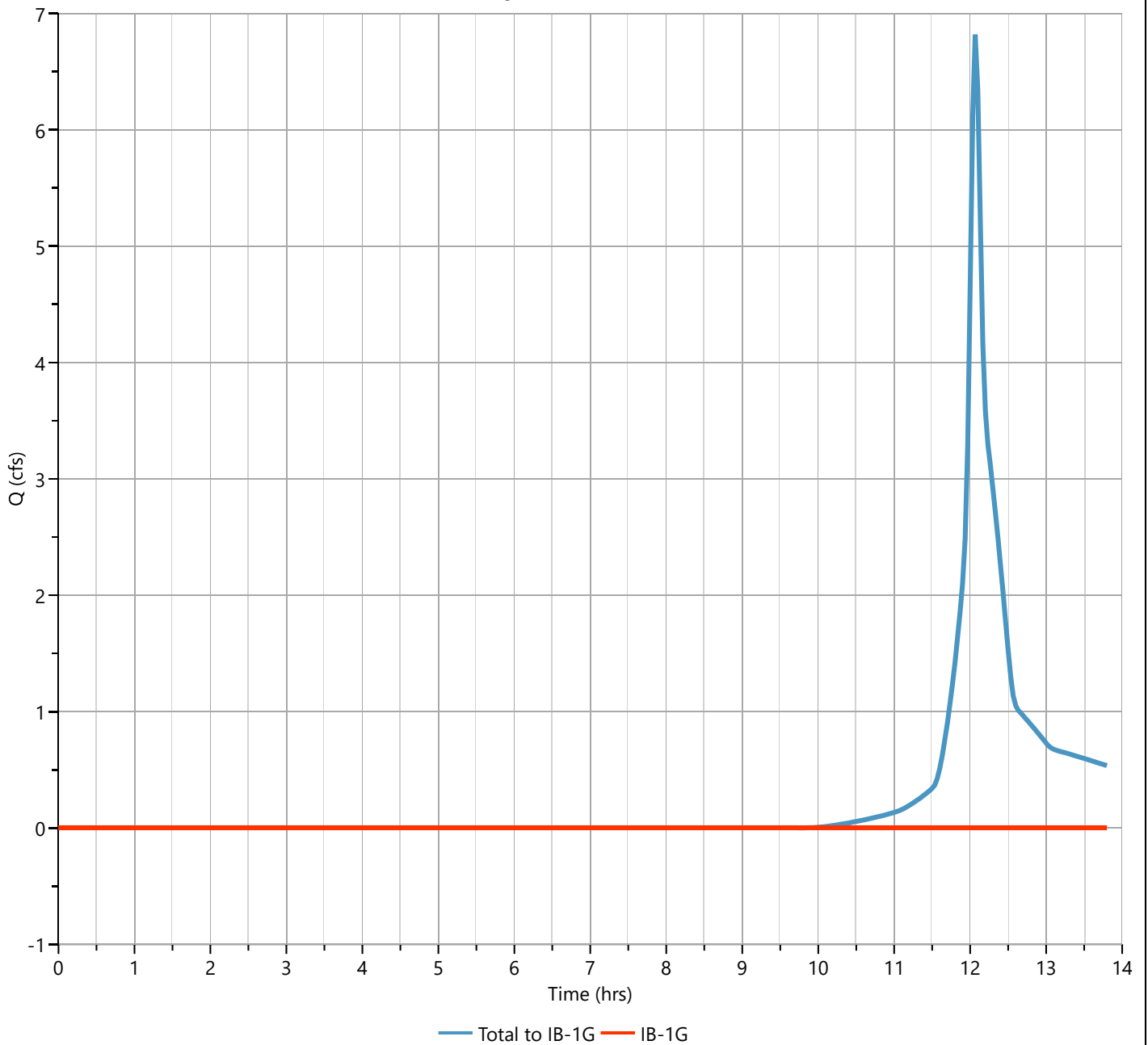
Hyd. No. 32

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 13.50 hrs
Time Interval	= 2 min	Hydrograph Volume	= -0.003 cuft
Inflow Hydrograph	= 31 - Total to IB-1G	Max. Elevation	= 221.12 ft
Pond Name	= Basin P-1G	Max. Storage	= 7,281 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 1.36 hrs

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

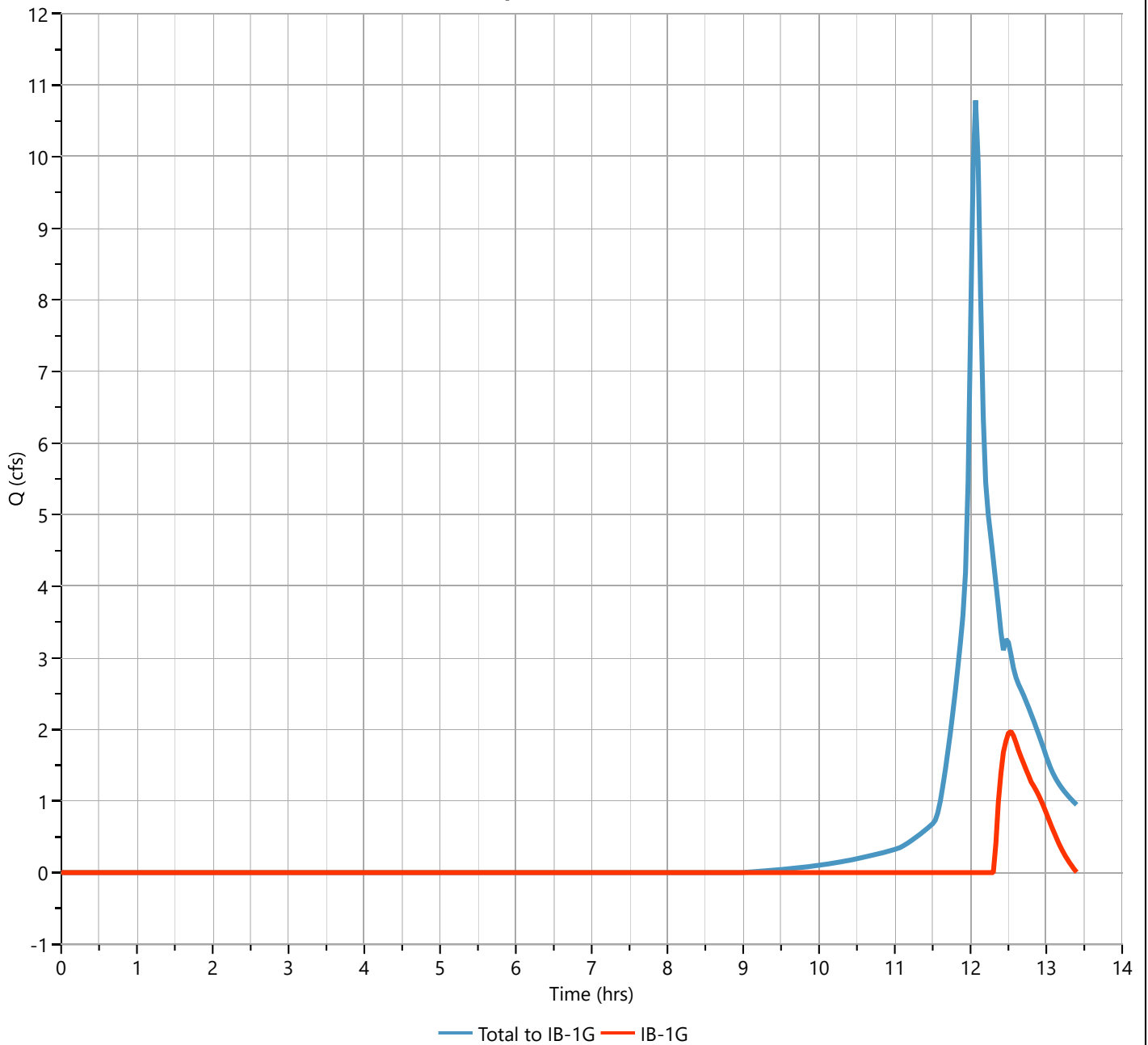
IB-1G

Hyd. No. 32

Hydrograph Type	= Pond Route	Peak Flow	= 1.970 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.53 hrs
Time Interval	= 2 min	Hydrograph Volume	= 3,951 cuft
Inflow Hydrograph	= 31 - Total to IB-1G	Max. Elevation	= 221.93 ft
Pond Name	= Basin P-1G	Max. Storage	= 11,660 cuft

Pond Routing by Storage Indication Method

Qp = 1.97 cfs



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

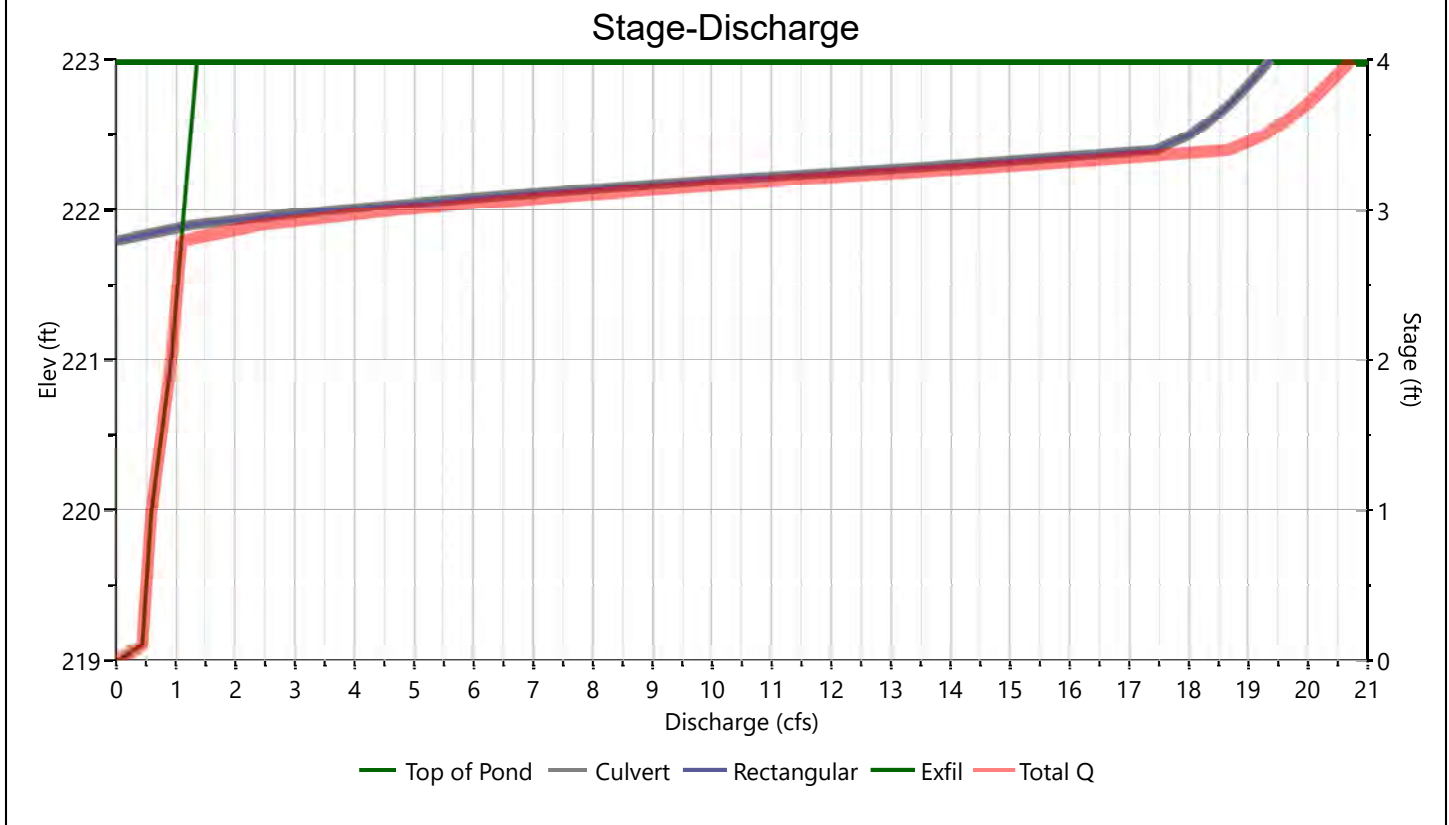
12-14-2023

Basin P-1G

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in	18				Hole Diameter, in
Span, in	18				No. holes
No. Barrels	1				Invert Elevation, ft
Invert Elevation, ft	217.00				Height, ft
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co
Length, ft	50				
Barrel Slope, %	2				
N-Value, n	0.012				
Weirs	Riser*	Weirs			Ancillary
		1*	2	3	
Shape / Type		Rectangular			Exfiltration, in/hr
Crest Elevation, ft		221.8			8.27**
Crest Length, ft		12			
Angle, deg					
Weir Coefficient, Cw		3.3			

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Basin P-1G

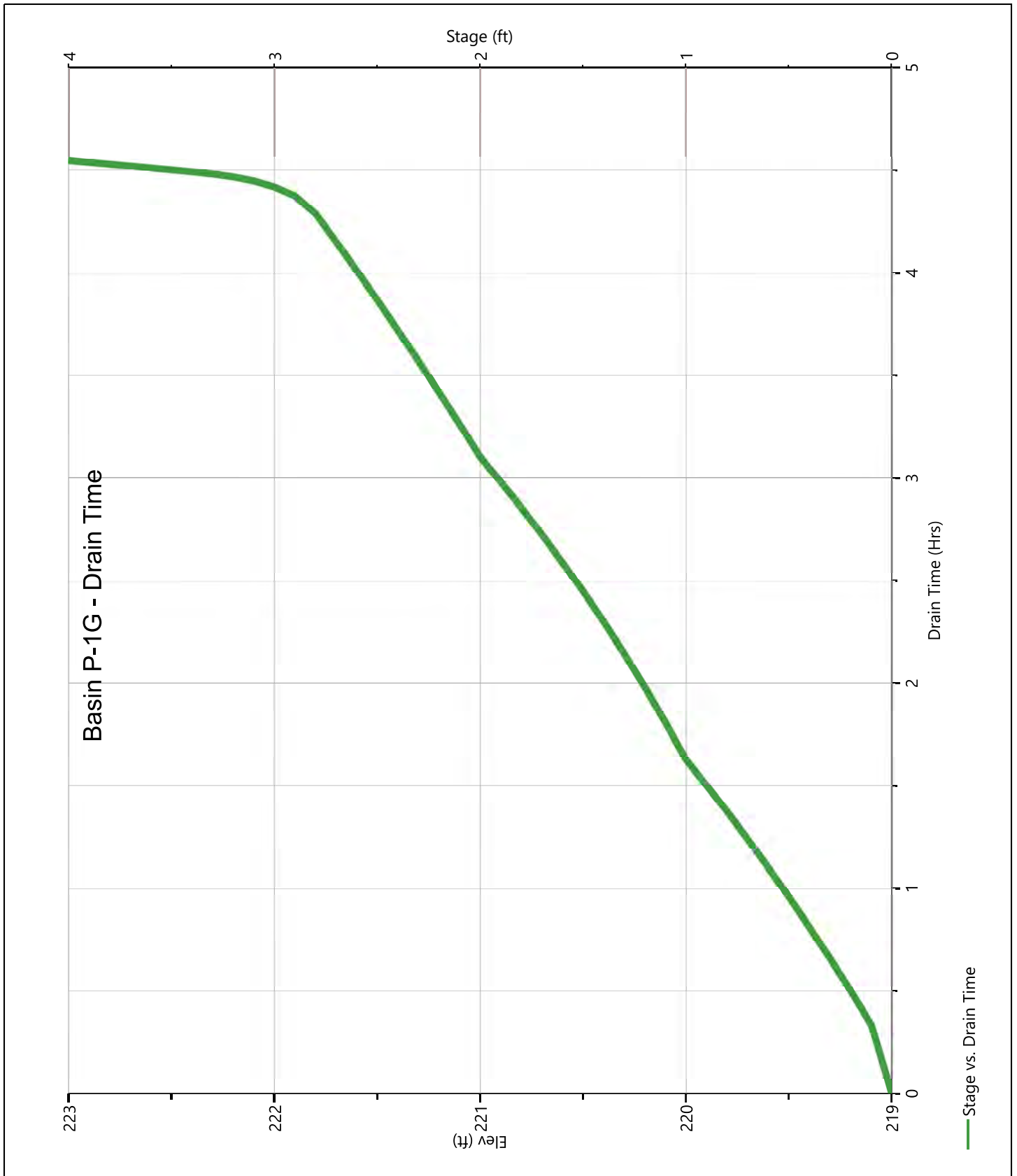
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	219.00	0.000	0.000					0.000				0.000		0.000
1.00	220.00	2,655	0.000 ic					0.000				0.594		0.594
2.00	221.00	6,632	0.000 ic					0.000				0.928		0.928
3.00	222.00	12,031	3.542 ic					3.542				1.139		4.681
4.00	223.00	18,563	19.37 ic					19.37 s				1.361		20.73

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

Basin P-1G

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-1H

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.84	82.49
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			1.38	53.82
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					2.22	136.31

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{136.31}{2.22} = 61.35$; Use CN = **61**

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	0.47	1.40	3.35

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Hydrograph Report

Project Name:

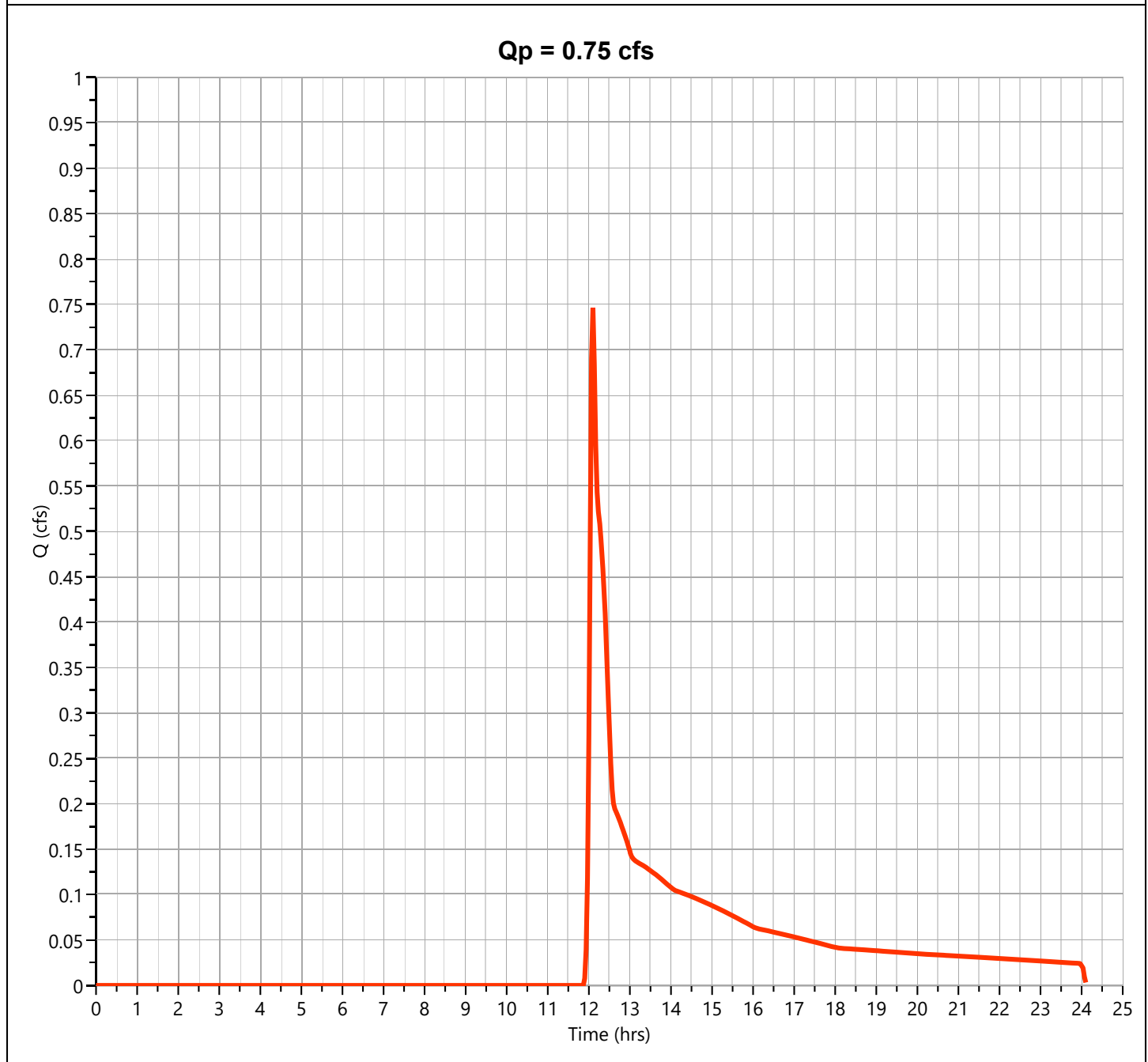
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1H

Hyd. No. 34

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.746 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.10 hrs
Time Interval	= 2 min	Runoff Volume	= 3,447 cuft
Drainage Area	= 2.22 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

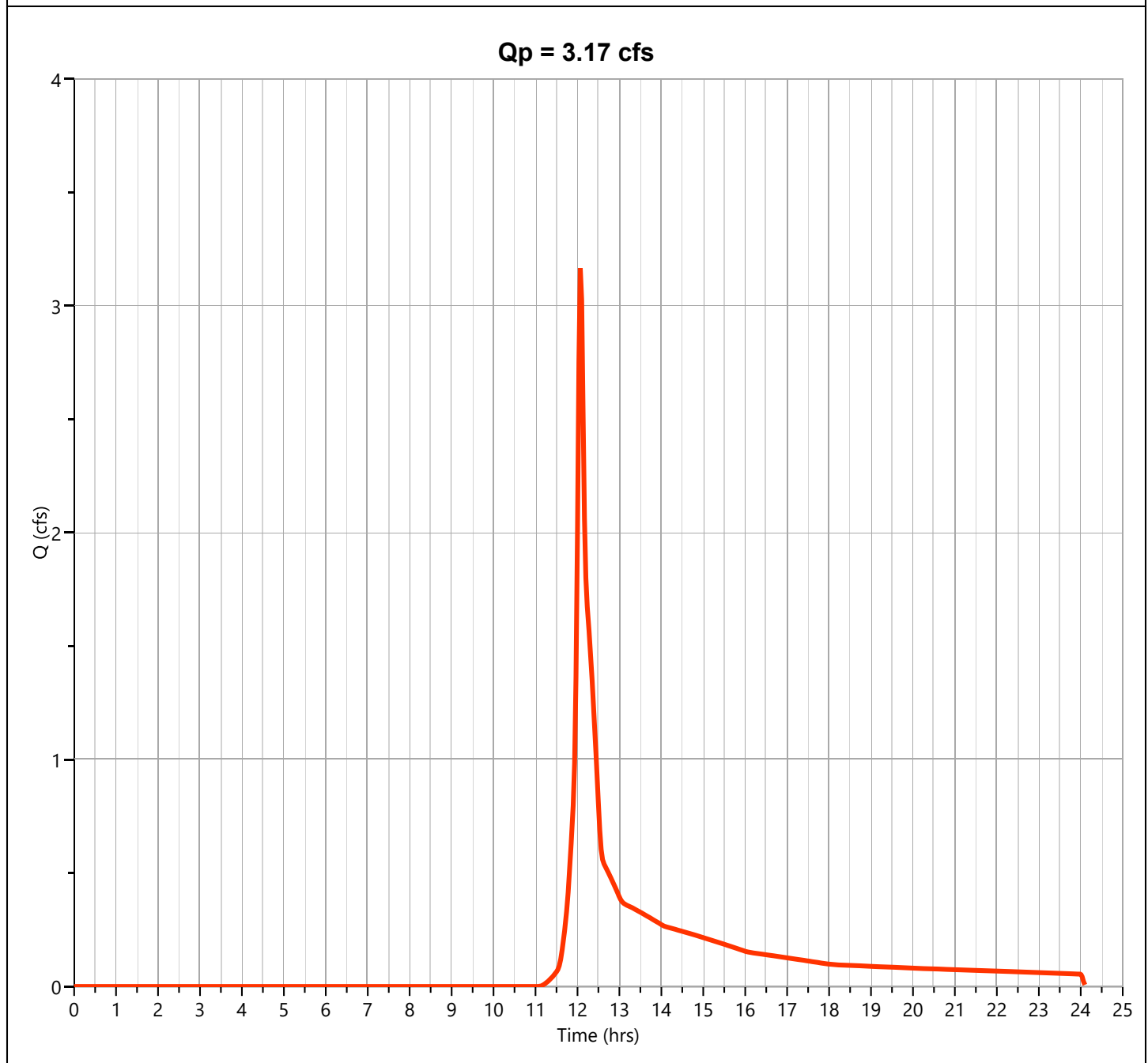
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1H

Hyd. No. 34

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.166 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 10,389 cuft
Drainage Area	= 2.22 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

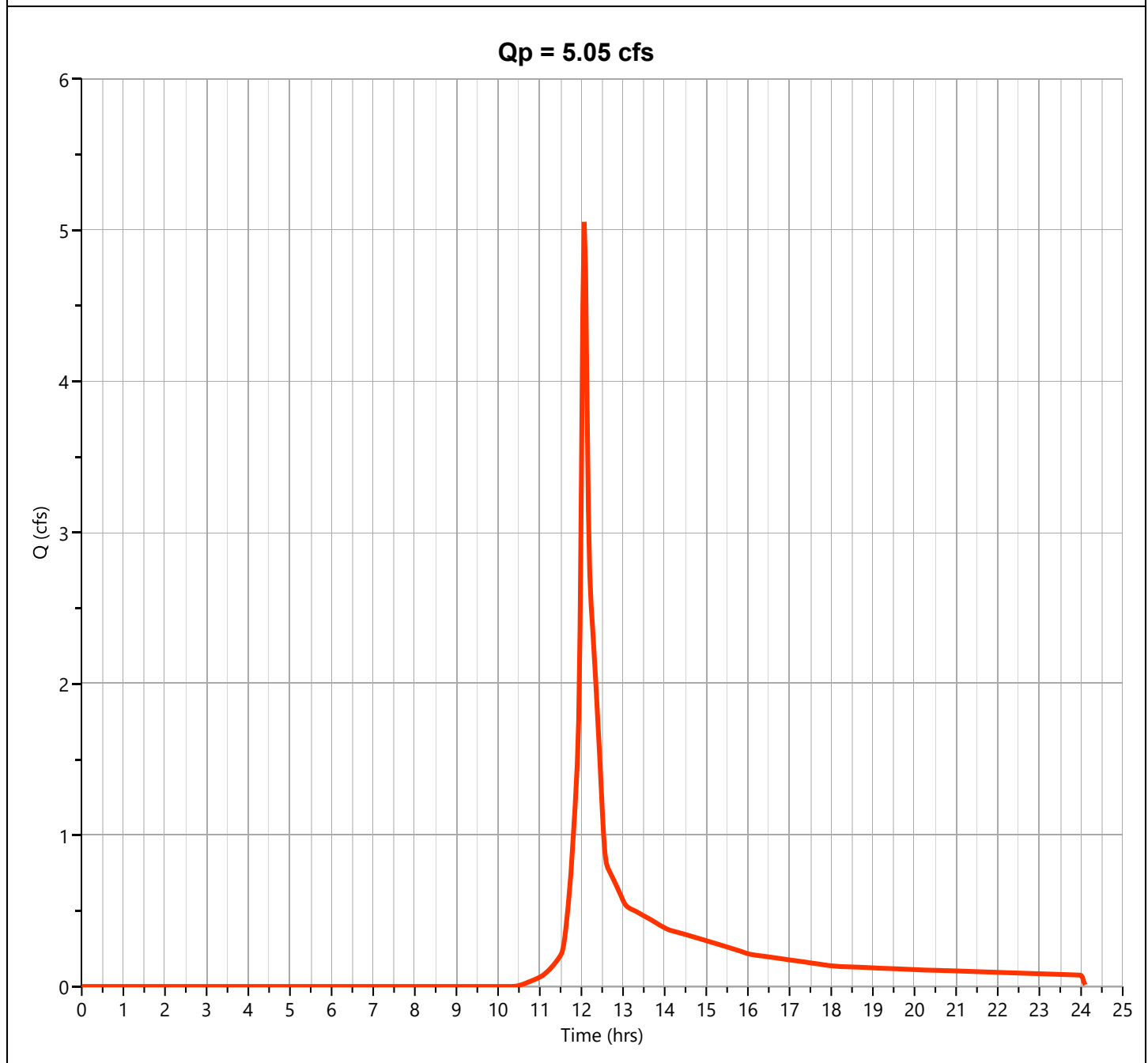
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1H

Hyd. No. 34

Hydrograph Type	= NRCS Runoff	Peak Flow	= 5.055 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 15,761 cuft
Drainage Area	= 2.22 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

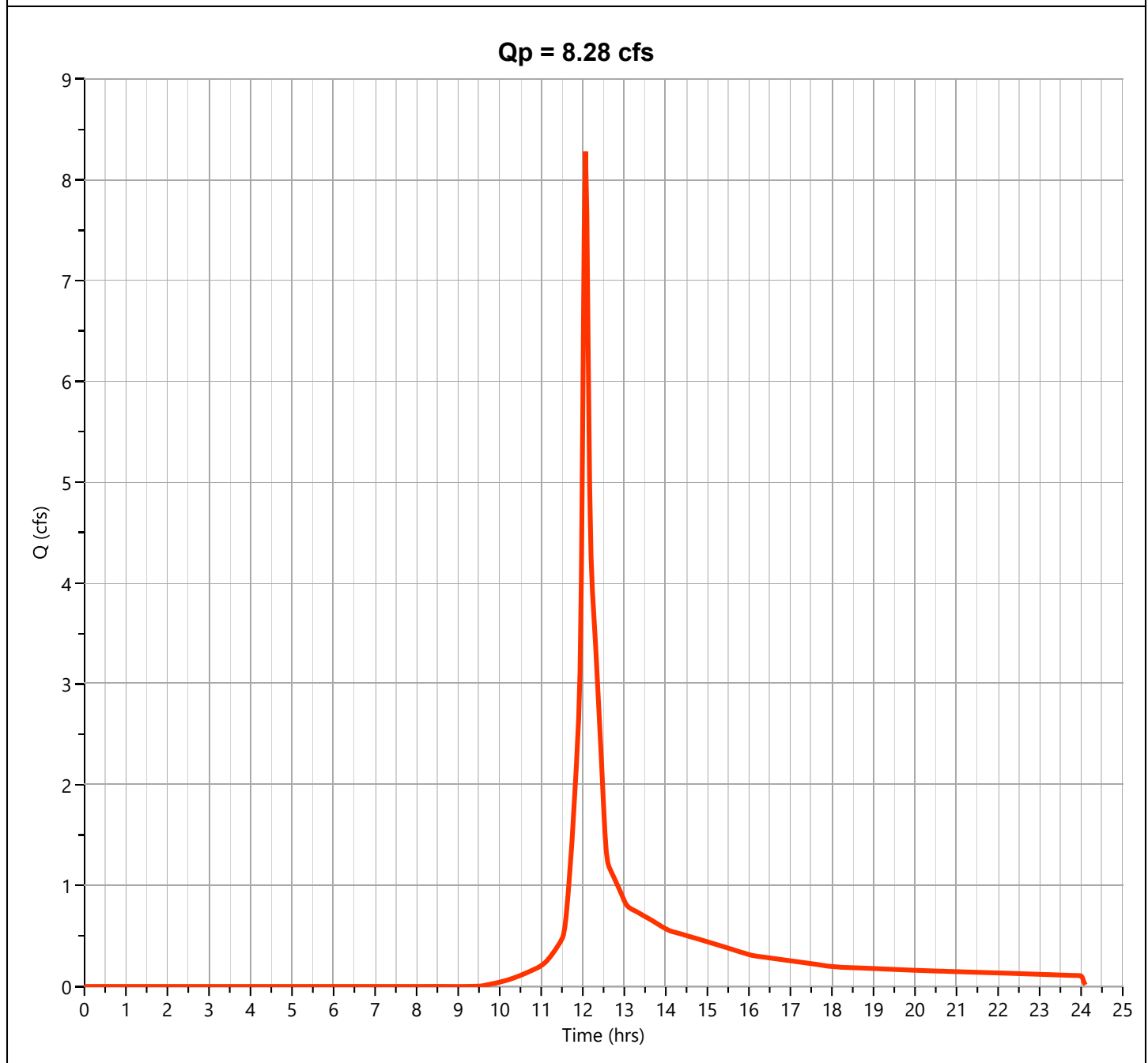
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1H

Hyd. No. 34

Hydrograph Type	= NRCS Runoff	Peak Flow	= 8.281 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 25,049 cuft
Drainage Area	= 2.22 ac	Curve Number	= 61
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

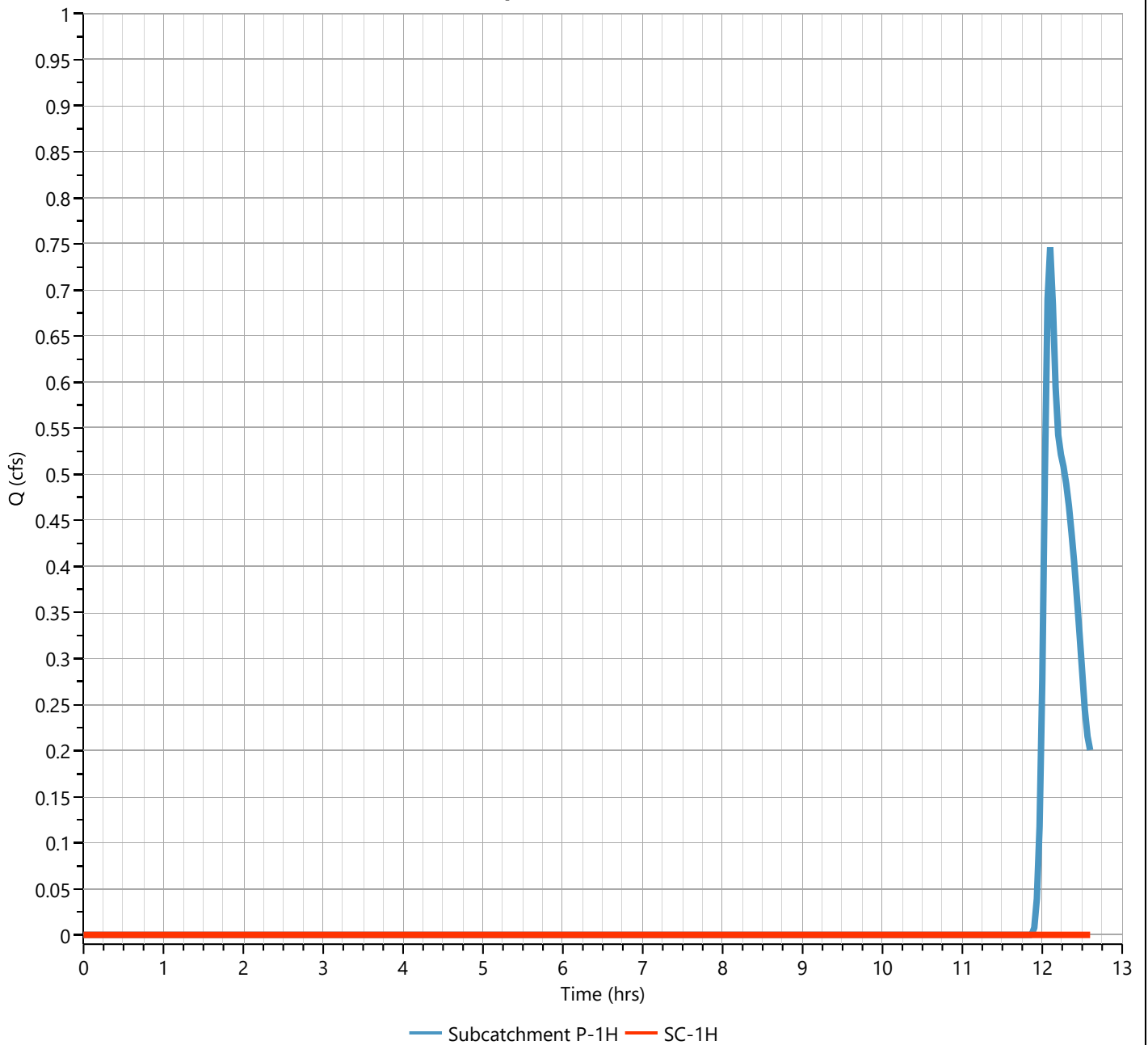
SC-1H

Hyd. No. 35

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.57 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 34 - Subcatchment P-1H	Max. Elevation	= 217.02 ft
Pond Name	= SC-1H	Max. Storage	= 34.7 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

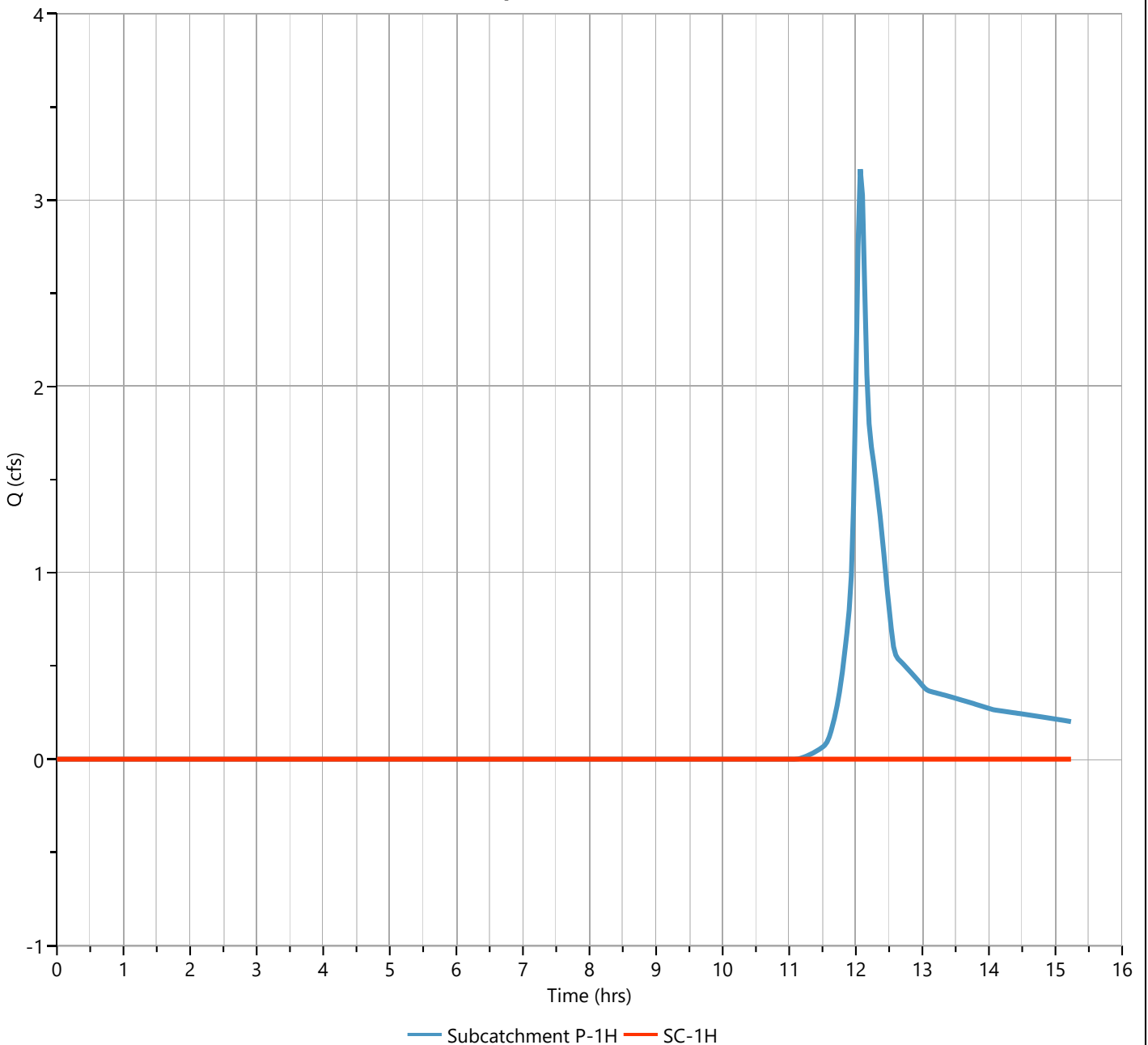
SC-1H

Hyd. No. 35

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 15.20 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 34 - Subcatchment P-1H	Max. Elevation	= 218.04 ft
Pond Name	= SC-1H	Max. Storage	= 2,260 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

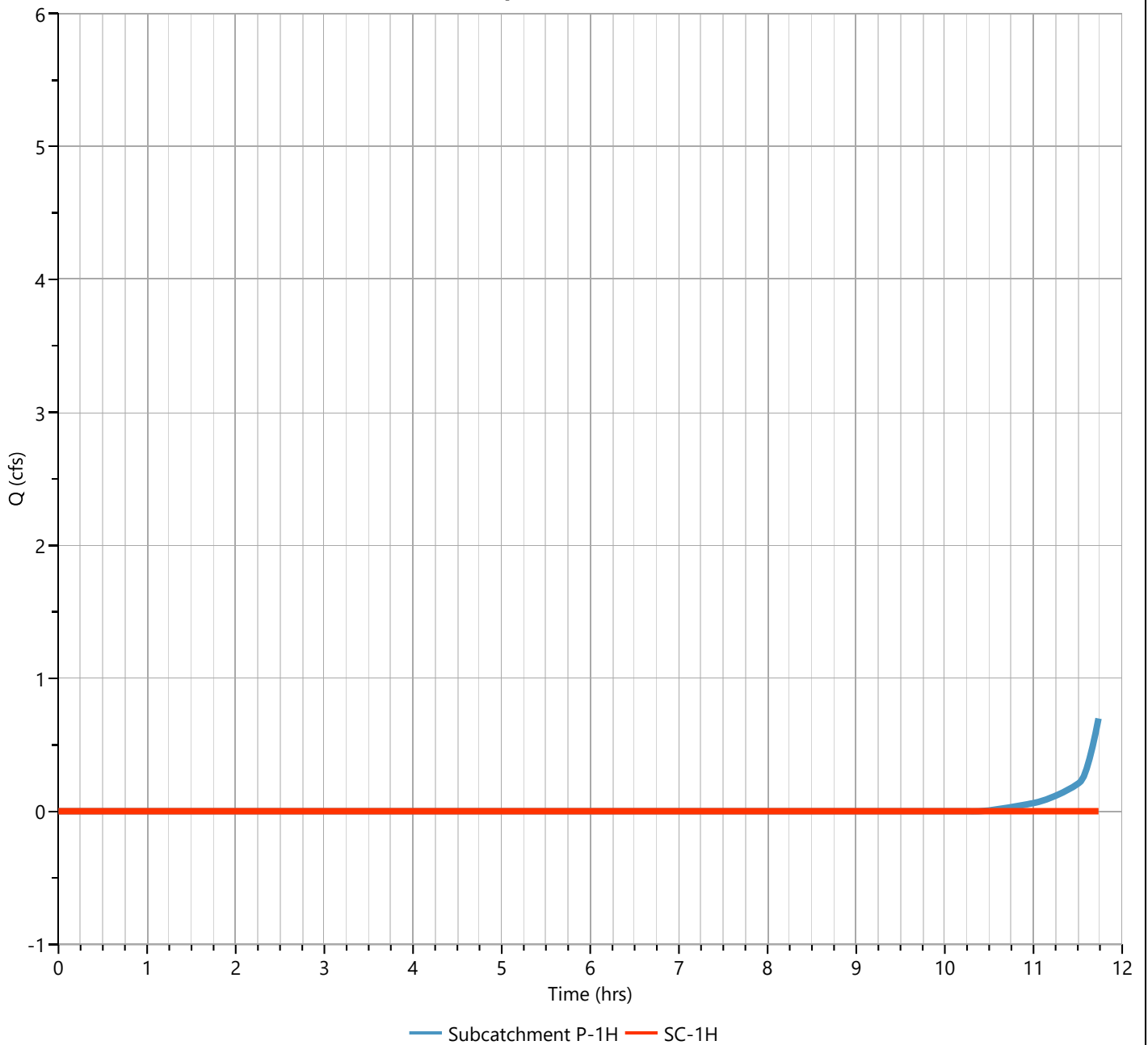
SC-1H

Hyd. No. 35

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 11.70 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 34 - Subcatchment P-1H	Max. Elevation	= 218.92 ft
Pond Name	= SC-1H	Max. Storage	= 4,679 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

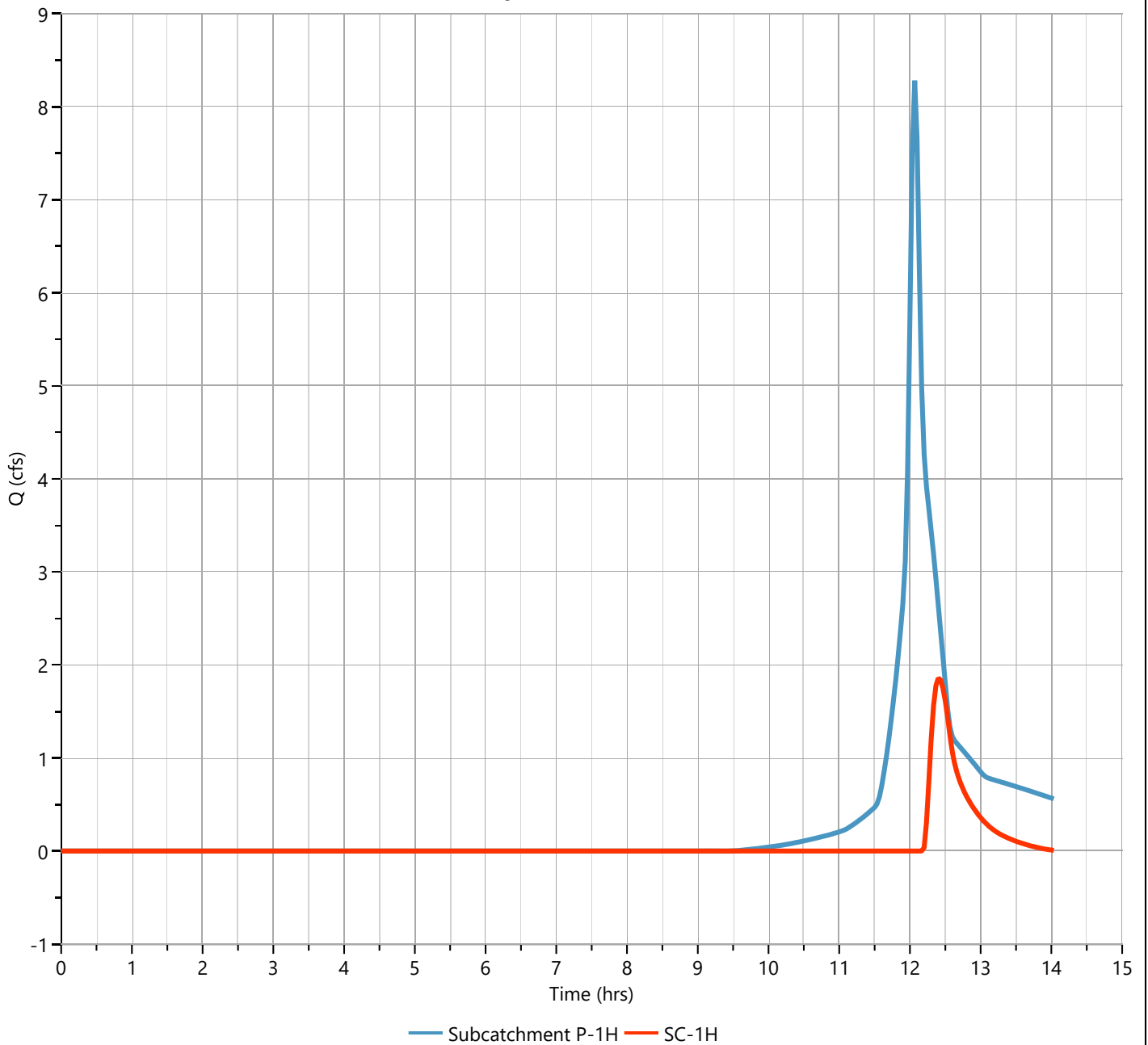
SC-1H

Hyd. No. 35

Hydrograph Type	= Pond Route	Peak Flow	= 1.857 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.40 hrs
Time Interval	= 2 min	Hydrograph Volume	= 3,271 cuft
Inflow Hydrograph	= 34 - Subcatchment P-1H	Max. Elevation	= 220.25 ft
Pond Name	= SC-1H	Max. Storage	= 7,499 cuft

Pond Routing by Storage Indication Method

Qp = 1.86 cfs



Pond Report

Project Name:

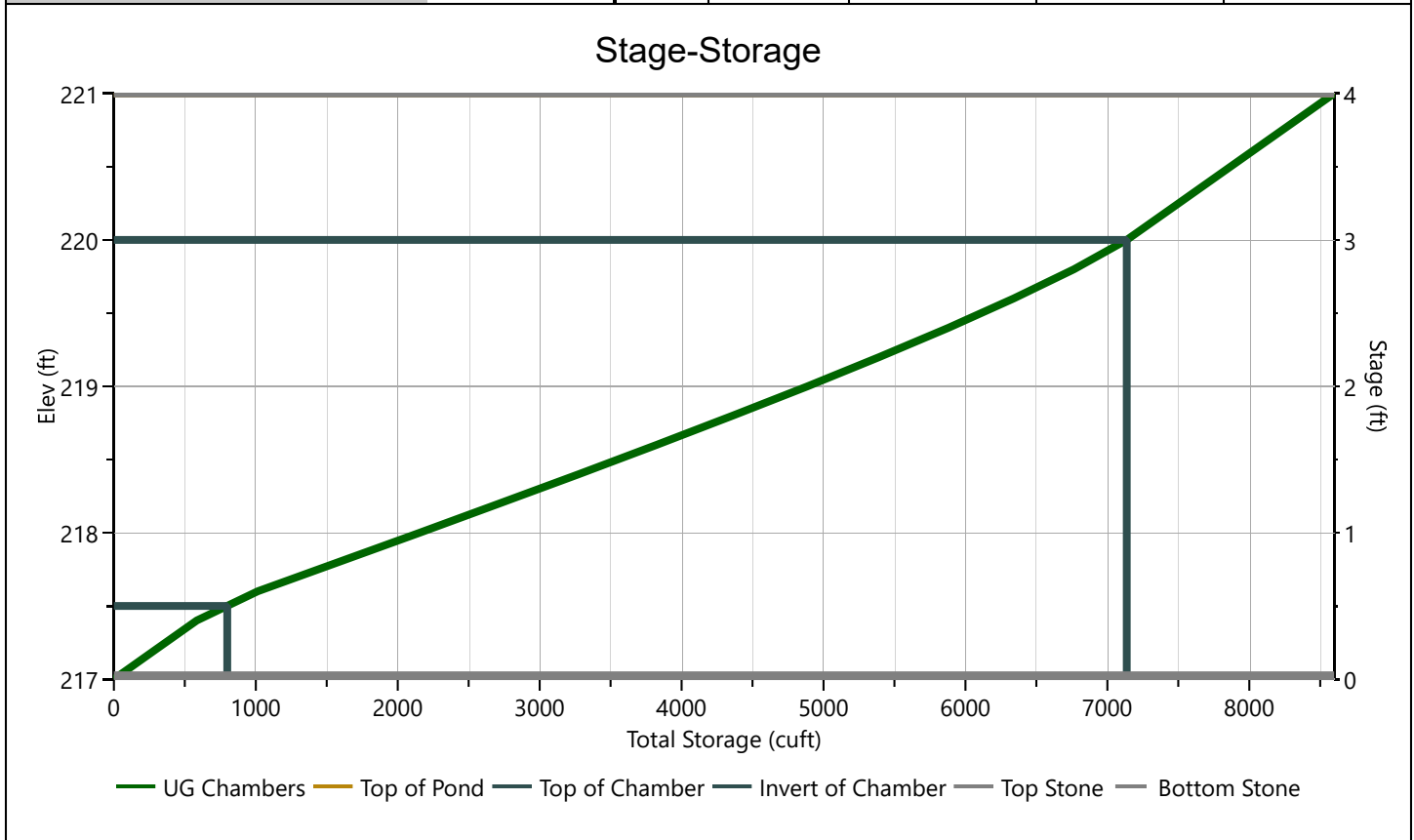
Hydrology Studio v 3.0.0.29

12-13-2023

SC-1H

Stage-Storage

StormTech® SC-740™ Chamber		Stage / Storage Table				
Description	Input	Stage (in)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Chamber Height, in	30	0.0	217.00	3,652	0.000	0.000
Chamber Shape	Arch	2.4	217.20	3,652	292	292
Chamber Width, in	51	4.8	217.40	3,652	292	584
Installed Length, ft	7.12	7.2	217.60	3,652	430	1,014
No. Chambers	100	9.6	217.80	3,652	571	1,585
Bare Chamber Stor, cuft	4,590	12.0	218.00	3,652	569	2,154
No. Rows	10	14.4	218.20	3,652	564	2,718
Space Between Rows, in	6	16.8	218.40	3,652	558	3,276
Stone Above, in	12	19.2	218.60	3,652	549	3,825
Stone Below, in	6	21.6	218.80	3,652	538	4,363
Stone Sides, in	12	24.0	219.00	3,652	524	4,887
Stone Ends, in	12	26.4	219.20	3,652	507	5,394
Encasement Voids, %	40.00	28.8	219.40	3,652	486	5,881
Encasement Bottom Elevation, ft	217.00	31.2	219.60	3,652	460	6,341
		33.6	219.80	3,652	425	6,765
		36.0	220.00	3,652	371	7,137
		38.4	220.20	3,652	292	7,429
		40.8	220.40	3,652	292	7,721
		43.2	220.60	3,652	292	8,013
		45.6	220.80	3,652	292	8,305
		48.0	221.00	3,652	292	8,597



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

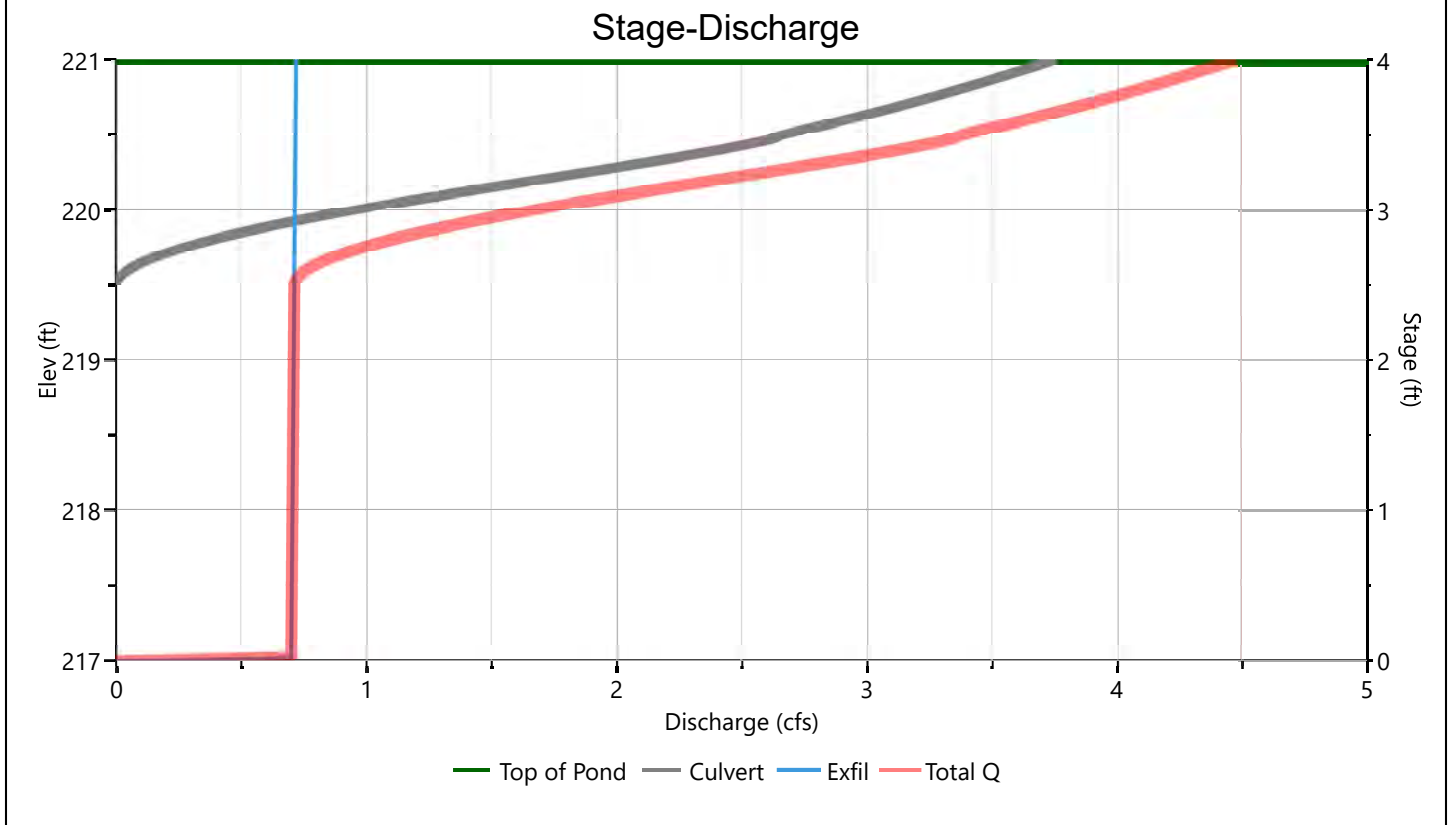
12-13-2023

SC-1H

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in	12				Hole Diameter, in
Span, in	12				No. holes
No. Barrels	1				Invert Elevation, ft
Invert Elevation, ft	219.50				Height, ft
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co
Length, ft	50				
Barrel Slope, %	1				
N-Value, n	0.012				
Weirs	Riser*	Weirs			Ancillary
Shape / Type		1	2	3	Exfiltration, in/hr
Crest Elevation, ft					8.27**
Crest Length, ft					
Angle, deg					
Weir Coefficient, Cw					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

SC-1H

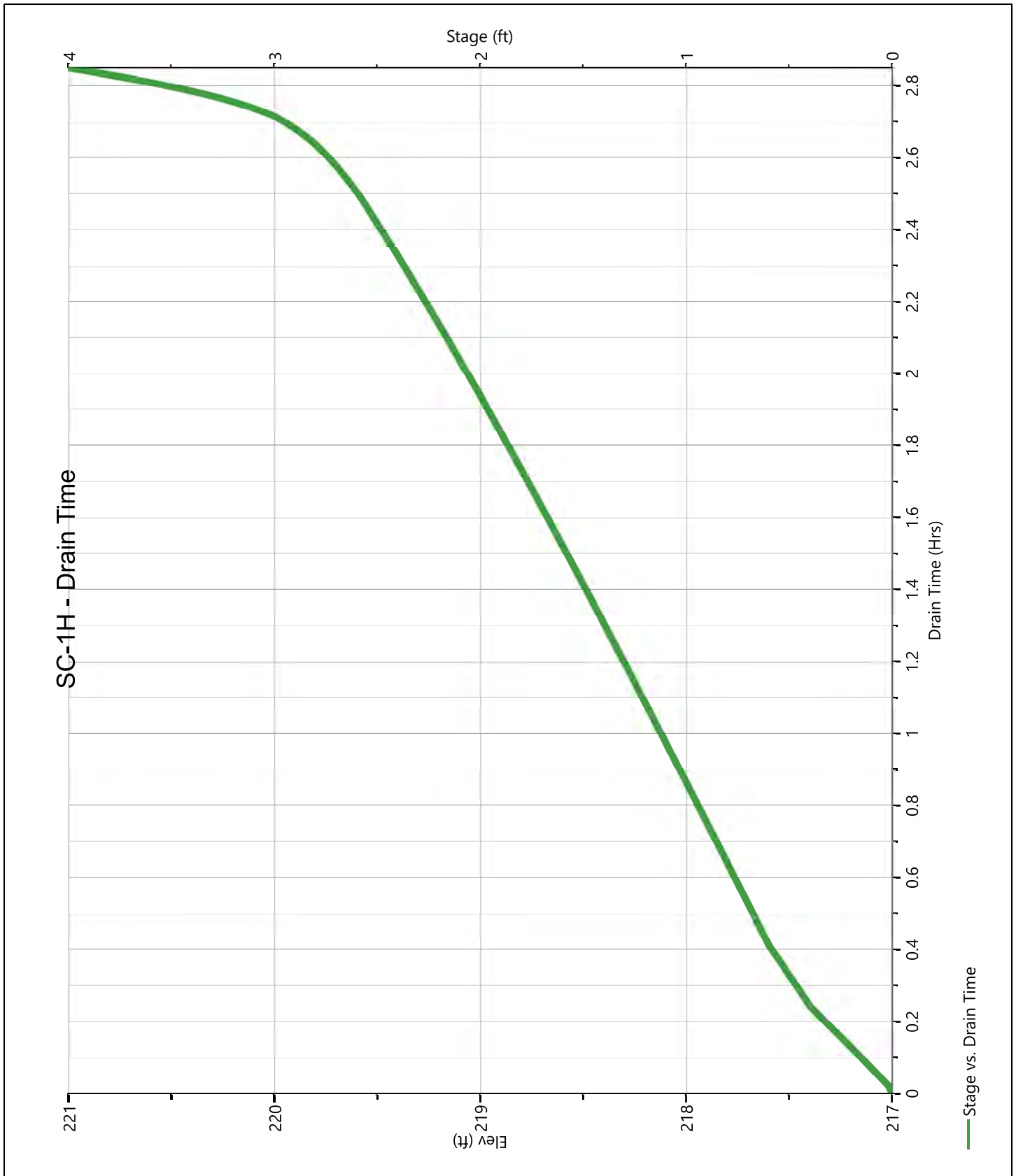
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	217.00	0.000	0.000								0.000		0.000	
0.20	217.20	292	0.000								0.700		0.700	
0.40	217.40	584	0.000								0.701		0.701	
0.60	217.60	1,014	0.000								0.702		0.702	
0.80	217.80	1,585	0.000								0.703		0.703	
1.00	218.00	2,154	0.000								0.704		0.704	
1.20	218.20	2,718	0.000								0.705		0.705	
1.40	218.40	3,276	0.000								0.706		0.706	
1.60	218.60	3,825	0.000								0.707		0.707	
1.80	218.80	4,363	0.000								0.708		0.708	
2.00	219.00	4,887	0.000								0.709		0.709	
2.20	219.20	5,394	0.000								0.710		0.710	
2.40	219.40	5,881	0.000								0.711		0.711	
2.60	219.60	6,341	0.044 ic								0.712		0.756	
2.80	219.80	6,765	0.371 ic								0.713		1.084	
3.00	220.00	7,137	0.945 ic								0.714		1.660	
3.20	220.20	7,429	1.673 ic								0.715		2.388	
3.40	220.40	7,721	2.405 ic								0.716		3.122	
3.60	220.60	8,013	2.907 oc								0.717		3.624	
3.80	220.80	8,305	3.357 oc								0.718		4.075	
4.00	221.00	8,597	3.753 oc								0.719		4.472	

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

SC-1H

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present Developed Subcatchment P-11

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area Acres	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
-	Impervious	98			0.43	41.74
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			0.17	6.53
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					0.59	48.27

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{48.27}{0.59} = 81.34 ; \text{ Use CN} = \boxed{81}$$

2. Runoff

Frequency..... yr
 Rainfall, P (24-hour)..... in
 Runoff, Q..... in
 (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
1.52	3.03	5.62

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one: Present Developed

SUBCATCHMENT P-11

Circle one: Tc Tt through subarea

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	LAWN		
	0.24		
ft	50		
in	3.1		
ft/ft	0.050		
Compute Tt hr	0.10		0.10

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C		
	UNPAVED		
ft	176		
ft/ft	0.05		
ft/s	3.61		
Compute Tt hr	0.01		0.01

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r ft			
ft/ft			
Compute V ft/s			
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.11
min 6.6

Hydrograph Report

Project Name:

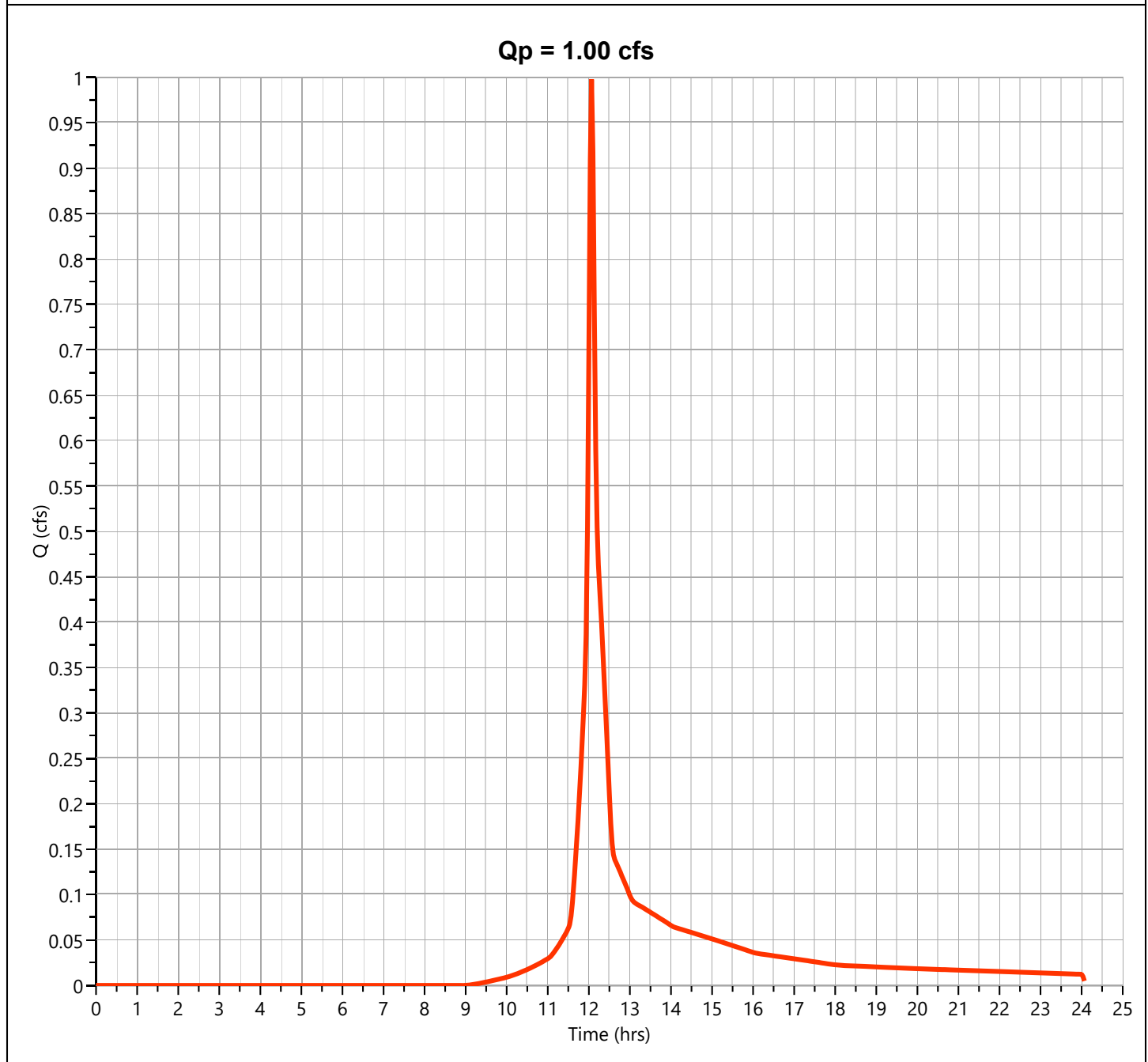
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-11

Hyd. No. 36

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.998 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 2,997 cuft
Drainage Area	= 0.59 ac	Curve Number	= 81
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

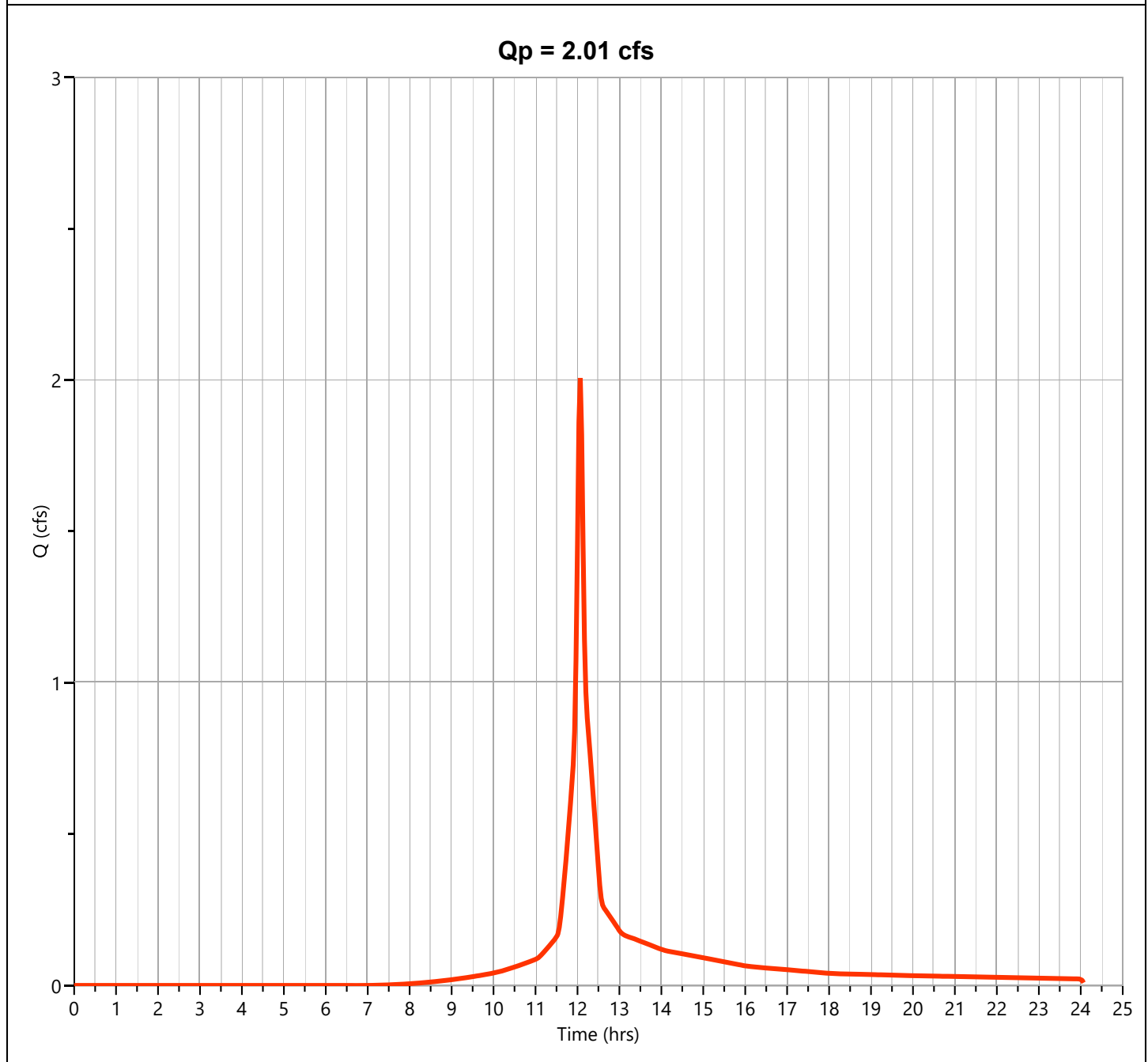
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1I

Hyd. No. 36

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.007 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 6,012 cuft
Drainage Area	= 0.59 ac	Curve Number	= 81
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

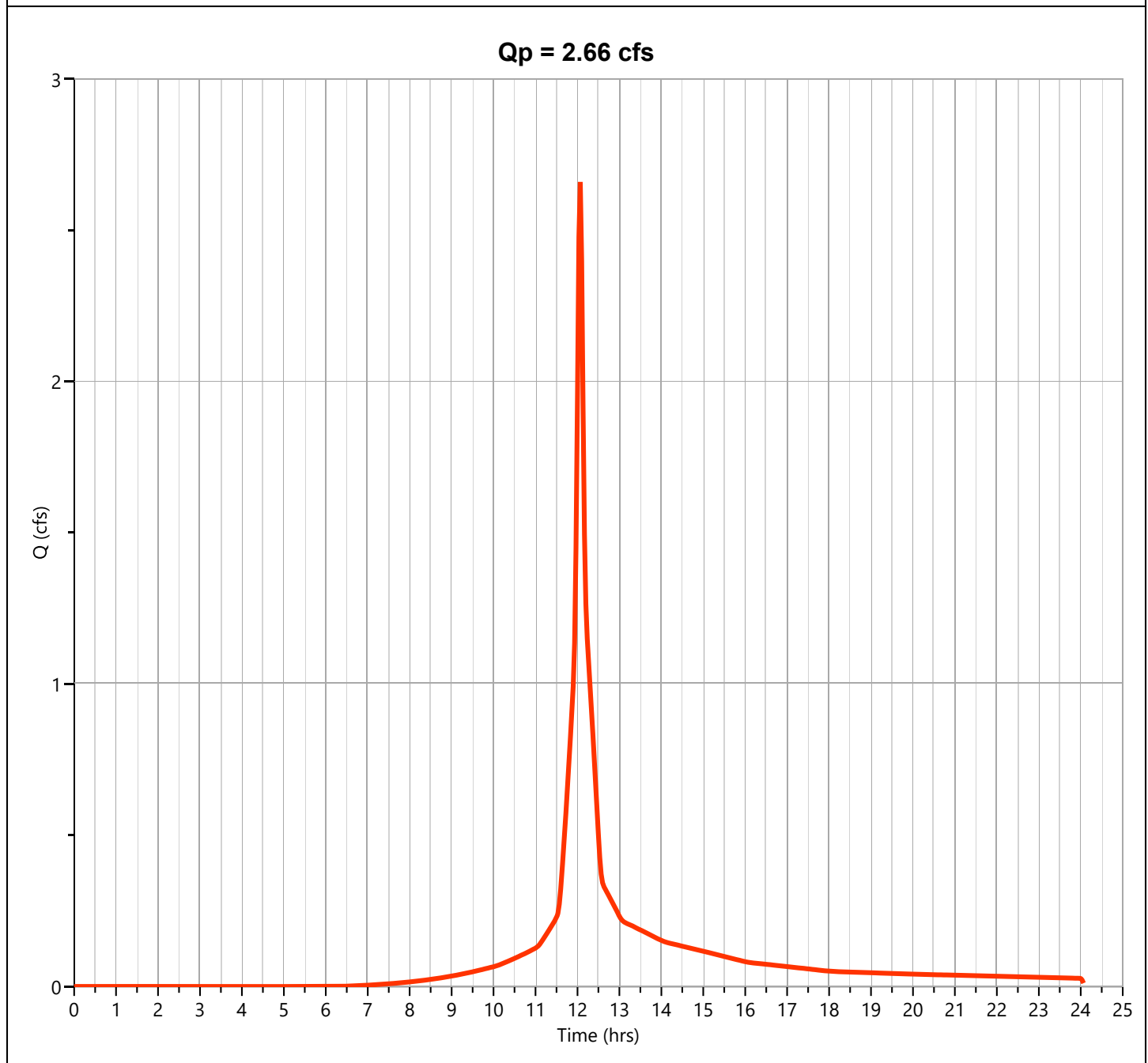
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1I

Hyd. No. 36

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.658 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 8,018 cuft
Drainage Area	= 0.59 ac	Curve Number	= 81
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

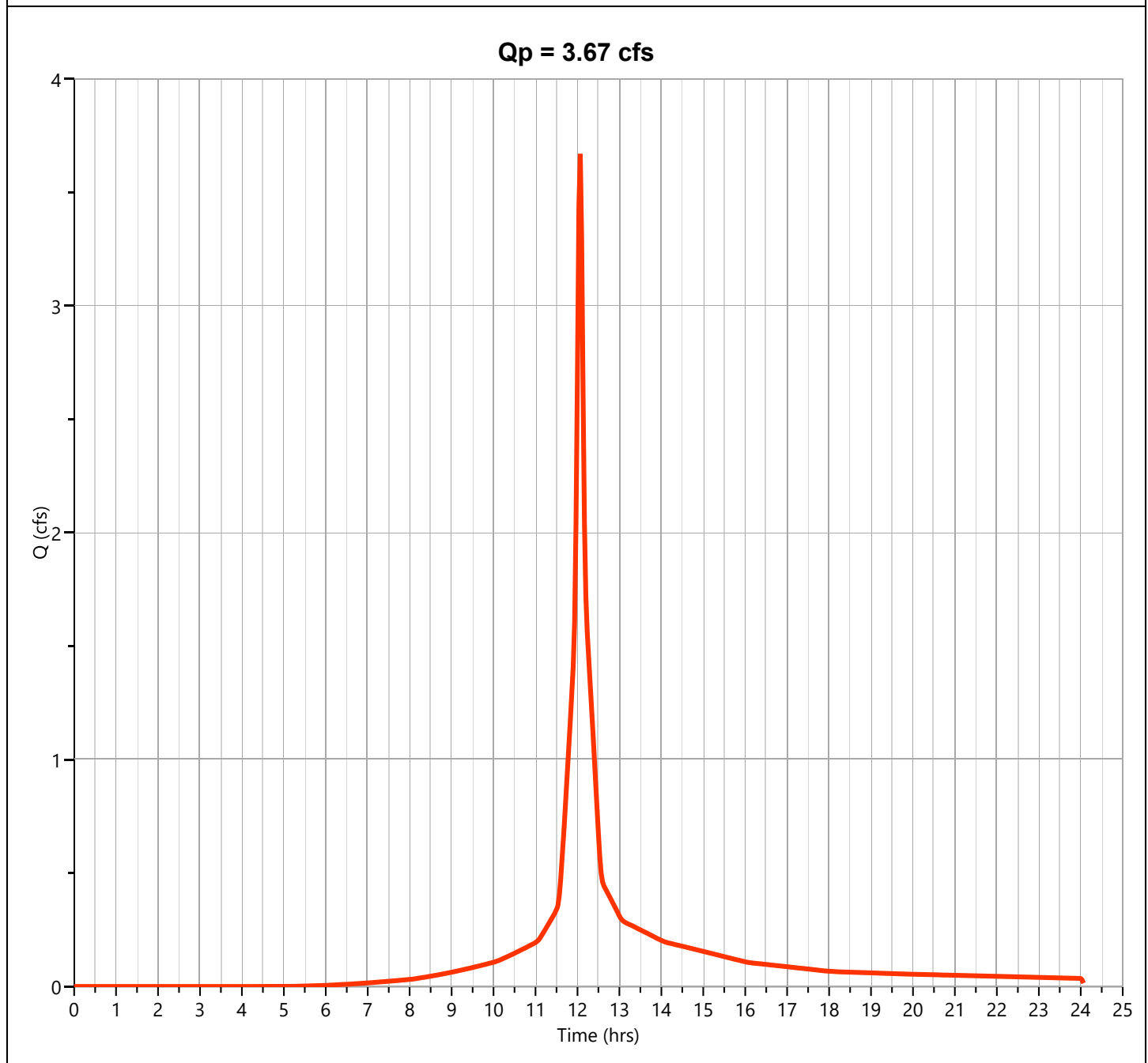
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1I

Hyd. No. 36

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.670 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 11,208 cuft
Drainage Area	= 0.59 ac	Curve Number	= 81
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

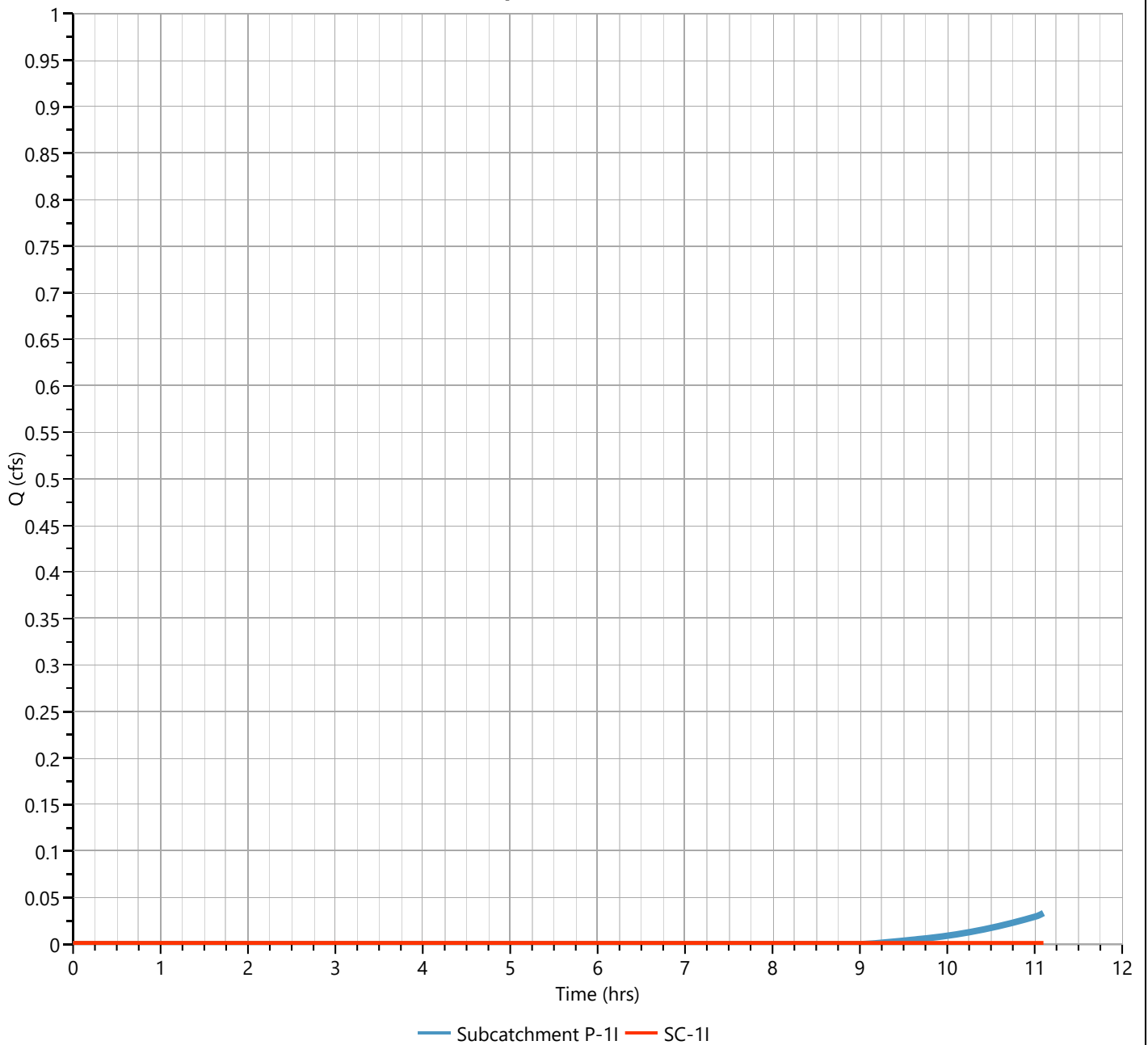
SC-1I

Hyd. No. 37

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 11.07 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 36 - Subcatchment P-1I	Max. Elevation	= 218.37 ft
Pond Name	= SC-1I	Max. Storage	= 1,184 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

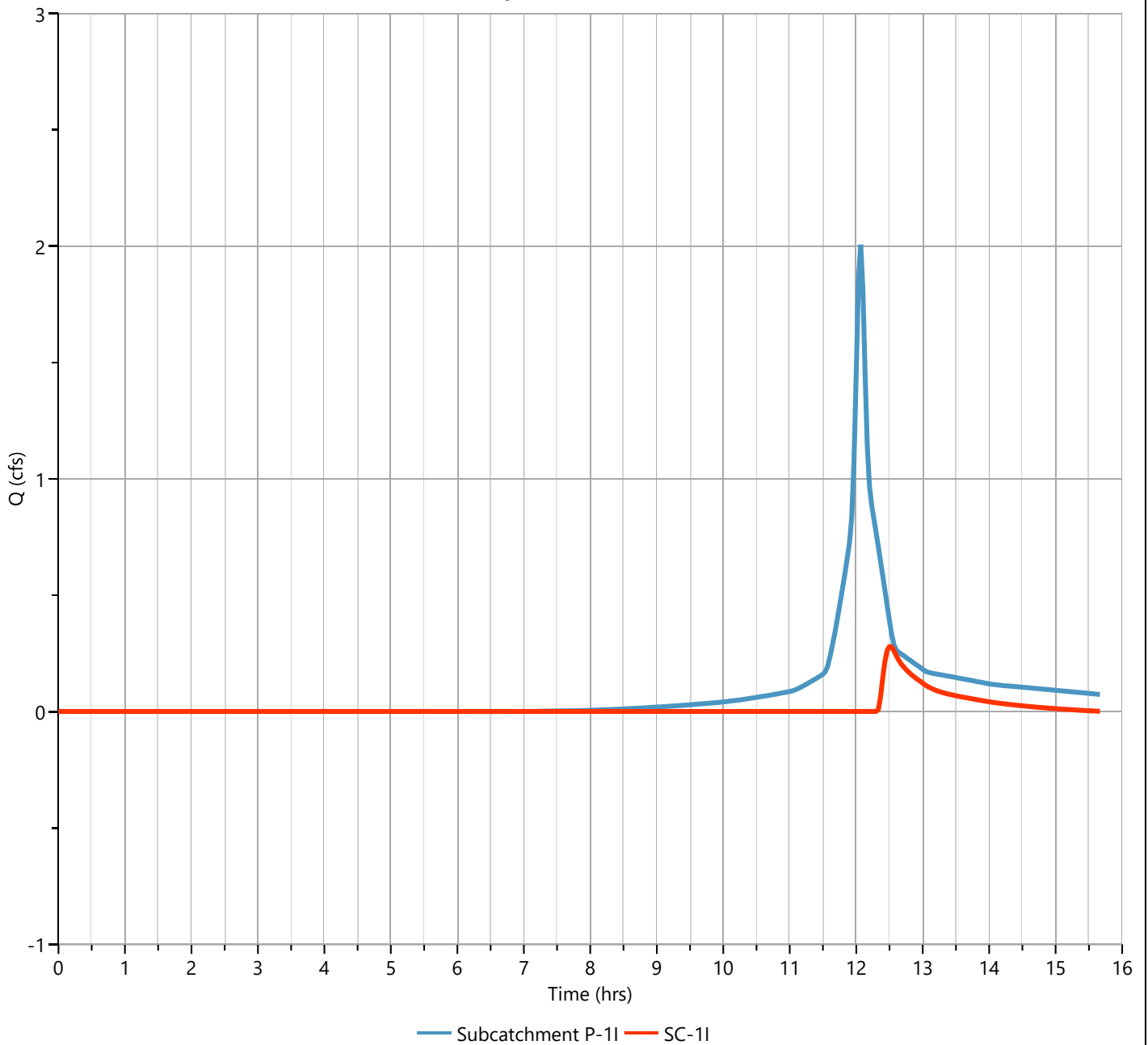
SC-1I

Hyd. No. 37

Hydrograph Type	= Pond Route	Peak Flow	= 0.281 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.50 hrs
Time Interval	= 2 min	Hydrograph Volume	= 806 cuft
Inflow Hydrograph	= 36 - Subcatchment P-1I	Max. Elevation	= 219.76 ft
Pond Name	= SC-1I	Max. Storage	= 2,478 cuft

Pond Routing by Storage Indication Method

Qp = 0.28 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

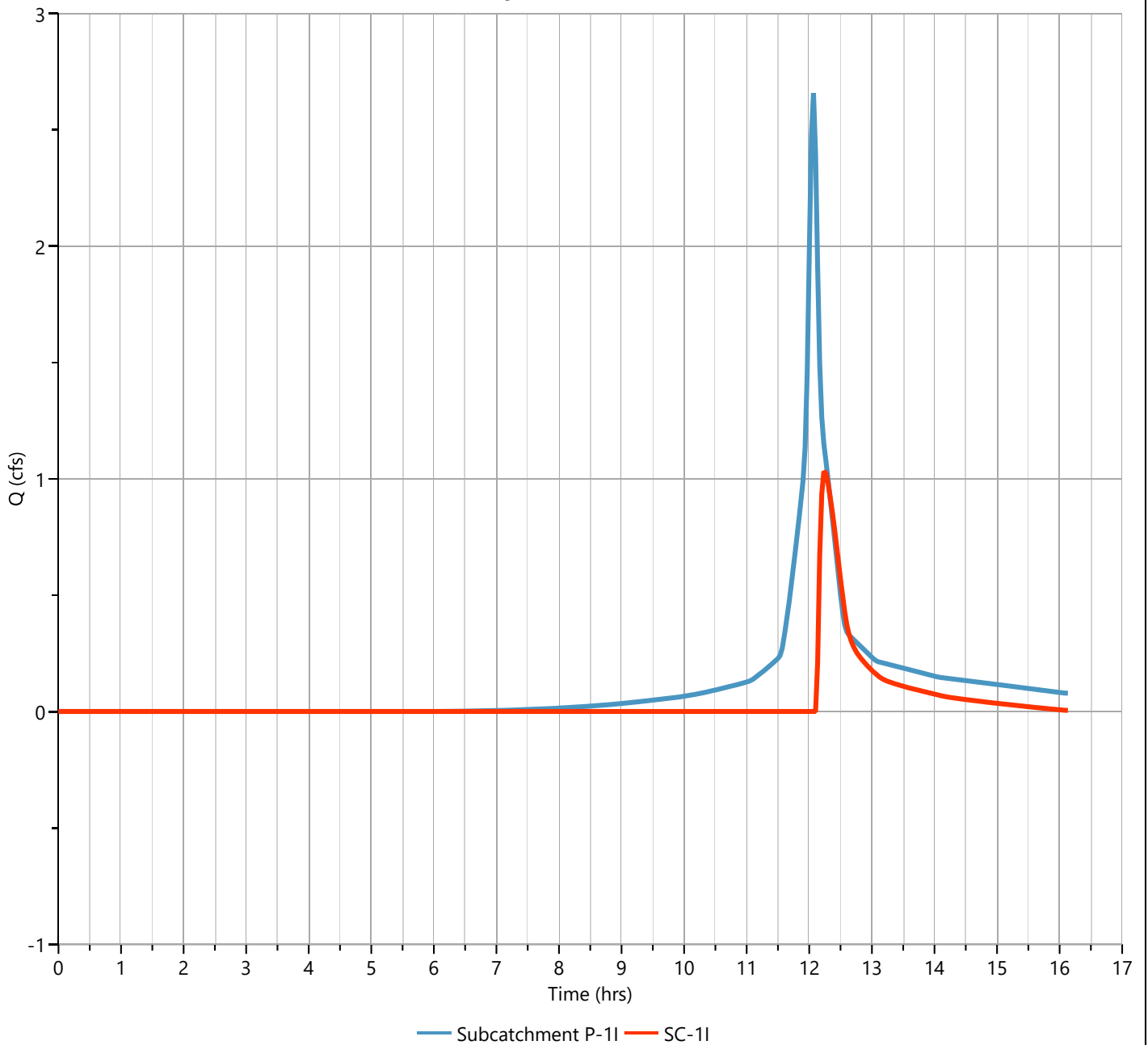
SC-1I

Hyd. No. 37

Hydrograph Type	= Pond Route	Peak Flow	= 1.031 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.23 hrs
Time Interval	= 2 min	Hydrograph Volume	= 2,288 cuft
Inflow Hydrograph	= 36 - Subcatchment P-1I	Max. Elevation	= 220.03 ft
Pond Name	= SC-1I	Max. Storage	= 2,664 cuft

Pond Routing by Storage Indication Method

Qp = 1.03 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

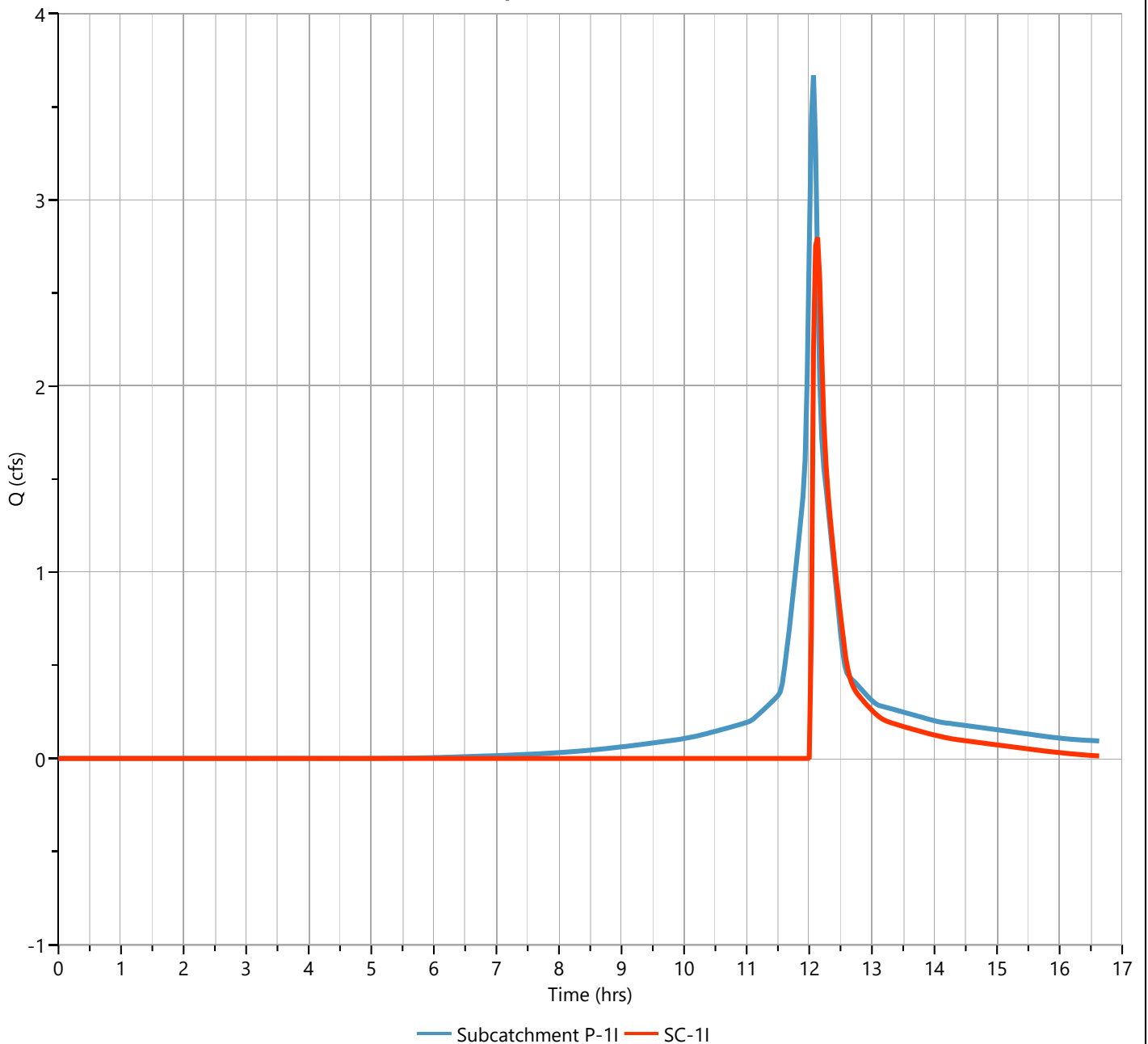
SC-1I

Hyd. No. 37

Hydrograph Type	= Pond Route	Peak Flow	= 2.798 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.13 hrs
Time Interval	= 2 min	Hydrograph Volume	= 4,810 cuft
Inflow Hydrograph	= 36 - Subcatchment P-1I	Max. Elevation	= 220.59 ft
Pond Name	= SC-1I	Max. Storage	= 2,957 cuft

Pond Routing by Storage Indication Method

Qp = 2.80 cfs



Pond Report

Project Name:

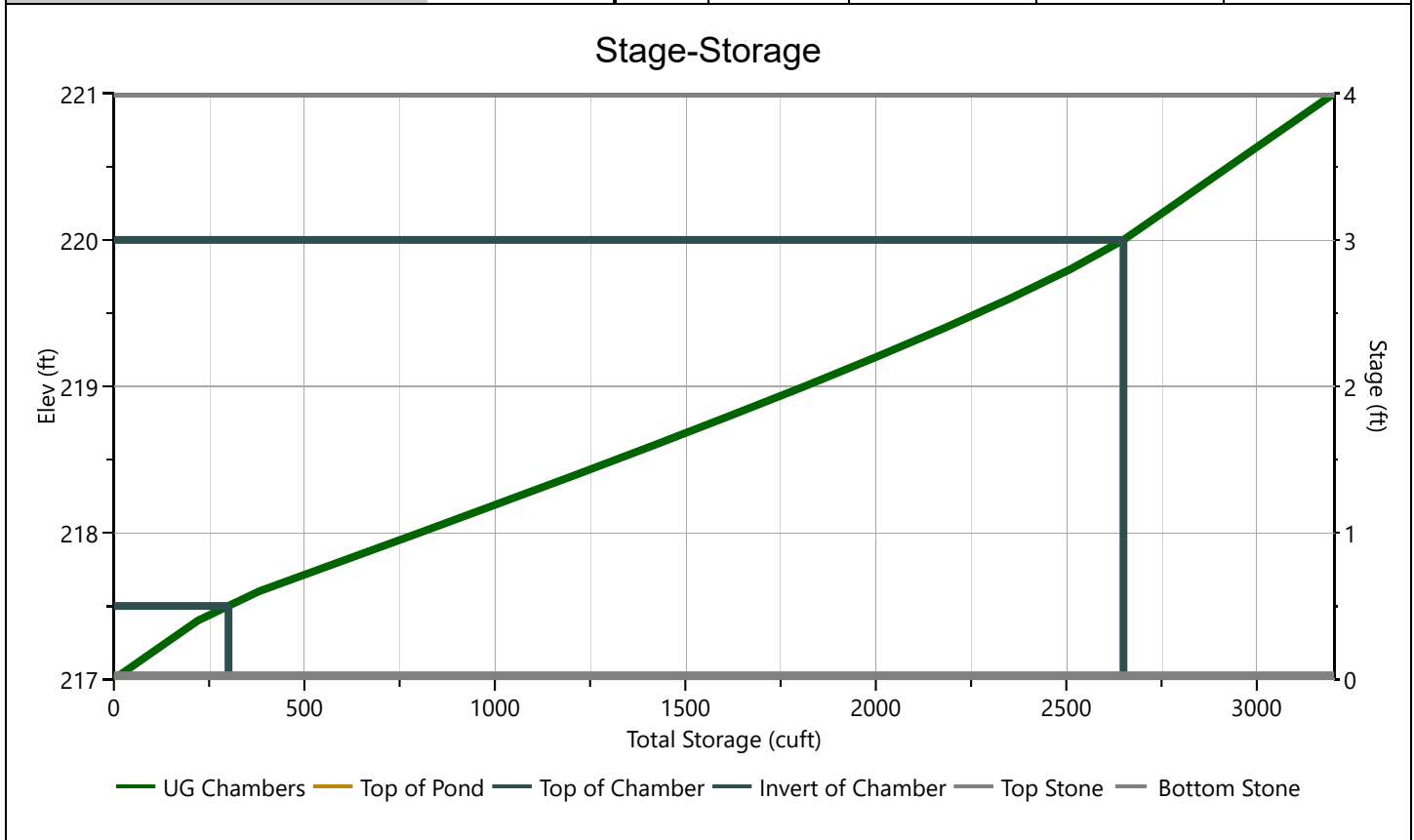
Hydrology Studio v 3.0.0.29

12-13-2023

SC-1I

Stage-Storage

StormTech® SC-740™ Chamber		Stage / Storage Table				
Description	Input	Stage (in)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Chamber Height, in	30	0.0	217.00	1,382	0.000	0.000
Chamber Shape	Arch	2.4	217.20	1,382	111	111
Chamber Width, in	51	4.8	217.40	1,382	111	221
Installed Length, ft	7.12	7.2	217.60	1,382	160	381
No. Chambers	36	9.6	217.80	1,382	211	592
Bare Chamber Stor, cuft	1,652	12.0	218.00	1,382	210	802
No. Rows	4	14.4	218.20	1,382	208	1,011
Space Between Rows, in	6	16.8	218.40	1,382	206	1,217
Stone Above, in	12	19.2	218.60	1,382	203	1,420
Stone Below, in	6	21.6	218.80	1,382	199	1,619
Stone Sides, in	12	24.0	219.00	1,382	194	1,813
Stone Ends, in	12	26.4	219.20	1,382	188	2,001
Encasement Voids, %	40.00	28.8	219.40	1,382	180	2,182
Encasement Bottom Elevation, ft	217.00	31.2	219.60	1,382	171	2,352
		33.6	219.80	1,382	158	2,511
		36.0	220.00	1,382	139	2,650
		38.4	220.20	1,382	111	2,760
		40.8	220.40	1,382	111	2,871
		43.2	220.60	1,382	111	2,981
		45.6	220.80	1,382	111	3,092
		48.0	221.00	1,382	111	3,203



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

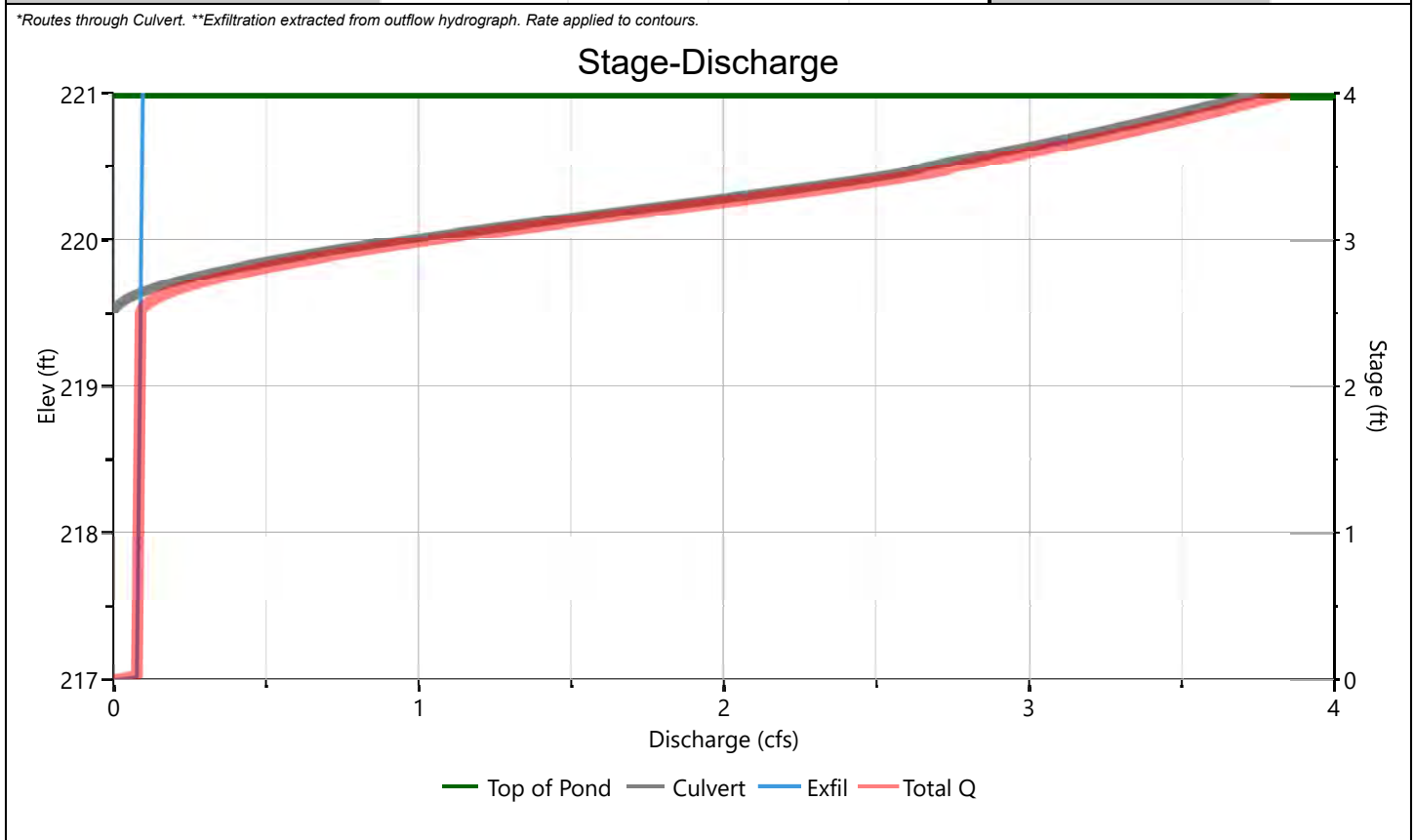
12-13-2023

SC-1I

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in	12				Hole Diameter, in
Span, in	12				No. holes
No. Barrels	1				Invert Elevation, ft
Invert Elevation, ft	219.50				Height, ft
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co
Length, ft	50				
Barrel Slope, %	1				
N-Value, n	0.012				
Weirs	Riser*	Weirs			Ancillary
		1	2	3	
Shape / Type					Exfiltration, in/hr
Crest Elevation, ft					2.41**
Crest Length, ft					
Angle, deg					
Weir Coefficient, Cw					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

SC-1I

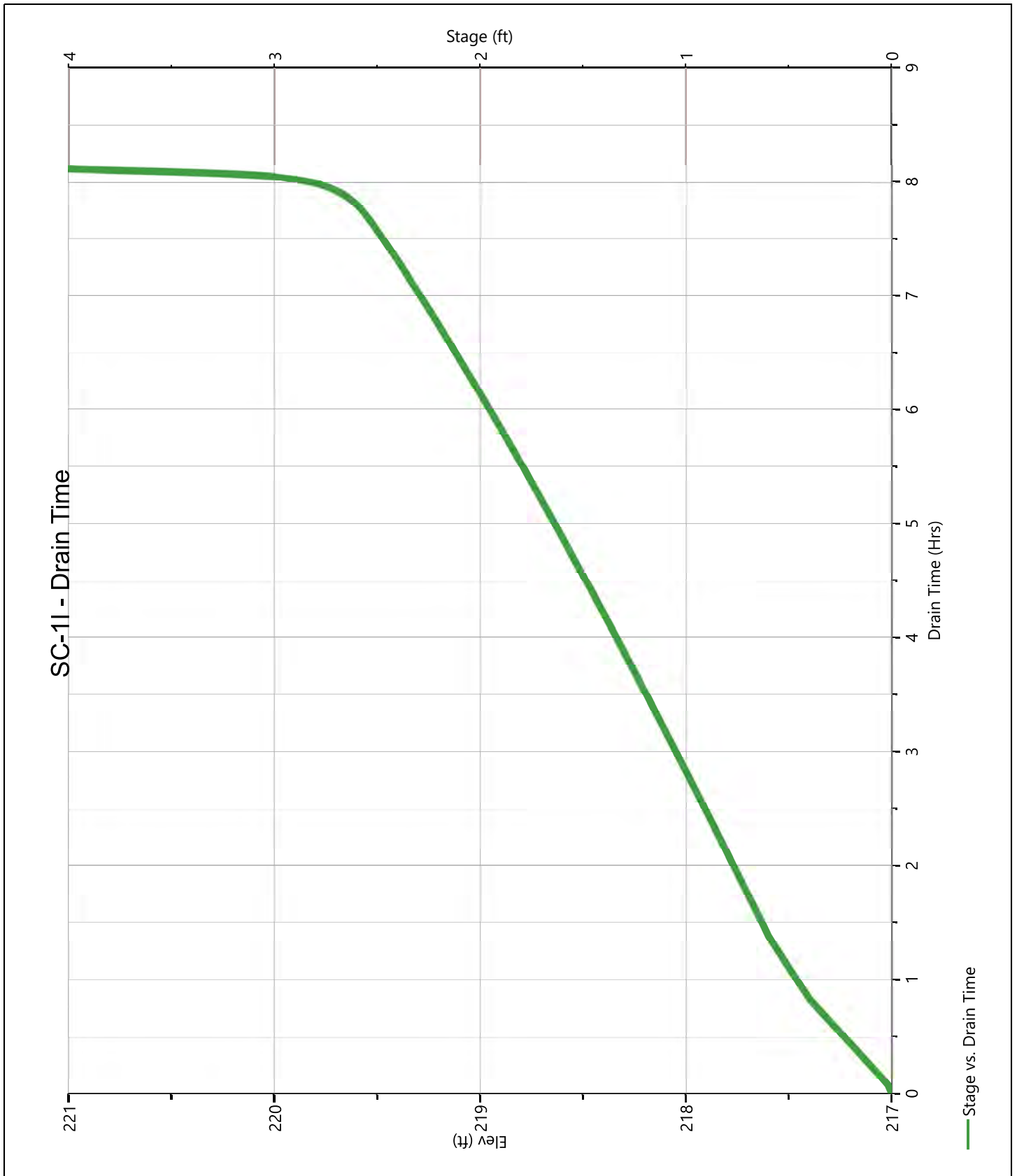
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	217.00	0.000	0.000								0.000		0.000	
0.20	217.20	111	0.000								0.078		0.078	
0.40	217.40	221	0.000								0.079		0.079	
0.60	217.60	381	0.000								0.080		0.080	
0.80	217.80	592	0.000								0.081		0.081	
1.00	218.00	802	0.000								0.082		0.082	
1.20	218.20	1,011	0.000								0.083		0.083	
1.40	218.40	1,217	0.000								0.084		0.084	
1.60	218.60	1,420	0.000								0.085		0.085	
1.80	218.80	1,619	0.000								0.086		0.086	
2.00	219.00	1,813	0.000								0.087		0.087	
2.20	219.20	2,001	0.000								0.088		0.088	
2.40	219.40	2,182	0.000								0.089		0.089	
2.60	219.60	2,352	0.044 ic								0.090		0.134	
2.80	219.80	2,511	0.371 ic								0.091		0.462	
3.00	220.00	2,650	0.945 ic								0.092		1.038	
3.20	220.20	2,760	1.673 ic								0.093		1.766	
3.40	220.40	2,871	2.405 ic								0.094		2.499	
3.60	220.60	2,981	2.907 oc								0.095		3.002	
3.80	220.80	3,092	3.357 oc								0.096		3.453	
4.00	221.00	3,203	3.753 oc								0.097		3.850	

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

SC-1I

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-1J

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.48	46.83
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			0.14	5.36
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					0.62	52.19

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{52.19}{0.62} = 84.83 ; \text{ Use CN} = \boxed{85}$$

2. Runoff

Frequency..... yr

Rainfall, P (24-hour)..... in

Runoff, Q..... in

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
1.77	3.36	6.03

Hydrograph Report

Project Name:

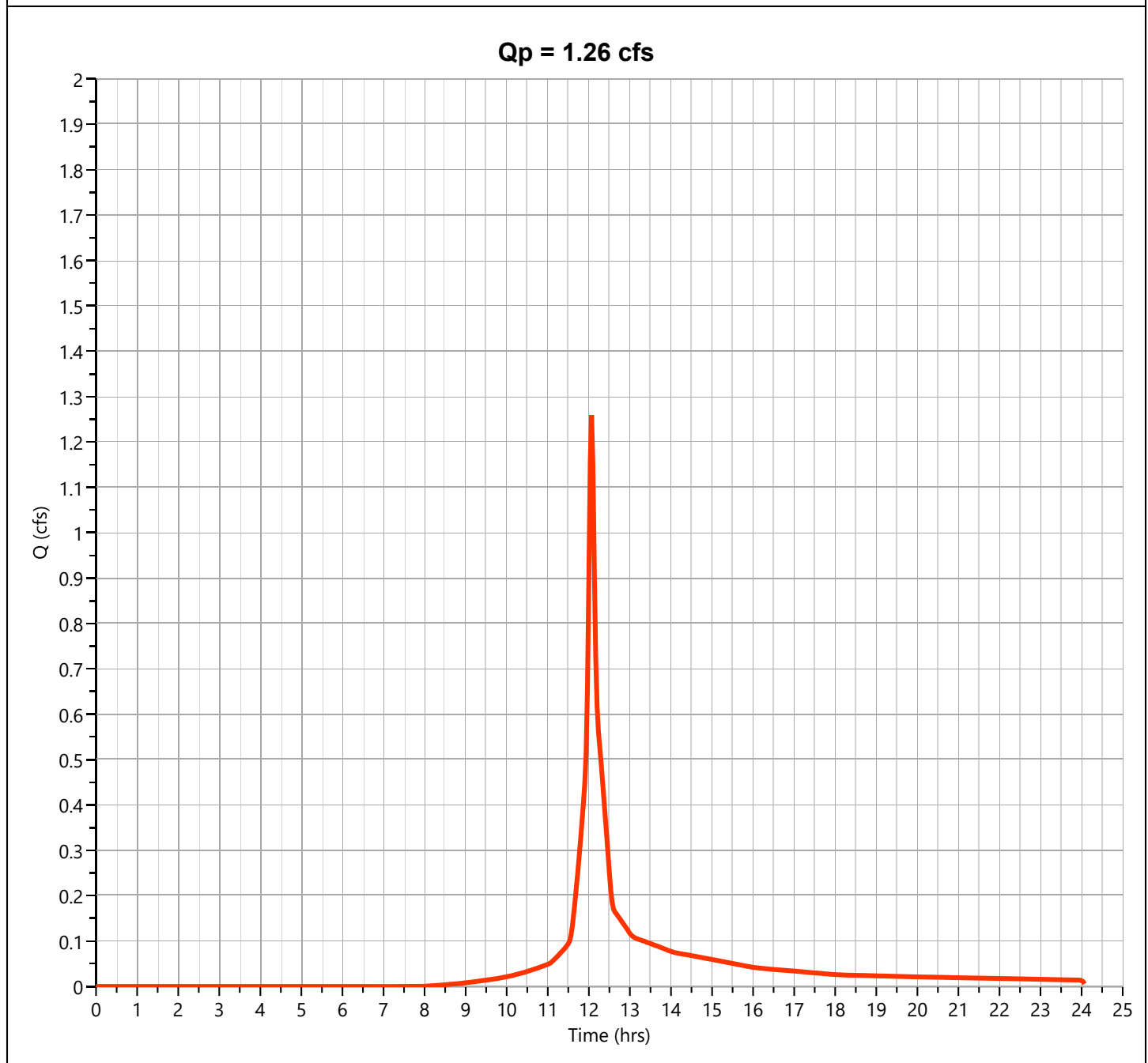
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-1J

Hyd. No. 38

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.259 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 3,763 cuft
Drainage Area	= 0.62 ac	Curve Number	= 85
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

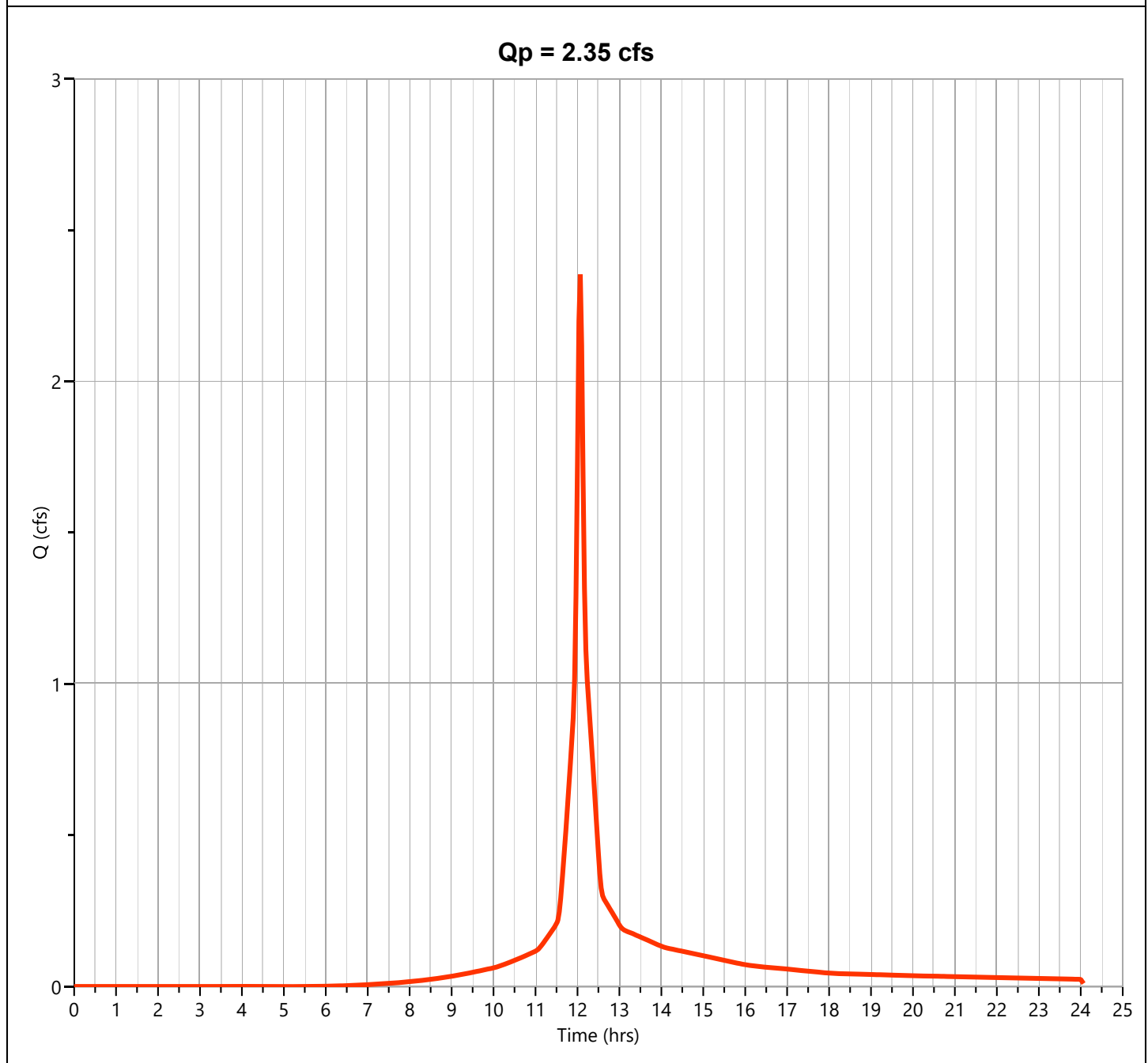
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-1J

Hyd. No. 38

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.354 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 7,126 cuft
Drainage Area	= 0.62 ac	Curve Number	= 85
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

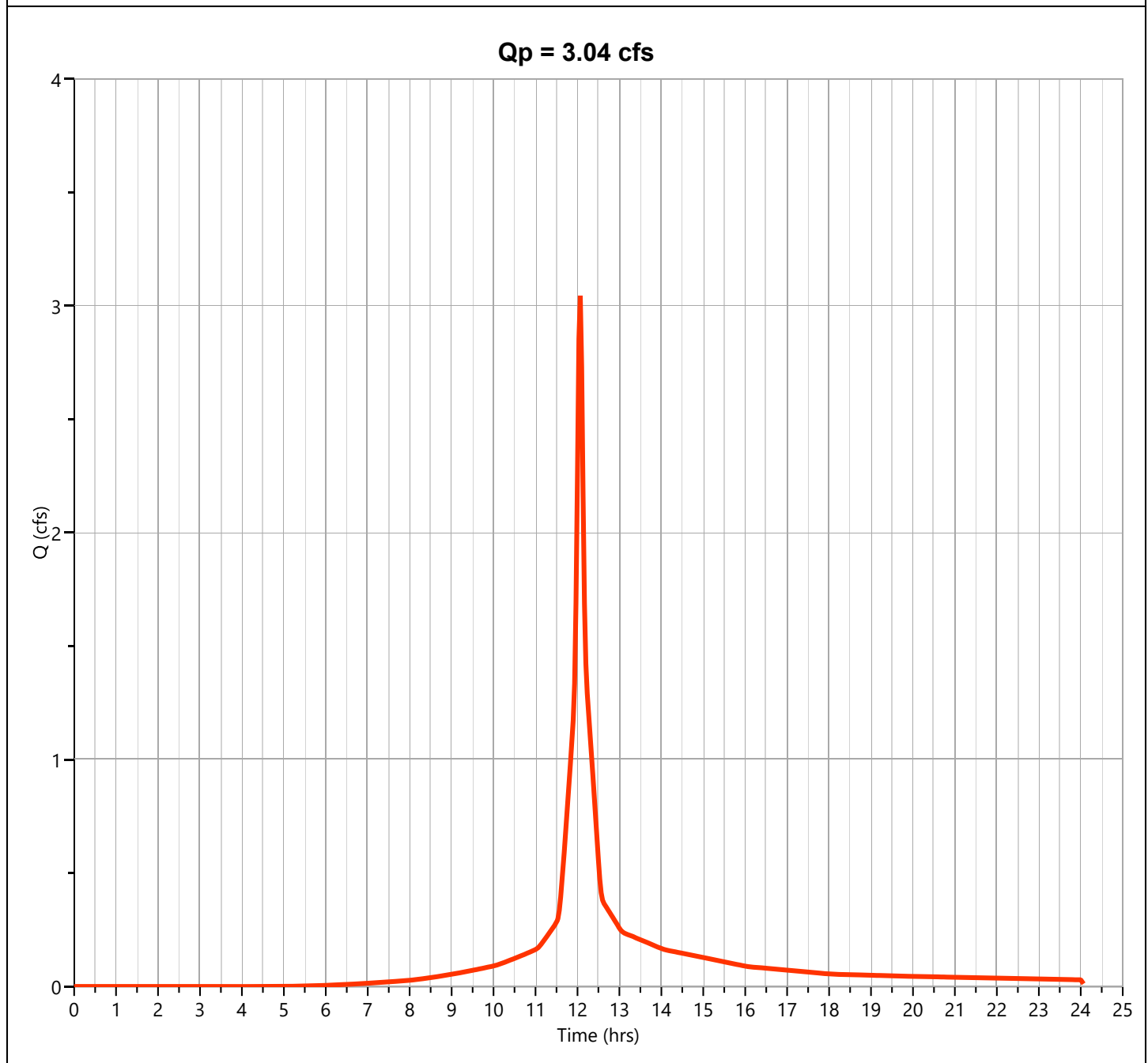
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-1J

Hyd. No. 38

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.044 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 9,317 cuft
Drainage Area	= 0.62 ac	Curve Number	= 85
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

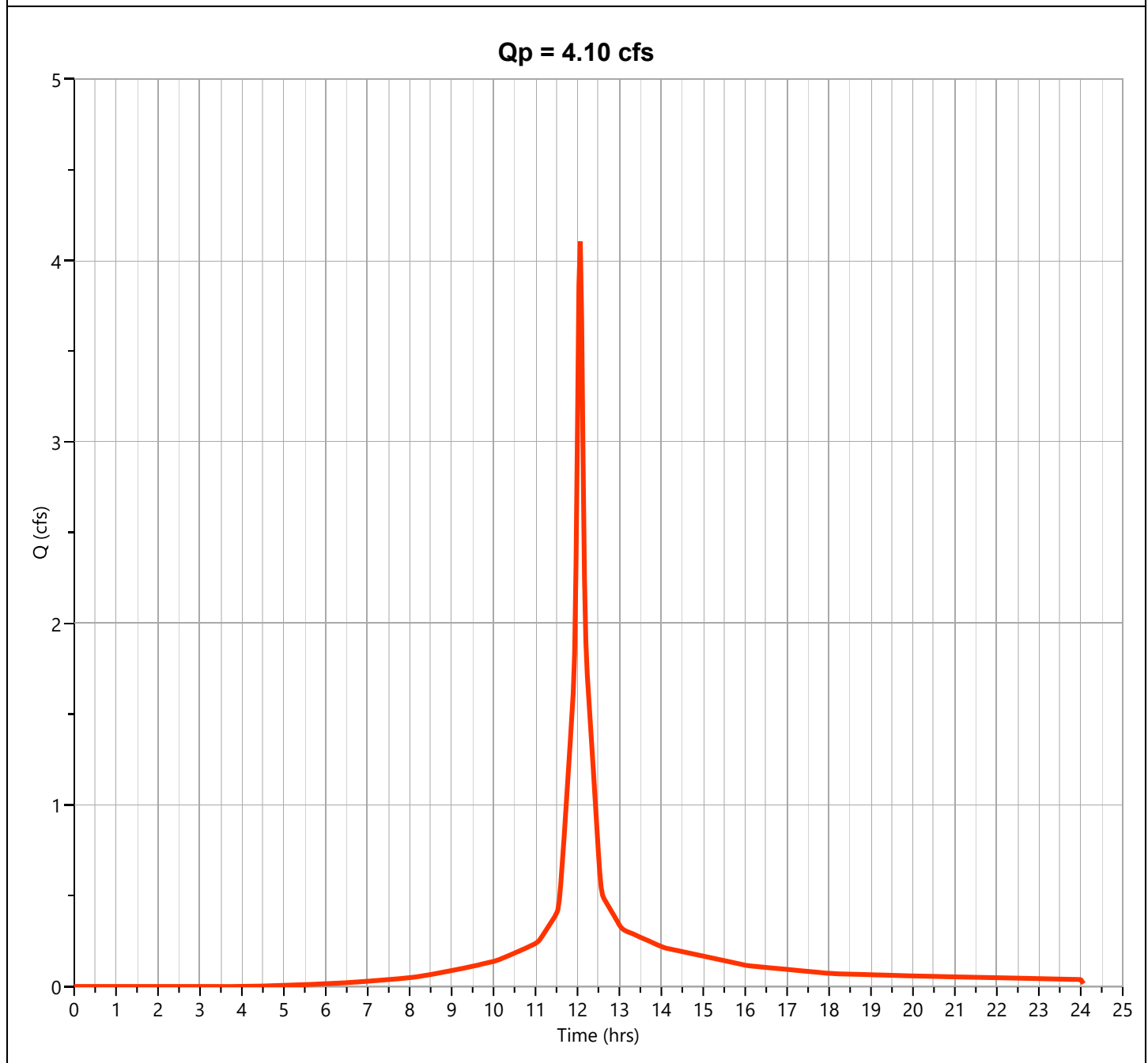
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-1J

Hyd. No. 38

Hydrograph Type	= NRCS Runoff	Peak Flow	= 4.104 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 12,764 cuft
Drainage Area	= 0.62 ac	Curve Number	= 85
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

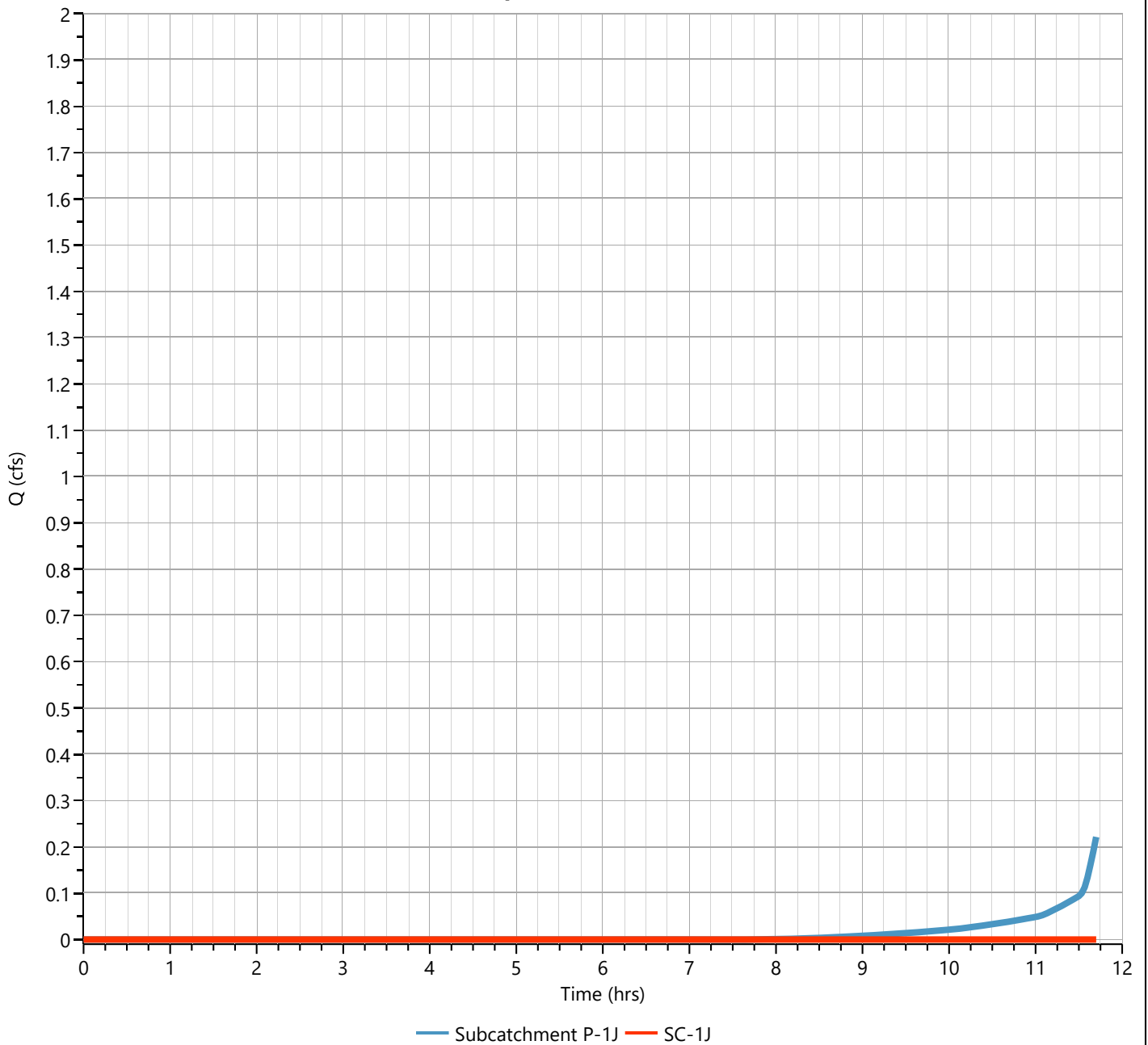
SC-1J

Hyd. No. 39

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 11.67 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 38 - Subcatchment P-1J	Max. Elevation	= 222.22 ft
Pond Name	= SC-1J	Max. Storage	= 675 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

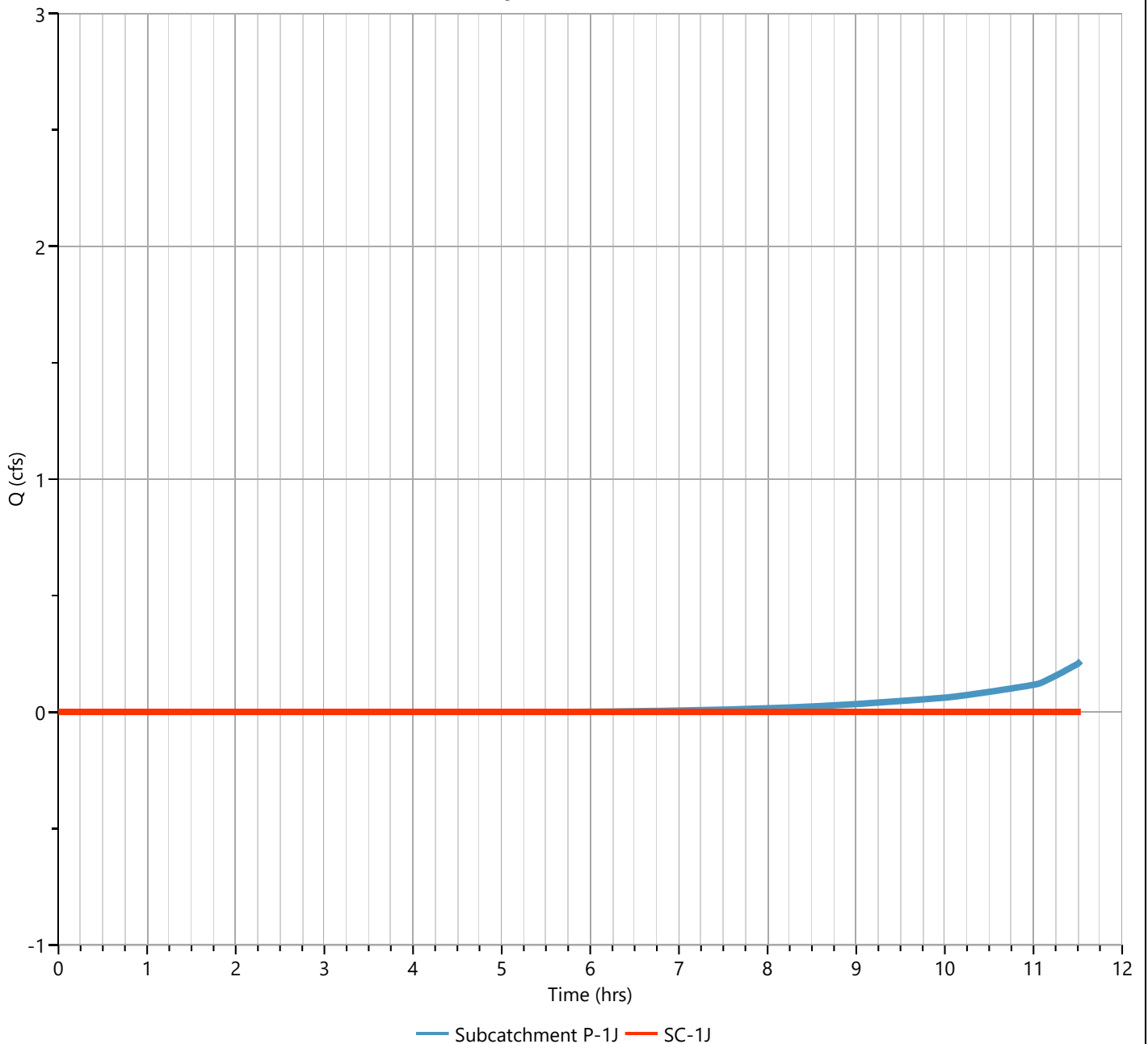
SC-1J

Hyd. No. 39

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 11.47 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 38 - Subcatchment P-1J	Max. Elevation	= 223.22 ft
Pond Name	= SC-1J	Max. Storage	= 2,076 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

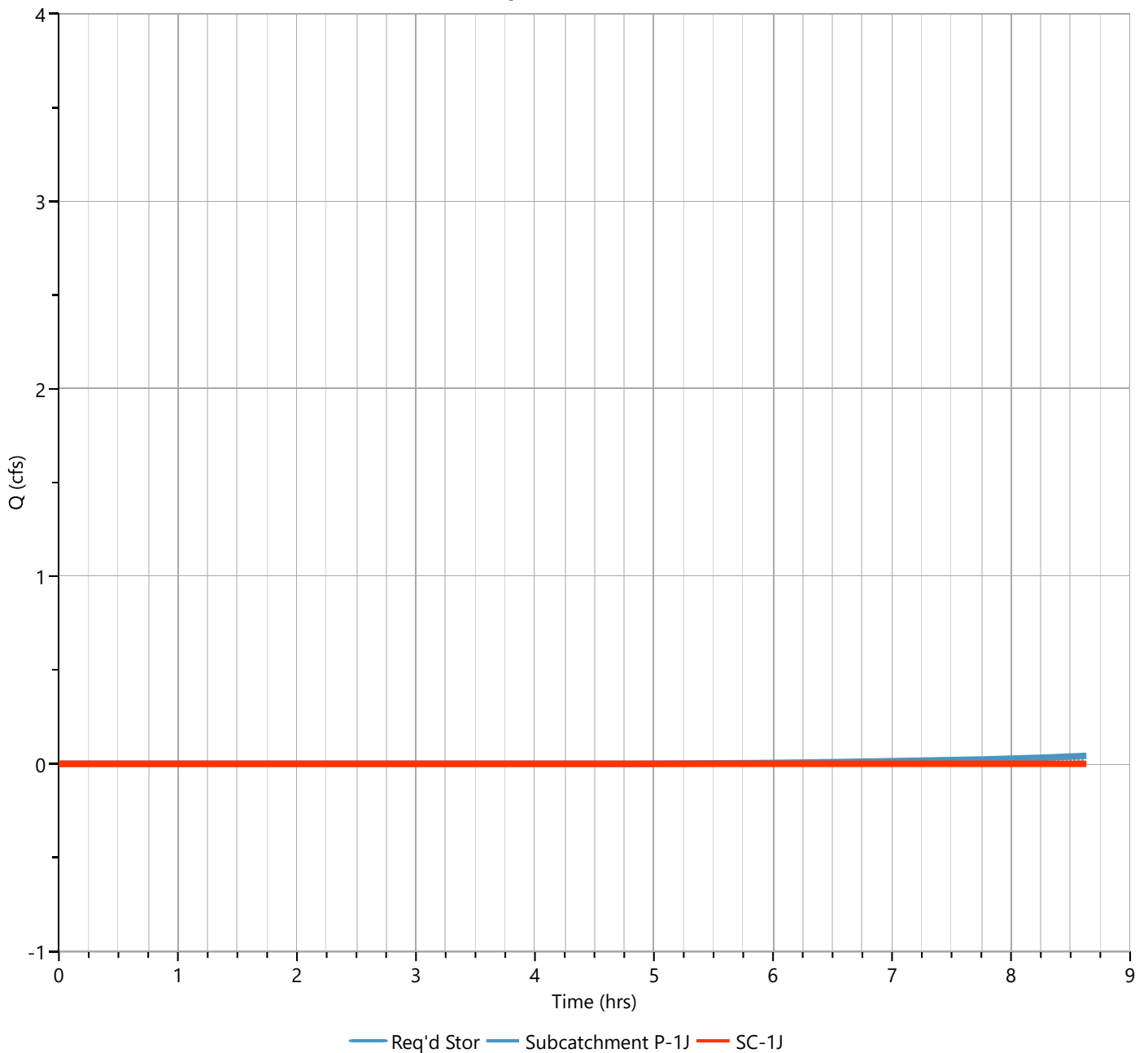
SC-1J

Hyd. No. 39

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 8.60 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 38 - Subcatchment P-1J	Max. Elevation	= 224.00 ft
Pond Name	= SC-1J	Max. Storage	= 3,050 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

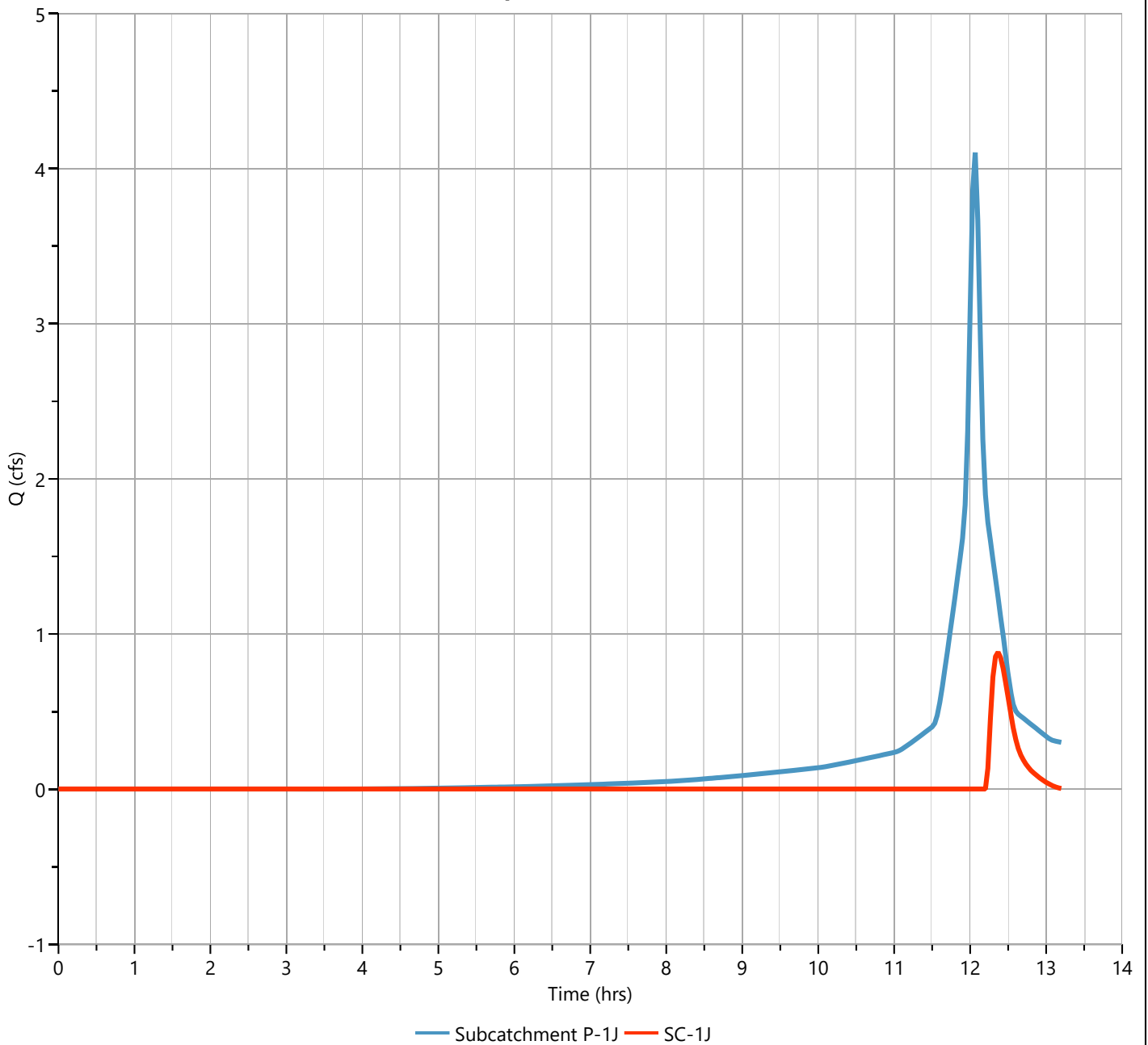
SC-1J

Hyd. No. 39

Hydrograph Type	= Pond Route	Peak Flow	= 0.883 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Hydrograph Volume	= 1,054 cuft
Inflow Hydrograph	= 38 - Subcatchment P-1J	Max. Elevation	= 224.98 ft
Pond Name	= SC-1J	Max. Storage	= 3,922 cuft

Pond Routing by Storage Indication Method

Qp = 0.88 cfs



Pond Report

Project Name:

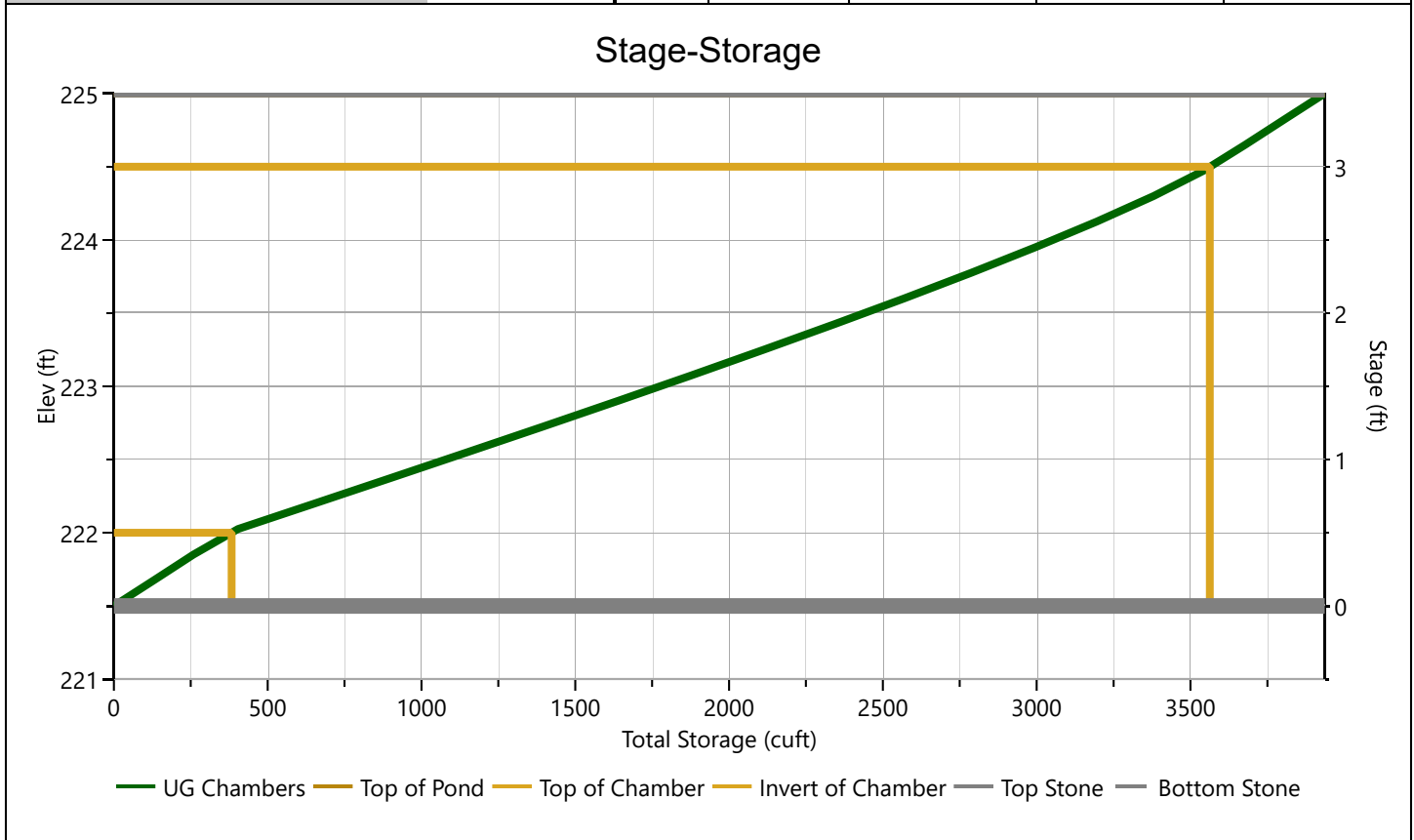
Hydrology Studio v 3.0.0.29

12-14-2023

SC-1J

Stage-Storage

StormTech® SC-740™ Chamber		Stage / Storage Table				
Description	Input	Stage (in)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Chamber Height, in	30	0.0	221.50	1,848	0.000	0.000
Chamber Shape	Arch	2.1	221.68	1,848	129	129
Chamber Width, in	51	4.2	221.85	1,848	129	259
Installed Length, ft	7.12	6.3	222.03	1,848	145	404
No. Chambers	49	8.4	222.20	1,848	249	653
Bare Chamber Stor, cuft	2,249	10.5	222.38	1,848	249	902
No. Rows	7	12.6	222.55	1,848	247	1,149
Space Between Rows, in	6	14.7	222.73	1,848	245	1,395
Stone Above, in	6	16.8	222.90	1,848	243	1,638
Stone Below, in	6	18.9	223.08	1,848	240	1,877
Stone Sides, in	12	21.0	223.25	1,848	236	2,113
Stone Ends, in	12	23.1	223.43	1,848	231	2,344
Encasement Voids, %	40.00	25.2	223.60	1,848	225	2,569
Encasement Bottom Elevation, ft	221.50	27.3	223.78	1,848	218	2,787
		29.4	223.95	1,848	209	2,996
		31.5	224.13	1,848	199	3,195
		33.6	224.30	1,848	185	3,380
		35.7	224.48	1,848	164	3,544
		37.8	224.65	1,848	134	3,678
		39.9	224.83	1,848	129	3,807
		42.0	225.00	1,848	129	3,936



— UG Chambers
 — Top of Pond
 — Top of Chamber
 — Invert of Chamber
 — Top Stone
 — Bottom Stone

Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

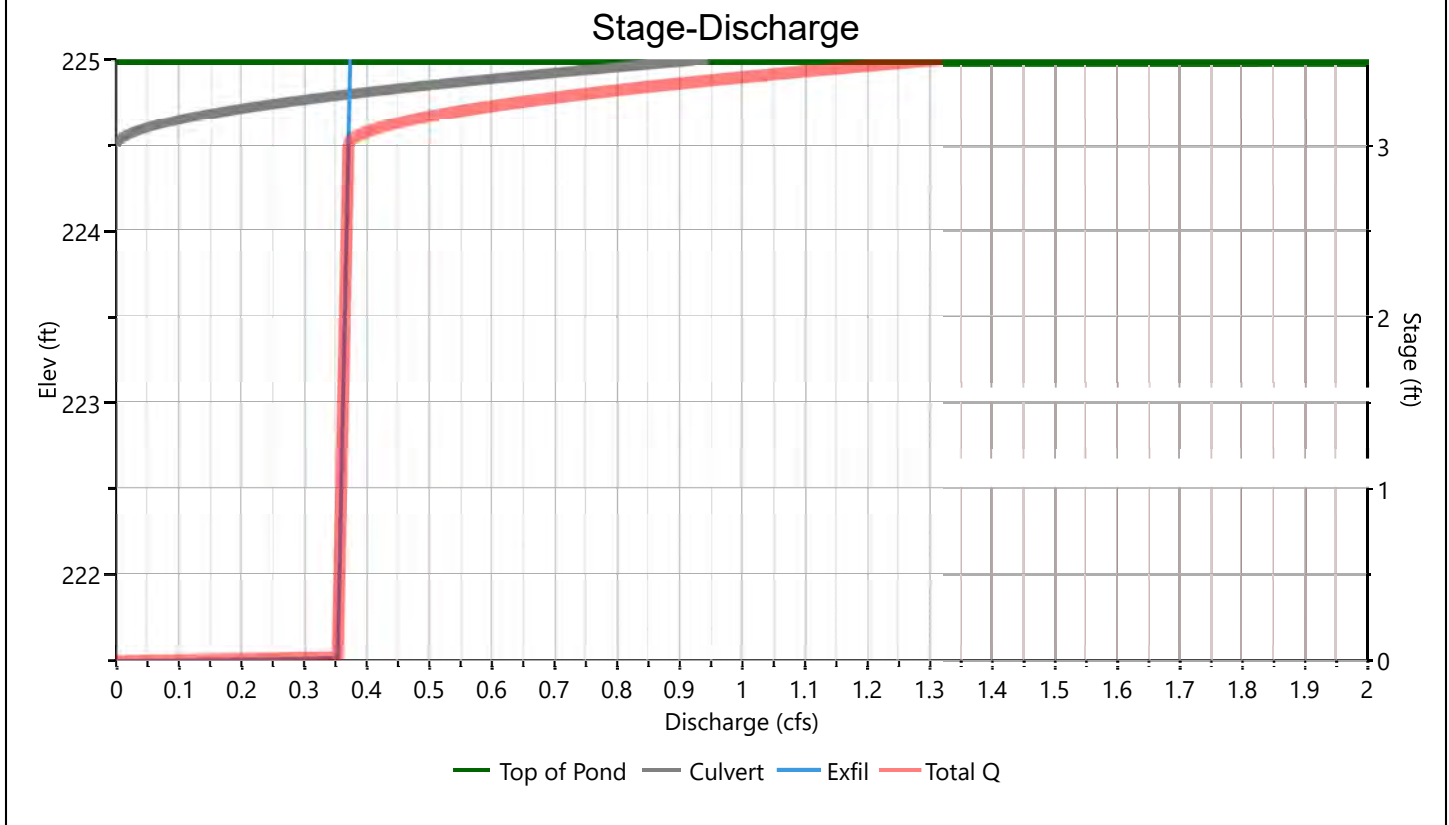
12-14-2023

SC-1J

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in	12				Hole Diameter, in
Span, in	12				No. holes
No. Barrels	1				Invert Elevation, ft
Invert Elevation, ft	224.50				Height, ft
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co
Length, ft	49				
Barrel Slope, %	7.2				
N-Value, n	0.012				
Weirs	Riser*	Weirs			Ancillary
		1	2	3	
Shape / Type					Exfiltration, in/hr
Crest Elevation, ft					8.27**
Crest Length, ft					
Angle, deg					
Weir Coefficient, Cw					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

SC-1J

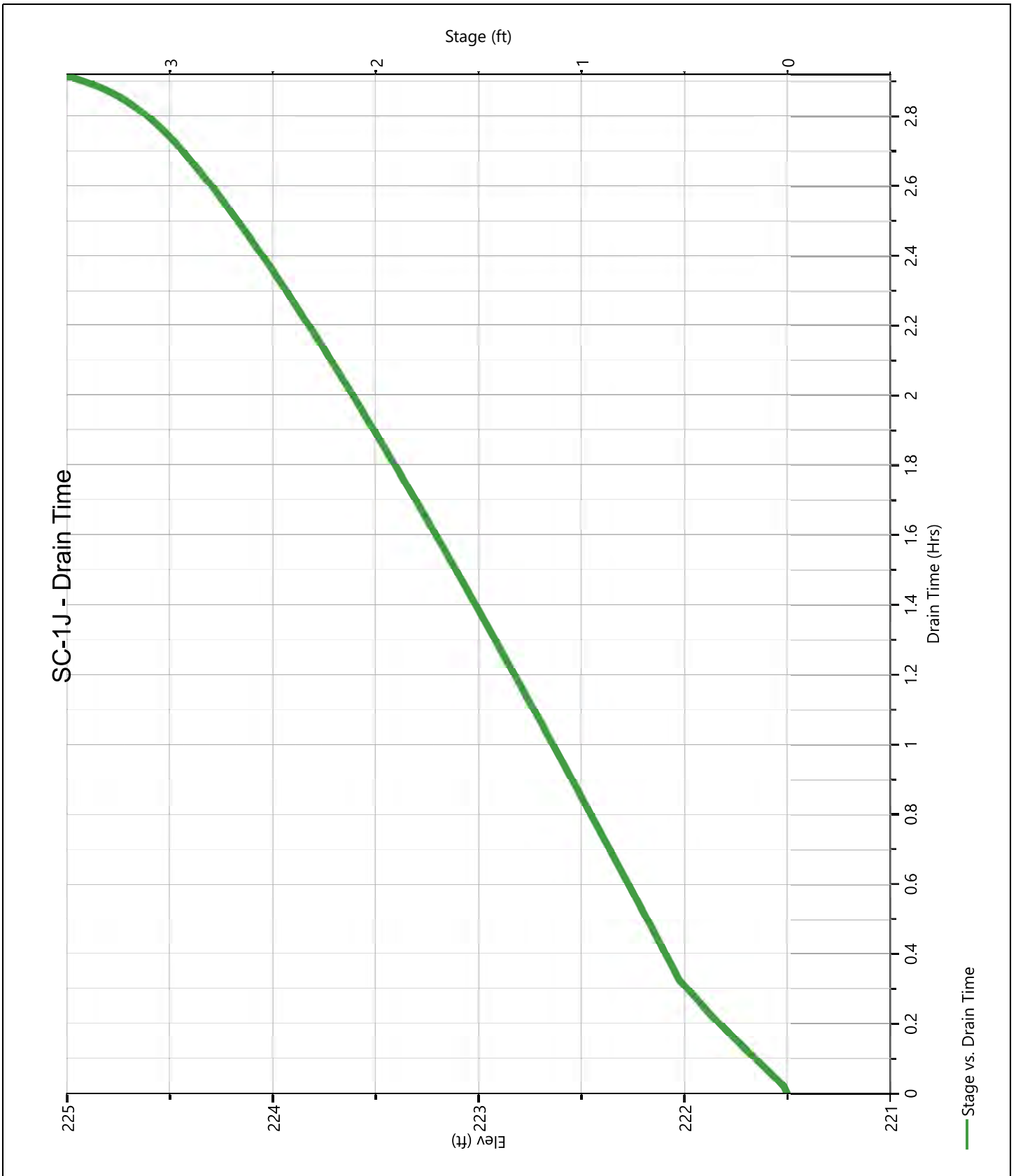
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	221.50	0.000	0.000								0.000		0.000	
0.18	221.68	129	0.000								0.355		0.355	
0.35	221.85	259	0.000								0.356		0.356	
0.53	222.03	404	0.000								0.357		0.357	
0.70	222.20	653	0.000								0.358		0.358	
0.88	222.38	902	0.000								0.359		0.359	
1.05	222.55	1,149	0.000								0.360		0.360	
1.23	222.73	1,395	0.000								0.361		0.361	
1.40	222.90	1,638	0.000								0.362		0.362	
1.58	223.08	1,877	0.000								0.363		0.363	
1.75	223.25	2,113	0.000								0.364		0.364	
1.93	223.43	2,344	0.000								0.365		0.365	
2.10	223.60	2,569	0.000								0.366		0.366	
2.28	223.78	2,787	0.000								0.367		0.367	
2.45	223.95	2,996	0.000								0.368		0.368	
2.63	224.13	3,195	0.000								0.369		0.369	
2.80	224.30	3,380	0.000								0.370		0.370	
2.97	224.48	3,544	0.000								0.371		0.371	
3.15	224.65	3,678	0.098 ic								0.372		0.469	
3.32	224.83	3,807	0.430 ic								0.373		0.803	
3.50	225.00	3,936	0.945 ic								0.374		1.319	

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

SC-1J

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-1K

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.00	0.00
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			0.00	0.00
C	Woods - Good Condition	70			2.10	147.23
C	Open Space - Good Condition	74			1.42	104.87
D	BVW	77			0.62	47.72
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			20.11	1588.76
Totals =					24.25	1888.58

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{1888.58}{24.25} = 77.88$; Use CN = **78**

2. Runoff

Frequency..... yr

Rainfall, P (24-hour)..... in

Runoff, Q..... in

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
1.29	2.71	5.22

Hydrograph Report

Project Name:

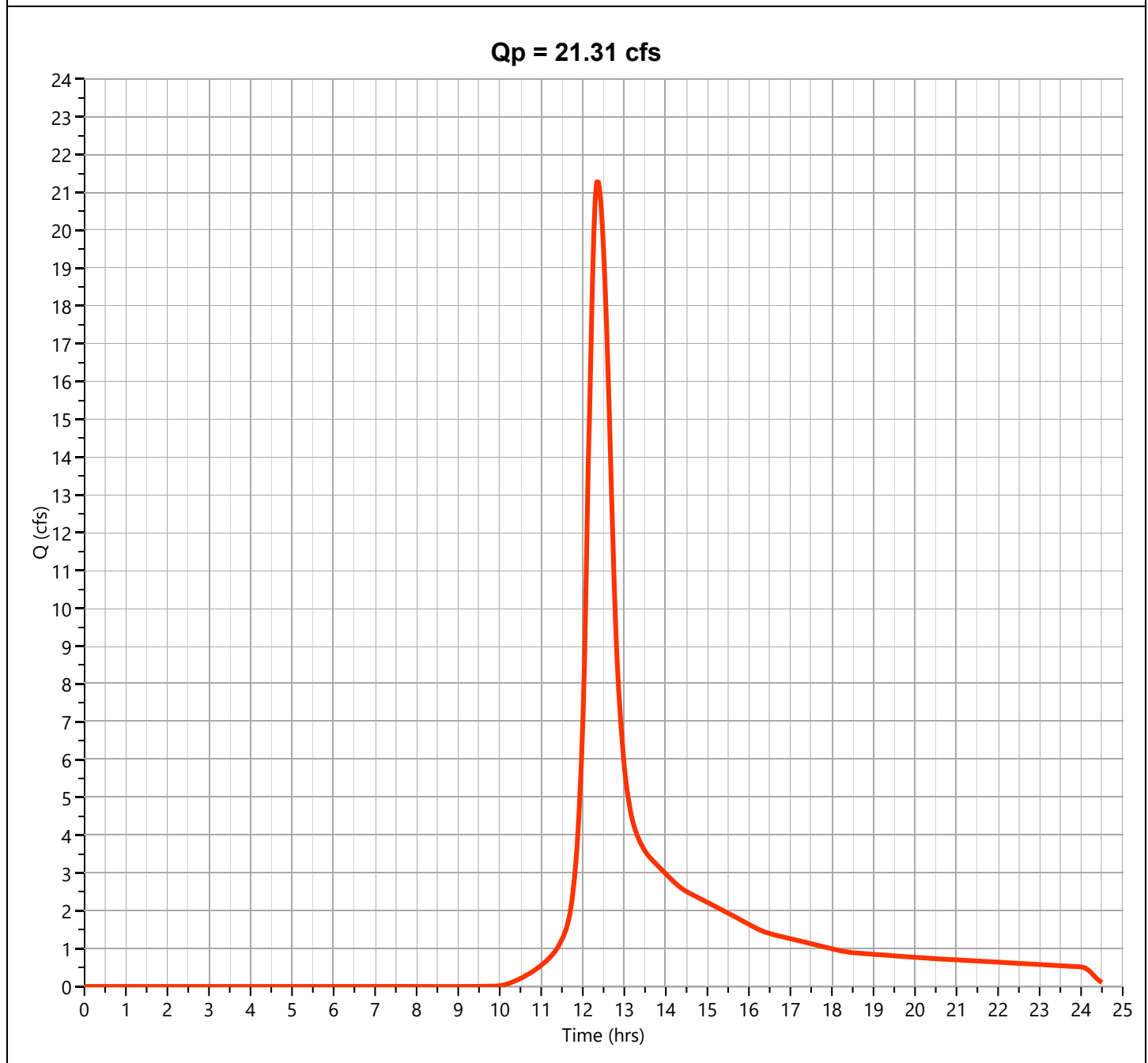
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1K

Hyd. No. 40

Hydrograph Type	= NRCS Runoff	Peak Flow	= 21.31 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Runoff Volume	= 114,029 cuft
Drainage Area	= 24.25 ac	Curve Number	= 78
Tc Method	= User	Time of Conc. (Tc)	= 27.5 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

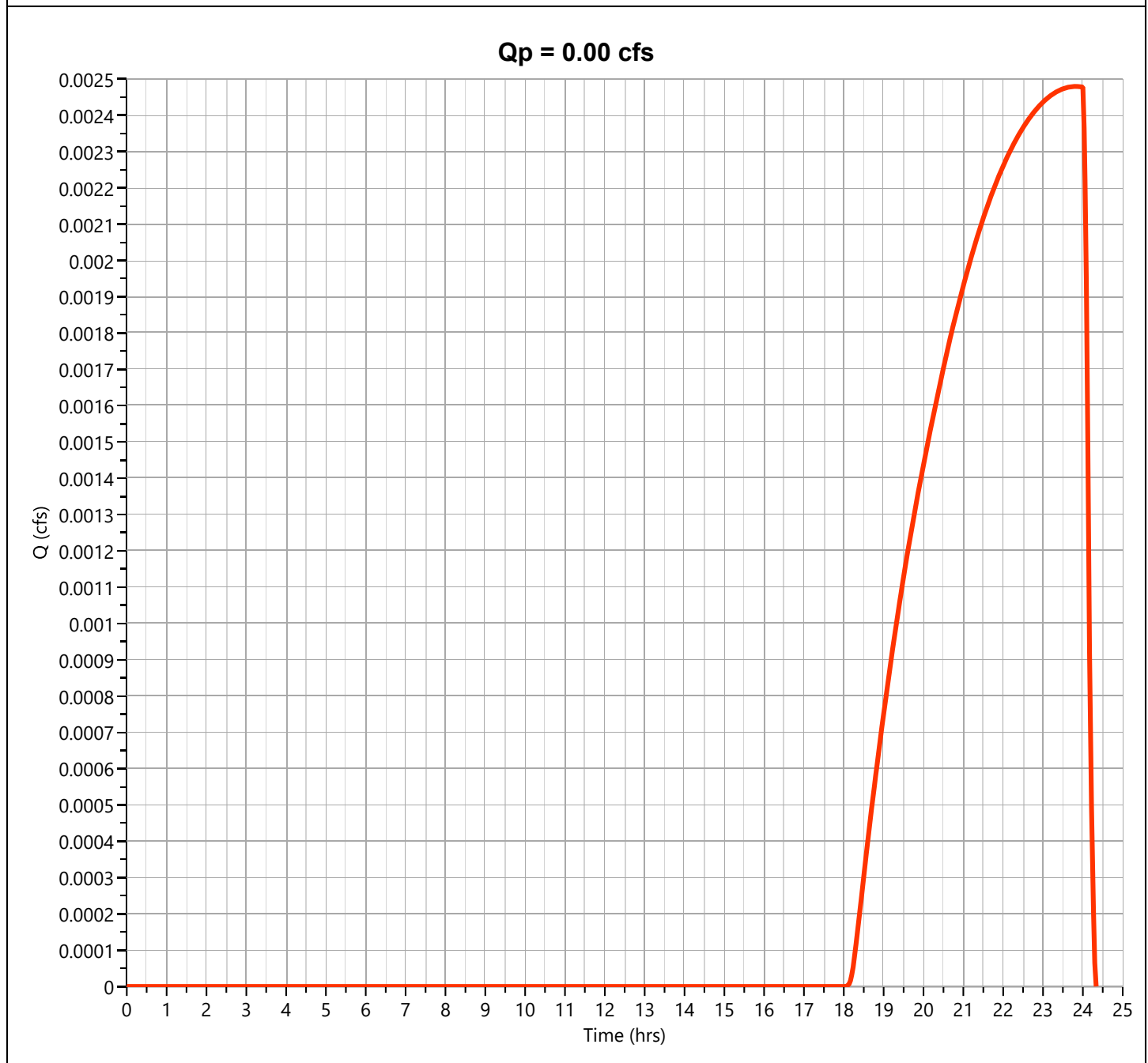
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1L

Hyd. No. 41

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.002 cfs
Storm Frequency	= 2-yr	Time to Peak	= 23.83 hrs
Time Interval	= 2 min	Runoff Volume	= 37.6 cuft
Drainage Area	= 2.89 ac	Curve Number	= 40
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

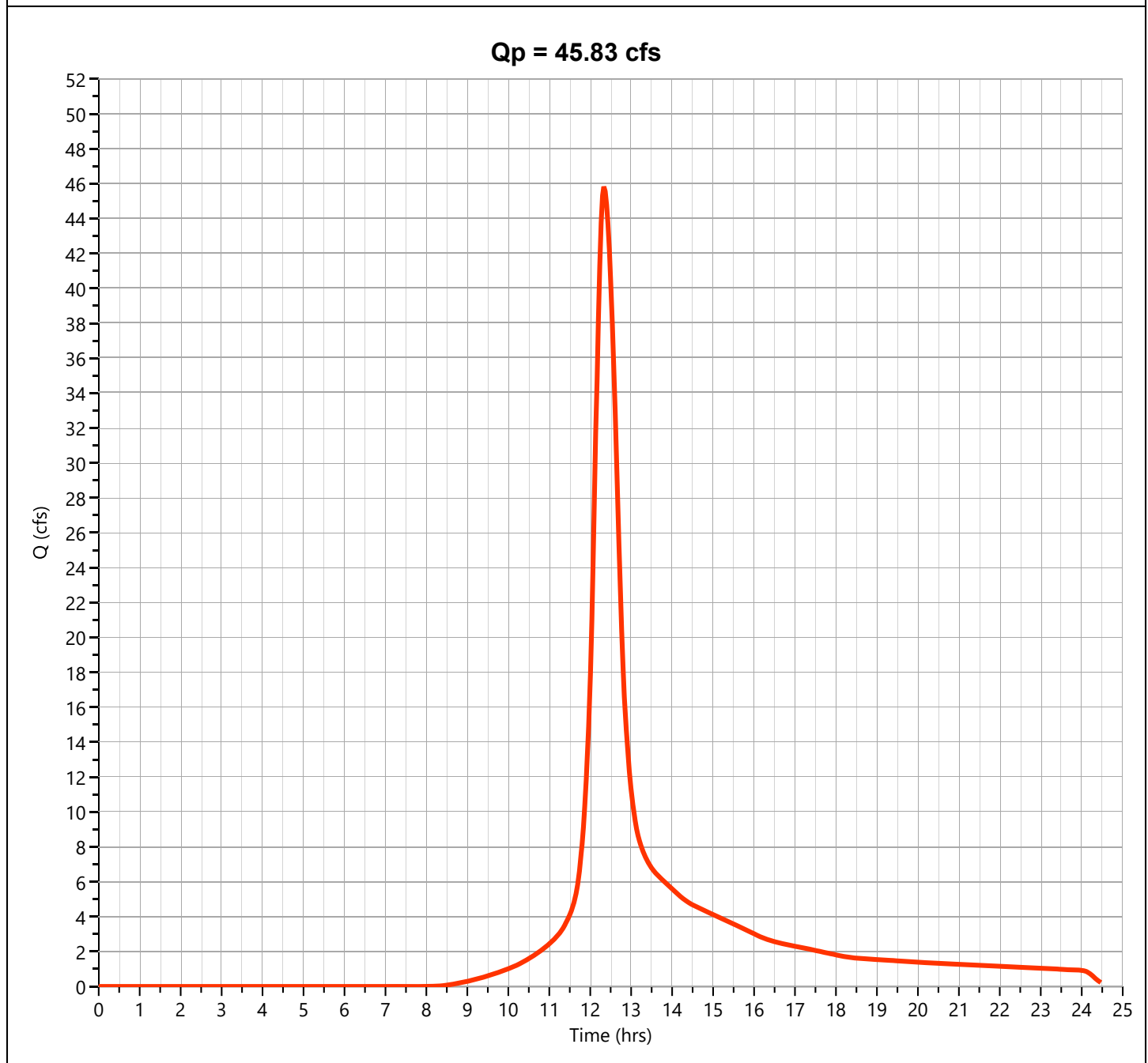
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1K

Hyd. No. 40

Hydrograph Type	= NRCS Runoff	Peak Flow	= 45.83 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Runoff Volume	= 239,451 cuft
Drainage Area	= 24.25 ac	Curve Number	= 78
Tc Method	= User	Time of Conc. (Tc)	= 27.5 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

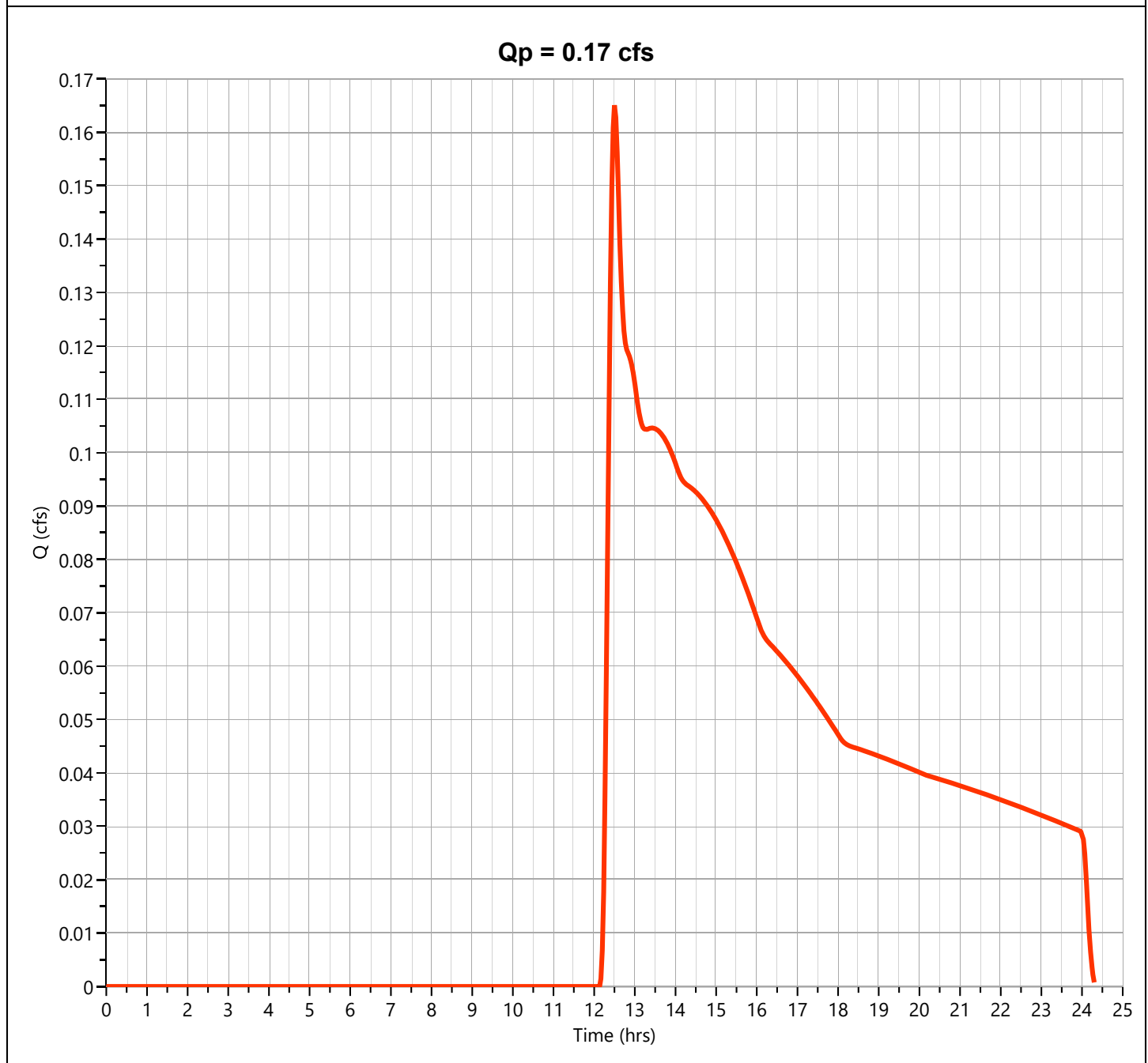
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1L

Hyd. No. 41

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.165 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.50 hrs
Time Interval	= 2 min	Runoff Volume	= 2,570 cuft
Drainage Area	= 2.89 ac	Curve Number	= 40
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

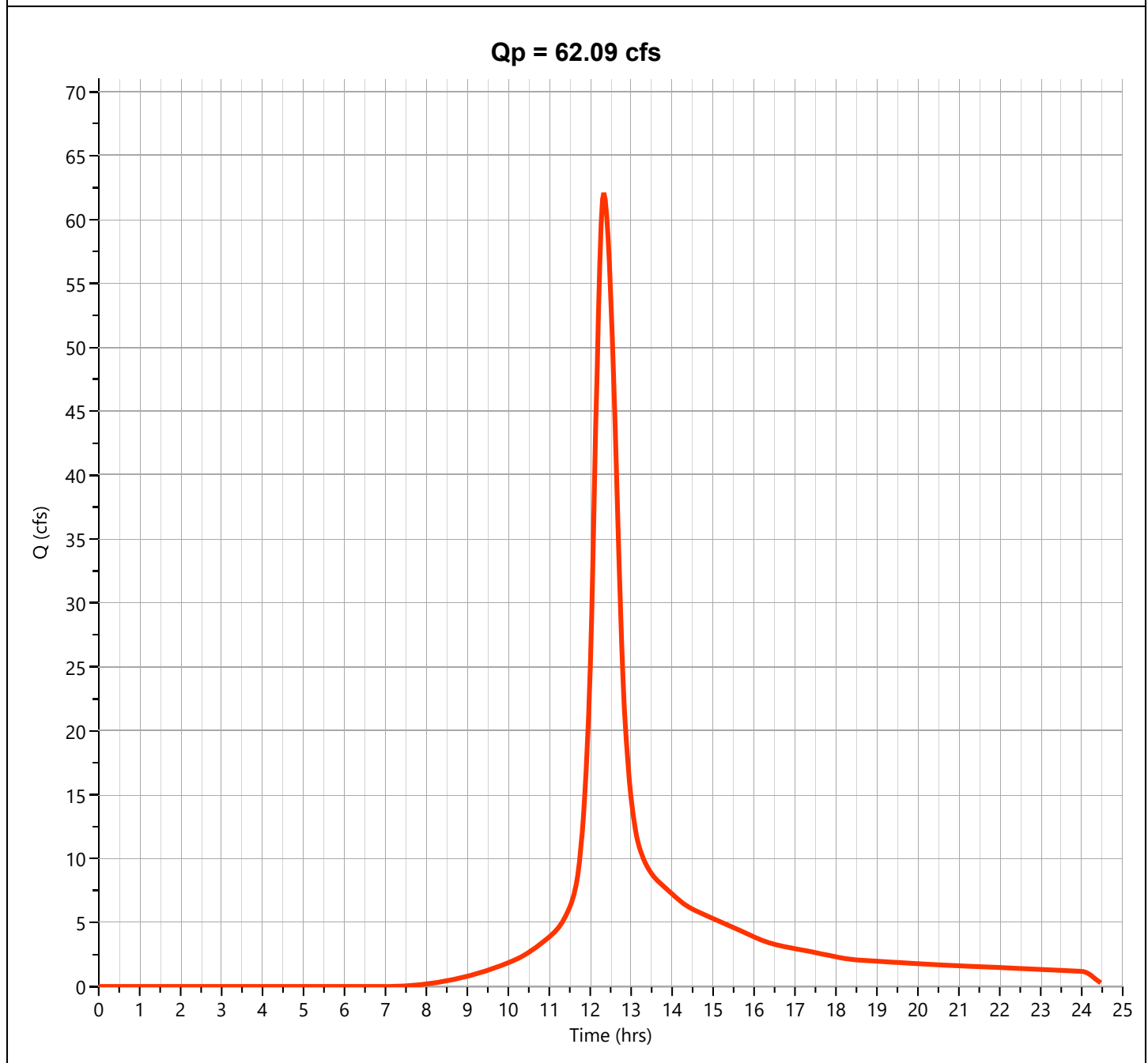
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1K

Hyd. No. 40

Hydrograph Type	= NRCS Runoff	Peak Flow	= 62.09 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Runoff Volume	= 324,391 cuft
Drainage Area	= 24.25 ac	Curve Number	= 78
Tc Method	= User	Time of Conc. (Tc)	= 27.5 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

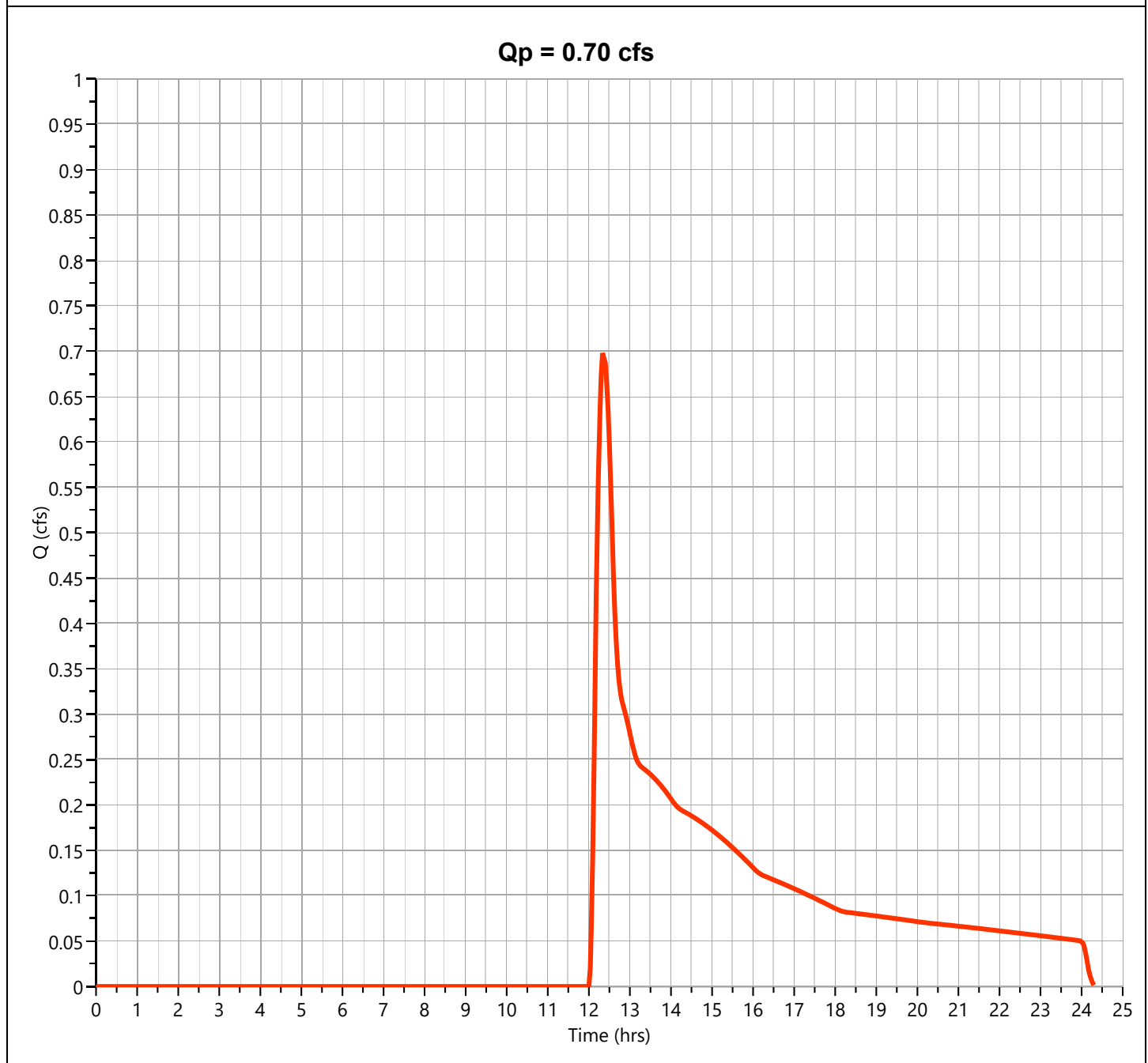
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1L

Hyd. No. 41

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.699 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Runoff Volume	= 5,809 cuft
Drainage Area	= 2.89 ac	Curve Number	= 40
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

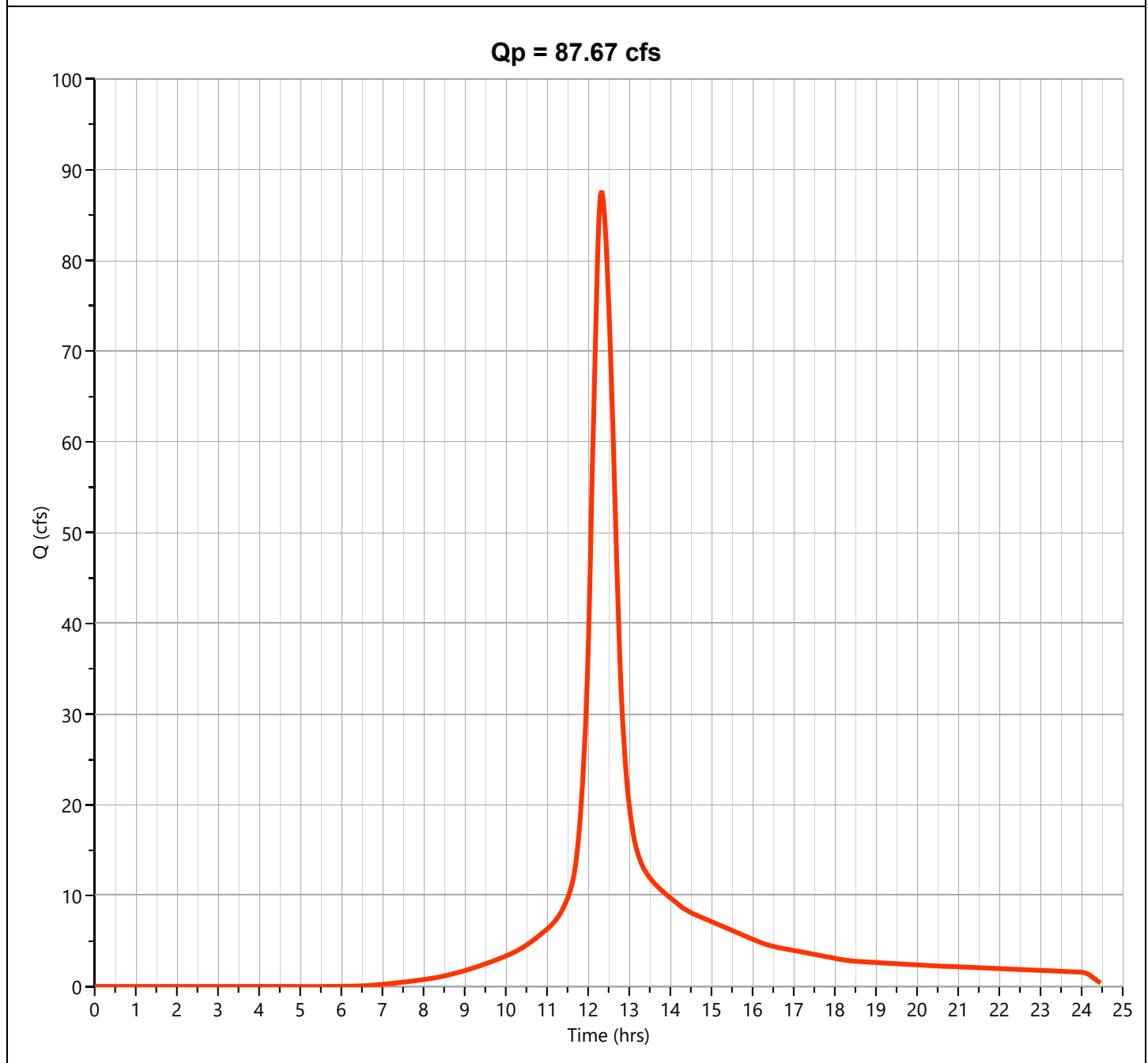
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1K

Hyd. No. 40

Hydrograph Type	= NRCS Runoff	Peak Flow	= 87.67 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Runoff Volume	= 460,745 cuft
Drainage Area	= 24.25 ac	Curve Number	= 78
Tc Method	= User	Time of Conc. (Tc)	= 27.5 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

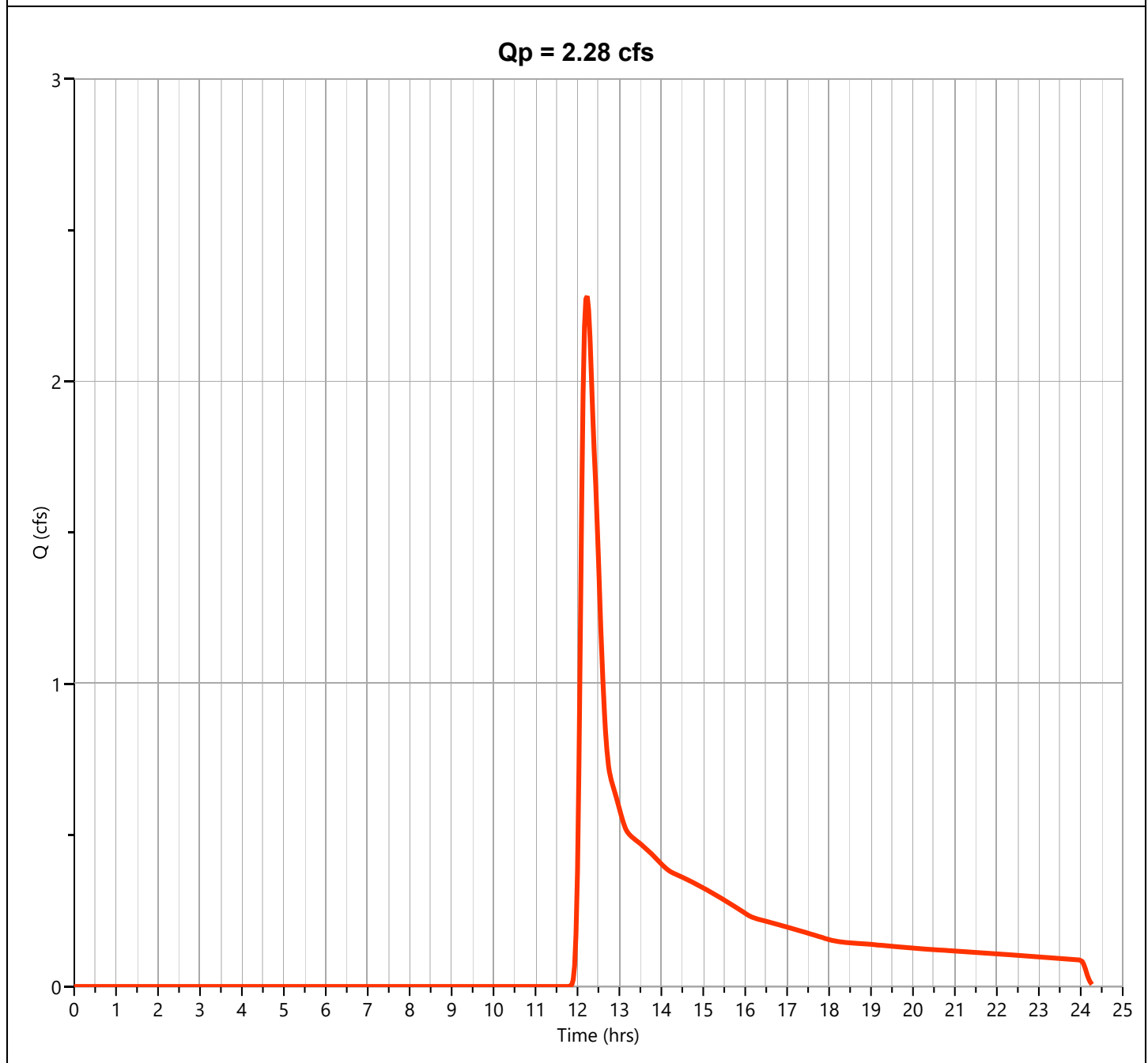
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1L

Hyd. No. 41

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.282 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.23 hrs
Time Interval	= 2 min	Runoff Volume	= 12,727 cuft
Drainage Area	= 2.89 ac	Curve Number	= 40
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one: Present Developed

Subcatchment P-1K

Circle one: Tc Tt through subarea

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	Wooded		
	0.6		
ft	50		
in	3.1		
ft/ft	0.020		
Compute Tt hr	0.29		0.29

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C	C-D	D-E
	UNPAVED	UNPAVED	UNPAVED
ft	1293	91	165
ft/ft	0.023	0.05	0.036
ft/s	2.45	3.61	3.06
Compute Tt hr	0.15	0.01	0.01

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r			
ft/ft			
Compute V			
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.46
min 27.5

Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-1L

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.00	0.00
A	Woods - Good Condition	30			0.14	4.32
A	Open Space - Good Condition	39			2.44	95.14
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.31	15.83
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					2.89	115.29

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{115.29}{2.89} = 39.84 ; \text{ Use CN} = \boxed{40}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	0.00	0.23	1.16

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one: Present Developed

Subcatchment P-1L

Circle one: Tc Tt through subarea

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	Wooded		
	0.6		
ft	50		
in	3.1		
ft/ft	0.050		
Compute Tt hr	0.20		0.20

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C		
	UNPAVED		
ft	448		
ft/ft	0.01		
ft/s	1.61		
Compute Tt hr	0.08		0.08

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r	ft		
ft/ft			
Compute V	ft/s		
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.28
min 16.6

Hydrograph Report

Project Name:

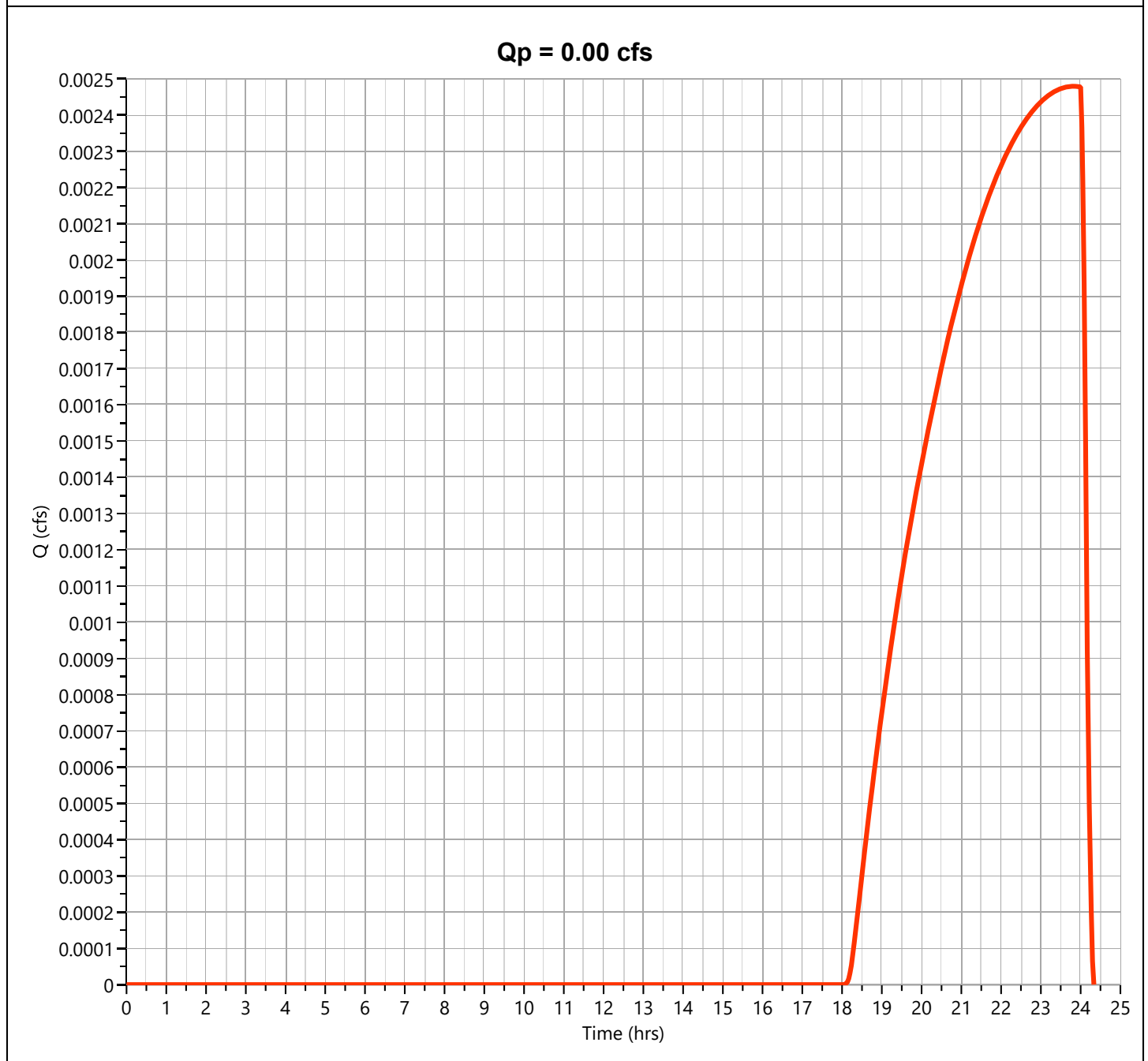
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1L

Hyd. No. 41

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.002 cfs
Storm Frequency	= 2-yr	Time to Peak	= 23.83 hrs
Time Interval	= 2 min	Runoff Volume	= 37.6 cuft
Drainage Area	= 2.89 ac	Curve Number	= 40
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

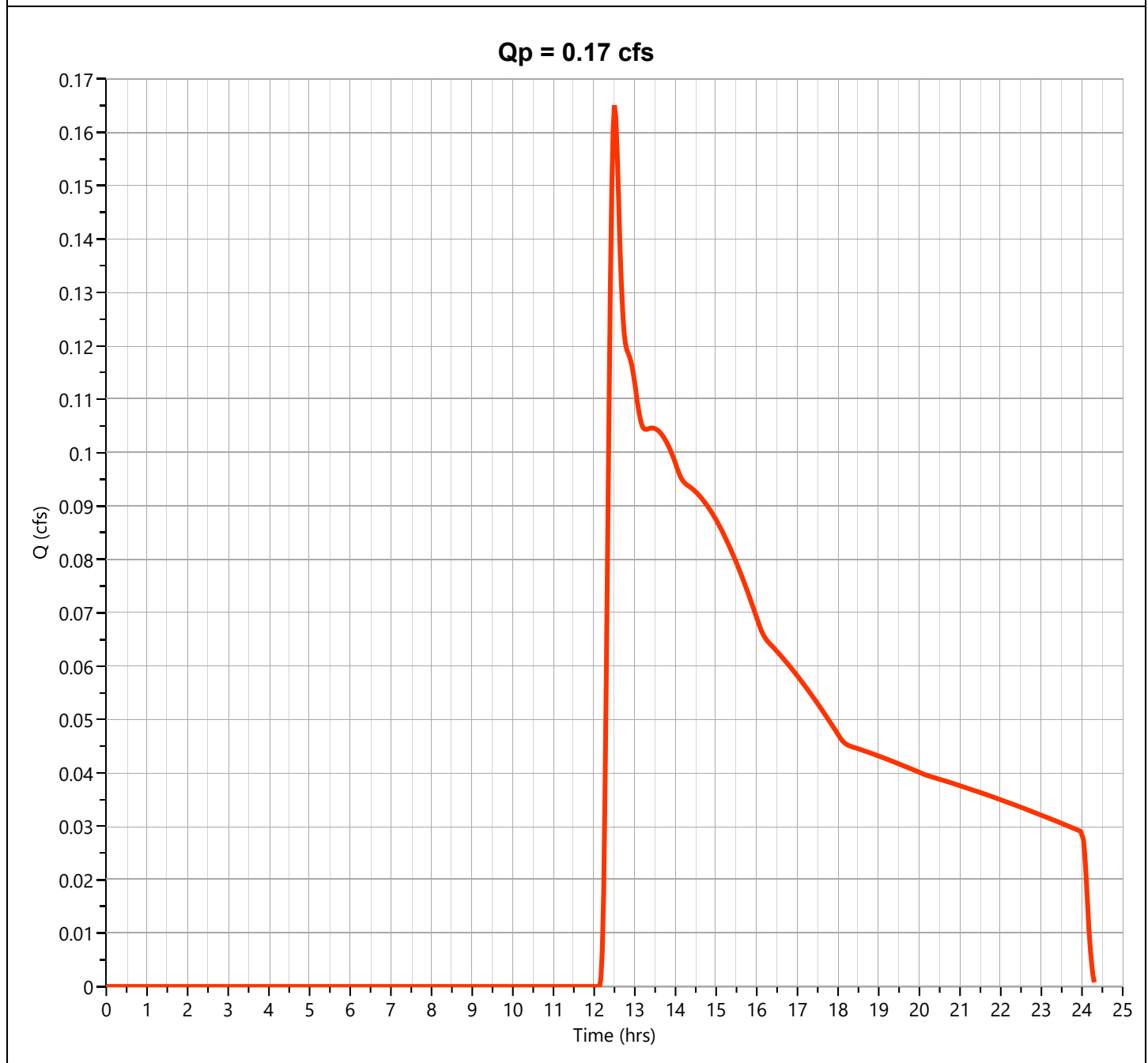
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1L

Hyd. No. 41

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.165 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.50 hrs
Time Interval	= 2 min	Runoff Volume	= 2,570 cuft
Drainage Area	= 2.89 ac	Curve Number	= 40
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

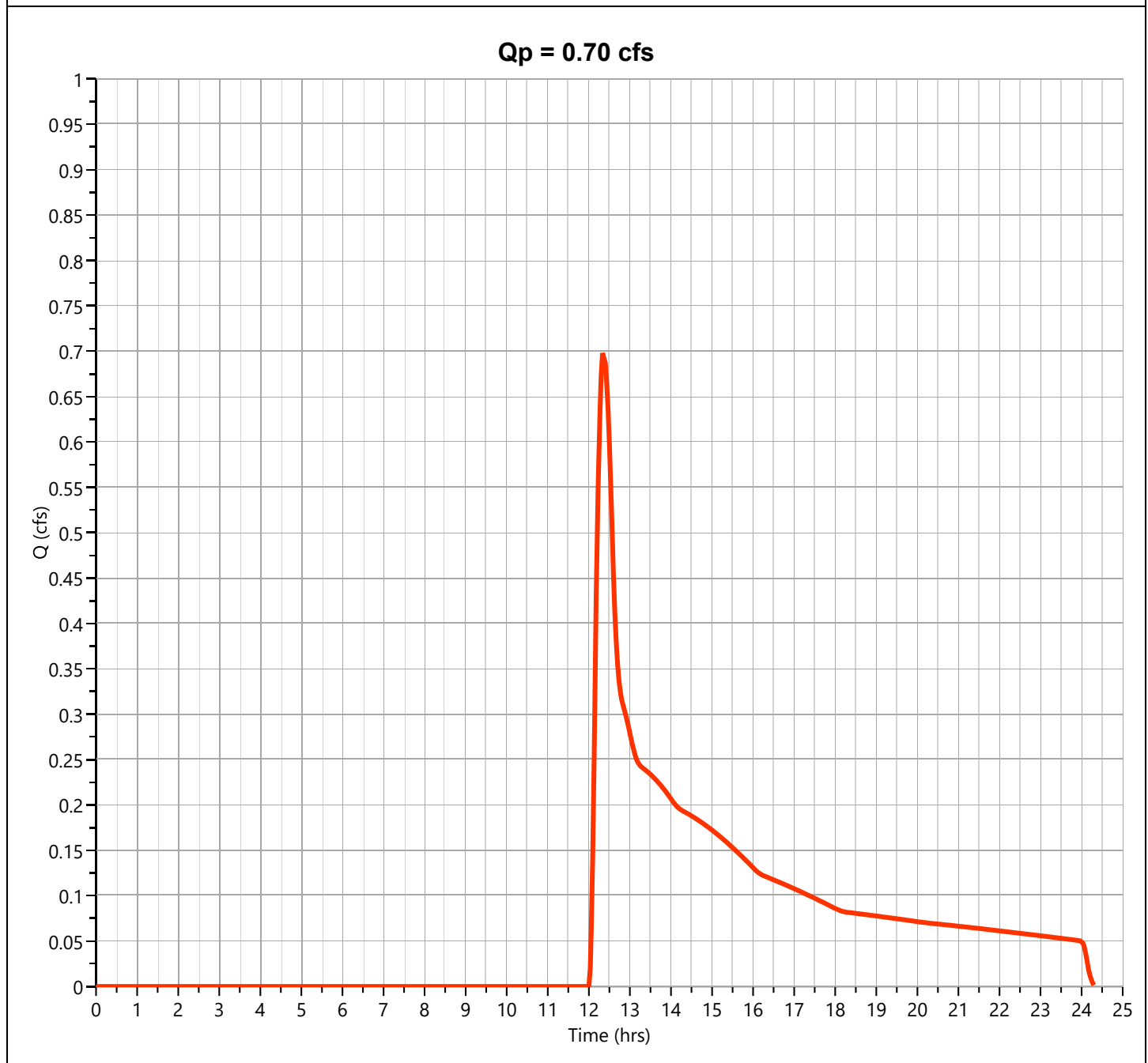
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1L

Hyd. No. 41

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.699 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Runoff Volume	= 5,809 cuft
Drainage Area	= 2.89 ac	Curve Number	= 40
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

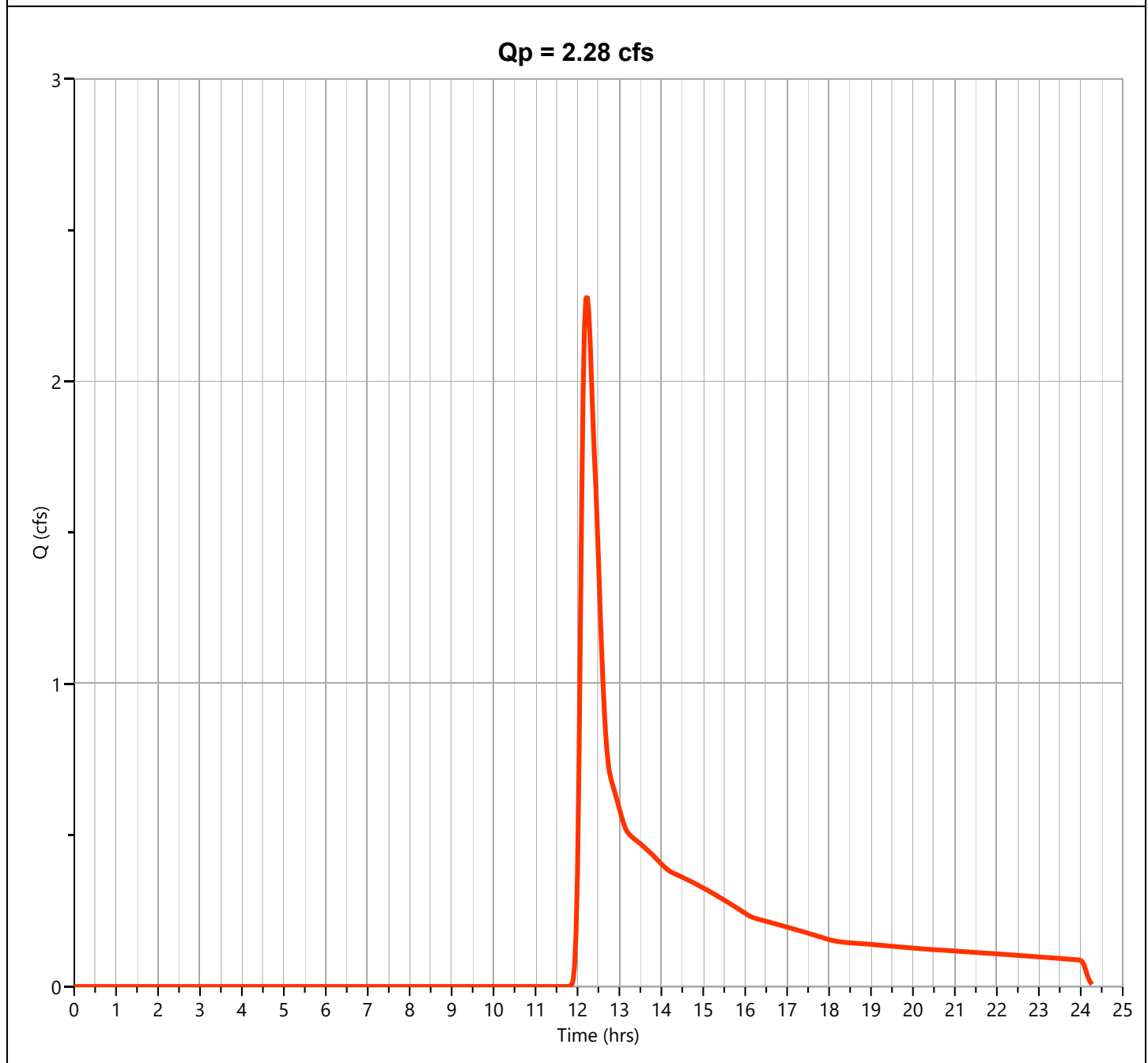
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-1L

Hyd. No. 41

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.282 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.23 hrs
Time Interval	= 2 min	Runoff Volume	= 12,727 cuft
Drainage Area	= 2.89 ac	Curve Number	= 40
Tc Method	= User	Time of Conc. (Tc)	= 10.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

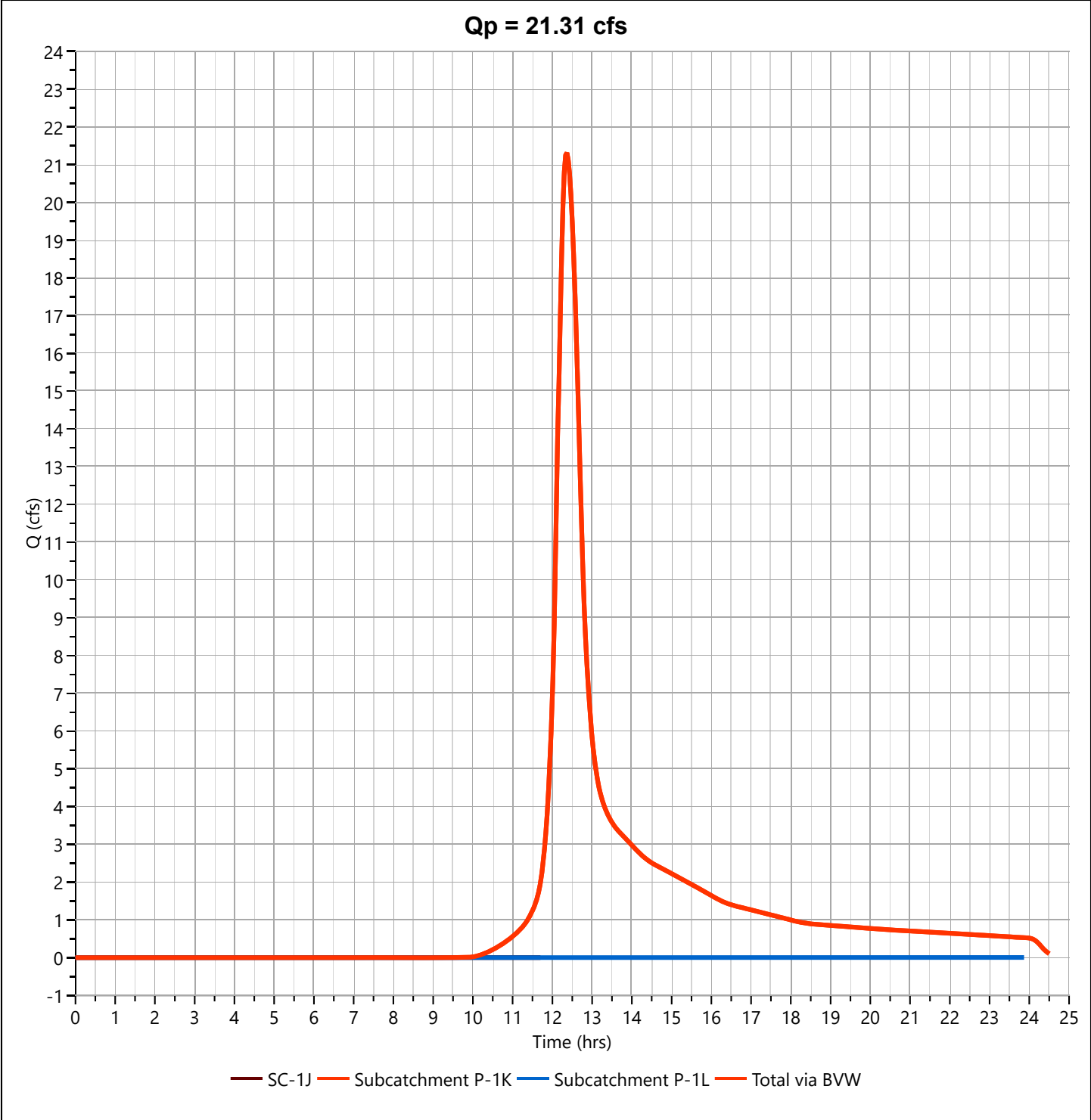
Hydrology Studio v 3.0.0.29

12-14-2023

Total via BVW

Hyd. No. 42

Hydrograph Type	= Junction	Peak Flow	= 21.31 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Hydrograph Volume	= 114,067 cuft
Inflow Hydrographs	= 39, 40, 41	Total Contrib. Area	= 27.14 ac



Hydrograph Report

Project Name:

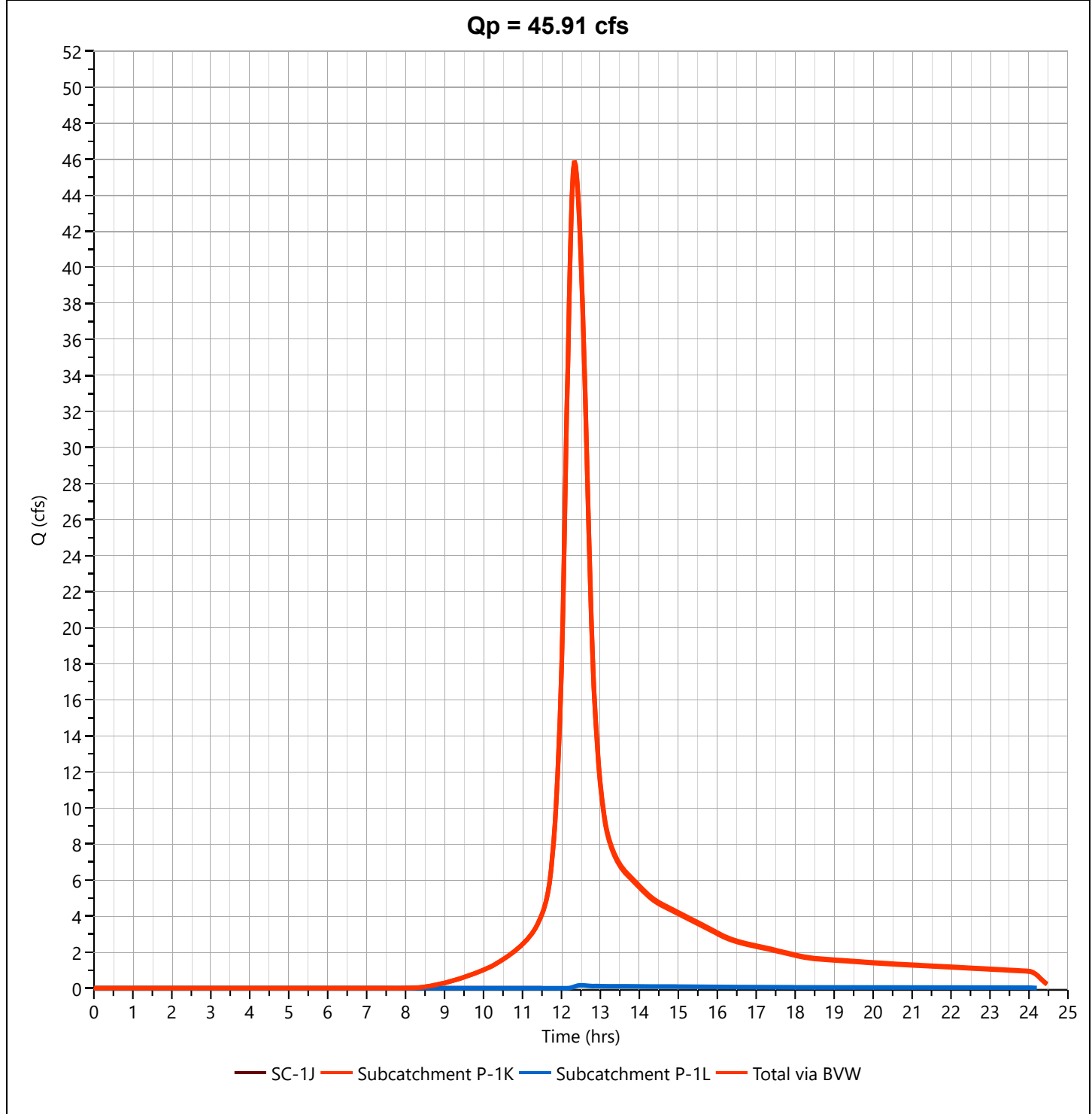
Hydrology Studio v 3.0.0.29

12-14-2023

Total via BVW

Hyd. No. 42

Hydrograph Type	= Junction	Peak Flow	= 45.91 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 242,021 cuft
Inflow Hydrographs	= 39, 40, 41	Total Contrib. Area	= 27.14 ac



Hydrograph Report

Project Name:

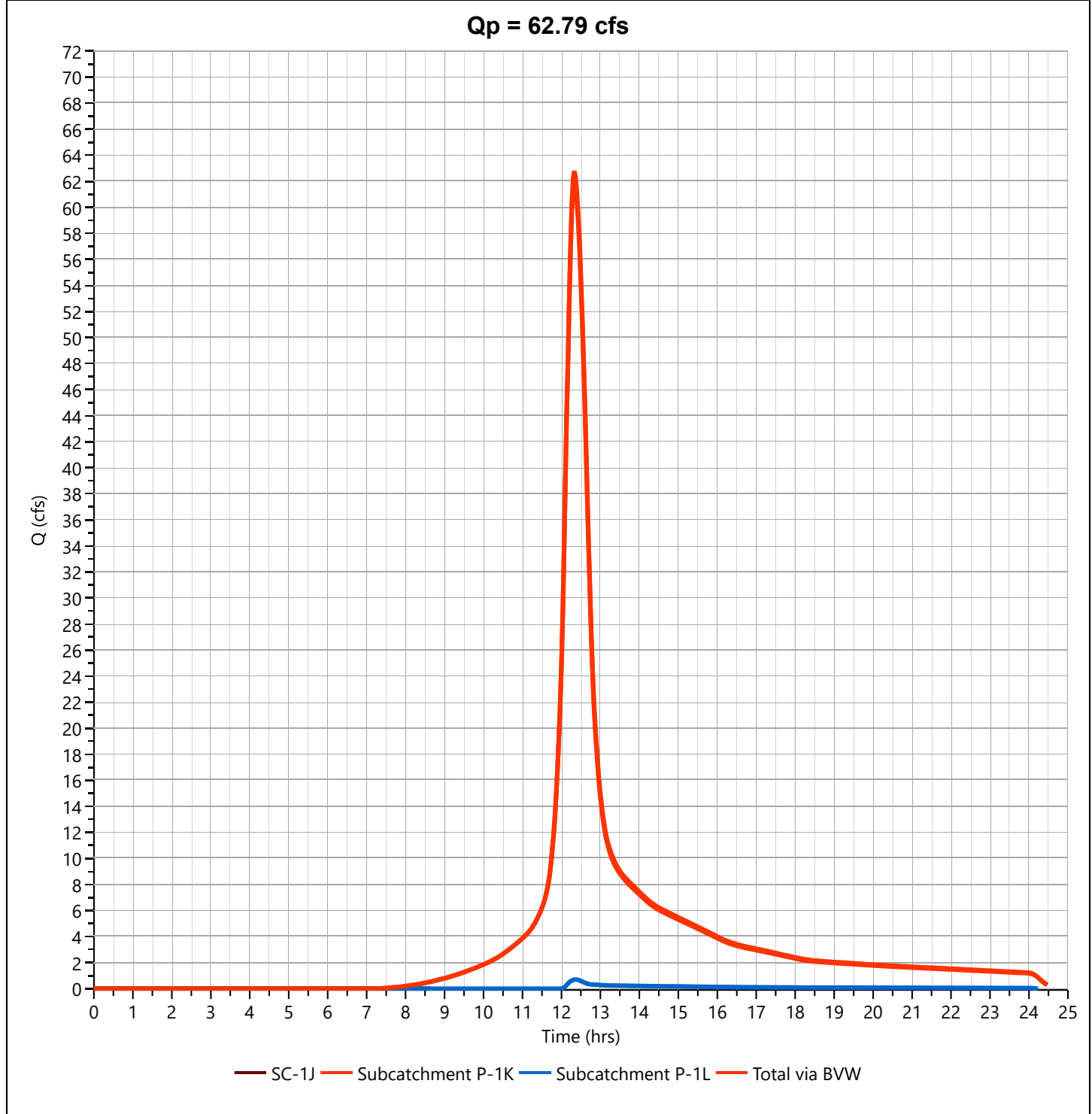
Hydrology Studio v 3.0.0.29

12-14-2023

Total via BVW

Hyd. No. 42

Hydrograph Type	= Junction	Peak Flow	= 62.79 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 330,200 cuft
Inflow Hydrographs	= 39, 40, 41	Total Contrib. Area	= 27.14 ac



Hydrograph Report

Project Name:

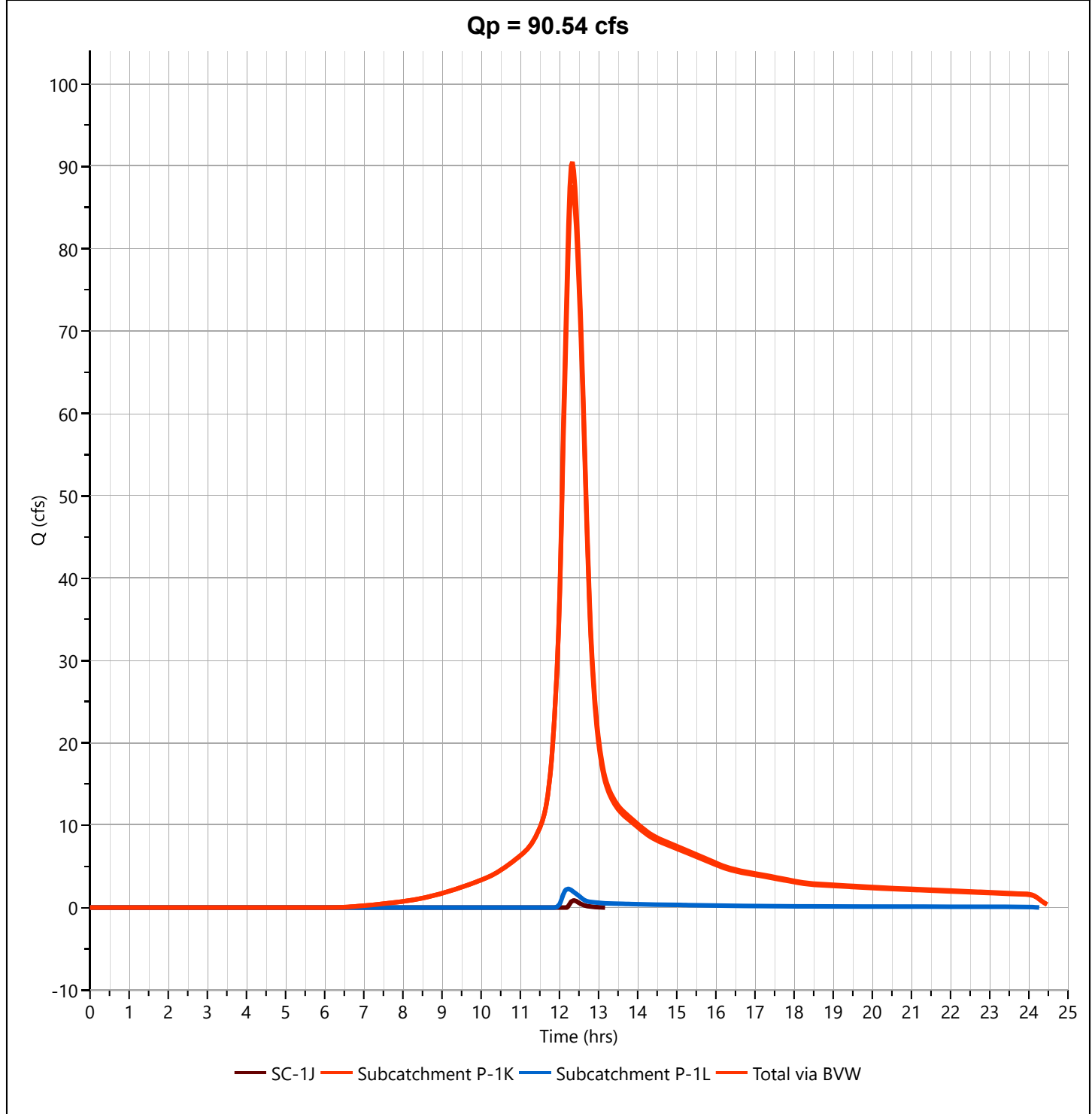
Hydrology Studio v 3.0.0.29

12-14-2023

Total via BVW

Hyd. No. 42

Hydrograph Type	= Junction	Peak Flow	= 90.54 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 474,525 cuft
Inflow Hydrographs	= 39, 40, 41	Total Contrib. Area	= 27.14 ac



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-1M

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.32	31.48
A	Woods - Good Condition	30			0.48	14.38
A	Open Space - Good Condition	39			1.10	42.78
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					1.90	88.63

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{88.63}{1.90} = 46.72 ; \text{ Use CN} = \boxed{47}$$

2. Runoff

Frequency..... yr

Rainfall, P (24-hour)..... in

Runoff, Q..... in

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
0.07	0.53	1.82

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one: Present Developed

Subcatchment P-1M

Circle one: Tc Tt through subarea

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	LAWN		
	0.24		
ft	50		
in	3.1		
ft/ft	0.020		
Compute Tt hr	0.14		0.14

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C	C-D	D-E
	UNPAVED	UNPAVED	UNPAVED
ft	33	12	74
ft/ft	0.02	0.33	0.05
ft/s	2.28	9.27	3.61
Compute Tt hr	0.00	0.00	0.01

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r ft			
ft/ft			
Compute V ft/s			
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.15
min 8.9

Hydrograph Report

Project Name:

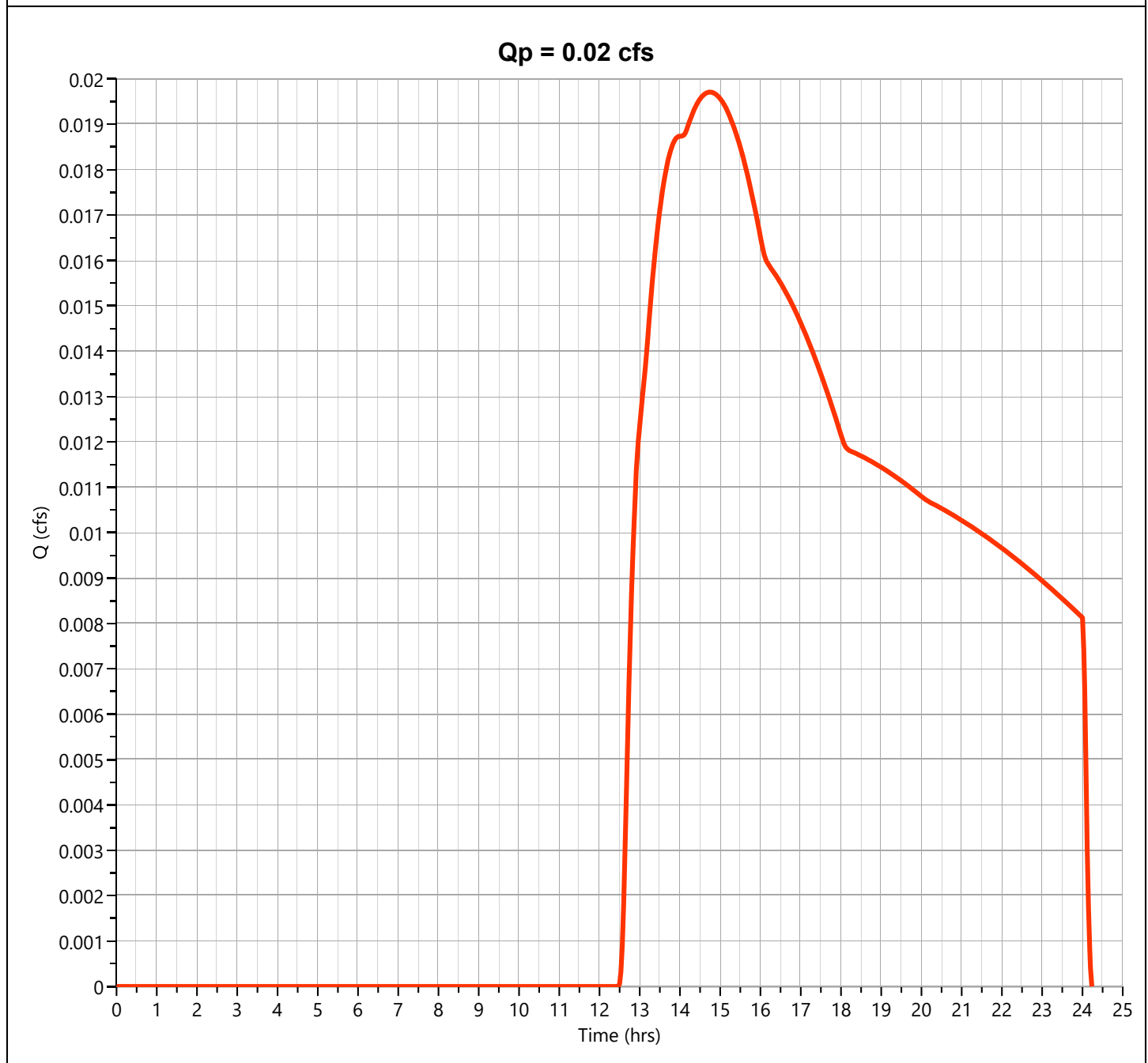
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-1M

Hyd. No. 43

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.020 cfs
Storm Frequency	= 2-yr	Time to Peak	= 14.73 hrs
Time Interval	= 2 min	Runoff Volume	= 535 cuft
Drainage Area	= 1.9 ac	Curve Number	= 47
Tc Method	= User	Time of Conc. (Tc)	= 8.9 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

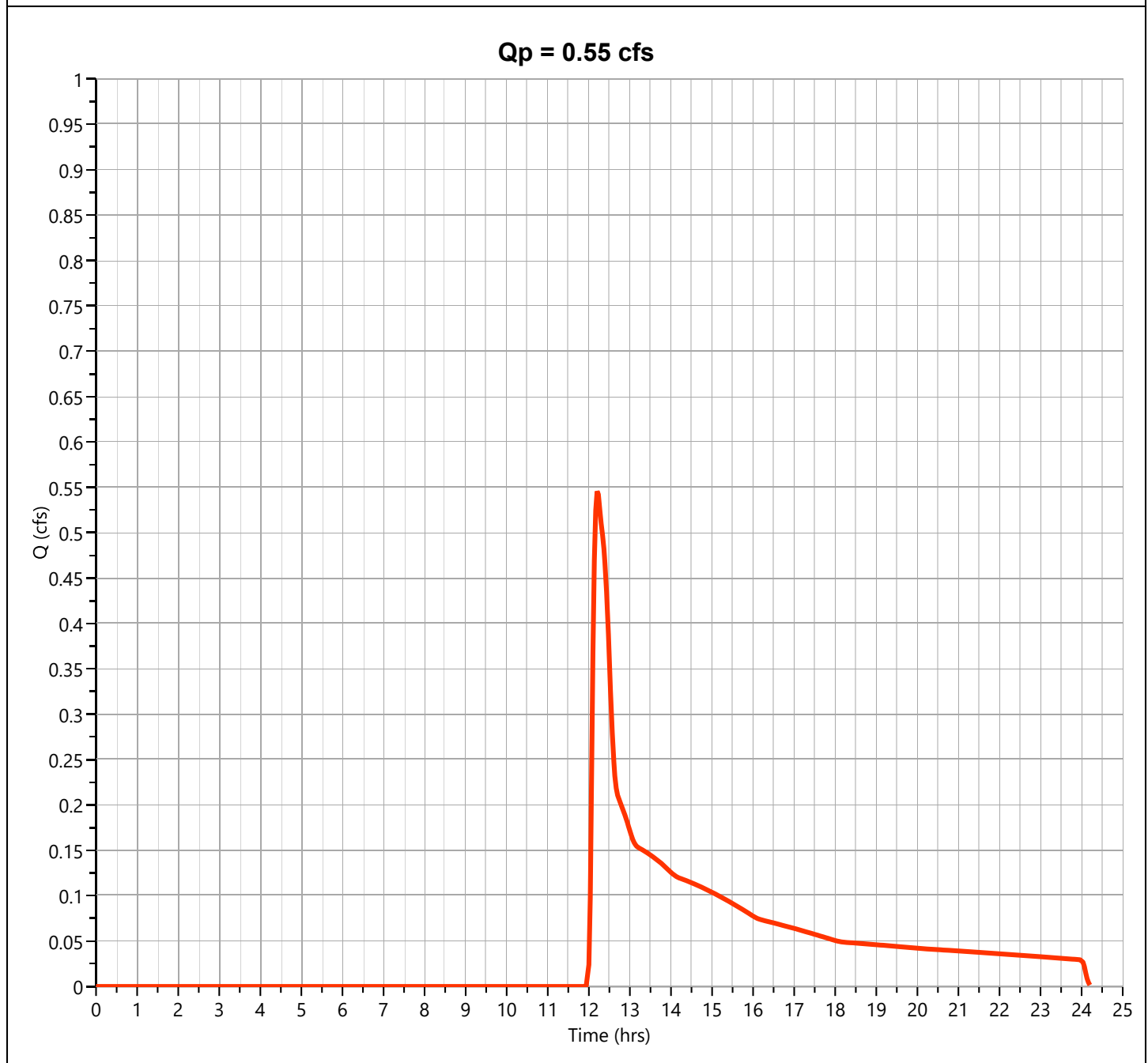
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-1M

Hyd. No. 43

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.546 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.20 hrs
Time Interval	= 2 min	Runoff Volume	= 3,727 cuft
Drainage Area	= 1.9 ac	Curve Number	= 47
Tc Method	= User	Time of Conc. (Tc)	= 8.9 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

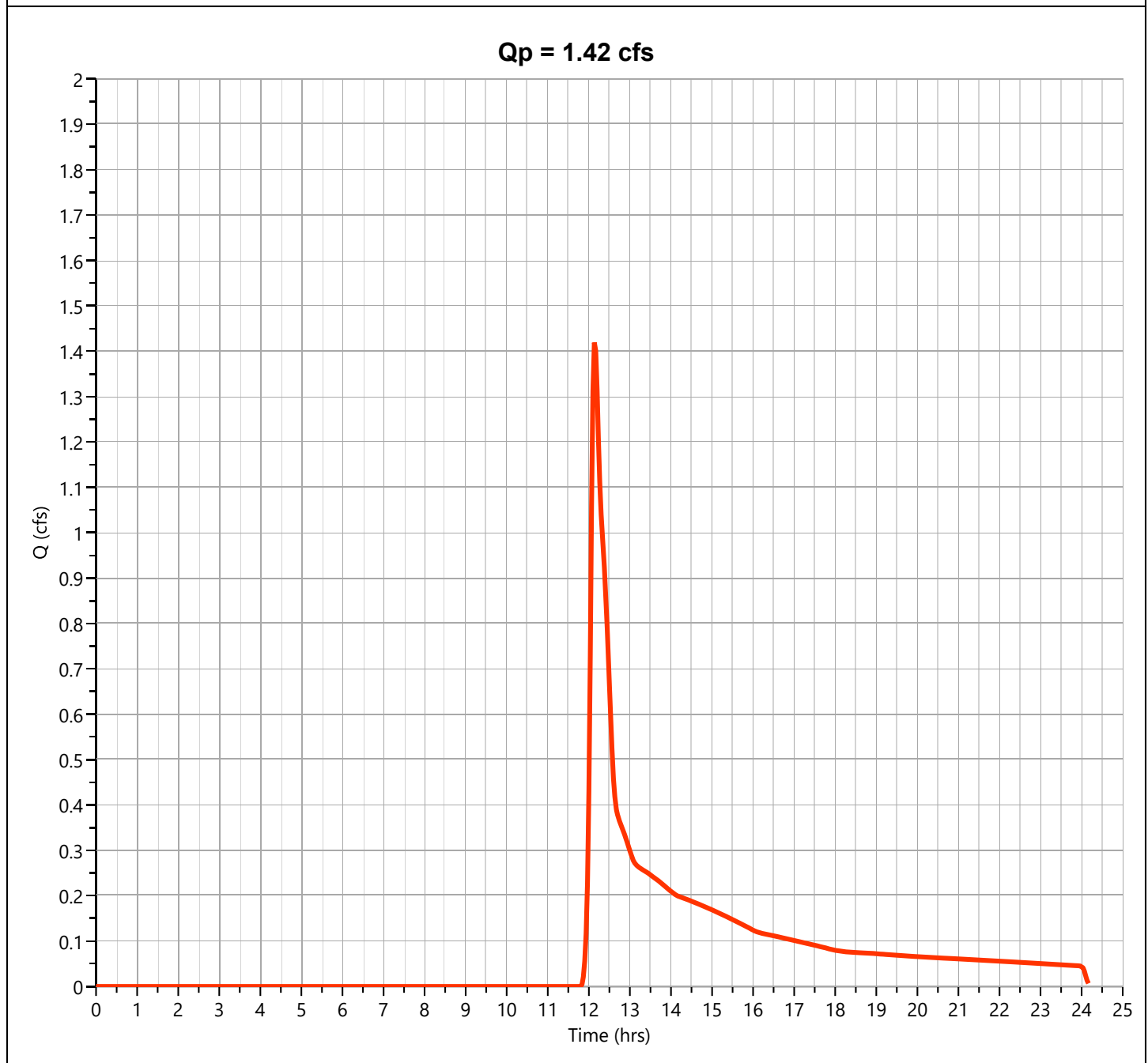
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-1M

Hyd. No. 43

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.419 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.13 hrs
Time Interval	= 2 min	Runoff Volume	= 6,803 cuft
Drainage Area	= 1.9 ac	Curve Number	= 47
Tc Method	= User	Time of Conc. (Tc)	= 8.9 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

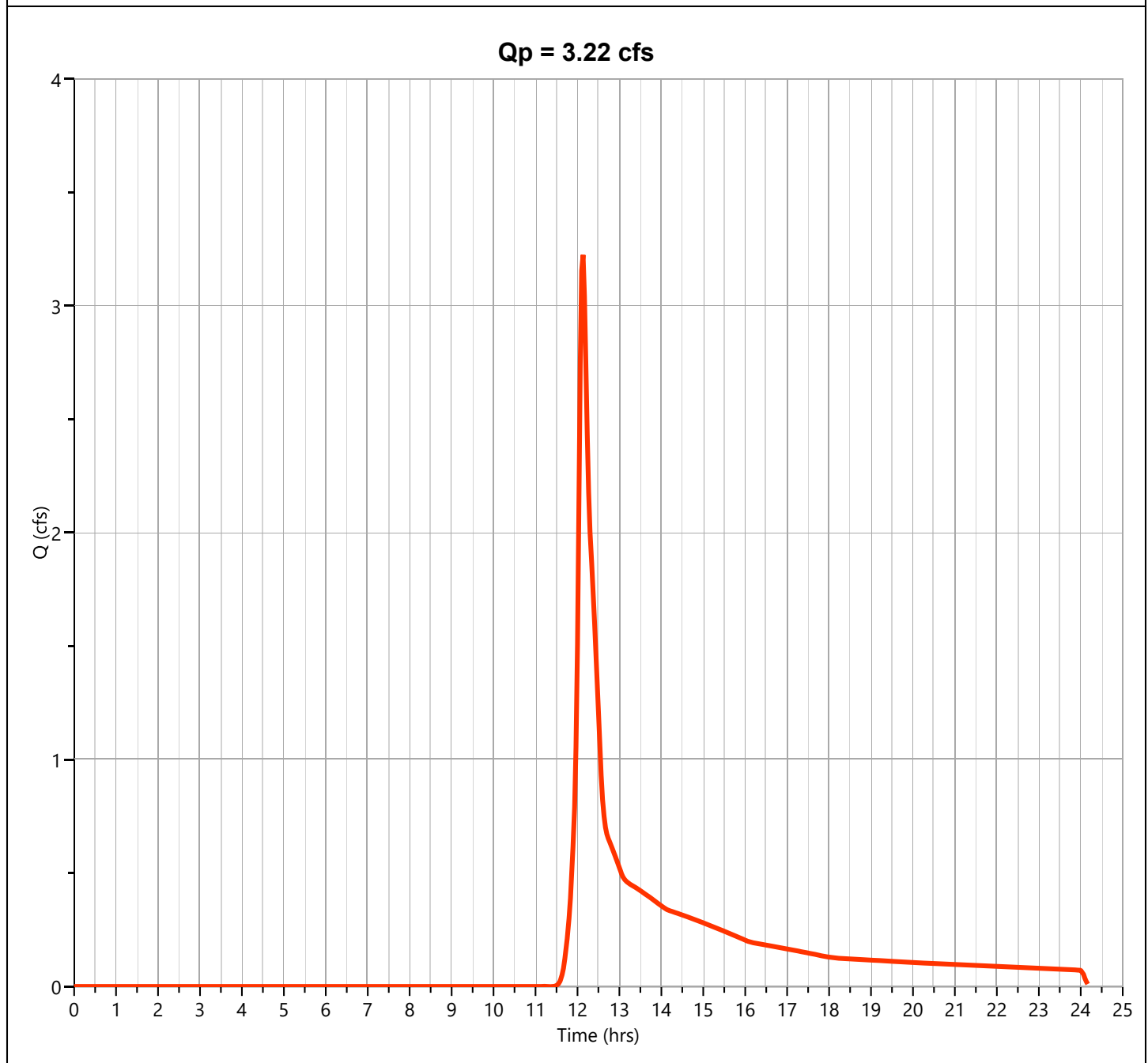
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-1M

Hyd. No. 43

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.224 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.13 hrs
Time Interval	= 2 min	Runoff Volume	= 12,719 cuft
Drainage Area	= 1.9 ac	Curve Number	= 47
Tc Method	= User	Time of Conc. (Tc)	= 8.9 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

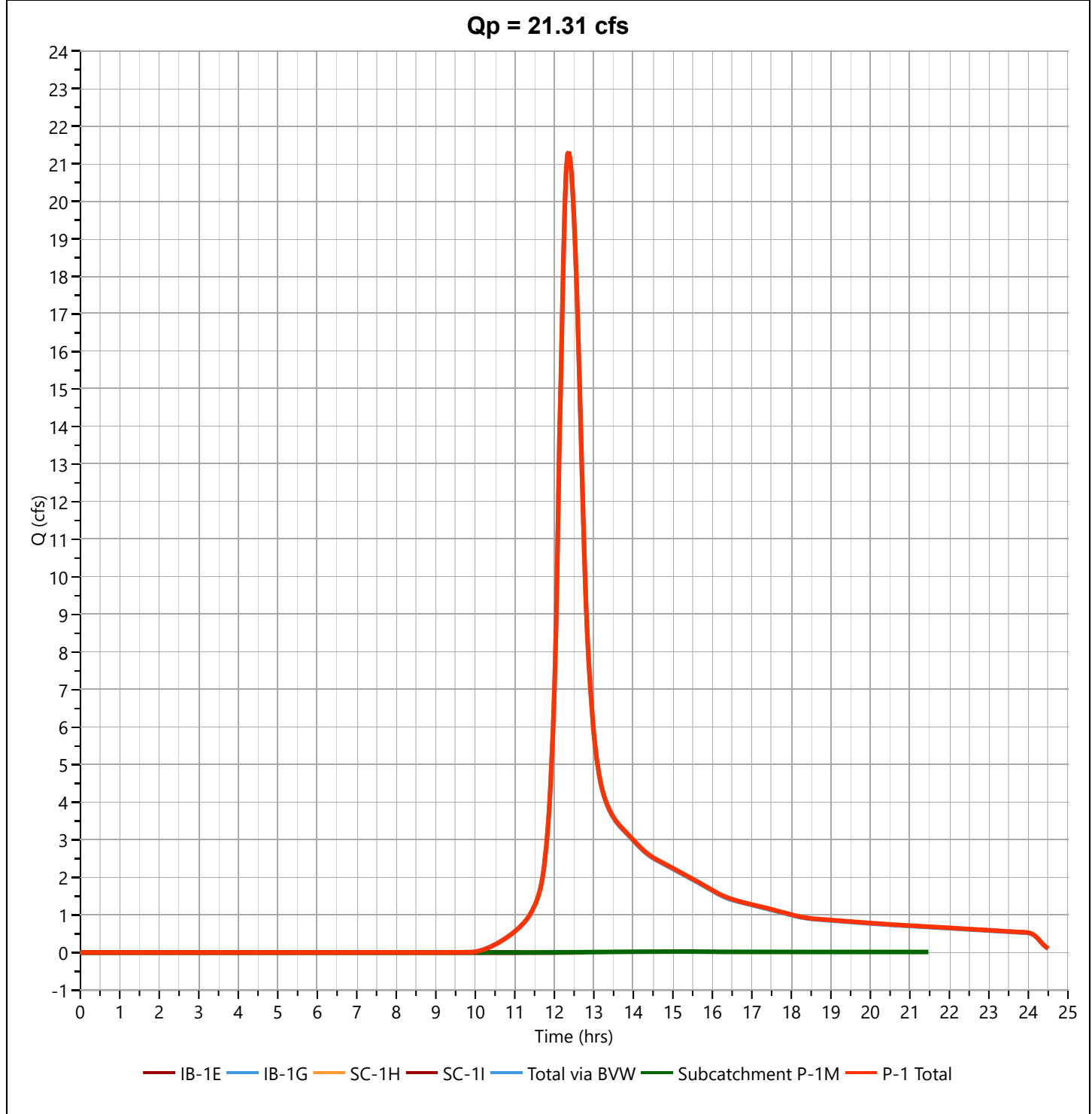
Hydrology Studio v 3.0.0.29

12-14-2023

P-1 Total

Hyd. No. 44

Hydrograph Type	= Junction	Peak Flow	= 21.31 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Hydrograph Volume	= 114,602 cuft
Inflow Hydrographs	= 27, 32, 35, 37, 42, 43	Total Contrib. Area	= 29.04 ac



Hydrograph Report

Project Name:

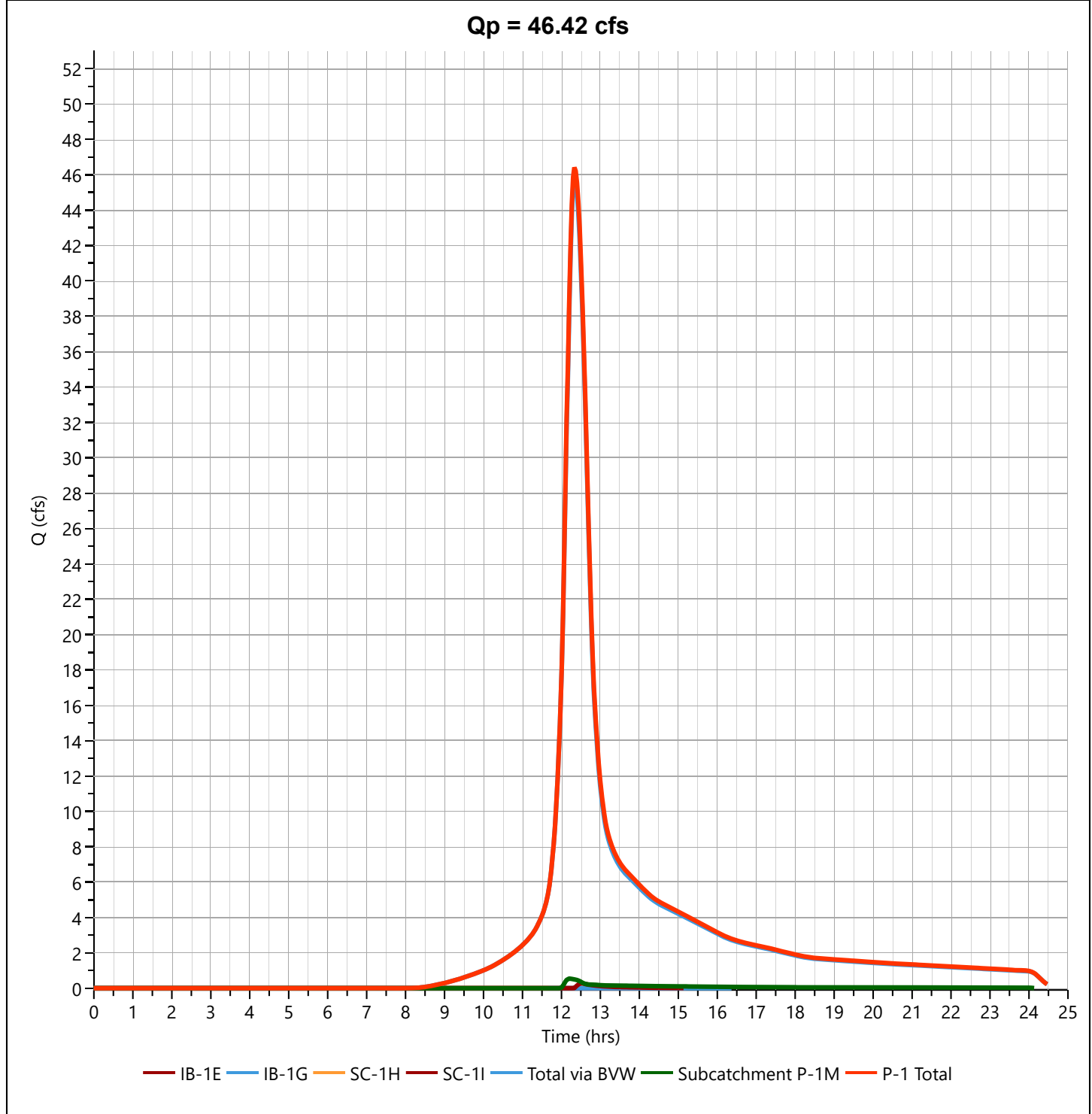
Hydrology Studio v 3.0.0.29

12-14-2023

P-1 Total

Hyd. No. 44

Hydrograph Type	= Junction	Peak Flow	= 46.42 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 246,554 cuft
Inflow Hydrographs	= 27, 32, 35, 37, 42, 43	Total Contrib. Area	= 29.04 ac



Hydrograph Report

Project Name:

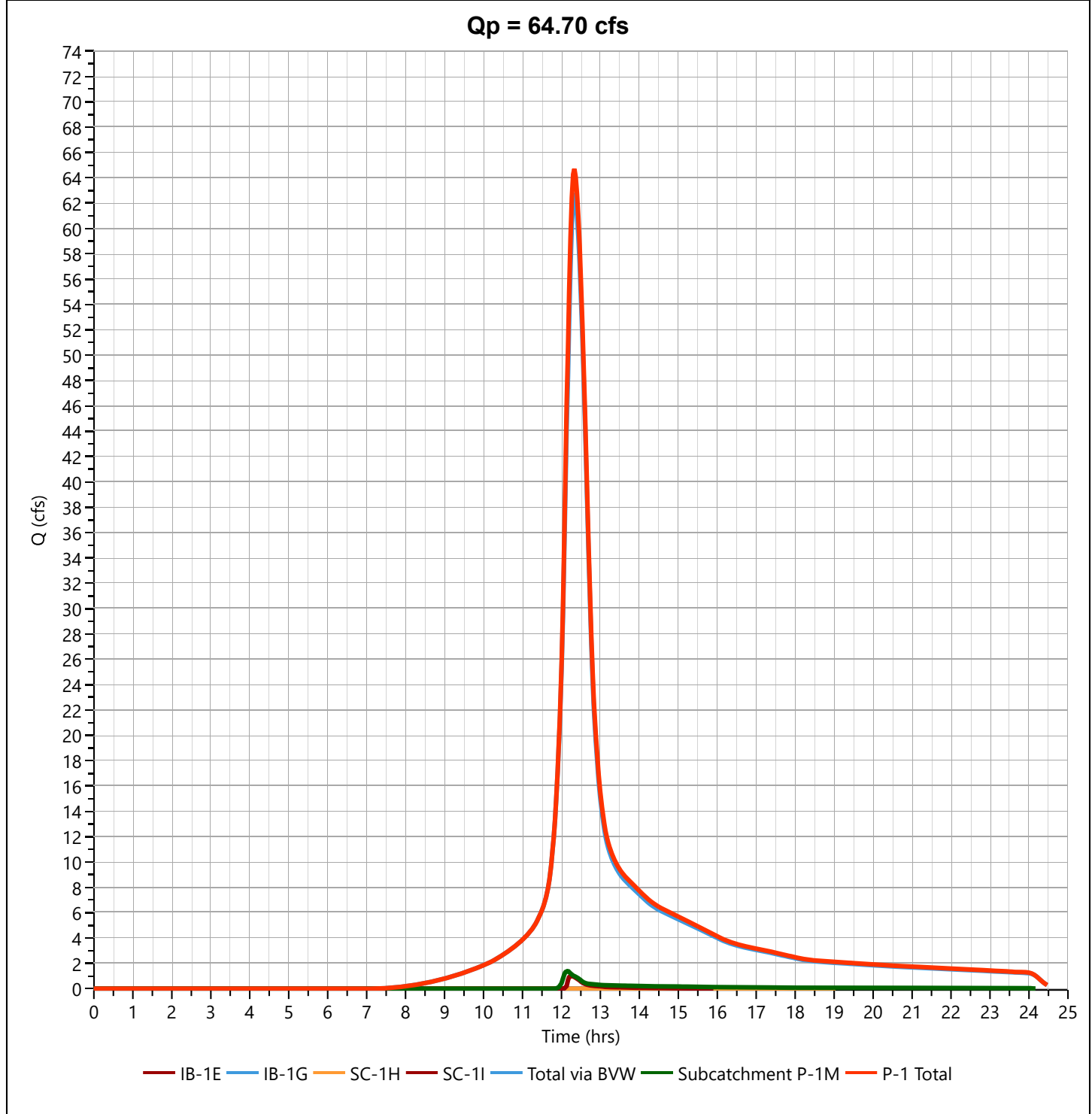
Hydrology Studio v 3.0.0.29

12-14-2023

P-1 Total

Hyd. No. 44

Hydrograph Type	= Junction	Peak Flow	= 64.70 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 339,291 cuft
Inflow Hydrographs	= 27, 32, 35, 37, 42, 43	Total Contrib. Area	= 29.04 ac



Hydrograph Report

Project Name:

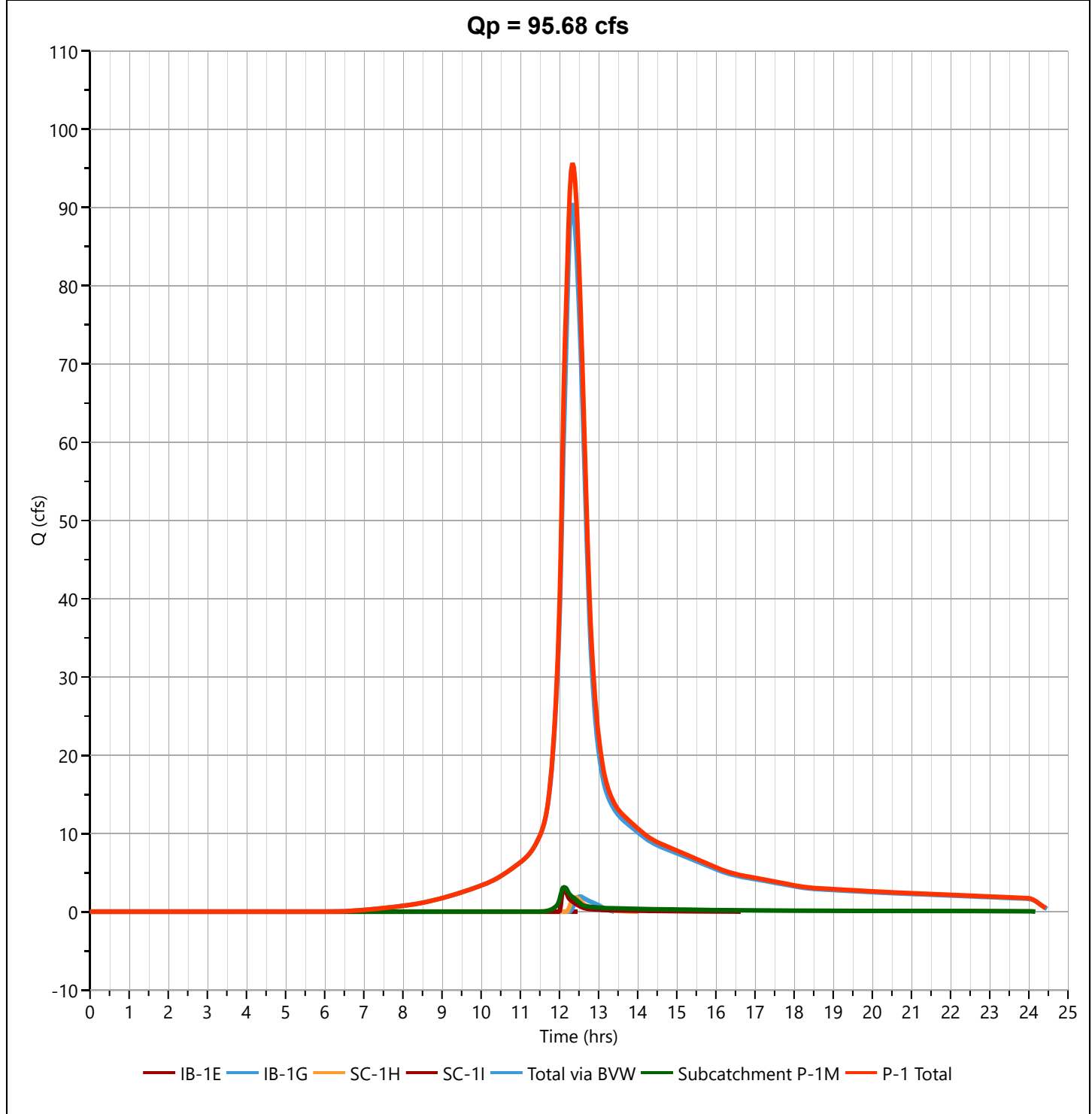
Hydrology Studio v 3.0.0.29

12-14-2023

P-1 Total

Hyd. No. 44

Hydrograph Type	= Junction	Peak Flow	= 95.68 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 499,278 cuft
Inflow Hydrographs	= 27, 32, 35, 37, 42, 43	Total Contrib. Area	= 29.04 ac



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-2A

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.43	42.63
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			0.40	15.73
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					0.84	58.36

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{58.36}{0.84} = 69.61 ; \text{ Use CN} = \boxed{70}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	0.83	2.01	4.27

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Hydrograph Report

Project Name:

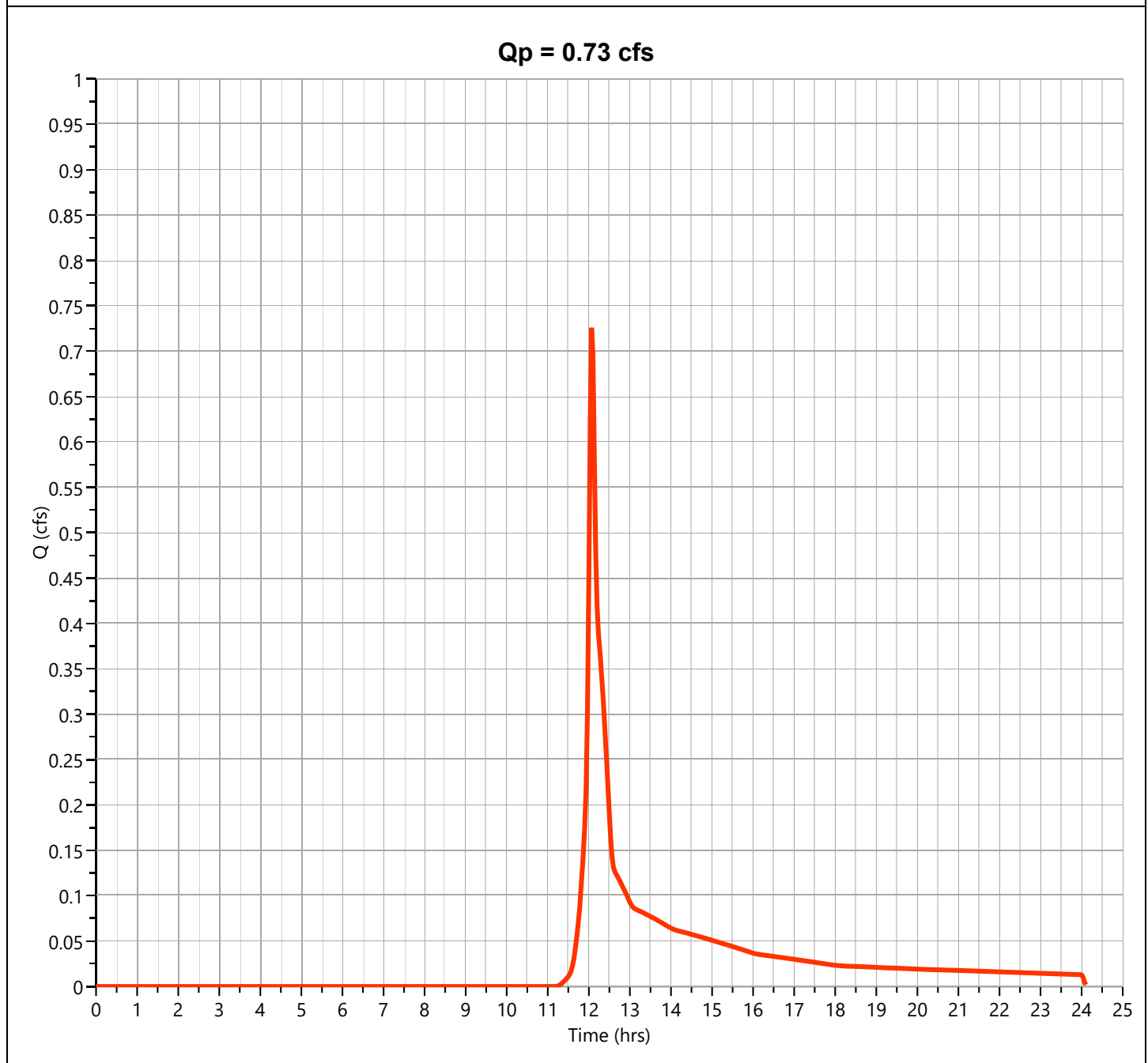
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-2A

Hyd. No. 46

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.726 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 2,417 cuft
Drainage Area	= 0.84 ac	Curve Number	= 70
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

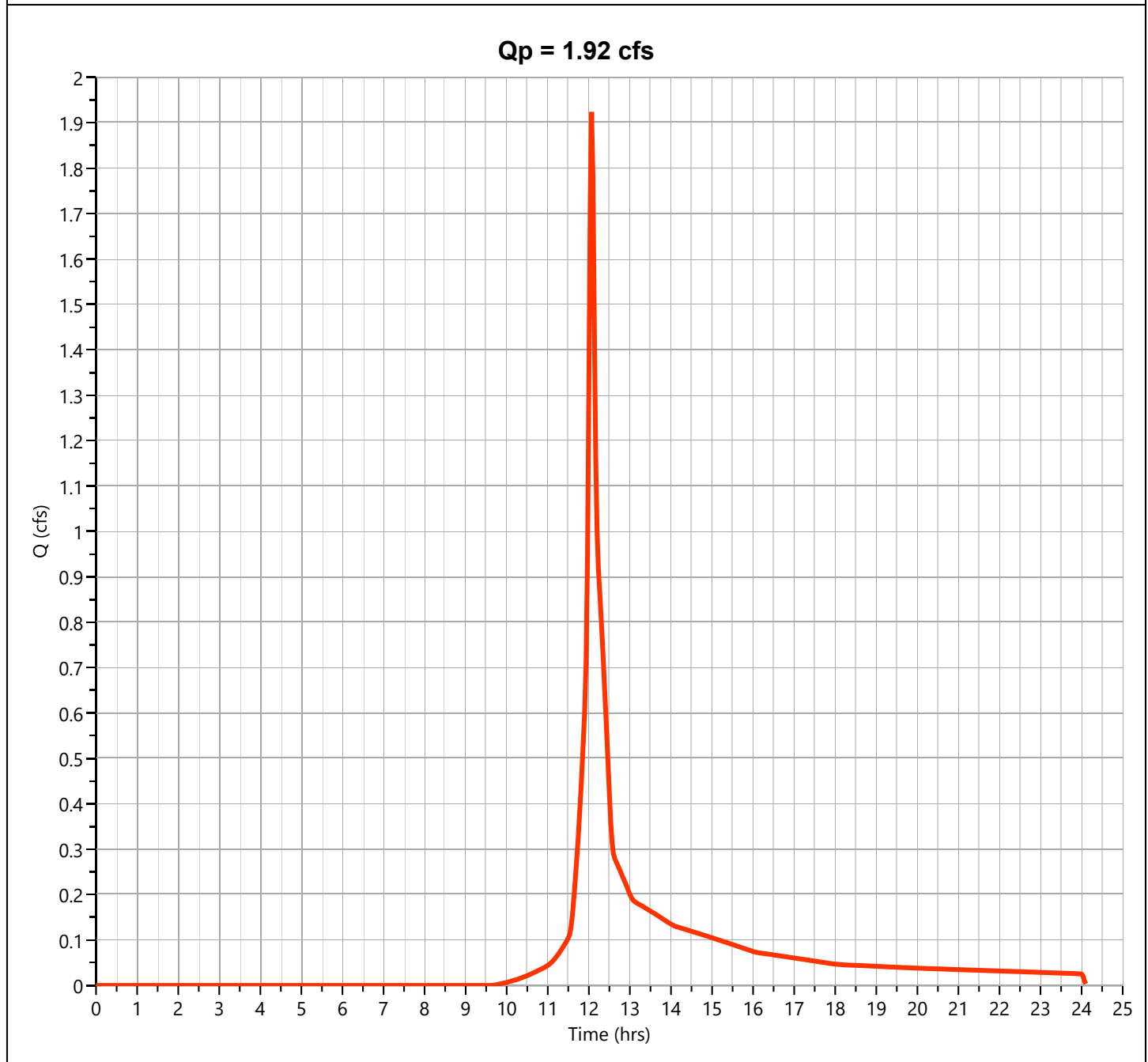
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-2A

Hyd. No. 46

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.924 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 5,842 cuft
Drainage Area	= 0.84 ac	Curve Number	= 70
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

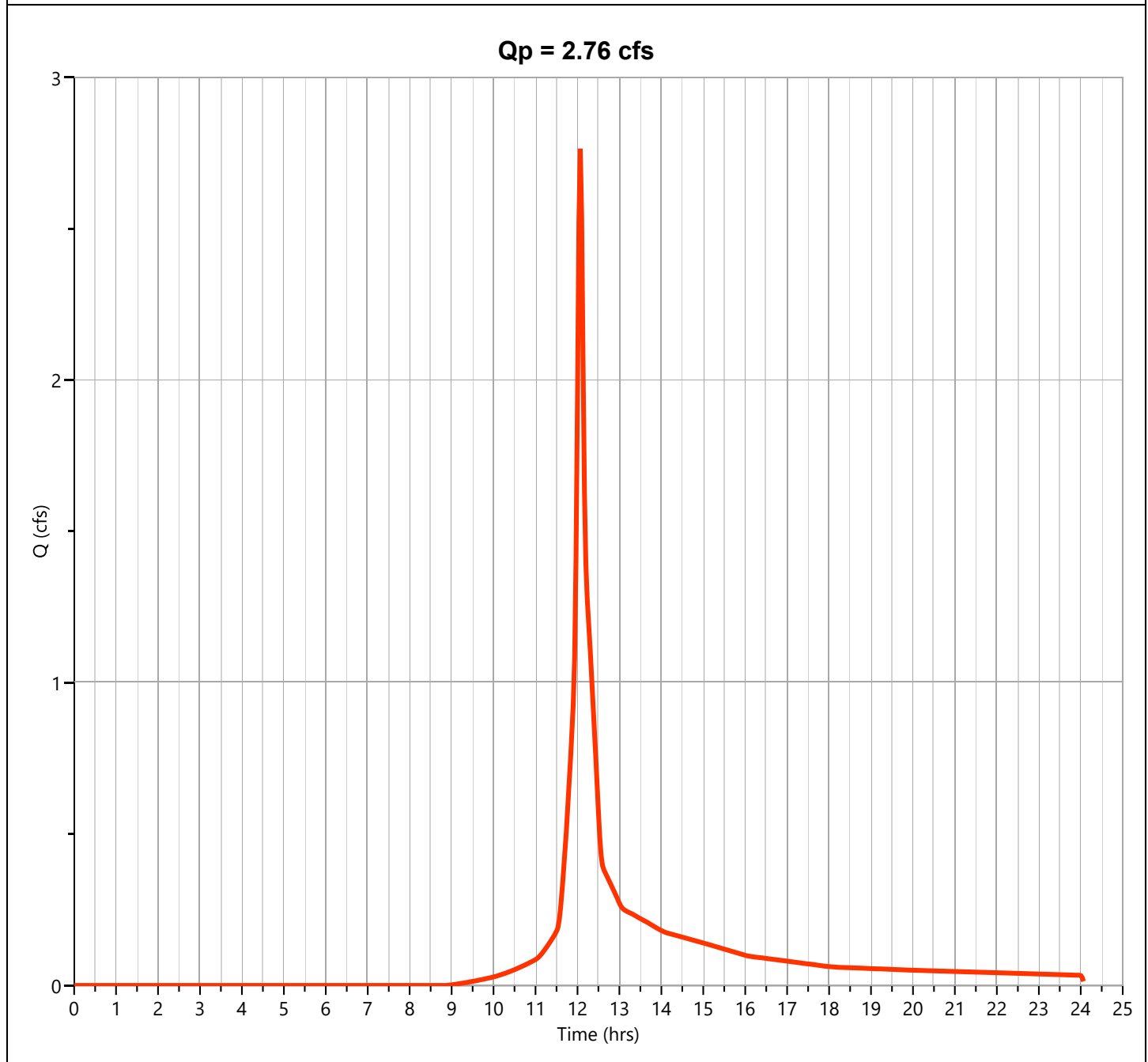
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-2A

Hyd. No. 46

Hydrograph Type	= NRCS Runoff	Peak Flow	= 2.765 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 8,292 cuft
Drainage Area	= 0.84 ac	Curve Number	= 70
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

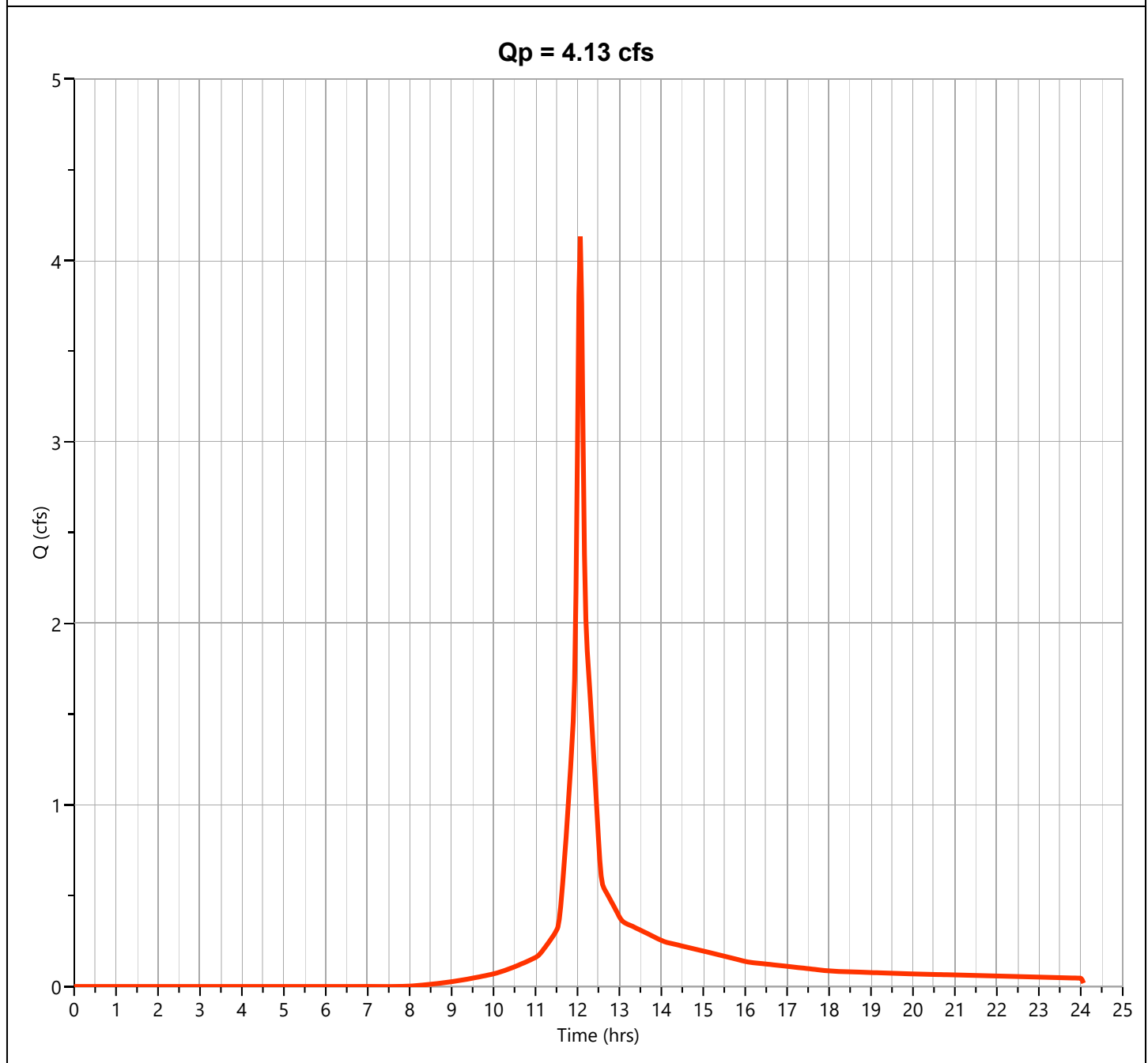
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-2A

Hyd. No. 46

Hydrograph Type	= NRCS Runoff	Peak Flow	= 4.131 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 12,345 cuft
Drainage Area	= 0.84 ac	Curve Number	= 70
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

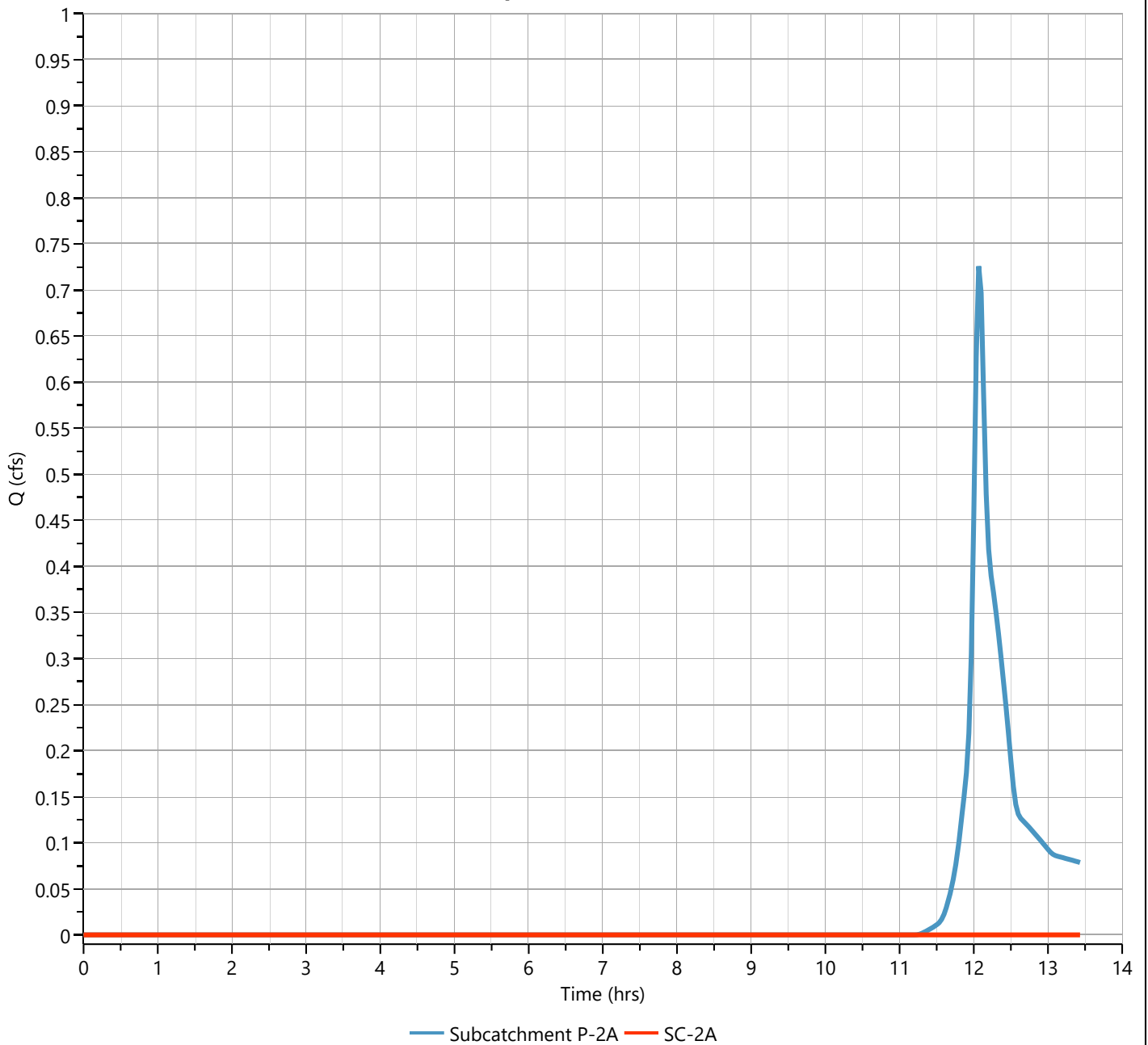
SC-2A

Hyd. No. 47

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 13.40 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 46 - Subcatchment P-2A	Max. Elevation	= 224.73 ft
Pond Name	= SC-2A	Max. Storage	= 376 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

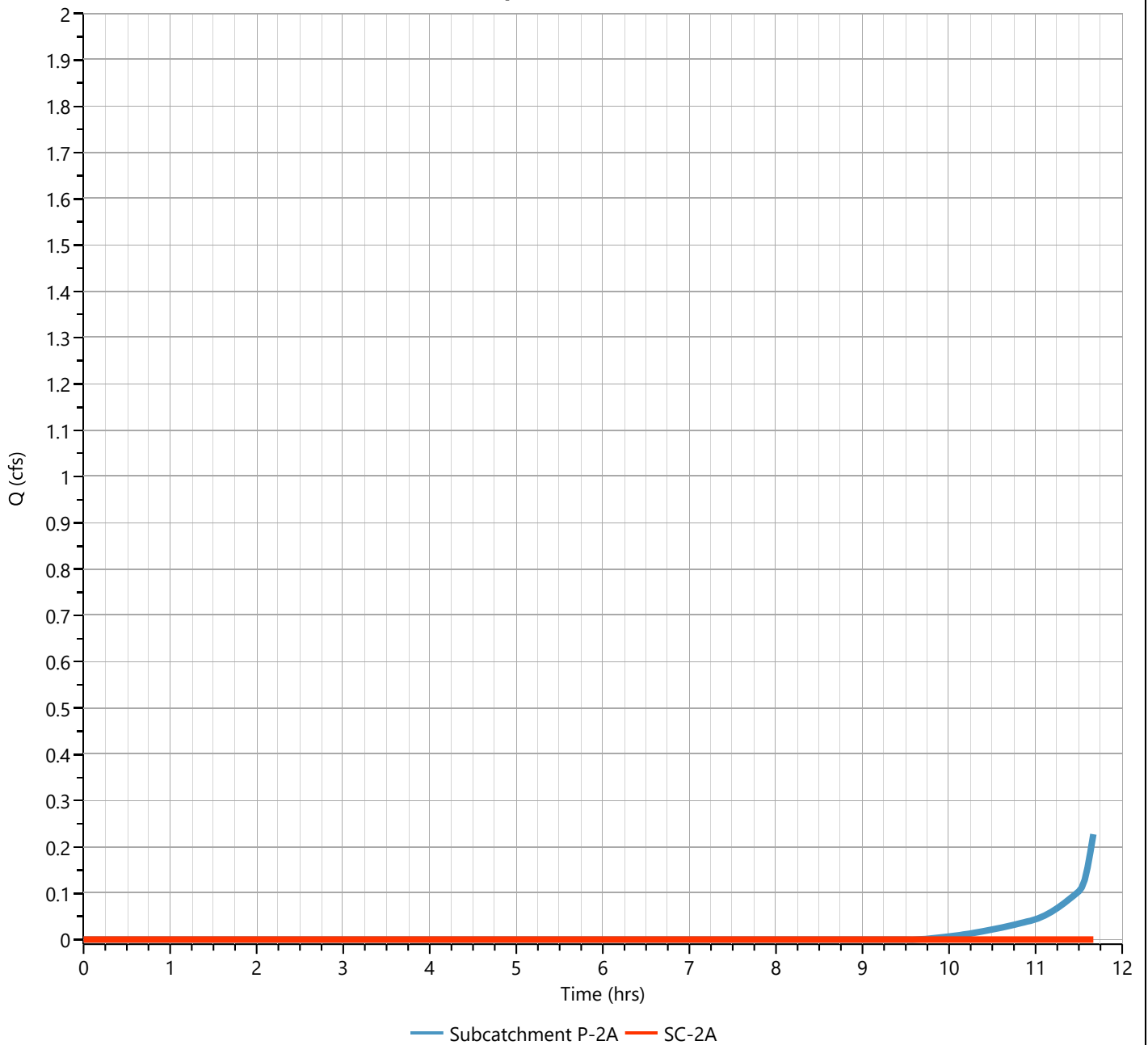
SC-2A

Hyd. No. 47

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 11.63 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 46 - Subcatchment P-2A	Max. Elevation	= 226.38 ft
Pond Name	= SC-2A	Max. Storage	= 1,882 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

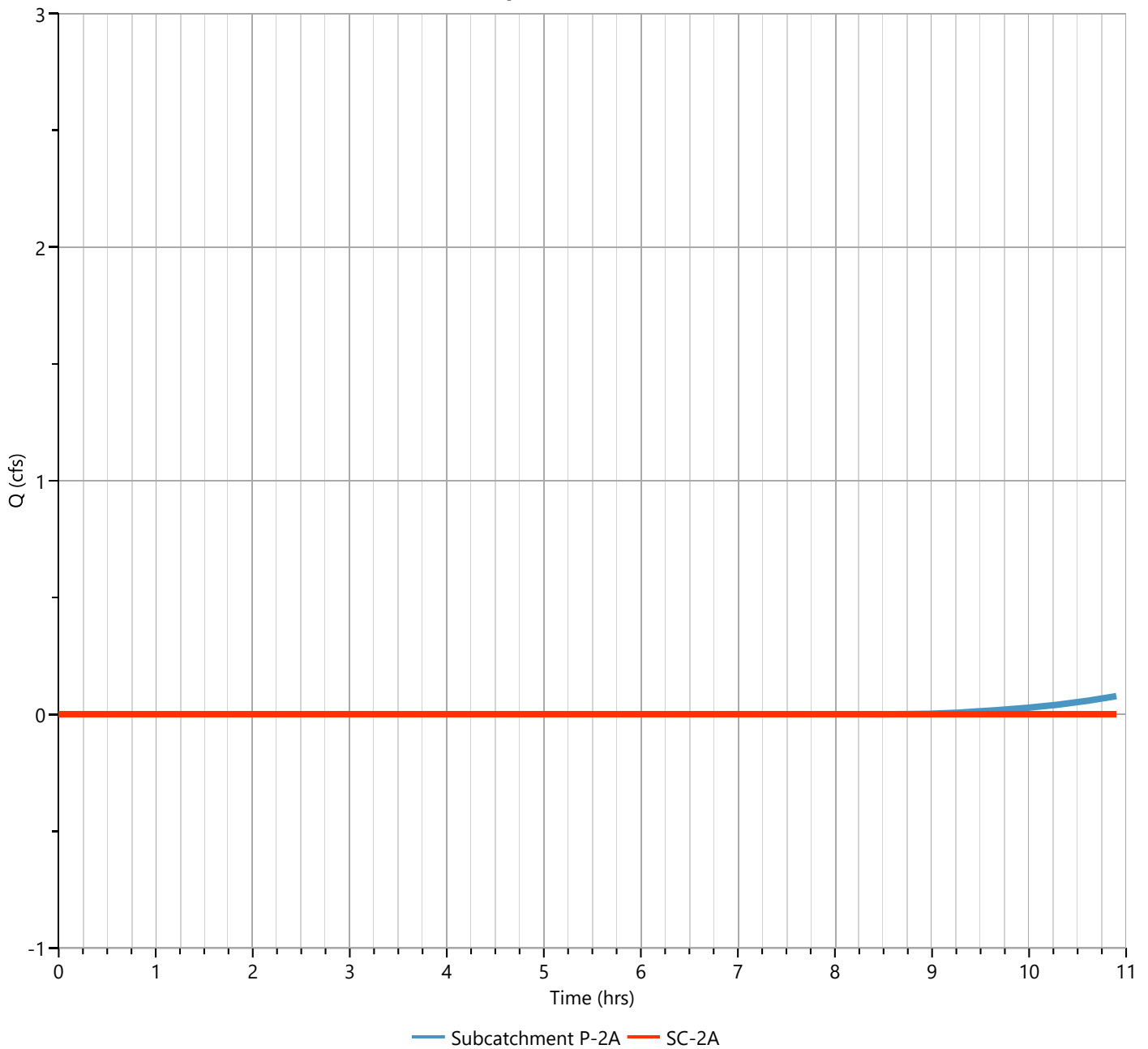
SC-2A

Hyd. No. 47

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 10.87 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 46 - Subcatchment P-2A	Max. Elevation	= 227.92 ft
Pond Name	= SC-2A	Max. Storage	= 3,165 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

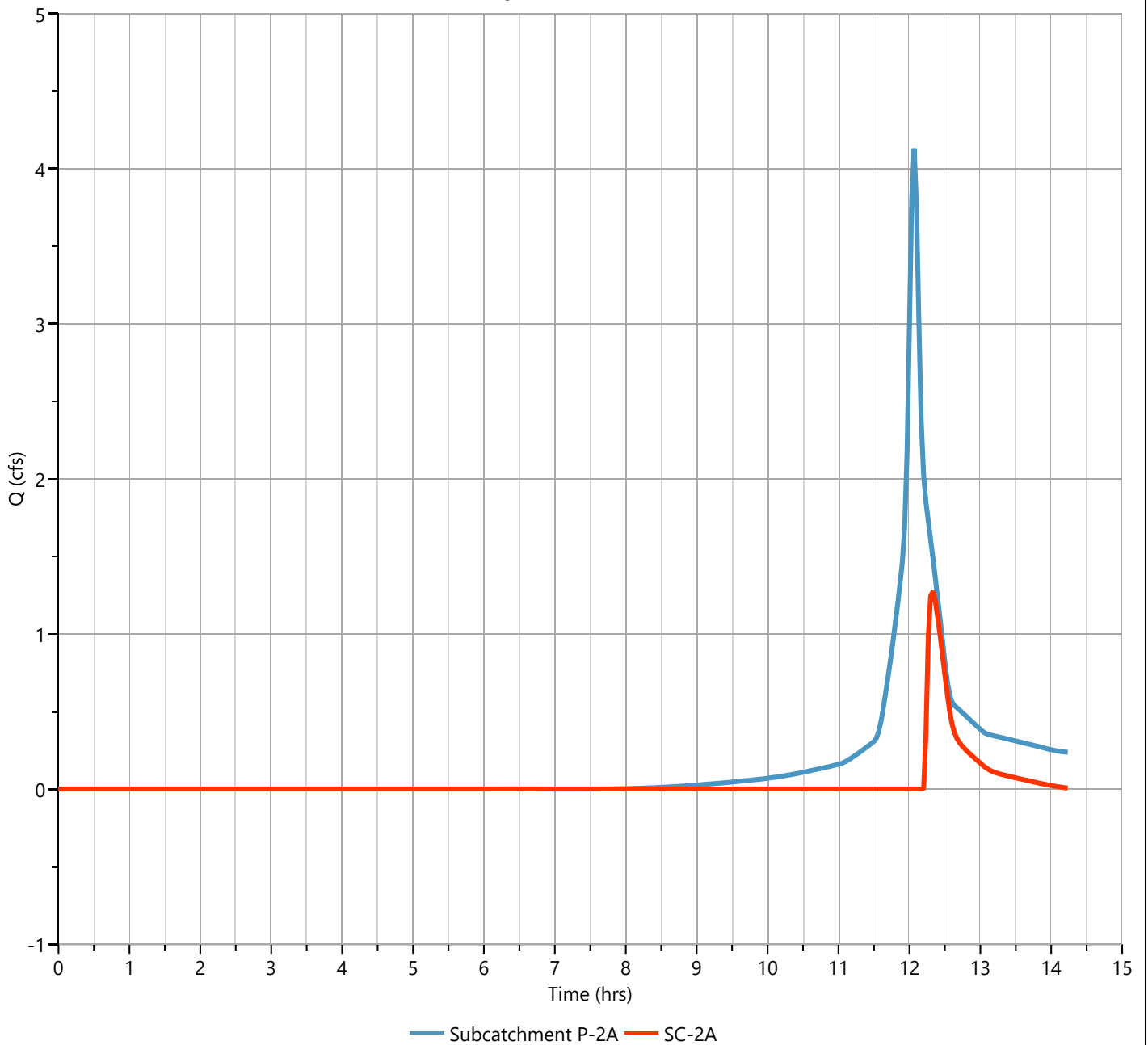
SC-2A

Hyd. No. 47

Hydrograph Type	= Pond Route	Peak Flow	= 1.275 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 1,877 cuft
Inflow Hydrograph	= 46 - Subcatchment P-2A	Max. Elevation	= 229.35 ft
Pond Name	= SC-2A	Max. Storage	= 3,958 cuft

Pond Routing by Storage Indication Method

Qp = 1.28 cfs



Pond Report

Project Name:

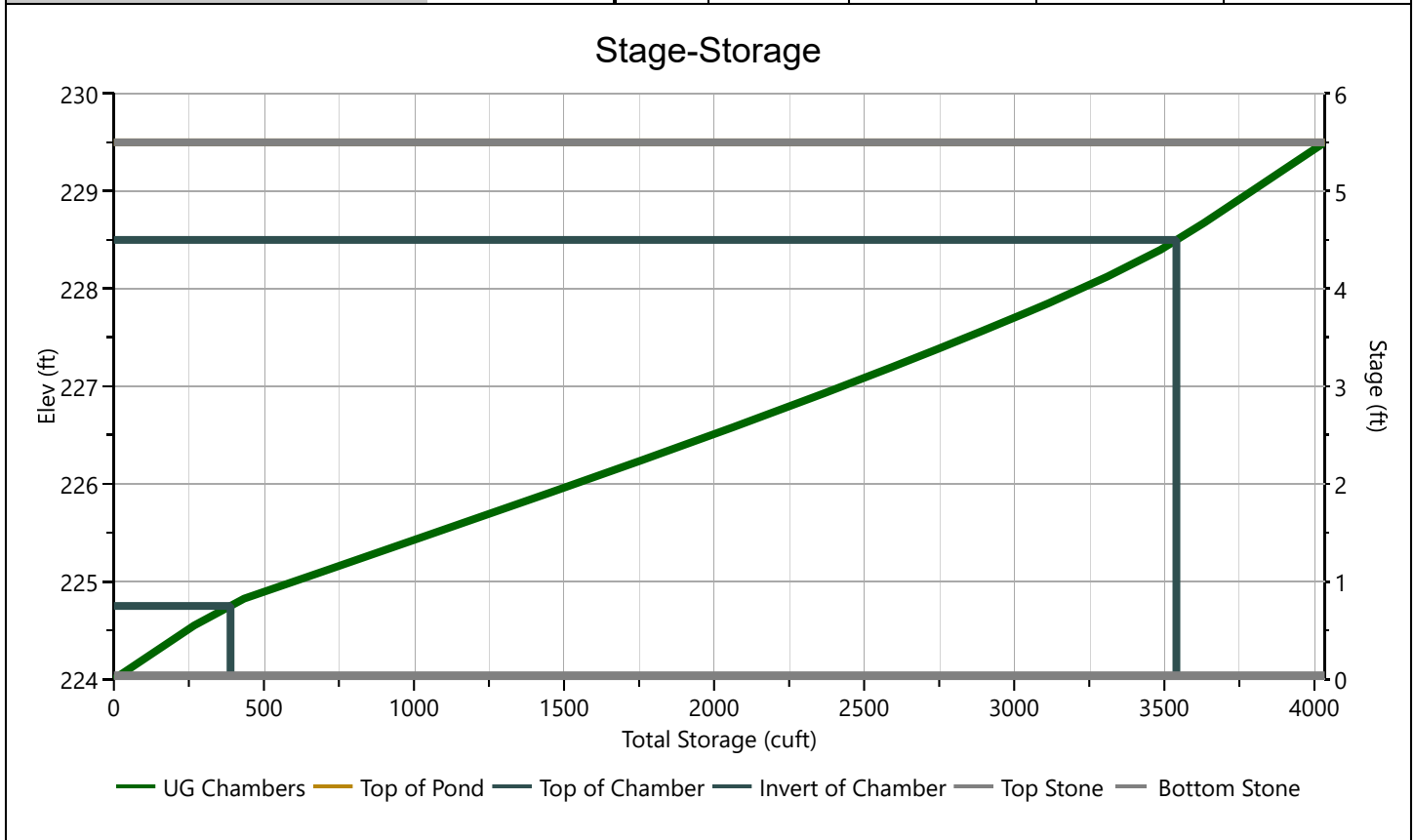
Hydrology Studio v 3.0.0.29

12-13-2023

SC-2A

Stage-Storage

StormTech® MC-3500™ Chamber		Stage / Storage Table				
Description	Input	Stage (in)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Chamber Height, in	45	0.0	224.00	1,217	0.000	0.000
Chamber Shape	Arch	3.3	224.28	1,217	134	134
Chamber Width, in	77	6.6	224.55	1,217	134	268
Installed Length, ft	7.17	9.9	224.83	1,217	166	434
No. Chambers	20	13.2	225.10	1,217	260	694
Bare Chamber Stor, cuft	2,198	16.5	225.38	1,217	259	954
No. Rows	2	19.8	225.65	1,217	258	1,211
Space Between Rows, in	9	23.1	225.93	1,217	255	1,467
Stone Above, in	12	26.4	226.20	1,217	252	1,719
Stone Below, in	9	29.7	226.48	1,217	248	1,967
Stone Sides, in	12	33.0	226.75	1,217	244	2,211
Stone Ends, in	12	36.3	227.03	1,217	238	2,449
Encasement Voids, %	40.00	39.6	227.30	1,217	231	2,679
Encasement Bottom Elevation, ft	224.00	42.9	227.58	1,217	222	2,901
		46.2	227.85	1,217	211	3,113
		49.5	228.13	1,217	197	3,310
		52.8	228.40	1,217	177	3,488
		56.1	228.68	1,217	145	3,633
		59.4	228.95	1,217	134	3,767
		62.7	229.23	1,217	134	3,900
		66.0	229.50	1,217	134	4,034



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

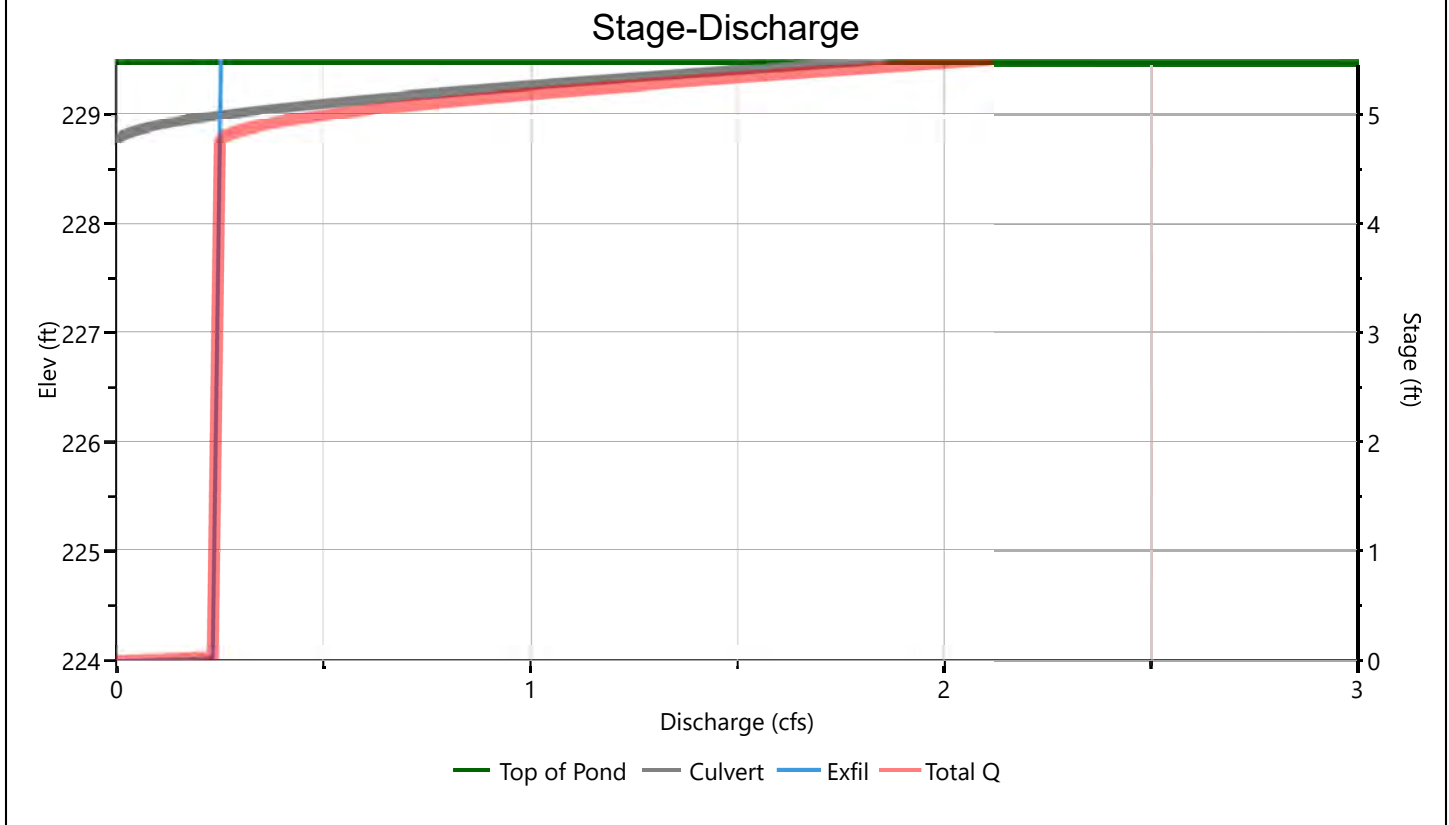
12-13-2023

SC-2A

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in	12				Hole Diameter, in
Span, in	12				No. holes
No. Barrels	1				Invert Elevation, ft
Invert Elevation, ft	228.75				Height, ft
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co
Length, ft	50				
Barrel Slope, %	2				
N-Value, n	0.012				
Weirs	Riser*	Weirs			Ancillary
		1	2	3	
Shape / Type					Exfiltration, in/hr
Crest Elevation, ft					8.27**
Crest Length, ft					
Angle, deg					
Weir Coefficient, Cw					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

SC-2A

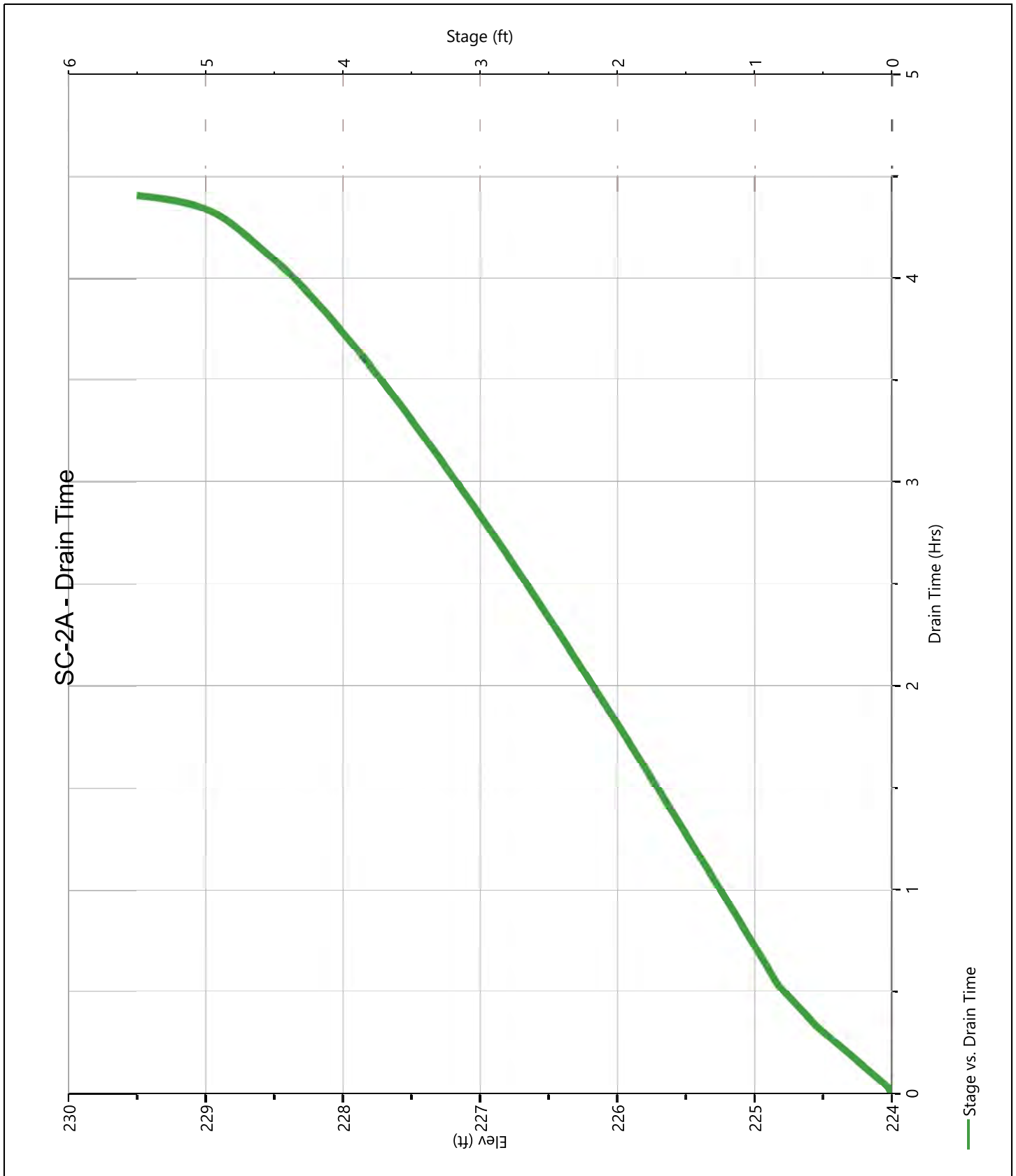
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	224.00	0.000	0.000								0.000		0.000	
0.28	224.28	134	0.000								0.234		0.234	
0.55	224.55	268	0.000								0.235		0.235	
0.83	224.83	434	0.000								0.236		0.236	
1.10	225.10	694	0.000								0.237		0.237	
1.38	225.38	954	0.000								0.238		0.238	
1.65	225.65	1,211	0.000								0.239		0.239	
1.93	225.93	1,467	0.000								0.240		0.240	
2.20	226.20	1,719	0.000								0.241		0.241	
2.48	226.48	1,967	0.000								0.242		0.242	
2.75	226.75	2,211	0.000								0.243		0.243	
3.03	227.03	2,449	0.000								0.244		0.244	
3.30	227.30	2,679	0.000								0.245		0.245	
3.58	227.58	2,901	0.000								0.246		0.246	
3.85	227.85	3,113	0.000								0.247		0.247	
4.13	228.13	3,310	0.000								0.248		0.248	
4.40	228.40	3,488	0.000								0.249		0.249	
4.68	228.68	3,633	0.000								0.250		0.250	
4.95	228.95	3,767	0.171 ic								0.251		0.422	
5.23	229.23	3,900	0.864 ic								0.252		1.116	
5.50	229.50	4,034	1.864 ic								0.253		2.117	

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

SC-2A

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-2B

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.06	5.93
A	Woods - Good Condition	30			0.65	19.42
A	Open Space - Good Condition	39			1.80	70.13
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					2.51	95.48

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{95.48}{2.51} = \underline{38.10} ; \text{ Use CN} = \underline{38}$$

2. Runoff

Frequency..... yr

Rainfall, P (24-hour)..... in

Runoff, Q..... in

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
0.00	0.17	1.01

Worksheet 3: Time of Concentration (Tc) or travel time (Tt)

SM-6781

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one: Present Developed

Subcatchment P-2B

Circle one: Tc Tt through subarea

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $T_t = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Compute Tt hr

Segment ID	A-B		
	LAWN		
	0.24		
ft	50		
in	3.1		
ft/ft	0.020		
	0.14		0.14

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $T_t = L / 3600V$

Compute Tt hr

Segment ID	B-C		
	UNPAVED		
ft	144		
ft/ft	0.06		
ft/s	3.95		
	0.01		0.01

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $T_t = L / 3600V$

Compute r

ft/ft

Compute V

ft/s

Compute Tt hr

Segment ID			
			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.15
min 8.9

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-2B

Hyd. No. 48

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.00 hrs
Time Interval	= 2 min	Runoff Volume	= 0.000 cuft
Drainage Area	= 2.51 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 8.9 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484

Qp = 0.00 cfs

Hydrograph Report

Project Name:

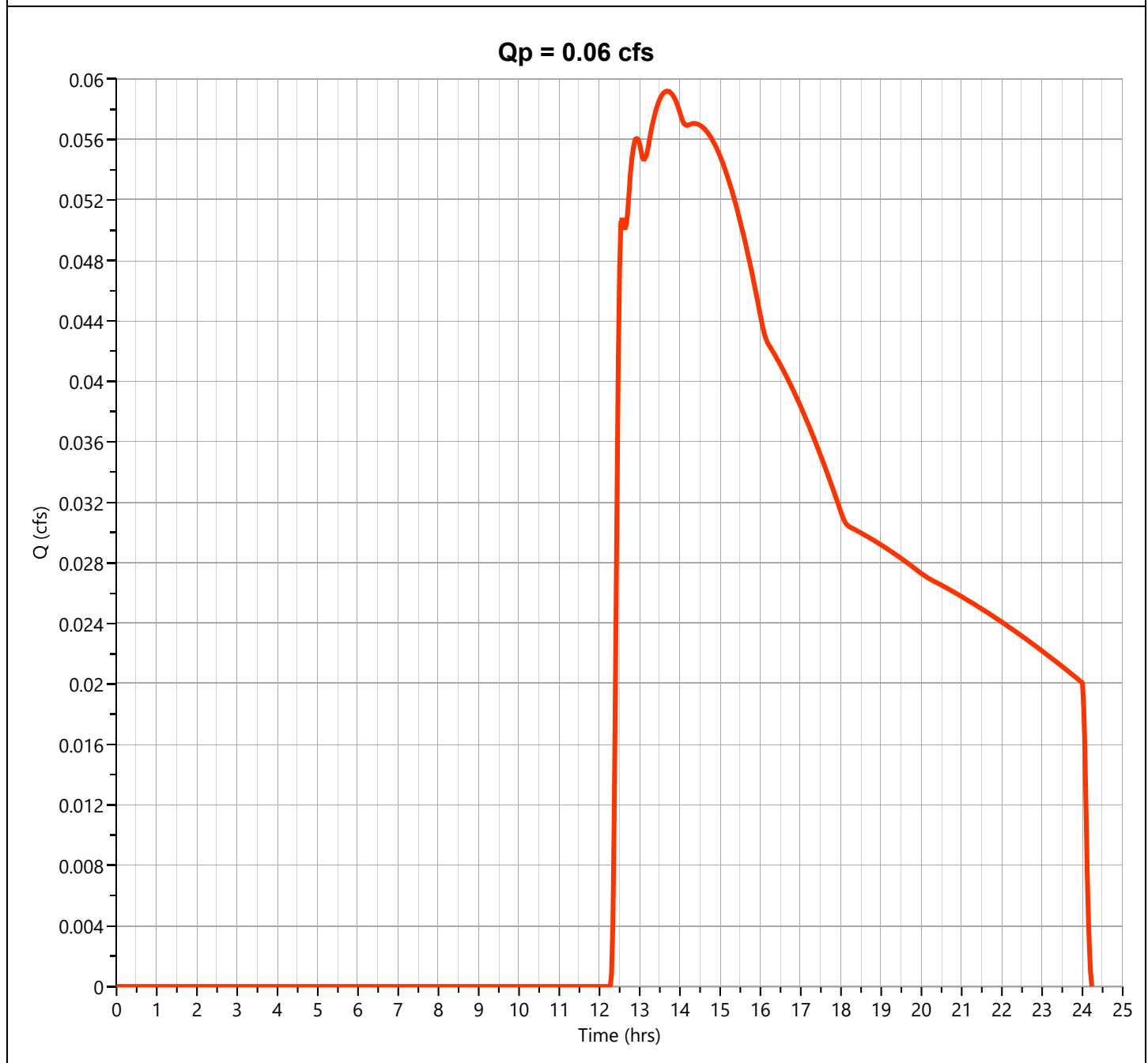
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-2B

Hyd. No. 48

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.059 cfs
Storm Frequency	= 10-yr	Time to Peak	= 13.70 hrs
Time Interval	= 2 min	Runoff Volume	= 1,539 cuft
Drainage Area	= 2.51 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 8.9 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

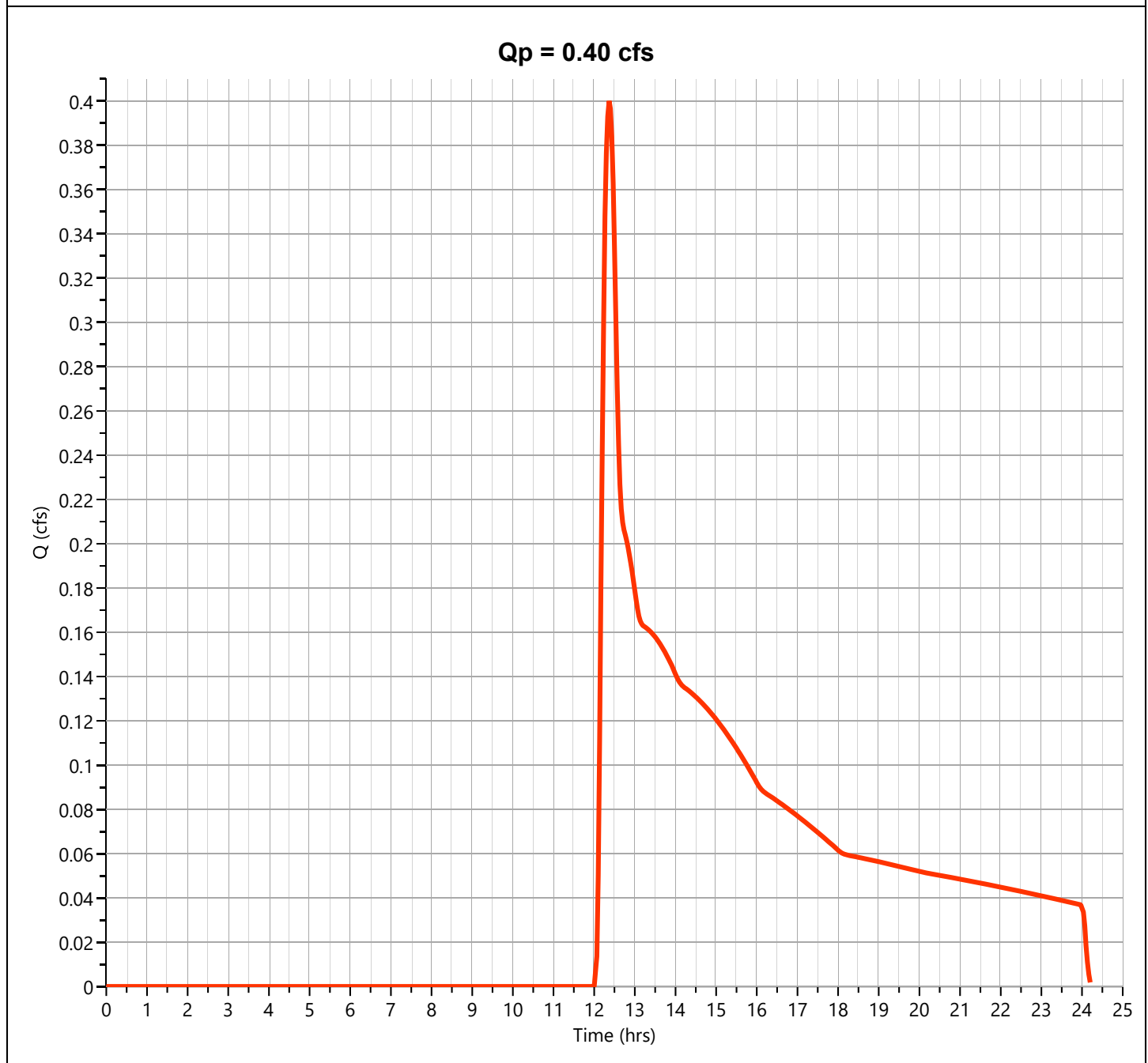
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-2B

Hyd. No. 48

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.400 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Runoff Volume	= 3,878 cuft
Drainage Area	= 2.51 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 8.9 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

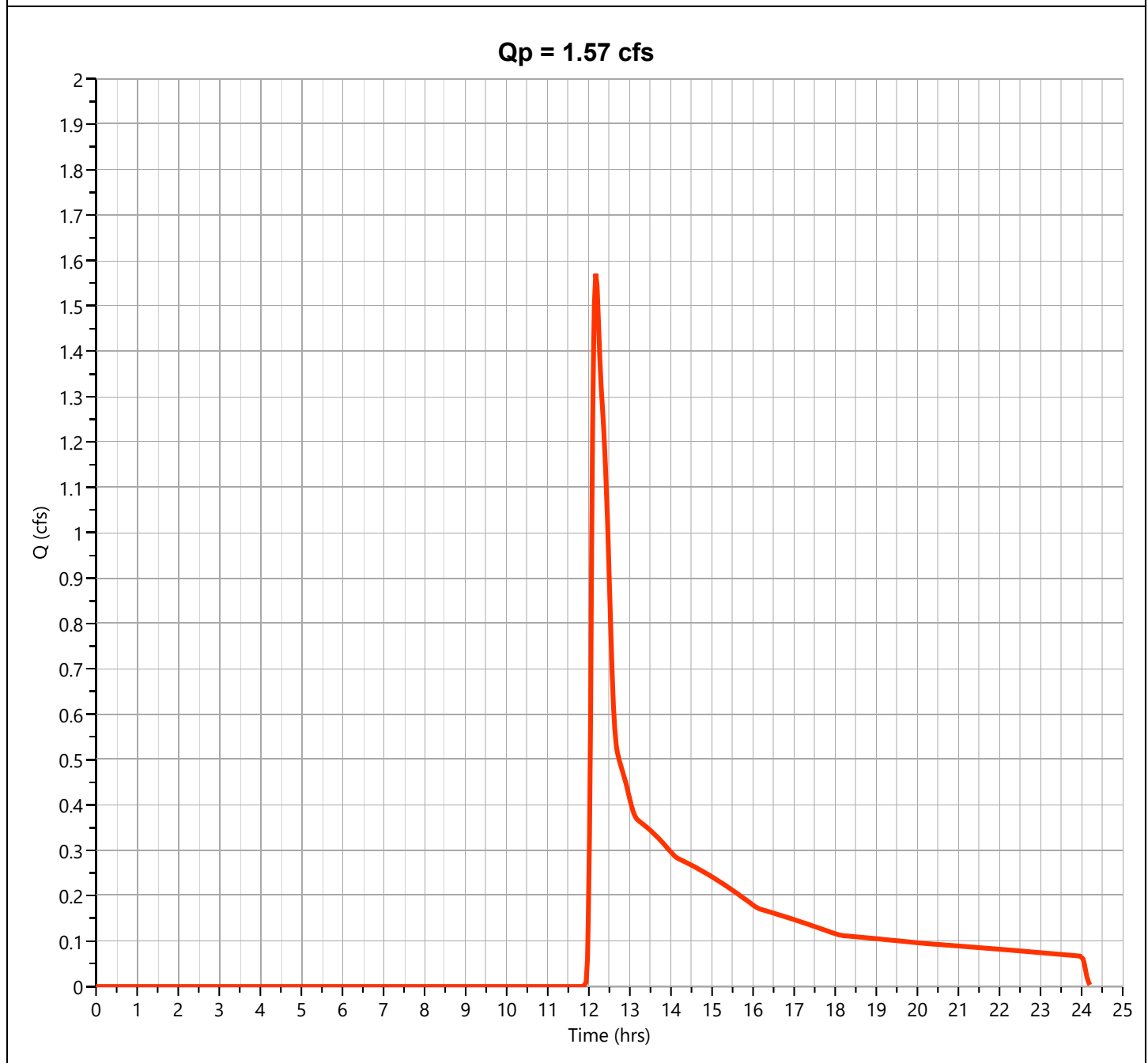
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-2B

Hyd. No. 48

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.571 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.17 hrs
Time Interval	= 2 min	Runoff Volume	= 9,100 cuft
Drainage Area	= 2.51 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 8.9 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

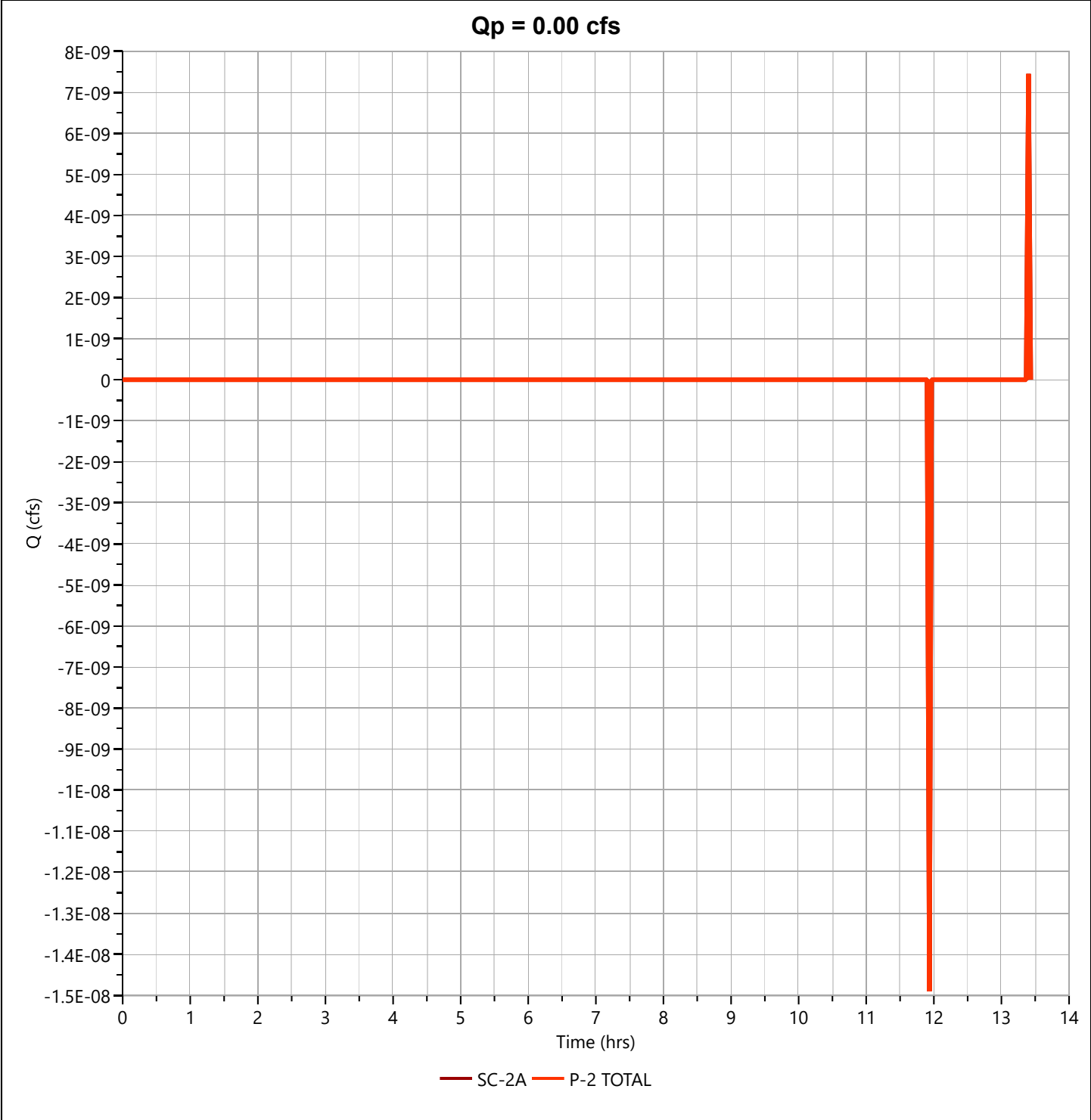
Hydrology Studio v 3.0.0.29

12-13-2023

P-2 TOTAL

Hyd. No. 49

Hydrograph Type	= Junction	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 13.40 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrographs	= 47, 48	Total Contrib. Area	= 2.51 ac



Hydrograph Report

Project Name:

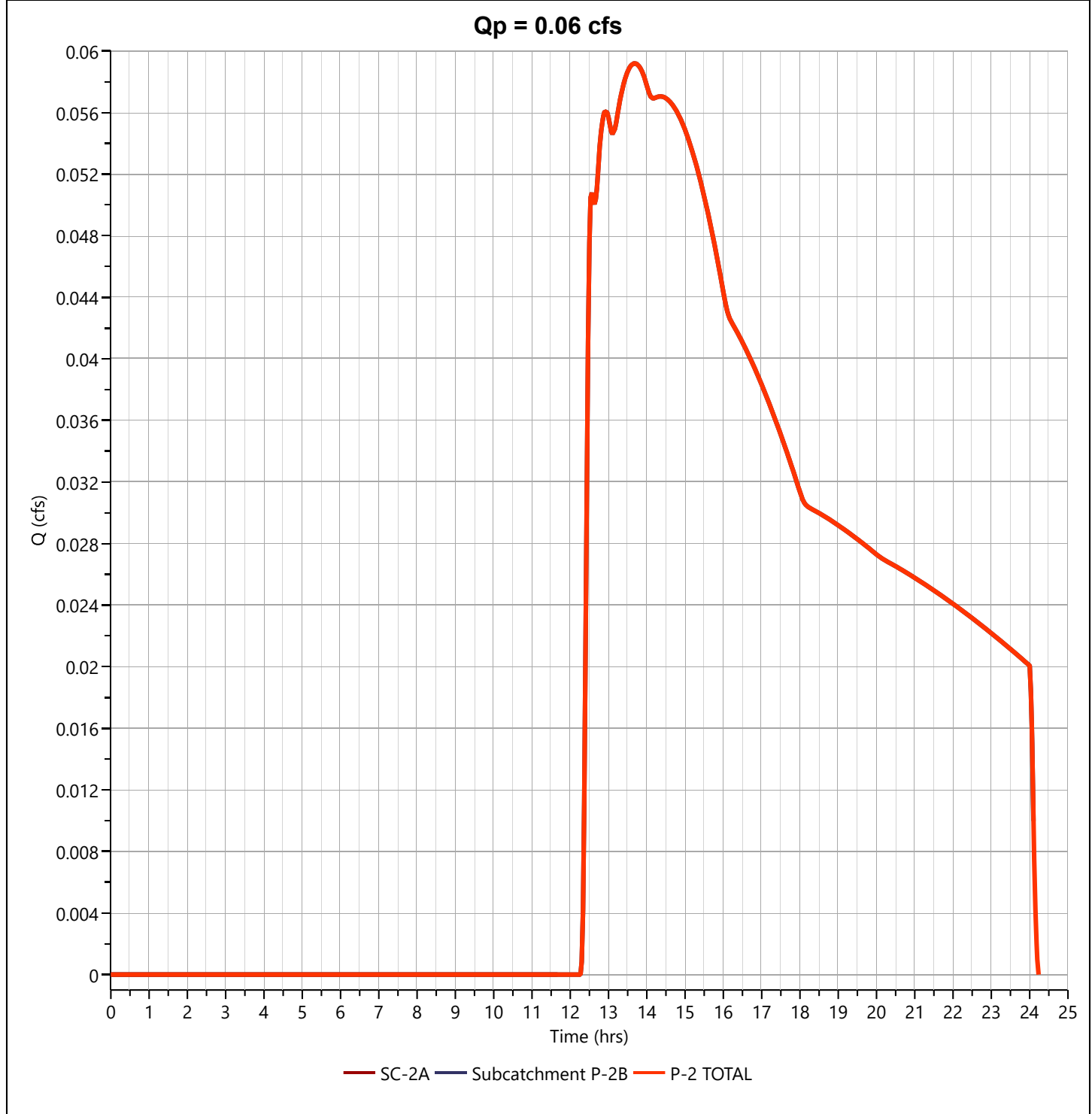
Hydrology Studio v 3.0.0.29

12-13-2023

P-2 TOTAL

Hyd. No. 49

Hydrograph Type	= Junction	Peak Flow	= 0.059 cfs
Storm Frequency	= 10-yr	Time to Peak	= 13.70 hrs
Time Interval	= 2 min	Hydrograph Volume	= 1,539 cuft
Inflow Hydrographs	= 47, 48	Total Contrib. Area	= 2.51 ac



Hydrograph Report

Project Name:

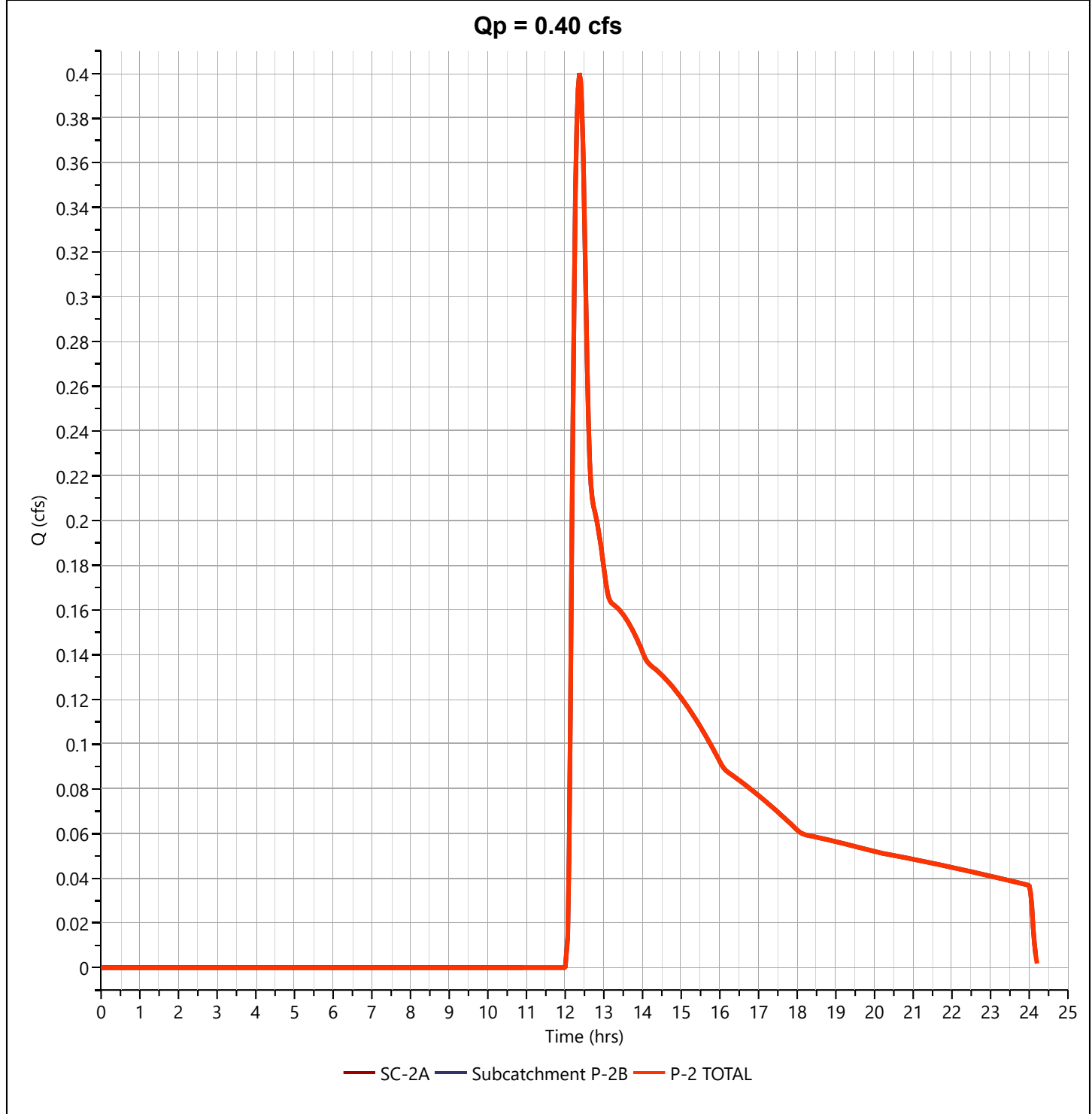
Hydrology Studio v 3.0.0.29

12-13-2023

P-2 TOTAL

Hyd. No. 49

Hydrograph Type	= Junction	Peak Flow	= 0.400 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Hydrograph Volume	= 3,878 cuft
Inflow Hydrographs	= 47, 48	Total Contrib. Area	= 2.51 ac



Hydrograph Report

Project Name:

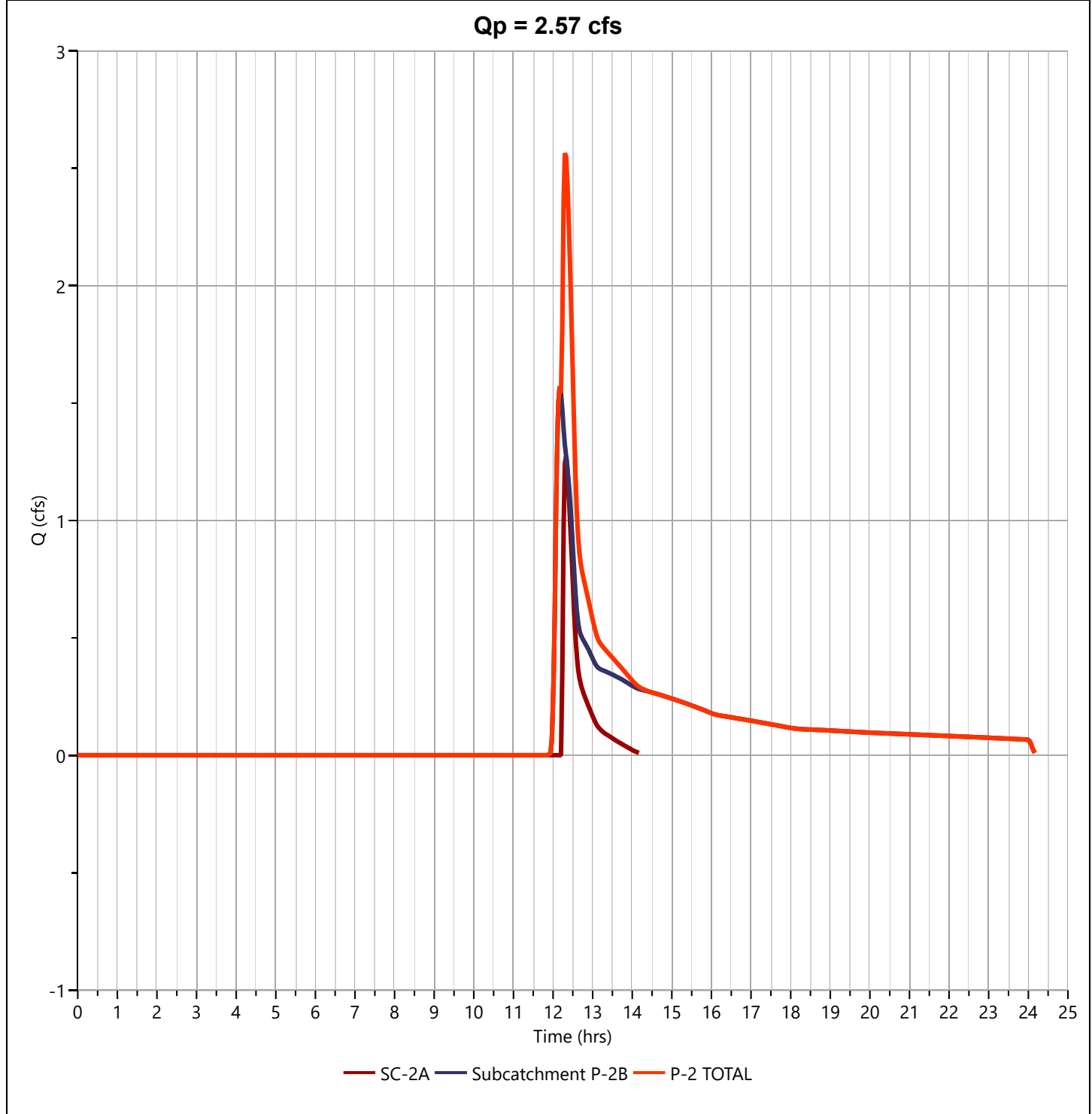
Hydrology Studio v 3.0.0.29

12-13-2023

P-2 TOTAL

Hyd. No. 49

Hydrograph Type	= Junction	Peak Flow	= 2.565 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.30 hrs
Time Interval	= 2 min	Hydrograph Volume	= 10,976 cuft
Inflow Hydrographs	= 47, 48	Total Contrib. Area	= 2.51 ac



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-3A

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			1.34	130.87
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			1.54	59.94
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					2.87	190.80

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{190.80}{2.87} = \underline{66.43} ; \text{ Use CN} = \underline{66}$$

2. Runoff

Frequency..... yr

Rainfall, P (24-hour)..... in

Runoff, Q..... in

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
0.68	1.77	3.92

Hydrograph Report

Project Name:

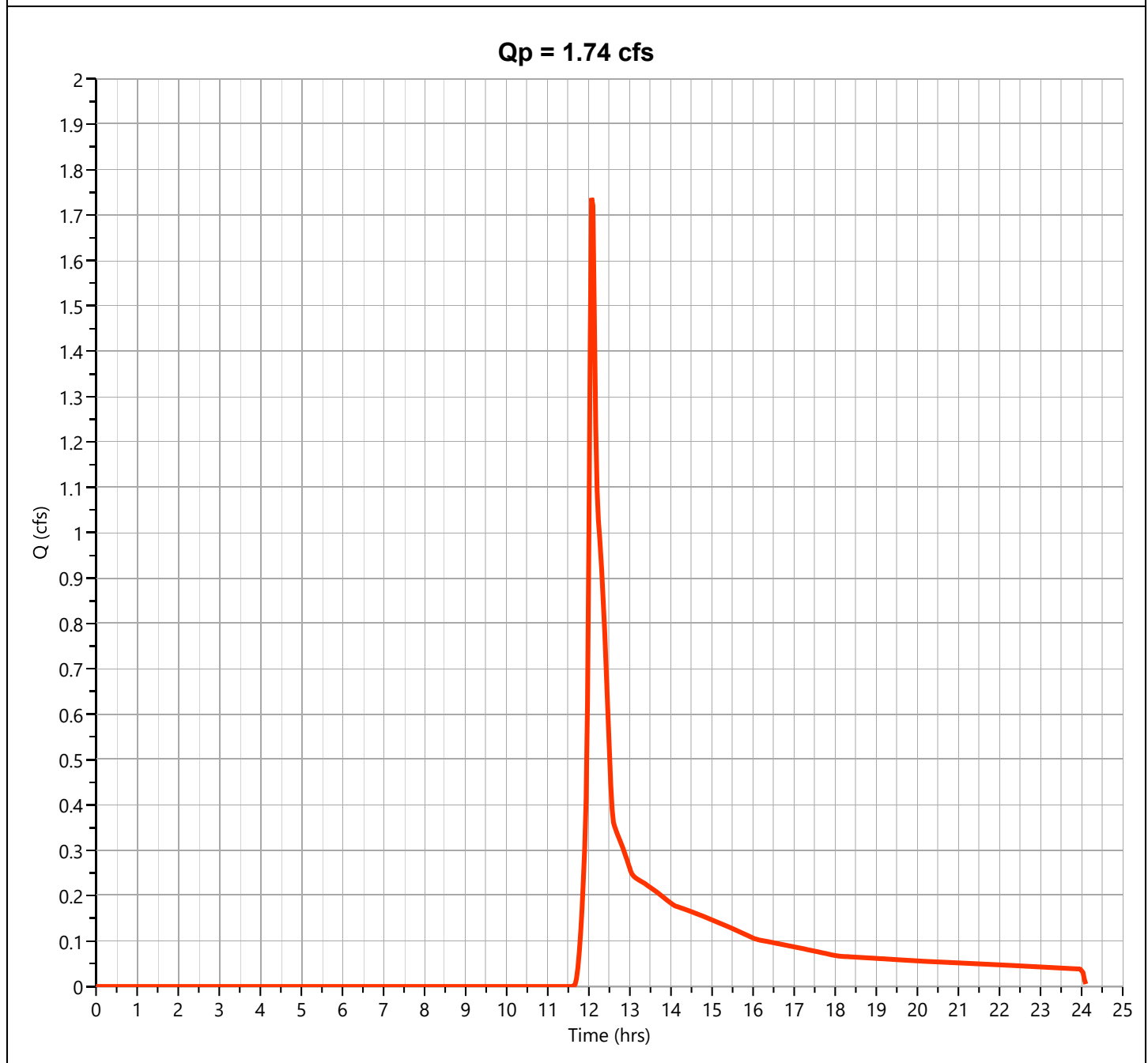
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-3A

Hyd. No. 51

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.738 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 6,429 cuft
Drainage Area	= 2.87 ac	Curve Number	= 66
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

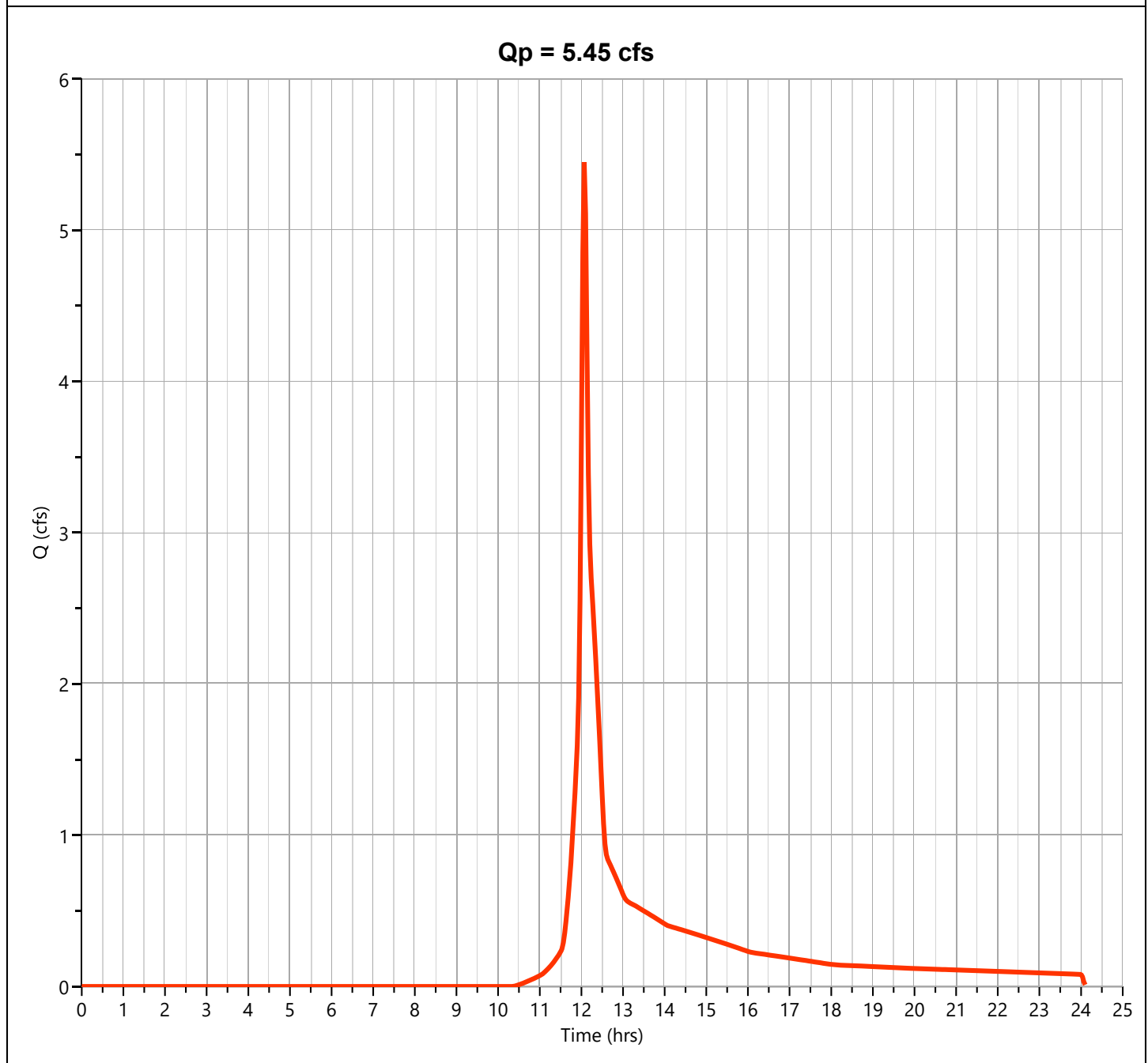
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-3A

Hyd. No. 51

Hydrograph Type	= NRCS Runoff	Peak Flow	= 5.448 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 16,941 cuft
Drainage Area	= 2.87 ac	Curve Number	= 66
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

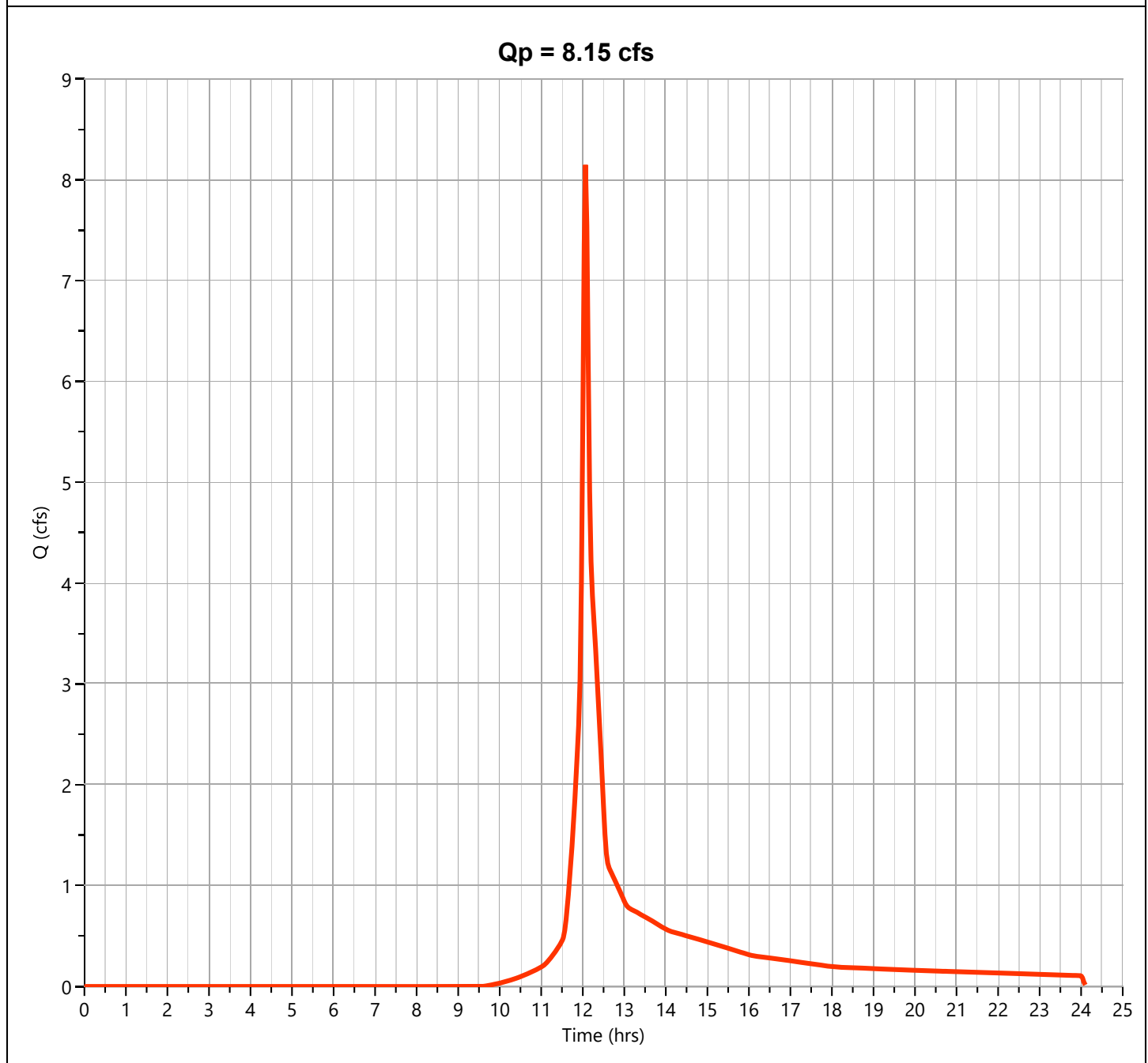
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-3A

Hyd. No. 51

Hydrograph Type	= NRCS Runoff	Peak Flow	= 8.147 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 24,705 cuft
Drainage Area	= 2.87 ac	Curve Number	= 66
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

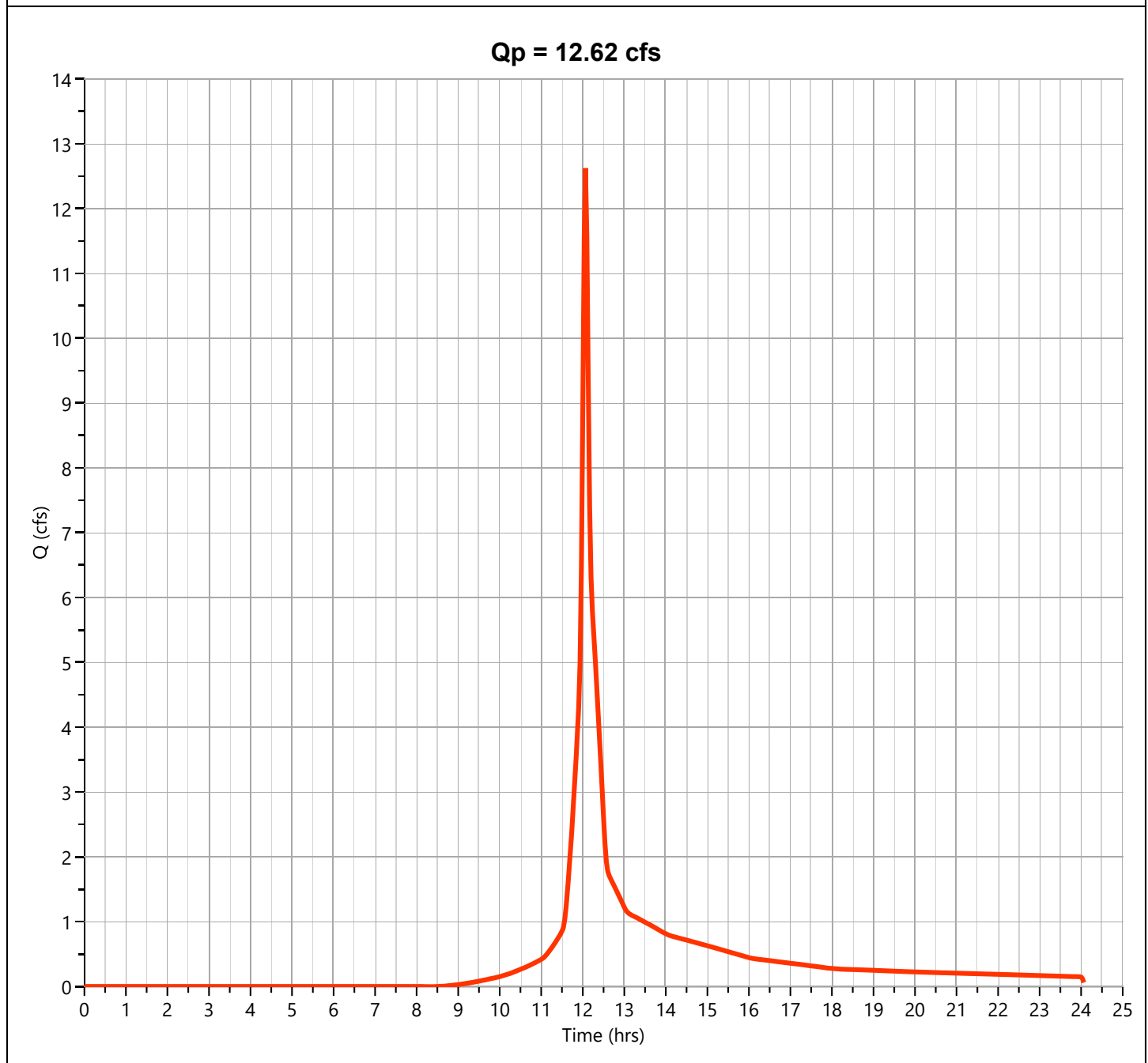
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-3A

Hyd. No. 51

Hydrograph Type	= NRCS Runoff	Peak Flow	= 12.62 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 37,786 cuft
Drainage Area	= 2.87 ac	Curve Number	= 66
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

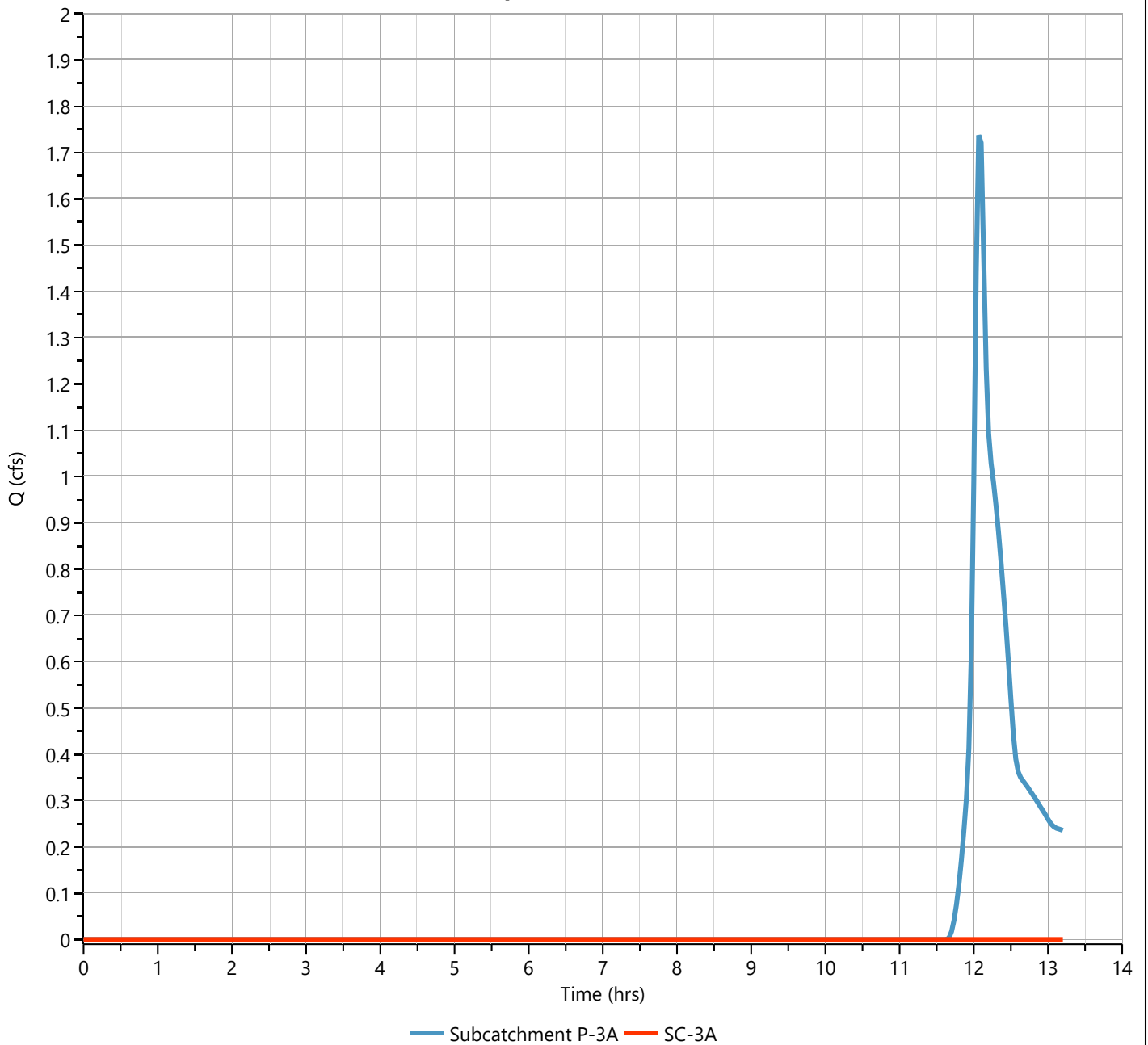
SC-3A

Hyd. No. 52

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 13.17 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 51 - Subcatchment P-3A	Max. Elevation	= 225.46 ft
Pond Name	= SC-3A	Max. Storage	= 416 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

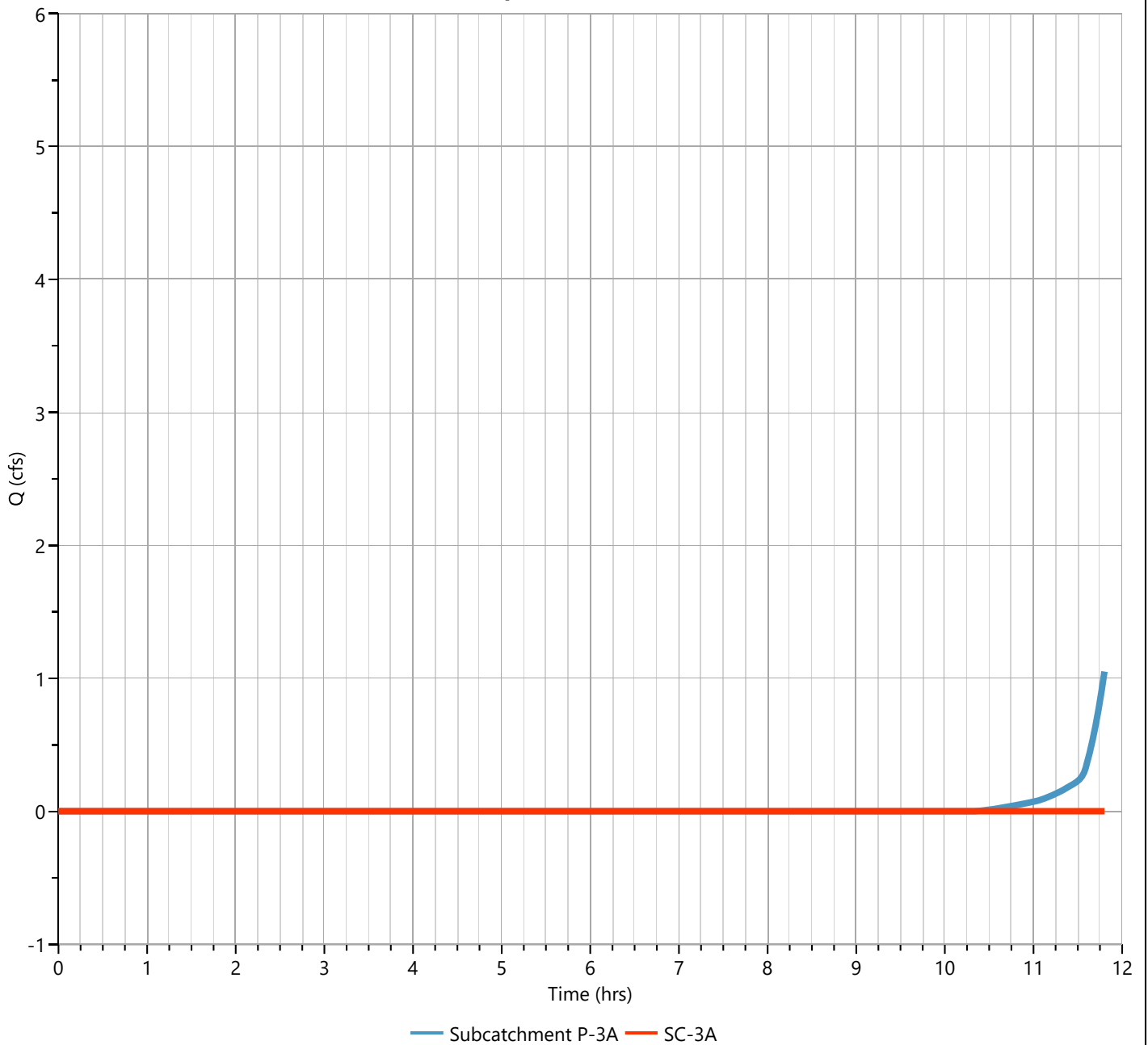
SC-3A

Hyd. No. 52

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 11.77 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 51 - Subcatchment P-3A	Max. Elevation	= 226.72 ft
Pond Name	= SC-3A	Max. Storage	= 4,404 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

SC-3A

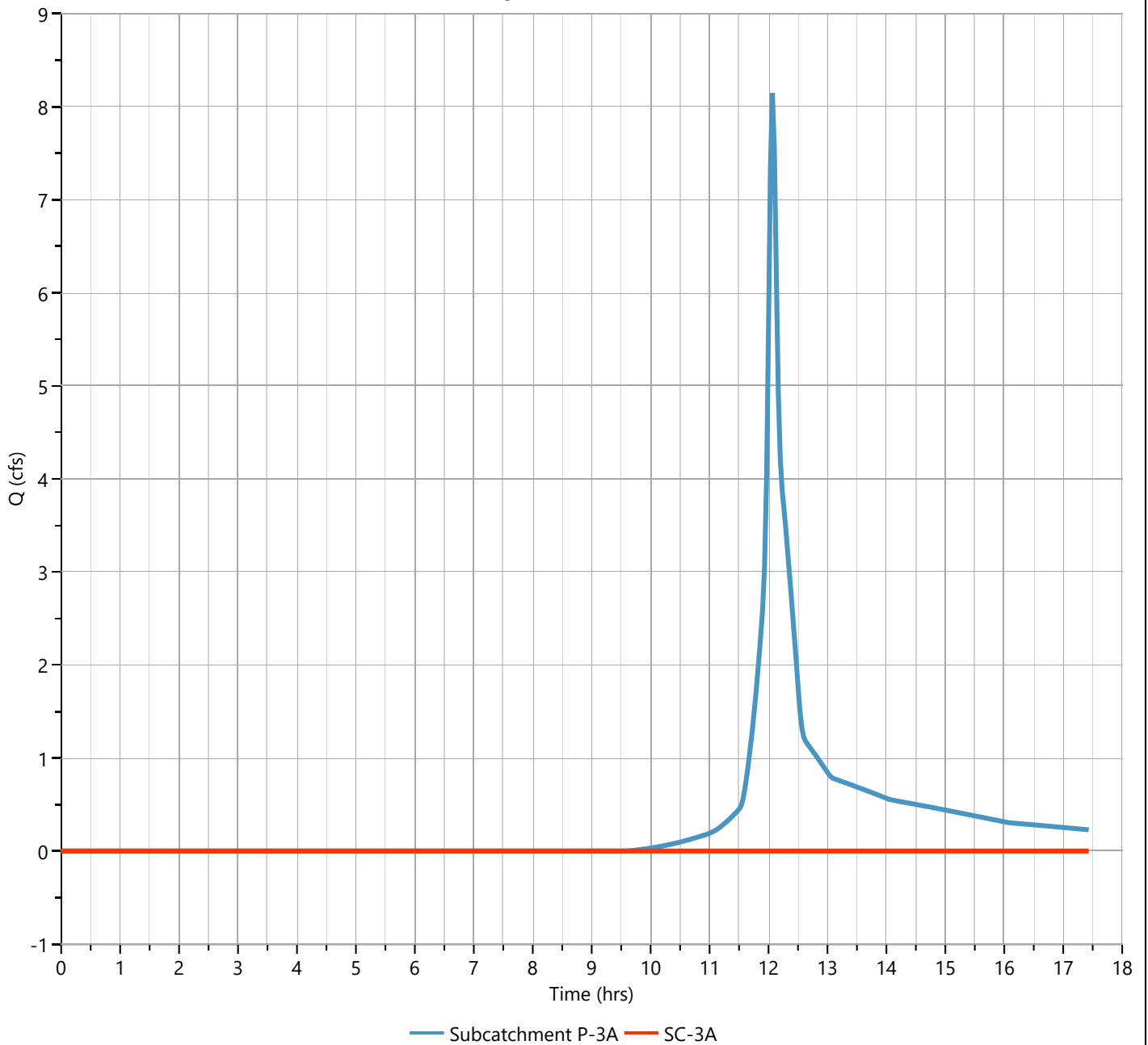
Hyd. No. 52

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 17.40 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 51 - Subcatchment P-3A	Max. Elevation	= 227.66 ft
Pond Name	= SC-3A	Max. Storage	= 8,131 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 3.45 hrs

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

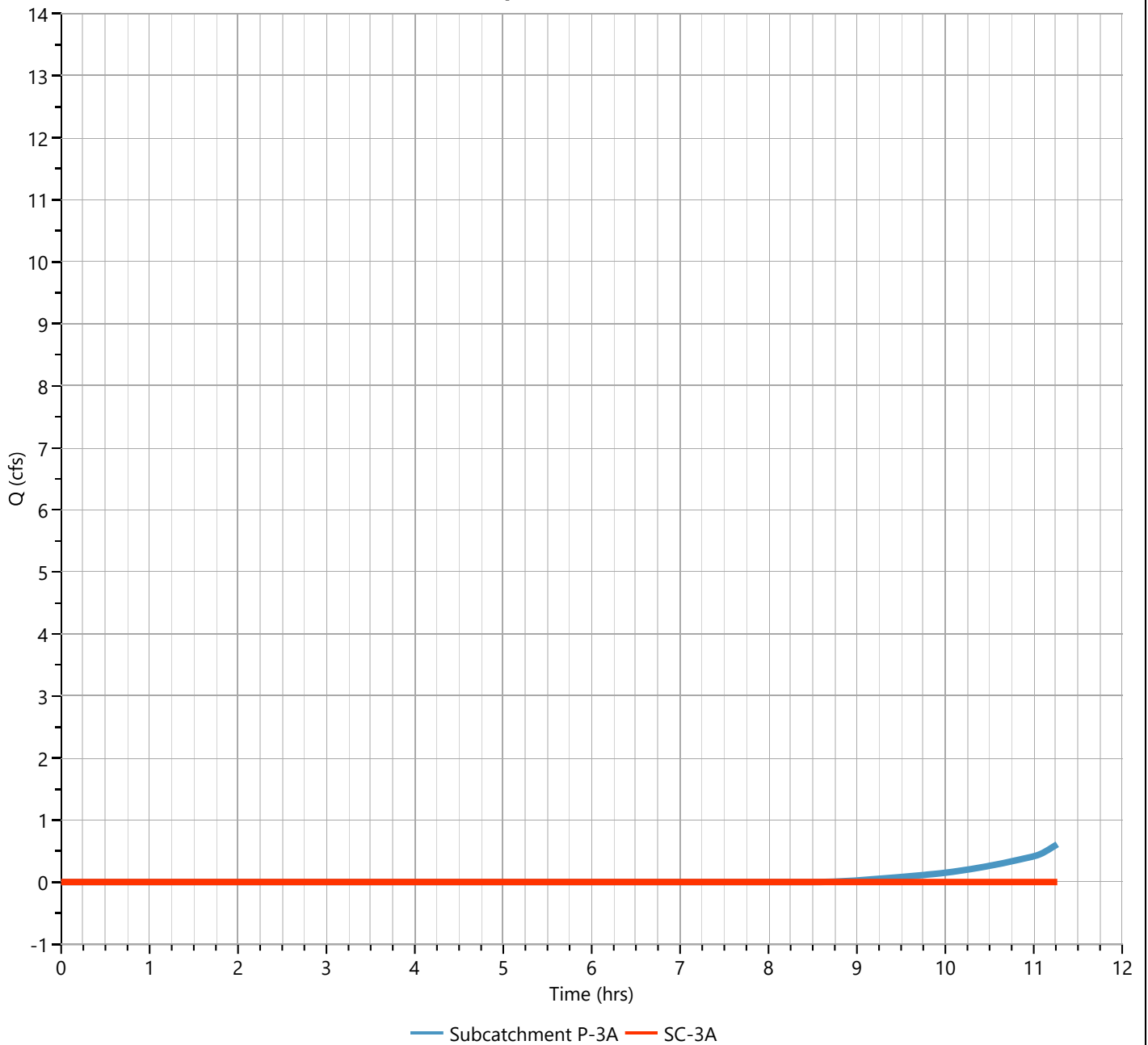
SC-3A

Hyd. No. 52

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 11.23 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 51 - Subcatchment P-3A	Max. Elevation	= 229.82 ft
Pond Name	= SC-3A	Max. Storage	= 15,255 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Pond Report

Project Name:

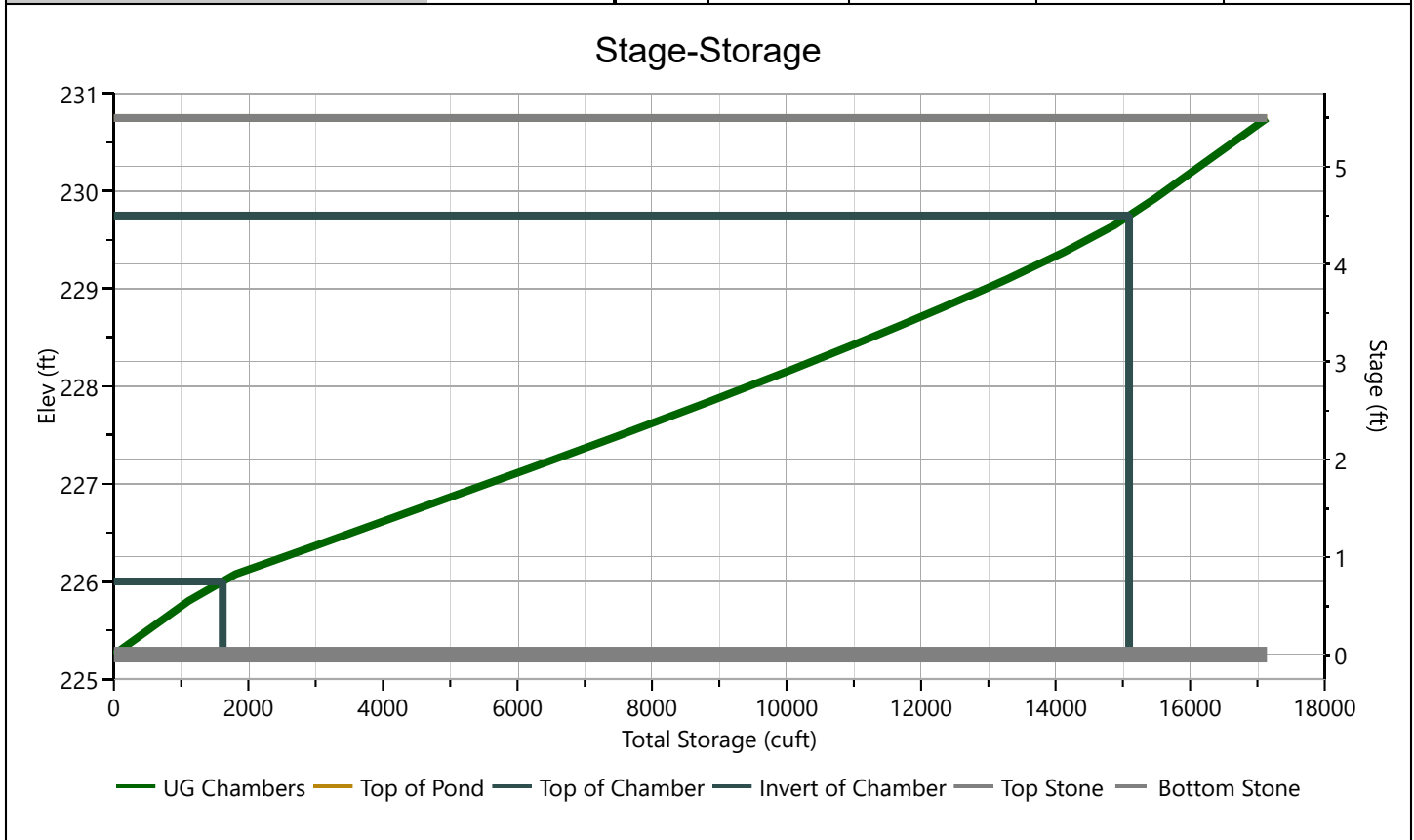
Hydrology Studio v 3.0.0.29

12-13-2023

SC-3A

Stage-Storage

StormTech® MC-3500™ Chamber		Stage / Storage Table				
Description	Input	Stage (in)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Chamber Height, in	45	0.0	225.25	5,043	0.000	0.000
Chamber Shape	Arch	3.3	225.53	5,043	555	555
Chamber Width, in	77	6.6	225.80	5,043	555	1,109
Installed Length, ft	7.17	9.9	226.08	5,043	700	1,809
No. Chambers	90	13.2	226.35	5,043	1,117	2,927
Bare Chamber Stor, cuft	9,891	16.5	226.63	5,043	1,114	4,040
No. Rows	6	19.8	226.90	5,043	1,107	5,147
Space Between Rows, in	9	23.1	227.18	5,043	1,096	6,243
Stone Above, in	12	26.4	227.45	5,043	1,083	7,326
Stone Below, in	9	29.7	227.73	5,043	1,065	8,391
Stone Sides, in	12	33.0	228.00	5,043	1,044	9,435
Stone Ends, in	12	36.3	228.28	5,043	1,018	10,453
Encasement Voids, %	40.00	39.6	228.55	5,043	986	11,439
Encasement Bottom Elevation, ft	225.25	42.9	228.83	5,043	948	12,386
		46.2	229.10	5,043	900	13,286
		49.5	229.38	5,043	838	14,125
		52.8	229.65	5,043	749	14,874
		56.1	229.93	5,043	604	15,477
		59.4	230.20	5,043	555	16,032
		62.7	230.48	5,043	555	16,587
		66.0	230.75	5,043	555	17,142



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

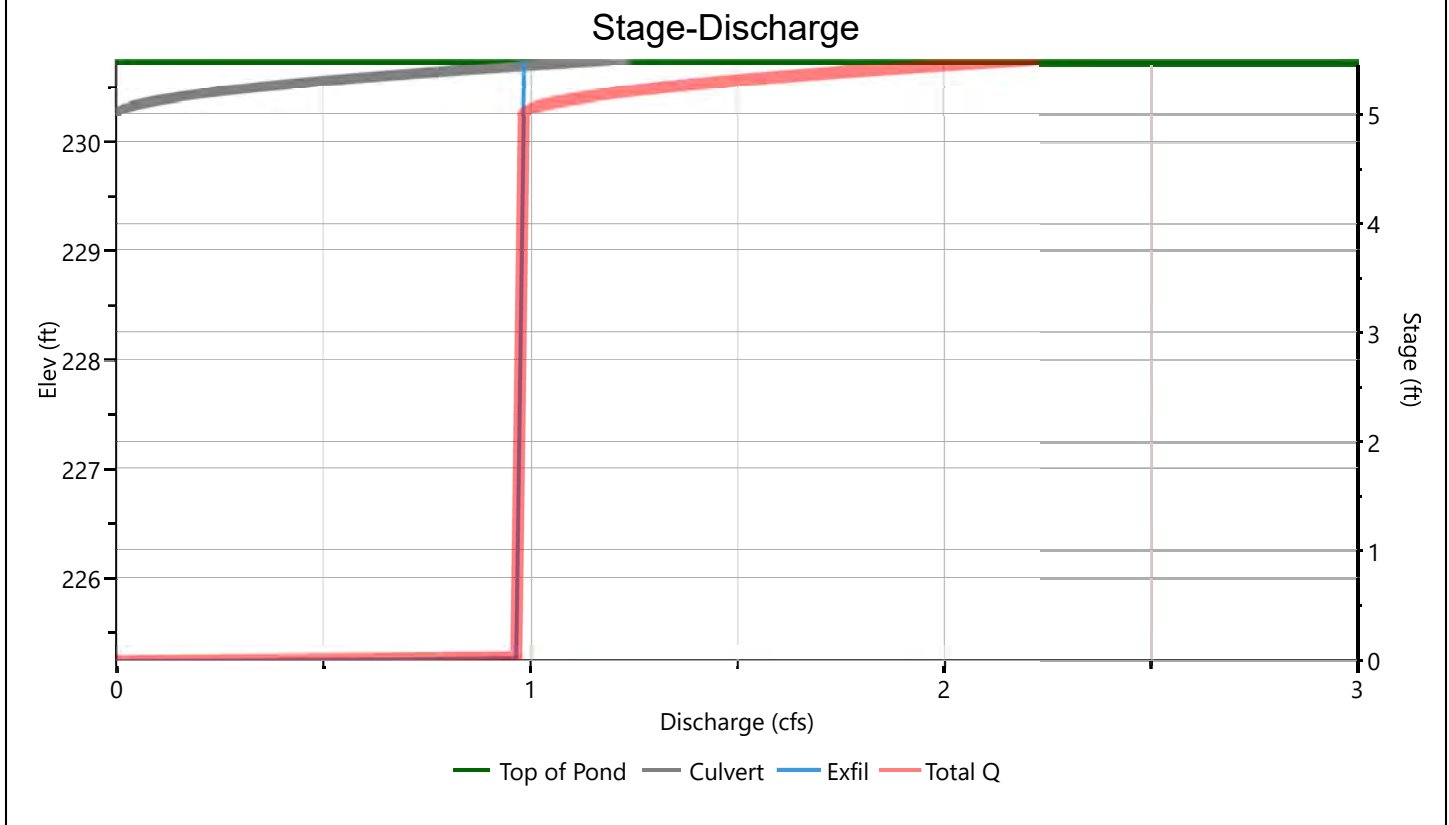
12-13-2023

SC-3A

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in	18				Hole Diameter, in
Span, in	18				No. holes
No. Barrels	1				Invert Elevation, ft
Invert Elevation, ft	230.25				Height, ft
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co
Length, ft	50				
Barrel Slope, %	2				
N-Value, n	0.012				
Weirs	Riser*	Weirs			Ancillary
		1	2	3	
Shape / Type					Exfiltration, in/hr
Crest Elevation, ft					8.27**
Crest Length, ft					
Angle, deg					
Weir Coefficient, Cw					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

SC-3A

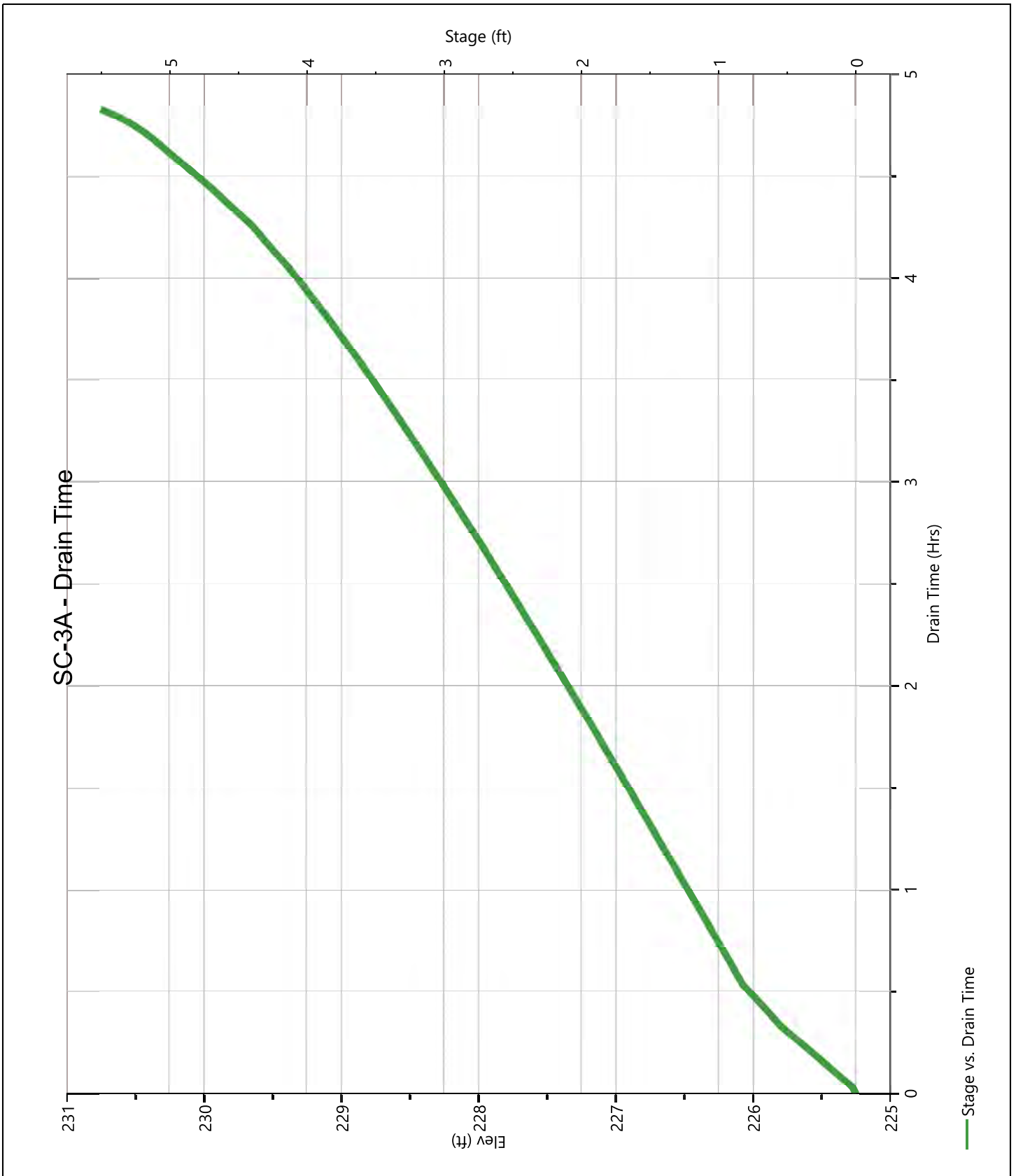
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	225.25	0.000	0.000								0.000		0.000	
0.28	225.53	555	0.000								0.966		0.966	
0.55	225.80	1,109	0.000								0.967		0.967	
0.83	226.08	1,809	0.000								0.968		0.968	
1.10	226.35	2,927	0.000								0.969		0.969	
1.38	226.63	4,040	0.000								0.970		0.970	
1.65	226.90	5,147	0.000								0.971		0.971	
1.93	227.18	6,243	0.000								0.972		0.972	
2.20	227.45	7,326	0.000								0.973		0.973	
2.48	227.73	8,391	0.000								0.974		0.974	
2.75	228.00	9,435	0.000								0.975		0.975	
3.03	228.28	10,453	0.000								0.976		0.976	
3.30	228.55	11,439	0.000								0.977		0.977	
3.58	228.83	12,386	0.000								0.978		0.978	
3.85	229.10	13,286	0.000								0.979		0.979	
4.13	229.38	14,125	0.000								0.980		0.980	
4.40	229.65	14,874	0.000								0.981		0.981	
4.68	229.93	15,477	0.000								0.982		0.982	
4.95	230.20	16,032	0.000								0.983		0.983	
5.23	230.48	16,587	0.269 ic								0.984		1.254	
5.50	230.75	17,142	1.243 ic								0.985		2.228	

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

SC-3A

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-3B

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			1.00	98.38
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			1.05	41.14
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					2.06	139.52

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{139.52}{2.06} = \underline{67.77} ; \text{ Use CN} = \underline{68}$$

2. Runoff

Frequency..... yr

Rainfall, P (24-hour)..... in

Runoff, Q..... in

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
0.74	1.87	4.07

Hydrograph Report

Project Name:

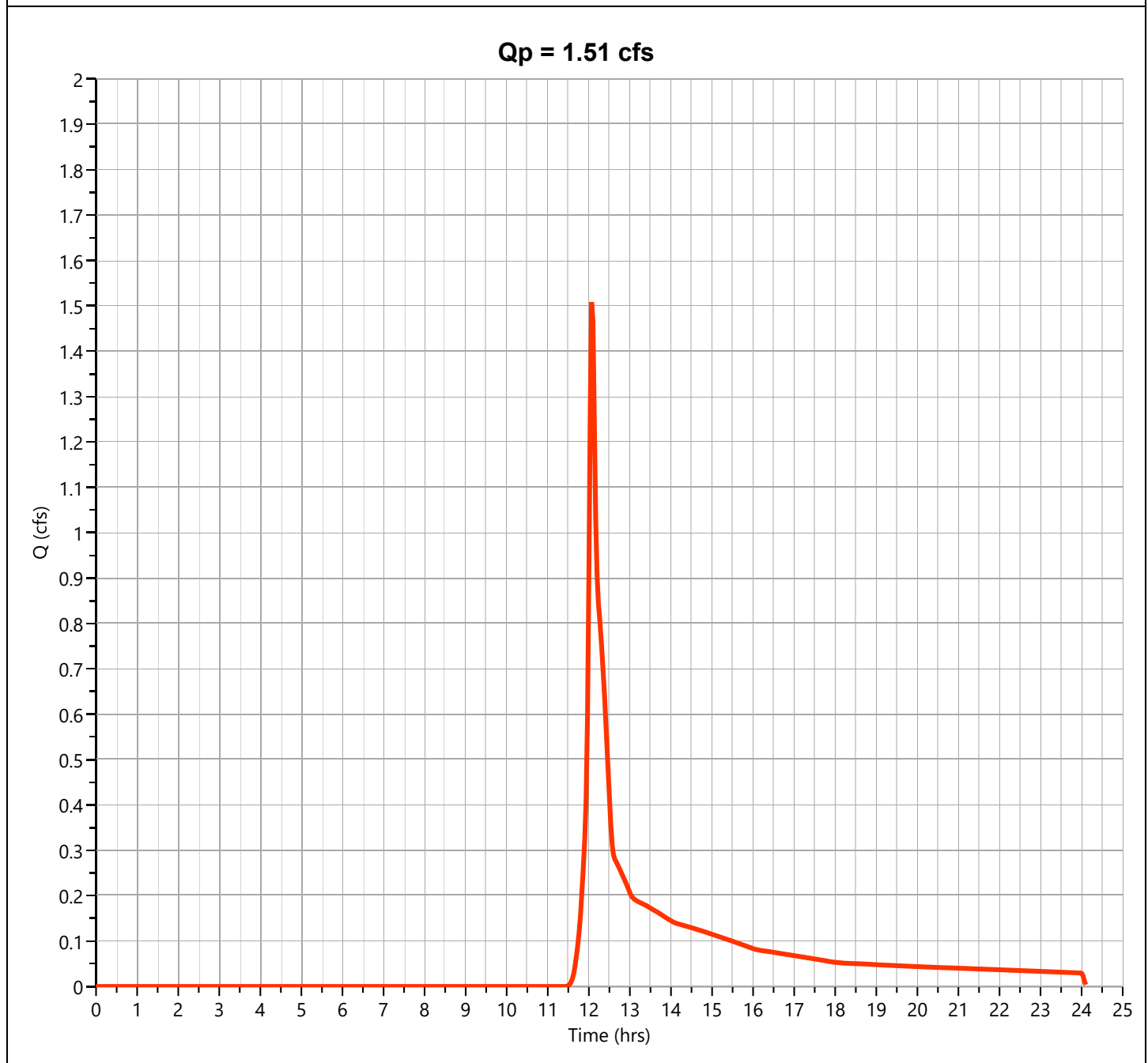
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-3B

Hyd. No. 53

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.508 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 5,250 cuft
Drainage Area	= 2.06 ac	Curve Number	= 68
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

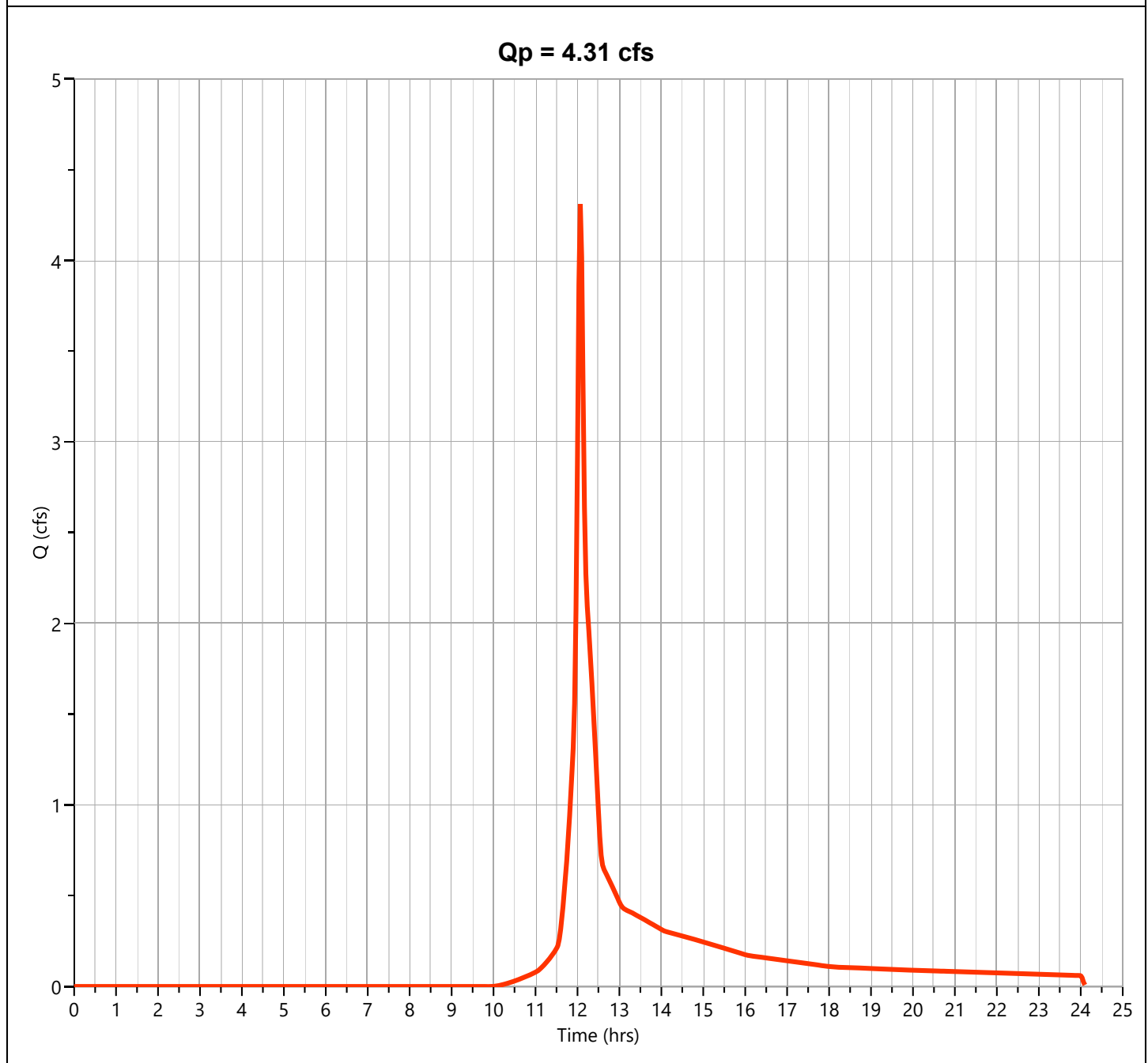
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-3B

Hyd. No. 53

Hydrograph Type	= NRCS Runoff	Peak Flow	= 4.311 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 13,227 cuft
Drainage Area	= 2.06 ac	Curve Number	= 68
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

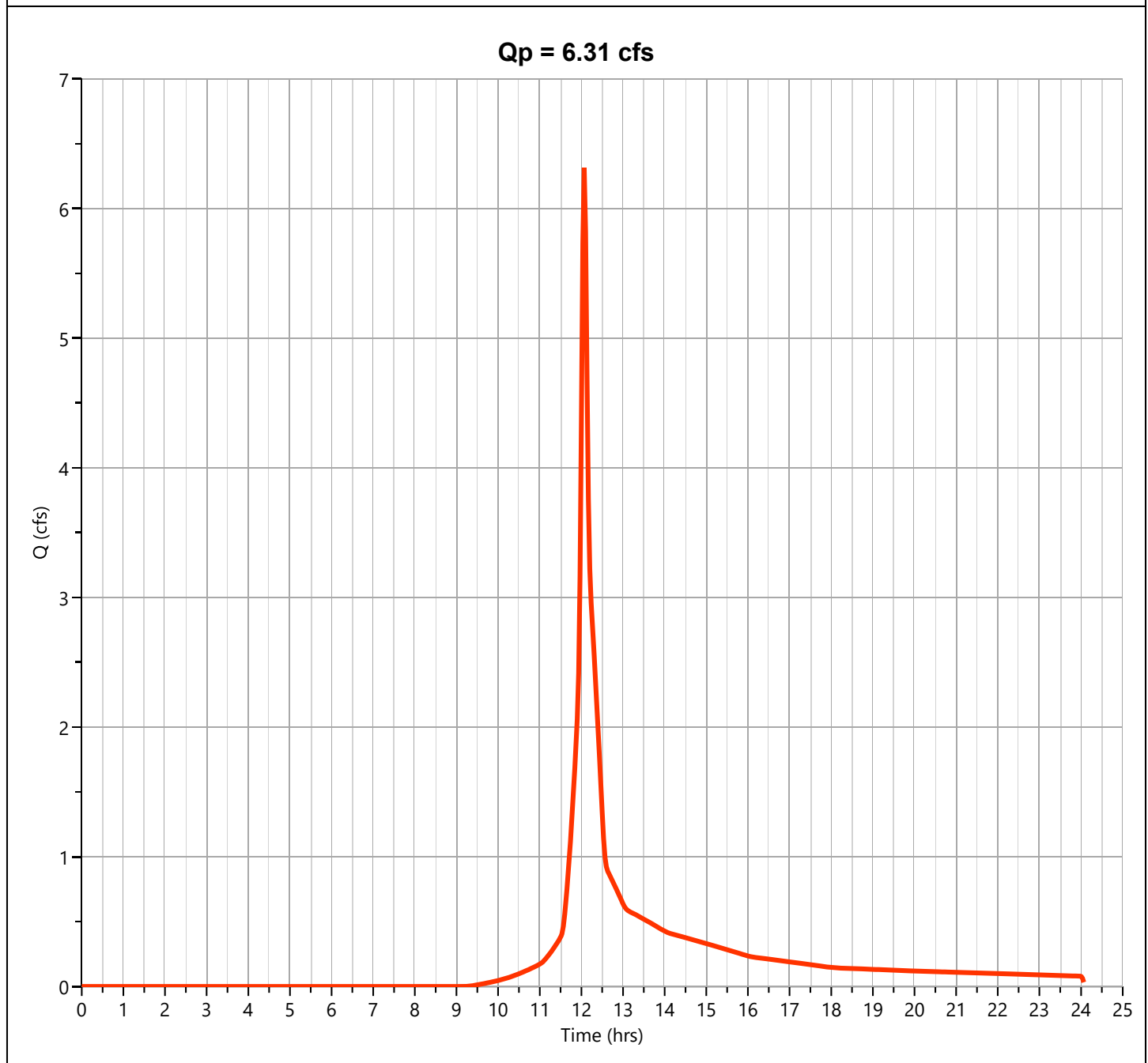
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-3B

Hyd. No. 53

Hydrograph Type	= NRCS Runoff	Peak Flow	= 6.314 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 19,021 cuft
Drainage Area	= 2.06 ac	Curve Number	= 68
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

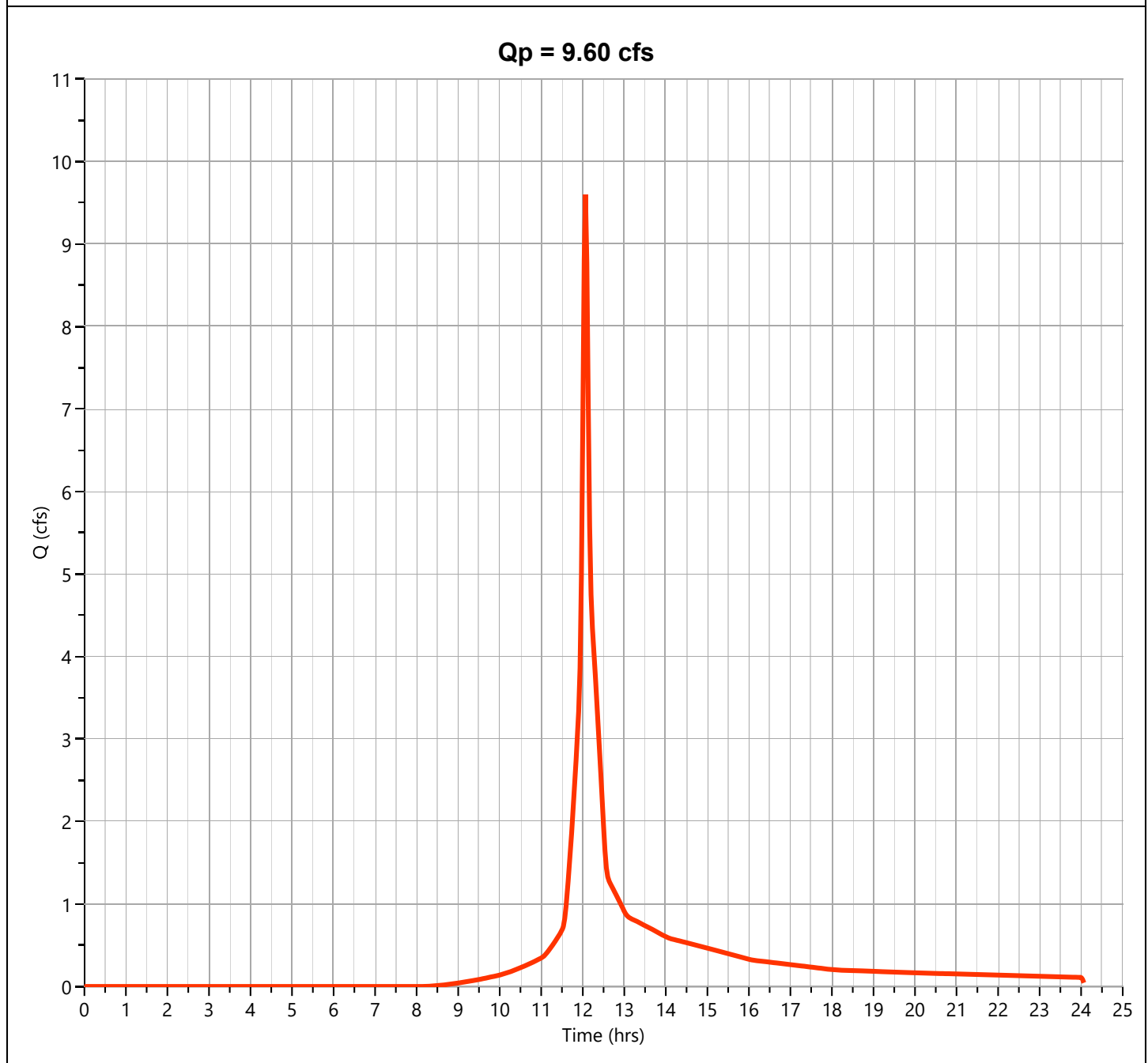
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-3B

Hyd. No. 53

Hydrograph Type	= NRCS Runoff	Peak Flow	= 9.600 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 28,693 cuft
Drainage Area	= 2.06 ac	Curve Number	= 68
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

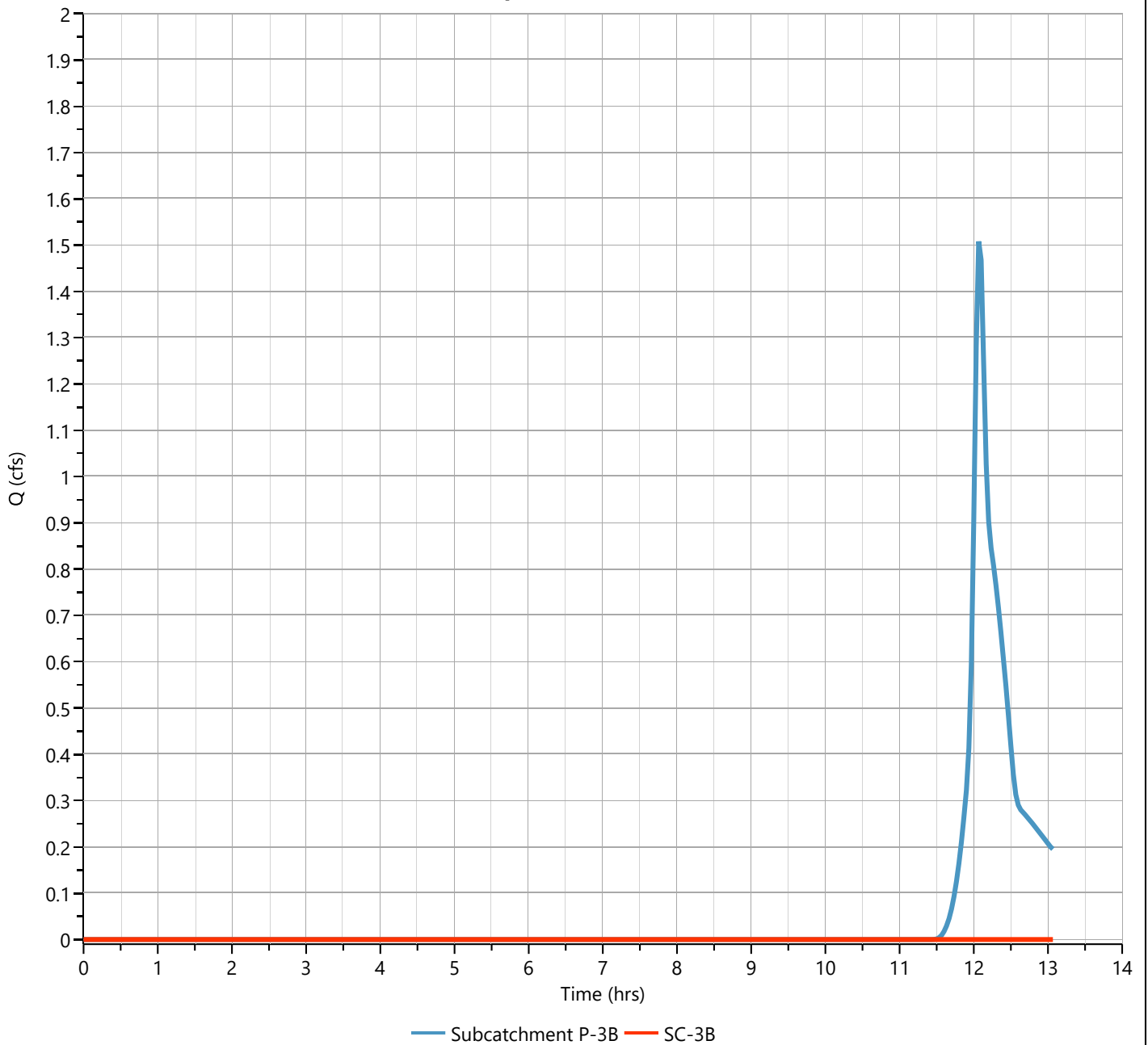
SC-3B

Hyd. No. 54

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 13.03 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 53 - Subcatchment P-3B	Max. Elevation	= 221.62 ft
Pond Name	= SC-3B	Max. Storage	= 519 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

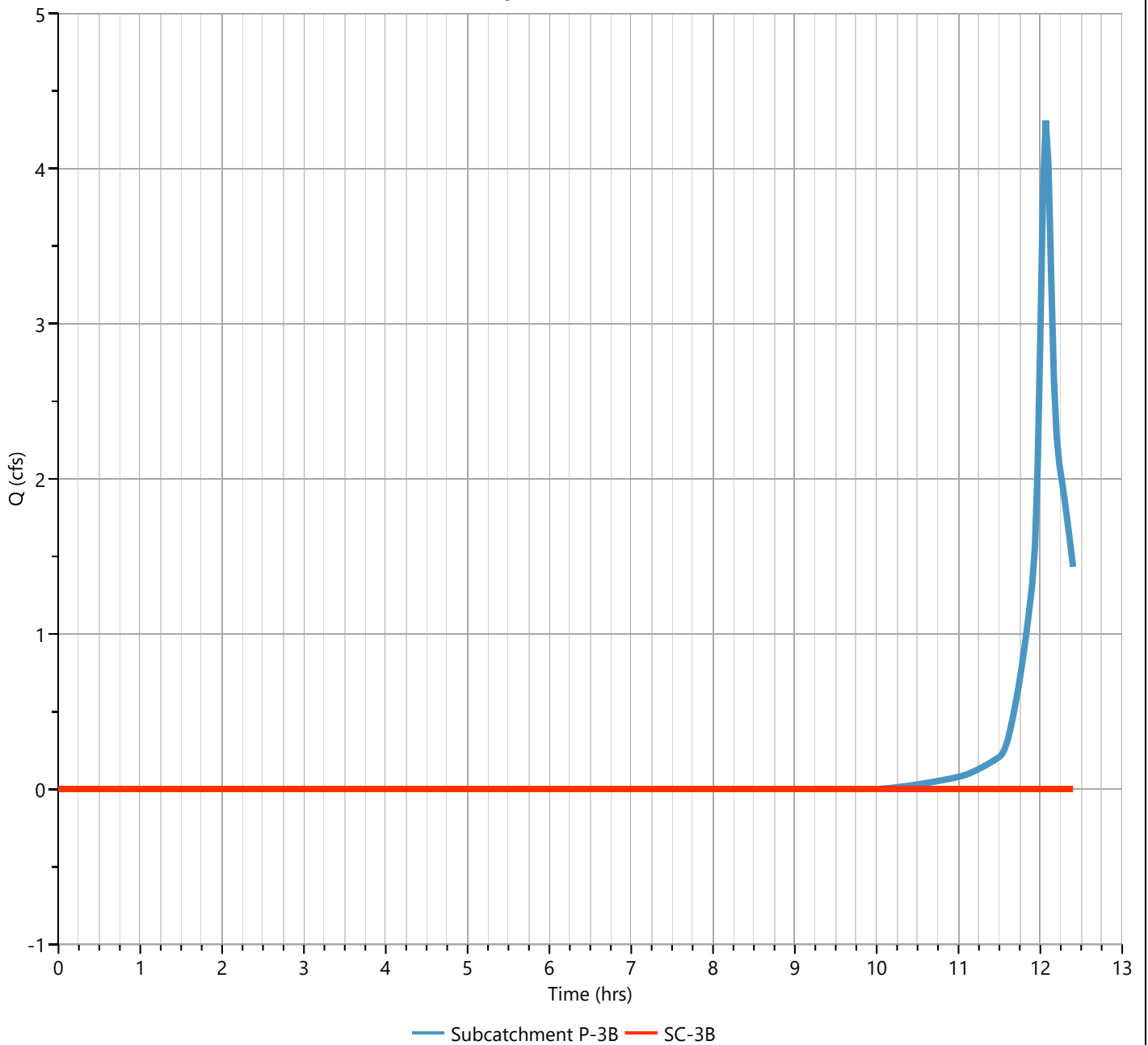
SC-3B

Hyd. No. 54

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 53 - Subcatchment P-3B	Max. Elevation	= 222.96 ft
Pond Name	= SC-3B	Max. Storage	= 3,724 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

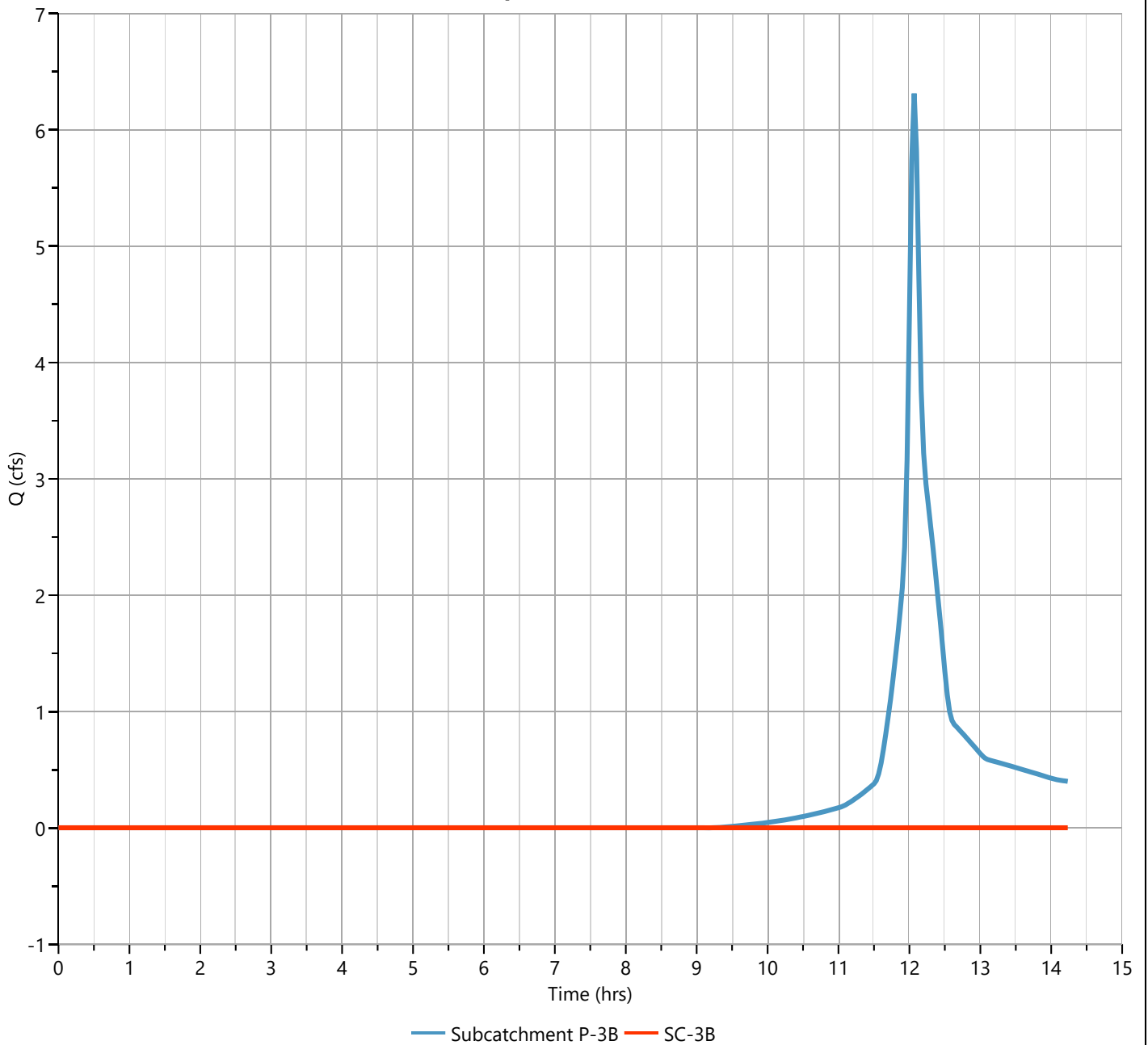
SC-3B

Hyd. No. 54

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 14.13 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 53 - Subcatchment P-3B	Max. Elevation	= 224.03 ft
Pond Name	= SC-3B	Max. Storage	= 6,600 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

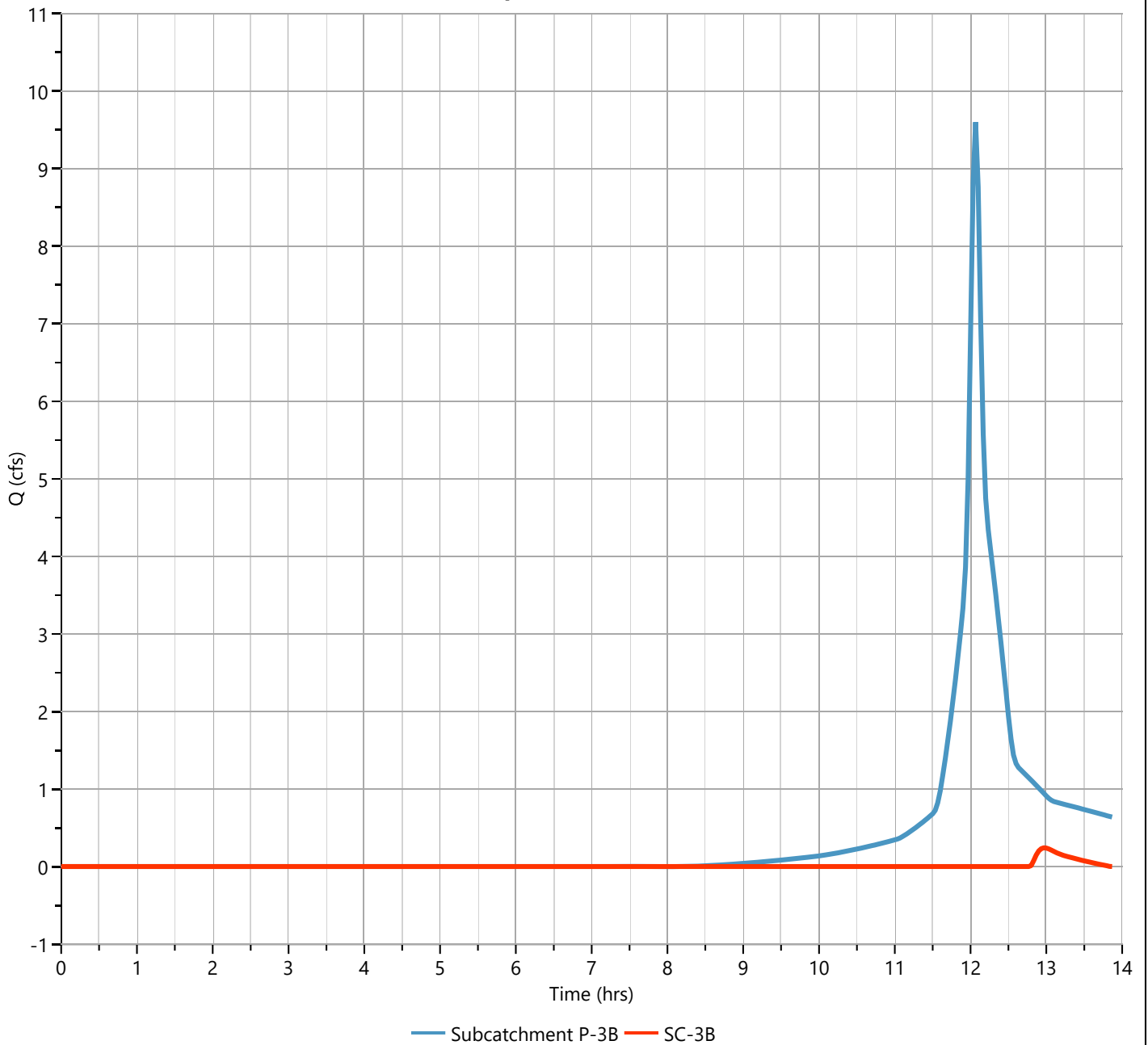
SC-3B

Hyd. No. 54

Hydrograph Type	= Pond Route	Peak Flow	= 0.242 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.97 hrs
Time Interval	= 2 min	Hydrograph Volume	= 432 cuft
Inflow Hydrograph	= 53 - Subcatchment P-3B	Max. Elevation	= 226.58 ft
Pond Name	= SC-3B	Max. Storage	= 11,630 cuft

Pond Routing by Storage Indication Method

Qp = 0.24 cfs



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

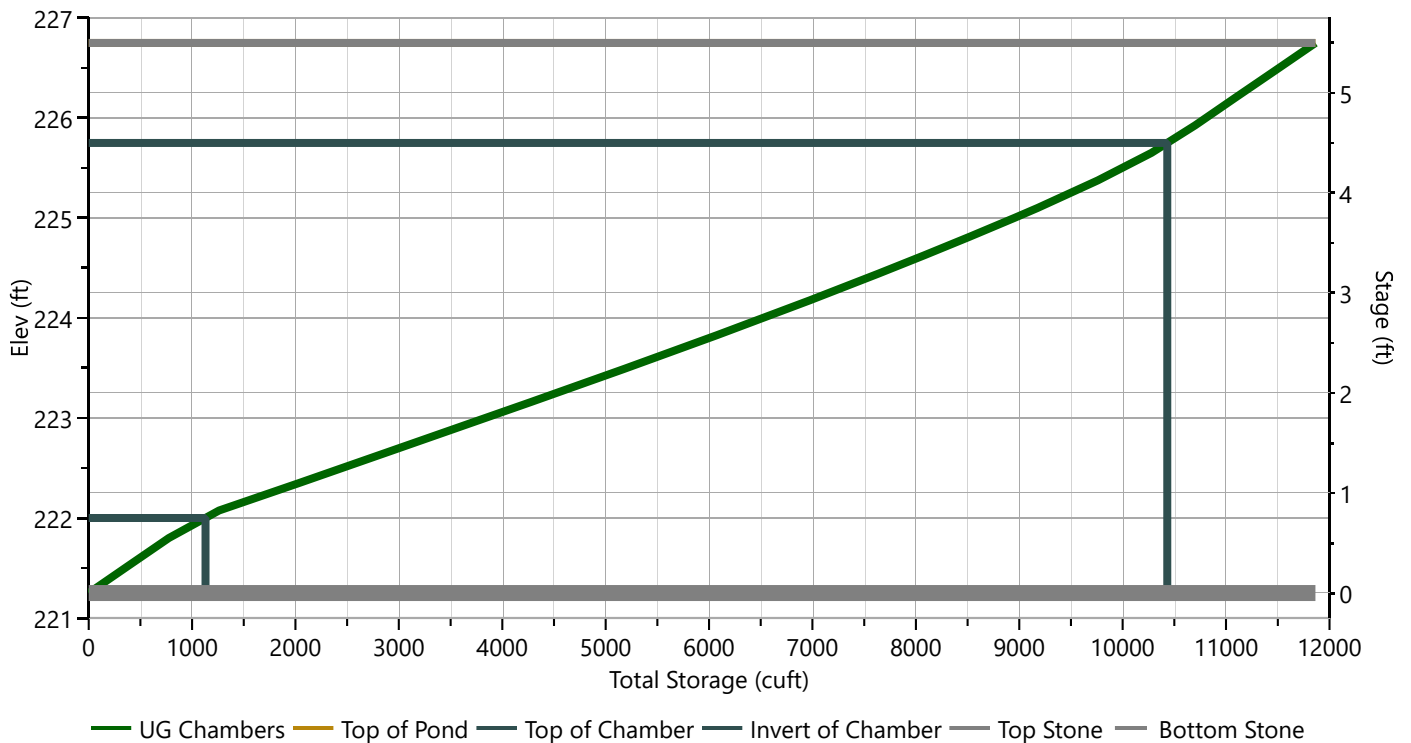
12-13-2023

SC-3B

Stage-Storage

StormTech® MC-3500™ Chamber		Stage / Storage Table				
Description	Input	Stage (in)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Chamber Height, in	45	0.0	221.25	3,526	0.000	0.000
Chamber Shape	Arch	3.3	221.53	3,526	388	388
Chamber Width, in	77	6.6	221.80	3,526	388	776
Installed Length, ft	7.17	9.9	222.08	3,526	486	1,262
No. Chambers	60	13.2	222.35	3,526	770	2,032
Bare Chamber Stor, cuft	6,594	16.5	222.63	3,526	767	2,799
No. Rows	8	19.8	222.90	3,526	763	3,562
Space Between Rows, in	9	23.1	223.18	3,526	756	4,318
Stone Above, in	12	26.4	223.45	3,526	746	5,064
Stone Below, in	9	29.7	223.73	3,526	735	5,799
Stone Sides, in	12	33.0	224.00	3,526	720	6,519
Stone Ends, in	12	36.3	224.28	3,526	702	7,221
Encasement Voids, %	40.00	39.6	224.55	3,526	681	7,902
Encasement Bottom Elevation, ft	221.25	42.9	224.83	3,526	655	8,557
		46.2	225.10	3,526	622	9,179
		49.5	225.38	3,526	580	9,759
		52.8	225.65	3,526	520	10,279
		56.1	225.93	3,526	421	10,700
		59.4	226.20	3,526	388	11,088
		62.7	226.48	3,526	388	11,476
		66.0	226.75	3,526	388	11,864

Stage-Storage



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

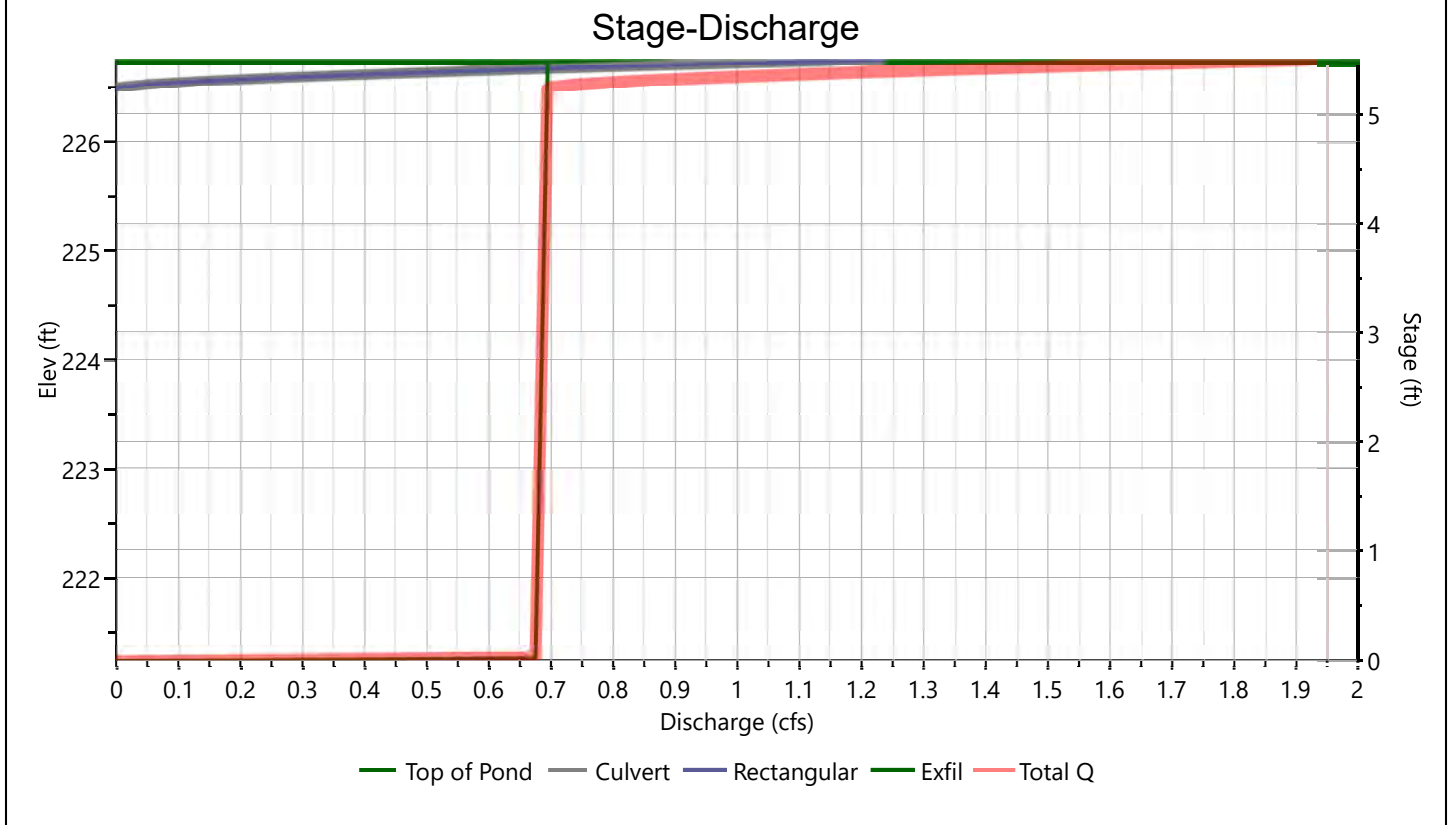
12-13-2023

SC-3B

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in	15				Hole Diameter, in
Span, in	15				No. holes
No. Barrels	1				Invert Elevation, ft
Invert Elevation, ft	222.00				Height, ft
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co
Length, ft	50				
Barrel Slope, %	2				
N-Value, n	0.012				
Weirs	Riser*	Weirs			Ancillary
		1*	2	3	
Shape / Type		Rectangular			Exfiltration, in/hr
Crest Elevation, ft		226.5			8.27**
Crest Length, ft		3			
Angle, deg					
Weir Coefficient, Cw		3.3			

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

SC-3B

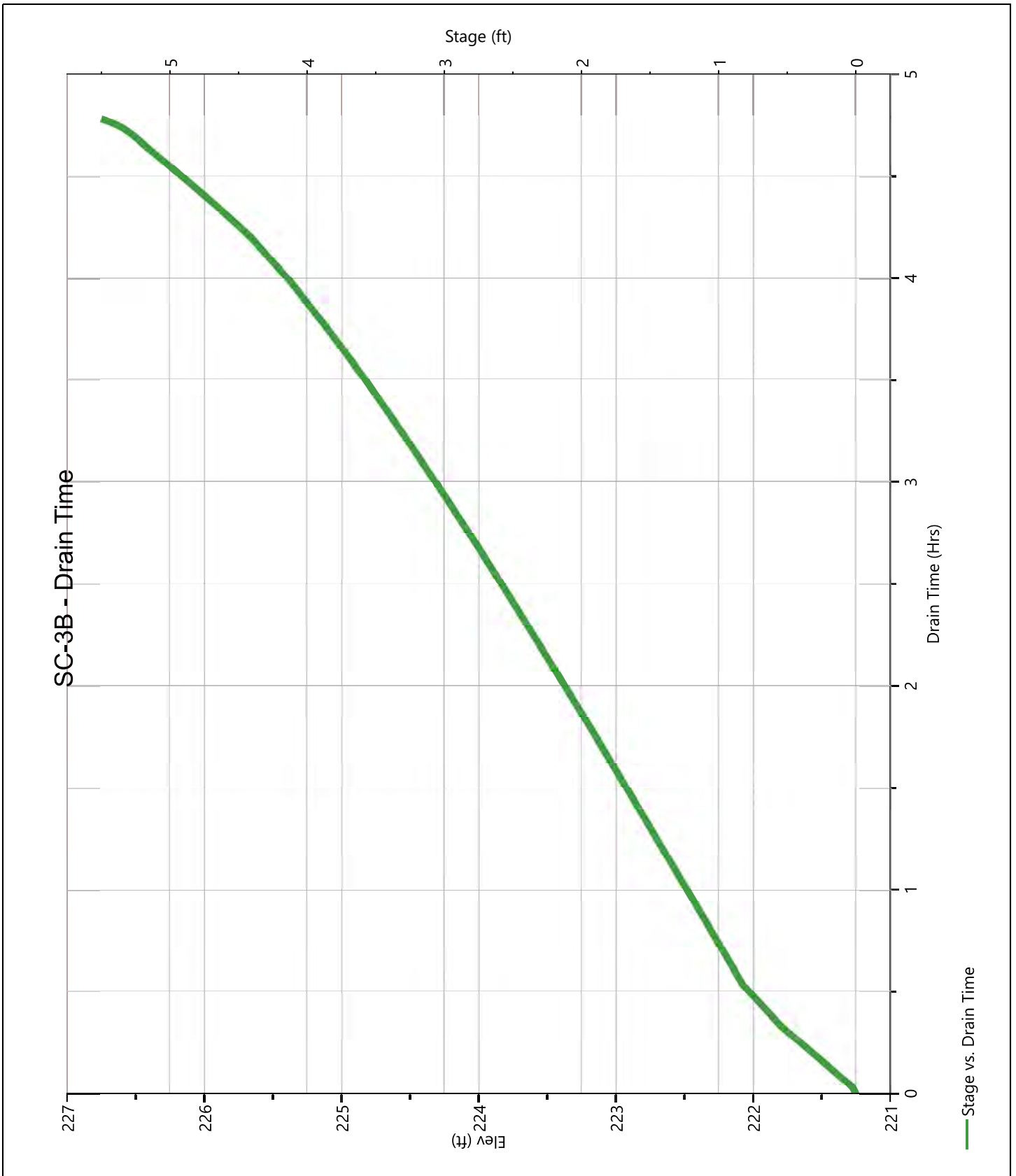
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	221.25	0.000	0.000					0.000				0.000		0.000
0.28	221.53	388	0.000					0.000				0.676		0.676
0.55	221.80	776	0.000					0.000				0.677		0.677
0.83	222.08	1,262	0.000					0.000				0.678		0.678
1.10	222.35	2,032	0.000					0.000				0.679		0.679
1.38	222.63	2,799	0.000					0.000				0.680		0.680
1.65	222.90	3,562	0.000					0.000				0.681		0.681
1.93	223.18	4,318	0.000					0.000				0.682		0.682
2.20	223.45	5,064	0.000					0.000				0.683		0.683
2.48	223.73	5,799	0.000					0.000				0.684		0.684
2.75	224.00	6,519	0.000					0.000				0.685		0.685
3.03	224.28	7,221	0.000					0.000				0.686		0.686
3.30	224.55	7,902	0.000					0.000				0.687		0.687
3.58	224.83	8,557	0.000					0.000				0.688		0.688
3.85	225.10	9,179	0.000					0.000				0.689		0.689
4.13	225.38	9,759	0.000					0.000				0.690		0.690
4.40	225.65	10,279	0.000					0.000				0.691		0.691
4.68	225.93	10,700	0.000					0.000				0.692		0.692
4.95	226.20	11,088	0.000					0.000				0.693		0.693
5.23	226.48	11,476	0.000					0.000				0.694		0.694
5.50	226.75	11,864	1.238 ic					1.238				0.695		1.933

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

SC-3B

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-3B

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.05	4.63
A	Woods - Good Condition	30			2.09	62.62
A	Open Space - Good Condition	39			0.51	19.72
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					2.64	86.97

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{86.97}{2.64} = \underline{32.94} ; \text{ Use CN} = \underline{33}$$

2. Runoff

Frequency..... yr
 Rainfall, P (24-hour)..... in
 Runoff, Q..... in
 (Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
0.04	0.04	0.59

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one: Present Developed

Subcatchment P-3C

Circle one: Tc Tt through subarea

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	Wooded		
	0.6		
ft	50		
in	3.1		
ft/ft	0.040		
Compute Tt hr	0.22		0.22

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C	C-D	
	UNPAVED	UNPAVED	
ft	30	39	
ft/ft	0.1	0.2	
ft/s	5.10	7.22	
Compute Tt hr	0.00	0.00	0.00

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r ft			
ft/ft			
Compute V ft/s			
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.22
min 13.3

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-3C

Hyd. No. 55

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.00 hrs
Time Interval	= 2 min	Runoff Volume	= 0.000 cuft
Drainage Area	= 2.64 ac	Curve Number	= 33
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484

Qp = 0.00 cfs

Hydrograph Report

Project Name:

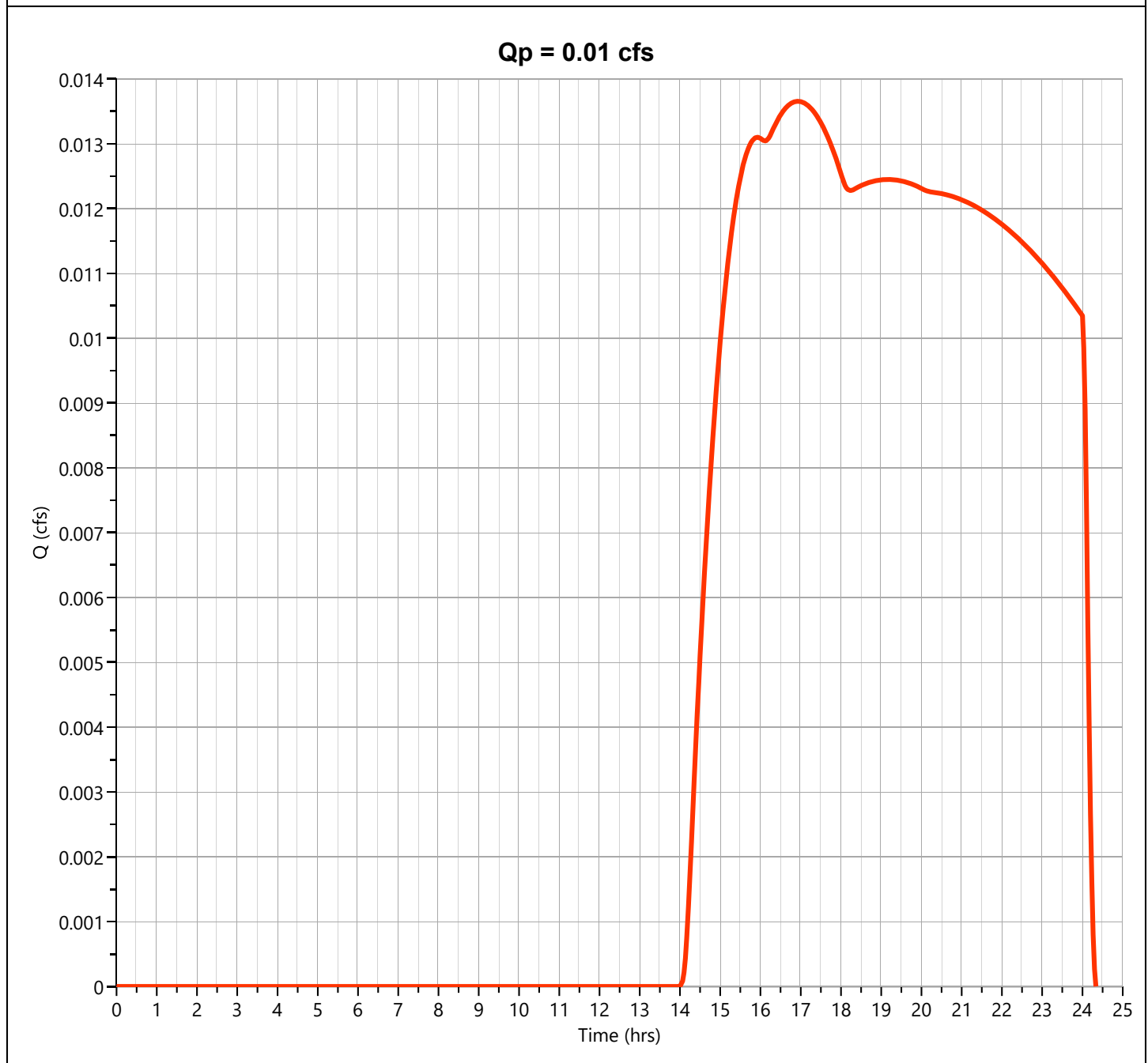
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-3C

Hyd. No. 55

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.014 cfs
Storm Frequency	= 10-yr	Time to Peak	= 16.93 hrs
Time Interval	= 2 min	Runoff Volume	= 419 cuft
Drainage Area	= 2.64 ac	Curve Number	= 33
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

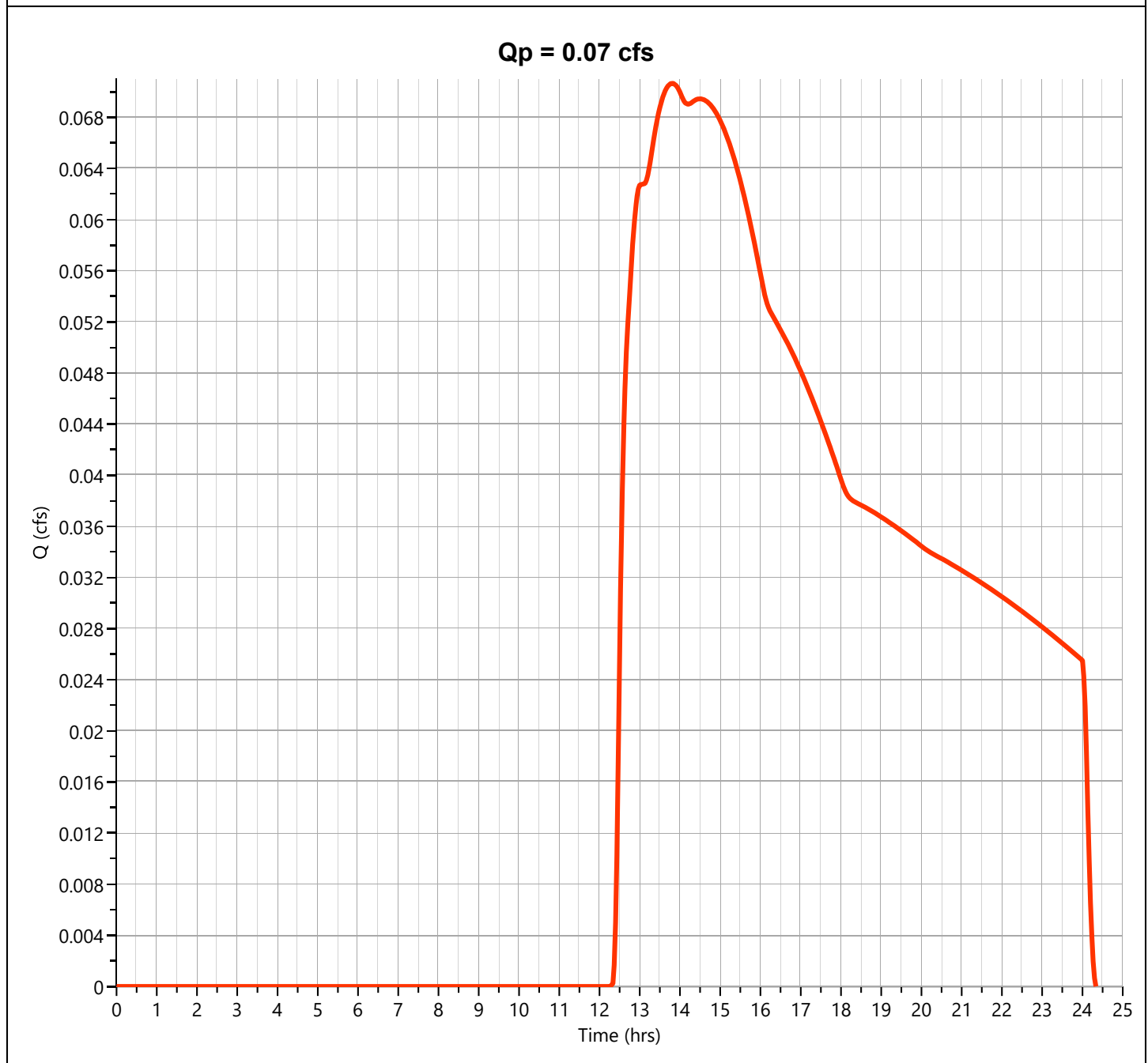
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-3C

Hyd. No. 55

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.071 cfs
Storm Frequency	= 25-yr	Time to Peak	= 13.80 hrs
Time Interval	= 2 min	Runoff Volume	= 1,874 cuft
Drainage Area	= 2.64 ac	Curve Number	= 33
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

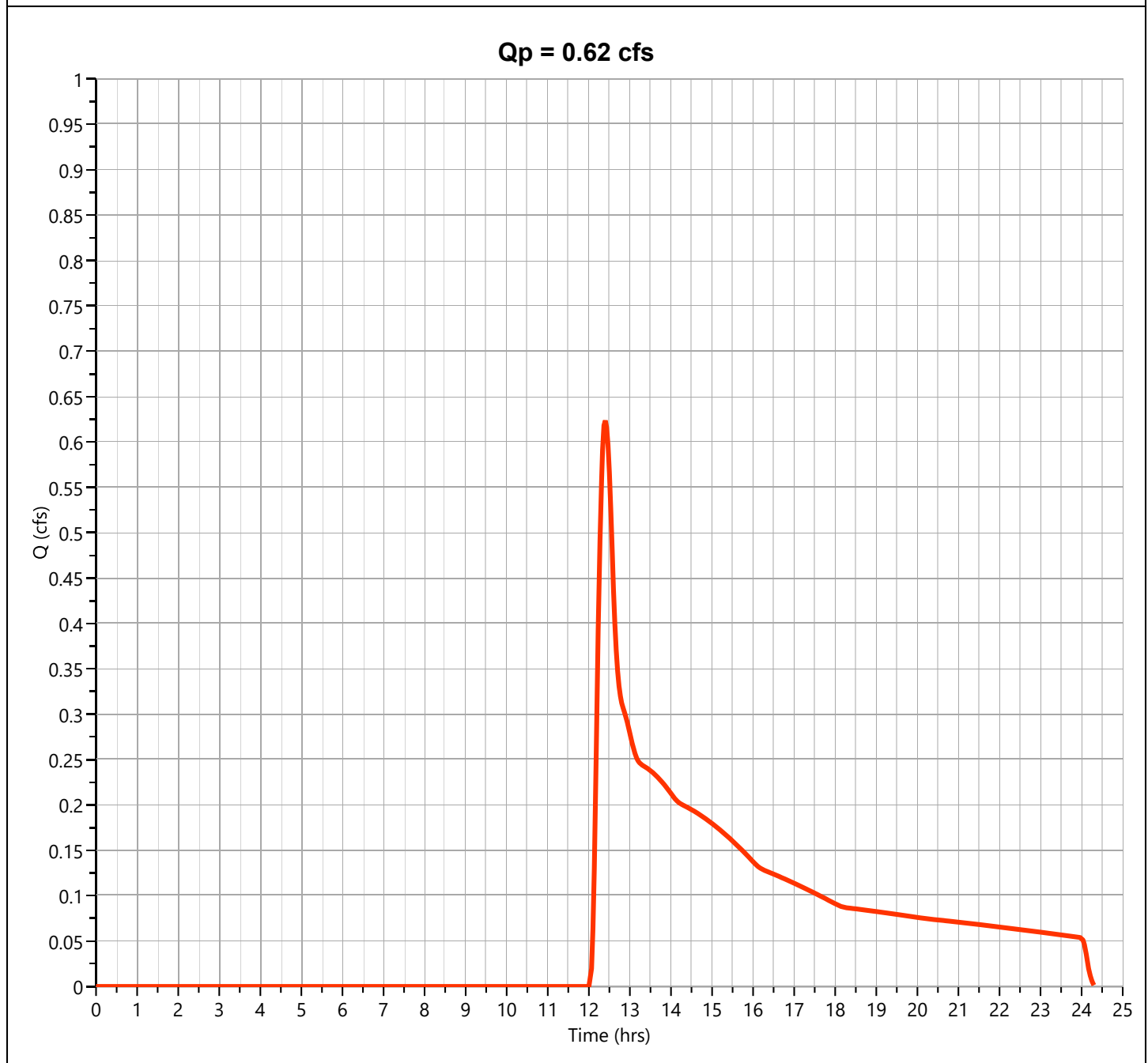
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-3C

Hyd. No. 55

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.624 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.40 hrs
Time Interval	= 2 min	Runoff Volume	= 5,824 cuft
Drainage Area	= 2.64 ac	Curve Number	= 33
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

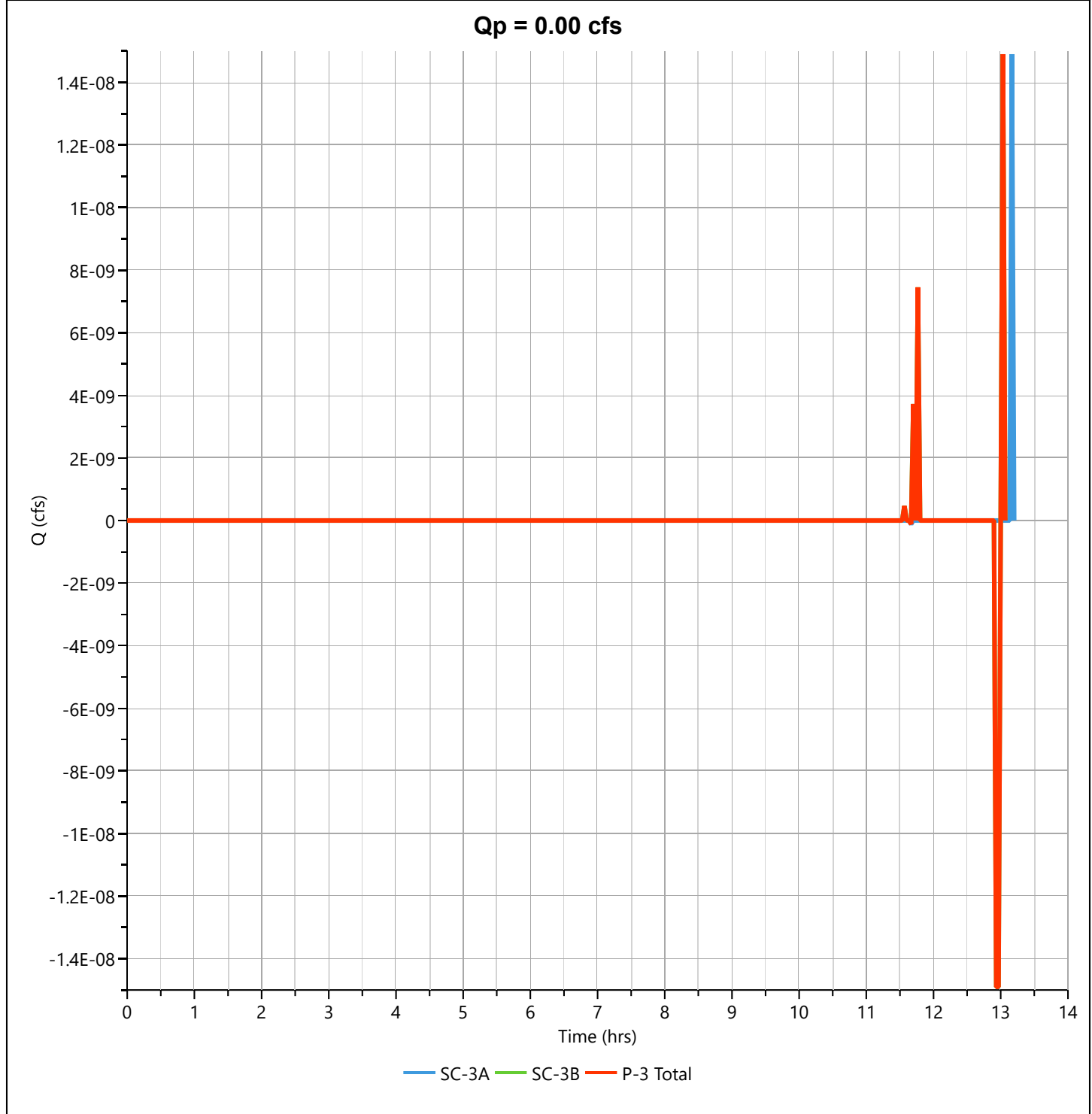
Hydrology Studio v 3.0.0.29

12-13-2023

P-3 Total

Hyd. No. 56

Hydrograph Type	= Junction	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 13.03 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrographs	= 52, 54, 55	Total Contrib. Area	= 2.64 ac



Hydrograph Report

Project Name:

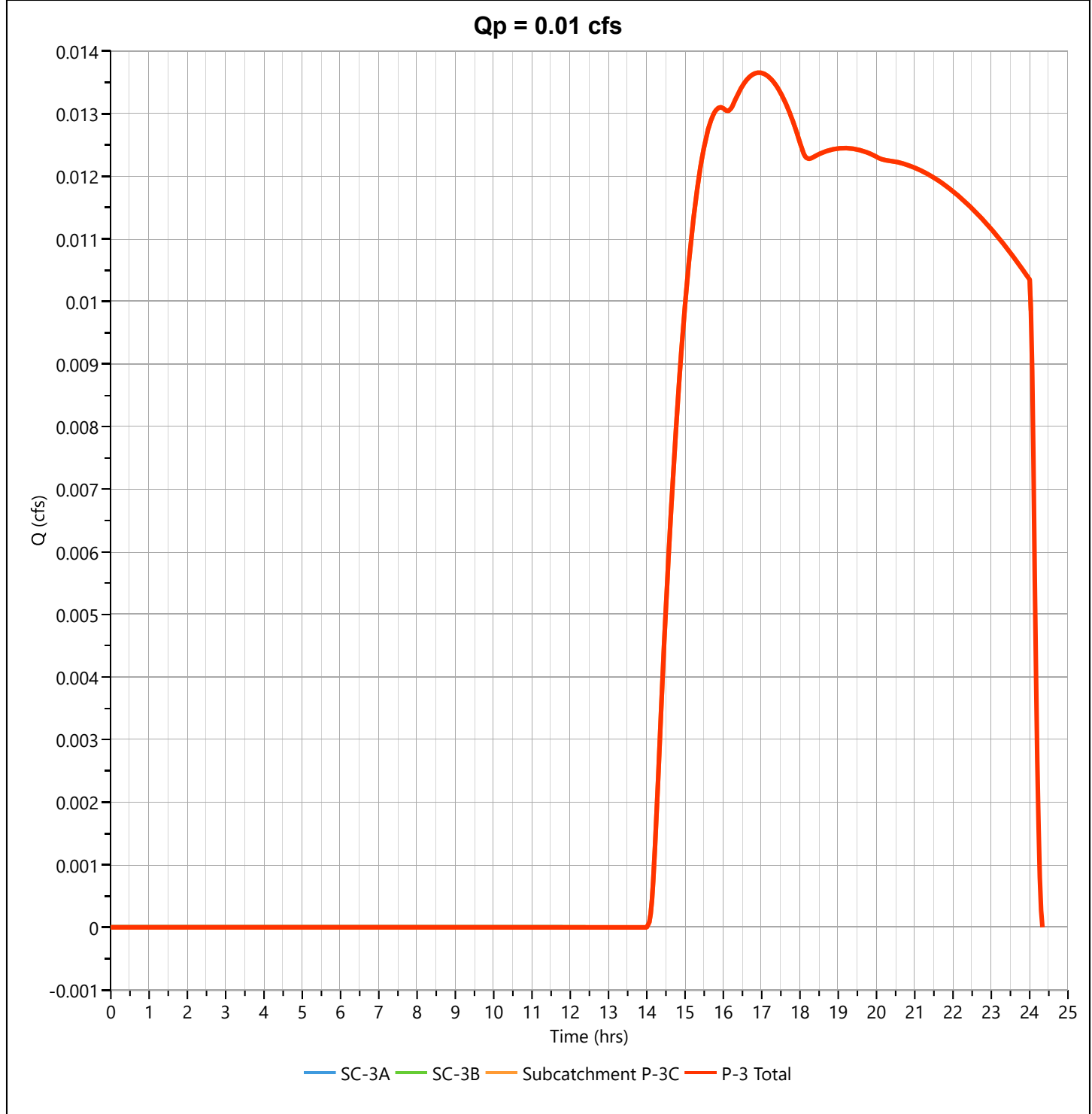
Hydrology Studio v 3.0.0.29

12-13-2023

P-3 Total

Hyd. No. 56

Hydrograph Type	= Junction	Peak Flow	= 0.014 cfs
Storm Frequency	= 10-yr	Time to Peak	= 16.93 hrs
Time Interval	= 2 min	Hydrograph Volume	= 419 cuft
Inflow Hydrographs	= 52, 54, 55	Total Contrib. Area	= 2.64 ac



Hydrograph Report

Project Name:

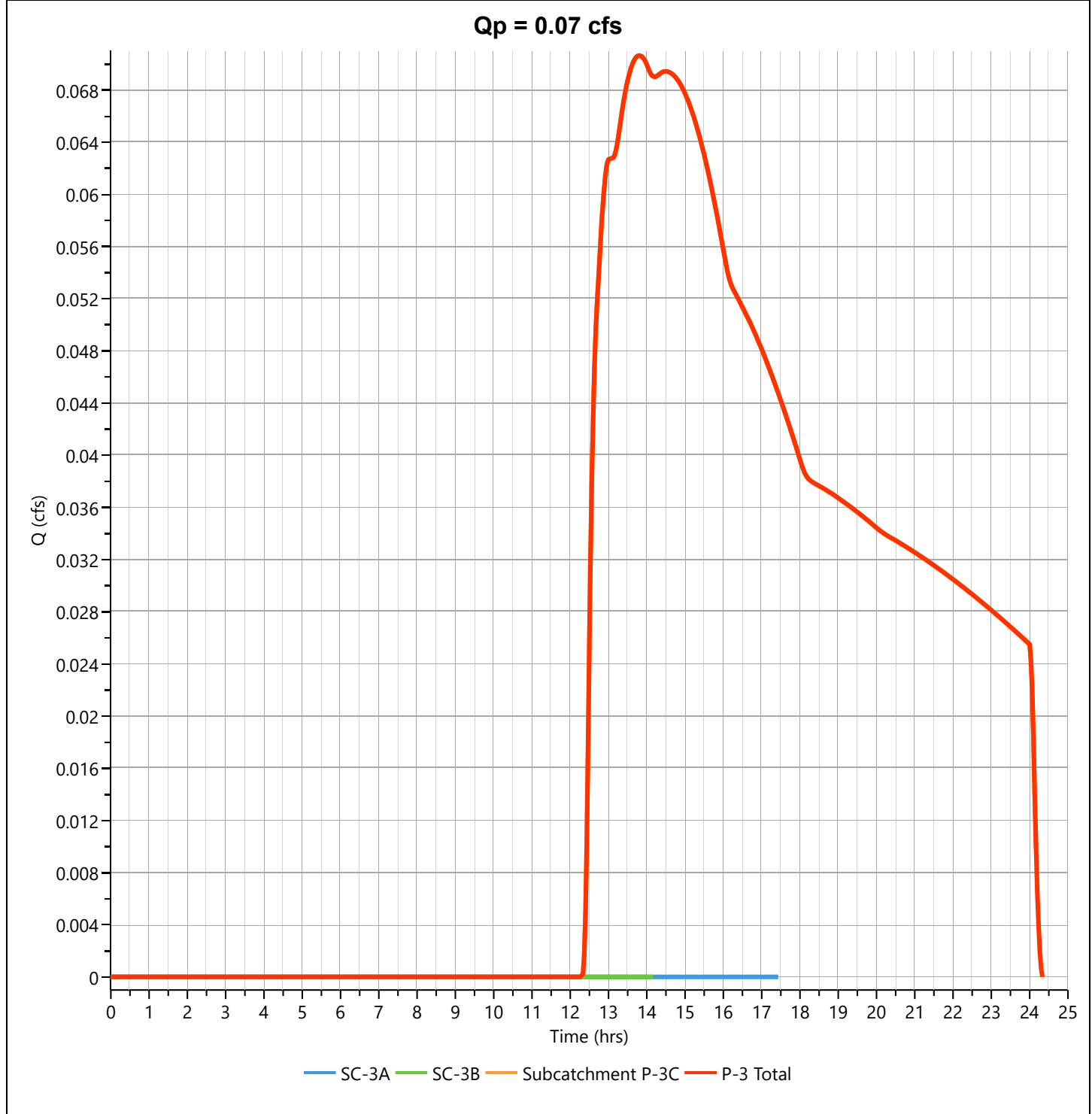
Hydrology Studio v 3.0.0.29

12-13-2023

P-3 Total

Hyd. No. 56

Hydrograph Type	= Junction	Peak Flow	= 0.071 cfs
Storm Frequency	= 25-yr	Time to Peak	= 13.80 hrs
Time Interval	= 2 min	Hydrograph Volume	= 1,874 cuft
Inflow Hydrographs	= 52, 54, 55	Total Contrib. Area	= 2.64 ac



Hydrograph Report

Project Name:

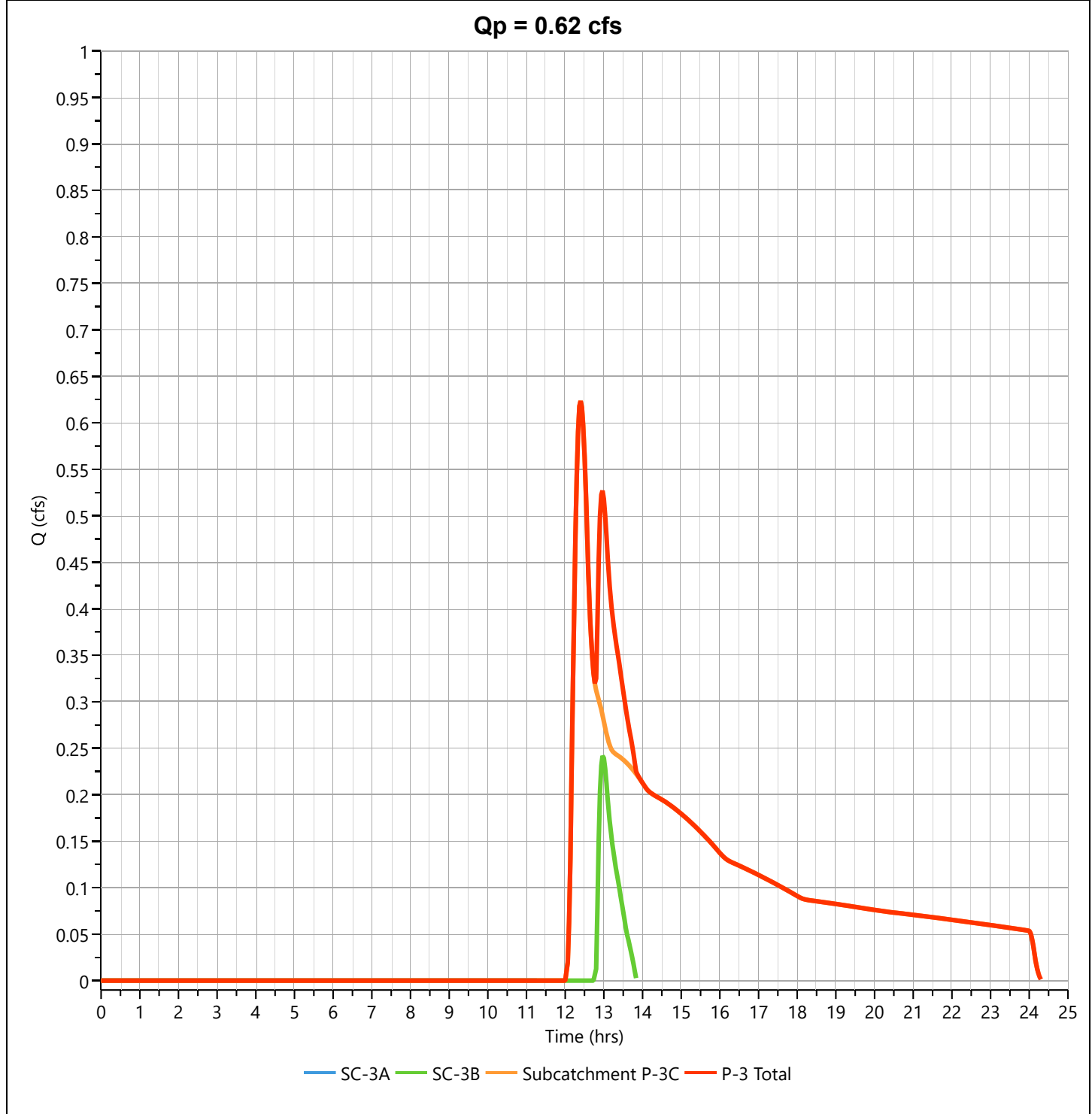
Hydrology Studio v 3.0.0.29

12-13-2023

P-3 Total

Hyd. No. 56

Hydrograph Type	= Junction	Peak Flow	= 0.624 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.40 hrs
Time Interval	= 2 min	Hydrograph Volume	= 6,256 cuft
Inflow Hydrographs	= 52, 54, 55	Total Contrib. Area	= 2.64 ac



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-1D

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area Acres	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
-	Impervious	98			0.26	25.96
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			0.00	0.00
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					0.26	25.96

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{25.96}{0.26} = 98.00 ; \text{ Use CN} = \boxed{98}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	3.00	4.77	7.59

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Hydrograph Report

Project Name:

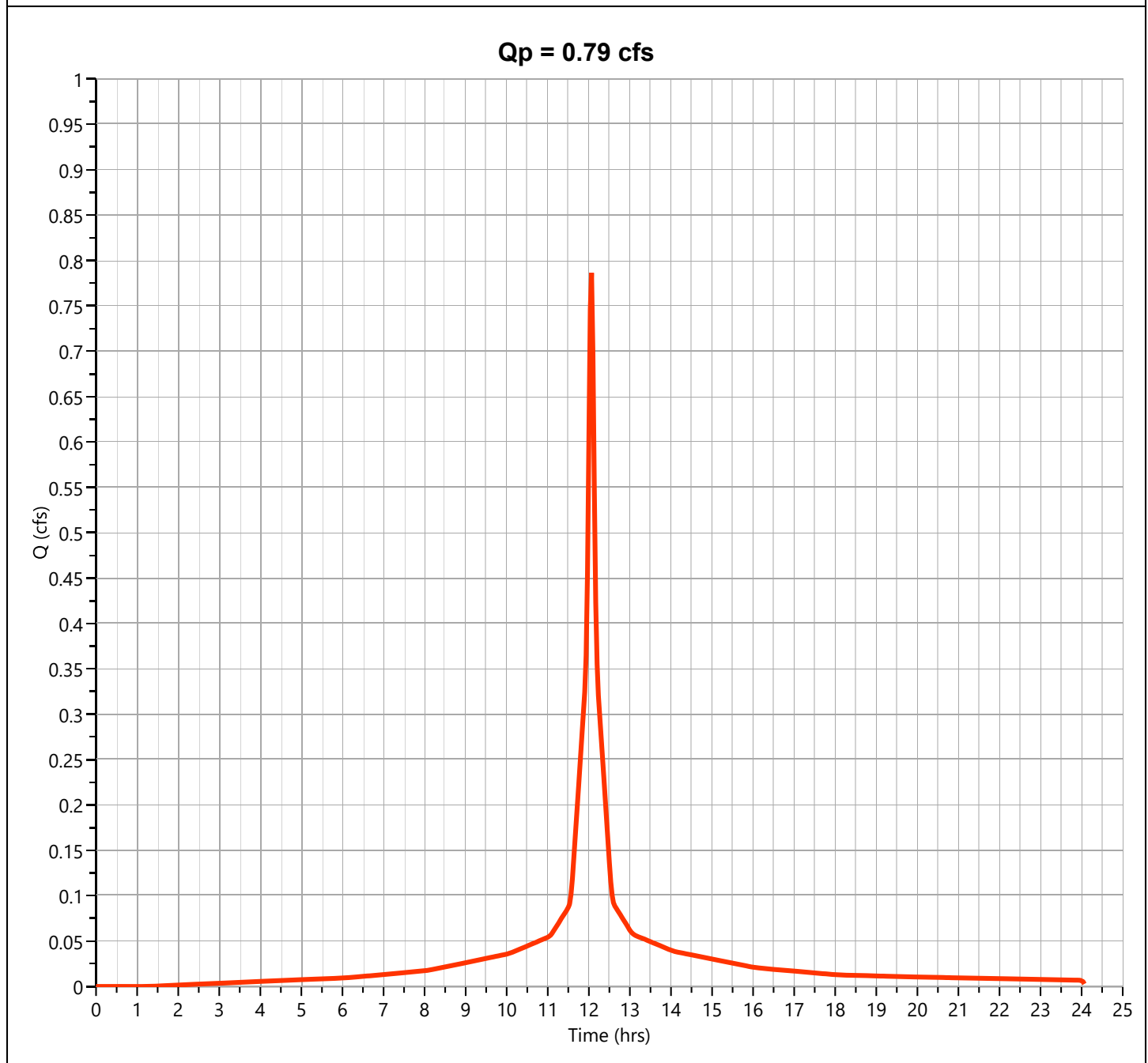
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-4A

Hyd. No. 58

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.786 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 2,652 cuft
Drainage Area	= 0.26 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

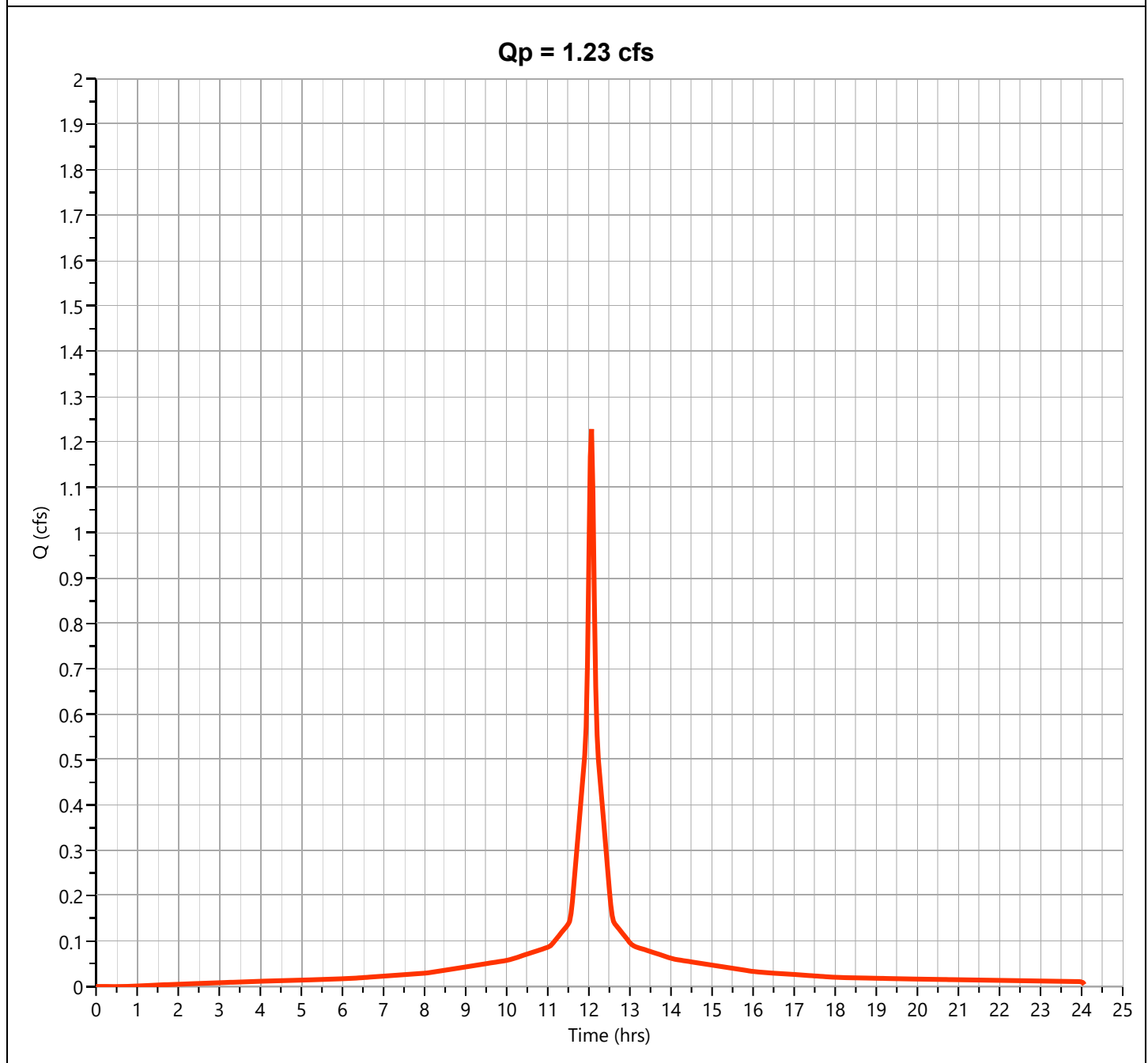
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-4A

Hyd. No. 58

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.228 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 4,223 cuft
Drainage Area	= 0.26 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

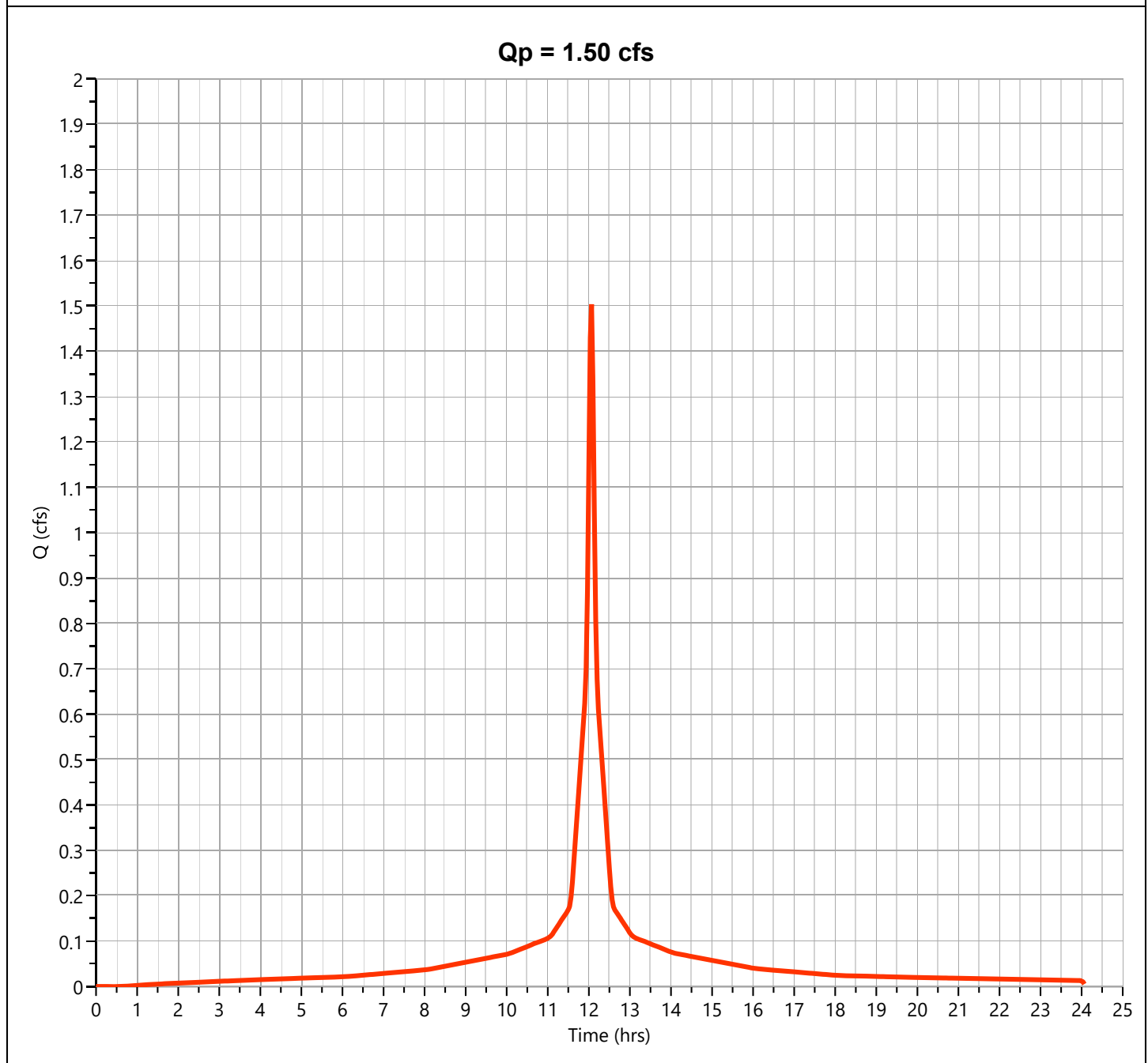
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-4A

Hyd. No. 58

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.503 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 5,204 cuft
Drainage Area	= 0.26 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

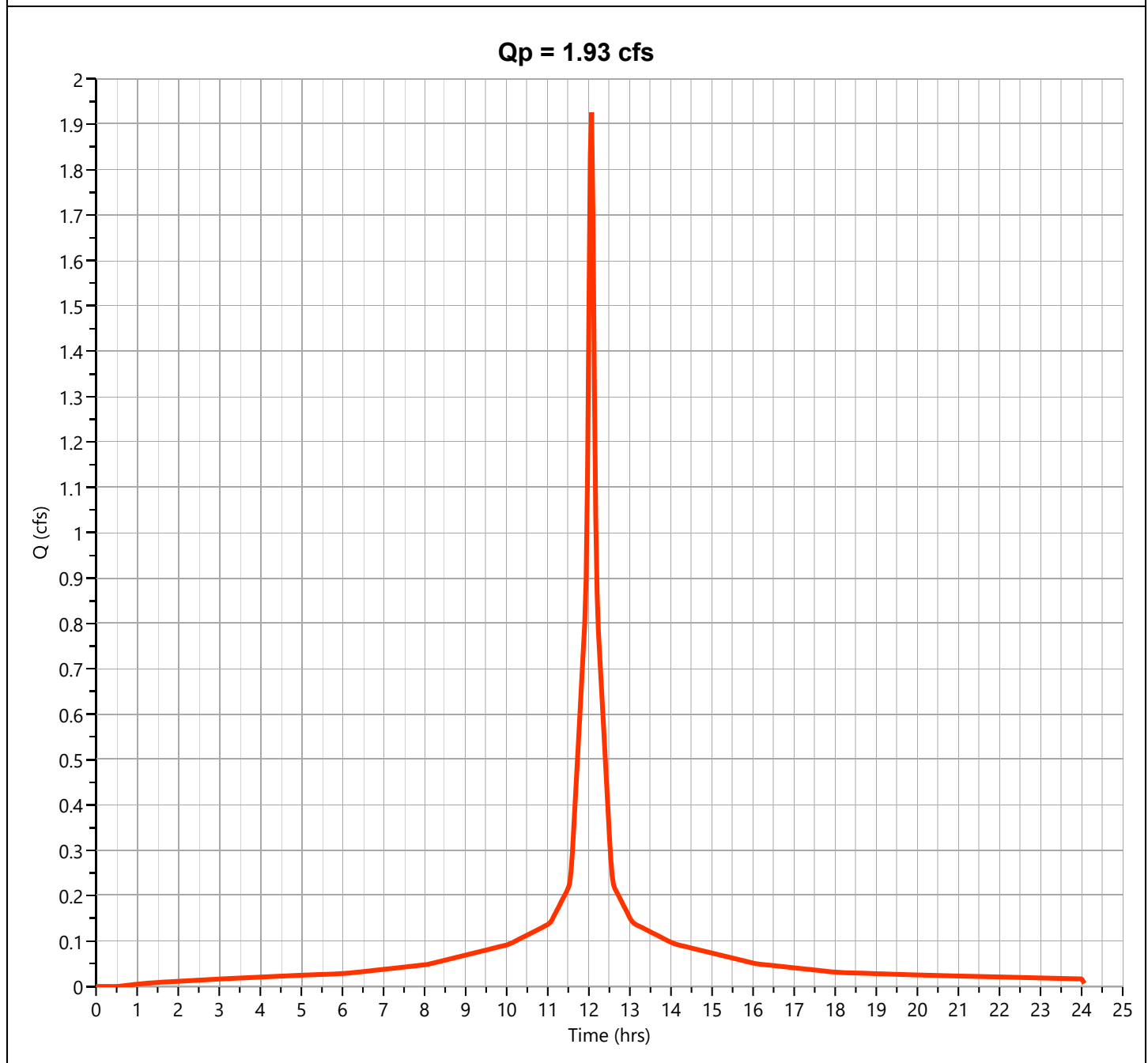
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-4A

Hyd. No. 58

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.926 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 6,716 cuft
Drainage Area	= 0.26 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

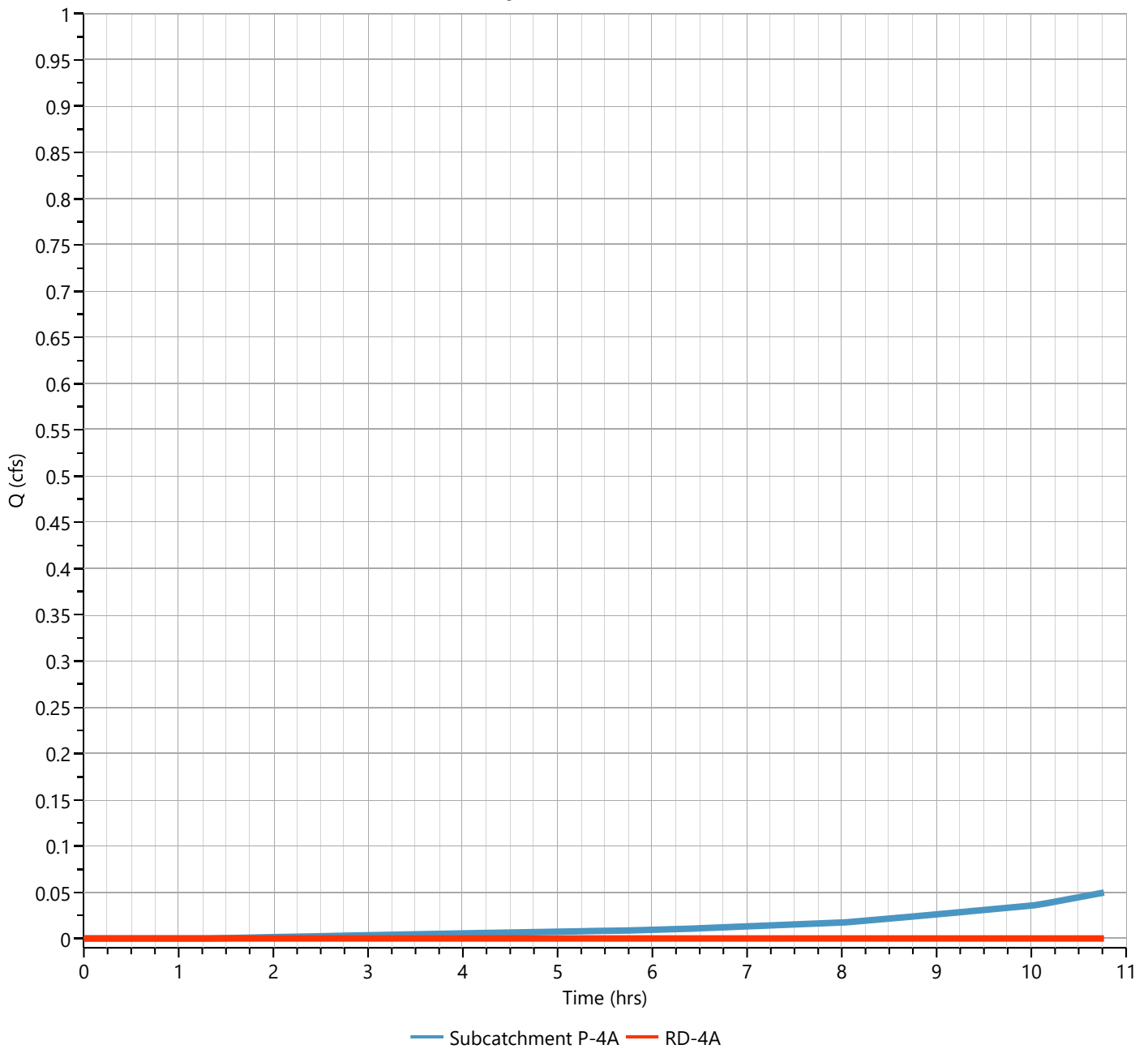
RD-4A

Hyd. No. 59

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 10.73 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 58 - Subcatchment P-4A	Max. Elevation	= 1.83 ft
Pond Name	= RD-4A	Max. Storage	= 464 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

RD-4A

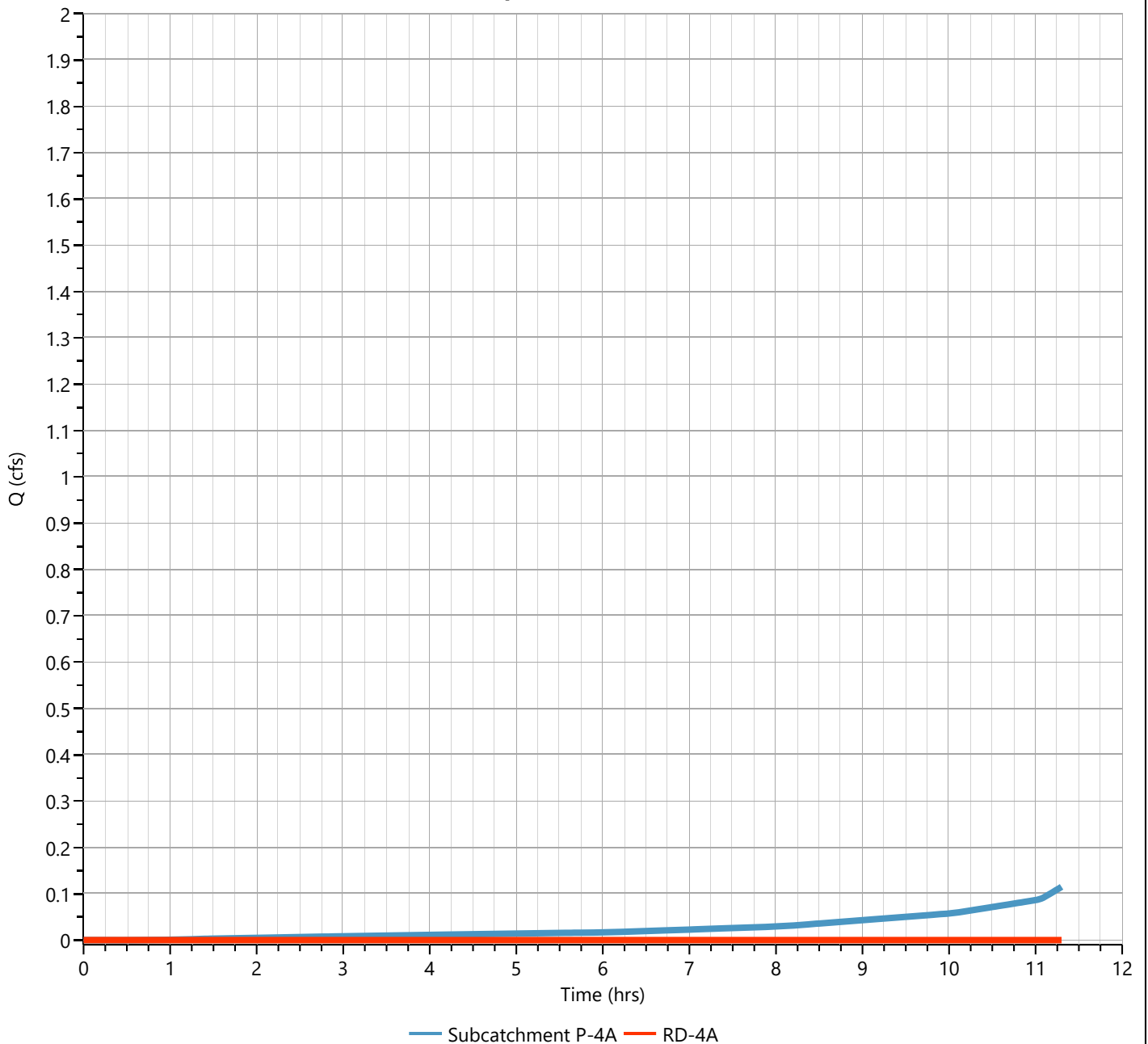
Hyd. No. 59

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 11.27 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 58 - Subcatchment P-4A	Max. Elevation	= 2.60 ft
Pond Name	= RD-4A	Max. Storage	= 1,040 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 1.18 hrs

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

RD-4A

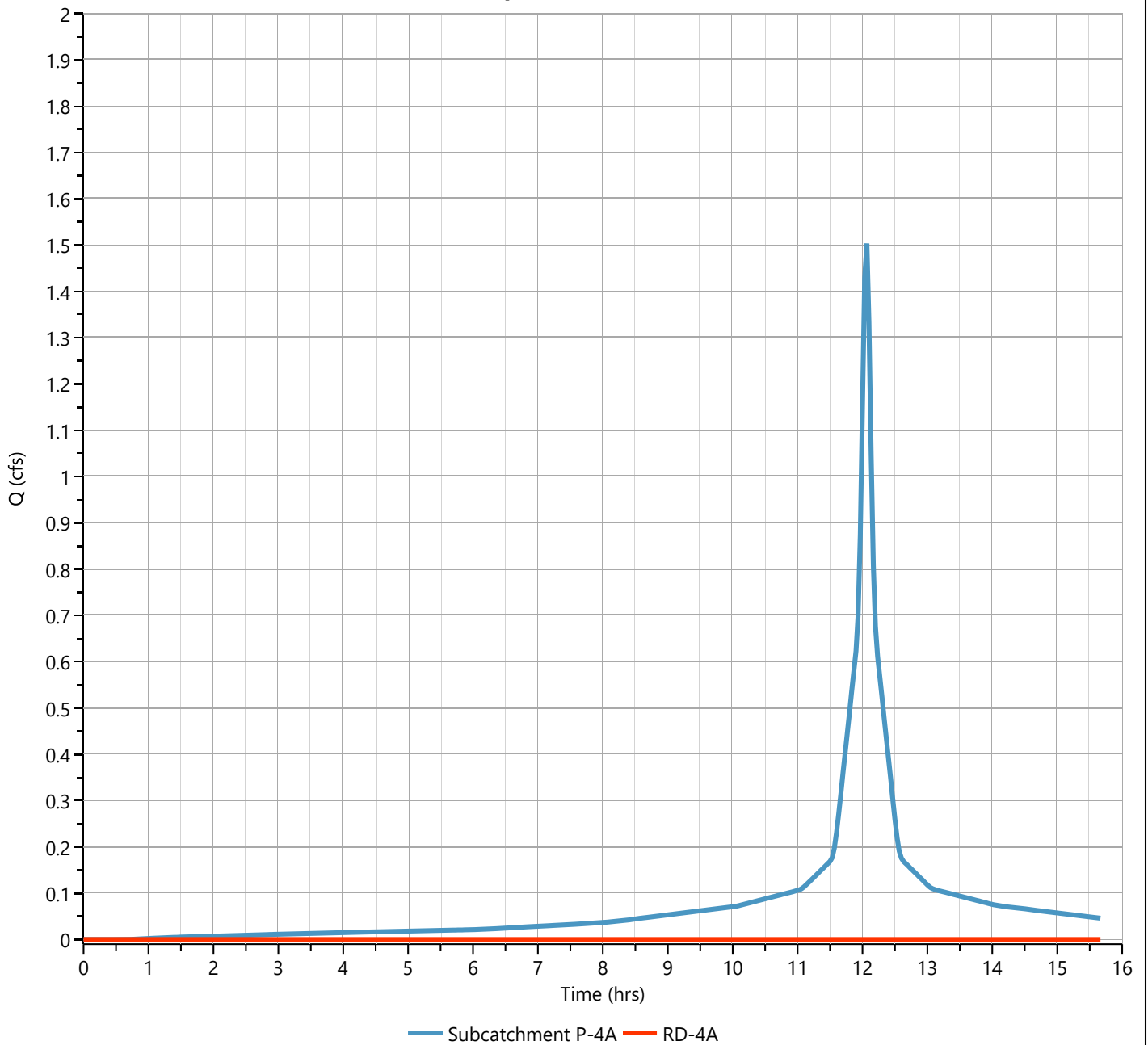
Hyd. No. 59

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 15.63 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 58 - Subcatchment P-4A	Max. Elevation	= 3.14 ft
Pond Name	= RD-4A	Max. Storage	= 1,422 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 17 min

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

RD-4A

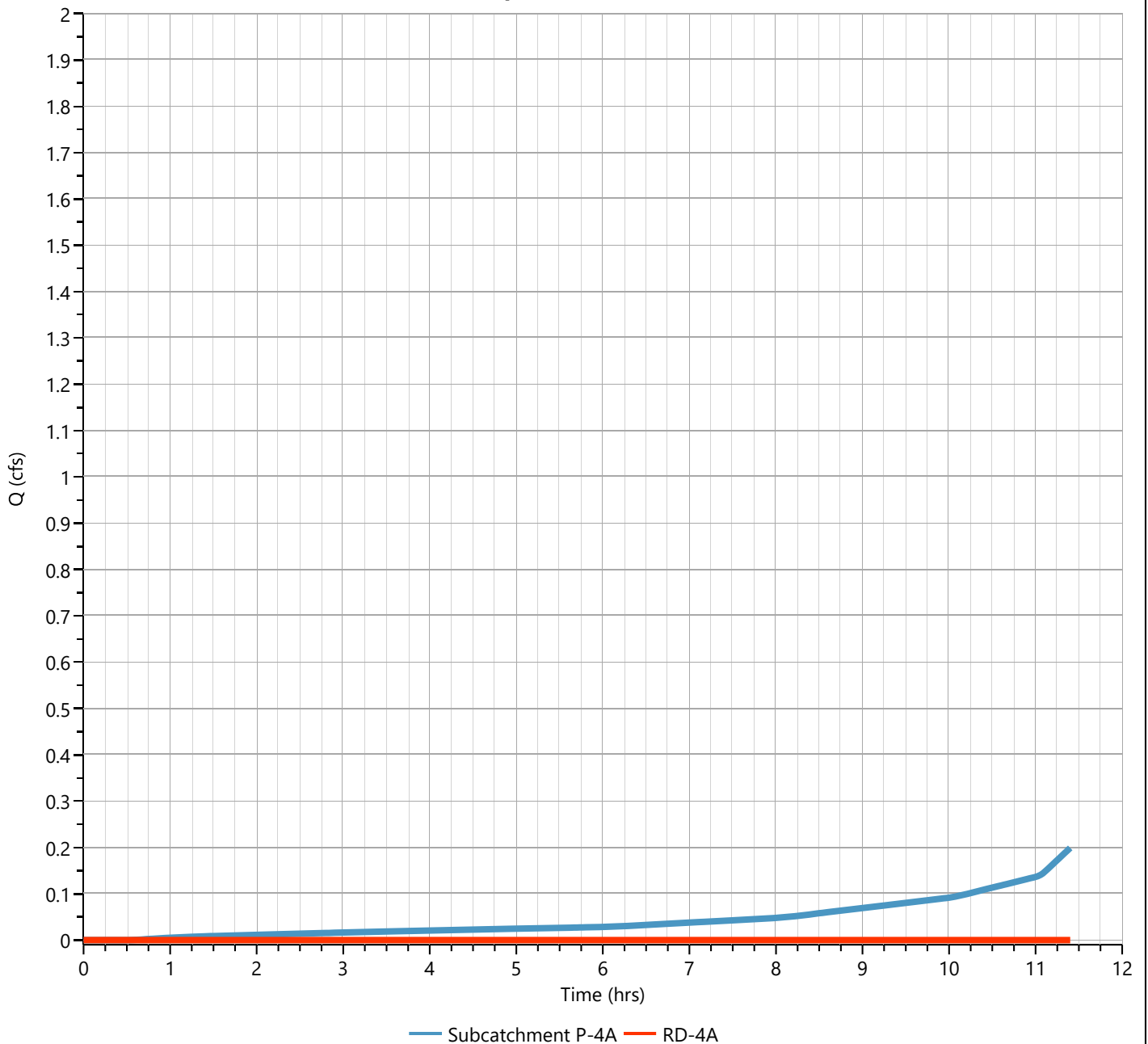
Hyd. No. 59

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 11.37 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 58 - Subcatchment P-4A	Max. Elevation	= 4.20 ft
Pond Name	= RD-4A	Max. Storage	= 2,032 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 2.46 hrs

Qp = 0.00 cfs



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

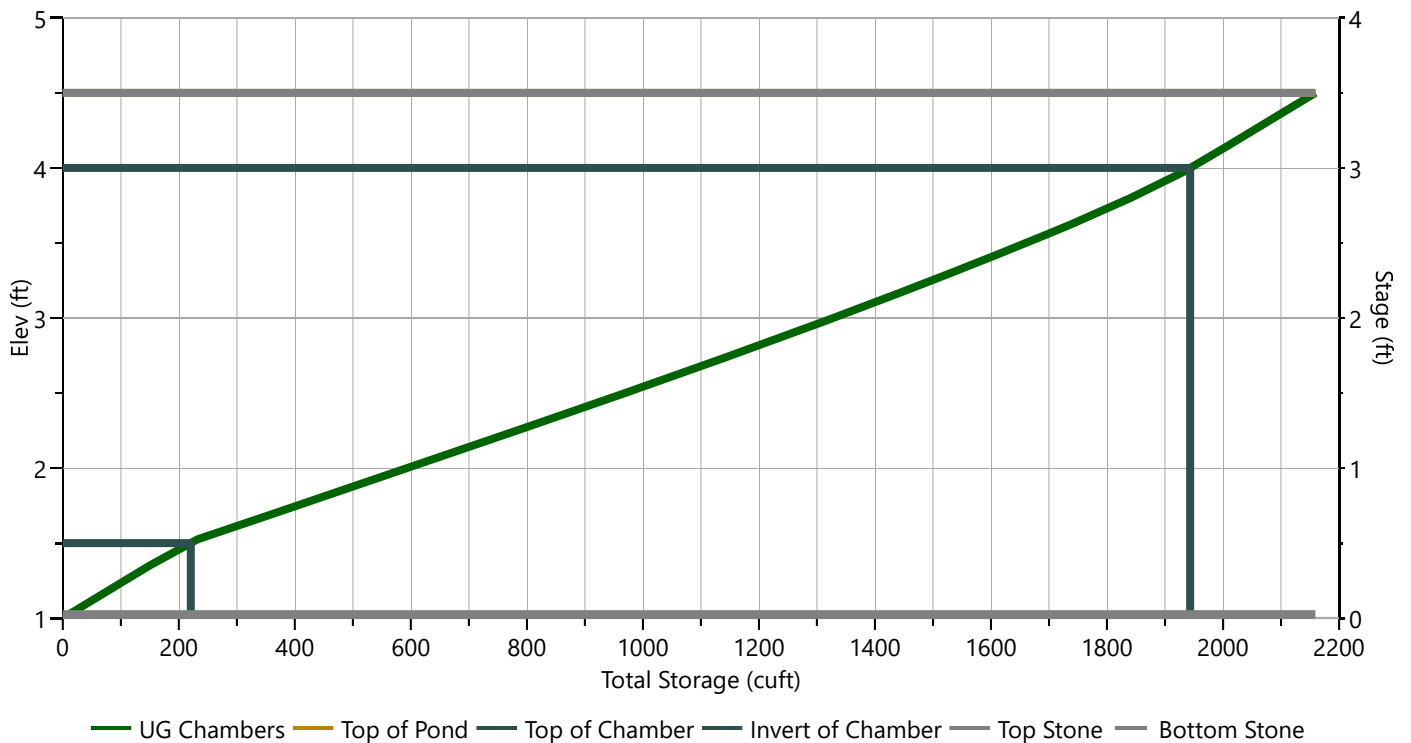
12-13-2023

RD-4A

Stage-Storage

StormTech® SC-740™ Chamber		Stage / Storage Table				
Description	Input	Stage (in)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Chamber Height, in	30	0.0	1.00	1,070	0.000	0.000
Chamber Shape	Arch	2.1	1.18	1,070	74.9	74.9
Chamber Width, in	51	4.2	1.35	1,070	74.9	150
Installed Length, ft	7.12	6.3	1.53	1,070	82.7	232
No. Chambers	24	8.4	1.70	1,070	134	366
Bare Chamber Stor, cuft	1,102	10.5	1.88	1,070	133	500
No. Rows	3	12.6	2.05	1,070	133	632
Space Between Rows, in	18	14.7	2.23	1,070	132	764
Stone Above, in	6	16.8	2.40	1,070	131	895
Stone Below, in	6	18.9	2.58	1,070	129	1,024
Stone Sides, in	12	21.0	2.75	1,070	127	1,151
Stone Ends, in	12	23.1	2.93	1,070	125	1,275
Encasement Voids, %	40.00	25.2	3.10	1,070	122	1,397
Encasement Bottom Elevation, ft	1.00	27.3	3.28	1,070	118	1,515
		29.4	3.45	1,070	114	1,629
		31.5	3.63	1,070	109	1,738
		33.6	3.80	1,070	102	1,841
		35.7	3.97	1,070	91.8	1,932
		37.8	4.15	1,070	77.0	2,009
		39.9	4.32	1,070	74.9	2,084
		42.0	4.50	1,070	74.9	2,159

Stage-Storage



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

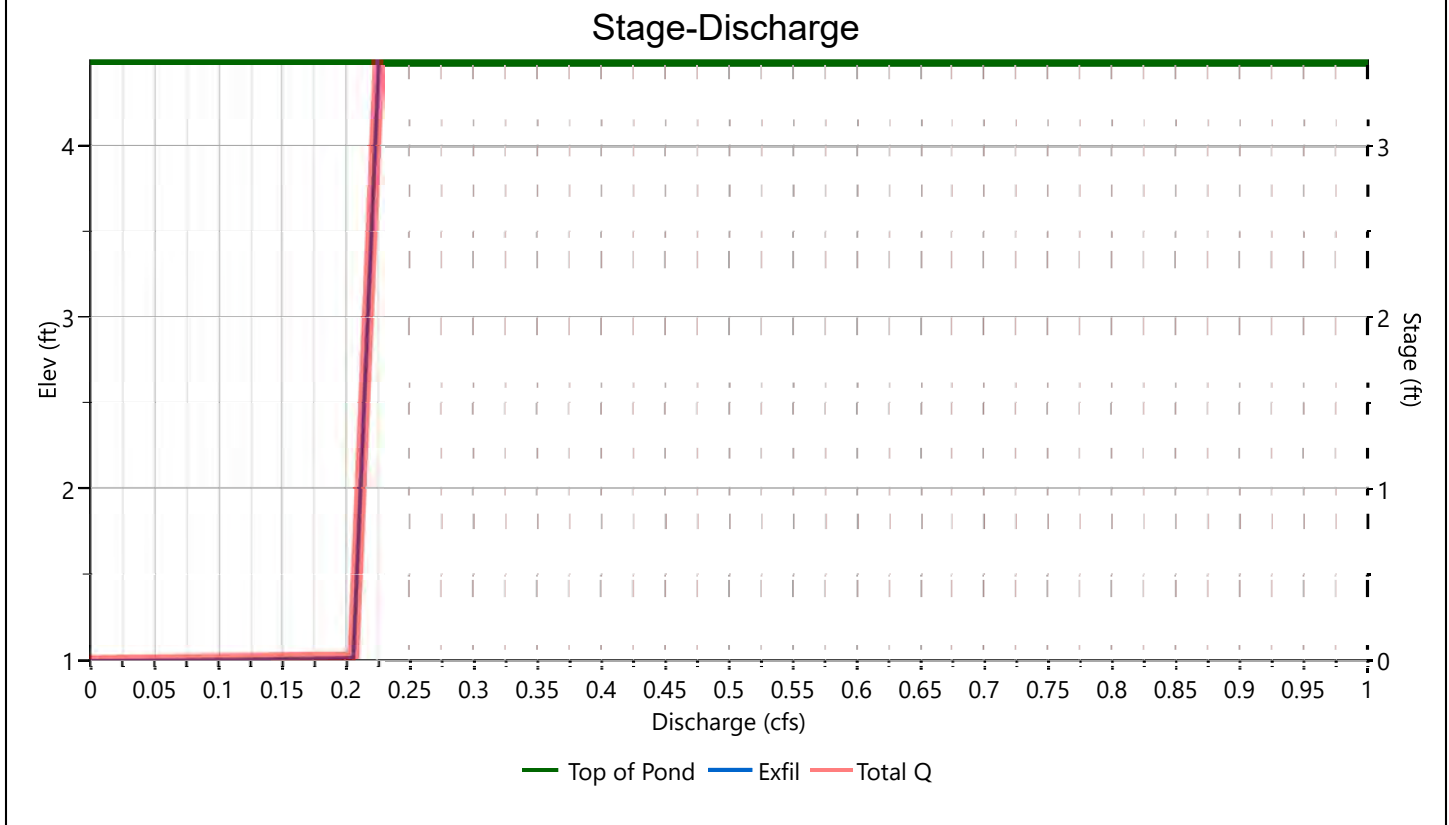
12-13-2023

RD-4A

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in					Hole Diameter, in
Span, in					No. holes
No. Barrels					Invert Elevation, ft
Invert Elevation, ft					Height, ft
Orifice Coefficient, Co					Orifice Coefficient, Co
Length, ft					
Barrel Slope, %					
N-Value, n	0.000				
Weirs	Riser*	Weirs			Ancillary
		1	2	3	
Shape / Type					Exfiltration, in/hr
Crest Elevation, ft					8.27**
Crest Length, ft					
Angle, deg					
Weir Coefficient, Cw					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

RD-4A

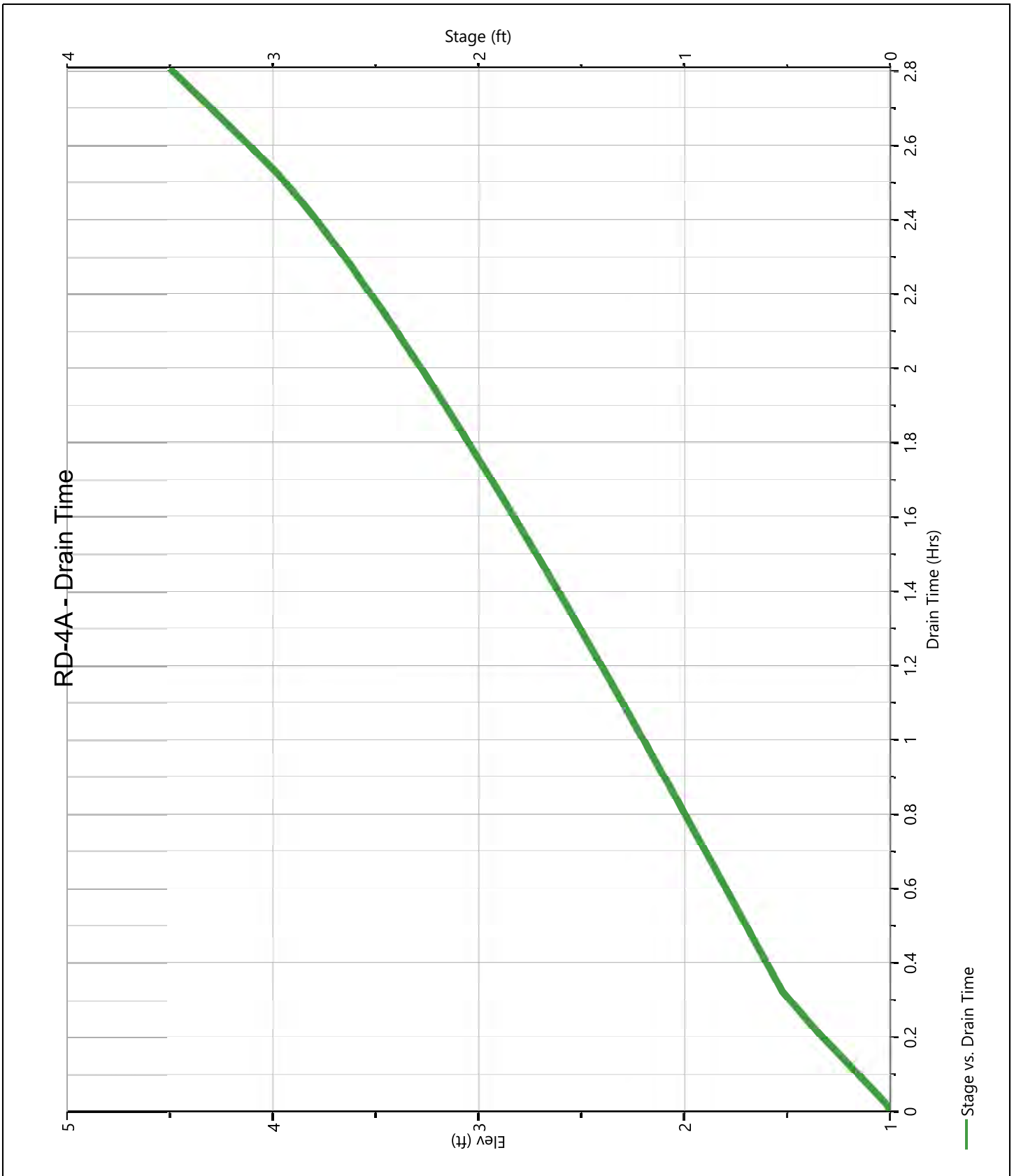
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	1.00	0.000										0.000		0.000
0.18	1.18	74.9										0.206		0.206
0.35	1.35	150										0.207		0.207
0.53	1.53	232										0.208		0.208
0.70	1.70	366										0.209		0.209
0.88	1.88	500										0.210		0.210
1.05	2.05	632										0.211		0.211
1.23	2.23	764										0.212		0.212
1.40	2.40	895										0.213		0.213
1.58	2.58	1,024										0.214		0.214
1.75	2.75	1,151										0.215		0.215
1.93	2.93	1,275										0.216		0.216
2.10	3.10	1,397										0.217		0.217
2.28	3.28	1,515										0.218		0.218
2.45	3.45	1,629										0.219		0.219
2.63	3.63	1,738										0.220		0.220
2.80	3.80	1,841										0.221		0.221
2.97	3.97	1,932										0.222		0.222
3.15	4.15	2,009										0.223		0.223
3.32	4.32	2,084										0.224		0.224
3.50	4.50	2,159										0.225		0.225

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

RD-4A

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-1D

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.07	7.17
A	Woods - Good Condition	30			1.10	32.86
A	Open Space - Good Condition	39			0.73	28.60
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					1.90	68.63

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{68.63}{1.90} = 36.09 ; \text{ Use CN} = \boxed{36}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	0.01	0.11	0.84

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-4B

Hyd. No. 60

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.00 hrs
Time Interval	= 2 min	Runoff Volume	= 0.000 cuft
Drainage Area	= 1.9 ac	Curve Number	= 36
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484

Qp = 0.00 cfs

Hydrograph Report

Project Name:

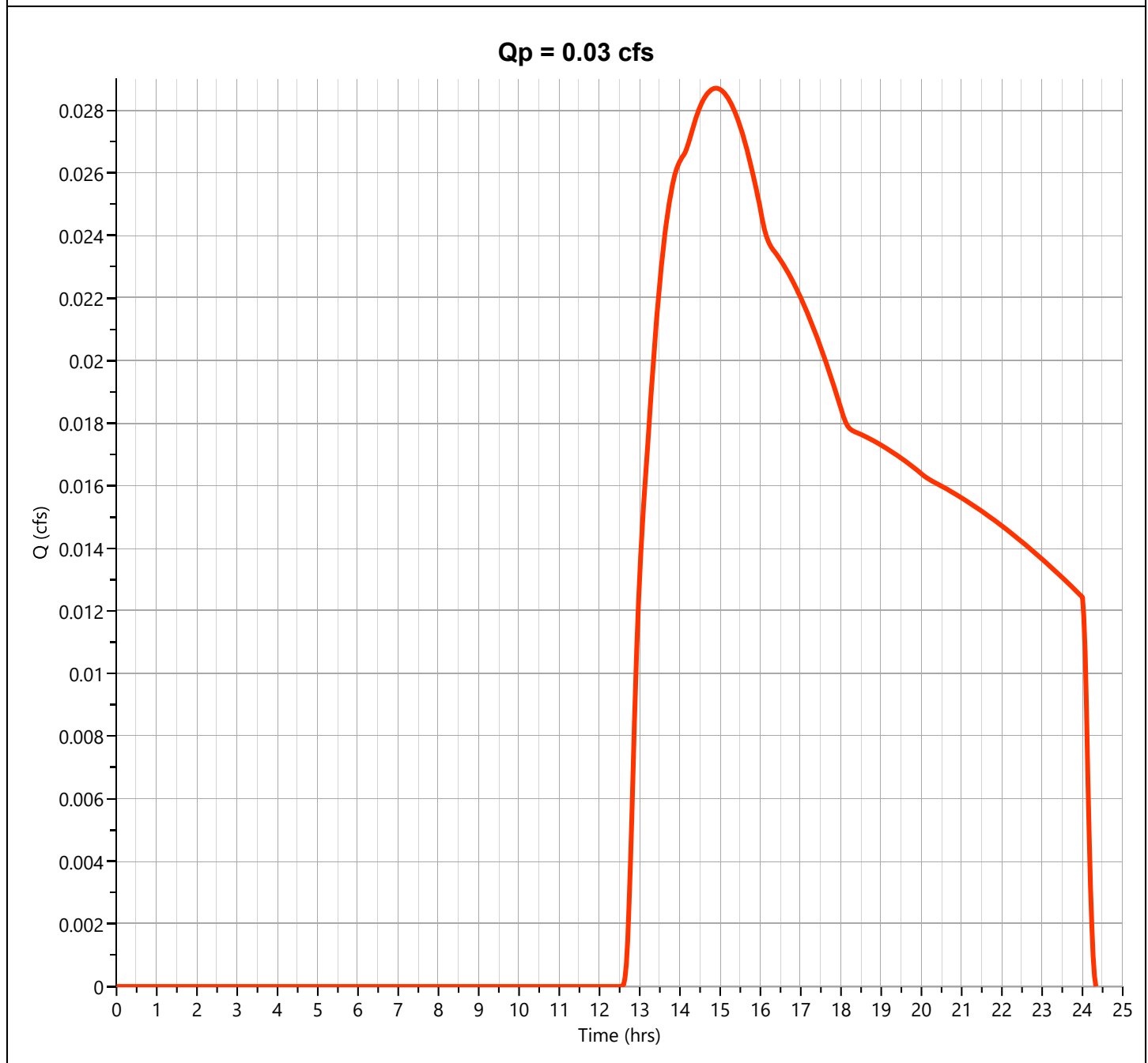
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-4B

Hyd. No. 60

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.029 cfs
Storm Frequency	= 10-yr	Time to Peak	= 14.90 hrs
Time Interval	= 2 min	Runoff Volume	= 782 cuft
Drainage Area	= 1.9 ac	Curve Number	= 36
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

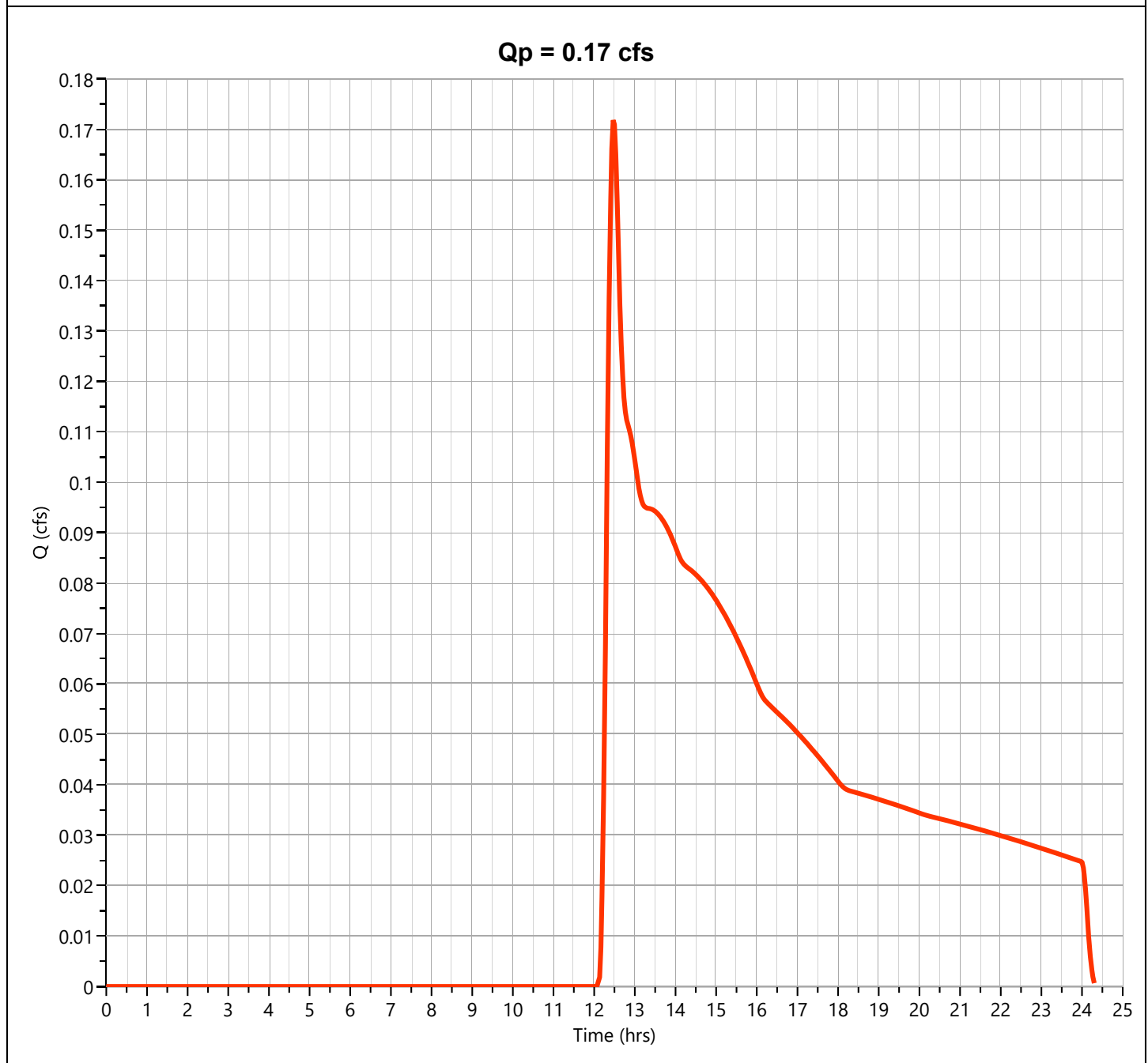
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-4B

Hyd. No. 60

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.172 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.47 hrs
Time Interval	= 2 min	Runoff Volume	= 2,299 cuft
Drainage Area	= 1.9 ac	Curve Number	= 36
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

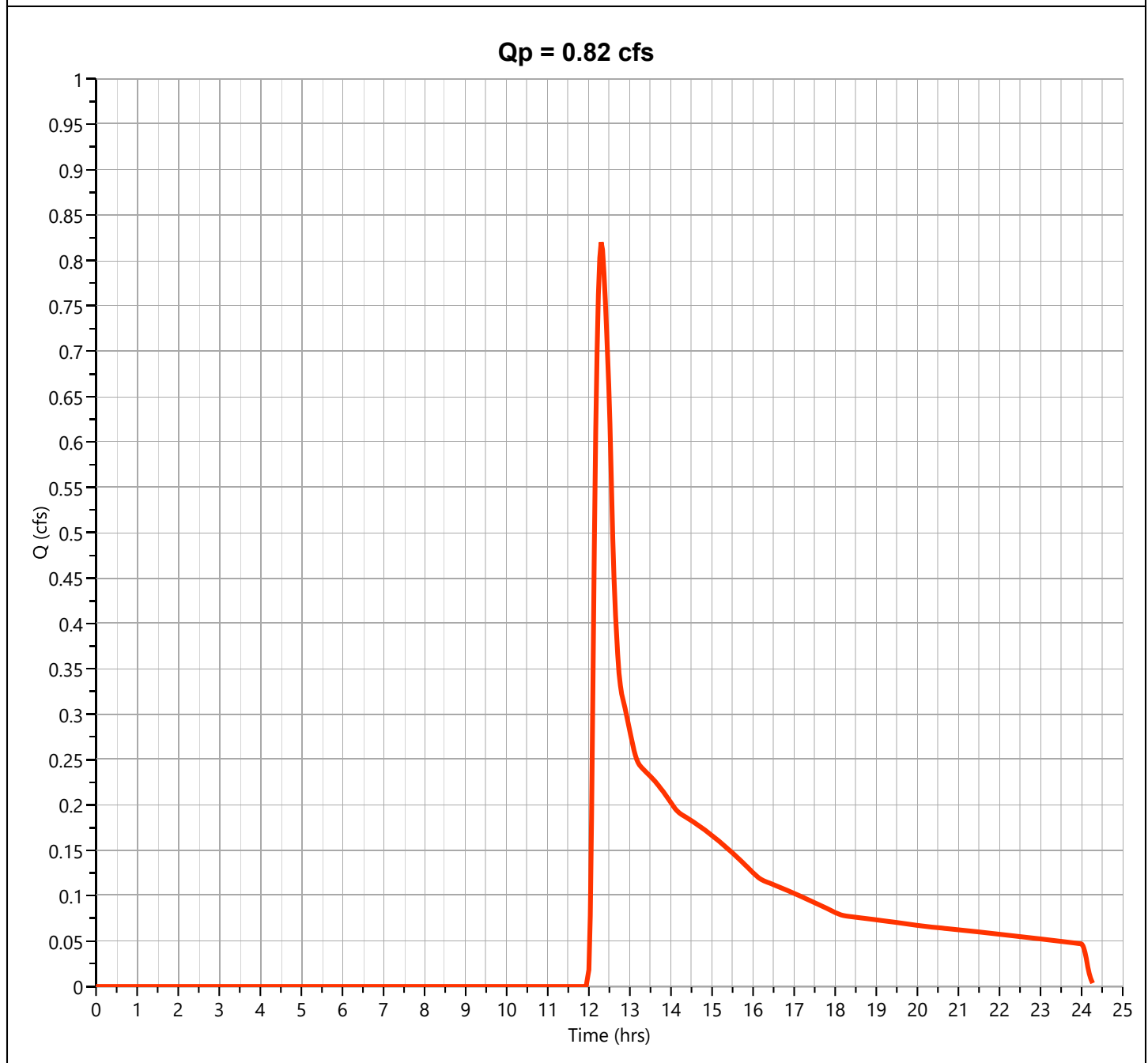
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-4B

Hyd. No. 60

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.820 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.30 hrs
Time Interval	= 2 min	Runoff Volume	= 5,891 cuft
Drainage Area	= 1.9 ac	Curve Number	= 36
Tc Method	= User	Time of Conc. (Tc)	= 13.3 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

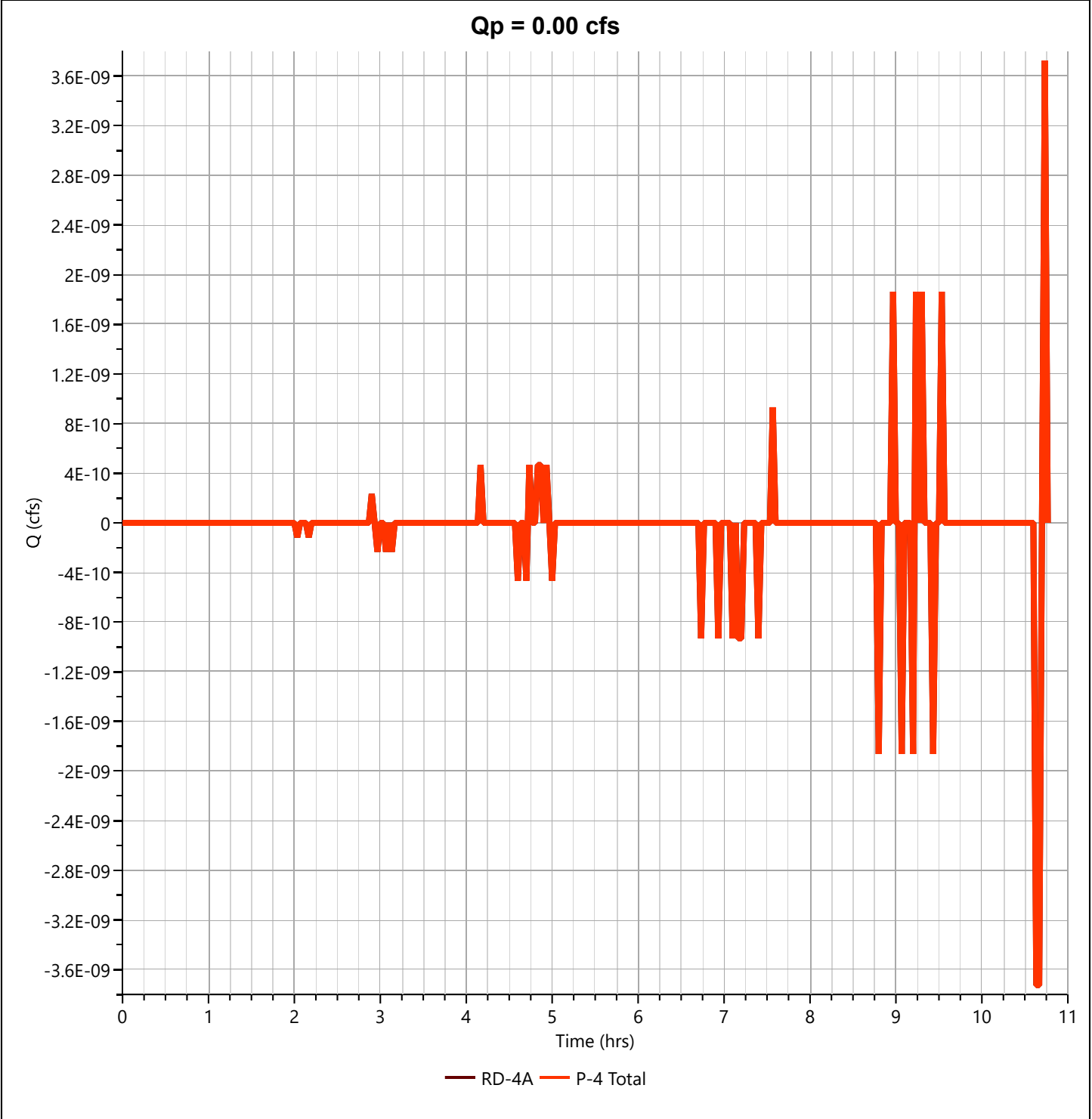
Hydrology Studio v 3.0.0.29

12-13-2023

P-4 Total

Hyd. No. 61

Hydrograph Type	= Junction	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 10.73 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrographs	= 59, 60	Total Contrib. Area	= 1.9 ac



Hydrograph Report

Project Name:

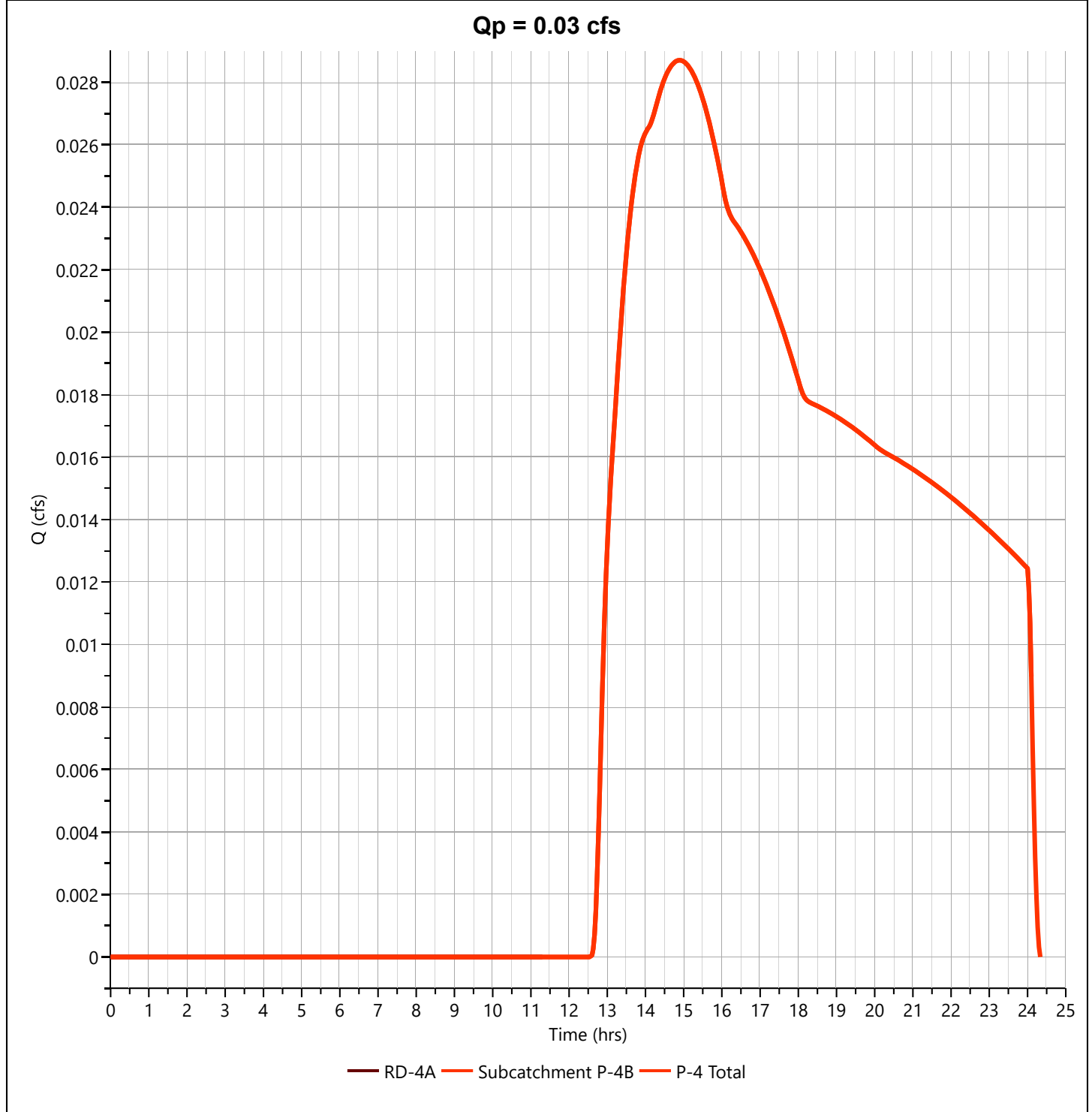
Hydrology Studio v 3.0.0.29

12-13-2023

P-4 Total

Hyd. No. 61

Hydrograph Type	= Junction	Peak Flow	= 0.029 cfs
Storm Frequency	= 10-yr	Time to Peak	= 14.90 hrs
Time Interval	= 2 min	Hydrograph Volume	= 782 cuft
Inflow Hydrographs	= 59, 60	Total Contrib. Area	= 1.9 ac



Hydrograph Report

Project Name:

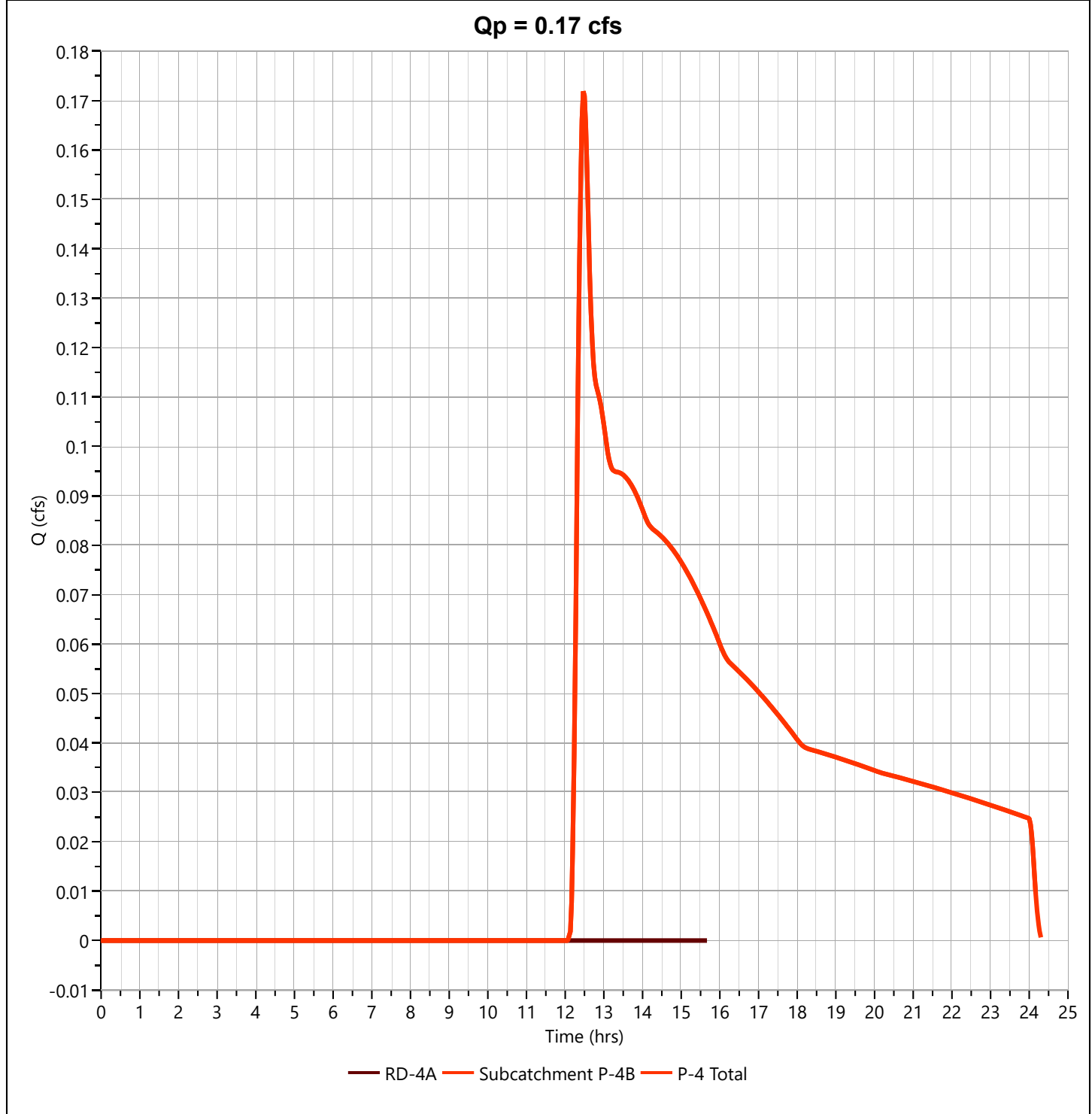
Hydrology Studio v 3.0.0.29

12-13-2023

P-4 Total

Hyd. No. 61

Hydrograph Type	= Junction	Peak Flow	= 0.172 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.47 hrs
Time Interval	= 2 min	Hydrograph Volume	= 2,299 cuft
Inflow Hydrographs	= 59, 60	Total Contrib. Area	= 1.9 ac



Hydrograph Report

Project Name:

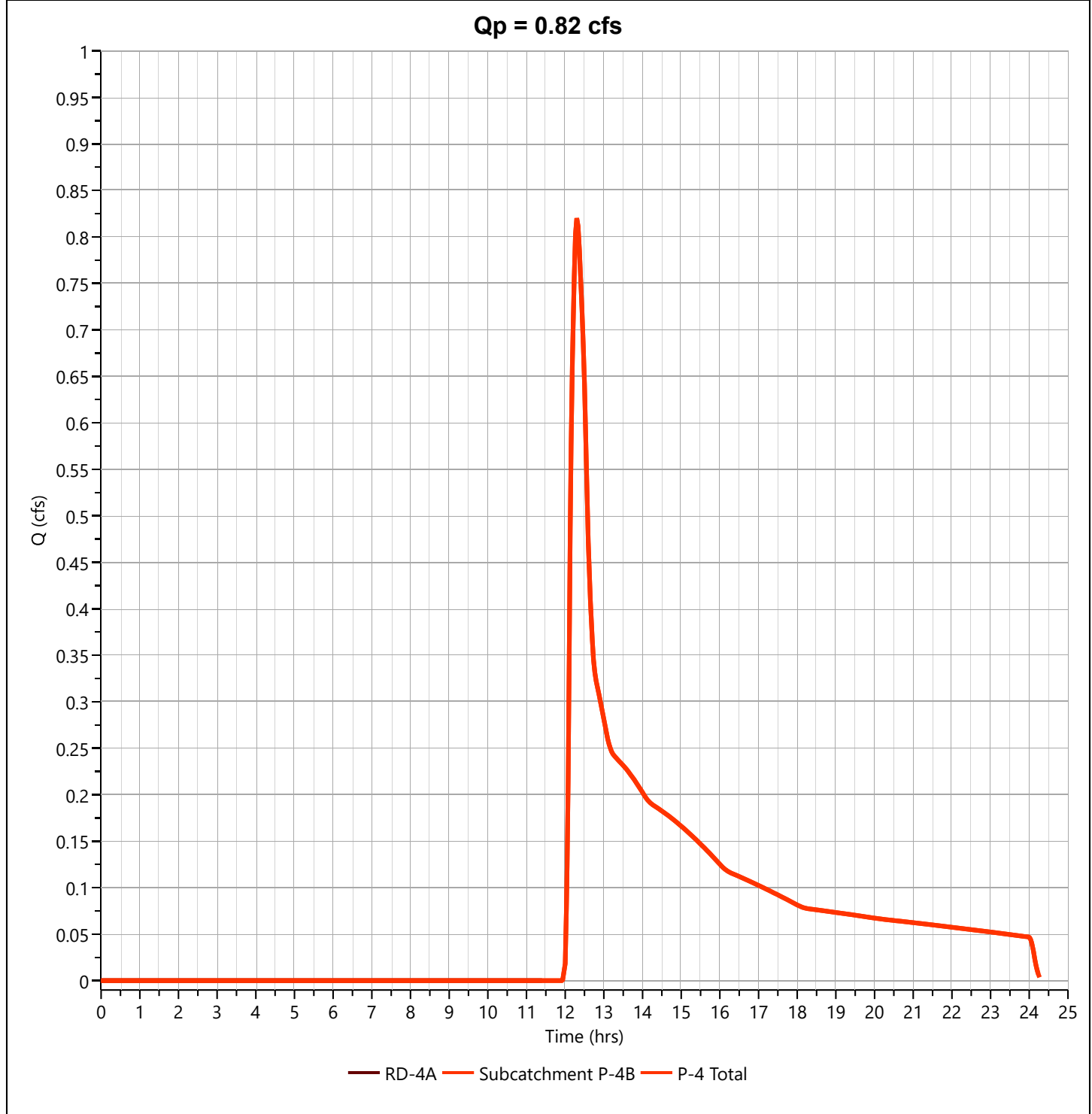
Hydrology Studio v 3.0.0.29

12-13-2023

P-4 Total

Hyd. No. 61

Hydrograph Type	= Junction	Peak Flow	= 0.820 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.30 hrs
Time Interval	= 2 min	Hydrograph Volume	= 5,891 cuft
Inflow Hydrographs	= 59, 60	Total Contrib. Area	= 1.9 ac



Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one: Present Developed

Subcatchment P-4B

Circle one: Tc Tt through subarea

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	Wooded		
	0.6		
ft	50		
in	3.1		
ft/ft	0.050		
Compute Tt hr	0.20		0.20

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C		
	UNPAVED		
ft	260		
ft/ft	0.045		
ft/s	3.42		
Compute Tt hr	0.02		0.02

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r ft			
ft/ft			
Compute V ft/s			
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.22
min 13.3

Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-5B

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area Acres	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
-	Impervious	98			0.13	12.81
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			0.00	0.00
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					0.13	12.81

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{12.81}{0.13} = 98.00 ; \text{ Use CN} = \boxed{98}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	3.00	4.77	7.59

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Hydrograph Report

Project Name:

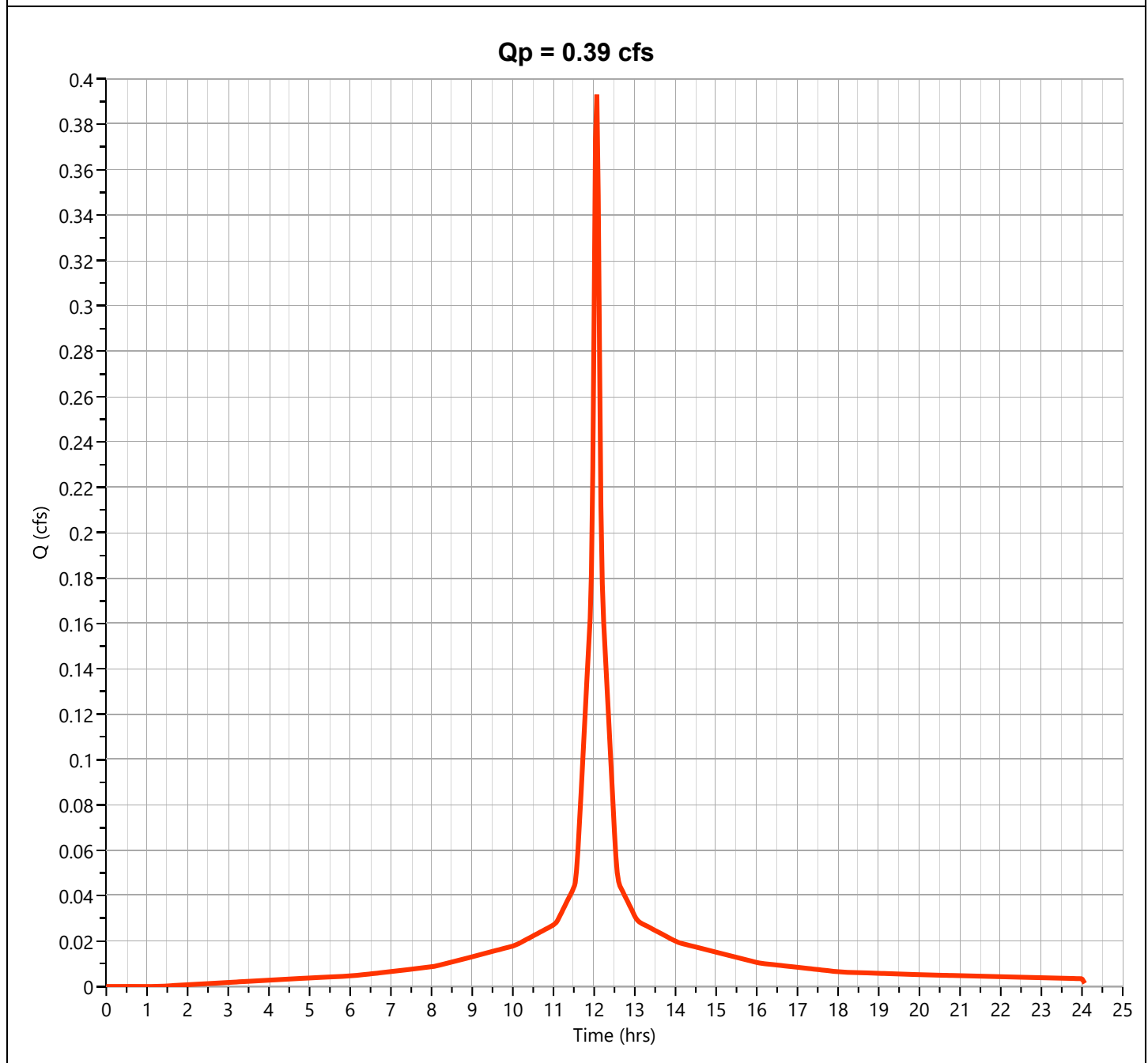
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-5A

Hyd. No. 63

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.393 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 1,326 cuft
Drainage Area	= 0.13 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

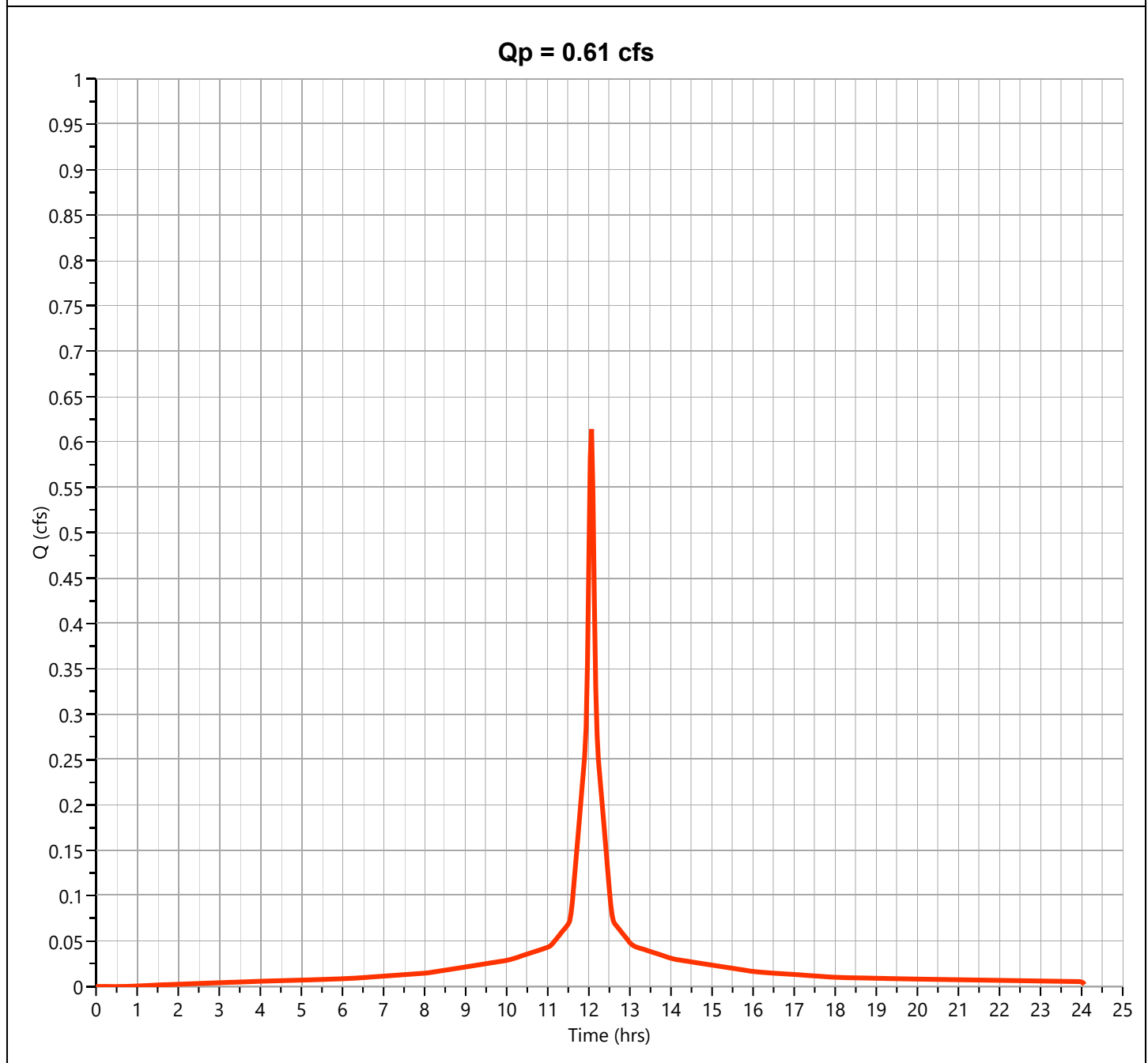
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-5A

Hyd. No. 63

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.614 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 2,112 cuft
Drainage Area	= 0.13 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

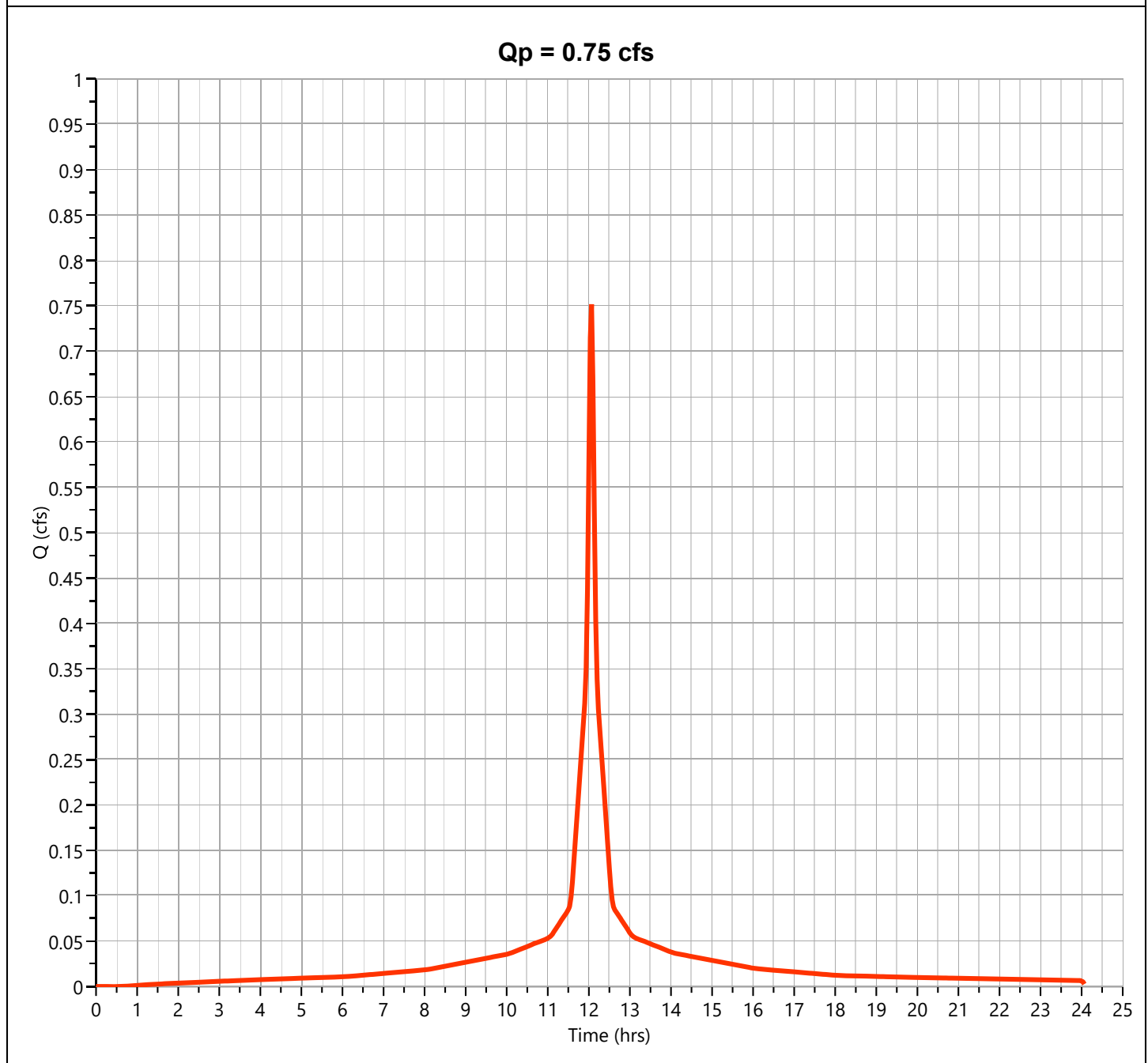
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-5A

Hyd. No. 63

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.752 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 2,602 cuft
Drainage Area	= 0.13 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

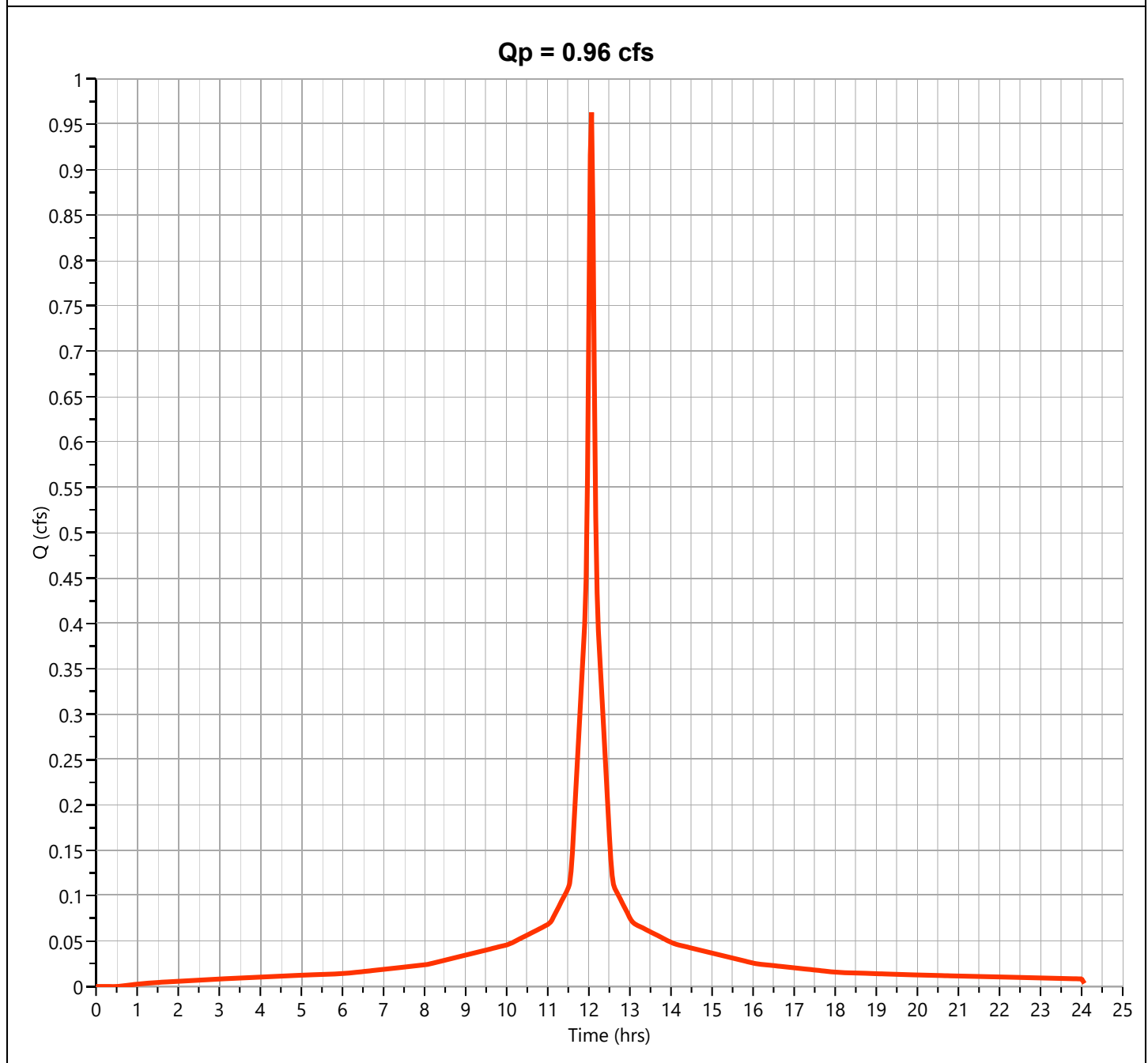
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-5A

Hyd. No. 63

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.963 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 3,358 cuft
Drainage Area	= 0.13 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

RD-5A

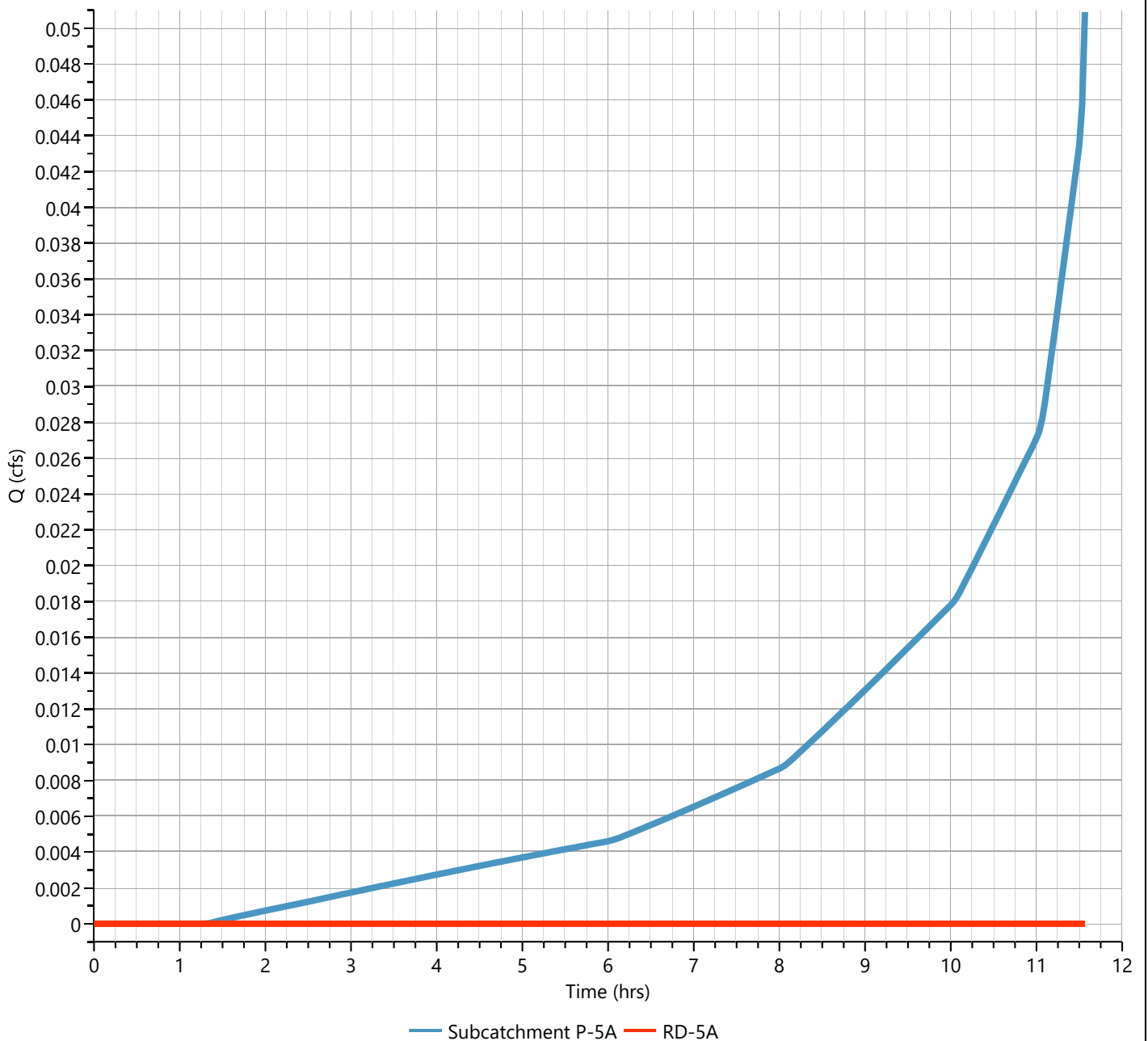
Hyd. No. 64

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 11.53 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 63 - Subcatchment P-5A	Max. Elevation	= 1.89 ft
Pond Name	= RD-5A	Max. Storage	= 244 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 3.59 hrs

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

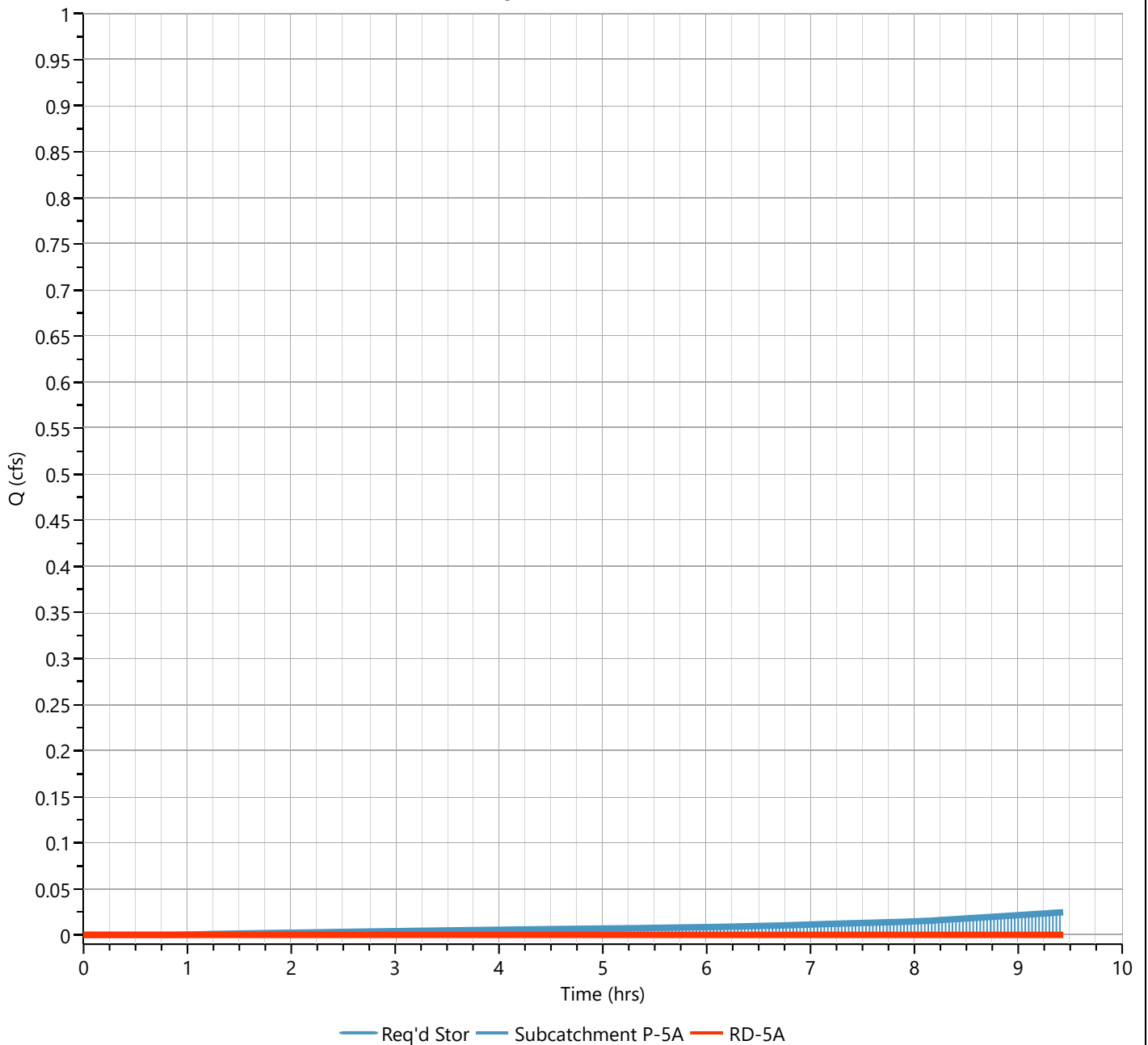
RD-5A

Hyd. No. 64

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 9.40 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 63 - Subcatchment P-5A	Max. Elevation	= 2.69 ft
Pond Name	= RD-5A	Max. Storage	= 532 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

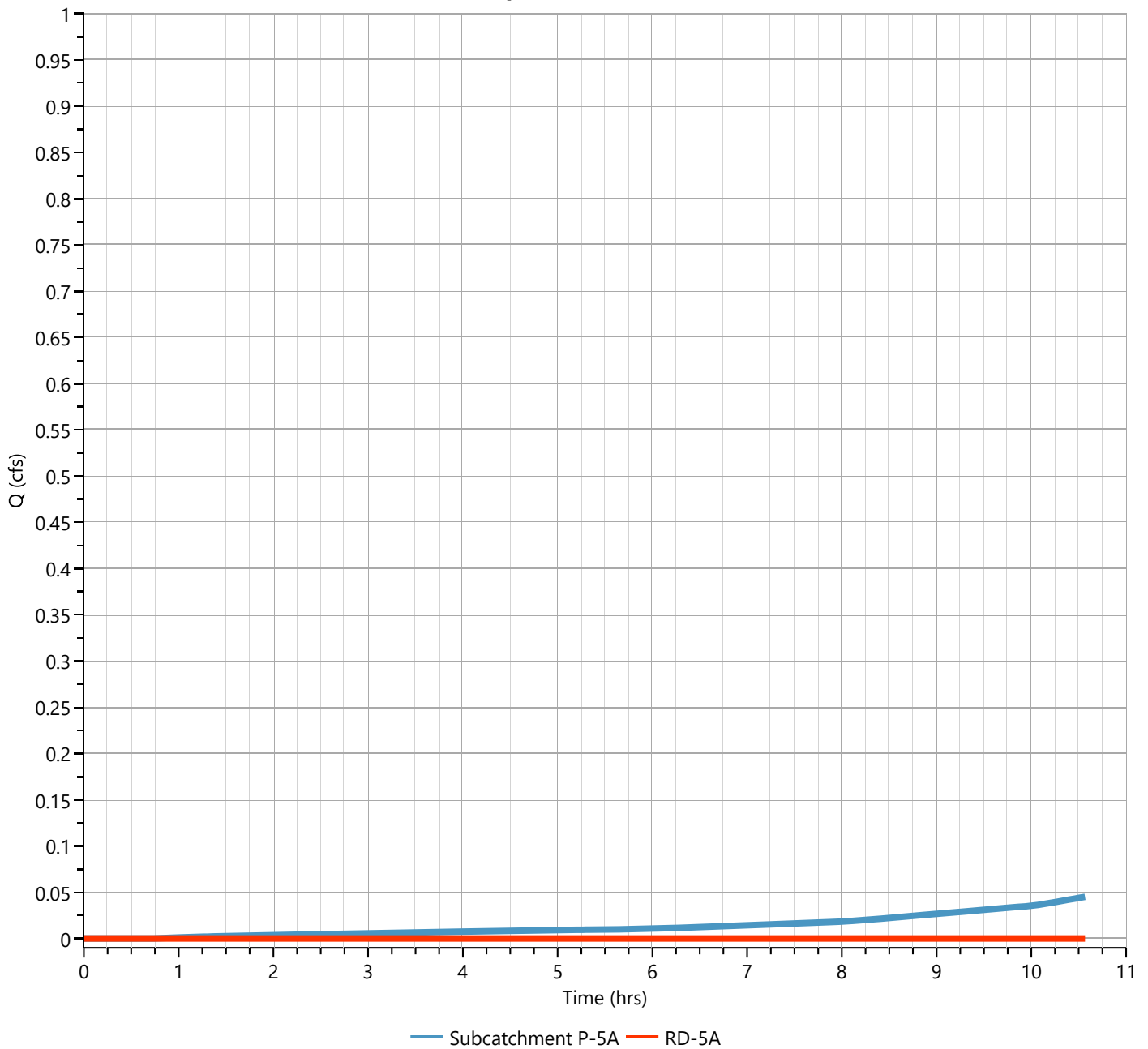
RD-5A

Hyd. No. 64

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 10.53 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 63 - Subcatchment P-5A	Max. Elevation	= 3.26 ft
Pond Name	= RD-5A	Max. Storage	= 721 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

RD-5A

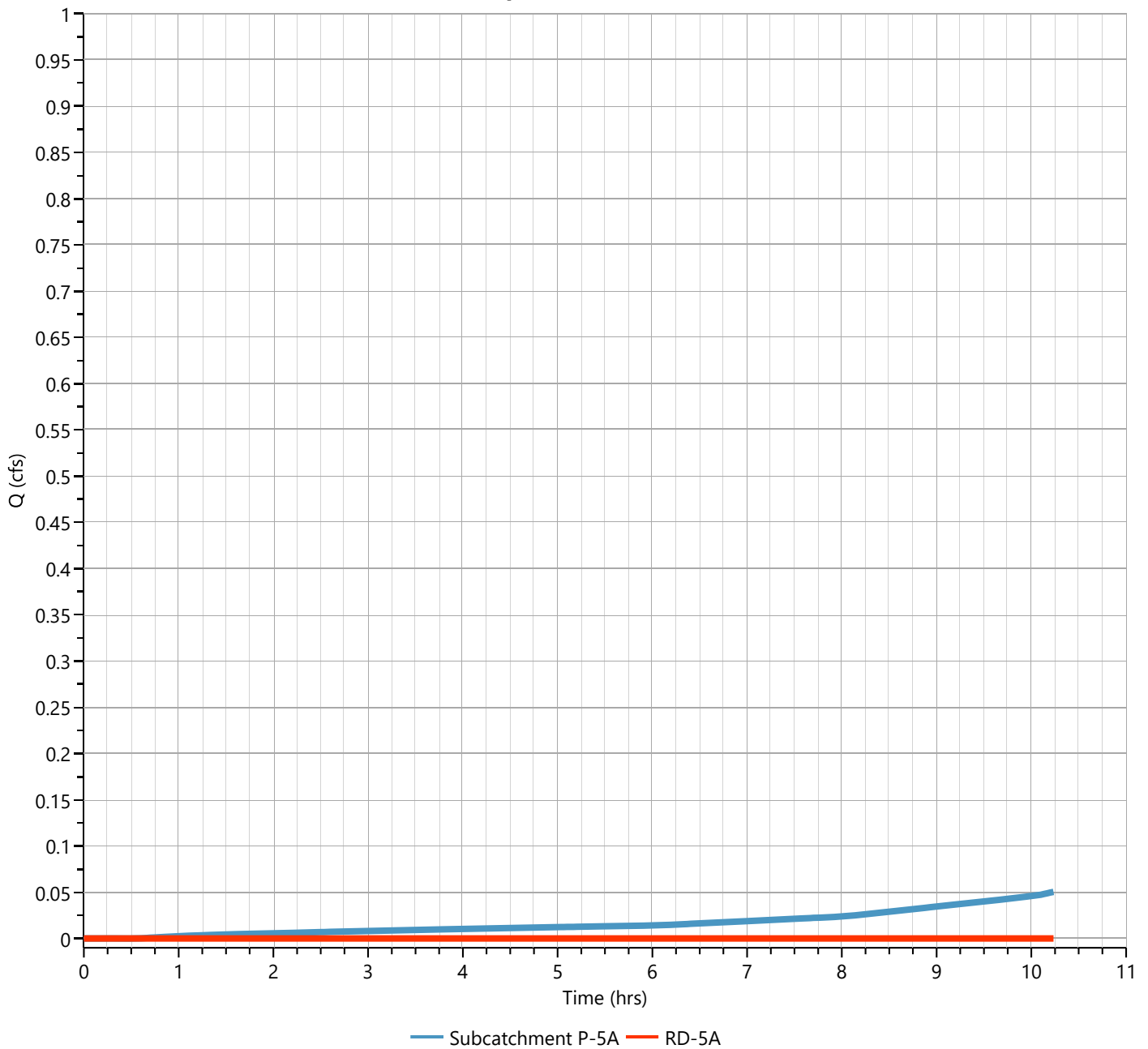
Hyd. No. 64

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 10.20 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 63 - Subcatchment P-5A	Max. Elevation	= 4.46 ft
Pond Name	= RD-5A	Max. Storage	= 1,023 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 26 min

Qp = 0.00 cfs



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

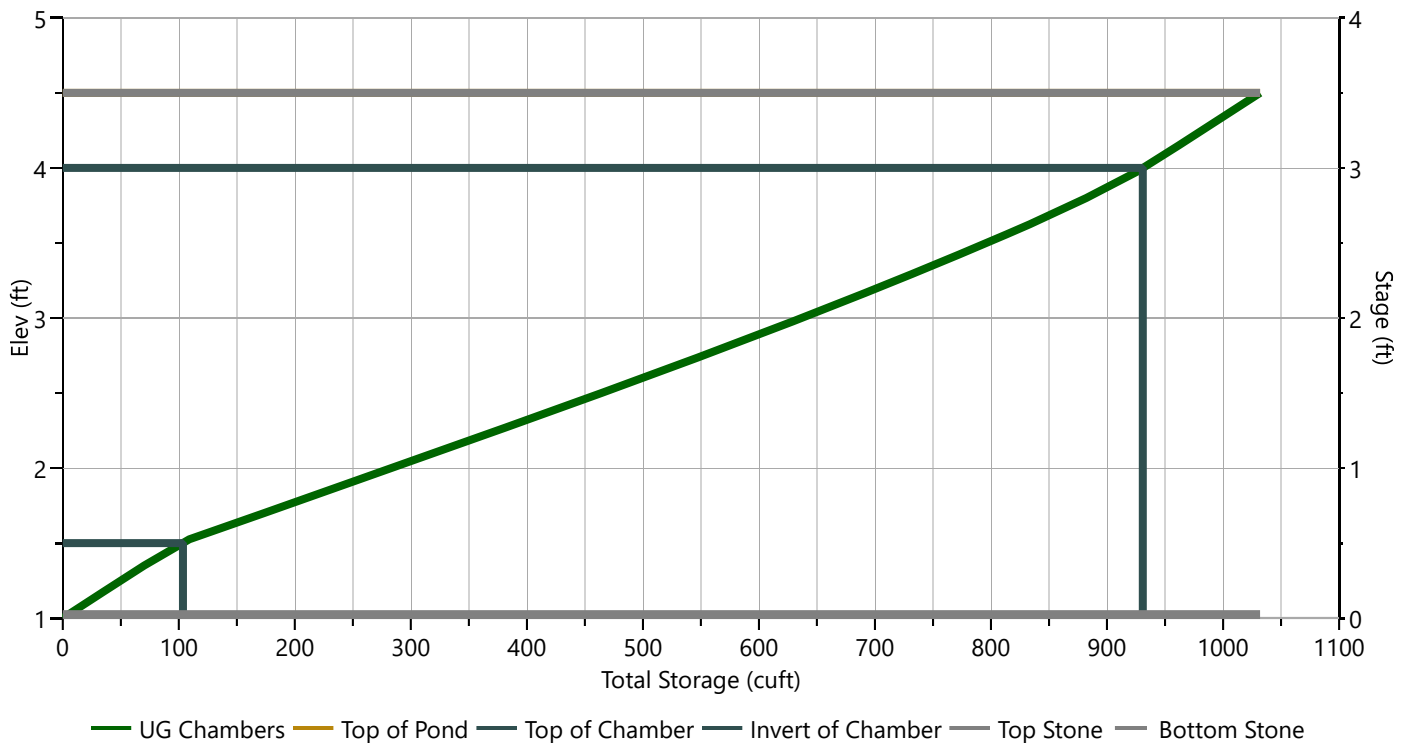
12-13-2023

RD-5A

Stage-Storage

StormTech® SC-740™ Chamber		Stage / Storage Table				
Description	Input	Stage (in)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Chamber Height, in	30	0.0	1.00	501	0.000	0.000
Chamber Shape	Arch	2.1	1.18	501	35.1	35.1
Chamber Width, in	51	4.2	1.35	501	35.1	70.1
Installed Length, ft	7.12	6.3	1.53	501	39.0	109
No. Chambers	12	8.4	1.70	501	64.5	174
Bare Chamber Stor, cuft	551	10.5	1.88	501	64.3	238
No. Rows	3	12.6	2.05	501	64.0	302
Space Between Rows, in	6	14.7	2.23	501	63.5	365
Stone Above, in	6	16.8	2.40	501	62.9	428
Stone Below, in	6	18.9	2.58	501	62.1	490
Stone Sides, in	12	21.0	2.75	501	61.1	551
Stone Ends, in	12	23.1	2.93	501	59.9	611
Encasement Voids, %	40.00	25.2	3.10	501	58.5	670
Encasement Bottom Elevation, ft	1.00	27.3	3.28	501	56.8	727
		29.4	3.45	501	54.7	781
		31.5	3.63	501	52.1	833
		33.6	3.80	501	48.7	882
		35.7	3.97	501	43.5	926
		37.8	4.15	501	36.1	962
		39.9	4.32	501	35.1	997
		42.0	4.50	501	35.1	1,032

Stage-Storage



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

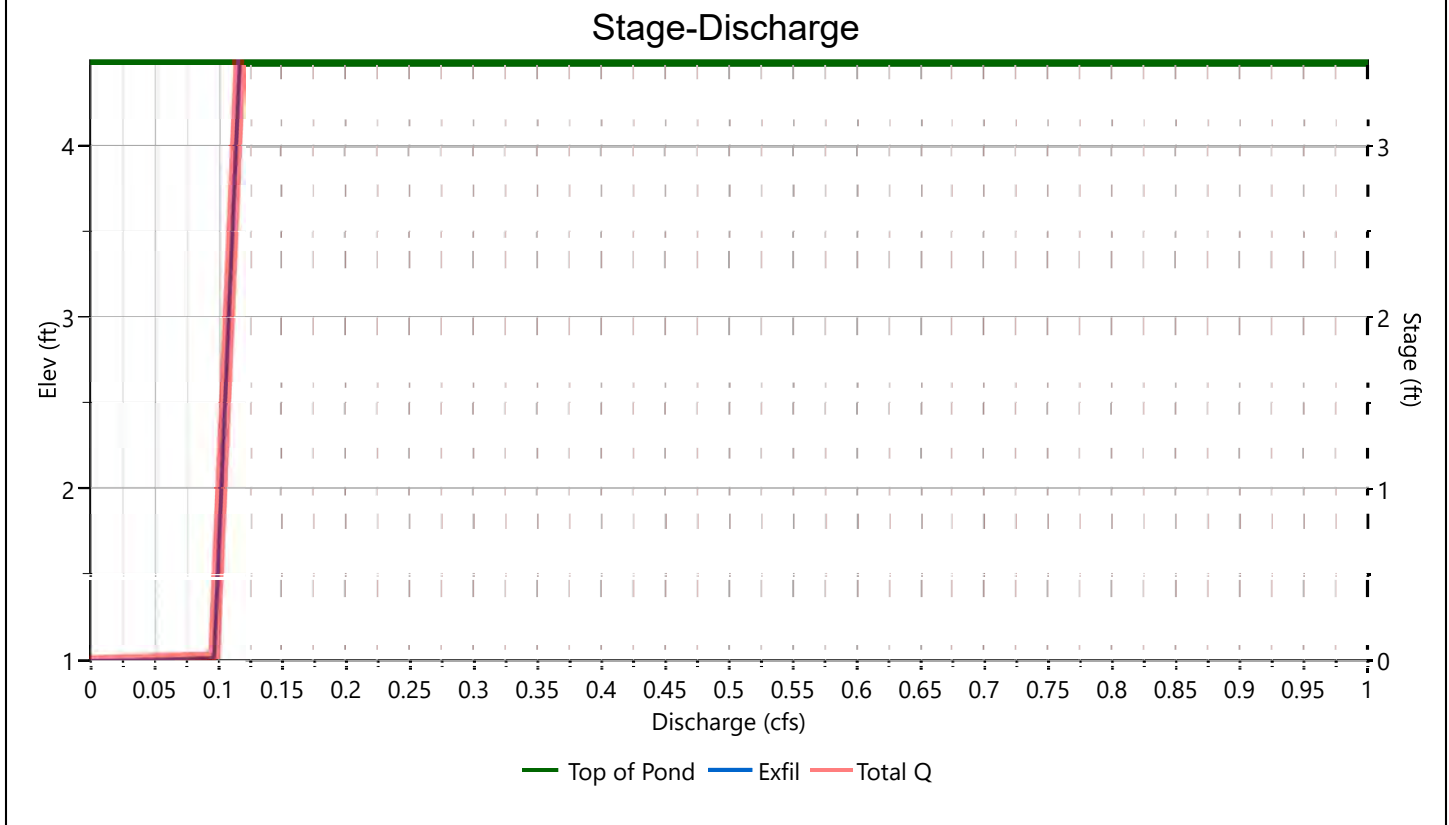
12-13-2023

RD-5A

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in					Hole Diameter, in
Span, in					No. holes
No. Barrels					Invert Elevation, ft
Invert Elevation, ft					Height, ft
Orifice Coefficient, Co					Orifice Coefficient, Co
Length, ft					
Barrel Slope, %					
N-Value, n	0.000				
Weirs	Riser*	Weirs			Ancillary
		1	2	3	
Shape / Type					Exfiltration, in/hr
Crest Elevation, ft					8.27**
Crest Length, ft					
Angle, deg					
Weir Coefficient, Cw					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

RD-5A

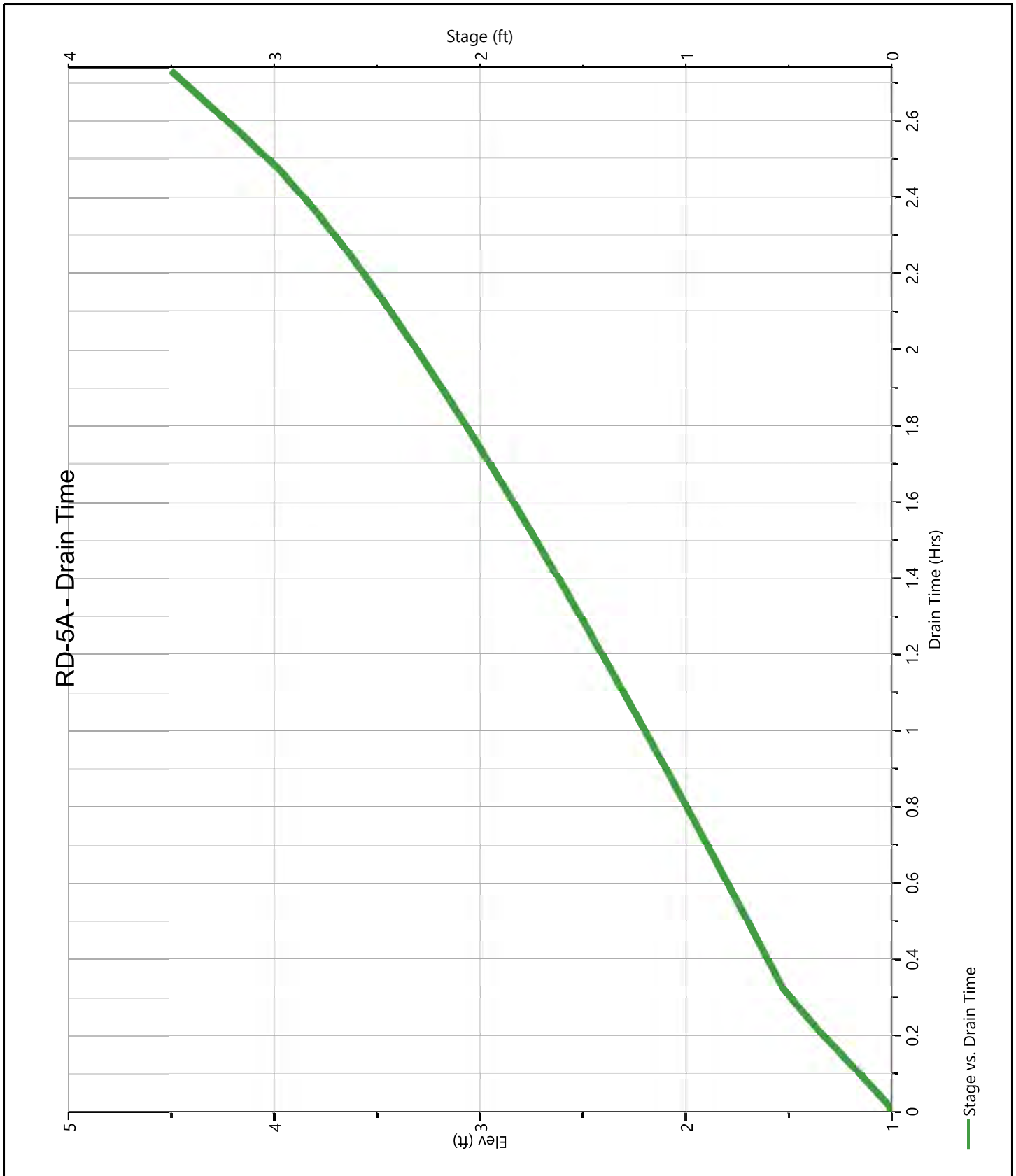
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	1.00	0.000										0.000		0.000
0.18	1.18	35.1										0.097		0.097
0.35	1.35	70.1										0.098		0.098
0.53	1.53	109										0.099		0.099
0.70	1.70	174										0.100		0.100
0.88	1.88	238										0.101		0.101
1.05	2.05	302										0.102		0.102
1.23	2.23	365										0.103		0.103
1.40	2.40	428										0.104		0.104
1.58	2.58	490										0.105		0.105
1.75	2.75	551										0.106		0.106
1.93	2.93	611										0.107		0.107
2.10	3.10	670										0.108		0.108
2.28	3.28	727										0.109		0.109
2.45	3.45	781										0.110		0.110
2.63	3.63	833										0.111		0.111
2.80	3.80	882										0.112		0.112
2.97	3.97	926										0.113		0.113
3.15	4.15	962										0.114		0.114
3.32	4.32	997										0.115		0.115
3.50	4.50	1,032										0.116		0.116

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

RD-5A

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-5B

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.00	0.00
A	Woods - Good Condition	30			0.06	1.76
A	Open Space - Good Condition	39			0.31	11.91
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					0.36	13.67

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{13.67}{0.36} = \underline{37.55} ; \text{ Use CN} = \underline{38}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	0.00	0.15	0.96

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one: Present Developed

Subcatchment P-5B

Circle one: Tc Tt through subarea

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	Wooded		
	0.6		
ft	50		
in	3.1		
ft/ft	0.040		
Compute Tt hr	0.22		0.22

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C		
	UNPAVED		
ft	113		
ft/ft	0.08		
ft/s	4.56		
Compute Tt hr	0.01		0.01

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r ft			
ft/ft			
Compute V ft/s			
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.23
min 13.5

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-5B

Hyd. No. 65

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.00 hrs
Time Interval	= 2 min	Runoff Volume	= 0.000 cuft
Drainage Area	= 0.36 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 13.5 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484

Qp = 0.00 cfs

Hydrograph Report

Project Name:

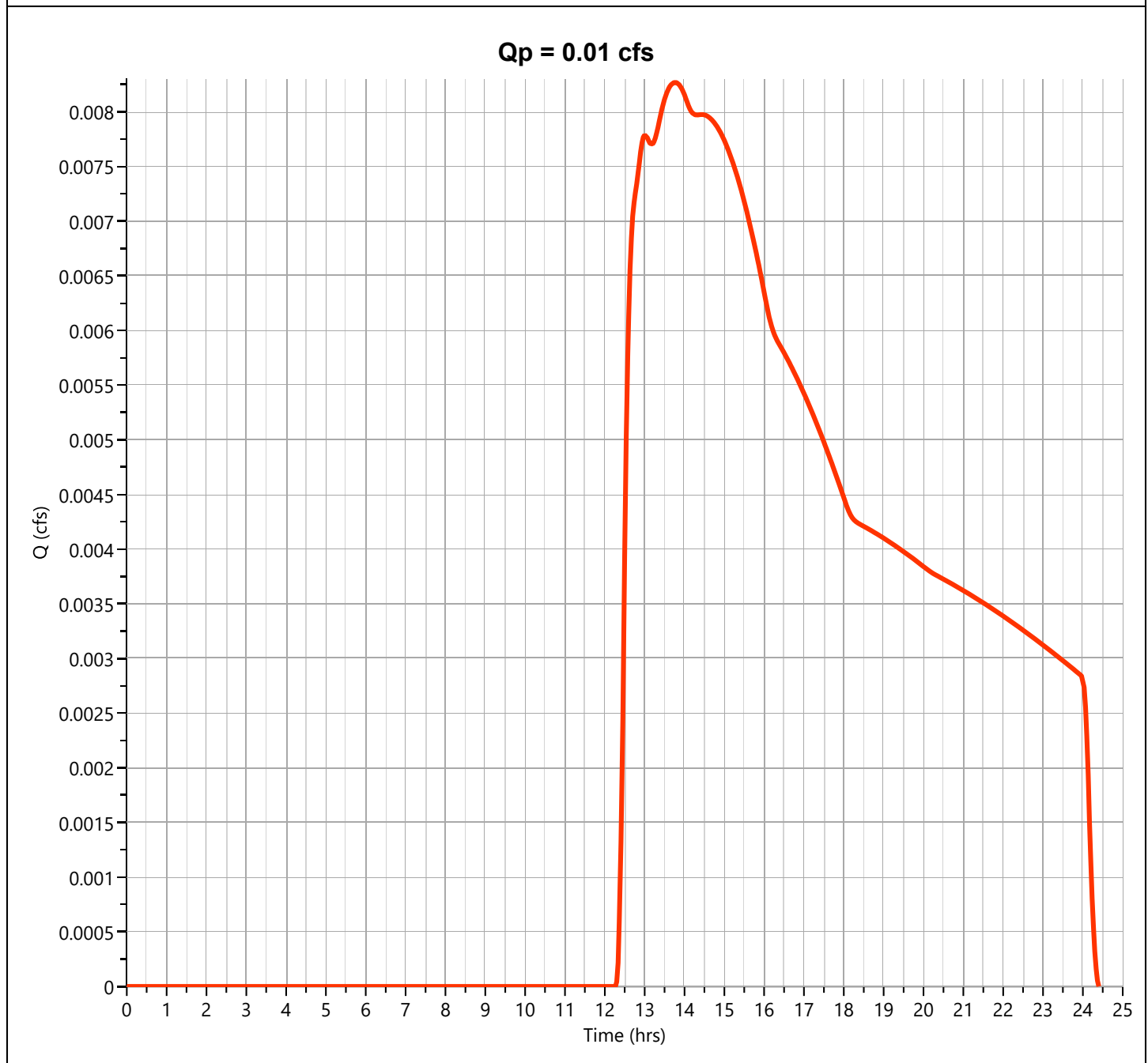
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-5B

Hyd. No. 65

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.008 cfs
Storm Frequency	= 10-yr	Time to Peak	= 13.77 hrs
Time Interval	= 2 min	Runoff Volume	= 215 cuft
Drainage Area	= 0.36 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 13.5 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

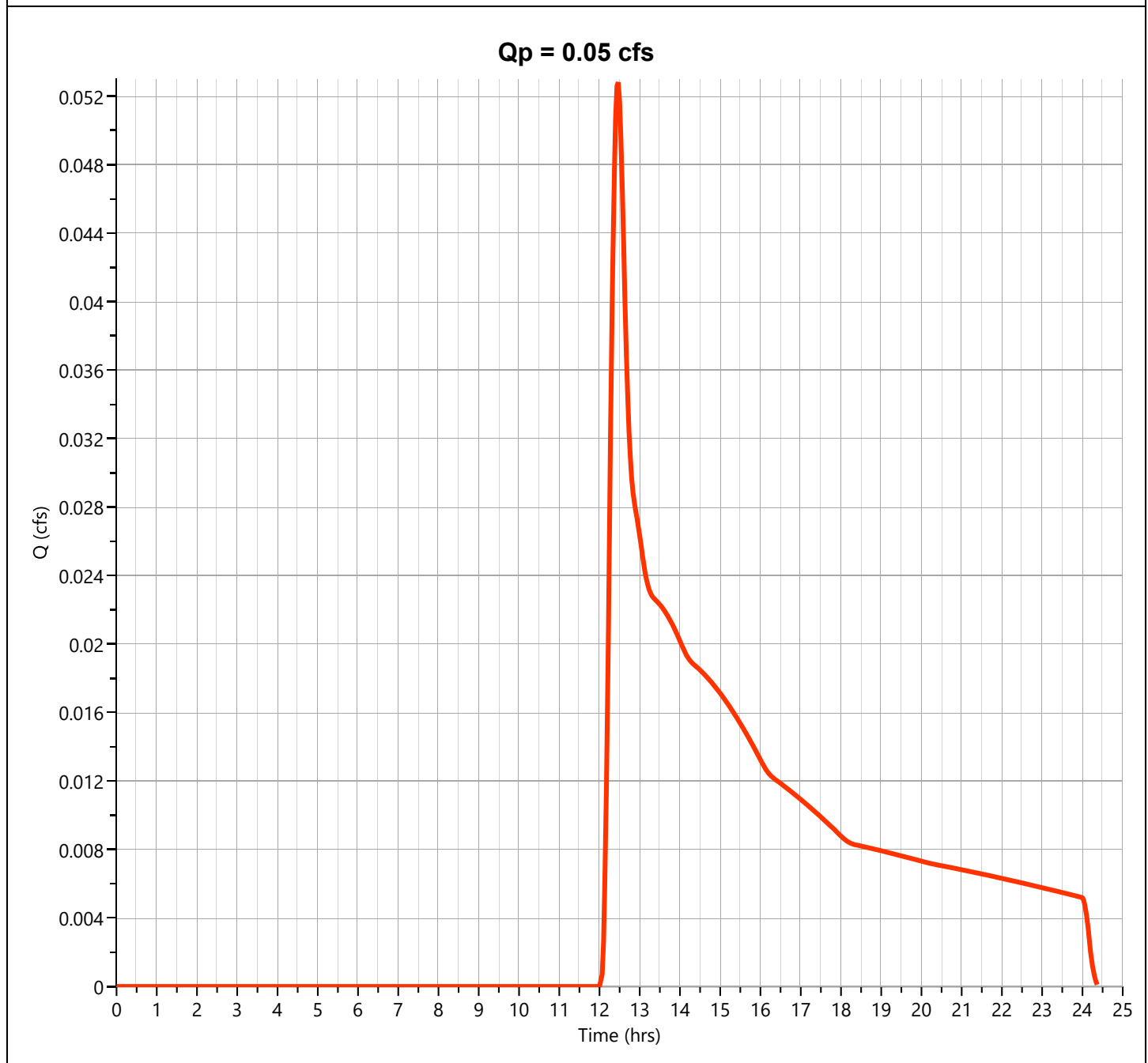
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-5B

Hyd. No. 65

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.053 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.47 hrs
Time Interval	= 2 min	Runoff Volume	= 542 cuft
Drainage Area	= 0.36 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 13.5 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

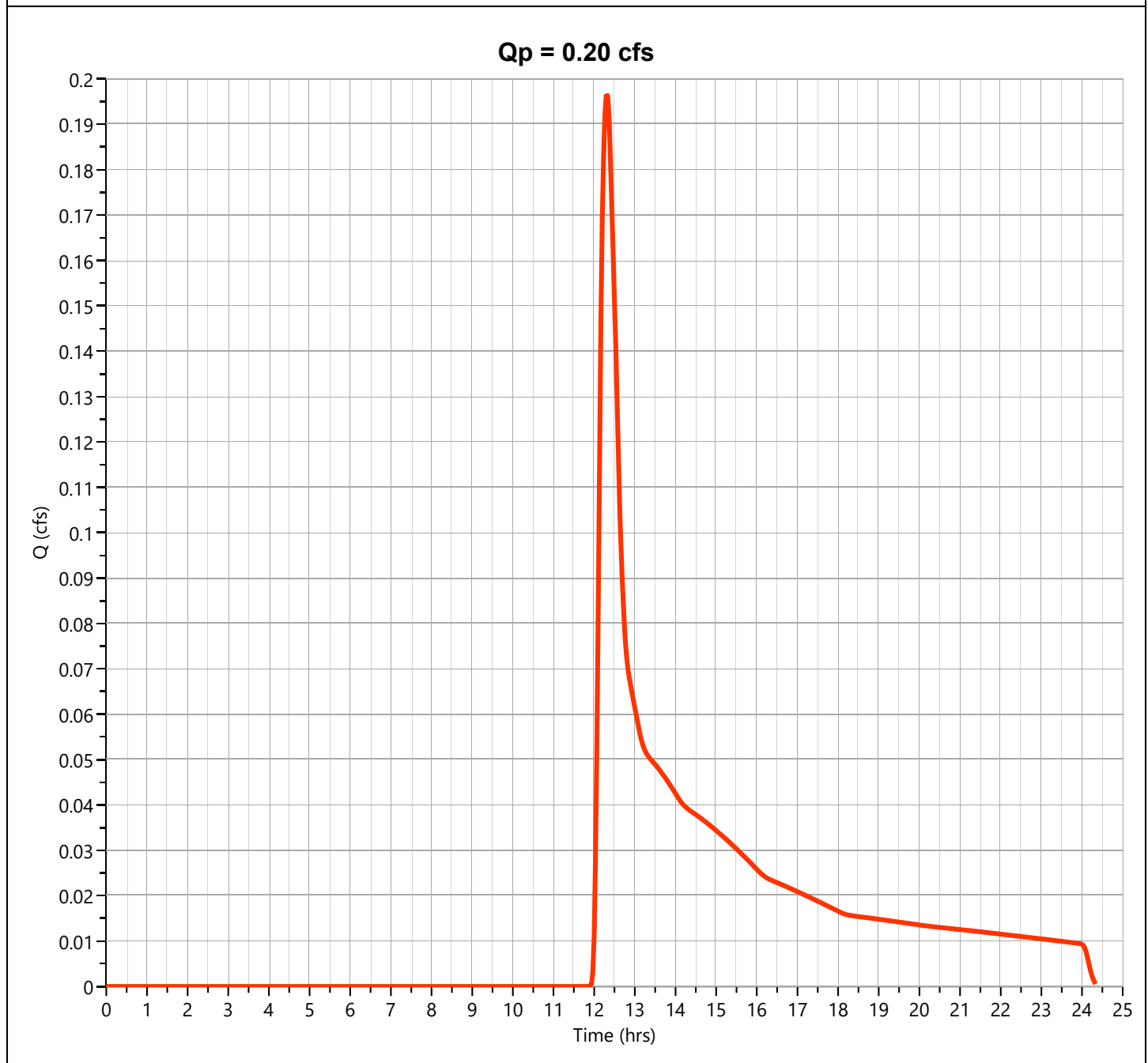
Hydrology Studio v 3.0.0.29

12-14-2023

Subcatchment P-5B

Hyd. No. 65

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.197 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.30 hrs
Time Interval	= 2 min	Runoff Volume	= 1,273 cuft
Drainage Area	= 0.36 ac	Curve Number	= 38
Tc Method	= User	Time of Conc. (Tc)	= 13.5 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

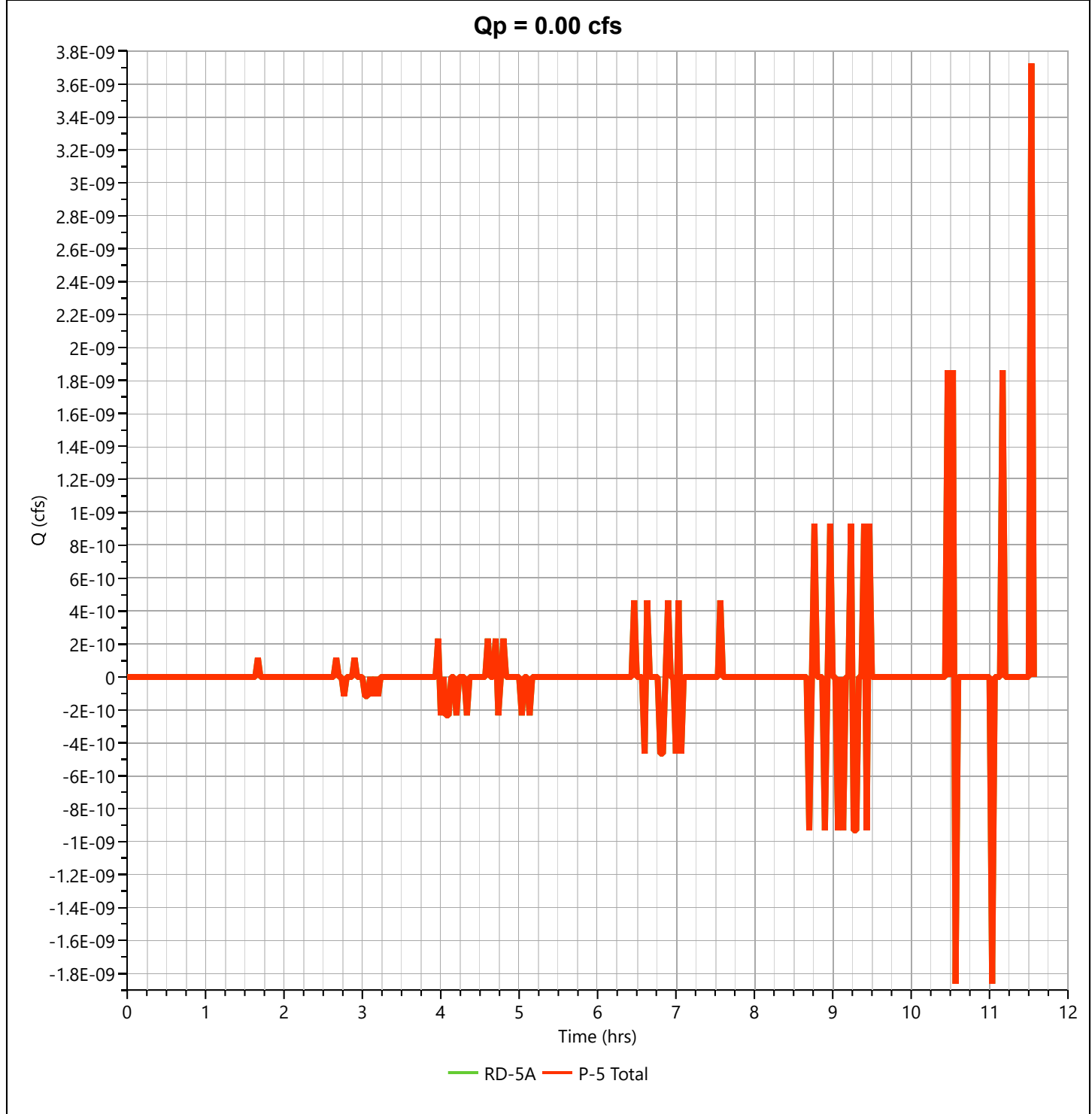
Hydrology Studio v 3.0.0.29

12-14-2023

P-5 Total

Hyd. No. 66

Hydrograph Type	= Junction	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 11.53 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrographs	= 64, 65	Total Contrib. Area	= 0.36 ac



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-14-2023

P-5 Total

Hyd. No. 66

Hydrograph Type	= Junction	Peak Flow	= 0.008 cfs
Storm Frequency	= 10-yr	Time to Peak	= 13.77 hrs
Time Interval	= 2 min	Hydrograph Volume	= 215 cuft
Inflow Hydrographs	= 64, 65	Total Contrib. Area	= 0.36 ac



Hydrograph Report

Project Name:

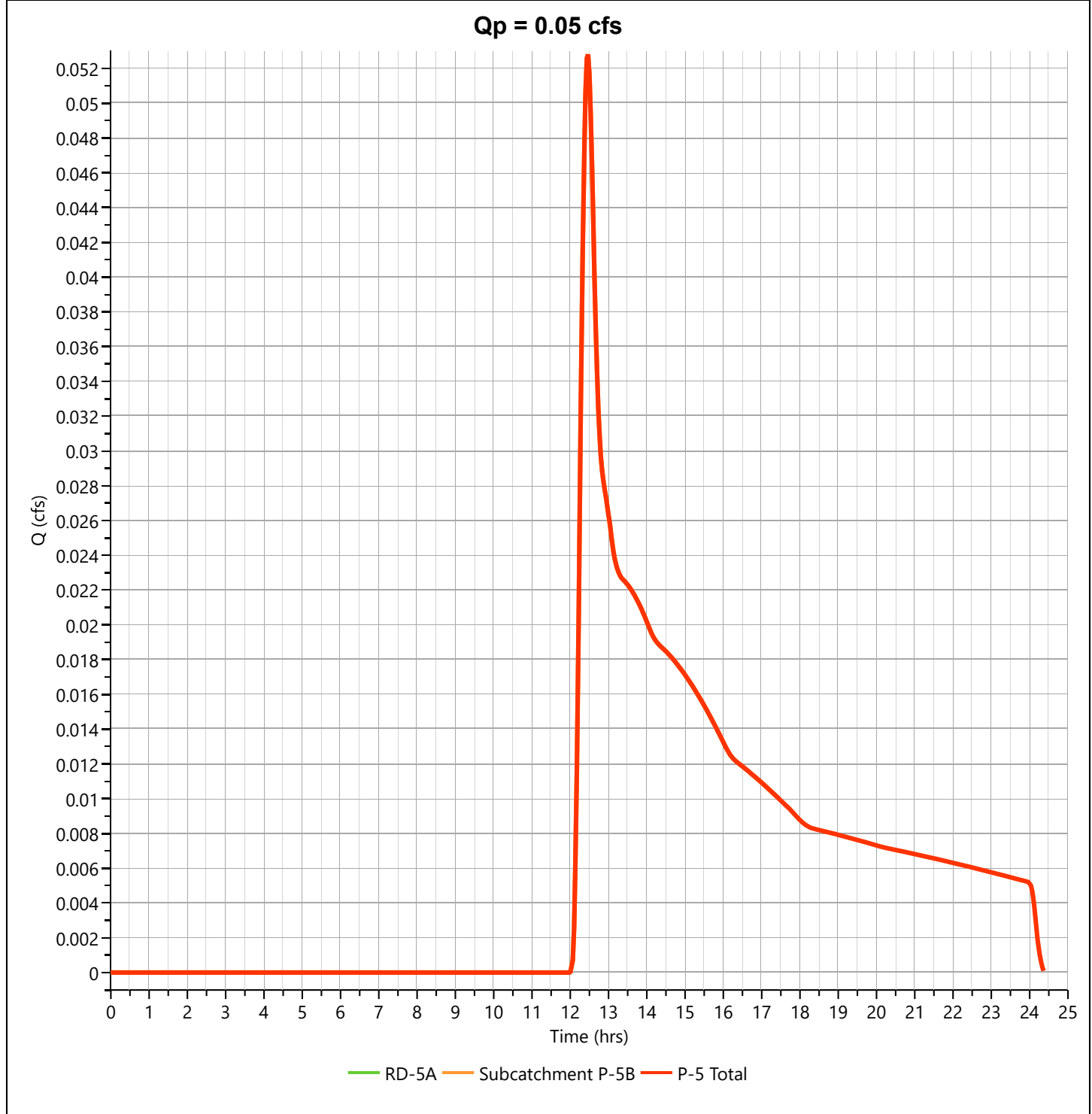
Hydrology Studio v 3.0.0.29

12-14-2023

P-5 Total

Hyd. No. 66

Hydrograph Type	= Junction	Peak Flow	= 0.053 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.47 hrs
Time Interval	= 2 min	Hydrograph Volume	= 542 cuft
Inflow Hydrographs	= 64, 65	Total Contrib. Area	= 0.36 ac



Hydrograph Report

Project Name:

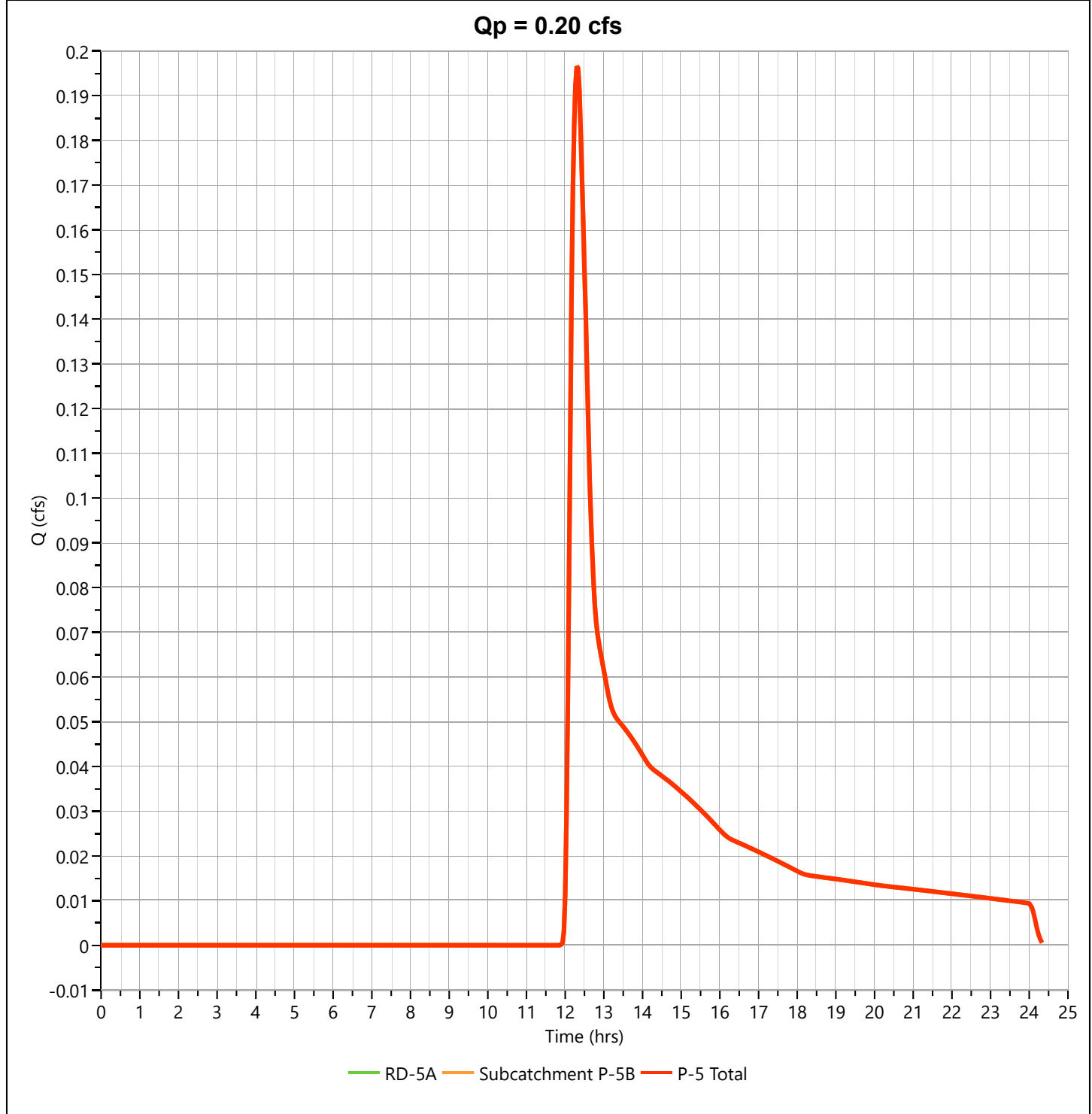
Hydrology Studio v 3.0.0.29

12-14-2023

P-5 Total

Hyd. No. 66

Hydrograph Type	= Junction	Peak Flow	= 0.197 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.30 hrs
Time Interval	= 2 min	Hydrograph Volume	= 1,273 cuft
Inflow Hydrographs	= 64, 65	Total Contrib. Area	= 0.36 ac



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-6A

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.63	61.77
A	Woods - Good Condition	30			0.22	6.48
A	Open Space - Good Condition	39			1.45	56.64
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					2.30	124.89

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{124.89}{2.30} = 54.33 ; \text{ Use CN} = \boxed{54}$$

2. Runoff

Frequency..... yr

Rainfall, P (24-hour)..... in

Runoff, Q..... in

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Storm #1	Storm #2	Storm #3
2	10	100
3.23	5.01	7.83
0.24	0.94	2.60

Hydrograph Report

Project Name:

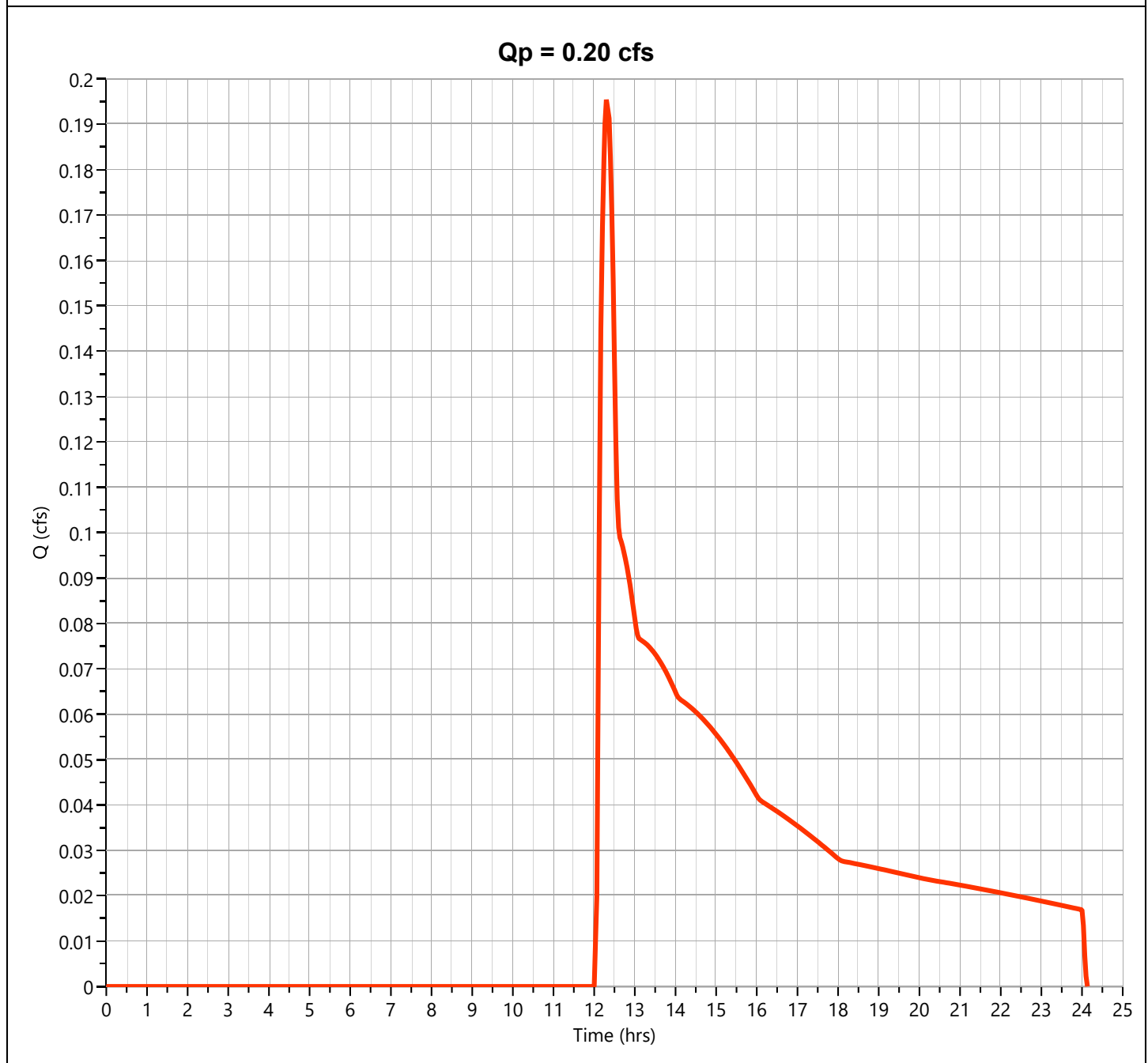
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-6A

Hyd. No. 68

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.196 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Runoff Volume	= 1,815 cuft
Drainage Area	= 2.3 ac	Curve Number	= 54
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

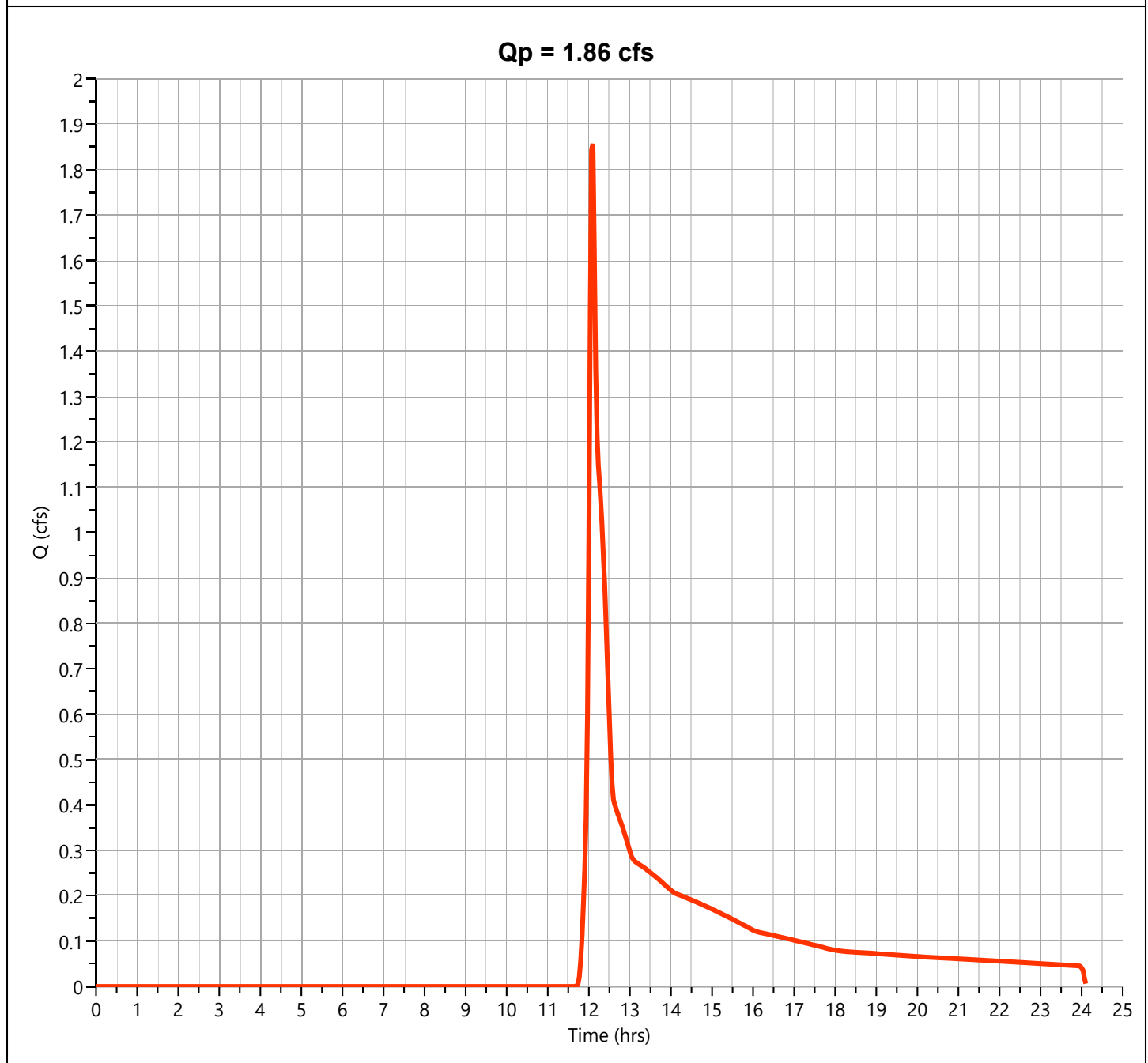
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-6A

Hyd. No. 68

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.857 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.10 hrs
Time Interval	= 2 min	Runoff Volume	= 7,236 cuft
Drainage Area	= 2.3 ac	Curve Number	= 54
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

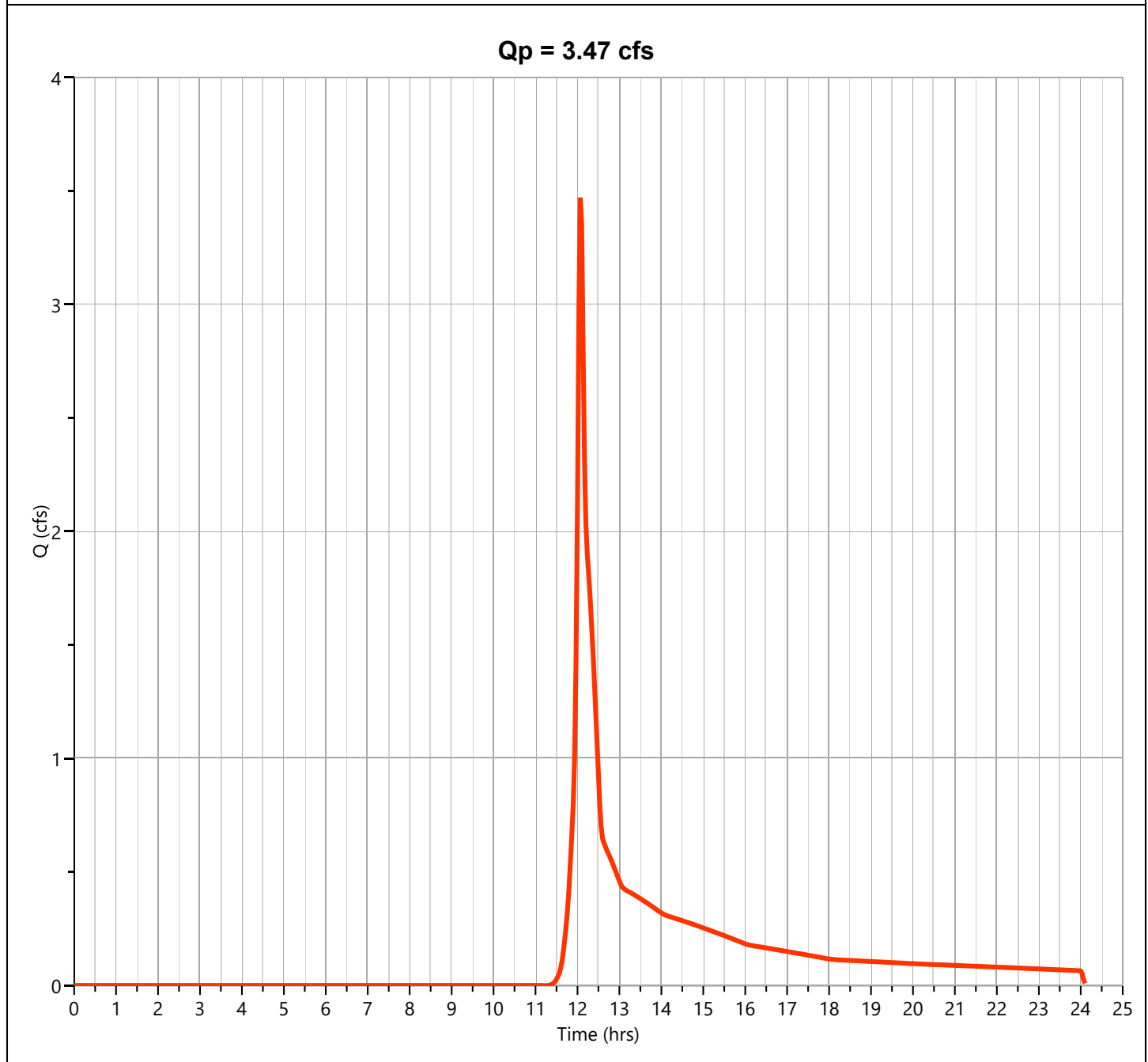
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-6A

Hyd. No. 68

Hydrograph Type	= NRCS Runoff	Peak Flow	= 3.471 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 11,802 cuft
Drainage Area	= 2.3 ac	Curve Number	= 54
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

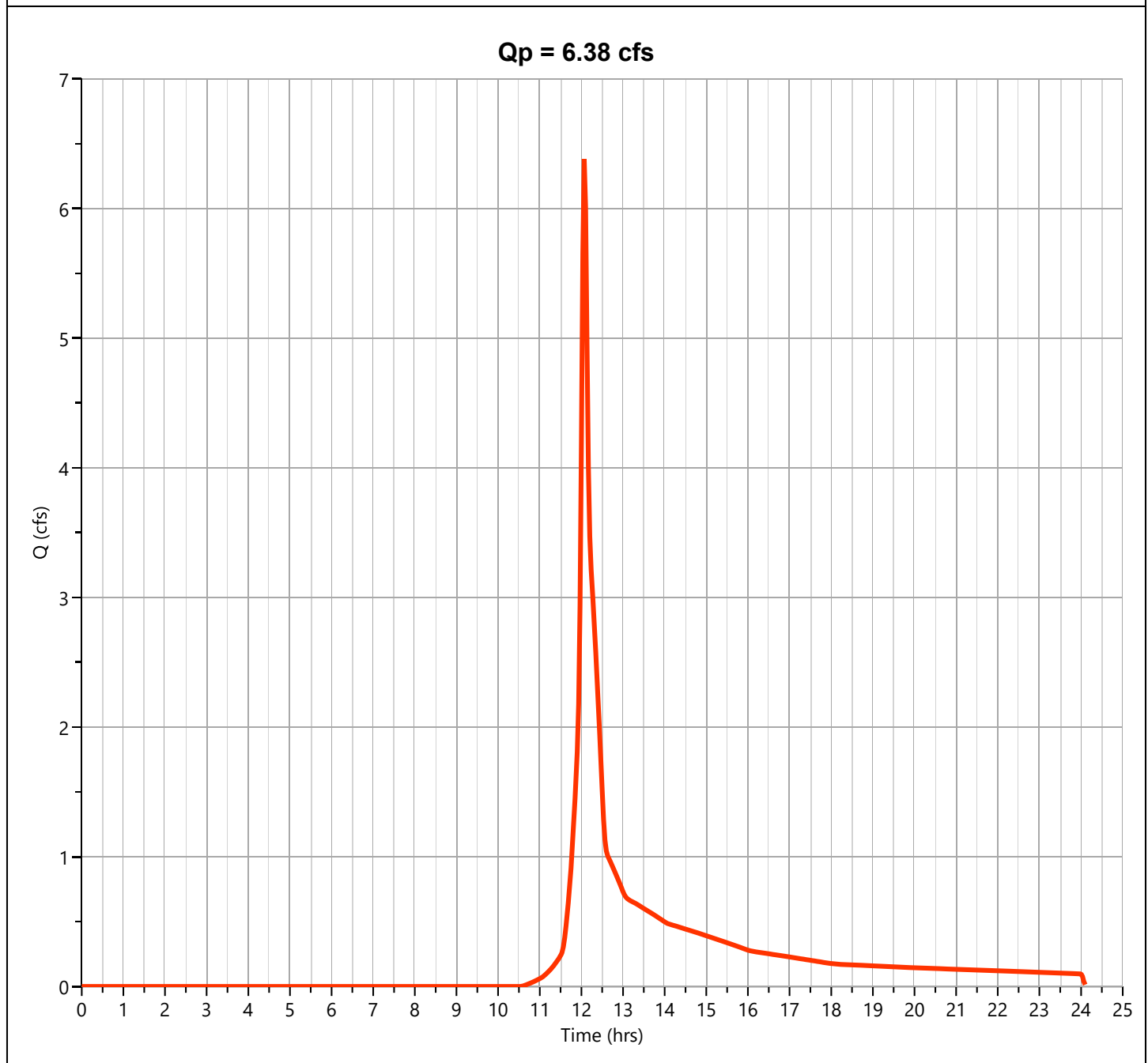
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-6A

Hyd. No. 68

Hydrograph Type	= NRCS Runoff	Peak Flow	= 6.383 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 20,059 cuft
Drainage Area	= 2.3 ac	Curve Number	= 54
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

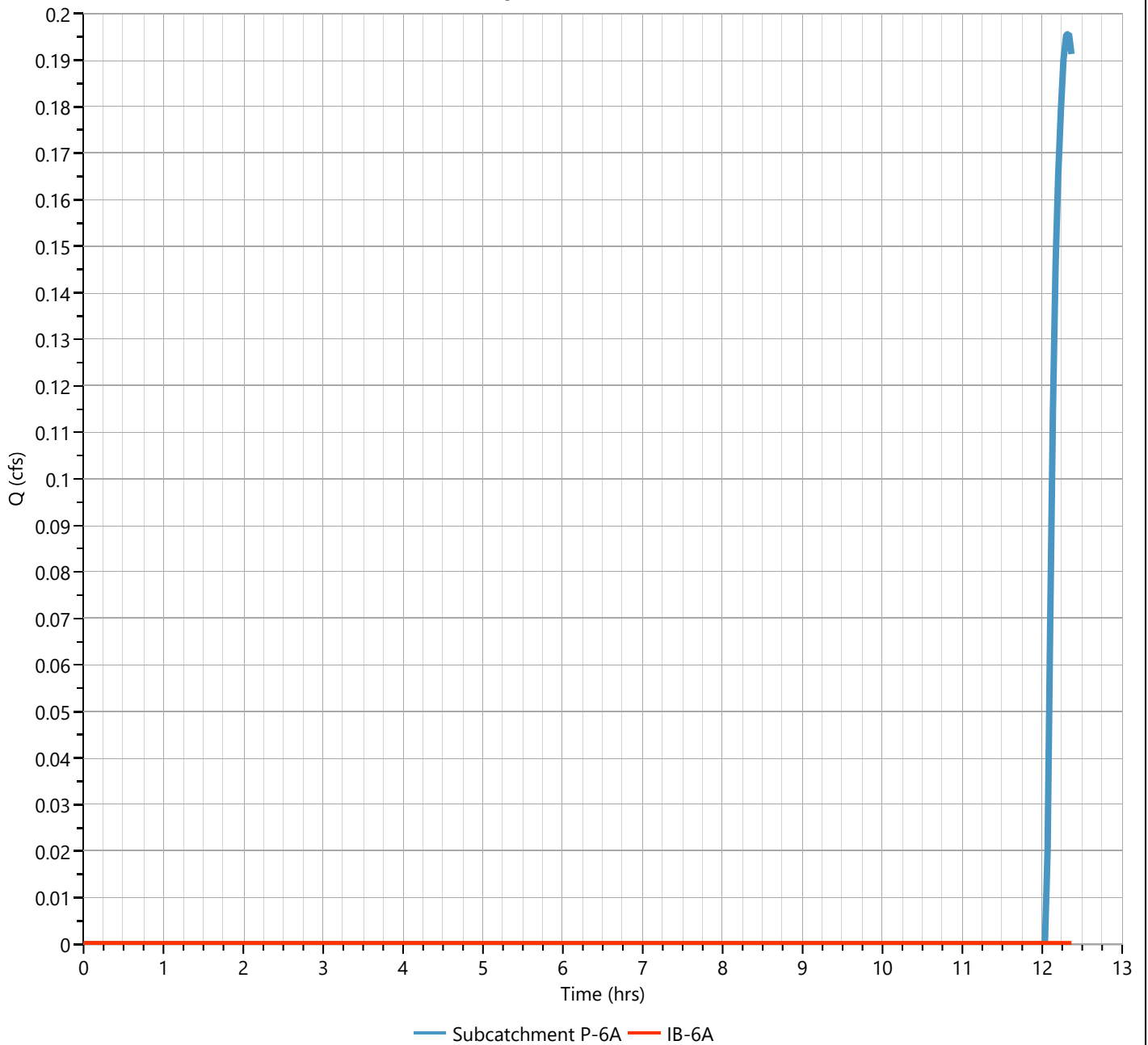
IB-6A

Hyd. No. 69

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 68 - Subcatchment P-6A	Max. Elevation	= 228.07 ft
Pond Name	= IB-6A	Max. Storage	= 97.2 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

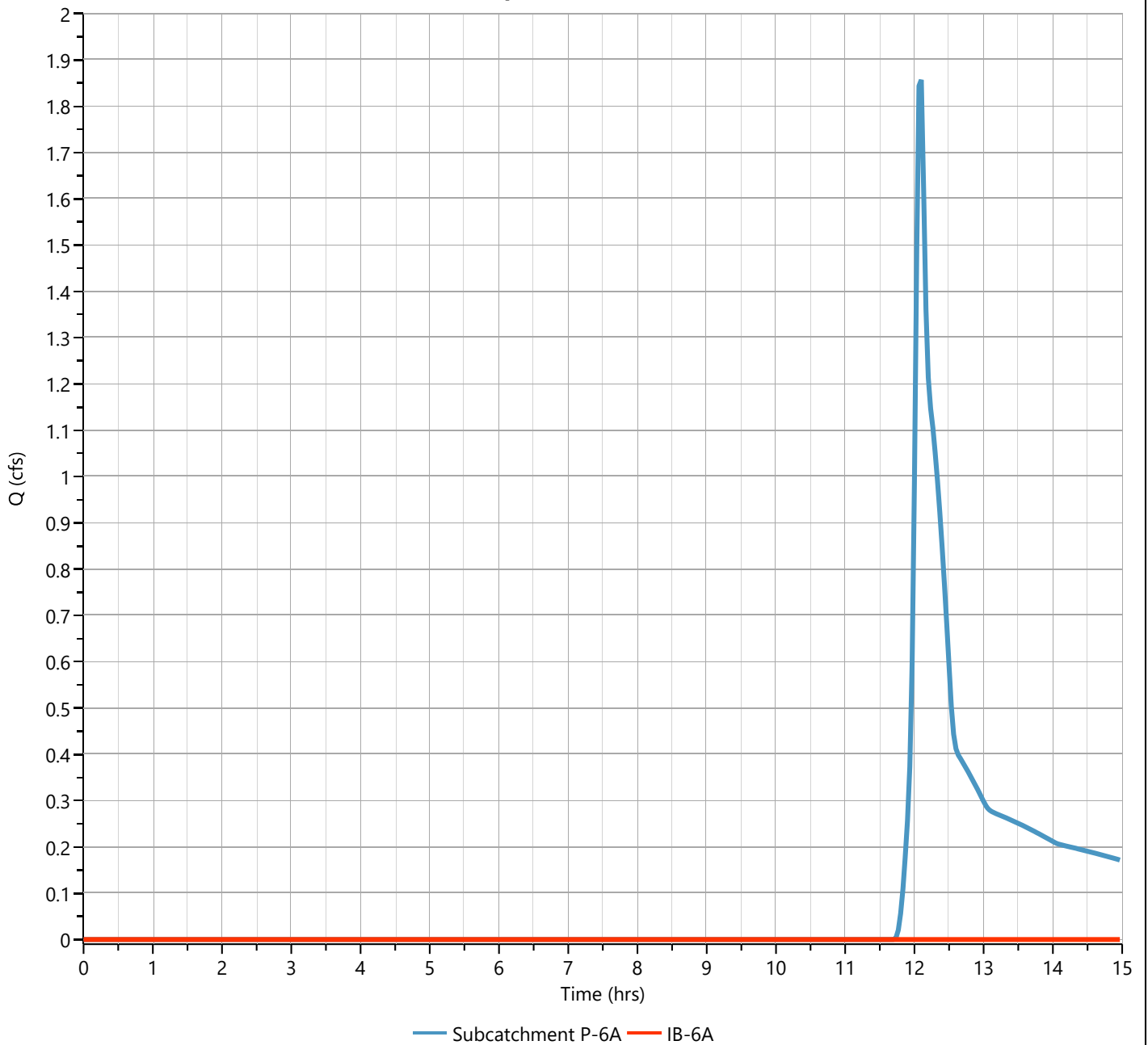
IB-6A

Hyd. No. 69

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.47 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.001 cuft
Inflow Hydrograph	= 68 - Subcatchment P-6A	Max. Elevation	= 229.14 ft
Pond Name	= IB-6A	Max. Storage	= 1,796 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

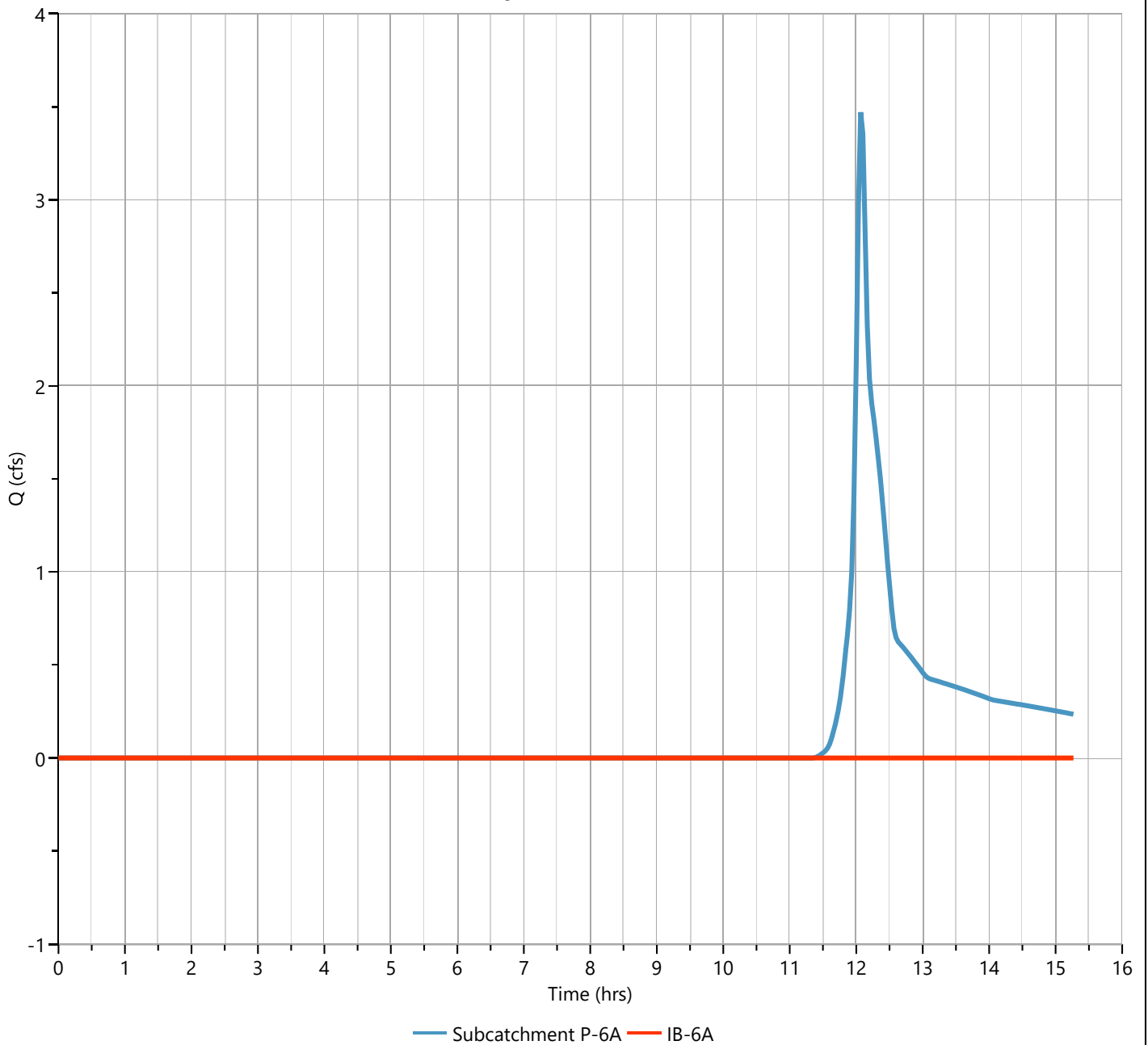
IB-6A

Hyd. No. 69

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 14.20 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.001 cuft
Inflow Hydrograph	= 68 - Subcatchment P-6A	Max. Elevation	= 229.90 ft
Pond Name	= IB-6A	Max. Storage	= 3,614 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

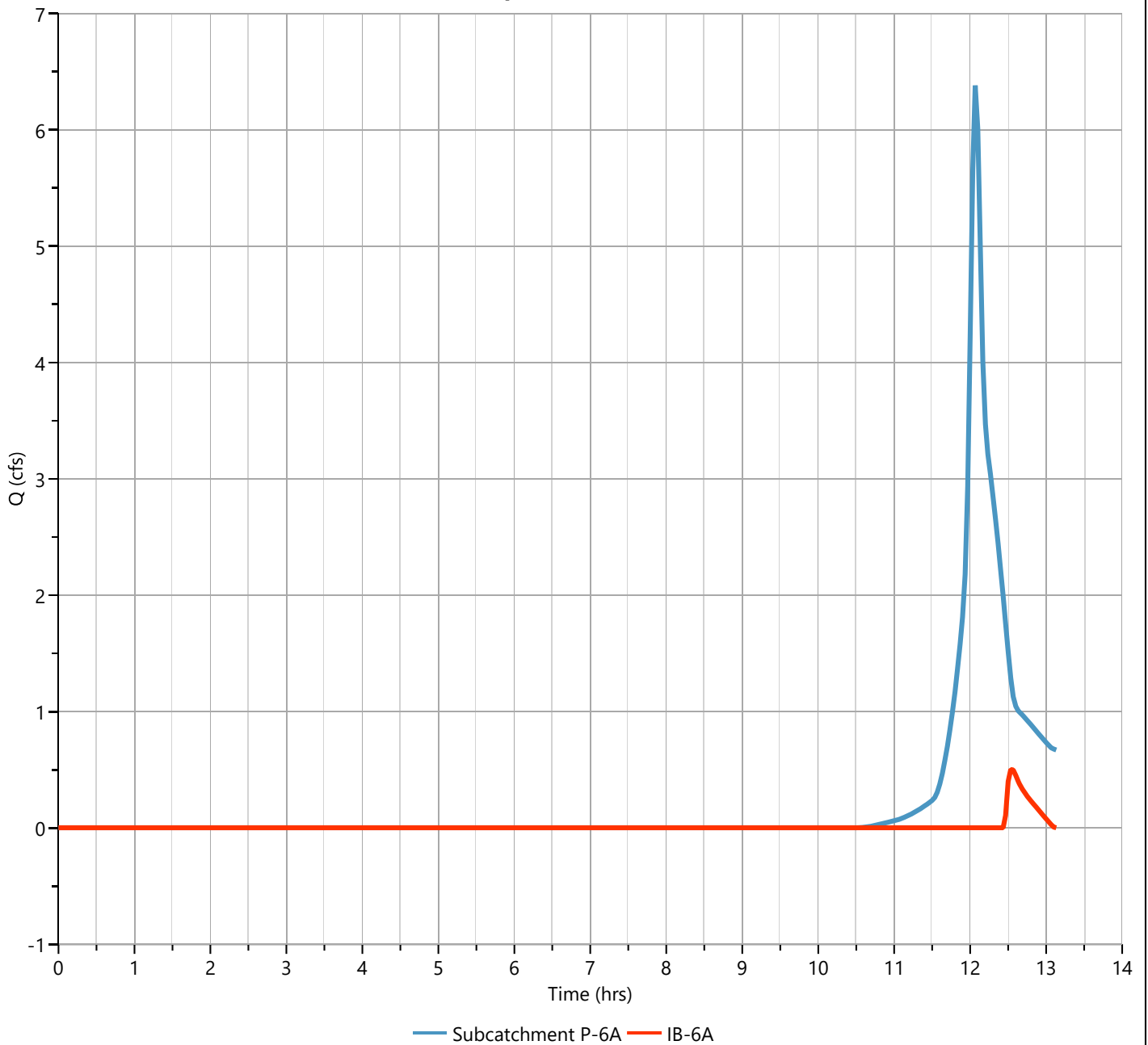
IB-6A

Hyd. No. 69

Hydrograph Type	= Pond Route	Peak Flow	= 0.501 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.53 hrs
Time Interval	= 2 min	Hydrograph Volume	= 568 cuft
Inflow Hydrograph	= 68 - Subcatchment P-6A	Max. Elevation	= 230.94 ft
Pond Name	= IB-6A	Max. Storage	= 7,073 cuft

Pond Routing by Storage Indication Method

Qp = 0.50 cfs



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

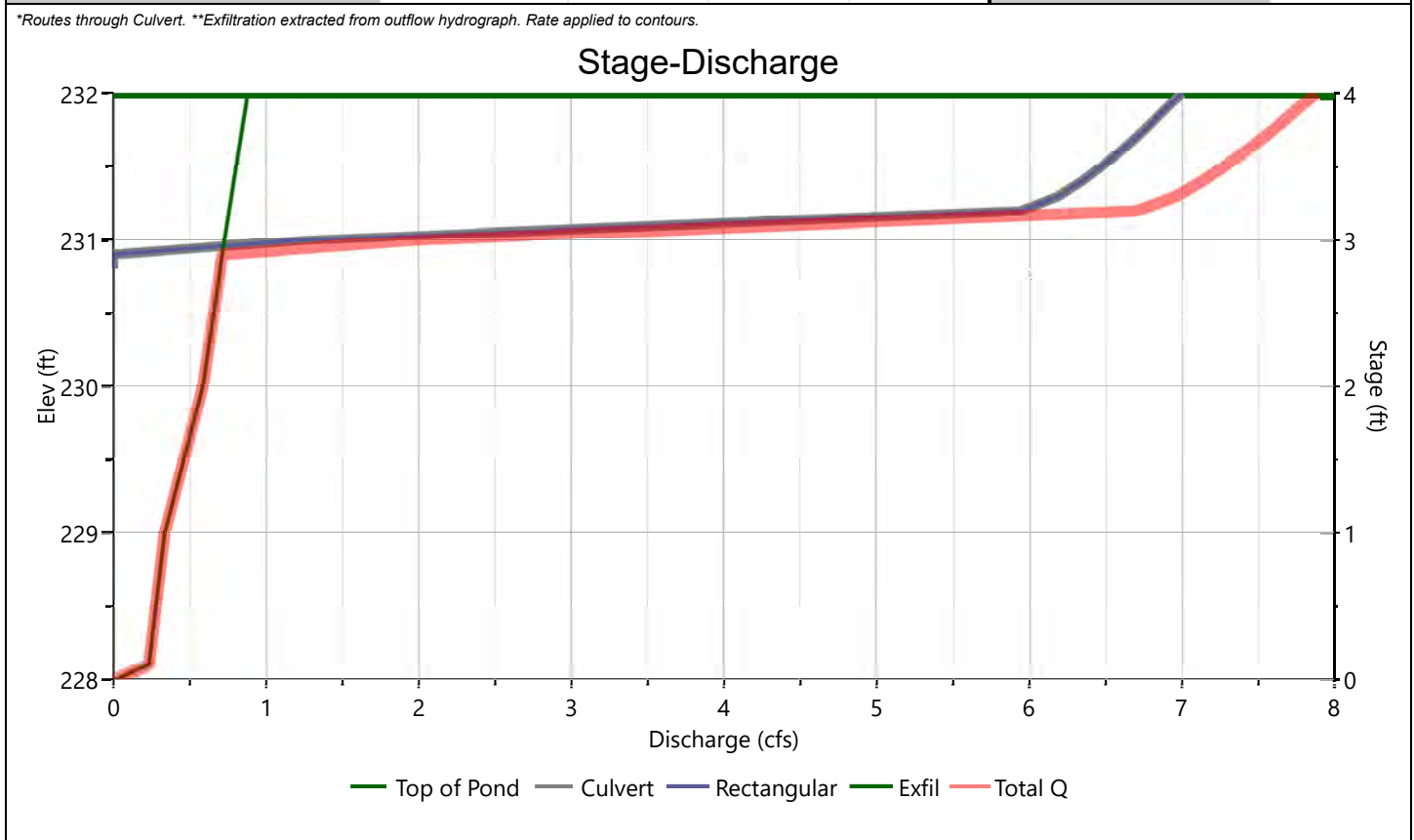
12-13-2023

IB-6A

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in	12				Hole Diameter, in
Span, in	12				No. holes
No. Barrels	1				Invert Elevation, ft
Invert Elevation, ft	228.00				Height, ft
Orifice Coefficient, Co	0.60				Orifice Coefficient, Co
Length, ft	50				
Barrel Slope, %	1				
N-Value, n	0.012				
Weirs	Riser*	Weirs			Ancillary
Shape / Type		1*	2	3	Exfiltration, in/hr
Crest Elevation, ft		Rectangular			8.27**
Crest Length, ft		230.9			
Angle, deg		12			
Weir Coefficient, Cw					
		3.3			

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

IB-6A

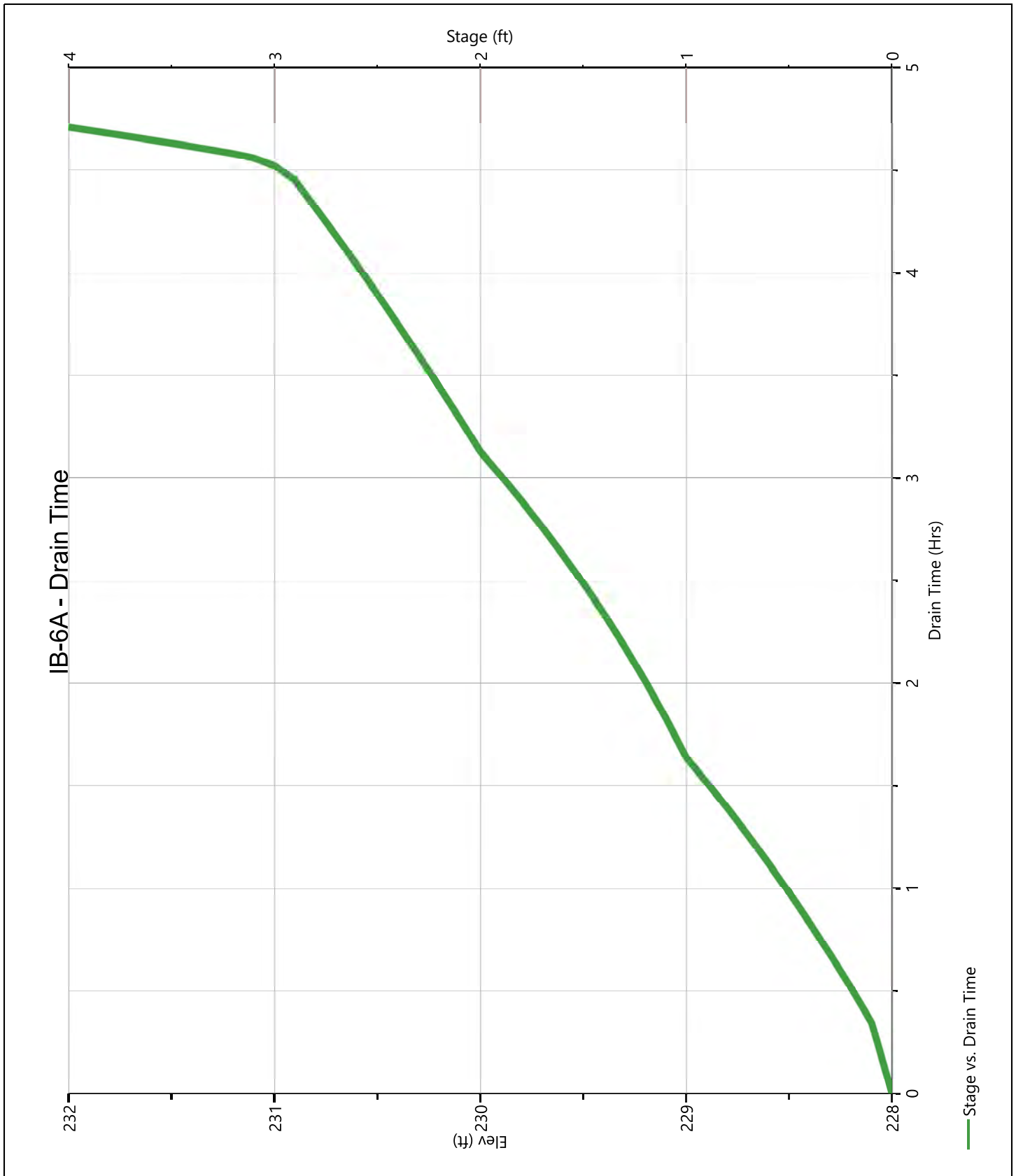
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	228.00	0.000	0.000					0.000				0.000		0.000
1.00	229.00	1,450	0.000					0.000				0.334		0.334
2.00	230.00	3,851	0.000					0.000				0.585		0.585
3.00	231.00	7,279	1.252 ic					1.252				0.727		1.980
4.00	232.00	11,479	7.000 oc					7.000 s				0.881		7.881

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

IB-6A

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Subcatchment P-6B

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.00	0.00
A	Woods - Good Condition	30			0.78	23.36
A	Open Space - Good Condition	39			2.13	83.00
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					2.91	106.35

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{106.35}{2.91} = 36.59 ; \text{ Use CN} = \boxed{37}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	0.00	0.13	0.88

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt)

SM-6781

Project: Stow Acres

By PFK

Date 12/12/2023

Location: Stow, MA

Checked _____

Date _____

Circle one: Present Developed

Subcatchment P-6B

Circle one: Tc Tt through subarea

Sheet flow (Applicable to Tc only)

1. Surface Description (table 3-1)

2. Mannings roughness coeff., n (table 3-1)

3. Flow length, L (total L <= 300 ft)

4. Two-yr 24-hr rainfall, P2

5. Land Slope, s

6. $Tt = 0.007 (nL)^{0.8} / (P2^{0.5} s^{0.4})$

Segment ID	A-B		
	Wooded		
	0.6		
ft	50		
in	3.1		
ft/ft	0.040		
Compute Tt hr	0.22		0.22

Shallow concentrated Flow

7. Surface Description (paved or unpaved)

8. Flow Length, L

9. Watercourse slope, s

10. Average Velocity, V (figure 3-1)

11. $Tt = L / 3600V$

Segment ID	B-C		
	UNPAVED		
ft	80		
ft/ft	0.02		
ft/s	2.28		
Compute Tt hr	0.01		0.01

Channel flow

12. Cross sectional flow area, a

13. Wetted perimeter, pw

14. Hydraulic radius, $r=a/wp$

15. Channel Slope, s

16. Manning's roughness coeff., n

17. $V = 1.49 r^{2/3} s^{1/2} / n$

18. Flow length, L

19. $Tt = L / 3600V$

Segment ID			
sf			
ft			
Compute r			
ft/ft			
Compute V			
ft/s			
ft			
Compute Tt hr			0

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)

hr 0.23
min 13.7

Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-6B

Hyd. No. 70

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 0.00 hrs
Time Interval	= 2 min	Runoff Volume	= 0.000 cuft
Drainage Area	= 2.91 ac	Curve Number	= 37
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484

Qp = 0.00 cfs

Hydrograph Report

Project Name:

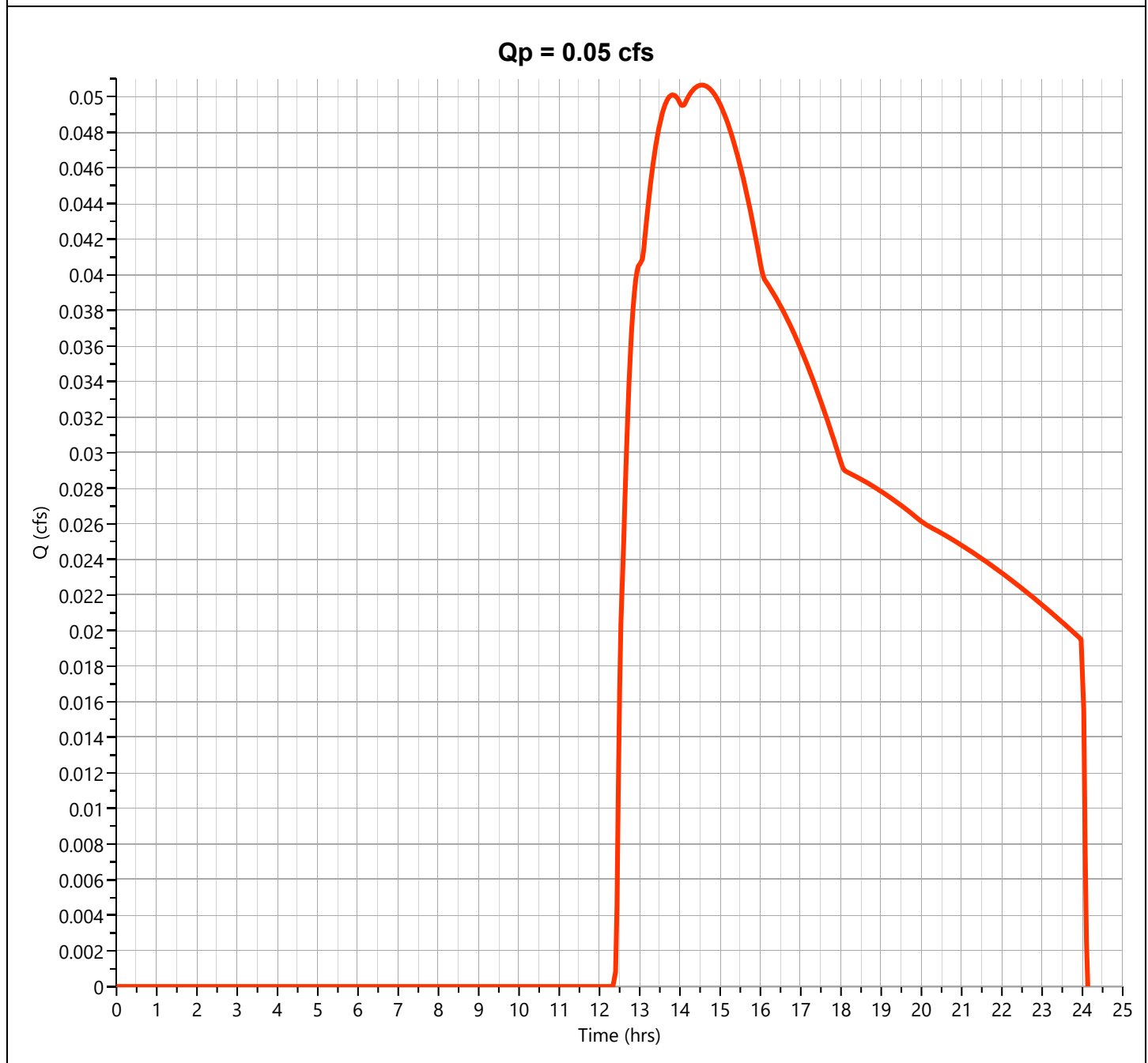
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-6B

Hyd. No. 70

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.051 cfs
Storm Frequency	= 10-yr	Time to Peak	= 14.53 hrs
Time Interval	= 2 min	Runoff Volume	= 1,368 cuft
Drainage Area	= 2.91 ac	Curve Number	= 37
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

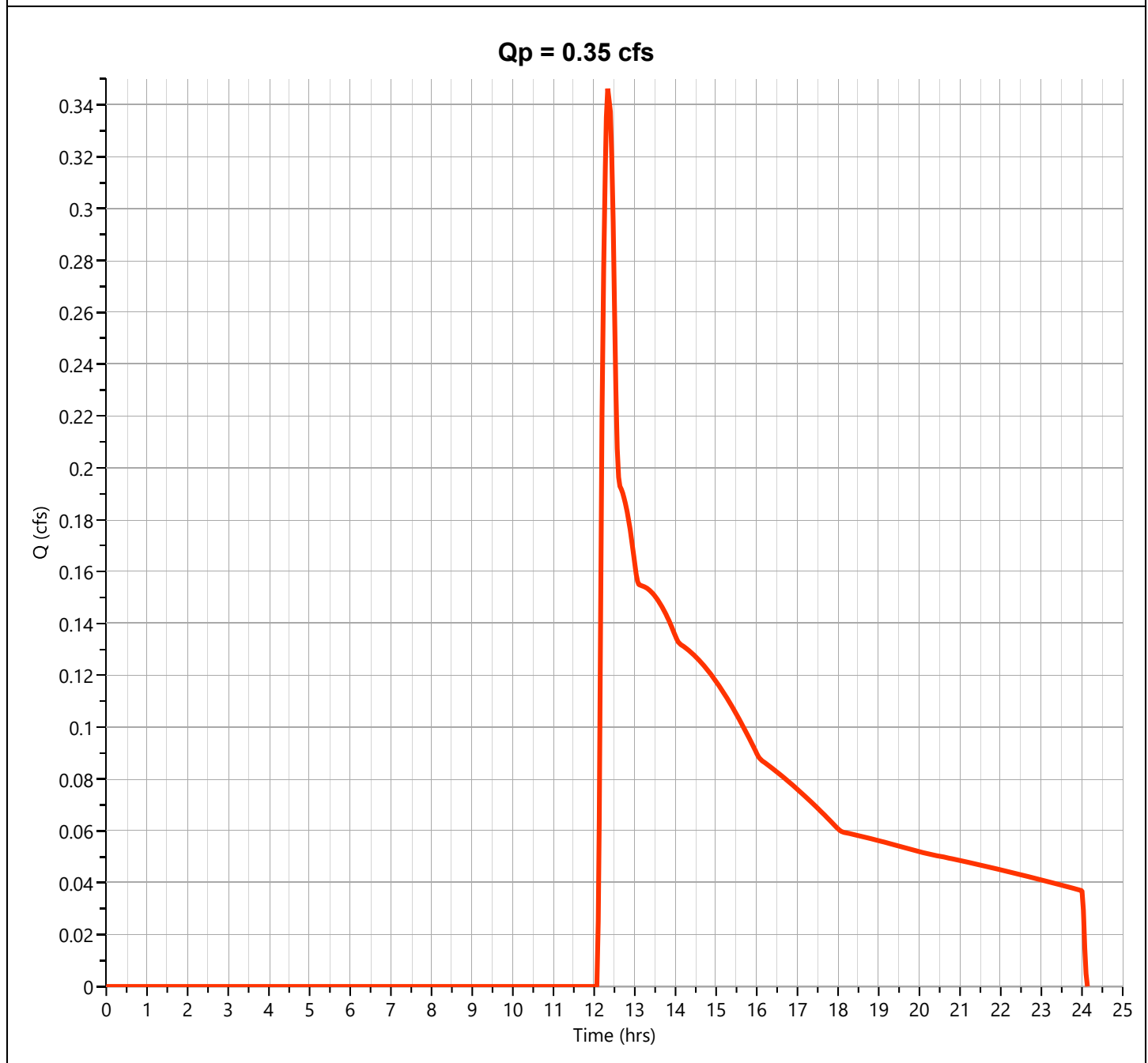
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-6B

Hyd. No. 70

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.347 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Runoff Volume	= 3,695 cuft
Drainage Area	= 2.91 ac	Curve Number	= 37
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

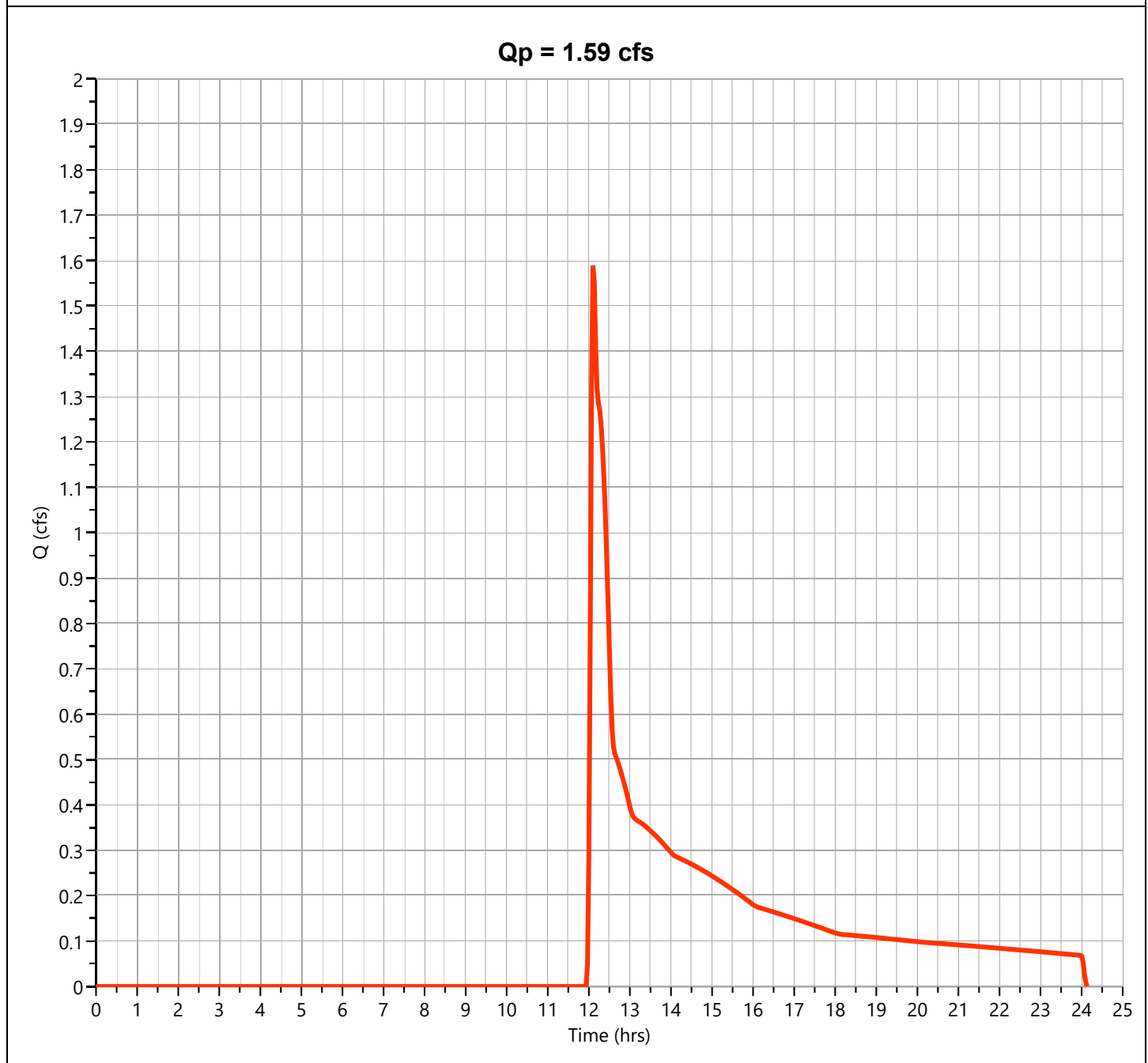
Hydrology Studio v 3.0.0.29

12-13-2023

Subcatchment P-6B

Hyd. No. 70

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.589 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 2 min	Runoff Volume	= 9,038 cuft
Drainage Area	= 2.91 ac	Curve Number	= 37
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

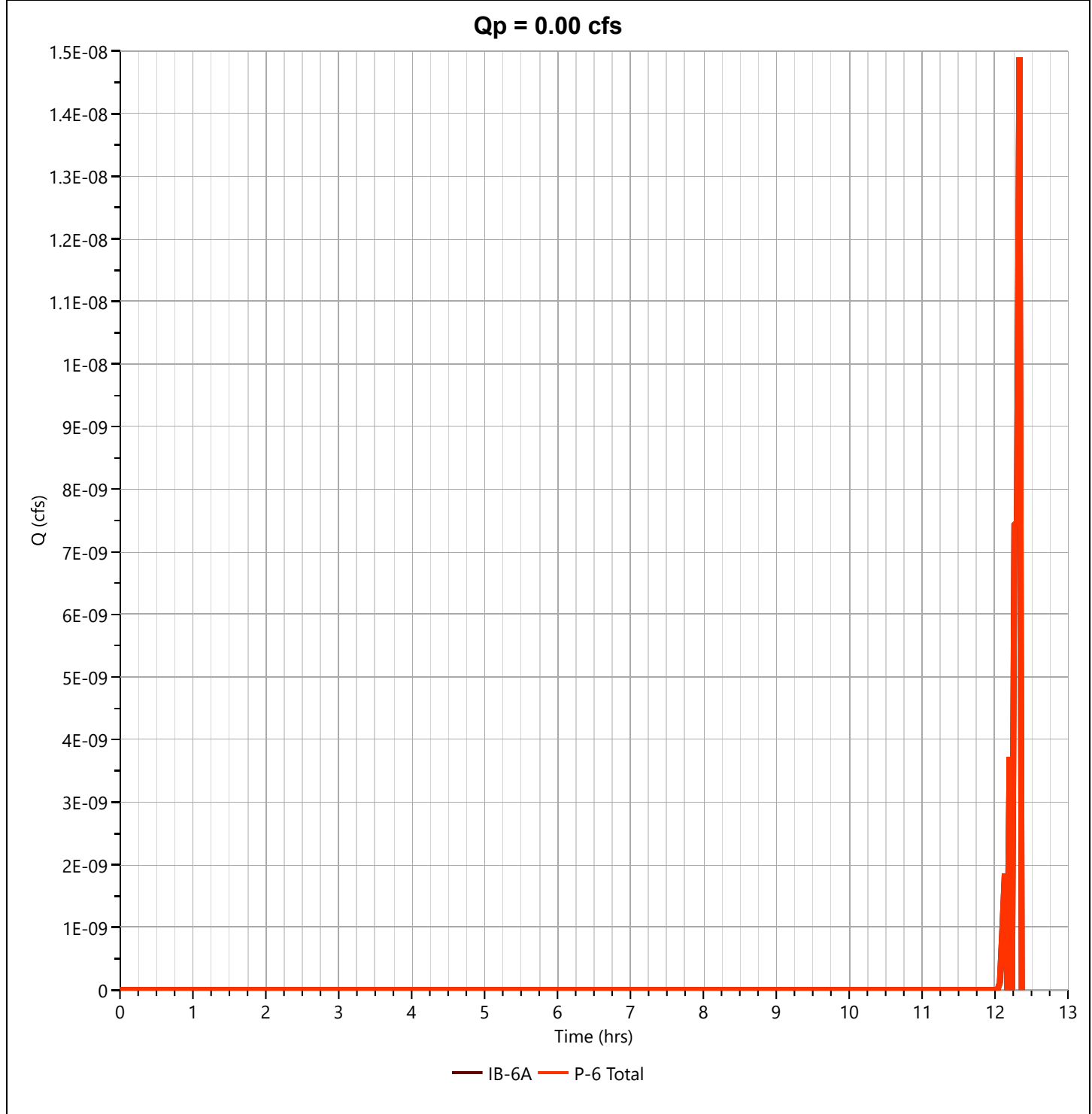
Hydrology Studio v 3.0.0.29

12-13-2023

P-6 Total

Hyd. No. 71

Hydrograph Type	= Junction	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.33 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrographs	= 69, 70	Total Contrib. Area	= 2.91 ac



Hydrograph Report

Project Name:

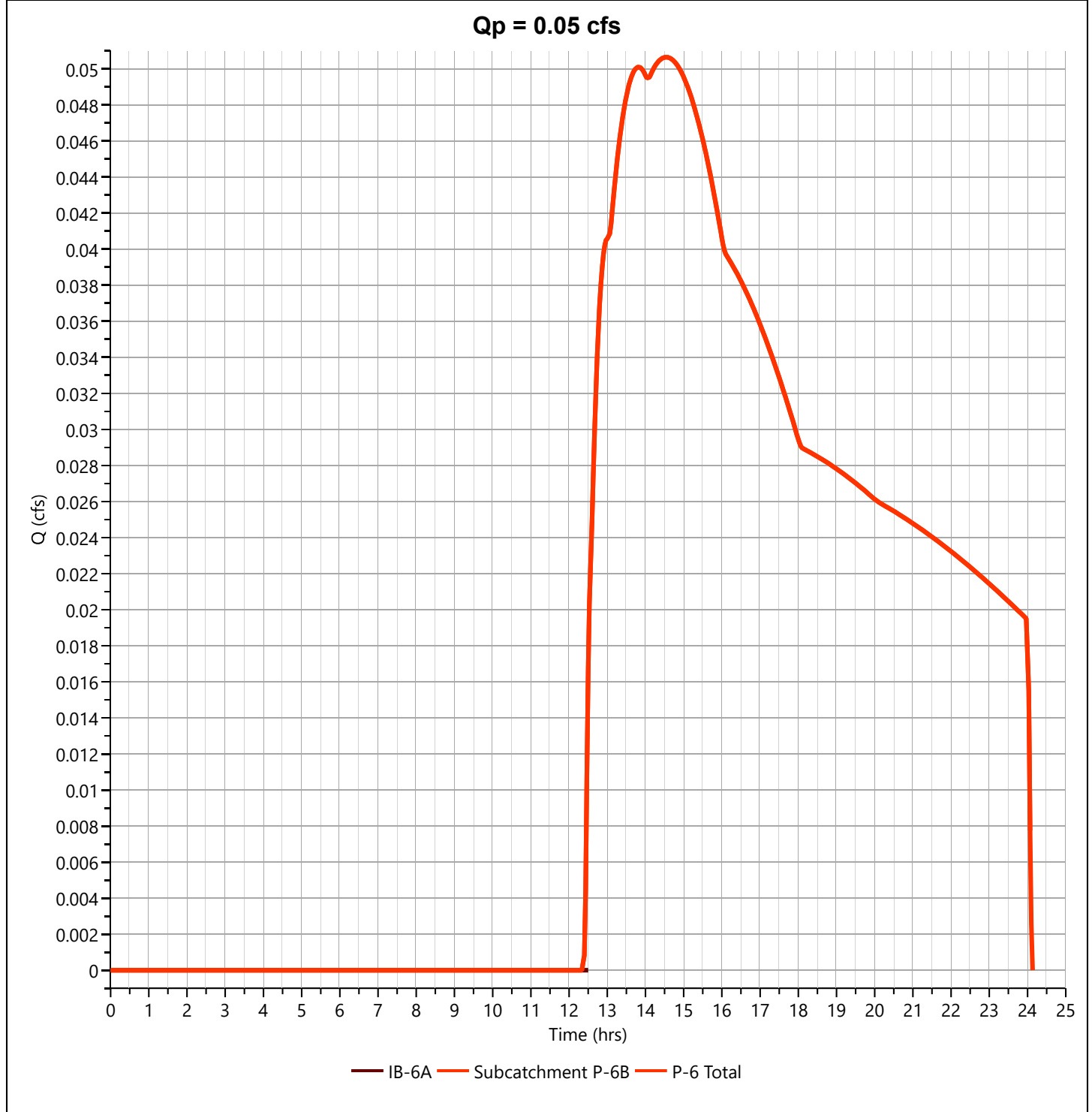
Hydrology Studio v 3.0.0.29

12-13-2023

P-6 Total

Hyd. No. 71

Hydrograph Type	= Junction	Peak Flow	= 0.051 cfs
Storm Frequency	= 10-yr	Time to Peak	= 14.53 hrs
Time Interval	= 2 min	Hydrograph Volume	= 1,368 cuft
Inflow Hydrographs	= 69, 70	Total Contrib. Area	= 2.91 ac



Hydrograph Report

Project Name:

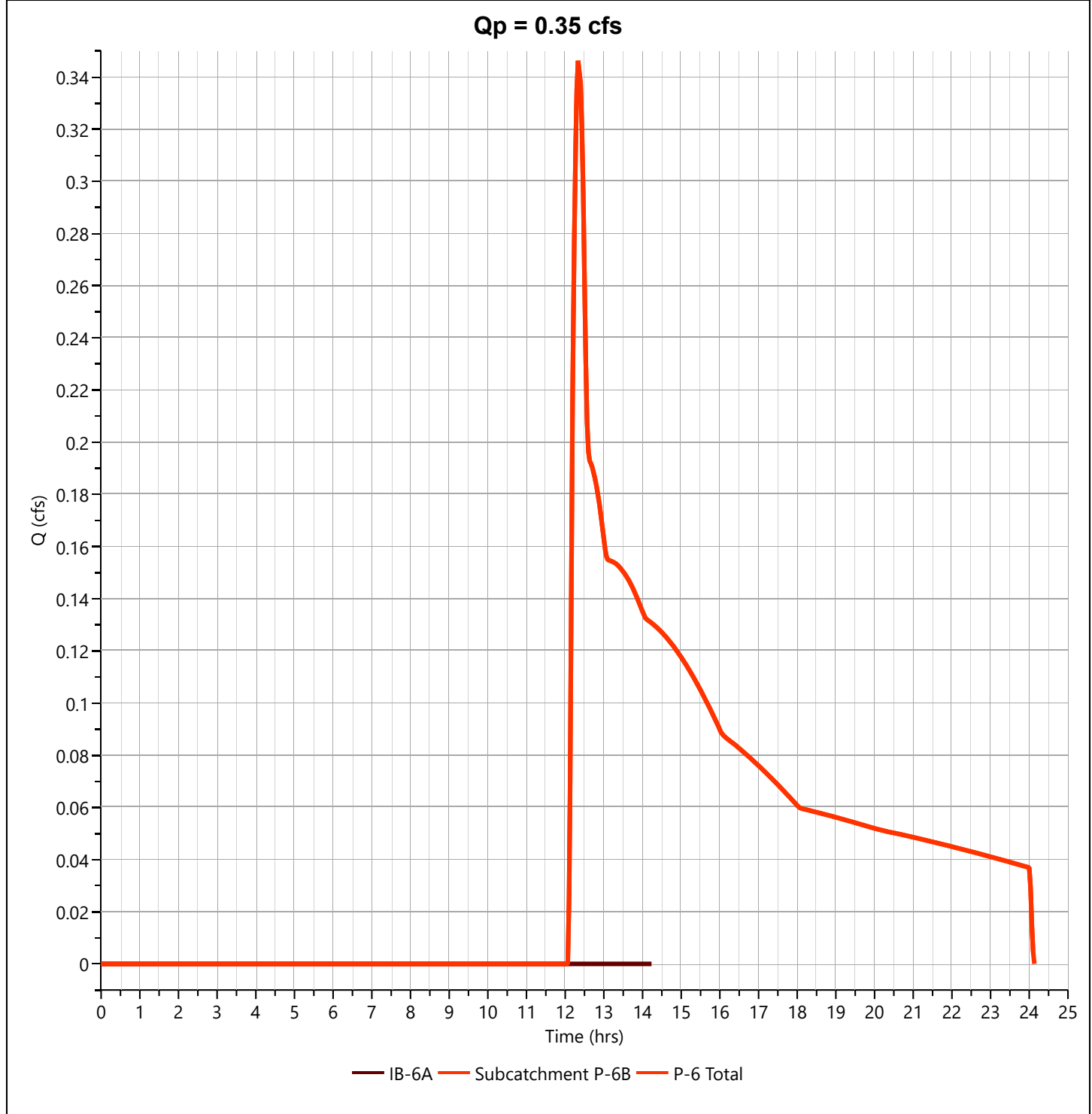
Hydrology Studio v 3.0.0.29

12-13-2023

P-6 Total

Hyd. No. 71

Hydrograph Type	= Junction	Peak Flow	= 0.347 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.37 hrs
Time Interval	= 2 min	Hydrograph Volume	= 3,695 cuft
Inflow Hydrographs	= 69, 70	Total Contrib. Area	= 2.91 ac



Hydrograph Report

Project Name:

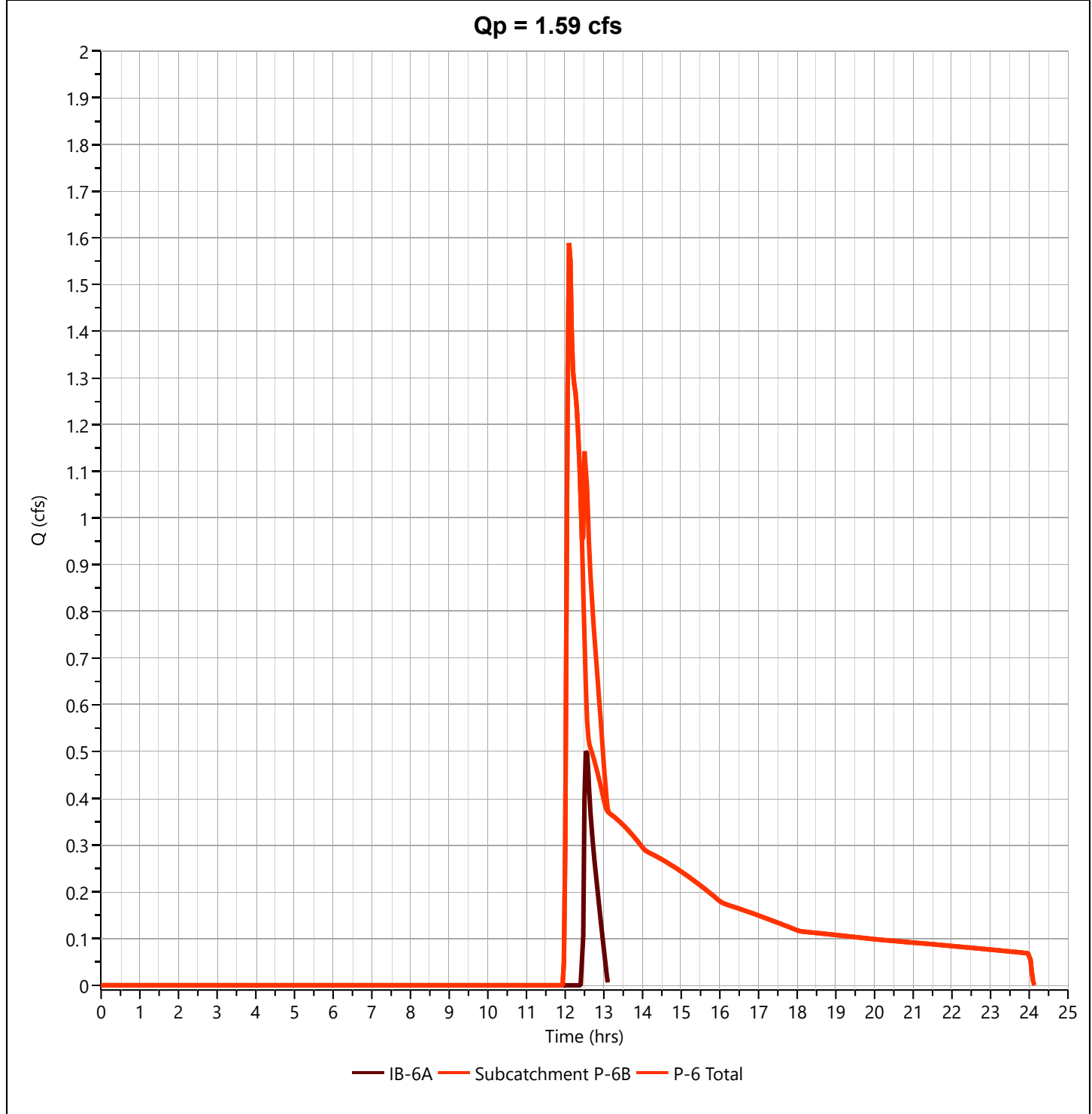
Hydrology Studio v 3.0.0.29

12-13-2023

P-6 Total

Hyd. No. 71

Hydrograph Type	= Junction	Peak Flow	= 1.589 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.10 hrs
Time Interval	= 2 min	Hydrograph Volume	= 9,605 cuft
Inflow Hydrographs	= 69, 70	Total Contrib. Area	= 2.91 ac



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Roof Drywell A

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.03	2.94
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			0.00	0.00
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					0.03	2.94

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{2.94}{0.03} = \underline{98.00} ; \text{ Use CN} = \underline{98}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	3.00	4.77	7.59

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Hydrograph Report

Project Name:

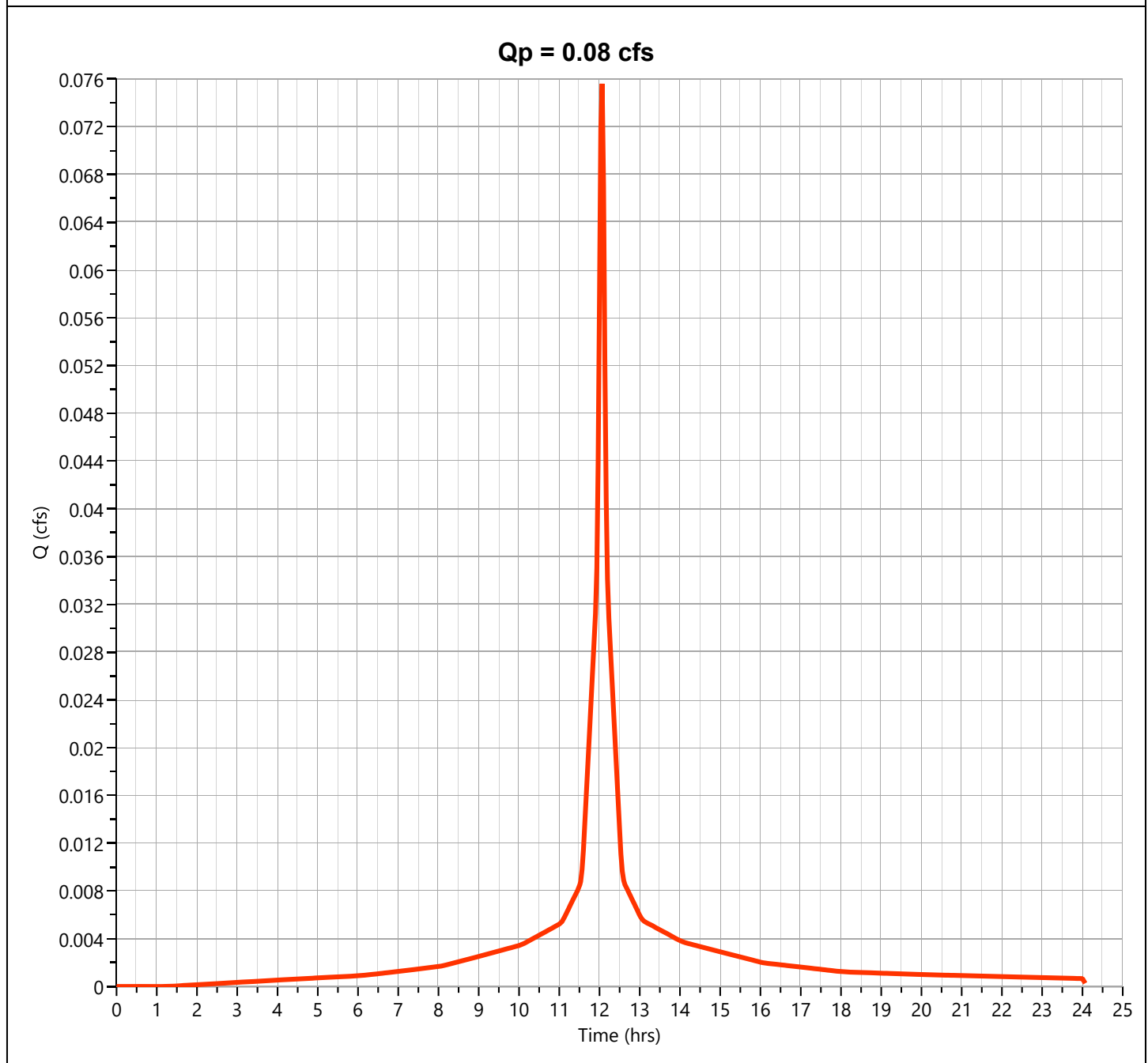
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell A

Hyd. No. 73

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.076 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 255 cuft
Drainage Area	= 0.025 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

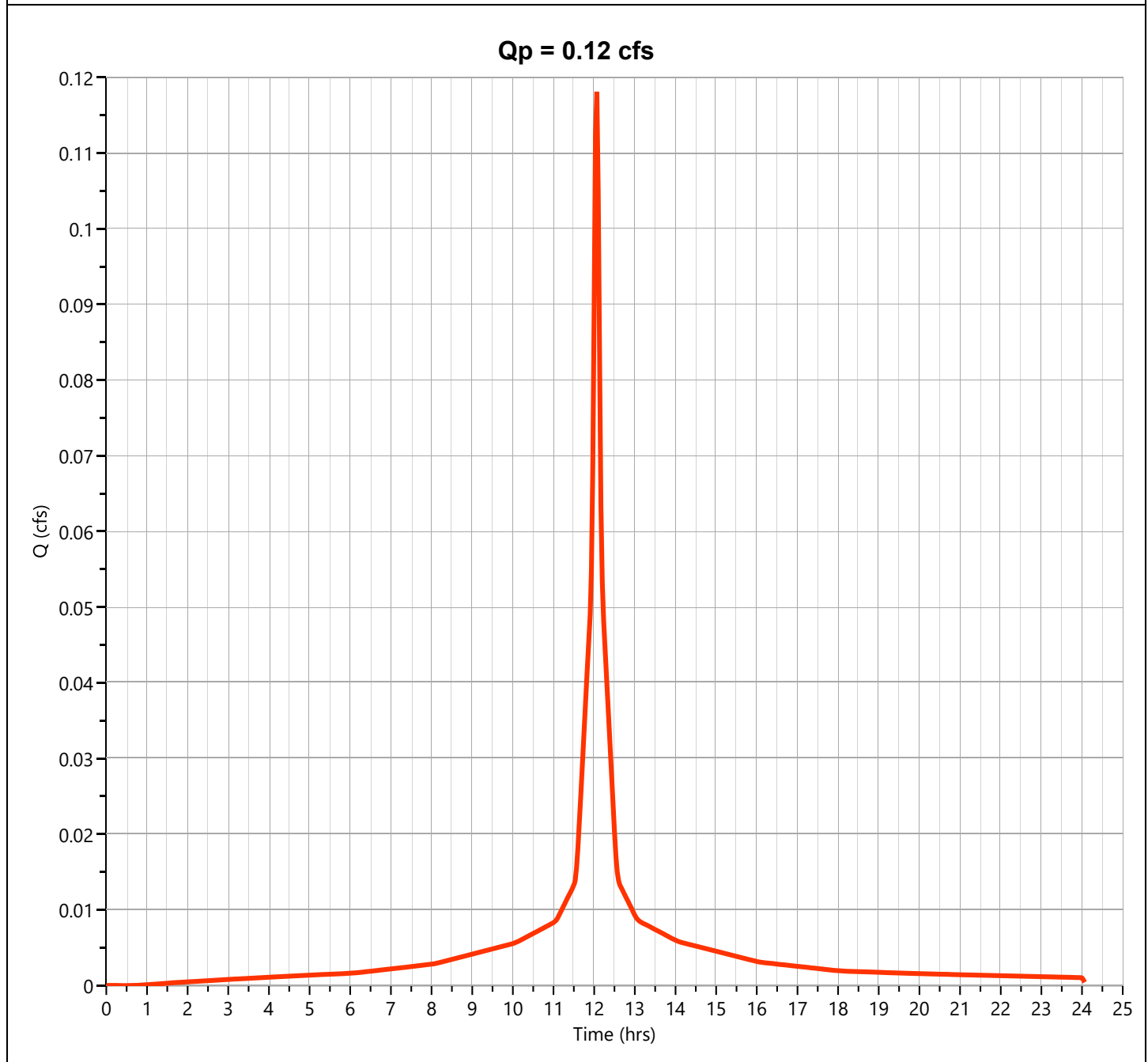
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell A

Hyd. No. 73

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.118 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 406 cuft
Drainage Area	= 0.025 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

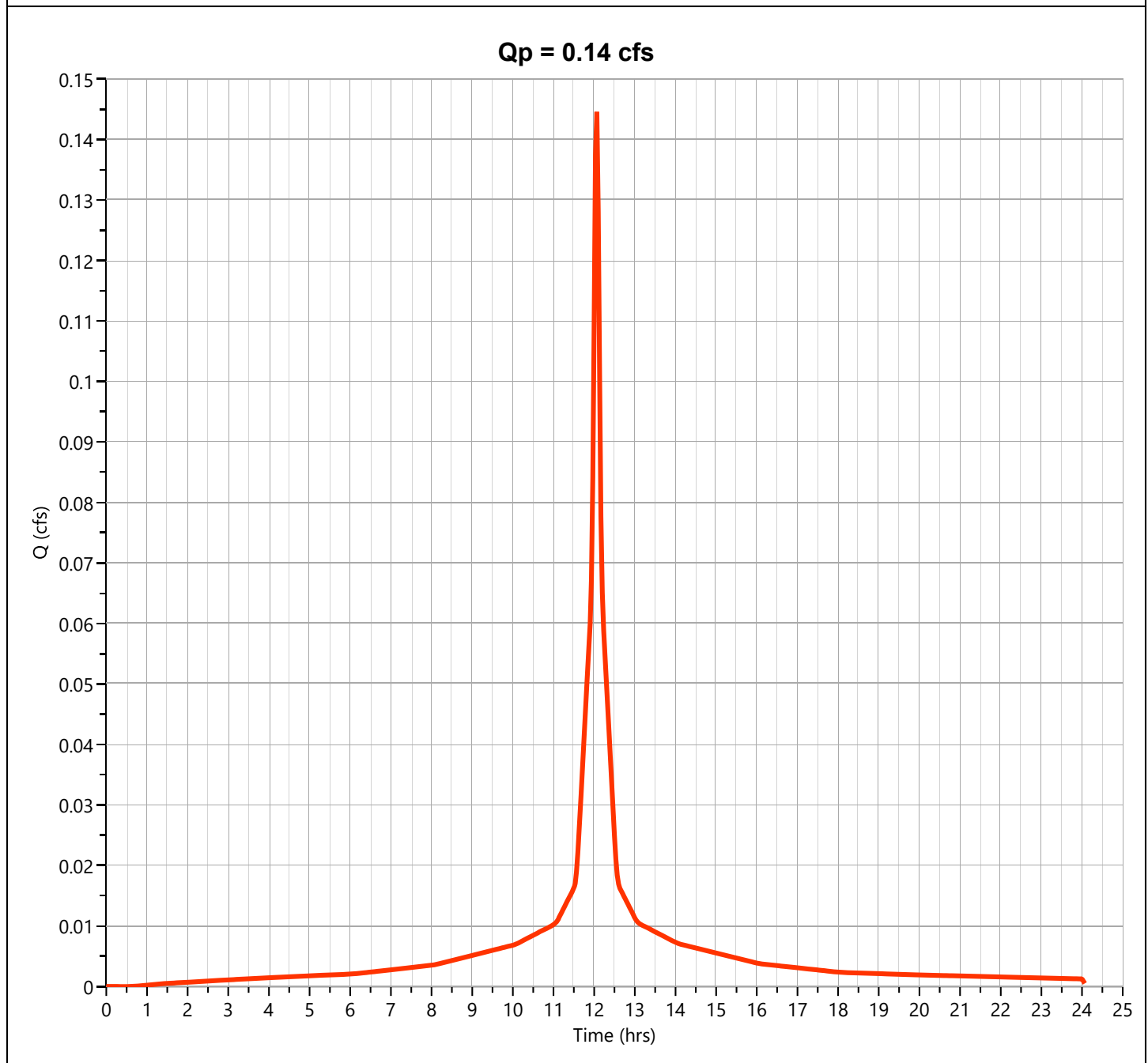
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell A

Hyd. No. 73

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.145 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 500 cuft
Drainage Area	= 0.025 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

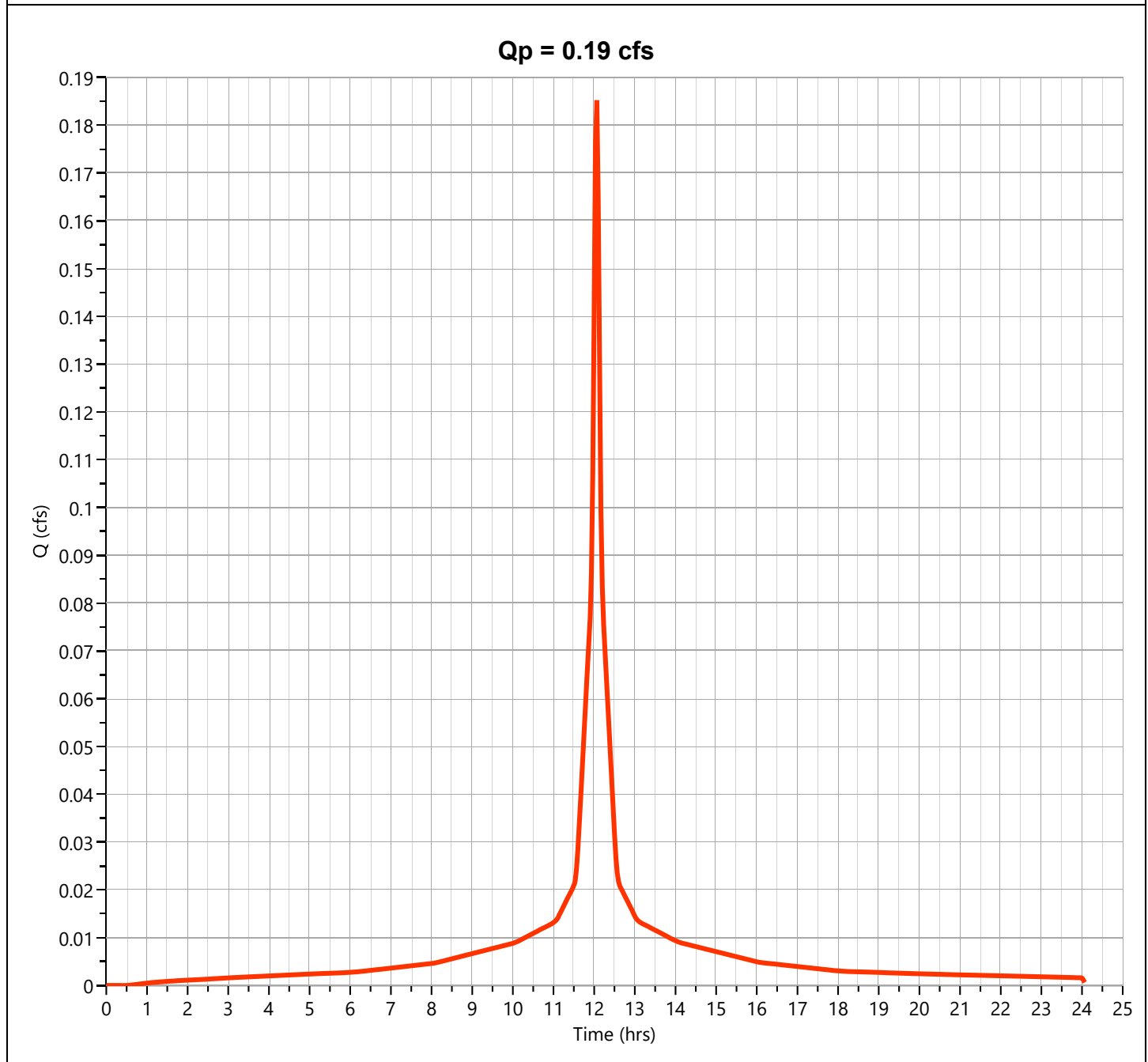
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell A

Hyd. No. 73

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.185 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 646 cuft
Drainage Area	= 0.025 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

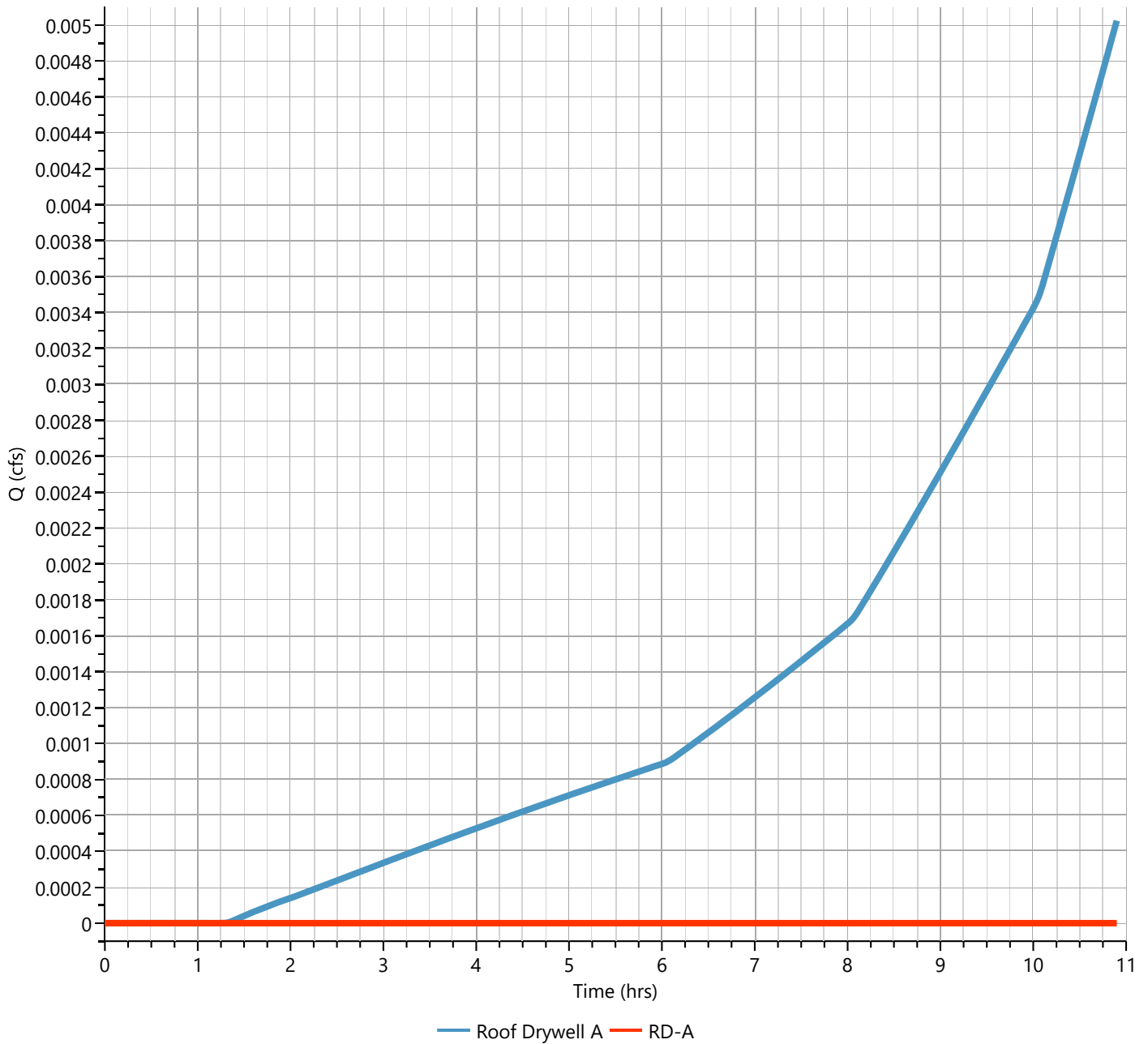
RD-A

Hyd. No. 74

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 10.83 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 73 - Roof Drywell A	Max. Elevation	= 1.71 ft
Pond Name	= RD-A	Max. Storage	= 37.3 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

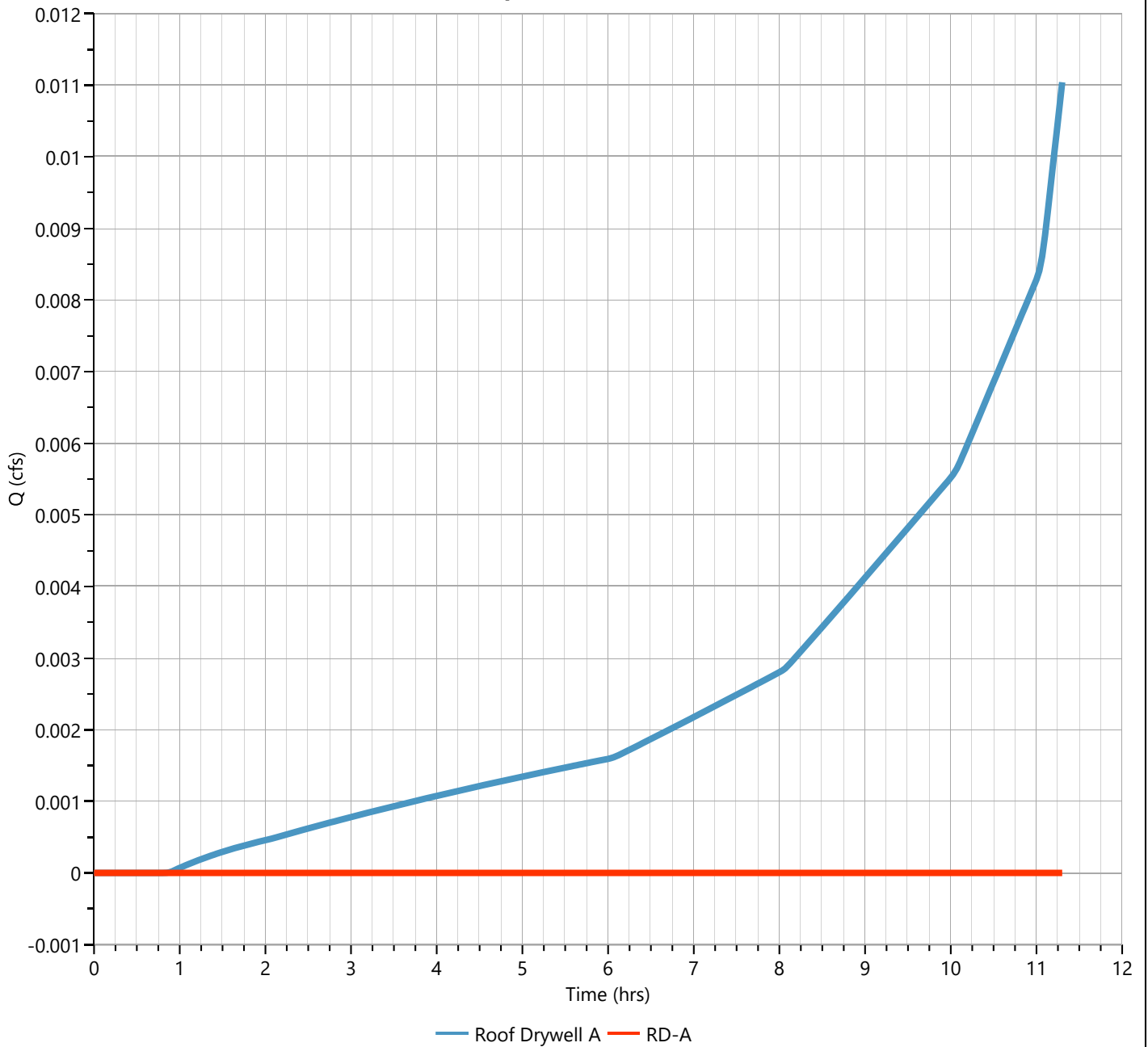
RD-A

Hyd. No. 74

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 11.23 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 73 - Roof Drywell A	Max. Elevation	= 2.38 ft
Pond Name	= RD-A	Max. Storage	= 84.7 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

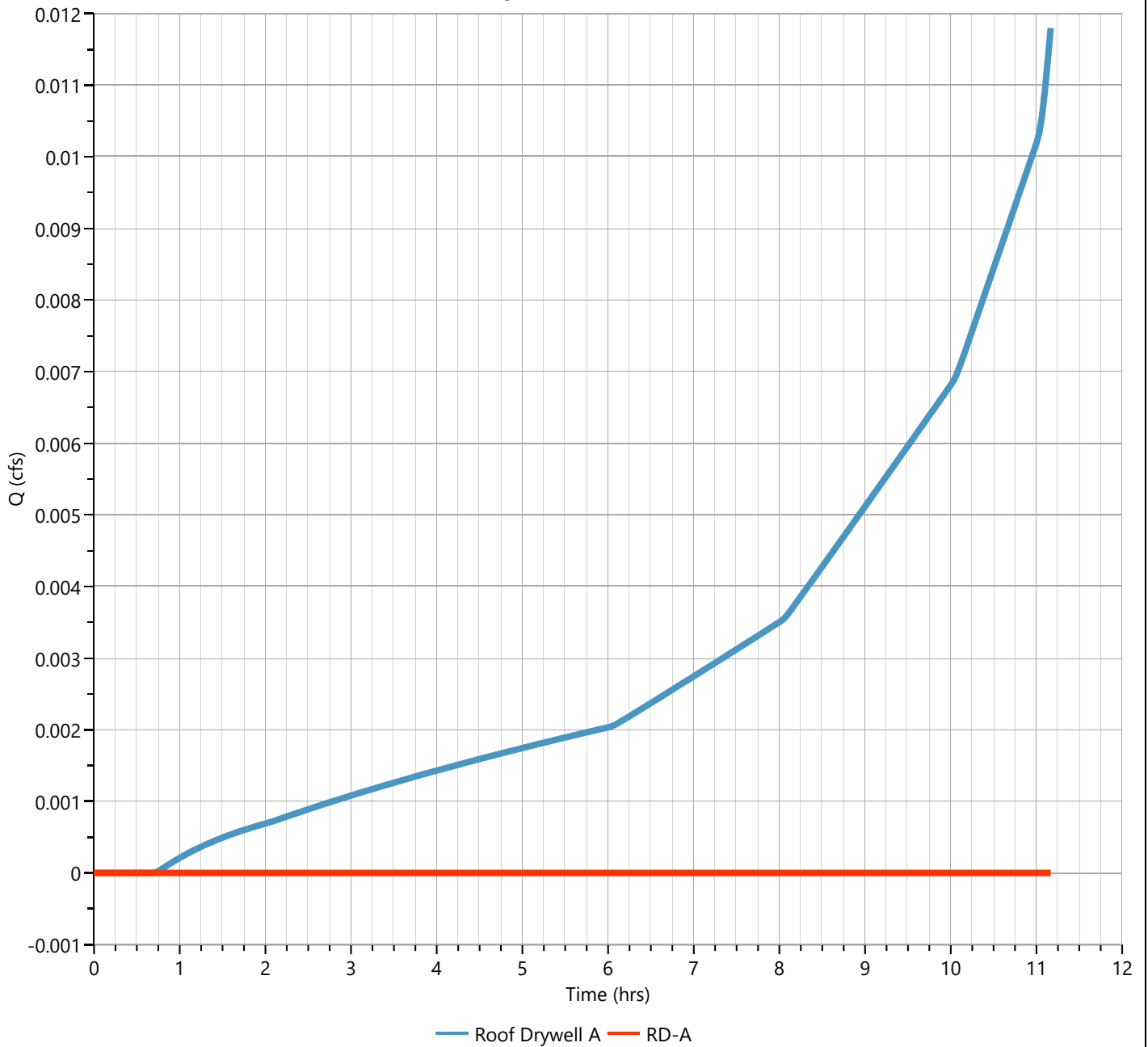
RD-A

Hyd. No. 74

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 11.10 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 73 - Roof Drywell A	Max. Elevation	= 2.84 ft
Pond Name	= RD-A	Max. Storage	= 116 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

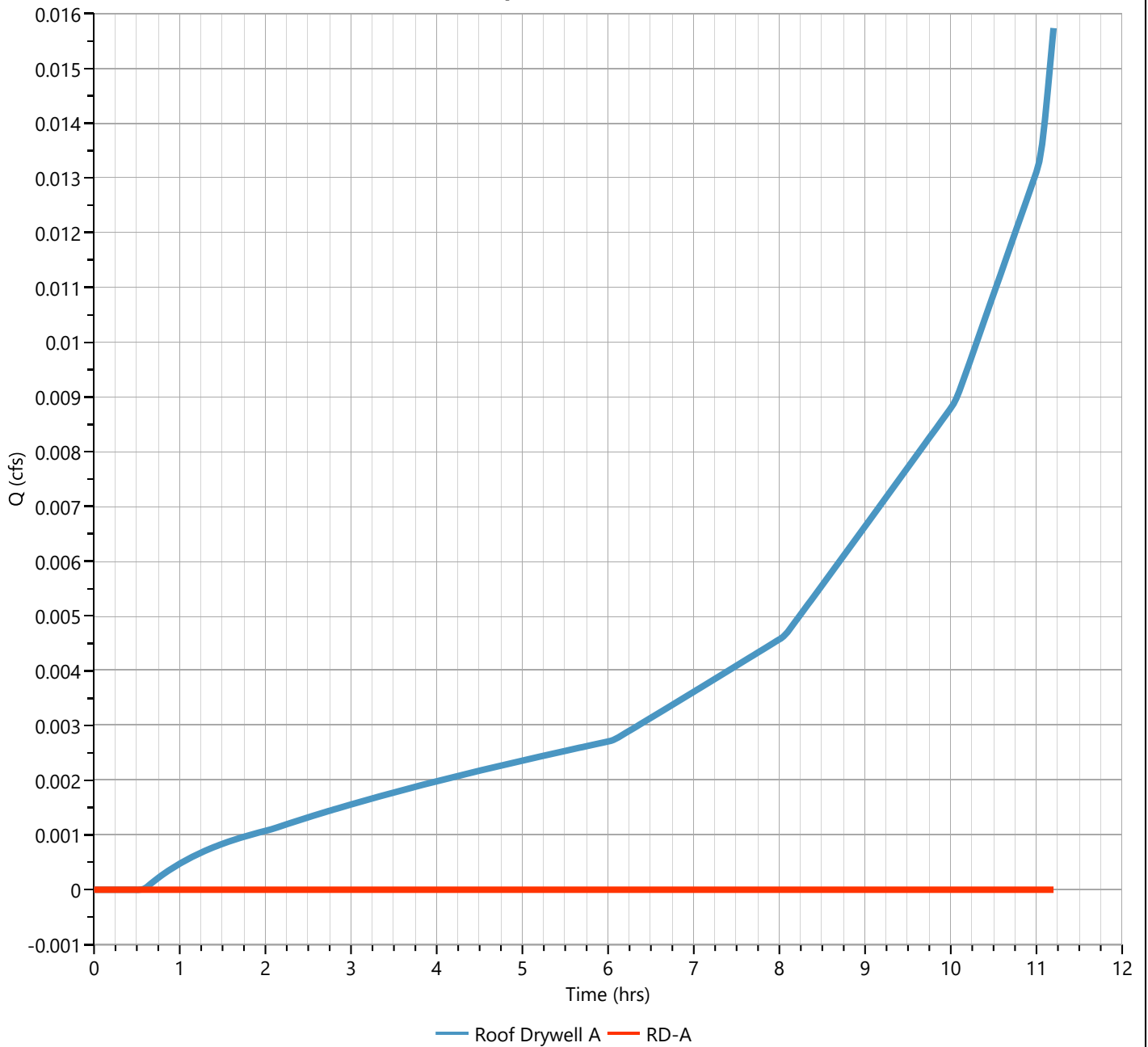
RD-A

Hyd. No. 74

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 11.17 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 73 - Roof Drywell A	Max. Elevation	= 3.61 ft
Pond Name	= RD-A	Max. Storage	= 166 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

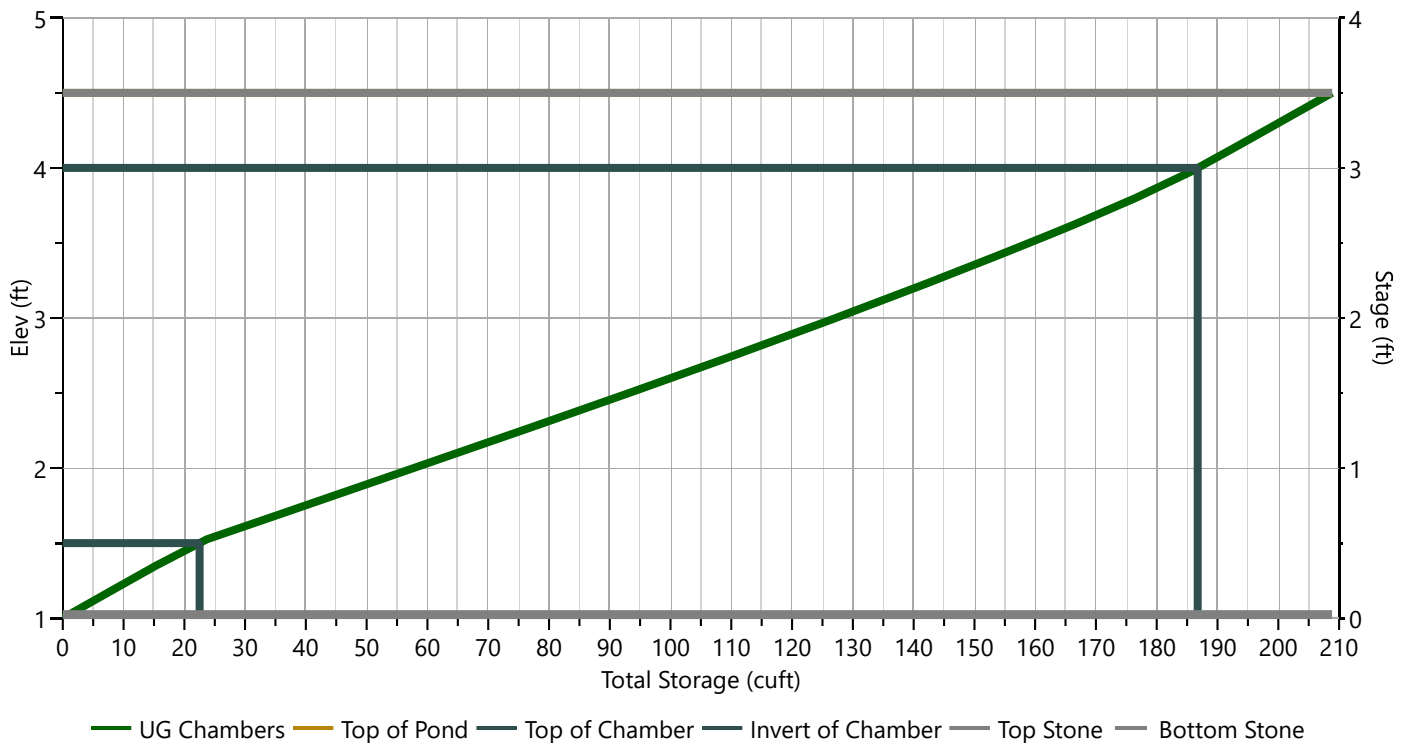
12-13-2023

RD-A

Stage-Storage

StormTech® SC-740™ Chamber		Stage / Storage Table				
Description	Input	Stage (in)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Chamber Height, in	30	0.0	1.00	110	0.000	0.000
Chamber Shape	Arch	2.1	1.18	110	7.69	7.69
Chamber Width, in	51	4.2	1.35	110	7.69	15.4
Installed Length, ft	7.12	6.3	1.53	110	8.33	23.7
No. Chambers	2	8.4	1.70	110	12.6	36.3
Bare Chamber Stor, cuft	91.8	10.5	1.88	110	12.6	48.9
No. Rows	1	12.6	2.05	110	12.5	61.4
Space Between Rows, in	6	14.7	2.23	110	12.4	73.8
Stone Above, in	6	16.8	2.40	110	12.3	86.1
Stone Below, in	6	18.9	2.58	110	12.2	98.3
Stone Sides, in	12	21.0	2.75	110	12.0	110
Stone Ends, in	12	23.1	2.93	110	11.8	122
Encasement Voids, %	40.00	25.2	3.10	110	11.6	134
Encasement Bottom Elevation, ft	1.00	27.3	3.28	110	11.3	145
		29.4	3.45	110	11.0	156
		31.5	3.63	110	10.5	167
		33.6	3.80	110	9.96	177
		35.7	3.97	110	9.10	186
		37.8	4.15	110	7.86	193
		39.9	4.32	110	7.69	201
		42.0	4.50	110	7.69	209

Stage-Storage



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

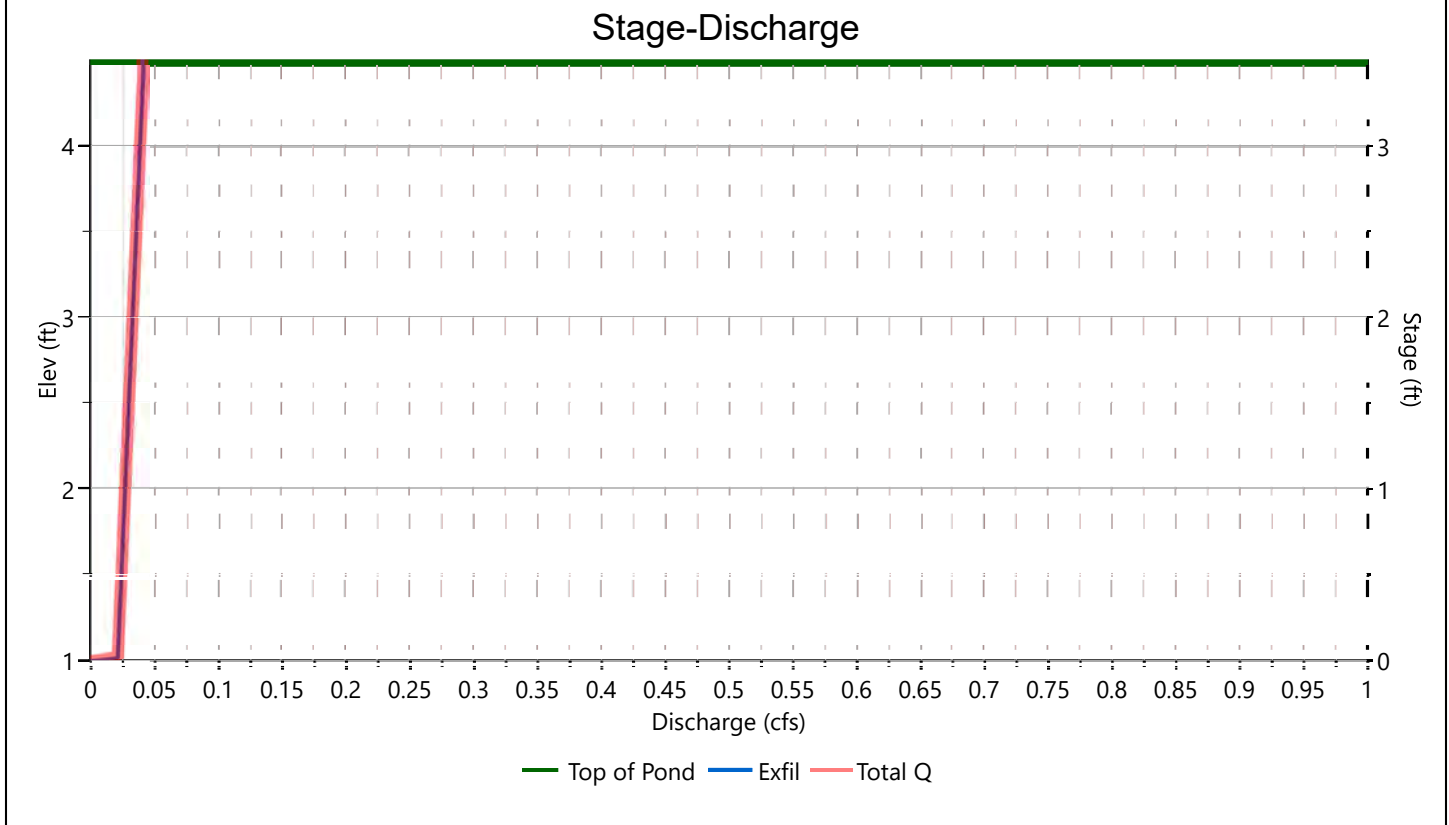
12-13-2023

RD-A

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in					Hole Diameter, in
Span, in					No. holes
No. Barrels					Invert Elevation, ft
Invert Elevation, ft					Height, ft
Orifice Coefficient, Co					Orifice Coefficient, Co
Length, ft					
Barrel Slope, %					
N-Value, n	0.000				
Weirs	Riser*	Weirs			Ancillary
		1	2	3	
Shape / Type					Exfiltration, in/hr
Crest Elevation, ft					8.27**
Crest Length, ft					
Angle, deg					
Weir Coefficient, Cw					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

RD-A

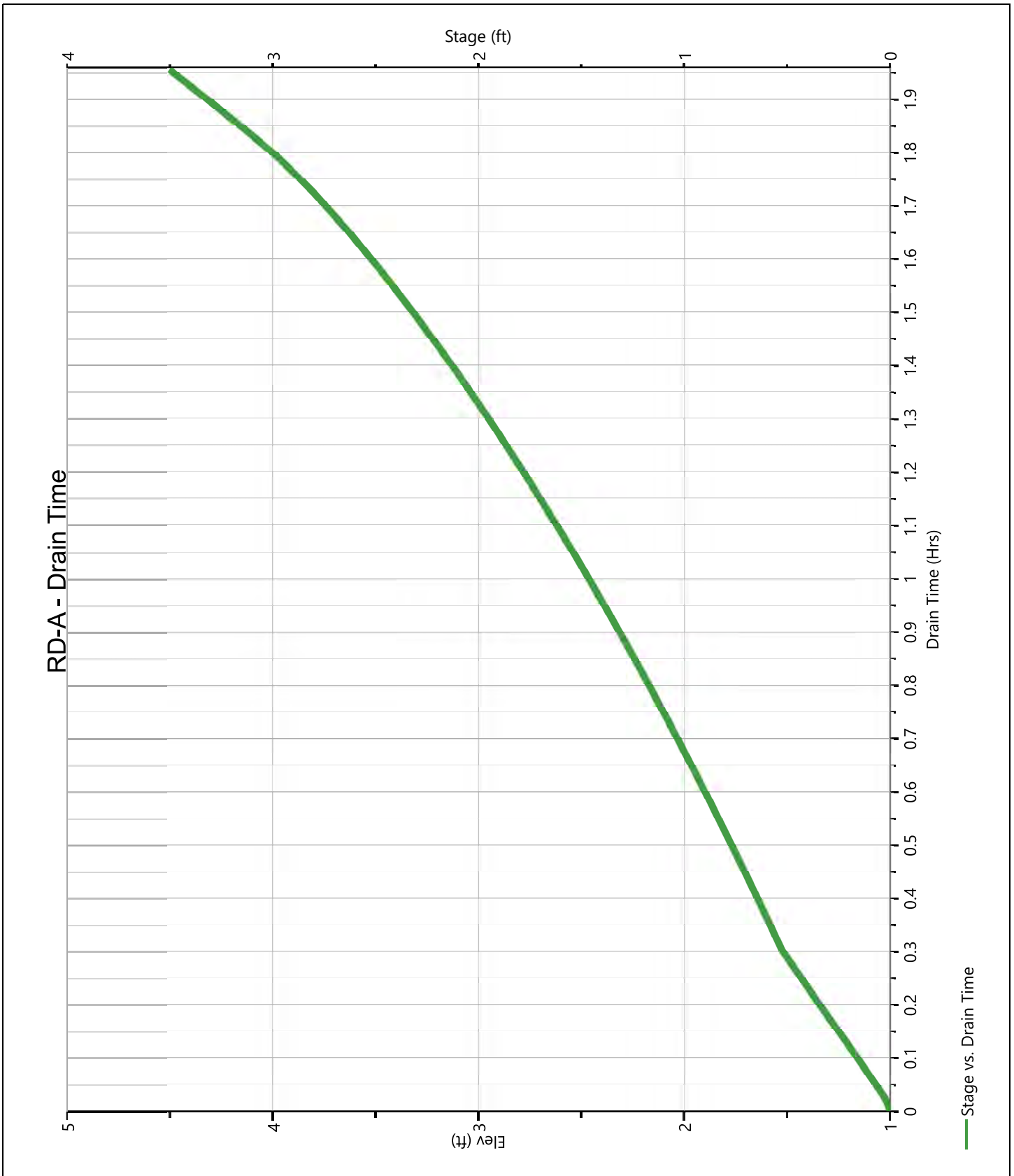
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	1.00	0.000									0.000		0.000	
0.18	1.18	7.69									0.022		0.022	
0.35	1.35	15.4									0.023		0.023	
0.53	1.53	23.7									0.024		0.024	
0.70	1.70	36.3									0.025		0.025	
0.88	1.88	48.9									0.026		0.026	
1.05	2.05	61.4									0.027		0.027	
1.23	2.23	73.8									0.028		0.028	
1.40	2.40	86.1									0.029		0.029	
1.58	2.58	98.3									0.030		0.030	
1.75	2.75	110									0.031		0.031	
1.93	2.93	122									0.032		0.032	
2.10	3.10	134									0.033		0.033	
2.28	3.28	145									0.034		0.034	
2.45	3.45	156									0.035		0.035	
2.63	3.63	167									0.036		0.036	
2.80	3.80	177									0.037		0.037	
2.97	3.97	186									0.038		0.038	
3.15	4.15	193									0.039		0.039	
3.32	4.32	201									0.040		0.040	
3.50	4.50	209									0.041		0.041	

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

RD-A

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Roof Drywell B

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.058	5.73
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			0.00	0.00
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					0.058	5.73

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{5.73}{0.06} = 98.00 ; \text{ Use CN} = \boxed{98}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	3.00	4.77	7.59

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Hydrograph Report

Project Name:

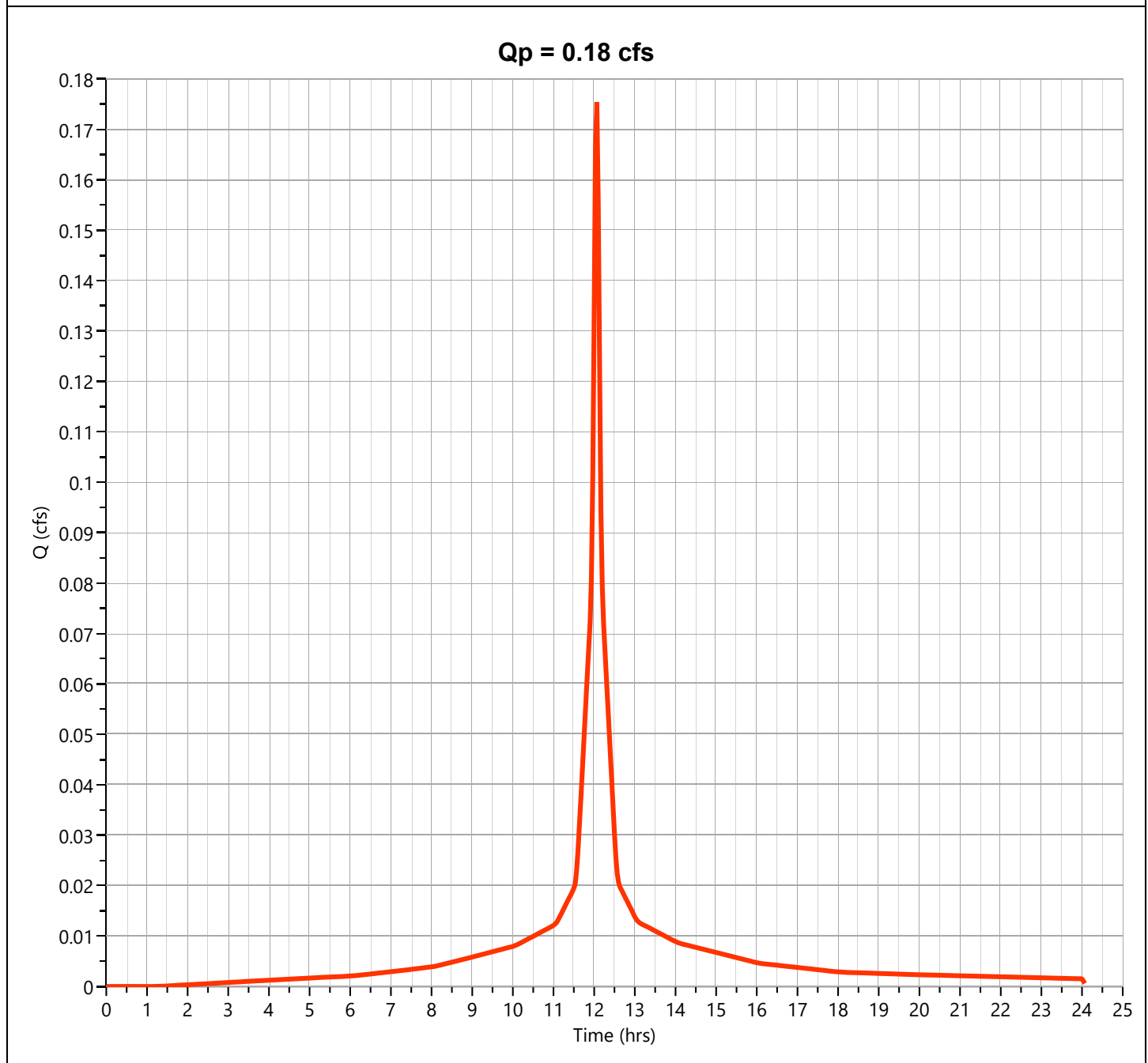
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell B

Hyd. No. 76

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.175 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 592 cuft
Drainage Area	= 0.058 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

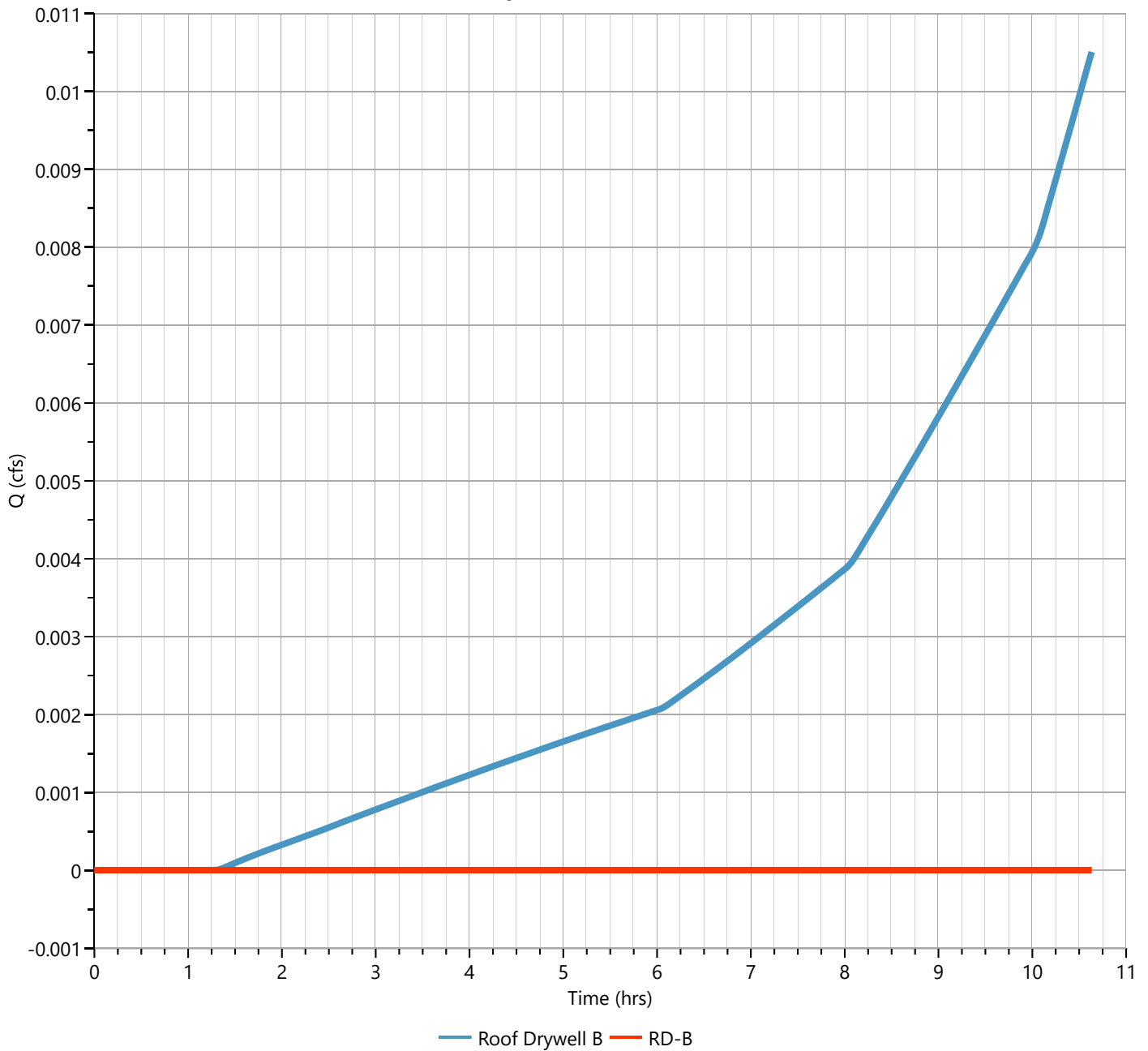
RD-B

Hyd. No. 77

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 10.60 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 76 - Roof Drywell B	Max. Elevation	= 2.03 ft
Pond Name	= RD-B	Max. Storage	= 106 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Pond Report

Project Name:

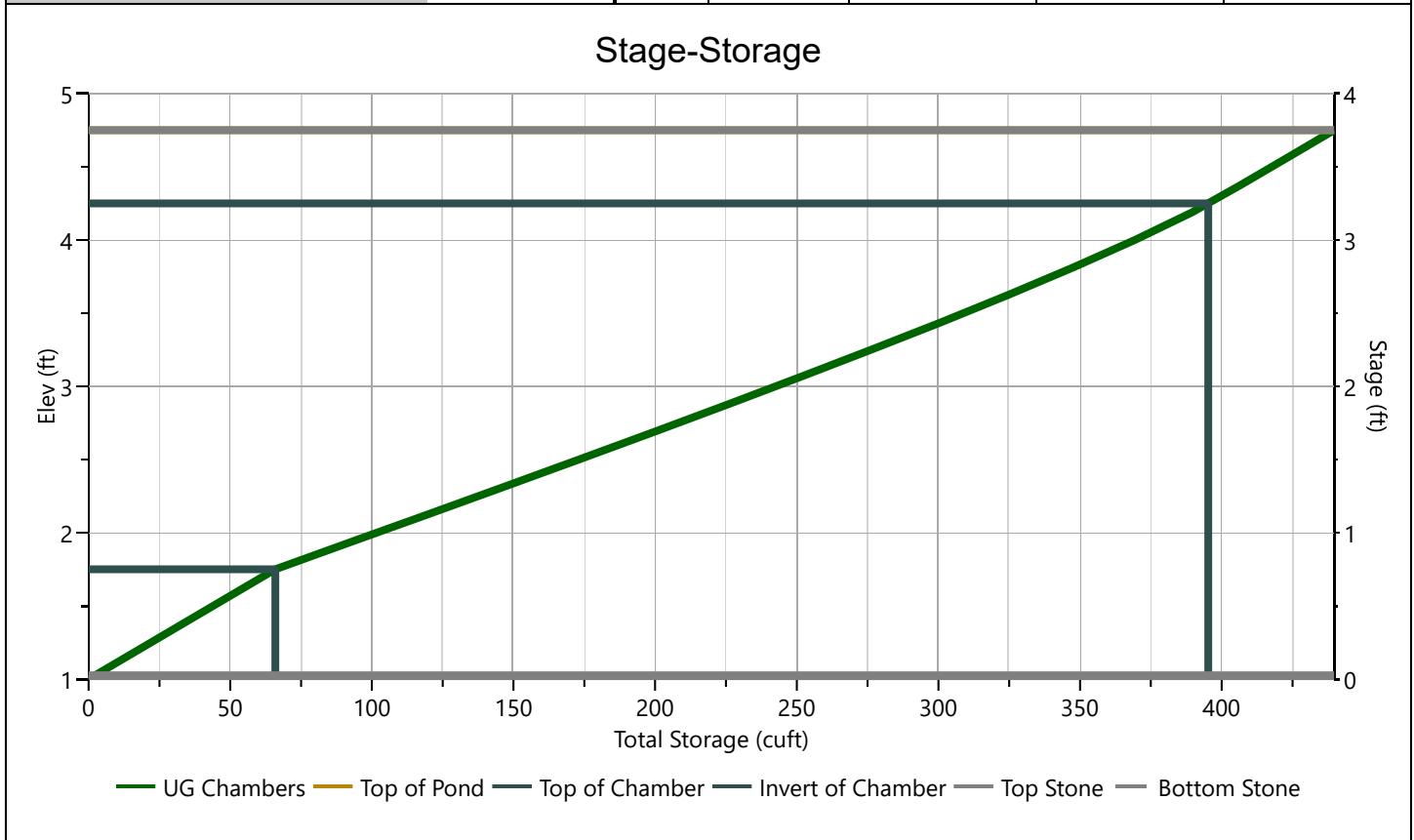
Hydrology Studio v 3.0.0.29

12-13-2023

RD-B

Stage-Storage

StormTech® SC-740™ Chamber		Stage / Storage Table				
Description	Input	Stage (in)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Chamber Height, in	30	0.0	1.00	220	0.000	0.000
Chamber Shape	Arch	2.3	1.19	220	16.5	16.5
Chamber Width, in	51	4.5	1.38	220	16.5	33.0
Installed Length, ft	7.12	6.8	1.56	220	16.5	49.4
No. Chambers	4	9.0	1.75	220	16.5	65.9
Bare Chamber Stor, cuft	184	11.3	1.94	220	26.9	92.8
No. Rows	2	13.5	2.13	220	26.9	120
Space Between Rows, in	24	15.8	2.31	220	26.8	146
Stone Above, in	6	18.0	2.50	220	26.6	173
Stone Below, in	9	20.3	2.69	220	26.4	199
Stone Sides, in	12	22.5	2.88	220	26.0	225
Stone Ends, in	12	24.8	3.06	220	25.6	251
Encasement Voids, %	40.00	27.0	3.25	220	25.2	276
Encasement Bottom Elevation, ft	1.00	29.3	3.44	220	24.6	301
		31.5	3.63	220	23.8	325
		33.8	3.81	220	22.9	348
		36.0	4.00	220	21.8	369
		38.3	4.19	220	20.1	389
		40.5	4.38	220	17.2	407
		42.8	4.56	220	16.5	423
		45.0	4.75	220	16.5	440



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

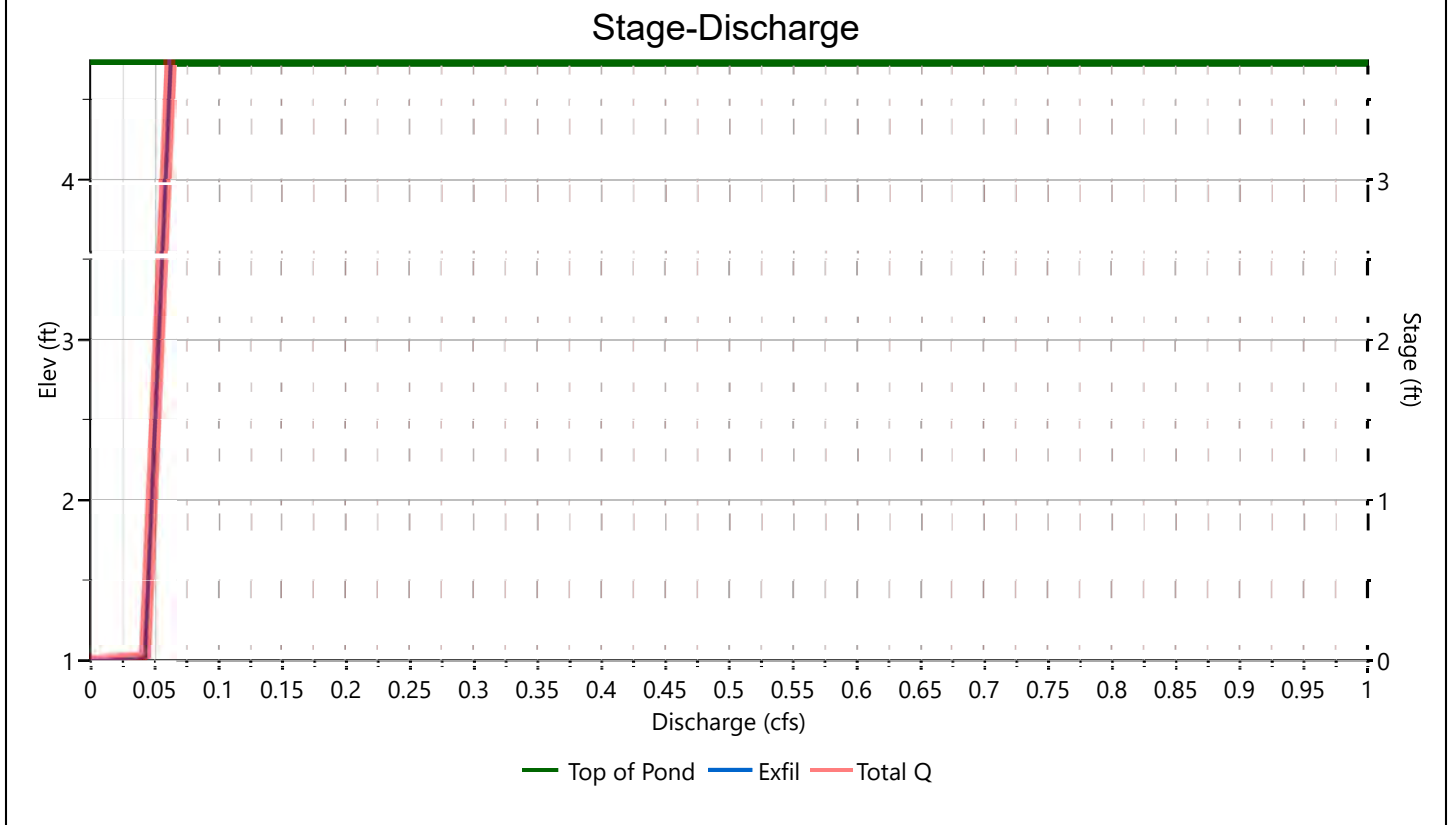
12-13-2023

RD-B

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in					Hole Diameter, in
Span, in					No. holes
No. Barrels					Invert Elevation, ft
Invert Elevation, ft					Height, ft
Orifice Coefficient, Co					Orifice Coefficient, Co
Length, ft					
Barrel Slope, %					
N-Value, n	0.000				
Weirs	Riser*	Weirs			Ancillary
		1	2	3	
Shape / Type					Exfiltration, in/hr
Crest Elevation, ft					8.27**
Crest Length, ft					
Angle, deg					
Weir Coefficient, Cw					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

RD-B

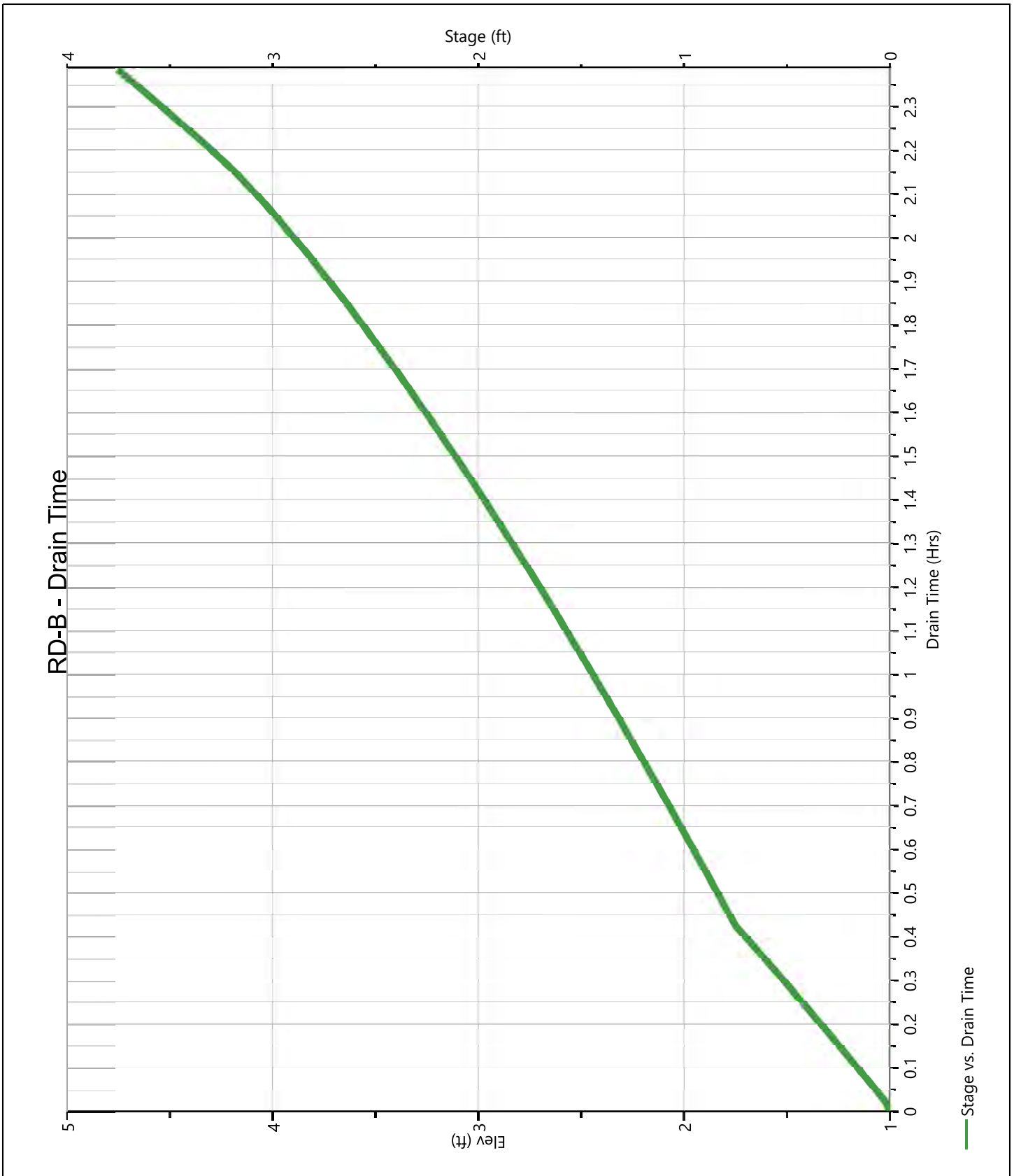
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	1.00	0.000										0.000		0.000
0.19	1.19	16.5										0.043		0.043
0.38	1.38	33.0										0.044		0.044
0.56	1.56	49.4										0.045		0.045
0.75	1.75	65.9										0.046		0.046
0.94	1.94	92.8										0.047		0.047
1.13	2.13	120										0.048		0.048
1.31	2.31	146										0.049		0.049
1.50	2.50	173										0.050		0.050
1.69	2.69	199										0.051		0.051
1.88	2.88	225										0.052		0.052
2.06	3.06	251										0.053		0.053
2.25	3.25	276										0.054		0.054
2.44	3.44	301										0.055		0.055
2.63	3.63	325										0.056		0.056
2.81	3.81	348										0.057		0.057
3.00	4.00	369										0.058		0.058
3.19	4.19	389										0.059		0.059
3.38	4.38	407										0.060		0.060
3.56	4.56	423										0.061		0.061
3.75	4.75	440										0.062		0.062

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

RD-B

Pond Drawdown



Hydrograph Report

Project Name:

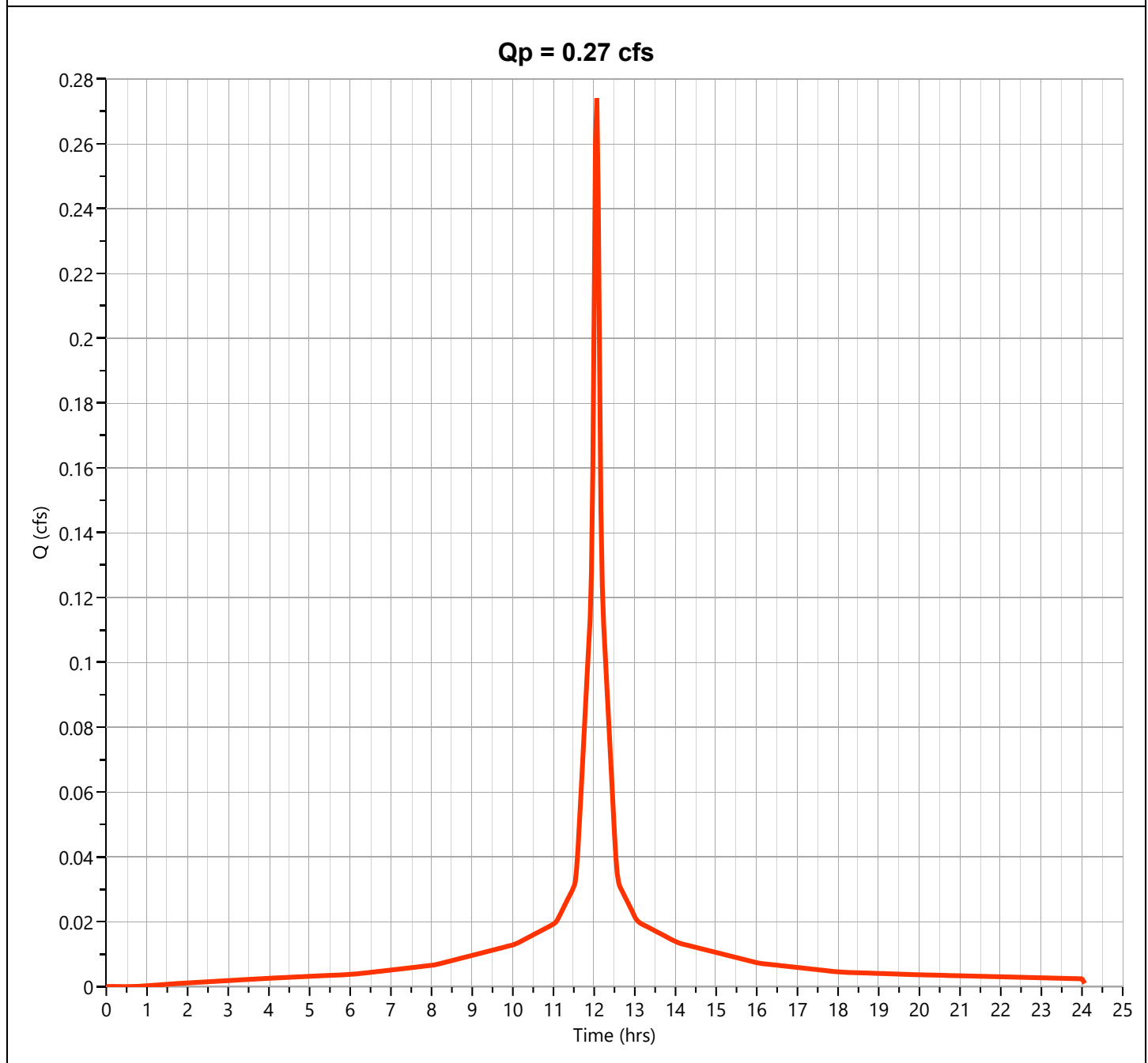
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell B

Hyd. No. 76

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.274 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 942 cuft
Drainage Area	= 0.058 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

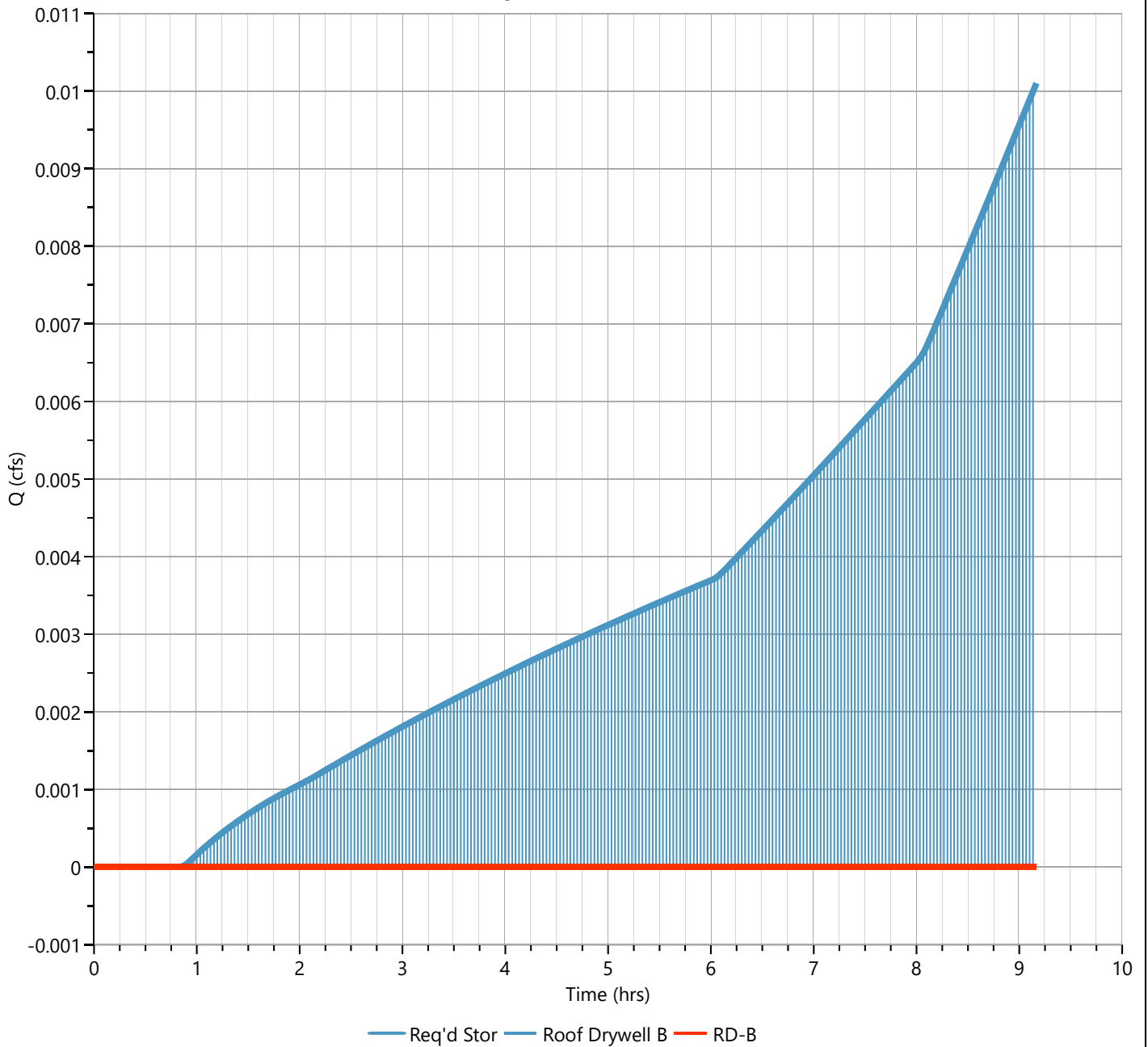
RD-B

Hyd. No. 77

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 9.13 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 76 - Roof Drywell B	Max. Elevation	= 2.91 ft
Pond Name	= RD-B	Max. Storage	= 230 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

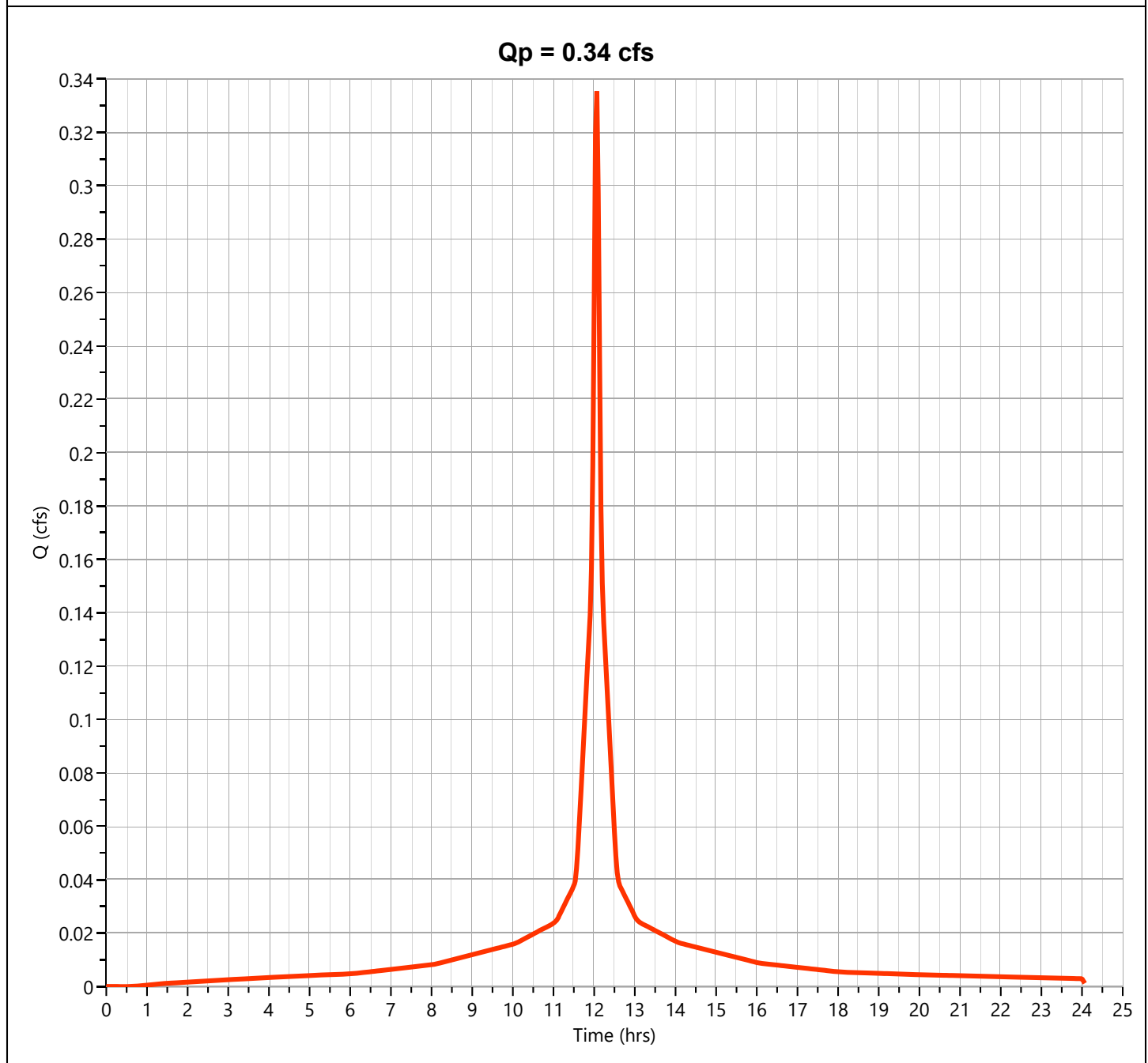
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell B

Hyd. No. 76

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.335 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 1,161 cuft
Drainage Area	= 0.058 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

RD-B

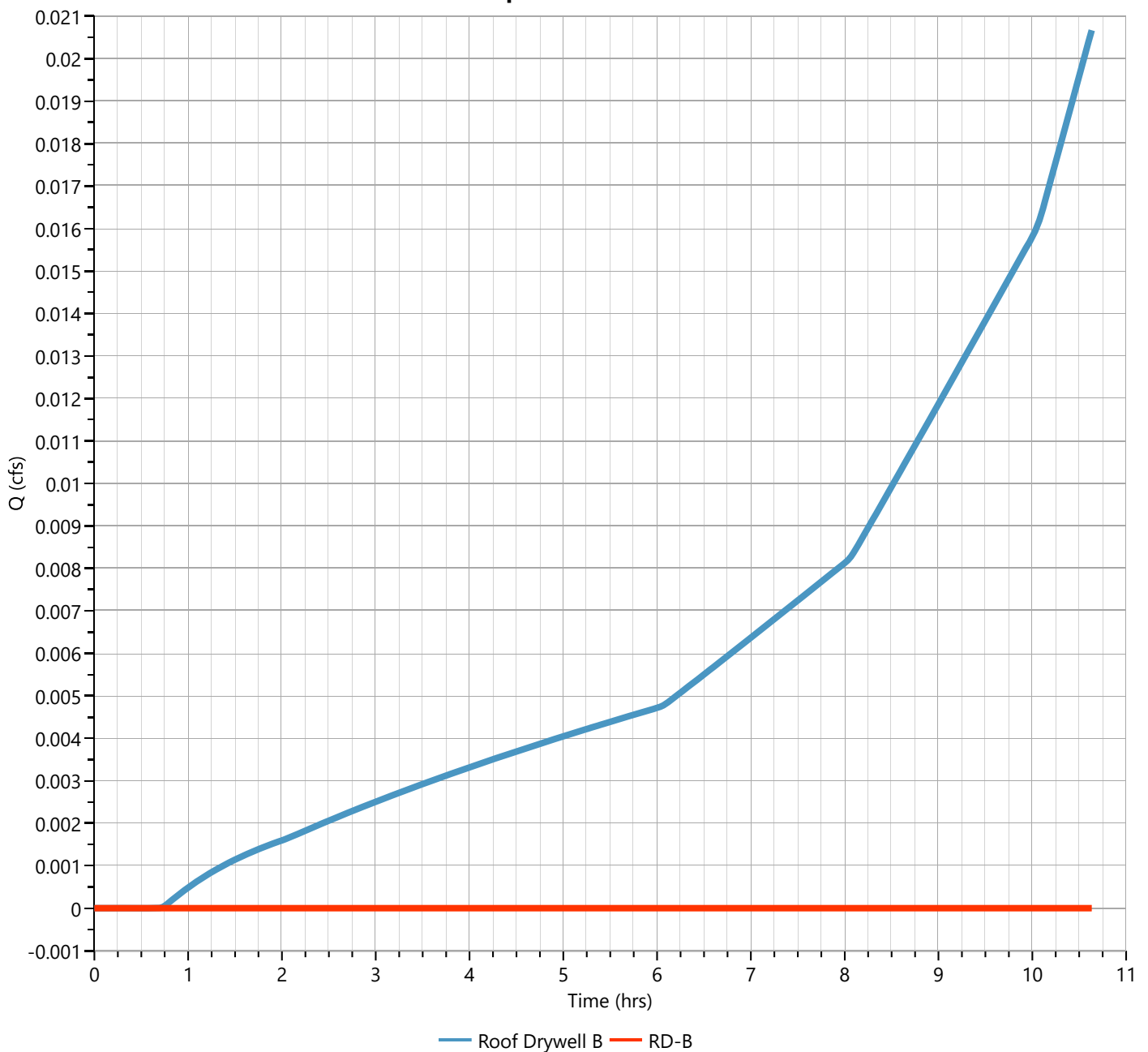
Hyd. No. 77

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 10.57 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 76 - Roof Drywell B	Max. Elevation	= 3.51 ft
Pond Name	= RD-B	Max. Storage	= 310 cuft

Pond Routing by Storage Indication Method

Center of mass detention time = 4.28 hrs

Qp = 0.00 cfs



Hydrograph Report

Project Name:

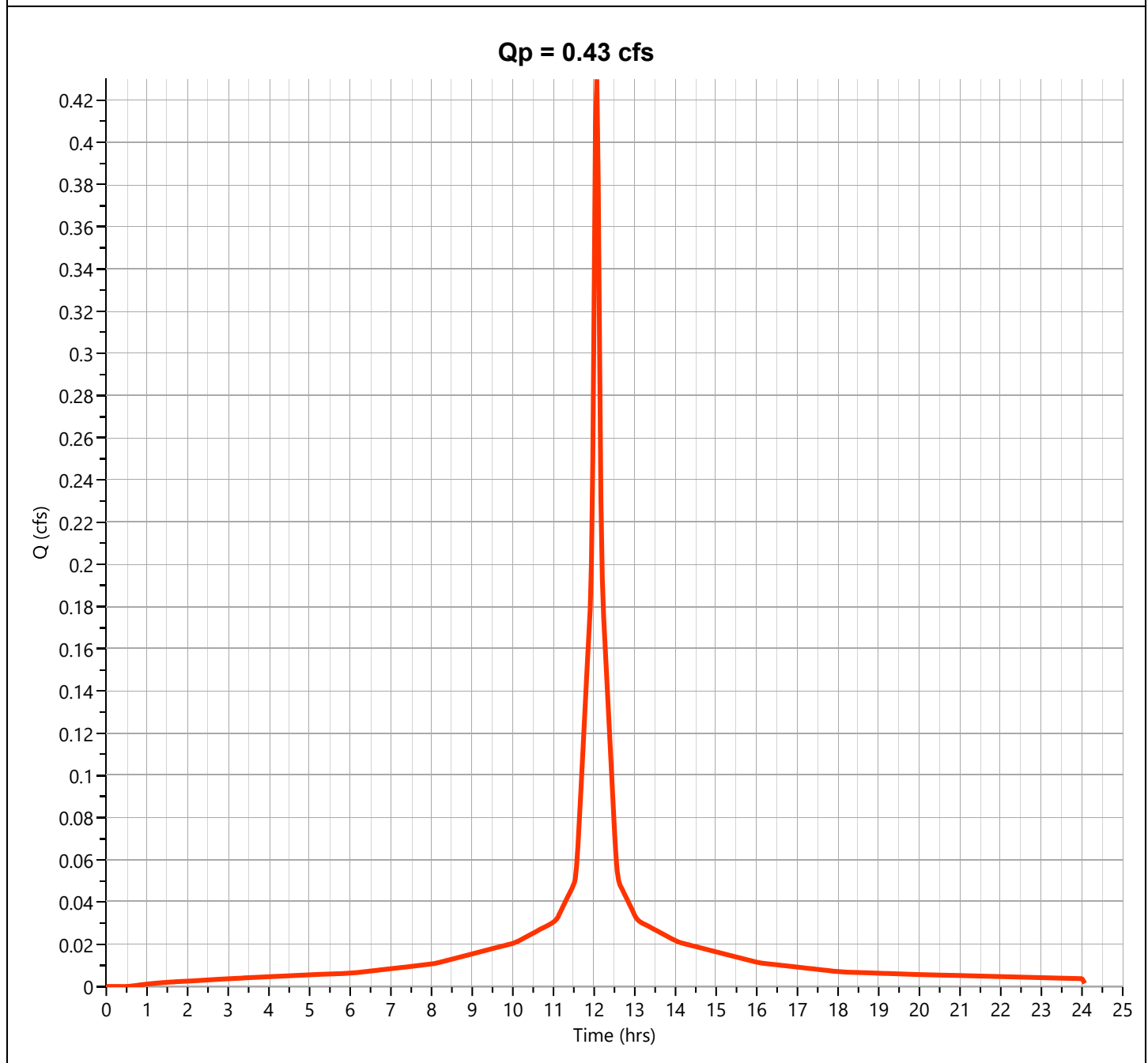
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell B

Hyd. No. 76

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.430 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 1,498 cuft
Drainage Area	= 0.058 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

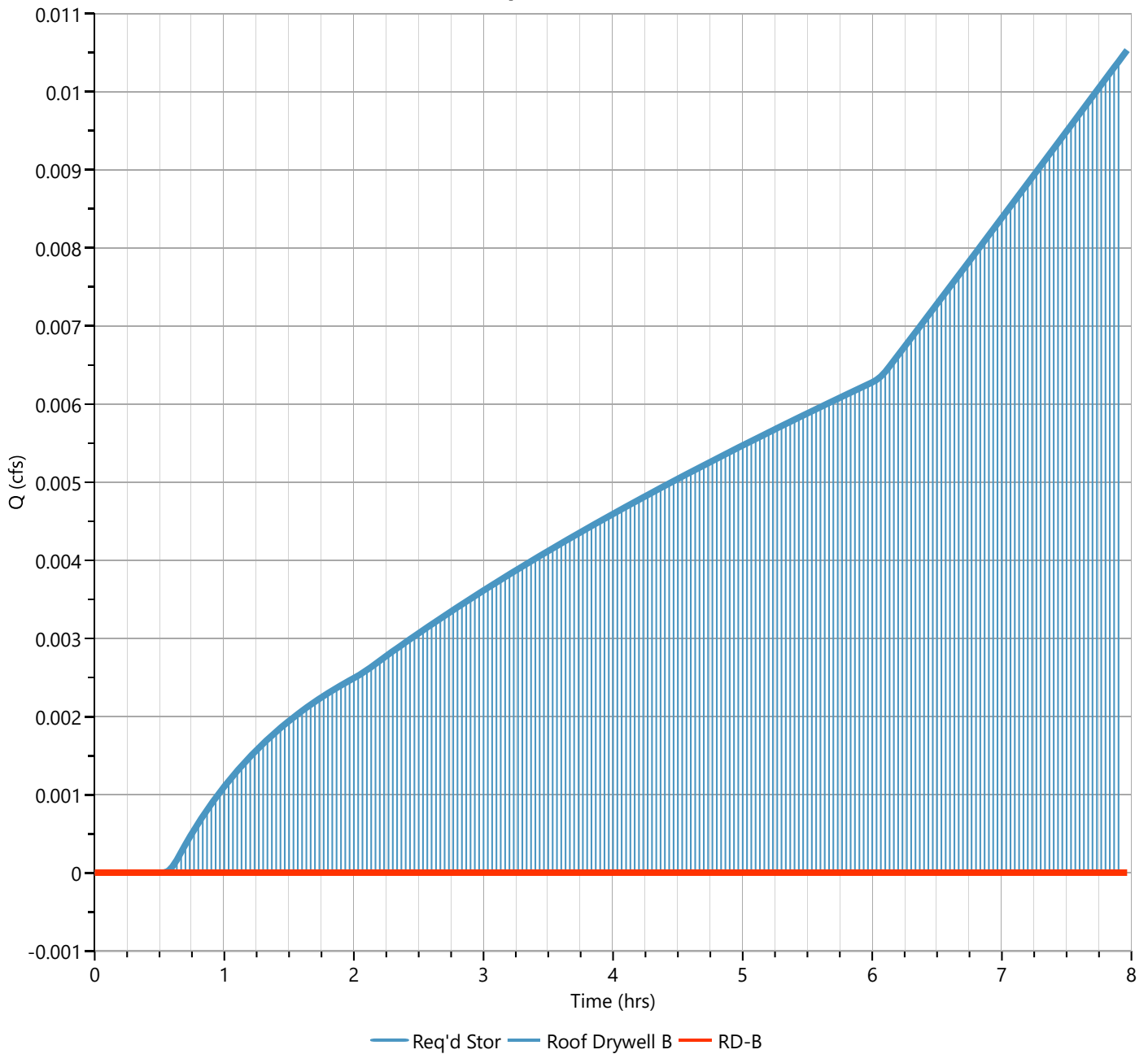
RD-B

Hyd. No. 77

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 7.90 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 76 - Roof Drywell B	Max. Elevation	= 4.74 ft
Pond Name	= RD-B	Max. Storage	= 438 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Roof Drywell B

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
-	Impervious	98			0.04	4.03
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			0.00	0.00
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					0.04	4.03

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{4.03}{0.04} = 98.00 ; \text{ Use CN} = \boxed{98}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	3.00	4.77	7.59

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Hydrograph Report

Project Name:

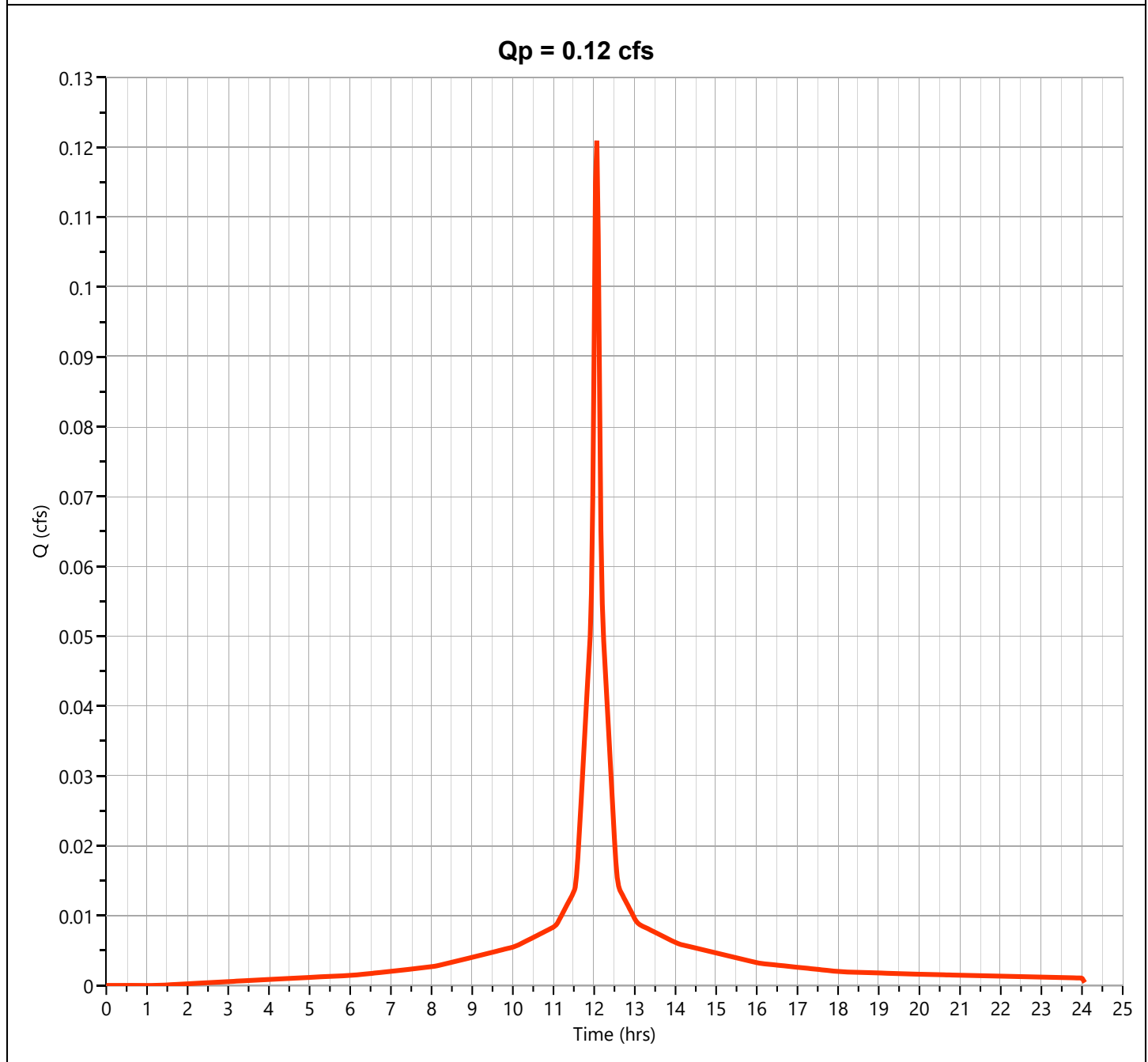
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell C

Hyd. No. 79

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.121 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 408 cuft
Drainage Area	= 0.04 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

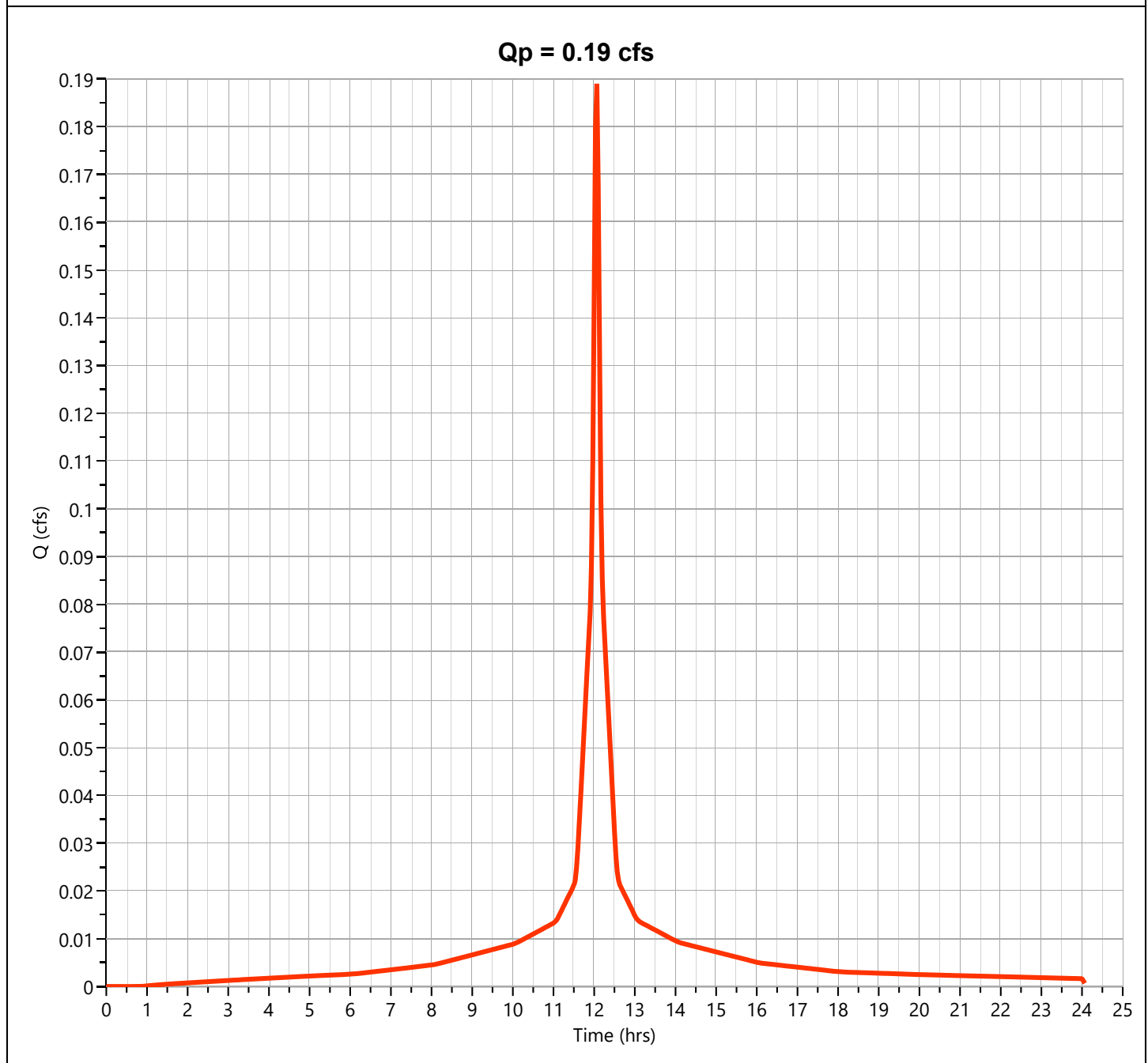
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell C

Hyd. No. 79

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.189 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 650 cuft
Drainage Area	= 0.04 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

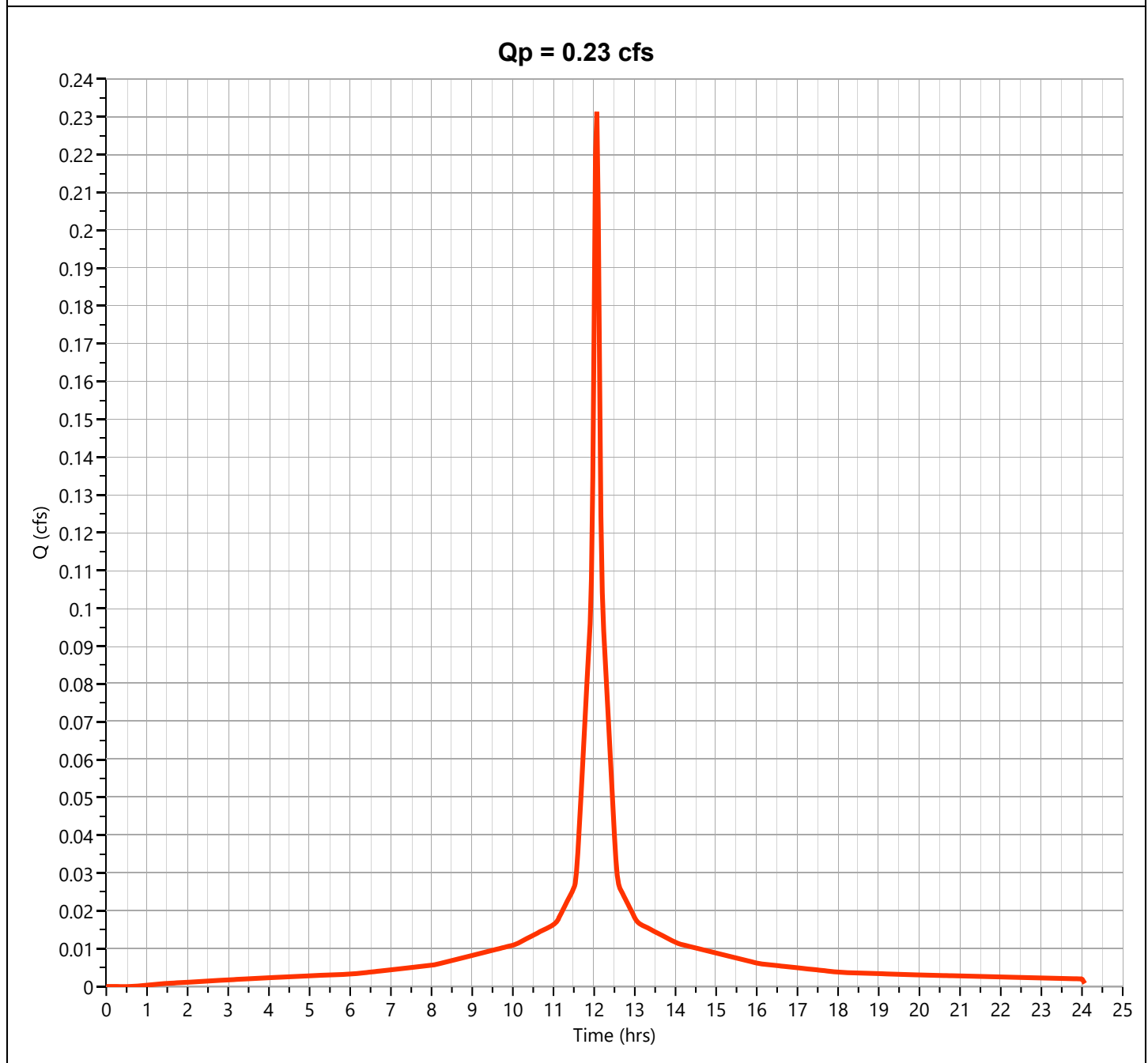
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell C

Hyd. No. 79

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.231 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 801 cuft
Drainage Area	= 0.04 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

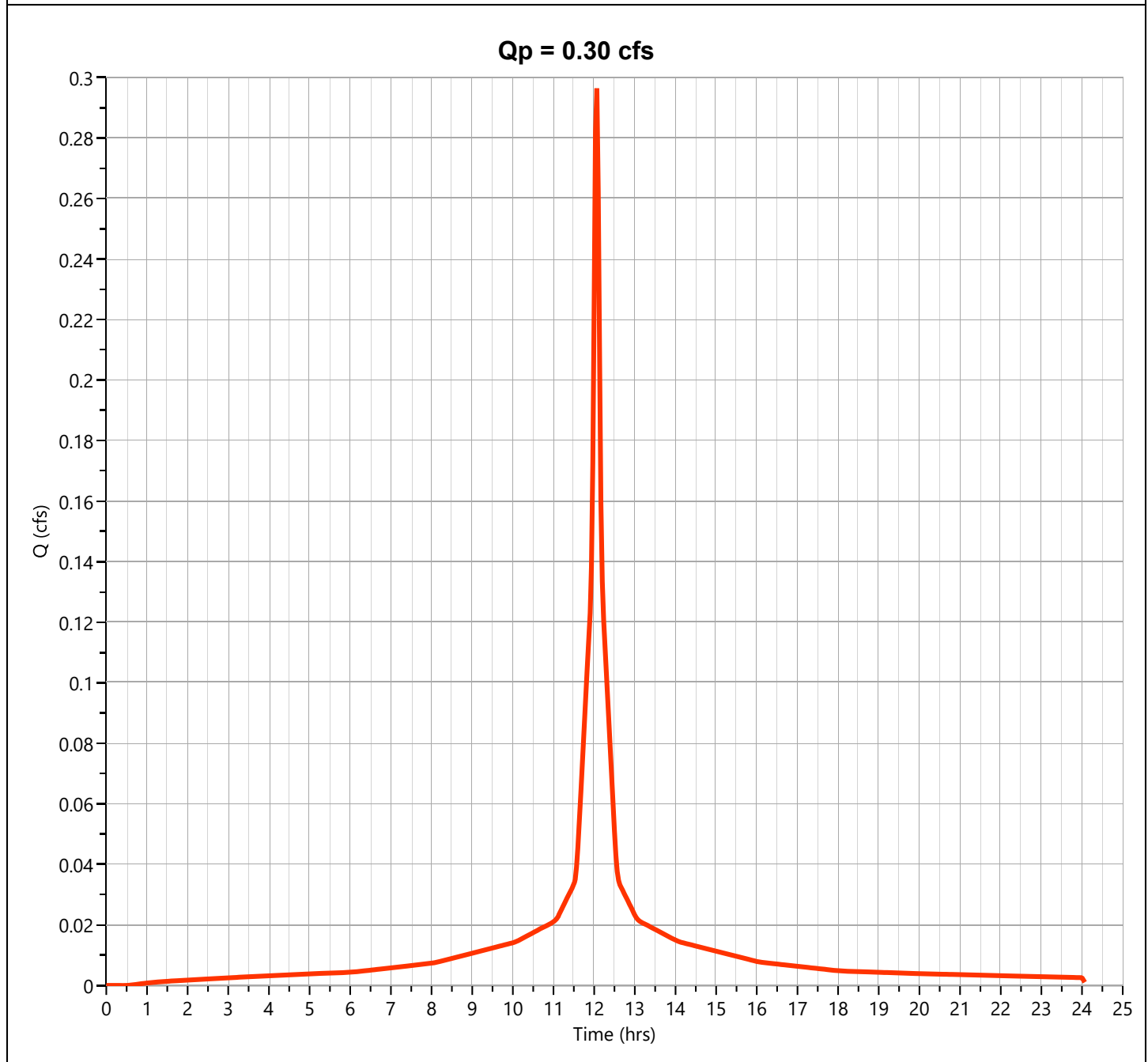
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell C

Hyd. No. 79

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.296 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 1,033 cuft
Drainage Area	= 0.04 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

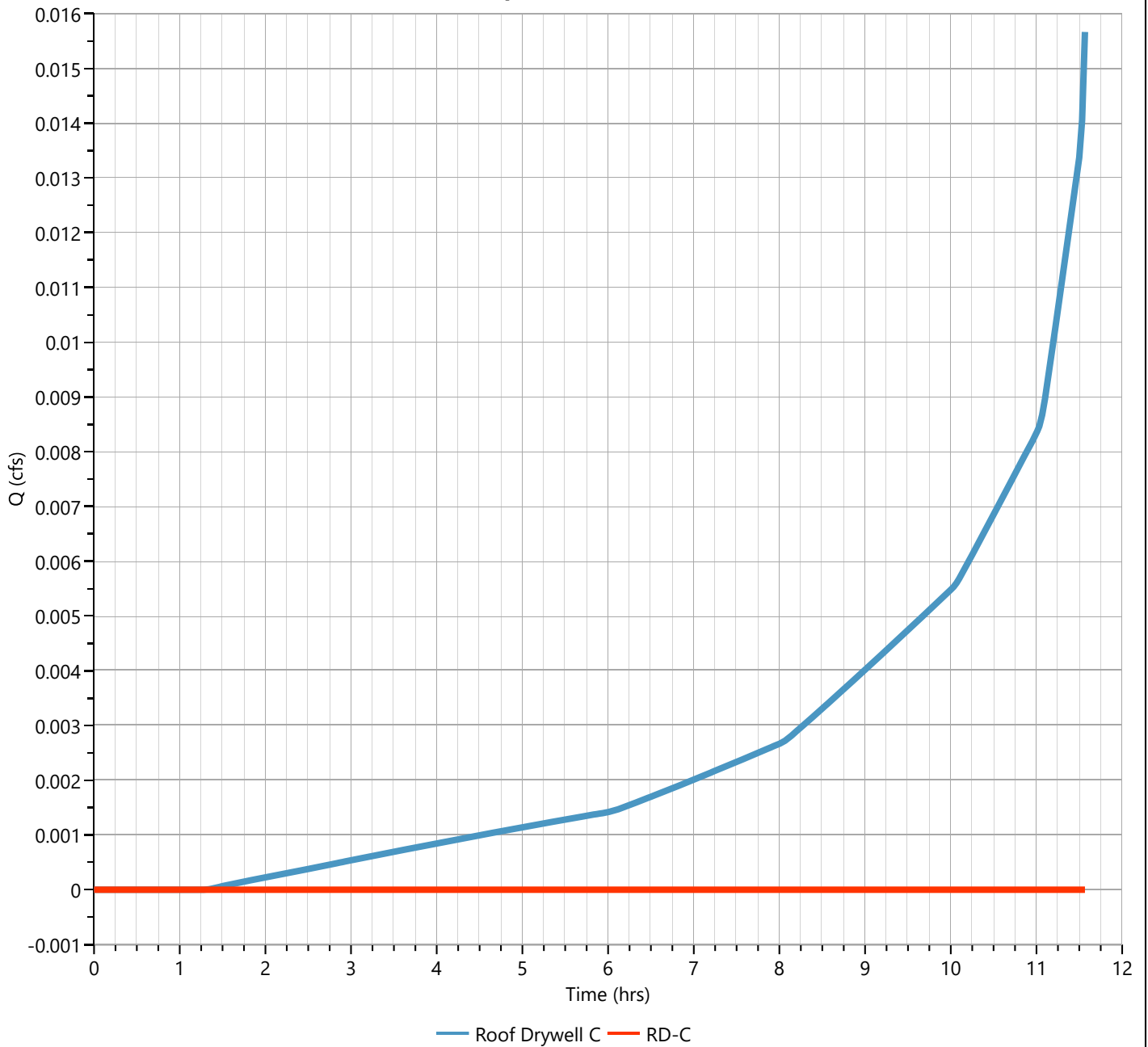
RD-C

Hyd. No. 80

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 11.53 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 79 - Roof Drywell C	Max. Elevation	= 1.91 ft
Pond Name	= RD-C	Max. Storage	= 66.3 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

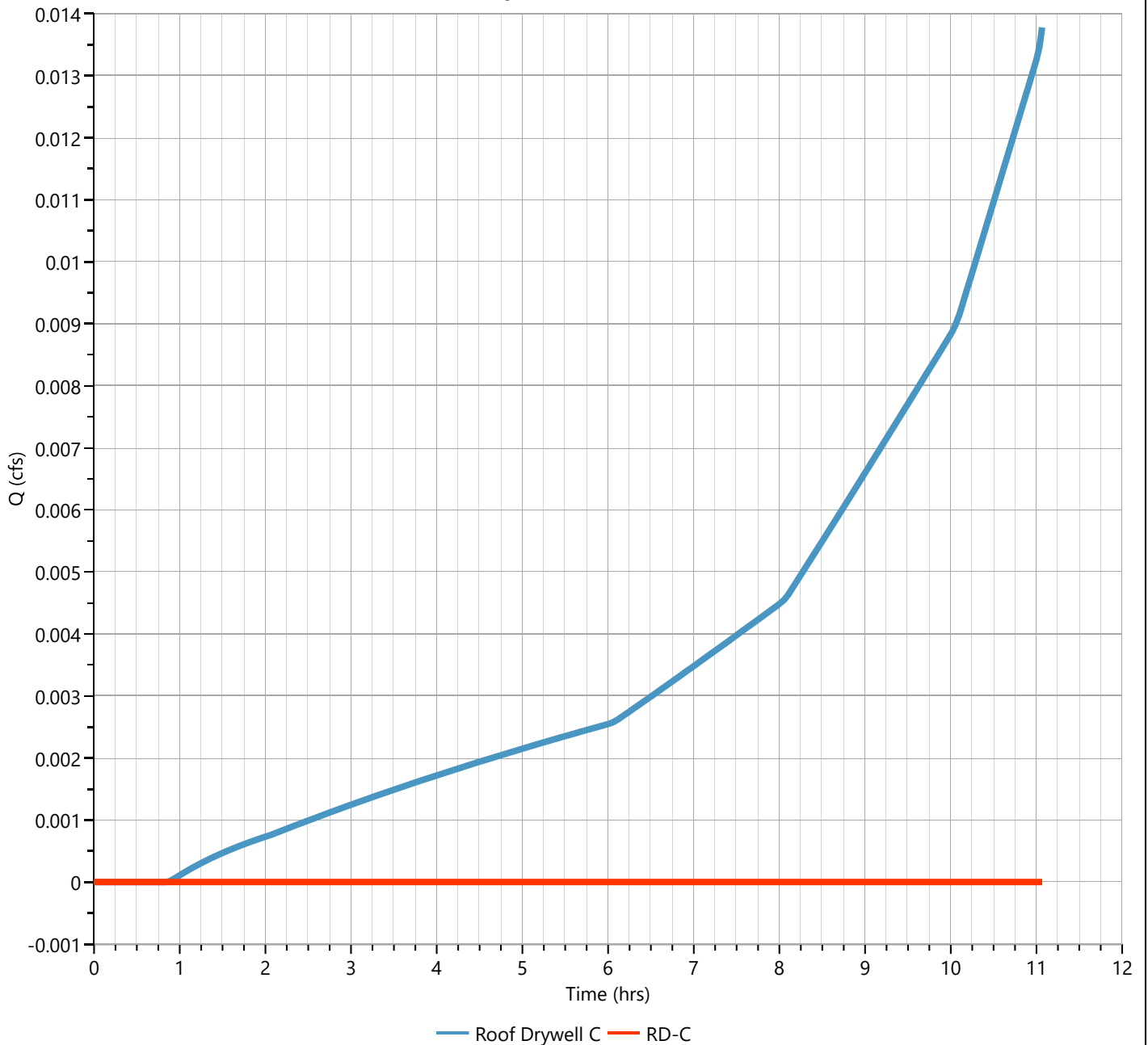
RD-C

Hyd. No. 80

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 11.03 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 79 - Roof Drywell C	Max. Elevation	= 2.67 ft
Pond Name	= RD-C	Max. Storage	= 148 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

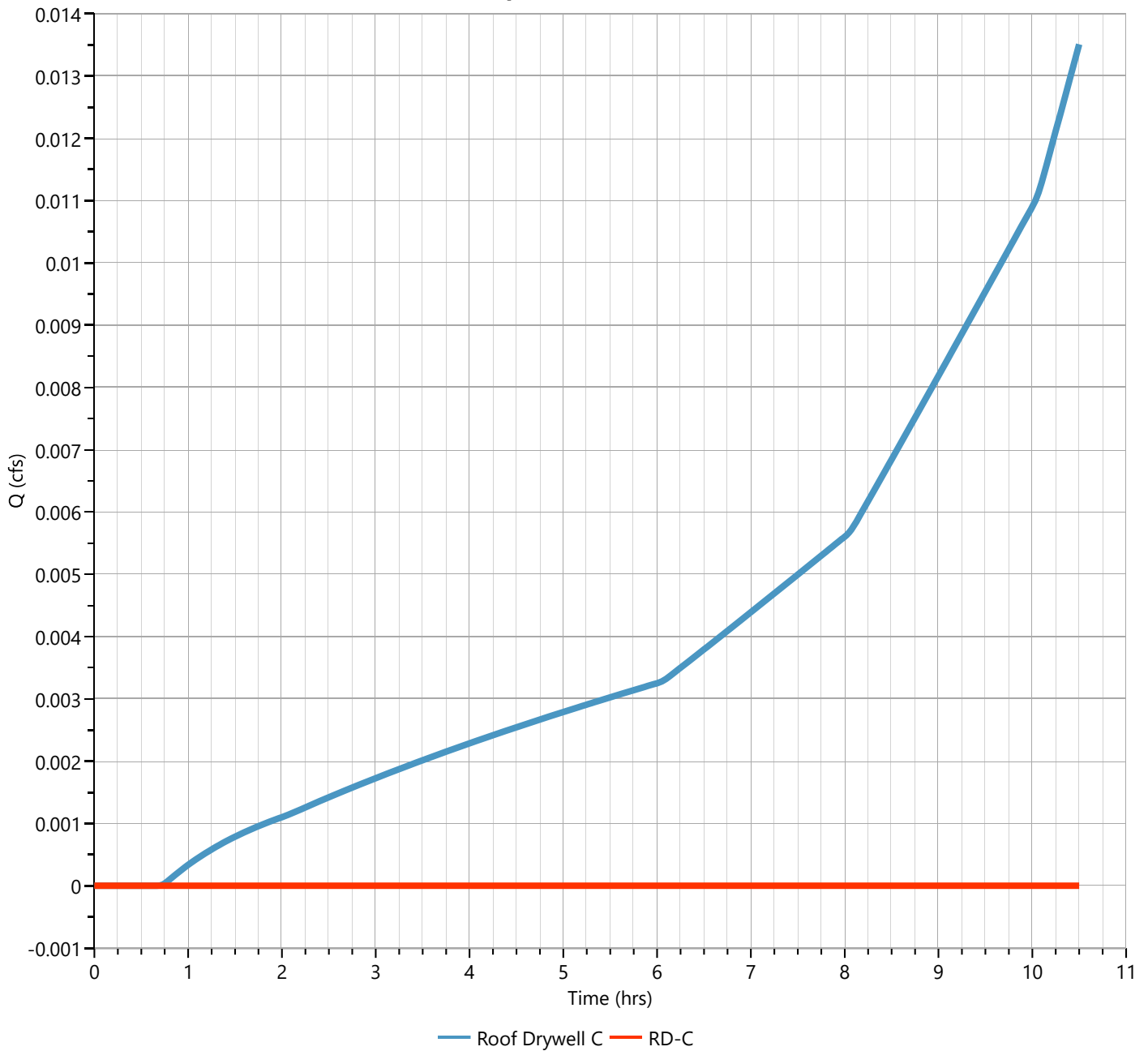
RD-C

Hyd. No. 80

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 10.47 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 79 - Roof Drywell C	Max. Elevation	= 3.19 ft
Pond Name	= RD-C	Max. Storage	= 201 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

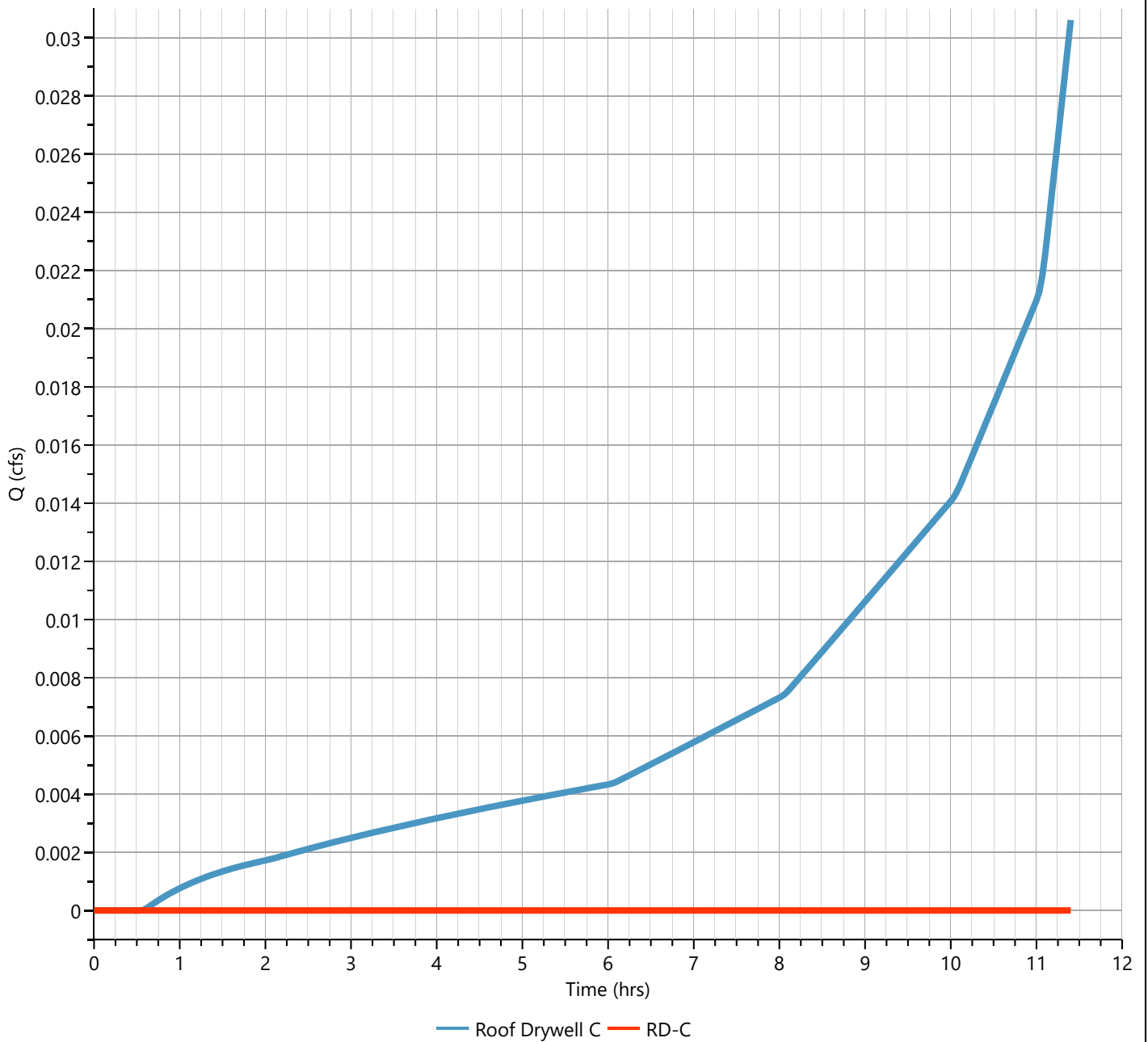
RD-C

Hyd. No. 80

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 11.37 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 79 - Roof Drywell C	Max. Elevation	= 4.12 ft
Pond Name	= RD-C	Max. Storage	= 286 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Pond Report

Project Name:

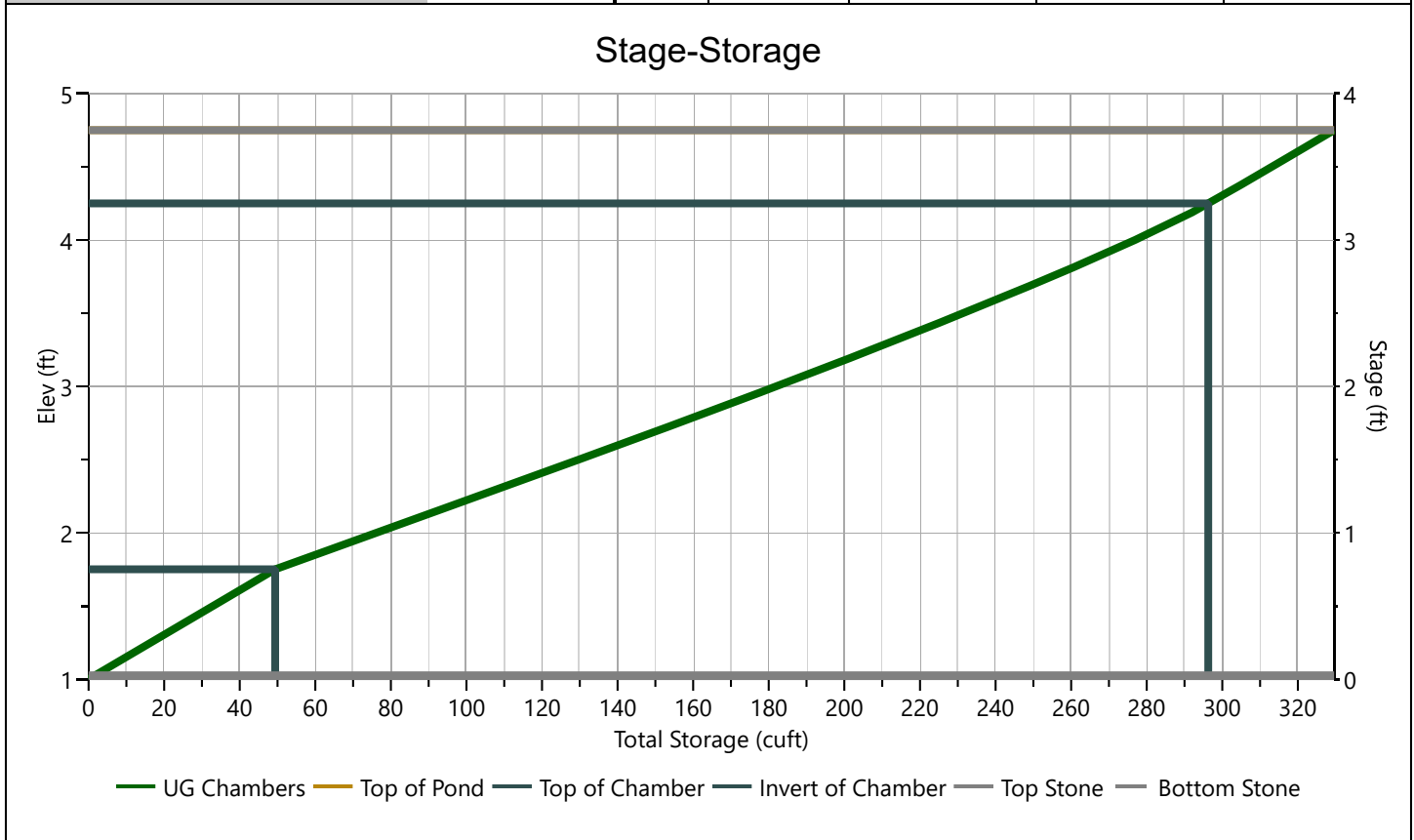
Hydrology Studio v 3.0.0.29

12-13-2023

RD-C

Stage-Storage

StormTech® SC-740™ Chamber		Stage / Storage Table				
Description	Input	Stage (in)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Chamber Height, in	30	0.0	1.00	165	0.000	0.000
Chamber Shape	Arch	2.3	1.19	165	12.3	12.3
Chamber Width, in	51	4.5	1.38	165	12.3	24.7
Installed Length, ft	7.12	6.8	1.56	165	12.3	37.0
No. Chambers	3	9.0	1.75	165	12.3	49.4
Bare Chamber Stor, cuft	138	11.3	1.94	165	20.1	69.5
No. Rows	3	13.5	2.13	165	20.2	89.7
Space Between Rows, in	6	15.8	2.31	165	20.1	110
Stone Above, in	6	18.0	2.50	165	20.0	130
Stone Below, in	9	20.3	2.69	165	19.8	150
Stone Sides, in	12	22.5	2.88	165	19.5	169
Stone Ends, in	12	24.8	3.06	165	19.2	188
Encasement Voids, %	40.00	27.0	3.25	165	18.9	207
Encasement Bottom Elevation, ft	1.00	29.3	3.44	165	18.4	226
		31.5	3.63	165	17.9	243
		33.8	3.81	165	17.2	261
		36.0	4.00	165	16.3	277
		38.3	4.19	165	15.0	292
		40.5	4.38	165	12.9	305
		42.8	4.56	165	12.3	317
		45.0	4.75	165	12.3	330



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

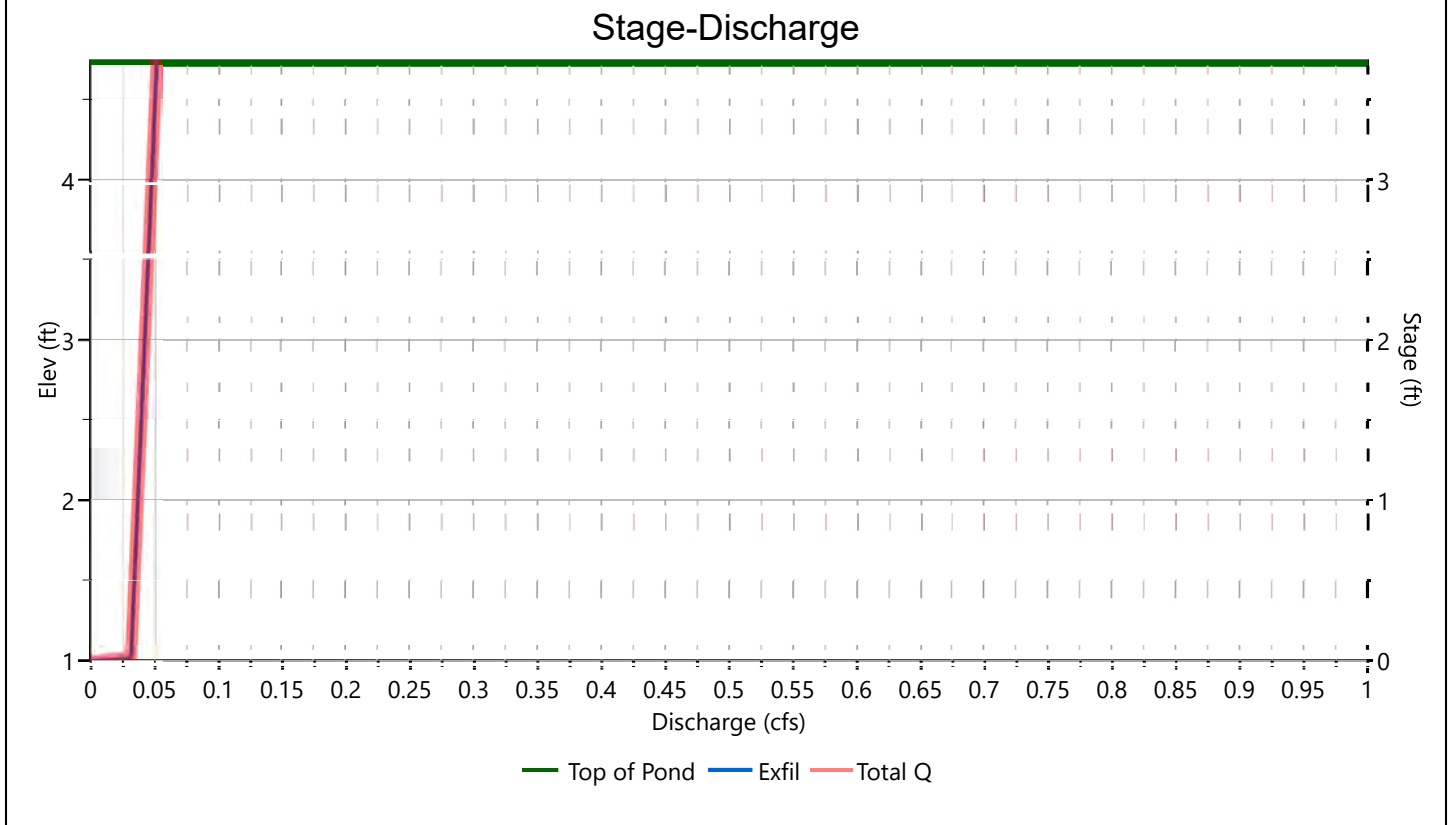
12-13-2023

RD-C

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in					Hole Diameter, in
Span, in					No. holes
No. Barrels					Invert Elevation, ft
Invert Elevation, ft					Height, ft
Orifice Coefficient, Co					Orifice Coefficient, Co
Length, ft					
Barrel Slope, %					
N-Value, n	0.000				
Weirs	Riser*	Weirs			Ancillary
		1	2	3	
Shape / Type					Exfiltration, in/hr
Crest Elevation, ft					8.27**
Crest Length, ft					
Angle, deg					
Weir Coefficient, Cw					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

RD-C

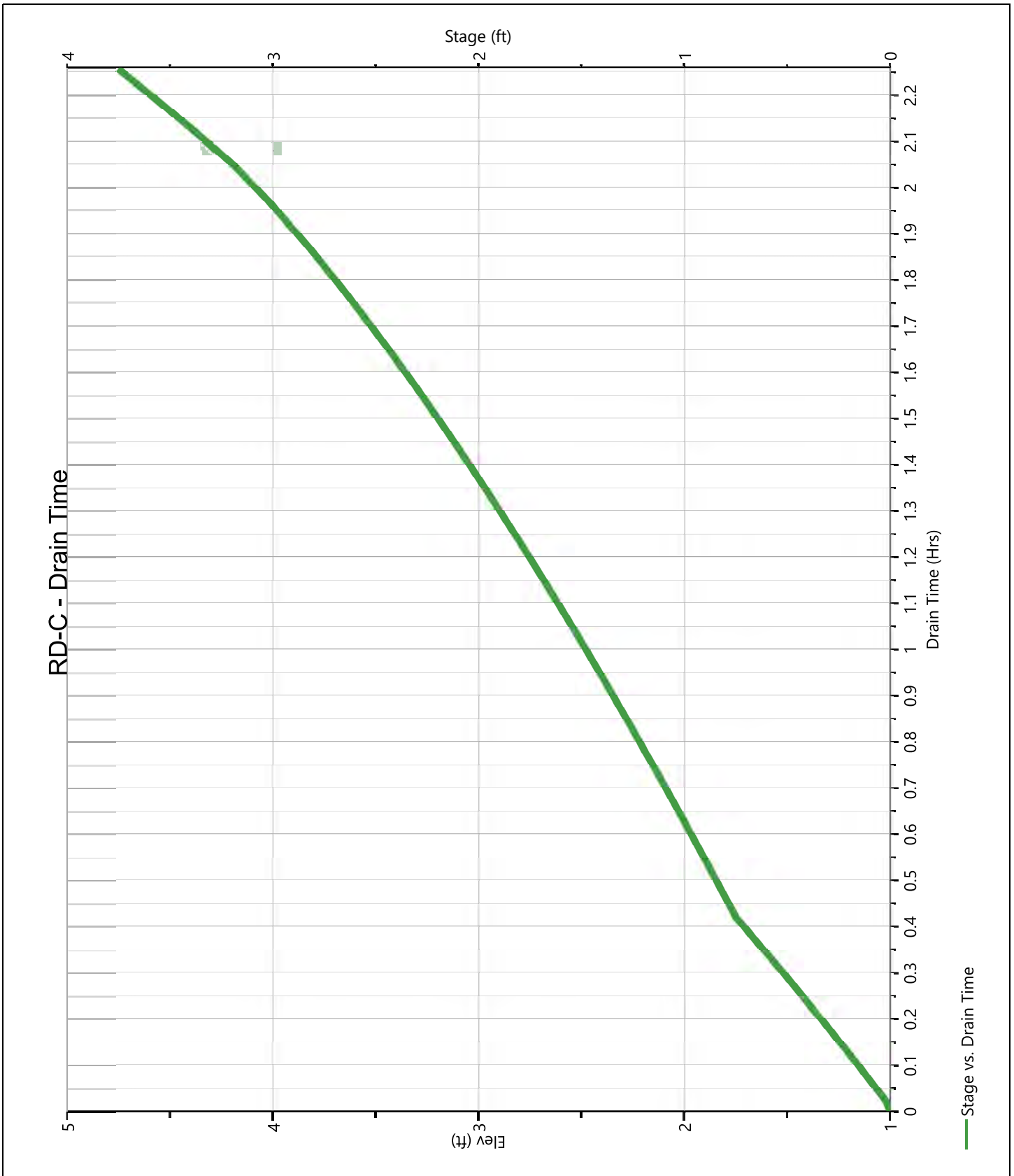
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	1.00	0.000									0.000		0.000	
0.19	1.19	12.3									0.033		0.033	
0.38	1.38	24.7									0.034		0.034	
0.56	1.56	37.0									0.035		0.035	
0.75	1.75	49.4									0.036		0.036	
0.94	1.94	69.5									0.037		0.037	
1.13	2.13	89.7									0.038		0.038	
1.31	2.31	110									0.039		0.039	
1.50	2.50	130									0.040		0.040	
1.69	2.69	150									0.041		0.041	
1.88	2.88	169									0.042		0.042	
2.06	3.06	188									0.043		0.043	
2.25	3.25	207									0.044		0.044	
2.44	3.44	226									0.045		0.045	
2.63	3.63	243									0.046		0.046	
2.81	3.81	261									0.047		0.047	
3.00	4.00	277									0.048		0.048	
3.19	4.19	292									0.049		0.049	
3.38	4.38	305									0.050		0.050	
3.56	4.56	317									0.051		0.051	
3.75	4.75	330									0.052		0.052	

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

RD-C

Pond Drawdown



Worksheet 2: Runoff curve number and runoff

SM-6781

Project: Stow Acres By PFK Date 12/12/23

Location: Stow, MA Checked _____ Date _____

Circle one: Present **Developed** Roof Drywell E

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area Acres	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4		
-	Impervious	98			0.25	24.93
A	Woods - Good Condition	30			0.00	0.00
A	Open Space - Good Condition	39			0.00	0.00
C	Woods - Good Condition	70			0.00	0.00
C	Open Space - Good Condition	74			0.00	0.00
D	BVW	77			0.00	0.00
A	Gravel	76			0.00	0.00
A	OFFSITE AREA - 1 ACRE LOTS	51			0.00	0.00
C	OFFSITE AREA - 1 ACRE LOTS	79			0.00	0.00
Totals =					0.25	24.93

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{24.93}{0.25} = 98.00 ; \text{ Use CN} = \boxed{98}$$

2. Runoff

	Storm #1	Storm #2	Storm #3
Frequency..... yr	2	10	100
Rainfall, P (24-hour)..... in	3.23	5.01	7.83
Runoff, Q..... in	3.00	4.77	7.59

(Use P and CN with table 2-1, fig. 2-1, or eqs. 2-3 and 2-4.)

Hydrograph Report

Project Name:

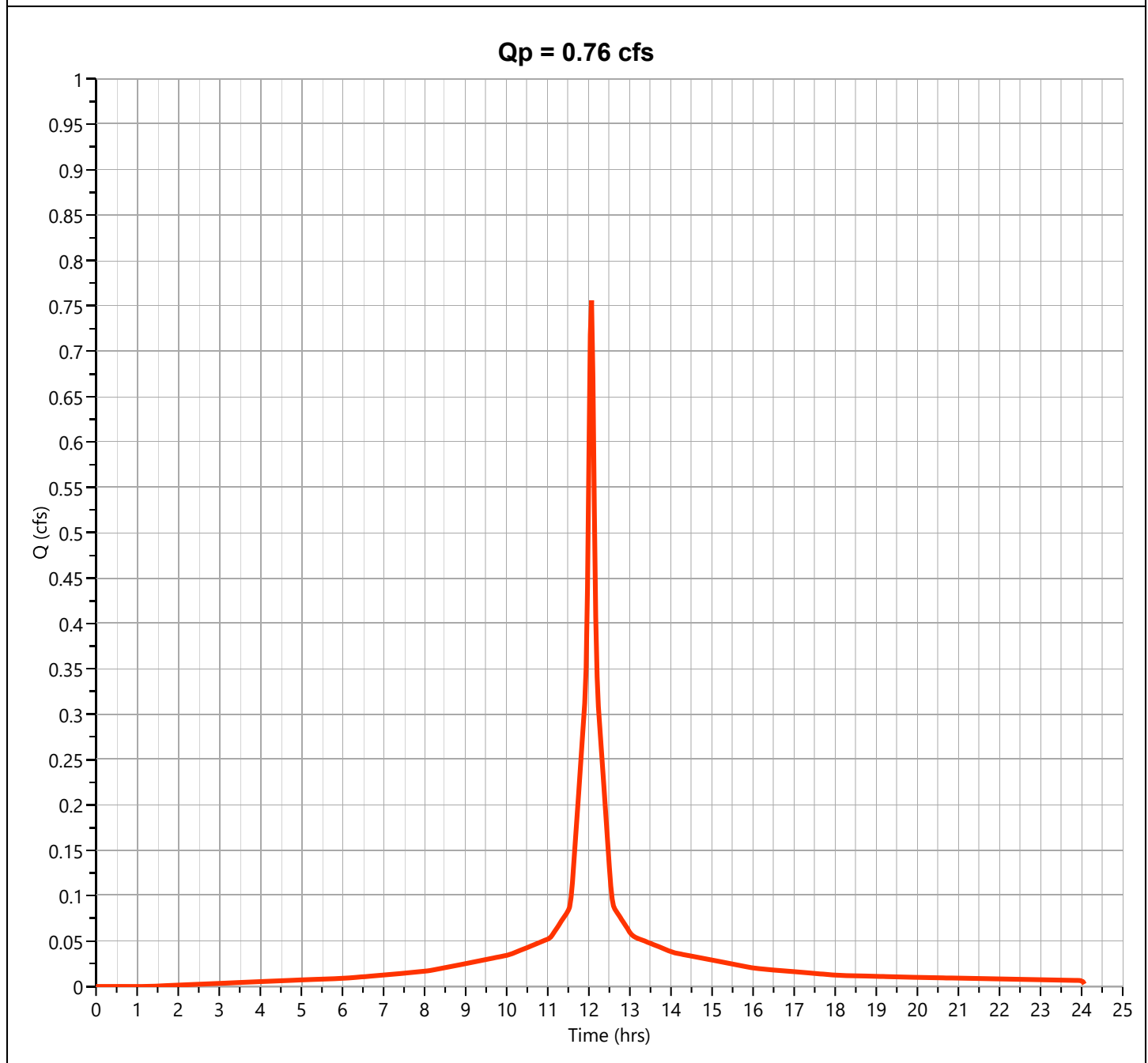
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell E

Hyd. No. 82

Hydrograph Type	= NRCS Runoff	Peak Flow	= 0.756 cfs
Storm Frequency	= 2-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 2,550 cuft
Drainage Area	= 0.25 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 3.23 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

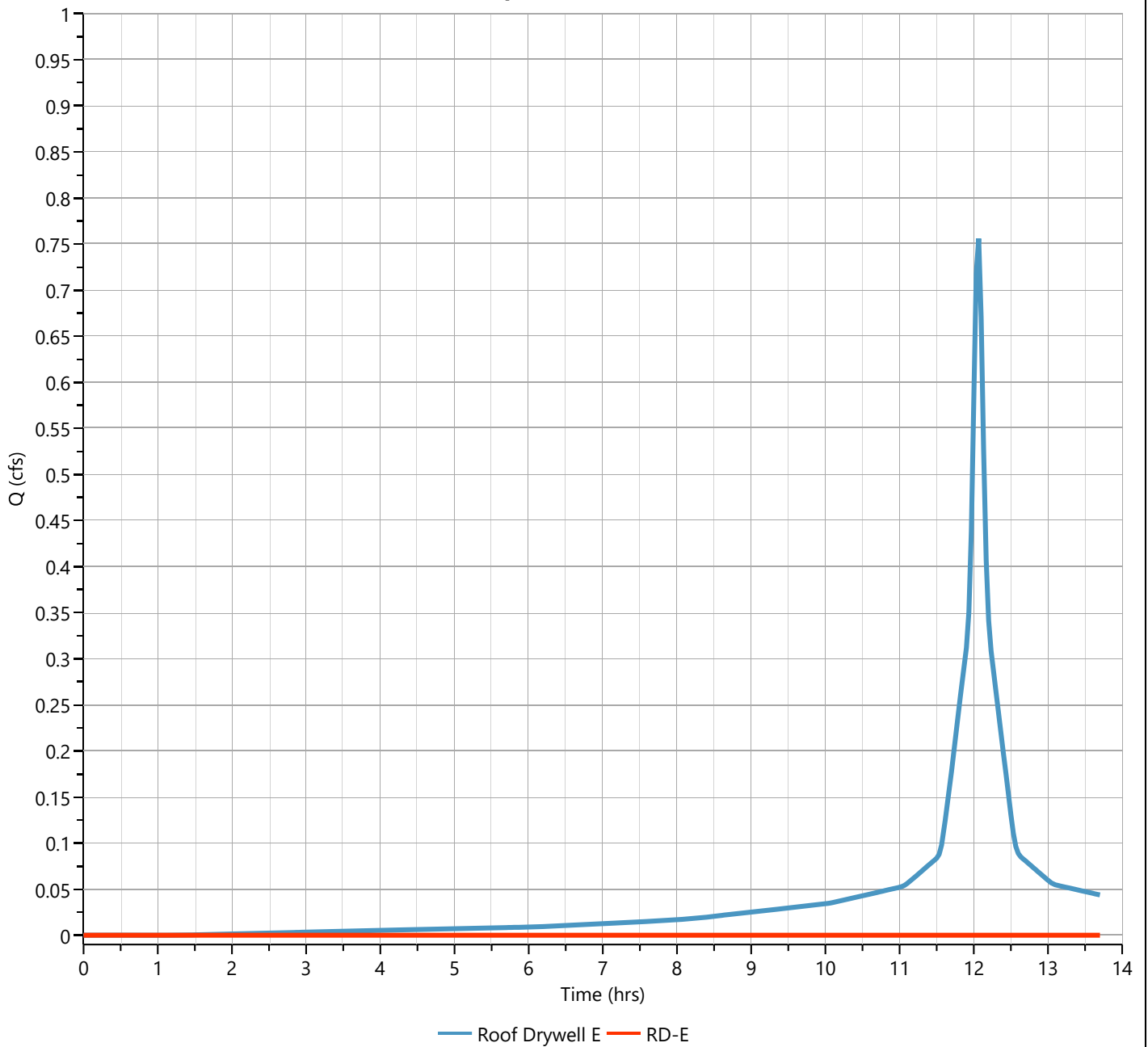
RD-E

Hyd. No. 83

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 2-yr	Time to Peak	= 13.67 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 82 - Roof Drywell E	Max. Elevation	= 222.15 ft
Pond Name	= RD-E	Max. Storage	= 485 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Pond Report

Project Name:

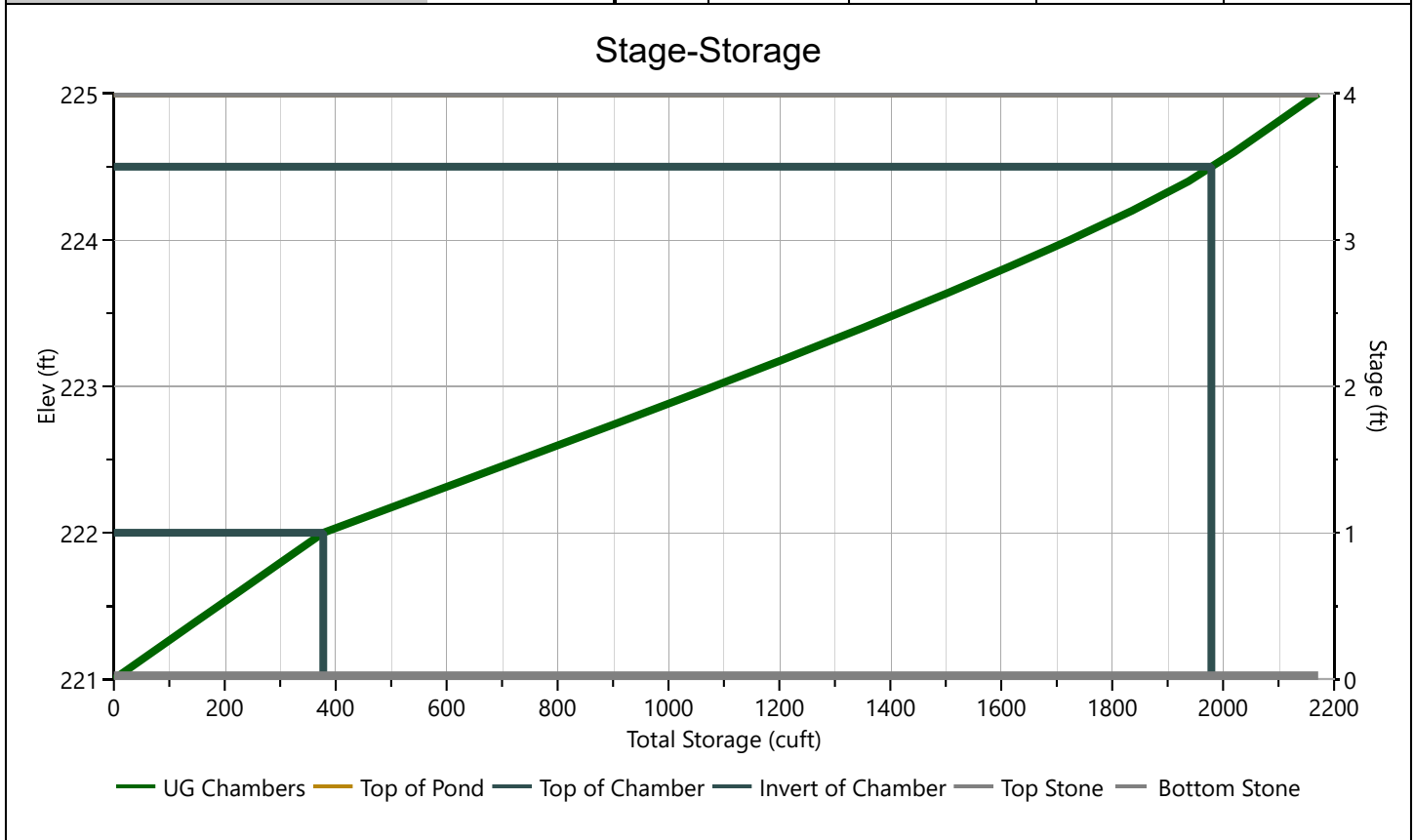
Hydrology Studio v 3.0.0.29

12-13-2023

RD-E

Stage-Storage

StormTech® SC-740™ Chamber		Stage / Storage Table				
Description	Input	Stage (in)	Elevation (ft)	Contour Area (sqft)	Incr. Storage (cuft)	Total Storage (cuft)
Chamber Height, in	30	0.0	221.00	944	0.000	0.000
Chamber Shape	Arch	2.4	221.20	944	75.5	75.5
Chamber Width, in	51	4.8	221.40	944	75.5	151
Installed Length, ft	7.12	7.2	221.60	944	75.5	227
No. Chambers	24	9.6	221.80	944	75.5	302
Bare Chamber Stor, cuft	1,102	12.0	222.00	944	75.5	378
No. Rows	4	14.4	222.20	944	142	520
Space Between Rows, in	6	16.8	222.40	944	142	662
Stone Above, in	6	19.2	222.60	944	141	803
Stone Below, in	12	21.6	222.80	944	140	943
Stone Sides, in	12	24.0	223.00	944	138	1,082
Stone Ends, in	12	26.4	223.20	944	136	1,218
Encasement Voids, %	40.00	28.8	223.40	944	133	1,351
Encasement Bottom Elevation, ft	221.00	31.2	223.60	944	129	1,480
		33.6	223.80	944	125	1,605
		36.0	224.00	944	119	1,724
		38.4	224.20	944	112	1,836
		40.8	224.40	944	102	1,937
		43.2	224.60	944	83.1	2,020
		45.6	224.80	944	75.5	2,096
		48.0	225.00	944	75.5	2,172



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

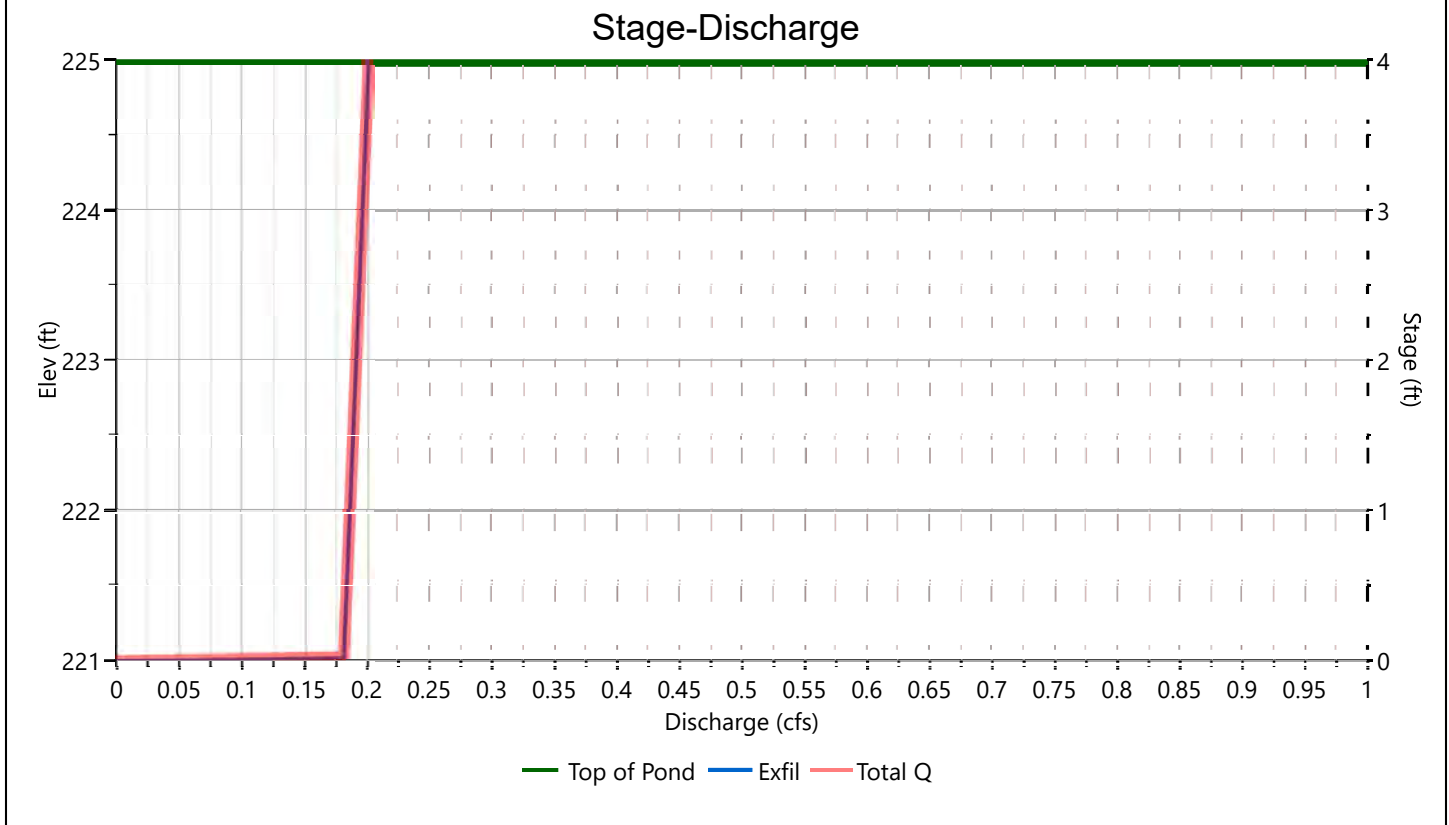
12-13-2023

RD-E

Stage-Discharge

Culvert / Orifices	Culvert	Orifices			Perforated Riser
		1	2	3	
Rise, in					Hole Diameter, in
Span, in					No. holes
No. Barrels					Invert Elevation, ft
Invert Elevation, ft					Height, ft
Orifice Coefficient, Co					Orifice Coefficient, Co
Length, ft					
Barrel Slope, %					
N-Value, n	0.000				
Weirs	Riser*	Weirs			Ancillary
		1	2	3	
Shape / Type					Exfiltration, in/hr
Crest Elevation, ft					8.27**
Crest Length, ft					
Angle, deg					
Weir Coefficient, Cw					

*Routes through Culvert. **Exfiltration extracted from outflow hydrograph. Rate applied to contours.



Pond Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

RD-E

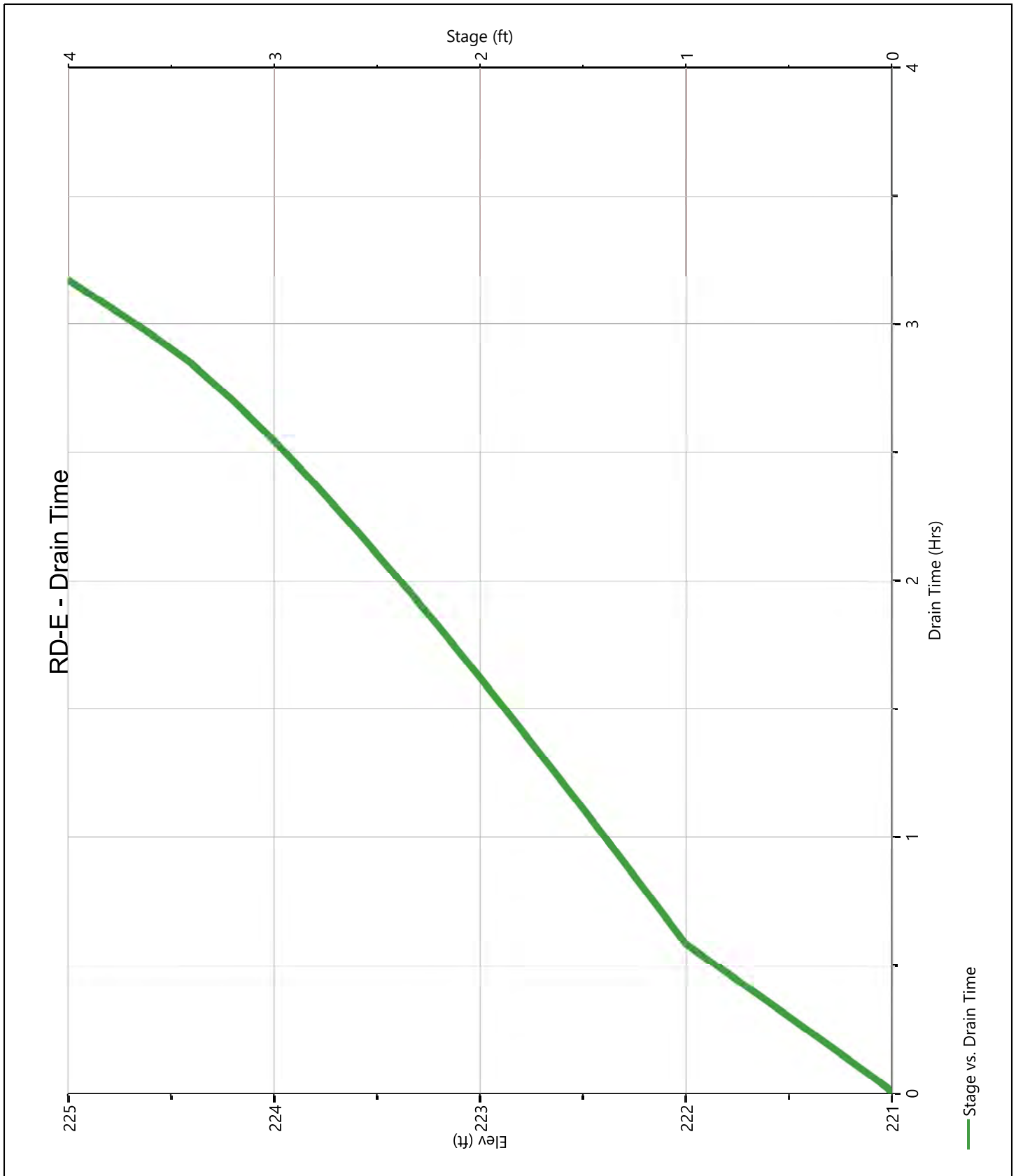
Stage-Storage-Discharge Summary

Stage (ft)	Elev. (ft)	Storage (cuft)	Culvert (cfs)	Orifices, cfs			Riser (cfs)	Weirs, cfs			Pf Riser (cfs)	Exfil (cfs)	User (cfs)	Total (cfs)
				1	2	3		1	2	3				
0.00	221.00	0.000									0.000		0.000	
0.20	221.20	75.5									0.182		0.182	
0.40	221.40	151									0.183		0.183	
0.60	221.60	227									0.184		0.184	
0.80	221.80	302									0.185		0.185	
1.00	222.00	378									0.186		0.186	
1.20	222.20	520									0.187		0.187	
1.40	222.40	662									0.188		0.188	
1.60	222.60	803									0.189		0.189	
1.80	222.80	943									0.190		0.190	
2.00	223.00	1,082									0.191		0.191	
2.20	223.20	1,218									0.192		0.192	
2.40	223.40	1,351									0.193		0.193	
2.60	223.60	1,480									0.194		0.194	
2.80	223.80	1,605									0.195		0.195	
3.00	224.00	1,724									0.196		0.196	
3.20	224.20	1,836									0.197		0.197	
3.40	224.40	1,937									0.198		0.198	
3.60	224.60	2,020									0.199		0.199	
3.80	224.80	2,096									0.200		0.200	
4.00	225.00	2,172									0.201		0.201	

Suffix key: ic = inlet control, oc = outlet control, s = submerged weir

RD-E

Pond Drawdown



Hydrograph Report

Project Name:

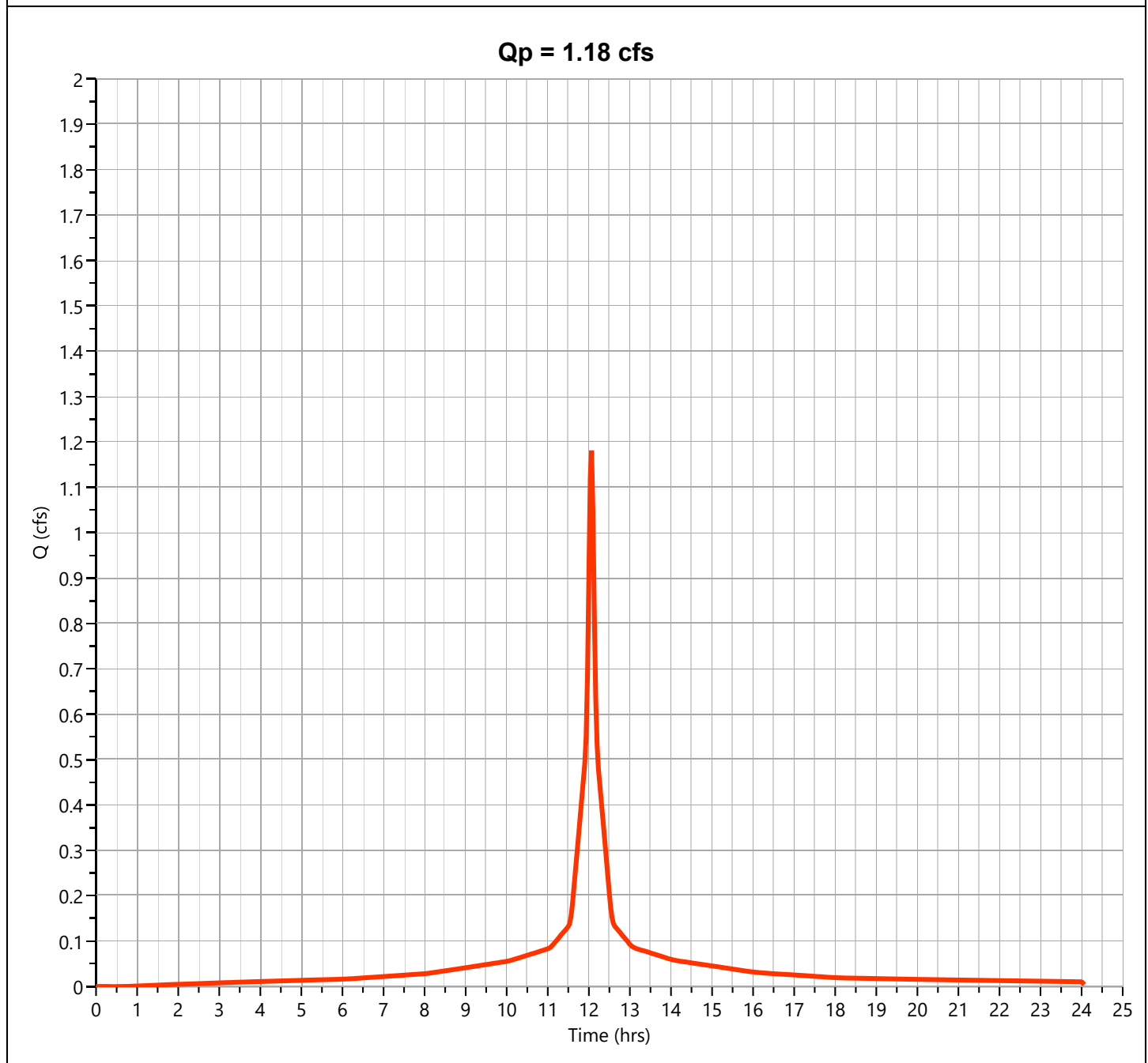
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell E

Hyd. No. 82

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.181 cfs
Storm Frequency	= 10-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 4,061 cuft
Drainage Area	= 0.25 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 5.01 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

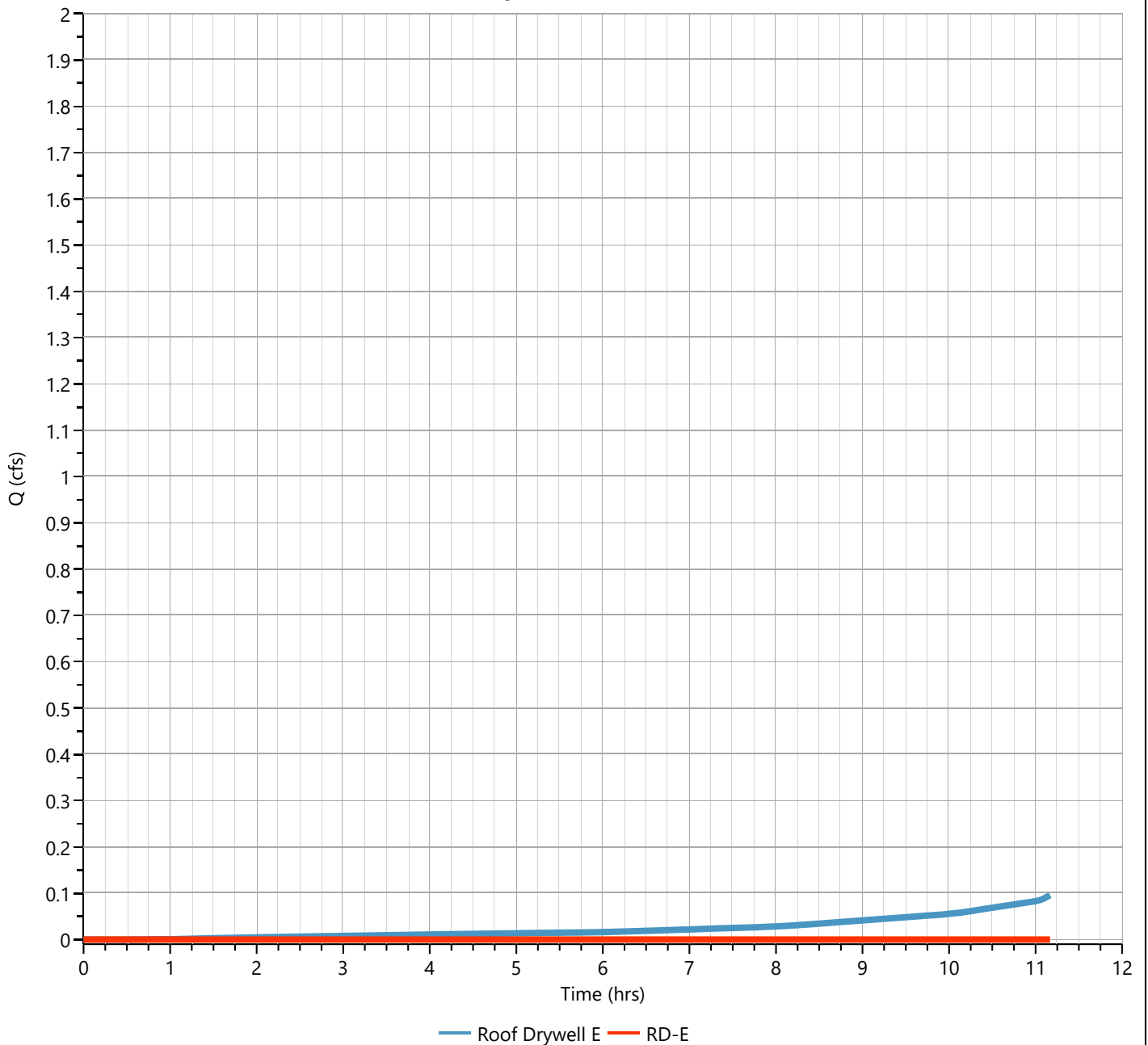
RD-E

Hyd. No. 83

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 10-yr	Time to Peak	= 11.10 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 82 - Roof Drywell E	Max. Elevation	= 222.96 ft
Pond Name	= RD-E	Max. Storage	= 1,051 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

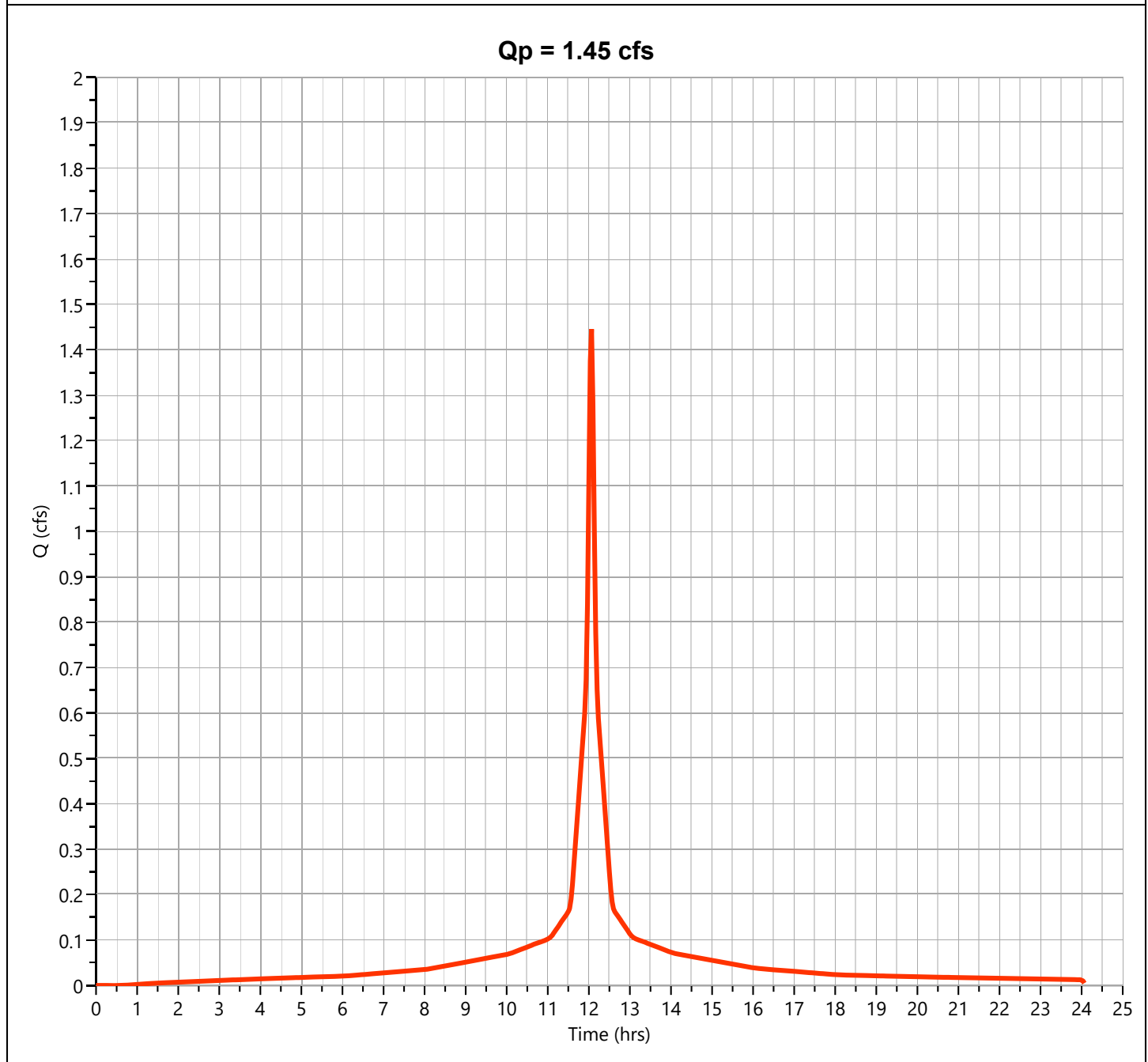
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell E

Hyd. No. 82

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.446 cfs
Storm Frequency	= 25-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 5,004 cuft
Drainage Area	= 0.25 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 6.12 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

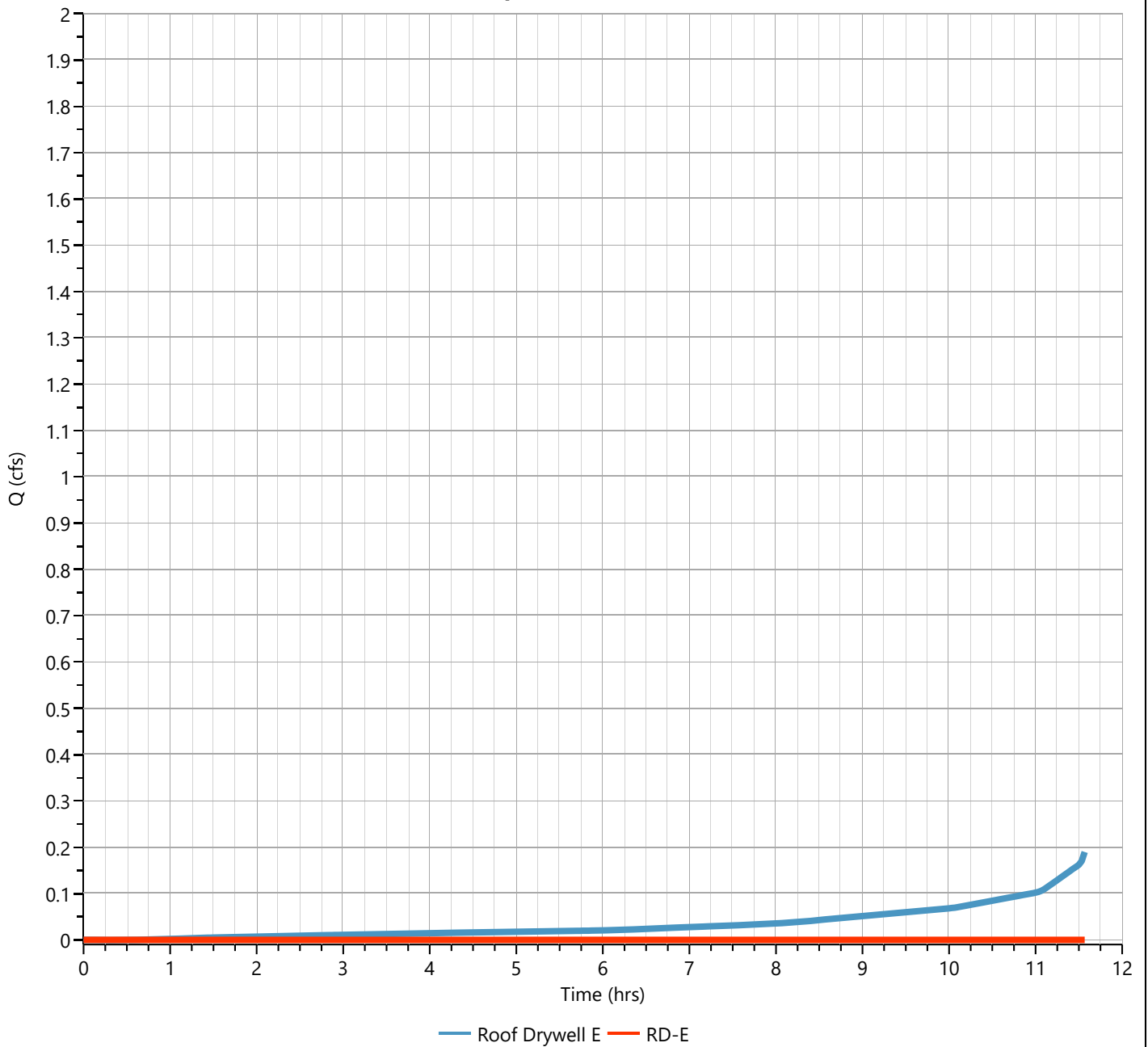
RD-E

Hyd. No. 83

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 25-yr	Time to Peak	= 11.53 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 82 - Roof Drywell E	Max. Elevation	= 223.51 ft
Pond Name	= RD-E	Max. Storage	= 1,423 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Hydrograph Report

Project Name:

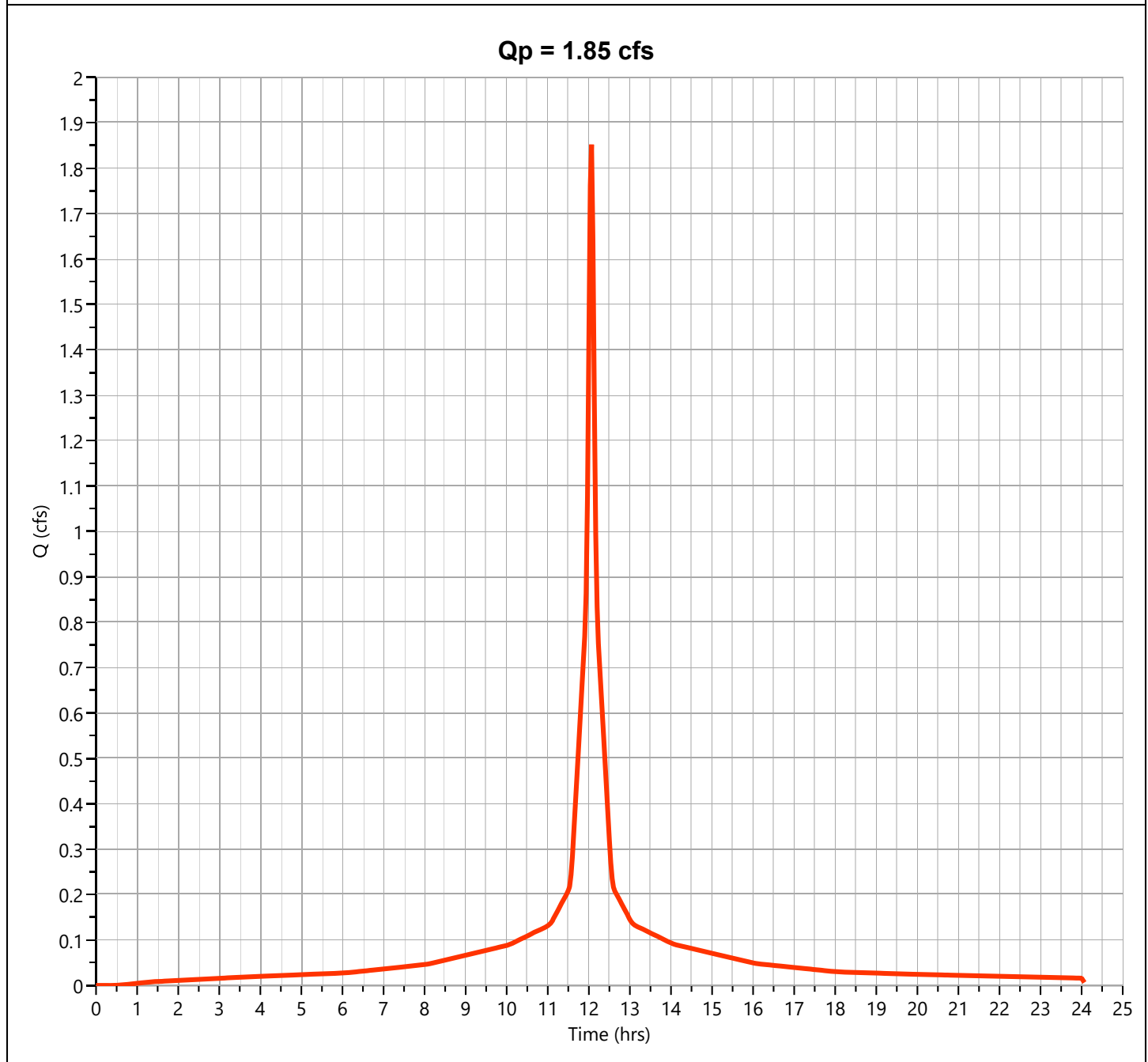
Hydrology Studio v 3.0.0.29

12-13-2023

Roof Drywell E

Hyd. No. 82

Hydrograph Type	= NRCS Runoff	Peak Flow	= 1.852 cfs
Storm Frequency	= 100-yr	Time to Peak	= 12.07 hrs
Time Interval	= 2 min	Runoff Volume	= 6,458 cuft
Drainage Area	= 0.25 ac	Curve Number	= 98
Tc Method	= User	Time of Conc. (Tc)	= 6.0 min
Total Rainfall	= 7.83 in	Design Storm	= Type III
Storm Duration	= 24 hrs	Shape Factor	= 484



Hydrograph Report

Project Name:

Hydrology Studio v 3.0.0.29

12-13-2023

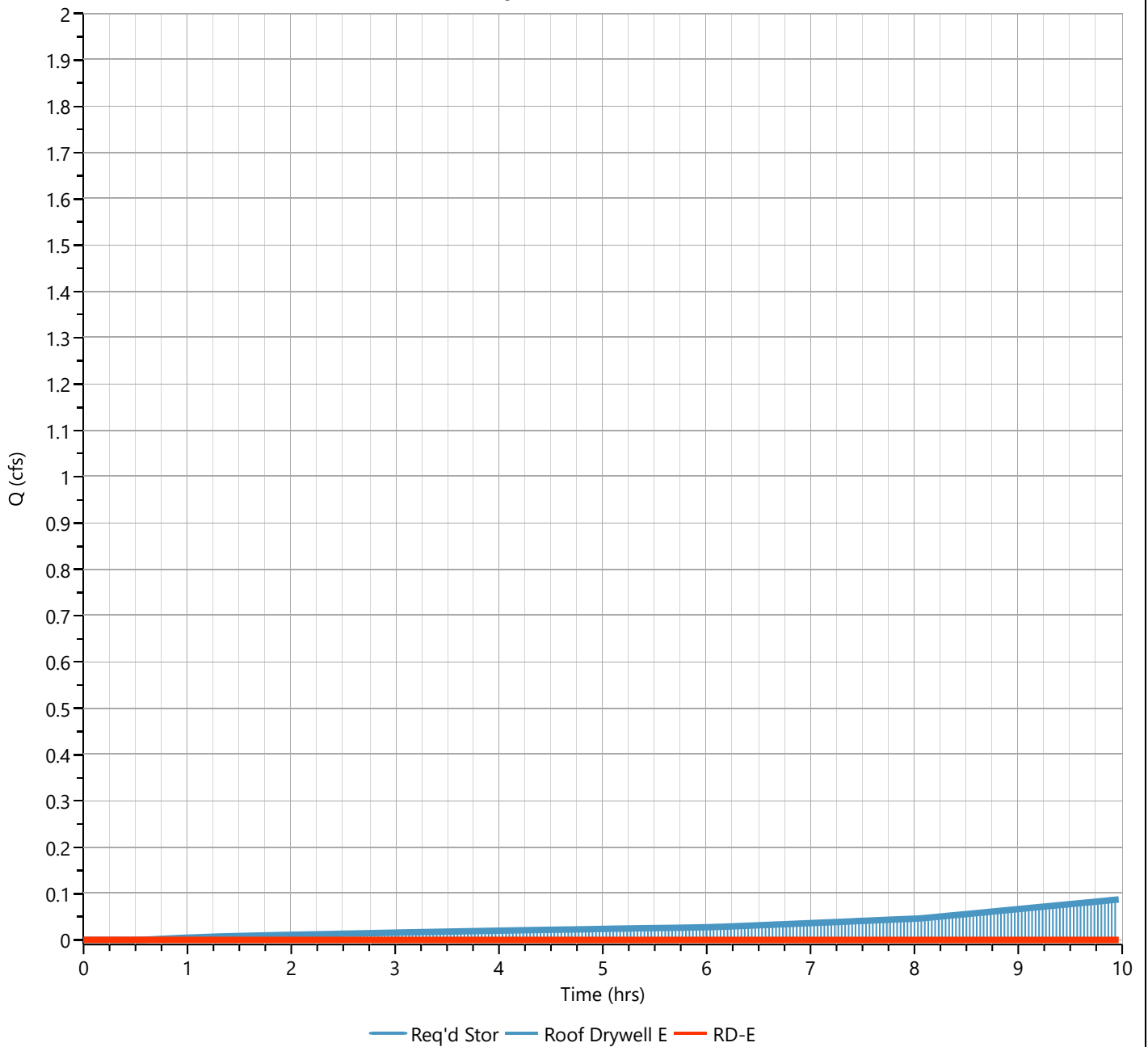
RD-E

Hyd. No. 83

Hydrograph Type	= Pond Route	Peak Flow	= 0.000 cfs
Storm Frequency	= 100-yr	Time to Peak	= 9.93 hrs
Time Interval	= 2 min	Hydrograph Volume	= 0.000 cuft
Inflow Hydrograph	= 82 - Roof Drywell E	Max. Elevation	= 224.61 ft
Pond Name	= RD-E	Max. Storage	= 2,025 cuft

Pond Routing by Storage Indication Method

Qp = 0.00 cfs



Groundwater Recharge Calculations

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

INFILTRATION BASIN 1A (IB-1A)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 0.61 acres

26,592 s.f.

Required Recharge Volume (Rv)

$$Rv = 26,592 \text{ s.f.} \times \frac{0.6}{12} = 1,330 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 3.17 ft
K (saturated hydraulic conductivity): 8.27 inches/hour
0.69 feet/hour

T (time): 2 hours

A = 1,457 s.f.

voids = 1.00

Rv = 6,627 c.f.

Basin Volume: 7,171 c.f.

(Below Outlet)

> 1,330 c.f.

72 Hour Drawdown

$$Rv / (K \times \text{Bottom Area}) = 1.57 \text{ Hours}$$

1.57 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

INFILTRATION BASIN 1B (IB-1B)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 0.61 acres

26,702 s.f.

Required Recharge Volume (Rv)

$$Rv = 26,702 \text{ s.f.} \times \frac{0.6}{12} = 1,335 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 2.9 ft
K (saturated hydraulic conductivity): 8.27 inches/hour
0.69 feet/hour

T (time): 2 hours

A = 1,244 s.f.

voids = 1.00

Rv = 5,322 c.f.

Basin Volume: 6,649 c.f. (Below Outlet)

> 1,335 c.f.

72 Hour Drawdown

$Rv / (K \times \text{Bottom Area}) = 1.81 \text{ Hours}$

1.81 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

INFILTRATION BASIN 1C (IB-1C)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 0.45 acres

19,524 s.f.

Required Recharge Volume (Rv)

$$Rv = 19,524 \text{ s.f.} \times \frac{0.6}{12} = 976 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 2.9 ft
K (saturated hydraulic conductivity): 8.27 inches/hour
0.69 feet/hour

T (time): 2 hours

A = 670 s.f.

voids = 1.00

Rv = 2,866 c.f.

Basin Volume: 4,528 c.f. (Below Outlet)

> 976 c.f.

72 Hour Drawdown

$$Rv / (K \times \text{Bottom Area}) = 2.29 \text{ Hours}$$

2.29 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

INFILTRATION BASIN 1D (IB-1D)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 0.42 acres

18,184 s.f.

Required Recharge Volume (Rv)

$$Rv = 18,184 \text{ s.f.} \times \frac{0.6}{12} = 909 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 2.75 ft

K (saturated hydraulic conductivity): 8.27 inches/hour

0.69 feet/hour

T (time): 2 hours

A = 833 s.f.

voids = 1.00

Rv = 3,439 c.f.

Basin Volume: 4,728 c.f.

(Below Outlet)

>

909 c.f.

72 Hour Drawdown

$$Rv / (K \times \text{Bottom Area}) = 1.99 \text{ Hours}$$

1.99 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

INFILTRATION BASIN 1E (IB-1E)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 1.94 acres

84,698 s.f.

Required Recharge Volume (Rv)

$$Rv = 84,698 \text{ s.f.} \times \frac{0.6}{12} = 4,235 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 3.5 ft

K (saturated hydraulic conductivity): 8.27 inches/hour

0.69 feet/hour

T (time): 2 hours

A = 2,758 s.f.

voids = 1.00

Rv = 13,454 c.f.

Basin Volume: 26,816 c.f.

(Below Outlet)

> 4,235 c.f.

72 Hour Drawdown

$$Rv / (K \times \text{Bottom Area}) = 2.89 \text{ Hours}$$

2.89 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

INFILTRATION BASIN 1F (IB-1F)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 1.65 acres

71,790 s.f.

Required Recharge Volume (Rv)

$$Rv = 71,790 \text{ s.f.} \times \frac{0.6}{12} = 3,590 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 2.9 ft

K (saturated hydraulic conductivity): 8.27 inches/hour

0.69 feet/hour

T (time): 2 hours

A = 3,972 s.f.

voids = 1.00

Rv = 16,994 c.f.

Basin Volume: 18,676 c.f.

(Below Outlet)

> 3,590 c.f.

72 Hour Drawdown

$$Rv / (K \times \text{Bottom Area}) = 1.59 \text{ Hours}$$

1.59 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

INFILTRATION BASIN 1G (IB-1G)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 1.10 acres

47,811 s.f.

Required Recharge Volume (Rv)

$$Rv = 47,811 \text{ s.f.} \times \frac{0.6}{12} = 2,391 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 2.8 ft
K (saturated hydraulic conductivity): 8.27 inches/hour
0.69 feet/hour

T (time): 2 hours

A = 2,205 s.f.

voids = 1.00

Rv = 9,213 c.f.

Basin Volume: 10,951 c.f. (Below Outlet)

> 2,391 c.f.

72 Hour Drawdown

$Rv / (K \times \text{Bottom Area}) = 1.72 \text{ Hours}$

1.72 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

Subsurface Chambers 1H (SC-1H)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 0.84 acres
36,667 s.f.

Required Recharge Volume (Rv)

$$Rv = 36,667 \text{ s.f.} \times \frac{0.6}{12} = 1,833 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 2.5 ft
K (saturated hydraulic conductivity): 8.27 inches/hour
0.69 feet/hour

T (time): 2 hours

A = 3,652 s.f.

Void = 0.40

Rv = 8,686 c.f.

Basin Volume: 6,111 c.f.

> 1,833 c.f.

(Below Outlet, from Hydrology Studio Model)

72 Hour Drawdown

$Rv / (K \times \text{Bottom Area}) = 1.02 \text{ Hours}$

1.02 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

Subsurface Chambers 1I (SC-1I)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 0.43 acres

18,552 s.f.

Required Recharge Volume (Rv)

$$Rv = 18,552 \text{ s.f.} \times \frac{0.6}{12} = 928 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 2.5 ft

K (saturated hydraulic conductivity): 8.27 inches/hour

0.69 feet/hour

T (time): 2 hours

A = 1,382 s.f.

Void = 0.40

Rv = 3,287 c.f.

Basin Volume: 2,267 c.f.

> 928 c.f.

(Below Outlet, from Hydrology Studio Model)

72 Hour Drawdown

$Rv / (K \times \text{Bottom Area}) = 1.00 \text{ Hours}$

1.00 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

Subsurface Chambers 1J (SC-1J)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 0.48 acres

20,815 s.f.

Required Recharge Volume (Rv)

$$Rv = 20,815 \text{ s.f.} \times \frac{0.6}{12} = 1,041 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 3 ft

K (saturated hydraulic conductivity): 8.27 inches/hour

0.69 feet/hour

T (time): 2 hours

A = 1,848 s.f.

Voids = 0.40

Rv = 4,765 c.f.

Basin Volume: 3,564 c.f.

> 1,041 c.f.

(Below Outlet, from Hydrology Studio Model)

72 Hour Drawdown

$Rv / (K \times \text{Bottom Area}) = 1.09 \text{ Hours}$

1.09 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

Subsurface Chambers 2A (SC-2A)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 0.43 acres
18,948 s.f.

Required Recharge Volume (Rv)

$$Rv = 18,948 \text{ s.f.} \times \frac{0.6}{12} = 947 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + kT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 4.75 ft
K (saturated hydraulic conductivity): 8.27 inches/hour
0.69 feet/hour

T (time): 2 hours

A = 1,217 s.f.

voids = 1.00

Rv = 7,458 c.f.

Basin Volume: 3,659 c.f. (Below Outlet)

> 947 c.f.

72 Hour Drawdown

$$Rv / (K \times \text{Bottom Area}) = 0.71 \text{ Hours}$$

0.71 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

Subsurface Chambers 3A (SC-3A)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 1.34 acres
58,169 s.f.

Required Recharge Volume (Rv)

$$Rv = 58,169 \text{ s.f.} \times \frac{0.6}{12} = 2,908 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 5 ft
K (saturated hydraulic conductivity): 8.27 inches/hour
0.69 feet/hour

T (time): 2 hours

A = 5,043 s.f.

Voids = 0.40

Rv = 17,037 c.f.

Basin Volume: 16,124 c.f.

> 2,908 c.f.

(Below Outlet, from Hydrology Studio Model)

72 Hour Drawdown

$Rv / (K \times \text{Bottom Area}) = 1.37 \text{ Hours}$

1.37 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

Subsurface Chambers 3B (SC-3B)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 1.00 acres

43,730 s.f.

Required Recharge Volume (Rv)

$$Rv = 43,730 \text{ s.f.} \times \frac{0.6}{12} = 2,187 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 5.25 ft

K (saturated hydraulic conductivity): 8.27 inches/hour

0.69 feet/hour

T (time): 2 hours

A = 3,526 s.f.

Voids = 0.40

Rv = 12,265 c.f.

Basin Volume: 11,515 c.f.

> 2,187 c.f.

(Below Outlet, from Hydrology Studio Model)

72 Hour Drawdown

$Rv / (K \times \text{Bottom Area}) = 1.36 \text{ Hours}$

1.36 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

Subsurface Chambers 4A (SC-4A)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 0.26 acres

11,538 s.f.

Required Recharge Volume (Rv)

$$Rv = 11,538 \text{ s.f.} \times \frac{0.6}{12} = 577 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 3.5 ft

K (saturated hydraulic conductivity): 8.27 inches/hour

0.69 feet/hour

T (time): 2 hours

A = 1,070 s.f.

Void = 0.40

Rv = 2,973 c.f.

Basin Volume: 2,159 c.f.

> 577 c.f.

(Below Outlet, from Hydrology Studio Model)

72 Hour Drawdown

$Rv / (K \times \text{Bottom Area}) = 1.05 \text{ Hours}$

1.05 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

Subsurface Chambers 5A (SC-5A)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 0.26 acres
11,538 s.f.

Required Recharge Volume (Rv)

$$Rv = 11,538 \text{ s.f.} \times \frac{0.6}{12} = 577 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 3.5 ft
K (saturated hydraulic conductivity): 8.27 inches/hour
0.69 feet/hour

T (time): 2 hours

A = 501 s.f.

Voids = 0.40

Rv = 1,392 c.f.

Basin Volume: 1,032 c.f.

> 577 c.f.

(Below Outlet, from Hydrology Studio Model)

72 Hour Drawdown

$Rv / (K \times \text{Bottom Area}) = 1.08 \text{ Hours}$

1.08 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

INFILTRATION BASIN 6A (IB-6A)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 0.63 acres
27,456 s.f.

Required Recharge Volume (Rv)

$$Rv = 27,456 \text{ s.f.} \times \frac{0.6}{12} = 1,373 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 2.9 ft
K (saturated hydraulic conductivity): 8.27 inches/hour
0.69 feet/hour

T (time): 2 hours

A = 1,153 s.f.

voids = 1.00

Rv = 4,933 c.f.

Basin Volume: 6,936 c.f. (Below Outlet)

> 1,373 c.f.

72 Hour Drawdown

$$Rv / (K \times \text{Bottom Area}) = 2.04 \text{ Hours}$$

2.04 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

Roof Drywell A (RD-A)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 0.03 acres

1,308 s.f.

Required Recharge Volume (Rv)

$$Rv = 1,308 \text{ s.f.} \times \frac{0.6}{12} = 65 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 3.5 ft

K (saturated hydraulic conductivity): 8.27 inches/hour

0.69 feet/hour

T (time): 2 hours

A = 110 s.f.

Void = 0.40

Rv = 306 c.f.

Basin Volume: 220 c.f.

> 65 c.f.

(Below Outlet, from Hydrology Studio Model)

72 Hour Drawdown

$$Rv / (K \times \text{Bottom Area}) = 1.04 \text{ Hours}$$

1.04 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

Roof Drywell B (RD-B)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 0.06 acres
2,547 s.f.

Required Recharge Volume (Rv)

$$Rv = 2,547 \text{ s.f.} \times \frac{0.6}{12} = 127 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 3.5 ft
K (saturated hydraulic conductivity): 8.27 inches/hour
0.69 feet/hour

T (time): 2 hours

A = 220 s.f.

Void = 0.40

Rv = 611 c.f.

Basin Volume: 440 c.f.

> 127 c.f.
(Below Outlet, from Hydrology Studio Model)

72 Hour Drawdown

$$Rv / (K \times \text{Bottom Area}) = 1.04 \text{ Hours}$$

1.04 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

Roof Drywell C (RD-C)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 0.04 acres

1,791 s.f.

Required Recharge Volume (Rv)

$$Rv = 1,791 \text{ s.f.} \times \frac{0.6}{12} = 90 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 3.5 ft
K (saturated hydraulic conductivity): 8.27 inches/hour
0.69 feet/hour

T (time): 2 hours

A = 165 s.f.

Void = 0.40

Rv = 458 c.f.

Basin Volume: 330 c.f.

> 90 c.f.
(Below Outlet, from Hydrology Studio Model)

72 Hour Drawdown

$$Rv / (K \times \text{Bottom Area}) = 1.04 \text{ Hours}$$

1.04 < 72 hours O.K.

Recharge Volume Calculations

Job: SM-6781

Calculated PFK

Date: 12/12/2023

Roof Drywell A (RD-E)

Soils: Sand

Hydrologic Group: A

Required Recharge Volume

0.6 inches of runoff x impervious area

Impervious area: 0.25 acres

11,083 s.f.

Required Recharge Volume (Rv)

$$Rv = 11,083 \text{ s.f.} \times \frac{0.6}{12} = 554 \text{ c.f.}$$

Simple Dynamic Method

$$A = Rv / (D + KT)$$

$$Rv = A(D + kT)$$

D (depth of infiltration facility): 3.5 ft

K (saturated hydraulic conductivity): 8.27 inches/hour

0.69 feet/hour

T (time): 2 hours

A = 944 s.f.

Void = 0.40

Rv = 2,623 c.f.

Basin Volume: 2,172 c.f.

> 554 c.f.

(Below Outlet, from Hydrology Studio Model)

72 Hour Drawdown

$Rv / (K \times \text{Bottom Area}) = 1.20 \text{ Hours}$

1.20 < 72 hours O.K.

Required Recharge Volume

Job:	SM-6781					Calculated by:	PFK	
						Date:	12/12/2023	
<u>Required Recharge Volume</u>								
		Soils:	Sand					
		Hydrologic Group:	A					
		Required Recharge Volume						
		0.6 inches of runoff x impervious area						
		Total Impervious Area:	18.02 acres					
			785,157 s.f.					
		1.) <u>Required Recharge Volume (Rv)</u>						
		Rv =	785,157	s.f. x	<u>0.6</u>	=	39,258 c.f.	
					12			
						=	39,258 c.f.	
		<u>Impervious Area draining to recharge facilities</u>						
			785,157			=	785,157 s.f.	
			785,157			=	1.00	
		2.) <u>Adjusted Minimum Required Recharge Volume</u>						
		3.)						
		Rv=	39,258	s.f. x	1.00	=	39,258 c.f.	
		4.)						
		<u>Recharge Volume Provided</u>						
		INFILTRATION BASIN 1A (IB-1A)				=	6,627	c.f.
		INFILTRATION BASIN 1B (IB-1B)				=	5,322	c.f.
		INFILTRATION BASIN 1C (IB-1C)				=	2,866	c.f.
		INFILTRATION BASIN 1D (IB-1D)				=	3,439	c.f.
		INFILTRATION BASIN 1E (IB-1E)				=	13,454	c.f.
		INFILTRATION BASIN 1F (IB-1F)				=	16,994	c.f.
		INFILTRATION BASIN 1G (IB-1G)				=	9,213	c.f.
		Subsurface Chambers 1H (SC-1H)				=	8,686	c.f.
		Subsurface Chambers 1I (SC-1I)				=	3,287	c.f.
		Subsurface Chambers 1J (SC-1J)				=	4,765	c.f.
		Subsurface Chambers 2A (SC-2A)				=	7,458	c.f.
		Subsurface Chambers 3A (SC-3A)				=	17,037	c.f.
		Subsurface Chambers 3B (SC-3B)				=	12,265	c.f.
		Subsurface Chambers 4A (SC-4A)				=	2,973	c.f.
		Subsurface Chambers 5A (SC-5A)				=	1,392	c.f.
		INFILTRATION BASIN 6A (IB-6A)				=	4,933	c.f.
		Roof Drywell A (RD-A)		5 units	=	1,528	c.f.	
		Roof Drywell B (RD-B)		51 units	=	31,173	c.f.	
		Roof Drywell C (RD-C)		53 units	=	24,297	c.f.	
		Roof Drywell A (RD-E)			=	2,623	c.f.	
		Total Recharge Volume Provided				=	180,331 c.f.	
		<u>180,331</u>	<u>c.f.</u>	<u>≥</u>	<u>39,258</u>	<u>c.f.</u>	<u>OK</u>	
			=	<u>785,157</u>	=	100%		
				<u>785,157</u>				
		Total Impervious area						
		<u>Impervious area being recharged</u>						
		<u>100%</u>		<u>≥</u>	<u>65%</u>		<u>OK</u>	

Water Quality Volume Calculations

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

INFILTRATION BASIN 1A (IB-1A)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 0.61 acres
26,592 s.f.

Required Water Quality Volume

$$V = 26,592 \text{ s.f.} \times \frac{1}{12} = 2,216 \text{ c.f.}$$

Volume Provided 7,171 c.f.

7,171 c.f. > 2,216 c.f. O.K.
--

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

INFILTRATION BASIN 1B (IB-1B)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 0.61 acres
26,702 s.f.

Required Water Quality Volume

$$V = 26,702 \text{ s.f.} \times \frac{1}{12} = 2,225 \text{ c.f.}$$

Volume Provided 6,649 c.f.

6,649 c.f. > 2,225 c.f. O.K.

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

INFILTRATION BASIN 1C (IB-1C)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 0.45 acres
19,524 s.f.

Required Water Quality Volume

$$V = 19,524 \text{ s.f.} \times \frac{1}{12} = 1,627 \text{ c.f.}$$

Volume Provided 4,528 c.f.

4,528 c.f. > 1,627 c.f. O.K.

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

INFILTRATION BASIN 1D (IB-1D)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 0.42 acres
18,184 s.f.

Required Water Quality Volume

$$V = 18,184 \text{ s.f.} \times \frac{1}{12} = 1,515 \text{ c.f.}$$

Volume Provided 4,728 c.f.

4,728 c.f. > 1,515 c.f. O.K.

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

INFILTRATION BASIN 1E (IB-1E)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 1.94 acres
84,698 s.f.

Required Water Quality Volume

$$V = 84,698 \text{ s.f.} \times \frac{1}{12} = 7,058 \text{ c.f.}$$

Volume Provided: 26,816 c.f.

26,816 c.f. > 7,058 c.f. O.K.

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

INFILTRATION BASIN 1F (IB-1F)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 1.65 acres
71,790 s.f.

Required Water Quality Volume

$$V = 71,790 \text{ s.f.} \times \frac{1}{12} = 5,983 \text{ c.f.}$$

Volume Provided 18,676 c.f.

18,676 c.f. > 5,983 c.f. O.K.

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

INFILTRATION BASIN 1E (IB-1E)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 1.10 acres
47,811 s.f.

Required Water Quality Volume

$$V = 47,811 \text{ s.f.} \times \frac{1}{12} = 3,984 \text{ c.f.}$$

Volume Provided 10,951 c.f.

10,951 c.f. > 3,984 c.f. O.K.

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

Subsurface Chambers 1H (SC-1H)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 0.84 acres
36,667 s.f.

Required Water Quality Volume

$$V = 36,667 \text{ s.f.} \times \frac{1}{12} = 3,056 \text{ c.f.}$$

Volume Provided 6,111 c.f.

6,111 c.f. > 3,056 c.f. O.K.

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

Subsurface Chambers 1I (SC-1I)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 0.43 acres
18,552 s.f.

Required Water Quality Volume

$$V = 18,552 \text{ s.f.} \times \frac{1}{12} = 1,546 \text{ c.f.}$$

Volume Provided 2,267 c.f.

2,267 c.f. > 1,546 c.f. O.K.
--

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

Subsurface Chambers 1J (SC-1J)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 0.48 acres
20,815 s.f.

Required Water Quality Volume

$$V = 20,815 \text{ s.f.} \times \frac{1}{12} = 1,735 \text{ c.f.}$$

Volume Provided 3,564 c.f.

3,564 c.f. > 1,735 c.f. O.K.

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

Subsurface Chambers 2A (SC-2A)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 0.43 acres
18,948 s.f.

Required Water Quality Volume

$$V = 18,948 \text{ s.f.} \times \frac{1}{12} = 1,579 \text{ c.f.}$$

Volume Provided 3,659 c.f.

3,659	c.f. >	1,579	c.f. O.K.
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Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

Subsurface Chambers 3A (SC-3A)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 1.34 acres
58,169 s.f.

Required Water Quality Volume

$$V = 58,169 \text{ s.f.} \times \frac{1}{12} = 4,847 \text{ c.f.}$$

Volume Provided 16,124 c.f.

16,124 c.f. > 4,847 c.f. O.K.

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

Subsurface Chambers 3B (SC-3B)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 1.00 acres
43,730 s.f.

Required Water Quality Volume

$$V = 43,730 \text{ s.f.} \times \frac{1}{12} = 3,644 \text{ c.f.}$$

Volume Provided 11,515 c.f.

11,515 c.f. > 3,644 c.f. O.K.

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

Subsurface Chambers 4A (SC-4A)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 0.26 acres
11,538 s.f.

Required Water Quality Volume

$$V = 11,538 \text{ s.f.} \times \frac{1}{12} = 962 \text{ c.f.}$$

Volume Provided 2,159 c.f.

2,159	c.f. >	962	c.f. O.K.
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Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

Subsurface Chambers 5A (SC-5A)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 0.26 acres
11,538 s.f.

Required Water Quality Volume

$$V = 11,538 \text{ s.f.} \times \frac{1}{12} = 962 \text{ c.f.}$$

Volume Provided: 1,032 c.f.

1,032	c.f. >	962	c.f. O.K.
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Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

INFILTRATION BASIN 6A (IB-6A)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 0.63 acres
27,456 s.f.

Required Water Quality Volume

$$V = 27,456 \text{ s.f.} \times \frac{1}{12} = 2,288 \text{ c.f.}$$

Volume Provided 6,936 c.f.

6,936 c.f. > 2,288 c.f. O.K.

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

Roof Drywell A (RD-A)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 0.03 acres
1,308 s.f.

Required Water Quality Volume

$$V = 1,308 \text{ s.f.} \times \frac{1}{12} = 109 \text{ c.f.}$$

Volume Provided 220 c.f.

220 c.f. > 109 c.f. O.K.
--

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

Roof Drywell B (RD-B)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 0.06 acres
2,547 s.f.

Required Water Quality Volume

$$V = 2,547 \text{ s.f.} \times \frac{1}{12} = 212 \text{ c.f.}$$

Volume Provided 440 c.f.

440 c.f. > 212 c.f. O.K.
--

Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

Roof Drywell C (RD-C)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 0.04 acres
1,791 s.f.

Required Water Quality Volume

$$V = 1,791 \text{ s.f.} \times \frac{1}{12} = 149 \text{ c.f.}$$

Volume Provided 330 c.f.

330	c.f. >	149	c.f. O.K.
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Water Quality Volume Calculations

Job: SM-6781

Calculated by: PFK
Date: 12/12/2023

Roof Drywell A (RD-E)

Soils: SAND

Hydrologic Group: A

Required First Flush Volume

1 inch of runoff x impervious area (Chapter X)

Impervious area: 0.25 acres
11,083 s.f.

Required Water Quality Volume

$$V = 11,083 \text{ s.f.} \times \frac{1}{12} = 924 \text{ c.f.}$$

Volume Provided 2,172 c.f.

2,172	c.f. >	924	c.f. O.K.
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Groundwater Mounding Calculations

Groundwater Mounding Analysis

Project: The Residences at Stow Acres
 Location: STOW, MA

SM-6781
 Date: 12/12/2023

By: PFK

	Length of Application (ft)	Width of Application (ft)	Bottom Area (s.f.)	Required Recharge Volume (c.f.)	Application Rate (c.f./day/s.f.)	Duration of Application	Fillable Porosity for Sand	Hydraulic Conductivity (ft/day)	Bottom of Structure Elevation	Average Depth of Ledge (ft)	E.S.H.G.W.	Initial Saturated Thickness Used (ft)	Mound Height
IB-1A	40	25.525	1,021	1330	1.30	1 day	0.28	39	228.5	Unknown	2' DEPTH	9	0.94
IB-1B	50	24.88	1,244	1335	1.07				227.0	Unknown	2' DEPTH	9	0.86
IB-1C	25	26.8	670	976	1.46				224.0	Unknown	2' DEPTH	9	0.95
IB-1D	30	27.77	833	909	1.09				223.0	Unknown	2' DEPTH	9	0.83
IB-1E	150	18.39	2,759	4235	1.54				221.0	Unknown	2' DEPTH	9	1.57
IB-1F	189.14	21	3,972	3590	0.90				222.0	Unknown	2' DEPTH	9	1.05
IB-1G	110	20.04	2,204	2391	1.08				219.0	Unknown	2' DEPTH	9	1.14
SC-1H	74.53	49	3,652	1833	0.50				217.0	Unknown	2' DEPTH	9	0.92
SC-1I	67.41	20.5	1,382	928	0.67				217.0	Unknown	2' DEPTH	9	0.62
SC-1J	53.17	34.75	1,848	1041	0.56				221.5	Unknown	2' DEPTH	9	0.70
SC-2A	78.12	15.58	1,217	947	0.78				224.0	Unknown	2' DEPTH	9	0.60
SC-3A	113.97	44.25	5,043	2908	0.58				225.3	Unknown	2' DEPTH	9	1.13
SC-3B	63.78	51.42	3,280	2187	0.67				221.3	Unknown	2' DEPTH	9	1.18
SC-4A	60.29	17.75	1,070	577	0.54				219.5	Unknown	2' DEPTH	9	0.43
SC-5A	31.81	15.75	501	577	1.15				229.0	Unknown	2' DEPTH	9	0.58
SC-6A	76.88	15	1,153	1373	1.19				228.0	Unknown	2' DEPTH	9	0.89

Application Rate =
$$\frac{\text{Required Recharge Volume}}{\text{Bottom Area}}$$

Duration of Application = 1 day for analysis of 24-hour storm events

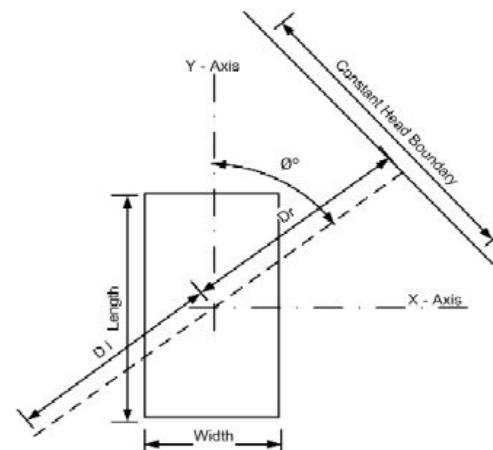
Fillable Porosity = Value based on soil classification from attached table

Hydraulic Conductivity = Value taken from attached table

Initial Saturated Thickness = Depth from bottom of test pit to estimated seasonal high groundwater (ESHGW)

Distance to Constant Head Boundary (Di & Dr):
 Ponds used as constant head boundary

Angle from z-axis (φ):



SPECIFIC YIELD VALUES (%)

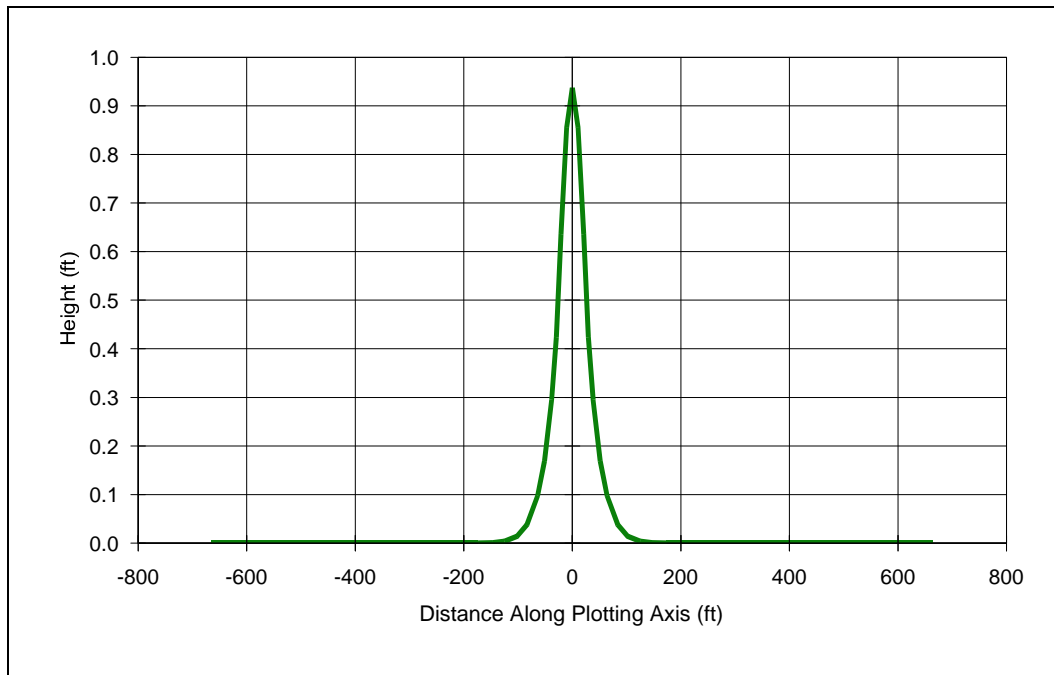
Coarse gravel	0.23
Medium gravel	0.24
Fine gravel	0.25
Coarse sand	0.27
Medium sand	0.28
Fine sand	0.23
Silt	0.08
Clay	0.03

HYDRAULIC CONDUCTIVITY VALUES (FT/DAY)

<u>MATERIAL</u>	<u>AVERAGE</u>	<u>RANGE</u>
Fine gravel	1476	1181 - 3280
Medium gravel	886	689 - 1181
Coarse gravel	492	328 - 689
Coarse sand	148	65 - 328
Medium sand	39	16 - 65
Fine sand	8	3 - 16
Silt	0.3	0.03 - 3
Clay	0.0007	<0.03
S & G mix	172	16 - 328
S & G glacial till		<100
Glacial till		<10

*Mass DEP Groundwater Mounding for Systems Larger than 2,000 GPD Presentation

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: IB-1A

ANALYST: PFK

DATE: 12/15/2023 TIME: 3:32:22 PM

INPUT PARAMETERS

Application rate: 1.3 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 9 ft

Length of application area: 40 ft

Width of application area: 25.525 ft

Constant head boundary used at: 660 ft

Plotting axis from Y-Axis: 30 degrees

Edge of recharge area:

positive X: 11.5 ft

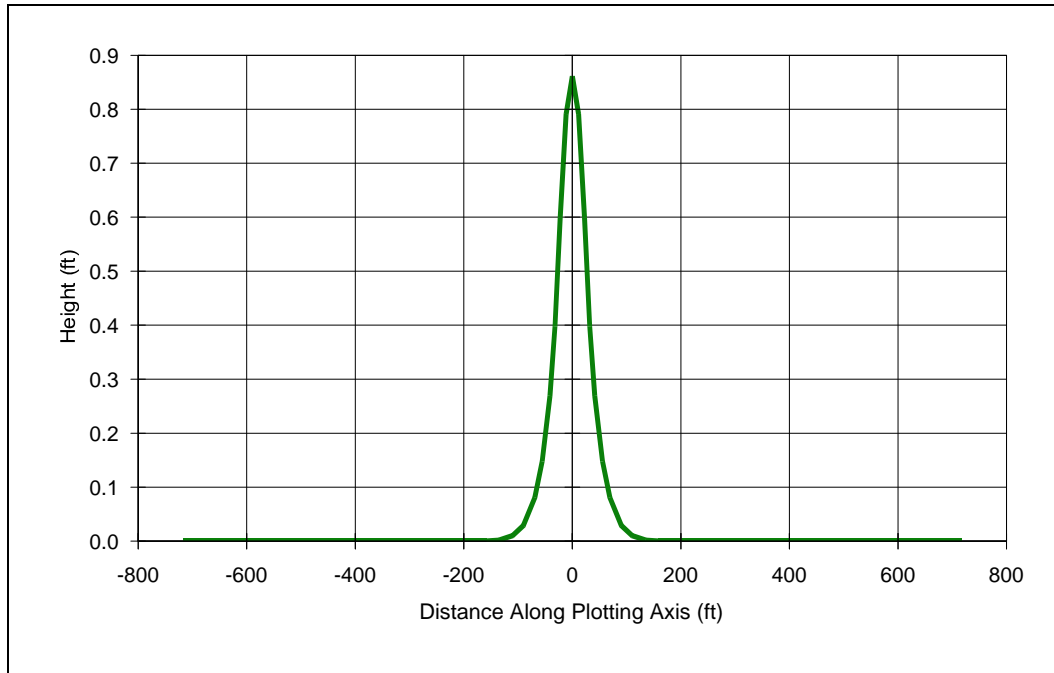
positive Y: 20 ft

Total volume applied: 1327.3 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-330	-571.6	-660	0
-277.5	-480.7	-555	0
-225	-389.8	-450	0
-172.6	-298.9	-345	0
-131.3	-227.4	-263	0
-99.3	-172	-199	0
-73.2	-126.8	-146	0
-51.1	-88.5	-102	0.01
-32	-55.4	-64	0.1
-19.1	-33.2	-38	0.3
-10.4	-18	-21	0.64
0	0	0	0.94
10.4	18	21	0.64
19.1	33.2	38	0.3
32	55.4	64	0.1
51.1	88.5	102	0.01
73.2	126.8	146	0
99.3	172	199	0
131.3	227.4	263	0
172.6	298.9	345	0
225	389.8	450	0
277.5	480.7	555	0
330	571.6	660	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: IB-1B

ANALYST: PFK

DATE: 12/15/2023 TIME: 3:35:20 PM

INPUT PARAMETERS

Application rate: 1.07 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 9 ft

Length of application area: 50 ft

Width of application area: 24.88 ft

Constant head boundary used at: 712 ft

Plotting axis from Y-Axis: 30 degrees

Edge of recharge area:

positive X: 12.4 ft

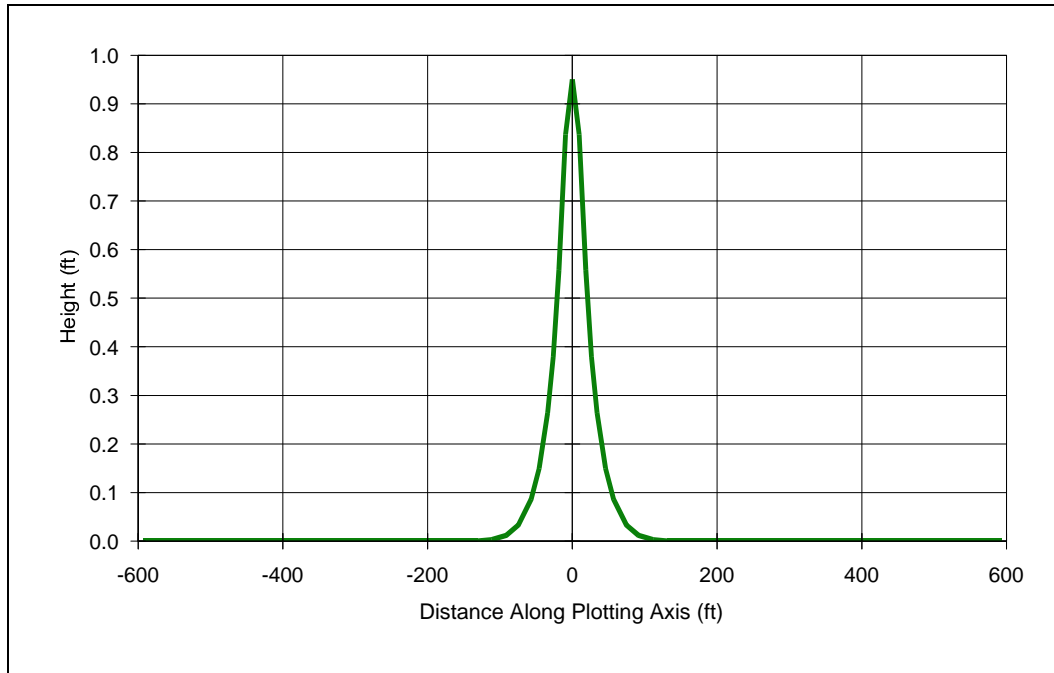
positive Y: 21.5 ft

Total volume applied: 1331.08 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-356	-616.6	-712	0
-299.4	-518.6	-599	0
-242.8	-420.5	-486	0
-186.2	-322.4	-372	0
-141.7	-245.3	-283	0
-107.2	-185.6	-214	0
-79	-136.8	-158	0
-55.1	-95.5	-110	0.01
-34.5	-59.7	-69	0.08
-20.6	-35.8	-41	0.27
-11.2	-19.4	-22	0.6
0	0	0	0.86
11.2	19.4	22	0.6
20.6	35.8	41	0.27
34.5	59.7	69	0.08
55.1	95.5	110	0.01
79	136.8	158	0
107.2	185.6	214	0
141.7	245.3	283	0
186.2	322.4	372	0
242.8	420.5	486	0
299.4	518.6	599	0
356	616.6	712	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: IB-1C

ANALYST: PFK

DATE: 12/15/2023 TIME: 3:37:37 PM

INPUT PARAMETERS

Application rate: 1.46 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 7 ft

Length of application area: 25 ft

Width of application area: 26.8 ft

Constant head boundary used at: 589 ft

Plotting axis from Y-Axis: 30 degrees

Edge of recharge area:

positive X: 7.2 ft

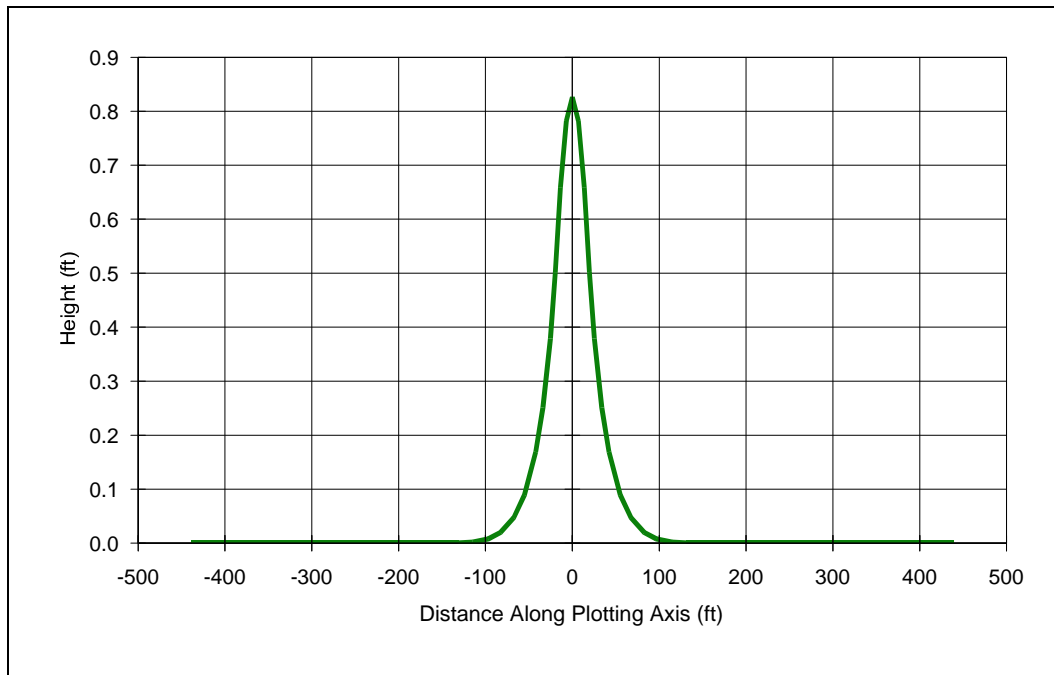
positive Y: 12.5 ft

Total volume applied: 978.2 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-294.5	-510.1	-589	0
-247.7	-429	-495	0
-200.8	-347.8	-402	0
-154	-266.7	-308	0
-117.2	-203	-234	0
-88.6	-153.5	-177	0
-65.3	-113.1	-131	0
-45.6	-79	-91	0.01
-28.5	-49.4	-57	0.09
-17.1	-29.6	-34	0.26
-9.3	-16.1	-19	0.56
0	0	0	0.95
9.3	16.1	19	0.56
17.1	29.6	34	0.26
28.5	49.4	57	0.09
45.6	79	91	0.01
65.3	113.1	131	0
88.6	153.5	177	0
117.2	203	234	0
154	266.7	308	0
200.8	347.8	402	0
247.7	429	495	0
294.5	510.1	589	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: IB-1D

ANALYST: PFK

DATE: 12/15/2023 TIME: 3:39:12 PM

INPUT PARAMETERS

Application rate: 1.09 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 7 ft

Length of application area: 30 ft

Width of application area: 27.77 ft

Constant head boundary used at: 436 ft

Plotting axis from Y-Axis: 30 degrees

Edge of recharge area:

positive X: 8.7 ft

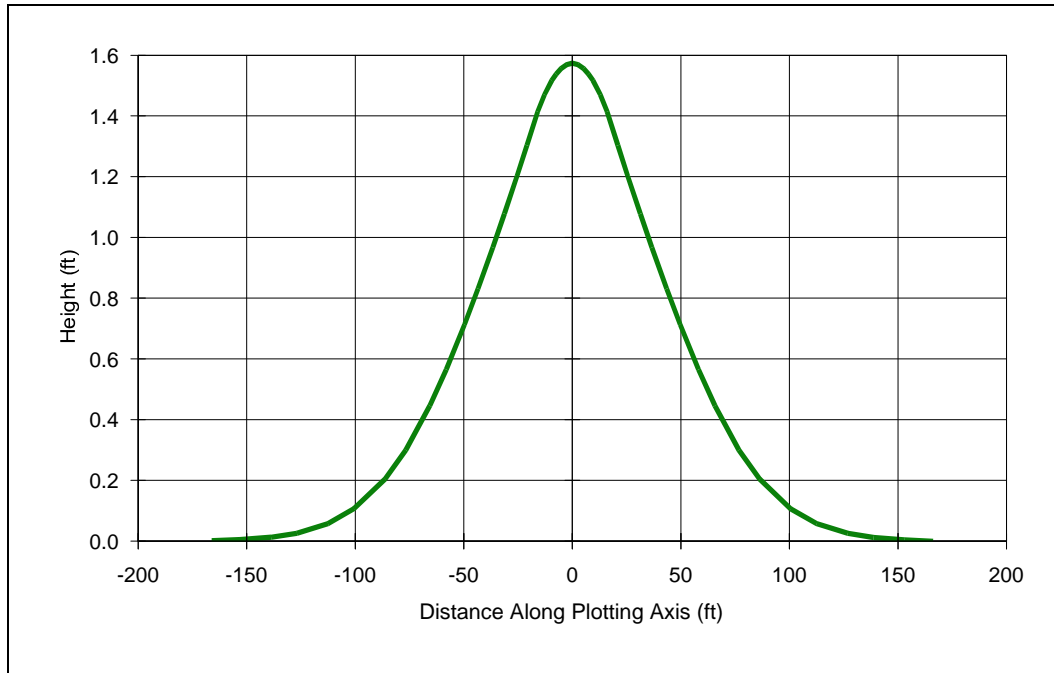
positive Y: 15 ft

Total volume applied: 908.079 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-218	-377.6	-436	0
-183.3	-317.6	-367	0
-148.7	-257.5	-297	0
-114	-197.4	-228	0
-86.7	-150.2	-173	0
-65.6	-113.7	-131	0
-48.4	-83.7	-97	0.01
-33.8	-58.5	-68	0.05
-21.1	-36.6	-42	0.17
-12.6	-21.9	-25	0.38
-6.9	-11.9	-14	0.66
0	0	0	0.83
6.9	11.9	14	0.66
12.6	21.9	25	0.38
21.1	36.6	42	0.17
33.8	58.5	68	0.05
48.4	83.7	97	0.01
65.6	113.7	131	0
86.7	150.2	173	0
114	197.4	228	0
148.7	257.5	297	0
183.3	317.6	367	0
218	377.6	436	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: IB-1E

ANALYST: PFK

DATE: 12/15/2023 TIME: 3:41:19 PM

INPUT PARAMETERS

Application rate: 1.54 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 7 ft

Length of application area: 150 ft

Width of application area: 18.39 ft

Constant head boundary used at: 165 ft

Plotting axis from Y-Axis: 30 degrees

Edge of recharge area:

positive X: 9.2 ft

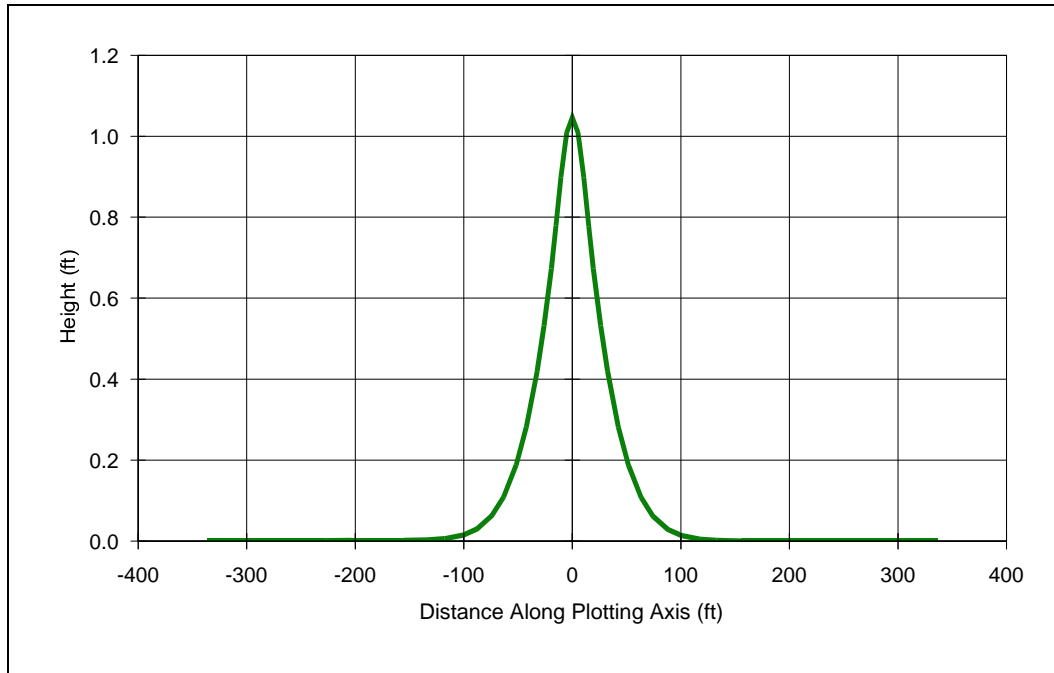
positive Y: 15.9 ft

Total volume applied: 4248.09 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-82.5	-142.9	-165	0
-69.4	-120.2	-139	0.01
-56.3	-97.4	-113	0.06
-43.1	-74.7	-86	0.2
-32.8	-56.9	-66	0.45
-24.8	-43	-50	0.71
-18.3	-31.7	-37	0.97
-12.8	-22.1	-26	1.2
-8	-13.8	-16	1.41
-4.8	-8.3	-10	1.52
-2.6	-4.5	-5	1.56
0	0	0	1.57
2.6	4.5	5	1.56
4.8	8.3	10	1.52
8	13.8	16	1.41
12.8	22.1	26	1.2
18.3	31.7	37	0.97
24.8	43	50	0.71
32.8	56.9	66	0.45
43.1	74.7	86	0.2
56.3	97.4	113	0.06
69.4	120.2	139	0.01
82.5	142.9	165	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: IB-1F

ANALYST: PFK

DATE: 12/15/2023 TIME: 3:42:47 PM

INPUT PARAMETERS

Application rate: 0.9 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 7 ft

Length of application area: 189.14 ft

Width of application area: 21 ft

Constant head boundary used at: 334 ft

Plotting axis from Y-Axis: 90 degrees

Edge of recharge area:

positive X: 10.5 ft

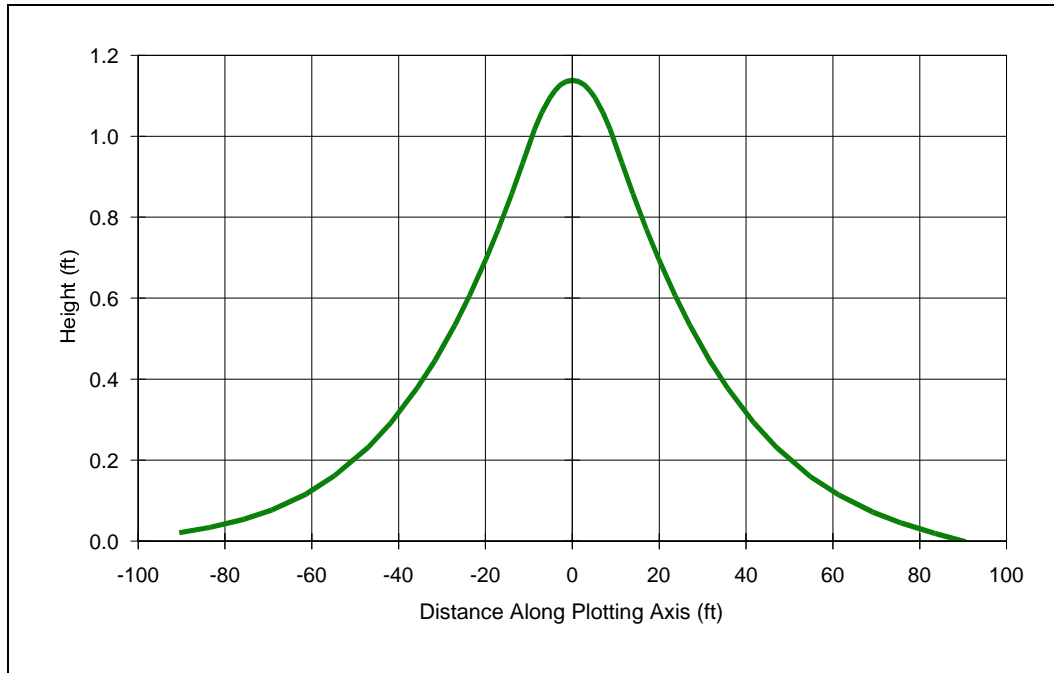
positive Y: 0 ft

Total volume applied: 3574.746 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-334	0	-334	0
-280.9	0	-281	0
-227.8	0	-228	0
-174.6	0	-175	0
-132.9	0	-133	0
-100.5	0	-101	0.02
-74.1	0	-74	0.06
-51.7	0	-52	0.19
-32.4	0	-32	0.42
-19.4	0	-19	0.67
-10.5	0	-11	0.9
0	0	0	1.05
10.5	0	11	0.9
19.4	0	19	0.67
32.4	0	32	0.42
51.7	0	52	0.19
74.1	0	74	0.06
100.5	0	101	0.01
132.9	0	133	0
174.6	0	175	0
227.8	0	228	0
280.9	0	281	0
334	0	334	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: IB-1G

ANALYST: PFK

DATE: 12/15/2023 TIME: 3:43:47 PM

INPUT PARAMETERS

Application rate: 1.08 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 7 ft

Length of application area: 110 ft

Width of application area: 20.04 ft

Constant head boundary used at: 90 ft

Plotting axis from Y-Axis: 90 degrees

Edge of recharge area:

positive X: 10 ft

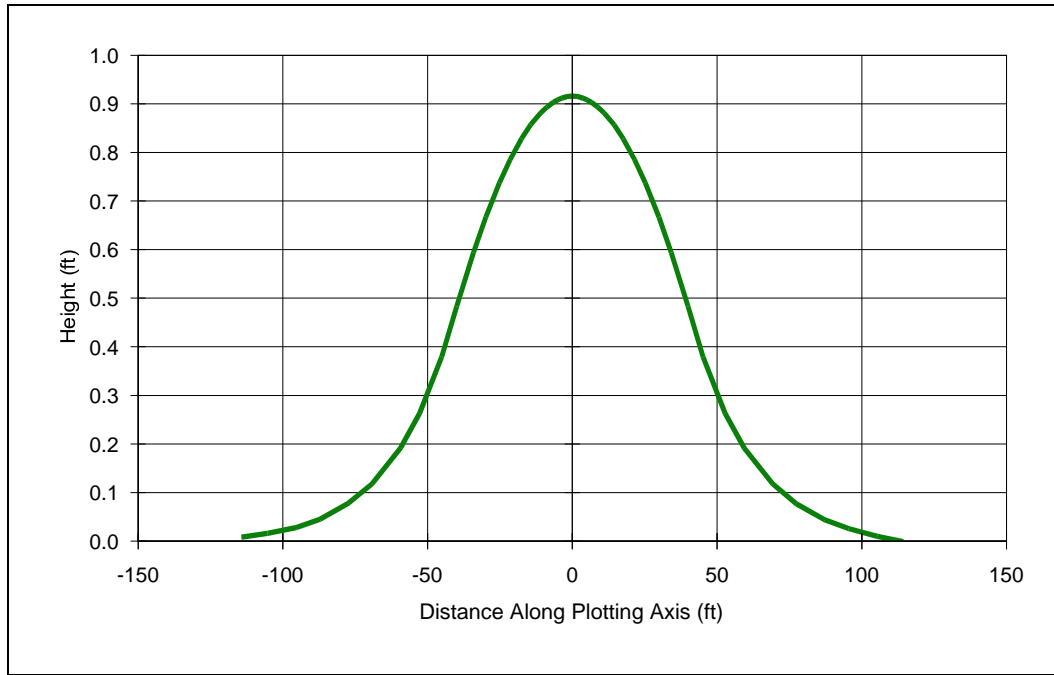
positive Y: 0 ft

Total volume applied: 2380.752 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-90	0	-90	0.02
-75.7	0	-76	0.05
-61.4	0	-61	0.12
-47.1	0	-47	0.23
-35.8	0	-36	0.38
-27.1	0	-27	0.53
-20	0	-20	0.7
-13.9	0	-14	0.86
-8.7	0	-9	1.02
-5.2	0	-5	1.09
-2.8	0	-3	1.13
0	0	0	1.14
2.8	0	3	1.13
5.2	0	5	1.1
8.7	0	9	1.02
13.9	0	14	0.86
20	0	20	0.7
27.1	0	27	0.53
35.8	0	36	0.38
47.1	0	47	0.23
61.4	0	61	0.11
75.7	0	76	0.04
90	0	90	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: SC-1H

ANALYST: PFK

DATE: 12/15/2023 TIME: 3:57:36 PM

INPUT PARAMETERS

Application rate: 0.5 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 7 ft

Length of application area: 74.53 ft

Width of application area: 49 ft

Constant head boundary used at: 113.5 ft

Plotting axis from Y-Axis: 30 degrees

Edge of recharge area:

positive X: 21.5 ft

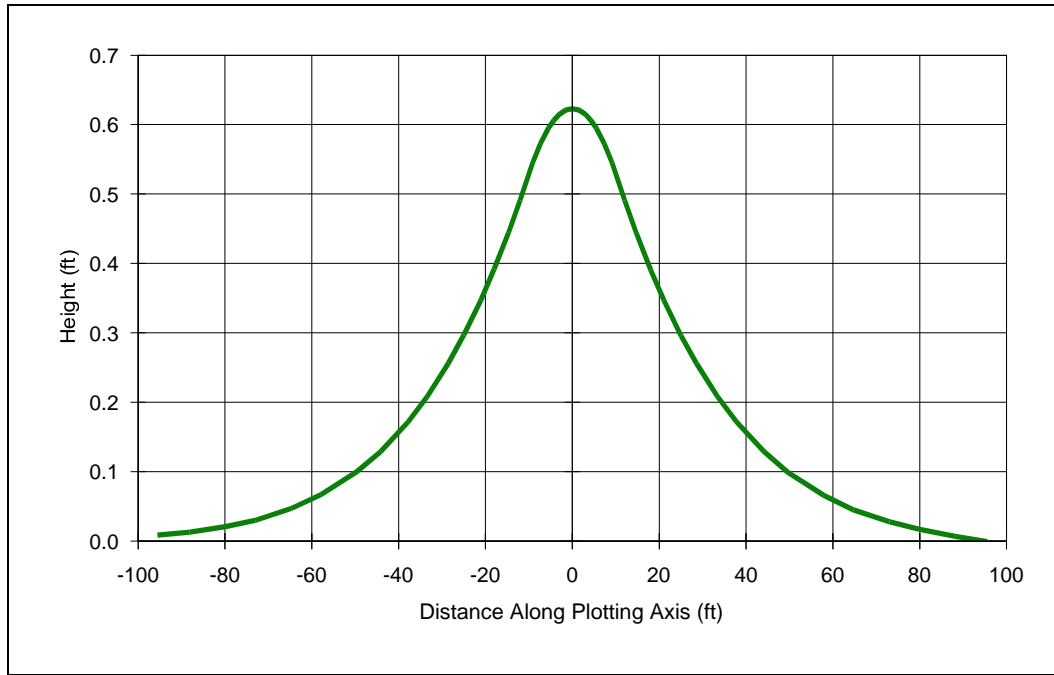
positive Y: 37.3 ft

Total volume applied: 1825.985 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-56.7	-98.3	-114	0.01
-47.7	-82.7	-95	0.03
-38.7	-67	-77	0.08
-29.7	-51.4	-59	0.19
-22.6	-39.1	-45	0.38
-17.1	-29.6	-34	0.59
-12.6	-21.8	-25	0.74
-8.8	-15.2	-18	0.83
-5.5	-9.5	-11	0.88
-3.3	-5.7	-7	0.9
-1.8	-3.1	-4	0.91
0	0	0	0.92
1.8	3.1	4	0.91
3.3	5.7	7	0.9
5.5	9.5	11	0.88
8.8	15.2	18	0.83
12.6	21.8	25	0.74
17.1	29.6	34	0.59
22.6	39.1	45	0.38
29.7	51.4	59	0.19
38.7	67	77	0.08
47.7	82.7	95	0.03
56.7	98.3	114	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: SC-11

ANALYST: PFK

DATE: 12/15/2023 TIME: 3:59:14 PM

INPUT PARAMETERS

Application rate: 0.67 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 7 ft

Length of application area: 67.41 ft

Width of application area: 20.5 ft

Constant head boundary used at: 95 ft

Plotting axis from Y-Axis: 90 degrees

Edge of recharge area:

positive X: 10.2 ft

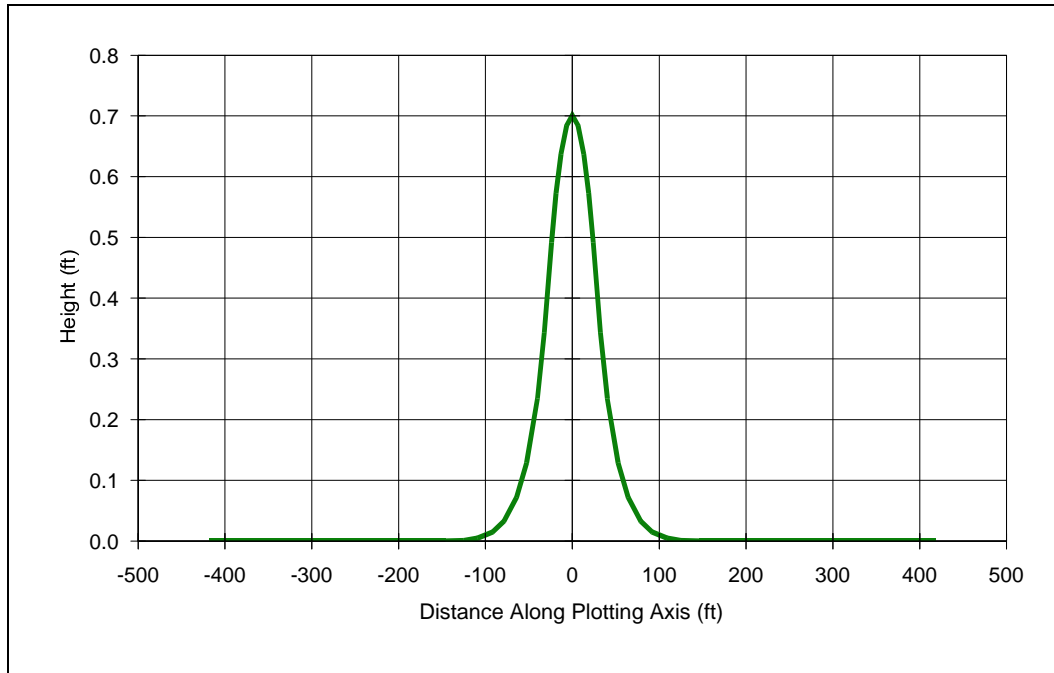
positive Y: 0 ft

Total volume applied: 925.8764 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-95	0	-95	0.01
-79.9	0	-80	0.02
-64.8	0	-65	0.05
-49.7	0	-50	0.1
-37.8	0	-38	0.17
-28.6	0	-29	0.26
-21.1	0	-21	0.35
-14.7	0	-15	0.44
-9.2	0	-9	0.54
-5.5	0	-6	0.6
-3	0	-3	0.62
0	0	0	0.62
3	0	3	0.62
5.5	0	6	0.6
9.2	0	9	0.54
14.7	0	15	0.44
21.1	0	21	0.35
28.6	0	29	0.26
37.8	0	38	0.17
49.7	0	50	0.1
64.8	0	65	0.04
79.9	0	80	0.02
95	0	95	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: SC-1J

ANALYST: PFK

DATE: 12/15/2023 TIME: 4:00:26 PM

INPUT PARAMETERS

Application rate: 0.56 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 7 ft

Length of application area: 53.17 ft

Width of application area: 34.75 ft

Constant head boundary used at: 415 ft

Plotting axis from Y-Axis: 30 degrees

Edge of recharge area:

positive X: 15.3 ft

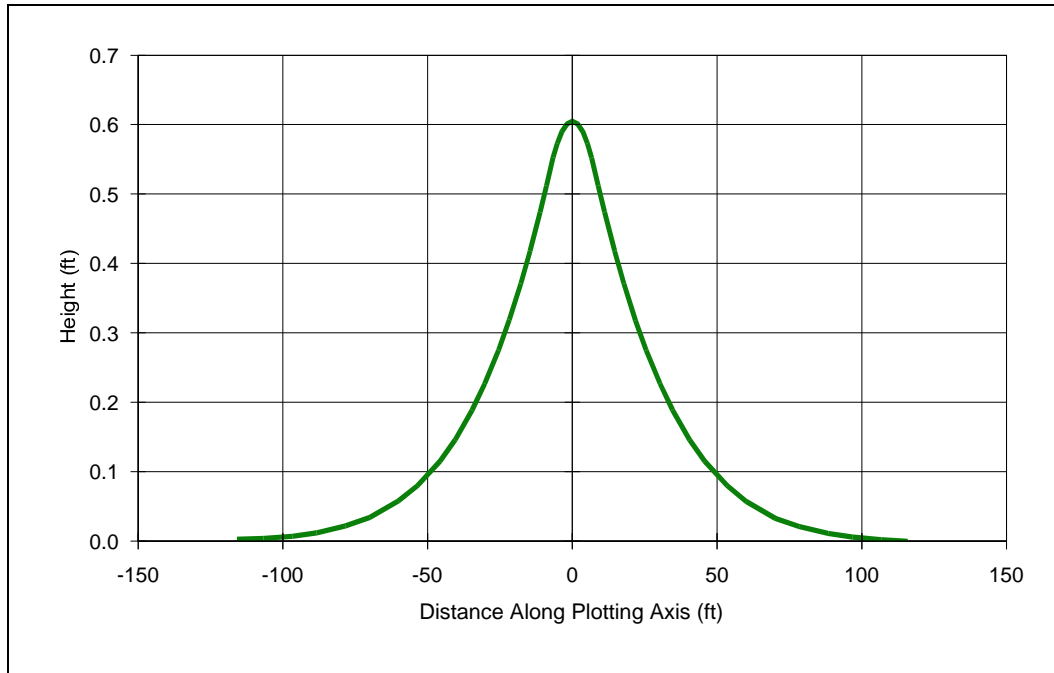
positive Y: 26.6 ft

Total volume applied: 1034.688 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-207.5	-359.4	-415	0
-174.5	-302.3	-349	0
-141.5	-245.1	-283	0
-108.5	-187.9	-217	0
-82.6	-143	-165	0
-62.5	-108.2	-125	0
-46	-79.7	-92	0.02
-32.1	-55.7	-64	0.07
-20.1	-34.8	-40	0.24
-12	-20.8	-24	0.49
-6.5	-11.3	-13	0.64
0	0	0	0.7
6.5	11.3	13	0.64
12	20.8	24	0.49
20.1	34.8	40	0.24
32.1	55.7	64	0.07
46	79.7	92	0.02
62.5	108.2	125	0
82.6	143	165	0
108.5	187.9	217	0
141.5	245.1	283	0
174.5	302.3	349	0
207.5	359.4	415	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: SC-2A

ANALYST: PFK

DATE: 12/15/2023 TIME: 4:01:27 PM

INPUT PARAMETERS

Application rate: 0.78 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 7 ft

Length of application area: 78.12 ft

Width of application area: 15.58 ft

Constant head boundary used at: 115 ft

Plotting axis from Y-Axis: 90 degrees

Edge of recharge area:

positive X: 7.8 ft

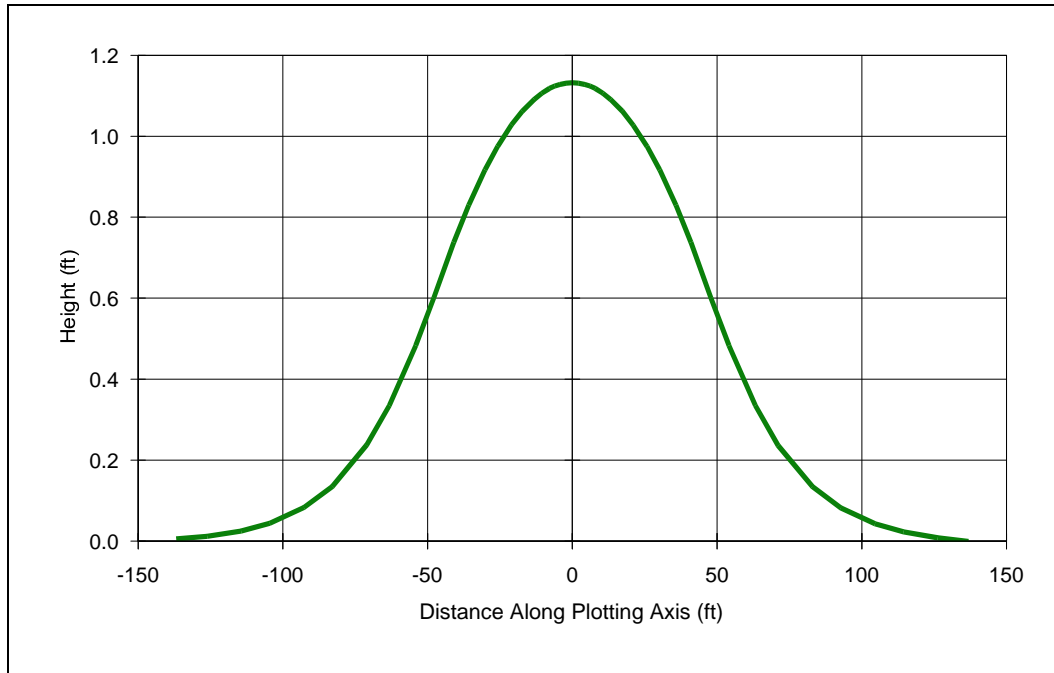
positive Y: 0 ft

Total volume applied: 949.3455 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-115	0	-115	0
-96.7	0	-97	0.01
-78.4	0	-78	0.02
-60.1	0	-60	0.06
-45.8	0	-46	0.12
-34.6	0	-35	0.19
-25.5	0	-26	0.28
-17.8	0	-18	0.37
-11.1	0	-11	0.47
-6.7	0	-7	0.55
-3.6	0	-4	0.59
0	0	0	0.6
3.6	0	4	0.59
6.7	0	7	0.55
11.1	0	11	0.47
17.8	0	18	0.37
25.5	0	26	0.28
34.6	0	35	0.19
45.8	0	46	0.12
60.1	0	60	0.06
78.4	0	78	0.02
96.7	0	97	0.01
115	0	115	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: SC-3A

ANALYST: PFK

DATE: 12/15/2023 TIME: 4:02:30 PM

INPUT PARAMETERS

Application rate: 0.58 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 7 ft

Length of application area: 113.97 ft

Width of application area: 44.25 ft

Constant head boundary used at: 136 ft

Plotting axis from Y-Axis: 30 degrees

Edge of recharge area:

positive X: 22.1 ft

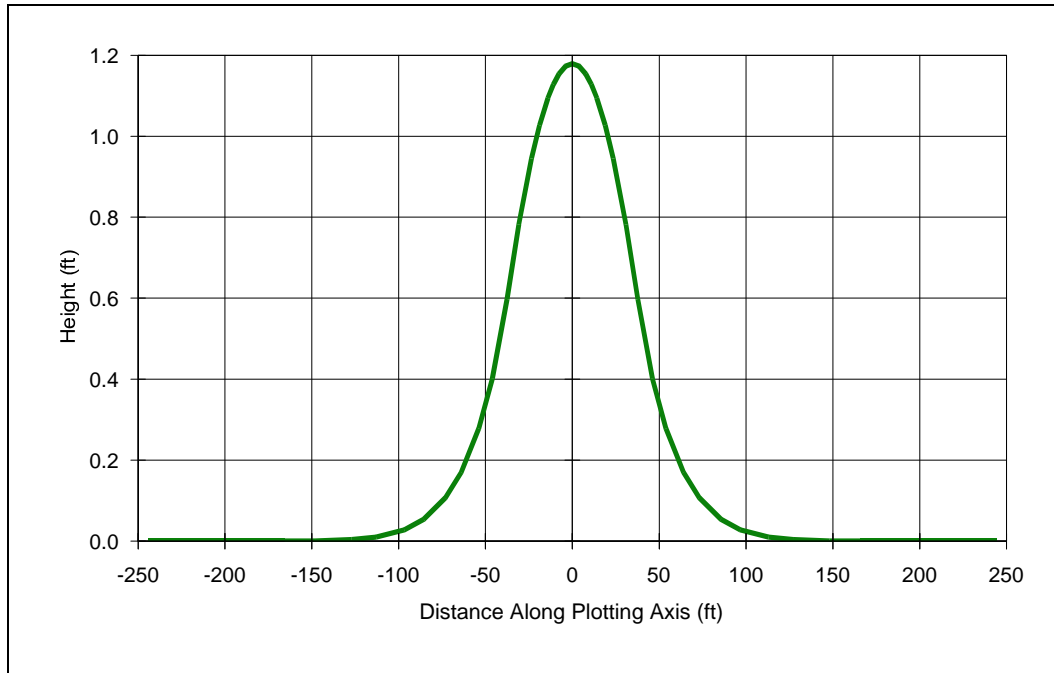
positive Y: 38.3 ft

Total volume applied: 2925.04 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-68	-117.8	-136	0.01
-57.2	-99.1	-114	0.02
-46.4	-80.3	-93	0.08
-35.6	-61.6	-71	0.24
-27.1	-46.9	-54	0.48
-20.5	-35.5	-41	0.74
-15.1	-26.1	-30	0.92
-10.5	-18.2	-21	1.03
-6.6	-11.4	-13	1.09
-3.9	-6.8	-8	1.12
-2.1	-3.7	-4	1.13
0	0	0	1.13
2.1	3.7	4	1.13
3.9	6.8	8	1.12
6.6	11.4	13	1.09
10.5	18.2	21	1.03
15.1	26.1	30	0.92
20.5	35.5	41	0.74
27.1	46.9	54	0.48
35.6	61.6	71	0.24
46.4	80.3	93	0.08
57.2	99.1	114	0.02
68	117.8	136	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: SC-3B

ANALYST: PFK

DATE: 12/15/2023 TIME: 4:03:59 PM

INPUT PARAMETERS

Application rate: 0.67 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 7 ft

Length of application area: 63.78 ft

Width of application area: 51.42 ft

Constant head boundary used at: 243 ft

Plotting axis from Y-Axis: 30 degrees

Edge of recharge area:

positive X: 18.4 ft

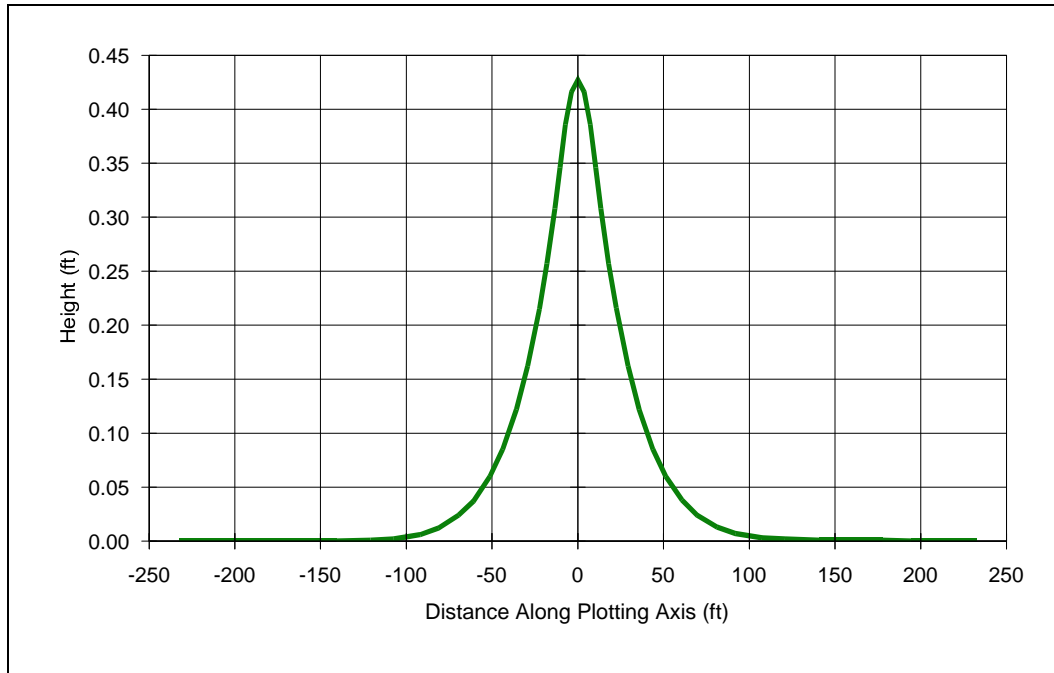
positive Y: 31.9 ft

Total volume applied: 2197.31 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-121.5	-210.4	-243	0
-102.2	-177	-204	0
-82.9	-143.5	-166	0
-63.5	-110	-127	0
-48.3	-83.7	-97	0.03
-36.6	-63.3	-73	0.11
-26.9	-46.7	-54	0.28
-18.8	-32.6	-38	0.6
-11.8	-20.4	-24	0.94
-7	-12.2	-14	1.09
-3.8	-6.6	-8	1.15
0	0	0	1.18
3.8	6.6	8	1.15
7	12.2	14	1.09
11.8	20.4	24	0.94
18.8	32.6	38	0.6
26.9	46.7	54	0.28
36.6	63.3	73	0.11
48.3	83.7	97	0.03
63.5	110	127	0
82.9	143.5	166	0
102.2	177	204	0
121.5	210.4	243	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: SC-4A

ANALYST: PFK

DATE: 12/15/2023 TIME: 4:05:09 PM

INPUT PARAMETERS

Application rate: 0.54 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 7 ft

Length of application area: 60.29 ft

Width of application area: 17.75 ft

Constant head boundary used at: 231 ft

Plotting axis from Y-Axis: 90 degrees

Edge of recharge area:

positive X: 8.9 ft

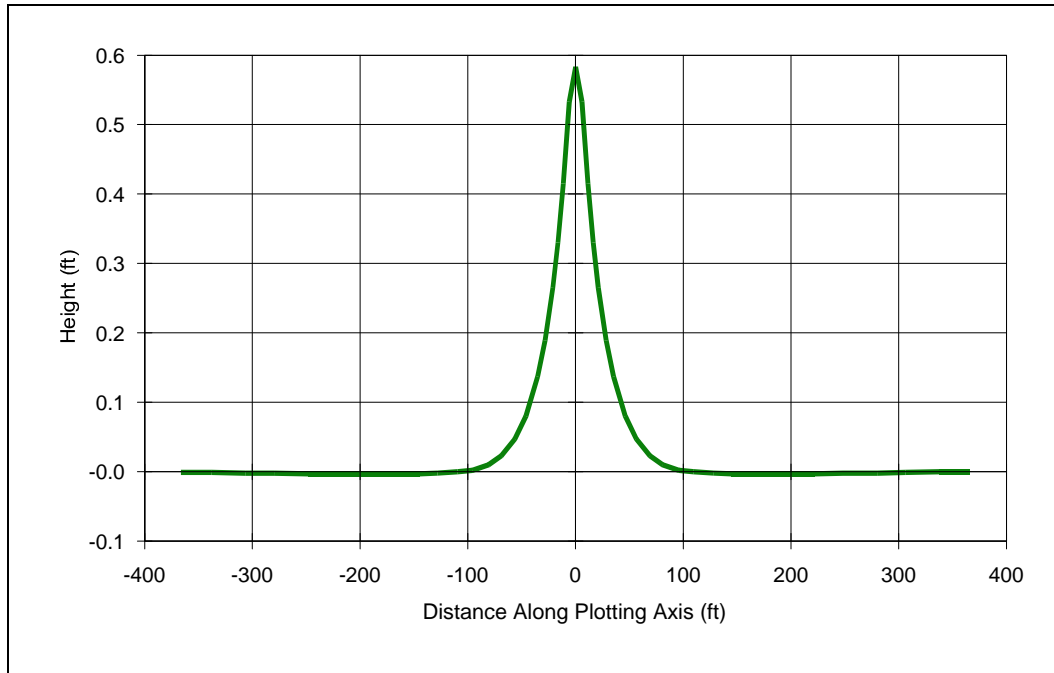
positive Y: 0 ft

Total volume applied: 577.8796 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-231	0	-231	0
-194.3	0	-194	0
-157.5	0	-158	0
-120.8	0	-121	0
-91.9	0	-92	0.01
-69.5	0	-70	0.02
-51.2	0	-51	0.06
-35.8	0	-36	0.12
-22.4	0	-22	0.22
-13.4	0	-13	0.31
-7.3	0	-7	0.39
0	0	0	0.43
7.3	0	7	0.39
13.4	0	13	0.31
22.4	0	22	0.22
35.8	0	36	0.12
51.2	0	51	0.06
69.5	0	70	0.02
91.9	0	92	0.01
120.8	0	121	0
157.5	0	158	0
194.3	0	194	0
231	0	231	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: SC-5A

ANALYST: PFK

DATE: 12/15/2023 TIME: 4:06:26 PM

INPUT PARAMETERS

Application rate: 1.15 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 7 ft

Length of application area: 31.81 ft

Width of application area: 15.75 ft

Constant head boundary used at: 364 ft

Plotting axis from Y-Axis: 90 degrees

Edge of recharge area:

positive X: 7.9 ft

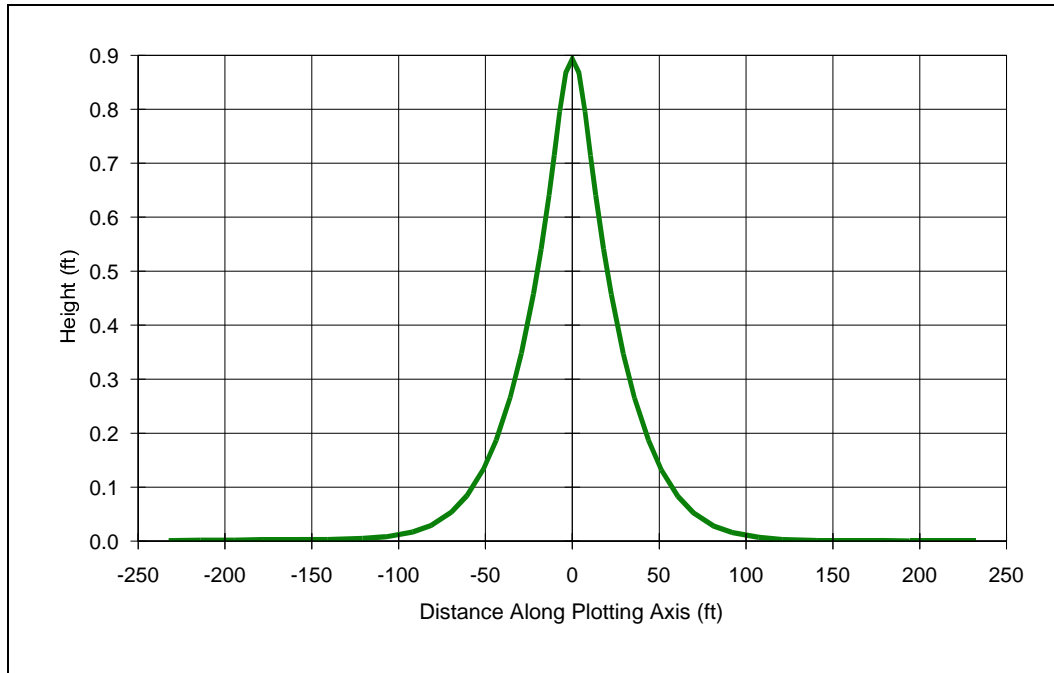
positive Y: 0 ft

Total volume applied: 576.1586 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-364	0	-364	0
-306.1	0	-306	0
-248.2	0	-248	0
-190.3	0	-190	0
-144.8	0	-145	0
-109.6	0	-110	0
-80.7	0	-81	0.01
-56.4	0	-56	0.05
-35.3	0	-35	0.14
-21.1	0	-21	0.26
-11.5	0	-11	0.42
0	0	0	0.58
11.5	0	11	0.42
21.1	0	21	0.26
35.3	0	35	0.14
56.4	0	56	0.05
80.7	0	81	0.01
109.6	0	110	0
144.8	0	145	0
190.3	0	190	0
248.2	0	248	0
306.1	0	306	0
364	0	364	0

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary, Inc.

PROJECT: IB-6A

ANALYST: PFK

DATE: 12/15/2023 TIME: 4:09:15 PM

INPUT PARAMETERS

Application rate: 1.19 c.ft/day/sq. ft

Duration of application: 1 days

Fillable porosity: 0.28

Hydraulic conductivity: 39 ft/day

Initial saturated thickness: 7 ft

Length of application area: 76.88 ft

Width of application area: 15 ft

Constant head boundary used at: 231 ft

Plotting axis from Y-Axis: 90 degrees

Edge of recharge area:

positive X: 7.5 ft

positive Y: 0 ft

Total volume applied: 1372.308 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-231	0	-231	0
-194.3	0	-194	0
-157.5	0	-158	0
-120.8	0	-121	0
-91.9	0	-92	0.02
-69.5	0	-70	0.05
-51.2	0	-51	0.13
-35.8	0	-36	0.27
-22.4	0	-22	0.46
-13.4	0	-13	0.64
-7.3	0	-7	0.8
0	0	0	0.89
7.3	0	7	0.8
13.4	0	13	0.64
22.4	0	22	0.46
35.8	0	36	0.26
51.2	0	51	0.13
69.5	0	70	0.05
91.9	0	92	0.02
120.8	0	121	0
157.5	0	158	0
194.3	0	194	0
231	0	231	0

TSS Removal Worksheets

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location:

A	B	C	D	E
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (B*C)	Remaining Load (C-D)
Deep-sump hooded catch basins	25%	1.00	0.25	0.75
Sediment Forebay	25%	0.75	0.25	0.56

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

Total TSS Removal =

Project:
 Prepared By:
 Date:

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

TSS Removal Calculation Worksheet

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Location:

A	B	C	D	E
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (B*C)	Remaining Load (C-D)
Infiltration Basin w/ Pretreatment	80%	1.00	0.80	0.20

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

Total TSS Removal =

Project:

Prepared By:

Date:

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

TSS Removal Calculation Worksheet

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location:

A	B	C	D	E
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (B*C)	Remaining Load (C-D)
Deep-sump hooded catch basins	25%	1.00	0.25	0.75
Isolator Rows	25%	0.75	0.25	0.56

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

Total TSS Removal =

Project:
 Prepared By:
 Date:

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

TSS Removal Calculation Worksheet

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C value within Row
5. Total TSS Removal = Sum All Values in Column D

Location:

A	B	C	D	E
BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (B*C)	Remaining Load (C-D)
Chambers w/ Pretreatment	80%	1.00	0.80	0.20

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

Total TSS Removal =

Project:
 Prepared By:
 Date:

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

TSS Removal Calculation Worksheet

Soil Evaluation



Commonwealth of Massachusetts
City/Town of

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

A. Facility Information

Owner Name STOW HOLDINGS LLC
 Street Address 0 RANDALL ROAD Map/Lot # MAP R11, PARCEL 25B-3
 City STOW State MA Zip Code 01775

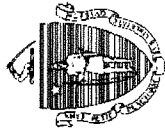
B. Site Information

- (Check one) New Construction Upgrade DRAINAGE
- Soil Survey WEB SOIL SURVEY Source 253B, 254B Soil Map Unit HINCKLEY LOAMY SAND, MERRIMAC FINE SANDY LOAM
OUTWASH TERRACE/DETA/PLAINS, KAMES Landform ESKERS MARCHES

Soil Parent material OUTWASH Soil Limitations
 Surficial Geological Report MASS MAPPER Year Published/Source SAND AND GRAVEL Map Unit

Description of Geologic Map Unit:

- Flood Rate Insurance Map Within a regulatory floodway? Yes No
- Within a velocity zone? Yes No
- Within a Mapped Wetland Area? Yes No
- Current Water Resource Conditions (USGS): 11/7/22 Range: Above Normal Normal Below Normal
 Month/Day/Year
- Other references reviewed: (Zone II, IWPA, Zone A, EEA Data Portal, etc.)



Commonwealth of Massachusetts
City/Town of

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

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

Deep Observation Hole Number: TP-22-1 Date: 11/7/22 Hole #: _____ Time: _____ Weather: _____ Latitude: _____ Longitude: 0-5

Land Use: GOLF COURSE Vegetation: GRASS Surface Stones (e.g., cobbles, stones, boulders, etc.): _____ Slope (%): _____

Description of Location: _____

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands >700 feet
 Property Line 770 feet Drinking Water Well >700 feet Other _____ feet

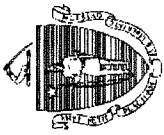
4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole _____

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Consistence (Moist)	Soil Structure	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
12	A	SL	10YR 3/2	Cnc : Dpl:	-	-	-	-	M	F	
34	B	S	10YR 5/6	Cnc : Dpl:	-	-	-	-	SG	L	
144	C	S	10YR 5/3	Cnc : Dpl:	-	-	15	15	SG	L	
				Cnc : Dpl:							
				Cnc : Dpl:							
				Cnc : Dpl:							
				Cnc : Dpl:							

Additional Notes:



Commonwealth of Massachusetts
City/Town of

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

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

Deep Observation Hole Number: TP-22-2 Date: 11/7/22 Time: _____ Weather: _____ Latitude: _____ Longitude: _____

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

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth Standing Water in Hole _____

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
12	A	SL	10YR 3/2	Cnc : Dpl:					M	F	
36	B	S	10YR 5/8	Cnc : Dpl:					SG	L	
132	C	S	10YR 5/3	Cnc : Dpl:			15	15	SG	L	
				Cnc : Dpl:							
				Cnc : Dpl:							
				Cnc : Dpl:							
				Cnc : Dpl:							

Additional Notes:



Commonwealth of Massachusetts
City/Town of

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

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

Deep Observation Hole Number: TP-223 Date: 11/7/22 Time: _____ Weather: _____ Latitude: _____ Longitude: _____

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

Description of Location: _____

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth Standing Water in Hole _____

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
84	FILL	-	-	Cnc : Dpl:	-	-	-	-	-	-	
132	C	S	10YR 5/3	Cnc : Dpl:	-	-	15	15	SG	L	
				Cnc : Dpl:							
				Cnc : Dpl:							
				Cnc : Dpl:							
				Cnc : Dpl:							
				Cnc : Dpl:							

Additional Notes: _____



Commonwealth of Massachusetts
City/Town of

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

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

Deep Observation Hole Number: TP-22-4 Date: 11/7/22 Time: _____ Weather: _____ Latitude: _____ Longitude: _____
Hole # _____

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

Description of Location: _____

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth Standing Water in Hole _____

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
12	A	SL	10YR 3/2	Cnc : Dpl:					M	F	
36	B	S	10YR 5/5	Cnc : Dpl:					SG	L	
132	C	S	10YR 5/3	Cnc : Dpl:			15	15	SG	L	
				Cnc : Dpl:							
				Cnc : Dpl:							
				Cnc : Dpl:							
				Cnc : Dpl:							

Additional Notes: _____



Commonwealth of Massachusetts
City/Town of

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

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

Deep Observation Hole Number: IP-22-5 Date: 11/7/22

Hole # _____ Time _____ Weather _____ Latitude _____ Longitude _____

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

Description of Location: _____

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth Standing Water in Hole _____

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features		Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel			
12	A	SL	10YR 3/2	Cnc : Dpl:		-	-	M	F	
24	B	S	10YR 5/6	Cnc : Dpl:		-	-	SG	L	
126	C1	COARSE SAND	10YR 5/3	Cnc : Dpl:		-	15	SG	L	
144	C2	S	10YR 6/4	Cnc : Dpl:		5	-	SG	L	
				Cnc : Dpl:						
				Cnc : Dpl:						

Additional Notes: _____



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

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

Deep Observation Hole Number: TP-22-6 Date: 11/7/22 Time: _____ Weather: _____ Latitude: _____ Longitude: _____

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

Description of Location: _____ Landform: _____ Position on Landscape (SU, SH, BS, FS, TS, Plain): _____

2. Soil Parent Material: _____ Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

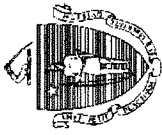
3. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

4. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth Standing Water in Hole _____

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features		Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel			
10	A	SL	10YR 3/2	Cnc : Dpl:				M	F	
108	C	S	10YR 5/3	Cnc : Dpl:	5	15	15	SG	L	
				Cnc : Dpl:						
				Cnc : Dpl:						
				Cnc : Dpl:						
				Cnc : Dpl:						

Additional Notes: _____



Commonwealth of Massachusetts
City/Town of

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

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

Deep Observation Hole Number: IP-12-9 Date: 11/7/22

Hole # _____ Time _____ Weather _____ Latitude _____ Longitude _____

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

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

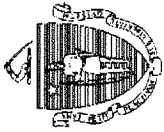
4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil/Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth to Weeping in Hole _____ Depth Standing Water in Hole _____

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
8	A	SL	10YR 3/2	Cnc : Dpl:		-	-	-	M	F	
24	B	S	10YR 5/8	Cnc : Dpl:		-	-	-	SG	L	
108	C	S	10YR 5/3	Cnc : Dpl:		-	15	15	SG	L	
				Cnc : Dpl:							
				Cnc : Dpl:							
				Cnc : Dpl:							
				Cnc : Dpl:							

Additional Notes:



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

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):

Depth to soil redoximorphic features

Obs. Hole # _____ inches
Obs. Hole # _____ inches

Depth to observed standing water in observation hole

_____ inches

Depth to adjusted seasonal high groundwater (S_h)
(USGS methodology)

_____ inches

SEE LOGS

Index Well Number _____ Reading Date _____

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

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

E. Depth of Pervious Material

SEE LOGS

1. Depth of Naturally Occurring Pervious Material

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

Yes No

b. If yes, at what depth was it observed (exclude O, A, and E Horizons)?

Upper boundary: _____ inches
Lower boundary: _____ inches

c. If no, at what depth was impervious material observed?

Upper boundary: _____ inches
Lower boundary: _____ inches



Commonwealth of Massachusetts
City/Town of

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

F. Certification

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

Paul Kirchner

11/7/22

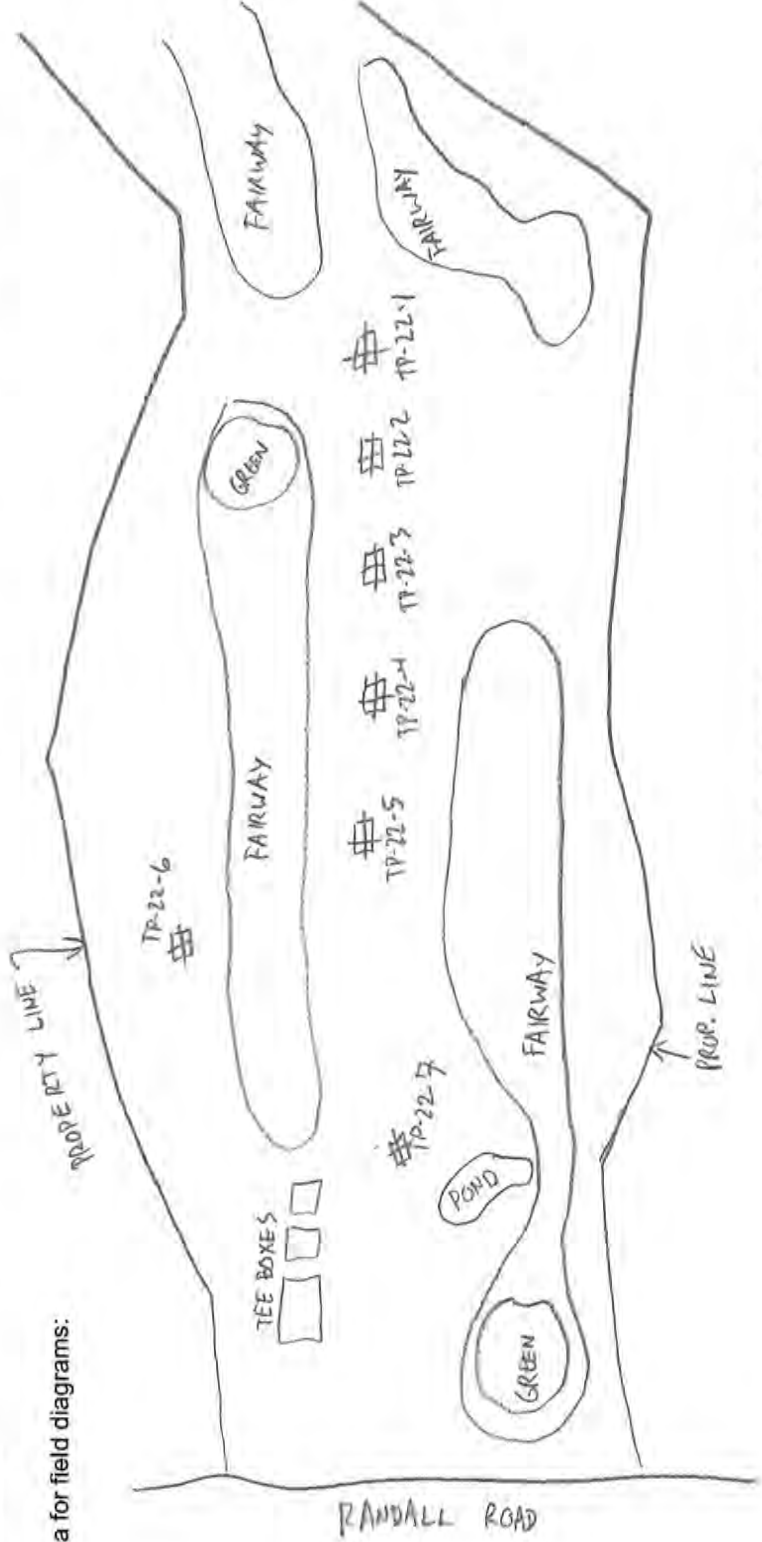
Signature of Soil Evaluator
PAUL KIRCHNER SE#4237
 Date **11/7/22**

Typed or Printed Name of Soil Evaluator / License #
N/A - DRAINAGE
 Expiration Date of License **6/30/24**

Name of Approving Authority / Witness
 Approving Authority

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

Field Diagrams: Use this area for field diagrams:





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

A. Facility Information

Stow Holdings LLC

Owner Name

58 Randall Road

Street Address

Stow

City

MA

State

Map R11, Parcel 25B-3

Map/Lot #

01775

Zip Code

B. Site Information

1. (Check one) New Construction Upgrade Repair

2. Soil Survey Available? Yes No If yes:

Web soil survey
Source

253B, 254B
Soil Map Unit

Hinckley loamy sand, Merrimac fine sandy loam

Soil Name

outwash

Soil Parent material

Soil Limitations

outwash terrace, outwash delta, outwash plains, eskers, moraines, kame terrace, kames

Landform

3. Surficial Geological Report Available? Yes No

If yes:

Oliver

Year Published/Source

Sand and Gravel

Map Unit

Description of Geologic Map Unit:

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

5. Within a velocity zone? Yes No

6. Within a Mapped Wetland Area? Yes No

If yes, MassGIS Wetland Data Layer:

Wetland Type

7. Current Water Resource Conditions (USGS): 4/7/2021

Month/Day/ Year

Range: Above Normal

Normal

Below Normal

8. Other references reviewed:



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

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

Deep Observation Hole Number: TP-1 4/2/2021 6:30am 30d clear
Hole # Date Time Weather Latitude Longitude: varies

1. Land Use golf course grass, manicured woods some
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.) Slope (%)

Description of Location: North Course

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

3. Distances from: Open Water Body feet Drainage Way feet Wetlands feet
 Property Line feet Drinking Water Well feet Other feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: Depth Weeping from Pit Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
12	A	SL	10YR 3/3	-	-	-	-	-	M	F	
20	B	LS	10YR 5/6	-	-	-	-	-	M	F	
42	C1	Sand	10YR 5/3	-	-	-	-	-	SG	L	
84	C2	Coarse S	10YR 4/2	42	high/low	2	-	-	SG	L	

Additional Notes:



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

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

Deep Observation Hole Number: TP-2 4/2/2021
Hole # Date Time Weather Latitude Longitude:

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

Description of Location: _____

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable

Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
12	A	SL	10YR 3/3	-	-	-	-	-	M	F	
24	B	LS	10YR 5/6	-	-	-	-	-	M	F	
48	C1	S	10YR 4/2	-	-	-	-	-	SG	L	
54	C2	Fine S	10YR 5/3	48	high/low	2	-	-	SG	L	
120	C3	S	10YR 4/2	-	-	-	-	-	SG	L	

Additional Notes: _____



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

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

Deep Observation Hole Number: TP-3 4/2/2021
Hole # Date Time Weather Latitude Longitude:

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

Description of Location: _____

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
 Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable

Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
12	A	SL	10YR 3/3	-	-	-	-	-	M	F	
24	B	LS	10YR 5/6	-	-	-	-	-	M	F	
84	C1	S	10YR 4/2	-	-	-	-	-	SG	L	
96	C2	Fine S	10YR 5/3	84	high/low	2	-	-	SG	L	
120	C3	S	10YR 4/2	-	-	-	-	-	SG	L	

Additional Notes: _____



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

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

Deep Observation Hole Number: TP-4 4/2/2021
Hole # Date Time Weather Latitude Longitude:

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

Description of Location: _____

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
 Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable

Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
12	A	SL	10YR 3/3	-	-	-	-	-	M	F	
24	B	LS	7.5YR 5/6	-	-	-	-	-	M	F	
120	C	S	7.5YR 4/4	-	-	-	10	15	SG	L	

Additional Notes: _____



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

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

Deep Observation Hole Number: TP-5 4/2/2021
Hole # Date Time Weather Latitude Longitude:

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

Description of Location: _____

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
12	A	SL	10YR 3/3	-	-	-	-	-	M	F	
24	B	LS	10YR 5/6	-	-	-	-	-	M	F	
120	C	S	10YR 5/3	-	-	-	10	15	SG	L	

Additional Notes: _____



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

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

Deep Observation Hole Number: TP-6 4/2/2021
Hole # Date Time Weather Latitude Longitude:

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

Description of Location: _____

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
 Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable
 Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
12	A	SL	10YR 3/3	-	-	-	-	-	M	F	
24	B	LS	10YR 5/6	-	-	-	-	-	M	F	
102	C1	S	10YR 5/3	-	-	-	-	-	SG	L	
132	C2	Fine S	10YR 5/3	102	high/low	2	-	-	SG	L	

Additional Notes: _____



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

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

Deep Observation Hole Number: TP-7 4/2/2021
Hole # Date Time Weather Latitude Longitude:

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

Description of Location: _____

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
 Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable
 Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
12	A	SL	10YR 5/3	-	-	-	-	-	M	F	
24	B	LS	10YR 5/6	-	-	-	-	-	M	F	
54	C1	Coarse S	10YR 5/3	-	-	-	5	5	SG	L	
72	C2	Med S	10YR 5/3	-	-	-	-	-	SG	L	
120	C3	Coarse S	10YR 5/3	-	-	-	5	5	SG	L	

Additional Notes: _____



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

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

Deep Observation Hole Number: TP-8 4/2/2021
Hole # Date Time Weather Latitude Longitude:

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

Description of Location: _____

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
 Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable

Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
4	A	SL	10YR 3/3	-	-	-	-	-	M	F	
24	B	S	10YR 5/6	-	-	-	-	-	SG	L	
120	C	S	10YR 5/3	-	-	-	10	10	SG	L	

Additional Notes: _____



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

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

Deep Observation Hole Number: TP-9 4/2/2021
Hole # Date Time Weather Latitude Longitude:

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

Description of Location: _____

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable
Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
8	A	SL	10YR 3/3	-	-	-	-	-	M	F	
18	B	LS	10YR 5/6	-	-	-	-	-	M	F	
80	C1	Med S	10YR 5/3	-	-	-	-	-	SG	L	
120	C2	S	10YR 5/3	-	-	-	-	-	SG	L	

Additional Notes: _____



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

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

Deep Observation Hole Number: TP-10 4/2/2021
Hole # Date Time Weather Latitude Longitude:

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

Description of Location: _____

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
 Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
12	A	SL	10YR 3/3	-	-	-	-	-	M	F	
24	B	LS	10YR 5/6	-	-	-	-	-	M	F	
72	C1	S	10YR 5/3	-	-	-	5	5	SG	L	
126	C2	Fine S	10YR 5/3	72	high/low	2	-	-	SG	L	

Additional Notes: _____



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

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

Deep Observation Hole Number: TP-11 4/2/2021
Hole # Date Time Weather Latitude Longitude:

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

Description of Location: _____

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable

Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
36	FILL										
52	B	LS	10YR 5/6	-	-	-	-	-	M	F	
84	C1	Fine S	10YR 5/3	52	high/low	2	-	-	SG	L	
96	C2	Coarse S	10YR 5/3	-	-	-	-	-	SG	L	

Additional Notes: _____



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

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

Deep Observation Hole Number: TP-12 4/2/2021
Hole # Date Time Weather Latitude Longitude:

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

Description of Location: _____

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

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet
Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable

Materials Present: Yes No If Yes: Disturbed Soil Fill Material Weathered/Fractured Rock Bedrock

5. Groundwater Observed: Yes No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
6	A	SL	10YR 3/3	-	-	-	-	-	M	F	
18	B	LS	10YR 5/6	-	-	-	-	-	M	F	
126	C	Coarse S	10YR 5/3	-	-	-	-	-	SG	L	

Additional Notes: _____



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

D. Determination of High Groundwater Elevation

1. Method Used:
- | | | | |
|---|-------------------|-------------------|----------|
| <input type="checkbox"/> Depth observed standing water in observation hole | Obs. Hole # _____ | Obs. Hole # _____ | |
| | _____ inches | _____ inches | |
| <input type="checkbox"/> Depth weeping from side of observation hole | _____ inches | _____ inches | |
| <input checked="" type="checkbox"/> Depth to soil redoximorphic features (mottles) | _____ inches | _____ inches | SEE LOGS |
| <input type="checkbox"/> Depth to adjusted seasonal high groundwater (S_h) (USGS methodology) | _____ inches | _____ inches | |

Index Well Number _____

Reading Date _____

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

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

2. Estimated Depth to High Groundwater: _____ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material SEE LOGS
- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?
- Yes No
- b. If yes, at what depth was it observed (exclude A and O Horizons)?
- | | |
|-----------------------|-----------------------|
| Upper boundary: _____ | Lower boundary: _____ |
| inches | inches |
- c. If no, at what depth was impervious material observed?
- | | |
|-----------------------|-----------------------|
| Upper boundary: _____ | Lower boundary: _____ |
| inches | inches |



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

F. Certification

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

Signature of Soil Evaluator

Paul Kirchner, SE 14237

Typed or Printed Name of Soil Evaluator / License #

4/9/2021

Date

7/1/2021

Expiration Date of License

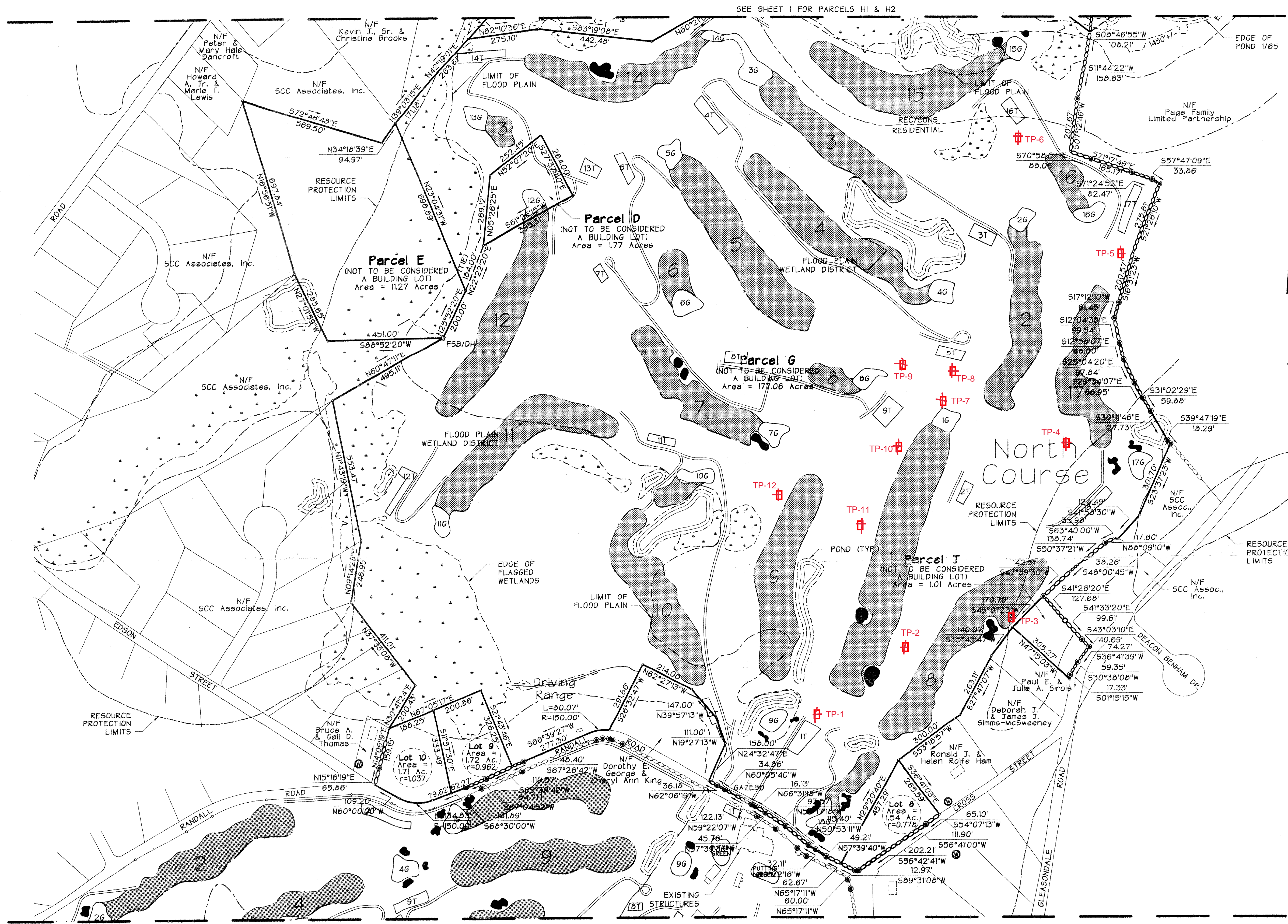
Name of Approving Authority Witness

Approving Authority

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

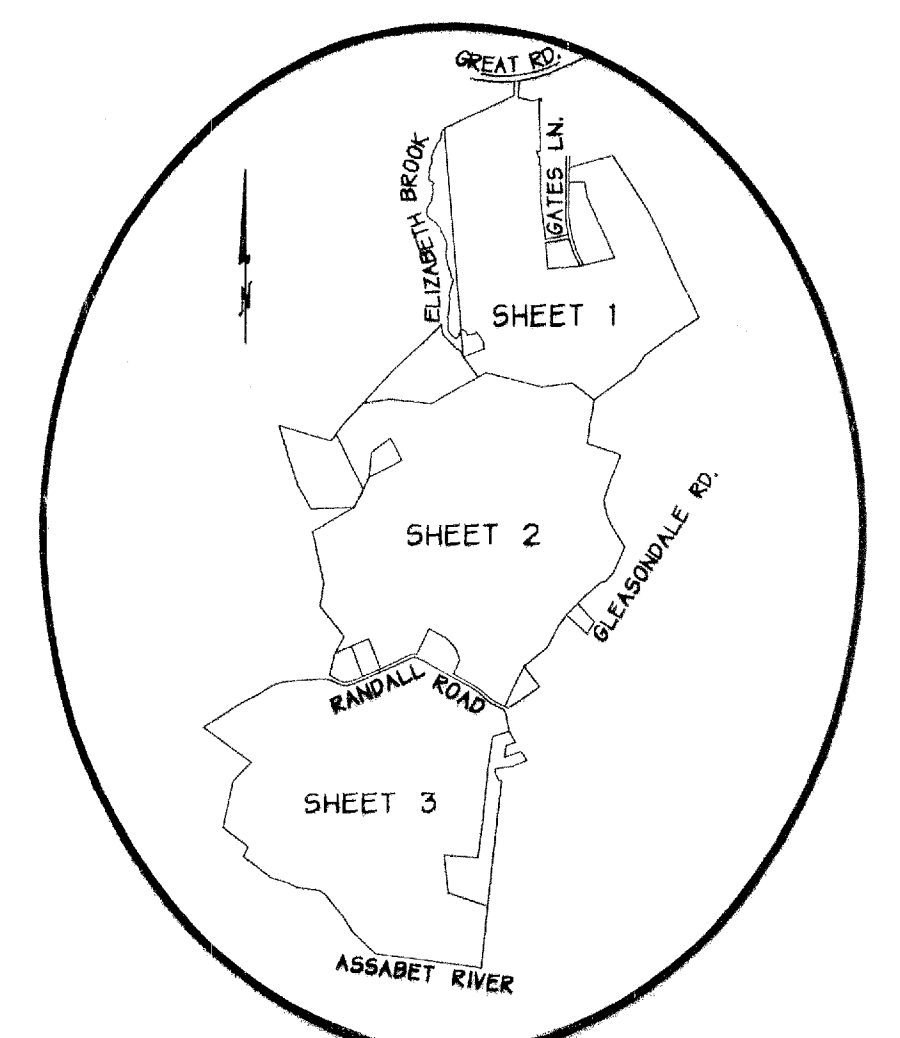
Field Diagrams: Use this area for field diagrams:

SEE ATTACHED



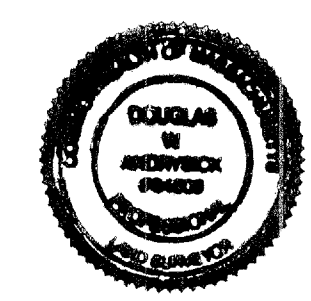
- PLAN REFERENCES**
- PLAN 700 OF 1993
 - PLAN ENTITLED "PLAN OF LAND IN STOW, MA" DATED FEBRUARY 3, 1998, AND PREPARED BY ACTON SURVEY & ENGINEERING, INC.
- DEED REFERENCE**
- BOOK 17734 PAGE 443
- NOTES**
- ASSESSORS MAPS R-10 & R-11, PARCELS 11 & 25.
 - ZONING: RESIDENTIAL AND RECREATION CONSERVATION.
 - THIS PLAN SUPERCEDES ALL PREVIOUS PLANS OF RECORD PERTAINING TO THIS LAND.
 - PARCELS D, E, F, G, H1, H2, J, & K ARE NOT TO BE CONSIDERED BUILDING LOTS.
 - A LEVEL 2 SPECIAL PERMIT TO OPERATE A DRIVING RANGE WAS GRANTED BY THE BOARD OF APPEALS AND WAS FILED WITH THE TOWN CLERK ON APRIL 28, 1989. NO OTHER VARIANCE HAS BEEN GRANTED DURING THE PERIOD OF SCC ASSOCIATES, INC. OWNERSHIP.
 - FIELD SURVEY DONE NOVEMBER 1997 AND AUGUST 2001.
 - ALL STREETS ABUTTING THIS LAND ARE PUBLIC. ELIZABETH STREET, ALSO SHOWN ON THIS PLAN, IS PRIVATE.
 - PROPERTY LINE INFORMATION TAKEN FROM A PLAN ENTITLED "PLAN OF LAND IN STOW, MASS. OWNED BY SCC ASSOCIATES, INC." DATED AUGUST 23, 1993 BY COLBURN ENGINEERING, INC. AND RECORDED IN THE MIDDLESEX REGISTRY OF DEEDS AS PLAN NUMBER 700 OF 1993, AND IS NOT THE RESULT OF A COMPLETE PERIMETER SURVEY BY ACTON SURVEY & ENGINEERING, INC.
 - GREENS, TREES AND CART PATHS ARE TAKEN FROM PHOTOGRAPHS PROVIDED BY THE CLIENT AND SUPPLEMENTED BY VISUAL OBSERVATION. THEIR LOCATIONS AS SHOWN ON THIS PLAN ARE NOT THE RESULT OF AN INSTRUMENT SURVEY BY ACTON SURVEY & ENGINEERING, INC. AND SHOULD BE CONSIDERED TO BE APPROXIMATE ONLY.

- LEGEND**
- FOUND DRILL HOLE (DH).
 - FOUND IRON PIPE (IP).
 - ⊠ FOUND STONE BOUND/DRILL HOLE (SB/DH).
 - ⊡ FOUND FIELD STONE BOUND/DRILL HOLE (FSB/DH).
 - FOUND IRON PIPE (IP).
 - DENOTES STONE WALL
 - APPROXIMATE SEPTIC SYSTEM LOCATION
 - FOUND WELL
 - 150' DIAMETER BUILDING CIRCLE.
 - BODY OF WATER
 - GOLF CART PATH

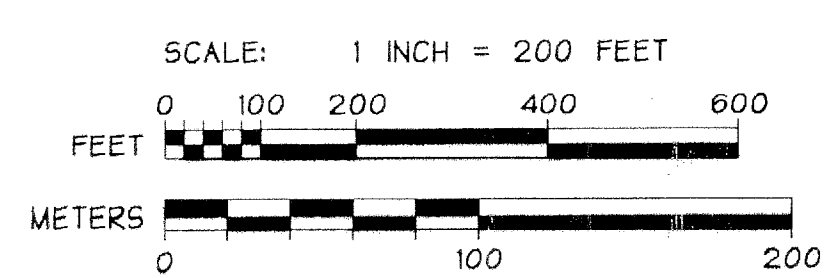


SEE SHEET 1 FOR PARCELS H1 & H2

SEE SHEET 3 FOR PARCELS F & K



Douglas W. Aronoff
5/17/02



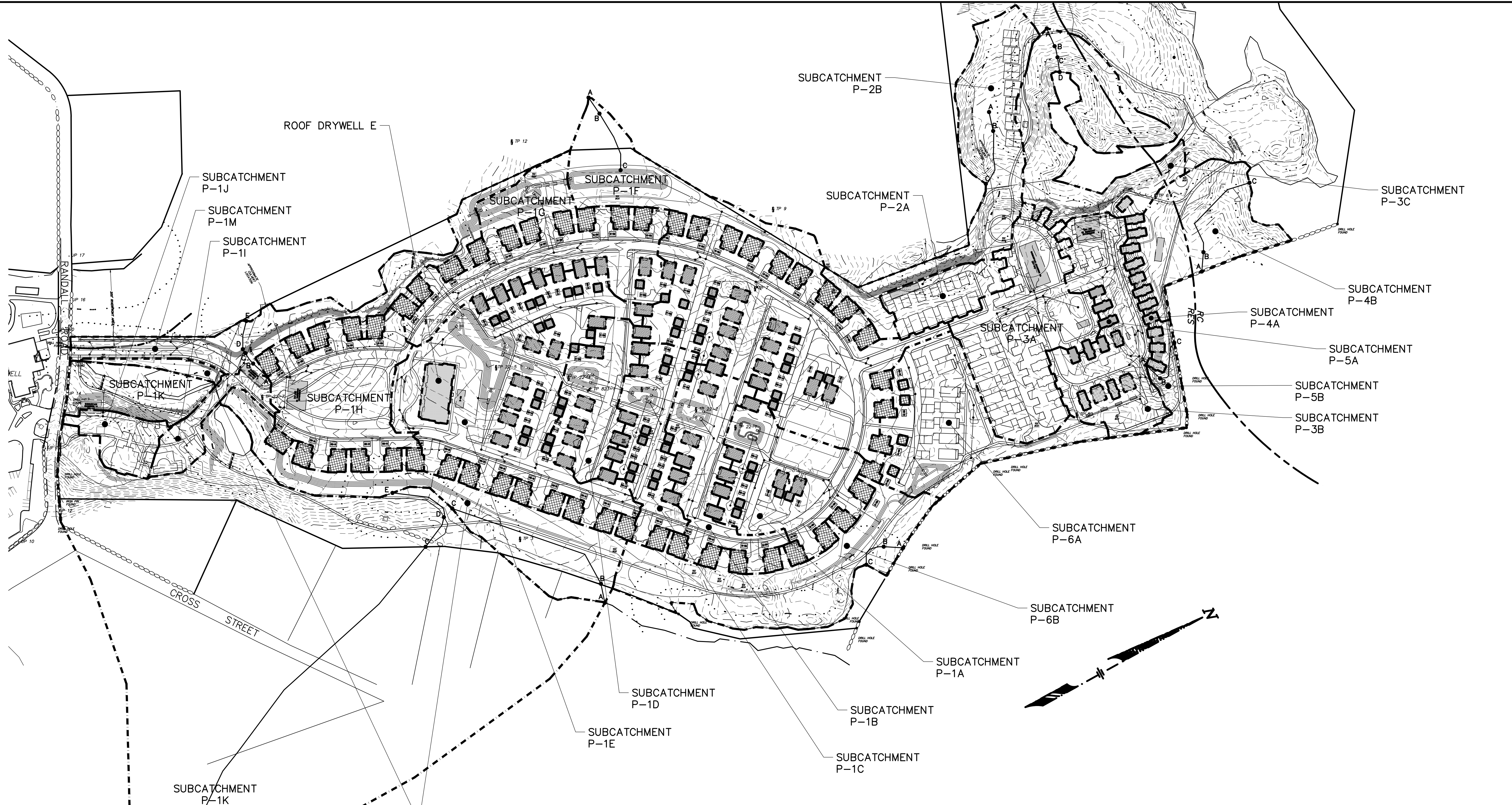
PLAN OF LAND IN STOW, MASSACHUSETTS

PREPARED FOR: SCC ASSOCIATES, INC.
58 RANDALL ROAD, STOW, MASSACHUSETTS 01775

SCALE: 1 INCH = 200 FEET DATE: MAY 2002

ACTON SURVEY & ENGINEERING, INC.
97 GREAT ROAD - P.O. BOX 666 - ACTON - MASS.
(978) 263-3666 FAX (978) 635-0218

Drainage Maps



THE RESIDENCES AT STOW ACRES
 PRELIMINARY COMPREHENSIVE PERMIT PLAN
 IN
 STOW, MASSACHUSETTS
 (MIDDLESEX COUNTY)

POST-DEVELOPMENT DRAINAGE MAP
 FOR: MCO & ASSOCIATES, INC.
 SCALE: NOVEMBER 21, 2023

STAMSKI AND McNARY, INC.
 1000 MAIN STREET ACTON, MASS.
 ENGINEERING - PLANNING - SURVEYING

SM-6781 (6781.SITE.N.dwg) SHEET OF 33

Stormwater Operation and Maintenance Manual

Stamski And McNary, Inc.

Engineering - Planning – Surveying

1000 Main Street; Acton, MA 01720 (978) 263-8585

www.stamskiandmcnary.com

Stormwater Operation and Maintenance Manual

For

The Residences at Stow Acres
Stow, MA

December 12, 2023

SM-6781

Table of Contents

Long Term Operation and Maintenance Plan

Operation and Maintenance Sample Inspection Log

Long Term Operation and Maintenance Plan

Schedule for Inspection and Maintenance:

Street Sweeping:

The pavement shall be swept of all sediment once in the spring and once in the fall.

Infiltration Basin and Sediment Forebay:

During construction, side slopes of the basin shall be inspected for erosion. All eroded areas shall receive 6" of loam and shall be reseeded per the design plan. During the first year after construction, inspection shall be conducted monthly. Areas of continued erosion should be stabilized with crushed stone. The basin shall be cleaned upon the accumulation of 6 inches of sediment during construction. The basin shall be cleaned upon the completion of construction.

During the first three years after construction, the basin shall be inspected during the growing and non-growing season, twice per year. Data gathered during inspections should be recorded, mapped, and assessed.

At a minimum, inspect the sediment forebay monthly, and clean it out at least 4 times per year. After removing sediment, replace any vegetation damaged during the clean-out by either reseeding or resodding. When reseeding, incorporate practices such as hydroseeding with a tackifier, blanket, or similar practice to ensure that no scour occurs in the forebay while the seeds germinate and develop roots.

At least twice per year, mow the buffer area, side slope, and bottom of the Infiltration Basin and Sediment Forebay.

Subsurface Chambers:

Inspect the roof drywell and subsurface chamber after every major storm event via the inspection port for the first few months to ensure proper stabilization and function. Thereafter, inspect at least once per year. Water levels should be recorded over several days to check chamber drainage. Also, mosquito controls may be necessary.

Isolator Rows:

Inspect the isolator row after every major storm for the first few months after construction to ensure proper stabilization and function. Thereafter, inspect and clean at least twice per year. Water levels should be recorded over several days to check the structures drainage. Mosquito controls may be necessary. If at the time of inspection the depth of sediment within the isolator row exceeds 4 inches, a clean-out shall be performed. Cleaning the isolator row involves using the jetvac process that flushes water through the system with sediment collecting in the manhole. Flush water through the system until backflush water is clean. Vacuum manhole as needed.

Deep Sump Hooded Catch Basins and Manholes:

During construction, catch basin grates shall be wrapped with filter fabric. Catch basins shall be cleaned upon the completion of construction. After construction, the deep sumps for all catch basins and drain manholes shall be inspected four times per year and cleaned four times per year. Sediment removed shall be disposed of in accordance with applicable local, state, and federal guidelines and regulations. The depth of sediment in a basin shall not exceed a depth of 18 inches as determined by probing with a stick. If the stick hits the bottom within 30 inches of the water level, more than 18 inches of sediment has accumulated and must be removed. Licensed persons should remove and dispose of the contents of the sump in accordance with applicable regulations.

Flared Ends:

The flared end shall be inspected annually. The flared end shall be inspected for excessive sediment buildup. If appreciable amounts of sediment are observed, it shall be removed.

Emergency Contacts:

In the event of a hazardous materials spill on the site the following parties shall be contacted:
Stow Fire Department: ph: 978-897-4537

Records:

The Responsible Party shall maintain an inspection log of all elements of the storm water management plan. The Responsible Party shall maintain a maintenance log documenting the inspection and maintenance of the drainage structures under his control. A copy of the erosion control and storm water maintenance plan and inspection logs shall be kept onsite at all times.

Inspections:

Members of the Maynard Planning Board and Conservation Commission or their designee shall be allowed to enter the property at reasonable times and in a reasonable manner for the purposes of inspection in accordance with the Town's Stormwater Regulations.

Responsibility Party:

The Applicant shall be responsible for all inspection and maintenance of the items included in the Manual during construction and after construction.

Budget:

The estimated annual operation and maintenance budget is \$5,000.

Name: _____

Signature: _____

Date: _____

Operation and Maintenance Sample Inspection Log

The Residences at Stow Acres
Operation and Maintenance Inspection Log

Year: _____

Inspection Items:

Street Sweeping

Catch Basin

Infiltration Basin

Sediment Forebay

Subsurface Chambers

Frequency:

Two times per year

Four times per year

Two times per year

Monthly

Two times per year

Street Sweeping:

Previous Inspection Date: _____

Inspection Date: _____

Inspector Name: _____

Comments: _____

Action Required:

Catch Basin:

Previous Inspection Date: _____

Inspection Date: _____

Inspector Name: _____

Sediment Depth: _____ (Remove if depth greater than 18")

Comments: _____

Action Required:

Infiltration Basin:

Previous Inspection Date: _____

Inspection Date: _____

Inspector Name: _____

Sediment Depth: _____

Erosion in Basin: _____

Outlet Structure: _____

Comments: _____

Action Required:

Sediment Forebay:

Previous Inspection Date: _____

Inspection Date: _____

Inspector Name: _____

Sediment Depth: _____ (Remove if depth is between 3"-6")

Comments:

Action Required:

Subsurface Chambers:

Previous Inspection Date: _____

Inspection Date: _____

Inspector Name: _____

Comments:

Action Required: